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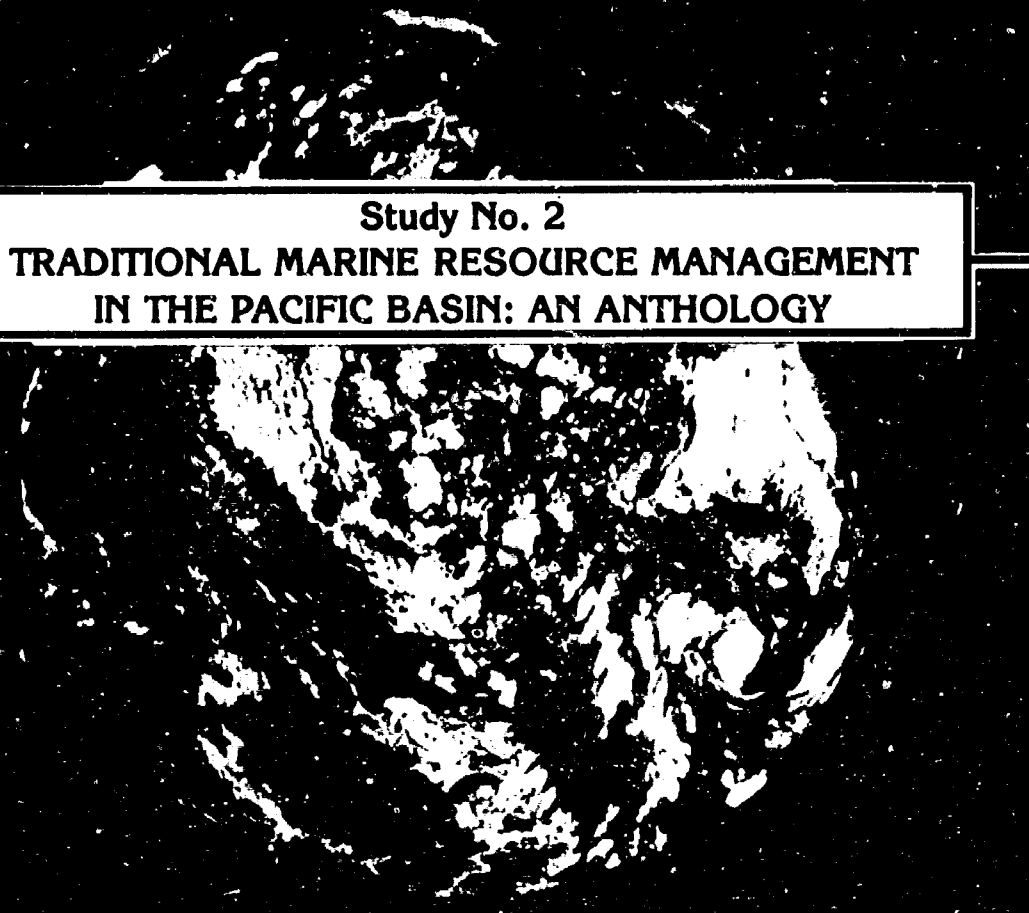

Study No. 2
TRADITIONAL MARINE RESOURCE MANAGEMENT IN THE PACIFIC BASIN: AN ANTHOLOGY

EDITED BY

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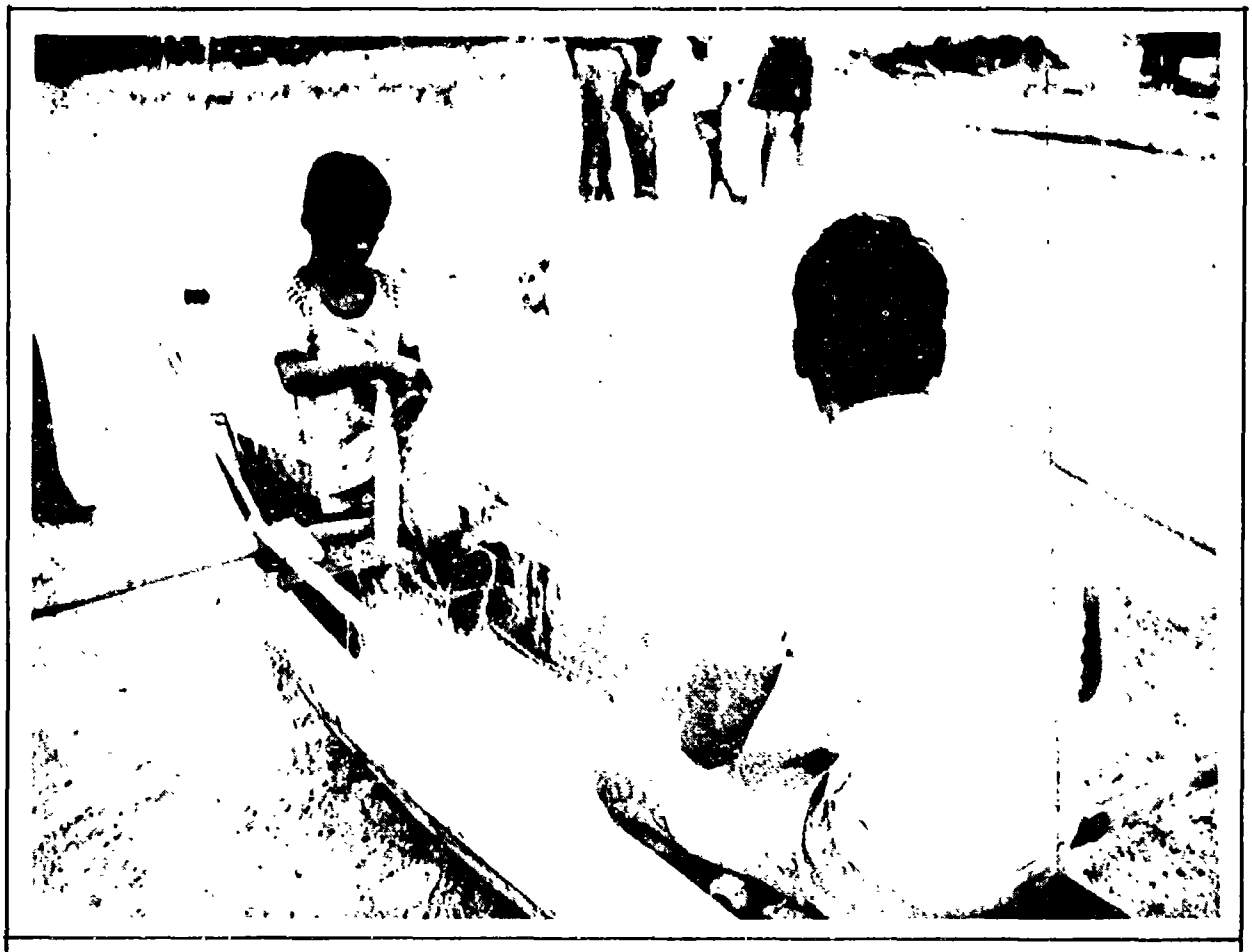

The cover photograph illustrates an essential aspect of good management in traditional fisheries, the transmission of knowledge between generations. Here, on the beach at Arbolan, Palawan Island, in the Philippines, a father is beginning the instruction of his 7-year-old son in the rudiments of inshore gill-netting. It was taken by Kenneth Ruddle.

TRADITIONAL MARINE RESOURCE MANAGEMENT IN THE PACIFIC BASIN:

AN ANTHOLOGY

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An anthology of papers dealing with traditional resource management procedures assembled within the framework of the Unesco-COMAR programme and the Unesco/IABO working group on traditional knowledge of coastal systems as a follow-up to a Unesco/ROSTSEA regional seminar held in Jakarta, Indonesia on 05-09 December 1983.

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Kenneth Ruddle,
Osaka;

and

R.E.Johannes,
Hobart.

April, 1989.

INTRODUCTION

by

KENNETH RUDDLE and R.E. JOHANNES

Owing to the continued demand for two recent publications that went quickly out-of-print, Maritime Institutions in the Western Pacific (K. Ruddle and T. Akimichi, eds., 1984, National Museum of Ethnology) and The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific (K.Ruddle and R.E.Johannes, eds., 1985, UNESCO), it has been decided to reprint in this anthology several of the more relevant contributions contained in those two volumes. These reprinted papers have been complemented by five contributions prepared especially for this volume, and one republished from another source.

The intent of this volume is to contribute to the growing body of documentation on traditional systems of fisheries management. This is an essential prerequisite to any comparative, problem-oriented study. Synthesis of the cases and in-depth examination of key theoretical issues in traditional fisheries management is deferred to a volume which will present the results of the next stage of this on-going research. Rather than the generally static "snapshots" of individual systems presented here and in the two preceding volumes, further research is aimed at distilling general principles underlying sea tenure systems, as well as highlighting the processual aspects of sea tenure in their continual adaptation to constantly evolving socio-economic, biological and physical general environments, that together add up to global change. It will also attempt to evaluate systems comparatively and measure their performance, to provide options for contending with global change.

Traditional fisheries management in the Pacific Basin is examined in the first seven papers. Hviding's study, conducted in Western Province of the Solomon Islands, deals with some aspects of tho detailed traditional marine resources knowledge of the Marovo people, and their complex customary system of marine tenure. In Marovo society tenure is vested in local corporate kinship groups, which control ancestral marine territories. Management of rights to marine and terrestrial resources constitute the principal organizational focus of such groups. Using empirical event-based descriptions of the day-to-day operation of sea tenure, Hviding illustrates how the continuous management dynamics of the system mold economically productive and social activities, and expands the concepts underpinning the

study of traditional marine resource management systems beyond largely generalized and idealized norm structures characterizing most previous studies.

In some traditional societies the entire physical, economic and spiritual life of communities is centered on the sea. Davis illustrates this in his contribution on the Yolngu people of northern Arnhem Land, Northern Australia. Since the Yolngu believe that their spirit comes from the sea at birth, and returns there at the time of death, they ensure that the boundaries of clan estates encompass tracts of sea space. For religious reasons access rights are strictly enforced, on pain of death. Davis also examines the conflict between Aboriginal tenurial concepts and those of the Euro-Australian tradition, and the resolution of those differences through legal channels.

Many Oceanian societies, particularly those of the dry, infertile atolls of the Central and Western Pacific, long ago developed effective strategies for the sustained management of limited marine resources. And in some a traditional resource conservation ethic remains strong, and underpins a wide range of strategies aimed at the long-term sustained yield of marine resources. Zann examines such strategies for the traditional fisheries of Kiribati and Tuvalu. Here sea tenure controlled access, and fishing effort was controlled by both customary behaviour and explicit regulation. Turtles were protected, and food taboos distributed fishing pressure. In combination with the preferential exploitation of both pelagic and low trophic level lagoon species, together with weather conditions, geographical proximity of settlements to resources, and gear limitations, these practises were traditionally used to manage reef and lagoon resources in a sustained manner. Zann also examines changes caused by modernization on traditional management strategies.

Teulieres' brief account of traditional management of lagoon fisheries among the Nenema people of northwestern New Caledonia is an important introduction to the traditional sea tenure system in an area from which surprisingly little published information is available on either traditional fisheries in general, or marine resource management systems in particular. Lagoon fisheries in New Caledonia are delimited, "owned" and subject to management regulations. The local "ownership" of lagoon waters is vested in traditional "chiefdoms", which manage their fisheries principally by controlling access to them. Access control is supplemented by social pressures that, in effect, result in both quantitative and qualitative regulation of catches.

Reiterating a theme initiated in Hviding's paper, Akimichi's contribution, on Okinawan ambushi (stake net) fishery, demonstrates that examination of the normal or idealized elements of a system of sea tenure will yield only a partial understanding of the system. Fuller elucidation requires that such an examination be complemented by an analysis of the behaviour of individual fishing units. Akimichi provides a descriptive case study of the informal regulation of the more than 200 territories defined for the stake net fishery in the inshore waters off Itoman, on the main island of Okinawa Prefecture, Japan.

Despite many important gaps in information, traditional systems of sea tenure and their supporting knowledge bases in Oceania are well-documented compared with other parts of the world. Many different types of sea tenure exist, or have existed, in Micronesia. In a review of nine societies, Sudo distinguishes four principal types of sea tenure system, based on the relationship between categories of social group and marine resources: (1) those in which resource "ownership" is vested in local communities, but in which ultimate control is vested in a chief; (2) "ownership" of defined areas of reef and lagoon by lineages or clans; (3) "ownership" of entire reef-lagoon systems by lineages or clans; and (4) "ownership" of tracts of reef-lagoon complex by individual families.

Research on the use of renewable natural resources by pre-industrial societies has led to the notion of a widespread traditional conservation ethic. The contribution by Polunin, on the traditional management of marine resources in Indonesia and Papua New Guinea, challenges this idea. In these two countries greater attention was traditionally paid to terrestrial resources compared with those of the sea, and this might account for the distribution of sea tenure systems there. Polunin contends that, in these countries at least, systems of sea tenure probably arose less from a conservation ethic than from the more intense inter- and, perhaps, intra-community conflict that developed as inshore marine resources became more economically valuable.

The following five papers group around the theme of the transition from traditional systems of marine resources management to a modern context. Contributing further to the theme of Polunin's paper is Hooper's examination of the fisheries of Tokelau. Hooper contends that the distinctive feature of traditional fishing in Tokelau was not its conservationist ethic, but its conservatism, and that the multitude of customary restrictions in which it was enmeshed were directed primarily towards maintaining the authority of elders and, thus, the stability of social order, rather than towards the maintenance of a balance with nature. However, with developments since the 1970s, Tokelauan fishing has lost much of its conservatism and ritual, and has become more monetised, yet not wholly commercialised. Aspects of the traditional system have retained both practical importance and symbolic significance.

Despite the widespread yet contrasting assertions that traditional systems of fisheries management can either assist in or impede the design of modern systems of coastal marine resources management, there has been little scientific assessment of them. In their examination of two traditional systems of sea tenure in the Torres Strait, Johannes and MacFarlane demonstrate that neither generalisation is correct. Rather, each customary system of marine tenure should be evaluated independently, to assess its potential role in modern management. Such an assessment should be based on the ability of a system to facilitate resource conservation, its compatibility with government policy, and the rigour with which the system is defined and maintained.

That traditional management systems for marine resources can

be adapted, although not necessarily in an evolutionary manner, to serve a modern purpose, is illustrated by the historical continuity evident in the management of Japanese coastal fisheries, as examined in the paper by Ruddle. Through a rights system and membership in local fisheries cooperative associations, both of which are based on deep historical roots, Japanese coastal fishermen have legally guaranteed equitable access to and "ownership" of living aquatic resources in their tenured waters. Contemporary coastal sea tenure in Japan involves time-honoured village customary procedures that have been incorporated into modern legislation.

In his examination of a traditional basis for the development of coastal fisheries in the Solomon Islands, Baines argues that incorporation of traditional systems of fisheries management is a *sine qua non* for successful fisheries development. Prior to the planning of fisheries development, a "basic fisheries tradition" should be defined for each culture group. This would clarify such key elements as areas, boundaries, rights, principles of catch distribution, and management responsibilities for each traditional management system, and would provide a realistic framework and guidelines for planning fisheries development at both provincial and national levels.

Wright continues this theme with an examination of the integration of traditional fisheries concepts in contemporary development in Papua New Guinea. Many of the traditional marine subsistence resources of the country have now acquired a commercial export importance. Thus indigenous customs governing resource use and local claims of "ownership" now conflict with official plans to develop resources commercially. On the other hand, there are also examples in Papua New Guinea that illustrate the successful integration of traditional practises with modern fishing ventures.

As demonstrated by Sims for the Cook Islands, the impact of Western cultures and the processes of modernization often erode - or, at minimum, lead to hybridization of - traditional marine tenure and management systems. Sims examines the adaptation of traditional systems to fit modern conditions, and identifies perceptions, investment, knowledge, and skills as the principal motivations and means of maintaining systems of sea tenure. Where modern management has been based on customary procedures, such as area closures, seasonal restrictions, gear restrictions, and breeding reserves, the new methods have been complied with.

The volume concludes with two quite distinct topics. Chou examines the changes in the traditional *kelong* (stake net) fishery of Singapore, and its gradual conversion to an aquaculture system, as a result of the enforcement of the national development policy. This study demonstrates that the mode of production in the *kelong* depends as much on ideologies that govern social relationships and networks among fishery workers, together with religion and national development policies, as it does on economic considerations.

Finally, Costa-Pierce describes the integrated systems of aquaculture and agriculture in pre-contact Hawaii. He concludes that such systems, which demonstrate a remarkably sophisticated

ecological knowledge base rather than technological backwardness, may have much to contribute to the design of contemporary integrated systems.

KEEPING THE SEA:
ASPECTS OF MARINE TENURE IN MAROVO LAGOON, SOLOMON ISLANDS

by

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ABSTRACT

A large, ecologically complex barrier reef and lagoon system fringing a group of high volcanic islands is the core of existence for the people of Marovo, Western Province, Solomon Islands. Not only do Marovo people base much of their livelihood on their marine resources, but local identity to a large degree builds on deeply rooted associations between people and sea.

Still characterized by comparative resource abundance, the Marovo coastal environment is facing a number of possible disturbances related to rapid population growth as well as to commercial resource development. Marovo people still possess an impressive traditional knowledge of the marine environment, and reef and lagoon areas are managed through a complex system of customary marine tenure, in which descent groups control ancestral marine territories. The core of the tenure system are certain long-standing basic principles which enable group leaders to continuously adapt resource management to changing circumstances.

Marine tenure in today's Marovo is characterized by diversity, flexibility and a strong interplay between types of kinship-based primary and secondary rights. There is a large, non-codified variety of restrictions applying to entry, technologies and target species. The actual announcement and enforcement of restrictions fluctuates through time and space according to which resources emerge as important issues, and involves negotiation between resource users and managers.

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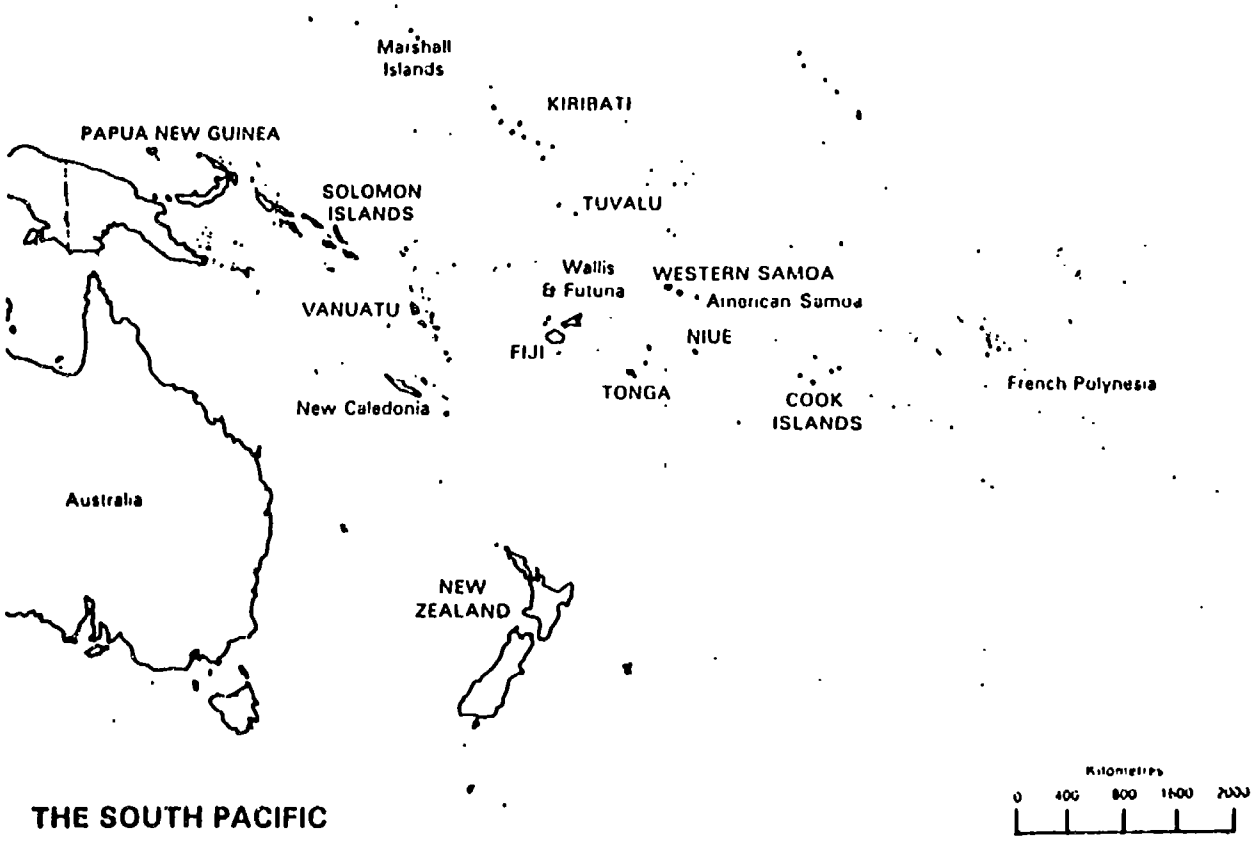
INTRODUCTION

This paper deals with relationships between people and sea in the Marovo Lagoon area of Western Province, Solomon Islands (Figs. 1 & 2). It describes some aspects of Marovo people's traditional knowledge and management of their seas and reefs. Detailed knowledge of the marine environment and a complex system of customary marine tenure, which both evolved through many generations, constitute today's links between Marovo society and local marine resources. Marovo society is based on corporate kinship groups locally termed butubutu. These groups have the tenure of land and sea as their most important organizational focus. Through handling a variety of everyday tasks related to the management of resources, a butubutu defines itself as a corporate unit and reaffirms an ancient link between group and territory.

FIGURE 1: THE LOCATION OF THE SOLOMON ISLANDS IN THE SOUTH PACIFIC

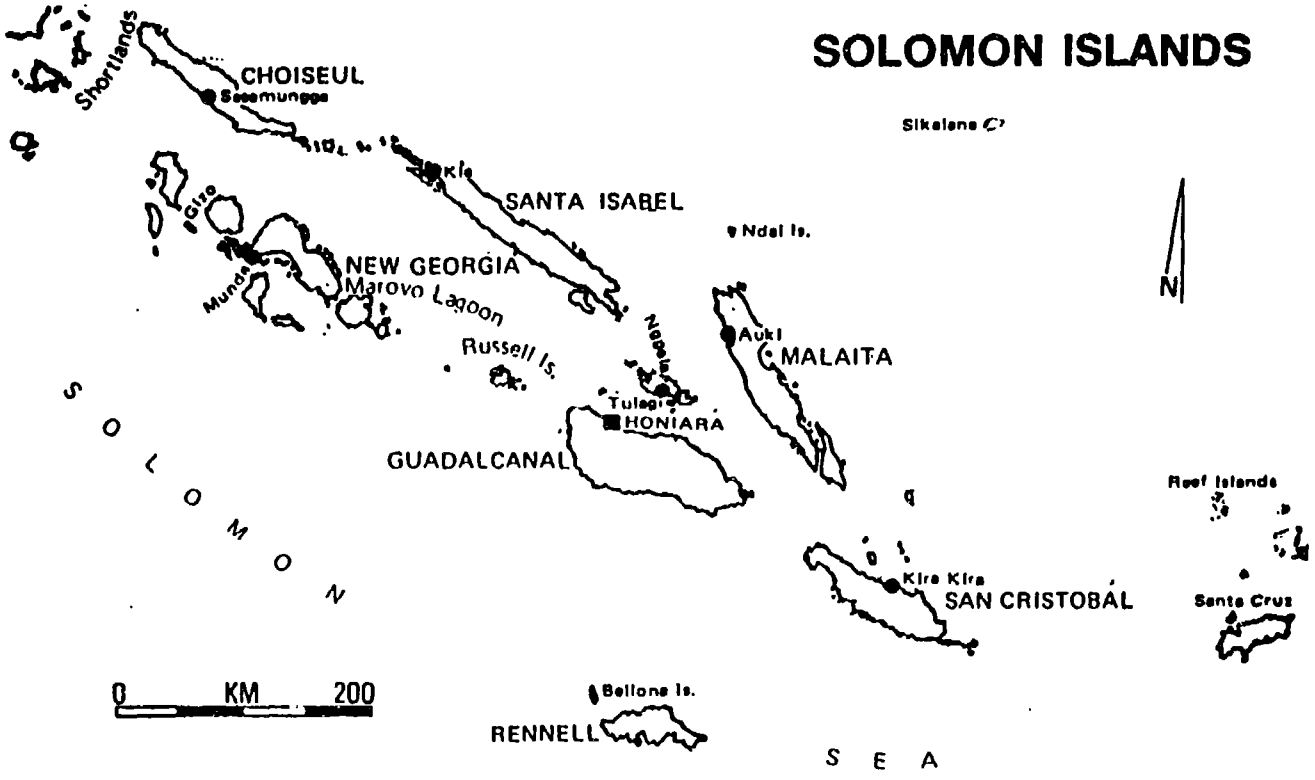


Sociocultural Setting

The Marovo area is dominated by a very large coastal lagoon embracing several high volcanic islands (Fig. 3). In the lagoon

area and on the weather coasts of the main islands lives a population of some 7800 (GOS, 1986). These people form a culture complex where the Marovo language is predominant, although there are also four other indigenous languages.

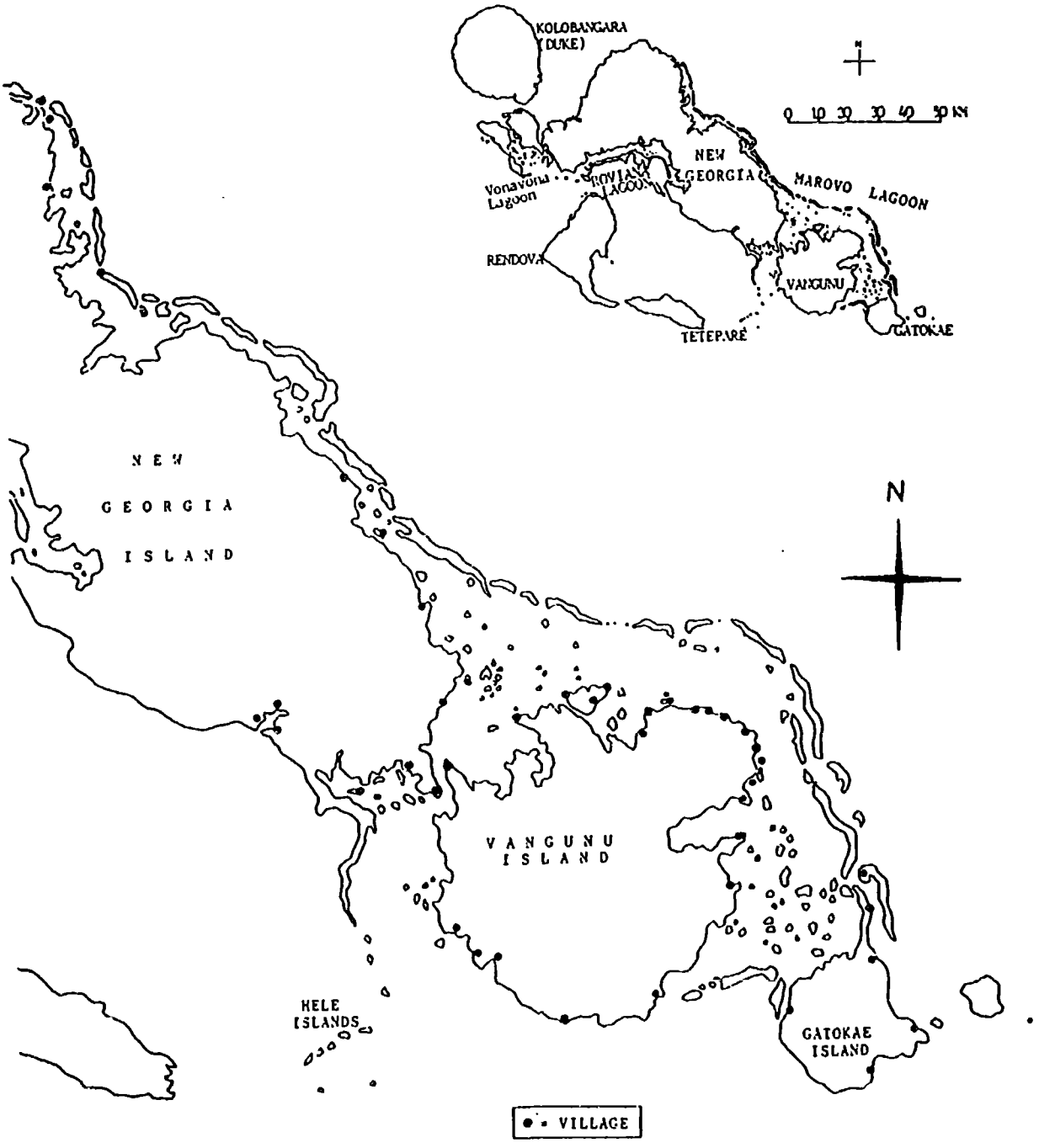
FIGURE 2: PRINCIPAL LOCATIONS IN THE SOLOMON ISLANDS



A traditional contrast between coastal people and bush people exists, but today all villages are situated on the mainland coasts or on small islands in the lagoon. Marovo society is divided into more than fifteen named corporate kinship groups, called butubutu, each controlling a defined area of land and, in most cases, sea. Resource control is carried out through a traditional authority structure in which the affairs of each butubutu are managed by a senior male leader with a number of associate leaders, all recruited from a core of people permanently resident in the area of the butubutu. Leadership succession, especially for the senior positions, has a strong element of inheritance, usually from father to son.

Today, sociocultural variation throughout the Marovo area is mainly related to the important role played by three different church denominations: The Seventh Day Adventist Church (SDA), the

FIGURE 3: THE MAIN ISLANDS OF THE NEW GEORGIA GROUP, AND THE CONTEMPORARY SETTLEMENT PATTERN IN THE MAROVO AREA



United Church (UC, Methodist) and the Christian Fellowship Church (CFC), an indigenous church where Methodism is fused with strong communalism. Each village adheres to one denomination only. Churches have a strong influence on everyday village life, but have less impact in direct matters of customary resource tenure.

Throughout the more than fifty Marovo villages, diverse subsistence agriculture and fishing activities form the basis of the economy. In Marovo fishing, a large and diverse number of mainly traditional techniques are used from small craft, mostly locally-made dugout canoes (Fig. 4). Marovo fishing on the whole seems to be rather productive: Analysis of catch-and-effort data from a sample of fishing trips gives an estimated mean output in whole fish of 2.7 kg/man-hour (1). Fish catches are mostly consumed by the fisherman's family, with the surplus distributed among relatives (Fig.5). Small-scale marketing of fish is increasing, particularly as more outboard motors are purchased, adding fuel expenses to the investments made in fishing trips. The gathering of shellfish and crabs by women is a major contribution to the diet in UC and CFC villages, whereas the SDA faith prohibits the consumption of such foods.

There is an overall increase in reliance on cash income in Marovo. This income has a variety of sources, such as copra (declining), woodcarving and other handicrafts-making, commercial shells, marketing of garden produce and fish, and the like, as well as remittances from relatives working in urban centers. In the everyday life of most households, however, there remains a strong emphasis on meeting subsistence needs before engaging in money-making activities.

Environment and Resources

The climate of Marovo is hot and humid throughout the year. From April to September, the southeasterly trade winds prevail, whereas the more irregular and wet northwest monsoons are predominant during the November-March period. The time of SE winds coincides with the occurrence of low tides during the daytime, and that of NW winds with low tides at night. This recurring pattern is important for the yearly cycle of fishing and is tied up with local knowledge about a number of other cyclical events in nature.

The Marovo reef and lagoon complex embraces the northern and eastern coasts of New Georgia and Vangunu islands, stretching from Jela, at the northern tip of New Georgia, southeastwards to the island of Gatokae. The lagoon thus delimited by barrier

(1) The survey was carried out in one village, covering trips in which, altogether, about 350 fishermen took part. All trips were for subsistence purposes only, thus hardly reflecting maximum possible fishing effort. Catches were not weighed, but estimated from guidelines on fish species, size and weight, established through initial scaling trials.

FIGURE 4: A MOTORISED, WOODEN DUG-OUT CANOE ON THE SHALLOWS OF MAROVO BARRIER REEF. ACROSS THE LAGOON LIES THE MAINLAND OF NEW GEORGIA ISLAND

reef and main islands covers an area of ca. 700 km2 (Stoddart, 1969).

The three high volcanic islands have a largely intact cover of tropical rainforest, only a few areas having been subject to large-scale commercial logging. The forest provides medicinal plants, housing materials, trees for dugout canoes, and animal protein (wild pig, opossum and birds, among others). Subsistence agriculture - mainly the shifting cultivation of sweet potato and cassava, supplemented by plantings of ngali nuts (Canarium spp.), some cocoa, and coconuts and sago palm (Metroxylon spp.) along the coast - is conducted in the lower foothills.

Many small rivers enter the lagoon in wide, shallow estuaries, with dense mangroves containing rich resources of shells and crabs. In several rivers, large and predictable aggregations of mullet (Mugil spp.), a valued food fish, occur.

The lagoon proper varies considerably in width, i.e., the distance from mainland to barrier reefs. The northern and south-eastern parts of the lagoon are fairly shallow, whereas depths of 25 m or more are common in the central parts (cf. Stoddart, 1969 for details on the geomorphology of the Marovo reefs). The

FIGURE 5: IN CHEA VILLAGE, CENTRAL MAROVO, AFTER THE FISHERMAN RETURN AT NOON FROM A GROUP FISHING EFFORT, THE CATCH IS CLEANED AND DISTRIBUTED AMONG THE VILLAGERS.

lagoon is studded with a myriad of small islands, many of which are covered with forest and mangroves. Others are planted with coconuts.

The barrier reef, or toba, as it is locally termed, consists of long, narrow raised reef islands, intersected by passages. A few sections of toba are submerged at high tide, but the barrier islands as a whole have dense and tall vegetation. The complex toba reef environment contains the most important fishing grounds of Marovo. On the exposed weather coasts of Vangunu and Gatokae there is no toba, however, and the people of the south Vangunu coast find their richest marine resources in the remote islands and sand cays of the Hele Bar, where there are also locally important nesting beaches for hawksbill (Eretmochelys imbricata) and green (Chelonia mydas) turtles.

For subsistence and marketing purposes, a vast variety of fish, shellfish, molluscs and crustaceans is available (plus declining populations of turtles and dugong [Dugong dugon]), in the toba as well as in the lagoon, along mainland coasts and in the Hele islands. Commercially exploited species include pearlshell (Pinctada margaritifera) , trochus (Trochus niloticus) and other shells, bêche-de-mer and precious coral. The barrier islands also supply certain valuable resources that are now becoming jealously guarded: "Kerosene wood" for carving, and coconut crabs

(Birgus latro).

By and large, the terrestrial, coastal and marine environment of Marovo has not been significantly altered by human activity, and many areas still have a pristine quality. The diverse

FIGURE 6: TROLLING NEAR THE MAROVO BARRIER REEF ISLANDS CATCHES A SPANISH MACHEREL. LIKE THE BARRACUDA, THESE FISH ARE ALWAYS KNOCKED DEAD, SINCE THEY TEND TO BITE THE FISHERMEN.

environments of Marovo constitute a "rich, but threatened resource" (CSC, 1986:10), in the face of future prospects that

include rapid population growth and an expected increase in commercial ventures of fishing, mining, logging, and tourism.

Framework of Discussion

Concepts like "customary marine tenure", "sea tenure", "fishing rights", or whatever term we might use, define social institutions which regulate the relationship between people and the marine environment. These institutions involve people as individuals and in groups - and, moreover, people in interaction, using their knowledge and ideas to accomplish certain ends vis-à-vis each other. To deepen an understanding of marine tenure systems it is fruitful to focus precisely on the events and scenes where people interact and where marine tenure is an issue. The focus must be on what actually happens on the fishing ground, and an attempt should be made to identify patterns in the multitude of decisions made, and actions taken by, individual fishermen and resource managers. (Cf. Barth's "generative" models of processes in social organization, [e.g., 1966; 1969].)

Parts of this paper are devoted to descriptions of three fishing and shell-diving trips. I took part in the first and third of these during long-term field research in Marovo (2), and I learned about the second one from extensive discussions with participants, immediately after the trip. From these case examples, adapted from my fieldnotes, some key features of Marovo fishing, environmental knowledge and marine tenure emerge for further discussion.

In the scarce literature on marine tenure systems (e.g., Ruddle & Akimichi, 1984; Ruddle & Johannes, 1985; Carrier, 1981), a shortage of empirical event-based data has often confined the focus to generalized and idealized norm structures. Thus it is difficult to assess how far stated norms and rules influence actual, everyday fishing activities. By using long, running descriptions of actual events I aim here to present information on Marovo marine tenure as a continuing system, as it unfolds in daily processes on the fishing grounds and in the village. Focussing in this way on chains of events, and on dynamic processes rather than static structures, we may examine the role of marine tenure in the continuous dynamics of local production and social life.

I consider the essence of Marovo marine tenure to be people managing and negotiating access to valued marine resources, each individual or group acting with a firm basis in the kinship system of Marovo - a flexible and fluid system of adherence to descent groups which is the basis of Marovo social organization. Through such processes of continuous interaction, distinct social groups carry out long-term management of their marine resources.

(2) Field research, based on methods of participant observation, was carried out in the Marovo area for eighteen months (April 1986 - October 1987), as part of the High Islands Project of the South Pacific Coastal Zone Management Programme (SOPACOAST).

In the paper I focus specifically on customary marine tenure. Traditional environmental knowledge is seen primarily in its role as an important determinant of processes in the tenure system.

NOTES FROM THE FISHING GROUND, PART 1

The first case example serves as a starting point for a closer examination of the Marovo marine tenure system. The detailed notes aim to convey an impression of the everyday dynamics in traditional knowledge, use and management of marine resources, by giving examples of how environmental knowledge and rules of marine tenure play a part in fishermen's activities. Also contained in the notes are details that hopefully give some flavour of local environment, social life and technology.

Cases 1, 2 and 3 together form a running description of actual developments in marine tenure in Marovo over a period of several months. They should be read as integral parts of the paper, since they reveal many important elements of Marovo's marine tenure system.

CASE 1: A Friday Morning, April 1987

Grey morning sky and a silvery sheen on the lagoon. It is the beginning of the southeasterly tradewind season and the winds will, as always these days, start blowing later in the morning. The people of Patu village (3) are Seventh-Day Adventists, and for them Friday is the week's most important fishing day, since tomorrow is the Sabbath when no work is allowed. About ten men from Patu have already gone out fishing to the toba - the barrier islands - on their own or in pairs. Norman and I have decided to go trolling today for makasi, the bonito (skipjack tuna, Katsuwonus pelamis), which, now early in the year, comes in close to the barrier in fast-moving schools.

We start our outboard motor, and run some 5 km out from the village to the toba, which hangs like a black line on the horizon. Norman has a hunch that the makasi is somewhere "up east" today, and our course is set accordingly. Approaching the barrier reef, in the area where forest-clad, narrow islands are separated by a long stretch of submerged reef flat, we stop the engine and paddle the long fibreglass canoe across. We pass a wave-eroded coral rock with dense pandanus bush on top. On such rocks, two to four metres high, stone shrines with ancestral skulls were built in pre-Christian times, to validate a kinship group's claims to a particular stretch of reef and sea. In today's overwhelmingly Christian Marovo, knowledge about ancestral

(3) Names of persons and places have been changed throughout the text of the three case examples.

skull shrines is still frequently used to validate ancient claims to land or reefs.

Our canoe glides over the outer reef dropoff, we start the engine and move into the open sea. We look for seabirds - for the soaring belama (the frigatebird, Fregata ariel), or for the more erratic flocks of chelekae (the white tern, Sterna sp.), and dekere (the small brown noddy, Anous sp.). Marovo fishermen know that the belama and the larger tuna both prefer larger types of bait, so the presence of a flock of belama usually is a sure indication that large bonito (6-7 kg or more), or sometimes the much bigger yellowfin tuna (Thunnus albacares), are below. A flock of chelekae or dekere, however, indicates the presence of smaller bonito. No Marovo fisherman wants to kill or eat these seabirds. "They are our best helpers when we are out looking for the makasi", they say.

What we are looking for now is an avara - meaning a school of makasi or other tuna, together with seabirds, moving across the open sea. Norman scans the horizon, particularly to the east. Only a few belama are sighted, singly or in twos and threes - they all fly "up" or eastwards. "The makasi is further up there", Norman concludes, stopping the engine. We float idly for twenty minutes, closely watching the eastern horizon for further signs.

"There's something up there." Invisible for the un-trained eye, tell-tale birds have been spotted by Norman. "We'll go up to Bokala." We start the engine again and move towards the green arc of the barrier islands. To make the most of our trip we move close to the toba, and troll eastwards along the outer reef dropoff where barracuda (Agrioposphyraena barracuda) and trevallies (Caranx spp.) swim.

We approach Malakeoro, the spot where an expanse of clear sandy bottom stretches right across the rocky reef flat, from lagoon to open sea. This striking submerged feature is often visible from quite a distance as a bright turquoise band of water, and from the special wave pattern created by tidal currents flowing over the smooth bottom. It marks the traditional boundary between the sea and reefs of Norman's butubutu, or "tribe", living in Patu and a couple of nearby villages, and those of the Suvi tribe. "Here's where the power of the Suvi people starts", Norman reminds me.

We are now moving in Suvi waters, but he who hunts for the makasi may generally follow it wherever it goes. Norman usually would not hesitate to cross into Suvi seas anyway - his lineage has a well-known ancient kin tie with the Suvi people, who would hardly refuse

him to go fishing there, as long as he doesn't come for intensive commercial fishing. This certainly is not Norman's home area, however - it belongs to another tribe, and that is most clearly demonstrated by his only fragmentary knowledge of place names in the reefs and islands here.

West of Malakeoro we passed a few spearfishermen from Patu diving along the outer reef dropoff. Now, as we troll along the Suvi toba, through an area which is sheltered from the upcoming southeasterlies, we meet three more Patu men, each in his small dugout canoe, drifting near the dropoff and fishing with hook-and-line on the deep reef slope. There is often an abundance of red coral trout (Variola louti) here, especially now during the last week of the lunar month, when the moon is "about to go". This sheltered area is also more suitable for small canoes. These reefs belong to Suvi people, but it is all right for the Patu men to fish here; "Suvi are our relatives, and we are only fishing for food."

The barracuda does not bite today. It is, in any case, known to bite most eagerly around full moon. We continue eastwards along the reef, approaching Tapala, where the ocean cuts through the barrier in a deep passage. The wide waters of the passage are disturbed by currents, and small whirlpools are common. Despite dangers posed by currents and an abundance of sharks, the Tapala passage is a favourite area for spearfishing. Some men from Rovana, the village where most of the Suvi people live, are diving here. We wave to them and exchange greetings and jokes as we pass. In Marovo, there are at the most only a few outboard motors in each village, and a passing "dinghy", as OBM-powered canoes are called, is always easily identified, even from a distance. Thus, poaching on other people's fishing grounds can hardly go unnoticed if one uses such a conspicuous vessel. Today, however, there is no reason why we should not exchange jokes with Suvi representatives; we are not poaching.

A short distance from the Rovana divers, another man from Patu is fishing from his small canoe. Also nearby are two men from one of the coastal villages of the "bush people", on the mainland. Their forefathers were kept away from the seashore by marauding coastal dwellers, whose descendants (e.g., the Suvi people) still control the lagoon and reefs. However, groups of bush origin, who still control almost the entire mainland, have wide-ranging use rights in fishing, granted to them by coastal leaders around the end of last century, when warfare was on the wane in Marovo.

On our way from the Tapala passage we catch two

medium-sized "kingfish" (Spanish mackerel, Scomberomorus commerson). A fair enough food fish, but our aim today is to take makasi. And there, as we approach the long barrier island of Bokala, Norman spots a number of avara further out at sea. Just as he predicted! We leave he toba at full speed as we wave to Beru. Living with his father's people at Patu, he has strong ties to the Suvi people through his mother, and often goes to the Bokala area not only to fish, but also to dive for blacklip pearlshell and trochus. Beru is busy diving from his canoe, and probably doesn't have enough fuel left to join a speedy makasi hunt.

We rush across the sea, slightly choppy, out towards the large group of soaring belama. The birds dive and start moving with the fish, going further east. And there, just beyond, we see several more avara - all belama and large makasi. As we feed out sturdy lines with heavy plastic lures and wire leaders, Norman steers the canoe at full speed towards the "head" of the moving avara - he goes right in front of the jumping makasi, our hooks trailing behind. Immediately, each hook is taken by a large makasi. Norman leaves the engine in neutral while we pull the two powerful fish, careful to keep the lines taut while pulling as quickly as possible to avoid the sharks which are often lurking near an avara.

It is going to be a good day of fishing, with plenty of first-class makasi to distribute among relatives in the village. The canoe is already running with blood from the struggling fish - blood which we must not bail out until we are far from any avara. If blood from the makasi is spilled into the sea, the fish will, according to tradition, react with fear, cease biting and disappear into the deep.

For a number of reasons, the neighbouring Suvi waters and reefs were extensively used today by Patu fishermen. Major fishing grounds in their own area were too exposed to the upcoming southeasterly wind. East of the Malakeoro boundary, the Suvi barrier islands bend slightly northwards before stretching to the southeast, and it was in this sheltered area that Patu people took their best catches today. In addition, the moon was in an advantageous phase today for deep dropline fishing for coral trout on the outer reef slopes. Sheltered spots, known as very good for taking coral trout, were chosen, despite being within the Suvi boundary.

Based on an intimate knowledge of the marine environment, the five Patu men we met in Suvi waters had decided that going there would be most advantageous - an important consideration for fishing on a Friday, which is the day of the week when one is

expected to bring home good catches. However, they all entered the Suvi area clearly aware that they were crossing a boundary and leaving their own home reefs, an action which normally requires permission from the custodians of the area entered. Such permissions were not sought today, and no Suvi complained about it. Patu people were fishing only for own consumption; and a number of them have close kinship ties to Suvi.

KEY FEATURES OF MARINE TENURE IN MAROVO

The sea tenure system in Marovo is one of considerable complexity, not least because of the flexible and fluid nature of Marovo social organization. This paper is one step in a continuing analysis, and I aim to present here only the basic elements of the system. Elsewhere (Hviding, 1988a) I have dealt with the traditional marine knowledge and resource management of Marovo, related to issues of change and development. A detailed analytical account of the cultural and social processes of Marovo marine tenure is provided in Hviding, 1988b.

Groups and Territories

In Marovo, tenure of land and sea resources is inextricably linked with kinship. Descent groups, called butubutu, some large and some small, but many of them organizing several hundred people, claim and control territories in their capacity as corporate, largely localized kin groups. Generally, an individual has rights to use the resources of an area through inherited membership in the entitled butubutu.

The basic element in the overall tenure of natural resources in Marovo is that each butubutu controls a puava; a defined, named area of land and, in most cases, sea. A puava in the widest sense includes all areas and resources associated with a butubutu through ancestral rights. It extends, conceptually, from the top of mainland mountains to the open sea outside the barrier reef.

Like land, barrier reef and lagoon are traditionally divided into sections. From northwest to southeast the barrier consists of somewhat more than ten sections (the exact number depending on the definition of subsections), varying in length from ca. 2-20 km. Each of these sections, together with the adjacent lagoon, is associated with and controlled by one specific named butubutu, with some slight overlap in claims between neighbouring groups. In Marovo there are no subdivisions of marine puava sections, in the sense that certain parts of a butubutu's area are reserved only for certain members of the group. Recognized butubutu members may freely use resources anywhere in the marine puava, unlike the land areas, which are divided into smaller blocks allocated to each extended family.

The outer limits of a marine puava section are defined by

certain features in the barrier reef, in most cases passages from the lagoon to the open sea. Open sea is considered to be tied to the adjacent, barrier but today is rarely subject to strong claims. Open sea is important for tuna-fishing, however, and some degree of exclusiveness, for several kilometers outwards, was enforced as long as traditional pole-and-line tuna fishing was carried out. During the 1970s, much more mobile trolling techniques took over, and open-sea boundaries became less relevant. Should future attention be given to offshore fish and mineral resources, however, it is likely that the open-sea area claims of the various butubutu of Marovo will be resurrected.

The butubutu holding the various barrier island sections define their respective lagoon areas by means of boundaries, seen as running from the relevant barrier passages to the mainland river mouths, which mark land boundaries. Roughly rectangular areas are thus delimited, with estimated sizes ranging from ca. 20-170 km2 (4). On the weather coasts, definitions of marine holdings are somewhat more diffuse, but include reefs several kilometers offshore.

In the lagoon area, the usual pattern is that a butubutu controls a substantial area of land, lagoon and barrier reef. But there are exceptions. In the central part of the main lagoon, several small butubutu of "coastal origin" (see below) claim and control the whole barrier and most of the lagoon. These claims are generally accepted as historically valid by the large "bush" groups that control huge areas of adjacent mainland, but neither sea nor barrier. The huge marine puava of the "coastal" people are complemented by only limited strips of coastal land, their villages being situated on small islands.

The association of specific groups with specific territories of land, reef and sea has an ancient basis, and the spatial patterns existing today are the outcome of historical processes of settlement, warfare and migration. In pre-Christian Marovo, endemic warfare forced many groups to stay inland (cf. Somerville, 1897) and hide from powerful coastal dwellers. According to oral tradition, in those days only the coastal groups were capable of fishing. They were the first people to visit and use the barrier islands, thereby claiming and establishing the primary rights over sea and reefs which are still held today by their descendants. Most of these descendants still live in the traditional villages of "coastal" or "salt water" people (cf. the preceding paragraph). However, because of increased intermarriage between "coastal" and "bush" people, a number of influential marine rightholders now live also in villages of the "bush" groups. For example, although most spokesmen in matters

(4) It is not the aim here to map the customary boundaries of Marovo, where local territorial disputes are frequent. Rather than mapping areas and associating them with named groups, I describe important general principles of boundaries and areas. The estimates quoted reflect general views held throughout Marovo.

concerning Suvi reefs (cf. Case 1) live in the traditional Suvi village of Rovana, there are also several influential people of Suvi descent living in the "bush" villages on the mainland coast. It is important to note that resource control in Marovo is not exercised by villages as such, but by corporate groups of relatives, most of whom are resident in their own area, and some of whom live in the areas of other groups.

Until the beginning of the twentieth century, group structures and settlement patterns in Marovo seem to have been relatively unstable, and oral tradition provides many examples of group fission, resettlement and redistribution of territories. After the end of warfare, around the end of the nineteenth century, and the subsequent establishment of missions and British colonial power, relations between groups and territories became more stable. However, territorial disputes are still frequent, and are nowadays handled sometimes by the national court system.

In contemporary disputes and in everyday discourse, the relation between a group and a territory is still validated by demonstrating knowledge of ancestral skull shrines, placed in the barrier, in the case of marine tenure, and in the mainland bush in the case of land tenure. This knowledge is underpinned by genealogies and oral tradition, as well as by the ability to name features of the landscape and seascape in an area. Place names, as well as the exact locations of boundaries and of ancestral skull shrines, are transmitted to members of the entitled group through story-telling and through involvement in everyday fishing, hunting and gardening. By using the puava of his or her butubutu, a person learns to know the area and its history, and thereby his or her own association with it. The perception of barrier and lagoon as consisting of defined sections is shaped in people's minds through their frequent encounters with marine boundaries; with the concepts of "our" sea and "theirs".

The identity of a butubutu as a distinct group builds on tradition held jointly by the group members - stories and legends about ancestors and their doings, and about the origins of prominent natural features in the puava. Stories and legends describe events placed in space and time, are reflected today by the place names in the landscape and seascapes held by the butubutu, and validate the historical link between group and territory. This is particularly important for the "coastal people", who have had a seawards orientation for generations, and whose territorial holdings are predominantly marine.

It is frequently said that "without a puava, the butubutu cannot exist". The group derives its identity from the puava, which is held by the group as ancestral title and cannot be freely sold or otherwise transferred to non-members. The group-territory relationship actually has an almost timeless horizon; it "comes out of olden times" and is expected to continue indefinitely.

Most butubutu are named after their respective areas or

particular places within those areas, through a naming system that expresses the group-territory relationship on several levels. The butubutu of Vahole, in north Marovo, may serve as an example. Basically, Vahole is the name of an old settlement site in the forest. The name gradually evolved to represent a much larger area of land, also including adjacent inshore waters, islets and reefs; and a particular descent group whose founding ancestors lived at the Vahole settlement. On the most inclusive level, "Vahole" is a name that covers all terrestrial and marine parts of the puava, as well as the people who live there and control the resources of the area.

In Marovo, ancestral rights over a marine area are clearly more than just fishing rights. It follows that the local principles of customary marine tenure are not adequately covered by Christy's (1982) popular TURF (Territorial Use Rights in Fisheries) concept, nor by Western "ownership" concepts which imply the owners' right to transfer their property freely. The Marovo system contains basically inalienable sea rights, embracing the role of the sea both as a valued economic resource, and as a valued source of history and identity, without which the butubutu can hardly exist as a distinct group.

Restrictions on Marine Resource Use

Each butubutu formulates its own set of regulations on access to and use of its marine resources by other people. Whereas anyone may pass through any area while travelling, a variety of restrictions may be enforced regarding who may exploit fish, shells and other resources.

In general, resident members of a butubutu may freely exploit all marine resources held by their group, as long as they do not use unacceptable technologies, invite too many outsiders to join, or otherwise break the rules set forth by political and religious leaders. In some parts of Marovo, traditional taboos that prohibit members of certain groups from killing particular animals (e.g., giant clams, sharks, crocodiles) are still in force. New food taboos, on shellfish and crustaceans, among others, were introduced by SDA missionaries from 1915 onwards, and are observed in all SDA villages (embracing about 60 % of the population of Marovo).

Most restrictions, however, apply to the use of marine resources by people from other groups, i.e., "outsiders". There is often some degree of boundary permeability between neighbouring groups, as a result of longterm friendship, kinship ties or otherwise close association (cf. Patu villagers' access to Suvi waters, described in case 1). Regulations and exclusiveness of boundaries thus have their fullest restrictive force vis-à-vis a group's more distant neighbours (who are also usually more distant relatives), although an increase in commercial resource use often leads to greater restrictions on close neighbours as well.

Many restrictions apply specifically to certain technologies or resource types. For example, gill nets are prohibited by some butubutu, and so is reef fishing with poisonous leaves. Both are seen as indiscriminate and over-efficient catching methods. The same applies to fishing with spearguns, and to diving at night with flashlights. Fishing with dynamite is prohibited by every reef-holding group of Marovo. In many areas, certain techniques, such as those mentioned above may be used by members of the group controlling an area, but not by people from outside the group.

Leaders of a butubutu may sometimes announce temporary closures of certain reefs, applying to members of their group as well as to outsiders. Taboos of some weeks' duration may be placed on a particular fishing spot to let valuable food fish aggregate, in preparation for a large fish drive. The taking of turtle eggs and nesting turtles in the Hele islands have, on several occasions, been prohibited for a year or so. Collecting trochus from certain reefs may be prohibited for periods of a year or two, to let stocks build up. However, several leaders say that such taboos are becoming very difficult to enforce today, because of many younger fishermen's lack of respect for elders, and because of the expansionist attitudes on the rise among many fishermen, as a result of cash needs and their increased mobility with outboard motors.

Types of Rights: The Individual's Perspective

Access to resources in an area defined by a set of boundaries formally requires either membership in the butubutu managing the area, or permission from that butubutu. As long as membership is acknowledged, further permission is seldom necessary, since membership generally includes the right to use the puava. It is important to note that Marovo people generally do not inherit fishing rights as such; rights to fish are embodied in a multitude of entitlements and obligations derived mostly from inherited kinship statuses.

The Marovo system of descent and inheritance is a cognatic one, where an individual inherits butubutu membership and associated puava rights from the sides of both parents. A cognatic system creates a wide set of formal and potential descent group memberships for each person (cf. for example Scheffler, 1965). Hence, a Marovo person's inherited rights will generally extend over several puava (e.g., a minimum of four, if all grandparents come from different butubutu). However, the actual extent of these various rights depends on additional factors, but mainly on a person's place of primary residence. One normally has the most influential and wide-ranging rights in the area where one lives most of the time, although some people who descend from important leaders may retain strong rights of control in an area, even if they live elsewhere. It is generally held that puava rights grow weaker if they are not actively used. This reduces the value of claims by absentees, and the individual has to

maintain an active link with the butubutu to reconfirm puava rights.

Rights in resources may be either primary or secondary. Primary rights are inherited from parents, maintained through long-term residence, and cover use rights as well as rights to control. They imply that a person is "entitled" (isiri) to use the resources of the butubutu as he or she likes, and often (although to a lesser degree for women) include membership in the core of leaders who "speak about" the puava, thereby making decisions on the allocation and use of its resources. Secondary rights are also generally inherited, but restricted to use rights and tied to butubutu with whom the individual does not reside. A holder of secondary rights may use resources in the puava, but only after having given notice (varivaavosoi, lit. "to make someone hear"), a requirement that is often dealt with quite liberally. A person who has neither primary nor secondary entitlements in a puava is formally required to ask for permission (varitepae, lit. "to ask someone [for something]") from leaders, a permission that will not always be granted. Such persons may, however, obtain types of secondary rights that are usually non-transferable and temporary. The marine use rights held by the bush groups are an example of acquired secondary rights that have become largely permanent. Persons who settle in the village of their spouses, are required to make one initial respectful act of varitepae, and are subsequently given longterm use rights.

When perceiving the exclusiveness of marine boundaries and handling questions of access in daily fishing, fishermen tend to interpret kinship connections in a way that will allow them to range over as wide an area as possible. Often, a fisherman's interpretation of why he should have access to an area is in accordance with the philosophy of that area's managers. Disagreement occurs where managers feel that someone has interpreted his kinship tie to them too liberally, and should, in fact, be defined as an "outsider". A person claiming to have primary rights may be defined as having only secondary entitlements; or someone claiming some diffuse secondary entitlement may be told to pay due respect, and ask for proper permission.

Once an outsider has obtained permission to fish or gather shells, compensation or "fees" in the form a share of the catch is seldom asked for. But there are indications that such demands are on the rise.

Traditional Marine Knowledge and its Role in Fishing Strategy

The rights and obligations contained in customary marine tenure structure the social relationships in marine resource use. They are one framework for making choices on spatial and technological orientation and in daily fishing. Detailed local knowledge of the marine environment is another basic framework for Marovo people when making decisions on where, when and how to fish. The most important environmental knowledge possessed by

Marovo fishermen and fisherwomen concerns where fish and other marine organisms are found in large numbers; when they are found there (according to season, lunar period, tidal stage and time of day); their behaviour and movements; how to catch them; and changes that have occurred over the years in their numbers and mean sizes (Johannes & Hviding, 1987).

Local classification of fish habitats includes 40 categories pertaining to reef zones, bottom types and water column. Marovo fish taxonomy contains nearly 400 names for locally defined species (with additional sub-categories), and more than 20 different types of fish aggregation are recognized. There is extensive knowledge of spawning, migration and general fish behaviour, accumulated from empirical observation through generations.

There are more than 60 different named fishing methods in Marovo, most of them containing several additional sub-categories, the choice of which depends on where and when fishing occurs. Ancient knowledge is often employed in new technological contexts; for example in today's high-speed trolling for tuna. Finding the tuna is still based on a body of knowledge about fish, seabirds and weather that was developed in pre-Christian times.

For experienced Marovo fishermen, who know where particular species will aggregate on specific days, fishing is a predictable affair. Throughout the lunar month, and throughout the year with its seasonal variations in winds, tides and currents, a large variety of fishing grounds is exploited. The cultural knowledge of relations among moon phase, tides, seasons and fish behaviour creates a rotation between fishing grounds which prevents continuous exploitation of any specific site. This rotational pattern in fishing strategies may be seen as a conservational implication of traditional knowledge.

Local marine knowledge and fishing skills can be seen as the initial input in the decision-making processes of everyday fishing. This input is, in turn, confronted with restrictions on access to fishing grounds, on the use of various techniques, and exploitation of different species. Environmental knowledge and marine tenure principles closely interact as opportunities and constraints (cf. Barth, 1966) for marine resource use: Marovo people decide where to go fishing on a specific day on the basis of their environmental knowledge - where fishing should take place to maximize the catch; guided by the constraints posed by marine tenure regulations - where fishing may legitimately take place according to the rights held or permissions asked. Further influencing the choice may be factors such as distance, available technology (e.g., outboard motor) and the required catch size.

NOTES FROM THE FISHING GROUND, PART 2

It is now time to turn once more to what actually happens on the fishing grounds. The two following case examples should be read as a sequel to case 1, since all three cases deal with the same areas and groups, and together describe a sequence of related events. The cases below focus especially on the ways in which people's definitions of access to resources and areas are subject to negotiation and sometimes rapid change. Marine regulations, applying to areas, technologies and resource types or species, vary not only throughout Marovo, but also through time.

CASE 2: A Wednesday Morning, August 1987

For a week now, a representative from one of Honiara's main shell-buying companies has been living in Patu, from where he travels around by canoe to other villages, buying pearlshell, trochus and hawksbill turtle shell on the spot. He gives good prices, considering that his business relieves local divers of the need to go to Honiara themselves to sell the shells. Cash needed for household essentials can now be obtained in the village. As a result, there is a boom in diving especially for the blacklip pearlshell, a resource which was left largely untouched during the two preceding years' heavy exploitation of "brownlip" shells (Pteria macroptera). As of now, however, no one buys brownlip.

Patu people are particularly active blacklip divers now. For a couple of days, Robert, Beru and some others have been going up to the rich blacklip areas of the Suvi barrier. The two men are experienced divers, and are closely related to Suvi through their mothers. Their status as "Suvi men" is such that they are entitled to take commercial shells without needing to ask for permission.

Today is clear and calm; the southeasterlies are on the wane and haven't been blowing since Sunday. Early in the morning Robert and Beru leave, each in his outboard-powered canoe, going towards the long submerged barrier reef near Bokala Island, to look for blacklip. With them are nine other men from Patu - they have shared the fuel expenses with Robert and Beru. Most of them do not have very close kinship ties with Suvi, but going together with Robert and Beru is seen by them as a legitimate way of taking shells from the otherwise less accessible Suvi reefs. It is the third day in a row that Robert has taken a group with him to these reefs.

They arrive at the barrier, and soon eleven men are diving in the turquoise water around the canoes. Here

at Bokala, blacklip stocks have been largely undisturbed for three years, and quantities of shells can be taken easily from moderate depths. Unlike over on the other side, in Patu people's own barrier, where most of the shallower reefs have already been cleared of blacklip. "With such an abundance of blacklip, we may even start to think about paying the school fees!" one man, with four children currently in primary school, shouts.

After a while, a man from Rovana, whom they all know, comes paddling towards them from a distance. He has been out fishing on the seaward reefs. He waves his arm in a fashion not to be misunderstood - he is telling them to get away. "Now, what's this? I don't like it!", says Billy. He is from a more distant village but has moved to his wife's people at Patu. As an in-law he is obliged to act as a powerless guest in the present context. Beru and Robert, however, tell the men to continue with their diving and not to worry about the Rovana man, who now waves once again to warn them. His efforts do not succeed. The Patu men go on diving, and he does not come closer, but leaves for Rovana, paddling down over the calm, blue water of the lagoon.

Discussion starts among the Patu divers. Some feel uncomfortable at having been "discovered", and express feelings of guilt. "I'm sure he'll go and tell the elders at Rovana!" one man sighs.

Towards the evening, when the shell divers have returned to Patu tired after a full day on the reef, a message arrives from Hilaka, a Rovana elder and the usual spokesman of Suvi people in affairs concerning reefs. Hilaka had met Remon, a Patu man, in a nearby village just an hour ago, and had given him the following short "speech": "Some people have been seen diving for blacklip on the reefs which I hold on behalf of the Suvi butubutu. I know that most of them weren't my own people, so I want you to tell your people at Patu that no one is to take shells from Suvi reefs without asking me for permission first."

When Remon returned to Patu, the message quickly spread all around the village, not least to the "guilty" divers. Robert's comment was: "I'm a Suvi man through my mother. And I can go up there as much as I like. But it is not my business to ask permission on behalf of others. If a man wants to follow me up there, then it is up to him to straighten his diving with Hilaka." To this, one of the Patu elders remarked: "It is true you are a Suvi man. But that doesn't mean that you can bring everyone from Patu with you up to the Suvi toba to take shells. You should at least

have given notice to Hilaka that you were bringing someone with you. You should have told him that, even though you do not need to ask permission just for yourself."

The next day, spirits were not so high among Patu divers. Robert and Beru went up to the Suvi blacklip reefs again to continue their diving, but they were not followed by anyone, except one of Beru's brothers.

CASE 3: A Friday Morning, August 1987

It is two days after Patu people went diving for blacklip at Suvi and the "reprimand" arrived from Hilaka. As usual on a Friday, the main concern today is the supply of food for tomorrow's Sabbath. The women and many men spent yesterday in the gardens, and today women are at work in the kitchens while most men go fishing. Some women have commented, "We know that many of the men just go to sea for blacklip today. They say to us that they will go fishing, but that's a lie!"

Joseph and I arrived out at the barrier reef fairly early. Today is just before full moon, there is low tide around midday, and it is just the right time to fish for a number of species on the deep outer reef slopes. We are using the kurakura technique. A hook ornamented with a piece of white leaf is fastened onto a coconut leaf which has been tied around a small coral stone. The stone is thrown overboard, pulling with it the hook and some four or five forty-yard coils of fishing line before resting on the reef slope. Joseph jerks the line to loosen the hook from the coconut leaf and stone, and now the hard work begins - rapidly pulling two hundred yards of fishing line.

This is vertical deep-water trolling, and often yields fine and large fish if you know the right spots along the reef slope. On the first attempt the hook is taken mid-way up - Joseph pulls heavily on the remaining line and lands a dovaro (rosy job-fish, Aprion microlepsis) of 5 kg or so. On with another stone, and out with the line. The wind is coming up stronger now, it is hard to keep the large dug-out canoe properly positioned above the reef slope, and undercurrents make it hard to keep the line vertical. Joseph pulls up once more, no fish this time. We try again, but wind and waves still increase.

Two Patu men come paddling up towards us. They have been trying kurakura further west along the barrier, but sharks were abundant there today, tearing off hooked fish. "The wind is too bad here," we tell them, and an immediate question comes up: Why don't we go up

east to the Suvi area, to where the outer reef is sheltered from the wind by the cliffs and forest of the barrier island? Large tilo (dogtooth tuna, Gymnosarda unicolor), are always found there at this time.

"I wish we could go up there, like we have always done," says Joseph. "But I don't want to go there now. Those other guys were just chased away on Wednesday - and I know that the Rovana people are keeping an eye on us now. Since Wednesday, it's as if the sea boundaries are so much stronger. Even though we are just fishing for food today, just like before, I don't want to go over there, because I feel they will be watching me. I don't have strong rights in the Suvi toba anyway."

With that, the decision is made: We remain in our own home area on this trip , despite the winds and sharks that combined today to make the area a most inferior fishing ground. We make some more largely unsuccessful kurakura attempts. After midday, when the tide comes up again, we dive in unpleasant waves along the reef dropoff and spear some parrotfish and smaller reef-fish. "I wish we could have gone up to that other place for some real fish," Joseph sighs on our return to the village with a meagre catch of largely inferior species.

These cases indicate how fishermen interpret their access to the reefs of other groups on the basis of kinship ties. The exact content of kinship-based entitlements may be subject to diverging interpretations from individuals and resource-holding groups, and conflict may arise. They also show how different resource types are often subject to different regulations: Whereas most people from the neighbouring butubutu could enter Suvi waters for subsistence fishing, only those with very close kin ties to Suvi could freely collect shells of commercial value. In general, when commercial activities increase, leaders of a butubutu will draw tighter kinship boundaries when determining who is entitled to exploit the group's resources for cash purposes. This limits the number of "insiders" who may fish or gather shells without having to ask for permission. To justify such measures it is often said that when people are fishing to sell their catch, they will fish far more than is needed to feed their families. Therefore, many leaders feel that commercial fishing must be regulated, to avoid rapid overexploitation of fish and shell stocks, and to reserve them as much as possible for the butubutu's own benefit.

During the mid-1980s there were many small-scale commercial fishing ventures in Marovo. Local entrepreneurs bought catches and sent them in ice boxes to the market in Honiara, the capital of the Solomon Islands. In that period, restrictions on access, fishing gear and target species were firmly enforced by most reef-holding butubutu, limiting fishing by outsiders. In 1986-

87, however, little commercial fishing was carried out, and regulations were more relaxed. The level of enforcement of restrictions clearly fluctuates with the level of competition for resources.

In Marovo, there is often an interconnection between the various activity contexts of marine tenure. Cases 2 and 3 describe how an area that had long been used by neighbours for subsistence fishing was avoided after conflict arose over commercial shell-diving. Stronger enforcement of regulations on pearlshell-diving quickly influenced people's subsistence fishing strategies. Such interconnections demonstrate the flexible nature of marine regulations. A definition of access which is valid today may not be valid next week.

THE *BUTUBUTU* AS A MANAGEMENT UNIT

The Role of the Descent Group

Given the well-documented communal and descent-group based land tenure systems found throughout Melanesia, Micronesia and Polynesia (*e.g.*, Crocombe, 1987; Lundsgaarde, 1974; Sahlins, 1958) it seems unwarranted to assume a predominance either of village units or of individual ownership in the management of marine resources in this region. Rather, ethnographic literature suggests that tenure of sea resources is in most cases in the hands of *descent groups*, whose members form corporate units in these matters (*e.g.*, Sudo, 1984).

In contemporary Marovo society members of a *butubutu* are usually somewhat scattered and settled in a number of areas, as a result of the flexible cognatic system of descent and affiliation. The everyday tasks of managing the *puava* are therefore in the hands of the resident core of the *butubutu*. They are people who actually live on the *puava* and use it daily, and who exercise exclusive rights of control over it on behalf of all *butubutu* members.

Authority in Resource Management: Enforcing Regulations

Resource management is led by a senior male leader (*bangara*) who acts as a main trustee for the *puava*, on behalf of the *butubutu*. He is the main spokesman in tenure matters, although he is assisted by and obliged to seek advice from the other "big men" (*palabatu*) and "keepers" (*chakei*) of the *butubutu*. The leadership teams of each *butubutu* formulate, announce and enforce restrictions on resource use. There are a number of responses to people who violate these regulations, *e.g.*, by taking resources without asking for proper permission, by using prohibited fishing techniques or by trespassing in closed areas.

In Marovo society there is a strong desire to avoid open conflict and public criticism and shame. When someone has vio-

lated fishing or shell-diving regulations, leaders of the offended butubutu will often create social pressures against the trespassers by sending written or oral messages to them and often to the bangara of their group. Compensation, in cash or in the actual resource taken (e.g., commercial shells) can be demanded, a public apology asked for, and the termination of trespassing (karovoa voloso, lit. "going across a boundary") called for. Thus, open conflict is created, focussed on specific persons who are publicly criticized and put to shame. But case 2 shows a milder type of sanction which is often used initially, after one or two instances of trespass: A message is passed to the offenders' village that "some people" - no names given - have been fishing "illegally" in area so-and-so. This serves as a reminder of the need to ask permission and as an announcement that the trespassers have been observed, but avoids initial public shame, reserving it for repeated or more serious transgressions.

Here the sanction against trespassers was based largely on traditional authority and enforced on the inter-butubutu level. In some cases, however, the support of the formal court system is enlisted, and offenders reported to the local police. This has happened in some cases of dynamite-fishing, which is prohibited both by Marovo customary law and Solomon Islands state law.

Comments on Traditional Authority and Resource Management in Melanesia

The position of bangara in Marovo is to a large degree an ascribed one, transferred through inheritance (usually from father to eldest son). However, a candidate also has to prove his suitability as a bangara by keeping a good personal record and displaying the right "character" (kinokoko). There is a considerable stability in the career of most bangara, who fill their positions until either they die or become too old and weak to act as firm leaders.

The Marovo situation is in contrast with the stereotyped generalizations, very influential in studies of Oceanian leadership, about "unstable big-men" of Melanesia and "stable chieftains" of Polynesia and Micronesia (cf., Sahlins, 1963). Chapman (1987) draws heavily on these stereotypes in a recent discussion of political systems in Oceania and their potential for longterm resource management. She argues that Melanesian leaders, because of a presumed instability in their power, operate on too short a time horizon to be capable of holding longterm management perspectives. This argument should be treated with caution and is, at best, a preliminary working hypothesis based on distorted data. First, stable leadership positions with a strong element of inheritance are found in many parts of coastal Melanesia (e.g., Malinowski, 1922; Keesing, 1984; Scheffler, 1965; Bennett, 1987). Second, ethnographic literature suggests anyway that stable "chieftainship" is not a necessary precondition for the formulation and enforcement of resource conservation; such efforts have been described also for so-called "chiefless" socie-

ties. (See, for example, Henriksen [1973] for a comparative example from a hunting society.) Assessing the conservational potential of traditional political systems should not be done from a basis of generalized, regional "archetypes", but rather from accumulated empirical data on actual processes at the local level.

In Marovo, it is firmly held that the most important responsibility of the bangara and his associates is to "look after" and "keep" (chakei) the people and the resources, with concern frequently being expressed for the well-being of future generations. The conservation of resources is a key concern for most of today's leaders - more so than for previous generations, when population density was low and resources abundant. A growing awareness of possible resource scarcity and a strong concern for continuous economic self-sufficiency lie behind many present initiatives to regulate the use of land and sea resources. Here, as elsewhere in the Solomons and beyond, an intimate, permanent association between people and environment has strong spiritual overtones, provides the roots of local identity, and is far from short-term in its outlook.

Chapman (1987) also argues that the traditional political systems of Melanesia lack the scale and complexity to allow for a wider enforcement of limited entry rules. It has, however, been convincingly demonstrated by Strathern (1971), for example, that seemingly small-scale tribal societies of traditional Melanesia are in fact woven together in complex, far-ranging networks of kinship, exchange, warfare and political allegiances. So also in Marovo, where pre-Christian society was dominated by political processes far beyond the intra-butubutu level. Later, in the 1930s and 1950s, strong traditional leaders were able to enforce regional, inter-butubutu taboos on large areas of fishing grounds and trochus reefs, so as to ensure the building-up of stocks for mission fund-raising purposes. This was a direct continuation of the taboos (hope) announced by pre-Christian regional leaders over large reef and open-sea areas in preparation for feasts. Today, many of Marovo's traditional bangara operate their politics from the butubutu and village levels across the wider Marovo and New Georgia area, to the highest political levels. Some of them have actually enforced closures of their seas vis-à-vis transnational companies (cf., the bait ground system, see below).

When dealing with systems of traditional marine resource management in Melanesia, the paucity of detailed empirical data on such systems must be carefully considered. Considerable caution is required when making regional generalizations from such a shortage of data. In the assessment of the conservational potentials of customary marine tenure, the focus needs shifting away from doubtful generalizations on motivational (cf. Polunin, 1984, and this vol.) and political (cf. Chapman, 1987) bases, to look instead at the actual political opportunities and ecological implications of specific tenure systems.

Johannes (1978) has written on the "traditional conservation

ethic" among some Pacific Island fishing peoples. This search for elements of intentional conservation must be supplemented by the following important questions: To what extent does a specific marine tenure system actually facilitate conservational efforts? (see below); and what are the ecological implications of the system's consequences for marine resource use? (see above).

Marine Tenure and Management Tasks: Diversity and Patterns

A Marovo butubutu participates in resource management tasks and enforces regulations in a number of activity contexts on local and extra-local levels. The marine tenure system does not constitute a single, fixed set of rules relevant in all contexts where marine resources are an issue, as illustrated, for instance, by the different degrees of restriction applying to subsistence and commercial fishing, respectively.

The most important customary right of a Marovo butubutu vis-à-vis other butubutu, as well as the wider society, is the right of the group to continuously formulate and enforce its own set of regulations for its own resource area, on land and at sea. Local restrictions on marine resource use still operate mainly within the context of Marovo customary law, since participants and opponents are usually Marovo fishermen and traditional leaders. As such, a butubutu's exclusive rights of control are to some degree recognized also on a national level, in the support given to unwritten customary law by certain elements of government policies and legislation (cf. Baines, 1985:43-45).

Different Marovo butubutu face different problems in the management of their resources. Some areas are remote and sparsely populated, whereas the natural resources of others are under heavy pressure. Seventh-Day Adventist villagers need more cash than do Methodists, mainly because the SDA church finances its own schools outside the government school system. Thus, SDA villagers show a certain preference for commercial exploitation, though not necessarily lacking in a longterm perspective.

Despite such diversity, however, some basic principles seem to be common to the marine tenure "profile" of all butubutu, and to play a part in most, if not all, situations where the sea is an issue (cf. Hviding, n.d.).

The following three principles emerge from the empirical material gathered during my field research:

1.The butubutu has recognized control over all the resources contained within its marine boundaries. "We have the power to speak to others about all things in our sea" is a rhetorical statement often used when a clear view of the extent of a butubutu's rights to control sea and reefs is required.

2. No person defined as an outsider is allowed to exploit the marine resources of a butubutu for cash purposes without

asking permission first. There is a clear tendency for a butubutu's managers to increase the scope and restrictive force of marine regulations with the increase of commercial exploitation and perceived resource value.

3. Exploitation that is seen as a threat to the marine resource base, creating scarcity of resources, is often opposed and prohibited. This has led to some groups' recent prohibitions of technology like gill nets, spearguns and poison leaves, and to the condemnation of dynamite-fishing. Such prohibitions indicate a definite conservational potential the customary tenure system, the "keeping" (chinakei) of reefs.

However, it has yet to be seen whether the various Marovo butubutu will be able to keep their own marine resources from being overexploited in future. A level of commercialization and export high enough to threaten the resource base has not yet been reached in Marovo. There are indications, however, of localized depletion of certain fish and shellfish stocks (Johannes & Hviding, 1987) occasioned mainly by periods of intensified commercial exploitation. The existence of limited entry is not in itself enough to ensure longterm conservation. Granted that the customary entry limitations are respected, nevertheless resource management depends on the level of resource exploitation by the butubutu itself.

Change and Adaptation: Formulating Marine Tenure

The idea of controlling "all things" on the reefs and in the sea is a key feature of the dynamics and flexibility of Marovo marine tenure. Several leaders emphasized to me that as long as everyone recognizes this "general power" (nginira) of the butubutu, it is not necessary to formulate detailed rules covering every resource type, unless a specific resource becomes an important issue which requires more precise use restrictions. Through such judgements and actions from bangara and managers, longstanding basic principles, such as the three set out above, are continuously transformed into contemporary regulations that fit changing circumstances and patterns in resource use and availability. The ancient group-territory relationships and associated basic principles constitute a core from which suitable tenure arrangements are developed and adapted to current needs.

There is a characteristic pragmatism in the formulation and enforcement of regulations, as can be seen from case 2, on blacklip diving: First, people perceived as "outsiders" broke the customary laws contained within the mentioned basic principles. Only then were restrictions on further exploitation announced by the people who have the right to "speak about" the resource and area in question.

Negotiation is important in these processes: "Outsiders" see how far they can go without being "caught", often viewing themselves initially as "insiders", on the basis of kin ties. It is

then up to representatives of the butubutu controlling the area to judge whether the person in question is enough of an outsider to be reprimanded as a trespasser, or whether his perception of himself as an entitled insider should be recognized.

The Contemporary Scope of Marovo Marine Tenure

Resource management tasks, with their multiple role in assertion of identity as well as tenure of resources, involve not only different Marovo butubutu, but are increasingly carried out in a number of extra-local contexts. This makes contemporary marine tenure more complex and far-ranging than the purely traditional system. Customary marine tenure has lately been taken up in a number of discussions and conflicts where local people have met with tourist resort operators, yacht crews, transnational fishing, mining and logging companies, and a variety of Honiara businessmen. As concerns over large-scale commercial exploitation increase, local leaders carry their ideas on sea rights through diverse political and legal channels and into the corridors of Provincial and National government.

For example, marine tenure in today's Marovo has implications for the international tuna-fishing industry. Catcher-boats from the two partly nationally-owned tuna companies operating in the Solomons enter the Marovo Lagoon on a nightly basis during the March-November season, to net live baitfish. To regulate the various aspects of these baitfishing operations, a national system of formally-defined "bait grounds" has been worked out. In Marovo, the boundaries of bait grounds are to some degree based on customary ones (see also Baines, 1985:49), and standardized payments, "royalties", are given on a per night/per vessel basis to named trustees (usually three or four) of each bait ground.

This system, originally intended to comply with demands put forth by traditional reef-holding groups, has created some conflict in Marovo. While a number of bait ground trustees act as expected and use the royalties for community benefit, others have come to see themselves as sole "owners" of the bait ground, keeping the royalties for their own use. Such occurrences, as well as disputes over the non-traditional nature of some bait ground boundaries, have led to a number of local court cases. In addition, social problems are sometimes created in villages by visiting tuna boat crews.

To avoid conflict, and because of a belief that bait-fishing disturbs food fish stocks, leaders of some butubutu have refused to allow baitfishing in their areas, and some others have closed bait grounds after some years' operation. Such closures are generally respected by the tuna companies, but have caused some concern - also among high-level fisheries administrators - because today's pole-and-line tuna fishery is totally dependent on a continuous supply of live bait from areas like Marovo.

CONCLUDING REMARKS: MARINE TENURE AS IT HAPPENS

What emerges from this examination of Marovo customary marine tenure is a picture of a dynamic and flexible, non-codified resource management system with a considerable potential for handling contemporary change, including influences from the world outside. Though being firmly tied up with land tenure in reflecting a deeply rooted relationship between groups and territories, the marine tenure component of customary law, that of "keeping the sea", also has its own dynamics, reflecting the mobile and diverse nature of marine resource use in Marovo.

By describing sequences of events in local resource use and management, I have attempted to view Marovo's marine tenure system as something which happens, rather than merely is - as a continuing, adaptive process rather than a formalized, static structure. The present tense has been used throughout this paper, not as some form of timeless "ethnographic present", but because the traditional management system described actually unfolds in contemporary events and is very much "alive" today.

Customary marine tenure in Marovo lacks an elaborate framework of codified rules beyond the deeply-rooted basic principles. This deceptive informality is sometimes summed up in statements such as, "... in here, everyone can go fishing anywhere." But then such statements are invariably followed by, "... as long as...", indicating that the concept of free access to fishing grounds has in fact a very limited scope and is subject to a number of restrictions. The full complexity of those restrictions, of their formulation and enforcement, and the actual limitations on free access can be seen in chains of events that actually unfold on the fishing grounds, in the villages and in various political channels.

It is in the patterns of everyday marine resource use that the principles of the marine tenure system emerge most clearly. Resource management actually happens when people meet in their various capacities as users and keepers of the sea.

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MARITIME CLAIMS BY ABORIGINAL GROUPS IN NORTH AUSTRALIA

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ABSTRACT

The physical, economic and spiritual life of Aboriginal people on the North Australian coast is centered around the sea. From the sea, they believe, their spirit comes at conception, and to the sea it must return on their death. For the coastal Aboriginal groups the exclusive right to inhabit coastal waters in their area and use the resources contained therein has been theirs since time immemorial. They delineate precisely the boundaries of their clan estates, which encompass the sea. Within these boundaries they have established elaborate rules for restricting access to sacred sites and for apportioning access to economic resources. These aboriginal groups perceive non-Aboriginal commercial fishing in their marine estates as a threat to their traditional rights. They attribute the deaths of several senior Aboriginal men to supernatural punishment for their not having been able to prevent the violation of scared sites by commercial fishermen. Recent studies of Aboriginal fishing customs and traditional sea rights in Northern Australia have helped reconcile Aboriginal needs and those of growing numbers of non-Aboriginal fishermen in a number of very significant cases.

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INTRODUCTION

The coastal Aboriginal people of northeastern Arnhem Land may be considered an homogeneous group in terms of their exploitation of marine resources. They refer to themselves as Yolngu, a vernacular term meaning Aboriginal man, and are variously referred to in the literature as Murngin (Warner, 1937), Wulamba (Berndt, 1951), and currently as the Yolngu bloc.

The Yolngu world is divided into two patrilineal moities, Dhuwa and Yirritja. Each person is born into a patrilineal group (clan) within one of the moieties which afford them, among other things, economic and ritual use of particular tracts of land and/or sea (commonly referred to as "estates"). They also obtain varied rights to other tracts through their matrilineal affiliation.

The Crocodile Islands and Castlereagh Bay area of northeastern Arnhem Land represents 18 clan estates, ranging from the mainland to inshore estuarine localities to offshore islands, reefs, and sand-bars, up to 80 km from the mainland (Fig. 1). It was here that I conducted research and lived among the Yolngu for three years, from 1979. The research programme included documenting the boundaries of clan estates, economic zones, sites and paths of ancestral activity, the location of residential and hunting camps, and the knowledge and use of the sea throughout the yearly cycle.

ACKNOWLEDGEMENT OF ABORIGINAL CLAIMS

From earliest contact, Aboriginal people on the North Australian coast have asserted rights over adjacent seas. Many accounts of contact either provide evidence of or acknowledge Aboriginal rights over the sea. Prior to European contact with Aboriginal people in Arnhem Land, there were at least three sources of non-Aboriginal contact (Berndt and Berndt, 1954).

Aboriginal people speak of the Baydjini people who came from the northwest, beyond the Arafura and Timor seas, travelling on the monsoons in praus, and bringing women and cloth. They stayed long enough to cultivate the land and build permanent stone dwellings. Berndt and Berndt (1954) recorded stories from older Aboriginal people which suggest that the Baydjini originated from present-day Indonesia.

Contact with another group,known by the Aboriginals as the Badu, is recorded by a cycle of songs which deals with pre-European contact (Berndt and Berndt, 1954). The Badu came from the northeast, an area which is associated mythologically with the spirits of dead Aboriginal people.

The third and major pre-European contact with Aboriginal people in Arnhem Land came from the Macassans of present-day Sulawesi. These contacts, which began perhaps as early as the 16th century, were much more frequent than those with other peoples, and continued until as recently as 40 years ago (Berndt and Berndt, 1977; MacKnight, 1969, 1976). The Macassans attempted to develop good relationships with the Aboriginal people, whom they often needed to supplement their labour force to fish for trepang. The Macassans also traded for rights to set up camps and for access to freshwater.

These same rights were acknowledged in a letter carried by James Cook, in 1768, on his voyage to the "Southern Continent" in the "Endeavour". The letter, from the President of the Royal Society, as co-sponsor of the voyage, gave Cook the following advice with respect to indigenous persons: "They are the natural, and in the strictest sense of the word, the legal possessors of the several regions they inhabit. No European nation has the right to occupy any part of their country, or settle among them without their voluntary consent" (Beaglehole, 1955: 514).

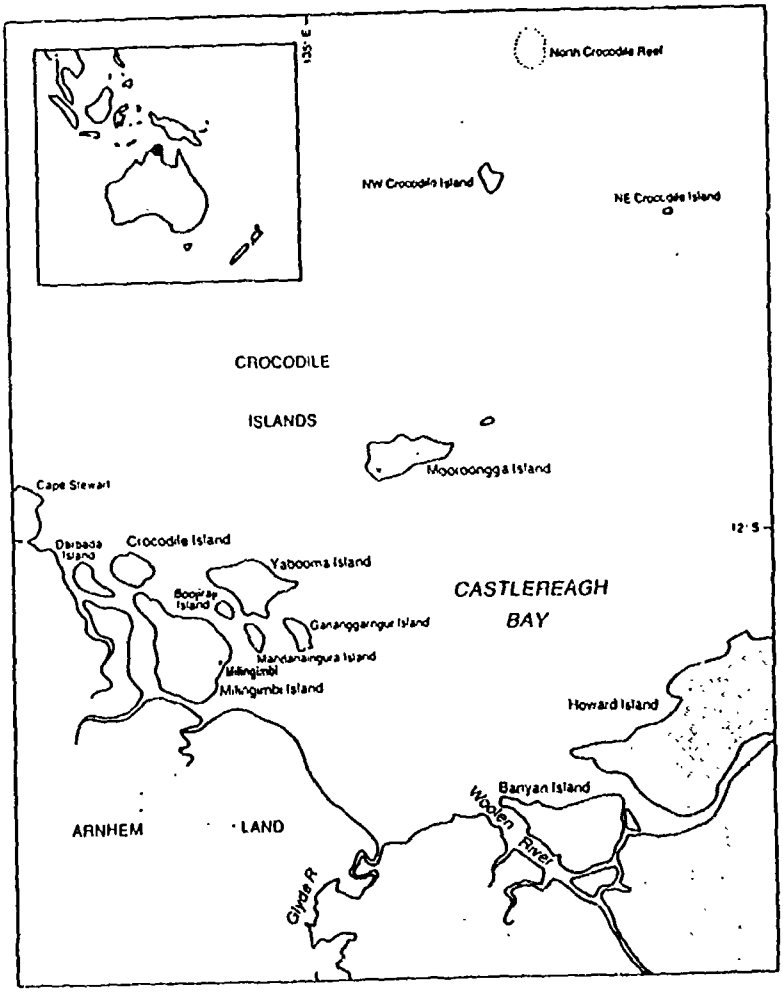
From earliest known contacts, then, various acknowledgements have been made of Aboriginal rights over territorial seas and the economic resources contained therein, whether by payment, recompense, or otherwise.

ECONOMIC CONSIDERATIONS

Each clan group acknowledges the rights of other clan groups over particular areas or estates encompassing the sea and foreshore. These estates are not always continuous, and may be composed of a number of areas encompassing different habitats. This distribution allows exploitation of resources in differing areas at various and appropriate times of the year. A common spread of such areas shows a marked break-up of localities, consistent with seasonal differences in the availability of fish, shellfish, turtles, dugongs, and other marine resources, such as turtle eggs. The boundaries are rigid and rarely, if ever, subject to dispute among Aboriginal people. Aboriginal people regard their estates as encompassing all parts of their territorial seas, which extend from the land to the seaward horizon, as viewed from the shore. That area beyond the horizon is regarded as being "for the government".

Hunting for dugong and turtle generally takes place over shallow water, where the prey cannot dive deeply to dislodge the harpoon and elude the hunters. It is therefore to be anticipated that large shallow areas will be the focus of such hunting activities at the appropriate time of the year. Often, wide, flat, shallow sand-banks fringe relatively narrow channels. It is here, in particular, that turtles are hunted as they move from the channels through the shallow water covering the sand-banks.

FIGURE 1: LOCATION OF THE CROCODILE ISLANDS, CASTLEREAGH BAY AREA, NORTHERN TERRITORY



The zones for shellfish collection extend down to Lowest Astronomical Tide (LAT). When the lowest tides of the year occur, false trumpet shells (Syrinx arnanus) are particularly sought, when they are exposed on the outermost reaches of the sand-bars. The foraging methods employed to collect these shells are the same as those used for other shellfish in beds adjacent to land. This reinforces the classification of the water's edge at LAT as being the seaward extremity of the "land". Above LAT the concept of "seas" is restricted to the seawater itself, which has inundates the land as Spring tides inundate salt flats. Hence all low tide elevations above LAT are considered by Yolngu to be land.

Many Yolngu do not live in the local, central communities established years ago by the missions, and subsequently administered by the state and federal governments. Rather, they live on their own clan estate and rely largely on its economic resources.

It is a mark of the responsibility of a man for his estate that he should occupy it and hunt on it. Yolngu regard hunting and foraging as responsible estate management.

The management of natural resources is an integral part of "owning" land and sea, in the Aboriginal sense of ownership. This is not so much a matter of "owning" as it is of "being owned"; that is, not having or possessing land and sea but being an inseparable part of it. For Yolngu there is no concept of sale or disposal of land and sea. As one senior Yolngu man put it: "If I cut off my arm and give it to you it will not grow on you. Nor will my leg or any other part of me. That is the same with my country (estate). I cannot sell it or give it to someone. It will be of no use to them".

The act of ownership requires physical management, such as systematic burning to "clean up" the land, harvesting from land and sea, and the like, which are obligatory activities that fulfill spiritual obligations. Such management is the prerogative and responsibility of particular senior men. To not perform such acts leaves one open to accusations of gross neglect by other custodians who may also have specified rights to those areas of land and sea. To usurp their role by indiscriminate burning by other Aboriginals, for example, is considered a serious crime, which, traditionally, would result in reparations or possible physical conflict with spears.

When describing their country, Aboriginal people will invariably launch into a graphic description of the abundance of its food resources, e.g., "lots of fish, lots of wallabies, almost too many turtles". They describe their country in terms of its natural resources, and, in particular, those which signify an abundance of food yielded for a minimal expenditure of energy. This conveys a richness in the country, which reflects favourably on the status of the person extolling its virtues.

In terms of natural resource management, central communities have become more a place to cater for older people and those needing medical attention, a place to liase with Government officials, engender European education, and the like, enabling more mobile groups less encumbered access to clan areas for hunting and ceremonial purposes. The latter is facilitated by aluminium dinghies with outboard motors, and by 4-wheel drive vehicles. Where such habitats and clan areas are not in reasonable proximity to settlements, movement over the range of accessible habitats resembles much more the traditional patterns.

In general, the heavy rain of the wet season dictates a sedentary existence. At such times camp sites are invariably centered around beach areas that afford shelter under spreading trees (good drainage), and ready access to shellfish beds and freshwater. As the wet season draws to a close, forest areas yield fruit and fish from habitats further afield become "fat", and the mobility of food-seeking groups increases rapidly.

SEASONAL MOVEMENT OF THE YOLNGU

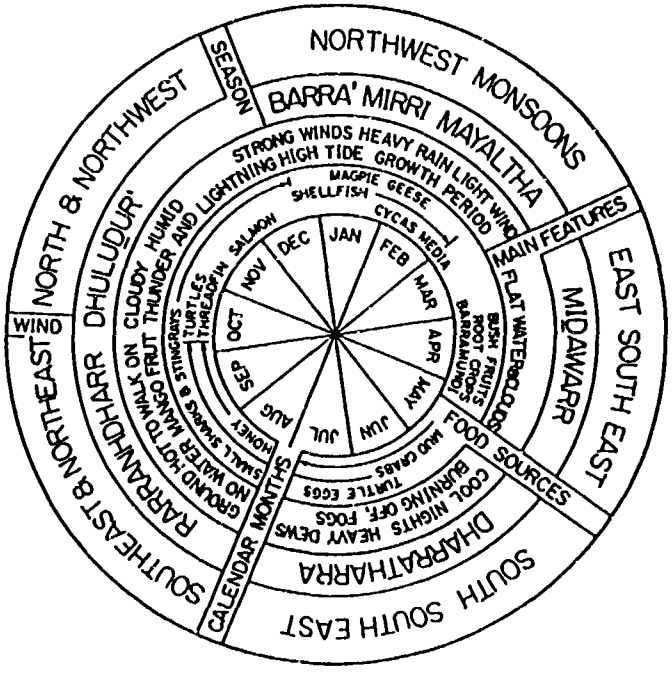
Within the Crocodile Islands and Castlereagh Bay area, the seasonal movement of the Yolngu is closely tied to the shifting emphasis on different marine resources. The total estate of each clan group may be composed of several discrete tracts of land and sea. This, coupled with access to adjoining estates made possible through kinship relationships, allows for considerable latitude in the movement of one group throughout the annual seasonal cycles of abundance or palatability (as evaluated roughly in terms of perceived fat content) of various marine species.

During the northwest monsoons of the wet season, approximately from December to March (Fig. 2), shellfish form a major part of the Yolngu daily diet. At this time seas may be quite rough, precluding line fishing. The rough seas and heavy discharge of water from large estuarine systems also makes fish-spearing almost impossible. Yolngu therefore move to areas sheltered from the northwest monsoons and adjacent to shellfish beds. At such times shellfish beds and molluscs from nearby mangroves play a major dietary role.

The late-wet season and early-dry season see a revival of fishing, with barramundi (Lates calcarifer), in particular, being hunted with spears across totally inudated floodplains. Mud crabs (Scylla serrata) are fat, and turtles are also harvested.

As the wind settles to the southeast during the dry season, roughly from April until October, fishing with spears and lines, and turtle- and dugong-hunting become the primary activities of coastal hunting groups. By this time of the year activities are centered on the outer islands of the Crocodile Islands group.

FIGURE 2: YOLNGU SEASONAL CALENDAR



During the mid-dry season young sharks and stingrays are hunted with pronged spears. Stingrays, young sharks, fish, turtles, and shellfish are judged alike by the Yolngu as being significant and desirable food sources when they possess fat (djukurrmirr).

Towards the end of the dry season, around November-December, offshore reefs and sand-bars are fished heavily and gleaned for particular species of shellfish, such as oysters (Saccrosta sp.). The beach areas of the islands are another significant locality for fish spearing during this time.

In each of the major seasons camp site locations are associated as closely as possible to hunting and foraging grounds. Freshwater is a major factor determining camp sites. Thus many locations with just small wells or soaks to sustain the daily hunting party may be established only as short-duration hunting sites.

MARINE TRAVEL

Only since contact with Macassans have dugout canoes been in

use along the north coast of Australia. Prior to that time bark canoes were used widely, and occasional use was made also of rafts constructed from such buoyant timbers as Camptostemon schultzii. Bark canoes made from stingybark (Eucalyptus tetradonta) were used widely on the sea, whereas paperbark (Melaleuca sp.) canoes were used commonly on inland waters and wetlands. Bark canoes are still used occasionally in some areas, most commonly to travel between the mainland and islands. Navigational skills are best evidenced during such trips.

Generally, canoe trips were made within sight of land, following the coast and taking shelter in the lee of the mainland. Even today, using aluminium and fibreglass boats powered by large outboard engines, Aboriginal people prefer to travel in a roundabout fashion, hugging the coast, rather than taking more direct routes across open waters. This does not demonstrate fear; rather, keeping landmarks in sight maintains an identity and affiliation with the land.

The seaward extent of travel following these principles is greatly enhanced along the north coast of Australia at low water. There the large tidal amplitude may result in an additional 8 m of elevation in terrestrial features, when viewed from seaward, and hence a greater distance offshore may be claimed based on the principle of sight-of-land. Generally, in areas of low tide elevation (i.e., sand-bars and reefs) adjacent to the mainland, territorial claims of up to 15 km offshore are common. The extension of the land mass at lower tidal levels lessens considerably the expanses of water to be crossed between islands and the mainland. In addition, Yolngu consider weather conditions to be generally more stable at the lower levels of the tidal range, with gusty winds generally becoming stronger as the tide rises. The more reliable weather conditions and narrower watercourses, combined with expert use of strong tidal streams, make crossing between landmasses at low tide easier and less harzardous than high tide crossings.

The marine environment provides ample food for the traveller, mainly in the form of shellfish, which is readily available along the shore. Freshwater is usually available, since it is to be found on all but a few islands and mainland areas, except in the latter part of the "dry" (August-November).

Most sea travel is done early in the dry season (April-May), when the winds change from the northwest monsoons to the southeast trades. Clouds are still common at this time, but it has stopped raining. By noon cumulus columns begin to rise from the low horizon, and invariably indicate land at their base. They signpost islands located off the mainland. When it is necessary to travel out of sight of land, such cloud columns are commonly used as navigation aids. Such cumulus columns are symbolised in restricted ritual designs used in the performance of ceremonies identifying a man with his estate. The design is painted on the body of each performer and may be depicted as large sand sculptures within which ritual cleaning takes place at the conclusion

of mortuary ceremonies. The same design retains its ritual function but changes its identity with clan groups belonging to other ritual cycles. It variously portrays the tail of the whale, the tail of the dugong, the body and tail of barramundi and turrum, and the habit of the stilted mangrove (Ryzophora stylosa), each identifying the marine claims of a particular clan (Fig. 3).

FIGURE 3: CEREMONIAL BODY PAINTING SYMBOLISING THE TAIL OF THE WHALE

RESTRICTIONS ON ENTRY TO TERRITORIAL SEAS

Permission to Enter

Ancestral beings who shaped the land and the sea, and who were subsequently transformed into features in the sea or on land, gave Aboriginal groups the rights to a particular territory. These rights were dependent on the owners both continuing to perform ceremonies and caring for the sacred objects and places.

Each complex of ceremonies is associated with particular topographical features. In northeast Arnhem Land, for example, the Djang'kawu ancestral beings are associated with the creation of river mouths and channels, and with freshwater springs in the mangroves and at the edge of saline mud flats; the Wagilak ritual cycle is associated with grasslands, and the ritual cycle featuring the water python with billabongs, rivers and creeks. Other song and ritual cycles, such as mortuary rites, follow a progression from the deep sea through to the beach, grassland and semi-deciduous monsoon forest, whereas others, such as the crocodile, turtle spear and wood swallow rituals, are associated with islands, reefs, sand-bars, channels, and creeks. An important part of land "ownership" in Aboriginal terms is caring for the clan territory. Deriving from this is the right to be consulted about entry, and the right to allocate use to others. Thus, Aboriginal people adhere to the principle of seeking the permission of senior men of the custodial clans before entering or using the resources of territory belonging to other clans. This applies with particular force to strangers. The rights of such men are often recognised by those who exploit the economic resources of areas by apportioning part of the resultant turtle, shellfish, fish catch, and the like, to the senior men.

Strangers

One Aboriginal custodian of a coastal clan estate in Castlereagh Bay defined a stranger as "someone who doesn't know this place" or "someone who you aren't sure of, when you haven't seen him before". When a person enters a territory for the first time, he is "someone who does not know". He does not know the land or sea, nor does he know the places which are sacred and dangerous, and so he cannot expect the territory to yield up its resources to him. A stranger must be introduced to the territory by the custodians, so that he becomes "someone who knows" and can safely visit and exploit that territory.

If a person is not properly introduced to the clan territory, it is held that there may be serious consequences for the intruder, the custodians, and for the territory. If the intruder disturbs sacred places in the sea, for example, he may drown or later become ill or bring sickness to the principal custodians. Custodians who must ensure that such places are not disturbed, may become ill or die if they fail in this responsibility. There may be a storm, or a sudden decrease or increase in certain marine species (both of which unbalance the natural environment), or other physical changes may occur. Yolngu cite the decreased number and size of barramundi and catfish as a response by ancestral beings to continued incursions by commercial fishermen.

Invitation to Enter

Custodians may invite members of another clan to share the

resources of their territory, perhaps because of an abundance of a particular food in their territory at that time, but the element of permission remains. Such invitations were traditionally conveyed by message stick.

Aboriginal people who are closely related to a particular custodian may have what could be termed a "standing invitation" to enter and use the resources of that clan's territory. Even when a "standing invitation" exists, a person will often tell the principal custodians on his return from their territory, and share with them all the foods he has collected there. Often, a hunting party will include at least one member of the custodial group, ensuring access rights.

Despite any variations that may occur in the requirement to seek permission, Aboriginal people are very clear on one thing: before any large-scale exploitation of a clan's territory (e.g., construction of a fish trap, taking a large number of fish, or burning-off an area of for hunting), the custodians of that territory must give their permission. Rarely do Aboriginal people fail to seek permission; when someone does neglect to carry out the proper procedure, lengthy argument, dispute, and, possibly, fighting may ensue.

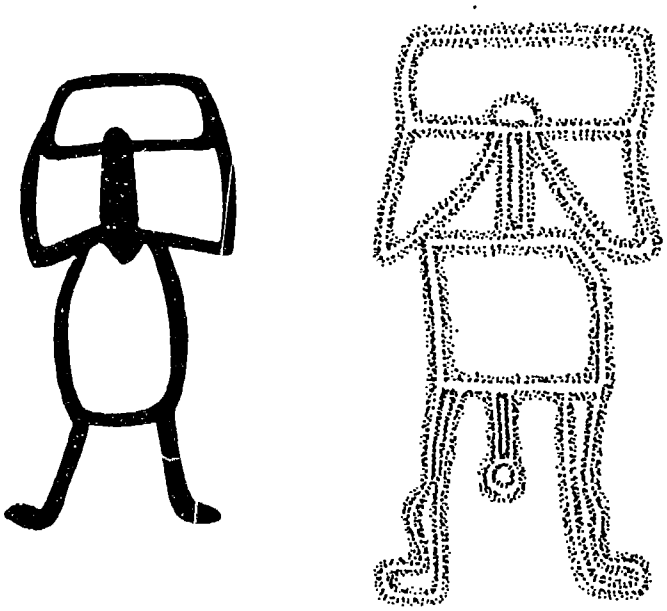
YOLNGU DELINEATION OF TERRITORIAL SEAS

Ritual Boundaries

Boundaries that indicate the ownership of tracts of land and sea among the Yolngu are manifested in several ways, and are generally related to various acts performed by ancestral beings while travelling over the area. A cluster of sites within a tract usually indicates several significant acts performed on one occasion by an ancestral being. While travelling under a channel in the sea, an ancestral being may have surfaced several times. As he surfaced he gave the adjacent seas their significance. Each place at which he surfaced and submerged is marked by naming a reef or sand-bar, and these form a cluster of sites associated with that being. In other cases, two or three sites over the length of a tract may mark the path of the ancestral being, and the sites of significant acts that it performed. Figure 4 illustrates some of the symbolism used in mortuary ceremonies to depict the ancestral being who voluntarily turned himself into a reef on completion of his tasks. This symbolism is shared by several coastal clan groups whose estates primarily encompass reefs, sand-bars, large tracts of sea and some adjacent island areas. These same clan groups share song cycles and many other facets of ritual life.

This symbolism portrays the major sites of significance to clan groups. It is from one of these sites that a person's spirit

FIGURE 4: NGARAPIYA AS PAINTED ON THE DUPUN POLE (l) AND SAND SCULPTURE OF NGARAPIYA AT THE DUPUN CEREMONY (r)



emanates and is impregnated in his mother's womb, and it is to that site that a man's spirit will return after his death. Variations of this design may be painted on a man's body at his initiation, as public recognition of his identity. Similarly, the design may be painted on the deceased person's body to ensure the spirit's return to its conception site. In cases such as these, the tract is usually marked by boundaries evenly spaced on either side of the being's path. Other seemingly isolated tracts belonging to a single group may be joined by their association to one ancestral being, who travelled either under or flew over intervening tracts of land and sea owned by other groups of people.

One ancestral being, for example, flew over tracts of land and sea and landed on a sand-bar. He performed several significant acts there and on a nearby island. All these areas where acts were performed belong to one group of people, whereas the surrounding area is owned by other clan groups. In another case, an ancestral being swam through the sea from an unknown point. In the form of a crocodile he emerged on the shore of an island, but this area was already owned by another clan group. So he submerged and swam under the island, continuing under the sea on the opposite side until he reached another island. There he performed significant acts which gave form to the land (the land existed, but was without form). Then he continued over the island, swimming on top of the adjoining sea, until he reached the mainland. He then rested on a beach and crawled into the bush, where he lay down and remains to this day.

When this being emerged initially on the first island, only that one site and a very small area surrounding it were owned by the clan group with which he is associated. From where he emerged on the second island to where he finally came to rest constitutes one tract, also owned by the same clan group. In both examples cited above, the area that the ancestral beings either flew over or passed under belonged to another group, and was not entered. Its boundary, having been encountered, clearly symbolised existing ownership. These same boundaries exist today as clear delineations of ownership.

Geographical Boundaries

(1) Foreshore

Boundaries are marked on landward areas, generally by geographical features. Sites characterised by different elevations show the initial change in gradient either as the boundary or included in the boundary. Otherwise rivers and creeks are the most easily distinguished boundaries. Changes in soil type, colour and consistency offer another criterion for delineating boundaries, although this is usually more easily associated with changes in vegetation. Vegetation zones are commonly used as boundaries. Drainage areas, for example, are used in almost every case as a boundary. It is not the change in gradient but the vegetation change which is the reference. This is indicated by the vernacular terms used to refer to a boundary; terms generally being the species names for particular plants or plant communities which border drainage areas. For example, among the Yolngu who speak the Gupapuyngu language, the generic term for mangrove is larr'tha. This word is used to define the seaward border of an area of coastal plains which abuts fringing mangrove vegetation. In this case and others, land boundaries are defined by vegetation perimeters. In describing the boundaries of an area, various vegetational and geomorphological criteria may be combined.

(2) Sea

Tidal channels, which often extend many kilometers out to sea, are the most easily recognised boundaries used to define areas in the sea. They are used in much the same way as rivers and creeks are used in reference to landward areas, but with the difference that tidal channels used to define boundaries are not owned exclusively by either of the adjoining groups. Channels that fall within a bounded area, however, are subject to strict rules of ownership. In several cases inshore tidal channels develop into deepwater channels with depths greater than 20 m and extending more than 30 km out to sea. As deepwater channels they then possess identifiable ownership by a specific clan group. Such channels may otherwise be held in common, where the channel is the major access for several groups.

In all cases reef and sand-bars, which are exposed at low tide, fall within bounded areas. Of over 100 reefs and sand-bars documented, not one is either used as, or incorporated into, a boundary; all are contained wholly within the bounded areas of sea. As such, these denote sites identified by specific clan ownership. In order that there be no question of, or challenge to, ownership, a significant physical feature is generally located well within a bounded area. Where the sea is encompassed in a bounded area, it can be divided into three main zones. The first extends from High Water Spring Tide (HWS) down to the LAT. This is the area which yields the bulk of the marine foodstuffs (at least 60% and often up to 90% of that taken by individual hunting groups) (Davis, 1984). This is also the area where most turtle- and dugong-hunting occurs, and where most fish are caught. The second zone extends from LAT to deeper waters, about 20 m in depth. Beyond the 20 m isobath are the waters of the third zone, which extends to the deep sea. Clan boundaries run through all three zones in a clearly delineated manner. Boundaries delineating sacred sites and those delineating economic zones, such a turtle- and dugong-hunting areas and fisheries, are usually located within a zone.

Shared Areas/Access Routes

As already mentioned, some sea areas are held in common by adjacent clan groups. Such areas are not seen as belonging to either group, but as being for all Aboriginal people in the area. These areas are usually access routes. No practical alternative access is generally available in such cases. These areas provide access through channels sheltered from open and particularly unpredictable areas of ocean, or merely through the only navigable channel. Such access routes may lead to a cluster of bounded areas owned by various clan groups, or to a ceremonial site or a settlement. In some cases, the area held in common also serves as a hunting area of shared economic rights. Often, where the access route leads to a cluster of areas owned by clan groups of both moieties, it is common to all and owned by none. But access is nevertheless denied to strangers. Where the route leads to areas owned by two or more clan groups of the one moiety it belongs to that moiety. For example, in the Crocodile Islands area a deepwater channel south of Murrunga Island is a Yirritja moiety channel, because it gives deep sea access to Walamangu and Ngurruwulu clan estates (both clan groups being of the Yirritja moiety).

Sometimes, after the death of a senior custodian, certain areas of land and/or sea within the clan's territory will be closed temporarily. The area will be reopened after fires have been lit to smoke and cleanse the landward area, and the appropriate ceremonies conducted. This is distinct from normal restrictions on access.

SACRED SITES

Ancestral beings created animals and birds, changed topographical features, made freshwater holes on land and in the sea (there are many examples of freshwater springs in tidal areas in the Crocodile Islands), and left reminders of these acts in the ritual paraphernalia used in ceremonies today. The focus of such acts within a bounded area belonging to one group can be described as a "sacred site". Such sites are sacred in that a number of prohibitions relate to their existence, including restrictions on access.

The exact location of the act performed by the ancestral being varies from a site a few meters in diameter, as with several freshwater springs in mangroves and the sea, to one several kilometers long, in the case of an offshore reef where one ancestral being still lives. Such sites may take the form of depressions in the land surface, areas devoid of vegetation, rock outcrops, sand ridges, sand-bars, reefs, underwater holes, restrictions in creeks, billabongs, freshwater springs, tidal channels, shell mounds, particular shapes in land features (especially curves), distinctive vegetation patterns, and the like. Such identifiable locations are only the focus of the site, and the site itself extends its influence over an area around the central location, which may be regarded as the "inner sanctum". Aboriginal people regard the whole area, including the area of influence, as "sacred".

Violation of the area of influence requires action by the custodians. However, violation of the central site of the ancestral act has immediate consequences for the patrilineal owners and all close kin who claim affiliation with that site. The perceived consequences range from mild sickness, headaches and nausea, to death, several incidents of which have been recorded in the study area. Desecration of a site is held inevitably to bring severe consequences. A stranger must therefore be properly introduced to the estate by the custodians of the territory, and must seek their permission, as only the custodians legitimately possess knowledge of the area.

There are a number of different types of areas which may be subject to restriction on access. The places of greatest significance are those sites associated with the ancestral being who created the land and sea, and who are believed to still dwell in these places. The manifestations of such activities in the sea may be rocks, sandbanks, mudbands, channels, tidal eddies, or reefs. Some areas are regarded as extremely dangerous, and Aboriginal people will avoid them at all times.

Some places may be approached with caution, allowing rights of passage through the area. Other places, may be visited by strangers only if they are accompanied by custodians. There are other areas which are secret and some which are public ceremony places. Such places are also held to be dangerous, except to

those protected by ritual knowledge and status.

Such sites are integral to the Aboriginal worldview, on which they base their group identity. They believe that disturbance of one part of their world affects the rest of it. Aboriginal distress over disturbance of sites concerns what custodians perceive as an attack on their whole cultural system, an attack on personal and group welfare, and an attack on the natural order of their world.

SYMBOLISM OF THE SEA

Territorial rights among Yolngu were, and still are, expressed in song cycles, painted and carved totemic emblems, body painting, paintings on bark, and sand sculptures. Painted designs frequently used in northeastern Arnhem Land, for example, continually portray not only the physical action of the sea, such as waves and estuaries, but also the geomorphology of the sea, including sand-bars, reefs, islands, rock shelves, and estuaries (Figs. 5 and 6).

In the song cycle of the Yirritja moiety, typically sung at a mortuary ceremony, each clan sings their part of the cycle, telling of how the relevant ancestral being travelled through their clan area paddling a canoe, and of the action of the waves, the wind on the sea, the waves on the beach, and the spray and foam of the sea. The major ceremony identifying a man with his estate finishes after several months with the ritual washing of several hundred people in the sea.

COMMERCIAL FISHING BY ABORIGINES

Yolngu fish for subsistence purposes only. There have been attempts to institute commercial fishing programmes in each of the major Aboriginal communities along the Northern Territory coast, but all have ultimately failed, and Aboriginal men returned to subsistence fishing.

Commercial fishing operations have existed among Aboriginal men only where the impetus to sustain the activity came from non-Aboriginal persons. In every case, where such impetus has been removed the commercial operation collapsed. At least in part, this is because without an outside agent to act as their medium of operation, Yolngu cannot circumvent their kinship systems and social structure so as to dispose of their catch outside their community.

Within the social and political structures to which each Yolngu is subject, there is a culturally prescribed mechanism for the distribution of all of the catch resulting from turtle-hunting, fishing, dugong-hunting, and other similar activities.

FIGURE 5: PAINTED DESIGNS DEPICTING SYMBOLISM OF THE SEA

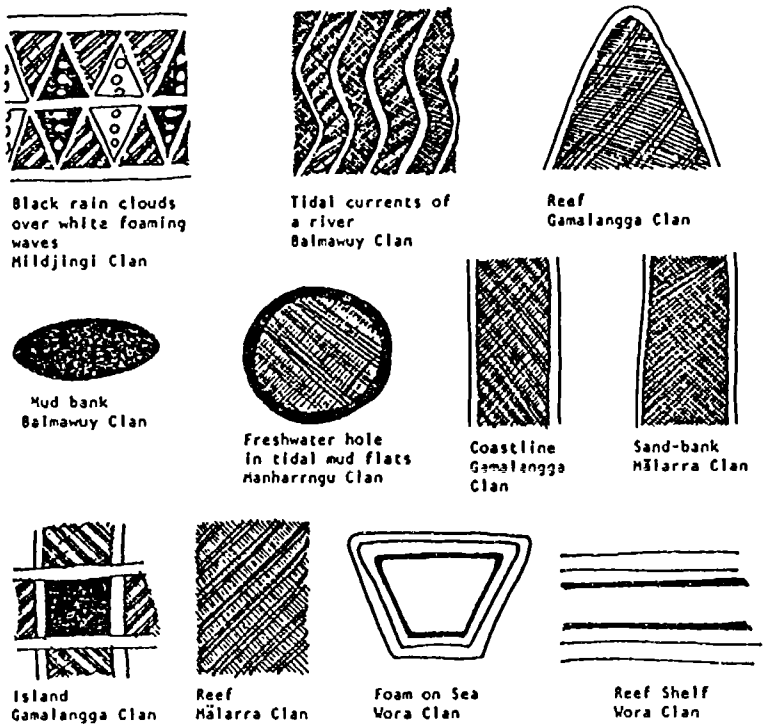
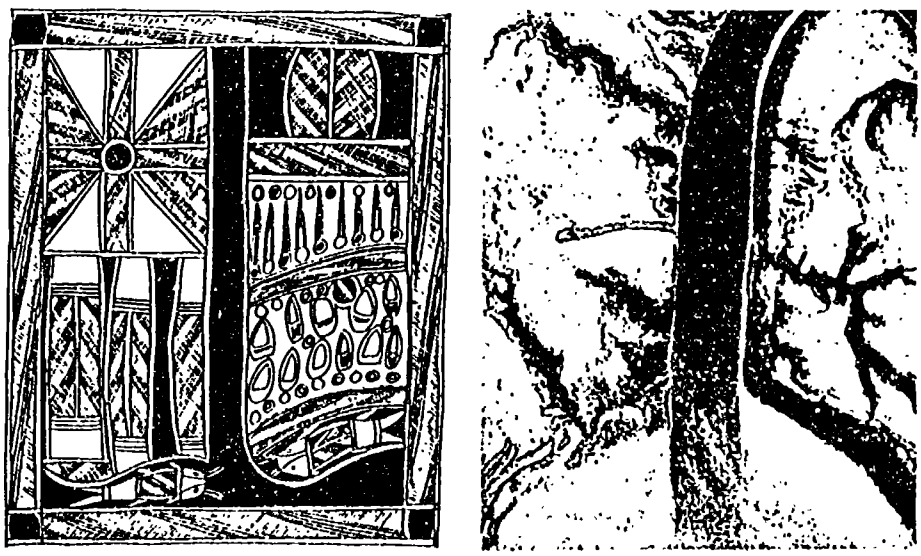


FIGURE 6: THE GLYDE RIVER, CASTLEREAGH BAY, N.T., PORTRAYED TRADITIONALLY AS A PAINTING ON BARK (l) AND AS AN AERIAL PHOTOGRAPH FROM 2,400 m (r)



Where the catch is clearly more than will meet the needs of the immediate family, claims on the remainder may be made according to established rules. For example, the head of the turtle belongs to the man who captained the boat, and the shoulder to those who stand in an uncle relationship to the successful hunter. The snout of the dugong is apportioned to the man who flung the harpoon. Each part of the turtle carcass is potentially claimable through a specified relationship to the hunter. Thus there is no surplus. There is no sale; no capital return on the product. But such distribution patterns are vital to the building of reciprocal obligations. For example, accrual of such obligations is an important part of wife bestowal, and of calling on allies for dispute resolution, among other things.

However, a non-Aboriginal who operates as the catalyst for a commercial operation, particularly if he is seen as a government agent, allows the Yolngu rules of product distribution to be bypassed. Although this may then result in an inflow of cash or goods, the Yolngu social structure will again intervene by not allowing any person to acquire that which will elevate him beyond his position in society. Hence Yolngu may avoid commercial operations, such as fishing, because they could ultimately be socially discriminated against within their own culture were they to participate; they and their family might not benefit any more that they would from a daily subsistence operation.

COMMERCIAL FISHING BY NON-ABORIGINALS

Barramundi fishing represents the largest sector of commercial fishing operations in the Northern territory. It is conducted largely in close proximity to estuarine areas. It is illegal, under the Northern Territory Fish and Fisheries Act, for a commercial fisherman to lay a net inside the mouth of a river. Nor may commercial fishermen completely restrict the mouth of the river with nets. There has been much contention generated by fishermen regarding the criteria used to delineate river mouths, as a more inclusive definition would restrict commercial operations in prime fishing areas. Such localities are rarely, if ever, fished by the Yolngu.

Yolngu generally regard estuarine areas as being the focus of the activities of ancestral beings, and, therefore, subject to severe restrictions on access. Some areas are subject to total prohibitions on entry, whereas access to others may be permitted only in the presence of senior ritual leaders. There are a range of conditions of entry applying to areas of restricted access. The entry, then, of commercial fishermen into these areas is a matter of considerable concern to Yolngu, in terms of their spiritual well-being.

Yolngu cannot understand why commercial fishermen persist in fishing in estuaries throughout the year. Yolngu knowledge of the

movement of fish indicates that most barramundi move through the estuarine areas twice a year. Yolngu state that barramundi innabit the mangroves and adjacent shallow foreshores throughout the dry season until spawning, after which they move up the river during the wet season, to feed across the floodplains inundated by the spring tides and wet season storms. It is here that Yolngu hunt the barramundi with spears. Often, a Yolngu man will wait by a gutter leading from the river to the adjacent floodplain, and spear the barramundi as they enter with the rising tide. After gorging themselves with food, most barramundi move downstream to the sea. Yolngu state that most barramundi funnel through the river mouth into the adjacent mangrove communities of the open coast. Some remain in the river system, moving in and out of small gutters and around the river mouth, with the ebb and flow of the tide. Recent studies by marine biologists have confirmed the accuracy of Yolngu knowledge of barramundi behaviour.

Yolngu therefore see commercial fishermen who set their nets at the river mouth as seriously interrupting the natural movement of the species and diminishing the barramundi population in the mangroves and the adjacent foreshore. And it is in the mangroves and the associated channels that the Yolngu fish in the dry season.

COMMERCIAL AND SUBSISTENCE CONFLICT

Gross misunderstandings between commercial fishermen and Aboriginal people located in close proximity to prime fishing grounds have led, in some cases, to confrontation and threats of shooting and spearing. Commercial fishermen claim the fish as a resource for all Australians, which any person should be able to harvest. Several species of fish taken by commercial fishermen are of a totemic significance to Yolngu, according to Aboriginal law, the Yolngu are charged with ensuring the continued well-being of such species within their clan estate and its surroundings.

Issues surrounding the conflict between commercial fishermen and Aboriginal people have become so emotionally charged that the participants have failed to look analytically at each other's operations in terms of the species sought, the time of the year that such species are sought by each group, and the area over which each group conducts it activities. Barramundi, the main inshore fish resource sought by commercial fishermen, is the primary focus of the conflict. The methods used, areas fished and times of operations of each opposing group are quite disparate. There is sufficient information from commercial fishermens' monthly fishing returns and the daily aerial coastal surveillance to assess their methods, areas fished and times of operations. However, until recently there had been no funded research on Aboriginal fishing methods and the areas fished, nor any state-

ment as to the seasonality or otherwise of such fishing activities.

Yolngu perceive the presence of a commercial fishing vessel in their area as a positive intent to violate their traditional rights. However, it is crucial to realise that Yolngu do not perceive the taking of fish in the economic sphere as the most threatening aspect. The ability of the non-Aboriginal to enter a Yolngu clan estate without permission from the Yolngu custodians, to remain on that area and then to move freely in it and take its resources are acts which, if committed by an Aboriginal person but a few years ago, would probably have resulted in the death of the intruder. Today, such an offence in Aboriginal law would certainly result in open social redress and compensation.

The boundaries established in Aboriginal law are generally unrecognised and unacknowledged by government, commercial fishermen and non-Aboriginal society. To fail to acknowledge such boundaries and rules of access and permission is, within Aboriginal law, a threat to usurp the position, power and identity of the people of both that estate and those on whom they may call for allegiance.

Hence, Aboriginal people have made recourse to often insufficient, yet the only available, European law, in an effort to curtail such violations of their clan estates. Such recourse was for several years couched only in terms of apprehending and prosecuting, under the Northern Territory Fish and Fisheries Act, commercial fishermen acting illegally. For a number of reasons, prosecutions either failed to be secured or resulted in insignificant fines. Recourse was then made to the Aboriginal Land Act (1978), in an effort to close the seas adjacent to Aboriginal land.

CLOSURE OF SEAS

The Aboriginal Land Rights (Northern Territory) Act (1976) Section 73(1) empowers the Legislative Assembly of the Northern Territory to make laws:-

> .... regulating or prohibiting the entry of persons into, or controlling fishing or other activities in, waters of the seas, including waters of the territorial sea of Australia, adjoining, and within 2 kilometers of, Aboriginal land, but so that any such laws shall provide for the right of Aboriginals to enter, and use the resources of, those waters in accordance with Aboriginal tradition.

In exercise of that authority, the Assembly enacted Part III of the Aboriginal Land Act (1978) - "Control of Entry Onto Seas

Adjoining Aboriginal Land". Section 12(1) of the Act empowers the Administrator of the Northern Territory of Australia by notice in the Gazette, to close the seas adjoining and within two km of Aboriginal land:

> .... to any classes of person, or for any purpose other than to Aboriginals who are entitled by Aboriginal tradition to enter and use those seas and who enter and use those seas in accordance with Aboriginal tradition.

Section 12(2) provides that the notice in the Gazette shall specify:-

> (a) the area closed by the notice by description of the boundaries and by a diagram showing the approximate position of the boundaries;
>
> (b) the persons or classes of persons to whom the area is closed; and
>
> (c) the purpose for which the area of the sea is closed.

The Administrator of the Northern Territory may, before deciding to close a part of the seas, refer the matter of closure to the Aboriginal Land Commissioner, according to Section 12(3), for report and inquiry. In the event of the Administrator not being prepared to close an area within 56 days of the matter being referred to him, he is obliged to refer it to the Aboriginal Land Commissioner.

Section 12(3) lists for inquiry:-

> (a) whether, in accordance with Aboriginal tradition, strangers were restricted in their right to enter those seas;
>
> (b) whether the use of those seas by strangers is interfering with or may interfere with the use of those seas in accordance with Aboriginal tradition by the Aboriginals who have traditionally used those seas;
>
> (c) whether the use of those seas by strangers is interfering with or may interfere with the use of adjoining Aboriginal lands by the traditional Aboriginal owners;
>
> (d) whether any person would be disadvantaged if the seas were closed to him;
>
> (e) the commercial, environmental and recreational interests of the public; and

(f) such other matters as the Aboriginal Land Commissioner considers relevant to closure of those seas.

Several Aboriginal groups have made application to the Administrator to close seas adjacent to Aboriginal land. In practise, however, all such applications have been subsequently referred to the Aboriginal Land Commissioner at the expiry of the statutory 56 days, in accordance with Section 12(3). This has resulted in the hearing of two applications. Both were in the Crocodile Islands and Castlereagh Bay areas. The Aboriginal Land Commissioner is not required, under the Aboriginal Land Act, to make recommendations. His function is to inquire into, and report to the Administrator on those matters mentioned specifically in Section 12(3) of the Act, and on such other matters as he considers relevant to the closure of the seas.

Two years after the Commissioner's report on the first case Closure of the Seas: Milingimbi, Crocodile Islands and Glyde River Area, which was forwarded to the Commissioner on 28 August, 1981, the Northern Territory Government directed the Administrator of the Northern Territory to close the seas in the Milingimbi, Crocodile Islands and Glyde River area, as specified in The Northern Territory Government Gazette No. G30, 29 July, 1983, in pursuance of sections 12(1) and 12(2) of the Aboriginal Land Act. The areas of the seas specified were closed:-

(i) to provide for the quiet enjoyment of those seas by Aboriginals who are entitled by Aboriginal tradition to enter and use those seas; and
(ii) for the protection of sacred sites important to the Aboriginals referred to in sub-paragraph (i).

The location of the "sacred sites" was not specified, but was assumed to lie within the gazetted area. However, this was not the case with all sites. The basic document for the closure of the seas application, prepared on behalf of the Aboriginal applicants, and known as the Claim Book, was prepared in this case by a legal officer of the Northern Land Council. There was no reference to expertise in traditional coastal resource management, and little data on Aboriginal knowledge of the littoral zone included in the Claim Book. Such omissions became apparent just days before the court hearing. Local knowledge then became the cornerstone of the case, with most evidence being introduced orally during the hearing. As in Aboriginal claims to land previously heard under the Aboriginal Land Act (1978), the Commissioner made an on-site inspection of the seas under application. evidence was taken in open court on-site, as well as in closed sessions restricted to Aboriginal men only. In such closed sessions evidence was generally given as to the ritual significance of marine areas and details of related mythology.

The second closure of the seas application, Closure of Seas: Howard Island and Castlereagh Bay, to be heard before the Aboriginal Land Commissioner made considerable use of indigenous knowledge of coastal marine resources. In contrast to the earlier case, the Claim Book was prepared by consultants engaged directly by the applicants, because of their experience with Aboriginal marine knowledge and familiarity with the applicants. The team comprised a geographer and an anthropologist, in addition to lawyers.

The third application is the Groote Eylandt claim, which has had its preliminary hearing before the Aboriginal Land Commissioner.

A draft copy of one further claim, the Bathurst and Melville Islands Sea Closure Application, was completed in November, 1983. The maps accompanying the report delineated the location of marine economic zones, and specified marine food sources used by the Tiwi people of Bathurst and Melville Islands. Specific clan boundaries, hunting camps, ceremonial sites, marine areas of significance owing to the activities of ancestral beings, and named localities were detailed on the maps. Such data in this case have facilitated discussions between the Tiwi Aboriginal people of Bathurst and Melville Islands and other prospective users of the marine area, particularly, commercial and amateur fishermen. Owing to the close proximity of Darwin, the seas adjacent to the 1,100 km of the Bathurst and Melville Islands coastline represent an outstanding marine resource.

PROBLEMS WITH PRESENT LEGISLATIVE PROTECTION

Most applications for closure of the seas, if they proceed in the manner of applications in Northern Territory, could each be expected to cost at least one million dollars. The size of the marine area under consideration makes little difference to the total cost of the application.

Court proceedings are an adversary situation, and, as such, inevitably bring Aboriginal applicants into confrontation with objectors to sea closures. Such situations are difficult, in that most custodians of areas under application are old, senior Aboriginal men, who invariably seek to avoid confrontations which lead to a degeneration of race relations. Further, such senior men are also the custodians of restricted ritual information. They often feel obliged to reveal such information in the course of court proceedings. This causes them considerable stress, as, they believe, any possible abuse of the information may be viewed by ancestral beings as tantamount to mismanagement of ancestral activity sites, with fatal consequences for the custodians. There is then a considerable anxiety and stress for senior custodians inherent in court proceedings, which are the vehicle of an application to close the seas under the present legislation.

The successful Milingimbi and Glyde River Sea Closure Application resulted in little change for the protection of marine areas for the Aboriginal applicants. Existing holders of commercial barramundi fishing licenses can continue to enter and fish in the closure area. This situation does not apply to licenses that are transferred on the sale of the boat and/or license. Naval vessels, Commonwealth Government personnel and vessels supplying goods to coastal communities appear to be exempt from closure restrictions. So, ultimately, it is only the rare touring yacht that may be subject to restrictions applying to areas of closed seas, and yet Aboriginal people have often shown hospitality to such yachts.

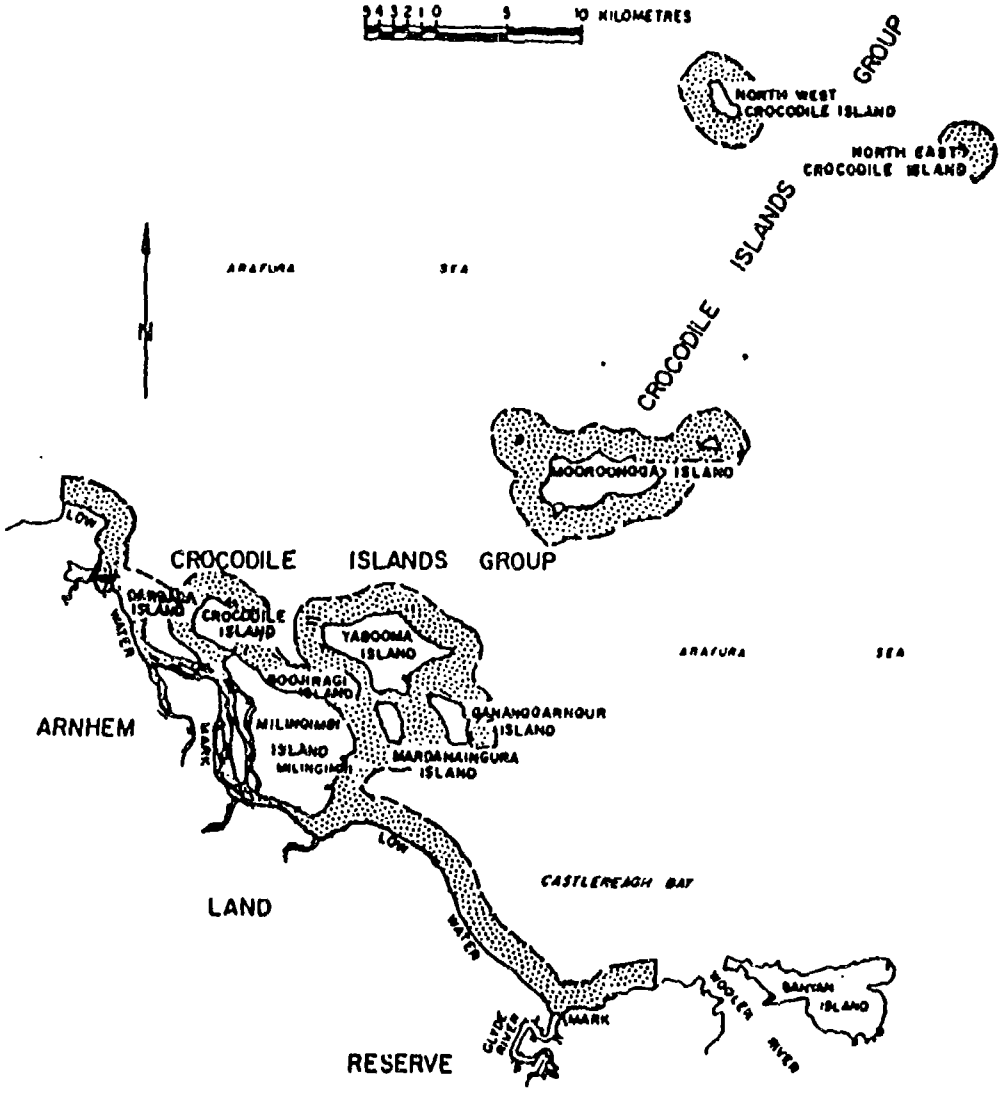
With no determination of the term "low water" in the Arnhem Land Grant, the base from which to measure the 2 km closure is obscure, thereby negating the usefulness of the gazetted map (Fig. 7).

The closure of the seas is operative from the "low water mark" of the adjoining Aboriginal land. However, there is no indication in the Arnhem Land Land grant (1933) as to which low water mark was intended (i.e., low water indian spring, low water neap, mean low water, or LAT). In areas of large tidal amplitude and low gradient coastline, such as are dominant along the coast of north Australia, small variations in vertical height, as may be evident among alternative interpretations of "low water mark", may result in large horizontal shifts in the seaward extent of the closure zone. In the Milingimbi region, for example, from the high water indian spring mark there is an approximately 13 km seaward exposure of substrate from the site known as Malwanhatharra, on the foreshore of the Milidjini clan estate, on a 0.1 m tide, which approximates the LAT. The lateral shift in the 2 km-wide closure zone declared under Northern Territory legislation in this area consequent to various interpretations of the term "low water mark", could conceivably be of such magnitude that the closure zones from LAT and low water mean tide, respectively, were entirely disparate. In such a situation, with the closure operating from mean low water mark, there would be occasions, such as extremely low tides approaching 0.1 m when the zone of sea closure would be entirely exposed, resulting in a sea closure with no sea.

Policing closed areas of sea has proven to be a problem. Areas subject to closure applications are most often remote, with little or no police presence. The government-sponsored daily aerial coastal surveillance documents and photographs each vessel encountered in the vicinity of closed seas. However, not only are coastal surveillance authorities reluctant to be party to possible resultant prosecutions, but there seems to be no mechanism for ensuring the transmission to policing authorities of data on official sitings of intrusions.

It is left to local Aboriginal people in the vicinity of the closure area to perform police functions. Within Aboriginal tra-

FIGURE 7: GAZETTED MAP DELINEATING CLOSURE OF SEAS IN MILINGIMBI AND GLYDE RIVER AREAS



dition such functions were clearcut, but Aboriginal people do not feel the same confidence in applying legislation which they perceive as distinct from Aboriginal law. For Yolngu and other Aboriginal groups in north Australia, Australian law lacks the immutable quality of Aboriginal law, and inevitably results in confrontation. Hence Aboriginal people prefer to avoid active involvement in the administration of Australian law.

The administration of Aboriginal sacred sites legislation similarly suffers from the problems of policing marine areas registered or declared as sacred sites along the Northern Territory coastline.

FUTURE OF ABORIGINAL SEA RIGHTS

The Groote Eylandt sea closure application is now before the Aboriginal Land Commissioner. Draft claim books presenting the cases of the applicants have also been prepared on the Croker Island and Daly River areas of the Northern Territory coast. The Daly River case is expected to draw significant objections from mineral exploration companies as well as commercial fishing interests. All three cases receive objections on behalf of the recreational interests of the Northern Territory public. The Groote Eylandt case, however, is the first sea case to demonstrate considerable economic detriment to present users of the area under application for closure.

Commercial fishing interests claim that at least 2,000 persons are dependent on commercial fishing in the Grote Eylandt area under application. Further, half the northern prawn fleet, representing an investment of approximately A$ 111 million, operated in the area during 1982-1983 (the most recent period for which data are available), and the catch value from that area in the last few years has amounted to several million dollars. To be weighed against this and other evidence from objectors to the proposed sea closure is the traditional and contemporary significance of the area to Aboriginal people. The presentation of a case on behalf of Aboriginal applicants sufficient to outweigh the detriment alleged in the submissions by commercial fishing interests is a formidable task. Yet the Claim Book states that it was prepared with only three weeks of fieldwork by a person with no previous experience either with that Aboriginal group or in marine tenure issues, and with no recourse to any discipline other than anthropology.

The case to close seas adjacent to Aboriginal land is presented by a lawyer on behalf of the Aboriginal applicants. The case is based on data gathered and interpreted by an anthropologist. But can any one discipline reasonably contend to interprete adequately the spectrum of information required to produce a cohesive and coherent representation of a system of sea tenure as it relates to a specific geographical area, and also to a

social group's spiritual and economic reliance on that system?

The system of tenure relies on information from social anthropologists, interpreted against a background of geographical data, such as tidal amplitude and flow, coastal sedimentation and river formation. Similarly, biological data, such as the movement and habits of marine species, is critical in its potential correlation with human population movements through the biosphere.

By far the most desireable resolution of claims is a mutual agreement among all parties, thereby negating the need for a pitched battle in court or legal ratification of an agreement among all parties. This has been the situation among the Tiwi of Bathurst and Melville Islands. Documentation on sea tenure was produced over a two-year period by a research team. The resultant data formed the basis for negotiations between Tiwi and other users of the seas adjacent to Tiwi Aboriginal Land. The negotiations have produced amicable relations between all parties, through a mutual understanding of each group's interests and concerns. Non-Aboriginal fishermen have been considerably impressed by Tiwi knowledge of fish species and of the sea in general. Soon, the Tiwi hope to have the results of such negotiations recognised formally by the government of the Northern Territory.

The system of sea tenure is similar throughout all the coastal Aboriginal groups of northern Australia, where spiritual affiliation and economic usage along traditional lines remains strong. The Northern Territory is unique in that its entire coastline falls within the bounds of such usage patterns. In contrast, in the southern areas of Queensland and Western Australia, traditional economic usages of marine areas by Aboriginals has become greatly reduced. How, then will state and national legislation adequately reflect the breadth of Aboriginal claims?

Following the hearing of cases in the Crocodile Islands, the Northern Territory Department of Ports and Fisheries commissioned a major research project to examine sea and coast tenure among Aboriginal groups. The results of this project, conducted by a multi-disciplinary team, have facilitated constructive and mutually fruitful communication between the government and Aboriginal groups, in both daily conduct of business and in policy areas.

Future research on Aboriginal sea tenure would be considerably advanced were it to proceed on a cooperative, multidisciplinary basis. There is no doubt that the results of such research should be made available to legislators, so that legislation will reflect reasonably the realities of daily life. If this is not done, then implementation of the legislation may prove frustrating and costly.

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TRADITIONAL MANAGEMENT AND CONSERVATION OF FISHERIES IN KIRIBATI AND TUVALU ATOLLS

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ABSTRACT

The peoples of the dry, infertile Central Pacific atolls evolved effective strategies for conserving limited marine resources. Sea tenure controlled access; turtles were protected; various regulations and customs controlled fishing effort; food taboos distributed fishing pressure; and preferential exploitation of pelagic and low trophic level lagoon species, as well as weather and distance, among other things, reduced fishing pressure on reefs. The effects of colonial rule and modern changes and pressures (urbanization, introduced technologies, increased fishing pressures, inter alia) are discussed.

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INTRODUCTION

The terrestrial resources of the Central and Western Pacific atolls are particularly meagre and small isolated reef islands also have limited marine resources. However, it is likely that many have been continuously inhabited for two to three thousand years and have supported very high population densities. Because the inhabitants must have utilised their fisheries to the fullest it is probable that they have evolved, over centuries of trial and error, effective ways of managing their fisheries and conserving the reefs and lagoons. The documentation and evaluation of this wealth of sea lore accumulated over millennia of atoll life is important for its anthropological and potential scientific value, and particularly for the formulation of modern management policies in the developing island nations.

The European impact on the small, isolated Central Pacific atolls of Kiribati and Tuvalu has been minimal, because they often held little to interest the colonial nations. After almost a century of British rule under a "museum policy" to avoid foreign influence (Maude, in Sabatier, 1977) the now independent atoll nations, unlike most of their Pacific neighbours, have retained much of their traditional life. Outside the two urban atolls (South Tarawa in Kiribati, and Funafuti in Tuvalu) where there is some salaried employment, most of the atoll peoples have remained subsistence fishermen, using techniques of exploitation and management which are little changed since ancient times.

Zann *et al.* (n.d.) describe the fisheries and evaluate the yields of these atolls. Some of the traditional ways in which the fisheries were managed and the response to new pressures resulting from Western impact are outlined below. A number of examples of conservation practices were taken from the scattered literature pertaining to the atolls, but where the source is not cited the information was obtained from an informant on the island mentioned.

GEOGRAPHY, DEMOGRAPHY AND FISHERIES

The atolls of the recently independent nations of Kiribati and Tuvalu, formerly the British Gilbert and Ellice Islands Colony, lie scattered along a 1800 km archipelago, from about 11°S to 3°N, in the Central Pacific (Fig.1). The Republic of Kiribati includes the formerly uninhabited Phoenix and Line Groups in the east, as well as the 16 inhabited atolls of the Gilbert Group. Tuvalu comprises nine atolls, eight of which were permanently inhabited in traditional times. The coral islands include typical atolls with a large central lagoon partially to fully enclosed by reef, elongate atolls with land on one side and reef on the other, and elevated, circular reef islands without lagoon or coral patches (Fig.2). The islands are separated by 20 - 100 km of deep water.

The total land area of the Gilbert Group is 295 square kilometers, and Tuvalu is 26 square kilometers. The pre-European population of the Gilbert Group, mainly of Micronesian origin, was

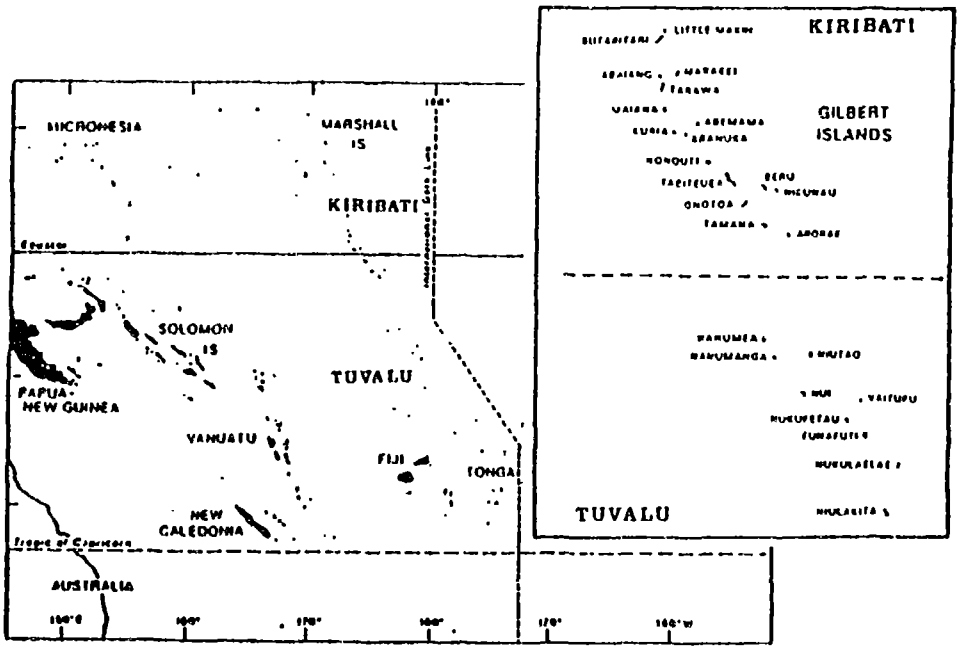

FIGURE 1: Southwestern Pacific islands (left) and inset showing atolls of Kiribati and Tuvalu archipelago.

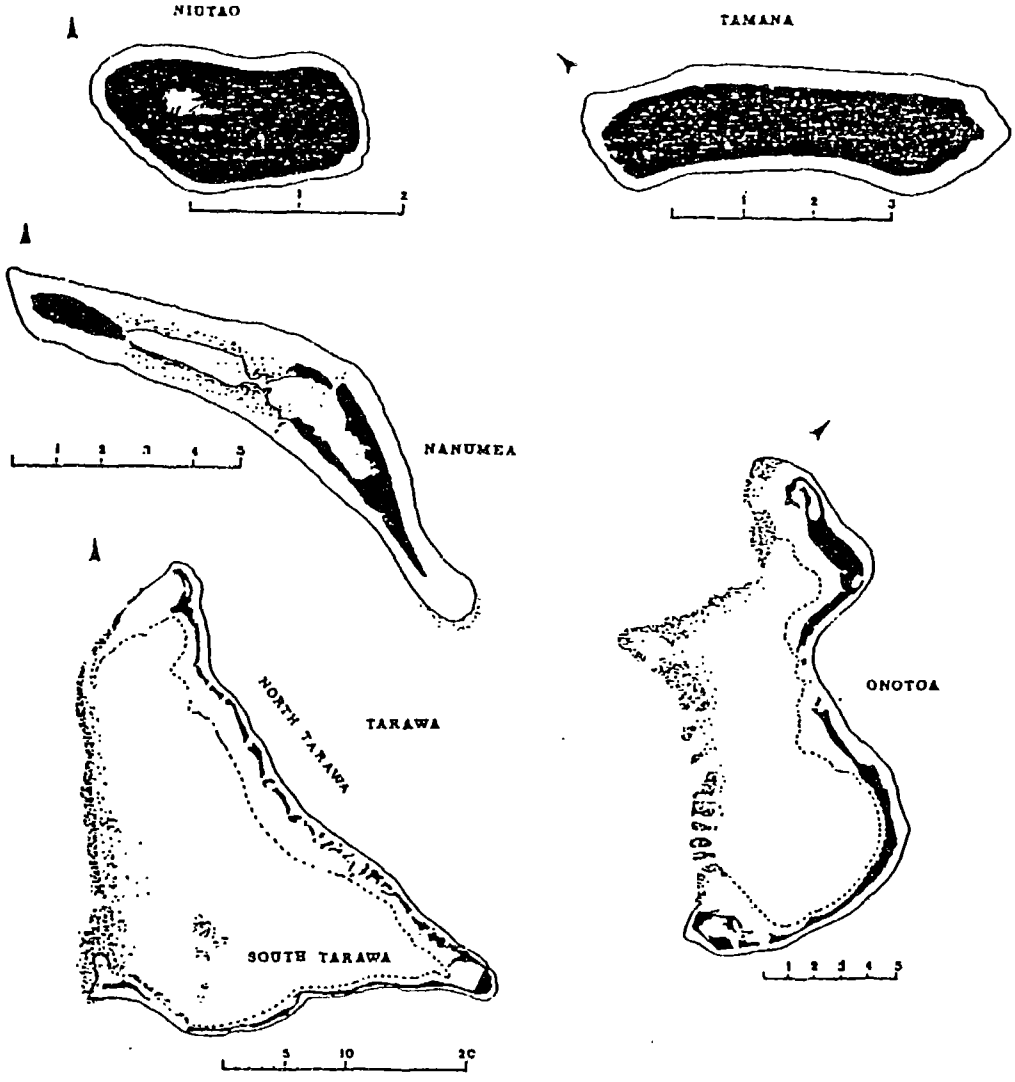

FIGURE 2: Detail of island types. Niutao and Tamana, raised reef islands with limited coral growth surrounding. Naumea, atoll with small enclosed lagoon. Onotoa, small atoll with small lagoon and well developed reef. Tarawa, large atoll with large shallow lagoon and well developed reef. Urban South Tarawa is the administrative centre of Kiribati. Scale in kilometres.

25,000 - 30,000 and the population of Tuvalu, mainly of Polynesian origin, was 3,000 - 4,000 (Bedford et al., 1980; Maude, 1982). Traditional population densities were high, averaging about 93 and 135 per square kilometer, respectively. Populations have subsequently doubled: the Gilberts have a population at present of some 56,000, and Tuvalu of about 7,500. But the urban centres of Tarawa and Funafuti and emigration have absorbed most of the increase.

From linguistic evidence it is thought that nuclear Micronesia, including the Gilberts, was first settled around 1300 BC (Mark, 1975, cited in Bellwood, 1979). Tuvalu was probably first settled about 2000 years ago from Samoa, although Nui atoll was invaded by I-Kiribati (people of Kiribati, also referred to as Kiribatese and Gilbertese) in more recent times. Most of the islands are dry and infertile. Cultivation is difficult and taro, a staple elsewhere in the Pacific, is a prestigious food reserved for festive occasions. The traditional diet consisted of fish and coconut products (meat, milk and "toddy"), with pandanus fruit and bread-fruit in season (e.g., Catala, 1957).

The sea provides virtually all the animal protein in the diets of the atoll peoples. Terrestrial sources (formerly land birds, lizards and rats, and today pigs, chickens and dogs) comprise an insignificant part of the diet -- Sewell (1976) found these appear in less than 1 percent of total meals on Butaritari, the most fertile atoll. Because of limited terrestrial protein and carbohydrate, fish consumption is among the highest in the world. Zann et al. (n.d.) estimate the average consumption of whole fish at 565g/capita/day on rural atolls, and 320g/capita/day on urban South Tarawa. As F.A.O. (1972) estimates that about 300g of whole fish/capita/day would provide the minimum protein requirements, it is evident that fish also provides much of the daily energy requirements because of the limited carbohydrate in the diet. Reefs are therefore very heavily fished, providing yields of 6 - 25 t/finfish/sq km/year (Zann et al., n.d.).

Atoll fishermen developed many specialised fishing techniques involving different types of nets, hooks and lines, spears lures, nooses, traps and fences, poisoning and gleaning. Lawrence (1977) listed 33 distinct techniques on Tamana, a reef island. Many hundreds of different marine organisms including algae, jellyfish, sipunculid worms, molluscs, crustaceans, echinoderms, virtually all non-toxic species of fish over a few centimetres in length, turtles, seabirds and cetaceans are eaten and various shells, teeth and other hard parts were formerly used in the material culture.

The identity and quantity of the major marine organisms eaten varies greatly, depending on an island's size and nature (atoll or reef island), its marine habitats, the area of reef and lagoon, and the productivity of surrounding water, as well as social factors, community structure, fishermen's skills and specialities and the nature and size of the fishing unit. On those atolls with well-developed lagoons, the lagoonal and reef fish are usually the staples, but on reef islands flyingfish and tunas are more important (Zann et al., n.d.).

A scarcity of certain marine organisms such as turtles, large reef cods (Serranidae) and giant clams (Tridacna spp.) indicates that the atolls have been overfished in the past, although the existence of a variety of conservation practices is ample evidence that this has occurred. Although the paucity of terrestrial resources, the small size of the islands, their infertility and periodic droughts have been the major factors limiting human populations in the past, it it probable that the marine resources were at times also over-exploited and yields declined. Lawrence (1977) mentions that in times of extreme famine on Tamana, even the fish catches declined and starvation was general. This may have occurred because of the increased fishing pressure and/or the effects of a past El Niño phenomenon. During the recent 1982-83 El Niño the region experienced a prolonged drought, coral and fish kills followed a decline in mean sea levels, and the size of the skipjack tuna declined.

However, apart from the rarity of certain species such as giant coral cod and turtles, my general impression after studying the reefs off the most densely-populated (6,000 sq km) islet of Betio was not one of scarcity (Zann, 1982). This probably reflects the efficacy of reef conservation practices rather than a natural abundance of marine resources.

The conservation ethic remains very strong among today's atoll peoples and the wide range of conservation practices still in use indicates that their ancestors actively attempted to manage marine resources, and had an extensive knowledge of fish, fishing, knowledge and the sea. Very little of this has been recorded but from those practices which have survived it is evident that sea tenure was important in limiting access, certain over-fished species were protected and fishing effort was regulated by various restrictions, social beliefs and taboos to ensure a high sustainable yield from the atoll's resources. Weather, distance and gear limitations were probably also important in lowering fishing pressure.

THE CONSERVATION ETHIC AND SOCIAL FACTORS PROMOTING CONSERVATION

A deep-rooted conservation ethic, the result of thousands of years of tenuous atoll existence, manifests itself in all aspects of atoll life. As a constant reminder that nature should not be overused, the I-Kiribati always leave a little flesh on a fish's tail at the end of a meal, and leave a little milk in the bottom of a coconut after a drink (Sabatier, 1977).

It is unacceptable in the rural islands of the southern Gilberts and in Tuvalu to sell fish. This attitude initially hindered commercial fisheries development in the urban centres but custom has compromised in that it is now acceptable in urban areas to sell to non-kin.

The communal nature of Polynesian and Micronesian life and strong kinship obligation deter acquisitiveness. In Kiribati, a successful and generous fisherman is greatly esteemed while in

Tuvalu, where the catch must be divided among kin and neighbours, a selfish fisherman is despised and shamed before the community. Although craftsmen such as canoe-builders were usually supplied with fish by their clients (Chambers, 1975) there was no trade in fish and each household normally caught its own requirements. Thus a fisherman only caught enough fish for his family's immediate needs and to meet his social obligations.

Secrecy and clan specialisation, features of both atoll cultures, also aid in conservation. Each clan has a specific skill in fields such as taro culture, canoe building, octopus fishing, deepwater fishing, diving and so on, and their special techniques are closely guarded. Sewell (1976) commented on how the fishermen on Butaritari went to extraordinary lengths to keep their fishing grounds secret and often fished alone for that reason. Kennedy (1953) described a lands court case in which a man in Tuvalu actually traded land for a fishing secret. (Because he did not convey this secret to his clan before dying, his clan requested -- and was awarded -- the return of their traditional land.)

The invocation of a taboo, a ban or prohibition on a certain object or practice for spiritual or other reasons, was an effective mechanism of enforcing a protective proclamation. A range of penalties, from fines to removal of fishing rights and even death, might be imposed by the island king or community for breaches of fisheries regulations.

In both groups social and climatic factors formerly limited populations, thereby reducing pressures on terrestrial and marine resources. Birth control practices were relatively effective and infanticide was common; in Tuvalu and children after the second were smothered at birth. Off-shore canoe fishing was hazardous -- canoes and motorboats are still regularly lost at sea -- resulting in a high mortality among fishermen. In Kiribati warfare over land was widespread and death penalties were mandatory for many offences (Baraniko et al., 1979). In Tuvalu, suicide by leaving the island in a canoe, was a common response to shame (and was probably important in island colonisation). Famines were periodic in the southern Gilberts and caused widespread starvation, and various diseases and dietary deficiencies, still relatively prevalent, contributed to a high death rate.

TRADITIONAL FISHING KNOWLEDGE AND SEA LORE

Pacific Island fishermen possess a wealth of untapped traditional knowledge on the natural history and behaviour of reef fishes which could assist fisheries biologists and ecologists in the formulation of management procedures for coral reefs (e.g., Johannes 1977, 1981a, 1981b). The extent of the traditional fishing knowledge of I-Kiribati and Tuvaluans is indicated by their large number of fish names. Lobel (1978) published 254 I-Kiribati names and 153 Tuvaluan names for 210 species of fishes from 60 families. As his informants were expatriate labourers on Fanning Island, it is probable that many more names are in use in the home islands.

Invertebrates are not as well-named, indicating their lesser importance; Lobel published 95 I-Kiribati names and I recorded 75 Tuvaluan names for 60 species or groups.

Atoll fishermen are astute observers of natural phenomena. While many of their explanations may be steeped in spiritualism and folk lore, their actual observations are highly reliable. They also have an excellent ability to estimate distance at sea, as well as fish sizes and weights.

Reef fishermen, particularly those who tend their fish weirs daily and those who regularly glean reefs at night, have acquired an extensive knowledge of the migration and spawning aggregations of many reef fishes, and have correlated these with the lunar and seasonal cycles to predict optimal fishing areas and times. This knowledge is passed from father to son and is kept secret, making documentation difficult.

The I-Kiribati categorise the marine environment according to reef structure, depth and direction. On lagoonless Tamana Island shores are named after the prevailing winds, while the zones are divided into sandy beach, reef flat, spur-and-groove, reef terrace and deep sea, which is subdivided into the surface 55 m, and the deeps, below 55m (Lawrence, 1977). Fishermen also know of the existence and depth of the temperature barrier, the thermocline, because of the coldness of fish caught below certain depths. Teiwaki (pers. comm.) has recorded terms for almost 20 different zones in the sea.

Because the atolls are low, and even neighbouring islands are not visible from the shores, atoll peoples became highly skilled in off-shore navigation. Lewis (1972) has documented much of the surviving traditional I-Kiribati knowledge on navigation, and the use of wave trains, currents and astronomy in position finding. This is probably the only field in which traditional knowledge is endangered; inter-atoll voyaging declined with the advent of the trading and colonial schooners, and ceased altogether with the colonial administration's ban on inter-atoll travel, early this century. However, although not practiced for almost a century, much of this knowledge has still been handed down.

Although no voyaging canoes (te baurua) have been constructed for over half a century, a 23 m-long voyaging canoe was constructed in North Tarawa in 1976 for a "re-enacted" voyage to Fiji (Sears, 1977). This prompted several island communities and church groups to construct their own baurua.

SEA TENURE AND LIMITED ACCESS

In pre-contact times land owners in Kiribati, and probably also in Tuvalu atolls, held tenure to the reefs and lagoons adjacent to their lands and had exclusive rights to fisheries and passage. The importance of sea tenure in fisheries management has been

stressed by Johannes (1977) for it is in the interests of the owners not to overfish their own waters: self interest determines wise use.

The traditional sea tenure systems have subsequently broken down during the past century and few details of them are recorded. In the more democratic southern Gilberts, where rule was by the elders of the maneaba (meeting house), land owning clans also held tenure to the reefs and lagoon adjacent to their land. In the northern Gilbert atolls, which were ruled by kings, one man had control of a large area of land, reef and lagoon and dispensed fishing rights to the various clans in the area. For example, a chief of Tarawa, named Ten Nawaia, had complete autonomy over an area of reef and lagoon about 18 km long, while the chief of the southwestern district of Banaba Island was also the "king of the sea" (Teiwaki, pers. comm.).

The I-Kiribati formerly lived in scattered small villages or hamlets (kaainga), each comprising a small group of extended families (utu) related through a common ancestor. The collective land of the kaainga usually extended as a band across the narrow islets, from the ocean reef (maran) to the lagoon shores (nama), or in the reef islands, from one ocean reef to the other. The utu who owned sections of a reef or lagoon flat had exclusive ownership of its marine resources, the rights to control access and the rights to all flotsam (drift timber for canoes). Infringements of sea rights, like land rights, could be punished by death (Bate et al., 1979).

After the islands became a British Protectorate, in 1892, the kaainga were amalgamated into surveyed villages (kawa) on land selected by the administration. Sea tenure possibly began to break down because many utu found themselves relocated at a considerable distance from their traditional waters.

Banner and Randall (1953) stated that the breakdown of sea tenure on Onotoa began with the missionaries and was hastened by the British, but other factors also contributed. Goodenough (1963) considered that a change in fishing strategy, resulting from the increased used of canoes, was the primary factor responsible for the breakdown. In former times a lack of suitable timber had limited the use of canoes but when imported timber became available from European traders, canoe building increased and more fishermen began to fish for the off-shore tunas. "De-emphasis of in-shore fishing has so decreased the once jealously guarded property rights in fishing sites around coral heads within the lagoon that they have been allowed to lapse. In 1951, the people (on Onotoa) readily agreed to declare the lagoon public domain when they adopted by referendum a formal code based on customary property law" (Goodenough, 1963).

There is little doubt that the British were also partly responsible for the breakdown of sea tenure. Although there was an attempt to codify fishing rights (Section 10 of the Fisheries Caption 48 provided for the protection of native customary rights which made it unlawful to fish in any area forming part of the ancient customary fishing ground of any kaainga, utu or other

division) the colonial government recognised only the tenure of fish weirs, reclaimed areas, fish ponds and other accretions. Whereas the British claimed that sea tenure had broken down before their arrival (e.g., in 1948 the Chief Lands Commissioner was advised by the Secretary to Government that in general customary fishing rights had became "inoperative" before the declaration of the Protectorate, in 1890), Teiwaki (pers. comm.) considers that the Imperial British "Pax Britannica" and the concept of "freedom of the seas" were ultimately responsible, as the existence of sea tenure was never officially recognised.

Today, according to the national laws, individuals or utu have ownership of stone fish weirs, and may still construct new ones on the reefs adjacent to their land. Fishing is forbidden by Local Council bye-law within a prescribed distance of the weirs. A builder may also assume ownership of reclaimed areas of lagoon if there are no objections from the community (Teiwaki, pers. comm.); on the death of the builder, ownership is assumed jointly by his family (Bate et al., 1979).

Since the breakdown of the traditional sea tenure systems, various attempts have been made to protect the fishing interests of the now basic community unit, the kawa or village. A number of Local Councils have enacted bye-laws limiting access to certain waters. The Local Council of rural North Tarawa has banned fishermen from urban South Tarawa from fishing within a prescribed distance of their shores. Abemama has prohibited the taking of its Tridacna clams by visitors. Nukunau has banned certain fishing techniques in areas close to the villages. Tamana (and possibly other southern Gilbert Islands) has banned visitors on the inter-island boats from fishing while they are in its waters. Kiribati's commercial fishing company, Te Mautari Ltd., has encountered considerable antagonism while collecting wild tuna baitfish on many atolls and has been forced to pay fees. On Tarawa "former" sea owners have prevented Te Mautari from collecting milkfish (Chanos chanos) fry for their baitfish aquaculture, but a confrontation between traditional interests and the national government was averted by the decision to pay villagers $5 per bucket of fry (Teiwaki, pers. comm.). Traditional owners of the lagoon floor at Ambo, in Tarawa, are currently complaining about an Eucheuma algae farm in their area, while those at nearby Bonriki are protesting the establishment of government milkfish ponds in their traditional waters.

FISHERIES REGULATIONS

A number of laws and customs regulating various aspects of fishing activities are still to be found on most atolls. Some are ancient, dating from pre-contact times, but others are more recent and reflect the fishermen's and community leaders' concerns about new factors affecting their marine resources. In a discussion of marine conservation of Tamana, Lawrence (1977) noted the "... continued and largely successful efforts to regulate fisheries on the island. These are not new or recent efforts but stem, according

to my informants, from pre-missionary times." Regulations have been effected for a variety of reasons, not all of which are based on sound conservation grounds or fisheries principles.

Regulations to conserve a limited resource

On certain atolls turtle meat was formerly prohibited to commoners because of its rarity. Hedley (1897) stated that on Funafuti where turtles were rare, turtle meat was taboo to all except the king, and transgressors were fined. On Arorae it could only be eaten by the priests. Similar prohibitions existed elsewhere in the Pacific (e.g., Baines, 1982). Grimble (1933) stated that turtles were regarded as cowardly animals in the Gilbert islands and were therefore never eaten in times of war or crisis. They were also taboo to pregnant women, lest their cowardly ways affect the unborn child. The turtle taboo appears to have largely broken down in recent decades. As suggested by Baines (1982) in Fiji, the reason probably stems from the former European trade in the hawksbill turtle for its shell, and in the green turtle for its flesh. The decline in the power of the chiefly systems and former religions also probably contributed. The decline has been hastened in recent years by the increased use of outboard motors for hunting (e.g., Chambers, 1975).

Restrictions on gear, catch limits

A number of modern regulations have been formulated by Island Councils in both groups to control the use of introduced gear and techniques thought to be harmful. Several islands (e.g., Tamana, Lawrence 1977) ban the use of pressure lanterns for the dip-netting of flyingfish as they are thought to be more effective, than frond flares, and Butaritari Island Council introduced a catch limit on flyingfish off Ukiangang, in 1975, because of declining catches (Sewell, 1976).

Monofilament gill nets are banned on several islands in Kiribati because they are too effective (Tikai, 1980). The use of pearlshell lures equipped with steel hooks, or any imported lure, is banned in Tamana (Lawrence, 1977) and several other islands in Kiribati (Tikai, 1980) in the belief that they are too efficient and damage the jaws of those tuna which escape. Because their catch of yellowfin tuna was apparently declining, fishermen of one atoll in the southern Gilberts elected to impose a ban on certain lures, in the belief that they were responsible for overfishing (Kearney, 1983a).

Monofilament gill nets are extremely effective and have been responsible for overfishing in other places, but it is more difficult to explain the decreasing catches of pelagic flyingfish following the introduction of brighter lights. Possibly the species affected are neritic-pelagic in habitat, and may therefore be limited in numbers. The decline in yellowfin tuna has also been detected by the South Pacific Commission (Kearney, 1983b) and is attributed to recent overfishing by long-liners and purse-seiners. The catch of a small atoll, about 60 - 80 t/yr (Zann, et al., n.d.)

is insignificant when compared with the commercial catch and the vast standing stock of the migratory tunas.

Restrictions on time

Other regulations limit the time and duration of fishing activities. For example, at Ukiangang village on Butaritari, those who glean the reefs during the nocturnal spring tides must do so in groups and not singly, lest the lights of an early fisherman frighten the fish away. (This is referred to as "disturbing the tide".) Offenders have their lanterns smashed. Banner and Randall (1953) mention a similar law on Onotoa prohibiting flare fishing for flyingfish when schools of Caesio gather in the lagoon, as lights disturb the latter. On Onotoa and on some other islands, skipjack fishermen must not leave the island before dawn. This is probably a recent regulation, dating from the authoritarian "Regulations for the good order and cleanliness of the Gilbert and Ellice Islands," imposed by the British administrator in 1917 (Teo, 1983).

Regulations to promote orderly fishing and to protect fish schools

Various other regulations have been imposed to promote orderly fishing. These may aid indirectly in conservation by reducing competition among fishermen, and by preventing excessive disturbance of reef and pelagic fish which may drive them away.

Strict rules control the activity of canoes flare fishing or dip-netting for flyingfish at night (for a detailed description see Kennedy, 1931). In the atolls of Tuvalu and in the reef islands of the southern Gilberts, regulations limit the number of canoes in a line and govern the order in which canoes change position. Co-operative fishing of canoes in a fleet increases an individual canoe's catch while regulations for changing a canoe's position ensure that they share equally in the best positions.

Important rules govern skipjack fishing using a pearlshell lure and a pole-and-line from a canoe (cf. Kennedy, 1931). On Nanumea, Niutao, Onotoa, and probably other tuna fishing islands, the whole village must be quiet both before the expedition and when it is at sea. In Kiribati a man should not sleep with his wife before an expedition (a widespread taboo among Pacific fishermen, cf. Johannes, 1981a). On Vaitupu (Kennedy, 1931), Tamana (Lawrence, 1977), Nanumea (Chambers, 1975), Niutao, and probably some other islands, it is taboo to disturb a feeding tuna school by dropping a paddle, releasing a fish or even letting a pole tip touch the water. Should this occur it is believed that the school, and others within a radius of several miles, will dive and leave the vicinity. Penalties are severe: On Vaitupu an offender's canoe was wrecked and he was banned from fishing for one season (Kennedy, 1931). Similar penalties existed on Tamana but these have been replaced by a $20 fine or a maximum of six months imprisonment (Lawrence, 1977). On Nanumea the penalty is forced labour on the community's copra plantation for first offenders. Repeated offenders may even be punished with a life-time ban (Chambers, 1975).

I also recorded similar taboos on disturbing tuna schools in other tuna-fishing communities, such as in the Western Province of the Solomon Islands and in Morobe Province, Papua New Guinea. Hooper (this vol.) also describes such a taboo in Tokelau. Commercial pole-and-line fishermen in the South Pacific have similarly found that excessive disturbances, tuna blood entering the water, wounded fish and even moribund bait may stop a tuna school from feeding, and cause it to disperse. It is widely believed among commercial fishermen that skipjack can detect the sound of other tunas feeding some distance away (Travers, pers. comm.), adding support for the islanders' belief in long-distance communication between schools.

FAMINE FOODS, STATUS FOODS AND FISHING STRATEGIES

Some visitors to Kiribati and Tuvalu, such as Hedley (1897) and Catala (1957), have remarked that the people made less use of sea food than those in other parts to the Pacific, as they did not eat algae, holothurians, echinoids and many molluscs and crustaceans which are often common and palatable. Dietary studies by Chambers (1975) on Nanumea, Lawrence (1977) on Tamana, Geddes (1976) on Tabitueuea, and Sewell (1976) on Butaritari indicated that invertebrates comprise only a small part of the diet on most islands. However, lagoon bivalves (mainly Anadara maculata, Gafrarium tumidum and Asaphis violascens) have become staples in urban South Tarawa, with landings exceeding that of all finfish combined (Zann et al., n.d.).

On most atolls of both groups the intertidal algae and reef invertebrates are derogatorily referred to as "woman's food" or "old man's food" and are eaten only in cases of hardship when fish is unavailable. Abemama atoll, reknown in Kiribati for the richness of its reefs, is therefore rather enviously known as "the island of women" as its inhabitants eat many invertebrates and rarely fish off-shore. On Tarawa, during World War II, a variety of seaweeds and invertebrates not eaten by choice today were consumed because the Japanese prohibited off-shore fishing.

On those islands where in-shore resources are limited, the low status of invertebrates and small reef fish, and the corresponding high status of the tunas, redirects fishing pressure to the virtually inexhaustable migratory pelagic species. Tunas are a preferred fish because of their oily flesh, their high recoverable weights, the excitement involved in their capture and the opportunity to improve one's status. Tuna fishing is an occupation for the strong young men, the expert seamen and those wealthy enough to own a large canoe. Goodenough (1963) referred to tuna fishing as a "sport" on Onotoa for those fortunate enough to own a canoe. Open-sea species therefore rated high as food. On atolls with smaller reefs, the tunas and flyingfish are vital for subsistance. In Tuvalu the esteemed title of tautai (master fisherman) was bestowed on those who caught more than one hundred skipjack in a day. Today on Nanumea the island publicly acknowledges the skill of these and other successful fishermen at island feasts, when the names of the

best fishermen and their catches are read out (Chambers, 1975). Dip-netting for flyingfish in Tuvalu is similarly exciting and is regarded as an enjoyable social event.

On atolls with large shallow lagoons, the abundant bonefish (Albula), mullet (Mugilidae), milkfish (Chanos), silver biddies (Gerres) and goatfish (Mullidae) are generally fished in preference to reef fish because they are easily netted and occur in larger schools. The pelagic species are not commonly fished (Zann et al., n.d.). Whereas tunas are the most popular eating fish for reef-island and ocean fishing communities, milkfish and bonefish (regarded as inferior eating fish in many other islands in the Pacific) are preferred by lagoon communities.

The importance placed on the abundant species, such as the pelagic flyingfish and tunas and the lagoonal bonefish and milkfish, has probably evolved as a strategy to reduce fishing pressure on the more accessible, but more vulnerable in-shore reefs. Fishing on atolls with limited reefs is generally reserved for periods of bad weather and for those people who are incapable of going to sea. The in-shore invertebrates are literally "old men's food," a type of social security for the disadvantaged, and "famine foods" when other fish are unavailable.

TABOOS ON MARINE ANIMALS

A number of age, sex, totem and community-wide taboos prohibit the consumption of certain marine animals, particularly in Kiribati. Sabatier (1977) noted that many things were banned in Kiribati, whereas Chambers (1975) remarked that almost everything edible on Nanumea in Tuvalu was eaten.

Grimble (1933) listed many of the I-Kiribati prohibitions, particularly those pertaining to clan totems. Gilbertese society is divided into exogamous groups of patrilineal descent, each of which has at least one totem, but generally three or four, and sometimes as many as eight. No clan member may eat its totem. Further it is usual for a man not to eat his mother's and wife's totems. A man's totem is "held to be flesh of his flesh and to eat it would be a type of incest" (Grimble, 1933). If eaten, it is believed that the spirit of that animal will return while a man sleeps, and will strangle him. Not all totemic taboos are strictly adhered to: the practice was already declining in Grimble's time, and Turbott (1949) recorded an additional subsequent decline. Few I-Kiribati whom I interviewed professed a knowledge of their clan totems, but most continue to observe a number of food taboos.

The list of totemic prohibitions for any individual may be extensive. For example, an informant from Onotoa could not eat reef cods (Serranidae), crayfish (Palinuridae) and jacks (Carangidae) while another could not eat rays, sharks, turtles or wrasses (Labridae). One from the clan of "porpoise-callers" of Butaritari (cf. Grimble, 1972 for a description of porpoise-calling) could not eat any cetacean, eel, octopus or scorpionfish (Scorpaenidae).

In addition, there exist prohibitions on certain other marine animals by specific age group and by sex. For example, raw fish was taboo for young children (Grimble, 1933). Common taboos in Kiribati prohibit boys from eating: cowries (Cypraeiidae, especially C. tigris) as "they prevent public hair from growing," a reference to their smooth shells; damselfish (Pomacentridae) as "they are nervous fish and make boys grow into nervous adults;" and lagoon bivalves which "prevent them from becoming strong men." These taboos probably help prepare the boys for their future role as off-shore fishermen. During periods of warfare and of personal strife a man did not eat turtle (vide supra), various wrasses, jellyfish or any fish liver, a common bait for sharks (Grimble, 1933). Old men do not eat Tridacna clams or certain other shellfish to avoid balding (Sabatier, 1977). On Beru many do not eat the leatherskin (Chorinemus) or certain coral cod (Epinephelus), as they are believed to "make one forgetful." (The heads of certain goatfish are eaten by some because of their hallucinogenic effects.)

Many other taboos apply to females, especially when menstruating or pregnant. Grimble (1933) listed the following taboos for pregnant women: sole and flounder ("because they give the baby a malformed face"); turtle ("because the child will always crawl like a turtle and will be cowardly"); Tridacna clams ("cause baldness when a male baby grows old); a certain wrasse ("gives the baby a small mouth"); a certain pufferfish ("prevents large eyebrows", a sign of beauty); crayfish ("makes excessively bristly eyebrows"); garfish ("prevents a male baby from later growing a beard"); any fish which had formerly been used for bait ("cause twisted limbs, lechery and incest"); cetacean flesh ("cause bad teeth"); plus any taboo of the husband and brothers. My various informants had heard of most of these taboos and stated they were still observed. It was explained that cetacean was prohibited to any woman on Onotoa because "if once she ate this rare and tasty food she may develop a craving for it when she is pregnant, and then go mad if it could not be provided." (The stranding of a whale is a very infrequent occurrence.) Women past child-bearing age can eat cetacean flesh. Grimble (1933) also noted that a certain unnamed fish was taboo for women "because it causes wrinkled skin," and another "because it gives hair split ends." Conversely, a number of fish were eaten for the benefit of the unborn child; on Beru stonefish (Synanceja) are sought after as "they make the baby beautiful."

In Tuvalu rays are also taboo to pregnant women "as they cause the baby to develop a flat head." Community taboos include: turtle (vide supra); sharks (in general in Tuvalu, but they are a popular food fish in Kiribati); octopus (in Tuvalu, for those of Samoan descent); and dolphins (in general in Tuvalu, especially for those of chiefly descent, cf. Chambers, 1975). Eels and flatfish are taboo in most of Tuvalu as these were believed to be the creators of the world. Beach crabs (ocypodids) are taboo as they may feed on human faeces deposited on beaches. In Kiribati a large number of fish used for divination are also taboo (Grimble, 1933).

AQUACULTURE

On many islands on Kiribati, and on Nui in Tuvalu (a former Gilbertese colony), milkfish are, or were formerly, raised in excavated ponds (te nei) or in natural fresh or brackish pools. Wild fry are collected from beneath frond rafts placed at the lagoon edges or in island passages on days around new and full moon. The fry are caught with a fine net (now of mosquito gauze) and feed on the natural accumulations of debris and algae in the pools, sometimes supplemented by scraped coconut. The fish grow to edible size in about 12 months. The ponds were formerly considered valuable possessions and were inherited with land. Catala (1957) described several types of ponds in detail, and commented that many were then falling into disuse. The decline in milkfish culture has been hastened by the introduction of Tilapia, which eat the fry. Tilapia are not aquacultured and are eaten on only a few islands, such as Butaritari which have large natural ponds, for their flesh becomes tainted under confined conditions. Milkfish are currently cultured on a large-scale by the Kiribati Fisheries Division for tuna baitfish and for domestic consumption on South Tarawa.

Green turtles are sometimes ranched in both groups. Hatchlings and juveniles accidentally caught in gill nets are held in natural salt water ponds, whereas captive adults may be tethered by a flipper to a stake at the lagoon edge, until ready to eat (Chambers, 1975). Chambers also reported that any turtle eggs found were generally brought home and allowed to hatch, and that hatchlings were sold at the Nanumea store as "pets" for 11¢ each. The survival rate was not high, as most were kept in basins.

A turtle ranching pond which I visited on Taratai, North Tarawa, was a mangrove-fringed passage between islets, one end of which had been blocked by a storm bank and the other end by a foot-path causeway. At the time the 120m x 20m x 1m tidal pond contained only two turtles, but the owner stated that he normally kept 10 - 15, and that he once had 60. Their diet consisted of naturally growing algae and mangrove "twigs" (probably Rhizophora seedlings). Their growth was said to be rapid, from about 20 - 30 cm to 80 - 100 cm in one year. They were usually sold on Betio, the urban centre of Tarawa, during festive occasions.

A common practice on Tarawa, where the cockle Anadara maculosa (te bun) is a staple, is for excess bivalves to be cached in a delineated area (approximately 4m x 4m) of sand near the lagoon shore. This is similar to the "gardening" of Tridacna clams on Manus Island (Maclean, 1978) and in parts of the Solomon Islands (unpub.). The live storage of bivalves cannot strictly be termed aquaculture (Johannes, 1982).

PHYSICAL AND ENVIRONMENTAL FACTORS EASING FISHING PRESSURE

Fishing pressure on atolls is also reduced by physical and environmental factors such as topography, distance, the exposure of the coastline and weather. Although the waters adjacent to villages

may be overfished, those of deeper areas, more distant reefs and reefs exposed to strong wave action (the eastern and southern aspects of atolls) are often underfished and may act as refuges. Bad weather also interrupts many kinds of fishing activity, forcing the fisherman to work alternative grounds or species.

Similarly an outbreak of ciguatera fish poisoning sometimes forces atoll fishermen to leave reefs "fallow" for several years. Hedley (1897) described how a certain reef on Funafuti had not been fished for some years following a case of fish poisoning, and Cooper (1964) reported that during a severe outbreak after World War II many usually harmless fish on Tarawa became toxic and large areas of reef were consequently avoided by fishermen. Chambers (1975) was also told that there had been a similar outbreak on Nanumea after Word War II, and that it is still considered unsafe to eat fish caught on the reef top outside the village. Both communities believed that the outbreaks were related to wartime wrecks. Some reefs on Tarawa atoll are similarly avoided because of an outbreak of ciguatera poisoning in 1982.

DISCUSSION: EVALUATION AND STATUS OF TRADITIONAL PRACTICES

The efficacy of traditional conservation and management practices is evident from the high pre-European population densities and the long period of occupation of the dry, infertile coral islands.

Sea tenure, held by either the clans or the autocratic kings, formerly limited access to fisheries and enabled the owner-users to conserve and manage their marine resources. Although the traditional sea tenure systems have now largely broken down, the village community, through the traditional maneaba system and the present Local Councils, have generally been active in protecting their members' fishing interests and have limited access to certain fishing grounds to members of a particular village or island. One tenure system has been replaced by another, more relevant to modern atoll life. The decline of turtles since the taboos to commoners broke down is evidence enough of their former efficacy. Bans on certain effective or harmful gear, restrictions on fishing activities and time, and the imposition of quotas have been codified in Local Council bye-laws on various islands. Such regulations are widely used in modern managed fisheries around the world to lower the efficiency of the individual fishing unit, and appear to have been devised independently by the islands' traditional fisheries managers as a response to new, introduced gear and increasing fishing pressures.

The reservation of certain organisms for times of bad weather, famine, old age or other hardships, by the preferential exploitation of migratory pelagic species and of the abundant low trophic level lagoonal species, is an effective and ecologically sound conservation strategy. The practice remains widespread on rural islands, particularly on the small raised reef islands, but is breaking down in urban areas as immigrants do not have the same

conservation interests as the original occupants. Low-status shellfish have therefore become a staple in South Tarawa.

Although the majority of the taboos on the consumption of various marine species were not invoked for reasons of conservation (the turtle taboo is an exception), such taboos might be beneficial by relieving the fishing pressure on certain accessible species (e.g., damselfish) as well as those vulnerable to overfishing (e.g., coral cods). It is significant that no food taboos were recorded involving the abundant staples, pelagic flyingfish and tunas, and lagoonal bonefish, goatfish, milkfish, clupids and mullet. A taboo on a particular species is not automatically beneficial; as Bulmer (1982) and Johannes (1982) noted, it may redirect fishing pressure onto more vulnerable species.

The development of aquaculture in the atolls in an advance on primitive hunter-gathering and capture fisheries as it makes more effective use of a resource, ensures a supply when required and provides an emergency food during bad weather. Although the aquaculture of milkfish in Kiribati has declined in recent years, some islands are now requesting the Tilapia be destroyed so milkfish can be restocked. The large-scale commercial raising of milkfish by Te Mautari Ltd., in Tarawa, has been successful, indicating that the traditional skills and interests in this area have been retained.

The effects of physical and other factors in reducing fishing pressure should be assessed in a review of traditional conservation. Alcala and Luchavez (1981) concluded that the weather was a major natural "conservation factor" in Apo Island, in the Philippines, since periodic rough seas prevented any area from being over-fished. They concluded that it had such an effect on distributing fishing pressure that other fisheries management was unnecessary. Distance and the limitations of the traditional fishing technologies also tended to prevent over-fishing in former times, although the advent of outboard motors and inexpensive introduced fishing gear is over-riding such natural barriers.

To conclude, although the cultures of the atoll peoples have been greatly influenced by Christianity, British colonial administration, post-war development, Western education, technological revolution and recent political independence, the way of life on the rural islands has changed little and still revolves around fishing and the sea. Unlike among many other Pacific Islanders, traditional fishing skills and sea lore are in no immediate danger of being lost. Among the overseas-educated, those in the community who have become most Westernised, there has been a resurgence of national pride since independence, and a movement to return to the former, simpler ways of life, te katei ni Kiribati and the faka Tuvalu.

PRESSURES ON ATOLL RESOURCES AND FUTURE MANAGEMENT STRATEGIES

Pressures on the atolls' limited resources are rapidly mounting. Populations have more than doubled in a century; emigration and urban drift have offset much of the increase in rural

islands while creating major problems in the capitals, where almost half the nations' populations now reside.

The high urban demand for fresh fish, changes in fishing technology, the development of the mechanised artisanal or small-scale commercial fisheries, cold storage and improved communications are increasing fishing pressure. Yields of the important lagoon bivalves are declining on South Tarawa (Zann et al., n.d.) and catches of lagoon fish in Funafuti are probably also declining (Pita and Rawlins, pers. comm.). If overseas markets can be established, Kiribati plans to export reef and lagoon fish from Tarawa and the rural atolls, greatly increasing fishing pressure. Already there have been serious clashes within the fishing sectors: between the subsistence and artisanal fisheries over fishing grounds, and between the subsistence sector and national tuna corporations over bait fishing.

Urban problems include pollution of fresh water supplies and lagoons (a serious cholera epidemic swept Tarawa in 1977), coastal erosion, and the adverse effects of causeway construction, such as the blocking of migration routes of lagoon fish and alteration of water current patterns. Extensive coral mortalities have occurred in South Tarawa in the past decade (Zann, 1982) and the problem is reported to be continuing, although its causes remain unclear.

Disturbances, which might have a very minor impact on larger islands, may be catastrophic on the small coral islands. If present plans to construct airstrips on Tuvalu's outer islands are implemented, the nation may lose as much as a quarter of its arable land.

Attempts are being made to address the problems of urbanisation. Modern birth control methods have been promoted to control rising populations, the most critical problem, and urban drift is to be regulated. Sanitation is being improved, reducing the risk of faecal pollution. The importance of Tarawa's subsistence fisheries has now been recognised and Kiribati Fisheries Division is currently monitoring the atoll's catch. At the national level, the young nations' leaders have chosen a realistic policy of limited economic development and the retention of the traditional values and ways of life.

Because of their isolation, rural islanders are free of most of the urban problems. They have retained more of their traditional culture, and enjoy a considerable autonomy in local affairs. In mid-1984, in Kiribati, legislation was passed to give greater autonomy to the rural islands. The management of local fisheries remains with the traditional community leaders, and the elected Local Councillors, most of whom are subsistence fishermen. Although the national Fisheries Divisions have had very little influence in the outer islands to date, it is hoped that well developed extension services might some day assist the traditional managers in combining, to best advantage, traditional and modern strategies of management.

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TRADITIONAL MARINE RESOURCE MANAGEMENT AMONG THE NENEMA OF NORTHWESTERN NEW CALEDONIA

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ABSTRACT

This is a brief account of some aspects of Kanak history and social organisation that relate to customary marine tenure in New Caledonia. Mechanisms limiting the access of resource users to marine resources, and which might therefore provide mechanisms for indirect management of fisheries, are also discussed.

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INTRODUCTION

Situated in the southwestern Pacific Ocean, between 18°and 22°S and 63°and 168°E, the New Caledonian archipelago comprises: the principal island or "mainland"; the Loyalty Islands (Lifou, Maré, Ouvéa, Tiga, Walpole) in the East; the Belep, Huon, Surprise and Chesterfield Islands to the North; and the Isle of Pines in the South. The mainland, which covers an area of about 16,750 km^2, comprises a mountainous chain oriented northwest - southeast, and is about 400 km long, with an average breadth of about 50 km.

New Caledonia was annexed by the French in 1854. At that time the country was occupied by about 60,000 Melanesian aboriginals, gathered in hamlets of varying size, spread over the whole of the territory, and politically independent of each other. The Kanaks cultivated root crops - yams, taros, and the like - under a system of shifting cultivation. The French government first laid claim to lands that were in fallow, and so apparently unused. The remaining land was progressively annexed, except for "reserves". These were demarcated areas within the traditional territories of each "tribe", the size of which was calculated as a function of the number of inhabitants and, in theory, soil quality. The Kanaks were confined in these reserves, which still exist. And, when they revolted, as they did on several occasions in response to land alienation by the French, whole populations were transported and confined in areas which were frequently not their own.

Subjected to the "Native Code" until 1946, Kanaks had to pay a head tax and provide a specified amount of unpaid labour each year for the benefit of the colonists and the Administration. The Administration practiced a repopulation policy aimed at offsetting the Kanak presence by encouraging immigration. However, the Kanak population, threatened with extinction at the end of the century as a result of epidemics and of the toll taken by the various uprisings, began to re-establish itself in 1925, and totalled 40,000 by 1976. At present, there are 61,870 Kanaks (INSEE, 1988), who comprise the ethnic majority of New Caledonia.

In 1956, the Kanaks achieved universal suffrage, and a number of different Kanak political parties were subsequently established. Demands for independence were first officially expressed by the Melanesians in 1975, and have strengthened in recent years. During the last 20 years, as a result of changing political trends in metropolitan France, the politics of New Caledonia have oscillated between attempts at liberalisation, to the point where a statute of "Independence-Association" was instituted, in 1985, and reforms which aimed at reinforcing the colonial situation (the Pons statute of 1988).

Literature on the Kanak Fishing Cultures of New Caledonia

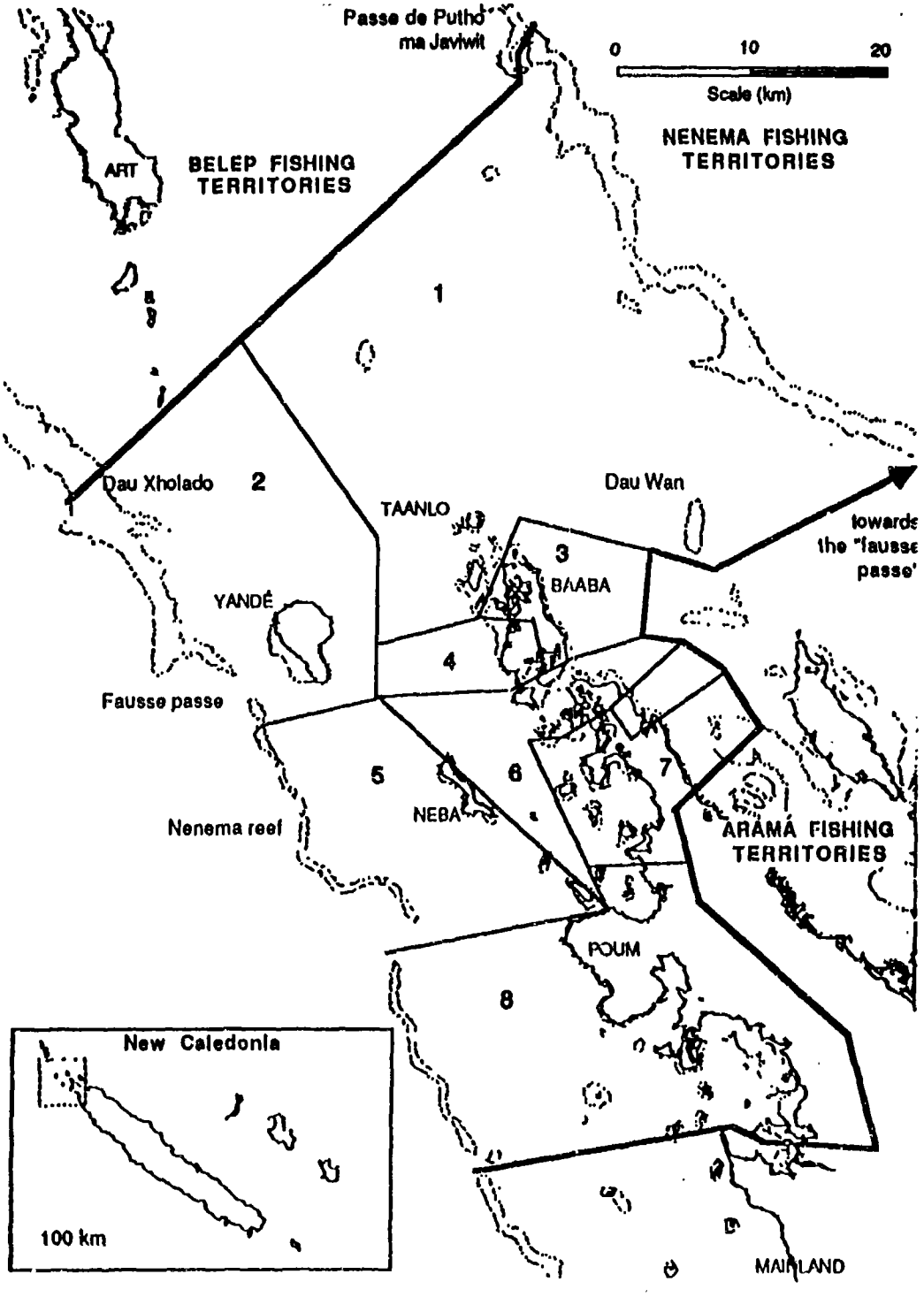
Literature dealing directly with Kanak fishing societies is limited. As in much of the South Pacific, agricultural topics have been favoured by researchers. New Caledonia is often taken as an example of what Haudricourt (1964) named "the civilization of the yam", although at the same time fully recognising the important role played by marine fishing, since "... it is this [fishing] which enabled [New Caledonia's] initial population (which probably originated from the New Hebrides), it is this which explains the socio-political organisation, as we can readily see if we compare New Caledonia proper (the mainland) with the Loyalty Islands, with Fiji, and with Polynesia...". This agriculture bias may help to explain why there are no ethnological works devoted to Kanak fishing prior to 1973. In 1973, Hassan and Marzol published Bensa's field notes describing the fishing techniques of the Paicî area, in the north-central mainland (Bensa, 1973). In 1987, Leblic, who worked in the south (Isle of Pines -- Goro), and Teulières, who worked in the extreme north of the mainland, co-published on the traditional utilization of marine resources in New Caledonia (Leblic and Teulières, 1987).

Some data on Kanak fishing techniques, gear, and accompanying rituals are provided in the accounts of the first European voyagers -- sandalwood traders (cf. notably Shineberg [1967; 1971]), mariners, geographers, and naturalists, among others. Noteworthy among them are Cook (1954), de Rochas (1862), Garnier (1871; 1878), Patouillet (1872), Lemire (1884), Bernard (1895), Mialaret (1897), and Sarasin (1917). Certain fishing gears have inspired more substantial works, such that by Neyret (1974), on traditional watercraft.

Missionaries who stayed for extended periods in the country sometimes dedicated a chapter of their monographs to fishing (e.g., Lambert [1900], the missionary wife Hadfield [1920], Leenhardt [1930], and Dubois [1984]). Scattered details on fishing occur in the correspondence of the Marist Fathers.

Not all of the traditional fishing techniques used in Northwestern New Caledonia may be directly intended for, or even consciously related to, the management of marine resources. Nevertheless they play an important part in it, and may eventually be put to use in the context of modern resource management. This study of traditional fishing techniques was carried out in the Nenema zone of northwestern New Caledonia (Fig. 1). The area sustains a population of about 470 Kanak people, distributed both on islands and on the extreme north of the mainland. This study is based on data obtained during some 9 months of fieldwork, carried out in two phases between 1983 and 1987, when I lived in the fishing communities in question. The aims were to collect information on traditional fishing techniques, and to analyse the social organisation of the fishing community in the pre-colonial era and its evolution to the present day, by the use of parti-

FIGURE 1: FISHING TERRITORIES IN NORTHWESTERN NEW CALEDONIA.



Notes:
(1) Kavebu Tanlôma (or Phwepjama); (2) Kavebu Têâ Dau; (3) Kavebu Têâ Bula; (4) Kavebu Têâ Bwamat; (5) Kavebu Nevama; (6) Kavebu Bauma; (7) Kavebu Phadoma; (8) Kavebu Têâ Bwauva.
(Map made with the assistance of the Dayaan Cultural Group.)

cipant observation, structured interviews and informal discussions.

THE NENEMA ZONE

Natural Environment

The Nenema zone, one of 28 linguistically distinct areas of New Caledonia, is composed of numerous islands and islets. It is situated between the extreme north of the mainland and the Belep Islands, the principal of which are Taanlô (81 ha) and Tia (43 ha, now uninhabited), Baaba (2120 ha), Yenghebane (138 ha), Tie (45 ha), Yande (1325 ha), and Neba (357 ha, now uninhabited).

At present, because of the history of the various clans and their manipulation by the Colonial Administration, two areas of the mainland have also been incorporated: Tiabet (300 ha) and Poum (the reserve of Tic, 106 ha). The Nenema zone thus totals about 5,000 ha, the islands and islets themselves covering an area of 4,563 ha.

The zone is characterised physically by relatively abrupt massive serpentine and olovine rock formations, as in Poum and on the island of Yandé, and low-lying areas that are remnants of a now submerged region, exemplified by the islands of Taanlô, Yenghebane, Tie, and Baaba. With the exception of the coastal plain of Poum, there are scant littoral or alluvial valleys. Hydrographically, Poum and Yandê are characterised by short, torrential creeks. There are no substantial rivers. Taanlô, Yenghebane and Tie lack even creeks. The climate is mostly dry, with an annual rainfall of about 1000 mm, and much warmer than in the southern part of the mainland.

Within the waters of the Nenema zone are many small, scattered islands and reefs within an extensive lagoon, which seldom exceeds a depth of 25 m. Shallow, sandy banks and extensive littoral flats are exposed at low tide. There are many pockets of mangrove and coastal wetlands. Apart from the areas of living reef, most of the lagoon floor is sandy or silty, with occasional seagrass beds.

Soils are mostly unsuited to agriculture, except in the valley around Poum and in the small alluvial pockets. There enough food can be grown for the subsistence of the communities established on the narrow coastal band of sandy soil. Coconut palm cultivation is the only form of agriculture feasible on other soils. Extreme relief also inhibits agriculture. Extensive animal husbandry, without improvement of pastures, holds little promise given the shortage of grazing land. Substantial agricultural development is probably infeasible in this zone. Rocheteau (1968) notes the existence "of the important potential resources of the sub-soils [mining] and of the sea".

History

Located at the extreme north of the mainland, the pre-colonial Nenema zone was surrounded by the chiefdoms of Belep, in the north, Arama, in the southeast, and Koumac, in the southwest. Its relations were generally good with Belep, and poor with Arama and Koumac, but in reality they extended far beyond the immediate neighbourhood. For example, the Nenema obtained wood for building canoes from a place on the mainland 75 km south of Poum. During the Kanak revolt of 1917, the people of Poum received war messages for help from Tianou, a village situated on the west coast, 125 km away (Saussol, 1979: 314). The Nenema zone is situated about 60 km from Balade on the East coast, where the first Kanak contacts with Europeans (Cook and d'Entrecasteaux) occurred.

Before the French took possession of the islands, a number of adventurers -- whalers, sandalwood traders, and the like -- established themselves at Poum, and had significant impacts on the land and its people. Since 1860, the islands of the North were leased by the French government to private concerns. Baaba was first occupied by a rope factory. Subsequently the islets were used to rear cattle and grow coconuts for copra-making. The owner displaced some of the populations of Taanlô and Baaba, and imported labour from Indonesia and the New Hebrides (now Vanuatu). Elsewhere, under pressure from colonists, the inhabitants of Bwara, to the northwest of the mainland, were obliged, to emigrate to Tie.

In 1843, Marist missionaries established themselves at Balade, but were obliged to leave their station in 1847, following tensions caused principally by the influenza epidemics and other diseases, which ravaged the islanders. In 1860-61, another epidemic struck the Nenema islands. Between 1887 and 1891, 12.7% of the population of the fifth district, in which the Northern islands are located, died as a result of disease as well as military oppression.

Society in the extreme North was also affected by the discovery and mining of gold, copper, cobalt, lead, zinc, chrome, and, much later, in 1954, nickel, which is now the country's leading export. Mining centres were established and caused a population boom. In 1917, the development of a fishery for the topshell (Trochus niloticus) contributed to a further increase in traffic in the north, and the people of Nenema found in mining and trochus-collecting opportunities for employment.

From 1911, the aboriginal population of the islands of the North began to re-establish itself, following the general trend of the country. But other factors renewed the depopulation of the Nenema islands, following the abolition in 1946 of the laws that obliged Kanaks to live in reservations. These were the need to send children to school on the mainland, and to find salaried employment in order to purchase basic commodities that were either no longer locally produced, or that became necessary as a

result of changing lifestyles. Today, the islands of the North function more as dormitory-islands, with very low populations for most of the year. Populations may increase by a factor of five in several hours on the occasion of marriages, funerals, and the like, or, to a lesser extent, during school holidays. Mining activity in the region has now slowed considerably, reducing the principal source of temporary employment.

The commercialisation of fishing activities has become a particularly important means of discouraging emigration. This helped prompt the formation, in 1983, of a GIE ("Economic Interest Group"), which attracted about 60 fishermen. At present, however, only about 20 of them fish regularly, generally from Monday to Wednesday, so as to allow the GIE truck to deliver its load to Nouméa on Thursdays. Various problems, including those of management, have faced the GIE since its establishment. Initially, the catch typically reached 1 t/wk, when the weather was favourable. Now, weekly catches are often less than 500 kg, in which case they may be sold locally to schools, and in large villages, such as Koumac. The consumption of fish by a family of two adults and two children can be as much as 20 kg/wk, which, in many cases, is the equivalent of the weekly commercial catch by a member of the GIE.

Social Organisation

The Nenema country is a geographically, politically and linguistically self-contained area. It comprises 8 independent units or kavebu ("chiefdom"), the largest political and social unit (1). (The term refers to a localised geographical grouping, but never designates a landed property or a place of residence devoid of occupants.)

Each kavebu possesses a well-defined land-based and marine territory, considered together as a whole, and is generally designated by the name of its têâ ("chief"). "Kavebu i Têâ Daye", for example, refers to the chiefdom of Yenghebane, where the Têâ Daye lives. Within the kavebu are several yamevwuk ("great clan"), which designates the largest unit of kinship. Each yamevwuk is subdivided into duabo (sub-clans), described as a "division between brothers [meevuk]". The French Administration has, for its own convenience, superimposed a system of "great-chiefdoms" on the traditional order. These often have no real social or cultural basis, but function rather as administrative groupings for local government.

The concept of a marine or land-based territory is represented in Nenema by the expression "the place from which one draws one's provisions": na yalap (na = a place; yalap = to search for food), to which is added as appropriate, ni wi yak (wi

(1) For further details on the social organization, especially for the Cèmuhî area of the north-central east coast, see Bensa and Riviere (1982),

yak = salt water, i.e., the sea) to designate "fishing grounds", or ni daak for areas where crops are grown (2). A Nenema whom one asks to "go to find food" will translate this immediately as "go fishing", this being the predominant subsistence activity. (To inhabitants of the interior valleys of the mainland, who do not have access to the sea, in contrast, the phrase would immediately be associated with field crops.)

In a simplified manner, three principal political levels may be distinguished: that of the têâ (chief), that of the mweau (spokesman for the chiefdom), and that of individuals belonging to clans other than those of the têâ or mweau, who are yabwec ("subjects"). The function of the mweau is exercised by the eldest descendant, on the paternal side, of the ancestor who founded the yamevwuk. Only he can authorise new arrivals to make use of the land. It is mweau who names the chief, têâ. The têâ has a political role, but does not truly "own" any land.

Throughout New Caledonia, the marine zone inside the lagoon is associated with the land-based domain, and is everywhere delimited and subject to ownership. Access to it, as in the Nenema area, is subject to certain rules. For clarity, the traditional resource management mechanisms described here have been separated into two broad categories; those limiting access to resources, and those limiting catches.

LIMITATION OF ACCESS TO MARINE RESOURCES

Marine Tenure

One of the most direct means of managing lagoon resources is to limit access to them: the foremost traditional mechanism used for this purpose by the Nenema is that of marine tenure. The marine zone is divided into territories owned at two levels: (1) At the level of the Nenema "great chiefdom", as opposed to the neighbouring "great chiefdom": Belep in the North, Aonvase (Arama) in the South-east and Koumac in the South-west (Fig.1); and (2) between the different Nenema kavebu within each "great chiefdom".

In everyday practice, however, the distinction operates from one kavebu to another, and not among "great chiefdoms". The different kavebu are long-established traditional units (that are autonomous even though belonging to a linguistically and culturally homogeneous area) whereas the "great chiefdoms" are of recent creation.

The territorial limits fixed for each kavebu are fixed by such landmarks as the crests of hills, creek mouths, points of

(2) Phwaamwa can equally be employed in the sense of land-based property.

capes, and, at sea, by submarine reefs, channels or passes through the barrier reef. Access to the sea is not limited by social controls seawards of the barrier reef.

It is still required that a kavebu seek permission to fish in a territory of another. Permission is rarely denied, since the different kavebu are often united by kinship, from which frequent exchanges of goods and favours arise in connection with such ceremonial events as marriages, funerals, and the like.

Permission may nevertheless be withdrawn, as happened in Yenghebane in 1986. This occurred as a result of the almost total disappearance of bêche-de-mer on their shores. The fishermen of Yenghebane feared degradation of the local ecosystem, and withdrew from the other islanders the right to continue harvesting the holothurians. They also found that processing of the holothurians near the fishing grounds, which involves cleaning the guts into the sea, caused poisoning of the fish that lived in the area. These problems led to a ban on the harvesting of bêche-de-mer in their waters.(3) This resource, which is now protected, is today considered as a reserve, available only to the kavebu, to be used in a time of need.

Permission to fish commercially in a territory belonging to others may even be given, especially to fish for crabs, and, sometimes, as discussed above, for collecting bêche de mer. A Kanak fisherman can usually fish without problems in a kavebu other than his own, even for commercial purposes, as long as he is accompanied by fishermen from that kavebu.

Certain kavebu impose more restrictions than others. The people of Yandè, for example, prohibit commercial fishing by members of neighbouring kavebu, reserving the resource for themselves.

There are a number of strongly and universally held beliefs about the consequences of transgressing the rules of access to fishing grounds. If a fisherman fishes without permission in a kavebu other than his own, he will be unable to catch fish unless he succeeds in not being seen by the people of the kavebu. His sense of guilt at his transgression will probably result in his becoming physically ill. To overcome the sickness, he must seek the pardon of the chief of the kavebu that owns the area in which he fished. It may be the chief or another representative of his own kavebu who has to go to seek forgiveness from the offended kavebu, on behalf of the fisherman. The traditional system, which demands respect of the marine or terrestrial territory of one's

(3) The toxicity of the bêche-de-mer to fish is used on purpose as a fishing technique in the Païci and Cemuhi areas in the centre of the mainland (Bensa, 1973) and in the Loyalty Islands (F.J.Conand, pers. comm.). In Mare, Leblic reports that it is used to attract crayfish (Leblic and Teulières, 1987). In other Pacific Island countries this toxicity is also documented (e.g., Yamanouchi, 1955).

neighbours, is still very strong among Kanaks.

Respect for marine territories delimited in this way is therefore generally maintained by the Nenema, as well as by some Europeans long-established in the region. It is not uncommon for those Europeans who run a hotel-restaurant business, for example, to employ local fishermen to fish on their behalf, thereby circumventing the problem of gaining access to locally-owned marine resources. However, the traditional ownership of maritime territories is not recognised by French law. This has given rise to a number of problems for professional fishermen (Europeans, Tahitians and others) who fish in an area with a permit from the Merchant Navy and Fisheries Service, but who fail to seek access permission from chiefs of the different kavebu whose territories they have come to exploit. Local fishermen are thus offended by the lack of acknowledgement of their traditional rights, and fearful of seeing their resources endangered if they authorise fishermen who are foreign to the zone to work in their part of the lagoon, often with more technologically sophisticated means.

Several conflicts have resulted in the Nenema zone. One involved a Tahitian who fished using nets totaling 1.5 km in length, and who was refused the right to fish inside the lagoon because this technique was considered too destructive. There was no objection, nevertheless, to his fishing outside the reef. In 1972-73, two caldoche (French settlers of several generation's residence in New Caledonia) were spear-fishing at night, using spotlights, around Neba (which is uninhabited today, but nevertheless forms part of the fishing ground of Yenghebane). The people of that island contacted the police to warn them that action would be taken if this activity was not stopped. In late-1987, a professional fishing boat operating out of Nouméa had its fishing gear confiscated by the people of Yandé: being incorrectly informed, the boat operators had not requested permission to fish in these waters. Similar problems have occurred in other areas, as at Belep.

In addition to the existence of areas where fishing rights are established, access to a small number of specified places is completely prohibited, for reasons unconnected with fishing, but which nevertheless have an indirect influence on the way it is conducted. For example, a certain part of the shore may not be used by fishermen (or anyone else) because it it is believed to lie on the road used by the dead to travel to their underwater domain. Access to other areas may be authorised, but only under certain conditions, with prohibitions on shouting, playing noisily, running, and the like, for similar kinds of reasons. In this way, a few such areas function as unexploited marine biological reserves.

Sexual Division of Labour

Another way of limiting access to the resources of the lagoon is to forbid certain individuals from exploiting them. The sexual division of labour among the Nenema people works indirectly to this end.

This division of labour traditionally confined the access of women to those marine foods that are harvested by hand on the reef flat (octopus, shells, etc) or in the mangroves (mangrove crabs, etc). Net fishing, for example, which usually necessitated transporting several fishermen by canoe, was reserved exclusively for men. The kedok ("magic parcels"), that certain fishermen had the power to place in the nets before fishing, were prohibited in the presence of women, being "dangerous" for them. Although these customs are no longer observed, Nenema women do not usually use nets for fishing, and especially not in the presence of men, except for the recently introduced European-style casting nets.

This sexual division of labour ensured the simultaneous exploitation of the resources of both the reef flat (by women) and those of the deeper waters of the lagoon (by men). It is no longer maintained, mainly because of the commercial value attached to certain species. Shortage of manpower in the Nenema islands encourages women to participate actively in commercial fishing expeditions. This is mostly by line-fishing from a boat.

In addition, certain fishing methods that were formerly restricted to women, including the capture of shalaqa (Mangrove crabs, Scylla spp.), are now also practised by men, notably during important fishing expeditions. The technique itself remains practically unchanged, but increased participation, added to a tendency towards more intensive exploitation (mangrove crab sells well and can be caught when fishing trips cannot be made because of bad weather or equipment breakdown) may have contributed to the depletion of the species in the Nenema zone (Rocheteau, 1968).

REGULATION OF CATCHES

As well as limiting access to the resource, social pressure influences how heavily resources are exploited, and by what means.

Quantitative Regulation

If the Nenema people did not traditionally manage their stocks in the modern sense of the term, they made sure, nevertheless, to avoid catching more than they could consume. Wastage of fish was condemned.

Efforts to protect certain species were also made in response to outside interference. For example, some fishermen from Yandé, fearing that the Europeans would take too many fish of a particular species of symbolic value from their waters, are said to have used a "magic stone" in their possession to chase the fish away, and draw them outside the barrier reef.

Fishing is never conceived of as "sport", i.e., for other purposes than providing food. Overfishing has always been associated with commercialisation, and with the resources that present economic opportunities, e.g., crabs in the North and lobsters in the South. The stocks of crabs available in Nenema, particularly at Baaba, reached such a low point around 1965 that fishermen were obliged to travel to Balabio Island to catch commercially viable quantities (Rocheteau 1968: 78).

Certain fishing methods known to be destructive were not systematically used. This is the case with poison fishing (kep, keva), an effective fishing technique that can result in extremely large catches. Used throughout the New Caledonia, it does not seem to have been much favoured by the Nenema people, although the fishermen still know the poisons used. One explanation offered is the fear that currents spread poisons over too wide an area. However, since this technique has been banned by the Administration, it is possible that the little information collected on this method from the Nenema may be a result of its lack of use for a long time. In other areas, such as the Isle of Pines and Maré, fish poison seems to have been the object of local regulations: it needed, for example, the authorisation of the chief, who gave it only rarely, such as during famines, or other similar occasions (Leblic and Teulières, 1987: 271-279).

Qualitative Regulations

Traditionally, efforts were made to preserve favoured fishing habitats to ensure a continued availability of fish, crustaceans and other organisms. In fishing for mangrove crabs, for example, care is taken not to damage the animal's burrow. Thus, for instance, another hole is not dug too near the probable end of the burrow, even if this would allow faster access, as this increases the risk that the burrow will not then be reoccupied by other crabs.

Elsewhere today Kanaks (particularly those of Yenghebane and Tie) fishing commercially avoid working the same spots as fished on their previous trip. They will re-use them only as a last resort, if fishing is poor elsewhere. In addition, certain areas near a fisherman's residence are reserved to ensure a continuous subsistence supply of easy access.

The capture of certain species is traditionally restricted for reasons unrelated to resource conservation. Nevertheless, such restrictions may function to this end, especially if the species concerned are the targets of commercial fishing.

For example, certain marine animals have a special relationship with a given clan (yamevwuk). They are often annually migratory species which migrate at a precise time and according to a known route, from the lagoon zone, that they occupy for most of the year, to spawning locations outside the reef. While migrating they may be found close to a part of the shore that they only frequent briefly on that occasion, subsequently returning to their original habitat.

In Taanlô two species are associated in this way with a particular clan. These are a rabbitfish, aalaat (Siganus sp.) and a trevally, nok daalaak (Carangidae). The first migrates at the full moon around November, and the second around March (Fig. 2) into a basin in the lagoon. According to the fishermen of Poum, the arrival of the schools of rabbitfish draws other fish with them in their migration (4).

At present, the fish of Taanlô that are captured on these migrations are not destined for commercial use because of their sacred nature. Their capture is apparently reserved for members of this clan only. In former times, these fish were caught in encircling nets (as they are today), but were protected from being speared. This is another consequence of their "special relationship" with the clan.

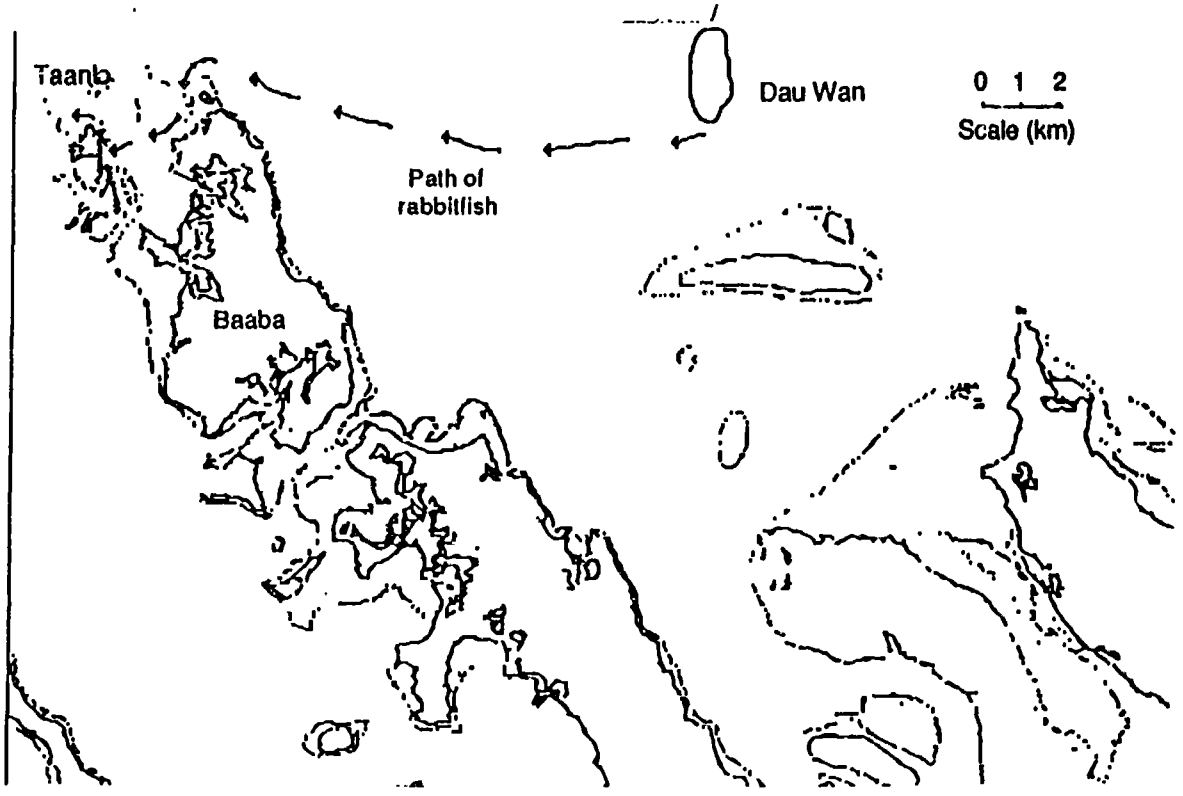
Milkfish (Chanos chanos) are said to migrate from the southeast of the mainland to Lifou. The route is seen as being related to the path taken (over many generations) by the women (probably of a certain clan) as they changed their place of residence on marriage. In a highly schematic way, the presence of these fish is a manifestation of the ancestry of the clans founders, and they are the direct link between the ancestor of the clan and his descendants.

Other bans which appear to work somewhat differently also have a bearing on the capture of certain species. In Lifou, for example, turtles are reserved for the chief, and may not be captured without his permission. Each turtle captured must be brought to him. Since this often involves such a complicated journey, fishermen prefer to avoid turtling.

Numerous clans have some form of relationship to a species of fish or crustacean, as a result of which it is not normally exploited commercially. This is a system of control over exploitation closely linked to the Kanak fisherman's perception of his world.

(4) The name of this part of the lagoon refers to this event; phwa-jep ("the pass of schools of rabbitfish ready to spawn") (Haudricourt, 1963).

FIGURE 2: PATH FOLLOWED BY THE RABBITFISH TOWARDS TAANLÔ



Ciguatera

Another factor which reduces fishing pressure on certain species is not linked to a cultural consideration, but rather to an ecological problem. It influences the capture and consumption of fish according to their species, their size, and the place and season of their capture. This is the existence of ichthyosarcotoxism, or ciguatera poisoning (called shan in the Nenema area).

The species avoided in the extreme north are:

(1) phuru: under this term the Nenema fishermen distinguish at least four lutjanids; Lutjanus fulviflamma, L. kasmira, L. lineolatus, and L. quinquelineatus. Phuru are not eaten if they are fished from certain places (in the closed basin on the west coast of Yandé, and the one which lies between the island of Yowow and Poum, for example), although other fishes are. Elsewhere, these four species can be eaten.

(2) deee: under this name, the Nenema people distinguish several serranids, or coral trouts. That which must not be eaten is "black with white marks on the back, found on both sides of the large side the big reef. We find

it everywhere inside the big reef on the west coast and we do not eat it anywhere". It may be Plectropoma melanoleucus.

(3) bwavu: Plectorhynchus picus; this pomadasyid is not eaten at Yandé from the time that the wâârìc (Semecarpus atra (Vieil)) flowers and bears fruit, until the yam-planting season.

Nenema fishermen tend to avoid eating large fish "especially when they are fat, since they have shan when they are fat".

CONCLUSION

The customs and beliefs described here play, to differing degrees, roles in the traditional Nenema management of marine resources. The question of whether certain of these mechanisms should be reinforced or not, and for what purpose, has not been treated here. Rather, the aim has been simply to give a glimpse of how such traditions operate. Decisions concerning appropriate ways of carrying out marine resource management should be made in consultation with the people involved, starting with the fishermen themselves. It is clear that the harmonious management of lagoon resources requires a two-way flow of information: scientific information on the extent to which the resources of the lagoon can be safely exploited, and empirical information from the fishermen on the traditional management of these resources.

The traditional resource management practices in the Nenema culture - and those of the Kanaks in general - may not always fit Western concepts of optimum yields or freedom of the seas. They are, nevertheless, accepted and put into practice by the resource users. Only knowledge and understanding of this type of "management" will permit resource managers to cooperate with the interested parties in developing their positive aspects within the framework of a modern management regime. If such development is to take place, it should not proceed without due consideration being given to local knowledge and practices, and should work through such organisations as the Nenema Cultural Office, already established for that purpose.

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TERRITORIAL REGULATION IN THE SMALL-SCALE FISHERIES OF ITOMAN, OKINAWA

by

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Territorial Regulation in the Small-Scale Fisheries of Itoman, Okinawa

TOMOYA AKIMICHI

Variables moulding territorial rights in small-scale fisheries are multiple. Up to now, analyses of territoriality have mainly focussed on well-defined and institutionalized aspects of the "Law of the Sea." Failure to consider non-institutionalized but nevertheless locally enforceable aspects of territoriality leads to a misinterpretation of the wide spectrum of human territorial behavior.

This paper attempts to remedy that situation by providing a detailed case study on informal regulation in small-scale fisheries in a sub-tropical fishery conducted in the inshore waters of Itoman, Okinawa. More than 200 informally defined territories, together with the rules associated with the tenurial behavior of fishermen provide a new perspective in the study of territoriality. Although study of informal tenure systems permits elucidation of psychological, behavioral and ethical aspects of small-scale fishermen's behavior, its ultimate implication lies in a flexibility toward environmental, technological and social factors. This demands an understanding of the variables that impinge on territorial rights, such as fish ecology, micro-environmental gradients, typhoon effects and contemporary environmental changes, particularly those induced by land reclamation and the introduction of new technologies. Study of informal regulation mechanisms jointly with the formal mechanisms elicits new methodological and theoretical tools for use in clarifying sea tenure systems in their totality.

INTRODUCTION

As a consequence of increasing claims to the optimal use of natural marine resources worldwide, together with the subsequent rise of international disputes on sea tenure, the concept of territoriality in the maritime environment has increasingly attracted the attention of anthropologists, marine biologists and policy-makers, among others.

Territoriality in fisheries is open to various broad definitions, depending on the type of fishery concerned [ACHESON 1975; CHRISTY 1982], and more basically according to culture and society. Whatever the sea territory defined its macro-level implications appear to lie, in terms of its institutions and relevant rights, somewhere between the two extreme forms of exclusive rights and no property [PEARSE 1981].

Territoriality does not always demand written documents or closely codified jurisdictions for the administration of sea tenure. In Japan, for example, territoriality is legally enforced via exclusive use rights and well-documented fisheries laws [HABARA 1957; NINOHEI 1978].

By contrast, in a number of Pacific island communities ownership of reef and sea have long existed, as Johannes [1978a] overviews. Such traditional laws of the sea are culturally sanctioned and form integral and sophisticated parts of oral traditions and customary rules. In Ulithi atoll, in the Carolines, ownership of sea territory is closely associated with the political organization and the hegemony of chiefs or headmen [USHIJIMA 1982], or with religious restrictions and beliefs in limiting access during tabooed periods, as are seen in Tikopia [FIRTH 1965], Malaita, in the Solomon Islands, [AKIMICHI 1981], and Satawal, in the Carolines [AKIMICHI n.d.].

In most detailed studies of both Japanese and Oceanic cases, however, territoriality appears to denote only institutionalized and formal aspects. But when attention is directed to the personal or interpersonal levels in fisheries different aspects of territoriality emerge. For instance, in many societies priority claims to fishing grounds seem to be widely practised where entry rights are equal for all fishermen. Priority claims are only implicitly admitted as rational among fishermen [RUDDLE and AKIMICHI n.d.], and to break the rule is against ethical conduct. In Tobi-shima, northern Japan, octopus holes were owned and inherited as a personal property [NAGAI 1951]. Such informal aspects of territoriality need careful consideration since practical jurisdictions are based on, and often have originated from, informal and customary rules that are widely recognized among fishermen and are deeply embedded in local customs.

Hence the mechanisms by which territoriality is sustained appear to be twofold: legally sanctioned and institutionally authorized aspects, and implicitly recognized but practically enforceable ones. Distinction between the two is not, however, clear-cut, and a broader spectrum of intermediate measures exists. However, it is my premise that territoriality has been designed as an integrated system of both formal and informal components, and that analysis should be directed to identify and interprete them, as well as to elucidate internal processes within the system.

The function of territoriality is another crucial issue. The principal goals of territoriality can be broadly described as social and economic equity in the access to resources, the avoidance of dispute and conflict and resource conservation. Even if one system of territoriality is desirable in a given area and under particular socio-economic conditions, the range of its applicability might change through time and in different areas. For instance, population growth, environmental change or the penetration of a market economy [ALEXANDER 1977] have the potential to cause inconsistency and increase stress and malfunction of given territorial regulations. Territoriality should, then, be understood as a series of processes operating through time. Again, informal regulations may arise as a cue to evaluate territorial behaviors of fishermen under changing conditions. In sum, an understanding of territoriality

in fisheries should be focussed equally on both the formal and informal aspects of a diachronically changing system.

In this paper I will discuss the formal and informal regulation of the sea, using data from a small-scale fishery conducted in the sub-tropical waters of Okinawa Island, southwestern Japan. My first objective is to describe briefly the institutional aspects of sea tenure in the study area, Itoman. Secondly, I examine the system of territoriality, using as an example the informal aspects of a stake net fishery (*ambushi*). Lastly, the ecological significance of the contemporary sea tenure system in the area is discussed. This paper is based on data collected during fieldwork conducted at Itoman since 1979.[1]

FORMAL REGULATIONS IN THE SMALL-SCALE FISHERY

The Itoman Setting

Itoman is located about 10 km south of Naha, the capital of Okinawa Prefecture. It occupies the southwestern part of Okinawa Island and faces the East China Sea

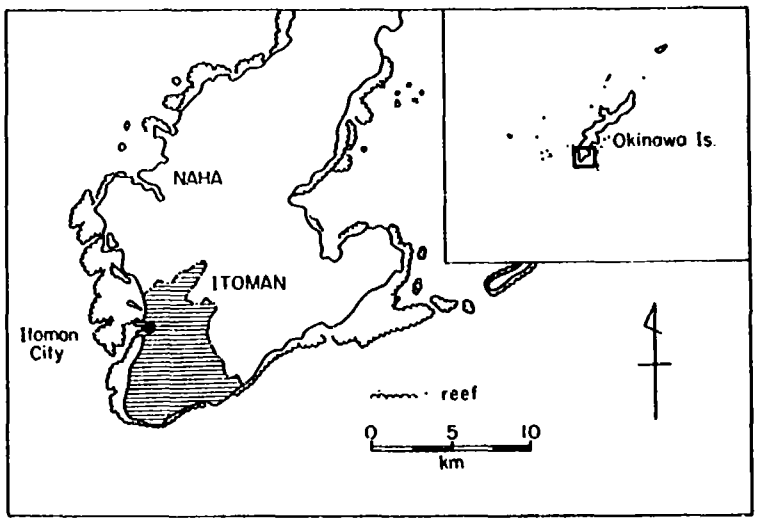


Figure 1. Location of Itoman

1) Research was partly supported by grants from the Japanese Ministry of Education, Science and Culture. I am deeply indebted to two key informants, Kōkichi Uehara and Shige-ichi Uehara, the stake net fishermen of highest repute in Itoman. I greatly appreciate the kind support of Ryōtoku Shimabukuro (Committee of Cultural Properties Preservation, in Itoman) during my fieldwork. I also thank Dr. R. E. Johannes for his valuable comments and assistance. Lastly, special thanks go to the late Mr. Noboru Innami and Mr. Masashi Takagi, fisheries officers of the Fisheries Section, Okinawa Prefectural Government, for providing access to documents.

(Fig. 1). Fringing reefs, about 3 km at their widest, and partly breached by channels, are developed along the coast.

Historically, Itoman was well-known as the center of Okinawan coastal and offshore fisheries. *Ichimanā* (Itoman fishermen) have, in fact, a brilliant history of fishing activities, not only in the Ryukyus proper and mainland Japan, but also in Southeast Asia, Micronesia and Melanesia. Breath-holding diving, fish driving and pole-and-line fishing for bonito, comprised the major fishing traditions of *Ichimanā*. However, owing to the decline of coastal fisheries and overseas fishing expeditions, modernization of the fishery sector, and, more seriously, as a consequence of large-scale land reclamation in the harbor area, Itoman's maritime traditions have recently undergone drastic socio-economic change. In this section the formal aspects of territoriality are discussed.

History of Sea Tenure in Itoman

During feudal times, prior to the Meiji Restoration (1868), rights to exploit a sea territory (*umi-hā-giri*) fronting each village were claimed for exclusive use. The sea territory corresponded to the coastal waters of the village territory (*magiri*) [RYŪKYŪ SEIFU 1968]. According to the village laws of Kanegusuku-Magiri (which includes Itoman village), its sea territory was divided into three; south, middle and west. Three villages controlled, in turn, each of these three sections during a year. Fishing outside the corresponding sea territory was banned and those who fished illegally were charged prevailing prices for the fish "stolen." Also, fishermen 17-49 years-of-age had to contribute marine products for the festivals (*tatācha*) in honor of sea-gods and ancestors, which were held three times a year. Illegal fishing was also banned [RYŪKYŪ SEIFU 1965].

During feudal times use rights in fisheries were not solely village-oriented, and some territories were owned jointly by fishermen from different villages. Itoman, in particular, was one of the most progressive and developed fishing villages in Okinawa during feudal times and Itoman fishermen migrated seasonally to other villages or islands for fishing. In such cases they made registrations by paying fees either for entry or for rights to fish. In the 1670s, for instance, entry rights to uninhabited islands and reefs located off southwestern Okinawa main island were authorized for use by Itoman fishermen through monetary contracts between the Ryūkyū Government and Itoman. The government also made similar contracts with other villages [TAMASHIRO 1915].

Following passage of the Meiji *Fisheries Law*, in 1901, a licensing system was adopted nationwide, as the major regulatory measure in coastal fisheries. The Fisheries Cooperative Association (FCA), which was village-based during the initial stage, became the administrative focus for obtaining fisheries rights and also for the control and execution of associated formal rules and rights (membership, type and season of fishery, sea territory and so forth).

Itoman's dominant role in the coastal fisheries of Okinawa was reinforced during the post-Meiji period via the securing of entry rights to the sea territories of other

villages. Indeed, areas exploited by Itoman fishermen included all the major fishing grounds of Okinawa Island and its dependent small islands, as well as the Miyako and Yaeyama groups [see AKIMICHI and RUDDLE, this vol.]. However, the establishment of village-based FCAs and the subsequent rise of local exclusionism (particularly toward fishermen from Itoman) greatly reduced the opportunity for Itoman fishermen to conduct fisheries in coastal waters controlled by other villages. Litigation and the disputes that burst forth in the first two decades of this century between the Itoman and local fishermen were inevitable [ITOMAN SHI-SHI HENSHŪ IINKAI 1983].

As might be expected, the ranges and contents of territories claimed by each FCA have not remained the same during these one hundred years, but have undergone considerable changes. Apart from the expansion and contraction processes of the areas exploited by Itoman, village sea territory *per se* was transformed through formal revisions to the Fisheries Laws. According to the exclusive fisheries rights of Itoman FCA, officially approved in 1908, the exclusive sea territory was roughly rectangular in shape (Fig. 2-1). The lateral boundaries correspond to the seaward extension of the village boundaries (*magiri*) whereas the offshore limit extends beyond the fringing reef and is between 2.5 and 3 nm from the shoreline.

This license was effective until 1928 (for twenty years). It was then renewed and remained effective until 1947. In 1965, Itoman FCA claimed a communal fisheries rights territory, based on the *Fisheries Law* (1949). Subsequently this has been renewed three times (1970, 1974 and 1983). As is shown in Figure 2-1, the present-day sea territory is much wider than that of the Meiji Period.[2]

Present-day Fisheries in Itoman

Present-day fisheries conducted by the members of Itoman FCA are characterized by two distinctive components: small-scale fisheries in coastal waters, and medium

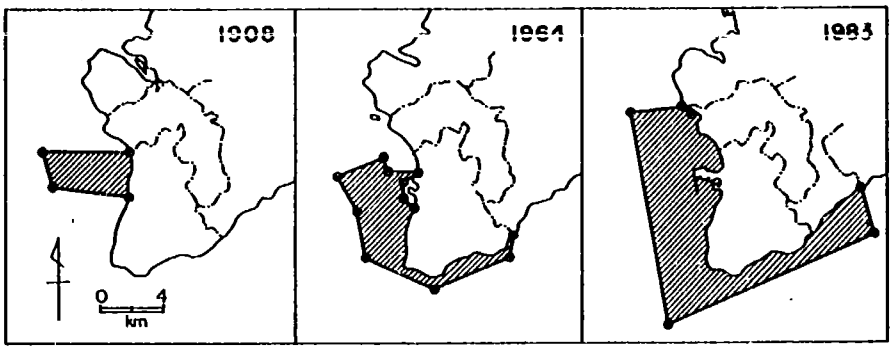


Figure 2-1. Historical Changes in the Sea Territory of Itoman
Sources: [NŌSHŌMUSHŌ 1909; RYŪKYŪ SEIFU 1964; ITOMAN GYOGYŌ KYŌDŌ KUMIAI 1983; See also NŌRINSHŌ 1928 ; OKINAWA-KEN 1974.]

2) The causes and processes of these changes are discussed by AKIMICHI and RUDDLE (this vol.).

and large-scale operations offshore. Near the reef flat and off the seaward slope and its vicinity small fishing boats of less than one ton are mainly employed for net fishing (using gill nets, the fish-drive, and stake nets), trolling and seaweed aquaculture, whereas in deep waters larger vessels, of over three tons, are used for catching surface swimmers, such as tuna by long lining and demersel snappers by using bottom lines. The total yields of the latter far exceed those of the former. The number of

Table 1. Fishing Boats by Tonnage Group and by Technique Employed

Fishing Technique	Tonnage Group					
	<1	1-3	3-5	5-10	>10	Total
Long line	3	30	16	11	7	67
Bottom line	5	30	4	0	0	39
Troll line	40	32	0	0	0	72
Diver	4	7	0	0	0	11
Gill net	9	4	0	0	0	13
Fish drive	3	0	0	0	0	3
Stake net	2	0	0	0	0	2
Seaweed aquaculture	18	8	0	0	0	26
Miscellaneous	7	7	1	0	0	15
Total	91	118	21	11	7	248

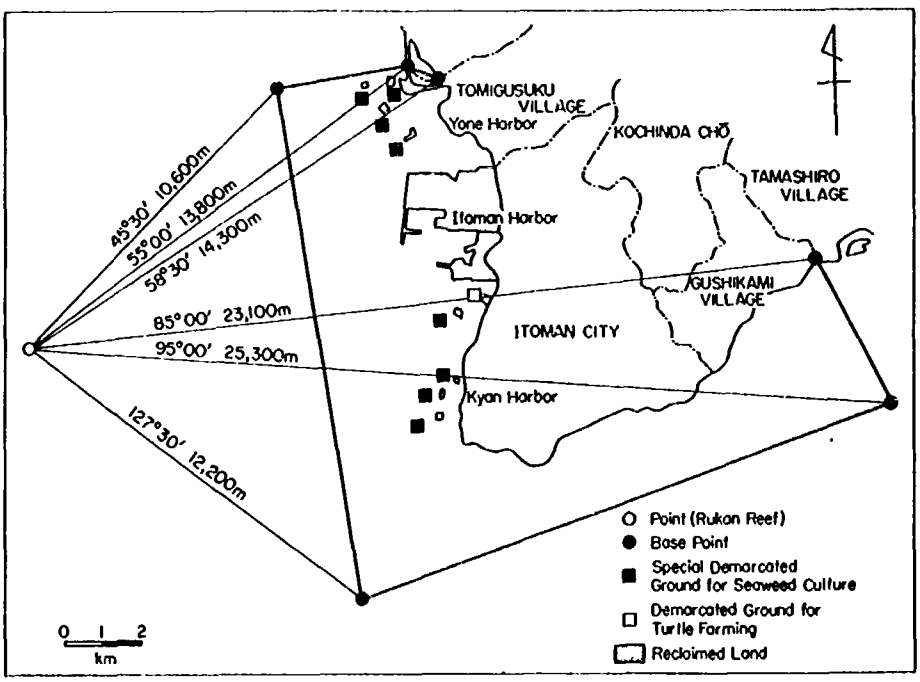


Figure 2-2. Joint Fisheries Rights of Itoman FCA in 1983
Source: [ITOMAN GYOGYŌ KYŌDŌ KUMIAI 1983]

fishing boats by tonnage group and fishing technique is shown in Table 1.

The allocation of present-day territories claimed by the three types of fisheries rights is also shown in Figure 2-2. In terms of space use within the area four distinctive categories of fishing occur (license no. 16, the latest retained by Itoman FCA and Minatogawa FCA [ITOMAN GYOGYŌ KYŌDŌ KUMIAI 1983]):

(1) joint fisheries rights for collecting benthic animals and seaweeds;

(2) joint fisheries rights to conduct fisheries using nets and fish traps (gill net, stake net, small-scale fixed net, fish-drive, and fish trapping);

(3) demarcated fishery for turtle farming; and

(4) special demarcated fisheries rights for culturing seaweeds (*Nemacystus* spp.).

The first two types are permitted anywhere within the territory, whereas the latter two can be conducted only in small defined portions of the enclosed sea area within the territory. The other types of fisheries (*e.g.*, line fisheries) can be undertaken freely inside or outside the territory [KANEDA 1980].

For marine resource conservation and fishery control, in general, several regulations are enforced regarding fishing season, size limitation, fishing gear and number of gear units permitted. For benthic animals and seaweeds the regulations appear to be common to all Okinawan FCAs, and any differences might reside in the local diversity of marine resources. In contrast, regulations for net fisheries vary considerably per FCA and per individual fisherman with regard to the maximum number of fishing nets that can be employed.

Overall, macro-level formal regulations on territoriality primarily provide for the spacing behavior of fishermen. The effectiveness, contradiction and ecological consequences of this formal aspect can, however, be understood only by considering the informal or micro-level component.

THE STAKE NET FISHERY

Stake netting, locally termed *ambushi* (lit. *ami*: "net", *bushi*: "to drain off" or "to turn down"), has been practised not only in Okinawan waters, but nationwide, and is known generally in Japan as *tateboshi-ami* [*cf.* KANEDA 1977]. According to the documents of Exclusive Fisheries Rights for the late-1900s, Itoman fishermen had already made contracts to conduct *ambushi* fishing as well as fish driving and other techniques in the territorial waters of other villages, in return for paying an entry charge (*umi-gane*) [TAMASHIRO 1915]. A brief examination of a list of exclusive fisheries rights proclaimed by FCAs, and more rarely by individuals, reveals that the *ambushi* technique was adopted by twenty-seven of total of fifty-four FCAs in Okinawa Prefecture.

Procedures and catch

The method of *ambushi* fishing is basically similar to such techniques as the fixed net and stand net; *i.e.*, the setting of stationary gear in shallow waters to catch fish by taking advantage of tidal movements and corresponding fish behavior. A net is

set at high tide when fish feed at grass beds in shallow waters. When fish retreat toward deep water with tides, they enter the net. In a sense the stone weir, which is widespread in the tropical Pacific [ANELL 1955; REINMAN 1967] and was formerly important in Okinawan waters [SHIMABUKURO 1966; NISHIMURA 1975], is a prototype of this technique.

An *ambushi* net is composed of two main parts; a bag net (*fukuru-ami*) and two wing nets (*tibashi-ami*). A bag net is set using poles fixed in a semi-rectangular shape at the site of coral rock about three to four fathoms deep. Wing nets are attached to each side of the bag net and both edges are inflected to prevent fish from escaping (Fig. 3). Coral rocks are used to fix the net to the bottom. Ordinarily, the length of the two wing nets is the same, but occasionally a longer wing net (*nagari*) and a shorter one (*inkari*) are employed, depending on the topographical features of the fishing ground. They are usually 50–100 m long.

The spot where a bag net is located is generally termed *ishiyā* or *tuiba*. A fishing site is carefully selected where two or more coral rocks occur. These rocks not only provide the small fish passage (*kuchi*: "mouth") into a bag net, but also are used for fixing the poles. Where coral rocks are not naturally available fishermen carry them in their boats. Usually, these fishing sites are given particular names. For instance, more than two hundred named sites for *ishiyā* are distinguished and recognized among the *ambushi* fishermen of Itoman. These are designated as *Amuru-no-hē* (south of *Amuru* reef), *Shinaganchi-uchi-no-hē* (south of *Shinaganchi*'s and coastward), and the like.

An *ambushi* catch comprises various fish species and marine animals. Commonest catch compositions are rabbitfish (*Siganus* spp.), goatfish (*Parupeneus* spp. and *Mulloidichthys* spp.), silver biddies (*Gerres* spp.) and other reef fish such as parrotfish, sea-perch, barracuda and wrasse. Apart from fish, cuttlefish (*Sepia* spp.), squid (*Sepioteuthis* sp.), octopus and crabs are also commonly caught [*cf.* YOSHINO *et al.* 1975; MASUDA *et al.* 1978; and see Appendix I]. The *ambushi* is employed

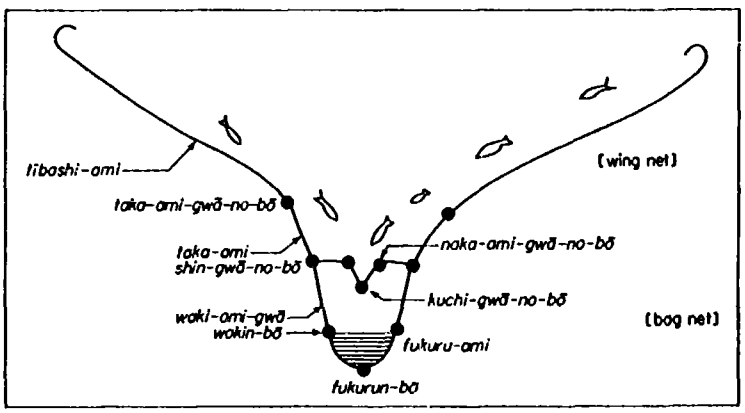


Figure 3. Stake Net

year-round, although during January and February fishing is less productive because of the strong northerly winds and rough seas, even inside the reef. Also, the frequent occurrence of typhoons, particularly in September and October, reduces fishing intensity and catch size (*vide infra*).

Ambushi fishing is individualistic in nature. Normally each fisherman works alone with his own small *sabani* boat and netting gears. But in former times a father and son team worked together.

Socio-cultural background

Ambushi is especially important for Itoman fishermen since young boys were formerly initiated by this technique as the first major fisheries task to be learned. Their training period in *ambushi* lasted at least one or two years, after which they could start to learn the more difficult work, such as fish driving, in deeper waters. Indeed, use of the *ambushi* was a rite of passage for future independent fishermen.

Those who were able to be full-time *ambushi* specialists (*e.g.*, *ambushisā*) were generally affiliated as members of particular social group, known as the *munchū* or *bara* (lit. [*bara*]: "abdomen"), indigenous descent groups in Okinawan society. In the early Showa Period (1920s), 42 *munchū* existed in Itoman [ITOMAN-CHŌ YAKUBA 1940], and *ambushi* fishermen belonged almost exclusively to the *Sumu-bara* group. A genealogy of this *Sumu-bara* group reveals that *ambushisā* practically form an occupational group.

Around the mid-1930s, seven or eight fishermen were working with their assistants in the *ambushi* fishery. Again, the genealogy of *ambushisā* illustrates that this technique had been employed generationally through this group during the last 100–150 years (Fig. 4).

Also, according to a fisheries survey conducted by the Okinawa Prefectural

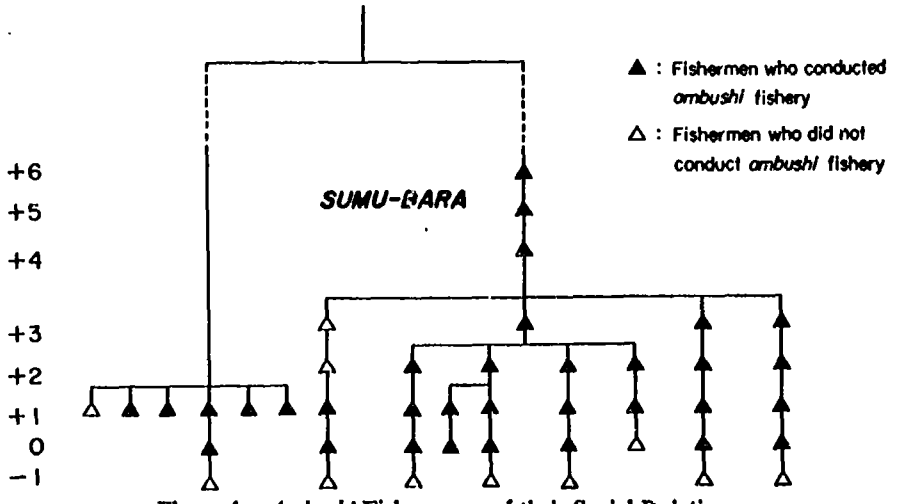


Figure 4. *Ambushi* Fishermen and their Social Relations

Fisheries Experimental Station, in 1929, fifteen *ambushi* groups were based in Itoman [NIHON JŌMIN BUNKA KENKYŪSHO 1956]. Since then, however, the *ambushi* has declined as the young successors of *ambushi* fishermen were urged to engage in the large-scale fish-drive employed during overseas fishing expeditions to Singapore, the Philippines and Indonesia. In the postwar period *ambushi* began again, but the number of fishermen involved has never exceeded five.

Formal Regulations

According to the fisheries regulation rules of 1912, any other fishing or activities in the coastwise area in front of an *ambushi* net, and that might interfere with it, were formally prohibited [NŌRINSHŌ 1938]. This kind of rule was also applied to other types of stationary fishery. Other than this spatial regulation no formal regulations were applied to *ambushi* prior to 1983, when the maximum number of nets that could be operated by an individual fisherman was determined at the General Meeting of the Itoman FCA.

TERRITORIALITY AND REGULATIONS IN AMBUSHI FISHERY

Description

As mentioned above, the *ambushi* fishery has been undertaken for several centuries in the coastal waters of Itoman. Before regulation of the maximum number of nets per capita was made in 1983, the only formal regulation applied to *ambushi* was that on the exclusive use of coastal waters in front of the net. No other rules were applied so long as the fishery was undertaken within the outermost boundaries of a sea territory (*e.g.*, *umi-hō-giri* during feudal times, the Exclusive Fisheries Rights territory after Meiji and the Joint Fisheries Rights territory in the postwar period).

Although these formal regulations offer a clue to the territorial behavior of fishermen, they do not provide an appropriate base for elucidating the practical territorial behavior of fishermen nor do they demonstrate the contents of territoriality. On the contrary, these substantial regulations resided as informal regulations acknowledged only among members of the *ambushi* fishery.

Ambushi-juri

Sea tenure in the *ambushi* fishery was deliberately organized. It can be simply stated as the system of informal agreements on the use of fishing sites. These agreements were decided on in the meeting among *ambushi* fishermen, *ambushi-juri* (lit. [*juri*] "to assemble"). This meeting was called by a senior fisherman and normally held once a year on off-work days during typhoons or stormy periods.

The major purpose of this meeting was to discuss practical issues on use rights, to resolve conflicts, and to maximize and maintain equitable use of the limited sea space. Further, when new fishing spots yielding a good catch were located, discussion on the proper allocation of nets in the corresponding sea area took place. Resultant agreements were recorded in detail by one secretary-fisherman. This

record was kept as the "Rule Book" for the resolution of future conflict. If agreement could not be reached on a dispute, solution was deferred to the next meeting. Participation in an *ambushi-juri* was voluntary among *ambushisā*, but practically speaking those who could take part as members were limited; successful *ambushi*-fishing requiring long experience and a profound knowledge, so beginners were, in most cases, obliged to give-up within a short period owing to poor catches.

It is not known when the first such meeting was organized, but presumably it was around the late-1890s. It is probable that *ambushi* fishery was most intensively practiced after the invention of water goggles, in that same period. An *ambushi-juri* has been convened only a few times in the postwar period despite the frequent occurrence of conflict. According to one informant, this is the result of a lack of mutualism among fishermen. Although the meeting has not been called the fishermen still observe rules on territoriality

Several principles and rules are illustrated below, based on information provided by one senior fisherman. Informal acts decided at the meeting are generally called *kimiin* ("to decide"), and cover both general and specific aspects of sea tenure.

Informal Territorial Regulations

USE RIGHTS

As a general rule the first-comer to any fishing spot (*ishiyā*) can claim the corresponding use rights. This principle of "the prior claim" in itself is termed *saki-ɲaishiga-mūn* (lit. "property of those who proclaim"), or *ami-hēte-naran* (lit. "prohibited to set the net in"). In the Yaeyama archipelago of southern Okinawa fishermen call a similar practice *sente-gachi* (lit. *sente* "first-come", *gachi* "to win") [RUDDLE and AKIMICHI n.d.]. It is not a rule peculiar only to *ambushi* fishing but is also widely recognized as self-evident in many different types of fishing. Indeed, to preempt a good fishing ground is the most important and commonest strategy employed to secure a larger catch than other fishermen. In Itoman, when fishermen rush to the fishing ground to scoop rabbitfish fingerlings in the summer season [*cf.* JOHANNES 1978b], prior occupancy rights are admitted as an unwritten rule; the first to discover a fish school has the right to set the net. This should, however, not be accepted as a *laissez-faire* principle ungoverned by regulations, but rather as a rigorous order of territorial definition.

However, the concept of prior claim raises the critical question of its effectiveness in reducing competitiveness. If the prior occupancy rule is proper, and if one fisherman happens across another at the same spot, stress might escalate into aggressive behavior. If an unskillful fisherman follows a skilled one in order to steal his knowledge, and tries to fish at the same spot, conflict may arise. Thus these rules do not always compromise fishermen's "egocentrism," nor do they afford a satisfactory basis for territoriality.

RESERVING TERRITORY

The prior occupancy claim in *ambushi* fishery is not enforced by a fisherman's

occupancy of a certain spot at the time of fishing. Rather it is done on the day before. After fishing a fisherman could set bamboo or wooden poles (*bōwīn*) at the spot where he planned to fish next day. Usually, one or two sites are thus reserved. A round stone with a hole through it is fixed to the pole, or a piece of cloth is attached to the pole, as a fisherman's identification. This practise was valid in any spot available for *ambushi*. In contrast, to reserve any spot for the following day before conducting a day's fishing was strictly banned. In that way competiveness and stress over preemption were reduced in advance, and a man could go to the reserved sea space without anticipating any conflict with others.

This sea-mark has no validity in limiting access of fishermen undertaking other types of fishing (*e.g., pantatakā* fish drive, fixed netting, gill netting, and so forth), since no agreements are established among them. However, since the *ambushi* sea-mark is detected by other fishermen, and heneeforth secrecy is lost, it might enhance competition between fishermen using similar techniques. This issue will be discussed below.

CONVENTIONAL SMALL TERRITORY

In general, a particular *ishiyā* is not always independently "possessed," but rather a few spots are regarded as identical in terms of prior occupancy rights. In other words, a defined territory includes from one to five fishing spots. Generally, such a territory is termed *ttchi* (lit. "a unit" or "one"), and is also given a particular name, such as *Inuyā-bara, Nagōji-bara*, and the like (lit. [*bara*] "plain, field").

For example, sites 151, 152, 153 and 154 are individually named *ishiyā*, and the

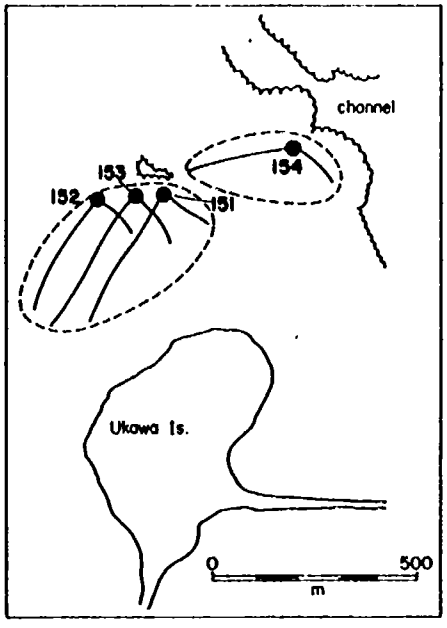
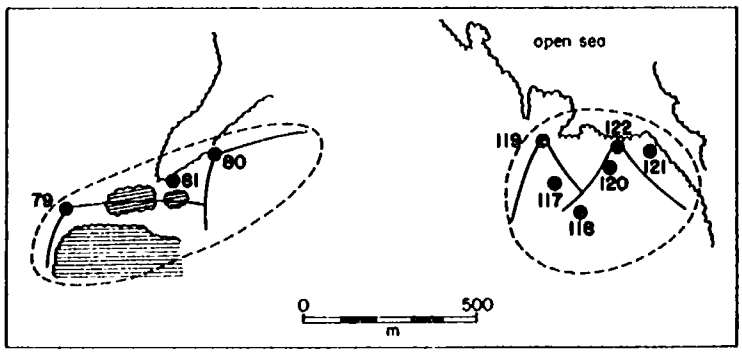


Figure 5-1. Conventional Small-Sized Territory



Figures 5–2, 5–3. Conventional Medium-Sized Territory

areas covered by site 151, 152 and 153 and site 154 form two independent territories (Fig. 5-1). Once a fisherman claims site 151, for instance, no other fishermen can use site 152 and 153, belonging to the same territory as site 151. Alternatively, they or he can choose the separate territory of site 154. Agreements on this kind of exclusive territoriality characterize the basic sea tenure system in *ambushi*. We can designate this as a "conventional small territory." Distribution of these territories is illustrated in Figure 7.

CONVENTIONAL MEDIUM-SIZED TERRITORY

Although exceptional there are a few cases that permit two fishermen to conduct *ambushi* separately within the same territory. Sites 79, 80 and 81 comprise a territory and the corresponding prior occupancy rule is applied. However, even if one fisherman claims site 80, another can also spread his net as far as the point where his wing net reaches a wing net spread from site 80 (Fig. 5-2). The other example is a territory shared by six *ishiyā* (*e.g.*, sites 117–122). Even when one fisherman claims either site 121 or 122, another fisherman could set net at sites 117 or 119, and, further, he can spread the wing net as far as the crossing point with that spread from site 121 or 122 (Fig. 5-3).

These two examples suggest that even within the same territory space-sharing is often allowed so long as a given territory is wide enough to separate two nets. We may call this a "conventional medium-sized territory."

AVOIDANCE OF NET CROSSING

1) One-sided concession

The preceding rules do not always suffice, since a wing net often tends to penetrate the neighboring territory, which might be occupied by another fisherman. In such a case, crossing of two wing nets, both from territories I and II, induces tension and often escalates into conflict. To avoid this the proper arrangement of wing nets is indispensable. Figure 5-4, assumes that fisherman X occupies site 8 in advance (proclaiming territory I) and fisherman Y works site 9 in territory II. Y cannot extend a wing net beyond that spread by X. In other words, the outer edge of a wing net of Y should be spread as far as the crossing point of X's wing net. To properly

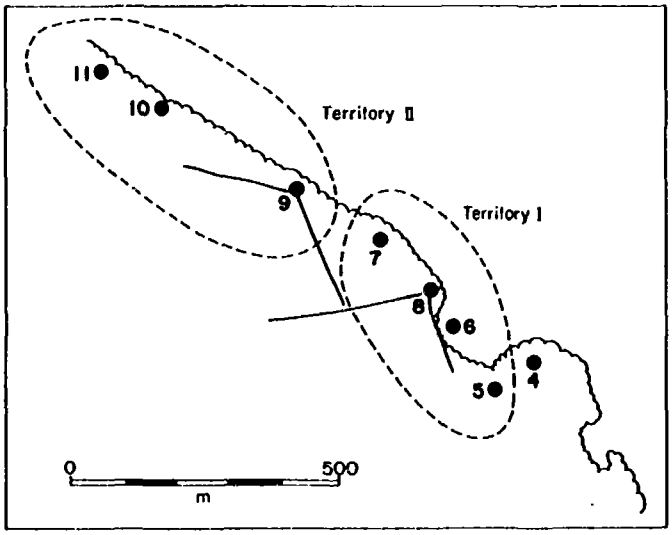
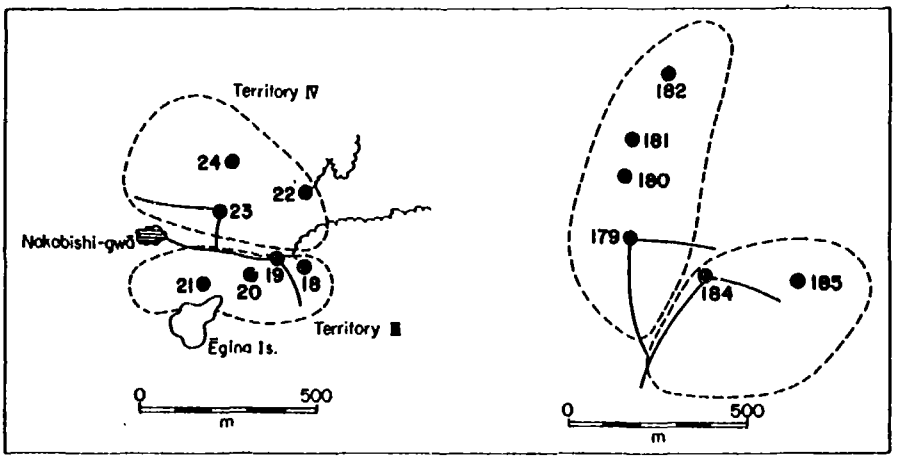


Figure 5-4. Avoidance of Net Crossing

allocate one's wing nets with reference to those of another is locally called *chikin*.

Sometimes, a certain spot or coral rock is appointed as the mark that serves to specify the direction of a wing net. Figure 5-5 shows an example of this. In Figure 5-5 sites 18, 19, 20 and 21, and 22, 23 and 24 are included in territory III and IV, respectively. The only problem between these two territories is the direction of a left wing net from territory III. At their meeting fishermen reached the agreement that the direction of a wing net spread from territory III should not extend westward beyond the *Nakabishi-gwā* (a reef called *Nakabishi*).

Similar cases also occur elsewhere. Sites 179-182 and 184 and 185 comprise



Figures 5-5, 5-6. Avoidance of Net Crossing

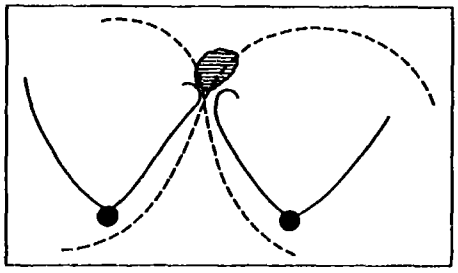


Figure 5–7. Mutual Concession

two independent territories. If either 184 or 185 is occupied, one end of a wing net from either sites 179 or 180 should be subject to the boundary made by the wing net from sites 184 or 185 (Fig. 5-6). Hence, this sort of rule is enforced between two neighboring territories. In fact, the *raison d'être* of this kind of agreement implies that trespass was very likely to occur in productive fishing areas.

2) Mutual concession

One of the striking measures in the *ambushi* fishery to afford maximum opportunity for fishermen to exploit an adjacent area is the rule that the end of the wing net must be bent (Fig. 5-7). When a first-comer permits a later man to spread his net in the adjacent territory, both fishermen concede by inflecting the wing of their nets, at such particular spots as reefs and abysses in the lagoon. This practise of mutual concession is called *ēmagi*, which seems to be of importance in avoiding contact.

PROHIBITION

Occasionally, the use of certain sites is prohibited. Apparently, the spread net not only intercepts activities of fishermen in the neighborhood, but also takes fish in advance as they retreat from shallow to deep waters. In Figure 5-8, sites 14, 15, 16 and 17 form a territory (V), and when poles are found in any of these four sites a newcomer cannot claim site 13, as the occupancy of site 13 inevitably reduces the catch in territory V. It should be noted that site 12, although both site 12 and 13 share the same territory (VI), can be claimed even when sites 14, 15, 16 or 17 have been occupied in advance.

NON-INTERFERENCE

As we have seen, the principle of prior occupancy is first enforced before fishing begins at a certain spot. This then automatically creates an exclusive, wider territory. The prior occupancy rule also governs different cases. Some areas are less exploited during the course of a year by any fishermen and no *ad hoc* agreements, rules and territoriality are claimed. This is partly the result of the ineffectiveness of *ambushi* around the surf break and reef front (see sites 27, 28, 29, 30, for instance) (Fig. 5-9), and partly owing to the ecological reason that these sites are not regarded as good fishing grounds for *ambushi*, but rather for a small-scale fish drive (*pantatakā*). Fishermen call such a situation where no rules are applied, *kimiiteukan* (lit. "not to regulate or agree").

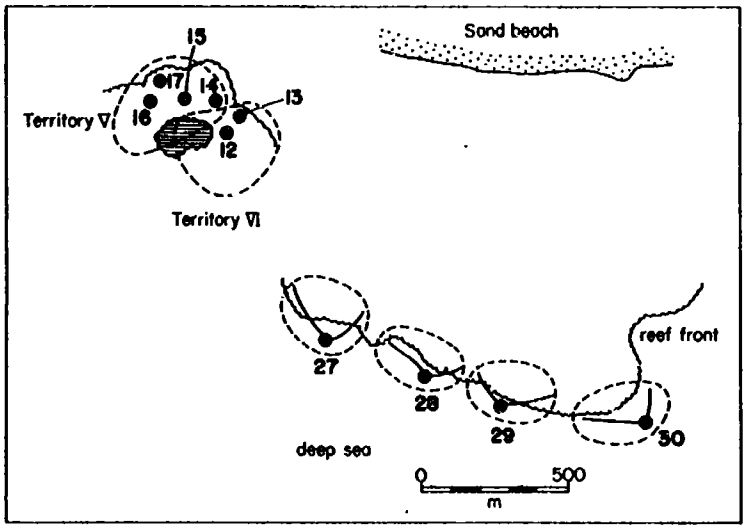


Figure 5–8. (u.) Prohibition of Net Crossing **Figure 5–9.** (l.) Independent Territory

PERMISSION

In most cases, proclamation of territory is implicitly acknowledged. However, the following two examples show that the permission rule is applied on exceptional occasions. When either site 103, 104 or 105 is already occupied, any fisherman wishing to use either site 106, 107 or 108, which belong to the same territory, is required to seek the permission (*sōdan*: lit. "to discuss") of the fisherman in the neighboring territory. Similarly, when territory P, which involves sites 103, 104

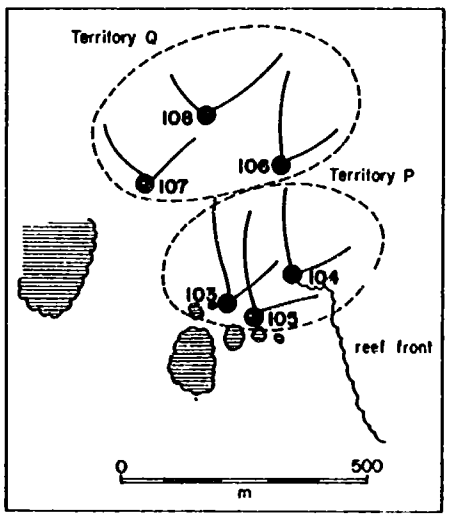


Figure 5–10. Permission and Net Setting

Table 2. Types of Sea Tenure in *Ambushi* Fishing

Type of principle		Number of Cases	
Conventional territory			52
which is composed of	a single fishing site	6	
	two sites	18	
	three sites	17	
	four sites	7	
	five sites	3	
	six sites	1	
Avoidance of net crossing	between two fishermen		23
	within a territory	3	
	between two territories	20	
Regulation on net boundary between neighboring territories, appointing coral rocks as a marker			5
Prohibition on use of certain territory under the occupation of the neighboring territory			3
Approval of use of certain territory under the occupation of the neighboring territory			2
Free-use or non-interference			36
because:	no value for *ambushi* fishing	7	
	inefficiency (reef front)	29	

and 105, is staked, any fisherman who tries to utilize territory Q, comprising sites 106, 107 and 108, must first ask permission (Fig. 5-10).

OPTIONAL CHOICE

It should be noted that any fisherman has two options when someone has already staked a given territory. First, he is obliged to leave the territory by accepting silent priority rules, or second, given that the territory is wide enough to allow another fisherman to enter, he can ask permission of the first-comer.

From the examples and principles described above, it is apparent that the sea space for *ambushi* fishery is deliberately divided into numerous territories (*itchi*), which function to reduce stress and conflict among fishermen. Additional rules attached to each territory serve the same function. A summary of the number of territories and specific areas where complementary rules are applied is shown in Table 2.

Territoriality appears to be one of the dominant factors in sea tenure, judging from this figure. Although free-access areas lacking regulation have only a minor role in the sea tenure system, on the one hand, strict prohibition rules and fairly moderate approval among fishermen prescribe the nature of sea tenure at the other extreme.

These findings suggest important notions for territorial regulation in fisheries. Space-sharing mechanisms involved in even one type of fishing are revealed as complex and diverse, showing the multifacetedness of human territorial behavior for retaining minimum spacing between fishermen [*cf.* PETERSON 1975], avoiding conflicts

within a descent-oriented small occupational group, although prior claim to the fishing spot and the concession rule often call for morality and an ethical code. Hence, inquiries into the basis of formal or macro-level regulation, such as most policy-makers and formalists make, do not alone yield a satisfactory understanding of the territorial behavior of fishermen.

TERRITORIALITY IN ECOLOGICAL AND SOCIOLOGICAL PERSPECTIVE

Trends in Space-Use

FREQUENCY AND EFFICIENCY IN SPACE-USE

The more than two hundred spots utilized in *ambushi* fishery do not all have the same potential as fishing grounds. Informal agreements on space-use suggest that there may be great differences in potential yields, depending on fishing spot and season. Creation of territorial rights also requires special attention if there is a significant difference in yields of individual *ishiyā* within a single territory (*iichi*). To understand the ecological bases of the informal regulations in *ambushi* fishery, a diary kept by 52 year-old fisherman was studied. Almost two years' data (from Sep 30, 1980 to Sep 17, 1982) was thereby obtained on the daily fishing activities of this fisherman. In his diary fishing sites (*ishiyā*) used as well as the amount and kind of catch taken are described. These data were computed for the following analysis. The results are summarized below:

(1) Total number of fishing days *per annum* is 199 (64.6%) of 308 days (Sep 30, 1980–Aug 3, 1981), and 226 (67.7%) of 334 days (Oct 18, 1981–Sep 17, 1982). This supports the idea that fishermen work as much as possible, although seasonal fluctuation of fishing effort exists. During the winter season (December through March) 71 of 121 days, both in 1980 and 1981, were off-days, whereas during the most productive season (April through May) only one and five days, respectively, were spent resting in the two years;

(2) The use frequency of each fishing spot varies conspicuously, and it seems to exhibit either a Poisson or exponential distribution. Fishing spots exploited once a year are the most in number, and the frequency decreases as use frequency increases. More than 60 percent of the fishing spots were used less than three times a year whereas those utilized over 15 times accounted for only 5 percent. No statistically significant difference was found between the two years' distributions, by applying the Kolmogorov-Smirnov test (χ^2=2.835) (Fig. 6);

(3) Frequency in the use of individual territory was examined. Since one territory includes more than one fishing spot, some were used more than 20 times a year, whereas territories used less than four times still comprise more than 50 percent of the total;

(4) Yields per haul vary considerably from null to over 156 kg ($\bar{x}$=23.6, s=27.71, n=296, for 1980-81, $\bar{x}$=18.5, s=16.33, n=424, for 1981-82); and

(5) Fishing spots were ranked into five classes according to use frequency (I[1–4 times/yr.], II [5–9 times/yr.], III [10–14 times/yr.], IV [15–19 times/yr.] and V [over

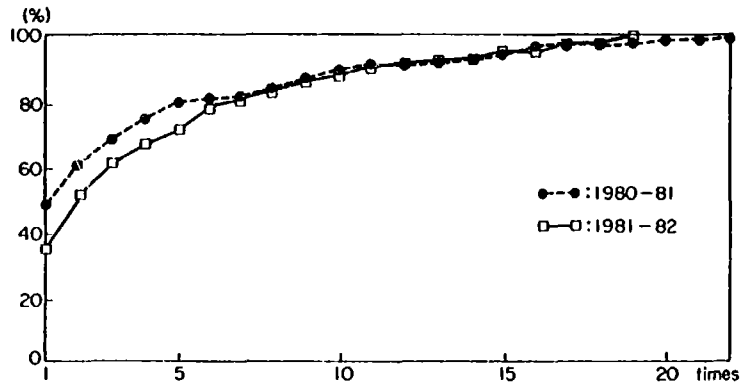


Figure 6. Cumulative Frequency in Use of Fishing Spots

20 times/yr.]). Generally, particular trends in yields according to use frequency were not found in 1980-81 ($F=1.507$), but in 1981-82 a statistical significance was detected between frequency and yield ($F=2.907$, $p<0.05$), by Welch's method.

Overall, the data suggest that there exist unpredictable trends in yields. If so, what is the cause of the differential use of space? And how is space-use related to the ecological diversity of fishing grounds on the one hand and to the territorial behavior of fishermen on the other?

POTENTIALS OF FISHING SPOTS

Based on information of two fishermen, X and Y, how fishermen qualify each fishing spot was examined in order of preference rank. This was ranked into five categories; frequently used, commonly used, rarely used, never used, once used but abandoned owing to the lowest catches obtained.

Results were compared with use frequency data of another fisherman, Z. According to the evaluation of fishing spots by X and Y, the correlation, expressed by a contingency coefficient in terms of use frequency, between the two is $C=0.69$ ($\chi^2=175.37$) [SIEGEL 1956]. These qualitative data were compared with actual use patterns of fisherman Z. Evaluation of fishing spots was found to differ among the three; some spots perceived as "the best" were not exploited by fisherman Z, whereas a few spots that had never been used by X and Y were exploited over five times a year by Z. Contingency of use frequency by fisherman Z was examined, based on the five categories of fishermen X and Y. Significant differences were detected ($\chi^2=21.31$, $p<0.001$). However, it is primarily the result of the different perception of rarely used fishing spots ($\chi^2=18.58$). On the other hand, perception of the frequently used fishing spots is similar between X and Y ($\chi^2=0.2$). Fishing spots that were used but abandoned were also similar. In summary, perception and actual use of the fishing spots is generally uniform, except those rarely used, as the latter are greatly affected by environmental constraints.

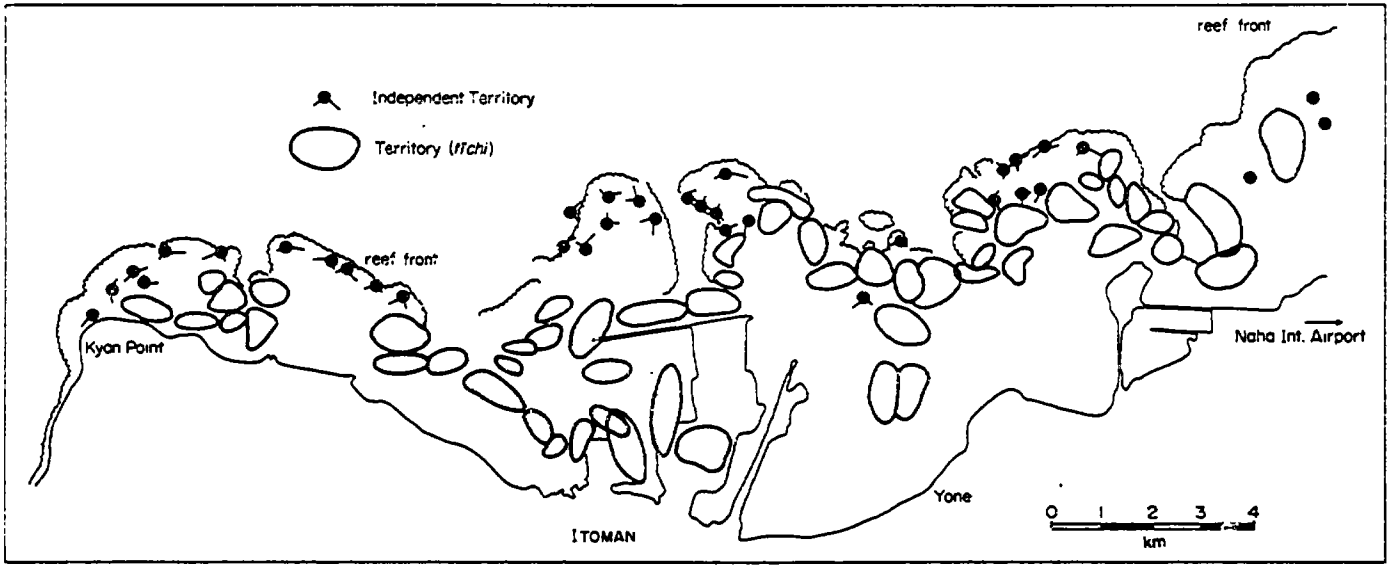


Figure 7. Location of Territories of *ambushi* Fishery

Environmental Factors Influencing Space Use

Typhoon Effect

Winds and waves are one of the major physical environmental factors that limit access and affect efficiency in *ambushi* fishing. Fishermen are often urged to rest during the windy winter season. Even on calm days wave action around reef fronts often reduces the efficiency of activities. This is closely related to the absence of special regulations for them (*vide supra* "non-interference"). Nevertheless, *ambushi* fishery has the advantage that it can be employed all-year in protected shallow waters, unlike deep-sea oriented fish driving techniques. Storms and typhoons are likely

Table 3. Post-Typhoon Fishing
(Three days records after typhoon are described)

Date	Fishing Spot I.D.	No. times of use per year[1)]
1980 Oct 15	65	8
	78	7
Oct 16	16	11
	18	20
Oct 17	32	18
	8	11
1980 Nov 09	12	16
Nov 10	32	18
	76	14
Nov 11	198	14
	76	14
1981 Apr 24	12	16
Apr 25	14	4
	121	8
Apr 26	18	20
	121	8
Apr 27	112	5
	121	8
1981 Nov 28	12	11
Nov 30	198	15
	87	12
1982 Jan 06	8	19
Jan 07	22	15
	18	17
1982 Apr 10	18	17
Apr 11	22	15
	120	4
Apr 12	87	12
1982 Aug 16	8	9
	?	9
Aug 17	11	7
	80	10
Aug 18	38	17
	147	8

Table Note: [1)] Use frequency of the fishing spots differs in the two years: for instance during 1980–81 site 8 was used eight times whereas in 1981–82 the same spot was exploited nineteen times.

to minimize fishing intensity. However, fishermen believe that "post-typhoon fishing" sometimes results in a greater than usual catch. Therefore, to choose potentially highly productive spots is the focus in "post-typhoon fishing," and fishermen used to rush into the rough sea to claim good fishing spots after the passage of a typhoon.

According to the diary examined, certain spots were specifically chosen; site 12 was used for three successive days after a storm (April, 1981), and a total of 393 kg of reef fish was obtained. Site 18 was used a total of eight times in a year, of which five were following typhoons or storms during 1980–82. Generally, sites utilized after typhoons and storms are likely to be frequented by fisherman in other periods of the year as well (Table 3). Given the high rate of return in "post-typhoon fishing" possible causes may be related to either the resultant preservation (*vide infra*) of the sea for a short period of time (usually less than a week or so) or wave action by which fish were driven toward shallow waters.

Only brief information of post-typhoon effects on the fish aggregation towards shallow water is available in the literature, from Cuba. It suggests that certain reef species migrate in turn to specific spots after the passage of a typhoon [ROIG and MUZA 1952].

Unlike typhoons that occur irregularly, such periodic phenomenon as lunar-tidal cycles may afford much more reliable and accumulated knowledge regarding timing and production [CORDELL 1974].

FISH RECOVERY CYCLE

It is generally recognized among fishermen that once any spot is exploited it requires a "resting time" until an exploitable quantity of fish has returned. By experience fishermen memorize locality-specific "resting times" and "preserve the sea" for a certain period of time after exploitation. This strategy is locally termed *umi yukkwasu* (lit. "to give a rest to the sea"). Fishermen believe that a good fishing spot, *ii umi* (lit. "good sea"), gives a constant catch regardless of the frequency of use. It is presumed that more regularly used fishing spots have a potentially fast fish recovery cycle whereas those used less often have a slower one. No statistical differences between intervals of "resting" and use frequency were detected ($F=0.81$ as of 1980–81, $F=0.59$ as of 1981–82) by analysis of variance. The mode of distribution is at less than one week, except for the least used spots (2–4 times/p.a.) where the mode is at over six weeks. However, it was ascertained that most frequently used spots (over 15 times/p.a.) have the shortest intervals of "resting," compared with those less frequently used (for instance, $t=1.77$, $p<0.1$ for 1980–81, $t=2.38$, $p<0.05$ for 1981–82), by Welch's t-test.

"Resting times" are often disturbed by another fisherman who, unobserved, uses the spot. In such a case both fishermen will eventually obtain a smaller catch than expected. Henceforth, a fishing spot used once is either exploited for a few successive days, so long as a good catch lasts, or remains temporarily unexploited.

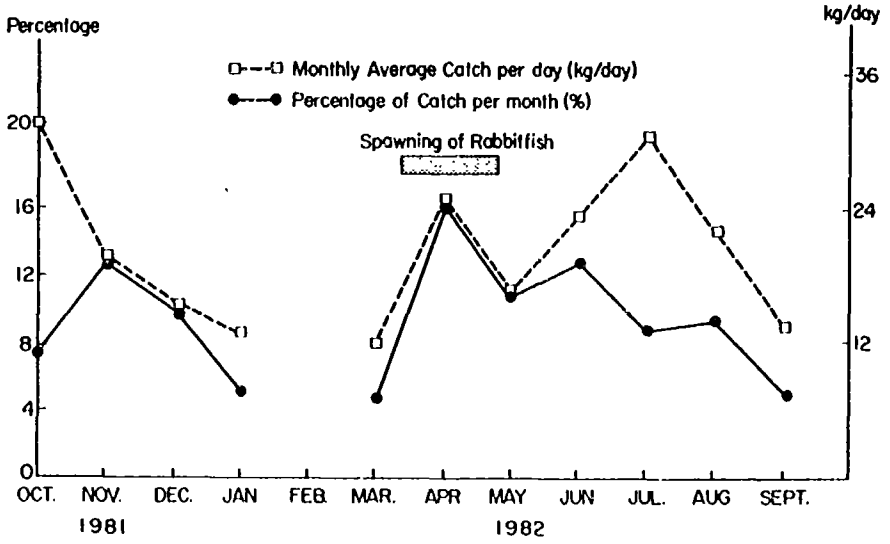


Figure 8. Seasonal Trend in Yields and Average Catch per Day

SPAWNING

Generally, fishermen believe that a good catch is expected during the spawning season. This is particularly true of rabbitfish, *miyagē* (*Siganus fuscescens*), and *kāē* (*S. guttatus*), from mid-March to May. Fishermen believe that most species spawn around these periods [*cf.* JOHANNES 1978b]. Coupled with fishing intensity, yields of fish increase during the spawning season compared with other periods of the year, although average catches per day increase more in July and October than in the spawning season (Fig. 8).

Ambushi fishery was formerly conducted by one fisherman seasonally, during the spawning season of squid. During the period May through July, locally termed *yū-jiki* (lit. "season of fish"), fishermen cannot expect a good catch of squid using a small-scale fish drive, since squid almost disappear. In prewar times there was only one fish drive group, composed of a senior leader and 10–20 young men, but the number of groups increased to four after the war. Since these four groups conducted fish driving all year, without observing any conservation measures, squid yields decreased considerably. This resulted in a shortage of labor for those groups that obtained the lower catches, and consequently three were obliged to give-up fish-driving. This illustrates that the fish driving technique exhausts fish populations whereas *ambushi* is less destructive. Seasonality in spatial allocation of the fishing grounds seems to be less clear. Whether or not it relates to fish ecology should be further examined.

FIXED NETTING AND COMPETITION

A few kinds of small-scale fisheries are conducted off the coastal areas of Itoman, including gill netting, stake netting, fish driving and fixed netting. Of these both

stake netting and fish driving have long co-existed. Three types of fish driving techniques are distinguished: *pantatakā*, *chinakakiyā* and *agiyā*. *Agiyā* is a large-scale technique conducted in deep waters for fusilier and damselfish whereas the other two are done in shallow waters within the reef. *Chinakakiyā* is medium-scale whereas *pantatakā* is small-scale. A variety of reef fishes is taken by these two techniques. In Itoman the *pantatakā* technique is important and is preferably undertaken in coral habitats, whereas stake netting is done in sandy and grassy habitats.

Further, the fish drive is conducted about ten times per day, seeking schools of fish in shallow waters. The stake net, however, is stationary and the gear is set for at least a day or so.

The other two techniques are new to Itoman, and their impact is quite different. The gill net (*sashi-ami*) is not suited to the shallow waters within the lagoon, but rather to the deeper reef crest waters and along the reef edge. These correspond to the daily feeding migration routes of fish [*cf.* AKIMICHI 1978a]. In other words, fishing spots suited for gill netting are not effective for stake netting, and so the former are spatially segregated from the latter.

Fixed netting is hazardous to the stake net fishery. The introduction of the small-scale fixed net fishery (*masu-ami*) to Itoman waters provoked territorial conflicts among the two groups of fishermen. This net was first introduced in the early-1970s and was operated by fishermen from Yone and Kyan, who belong to the Itoman FCA but who are not affiliated with the Itoman fishermen. The fixed net is semi-permanently placed in fishing grounds that are also suitable for *ambushi*. In particular, the more than 20–30 iron poles required for fixing a bag net for the season occupy a sea area semi-permanently. Although no legal basis for rejecting the other fishermen's intrusion exsists, these poles interfere with other nearby activities. The location of fixed nets and poles is indicative of over-crowding, as is shown in Figure 9. The large proportion of juvenile fish taken by fixed netting is also the ecologically hazardous.

A general meeting of the Itoman FCA was called in the sumnier of 1983 to approve several types of fisheries rights. The maximum number of stake nets per fisherman was discussed. But the meeting had a disadvantageous outcome for the *ambushi* fishermen. The maximum number of nets for both *ambushi* and small-scale fixed nets was set four per fisherman. Whereas *ambushi* fishermen can manage to use only three nets a day at most, working for approximately twelve hours, the fixed netter is favored with a larger catch while spending fewer hours hauling. Although sharing the same FCA membership, *ambushi* fishermen and fixed netters live in two separate communities and oppose each other for the use of the same fishing grounds. No strong social bonds like the *munchū* in the *ambushi* fishermen's group exsist. Ecological and political processes involved in this problem should, however, be examined through follow-up studies [AKIMICHI 1978b].

RECLAMATION

Man-induced modification of the coastal environment has also greatly affected territorial behavior in the *ambushi* fishery. Owing to large-scale land reclamation

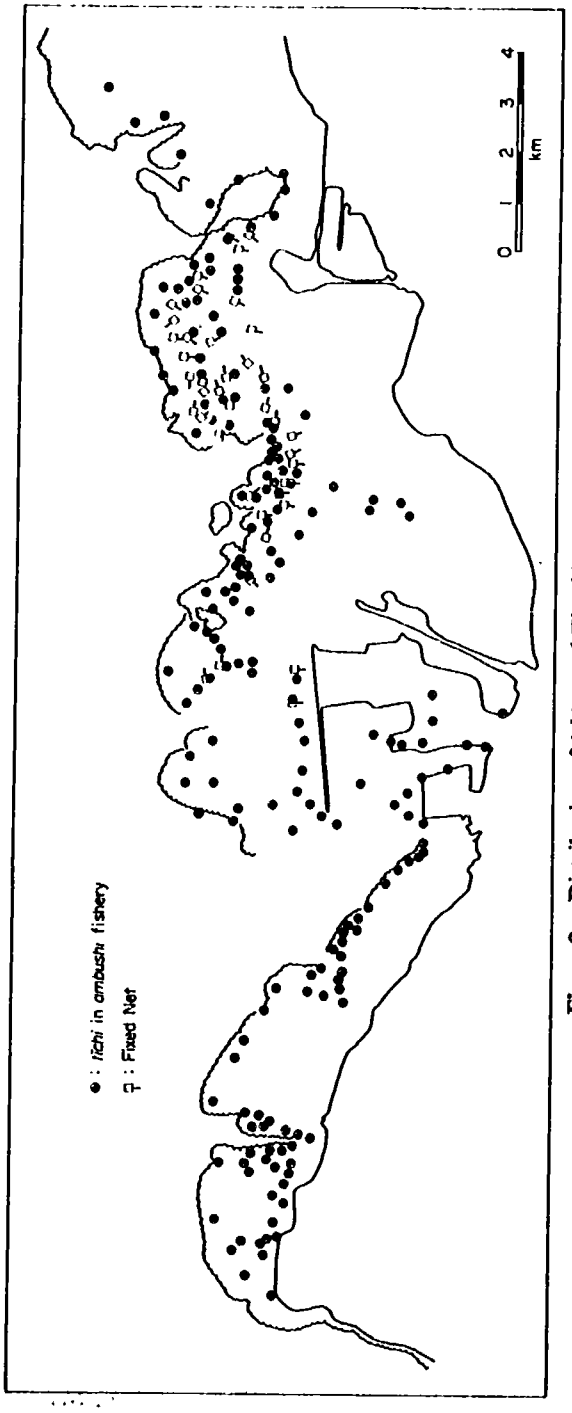


Figure 9. Distribution of *ishiyā* and Fixed Net (*masu-ami*)

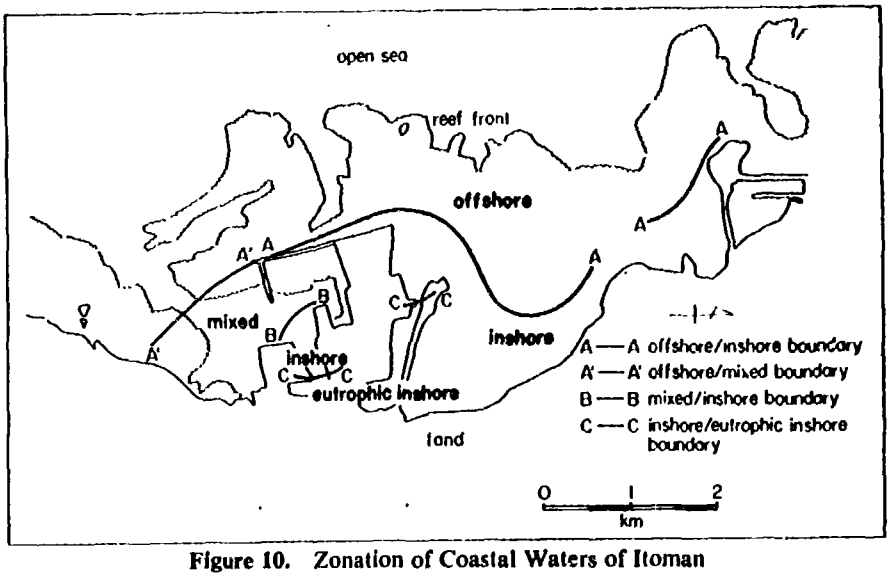


Figure 10. Zonation of Coastal Waters of Itoman

Source: [OKINAWA-KEN and UBE TANKI-DAIGAKU 1981: 25]

since the 1960s, the coastal waters of Itoman have been altered enormously. As a consequence of this, and the destruction of fishing grounds in particular, the number of available fishing spots has drastically diminished. According to an environmental assessment survey made in 1980, the coastal waters of Itoman can be divided into four zones, judging from the biological composition of plankton and

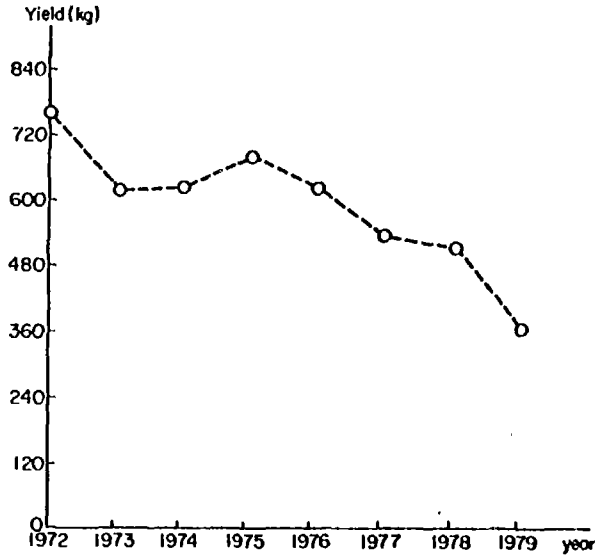


Figure 11. Trend in the Yield of Fish Drive and Stake Net Fisheries

benthos in the area. These are offshore, inshore, mixed (offshore and inshore) and eutrophic inshore zones [OKINAWA-KEN and UBE TANKI-DAIGAKU 1981]. As shown in Fig. 10, lines A, B, and C are the possible ecological boundaries of offshore, inshore and eutrophic zones. Though data are not available on the distribution of coastal biota before the start of large-scale reclamation, both lines A and B must have been nearer the coast than at present, and line C might have been confined to a small area.

Eight years of catch records (1972–1979) for one fishermen who conducted both stake netting and fish driving show that there has been an apparent decline in yields per day during the last 5–6 years (Fig. 11).

Ecology and Territoriality

Judging from the present findings on the use of fishing spots, creation of territory in *ambushi* fishery was the adaptive measure of sea tenure applied for both conflict resolution and resource conservation.

Such environmental constraints as typhoons and the fish recovery cycle primarily give ecological bases to the informal regulations on territoriality in terms of space and time factors in fishing activities. That knowledge of good fishing spots appears to be shared quite uniformly among fishermen is related to the group membership composition of fishermen. In other words, the strong social bonding of *munchū* also enabled fishermen to informally create sea tenure regulations. Both ecological and social factors are the bases of territoriality in *ambushi* fishery.

However, land reclamation and the introduction of a fixed net fishery have not only reduced possible fishing areas for *ambushi* fishery but also the number of fishermen who can catch enough fish to sustain a livelihood. Decrease in the number of fishermen might first make it likely that informal regulations would fall into disuse, but owing to over-crowding induced by the fixed net fishery a need has arisen for alternative regulations. The formal regulations on the maximum number of nets, made in the summer of 1983, unexpectedly served to undermine the harmony of ecology and social structure.

CONCLUSION

Concepts, processes and the implementation of territoriality in a small-scale fishery have been described, focussing on the stake net fishery of Itoman, Okinawa Prefecture.

At the macro-level, historically stratified maritime institutions, such as village-based *umi-hō-giri*, entry rights, exclusive fisheries rights and communal fisheries rights, profile the formal aspect of territoriality, whereas at the micro-level, through such measures as prior occupation claims, conventional territory, concession, negotiation and prohibition, practical territorial behavior is informally regulated.

Such environmental factors as winds, waves, spawning season, and, *inter alia*, fish recovery cycles, provide the ecological bases for informal regulations in the

stake net fishery. In addition, socio-economic consequences have moulded these ecological premises. Emergence, establishment and decline of the territory in *ambushi* fishery in Itoman can be interpreted as the disparity process of ecology and social structure in a fishing community. The study of informal regulations in the territorial behavior in a small-scale fishery is indispensable to an understanding of maritime institutions as a system of man's adaptation to the marine environment.

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SOCIAL ORGANIZATION AND TYPES OF SEA TENURE IN MICRONESIA

by

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Social Organization and Types of Sea Tenure in Micronesia

KEN-ICHI SUDO

Although geologically diverse, most islands of Micronesia are surrounded by a reef-lagoon system, which, together with deeper waters outside the reef supplies the islanders' principal sources of animal protein.

Traditional sea tenure, especially reef and lagoon tenure, in Micronesia may be broadly conceived of as a system of social relationships between persons or groups of persons with respect to marine areas and their resources. Patterns of tenure in Micronesia range from the "ownership" of specific tracts of sea space by families, through lineages and clans, to communities.

Based on a study of nine Micronesian societies, this paper examines the social basis for different types of sea tenure in the region. Although details of course vary, four main types of sea tenure may be distinguished in Micronesia:

Type 1: In which a reef and lagoon is owned by all islanders or villagers but is controlled by a chief, as in Palau, Ponape and Satawal;

Type 2: In which particular areas of reef and lagoon are owned by lineages, clans or other similar units, as in Namonuito and the Marshall Islands;

Type 3: In which the entire reef-lagoon system is owned by lineages or clans, as in Ulithi, Lamotrek, Truk, Mortlock and the Gilberts; and

Type 4: In which the reef-lagoon is owned by families, as in Yap.

INTRODUCTION

The islands of Micronesia are not all of the same type: the Marianas are volcanic, the Carolines include both high volcanic and low coral islands, whereas the Marshalls and Gilberts are composed entirely of coral. Although the sizes and forms of these islands are varied, each is usually surrounded by a reef and lagoon system. Needless to say, the most important source of animal protein in Micronesian diets is derived from a wide variety of reef, lagoon and blue-water fishes, supplemented by shellfish and sea turtles.

The concept of sea tenure refers to a multitude of reciprocal rights and duties that arise in relation to real property [see LUNDSGAARDE 1974a,b]. I consider sea tenure as system by which some person or a social group utilizes sea areas, controls the extent and degree of exploitation of their waters and thereby protects them against over-exploitation. As such, traditional sea tenure in Micronesia, especially

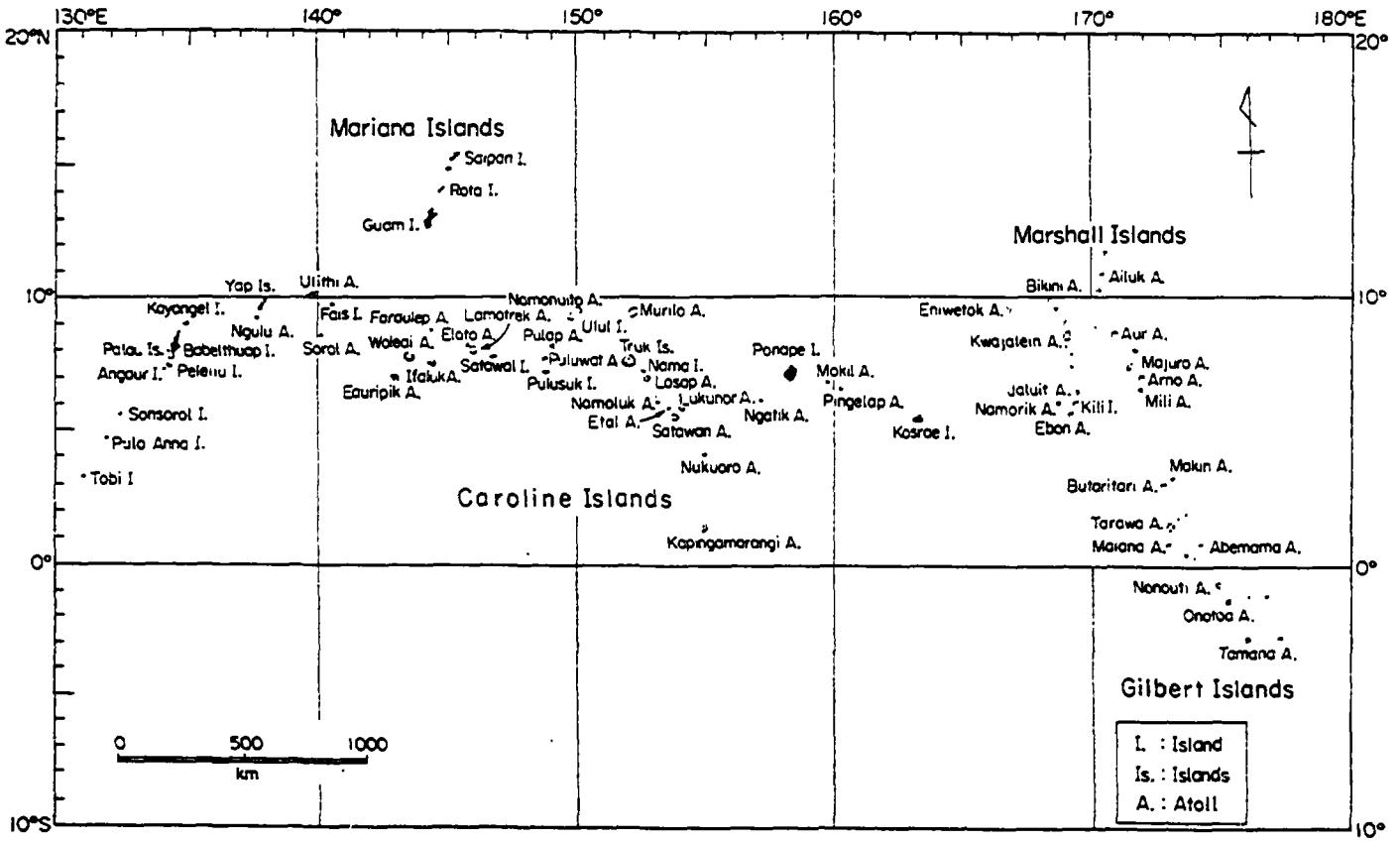

Figure 1. Map of Micronesia

reef and lagoon tenure, may be conceived of as systems of social relationships between persons or groups of persons regarding the sea.

With respect to the features of sea tenure in Micronesia, Johannes has stressed its importance in fisheries and conservational management via protection against overfishing in local fishing grounds [JOHANNES 1977, 1981]. He points out that "...the right to fish in a particular area was controlled by a clan, chief, or family, who thus regulated the exploitation of their own marine resources" [JOHANNES 1978a: 350]. The problems of sea tenure and regulation to conserve a limited resource on Kiribati (Gilbert Islands) have been discussed by Zann [n.d.].

In this paper I attempt to clarify the nature of the relationship between social groups and their exploitation of marine resources. For this purpose it is necessary to answer each of the following questions: what sections of inshore water are categorized as fishing grounds?, what kind of social unit forms the basis for sea tenure?, and how may a person acquire use rights in a sea area?

The patterns of sea tenure range in type from the "ownership" of specific tracts by individual families, through progressively larger social units, such as lineages and clans, to the communities. In Palau, for example, the reef and lagoon belongs to districts or villages. But at the other extreme, in Yap, particular reef and lagoon areas are owned exclusively by patri-extended families.

In this paper nine Micronesian societies are examined, focussing on the social units of sea tenure (Fig. 1). The data on Satawal, Ulul and Truk were collected during the course of my own field research, and those for the others were derived from published sources. For convenience, the societies have been grouped into four major categories (Types I–IV), based on the social units of sea tenure, in a progression from less to more sub-divided.

Type I is where inshore waters are considered the "common property" of all the islanders or villagers and fishing rights are controlled by a chief or village council. Palau, Ponape and Satawal are included into this type;

Type II occurs in societies where several specified sections of the inshore waters are owned by a particular kin group (clan or lineage), but where there are other areas open to use by all inhabitants. Ulul and the Marshall islands are included in this type;

Type III is those societies in which inshore waters are divided into small sections, each owned by a particular kin group. The Mortlocks, Truk and Ulithi atolls are included into this type; and

Type IV is where inshore waters are parcelled into small tracts, each owned by a particular family.

SEA TENURE PRINCIPLES IN PALAU, PONAPE AND SATAWAL ISLAND

Palau

The Palau islands extend northeast to southwest from Kayangel to Angaur, for some 170 km. This chain is composed of about 350 islands, the largest of which is

Babeldaob, a volcanic island with a total area of 230 km². In 1980 the 12,116 people of Palau resided in villages scattered along the coasts of the major islands. Babeldaob Island is divided into 10 Districts comprising about 70 villages. Each village was traditionally settled by either seven or ten ranked clans. The eldest man from the four highest-ranking clans of a village became the leader of the Village Council (*klobak*), which was composed at the heads of all village clans.

The clan is based on the principle of matrilineal descent and segments into lesser units, lineages or families. It is a dispersed, exogamous, named and ranked group. The segments of a clan are the units of land-holding. Post-marital residence is usually patri-avunculocal, therefore the members of one family (household) are a man, his son and in-marrying wives with unmarried sons. However, after the death of a maternal relative, a man usually moves to his mother's village, where his own clan members reside.

In aboriginal Palau, land was divided into public lands and clan lands. The former consisted of lands in the interior of islands (Babeldaob, Koror, Peleliw and Airai), mangrove swamps and the sea and reefs [SUGIURA 1944; BARNETT 1949; KANESHIRO 1958; MCCUTCHEON 1981].

FISHING GROUNDS AND FISHING RIGHTS

The public land was owned by the village (*beluú*) and administered by the Village Council. Members of a village had rights to utilize the resources of those areas. That is, they could enter and exploit resources in public lands without first obtaining permission from the council. Other villagers were required to obtain prior approval of the council, and in some cases make a payment of traditional Palauan money before exploiting any resources within the lagoon.

Fishing rights in inshore waters owned by each village are controlled by the chiefs or the Village Council [JOHANNES 1981]. Villagers are free to undertake any kind of fishing. Women may gather shellfish and men may carry out spear fishing, trapping and stone weir fishing. Fish traps and stone weirs are collectively set or constructed by the members of a male age group or by individuals. The men who set the fish traps and the stone weirs have permanent use rights to them. The catches obtained are consumed not only by fishermen's families but are also shared among all the village families. The chiefs, however, are not privileged to receive any share of the catch as a contribution derived from their own status [SUGIURA 1944].

Fishing rights to the open sea, on the other hand, are not defined so strictly and are not regarded by villagers as important fishing grounds. This is because the lagoon provides abundant marine resources and so there is no reason to go beyond the reef for fishing [JOHANNES 1977]. In aboriginal times, it appears that the reef boundaries were not so clearly defined as at present. During foreign administration, following the establishment of the trochus industry, reef rights were instituted [KANESHIRO 1958].

Ngerael and Kossol reefs, between Kayangel and Ngarhelong, exemplify two districts having use rights to the same inshore waters. Traditionally, those reefs belonged to the two districts and were freely accessible to members of both villages.

Further, two districts may arrange for the mutual exploitation of their respective reefs. For example, Ngardmou and Ngaremlengui trochus fishermen do not enter each other's reef area during the first three days of the trochus season, but may do so after the third day [KANESHIRO 1958].

To summarize, inshore waters in Palau are owned by a village and controlled by the Village Council. The members of a village have the right to exploit marine resources in inshore waters belonging to their village. And men usually have the right to use both the inshore waters of their father's and mother's village, owing to the patri-avunculocal residence rules.

Ponape

Ponape is a high island with associated small islands, and has a total area of 375 km². It is surrounded by a barrier reef which averages 4 km in width. In 1980 it had a population of about 20,000 persons, but in aboriginal times the population was probably about two or three times larger. Ponape is divided into five districts, each of which was originally independent and dominated politically by two lines of chiefs, each with particular ceremonial and political functions [FISCHER 1957]. The head of the most important line is *Nanmwarki* (king), who was considered as the original titular owner of the land and sea shore in his district, but who appointed a sub-chief to control each village (*kowshap*). A village is composed of several matri-localized clans.

A number of reef formations are distinguished into several sections; inner reef (*mathalap*), coral heads (*mathapei*), outer barrier reef (*paina*) and small coral island (*theke*). Various fishing methods are related to the tide; hand fishing, hand net fishing, seine netting and fish poisoning, among others [BASCOM 1965]. All those sections are called *nansed* (lit. "home waters"). On the other hand, the open sea (*nanmadau*), the area outside the barrier reefs, is not exploited as a fishing ground by the native islanders [SHIMIZU 1982]. In aboriginal Ponape the inshore waters are strictly divided among the villages. In them fishing and all other use rights are enjoyed by all residents of the village, who are free to enter and exploit the marine resources of the area [FISCHER 1958]. If fishermen catch a particular species of fish or Green sea turtle (*Chelonia mydas*), they are obliged to contribute it to *Nanmwarki* [SUGIURA 1944; SHIMIZU 1982].

However, *Nanmwarki* have no privilege to receive any share of the catch as a contribution derived from the status of titular owner. The catch obtained is distributed to fishermen's relatives. After the establishment of the German mandate, around the turn of the century, the custom that each village, through its *Nanmwarki*, had the right to control access to its fishing ground died out [JOHANNES 1978b]. Today fishing grounds are open to everyone [pers. comm. SHIMIZU]. To summarize, inshore waters on Ponape are believed to have originally been the property of the king, whereas the members of a village have rights to exploit marine resources without the permission of the king.

Satawal

Satawal island lies 1,000 km east of Yap and 500 km west of Truk. It is a raised coral island surrounded by a fringing reef that averages 50 m in width (Fig. 2). In 1980 there were 492 people living on Satawal, comprising 86 household groups. The important kin group and the unit of land ownership in Satawalese society is the matrilineal lineage or clan (*yáyinang*). As postmarital residence is matrilocal, the residential group is the matrilocal extended family: several women (sisters), their daughters and their daughters' daughters with in-marrying husbands, unmarried sons and adopted children. Family members live in adjacent houses built on their lineage land and comprise a corporate group. This residential group is called *pwukos* (homestead). There are fifteen homesteads, the largest of which contains 12 households and 72 members [SUDO 1979, 1980].

SOCIAL ORGANIZATION

Satawalese society is composed of eight matri-clans, which are strictly exogamous, ranked and have names. All clans on Satawal are ranked in an order based on the sequence of their arrival on the island. The three highest-ranking clans are thought of as the "original" clans, and are known as the "clans of chief." The other five are considered as later immigrants, and called "the clans of the commoners." The eldest man of the senior line in the clans takes the status of the clan chief. They control the clan lands and allocate lineage members plots of land.

The heads of the three chiefly clans have authority to organize and initiate island or intra-island activities. They discuss and make decisions on the important affairs of the island, such as communal fishing, ocean-going expeditions by sailing canoe, and sanctions to be imposed on a person. They have the right to call meetings and convey decisions to the islanders. They are also responsible for controlling food resources. For example, they may place taboos to prohibit the use of taro patches, coconut palms or a particular sea area in times of scarcity.

Today, the order of ranking among the three chiefs is less clear so that they share the responsibilities for island affairs: fishing, taro gardening and coconut harvesting. The chief of fishing activities is called *sómwoon sáát* (lit. "chief of the sea") and has rights to control marine resource use and to decide fishing methods.

FISHING ACTIVITIES ON SATAWAL ISLAND

The inshore waters of Satawal are broadly classified into four sections; *neenéné* (reef flat), *woorh* (reef front), *núkúnú woorh* (seaward margin) and *metaw* (open sea).

Neenéné is a shallow reef flat exposed at lowest tide and is small in area. A good catch cannot be expected there. In this area men and women collect shellfish and spear octopus. Some men set small fish traps to catch goatfish (Mullidae) when the southwest wind prevails, especially in June and July. And the communal fish driving, using long ropes with coconut fronds attached, is done only occasionally. This activity is directed by "the chief of the sea" and all islanders participate in it.

On the *woorh* women collect sea urchin during the summer season. The *núkúnú woorh* is the most important fishing ground, where men engage daily in many

kinds of fishing. Fishing techniques employed in this zone are underwater spear fishing, fish driving using a net, pole fishing while swimming, bottom line fishing, and fish trapping. The technique most usually employed is spear fishing. Occasionally, 8–10 fishermen jointly make a circle, hit the water surface and spear fishes which rush to the shelter of the coral reef. Of greater importance is the use of fish traps belonging to a lineage and fish driving techniques.

Fish traps are used from May to July, when the southwest wind is dominant and the sea becomes calm. Traps are set at a depth of five or six fathoms, outside the reef, and retrieved every one or two days. Catches consist mainly of parrotfish (Scaridae), wrasse (Labridae), surgeonfish (Acanthuridae), leopard-cod (*Plectropoma leopardus*), and the like. Fish driving employs a semicircle of 20 swimmers who drive fish toward the net by hitting the water surface and making noise. This communal fishing activity is only permitted on special occasions, when major ceremonies take place. The chief makes the decision to conduct a fish drive.

Bottom lining is usually conducted from canoes both during the day and at night, outside the reef. Fishermen paddle their canoes outside the reef and set lines at depths 10 to 20 fathoms, using sinkers. Bottom line fishing is done at a particular fishing ground off the island; at Wénimong reef, which extends from the northeastern end (Fig. 2). This reef is usually closed to fishing and controlled by the "chief of

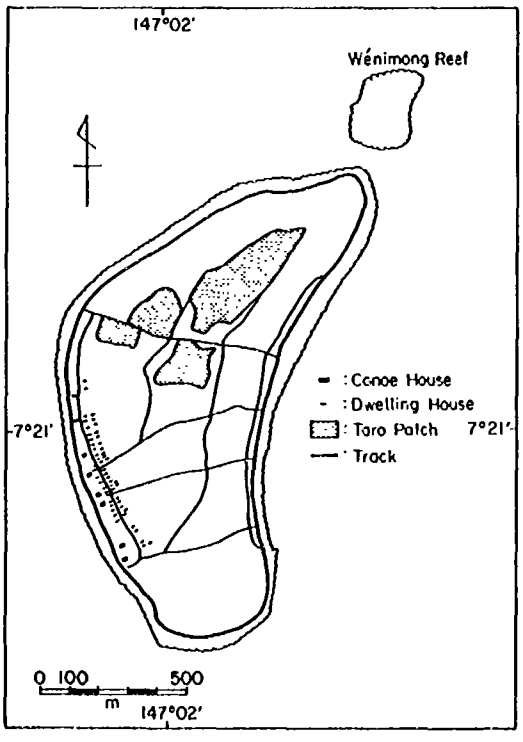

Figure 2. Satawal Island

sea." Night fishing, using a carbide torch, hooks mackerel scad (*Decapterus pinnulatus*).

The open sea around the island is trolled by sailing canoes which tack back and forth on the lee side of the island, trailing one or two lines. Outboard motor-powered boats have been introduced from the 1970s. Pelagic fishes taken by trolling are tuna (*Thunnus* sp.), bonito (*Euthynnus* spp.), wahoo (*Acanthocybium solandri*), and dolfinfish (*Coryphaena* sp.). Two other important fishing techniques are used; pole-and-line fishing and capturing Green sea turtles (*Chelonia mydas*) either by hand or with a large spear. Pole fishing is oriented toward specific species by season, and is conducted at an unidentified reef, called Wenikiiy, some 15 km southwest of the island.

Wenikiiy is a good fishing ground since tuna and bonito school there for feeding. This fishing is conducted from large sailing canoes which must be steered to chase the schools of fish. Fishermen hook these fish using a long pole-and-line, during the northeast wind season (October to February). Turtling is mostly limited to two uninhabitant islands, West Fayu Island, 180 km north-northwest, and Pikelot Island, 90 km northeast of Satawal, respectively (Fig. 3). The men of Satawal sail their canoes to those islands in search of turtles. After arriving they walk around the islands looking for nesting turtles or signs of nesting. When a turtle is found it is immediately captured and turned over on the beach. If a turtle is found swimming within the reef, two men chase it with hooks inserted in a bamboo pole and hook it round the neck. Permission must be obtained from the chief to undertake a turtling expedition [McCoy 1974].

Table 1 shows the fishing activities conducted from June to December, 1979 on Satawal. Fishing on Satawal has the following characteristics: activities both in the

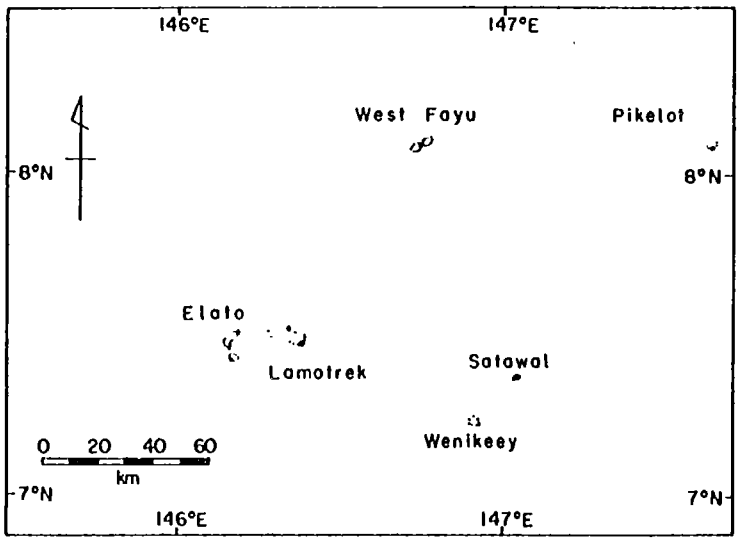

Figure 3. Location of Satawal and nearby Islands

Table 1. Fishing Activities on Satawal, from June to December, 1979[1]

Month	Reef Flat and Seaward Margin				Wénimong	Wenikeey		West Fayu	Events
	Trapping	Spear-f.[2]	Fish-d.	Bottom-l.	Bottom-l.	Pole-l.	Trolling[3]	Turtling	
6	6 days	8 days	2 days	1 day	1 day	0	2 days	1 time	—
7	4	12	4	2	2	0	3	1	—
8	0	9	4	3	2	0	4	0	Church, child[4]
9	0	6	2	2	2	0	3	0	child
10	0	7	2	1	2	0	2	0	U.N. Day, child
11	0	4	0	0	1	3	1	2	—
12	0	4	0	0	2	2	2	2	Christmas

Table Notes: 1) Days surveyed are from 15–30, June and from 12–30, November. 2) Spear-f. (Spear fishing), Bottom-l. (Bottom line fishing), (Fish-d. Fish driving) and Pole-l. (Pole-and-line fishing). 3) Trolling was carried out by outboard motor-powered boat. 4) Child indicates the birth of a child.

lagoon and outside the reef are conducted extensively from June to August, the southwest wind season, and those done in remote reef areas and off uninhabited islands are engaged in from October to December (northeast wind season). Also, the fishing techniques differ by season, in the southwest wind season spear fishing, fish driving and fish trapping are done, whereas in the northeast wind season pole-and-line fishing, trolling and turtling are carried out.

Fishing Grounds and Fishing Rights

As mentioned above, Satawalese fishermen exploit four main fishing grounds: the area inside and outside the fringing reef, an unidentified reef adjacent to the island, a remote unidentified reef, and two uninhabited islands. Fishing activities in those fishing grounds are usually controlled by chiefs, especially the "Chief of the Sea." However, the fishing grounds around the fringing reef are open to everybody. Fishing rights of women are limited to within the reef only. Men who wish to fish in the reef flat, at the reef and off the seaward margin are free to do so. Occasionally, the "Chief of the Sea" prohibits use of spears in these areas.

On the other hand, the exploitation of marine resources in all other areas is strictly regulated by the chief. Fishing activities in Wénimong Reef are usually prohibited. The chief permits fishermen to enter and to engage in bottom line fishing on special occasions. For instance, the ban on those fishing grounds was lifted 12 times during a seven month period from June to December, 1979 (Table 1). Those occasions were times of major ceremonies, such as on the national holidays of the U.S.A., on the holy days of church, and on the birth of a child.

Men who wish to visit remote reefs or uninhabited islands for fishing, are required to visit the "Chief of the Sea" and to obtain his prior approval. It is considered that the "Chief of the Sea" has proprietary rights to utilize the food resources in those areas.

Distribution of Catches

The catches obtained by individuals or members of an extended family from

fishing grounds in the reef flat and the seaward margin are owned and consumed by them. On the other hand, when the chief directs communal fishing in those areas, all the fishes caught are distributed equally to each islander. This is usually done every Saturday, if fishing can be conducted.

Further, fish and turtles obtained in fishing grounds other than the fringing reef areas are regarded as "foods of the island." For example, when fishing at Wénimong Reef, an area normally closed to fishing, is not banned, all men engage in bottom line fishing and large catches are obtained. On returning to the island, fishermen must bring all their catch to the canoe house of the chief's clan. Then the chief orders the second chief of his clan to distribute the catch equally to all islanders.

After fishing in specified areas, men who participated have the privilege of taking the several bigger fishes as their portion. They eat them, after broiling, in front of the canoe house. Men who did not participate also join this feast. However, the "Chief of the Sea" has no claim to more shares than the others, except for the occasional gift of several specific kinds of fish, such as Maori wrasse (*Cheilinus undulatus*), tuna, and the head of turtle [AKIMICHI 1981; AKIMICHI and SAUCHOMAN 1983]. That is, if fishermen catch these fishes they must present them to the chief.

SUMMARY

Fishing grounds are divided into areas closed to fishing and those open for it. The former comprise the unidentified reefs and uninhabited islands which are controlled by the chief, whereas the latter is the inshore waters around the island, which are utilized by all islanders. Satawalese fishermen characteristically exploit marine resources on the open sea, including those off unidentified reefs and uninhabited islands, during the northeast wind season, when food resources are scarce.

PRINCIPLES OF SEA TENURE IN ULUL AND THE MARSHALL ISLANDS

Ulul Island

Namonuito Atoll lies 230 km northwest of Truk, and comprises five inhabited islands. The largest, Ulul, is 1.5 km² in area and is surrounded by a fringing reef which varies from 50 to 300 m in width (Fig. 4). There are three passages through the reef. These have sandy bottoms and circuitous channels that lead from the beach through the reef flat to the open sea.

In 1974, Ulul had a population of 276 persons. Ulul society is composed of nine matri-localized clans, segmenting into 12 lineages, the latter being the important kin groups and the units of land ownership. Since post-marital residence is uxorilocal, the basic residential group is the matri-extended family. Each clan has a proper name, is exogamous and ranked. Status ranking of clans is based on their order of arrival on the island, and that which settled first provides the chief of the island. The chief has authority to proclaim an island-wide food taboo following the death of prominent men or to declare a community feast in honor of visitors. He is also responsible for controlling marine resources, and, for instance, for directing communal fishing [SUDO 1976].

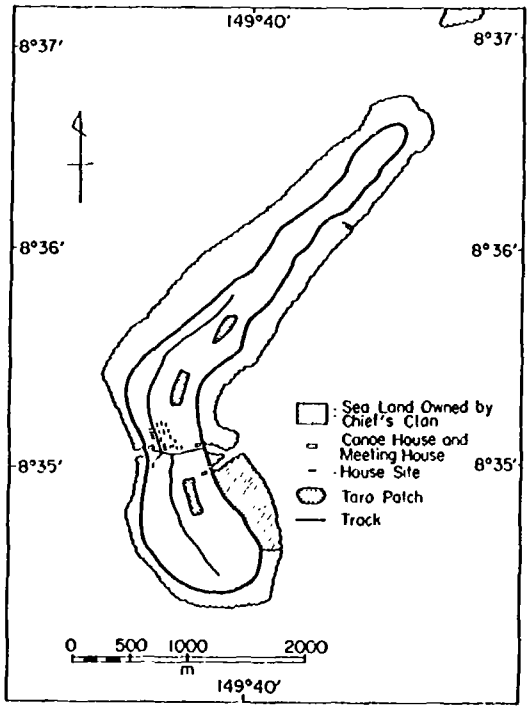

Figure 4. Ulul Island

FISHING GROUNDS AND FISHING RIGHTS

Inshore waters are grouped into three classes: *lelóólō* (reef flat), *lúkúnú woorh* (seaward margin) and *mataw* (deep sea inside atoll). *Lelóólō* has a depth of about one fathom at high tide, and is used by men and women to spear octopus or to take needlefish (Belonidae) using a rod-and-line. Occasionally, led by the chief, men conduct fish-drives. In the *lúkúnú woorh*, men engage in collective underwater spear fishing, encircling fishes by hitting the water surface and spearing them as they rush to seek the shelter of the reef.

Mataw is the most important fishing ground, where men carry out bottom line fishing or trolling from canoes. Men paddle canoes 8–9 km offshore to catch snappers (Lutjanidae), leopard cod, porgies (Sparidae), emperors (*Lethrinus* spp.), and the like from the sea bottom, about 30 fathoms below. They also troll from large sailing canoes for such large fish as tuna, bonito and barracuda (Sphyraenidae). All islanders are permitted to do any kind of fishing everywhere, except in one tract inside the reef. That tract, located in the southwestern part of island and near a large reef passage, is exclusively owned by the chief's clan. It is the widest reef flat area and fishes are especially plentiful there.

The members of the chiefly clan utilize it mainly to catch octopus for the baiting of fishing lines or for food. However, this fishing ground is preferentially opened to all islanders for the occasional communal fish drive. Communal fishing directed

by the chief is carried out in different lagoon areas twice a month, on the average. It involves mainly fish driving near the reef flat or bottom line fishing inside the atoll. The chief distributes the catch equally to all the inhabitants.

Marshall Islands

The 29 atolls and 5 raised coral islands which comprise the Marshalls have a total land area of only 120 km² and a population of 30,000 (1980). Marshallese society is composed of a number of ranked matrilineal clans. The most important corporate descent group is the matri-lineage (*bwij*), the basic and foremost land-holding group. A residential group can range in size from a nuclear family to a large matri-extended family of 20 to 25 members [ALKIRE 1977]. In social organization, the head of the highest-ranking clan in any island or atoll assumes the status of paramount chief [SPOEHR 1949; MCGRATH and WILSON 1971].

FISHING RIGHTS

Throughout the Marshalls the paramount chief traditionally claimed the reef section. He could place a taboo on several particular reef sections, which were usually near a lagoon entrance and the habitat of schools of fish. When so tabooed, no one else was permitted to fish that particular reef. (In 1934, the Japanese authorities voided that and declared the entire reef open to everyone [TOBIN 1958].)

On the other hand, the inhabitants of any atoll were allowed to utilize the marine resources in sections other than where the chief had invoked a taboo. However, outsiders were strictly prohibited from exploiting the resources of an atoll without obtaining permission from the chief. According to Tobin, "...the power of the

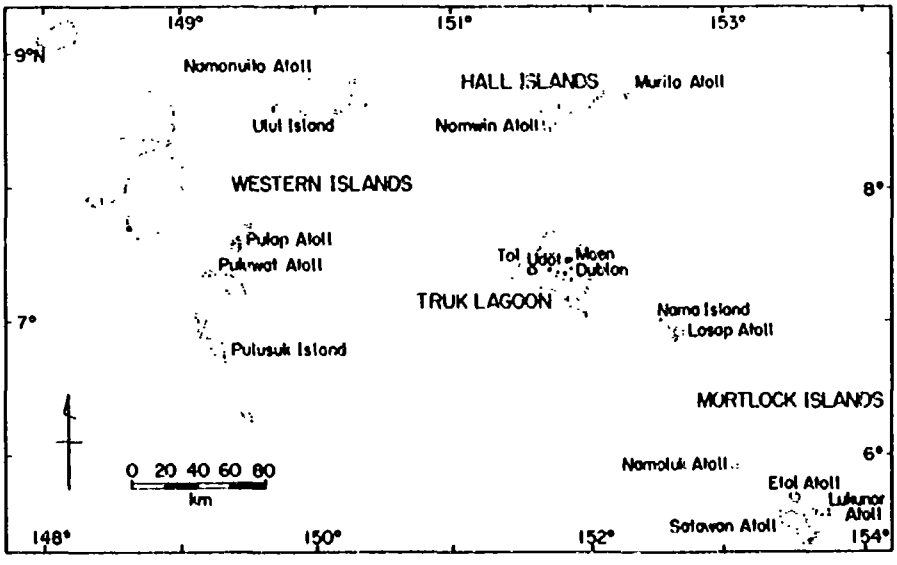

Figure 5. Truk State
Source: [NASON 1975]

chief has become weakened since the arrival of the foreigners but the concept that the right to exploit the marine resources of an atoll is the prerogative of the inhabitants of that atoll still persists" [TOBIN 1958: 69].

In summary, in Ulul and the Marshalls the paramount chief has proprietary rights to control particular areas of inshore waters where fish are especially plentiful. Except for specified sections, all inhabitants may exploit marine resources.

SEA TENURE PRINCIPLES IN MORTLOCK, TRUK AND ULITHI ATOLL

Mortlock

Etal island is an atoll which comprises the Mortlock Islands (Etal, Satawan and Lukunor Atoll). Although there are 15 islets in Etal Atoll, only Etal, the largest, is inhabited. It has area of 0.6 km² and in 1980 had a population of 446. Etal Island is divided into two districts: Western and Eastern (Fig. 5, 6). Mortlock society is composed of eight matri-clans which are strictly exogamous, named and

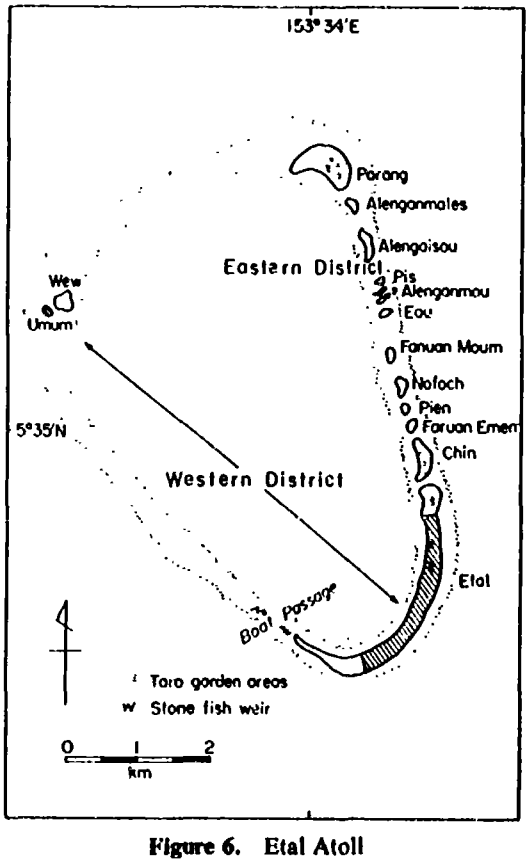

Figure 6. Etal Atoll
Source: [Nason 1975]

ranked. The most important kin groups and the units of land ownership are the matrilineal descent groups, clans or sub-clans. All clans are ranked in an order based on their sequence of arrival on the island.

The head of the first and highest ranking clans is the island "Paramount Chief." He holds proprietary rights over the entire atoll and is also the chief of Western District. Those rights to both land and sea are the basis for the highest ranking clan's political suzerainty over all later in-coming clans [NASON 1971]. The head of the second ranking clan takes the status of Eastern District chief. The chief of each clan initiates and directs labor activities that are clan-oriented, *e.g.*, cooperative work to clean or maintain clan land, the operation of clan-owned fish weirs and the instruction of collective fish driving.

FISHING GROUNDS AND FISHING RIGHTS

The inshore waters of Etal Atoll are divided broadly into two categories: *wa* and *setllap*. *Wa* is the sections adjacent to the reef, *i.e.*, the reef front and reef flat deeper than 15–30 fathoms. These sections are important fishing ground since they are used by women to collect shellfish, whereas men place fish traps and construct stone fish weirs there. *Setllap* refers to all other deep water sections inside the reef where men carry out bottom line fishing and fish driving.

Compared with *wa* and *setllap*, the open sea is relatively unimportant since it is closed to exploitation for several months each year owing to hazardous wind and sea conditions [NASON 1971]. *Wa* and *setllap* are divided into small tracts, each of which is named. These tracts are owned by clans or sub-clans, which have exclusive fishing rights to them. That is, members of the clan or sub-clan can conduct any kind of fishing in inshore waters belonging to their kin group.

Members of the same clan engage jointly in specific fishing activities: lagoon fish drives into stone fish weirs, lagoon fish drives using a net and joint bottom-line fishing. There are five fish weirs owned by particular clans. The catch obtained from an owned weir or lagoon section is usually distributed to all the clan members by the clan chief. However, if members of another clan wish to utilize the weirs, they must seek permission from clan owning them, just as they would if they wished to do bottom-line fishing in a lagoon section owned by any another clan. And if another clan's members fished there, they are obliged to present some of the catch (from 25–50 percent of the total) to the owners of the weir or lagoon section [NASON 1971].

Since the paramount chief of Etal holds proprietary rights over the lands and inshore waters, he can place a taboo over one section of the reef off Etal islet in times of food scarcity or to commemorate the death of a prominent man. The chiefs of each district also possess proprietary rights to place taboos on particular reef sections within each district. These taboos are designed to conserve marine resources. After removing the taboo, the catches obtained in those sections are distributed to all the inhabitants of Etal or to those of each district.

In Lukunor Atoll, which lies 30 km southeast of Etal, fishing rights to inshore waters are almost same as those of Etal. *Setllap*, the shallow, sandy-bottomed areas within the lagoon, is owned by a matri-clan or matri-lineage. *Wanfouko*

(*wa*) are the submerged shelves jutting out from both sides of the island, in which individuals or lineages have exclusive fishing rights. Stone fish weirs built in the *wanfouko* are owned by clans or lineages, but not by individuals [MARK 1977].

In brief, the fishing rights to inshore waters in the Mortlock Islands are owned by matrilineal descent groups; matri-clans or the lesser segments of those. Clans are ranked, usually in accordance with the order of their arrival on an island. Therefore the chiefs of two higher-ranking clans have specific rights to control the marine resources of inshore waters. In other words, they are the overseers of several particular sections of fishing grounds, the catches of which are distributed to all the inhabitants of an island.

Truk

The Truk Islands are a complex of volcanic and coral islands within a large lagoon encircled by an extensive reef. Individual islands are surrounded by a fringing reef. The land area of Truk is approximately 100 km². The 14 main islands are inhabited and in 1980 had a population of about 34,000. In terms of social organization, each island is divided into several districts, comprised of villages. A village is composed of a number of matri-lineages, the basic units of land holding [GOODENOUGH 1951].

Waters inside a lagoon are broadly classified into the reef flat (*wóónmaanuaw*), seaward margin (*wooch*), and blue water (*mesaaraw*). The reef flat and seaward margin are the most important fishing grounds, and are strictly sub-divided into several named sections. Each section is owned and controlled by a particular lineage. Although such property as sand or rock is owned exclusively by lineages, fishing rights in those sections are open to all villagers. Women gather shellfish and carry out hand net fishing. On the other hand, the fishing rights to the seaward margin are limited to members of the lineage owning that section. Men engage in underwater spear fishing or drag net fishing in this section. If men obtain a catch in reef sections owned by another lineage they are obliged to present several fishes to the owner of that section.

Ulithi

Ulithi Atoll lies 160 km northeast of Yap. It comprises about 30 islands or islets, of which only five are inhabited, by 710 persons in 1980. Politically, the atoll is divided into eight districts, each composed of several villages and one or more lesser islands. Districts are ranked and Mogmog District is the main one.

The basic corporate group which owns land is the matrilineal lineage or clan. Lineages or clans are also ranked, therefore the highest ranking clan of Mogmog District furnishes the hereditary, paramount chief. The paramount chief of Mogmog has some jurisdiction over the entire atoll. It is said that each district was distributed to the chief of each island by the paramount chief, who set aside several reefs, lagoons and islands that he had controlled directly. The chiefs of each district control marine resources on behalf of the paramount chief [USHIJIMA 1982b].

The lagoon and reef areas of Ulithi Atoll are divded into sections: 14 in the lagoon and 18 in the reef. Sections are possessed and controlled by particular clans in a district (Fig. 7; Table 2). Members of clans in any district or island have fishing rights in inshore waters belonging to their clan. They carry out mainly bottom-line fishing and trolling in the deep lagoon sections. In adjacent reef sections spear fishing, drag net fishing and fish driving are done by men.

The authority of the paramount chief is acknowledged by periodic gifts of specified fish, such as Maori wrasse, leopard cod, bluefin trevally (*Caranx melampygus*) and red-throated rainbowfish (*Coris aygula*). No one may partake of them until the proper presentation has been made [Lessa 1950; Akimichi and Saucholman 1982]. If some of these fishes are not presented to the paramount chief he may confiscate the reef or lagoon sections from which they were obtained. That is, the paramount chief has the right to dispossess the inshore water sections of particular clans.

To summarize, in these three societies the inshore water sections, especially lagoon and reef area, are divided into small tracts and each tract is held separately by a descent group. And the chief of the highest ranking clan has the privilege to control and to regulate a specific area of fishing grounds. This regulation is to conserve marine resources for a few months.

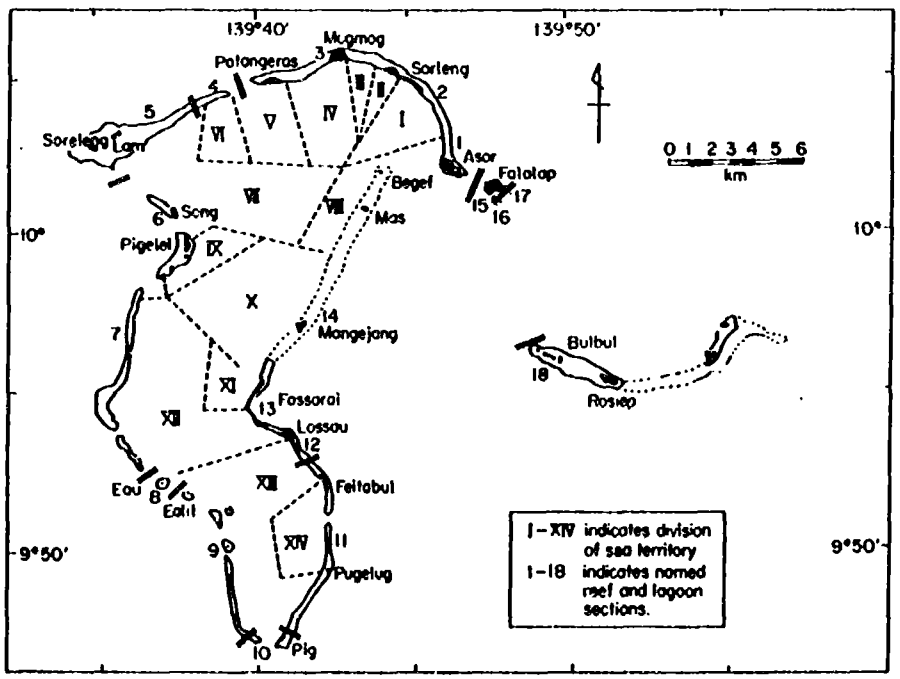

Figure 7. Reef and Lagoon Sections on Ulithi Atoll [after Ushijima 1982b]

Table 2. Division of Lagoon and Reef Sections in Ulithi Atoll

Clan	Location	Reef Section	Lagoon Section
Rigipa	Falalap	15	—
Falchugoi	Falalap	16	—
Falkel	Falalap	17	—
Bogatlaplap	Rosiep	18	—
Efan	Asor	1	VIII
Lugalap	Sorleng	2, 5	—
Maifan	Sorleng	—	I
Maiyor	Sorleng	—	II
Fashilith & Numurui	Mogmog	3	IV, V
Falmay	Mogmog	—	III
Fashilith[1)]	Mogmog	4, 6	VI, VII, IX
Muroch	Mangejang	7, 9, 11, 14	X
Lebogat	Fassarai	8, 13	XII
Tauefan	Fassarai	—	XI
Fachal	Lossau	10, 12	XIII
Ligafaly	Lossau	—	XIV

Table Note: [1)] Paramount Chief's clan.

PRINCIPLES OF SEA TENURE IN YAP

Yap is a high island 216 km² in area, or, it the reef area is included, approximately 400 km². In 1980 it had a population of 6,670, settled in about 100 small coastal villages (Fig. 8), but in aboriginal times the population is estimated to have been four or five times larger. The important kin group and traditional unit of land ownership in Yapese society is the patrilineal lineage, *tabinaw* (lit. "one land"). As post-marital residence is usually patri-local, the residential group is the patri-extended family; a man, his sons and his son's sons with in-marrying wives and unmarried daughters. That family may live on lands belonging to a single, named house site. Schneider [1974] has referred to these associated land parcels as an "estate." Lingenfelter [1975] and Labby [1976] have characterized the *tabinaw* by such terms as "landed estate."

"Estate Land" and Sea Resources

A Yapese estate usually consists of one or more houses, several taro patches (*maut*), yam gardens (*milay*), coconut palms (*nhw*), grassy uplands (*tayld*), forests (*egaragar*), tracts of sea inside the reef (*daay*) and stone fish weirs (*ech*). The eldest man of a patri-lineage heads the estate and has nominal control over all estate land. The Yapese consider these associated land and sea resources as a single unit centered around an elevated stone foundation, on which main dwelling house is constructed. This stone foundation is called *dayif* [Mahoney 1958; Ushijima 1982a].

That is important because the rank of a lineage is derived from the rank of the name-bearing *dayif* itself. The *dayif* is also the seat of all authority and political rights that, by definition, belong to an estate. To the Yapese, people express those roles that are seen to reside within their land. That is, a man is chief because he

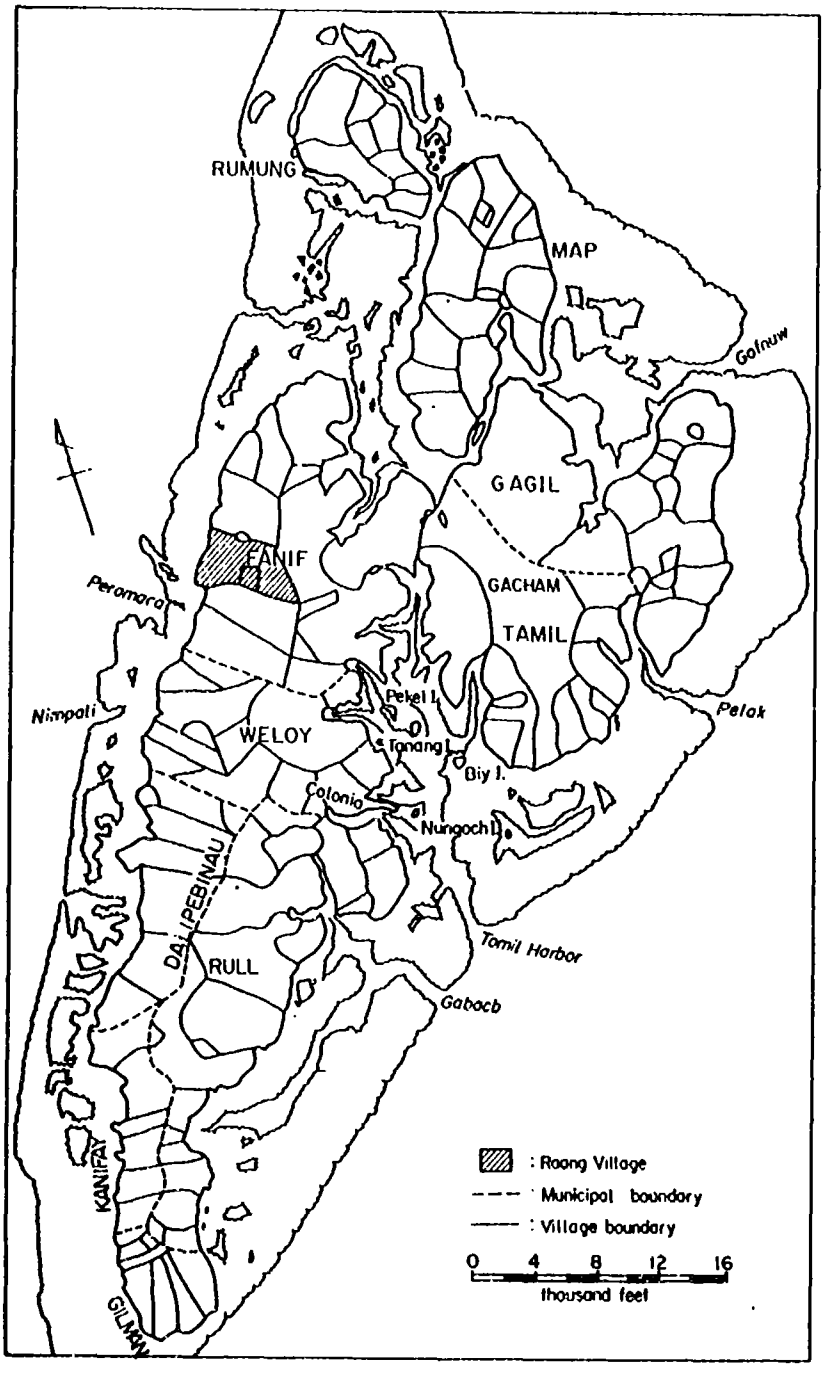

Figure 8. Yap Island
Source: [LINGENFELTER 1975]

holds chief's land. It is said that people are not chief, but rather that the land is chief. Therefore the "estate" (*tabinaw*) supplies more than just subsistence and living space to its occupants. It is also the source of social status [LINGENFELTER 1975; LABBY 1976].

VILLAGE ORGANIZATION

The Yapese community is a distinctly defined and named village settlement, within which land and sea resources are developed, exploited and protected by communal operation. A village (*binaw*) is organized by several patri-lineages (*tabinaw*) each of which is represented by its head at village councils. The council forms the decision-making body and is the legal authority of the village. In the organization of a village, three particular statuses stand out above all others: "the Chief of Ritual," "the Chief of Village," and "the Chief of Young Men."

The "Chief of Ritual" is the old, wise counselor to the council and chiefs. In the past he was responsibile for holding religious ceremonies. The "Chief of Village" is the executive head of a village. He is also the economic leader who controls the lands and marine resources in a village. The "Chief of Young Men" is to be heard in all village councils. If the council decides upon work, the young men do it. Those chiefs are heads of the highest ranking patri-lineage, the pioneers of the village, which in any village have the greatest power. Each status is assigned to a certain "estate" (*dayif*) in the village.

A number of lesser statuses are found in the organization of village affairs. These have particular rights or authorities for certain communal activities. For instance, the men appointed to such statuses carry out the roles of the "Leader of Gardening," the "Leader of Net Fishing" and the "Leader of Torch Fishing" in the open sea (*pilung ko fita*). The activities of net fishing and torch fishing are complemented by those of the "Magician of Net Fishing" and "Magician of Torch Fishing." The chiefs and magicians may often be authorities held by the same "estate" and the same person [LINGENFELTER 1975].

In the village organization there are other important statuses, called *suwon* (lit. "sitting erect," "trusteeship," or "to oversee something"). This concept is applied to the men's house, club house, land and food resources. The levels of overseeing vary with the level of village division. There are *suwon e maut* (taro patches), *suwon e daay* (sea lands) and *suwon e fita* (fishing), among others. Those statuses are also derived from a certain "estate."

FISHING ACTIVITIES IN INSHORE WATERS OF RAANG VILLAGE

Raang village, Fanif District, is located in the eastern part of Yap Island. Its shoreline is 800 m in length and surrounded by a fringing reef which averages over 1 km in width. In 1977 it comprised five patri-extended families (*tabinaw*), and had a population of 20 (male 12, female 8). Although there are 50 estates with the *dayif*, only five are occupied by residents, a result of extreme depopulation over time. According to informants, there were estates five or six times this size in the early-twentieth century. The inshore waters of Yap are divided by each village boundary, which extends directly from the village through the lagoon and reef and to the open

sea. Boundaries inside the reef are defined by passages or channels through the fringing reef.

Inshore water is classified into four sections; *ey* (mud flat), *rayém* (reef flat), *náá* (inner side of the fringing reef) and *riigur* (open sea). *Ey* is the sandy tideflat alternately submerged and uncovered by tidal movements. This shore section is utilized for hand net fishing by individuals or members of a family. The catches are mainly damselfish (Pomacentridae) and wrasse (Labridae). *Rayém* is the submerged shelf, with deep holes at low tide. The villagers engage in trap fishing or collective drag net fishing in this area. Their catch consists of wrasse, rabbitfish, goatfish and snappers. In the area through *ey* and *rayém*, one or two families join together and build a large bamboo fish weir (*seegal*). Villagers also engage in fish driving to catch needlefish (Fig. 9).

Náá includes the reef crest and coral heads and patches where there are many passes and submerged channels where fish are especially plentiful. Men engage jointly in drag net fishing, led by the "Overseer of Fishing" (*suwon e fita*), and construct stone fish weirs in this area. This fishing ground is divided into small tracts owned by particular families. The families who own tracts have the right to build stone fish weirs. Villagers consider these tracts and stone weirs as immovable property of particular families. The fishes caught by drag net fishing and the stone weirs are mainly porgies, goatfish, parrotfish, snappers, wrasse, filefish (Aluteridae), and mullet (Mugilidae) [HAYAKAWA 1982; USHIJIMA 1982a].

Fishing in the open sea is a village affair, led by the "Chief of Fishing" (*pilung ko fita*) who is a village official and at the same time a skillful expert and magician of fishing. There are two kinds of typical fishing methods; *mangal* (flying fish: Exocoetidae)-fishing and *athing* fishing. *Mangal*-fishing is done for one or two months during the southwest wind season (June and July). Fifteen fishermen board a canoe at night, two of them having torches, others having large hand nets to scoop-up the flying fishes attracted by the torch light. *Athing*-fishing is a kind of the round haul net fishing. About 32 fishermen get into two canoes. This fishing is done by a long drag net stretched between the two canoes. Fishermen spread the net in large semi-circle and enclose the fish [SUGIURA 1939].

Today, the only fishing activities done in Raang village are at the individual family-level, for subsistence. Communal fishing, in which all male members of a village participate, and which was once important, has been abandoned, as have stone weirs.

FISHING RIGHTS AND FISHING GROUNDS

The inshore waters of each village are called *madaay* ("Village Sea Land") and are owned by the villagers. Outsiders are strictly prohibited from exploiting the resources in this area. If a person lacking an estate in this village fishes inside the *madaay*, the villagers may seize all the catch and gear of the trespasser. In Raang village certain patri-extended families, usually of high ranking estates, "own" and oversee all fishing grounds within the reef. The fishing rights are parceled out to various estates and careful distinction is made among the methods of fishing permitted

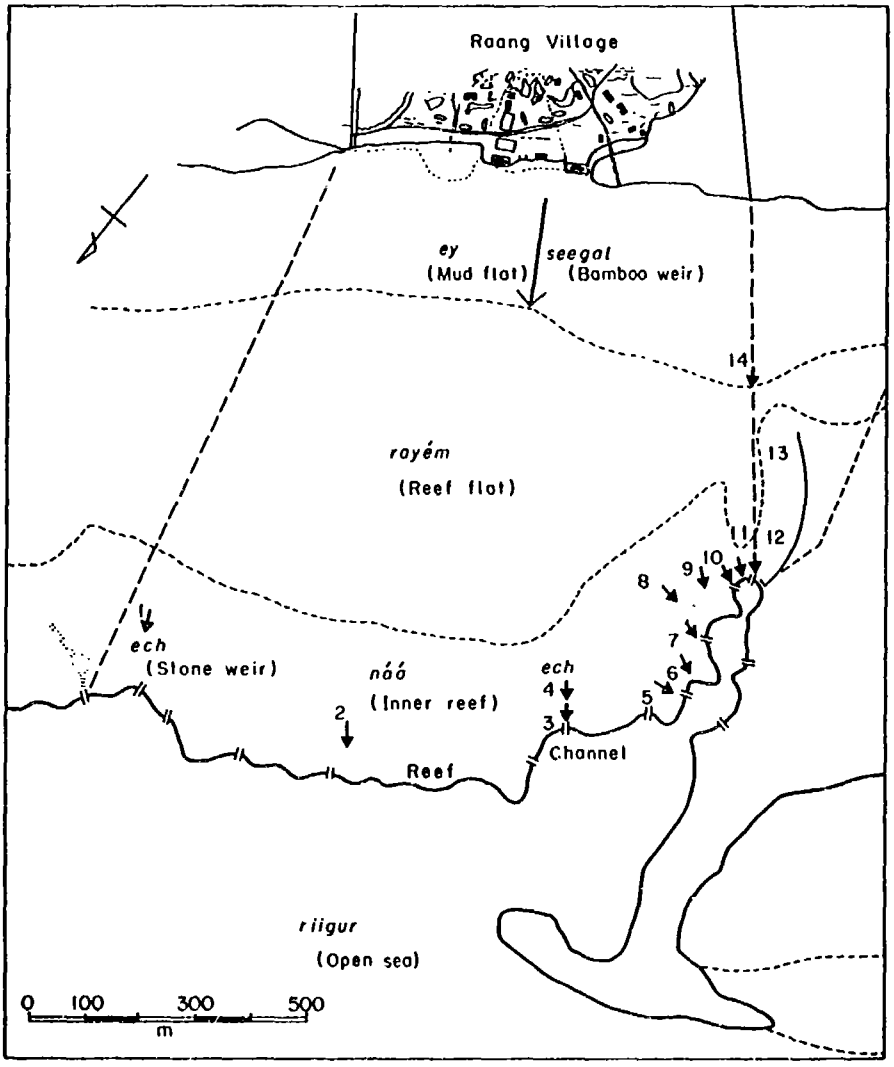

Figure 9. Location of Stone Weirs, Yap
after [HAYAKAWA 1982]

and prohibited.

There are two kinds of statuses concerned with fishing grounds and fishing methods, *suwon e madaay* ("Overseer of Village Sea Land"), and *suwon e fita* ("Overseer of Fishing within the Reef"). *Suwon e madaay* is divided into two statuses; *suwon e ey* (mud flat) and *suwon e rayém* (reef flat). The status of *suwon e ey* is to assigned the highest-ranking estate in the village ("Chief of Village"). And *suwon e rayém* is allotted to another higher estate. *Suwon e fita* is the overseer and at the same time director of collective fishing in the lagoon.

In the *ey* and *rayém* rights to hand net fishing are allowed to all villagers. But rights to use the drag net, fish trap and bamboo fish weir are owned by the *suwon e madaay*. When villagers engage in such kinds of fishing in the *ey* or *rayém*, they are required to obtain prior approval of the "Overseer of Sea Land." And they are obliged to contribute a portion of the catch to him.

Fishing rights in the *nád* are privately owned by particular patri-extended families. Those families' members have rights to construct stone weirs in this fishing ground. In Raang village are 14 stone weirs which have fallen into disuse. Each weir is set near a pass or channel in the fringing reef (Fig. 9; Table 3).

Today those weirs are owned by six families. Although some families own many stone weirs, in principle one family used to own one stone weir belonging to its *dayif* (estate). Because of depopulation, some families have inherited several *dayif* from relatives. For example, Waath has five weirs, but his own estate has only one (1. Funagil), which is associated with the status of the "Magicians of Fishing in the Open Sea." The others belong to the *dayif* it has inherited.

In the Mangabachans' case, the family owns three weirs. The weir called Fiitlangith is associated with the *dayif* of Tayib, which is assigned to the status of the *suwon e fita*. On the other hand, there are families who do not own fish weirs. Further, families living in another village (Gimen, Lubunow and Falawath) still have the right to use weirs in Raang village, rights passed on to them from an ancestor of this village. Some families of this village have rights to use weirs in other villages. Thus the ownership of the stone fish weirs has been complicated. However, the traditional custom of owning and controlling the use rights of the *nád* section is still recognized by the people of Raang village.

TRADITIONAL METHODS OF DISTRIBUTING CATCHES

There are two kinds of fishing activities in Raang village: individual or family-

Table 3. Ownership of Fish Weirs in Raang Village

Name of Fish Weir	Name of *Dayif*	Owner
1. Funagil	Bileganow	Mangabachan*
2. Girey	Biléaaw	Lubunow
3. Kókó	Bilemire	Funuo*
4. Efaal	Bilemi	Funuo*
5. Pumurl	Fiitéech	Gimen
6. Kadaay	Elaal	Waath*
7. Rayi	Daney	Falawath
8. Fiitlangith	Tayib	Mangabachan*
9. Wolmúw	Daney	Funuo*
10. Tabuuy	Daney	Waath*
11. Funamayib	Funaamathaw	Mangabachan*
12. Filtrow	Gelbuch	Waath*
13. Dorach	Fiitedoo	Waath*
14. Peey	Fiitedoo	Waath*

Table Note:* family living in Raang village.

level and collective (communal) fishing. The catch obtained by small-scale hand net fishing in the lagoon is considered the fisherman's own and is consumed by his family. For stone weirs a particular family who owns the rights to them may also take all the catch. On the other hand, communal fishing inside the reef is led and directed by the *suwon e fita* ("Overseer of Fishing"). He is also responsible for the distribution of the catch and is privileged to take several big fishes as his portion. Some pieces of those fish are presented to the chiefs. Each participant in this activity receives an equal share of the catch. Men engaged in fish trapping or use of bamboo fish weirs are obliged to present three pieces of fishes to the *suwon e mudaay*, "Chief of Village."

The distribution methods of communal catches from the open sea are different from those of the lagoon. As mentioned above, there are two kinds of fishing; *mangal* and *athing*, each led by a distinctive "Chief of Fishing" (*pilung ko fita*) with magical power. This leader lays out the catch in front of the men's house and divides it into two parts, one for the "Chief of the Village," and the other to be shared by each participant. At this time the "Chief of Fishing" takes a large fish as the portion derived from his status.

The fishes received by the "Chief of the Village" are redistributed to the villagers who did not participate in the communal fishing, in exchange for traditional Yapese money, *ngane fita* (lit. "food for fisherman"), which is kept for the communal use of the village [SUGIURA 1939; USHIJIMA 1982b].

SUMMARY

Yapese society has complex systems of rank concerned with the rights to use and exploit inshore waters. There are three well-defined status levels, each with definite roles in controlling marine resources. The "Chief of the Village," the highest rank, has important rights to exercise general control over inshore waters. His supreme rights are acknowleged by gifts from the catch obtained by communal fishing and fish trapping.

The "Chief of Fishing," of second rank, is the status which leads communal fishing in the open sea. The statuses to lead fishing and to exercise magical ritual in fishing are appendant to the privilege to receive a portion of the catch. And the "Overseer of Fishing" has the right to direct communal fishing inside the lagoon. He has the privilege to take more shares than the other participants. It is interesting that those statuses are assigned to particular estates.

On the other hand the right to use inshore waters is sub-divided. The fishing rights in reef flat areas are controlled by particular families. Small-scale fishing is allowed to every villager but for communal fishing permission must be obtained from the "Overseer of Village Sea Land." The tracts inside reefs are parcelled out and owned by particular families.

CONCLUSIONS

In this paper I have described various aspects of sea tenure principles among

Micronesian societies, on the basis of documents and from my own field data. There are multiple coexisting tenure categories and there exists a diversity of forms of sea use. I have tried to classify them into four types focussing on the social unit of ownership and the rights to exploit marine resources. That is, I refer to Type I as a type of community tenure; Type II as a composite of community and kin group tenure; Type III as a type of kin group tenure; and Type IV as a type of family tenure. Although the data on each society are not always complete, my tentative conclusions are as follows.

1) The principles of sea tenure among Micronesian societies are that people may hold rights to the sea by virtue of their status as members of a social group, formations of which range from community, through kin group, to family. And kin groups in any society are ranked according to their order of settlement on the island or in the village. Therefore the degree of stratification in society is reflected in the system of sea tenure. In Yap, especially, the authority to exploit and control marine resources is associated with the rank of the family estate. On the other hand, it is common to all societies that some persons (chiefs) or organizations (councils) exist to control and conserve marine resources. Those have rights to regulate the use of particular sea sections, and have responsibilities to protect against the exhaustion of food resources. And those authorities or statuses are alloted by the head of the first and highest-ranking kin group, which have proprietary rights over sea and land.

2) The patterns of utilization of inshore waters, lagoon, reef front and open sea, differ from island-to-island (Table 4). In islands surrounded by a wide lagoon,

Table 4. Sea Tenure Patterns in Micronesia

	Island	Utilization of Sea			Unit of Sea Tenure	Unit of Land Tenure	Type of Sea Tenure	Controlled by
		Lagoon	Reef	Open Sea				
1.	Palau (vo.)	++	–	–	co.	ma-li.	Type I. community	village council
2.	Ponape (vo.)	++	–	–	co.	ma-li.		village chief (king)
3.	Satawal (r. re.)	+	++	+	co.	ma-li.		chief of sea
4.	Ulul (at.)	+	+	++	co. & cl.	ma-li.	Type II. community & clan	paramount chief
5.	Marshall (at., r. re.)	++	++	–	co. & cl.	ma-li.		paramount chief
6.	Mortlock (at.)	++	++	–	cl.	ma-li.	Type III. clan	paramount chief
7.	Truk (vol.)	+	++	–	cl.	ma-li.		paramount chief
8.	Ulithi (at.)	+	++	–	cl.	ma-li.		paramount chief
9.	Yap (vol.)	++	+	+	fa.	pa-fa.	Type IV. family	chief of village, fishing, sea

Table Note:
Importance: Primary = ++, Secondary = +, Not used = –
co. = Community, cl. = Clan, fa. = Family
ma-li = Matri-lineage, pa-fa. = Patri-extended family
vol. = Volcanic island, r. re. = Raised Coral Reef island, at. = Atoll

lagoon sections are the most important fishing grounds. Compared with lagoons, reef front and the open sea are not utilized to such a degree by native fishermen. In islands with an atoll formation both lagoon and reef front sections are exploited as the main fishing grounds. On the other hand, in raised coral islands with undeveloped fringing reefs marine resources in the lagoon area are not so abundant, as a consequence those of the reef front and open sea, including reefs and uninhabited islands, are exploited to a maximum.

However, Yap and Ulul islands, both of which have wide areas of lagoon, are not included. In Yap the lagoon and open sea are very important as fishing grounds. In Ulul all sections are utilized, and the open sea area inside the atoll is an especially important fishing ground. Although I have arranged the patterns of sea use based on ecological conditions, I cannot discover a corelationship between patterns of sea use and systems of sea tenure. Therefore I would point out that the principles of sea tenure are far from being decided by ecological factors alone.

3) Finally, in many societies inshore waters are treated in much the same way as is land, and all areas are referred to as "food resources." Therefore, the subject of sea tenure should be discussed within the broader context of land tenure. In general, land, especially agricultural land, is sub-divided into a number of plots, and each is owed or held by particular kin group. The traditional land holding group is basically a matri-lineage or a matri-extended family, except for Yap (Table 4).

Comparing the social unit of land tenure with that of sea tenure, the societies in which the two coincide are the Mortlocks, Ulithi, Truk and Yap. In Yap, especially, a family estate is composed of yam lands, taro patches, coconut palms and sea sections. On the other hand, in the societies included in Type I and Type II, inshore waters are not strictly divided into small sections for the purpose of ownership or holding. That is, the sub-divided lands are owned or held by a kin group, but inshore waters are considered as the common property of all inhabitants. Therefore the principles of land tenure are different from those of sea tenure in those societies.

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DO TRADITIONAL MARINE "RESERVES" CONSERVE? A VIEW OF INDONESIAN AND NEW GUINEAN EVIDENCE

by

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Do Traditional Marine "Reserves" Conserve? A View of Indonesian and New Guinean Evidence

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The concept of a "traditional marine conservation ethic" existing among coastal people has been suggested by work in the oceanic western Pacific. The idea is evaluated here by using available information on territorial fishing rights in Indonesia and Papua New Guinea. Relevant data are not overabundant, but are sufficient to begin to answer some basic questions regarding the origins of marine tenure and the relationship of this ownership to marine resource exploitation and management. It would appear that such tenure is not universal, and this patchiness may be determined by a general inclination of people to give greater attention to the land than to the sea in their subsistence patterns. When it did develop, tenure probably arose most commonly as a result of conflict over marine areas, and this competition was intensified, not diminished, when certain resources became economically valuable. Such disputes were bound to be influenced by a number of factors pertaining to marine exploitation directly, but also including social and political issues and problems not necessarily relating to marine biological resources. Overall, the strong impression given is that exclusive areas became established not because people wished to conserve resources, but rather because they tended to exploit more and eventually came up against neighboring people doing the same sorts of things. Traditional tenure is but one circumstance which might have enhanced any supposed natural *status quo* between man and resources existing in the past. It is especially hard to conclude that numbers of people were determined by marine resources alone when they lived on the land and typically found most of their food there. Traditional tenure also imposes adverse constraints on coastal zone development and management, and there are certainly many problems with which it cannot begin to cope. It is difficult to argue that traditional tenure systems could realistically stand up to modern threats to the coastal zone. It is true that without responsibility on the part of the fisherman management measures cannot be expected to work. But traditional ownership patterns can only be regarded as a very imperfect route to establishing that responsibility, because the ownership existed for gain and not for restraint.

INTRODUCTION

According to the traditional conservation ethic, the practises and attitudes of subsistence peoples have much that is relevant to conservation today. It is a view

which has been developed in the marine sphere in particular from assessment of the information available on small-island peoples of the western Pacific [JOHANNES 1978]. Few ideas could be more appealing in the attempt simultaneously to prevent both over-exploitation of natural resources and the decline of traditional cultures than one which suggests that people of old developed the means of controlling the human use of natural ecosystems, and that this experience is of value to modern management. For the concept to be widely of use, it is clearly important to show that it is indeed applicable to areas other than that for which it was proposed. For the supposition to be correct, it has to be demonstrated that traditional people were either aware of conservation as we now perceive it, or that their practises had conservation effects as a by-product, even if instigated for other reasons. There is also an assumption that the conditions for which traditional practises were appropriate in terms of conservation, are similar to those prevailing today.

I will begin to provide an answer to these questions by piecing together the data available specifically on protected area practises in the exploitation of coastal resources of Indonesia and Papua New Guinea. This paper is confined to systems of marine tenure because within a broad view of protected areas, traditional "reserves" are most closely identifiable, superficially at least, with their modern counterparts.

HOW WIDESPREAD ARE TRADITIONAL MARINE CONTROLLED AREAS?

At least at one time, fishing-grounds off Aceh, in northern Sumatra, were each supervised by a special individual, the *Panglima-laut*, who could arrange the times when fishing was permitted [ANON. 1910]. Schot [1883] reported how groups of Orang Laut on the eastern coast of Sumatra came to exploit separate areas through mutual agreement. In the Palembang area of southern Sumatra van Royen [1927] has given a broad account of how the use of coastal swamps was regulated by the communal system of the *marga*. Off Tuban, in Central Java, offshore fishing-grounds were identified by floating markers anchored to the bottom [ANON. 1921].

At Salayar Island, in the Flores Sea, Kriebel [1919] mentions how reef areas were tenured and passed from father to son. Around Tanimbar, Kolff [1840] refers to areas which were exclusively used by adjacent villages. In the Kei Islands of southern Maluku, van Hoëvell [1890a] describes reserves to which all members of a village had access, although recently Barraud [1979] reported that fishing areas were not owned in the part of the Keis in which she worked. Tenure of fishing grounds at the village level has been reported for the Galelarese of Halmahera, in northern Maluku [ANON. 1937].

Traditional reserves, mostly belonging to whole villages, have been reported several times from western New Guinea, especially for the northern coast and islands [VAN DER SANDE 1907; FEUILLETEAU DE BRUYN 1920; GALIS 1955, 1970]. There is more sparse evidence of ownership of marine areas along the southern coast as well [GEURTJENS 1929; POUWER 1970].

I have come across little evidence of well-developed traditional ownership of marine areas along the southern Papuan coast of Papua New Guinea. By contrast, there are several references to tenure for the northern coast and islands. Among these are reports by Malinowski [1918] from the Trobriand Islands, by Bell [1953-1954] on Tanga Island, off New Ireland, by Panoff [1969-1970] on New Britain and by Carrier [1981] on Ponam Island, off Manus. Although this summary suggests that ownership of marine areas has developed widely in the region, it hardly supports the notion that marine tenure is, or has been, universal.

That tentative conclusion must, however, be qualified by the recognition that coverage of maritime topics has been far from adequate for the region. So often observers have given elaborate descriptions of land tenure, but have scarcely dealt with patterns of water ownership. Evidence is commonly given that such tenure is known, but not enough detail is offered to provide the inference with any foundation. That this lack represents a certain bias in the reporting of maritime matters as a whole is supported by an apparent disinterest in marine exploitation. Frequently, one is informed that fishing is a significant activity for a particular group of people, but again the details of its performance are left to the imagination. This discrepancy has been noted elsewhere, the most comprehensive review being that of Emmerson [1980]. Anell [1955], among others, refers to the paucity of data on fishing in his historical review.

At the same time, however, it seems certain that either marine tenure never existed in certain areas, or, if it existed, it disappeared some time ago. I have yet to come across any mention of marine tenure for the western coast of Sumatra, for Kalimantan or mainland Sulawesi; there is surprisingly little information given on such ownership in Java. By contrast, there is sufficient evidence of marine tenure for the eastern coast of Sumatra, for parts of Maluku, and especially for the northern coasts and islands of New Guinea. This is not a distribution which I can explain in terms of the intensity of observations. If marine tenure is patchy in its occurrence, this should not be surprising in itself, because territoriality of natural areas is not invariably found in traditional societies [HARDESTY 1977], and this is true also of fishing rights [ACHESON 1981].

UNDER WHAT CONDITIONS HAS MARINE TENURE DEVELOPED?

Is there then anything special about the perceived distribution which might explain why tenure has developed in some areas and not in others? In general it can be expected that ownership of marine areas will develop where some benefit accrues to the people involved. The resources thus contained may be particularly valuable in some way, and, or alternatively, they may be especially easy to defend. Is tenure well-developed among those people for whom marine resources are especially important? Obvious candidates for this are the sea-gypsies, the Orang Laut of western Indonesia, and the Sama Bajau or Bajau Laut of eastern Indonesia, whose livelihood has long been almost exclusively dependent on marine gathering. I have mentioned

one recorded case of ownership amongst the Orang Laut of eastern Sumatra, but there seems to be no mention of such practises among the Bajau. Perhaps such people, leading a semi-nomadic life, were in fact disinclined to associate themselves with a particular area for long enough to want to claim it; certainly they have wandered widely in the archipelago. Lack of study of their case would not seem to be responsible, because a great deal has been written about them over the years [SOPHER 1965].

Has ownership developed among sedentary coastal residents in especially productive areas? Kriebel [1919] described a case where marine tenure was well-established on one side of an island, Bonea, which was productive, while the western, unproductive side was unclaimed. Productivity alone, however, can not explain the broader pattern, because otherwise areas such as Aru, in southern Maluku, long-renowned for its wealth in marine resources, could be expected to have a well-developed tenure system. But I have yet to come across any reference to marine ownership in that area. It is admittedly possible that this is a historical quirk, that tenure once existed, but has been lost, perhaps swamped by outside commercial interests [VAN HOËVELL 1890b]. A similar explanation, though here through intrinsic population growth, might be offered in the case of Java. According to an old report [ANON. 1930], marine tenure once existed around Enggano (off Sumatra), but was abolished in the last century by decree of the Resident; the reason given was that feuds were necessary to maintain territories, and the Dutch wished to prohibit fighting.

It would still seem that a broader explanation is needed for the inferred patchiness of marine tenure in this region, and I would like to suggest two possible causes. The first is primarily ecological, namely that as often as not more reliable means of human sustenance were avaliable on land. The other suggested reason, although not necessarily unrelated to the first, is that where they are faced with the alternative of a land- or a sea-based livelihood, people seem in most cases more inclined to choose the former. Both ideas have been expressed by Bell [1946–1947: 326], in seeking thus to account for the insignificant role of fishing in the life of the Tanga Islanders:

> "The explanation [for this lack of fishing] may lie in the supernatural background dread which these people have of the sea and all that comes from it, or in the abundant and well-balanced food supply which is always available to them in their gardens and their pig pens."

I have scarcely seen such an attitude toward the sea evinced for any other Papua New Guinean people, but the former theme does exist also in the Indonesian setting. Thus van der Kroef [1954] has described ways in which the sea is widely viewed as being symbolically opposed to the land. Such antithesis has been most evocatively described in the case of the Balinese, of whom Swellengrebel [cited in VAN DER KROEF 1954] felt that the land/sea opposition dominated human existence. To the Balinese it is the mountains which are pure: they provide water and are the seat of the gods. By contrast, the sea receives the filth of the land [COVARRUBIAS 1937; HOBART 1978]. Apparently as a reflection of such attitudes, the Balinese have not traditionally lived by the sea; coastal dwellers in Bali have long been of other ethnic groups, such as the

Buginese. Although this state of affairs has been most vividly described in the Balinese case, it is probably not exclusive to it. Lombard [1980], for example, has described how to the Javanese the sea is a wilderness beyond the control of human society and as such inspires a certain awe. Emmerson [1980] has expressed the opinion that fishermen and coastal dwellers in the same area are generally looked down on.

I suggest that this caution with respect to the sea may have been reinforced by natural phenomena, such as tidal waves, and also for anthropogenic reasons, such as slaving raids in former times. Piracy was certainly a risk of coastal living over large areas of Indonesia, into the last century.

The second factor, expressed above in the words of Bell, is that once simple methods for enhancing production on land had been developed this land provided a surer source of food than did the sea. It is true that Indonesia is the home of a diverse maritime technology, as is amply illustrated by works such as that of Hornell [1920] on the design of outriggers. But it is also surprising how commonly marine exploitation is reported to be unimportant. Such lack of development of marine resources may serve to explain how it is that a minority of people—groups such as the Bajau and Buginese—came to play such a central part in marine exploitation and trade in the Indonesian archipelago.

Among New Guinean coastal peoples the picture is one of a rather sporadic dependence on marine resources. Bell [1946–1947: 310] reported that fishing by the Tanga Islanders "...is, for the most part, not regarded as an occupation vital to the economic well-being of the community nor does it loom large in the ritual horizon." Of the people of south-west New Britain which he studied, Todd [1934–1935: 194] says that "...fish and reef products provide a rather inadequate flesh supply." Referring to the Wogeo Islanders, Hogbin [1967b: 52] informs us that "...fishing by one method or another is carried out at all times, but, except when the palolo worm is expected, sea food is never of such overwhelming importance that the gardens are neglected." Verschueren [1970: 45–46] observed that the Marind-Anim whom he studied evidently prefer the months which they spend hunting and fishing inland, but that during the wet season the abundance of mosquitoes drives them to coastal dune areas where they "content themselves with the yield of the sea." Writing of the Manam Islanders, Wedgewood [1934] gives the impression that fishing is most erratic in its results.

In contrast to the picture given by such views are reports, for example by Epstein [1963] and Malinowski [1918], of the importance of fishing in the economies of the Tolai of East New Britain and the Trobriand Islanders, respectively. Clearly, exploitation of marine resources is extensive among some coastal groups, but in others a more land-based livelihood has been pursued.

Such patchy development of marine exploitation can be contrasted with that prevailing in the oceanic Pacific. Reinman [1967: 194] in his review concludes that "Present evidence for the use of the marine environment seems to indicate an increasing usage of its products from South East Asia through the Melanesian area and into

Polynesia." Anell [1955] had already contrasted fishing techniques between Micronesia-Polynesia and Melanesia, and the general view from archeological evidence is that fish and fishing techniques are more in evidence in Polynesian sites [REINMAN 1967]. This relative importance might explain any prominence of marine tenure in the oceanic Pacific. Conversely, lack of indigenous marine exploitation may explain the absence of such ownership in some areas, as suggested for southern and eastern Kalimantan [ANON. 1926b].

There are other reasons why marine tenure might not have developed more extensively than it appears to have done. Returning again to the argument that areas will be defended only where such defense is feasible, there is often the suggestion in the literature on tenure as a whole that explicit ownership occurs most commonly where the resource being defended has involved some investment on the part of the owner. Thus Crocombe and Hide [1971] explain the absence of ownership of mangrove forest by the people of Marshall Lagoon by lack of expenditure of labor in establishing or improving mangroves as a valuable resource. The labor comes only in harvesting the resources and in preparing them after they have been gathered. Another example is afforded by tidal stone weirs which are constructed on reef flats to catch fish: at least on Aua Island [PITT-RIVERS 1925] and on Ponam Island [CARRIER 1981] to the west and north of Manus, respectively, these are owned.

A further condition for effective ownership may be demarcation. Crocombe and Hide [1971] suggest that ease of identification and boundary delimitation may determine the types of area which people are likely to own and protect. This, in addition to the notion of investment, may explain why agricultural areas are so often finely divided within and between communities, whereas tracts of open water and forest are rarely subject to the same patterns of intense subdivision and regulation. Open sea areas were demarcated on occasion [ANON. 1921], though I suggest that such boundaries would have needed constant maintenance.

In summary, marine tenure is found in some areas, but it does not occur all over. Two major explanations and some lesser ones are put forward as to why this might be so. For one thing, people in several areas tend, according to some accounts, to be averse to the sea. For another, perhaps not an unrelated reason, marine exploitation is not as developed as one might expect. A third possible cause is that marine areas may not be worth owning in many cases: the resources may not be valuable enough, there is in any case rarely a large personal investment in the way that there is in agricultural land, and the areas may be difficult to demarcate.

HOW DID TRADITIONAL RESERVES FORM?

There are records of conflicts between groups of coastal fishermen in Aceh, northern Sumatra [SNOUCK HURGRONJE 1906; ANON. 1910]. One report mentioned that marine tenure around Enggano, to the west of Sumatra, was maintained by continual battles [ANON. 1930]. Schot [1883] mentions disputes between Orang

Laut groups over fishing-grounds along the eastern coast of Sumatra, and that these led to people exploiting exclusive areas.

In 1913 a group of Kangean Islanders persuaded some North Madurans to fish elsewhere because they believed that the latter were depleting their reefs [ANON. 1931]. Disputes over the exploitation of reefs have been described on Salayar, in the Flores Sea [KRIEBEL 1919], on Tanimbar [KOLFF 1840; VAN HOËVELL 1890c], and around Aru [KOLFF 1840].

Malinowski [1918] mentions that disputes over village fishing grounds had occurred in the Trobriand Islands, and van der Sande [1907] records the same off the northern coast of western New Guinea. Bell [1946–1947] reports inter-clan fighting over fishing rights off Tanga.

The inference from such reports is that tenured areas have come into being as a means of resolving conflict between people. Disputes did not come entirely to a halt thereby, and Kolff's description of one confrontation [KOLFF 1840] shows how events other than those to do with the area involved could contribute to the escalation of a disagreement. Clearly, disputes did not arise unless people had something to fight over, and Kriebel's [1919] anecdote of how only the productive side of an island came to be tenured is instructive in this regard. A complication to the productivity story is Carrier's [1981] description of how, although only obviously productive areas are owned around part of the coast of Ponam Island, in another part even intervening relatively unproductive habitat is claimed.

If, as a whole, however, people only take the trouble to defend what is valuable, then tenure patterns may clearly change according to what is deemed worth owning. A third feature of disputes over traditional marine "reserves" involves an element of opportunism. Both Carrier [1981] and Johannes [1982] report how conflict over reefs evidently increased around Manus, to the north of mainland Papua New Guinea, when *Trochus* became a valuable commodity. In Carrier's case the disputes led to the breakdown of dominance by a single clan, although whether the multi-clan tenure which arose in its place was a reversion to some earlier pattern of ownership is unclear [CARRIER 1981]. It has been reported that around Marshall Lagoon, on the Papuan Coast, marine tenure was until recently poorly developed, if at all. It is only with the expansion of fish as a cash commodity that villages have started claiming exclusive rights to their adjacent waters [R. ALU, pers. comm. 1983]. Kolff [1840] described how a dispute arose between two villages over the harvest of *trepang* (bêche-de-mer), trade in which is thought to have greatly expanded in the latter part of the eighteenth century. Perhaps marine tenure there was a response to this valuable business. On Nila Island, in eastern Nusa Tenggara, the latter was not the case; tenure arose early on, but disputes evidently increased when pearl-shell became valuable [ANON. 1926a].

A further feature of disputes over rights to marine exploitation is that these were commonly influenced by such social factors as intergroup rivalry. A case relevant to this issue was related in Aroma, on the Papuan coast [K. RAVU, pers. comm. 1982]. Apparently a few decades ago (in the time of my informant's grandfather), a group

of fishermen, the Alukuni, settled near the mouth of Hood Lagoon, just to the west of Aroma. There was a long-standing disagreement over land rights between the Aromans and two pre-existing villages in Hood Lagoon, Keapara and Karawa, and it was the latter people who permitted the Alukuni to settle where they did, between them and their adversaries along the coast, in Aroma. Matters were aggravated when the Alukuni, non-agriculturalists and fishermen exclusively, began fishing in Aroma Bay and came to barter their catch for vegetable produce in Aroma. As a result of this affront the Aromans unilaterally fixed a boundary close to the Alukuni settlement, across which the latter were not permitted to venture. Particularly because the Aromans themselves were not keen fishermen and were primarily cultivators, the disputes were perhaps least of all over the marine issues overtly focussed on, more over land, and perhaps most of all over intergroup differences. Baines [1982], in attempting to explain how comparable villages on a Fijian island have come to own marine areas of very different size and location relative to the owning villages, suggests that these distributions are as much a result of historical factors, including the order of colonization, and fluctuations in local power, as a reflection of the equable dispersion of people and resources.

Having discussed these aspects of disputes in an attempt to understand the origins of marine tenure, I have nevertheless to admit that it is also arguable that some conflict may have arisen as much as a consequence of the instigation of tenure, as that tenure might have developed out of original conflict. Indeed, it often seems possible that the idea of laying claim to marine areas might have been introduced from outside rather than deduced autonomously from conditions prevailing within the area. This is a historical question which is not easily, if ever, going to be resolved for any one case.

HOW DO MARINE TERRITORIES RELATE TO THE RENEWABLE RESOURCES WITHIN THEM?

In giving a brief overview of the conditions under which tenure might have developed, I have already implied that ownership may be influenced by a number of factors. Although disputes, as indicators of the conditions leading to territoriality, seem often to have related to the exploitation of biological resources, conflict could also arise for other reasons. Thus van der Sande [1907] speaks of ownership being directed not only at fishing, but also at trade through the waters claimed by villages, and Panoff [1969–1970] relates how landing site rights can be involved in addition to those of fisheries in village reserves among the Maenge of New Britain. The case of the Alukuni and Aroma in Papua suggests, moreover, that where conflict developed overtly over fishing issues the prime mover may not have had anything directly to do with the sea. The resulting boundary would appear to have been quite arbitrarily placed, as far as habitats and resources are concerned.

It becomes evident that in many cases "social" issues may have been as much at stake as "resource" ones. Referring to the Trobriand Islanders, Malinowski [1918]

stated that with catches being abundant, there were no grounds for anyone to be mean in distributing the catch. Everyone received a share of the harvest, but the privilege of giving was highly valued and distribution had to proceed according to customary rules. An implication is that if people fought over marine areas [MALINOWSKI 1918], this was not for scarce resources, but rather for the status of being a giver. Both Baines [1982], writing of Fiji, and Bell [1946-1947], describing the Tanga Islanders, imply that power-play is as much involved in marine tenure as is an ecological allocation of resources. Comparable contentions for land tenure can be found in the works of Hogbin [1967a], Crocombe and Hide [1971] and the Papua New Guinea Commission of Inquiry into Land Matters [ANON. 1973]. Perhaps we should recognize, as Sahlins [1968] did, that both environment and culture are likely to be important in shaping the organization of people. This does not mean that ecological factors could not be of predominant importance in some cases, and one might argue that since it is exploitation which is primarily involved in the case of the sea, and not additional factors such as settlement, therefore such might be the case with marine tenure. In view of what I have said above, however, I believe that such an extreme stand is scarcely tenable.

Even if an ecological-determinist argument is pursued, it is not at all clear what might be the limiting resource which would determine the carrying capacity of people. With the widespread role of agriculture, and sporadic dependence on fishing, it would seem more likely that land resources are significant in this regard than marine ones. Perhaps this relationship depends on what influence agriculture had on patterns of marine exploitation, but from first principles either an increase or a decrease in the intensity of marine use could be argued. It depends rather on whether people became more or less likely to fish in the sea as advances in cultivation techniques occurred.

The impression given from several accounts is that tenured marine areas were simply a seaward extension of tenured lands. On the island of Nila, for example, only people owning land adjacent to the sea had rights to marine exploitation [ANON. 1926a]. The design of the traditional marine "reserves" would thus seem to be more dependent on those on land than *vice versa*. Fishing and agricultural coastal people therefore present a case that is particularly difficult to evaluate. Perhaps the marine picture would be far simpler if people lived on the sea, but then, as on land, additional factors would come into play. Vayda [1976] has presented a case for warfare among certain inland groups, among them the Highland Maring of Papua New Guinea, maintaining the population at carrying capacity. Eibl-Eibesfeldt [1979] argues more generally that this might be so, but there are problems with such a simple model. Fighting still occurs at low population density [VAYDA 1976], and also specifically where wild protein is more than ample for hunter-gatherers [CHAGNON and HAMES 1979].

In conclusion, although marine tenure exists in many areas, this ownership is likely often to relate to factors other than marine biological resources. Issues aside from fishing were often at stake, rivalry within and between groups was frequently important, and even in an ecological model marine resources were not necessarily

the factor determining the carrying capacity of people. It appears also that marine reserves were commonly a mere appendage of owned land, and that there was considerable opportunism in their establishment. Although some literature gives the impression that territoriality might have adjusted populations to the capacity of their environment to support them, it has to be recognized that this state of affairs, if indeed it did come about, arose most probably through the self-interest of groups. Carrying capacity was reached, if at all, because people tended constantly to expand their populations and their use of resources, not necessarily because there was any conscious effort to balance the man-resources equation. Similar views have been more eloquently expressed by Bulmer [1982] for inland people of Papua New Guinea, and by Carrier [1982] for the Ponam Islanders. This mechanism of boundaries established by "greed" rather than by self-restraint might help to explain the paradox of people being supposedly concerned about their environment and yet tending willingly to accept economic development which can massively change that environment [*e.g.*, HAINES 1982]. They are concerned about their environment because it affords them their livelihood, but they will not readily reject something which clearly raises their meagre standard of living.

WHAT HAS CONSERVED RESOURCES?

Although it appears that on occasion people have locally depleted populations of certain marine species [*e.g.*, BULMER 1982], it may be possible to say that, as a whole, exploitable populations have tended to be conserved. However, if people did not, in the final analysis, consciously conserve marine resources, what did the job for them? I have argued above that not only were disputes not necessarily related to resources, but that even if they were, these were not invariably marine resources. The case is debatable, but territoriality would not seem obviously to have been the factor responsible for "conservation." Explanations which are at least as plausible come readily to hand.

Foremost among these is the comparative lack of marine exploitation, for which, as implied above, several factors could be held responsible. People might simply not have had the maritime technical means, or if they did they were loathe to use them. In favor of the former point is Reinman's [1967] recognition of the relative lack of certain basic items of fishing gear, such as hooks, from Southeast Asian archeological sites. Conversely, even for the Polynesian outlier, Tikopia, Kirch and Yen [1982] observe that while inshore species dominate the remains of marine organisms in middens, this was not apparently due to any technical inability to exploit pelagic species. This brings us back to an earlier contention, that of the inclination of people to remain close to land where sufficient sustenance was afforded by so doing. Did coastal people tend not to exploit marine areas because they lacked the technology and, or alternatively, because they were averse to such a livelihood? As implied above, the answer is not clear-cut, but I think the point is adequately made that marine exploitation may have been limited by means other than territoriality.

It is also possible that a relative lack of trade and monetary exchange helped conserve marine resources in many localities, although both potential influences have been present in some form in many parts of the region for a long time. Up to a point commercial values for marine products may have increased, or even led to the initial establishment of, territoriality, but I doubt that this reduced the tendency of people to deplete marine resources. People instigated reserves not so that they could take less, but rather so that they should, on average, have exclusive access to more, if the arguments I have pursued are correct.

Alternatively, it may be that if marine technology and exchange systems were adequate for resources to be depleted that this resource decline did not happen because population, or exploitation activity, was kept in check by a factor other than the availability of those marine resources. I have suggested above that this factor was more likely to have been something related to land than anything marine. Disease, malnutrition or warfare are all factors which might have contributed to keeping numbers of people down.

WAS CONSERVATION AN INADVERTENT CONSEQUENCE OF TERRITORIALITY?

For territoriality to have conservation as a by-product, either people must take more care of what they have so delimited than would otherwise be the case, or the exclusion of others must have conservation effects. If people tended to establish territories for reasons other than conservation, it is not immediately obvious that they would have managed their resources better. Although regulations prohibiting the harvesting of depleted species have been reported elsewhere [JOHANNES 1978], I have seen little mention of such measures in the region with which we are concerned here. What has been indicated is that influential individuals often place a temporary taboo on certain areas, particularly before ceremonial feasts, so that just before the event a large catch is taken from the reserve. Having visited such an area myself, off the east coast of New Ireland, in the few weeks leading up to Christmas, I fail to see how this would have conserved anything. Presumably fish frightened out of actively fished areas tend to congregate in the protected one. The time-scale would have been too short for any population increase. It is possible that the harvest was greater thereby—no doubt for the people immediately involved, conceivably also for the overall stocks concerned. Some fisheries students at the University of Papua New Guinea have also suggested that controls within some northern coastal communities have recently been instigated.

Although I can find nothing relevant on the effect of village-type reserves, there is evidence that where rights of exploitation were rented out over-exploitation sometimes resulted. Luytjes [1923], for example, complained of mangrove degradation within concessions in Sumatra. Gramberg [1880] reports what appears to have been a marked decline in an estuarine clupeoid fishery of eastern Sumatra, access to which was given on payment of a fee. Once more I see self-interest more than a desire to

conserve, although I concede that limited-term access may have precluded any long-term concern for restraint.

The result of excluding outsiders would appear to depend on the level and origin of outside exploitation. Perhaps the best way to understand this is to imagine a coast with villages along it. In the absence of exclusive ownership, people from each village would tend to exploit stocks over a greater stretch of coast, but this would not of itself lead to heavier exploitation. Given disparities in each village's population size and adjacent area, it might even lead to a more desirable uniformity of exploitation. Only if people were more likely to take a greater harvest per head of overall population, or if exploitation by non-coastal people were more intense without reserves than with them, would the resources of the entire area be more likely to become depleted. It is difficult to see how the former case might have held but the latter might have been common where people could take larger catches and preserve them. This would seem to have been less the likelihood in areas such as New Guinea than in western Indonesia, for example, where fish have been salted and therefore the potential markets larger, and where wandering marine exploitation has been a livelihood, if only among a minority of people, for longer.

WHERE MIGHT TRADITIONAL RESERVES BE APPLIED TO MODERN MANAGEMENT PROBLEMS, AND WHAT MIGHT BE THE CONSEQUENCES?

In the preceding sections I have attempted to define some of the characteristics of traditional tenure of marine areas. To begin with, there are quite clearly several types of problem which a system of traditional limited entry areas would be able to help little in alleviating. Areas of limited entry may not be able to do much for the consequences of rapid population growth, whether from intrinsic increase or immigration; they may not stand up to sudden commercialization, where the tradeable value of a resource rapidly increases; they are going to be of little use in remote, sparsely-populated areas; and they are unlikely to be of any use for regulating the exploitation of migratory-species. It is, however, hard to conceive of any generalized type of significant coastal problem to which these areas might be of great use. Conceivably they might help protect relatively sedentary species of local subsistence value, but the pressures on such resources will probably be endogenous as much as external, and there is little evidence that the system can cope with the former.

It can be claimed that the social basis for these systems has something to offer the manager. Perhaps the basic message of the traditional conservation ethic in this context is that people obviously have to be involved in the development of their resources. If so my worry is whether most people are able to differentiate between "good" and "bad" development. Traditional ownership is, in fact, at least in Papua New Guinea, a major bane of fisheries officers [*e.g.*, HAINES 1982]. The radical conservationist might claim that this proves the point; people have evidently decided that they do not want development. I do not believe that such a conclusion would

be warranted. I have heard of cases in Papua New Guinea where people have entered with apparent willingness into fisheries development projects [*e.g.*, the Sepik *solpis* program], or have accepted large revenue from development of a resource by others (*e.g.*, the Kavieng tuna-bait fishery). Perhaps problems arise primarily where a number of owning groups and a valuable resource is involved: it becomes a matter of status how much is paid and to whom. The difficulty of developing and managing coastal resources in an inter-village cooperative way in Papua New Guinea would seem to be next-to-insurmountable. To be sure legal controls in management are useless without responsibility, and this may come about through ownership of some kind. To the extent that biological resource management is a compromise, between the need to generate further knowledge and the urgency to act now, such ownership could be expressed through traditional tenure systems. From my analysis, I believe that this conclusion is based on misconceptions about tenure, and it is certainly not without disadvantages to other beneficial activities, of which conservation is but one.

A further feature of ownership patterns is their flexibility. Of New Guinea tenure, Crocombe and Hide [1971] state:

> In the short term, the lack of formal courts and rank hierarchies led to the settlement of disputes more in terms of current pressures than ideology, by negotiations or warfare. Flexibility is a distinctive characteristic of all tenure systems, and powerful individuals could select and manipulate those principles which would maximize their own advantage.

Haines [1982] warns specifically against formalizing tenure systems in Papua New Guinea fisheries. The Report of the Papua New Guinea Commission of Inquiry into Land Matters [ANON. 1973] also emphasized that not only is the demarcation of boundaries between groups difficult, it may in fact contradict inter-group relations. It also points out that membership of groups is such that to translate it into registered title is next to impossible. Even if the system could be rigidly imposed, the assumption would still be that people are "in balance" with the resources deemed most worthy of management. I have yet to see any support for this.

If traditional reserves do not typically promote conservation in any practical sense, if they often inhibit development which, it is claimed, should go hand-in-hand with conservation, and if we cannot codify their structure, what is there left? Perhaps we are left with a message that man and biological resources are intimately related, that any effect on one may have consequences for the other. I am not sure whether we have to preserve a tenure system specifically to remind us of this! I am not suggesting that the system be abolished—in countries such as Papua New Guinea this would, in any case, be impossible—but rather that, in this context, we cannot prop it up with spurious evidence of supposed roles in conservation.

My main concern, however, is whether these traditional systems can really mitigate the adverse effects of massive change. It is perhaps unreasonable to expect them to respond appropriately to novel developments far removed from the conditions under which they evolved, but such robustness is indeed necessary in the real world. If I end thus on a pessimistic note it is not for want of trying to understand

the context which I set myself at the start. Throughout, my attempt at analysis has been plagued by a lack of information. If I conclude that the traditional conservation ethic is somewhat ill-conceived in this setting I would nevertheless be among the first to admit that our knowledge of marine tenure in this region is derisorily fragmentary. A great deal more should be done to elucidate the structure and functions of sea tenure systems before they are lost altogether, or to attempt to reconstruct information on those that may already have disappeared.

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TOKELAU FISHING IN TRADITIONAL AND MODERN CONTEXTS

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ABSTRACT

Tokelau is a Polynesian atoll society with relatively abundant marine resources which has only recently begun to participate in Western-style development. This paper describes the changing social and cultural context of fishing during the developments of the 1970s. Although traditional Tokelau fishing was not at all conservationalist in emphasis, it was both conservative and ritualised. With development, fishing has lost much of its conservatism and ritual, and has become more monetised. It remains, however, not wholly commercialised, and aspects of the traditional system are still employed for both practical reasons and for their new symbolic significances.

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INTRODUCTION

> Fish and fisheries play a very significant part in the culture, sustenance and recreation of all small island communities. Even though Western style development has diversified life styles in most island communities and has created new alternatives to fish and fishing as a way of life, it is doubtful if the significance of fisheries to island people has decreased in recent years.
>
> R.E. Kearney (1980: 41)

Although the situation has hardly been adequately documented, I suspect that few people with experience of the contemporary South Pacific would deny the aptness of Kearney's statement. Everywhere outside the urban centres, fish have an important place in domestic household economies, and people frequently devote more time and energy to fishing and the gathering of marine resources than might be justified by a strictly cost-benefit view of nutrition. The same may be said of many living in urban centres, and even of migrant Polynesians in the metropolitan areas of New Zealand. Fish are much more than "just food", and fishing still connotes a distinctive style of sociability (especially for men), gathering together many diverse strands of cultural life, from the attainment and display of skills and the ideals of generosity, hospitality and sharing to the assertion and maintenance of cultural identity.

That much is a matter of casual observation. It is more difficult, however, to say very much at all for most places about the significance of fish and fisheries in the days before what Kearney calls "Western style development" began -- before the twentieth century transformations due to urbanisation, large-scale foreign aid, emigration and the spread of a market economy. Historical records are largely devoid of references to fishing, and the anthropologists of the earlier part of this century (who might have been expected to do better) seem to have paid much more attention to kinship terminology and the principles of land tenure than they did to people's ideas about fish and the place of fishing in the scheme of things.

In this paper I take up these questions of the changing significance of fish and fishery with reference to Tokelau, a Polynesian atoll society in which fishing has always been of prime importance and which has only recently started to participate in the process of Western-style development. The paper is based on over 30 months of field research on the atoll of Fakaofo at various times between 1967 and 1984, a period during which many important economic and political changes were taking place in the group.

My emphasis is on the social and cultural context of fishing rather than on changing ecological relationships or the extensive Tokelau ichthyological knowledge. From this point of view the changes between what might be called "traditional" Tokelau fishing and the Tokelau fishing of the 1980s are very marked. They can not,

however, be adequately characterised as the simple loss of knowledge, techniques and management practices, nor yet as a transition from an exploitation pattern based on conservationist principles to one emphasising individual enterprise or commercial gain. In the Tokelau case at least, the whole transition appears much more problematical, perhaps because I have been able to document many of the changes as they have occurred. For one thing, knowledge, techniques and management practices have not simply been "lost", as one might mislay a net or some other piece of equipment; they have remained firmly in people's heads as topics for reflection and discussion, and are still to some extent in the process of being adapted and incorporated into new contexts. Again, traditional Tokelau fishing in fact had no explicitly conservationist strategies. There were no closed seasons, no prohibited areas, nor any of the other conservationist measures mentioned by Johannes (1978) as characteristic of traditional Pacific Island fisheries -- and that remains the case in the 1980s.

The distinctive feature of traditional Tokelau fishing was not its conservationist ethic, but its conservatism. I shall argue that the multitude of customary restrictions surrounding traditional fishing were primarily directed toward maintaining the authority of elders and the stability of the social order (which in Tokelau amounted to the same thing) rather than toward maintaining a stable balance with nature.

TOKELAU

Tokelau comprises three small atolls set on a northwest-southeast axis between 8 and 10°S lat. and 171 and 173°W long. The total land area is only 12.2 square kilometers, made up of low-lying islets of varying size, which are basically coral rubble and sand mixed with a thin humus. Generally, they are low in fertility. The islands lie just outside the South Pacific equatorial dry zone and experience considerable variations in rainfall. Precipitation data from a 24 year period show an average annual rainfall of about 2500 mm. This is spread over all months, though the fall from April through September is approximately half of that for the remaining months. The mean daily temperature is 83°F. Hurricanes are rare; there have been only two major ones during this century though stormy weather is not uncommon during the period November through March.

In the earlier part of the nineteenth century, before the people had extensive contacts with the outside world, coconut and pandanus were the only food plants. There were no pigs and very likely no chickens. The group nevertheless had quite a sizeable population, by all accounts more on Fakaofo, the political centre. Hale wrote of his visit to Fakaofo with the U.S. Exploring Expedition, in 1841, that:

> The only edible fruits which the island produces are those of the cocoa-nut and the pandanus; and the fact that the hard and distasteful nuts of the latter are

> eaten, may lead us to believe that the natives are sufferers from want of food. The rest of their sustenance is drawn from the sea ... (1846: 160).

There can be little doubt that the people did make extensive use of their available marine resources, both in the lagoons and the immediately surrounding ocean. Although the three lagoons (covering 17, 50 and 98 square kilometers, respectively) are much more extensive than the land, none have deep-water passages to the open sea. Although this has limited the range of marine fauna in the lagoons, many varieties of fish move across the reefs between ocean and lagoon in well-known lunar monthly and annual cycles, and are caught fairly readily at those times.

After some sporadic contacts during the late 18th and early 19th centuries, the first major outside influences on Tokelau came with missionisation, in the early 1860s. In 1863 all of the atolls were raided by slavers engaged in the Peruvian slave trade, who removed over 45 percent of the population of about a thousand people. Declared as protectorates of Great Britain in 1889, the atolls were incorporated into the Gilbert and Ellice Island Protectorate in 1910, and later, in 1916, into the Gilbert and Ellice Islands colony. Disannexed in 1924, they came under the effective control of the New Zealand Administration of Western Samoa, in 1925. In terms of U.N. classification, Tokelau is a "non self-governing territory" and New Zealand remains the administering power.

The years between the 1860s and the 1920s were a time of slow but steady population increase, and saw the formation of the major features of a neo-traditional social order on each of the atolls. The technological base of the society was modified by the introduction of steel implements and utensils, including fish hooks. Clothing and cotton fishing lines became widespread, and the subsistence resources were supplemented by the successful introduction of breadfruit, pulaka (Cyrtosperma chamissonis), pigs and chickens. Until the 1950s Tokelau was to a large extent isolated from changes taking place in other parts of the Pacific. The New Zealand presence was hardly an obtrusive one, being reduced for very considerable periods to annual visits by an administrator based in Western Samoa. In these circumstances Tokelauans looked after themselves in their own way; each island had its own comprehensive system of local government and control, its own parish organisations, and, especially during periods of low copra prices, largely self-sufficient subsistence economies. It was this period, which in some aspects lasted until the 1950s, that I shall refer to as the period of the "traditional" Tokelau social order.

The changes instituted since the 1950s have followed a pattern familiar from many other parts of the Pacific. Secular education began under government sponsorship in the 1950s and was expanded during the 1960s by the introduction of the full New Zealand primary school curriculum. The 1960s also saw the introduction of a programme of government-sponsored emigration to New Zealand; altogether, over 350 people, either as single individuals

or in family groups, took advantage of the scheme before it was abandoned in the mid-1970s, while others emigrated with help from those who had previously left. There are now some 3000 Tokelauans living in New Zealand, and the population of the home atolls has stabilised at around 1600. A visiting mission from the U.N. Committee on Colonialism, in 1976, prompted further changes aimed at preparing the people of the group for eventual self-government. The most socially significant innovation has been the creation of an extensive and organised body of paid public servants. This has led to further monetisation of the local economies and to a decline in the significance and powers of village governments as more and more responsibilities have been assumed by the Public Service. The current level of New Zealand aid to the 1600 people of Tokelau is about NZ$3 million annually. Confronted by these sweeping changes, many of the old understandings on which the traditional social order was based have been eroded, and Tokelau appears to be set on a path toward closer relationships with New Zealand and a dependence on aid.

ELEMENTS OF THE TRADITIONAL SOCIAL ORDER

The traditional Tokelau social order was one of surprising complexity, with rights and responsibilities intricately divided among a number of groups and institutions with overlapping memberships (Hooper, 1970; Huntsman and Hooper, 1975, 1976). Within this order, there were two institutions of central importance, the taupulega 'council of elders' and the kāiga or 'extended families'.

Each of the three Tokelau villages was directed by a council of elders which had sweeping powers to control nearly all aspects of island life, and to decide upon questions of ownership and what might elsewhere be known as "individual" rights. Although the pattern of recruitment to the councils differed slightly on each of the atolls, they were all dominated by old men. This was in accord with two fundamental Tokelau ideas about people and their development. In the first place, relative age was an important principle of the social structure; according to Tokelau views of the life-cycle, both knowledge and the ability to think clearly and come to wise decisions increase with age. There was a prima facie assumption that the older a person was, the greater his or her capacity to think reasonably. Thus older people had greater authority than younger ones. The importance of elders in all aspects of Tokelau life is summed up in a characteristically nautical aphorism, Ko he toeaina lava ke i te muli vaka 'Only an elder for the canoe stern'. Secondly, women had no place in deliberations of decisions concerning the village. Their place was in the domestic domain, where they had key roles to play in the allocation of resources and the continuity of both kāiga and residence groups.

The most important aspects of the accumulated wisdom of the elders concerned their knowledge of the natural environment and the techniques for exploiting it, and their ability to balance conflicting demands of different sections of the community to maintain social harmony. Their collective knowledge of the environ-

ment was extensive; most importantly, they were the custodians of the knowledge about the stars which enabled the seasonal progressions to be anticipated and prepared for. This knowledge was extremely important for fishing and for the management of land resources, such as coconut and pandanus. Coconut plantations in particular were closely managed by direction from the councils of elders. Although the majority of the lands and palms on each atoll were owned by extended families, their exploitation was carefully controlled so that all sections of the atoll were evenly exploited, leaving adequate reserves.

An essential factor in the councils' control of village affairs was their right to decide upon a weekly schedule for the village and to direct the activities of all able-bodied men. In the usual weekly round of traditional life, Sundays were devoted to church, then perhaps two or three days for communal village work, followed by one or two others when men might attend to their own private affairs, or to the demands of other groups and organisations; Fridays were generally set aside for family expeditions across the lagoons to gather supplies, and Saturdays were devoted to fishing and cooking for Sundays. All this direction meant that men had very little time for a "private" life and little scope for initiative which was not directed toward some group end. Communal fishing expeditions were frequent. Those organised by the village councils involved all able-bodied men, who were allocated to canoe crews by the elders. The catch was distributed through the village inati system. This peculiarly Tokelauan institution involved the division of the whole population, men, women and children, into groups of between three and 20 people which were known as inati. Communally owned resources (most commonly fish, but also at times, other goods such as coconuts and imported flour and sugar) were distributed through this system, with each person getting an exactly equal share. The singular feature of the inati groups was that they corresponded neither to households nor to the extended family groupings, but overlapped the two. The principle of exactly equal shares for all was an important part of the traditional ethic, and one of the justifications given for communal enterprises such as fishing was that it ensured that everyone would receive an equal share, even those who belonged to families which were short of resources or able-bodied providers.

The kāiga, or extended families, remain the basic property-owning units of Tokelau society, although their economic and social significance has been eroded in recent years. Most of the land on each atoll (but neither the reefs nor the lagoons) is divided into small named sections which are vested in the various extended families. Kāiga vary widely in size, from four or five individuals up to several hundred, but they are all essentially cognatic descent groups, comprising all the descendants of an ancestral couple. The property is owned and worked in common by the whole body of descendants under the direction of a chosen head, usually the most senior male.

That much is straightforward. But there are complications. The first is that kāiga are non-exclusive groups. People belong to

at least two, one through each parent, and a common Tokelau way of reckoning and organising activities is to see everyone as affiliated with the four kāiga to which their grandparents belonged. The kāiga are not perpetual corporations; when they have attained a depth of between four and six generations most are so large that they are divided, with the lands being redistributed through the resulting segments, to be eventually recombined with the resources of other kāiga, through marriage. A second complication is that each kāiga is divided into two complementary sections -- the tama tāne or 'children of males' and the tama fafine, 'children of females', the point of reference for the division being the sons and daughters of the founding couple. Although males of the tama tāne have authority within the kāiga, the females of the tama fafine have the right to reside in the kāiga house and to divide and allocate among the members of the extended family all of the produce brought in (usually by males) from the family lands or attained by the use of a kāiga-owned canoe. This gives women quite considerable powers within the domestic sphere. A third complication, and one which also gives power to women, is that marriage is uxorilocal; a man should move to live with his wife in her extended-family household. This means that while men live in households associated with their wive's kāiga, they hold no authority there; instead, their authority is in kāiga in which they are tama tāne. Men may, however, work for their wive's kāiga, or, for that matter, any kāiga in which they hold rights.

The importance of the extended family system is that kāiga control access to the basic subsistence resources of the islands. Although people have rights in several kāiga they are generally only active members in two or three of their choice, and their choice is always influenced to some extent by economic considerations. The kāiga also control the distribution of all subsistence resources, none of which are bought and sold.

FISHING AND THE TRADITIONAL SOCIAL ORDER

It is clear from the historical evidence that Tokelauans used lines, hooks, lures, rods and nets of various kinds as well as traps and stone weirs in the days before they had extensive contact with the European world. The records of the United States Exploring Expedition (Wilkes, 1845; Hale, 1846), which visited Atafu and Fakaofo briefly in 1841, all mention the people's extreme eagerness to trade, particularly for fish-hooks and pieces of iron that could be made into hooks. It seems very probable that from that time on Tokelauans enthusiastically adopted every new material and method for taking fish that became available to them. The only possible exceptions to this are poisons (which are not available in the local flora, anyway) and explosives, which were similarly difficult to obtain. According to present day informants both these methods of taking fish have "always" been prohibited locally.

By the late 1960s, at the time of my initial field research, imported fishing equipment had almost entirely replaced items of local manufacture, the one important exception being canoes.

Monofilament nylon lines were in widespread use, having completely replaced cotton lines -- which in turn had supplanted lines made of sennit or the braided fibres of Hibiscus tiliaceus. Most men had access to a range of lines of varying strengths from 5 kg or so up to the 200 kg lines used for ruvettus and yellowfin and also capable of holding sharks, marlin and sailfish. Stainless steel trace was in perennially short supply, as were the most favoured kinds of hooks. Line fishing in the lagoon, for a variety of perch and wrasses, was not greatly favoured, except in periods of stormy weather -- though a few older men made something of a specialty of it because it was both easy and a relatively sure way of getting fish. Perhaps the most favoured kind of hand-lining was that done at night off the lee side of the island, from canoes anchored off the reef on long warps and bottom-fishing at depths of between 40 and 60 fathoms. Further out, and with stronger gear, they also fished for ruvettus (Ruvettus pretiosus) and kapoa (Promethichthys prometheus) and frequently took a wide variety of sharks as well. During daylight, the most favoured forms of hand-lining were for yellowfin, barracuda and cod. The technique of long-lining along the lower depths of the reef slope, known as makomako, was well known to older men, some of whom still kept their home-made hooks, but it was not greatly favoured because of the effort of pulling up and storing the long lengths of line involved. The only form of trolling commonly done was for small fish such as malau 'soldier fish' and atule (Selar crumenopthalmus) from canoes which were gently paddled.

Nets, all of which were locally made from imported twines, were also widely used for reef fishing. Many kāiga had scoop nets as well as the long-handled nets used for flying fish. The larger seine nets were all owned by larger groups, such as the voluntary associations or the two 'sides' of the village, which could muster the numbers of men needed for successful drives on the reef flats. The only net considered to be the property of the village as a whole was of finely braided sennit and used for the taking of the baitfish known as o. This had been made by the elders during the 1950s to replace an earlier one, and was the focus of a special ritual significance. It was, however, unwieldy and extremely heavy to use in the water and has been replaced by a nylon bait net (the original sennit net is now in the Auckland Museum).

Spears and spear-fishing were not at all favoured. Although many canoes did carry a long-handled single-pronged spear as part of their usual gear this was used mainly in emergencies, handling eels and strong fish, rather than as a separate form of fishing. Throwing spears were not used at all, and the people maintained that they did more harm than good, serving to alarm more fish than could actually be taken. They held the same opinion of spear-guns. Although a few younger men had home-made Hawaiian slings, the council of elders had long prohibited their use on the grounds that many fish were merely wounded by the barbless spears without being taken, and that the use of the slings led fish to build up a fear of men in the water.

Stone weir traps were located at various well known locations along the reef and were regarded as the property of the village as a whole, being maintained by parties of men working under the direction of the council of elders. Fish could be taken from them by individuals, but at the times when there were large spawning runs of jacks and rabbitfish, maeava (Siganus rostratus), they were most commonly tended by organised village parties.

Although light rods were fairly extensively used for fishing in gullets in the outer reef margins or casting for gatala (Epinephelus merra) or for carangids beyond the surge-line, the lure-fishing par excellence was that done for skipjack. Every Tokelau fisherman had a kofe, a bamboo rod up to 3 m long and set in a special hardwood butt to which were attached monofilament nylon lines and traditional pearl-shell lures. Though seldom used, because of the great scarcity of skipjack shoals, men nearly always took a kofe to sea on daylight fishing expeditions. Macgregor (1937) gives a good description of this gear. Its cultural significance is described in more detail below.

Kāiga

Although Tokelauans readily accepted new materials for fishing gear and had doubtless made many technical innovations, all aspects of Tokelau fishing, from the production of the simplest equipment through the organisation of crews to the distribution of catches, remained closely linked with the traditional social structure.

Since the kāiga controlled virtually all land, they also controlled access to the raw materials from which fishing gear could be made. This was perhaps more obviously the case in the days when everything, including lines and nets, were made exclusively of local materials. But it was also true to a very large extent up to the 1960s, when virtually the only access people had to money was through the sale of copra. Since copra was produced from kāiga-owned trees, both the money and what could be bought with it in the way of lines, hooks and netting twine, were also kāiga property. Canoes, which until the early 1970s were the single most important item of fishing equipment, were unequivocally kāiga property. Each extended family had at least one, and could hardly have existed as an independent unit without it. The canoes were made of the heavy, dark heartwood of Cordia subcordata which, with proper care, would last for 80 years or more. Since wood was scarce, the canoes were made up of sections (up to four in some large canoes) which were lashed together with sennit and extensively caulked. They could be paddled, poled or sailed, and were tough enough to stand the buffeting and abrading associated with passages between lagoon and the open sea.

Canoe sections were also frequently used as coffins on the death of an old and respected member of a kāiga. Since the death of such a person was not infrequently associated with the division of lands and the break-up of the kāiga, the dismantling of a canoe for a funeral symbolised in a very explicit and poignant manner the social dislocations and rearrangements involved with the death. The

control of kāiga canoe was vested in the tama tane and it was usually crewed by men of that group. In these circumstances an entire catch from a canoe would be taken to the senior female of the tama fafine, who would divide it equitably among all kāiga members. By the 1960s, this procedure had been progressively modified so that catches were more frequently divided equally among crew members. The kāiga emphasis remained, however, since crew members would then take their shares to their mothers or their sisters (and not their wives) to divide. In all these contexts the emphasis was heavily on division and distribution, so that all could share according to their needs -- and when the shares reached down to household and kitchen level they were frequently divided yet again, so that less fortunate neighbours might have some. Fish could also be quite properly asked for, in a very direct manner, and were almost inevitably given. Tokelauans would explicitly draw attention to this customary practice and its practical and moral virtues, always contrasting it with other more benighted places that they knew of. No fish were ever sold.

Elders

As in all other aspects of men's lives, the place of the elders was of prime significance. It was they who had the responsibility of maintaining the seasonal calendar by which all fishing activities were regulated. Right through the 1940s, well within the memory of many living people, elders kept watch on the eastern sky in the hours before daybreak, monitoring the new stars and constellations which progressively appeared -- and spoke about the seasons in terms of them. The star progression was linked with lunar months, each divided into thirty named 'nights' (3 series of 10 nights each), and this in turn was linked with predictive knowledge about the movements and behaviour of fish. In the last 40 years or so, English month names have progressively replaced the star calendar. But much of the star knowledge is still fairly well known, and some has been committed to writing, generally in the form of lists of the Tokelau months correlated with the Tokelau star names and the movements and behaviour of fish -- most notably gatala (Epinephelus merra), fāpuku (Epinephelus microdon), pone (Ctenochaetus striatus), laulaufau 'Moorish idol', and pāla (Acanthocybium solandri).

According to all accounts, the linkage of the star progression with the lunar calendar was not a straightforward matter, and required much continuing discussion among elders so that they could properly manage and organise fishing on each of the atolls. Tokelau canoes were slow and heavy and had to be deployed over fairly wide areas, so it was important that they should be in the right places at the right times in order to maximise catches.

The elders were also those who were held to know the most about the finer points of fishing technique -- matters such as the proper placement of baits, ways to handle currents and a host of other matters. This sort of knowledge was very closely guarded. It was taught most commonly at sea, in practical "hands on" contexts, and almost exclusively to sons, although in special circumstances it

might also be taught to sister's sons or to sons-in-law. Tokelauans speak of this process of instruction as fakapuku, literally 'to cause to swallow', a term which is used to refer to a bird's feeding of its young as well as to the passing on of traditional knowledge; the metaphorical usage is explicitly seen as an exact one, since birds feed only their own young. This attitude to fishing knowledge is still prevalent, though it may also at times be deplored -- perhaps more commonly by those who have never had the opportunities to learn. Any passing on of information about fishing outside this context was seen as a special favour. During celebrations, when the whole village was gathered together for dancing and merriment, an elder, moved by the spirit of the occasion, might stand and give a solemn discourse on some arcane points of fishing technique, and such homilies were widely appreciated and regarded as a special gracing of the celebrations. All this is not to suggest that it was only elders who knew a great deal. Other younger men were also well informed, and they certainly made innovations of their own. But it would have been highly inappropriate and presumptious for them to speak of such matters in public.

A further aspect of the elders' control over fishing was that they did not simply orate and plan expeditions -- and then stay on shore. They went with the younger men and directed the whole operation. Then, in subsequent meetings, they would generally praise the men for their efforts before calling to task before their peers anyone who had offended against the established protocol and procedures. Simple incompetence was never scolded, but effectively dealt with by joking and ridicule. The cases singled out for disapprobation were generally ones in which a man had been too eager and had interfered with the rights of others. There are many examples of this, but a single case can be taken as an illustration. In August of 1971 there was a communal line-fishing for yellowfin, using uli (Caesio sp.) as bait. The bait was caught at a special place outside the reef by swimming men who attracted the uli up from deep water by diving down and blowing from their mouths clouds of chewed-up coconut, and then catching them using tiny hooks baited with coconut. (The uli were always fished at the same place, where they were regularly fed by men even when they were not wanted for bait -- the object being to maintain a supply of "tame" uli for occasions when they might be needed.) On this expedition, one man who was a much better diver than the others, consistently went deeper than his companions, thus catching considerably more uli than they did. Although he shared his catch to some extent with men from other canoes, his behaviour was resented and he was publicly scolded at a meeting the next day on the grounds the he had probably lessened the supply of bait available to the expedition as a whole.

'Sacred Fish'

Both turtles and hakulā (a term covering all the larger billfish, in practice marlin and sailfish) were designated as ika hā 'sacred fish' and were divided among the whole population through the inati system. Any man who caught one would bring it back to the village and take it quietly, without ceremony, to the place where food divisions were made and simply leave it there. The fisherman

and his crew received no special share, and got the same portion as everyone else. Neither a single turtle nor a single hakulā could go very far when divided among over 600 people, but the practice was followed punctiliously and, as far as I could tell, without question. The fisherman received some public approbation, but no lasting status or renown. Skipjack were not of themselves 'sacred', but any canoe returning with many (say 50 or more) was expected to 'take them to the village'.

It is likely that this practice is an old one, going back to the offerings of fish made to the pagan god of the group. It has no such connotations today, though it is still valued -- perhaps more as a symbol of the special Tokelau way of doing things than anything else.

Tautai and the Kau kumete

Tautai was a status which could be achieved by men who had demonstrated competence in fishing, and was bestowed by the elders at a ceremony known as a kau kumete. Until a man was a tautai he was not supposed to take the stern seat in a canoe, the position from which all operations were directed. "Master fisherman" is a somewhat inadequate translation of the term, since the status involved much more than simply being able to fish effectively; being able to take responsibility and knowing how to ensure the safety of both canoe and crew were just as important. The kau kumete ceremony was simple enough in outline. A man's family would prepare generous amounts of feast foods which were then taken to the assembled elders in return for their "blessings" in the form of further instructions and advice and gifts of gear -- most commonly mother-of-pearl skipjack lures. It was all phrased in terms of gift and countergift -- with speeches, feasting, presentations and the inevitable distributions of food.

Kupu o te Moana 'Words of the Sea'

Any account of traditional Tokelau fishing couched wholly in the flat detached idioms of social analysis, and dealing only with matters of technique and relations of production (however fully) would miss much of what it was "really" all about. For Tokelauans, fishing drew together and displayed a huge range of significant cultural meanings. Many aspects were highly elaborated, to the point where an expedition for skipjack became both a public celebration and a ritual performance, freighted with taboos, anxiety and an air of high seriousness. There were elaborate canons of etiquette among fishermen, and in following them men were also acting out some of the deepest and most pervasive themes of the Tokelau moral order. Fishing was a matter of passionate concern. It was, in fact, much of what Tokelau masculinity was all about.

To describe this at all adequately would take us far from the confines and concerns of this paper. I shall, instead, simply exemplify it by a short account of what happened on Fakaofo during a brief period in 1971.

In late April of that year large numbers of skipjack suddenly appeared around the shores, after a period of between 15 and 20 years when there had been none to speak of, and when there had been no communal skipjack expeditions. It was a time of great excitement and general elan, which saw the hasty establishment of the "proper" organisation and the formal instruction of a large number of men who had never had the opportunity to learn the traditional lore. The frenzy began quietly enough on 19 April, with the return to the village of four canoes sent by the elders to monitor the rising of a small baitfish. The canoes had seen no schools of baitfish, but they had caught fish which had them in their stomachs. They had seen large flocks of birds working far out to sea. Four more canoes were designated to be outside the reef early the following day, while other men worked at tasks on shore. The following day one skipjack was taken from a shoal, but in circumstances so auspicious that it seemed certain that more would follow; that evening there was an excited two-hour meeting of all the elders and men, at which many points of custom were discussed. That night the elders proclaimed a hā 'taboo' on the seas around the island, which meant that all other ocean fishing (especially that for Ruvettus and flying fish) was prohibited. Forty fish were taken over the next four days, all of them distributed through the inati. There were also two more long meetings of men and elders.

During the following six days, 1100 skipjack were caught. The village was ecstatic; women danced on the shore to welcome the canoes back each day, and prepared food so that the men could eat together and hold long meetings before they went off to sleep to prepare for the next day. Then the birds suddenly disappeared and there were no more skipjack. At this point the elders decided on a kau kumete, and two days later the ceremony was held for 39 men, most of whom were about 30 years of (though three were over 40), whose families contributed 495 baskets (over 600 kg) of vegetable foods, 13 pigs, 12 tins of cabin bread, one chicken and $6 in cash. It was the culmination of two extraordinary weeks in which a whole age-group of men had listened to some 18 hours of instruction on na kupu o te moana 'words of the sea' at formal meetings, had listened to countless other tales in other less formal contexts, and had a little practical experience. And still the elders could say, with a mixture of sorrow and compassion, that they had hardly even begun their proper instruction -- a view which most of the novices freely acknowledged.

The following is a summary of the speeches given by elders at the kau kumete.

First elder: Began by explaining the significance of the gathering, its ancestral base, its rarity nowadays and the high seriousness with which it was regarded. He emphasised that it was done as a "blessing" of young men. He praised the men for their efforts over the previous days, extolled their families for the enormous amounts of food "poured out" for the occasion, and asked for God's blessing on all.

Second elder: Taking his cue from this Christian blessing, the second elder began by reciting a well-known pagan prayer asking for plenitude of all natural products. He then spoke of "the most important thing" -- respect and courtesy between men at sea, and the value of generosity. "Let your hands be open on the ocean. Do not close them. If your hands are open, you will be known for it". He then referred to the ika hā 'sacred fish', exhorting all inexperienced fishermen to leave them alone if they encountered them at sea, "because they are the death of men". He explained in great detail the dangers of coiling the rope commonly taken when swimming to catch mating turtles, and the procedures to be followed if they were audacious enough to try snaring marlin. He ended with a blessing.

Third elder: The third elder began his speech by pointing out that his words would be like the fakapuku given by a father. He spoke of lūlū, a longline technique used for yellowfin which involves releasing parcels of chum at depths of up to 200 fathoms, and emphasised the need to begin near the surface and only gradually move down to greater depths, keeping lines at different depths until they found out where the fish were. Turning then to the noosing of pāla (Acanthocybium solandri) he stressed the need for correct placement of the baits in order to set a pāla on its final course towards the noose, and the point of the stylised, graceful athletic movements involved in closing the noose -- demonstrating them all rather stiffly. Then, referring to his father's practice, he emphasised the importance of going to sea prepared for any eventuality, with hooks and gear ready, so that if one sort of fishing failed they could always try another and not come home empty-handed.

Second elder: Inspired by this advice on correct placement of baits for pāla, he went into the subject in very precise detail, some of which appeared to contradict what the third elder had said.

Third elder: Thanking the previous speaker for his amplification (and disregarding the points of difference between them) he added further details about the proper cutting up of a skipjack to use as baits for pāla.

First elder: Pointed out that fishing matters were really too complicated to learn just through words, and exhorted the novices to go out with older men and get experience, using the words only as mental maps for general orientation. Then, turning to the noosing of pāla, he pointed out the importance of patterns of sea currents for the fishing and the value of being out in the very early morning when pāla might reveal their presence by a phosphorescent glow. He also drew attention to the well-known dangers of noosing, telling a story of what had happened to him on one expedition. For these reasons, he said, novice fishermen should do things slowly and carefully at first, until they got the techniques right.

Fourth elder: This man was somewhat younger than the previous speakers, and assumed the responsibility of being the final speaker only because of his position as chairman of the council of elders. In this closing speech he explained once again the great necessity for care and attention to the welfare of crew members, and then told a long story about four canoes at sea together, one of which was in control of a tautai who refused to give bait to the other canoes and how later in the day this tautai was repaid by men in the other three canoes who caused a shoal of skipjack to sound and disappear just as he came up to it in his canoe. The moral was the need to be "open handed at sea". He then presented the novices with mother-of-pearl skipjack lures which had been collected by the elders, explaining that though it was a very poor collection it was the best that they could do these days and at such short notice. And, since the food was ready, he told people to eat.

Third elder: Pleading forgiveness for the interruption, the third elder, seeking the last word, stated that if the men really wanted to keep all the old ways then they should do things properly. If they cut up a skipjack at sea (to eat) then the backbone and tail should be kept for the man in the bow seat, while the head went to the tautai seated at the stern.

Everyone then ate, while some youths were dispatched to the shore to carry up a small canoe and place it on the ground outside the meeting house. When the meal was finished, three elders in turn climbed into the canoe to give practical demonstrations of the ala a atu, literally 'skipjack paths', a term applied to the named techniques for swinging a skipjack out of the water so that it ends up striking the fisherman's body and falling into the bottom of the canoe. For this they used a makeshift rod and a mature coconut tied on to the end of it to represent a skipjack. The demonstrations lasted a further half hour, with those given by an especially skilled and very old man (who had not made a speech) being particularly appreciated.

While this bald summary gives really very little idea of the richness and technical complexity of the operations described, it does at least display the dominant themes which ran through traditional Tokelau fishing. The ceremony was not in any sense a venue for open discussion, but rather an exposition and affirmation of the distinctively Tokelauan techniques. The very structure of the occasion emphasised the authority of the elders, making explicit at least some of the knowledge and experience which legitimated that authority. Secondly, all the speakers emphasised the need for care and skill, especially when dealing with turtles in the water and with powerful, fast fish like marlin and pāla. Thirdly, the speeches all extolled the virtues of cooperation, protocol, etiquette and generosity, all of which are summed up in the phrase āva i te moana 'respect (one another) at sea'. The fact that the speakers concentrated on the noosing of pāla was probably fortuitous; they might just have easily have concentrated on puke fonu (the techniques for handling mating turtles) or long-lining, or the mass of prohibitions surrounding the taking of the small

baitfish known as o. But it was no accident that they concentrated on ocean fishing of the more spectacular kinds, involving danger, skill and excitement.

The discussions at the meetings during the previous two weeks were also pervaded by these themes of tradition, safety and respect. All in all, those two weeks in early 1971 were a very intensive "crash course", not only on skipjack fishing, but the place of fishing in the entire Tokelau scheme of things.

The organisational features were certainly striking. Even at the stage when only one skipjack had been taken, the necessary political decisions had been made, with a taboo on the ocean and all mens' activities placed under the direction of the elders, who also assumed authority over the kāiga-owned canoes and the allocation of crews to them. Strategies for each day were discussed and planned the previous evening, and each day's activities were placed under the direction of a specific elder (usually the oldest one going to sea on that day) who had the responsibility or privilege of beginning the day's fishing by being the first to 'enter' a shoal and cast out a lure. The novices were also made well aware of the authority which any older tautai had while at sea to tell a younger fisherman to make ki gauta 'beat it back to shore' if he were being either incompetent or disruptive. This happened on a couple of occasions during the excitement and tension at sea. In one incident a novice, not particularly well-known for fishing abilities of any sort, was letting fish fall from his line back into the sea when an elder yelled at him, Titiko titiko koe i gauta oi hau ai ki moana? 'You shit around and shit around on land and then come to sea?'. In another, a novice encroached on the water being fished by an older man and was told in similarly direct terms to make for the shore. In both instances the young men later apologised profusely, in scenes fraught with emotion, tears and assertions of forgiveness and compassion.

The novices had also had the opportunity to learn a lot of the technical aspects of skipjack fishing, and some of the rationale behind them. It went almost without saying that the only technique used was the traditional one involving rod and pearl-shell lures, with the tautai standing in the canoe stern facing aft and the canoe being paddled under the direction of the man seated immediately forward. The possibility of using outboard motors was discussed in detail before a decision was taken to prohibit them entirely for the duration of the taboo on the ocean. There were at the time only four engines on the island, and only three aluminium dinghies. A number of the men had trolled successfully for skipjack on other places outside of Tokelau and were aware that it could be done without alarming the shoals. The elders, however, were skeptical, and they could in any case justify their ban on engines on the grounds that their use would give an unfair advantage to a few. The prohibition of engines meant that only canoes were used, since it is impossible to use the traditional technique from a light dinghy.

In the instruction of the novices a tremendous amount of emphasis was placed on prohibitions against allowing objects such as

hats or paddles to drop, or tips of rods to be pulled down into the water, or, worst of all, allowing wounded fish to drop back and set up a panic reaction in the shoal. This meant that men had to take elaborate care with their preparations and had to master the complex skills of handling their rods so that the fish would neither struggle free nor be swung out of the water to sail through the air over the bow of the canoe. (As anyone who has tried can attest, this is difficult.) The novices were shown the several named variations of how to do this and exhorted to practice (not in communal expeditions and preferably with a coconut rather than a skipjack) until they became proficient. They were also shown how to recognise the various named laga, the signs on the surface of the water indicating the presence of a shoal, ranging all the way from frenzy of birds and broaching fish to those almost invisible to the untrained eye -- smooth, oily-looking patches on an otherwise rippling surface, or a faintly rippled area on a calm sea.

Much attention was also drawn to the proper preparation of gear and its historical and cultural significance. This applied particularly to skipjack lures. They were at the time in short supply, partly because many of the oldest and best ones (made from shells brought back from New Guinea earlier in the century by a few Tokelau pastors who had gone there as missionaries) had been dismantled and dispersed, some of them as gifts to people on other islands. Many had been given to women, either by doting fathers or in the customary adornment of brides by members of their natal kāiga. Gaining access to these treasures involved many men in a lot of delicate negotiations.

A most significant and striking aspect of the two weeks' activities was the elan and sense of concerted purpose that was generated. The impulse to do things "properly" and in the traditional manner came not from the elders but from younger men, many of whom had never seen skipjack taken with kofe and lures. They wanted to do it, and do it properly, observing all the rules and proscriptions seriously. It was also the younger men who made the suggestion of holding a kau kumete; the elders of course willingly obliged, even though it involved them in much scurrying about, cutting up their scant supplies of suitable shell for new shanks and retying old lures. Women entered throughly into the spirit of the occasion as well, not only through their welcome ceremonies and preparation of food, but also by assembling to drink skipjack blood in order to 'give them strength'. And the children of course mimicked it all in their play.

FISHING IN TRANSITION

One of the most striking features of Tokelau village life over the period from 1967 to 1981 was the persistence of its basic institutional structures. On the surface at least, many things in Fakaofo in December of 1981 appeared to be much as they had been a decade before. The council of elders still met regularly, and from time to time the able-bodied men still worked unpaid on various village enterprises. None of the kāiga had been radically modified,

and distributions were still being made through the inati system. In a deeper sense, though, everything had been radically changed. Although the structures of village life and activities persisted, they were all invested with a radically different scheme of meanings and significance. The outward forms remained, but the old understandings on which they were based had been eroded and changed.

Since the changes involved have been described in some detail elsewhere (Hooper, 1982) it is sufficient for our present purposes to simply outline them briefly. Following the visit of a U.N. mission, in 1976, New Zealand aid to Tokelau was stepped up considerably. The Administration of the group was greatly expanded along New Zealand Public Service lines and staffed almost wholly by Tokelauans. In the village context, this meant a great deal more wage and salaried employment, large increases in the amount of money in circulation, and the removal of considerable numbers of men from the village labour force (directed by the council of elders) to the Tokelau Public Service (directed, ultimately, by the N.Z. government). Inevitably, the authority and cohesiveness of village government and village-based institutions had declined.

The changes had reached right down to kāiga level. Where previously most cash income was generated from the sale of copra grown on kāiga lands, and was thus under kāiga control, it now came from wages and salaries paid directly to individuals. Furthermore, the Public Service conditions gave virtually life-long guarantees of employment, together with subsidised superannuation. Although members of Kāiga still owned land in common, there was not the same need for their cooperative enterprise.

All these changes had undoubtedly facilitated the widespread introduction of aluminium dinghies and outboard engines. In 1971, Fakaofo had about 60 canoes, which, when not in use, were drawn up onto the crowded slips surrounding the village islet and carefully covered with palm fronds. By 1981 there were only 8 canoes in servicable condition, all of them owned by men who were keen fishermen. The rest had been dismantled rather than completely discarded -- their lashings cut and the sections stored around the houses. In their place were over 50 New Zealand-made aluminium boats, most of them 12-14 foot long, powered by a variety of outboard engines of between 15 and 25 horsepower. The great majority of these boats and motors had been bought with the assistance of relatives in New Zealand (usually children or siblings of working age) at a cost of between NZ$1800 and NZ$2600 each. The boats were regarded as being the property of individuals, or of married couples, and not of kāiga; and, most importantly, kāiga members thus had no strong moral or customary claims on any fish caught with their aid.

The outboard-powered dinghies had a great number of very practical advantages, especially in the lagoon. Where a sailing canoe might take several hours of laborious work -- paddling, poling and sailing against contrary winds -- to reach the opposite shore, the boats took less than half an hour, and involved no human effort.

Furthermore, they had a much greater carrying capacity than the canoes.

When they were first introduced, men had found the light boats difficult to handle safely when crossing the reef between lagoon and open sea. But with experience (and not a few damaged engines) the problems were largely overcome, and trolling for yellowfin, skipjack and pāla became extremely popular. As a fishing technique, it was quick and relatively effortless. The boats could venture into rougher water than could be handled by canoes, and could follow birds to shoaling fish. Although trolling was expensive, it was also on occasion highly productive and well suited to the constraints faced by men who had to work daily at government jobs (and thus had the money to pay high petrol costs). The boats also proved suitable for handlining during both daylight and night, when anchored close off the lee reef. They were less suitable, however, for handlining in deeper water for yellowfin or Ruvettus, since they so easily drifted with the wind -- and could be positively dangerous when handling marlin or large sharks. For these, the heavy stable canoes remained much more suitable. And for the "classic" Tokelau techniques of noosing pāla and fishing for skipjack, nothing but a canoe would do.

Trolling was of course a technique which none of the elders could say very much about, since they were unfamiliar with the gear and knew nothing about times, seasons and suitable localities. But, to a man, they were fully of the opinion that it would turn out to be unsuitable simply because many fish were lost through hooks tearing from their mouths. Eventually, they maintained, the fish would become wary of both engines and lures, and might even avoid the island altogether. From time to time, whenever trolling catches declined, it did seem that something of that sort might be happening and trolling was banned completely. But the bans were always eventually lifted, whenever the village had a pressing need to obtain good fish quickly; and as more and more men obtained boats, the prohibitions became harder to maintain effectively. But the elders might have been at least partly right about trolling. Although the claim is difficult to substantiate, many men maintain that it is now more difficult than it used to be to obtain good catches of yellowfin from the most frequented trolling localities.

The boats had also brought about other changes. Since gasoline cost over $3.00 Samoan an imperial gallon, fishing expeditions could be expensive. The obvious solution was to sell all or at least part of a catch to recoup costs. Some men were doing this (at least some of the time) in 1981, but always in a rather shamefaced, indirect way. In Tokelau terms, the idea of selling fish remained as offensive as it had ever been, cutting right across deeply-felt ideals of decent behaviour towards kinsmen and neighbours. People discussed the contradictions endlessly, canvassing solutions which ranged all the way from "sell it all" to "give it all away", but no overall consensus ever seemed to emerge. These contradictions were exacerbated by the new economic differentiations which had arisen, since it was not only those men who were without paid employment who got good catches or who felt any need to

recover petrol costs by selling fish. The contradictions might of course have been resolved by some men taking up fishing as a full time economic specialisation. But given the enjoyment that all men got from fishing, and the high regard in which it was generally held, that was not happening.

The authority of the council of elders had been plainly affected by the development of wage and salary employment. Although the council could still call together and direct the labour force of non-employed "village" men, any enterprises which they undertook were compromised by the fact that they were, by custom, done for the good of the whole village, while the employed "government" men worked for themselves. Communal fishing expeditions were directly affected. Village men could not be expected to fish all day in heat and discomfort for catches which would then be distributed through the inati system to those who had been paid good money for their day's work. The practice of sending out canoes to monitor fish movements, which had long been common, especially during last quarters of the moon, had almost been abandoned, for the same reasons. Though men of course still watched for the signs of spawning aggregations, and talked about them with excitement and interest, there were no longer any village-organised expeditions to exploit them.

The elders were also caught in other contradictions. In 1980, each Tokelau village received from UNDP a 29 foot outboard-powered aluminium catamaran, of a design which had been developed in Western Samoa for small-scale artisanal and subsistence fisheries. The craft were in many ways ideally suited to Tokelau conditions, and they were extolled in official reports as having "dramatically improved subsistence fishing capabilities" (Administrator of Tokelau, 1981:8). But this was largely wishful thinking, since the only advantage which the catamarans had over canoes and dinghies was for rough-water trolling -- and the organisation of that on a village basis ran into difficulties. Gasoline had to be bought and the outboard motors needed maintenance, which meant that fish had to be sold. That in turn demanded that the village councils take on some of the aspects of a business enterprise, which went right against their own and others conceptions of their role. Fortunately the catamarans have proved to be useful in other ways, mainly for ferrying materials and men on the sheltered waters of the lagoons.

UNDP-supplied freezers have also had unforeseen consequences, none of which have contributed to "development" in any commonly accepted meaning of the term. In 1977 each village received a top-loading commercial type freezer of about 25 cubic foot capacity, intended for "the storage of fish for export as well as local consumption" (Ministry of Foreign Affairs, 1977:6). To my knowledge, however, none of the atolls has ever used them to store fish for export and they have been used only very occasionally to store fish for local use. Perhaps inevitably, their greatest use has been for the storage of imported beer, mutton flaps and chicken backs, all of which have proved popular among those who can readily afford them. The freezers have also been occasionally used in the considerable export of Giant clams (Tridacna sp.) which has

developed recently. These are sent to Tokelauans in Western Samoa, mainly as gifts, in exchange for other gifts and services. On occasions when the schedule of the supply ship is suitable, the freezers full of clams are hoisted on board and connected to the ship's electricity supply for the journey to Western Samoa.

Regardless of all these changes (and not, I think, in any way because of them) fish were still in fairly plentiful supply. According to catch information recorded over an eight-week period between June 15 and August 8, 1981, the average weekly catch was 3,380 lbs. Divided among the total island population of 650, that would have allowed about three quarters of a pound of fish per person per day. However, the catches varied widely from week to week, according to the amount of time which men had available for fishing. The variations, and some of the reasons for them, are shown in Table 1.

TABLE 1. FAKAOFO WEEKLY FISH CATCH 15 JUNE 1981 - 8 August 1981

Week	Other village activities	Fish catch, in lbs.
(1) 15-20 June	One day of communal work, and two days given over to the annual celebration of a village club. Communal fishing of whole village on Saturday.	1,993
(2) 22-27 June	Four days of communal work, in preparation for U.N. Visiting Mission. Catch inflated by 470 lbs of turtle.	2,159 (or 1,683 without turtle)
(3) 29 June - 4 July	Four work days, including two days of U.N. visit.	1,543
(4) 6-11 July	No communal work. One day of cricket to celebrate a Saints Day. A death kept all men in village on another day.	3,752
(5) 13-18 July	No communal work days. Six days given over to cricket.	2,750
(6) 20-25 July	No communal work days	4,301
(7) 27 July - 1 Aug.	Two communal work days	5,274
(8) 3-8 Aug.	One day of communal work	5,306

The steady rise in catch weights over the 8-week period may to some extent be due to seasonal change. Tokelauans regard August as a month in which fish generally start to become more plentiful, building up to the September and October spawning runs of parrotfish, surgeonfish and Moorish Idols. But variations due to people's other commitments are also significant. The time devoted to the U.N. Mission had an obvious effect on catches in weeks 2 and 3, as is shown by the sharp rise of the catch in week 4. Any visiting ship disrupts Tokelau subsistence activities, especially fishing, and probably boosts the sale of store goods. "Traditional" activities such as cricket and club days also disrupt production, as can be seen from the catch weights for weeks 1 and 5, but not quite to the same extent. The whole of these catches were consumed locally. It was only during weeks 7 and 8 that small quantities of fish were salted and sun-dried. None were exported and none were stored in the village freezer.

Since there are no catch data of any kind from Tokelau for the early 1970s, when fishing was part of a much more traditional context, it is not possible to say with any certainty just what the effects of recent social and technological changes have been. Tokelauans do not draw attention to any major changes, and generally seem to think that fish are about as plentiful as they always were. The only exceptions to this which they point out, and are inclined to worry about, are the marked decline in skipjack and the almost complete disappearance from the reefs and lagoons of tonu "Coral trout" (Plectropomus leopardus) and laea (Scarus gibbus). They very firmly attribute the disappearance of skipjack to the activities of foreign deep-water fishing vessels in the region, but have no particular theories about the other declines.

All in all, the effect of recent changes in Tokelau has been to make fishing both more individualistic and more monetised. The new boats and outboard motors have largely detached fishing from its kāiga context, and the build up of the Public Service, with its opportunities for employment, has eroded the authority of the council of elders to direct certain kinds of communal fishing, and also perhaps diminished the economic need for such centralised control. Monetisation has been an inevitable accompaniment of boats, engines and gasoline, but fishing remains very imperfectly commercialised, and may well remain so as long as there are no external markets.

CONCLUSION

Many features of Tokelau fishing, both traditional and modern, can probably be laid directly to the abundance of resources. In the traditional system, with low populations and relatively unsophisticated gear, there was probably no danger of overfishing, and thus no need for conservation measures. When capturing large spawning aggregations in nets and traps they took all fish, well aware that there were similar aggregations in other parts of the lagoon and reef which were not being disturbed and which would be more than sufficient to replenish stocks. And with other fish, they

seemed certain that what they took had no noticeable effects on stocks. What did concern people under the traditional system was the danger of scaring fish away. There is little doubt that the centralised control of fishing did have something to do with maintaining a balanced supply, since if any declines had been noticed, measures would have been taken to stop any overfishing that might have caused it.

The "ritualisation" of traditional fishing was perhaps somewhat unusual -- although, once again, it is difficult to say with any certainty whether other traditional Polynesian systems had anything comparable. Anthropologists are familiar enough with the way in which many cultures elaborate and develop certain key elements far beyond what might seem, to an outside observer, the demands of any practical necessity (Ortner, 1973). Potlatches, automobiles, the Kula and many more patently "religious" activities all demand interpretations which go beyond a narrow utilitarianism. Fishing was such an activity within the traditional Tokelau setting. Tokelau men thought of themselves as fishermen above all else. They did other things, of course -- planting, harvesting, maintaining houses and households and so forth; but these were mundane chores compared with the intellectual, emotional and physical satisfactions which fish and fishing provided. The habits and movements of fish were topics really worthy of investigation, speculation and discussion, and were developed into bodies of knowledge which could be immediately and directly related to observation and practical experience. And in a social sense, in its links with the elders and the kāiga, the organisation of fishing provided both the setting and some of the idioms for Tokelau conceptions of their social order. Thus events such as skipjack expeditions and kau kumete, though they served material ends, were also much more than that -- full-blown "cultural performances" which encapsulated huge chunks of the social and symbolic order.

Although I have suggested that the many restrictions and taboos surrounding fishing served to bolster and reinforce the powers of the elders, this is not to suggest any element of oppression or "exploitation". As Tokelauans conceived things (and would patiently explain to outsiders) theirs was a highly egalitarian and even "democratic" system, since all one needed to do was to live long enough and stay relatively sane and one would eventually take ones place among the elders. (If, of course, one were male -- but that is another issue.)

In the modern setting, resources still appear to be relatively abundant. There is certainly no public consciousness of any decline, and this has probably smoothed the path of many of the new innovations. The one resource which has been depleted is Giant clams. Formerly regarded as a sort of "emergency" resource to be tapped mainly when storms and rough weather made other forms of fishing difficult, the new export "market" has meant that they are taken much more regularly, and men complain that they "now have to dive for them". I do not know how seriously this should be regarded, but few people see it as an issue. The village elders are perhaps powerless to exercise any controls, especially as the main

beneficiaries are also the main proponents of the new economic and social order.

Fish also still make up an important part of the Tokelau subsistence economy. Although it is difficult to calculate the monetary value of this, some indication can be gained by considering the average weekly catch, on the basis of the 1981 catch records, to be around 3,400 lbs. If the people were to substitute for this canned mackerel at the going rate of 64 cents Samoan for a one pound can, the annual cost would be Samoan $113,152 -- which is about equivalent to the total annual cash income of Fakaofo from copra sales and government wages and salaries.

For this reason alone, fishing might be expected to retain its importance and prestige. Men still seek to be competent fishermen, and many of the younger ones have sought to learn as much as they can of the traditional knowledge and apply it whenever it is relevant. And there are of course still a number of older men who know and use the traditional lore and skills. But there is still more to fishing than its practical economic value. Although I doubt whether there will ever be another kau kumete of the kind that was held in 1971, the values, attitudes and meanings which that ceremony expressed still retain much of their importance and are coming to be expressed in new ways. Men who have travelled abroad and seen subsistence and artisanal fishing in other parts of the Pacific are generally convinced that people elsewhere have neither the knowledge nor the competence that Tokelauans have. Perhaps all fishermen have such convictions. But be that as it may, among Tokelau men with Western education there is a deep and growing interest in traditional lore, simply because it is traditional, and a consciousness that it provides a key element of Tokelau identity.

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ASSESSING CUSTOMARY MARINE TENURE SYSTEMS IN THE CONTEXT OF MARINE RESOURCE MANAGEMENT: A TORRES STRAIT EXAMPLE

by

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ABSTRACT

Some researchers regard customary marine tenure (CMT) systems as an aid to contemporary fisheries management. Others consider them an impediment. Neither generalization is correct. Each CMT system should be assessed independently in this connection. In doing so, three questions that should be addressed are: (1) does the CMT system facilitate the conservation of marine resources?; (2) is it compatible with government marine resources policy?; and (3) how rigorously is it defined and maintained? To illustrate the use of these questions we assess two systems of customary marine tenure in the Torres Strait Islands; "extended fishing rights" and "home reef fishing rights". We conclude that whereas the "home reef fishing rights" play a useful role in contemporary fisheries managment, "extended fishing rights" do not.

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INTRODUCTION

Communication suffers in fisheries research when social and biological scientists overlook the differing primary objectives of their two professions, the value of each and the importance of reconciling them. Fisheries biologists focus on marine biological resources and their sound management. Social scientists who study fisheries focus, in contrast, on human society and are often concerned with maintaining the cultural integrity of fishing communities.

It is difficult to maintain the integrity a fishing community without conserving the marine resources on which it depends, even if this requires policies that are sometimes unpopular with fishermen - a fact not always fully appreciated by social scientists. But it is all too easy to approach fisheries management in ways that create unnecessary problems for fishing communities - a point often overlooked by fisheries biologists, especially when they are working in cultures other than their own. The sound management of a fishery depends on recognizing both points.

Here, and with these considerations in mind, we present our perspective, as biologists, on an issue of growing concern in waters where traditional and contemporary resource management systems converge.

A number of writers see systems of customary marine tenure (CMT - Hviding, this vol.) as playing valuable roles in contemporary marine resource management. They point out that CMT systems can: (1) provide an incentive for conservation, since tenure holders can restrict access to and control exploitation of their marine resources; (2) provide culturally sanctioned rules for allocating these resources and adjudicating disputes (usually without recourse to government officials, thereby reducing administrative costs); and (3) facilitate more flexible adjustments to changing biological or socio-economic conditions affecting marine resource use than do government regulatory bodies (e.g., Cordell, 1977; Johannes, 1977; Panayatou, 1982; Christy, 1982).

Others point out, however, that: (1) CMT can be a source of considerable friction between rival groups of fishermen; (2) holders of CMT may overharvest their marine resources, despite the fact that CMT provides the framework for their conservation; or, conversely, (3) holders of CMT may hinder the full exploitation of their marine resources by excluding those with the necessary capital and expertise (Carrier, 1981; Johannes, 1982; Haines, 1982; Polunin, 1984, and this vol.; Wright, 1985, and this vol.).

These differing assessments have arisen from studies of different CMT systems. But there has been a tendency within each of these two groups of researchers to generalize too freely from their own particular experiences and to view the perceptions of the other group as being misguided. This threatens not only to polarize debate on the subject, but also to misdirect it.

Whether or not CMT systems are, in general, useful in the context of marine resource management should not be at issue. These systems vary greatly from place to place. So do the relevant social, political, geographic and economic features of the regions in which they exist, and the nature and condition of the marine resources involved. Accordingly, some CMT systems facilitate sound marine resource management whereas others create impediments. The merits of each CMT system as a framework for fisheries conservation, therefore, must be based on an assessment of its particular characteristics.

Here we pose three questions that a fisheries manager needs to address in order to determine whether to tailor marine resource management to dovetail with an existing CMT system, or to create an entirely new management scheme. To illustrate their use, we then apply them to the traditional fisheries of Torres Strait.

CRITERIA FOR ASSESSING CMT

Providing a comprehensive guide for analyzing all possible social, political, environmental and economic implications of CMTs would require volumes (1). Here we focus specifically on the important questions which CMT pose for the marine resource manager:

1. Does the CMT system contribute, or have the potential to contribute, to the conservation of marine resources?

To answer this question we must first determine whether the marine resources involved are subject to, or threatened with overexploitation, or other deleterious human activities (e.g., pollution, destructive fishing practices such as dynamiting). Making this judgement sometimes requires considerable biological research; here the social scientist interested in evaluating a CMT system should seek the advice of the fisheries biologist.

CMT provides an incentive to harvest in moderation. Nevertheless, some CMT holders do nothing to limit their own fishing pressure (e.g., Polunin, 1984, and this vol.; Carrier, 1987). Fishermen in some communities, for example, do not perceive a causal relationship between the pressure they put on their natural resources and future yields (e.g., Carrier, 1980). In some cases this is probably because there has been no relationship; that is, marine resources in the area in question have existed in quantities well in excess of demand. This situation is found, for example, in some coastal areas of Melanesia where human population densities are low. When marine resources come

(1) A more generalized list of the kinds of information required to describe CMT systems was developed at the UNESCO "Workshop on Knowledge and Management of Coastal Systems in Asia and the Pacific" (Ruddle and Johannes, 1985; and Ruddle, this vol.).

under threat in such areas because of increased fishing pressure (for example, as when an export market develops) fishermen may not recognize the need for conservation because there is no cultural precedent (e.g., Johannes and MacFarlane, in press).

This should not be taken as evidence that local CMT serves no conservation purpose, however. CMT holders generally do exercise their rights to limit fishing by outsiders. By so doing, and irrespective of their motives, they are acting in a manner which, although it does not guarantee efficient marine resource management, is almost universally recognized as a vital prerequisite for conservation in a fishery threatened with overexploitation.

The conservation value of excluding outsiders from a fishing ground depends on the ratio of existing fishing pressure to optimum fishing pressure (2). If the ratio is less than one, then excluding additional fishing pressure may sustain a departure from optimum yield through underharvesting. But a ratio of more than one - characteristic of many of world's nearshore fisheries - means that there is excessive pressure on the resource, and that excluding outsiders will prevent additional overharvesting.

The size of the area which a CMT system encompasses will influence whether it operates more like a commons or a system of limited entry. If the area is too large, forbidden fishing activities may be difficult to detect and individual disincentives to overfish may be low. In addition, it is also easier to flout CMT regulations in a fishing area of complex surface topography, such as a coastal area containing many small islands or estuaries, because of the ease of concealing forbidden activities. (However, the detection of abuses and the application of sanctions in such areas are usually more likely to be accomplished by CMT owners than by government enforcement personnel).

If stocks are not threatened by heavy fishing pressure or other human actions, then CMT will probably not function to improve yields, except perhaps in cases where the owners improve on nature - for example, by creating new habitats such as artificial reefs. But human population growth and economic development are accompanied by growing demands for marine resources. Abandoning a customary tenure system because it serves no conservation function at present, rules out the option of employing it later as previously underexploited marine resources come under increasing pressure. Such systems cannot simply be reactivated at the whim of the marine resource manager (see below).

(2) One can, of course, define optimum fishing pressure in various ways depending on whether biological yield, economic yield, employment, or some other optimum condition is the objective. How it is defined is unimportant here.

2. How robust and clearly defined are tenure rights?

In some areas, as in parts of Papua New Guinea and the Solomon Islands, CMT holders may strongly defend their fishing rights, which may also enjoy legal protection. Dismantling such CMT systems is usually politically or legally prohibitive, irrespective of their value in fisheries management (e.g., Johannes, 1982). Their existence will sometimes make the marine resource manager's job harder. He can only accept them and tailor his management program accordingly.

In other areas CMT has weakened since western contact, has been allowed to lapse, or has been forcibly abandoned as a result of colonization, westernization, industrialization and/or increased population pressure (e.g., Johannes, 1978; and see below). But, as the value of a resource increases, so will efforts to control access to it. Accordingly, fishermen sometimes attempt to revive and obtain legal recognition of weakened or lapsed CMT (e.g., Polunin, 1984, and this vol.;and see below). A fisheries manager might welcome such moves, seeing them as facilitating a locally acceptable form of resource management. The potential difficulties should not be underestimated, however.

First there is the problem of determining just where the traditional boundaries lie. Sometimes they are imperfectly remembered, and adequate historical records rarely exist to enable the courts to settle conflicting claims (e.g., Johannes, 1982).

Second, the problem of identifying just who, today, possesses traditional fishing rights within these boundaries can be extremely complicated. The reorganization of residence patterns by churches or governments, or as a result of urban drift, may have reduced the importance of hereditary groupings to the point where boundaries are poorly remembered.

A government's efforts to resurrect or shore up imperfectly remembered marine tenure systems may thus precipitate territorial disputes and sour relations between fishing communities for years (e.g., Johannes, 1982). This illustrates Useem's observation (1945: 581) that, "reconstruction of a culture brings forth at least as many societal problems as the process of destruction". It is perhaps partly for this reason that some countries do not recognize customary tenure systems in state law unless they have remained in continuous operation during historical times (e.g., Allan, 1957).

3. Is the CMT compatible with government marine resource policies?

It is not practical here to describe all the issues a researcher might encounter in trying to answer this question fully. Government fisheries policies differ greatly in their objectives and the degree to which these are clearly defined. But it is essential to try to determine whether government policy favors

maximimizing profits, yields or employment; it is not possible to maximize simultaneously for more than one of these three variables, and a CMT system may be viewed differently, depending on which has priority.

For many governments today, employment and social equity in nearshore fisheries take priority over maximizing yields or profits. High technology commercial marine resource often threaten traditional, labor-intensive marine resources (e.g., Smith, 1979). Legal recognition of CMT reduces this threat, helping to maintain employment and social equity in a fishery by providing local fishermen with a means of keeping competitors with higher technologies at bay.

On the other hand, if a government wishes to maximize profits or yields, this often requires the introduction of higher technologies. Artisanal fishermen who are constrained by cultural restrictions on entrepreneurial behavior, or who lack the capital and/or skills for such fishing, sometimes use their CMT to exclude commercial fishermen who are not similarly constrained. In the past, under such circumstances, colonial governments often simply ignored or overrode CMT, granting access to fishermen having no traditional fishing rights in an area (e.g., Johannes, 1978).

Today, many governments recognize the legitimacy of CMT, especially those in Oceania. Here, when CMT threatens to hinder fisheries development, such governments may work to reconcile through mediation the needs of traditional and higher technology fishermen. For example, they may arrange for CMT holders to be compensated for the use of their fishing grounds by outside fishermen (e.g., Johannes, 1982; Baines, 1985, and this vol.), thus seeking a balance between employment and profit.

If maximizing economic rent is the main government fisheries objective, then it should be determined if CMT holders excercise their property rights in a manner that discourages overcapitalization as well as overfishing. When CMT operates to discourage outsiders from entering a heavily exploited fishery this helps limit overcapitalization. But overcapitalization may still occur within the CMT-holding group itself.

CMT IN THE TORRES STRAIT ISLANDS

We now describe the customary marine tenure systems of Torres Strait Islanders, and evaluate them according to the three questions discussed above. Much of the information discussed here was obtained during interviews between 1984 and 1987, with fishermen in all seventeen Torres Strait Island fishing communities.

Torres Strait lies between the southern coast of Papua New Guinea and Cape York, the northeastern extremity of the mainland

of Australia (Fig. 1). It is about 180 km wide, shallow and studded with coral reefs, sandbanks and islands. All but the three northernmost islands are part of the State of Queensland, Australia. There are villages on 15 of these islands, and their inhabitants, mainly of Papuan origin, have fished the waters of Torres Straits for many centuries.

Papuans living along the northern edge of the Strait have also traditionally fished in the Strait and traded with the Islanders to whom they are closely related culturally and through intermarriage.

Commercial fishermen from ports on the Australian mainland also trawl for prawns or troll for mackerel in the Strait.

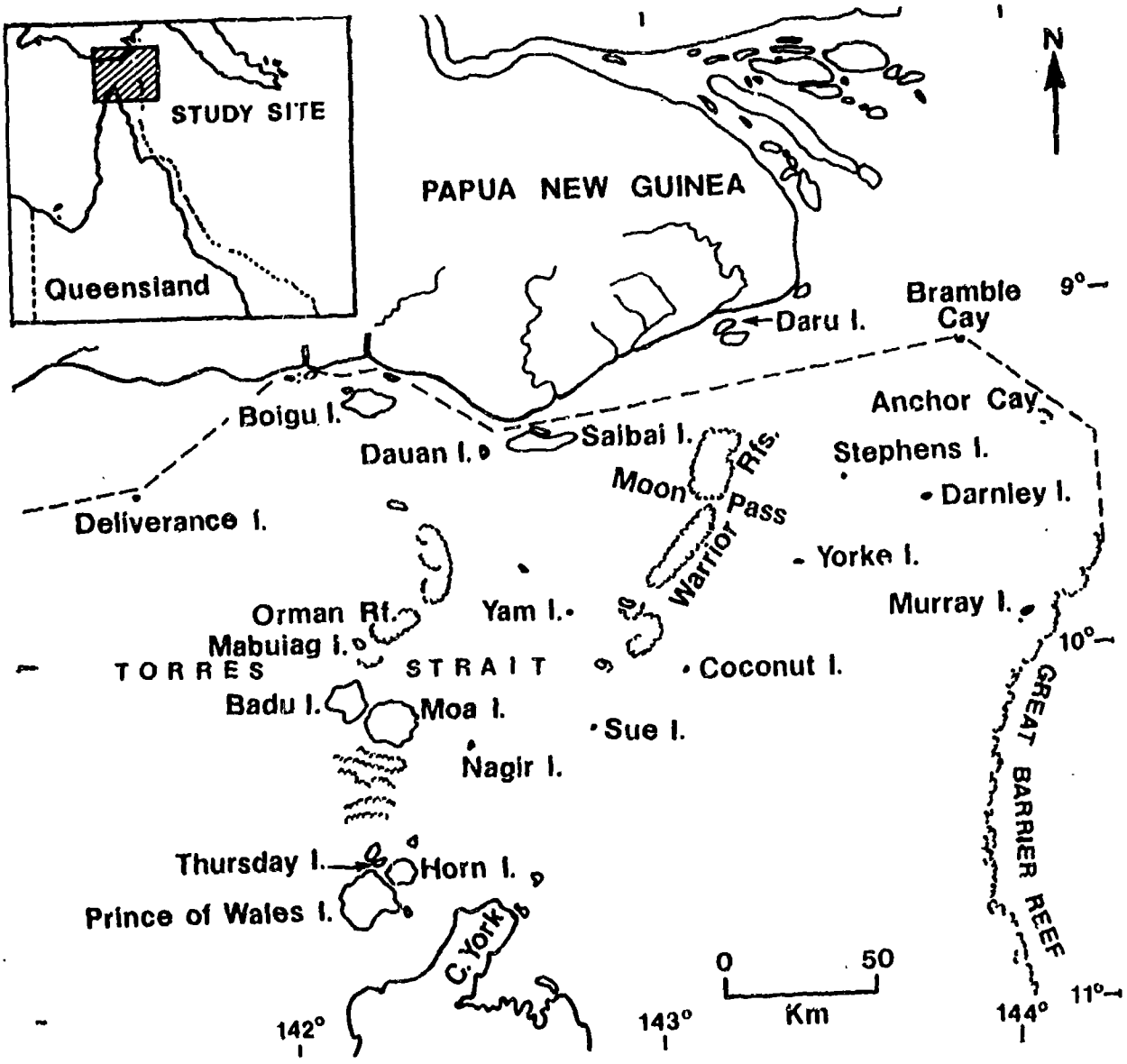
The Torres Strait Treaty, ratified by Papua New Guinea and Australia in 1985, resulted from negotiations over sovereignty and maritime boundaries in the Strait. One of the main objectives of the Treaty is to "acknowledge and protect the traditional way of life and livelihood of the traditional inhabitants, including their traditional fishing." No clear policy has been enunciated concerning the relative importance of maximizing yields, profits, or employment within the traditional fishery. But Islanders' fishing activities are given precedence, under Article 20(1) of the Treaty, over those of other (commercial) fishermen working in the Strait, in the event of competition between the two groups. Employment, then, can be presumed to have a high priority.

Islanders catch a wide variety of reef, mangrove and pelagic fishes with nets and hook-and-line. They also harvest rock lobsters using short underwater spears, gather various molluscs and crustaceans at low tide, and hunt sea turtles and dugongs from aluminum dinghies equipped with outboard motors. Most of the catch is consumed locally, although rock lobsters and small quantities of mackerel, other fish and shells are sold for export.

European observers in Torres Strait noted in the 19th century that the Islanders exercised territorial use rights over fishing grounds (e.g., Haddon, 1935). These rights extended beyond the edge of the reefs fringing inhabited islands to include fishing grounds as much as several tens of kilometers from island communities (e.g., Wilkin, 1908: 167). During the past century traditional sea rights have weakened considerably in the Strait, but have not disappeared.

For the purposes of this discussion it is useful to divide Torres Strait CMT into two categories:
(1) Home Reef CMT - exercised over reefs fringing inhabited islands (referred to in the Strait as "home reefs"); and (2) Extended CMT - exercised over waters, banks and reefs beyond the home reefs.

FIGURE 1: THE TORRES STRAIT ISLANDS

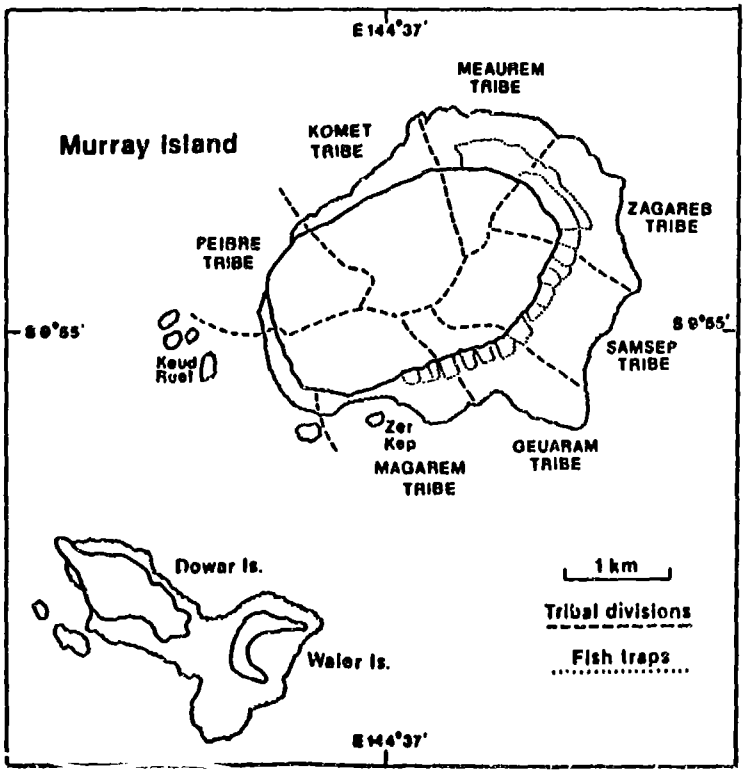


Historical and contemporary fishing rights practices vary from island to island in Torres Strait. (The subject is treated in more detail in Johannes and MacFarlane, in press.) On thirteen of the sixteen islands inhabited today, home reef CMT is still strongly held (although visitors can often fish for subsistence purposes after requesting permission). The inhabitants of Thursday, Hammond and Prince of Wales Islands - all immigrants rather than traditional inhabitants - do not claim reef fishing rights. The practice of extended CMT has all but disappeared from the Strait (see below).

Today, the observance of customary marine tenure around Murray Island, the easternmost island in Torres Strait, is more complicated than elsewhere in the Strait. But even here the rigor with which it has been observed has declined considerably in the past century.

Home CMT rights on Murray Island are nested. That is, the home reef is owned collectively by Murray Islanders (insofar as they would, in theory, act in concert to prevent outsiders from using it), but rights to use different portions of the home reef are divided among different tribes, and sometimes further subdivided among different families. Traditionally, a tribe owns the reef bordering its lands. The lateral boundaries of these home reefs on Murray Island are shown in Fig. 2.

FIGURE 2: MURRAY ISLANDER TRIBAL LANDS AND HOME REEFS (MODIFIED FROM RIVERS [1908],WITH FISH TRAPS ADDED FROM AERIAL PHOTOGRAPHS)



On the fringing reef flat on the north and east coat of the island are rock fish traps (Fig. 2). Fish and other marine animals trapped on receding tides tend to gather in the deepest parts of the traps, which are generally found along the walls. These spots or "corners" are owned by families who have traditionally held exclusive right to the fish in them.

Some families also own keiar meta (lit. "rock lobster houses") on the reef flat. These are spots where rock lobsters seek shelter in holes and crevices. In earlier times they were sometimes enlarged by piling coral and coral rock loosely on top to create additional shelter. Calcareous overgrowth cemented the fragments together, creating a physically stable habitat.

Clams of the genera Tridacna and Hippopus are sometimes placed on the home reef, to keep in reserve for when they are needed. The deposited clams are marked by a low rock enclosure to indicate ownership.

Traditions concerning hereditary transfer of CMT rights on Murray Islands and means of settling dispute over them are described elsewhere (Johannes and MacFarlane, in press).

Today, CMT rights associated with Murray Island stone fish traps are still observed by some owners. Rights associated with traditional sub-divisions of the home reef outside the fish traps are less consistently observed. Some owners insist on continuing recognition of their home reef CMT rights; others do not. Nearby Darnley Island appears to be the only other Torres Strait island where the sub-division of home reef CMT rights is still recognized by some inhabitants.

Traditionally, various Murray Island tribes also observed extended CMT rights, claiming reefs, banks and water extending as much as 60 km from the home reef. We have not been able to determine the precise boundaries of their traditional fishing grounds beyond the home reef; the area has not been adequately surveyed, and the shapes and locations of the reefs and banks on hydrographic charts of the area are not reliable. Moreover, some of these reefs are rarely visited by Murray Islanders today, and their locations are not precisely remembered.

Extended CMT rights were exercised in former times by the inhabitants of at least six islands in Torres Strait (Johannes and MacFarlane, in press). They may also have been observed on other islands, but the historical records are silent on this point, and relevant information is beyond the recall of living inhabitants.

With one recent exception, however, extended CMT has generally not been defended since the turn of the century. This exception involved the demonstration in the mid-1980's by Murray Islanders of some hostility toward non-Murray Islanders fishing in waters of which the former had traditionally exercised exten-

ded CMT. This action was apparently motivated by the desire of Murray Islanders to dramatize their petition to Queensland and Australian Commonwealth governments to recognize their ownership of traditional land and waters. The petition is still in the courts.

CONTEMPORARY SIGNIFICANCE OF EXTENDED CMT IN TORRES STRAIT

There are about 30,000 km2 of accessible shallow water in the Strait from which to obtain seafood. Sustained yields of reef and lagoon fisheries elsewhere in the tropics range from 0.4 to 23.7 t km-2 yr-1 (Russ, 1984). The lower figures within this range represent fisheries under low exploitation pressure. The higher figures represent heavily exploited coral reef communities. Figures in the middle of this range represent coral reef, seagrass and sand bottom complexes, such as those in Torres Strait - for which a mean yield of 3 - 5 tonnes km-2 can be expected in a moderately to heavily exploited fishery.

If we calculate, very conservatively, that Torres Strait could yield 1 tonne km-2 of seafood annually, this would amount to 30,000 tonnes of seafood, or about 6.0 kg day-1 per capita, for Strait inhabitants. When the commercial catch of prawns, crayfish and finfishes exported from the Strait is subtracted from this figure a potential per capita yield of about 5.7 kg day-1 remains. This is, of course, far in excess of demand.

This conclusion is supported by diving observations made around inhabited islands in the Strait. Although we have carried out no quantitative surveys, it is nonetheless obvious that stocks of reef food fishes are much higher than they are around, for example, many inhabited islands in Oceania, where one of us (R.E.J.) has dived extensively. In Torres Strait large specimens of food fishes, such as coral trout and trevally, are still common on reefs within as little as 1 km of island villages. Such a situation is rare indeed in Oceania, where the ratio of people to adjacent areas of shallow marine water is typically much higher than it is in Torres Strait.

Despite the superabundance of total seafood stocks in the area, a few prized species are harvested at levels around or beyond those that will support maximum sustained yields. Dugongs are currently being overharvested, according to recent studies (Marsh, 1986; Johannes and McFarlane, in press). There is also some evidence that green turtle stocks in the Strait may be under threat (Limpus and Parmenter, 1986). Rock lobster stocks could conceivably be overfished in the future, despite the recent curbs placed on trawling for the species, especially if hookah and scuba gear are widely adopted by rock lobster divers.

It is important to note that all of these species are migratory. Unlike reef fishes, their movements carry them in and out of Torres Strait (the evidence here is incontrovertible for

turtles and rock lobsters, inferential for dugongs) and through fishing grounds belonging traditionally to different groups of inhabitants of the Strait. The limited-entry function of CMT cannot facilitate rational management of mobile species such as these. Only stocks which reside within a bounded fishing area can be protected from overexploitation through limited entry (e.g., Haines, 1982); there is little incentive to fish in moderation for a species when it is known that uncaught individuals will migrate elsewhere to become targets of other fishermen.

In short, most seafood stocks in Torres Strait are under exploited, and those few that are heavily exploited not amenable to conservation by means of limited entry because of their migratory behavior. The revival of extended CMT would thus not appear to contribute importantly to the conservation of Torres Strait seafood stocks today.

In the event that seafood stocks eventually become limited in Torres Strait owing to increased fishing pressure, would extended CMT then offer a practical means of conserving non-migratory seafood stocks in Torres Strait? The answer to this question depends on the ease with which CMT could be revived and made to work effectively. This brings us to another of the three questions we posed above: how strongly held and clearly defined is CMT in Torres Strait today?

We have seen how extended CMT has not been observed in Torres Strait since the last century. And on no island in the Strait were fishermen able to describe to us the precise boundaries of more than a portion of the areas over which they traditionally exercised extended CMT.

Several additional problems would appear to hinder the renewed observance of extended CMTs in Torres Strait. The problem of just who, today, possesses traditional fishing rights within these boundaries is extremely complicated. As Beckett (1983: 206) states, the cessation of cult activity and the reorganization of residence patterns have reduced the importance of traditional (hereditary) groupings, in some places (in Torres Strait) to the point where they have been forgotten.

One consequence of the increasing mobility of Islanders and the cessation of traditional inter-island hostilities has been an increase in this century in the number of inter-island marriages, as well as marriages to non-islanders. Further, on some islands traditional marriages are being replaced increasingly with de facto arrangements. These developments are the consequences of inter-island peace imposed by the London Missionary Society and the government (Kitaoji, 1978), and, more recently, of inflation in the heavy expenses associated with Islander wedding ceremonies and the receipt of social benefits from the Australian government by unwed mothers (Fitzpatrick-Nietschmann, 1980). Children of such arrangements do not obtain their father's name nor land or sea rights within his clan.

There is also an increasing number of caretaker arrangements associated with absentee landlords; more than half of all Torres Strait Islanders now reside on the Australian mainland. On some islands such arrangements have become the focus of many land disputes (Beckett, 1983).

Finally, formally recognizing the Islanders' extended CMT boundaries would undoubtedly lead to a call for the observance of similar and overlapping Papuan CMT boundaries in the Strait (Hudson, 1986), although the observation of the latter was described over 60 years ago as having virtually ceased (Landtman, 1927). The approximate boundaries of Papuan and Islanders' extended CMT areas are shown in Fig. 3, and were drawn using the best (albeit inadequate) information available today. It can be seen at a glance that the superimposition of these boundaries on the already intricate system of modern sea boundaries defined in the Torres Strait Treaty would create a jurisdictional nightmare. Clearly, in answer to our final question concerning the contemporary management value of CMT, the revival of extended fishing rights in Torres Strait would not be consistent with fisheries policies of either Papua New Guinea or Australia, as enunciated in the Treaty.

HOME REEF CMT

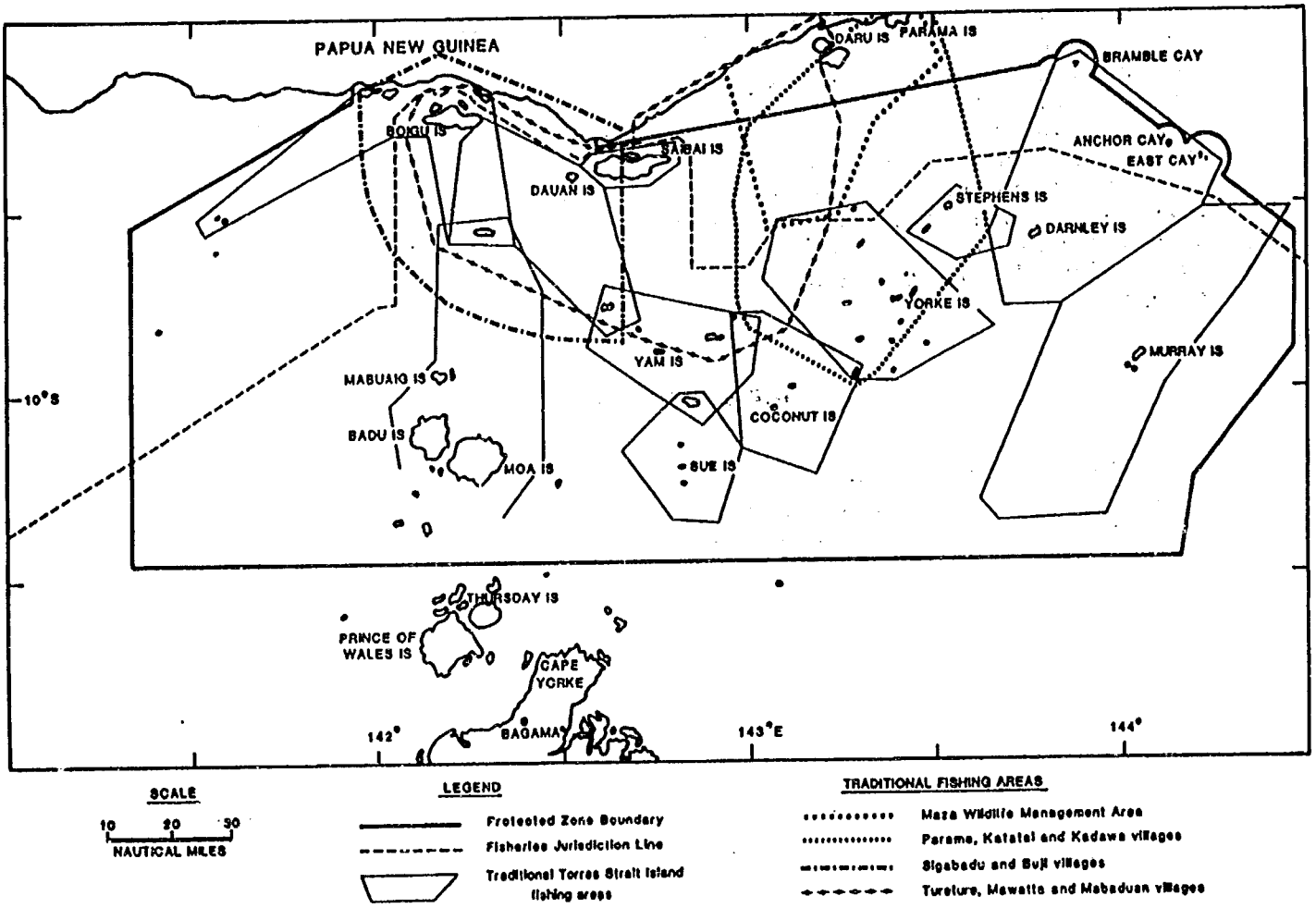
Although most seafood stocks are in no imminent danger of depletion in Torres Strait as a whole, heavy fishing pressure on reefs in the immediate vicinity of villages can easily lead to localized depletion of non-migratory species. Unlike extended CMT, home reef CMT is still widely practiced in Torres Strait and continues to serve to spread out fishing pressure, as well as to allocate resources.

Home reefs are a significant source of shellfish and other seafood for islanders gleaning on foot. This latter activity is especially important for the poor who have no boats, and the poor, elderly or infirm, whose reliance on seafoods found in the immediate vicinity of the village is higher than it is among other Islanders.

The continuing observance of home reef CMT would, moreover, not appear to have undesirable consequences. The total area involved represents only about 302 km2 (Johannes and MacFarlane, in press) or about 11% of the shallow reef and bank area in Torres Strait. No formal outer boundaries need be drawn, for the outer limits of home reefs are in most cases readily discernible by the casual observer; they coincide with the locations at which the shallow fringing reef flats of inhabited islands drop off, usually steeply, into deeper water. Commercial fishing carried out by non-islanders in Torres Strait, for prawns and mackerel, does not impinge on home reefs.

In short, home reef CMT does function to conserve some seafood stocks in the vicinity of villages, is still in operation

FIGURE 3: SUPERIMPOSITION OF CMT BOUNDARIES OF COASTAL PAPUAN VILLAGERS (AFTER HUDSON, 1986) AND TORRES STRAIT ISLANDERS OVER TORRES STRAIT TREATY FISHERIES JURISDICTION LINES



around most inhabited Torres Strait Islands, and does not conflict with government fisheries policy.

CONCLUSION

We have seen that one of the two traditional CMT systems in the Torres Strait Islands plays a useful, if minor, role in marine resource management, whereas the other, if revived, would impede it. The Torres Strait situation is undoubtedly unique in some respects. But the general approach we have used in assessing the contemporary value of CMT in the context of contemporary fisheries management in Torres Strait should be readily applicable to other CMT systems. It also demonstrates, we hope, the inappropriateness of the debate over whether or not CMT systems are valuable in the context of traditional marine resource management.

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THE CONTINUITY OF TRADITIONAL MANAGEMENT PRACTISES: THE CASE OF JAPANESE COASTAL FISHERIES

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ABSTRACT

Most small-scale fishing communities in the developing world are relatively impoverished. Further, most development plans aimed at them are based on Western concepts and models, with their central notion that marine resources are common property. This free-for-all approach has not infrequently resulted in cut-throat competition and overfishing and has prompted the design of licensing schemes to limit entry into defined fisheries. This paper examines the alternative model of essentially village-based control provided by the Japanese system of small-scale fisheries organisation and management. Although not without its own problems, this system, based on deep historical roots, serves to ensure equitable access by small-scale operators to both fisheries and economic opportunity.

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INTRODUCTION

In Asia, where coastal fisheries have generally been regarded as common property, conflicts between traditional, small-scale fishermen and modern, large-scale operators have usually been resolved in favour of the latter. This has led, in large part, to the disinheritance and impoverishment of traditional fishing communities. At the national political level the usual result has been to design and implement such alternative systems of fisheries management as limited entry, in most instances on the numbers of fishermen and classes of boats and gear, to curb the excesses of common property tenure.

But legislators in developing countries have few viable fisheries management models to consult, since most national policies for small-scale fisheries are in various stages of chaos over the issue of private versus public rights. In most industrialised countries a welter of recent regulations, such as catch quotas and limited entry, have been imposed, principally for the purpose of stock conservation; whereas in developing countries unmodified legislation, in large part inherited from colonial administrations, exists in theory but is hardly ever put into practice (see, for example, Baines, this vol.).

Thus it is refreshing to also have in the Asia-Pacific region the example of Japanese nearshore fisheries, which, although by no means perfect in their administration and operation, stand in complete contrast to the dismal litany characteristic of most other countries in the Western Pacific.

Based on deep historical roots, Japanese small-scale fishermen have legally-guaranteed equitable access to and "ownership" of the living aquatic resources in nearshore waters. Further, the abject poverty which formerly characterised the fishing communities of Japan, and which remains so intractably persistent over much of the rest of the region, has now disappeared nationwide. Such a striking contrast is of great inherent interest, although it might not provide a totally transferable model for the rest of Asia (vide infra). In Japan no conceptual distinction exists between land holdings, or land tenure, and sea holdings or sea tenure. And as is clearly set forth in the Civil Code, fisheries rights enjoy a legal status equal to that of land ownership. According to the Fisheries Law (1949), fisheries rights in the sea area under the jurisdiction of a Fisheries Cooperative Association (FCA) are the bona fide personal property of the individual members of the Association, to whom they are distributed by the Association. Each Association establishes regulations for the control and operation of various types of fishery in an equitable, efficient and sustained manner, as local conditions dictate (Hirasawa, 1980). This situation has its origins in both village customary law and in the formal legislation of the Japanese feudal era, although democratic processes and equitable treatment had to await the sweeping institutional reforms that followed World War II.

As I attempt to demonstrate in this paper, sea tenure in Japan is a complex subject which involves time-honoured customary procedures that have been gradually incorporated into modern legislation, after suitable modification. It operates at various levels ranging from the national government, through the prefecture and local FCA, to the small fishing group, and finally to the individual small-scale fisherman (Ruddle and Akimichi, in press). It is also a topic that is scarcely known outside of Japan.

ASSUMPTIONS ABOUT TERRITORIALITY AND MANAGEMENT IN EARLY JAPAN

The complex and bureaucratic system of modern Japanese sea tenure evolved during the twentieth century. But it had a long historical legacy, with its codification clearly embedded in the early Feudal Era, or Edo Period (1603-1867 A.D.). Formalization of systems of sea tenure by the Edo Government must have been based on precedents in customary usage, particularly the manorial system, although this can only be inferred.

Abundant and diverse shellmounds, particularly around Tokyo Bay, demonstrate that by the Middle and Late Phases of the Jomon Period (4500-2000 B.P.) permanent fishing and shellfish-gathering settlements were established, at least on the Pacific coast of Eastern Japan, and that they were specialised according to whether they exploited the aquatic resources of fresh-, brackish- or shallow, inshore marine water. Such specialisation according to habitat, together with a fairly regular distribution of shellmounds at approximately two kilometer intervals along former coastlines, may demonstrate territoriality with respect to aquatic resource use (Akazawa, 1981; Oikawa and Koyama, 1981). Increasingly specialised and larger-scale fisheries are revealed by the shellmounds of the ensuing Yayoi Period (2000-1500 B.P.), with particular emphasis on abalone (*Haliotis* sp.) collection (Koyama, 1969).

Further evidence is provided in the *Account of Three Kingdoms* (*San Kuo Chih*), an official Chinese document compiled before 297 A.D., that in the section dealing with the Wei Dynasty (*Wei Chih*) mentions abalone as being a tribute item sent from Japan to China. Many marine resources were important as tribute or tax items in early Japan, including sea salt, various seaweeds, salmon and many species of small fish, in addition to abalone, as confirmed by numerous *mokkan* (lit. "wooden tablets"), which may have been tribute or tax lists, excavated at the eighth-century palaces at Nara and Asuka (Koyama, 1969).

It is not difficult to imagine, then, that in parts of Japan some form of management must have been applied to the exploitation of particular marine species, at least in specific habitats, starting about two millenia ago. Since once a particular item is regarded as a tax, revenue or tribute item, measures must be applied to secure a continuous and stable supply.

EVOLUTION OF SEA TENURE IN THE FEUDAL ERA (1603-1867 A.D.)

During the feudal era, or Edo Period (1603-1867 A.D.), all sectors of Japanese society were strictly controlled and carefully organised according to a strict hierarchical system. Most of the country was divided into large fiefdoms (han), the forerunners of the present day prefectures, each one privately owned, in effect, by a regional lord. Only a few agriculturally unproductive mountainous areas remained in the public domain, for common use. A nationwide cadastral survey was conducted prior to 1610 to establish the economic productivity of each village, and thus its level of taxation. At that time village boundaries were clearly demarcated, based largely on customary usage, as were the sea boundaries of coastal villages (Hara, 1977).

Apart from areas with particularly productive fishing grounds, which provided an important source of tax revenues, most fief governments were little interested in fisheries (Yamaguchi, 1948). In the early decades of the feudal era, as the richer fishing grounds were assimilated into the fiefs, regulations were gradually introduced, especially for species with high economic value and those required for taxes and tribute (Ninohei, 1981). At the same time, coastal villages were classified into two types: jikata, "farming villages," and urakata, "fishing villages," thereby defining their duties toward the ruling classes. In general, although not in all cases, farmers were prohibited from engaging in fisheries and were forced to concentrate on the production of rice, the all-important tax commodity, against which the value of other primary products was assessed.

Although there remains a wealth of primary historical sources dealing with Japanese coastal fisheries, no historical document provides an exact date for the beginning of an institutionalised system of village or local sea tenure in either Japan or the Ryukyus. However, it is generally assumed to have occurred sometime during the early part of the Edo Period (Yamaguchi, 1948), since during that time villages became increasingly specialised in particular types of coastal fishery and started to claim their own fishing grounds.

During the feudal era one characteristic of present day coastal fisheries was paramount -- and even at that time it must have been based on the precedent of pre-existing customary usage -- and that was the notable lack of uniformity in the definition of coastal fisheries and their regulation procedures. In other words, despite an increasingly centralised and bureaucratised government during the Edo Period, coastal fisheries were very much "localite" and closely adapted to local physical, biological and socio-economic conditions, a dominant feature that persists to this day. This inevitably led to considerable variation throughout Japan in their organisation and conduct, as exemplified below.

(1) the Local Importance of Fisheries

The local importance of coastal fisheries varied considerable throughout the country during the Edo Period, although in general

they were of minor concern to most fiefs compared with agriculture. Despite some fisheries being a particularly important source of revenue, in most instances marine products were recorded in local tax books as "miscellaneous items." From the mid-Edo Period, however, the Central Government took as a tax on the fiefs all abalone, kelp, sharkfin and sea cucumber produced throughout Japan for export to China (Nose, 1980).

Where coastal fisheries were important to a fief's treasury, and particularly the highly capitalised, large-gear using fisheries, strict regulations were generally imposed on the number of entrants (via the licensing of gear). This was also done to conserve stocks and limit, via taxes, exploitation by outsiders. This is well-illustrated by the regulations adopted by Uwajima fief, in south-western Shikoku Island (Ruddle and Akimichi, in press), where the sardine fishery was a major source of revenue, and in the Fukuoka domain of Kyushu (Kalland, in press).

At the other extreme were conditions in parts of the Ryukyu Islands -- now Okinawa Prefecture -- such as in the Yaeyama Archipelago. Historically, Yaeyama has been a poor, remote and neglected part of the Ryukyus, a situation that the islanders could not alleviate by developing the rich fish resources, since under the Ryukyuan monarchy the exploitation of marine fisheries was limited to the use of stone weirs (Ruddle and Akimichi, in press). That situation continued when the islands passed to the control of the Satsuma fief, in 1609, since the Satsuma regarded fishing as a low caste activity, and entry to the sea was strictly forbidden. Thus marine resources were barely exploited, using only rudimentary techniques and for subsistence purposes (Kishaba, 1975). However, in other parts of the Ryukyus highly specialised fishing communities, such as at Itoman, on Okinawa Island, existed throughout the feudal era (Akimichi and Ruddle, in press).

(2) Division into "jikata" and "urakata"

As noted above, coastal villages were classified either as farming (jikata) or fishing (urakata) settlements. Although the situation was not uniform, the inhabitants of jikata were usually prohibited from claiming the right to engage in fisheries -- except for the collection of seaweed for use as fertilizer -- even though their village might front on the sea. They were made to concentrate instead on the vastly more important production of rice. In some fiefs only poor villagers were permitted to fish in nearshore waters. And in other settlements where the economy was based on a mixture of agriculture and marine fisheries, only members of the lower caste were permitted to fish. In general, only specialised fishermen resident in urakata were allowed to exploit nearshore marine resources in the common waters of the village, on payment of a tax or tribute to the fief.

(3) Boundaries of Sea Territories and Access Rights

Usually, a particular local fishing ground belonged to a single village, but some were the common property of several settlements. Generally, those old common village territories

correspond to the present common rights fishing grounds. Virtually without exception, the coastwise extent of such village sea territories was defined by the projection seaward of the terrestrial boundaries of the village, although the angle at which these boundaries were projected was sometimes a cause of friction between villages. On the other hand, the seaward limit of a village's territory, i.e., the boundary between coastal and off-shore fishing grounds, was not defined with precision nationwide, and the criterion for establishing it varied in different localities.

In the Ryukyus, shallow water in which an adult could walk (naba, lit. "fishing ground") was reserved for the adjacent village, for the exclusive use of its inhabitants. In most instances in the Ryukyus the area of the naba largely coincides with that of the reef flat. The deeper water beyond the reef could be used freely by all Ryukyuans living in an area wider than the adjacent village (Shimabukuro, 1971).

In Japan proper various criteria were used in different places to define the seaward boundary. A fairly common criterion was the number of fishermen with access rights. This was often a cause of considerable variation in fixing the seaward boundaries. Along the relatively sparsely populated Sea of Japan coast of Honshu, for example, a large sea territory was available, and the seaward boundary of coastal fisheries was set at 20-30 Chinese li (some 12-18 km) from the coast. But around the densely populated Inland Sea, where demand for access was heavy, the boundary was set at only 1 Japanese li (3.92 km) from the high tide mark. In yet other cases no geographical boundaries were delimited, either along the coast or seawards.

(4) Common usage

In feudal Japan the concept of common land (iriaichi) shared by several or more villages within a fief, for the collection of fuelwood, thatching materials and the like, was widespread. This same concept was also extended to the sea territories and fishing rights in fishing villages (Hara, 1977). Within the common fishing territory (iriai) the use of a given technology or the harvest of a particular species was reserved for one village, whereas other species could be taken using different gear, regardless of where the fishermen lived, providing that his residence was in one of the settlements having rights in the common fishing grounds, and particularly if it was a branch village founded by migrants from an older settlement. Under other circumstances the iriai concept was applied among the fishermen from a single village where a portion of the village sea territory would be licensed to a particular individual for a beach-seine operation, and the remainder of the area would be regarded as iriai for the free use of non-netting techniques. Further, the open sea beyond a village sea territory was also known as iriai, and could be exploited freely by the larger boats from any village along the coast of the fief. The owners of these larger boats formed guilds, which were licensed by the fief in return for the payment of a tax, the performance of coast guarding duties and the transport of fief goods, on demand.

Prior to instituting sea tenurial reforms in coastal fisheries (vide infra), the Meiji Government made an exhaustive search of Edo Period documents to establish the historical basis of sea tenure throughout Japan. This led to the government's postulation of a three-stage model for the development of village sea tenure during the Edo period (Hirasawa, 1979).

In the first stage, the privileged or "real" fishermen (i.e., full-time specialists) of an urakata village (village A) could fish freely in the territories of the neighbouring villages (B and C), which were jikata settlements whose inhabitants were prohibited from fishing. Later, a need arose to regulate access when villages B and C claimed their own sea territories. However, since the inhabitants of A were still regarded, according to the implicit caste system, as "true fishermen" they retained limited exclusive rights within the territories of the adjacent villages, such as those to exploit benthos, for example, whereas the inhabitants of B and C henceforth held all other marine resource rights. The third stage was reached when each village decided to enforce exclusive rights to its own sea territory.

The processes postulated by that model appear to have developed gradually during the Edo Period, so that by the middle and late years of the Period the establishment of village sea tenure was widespread. At the very end of Japan's feudal age, just prior to the Meiji Restoration, in 1868, it appears that the second stage of the model was the dominant tenurial mode, that stage one was still common, and that the final stage was just beginning to emerge in the most highly developed and productive fisheries. It was that final stage which was institutionalised by the Fisheries Law of 1901 (vide infra).

(5) Licensing

In some fiefs fisheries were strictly licensed. In Uwajima fief, for example, special licenses were issued to members of the shōya class to operate beach seine nets to catch sardines within the sea territory of each village. (This class was a hereditary village elite composed generally of rich farmers, wealthy fishermen or merchants.) The owner of a beach seine (ami moto) received a special ajiro (lit. "territory of the net") license from the lord, via the Country Office Court, which gave him the exclusive rights to operate in a particular tract of sea, as well as the exclusive right to use a stretch of the foreshore for hauling, drying and maintaining the net. Apart from that ami moto, which was hereditary, no other permanent fishery based on netting was permitted. There existed, however, the concept of kōgi ajiro (lit. "official ajiro"), which were regarded by the fief authorities as potential sites for establishing an ami moto at some future time. Prior to awarding a permanent ami moto for such sites other village fishermen, or fishermen from other villages, could apply to the fief for a temporary license to operate a beach seine in the kōgi ajiro. These temporary licenses were known as hyakushō ami (lit. "common people's net, i.e., "farmer's net"), to distinguish them from the ami moto belonging to the higher status people (shōya). Gradually, in Uwajima, this dual licensing system led to an extreme overcrowding

of the beach seine fishery, and eventually the commoners objected to the privileged position of the ami moto holder. In response, in 1831, the fief cancelled all existing beach seine licenses and issued only one ajiro territory for an ami moto per village.

(6) Regulations Imposed on Fishing

Strict regulations were drawn up by the Uwajima fief to ensure the conservation of marine resources. Use of bottom gill nets for the benthos catch was prohibited, and fishing with a small-mesh trawl net ("with a mesh like a mosquito net") was forbidden. Piscicides were not permitted and night fishing with torches was regulated by season and sometimes prohibited. Seaweed harvesting was also banned during the spawning season of fish, since the eggs of certain species attach to the weeds (Ehime Pref., 1938, 1962; Onō, 1938; Ishige, 1975). Similar regulations obtained in other fiefs, such as Fukuoka (Kalland, in press).

Documentation is far from complete for any part of Japan, and that which is available rarely contains mention of intra-community conditions, largely because they were not recorded by fief officials who left villagers responsible for village affairs. Nevertheless it is apparent that during the Japanese fuedal era the control of coastal fisheries was, at the first level, regulated in broad terms by the fief (in many instances equivalent to the modern prefectural-level control) and particularly for large-scale netting operations. However, the details of implementation resided with the village, and especially with village officials and elites. Further, there is considerable evidence from some localities to show that a degree of democracy among fishermen existed despite an overall feudal organisation and that the rights of the small-scale operation vis-à-vis the village elites were upheld (Kalland, in press). That system resembled the present day FCA system. Further, and again like the Japan of today, there existed considerable heterogeneity in fisheries organisation (by virtue of an essentially local, village control). Thus in Japan's immediately pre-modern era there existed well-developed systems of local fisheries administration, themselves based on earlier precedents, that provided a traditional basis for modern fisheries organisation.

THE PERIOD 1868-1948

With the Meiji Restoration of 1868 the feudal order collapsed throughout Japan. Disputes erupted within the fisheries sector and chaos reigned as the new Meiji Government experimented with administrative structures.

In 1876, after the dissolution of the fiefs, the ownership of all fisheries reverted to the central government, which permitted operations on the payment of a use tax by individual fishermen. A free-for-all ensued as new entries into coastal fisheries increased vastly, leading to widespread disputes over access and traditional rights. And the highly capitalised big operator, generally a rich village merchant, bettered his position against the small-scale

fisherman. Controversy and dispute in the fisheries sector intensified in the 1880s owing to the economic depression consequent upon the government's deflation policy, adopted to curb the inflation caused by the Civil War. As a consequence, the government was obliged to abandon its revolutionary system. The traditional system that had persisted throughout the Edo Period was revived, and de facto ownership of fishing grounds reverted to each prefecture, the administrative division that replaced the fief after the Meiji Resoration (Yabuuchi, 1958). However, in 1887 the Nōshōmushō (Ministry of Primary Industries) directed, via the "Standard Rules for Fishery Association," the establishment of fisheries cooperatives to co-ordinate the use of coastal fishing grounds. That was the only intervention in the fisheries sector by the new central government during the nineteenth century. Thus, until the Fisheries Law was enacted, in 1901, Japanese fisheries were controlled entirely by the local governments.

To maintain order and peace in the fishing communities, the 1901 law was based on traditional practices that had developed during the long Edo Period. Many of the privileges and inequities of the large-scale operator also continued. In feudal times fishermen worked as members of a fishing village guild, membership in which was limited rigidly to fishermen born in a particular village. All members had to follow strictly the regulations of the guild, which established fishing zones, seasons, gear, and methods. The traditional practices were incorporated into the 1901 law. It took the old guilds as its local administrative nucleus, designated them as Fisheries Cooperative Associations (FCAs), and charged them with carrying out fisheries management via the granting of fisheries rights and the issue of licenses, as they had traditionally. By the 1901 law the FCAs were granted the legal status to own and manage all coastal fisheries rights and licenses within the sea territory of a village or a group of villages. That law was amended in 1910 to permit the FCAs to engage in economic activities, including cooperative marketing, but their principal function remained, as indeed it still does, the administration of fishing rights in coastal waters.

Implementation of the 1901 Fisheries Law seems to have done little or nothing to alleviate the economic plight of the small-scale fishermen, which owed much to their exploitation by middlemen and fish wholesalers. Economic distress in fishing communities reached a peak during the Great Depression, at which point the government attempted to break the grip of the middlemen by encouraging cooperative marketing by the FCAs. Movement in that direction was reinforced after 1937 as Japan shifted to a war footing and the government increasingly controlled food distribution. At the same time the FCAs were re-organised as part of the centrally controlled war economy; one Association was established per village or town, and its president was appointed directly by the prefectural governor. Despite centralized administration under a wartime economy, from the late-1930s, with the great decline in the number of middlemen, wholesalers, and money-lenders, the negative remnants of feudalism were essentially eliminated from Japanese fishing villages and fish landing ports.

Henceforth, the fishermen themselves were the masters of the coastal fishing grounds and their own communities, a circumstance that would soon be confirmed by post-war democratisation, undertaken at the direction of the U.S. occupation authorities.

THE PRESENT DAY ADMINISTRATION OF JAPANESE FISHERIES

Present day Japanese fisheries are basically administered according to the "Fisheries Law" of 1949, and some related legislation, particularly the "Fisheries Cooperative Association Law" of 1948.

The Fisheries Law of 1949 was designed within the framework of the post-W.W.II democratization of Japanese institutions, and had as its principal objective (Article 1) the establishment of "... the fundamental system relative to fishery production, to attain promotion of fishery productivity and democratization of fishery by an overall exploitation of the waters through the function of fishery adjustment organisations whose principal constituents are fishery operators and fishery employees" (Zengyōren, 1979a).

To attain that goal detailed modifications to the 1901 Fisheries Law were based on three principles intended to eradicate the remaining elements of feudalism: -

(1) Henceforth fishery rights and licenses were to be granted only to fishermen or fishing enterprises actually engaged in fishing, and leasing arrangements were prohibited;

(2) The local administration of fishing rights was to be invested only in FCAs or similar organisations; and

(3) Fishery Co-ordination Committees, to be established for each sea area, were charged with preparing comprehensive plans for the full and rational use of coastal fishing grounds, and based on these plans fishing rights and licenses were to be granted to FCAs, other bodies and individuals.

Previously, in 1948, a democratic "Fisheries Cooperative Association Law" had been enacted, the specific purpose of which (Article 1) was "... to contribute to the purpose of the national economy by increasing fishery productivity and improving the economic and social status of fishermen and fish processors through the development of FCAs." This law restricted membership in FCAs to fishermen resident in the jurisdictional area of the Association and who were engaged in fishing for 90-120 days a year, the precise period being determined by each FCA. Aimed again at sweeping away remaining vestiges of feudalism, among the democratic principles embodied in this law were voluntary participation (although nobody could fish without a valid membership!), democratic control by the membership (one vote per member), and an election and recall system for officers (Zengyōren, 1979b).

As a consequence, the FCA has emerged as a vitally important intermediate organisation that links the central and prefectural government with the individual fisherman. Although comprising the

fundamental unit of governmental fisheries administration, and being the key organisation in the implementation of official fisheries projects, an FCA belongs entirely to a local community of fishermen. The FCA lies at the hub of modern Japanese fishing communities in which it constitutes the focus of social and economic activities. But, as throughout modern history, its principal function remains the planning, management and continuing sustained development of the sea territory to which the individual community has tenure.

Fisheries are managed today according to a comprehensive dual system of rights and licenses, both administered by the Ministry of Agriculture, Forestry and Fisheries, according to the Fisheries Law of 1949. In practice the Ministry delegates most of the responsibility for administering coastal waters to each prefecture.

Fishery rights, which are defined as the rights to conduct a particular fishery within a confined public sea, lake or river area, refer in the marine environment to coastal waters, and cover those types of fishery that either employ fixed gear or that exploit a relatively immobile benthos. All coastal waters, with the exception of ports, their adjacent areas and tracts reclaimed for industrial zones, are divided-up among FCAs or Federations of FCAs. In contrast, licenses govern those types of fishery that move gear over often considerable distances in search of highly mobile fish. They are issued for coastal, off-shore and distant water fisheries.

Fisheries Rights

Three principal categories of rights are recognised under Japanese law: Joint Rights, Demarcated Rights and Set-net Rights (Table 1).

Fishing Licenses

Only the licenses issued for small-scale, nearshore fisheries are of concern here (Table 1). Such licenses are issued by each prefecture to individual fishermen, or to an FCA where the number of individual applicants is large. In the latter case the government decides only the number of licenses to be alloted per FCA, and each Association then distributes them among its membership.

The Distribution of Rights and Licenses

When fishery rights are awarded exclusively to FCAs no problems of distribution occur between the association and the government, and distribution among its membership is an internal question to be resolved by each FCA. Allocation problems could arise in rights to Large-Scale Set-net Fisheries and in Demarcated Fisheries, where private organisations and individuals, in addition to FCAs, are eligible to apply for rights at the same time, were it not for particular conditions of eligibility and an order of priority set forth in the Fisheries Law that ranks FCAs first.

TABLE 1: THE STRUCTURE OF JAPANESE FISHERIES RIGHTS AND LICENSES

	CATEGORIES	GRANTED TO
RIGHTS:	(1) JOINT FISHERY RIGHTS(a)	
	a. Gathering of seaweed, shellfish and other benthos b. Specific small-scale net fisheries c. Beach seines, unmotorized trawling, fish shelters	Exclusively to FCAs
	(2) DEMARCATED FISHERY RIGHTS	
	a. Special Demarcated Fishery Rights(b)	Exclusively to FCAs
	b. Demarcated Fishery Rights(c)	To FCAs, and private organisations and individuals
	(3) LARGE-SCALE SET-NET FISHERY RIGHTS	Ditto
LICENSES:	(1) LARGE-SCALE OPERATIONS IN DISTANT WATERS	Mostly to private organisations and individuals
	(2) MEDIUM-SCALE OPERATIONS IN DEEP WATERS	Ditto
	(3) SMALL-SCALE NEARSHORE OPERATIONS	FCAs or individuals

(a) Two further sub-divisions exist, one for particular stocks in the Inland Sea and off Mie Prefecture, and the other for inland fisheries.

(b) Granted when fishermen apply for different types of aquaculture in relatively pollution-prone sites and which must therefore be managed in a compatible and equitable manner.

(c) For pond aquaculture or that occupying either an isolated or fixed site that need not be coordinated with other, potentially incompatible activities.

That arrangement breaks down, however, when an FCA lacks experience in a particular fishery. When the application of an FCA is disallowed the ultimate decision is left to the prefectural Sea-Area Adjustment Commission. The principal function of these powerful bodies, which exist in every prefecture with a coastline, and which are composed of members elected by the fishermen and experts appointed by the Governor, is the preparation of plans for the fishing grounds. Their other important responsibilities include decision-making on the eligibility of applications for fisheries rights and licences, conflict mediation and advising the local government on the management of living aquatic resources. Based on these plans and that advice, detailed regulations to control fishery operations and to ensure the conservation and rational exploitation of resources are established by the Fisheries Agency in each prefecture. Prefectural regulations are supplemented and enforced by each FCA.

In the interest of resource conservation the Ministry places limits and sometimes outright bans on some fisheries. Certain fisheries, for example, are classified as "Semi-Designated," and require an annual renewal of permission from the Ministry. Such fisheries that are regulated directly by the Ministry -- as do those directly controlled by the Prefecture -- may also be further restricted by limitations on boat size and number, gear type and size, seasonal use, fishing ground location and catch size. The prefectures also supplement ministerial conservation regulations.

The Administrative Role of the Prefecture

Detailed regulations to control fishery operations and to ensure the conservation and rational exploitation of living aquatic resources are established, as required by local conditions, by the office of the Fisheries Agency in each prefecture. Essentially, such regulations define closed seasons and other limitations for the various fisheries, control the kinds of gear and methods that may be employed by professional fishermen as well as those specifically for sport or recreational fishing, establish the minimum exploitable sizes of particular marine animals, specify closed areas for the purpose of resource conservation, and set various "associated" rules. Here, the administrative role of the prefecture is illustrated with particular reference to Okinawa (Okinawa Prefecture, 1977).

Complete Prohibitions: Neither turtle eggs of any species nor corals of the Orders Scleractinia, Gorgonacea, and Stolonifera may be collected in Okinawa Prefecture, nor may they be owned, processed, or sold if they originate from prefectural waters.

Size Limitations: In the interests of resource conservation, the exploitation, together with the keeping and sale of their products, of specific marine animals is prohibited if established minimum size requirements are not met. Harvesting of seedstock for aquaculture is excepted, provided it is specifically licensed by the Governor.

Closed Areas: According to the need to conserve marine resources, restrictions may be placed on exploitative activities in particular locations. Such restrictions may be applied to the use of a particular gear or technique, to the exploitation of a specific fishery, or can be a total ban on any exploitative activity whatsoever.

Closed Seasons: Except for the gathering of seedstock for aquaculture, closed seasons are imposed on the exploitation of turtles, Eucheuma seaweed, and Spiny lobsters. In the interest of conservation, it is illegal to capture the Green sea turtle (Chelonia mydas), the Hawksbill (Eretmochelys imbricata), and others, and to harvest red seaweed during the two month period, June 1 through July 31, each year. Lobster fisheries are closed for three months, from April 1 until June 30. These closed periods correspond with the spawning seasons of animals and the propagation period of seaweed.

Limitations on Fishing Gear: This category of regulations pertains mainly to forbidding the use of certain types of nets; controlling the use of electrical gear; restricting boat numbers in particular types of fishery; and limiting the fishing methods that may be used by amateur fishermen. The Prefecture imposes two types of restriction on net use. First, nets with a mesh size of less than 28 mm may not be used in the fish drive, except to catch specified small target fish, including juvenile Siganus spp., Apogon spp., and Abudefduf spp., among others. Second, in summer, from June 1 until September 30, the use of the trammel gill net is prohibited, since fish would spoil rapidly in the high temperatures of the shallow waters, and also because this period is the spawning season of several species of Sea bass. The use of electricity in fishing operations is also restricted. In Okinawa it is illegal to operate underwater gear with the use of electricity, and in medium- and small-scale seine net fisheries, lift-netting, and pole-and-line fishing, 5 kw is the maximum permitted capacity of electrical lamps fitted per boat. Boat numbers are also restricted in certain types of fishery. For lift-netting, a maximum of two boats can be employed, and in medium-scale seine fishing, no more than three can be used. Recreational fisheries are restricted to pole-and-line, hand-line (without using a dynamo-powered light or chumming), a small landing net or scoop net, a casting net thrown from the shore, spearing or gaffing, and wading for collection in shallow waters. Licensed, professional fishermen and crew members of fishing boats are prohibitted from employing these techniques.

Further prefectural control is excercised through the issue of licenses for specific categories of fisheries in waters not included within the Demarcated Area rights of an FCA. Licenses, issued per boat and not per fisherman, and valid for three years, must be obtained from the Governor to engage in: small-scale seine-netting (using boats of less than 5 tons); coral-collecting (using boats of less than 5 tons); tuna, bonito, swordfish, and shark fisheries (with boats 5-20 tons and employing either floating long-line or angling gear); long-line fishing for demersal species (from boats larger than 5 tons); collecting fish for sale to aquaria

(if from the 125 species described in the Fisheries Rule Book); and, using boats greater than 5 tons, divers assisted by compressed air, small-scale fixed-netting, stand-netting, lift-netting, stationary gill-netting, and fish-driving.

Seasonal limitations specified in the prefectural license are reinforced locally by their incorporation into the "Executive Rules for Licensed Fisheries," drawn-up by the FCA. In the territory of the Yaeyama FCA, in southwestern Okinawa, for example, at present only four kinds of seaweed, together with lobsters, are seasonally closed, and using a stationary gill net is forbidden during the summer (June 1 through September 30). All other fisheries may be operated year-round. However, the Director of the FCA can at any time restrict the harvesting of any species to conserve resources and to control the fishery.

Only fully paid-up members of the Yaeyama FCA, possessing appropriate licenses and who work for at least 90 days a year are permitted to fish. Rights and licenses can neither be transferred nor loaned, but they can be inherited by a kinsman or a successor, provided that such a person is an FCA member.

With the exception of the Black-lipped Pearl shell (Pinctada margaritifera), which can also be exploited by corporations, exploitation of benthos is limited to individual fishermen, who can harvest them freely within the waters allotted to the FCA. Net fisheries, however, are more strictly controlled, being limited to those FCA members who own a fishing boat and with experience in operating the gear licensed. Entry is also controlled by restricting the number of nets per fishing unit.

The President of the FCA can restrict any of the aspects of net fisheries regulations, but in this case he does so on the advice of the "Integrated Management Committee for Fisheries," which consists of three representatives of each type of net fishery. The consultative committee also decides on the membership of the net fishing category, as well as the period and area of exploitation by netting, together with the associated conditions for each type of fishery within the netting category. The decisions of that committee are reported to the Executive Committee of the FCA, which, in turn, submits them to the Annual General Meeting of all FCA members. Usually, the Annual General Meeting accepts with little or no opposition plans made by the management committee, since the need to ensure sustained yields via stock conservation is readily accepted.

THE CONTINUITY OF TRADITION: ADVANTAGES AND PROBLEMS

In present day Japan the FCA is a vitally important intermediate organisation that links the central and prefectural governments with the individual fisherman. Although comprising the fundamental unit of governmental fisheries administration, and being the key organisation in the implementation of official fisheries projects, an FCA belongs entirely to the local community of

fishermen. The FCA lies at the hub of modern Japanese fishing communities, in which it constitutes the focus of social and economic activities. But, as throughout modern history, its principal function remains the planning, management, and continuing sustained development of the local sea territory to which the individual community has tenure.

Although "incipient FCAs" existed during the Edo Period and were more fully formed by the 1901 Fisheries Law, they were under the thumb of village middlemen and other dominant personalities. Yet the modern Japanese FCA is really only an elaborate variant of a traditional fishing village organisation that has persisted since feudal times, and maybe even earlier. Important functions of those traditional organisations included the resolution of conflicts among fishermen regarding the use of fishing grounds, and ensuring the collaborative efforts of villagers, in terms of gear and manpower, to catch migratory species that seasonally entered relatively enclosed bays.

Those beneficial aspects of traditional village institutions were not abandoned during the modernisation of Japan. Instead, they were transferred to Fishery Associations and later to the Fisheries Co-operative Associations. Thus organisation and administration of modern Japanese coastal fisheries owes much to the continuity of an entity developed during feudal times.

On the surface it seems as if the Japanese small-scale fisherman is strictly bound by many detailed rules and regulations handed down through a rigidly hierarchical structure from the Ministry of Agriculture, Forestry and Fisheries, via the Prefectural Fisheries Office, and then to the FCA, which finally issues them to the individual fisherman and ensures their enforcement. But analysis of the documents issued in support of regulations, such as the "Exclusive Fisheries Rights Documents," issued to each FCA, reveals an ambiguity and generality of language. These characteristics lend to the documents, which limit themselves virtually to a simple statement of basic principles and fundamental rules of behaviour, a wide latitude for interpretation. In general the rules and regulations permit enormous flexibility, on a characteristically Japanese case-by-case basis, as suited to the specific requirements of each FCA.

Detailed application of these basic ministerial or prefectural guidelines is left entirely in the hands of the FCA -- in which every fisherman is assured a voice -- and in many instances at the level of a "sub-FCA," such at a Sea Urchin-Collecting Association, or a Live-Bait-Netting Association. Thus within a framework of basic policy guidelines for fisheries decided at the two higher levels the planning, management and monitoring of Japanese inshore fisheries rests essentially in the hands of the day-to-day operators. The FCA is at the core of the regulatory process and can adapt its implementation or execution rules and regulations to the local needs and conditions of specific fisheries, based on the empirical information provided either directly by the fishermen or indirectly by their fishing behaviour and performance.

Again, this is a tradition continued from the Edo Period, during which time fief-level officials limited their interventions to major factors of concern to the fief, and left the day-to-day decisions and operations firmly in village hands.

Other beneficial aspects of the old village-level fisheries institutions developed through the centuries were not abandoned during modernisation over the past 80 years. Instead what emerges in summarising the situation over the past eight decades years since the implementation of the "Meiji Fisheries Law" is that, apart from modernisation, little fundamental change has occurred within the local fisheries institutions and the fisheries themselves. Present day regulations pertaining to entry and fishing grounds remain essentially the same as during the Edo Period, as do those regarding size limitations and seasonal regulations of the species taken. In reality, too, the tenured territories of the local FCAs have varied little, apart from a trend toward aggregation under consolidated FCAs, as have traditional concepts of the access to outside fishermen. Overall, the major trend discernible has been one of institutional simplification together with a reduction of the former proliferation of institutions and administrative procedures (Akimichi and Ruddle, in press).

Yet, the very strength and continuity of a tradition of "localiteness" is the major cause of problems in present day Japanese coastal fisheries. So strong are his rights, in fact, that the small-scale fisherman has an impact on other forms of coastal resource use. Whereas the government can expropriate fishing grounds for, say, land reclamation and industrial development, on payment of fair compensation, a private developer must, prior to initiating any project, either purchase entirely all the fisheries rights that would be lost as a consequence of the development, or compensate for any reduction in the quality of the rights, or a combination of both. But if the fishermen refuse to relinquish their rights there is nothing to be done about it, since not even the Central Government is permitted to intervene when an FCA is resolutely opposed to a transaction. But big money is persuasive and vast sums have been paid to compensate FCAs in situations that have been awash with the potential for corruption of FCA officials, as well as other shady deals (Befu, 1980). Not uncommonly, Japanese fishing communities have been torn apart by conflicting opinions and the actions of those members opposed to and those in favour of development and change.

The formal administration of Japanese fisheries is a complex, highly structured yet locally controlled system that, as has been demonstrated, evolved over several centuries from customary village procedures that are deeply ingrained in Japanese rural society. Within the overall framework of the formal regulations exists an unwritten community law that, perhaps more firmly than the official rules and regulations, governs fishermen's behaviour according to local norms. First-comer's rights to a particular fishing spot, skill, knowledge and secrecy, pride of workmanship and community pressures to conform, all serve to balance-out excessive competitiveness and to ensure that all but the most intractable

conflicts are resolved by informal mechanisms (Ruddle and Akimichi, in press).

Local community perceptions of social and "owned" space are one of the keys to understanding the territorial and tenurial behaviour of Japanese small-scale fishermen, since community norms are flouted at one's peril and the threat of social banishment from the community is real and horrifying. On the other hand, the anonymous prefectural regulations, and even more so those established by the remote Ministry, are generally regarded as less binding.

It is characteristic of Japanese society in general that people heed closely the opinions and criticisms of their fellow community members, somewhat less closely those of the neighbouring community, and only nominally those of the larger society. Japanese rural communities, and no less those of the fishermen among them, may well be categorized as inward looking and "localite" in their behaviour. This fundamental characteristic seems to have been throughly appreciated by those who framed fisheries legislation: they erected the basic structure but left details and implementation firmly under local community control. Most contemporary problems in Japanese nearshore fisheries, such as environmental degradation, pressures from other economic sectors, and the like, can therefore be interpreted as a clash between local and non-local perceptions and norms of behaviour.

Therein resides a key problem. It might not be over-stating the point to claim that the legal structure governing Japanese nearshore fisheries was anachronistic even when being put into place by the Fisheries Law of 1949. In effect that law froze what were basically static Edo Period concepts within a rapidly changing socio-economic and ecological context. But in levelling such a criticism the chaos that characterised life in immediately post-W.W.II Japan should not be overlooked. Not surprising under such circumstances, legislative contradictions arose between the need to build an economy predicated on urban-based, internationalised heavy industry in coastal locations, and a fisheries and agricultural sector that was essentially based on long-held traditions and oriented exclusively towards the domestic market. But the legislation was implemented at a time when rural values and traditions were everywhere collapsing and when Japanese society was gravitating towards the burgeoning urban centres.

Superficially, in terms of vessels, gear and marketing, for example, many if not most Japanese nearshore fisheries are now industrialised. But their administration remains essentially village-based, at least in terms of implementation. This problem is not without solution, but it does require that at the local level fishing communities -- and, indeed, rural society as a whole -- break-out of their enclave mentality, while at the prefectural and national level a comprehensive master plan for coastal space and natural resource use be formulated and implemented nationwide.

In summary it must be reiterated that, regardless of this increasingly important defect, the Japanese system of nearshore sea tenure, which ensures intra-village cooperation and egalitarianism, is unparalleled throughout the world, and stands in striking contrast to conditions in most other countries, be it the impoverishment of most Southeast Asian fishermen or the unmitigated chaos that reigns in U.S. coastal waters. But given its unique history, long genesis, social contexts, merits and demerits, which certainly make the Japanese system intellectually fascinating and stimulating to fisheries administrators in other countries, there remains the challenge of evaluating it for transfer to other socio-economic contexts. Whereas evaluation and the design of plans based upon it probably are not beyond our capacities, implementation in other socio-political contexts might well be.

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A TRADITIONAL BASE FOR INSHORE FISHERIES DEVELOPMENT IN THE SOLOMON ISLANDS

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ABSTRACT

Some features of traditional fisheries of the Solomon Islands are reported on with references to the government's determination that economic development should be tempered by tradition.

The nature of traditional rights, perceptions of these and living marine resources within traditional areas, and the relevance of both primary and secondary rights, are explained. Emphasis is given to a question the answer to which will have far-reaching implications for development -- whether traditional rights are rights to use or to own.

Skipjack tuna industry arrangements for harvesting bait fish from traditional fisheries areas are questioned.

Factors to be considered in establishing tradition-based inshore fisheries regimes are listed, and it is proposed that a "basic fisheries tradition" for each culture should be determined.

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TRADITION AND DEVELOPMENT IN THE SOLOMON ISLANDS

Two systems of law operate in the Solomons. One is the formal, written law of this recently established (1978) parliamentary democracy. This is the law which evolved during 75 years of British colonial administration. It is basically English law, with some modification to accommodate traditional concepts of land (including reef) resource ownership. The second legal system is that of traditional law. This is largely unwritten. Nor is it uniform, although certain principles of traditional resource ownership are consistent throughout the country's 65 language areas.

There has been insufficient time and opportunity for the evolution of a system of law better suited to Solomons needs -- a modern system within which elements of traditional law are incorporated. Resource development therefore proceeds in a somewhat uncertain legal environment. Where doubts, conflicts or dilemmas arise, however, traditional law usually prevails. The traditional resource rights of indigenous Solomon Islanders are widely regarded as being of paramount importance, and the recognition of such rights has been a vital element of the policies of all post-Independence Solomon Islands governments(1).

Accommodating tradition and responding to the expressed concerns of conservative rural communities about possible commercial fisheries disturbances to their resources and to their societies is not merely a cultural or political nicety. Rather, it is a practical necessity to ensure that appropriate fisheries development can proceed with the support of rural communities, and not just limp along uncertainly in spite of them.

In general, therefore, matters of tradition or custom in relation to economic development must be treated with respect. However, the extent to which tradition is to be accommodated in contemporary development, and the way in which this is to be done, has not been clearly defined. Without clear guidelines for matching tradition to economic development, tradition is likely to be overwhelmed by development pressures. The risk than this may happen is increased because the Islander elite which makes development policy decisions has been educated in a foreign mode, leaving some with limited understanding of their own people's tradition.

In this paper some of the facts and issues about traditional marine resource rights in the Solomons are examined. On this basis, together with ideas derived from experience with traditional marine resource management elsewhere in the South Pacific, suggestions are made regarding the establishment of an adequate foundation for traditional fisheries development in the Solomon Islands.

TRADITIONAL PERCEPTIONS OF MARINE RESOURCES

Man-environment Interdependence

Land, and all that grows upon it, together with the people

who derive their sustenance from it, are one and indivisible in many South Pacific Island communities. Adjacent reefs and intervening lagoons, mangroves and estuaries are seen as integral components of that land, not as distinct entities separated from land by a certain tidal level.

It is difficult for outsiders to comprehend this close identification of Pacific islanders with their resources. Land and reefs are usually not viewed as commodities to be sold or exchanged -- although certain rights to use them, or trees or other species growing on them might be granted by resource custodians or "owners." The word "owners" is itself misleading, since it indicates a possessive and dominating relationship, rather than a sense of being part of that land or reef. Davis (this vol.) discusses this concept in the context of northern Australia. This sense of close identification of individual and community with resources is eroding, although it persists among the more conservative communities of the Solomon Islands.

Traditional resources

In the Solomons, marine areas have traditionally been regarded as being useful for:

- fishing for food using line, net, spear, poison, trap and by gathering;
- gathering of shells used for manufacture of traditional "money" and ornaments;
- sand and coral rock for landfill and for construction;
- passage of canoes; and
- disposal of the dead.

The relative importance of these uses has varied according to culture group, the location of the "owners" in relation to the marine area in question, and the influence of agents of economic development.

Boundaries

Customary rights to an area of marine resources in the Solomons are usually retained by the social group which has rights to the adjacent land. The situation can be much more complex, as explained in an example from Fiji, discussed by Baines (1982), and similar situations may occur in the Solomons.

In simple cases, where a Pacific Island group's rights to an area of land also include adjacent marine resources, the side boundaries of the traditional marine resource area are often simple extensions of the land boundaries, from points at which they reach the coast. These boundaries then follow prominent surface and subsurface features of the marine area outwards to an offshore boundary which may be determined by:

- the outer edge of the fringing or barrier coral reef (Baines, 1982; Carrier, 1981);
- the distance of the horizon as viewed from the shore (roughly 4 km);

- the distance from which the associated island can be seen by a man offshore in a canoe (Johannes, 1977);
- bottom visibility; or
- limits of traditional bottom fishing.

There is a special case of a traditional fisheries area where an offshore fishing ground may exist owing to a submarine feature, such as a submerged reef. An example is given by Carrier (1981) for Ponam, where traditional rights have been assigned to certain patch reefs in otherwise deep water to which no traditional "ownership" is recognised.

No reference has been made to boundaries for this Ponam example. However, boundaries are likely to exist in similar cases elsewhere. Such boundaries are probably determined largely by the areal extent to which traditional fisheries technology has made it possible for the area of the submerged feature to be fished. Johannes and MacFarlane (in press) refer to further examples of traditional offshore rights in Torres Strait, between Australia and Papua New Guinea.

In the distant past traditional fisheries area boundaries, where they existed, in many instances may not have been of great significance. Today, however, because of a need to clearly define traditional marine resource rights and to provide for their formal legal protection, boundary definition and location has become an issue of major importance.

TRADITIONAL RIGHTS

There is a general understanding in the Solomons that traditional marine area rights must be respected. Government policy embraces this point, and formal legal recognition of the situation is provided for in clauses which limit, or disallow, the application of formal law in areas where traditional law prevails. An example is section 3(7) of the Provincial Government Act 1981: "Nothing in this section shall be construed as affecting traditional rights, privileges and usages in respect of land and fisheries in any parts of the Solomon Islands."

There is, however, no clear statement of traditional marine area law. Inshore fisheries development cannot proceed effectively in the absence of a more detailed knowledge and understanding of traditional rights to, and uses of, marine resources.

What are traditional rights?

Most commonly in the Solomon Islands, as elsewhere in the South Pacific island region, traditional fisheries rights apply to areas. South Pacific island examples are provided by Johannes (1977) for Micronesia, Carrier (1981) for Ponam, and Baines (1982) for Fiji. Superimposed on such area rights there may be those held by individuals or groups to species, and to fishing technology. Carrier (1981) discusses the complexity of species and technology

rights in what is perhaps the most detailed published example of a traditional South Pacific island marine resource tenure system.

The nature and application of traditional marine resource rights has not been examined closely in the Solomon Islands. Though these rights are generally interpreted as being rights to specific areas, closer examination of the various traditional societies might reveal examples of species and technology rights also.

Some writers on the subject of traditional fisheries rights have assumed that these are rights of ownership in a Western sense; e.g., Polunin (in press) or Wright (this volume). Others, such as Davis (this volume), Johannes and MacFarlane (in press) speak of rights of use. Close examination of the relationship between resources and traditional Pacific island societies would seem to indicate a custodial, rather than possessive, attitude of people to their resources. Thompson (1949) demonstrates this for the Lau island area of Fiji, whereas Spoehr (1965) flatly rejects the notion that an equivalent of Western ownership of resources might have been part of traditional Pacific island cultures.

It would be more accurate, then, to define traditional fisheries rights as various rights of use, rather than of "ownership". This, indeed, is the definition incorporated in the formal fisheries law of Fiji(2).

It should be noted that rights to use can be exclusive in that they can be interpreted to mean that those holding primary rights may have a subsidiary right to prevent others from using certain resources within the area over which traditional control is exerted. Such a right to exclude others has been established for the Marau area of the Solomons (High Court of the Western Pacific, 1951).

In the Solomon Islands today it is generally held that traditional marine resource rights imply full, exclusive "ownership" of the area concerned. This interpretation may have been modelled on the Western concept of property rights, first introduced to the Solomons by opportunist traders through their nineteenth century land "purchases."

An examination of Solomon Islands traditional land issues in times of relatively low "development pressure" (1954 and 1956) led Allan (1957) to conclude that, "Not all reefs were subject to interests, let alone the same interests, and not all interests had an element of exclusiveness." Interests in reefs (Allan, 1957) are expressed in various ways, depending on social organisation and culture -- from a close subdivision on an individual basis found in the Reef Islands, through tenure based on the family group (Roviana), to a relative lack of exclusiveness in Tikopia.

The exclusiveness of interests in reefs is directly related to the significance of the reefs and their resources to the community concerned. Allan (1957) illustrates this point with an example from Lau (Malaita). An individual holding primary interests

in a reef area would exercise exclusive interests in gathering shells such as trochus for commercial sale, net and trap fishing, and gathering shells for the manufacture of traditional money. This individual would have much less interest in line, spear and pole fishing, shells for the manufacture of ornaments, and other marine resource activities. In such a situation, then, persons without traditional rights on that reef, who, passing in a canoe and seeing a single turtle there, might dive overboard and catch it by hand. With luck, no protest would be made by those who have rights to the reef. However, if the violators attempted to use a net to ensnare the turtle trouble would certainly result.

Changing perceptions

The interests which a rights-holding group has in marine resources may alter as circumstances change. Rights to trochus shell as material for personal adornment are unlikely to have been strongly exercised in the past, because the supply of shell was high in relation to demand. However, commercial trade, beginning in the nineteenth century, put much heavier pressure on this resource and led to exclusive rights being exercised. The Solomons' benchmark court decision on traditional fisheries rights (High Court of the Western Pacific, 1951) arose from a claim by a group to exclusive rights to fish for trochus shell.

Clam meat (Tridacna spp.) has long been an item of traditional Solomon Islands diet. However, communities which in the early twentieth century chose to follow the directives of the Seventh Day Adventist Church were forbidden to eat this mollusc. Since the rights of such groups were no longer exercised, in effect, they lapsed. However, when a foreign fishing enterprise recently offered to harvest clams and to exchange them for money there was a sudden resurgence of interest in exercising exclusive rights to this resource!

Two examples from elsewhere in the South Pacific further illustrate the implications of changing perceptions. The first is given by Carrier (1981) for Ponam. He describes a clan's loss of traditional control of a reef area as a consequence of a rise in the monetary value of trochus, in a situation rendered more complicated because the clan did not have primary rights to the trochus resource.

In Fiji, an incident has been recorded (Baines, 1982) where the bêche-de-mer resources of a distant reef in the open sea suddenly attained primary significance for the group holding rights to the reef. This sudden interest was caused by the visit of a group without traditional rights to the long neglected reef to harvest its bêche-de-mer for commercial gain.

Another example from the Solomon Islands of the implications of changing perceptions of marine resources -- an example with extensive social and political consequences -- was recorded by McKinnon (1975). Before contact with European culture, traditional use of the hawksbill turtle resource was restricted largely to using

small pieces of turtleshell artistically worked into personal adornments. McKinnon demonstrates that, since visiting nineteenth century European traders were prepared to exchange iron, tomahawks, and even muskets for turtleshell, control of turtle hunting grounds became the key to power and status. This was simply because the most direct way of gaining spiritual power was believed to be through taking the life force of other humans, centred in the head. Steel axes and firearms greatly improved the effectiveness of headhunting. In this way the turtle shell trade promoted the massive headhunting expeditions of the late-nineteenth century.

Primary and secondary rights

Whether traditional rights are rights of use only, or whether they really are rights to "own" in a Western sense, may appear to be a trivial question. There is a widespread belief in the Solomon Islands today that reef "owners" really do own. Yet, consider the relevance of another feature of traditional resource rights -- a feature which is still regarded as important within traditional rural Solomon Islander communities -- the matter of secondary rights.

Primary rights are those rights to which a group (or, sometimes, an individual) is usually entitled only through inheritance(3). Generally it is only secondary rights that can be acquired, through marriage, by traditional purchase or in return for services rendered, for example.

In Lau, Malaita, Akimichi (1978) describes a traditional fishery that was subdivided into individual fishing areas, some of which were allocated to individuals with secondary rights. The only practical difference in this case between those with primary and those with secondary rights appears to be that only the former can prohibit fishing in some parts of the fishery for specific periods during a season, which extends from early-March to April or May. This example is but one of many which could be given to illustrate that, in the Solomons, secondary rights to land and sea resources are still recognised as an important part of tradition.

Should inshore fisheries development be promoted in ways which emphasise primary rights to the detriment of secondary rights, then an important feature of Solomon Islands society will have been weakened.

Access rights

Right of access to and/or through a traditional fishing area for navigation is also important. Until the beginning of the twentieth century, when extensive inter-tribal warfare ceased, rights of access were restricted to close kin and to groups linked by military alliances. A clear indication of the situation in more recent times is a court decision (High Court of the Western Pacific, 1951), which specified that the traditional right of exclusion of outsider fishermen, which the Court recognised, "does not extend to excluding the passage of vessels."

Present practice in the Solomons is generally consistent with that court decision, except where there is active dispute over "reef ownership" in which one claimant group attempts to exclude the other. In a few recent instances navigation rights have been denied to visiting tourist yachts -- on the grounds of yacht crews' disrespect for local tradition and their theft of valuable seashells. These are both special cases and they do not alter the fact that rights of innocent passage are still generally available to all.

TRADITIONAL RIGHTS AND THE TUNA INDUSTRY

In the absence of a comprehensive, studied approach to the definition of traditional rights, and the areas and social groups to which these apply, fisheries development agencies in the Solomon Islands have had to proceed on the basis of a limited knowledge and understanding of traditional fisheries.

The success of a pole-and-line skipjack tuna fishery in the Solomons depends on a continuing supply of live bait fish taken from areas subject to traditional marine resource rights. These bait fish are harvested not by individuals from the communities with traditional fisheries rights but by employees of two tuna fishing companies. Nevertheless, resource rents are paid by the companies to traditional fisheries area "owners."

To facilitate the calculation and payment of resource rents a system of bait fish areas has been established. The boundaries of these areas are based to some degree on apparent traditional boundaries between areas to which different groups hold fisheries rights.

In mapping bait fish areas, however, it appears to have been assumed that primary (hereditary) rights alone are significant. Boundaries have been apparently determined on the basis of discussions with individuals or groups claiming traditional marine resource rights, but there has been no rigorous examination of the validity of these claims. Nor have opportunities been provided for other individuals or groups to file counter-claims, some of which are likely to be well-founded.

The mapping of bait fish areas has certainly incorporated elements of traditional fisheries rights, a requirement for development of fisheries in the Solomon Islands. However, the approach has been too simplistic and too hurried. A number of important and complex traditional fisheries rights principles has been overlooked. Complaints and compensation claims from "reef owners", together with reports of arbitrary changes of bait fish area boundaries, indicate that this traditional fisheries rights model is inadequate as a basis for fisheries development in the Solomon Islands.

TRADITION-BASED INSHORE DEVELOPMENT

The above, admittedly preliminary, examination of traditional fisheries in the Solomon Islands reveals a complexity which is perhaps not fully appreciated by agents of commercial inshore fisheries development. It points to a need for a fresh and more comprehensive look at traditional fisheries as they exist today, before further commercial development takes place in marine areas subject to traditional control.

In formulating a framework and preparing guidelines for tradition-based inshore fisheries management regimes in the Solomon Islands it must be recognised that:

- traditional cultures are dynamic and changing;
- perceptions of traditional resources change;
- traditional fisheries rights may involve areas, species, and/or technology;
- it has not been clearly established whether primary traditional rights imply ownership; and
- both primary and secondary rights are relevant.

Current National Government policy emphasises the discussion and resolution of matters affecting tradition, at local government levels -- in Area Councils and Provincial Assemblies. With some technical advice from relevant National Government agencies it should be possible at the local level to establish, by general agreement, a "basic fisheries tradition" for each culture group. Among groups long interconnected by trade, marriage and warfare such a tradition is likely to be shared.

Defining a "basic fisheries tradition" need not involve detailed description. Key elements of tradition should be clarified and agreed upon by the communities within a culture group. Such matters as areas, boundaries, primary and secondary rights, principles of distribution of benefits arising from exploitation of resources, and responsibility for management of traditional fisheries areas would be included.

Examination of each "basic fisheries tradition" at the provincial administrative level would make it possible to establish a regional framework and guidelines for inshore fisheries development -- with allowance for significant differences of tradition within the province.

Wherever practicable, an effort should be made to identify principles which could be applied on a national basis, throughout all seven provinces. It would be a mistake, however, to attempt to override significant regional and/or cultural differences.

For political, economic and administrative reasons there is one vital issue which must be determined on a national basis; that is, are traditional fisheries rights rights to use or rights to own? The answer will have far-reaching consequences for economic development and for the distribution of development benefits.

NOTES

1) It should be noted that with occasional exceptions some measure of recognition of these customary rights was also provided by the British colonial administration.

2) Contemporary formal legal interpretation of traditional Fijian law, coupled with unresolved questions about the historical basis for this interpretation, have given rise to a controversy in Fiji about the nature of traditional rights.

3) Allan (1957), however, quotes unusual examples of transfers of primary rights in Lau, Malaita, for services rendered, or even for compensation.

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MARINE RESOURCE USE IN PAPUA NEW GUINEA

CAN TRADITIONAL CONCEPTS AND CONTEMPORARY DEVELOPMENT BE INTEGRATED?

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ABSTRACT

The recently independent state of Papua New Guinea (PNG) is rich in marine resources traditionally utilised for subsistence purposes. The same resources today offer opportunities to earn some of the foreign exchange required to support a high domestic consumption of foreign goods. Indigenous customs governing resource use and local claims of ownership are conflicting with the ambitions of developers, bureaucrats and politicians who wish to develop these resources commercially. Some practices, such as traditional tenure in coastal waters, have been integrated with some success with commercial fishing ventures in PNG.

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INTRODUCTION

For some time fisheries planners in Papua New Guinea (PNG) have been aware of the conflict between the development of coastal resources and the preservation of traditions relating to their utilisation. Study of this problem is hampered by the diversity of attitudes to resource use which have evolved on different sections of the coast. Anthropological and socio-economic studies of PNG's relatively isolated coastal communities, which today continue to operate at a subsistence or semi-subsistence level, have generally neglected this problem. As a result little information exists concerning traditional perceptions governing the use of marine resources. Further, present "traditional" practices have been influenced by two centuries of contact with western societies. However, as a consequence of the increasing commercialisation of formerly subsistence resources, ownership of access rights to coastal habitats and resources based on traditional claims increasingly have become jealously guarded possessions.

Many of the 390,000 people residing in the PNG coastal zone, or 13 percent of the total population (Frielink, 1983), utilise marine resources for some of their subsistence needs. Today, an unprecedented influx of foreign goods and materials has caused a need for foreign exchange, which can be generated in part by exploiting these same resources. The PNG government recognises a need to both decrease the imports of fisheries products, the value of which has been increasing at 8.4 percent/yr during the last five years, and attained K30 million in 1981, and to promote self-sufficiency. Ironically, increased production of fish at the village level results in some of the cash acquired being spent on imported fish products, notably tinned fish. Remittances from village members working in urban areas also contribute to this trend.

Below I will discuss some aspects of the traditional use of marine resources and the effect of contact with western societies on attitudes towards resource use. Although it is generally thought that prehistoric coastal communities in PNG did not harvest natural resources intensively, because of the low population density relative to resource availability, I discuss some evidence for heavy human utilisation of some coastal resources. Present attempts at preserving traditional knowledge and customs by incorporating aspects of them into the present educational system, and the difficulties faced in undertaking such a programme, are also outlined. Recent studies of the subsistence use of marine resources are reviewed and I discuss examples of attempts to integrate traditional practices into present day development programmes, and the problems such attempts face.

SOME ASPECTS OF TRADITIONAL COASTAL RESOURCE USE AND TRANSITION ASSOCIATED WITH EARLY EUROPEAN INFLUENCE

Although the inhabitants of the Ninigo Islands, in northwest PNG, believed that the sea and its resources belonged to all men (Spring, 1982), many villages in PNG established areas of marine

tenure, defending the boundaries with a vigour proportionate to the perceived value of the resources bounded (Johannes, 1982). Jealously guarded inter-village fishing rights (Malinowski, 1918; Landtman, 1927; Bell, 1946-47; Carrier, 1982) provided a useful means of controlling access to marine resources, although ownership of resources did not gaurantee that resources were "managed" to ensure long-term supply. Also, isolated attempts at conserving resources on different sections of the coast would have had negligible effect on migratory species (Haines, 1982), as such resources were capable of transiting a number of individually owned areas, each probably under a different "management" regime.

To appreciate the problems facing present day coastal resource development planners, an understanding of the complexity of traditional access rights to marine habitats and resources is necessary. However, there is little documentation of the dynamics of traditional marine tenure in PNG. This contrasts dramatically with the amount of published information on land tenure (Johannes, 1978).

In New Ireland, as in much of PNG, coastal and marine tenure are closely related. Usually a landowner also owns the marine area adjoining his land, which often extends offshore to where the land is just visible on the horizon (see also Johannes and MacFarlane, in press; Baines, this vol.; Zann, this vol.). Traditionally, on the death of a landowner in New Ireland, fishing in the tenured marine area was prohibited until members of the family of the deceased had prepared six feasts, at yearly intervals (see also Davis, this vol.). Today, the feasting is usually completed in two years, this change having occurred as a result of the decline of traditional customs rather than as a consequence of community pressure applied to gain access to resources within the restricted area.

Traditionally, eastern Melanesian societies are matrilineal whereas much of western Melanesia is uni- or patrilineal (Chowning, 1977). In PNG, fishing rights and fishing knowledge relating to specialised fishing techniques are usually passed from father to son or from uncle to nephew. Occasionally, in the past, ownership of fishing rights was acquired by force. For example, the ownership of a particularly important net on Ponam Island was divided between two clans, as a result of war, until the dispute was resolved by village courts in the early 1970's (Carrier, 1982). In the Trobriand Islands, Malinowski (1918) reported that rights to shark fishing were transferred from one group to another as a result of a quarrel. A recent development reported from two areas, Manus (Chapau, pers. comm.) and the Lavongai Islands (Wright, unpubl. data), but possibly common throughout PNG, is that as a result of the continuing migration of young people to urban centres, traditional rights are passed to those young persons remaining in the village who show the most potential to utilise them, whether or not these individuals are blood relations. In some cases knowledge or techniques are for sale, although few young people today appear willing to purchase them.

An example of the complexity of traditional marine ownership custom has been described by Carrier and Carrier (1983) from Ponam Island, Manus Province. On this island different patrilineages own different areas of the adjacent water, the fish in it and the techniques permitted for their harvest. Rights overlap so that a group owning a particular technique can use it, regardless of the wishes of the sea owner. However, the permission of the owner of the target species must be obtained. The use of unowned techniques depends on tenure customs relating to the area to be fished. As in the Trobriand Islands (Malinowski, 1918), the various right holders were each allocated a portion of the catch. In West Sepik Province exclusive ownership of individual species and the knowledge and techniques used to capture them are vested in individual clans. The likelihood of success of such traditional fishing practices was believed to be improved if certain rituals were observed by villagers. These included the isolation of fishermen from the remainder of the village, the isolation of males from females, complete silence, a prohibition on female contact with fishing gear and a precise treatment and distribution of the catch. Rituals were intended to assure the continued supply of community needs and were not designed to protect the environment, although conservation of the environment and resources was often a by-product of such practices (Bulmer, 1982).

Today, as in the past, fishing activities in some sections of the PNG coast are prohibited under certain circumstances. Bans on specified areas within traditional boundaries are imposed by the owner of the area, the community magician or by village leaders. Temporary bans on areas are imposed to permit the accumulation of resources within that area in preparation for an important celebration for which unusually large harvests are required. Long-term or permanent bans usually result from an apparent inability of humans to compete with the spiritual custodians (masalai) for access to the resources of a particular area. Masalai embody one of the few traditional concepts still commanding widespread respect; they protect resources in an environment in which man is considered to be an intruder. As with taboos on species, access to resources is controlled for the ultimate social and physical welfare of coastal residents, not for the preservation of resources. Such controls are effective conservationally in that the area or resource is avoided for fear of sickness or death that is believed to result from a breach of customary laws (see also Hooper, this vol.). There has been little work done to assess the conservational value of taboos, although Johannes (1982) has pointed out that taboos are only conservational if they redirect demand to more plentiful resources.

The perceived value of resources and habitats gradually altered on contact with Europeans. On Manus (Carrier, 1980) and New Ireland (Wright and Kurtama, n.d.), colonial administrations resettled inland people on the coast, for easier access. This resulted in conflicts, which carry over to the present day, between the original inhabitants and relocated villagers, even though inland people lacked a maritime heritage. On Manus the implementation of colonial peace disrupted local manufacturing monopolies, and the

movement of inland agriculturists to the sea decreased the economic importance of fish (Carrier, 1983). Migration of males to administrative centres in search of employment prompted women to assume traditionally male roles in resource harvesting. This was assisted by the colonial imposition of peace between previously aggressive coastal neighbours, which removed the traditional dangers involved in venturing far from the village.

Christianity was introduced to PNG during the eighteenth century. Its effect on coastal resource use by indigenous coastal residents has been discussed by Pulseford (1975), Johannes and MacFarlane (in press) and Nietschmann (this vol.). In New Ireland, today, marine resources may be "conserved" for specific religious occasions prior to which a concentrated effort is applied to obtain plentiful food for feasting. Polunin (in press) concluded that in such cases the time scale is usually too short to achieve a real increase in the resource population. Harvests subsequently may have been artificially high because of the concentrated community effort involved.

CONSEQUENCES OF SOME TRADITIONAL COASTAL RESOURCE USE PRACTICES

Although traditional societies developed an intimate knowledge of their environment, there is some evidence in PNG that perceptions governing resource use did not always extend to a consideration of the requirements of future generations. In a subsistence economy people are more likely to have been environmentally aware for own their immediate benefit.

According to Reinman (1967) the use of marine resources by early colonists from Southeast Asia was not extensively developed. But faunal remains from archaeological sites, mainly in coastal Papua, reflect a widespread pattern of the use of marine, estuarine and terrestrial fauna during the last 4,000 years. In areas of concentrated human settlement there is evidence for heavy resource utilisation, which in some cases resulted in local extinctions. Swadling (1977) suggested that the same range of molluscan species has been utilised in the vicinity of Pari, on the Papuan coast, for 2,000 years, and that populations of *Strombus luhuanus* and *Anadara antiquata* did not revert to an unexploited state over the period of occupation. Generally, most marine resources are highly fecund (Haines, 1982) and were capable of fulfilling subsistence needs for pre-contact coastal populations on a sustainable basis. However, the dugong (*Dugong dugong*) disappeared from the archaeological record in the Port Moresby region in the late-nineteenth century, and is not present on this section of coast today. Pernetta (pers. comm.) believes that this resulted from over harvesting rather than a migration of dugong away from this region(2). But there is no scientific evidence to support this theory.

The Tolai of northern New Britain, use the *tambu* shell (*Nassarius sp.*) as a traditional currency, the accumulation of which is a measure of wealth. The present day Tolai claim that their ancestors harvested *tambu* close to their villages in Blanche Bay,

but that these local stocks were exhausted long before contact with Europeans, forcing villagers to travel as much as 200 miles along the coast in search of them (Epstein, n.d.).

Some traditional fishing techniques involved considerable habitat alteration to make an area more attractive to a particular resource. Tidal weirs and stone traps were constructed by removing coral boulders from the reef flat (Johannes, 1982; Wright, 1983; Johannes and MacFarlane, in press) or by gathering volcanic rocks (Johannes and MacFarlane, in press) and incorporating them into a trap. Fish sought the protection of the trap which offered the only shelter in a barren area created around it. Another method, the leaf sweep (Johannes, 1982), is still used on Manus Island. Burrows and Spiro (1953) considered this technique, which is capable of removing the majority of fish resident on a large area of reef or shallow sea grass habitat, to be the most productive traditional fishing activity in Oceania. The leaf sweep was also used in Milne Bay where Malinowski (1918) reported that harvests of fish sometimes exceeded village needs, and that the surplus was left to rot on the beach.

SUBSISTENCE USE OF MARINE RESOURCES BY COASTAL SOCIETIES

Available data on the subsistence use of coastal resources in PNG suggests that coastal people living adjacent to cultivable land adopt agriculture in preference to exploiting marine resources. This may stem from an ancestral fear of the sea, as is the case in some parts of Indonesia (Polunin, n.d.), a preference for agricultural foodstuffs, or a greater feeling of security that arises from cultivating land close to a village.

Pernetta and Hill (1983) consider that the use of marine resources by coastal populations has been undervalued by anthropologists and others who have suggested fishing activities are undertaken more for fun than necessity. Pernetta and Hill (1983) quote Moulik (1973), who described fishing in Milne Bay as forming "only an intermittent food producing task, which provides no regular contribution to the diet." They disputed this statement on the basis of Moulik's own data which showed 3.1 hours/week, or 17 percent of the productive work time (18.2 hours/week), were spent fishing. Alternatively, fishing methods may have been either efficient enough or resources in such abundance that relatively little effort was required to meet dietary needs. However, no data was presented concerning productivity of fishing methods. In Fiji, Bayliss-Smith (unpublished data in Pernetta and Hill, 1983), found that a similar proportion of work time spent fishing yielded 79-95 percent of the total animal protein in the diet, but only 7-13 percent of the total dietary energy. Thus the total nutritional importance of the food item, not merely energy value, needs to be assessed (cf. Meehan, 1977).

One of the few detailed nutritional studies carried out in PNG has been done on Karkar Island by Norgan et al., (1974). For the residents of this island, animal protein from the forest was

more important than fish in the diet. Fishing was seldom related to the availability of food or a desire to alter the diet, but was more often regarded as a leisure activity, reflecting the general adequacy of taro, fruits and store-bought foods. Karkar men spent an average of 63 min/week fishing or 1.5 percent of their average weekly activities (34.3 percent of their time was spent sleeping, 36.9 percent sitting and 1.2 percent gardening).

Whereas scarcity of agricultural land forced a reliance on marine resources in the past, today remittances from family members working away from the village assist the purchase of imported alternatives. Generally, fish and shellfish contribute surprisingly little to the diets of coastal residents. Haines (1978-79) found that the average daily subsistence catch of fish from the mangrove-dominated environment of the Gulf of Papua region was 80g, with an additional 40g of crabs and similar amounts of prawns. He noted that 30-40 percent of this was traded for sago, a preferred food. From data provided by Green and Sanders (1978) it can be calculated that residents of the West New Britain Coast consumed 11.4g of fresh fish per day.

Residents of the Tigak Islands, New Ireland Province eat an average of 23.4g whole weight/day of locally caught fish (Wright and Richards, 1983). This was estimated to be 7.7 percent of a moderately active adult male's recommended daily protein requirement, according to FAO - WHO (1972) figures, and 9.8 percent of a female's. Dietary energy was supplemented from sources such as sago, rice, banana, tinned meat and tinned fish. An exception to these low intake figures in provided by Carrier (1983) for diets of the residents of Ponam Island, a low island north of Manus. There, adults and children reportedly ate 500g and 250g, respectively, of fish and meat per day. He estimated the island provided 80 percent of this intake and that the balance was derived from tinned meat and fish.

As part of a National Nutrition Survey, a dietary study was conducted in New Ireland during 1982. Of the 858 families questioned about their food intake for the previous day, 36.8 percent had eaten locally caught fish. Of 1,415 children weighed, 25.7 percent were below 80 percent weight-for-age, and thus were malnourished (Singleton, pers. comm., 3).

Wright and Richards (1983) estimated that the subsistence harvest of fin fish from the reefs and associated shallow water environments of the Tigak Islands amounted to 0.63 kg/ha/yr. Munro (1982) suggested that reef areas are capable of sustaining yields of 40-75 kg/ha/yr. As PNG's reefs support a rich fish fauna in terms of both diversity and abundance, lack of motivation rather than resource availability appears to be the main reason for the current low subsistence use of marine resources. Sufficient quantities of more accessible, although not necessarily more desirable, foods are generally available from the terrestrial environment or in stores close to the village.

PROMOTING AWARENESS OF TRADITIONAL CONCEPTS

Many traditional practices required patience and skills developed in subsistence situations where the benefits of an intimate knowledge of the environment and the renewable natural resource assemblage was of an obvious practical value. For an increasing number of people in PNG such knowledge is no longer a pre-requisite for the satisfaction of daily food needs.

Although study of traditional music and art is offered at the tertiary level in PNG, most curricula do not incorporate a cultural component dealing with traditional natural resource use. In any case, the best teachers of this subject live in the villages. Teachers and students alike in modern schools lack the knowledge and experience of traditional practices necessary to impart a meaningful appreciation of traditional human interactions with the environment. In addition, few indigenous teachers understand western principles of resource management. Thus teachers as well as students require additional training in order to facilitate this approach.

Education centres in PNG are generally remote from the home environment and they introduce ideas and concepts that have little application in the village setting. Schools aggregate students from a variety of backgrounds, inland and coastal, rural and urban, with their associated differences in local languages and perceptions of the environment. Today, modern trade skills and administrative and management ability mean more to them for career development than does an understanding of ancestral knowledge important in subsistence activities.

Although English has been proclaimed the national language in schools, early schooling based on community value systems and knowledge is carried out in the vernacular in the North Solomons Province (Hill *et al.*, 1982). This offers a good opportunity to promote an awareness of ancestral perceptions of the environment. Dwyer (1982) has suggested that each community school should have associated with it a reserve area that could provide a focus for the teaching and recording of traditional knowledge. However, unless the principles of the traditional knowledge base are reinforced through higher levels of education, this early awareness is likely to be supplanted by western values and ideas. Recognising this the Committee on University Development has proposed that students return to their communities during their education to reinforce childhood experiences (Gris, 1974). Johannes (1982) proposed all tertiary institutions in PNG should encourage students to undertake a project to record traditional knowledge and practices from their home areas. Of course, all such knowledge will not be of obvious value in the modern context.

In addition, attempts should be made to familiarise villagers with the potential economic and associated benefits of development and its likely effects on their traditional system, assuming that the system is understood. Bureaucrats and politicians, whose traditional association with the natural environment is usually limited to their childhood experiences,

should be made fully aware of the possible repercussions of development on traditional societies. When pursuing development those unaware of the cultural constraints of traditional Melanesian coastal societies ignore not only traditional resource management techniques, but also the social structure that supports them (Togolo, 1982). Administrators require a good understanding of traditional concepts before the implications of development can be adequately anticipated. With this background, innovative ideas incorporating traditional practices in modern development programmes could be encouraged.

Present attempts to promote cultural awareness and stimulate interest in traditional practices in PNG is resulting in the commercialisation of the cultural base. For example, young people may learn how to reproduce traditional artifacts but the traditions associated with them have been eroded to an extent that, in some villages, mass production of relatively poor quality immitations is now more important than understanding the cultural context in which the objects were traditionally imbedded. Often, cash benefit is the only incentive for the retention of traditional knowledge and practices.

THE INTEGRATION OF TRADITIONAL PRACTICES IN MODERN COASTAL RESOURCE DEVELOPMENT PROGRAMMES

Access to marine resources in PNG is limited through a variety of traditional customs, few of which are geographically widespread. To facilitate the incorporation of traditional practices into development proposals, an understanding of the dynamics of traditional conceptions and practices in essential. The integration of traditional concepts and development has been attempted in PNG where local leaders and traditional landowners have assumed responsibility for the management of some forest resources. In at least one case (Waiko and Jaigari, 1982) traditional owners have prohibited commercial activities in their forest, foregoing any immediate economic benefit.

Such coastal control is yet to be implemented mainly because traditional management regimes provided for subsistence yields, which, in the case of many nearshore resources, will not support intensive commercial exploitation. Nor are local people predisposed to accept development controlled and directed by non-residents.

The alternative of placing responsibility for production in the hands of the traditional resource owners does not guarantee continuous production, since production is influenced by intermittant social demands and economic requirements in the village. Recent experience suggests that traditional resource owners may often prefer development by established companies, from which they receive a levy or royalty as payment (Wright, unpubl. data). They also desire the option to be directly involved in development if members of the community so wish, but developers cannot be seen to benefit selected individuals or groups within a community without the risk of provoking jealousy. Exploitation

should also be managed at a level that ensures the continued supply of subsistence needs.

Some developing fisheries exploited resources that were of little traditional subsistence value to coastal residents. Bêche-de-mer, Trochus and green snail resources were exploited mainly on the initiative of Chinese middlemen. So successful were they that some villages almost exterminated local stocks (Glucksman and Lindholm, n.d.), leading to increased competion for the resource and subsequently inter- and intra-village disputes (Johannes, 1982).

Commercial resource developers have attempted to accommodate traditional fishing rights into a number of PNG fisheries. The barramundi fishery in Western Province was originally developed by Australian fishermen operating freezer boats and employing local people to tend the nets. To encourage more local involvement in the fishery and a more even distribution of fishing effort a system was introduced whereby traditional landowners would decide for themselves whether or not to license a freezer boat to operate in the waters within their jurisdiction. If permission was given, the freezer boats loaned nets to the local residents who, in turn, sold their catch to the freezer boats at a rate lower than they would have received had they used their own nets. The license does not permit foreigners to fish for themselves.

Until late-1981 PNG had a domestic pole-and-line tuna industry, which ceased operations as a result of depressed world markets (Doulman and Wright, 1983). The fishery, operated predominantly by foreign fishermen, was dependent on a nearshore fishery for bait (Kearney, 1975; Dalzell and Pankowski, 1980). Bait fishing was conducted at night by the tuna vessel crew. Bait fishing was generally limited to two major and six minor grounds adjacent to good skipjack fishing grounds, mostly in waters bordering the northern islands. Access to bait fishing grounds depended on the consent of traditional owners and provincial governments (see also Baines, this vol.), even though the National Government claimed ownership to all water below low water mark, through the Fisheries Act (1974).

Prior to 1975, limited employment on tuna boats was the only compensation offered. In June 1975, the then Minister for the Department of Primary Industry requested the tuna companies to pay traditional owners of the bait grounds a bait levy of 2.5 percent of the F.O.B. price for tuna exported. This levy was not considered "... payment to the State in consideration of the right to take ..." i.e., in terms of Section 67(1) of the Organic Law on Provincial Governments, but compensation for taking bait fish as an incidental and inseparable part of tuna fishing (Anon., 1978). As such, it challenged the 1974 Fisheries Act and could be interpreted as *de facto* recognition by the National Government of traditional tenure to marine areas.

This was important in that bait fish were not a traditionally utilised resource (Wright *et al.*, 1983). However, bait fishing removed a portion of the food resource utilised by demersal and

neritic pelagic reef-associated fish that were a subsistence food resource for coastal residents. Whether this constitutes an ecologically significant problem is under investigation..

The bait royalty monies were paid into a central fund administered by elected representatives from the bait fishing areas and distributed on a per capita basis determined by the frequency of baiting, rather than catch size, in each traditional area. However, management of the resource through controlled access to the fishing grounds was implemented by the Fisheries Division of the National Government on the basis of samples of bait fish regularly collected from operators to assess the effect of fishing on stocks.

Few conflicts between Okinawan, Filipino and Korean fishermen and local residents were reported, and in fact in most cases these fishermen were well received. Most problems that arose concerned the distribution and use of bait levy monies. There was also some ill-feeling between people living close to baiting areas in which no fishing occurred and those adjacent communities receiving benefits.

PNG and Australia have been able to cater for traditional practices in the Torres Strait region in a Treaty signed in 1978, but awaiting ratification by both Governments (see also, Johannes and MacFarlane, in press; and Baines, this vol.). Article 10 of this Treaty establishes a Protected Zone in which the traditional way of life and the livelihood of the traditional inhabitants, including traditional fishing practices, are protected (Baines, 1982; Haines, 1983). This type of international treaty, which protects all forms of traditional non-commercial fishing by the indigenous inhabitants, is unique (Baines, 1982). Implementing such a plan, that accommodates traditional practices and provides for subsistence needs in an area rich in commercially exploitable resources, will be a challenging and important exercise.

The problems of integrating traditional conservation practices and aspirations concerning the development of natural resources, formed the basis of a conference convened in Port Moresby in 1980 (Morauta et al., 1982). More recently, Polunin (in press) has discussed the practicality of marine tenure systems in PNG and Indonesia, in an attempt to assess their applicability to present day aspirations for coastal resource use.

The Port Moresby conference concluded that the major difficulty when trying to apply traditional practices in modern projects is a lack of information on the structure and functioning of traditional management systems. It is thus difficult to assess the destructive or conservative consequences of traditional practices. Often, traditional concepts have only local applications and attempts to transfer them to different environmental, political and social contexts could be hazardous (Bulmer, 1982). Also, PNG's contemporary aspirations, which involve "western-style development models and administrative systems, the influence of international funding agencies, western-style education and lack of trained national manpower, combine to undervalue traditional knowledge and

practices and render applications difficult" (Pernetta et al., 1982:10).

Haines (1982:289) bluntly states that it is, "counter-productive to resurrect the past by entrenching traditional fishing patterns, or rather the modern distortions of them in the PNG administration." Polunin (in press) similarly could find little in marine tenure systems that offered a potential to mitigate the effects of massive change. However, traditional knowledge and practices may be important in forging a national conservation ethic to promote environmental awareness. Some values implicit in traditional knowledge may provide opportunities to assess the social and environmental costs of exploitation. Concepts such as frugality of resource use (Hughes, 1982) or distributive justice (Togolo, 1982) may be particularly applicable. Traditional knowledge may be useful in baseline work for environmental impact studies (De'Ath, 1982) and in identifying potential reserve areas associated with major development projects (Hill et al., 1982)

A prerequisite for any coastal development in PNG is that the means of fulfilling subsistence requirements are not threatened. Baines (1982) and Johannes (1982) suggest resources for commercial exploitation and those for subsistence use should be kept separate. Subsistence societies cannot continue to exist if they sell subsistence resources. In PNG, few coastal resource users see their own subsistence harvesting activities as having a significant impact on the natural balance in an ecosystem. Thus resource conservation in terms of the western conservation ethic is often incomprehensible to them (Carrier, 1982).

A useful approach to the problem of codifying laws relating to the involvement of traditional habitat and resource owners in the development of coastal resources in PNG may be found in the judicial system used at present to resolve village disputes over land rights (Campbell, n.d.). The basis of this system, which allows for the settlement of disputes by the villagers themselves, is the village court. But legislation concerning rights of indigenous peoples to claim traditional ownership of resources in the coastal zone is both scant and vague. The Land Disputes Settlement Act makes reference to reefs, banks and organisms occupying the water over land. It does not make special reference to the use of marine resources. In its present form the Village Courts Act does not clearly define the jurisdiction of such courts over sea use disputes, although these courts in the past ruled on marine matters (Carrier, 1983). "There is little or no help in the ambiguities of the Fisheries Act, the Continental Shelf (Living Natural Resources) Act, or the Custom Act. All of these are a potential source of confusion and disagreement when applied to traditional use rights of the coastal zone and its associated resources" (Campbell, n.d.:12).

PNG is perhaps fortunate in being able to examine the effects of past resource management strategies applied to similar resources in other countries, and thus to have the potential to evolve a system that mitigates the problems encountered by them. To be able to take advantage of this situation, PNG must first assess

the benefits of increased national self-sufficiency through high export earnings relative to potentially damaging social consequences at the village level.

NOTES

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ADAPTING TRADITIONAL MARINE TENURE AND MANAGEMENT PRACTICES TO THE MODERN FISHERIES FRAMEWORK IN THE COOK ISLANDS

by

Neil Anthony Sims

"I...said, 'Queen Victoria would be very sorry to hear that such prosperous and religious people were quarrelling about pearl-shell (fishing rights in the lagoon), there was more than enough for all, and they were rich, these disputes should be settled amicably',... The chiefs then assured me ...I could tell (the) Queen they would not dispute."

Reginald Tupper
(1899)

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ABSTRACT

Traditional marine tenure and management systems have been largely eroded in the Cook Islands since Western contact. The dismantling of the traditional political systems was followed by the displacement of traditional marine tenure by colonial legislation, granting Crown jurisdiction over all lagoon and reef areas. This process was hastened by demographic changes and Western cultural impacts, such as diversification of fishing activity, which lessened the perceived value of lagoon and reef ownership.

Tenure systems have, however, been adapted or modified to the modern framework in a number of instances. Examples of these are reviewed. The retention of perceptions of the value of a resource, an investment of effort, or protection of exclusive knowledge or skills, are the identifiable motivations and means for maintaining tenure concepts. Island-specific tenure perceptions are also still strongly in evidence, and this suggests that modern fisheries management should operate, as much as possible, on the individual island level. A renewed incentive for lagoon tenure has arisen with recent aquaculture developments, but it is suggested that these industries would develop more equitably under Western-style leasing arrangements.

Other traditional mechanisms have proved adaptable to the modern fisheries management context. The traditional practice of ra'ui, or area closures, has been the basis of support for, and compliance with closed seasons and breeding reserves in the modern commercial shellfisheries. Gear restrictions are still widely used in local management of subsistence or small-scale commercial fin-fisheries. The retention of these practices, and the success of informal enforcement mechanisms, is inversely related to the degree of Western impacts on the island, and the socio-cultural changes which have been associated with these impacts. Other traditional management mechanisms, such as co-ordination of fishing activities and catch disbursement patterns, have declined throughout the Cooks, and are incompatible with modern social structures and cash economies.

Minimum size restrictions and quotas have been less successfully applied to modern fisheries, probably because there is no traditional foundation for such regulations. In light of the above, recommendations are made as to the most appropriate path for future fisheries management mechanisms, enforcement and administrative procedures in the Cook Islands.

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INTRODUCTION

The Cook Islands

The Cook Islands consists of 15 islands, scattered from 23° S to 8° S, with French Polynesia to the East, and Samoa and Tonga to the West (Fig.1). The islands are divided into the Northern Group of isolated atolls, and the Southern Group of high volcanic and makatea islands (eroded volcanic islands, with a peripheral rim of ancient raised reef), together with two atolls and an almost-atoll, centered on the largest island of Rarotonga. In contrast to a total land area of only 240 km2, the Exclusive Economic Zone of the Cook Islands extends over 2.2 million km2 of ocean.

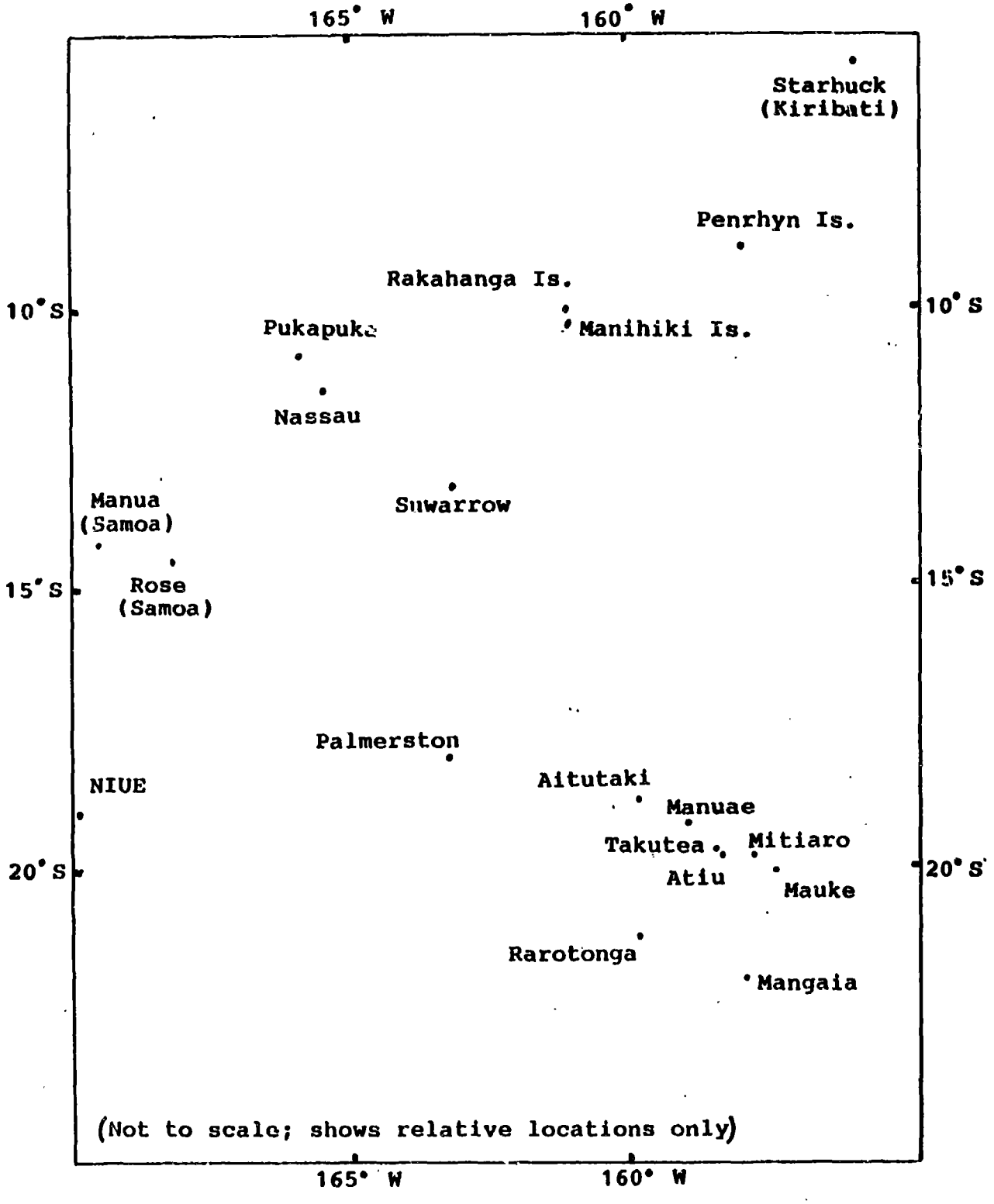
Cook Islanders (called 'Maori') are Polynesians, with close genealogical, linguistic and cultural connections with the Society and Tuamotu Group peoples of French Polynesia, and the Maori of New Zealand. The total population of 17,750 (1981) is stabilising, after recent declines. There is a flow of emigration from the outer islands to Rarotonga (pop. 9,530), and further emigration to New Zealand and Australia. More than 20,000 Cook Islands Maoris currently live in New Zealand.

As the administrative and commercial centre, Rarotonga has developed rapidly, with extensive Western cultural and economic influences. Aitutaki and the other larger Southern Group islands are less developed, whereas the smaller Southern Group islands, and the atolls of the North still retain more traditional, semi-subsistence societies. Particularly in the last two decades, Rarotonga and the larger Southern Group islands have developed modern cash economies, with agricultural export industries, and an expanding tourist trade. Remittances from family members working overseas and public service salaries remain the primary sources of income on most of the outer islands.

Cook Islands' Fisheries: The Dilemmas of Development

For Cook Islanders, as with other Polynesian societies, the sea has long constituted the primary source of protein foods. The subsistence basis of traditional societies meant that knowledge of when, where and how to fish was critical to survival. The importance of fishing was reflected in the mana (authority, prestige or esteem) held for a ravakai (lit. "food enough") or master fisherman. Among fishermen, there were strict levels of organisation, and highly ritualised procedures involving tapu (taboos), omens, and rituals of worship and offerings. Mokoroa (1984) describes a number of such rituals from Atiu, and outlines the significance of the moon phases (arapo) governing fishing activities. Traditional marine tenure systems operated to varying degrees on each island. Fisheries management systems often possessed either incidentally or consciously derived benefits of ensuring a continuity of supply of exploitable stocks, or an equitable distribution of catches.

FIGURE 1: LOCATION OF THE COOK ISLANDS



These traditional systems have been largely eroded since Western contact by the profound socio-cultural, demographic, political, and economic restructuring of Cook Islands' society. Traditional lagoon and reef tenure has disappeared, and only in specific instances do remnants of tenure practices remain, over confined areas. Responsibility for fisheries management has shifted away from the traditional, community-based mechanisms, with initially the colonial authorities, and eventually the central government, assuming control of the large-scale commercial fisheries for pearl-shell in the Northern Group atolls, and later for the trochus fishery on Aitutaki. Subsistence fisheries and small-scale commercial fin-fisheries were left largely unregulated. Responsibility for subsistence fisheries management often fell by default to the Island Councils, partially elected bodies empowered to promulgate by-laws in their island's interest. Other community authorities occasionally acted on a more traditional basis. The mana of the traditional leaders and Island Councils was usually sufficient to ensure obedience to such laws. However, further erosion of socio-cultural values has rendered these extrajudicial enforcement mechanisms ineffective, particularly in the face of increasing commercial pressures on traditional subsistence resources.

The Cook Islands faces an array of dilemmas in determining rights and delineating responsibilities in marine resources management and development. Who should manage subsistence fisheries, and how should the regulations be enforced? Can traditional regulatory and enforcement mechanisms be incorporated into a stronger legal framework? How much control, and what developmental role should central government be given in small-scale commercial fisheries on individual islands? Are Fishery Management Plans on a national scale a workable concept, or do local interests and concerns preclude centralised coordination of policy? What should be the processes of consultation and collaboration between fishermen, local and national authorities?

The questions raised above might at first appear to be merely issues of jurisdiction between local and national authorities. However, traditional fisheries management generally operated on the scale of individual islands, whereas the modern, Western-style approach has involved the centralisation of administrative powers on Rarotonga. The underlying issues, then, are more about the approaches and mechanisms of managing marine resources; of adapting the traditional concepts to meld within the modern framework. Fisheries management and development must be able to serve on a range from the subsistence fisherman, following in the traditions of his forefathers, to the scale of the potential multi-million dollar pearl-culture industry. In an attempt to address these questions, issues and conflicts, a comprehensive Fisheries Act has been drafted. However, the bill has been pending tabling in Parliament for the last four years; itself the centre of disputed rights and responsibilities between traditional, local and national authorities.

A recent proliferation of interest in traditional marine

conservation systems has seen considerable discussion of their potential value to Pacific island fisheries (e.g., Johannes, 1978; Morauta, et al., 1982; and Ruddle and Johannes, 1985). There is an overdue need to review the traditions and adaptations of fisheries management in the Cook Islands, and to assess their value within the modern fisheries context. Tracing the evolution of fisheries management mechanisms through the last century and a half of sweeping changes could help to identify future directions for establishing a workable, enforceable and adaptable fisheries management structure.

MARINE TENURE SYSTEMS

Traditional Tenure - Ownership Through Adjacency

Most island societies remained relatively isolated before European contact. Canoe voyages between neighbouring islands occurred with some regularity, however, especially among the closely linked island groups of Ngaputoru (Atiu, Mauke and Mitiaro), and Manihiki-Rakahanga. High chiefs (ariki) of a tribe, ruled on most islands (vakas) (tribal districts). Settlements were dispersed around taro swamps, in the South, or the larger lagoon-rim islets (motu), in the northern atolls. Although marine tenure systems of pre-contact Cook Island societies were poorly documented, it appears that there were marked differences among the islands.

In the makatea islands of the south, settlements were centred on the productive soils of the swamps and inland valleys. These were separated from the reef and offshore waters by the makatea, the barrier rim of ancient raised-reef. Fishing was limited largely to the leeward sides of these islands, and canoe access to the outer reef and offshore waters was restricted at any one time to one or two workable passages. Under such constraints, canoe-passage use, and therefore access to offshore waters, by necessity operated under an unrestricted system.

Differences in tenure systems over the narrow bench reefs of the makatea islands serve to illustrate the factors influencing establishment and maintenance of such arrangements. The only evidence of the existence, or otherwise, of marine tenure on Mangaia is found in the legend of Taipiro, recounted in Gill (1894). Fishermen from two different tribes went netting together on a distant side of the island, on a reef adjacent to the land of yet another tribe. The legend centres on the bloody consequences of an inequitable sharing of the catch, and such combined fishing expeditions were, it can be assumed, fairly commonplace. No other mention of marine tenure systems has been found in Mangaian myth, legend or history, and modern day informants assert no such system existed. On Atiu, however, "family" (clan) marine tenure systems operated traditionally, with reef sector boundaries delineated by landmarks on the shoreward cliffs (Mokoroa, 1984).

The existence of tenure systems on Atiu, yet not on Mangaia,

could be due to both topographical and political differences between the two islands. Access through the makatea on Atiu is relatively easy, compared with the almost impassable makatea on Mangaia, where all fishermen must have, by necessity, used only one or two paths to get to the leeward side reef. The centralisation of power in a single ruling warlord on Mangaia meant that in times of peace, the island operated on a more open access system (Gill, 1894; Hiroa, 1934), whereas the independent ariki and mataiapo on Atiu maintained more control over their separate domains (Crocombe, 1967), including their own sectors of reef. The smaller makatea islands of Mauke and Mitiaro fell largely under Atiuan martial sovereignty. Both their limited physical size and the implied degree of social cohesion on each island support informants' assertions that there were no traditional reef tenure systems on these islands.

The villages spread around the coastal lands and taro swamps of Rarotonga and Aitutaki maintained a closer physical relationship with adjacent areas of lagoon and reef than those on the makatea islands. The inhabitants possessed a greater sense of identification with and rights of ownership of such areas, as manifested in a tenure system based on clan subdivisions within tribal districts. Tenure governed the right to exploit lagoon and reef resources, as well as, at least in Rarotonga, codes of access to canoe passages (Crocombe, 1961, and 1964; Utanga, 1988). The broader, deeper passages on Rarotonga remained workable even when adverse weather conditions arose suddenly, and so it was a privilege, rather than a necessity, to use another passage.

Marine resource use and access rights for Pukapuka were documented extensively by Beaglehole and Beaglehole (1938). These governed both the right to exploit resources within the clan's sector of reef and lagoon, and right of access or passage through another clan's sector. These strictly enforced arrangements might reflect the systems which operated prior to Western contact in the other Northern Group atolls, although in Manihiki, Rakahanga and Penrhyn, the situation is less well documented.

Evidently, the traditional marine tenure system was still largely retained under the early Laws of Penrhyn Islands. Under this, the Law for the Sea and Ocean declared an open access system, except for "Turtle, as it has been from old" (Anon, 1888). The pre-contact traditions were, however, much obscured by the development of the pearl-shell fisheries, which provided a greater incentive to establish ownership over lagoon areas. Tupper (1899), Gudgeon (1902) and Hiroa (1932a) provide evidence that lagoon tenure in Penrhyn applied only to the pearl-shell fishery, and was thus perhaps only a post-contact development.

There is no evidence that tenure systems existed in pre-contact times in Manihiki and Rakahanga. These islands were alternately occupied by the one population, which migrated regularly across the 26 n.m. distance between them. On Rakahanga, the people all lived on one small motu (islet), whereas on Manihiki,

they divided into two villages. In the former instance, it is unlikely that any tenure system operated, but it is possible that Manihiki lagoon was divided into two sectors, one for each village. Again, the most active post-contact form of tenure in Manihiki is in the pearl-shell fishery, and the commercial incentive has probably led to considerable distortion of any former system.

Decline of the Marine Tenure Systems

The Decline of Traditional Political Systems

Regular Western contacts started with the Christian conversion of the Cook Islands by the London Missionary Society, beginning in 1821. Christianity brought with it the burning of traditional idols and god-staffs, the discrediting of high priests, and a British code of law-and-order, somewhat modified to fit the missionaries' ideals.

The Cook Islands were declared a British Protectorate in 1888, and formally annexed to New Zealand in 1901. The powers of the colonial administration were vested in the Resident Commissioner on Rarotonga, and Resident Agents on each of the larger outer islands. The early Cook Islands Parliament became a Legislative Assembly in 1946, and elected Island Councils were later established (Gilson, 1980). With the development of democratic principles, the strength of the traditional power base further waned. The single, nominally inviolable voice of the autocracies was subordinated, and an essential component of the traditional resource management mechanisms was lost.

Erosion of the power of the ariki, together with the introduction by the British of the concepts of 'Freedom of the Seas' culminated in 1915 in the passage through the New Zealand Parliament of the Cook Islands Act, where "... all land lying below the high water mark was declared by section 419 to be Crown land, thus annulling the indigenous pattern of rights to reef and lagoon waters", (Crocombe, 1964). The dismantling of traditional tenure systems under this legislation was achieved with, evidently, little objection. An examination of the other changes which were occurring in Cook Islands' societies at that time gives indications as to why this might have been the case.

Demographic Dislocation

Western contact also resulted in the introduction of diseases which decimated local populations. The population of Rarotonga fell from an estimated 6,000 - 7,000 in pre-contact times to around 1,800 in 1867 (Crocombe, 1964), and "a similar pattern of decline occurred throughout the Southern Group, though on Mauke, Mitiaro and Atiu the losses were less severe" (Ibid). In the North, "blackbirders", or Peruvian slave traders, further hastened the decline. In the worst instance, on Penrhyn, where a

pre-contact population of around 2,000 had already fallen to about 700 by 1862, blackbirders "recruited" 472 natives. At one stage, only 88 people, largely children and the elderly, remained on the island, and two villages in the southern end of the lagoon had to be abandoned (Maude, 1981).

The missionaries encouraged the natives to aggregate into new villages, usually near the most serviceable boat passage. Migration to the main villages of each island, and eventually to Rarotonga and beyond, resulted in further social fracturing. By 1895, over 30 mpercent of the Rarotongan population consisted of immigrants (Crocombe, 1964).

These changes in demographic structure contributed to the decline of the traditional social systems. The spiritual and temporal mechanisms of enforcement of marine tenure and resource management systems had been much weakened by the decline of the traditional political and religious power bases. These demographic shifts further altered the whole rationale behind such practices. Now that pre-contact levels of fishing pressure no longer operated, there was neither the need nor the incentive (except in the commercial pearl-shell fisheries) to apply the traditional systems of tenure and management to marine resources.

Cultural Impacts

With the introduction of Western material culture, metal hooks and spears, manufactured lines and nets, kerosene lanterns, and modern canoe construction methods were rapidly adopted. Fishing gear had previously been entirely handmade, and methods of fishing had been constrained by both the scarcity of natural materials and gear loss rates. The availability of modern, manufactured gear meant increased fishing power and catches, and allowed diversification of fishing activity. For example, Hiroa (1932a) described the limited fishing gear and methods used in Penrhyn pre-contact society, and suggested that flying-fish torching, pole-and-line bonito fishing, drop-stoning for tuna and Ruvettus pretiosus (Castor oil fish), and the use of seine-nets and gill-nets were all post-contact innovations. These are the main techniques used today in the subsistence fishing sector (Sims, unpub. field notes).

As fin-fisheries remained almost entirely subsistence, such broadening of fishing effort, and shifts towards greater exploitation of pelagic stocks, would generally have lessened pressures on traditionally exploited reef and lagoon fish stocks. The shifts in fishing pressures would then also have lessened the perceived value of lagoon and reef resources. Goodenough (in Zann, 1985; and this vol.) observed similar responses in Gilbert Islands' communities, with diversification of fishing. This would have further eroded the rationale for maintaining traditional tenure and management systems, which had been already weakened by the socio-political and demographic disruptions.

The impacts of the earlier population upheavals combined with a reduced reliance on fishing (through the development of animal husbandry and the increasing availability of imported protein foods, with salted meats and later canned foods), and the shifts in fishing pressures outlined above, all combined to lessen both the real and perceived values of lagoon and reef resources. There was, therefore, a decline in the active and conscious support for management of these resources, and a reduced incentive for maintaining restricted access through tenure. Thus when the colonial powers dismantled the traditional tenure rights through the 1915 Act, there was no apparent reason to argue against this action. Only in the commercial fishery for pearl-shell was sufficient value placed on the resource to maintain support for the 'traditional' tenure system.

Adaptation and Modification of Tenure

Commercial Incentive: Pearl-shell Fisheries

Tenure systems were retained most strongly in Penrhyn and Manihiki, where the commercial pearl-shell fisheries became established. Tupper (1899) indicates that conflicts arose between the two villages in Penrhyn over demarcation of pearl-shell fishing areas in the lagoon. Hiroa (1932a) notes that in Penrhyn "communal rights are exercised [over] the sea and the lagoon.... However, communal rights over shell fish grounds and rocks [coral heads or pinnacles? N.A.S.] are exercised only by the local groups which live near them." In Manihiki, the lagoon was subdivided into areas of extended family ownership, which involved control only over pearl-shell fishing activities. A diver required permission to work in another family's area, and had to give as payment a portion of the shell taken (Pupuke Robati, pers. comm.). Family or village lagoon tenure patterns operated in Penrhyn and Manihiki until the 1920's. The development of the commercial fisheries on these island had led to adaptive changes of traditional tenure systems, as the perceived value of access to areas of lagoon was retained or increased by the creation of commercial fisheries.

Little documentation exists of the problems which must have been encountered by the colonial authorities in breaking down these tenure systems, under the 1915 Cook Islands Act. Informants suggest that the Manihiki community strongly resisted attempts in the 1920's by the then Resident Agent, Henry Williams, to break up the traditional pattern of lagoon ownership. Hiroa's observations (1932; and above), indicate that Penrhyn islanders still maintained their tenure control over pearl-shell grounds well after the Act was passed. Currently, however, the pearl-shell fisheries in both lagoons operate on an open access system. Families still profess knowledge of "their" areas of lagoon, and the development of pearl-culture in recent years has seen an increased reference to these claims (see below).

Ownership of Defined Areas: Fish Weirs and Pearl-shell Banks

Actual ownership of areas of lagoon or reef is more strongly perceived where there is an investment of individual effort, as in the construction of fish weirs. Traditionally, stone fish weirs were considered the property of the original builder, and were handed down to a favoured son or nephew. Access rights originally encompassed only the extended family, but now usually include all descendants of the original builder (Crocombe, 1964).

In some islands in the North, individual family claims are still enforced. If non-family members collect fish from a trap, a proportion of the catch must be rendered to the owner. Poaching is widespread, and breaches usually invoke only threats of punishment. If the violation is repeated, sterner measures may be taken. On Manihiki, the re-emergence of 'ownership through adjacency' perceptions have led to fish weirs on the southern and eastern reef being operated under a more open access system. In contrast, those on the northwestern reef, between the two villages, are still privately claimed. There are no constraints on selection of sites for construction of new fish weirs, so long as the effectiveness of existing weirs is not reduced.

Fish weirs in Palmerston (Crocombe, 1974), Pukapuka and the Southern Group now operate on an open access basis, with no restrictions on their use. Maintenance of these weirs is usually a community responsibility.

Similar control over a small, defined area, where effort has been invested by a fisherman, is found on the pearl-shell islands of Penrhyn and Manihiki. "Banking" of pearl-oysters (collecting and holding the juvenile pearl-oysters on a coral head or shoal until they reach legal size) has long been a common practice. Banks are usually sited near the village, and are located by owners using bearings to island landmarks. Undersized oysters are deposited surreptitiously on the bank on returning from diving. With the recent lifting of pearl-oyster size-regulations on Manihiki, however, banks are now marked with buoys, and worked on openly. Banks represent, then, the most active extant form of marine tenure in Manihiki and Penrhyn. Poaching of banks is not uncommon, and, although no specific instances were quoted, informants state that summary corporal punishment is dealt to poachers who are caught, or those strongly suspected of poaching.

Pearl-culture developments on Manihiki have seen pearl-farms operated, up to now, largely on the basis of 'up-graded banks'. A formal system of farm leasing and registration of spat collector line sites has been initiated by the Island Council, as a means of minimizing conflicts both between farmers and with other user-groups.

The "Caretaker" Conservation Ethic: Crayfish Cupboards and Koperu

The guarding of information on locations and techniques of fishing is often used by fishermen as a means of restricting access, and results both in better catches, thereby maintaining the mana of the ravakai. A stronger conservation ethic often evolves around such exclusivity. In the Northern Group, for example, the location of 'cupboards' for crayfish (Panulirus penicillatus) and Napoleon Wrasse (Cheilinus undulatus) are known to only a few of the more experienced divers. Although there is no claiming of exclusive right, knowledge of the location of these 'cupboards' is considered a family secret. Informants assert that less experienced divers, with a more open range attitude to the lagoon, will sometimes break open a coral head to extract a speared crayfish or Napoleon Wrasse. Once destroyed, a hole will never again be occupied, and so the 'cupboard' becomes bare.

Koperu (Decapterus macarellus; mackerel scad) fishing grounds can be established by setting up daily feeding patterns by chumming a school in the same location at around the same time each day. In Ngaputoru, up until the 1960's, a fisherman who established and maintained a school off a stretch of reef was considered to 'own' the school. The reasoning given for the fisherman's right over the taunga koperu was that it was earned, by virtue of "the fish being fed with the food from the [fisherman's] land" (Mokoroa, 1984). The earned right of control was also likely associated with the skill of the fisherman in recognising a suitable reef area, and the effort expended in establishing the feeding pattern. Permission was sought from the 'owner' before fishing koperu in or near the area. This requirement was to prevent others feeding the school at the wrong time of day (and upsetting the aggregating pattern), or 'stealing' the school, by gradually shifting the feeding site along the reef (Julian Dashwood, pers. comm.).

The koperu tenure system broke down about two decades ago. This probably came about as a result of decreased sharing of catches with changes in living standards, such as the increased availability of freezers. Associated with this were cultural changes, such as a decrease in the size of social units to more nuclear families, and increased acceptability of selling fish in the village. The resulting increase in the incentive for individuals to fish for themselves would have led to fewer coordinated activities, and less support for observance of koperu rights.

Under the conditions of 'guarded access', in the above examples, the fisherman is perceived more as a caretaker than an owner of the resource. The benefits of the system were widely recognised and generally supported. Good catches were invariably shared throughout the village, and prestige was thereby gained by the fisherman. It is in having an abundance of food, a demonstrable prowess, and being able to share, that the fisherman's status is increased. In protecting earned rights, a fisherman is

protecting not merely his access to the resource, but also his means of reaffirming his status in the community. As the importance of mana as a social calibrator has declined in recent years, and the strength of the social fabric of Cook Islands communities has weakened with other external influences, the recognition and support for these systems has declined. Where the knowledge itself is guarded, as in the example of the crayfish holes, however, the tradition is more likely to be retained.

Inter-Island Tenure Rights

The most basic, though perhaps at first glance the least obvious form of marine tenure to be found in the Cook Islands, is that which operates on the penultimate scale of each island unit. An island community has a clear perception of its marine resources as its own to use and to manage. A strong conservation ethic can usually be found in this close identification with the island resources. Evidence of the alternative is found in the overexploitation of the pearl-oyster stocks on the uninhabited island of Suwarrow (Sims, 1988a). Successive groups of Manihikian divers travelled to Suwarrow to work for periods of up to six months or more, and stocks were gradually depleted to the point of economic extinction; the frequent fate of 'un-owned', common resources.

The islanders' strong sense of exclusive right to, and control over the marine resources of their own island has occasionally been modified or muted. These rights and controls, of course, seldom needed to be exercised in subsistence fisheries. Although immigrants from one island to another must be formally granted land rights, one is entitled to marine resource access immediately on taking-up residence. Previously, the Maori cultural tenet of extending all generosity to visitors or newcomers prevailed, but access to commercially exploited resources is nowadays more restricted.

In the pearl-shell boom years of the post-WWII period, over 200 Penrhyn divers worked in the Manihiki pearl-shell fishery at any one time. This willing provision of access for non-Manihikians (though people from both islands are related by blood and marriage) to a lucrative Manihikian resource was probably associated with the renown of the Penrhyn men as skilled divers. Initially, most Manihikians did not know how to "dive shell" and were taught by the Penrhyn divers. The perception of the pearl-shell resources as inexhaustible, or at least with "more than enough for all" (Tupper, 1899, in frontispiece quote), might also have helped to lessen the exercising of island resource ownership. Traditional family tenure had already been dismantled, and the colonial administration, eager to see the resource exploited and the islanders gainfully employed, would have lent its support for Penrhyn involvement in the fishery.

Resentment of the Penrhyn presence began to be felt only after the initial collapse of the fishery, in the late-1950's.

This coincided with the more rigid application of harvest quotas. Manihikians perhaps came to realise the limited nature of the resource, and that more divers meant smaller individual catches. Previously, only harvest duration had been regulated, and the relationship between total effort and individual catch was probably less obvious. It was not until 1969, after self-government, that the Manihiki Island Council became more assertive of their exclusive rights. After a five year closure, the lagoon was opened for a three-month period, and the Council requested that the central government give Manihikians sole access for the first month. The Penrhyn divers felt this discrimination unjust. Eventually a compromise was reached of a two-week 'Manihiki only' period (Hambuechen, 1969). The harvest season was halted, however, after 120 t of shell were taken in only 42 days. The next Manihiki harvest, in 1974, also involved heavy Penrhyn participation, but by the 1977 harvest Manihikians had full control and use of their pearl-oyster resource.

Strong family ties exist between Rakahanga and Manihiki, which consisted originally of one population later separated by the missionaries. These ties are reflected in general acceptance of Rakahangan claims of some right of access to Manihiki lagoon. In the 1970's, for example, when a private pearl-farming concern was operating in Manihiki, a portion of the lease fees paid to the Manihiki Council was given to the Rakahanga Island Council, in recognition of their traditional right to share in the benefits arising from the resource. Rakahanga has also recently been granted permission to establish an island pearl-farm in Manihiki lagoon.

Although Rakahangan and Penrhyn islanders were considered as having a right to use the Manihiki lagoon, Manihikian generosity did not extend to giving the other islanders a share in the control over the resource. The responsibility for management of an island's marine resources is considered the indisputable right of those islanders only.

Reinstating Tenure: The Aquaculture Argument

The concept of lagoon tenure has recently been reexamined by Cook Islanders, as interest in aquaculture has developed. With pearl-farming an actuality in Manihiki, and under consideration in Penrhyn lagoon, and giant clam (Tridacna spp.) and seaweed (Eucheuma sp.) culture trials in Aitutaki, the perceived value of rights over lagoon areas has increased.

Allocation of pearl-farming areas in Manihiki has to date operated on an open access system of first-come-first-served. Prime farm and spat collector sites near the villages (where the farm can be watched closely, to prevent poaching) are quickly becoming filled, however. Other prospective farmers are forced to site their platforms and spat-collector lines further from the villages, or between other farms. The potential for conflicts increases, with no easy solution evident. Re-establishment of

some form of marine tenure system for pearl-culture may reduce the likelihood of open conflict, but it would also mean that opportunities for involvement in the industry were unequal. It is likely that only those with lagoon rights near the villages would be able to provide sufficient surveillance to maintain their farms. This would seriously hinder the development and distribution of benefits of this lucrative industry.

Similarly, concerns have been expressed by the Island Council of Aitutaki that entry into any giant clam or seaweed culture industry (still at the stage of feasibility trials) would be limited to those villages closest to the best sites. Other more equitable systems of lagoon area leasing would probably receive better support, and would promote the more broadly beneficial development of aquaculture industries.

MANAGEMENT MECHANISMS

Many traditional fisheries management mechanisms are similar to measures which Western-style fisheries managers have sought to introduce (Johannes, 1978). The traditional mechanisms have sometimes been incorporated, deliberately or coincidentally, into a modern framework. In a number of instances, however, traditional management mechanisms have fallen into disuse. Development of a management strategy should be based on an understanding of where and why traditional management mechanisms have been retained, or why they have lapsed, along with the converse perspective of where and why modern mechanisms have succeeded or otherwise.

Ra'ui - Area Closures and Rotations

The Traditional Practice

The ra'ui system of periodic area closures was a ubiquitous and commonly utilized conservation mechanism of traditional Maori society. Ra'ui were declared either with the broad intent of allowing an area of reef and lagoon to lie fallow, or to add ceremonial effect to the closure of a seasonal fishery.

The opening of seasonal fisheries, such as for snake mackerel (Promethichthys prometheus) or flying fish (Exocoetidae), was accompanied by great ceremony and strict rules of fishing conduct and catch distribution (Gill, 1894; Mokoroa, 1981). These constraints appear more part of the ritual to maintain the sanctification of the fishing activity, or ensuring equitable distribution of catches throughout the community. Ra'ui applied to perennial reef and lagoon fisheries, however, were recognised as a means of restricting effort, and thereby reducing pressures on fish stocks.

The traditional occupation of Manihiki and Rakahanga pro-

vides an example of a large-scale ra'ui. Neither atoll was permanently occupied and migrations were undertaken across the 26 n.m. (40 km) of open ocean from one atoll to the other, leaving one island always unpopulated. Hiroa (1932b) attributed the migrations to "depletions of the coconut and puraka [species of taro] supplies". This suggests that the development of these conservation practices arose largely from needs based on terrestrial, rather than marine resources. Ra'ui were extensively applied to land areas, but the concept was only applied with any regularity to reef and lagoon areas in the Northern Group, where the inhabitants of the atolls possessed a more intimate dependence on marine resources.

The time period, and extent of closure of lagoon and reef areas under ra'ui varied from island-to-island. In Manihiki, until the 1950's, the entire southern and eastern reef area was covered by a rotational ra'ui system. Sectors of the ra'ui area would be declared open for several days when onshore winds on the western or village side of the island restricted fishing activity there. Today on Manihiki, traditional ra'ui extend only over the brackish ponds periodically stocked with ava (Chanos chanos) fingerlings. The Island Council co-ordinates the fingerling fishing drive, and decides when to open the pond for fishing (Mokoroa, 1981). On Pukapuka, the two outer islets and the adjacent reefs are still covered by a ra'ui. The islets are occupied for periods of weeks to several months for copra-making, and the ra'ui on the corresponding reef area is temporarily lifted.

Hiroa (1928) described the justifications given for "close seasons" in Rarotonga, as "necessary [for] a successful 'ora' [fish poisoning drive]". Similar arrangements are described by Wright (1985; and this vol.) for Papua New Guinea, where reserve declarations were short-term, ad hoc actions, intended to ensure abundant stocks for ceremonies or social functions. It seems unlikely that there was any enduring benefit to fish stocks from such a hiatus-and-harvest approach. The short period of investment and return does not, however, diminish either the significance of the ra'ui as a valid, conscious conservation mechanism, or the value of the tradition to modern fisheries managers, seeking to establish systems of closed seasons in heavily exploited fisheries.

Decline and Adaptation

The last ra'ui declaration on Rarotonga, in 1967, over the Arorangi reef and lagoon, was apparently ineffective because of both weak enforcement and a lack of support within the general community (Julian Dashwood, pers. comm.). Ra'ui relied on social conscience for compliance, and socio-cultural sanctions, or stronger measures, as enforcement mechanisms. As the mana and enforcement capabilities of the traditional leaders and Island Councils have declined, so has both the means to maintain ra'ui systems and the motivation to reinstate them.

In Rarotonga, supervision of ora events (fish poisoning drives) passed from traditional leaders to the Women's Committees, to allow accommodation of Christian principles of non-violence in the enforcement mechanisms. Hiroa (1928) reported that the women were able to effectively enforce the "certain ancient observances" associated with the occasion, by means other than traditional corporal punishment or "physical unpleasantness" (Ibid). The formal controls exercised by the women over such ceremonial fishing events, however, were not a practical means of enforcing regulations in everyday fishing activities.

Ra'ui concepts have, however, been readily incorporated into commercial fisheries management strategies administered or enforced by the central government. Both the pearl-shell fisheries of the northern atolls and the trochus fishery of Aitutaki (Sims, 1985) have operated under closed seasons, with periodic harvests permitted and permanent reserve areas established to preserve breeding stocks. The weakened traditional mechanisms of enforcement have been replaced with fines and catch confiscations operating under the modern legal framework. In both fisheries these tradition-based regulations have been fairly well accepted, in contrast with the less traditional concepts of size limits and harvest quotas.

(a) Aitutaki Trochus

As an introduced, economically valuable but ecologically vulnerable resource, strict management measures are necessary in the Aitutaki trochus fishery (Sims, 1985, and Sims, 1988b). Experience has shown, however, that although the need for controls is recognised, a more exploitative approach to the resource has been evident in the Island Council and the wider community. The fishery is managed under an Act of Parliament by the Ministry of Marine Resources, in consultation with the Island Council.

Aitutakians readily recognise the benefits of management mechanisms based on the traditional ra'ui system, but poor enforcement has weakened their usefulness in the trochus fishery. The establishment of a trochus breeding reserve over 3 km of windward reef was well supported by the Island Council, but the reserve is still subjected to occasional poaching (Sims, 1988b). Similarly, the need for annual harvest seasons is widely accepted, but stockpiling of trochus shell outside the harvest season still occurs. There is even less support from the Island Council and the community, however, for the non-traditional management measures, such as size limits and quotas, which have been poorly understood and particularly widely breached.

(b) Manihiki Pearl-shell

Black-lip pearl-oyster stocks (Pinctada margaritifera) in Manihiki and Penrhyn lagoons were virtually unexploited in pre-contact times, but flourished into the only large-scale commercial fishery in operation in the Cook Islands during the colonial

era. The life history of the pearl-oyster and the value of pearl-shell rendered the resource particularly vulnerable to overexploitation (Sims, 1988c). Even though this vulnerability is acknowledged, and has been repeatedly demonstrated, there have been difficulties in obtaining support from the Island Councils and the fishermen for stronger management measures (Ron Powell and Julian Dashwood, pers. comm.).

Apart from infrequent closures of the lagoons to pearl-shell diving, few of the traditional management mechanisms proved adaptable to the pearl-shell fisheries. As many of these mechanisms were founded on the communal cooperative spirit, they have proved less than effective in the face of the commercial incentive offered by the pearl-shell fisheries. The colonial administration had, in essence, assumed responsibility for managing the resource, by virtue of the disinheritance of local authority and the dismantling of the lagoon tenure system under the 1915 Cook Islands Act. Periodic closures of the Manihiki lagoon were declared by the Island Council in the 1930's (Island Council Minutes), but regulations established under an Act in 1950 were not fully applied until after the Manihiki fishery collapsed, in the late-1950's. A series of lengthy lagoon closures punctuated by short harvest seasons was then applied. Minimum size limits and reserves were established, and diving-machine use was also regulated.

Closure of the Manihiki pearl-shell fishery varied in duration. The colonial authorities, and later the central government, relied primarily on their own subjective estimates as to whether stocks could sustain further harvesting, with Island Council opinions seen as more biased towards short-term gains. The lagoon closures were relatively well accepted and easily enforceable, reflecting both the traditional basis for such closures through the ra'ui concept, as well as socio-economic and geographical considerations. Lagoon closures could be easily enforced, since the relatively small size of the lagoon and the two discrete villages enabled all activities to be easily monitored. Lengthy closures were also an acceptable measure because of the availability of alternative income opportunities through copra production, government employment and emigration, with the sporadic pearl-shell income providing for purchase of large capital items and luxuries rather than necessities. (Foods retain a substantial subsistence element.)

The Manihiki pearl-oyster reserve was established in 1960, over a 0.65 km2 area of the lagoon. In 1984, however, with the fishery under local Island Council management, the reserve was opened to diving. There followed intensive community fishing in the reserve for about a week to raise money for an island dance group travelling to Rarotonga. The function of the reserve had been transmuted, in many minds, into a community pearl-shell reserve, rather than a pearl-oyster breeding reserve.

Quotas, set arbitrarily by the colonial or central government, were perceived more as harvest targets than conservation

considerations, and were frequently exceeded. Seasons were often extended if the quota was not at first attained, as was usually the case after the departure of the Penrhyn divers. Size limits were applied to the pearl-shell fishery from the early-1950's, but these were determined on the basis of optimum shell value, rather than the reproductive sustainability of the pearl-oyster stocks (Van Pel, 1950; Hynd, 1960; Sims, 1988c). The widely practiced 'banking' of undersized pearl-oysters is evidence of the poor support accorded to this non-traditional measure.

In 1982, when the Island Council assumed responsibility for management of the pearl-shell fishery, the lagoon was declared open for a continuous harvest season, and remains so to date. Although the long-term benefits of reinstating some form of rotating ra'ui or periodic closure system are widely understood, the Island Council and the divers are reluctant to initiate such steps. The pressure of public opinion on the Councilors and the short-term economic perspective of the divers impair the ability of the Council to take strong management stands.

Gear Restrictions

Traditionally there were no restrictions placed on fishing gear; in pre-contact subsistence fisheries any gear developments were obviously beneficial. In recent times, the degree of acceptance by islanders of innovative fishing gear and techniques has been influenced by their exposure to change through immigrants, and by introductions of other material benefits. Acceptance of innovations and developments is also related to the compatibility of any new technique with existing methods; whether it represents a simple refinement of an already existing technique, and whether it disadvantages fishermen who are unable or unwilling to adopt the innovation.

Exposure to External Influences

On Rarotonga, where external influences have been most marked, gear or technique innovations have been rapid and uncontrolled. Northern Group residents of Rarotonga have successively introduced underwater rod-fishing for koperu (Decapterus macarellus; mackerel scad), and underwater spear-fishing on a commercial basis, with only minor local resentments reported. The introduction of underwater spear-fishing after WWII resulted in increased pressures on more vulnerable, highly favoured food fishes, such as coral trout and groupers (Serranidae). Plectropomus laevis and Promicrops lanceolatus are reported as previously occurring in Rarotonga, but they apparently disappeared soon after the introduction of spear-fishing (Sims, n.d.). These possible extinctions, and reported declines in abundance of other lagoon and reef fishes are frequently attributed to spear-fishing, or the increasing use of gill-nets in the lagoon. Similarly, there is wide acceptance on Rarotonga of SCUBA spear-fishing, which began in the early-1970's, despite the disadvantages to free-diving

spear-fishermen, who are forced to work deeper and for longer periods, as well as the increased pressures on already heavily fished stock. There are, however, no restrictions on the use of any fishing gear in Rarotonga.

By contrast, Aitutaki Island Council has recently banned SCUBA spear-fishing (which was initiated there only in 1986), and Pukapuka Island Council, in 1986, prohibited all spear-fishing inside the lagoon. People on these less developed islands wish to limit the impacts of technological innovations on fish stocks and, ultimately, the average subsistence fisherman.

Fish Poisons - Refinement of Traditional Methods

Modern refinements of traditional fishing methods rarely resulted in any perceived gear conflicts. The introduction of manufactured materials - steel hooks and metal tips for throwing spears, manufactured twines, and, later, monofilament lines and nets - were all readily accepted, as they merely reduced the time required to make and maintain gear already in use. Also, as these new materials were fairly widely available, so were the increases in efficiency and catch, and the developments were therefore more culturally acceptable.

The patterns of use of introduced fish poisons demonstrate the ready acceptance by a community of a refinement or enhancement of what was originally a traditional fishing method. The roots and seed pods of Barringtonia asiatica, and the leaves, bark and twigs of Tephrosia purpurea were used as fish poisons in pre-contact times throughout the Southern Group. The introduction of the more effective derris root (Derris elliptica; ora papua), which was brought back from Papua - hence the local name - by returning Maori missionaries, saw the practice proliferate (Hiroa, 1928; Gold, 1955). In the post-WWII era, agricultural pesticides became widely available throughout the Southern Group, and were for a time used extensively as fish poisons, particularly on Rarotonga. The use of pesticides has largely ceased, apparently as awareness increased of the detriment caused by manufactured chemicals to the marine environment. Although derris poisoning is proscribed by Island Council by-laws, however, it is still widely used on most outer islands in the Southern Group. Derris, being based on traditional practices, is viewed as less ecologically and culturally offensive, despite the similarly debilitating impacts on fish stocks of both manufactured and cultivated poisons.

In the North, where Barringtonia was not traditionally available, neither derris nor agricultural pesticides have been widely used. Significantly, however, early Rarotongan immigrants to Manihiki had begun to use paru-utu on the outer reef slope, and some Manihikians had initially followed the example. This method of poisoning targets primarily Serranids (e.g., Variola louti, Epinephelis microdon), and involves mixing Barringtonia with ground bait, wrapping all in leaves, tying with a slip-knot, and

releasing the bundle of paru and poison at a specified depth (as with the drop-stoning method for fishing tuna, described by Mokoroa, 1984). The method is, like all fish poisoning, both indiscriminate in size of fish killed and inefficient. As fish in some areas became scarcer, conflicts between the poison users and other fishermen arose, with occasional incidents of violence reported. The practice fell into disuse in the face of strong community disapproval, and although derris was later introduced, again by Rarotongans, it never became widely used. The lack of cultural precedent for fish poisoning, the retention of informal community enforcement mechanisms and the more intimate relationship of the atoll inhabitants with their marine resources (with greater reliance on, and knowledge of their marine resources), have all contributed to limit fish poison use in the northern atolls.

Gear-use, Efficiency and Equitable Access

In lagoon or reef fisheries innovations of fishing materials or techniques can often result in a disadvantage to other fishermen, by causing a decrease in their efficiency. Fish may appear to become more timid, smaller or scarcer, and such perceptions mean that the gear development is more likely to be viewed as unacceptable. Management mechanisms have been occasionally successful in addressing these issues in subsistence fisheries, such as in the restrictions imposed on spear-fishing by the Aitutaki and Pukapuka Island Councils (referred to above). However, where commercial interests are involved, tradition-based regulatory and enforcement measures have proved less effective in resolving these gear conflicts.

On Aitutaki, for example, a growing commercial gill-net fishery in the 1960's and 70's resulted in a noticeable decrease in parrot fish abundance. To protect subsistence fishing interests, the Island Council promulgated a by-law regulating net length and minimum mesh sizes. The by-law, however, relied only on the traditional authority of the Island Council. With no legal means of enforcement, the regulation was ignored by the commercial gill-netters. Significantly, it was a European resident who continued fishing in contravention of the by-law, but local gill-netters quickly followed his example.

The external regulatory authority of the colonial administration, and later the central government, proved more successful in resolving the potential conflict between machine-diving and free-diving in the pearl-shell fisheries. Hard-hat and hookah machine use was limited to depths below 15 fathoms (30 metres), the average maximum working depth for free-divers. The regulations were made under an Act of the New Zealand Parliament, which, together with the stronger informal community enforcement mechanisms in the Northern Group, ensured that they were abided by.

Unrestricted Effort: Pelagic Fisheries

The development of new fishing techniques and gear in pelagic fisheries, such as for tuna and flying fish, has not been similarly constrained. As the resources are perceived as virtually unlimited, one fisherman's increased efficiency does not disadvantage the rest, and gear use conflicts seldom arise. Codes of practice still operated in these traditional fisheries, however, as the fishing fleet worked closely together for mutual benefit. In modern pelagic fisheries, fishing is more of an individual activity, and the cooperative spirit has largely broken down, particularly where commercial incentives exist.

Fishing for flying fish in early times was a communal subsistence activity, with six or more crew in each canoe, and several canoes working together on any one night. A refined set of rules and procedures operated, similar to that described by Zann (1985; and this vol.) for Kiribati and Tuvalu, to ensure equal access and opportunity for each canoe. Fishing for flying fish is now largely a commercial activity, with the fleet consisting of outboard-powered runabouts handled by one man. The commercial incentive for the individual operator has seen the disappearance of the traditional codes of practice.

The cooperative community spirit is also less in evidence nowadays in tuna fishing, even on islands where it is still principally a subsistence fishery. Previously, fisherman dropstoning for tuna from canoes called out the depths of their hooks to others nearby, so that hooks and ground bait could be spread through the water column, to quickly determine the depth of the tuna. The first fisherman to hook-up would confirm the depth to the others, so that they could set their hooks at the same depth. This level of cooperation is now found only among friends or family members, with other fishermen more than likely to give a misleading depth for a hook-up.

Informants from the Northern Group assert that previously hooks and ground-bait were set progressively deeper throughout the morning, but not beyond 40 fathoms. The intention was to make the tuna rise up to the baits. If a fisherman fished deeper than 40 fathoms, he would likely hook-up first, but the tuna would not then rise any further and everyone would be forced to fish deeper. Repeated offenders risked having their lines cut.

Earlier this in century, the renowned ravakai, Makea Nui Tinirau Ariki, exercised considerable control over the fleet in the Rarotongan tuna fishery (Powell, 1979). Ground bait and hooks were initially set at a variety of depths, and were gradually raised above the depth of first hook-up, according to Makea's directions, to bring the school closer to the surface. Inexperienced fishermen, or those with shoddy gear, would be sent ashore by Makea, to prevent them from hooking and then losing a fish and thereby dispersing the school. Mokoroa (1984) describes a similar rule in Atiu, where if a fisherman's "line is cut [broken] more than twice, [he] has to go back ashore" (Ibid).

Modern tuna fishing exhibits no such communal cooperation. In the Rarotongan commercial fishery, based mainly on trolling offshore and around the FADs, a keen competitive spirit exists among the fishermen, as might be found in a commercial fleet in any fishery in the world.

Species Bans and Restrictions

Species-specific Conservation

In traditional subsistence fisheries, few, if any, conservation mechanisms were based on regulating catches through limiting the number, sizes or species which could be caught. It could be hypothesised that self-regulating systems might have come into operation in the traditional subsistence fisheries as a species became overfished. Traditional fishing methods usually targetted one species or group of fishes (see, for example, Beaglehole and Beaglehole, 1938), and decreased catches, or an increased proportion of less desirable fishes, would have discouraged the the use of the particular fishing method for the targetted, overfished species.

Species-specific conservation mechanisms are required only when a species is particularly vulnerable to a new gear type or technique (where more effective management could be applied by controlling the gear itself), or when commercial incentive prompts overfishing of a stock. In the case of the possible local extinction of some species of Serranids on Rarotonga (see above), however, it would have been impractical to restrict such a productive new technique as spear-fishing. It is also unlikely that a specific ban on spearing the threatened species would have been complied with.

On Palmerston Atoll, in the 1950's, local regulations banned the taking of nesting turtles (Chelonia mydas) or turtle eggs, but turtles 'on-the-wing' were still considered fair game (Crocombe, 1974). This is, essentially, a restriction on an over-efficient harvesting technique, to protect a single, valued species. Most of the atoll islands have similar traditions of ra'ui to protect nesting turtles, but these have not been applied recently.

Palmerston Islanders were also, for a time, obligated by local regulations to hatch, raise and release a specified number of young turtles each year. Turtles by then, however, possessed a commercial value, with shell, meat and preserved hatchlings sold to passing yachts, or in Rarotonga. This was probably a response in recognition of the increased pressures of commercial harvest. There are no records of such husbandry practices from subsistence fisheries of earlier times or other islands.

Regulations Governing Catch Disbursement

The disbursement and consumption of fish catches within a traditional Cook Islands community was a highly structured process (Beaglehole and Beaglehole, 1938; Mokoroa, 1981; and Mokoroa, 1984). These practices would have promoted conservation of fish resources, however, only through the prevention of excessive prodigality in times of plenty. Systematic or ceremonial distribution of catches often occurred in short seasonal fisheries (Gill, 1894). Restrictions were also often applied to the more desirable or larger fishes, and required a fisherman to render to the ariki all of such species caught. The ariki would be empowered to dispose of the catch at his pleasure, but this often involved the distribution of portions of the catch to the fisherman and throughout the community. These systems ensured that large catches were not wasted and that all (particularly the ariki) received a share. Little or no disincentive was thereby imposed on fishermen targetting these favoured species.

A number of foods in pre-contact societies were reserved exclusively for the ariki and other members of the elite. Foods which fell under such restrictions included Napoleon wrasse (Cheilinus undulatus) and turtle, in the North, and possibly several other species in the South (e.g., Kyphosus bigibbus). Mokoroa (1981) also suggests that sharks and pui-pata (Gymnothorax javanicus) were foods reserved for the elite, but it is unclear to which island this applied. These species are among the most favoured of seafoods, and the exclusive distribution system would have furthered the social status of the fisherman (Mokoroa, 1981). It would also appear, however, that the ariki was exercising a royal privilege for personal gratification, rather than intending to inherently constrain the effort on species which were vulnerable because of their desirability. The conservation value of such practices, if any, was probably only incidental.

The traditional restrictions governing the distribution and consumption of turtles on Penrhyn is well documented, together with accounts of the collapse of the practice. Traditionally, turtles were considered hui atua (prohibited) to women, and consumption was generally restricted to the priests and high chief (Lamont, 1867). Great ceremony accompanied the capture, killing and consumption of turtles. Hiroa (1932a) notes that it was actually "the special marae ceremony which ... rendered [the turtles prohibited]" (Ibid), rather than a universal taboo on the species. Hiroa (Ibid) also inferred that the incantations recited by the priest prior to slaughter of the turtle involved "the life-principle of the turtle ... being returned to the sea, that the supply of turtles might continue undepleted." An awareness of the principles of conservation, or at least of the limited nature of the resource, is implied.

Although founded on traditional religious practices, the system of preferential distribution of turtles persisted into the post-contact period. The system eventually broke down among a

confusion of traditional and modern authority, when a Penrhyn pastor held a disputed claim to chieftainship through his wife. Initially he "obtained the turtles as his special property -- the people consenting" (Chalmers, 1870). However, "when time after time, he assumed sole right to the turtle ... a quarrel took place" (Vivian, 1871), and "people began to take and eat their own turtles" (Ibid). If conservation of the resource rather than an elitist privilege had been the underlying principle behind the practice, it would likely have received wider support from the community. In any case, it is difficult to see such preferential distribution systems operating in any form within the modern island social structures.

In recent years significant changes in fish distribution patterns have occurred, usually accompanying the arrival of electricity and freezer chests on an island. Surplus catches are now often frozen for later consumption by the immediate family, where previously they would have been distributed through the extended family and the rest of the village. The distribution of benefits from commercial fish shipments from Palmerston to Rarotonga provide an interesting example. In the 1950's the limited freezer capacity of vessels serving the island restricted the volume of fish shipped, and fishing was conducted and benefits distributed on a communal basis (Crocombe, 1974). Apparently, as freezer capacities of vessels increased and lifted the constraints on shipment volumes, the islanders developed a more entrepeneurial attitude, with families or individual fishermen working and being paid separately.

Associated changes in perceptions of the value of fish have also recently occurred on most islands. Increased employment opportunities in other sectors have both reduced the level of subsistence fishing activity and increased the cash flow through the economy, resulting in a demand and capacity to pay for fish. The construction of a commercial freezer facility on Rakahanga, for example, provided a market for surplus tuna catches which would otherwise have been distributed free. The community was quick to recognise the new monetary value of tuna, and prices paid for fish on the beach by villagers rose quickly, until they matched or exceeded that paid at the freezer.

Totemic Taboos (Arai)

Throughout traditional Polynesian society a wide variety of aquatic animals was imbued with religious significance, as deities, incarnations of ancestors or mythological figures (Handy, 1927; Clerk, 1981). The offering to a god or gods of a portion of a fisherman's catch was a ubiquitous practice throughout the Cook Islands. In Mangaia, even an unsuccessful fisherman would place an offering of kirikiri (a piece of coral) in the basket for the gods. Human sacrifices to the gods were also widely referred to as 'fish' (Hiroa, 1934); a euphemism which may have "evolved from an earlier, simpler offering of fish" (Handy, 1927).

On Manihiki and Rakahanga, clan taboos on species or groups of fishes (arai) are still common. The origin, incorporation into legend and maintenance and reinforcement of arai are documented comprehensively in Hiroa (1932b). Informants today support Hiroa's assertion (Ibid) that arai are pragmatic precautions against hereditary allergies, rather than altruistic measures. As noted by Hiroa and reaffirmed by modern informants, arai govern only consumption, and a fisherman will readily assist others in catching what is, for him, proscribed as food. Examples of species which are arai include moray eels (pu'i or a'a pata, mostly Gymnothorax javanicus), some snappers (taea, Lutjanus gibbus), pufferfish and trunkfish (u'e and moamoa, Tetraodontidae and Ostraciontidae), as well as octopus (eke, Octopus spp.) and some seabirds. Allergic reactions usually involve hives and itches, rashes, vomiting and diarrhea. Offenders usually receive sufficient reinforcement to ensure that arai are still consistently observed. One family, however, claims that a recent ancestor persisted in eating his arai (marau tua uri, Myripristis adustus), repeatedly suffering from symptoms, but insisting he would continue until rid of the curse, so that his offspring would be able to enjoy eating the fish. It is claimed that he was successful in his efforts (Tekake Williams, pers. comm.).

Lamont (1867) also wrote of Penrhyn islanders' "abhorrence" of tupa (Land crab, Cardisoma carnifex) and kaveau (Coconut crabs Birgus latro). It is unclear whether these species, which could otherwise have provided excellent alternative sources of protein, were tapu for the entire island or only one clan. Arai are not known from any other islands, although Mokoroa (1981) also refers to koperu (Decapterus macarellus) as not eaten by a particular family on (presumably) Atiu. On most islands some fishes were of particular religious significance, and were perhaps taboo to a specific clan or tribe. Again, however, there is no evidence that the species restrictions were intended as a conservation mechanism. As with traditional catch distribution patterns, it is difficult to imagine how such practices could be incorporated into a modern fisheries management framework.

Minimum Size Regulations

Generally, there were no traditional restrictions in the Cook Islands on catching or eating small fish. Indeed, in some shell-fisheries there is conscious size-selection; smaller pa'ua (Tridacna maxima) and ariri (Turbo setosus) are preferred. In some instances (e.g., use of fish poison) the indiscriminate killing of juvenile fish is recognised as wasteful, but in most fishing, the method used determines the size of fish caught (e.g., hook size, mesh size), and there are few restrictions on gear or catch size.

Minimum size restrictions for pearl-oysters, of 11.43 cm shell diameter, were initially established under the Cook Islands Pearl Shell Fisheries Regulations, of 1950, apparently with no other justification than that some limits needed to be imposed.

In 1957, the minimum size limit was raised to 12.7 cm for trimmed shell (with the non-nacreous lip removed), following Van Pel's report (1955). Van Pel's recommendation was based on an estimate of optimum yield (in shell weight) per capture, and was supported by Hynd (1960). This estimate was based on a compromise between attempting to maintain stock reproductive potential, and minimizing the damage to older shells from boring worms and sponges. These estimates were, at best, intuitive, as there was minimal information on the reproductive biology and growth rate of the pearl-oysters, and only cursory approximations of the rate of infestation of pearl-oysters by borers.

Initially, undersized pearl-shell was deliberately smashed, and sold legally as "broken shell". This practice was only halted by prohibiting the sale or trade of all "broken shell". The widespread "banking" of juvenile pearl-oysters is further evidence that size regulations are poorly supported by traditional leaders and communities. The borer problem was also given as a rationale for the 1984 harvesting in the reserve, where it was claimed that the "wormed" older shell in the reserve needed to be "cleaned out" to prevent the spread of borers to the rest of the lagoon.

Whereas the rationale and benefits of size regulations were evident to colonial administrators acquainted with Western fisheries management practices, the principle fell outside both traditional management concepts and the immediate economic logic of pearl-shell divers. The effectiveness of minimum size limits based on shell diameter for Pinctada margaritifera has recently been questioned (Sims, 1988c), and it is apparent that other, more tradition-based mechanisms, would prove more successful in the pearl-shell fishery.

Minimum and maximum size limits have been applied to the trochus fishery of Aitutaki, although difficulties in compliance and enforcement have been encountered. The size regulations are, however, based on a solid understanding of the growth and reproductive biology of the trochus, and appear to be an effective method of ensuring that both optimum return per capture is approached, and that the reproductive capacity of the stock is maintained (Bour, et al., 1982; Sims, 1988b). The application of size regulations in the fishery should be continued. However, increased public education and extension services need to accompany the use of these mechanisms, in recognition of their non-traditional basis.

CONCLUSIONS

The adaptation of traditional marine tenure and resource management mechanisms to the modern Cook Islands subsistence fishery context reflects the relative value, real or perceived, of each mechanism as a conservation device or means of reducing conflict. Where commercial fisheries have arisen, however, the value of the traditional mechanisms has been distorted; in all

cases (except for the retention of tenure over pearl-shell grounds) the traditional mechanisms have been downgraded by commercial incentive.

In subsistence fisheries, traditional marine tenure fell into disuse because demographic and material culture revolutions decreased the reliance on lagoon and reef resources. Only where there were direct, identifiable benefits in the short-term were attempts made to retain the tenure systems. These have persisted only in a few instances. In most, particularly the lucrative pearl-shell fisheries, the might of colonial authority or the infusion of Western values has seen them broken down.

There appears now to be both little incentive and negligible support to reinstate tenure over subsistence fisheries resources. Although there may be arguments for reinstating tenure in the commercial pearl-shell fisheries, the development of a broadly beneficial pearl-culture industry requires an equal access system. The need for siting of all pearl-farms close to the villages decrees that Western-style leasing arrangements be implemented. Most forms of aquaculture in lagoon and reef areas would be hindered in development, and difficult to administer, under strict tenure systems.

Reinstating lagoon and reef tenure to control the establishment and level of exploitation of small-scale commercial fisheries may seem to have some merit, but again, such systems would lack the necessary community support. The concept of limiting entry is now viewed as unfairly constraining. Other management mechanisms to control effort would seem to be more practical.

The strong identification of the islands as a unit of tenure implies that an island's resource management should be empowered, as much as possible, in the local authorities, such as the Island Councils. There has been, however, a weakening in the enforcement capacities of the Island Councils and the traditional leaders, in direct proportion to the extent of infusion of Western political and socio-economic structures. Through the proposed new comprehensive fisheries legislation, provisions are made for giving legal substance to the local management bodies.

With stronger legal backing, ra'ui and gear restrictions should be widely implementable and effectively enforced at the local level. These mechanisms should prove sufficient for local authorities to manage subsistence and small-scale commercial fisheries, with minimal advisory inputs from the Ministry of Marine Resources.

Species bans or restrictions, such as size regulations or species-specific protection, would appear to be both impractical and unenforceable in most subsistence fisheries. Such measures are probably unnecessary, given that ra'ui and gear restrictions could be more effectively imposed.

In the large-scale commercial fisheries, local authorities have proven unwilling or unable to effectively regulate fishing activities. Strict regulatory measures and effective enforcement are essential for these valuable, vulnerable resources, and some degree of expertise is necessary to monitor stocks. These fisheries would optimally be managed, then, under a western-style framework, administered at the national level, although day-to-day management and enforcement would probably best be implemented through the local authorities.

Past experience in these fisheries has proven the effectiveness of modified traditional mechanisms, such as ra'ui and breeding reserves, and these traditional elements should form the basis of the management strategies for these fisheries. Size limits should be retained in the trochus fishery. The retention of size limits in the pearl-shell fishery is perhaps of some value, but harvest season and breeding reserves are likely to prove most effective. Where size limits are applied, there is a need for more concerted public education and extension services to promote support for the goals, and to ensure compliance with such non-traditional fisheries management mechanisms.

ACKNOWLEDGEMENTS

This document draws extensively on information gathered in formal meetings and friendly discussions with Cook Islands fishermen themselves. Large portions of the work should perhaps cited as "Te au tangata tautai, pers. comm." I only hope that, in identifying some of the mechanisms and motivations of fisheries management in the Cooks, the future options are somewhat clarified.

Although the information was provided by others, the errors are entirely my own, and neither my informants, reviewers or editors should be held responsible; nor should the Ministry of Marine Resources be held responsible for any of the omissions or the opinions I have expressed here.

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THE TRADITIONAL MANAGEMENT OF THE KELONG IN SINGAPORE

by

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ABSTRACT

From late-1985 to early-1986, I spent several months on the north coast of Singapore collecting ethnographic data on and from the stake net (kelong) operators. This paper traces briefly the history of the kelong fishery, and focusses on the issue that the mode of production depends not entirely on economic considerations of profitability alone. Rather, much rests on certain ideological stances of social relations and networks among the workers, and in particular on religion and how it influences the concepts of time and space. The recent history and future of the fishery is also greatly dependent on the official ideology that has guided the economic development of Singapore.

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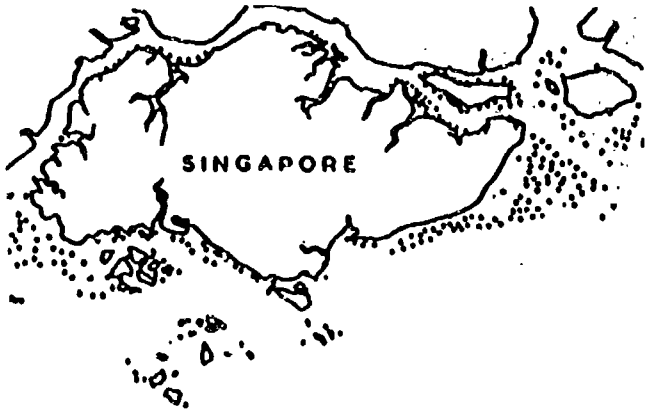
INTRODUCTION

Trapping is an ancient fishing technology that has its origins in a hunting and gathering mode of subsistence. One widespread type of fish trap is the stake trap, variations of which are still used in many fisheries around the world.

Fixed stake traps have been, and in some places still are, very important fishing devices used in Asia to the north of Malaysia ; along the shores of the inner Gulf of Thailand, in the Mekong delta, in the Philippine Islands, and in Southern China. Along the densely populated coast of north Java, near Jakarta, the use of stake traps (seros) completely displaced net-fishing along the shore. Such stake traps were found "almost everywhere on the coast of all Indonesian Islands" (Stibbe, 1919-39, 4: 580). (However, this generalisation, which referred to the high cultures of Indonesia, overlooked the ethnological significance of certain areas where the method was absent or little used.)

The importance of fish traps is now declining in Singapore. Formerly, the commercial marine fisheries of the west coast of Malaysia, along the Strait of Malacca and around Singapore Island, were dominated by large stake installations (Fig. 1). These devices were rarer, however, on the east coast, where net fishing was predominant, since, in many locations on this coast the steepness with which the bottom slopes away from the shore renders stake traps far less practicable than along the west coast. In general, the fishing stakes yielded the greater part of the marine fish caught in Malaysia. The kelong is a derivative of the stake trap. It is the largest form of offshore Palisade trap (those with a screening device). In Singapore, most existing kelongs are located in the Changi-Punggol area of the North Coast.

FIGURE 1: THE DISTRIBUTION OF OFFSHORE PALISADE TRAPS (KELONG) IN SINGAPORE WATERS IN 1954

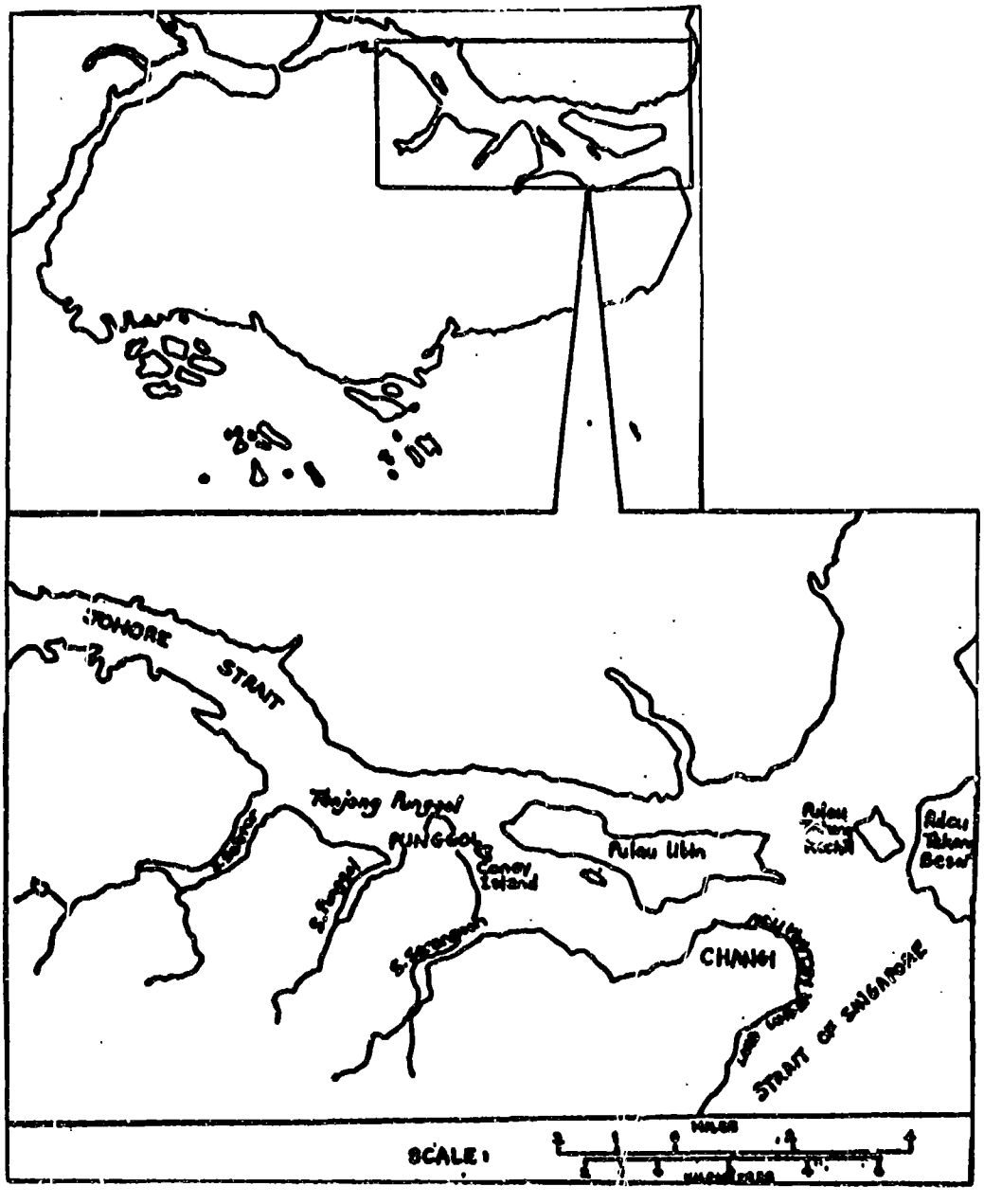


(After Burdon and Parry, 1954)

DATA COLLECTION

The kelong fishery is being phased out by the Government of Singapore, which is encouraging former kelong-operators to participate in intensive and scientific fish breeding and harvesting. In this paper, to show the transition of the traditional kelong industry to the modern fish-farm industry, comparisons are made between the structure and functioning of the kelong and the fish-farm.

FIGURE 2: LOCATION OF THE STUDY AREA ALONG THE STRAIT OF JOHORE



From late-1985 to early-1986, I spent several months on the North Coast of Singapore (Fig. 2), collecting ethnographic data on kelong-operators and fish-farmers. My entree to the kelong-fishery and fish-farming industries was facilitated by personal friendships with a taxi-boatman at Punggol, and a friend in the Primary Production Department of the Government of Singapore. These relationships determined my sampling technique and size.

I interviewed as many fishermen and fisherwomen as possible in the two communities, via informal and formal meetings and interviews. No stratified sample was used, rather I interviewed almost anyone who was willing to talk, and then organised all the primary data toward the end of the fieldwork period. I also asked each respondent to suggest other potential interviewees.

Besides observing and participating in the kelong community, I used a semi-structured questionnaire as a general guide to structure interviewing. Many ad hoc questions were asked whenever I thought a subject worth following-up. I collected data whenever and wherever possible - over meals, during working hours and during periods of relaxation. Most in-depth interviews were carried out during the workers' free time. (This would not have been possible in the past, when women were not allowed onto a kelong. But that taboo has disappeared, and nowadays it is not uncommon for whole families to be involved in kelong activities.)

The main purposes of using participant observation were (1) to understand the kelong operators' views about their situation in the wider context of Singaporean society; and (2) to observe the differences between what is said and what is actually carried out.

The principal problem encountered was accessibility. Although I had an official letter from the National University, it was not easy to allay the kelong-operators' fear of being fined by the Primary Production Department for allowing visitors onto the kelong. (According to my informants, each fine could amount to S$500.) Oneinformant said that, visitors are banned because kelongs could be used as points for smuggling prostitutes, merchandise and oysters into Singapore, since, being elevated platforms, kelongs provide a good point from which to lookout for the Marine Police. However, the kelong-operators said that the official explanation for the ban was that the Primary Production Department fears that visitors might fall into the sea and drown!

Because of that situation some kelong were impossible to sample, since, owing to the perceived risk involved some operators attempted to charge me for visiting. (They attempted to bargain either a flat rate of S$180 a night or S$60 a night per visitor.)

Another problem was the outdated literature on kelong. Interest in this traditional fishing technique has waned, such that the last sociological study conducted on it in Singapore is The Kelong Fisherman and His Way of Life (Chan, 1963-64). Much

has changed since that time. In contrast, material on fish-farms is relatively abundant, since this modern industry is being officially encouraged.

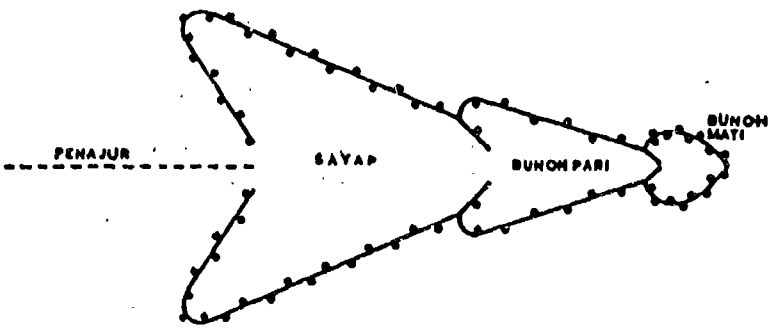
STRUCTURE AND OPERATION OF A KELONG AND FISH-FARM

Informants classify kelong into four types, based on structure. A number of hybrid or intermediate forms exist.

(1) Inter-tidal Palisade Trap (Belat or Kelong Chadok)

This is the simplest form of kelong (Fig. 3). It consists of guiding barrier of poles leading to a three-chamber trap, the entrance to each of which lies at the end of two converging walls. This type of trap is built in shallow water, such that the depth of the terminal chamber is rarely more than 1 m at low tide. Informants noted that this type of kelong without a "rumah" (house) used to be common among Malays, as it required less capital to construct. Kelong belat was common especially among the former Pulau Sedong fishermen. The kelong belat attracts the Toa-peh-kong-hi (Queenfish), which fetches high prices during the Chinese New Year period. (According to Teochiu belief, this fish should be eaten then to ensure prosperity.)

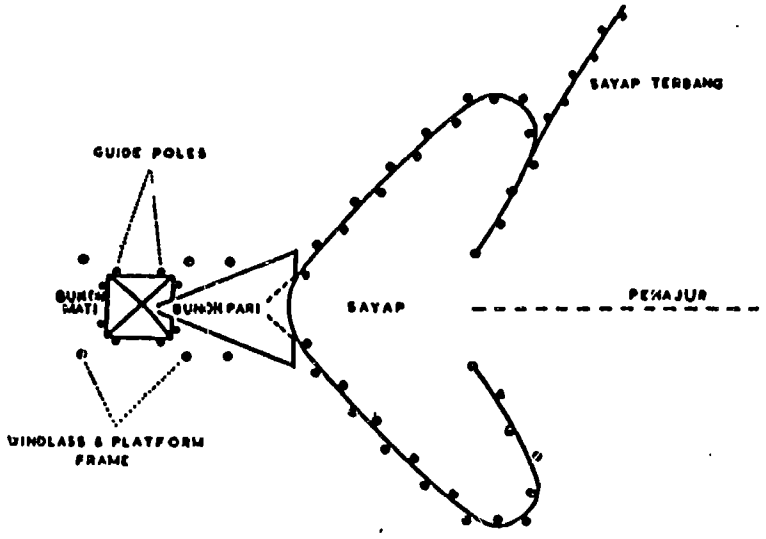
FIGURE 3: AN INTER-TIDAL PALISADE TRAP (BELAT or KELONG CHADOK)



(After Burdon, 1954)

(2) Shallow-water Palisade Trap (Belat buru) (This trap [Fig. 4] is a deeper-water variant of the belat.)

FIGURE: 4: A SHALLOW-WATER PALISADE TRAP (BELAT BURU)

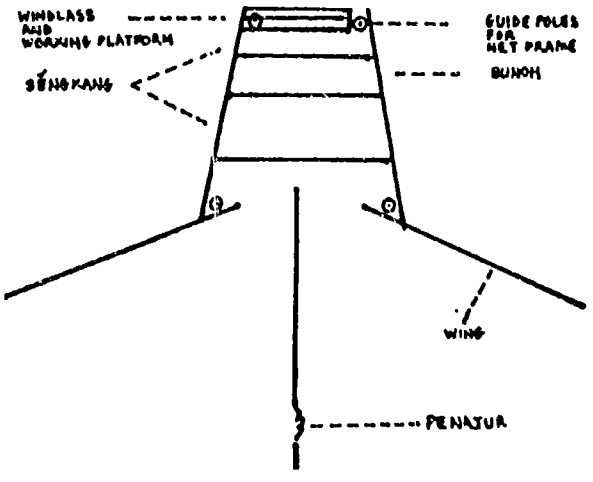


(After Burdon, 1954)

(3) The Anchovy Palisade Trap (Kelong bilis)

This type of trap (Fig. 5), aimed mainly at anchovies, is smaller and less expensive to construct than a kelong betawi (see below). It occurs mainly in the Strait of Johore, where the catches are less than other places. The kelong bilis has only a single chamber.

FIGURE 5: AN ANCHOVY PALISADE TRAP (KELONG BILIS)



(After Burdon, 1954)

The origin of this type of trap is difficult to discern. It might represent a simplified form from which the kelong developed. However, it is most likely that kelong bilis and belat bubu evolved from the belat.

(4) Off-shore Palisade Trap (Kelong betawi)

Whenever the term "kelong" is used, it is popularly accepted as referring to the "kelong betawi", the largest of all kelong.

The kelong betawi consists of three main components (Figs. 6 - 8): the bunoh (or net chamber), the sayap (play-pen) and the penajur (guiding barrier). The upright stakes and strengthening cross-pieces (lawa) are made from stems of the nibong (Oncospera tigillaria [Ridil] palm.

The trap operates automatically. The fishing stakes intercept the tidal currents from which the fish come in-shore and also leave. In this respect, kelongs are classifiable into two types: those that trap fish from incoming currents and those that trap them from out-going currents (Fig. 9). Scared by the swaying movements of the nibong poles, the fishes change direction and swim alongside the stakes into deeper waters and enter the sayap. Once the fish enter the sayap, they are guided into the bunoh pari, the fish are again guided in the same way into the bunoh mati. At night, a powerful lamp is suspended over the water in

FIGURE 6: PLAN VIEW OF AN OFF-SHORE PALISADE TRAP (KELONG BETAWI)

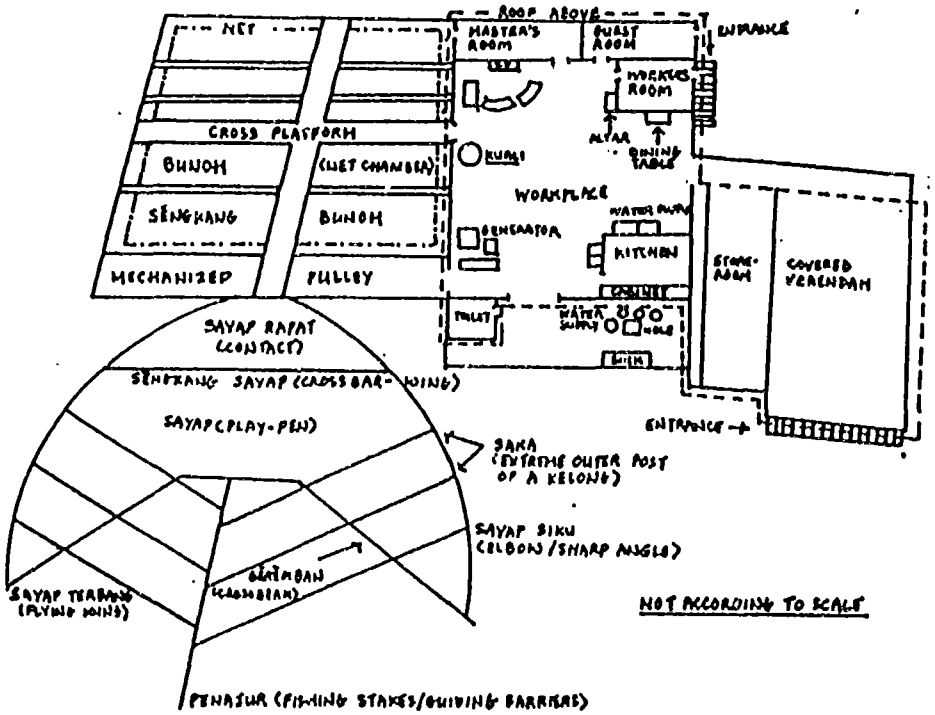


FIGURE 7: CROSS-SECTION OF AN OFF-SHORE PALISADE TRAP (KELONG BETAWI)

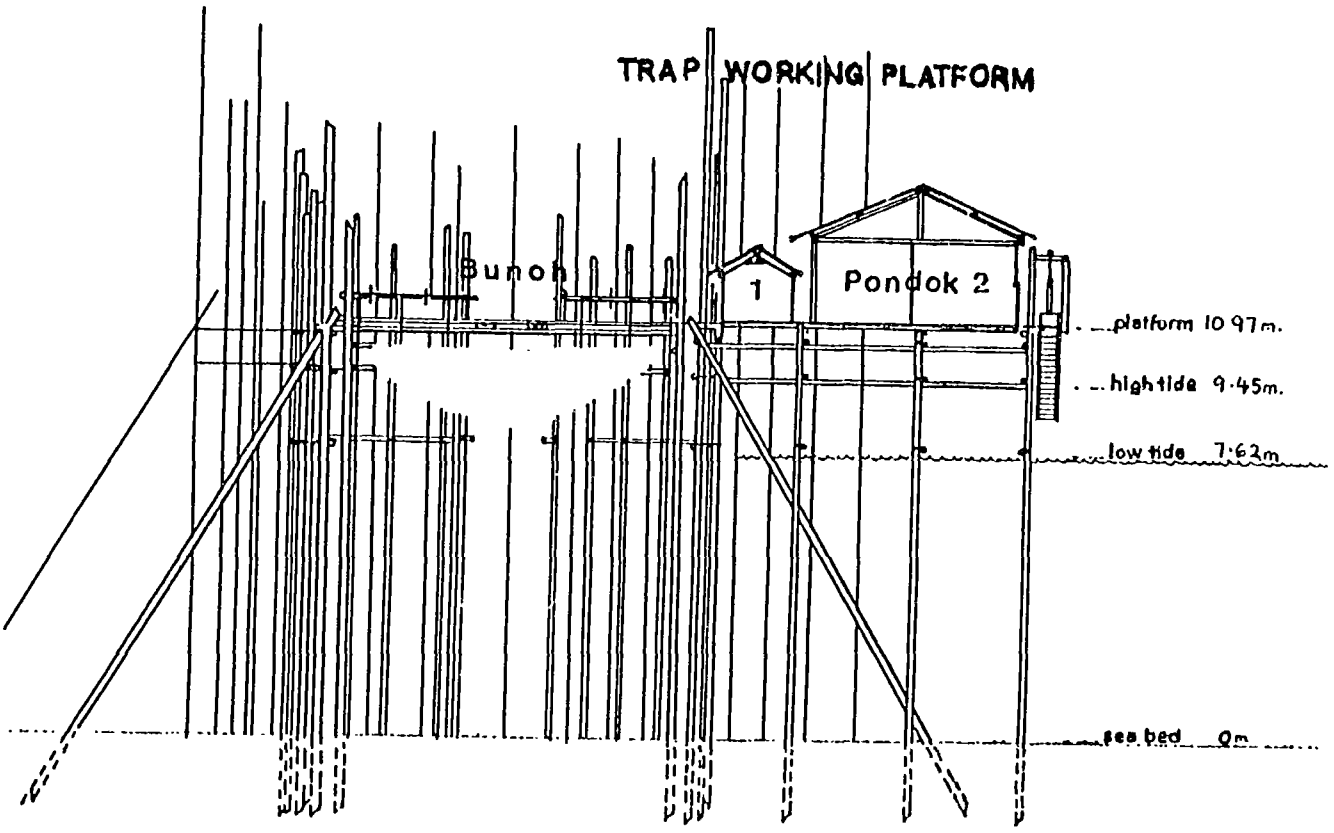
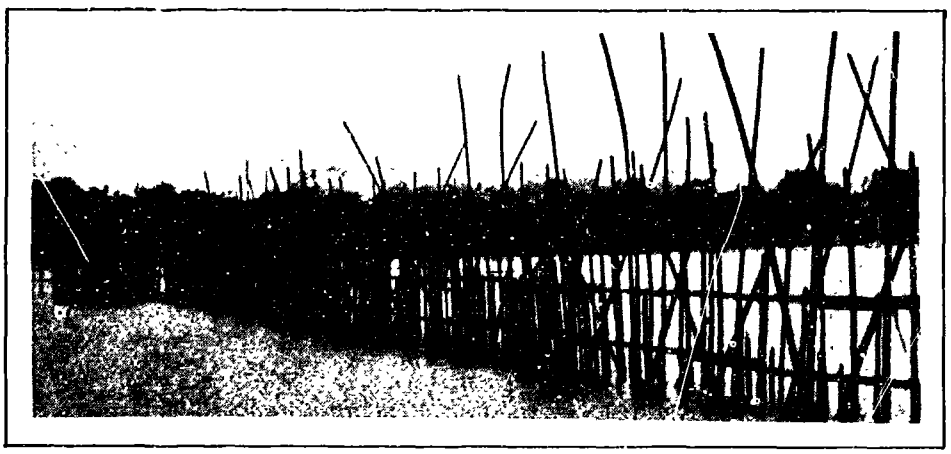


FIGURE 8: A TYPICAL PALISADE TRAP (KELONG BETAWI)

FIGURE 9: NIBONG STAKE LEADERS GUIDE THE FISH INTO THE TRAP



the centre of the bunoh, to lure the fish.

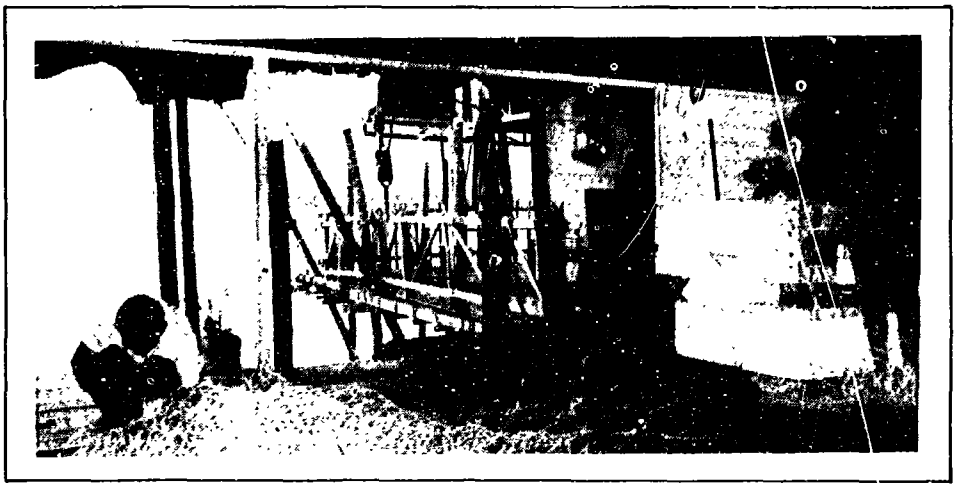
The sayap, bunoh mati and the penajur are screened with wire or wire mesh. Fishes which enter the bunoh mati remain swimming above the net until they are hauled up, normally at about three-hourly intervals.

On the platform, atap huts are built to serve as a store, a boiling shed for bilis (anchovies) and the living quarters for the kelong-operators (Fig. 10). The design is variable and depends on the requirements of the owner.

The site for constructing a kelong must be inspected and approved of by the Fisheries Division. However, the choice of a site is made by an expert - the pawang ("magician") - who possesses an intimate knowledge of the tides, the nature and contours of the bottom, and the productivity of the area. The expert dives to the bottom of the sea and verifies that the place is suitable for the trap. This procedure is often accompanied by magical rites intended to assure the success of the operations (Burdon and Parry 1954 :37). The skill of a pawang is remarkable in that

he can locate the fish by sound. This faculty appears to be

FIGURE 10: MENDING NETS ON THE WORKING PLATFORM OF A KELONG



restricted to the Malays, who have long exploited the noises made by fish and who can often recognise the type and quantity of the fish concerned (Burdon and Parry 1954 :63). Generally, the trap is sited on an area of the bottom that will permit the nibong poles to penetrate to a depth of 3.0-3.7 m. Hard ground is used only if the anticipated catches are high. The most suitable bottom type is a mixture of fine sand and mud. Loose sand and coral are avoided (Burdon and Parry 1954 :36). Traps are built in water up to 13 m in depth, but those in deep water are subject to heavy storms and are very expensive to construct, owing to the difficulty of obtaining nibong poles of adequate length.

INTEGRATED KELONG

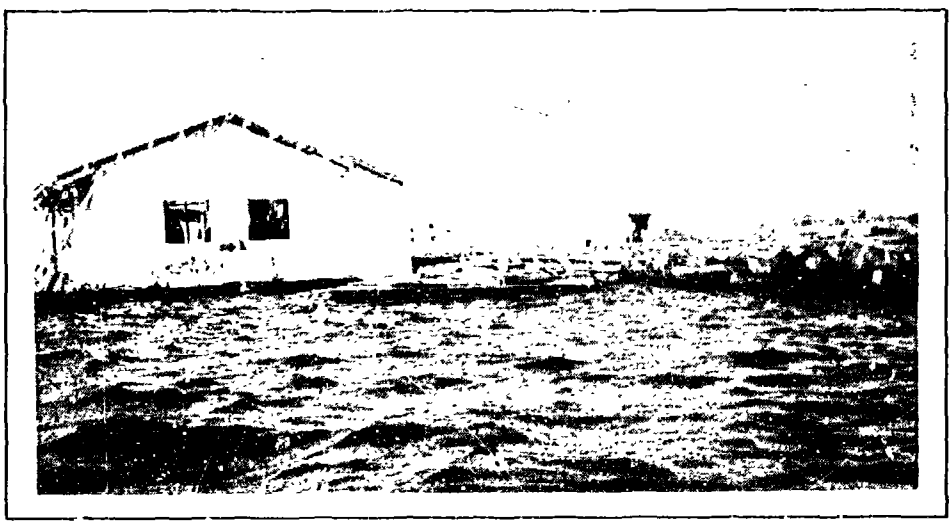
Some traps are now operated as integrated kelong and fish-farms (Figs. 11 and 12). A scheme to encourage aquaculture activities in coastal waters was implemented in March, 1981, following the enactment of Fish Culture (Control and Licensing Rules). The government is starting fish-farms to encourage former kelong-operators whose kelongs have been phased out to participate in intensive aquaculture. The Government's preference for fish-farming is illustrated by its offer to start a fish-farm for anyone who can afford the S$5000 deposit and annual rent, whereas no license is now issued for a kelong. The cost of setting up a farm is S$150,000 - S$200,000, depending on size. Under the fish-farming scheme, waters off Pulau Ubin, Sungai Serangoon and Punggol estuaries and Lim Chu Kang have been set aside for fish farming. (These areas are free of navigation.) At present, there are some 65 fish-farms covering about 35 ha.

Each farm covers a maximum water area of 5000 m2. A typical fish-farm has 30 cages, each of about 25 m2 and stocked with an average of 1000 fish, mainly grouper and seabass. Some have also introduced prawn, crab and lobsters, whereas others culture mus-

sels on ropes suspended from the raft (Fig. 13).

FIGURE 11: AN INTEGRATED KELONG.
(To the left and right of the kelong is the fish-farm which is attached to the kelong)

FIGURE 12 : FISH-FARMS ARE BASICALLY OF THE SAME STRUCTURE. IN THE DESIGNATED AREAS, FLOATING HOUSES AND CAGES ARE ANCHORED BY ROPES TO GIANT CONCRETE BLOCKS ON THE SEABED



The Changi Aquaculture Unit provides technical and advisory services management, fish husbandry, quarantine, and disease treatment. The Unit also provides a fish quarantine service to fingerling importers for treatment and quarantine before stocking. It also conducts research on fish breeding, nutrition and disease treatment.

Ironically, even though the government is phasing out the kelong, and moving toward modern and technologically advanced aquaculture, these farms rely heavily on kelongs and trawlers for their by-catch used as feed for cultured fish. Any other feed-

stuff would increase the input costs of the farms.

FIGURE 13: THE FLOATING NET-CAGE SYSTEM CONSISTS OF THE NET-CAGE PROPER AND A WOODEN RAFT TO SUPPORT THE NETS. NEXT TO THE PLATFORM SUPPORTING THE CAGES IS A MAIN HOUSE-CUM-OFFICE, WHICH OPENS ONTO THE SHADED WORKING AND EQUIPMENT STORAGE AREA

SPECIES TAKEN WITH THE KELONG

The catch of a kelong consists of a large variety of fish, including, principally, Clupeoids, Carangids, mackerels, Ambassis and other Percomrphs. As shown in Table 1, apart from 1972, the last year for which data are available, total production of the kelong fishery has declined gradually.

TABLE 1: ESTIMATED TOTAL PRODUCTION OF FISH FROM THE KELONG (INCLUDING THAT USED AS ANIMAL FEED OR MANURE) (t)

Year	Amount	% (nat.catch)
1960	4 151.13	45.74
1961	3 139.51	32.91
1962	3 290.91	28.99
1963	2 981.28	24.26
1964	3 024.77	29.42
1965	3 846.36	35.63
1966	3 131.93	17.25
1967	2 826.16	15.77
1968	2 366.69	13.89
1969	1 842.52	10.78
1970	1 413.61	8.10
1971	1 347.00	8.9
1972	2 064.00	13.2

Sources PPD Annual Reports, 1960 - 1972

HISTORICAL OVERVIEW

Given the antiquity of the kelong, together with a lack of documentation, there is no precise account of its first appearance in Singapore. According to Munshi Abdullah (1797-1854), kelong first appeared in Singapore soon after February, 1819;

> When the Singapore settlement was a year old, there came a certain Malacca man named Haji Mata-mata. He constructed large fish traps with rows of stakes called belat and kelong... the place where they built kelong was at Telok Ayer Point named Tanjung Malang....The quantity of fish caught was so great that the people were not able to consume them, and the fishermen at last commenced to preserve only the fish roe, which they salted and packed for exportation.
>
> (Abdullah 1970:161).

That the builder was from Malacca, which had been under the influence of Java in the 14th and 15th centuries, suggests the possibility that the kelong has a Javanese origin. (Chan 1978:29).

Undoubtedly, the Chinese, who flocked to Singapore soon after it was founded, heavily influenced the design of the kelong. Such influences include the windlass used to haul the net, the large cauldron and bamboo chopsticks used for fish preservation by boiling in brine; and two small watercraft, the kolek chiau, used by early kelong fishermen as a means of transport, and the sampan kotak, which functions as a platform in the construction of the kelong (Chan 1978:29).

Although the Chinese and Malays and other local people use essentially the same kind of gear, the forms used by the Chinese are larger, more complex and capable of catching more fish, because of the Chinese desire to apply the kelong technique commercially (Sopher 1965:219). The contribution of the Chinese made it possible for the kelong to be constructed further out into sea, where the fishing grounds are richer. They also improved the means of hauling a larger volume of fish from the net chamber and the mode of transportation, and were able to finance large-scale operations. Thus, the Chinese commercial methods improved and modified pre-existing techniques, which operated mainly to supply a subsistence economy.

As observed by two present-day kelong-operators:

> All the terms we use to describe the kelong are of Malay origin...later it was adopted by the Chinese. Now, there are only Chinese kelong owners, but they resort to the Malays for their technical skills...this kelong has been up for about 60-70 years. I was about 18 when I started living in this kelong. I left it for about 40 years and then I returned. The license for this kelong has been in

existence from even before the Japanese occupation till this very day. This kelong has been very active for about 40 years already. In fact, for as long as 60-70 years.
(Ah Mak, a kelong owner in the Changi-Punggol area. Translated from the Teochiu.)

People from Singapore visited Indonesia and brought home ideas on how to set up kelongs. The Chinese built the larger kelong betawi and the Malays built the smaller kelong belat due to their different financial status.
(Mr Akop, who lives on the West Coast beach, making bubu [fish traps] and guarding the boats parked on the beach. Formerly a resident of one of Singapore's off-shore islands, he has been resettled onto the mainland. Translated from the Malay.)

Since 1953, the Fisheries Division has stopped issuing new licenses for the erection of kelong. Licenses are also revoked when kelong are found not to have been in working order for six consecutive months. Each license is renewable annually. The renewal of a license and resiting of kelongs is subject to approval from the Fisheries Division, the Marine Department, the Singapore Navy, Ministry of National Defence, Telecommunication Authority, and the Port of Singapore Authority. Further, notification must be given to the Economic Development Board (Chan, 1978:30).

The kelong in Singapore reached its peak in 1952, with 310 traps, which contributed 70 percent of the total fish landings from inshore fisheries. However, there were only 93 kelong in 1975 (Chan, 1978) (Table 2). According to my kelong-operator informants, there are now only 30-40 kelong remaining in the Changi-Punggol area.

The decrease in the number of kelong resulted also from declining catches in the face of increasing material and labour costs :-

We can't get the wood anymore...the cost of bringing up a stick here is so expensive. Building a kelong requires over 800 sticks. An 8 siam nibong pole costs $11; add $5.50 for a 9 siam pole; for a 10 siam pole - $22 etc...
(Ah Mak, Translated from the Teochiu).
(Siam is the Chinese equivalent of the Malay depa, a unit of linear measure represented by the span of the outstretched arms.)

These big pieces of wood cost $200 each...we call it seng-kang. These smaller ones are called le-mong. See the ropes - it takes a specialist to know how to tie them together. We have got to get others to build it. Takes about 20-25 days to raise a

kelong. If it is slow, then approximately one month. (Many) kelongs have closed because of lack of business. It costs to upkeep a kelong. We spend about $460 a day on each person's labour costs and food just to retie the loose ropes. It takes about 6-7 people a whole day to finish the task. Multiply that - it is approximately $480 a day or even $600 a day. Plus the wood, ropes,wire etc...they all make up additional costs. One stilt lasts approximately 10 months.

(Mong Chek [a kelong-operator in the Punggol-Changi area], Translated from the Teochiu.)

The water is now polluted. There used to be a lot of seaweed and small fish. Now, it is all mud. The pig farms (nearby) have polluted the sea. It will take 10 years to clear the pollution.

(Mr. Leong [a kelong-operator in the Punggol-Changi area], Translated from the Teochiu.)

TABLE 2: NUMBER OF LICENSED KELONG

YEAR	FATHOMS DEPTH AT LWST			
	> 3	1 - 3	< 1	Total
1952*	-	-	-	310
1960	169	81	18	268
1961	162	74	16	252
1962	150	71	16	237
1963	148	62	15	225
1964	128	55	16	199
1965	115	50	16	181
1966	101	44	16	161
1967	93	34	16	143
1968	82	35	15	132
1969	77	34	15	126
1970	69	35	13	117
1975*	-	-	-	93

*No size class breakdown available

Thus the decline in the kelong population is not only due to moves made by the government, but also to the pressures faced by the kelong-operators themselves. Other reasons contributing to a fall in the landings have been (Chan, 1978:30):

1. The implementation of large-scale housing projects which involves land reclamation, which, in turn, affects the continued existence of kelong;

2. Brighter surroundings, owing to increased illumination from development along coastal fronts and lights from anchored ships. These distract fishes from the lamp hung over the fish trap of the kelong at night, as a lure;

3. The increase in the volume of shipping and number of industries along the coast, which pollute the waters;

4. Increased intensity of fishing using off-shore drift nets, which intercept fish before they reach inshore waters; and

5. The alterations of tidal currents and accelerated siltation caused by land reclamation.

Life for the kelong-operators has changed greatly in the last few decades. For example, in former times kerosene burners or lanterns were used in the kelong. They were replaced by gas burners, and now some operators are installing electricity generators. Engines are employed for net-hauling, and have replaced manual labour. Kelong-operators now wrap their nibong poles in plastic or alternatively, in rubber tubing, to prolong the usefull life of the poles and thereby to economise on the operation. And the formerly hand-woven netting is now made by machine.

> (The early days were) extremely difficult. Everything was manual labour. We used our legs to raise the net. Now we use the generator. In the past, after every 10 days, we had to wash and dry the net, which smelt badly. We first washed it in sea water, then rinsed with freshwater. Those nets were made from string. Now, we use nylon nets. We only need to dry them and they are more tahan (lasting). We had to obtain sap from the wood, boil it to a starchy consistency and then spread it over the traditional nets, so that they would be harder and lasting. Now our nets last for 2 to 3 years. Last time - only a year. Now, if a net is spoilt, it is discarded. Thau-ke will buy a new one.
>
> (Mong Chek, Translated from the Teochiu).

Not all kelongs-owners are equally modernising. One may follow old principles, whereas his neighbours may be fully equipped with television sets, radios and huge generators. Although the remaining kelong-operators are maintaining equipment, and in some cases even investing in new equipment, the kelong is still being phased out by the government.

Before the Housing and Development Board began its intensive programme of resettling people into apartments, most of my kelong

informants lived along the coastal fringes of Punggol and Kangkar. (Some are still living there.) This was a significant factor which started them off in their trade. The kelong-operators I interviewed claimed that their skills and secrets of the trade came only through years of experience. They had to learn by observing what was done by other workers and to tally the methods of the more experienced with their catch by gauging the effectiveness of their methods according to the size of their catch. They had to imitate and innovate continually.

> My father was born in Singapore. Ah Pa (Father) taught...so we learned. We stayed by the sea. At 16, I gave up studying and went out to sea, then to my father's kelong. From then till now.
>
> (Mong Chek, Translated from the Teochiu).

> Same. I came from Pontian. I was 12 when I started at a "har-long"(prawn trap). It's different and more difficult as compared to a kelong which has an attached house. When it rained, it was especially difficult. I've been fishing for over 50 years. My father was just a fisherman. I'm an illiterate...we just use our heads to know what to do.
>
> (Ah Sia [a kelong-operator in the Punggol-Changi area], Translated from the Teochiu).

Though illiterate, many are now able to speak some Mandarin and even a smattering of English. It was common practice among the early Chinese fishermen to pass on their skills to kinsfolk. Although some of my respondents migrated to Singapore direct from China, most are either from Malaysia or are second-generation locally-born kelong-operators, who gained experience from the exposure they received from their fishing relatives.

Although remnants of the migrant traditions are still maintained to a greater or lesser degree by those who are knowledgeable, there is still the problem of transmission. The transmission of these traditions depends largely on informal observation, imitation and explicit learning. With the stress on compulsory formal education, the kelong fishery is declining quickly. Children of present kelong-operators can no longer spend long hours at sea with their fathers. Those who have entered into the mainstream of society have no time to learn about these traditions. With the increase in literacy, the present generation is looking toward better jobs. Further, many kelong-operators are not keen on passing on their skills to their children :-

> ...the kelong business isn't very good - Bo-chhai-kang (it's not worth the effort). Even if I were to tell you about the kelong, it's useless because

> petrol is very expensive... The government isn't even helping us. It was different previously - when fish was important.Now ... so few kelongs are left in Singapore. The government is taking them away.
> (Ah Mak, Translated from the Teochiu).

It is interesting to note the change in the background of the present-day kelong-operators compared to that of their pioneering fathers. Although there are those who have spent a lifetime at sea, many in this generation have spent several years away from the kelong, in other occupations, before returning to the sea, largely because of their love for the peacefulness of the situation.

Such an interlude occurred at the prime of their lives coincident with the period of economic expansion which was gripping the nation. As the cost of living increased, these people were compelled to seek more stable incomes.

CONFLICTS IN THE MODERNISATION PROCESS

The existence of kelong and fish-farms must be understood in the context of a national ideology of development. The explanation offered by the Government in favour of fish-farms to replace of the kelong fishery is that:

> In view of Singapore's limited agricultural land and shrinking workforce, the emphasis is on the use of advanced technology for the cultivation of high value-added and non-polluting agricultural products. Viewed in this light, the future of the fish-farming industry seems bright as it is not only a non-polluting activity, but one that generates high economic returns and productivity gains. The success of all this research could spark off the development of a whole new range of interrelated fish production industry, from intensive culture to hatchery operation and feed production. (The Mirror, 21 (15) August 1, 1985 :11).

The non-polluting arguement in favour of fish-farms is untenable because, it must be stressed, that the kelongs are also a non-polluting. In addition, they generate the same economic returns as fish-farms. It costs the same to establish a kelong as it does a fish-farm, that is, approximately $180,000. Monthly maintenance costs are also the same. This paradox cannot be understood from a materialistic perspective alone; it also requires an appreciation of the ideological domain, since ideologies influence or even dominate economic modes.

At this juncture, it is necessary to examine briefly the direction of the Singapore economy. A significant characteristic

is that the People's Action Party has been in power for the last twenty-five years. As described by Chen and Evers (1978), it is also the largest owner of capital in the economy. This government is run by a small group of University-trained professionals who thus constitute a strong cohesive and homogeneous elite of similar political ideas, interests and objectives. They are development-oriented men, and, as development technocrats, are shifting Singapore from a loosely structured laissez-faire society to a planned, development-oriented state. This is an extension of Hall's argument that it is necessary for them to show the relationship between wealth, income and social usefulness and education. In this sense, government, professionals and bureaucrats, all have an interest in discouraging the family business, the very small-scale marginal business activities. People who are neither employers or employees, but who independently provide a living for themselves and their families, as well as providing goods and services that are useful and necessary to others, disprove the relationship between education and rewards. There are two possible ways to describe them in terms of the labour market. One way is to say that they occupy a position of independence within it; the other is that they are right out of it. In either case, their independence or absence highlights the dependence of professionals and bureaucrats on the labour market, while it has no effect on big businessmen. In terms of legitimation then, professionals and bureaucrats would desire every one to be in the same labour market as employees.

In terms of economic and political power, marginal family businesses have no political power, and little or no wealth, but their independence is a source of some power. Therefore they can always keep themselves going regardless of whatever economic changes occur. Their existence provides them with a resilience in terms of changes in the commodity market. Since they provide themselves with their own position as sellers in the commodity market, they are not obligated to anyone but themselves (Hall, 1982).

As a professional group holding long term power, the leaders of Singapore are both likely and able to shape institutions in the image of their own perceptions of society. Their concepts of development not only include an increase in the national income, raising standards of living, the adaptation of new technology, and the acquisition of new skills and capacities, they also involve changes in ways of thought, occupation changes, reforms of socio-economic structures, and the establishment of new institutions (Hassan, 1976:339-340).

Being professionals, the government leaders themselves are basically employees and independent sellers of skills earned through long years of training. The ability to pass examinations is considered as a measure of talent and ability, a valid criterion of rewards. The government takes a negative view toward untrained workers (Hall, 1982). In late-December 1966, the Prime Minister, Mr Lee Kuan Yew, stated that a good citizen is "robust, well-educated, skilled and well-adjusted". On July 7, 1971, the

Prime Minister was again reported to have said publicly that to have to continue as unskilled labourers is to be "frustrated" and "deprived" (Straits Times, July 7, 1971). This sentiment of excellence has often been voiced by the leaders of Singapore. According to Mr S. Dhanabalan, Minister for Foreign Affairs and Minister for National Development;

> To realize your potential, you need more education and more new skills. But a society of excellence requires more than education and skills. It requires dedication to excellence at every level as you move up the education and skill ladder...For the whole tone and character of the society is very much seen to be better educated and more successful. (The Mirror, Vol 21(15), August 1, 1985).

For the kelong-operators, the shift toward skills, modern mechanical methods and the employment of specialists means that such principles as loyalty, family relationships and learning on the job through informal apprenticeship, are diminished, in favour of the bureaucratic principles of recruitment, training, payment, and promotions. Such modern methods are based on rational calculations, single-minded profit making and bureaucratic organisation, where efficiency takes the place of feelings in personal relationships, as in independent family businesses, such as the kelong-industry (Hassan, 1976:341).

Therefore, the kelong-operators perceive the demolishing of kelongs, resettlement and clearance schemes, and the licensing of traditional activities as political means of making the traditional kelong-operators unable to continue in their trade. The change in production methods involves more than a change in techniques. It involves a reshaping of their worldview in time and space concepts. This can be seen in the case of how the earnings of the kelong-operator are dominated by his personal religious beliefs. To them, what Ma Zu, their sea-goddess, sees as correct or permissible is far more important than what the authorities would dictate. Religion plays an important part in the lives of the kelong-operators. Ma Zu is the Teochiu goddess of the sea. They look to her for protection from the dangers of the sea and pirates. Fruits and sa - se (literally "3 types" : that is, chicken, cuttlefish and pork) are offered to her. Otherwise, a simpler offering consists of only fruits. In the most simple ritual, joss-sticks alone are offered to appease her. With each new year, if all has gone well, the kelong-operators deem it necessary to offer a pig's head, chicken and cuttlefish.

> Do that and she writes down your name and says "Ah, you've come to pay your respects." It's all like that... that's how the world goes on - all properly and orderly.
>
> (Mong Chek, Translated from the Teochiu).

> We tolong (beg) Ma Zu. Sometimes I forget to pray. I ask for forgiveness - I utang (owe) her my

offerings and prayers then.
(Ah Mak, Translated from the Teochiu).

Although fewer taboos than formerly now constrain kelong-workers, there are certain beliefs they firmly adhere to. Their industry, profits and productivity are based on their religious beliefs and their own understanding of time and space, rather than on the principles of specialisation, expertise and rationalisation of the bureaucrats. For example, there are certain types of fishes that may not be caught.

> Dolphins and turtles are the saviours of drowning men. Never capture them. The have divine powers.
> (Ah Ni [now a taxi-boatman operating in the Changi-Punggol area, he formerly owned a kelong in Singapore], Translated from the Teochiu.)

> Don't capture he-siu (cow fish). They will die. They are the monks of the sea. It will bring you bad luck. Croakers also bring you bad luck. Once I caught them and nearly died. We Chinese are smart. The Westerners aren't smart. They don't understand and don't know what they can or can't catch. Christians have never met ghosts and don't believe in spirits. But there are spirits in the sea.
>
> (Mong Chek, Translated from the Teochiu.)

(Although my informant deems it taboo to capture croakers, there is a traditional Chinese belief too that the dried flesh of croakers is a sovereign remedy for dysentery, nightmares and dissolving undigested melon (Davidson 1977:89.)

> The Toa-peh-kong-hi (Queenfish) has five marks on its body. The god of the sea reserved this fish for himself with his fingermarks. It shouldn't be eaten by ordinary people.
> (Mr. Leong, Translated from the Teochiu).

On the other hand, it is believed that eating the roe of the Toa-peh-kong-hi (Queenfish) during Chinese New Year, brings good fortune, as this has been decreed by the gods. One explanation for this is that during the Chinese New Year season, the belly of the female Queenfish turns red. Thus the thumbprint-like dark blotches above the lateral line are indistinct.

Although political boundaries have been drawn to demarcate state ownership of land and sea, my kelong informants are more concerned with the spiritual ownership of the area. Their world-view is that wherever you are, respect must be shown to the spirit that really owns the place. The logic of "indigenous localism" is that the area will be opened to them if they are respectful to the various spirits whose areas they pass through. (See Wee, 1982).

When you pass a place with a white or red flag, it indicates that a Datuk or a Chinese spirit rules the area respectively. Usually, respect and offering must be given to them.

(Ah Ni, Translated from the Teochiu).

If you pass the tanjung - there's a Datuk (a Malay term for "grandfather" or "lord") there. You've to throw in gold paper to respect the Datuk. Even Christians have to do that. My brother is a Catholic. Once we were passing a tanjung and my boat stalled. "Did you offer gold paper?" my brother asked. "No" I said. "Oh! so we forgot! We threw the paper in. Then we passed." We daren't say anything against them in their waters. There're definitely many spirits.

(Ah Mak, Translated from the Teochiu).

After the Japanese occupation, I had a kelong that cost about $20,000 at that time. We caught a lot of fish. A friend of mine went hunting - caught a wild boar and killed it in the kelong. My whole kelong was unlucky - no fish means no fish because the Datuk and the wild boar can't go together. The wild boar is for the jungle. I called Malays in to pray - but no fish means no fish. That was the end of the whole kelong. In twenty-two months, I lost $20,000.

(Ah Ni, Translated from the Teochiu).

According to Wee (1984:22), most migrants who came during the colonial period, had no intention of settling for good. Most came to make quick money and then go home. For example, Chinese migrants were well aware that Singapore was fandi (Mandarin: "barbarian land"), and it was not China. Since they intended to stay only temporarily, they were not seriously interested in trying to sinicize the place. Ironically, this attitude of temporarily exploiting a barbarian land rather disposed them to adopt at least some of the "indigenous localism". The Chinese adoption of "indigeneous localism" was expressed in their respect to the Datuk. The Chinese migrants accepted the local Datuk as their deity too. Therefore, it was necessary for them to pay their respects to the Datuk, because it was felt that they were merely borrowing the land to make a living. There are still some Chinese who hold on to this belief. My kelong informant in this case is an example. He found it necessary to call in the Malays to offer their prayers to appease the Datuk, as he considered the space in which his kelong stood as really belonging to the Malays.

The kelong-operators belief in the spiritual ownership of area runs contrary to the government's ideology that the area has been neatly catergorised as part of a rationalised developmental

plan of the People's Action Party. Within this ideology, there is no room for any belief in local spirits. Thus are fish-farms designated and allocated their areas.

For the kelong-operators, the Chinese calendar is used to explain the incoming and outgoing tides. Ah Mak explained his perception of time and space :-

> We are upside down - our head faces downwards. The sun and moon are stationary and our world revolves around it slowly, so that we don't know that we are revolving. So when the earth is up, the tide is low and vice versa. Just look at the water. Our Chinese calendar tells us the tides exactly - where, when. The Westerners - they have got it all wrong. The Malays gauge through the moon - about the same as the Chinese.
>
> (Ah Mak, Translated from the Teochiu).

Western-educated Singaporeans - especially the bureaucrats - are thus regarded as people ignorant of the real world.

MANAGEMENT PRACTISES

The following is a record of a typical two-days (19th - 20th August, 1985) of activities at Ah Liang's kelong, in Punggol. The schedule for each day is not rigidly structured, as it depends on daily catch rates.

17.30: Free-time, which may be spent mending their fishing nets
19:00: The net is put away and the area swept clean in preparation for the night's work. Dinner is prepared. While some provisions need to be bought, the kelong-workers put aside some of their own haul for personal consumption.
19:15: The net is lowered by the mechanised pulley and the overhead lamp is switched on to lure fish. In the meantime, the workers take a bath.
19.30: The workers eat dinner separately sitting informally on the planks over the net.
20.30: Watching television is a favourite past time for kelong-workers. The television is often left switched on all evening. They may even be so engrossed in following their favourite Chinese serial that raising the net may temporarily forgotten.
21:00: Friends from the neighbouring kelong come in for a chat. During these hours, they are usually free while waiting for the first haul.
21.15: Ah Sia starts his generator to raise the net for the first time that evening. The generator is placed strategically next to an opening which looks out into the net. This way, the worker may be able to gauge if any adjustments need to be made. Outside, Mong Chek squats over a plank to check if there is enough fish and if the ropes need to be re-

adjusted to bring the net higher. This time the workers decided that there was too little in the net for them to scoop the fishes up. Further, the net was far too low and the ropes for the pulleys needed readjustment.

21.35: An unsuccessful second attempt was made to haul the net. The workers decided that there were far too few fish and lowered the net again.

00.10: The television programmes ended, but it was still early for the kelong-workers. One left on his motor-boat to set his crab traps. The other takes out his mattress to the verandah to sleep. When the crab traps have been set the worker returns, but sleeps in his boat. This is a precaution taken to prevent pirates from stealing the outboard motors.

05.00: The net is raised again. Ah Sia uses a scoop net to transfer fish from the trap to a basket.

05.30: The basket of fish, squid, prawns and other species is dragged to the working platform in the house. A fisherman who has parked his boat beneath the kelong comes to select some of the by-catch for use as bait. He pays S$1.20 for a bagful. The remainder of the catch must be sorted into baskets. Much is ikan bilis (anchovies), which will be sold at the auction market. Through a hole in the side of the working platform a bucket is filled with seawater, which is poured into a frying pan. After the fishes have been sorted out into respective baskets, each basketful is washed to remove any sediment. If the ikan bilis is caught too early, they may be boiled to preserve them. Some are also preserved in boxes of dry ice.

06.45: Although there is no "kelong-association", there is understanding and co-operation amongst the community in taking the fish to the auction market in Punggol or Kangkar. The baskets of fish are lowered by a pulley into the waiting boat. In this case, it is Mong Chek's brother who transports the fish to the Punggol auction market.

06.50: Crabs are collected by another fisherman.

07.00: The net is raised again, and the procedure of hauling fishes is repeated.

07.15: Neighbouring fish-farmers come in. The kelong-workers leave them to get the remaining by-catch from the net as feed for their fish-farm. After the selection is made, the kelong-operator is paid a negotiated amount.

07.40: After the departure of the fish-farmers, the net is raised and dried for the rest of the day, and the working platform is given a final sweep and wash.

09.00: Another basket of by-catch is lowered by pulley into the waiting boat of a duck-farmer, who has come to buy feed.

09.30: Preparations for breakfast and lunch begin. The workers may take lunch at any time. They generally sleep until late-afternoon, before the start of another "working day".

There is a discernible kelong sub-culture which is distinct from the mainland urban culture. Labour in the kelong is often organised on a kinship basis. To the kelong-operator, almost everyone in his community is either a real or fictive kinsperson. (Fictive kinship denotes a relationship based neither on blood ties nor marriage; e.g., godfather-godson.) Even if extra help is employed, everyone is known in Teochiu or Hokkien, the two languages of communication among the kelong owners, as "Uncle", "Older Brother" or "Younger Brother". The line between "worker" and kinfolk is thus often blurred.

To understand the social dimension of the Chinese, one must realise that among them, "many kinds of social dyads such as teacher-student, master-apprentice, employer-employee and ... are often patterned after kinship relations and are used to seek or establish authority in all inter-personal relationships" (Hsieh, 1977:103). This contrasts with large companies, where interaction is generally based on formal rules and authority is held by virtue of position and hierarchy. Lau (1973/74) reported similar findings with regards to the social structure of small Chinese firms in Singapore; that is, a sense of paternalism felt by most proprietors and the lack of explicit written rules and regulations in social interaction.

Although there is a hierarchy among kelong-operators, it is often not clearly visible. The only indicators of its existence are perhaps the differences in salaries and the general expectation that the thau-chhiu (foreman) knows when to raise the nets, how to boil the fish, tie the ropes, and so on.

Real or fictive kinship ties among the kelong-operators are based on claims that they themselves articulate. However, from my own observations this does does not mean that all kelong-operators are friendly or even warm toward each other. But even though relations may not be warm, the kelong-operators are great defenders of the kelong community, always maintaining that they are great friends.

> We need to be friends. It's important.... whenever we pass each other by boat - be sure to wave in acknowledgement - just like this (raises his hand to demonstrate). We don't need to say anything....it's important so that if we're in trouble in the middle of the sea, there'll be help. We make our own informal arrangements to help each other bring the fish to the auction market.
>
> (Mr. Leong, Translated from the Teochiu).

Although strains in relationships may exist, they are often hidden behind superficial actions supposedly denoting goodwill. People living and working together inevitably have conflicting interests, but, in general, they have a common interest in the maintenance of existing social relations. Individual goals must be attained through socially approved processes, and, as far as possible, the illusion must be maintained that each individual is acting only in the best interest of the community. As far as possible, too, the group must appear united, not only vis-à-vis other similar groups, but also to itself.

The kelong is also involved in a complex redistribution characterised by the establishment of relationships on a permanent basis, based on a more or less extended network of kinship and marriage relations. How the fish is finally transported to the auction market is enmeshed in this intricate matrix of kinship ties.

By mutual agreement, one of the kelong-operators goes round to the various kelongs in his locality to pick up the fish for the auction market. Therefore, although the early hours of the morning may be characterised by the busy traffic of various boats coming to collect the fish and to deliver provisions, underlying this complex redistribution process is an informal schedule which has been worked out among the various operators, so that this obligation is shared by everyone.

The extended network of kinship involved in the labour force also means that what is always quoted as the cost of running a kelong overlooks the unpaid cost of informal help drawn from the kinfolk, especially at weekends. The kelong-industry is so enmeshed in this complex network of kinship ties that the operator does not see his home as being separate from his workplace.

Politics is often discussed with visitors, focussing on complaints about the government with regards to land reclamation and the progressive demolition of their kelong. The kelong belt in Punggol is already up for reclamation. Bureaucratic intervention is resented, and kelong-operators are very vocal in expressing their dissatisfaction over government policies. The government is often seen as taking away their kelongs and money, so any form of bureaucracy is resented by the kelong-operators. Associations are resented, as they are linked with bureaucratic principles.

> We've lived here for so long. We know everyone, we don't need associations. All associations are fakes and useless. It is like the big fish eating the small fish. You only end up giving your money to others.
>
> (Ah Hak, Translated from the Teochiu).

A kelong-operator who sets up an attached fish-farm must obtain a fish-farm license and must pay the additional annual fish-farm license fees. This bureaucratic procedure is viewed with distaste and contempt by the kelong-owners.

> Our kelong doesn't breed the small fishes we catch although some kelongs do. We need a license to breed. It is not our wish; the reason is that the government is only interested in accruing money. Otherwise, anyone who is interested will be able to set up an integrated kelong.
>
> (Mong Chek, Translated from the Teochiu).

The kelong-operators, with their differing worldview and lack of rapport with the authorities, cannot see how they can in any way alter bureaucratic policies in phasing out the kelong-industry.

The present government deems the traditional method of kelong fishing unsuitable for a modern state. The initial idea was that since many kelongs were to be demolished, especially those off the Southern Islands and Pulau Tekong, the government would have to provide alternative employment for the kelong-workers. The idea of fish-farming was seen as a substitute for the kelong. Yet, ironically, even though there is some flow-over from the kelong community to the fish farms, most people that have ventured into fish farming are entrepreneurs, rather than kelong fishermen.

The difficulties in the continued existence of the kelong fishery stem not only from their technological or production methods, but also from political pressures to push them into modern aquaculture.

Such being the case, the kelong-operators are disillusioned about the future. They dare not harbour any hope of continuing in the kelongs for much longer. They simply intend to keep going until their time is up.

GLOSSARY OF CHINESE TERMS

Teochiu	English
fandi (Mandarin)	Barbarian land
Ma Zu (Mandarin)	Ancestral mother
sa-se	An altar offering of three varieties of food:chicken, cuttlefish and pork.
thau-chhiu	Foreman
toa-peh-kong-hi	Queenfish
thau-ke	Boss

GLOSSARY OF MALAY TERMS

Malay	English
belat bubu	Shallow-water palisade trap.
bunoh	"Slaying; putting an end to". It is also an abbreviation for bunoh mati used by the fisherfolk.
Datuk	Godfather or lord.
kelong	Abbreviation for kelong betawi.
kelong betawi	Offshore palisade trap.
kelong bilis	Lift-net kelong construction for the capture of anchovies or Stolephorus spp. The trap consists of a seaward enclosure and a lead only.
lawa	Cross pieces of nibong poles.
nibong	A palm stem.
pawang kelong	Kelong magician.
penajur	Guiding barrier.
sayap	The first cardiac chamber of the kelong.
seros	A form of fish stake.
tanjung	Channel

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AQUACULTURE IN ANCIENT HAWAII

by

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Aquaculture in Ancient Hawaii

Integrated farming systems included massive freshwater and seawater fish ponds

Barry A. Costa-Pierce

A combination of food-producing technologies is required to support a large human population where there is a limited amount of arable land. Today integrated farming systems—combining agriculture, aquaculture, animal husbandry, and waste treatment technologies—are in use in South and Southeast Asia and China, as well as in Eastern Europe and the Middle East.

In Hungary, for example, a ten-year cycle of land and water use is commonly practiced to convert marginal agricultural and waste lands into productive agricultural lands (Brown 1977, Muller 1978). For five years a combination of duck and common carp (*Cyprinus carpio*) farming in ponds produces about 4000 kg/ha/year of ducks and fish. During years six and seven, the ponds are drained and alfalfa is planted in the pond bottoms. Yields of alfalfa are approximately 8000kg/ha in the first year and 6000 kg/ha in the second. During years eight, nine, and ten, rice is planted, and harvests average 3000–3500 kg/ha/year. The ten-year cycle then begins anew with combined duck and fish farming.

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Seawater farming may have originated in Hawaii more than 1500 years ago

In the northern Delta region of Egypt, aquaculture is being used as a first stage of reclaiming over 50,000 ha of highly saline soils for agriculture, and up to 10,000 families are supported by the practice (Cross 1981). In spring, large ponds are constructed in unreclaimed saline soils, which may have salt concentrations as high as 200 parts per thousand (ppt). These ponds are flooded with water of 5–8 ppt for two weeks, then the water is drained. Flooding is then repeated. After the second batch of water is discarded, the ponds are filled to 30 cm depth and stocked with mullet fingerlings (*Lisa ramada*, *Lisa saliens*, and *Mugil cephalus*) caught from the sea. Farmers regulate the pond salinity by adding water during the season, and no feed or fertilizer is used. Fish are harvested from December to April and yields are 300–500 kg/ha/year.

Low salinity standing water in the ponds forces the higher salinity groundwater downwards through the soil profile, where it is collected in subsurface drains. Each spring the progress of soil desalination is checked by inserting twigs of *Eucalyptus* sp. into the pond soil. If the twigs die, the land is again used for aquaculture; if the twigs live, the farmers know the soil can support a crop of barley. This system reclaims soils over a three- to four-year period and has replaced the costly conventional ten-year reclamation schemes previously used by government engineers in the region.

Similarly, in Thailand, a single large farm may contain several thousand ducks, chickens, and pigs, as well as over a million fish, in a system incorporating anaerobic digestion, waste recycling, and water reuse (Figure 1).

Only recently have scientists begun to understand the fundamental value of integrating food production systems (Bardach 1982, Billard 1986, Ma 1985, Pullin and Shehadeh 1980, Shang and Costa-Pierce 1983). In some cases, however, integrated farming systems techniques have experienced failure due at least in part to socio-economic, cultural, and political factors. Therefore it is useful to consider historical examples of integrated farming systems and their socio-cultural contexts.

Some traditions of ancient aquaculture

Integrated farming systems, which included aquaculture, arose in ancient China, Egypt, and Hawaii, and perhaps also Europe and the southwestern United States. This innovation in food production, which developed in localized regions, may have resulted from extreme population pressure on the production capacities of natural and agricultural ecosystems. There is evidence of both local and widespread famine in ancient China, Eu-

rope, the Middle East, and Oceania. Mallory (1928) reported that China experienced famine in some province nearly every year for over a thousand years. In 1878 Cornelius Walford compiled a chronicle of 350 famines in Europe and the Middle East, going back as far as a famine in Rome in 436 B.C. (Ehrlich and Ehrlich 1972).

Originally, aquaculture seems to have evolved from fishing. Then it developed into integrated agriculture-aquaculture farming systems in the most advanced ancient agricultural societies (Ruddle 1980, 1982). For example, in the upper Mekong River watershed, in southwest China and Laos, ricefield fisheries may have co-evolved with wet rice cultivation and the fermentation of rice and fish surpluses (Ishige and Ruddle 1985). In these systems freshwater aquaculture was integrated into existing agricultural enterprises, creating a new type of agroecosystem.

China is often credited with the development of much of the art and science of modern aquaculture. Chinese fishing methods, fisheries management, and early aquaculture techniques have been documented as far back as 1122 B.C. (Radcliffe 1926). Intensive fishing pressure, due to the great population pressures in the coastal zone of ancient China likely helped initiate the early aquaculture development. Around 2000 B.C. the ruler Yu Wang issued a conservation edict prohibiting fishing during the spawning seasons (Wu 1985). During the Chou Dynasty (1122 to 249 B.C.), Fan Li started breeding and raising common carp in Wuxi, Jiangsu Province, in eastern China. In 473 B.C. he wrote a book entitled *Fish Breeding*, the first known document on aquaculture (Fan Li fifth century B.C.).

Ancient Chinese aquaculture employed only common carp until the Tang Dynasty (618 to 906 A.D.), when the Emperor Li banned the culture, fishing, sale, and consumption of this fish because its Chinese name was the same as that of the Emperor! Over time, aquaculture was begun using five other carp species—grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Aristichthys nobilis*), mud carp (*Cirrhina molitorella*), and black carp (*Mylopharyngodon piceus*)—whose fingerlings could be easily caught in the Pearl and Yangtze rivers and reared together in ponds. Thus arose the classical Chinese fish polyculture that is widely practiced today (FAO 1983, Ruddle and Zhong 1987).

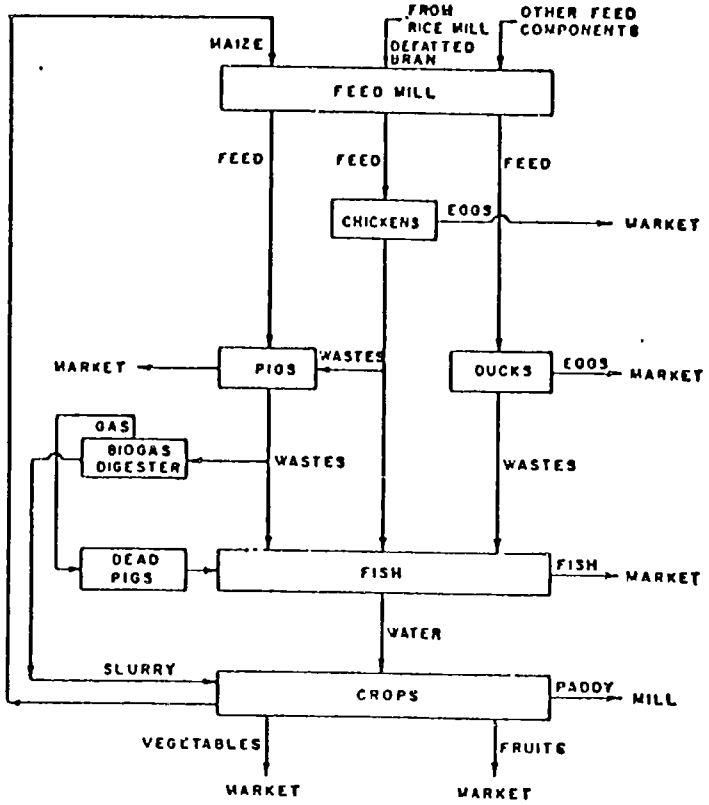

Figure 1. System schematic of Kirikan Farm, Thailand, a large-scale integrated biogas energy-agriculture-aquaculture facility, which illustrates the principles of resource conservation, waste recycling, and symbiotic, high-yielding food production subunits. Modified from Edwards (1980).

It is not clear whether aquaculture originated in China or was introduced from elsewhere before 2000 B.C. Common carp are not native to China but came from the rivers of Central Asia that drain into the Black and Caspian Seas (Schäperclaus 1962). Okada (1960) proposes that the Romans or their predecessors introduced the fish into ancient China and Europe. Thus the origins of aquaculture might lie somewhere in ancient Europe, and aquaculture may have been transplanted into China by ancient trade and migration.

Once established in China, however, fish culture techniques spread rapidly from the Chinese mainland into Japan, but aquaculture in Japan remained unimportant until recently (Drews 1951). Chinese aquaculture techniques also spread into India around 1127 A.D. (Bimacher and Tripathi 1966, Jhingran 1969). More recently (about 1910), Chinese immigrants introduced aquaculture into Thailand (Smith 1925) and integrated farming techniques into Malaysia, Singapore, and Indonesia (Tetra 1958).

The sophistication of aquaculture in ancient China has been well documented; however, parallel developments occurred in ancient Egypt. Although no written treatise is known that describes ancient Egyptian aquaculture techniques, well-preserved, magnificently detailed bas reliefs illustrate a highly developed technology of farming the Nile tilapia (*Oreochromis niloticus*) (Chimits 1957).

In a scene on the Tomb of Thebaine (Davis and Gardner 1954), for instance, an Egyptian of importance is sitting in his garden and fishing a drainable, artificial fish tank for Nile tilapia, using a double line with two hooks (Figure 2). His wife is seated

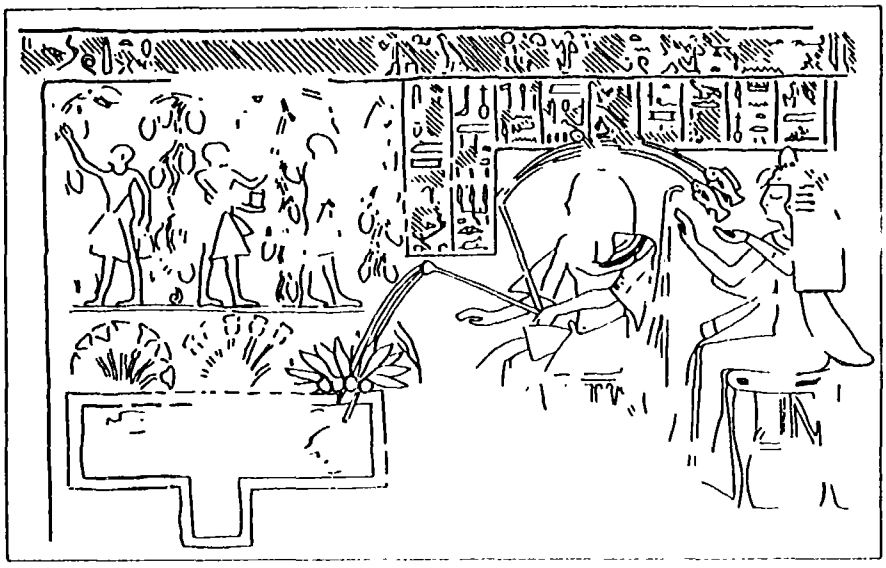

Figure 2. Bas relief on the Tomb of Thebaine, Nile Delta, Egypt, circa 2000 B.C. Note the central drainage canal, floating plants, and juxtaposition of tank to fruit trees. These components are widely used in modern aquaculture to harvest fish, provide shelter for small fish, and reuse wastewaters in agriculture, respectively. Redrawn from author's photographs and Chimits (1957).

just behind him to unhook the catch. The tank has a clearly defined central drainage canal and shallow sides with floating plants as shelter for the fish. In the background are servants picking fruit from trees that are irrigated by water from the fish pond. This illustration indicates that fish culture in artificial ponds was used in conjunction with agriculture before 2000 B.C. in Egypt, and the system provides a remarkable parallel to ancient Chinese integrated farming systems.

With a system of canals and gates, ancient Egyptians managed large inland lakes for fish production. Isaiah's prophesy (19 Is 10) was failure "for all that make sluices or ponds for fish," referring to the ancient Egyptians (Fryer and Iles 1972). These techniques are described further:

> Lake Moeris, which is in a very dry region, is fed by an artificial canal coming from the Nile; the water flows into the lake for six months, and back from the lake into the Nile for another six months. With the water flowing back into the Nile, the lake brought to the Royal Treasury, through its fisheries, one talent [35 kg] a day. While flowing back into the lake, the output was only 20 mines [11 kg].
>
> —*Herodotus*, Book II written circa 450 B.C. (Chimits 1957, p. 214).

In addition to the Chinese and Egyptian examples of ancient aquaculture, fish culture or fish "storage" may have been practiced in ancient Poland (Bogucki and Grygiel 1983) and in the US Southwest (Figure 3) (McCown and McCown 1982). But more careful studies are needed to document true aquaculture at these sites.

The ancient aquaculture and integrated farming systems of Hawaii exhibit a very remarkable sophistication in terms of their diversity, distinctive management, and sheer extent of development, especially given the small size of Hawaii. Although the Hawaiian systems are only 1500–1800 years old (a comparatively recent development by Chinese and Egyptian standards) mariculture—seawater farming—may have originated in Hawaii.

Socio-cultural system of ancient Hawaii

> The whole distance to the village of Whyeete is taken up with innumerable artificial fishponds extending a mile inland from shore, in these the fish taken by nets in the sea are put, and though most of the ponds are fresh water, yet the fish seem to thrive and fatten.... The ponds are several hundred in number and are the resort of ducks and other water fowl.
>
> —T. Bloxam, British naturalist on *H. M. S.* Blonde, describing Waikiki in 1825 (Handy and Handy 1972, p. 482).

The ancient Hawaiian fishponds were part of a large, integrated, and complex Hawaiian subsistence and barter economy that included agriculture, aquaculture, and animal rearing. The political aspects of this socio-cultural system contributed greatly to the development of the expansive aquaculture-agriculture network.

Hierarchical political control and redistribution of food was essential to the smooth functioning of the ancient integrated farming systems, because construction and management of the huge fishpond complexes required sizeable labor forces. Massive ponds such as the Kaloko pond in Kona, Hawaii, have a 229-m-long wall measuring about 2 m high and 11 m thick at the base. This wall contains an estimated 150,000 m^3 of rock and fill (Apple and Kikuchi 1975). The Kuapa pond at Maunalua, Oahu, was reportedly built over several years by thousands of people who formed long human chains to transport rocks from the Ko'olau Mountains. Efforts of this magnitude obviously required great social organization.

Ancient Hawaii had highly stratified chiefdoms with a well-defined class structure separating chiefs, advisors, stewards, and commoners. This organization was similar to that of the chiefdoms found in Tonga, Samoa, and the Society Islands (Sahlins 1958). Prior to 1848, all Hawaiian land—its resources, fishponds, and communal and spiritual centers—were owned by the kings (*ali'i*). The kings would contract the bulk of the land and fishponds to lesser chiefs (*konohiki*) but keep sacred and special resources, such as fishponds that produced especially tasty fish, under their direct control. Couriers would transport, from these royal ponds to the court, plump fish in water-filled gourds or by hand (Rice 1923) (Figure 4).

Konohiki were granted large, wedge-shaped areas (*ahupua'a*) of the Hawaiian islands that encompassed entire valleys and stretched from the mountains to the sea (Lind 1938)

Figure 3. Aerial view of fish ponds, possibly built by the Palm Springs or Cahuilla Native Americans, along the shore of ancient Lake Le Conte, now west of the Salton Sea in Southern California. Numerous circular and rectangular ponds can be seen along the former lake shoreline. It is not yet known if true aquaculture or simple fish trapping occurred in this region, but growing archeological evidence exists that a highly sophisticated agricultural/fisheries society trapped migrating fish from the ancient lake, cultured them in small ponds, and reproduced them for distribution elsewhere. Photo: Frank Colver with permission from B. H. McCown, Archaeological Survey Association of Southern California, Redlands, CA.

(Figure 5). These *ahupua'a* were generally not demarcated in Hawaii; no evidence of erect stones marking individual land holdings, such as in Tahiti, have been found (Handy and Handy 1972). It appears that the *ahupua'a* were mainly political subdivisions granted by the *ali'i* to *konohiki* to assure subsistence supplies of food, firewood, timber, thatch, and ornamentation.

Handy and Handy (1972) have described a share-cropping arrangement between tenant families and the *konohiki* that was "comprehensive and reciprocal in its benefits." Within an *ahupua'a* were sections of land (*'ili*) granted to individual extended families (*'ohana*) for cultivation. These temporary or permanent land divisions within the *ahupua'a* were clearly marked and carried individual titles. "It was said that in every com-

Figure 4. "Makoa," an illustration of the Hawaiian fish couriers who carried fresh fish over long distances from royal ponds to the travelling court of ancient Hawaiian kings. Print: Dietrich Varez, Volcano, HI.

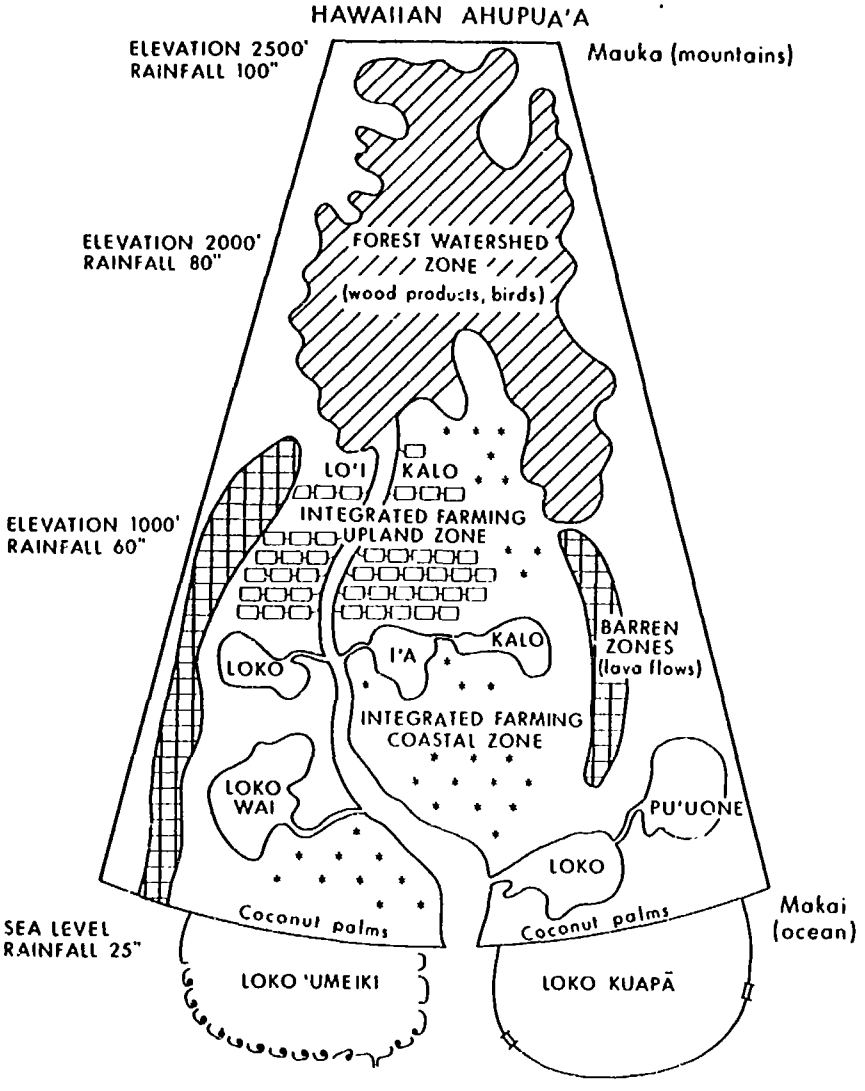

Figure 5. An idealized Hawaiian *ahupua'a* showing topographical placement of freshwater, brackish-water, and oceanic integrated farming systems. Stars indicate placement of settlements. The systems were very diverse and were adapted to the wide range of environments present, but typical valley systems of this type would be approximately 10 km from mountains to ocean and 10–20 km along the shoreline.

munity there were individuals who were well versed in the local lore of land boundaries, rights, and history" (Handy and Handy 1972, p. 49).

All harvests from the fishponds were distributed in a politically institutionalized manner by the *konohiki* to the *'ohana* and pond workers living in the *ahupua'a*. Kikuchi (1976) has suggested that the fishponds were symbols of the chiefly right to conspicuous consumption and the exclusive ownership of the land and its resources, and that the fishponds were the subject of frequent intertribal and intratribal conflict.

Kamakau (1976) argues, however, that the presence of the fishponds did not indicate any contempt on the part of the *konohiki* for the local populace. He stated, "How could they have worked together in unity and made these walls if they had been frequently at war and in opposition one against another? If they did not eat the fruit of their efforts?" Indeed, a native Hawaiian, David Malo, wrote of a Big Island chief who was killed because of his cruel efforts to exploit his people when he "... made the people of Ka'u sweat and groan ...[with] the building of heavy stone walls about several fishponds..." (Malo 1951).

Contact with Europeans, which began in 1778, had a variety of dramatic effects on Hawaiian society. It destroyed the ancient religion and the chief's supernatural right to control all the land, its resources, and its people. The economy changed from the traditional barter system to a money economy. Contact with foreigners also brought new diseases, which led to the massive depopulation of Hawaii.

The Hawaiian land decision of 1848 allowed the purchase of land by Hawaiian commoners and by foreigners. In many areas the largest purchase of government lands was by foreigners; some foreigners purchased thousands of acres for $.25–$.50 per acre (Kelly 1980). This land decision (locally known as the Great Mahele) was a pivotal point not only in Hawaiian history but also in the history of the integrated farming systems. Decline of the fishpond complexes and Hawaiian integrated farming systems was rapid after the Great Mahele.

Once the harvests from the lands and fishponds became economic entities with prices, their distribution tended no longer to follow either an institutionalized pattern of sharing (Handy and Handy 1972) or of exploitation of the commoners by the chiefs (Kikuchi 1973), as before the Great Mahele. With the general demise of native Hawaiian society, the majority of Hawaiian integrated farming systems fell into disuse and disrepair.

When Captain James Cook reached Hawaii in 1778, at least 360 fishponds existed. They produced some 900,000 kg fish/yr (Table 1). According to the State of Hawaii only 28 ponds were suitable for fish culture in 1977 (Madden and Paulsen 1977); by 1985 only seven ponds were in commercial or subsistence use. These ponds produced 15,000–20,000 kg/yr, a mere one to two percent of the earlier production.

Integrated farming systems

Four basic types of fishponds and one fish "trap" were known in ancient Hawaii and were integrated to various degrees with taro (*Colocasia esculenta*) agriculture. Ponds were fed with cut grass, mussels, clams, seaweeds, and taro leaf from adjacent

agricultural or natural ecosystems (Titcomb 1952, Wilder 1923). In contrast to modern integrated systems, Hawaiian fishponds did not receive fertilization from animal or human wastes or kitchen refuse; the chiefs prohibited such waste use (Kikuchi 1976).

The diversity, extent, and number of fishponds in Hawaii before contact with Europeans is impressive. The various fishponds (Figure 6) spanned the natural salinity range of water. The four types of fishponds (Figure 7) developed within the *ahupua'a* were:

- freshwater taro fishponds (*loko i'a kalo*)
- other freshwater ponds (*loko iwai*)
- brackish water ponds (*loko pu'uone*)
- seawater ponds (*loko kuapa*)

An additional type of pond (really a fish trap) was known as *loko 'umeiki* (Summers 1964).

Table 1. Estimated yields of Hawaiian aquaculture ponds before 1900.

Island	Number of ponds	Area in hectares*	Minimum yield† (kg)	Percent total
Oahu	175	1306	438,816	49
Hawaii	59	440	147,840	16
Molokai	56	418	140,448	16
Kauai	42	313	105,168	12
Maui	26	194	65,184	7
Lanai	1	7	2,352	<1
Niihau	1	7	2,352	<1
Total	360	2685	902,160	100

* Using an average of 7.46 ha per fishpond (Kikuchi 1973).
† Using an average of 336 kg/ha/yr (Cobb 1902).

Freshwater taro fishponds. The taro fishponds (*loko i'a kalo*) were developed in the uplands to cultivate taro and simultaneously grow a limited range of euryhaline and freshwater fish, such as mullet (*Mugil cephalus; ama 'ama*), silver perch (*Kuhlia sandwicensis; aholehole*), and Hawaiian gobies (*Eleotris sandwicensis* and *E. fusca; 'o'opu*). Freshwater prawn (*Macrobrachium* sp.; *opae*) and green algae (*Spirogyra* sp. and *Cladophora* sp.; *limu kalawai*) were also grown. These fishponds probably arose originally from shallow ponds (*lo'i*), which were created by the diversion of stream runoff for the irrigation of taro, and over time the Hawaiians added aquaculture to the design of these ponds.

Surplus fish from abundant sea harvests of milkfish (*Chanos chanos*), mullet, and silver perch were put in shallow ponds located close to the sea. Fish also directly entered the taro patch-fishponds from the sea through the newly created artificial estuary. It is likely that the originators of the stocking practice observed that fish held in these ponds not only survived the harsh transition in salinity from seawater to freshwater but also grew well. They also probably noticed that their taro grew more luxuriantly and had fewer pests, owing to the continual grazing and pruning activities of certain types of fish. Taro was planted in mounds to leave channels for swimming fish to feed on the insects and ripe leaf stems of the taro (Kamakau 1976).

Other freshwater ponds. The second type of freshwater ponds, *loko iwai* (Figure 7), were inland ponds or lakes typically excavated by hand from a natural depression, lake, or pool and supplied with water diverted by ditches from streams, rivers, or by natural groundwater springs or aquifers. Native species of freshwater prawn and Hawaiian gobies (*Eleotris sandwicensis, E. fusca*, and *Gnatholepis anjer-*

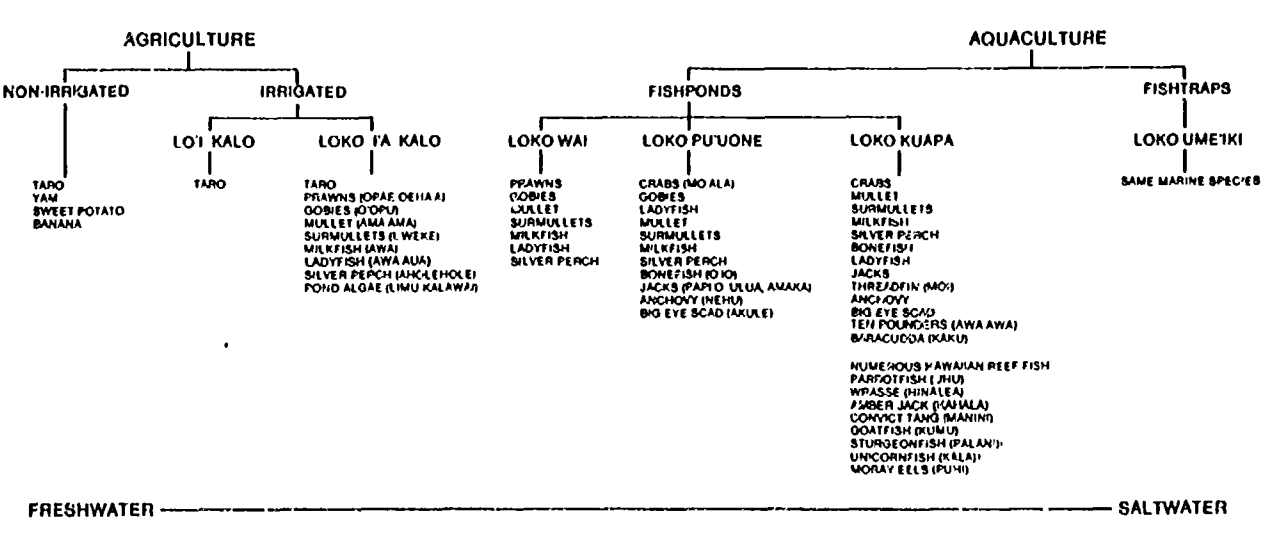

Figure 6. The Hawaiian integrated farming system spanned the normal salinity range of water and comprised a continuum from agriculture to aquaculture. An impressive number of species were harvested from seawater fishponds and traps; the ponds enclosed a reef-flat environment and all its species. Modified from Kikuchi (1976).

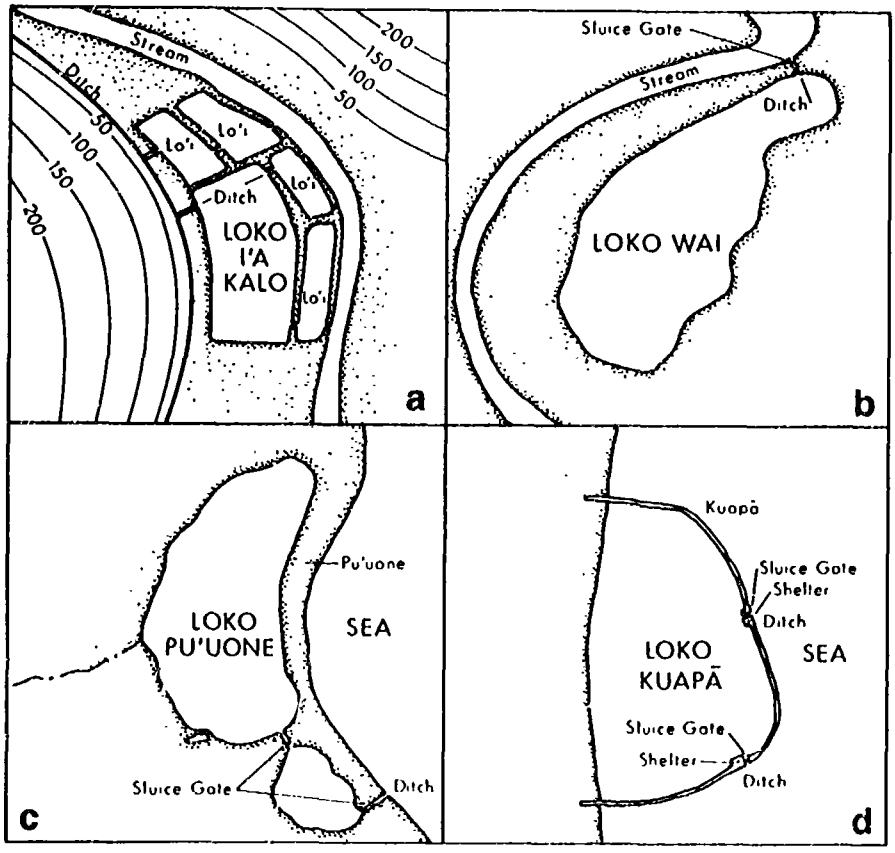

Figure 7. Four main types of ancient Hawaiian integrated farming systems: (a) *lo'i* were for the paddy culture of taro (*Colocasia esculenta*, and *loko i'a kalo* were taro patches modified to include aquaculture; these upland ponds are depicted in a valley with elevation contours indicated; (b) *loko wai* were artificial and natural freshwater lakes excavated for or modified for aquaculture respectively; (c) *loko pu'uone* were brackish-water lakes separated from the sea by a *pu'uone* or spit of land reinforced by mud, silt, and refuse and connected to the sea by a ditch that had grates to trap and hold large fish; (d) *loko kuapa* were ponds built along the shoreline usually on top of a reef flat with volcanic rock and/or coral to form a wall (*kuapa*). Controlled harvests were accomplished using a canal, net, and grate system. Modified from Kikuchi (1976).

nesis) and migrants from the sea that move into fresh water (mullet, milkfish, and silver perch) were stocked, grown, and harvested from these ponds. Milkfish were particularly abundant in these ponds, having been procured in shallow shoreline areas and carried long distances in large gourds filled with water (Beckley 1883). These ponds were harvested by woven reed nets (*hala*) placed across a channel to capture the fish during their seaward spawning migrations, oftentimes during full moons in the spring.

Brackish-water ponds. Brackish-water ponds, the third type of fishpond, were coastal ponds excavated by hand from a natural body of water stranded by eustatic sea-level changes (Kikuchi 1976), or formed by piling mud, sand, and coral to form earth embankments parallel to the coast (Figure 7). A sand bar, coastal reef, or two adjacent edges of land mass isolated these ponds from the open sea. These *loko pu'uone* were connected to the ocean by a canal constructed so that seawater would enter the fishpond on a rising tide. *Loko pu'uone* usually had some freshwater inputs, either from springs, streams entering the pond, submarine groundwater discharges, or water percolating from adjacent aquifers. The combination of fresh and salt water produced a brackish-water environment that was very productive and very diverse in the species that could acclimate from both fresh and salt water. Two types of *loko pu'uone* have been described, a planter's *pu'uone* and an *ali'i pu'uone* (Handy and Handy 1972), classified by their ownership and the effort and elaboration used in their construction.

Seawater ponds. The fourth type of fishpond, the seawater ponds or *loko kuapa* (Figure 7), was the ultimate aquaculture achievement of the native Hawaiians and a valuable contribution to native engineering and subsistence food production. Mariculture, or the farming of euryhaline and marine aquatic animals in seawater, appears to have reached a sophisticated level in ancient Hawaii. Summers (1964) states that *loko kuapa* are found nowhere else in Polynesia.

The main isolating feature of these ponds was a seawall (*kuapa*) constructed of coral or lava rock. Kikuchi (1973) noted that the lengths of 90 fishponds studied ranged from 46–1920 m, with the greatest frequency of lengths between 366–610 m, and containing an average of 955 m^3 of rocks and fill. Some of the stones used in the walls have been estimated to weigh as much as a half a ton.

On the island of Molokai, which has a protected, regular, shoal southern coastline, more *loko kuapa* were constructed per area of land than anywhere else in Hawaii (Figure 8). Large numbers of these ponds were also developed in the Kaneohe Bay, Waikiki, and Pearl Harbor areas of Oahu (Figure 9). In some of the Molokai ponds coralline algae, which secretes a natural cement, was used to strengthen the walls. Women and children gathered these algae from the sea for this purpose (Summers 1964). Ponds on Molokai were built on a reef flat, with the walls extending in a semicircle from the shoreline. The ponds thereby contained all of the marine aquatic biota of the original reef environment. At least 22 species of marine life flourished in these ponds.

Loko kuapa had an additional feature that can only be described as an ancient engineering marvel. Canals (*auwai*) were constructed into the walls of the ponds for the stocking, harvesting, and cleaning of the seawater ponds with minimal human effort. The canals connected the ponds di-

rectly to the sea and had, in the middle, a single, immovable grate (*makaha*) made of dense native woods (Figure 10). These grates were constructed by vertically lashing solid timbers (*'ohi'ia* or *lama*) to two or three cross beams with ferns, so that the individual timbers were separated by approximately 0.5–2.0-cm wide spaces. Thus only water and very small fish could pass freely in and out of the pond. The pond was therefore automatically stocked from the sea.

The grates were fixed in the canal and large fish trying to migrate to the sea were harvested by setting nets on the pond side of the grate or by hand capture (Kamakau 1976). Harvesting was attuned to the behavior of the fish. *Loko kuapa* were used to culture mainly two species of fish—milkfish and mullet. Both are technically sea spawners (catadromous). During certain seasons (frequently spring moons in Hawaii), they return from their freshwater and brackish-water habitats to spawn in coastal seawater. In contrast, salmon, being anadromous fish, have an exactly opposite life cycle. During the migration periods the keepers of the fish pond (*kia'i*) would joyously watch hundreds of fish swim into the canal in a futile attempt to reach the sea. Nets set on the pond side of the *makaha* would close off the migratory route.

Later in Hawaiian history, the canals were modified to have one or two vertically moveable *makaha* substituting for the set net and immovable *makaha* used earlier. With this modification, as the fish entered the canal and tried to migrate to the sea, the seaside *makaha* was lowered (or was permanently fixed) and the pondside *makaha* raised. The pondside *makaha* was then lowered, trapping the fish, which were simply netted out of the canal. The process was then repeated. Thus through the use of keen observational skills and knowledge of fish behavior, a method was devised of allowing the fish to harvest themselves.

> When the keeper of the pond wished to remove some fish, he would go to the makaha (grate) while the tide was coming.... The keeper would dip his foot into the water at the makaha and if the sea pressed in like a stream and felt warm, then he knew that the sluice would be full of fish. The fish would scent the fresh sea and long for it. I have seen them become like wild things. At a sluice where the fish had been treated like pet pigs, they would crowd to the makaha where the keepers felt of them with their hands and took whatever of them they wanted....
>
> —S. M. Kamakau, 9 December 1869
> Translated from a Hawaiian Newspaper, *Ke Au 'Oko'a*
> (Kamakau 1976, p. 49)

Over time the *loko kuapa* would become filled with sediments, either washed in during heavy rains or accumulated from the settling of particles in the water. In some of the larger ponds on Molokai that tended to become silted, the grates and canals were operated to clean the ponds, in a clever example of practical maintenance. In these cases, more than one canal was constructed in an orderly pattern in the pond walls, with grates set across from each other into the direction of the prevailing longshore current.

On a rising tide the grate on the upstream end of the longshore current was opened. This washed the sediment accumulated at this upstream grate downstream toward the middle of the fishpond. On the next ebb tide this upstream grate was closed, and the downstream grate on the opposite side of the pond opened.

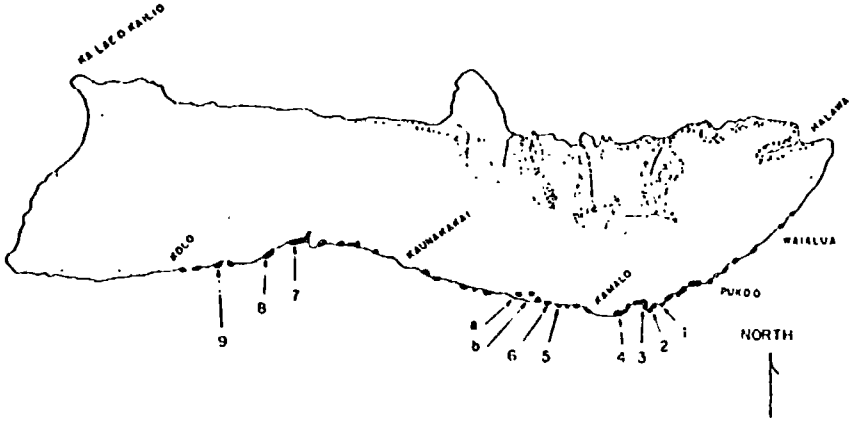

Figure 8. A map of the Hawaiian island of Molokai with its long, shoal southern coastline. Darkened areas indicate the areas of some 28 marine fishponds (*loko kuapa*). Two brackish water ponds (*loko pu'uone*) are indicated by letters. Numbers refer to the location of fish traps (*loko 'umeiki*). Modified from Cobb (1902).

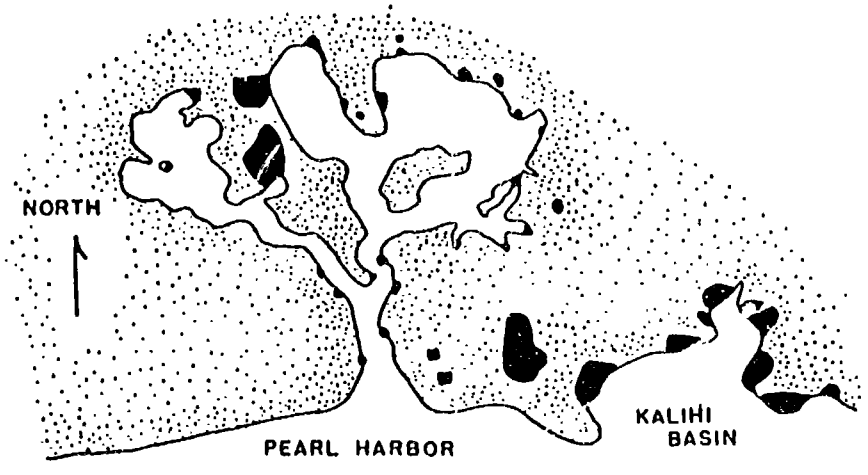

Figure 9. A map of the Pearl Harbor and Kalihi Basin areas of the island of Oahu, Hawaii. Darkened areas depict the locations of more than 30 *loko wai, loko pu'uone,* and *loko kuapa.* Modified from McAllister (1933).

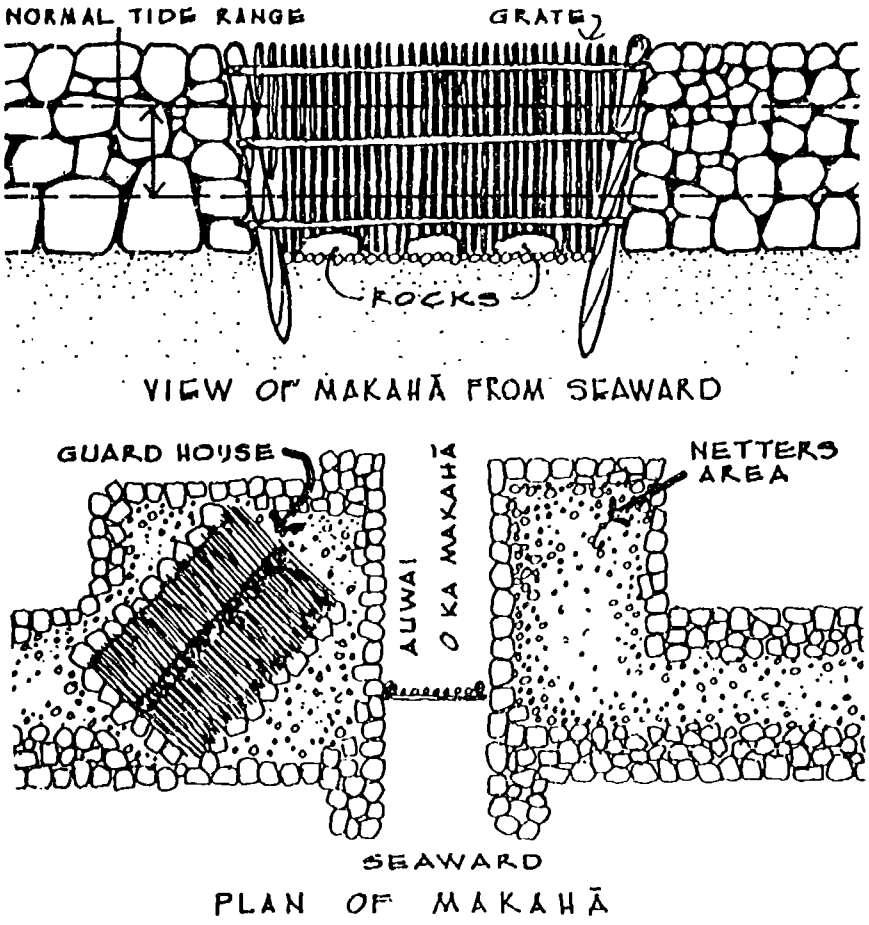

Figure 10. Details of the sluice grate (*makaha*) that was permanently fixed in a canal (*auwai o ka makaha*) connecting the pond to the open sea. Nets were set on the pond side of the canal to capture fish gathering in the canal attempting to migrate to the sea. Note that a single, immovable grate was used in the ancient design. Modified from Apple and Kikuchi (1975).

The ebb tide therefore tended to pull the accumulated sediment from the middle of the pond toward the downstream grate. By a regular program of following the tidal cycle and opening and closing the proper grates the ponds could be effectively cleaned of sediment. In addition, if a pond was silted up after a particularly heavy rain, weighted bamboo rakes (*kope 'ohe*) were towed behind outrigger canoes to facilitate movement of the accumulated sediment out of the fish ponds.

Cordover (1970) has discovered another type of seawater fishpond on Molokai with no grates. These ponds were stocked with fingerling mullet (*Mugil cephalus*) only once, and it was reported by Hawaiians that mullet spawned and grew there successfully. Hamre (1945) reported more of these types of ponds on Molokai prior to the 1946 tsunami. Although modern scientists have had great difficulty in spawning mullet in captivity (this has improved only recently). Phelps was assured by Hawaiian elders that mullet had indeed spawned regularly in these ponds. He states, "The Hawaiian knowledge of the natural history of fishes, in the old days, should not be underestimated" (Phelps 1937, p. 14).

Fish trap. The last type of fishpond used by the Hawaiians, *loko 'umeiki*, was actually a trap rather than a pond (Figure 11). Hawaiian fish traps are very similar to those in much of Oceania. Like *loko kuapa*, these traps were shoreline ponds with low, semicircular pond walls. However, unlike the *loko kuapa*, pond walls were partially or wholly submerged at high tide and contained numerous openings, or lanes, leading into or out of the trap. Most known *loko'umeiki* were located on the island of Molokai, possibly owing to the favorable orientation of the island with regard to longshore currents. However, it is claimed that Pearl Harbor, on Oahu, had three or four of these types of traps and that one fish trap may have existed on land.[1]

These lanes connecting the traps with the ocean were used to catch fish migrating down the coastline, which were attracted to the surge of water at the lane entrances (Figure 11). Fishermen simply laid a net facing the sea across the opening of the lane to capture inflowing fish on an incoming tide. When the tide reversed, fishermen faced their nets toward the traps, capturing fish as they swam out toward the sea. It was reported that the right to fish during different portions of the tidal cycle was divided among family groups.

> Such was the case of Mikiawa Pond at Ka'amola, Molokai. When the tide was coming in, the people of Keawanui could use the lanes. When the sea ebbed, the fish belong to Ka'amola.
>
> —Timoteo Keaweiwi, 1853
> *Foreign Native Testimony Book 16*
> State of Hawaii Archives
> Honolulu, Hawaii
> (Summers 1964, p. 56)

Implications

It is evident that the ancient Hawaiians supported a relatively high population density by managing an ecologically complex integrated farming system that connected agricultural watersheds to oceanic environments. These historical developments are remarkably similar in principle to integrated farming systems developed in ancient China and Egypt. Hawaiian society, like other ancient civilizations, was subject to droughts, climatic disruptions, natural disasters, and famines; it may have developed these integrated farming systems in response.

The limited archeological and

[1] W. Kikuchi, 1985, personal communication. Department of Science, Kauai Community College, Lihue, Kauai, HI.

systems are quite similar to the ancient Hawaiian systems. Simple technology transfer from one traditional system to another may dramatically increase productivity and efficiency. For example, the modern version of the Hawaiian canal-grate system may have great potential for the thousands of hectares of extensive marine ponds along the coasts of India and Indonesia.

Transfer and improvement of knowledge in traditional food production systems may have greater value than any "technological fix" applied by modern machines and methods. While we do not know how to stimulate, manage, and sustain a natural food web in an extensive aquaculture system to repeatedly obtain high yields, we do know it is possible. With no supplemental feeds or fertilizers added, and management timed to the abundances of natural foods available, scientists have achieved experimental productivities from 11,000–25,500 kg/ha/year in Laguna de Bay, Philippines (SEAFDEC 1980).

Hawaiian integrated farming systems evolved and proliferated within a unique socio-cultural context. However, the traditional designs, ecosystem development concepts, and integrated aquatic resources management principles may be instructive to some modern societies with burgeoning populations desperate to increase food production and employment opportunities in traditional agricultural sectors.

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aquaculture research, as well as exploration in the Pacific Basin, allows no conclusions to be drawn either regarding the uniqueness of the Hawaiian integrated farming systems among the Pacific islands, as some have suggested (Kikuchi 1973, Summers 1964), or their possible relationships to Chinese or other Asian systems. The Hawaiians appear to be one of the originators of mariculture; there is no evidence of another ancient culture using oceanic resources in this manner.

Most of the previous work on early Hawaiian aquaculture focused on the marine fishponds. These studies concluded that the ponds were technologically primitive, ecologically inefficient, and unproductive in biomass per unit area when compared with Asian practices (Hiatt 1947a,b, Kikuchi 1973, 1976). But these earlier interpretations may be inappropriate in light of the total farming system, which spanned an extensive salinity range of water and encompassed entire valleys.

Direct comparison with Asian systems is unjustified, because the aquaculture systems are at opposite ends of the management spectrum. The Asian systems are semi-intensive, sustained by large inputs of labor, feed, and fertilizer supplements; whereas the Hawaiian systems were mostly sustained by natural productivity, and thus are called extensive. For an extensive system, the estimated yields by Cobb (1902) of 336 kg/ha/year would place the Hawaiian fishpond systems operated before contact with European culture on par with most extensive aquaculture systems in the world today. Indeed these yields are comparable to some of the smaller intensively managed modern Chinese lakes and reservoirs (Billard 1986).

Only recently have scientists systematically documented traditional technologies of agricultural and fishing societies. These studies of traditional crops, methods, and systems have produced so many advances in such a short time, many agricultural researchers now first consider traditional knowledge, however primitive it may appear, and use it as a foundation for further research (Richards 1985).

Until the 1970s, however, the poverty and underdeveloped status of fishing and agricultural societies were attributed to their "inefficient," "primitive," and "subsistence" technologies, without any consideration of sociocultural and economic concerns (Ruddle and Grandstaff 1978). Thus, the poverty of traditional fishermen was ascribed to a lack of modern fishing gear and methods. Recent scientific study, however, has shown that traditional fishermen have a wide knowledge of oceanography, fish biology and behavior, and conservation and management practices that preserved the biological integrity of fish stocks for generations before the advent of modern gear or methods (Johannes 1978, Johannes et al. 1983, RaiChoudhury 1980, Roy 1982, Ruddle and Johannes 1985). Perhaps these traditional fishing and agricultural societies should be termed ecologically advanced rather than technologically backward.

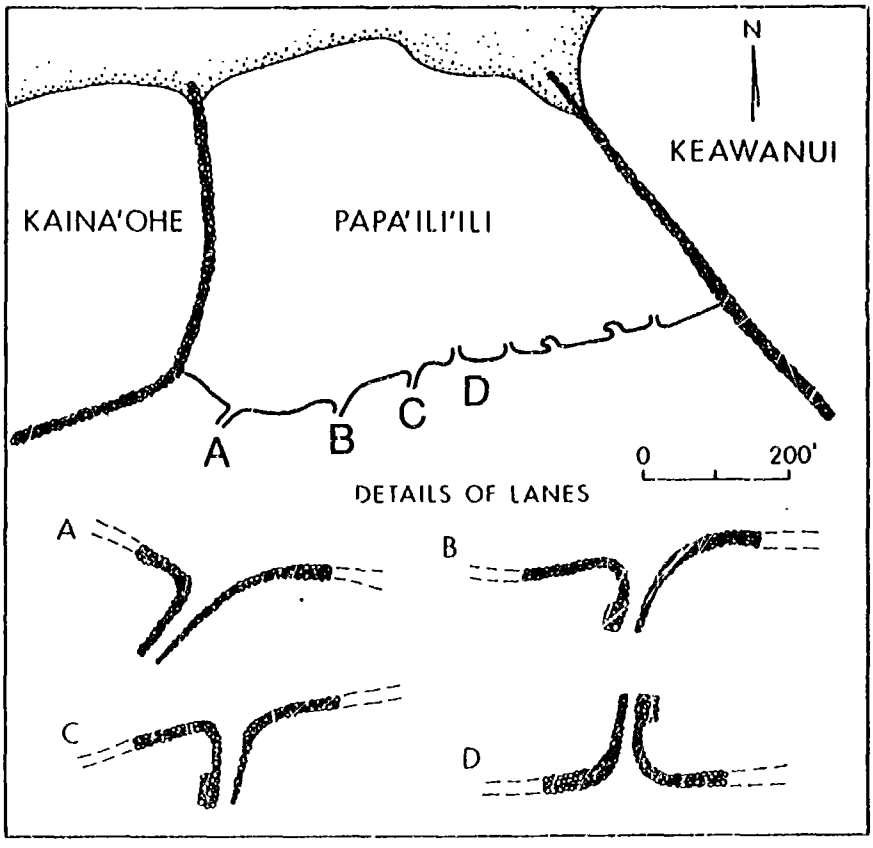

Figure 11. Plan of a fish trap (*loko'umeiki*) (*Papa'ili'ili*), from Molokai wedged between two marine fishponds (*loko kuapa*) (*Kaina'ohe* and *Keawanui*). Details of three pond outlet canals (A, B, C) and one pond inlet canal (D) are shown. Note the enlarged wall sections on canals B, C, and D accommodating fisherman. These areas indicate where nets were set to capture fish on rising (D) and falling (A, B, C) tides. Modified from Stokes (1909).

Extensive aquaculture systems, their sustainability, productivity, and roles in traditional food production networks have received little attention to date. These systems may have a much greater role in integrated rural development schemes worldwide than the high-yielding intensive aquaculture systems because they can be ecologically benign and integrated into fragile natural ecosystems with no pollution impact (Hirata 1983); they have lower capital costs, allowing entry by the poorest farmers in society; they require little management or foreign expertise; and they frequently have higher economic returns than intensive systems (Hirasawa 1985).

The vast majority of aquaculture production today comes from extensive and integrated farming systems in Asia (FAO 1984, Zweig 1985). The principles and management of these

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