THE MODERN VALUE OF TRADITIONAL VILLAGE FISHING IN FISHERIES DEVELOPMENT PLANNING IN THE ISLAND PACIFIC : SOME THOUGHTS ON THE CASE OF VANUATU*

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Abstract

The rational use of marine coastal resources is a priority for the Pacific Islands. Emphasis has often been placed on the development of a commercial structured fihing sector based on the specialization of the means of production and fishing techniques for catching a small range of high commercial value species. After ten years and often more of fishing development in the Pacific Islands this policy can be deemed to have been a failure in many cases. The reasons of this failure can be found in the lack of adaptation of the development programmes to the socio-economic and cultural constraints inherent to village communities and to ecological constraints inherent to the Pacific islands coastal marine environment. Contrary to commercial structured fishing, the traditionnal village fishing is completely adapted to these constraints, mainly in terms of production modes and resource management. These different topics are discussed through the exemple of Vanuatu and some propositions are made for the integration of traditional practices in modern coastal resource development programmes.

Key words : coastal environment, commercial fisheries, subsistence activities, traditional fishing, Pacific Islands, Vanuatu.

Résumé

L'utilisation rationnelle des ressources côtières est une priorité pour les îles du Pacfique qui pour une large part font reposer leur développement économique sur l'exploitation de leurs ressources naturelles. Les politiques mises en oeuvres portent généralement sur le développement d'une pêche artisanale commerciale structurée à travers la spécialisation des moyens et des techniques de production destinés à la capture d'un petit nombre d'espèces cibles de haute valeur commerciale. Après plus d'une dizaine d'années de mise en application, ces politiques se soldent bien souvent par un échec, dont les causes sont à rechercher dans le manque d'adaptation des programmes de développement halieutique aux contraintes socio-économiques et culturelles des communautés villageoises ainsi qu'aux contraintes écologiques inhérentes à l'environnement littoral des îles du pacifique. Contrairement à la pêche commerciale structurée, la pêche villageoise traditionnelle intègre totalement ces contraintes en ce qui concerne les modes de production comme en ce qui concerne la gestion de la ressource. Ces différents thèmes sont discutés à travers l'exemple de Vanuatu et des propositions conduisant à intégrer les pratiques traditionnelles aux programmes de développement de la pêche côtière sont formulées.

Mots clef : Economie vivrière, Environnement côtier, Pacifique insulaire, Pëche commerciale, Pëche traditionnelle, Vanuatu.

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Introduction

In Vanuatu, as in many nations of the island Pacific, the development of artisanal fishing in coastal waters represents an economic priority. Small scale traditional fishing had been the object of little research at the time when policies for development of artisanal fishing were formulated. The sketchy knowledge that existed on the subject tended to indicate that here was a low-efficiency type of activity, unlikely to generate a lasting increase in fisheries production. To base a fisheries development policy on small scale traditional village fishing appeared as a dangerous utopia. It was assumed that the challenge facing Vanuatu in developing its fisheries sector could only be met through modern structured methods. This challenge consisted of :
- keeping up with the growing demand among both urban and rural populations for protein food of marine origin;
- improving the trade balance for these marine food products by encouraging exports while minimizing imports of canned fish.

The efforts in this domain were directed toward the opening of new fishing grounds by using motorized craft, equipped with reels, to fish the outside face of the reef wall, at depths of 100 to 400 m, well outside of the effective range of traditional paddle-propelled native canoes, and well beyond the narrow band of fringing reefs where, in the absence of a lagoon, fishing has traditionally been practiced.

During the last decade, considerably more information about traditional fishing methods and fishing development has become available. Also, the various fisheries development projects have produced a certain amount of feed-back. Gradually, the preconceived understanding of traditional fishing that the planners had accepted is beginning to broaden. They no longer view this type of activity merely as "an accumulation of gear and techniques in daily use since time out of mind". The real picture, they are discovering, is more complex. Increasingly, traditional fishing is viewed as a workable system which brings together a resource, a technology (fishing gear and techniques, fish preserving methods), a population (producers and consumers), its social and cultural environment (traditional lore and customs, rules and regulations), and the inter-relationships based on the exchange of goods and information that can cement all these elements together and balance the system[1]. So far as such a "traditional fishing system" exists,there is also a "commercial artisanal fishing system". Fisheries development can only be analyzed in terms of "system". This systemic approach opens up new vistas for research; it turns out to be particularly useful when we wish to compare traditional versus artisanal types of fishing, and the logic that underlies them. It will enable us to address the following questions :
- a) can a better understanding of the traditional fishing system be of any use in planning fisheries development ?
- b) by a reverse approach, is it possible to modernize this system of traditional fishing in order to turn it into a commercially profitable enterprise ?
In other words, can the development of artisanal fishing be based on traditional fishing ?

We shall only deal here with the first of these questions. For this, we shall make use of the results of a program carried out by ORSTOM in Vanuatu since 1983, in close co-operation with the Fisheries Department, under the name "Artisanal Fishing and Subsistence". We shall consider three major topics :
- the role of traditional fishing in the social, economic and cultural environment of the islands, and the limitations that this context imposes on fisheries development;
- the manner in which the fishing grounds have traditionally been governed;
- the extrapolation of this traditional approach to resource management to modern fishing methods.

1. The role of traditional fishing in the social, economic and cultural environment of the Islands.

In traditional society, not only the major social events but the whole of daily life is governed by "custom", a generic term that we shall use and understand as meaning "a network of cultural behaviour patterns in human relationships, aimed at preserving the community structure of the villages and guaranteeing its continued existence". In Vanuatu, the village, foundation of all community life, is first and foremost a society of abundance, as the term is used by Sahlings (1976), where gift giving and exchange assume a primary role. It is also a society which is constantly under threat, from either natural or man-made hazards. During the course of centuries, the structure of the village has had to confront three main dangers : famine, war, and social destabilization. It is as a response to these threats that social, economic and cultural behaviour patterns have evolved to become "custom". Fishing, as other aspects of village life, was conditioned by these influences, among which the two most important ones were a rejection of specialization, and a search for social cohesiveness.

1.1. The rejection of specialization.

When we study the integration of fishing activities within the island social, economic and cultural context, the most noticeable fact is that, whether island-wide or at village level, fishing is never reserved for specialized individuals. For the fisherman, fishing is never the only activity. The majority of the foreshore population engages in fishing, although agriculture is everywhere the primary survival activity, and the main source of income for rural households. This rejection of specialization, and preference for diversified activity, are one of the characteristics of Melanesian society. It can be explained by the diversity of the available food resources, and by a constant preoccupation with minimizing the risk of food shortages. Since the land, in Vanuatu, is remarkably fertile, the risk of chronic long-term famine is insignificant. Occasional short-term food shortages, however, are always a possibility as a result of a period of drought or of a hurricane, with the smallness and relative isolation of the islands compounding the population's vulnerability to such accidents. For village communities, adapting to these threats has resulted in a systematic search for diversity, in the methods of food production as well as in the diet itself. This concern for diversity can be observed in the planning of the vegetable gardens, and the great variety of traditional foods consumed. Alongside the usual root crops, we find not only the catch of hunters and fishermen, but a whole range of wild forest nuts, berries, fruit, roots and edible leaves which can bridge the gap in cases of temporary shortages of the basic root crops. In a similar manner, the reef flats and the nearby shallows which make up the traditional fishing grounds have traditionally provided a "larder", little used in normal circumstances, but drawn upon in time of need. During these periods of food shortage, fishing was likely to become intensive, but in time of plenty the stock had time to renew itself, with temporary bans on fishing often helping the process along.

Only in the most extreme geographical situations, where high population density, low agricultural productivity due to shortage of arable space, combined with a favourable marine environment of extensive reef flats, seagrass beds and mangroves, does fishing cease to be simply an alternative food supply in time of need to become the main source of food for the population. Traditional lore concerning the maritime environment, the species that populate it, and the means of catching them, is therefore very rich and occupies a place of choice in the culture of the population of these areas. This maritime culture is quite evident in the traditional nomenclature for fish species in the vernacular languages. It is evident in quantitative terms, with all the reef species having at least one name, and sometimes several, in which case the different names correspond to different growth stages of each specie. It is evident in qualitative terms, with the different species named according to their anatomical characteristics, the type of environment in which they are found, or the type of fishing tackle used in their capture. One finds this type of situation mostly on the small islets located close to the shore of the main islands, where for centuries certain tribes have sought shelter from their "mainland" enemies.

So the burden of history still plays a significant role in the importance of fishing among village activities. This influence can be positive, as we have just seen, when it complements ecological determinism. It can also be negative. To a great extent, the settlement of the coastline is the product

of the country's colonial history. Many of the present residents of the foreshore areas came originally from inland villages which they abandoned in the first half of this century, or later still, in order to congregate around the missions, which were all located near the waterfront. Faced with a totally alien environment - the sea - these "bush" people had to invent, in the space of a few decades, a whole new culture adapted to this environment. Very often, the new lore was developed in relationship to the old land-oriented knowledge, and is fragmentary at best : some parts of the marine world and some of its fauna lack names; sometimes one name serves for several species; often the names given to the varieties of fish, squid, shellfish or lobster are taken from those of land plants and animals.

1.2. The search for social cohesiveness

This is a type of adaptation which can lead to social destabilization, which can in turn lead to the kind of boredom and caged-in feeling which affects many small isolated communities. Once this destructuring process is begun, it is very difficult to reverse, since there is no longer the possibility of a collective effort to do so. It then leads inevitably to the break down or the scattering of the community, possibly even to the point of total physical destruction of the population, as was the case with the "Bounty" mutineers once they reached the island of Pitcairn.

There are two major factors that may help prevent this very serious danger. On one hand, there is the complexity of social interaction, some of the most spectacular forms of which are the "pig trade" and the "mat trade" practiced by men and women of northern Vanuatu, the famous land-diving of southern Pentecost, the circumcision rites and the Toka celebration of Tanna. On the other hand, there is the strong cohesive force which comes of a tradition of decision making by consensus. This is an extraordinary tool for resolving disputes. Any potential threat to peace and harmony is first expressed orally before it has a chance of turning into active hostilities. It is submitted to the wisdom of the adult men of the village who will discuss it at great length. Handed around the community in a fascinating pattern of speeches, the threat gradually loses its emotional, and potentially violent, character. It is polished and refined through this process of speech making, until a consensus is reached on the necessity for a particular course of action, or for the discouragement of any action, so as to avoid any danger to the survival of the community.

As far as developing artisanal fisheries is concerned, this preventive process against a possible destructuring of village communities, the result of a long evolution of traditional society, often results in powerful obstacles to innovation. Any initiative on the part of the authorities can only be accepted by village society if it fits in with the collective or personal aspirations of the population, and only as long as it isn't perceived as a threat to community peace and harmony. In this context, individual success is regarded with a great deal of suspicion. The motivation for such an economic success, in other words the desire for personal monetary gain, is seen as contrary to the principle of communal economy which looks askance at individual wealth and would prefer to see any income shared among the entire community, and applied to fostering community survival by adding yet another facet to its range of resources and thus lessening its vulnerability to the outside world.

2. **Traditional management of the fishing grounds**

2.1. The limitations imposed by the environment

Fishing, in Vanuatu, takes place at the level of the village community. The village provides the triple function of place of residence for the fisherman, centre for the unloading of the catch, and primary consumer market. The location of the fishing grounds is greatly a function of the location of the villages. They are usually situated near the villages, and are limited to the shallower sections of the foreshore : the inter-tidal zone and those areas below the low-water mark that are less than 10 m deep, and to the areas that are sheltered from the prevailing ocean swell. The inter-tidal zone offers the greatest variety to the fisherman. It can be divided into four types of marine environments : the reef flats[2], the beach, the mangrove, the seagrass beds, and the mouths of rivers. Generally speaking, fishing on these types of grounds depends on two parameters : the presence of fish and its abundance 3, and the presence of the fisherman 4. We shall consider each of these two parameters in turn.

2.1.1. Factors affecting the presence of fishermen on the fishing grounds

They are essentially of meteorological nature : the state of the sea and the weather conditions, particularly wind velocity and precipitations. They determine the working conditions on the fishing grounds, and therefore shape the fisherman's decision as to whether or not he will go fishing at all that day. The importance of this factor, of course, will not be the same for the inter-tidal zone as for the more distant fishing grounds accessible only by sea, especially considering that the available craft tend to be small and have poor sea-going qualities5. It is not unusual for a fresh breeze and a well formed sea to prohibit all fishing activities. Apart from the area of actual breakers, the inter-tidal zone is far less affected by the state of the sea. River mouths are often protected by sand spits. Extensive beaches are usually located inside deep bays. Mangroves and seagrass beds invariably grow in fine sediments, a type of bottom only found in areas well sheltered from ocean swells and wind-produced waves. In such areas, the presence or absence of fishermen is far more influenced by variations in conditions of precipitations and temperature.

2.1.2. Factors affecting the presence and abundance of fish life

In all the ecosystems of the inter-tidal zone and of the reef slope we find a great variety of ecolo-gical niches, and a marked specialization of the species that fill them, both from the point of view of their feeding habits and of their type of habitat. Over 80 species are fished for just in the mangroves and seagrass beds around the Maskelyne islands, off the S-E point of Malekula (David, 1985). During the course of the inventory of Vanuatu's marine resources carried out by A.I.M.S. in 1988 (Donne and Navin; Williams, 1990), 469 species of fish were identified visually, among which Pomacentridae, Scaridae, Labridae, Acanthuridae, Siganidae, Chaetodontidae were, in order of decreasing importance, the most common. Coral reefs are the ecosystem offering the greatest specific diversity. It is not unusual for over a hundred species to be identified within a single hectare of reef. This great specific diversity goes hand in hand with a wide geographical distribution for any one specie. Suitable biotopes for each specie tend to be small in extent - we use the term of microbiotope -, and often unconnected to each other. The sum of all these microbiotopes constitutes a three dimensional mosaic, with each element holding a micro-population composed of a small number of individuals of the same specie. Because, at the scale of the fishing grounds, these micro-populations are scattered far from each other, there tends to be little migration of fish of the same specie between them. Over a short time period, say a few weeks, each micro-population can be considered as an isolated system, evolving according to its own demographic dynamics. Thus to each of these micro-populations corresponds a micro-stock unit, which is the portion of the micro-population that can be caught by the fishermen's equipment.

Considering their small size, these micro-stock units are vulnerable to over-exploitation by the fishermen, and their numbers per hectare are limited. These two factors, together with the great diversity of the fish biomass, constitute some of the primary limitations to fishing activities. To these we can add seasonal variations in the size of fish populations. This is particularly the case for the small pelagic species like mackerels and sardines (Grandperrin et al., 1982). For the fisherman, there is no way around these limitations ; he must inevitably take them into account in his fishing strategy and his choice of techniques.

2.2. Adaptation of the fishermen to the limitations imposed by the environment

2.2.1. General considerations

There are three basic concepts that can be used to describe the type of adaptation to the limita-tions [6] imposed by the meteorological and ecological situation that can affect traditional fishing :
- diversity of techniques and strategies used, whether in terms of species targeted or of biotopes worked;
- low cost of the means put to use, whether in terms of hours spent, of energy, or of cash expense;
- control of the access to the resource.

A total of seven main types of adaptation, based on the above concepts, can be identified (Fig. 1). They fall under two categories. On one hand we see "primary adaptation" to the limitations imposed

by the environment, such as controlled access to the resource as an answer to vulnerability to over-exploitation. On the other hand, we have "secondary" forms of adaptation, derived from the primary responses. In this way, diversification of the equipment is arrived at as a result of the diversification of the target species, itself a primary response to the limitations of the resource. Among these secondary forms of adaptation, we shall make a further distinction between "secondary adaptations of the first order", which are the immediate result of primary adaptation, "secondary adaptations of the second order", which are themselves the result of a secondary adaptation of the first order (in this manner, the low-cost of the means of production is seen as a result of the diversification of these means of production, with this diversity itself being an adaptation to the diversity of target species), and, similarly, "secondary adaptations of the third order", such as the low-cost of the fishing outings, derived from the low-cost of the means of production (see Fig. 6).

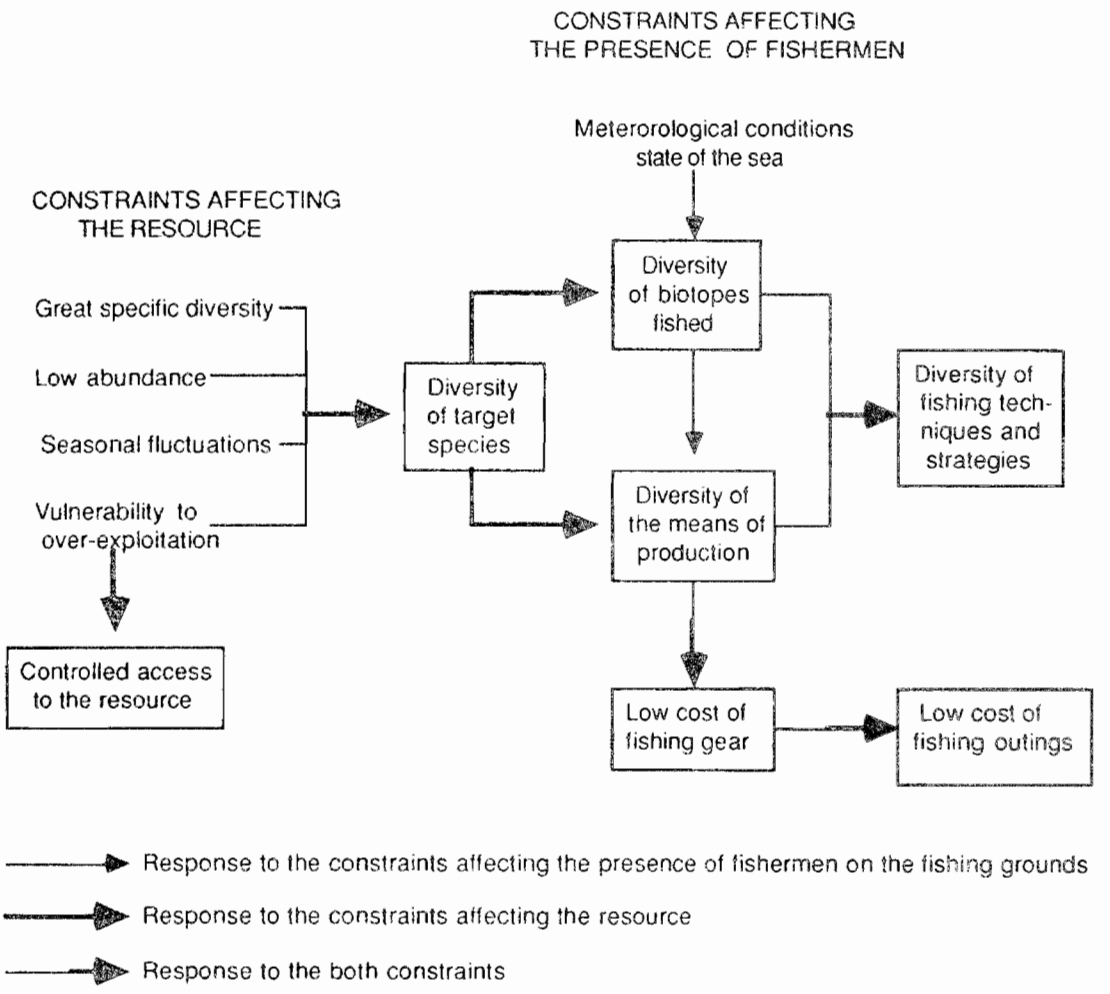

Figure 6. Adaptations of the traditionnal village fisheries in Vanuatu to the environmental constraints

Among the forms of primary adaptation, we shall make the distinction between responses to limitations affecting the fishermen, and responses to those affecting the resource, such as the diversification of target species that we have just mentioned. It isn't practical to make this distinction for secondary adaptations : while there exist exclusive secondary adaptations to limitations affecting the resource (for instance diversification of the means of production), there are no exclusive secondary adaptations to the limitations affecting the fishermen. On the other hand, there exist secondary adaptations that are responses to limitations on both fishermen and resource, as for instance the diversification of techniques and strategies, or the low cost of fishing operations.

We should also note that certain forms of secondary adaptation resulting from limitations affecting the resource are at the same time primary adaptations to limitations affecting the fisherman. In this way, the diversity of the biotopes that are fished is both a primary adaptation to unfavourable sea and meteorological conditions, and a secondary adaptation to the diversity of target species, itself a primary adaptation to the limitations affecting the resource. This same diversification of target species can also be seen as an secondary adaptation to the limitations affecting the presence of fishermen on the fishing grounds resulting from the primary adaptation to these limitations represented by the diversification of the biotopes put to use.

2.2.2. Diversification of target species and biotopes fished

This represents the major adaptation of traditional fishing to the four main types of limitations affecting the resource. It relies on the great specific diversity of the stock, and provides a logical response to the low abundance of monospecific micro-stock units that make it up[7], and to the seasonal variations that affect it. In this way, when one or more species become scarce, whether from such natural causes as seasonal fluctuations or from over-exploitation, it becomes possible to shift the emphasis of the fishing effort to such other species as have remained plentiful on the fishing grounds. A Vanuatu-wide 1984 survey of 943 fishing outings showed that over 100 species of fish, belonging to 32 families, were commonly caught by village fishermen.

Such a diversity of target species can only be achieved by fishing several different biotopes. This diversity of fished biotopes is common to the majority of artisanal fishermen worldwide when we look at their operations over the course of a whole year. However, if we consider only a single outing, we find this diversity to be far more unusual. We believe this to be one of the special characteristics of traditional fishing in Vanuatu. There, it is usual for a fisherman, during the course of a single fishing outing, to try his luck on the reef flat, on the first few meters of the outer reef wall, and within the different biotope of beach, mangrove and river mouth. This habit of sampling different biotopes offers the best insurance against variations in meteorological conditions and in sea state. When rough seas forbid venturing offshore in canoes, it is always possible to shelter in the mouths of creeks, in protected bays or among the mangroves, and to carry on fishing for one or more target species depending on their abundance and diversity.

2.2.3. Diversification of the means of production, and of fishing technique and strategy

The diversification of the means of production is reflected essentially in the diversity of the fishing gear. A wide range of implements is used. The majority are of the throwing or casting type (hand-spears, bow-and-arrow, casting nets, underwater spear guns), or of the passive type (traps, gill-nets, holding pens). This equipment is usually the property of the fisherman. Whereas the materials used in the construction of the devices are usually of industrial origin, the design remains mostly traditional. Generally, they are small in size.

Devices that are specifically made for fishing

Of all fish-catching devices, hand-held lines are the most versatile. They can be used for trolling or for bottom fishing, either from boats or while wading on the outer edge of the shallow coral flats. Given this versatility, it isn't surprising that they should be the most commonly found type of fishing gear. They account for 55% of all fish catching equipment. Each household owns an average of 2.5 such hand-lines. Their design is very simple : usually, a fish hook is attached to the end of a length of nylon line, which is then wound around a coca-cola bottle. When used for fishing on or just off the bottom, the line is weighted with a stone, or an old flashlight battery.

Line fishing is hardly a traditional fishing technique in Vanuatu, and eye-witness accounts, such as that of J. Garanger (1972, p.109), show that twenty years ago line fishing was seldom practiced8. The Banks and Torres island groups in the North of the country are an exception to this. At the close of the last century, the reverend Codrington (1891) noted the manufacture of large numbers of mother-of-pearl and tortoise shell fish-hooks, and of the common use of surface lines for the catching of flying fish. Apart from the Banks and Torres groups, then, the hand-held line can be considered as a

modern development in Vanuatu, and its use began to spread only recently with the availability of monofilament nylon line and steel fish-hooks in the small general stores of the coastal villages.

From 25 to 30% of fish catching equipment still consists of traditional implements. These are hand spears, bows and arrows, and fish traps. Hand spears and bows are used exclusively by men and youths, either on foot, or from canoes. The use of fish traps is reserved for women and girl-children. Spears are the most common type of traditional implement. They represent 20% of all fish-catching equipment, and 74% of traditional equipment. The most frequently seen model is made of a long bamboo shaft, with four wooden spikes, ten to twenty centimeter long, lashed at the end. Over the last few years, the wooden spikes have been getting replaced by sharpened steel ones. Fishing is done on foot, along the intertidal coral flats or tidal channels through marine sea-grass, or from canoes among the edges of mangrove swamps, over the reef at high tide, or, less frequently, offshore in deep water. Alongside these small spears, of which every household owns from one to three, are longer spears designed for catching turtles. These are made of a shaft of heavy hardwood, fitted at the end with a sharpened metal tip. They are tied to a large plastic float with a few meters of rope, so that the flight of the harpooned turtle may be easily followed after the animal has dived.

Still widely used in certain islands, such as Malekula, the bow and arrow technique has completely disappeared in other places. This represents 5% of the fish-catching equipment used in Vanuatu. Its use is exclusively reserved to the men. Generally, bow-and-arrow fishermen are either older men, faithful to the old techniques, or children and youths, for whom the bow is more of a toy to show off their skill than a serious fishing implement. In either case, the bow is usually used while wading on the coral flats. Fish traps as a fish-catching device are disappearing. They are made of flexible sticks, and their use is by now limited to catching small fish on the coastal reef flats, particularly in tidal pools, and at the mouths of rivers.

Although it has been shown that their use was traditional in the Banks and Torres groups for co-operative fishing ventures, and Father Doucere (1922) noted their widespread use in many parts of the country, gill-nets must be classified as modern equipment. The nets currently in use, the materials they are made of, and the fishing methods and strategies used, have very little in common with the traditional nets and methods of the beginning of the century. The most commonly used type of net is imported from Asia. Typically, it is roughly 10 meters long, 1.5 to 2 meters deep, and is made of synthetic fibres. Considering its high price compared to the disposable income of the average rural household, the purchase of a gill-net represents a major investment, one that can only be contemplated by the wealthier households. Thus it is not surprising that gill-nets currently represent only 4% of all fishing equipment, and that the majority of them are found near the urban centres. Fishing with gill-nets is usually considered a man's task. They are used more often by fishermen on foot than during outings with boats. The device is laid parallel to the direction of the flow, in the breakers along the beach, at the edge of mangroves, or where the fringing reef drops off. This is an active type of fishing, the fisherman remaining near his net, ready to haul it in as soon as an interesting catch has been sighted.

Trickier to handle, casting nets are less common than gill-nets, although their purchase price might be up to 40% lower. They represent only 1% of all fishing equipment. Half of the casting nets are found on the island of Efate and the nearby islets. Exclusively reserved for men, they are used on a rising or a falling tide while wading on the coral flats or at the line of breakers off the beach.

Whereas the spread of gill-nets through the fishing community took place in a gradual manner, underwater spearfishing caught on rapidly. At this time, one third of all households engaged in fishing own a spear gun, and spear guns represent 10% of all fish-catching equipment. Alongside the standard western-made spear guns are found some of local manufacture, very rudimentary in design, made up of a metal spear and of a rubber launcher attached to a piece of wood, 10 cm long, against which rests the end of the spear. Snorkels are rare, but all divers use face masks. Spear fishing with a gun is usually reserved for the men, but diving in shallow water for the purpose of gathering shellfish (or, more rarely, crayfish) may be undertaken by women, as long as this is done for subsistence reasons only. This explains why diving to gather trocas and large sea snails, both valuable commercial pearl shells, is still the prerogative of the men.

Fish holding pens are the least numerous of the modern devices. There exist only a few dozens, most of them on Efate. The introduction of this type of equipment in Vanuatu is recent, and can be attributed to immigrants from French Polynesia. A holding pen consists of roughly fifty meters of "chicken wire", about 1.5 meters high, stretched on metal uprights stuck in the coral of the fringing reef, or on wooden poles driven into the mud. The wire mesh being subject to rapid corrosion, this equipment has but a short life span. These Polynesian fish holding pens are an improvement on the older traditional type of traps, which consisted of blocks of coral arranged in circular patterns on the coral flats, and designed to retain water as the tide ebbed. It doesn't appear that this older type is still in use anywhere, but the remains of some can still be seen, such as the ones mentioned by J. Barreau (1956) in Aliak, on the West coast of the island of Pentecost, and which were still visible in 1985. These ruins are only a few centimeters high, and are only able to trap very small fish. This is more in the nature of an amusement for children than a genuine subsistence activity. Another type of construction consists of piling up stones in a tidal pool. At the scale of the pool, the construction acts as a miniature artificial reef. On a rising tide, it attracts small fish which enter it for protection, and they are trapped there at low tide. The pile of stones is then dismantled, and the fish gathered. This type of fishing has also been mostly abandoned, and is only occasionally practiced by women and children.

Multi-purpose equipment and one-time implements

Alongside implements which can be unmistakably classified as fishing gear, since the catching of sea-life is their main function, we find some devices which can have more than one purpose, and for which fishing is but one of many uses. The most common among these is the ubiquitous bush knife, one of which at the very least can always be found in every rural household. Fishermen often use them to "cut" fish which have been trapped by the ebb in tidal pools, or while wading on the coral flats at night. The bush knife is wielded as readily by women and youths as by men. Less common, and mostly reserved for the women, are steel rods used for catching octopus at low tide, and for looking for shells under rocks. These are often spears from a native spear-gun, when the household owns such a device.

Apart from the strictly speaking fishing gear, and the multi-purpose tools used in fishing, there is a third category of fishing tools which consists of devices used only once : among others, we will note principally coconut fronds and vegetable poisons. Coconut fronds are used as nets for community fishing. Once woven, they can be assembled to form rude nets, ten or so meters long, often used in the Banks islands to drive small fish toward the beach in narrow bays, where they are then killed with bow and arrow, hand spears, or bush knives. Vegetable poisons are derived from the leaves of the foreshore shrubs barringtonias and derrys, which are either bruised, pounded or shredded before being placed in pools where they poison the whole of the fauna. Very popular during the first half of this century, particularly during the few years following World War Two, the use of explosives - the one-time device par excellence - seems to have mostly disappeared by now, partly on account of the difficulty of supply, and partly because of the government's efforts to ban the practice.

The diversity of the means of production follows logically from the diversity of the target species used in traditional village fishing. Each type of fishing implement is effective only on a small number of species. The vulnerability of any one specie of fish to a particular device depends at the same time on
- its morphology, particularly its shape, its size, and the size of its mouth 9;
- its feeding habits 10;
- its type of habitat : beach, holes in the coral, vicinity of coral heads,...;
- the depth it lives at 11.

To limit fishing gear to one type of implement would amount to ignoring a large number of edible species which cannot be caught with this particular instrument but which could easily be caught by other means. This preoccupation with adaptation to the fluctuations in abundance and vulnerability of the desired species forces the fisherman to own several kinds of tackle, and especially to use more than one during the course of a single outing, which is more remarkable. In the 1984 survey mentioned earlier, during the 943 fishing trips recorded, 10 types of fishing devices were identified, with 7 being used either by themselves or in conjunction with one or more other instruments during

the course of the same outing, and 3 used only together with other devices. The survey recorded 22 methods using two devices together, nine using three, and one using four.

The diversity of the means of production is not simply the direct result of the diversity of target species, but it is also the result of a concern on the part of the fishermen to draw from the greatest possible number of different biotopes, in order to minimize the risk of finding themselves unable to go fishing on account of meteorological conditions or state of the sea (Fig. 1). On one hand, certain types of fishing implements are better suited to certain specific biotopes; on the other hand, according to fluctuations in the environment, it can be a useful to be able to choose between several types of implements in order to take best advantage of a given biotope. In this manner, underwater diving can prove to be a most efficient way to fish the first few meters of the outer reef wall when the water is clear, while that particular technique may be totally useless on the days when the water is muddy, at which time line fishing can become a valid alternative.

By "fishing techniques", we refer here to the use of a fishing device. For any one type of device, there may exist several techniques, varying according to whether the fisherman is or not using a boat, or according to the biotope being fished. Based on this definition, 97 fishing techniques, making use of 39 types of devices or combinations of devices, were identified during the course of the 943 fishing outings of our survey. The biotopes having been deliberately classified into only three categories (outer reef wall and beyond; reef flats, kelp beds and beaches; river mouths and mangroves), this number of identified techniques is grossly underestimated, as the fishermen themselves recognize a much greater number of workable biotopes for their fishing strategies.

2.2.4. The low cost of fishing gear and of fishing outings

It is easy to assess the cost of items of fishing gear when they are manufactured products, bought for cash : the cost is then equal to the market value of the product. This assessment becomes more difficult when we deal with devices made either by the fisherman himself or by members of his family. The "cost" of the device is then determined by the amount of time spent in its fabrication. In either case, the cost of the equipment used in traditional fishing in Vanuatu is invariably low. Generally speaking, the same holds true for housing, agriculture or cattle raising. This is an inherent characteristic of "abundance" societies (Sahlings, 1976). The design of the devices is so simple, and the materials used so common, that their construction is both inexpensive and quick. This allows frequent replacement of the gear. We can add to this the fact that fishing only plays a secondary role within traditional Melanesian society in Vanuatu. Social prestige is acquired by other means. It wouldn't therefore be logical to invest money or effort in sophisticated fishing gear, particularly since the productivity of fishing outings is rather low in any case, from a few hundred grams to 3 or 4 kg at best. When we think of manufactured (= bought) equipment, we must remember that the cash income of rural families is very low in Vanuatu, so that the purchase of fishing equipment represents a low priority in a family's budget, and will only be considered if this equipment is inexpensive.

The same logic applies to the cost of the fishing outing, which goes some way toward explaining why village fishing grounds tend to be of limited size. Indeed, why expend a lot of energy and time in order to fish distant areas, which, in any case, are unlikely to yield a richer catch than the ones nearer the village, provided these village fishing grounds are husbanded with care. Here, we begin to see one of the fundamental aspects of the logic that underlies traditional societies : maximizing the productivity of labour (in this case, the number of fish caught in a given period), rather than maximizing the output of the natural environment, which here would mean the number of fish caught for a given surface area of fishing grounds. From the point of view of the fisherman, it is more logical to limit his fishing outings to the vicinity of the village, where, for a number of short trips of duration T, he can hope to catch a number X of fish, rather than to prospect more distant areas, where journeys of duration 3T will only result in a production of 2 or 3X.

2.2.5. Control of the access to the resource

Given the small size of the fishing grounds, and the sensitivity of the resource to over-intensive harvesting, traditional fishing has often to face the threat of over-exploitation when serious fishing[12] is maintained over long periods of time. For fishing to remain viable, the activity must be regulated.

The traditional solution to this situation is to control access to the resource by means of temporary bans on fishing enforced on the whole village community which owns the fishing grounds. These bans, or taboos, are placed by the community chief during a special "custom" ceremony, and are usually made evident by some sign understood by all, such as a pole stuck in the reef flats. These taboos can be total, in which case they apply to the whole of the useable species, or partial and apply only to the most threatened species. The duration of such interdictions can be highly variable, but it is seldom less than six months and rarely more than three years. Any community member breaking the taboo is liable to a heavy "custom" fine, a deterrent sufficient to make taboo breaking a rare occurrence. The effectiveness of such taboos rests on the fact that the fishing territory is open to the flow of eggs and larvae of fish, invertebrates and shellfish coming from outside. This allows a gradual repopulation of the habitats depleted by over-fishing. This potential for regeneration of fishing stocks, characteristic of the reef environment, is a great asset and offsets its high vulnerability to over-intensive fishing. All species do not have the same potential for repopulating the depleted habitats. Species whose larvae develop in open waters have an advantage when compared with those whose larval stage is mostly spent attached to the bottom. The former, drifting with tides and currents, can cover great distances; the latter can only spread over a small area, and thus can only gradually, step by step, repopulate the depleted habitats from their laying grounds.

Once the temporary ban on fishing is lifted, all members of the village community regain access to the fishing grounds. However, this access remains subject to the permission of the local chief for any outsider to the community. The formality of these authorizations will depend on the legal status of the land to which the fishing grounds belong. The fishing grounds are considered part of village territory, and as such they are viewed with the same feeling of ownership and identification as the land part of the territory13. Where the fishing grounds are thus perceived as an extension of the cultivated gardens within the village territory, access to outsiders is very strictly regulated. This access is usually reserved for groups considered as allies. We may encounter two types of situations : one case would be a neighboring group who has placed its own fishing grounds under temporary taboo and requests permission to share the village's fishing resources for the duration of the ban. another case could be an inland group, holder of a landlocked territory, wishing occasional access to the ocean. In both cases, the granting of a fishing-rights agreement will be the occasion of a traditional ceremony to cement the alliance between the two groups.

When the fishing grounds are perceived as part of the non-cultivated portion of the territory, their have a lesser status, and the granting of access to outsiders follows a less formal procedure. In certain villages, this access may even be free to all, at least this is claimed by members of the community14. The inalienable relationship between the land and its inhabitants runs so deep in Vanuatu that it would seem extraordinarily for anyone wishing to fish in a territory not his own to fail to inform the rightful owners and seek their permission to do so. Thus, even in cases where outsider access to the resource isn't governed by a set of formal traditional rules and procedures, it is still subject to the traditional usage regarding land-rights common to all Vanuatu, a body of customs which will be implicitly respected.

3. Traditional fishing and the development of artisanal fishing

3.1. Are the two approaches contradictory ?

After this brief survey of the role of traditional fishing in the social, economic and cultural life of the islands, and the ways by which the resources of the fishing grounds are husbanded, we now have some tangible elements on which we can base an inquiry on how traditional fishing can be used as a foundation for artisanal fishing development.

Only ten years ago, simply to ask the question would have seemed bizarre. As far as development planners were concerned, the only model worth following was that of western artisanal fisheries, who, in the space of fifty years, have progressed from small operations close inshore (day outings using small craft of 4 to 10 meters in length) to deep-sea operations using vessels of over 30 meters capable of staying at sea several weeks. The specialists used to consider this type of evolution as universal, and nations could be classified for modernity by their progress along this path of

development. The islands of the Pacific were rated as the bottom rung of this ladder, and thus the potential for improvement seemed all the greater, provided these countries were given technical and financial assistance by the international funding organizations. The speed with which artisanal fishing was going to develop was understood to be simply a function of the magnitude of this assistance. Given this type of reasoning, what role could traditional (i.e. archaic, practically prehistoric) fishing possibly have, with its ignorance of motorized craft or of refrigeration and its reliance on devices as hopelessly primitive as spears or bows and arrows ?

Since then, experience has shown that the Pacific was not Europe or America, and that models that worked very well in western countries were not necessarily adapted to the islands of Oceania. In spite of the millions of US dollars spent on development, and of the goodwill and dedication of the fisheries experts and master-fishermen whose task it was to introduce, then to help spread, modern fishing techniques among the village communities of the Pacific, the results are far from spectacular. The production of modern artisanal fishing, subsidized by governments, is growing at a very slow pace, and remains to date greatly inferior to that of unsubsidized and unassisted traditional fishing15.

The failure of current coastal fishing development policies is not due to chance. It can be explained through the fact that the development model followed is poorly adapted both to the physical limitations inherent to the Pacific island ecosystems, and to social, economic and cultural limitations inherent to traditional village society (David, 1990a and 1991). The first type of limitations cannot be overcome; traditional fishing has adapted to them. If artisanal fishing is to be developed, it too will have to adapt to them if it wishes to succeed. The second type of limitations are very difficult to bypass or overcome. Tradition and culture are still very much alive in rural areas, they are the product of the relationships that society has developed with its ecological environment, and they completely shape this society. No fisheries development project will be able to place itself outside of this context, or be able to afford to ignore it. Thus, any innovation proposed by the development planners will only have a chance of becoming truly adopted if it can fit in with the personal and community aspirations of the "society in need of development". As Johannes (1990) rightly points out, these aspirations usually do not include the increase of the fishing output, the search for maximum balanced catch, or optimum production in economic terms. Yet these are the primary goals usually assigned to any fisheries development policy. So it is essential to reshape the contents of fisheries development planning in order that it be better adapted to this social-economic-cultural context, and, at long last, have a chance of success. The only model currently available is that of traditional fishing, and thus the success of any fisheries development project will depend on using it as a guiding light. This, of course, doesn't mean limiting fisheries development to ancestral techniques or equipment, but rather respecting the philosophy through which traditional fishing has adapted to the limitations imposed by the physical environment, and the spirit in which it has made itself a part of the social and cultural context of island village society.

There is of course another possible approach, which is that of urging the island populations toward a complete divorce from the traditional ways and customs. As territory, culture and racial identity are inseparably linked in traditional society, this requires the "breaking" of the logic which ties these three fundamental elements together. Migration toward the urban centres is the best way to achieve this. A long-term separation from the land of origin, and the daily contacts with other ethnic groups lead to a gradual break down of the sense of identity with the territory. As this identification is the keystone of the triad "culture-territory-racial identity", its loss leads to the loss of the original culture. This traditional culture, powerfully associated with the territory, gives way to the culture of the new habitat - the city -, a culture that is replete with such western values as efficiency, profit motive, and intensification of productivity, all for the sake of a type of development that is reduced to its single dimension of economic growth.

We ourselves refuse to be a part of this kind of logic of cultural destruction, and would much rather see the forging of links between tradition and modernism. We reject an approach that would only retain of modernism its most brutal aspects, the ones that prevail when the only criterion is the constant upgrading of economic indexes.

3.2. The contribution of traditional fishing in resource management

Of all the possible aspects of traditional fishing which can inspire development planners, this is the one which shows most promise according to the planners. It was the subject of a major part of the debates during the workshop on the social and economic aspects of fisheries organized by the South Pacific Commission during the 1991 Regional Technical Meeting on Fisheries. Ruddle brought together the various elements with great clarity during the International Conference on the Economy of Fisheries Management in the Pacific Islands, held in Hobbart in 1989 under the sponsorship of A.C.I.A.R. . The interest in this subject has a lot to do with the difficulties that the various national Fisheries Departments experience in trying to implement and enforce regulations regarding the preservation and management of stocks when faced with territories as vast as the island groups of the Pacific. They see this form of decentralized resource management at village level as far more effective, backed as it is by traditional chiefly authority and the participation of the fishermen. They see it as an attractive solution to the problems they face at the national level. As far as we are concerned, we only partially share this enthusiasm. To work, village level resource management depends on a very important requirement : the continued respect for the traditional system of authority. This is still usually the case, as long as fishing is limited to the traditional activity for self-subsistence, or to a small-scale commercial pursuit with only the village, and perhaps the neighboring villages, for a market. On the other hand, once the resource has to supply demand at the national and possibly international scale, there is no guarantee that "custom" authority will be powerful enough to enforce respect of the necessary temporary fishing taboos, or even that this authority will have any desire to impose such bans. Once fishing is capable of providing a substantial income to the majority of families, it becomes difficult, in times of tight money, to deny this "manna" to the village community, even if means putting the fish stock in jeopardy. This situation occurs often in the case of trochus shell and of beche-de-mer. With world-wide supply of these products beginning to dry up, and demand remaining high, the prices paid to the producer are usually very attractive. The traditional economic system isn't geared to resist to such pressures. So it isn't unusual for fishermen to succumb to the lure of quick and easy money, and for concern for the survival of the resource to assume a secondary role.

In this type of situation, it is essential that the State be able to control fishing activities. With the decline of traditional authority, too often helpless against the high stakes involved, the State is the only institution who can counteract the logic of the profit motive generated by international demand, by enforcing a regulation of supply at the national level. For this purpose, neither the quota system, nor a system of licensing, are satisfactory. As is so often the case, the simplest solution is the best. It is based on acceptance at the national level of a minimum size for specimens caught, in some cases a maximum size. The Customs Department can then monitor compliance to the size regulations at the point of export; any undersize product is immediately destroyed, and a heavy fine levied against the exporter. In this way, demand will always be for legal sizes, thus allowing the stock the possibility of replenishing itself. In cases where the product undergoes a manufacturing process prior to exporting, such as for trocca shell, monitoring for legal sizes will be done at the place of fabrication. A company that refuses to co-operate in this monitoring would see its export licence cancelled by the government.

The management of the resource has to be flexible and adaptable. Products aimed at the international market must come under nation-wide regulations. On the other hand, products aimed exclusively at the local consumer market can be placed under traditional control at the village scale, provided the regulations can be made to apply to every village. As we can see, there is still a long way to go before a resource management model inspired by traditional methods can be put into practice at national level. To limit the contribution of these traditional methods to fisheries development planning strictly to the problems of controlling access to the resource would be a mistake. Traditional fishing has much more to offer us in this field.

3.3. The contribution of traditional fishing to the commercial use of the environment

We think that it is in this sector that traditional fishing has the most to contribute to the development of artisanal fishing. This development, as it has been planned so far, labours under three major handicaps :

a) It is too innovative, and too lacking in flexibility. Every aspect of what is proposed to the fishermen about the new developments is new to them : the resource (deep-bottom species), the type of habitat fished (the deeper portions of the outer reef wall), the boats (single-hulled or twin-hulled motorized craft), the tackle (reel-mounted deep-bottom lines), and such aspects as fishing technique, gear maintenance, book-keeping... The potential of such a model for integration within island society is very low. For this reason, a program of strict monitoring and assistance to the fishermen has had to be organized. Every fishermen's association is regularly visited and checked by an agent of the Fisheries Department, who lives on the island. This agent is in daily radio contact with the headquarters of the Department in Port Vila. Within this system, the only role played by the fishermen consists in the strict application of the directives given by the Fisheries agent. The success of the project, and the eventual spreading of development of the fishing industry throughout Vanuatu, is expected to depend on this faithful adherence to the agent's directives. The economic success of the participating fishermen is then supposed to inspire others to take up commercial fishing, leading to the development of more fishing projects in those islands and districts which are still innocent of intensive fishing. This system of technical support worked correctly for only two years. Designed to help manage 25 fishermen's associations, it soon found itself having to deal with five times the number. The greater part of these associations were then mostly left to their own devices, and, with a few rare exceptions, the experiment ended up in failure.

b) It is too specialized. The whole of the development effort is targeted on a small number of species, on a single type of tackle, a single territory, a single method of product conservation. This is one of the classical approaches to development, with specialization being equated to increase in production, and economy through increase of scale.

c) It is too costly, both in terms of working time and of cash outlay. In 1984, a motor catamaran, complete with twin outboards and all fishing gear, was worth 900 000 Vatus (roughly US$ 9000). The cost of an ice-making plant was US$ 10000, and US$ 15000 for a small cold storage facility. Most usually, the E.E.C., through the European Development Fund, covered 51% of the expense in the form of outright gifts, while the Vanuatu Development Bank supplied 42% in the form of three-year loans at 4% interest. The goal that had been set for the fishermen's associations was an average of 150 fishing days per year, a day representing an 8 to 12 hour trip, with 4 to 5 hours of active fishing. This large investment in work and time was deemed necessary to guarantee the fishermen a reasonably comfortable income, while fulfilling the expectations of the E.E.C., who wanted to see its gifts used to best advantage, and of the Vanuatu Development Bank, who hoped for repayment of the sums borrowed. This calculation fails to take into account that fishing is hard work indeed, particularly when it is practiced from small boats in the kind of well formed sea that is usually found between the islands of Vanuatu. It was long before the fishermen, finding the working conditions too hard and time consuming in comparison with the returns, started to turn their attention back to agricultural pursuits, or, if they continued going to sea, to the transport of goods and passengers, a type of activity generating less income than fishing, but considerably less demanding in time and effort. We see here an excellent example of the principle that we mentioned
earlier and according to which the tendency will be toward optimizing return for given effort, rather trying to improve the productivity of the environment.

We will not insist any further on the problems encountered by the development of artisanal fishing in Vanuatu. The subject has been exhaustively discussed elsewhere (David, 1990a, 1991). We have shown that the rigidity, the excessive cost and the over-specialization of the proposed model have been largely responsible for the failures that have been experienced. Given the social and cultural context of the island societies, and the limitations imposed by the environment, the planners should instead turn their attention to concepts of adaptability, of diversity, of inexpensiveness, and of flexibility. These concepts are already at work in traditional fishing, and constitute, as we have seen, its fundamental philosophy.

There is an urgent need for these principles to find their way into the policies that govern the development of artisanal fishing in coastal waters, whether in Vanuatu or in any other nation of the island Pacific that faces similar limitations, both physical and human. This means that development planners must accept the idea of pluralistic development allowing the existence of a high performance sector, engaged in a regular activity, made up of a small number of expensive projects

using sophisticated equipment, aimed at the international export and the tourist markets, while encouraging in parallel the existence of a more informal sector, made up of a multitude of small operators, engaged in a more sporadic type of fishing, using much simpler and inexpensive equipment both in terms of craft[16], tackle, or conservation methods. In Vanuatu, the simple expedient of introducing such unsophisticated and inexpensive conservation methods as fish smoking and salting[17]would make an increase of production possible. This would offer to those who fish only for their own family the possibility of taking advantage of occasional abundances of certain species, particularly the small pelagic species, which at present they are unable to stockpile for lack of the means of preserving them. In this way they would be able, if they wished, to put away surplus production, and possibly acquire the notion of marketing. Smoking and salting of fish, by offering the possibility of marketing their catch to a greater number of fishermen of modest means, are one of the keys of the development of fisheries, and of the distribution of fish products to the interior of the islands where the road network is often embryonic if not completely absent. Smoked or salted products will keep well for several days, even several weeks, at ambient temperature, and are easier to transport than the fresh article.

In most topical countries where fish is smoked or salted as an artisanal activity, the work of preparing and marketing the product is done by women. This is done at home as a "cottage" industry, where it forms a part of the women's daily household chores. In rural Vanuatu, where women are generally excluded from participating in income-producing activities, to adopt such a model would give them an opportunity to acquire a degree of economic freedom from their husbands, and to gain a certain economic stature within the family structure. They might bring to the development of the fishing industry an enthusiasm and a form of pragmatism they have developed over centuries of having to master the difficulties of subsistence agriculture in Vanuatu.

Conclusion

The development of artisanal fisheries is currently in the throes of a crisis throughout the island Pacific. The models followed over the last fifteen years or so by the various Fisheries Departments of the region are being increasingly questioned, particularly by the funding organizations who are wondering whether similar levels of production couldn't be achieved at less expense, or, similarly, whether the same cash outlays couldn't be made to yield better results. What is being reassessed here is the whole concept of development based on specialization and on intensification of production. This type of development is too innovative, too alien to the culture - and its understanding of time and space - of the village society to which the fishermen belong, and the mere injection of massive capital is unlikely to be enough to make it catch on at grass-roots level. The island Pacific is still too heterogeneous, in ecological, economic, geographical, social, and cultural terms for models which have served well in Europe or North America to be useable as-is. Two main lessons can be learned from the failure of the artisanal fisheries development policies in Vanuatu :
- If neither the physical nor the human contexts can adapt to the development model, then it is up to this model to adjust to the physical and human realities of the islands;
- It is impossible to build anything without using what is already there as a solid foundation.

In this particular field, traditional fishing can provide an excellent source of inspiration. It prominently features adaptability, diversity, and flexibility in methods, techniques and strategies; it offers an economy - both in terms of money and of labour - of equipment and energy; it makes use of the diversity of possible target species and of biotopes suitable for fishing. These are general principle that can help guide the development of artisanal fishing in coastal waters.

Yet, the inspiration shouldn't be limited to traditional fishing methods of the Pacific alone. One would like to hope that the type of "North-South" co-operation that is typical of artisanal fishing development in Vanuatu could one day be replaced by a "South-South" co-operation between the nations of the island Pacific and the other countries of the inter-tropical zone. There is no doubt that Fanti or Senegalese fishing skippers have a wealth of experience that they could share with their Ni-vanuatu counterparts. There is no doubt that the women of Vridi, on the Ebrié lagune of Ivory Coast, famed for their smoked fish, have much that they could teach to the women of Vanuatu and the other island nations of the Pacific.

Notes

1) This concept of "fishing system" has only been used for the last twenty years or so. It was introduced by such pioneers as Rhode Island University's Polnac and Sutinen (1979), or ICLARM's Smith (1979), and became adopted in the South Pacific in the course of regional conferences such as the S.P.C.'s symposium on coastal fishing resources in the Pacific of 1988, or the conference organized in 1989 by ACIAR in Hobart (Campbell, Menz and Waugh, 1989).

2).In Vanuatu, an island group devoid of laggons, coral formations are limited to a narrow band of fringing reefs, offering two very distinct fishing zones : the shallow reef flats and the first few meters of the outer reef slope.

3) .By "abundance", we mean the total population numbers of the stock that is fished.

4). Generally speaking, the fisherman will take from the stock a quantity of fish varying with the effort that he has expended and his productivity. This productivity is measured as a fisherman's output per unit of time. It will depend both on the abundance of the resource and on the efficiency of the device used, and can be considered as a ratio between the number of target specimens present on the fishing grounds and the number of such specimens caught.

5). Most of the outings are done in small outrigger dugout canoes propelled with paddles. Their nautical performance is poor, and they are not well suited to offshore travelling. The few sailing canoes are superior in this regard. They are usually larger than the paddled kind, and can reach lengths of up to 10 meters. The greatest concentration of canoes is found on the island of Malekula, with fully one third of the total canoe population of the whole group.

6). These are basically four in number : the great diversity of the stock, the low abundance of monospecific micro-stock units, the seasonal fluctuations affecting these stocks, and the extreme vulnerability of these stocks to over-exploitation.

7). It would be risky for the fisherman to target his efforts on a single specie when the likelihood of coming across fish of the target specie is low.

8).For a discussion of traditional fishing techniques, the reader would be well advised to consult the work of Anell (1955).

9). It would hardly be practical to attempt to catch sardines with a spear gun, on account of the small size of the fish. A net would be far more appropriate.

10). There would be no point in hoping to catch a herbivorous fish on a hook baited with shellfish, or in fishing by day for a specie that feeds only at night.

11). Trying to capture deep-bottom fish by deploying a vertical float-suspended net would be unrealistic. Diving with a spear gun, or fishing with a hand-line, would make far more sense.

12). The yearly number of fishing outings per hectare of useable fishing grounds is a good way of measuring the intensity of the fishing activity. Where this figure is not available, the density of fishermen on the fishing grounds can also be used.

13). In the island Pacific, as was shown by Bonnemaison (1981 and 1986), the notions of territory and of ethnic identity are very much interweaved. "The sense of ethnic identity is based on, and finds its security in, the depth of its rooting to the land and the degree of intimacy it enjoys with a space that it structures, orders and focuses according to its own aspirations and symbolic representations, in other words its territory."

14). The reader who might wish to pursue the subject of the various forms of status of the fishing grounds in Vanuatu will be well advised to consult the thesis of B. Vienne (1984) concerning the Banks Islands, particularly chapter 4 : "La Maitrise de la Nature".

15). Thus, in Vanuatu, after ten years of Village Development Fisheries Programme, the annual catch of fish has never exceeded the 200 tonne mark. Traditional fishing, meanwhile, supplies between 1500 and 2000 tonnes per year (David, 1991).

16). The use of sailing canoes, with a small auxiliary engine to help them in going to windward, is certainly the least expensive way to develop fishing in the shallower portions of the outer reef wall, in depths of between 10 m and 100 m, particularly on the leeward side of the islands, where there is shelter from prevailing winds and ocean swells.

17). Readers who might be interested in the application of these techniques to Vanuatu should consult Van Pel (1958) and issue n° 50 of the S.P.C.'s information niewsletter on fisheries (David, 1990b).

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APPENDIX

The appendix on the following four pages shows copies of the questionnaires/forms used by ORSTOM and the Vanuatu Fisheries Department to monitor the production of deep-bottom-dwelling fish, which are the target of the VFDP. As described above, the data-gathering process is divided into three levels, each corresponding to one of the stages of fish production : landings, rural fish sales, and the urban market..

VILEJ FISING PROJEK

REKOT BLONG FISING LONG WAN TRIP

Nem blong kampani : .....

Nem blong bot : ..... Hamas man i stap long bot : .....

Deit yu ko aot : ..... Taem yu ko aot : .....

Deit yu kam bak : ..... Taem yu kam bak : .....

Fising eria : ..... Fising depth : .....

Hamas line yu usum : .....
long dip solwota

Hamas line yu usum : .....
long trolling

Hamas kilo fis yu kasem : ..... kg
long dip solwota

Hamas kilo fis yu kasem : ..... kg
long trolling

Taem yu start bottom fising : .....

Taem yu start troll : .....

Taem yu stop bottom fising : .....

Taem yu stop troll : .....

Wanem kaen beit yu usum : .....

Hamas kilo beit yu usum : ..... kg

INCOME

Hamas mane yu kasem long fis sales : ..... VT

Nara income : ..... VT

HAMAS MANE YU USUM

Benzene/oel : .....

Repair mo maintenance : .....

Samting blong fising : .....

Freight : .....

Pay : .....

Ol nara expense : .....

Nem blong fis	Mesament blong fis (length long cm)
Etelis coruscans	
Etelis carbunculus	
Etelis radiosus	
Pristipomoides multidens	
Pristipomoides filamentosus	
Pristipomoides flavipinnis	
Epinephelus magniscuttis	
Epinephelus morrhua	
Epinephelus septemfasciatus	
Lutjanus malabaricus	
Aphareus rutilans	

REMARKS

REPUBLIC OF VANUATU

FISHERIES EXTENSION SERVICE
RESEARCH UNIT ORSTOM - FISHERIES DEPARTMENT
GOODS RECEIVED NOTE

GRN Nº 2951

Extension Centre ..... Date .....

Fishing Project ..... Procode .....

Fishing Area ..... Trip Length ..... Hours

PIECES	SPECIES		KILOS	PRICE	VALUE
	E. carbunculus	(Red Short Tail)			
	E. coruscans	(Red Long Tail)			
	E. radiosus	(Silver Jaw)			
	P. multidens	(Large Scaled Jobfish)			
	P. flavipinnis	(Yellow Jobfish)			
	P. filamentosus	(White Poulet)			
	L. malabaricus	(Red Snapper)			
	A. rutilans	(Green Jobfish)			
	S. rivoliana	(Amberjack)			
	E. magniscuttis	(Spotted Loche)			
	E. morrhua	(Brn. Striped Loche)			
	E. septemfasciatus	(7 Banded Loche)			
	G. unicolor	(Dog Tooth Tuna)			
	T. albacares	(Yellow Fin Tuna)			
	K. pelamis	(Skipjack)			
	T. alalunga	(Albacore)			
	C. hippurus	(Mahi-mahi)			
	M. seheli	(Mullet)			
	S. crumenophtalmus	(Mangreau)			
	Clupea sp.	(Sardine)			
	Mixed Reef Fish				
	Other Species				
		TOTAL			

Received from Fisheries Extension Service ..... VT.

Signed .....

"NATAI"

PORT VILA FISHERIES LIMITED
P.O. Box 883, Port Vila — Telephone : 23344
P.O. Box 211 — Luganville, Santo — Telephone : 36841

GOOD RECEIVED NOTE № 11563

Date : .....

Received from : .....

AWB No : .....

Bag No's : .....

CODE

Grade A - First Grade
B - Second Grade
C - Third Grade
IKE - Killed
HIG - Headed & Gutted
H/G - Head Off
G&G - Gilled & Gutted
WH - Whole
L - Live
D - Dead
F - Frozen

Description of Goods	Code	Kgs	Price	AMOUNT Vts

VOID
24.1.92.

Total Kgs | **Sub Total**

Goods Received Signed : ..... **Freight Ded**

Approved Payment Signed : ..... **Other Ded**

Till Cash ..... Cheque No. ..... **Total Payable**

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