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NOTE FROM THE CO-ORDINATOR

Our Special Interest Group is beginning to attract attention, and we are starting to receive unsolicited contributions, requests for information, and news items on publications and events. However, ironically, most of the interest is coming from outside the Pacific region! We need more contributions from within the region.

In this Information Bulletin there are several thought-provoking articles. Tom Graham, of the CNMI Division of Fish and Wildlife, takes issue with the commonly held notion that the codification of traditional laws and rights in fisheries will necessarily result in the loss of flexibility, one of their basic attributes. This ought to provoke some dissenting correspondence, which we would like to seek published in future issues of the Bulletin!

Dan Pauly, of ICLARM, has provided a most useful paper that distinguishes among and briefly reviews the different types of overfishing. Of particular practical importance to students of development and planners is the discussion of Malthusian overfishing, a problem that can be solved not within the fisheries sector but in other sectors of the national economy. Dan also provides a useful bibliography for digging deeper into the concepts he discusses.

Joeli Vetayaki, of the USP Ocean Resources Management Programme, discusses some of the background to changing practices in traditional inshore fisheries.

In this edition of the 'Information Bulletin' we are starting a new section on recent publications. Two newly published books are featured this time. We would like to make this a regular feature, so please send reports, articles, notices, and review copies of books to the Co-ordinator.

Kenneth Ruddle

Inside this issue

PIMRIS is a joint project of 4 international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA), the University of the South Pacific's Pacific Information Centre (USP-PIC), and the South Pacific Applied Geoscience Commission (SOPAC). Funding is provided by the International Centre for Ocean Development (ICOD) and the Government of France. This bulletin is produced by SPC as part of its commitment to PIMRIS. The aim of PIMRIS is to improve the availability of information on marine resources to users in the region, so as to support their rational development and management. PIMRIS activities include: the active collection, cataloguing and archiving of technical documents, especially ephemera ('grey literature'); evaluation, repackaging and dissemination of information; provision of literature searches, question-and-answer services and bibliographic support; and assistance with the development of in-country reference collections and databases on marine resources.

PIMRIS
Pacific Islands Marine Resources Information System

Flexibility and the codification of traditional fisheries management systems

by Tom Graham
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In order to preserve what in many areas are rapidly eroding systems of traditional marine resource management, some governments and their advisers have called for the codification of traditional laws and rights in the legal institutions of today's centralised governments.

Caution has been urged regarding this approach, however, primarily because of concern that codification might 'fossilise' or 'freeze' traditional laws and customs, rendering the management systems unable to adapt to changing conditions in the biophysical, economic and political environments. At the 1991 South Pacific Commission's Regional Technical Meeting on Fisheries, for example, 'there seemed to be clear agreement that it is not desirable to dilute the flexibility of CMT [customary marine tenure] systems' (Hviding & Ruddle 1991: 8). Summarising the results of a 1988 SPREP workshop on customary tenure, Thomas (1989: 8) reported that 'the workshop did not recommend codifying custom, because it believed such action could rigidify changing practices'.

How, then, can governments go about reinvigorating deteriorating management systems (presuming that the systems are useful and should be maintained) while ensuring that those systems do not, in the process, become so stiff as to become ineffective? In this paper I review briefly some of the options facing policymakers, with a focus on the 'flexibility problem'. The main questions addressed are:

1) What types of flexibility are important, and over what time scales?

2) Just how flexible were traditional tenure and management systems?

3) Can codified traditional law incorporate the right types and amounts of flexibility?

What needs to flex?

Johannes et al. (1991: 3) cited the need for fishery management systems to be able to adjust to 'changing biological and socio-economic conditions affecting the fishery', and argued that customary tenure systems could do so more effectively than could government regulations. What sorts of biological and socio-economic changes might the fishery be subject to, and on what time scales might these changes occur?

Even over the course of a single day important changes occur in the marine environment, with shifting tides and the position of the sun affecting the locations and behaviour of fish. Lunar cycles are also important to reef fish – affecting tides, influencing the brightness of the night, and governing spawning behaviour. Seasonal cycles also influence spawning and other migratory activities.[1] Seasons also bring changes in weather patterns, in labour markets (such as shifts among land-based and marine-based activities), and in local and distant seafood markets (such as cycles in the supply and demand of fish and other foods) – all of which influence the fishing patterns of individuals and communities. Over longer time scales, such as years and decades, coastal communities might experience significant demographic shifts, restructuring of local, national and foreign economies and markets, changes in fishing technologies, and changes in the distribution of political power. Another important category of potential long-term changes is ecological changes – changes that affect the composition and productivity of exploited fish communities. All these changes can affect the way people harvest and distribute their marine resources.

Traditional flexibility

In order to cope with this broad array of potential changes, we have a lot to ask of marine resource management systems. How well did traditional management systems deal with these changes before contact with the West or with other newcomers?

It appears that they must have coped well with (and were probably built around) predictable economic and biological cycles, such as those associated with the moon and the seasons. In Bahia, Brazil, for example, Cordell (1989) reports that during the annual run of catfish into an estuary, fishermen relax the boundaries of their claimed fishing turfs and enter into temporary partnerships with other fishermen in order to increase their catches. Similar arrangements that accommodated short-term changes and needs were prob-

[1] *Johannes (1981) describes in some detail the tidal, lunar, and seasonal rhythms of the reef fish of Palau, as reported by local fishermen.*

ably common in other such systems. In Palau, for example, 'fishermen were sometimes allowed to fish in their neighbor's waters providing they asked permission and agreed to pay a portion of the catch' (Johannes 1981: 65).

More permanent transfers of fishing rights may have also been common. Johannes (1981) reports that in about 1930 one municipality in Palau 'ceded' some territorial fishing rights to a neighbouring district. In Yap, rights to marine resources probably shifted among villages as the distribution of political power shifted (see Lingenfelter 1975).

Some systems may also have the ability to adapt to some of today's more rapid and unpredictable changes. In describing the present state of marine tenure in Marovo Lagoon, Solomon Islands, Hviding (1990) emphasises the ability of rights-holders and traditional leaders to focus on marine resource-related issues as they arise and to implement controls over their use on a reactive basis. Ruddle et al. (1992: 254) claim that the system in Marovo 'can handle many contemporary local issues related to subsistence and commercial use, as well as those involving demographic and political change'. The authors cite examples of Marovo marine rights–holders actively exercising their traditional rights vis–à–vis such contemporary developments as mining, logging, and the harvest of baitfish by foreign tuna fleets.

Notwithstanding this type of evidence of the resilience of some systems, it is questionable whether traditional systems in general were fostered under conditions that allowed them to readily adapt to unpredictable and rapid changes in the economic or political environments. Evidence of this is apparent in the many cases of eroding systems throughout the Pacific.[2]

My impression is that Pacific Island societies were built to be cautious. In order not to self-destruct, these small, isolated and closed societies must have had to develop institutions and customs that were solid and steady and that resisted social, economic and political change. One can observe on Yap – which used to be a very densely populated island – numerous customs and behaviours that effectively serve to avoid or minimise confrontations, and so tend to forestall change. Even the ubiquitous wars that shaped Yap's political structure were carefully orchestrated events; the outcomes and even the casualties planned in advance by carefully cultivated alliances (Lingenfelter 1975).

Marine tenure systems that developed in these types of societies must not have been exposed to radical socio-economic changes. In fact, marine tenure systems were probably important in stabilising society. Panayotou (1989) suggests that marine tenure systems may have arisen not out of the need to conserve fish, but rather in order to preserve social order and local power structures. Where fishing is the main source of food and employment, 'control of access to fishing grounds is tantamount to political and social control' (ibid:87).[3] While this hypothesis has important implications with regard to whether or not traditional tenure systems can provide the means to conserve or optimise the use of fisheries resources, the relevant point here is that the inherent flexibility of traditional management systems with regard to long–term changes may not be enough to cope with the rapid and dramatic changes occurring in many Pacific Island societies.

Codifying traditional law

Where traditional tenure systems are collapsing because of the inability of traditional authorities to effectively allocate, arbitrate and enforce use-rights, codification of traditional law can serve to replace or reinforce the power of traditional authorities. A long list of potential problems associated with codifying use-rights has emerged in the literature, however. For example, fishing rights that are extremely complex, blurry and, in Cordell's words (1984:322), 'hard to define outside of a total social context', could make codification a formidable task. The most frequent argument against codification, and the one addressed here, is that formalising use-rights could make the system rigid and unable to adapt to future circumstances.

It seems to be a common assumption that codification of customary rights would necessarily result in those rights being set in stone – unable to be changed, their boundaries unmovable. Indeed, some codification schemes could result in this sort of scenario.

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[2] *The collapse of customary management systems has typically been viewed as their succumbing to the effects of the new politics, economies and technologies to which they have been exposed (i.e., they failed to adapt). An alternative perspective is that they have 'successfully' adapted themselves out of existence. For example, traditional tenure systems may no longer serve the purposes for which they were developed, or those purposes may no longer reflect society's changing values.*

[3] *Panayotou further argues that a politically motivated management system would be less resilient to socio-political changes than a conservation-motivated system. This perhaps explains the current process of disintegration of traditional management systems.*

But there are a host of other ways to go about codifying customary rights, and not all of them would result in an inflexible management system.

Most of our highly formalised systems of land ownership would not prevent a landowner from allowing his neighbour to pass over his land or to take fruit from his tree. Western legal systems tend to work well (i.e., provide adequate security to rights of ownership) only when property boundaries are well defined and well documented. But this does not prevent landowners from treating their boundaries as hazily as they like on a day–to–day basis. Most legal systems also allow landowners to divide, lease and sell their land. These are the attributes of ownership that allow land management systems to flex and adapt to changing circumstances. Is there any reason these attributes cannot be applied to 'ownership' in the marine environment?

Countries that are experimenting with individual transferrable quotas (ITQs) in their fisheries are currently assessing how well the rights to lease, divide and transfer those quotas lend themselves to some of the objectives of fisheries management (e.g., conserving fish, generating rents and allocating resources equitably). Some of the most persuasive arguments in favor of ITQs (a highly formalised form of rights-based fishing) concern precisely their flexibility. Holders of sufficiently flexible rights should, in theory, be able to maximise individual efficiency and therefore encourage efficiency in the entire fishery precisely through their ability to adapt to changes in the biophysical and socio-economic environments. Holders of such rights might, for example, be able to trade their share of the catch either before or after capture, and either temporarily or permanently.

The point is that laws do not necessarily restrict flexibility. They can, in fact, create and ensure flexibility. The same legislation that grants title to marine space or marine resources based on customary use could also provide mechanisms to allow (and/or restrict) those rights to be transferred, leased or divided – the primary elements of flexibility.[4]

Even modern markets, often seen as culprits in the destruction of tradition, can be important elements of flexibility. Consider, for example, a traditional society in which the harvest of fish was restricted to a certain social caste, and then distributed to the rest of society via various mechanisms of barter, such as for land crops or labour. If the traditional fishing rights were codified in modern law without any mechanisms to ensure an 'equitable' distribution of the catch, whole classes of society might be effectively shut off from the resource. In this case, the market, if allowed to remain open, would be the only way for those classes to obtain fish. (That modern markets tend to use cash is irrelevant.)

It is useful to treat codification not as a yes–no option, but rather as a continuum of options – a continuum that can be described in terms of the degree of codification. Even a law that merely 'recognises' tradition is a form of codified traditional law. A little farther up the continuum would be options that strengthen the authority of traditional leaders and institutions without dealing with specific rights or claims. This approach would leave the system with roughly the equivalent of its traditional flexibility: particular rights could be claimed, arbitrated, enforced, and exchanged, as was done in the past – under the control of traditional authorities. In Solomon Islands, for example, traditional rights to marine areas have not been explicitly codified, but the laws and policies of the government provide enough recognition of traditional laws in general for traditional leaders to continue to be able to exercise considerable authority with regard to claims to marine resources (Baines 1985). According to Ruddle et al. (1992), this approach is common among the governments of Melanesia. (Without inferring any cause or effect, they also note that it is in this part of Oceania that systems appear to have the greatest ability to cope with contemporary pressures.)

In some cases this approach of reinforcing the power of traditional leaders might not provide enough security to rights-holders. Possible problems include:

1) State authorities might have a difficult time relinquishing power to traditional leaders, and it might be difficult to avoid overlaps and ambiguities between traditional and State law. In Yap State, for example, people complained of being punished twice for the same offence – once by traditional authorities and again under State law (MRMD 1991);

2) It might be very difficult from a practical standpoint to give power back to traditional authorities if they no longer have the 'real' power they

[4] *Scott (1988) provides a list of six quantitative characteristics of property, the magnitudes of which collectively determine the degree of interest in a property. "Interest" in this sense describes the degree of "ownership" in a property – the higher the degree of interest perceived by the "owner", the more he treats/uses/manages the resource as solely his own. One characteristic on the list is "flexibility". The others are duration, exclusivity, quality of title, transferability, and divisibility.*

used to have. Traditional authority was based on political/social position which was in turn probably based on, or at least linked to, economic power. If, because of changes in economies, traditional leaders are no longer as wealthy as before, then they probably also lack the authoritative power they once had; and

3) Traditional means of enforcement and punishment may no longer be viable. Deterrents based on spiritual beliefs, for example, may not be as effective as they once were. The practical means for enforcing fishing rights, such as manpower and motorised vessels, might also be lacking.

In these cases, more explicit recognition of traditional law (i.e., a greater degree of codification) might be necessary. At the extreme, legislation could formalise specific fishing rights. The main advantage of this approach is that the State might be able to give more security and durability to fishing rights than traditional authorities. Potential problems with this approach include those already mentioned, such as the difficulties in documenting complex, blurry and disputed traditional rights. Also, attempts to codify geographical rights without incorporating associated customary rights, such as obligations concerning the distribution of the catch, might lead to inequitable allocations of the resource. However, it is stressed here that the most common argument against this approach – that the system will lose its needed flexibility – is not a convincing one. Lawmakers should not be discouraged from considering the great variety of options offered under the broad term of 'codification.'

For example, an option involving an intermediate degree of codification was offered in a report by a government agency of Yap State. It suggested that any effort at codification be directed at claims at the municipal or village levels, leaving claims made by estates, families or individuals to be administered locally, such as by traditional authorities (MRMD 1991).

Conclusions

Codification of traditional law can range anywhere from simply 'recognising' those laws to granting title to explicitly defined rights to marine space, species or fishing methods. Choosing from this spectrum of options should have little to do with the amount of flexibility offered by any of them – the right types of flexibility should be able to be incorporated into any of them. Rather, choosing the best option – that is, the most appropriate degree of codification – should have more to do with choosing the type of authoritative structure necessary to give rights holders the degree of security necessary for them to meet their purposes, whatever those purposes may be. If a high degree of codification is necessary to do so, then effort should be made to ensure that the law allows the system to flex in a manner consistent with its objectives[5]. Four examples are provided below.

1) Short–term cyclic changes, such as those associated with tides, currents, and the sun, can be generally accommodated through the structure of the tenure system. This is where traditional systems should provide good models. A simple example is that if tidal and diel migrations of fishes are generally perpendicular and not parallel to shore, then boundaries of territorial rights will offer more exclusivity when oriented perpendicular to the shore.

2) Longer-term but predictable cycles, such as those associated with weather, spawning runs, and other migratory patterns of fish, can be accommodated through short-term transfers or dissolutions of fishing rights. Such arrangements might involve cash or some other compensation, such as surveillance duties, in exchange for the right to harvest the resource. Having fishing rights protected under law should – if the laws are crafted well – in no way hinder rights-holders from lending, leasing or temporarily trading fishing rights, just as they may have done in the past.

3) Non-cyclic longer-term changes, such as demographic shifts and changes in markets, economies and politics, can also be accommodated by transfers of fishing rights. A village that finds itself relatively depopulated, for example, might find it advantageous to transfer some of its rights either temporarily or permanently to more populated neighboring communities.

4) Finally, some changes in the biophysical or socio-economic environments may be sufficiently rapid, unpredictable and/or dramatic to leave any management system unable to cope. In

[5] *Some government policies might be at odds with too much flexibility. For example, a policy that seeks to ensure that fishing rights continue to be held by indigenous or traditional claimants might require that the transferability of those rights be restricted. This type of restriction could also serve to discourage commercialisation of the fishery. Equity problems might also stem from too much flexibility. A State court in the U.S., for example, ruled that free transferability of fishing permits in a salmon fishery (whose value had skyrocketed after entry to the fishery was limited) represented 'unfair discrimination based on wealth' (State of Alaska Superior Court, Third Judicial District, No. 3AN80-7652; cited in Karpoff n.d.).*

these cases, the law can simply be changed – it's done all the time. No legal system should be so inflexible as to prohibit this option. Even constitutions get amended.

In summary, codification should not be viewed as a hindrance to flexibility. The question facing governments that want to keep traditional management systems intact is not whether or not to codify; it is to what degree to codify.

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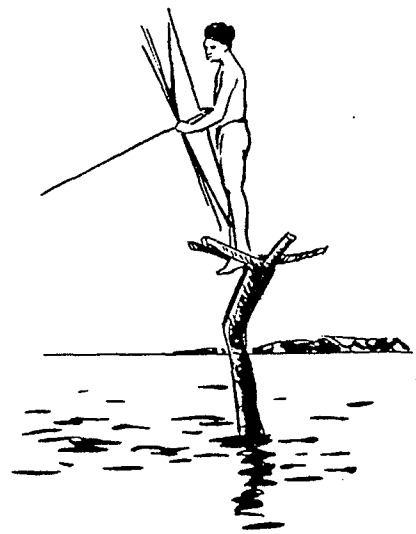

From growth to malthusian overfishing: Stages of fisheries resources misuse

By Daniel Pauly
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Abstract

This contribution briefly reviews the various forms of overfishing, with emphasis on their implications for tropical coastal fisheries, e.g. the coral reef fisheries of the South Pacific. Addressed are: growth overfishing and its relationship to the study of growth and mortality of fish, and of gear characteristics; recruitment overfishing and its links with parental biomasses; as well as 'biological' and ecosystem overfishing. Classical economic overfishing is then defined, along with its younger relative, Malthusian overfishing, which leads to a form of resources destruction not resolvable by interventions solely within the fisheries sector, and requiring alternative, land-based livelihood opportunities.

Introduction

There are different ways of managing fisheries systems, the most efficient probably being those which evolved in the South Pacific, where, usually, tradition-based rules regulate access to commonly held resources (see contributions in Ruddle & Johannes 1985).

In the West, however, a different tradition evolved, which looked first at the state of the fish stocks, and only then at the fisheries depending on these stocks. This is very well illustrated by the historical sequence of scientific concepts used to define overfishing, viz.:

1. Growth overfishing: the form of overfishing that was first to be identified and theoretically resolved (Baranov 1918; Beverton and Holt 1957; Fig. 1);

2. Recruitment overfishing: the second form of overfishing recognised by fisheries scientists, following the seminal paper of Ricker (1954; Fig. 2);

3. Biological overfishing: the combination of growth and recruitment overfishing leading to catch decline on the right, descending side of surplus production models (Schaefer 1954, 1957; Fox 1970; Ricker 1975; Fig. 3);

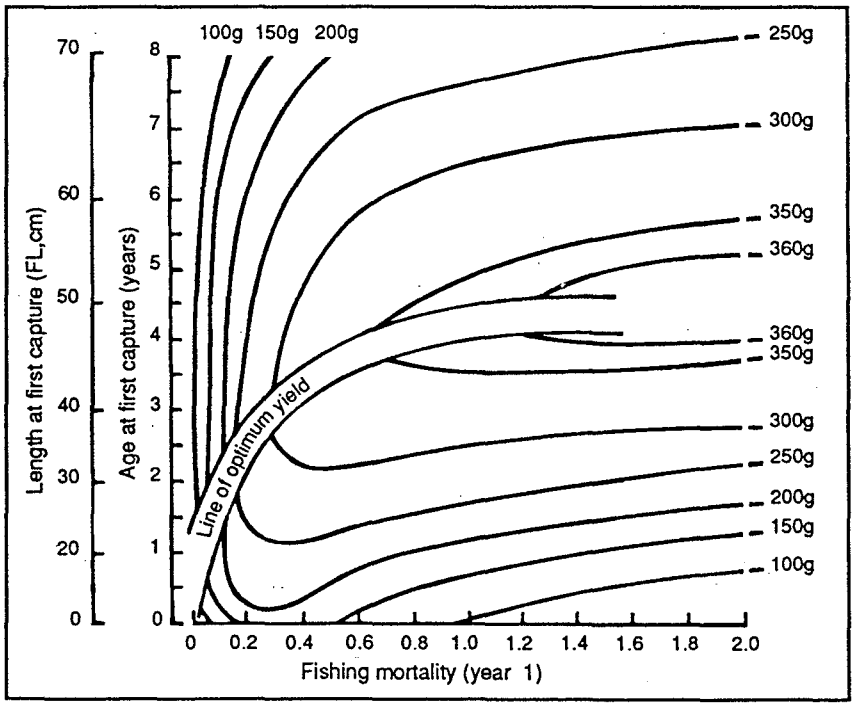

Fig. 1. Characteristic end result of a yield-per-recruit analysis: yield-per-recruit 'isopleths' for the snapper *Lutjanus sanguineus*, i.e. lines of equal yield (per recruit) depending on fishing mortality (usually proportional to fishing effort) and mesh size (and hence mean length and age-at-first-capture). Adapted from Pauly (1979b), with W_∞=12,226 g, K=0.154 year^{-1}, t_0=0.67 year, based on Lai & Lin (1974), and M=0.33 year-1.

4. Ecosystem overfishing: resulting from target species being reduced by fishing and being replaced only in part by other exploitable components of an ecosystem (Pauly 1979a, 1979b);

5. Economic overfishing: initially defined in terms of economic theory by Gordon (1953), then combined by various authors with the parabolic surplus production models in (3) to yield the Gordon–Schaefer model (see, e.g. Anderson 1977 and Fig. 3);

6. Malthusian overfishing: initially proposed by Pauly (1988) and further developed in Pauly et al. (1989) and Pauly (1990), this concept links a (small-scale) fishery with a large adjacent sector (generally, agriculture) generating surplus labour which the fisheries resource system cannot absorb without damage (Fig. 4).

More on various forms of overfishing

Growth overfishing is what happens when fish are caught before they have time to realise their growth potential. This form of overfishing, which began to occur in some Northern European fishing grounds as early as the end of the last century, was first analysed by the Russian scientist F.I. Baranov just after World War I. However, it was the work of R.J.H. Beverton and S.J. Holt, of the Lowestoft Laboratory, Britain, which after World War II presented a method for yield-per-recruit analysis by which growth overfishing could be diagnosed in practice and remedied by fisheries management, for example, through the imposition of appropriate mesh sizes for fishing gears (Beverton & Holt 1957; Ricker 1975; Gulland 1983; Pauly 1984).

Research work related to growth overfishing, conducted in various research institutions throughout the world, consists of estimating the ages, and the growth and mortality rates of fish and assessing the (mesh) selection characteristics of fishing gears, as well as adapting Beverton and Holt's yield-per-recruit and related models to the multispecies situations typical, for example, of coral reef fisheries.

More than 3,000 sets of growth parameter estimates, covering some 800 of the most important fish species in the world, and over 300 estimates of natural mortality are included in FishBase (Pauly & Froese 1991; Froese et al. 1992). Combined with sophisticated, single or multispecies yield-per-recruit models (Silvestre & Soriano 1988), these data make it straightforward to diagnose and quantify growth overfishing for almost any type of fish resource, tropical or not. Hence, fisheries research can now practically always go beyond the study of growth overfishing.

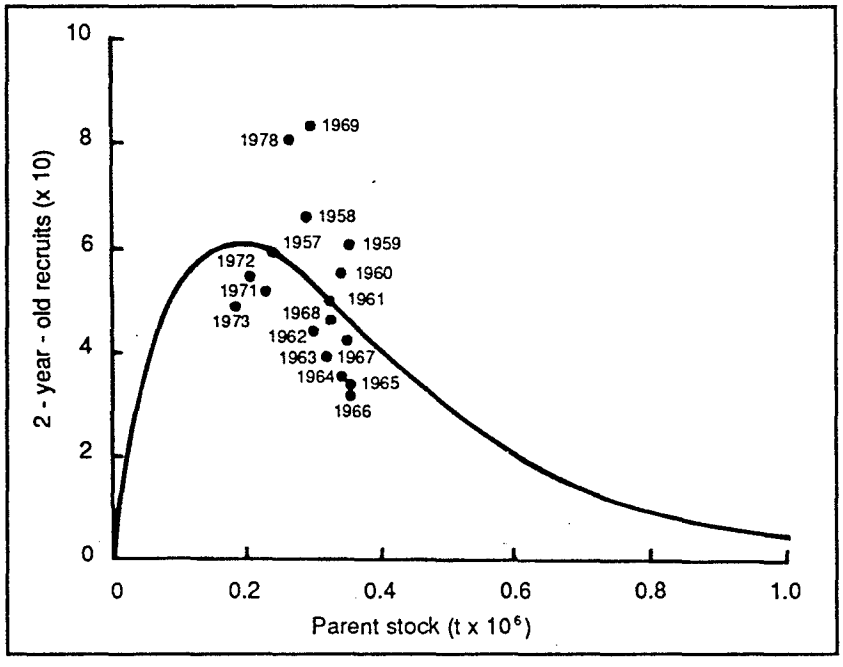

Fig. 2. A Ricker curve, meant to quantify the relationship between parental biomass and subsequent recruitment in Southern bluefin tuna (*Thunnus macoyii*), but in fact illustrating that next to nothing was known about that relationship at the time it was published except that it must pass through the origin (from Murphy 1982).

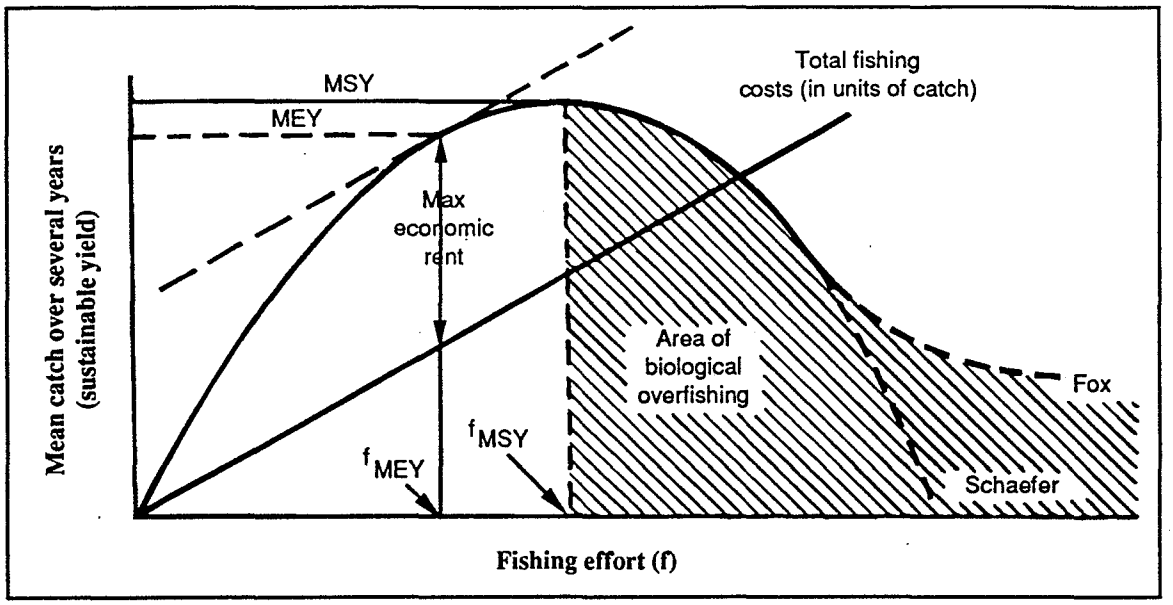

Fig. 3. Schematic representations of *biological* overfishing, due to both *growth* and *recruitment* overfishing (shaded, right area of a Schaefer- or Fox-type production model), and of *economic* overfishing, occurring when fishing effort exceeds the level (f_{MEY}) required to maximise economic rent, i.e. to produce MEY. Note that MEY is always (slightly) below MSY, the stated or implicit goal of many management schemes; and that beyond MSY, subsidies will *reduce* catches (by reducing total costs).

The second recognised form of overfishing is *recruitment overfishing* which refers to fishery-induced reductions of the number of young fish entering fishing grounds. Recruitment overfishing can be brought about by:

1) reduction of the spawning stock (which may become so small as to produce a limited number of eggs and hence of recruits), and

2) coastal environmental degradation, which affects recruitment through its effects on the size and/or suitability of nursery areas. [Note that preventing recruitment overfishing is not, as [some] think, a matter of letting 'each female spawn at least once', since, for example, less than one in a thousand anchovy or shrimp larvae reach a mature age, even in the absence of a fishery. Instead the crucial aspect is that the spawning stock should be large enough to ensure that the subsequent recruitment remains independent of the parental stock.]

Models to identify the levels below which parental stocks should not drop were first developed by the Canadian scientist W.E. Ricker. These models have found little direct application in the tropics, although they have led to generalisations useful for stock conservation (Goodyear 1989; Mathews 1991). Rather, it is surplus-production ('Schaefer' or 'Fox') models that are commonly used, along with their space-structured counterparts to assess tropical fisheries (Schaefer 1954, 1957; Fox 1970; Munro 1980). These models do not distinguish between growth and recruitment overfishing but rather lump the two processes into a single category of 'biological' overfishing (Fig. 3).

Fig. 3 also defines *economic overfishing* as what happens when a fishery is exploited at a level of effort higher than that which maximises the economic rent, i.e. the differences between gross returns and fishing costs. Note that this optimum level of effort is always less than that required to extract maximum sustainable yield (MSY) and that, therefore, maximum economic yield (MEY) is always less than MSY (Fig. 3). (Economic overfishing can also be expressed in terms of *monetary* yield-per-recruit; this and related themes constitute the subdiscipline of *bioeconomics*.)

I introduced, in 1979, the concept of *ecosystem overfishing* to characterise the process which took place in the 1960s in the Gulf of Thailand (and, at different times, in other tropical fisheries), where trawling was so intense that it altered the balance of species on the fishing grounds, with some species increasing, but failing to replace the depleted ones. A typical scenario is that longer-lived demersal species are replaced (but only in part) by shorter-lived small pelagic fish and squids.

This process implies that a larger part of the system's ecological production is now captured by benthic

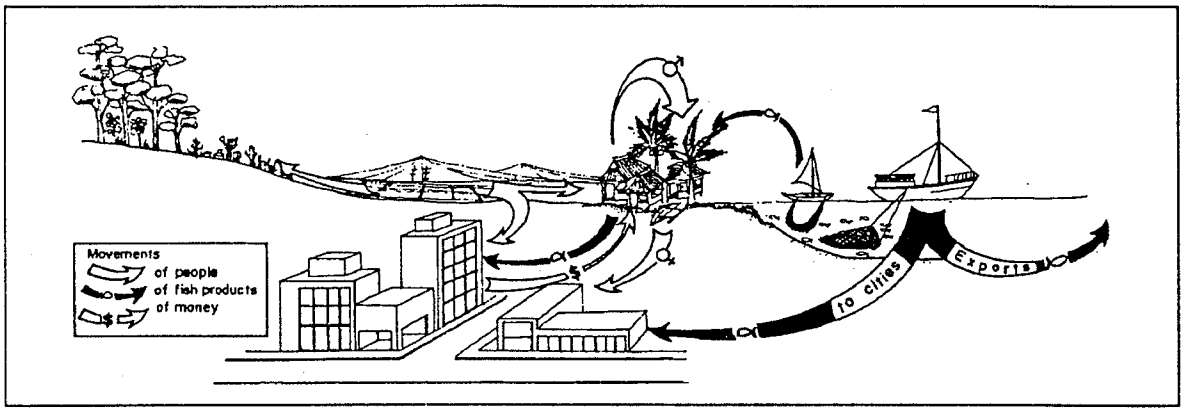

Fig. 4. Schematic representation of the processes leading to Malthusian overfishing: a comparatively large agricultural sector releases excess labour (=landless farmers) who migrate either to urban upland or coastal areas. Under this influx, traditional arrangements preventing open access to the fisheries gradually collapse, leading to excessive fishing pressure, exacerbated by inshore commercial fishing, and by the male children of fishers picking up their fathers' trade; many young women leave the communities to work in urban areas, and their remittances subsidise the men, who continue fishing even when the resources are depleted. The migrants to upland areas accelerate and complete the deforestation initiated by logging companies, which leads to siltation of rivers and streams, and eventually to smothering of coral reefs, thus further reducing coastal fish yields.

invertebrates and large zooplankton, i.e. into non-resource species. Examples of ecological overfishing abound throughout the world, and research to address this issue is being conducted at various institutions, including ICLARM (Christensen and Pauly 1992a, 1992b).

The forms of overfishing listed above are–with the exception of ecological overfishing–well described in textbooks, and the suggested remedies usually involve a mix of management measures aimed at reducing effective fishing effort (e.g. mesh size regulations, closed areas or seasons, limits on gear sizes or on craft designs, etc.). All of these measures imply that the fishers concerned are actually in a social and financial position to either implement or comply with those measures. Usually they can, because the textbooks are written in and for developed countries in which most fishers are the employees of well-financed corporations, or independent (if small) entrepreneurs who generally can generate enough political pressure to obtain governmental subsidies, or to take shore-based jobs if all else fails.

Malthusian overfishing defined

Small-scale fishers in tropical developing countries are usually poor and lack alternative employment opportunities, i.e. once they start fishing, they are forced to continue, even if the resource declines precipitously.

Over time, the number of these fishers usually increases, both because of internal recruitment (i.e. their own male children) and through new entrants, i.e. new fishers recruited from other sectors, usually landless farmers to whom fishing becomes an occupation of last resort (Fig. 4). *Malthusian overfishing* is what occurs when these poor fishers, lacking the usual alternative of 'traditional' fishers (e.g. a small plot of land or seasonal work on nearby farms or plantations), are faced with declining catches and induce wholesale resource destruction in their effort to maintain their incomes.

This may involve in order of seriousness and generally in temporal sequence:

1) use of fishing techniques, gears and/or of mesh sizes not sanctioned by government;

2) use of gears not sanctioned within the fisher communities and/or catching of fish 'reserved' for a certain segment of the community;

3) use of gears that destroy the resource base; and

4) use of destructive 'gears' such as dynamite and fish poisons that endanger the fishers themselves. [Note that this sequence parallels that occurring in upland areas, also subjected to environmental degradation–especially deforestation–exacerbated by immigration from the lowlands.]

This sequence, generally misunderstood by administrators and fisheries scientists alike, as reflective of ignorance, or of putting the short-term gain ahead of future benefit (or even as evidence of a

moral decline), is in fact reflective of nothing but declining catch per effort (and hence incomes).

The reason why I chose the adjective 'Malthusian' to characterise this process is not because I wanted to join the chorus lamenting the destructive impacts of population growth on natural production systems–these impacts are now obvious (see for example Southgate & Basterrechea 1992; Homer-Dixon et al. 1993). Rather, I wanted to emphasise an often ignored aspect of Malthus' writings, namely his contention that production (of food) can only increase 'arithmetically', that is, by a *constant amount* and hence, in the long run, would always become insufficient for a human population growing 'geometrically', i.e. by a constant *fraction*, but an ever *increasing amount* (Malthus 1798; Fig. 5A).

There are still many who believe that globally, food production will continue to increase as it has done since 1798 when Malthus published his major essay–despite well-documented, widespread destruction of agricultural production systems through erosion, salinisation, etc. (see for example Lightfoot 1990; Southgate & Basterrechea 1992).

These optimists will have to agree, however, that the production from a fisheries system is over time at best constant once MSY has been achieved; usually, it will fluctuate (Fig. 5B) and even gradually decline, because fishing effort will grow beyond

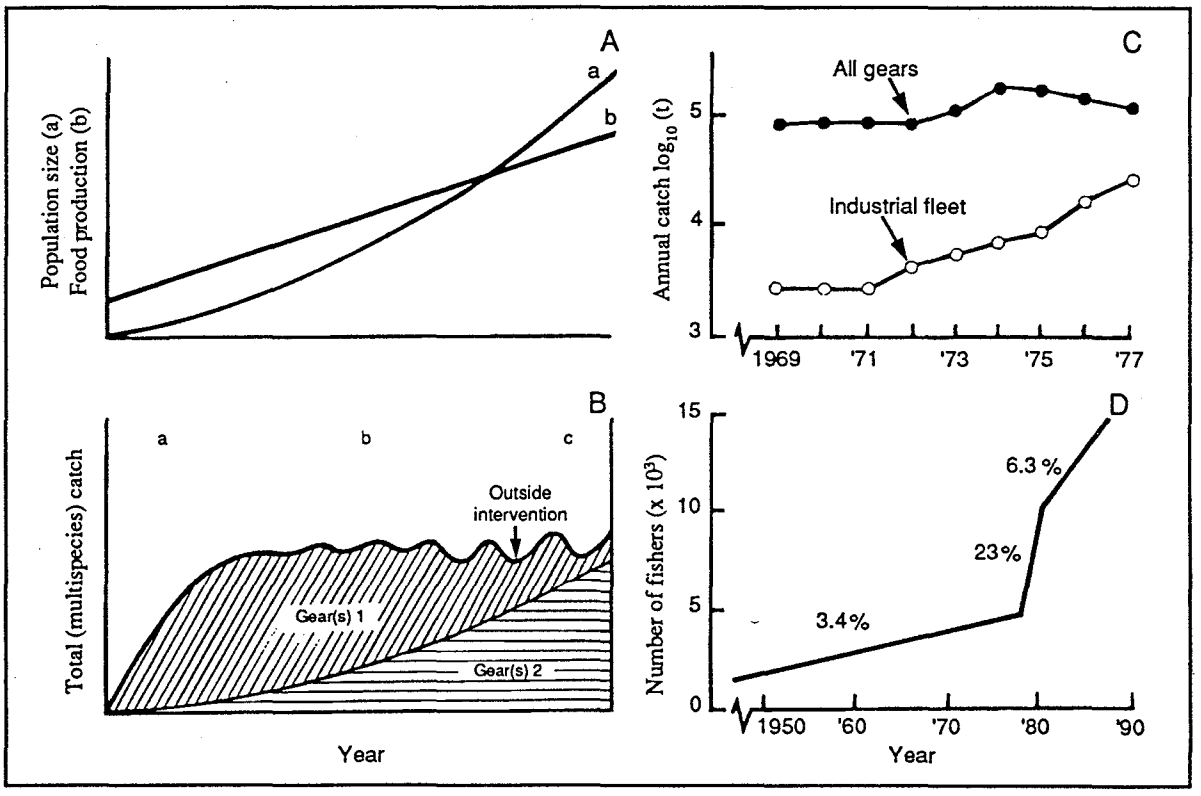

Fig 5. Aspects of Malthusian overfishing (adapted from Pauly 1990):

A: Difference between 'arithmetic' (or linear) growth (a) and 'geometric' (or exponential) growth (b): given sufficient time, (a) *always* overtakes (b) whatever the initial conditions and rates.

B: Phases in the development of a fishery: (a) development phase, corresponding to the left side of the graph in Fig. 3; (b) transfer of an increasing part of the total catch from gear(s) 1 to gear(s) 2 (or from artisanal to industrial fisheries), which may be more efficient, capital-intensive, or subsidised; (c) growth overfishing, leading to a biomass consisting mainly of small fish, induces increasingly large fluctuations, requiring management intervention (to resolve increasingly frequent between-gear conflicts).

C: An illustration of graph (B), showing stagnation of the total catch of Andra Pradesh State, India, and an increasing transfer of catch from the small-scale to the commercial fisheries (from data in Alagaraja et al. 1982).

D: Showing the rapid increase in the number of fishers in the Lingayen Gulf area, Philippines, due to internal recruitment and influx of new fishers (% values refer to mean annual increases during various periods).

that required to extract MSY (f_{MSY} in Fig. 3) and because of the reduction of biodiversity induced by overfishing. Thus for capture fisheries at least, Malthus was definitely right: once a fishery is developed, production will stagnate at best, and won't accommodate an ever-growing demand. Indeed, given enough pollution, e.g. in form of silt (see Fig. 4), fisheries production from an otherwise stressed stock will in fact decline (Hodgson & Dixon 1988, and see Fig. 4).

Diagnosis and mitigation of Malthusian overfishing

Given the above description and the elements of Fig. 5, the following features should occur in a fishery for it to be diagnosed as suffering from Malthusian overfishing:

- stagnating overall catches;
- an increasing number of fishers, leading to:
- decreasing catch and hence income per fisher; these jointly lead to:
- evidence of biological and ecological overfishing; and necessarily to:
- classical economic overfishing; also we should have:
- a breakdown of traditional management schemes; and
- non-enforcement of 'modern' management regulations. An important symptom is:
- new fishers recruited from ethnic groups (e.g. traditional pastoralists) or regions (e.g. highlands) without a tradition of fishing; this will lead to:
- increasing or common use of destructive gears (explosives, poisons); and an important, but often neglected corollary of poverty:
- a trend toward the women in fisher communities generating most of the family income and/or producing most of the food consumed in their family.

These criteria may appear to be hard to meet. However, several fisheries have been described in which most of these are met (see for example McManus et al. 1992), and their number can certainly be expected to increase. 'Modern technology' will not help, since, as might be seen from Fig. 3, any decrease in fishing costs (such as that induced by more efficient gears) will tend to deplete further the resource base of (open-access) fisheries.

Mitigation of Malthusian overfishing is conceptually simple, but hard to implement. Its key element is for women in fisher and adjacent rural communities to be offered the means, presently largely unavailable, to limit the number of children they want to bear. Presently, this right is largely negated by husbands and other powerful men (conservative politicians, religious leaders, etc.).

The next 'lever' to mitigate Malthusian overfishing is the creation of land-based alternative employment opportunities for ill-trained young fishers–a tall order.

Given less pressure on the resource, a 'rollback' strategy is then thinkable in which devolution of state authority to local fisher communities would lead to a rebuilding of 'traditional' management mechanisms limiting entry, complemented with 'modern' measures such as gear restrictions, and the establishment of sanctuaries (Alcala & Russ 1990), for which research a programme such as that in ICLARM's Mid-Term Plan[1] should provide the scientific underpinning.

The foregoing should have made obvious that Malthusian overfishing is the effect on the coastal fisheries sector of population growth and of non-sustainable development in the major sector(s) of the overall economy of a country. Hence, Malthusian overfishing can be alleviated only through sustainable development and, ultimately, by checking population growth.

[1] *Available from ICLARM, MC P.O. Box 2631, 0718 Makati, Metro Manila, Philippines.*

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Most village fishers, unless they have personally experienced the collapse of a fishery, still believe in the inherent capacity of an ecosystem to restore itself, regardless of the destabilising effect of increasing effort. It is therefore difficult to convince fishers of the need to exercise caution in their fishing, and that fisheries resources require careful management if they are to remain renewable.

The current deterioration of fisheries in areas under the responsibility of traditional fishing ground owners is now perhaps the major fisheries sector challenge to Pacific Island governments, because of the complexity of the problem. In nearly all cases, there occur the contradictory demands for the maximisation of production with the sustainable use of resources. Traditional practices and fishing methods have been altered while the adoption of new practices has changed the way fisheries resources are perceived and managed. Given this situation, it is inevitable that whatever fisheries management approach is adopted, it must comprise a blending of both the traditional and contemporary systems. Any management programme must be acceptable to most of the fishers and accommodate the socio-cultural features of coastal communities. Total reliance on any one system is doomed to fail.

Traditional resources management

The primary objective of any management programme in coastal communities should be the sustainable development and use of marine resources. This was possible in the past because fishers were fewer in number, had lesser needs and a limited fishing capacity. Further, socio-cultural conditions were such that custom and tradition were strong enough to support and enforce sustainable use practices. But conditions today are vastly different. Nowadays sustainable fisheries resources management is being undermined by such factors as the emphasis on production and participation in the formal economy, and by an increased fishing capacity that can easily result in overfishing, a lack of information on which to base management, and the destabilising influence of the cash economy. Under these conditions the best way to develop a sustainable fisheries management system is to strengthen traditional management practices and make them consistent with contemporary legislation and government policy, so as to enhance their effectiveness.

The sea and its resources were formerly treated with the utmost reverence by traditional fishers throughout the Pacific. For example, the Tatana villagers, in Port Moresby harbour, Papua New Guinea, formerly collected dead turtles and fish for burial on land, so as to avoid the pollution of their fishing area and also prevent shark infestation (Gaigo, 1982: 301). Similar practices were common in the Pacific.

But it must be also remembered that Pacific Islanders have employed some destructive practices. In parts of the region destructive methods such as fish poisoning and fish drives were used. But small human populations and their limited fishing capacity reduced the impact of such practices and kept them localised. Thus local ecosystems could regenerate. Generally, coral reefs, seagrass beds and mangroves were well managed, since their importance to the sustainable production of fisheries was widely understood. Thus in Fijian coastal communities the traditional land rights claim includes the land and the contiguous sea area, including the reef. Geographical isolation and the resultant difficulties of transportation associated with village life, together with the limitations they imposed on marketing, were important indirect conservation devices, because they limited fishing effort to satisfying just local needs. Further, there was little call for fish marketing, since there were fishers in all villages and most households did their own subsistence fishing. In most Fijian villages, because of role specialisation, fishing was normally done by the master fishers, who are from particular families. These conditions limited fishing effort and contributed to resource conservation.

The use of traditional techniques made fishing dependent on the weather. Thus fishing was occasionally impossible. The reliance on sail was a major factor limiting the fishing areas that could be visited.

Totemic and other taboos, such as those that restrict particular clans, families, age groups, or genders from eating certain types of marine food, contribute towards conservation sustenance (Johannes 1982: 240). In parts of Papua New Guinea, for example, turtles and dugongs were eaten only on special occasions, and the fishing of certain species was banned during specified periods, especially spawning times (Johannes 1982: 246). In Qoma, a fishing village on the north-east coast of Viti Levu, as well as in other parts of Fiji, fishers neither catch nor eat their totem fish. In traditional Fijian society the prohibition on turtle meat and/or turtle egg consumption in some areas and the restricted use of the breeding pool of mullet were management practices supervised by the chiefs (Siwatibau 1984: 368). In Naigani and in Nasomo, in Vanua Balavu, Fiji, the special fishing for which these villages are famous is conducted only if the master fisher (**bete**)

approves. These various limitations exemplify some of the different fisheries management measures used in the Pacific.

The most important form of marine conservation used in Fiji and elsewhere in the Pacific is the village ownership of an exclusive fishing ground extending to the outer reef, and the right to fish in any part of the reef or lagoon. In former times fishing area boundaries were clearly defined. But nowadays boundary determination is a major issue that requires formal governmental determination. Fishing within this area by outsiders is resented. A presentation of whale tooth (**tabua**) and kava (**yaqona**; *Piper methysticum*) is made to seek permission from the fishing ground owners (Kunatuba, 1983:48).

A fishing ground owner can, from time to time, declare a portion of his fishing ground out of bounds, in order to ensure a supply of fish for a particular purpose. In Fiji certain rituals relating to births, marriages and deaths performed in parts of the fishing grounds impose periodic prohibition on fishing in an area. People who bury the dead can use any section of the fishing ground (**qoliqoli**) for washing their hands and legs and the tools used at the burial ceremony. This section is then out of bounds (**tabu**), normally for one hundred nights, so as to provide enough fish for the food gift for the kin of the deceased (Ravuvu 1983).

In Qoma, much of the prohibition associated with fishing is related to the management of the fisheries. During fish drives, for instance, people are forbidden to eat, defecate, urinate or make unnecessary noise. The belief is that the fish will disappear if any of the prohibition (**tabu**) is broken. With turtle fishing, the traditional presentation of kava to summon turtle fishing (**sevusevu ni lawa**), is a means of limiting the catch and safeguarding the resources. Amongst the Islanders, it is believed that the ancestors will provide a catch only to meet the purpose for which the fishing is being done. During the presentation of **kava**, the particular purpose of the fishing should be clearly specified. A net cannot be used to fish for two purposes at the same time. People also believe that unless the fishers are righteous, they will fail to catch a turtle. This serves to limit turtling because some people have stopped seeking them after having been unsuccessful on many occasions.

The concept of a sacred fishing ground is widely observed. Fishing in such areas is strictly regulated, often conducted according to a prescribed code of conduct, and is enforced by beliefs of misfortune and mishap at sea. Permission to fish is sought in advance and noise kept to a minimum. The catch is restricted to subsistence and ceremonial uses only.

Major problems of traditional fisheries management systems

Most problems affecting traditional fishery management systems are associated with changes that are part of the commercialisation of fishing, especially the importance of cash, the modernisation of village life, pressures of urbanisation, and increasing population.

Traditional village fishers are capable of destroying fisheries resources, especially now that they have the physical capacity to over-exploit inshore marine resources. In Fiji the issue of licences inside the demarcated areas (IDA), in which the local chiefs are consulted, the control of effort and the development of other marine resources are features that can be abused easily, resulting in the depletion of fisheries resources within traditional fishing areas.

Traditional fisheries management systems can constrain national fisheries development. At present, the owners of traditional fishing grounds determine what to do with their resources. Decisions regarding the number of licences to be issued and the type(s) of fishing allowed in their areas are basically made by those concerned. At the national level this implies a need to ensure that all owners of fishing grounds make decisions that are consistent with the overall objectives of sustainable resource use. In some instances, neighbouring villagers have disagreed on boundaries to their sea areas. To reduce this type of problem, expensive boundary surveying and delimitation is required. Fishing ground owners should also be made aware that, according to national legislation, the state owns all the sea areas from the high tide mark. Ignorance of this has often resulted in problems in Fiji, because traditional fishing ground owners often do not understand the position of the state in allocating licences. Outsiders licensed by the government have occasionally been asked to explain themselves to highly suspicious traditional fishing ground owners. Further, fishing ground owners are beginning to demand increasing monetary compensation for the use of their fishing areas. Boundary disputes are likely to become common because of the implications and potential for resources ownership.

Management of fishing grounds is complicated by their common ownership characteristics. In most instances the state is now charged with the sole responsibility of managing the resource. Tradi-

tional fishing ground owners are taking the attitude of doing only as required when the enforcement officers are in the vicinity. For instance, dynamite fishing is still practised despite the many measures to prohibit it. Undersized fish are still sold unless violaters are apprehended.

Environmental disturbances of fishing grounds remain relatively minor in Fiji, and do not yet warrant particular management measures. Unless traditional owners have personally experienced the collapse of a fishery, they still believe in the inherent capacity of an ecosystem to regenerate, regardless of the effect of increasing fishing effort. It is ironic that even though fishers are travelling further from their villages to fish, they still do not acknowledge resource depletion in the nearer areas. Illegal fishing is becoming a major problem in traditional fishing areas close to the main population centres. In Fiji, there have been increasing reports of attacks on fishers from Suva caught operating illegally inside demarcated areas in Kadavu, Beqa, Lomaiviti, and Vanua Levu.

Management programmes must be adapted to different social and economic systems within the Pacific, and must be implemented before signs of depletion appear in the fisheries. The increased mobility of people and the decline of traditional authority make total reliance on traditional conservation methods alone inappropriate. Increasingly, fishers have little knowledge of traditional fisheries management practices. Nevertheless, it is important to note that traditional practices are perhaps still those best suited to managing Pacific Island fisheries. The system can accommodate socio-cultural conditions and be identified by most of those involved. Modification is required to ensure consistency and co-ordination with national legislation and policy.

Traditional fisheries resources management has a significant role to play in the Pacific, but it must be adapted to ensure its sensitivity to the local cultural, social and economic situation. The great deal of effort required to enable traditional resources management systems to address current management requirements can be readily justified.

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Recent publications and abstracts

Traditional Ecological Knowledge: Concepts and Cases, by Julian T. Inglis (ed.). 1993. Published by the International Program on Traditional Ecological Knowledge (Canadian Museum of Nature) and the International Development Research Center (IDRC). Price not stated. 142 pp.

The 13 papers in the volume were selected from presentations made in a number of special sessions on traditional ecological knowledge (TEK), held as part of the Second Annual Meeting of the International Association for the Study of Common Property, in Winnipeg, Manitoba, September 1991. The papers selected represent a wide range of perspectives on the nature of TEK. They explore the underlying concepts, provide case studies, and again confirm the importance and still unrealised potential of TEK in resource and environmental management.

Although none of the papers deals exclusively with the Pacific region, all are relevant to those working on TEK in the Pacific. The papers included are:

'Traditional ecological knowledge in perspective' (Fikret Berkes), 'International Workshop on Indigenous Knowledge and Community-based Resource Management: Keynote Address' (R. Wavey), 'The transmission of traditional ecological knowledge' (K. Ruddle), 'Integrating traditional ecological knowledge and management with environmental impact assessment' (R.E. Johannes), 'Find common ground: natural law and collective wisdom' (N.C. Doubleday), 'African indigenous knowledge and its relevance to sustainable development' (A. Lalonde), 'Community-based economic development and resource management in the Hudson Bay area' (M. McDonald and B. Fleming), 'Native land use and common property: Whose common?' (C. Hrenchuk), 'Stereotypes village economies and the Pinehouse harvest research' (T. Tobias), 'Astute observers on the sea ice edge: Inuit knowledge as a basis for Arctic co-management' (D.J. Nakashima), 'The Beverly-Kaminuriak Caribou Management Board: an experience in co-management' (P.J. Usher), 'Aboriginal people and resource co-management' (Lloyd N. Binder and B. Hanbridge), and 'Sami Fjord fishermen and the State: traditional knowledge and resource management in northern Norway' (E. Eythorsson).

For further information on the programme, and to purchase the publication, contact:

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Tel.: 1-613-998-9890
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The Politics of Exclusion: Indonesia fishing in the Australian Fishing Zone, by Bruce C. Campbell, and V.E. BuWilson. Published by the Indian Ocean Center for Peace Studies, University of Western Australia. Price A$ 20.00. 221 pp. + maps, illustrations and index. (Date of publication not indicated on the flyer received).

This study provides an analytical account of fishing in northern Australian waters by Indonesians. Three chapters provide the historical setting from 1669 to 1980. Other chapters cover environmental constraints on voyaging, species targeted (especially trochus and shark). The Australian response and the legal and political factors underlying it are examined. Research and policy implications are also discussed.

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The application of traditional rights-based fishing systems to contemporary problems in fisheries management – a focus on the Pacific basin, by Tom Graham. Abstract of a report submitted in 1992 to the Oregon State University as part of Master of Science degree. 47 pages + appendix.

Right-based systems for controlling the use of marine resources developed in many 'traditional' societies of the world – notably in the isolated island societies of the Pacific. These 'customary marine tenure' systems (CMT) have eroded or collapsed in many societies since the development of economic and other links with outside societies and economies. These collapses, however, do not preclude the possibility of reinvigorating or re-establishing modifications of these traditional systems in order to attain various objectives of fisheries management, including those associated with conservation, efficiency, and equity.

CMT systems may also be valuable in attaining some of the broader social and economic goals of nations, such as those associated with cultural preservation and economic development.

However, because the social and economic conditions underlying the original development of CMT systems may be substantially different from current conditions, the form and mechanisms of CMT systems may not be conducive to attaining contemporary management objectives.

Traditional management systems should therefore not be protected merely for the sake of cultural preservation. Rather, these systems may be substantially modified to ensure that they continue to function effectively. Codification of traditional law, for example, may be important not only in providing an adequate degree of security to fishing rights, but also in ensuring that CMT systems are flexible enough to adapt to the rapid pace of economic development.

Request for contacts & information exchange

M. Yves Renard, Executive Director, Caribbean Natural Resources Institute (CANARI), (Clarke Street, Vieux Fort, St. Lucia, West Indies) is interested in corresponding with members of similar NGOs in the Pacific Islands on topics of mutual interest to small island nations.

CANARI is a non-profit NGO dedicated to the protection and sustainable use of the natural resources of the Caribbean region. It operates throughout the region, and its work emphasises the special problems and needs of islands. CANARI's mission is to strengthen the capacity of Caribbean communities and their institutions to manage the natural resources critical to their development. It advocates and demonstrates the need for collaborative approaches to management, often referred to as co-management, and for increased community responsibility for decisions and institutions which affect the use of natural resources. CANARI undertakes research, information, training, and technical collaboration to achieve those goals.

Request for funding a research on traditional coastal management systems

We have received a letter from Mr Shankar Aswani, who is looking for a grant to undertake a project entitled 'Marine tenure and artisanal fishing in Roviana and Vona-Vona Lagoons: Evolutionary ecology of resource management'. A summary of his research proposal is shown below.

For more than a decade, both anthropologists and resource managers have been debating the role of indigenous marine tenure in the Pacific and its influence on resource use and conservation. Rapid population growth and inshore commercial development are now forcing us to find new ways to examine issues of marine tenure and conservation. This project proposes:

1) To record indigenous knowledge on fishing techniques and marine environments;

2) To investigate recent changes in marine tenure systems, and particularly how changing economic values and monetisation are impacting access rules and resource use patterns; and

3) To assess the relationship between territorial exclusion by individuals and groups and resource management and conservation.

The Roviana and Vona-Vona Lagoons, in the Island of New Georgia, Western Solomon Islands, are ideal sites to conduct this research. The lagoons exhibit various forms of marine tenure, ranging from unrestricted access in some parts of Roviana, to restricted entry in areas of the Vona-Vona Lagoon. This diversity of tenure management facilitates comparison of existing territorial strategies, and an exploration of the effects of territorial exclusion on resource use and conservation.

Information on indigenous knowledge of fishing and marine environments will be gained from open-ended and systematic interviews with elderly fishermen, and through observation of fishing. Likewise, marine tenure boundaries, or lack thereof, will be established through participant observation of fishermen and intensive interviews. Input-output and time allocation schedules will be collected from a set of randomly chosen households in both lagoons to determine participation in the cash economy. Finally, resource use patterns in different territorial regimes will be evaluated by testing Charnov's (1976) 'marginal value theorem'.

This study is significant in several ways. First, the collection of indigenous knowledge on marine environments can further our understanding of tropical marine ecosystems, and serve to preserve rapidly disappearing traditional knowledge. Second, this study will serve to evaluate the value of territoriality in managing and conserving aquatic resources, and establish whether economic benefits might actually result from territorial exclusion. Hence, the study will be significant for resource managers since the rigorous study of indigenous systems of marine tenure can provide alternative managerial models for the development of sound inshore fisheries management plans. Third, it will evaluate the utility of optimal foraging theory by assessing the use of Charnov's (1976) model in the analysis of fishing outputs, and its relation to resource management and conservation.

Mr Aswani can be contacted at the Dept. of Anthropology, Univ. of Hawaii, 2424 Maile Way, Honolulu, Hawaii 96822. Tel.: (808) 926-5080

Octopus fishing is women's work

By Henry O. Wright
Pacific Islands Monthly
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A Fijian legend has it that once a shipwrecked rat, when near to drowning was rescued by a kind-hearted, though wary, octopus.

The rescuer gave the rescued to understand in no uncertain terms that, as land was a long way off, he would bear his passenger thence, only if he first received and assurance that he was 'house broke' and a solemn promise that the land creature remembered his manners, keeping nature at bay until he was delivered safely ashore.

The promise was readily given, but alas, nature conquered, and at the moment the rat leapt ashore, the promise was broken. Like the elephant, the octopus never forgets!

Fijian mothers tell this story to their girl children, for it is by reminding the octopus of the false land creature that 'did him wrong,' that the fisherwomen are able to catch this most welcome of seafood delicacies.

A species of sea-shell, the kauri, with its dark mottled colouring and somewhat rat-body shape, is punctured here and there and lashed securely to a reed or tough willow wand, the appearance of the finished article having a fair resemblance to the octopus world's Public Enemy Number One.

Armed with this, and with her coconut-frond plaited waist-basket, the fisherwoman is ready for the fray. Together with others (she believes in 'safety in numbers') she proceeds reefwards, by canoe if the reef is well off-shore, or swimming there, if nearby.

Once on the reef, she begins searching in waist-deep water for likely holes in the coral which may house the prey. (I repeat, 'prey'!) Now she brings her makeshift rat to work, thrusting it rapidly in and out of the hole. Faint rat-squeak sounds are made as the water drives the air out through the holes in the shell, and should that particular hole house a 'Quita', it wastes no time in making a move to even up old scores.

First one tentacle then another, reaches out searchingly in waving eagerness, followed quickly by others that become longer with each hopeful movement. Soon there are five or six feelers, searching, hoping, remembering, in wild abandon, then lo, eureka! one is gripping, slimily-tight, onto 'the thing,' at the same time sending frantic messages to headquarters for support which almost immediately is forthcoming.

It is a matter of seconds only before five or six of the octopus's eight tentacles are glued firmly around, not the 'furry falseness', but now the woman's clenched fist and forearm - at the right moment she has substituted her arm for the squeaking shell, this being when she perceives her family's prospective dinner hasn't more than a 'leg or two' to stand on. She begins to feel the needling pain of blood about to be drawn through the skin, as the scores of suction cups that line the tentacles begin their work, and she tenses herself. This is it!

Heaving backwards she tears the creature forth into the clear. Swift and true her other hand thrusts into the bag-like head, and gripping firmly on slimy flesh, is withdrawn, pulling the head inside out. It is over. The octopus is at once a limp paralysed slipperiness, ready for the basket.

For some minutes after, the woman's arm sports a hundred or more small pinkish spots, where the suction cups had been busy. She hopes that before she returns there will be a moderate soreness where there is now only a tickling sensation, for then her basket will be heavy, and later, her family pot full.

The average size of her catch, measured by tentacle length, will be about four feet long, for she is wise enough to leave the larger ones alone.

Now and then, one finds an old hand at the game, wearing a scar necklace to show that she was one a tenderfoot, and probably only because she was assisted by other fisherwomen, is she around to show off her 'jewellery'.

This method of octopus fishing is, oddly enough, recognised to be one of the few which womenfolk only are allowed to practise. Others, such as prawning, crabbing and clam digging, are also 'sissy' and very definitely unworthy of a Fijian fisherman's time.