



**Resource Management in Asia-Pacific**

**Working Paper No. :47**

**Privatising Fish? Barriers to the Use of Marine Protected  
Areas for Conservation and Fishery Management in  
Melanesia**

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The correct citation for this publication is:

Authors: Simon Foale and Bruno Manele

Year of Publication: 2003

Title: Privatising Fish? Barriers to the Use of Marine Protected Areas for Conservation and Fishery Management in Melanesia.

Series: Resource Management in Asia-Pacific Working Paper No. 47

Publisher: Resource Management in Asia-Pacific Program

Research School of Pacific and Asian Studies

The Australian National University

Place of Publication: Canberra

ISSN – 1444-187X

## **Resource Management in Asia-Pacific**

### **Working Papers**

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# Privatising Fish? Barriers to the Use of Marine Protected Areas for Conservation and Fishery Management in Melanesia

## Abstract

In this paper we examine the strengths and weaknesses of state-supported Customary Marine Tenure (CMT) systems in two independent Melanesian states in the context of burgeoning commercial and subsistence fisheries. Both Papua New Guinea and Solomon Islands can be categorised as “weak states” where access by foreign-owned fishing companies to state-owned resources (e.g. tuna) is typically easy to obtain by bribing the relevant politicians and bureaucrats at national and/or provincial level. By contrast, access to near-shore fishery resources necessitates negotiation with the landowners of adjacent coastal zones, and this in itself can provide some level of resource protection. However the expansion of markets and rapid increases in populations in the region are exerting pressures on subsistence and commercial fisheries that are already creating significant problems. In the Solomon Islands the recent collapse of the state in a militia coup has also meant that any escalation in marine resource piracy is likely to proceed unchecked and indeed in many cases unnoticed and unreported. The management tool of choice for multi-species fisheries across the world, and particularly in cash-poor developing countries is the Marine Protected Area (MPA), and this system has proved quite successful in many instances, particularly in rich, industrialised countries. However, with some exceptions, typical Melanesian CMT regimes make MPAs difficult to establish because many coastal zones are finely divided along clan boundaries, such that few clans would be willing to “lock up” their own reefs for the benefit of neighbouring clans. How then can local communities in these countries most effectively manage their marine resources in an environment of escalating fishing pressure and weak governance? In this essay we analyse the social and institutional contexts of near-shore community-based fishery resource management, and explore options for the future. We look at the potential utility of educating reef owners about aspects of the life cycle of marine organisms that are mostly absent from local knowledge systems and how this information could empower villagers to better formulate their own management regimes.

## Introduction

All over the world fisheries are collapsing (Hutchings 2000, Pauly 1995, Pauly *et al.* 2002, Myers and Worm 2003). In fisheries parlance, what is happening is referred to as “recruitment failure”, or “recruitment overfishing” (Cushing 1981, p.143). In a given population of fish, if an excess of fishing pressure removes too many breeding adults, the population’s capacity to replace itself is undermined, and numbers crash. This is what finally happened, after more than 500 years of heavy fishing, in the late 1980s to the Grand Banks cod fishery off the Atlantic coast of North America (Cook *et al.* 1997, Kurlansky 1999). In the Asia-Pacific the problem is exacerbated by the fact that in some places, desperate fishers, chasing the dregs of already severely depleted fish stocks, are resorting to a range of destructive fishing techniques, such as blast-fishing, that destroy entire ecosystems. This only exacerbates the problem by increasing the amount of time it will take for the system and the fishery to recover (Pet-Soede and Erdmann 1998, Fox *et al.* 2003). Given the failure of the classical maximum sustainable yield (MSY) models to effect management even for many of the ecologically simpler temperate fisheries (Spurgeon 1997), and the difficulty of enforcing quotas and related management tools due to the weakness of the state apparatus in most countries of the Asia-Pacific region, the management tool of choice now appears to be the Marine Protected Area (MPA), or Marine Reserve (Jones 2001, Willis *et al.* 2003). In theory, no-take MPAs act as a hedge against large-scale fishery collapse by exporting both larvae and adults to neighbouring fished areas. While there are many more publications extolling the theoretical virtues of MPAs than those documenting scientific evidence of their efficacy (Willis *et al.* 2003), there are now enough empirical

studies validating the theory for existing MPAs (Alcala and Russ 1990, Russ and Alcala 1996, Roberts *et al.* 2001), that support for the idea is almost universal.

An MPA can only be regarded as successful if the fishery yield *outside* of the MPA can be demonstrated to increase. Increases in density or average size of target species *within* any area closed to fishing are virtually inevitable over time (unless the entire region has been completely fished out), but if this build-up of the stock is then reversed as a result of the closed area being opened again for fishing, this defeats the whole purpose of the exercise, i.e. that the larger reproductive potential of the stock inside the reserve benefits the neighbouring unprotected areas through the above mentioned spill-over effects (Jennings 2001, Valles *et al.* 2001). This important point will be discussed again below in relation to so-called traditional conservation practices in Melanesia. An important advantage of MPAs in tropical latitudes is that they protect whole coastal zones, not just populations of a single species (Jones 2001, Gerber *et al.* 2003). Given the immense diversity of Indo-Pacific fisheries (Wright and Hill 1993, Dalzell *et al.* 1996), and the obvious need to protect coastal habitats from destructive fishing methods, this makes good sense.

Here we review some of the institutional and cultural barriers to the effective implementation of MPAs in the Independent Melanesian states of Papua New Guinea (PNG) and Solomon Islands, and we single out one particular case study for more detailed attention. We begin by taking a close look at the difficulties of establishing MPAs on coral reefs and coastlines held under Customary Marine Tenure (CMT). We then discuss the difficulties inherent in the propagation of an ethic of “husbanding” of resources in a region where powerful cultural norms militate against it, and the low human population density<sup>i</sup> means that people have only just started to come up against their limits in terms of marine resources. Throughout most of coastal PNG and Solomon Islands, subsistence fisheries are not yet under anything approaching the kind of pressure they are under in many parts of South-East Asia.

On the other hand, certain small-scale commercial (artisanal) fisheries, such as trochus shells (*Trochus niloticus*) and beche-de-mer (sea cucumbers or “Trepang”) are either chronically overfished or comprise “boom-bust” fisheries (Foale and Day 1997, Kinch 2002). Pressure on fin-fish is also set to be increased by the opening up of markets for these commodities via developments such as the AusAID-sponsored wharf project in PNG, and the Southeast Asian Live Reef Fish trade. There are also emerging hotspots, such as Langalanga Lagoon on Malaita, Nggela, Marovo Lagoon (all in Solomon Islands), and the small islands to the west of Buka (PNG), where dynamite fishing, or “bombing” is degrading reefs, and their associated fisheries. The recent failure of the state in Solomon Islands following a militia coup in June 2000 has meant that most of the existing (already weak) management capacity of the government has now evaporated, and the only remaining management capacity is what can be exerted at the market end (e.g. size limits, or quotas on particular species)<sup>ii</sup> or at the community level.

Husbanding marine resources is in fact conceptually no different from husbanding money; indeed conservationists and resource management advisors often compare marine resources to money in the bank, imploring reef owners to try to harvest only the “interest” (i.e. sustainable yield), and not to eat into their capital. But capitalism has mostly failed spectacularly in Melanesia<sup>iii</sup>, and an understanding of the reasons for this is important if we are to have a clear vision of the challenges for fishery management in the region. Hernando de Soto (2000) has presented compelling explanations of why capitalism has failed in Latin America, the former Soviet Union and a number of other third world countries, but both his explanations and his solutions are in our view inappropriate for Melanesia. de Soto dismisses the significance of cultural factors for his case studies while we assert that they are paramount. We discuss this in more detail later in the article.

The *geographic scale* at which the stock-recruitment relationship operates varies enormously among the many species that are of commercial or subsistence importance in Melanesian near-shore marine habitats. The scale of the relationship is strongly related to the dispersal range of the planktonic larvae of each species. The vast majority of the marine organisms under consideration here reproduce by releasing eggs and sperm into the sea, whereupon external fertilisation takes

place, and the eggs develop into microscopic larvae that drift about in the currents for a period of time, after which they swim down to the sea bed (assuming they are over a sea-bed when they are ready to do this), and metamorphose into miniature versions of the adults.

It is the distance that larvae are dispersed away from their parent population that is of primary concern to our case here, because it determines the scale at which the stock-recruitment relationship operates, and hence the scale at which management must also be effective. Dispersal distance is roughly related to the time that larvae spend in the plankton (Shanks *et al.* 2003), though we shall presently show that this is not a strictly linear relationship for many species. Larval longevity is, nevertheless, known for many species. The larvae of trochus shells (*Trochus niloticus*) for example, can survive for about three days in the plankton, before they run out of food (they live entirely off the yolk they inherit from the egg) and must settle and metamorphose (Heslinga 1981). They probably disperse on a scale of hundreds of metres to tens of kilometres, depending on current regimes, bottom topography, and a number of other factors. The larvae of the Ornate Rock Lobster (*Panulirus ornatus*) on the other hand, can feed on microscopic algae while they are drifting in the plankton, and can survive at sea for up to a year (Pitcher 1993). As a result they can (and usually do) end up being carried many hundreds of kilometres from their natal reef (Dennis 2001).

The situation for reef fish is more complicated and a very large amount of research effort has been focussed on larval fish dispersal over the past decade or so (for a review see Mora and Sale 2002). Despite the potential for most reef fish larvae to disperse distances of tens to hundreds of kilometres (Cowen 2002), a number of studies show that the larvae of many species of reef fish behave in ways that maximise their retention close to their natal reef (Jones *et al.*, 1999, Swearer *et al.* 1999, Leis 2002). Several other factors may also contribute to a higher level of “self-recruitment” for larvae of marine fish and invertebrates than would be predicted if larval longevity alone were the sole criterion for dispersal distance (Sponaugle *et al.* 2002). However Mora and Sale (2002) argue that there is still not enough information to be dogmatic about whether fish populations are “closed” or open (moreover the scale at which populations are regarded as “closed” varies considerably), and that most are probably partly self-recruiting and partly open – the relative proportions of each being largely unknown.

These biological issues are highly relevant to the potential success of the MPA as a management tool. This is because the geographic scale of stock-recruitment relationships must coincide, more or less, with the scale of CMT in Melanesia if the MPA concept is to gain political acceptance at the community level. Both land and marine tenure<sup>iv</sup> in Melanesia are highly fragmented, i.e. the coastlines of many islands can be quite finely divided among separate clan or tribal groups, which we will call polities. The fishing rights of most coastal Melanesians for the most part do not extend much beyond the boundaries of their polity’s territory. If they do, they are usually not as strong, or as frequently exercised, as the rights they enjoy close to home<sup>v</sup>. The sizes of the territories of most coastal polities, in terms of coastline, are on a scale of hundreds of metres to a few kilometres (for examples see Aswani 2002, Hviding 1996, Foale and Macintyre 2000).

We therefore encounter a serious political problem if a fished stock is not predominantly self-recruiting within the CMT boundaries of a given polity, i.e. if larval longevity, behaviour, and the prevailing current regime means that the majority of larvae produced within one group’s coastal territory disperse out of that territory and recruit (i.e. settle) into the territories of neighbouring or even distant groups. What this means in economic terms is that even if the custodians of a given coastal territory choose to close part of their coastline to fishing, on a permanent basis, following the MPA rationale presented above, this does not guarantee that their sacrifice will be rewarded by an increase in recruitment, and therefore fishery production, within their own territory. Indeed for most species of fish, the majority of larvae recruiting to a given territory are likely to have come from other territories. As such, there would appear to be little reason for any one CMT polity to embrace the MPA as a management tool, unless all other groups were doing the same.

Those of us who have already spent some time working on marine resource management in Melanesia have predictably already jumped ahead of this particular issue (though not forsaking

customarily-owned coastlines altogether, as we shall discuss below), and have shifted some of our attention to coastal zones *not* under customary ownership. In Solomon Islands around 15% of the land in the country is not under customary ownership. This category of land includes the Arnavon Islands, between Choiseul and Ysabel Islands in the Solomons, where The Nature Conservancy (TNC) has been working on an MPA for over a decade now. A substantial fraction of this so-called “alienated land” also includes the island of Gizo, and a number of small islands around it. The island of Gizo is where the administrative capital of Western Province, Gizo town, and the headquarters of the World-Wide Fund for Nature’s (WWF) Solomon Islands Country Program are located (Figure 1).

### **The Gizo Marine Protected Area Project**

In the late 1990’s the WWF Solomon Islands Community Resource Conservation and Development Project (SI-CRCDP) commenced an initiative to establish MPAs at a number of sites around the island of Gizo. The sites chosen are marked in Figure 2. The three islands (“Hotspot” is a submerged reef) are all alienated land, owned by the government, except for Njari Island, which is privately owned. Kennedy and Njari Islands, and Hotspot were chosen partly for their aesthetic value, and popularity as tourist dive sites. The reefs at Njari and Kennedy Islands are now known to support spawning aggregations of *Epinephelus* and *Plectropomus* species of groupers. Although marine conservation work was proceeding in other locations in the Western Province (most of them customarily owned), the primary motivation for this work was a response to the above-mentioned obstacles to establishing permanent closures on customarily owned reefs. Despite this assumption, recent research findings arising primarily through a process of engagement with various community groups by one of us (BM) has unveiled a new set of complexities, which we shall outline here.

The majority of land on the main island of Gizo<sup>vi</sup>, as well as the surrounding small islands, was alienated from the original customary owners by the British colonial administration around 1900. A small section at the western end, encompassing three villages, is still under customary ownership and is inhabited by people from the neighbouring island of Vella Lavella to the northwest. These people claim to be the descendants of a handful of refugees who fled from an attack by warriors from New Georgia Island (to the East), possibly some time in the 19<sup>th</sup> century<sup>vii</sup>. When the British colonial administrators first came to Gizo they found it depopulated as a consequence of this raid, which undoubtedly made it easier for them to acquire it from the few remaining inhabitants. There is some doubt as to whether the island was in fact paid for in the same manner (tobacco, axes, boats) as other alienated pieces of land in the country.

For this reason, among others, a number of Gizo people are presently asserting their rights over portions of alienated land as part of a push for a reversion of title to customary ownership. Indeed this desire has been expressed by many groups across the Solomon Islands, and was supported (in theory at least) by Bartholomew Ulufa’alu’s government, which was removed in the June 2000 militia coup. Unfortunately the patterns of migrant settlement subsequent to the original alienation, which were in part engineered by the colonial administration, mean that reclaiming all of the alienated land will now be quite difficult. Several villages on alienated land, including one of the small neighbouring islands (Babanga) are inhabited by people, originally from Kiribati (formerly known as the Gilbert Islands, another former British colony), and their descendants. The colonial administration relocated them from overcrowded and drought-stricken Kiribati atolls between 1955 and 1971 (Bennett 1987, p.323). On the outskirts of Gizo town there is also a village of settlers from the island of Malaita (eastern Solomons), and there are another three villages populated by people from the island of Simbo (to the south). All of these newcomers are heavily dependent on the marine resources of the reefs around Gizo Island for both subsistence and cash.

In addition to the customary landowners at the western end of Gizo, there are other people staking claims over portions of alienated land on Gizo island. People from Simbo are basing their claims on the fact that many of the names of small islands, and places on Gizo Island, are Simbo names. Another group from Marovo Lagoon claim that they are descended from a woman who was originally kidnapped from Gizo prior to the raid that depopulated the island (McDougall {2000} analyses similar dynamics for the neighbouring island of Ranongga). And one family, originally

from Roviana Lagoon, who are living on another customarily owned block of land, are also defending their rights to that land.

These claims illustrate the complex and flexible nature of customary land tenure in the Solomon Islands and Papua New Guinea. People can stake claims to land on the basis of inheritance, knowledge of sacred sites, and the amount of improvement they have done in the form of planting trees, building houses, or creating other lasting and useful features (Foale and Macintyre 2000). Marine tenure can be even more complex, particularly for geographically complex areas such as large lagoon systems (Hviding 1996, Aswani 1997, 1999, 2002). For Ponam Island (off Manus, PNG), Carrier (1981, 1982) described highly elaborated tenure systems, which included exclusive rights over types of fishing gear, fish species, and seasons as well as locations.

Despite the fact that most of Gizo Island, and the surrounding small islands, is alienated land, the Lands Department in Gizo has now ruled that all of the reefs around Gizo, and the small islands, are held under customary ownership. This decision, whether it is based on the Lands Department's interpretation of the law, or the outcome of negotiations with landowners, essentially defeats the purpose of the exercise as far as WWF's original intent of finding reefs that are not customarily owned, which could therefore be closed to fishing, assuming consent from the leaseholder(s) could be obtained. It should be noted at this point that the law relating to ownership of the foreshore and seabed in Solomon Islands is still rather confused and ambiguous<sup>viii</sup>. Kabui (1997) has presented a thorough analysis of the legal rights of Solomon Islanders over the foreshores and reefs claimed under CMT. He concludes that:

The introduction of the common law of England in 1893 does not take away customary rights of ownership of the foreshores and reefs, depending on the facts of each case and proof of the existence of customary rights of ownership. (Kabui 1997, p. 141)

Perhaps it could be argued in this case, that the customary rights over the reefs by the former customary owners of those alienated islands selected by WWF are still in effect, even though the land has been registered and the title is held by another party. However, given the legal precedents that Kabui details in his article (in which customary claims over foreshore and sea-bed mostly lost to the government), if it came down to a court case over each reef, there is no guarantee that the people presently claiming customary ownership over those reefs would win. On the other hand, customary rights over the seabed have been respected by the pole-and-line tuna industry in both Solomon Islands and PNG, as evidenced by the regular payments of baitfish royalties to landowners adjacent to lagoonal bait-fishing grounds by foreign-owned commercial fishing companies (Turner 1994, Hviding 1996 pp 321-325)<sup>ix</sup>.

The situation at Gizo Island is further complicated by the fact that for some years people from neighbouring islands such as Simbo, Ranongga, Vella Lavella, and Kolombangara, as well as the resident Gilbertese, have been selling fish, mostly caught on reefs around Gizo Island, at the thriving fish market in Gizo town. Whether any of these people would be prepared to defend their rights to fish on these reefs against claims to customary ownership by the customary landowners resident at the western end of Gizo, or by others, is yet to be seen. At present the amounts of money involved in marketing reef-fish in Gizo town are probably not sufficient for conflicts over fishing rights to erupt into disputes. However, the present lease-holder of Njari Island, who happens to be a non-indigenous diving tourism operator, is taking diving tourists to the reefs around Njari and Kennedy Islands, as well as Hotspot, and would continue to derive income from this activity after those reefs were closed to fishing. This prospect has apparently generated some expressions of annoyance from various groups around Gizo, including the customary landowners at the western end of the island. This raises a number of complicated social issues relating to the difficulties most rural Solomon Islanders (and Papua New Guineans) have with capitalist enterprise, in addition to the important ways in which changing economic contexts influence the ways in which Melanesians think about property rights. These will be discussed in detail below.

The original assumption was that the government was likely to be the leaseholder for most of the islands (and surrounding reefs) earmarked for protection (Fig. 2), and the process ought therefore



to be relatively easy. But WWF's project was set in train several years before the militia coup, at a time when the courts and the government bureaucracy functioned relatively well. Many government officers have been made redundant at the time of writing, and the court system has collapsed into corruption and dysfunction<sup>x</sup>. This further underscores the importance of consideration of the "weak state" factor in the equation. Now, even if the government could be shown to have tenure over the designated reefs and islands, and could be persuaded to designate the reefs as permanent no-take zones, *governmental* capacity for enforcement of fishing prohibitions in these zones would be essentially non-existent. On one of the islands, Nusa Tupe, prohibitions on fishing are already enforced by the resident staff of the Worldfish Centre research and aquaculture facility, with assistance from their fierce dogs. This cannot feasibly be replicated for the other islands at present.

Despite these specific barriers to the easy implementation of no-take MPAs in the Gizo area, we are certainly not advocating that this strategy be abandoned in the future. The MPA at Arnavon Islands has a promising future, and in Milne Bay Province in PNG, Conservation International are presently negotiating to obtain leasehold over an island in the Conflicts Group, for the purposes of setting up an aquaculture operation as well as facilitating the enforcement of fishing closures in the area (Jeff Kinch, Pers. Comm.). Potential for a similar strategy may also exist in the Russell Islands, in Central Solomon Islands, where there are also large areas of alienated land, now owned by the government. However this path is clearly not the answer if we pull back to look at the big picture. Even if there are successes with government-backed or privately owned closed areas in Milne Bay Province or Russell Islands, these are small specks in a large area which is rapidly coming under more and more pressure as human populations burgeon, markets expand, and global warming-induced coral mortality threatens. Should we be looking at another approach? Can management be effected without the use of permanent closures, and if so, how?

### **Why Traditional "Management" Doesn't Work in Melanesia**

Throughout most of coastal Papua New Guinea and Solomon Islands there exists a system of periodic fishing closures, usually on inshore reefs, and this is normally referred to in Solomon Pijin or PNG Tok Pisin as a *tambu*. It involves the closure of fishing (and the closure may not even apply to all species) on a particular stretch of coastline for a specific period of time, usually from a few months to a year or in some cases a few years (on average less than a year), and might be advertised by the erection of a stick on the reef crest. The closure is quite often associated with a death within the clan that owns that stretch of coastline and is a ritual component of a cycle of feasting associated with that death, though this is by no means always the case (Polunin 1984, Foale and Macintyre 2000). The closure is often announced by an influential member of the clan, or by a member of the clergy, and it can often include the proclamation of a conditional spell or curse. The rationale for this is that if somebody violates the closure by fishing before the *tambu* is lifted, they run the risk of sickness, or falling victim to sorcery-induced misfortune that might involve severe injury or death. The level of respect for a *tambu* can therefore often be a function of the reputed magical powers or sorcery prowess of the person who made the conditional spell.

Be that as it may, the value of the *tambu* as a management tool for fisheries has significant limitations, despite the tendency for some romantically inclined (or politically correct) researchers to advocate it as the ideal management tool for Melanesia because of its perceived cultural appropriateness<sup>xi</sup>. The problem with the *tambu* system is that the closures are almost always opened again, usually after less than a year, and the accumulated stocks of many species, particularly benthic invertebrates, are then removed, often with alarming efficiency (Foale and Day 1997). *Tambus* are essentially a means of stockpiling resources, often for a specific purpose, such as a (funerary or other) feast; they have nothing to do with maximising and sustaining yields. If fishing pressure is high, stocks of most fished species can be severely depleted, despite the use of periodic closures using the *tambu* institution. Long-lived species are more disadvantaged than short-lived ones, since their populations take longer to recover. If the typical length of a *tambu* is a year or less, then most species of invertebrates and reef fish are vulnerable to overfishing. If the majority of customarily owned reefs in a given region are over-harvested, then rates of recruitment will gradually slow down over time, and fishery productivity will decline. For this reason, *impermanent* closures such as the

*tambu* system cannot be relied upon to prevent depletion and inevitable recruitment failure of subsistence and commercial fisheries in Melanesia.

The problem in our view is a cultural one that has as much to do with fishery management as it has to do with the difficulties the majority of Papua New Guineans and Solomon Islanders have with capitalism. Fishery management is so akin to capitalism it is worth some discussion here. As mentioned in the introduction, a fished stock is indeed like money in the bank – the more you have, the more interest it generates. Analogously, if a fished stock is large and healthy, it produces a lot of fertilised eggs, and high rates of recruitment (at the geographic scale determined by the distances that larvae disperse). High rates of recruitment eventually translate into higher yields. The optimal harvest strategy therefore, on the scale at which a stock is self-recruiting, is a compromise between maximising the catch and maximising the reproductive potential of the population. All of this can be and often is modelled mathematically (e.g. Foale and Day 1997), assuming enough information about the stock is available (Foale 1998). However most of this information is usually not available, and in developing countries such as PNG and Solomon Islands it would usually be difficult or impossible to obtain (Johannes 1998). Therefore such yield-based approaches are for the most part too costly and time-consuming to bother with. More importantly, the very *idea* of maximising and sustaining yields, for fisheries at least, is one that does not appear to have a lot of traction in many parts of coastal Melanesia<sup>xiii</sup>. There are important insights to be gained on why this is so by looking at the social context of the many failures of capitalist business enterprises in the region.

In an insightful and immensely useful analysis of small business development in Papua New Guinea, Sally Brooks (1996) looks at the cultural reasons for the failure of the majority of small business efforts in that country. She points out that one of the key barriers to the accumulation and maintenance of capital, whether it is in the form of assets or cash, is social pressure on the would-be entrepreneur to be seen to be generous, which is inevitably achieved by redistributing accumulated wealth among their kin and/or the community. This pressure is intense, and is greater for individuals who have, or aspire to have, high status<sup>xiii</sup>. In addition to this, Brooks emphasises the *cyclical* nature of traditional forms of communal cooperation, and contrasts these with the linear kind of cooperation necessary in a Western model.

In a PNG community, cooperation can be visualised as cyclical. Very high levels of cooperation are required, planned for and achieved, for a single event or goal (e.g. feast, brideprice ceremony). After this goal is achieved, the level of cooperation falls, temporary alliances break down and village communities naturally fragment into the smaller units that are more meaningful for daily living. (Brooks 1996 p. 8).

One way of looking at this is to consider the Tok Pisin word **bisnis**. People talk about *doing bisnis* as opposed to *having a bisnis*. **Bisnis** is an activity (possibly on a single occasion). Western business, on the other hand, is seen as something which exists apart from the person. In rural PNG, a **bisnis** [that] achieves a set goal, then ceases to exist *is a success*. (Brooks 1996 p.11; her italics and bold).

This analysis is just as appropriate for the *tambu* institution used for reefs as it is for the behaviour of business entrepreneurs. The *tambu* is a cyclical process of accumulation and redistribution - “saving” and “spending”. The crucial aspect is the impermanence of the accumulation. Cycles of redistribution of wealth as a means of obtaining status are a common pattern in many parts of coastal Melanesia. Many foreign aid-assisted development projects collapse because those managing them come under pressure to redistribute assets and/or operating capital to relatives or other members of their community. Profits are routinely spent on consumption rather than reinvested or amortised. On the island of Lihir in New Ireland Province, PNG, where a large foreign-owned mining company is attempting to foster economic independence from mining revenue among the landowning community, exactly the same sorts of patterns are visible<sup>xiv</sup>. The company’s agriculture department subsidises day-old chicks and chicken feed for landowners who are interested in running poultry businesses. Of the few that succeeded in 2002 (i.e. they grew the chickens to maturity and sold them for a profit) most did not go on to continue running the business. They tried it once, it worked and they shifted their attention to other activities.

The reason this sort of behaviour is viable in PNG and Solomon Islands, compared to many parts of Southeast Asia, is that the population density is still low enough that most people do not depend for their survival on the success of a business. If and when businesses fail, most people know that they can still eat – the subsistence base is still carrying people in most parts of these countries. That powerful cultural resistance to the sustained husbanding of accumulated material wealth is contingent upon the capacity of the environment to continue providing. However this will not be the case forever.

Hernando de Soto's (2000) analysis of why capitalism has failed in many developing and former communist countries is centred on property law. He argues that legal systems in these countries (and he does not specifically include any Melanesian or Pacific states among his examples) need to be restructured so that people's rights to their property can be formalised, thus enabling property to be used as collateral for low interest loans and such, that would enable them to start businesses and gain entry to the market economy. If he were including Solomon Islands and PNG in his analysis, he would almost certainly be arguing for land registration. This is undoubtedly one of the most controversial and hotly debated issues in the history of both countries. University students rioted twice in Port Moresby and in urban centres across PNG, in 1995 and 2001, in protest against World Bank-driven moves to register land in PNG (Filer 1997, 2000 pp. 32-33). Customary land tenure in PNG and Solomon Islands is immensely complex, flexible, and open to multiple interpretations, particularly when economic contexts are transformed by development projects (Ballard 1997, Holzknacht 1999, Ploeg 1999, Foale and Macintyre 2000, Jorgensen 2001). It has also been extensively studied and described by anthropologists and other intellectuals, both foreign and national, in both countries (Larmour 1979, 1991a, 1997, Sullivan 2002). The idea that land can be easily and quickly registered and that this will facilitate an immediate and successful engagement with the global market, while fondly embraced by economists and bankers alike, is not supported by historical or anthropological evidence to date.

But more importantly, as Sally Brooks' work illustrates so clearly, even if land were registered, and people were happy about it, mortgaging land against a loan for a business has an obvious risk. Given that the vast majority of businesses will inevitably collapse, for the reasons Brooks has outlined, what would happen to the land? The worst-case scenario is that it would become the legal property of the banks and people would be forced into peri-urban shantytowns around the bigger towns of Honiara, Port Moresby, Lae and Madang, where they would have nothing to sell but their (mostly unskilled) labour, in an economy where there is little demand for it. However at present the danger of this outcome does not seem to be all that great, for PNG at least, for a variety of reasons including a number of clauses in the Land Tenure Conversion Act (1963), and various other legal mechanisms which limit the freedom of landowners to mortgage or sell their land (Fingelton 1991, Larmour 1991b, McKillop 1991). In any case, de Soto's (2001) solutions fail to deal with the cultural complexities embedded in Melanesian tenure systems, which are also in many ways inextricable from the other cultural obstacles to capitalist enterprise that we have outlined above.

It is the commodification of land, trees, reefs and fish that underpins the majority of conflicts over property rights in Melanesia, but there also appears to be no way of avoiding the increasing engagement of Melanesian landowners and fishers with the global market, despite the crushing handicaps it imposes and escalating inequalities it generates (Macintyre and Foale, in press). As human populations burgeon and markets expand, or new ones open up, densities of fished stocks will continue to decline across the region. The traditional stockpiling model (the *tambu*), in its current incarnation at least, will inevitably be recognised as ineffectual as a management tool, for the majority of species. In some places this has already been demonstrated (Foale and Day 1997).

However some species, such as the mangrove bivalves *Polymesoda* spp. and *Anadara* spp., which have relatively short-lived larvae that are predominantly self-recruiting within customary tenure boundaries<sup>xv</sup> (Tawake Pers. Comm.), may well prove to be a notable exception. Work in Fiji (Tawake *et al.*, 2001) and the Solomon Islands (Aswani and Weiant 2003) indicates that community-based management using traditional temporary closures is facilitating recoveries of stocks of these species. However the very short dispersal distance of these species is what makes them an

exceptional case in this respect, and these successes should not be hailed as indicative of potential successes for species with larger dispersal distances. On the other hand, such situations provide excellent educational opportunities for stock-recruitment processes, particularly considering the many factors that can potentially delay post-closure recovery for many other species, and the difficulties involved in quantifying it (Jennings 2001).

In the absence of MPAs or some other form of proper management for most of the fished species with longer-lived larvae, the rate of recruitment throughout the region will in all likelihood continue to slow down, and the use of temporary closures will do little to mitigate this decline. There will still be fish to catch, but they will be fewer and smaller (Pauly *et al.* 1998; Hamilton 2003), and their reproductive output less. Yields will continue to decline. The steady decline in size and abundance of many fished species is amply substantiated by anecdotes from elderly fishers in the Pacific (Foale 1998, Johannes *et al.* 2000, R. Hamilton Pers. Comm.) and by a large body of historical, archaeological and ecological evidence in other parts of the world (Jackson 2001, Jackson *et al.* 2001). However as the elders die, and much of their knowledge is lost with them, we are also likely to see a shift in what is perceived as a “healthy” fishery – i.e. Daniel Pauly’s shifting baseline syndrome (Pauly 1995).

### Ways Forward

While fishers all over the world complain about how there are less fish now than there used to be, relatively few of them seem willing to connect their own activities to the problem. But this is exactly the issue that fishers in Melanesia must be engaged about if the current decline in fishery stock densities is to be halted or reversed. The threat of coral bleaching (Hoegh-Guldberg 1999, Wilkinson 1999) will only exacerbate the problem by adding additional stressors to the system, which will further extend recovery times (Hughes and Connell 1999, Hughes *et al.* 2000) for both reefs and fisheries. In the meantime Western environmentalist concerns about extinction (Roberts and Hawkins 1999) have led to a preoccupation among the big international environmental NGOs with “fencing off” the most “globally important” reefs and coastal zones<sup>vi</sup> within MPAs as soon as possible. This move has so far failed completely to consider the fact that the vast majority (if not every last one) of customary reef owners are unlikely to be convinced about, or even interested in, the “global importance” of their reefs, and in all likelihood will be less than happy about closing them off to fishing just to please the foreign environmental NGOs’ concerns about species extinction (Foale 2001). More recent discussions of the factors that impart resistance and resilience to bleaching-induced coral mortality (West and Salm 2003), while they deal with issues of greater relevance to fishery production, also focus on singling out optimal locations for further protective management (i.e. MPAs) and therefore face similar obstacles.

What is needed most urgently in Melanesia is a well-funded, long-term and broad-based educational campaign that explains in as much detail as possible the relationship between stock density and recruitment strength for the relevant fisheries, including discussions of the scale at which the stock-recruitment relationship occurs for each species, and the problems that customary tenure territoriality poses for a closure-based approach to management. Most rural Melanesians have no idea of the existence, much less the biology and behaviour of pelagic larvae, or the link between overfishing and recruitment failure. The fact that recruitment for most marine species occurs at a scale considerably larger than that of CMT boundaries is a highly problematic issue if MPAs are to be pursued as the only means of management. Permanent closure MPAs will probably only be viable where ownership of reefs is not communal *and* the owners are happy to close their reefs to fishing. In practice this is unlikely to be a common opportunity in either PNG or Solomon Islands.

Education programs should involve communities, particularly high-school aged youth, in stock assessment and reef monitoring work, as part of well-structured environmental education modules aimed at primary and secondary school levels as well as adult villagers. If the big environmental NGOs are able to sell the importance of this approach to their donors they could play a powerful role in such a program. At least one of them, The Nature Conservancy, has already made a useful start with the Mahonia Na Dari Program in Kimbe Bay, West New Britain. Similar programs should be funded by all of the environmental NGOs, but should also be extended to include a

touring component. However education is not an instant answer because it can never solve the issue of the scale of stock-recruitment dynamics transcending the scale at which Melanesian fishers are politically divided. If education does eventually generate some form of grass-roots political reform, it will probably take at least a generation to happen. Moreover, even with education, there is a tendency for conservatism about subsistence strategies that would further slow any process of introduced change.

Perhaps if *all* reef owning groups set aside part of their territory as a permanently closed MPA, some progress might be made. This is one possibility, but there may be others. The best way to discover these, in our view, can only be through a well-planned and coordinated process of information and engagement with rural fishers across the region. This will not only benefit the reef owners, but will hopefully also enlighten Western environmental activists about the ways in which capitalism and individualism constrains their own thinking.

Land registration is not the answer. Even if all the land in PNG and Solomon Islands became registered tomorrow, the deep divisions between landowning groups will still exist, and the fundamental lack of inter-group cooperation at a scale commensurate with the scale at which fish population replacement occurs, for the majority of fishery species of subsistence and commercial importance, will remain.

In the meantime, the potential for success on other fronts should not be ignored. Existing MPA projects, such as Arnavon Islands, Gizo Islands and the various initiatives presently underway in Papua New Guinea, should continue to receive support. Perhaps if some of the more powerful charismatic leaders in places like North New Georgia, Choiseul, or Petats Island in Buka, can be adequately apprised of the dynamics and scale of stock-recruitment processes for the various species that they harvest, they may be capable of galvanising some level of cooperative management across their jurisdictions. Indigenous knowledge of spawning aggregations may also prove to be highly valuable in ongoing localised research on dispersal and recruitment. Accurate local knowledge of spawning sites, seasons, and lunar cycles (Hamilton 1999, Hamilton and Walter 1999, Johannes and Hviding 2001), can be combined with local and/or scientific knowledge of current regimes, larval longevity and other species-specific biological and behavioural data, to make predictions about the probable dispersal and recruitment patterns of a number of aggregating species of fin-fish and other species of commercial or subsistence value. Although this can only go part of the way to improved understandings of site-specific stock-recruitment relationships, if the research involves local people, it cannot fail to raise awareness among reef owners of the need for management. The political changes necessary to effect such management cannot occur without this awareness.

The kind of restructuring that the National Fisheries Authority in Papua New Guinea recently went through was immensely beneficial, despite ongoing attempts by corrupt politicians to undermine its integrity. A similar effort would probably be equally rewarding in Solomon Islands, if the recent positive outcomes of the foreign intervention are anything to go by. Government intervention of some sort will be critical in the long run, as education alone is unlikely to bring about significant change without some sort of legislative support. The Resource Management Ordinance and the Marine Protected Area Ordinance of the Western Province in Solomon Islands are perfect examples of such a legislative tool, but others are likely to be needed. It is difficult to imagine progress in implementing effective fishery management measures at the community level in either country as being anything other than slow and difficult, but effective marine ecology education programs will both accelerate and strengthen the long-term outcomes.

### **Acknowledgements**

Thanks to the following people for reading and commenting on earlier drafts of this paper: Catherine Black, Martha Macintyre, Ian Scales, Dan Afzal, Colin Filer, Mike Bourke, Rick Hamilton, and Chris Chevalier.

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<sup>i</sup> Population density for Solomon Islands: 16 / km<sup>2</sup>. For PNG: 10.2 / km<sup>2</sup>. For Indonesia: 111.8/km<sup>2</sup>; For Java alone: 945 / km<sup>2</sup>.

<sup>ii</sup> And for Solomon Islands even this is uncertain in the present political environment.

<sup>iii</sup> There are some exceptions, such as in the highlands, and the Rabaul district in PNG.

<sup>iv</sup> In most parts of coastal Solomon Islands, Papua New Guinea, and many other Pacific countries, people regard reefs as an extension of the land, and boundaries of coastal properties are extended seawards to divide reefs, sea, offshore islands, and the resources associated with these (Allan 1957; Johannes 1978; Chapman 1985; Ruddle 1988, 1993; Baines 1990).

<sup>v</sup> While it would be inaccurate to depict fishing territories as completely nucleated and rigidly bounded (many people have rights to neighbouring or distant territories through inheritance, marriage or various forms of exchange), most people fish on a regular basis within a few kilometres of where they live.

<sup>vi</sup> There is some variation in naming conventions for the island of Gizo. Some maps and other sources spell it as Ghizo (and the town as Gizo). According to local oral history, the island's pre-colonial name was Ijo.

<sup>vii</sup> There is a richly detailed set of interviews obtained by BM recounting the events during and surrounding the pre-colonial warfare that depopulated Gizo.

<sup>viii</sup> On the other hand, legal recognition of Customary Marine Tenure in Papua New Guinea appears to be quite clearly supported by the PNG National Fisheries Management Act, 1998 (Part 3, Section 26, page 19): "The rights of customary owners of fisheries resources and fishing rights shall be recognised and respected in all transactions affecting the resource or the area in which the rights operate".

<sup>ix</sup> Both of these authors have described the ways in which the commodification of fishing grounds generated social upheaval and acrimonious disputes among and within the reef- and lagoon-owning groups involved.

<sup>x</sup> At the time of writing this situation looks likely to be reversed in the near future as a result of Australian-led military and governmental intervention.

<sup>xi</sup> And it is pertinent to mention here that the use of the *tambu* on marine resources only started after missionisation in many parts of Melanesia (Carrier 1981, Foale and Macintyre 2000, Kinch 2002).

<sup>xii</sup> However the idea of maximising yields in relation to *labour*, in the context of farming, does have some currency.

<sup>xiii</sup> Indeed Brooks notes that the people most likely to be successful with small businesses "were marginal members of the community who had little education and did not appear to have the skills or attributes for success in small business".

<sup>xiv</sup> This observation is based on extensive fieldwork over 6 years of working on the social impact of the mining operation at Lihir Island.

<sup>xv</sup> The relatively small amount of water movement in the mangrove zone is also likely to be a significant factor here (Sponaugle *et al.* 2002)

<sup>xvi</sup> These are mostly areas that have high densities of turtles, dugongs and other charismatic species that in real economic terms are of little importance to the majority of rural Melanesians.