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Multilateral Governance of Fisheries: Management and Cooperation in the Western and Central Pacific Tuna Fisheries

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Abstract

The tuna resources of the Western and Central Pacific (WCP) are the world's largest and most valuable fisheries of their type and are of significant economic importance to the Pacific Island countries (PICs), through whose waters of national jurisdiction the tuna migrate. Two major concerns exist with the current governance of the fishery. First, PICs are receiving only a small share of the resource rents from the tuna fisheries. Second, current management structure of the fisheries will not ensure the long-term sustainability of the resources. The paper presents a simple model to argue for increased resource taxation as a means of raising tax revenues and improving sustainability of the resource. Such an outcome is only possible when a single policy-maker has the prerogative to set taxes so that the government acts as a Stakelberg leader in this game. Institutional mechanisms to engender cooperation between PIC governments and with distant water fishing nations (DWFNs) to achieve the espoused outcomes of the model are also presented.

Introduction

The Pacific Ocean spans more than a third of the earth's surface and half of the earth's sea surface; an expanse of 180 million square kilometres. Scattered in the Western and Central part of the Pacific Ocean are the 200 high islands and 2500 low islands and atolls that comprise the 22 countries and territories of the Pacific islands (Figure 1). The Pacific islands' exclusive economic zones (ocean area of national jurisdiction within 200 miles of a state's coastline as delineated in the United Nations Convention on the Law of the Sea) exceed landmass by an average factor of 3,000 to 1 (World Bank 2000). Not surprisingly, the Pacific Ocean has had significant influence in the shaping of culture and the economy of these nations.

[Figure 1.]

While coastal marine resources provide an important source of food, income, culture and recreation, offshore marine resources in the region are frontiers of high economic and strategic potential. The Western and Central Pacific Ocean is home to the world's largest and most valuable tuna fishery (Table 1). The region services one third of the global tuna supply and 40 to 60 percent of tuna to canneries (Tarte 1999). The tuna is the only significant natural resource of the Polynesian and Micronesian communities.¹ The value of the fishery is approximately US\$1.9 billion, equal to around 11 percent of the region's gross domestic product (GDP) (Gillett *et al.* 2001). Domestic fishing fleets in the region are poorly developed and access fees paid by DWFNs of approximately US\$60 million dominate benefits from the fishery accruing to the PICs. Fishery revenue also constitutes a significant portion of government revenue, export earnings and GDP for many of the PICs, as shown in Table 2.

Table 1. Average yearly tuna catch in the major tuna fishing areas, late 1990s.

Major tuna fishing areas	Average yearly tuna catch (metric tonnes)
Western and Central Pacific	1,000,000
Eastern Pacific	525,000
West Africa	385,000
Western Indian Ocean	450,000

Source: Gillett *et al.* (2001)

Table 2. Economic statistics showing the importance of the fishing industry for selected Pacific Island countries

	Government revenue (percent)	Exports (percent of total value)	GDP (percent)
Cook Is.	...	41 (1999)	...
Fiji	...	7.0 (1997)	1.4 (1998)
FSM	29 (1998)	92 (1997)	15.5 (1990)
Kiribati	61 (1998)	53 (1993)	9.5 (1993)
Marshall Is.	25 (1993)	94 (1997)	...
New Caledonia	...	27 (1996)	...
Palau	5 (1993)	-	...
Papua New Guinea	2 (1999)	0.6 (1999)	...
Samoa	...	-	6.2 (1999)
Solomon Is.	≈ 5 (1993)	20.1(1993)	9 (1993)
Tonga	...	18 (1998)	...
Tuvalu	≈ 35 (1993)	-	5 (1993)
Vanuatu	-	<1 (1993)	...

Notes: ... = not available
 - = negligible or zero
 ≈ = approximately
 < = less than

Source: Petersen (2002)

There are two major concerns with current governance of the Western and Central Pacific tuna fisheries. The first is that the PICs are deriving only a small share of the benefits from exploitation of their tuna resources. The second is that the harvest rate of some tuna species is such that it exceeds the level that would maximize the present value of rents.

Bertignac *et al.* (2000) estimate that the overall resource rent in the Western and Central Pacific tuna fisheries is around 13 percent of gross revenue at 1996 levels of effort. They also argue that if effort level and the fleet structure of the fishery were at lower levels, the rent could be as high as 40 percent of gross sales. At lower levels of exploitation, the maximum possible rents as a proportion of gross returns would be comparable to what the European Union pays African countries for access fees that range from 18 and 45 percent of the value of their catch (Iheduru 1995). This compares to the Western Pacific where the Australian Fisheries Management Authority charges Australian Bluefin tuna fishers a management fee, based on cost recovery alone, of approximately 11 percent of gross revenue (Australian Fisheries Management Authority 2000). By contrast, PICs have negotiated access fees in the order of three percent of gross revenue for the right to fish in their exclusive economic zones (Gillett *et al.* 2001). Thus at the current access fees and level of exploitation, PICs could *potentially* double their fees and yet still receive less than half the total resource rents in the fisheries.

The second major issue for the Western and Central Pacific tuna fisheries is that the current structure of governance is not ensuring the long-term sustainability of the resource. Evidence exists of economic overexploitation (Bertignac *et al.* 2000) and concern has been raised that Bigeye tuna, the most lucrative of the four tuna species in the fishery, is being biologically over-exploited (Secretariat of the Pacific Community 2001). Similar worries have also been voiced arguing that exploitation levels for Yellowfin tuna are at the maximum sustainable yield (Secretariat of the Pacific Community 2001).

The paper proceeds as follows. Section 2 presents the case, via a model, where a single policymaker maximises steady state rents whilst ensuring sustainability of the resource via a single instrument in the form of an ad-valorem tax. The rest of the paper then focuses on designing an institutional mechanism that will encourage cooperation amongst PICs and DWFNs to achieve the outcomes of the proposed model. Section 3 describes the strengthening of multilateral fisheries governance worldwide. Section 4 describes the current governance for tuna in the Western and Central Pacific and highlights its institutional weaknesses. Section 5 details the proposed multilateral governance structure for the Western and Central Pacific tuna fisheries. The paper concludes with a review of the potential benefits and difficulties with implementing the multilateral governance structure.

The model

Let the aggregate catch be depicted by the following Cobb-Douglas production function of the form

$$Q = K^\alpha L^{1-\alpha} S(\tau) \quad S_\tau > 0 \quad (1)$$

where capital letters are used to denote aggregate quantities such that Q denotes total catch, K the industry capita stock, and L the total number of fishers. S denotes a steady-state stock (biomass)² of fish for given institutional controls placed on total catch reflected here by τ . τ is a policy instrument relating to price (i.e., a tax or charge) and is used to control biomass. In the latter case, τ can be defined as the market price of harvesting rights. Note that each of the factors in equation (1) are essential for production since a zero input of any one factor results in zero output. The relationship depicted in (1) may be thought of as a steady state relationship between total harvest and stocks for a given institutional regime. S is bounded from above by the biological carrying capacity of the ocean and could be zero when the stock is totally depleted; the former is possible when τ is relatively large while the latter materialises for lower (including negative) values of τ . The above imply a positive association between τ and S as shown by the right hand side inequality in equation (1) above.

The individual fisherman's production function can be depicted as the intensive-form equivalent of (1) as:

$$q = k^\alpha S(\tau) \quad (2)$$

where small letters are used to denote per-fisherman values for the variables in capital letters and an individual catch is assumed to be too small to impact on S . Assuming a unit price of fish, the after-tax profits accruing to an individual fisherman is given by

$$\pi = (1 - \tau)q - rk \quad (3)$$

where r denotes rental rate on capital. Profit maximisation through choice of the level of k by the individual fisherman gives the steady state stock of capital as:

$$k^* = \left[\frac{\alpha(1 - \tau)}{r} S(\tau) \right]^{\frac{1}{1-\alpha}} \quad (4)$$

Equation (4) shows that the steady-state level of k increases with a rise in capital productivity and/or stock of fish, falls with a rise in the rental rate, but is ambiguous to changes in τ . While a rise in τ lowers after-tax profits to the fisherman, it also raises the steady-state stock of fish; these two effects

work in opposite directions on k and are central to being able to use a tax instrument for revenue maximisation and sustainability of resource harvest.

The fisherman takes τ as given in choosing the level of effort; implying that the government acts as a Stakelberg leader in this game. Let the government maximise steady-state rents, R , from imposing a tariff τ on total catch, Q .

$$R = \begin{cases} \tau Q \\ \tau Lq \\ \tau Lk^\alpha S(\tau) \end{cases} \quad (5)$$

Substituting the steady state value of k^* into equation (5) and maximising R through choice of τ gives the following first order condition for the revenue function:

$$\frac{dR}{d\tau} = a(1-\tau)^{\frac{\alpha}{1-\alpha}} - \frac{\alpha}{1-\alpha}\tau(1-\tau)^{\frac{2\alpha-1}{1-\alpha}} + \frac{a}{1-\alpha}\tau(1-\tau)^{\frac{\alpha}{1-\alpha}} S^{\frac{2\alpha-1}{1-\alpha}} \frac{dS}{d\tau} \quad (6)$$

where $a = \left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} L$. The expression in (6) can be considerably simplified by setting $\alpha = 0.5$ and letting $S_\tau = \kappa$, a constant. Neither of these impositions change the basic structure of the model nor the qualitative findings emanating from the subsequent analysis. These values simplify equation (6) to the following:

$$\frac{dR}{d\tau} = \frac{1}{2r} [L - (L + 2r - 2\kappa LS)\tau - 2\kappa LS\tau^2] \quad (6a)$$

Equation (6a) suggests the revenue function is cubic, hence has two turning points in the R, τ space; these being

$$\tau^* = \frac{-(L + 2r - 2\kappa LS) \pm \sqrt{(\cdot)^2 + 8\kappa L^2 S}}{4\kappa LS} \quad (7)$$

Inspection of (7) suggests that R is minimised for the negative value of τ^* and maximised for the positive value of τ^* . This relation is depicted in Figure 2 below (where t represents τ). A subsidy of t^*_x leads to the stock being driven to zero such that revenues are nil. Note that as t^* increases from t^*_n to positive values, revenue increases. Hence, t^*_n has razor-edge property. Revenue is maximised at t^*_n which is also a stable equilibrium. The implication for policy is clear from this depiction; the policy maker raises any positive tax rate to the point where revenue is maximised, this being akin to following the arrows leading to t^*_p .

The assumption of a single policy-maker is crucial for the above policy to be implemented. This finding supports results of game-theoretical models of straddling stock fisheries (e.g., Arnason *et al.* 2000) that show that competitive games leads to exhaustion of the fishery whereas cooperative games (which produce single policy-maker type conditions) maximise long-term returns from the fishery. International developments aimed at strengthening multilateral fisheries governance to ensure the conservation for fish stocks through cooperation is outlined in the next section. An institutional

mechanism that encourages voluntary cooperation amongst PICs and distant water fishing nation is presented in Section 5. A tuna commission, for example, would be able to 'buy-out' policymakers at the fringe of participating by offering payments from the rise in R as a result of raising τ .

[Figure 2.]

The strengthening of multilateral fisheries governance

In order to encourage cooperation in the management of straddling and highly migratory fish stocks, the Draft Agreement for the implementation of the provisions of the UN Convention on the Law of the Seas of 10 December 1982 relating to the conservation and management of straddling and highly migratory fish stocks, known simply as the UN Fish Stocks Agreement, entered into force in 2001 (United Nations 2001). The most important aspect of the UN Fish Stocks Agreement is that both coastal states and DWFNs are required to cooperate in managing the fish stocks either bilaterally, multilaterally or through the establishment, as appropriate, of Regional Fisheries Management Organisations (RFMO). Thus while clearly defined property rights have not been defined for the high seas, indistinct property rights have been allocated to all users of marine resources that straddle the exclusive economic zones and high seas (coastal states and DWFNs) for management and conservation.

A number of RFMOs have been established both prior to, and as a response to, the establishment of the UN Fish Stocks Agreement. In 1950 the Inter-American Tropical Tuna Commission (IATTC) was established to maintain the populations of tuna, and other fish stocks taken by tuna vessels, in the Eastern Pacific Ocean (IATTC 1949). While its principal duties are to coordinate research and development activities and to recommend appropriate conservation measures, the IATTC has played a minor role in tuna management. The Indian Ocean Tuna Commission (IOTC) was established in 1996 and contributes to improving knowledge of tuna resources in the region, coordinating research and development activities, and keeping under review the economic and social aspects of fish stocks (IOTC 1995). Like the IATTC, the IOTC has played a limited role in conservation and management measures. However, it is envisaged that such measures are likely to be adopted in time by both these RFMOs (Hedley 2002).

The over-exploitation of Bigeye tuna and the negotiation of the UN Fish Stocks Agreement have alerted Pacific island and distant water fishing nations to the need for cooperation in managing the Western and Central Pacific tuna stocks. This led to the September 2000 signing of the Multilateral High Level Convention (MHLC) on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (MHLC 2000). All coastal and DWFNs (except Japan) signed the Convention, which requires the establishment of a WCP Tuna Commission that will be responsible for promoting cooperation and coordination between members to ensure the conservation of fish stocks. The Commission does not have an organisational structure as yet and, due to the time needed for ratification, it is not expected to come into force until at least 2004. The time is ripe for discussing institutional strengthening that encourages cooperation amongst PICs and DWFNs to ensure sustainability of the fishery and to maximise total resource rents collected from the resource.³ The current institutional structure of the WCP tuna fishery is discussed in the next section, and the institutional mechanisms for encouraging cooperation in the governance of the WCP is presented in Section 5.

Current institutional structure of the Western and Central Pacific tuna fishery

The ten DWFNs that fish in the WCP region account for 86 percent of the total tuna harvest. The four largest countries in terms of catches are Japan, Chinese Taipei, South Korea and the United States of America (Secretariat of the Pacific Community 2000). Most coastal states are subject to almost continual bilateral approaches for access by the mobile distant water fishing fleets (Cartwright and Willock 1999) and PICs allocate fishing entitlements to DWFNs mainly through international treaties. These treaties are negotiated because DWFNs have a cost advantage in harvesting and marketing tuna over PICs. Thus by allowing DWFNs to harvest their tuna resources, both parties can potentially be better off.

An illustration of the potential costs differences between DWFNs and PICs is illustrated in Figure 3. In this example, we assume density dependent growth for tuna resources, a competitive market for tuna and linear harvesting costs for both DWFNs and PICs. In the absence of cooperation or a bilateral treaty, the biomass that maximises the rent to the PIC is X^*_{PIC} . This biomass exceeds the open access or bionomic equilibrium (X^*_{PIC}) under sole coastal state exploitation where the fishery generates no rents for the PIC. By assumption, the DWFN has lower harvesting costs than the PIC and the biomass that maximises its rents is X^*_{DWFN} , where $X^*_{DWFN} < X^*_{PIC}$. Thus the lower cost DWFN will be less conservative in its harvesting and exploit at a lower level of the biomass than the higher cost PIC.⁴ It follows, therefore, that successful joint exploitation of the tuna resources requires agreement on both the division of rents and the appropriate level of exploitation. Moreover, given that tuna migrate across jurisdictions and on the high seas, overall rent maximising harvest and biomass levels requires cooperation from all parties, DWFN and PICs.

[Figure 3.]

With the exception of a treaty negotiated between the United States and the 16 PICs, all treaties between DWFNs and PICs are bilateral. PICs have been reluctant to enter into multilateral agreements for several reasons. First, there exists a perception by PICs that such agreements may compromise their sovereign rights. Second, the lack of supporting institutions that could compel or impose an agreement among PICs hinders their development. Third, the benefits and costs of implementing new institutions are likely to be unevenly distributed between PICs. Fourth, some PICs fear that multilateral agreements may jeopardise bilateral aid (Petersen 2002).

Petersen (2002) argues that existing bilateral treaties do not reflect the true value of the resource rent, are not transparent, give incentives to under-report, and do not ensure the least cost harvesters are allocated the access right. The politically independent countries cooperate closely on establishing these treaties with the Forum Fisheries Agency. However, decisions about defining protocols for fishing rights, the negotiation of the rights (including the tax rate represented by τ in Section 2 for each country) and the means by which the rights are enforced are the responsibility of the individual Pacific island states. While all vessels fishing in the region must be licensed, few restrictions are placed on the number of vessels, and hence licensing acts predominantly as a mechanism for monitoring fishing activity. In a few recent cases, individual PICs have issued more licenses than their allocated quota, this may be a case of the common pool problem, the incentives for which increase as the biomass falls below sustainable levels.

Rents in the tuna fisheries

Limited research has been conducted on estimating the rent potential of the WCP tuna fishery. Bertignac *et al.* (2000) use a tuna population dynamics model (spatially-disaggregated, multi-gear, multi-species model) to determine an optimal harvest size, age and technology structure for the fishery, given the objective of maximising economic rents in the long run. An access fee structure of four percent of the gross revenues of the DWFNs was assumed, and tuna prices were allowed to vary

as a function of the harvest of the various tuna species in the total tuna supply.⁵ The model indicates that the economic rent potential of the region could double if fishing effort were reduced and if exploitation were to shift from younger to older aged cohorts. The study suggests that the overall level of effort and the fleet structure of the fishery are sub-optimal. Given that the rent potential is much larger than rents presently accruing from the fishery, that the sustainability of the stock is in jeopardy, and that cooperation is required to maximise long-term revenues from the fishery, the question remains as to what institutional structure is required to one, increase total rents and two, increase the proportion of the rents that accrue to PICs?

A cooperative governance structure for Western and Central Pacific tuna fisheries

Successful governance of fisheries, at a minimum, requires the following. First, fishers should be actively involved in the co-management of the resources (Grafton 2000). Second, total exploitation rates are accepted by most resource users and set at levels that ensure on-going sustainability of the fishery. Third, fishers have both a long-term interest in the resource and individual incentives that help ensure private or self-interest is compatible with the collective good. In addition to these criteria, multilateral governance of fisheries also requires that all countries *voluntarily* cooperate in joint-management, abide by the agreed to rules of exploitation and support a mechanism for restricting new entrants into the fishery.⁶

The biggest difficulty in obtaining cooperation of all parties in fisheries governance is to meet the participation constraint, ie ensure each party is at least as well off with cooperation than without it. In addition, a mechanism must also exist to ensure that a cooperative outcome can be monitored and enforced with sufficiently high enough penalties to discourage non-compliance. In the case of the WCP tuna fisheries, substantial benefits exist for all parties in terms of cooperation. These benefits include the potential for tuna to be caught at an older age thus significantly raising the price per kilogram of the fish harvested. If stocks are being economically overexploited, as argued by Bertignac *et al.* (2000), reduced harvests have the potential to raise the present value of rents from the fisheries. A cooperative agreement, that includes restrictions on new entrants, can also raise future returns by reducing rent dissipation. Finally, if cooperation permits the creation of exclusive, tradable and divisible harvesting rights it allows fishers with the highest marginal net returns to increase their share of the harvest thus increasing the rents in the fishery.

Multilateral governance and the tuna commission

To help meet the criteria for improved management from the WCP tuna fisheries, a multilateral governance mechanism for tuna (MGMT) is proposed. At the core of the MGMT would be a Tuna Commission that would arbitrate disputes, facilitate cooperation, set harvest levels for the whole region and support the exclusivity of tuna harvesting rights.

Current DWFNs and PICs would be members of the Tuna Commission and each would be allocated *gratis* annually renewable tuna harvesting rights (THRs) based on a formula that recognized both coastal state rights and past catch levels of DWFNs.⁷ THRs would be freely tradable over a 12-month period and divisible. Member countries (both DWFNs and PICs) would have the right to assign their allotted THRs in whatever fashion they wish, provided that they were ultimately used by a vessel registered in one of the countries party to the commission. Monitoring and enforcement of management regulations in the high seas would be undertaken by the Tuna Commission, but with the assistance of member countries. On a cost recovery basis, the Tuna Commission could also assist in the policing of the EEZ of PICs, if so invited, but would have the right to verify that coastal states were in compliance with management regulations. Violations of management rules and regulations (such as overfishing or fishing in prohibited areas) would involve punishment of both the vessel owner and the member country under which flag it operates.

On-going and overhead costs of the commission would be paid for by a levy on the value of the catch associated with the THRs. To help ensure a more competitive market for THRs, each member country would be obliged to surrender three percent of their allocation every year to the commission to be sold by tender to the highest bidder. All proceeds of the tender would revert back to the member country and all parties would have the option of offering up to a 100 percent of all their THRs via tender. Countries not party to the original agreement would be permitted to become part of the Tuna Commission for a reasonable fee, but would have to lease annual THRs from existing members to harvest tuna.⁸ Pintassilgo and Costa Duarte (2000) found that this “transferable membership” solves the potential new member threat.

Initial allocation of harvesting rights

The biggest stumbling block to the successful creation of the MGMT would be the initial allocation of THRs. The expected return from joining the multilateral agreement for each party would have to exceed the payoff from not joining. Although cooperation may potentially benefit all parties, the possibility exists for strategic bargaining by one or more parties such that a proposed allocation may offer some parties less than they would receive without cooperation. Thus in the absence of complete information on the “threat points” of each party to the agreement, the possibility exists that non-cooperation is a stable equilibrium. Such a situation would resemble the non-cooperation that sometimes occurs with the exploitation of common pools, such as oil fields, where joint or cooperative behaviour is hampered by asymmetry in information about the value of the parties’ own and others drilling rights (Libecap 1989). Arnason et al. (2000) and Brasao et al. (2000) argue that cooperative multilateral governance is not stable unless side-payments are feasible. Nevertheless, the cooperative solution generates far higher aggregate profits than other solutions giving ample incentives to reach an agreement. Recent cooperation by all parties (with the exception of Japan) in the form of the MHLIC suggests that DWFNs and PICs are able to negotiate in favour of their collective interests.

Total allowable catch

The tuna commission would impose a total allowable catch on all tuna species for the whole region through which the fish migrate. The total allowable catch (TAC) should be conservative, consistent with a yield that maximises the present value of rents in the fishery, reviewed regularly and should be regional and time specific depending on migration and regeneration patterns of the fish stocks. Based on the analysis of Bertignac et al., the TAC for all tuna species would almost certainly be less than current rates of exploitation implying a reduction over time in the current fishing effort. Reductions in the harvest rate may also be justified on the precautionary principle of management as the current exploitation rate is viewed by some as imposing a risk on the sustainability of some tuna species (Secretariat of the Pacific Community 2002). This reduction in harvest would be achieved by raising τ to the point where steady-state revenues are maximised; this in turn will increase the biomass to sustainable levels.

Options for coastal states in managing their share of the total allowable catch

Coastal states will be able to allocate their share of the THRs in anyway they like, with the exception of the three percent surrendered for tender to the Commission. PICs, at their option, could continue to engage in bilateral or multilateral treaties with non-coastal states or sell or lease their rights to their own fishers or to fishers with vessels registered in member DWFNs. In addition, coastal states could assign up to their entire THRs to the commission to be tendered annually.

Monitoring and enforcement

The monitoring and enforcement of the coastal state's share of the total allowable catch would be the responsibility of the coastal states, and the monitoring and enforcement of in international waters would be the responsibility of the Tuna Commission. However, given the limited monitoring and enforcing capacity of most PICs, cooperation between the PICs and the Tuna Commission in these tasks will also be required.

The proposed monitoring model would encourage self-enforcement as holders of THRs would help monitor illegal fishing as non-compliance by others decreases the economic rents accruing from their own quota. Similar self-enforcement mechanisms have been shown to be effective in other fisheries (Duncan and Temu 1997).

Multilateral monitoring is likely to reduce enforcement costs as economies of size almost certainly exist in terms of surveillance. For example, aircraft used in one jurisdiction could also be used in another EEZ, or for high seas monitoring (Grafton 2000). Costs with monitoring compliance are also likely to decrease over time with technological improvements. For example, the instalment of a video on each vessel, which can be monitored through satellite, will enable the Tuna Commission to verify fishing activity. Video monitoring, coupled with a Vessel Monitoring System (VMS) where vessels are fitted with an Automatic Location Communicator that sends signals via satellite giving vessel location, speed and heading would be a cost-effective approach to ensuring compliance. Vessels not fitted with such equipment or not registered in a member country would be prohibited from fishing in both the high seas and the EEZs of the PICs.

Potential benefits to DWFNs and PICs

All parties can benefit from cooperation by ensuring the tuna resources are not over exploited, by preventing free entry into the fishery, by reducing the "race to fish", and by increasing returns from reduced exploitation and catching older age classes. In particular, DWFN will benefit from having assured and on-going excess to an exclusive resource without fear of further entry and will have the ability to purchase additional THRs from higher harvesting cost countries. PICs will have the most to gain from economies of size and scope from shared management responsibilities with the Tuna Commission and a much more competitive structure for the assignment of tuna harvesting rights that increases their bargaining power in bilateral negotiations.⁹

Concluding remarks

The tuna fisheries are of immense economic importance to the coastal states of the WCP. These tuna resources provide about one third of the global tuna supply and between 40 to 60 percent of tuna supplied to canneries. It is clear from the literature that the Pacific island countries are not maximizing net returns from the fishery, and that current management is not ensuring the long-term sustainability of fish stocks. These points are illustrated in a model presented in Section 2 which shows that long-term net revenue is maximized through the introduction of tax-like controls by a sole policy-maker. It is argued that the PICs could increase long-term net revenue by cooperating to achieve sole policy-maker type outcomes. Under the framework of the United Nations Fish Stocks Agreement, the paper proposes a change to the existing governance structure of the region to encourage cooperation amongst Pacific island countries and distant water fishing nations. The cooperative structure has the potential to offer significant benefits to both existing distant water fishing nations and Pacific island countries.

The proposed multilateral governance mechanism for tuna would create a Tuna Commission that would be answerable to participating member countries and comply with the United Nations Fish

Stocks Agreement (as has been created in the Western and Central Pacific Tuna Commission). Initial membership would be granted to Pacific island countries with exclusive economic zones in the region and current distant water fishing nations. Each member country would be allocated *gratis* annual transferable, divisible tuna harvesting rights that would be allocated to both distant water fishing nations and Pacific island countries on a formula that recognizes both coastal state rights and past catch histories. The harvesting rights could be used by any vessel legally registered and authorized to fish by one of the member countries. Every authorized vessel would also have to comply with all management and monitoring regulations set down by the Tuna Commission.

To promote a competitive market for harvesting rights, each member would surrender three percent of its annual allocation to the Tuna Commission for tender to the highest bidder, but would receive the full receipts from such sales. In addition, member countries would have the option of tendering up to 100 percent of their annual allocation if they considered it would generate a higher return than using the rights themselves or leasing them on a bilateral basis. New country entrants into the tuna fisheries would be permitted for a reasonable fee, but they would need to lease tuna harvesting rights from existing members to be able to fish.

The proposed governance structure offers substantial benefits to both Pacific Island and distant water fishing nations. First, cooperation gives greater scope for countries to set a regional total allowable catch for tuna that will increase the resource rents. Second, cooperation will allow tuna to be caught at an older age thereby increasing the returns per kilogram. Third, it provides a way to prevent free access into the fisheries and mitigates the “race to fish” while complying with United Nations agreements on fisheries. Fourth, it allows tuna to be traded at its marginal value and in a more competitive structure that can benefit both coastal states and low cost tuna harvesters. Fifth, it provides the opportunity for countries to reap the benefits of economies of size and scope in the management of tuna resources.

The greatest difficulty associated with establishing a new multilateral governance structure in the Western and Central Pacific is the initial allocation of tuna harvesting rights and the setting of the regional total allowable catches. These hurdles, and the relative benefits of multilateral governance for the distant water fishing nations and coastal states are the subject of further study.

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Footnotes

¹ The Pacific islands have three main cultural groups. The Melanesians settled in the high islands of Fiji, New Caledonia, Papua New Guinea, the Solomon Islands and Vanuatu. These islands are rich in natural resources such as minerals, petroleum and forests. Melanesia contrasts with the resource-poor islands of Polynesia (Cook Islands, French Polynesia, Wallis and Futuna, Niue, Pitcairn, Tokelau, Tuvalu, American Samoa, Samoa and Tonga) and Micronesia (Guam, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Northern Mariana Islands and Palau).

² Biomass is a composite measure of stock numbers and size, the rent-optimisation of which requires considerations around harvest size and technology to be employed.

³ Note that the WCP tuna fishery is termed a ‘straddling’ stock as resources move between the EEZs and adjacent high seas. Kaitala and Munro (1993) observe that the economics of ‘shared’ resources (which refers to resources that are shared between one or more coastal states) that is reasonably well developed takes us only part way in explaining the economics of straddling stocks, a field of research that is relatively undeveloped to date.

⁴ Munro (1979) analysed the case where two countries exploit a common transboundary fishery. If they both have the same discount rates, and if the lower cost country exploited the resource unilaterally, it would harvest at a lower biomass level than if its neighbour were the sole harvester.

⁵ Bertignac *et al.* (2000) estimated the demand elasticity for raw tuna supplied to the canning markets by purse-seine and pole-and-line fleets in the South Pacific to be 1.55, and that of the fresh and frozen tuna supplied by longline fleets to be 2.53.

⁶ Munro (1996) emphasises that without restriction on new entrants any cooperative agreement will almost certainly be unstable because extra effort by entrants reduces the benefits from cooperation relative to non-cooperation.

⁷ These rights assume that the members of the Commission acquire collective *de facto* property rights to the resource as shown to be required for successful cooperative governance by Munro (2000).

⁸ Such an arrangement precludes the necessity of creating “individual transferable memberships” as proposed for the Northwest Atlantic Fisheries Organisation (NAFO) by Munro (1996) or a two-tier allocation system proposed for the same organization by Grafton and Lane (1998).

⁹ Duncan and Temu (1997) has emphasised that under the present system of bilateral negotiations, that includes foreign aid and the offer of side payments, coastal states have limited negotiating power relative to distant water fishing nations.