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Mapping the Distribution of the Conservation Burden

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Abstract

The negotiation over the scope and application of a conservation measure is a negotiation over how the burden of conservation is distributed. The eventual decision will allocate the costs (conservation limits) and the benefits (fishing opportunities and future productivity improvements). Negotiations have to balance diverse interests and agree on how these interests are compromised.

The Western and Central Pacific Fisheries Convention requires parties to ensure that conservation and management measures do not result in transferring a disproportionate burden of conservation action on to developing States (Article 30), and prescribes various criteria to be considered when allocating catch or effort limits (Article 10). Determining the distribution of the conservation burden is a contentious issue as the Commission struggles to adequately respond to scientific advice to limit fishing effort and reduce fishing mortality for bigeye. Given current levels of overfishing and overcapacity, some or all Commission members must necessarily compromise their interests and carry some share of the conservation burden.

This paper analyses WCPFC catch data, annual reports and market data, and presents an approximate graph of Commission member interests and discusses the potential impact of proposed conservation and management measures on these interests. The paper concludes with a proposal for a transparent framework for determining the distribution of the conservation burden.

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Introduction

The key challenge to the negotiation of a conservation measure for the tropical tuna fisheries is the determination of how the burden of conservation is distributed. Given current levels of overfishing, some or all Commission members must necessarily compromise their interests and carry some share of the conservation burden. Depending upon its structure, a conservation measure will impact directly and indirectly on various participants: reducing benefits for some; limiting opportunities for others; and protecting or even increasing benefits for some participants.

The conservation measure may also impact on developing States that depend significantly on the fisheries and have strong aspirations to further develop their benefits. Some of these States may have few other development and resource options and could carry a relatively higher economic and social burden compared to other States with diverse resources, large institutions and substantial revenue streams from multiple economic activities.

The Western and Central Pacific Fisheries Convention (Convention) requires parties to ensure that conservation and management measures do not result in transferring a disproportionate burden of conservation action on to developing States (Article 30), and prescribes various criteria to be considered when allocating catch or effort limits (Article 10). However, the Western and Central Pacific Fisheries Commission (WCPFC) does not transparently study the likely distribution of the conservation burden that would arise from each potential management option. Instead, the WCPFC addresses deeply political and economic arguments within a scientific framework. This framework then becomes politicized as members favour scientific assessments for measures that best protect their own interests, and refute scientific assessments for measures that compromise their interests. Ultimately, the lack of a framework to address political and equity considerations undermines the fisheries science while still leaving the political and economic questions unanswered.

This paper analyses WCPFC catch data, annual reports and market data, and presents an approximate graph of Commission member interests and discusses the potential impact of proposed conservation and management measures on these interests. The paper then proposes a potential framework for determining the distribution of the conservation burden. This new decision making framework would enable fisheries science to determine the necessary extent of conservation measures, while a new conservation burden methodology would then determine the implementation of the measure and its impact on each member.

The WCPO Tuna Fisheries

The Western and Central Pacific Ocean (WCPO) stretches approximately 6,000 nautical miles across numerous jurisdictions, from the archipelagos of Southeast Asia to the remote atolls of Kiribati in the Central Pacific. This vast ocean is home to the world's most productive tuna fisheries, supplying global markets with skipjack, bigeye, yellowfin, albacore and other species worth approximately US$5.5 billion.[2] While albacore catches are significant to local fisheries, the region is dominated by the large scale tropical longline and

[2] P. Williams and P. Terawasi. *Overview of Tuna Fisheries in the Western and Central Pacific Ocean, Including Economic Conditions – 2011*. Eighth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. 7 – 15 August, 2012. Busan, Korea.

purse seine fisheries for skipjack, yellowfin and bigeye.

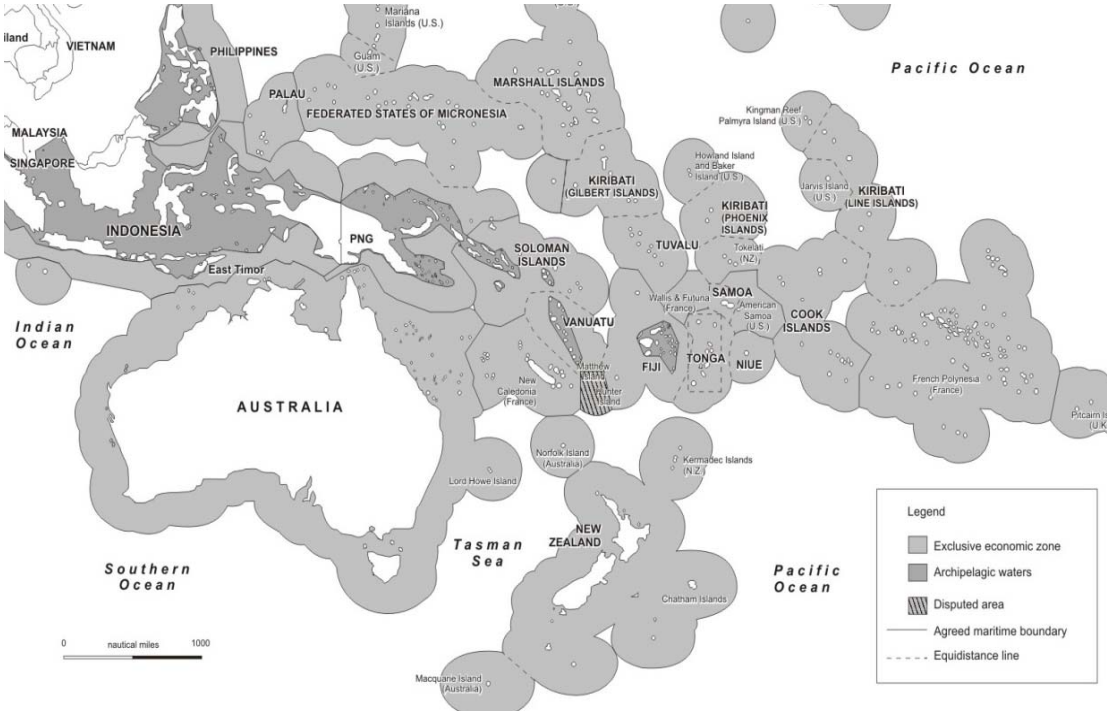
There are 89 States and territories that have some form of current or historical interest in these fisheries).[3] However, only 14 of them ultimately control access to the most productive fishing grounds and the vessels that fish in them. All but one of these States are full members of the Western and Central Pacific Fisheries Commission (WCPFC), and all have some form of vested interest in the long-term sustainability of some part of the tropical tuna fisheries. These States are: Papua New Guinea, Indonesia, the Philippines, Japan, Kiribati, Solomon Islands, Nauru, Federated States of Micronesia, Tuvalu, the Marshall Islands, South Korea, Chinese Taipei, the United States and China.[4]

These fisheries are critically different from other tuna fisheries in that 87% of all reported WCPO tuna catches are harvested from waters under national jurisdiction.[5] Unlike the high seas tuna fisheries of the Eastern Pacific, Indian Ocean and North Atlantic, the rights to the WCPO tuna fisheries are predominantly owned by a small group of developing coastal States. Fishing fleets depend upon access to these waters for their financial viability. No surface fishing fleet, distant water or locally based, can profitably operate pole and line or purse seine vessels without some access to waters under national jurisdiction.[6]

Nine of the coastal States identified above also control significant areas of archipelagic waters. Indonesia, Philippines, Papua New Guinea, Vanuatu, and Fiji have all submitted claims for archipelagic Status that are in accordance with the LOSC and broadly recognised.[7] The Solomon Islands is also considered to be an archipelagic State under the LOSC.[8] In accordance with the LOSC, these States are all entitled to claim sovereignty over substantial archipelagic waters. Kiribati, Tuvalu, and the Marshall Islands have also made declarations claiming archipelagic status, but these are inconsistent with the LOSC and are not shown on regional maps.[9]

[3] Q. Hanich. 'Interest and Influence – Conservation and Management in the Western and Central Pacific Fisheries Commission' (Phd Thesis, University of Wollongong 2011).
[4] Calculated based on data derived from P. Terawasi and L. Rodwell. *Value of WCPO Tuna Fisheries (Excel database)*. Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands. 2011).
[5] Ibid.
[6] G. Van Santen and P. Muller. *Working Apart or Together: The Case for a Common Approach to Management of Tuna Resources in Exclusive Economic Zones of Pacific Island Countries*. (The World Bank Washington, USA. 2000)
[7] United Nations. (2012). Maritime Space: Maritime Zones and Maritime Delimitation. Available at: http://www.un.org/Depts/los/LEGISLATIONANDTREATIES/asia.htm Accessed on 10 July 2012. R. R. Churchill and A. V. Lowe. *The Law of the Sea*. (3rd ed., Melland Schill Studies in International Law, Manchester University Press. Manchester, 1999).
[8] R. R. Churchill and A. V. Lowe. *The Law of the Sea*. (3rd ed., Melland Schill Studies in International Law, Manchester University Press. Manchester, 1999).
[9] United Nations Office of Legal Affairs. (2010) *United Nations Convention on the Law of the Sea: Declarations and Reservations*. UN Publications. R. R. Churchill and A. V. Lowe. *The Law of the Sea*. (3rd ed., Melland Schill Studies in International Law, Manchester University Press. Manchester, 1999).

***Figure 1: The WCPO*[10]**



The WCPFC faces a complex conservation and management challenge. The scientific assessments indicate that urgent action is required to address overfishing and reduce fishing mortality for bigeye, halt any increases in fishing mortality for yellowfin, reduce fishing mortality of juvenile bigeye and yellowfin, and develop precautionary limits for skipjack.[11] The conservation challenge is complicated by the multi-gear, multi-species and multi-national characteristics of the WCPO tropical tuna fisheries. Each species of tropical tuna is caught by each gear in a tightly intermeshed manner that is difficult, if not impossible, to separate. This complexity is exacerbated by the substantially different biological characteristics of skipjack, yellowfin and bigeye (i.e., highly resilient and productive skipjack compared to the longer-lived and less productive bigeye).

This intermeshed nature makes it extremely challenging to address a specific management challenge, such as overfishing of bigeye, with a narrowly focused management response. For example, the bigeye fishery is targeted almost entirely by longline vessels. However, the increasing use of fish aggregating devices (FADs) by the purse-seine fishery has resulted in a significant bycatch of juvenile bigeye.[12] Purse-seine sets on schools associated with FADs and logs will catch smaller fish, particularly juvenile yellowfin and bigeye, whereas sets on unassociated free-swimming schools (i.e., non-FAD sets) will catch larger skipjack and/or

[10] Map sourced from: Q. Hanich, C. Schofield, et al. 'Oceans of Opportunity? The Limits of Maritime Claims in the Western and Central Pacific Region' in Q. Hanich and M. Tsamenyi (eds). *Navigating Pacific Fisheries: Legal and Policy Trends in the Implementation of International Fisheries Instruments in the Western and Central Pacific Region*. (Australian National Centre for Ocean Resources and Security, Wollongong, 2009.

[11] WCPFC. *Report of the Seventh Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*. (Western and Central Pacific Fisheries Commission. Pohnpei, Federated States of Micronesia, 9-17 August 2011).

[12] N. Davies, S. Hoyle, S. Harley, A. Langley, P. Kleiber, J. Hampton. *Stock Assessment of Bigeye Tuna in the Western and Central Pacific Ocean.* (Western and Central Pacific Fisheries Commission. Pohnpei, Federated States of Micronesia, 9-17 August 2011).

adult yellowfin.[13] Proponents argue that FADs have increased the efficiency of purse seining,[14] while others note that the significant reduction in the size of fish caught undermines the efficiency gains.[15] In addition to their significant impacts on bigeye and high levels of juvenile catch, scientists have raised concerns that the use of FADs may be creating an 'ecological trap'.[16]

For the WCPFC to resolve the threat to bigeye, it must reduce longline catches, but also restrict the operation of purse-seine vessels utilising FADs that inadvertently catch bigeye while targeting the highly productive skipjack (not currently threatened by overfishing). Purse-seine fleets receive little benefit from bigeye catches and so will receive little or no long term sustainability benefit or increase in profitability if bigeye stocks rebuild. On the other hand, longline fleets will directly benefit from conservation measures that rebuild bigeye stocks as this will increase the profitability of longline fleets through improvements to their catch per unit of effort (CPUE).

WCPO Tuna Interests

Balancing the interests between purse seine and longline, FAD and free school, high seas and EEZs, historical and recent catches, are all important factors in the distribution of the conservation burden. The following figures illustrate some of these interests through providing an approximate indication of each State's interest on these issues. These figures are based on an analysis of reported catches from within the WCPFC Statistical Area (the perceived range of the stocks) and are based on the most recent data that was available at the time of the study. Data is sourced from the 2011 WCPFC Yearbook excel database,[17] and the Pacific Island Forum Fisheries Agency's Value of WCPO Tuna Fisheries excel database.[18] It is important to note the limitations of these figures due to the reporting inaccuracies of species,[19] mis-reporting of catches by vessels,[20] and the uncertainties due to the undefined western and northern boundaries of the WCPFC.

Figure 2 illustrates the balance of interests for coastal States from purse seine to longline, while Figure 3 presents the same analysis for flag States. These figures are based on the value of the tuna catch taken by their registered vessels or from waters under national jurisdiction in the benchmark year 2010.

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[13] Langley, A., A. Wright *et al.* Slow Steps Towards Management of the World's Largest Tuna Fishery. (2009). 33(2). *Marine Policy.*

[14] Moron, J., J.J. Areso *et al. Statistics and Technical Information About the Spanish Purse Seine Fleet in the Pacific*. (14th Meeting of the Standing Committee on Tuna and Billfish. Noumea, New Caledonia, 9-16 August. 2001.)

[15] Fonteneau, A., P. Pallares *et al.* The Effect of Tuna Fisheries on Tuna Resources and Offshore Pelagic Ecosystems. (2002). 16. *Ocean Yearbook*.

[16] An ecological trap is an event whereby population growth is reduced due to individuals making poor habitat choices. Studies have suggested that tuna associated with FADs are less healthy than those in unassociated free-swimming schools. It has also been pointed out that the use of FADs is introducing further uncertainties into scientific assessments due to their impact on tuna behaviour. P. Hallier and D. Gaertner. 'Drifting Fish Aggregation Devices Could Act as an Ecological Trap for Tropical Tuna Species' (2008). *Marine Ecology Progress Series.*

[17] P. Williams. *Tuna Fishery Yearbook: Western and Central Pacific Fisheries Commission (Raw Excel Database).* (Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia. 2011)

[18] P. Terawasi and L. Rodwell. *Value of WCPO Tuna Fisheries (Excel database).* Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands. 2011).

[19] P. Williams. *Scientific Data Available to the Western and Central Pacific Fisheries Commission*. Sixth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. (Nuku'alofa, Tonga, 10-19 August 2009)

[20] D. Soutar, Q. Hanich, et al. *Safeguarding the Stocks: A Report on Analytical Projects to Support the Development of a Regional MCS Strategy for Pacific Oceanic Fisheries*. (Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands. 2009)

Figure 2: Scale of Coastal State Interests from Longline to Purse Seine (2010)

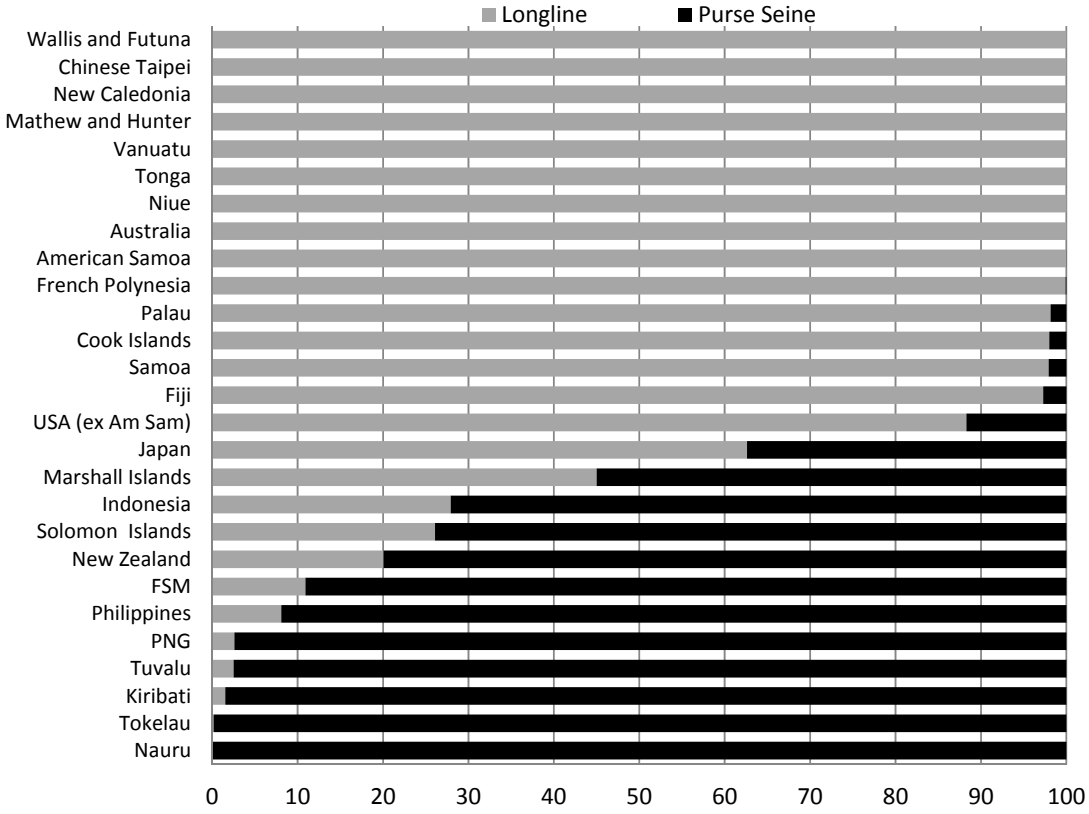
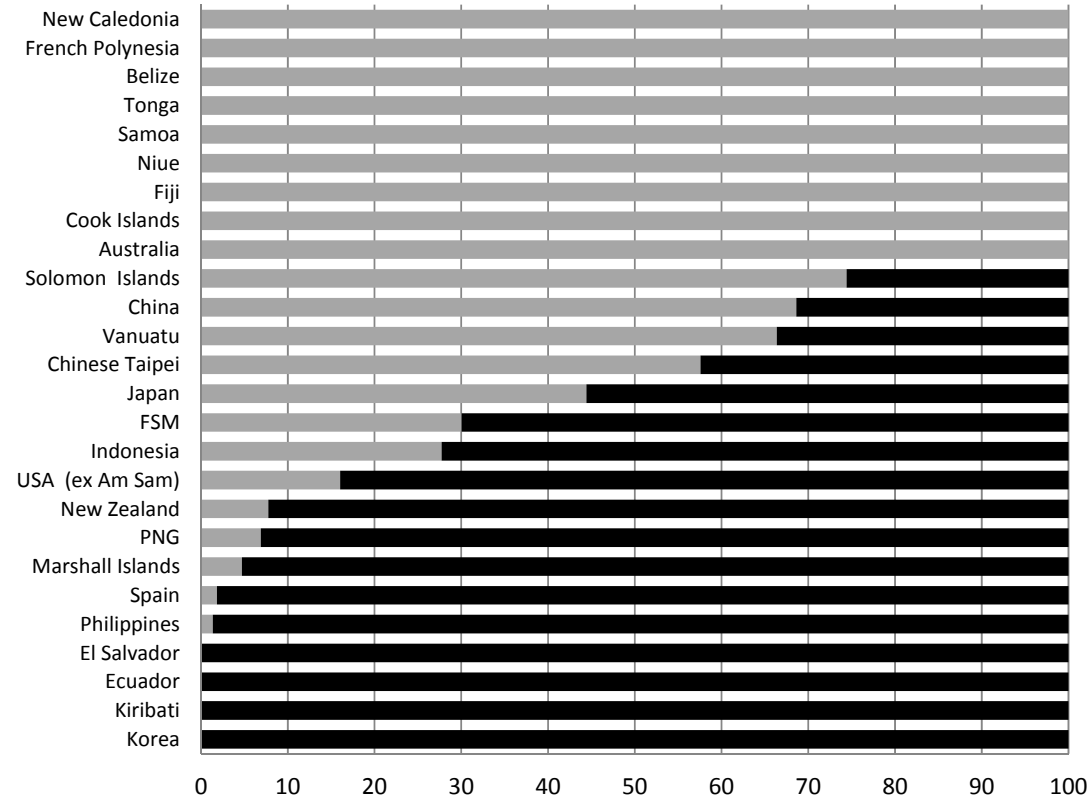


Figure 3: Scale of Flag State Interests from Longline to Purse Seine (2010)



Figures 4 and 5 illustrate the balance of interests for flag and coastal States from FAD purse seine fisheries to non-FAD purse seine fisheries and are based on average 2002-2008 catch data prior to the introduction of FAD restrictions in 2009.[21]

Figure 4: Scale of Flag State Interests in Purse Seine sets on Drifting FADs/logs

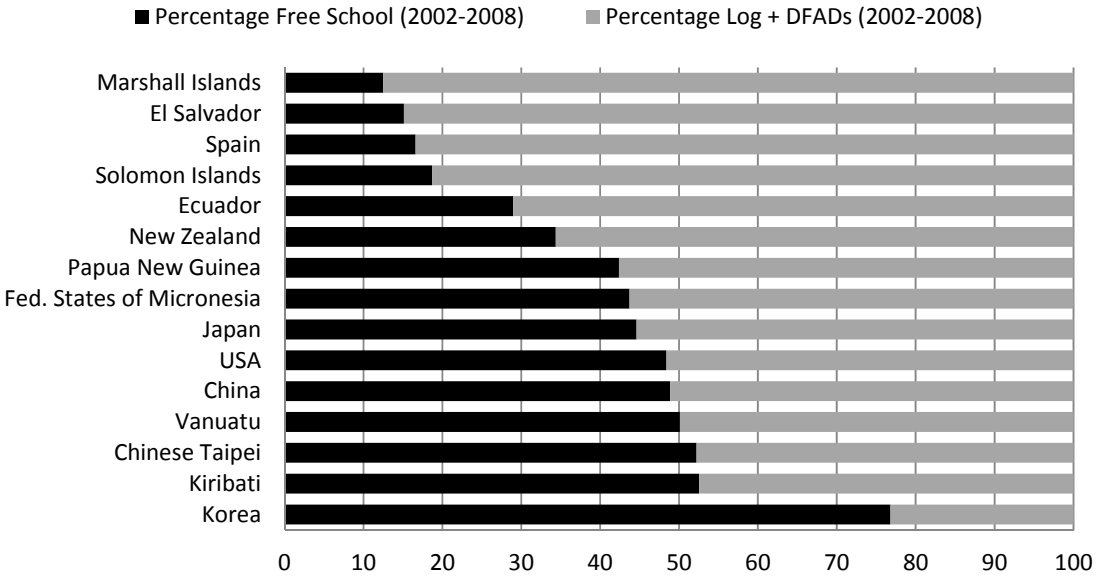


Figure 5: Scale of Coastal State Interests in Purse Seine sets on Drifting FADs/logs

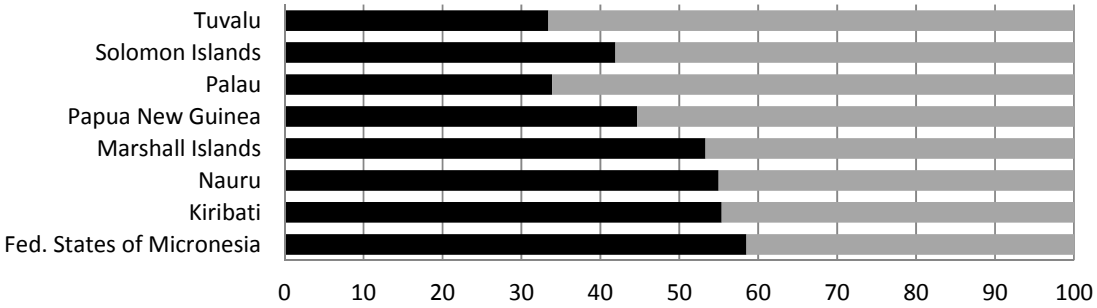
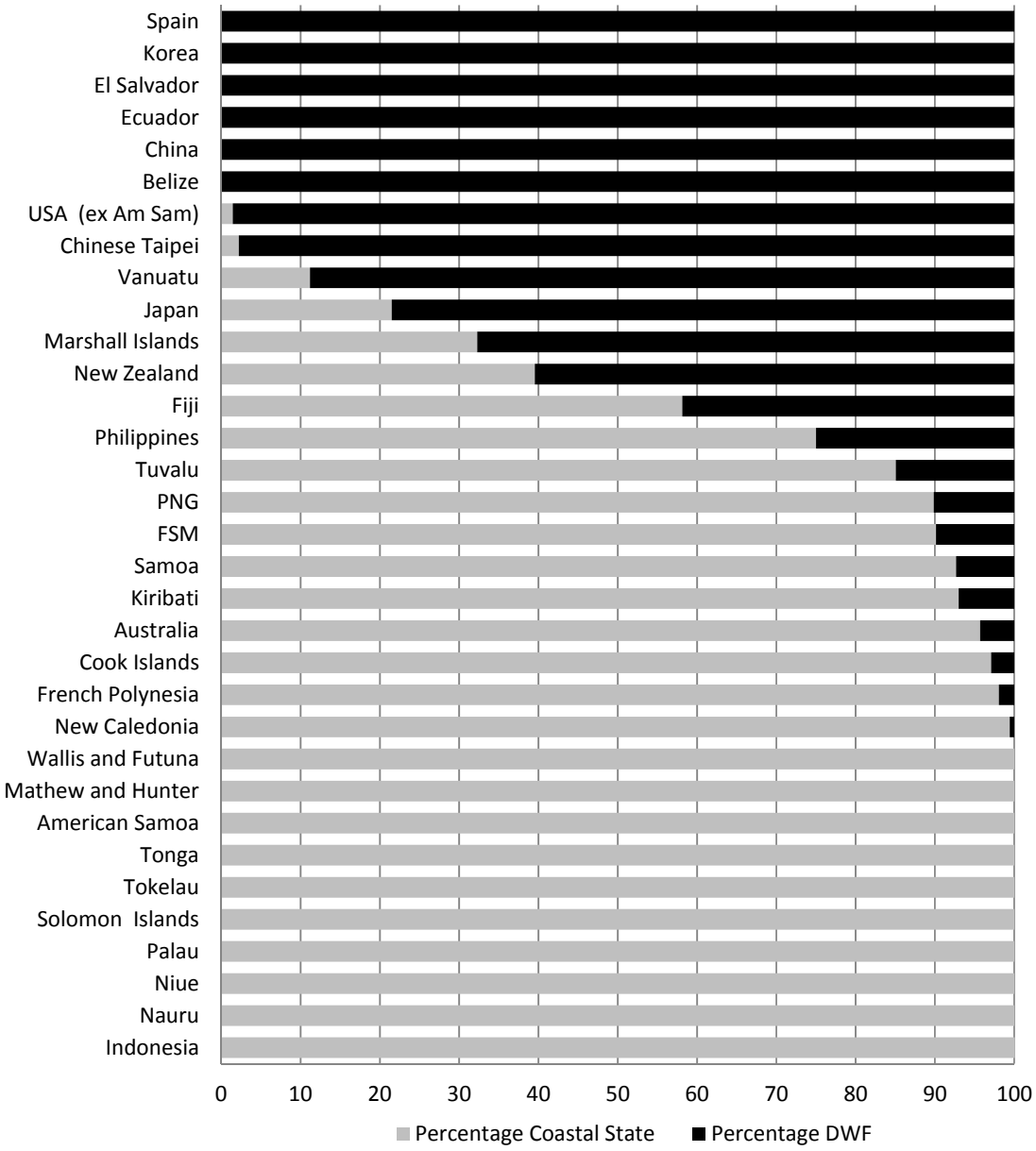


Figure 6 presents a calculation of the balance of interests between the value of the catch from a State's coastal waters and the value of the catch from that State's distant water fishing fleet (flag State interest). In cases where a State does not have any coastal waters within the WCPO, the State is assessed to have a 100% flag State interest. In cases where a State does not report any catches from registered distant water fishing vessels, the State is assessed to have a 100% coastal State interest.[22]

[21] Figure 36 was created by the author based on data provided in Excel form on 20 November 2010 by the SPC Oceanic Fisheries Programme. USA values are for 2005-2008.

[22] It should be noted that the figure for Indonesia appears unlikely and may be inaccurate due to reporting errors. Some flag State reports include charter vessels that were registered to other States but reported under the charter State for the duration of the charter. For example, Niue did not have a registry in 2008 and depended upon a charter fleet of vessels from New Zealand and the Cook Islands. Calculations are based on data sourced from: P. Williams. *Tuna Fishery Yearbook: Western and Central Pacific Fisheries Commission (Raw Excel Database)*. (Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia. 2011). P. Terawasi and L. Rodwell. *Value of WCPO Tuna Fisheries (Excel database)*. Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands. 2011).

Figure 6: Scale of Interests from Coastal State to Flag State (2010)



Figures 7 and 8 demonstrate the significance of benchmark years and illustrate the interests of States in the WCPO purse seine fisheries between 2001 and 2004, and more recently in 2010. These benchmark years were used in the WCPFC 2008 Conservation Measure for bigeye and yellowfin,[23] and its later amended version from 2012.[24]

[23] WCPFC. *CMM 2008-01 Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean*. Fifth Regular Session of the Western and Central Pacific Fisheries Commission. (Guam, USA, 8 - 12 December 2008).

[24] WCPFC. *Draft Decision on CMM2008-01* Eighth Regular Session of the Western and Central Pacific Fisheries Commission. (Guam, USA, 26-30 March, 2012).

Figure 7: Benchmark years. Value of all Species Caught by Purse Seine

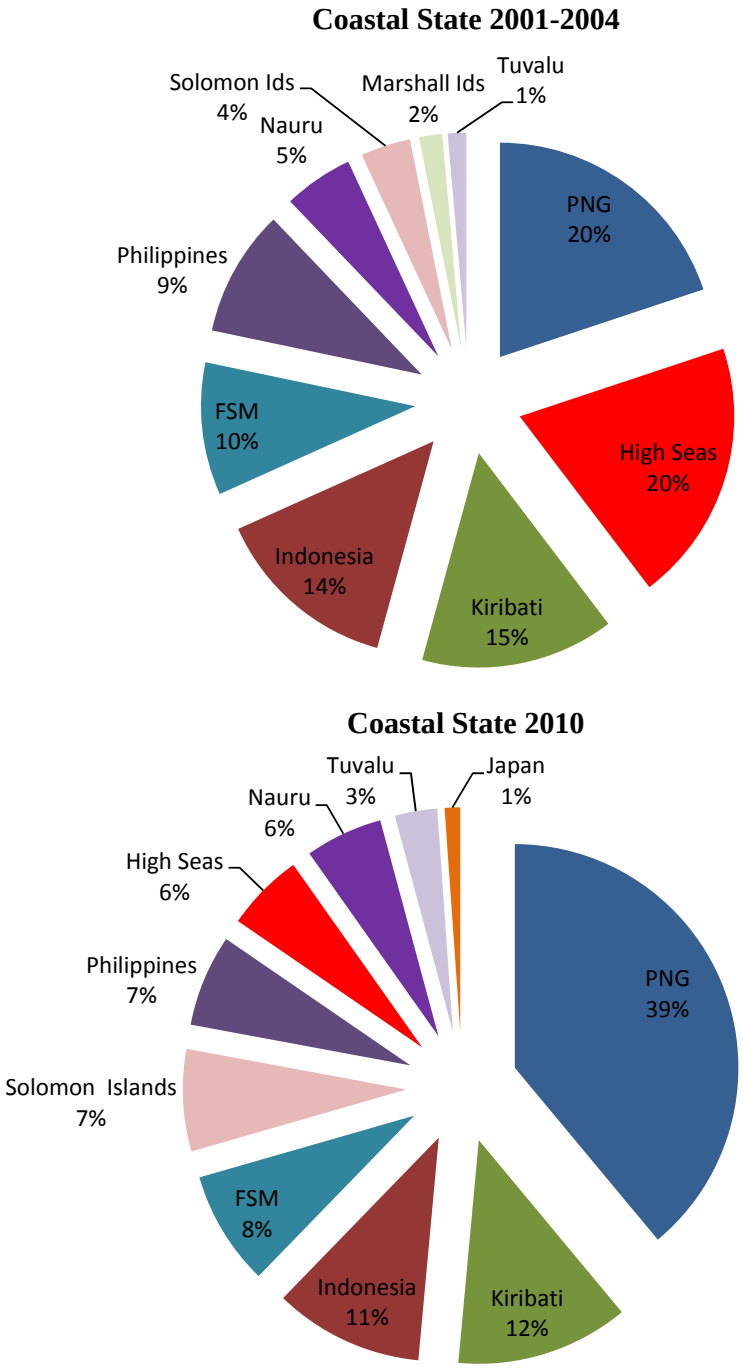
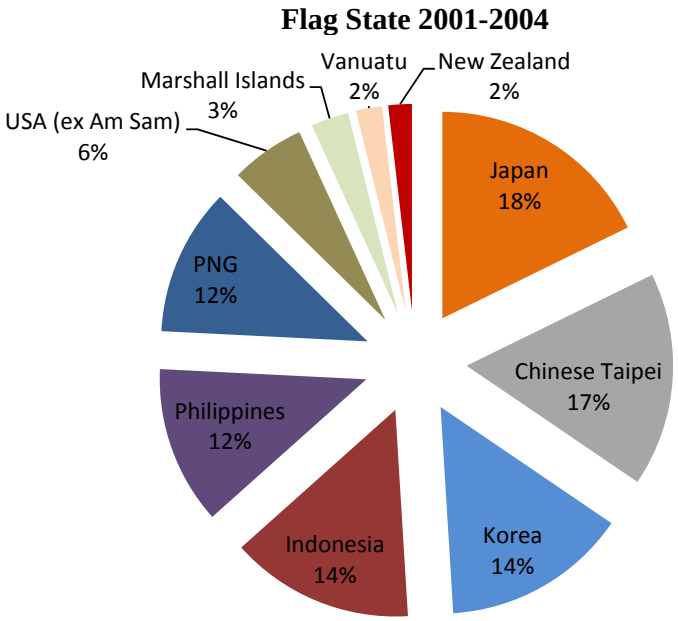
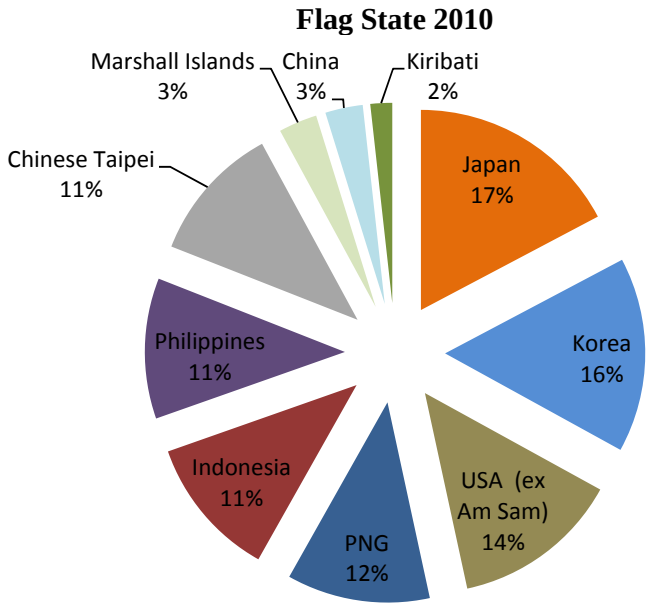


Figure 8: Benchmark years. Value of all Species Caught by Purse Seine





Discussion of Interests

Purse Seine-Longline interests

The figures show that seven of the core 14 States can be roughly identified as 'purse-seine/skipjack States'. Most of these States are part of the group of coastal States that dominate the most productive fishing grounds (Papua New Guinea, Kiribati, Tuvalu, Nauru, the Federated States of Micronesia and the Solomon Islands). Most of the benefits that these six States enjoy from the WCPO tuna fisheries come from skipjack (compared to bigeye and yellowfin), purse-seine fisheries (compared to longline and other gears) and licensing revenue for access to their EEZ (compared to their vessel registry interests).

The seventh of these purse-seine/skipjack States is the United States. The United States is dominated by its vessel registry interests due to the significant growth of its purse seine fleet in recent years. This fleet provides greater catches from the WCPO tuna fisheries than the predominantly longline catch from within the EEZ of its territories and Hawaii. Although far less significant in the context of its overall interest, the United States also catches substantial amounts of bigeye through its Hawaiian longline fisheries.

Japan, Indonesia, Chinese Taipei, South Korea, China, Marshall Islands and the Philippines all have fishing interests that are more widely distributed across multiple gears. Each of these States is a significant flag State, while Japan, Indonesia, Marshall Islands and the Philippines also have significant coastal State catches.

Interests in Fish Aggregating Devices (FADs)

The increasing use of FADs and drifting logs within the purse seine fishery has had a significant impact on the WCPO fisheries, particularly juvenile bigeye. Not all States with purse seine interests share the same interest in defending purse seine sets on FADs or floating logs. As demonstrated in Figures 4 and 5, some States have significantly less interest in purse seine sets on FADs or floating logs.

For example, Korea has a notably lower interest in FAD or log sets as its registered vessels primarily set on unassociated schools of tuna. Korean registered vessels only set on FADs or floating logs 23% of the time between 2002 and 2008. Consequently, a conservation measure that proposes a FAD prohibition to address overfishing of juvenile bigeye will have less impact on Korean interests than a generalised limit on purse seine effort. Alternatively, fleets from the European Union (Spain), Latin America, Solomon Islands, New Zealand and the Marshall Islands primarily set on FADs and floating logs. The flag States for these vessels may consider a generalised limit on purse seine effort to impact on their interests less significantly than a prohibition on the use of FADs.

Similar questions arise for coastal States, although there is less differentiation between each State's interests. FAD and log sets account for 40 to 70% of all purse seine sets within the EEZs of Pacific island tropical coastal States. These States will have an interest in FAD sets and will need to carefully consider which will have a greater impact on their interests: FAD prohibitions or purse seine effort limits.

Coastal State to Flag State Interests

Coastal and flag State interests are significant factors in the distribution of the conservation burden. States that are dominated by flag State or coastal State concerns are likely to suffer

from conservation measures that limit fishing opportunities or impose a higher conservation burden on high seas fisheries (impact on flag States) or waters under national jurisdiction (impact on coastal States). Additionally, these States may favour measures that empower their authority and long term allocation aspirations through the implementation of limits by vessel (strengthening flag States) or zone (strengthening coastal States).

Figure 6 suggests that in 2010, 19 States and territories were dominated by coastal State interests (greater than 80%). This is due to the large value of the catch taken from within their coastal waters compared to the smaller value of the catch (if any) taken by their registered fishing vessels outside their national waters. Some of these States have reported substantial catches by their registered vessels, but mostly within their own domestic waters. Consequently, these States have little interest in distant water fishing activities and remain primarily focused on the interests of the fisheries within their coastal waters, reinforcing their coastal State interests. States and territories with dominant coastal State interests are: American Samoa, Australia, Cook Islands, Federated States of Micronesia, French Polynesia, Indonesia, Kiribati, Matthew and Hunter, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Wallis and Futuna.

All of these States and territories are members of the WCPFC and are relied upon to effectively implement measures within their jurisdiction. Within this group, purse seine interests dominate the most productive equatorial coastal States, while longline interests dominate Palau and the sub-tropical less productive coastal States.

Nine States were dominated by their flag State registered fleets (greater than 80%) in 2010. These are: Belize, China, Chinese Taipei, Ecuador, El Salvador, European Union (Spain), Korea, USA and Vanuatu. These States have reported far more valuable catches from their distant water fishing fleets than from their own waters within the WCPO (Ecuador, El Salvador, Spain and Belize do not have any waters within the WCPO). Four of these States (China, Chinese Taipei, Korea and the USA) are part of the core 14 States and control significant fleets of purse seine and longline vessels).

The remaining five States and territories have mixed interests. Japan, Fiji, Marshall Islands, New Zealand and the Philippines all hold significant coastal State and flag State interests. Four of these States (Japan, Marshall Islands and the Philippines) control productive fishing grounds and significant fishing fleets, and are part of the core 14 States identified earlier.

The USA has perhaps the most complicated interest because its flag State interests are dominated by purse seine vessels yet the coastal State interests of its territories are clearly dominated by longline vessels. In total, the combined value of these two interests is still dominated by purse seine, however this may not accurately reflect the development aspirations of its territories given that their primary licensing benefit derives from longline fleets. This is an important insight given the ramifications that this may have on the USA approach to conservation and management measures and how it negotiates and implements such measures.

Many of the WCPO coastal States are also home to coastal communities that depend heavily upon living marine resources for food security and employment in artisanal fisheries. Among the Pacific islands, the tuna fisheries represent an important source of protein. Scientists have recommended that Pacific island governments should increase local access to these tuna fisheries in order to partly meet increasing Pacific island food security requirements. Recent

studies have estimated that 75% of Pacific island coastal fisheries will not meet forecast food security needs due to a forecast 50% growth in population by 2030, limited productivity of coastal fisheries (exacerbated by overfishing) and inadequate national distribution networks.[25]

Similarly, coastal communities within Vietnam, Indonesia and the Philippines also depend heavily on living marine resources for food security.[26] Unfortunately, coastal fisheries resources throughout South East Asia are in severe decline due to overfishing. This is increasing poverty throughout artisanal fishing communities and reducing the contribution of fisheries to food security among other things.[27]

The following coastal States are home to coastal communities that depend upon WCPO tuna fisheries for food security and artisanal employment to some degree:[28] Indonesia, Papua New Guinea, Philippines, Japan, Solomon Islands, New Caledonia, USA Territories, Tokelau, Tuvalu, Palau, Nauru, Kiribati, Marshall Islands, Samoa, Fiji, American Samoa, Vanuatu, Cook Islands, French Polynesia, Niue and Tonga. Many of the subsistence and artisanal fisheries that operate in these States and territories catch significant proportions of tuna (approximately 30% for subsistence and up to 100% of artisanal fisheries).[29] It is significant to note that 11 of the 14 core tuna States have interests in food security for their coastal communities.

The value of artisanal catches in some Pacific island States may exceed the value of commercial catches.[30] For example, in 2008 Kiribati received AU$32 million in government revenue from distant water fishing access fees. However, the artisanal fishing industry caught approximately 12,800 mt in 2008, valued at around A$33.2 million. While much of this value was consumed locally and provided little revenue, the locally based artisanal fleets operated approximately 4,800 vessels (under 7m) and directly or indirectly employed 20,000 people – roughly 20% of the entire Kiribati population.[31]

Many of the States with food security interests must balance tensions between artisanal and commercial fishing interests. Many Pacific island States have implemented regulations to protect near-shore artisanal fisheries and prohibit distant water fleets from fishing within coastal exclusion zones. Nevertheless, artisanal communities throughout the WCPO region continue to express concerns at the perceived impacts of distant water fishing fleets on artisanal fisheries.[32] These tensions are likely to increase if coastal fisheries continue their

[25] J. Bell, M. Kronen, et al. (2009) Planning the Use of Fish for Food Security in the Pacific. *Marine Policy*. 33.
[26] N. Salayo, L. Garces, et al. (2008) Managing Excess Capacity in Small-Scale Fisheries: Perspectives from Stakeholders in Three Southeast Asian Countries. *Marine Policy*. 32. P696. -- R. Pomeroy, J. Parks, et al. (2007) Fish Wars: Conflict and Collaboration in Fisheries Management in Southeast Asia. *Marine Policy*. 31. p645.
[27] G. Silvestre, L. Garces, et al. (2003) *South and South-East Asian Coastal Fisheries: Their Status and Directions for Improved Management. Conference Synopsis and Recommendations*. Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. Worldfish Center Conference Proceedings. Penang, Malaysia. Worldfish Center. p37.
[28] Q. Hanich. 'Interest and Influence – Conservation and Management in the Western and Central Pacific Fisheries Commission' (Phd Thesis, University of Wollongong 2011).
[29] R. Gillett, M. McCoy, et al. (2001) *Tuna: A Key Economic Resource in the Pacific Islands*. Manila. Asian Development Bank and Forum Fisheries Agency. p35.
[30] K. Barclay and I. Cartwright. (2007) *Capturing Wealth from Tuna: Case Studies from the Pacific*. Canberra, Australia. Asia Pacific Press. p31.
[31] Q. Hanich and M. Tsamenyi. (2010) *Review of Kiribati Access and Licensing Arrangements for Offshore Fisheries in Kiribati's EEZ*. Canberra, Australia. AusAID.
[32] G. Silvestre, L. Garces, et al. (2003) *South and South-East Asian Coastal Fisheries: Their Status and Directions for Improved Management. Conference Synopsis and Recommendations*. Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. Worldfish Center Conference Proceedings. Penang, Malaysia. Worldfish Center. p24. -- D. Pauly, R. Watson, et al. (2005) Global Trends in World Fisheries: Impacts on Marine Ecosystems and Food Security.

decline and increasingly transfer effort to near-shore skipjack tuna and anchored FADs.

Given their food security interests, these coastal States will suffer from conservation measures that limit artisanal catches or inequitably transfer any conservation burden onto artisanal communities. Furthermore, these States will have an explicit interest in ensuring that key fish stocks are sustained at a level to support continued food security for coastal communities.[33]

Development Aspirations and Benchmark Year Interests

Across the WCPO, the tropical tuna fisheries represent the primary economic opportunity for many of the region's developing coastal States. The equatorial Pacific islands States, Indonesia and the Philippines all depend heavily upon skipjack, yellowfin and bigeye for employment and economic development.[34]

Many of the developing coastal States throughout the WCPO region have long standing development aspirations for the WCPO tuna fisheries. These aspirations are particularly important for the Pacific islands region given their dependence upon fisheries resources and their lack of other development options. Regional institutions and donors have supported numerous development studies and projects to support these development aspirations, with mixed results.[35] A recent study prepared for the FFA identified six common development aspirations among the Pacific island States: expansion of longline fleet and catches; expansion of purse seine fleet and catches; value-adding through non-cannery activities; tuna processing ventures; expanding or starting shore based fleets; and small-scale development.[36] However, these development aspirations suffer significant constraints and challenges due to a number of industry and governance obstacles.[37]

Philosophical Transactions of the Royal Society. 360. p370. -- K. Barclay and I. Cartwright. (2007) *Capturing Wealth from Tuna: Case Studies from the Pacific*. Canberra, Australia. Asia Pacific Press.

[33] While there has been no discussion within the WCPFC of limiting artisanal catches, it is noteworthy that the European Union delegate to the Kobe II International Workshop on RFMO Management of Tuna Fisheries suggested that the Indian Ocean Tuna Commission may need to consider limiting artisanal catches of tuna given their significant impact on Indian Ocean tuna stocks. Personal notes. Comments by Mr Antonio Fernandez. European Commission Delegate. Comments made on 30 June 2010 at Kobe II International Workshop on RFMO Management of Tuna Fisheries. Brisbane, Australia. 29 June to 1 July 2010.

[34] SPC. (2009) *Estimates of Annual Catches in the WCPFC Statistical Area*. Fifth Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific. Port Vila, Vanuatu. WCPFC. Philippines. (2009) *Proposed Amendments to Paragraphs 22 of Conservation and Management Measure 2008-01*. Sixth Regular Session of the Western and Central Pacific Fisheries Commission. Papeete, French Polynesia, 7-11 December 2009. WCPFC. Indonesia. (2009) *Indonesia Annual Report to the Commission Part 1: Information on Fisheries, Research and Statistics* - Fifth Regular Session of the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 10-21 August 2009. WCPFC. B. Prisantoso. (2008) *Annual Report to the Commission Part 1: Information on Fisheries, research and Statistics - Indonesia*. Fourth Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Port Moresby, Papua New Guinea. WCPFC.

[35] For project examples, see: FFA. (2006) *Options for Domestic Fishing Industry Developments, Including Access Agreements*. 25th Meeting of the Parties to the Nauru Agreement. Nadi, Fiji. R. Gillett. (2003) *Domestic Tuna Industry Development in the Pacific Islands: The Current Situation and Considerations for Future Development Assistance*. Honiara, Solomon Islands. FFA. P. Philipson, R. Stone, et al. (2008) *Lessons Learned - A Review of Successes and Failures in Tuna Fisheries Development in the Pacific Islands*. Honiara, Solomon Islands. FFA, Pacific islands Forum Secretariat and the SPC.

[36] R. Gillett. (2008) *A Study of Tuna Industry Development Aspirations of FFA Member Countries*. Honiara, Solomon Islands. FFA.

[37] Pacific island States are disadvantaged by the highly globalised and integrated nature of the tuna industry, their remote location, lack of suitable skills, and weak domestic governance and institutions. The Pacific island States are effectively excluded from the more profitable 'downstream' end of the tuna business, as these activities, especially the distribution and retail components of the commodity chain, are dominated by multinational corporations. This has resulted in the failure of various attempts to establish domestic tuna operations. A number of reports and various literature have been written on these development constraints and challenges, and past failures. Further reading includes: R. Gillett and G. Van Santen. (2008) *Optimising Benefits in the Pacific Islands: Major Issues and Constraints*. Washington DC USA. World Bank. R. Schurman.

Vietnam, Indonesia and the Philippines are also developing coastal States with active interests in the WCPO tuna fisheries. These include significant commercial and artisanal catches and various onshore operations.[38]

Since the establishment of the WCPFC, these developing coastal States have been particularly concerned that their development aspirations are not unreasonably limited by WCPFC conservation and management measures. To date, these States have successfully sought exemptions for their developing fisheries from most conservation and management measures. While this satisfies short term concerns, there is increasing recognition that these exemptions are significantly undermining the effectiveness of conservation and management measures.[39] In the long term, Pacific island States appear to accept that these broad exemptions are not consistent with sustainable use objectives and will need to be replaced with measures that accommodate coastal State sovereignty, sovereign right and participatory right interests through which their development aspirations can be pursued.[40]

In the meantime, these developing coastal States will continue to bring their development aspirations to WCPFC negotiations and pursue these interests through conservation and management discussions. A good example of this can be seen in the significant increase in the coastal share of the purse seine fishery in Figure 7 from 2001-2004 to 2010, at the cost to the high seas share of the fishery. In contrast, flag State purse seine catch shares have changed little since 2001-2004.

Other Important Interests (Ports, Transhipment Vessels and Markets)

All catches must inevitably be landed if they are to be sold and consumed. This presents an opportunity for port States to benefit from landings or in-port transhipments through government charges and port employment. Additionally, ports serve as a critical opportunity to inspect vessels and monitor compliance with license conditions and conservation and management measures.[41]

(1998) Tuna Dreams: Resource Nationalism and the Pacific Island's Tuna Industry. *Development and Change.* 29. K. Barclay and I. Cartwright. (2007) *Capturing Wealth from Tuna: Case Studies from the Pacific*. Canberra, Australia. Asia Pacific Press. Q. Hanich, F. Teo, et al. (2008) *Closing the Gaps: Building Capacity in Pacific Fisheries Governance and Institutions*. Honiara, Solomon Islands. FFA. H. Parris and R. Q. Grafton. (2006) Can Tuna Promote Sustainable Development in the Pacific. *The Journal of Environment and Development.* 15. E. Havice. (2010) The Structure of Tuna Access Agreements in the Western and Central Pacific Ocean: Lessons for Vessel Day Scheme Planning. *Marine Policy*. 34.5. K. Barclay. (2010) Impacts of Tuna Industries on Coastal Communities in Pacific Island Countries. *Marine Policy*. 34.3.

[38] K. Barclay, H. Parris, et al. (2009) *Tuna Trade Flows from The Coral Triangle*. Sydney, Australia. TRAFFIC. -- UNDP and WCPFC. (2009) *West Pacific East Asia Oceanic Fisheries Management*. Pohnpei, Federated States of Micronesia. United Nations Development Programme and the WCPFC.

[39] In 2009, John Hampton presented a SPC study that found that all exemptions were having a significant impact on the effectiveness of the 2008 Conservation and Management Measure for Bigeye and Yellowfin. See: J. Hampton and S. Harley. (2009) *Assessment of the Potential Implications of Application of CMM-2008-01 for Bigeye and Yellowfin Tuna*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu. WCPFC.

[40] R. Gillett. (2008) *A Study of Tuna Industry Development Aspirations of FFA Member Countries*. Honiara, Solomon Islands. FFA.

[41] There has been an increasing recognition of the importance of strong port controls to combat IUU fishing. In November 2009, the Thirty Sixth Session of the United Nations Food and Agriculture Organisation Conference approved The Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. The aim of the Agreement is to prevent illegally caught fish from entering international markets through ports. The following WCPFC members have signed the Agreement: Australia, European Union, New Zealand, Indonesia, Samoa and the USA. *Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing* (Port State Agreement). 22 November 2009. Rome, Italy. 2009.

In April 1990, the equatorial Pacific islands States collectively agreed to prohibit all at-sea transhipments within their EEZs by licensed distant water fishing vessels. This was subsequently adopted by the FFA to be implemented throughout all FFA member EEZs.[42] The prohibition was adopted, in part to address misreporting of catches through verification of catch logbooks, and also to generate onshore services and revenue for Pacific island port States by forcing foreign fishing vessels in to port.[43] This prohibition was subsequently incorporated into the WCPF Convention for purse seine vessels (excepting small group seine vessels).[44]

The at-sea transhipment prohibition has since caused a dramatic increase in port activity with some in-port transhipment occurring throughout many FFA member States.[45] The benefits of these port activities can be substantial. Transhipment activities by visiting distant water fishing vessels can provide US$3,000 to US$6,000 in direct government revenue per activity (in 2007)[46] and substantial income to the local economy (in 1995).[47] However, the costs can also be high in significant social impacts (i.e. prostitution, substance abuse, disease transmission).[48]

Most States throughout the region will have some level of tuna landings or transhipments within their ports, and therefore some level of interest in WCPFC deliberations on port controls. However, a few States have a significant interest as they are host to the key ports which appear to handle most landings or transhipments of unprocessed WCPO tuna. The busiest ports within the Pacific islands region for purse seine in-port transhipments during the period 2004-2006 were: Pohnpei, Federated States of Micronesia (889 transhipments); Majuro, Marshall Islands (524); Rabaul, Papua New Guinea (381); Honiara, Solomon Islands (279); and Tarawa, Kiribati (187).[49]

Throughout the broader Asia-Pacific region, the key States that transhipment significant amounts of tuna within their ports are: Marshall Islands, Papua New Guinea, Solomon Islands, Federated States of Micronesia, French Polynesia, Kiribati, Japan, Fiji, Thailand, Philippines, Indonesia, and the USA (American Samoa and Hawaii).[50] This group of States includes nine

[42] The transhipment prohibition was a component of the Second Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties. A copy of the Second Implementing Arrangement is available in Appendix 2 of: M. Lodge. (1992) Minimum Terms and Conditions of Access: Responsible Fisheries Management Measures in the South Pacific Region. *Marine Policy.*

[43] S. Tarte. (1999) *Report on the Fourth Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific*. Suva, Fiji. University of the South Pacific. p13.

[44] Article 29. WCPF Convention.

[45] R. Gillett, M. McCoy, et al. (2001) *Tuna: A Key Economic Resource in the Pacific Islands*. Manila. Asian Development Bank and Forum Fisheries Agency. p28.

[46] R. Gillett. (2009) *Fisheries in the Economies of the Pacific Island Countries and Territories*. Mandaluyong City, Philippines. Asian Development Bank.

[47] R. Gillett, M. McCoy, et al. (2001) *Tuna: A Key Economic Resource in the Pacific Islands*. Manila. Asian Development Bank and Forum Fisheries Agency.

[48] K. Barclay. (2010) Impacts of Tuna Industries on Coastal Communities in Pacific Island Countries. *Marine Policy.* 34.3.

[49] R. Gillett. (2009) *Fisheries in the Economies of the Pacific Island Countries and Territories*. Mandaluyong City, Philippines. Asian Development Bank. p332.

[50] For references and further details on port interests, see: Ibid. p332. -- R. Gillett and C. Lightfoot. (2002) *The Contribution of Fisheries to the Economies of Pacific Island Countries*. Manila. Asian Development Bank, FFA and the World Bank. p28. -- K. Barclay and I. Cartwright. (2007) *Capturing Wealth from Tuna: Case Studies from the Pacific*. Canberra, Australia. Asia Pacific Press. (multiple references through Barclay report). -- T. Lawson, B. Iskandar, et al. (2007) *Report of the Eastern Indonesia Tuna Fishery Data Collection Workshop*. Eastern Indonesia Tuna Fishery Data Collection Workshop. Jakarta, Indonesia, 30-31 January 2007. WCPFC. (multiple references throughout Lawson report). -- China. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, research and Statistics*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 10-21 August 2009. WCPFC. p7. -- French Polynesia. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, Research and Statistics*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu,

of the 14 core States identified above. These States have an interest in any conservation and management measures that may require port States to implement additional regulations and encourage/restrict at-sea transhipments by WCPO tuna fishing vessels.

There are 22 flag States and territories with transhipment vessels that have historically operated within the WCPO tuna fisheries.[51] Fourteen of these flag States and territories reported transhipment vessels that were active between 2008 and 2011. They are: Bahamas, Cambodia, Cyprus, Isle of Man, Lithuania, Malta, Netherlands Antilles, Panama, Russia, Sierra Leone, Singapore, St Kitts and Nevis, Thailand and Tuvalu. None of these 14 States reported any other form of vessel activity during this time.[52] Only five of these States are WCPFC members or cooperating non-members (Tuvalu and European Union members, Cyprus, Lithuania, Isle of Man and Malta). The remaining eight States are not WCPFC members or cooperating non-members (Bahamas, Cambodia, Netherlands Antilles, Panama, Russia, Sierra Leone, Singapore and Thailand) although Panama and Thailand have both attended WCPFC meetings as observers. Many of these States have long histories in the region as active registers for transhipment vessels.

Few of these transhipment States are members or cooperating non-members of the WCPFC and are therefore not engaged in negotiations, nor able to readily influence negotiations. However, the vessels they flag are nevertheless expected to implement conservation and management measures relating to transhipment operations.

The distribution of the conservation burden could also extend to other industries and markets. A number of States around the world, including many of the core 14, have a commercial market interest in the WCPO tropical tuna fisheries through their consumption of tuna products. Tropical tuna are processed into a variety of products, ranging from minimally processed fresh and frozen whole tuna (i.e. bigeye and yellowfin), through various loining stages to fully processed canned retail products (i.e. skipjack and yellowfin). Canned tuna is one of the most significant products that originate from the WCPO purse-seine fisheries.

Thailand is the world's largest processor of canned tuna. Thailand is also the recipient of almost half of the WCPO's purse-seine catch.[53] The USA, Japan, China, Philippines, Korea, American Samoa, and increasingly Papua New Guinea and Indonesia also have significant

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10-21 August 2009. WCPFC. p5. -- Federated States of Micronesia. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, research and Statistics*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 10-21 August 2009. WCPFC. pp14-16. -- Kiribati. (2008) *Annual Report to the Commission - Part 1: Information on Fisheries, Research and Statistics* Fourth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Moresby, Papua New Guinea. WCPFC. pp12. -- Republic of the Marshall Islands. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, Research and Statistics*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 10-21 August 2009. WCPFC. pp14-15. -- Philippines. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, Research and Statistics.* Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 10-21 August 2009. WCPFC. pp11. -- United States of America. (2009) *Annual Report to the Commission Part 1: Information on Fisheries, Research and Statistics*. Fifth Regular Session of the Scientific Committee to the Western and Central Pacific Fisheries Commission. Port Vila, Vanuatu, 20-21 August 2009. WCPFC. pp21. -- T. Lewis. (2005) *The Tuna Fisheries of Vietnam - An Overview of Available Information*. First Meeting of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Noumea, New Caledonia, 8-19 August 2005. WCPFC. (multiple references through Lewis report). -- C. A. Vera and Z. Hipolito. (2006) *The Philippines Tuna Industry: A Profile*. International Collective in Support of Fishworkers. --P36-38. K. Barclay, H. Parris, et al. (2009) *Tuna Trade Flows from The Coral Triangle*. Sydney, Australia. TRAFFIC. pp24-27.

[51] Q. Hanich. 'Interest and Influence – Conservation and Management in the Western and Central Pacific Fisheries Commission' (Phd Thesis, University of Wollongong 2011).

[52] Ibid.

[53] Trimarine. *Tuna Markets and Seiner Capacity*. RFMO Tuna Management Workshop. (Brisbane, Australia 2010)

interests in domestic processing operations that are highly dependent upon consistent supplies of skipjack and yellowfin. Consequently each of these States has a strong interest in the continued operation of the skipjack and yellowfin fisheries and their provision of cheap raw material for their factories. Some WCPO States and territories also export various fresh, smoked and frozen products to global markets. Much of this requires minimal processing infrastructure compared to canning and loining, although some operations such as katsuoboshi require significant processing infrastructure.

The interests within these States may suffer if conservation measures were to restrict supply seasonally (as could happen if the WCPFC were to adopt proposals to close the entire WCPO purse-seine fishery for 3 months a year).[54] Similarly, these States would suffer if the WCPFC failed to address sustainability concerns.

The largest consumer markets in the world for fresh, frozen, smoked and canned tuna are the USA, Japan and Europe.[55] All of these markets, to some degree, depend upon the WCPO tropical tuna fisheries for their supply. In addition, markets in developing States are looking towards domestically produced and imported canned tuna to counter food insecurity and as a cheap form of protein.[56] Within this context, conservation and management decisions within the WCPFC, particularly in regard to skipjack and purse-seine fisheries, can quickly affect coastal food security and have significant repercussions for local and global market

Potential Impacts of Conservation

The complex and intermeshed nature of the WCPO tropical tuna fisheries makes it extremely challenging to address a specific management challenge, such as overfishing of bigeye, with a narrowly focused management response. Consequently, the WCPFC and its members must develop, negotiate and implement a conservation and management measure that includes a package of management options that will collectively achieve the conservation goal. The conservation and management measure must meet the following requirements.

1. It must be consistent with the WCPF Convention and other relevant instruments. The conservation and management measure must:[57]
    a. be based on the best scientific evidence available;
    b. ensure the long-term conservation and sustainable use of the WCPO tuna fisheries and their optimum utilisation;
    c. maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors;
    d. adopt a precautionary approach;
    e. avoid adverse impacts on the marine environment and maintain the integrity of marine ecosystems;

[54] For example, in February 2011 an industry association that represents some tuna industry interests called for a three-month closure of the WCPO purse-seine fishery. International Seafood Sustainability Foundation (ISSF). *Tuna Coalition Backs Seasonal Pacific Fishery Closure*. ISSF. Available at: http://iss-foundation.org/2011/02/22/tuna-coalition-backs-seasonal-pacific-fishery-closure/. Accessed on 23 February 2011.
[55] C. Catarsi. *World Tuna Markets*. (FAO, Rome, Italy 2004).
[56] Ibid.
[57] Articles 2, 5, 6 and 30. WCPF Convention.

f. ensure that conservation and management measures do not result in transferring a disproportionate burden of conservation onto developing State parties and territories.

2. In order for the conservation and management measure to be consistent with the best available scientific evidence (advice of the 2011 WCPFC scientific committee), the measure must:[58]
    a. reduce fishing mortality for bigeye by a minimum of 39% from 2004 levels, or 28% from average 2001-04 levels, or 32% from average 2006-09 levels;
    b. reduce fishing mortality of juvenile bigeye in order to increase potential yield and optimise utilisation;
    c. ensure no increase in fishing mortality for yellowfin in the western equatorial region;
    d. reduce fishing mortality of juvenile yellowfin in order to increase potential yield and optimise utilisation;
    e. implement precautionary limits on fishing activities for skipjack.

3. In order for the conservation and management measure to be consistent with the scientific advice and address the key impacts on the tropical tuna stocks, the measure must balance a mix of management options that:
    a. limit longline catches of bigeye;
    b. restrict purse-seine fishing activities;
    c. limit pole-and-line catches of yellowfin in the Japanese region;
    d. limit catches of bigeye and yellowfin within the Indonesian and Philippine fisheries.

The WCPFC can utilise a number of management options to meet these requirements. Each of these management options will support conservation and management objectives to varying degrees. However, each option will also impact upon the interests of WCPFC members to varying degrees. Key options and their potential impacts include:

Seasonal Closures

Some WCPFC members have supported the introduction of seasonal closures on the purse-seine fishery in order to reduce fishing effort, and therefore reduce fishing mortality of bigeye, yellowfin and skipjack. The efficacy of this measure depends upon the degree to which the restriction truly removes the effort from the fishery. It is likely that fleets will respond through maximising non-fishing days (i.e., maintenance, transits, etc.) during seasonal closures in order to minimise reductions in fishing effort. Similarly, some fleets may attempt to transfer their fishing effort to other fisheries during seasonal closures. The application of a seasonal closure is likely to significantly affect those coastal States and processing interests that have few options to mitigate the impact of seasonal closures, thereby raising concerns that such measures may disproportionately affect developing coastal State Parties.

Area Closures

Some WCPFC members have supported the introduction of area closures to reduce fishing effort and thereby reduce fishing mortality of bigeye, yellowfin and skipjack. As with

[58] WCPFC. (2011). *Draft Report of the Seventh Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission.* Seventh Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Pohnpei, Federated States of Micronesia, 9-17 August 2011.

seasonal closures, the efficacy of this measure depends upon the degree to which the restriction truly removes the effort from the fishery. It is likely that fleets will respond through migrating to other fishing zones such as EEZs, archipelagic waters and other high seas. The application of an area closure is likely to impact most on hosting coastal States if the area occurred within an EEZ, or on distant water fishing States if the measure closures areas of high seas. The use of high seas closures in a mix of measures offers opportunities for the WCPFC to comply with Article 30 and avoid disproportionate transfers of conservation burden onto developing coastal States.

Gear Restrictions (particularly FADs)

The WCPFC currently prescribes a three-month prohibition on the use of FADs by the purse-seine fishery. Recent assessments have indicated that this has been highly successful at reducing bigeye fishing mortality and has a strong impact on bigeye conservation. Assessments have also suggested that reductions in catches during the FAD closure may be offset by the larger average size of fish caught.[59] Further restrictions and limitations on the numbers of FADs that can be set are likely to impact on most members less than a total purse seine closure, with minimal difference in conservation outcome. However, a FAD closure will impact significantly on some fleets that have historically used FADs more than others, and also on some coastal States where the use of FADs is higher than elsewhere. Other gear restrictions are also feasible, including restrictions on purse-seine mesh size, time restrictions on deployment or retrieval, types of hooks, etc.

Capacity Limits

Some WCPFC members have strongly argued for the implementation of capacity limits to reduce effort, thereby reducing fishing mortality and increasing profitability. Various studies have also suggested that the profitability of the WCPO tuna fisheries could be increased through significant changes in fleet composition and reductions in most, if not all, fleets. [60] Catches of bigeye and yellowfin by purse-seine fishing vessels, particularly juveniles in schools associated with FADs, provide a smaller benefit to the overall value of the WCPO tuna fisheries than would be achieved if these fish had been allowed to mature and then be caught by longline. If purse seine FAD sets were prohibited, then these fish may potentially have become available to the longline fishery for a far greater benefit to the overall value of the WCPO tuna fisheries. However, bio-economic modelling has found that the benefits from significant fleet restructuring and purse-seine reductions would be enjoyed disproportionately and that the actual outcomes could be detrimental to coastal States with significant purse-seine fisheries.[61] Capacity limits can also be undermined by effort creep where vessels become faster, larger, more powerful and more effective at catching fish, thereby effectively increasing capacity. In addition, some members have strongly opposed capacity limits due to concerns that this would limit development opportunities for developing coastal States and

[59] Hampton, J., and P. Williams. *Analysis of Purse Seine Set Type Behaviour in 2009 and 2010.* Seventh Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. (Pohnpei, Federated States of Micronesia, 9-17 August 2011).

[60] M. Bertignac, A. Hand, et al. *A Bioeconomic Model of Longline, Pole and Line and Purse Seine Fisheries in the Western and Central Pacific*. (ACIAR Canberra, Australia 1998). H. Campbell. 'Managing Tuna Fisheries: A New Strategy for the Western and Central Pacific Ocean' (2000). 24(2) *Marine Policy*. M. Bertignac, H. Campbell, et al. 'Maximising Resource Rent from the Western and Central Pacific Tuna Fisheries' (2001) 15. *Marine Resource Economics.* T. Kompass and N. C. Tuong. 'Economic Profit and Optimal Effort in the Western and Central Pacific Tuna Fisheries' (2006). 21(3) *Pacific Economic Bulletin.* R. Hannesson and J. Kennedy. 'Rent-Maximisation Versus Competition in the Western and Central Pacific Tuna Fishery' (2009). 1(1) *Journal of Natural Resources Policy Research.*

[61] Reid, Bertignac *et al. Further Development of, and analysis using, the Western and Central Pacific Ocean Bioeconomic Tuna Model (WCPOBTM)*. (FFA and SPC. Honiara, Solomon Islands 2006). Reid, C. *Economic Implications of an Implicit Allocation of Bigeye Harvest Rights Through an Across the Board Reduction in Effort Levels in the Western and Central Pacific Tuna Fishery*. Sharing the Fish. Perth, Australia 2006.

impose a disproportionate conservation burden on developing State Parties. Such reductions in capacity could limit demand for access and potentially negatively impact on coastal State access revenue. Consequently, any resolution of overcapacity and fleet structures will likely require some mechanism to equitably distribute the reductions and benefits.

Catch and/or Effort Limits

The WCPFC currently prescribes catch limits on the longline fishery for bigeye and yellowfin and effort limits on the purse-seine fishery. These two management options provide a relatively transparent management mechanism for directly limiting fishing mortality. The efficacy of these management options depends on the consistency of the catch and effort limits with the scientific advice, and the monitoring of their implementation so as to avoid misreporting and discards. Any exemptions or special conditions must be considered during the formulation of the measure to ensure that these do not inflate the total catch or effort beyond the recommended fishing mortality. The allocation of catch limits to national fleets and effort limits to areas has avoided some of the problems inherent with 'Olympic' limits, that motivate a race to fish, but further discussion is likely to be required to more fully allocate catches and effort for high seas fisheries. Such discussions can quickly become contentious given the lack of an agreed framework for the distribution of such limits, and the need to ensure that any allocation of limits does not result in a disproportionate burden of conservation onto developing State parties and territories. Other feasible effort limits can include further restrictions on transhipments-at-sea to reduce opportunities to continuously maintain fishing effort without interruption.

Developing a New Approach to the Distribution of the Conservation Burden

Existing WCPFC processes fail to successfully resolve the political aspects of conservation negotiations, and consequently, members prove unwilling to compromise their interests. Measures are opposed or weakened as each member argues for exemptions, or will only support measures that impact minimally on their own interests.[62]

Some commentators argue that tuna RFMOs should distribute some form of property or use right in order to effectively address overfishing and reduce excess capacity.[63] They suggest that the lack of determined rights in a fishery undermines incentives for conservation, whereas a rights-based management approach would give stakeholders incentives to fish in a manner that ensured the long term sustainability and economic viability of the fishery.[64]

However, applying a stakeholder focused rights based management approach to the WCPFC would require first that the participating coastal and flag States agree on their national allocations before these rights can be trickled down to stakeholders. The determination of

[62] For examples and further discussion, see: Q. Hanich. *Interest and Influence – A Snapshot of the Western and Central Pacific Tropical Tuna Fisheries* (Australian National Centre for Ocean Resources and Security, Wollongong, 2011). Available at http://ro.uow.edu.au/uowbooks/1

[63] For further discussion, see: R. Allen, W. Bayliff, et al. 'Rights-Based Management in Transnational Tuna Fisheries' in R. Allen, J. Joseph, et al. (eds). *Conservation and Management of Transnational Tuna Fisheries*. (Wiley-Blackwell. Ames, USA, 2010).

[64] J. Joseph, D. Squires, et al. 'Addressing the Problem of Excess Fishing Capacity in Tuna Fisheries' in *Conservation and Management of Transnational Tuna Fisheries*. R. Allen, J. Joseph, et al. (eds). *Conservation and Management of Transnational Tuna Fisheries*. (Wiley-Blackwell. Ames, USA, 2010). A. Willock and I. Cartwright. *Conservation Implications of Allocation under the Western and Central Pacific Fisheries Commission*. (WWF Australia and TRAFFIC Oceania, Sydney, Australia 2006).

such rights through an explicit allocation process is highly fraught and could consume years of effort, particularly as the Convention requires that allocation decisions are adopted by consensus. These challenges are further exacerbated in the WCPFC as there is a fundamental disagreement between coastal States and distant water fishing States as to whether allocations should be limited to the high seas or also be applied to waters under national jurisdiction.

The WCPFC has effectively deferred indefinitely any explicit allocation of rights, but has nevertheless distributed a conservation burden through the adoption of conservation and management measures. In the stalemate vacuum that surrounds rights based management failures, the distribution of the conservation burden becomes in effect an interim reverse allocation. However, this approach does not support the negotiation of strong measures because it does not provide a transparent or equitable framework for a politically acceptable distribution of the conservation burden. Furthermore, these implicit allocations last only as long as the conservation and management measures are in force.

And herein lies the problem, and an opportunity. This paper proposes that the WCPFC adopt a new approach to the distribution of the conservation burden. This should work within the existing structures and the Convention and expand conservation negotiations to establish a transparent framework that defines the parameters for how it distributes the conservation burden. This type of approach would also mitigate disagreements inherent in rights based management regarding whether the WPCFC can extend allocation regimes into EEZs.

Importantly, such an approach would answer important equity questions that are fundamental to transparency in conservation and management negotiations and provide clarity and certainty to conservation negotiations. Some of these questions are presented in Figure 9.

Figure 9: Questions of Equity in the Distribution of the Conservation Burden

Factors	Questions of Equity	Considerations
Coastal States and Flag States	Should the WPCFC value the shared nature of (flag State) common rights to high seas fisheries as equal or less than the exclusive nature of (coastal State) sovereign rights over fisheries within EEZs? How should these rights be weighed against the absolute sovereignty that coastal States hold over fisheries within their archipelagic waters or territorial seas	LOSC and UNFSA prescribe no specific duty to cooperate or conservation responsibilities on coastal States for archipelagic waters or territorial seas. UNFSA protects coastal State and flag State rights under the LOSC.
Food Security for Coastal Communities.	How should the WCPFC consider the limited options available to artisanal communities in coastal developing States, compared to the diversity of food enjoyed by distant markets?	UNFSA requires RFMOs to consider the vulnerability and needs of developing States which are dependent on fisheries for food security.
Artisanal and Subsistence Fishing Communities.	How should the WCPFC balance the distribution of the conservation burden between artisanal and subsistence fisheries compared to large scale industrial fishing fleets?	LOSC and UNFSA requires consideration of artisanal and subsistence interests, but makes no such similar accommodation for industrial fleets. Similarly, UNFSA requires RFMOs to consider the needs of coastal States whose economies are dependent mainly on fishing for the stocks in question, but provides no such explicit requirement for consideration of distant water fishing fleets (beyond the general equal consideration of '...respective interests, fishing patterns and fishing practices of new and existing members...'.
Polluter Pays or Race to Fish.	Should the WCPFC incorporate the principle of 'polluter pays' into fisheries measures and focus the conservation burden on those States who are historically responsible for overfishing, or focus the distribution of the conservation burden on new entrants, protecting States with historically high fishing levels.	Neither LOSC or UNFSA provides guidance on whether States with a historical interest, or new entrants, should be protected or punished. UNFSA prescribes that various issues, including historical levels and the respective interests of new entrants and historically active participants must be considered but does not value their interests.
Mixed Benefits and Costs in Multi-gear and Multi-species Fisheries.	How should the WCPFC recognise the mixed benefits and costs in multi-gear/multi-species fisheries?	If one fleet (e.g. longline) will benefit from conservation reductions, should those States with significant interests in that fleet bear a greater share of the conservation burden than those States with minimal interests who will receive no direct benefit from reductions
Development Aspirations.	How should the development aspirations of developing States be recognised in practice?	International fisheries governance prescribes that RFMOs must not apply a disproportionate burden of conservation action onto developing States, but provides no such protection for developed States.
New entrants.	How should the WCPFC account for new entrants in a manner that is consistent with the LOSC and UNFSA while recognising the fully fished/overfished nature of most international fisheries?	UNFSA prescribes that various issues, including historical levels and the respective interests of new entrants and historically active participants must be considered but does not value their interests.

This paper proposes that the WCPFC develop a new approach for addressing these questions, implemented through decision making frameworks that transparently and equitably distribute the conservation burden. Such a new approach would move beyond the conceptual level of rights-based models and provide concrete steps that explicitly determine what conservation burden each State would carry depending on their national characteristics. This would modernise fisheries management to be more consistent with broader developments in common resource management (such as climate change) that incorporate principles of differentiated responsibilities (between developed and developing States).[65]

The approach would address the questions identified above and define the interest fields relevant to the distribution of the conservation burden, consistent with core principles of international fisheries governance. These interest fields could include the following:

- Coastal State interests in their territorial seas, archipelagic waters and EEZ:
  - Opportunity for domestic fleets and artisanal fishers to fish inside national waters;
  - Opportunity to provide immediate food security for coastal communities
  - Opportunity to license foreign vessels to fish in national waters.

- Flag State distant water fishing interests
  - Opportunity for registered vessels to fish.

- Market/consumer interests
  - Opportunity to supply processing interests;
  - Opportunity to supply commercial markets.

- Development aspirations
  - Opportunities to develop domestic fishing fleets;
  - Opportunities for domestic fishing fleets to fish national waters, adjacent high seas, and further beyond;
  - Opportunities to develop and supply domestic processing.

The approach would then develop a methodology for distributing the conservation burden, based on specific values for each interest field. Agreement on the values for each field would be developed in accordance with the international principles identified above and international practice. For example, values for interests in archipelagic waters would need to consider the higher level of rights (i.e. sovereignty) compared to the more limited sovereign rights that apply to EEZs, or the common rights that apply to the high seas.

The methodology would then prescribe the use of these values and how they would be applied to conservation measures. For example, if a limit reference point were exceeded, the Scientific committee would determine the extent of the necessary conservation response to reduce fishing mortality down to the level of the target reference point. The fisheries science would then advise on the conservation measure options that would achieve this conservation response and their necessary extent (i.e. restrictions and/or prohibitions on certain gears, areal and/or seasonal closures, capacity limits, catch/effort limits). This advice would only identify management options that are sufficient to achieve the necessary conservation response.

The methodology would then measure the impact of these alternative management options

[65] Article 3. United Nations Framework Convention on Climate Change. (1992) 31(4). *International legal Materials*. 851.

against the identified fields and their agreed values. The methodology would then determine which of the alternate management options impacted the least on the fields and values. The decision making framework would then prescribe that this minimal impact option be adopted.

Such an approach would separate the scientific advice from the distribution of the conservation burden and therefore de-politicise the scientific assessments and advice to a significant degree. Members would also be assured that their interests would be transparently and equitably considered in accordance with the agreed framework.

Ideally the approach would work alongside a harvest strategy that identifies target and limit reference points and prescribes management responses. In this context, the management response to an exceeded limit reference point would be to invoke the agreed methodology for distributing the conservation burden and develop a conservation measure in accordance with its pre-agreed values.

Assessing Management Options and Distributing the Conservation Burden

Within its complicated mix of interests, the WCPFC and its members must develop, negotiate and implement a conservation and management measure that includes a package of management options that will collectively achieve the conservation goal. The WCPFC can utilise a number of management options to meet these requirements. However, each of these management options will also directly and indirectly impact upon the interest fields of the WCPFC members to varying degrees.

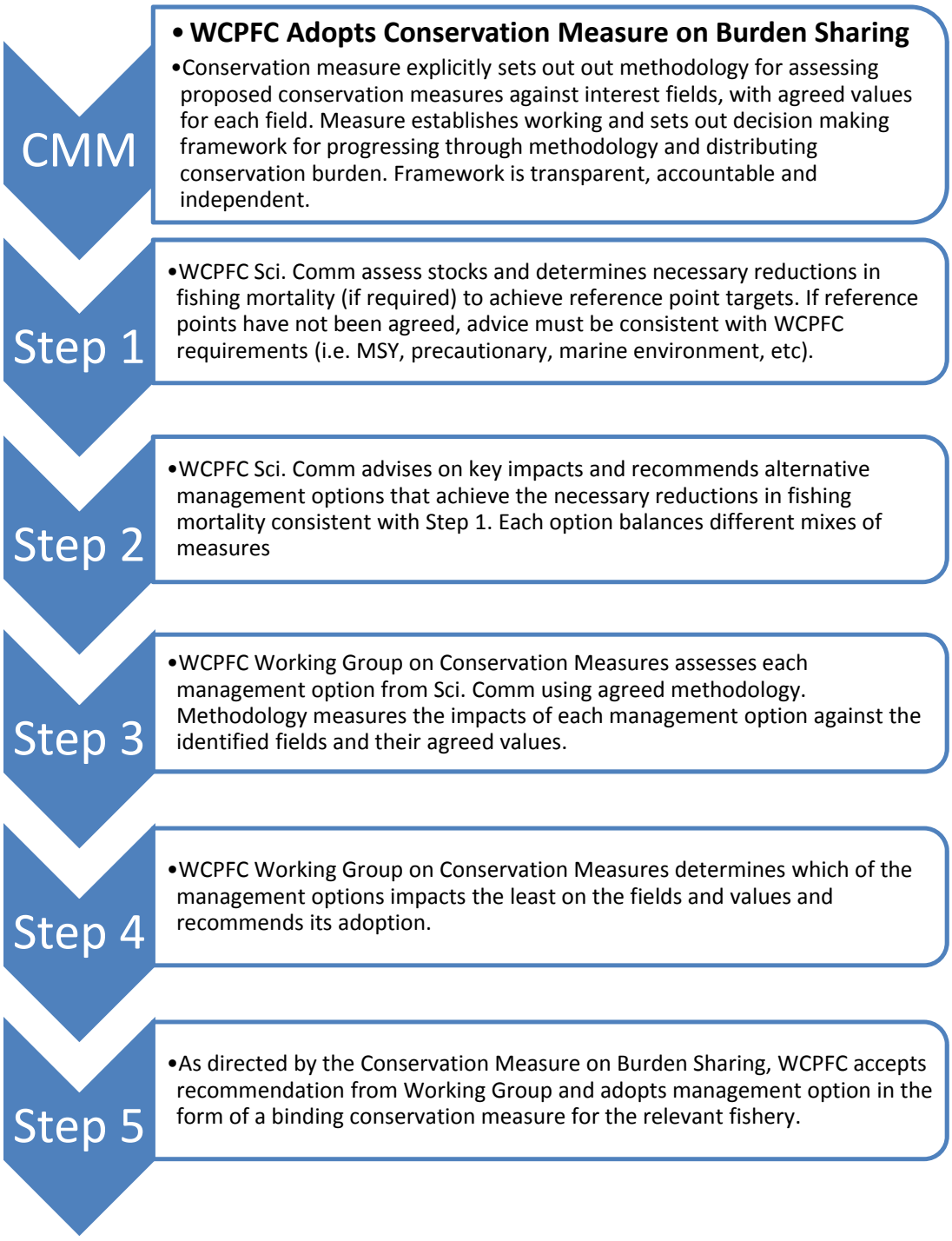
In order to implement a new approach to distributing the conservation burden, the paper proposes that the WCPFC develop a methodology based on four interest fields (coastal State, flag State, market/consumer State, and developing State) and determine values for each interest field. The WCPFC would then adopt a 'Burden-Sharing Conservation Measure' that prescribes the decision making framework for progressing through this methodology and distributing any conservation burden.

Subsequently, if a concern with overfishing arises, then the WCPFC Scientific Committee would have a clear mandate to advise on the necessary conservation response to address overfishing concerns and on the conservation measure options that would achieve this conservation response and their necessary extent (i.e. restrictions and/or prohibitions on certain gears, areal and/or seasonal closures, capacity limits, catch/effort limits). The WCPFC has not yet agreed on reference points, so in its gap, the conservation response must be consistent with the WCPF Convention.

The WCPFC Scientific Committee would then advise on the key impacts and recommend alternative management options that balance different mixes of measures that limit longline catches of bigeye, restrict purse-seine fishing activities, limit pole-and-line catches of yellowfin in the Japanese region, and limit catches of bigeye and yellowfin within the Indonesian and Philippine fisheries. The Scientific Committee would be required to limit its proposed management options to only those that achieve the conservation targets for producing the maximum sustainable yield (until a harvest strategy was adopted that established agreed reference points).

Figure 10 illustrates how such an approach might work in practice through a decision tree that charts each step in the process.

Figure 10: A Decision Tree for Distributing the Conservation Burden



The approach would then measure the impact of these alternative management options against the four interest-fields and their agreed values. The methodology used to measure these impacts would then determine which of the alternate management options impacted the least on the fields and values. The decision making framework prescribed in the Burden-Sharing Conservation Measure would then prescribe that the management option with the minimal impact on the fields and values be adopted.

Conclusion

This paper recommends that the WCPFC expanding on existing conservation and management processes to include this new 'conservation burden' step. This would be more relevant to the current context of declining fish stocks, as opposed to attempts to implement approaches to rights based management that typically focus on dividing the 'pie' (while in reality the pie is shrinking). This approach would also provide a greater degree of flexibility than existing models of rights based management, and would avoid coastal State arguments that oppose RFMOs implementing rights based management frameworks over waters under their national jurisdiction. In this regard, the approach could be more likely to resolve 'vested-interest' political obstacles to the adoption of sufficiently strong conservation measures than existing concepts of rights-based management.