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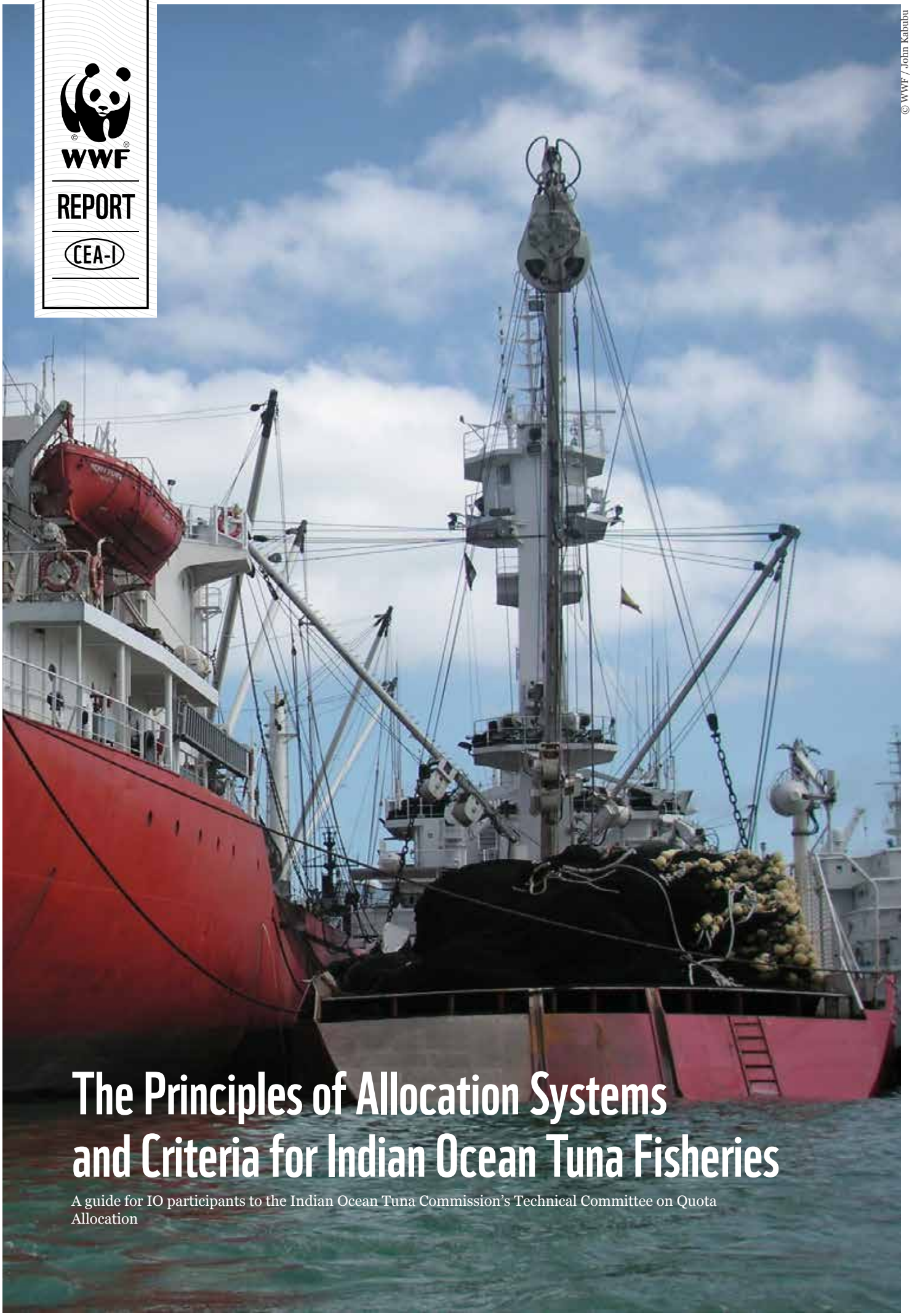

The Principles of Allocation Systems and Criteria for Indian Ocean Tuna Fisheries

A guide for IO participants to the Indian Ocean Tuna Commission's Technical Committee on Quota Allocation

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FOREWORD

The WWF Eastern and Southern Africa Regional Office has been working for nine years, within the Lake Victoria Basin, implementing the Lake Victoria Catchment Environmental Education Programme (LVCEEP). This programme, with funding from the Government of Sweden, has worked with schools and communities within the catchment area, to promote the conservation of natural resources and improve the livelihoods of the communities in the region. The programme has been working in the lake's catchment areas of Kenya, Uganda and Tanzania and in recent years has expanded into Rwanda.

The LVCEEP Programme has used a methodology of Education for Sustainable Development (ESD), in line with the United Nations Decade on Education for Sustainable Development (2005-2014) that has called for all forms of education to be re-oriented to mainstreaming sustainability concerns. The LVCEEP Programme, within an ESD context, has used the whole school approach, that considers schools as an integral part of the wider community, and as a strategy to mainstream sustainability into all forms of teaching and learning. To do this, we have integrated the participation of the the entire schools community, to include the pupils, teachers, non-teaching staff, school boards, parents teachers associations (PTAs), parents and community representatives, to help support and build their capacity on the best practices in regard to sound environmental management. This has enabled us also to provide alternative sources of livelihoods where conflicts between natural resource management and the livelihoods of the communities occurred, ensuring sustainability. Through this approach, the programme has led to improved schools environments which has, and can easily be replicated in the surrounding communities.

The programme has also invested in building the capacity of the schools teachers and boards on ESD methodologies, that promote pedagogies which are pupil centred, promote action research and active learning, encourage critical thinking skills, and allows for democratic decision-making and values that have all influenced the students way of thinking and view of life and the environment. The programme has seen profound changes in the teaching and learning institutions, with some schools reporting improved child enrolment and retention and improved academic performance.
This publication shares some of the best practices in LVCEEP Schools and provides good background for practitioners in education to embrace 'Education for Sustainable Development' within the context of a whole institutional approach.
We welcome you to enjoy reading this publication.

ACKNOWLEDGEMENTS

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CONTENTS

Overview and scope

The Indian Ocean Tuna Commission (IOTC) is currently developing a Quota Allocation System (QAS) for the main targeted species under the IOTC competence,toin part meet the Commission objective ofensuring the conservation and optimum utilization of stocks covered by the IOTC Agreement and encouraging sustainable development of fisheries based on such stocks.The IOTC has created and tasked its Technical Committee on Allocation Criteria (TCAC) to develop and recommend a QAS to the IOTC plenary.
This plain English guide provides a practical tool to assist individuals, organisations, states, and territories with an interest in the TCAC process to effectively QAS discussions in the Indian Ocean. The guide recognises that sustainable management of resources requires continuing and increasing benefits for member states.

Article V of the IOTC Agreement states:

> *2. In order to achieve the [Agreement's] objectives, the Commission shall have the following functions and responsibilities, in accordance with the principles expressed in the relevant provisions of the United Nations Convention on the Law of the Sea:*
>
> *(b) to encourage, recommend, and coordinate research and development activities ..., having due regard to the need to ensure the equitable participation of Members of the Commission in the fisheries and the special interests andneeds of Members in the region that are developing countries;*
>
> *(d) to keep under review the economic and social aspects of the fisheries based on the stocks covered by this Agreement bearing in mind, in particular, the interests of developing coastal states;*

This guide is therefore intended to place all regional participants in the best possible position to negotiate fair and sustainable allocation outcomes for tuna and tuna-related fisheries in the Indian Ocean.

Part One provides a brief history of the historical developments and context that have shaped the current negotiations to create a QAS in the Indian Ocean. Part Two analyses what a QAS is and explains the basic concepts involved. Part Three discusses the measures that Regional Fisheries Management Organizations (RFMOs) could put in place as an alternative to a QAS as well as the potential for subregional agreements to be used to assist with implementing alternative measures.

Appendices

Appendix A provides a comprehensive quick reference glossary for QAS participants on terms and concepts used in relation to the fisheries management and QASs.

Appendix B explores a range of hypothetical baseline allocation formulas for illustration purposes only.

Appendix C provides a range of possible correction factors and explains how they might operate in a QAS.

Appendix D demonstrates the effect of selected correction factors within a QAS for illustration purposes.

Appendix E includes the results of an indicative economic valuation of selected QAS proposals. It demonstrates the potential monetary impacts ongoing negotiations can have on participants. Due to the difficulties in valuing quota and the multiple ways in which this can be done, this valuation is nominal and for indicative use only.

Sources and selected further reading

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[The views expressed in this document are those of the individual authors and do not necessarily reflect those of WWF.]

Sources and selected further reading

The following selected resources have influenced this paper which readers seeking further detail may also find useful:

Allen, Robin, James Joseph, and Dale Squires, Conservation & Management of Transnational Tuna Fisheries (Wiley-Blackwell, 2010)

Caddy, J F, "An Objective Approach to the Negotiation of Allocations from Shared Living Resources" (1996) 20(2) Marine Policy 145

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Available online at:http://www.iotc.org/files/proceedings/2011/tcac/IOTC-2011-SS4-Info1[E].pdf

Marine Resources Assessment Group, "Allocation Issues for WCPFC Tuna Resources" (Discussion paper presented to the 3rd regular session of the Western and Central Pacific Fisheries Commission, WCPFC no WCPFC3-2006/15, Apia, Samoa, October 2006)

Available online at: http://www.wcpfc.int/doc/wcpfc3-2006-15/allocation
Numerous papers of interest concerning quota allocation in fisheries were presented at the Food and Agriculture Organization (FAO) Sharing the Fish Conference (Perth, Australia, 26 February–2 March 2006) and are available at: http://www.fao.org/docrep/013/i1788e/i1788e00.htm.

This article also draws on information from the United Nations Food and Agriculture Organisation (http://www.fao.org/fishery/en), the Indian Ocean Tuna Commission (http://www.iotc.org) & the Organisation for Economic Cooperation and Development (http://www.oecd.org).

Part One:
A brief history of quota allocation

The current development of a QAS in the Indian Ocean is not the inevitable result of technological progress but the consequence of particular choices taken in a historical context. Understanding how and why these choices were made reveals what alternative possibilities have been rejected as well as the full scope of potential measures that can be taken to manage fisheries in the Indian Ocean in the future.

The structure of any QAS that is eventually chosen will define the share each IOTC member state will receive of the estimated USD 2–3 billion worth of tuna caught in the Indian Ocean each year. This Part provides the context necessary to understand why the IOTC has chosen to develop and implement a QAS and the particular forms these QAS proposals presently take.

A very brief history of fisheries management

The high seas and its resources have long been treated as being held in common by all and the property of no one. The high seas were therefore open to unlimited exploitation by anyone.Rights to the living resources in the water column of the high seas began with the acceptance of 200nm Exclusive Economic Zones (EEZs) under the United Nations Convention on the Law of the Sea (UNCLOS) and continued with the establishment of RFMOs under the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement or UNFSA).

There is a general technical consensus that rights based management regimes are the most effective regimes for the rational management of international fisheries. This development has occurred as a result of the greater exploitative capacity of modern industry to utilise fisheries resources, the recognition that these fisheries resources are finite, and the consequent attempt by states to exert greater control and authority over those resources. The UN Fish Stocks Agreement also makes it one of the functions of RFMOs to agree on participatory rights such as allocations of allowable catch or levels of fishing effort.

The IOTC attempt to develop a QAS is at the forefront of RFMO management measures. No RFMO has to date implemented a permanent systematic method of allocating quotas (see "Allocation regimes in tuna RFMOs" below). Allocation of rights to fisheries resources has so far been subject to a split between the interests of proximate coastal states who claim their sovereignty right and the distant water fishing states (DWFS) who have historically exploited and utilised these resources.

The international legal framework

States have sought to govern international fisheries management through international law and have binding legal obligations relevant to fisheries management under international law (but not necessarily under their own domestic law). These obligations generally arise from the 1982 United Nations Convention on the Law of the Sea (UNCLOS).

[+]See generally Robin Allen, James Joseph, and Dale Squires, Conservation & Management of Transnational Tuna Fisheries (Wiley-Blackwell, 2010) and specifically therein Robin Allen et al, "Rights-Based Management in Transnational Tuna Fisheries" 65.

At last count, less than half of the 162 nations that have ratified UNCLOS have also ratified the 1995 UN Fish Stocks Agreement. Nevertheless, UNFSA has become the guiding framework for managing international fisheries and is generally accepted as elaborating the broader obligations in UNCLOSto manage straddling and highly migratory fish stocks, of which tuna and tuna-like species are the most commercially important. The most recent legal analysis suggests that there is nothing significantly controversial in making rights under UNCLOS, such as the right to fish on the high seas, subject to RFMO management under UNFSA.

UNFSA sets RFMOs as the central management bodies for inter- and trans-national fisheries. Article 10(b) of UNFSA states that through RFMOs, states will agree, as appropriate, on participatory rights such as allocations of allowable catch or levels of fishing effort. This article, along with the economic and environmental drivers towards sustainable fisheries management, has propelled development of quota allocation systems in RFMOs.

Current IOTC fisheries management and conservation measures

The Indian Ocean Tuna Commission (IOTC) was established in 1996 under the FAO framework. Since its inception the IOTChas implemented a variety of measures aimed at containing fishing mortalityof major species under its management following growing concern over the consequences of potential overfishing, as well as unsustainable and unfair fishing practices.

Up to 2011 these measures have included:

- mandatory data collection requirements including catch and effort by vessels over 24 metres in length,
- various monitoring and control requirements to address illegal, unreported, and unregulated (IUU) fishing, including a regional observer scheme, transhipment programme, and port state measures to deny IUU fishers port facilities,
- prohibitions on certain types of effort including fishing on data buoys,
- recommending retaining and landing all bigeye, skipjack, and yellowfin (unless unfit for human consumption or there is insufficient well space),
- area closures prohibiting fishing for one month by purse seine and longline fishing in a large area off the coast of Somalia,
- requests to implement measures to reduce fishing effort,
- limitations on fishing capacity in terms of number of vessels, overall tonnage, and overall fishing effort for tropical tunas, and
- the capping of catch of bigeye tuna at historical levels.

About two thirds of the IOTC's 33 CPCs are signatories to the UN Fish Stocks Agreement including major DWFS such as the EU, France, UK, Spain, Portugal, Korea, and Japan. The Republic of China (Taiwan), another major DWFS, is unable to sign the treaty due to its diplomatic status but claims to implement its provisions.

Andrew Serdy, "International Fisheries Law and the Transferability of Quota: Principles and Precedents" in Robin Allen, James Joseph, and Dale Squires, *Conservation and Management of Transnational Tuna Fisheries (Wiley-Blackwell, 2010)*.

More recently, during 16th session of the IOTC Commission, a proposal endorsing the precautionary approach in general was adopted as a binding resolution, and a second proposal providing interim reference pointswas adopted as a recommendation for application by the Scientific Committee.

Allocation regimes in tuna Regional Fisheries Management Organizations (RFMOs)

Five RFMOs around the world are centrally concerned with the management of tuna and tuna-like species:

- CCSBT: Commission for the Conservation of Southern Bluefin Tuna
- IATTC: Inter-American Tropical Tunas Commission
- IOTC: Indian Ocean Tuna Commission
- ICCAT: International Commission for the Conservation of Atlantic Tuna
- WCPFC: Western and Central Pacific Fisheries Commission

Until recently, no RFMO had implemented a QAS. RFMOs including the CCSBT and IATTC had implemented quota allocations but these were unsystematic, temporary allocations which were generally directly negotiated between the parties. The CCSBT has agreed to criteria upon which allocation decisions should be made, but these are applied gradually by CCSBT panels on a stock by stock basis. The IOTC and WCPFC are the only RFMOs currently exploring the possibility of more systematic arrangements.

The CCSBT allocates rights to a single species to three major parties; Australia, Japan, and New Zealand, and provides smaller allocations to other parties such as Korea, Taiwan, Indonesia, and South Africa. The initial allocation was fixed by direct negotiation between the parties rather than through a set of formulas intended to be permanent. Before 2011 temporary adjustments were made to take into account overfishing by some parties and to set aside quota for new entrants or limit quota for non-compliance, however this was all done by direct negotiation. Since 2011 a management procedure has been agreed which sets the basis for determining the total allowable catch (TAC) and an allocation breakdown for allocating the TAC to membersfor the next three years was agreed. Allocations are directly negotiated and fixed for a number of years, unless there is a change in the TAC. Changes in TAC are apportioned based on past nominal catch levels of the parties.

The IATTC restricts total purse seine vessel tonnage for its members based on historical catch rates, amount of catch taken in zones of national jurisdiction, tuna landings per state, and contributions to conservation programs. Longline fisheries are managed using quota allocations, but these are directly negotiated between parties and not decided by a systematic process or formulas.

Like the CCSBT, ICCAT initially allocated rights to a single species to a limited number of parties: Canada, Japan, and the United States of America (USA). The first distribution of TAC in 1982 was apportioned on the basis of historical catch rates and was directly negotiated and apportioned in the form of specific tonnage of catch. Later apportioning of TAC took into account the proximity and needs of local coastal states and developing fisheries, which included allocations to new parties including Brazil and Cuba, and later the United Kingdom (UK) and France - none of whom had historical catch rates to justify allocations. In 1997 the ICCAT allocated proportions of catch for swordfish in a more enduring arrangement, without making provision for new entrants.

In 2001, ICCAT agreed upon criteria for the allocation of fishing possibilities. Qualifying criteria included membership of the RFMO and a commitment to meet the relevant Conservation and Management Measures (CMMs) and reporting requirements. Allocation criteria included historical catch rates and fishing patterns, the distribution of the stock in EEZs and high seas, the needs of coastal states, interests of artisanal and subsistence fishers, socio-economic importance of the stock to the state including food security, and compliance with the RFMO's rules. The criteria, however, form a set of principles upon which allocations should be made – they do not create a system through which quota is allocated. Quota allocations are made on a stock by stock basis by relevant Panels who must apply the allocation criteria. No weightings were put on the particular criteria formulated at the time. ICCAT has also taken punitive action against parties who over-fish including reducing quotas.

The WCPFC has continually delayed discussion of an allocation system and concentrated on incorporating the Vessel Day Scheme (VDS) implemented by the Parties to the Nauru Agreement (PNA) into its CMMs. This provides an authorised way for PNA members to meet their responsibilities towards limiting mortality of bigeye and yellowfin tuna. So far, other states are required to implement compatible measures. However the PNA VDS currently only applies to EEZs. The WCPFC has discussed but not yet implemented an expanded VDS covering the high seas as well. Te Vaka Moana, a political grouping of South West Pacific nations, is also exploring the development of in-zone allocation approaches for the pelagic species in their waters.

Early IOTC proposals for catch allocations

The first resolutions concerning the allocation of catch were proposed by the European Union (EU) to the 13th IOTC session in April 2009. These resolutions were not adopted by the IOTC because of requests for major modifications from other parties which the EU considered unacceptable.

At the 14th session of the IOTC in March 2010, two new resolutions were proposed to limit the fishing of tuna stocks by the EU and the Seychelles. The EU proposal was adopted at that session becoming Resolution 10/01 "For the Conservation and Management of Tropical Tunas Stocks in the IOTC Area of Competence".

The Seychellois proposal was described as having "merged" with the EU proposal during negotiations. In reality, the Seychellois proposal went much further than the EU proposal. Itincluded immediate annual catch limits for yellowfin and bigeye tuna and an automatic closure of fishing for all vessels when that limit was reached. The final Resolution does not include these elements, and instead comprises a temporary seasonal fishing closure limited to a fishing area off the eastern coast of Somalia, which was already affected by piracy, together with an undertaking to implement a QAS including a TAC in 2012.

Alternative proposals at the IOTC

In October 2009, between the 13th and 14th IOTC general sessions, the IOTC's Working Party on Fishing Capacity(WPFC) recommended that input-based capacity measures limiting fishing effort should be investigated rather than output-based measures such as catch levels. The WPFC's input-based measurerecommendation was seen as not suitable for effective implementation in the IOTC,and instead Resolution 10/01 was adopted, which includeda deadline for a QAS by 2012.

The current timeline for an IOTC QAS

The current timeline for a QAS in the Indian Ocean emerged from Resolution 10/01 "For the Conservation and Management of Tropical Tunas Stocks in the IOTC Area of Competence" and requires:

1. Contracting parties and cooperating non-contracting parties (CPCs) to implement a quota allocation systemor any other relevant measures based on Scientific Committee recommendations for the main targeted species under IOTC competence;
2. technical committee meetingsto be held to discuss allocation criteria and recommend an allocation quota system for tuna in the Indian Ocean; and
3. an allocation quota system "or other relevant measure" for yellowfin and bigeye tuna to be adopted at the IOTC plenary session in 2012.

As required by IOTC Resolution 10/01 the IOTC Technical Committee on Allocation Criteria (TCAC) met for the first time in February 2011 in Nairobi to consider the development of a QAS. In the lead up to, and during the TCAC meeting, five proposals for a quota allocation system in the Indian Ocean were elaborated. The proposals originated from Indonesia, the Seychelles, the European Union, Iran, and the Republic of Korea and are analysed in Table 1.

The resolution, however, is clear that a QAS is only one option before the IOTC to manage excessive fishing effort and other relevant measures may be considered insteadof or as wellas a QAS so long as they are based on Scientific Committee recommendations.

The first TCAC meeting in February 2011 acknowledged that work on the allocation system was unfinished and that further meetings would be required. However discussion did highlight a variety of criteria and indicators that would be taken into account in any allocation and these are also discussed in Table 1 and the following sections.

Implementing a QAS in the IOTC

A quota allocation system would be implemented by the IOTC as a CMM. According to the IOTC Agreement, a CMM is binding on IOTC members if a two thirds majority of IOTC members present vote in favour of the measure. Members of the IOTC are allowed to issue objections to CMMs. A significant amount of objections can derail the implementation of a CMM.

Depending upon the recommendations of the TCAC and the implementation of the main targeted species quotas, further species could be integrated into this system at a later stage. While the proposals to date have focused on yellowfin and bigeye tunas, some states such as the Seychelles propose to directly integrate swordfishwith yellowfin and bigeye into the QAS.

Table 1: Analysis of current proposals for a QAS at the IOTC

Issue	European Union proposal	Seychellois proposal	Indonesian proposal	Iranian proposal	Korean proposal
Data used in base allocation decision	Historical catch rates of flag states over past 10 to 15 years.	Catch per area in EEZs of regional coastal states and historical catch of flag states on high seas over past 20 years.	Geographic zone, history of tuna fisheries, historical catch, fishing fleets and gear, socio-economic context, environmental concerns.	Average historical catch rate over past 10 years.	Historical catch rates 1960-2009.
Correction or adjustment factors	• Membership status IOTC • Payment of IOTC fees • Fulfilment of CMMs • Compliance status • Contribution to research • Actions against IUU vessels	• Membership status • Compliance with CMMs	Not addressed.	• Socio-economic context (reliance on fisheries) (30%) • Responsible fisheries plan (25%) • Location in IOTC area (15%) • Participation in IOTC (15%) • Cooperation with IOTC (15%)	Supported generally but not addressed specifically.
Balancing interests of coastal and distant water fishing nations	The sum of a fixed set aside plus the set aside resulting from the operation of correction factors is available for CPCs with concrete fleet development plans and developing states et al	Base allocation formula takes into account catch in EEZs of coastal states and balances this with historical catch rates of all CPCs.	Weighting or priority of criteria is not addressed.	Application of criteria means distant water fishing CPCs can only exploit a maximum of 85% (and potentially only 55%) of their potential quota.	Not addressed beyond wider reference years for base allocation decision.
Dealing with new entrants and developing countries	The sum of a fixed set aside plus the set aside resulting from the operation of correction factors is also available for new entrants.	Set aside from TAC allocated for new entrants. Developing coastal states have catch per area of their EEZ taken into account in base allocation.	Not addressed.	Does not address new entrants. Developing countries benefit from "socio-economic context" and "location within IOTC area" criteria.	Not addressed specifically. Implicitly weighted towards recognising older participants in the fishery.
Impact of compliance on allocations	Compliance is a correction factor which can negatively affect base allocation.	Compliance is an adjustment factor which can decrease base allocation.	Not addressed.	Application of criteria means non-compliant CPCs can only exploit up to 70% of their potential quota.	Not addressed.
Tradability or transferability of allocations	CPCs can transfer their quotas to other CPCs with prior notification to the IOTC.	CPCs can transfer quotas to other CPCs, but permanent trade of quota is proscribed for at least the first 15 years.	Not addressed.	Not addressed.	Not addressed.

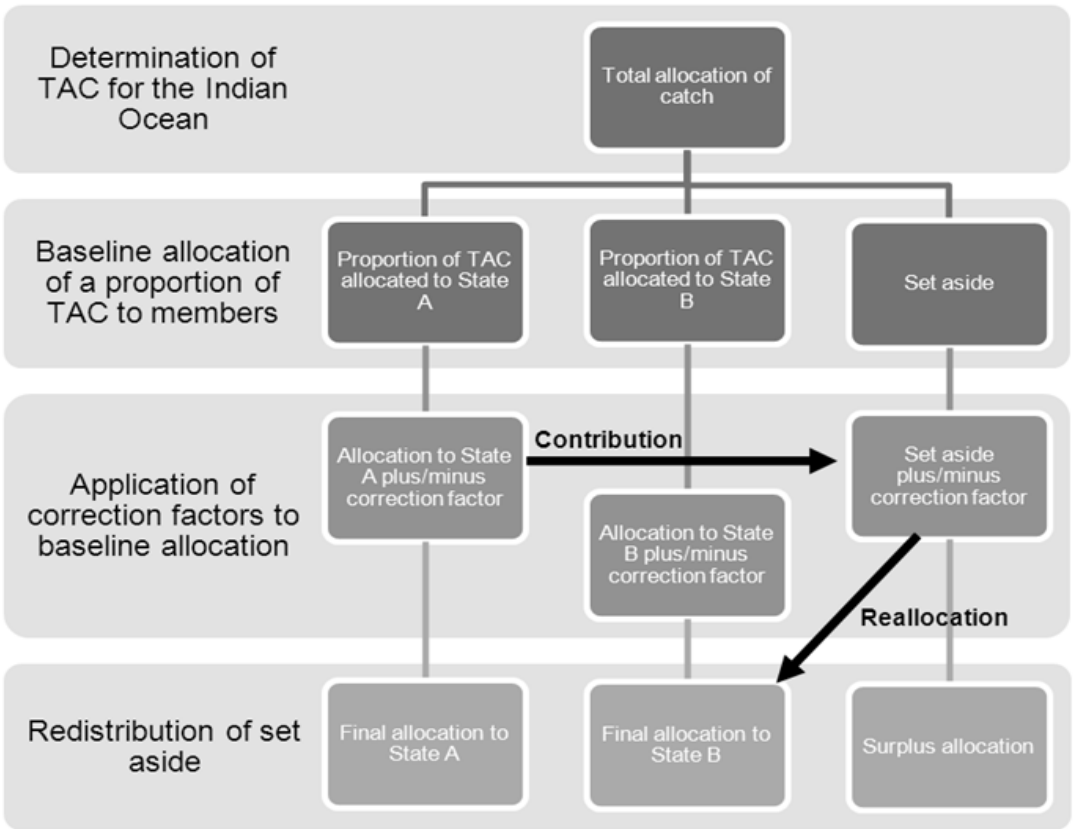
Part Two:
Basic elements of a quota allocation system

There are four levels to the type of quota allocation system currently being proposed at the IOTC:

1. Determination of the TAC.
2. The initial baseline allocation of a proportion of that TAC to participants.
3. The increasing or decreasing of baseline allocations of TAC by the application of correction factors.
4. The redistribution of any set aside created as a result ofthe baseline allocation and/or the application of correction factors.

This structure is demonstrated in Table 2 and each of these levels is explained in turn. The rationale for this structure is discussed at the end of this Part. Readers unfamiliar with the terms used in this explanation should refer to the quick reference glossary in Appendix A.

Table 2: Sample operation of the four levels of a quota allocation system



Level one: Determination of the TAC

The total allowable catch is the total catch allowed for a fishery during a set time period. The determination of a TAC is a relatively non-contentious part of a QAS. Participants generally assume that a TAC will be set by the relevant scientific committee or working group and appear confident that such a group would have the capacity and expertise to set an effective TAC that is considered legitimate by all IOTC members.

It is generally assumed that principles of international law of the sea such as the precautionary principle and the use of "best scientific information available" are applicable to the determination of a TAC. Obviously, if there is a risk that a TAC can be set above a stock's level of maximum sustainable yield then this would defeat the purpose of the QAS. Despite this, TAC rates are not always set at the rate recommended by scientists.

Beyond these shared assumptions there are also different approaches to the calculation of TAC. TAC has often been calculated by reference to the maximum sustainable yield (MSY) a fishery can sustain. MSY refers to the largest surplus that can be harvested from a species over a given period of time without affecting the stock's long-term biological sustainability. Since at least the late 1970s this concept has been criticised as inapplicable to real as opposed to hypothetical fisheries because it oversimplifies the biology involved in stock replenishment.

An alternative to MSY is Maximum Economic Yield (MEY). MEY refers to the amount of a fish stock that can be harvested to make the largest sustainable profit and recognises that what is sought from a fishery is not maximum yield but the largest profit from the least effort. Because higher stocks generally mean require lower fishing effort to extract the same value of catch, the necessary sustainable level of stock required by MEY will usually be higher than that required by MSY. At the same time, because MEY prefers, all things considered, lower effort, it lowers the opportunity cost to society of engaging in fisheries. MEY is now part of the Commonwealth Fisheries Harvest Strategy Policy and Guidelines in Australia. Given the recent IOTC adoption of the precautionary approach, MEY could become part of the QAS discussion as well.

[**]P A Larkin, "An Epitaph for the Concept of Maximum Sustained Yield" (1977) 106(1) *Transactions of the American Fisheries Society 1.*

There are tools available to assess and compare different management strategies in any given fishery. Management Strategy Evaluation (MSE) uses models and simulations to test different management strategies in different scenarios representing the accepted spectrum of uncertainty. The results of MSE can be used to compare the outcomes of different management strategies. The IOTC has endorsed MSE through its Scientific Committee and future use of MSE by the IOTC will be relevant to any IOTC QAS.

Level two: Baseline allocation

The baseline allocation is the initial allocation of a proportion of the TAC to certain participants which establishes the basic shares each participant will hold. The baseline allocation formula determines how those shares are calculated and distributed amongst participants.

Generally, the more permanent the allocation made by the baseline allocation formula, the closer the allocation comes to resembling a form of property right. This resemblance grows stronger when the baseline allocation can be transferred between participants. Where the baseline allocation resembles the allocation of permanent property-like rights, the baseline allocation formula becomes critically important as it directly distributes future benefits to the resource, usually as a windfall gain to the negotiating participants.

The development of property-like rights can be avoided by ensuring the baseline allocation is temporary and re-allocated regularly by correction factors or re-negotiation. This flexibility must be balanced, however, against the benefits brought by allocating property rights, which are generally thought to encourage efficient use and management of fisheries resources. Baseline allocations also do not necessarily need to be made to all participants or any at all. For example, a hybrid QAS could allocate a baseline allocation to regional coastal states and left over TAC to the RFMO which then distributes quota to interested parties according to correction factors.

This baseline allocation formula can be based on one or several elements combined together. Negotiation of baseline allocation formulas has so far appeared to be split between the interests of proximate coastal states and historical DWFS. Coastal states want the formula to take account of catch rates in their EEZ to represent their sovereign rights to resources in their EEZs. DWFS want the formula to take account of catch rates of flag states because of the effort they have invested in the fishery. It is also argued that a close relationship between past catch rates and future allowable catch will minimise the economic disruption to a fishery.

[++]R Quentin Grafton et al, "The Economics of Allocation in Tuna Regional Fisheries Management Organizations" in Robin Allen, James Joseph, and Dale Squires, *Conservation and Management of Transnational Tuna Fisheries (2010, Wiley-Blackwell).*

The principles used to distribute the initial allocation of TAC to participants are important for two main reasons:

1. The baseline allocation of a proportion of TAC to participants has the greatest effect on a participant's final quota allocation.Correction factors should not be relied upon to significantly reverse the effect of the baseline allocation formula or the QAS will become dysfunctional.

2. The baseline allocation roughly represents the distribution that participants accept as legitimate. The principles behind the baseline allocation formula therefore define what participants accept as determining legitimate ownership of the resource.

Potential baseline allocation formulas

Given the baseline allocation needs to roughly represent a legitimate distribution of TAC amongst participants, the following factors would potentially be relevant for the baseline allocation formula:

1. Historical catch data per flag state.
2. Historical catch data per area (EEZ or other defined region).
3. Estimated biomass data.
4. Historical effort data.
5. Special requirements of developing states in the convention area.

In principle, historical catch data is not the only option available as the basis of the allocation formula. The baseline allocation can potentially take into account any of the factors described below and in Appendix C as correction factors. However, in practice, historical catch data is often the easiest formula to implement. Which data is included in the baseline allocation is largely a question of context and negotiation subject to the requirements of international law.

For example, the UNFSA requires states to balance the interests of historical participants with regional states, developing states, small island developing states, and coastal states, so that every party with a real interest in the fisheries has a say in the management outcome. Furthermore, some principles of international law, such as coastal state sovereignty over its EEZ, and other accepted principles of politics and justice, such as proportionality and fairness, may require other data to be taken into account in the baseline allocation formula. The current proposals for a QAS in the Indian Ocean do not explicitly take account of the special interests of developing states in their baseline allocation formulas. The Seychellois proposal attempts to, but does so indirectly by measuring catch per area in state EEZs. The EU proposal takes account of developing states through the redistribution of set aside and the Iranian proposal uses correction factors to the same end.

It is a legitimate argument that the special interests of developing states should be explicitly included as a criterion in any baseline allocation formula. This argument is based on the principles found in Part VII and articles 3, 5, and 11 of UNFSA, and the points in Annex V of the IOTC Agreement outlined in the Overview and Scope section above. UNFSA requires states to give full recognition to the special interests of developing states in the conservation and management of highly migratory fish stocks such as tuna and specifies that this duty includes:

- ensuring that CMMs do not bear a disproportionate burden of conservation action;
- taking account of the vulnerability of developing states dependent on fish stocks including for reasons of food security;
- avoiding adverse impacts on subsistence, small scale, and artisanal fishers, as well as women fishworkers and indigenous people in developing states;
- assisting developing states to participate in high seas fisheries, including facilitating access to such fisheries; and
- enhancing the ability of developing states to engage in conservation and management of straddling and highly migratory fish stocks.

These principles are generally held to apply even more rigorously in the case of small island developing states which are recognised as having fewer natural resources on which to base their economic activity. The IOTC Agreement reflects the same principle in its preamble which recognises the special interests of developing countries to benefit equitably from the region's fisheries. Other RFMOs have given even greater emphasis to the duties contained in the UN Fish Stocks Agreement in their founding documents. The WCPFC convention, for example, specifically requires the needs of small island developing states to be taken into account in developing criteria for the allocation of TAC.

A range of hypothetical baseline allocation formulas are provided for illustration purposes only in Appendix B.

Level three: Correction and adjustment factors

Correction or adjustment factors are considerations used to modify the baseline allocations made to parties. The difference between the criteria used in the baseline allocation and those used as correction factors is generally one of perceived importance. Baseline allocation criteria are seen as more fundamental than other considerations, which should only be "correct" the result already reached. It is generally also assumed that the baseline allocation will only be made once, in the case of property rights, or at least much more sparingly than the application of correction factors, which themselves can be applied and/or adjusted more regularly.

The most important element of a correction factor is the weighting given to it. In principle, any weighting can be allocated to any correction factor. The relative importance of correction factors is a matter of negotiation between the parties, and will depend on the particular baseline allocation formula chosen. A list of possible correction factors is included in Appendix C.

In principle there is also no limit to the kind or number of correction factors that can be used. However, practical considerations may limit both scope and number of possible combinations. For example, correction factors are usually negative in effect. That is, they are used to reduce a party's baseline allocation but not to increase it. This is because increasing baseline allocations through correction factors could allow total allocations to exceed the TAC and lead to overfishing. To prevent correction factors that have a positive effect on baseline allocations from exceeding the TAC, more complex management of proportional shares is required. The different types of correction factors and how they work within a QAS is described in Appendix C.

Depending on the structure of the QAS, correction factors can have a critical impact on the end outcome of quota allocations. As an example, the correction factors contained in the Iranian QAS proposal to the IOTC are modelled in Appendix D.

Level four: Redistribution and final allocation

Quota can be set aside at any level of a QAS for redistribution, conservation, research or a variety of other purposes.A set aside can be created when calculating the TAC, making baseline allocations, applying correction factors, or by reducing all final quota allocations by a set percentage to create a set aside.
A set-aside can be used for a variety of functions. Set-aside has been proposed as a solution to certain issues that arise in a QAS and RFMOs including:

- New entrants: Any set aside could be ear-marked for potential allocation to legitimate new entrants to the fishery.
- Fairness: Any set aside could be reallocated to mitigate unfairness created by an otherwise appropriate baseline allocation formula.
- Funding: A stable set aside created through the baseline allocation formula could be auctioned off and the proceeds go towards the operating costs of the QAS.

The current EU QAS proposal, for example, creates a set aside by the application of correction factors as well as through the baseline allocation (the global set aside). This set-aside is then ear-marked for provision to coastal states without a quota allocation. However, other combinations of correction factors and allocation formulas could potentially render such a set aside arrangement superfluous.

Where there is no set aside to redistribute, the application of correction factors will result in the final allocation to participants and there will be no fourth stage in the QAS.

What happens after quota is allocated?

After baseline allocations are made, correction factors applied, and any set-aside redistributed, each state-participant to the RFMO will have a final proportion of TAC allocated to them. Once the TAC is determined, state-participants will be able to convert that proportion into an absolute figure and begin allocating their quota to fishers.
For a QAS to function properly, the RFMO, QAS operator, or RFMO members ideally need the capacity to trace every significant portion of catch of the target species taken from the RFMO area through a strong Monitoring, Control and Surveillance (MCS) regime. When catch is taken by a fisher without a quota, the QAS operator must be able to detect and sanction the infringement to prevent reoccurrence. Without such MCS and deterrence, the entire QAS becomes irrelevant and inoperative.

To preserve the integrity of the TAC, estimated IUU fishing catch ratescould be subtracted from TAC before allocation of quota. However, this mitigating factor would not address the root cause of IUU fishing. The problem, rather, is one of incentives. The benefit of a QAS is that it maximises participants' benefits by ensuring a sustainable stock to harvest from. If some fishers can routinely evade the obligations of a QAS then the TAC is compromised and other participants have no incentive to submit to the costs and regulatory burdens of compliance with the QAS.

As a result, any QAS critically depends on a strong MCS and enforcement regime that is both effectively deters infringements and non-compliance. Unfortunately, a 2009 performance review of the IOTC identified both compliance with IOTC requirements and data-integrity as key weaknesses in the IOTC regime. If these issues are not addressed prior to the implementation of a QAS they are likely to hinder the implementation of a QAS as well as be exacerbated by a QAS, because of its requirements for greater MCS and data.

The implicit rationale behind this QAS model

The structure for a QAS discussed above is drawn from the current QAS proposals before the IOTC. However it is not the only way rights to fisheries can be allocated. This model of QAS makes a number of significant assumptions including:

- Use of TAC rather than total allowable effort (TAE): controlling fishing capacity by regulating outputs (catch) rather than inputs (fishing effort as measured by number of fishers, time spent fishing, equipment used, etc).

- Two-tiered allocation: a long-term allocation to state-participants who may then make annual allocations to individual fishers.
- Original allocations made as a proportion (such as a percentage figure) of TAC to state-participants. The absolute value of the proportion allocated (e.g. its precise value measured in tonnes in any one year) may then change as the TAC changes.
- Allocation of property-like rights to state-participants.

These assumptions represent attempts to resolve the problems faced by other RFMOs that have allocated quotas. The solutions proposed use a property-rights based approach derived by analogy with domestic state-based QASs which have successfully limited fishing where RFMOs have failed. To this extent, this model of QAS is a further step in the privatisation of marine resources which were previously the common property of all.

In a nutshell, some state-based QASs are believed to be successful because they change the incentives for participants in a fishery. Fishers generally have an incentive to catch as much fish as quickly as possible regardless of long-term sustainability because this translates to greater short-term profit. But where participants in a fishery are allocated a permanent quota which they can then deal with as they see fit, that quota gains a positive capital value that can increase if the fishery is managed sustainably. The participants who are allocated quota then have a positive incentive to limit fishing which overcomes their incentive to fish to greatest capacity.

The use of a TAC rather than a TAE has two main purposes. First, it is supposed to avoid effort creep. Where a TAE is used it regulates certain inputs into fishing activities such as numbers of vessels used or days spent fishing. Some argue that this merely encourages fishers to increase catch by using unregulated inputs such as fish aggregating devices (FADs) or larger, more efficient vessels, without regard for sustainability. The second purpose of a TAC is to provide a more definite right for fishers. The value of a right to fish for a certain number of days cannot be as precisely valued for trading purposes as can a right to a certain amount of catch.

This QAS system assumes a two stage allocation process: TAC is first divided amongst state-participants and state-participants are then free to make secondary allocations to fishers directly. These elements of a QAS also support the property-rights approach to fisheries management. The distribution of TAC in permanent proportions via a previously agreed formula creates the stability and permanence required for a property right to gain value as an asset. However, the more stable and enduring the original allocation, the more likely it is to become a stumbling block in negotiations as states manoeuvrer to receive the largest proportion possible.

Part Three: Alternative measures

Technical opinion now generally recommends a QAS that confers proprietary or quasi-proprietary rights as the most effective and efficient way to sustainably manage fish stocks. However, a QAS is not the only way to prevent overfishing and sustainably manage fish stocks. States may initiallynot want to, or may not be able to, implement a QAS for a number of reasons. Negotiating parties may not be able to find sufficient common ground among their individual interests to accept a QAS, or the particular fishery to be managed may not be susceptible to a QAS approach for any number of reasons. Where this occurs, alternative measures can be considered to prevent overfishing.

This Part considers several types of alternative measures to a QAS that could be used to prevent overfishing by adopting a wider perspective that views quota allocation systems as just one potential fisheries management regime amongst others. The discussion in this Part is therefore broader and more general than in the rest of this guide.

The following consideration of alternative measures sets out the advantages and disadvantages of each measure but makes no explicit judgment as to their relative merit. We assume that the best management regime for any fishery will depend on the particular nature, context and participants of that fishery. As discussed at the end of Part Two, previous comparisons of alternative measures of managing fisheries have made a compelling distinction between measures which block incentives for fishers, and measures which change the incentives for fishers. Measures which merely attempt to block or counter act the incentives which drive fishers to fish unsustainably are considered to be less successful than measures which change the incentives for fishers. This distinction should be kept in mind when considering alternative measures.

Alternative measures will be considered when one or more party's preferred measure is unlikely to be successful or to meet with sufficient support throughout the RFMO membership as a whole. However, failure to implement a measure directly through the RFMO does not mean that the measure must be given up entirely. In the context of IOTC, this Part also discusses where and when smaller groupings of states may find it beneficial to implement a measure through sub-regional arrangements, especially where that measure is equivalent to or exceeds the measure put in place by the IOTC.

[**]See generally Robin Allen, James Joseph, and Dale Squires, *Conservation & Management of Transnational Tuna Fisheries (Wiley-Blackwell, 2010)* and specifically therein Robin Allen et al, "Rights-Based Management in Transnational Tuna Fisheries" 65.

Possible management regimes for fisheries

Fisheries are common pool resources. This means that it is difficult to exclude people from accessing the resource and that the resource is finite and can be depleted; when one person harvests the resource it limits the amount of the resource available for others. There are four methods of limiting overexploitation of common pool resources like fisheries:

1. Limiting access to the fish stock.
2. Limiting the amount of the fish stock that can be harvested.
3. Limiting the time that can be spent harvesting the fish stock.
4. Limiting the technology that is used to harvest the fish stock.

These methods are usually used in combination in an attempt to overcome the problems and limitations their individual use.
The solutions offered by the current IOTC QAS proposals limit access to the resource as well as the amount that can be harvested by using individual quotas. They do not, however, consider alternative measures such as limits on the time that can be spent harvesting the fish stock, or limits on the technology used to harvest the fish stock. As noted at the end of Part Two, the model of QAS currently under consideration by the IOTC has been developed over time to solve recurring issues in fisheries management such as incentives to overfish and effort creep. Any consideration of alternative measures should also consider these issues.

1. Limiting access to thefish stock

Limiting access to a fish stock is the primary means by which overfishing can be prevented. Limiting amounts of catch, time spent fishing, and technology used all imply access limits as fishers who do not comply with catch, time, or technology limits must be prevented from exploiting the fishery and benefiting from the resource. Allowing totally unrestricted access to a fish stock is equivalent to having no controls on fishing at all.

To this extent, the current proposals for a QAS in the Indian Ocean all include limiting access to certain fish stocks to parties to the QAS system who have a right to exploit a fish stock through a quota allocation. There are, however, other forms that access limits can take including:

1. Area and time closures.
2. Licencing schemes.
3. Taxation.

Area closures are a common form of access limit used in many RFMOs. Area closures are usually combined with time limits to prevent fishing for limited periods of time in limited areas within a fishery. Proposals for marine parks for conservation purposes usually include robust area closures. When targeted to prevent fishing in biologically important areas such as spawning or nursery areas, area closures can have a greater impact on stock regeneration. Because area closures usually prohibit fishing for their duration entirely, when the area is significantly large, they have an almost direct effect on fishing mortality. Area closures are for this reason often used in fisheries where a TAC is imposed without allocating quotas. The consequent race to catch as much fish as possible leads to the TAC being met and an area closure being imposed on the entire fishery until a new TAC is imposed the following fishing season or period.

At their most simple, licencing schemes limit access to those fishers with licences or permits to fish or enter a fishing zone. A cap on the number of licences issued is usually required. Licences therefore also act as technology limits as they limit capacity in a fishery. Licences can also include conditions similar to those in area and time closures as well as gear limitations amongst other measures. Licences can continue to reduce capacity when combined with a buyback program. However, as with a competitive TAC, licences do not by themselves remove the incentives for fishers to either avoid the limitations or engage in effort creep. Fishers continue to have incentives to frustrate the attempt at capacity restrictions. Combining licences with other measures such as limitations on the amount of a catch begins to operate more like a quota allocation scheme than a simple licencing scheme.

Taxation can also operate to limit access by increasing the costs of exploiting a fishery. While taxation does not directly restrict access to a resource, it has been suggested as potential measure that may limit capacity by devolving some or all of the costs of managing a fishery to the participants. Taxation could in principle operate as royalties or as a resource rent applied to profits generated from fisheries or directly to fisheries products. How taxation would be applied in practice in international fisheries is a controversial question. Taxation is in principle unproblematic for application to resources in EEZ waters; however its application to high seas could be highly contentious and complex to operationalise.

2. Limiting the amount of the fish stock that can be harvested

Limiting the amount of a fish stock that can be harvested involves directly regulating the amount of catch that can be taken from a fishery. Catch limits can be applied to a fishery as a whole (as a simple TAC) or to individual vessels. Where catch limits are applied to individual vessels they can apply as blanket restrictions on all vessels on the amount of catch they can take per trip or per period of time, or by allocating catch limits (quota) to individual vessels.

The current QAS proposals include a TAC that is intended to be split between participants to the fishery through an allocation formula and therefore involves limiting the amount of fish that can be harvested. The benefit of this approach is that it rewards and encourages productivity increases to the extent quota takes on the characteristics of a property right which can be held for a certain period of time and transferred to others. By devolving the value of catch down to individuals, it also incentivises those participants to sustainably manage the fishery to preserve the value of their quota asset. The main problem with the QAS approach is that it requires negotiation over the critically important original allocation to parties which usually assumes the form of a windfall gain to those participants rather than having to be paid for at market value. Agreement may therefore be more difficult to reach in the short term than with other more temporary measures. As mentioned above, a QAS also requires comparatively expensive monitoring, control, and surveillance to ensure compliance with its requirements.

An alternative, more simple measure is simply to set a TAC and not distribute allocations of it to participants. All participants are allowed to fish as much as they wish until the TAC is met for the fishing period and then the fishery is closed until the next period occurs. A simple TAC can reduce overfishing if the TAC is set to sustainable levels and some suggest it may also reduce capacity by forcing out inefficient fishers. It is also comparatively easy to implement and enforce as simpler catch documentation is required and area closures prohibit all fishing by all vessels. However, a simple TAC used in isolation is also universally acknowledged to lead to an increase in fishing effort and capacity as individual fishers have an incentive to catch as much fish as quickly as possible to increase their share of a now limited TAC at the expense of their competitors. This can lead to an economically inefficient fishery where fishers with large capacity may be tempted to overfish and/or underreport or otherwise act in a manner that causes effort creep.

3. Limiting the time that can be spent harvesting the fish stock

Limits on the time that can be spent harvesting a fish stock can be applied across a fishery, as an area closure, or to individual fishers. To individual fishers, time limits are most effectively applied as individual effort quotas which limit the time (usually measured in days) a vessel can spend fishing and generally requires tailoring to the particular fishery to be effective. To accommodate different vessel sizes one day actually spent fishing may count for more than one "vessel day" under the scheme. As fishers will inevitably attempt to increase the productivity of their vessels during individual days, the amount of total vessel days available may also need to be changed over time.

In the western Pacific Ocean, the PNA group have created a Vessel Day Scheme (VDS) for their EEZ waters which is now being implemented through WCPFC CMMs. Under the VDS vessel owners can only fish in the EEZ of participating states if they have purchased an entitlement to sufficient "days of fishing effort". The allocation of days of effort from a TAE is made to coastal states, rather than flag states, on the basis of a combination of historical effort and total estimated biomass in each state's EEZ. Althoughthere are significant contextual differencesbetween Pacific and Indian Ocean fisheries and there is no guarantee an equivalent scheme would work in the Indian Ocean.Relationships are being developed between the Indian Ocean fisheries management leadership and the PNA to learn more about how these tools operate in practice.

4. Limiting the technology that can be used harvesting the fish stock

Overfishing can also be prevented through limiting the technology that is used in harvesting a fish stock. The most significant limits on technology are:

1. Vessel limits (capacity limits).
2. Gear limits.
3. Buyback or decommissioning programs.

Vessel limits directly aim to reduce fishing capacity by limiting vessel numbers or size. This is merely a conditional access limit with or without a cap on vessel numbers. In practice it requires some kind of licencing or permit scheme to refuse access to those who do not meet the capacity limits, and is part of catch limit operation. These measures are discussed above.

Gear limits are implemented with other limits on effort to prevent effort creep. They are intended to dampen increases in fishing capacity by increases in individual vessel productivity. Obviously gear limits by themselves would be ineffective to prevent overfishing.

Buyback programs involve payments being made to fishers to decommission their fishing vessels. This can take the form of compensation as well as payment as incentives to fishers to exit a fishery. Decommissioning vessels directly can effectively cut capacity and transform a fishery into one where cooperation benefits the remaining vessel operators more than non-cooperation. Industry often supports decommissioning because it can potentially increase the profits of remaining operators. Decommissioning programs cannot in isolation, however, to reduce effort. Without additional measures, remaining vessel operators and new entrants still have an incentive to increase effort to take over the catch share left behind by their decommissioned competitors.

Subregional agreements for implementing alternative measures

The current QAS proposals are intended to be exclusively implemented at the RFMO level through the IOTC. In principle however, there is nothing preventing participants from entering into sub-regional agreements which may implement different measures in a more limited geographical area. Parties to any such agreement would need to ensure that the measures they implement are either consistent with or more stringent than the equivalent IOTC measures. A precedent for this type of action exists in the form of the PNA VDS which was created by sub-regional agreement and then subsequently incorporated into a WCPFC CMM.

A subregional agreement in the Western Indian Ocean?

A subregional agreement may be particularly helpful in the case of the IOTC because the territories and EEZs of a number of WIO states with relatively similar fisheries, economic profiles and national interests are contiguous and coincide with waters where certain tuna stocks are concentrated. This smaller grouping of states may find negotiating management measures easier in a sub-grouping as opposed to seeking the negotiation of such measures within the larger group of all IOTC members. The main obstacle to such an agreement to enhance the management of IOTCstocks as a whole for example, would be the need to ensure integration of the waters of France and potentially also the UK and therefore members of the EU. If such a subregional agreement could be developed through a side-agreement between the EU and WIO coastal states it should enhance both the management and the creation of economic value from the resources of the WIO for coastal states. The advantages of such regional arrangements are recognised throughout the world with the leading examples being in the Western Central Pacific. The European Union's Common Fisheries Policy (CFP) is itself also an example of such a regional agreement which allows a framework of measures to be developed and implemented by states with related interests

Subregional agreements do however also have certain disadvantages. Tuna stocks are generally not amenable to arbitrary political boundaries because of their mobility and are best managed as indivisible stocks. This is the rationale for RFMOs and the UN Fish Stocks Agreement in the first place. A sub-regional agreement that does not cover a sufficient part of a stock's biomass may find its conservation and management measures ineffective when the stock is affected outside of its jurisdiction. Likewise, the most productive geographic zones for harvesting the species may also change over time. A sub-regional agreement may find productivity in its sub-zone of jurisdiction to be unstable. A sub-regional agreement may also increase the administrative costs in managing a particular stock beyond the benefits it provides. These disadvantages can be minimised where the sub-regional agreement covers the most important habitats for the particular stock, but this would require the sub-regional grouping to be of a certain minimum size and coverage.

Sub-regional agreement and alternative management organisations

The current proposals for a QAS at the IOTC naturally assume that any QAS would be implemented through the institutional framework and constitution of the IOTC. Alternative measures implemented through a sub-regional agreement, on the other hand, would be free to be implemented through an alternative institutional framework.

WIO states organised through a subregional agreement would be free to consider organising themselves as a multinational resource cooperative as proposed by Trondsen, Matthiasson, and Young. In such an institution WIO states, including EU states with territories in that area, could pool their quota in a cooperative entity in which WIO states are shareholders. The cooperative would then be able to auction off quota directly to fishers. Profits from the auction would then be redistributed to shareholders according to pre-defined proportions or some sort of allocation formula.

This model has several advantages. It overcomes jurisdictional issues between certain WIO nations that may otherwise affect negotiations for a QAS. It also leads to better outcomes for quota-holding states as fishers cannot seek the lowest possible price for quota from other states seeking to sell it. In effect, the cooperative holds a monopoly over access to the EEZs of its members and can set a reasonable price for that access which benefits all members. The most significance disadvantage is the extra regulatory burden if such a cooperative was superimposed below an IOTC quota allocation system where the cost may not be worth the benefits to the members involved. As an alternative measure for consideration where a QAS is not agreed upon, however, this model holds significant advantages for WIO coastal states.

[**]Torbjorn Trondsen, Thorolfur Matthiasson, James A Young, "Towards a Market-Oriented Management Model for Straddling Fish Stocks" (2006) 30(3) *Marine Policy 199*.

Appendix A: Quick reference glossary of key terms and concepts

Adjustment factors	See correction factor.
ALB	See albacore.
Albacore	A species of tuna (Thunnus alalunga). Note that in French and other romance languages, "albacore" refers to yellowfin tuna (Thunnus albacares). The French word for Thunnus alalunga is "germon".
Allocation	The process of fixing rights to fish when those rights are limited and a distribution must be made.
Artisanal fishing	Small-scale fishing, not necessarily merely subsistence fishing, but usually referring to a combination of decentralised, non- industrialised, traditional, and/or coastal fishing. Often contrasted with industrial fishing and to a lesser extent subsistence fishing and recreational fishing.
Baseline allocation	The initial allocation of a proportion of the TAC to participants which establishes the basic shares each party will hold. The baseline allocation can then be adjusted by using correction factors for a variety of reasons
Baseline allocation formula	The formula used to make the initial baseline allocation.
BET	See bigeye.
BFT	See bluefin.
Bigeye	A species of tuna (Thunnus obesus).
Biomass	The amount of living material at one time in one area.
Bluefin	A genus of tuna which includes three separate species: pacific bluefin tuna (Thunnus orientalis northern bluefin tuna (Thunnus), thynnus), and southern bluefin tuna (Thunnus maccoyii).
Buy-back	Buying fishing vessels or fishing rights back from fishers to reduce fishing effort or capacity.
By-catch	Fish or other animals caught during fishing activities incidentally to the fish targeted by that fishing activity and not used, sold, or kept.
Catch per unit of effort	Total catch divided by the total amount of effort to return that catch.
Catch share	A secure right to fish in a fishery. Catch share can be allocated as IFQ, ITQ, TUR, LAP, or DAP.

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources.
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
Closed season	Period of time during which a specific specie or species may not be fished or harvested.
CMM	Conservation and Management Measure.
Code of Conduct for Responsible Fisheries	Voluntary code created by the FAO which sets out principles and international standards of behaviour for responsible fisheries practices. Aims to ensure effective consistent conservation, management and development of living aquatic resources.
Conservation and Management Measure	Binding measures taken (usually through formal procedures of an RFMO) to conserve and manage living marine resources consistently with UNFSA.
Correction factor	An element that calibrates a measurement which, in practice, deviates from the principles it is meant to follow. Emphasises the capacity for adjustment factors to be used to correct any undesirable results of the baseline allocation formula.
CP	Contracting party.
CPC	Contracting parties and cooperating non-contracting parties (to an RFMO).
CPUE	See catch per unit of effort.
CS	Coastal state.
DAP	See dedicated access privilege.
Dedicated access privilege	Sometimes used synonymously with LAP (see limited access privilege). Can also refer to an LAP where fishers are directly (and potentially permanently) allocated proportions of TAC rather than a specific and temporary quantity representing some proportion of TAC.
Driftnet fishing	Fishing by using long nets that drift in the water column in which fish become trapped. Driftnet fishing is often associated with inefficient fishing practices that have high loss of catch to over-exposure and predators and high levels of bycatch.
DWF	Distant water fishing (state, vessel, etc).
DWFS	Distant water fishing state.
EC	European Community.

EEZ	See Exclusive Economic Zone.
Effort	The amount of fishing as measured by inputs into fishing such as number of hours, days, vessels, fish hooks, kilometres of nets, tonnage, etc.
Effort creep	The ability for fishers to develop and use new unregulated fishing inputs when older regulated fishing inputs are limited. For example, if fishers face restrictions on vessel numbers, they may increase vessel size to increase harvests regardless.
EU	European Union.
Exclusive Economic Zone	The Exclusive Economic Zone is the area beyond and adjacent to a coastal state's territorial sea. A coastal state has sovereign rights over the natural resources and economic exploitation of its EEZ. The EEZ is defined in Part V of the United Nations Convention on the Law of the Sea.
FAD	Fish aggregating device.
FAO	Food and Agriculture Organization of the United Nations.
FFA	Pacific Islands Forum Fisheries Agency.
Flag state	The state under whose laws a vessel is registered or licenced. A ship operates under the laws of the state whose flag it flies.
HDI	Human Development Index.
IATTC	Inter-American Tropical Tuna Commission.
IBSFC	International Baltic Sea Fishery Commission (now defunct).
ICCAT	International Commission for the Conservation of Atlantic Tunas.
IFQ	See individual fishing quota.
Individual fishing quota	An allocation of catch (usually a share of TAC) to an individual. Where this share is transferable it may also be called an ITQ. An IFQ is usually specified for a particular species, a particular area, and a particular time.
Individual transferable quota	A share of catch (usually a share of TAC) which can be transferred to other parties. An ITQ is usually specified for a particular species, a particular area, and a particular time.
Input based capacity measures	Input based capacity measures are fisheries management techniques that aim to limit fishing capacity by controlling what goes into fishing, such as the amount of vessels, number of days spent fishing, etc.

International Plan of Action	IPOAs are voluntary guidelines for managing particular fisheries problems developed and produced by the FAO under the framework of the FAO Code of Conduct for Responsible Fisheries. IPOAs currently exist for issues such as incidental catch of seabirds, conservation of sharks, IUU fishing, and elimination of fishing capacity.
IOTC	Indian Ocean Tuna Commission.
IPOA	See International Plan of Action.
ITQ	See individual transferable quota.
IUU	Illegal, unreported, and unregulated fishing.
LAP	See limited access privileges.
Limited access privileges	Usually (especially in the USA) refers to a permit to harvest a quantity of fish representing a portion of TAC. LAPs can encompass both ITQs/IFQs and TURFS as they can refer to both individuals and groups.
LL	Longline. See longline fishing.
Longline fishing	Fishing by a "stem" fishing line from which many shorter "branches" of fishing line with hooks are attached. Longlines can be a hundred kilometres long or more, and suspended at set depths to cover large areas effectively.
Management strategy evaluation	A simulated model used to determine best management practice.
Maximum economic yield	The largest long-term average amount of catch that can be taken from a species whilst maintaining stable revenue from the stock.
Maximum sustainable yield	The largest long-term average amount of catch that can be taken from a species whilst maintaining stable stock size.
MCS	Monitoring, control, and surveillance.
MEY	See maximum economic yield.
MHLC	Multilateral high level conference.
MSE	Management strategy evaluation.
MSY	See maximum sustainable yield.
Olympic fishery	An Olympic fishery is a fishery with a TAC that is fished competitively rather than divided amongst participants in set amounts. The proportion of the TAC each fisher can catch is in principle unlimited. But as soon as the TAC is reached all fishing activities must cease. The resulting race to catch as much fish as fast as possible is characterised as Olympic in nature.

Open access	When access to a fishery is unrestricted.
Output based capacity measures	Output based capacity measures are fisheries management techniques that aim to limit fishing capacity by capping what can be taken out of fishing activities. This usually refers to amounts of catch.
PNA	Parties to the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest.
PS	Purse seine.
QAS	See quota allocation system.
Quota allocation system	A political and legal arrangement which distributes a limited amount of rights to access a resource in a regular or predictable way, and implements and manages the resulting mechanism.
Regional Fisheries Management Organisation	RFMOs are the arrangements empowered under UNFSA as the appropriate bodies for states to use to manage international fisheries resources.
RFMO	See Regional Fisheries Management Organisation.
SBT	See southern bluefin.
Set aside	A portion of resources set aside for a specific purpose.
Side payment	Payments made by parties to an agreement to induce another party to join the agreement. Usually, the parties who benefit from the agreement give part of their benefits to the parties who lose out from the agreement where acquiring the benefits necessitates the losing out parties to be part of the agreement.
SIDS	Small island developing states.
SIS	Small island states.
Skipjack	A species of tuna *(Katsuwonus pelamis)*.
SKJ	See skipjack.
Southern Bluefin	A species of tuna *(Thunnus maccoyii)*.
Subsistence fishing	Fishing for personal or non-commercial consumption such as traditional, social, or religious purposes.
SWO	See swordfish.
Swordfish	A type of large predatory billfish *(Xiphias gladius)*.

T	Metric tonne equivalent to 1 megagram.
TAC	See total allocated/allowable catch.
TAE	See total allocated/allowable effort.
TCAC	Technical Committee on Allocation Criteria (IOTC).
Territorial use right fishery	A fishery where access to and use of the resource is limited to a particular community or group. TURFs are usually contrasted to "common property" fisheries where there is no limitation on use or access. While multiple individuals can hold ITQs/IFQs for one area, a TURF gives exclusive access to one group or individual.
Total allocated/allowable catch	A catch limit set for a fishery during a set time period, usually expressed in tonnes and for an annual period.
Total allocated/allowable effort	The total amount of effort that an authority allows fishers to expend on harvesting a particular specie or species of fish.
TURF	See territorial use right fishery.
UN	United Nations.
UNCLOS	United Nations Convention on the Law of the Sea.
UN Fish Stocks Agreement	The short title for the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention of the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.
UNFSA	See UN Fish Stocks Agreement.
VDS	Vessel day scheme. Usually refers to the PNA VDS which currently operates in the western Pacific Ocean.
VMS	Vessel monitoring system or vessel monitoring and surveillance.
Vessel day schemet	A type of input based capacity measure restraining fishing effort by placing a limit on the allowable days of fishing for each vessel allowed in one area. Usually refers to the PNA VDS.
WCPFC	Western and Central Pacific Fisheries Commission.
WPFC	Working Party on Fishing Capacity (IOTC).
Yellowfin	A type of tuna *(Thunnus albacares)*. Note that in French and other romance languages yellowfin tuna is called "albacore" tuna. The English word *"albacore"* refers to *Thunnus alalunga*. The French word for *Thunnus alalunga is "germon"*.
YFTT	See yellowfin.

Appendix B: Hypothetical baseline allocation formulas for illustration

The following hypothetical baseline allocation formulas are provided for illustration purposes only. They illustrate the effect different baseline allocation formulas can have in different types of fisheries. The examples used are artificial and contrived to highlight the contrasting results of different baseline allocation formulas. They are not intended to represent actual fisheries or any particular context. The individual baseline allocation factors are equally capable of being used as correction factors. Other considerations, including political or contractual balances such as guarantees or side payments, are not considered in this guide.

Table 3 and 4 below contrast two different baseline allocation formulas in a particular type of fishery (the "fisheries context"). In each Table, one baseline allocation formula favours DWFS and the other formula favours coastal states. Together, the tables illustrate the importance of the nature of the fishery in determining what effect the baseline allocation can have: identical formulas can have radically different results in different fisheries. Table 3 uses historical catch data in two different formulas to illustrate how the same data can be used to favour either DWFS or coastal states depending on how the formula uses that data. In this Table, QAS A uses historical catch data per flag state to apportion quotas.

However, because in this fisheries context coastal states have not actively participated in the fishery, the sovereign interests of coastal states over resources in their EEZs are not adequately reflected. QAS B therefore limits this calculation to the high seas and allocates the proportion of catch taken in EEZs to that EEZ's coastal state. The result of QAS B would therefore be a windfall to local coastal states: as in this fisheries context most biomass is located in EEZs, DWFS would only receive a proportion of the much smaller high seas catch.

Table 3:
Hypothetical baseline allocation formulas using historical catch data

FISHERIES CONTEXT A	A fishery exploited to capacity or overexploited with biomass density distributed mostly in EEZs. Historically fished by DWFS with little participation by local coastal states.	
	QAS A	**QAS B**
DATA USED IN BASELINE ALLOCATION FORMULA	Historical catch data (per flag state only).	Historical catch data (per flag state and per area).
BASELINE ALLOCATION FORMULA	Fixed to average historical catch ratesof flag state nations over the past 10 years in the entire area.	Proportion of catch taken in high seas fixed to average historical catch rate of flag state nations over past 10 years. Proportion of catch taken in EEZs allocated to relevant coastal state.
RESULT	**Favours DWFS**	**Favours coastal states.**

Table 4:
Hypothetical baseline allocation formulas using biomass data

FISHERIES CONTEXT B	An underexploited fishery with high biomass density equally distributed mostly in the high seas. Historically not fished by DWFS until very recently but with high levels of artisanal fishing by coastal states in their EEZs.	
	QAS C	**QAS D**
DATA USED IN BASELINE ALLOCATION FORMULA	Biomass data (per area).	Combination of biomass and effort data.
BASELINE ALLOCATION FORMULA	Total estimated biomass in high seas split equally between all CPCs. Total biomass in each EEZ allocated to that coastal state.	Total biomass in high seas distributed between all CPCs in proportion to amount of total effort (including artisanal effort) averaged over past 20 years. Total biomass in each EEZ allocated to that coastal state.
RESULT	**Favours DWFS**	**Favours coastal states.**

Table 4 uses biomass and effort data to illustrate how different forms of data can be combined to change the result of a particular baseline allocation formula. In this Table, QAS C uses the proportion of biomass in the high seas to split an amount of TAC equally between all participating CPCs. However, in this fisheries context where most biomass is located in the high seas, this formula would result in a windfall to DWFS at the cost of coastal states with high artisanal fishing levels. QAS D therefore moderates this result by distributing biomass on the high seas in proportion to effort to better reflect the greater interest of coastal states in such a fishery.

Appendix C: Possible correction factors for illustration purposes

This appendix provides a list of possible correction factors for illustration purposes and the goes on to describe how different types of correction factors can operate in a QAS.

Possible correction factors

Particular correction factors are a measure or indicator of something that participants wish to sanction, encourage, or recompense through the operation of a QAS. For example, most QAS proposals suggest that compliance with the QAS should be encouraged, and non-compliance sanctioned, within the QAS. This can be achieved by reducing a participant's quota by set amounts to the extent of their non-compliance. As there are different ways in which compliance can be measured there are different correction factors that can be used to support this principle.

A comprehensive list and classification of proposed correction factors is provided in Table 5. We have divided the correction factors in Table 5 according to the principles sought to be encouraged or protected through the QAS. These proposed correction factors have been collected from a variety of sources including academic and technical recommendations for useful correction factors as well as the correction factors proposed by parties at the IOTC to date. Inclusion on this list does not in itself suggest that the correction factor has merit or does not have merit in any scheme for the Indian Ocean. Some factors also overlap as they can serve to measure multiple principles.

Calculating the effect of correction factors

Tables 3 and 4 illustrate the relationship between the nature of a fishery, the type of data used in the baseline allocation formula and the way this data is used in the formula to apportion fishing rights. Each element critically affects the resulting baseline allocation and each must therefore be taken into account in any baseline allocation formula. However, once a generally acceptable apportionment is achieved correction factors can also remedy some deficiencies such as the balance between coastal state interests and DWFS.

Table 5:
Potential correction factors

Principle	Possible measures/indicators	Further comments
Compliance	With CMMs	
	With IUU measures	
	With VMS measures	
	With observer program	
	With freezing capacity	
	With transhipment measures	
	RFMO membership status	
	Attendance at IOTC meetings	
	Timely payment of IOTC fees and funding	
	Mandatory reporting	
Environmental	Contribution towards restocking a common fishing area	
	Level of polluting	
	Implementation of a responsible fisheries plan	
	Stewardship of spawning or nursery areas	
Geographic	Proximity to RFMO area	
	EEZ size	
	Coastal state	
	Small island state	
	Length of coastline	
	Length of time migrating fish spend in waters	
	Archipelagic state	
Investment	Funds provided to IOTC for fisheries development	
	Implementation of IOTC programs	
Nature of fishery	Estimated biomass per EEZ	
	Fishing vessel tonnages	
	Fishing vessel lengths	
	Number of fishers	
	Number of fishing ports	
	Number of catch landing points	
	Number of processing and storage sites	
	Amount of bycatch	
	Amount of juvenile catch	
	Fishing equipment and gear used	

Past use	Historical catch rates of flag states	Can be weighted towards certain years or ranges of years to reflect investment in fisheries by parties or restrained fleet development by parties (which has potentially beneficial environmental and sustainability consequences).
	Historical catch rates per EEZ	
Research	Contribution towards significant fisheries research	Could include assessment of stocks as well as applied scientific research aimed at resolving management issues.
Socio-economic	HDI indicters	
	Economic weight of non-industrial fishery (artisanal, subsistence)	
	Economic weight of industrial fishery, secondary processing, and export sector	
	Proportion of catch destined for export	
	Development classification	
	Food security classification GDP	

Including a correction factor in a QAS does not guarantee it will be effective until it is attributed a weighting. The weighting of a correction factor is the effect the correction factor has on the final allocation of quota relative to other correction factors. For example, if parties accept to use a party's location in the RFMO area as a correction factor, a party located outside the RFMO area could have its quota reduced by anywhere between 1–100%. A lower weighting could make the existence of the correction factor more or less irrelevant in the final allocation of quota. The more factors are included in a QAS, the less influence each factor can have over the end result. It is thus relatively easy for negotiating parties to accept the inclusion of extra correction factors if the weight of those factors can then be minimised in negotiation.

The calculation of correction factors can be illustrated in a model. Highly simplified hypothetical models using randomly selected correction factors are provided in tables 6 and 7 below. Appendix D includes indicative modelling of the correction factors in the Iranian proposal for a QAS. The other proposals do not include weightings and therefore cannot be adequately modelled.

The simplest way to calculate correction factors is to make each correction factor a binary statement which has only two possible outcomes (for example, a true or false statement). One outcome leads to a set reduction in quota, the other outcome does not. Table 6 provides a model of possible binary correction factors that could reduce a party's baseline quota allocation by up to 65%. For example, if a hypothetical state is a non-member of the RFMO and classified as high on the United Nations Human Development Index, correction factors 1 and 5 are met and that state's quota is reduced by a total of 25%.

Table 6 uses a binary correction factor model to reduce participants' baseline quota

Table 6: Model of binary correction factors: Reducing baseline quota allocation (the weightings are hypothetical)

Correction factor	Weighting (as reduction of baseline quota allocation)
1. Non-member of RFMO	20%
2. Non-coastal state in RFMO area	20%
3. Classified as very high in United Nations Human Development index	10%
4. Vessels on RMFO IUU list	10%
5. Classified as high in United Nations Human Development index	5%

allocation. This model cannot be used to directly increase participant's baseline allocation as increasing baseline allocations by set percentages would risk exceeding the TAC. To avoid exceeding the TAC, a participants' quota can only be increased beyond their baseline allocation by correction factors where:

1. The correction factors only increase a participant's quota to the extent that they offset reductions by negative factors.
2. An amount of TAC is set aside for that purpose. This set aside can be created by the baseline allocation formula or through the operation of correction factors that remove quota from some parties for redistribution to others.

Once a set aside has been created it could be distributed in a relatively simple manner by equal distribution to all parties meeting certain eligibility criteria. However, the set aside could also be redistributed to all parties according to certain correction factors which would determine the redistribution. This requires correction factors that can be given a specific value in some kind of measurement unit such as kilometres, units of currency, scales of value, etc. This model has three steps and is illustrated in Table 7. First, correction factors are chosen and a unit of measurement and weighting negotiated for each factor. Second, each factor is measured in the agreed unit for each state party. Finally, the product of each value and its weighting is summed. The proportion of each party's sum to the total sum of all party's is the share of set-aside that it will receive on top of its baseline allocation.

The measurable correction factor model demonstrated in Table 7 apportions a set aside

[**]This model is based on the work of J F Caddy in "An Objective Approach to the Negotiation of Allocations from Shared Living Resources" (1996) 20(2) *Marine Policy* 145–55.

Table 7:
Model of measurable correction factors: Redistributing set aside

STEP ONE: Negotiating correction factors, units of measurement, and weightings					
Correction factor	**1. Spawning or nursery area stewardship**	**2. Estimated biomass in RMFO area EEZ**	**3. Length of coastline**	**4. Number of fishing vessels**	**5. Stock essential to food security**
Unit of measurement	Yes = 1 No = 0	Millions of metric tonnes	Thousands of km	Thousands	Scale of 0-9
Weighting	20	1	0.5	5	20

STEP TWO: Measurement of values for each correction factor					
State A	1	20	60	10	6
State B	0	2	5	0.2	2

STEP THREE: Product of value and weighting factor						Product sums	Share of set aside
State A	20	20	30	50	120	145	94.77%
State B	0	2	2.5	1	40	8	5.23%
TOTALS						153	100%

to participants and therefore increases their baseline quota allocation. The measurable correction factor model should not be used to reduce a participant's quota. This is because the measurable model calculates proportions of a whole and therefore cannot provide for the cumulative sanctions necessary in a QAS.

The effect of the correction factors used on final quota allocations depends on the relationship between the factors accepted, their measurement, and the weightings accorded to each of them in negotiation. Binary correction factors are simpler to use and easier to understand. Because the effect of each binary correction factor in the QAS as a whole is easy to gauge, it benefits both negotiators designing the QAS as well as the operators who would use the QAS. However, the simplicity of the binary model is only helpful in reducing participants' baseline allocations. The measurable correction factor model, on the other hand, can redistribute set aside to increase participants' baseline allocation. The measurable correction model allows for a greater variety of outcomes that could satisfy a greater number of participants. But this flexibility may need to be sacrificed to the simpler option of equally shares of set aside to those parties satisfying eligibility criteria.

**This model is based on the work of J F Caddy in "An Objective Approach to the Negotiation of Allocations from Shared Living Resources" (1996) 20(2) *Marine Policy 145–55*.

Appendix D: Indicative modelling of correction factors

This appendix models the application of the correction factors contained in the Iranian proposal for a QAS to baseline quota allocations for yellowfin tuna. It applies the Iranian correction factors to a number of WIO coastal states as well as the most significant DWFS. We have also used valuation data to give a nominal indication of what the value of the changes wrought by correction factors could amount to.This model provides a practical example of how correction factors proposed by negotiating parties can affect actual quota allocations.

Explanation of method

There are two steps to applying the correction factors as proposed by Iran. The first step is to determine which correction factors will apply to each state. The first step is reflected in Table 9. The second step is to reduce each state's baseline allocation by the sum of the weightings of each correction factor applicable to that state. The second step is reflected in Table 10.

Table 9 measures each country against the correction factors proposed by Iran. Iran's proposal for a QAS contained weightings for each correction factor which determine the maximum amount by which a participant's quota can be reduced if it does not meet that correction factor's requirements. However, the Iranian proposal does not specify the indicators to be used to determine whether a state is meeting the correction factor's requirements. We have measured each country according to indicators which seemed most appropriate, extracted in Table 8, to produce a proportion by which each participant's quota is to be reduced. If different indicators were used the final result would differ.

Table 10 takes the baseline allocations for yellowfin tuna under the EU proposal using a 15 year historical reference period (as calculated by the United Kingdom British Indian Ocean Territories) and corrects it according to the factors in the Iranian proposal. The amount of quota taken away from participants is also displayed as this would constitute any set aside available for redistribution to parties. We have also provided a nominal valuation of each baseline allocation, corrected quota allocation, and set aside, to indicate the economic stakes in the application of correction factors. The data used to determine this valuation is explained in Table 8 below.

The Iranian proposal does not include positive correction factors. If they were to be included, positive correction factors would either have to be limited to offsetting the impact of negative correction factors or only applied to redistribute a set aside.

Discussion and analysis

The initial baseline allocation allocates approximately one third of the TAC to WIO coastal states and two thirds to the most significant DWFS. After the Iranian correction factors are applied, WIO coastal states retain just under one third of TAC but the most significant DWFS retain only one fifth of the TAC. This results in the creation of a massive set aside of some 46% of TAC worth several hundred million US dollars. This set aside may then be available for redistribution to developing coastal states, new entrants, and parties with fleet development plans, including the roughly two thirds of WIO coastal states who have no yellowfin quota allocated to them at all under the EU baseline allocation.

When correction factors are applied the average total reduction of quota amongst WIO coastal states is 29%, while the average total reduction of quota amongst significant DWFS is over twice as much as 66%. However the highest reduction of quota amongst WIO coastal states falls disproportionately on those who have no baseline quota allocation at all. The three WIO coastal states who do receive a baseline allocation have an average total reduction of quota of only -13%. This means that DWFS contribute almost 90% of the set aside quota by themselves, with WIO coastal states only contributing some 4.69% of TAC.

If the set aside created by the Iranian correction factors was distributed equally amongst all the CPCs of the IOTC, each CPC would receive an additional 1.44% of TAC as quota valued at several million US dollars. A redistribution which privileged developing states and/or coastal states could significantly increase the value of additional quota for beneficiary states.

Table 8:
Data sources for indicative modelling of proposed Iranian correction factors

Data	Source	Comments and qualifications
Socio-economic reliance on fisheries	Edward H Allison et al, "Vulnerability of National Economies to the Impacts of Climate Change on Fisheries" (2009) 10(2) *Fish and Fisheries 173*.	Figure 4 in Allison's research calculates the dependence of national economies upon the fisheries sector by combining data on fishers as a proportion of the economically active population, fisheries landings, export value of fisheries products expressed as a proportion of total value of all exports, and fish consumption as a proportion of total animal protein consumption. This document measures the vulnerability of national economies to the changes in global fisheries not just particular fish stocks in the IOTC area. As a result, we have marked all DWFS as having "low" socio-economic reliance on IOTC fish stocks.
Compliance with FAO Code of Conduct for Responsible Fisheries	Tony J Pitcher et al, "Evaluations of Compliance with the FAO (UN) Code of Conduct for Responsible Fisheries (2006) 14(2) *Fisheries Centre Research Reports 16*.	The FAO hold current information from a variety of states on the status of their implementation of the FAO Code of Conduct. However, as this information is not publicly available, it is necessary to rely on older less comprehensive research from the University of British Columbia. This research does not measure the compliance with the code by Comoros, Kenya, Madagascar, Mauritius, Seychelles, Tanzania, Maldives, Mozambique, or Somalia. For these countries, we have marked them as "medium" compliance if they are parties to the Compliance agreement and UNFSA, and "low" if they are parties to only one of these agreements or fewer.

		Recent developments since this research are likely produce less harsh results overall.
Location in IOTC Area	IOTC website <www.iotc.org>	
Membership of IOTC	IOTC website <www.iotc.org>	
Cooperation with IOTC	IOTC website <www.iotc.org>	Potential indicators for cooperation include membership status, payment of membership fees, vessels on the IUU list, and timely submission of mandatory reports. As payment of membership fees is not made public, we have relied on submission of reports and vessels on IUU list to measure this correction factor, taking into account that the IOTC is unlikely to initially penalise members for cooperation when they are signing up to the requirements of a QAS. Taiwan has not been penalised for its non-member status as this is due to its diplomatic status.
Quota allocations	Indian Ocean Tuna Commission, "A Comparison of the Four Quota Allocation Proposals Submitted to the IOTC" (Information paper by the UK, IOTC-2011-SS4-Info1).	See Appendix E and Table 11 below.
Valuations	FAO data as used by MRAG Ltd	See Table 11 below.

Table 9: Measuring the weighting and calculation of proposed Iranian correction factors for a QAS

STATE	CORRECTION FACTORS										TOTAL REDUCTION
	Socio-economic reliance on IOTC fishery		Compliance with FAO Code for Responsible Fisheries		Located in IOTC area		Membership of IOTC		Cooperation with IOTC		
	Weighting	*Calculation*	*Weighting*	*Calculation*	*Weighting*	*Calculation*	*Weighting*	*Calculation*	*Weighting*	*Calculation*	
Comoros	Nil	High	- 25%	Low	Nil	Yes	Nil	Yes	Nil	Satisfact ory	**-25%**
France territories	Nil	High	- 12.50%	Moderate	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-13%**
Kenya	- 15%	Moderate	- 25%	Low	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-40%**
Madagascar	Nil	High	- 25%	Low	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-25%**
Mauritius	Nil	High	- 12.50%	Moderate	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-13%**
Seychelles	Nil	High	- 12.50%	Moderate	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-13%**
Tanzania	Nil	High	- 25%	Low	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-25%**
UK territories	Nil	High	- 12.50%	Moderate	Nil	Yes	Nil	Ye s	Nil	Satisfactory	**-13%**
Maldives	Nil	High	- 25%	Low	Nil	Yes	Nil	Yes	Nil	Satisfactory	**-25%**
Mozambique	Nil	High	- 25%	Low	Nil	Yes	- 15%	No (CPC)	Nil	Satisfactory	**-40%**
Somalia	- 30%	No data	- 25%	Low	Nil	Yes	- 15%	No	-15%	Low	**-85%**
WIO COASTAL STATE AVERAGE	**- 4.09%**		**- 20.45%**		**0.00%**		**-2.73%**		**-1.36%**		**-29%**
China	- 30%	Low	- 12.50%	Moderate	- 15%	No	Nil	Yes	Nil	Satisfactory	**-58%**
Taiwan	- 30%	Low	- 25%	Low	- 15%	No	- 15%	No	Nil	Satisfactory	**-85%**
European Union	- 30%	Low	- 12.50%	Moderate	- 15%	No	Nil	Yes	Nil	Satisfactory	**-58%**
Japan	- 30%	Low	- 12.50%	Moderate	- 15%	No	Nil	Yes	Nil	Satisfactory	**-58%**
Korea	- 30%	Low	- 25%	Low	- 15%	No	Nil	Yes	Nil	Satisfactor y	**-70%**
Philippines	- 30%	Low	- 25%	Low	- 15%	No	Nil	Yes	Nil	Satisfactory	**-70%**
SELECTED DWFS AVERAGE	**- 30%**		**- 19%**		**- 15%**		**-3%**		**0%**		**-66%**

Table 10:
Application of Iranian correction factors to EU baseline allocation for yellowfish stock (using 2007 prices)

STATE	BASELINE ALLOCATION		CORRECTION	CORRECTED QUOTA		SET ASIDE	
	15 year	Value (USD)		15 year	Value (USD)	Created	Value (USD)
Comoros	0	0	-25%	0.00%	0	0	0
France territories	25.00%	116 593 840	-13%	21.75%	101 436 641	3.25%	15 157 199
Kenya	0	0	-40%	0.00%	0	0	0
Madagascar	0	0	-25%	0.00%	0	0	0
Mauritius	0.23%	1 081 991	-13%	0.20%	941 332	0.03%	140 659
Seychelles	10.81%	50 415 176	-13%	9.40%	43 861 203	1.41%	6 553 973
Tanzania	0	0	-25%	0.00%	0	0	0
UK territories	0	0	-13%	0.00%	0	0	0
Maldives	0	0	-25%	0.00%	0	0	0
Mozambique	0	0	-40%	0.00%	0	0	0
Somalia	0	0	-85%	0.00%	0	0	0
WIO COASTAL STATE TOTAL	36.04%	168 091 007		31.36%	146 239 176	4.69%	21 851 831
China	1.00%	4 649 762	-58%	0.42%	1 952 900	0.58%	2 696 862
Taiwan	16.49%	76 905 297	-85%	2.47%	11 535 795	14.02%	65 369 502
European Union	35.79%	166 934 396	-58%	15.03%	70 112 446	20.76%	96 821 950
Japan	9.26%	43 181 695	-58%	3.89%	18 136 312	5.37%	25 045 383
Korea	0.63%	2 942 829	-70%	0.19%	882 849	0.44%	2 059 980
Philippines	0.48%	2 247 929	-70%	0.14%	674 379	0.34%	1 573 550
SIGNIFICANT DWFS TOTAL	63.65%	296 861 908		22.15%	103 294 680	41.50%	193 567 228
TOTAL	99.70%	464 952 915		53.50%	249 533 857	46.19%	215 419 059

Appendix E: Nominal economic valuation of quota allocations

Tables 12 and 13 calculate the baseline quota allocations of yellowfin tuna under the EU and Seychellois QAS proposals. Both EU and Seychellois QAS proposals note that the period of time over which historical catch rates are to be calculated is negotiable. These tables therefore provide quota allocations using 5, 10, 15 and 20 year historical catch periods. The different quota allocations are then valued according to estimated prices of yellowfin catch per metric tonne in US dollars in 2003 (Table 12) and 2009 (Table 13).

These tables are extracted from Jeremy Noye and Kwame Mfodwo, "First Steps Towards a Quota Allocation System in the Indian Ocean" (2012) Marine Policy (forthcoming). A short explanation of the sources of data for these tables in provided in Table 11 below. Full details and analysis can be found in the original article published in Marine Policy.

Discussion and analysis

Tables 12 and 13 demonstrate how the initial baseline allocation formula can have a major effect on quota allocations. Generally, the EU proposal is twice as favourable to DWFS as the Seychellois proposal. This difference between allocations between DWFS and coastal states represents approximately USD 250 million per year for yellowfin tuna alone. In comparison to past catch rates, the EU baseline allocation is also more favourable to DWFS than the Seychellois proposals as it positively endows DWFS with a greater proportion of catch then they have taken in the past. For example, while in 2003 and 2009 DWFS fished approximately 46-58% of yellowfin, the EU proposal allocates DWFS between 59-64% of yellowfin quota.

Under the EU proposal coastal states that could be considered to have a legitimate claim to the resources adjacent to their coastlines such as the Comoros, Eritrea, Kenya, Madagascar, Sri Lanka, Tanzania, the Maldives, Mozambique, and Somalia, are allocated zero quota. On the other hand, DWFS such as the EU are given a positive endowment as their quota increases to some 30%, where previously the main EU participant in the fishery, Spain, had only caught 25% of yellowfin in 2003 and 2009. Compounding this geographical imbalance, the only recently significant coastal state participant in the yellowfin fishery in the Indian Ocean, the Seychelles, receives a negative endowment under the EU proposal. Where in 2003 and 2009 the Seychelles caught some 11% and 16% of yellowfin respectively, under the EU QAS they would see their baseline quota limited to 8%-16%. The estimated value of the difference between 8% and 16% is some USD 75 million. Again, this value represents yellowfin tuna quota alone.

The Seychellois proposal appears to compromise between DWFS and coastal state interests by including catch per EEZ in the baseline allocation formula. Thus under the Seychellois proposal, states with a negative endowment in the EU proposal are instead provided with a positive endowment. These include Comoros, India, Indonesia, Kenya, Madagascar, Pakistan, Sri Lanka, Tanzania, Maldives, Bangladesh, Mozambique, Somalia and Yemen. While this positive endowment is small, it should be kept in mind that an increase from nil to 1% of quota can be worth USD 5-10 million on the valuations provided.

The results of these baseline allocations, however, are not final. They can be substantially modified by the application of correction factors. Appendix D demonstrates how significantly the Iranian correction factors could affect the EU baseline allocation under the 15 year historical catch period.

Table 11:
Data sources for nominal economic valuation of quota allocations under EU proposal

Data	Source	Comments and qualifications
Past catch data	IOTC Nominal Catch Database <www.iotc.org>	We have extracted catch data for yellowfin tuna by longline and purse seine gear types per fleet for the entire IOTC area. Data provided to this database may be incomplete and should be treated as indicative only. Small discrepancies in totals will also occur as a result of rounding.
Baseline allocation data	Indian Ocean Tuna Commission, "A Comparison of the Four Quota Allocation Proposals Submitted to the IOTC" (Information paper by the UK, IOTC-2011-SS4-Inf01).	An explanation of the manner in which the UK undertook these calculations is included in the original UK analysis. As discussed above in Part Three baseline quota allocations can be significantly varied by the application of correction factors and are therefore not conclusive quota allocations.
Price data for valuing catch allocations	FAO data as used by MRAG Ltd	The valuation of baseline allocations is based on estimated average value in USD of metric tonnes of yellowfin tuna in 2003 (USD 7000/t for longliner, USD 1270/t for purse seine) and 2009 (USD 7000/t for longliner, USD 1860/t for purse seine). The product of the estimated catch values and annual catch per fishing method for each country provides a valuation of past catch. There is substantial volatility in tuna prices. Future value of catch depends on the proportion of catch caught by longline or purse seine fishing. These valuations are provided as nominal figures to "cash out" the quota allocations for comparative purposes only. The actual value of catch depends on what point in the supply chain you crystallise value at and who you assess the value for.

Table 12:
Comparative yellowfin tuna allocations under EU and Seychellois QAS proposals valued at 2003 tuna prices

YELLOWFIN 2003 Valuations	2003 YELLOWFIN TUNA CATCH		COMPARATIVE YELLOWFIN TUNA ALLOCATIONS UNDER QAS PROPOSALS USING 2003 VALUATIONS											
			5 year				10 year				20 year			
	Proportion of YFT caught	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)
Australia	0.06%	1 337 000	0.00%	0	0.01%	89 319	0.07%	625 231	0.11%	982 507	0.04%	357 275	0.12%	1 071 825
Comoros	0.00%	0	0.00%	0	0.98%	8 753 241	0.00%	0	1.43%	12 772 586	0.00%	0	1.10%	9 825 066
Eritrea	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
France (territories)	20.45%	82 914 870	24.05%	214 811 671	9.65%	86 192 625	24.95%	222 850 361	10.70%	95 571 097	26.38%	235 622 947	12.24%	109 326 189
India	0.00%	91 000	0.00%	0	2.23%	19 918 088	0.00%	0	1.78%	15 898 743	0.07%	625 231	1.64%	14 648 280
Indonesia	6.82%	147 567 760	0.00%	0	0.02%	178 638	0.00%	0	0.03%	267 956	0.00%	0	0.09%	803 869
Iran	2.66%	10 496 550	0.00%	0	0.15%	1 339 782	0.00%	0	0.15%	1 339 782	0.00%	0	0.39%	3 483 432
Kenya	0.00%	0	0.00%	0	0.55%	4 912 533	0.00%	0	0.62%	5 537 764	0.00%	0	0.54%	4 823 214
Madagascar	0.00%	77 000	0.00%	0	1.84%	16 434 656	0.00%	0	2.28%	20 364 682	0.00%	0	2.51%	22 419 014
Malaysia	0.17%	3 682 000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Mauritius	0.01%	231 000	0.01%	89 319	1.33%	11 879 398	0.05%	446 594	1.90%	16 970 569	0.43%	3 840 708	2.23%	19 918 088
Oman	0.48%	10 383 540	0.00%	0	3.99%	35 638 194	0.00%	0	3.01%	26 884 953	0.00%	0	3.74%	33 405 224
Pakistan	0.00%	0	0.00%	0	1.53%	13 665 774	0.00%	0	1.08%	9 646 428	0.00%	0	1.35%	12 058 036
Seychelles	11.16%	52 048 230	16.93%	151 216 698	32.69%	291 983 098	14.28%	127 547 221	29.64%	264 740 870	8.49%	75 831 646	24.96%	222 939 680
Sri Lanka	0.00%	0	0.00%	0	0.08%	714 550	0.00%	0	0.14%	1 250 463	0.00%	0	0.14%	1 250 463
Tanzania	0.00%	0	0.00%	0	4.94%	44 123 478	0.00%	0	4.51%	40 282 771	0.00%	0	2.69%	24 026 752
Thailand	0.02%	476 000	0.27%	2 411 607	0.26%	2 322 288	0.15%	1 339 782	0.14%	1 250 463	0.09%	803 869	0.08%	714 550
UK (territories)	0.00%	0	0.00%	0	5.86%	52 340 806	0.00%	0	4.15%	37 067 295	0.00%	0	4.13%	36 888 657
Maldives	0.01%	126 000	0.00%	0	0.49%	4 376 620	0.00%	0	0.58%	5 180 489	0.00%	0	0.58%	5 180 489
South Africa	0.17%	3 654 000	0.02%	178 638	0.15%	1 339 782	0.05%	446 594	0.19%	1 697 057	0.03%	267 956	0.22%	1 965 013
Bangladesh	0.00%	0	0.00%	0	0.01%	89 319	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Mozambique	0.00%	0	0.00%	0	2.23%	19 918 088	0.00%	0	2.01%	17 953 075	0.00%	0	1.84%	16 434 656
Myanmar	0.00%	0	0.00%	0	0.01%	89 319	0.00%	0	0.03%	267 956	0.00%	0	0.03%	267 956
Somalia	0.00%	0	0.00%	0	2.02%	18 042 394	0.00%	0	3.54%	31 618 849	0.00%	0	3.28%	29 296 560
Yemen	0.00%	0	0.00%	0	0.32%	2 858 201	0.00%	0	0.45%	4 019 345	0.00%	0	0.36%	3 215 476
COASTAL STATE TOTAL	**42%**	**313 084 950**	**41%**	368 707 932	**71%**	637 200 191	**40%**	353 255 783	**68%**	611 565 700	**36%**	317 349 632	**64%**	573 962 493
Belize	0.11%	2 387 000	0.05%	446 594	0.03%	267 956	0.03%	267 956	0.02%	178 638	0.02%	178 638	0.01%	89 319
China	0.73%	15 953 000	1.49%	13 308 499	0.93%	8 306 647	1.37%	12 236 673	0.87%	7 770 734	0.78%	6 966 865	0.50%	4 465 939
Taiwan	9.55%	208 040 000	14.55%	129 958 828	5.31%	47 428 273	14.87%	132 817 029	6.56%	58 593 121	18.81%	168 008 629	9.27%	82 798 511
European Union	0.00%	0	32.01%	285 909 421	18.68%	166 847 485	33.97%	303 415 902	20.07%	179 262 795	35.10%	313 508 925	20.99%	187 480 123
Guinea	0.00%	91 000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Japan	5.72%	120 939 770	9.27%	82 798 511	3.02%	26 974 272	9.15%	81 726 686	3.48%	31 082 936	8.89%	79 404 397	4.53%	40 461 408
Korea	0.69%	15 120 000	0.49%	4 376620	0.14%	1 250 463	0.44%	3 930 026	0.17%	1 518 419	0.50%	4 465 939	0.21%	1 875 694
Philippines	0.53%	11 473 000	0.87%	7 770 734	0.55%	4 912 533	0.63%	5 627 083	0.40%	3 572 751	0.38%	3 394 114	0.24%	2 143 651
Sierra Leone	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Sudan	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Vanuatu	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Senegal	0.00%	7 000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Uruguay	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
NEI	15.25%	105 452 740	N/A											
Portugal	0.02%	350 000	See EU	catch above										
Spain	25.38%	100 289 360	See EU	catch above										
DWFS TOTAL	**58%**	**580 102 870**	**59%**	**524 569 207**	**29%**	**255 987 629**	**60%**	**540 021 356**	**32%**	**281 979 395**	**64%**	**575 927 506**	**36%**	**319 314 646**
TOTAL	**100%**	**893 187 820**	**100%**	**893 277 139**	**100%**	**893 187 820**	**100%**	**893 277 139**	**100%**	**893 545 095**	**100%**	**893 277 139**	**100%**	**893 277 139**

Table 13:
Comparative yellowfin tuna allocations under EU and Seychellois QAS proposals valued at 2009 tuna prices

YELLOWFIN 2009 Valuations	2009 YELLOWFIN TUNA CATCH		COMPARATIVE YELLOWFIN TUNA ALLOCATIONS UNDER QAS PROPOSALS USING 2009 VALUATIONS											
			5 year				10 year				20 year			
	Proportion of YFT caught	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)	EU	Value (USD)	Seychelles	Value (USD)
Australia	0.01%	84 000	0.00%	0	0.01%	46 638	0.07%	326 463	0.11%	513 013	0.04%	186 550	0.12%	559 650
Comoros	0.00%	0	0.00%	0	0.98%	4 570 479	0.00%	0	1.43%	6 669 168	0.00%	0	1.10%	5 130 129
Eritrea	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
France (territories)	21.39%	54 060880	24.05%	112 163 274	9.65%	45 005 222	24.95%	116 360 652	10.70%	49 902 164	26.38%	123 029 820	12.24%	57 084 344
India	2.35%	20 512 220	0.00%	0	2.23%	10 400 171	0.00%	0	1.78%	8 301 481	0.07%	326 463	1.64%	7 648 556
Indonesia	5.54%	49 130 060	0.00%	0	0.02%	93 275	0.00%	0	0.03%	139 913	0.00%	0	0.09%	419 738
Iran	1.29%	3 148 980	0.00%	0	0.15%	699 563	0.00%	0	0.15%	699 563	0.00%	0	0.39%	1 818 864
Kenya	0.01%	119 000	0.00%	0	0.55%	2 565 064	0.00%	0	0.62%	2 891 527	0.00%	0	0.54%	2 518 427
Madagascar	0.01%	105 000	0.00%	0	1.84%	8 581 307	0.00%	0	2.28%	10 633 358	0.00%	0	2.51%	11 706 022
Malaysia	0.76%	6 845 800	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Mauritius	0.00%	0	0.01%	46 638	1.33%	6 202 792	0.05%	233 188	1.90%	8 861 132	0.43%	2 005 414	2.23%	10 400 171
Oman	5.05%	46 508 000	0.00%	0	3.99%	18 608 377	0.00%	0	3.01%	14 037 898	0.00%	0	3.74%	17 442 438
Pakistan	0.00%	0	0.00%	0	1.53%	7 135 543	0.00%	0	1.08%	5 036 854	0.00%	0	1.35%	6 296 067
Seychelles	16.65%	43 663 800	16.93%	78 957 348	32.69%	152 458 105	14.28%	66 598 401	29.64%	138 233 657	8.49%	39 595 268	24.96%	116 407 290
Sri Lanka	0.00%	0	0.00%	0	0.08%	373 100	0.00%	0	0.14%	652 926	0.00%	0	0.14%	652 926
Tanzania	0.01%	91 000	0.00%	0	4.94%	23 038 943	0.00%	0	4.51%	21 033 529	0.00%	0	2.69%	12 545 497
Thailand	0.90%	2 545 640	0.27%	1 259 213	0.26%	1 212 576	0.15%	699 563	0.14%	652 926	0.09%	419 738	0.08%	373 100
UK (territories)	0.09%	840 000	0.00%	0	5.86%	27 329 596	0.00%	0	4.15%	19 354 577	0.00%	0	4.13%	19 261 302
Maldives	0.00%	0	0.00%	0	0.49%	2 285 239	0.00%	0	0.58%	2 704 977	0.00%	0	0.58%	2 704 977
South Africa	0.06%	560 000	0.02%	93 275	0.15%	699 563	0.05%	233 188	0.19%	886 113	0.03%	139 913	0.22%	1 026 026
Bangladesh	0.00%	0	0.00%	0	0.01%	46 638	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Mozambique	0.00%	0	0.00%	0	2.23%	10 400 171	0.00%	0	2.01%	9 374 145	0.00%	0	1.84%	8 581 307
Myanmar	0.00%	0	0.00%	0	0.01%	46 638	0.00%	0	0.03%	139 913	0.00%	0	0.03%	139 913
Somalia	0.00%	0	0.00%	0	2.02%	9 420 782	0.00%	0	3.54%	16 509 688	0.00%	0	3.28%	15 297 112
Yemen	0.00%	0	0.00%	0	0.32%	1 492 401	0.00%	0	0.45%	2 098 689	0.00%	0	0.36%	1 678 951
COASTAL STATE TOTAL	**54%**	228 214 380	**41%**	192 519 749	**71%**	332 712 182	**40%**	184 451 455	**68%**	319 327 209	**36%**	165 703 165	**64%**	299 692 806
Belize	0.04%	357 000	0.05%	233 188	0.03%	139 913	0.03%	139 913	0.02%	93 275	0.02%	93 275	0.01%	46 638
China	0.34%	3 171 000	1.49%	6 948 993	0.93%	4 337 291	1.37%	6 389 342	0.87%	4 057 466	0.78%	3 637 728	0.50%	2 331 877
Taiwan	10.24%	94 304 000	14.55%	67 857 615	5.31%	24 764 532	14.87%	69 350 016	6.56%	30 594 224	18.81%	87 725 205	9.27%	43 232 996
European Union	0.00%	0	32.01%	149 286 753	18.68%	87 118 917	33.97%	158 427 710	20.07%	93 601 535	35.10%	163 697 751	20.99%	97 892 188
Guinea	0.01%	91 000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Japan	4.13%	35 210 020	9.27%	43 232 996	3.02%	14 084536	9.15%	42 673 345	3.48%	16 229 863	8.89%	41 460 770	4.53%	21 126 804
Korea	0.69%	6 321 000	0.49%	2 285 239	0.14%	652 926	0.44%	2 052 052	0.17%	792 838	0.50%	2 331 877	0.21%	979 388
Philippines	0.25%	2 275 000	0.87%	4 057 466	0.55%	2 565 064	0.63%	2 938 165	0.40%	1 865 501	0.38%	1 772 226	0.24%	1 119 301
Sierra Leone	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Sudan	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Vanuatu	0.08%	721 000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Senegal	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Uruguay	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
NEI	4.51%	32 428 500	N/A											
Portugal	0.03%	280 000	See EU	catch above										
Spain	25.55%	63 002 460	See EU	catch above										
DWFS TOTAL	**46%**	**238 160 980**	**59%**	**273 902 249**	**29%**	**133 663 178**	**60%**	**281 970 543**	**32%**	**147 234 701**	**64%**	**300718 832**	**36%**	**166 729 191**
TOTAL	**100%**	**466 375 360**	**100%**	**466 421 998**	**100%**	**466 375 360**	**100%**	**466 421 998**	**100%**	**466 561 910**	**100%**	**466 421 998**	**100%**	**466 421 998**

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