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A MARKET PRICE VALUATION OF TUNA RESOURCES IN THE WESTERN INDIAN OCEAN - AN INDICATIVE REGIONAL & COUNTRY/EEZ PERSPECTIVE

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EXECUTIVE SUMMARY

1. Project objectives and Report focus

As required under the project TOR, this Report provides a market price based valuation of the tuna resources of the WIO. It will be recalled that in terms of its objectives, the project aims to estimate the economic importance of tuna fisheries to the states of the WIO with a specific focus on Comoros, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Reunion, Tanzania and to a much lesser extent, South Africa. It is also intended to provide its end-users with a sound overview of recent developments in the region as well as policy directions and advocacy insights with respect to the following issues:

1. The monetary value of WIO tuna.
2. The relative proportions of monetary value captured by foreign fleets/processors as distinct from local stakeholders in the WIO.
3. Options for increasing the proportion of benefits captured by WIO stakeholders – e.g. by negotiating better agreements and establishing better management frameworks.
4. The overall costs and benefits associated with current arrangements.

2. Data base for valuations and limitations of analysis undertaken

The figures used to back the market price valuation set out here are the latest available IOTC data set on catches, a dataset based on reports of catch within country EEZs but not from the full set of relevant high seas areas. Our analysis is therefore a partial analysis only as in the absence of high seas and artisanal catch data a definitive and comprehensive analysis cannot be provided. The study is also limited in its conclusions by the fact that it does not integrate the costs of production at fleet level into the analysis. This is because these figures are not publicly available generally, and those that are available cannot be integrated in a consistent way with the IOTC data set. We also did not include the ecological costs of fishing into our analysis, as there was not enough time to undertake this aspect of the analysis.

Despite these limitations, it is still possible to provide a reasonably sound overview of the monetary values based on market prices associated with the harvesting of tuna in the WIO. That is what this report provides.

3. Estimating distribution of benefits between WIO countries and foreign fleets - the rate of return (RoR) concept

Ideally, access fees or licence payments should be based on a clear RoR. The RoR is monetary value received by the Coastal State as a proportion of the total monetary value of the catch once sold in the final port of destination of the foreign fleet. The question then is what percentage of the ex-vessel value will be recovered by the Coastal State. – It could be a RoR of 5 per cent, 6 per cent, 7 per cent, 10 per cent and so on.

The RoR can be calculated based on the total catch taken from an EEZ; total catch taken by a particular fleet; total catch within the framework of specific agreements; or total catch taken by gear type. The RoR should also be calculated over a period of time most probably on an annual

basis or a multi – annual period. Where the RoR is low (2-4%) there is a case for increasing access, licence, transshipment, reflagging and other fees in order for the benefits to the country to be more equitable. However to undertake a sound and comprehensive RoR assessment, the analyst must have detailed country data, including all relevant access agreements and records of payments as well as accurate information on how much catch is taken out of each EEZ or under specific agreements. This total set of information however seldom available publicly, and in many cases may not even be collected in a form, which allows a full RoR analysis to be done. It is critical to emphasise that a robust RoR analysis can only be undertaken if there is enough information available to support: **(1) calculation of the amounts of actual catch taken from each EEZ; (2) calculate the annual monetary values generated by each EEZ when the catch is sold at ex-vessel prices.**

4. What is an adequate RoR?

The next question is what is an adequate RoR for WIO States specifically, and the Coastal State generally. In our view, based on current trends in the Pacific and the ecological costs of taking the fisheries resources out, States should be getting at least 7% of the returns whilst a steady possibility of capturing 10% of the returns would probably be the lower end of a fair and equitable outcome. Currently, the Pacific Island States, in the Western Central Pacific. (The States with the most advanced arrangements on a global basis) are achieving a RoR of between 8-10% across their bilateral arrangements. These States use a vessel day approach under which a minimum price for a vessel day is USD5000 a day. As at end February, information informally received from the relevant Pacific region officials indicate that the rate of return was 8.3% on average across all the bilateral arrangements although it has gone up to 10% under some bilateral arrangements.

5. The Specific RoR approach used in this paper.

In terms of RoR methodology the report has had three aspects:

- Step 1: estimate for each country, the ex-vessel monetary values of total EEZ catch for both industrial level purse seine and longline sectors using catch data estimates from the IOTC catch database –
- Step 2: for each country, calculate RoR reference amounts at 5%, 7% and 10% of the total values for the years 2007-2009;
- Step 3: for each country, where the figures are available, compare the year on year actual access fee receipts as percentages of the IOTC based catch value estimates for 2007-2009 with the 5%, 7% and 10% reference figures generated by step 2.

It would not have been possible to undertake this approach if CEA countries had not released information on their access agreement receipts and for this the consultants are grateful. However, whilst it is important to emphasize that the release of access fee payments by participating countries has been extremely useful, it is also important to emphasise that the data provided only supports an initial and not extremely robust assessment of ROR at country level. Limitations within the information data set include the fact that, for example, not all countries consistently record access payments by gear type. The result is that we have had to

aggregate purse seine and longline information. . **The most critical limitation however is that there is no information available on: (1) the amounts of actual catch taken from each WIO EEZ; (2) the annual monetary values generated by each EEZ when the catch is sold at ex-vessel prices.**

IT IS FOR THIS REASON THAT THE IOTC CATCH DATA HAS SUCH PROMINENCE IN THE STUDY – IT IS CURRENTLY THE ONLY SOURCE OF INFORMATION AVAILABLE ON THE TOTAL CATCH HARVESTED BY FLEETS FROM EACH ZONE. EVEN THOUGH USEFUL THIS DATA IS ALSO THEN FURTHER LIMITED BY THE FACT THAT IT DOES NOT DIFFERENTIATE FOREIGN FLEET CATCH FROM DOMESTIC FLEET CATCH.

6. Approaches to analysis and presentation of results

In total, the consultants used five different perspectives. Results from applying these different analytical perspectives are presented in the relevant parts of the Report as follows:

1. A statement at regional level of the monetary valuations for the resources targeted by the purse seine and longline fleets as well as RoRs calculated at 5%, 7% and 10% of the relevant totals. The approach used here was a simple procedure of multiplying catch values by market prices.
2. A statement at country level for the EEZ resources fished in the target countries as well as RoRs calculated at 5%, 7% and 10% of the relevant totals. The approach used here was a simple procedure of multiplying catch values by market prices.
3. RoR calculations for the EU FPAs with Madagascar, Mozambique and Comoros based on comparing the amounts paid under the agreements with the reference or benchmark RoRs (5%, 7%, 10%) calculated from the IOTC data.
4. RoR calculations based on actual data on access fee payments supplied by the Coastal East African countries - these results were compared with the reference RoR figures.
5. A preliminary statement of the results from applying a very basic Vessel Day analysis to the latest IOTC and other comparative data. The Vessel Day approach is now well established in the Western Central Pacific. This report applies it to the WIO region in a preliminary and indicative way as yet another method of providing a valuation of WIO/EEZ resources. The report does not advocate that WIO countries adopt a Vessel Day approach. Further work may however prove useful to provide another perspective on the monetary value of the region's tuna resources.

Despite these limitations, the RoR figures set out in this Report provide WWF with a reference point in its advocacy work in the WIO region, subject of course to the limitations of data identified above, The 10% figure also provides a reference point that can be reasonably aimed for and maintained by the countries and WWF. It addresses the terms of reference requirement: assess potential revenue that could be generated through an improved tuna fisheries strategy in the region.

² This data base although useful is also limited as it is often based on country reports that are not always accurate and in many cases attributes catch to the

³ Figures were released by Kenya, Mozambique and Tanzania. The authors already had figures from the Seychelles due to an earlier study undertaken for the government of Seychelles.

7. General observations on the political economy of tuna production and distribution of benefits between foreign actors and Coastal States

The investigation found that tuna caught in the WIO generates very little local value adding. It also generates limited multiplier impacts (direct, indirect and induced employment) in WIO economies. The reasons are as follows:

- WIO tuna fishing is dominated by EU fleets (principally French and Spanish purse seiners) and Asian longline fleets (mainly from Japan, Korea and Taiwan/China).
- The supply chains for the EU fleets are well organised with part of the catch landed for processing in Mauritius, Madagascar and Seychelles.
- Processed tuna, principally canned products and loins are exported to the EU countries and the US with another segment exported in low temperature containers to Europe and various Asian countries.
- The tuna processing plants in Madagascar, Mauritius and Seychelles are tightly integrated into supply chains dominated by companies based in the UK, France, Italy, the United States and Asia.
- The Asian longline fleets land some tuna in Port Louis, Mauritius for low temperature storage and subsequent transport to Asian destinations, with India emerging as a key market.
- However much of the catch in the EEZs of WIO states and adjacent high seas is transhipped at sea for onward transport to Japanese, Thai and other markets.
- Asian fleet value accruing to WIO coastal states is thus very limited with the bulk of such limited value captured principally by enterprises based at the Seafood Processing Hub in Port Louis.

Given the current structure of global supply chains and the dominance of these by foreign fleets/processors and as far as increasing returns is concerned, the following further comments can be made:

- Seasonality is decisive in deciding the economic importance of tuna fisheries to the various WIO countries
- Access/licence fees paid to each State are important - however the extent to which such payments represent an adequate proportion of the monetary value associated with the resource as well as the opportunity costs associated with allocating the specific fisheries resources to foreign and domestic fleets is still highly unclear – the reason is that there is not enough data and transparency with respect to all actors – fleets, processing companies, associations and governments.
- Non- access revenues are important but are not always properly factored in – we refer here to government and private revenues generated by port activities linked to landing and transhipment of tuna - port dues, vessel expenditures in port, fuel provision, crew accommodation and flights, vessel repairs and maintenance, chandlery, agency activity and other expenditure – value from this section of the supply chain could be increased – however for each country and for the region generally, it is unclear at what point such increases would reach a tipping point which makes a specific country or the region as a whole unattractive to the main fleets and companies.

- Value derived from the processing of landed tuna where processing facilities exist in a specific country are a highly important part of the value equation. Proper analysis of this aspect is seldom undertaken apart from in Seychelles.
- External constraining factors such as climate change and sharp shocks of the type caused by Somali pirate activity have also shown themselves to be very important economic factors. These issues are analysed in more detail by outputs from WORK PACKAGE 3: *Strengths, weaknesses and concerns within management arrangements and supply chains (Overview of IOTC arrangements, by-catch issues, IUU fishing, and piracy)*

Analysing the diversity of country situations in the regional context more closely, key differences in the importance of tuna fisheries can be summarised as follows.

- Seychelles is in the tuna fisheries belt and has over time become a major hub for EU purse seiners with occasional visits from Asian longliners. Tuna has a significant place in the economy of Seychelles.
- Port Louis, Mauritius, is a base for Asian longliners, which also use the port for repair and cold storage. Dry dock facilities also serve the occasional EU purse seiner. Most tuna passing through Mauritius is shipped on reefers from Seychelles and enters as a raw material for the tuna processing industry and ancillary industries in Mauritius. Mauritius therefore benefits from port visits and expenditure as well as the value added from the tuna processing industry.
- Madagascar through Diego Suarez is a supplementary part of the regional system focused on Seychelles and Mauritius.
- Réunion is a major base for the EU fleets active in both the Indian Ocean and the Atlantic and receives significant amounts of EU aid to assist with maintaining the competitiveness of the fleet, its ports and harbours.
- For the other regional countries, tuna fisheries have had little impact to date with the exception of Kenya and South Africa. Tanzania plans to expand its tuna sector, while Comoros receives virtually no value added from tuna apart from the access and licence fees from DG Mare, EU and trawler owners. Mozambique is rapidly seeking its proportion of the tuna economy.

Finally, it should be noted that South Africa presents a special case within the WIO framework for a variety of reasons, including its highly industrialised economy, its large internal market and its use of a quota management system to manage its fisheries. However, the apartheid period has meant that no relationship has developed between the markets and industries of South Africa and the fleets taking fish in the region. There is on the face of it scope for considerable benefit for WIO countries if a linkage to the South African economy was developed. Until 2003, the tuna resources migrating through South Africa's outer EEZ and adjacent high seas were caught by longline fleets from Japan and Taiwan as part of their tropical as well as temperate tuna harvest strategies. In 2003, the South African Minister of Environmental Affairs and Tourism decided not to renew the long-standing access agreements with Japan and Taiwan. The departure of the Japanese and Taiwanese longline fleets has created an opportunity for South African firms to invest in and develop a South African commercial large pelagic fishery aimed at the harvesting by longline of tuna, shark and swordfish.

8. A statement at regional level of monetary valuations for both purse seine and longline fleets and indicative RoR

The results of our investigation are as below:

NOMINAL CATCH VALUES LONGLINERS BY COUNTRY & AT REGIONAL LEVEL + ESTIMATED RATES OF RETURN (USD)

LONGLINERS	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009
Comoros	3,776,020	9,323,089	21,837,898	8,664,919	17,625,210	14,175,966	16,504,150	5,131,233	1,653,031	
Reunion	5,579,353	3,643,440	3,200,992	3,024,318	3,598,635	2,709,065	3,422,514	1,967,257	2,246,144	
French territories	23,415,515	24,998,829	23,633,436	23,712,739	21,693,947	27,844,717	27,234,302	17,658,943	4,866,033	
Kenya	15,796,756	17,534,148	14,089,370	9,335,007	12,861,027	22,651,321	22,808,886	8,610,984	8,155,120	
Madagascar	41,219,658	41,121,294	32,993,900	28,041,046	41,520,521	34,856,677	46,761,330	28,328,939	28,824,553	
Mauritius	68,622,337	111,188,902	100,824,063	80,987,247	61,906,721	60,776,529	49,022,933	26,355,585	28,329,050	
Mozambique	25,311,738	26,803,623	32,456,527	25,660,127	39,066,662	36,328,915	33,655,516	20,711,851	7,036,923	
Seychelles	77,659,069	94,022,440	159,944,831	214,038,402	199,748,865	143,624,135	136,094,817	77,541,971	41,819,733	
Somalia	35,929,961	78,373,050	103,613,025	73,978,960	49,341,620	16,859,799	8,835,884	3,404,578	7,626,361	
South Africa	7,635,129	7,498,180	21,689,162	19,683,998	29,506,353	20,120,303	11,192,443	10,407,619	2,590,301	
Tanzania	8,339,737	15,318,158	48,817,777	43,170,350	68,132,248	41,226,806	22,794,694	17,418,208	1,719,173	
TOTAL	313,285,273	429,825,153	563,100,983	530,297,113	545,001,810	421,174,233	378,327,468	217,537,168	134,866,422	3,533,415,623
5% of Total	15,664,263.65	21,491,257.65	28,155,049.15	26,514,855.65	27,250,090.5	21,058,711.65	18,916,373.4	10,876,858.4	6,743,321.1	176,670,781.15
7% of Total	21,929,969.11	30,087,760.71	39,417,068.81	37,120,797.91	38,150,126.7	29,482,196.31	26,482,922.76	15,227,601.76	9,440,649.54	247,339,093.61
10% of Total	31,328,527.3	42,982,515.3	56,310,098.3	53,029,711.3	54,500,181	42,117,423.3	37,832,746.8	21,753,716.8	13,486,642.2	353,341,562.3

NOMINAL CATCH VALUES PURSE SEINERS BY COUNTRY & AT REGIONAL
LEVEL + ESTIMATED RATES OF RETURN (USD)

PURSE SEINERS	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009
Comoros	9,083,136	15,276,636	8,550,237	2,362,886	2,637,459	9,417,760	9,451,801	8,194,555	7,625,377	
Reunion	918,084	875,283	270,554	159,903	125,475	133,865	717,167	378,565	754,114	
French territories	8,114,606	6,929,547	2,238,671	15,804	13,036,566	8,831,680	14,985,821	25,472,505	23,164,050	
Kenya	484,307	6,216,987	3,106,216	2,039,941	2,644,401	1,829,241	2,274,340	1,730,346	1,162,625	
Madagascar	7,682,917	6,530,828	4,231,835	4,210,508	10,066,117	4,478,165	7,995,625	17,392,979	15,687,648	
Mauritius	2,418,700	6,403,114	4,764,934	270,579	4,061,494	6,090,644	3,883,052	986,425	1,844,802	
Mozambique	5,134,443	5,501,335	3,117,898	19,169,683	3,085,144	2,513,247	2,283,223	12,492,471	8,738,370	
Seychelles	33,538,526	43,722,004	54,052,500	56,294,608	75,188,691	67,542,157	61,512,448	53,104,319	43,032,000	
Somalia	16,745,306	54,366,491	56,803,651	36,350,065	31,226,956	10,412,946	5,338,284	1,848,298	4,634,460	
South Africa	-	-	-	-	-	-	-	-	-	
Tanzania	2,004,659	8,370,580	19,397,297	18,228,446	7,243,351	6,681,520	8,158,457	4,750,182	2,408,646	
TOTAL	86,124,684	154,192,806	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109,052,092	1,155,203,538
5% of Total	4,306,234.2	7,709,640.3	7,826,689.55	6,955,121.15	7,465,782.7	5,896,561.2	5,830,010.9	6,317,532.3	5,452,604.6	57,760,176.9
7% of Total	6,028,727.88	10,793,496.42	10,957,365.37	9,737,169.61	10,452,095.78	8,255,185.68	8,162,015.26	8,844,545.22	7,633,646.44	80,864,247.66
10% of Total	8,612,468.4	15,419,280.6	15,653,379.1	13,910,242.3	14,931,565.4	11,793,122.4	11,660,021.8	12,635,064.6	10,905,209.2	115,520,353.8

9. Estimations of tuna catches, gross value and estimated rates of return at country/EEZ level

The results of our investigation are as follows:

I. COMOROS

A. Comoros Nominal Catch Values (USD) based on IOTC Whole of EEZ estimates

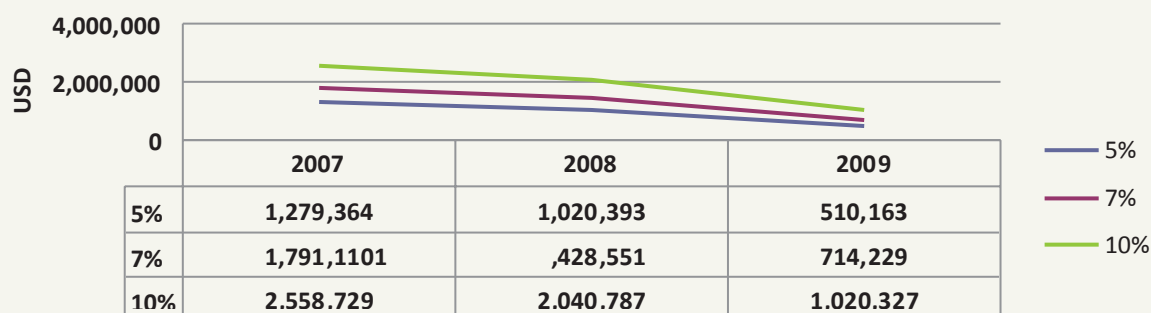
COMOROS	2007	2008	2009
Longliners	16,504,150	5,131,233	1,653,031
Purse seiners	9,083,136	15,276,636	8,550,237

B. Comoros - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	1,279,364	1,020,393	510,163
7%	1,791,110	1,428,551	714,229
10%	2,558,729	2,040,787	1,020,327

C. Overall Comoros Profile based on IOTC data

Comoros - Rate of Return on Nominal EEZ Tuna Resource Value



D Rates of return estimates - actual access fee data against IOTC Whole of EEZ estimates
No calculations attempted due to absence of information.

II. KENYA

A. Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

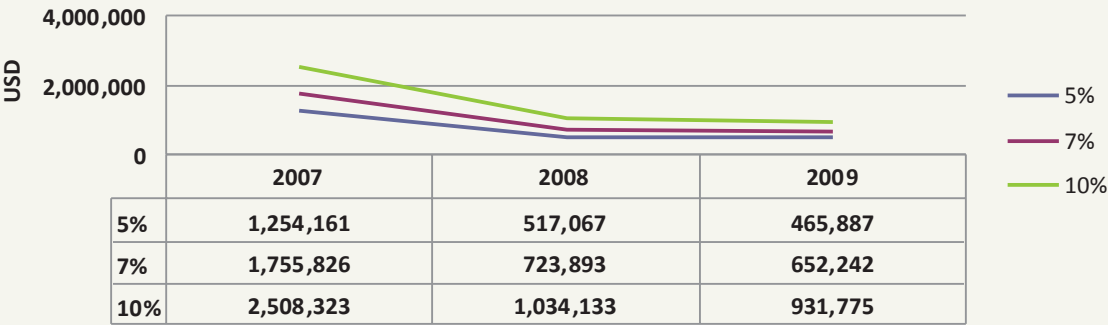
KENYA	2007	2008	2009
Longliners	22,808,886	8,610,984	8,155,120
Purse seiners	2,274,340	1,730,346	1,162,625

B. Kenya - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	1,254,161	517,067	465,887
7%	1,755,826	723,893	652,242
10%	2,508,323	1,034,133	931,775

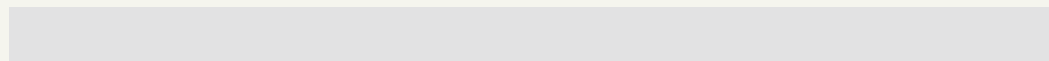
C. Overall Kenya profile based on IOTC data

Kenya - Rates of Return on Nominal EEZ Tuna Resource Value



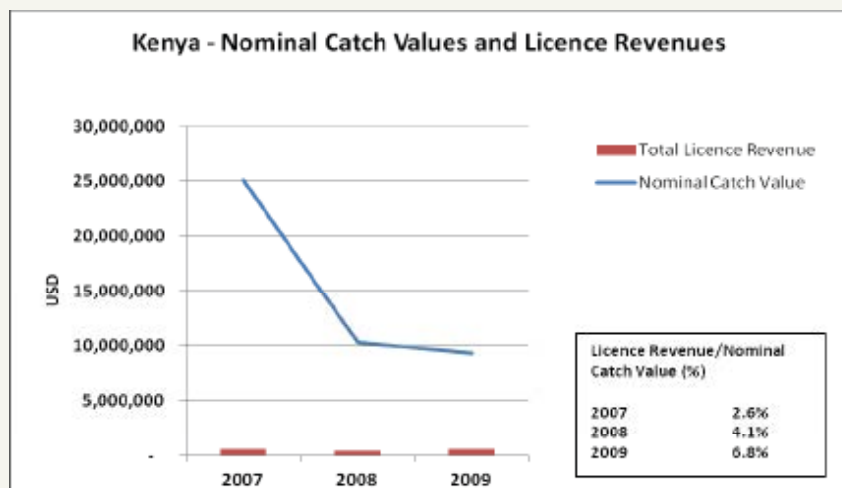
D. Kenya - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

Using the Kenyan catch values derived from the IOTC estimates, we calculated the RoR for actual fees paid to the Kenyan government to be 2.6% for 2007; 4.1% for 2008 and 6.8 % for 2009.



	Nominal Catch Value	Total Licence Revenue	Licence Revenue as % of Nominal Catch Value
2007	25,083,226	655,107	2.6
2008	10,341,330	419,059	4.1
2009	9,317,745	630,000	6.8

Kenya – nominal catch value and licence revenues



III. MADAGASCAR

A. Madagascar - Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

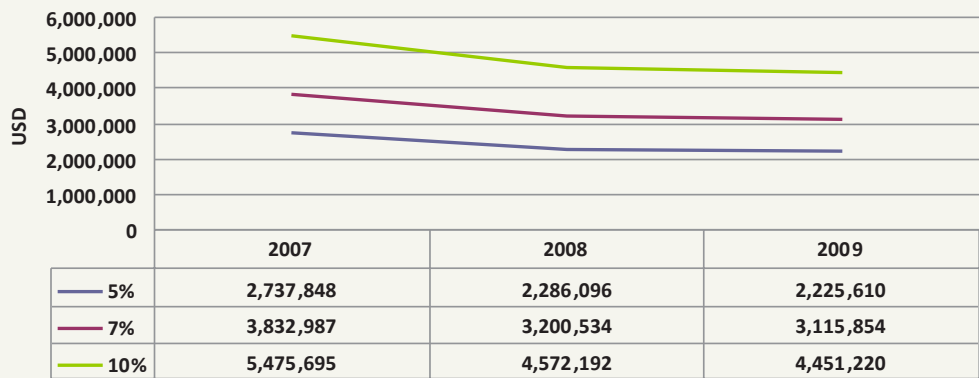
MADAGASCAR	2007	2008	2009
Longliners	46,761,330	28,328,939	28,824,553
Purse seiners	7,995,625	17,392,979	15,687,648

B. Madagascar - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	2,737,848	2,286,096	2,225,610
7%	3,832,987	3,200,534	3,115,854
10%	5,475,695	4,572,192	4,451,220

C. Overall Madagascar profile based on IOTC data

Madagascar - Rates of Return on Nominal EEZ
Tuna Resource Value



D. Madagascar - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

Madagascar released figures on actual access fee payments to WWF in 2012. These figures are compared to the IOTC data monetary valuations to show the relevant RoR as follows:

- 2007: 10.1%
- 2008: 19.0%
- 2009: 16.2%

Clearly, the RoR are much higher than the benchmark 5,7 and 10% used as reference points in the earlier step of our analysis.

	2007	2008	2009	2010	2011
RECEIPTS (ARIARY)					
EU	4,462,555,739	5,176,847,474	4,136,844,860	4,820,234,551	3,764,305,290
NON-EU	1,713,448,496	1,075,720,592	1,920,567,504	1,826,439,226	1,103,314,150
TOTAL	6,176,004,235	6,252,568,066	6,057,412,364	6,646,673,777	4,867,619,440
Ariary/USD	0.0005	0.0006	0.0005	0.0005	0.0005
RECEIPTS (USD)					
EU	2,231,278	3,106,108	2,068,422	2,410,117	1,882,153
NON-EU	856,724	645,432	960,284	913,220	551,657
EU FPA	1,639,890	1,639,890	1,639,890	1,639,890	1,639,890
Total	4,727,892	5,391,431	4,668,596	4,963,227	4,073,700
IOTC EEZ Nominal catch value	46,761,330	28,328,939	28,824,553		
Access payments against IOTC Catch value (%)	10.1	19.0	16.2		

Fees actually paid to Madagascar 2007-2011 and rates of return for 2007-2009

IV. MAURITIUS

A. Mauritius - Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

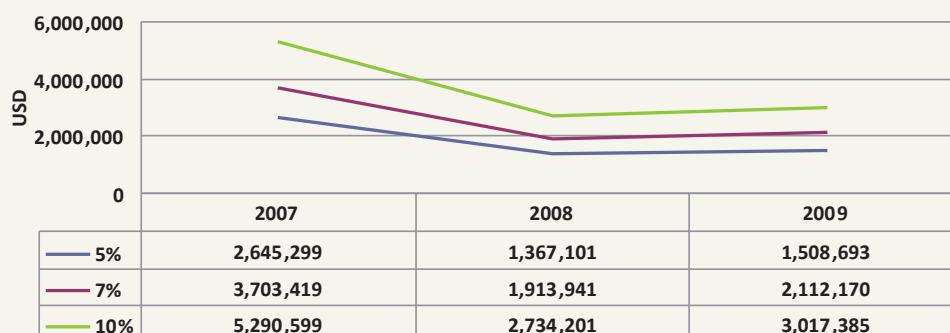
MAURITIUS	2007	2008	2009
Longliners	49,022,933	26,355,585	28,329,050
Purse seiners	3,883,052	986,425	1,844,802

B. Mauritius - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	2,645,299	1,367,101	1,508,693
7%	3,703,419	1,913,941	2,112,170
10%	5,290,599	2,734,201	3,017,385

C. Overall Mauritius profile based on IOTC Data

Mauritius - Rates of Return on Nominal EEZ Tuna Resource Value



D. Mauritius - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

No calculations were attempted due to absence of information.

V. MOZAMBIQUE

A. Mozambique - Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

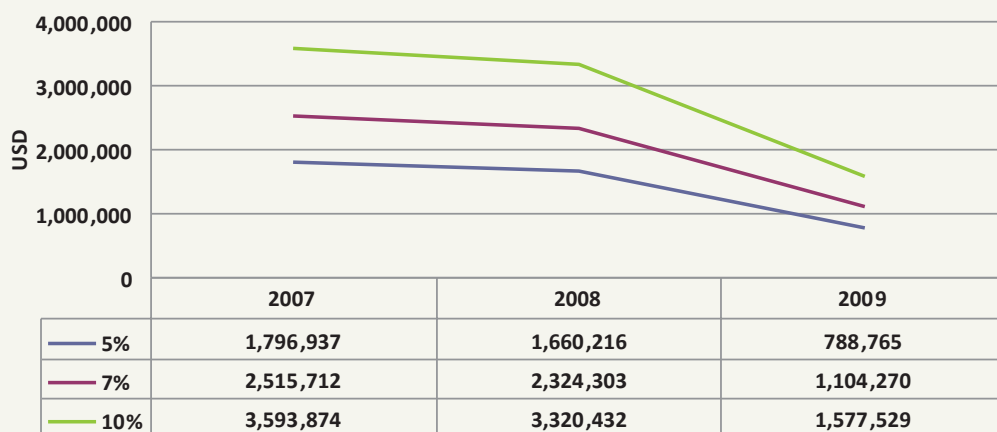
MOZAMBIQUE	2007	2008	2009
Longliners	33,655,516	20,711,851	7,036,923
Purse seiners	2,283,223	12,492,471	8,738,370

B. Mozambique - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	1,796,937	1,660,216	788,765
7%	2,515,712	2,324,303	1,104,270
10%	3,593,874	3,320,432	1,577,529

C. Overall Mozambique profile based on IOTC data

Mozambique - Rates of Return on Nominal EEZ Tuna Resource Value

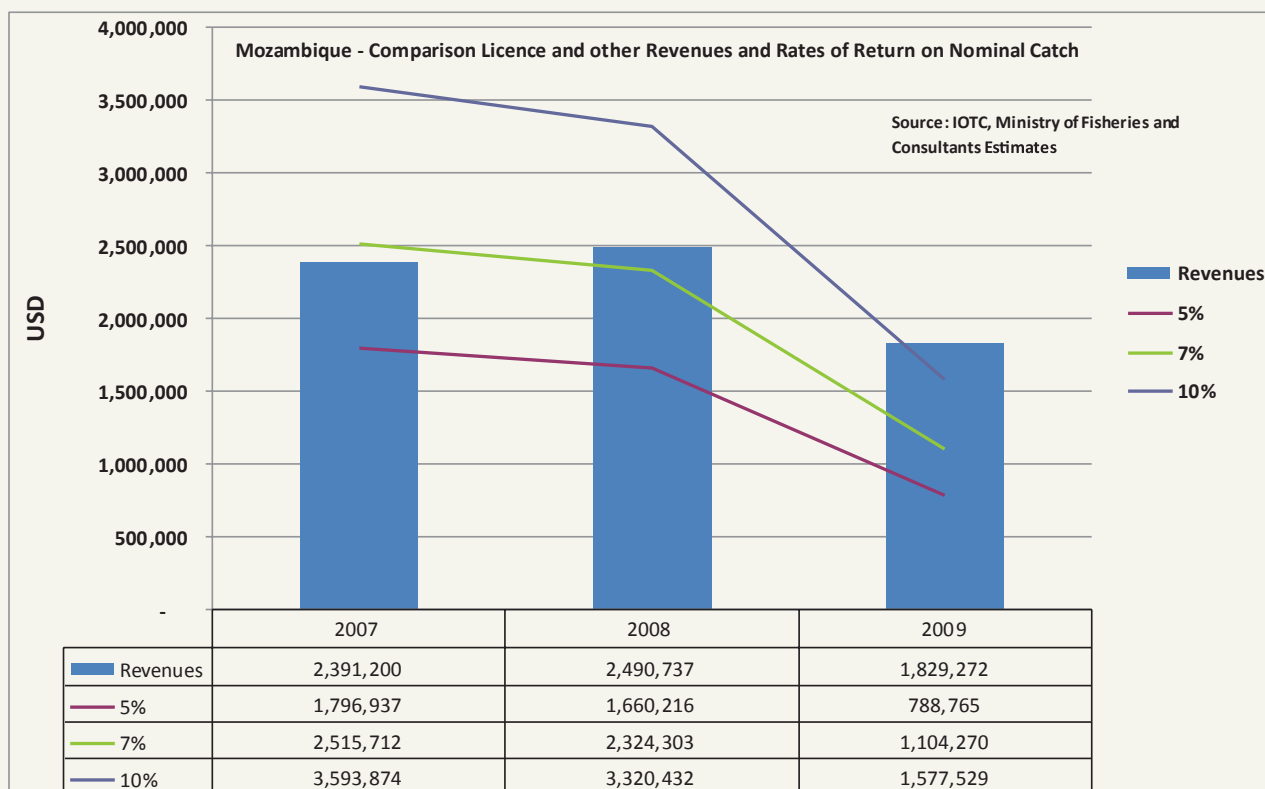


D. Mozambique - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

The results of our analysis showed the following rates of return:

- 2007: 4.9%
- 2008: 5.5 %
- 2009: 17.4%

Rate of return analysis for both EU and private licences



VI. TANZANIA

A. Tanzania - Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

TANZANIA	2007	2008	2009
Longliners	22,794,694	17,418,208	1,719,173
Purse seiners	8,158,457	4,750,182	2,408,646

B. Tanzania - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

Percentage	2007	2008	2009
5%	1,547,658	1,108,419	206,391
7%	2,166,721	1,551,787	288,947
10%	3,095,315	2,216,839	412,782

C. Tanzania - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

In 2007, the RoR was 3.09% whilst in 2008 it was 2.43% as shown by the table below.

	2007	2008	2009
Longliners	22,794,694	17,418,208	1,719,173
Purse seiners	8,158,457	4,750,182	2,408,646
Total nominal catch value (USD)	30,953,151	22,168,390	4,127,820
License fees as a % of nominal catch value	3.09	2.43	No license data

VII. SEYCHELLES

A. Seychelles - Nominal Catch Values (USD) based on IOTC Whole of EEZ Estimates

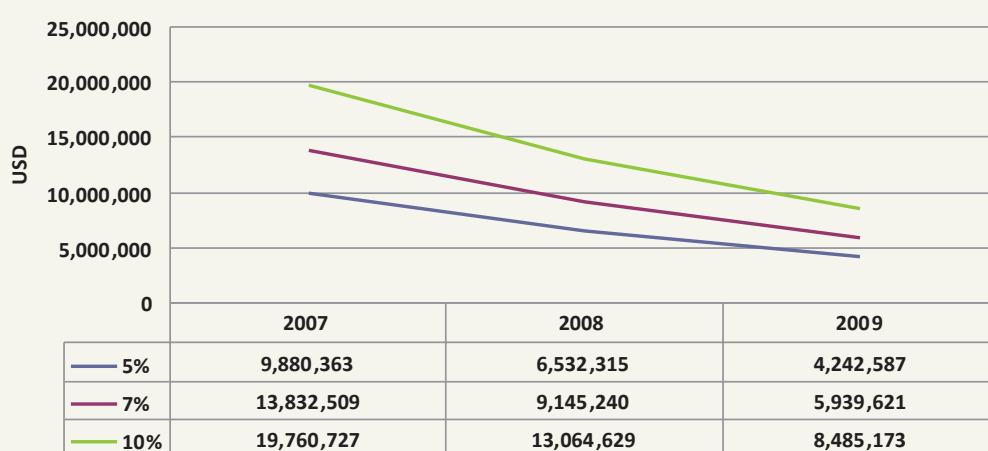
SEYCHELLES	2007	2008	2009
Longliners	136,094,817	77,541,971	41,819,733
Purse seiners	61,512,448	53,104,319	43,032,000

B. Seychelles - Rate of Return Estimates at 5%, 7% and 10% based on IOTC Data

	2007	2008	2009
5%	9,880,363	6,532,315	4,242,587
7%	13,832,509	9,145,240	5,939,621
10%	19,760,727	13,064,629	8,485,173

C. Overall Seychelles profile based on IOTC data

Seychelles - Rates of Return on Nominal EEZ Tuna Resource Value



D. Seychelles - rates of return estimates - actual access fee data against declared catch value information

For the Seychelles the consultant used a slightly different methodology. Here, instead of comparing the actual access fees against the IOTC nominal estimate the consultants had access to and used the reasonably accurate databases of the Seychelles Fisheries Authority. This database has declared catch information that is regarded as reasonably accurate. The period covered was from 2003 to 2008.

Actual payments to GoS gross reported catch value by purse seine and long line in Seychelles EEZ (all in US dollars)

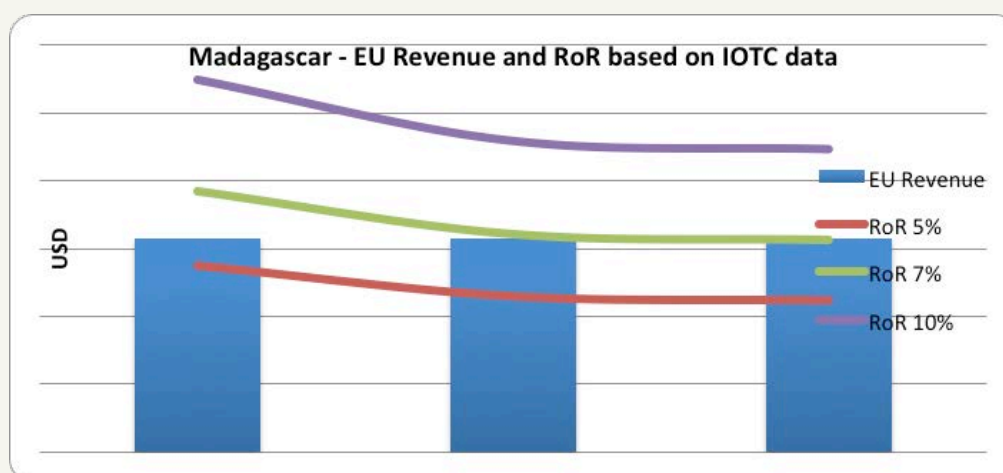
	Year	Total declared catch value	Actual total payments to Seychelles*	Actual ROR
EU FPA	2003	77,524,808	5,500,281	7.1%
	2004	87,545,915	5,517,195	6.3%
	2005	71,243,717	5,212,407	7.3%
	2006	90,113,313	6,650,438	7.4%
	2007	90,419,120	5,276,100*	5.8%
	2008	54,524,959	5,206,920*	9.5%
Seychelles flagged purse seine	2003	9,302,276	449,985	4.8%
	2004	15,178,012	577,500	3.8%
	2005	7,451,606	600,000	8.1%
	2006	11,354,886	855,000	7.5%
	2007	13,241,953	720,000	5.4%
	2008	8,352,031	660,000	7.9%
East Asian long line	2003	47,172,734	2,871,381	6.1%
	2004	77,360,210	2,789,750	3.5%
	2005	96,795,439	3,365,610	3.5%
	2006	47,977,984	2,240,006	4.8%

10. EU payments benchmarked against reference ROR derived from IOTC EEZ Catch Data

We also analysed the rates of return under the EU agreements using the monetary values associated with the IOTC EEZ catch data as well as the RoR estimates generated from these figures as the basis for our analysis. Appendices 5 sets out our calculations in detail to 7. Highlights of these calculations and assessments are set out immediately below.

Madagascar -EU payments benchmarked against reference ROR derived from IOTC EEZ Catch Data

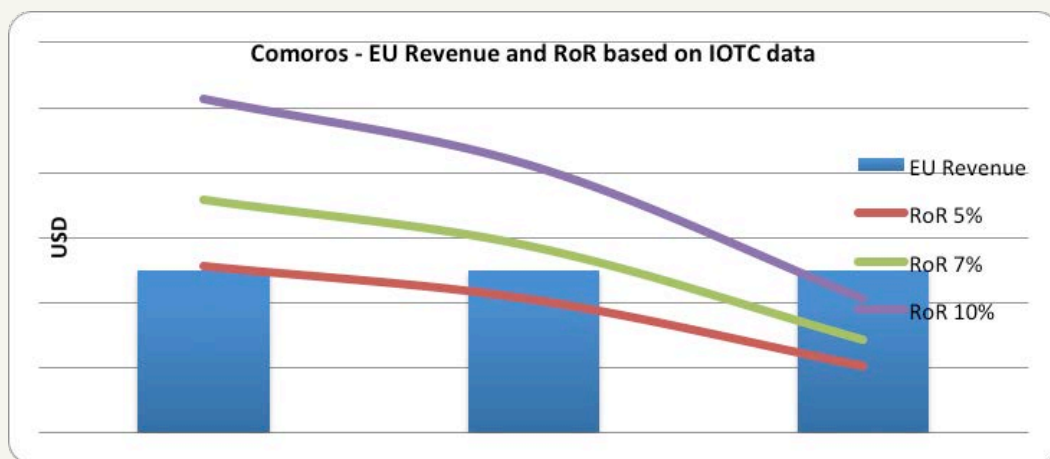
For 2007, the RoR was just under 6%. For both 2007 and 2009 it was just around 7%. Appendix 5 shows the full calculations for this assessment.



Madagascar	2007	2008	2009
EU Payments	3,150,642	3,150,642	3,150,642
IOTC reference RoR 5%	2,737,848	2,286,096	2,225,610
IOTC reference RoR 7%	3,832,987	3,200,534	3,115,854
IOTC reference RoR 10%	5,475,695	4,572,192	4,451,220

Comoros - EU payments benchmarked against reference ROR derived from IOTC EEZ Catch Data

For 2007, the Comoros RoR was just above 5%. For 2008, it was just under 6%. For 2009, it was above 10%, at approximately 12%. Appendix 6 shows the full calculations for this assessment.



Comoros	2007	2008	2009
EU Payments	1,247,821	1,247,821	1,247,821
IOTC reference RoR 5%	1,279,364	1,020,393	510,163
IOTC reference RoR 7%	1,791,110	1,428,551	714,229
IOTC reference RoR 10%	2,558,729	2,040,787	1,020,327

Mozambique - EU payments benchmarked against reference ROR derived from IOTC EEZ Catch Data

For both 2007 and 2008, the RoR was just around 5%. For 2009, it was approximately 10%.

Mozambique	2007	2008	2009
EU Payments	1,714,733	1,714,733	1,714,733
IOTC reference RoR 5%	1,796,937	1,660,216	788,765
IOTC reference RoR 7%	2,515,712	2,324,303	1,104,270
IOTC reference RoR 10%	3,593,874	3,320,432	1,577,529

The IOTC catch volume figures were however much lower for 2009.

11. Vessel day schemes – the general concept

Vessel day schemes sell vessels days to vessel owners on the basis that fishing effort is more precisely related to days actually used to undertake all activities related to fishing. A cap is also applied to the system. A vessel day does not take all factors related to fishing fully into account. Thus for example, it does not fully address the opportunity cost associated with the fishing activity. Even so, a vessel day captures a significant element of the costs and profits associated with the fishing activity and it is thus a useful proxy for the overall production process and contains within it all the factors related to costs, normal rents and above normal rents. Focusing on the vessel day as the unit, which provides a key to profitability in the fishery, therefore appears justified. Where the number of vessel days is fixed or capped, it is expected that vessel owners will compete for the available days thereby driving prices upwards. The fleet or vessel, which most values the vessel day, will pay the highest price. The current Pacific VDS is essentially a version of this approach with rights in use under access agreements currently calculable in terms of vessel days. Transferability makes short and long-term adjustment easier and allows for a better use of fishing capacities. VDS can be offered in incentive packages linked to onshore investment

12. Basic Vessel Day analysis – purse seine and longline fleets in the WIO The approach to calculation of the vessel day price used in the Pacific

This study applied the vessel day calculation methodology used in the Pacific in 2005-2007 so it is useful to detail that approach here. Appendix 5 on vessel day valuations of returns to selected Pacific Island States with estimated rates of return sets out the country by country results for the Pacific that were arrived at by analysts employed by FFA to undertake the relevant policy work. The method is quite simple. It involves establishing

1. How many vessel days were spent by a fleet in a specific country EEZ
2. Multiplying that quantum by an agreed price.

The results of this aspect of the analysis are set out below.

13. Applying priced vessel day calculations to value the purse seine fisheries in the WIO

We calculated in an indicative way, the value per vessel day for 2003-2009 for yellowfin, bigeye and skipjack tuna caught by the EU purse seine fleet. The analysis used comprehensive data on the EU purse seine from two recent Spanish and French fleet reports setting out days spent steaming and fishing in detail. We only used the fishing days data. More accurate work will need to be done to fully demonstrate the usefulness of this approach in the WIO context. A key consideration here is the fact that data from high sea activity will have to be much more robustly collected and analysed.

Applying priced vessel day calculations to value the EU purse-seine fisheries in the WIO (USD).

CATCH VALUE/ FISHING DAYS	2003	2004	2005	2006	2007	2008	2009
French Purse Seiners	3,488	3,836	3,845	4,815	5,541	4,844	3,315
Spanish Purse Seiners	4,468	4,730	5,808	6,462	5,895	4,792	3,784
Total fishing days	7,956	8,566	9,653	11,277	11,436	9,636	7,099
Total Nominal Catch values (USD)	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109,052, 092
Nominal catch value/ Fishing day (USD)	19,674.94	16,238.90	15,468.32	10,457.68	10,195.89	13,112.35	15, 361.61

14. Applying priced vessel day calculations to value the longline fisheries in the WIO

The indicative exercise undertaken here was slightly different as the analysis required conversion of the number of longline hooks per daily set into a vessel day equivalent in an effort to show the value of catch per vessel day for yellowfin, bigeye and skipjack tuna. Its focus was the longliners from Japan, Korea and Taiwan with some Spanish vessels reflagged with Seychelles flags. In this model, the impact of different sized sets (number of hooks per set) was used as a sensitivity test. It should be noted that these figures are very approximate. They are estimated from Seychelles data and include all longliners with licences excepting French and South African longliners. Consultation with other experts suggests that an average catch per day of 1.15 tonnes for all longliners is a reasonable estimate. Assuming the catch ratio of 1.3:1 for bigeye to yellowfin and using an indicative landed price per tonnes of USD.

An approximate catch value per vessel day is therefore USD 14,000. The data used is limited to EEZ data. There is thus no statement of vessel day results for the high seas.

Estimated catches per day for longliners 2001 - 2009

ASSUMED CATCH PER DAY (MT)	2001	2002	2003	2004	2005	2006	2007	2008	2009
YFT	1.41	1.41	1.56	1.68	2.07	2.07	2.07	2.07	2.07
BET	1.83	1.83	2.03	2.18	2.69	2.69	2.69	2.69	2.69
Assumptions									
3000 hooks/set/day									
CPUE/3000 hooks 30% more for BET									
Than YFT									
ESTIMATED FISHING DAYS									
YFT	11,608	14,567	18,725	15,622	12,647	9,143	7,020	3,893	2,311
BET	4,882	8,006	8,677	8,443	5,936	4,941	4,823	2,571	1,842

15. Limited analysis of the situation of the French Territories, Reunion and South Africa.

No detailed calculations were undertaken for Réunion and French territories beyond the below statement on nominal catch values. It can be seen that these values are very high and show the real interest that France and Reunion have in the resources of the region. No resources were provided for specifically investigating the situation of the French EEZs and Reunion any further. This aspect of the WIO system would benefit from its own specific study, as this would provide a sound basis for furthering regional co-operation between the region's Coastal States and the EU both within the IOTC but also within their own arrangements such as the IOC and any other independent arrangement.

Reunion - nominal Catch Values (USD)

FRANCE + FRENCH TERRITORIES	2007	2008	2009
Longliners	30,656,816	19,626,200	7,112,177
Purse seiners	15,702,988	25,851,071	23,918,164

Additionally, no calculations were undertaken for South Africa as this fell beyond the core area of focus of the project and no additional funding was available to pursue the South African aspects of the project.

16. Conclusions

This specific Report in overall terms meets the specific terms of reference:

- Give a regional overview of the economic importance of the tuna fisheries in WIO region; narrow down investigations to 1 or 2 individual countries (preferentially Madagascar and/or Seychelles).
- Analyse the economic characteristics and yield of the FPAs (Fisheries Protocol Agreement) and other licensing mechanisms relative to the value of fish caught in these EEZs and relative to the benefits of third countries;
- Assess potential revenue that could be generated through an improved tuna fisheries strategy in the region.

CONTENTS

1.	INTRODUCTION, BACKGROUND, SCOPE & OBJECTIVES OF THIS REPORT	28
2.	THE CONCEPTUAL APPROACH TO THE STUDY	31
3.	OVERALL METHODOLOGY, FIELD WORK, ANALYTICAL & DATA CONSTRAINTS & REPORT LIMITATIONS.	32
4.	THE RATE OF RETURN CONCEPT – CONCEPT AND SPECIFIC METHODOLOGY	33
5.	WIO SUPPLY CHAINS & THE DIFFERENTIAL ECONOMIC IMPORTANCE OF RESOURCES AT COUNTRY LEVEL - PRELIMINARY COMMENTS	36
6.	BUILDING BLOCKS FOR THE EVALUATION - THE EXCLUSIVE ECONOMIC ZONES OF THE WIO COUNTRIES	40
7.	BUILDING BLOCKS FOR THE EVALUATION - ESTIMATION OF CATCH DATA	42
8.	THE ESTIMATED VALUE OF EEZ CATCHES – AN AGGREGATE REGIONAL STATEMENT	43
9.	ESTIMATIONS OF TUNA CATCHES AND THEIR GROSS VALUE AT COUNTRY/EEZ LEVEL	45
10.	ESTIMATING DISTRIBUTION OF BENEFITS BETWEEN WIO COUNTRIES AND FOREIGN FLEETS - THE RATE OF RETURN ON LEASING OUT EEZ RESOURCES	46
11.	EU PAYMENTS BENCHMARKED AGAINST REFERENCE ROR DERIVED FROM IOTC EEZ CATCH DATA	49
12.	VESSEL OPERATING COSTS AND INTERACTION WITH MARKET PRICES - THE MISSING ELEMENT	50
13.	VALUATIONS AT COUNTRY LEVEL – COMOROS	52
14.	VALUATIONS AT COUNTRY LEVEL – FRANCE AND FRENCH TERRITORIES	54
15.	VALUATIONS AT COUNTRY LEVEL – KENYA	54
16.	VALUATIONS AT COUNTRY LEVEL – MADAGASCAR	56
17.	VALUATIONS AT COUNTRY LEVEL – MAURITIUS	60
18.	VALUATIONS AT COUNTRY LEVEL – MOZAMBIQUE	61
19.	VALUATIONS AT COUNTRY LEVEL – SEYCHELLES	63
20.	VALUATIONS AT COUNTRY LEVEL – SOUTH AFRICA	68
21.	VALUATIONS AT COUNTRY LEVEL – TANZANIA	69
22.	APPLYING THE VESSEL DAY APPROACH – AN ALTERNATIVE VALUATION APPROACH	70
23.	CONCLUSIONS	75
24.	APPENDICES	80
25.	REFERENCES	94

1. INTRODUCTION, BACKGROUND, SCOPE & OBJECTIVES OF THIS REPORT

1.1 Introduction

As required by World Wildlife Fund (WWF), Madagascar, this Report (WP 1: Economic valuations at regional and country level) provides a regional economic valuation statement with respect to the tuna resources in the Western Indian Region (WIO) in the context of the region's various supply chains. The countries covered by indicative and by no means conclusive valuation statements are Comoros, Kenya, Madagascar, Mauritius, Mozambique, Réunion, Seychelles and South Africa. A statement at regional level is also provided. However again this is cautionary. The reasons for caution are discussed more fully at

The Report is part of the set of outputs from the project as follows:

1. WORK PACKAGE 1: Economic valuations at regional and country level (this Report)
2. WORK PACKAGE 2: Supply chain and fleet/corporate profile analysis
3. WORK PACKAGE 3: Strengths, weaknesses and concerns within management arrangements and supply chains (Overview of IOTC arrangements, by-catch issues, IUU fishing, and piracy)
4. WORK PACKAGE 4 – Strategies, tactics and options for responding to the dominance of foreign fleets, companies and States
5. WORK PACKAGE 5 – Case Study reports – Madagascar, Seychelles and Mauritius.
6. WORK PACKAGE 6: - Case Study reports – Kenya, Comoros, Tanzania, Mozambique

In terms of its end uses, the project outputs are intended to provide end-users in the region, primarily WWF and country governments as well as users elsewhere with information and policy directions on the following issues:

5. The monetary value of WIO tuna calculated at the level of catch taken in EEZs.
6. The likely monetary value of quota allocations as currently proposed by various submissions to the Indian Ocean Tuna Commission in February 2011.
7. The relative proportions of value captured by foreign fleets/processors as distinct from local stakeholders in the WIO.
8. Options for increasing the proportion of benefits captured by WIO stakeholders – e.g. by negotiating better agreements and establishing better management frameworks.
9. Detailed advice on the current situation in the individual WIO countries.

Project outputs, whilst primarily presented as policy and economics outputs, are based on a sound understanding of the biological, ecological and ecosystems dynamics of the tuna resources of the region.

Finally, the report is required by the Terms of Reference to also set out clearly those areas where further work is required. This is done at the end of this Report and also in the other outputs.

1.2 Monetary valuations at regional and country level – objectives of this report

The consultants pursued the following objectives:

1. Using the latest IOTC data, identify at regional level, the monetary valuations that can be placed on the tuna resources targeted by the purse seine and longline fleets. The approach used here was a simple procedure of multiplying catch values by market prices.
2. Using the latest IOTC data, identify at country level, the monetary valuations that can be placed on the tuna resources extracted from the individual exclusive economic zones (EEZs) of Comoros, Kenya, Madagascar, Mauritius, Mozambique, Tanzania, Réunion, Seychelles and South Africa.
3. As another method of valuing WIO EEZ resources apply the Vessel Day approach now well established in the Western Central Pacific to the WIO region in a preliminary and indicative way - this aspect of the report addresses the terms of reference requirement - assess potential revenue that could be generated through an improved tuna fisheries strategy in the region.

This report in overall terms meets the specific terms of reference:

- Give a regional overview of the economic importance of the tuna fisheries in WIO region; narrow down investigations to 1 or 2 individual countries (preferentially Madagascar and/or Seychelles).
- Analyse the economic characteristics and yield of the FPAs (Fisheries Protocol Agreement) and other licensing mechanisms relative to the value of fish caught in these EEZs and relative to the benefits of third countries;
- Assess potential revenue that could be generated through an improved tuna fisheries strategy in the region.

1.3 Monetary valuations at regional and country level - structure of this report

The report is structured as follows:

- Introduction, background, scope & objectives of the report
- The conceptual approach to the study
- Field work and general analytical methodology (including constraints & report limitations)
- WIO resources - supply chains and economic importance of resources - preliminary comments
- Building blocks for the evaluation - the exclusive economic zones of the WIO countries
- Building blocks for the evaluation - estimation of catch data
- The estimated value of EEZ catches – an aggregate regional statement.
- Estimations of tuna catches and their gross value at country/EEZ level
- Estimating distribution of benefits between WIO countries and foreign fleets at fleet & access agreements & licence fee level
- Vessel operating costs and benefits - the missing element

⁴ It should be noted that in the absence of high seas and artisanal catch data this couldn't be attempted in a definitive and comprehensive way.

⁵ Market prices had to be averaged and have a large element of estimation in them as well given the variability attached to prices on a month-by-month and also year-by-year basis. There are also different price databases for the tuna sector. Sections 2 and 3 discuss these issues in more detail.

⁶ It should be noted that in the absence of artisanal catch data this couldn't be attempted in a definitive and comprehensive way.

⁷ It should be noted that in the absence of high seas and artisanal catch data this couldn't be attempted in a definitive and comprehensive way.

- Valuations at country level – Comoros
- Valuations at country level – France and French territories
- Valuations at country level – Kenya
- Valuations at country level – Madagascar
- Valuations at country level – Mauritius
- Valuations at country level – Mozambique
- Valuations at country level – Seychelles
- Valuations at country level – South Africa
- Valuations at country level – Tanzania
- Applying the vessel day approach – an alternative valuation perspective

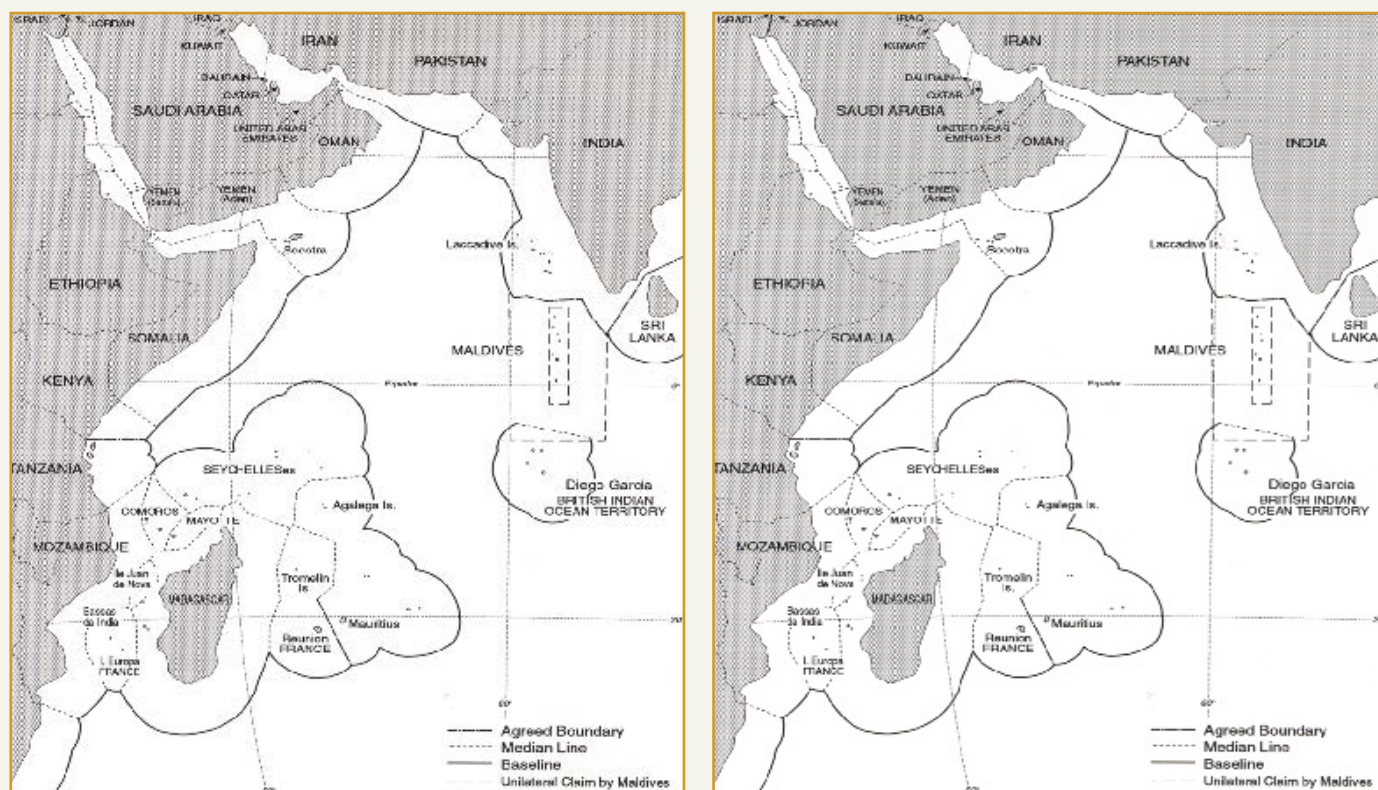


Figure 1.1 – The study area

NB – South Africa is not fully shown on this map.

⁸ The section on Mozambique is based on Patria, E, Castiano, M, Malan, P and Giroux, F. (2011). Mozambique report to the Secretariat of the Indian Ocean Tuna Commission (IOTC) for attaining the status of a Co-operating non Contracting Party

2. THE CONCEPTUAL APPROACH TO THE STUDY

As shown by Figure 2.1 a comprehensive economic valuation would need to cover all aspects of tuna resources and economy – social, economic and ecological – to arrive at a balanced and comprehensive statement of costs, benefits and options. However, the absence of basic data of all types has meant that the consultants have only been able to achieve some aspects of such a comprehensive evaluation. The emphasis has principally been on the market price aspects with very limited attention paid to the ecological and social aspects. Additionally it should be noted that this the first time such an evaluation based on catch data figures from IOTC has been attempted. The exercise is thus highly preliminary. Despite the cautions and reservations expressed it should nevertheless be stated that a degree of progress in establishing the economic value of the resources has been achieved. Figure 2.2 sets out the conceptual model as well as focus we have chosen in undertaking the study. In the detailed case studies for each of the countries virtually all aspects of the supply chain and revenue/economic/financial issues are reasonably comprehensively covered

(See in this regard Case Study reports – Madagascar, Seychelles, Mauritius, Kenya, Tanzania, Mozambique, and Comoros).

Figure 2.1 – Conceptual model - comprehensive economic valuation of Indian Ocean tuna resources

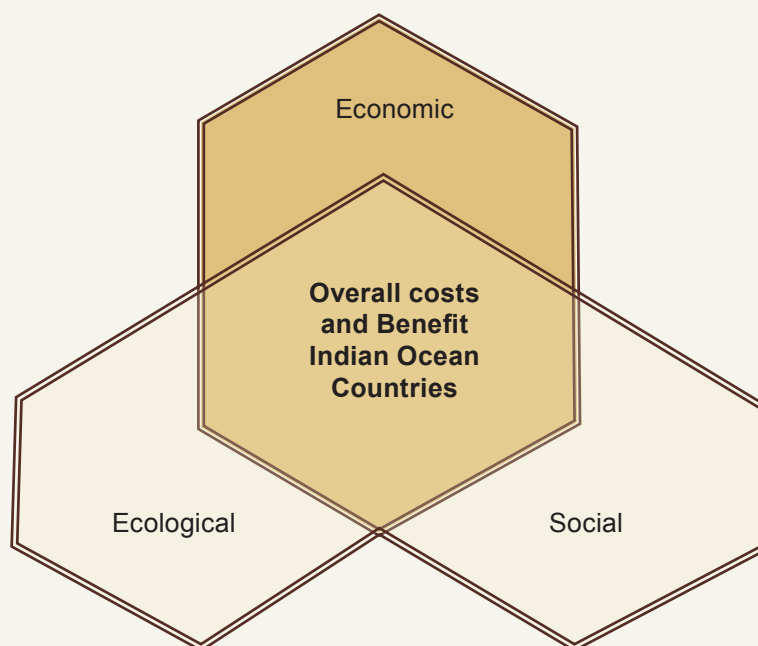
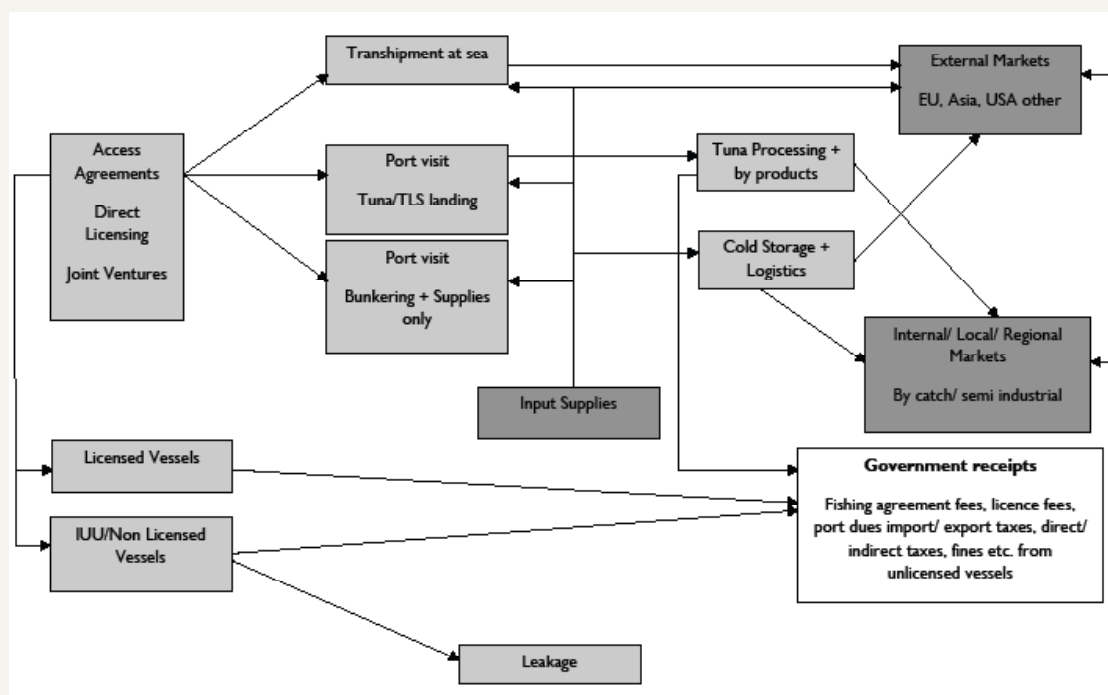


Figure 2.2 - Conceptual model – economic aspects of foreign fishing, access agreements and the typical Indian Ocean economy



3. OVERALL METHODOLOGY, FIELD WORK, ANALYTICAL & DATA CONSTRAINTS & REPORT LIMITATIONS.

The overall methodology backing project output and giving effect to the conceptual model set out by Figure 2.2 has been as follows:

- Review of all publicly available documents for all the countries supported by the extensive private holdings of the consultants.
- Consultation with the full range of agencies and authorities in charge of fisheries in Madagascar, Mauritius and Seychelles.
- Consultation with the IOTC in Seychelles and use of their extensive databases on tuna stocks, nominal catches and other data.
- Extensive use of detailed data on the value of tuna catches by vessel and by species obtained from Seychelles
- Contacts with the Food and Agricultural Organisation (FAO) in Rome and the Forum Fisheries Secretariat in Honiara, Solomon Islands.

The data used has thus been both quantitative and qualitative. The figures relied on to make the assessments are figures relating to catch taken in the EEZ and/or attributed to the EEZs of the WIO countries. No recent useful information was however available with respect to catch taken on the high seas. In the absence of this information, the EEZ figures are the best set of figures available. It should also be noted that there are also no figures of a reliable character available for artisan and semi-industrial fleets in the region. It is only industrial fisheries for the widely traded commodities that are covered by comprehensive databases.

THIS REPRESENTS A MAJOR CONSTRAINT WHICH NEEDS TO BE BORNE IN MIND BY THE READER. THE MARKET PRICE VALUATIONS PROVIDED HERE ARE THUS ONLY PARTIAL AND INDICATIVE ONLY.

Approaches to analysis and presentation of results

In total, the consultants have used five different perspectives. Results from applying these different analytical perspectives are presented in the relevant parts of the Report as follows:

- A statement at regional level of the monetary valuations for the resources targeted by the purse seine and longline fleets as well as RoRs calculated at 5%, 7% and 10% of the relevant totals. The approach used here was a simple procedure of multiplying catch values by market prices.
- A statement at country level for the EEZ resources fished in the target countries as well as RoRs calculated at 5%, 7% and 10% of the relevant totals. The approach used here was a simple procedure of multiplying catch values by market prices.
- RoR calculations for the EU FPAs with Madagascar, Mozambique and Comoros based on comparing the amounts paid under the agreements with the reference or benchmark RoRs (5%, 7%, 10%) calculated from the IOTC data.
- RoR calculations based on actual data on access fee payments supplied by the Coastal East African countries - these results were compared with the reference RoR figures.
- A preliminary statement of the results from applying a very basic Vessel Day analysis to the latest IOTC and other comparative data. The Vessel Day approach is now well established in the Western Central Pacific. This report applies it to the WIO region in a preliminary and indicative way as yet another method of providing a valuation of WIO/EEZ resources. The report does not advocate that WIO countries adopt a Vessel Day approach. Further work may however prove useful to provide another perspective on the monetary value of the region's tuna resources.

Despite these limitations, the RoR figures set out in this Report provide WWF with a reference point in its advocacy work in the WIO region, subject of course to the limitations of data identified above. The 10% figure also provides a reference point that can be reasonably aimed for and maintained by the countries and WWF. It addresses the terms of reference requirement: *assess potential revenue that could be generated through an improved tuna fisheries strategy in the region.*

4. THE RATE OF RETURN CONCEPT - CONCEPT AND SPECIFIC METHODOLOGY

4.1. Estimating distribution of benefits between Coastal States and foreign fleets - the rate of return (RoR) concept

Ideally, access fees or licence payments should be based on a clear RoR. The RoR is monetary value received by the Coastal State as a proportion of the total monetary value of the catch once sold in the final port of destination of the foreign fleet. The question then is what percentage of the ex-vessel value will be recovered by the Coastal State. – It could be a RoR of 5 per cent, 6

per cent, 7 per cent, 10 per cent and so on. The RoR can be calculated based on the total catch taken from an EEZ; total catch taken by a particular fleet; total catch within the framework of specific agreements; or total catch taken by gear type. The RoR should also be calculated over a period of time most probably on an annual basis or a multi – annual period. Where the RoR is low (2-4%) there is a case for increasing access, licence, transshipment, reflagging and other fees in order for the benefits to the country to be more equitable. However to undertake a sound and comprehensive RoR assessment, the analyst must have detailed country data, including all relevant access agreements and records of payments as well as accurate information on how much catch is taken out of each EEZ or under specific agreements. This total set of information however seldom available publicly, and in many cases may not even be collected in a form, which allows a full RoR analysis to be done. It is critical to emphasise that a robust RoR analysis can only be undertaken if there is enough information available to support: **(1) calculation of the amounts of actual catch taken from each EEZ; (2) calculate the annual monetary values generated by each EEZ when the catch is sold at ex-vessel prices.**

4.2. What is an adequate RoR?

The next question is what is an adequate RoR for WIO States specifically, and the Coastal State generally. In our view, based on current trends in the Pacific and the ecological costs of taking the fisheries resources out, States should be getting at least 7% of the returns whilst a steady possibility of capturing 10% of the returns would probably be the lower end of a fair and equitable outcome. Currently, the Pacific Island States in the Western Central Pacific. (The States with the most advanced arrangements on a global basis) are achieving a RoR of between 8-10% across their bilateral arrangements. These States use a vessel day approach under which a minimum price for a vessel day is USD5000 a day. As at end February, information informally received from the relevant Pacific region officials indicate that the rate of return was 8.3% on average across all the bilateral arrangements although it has gone up to 10% under some bilateral arrangements.

4.3. The Specific RoR approach used in this study

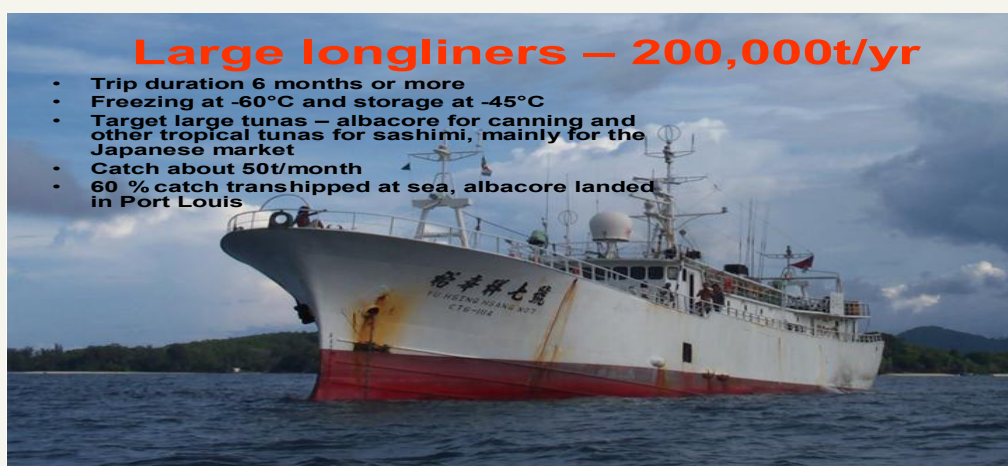
In terms of RoR methodology the study has had three aspects:

- Step 1: estimate for each country, the ex-vessel monetary values of total EEZ catch for both industrial level purse seine and longline sectors using catch data estimates from the IOTC catch database –
- Step 2: for each country, calculate RoR reference amounts at 5%, 7% and 10% of the total values for the years 2007-2009;
- Step 3: for each country, where the figures are available, compare the year on year actual access fee receipts as percentages of the IOTC based catch value estimates for 2007-2009 with the 5%, 7% and 10% reference figures generated by step 2.

It would not have been possible to undertake this approach if CEA countries had not released information on their access agreement receipts and for this the consultants are grateful. However, whilst it is important to emphasize that the release of access fee payments by participating countries has been extremely useful, it is also important to emphasise that the data provided only supports an initial and not extremely robust assessment of ROR at country level. Limitations within the information data set include the fact that, for example, not all countries consistently record access payments by gear type. The result is that we have had to aggregate purse seine and longline information. . **The most critical limitation however is that there is no information available on: (1) the amounts of actual catch taken from each WIO EEZ; (2) the annual monetary values generated by each EEZ when the catch is sold at ex-vessel prices.**

IT IS FOR THIS REASON THAT THE IOTC CATCH DATA HAS SUCH PROMINENCE IN THE STUDY – IT IS CURRENTLY THE ONLY SOURCE OF INFORMATION AVAILABLE ON THE TOTAL CATCH HARVESTED BY FLEETS FROM EACH ZONE. EVEN THOUGH USEFUL THIS DATA IS ALSO THEN FURTHER LIMITED BY THE FACT THAT IT DOES NOT DIFFERENTIATE FOREIGN FLEET CATCH FROM DOMESTIC FLEET CATCH.

Figure 4.1 – A large longliner



Source: IOTC/Ardill (2009)

⁹ This data base although useful is also limited as it is often based on country reports that are not always accurate and in many cases attributes catch to the

¹⁰ Figures were released by Kenya, Mozambique and Tanzania. The authors already had figures from the Seychelles due to an earlier study undertaken for the government of Seychelles.

5. WIO SUPPLY CHAINS & THE DIFFERENTIAL ECONOMIC IMPORTANCE OF RESOURCES AT COUNTRY LEVEL - PRELIMINARY COMMENTS

Tuna caught in the WIO generates very little local value adding. It also generates limited multiplier impacts (direct, indirect and induced employment) in WIO economies. The reasons are as are interlocked and varied. Firstly, WIO tuna fishing is dominated by EU fleets (principally French and Spanish purse seiners) and Asian longline fleets (mainly from Japan, Korea and Taiwan/China). The supply chains for the EU fleets are well organised with part of the catch landed for processing in Mauritius, Madagascar and Seychelles. Processed tuna, principally canned products and loins are exported to the EU countries and the US with another segment exported in low temperature containers to Europe and various Asian countries. The tuna processing plants in Madagascar, Mauritius and Seychelles are tightly integrated into supply chains dominated by companies based in the UK, France, Italy, the United States and Asia. The Asian longline fleets land some tuna in Port Louis, Mauritius for low temperature storage and subsequent transport to Asian destinations, with India emerging as a key market. However much of the catch in the EEZs of WIO states and adjacent high seas is transhipped at sea for onward transport to Japanese, Thai and other markets. Asian fleet value accruing to WIO coastal states is thus very limited with the bulk of such limited value captured principally by enterprises based at the Seafood Processing Hub in Port Louis. Given the current structure of global supply chains and the dominance of these by foreign fleets/processors, as far as our specific valuation task is concerned, the following points can be made:

- Seasonality as shown by Figure 4.4 is decisive in determining the economic importance of tuna fisheries to the various WIO countries
- Access/licence fees paid to each State are important - however the extent to which such payments represent an adequate proportion of the monetary value associated with the resource as well as the opportunity costs associated with allocating the specific fisheries resources to foreign and domestic fleets is still highly unclear
- Non- access revenues are important but are not always factored in – we refer here to government and private revenues generated by port activities linked to landing and transhipment of tuna - port dues, vessel expenditures in port, fuel provision, crew accommodation and flights, vessel repairs and maintenance, chandlery, agency activity and other expenditure – value from this section of the supply chain could be increased – however for each country and for the region generally, it is unclear at what point such increases would reach a tipping point which makes a specific country or the region as a whole unattractive to the fleets and companies.
- Value derived from the processing of landed tuna where processing facilities exist in a specific country are a highly important part of the value equation.
- External constraining factors such as climate change and sharp shocks of the type caused by Somali pirate activity have also shown themselves to be very important economic factors. These issues are analysed in more detail by outputs from WORK PACKAGE 3: Strengths, weaknesses and concerns within management arrangements and supply chains (*Overview of IOTC arrangements, by-catch issues, IUU fishing, and piracy*)

Figure 5.1. – A purse seiner



Source: IOTC/Ardill (2009)

Figure 52. – A small longliner

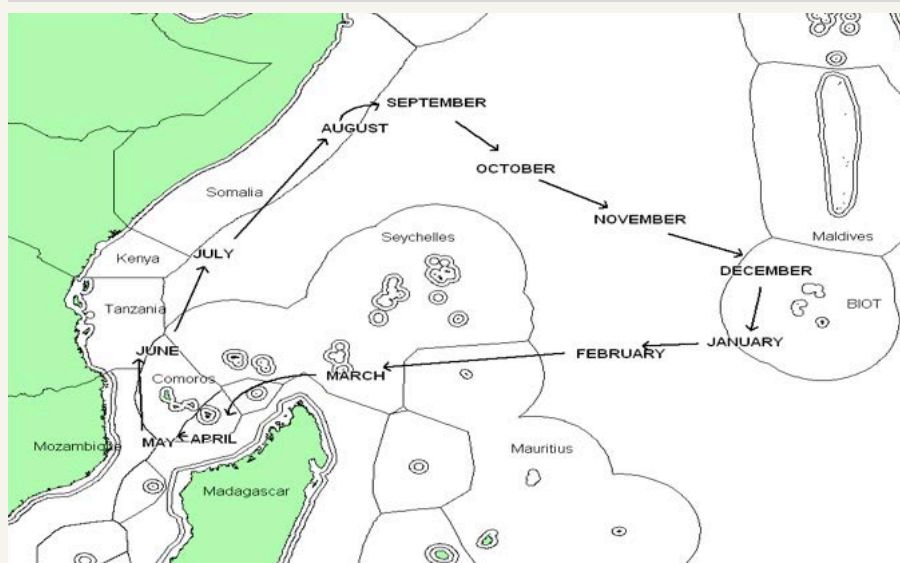


Source: IOTC/Ardill (2009)

5.1. Tuna Fishing Seasonality in the Western Indian Ocean and its impact on economic returns

The seasonality of the fisheries, a function of oceanographic and climatic factors and now further heightened by climate change factors are fundamental to understanding the political economy of regional tuna, the strategies and behaviour of foreign fleets as well as the options facing governments. Close study of Figure 4.4 explains this issue well. Seychelles for instance benefits much more because it is located in one of the main tuna 'belts' for much of the year. By contrast tuna fishing in the Mozambique Channel is much more seasonal. The recent exclusion of the Somali segment of the highly migratory path has significant implications as it has resulted in much of the fleet shifting further south and westwards.

Figure 5.3. Tuna Fishing Seasonality in the Western Indian ¹¹



Source: MRAG (2009)

5.2. Linkages with the Tuna Supply Chains and Economy of the WIO - a Country perspective.

Analysing the diversity of regional situations more closely, key differences in the importance of tuna fisheries can be summarised as follows.

- Seychelles is in the tuna fisheries belt and has over time become a major hub for EU purse seiners with occasional visits from Asian longliners. Tuna has a significant place in the economy of Seychelles.
- Port Louis, Mauritius, is a base for Asian longliners, which also use the port for repair and cold storage. Dry dock facilities also serve the occasional EU purse seiner. Most tuna passing through Mauritius is shipped on reefers from Seychelles and enters as a raw material for the tuna processing industry and ancillary industries in Mauritius. Mauritius therefore benefits from port visits and expenditure as well as the value added from the tuna processing industry.
- Madagascar through Diego Suarez is a supplementary part of the regional system focused on Seychelles and Mauritius.
- Reunion is a major base for the EU fleets active in both the Indian Ocean and the Atlantic and receives significant amounts of EU aid to assist with maintaining the competitiveness of the fleet, its ports and harbours.
- For the other regional countries, tuna fisheries have had little impact to date with the exception of Kenya and South Africa. Tanzania plans to expand its tuna sector, while Comoros receives virtually no value added from tuna apart from the access and licence fees from DG Mare, EU and trawler owners. Mozambique is rapidly seeking its proportion of the tuna economy.

In terms of economic contribution to the national economies, the EU purse seiner fleets (principally French, Spanish and Seychelles flagged purse seiners) have a greater impact, notably in Seychelles and to a much lesser extent Madagascar while the economic impact of Asian longliner activities is concentrated in Port Louis, Mauritius. In other cases, Asian longliners tranship their catch at sea to other vessels (on the high seas in principle) and in some cases refuel at sea. Arguably the principal weakness of the tuna sector is that much of the value added is exported to EU countries and Asia, principally China/Taiwan, Japan and Korea. Another area of loss is caused by the lack of monitoring, control and surveillance (MCS). Significant economic leakage is therefore generated by illegal, unreported and unregulated (IUU) tuna fishing.

¹¹ It should be noted that this graphic does not include South Africa.

Table 5.1 - Economic Benefits from Tuna Resources by Country in the WIO Region

COUNTRY	Access Agreements (licence fees and/or access payments)	Reflagging revenue	Port and in country revenues	Other comments
Comoros	FPA with EU	Uncertain	Revenues from EU access agreements and licence fees.	No facilities for landings and/or transshipment by tuna fishing vessels. There may be EU investment in port infrastructure as part of the latest EU/Comoros FPA
France	EU member	No	Some revenue from tuna fishing at Le Port, Réunion and Dzaoudzi, Mayotte	Includes Réunion, Mayotte and the EEZs around disputed islands. Member of IOTC.
Kenya	Private licences	Uncertain	Some port revenue in Mombasa and processing facilities at Wananchi Products, Mombasa	Limited multiplier impacts linked to tuna processing and port activities in Mombasa. Member of IOTC.
Madagascar	FPA with EU. Large number of recently licensed private vessels.	Yes	Port and processing revenues in Antsiranana, tuna landings and transshipment, vessel repairs for Spanish purse seiners	Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities linked to tuna. Member of IOTC.
Mauritius	Agreement with Japan. Numerous private licensing arrangements. Agreement may be concluded with the EU.	Yes	Major centre for tuna processing in Port Louis including canned tuna, tuna loins and by products including tuna oil and fishmeal	Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities linked to tuna. Member of IOTC.
Mozambique	FPA with EU. Large number of recently licensed private vessels.	Uncertain	No processing facilities and no port bases	May become a member of IOTC soon.
Seychelles	FPA with EU	Yes		Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities. Member of IOTC.
South Africa	No agreement with the EU	Uncertain	Some tuna processing	Some longliner fishing for southern Bluefin and albacore in Indian Ocean. May become a member of IOTC soon.
Tanzania	No agreement with the EU	Uncertain	No processing facilities and no port bases for tuna vessels	Some tuna fishing in EEZ. Member of IOTC.

5. 3. The special case of South Africa

Finally, it should be noted that South Africa presents a special case within the WIO framework for a variety of reasons, including its highly industrialised economy, its large internal market and its use of a quota management system to manage its fisheries. However, the apartheid period has meant that no relationship has developed between the markets and industries of South Africa and the fleets taking fish in the region. There is on the face of it scope for considerable benefit for WIO countries if a linkage to the South African economy was developed. Until 2003, the tuna resources migrating through South Africa’s outer EEZ and adjacent high seas were caught by longline fleets from Japan and Taiwan as part of their tropical as well as temperate tuna harvest strategies. In 2003, the South African Minister of Environmental Affairs and Tourism decided not to renew the long-standing access agreements with Japan and Taiwan.

The departure of the Japanese and Taiwanese longline fleets has created an opportunity for South African firms to invest in and develop a South African commercial large pelagic fishery aimed at the harvesting by longline of tuna, shark and swordfish. Fishing rights are allocated for a period of ten years. There is a total applied effort (“TAE”) level to accommodate 50 rights holders, divided into 20 swordfish directed and 30 tuna directed rights. Each rights holder is entitled to use a maximum of one vessel. The regional segment of the report will briefly review South Africa’s place in the WIO system and canvass options as to whether increased South African interest in tuna fisheries provides an option for other WIO States to improve their situation leveraging on South Africa’s industrial and market strength. It is hoped that a further more detailed study of the South African situation is possible as provisionally discussed.

6. BUILDING BLOCKS FOR THE EVALUATION - THE EXCLUSIVE ECONOMIC ZONES OF THE WIO COUNTRIES

The total EEZ area in the WIO region is approximately just under 10 million km2. Of this area, the case study countries (Madagascar, Mauritius and Seychelles) have a total EEZ of nearly 4 million km2 or 40 per cent of the total area. Summary data on the EEZs of the WIO regional countries is presented in Table 6.1 and 6.2. and Figure 6.1.

Table 6.1: WIO – EEZs with Several Claimants

CURRENT JURISDICTION	ISLAND	CLAIMANT
France	Banc de Geyser	Comoros,Madagascar
France	Bassas de India	Madagascar
France	Europa Island	Madagascar
France	Glorioso Island	Comoros,Madagascar, Seychelles
France	Juan de Vova	Madagascar
France	Tromelin	Mauritius
France	Mayotte	Comoros
United Kingdom	Diego Garcia/Chagos	Mauritius,Seychelles

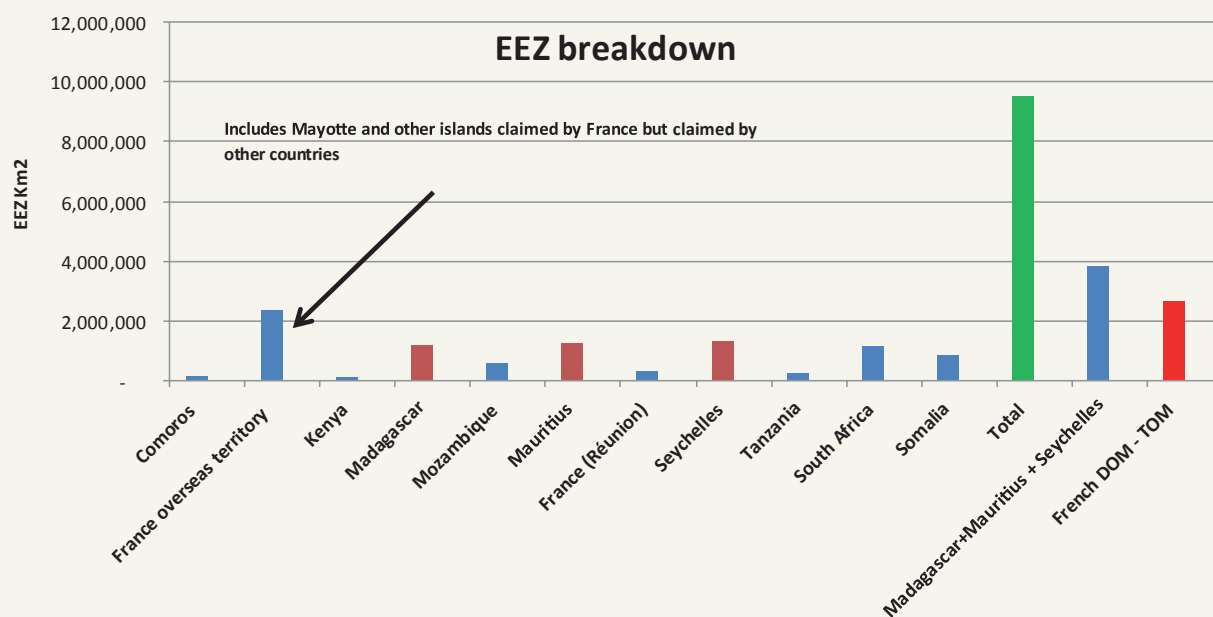
Table 6.2: EEZ data within the WIO region

Code	Country	EnglishName	FrenchName	EEZ IOTC (km ²)	% of EEZ IO	Coastline	Shelf
COM		Comoros	Comoros	164,529	1.72	400	1,416
FRAT		France OT	France overseas territory	2,337,559	24.50	306	-
KEN		Kenya	Kenya	111,805	1.17	450	8,460
MDG		Madagascar	Madagascar	1,198,462	12.56	4,000	96,653
MOZ		Mozambique	Mozambique	571,974	6.00	2,500	73,300
MUS		Mauritius	Mauritius	1,272,730	13.34	180	27,373
REU		France (Reunion)	France (Réunion)	314,874	3.30	207	965
SYC		Seychelles	Seychelles	1,332,331	13.96	-	31,479
TZA		Tanzania (United Republic of)	Tanzania	241,260	2.53	725	17,903
ZAF		South Africa	South Africa	1,164,739	12.21	3,000	160,937
SOM		Somalia	Somalia	830,464	8.70	3,200	40,392
		TOTAL	Total	9,540,727			
			Madagascar+Mauritius + Sey	3,803,523			
			French DOM - TOM	2,652,433			
EEZ surface estimated from EEZ areas used for the estimation of catch. Official figures may differ.							
TOTAL				9,540,727			

Source: IOTC (2011)

It should be emphasised that the EEZ area by country does not necessarily imply the acceptance of country ownership claims as several countries have competing claims with respect to different EEZs as shown in Table 6.1. This applies notably to a number of islands currently under French administration and which various independent countries claim.

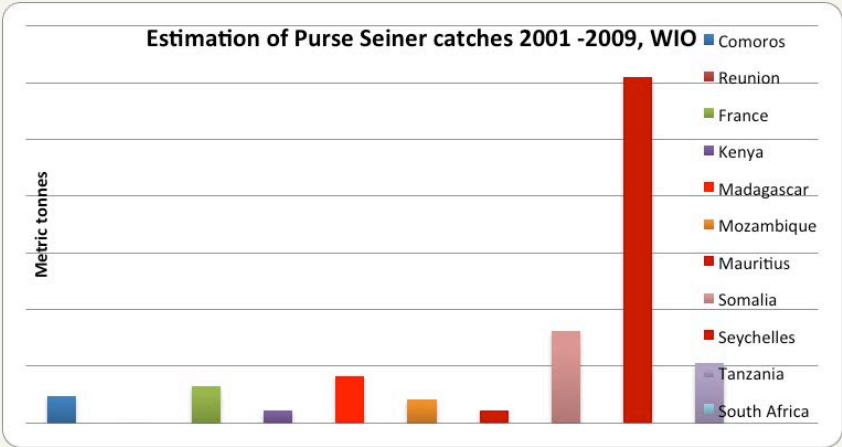
Figure 6.1: Estimated EEZ sizes in the WIO region



7. BUILDING BLOCKS FOR THE EVALUATION - ESTIMATION OF CATCH DATA

Catch data by EEZ in the WIO region are an approximation and there are problems of under reporting, accuracy of logbooks and other constraints. The figures below are for purse seiners (predominantly French and Spanish flagged) and for longliners (predominantly Asian vessels from Japan, Korea, Taiwan/China and Thailand). These estimates do not include tuna catches on the high seas. Figure 7.1 shows catch data by EEZ for tuna. These estimates are for the period 2001 - 2009 and do not take into account year on year variations. Figure 7.1 clearly shows the predominance of Seychelles in the WIO tuna economy. Seychelles is the main hub for tuna catches in the WIO given that it is in the ‘tuna belt’ and Victoria is the principal base. In resource importance, Seychelles is followed by Somalia which has an important upwelling but which is subject to major problems of access, piracy and political instability. With respect to longliners operating in the region, Port Louis, Mauritius, is an important base for Asian longliners other than those which tranship at sea. It should be noted however that a considerable proportion of longliners catches are made on the high seas. Estimates by MRAG (2011) are that 48 per cent of longliner catches are made on the high seas, while for bigeye tuna; the equivalent figure is 68 per cent.

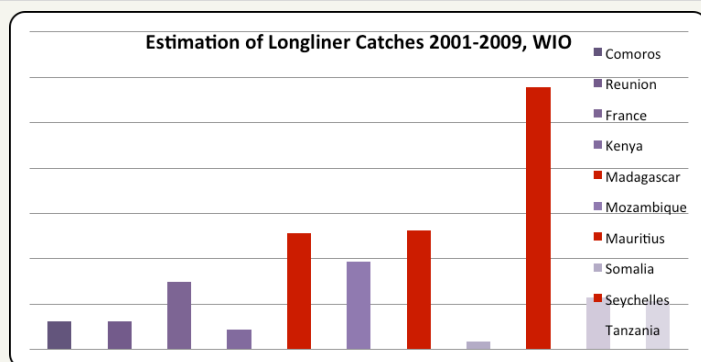
Figure 7.1: Estimated Purse Seiner Catches 2001 - 2009



Source: IOTC (2011)

The EEZs of Seychelles, Madagascar, Mauritius and Mozambique are nominally important areas for longliner catches of tuna. Again the situation is dynamic with catches year on year varying considerably. Many of the Asian longliners tranship at sea.

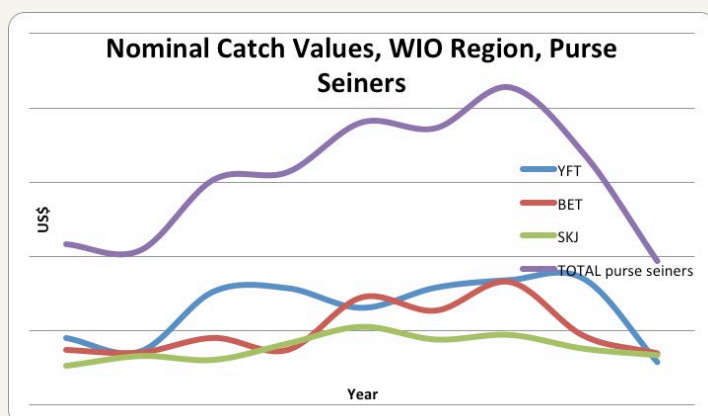
Figure 7.2: Estimates of Longliner catches in WIO EEZs



8. THE ESTIMATED VALUE OF EEZ CATCHES - AN AGGREGATE REGIONAL STATEMENT

The valuation of tuna catches is fraught with difficulties. The price of tuna by species varies considerably year on year and month on month. Gross catch value needs to be adjusted to reach a net value. From the revenues obtained by EU purse seiners and Asian longliners there needs to be deducted vessel operating costs, security and insurance costs, marketing and other transport costs to reach a net value CIF (Cost, Insurance, and Freight). This needs to be taken into account when valuing the tuna resources caught in the respective EEZs of WIO region countries. Bearing these caveats in mind, an approximation of catch values for purse seiners and longliners in the WIO region is provided by Figures 8.1 and 8.2 and Tables 8. 1 and 8.2. It should be noted that there is a decline in regional catch values and their gross value. This may be attributable to various factors – environmental factors, variation in tuna prices, catch composition and more recently the impacts of piracy on secure fishing areas and on vessel operating costs.

Figure 8.1 - Nominal Value of Catches, WIO – Purse Seiners, 2001 - 2009



¹² There is some analysis by IOTC that the impacts of the thermocline may have been responsible for the peak in catches in 2004 – 2006. The latest scientific evidence suggests that yellowfin tuna may be near MEY and therefore overfished while bigeye tuna is near the margin of overfishing.

Table 8.1. Nominal Value of Catches, WIO – Purse Seiners, 2001 - 2009

ANNUAL PRICE DATA (US\$/MT) - PURSE SEINERS									
YFT	1,160	1,283	1,270	1,467	1,686	1,702	2,210	2,490	1,860
BET	1,160	1,283	1,270	1,467	1,686	1,702	2,210	2,490	1,860
SKJ	1,160	1,283	1,270	1,467	1,686	1,702	2,210	2,490	1,860
NOMINAL CATCH BY SPECIES (mt)									
YFT	21,764	31,961	43,204	30,783	26,111	19,367	12,640	15,039	15,432
BET	13,650	14,260	22,295	13,894	17,888	17,425	13,273	11,857	12,935
SKJ	46,550	81,584	73,853	52,991	55,363	44,476	34,963	32,048	38,458
TOTAL REGIONAL VALUE OF CATCH (US\$) - PURSE SEINERS									
YFT	25,246,596	41,005,524	54,869,249	45,149,002	44,019,288	32,956,290	27,934,907	37,447,109	28,703,276
BET	15,834,412	18,295,510	28,314,508	20,378,261	30,155,958	29,651,472	29,333,130	29,524,588	24,058,308
SKJ	53,997,986	104,671,666	93,793,867	77,720,576	93,333,420	75,683,797	77,269,309	79,799,354	71,531,345
TOTAL NOMINAL VALUE OF CATCHES (MT) - WIO REGION									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
Purse seiners	95,078,994	163,972,699	176,977,625	143,247,839	167,508,666	138,291,558	134,537,346	146,771,051	124,292,930

Figure 8.2 - Nominal Value of Catches – Longliners versus Purse seiners, 2001 – 2009

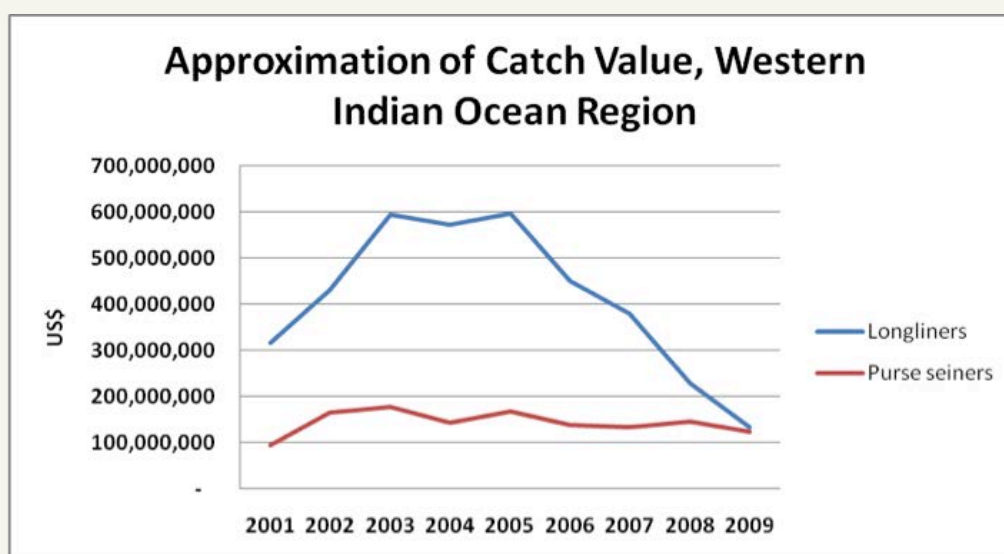


Table 8.2. – Total Nominal Catch Values – Longline and Purse-Seine Combined.

TOTAL NOMINAL VALUE OF CATCHES (MT) - WIO REGION									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
Longliners	315,916,657	431,464,335	593,256,689	572,182,365	597,413,673	449,795,875	380,267,821	229,602,895	133,108,931
Purse seiners	95,078,994	163,972,699	176,977,625	143,247,839	167,508,666	138,291,558	134,537,346	146,771,051	124,292,930

9. ESTIMATIONS OF TUNA CATCHES AND THEIR GROSS VALUE AT COUNTRY/EEZ LEVEL

Catch by species by EEZ in the WIO region for the period 2001 – 2009 was estimated using data provided by the IOTC. Gross catch values were then obtained using average annual indicative prices for YFT, BET and SKJ using time series data provided by FAO. Again it should be emphasised that such data is an approximation. Figures 9.1 and 9.2 give an indicative value of tuna catches by country for longliners and purse seiners. These figures are based on IOTC estimates per country EEZ. The annual values are an approximation and therefore the figures should be treated with caution. They do give an approximate picture of the evolution of catch values. There was a peak in catches in 2004/2005 which may have been linked to natural conditions, while the decline in catches within WIO EEZs may have been a combination of natural oceanic phenomena, the impact of piracy and world economic conditions, including vessel operating costs. The main points are:

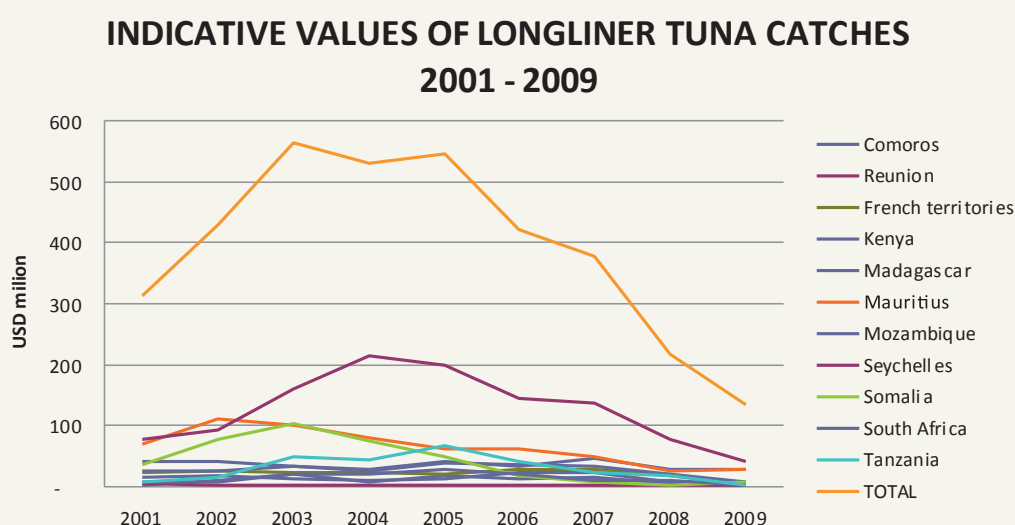
- The gradual decline in the value and quantity of tuna catches
- The relative predominance of the Seychelles EEZ as a tuna fishing zone

The value of longliner catches is increased by the relatively high value catches of bigeye tuna by Asian longliners in these EEZs, notably in the EEZs of Seychelles, Madagascar and Mauritius.

Figure 9.2 shows catch values by country EEZ for purse seiners. The key features are:

- The gradual decline in catches and their value over the period 2004 – 2009
- The predominance of the Seychelles EEZ as a fishing zone

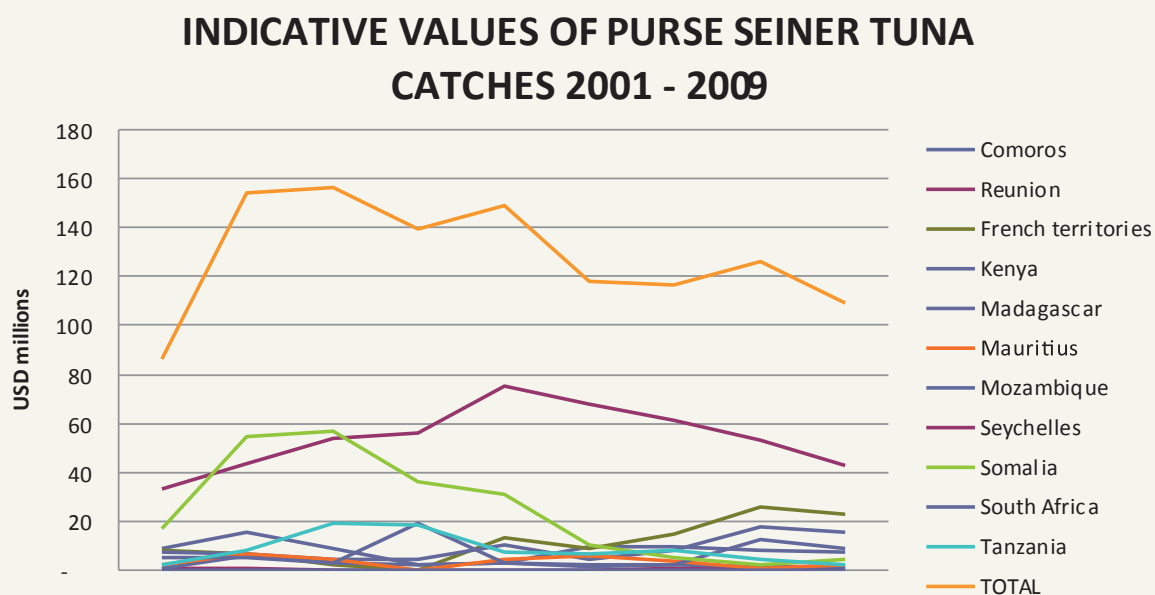
Figure 9.1 - Indicative values of longliner tuna catches by country, 2001 - 2009



Source: IOTC data and team estimates

Appendix 1 sets out in detail on a year-by-year basis, the nominal catch values for longliners by country.

Figure 9.2 - Indicative values of purse seiner catches by country 2001 – 2009



Source: IOTC data and team estimates

Appendix 2 sets out in detail on a year-by-year basis, the nominal catch values for purse seiners by country.

10. ESTIMATING DISTRIBUTION OF BENEFITS BETWEEN WIO COUNTRIES AND FOREIGN FLEETS - THE RATE OF RETURN ON LEASING OUT EEZ RESOURCES

As stated earlier, a robust rule of thumb approach for assessing the way benefits are distributed as between the foreign fleets is the so-called rule of thumb approach. **Table 10.1 shows the 2007-2009 monetary values for individual WIO EEZs as calculated from IOTC catch figures. Table 10.2 then shows the rate of return (RoR) on EEZ catch value figures for the years 2007-2009 for each of the WIO countries.** It should be added that the RoR is based on gross catch values and takes no account of vessel operating, transport and marketing costs.

Table 10.1 2007-2009 monetary values for individual WIO EEZs as calculated from IOTC catch figures.

CATCH VALUES

COMOROS	2007	2008	2009
Longliners	16,504,150	5,131,233	1,653,031
Purse seiners	9,083,136	15,276,636	8,550,237
KENYA	2007	2008	2009
Longliners	22,808,886	8,610,984	8,155,120
Purse seiners	2,274,340	1,730,346	1,162,625
MADAGASCAR	2007	2008	2009
Longliners	46,761,330	28,328,939	28,824,553
Purse seiners	7,995,625	17,392,979	15,687,648
MAURITIUS	2007	2008	2009
Longliners	49,022,933	26,355,585	28,329,050
Purse seiners	3,883,052	986,425	1,844,802
MOZAMBIQUE	2007	2008	2009
Longliners	33,655,516	20,711,851	7,036,923
Purse seiners	2,283,223	12,492,471	8,738,370
SEYCHELLES	2007	2008	2009
Longliners	136,094,817	77,541,971	41,819,733
Purse seiners	61,512,448	53,104,319	43,032,000
SOUTH AFRICA	2007	2008	2009
Longliners	11,192,443	10,407,619	2,590,301
Purse seiners	-	-	-
TANZANIA	2007	2008	2009
Longliners	22,794,694	17,418,208	1,719,173
Purse seiners	8,158,457	4,750,182	2,408,646
FRANCE + FRENCH TERRITORIES	2007	2008	2009
Longliners	30,656,816	19,626,200	7,112,177
Purse seiners	15,702,988	25,851,071	23,918,164

Table 10 2 Rate of return calculations on nominal catch value for aggregated purse seine and longline in WIO EEZs (USD)

RATE OF RETURN CALCULATIONS ON NOMINAL CATCH VALUE IN EEZs (USD)			
MADAGASCAR			
RoR	2007	2008	2009
5%	2,737,848	2,286,096	2,225,610
7%	3,832,987	3,200,534	3,115,854
10%	5,475,695	4,572,192	4,451,220
MAURITIUS			
RoR			
5%	2,645,299	1,367,101	1,508,693
7%	3,703,419	1,913,941	2,112,170
10%	5,290,599	2,734,201	3,017,385
COMOROS			
RoR	2007	2008	2009
5%	1,279,364	1,020,393	510,163
7%	1,791,110	1,428,551	714,229
10%	2,558,729	2,040,787	1,020,327
KENYA			
RoR	2007	2008	2009
5%	1,254,161	517,067	465,887
7%	1,755,826	723,893	652,242
10%	2,508,323	1,034,133	931,775
SEYCHELLES			
RoR	2007	2008	2009
5%	9,880,363	6,532,315	4,242,587
7%	13,832,509	9,145,240	5,939,621
10%	19,760,727	13,064,629	8,485,173
MOZAMBIQUE			
RoR	2007	2008	2009
5%	1,796,937	1,660,216	788,765
7%	2,515,712	2,324,303	1,104,270
10%	3,593,874	3,320,432	1,577,529
TANZANIA			
RoR	2007	2008	2009
5%	1,547,658	1,108,419	206,391
7%	2,166,721	1,551,787	288,947
10%	3,095,315	2,216,839	412,782

Source: IOTC + team estimates (2011) + Private data (2009)

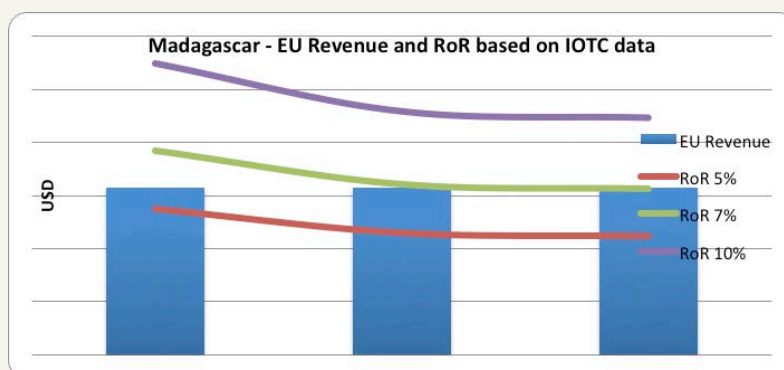
NB – There is no rate of return calculation for the French territories.

11. EU PAYMENTS BENCHMARKED AGAINST REFERENCE ROR DERIVED FROM IOTC EEZ CATCH DATA

We also analysed the rates of return under the EU agreements using the monetary values associated with the IOTC EEZ catch data as well as the RoR estimates generated from these figures as the basis for our analysis. Appendices 5 sets out our calculations in detail to 7. Highlights of these calculations and assessments are set out immediately below.

11.1. Madagascar - EU payments benchmarked against reference ROR from IOTC EEZ Catch Data

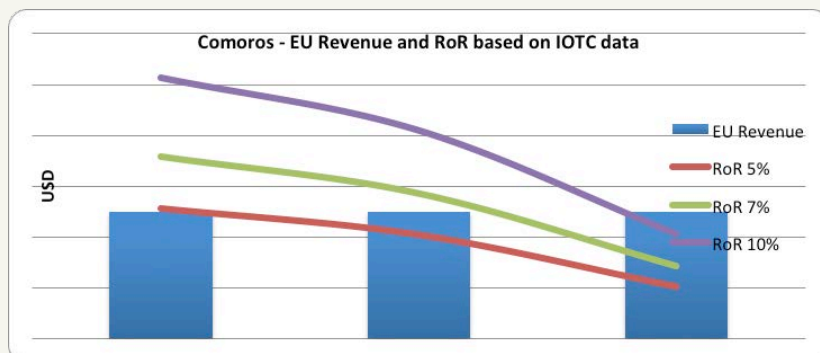
For 2007, the RoR was just under 6%. For both 2007 and 2009 it was just around 7%. Appendix 5 shows the full calculations for this assessment.



Madagascar	2007	2008	2009
EU Payments	3,150,642	3,150,642	3,150,642
IOTC reference RoR 5%	2,737,848	2,286,096	2,225,610
IOTC reference RoR 7%	3,832,987	3,200,534	3,115,854
IOTC reference RoR 10%	5,475,695	4,572,192	4,451,220

11.2. Comoros - EU payments benchmarked against reference ROR from IOTC EEZ Catch Data

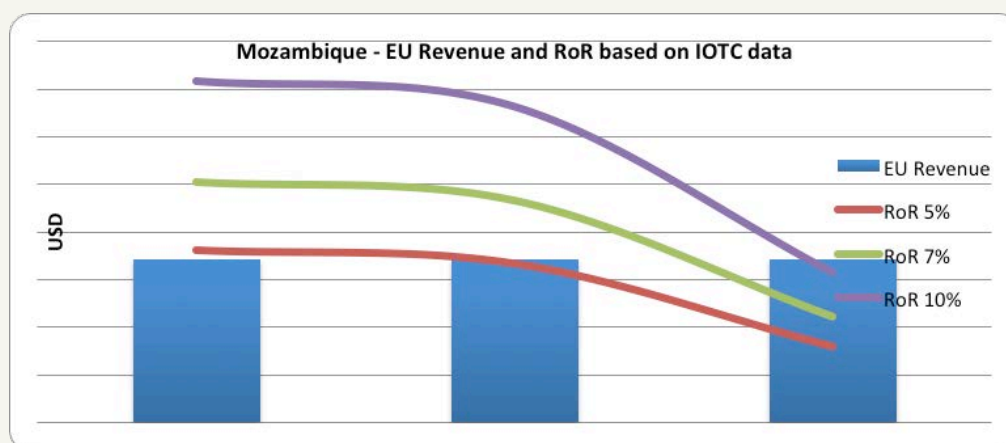
For 2007, the Comoros RoR was just above 5%. For 2008, it was just under 6%. For 2009, it was above 10%, at approximately 12%. Appendix 6 shows the full calculations for this assessment.



Comoros	2007	2008	2009
EU Payments	1,247,821	1,247,821	1,247,821
IOTC reference RoR 5%	1,279,364	1,020,393	510,163
IOTC reference RoR 7%	1,791,110	1,428,551	714,229
IOTC reference RoR 10%	2,558,729	2,040,787	1,020,327

11.3. Mozambique - EU payments benchmarked against reference ROR from IOTC EEZ Catch Data

For both 2007 and 2008, the RoR was just around 5%. For 2009, it was approximately 10%. The IOTC catch volume figures were however much lower for 2009. Appendix 7 shows the full calculations for this assessment.



Mozambique	2007	2008	2009
EU Payments	1,714,733	1,714,733	1,714,733
IOTC reference RoR 5%	1,796,937	1,660,216	788,765
IOTC reference RoR 7%	2,515,712	2,324,303	1,104,270
IOTC reference RoR 10%	3,593,874	3,320,432	1,577,529

12. VESSEL OPERATING COSTS AND INTERACTION WITH MARKET PRICES - THE MISSING ELEMENT

Reliable data on vessel operating costs and their relationship with market prices is difficult to come by. In understanding these difficulties the following comments made by Lent, Rogers and Gelz, in the mid 1990s need to be borne in mind. They wrote:¹³

The production of tuna at the ex-vessel level is a function of fishing costs per quantity of tuna landed. Short-run fishing costs are influenced by resource availability, and the costs

¹³ Rebecca Lent, Christopher Rogers and Karyl Brewster-Geisz, Tuna fishing processing and trade role of the Indian Ocean in Patrice Cayré et Jean-Yves Le Gall, (1998) Le Thon Enjeux et strategies pour l'océan Indien/Tuna Prospects and Strategies for the Indian Ocean, 273-286

of labour, fuel, bait, ice, and tackle. In the long run, fixed costs also influence the level of production: vessel, fishing gear, insurance, and association fees. The ex-vessel supply of tuna is thus influenced by a complex relation between biological and technological factors, and is influenced by relative input prices. Because of the difference in relative labour and capital costs and or availability, what is profitable for one country - or one fishing operation - may not be so for another. In addition, variations in crew remuneration techniques may also affect the supply function for tuna. Cost functions for processing firms are also defined by cost and technological relationships between output and the level of inputs.

They also correctly observe that:

Prices are also affected by vertical integration; a primary feature of ex-vessel seafood markets, stemming from the desire of processors to have adequate supply for high entry-cost processing (e.g. canning). Contractual arrangements between fishing vessel operators and processors also affect the functioning of ex-vessel markets for tunas and tuna-like species. Arrangements can be backward or forward integration, trading products and/or services, along with buyer-seller loyalty.

In the time available and with the resources available to the researchers, it was not possible to comprehensively investigate this dimension of the economic aspects of the Indian Ocean tuna industry. The attempts made to assess operating costs were thus limited. The principal investigations with respect to both the longline and purse seine sector are set out immediately below:

1. Longliners: A recent FAO report (2010) estimates that the operating costs for a Japanese longliner would be approximately US\$ 2.52 million per trip or US\$31,500 per fishing day (assuming 80 days at sea). On top of that there are the costs of the supply vessels which tranship at sea and which provide bait. The FAO estimates suggest that the profit margins for vessel owners are near operating costs, however the value added in Asia will be considerably more and there is no indication of the subsidy element in fuel, crew and other costs. In order of importance the most significant operating costs for Japanese distant water longliners are crew, fuel, bait and vessel maintenance.

2. Purse seiners: With respect to European purse seiners, a sample of French purse seiners showed that the most significant costs were fuel, vessel, crew and port in 2007. Average costs per trip were estimated at US\$ 303,000 per trip which for a trip of 10 days equals US\$30,000 per day. Daily costs will be higher than this as they do not include items such as crew travel and accommodation, FAD costs, depreciation and vessel maintenance costs. Again any subsidy element is not included in these costs. The same report shows that although net revenue has dropped it still covers vessel operating costs.

It should be emphasised that these vessel-operating costs are for 2006 and 2007, do not include all costs, subsidies and other incentives and are for a limited sample of Japanese longliners and French purse seiners. Operating costs will vary by year according to fuels prices, piracy and tuna movements. In dollar terms they will also vary with changing exchange rates between the US\$, Euro and Japanese Yen. Using an approximation of FAO data for 2007, operating costs are estimated at USD 7,200 per day while Seychelles data for Japanese

¹⁴ FAO (2010) Recent developments in the tuna industry. Stocks, fisheries, management, processing, trade and markets.

¹⁵ EU vessels including French purse seiners land a large proportion of their catch in the WIO in Seychelles which is a major transshipment hub.

vessels gives a catch per day of 1.3 tonnes. The valuation of the catch will depend on species composition but assuming an average catch value of USD 8,000 per tonne, this shows a small margin on gross revenue. Again it is emphasised that these figures are approximate.

13. MONETARY VALUATION AND RATE OF RETURN - COMOROS

13.1. General overview

The Comoros archipelago has a nominal EEZ of approximately 160,000 km². It consists of three main islands, which form the Federal Islamic Republic of Comoros (FIRC), and the island of Mayotte which is French territory although claimed by the FIRC. The economic benefits of tuna resources to Comoros are very limited. They consist of access and licence revenues from the EU. There are no landings by EU or other tuna fishing vessels given that there are no port facilities available for fishing vessels. The majority of local production is by artisanal fishers using outrigger canoes and tuna is sold on local markets.

The Union of Comoros signed a fishing partnership agreement (FPA) with the EU which covers the period 2005 – 2010 for tuna purse seiners and surface longliners. The former FPA includes the following provisions:

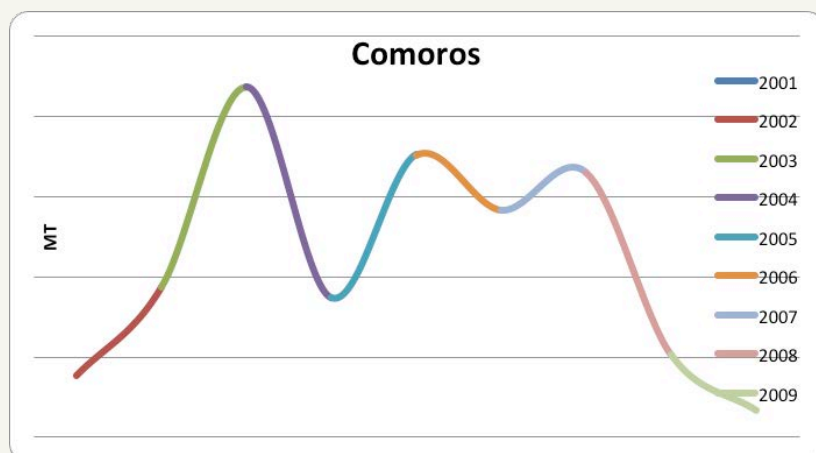
- Access for 40 purse seiners and 17 surface longliners.
- Financial compensation of up to €390,000 per year with the total compensation of €2.34 million. This can increase to a maximum of €780,000 per year if the ceiling tonnage of declared catches of tuna exceeds 6,000 tonnes per year.
- Per tonnage payments of €35 for tuna up to 6,000 tonnes per year. The per-tonnage payment above 6,000 tonnes of declared tuna catches increases to €100 per tonne.
- An advance must be paid of €3,375 per purse seiner and €2,065 per longliner.

13.2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

Results from the analysis are set out immediately below.

There are no exports currently from the Comoros and it is likely that any landing by EU purse seiners will be in other ports such as Antsiranana, Mombasa, and Port Louis, Seychelles. Asian long liners do not land tuna catches in the Comoros and rarely land in other IOC member state ports. They tend to tranship at sea or occasionally in ports such as Port Louis in Mauritius. Market opportunities for tuna and TLS catches in Comorian waters are limited. There are no landings or fish processing apart from on an artisanal scale. There are limited shipping links with the main markets for tuna and TLS and airfreight costs are high and connections are limited. Comoros imports some fish supplies from Madagascar (salted, dried and smoked fish) and canned sardines from Morocco.

Figure 13.1 - Nominal Tuna Catches in the Comoros EEZ



Source: Based on IOTC estimates

13.2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

The results of the analysis for Comoros are set out immediately below”

Table 13.1: Comoros Nominal Catch Values & Rate of Return estimates (USD)

COMOROS	2007	2008	2009
Longliners	16,504,150	5,131,233	1,653,031
Purse seiners	9,083,136	15,276,636	8,550,237

Table 13.2. Rate of Return Estimates

Percentage	2007	2008	2009
5%	1,279,364	1,020,393	510,163
7%	1,791,110	1,428,551	714,229
10%	2,558,729	2,040,787	1,020,327

14. MONETARY VALUATION ONLY – FRANCE AND FRENCH TERRITORIES

Within the WIO region Réunion is a French department and a base for semi-industrial longliners and shipments of Patagonian tooth fish. Mayotte is part of the Comoros archipelago and in common with other French territories in the Mozambique Channel is claimed by other WIO states. Table 12.1 gives estimates of the value of catches in this sub region.

Table 14.1 - Réunion and French territories - Nominal Catch Values (USD)

FRANCE + FRENCH TERRITORIES	2007	2008	2009
Longliners	30,656,816	19,626,200	7,112,177
Purse seiners	15,702,988	25,851,071	23,918,164

Source: IOTC data and team estimates

15. MONETARY VALUATION AND RATE OF RETURN – KENYA

15.1. General overview

Kenya has no domestically based or flagged industrial tuna fishing fleet of any size and relies on tuna landings by foreign fishing vessels which are in some cases licensed to fish in the Kenyan EEZ. In addition there are some landings by European purse seiners and by reefers. Kenya does not have a FPA with the EU. There are some landings of tuna by the Kenyan artisanal fishing fleet. The main economic benefit to Kenya from tuna resources is the production of tuna loins for export by a number of producers and traders in tuna and tuna products including Wananchi Marine Products, the main producer, Sea Harvest Marketing, Shimko and Trans Africa Fisheries. Tuna loin exports vary according to the availability of raw materials, but were around 15,000 tonnes in 2008. In addition Kenya has licensed a number of European and Asian vessels for purse seine and longline fishing, which mainly target tuna and similar species. In addition the main fishing base and port on the Kenyan coast, Mombasa also plays a limited role as a transshipment port for European and Asian fishing vessels which contributes some revenue to the fishing sector through transshipment fees, port dues and expenditure of fuel and other inputs. Nominal tuna catches for the Kenyan EEZ are shown in Figure 15.1. This demonstrates that tuna catches in the Kenyan EEZ are relatively low when compared for the main tuna belt countries (Madagascar and Seychelles). One of the problems for Kenya is its proximity to the zone in which Somali pirates operate.

15.1. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

The results for Kenya are immediately below.

Table 15.1 - Kenya - Nominal Catch Values (USD)

KENYA	2007	2008	2009
Longliners	22,808,886	8,610,984	8,155,120
Purse seiners	2,274,340	1,730,346	1,162,625

Source: IOTC data and team estimates

Figure 15.1 - Nominal Catches in the Kenyan EEZ

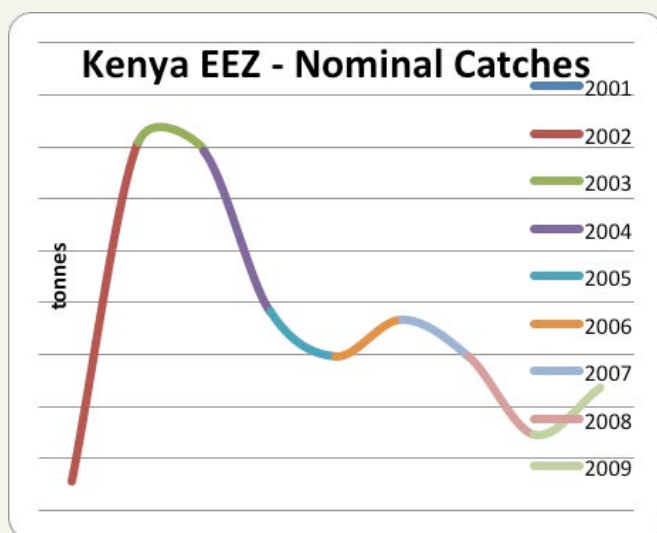


Table 15.2. Rate of return estimates

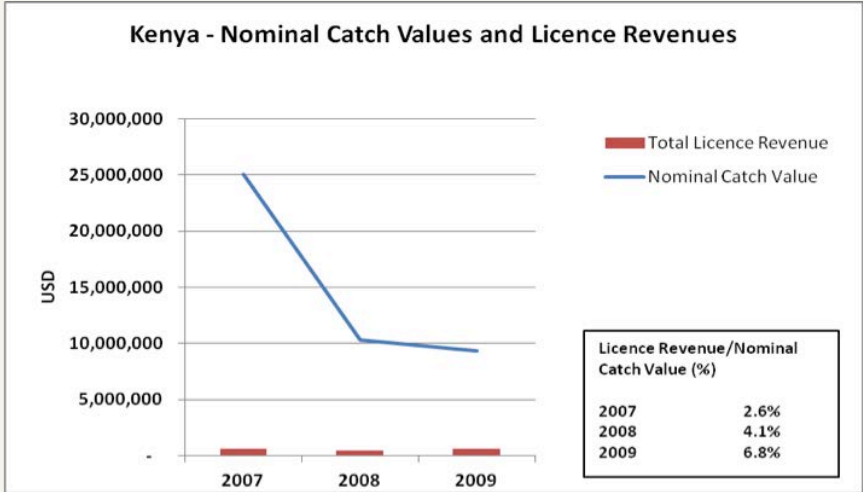
Percentage	2007	2008	2009
5%	1,254,161	517,067	465,887
7%	1,755,826	723,893	652,242
10%	2,508,323	1,034,133	931,775

15.2. Rate of return estimates - actual access fee data against IOTC whole of EEZ estimates

We compared actual access fee data released by the Kenyan government with the Kenyan catch values derived from the IOTC estimates. We arrived at RoR estimates of 2.6% for 2007; 4.1% for 2008 and 6.8 % for 2009.

	Nominal Catch Value	Total Licence Revenue	Licence Revenue as % of Nominal Catch Value
2007	25,083,226	655,107	2.6
2008	10,341,330	419,059	4.1
2009	9,317,745	630,000	6.8

Figure 15.2. Kenya – nominal catch value and licence revenues



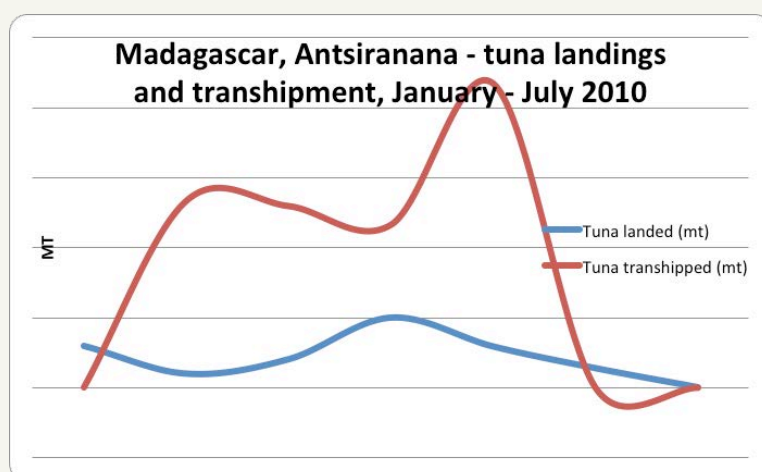
16. MONETARY VALUATION AND RATE OF RETURN - MADAGASCAR

16.1. General overview

This section of the report provides a summary of the economic benefits of tuna resources to Madagascar. A more detailed analysis is contained in the individual case study. Madagascar as with other countries in the region (with the exception of Seychelles and South Africa) has not developed its own domestically based tuna fishing fleet. The EEZ's importance lies in the fact that the Mozambique Channel is at certain times of the year an important fishing ground

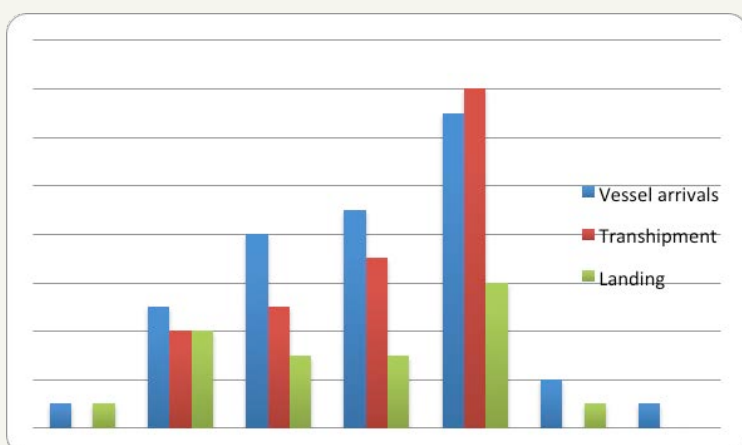
for EU purse seiners and Asian longliners. As a percentage of GDP, tuna fisheries make little contribution to GDP. The northern port of Antsiranana (Diego Suarez) is however the centre of tuna related activities in Madagascar. The port has vessel repair activities principally for Spanish purse seiners, which are operated by SECREN. In addition the port is used for transshipment of reefers delivering tuna to Seychelles and landing some tuna to the canning factory operated by PFOI near the port. Apart from port unloading and transshipment activities and the SECREN dry dock facilities, there are other supply chain linkages with tuna vessels including food and provisions, bunkering and agency and support services. Sub-standard tuna is given to the local markets for sale. A more detailed profile of Madagascar is contained in the individual case study.

The results from our analysis of the IOTC data set are as below:



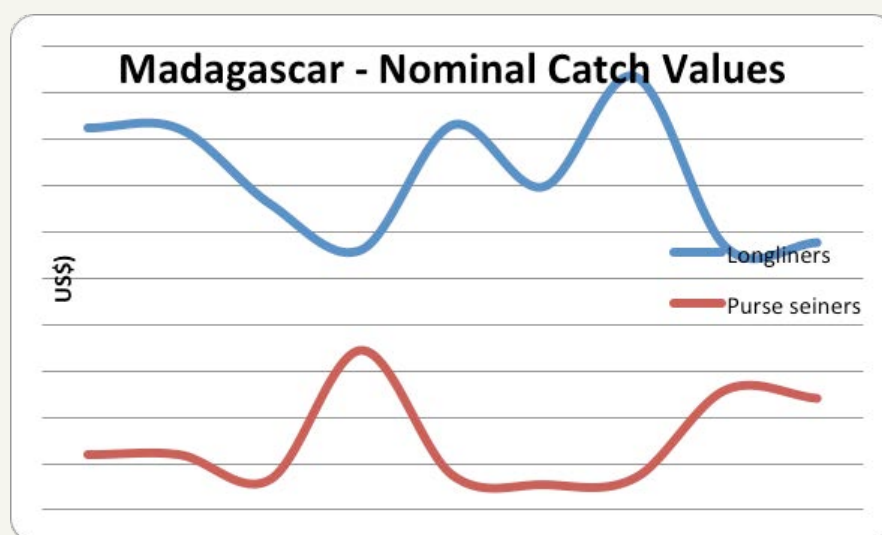
Source: Ministère de la Pêche et des Ressources Halieutiques. Antananarivo (2011)

Figure 16.2: Tuna Vessel Operations at Antsiranana, Madagascar 2010



Source: Ministère de la Pêche et des Ressources Halieutiques. Antananarivo (2011)

Figure 16.3: Madagascar – Nominal Catch Values 2001 – 2009 (USD)



Source: IOTC (2011) and study team estimates

16.2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

The results for Madagascar from analysis of the IOTC data are set out immediately below.

Table 16.1 - Madagascar - Nominal Catch Values & Rate of Return Estimates (USD)

MADAGASCAR	2007	2008	2009
Longliners	46,761,330	28,328,939	28,824,553
Purse seiners	7,995,625	17,392,979	15,687,648

Source: IOTC data and team estimates

Table 16. 2. Rate of return estimates based on IOTC data

Percentage	2007	2008	2009
5%	2,737,848	2,286,096	2,225,610
7%	3,832,987	3,200,534	3,115,854
10%	5,475,695	4,572,192	4,451,220

16.3. Rates of return from actual access fees against IOTC Whole of EEZ Estimates - Madagascar

Madagascar released figures on actual access fee payments to WWF in 2012. These figures are compared to the IOTC data monetary valuations to show the relevant RoR as follows:

2007: 10.1%

2008: 19.0%

2009: 16.2%

Clearly, the RoR are much higher than the benchmark 5,7 and 10% used as reference points in the earlier step of our analysis.

Fees actually paid to Madagascar 2007-2011 and rates of return for 2007-2009

	2007	2008	2009	2010	2011
RECEIPTS (ARIARY)					
EU	4,462,555,739	5,176,847,474	4,136,844,860	4,820,234,551	3,764,305,290
NON-EU	1,713,448,496	1,075,720,592	1,920,567,504	1,826,439,226	1,103,314,150
TOTAL	6,176,004,235	6,252,568,066	6,057,412,364	6,646,673,777	4,867,619,440
Ariary/USD	0.0005	0.0006	0.0005	0.0005	0.0005
RECEIPTS (USD)					
EU	2,231,278	3,106,108	2,068,422	2,410,117	1,882,153
NON-EU	856,724	645,432	960,284	913,220	551,657
EU FPA	1,639,890	1,639,890	1,639,890	1,639,890	1,639,890
Total	4,727,892	5,391,431	4,668,596	4,963,227	4,073,700
IOTC EEZ Nominal catch value	46,761,330	28,328,939	28,824,553		
Access payments against IOTC Catch value (%)	10.1	19.0	16.2		

17. MONETARY VALUATION AND RATE OF RETURN - MAURITIUS

17.1. General overview

Mauritius is considered in more depth in a detailed case study. Its importance is as a supply base for Asian longliners providing bunkering and other port facilities. It is also a major transshipment hub with extensive cold storage including low temperature storage for sashimi grade tuna. A number of Asian shipping agents are based in Port Louis, Mauritius and are an important linkage in the supply chain from tuna landings from longliners to the main Asian markets. A few EU, mainly French purse seiners use the port for repairs and dry-docking. Mauritius has an important linkage with the tuna fisheries in Seychelles. Mauritius is not situated in the main tuna belt and therefore its tuna processing industries, which are an important part of the Seafood Hub rely mainly on tuna transported from Seychelles by reefer. The tuna supply chain is well developed in Mauritius with good port and storage facilities for tuna and a number of companies engaged in the production of tuna products. These include Princes Tuna Mauritius, which has a large canning operation in Riche Terre in which Mitsubishi is the main shareholder with some equity held by the Mauritius Government, Thon des Mascareignes, Mer des Mascareignes and the IBL group.

17.2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

The results from the analysis of the IOTC data are set out immediately below.

Table 17.1 - Mauritius - Nominal Catch Values and Rate of Return Estimates (USD)

MAURITIUS	2007	2008	2009
Longliners	49,022,933	26,355,585	28,329,050
Purse seiners	3,883,052	986,425	1,844,802

Table 17.2. Rate of return estimates

Percentage			
5%	2,645,299	1,367,101	1,508,693
7%	3,703,419	1,913,941	2,112,170
10%	5,290,599	2,734,201	3,017,385

Source: IOTC data and team estimates

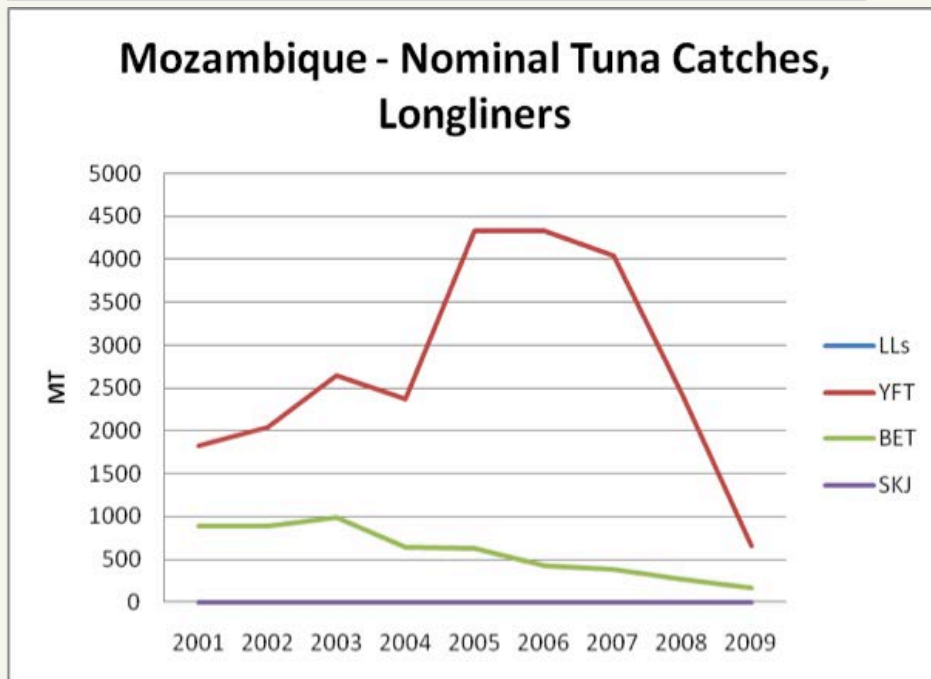
18. MONETARY VALUATION AND RATE OF RETURN - MOZAMBIQUE¹⁶

18.1. General overview

The Mozambique Channel is important for distant water fishing vessels as part of the zone of migratory species movement on a seasonal basis. European purse seiners, including French, Seychelles and Spanish flagged vessels, operate in the channel over the period March to June, while longliners operate mainly from January to December with a peak fishing period from December to February. Longliners include Chinese/Taiwanese, Japanese and Korean and Spanish flagged vessels. In addition there are some vessels operating on open registry including flags from Belize, Cambodia, Honduras and Panama. There are no significant landings of tuna in Mozambique and therefore the main revenue derived from tuna resources is from licence fees. There are also no tuna processing plants in Mozambique. In 2010 34 licences were issued for purse seiners (France, Italy, Seychelles and Spain) and 37 licences for longliners (China, Japan, Korea, Namibia, Portugal, Spain and the United Kingdom). There has been a decline in the number of licences issued over the period 2005 – 2010. Mozambique has a fishing agreement with the EU with 44 purse seiners and 45 longliners authorised to fish in the EEZ of Mozambique. The total number of vessels operating in Mozambican waters was 71 in 2010 with a declared catch of 3,811 tonnes, which represent a major decline from a peak of 17,470 tonnes in 2004. In 2009 and 2010, the main species caught in order of catch weight were skipjack, yellowfin, bigeye and albacore. While the purse seiner fleet operates mainly in the northern part of the Mozambique Channel the longliners operate mainly in the southern part of the Channel. There are also operations by small Comorian vessels in Mozambican waters. While tuna fishing is important to the economy, the main revenues are from the fishing and export of prawns. There have been reports of IUU fishing by EU purse seiners in Mozambican waters. Data from Patria et al (2011) in their report to the IOTC give a more precise indication of tuna catches and the number of licences issued by vessel type. These are indicated in Figure 16.2 on a logarithmic scale. While the catch estimates differ moderately from the IOTC estimates shown above, they do illustrate the peaking of catches in 2003/2004 and the steady decline in catches since that date. This may be due to the conditions of the marine environment as well as fishing effort. In the Mozambique Channel movements of vessels into the EEZ also depend on tuna movements as in other parts of the Western Indian Ocean region.

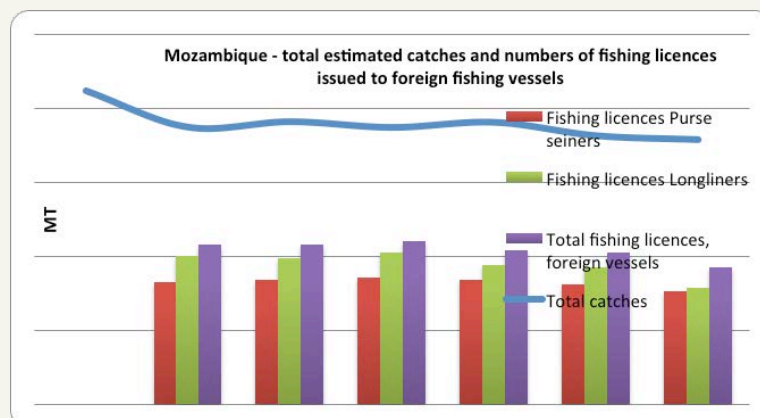
¹⁶ The section on Mozambique is based on Patria, E, Castiano, M, Malan, P and Giroux, F (2011). Mozambique report to the Secretariat of the Indian Ocean Tuna Commission (IOTC) for attaining the status of a Co-operating non Contracting Party.

Figure 18 1 - Mozambique, Nominal Catches of tuna by longliners 2001 - 2009



Source: IOTC estimates (2011)

Figure 18.2 - Mozambique – Nominal catches and foreign fishing licences issued

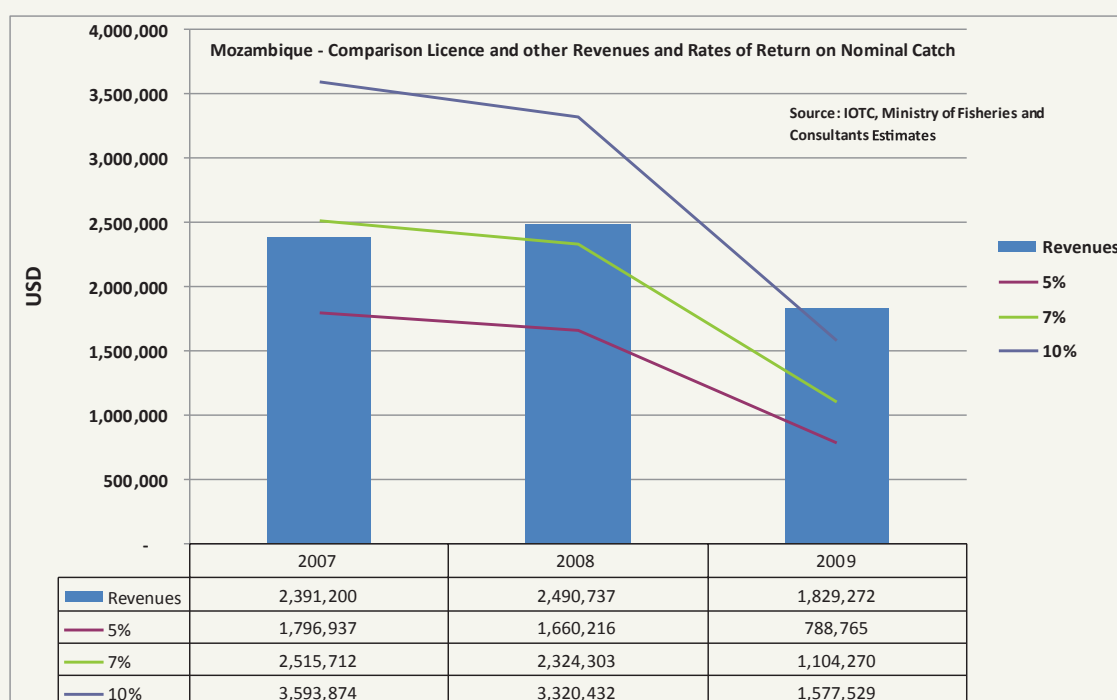


Source: Patria et al (2011)

18.2. Rates of return from actual access fees against IOTC Whole of EEZ Estimates – Madagascar.

The results of our analysis showed the following rates of return: 2007: 4.9%; 2008: 5.5 % and 2009: 17.4%

Figure 18.3. Rate of return analysis for both EU and private licences

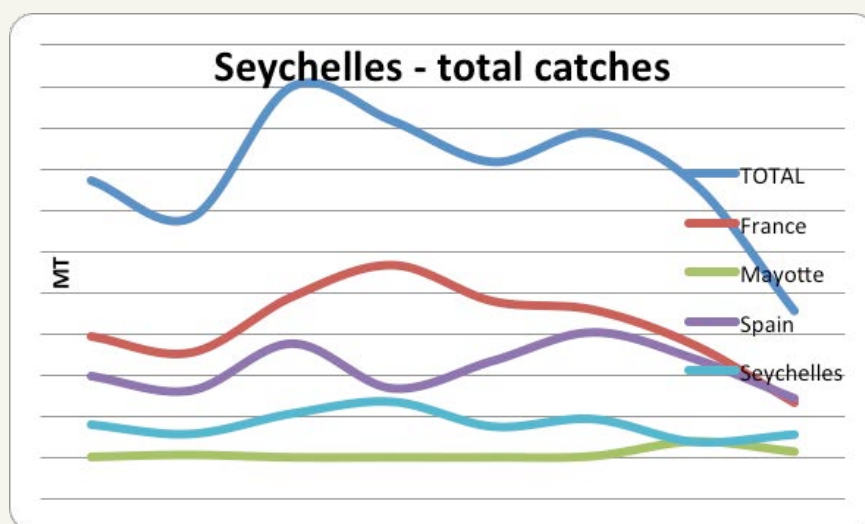


19. MONETARY VALUATION AND RATE OF RETURN - SEYCHELLES

The fisheries sector provides important sources of foreign exchange to the Seychelles economy. However what are most significant to the country are the net foreign exchange benefits. DWF fishing vessels generate foreign exchange through the payment of licence fees, fishing agreement payments (the EU FPA), expenditure on port dues, bunkering, food and other supplies, processed tuna and other fish exports, air transport with Air Seychelles for crew changes on EU purse seiners and other sources of foreign exchange revenue. However, while the EU purse seiner fleet makes a contribution through EU access agreement payments and other targeted payments and vessel expenditure in Victoria, the Asian longliner fleet only makes contributions through the payment of licences as no longliners currently land fish in Seychelles,

although there been occasional visits by longliners. SFA data gives a picture of total EEZ catches for the period 2001 – 2008, although the figures for 2008 are incomplete. The country activities will be discussed in more depth in a separate case study. Seychelles is the main base for EU tuna purse seiners, mainly French and Spanish in the WIO. Seychelles has a well-developed supply chain for tuna resources.

Figure 19. 1 - Seychelles, nominal total tuna catches from logbooks



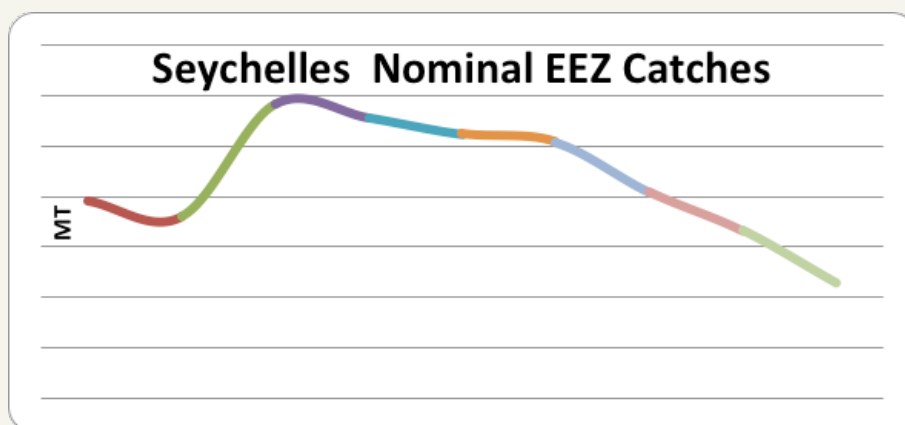
Source: SFA (2009)

The main activity is the MW Brands tuna canning factory and associated supply chain impacts including direct and indirect employment (some of which is expatriate), can production, water and energy supply. The factory has its own cold storage and quayside facilities. MW Brands has well developed marketing chains in France, Italy and the UK and exports to other countries. There are in addition two factories which are supplied with tuna and demersal fish from the Seychelles semi-industrial fleet. Apart from the tuna canning factory, the other components of the tuna supply chain in Seychelles include vessel repairs, shipping agent and chandlery services, vessel food supplies, transport, air travel (for crew changes) bunkering and the contribution which port revenues make to the national economy. It is estimated that the overall contribution of the tuna sector to the economy is over 12 per cent and is therefore vital to an economy whose main foreign exchange earning activities are tourism. It may also be argued that tuna processing is subject to less variation in income generating activities than tourism. Figure 9.5 shows nominal tuna catches in the Seychelles EEZ based on IOTC estimates.

19.2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

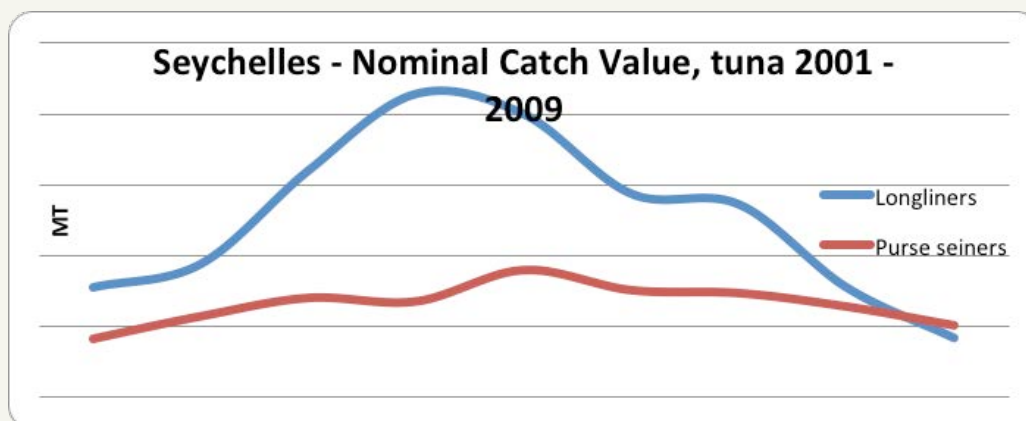
The results of our analysis of the Seychelles segment of the IOTC database are set out below:

Figure: 19.2 - Nominal Tuna Catches in the Seychelles EEZ



Source: IOTC

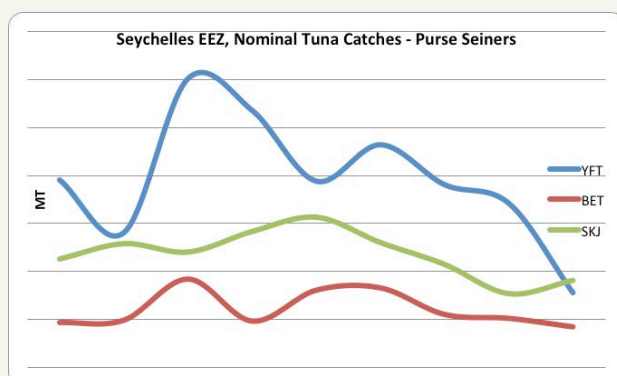
Figure 19.3 - Seychelles – Nominal Catch Value, tuna 2001 - 2009



Source: IOTC estimates (2011)

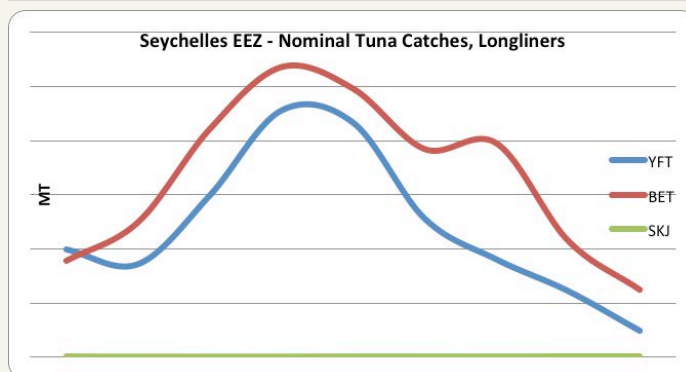
¹⁷ This depends in part on the impact of piracy within and adjacent to the Seychelles EEZ.

Figure 19.4 - Seychelles EEZ – Nominal Tuna Catches, purse seiners



Source: IOTC estimates (2011)

Figure 19.5 - Seychelles Nominal Tuna Catches



Source: IOTC estimates (2011)

19. 3. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

In terms of overall monetary values and rates of return, the key items of information are set out below. It can be seen that Seychelles derives million of dollars from tuna with a certain degree of fluctuation. There appears to be a downward trend from 2007. The higher values associated with longline catch is because of the much higher market value of the longline caught tuna used in sashimi.

Table 19.1 - Seychelles - Nominal Catch Values Rate of Return Estimates (USD)

SEYCHELLES	2007	2008	2009
Longliners	136,094,817	77,541,971	41,819,733
Purse seiners	61,512,448	53,104,319	43,032,000

Source: IOTC data and team estimates

Table 19.2. Seychelles - Rate of Return Estimates

Percentage	2007	2008	2009
5%	9,880,363	6,532,315	4,242,587
7%	13,832,509	9,145,240	5,939,621
10%	19,760,727	13,064,629	8,485,173

19.4. Comparing rates of return from actual access fees against declared catch – Seychelles.

For the Seychelles the consultant used a slightly different methodology. Here, instead of comparing the actual access fees against the IOTC nominal estimate the consultants had access to and used the reasonably accurate databases of the Seychelles Fisheries Authority. This database has declared catch information that is regarded as reasonably accurate. The period covered was from 2003 to 2008. The approach is quite detailed and shows rates of return across the three sub-sectors of the Seychelles system: purse seine fleets fishing under EU agreements; Seychelles flagged purse seine and the East Asian longline fleet. Table 19.3 sets out the rates of return over the period in detail.

Table 19.3. Actual payments to GoS gross reported catch value by purse seine and long line in Seychelles EEZ (all in US dollars)

	Year	Total declared catch value	Actual total payments to Seychelles*	Actual ROR
EU FPA	2003	77,524,808	5,500,281	7.1%
	2004	87,545,915	5,517,195	6.3%
	2005	71,243,717	5,212,407	7.3%
	2006	90,113,313	6,650,438	7.4%
	2007	90,419,120	5,276,100*	5.8%
Seychelles flagged purse seine	2008	54,524,959	5,206,920*	9.5%
	2003	9,302,276	449,985	4.8%
	2004	15,178,012	577,500	3.8%
	2005	7,451,606	600,000	8.1%
	2006	11,354,886	855,000	7.5%
East Asian long line	2007	13,241,953	720,000	5.4%
	2008	8,352,031	660,000	7.9%
	2003	47,172,734	2,871,381	6.1%
	2004	77,360,210	2,789,750	3.5%
	2005	96,795,439	3,365,610	3.5%
	2006	47,977,984	2,240,006	4.8%

20. MONETARY VALUATION AND RATE OF RETURN - TANZANIA

20.1. General overview

Marine fisheries are a relatively small sector of the Tanzanian economy and within the fishery as the inland fisheries of Lake Victoria are more important economically than marine fisheries. Marine fisheries are largely based on artisanal fishing fleets in Tanzania. An Act of Parliament established a Deep Sea Fishing Authority (DSFA) in Tanzania in 2008. Tanzania signed a one-year deep sea fishing agreement with the Japan Tuna Co-operative Association and Deep Sea Fishing Authority of Tanzania. According to the agreement, the Japanese association will deploy 30 tuna trawlers in the first year and pay a total of \$200 million in fees to the Tanzania government. Tanzania is yet to ratify an agreement with the EU which will include tuna. One issue is the division of revenue from such an agreement between mainland Tanzania and Zanzibar.

20. 2. Nominal Catch Values (USD) and Rates of return based on IOTC Whole of EEZ Estimates

The results of our study are below:

Table 20.1. - Tanzania - Nominal Catch Values & Rate of Return Estimates (USD)

TANZANIA	2007	2008	2009
Longliners	22,794,694	17,418,208	1,719,173
Purse seiners	8,158,457	4,750,182	2,408,646

Source: IOTC data and team estimates

Table 20.2. Rate of Return Estimates

Percentage	2007	2008	2009
5%	1,547,658	1,108,419	206,391
7%	2,166,721	1,551,787	288,947
10%	3,095,315	2,216,839	412,782

Source: IOTC data and team estimates

20.2. Tanzania - rates of return estimates - actual access fee data against IOTC whole of EEZ estimates

Our analysis shows that in 2007, the RoR was 3.09% whilst in 2008 it was 2.43% as shown by the table below.

Table 20.3. – Actual access fee rates of return against IOTC whole of EEZ estimates

	2007	2008	2009
Longliners	22,794,694	17,418,208	1,719,173
Purse seiners	8,158,457	4,750,182	2,408,646
Total nominal catch value (USD)	30,953,151	22,168,390	4,127,820
License fees as a % of nominal catch value	3.09	2.43	No license data

21. MONETARY VALUATION ONLY - SOUTH AFRICA

21.1. General overview

South Africa is the southernmost country in the western IOTC with an EEZ covering both the Indian and Atlantic Oceans. Its fleet of longliners and pole and line vessels catches mainly yellowfin, bigeye and albacore tuna. South Africa is a co-operating non-member of the IOTC. In this summary we consider the tuna fisheries in the Indian Ocean EEZ. There were formerly Asian longliners operating in this EEZ. Tuna processing occurs in Durban and Port Elizabeth. The apartheid period has meant that no relationship has developed between the markets and industries of South Africa and the fleets taking fish in the region. There is on the face of it scope for considerable benefit for WIO countries if a linkage to the South African economy was developed.

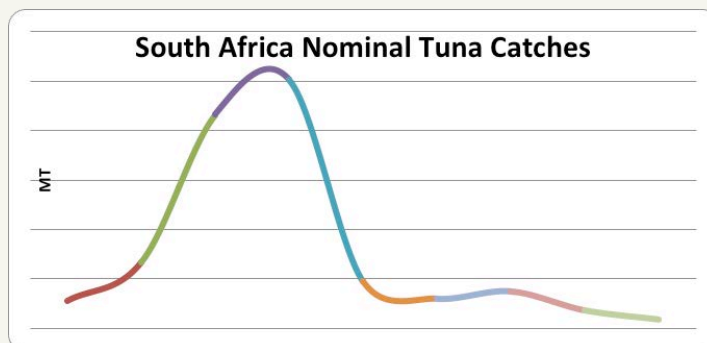
21.2. Nominal Catch Values (USD) based on IOTC Whole of EEZ estimates

Table 21.1 - South Africa - Nominal Catch Values (USD)

SOUTH AFRICA	2007	2008	2009
Longliners	11,192,443	10,407,619	2,590,301
Purse seiners	-	-	-

Source: IOTC data and team estimates

Figure 21.1 - South Africa Nominal Tuna Catches



22. APPLYING THE VESSEL DAY APPROACH - AN ALTERNATIVE VALUATION APPROACH

22. 1. Vessel day schemes – the general concept

Vessel day schemes sell vessels days to vessel owners on the basis that fishing effort is more precisely related to days actually used to undertake all activities related to fishing. A cap is also applied to the system. A vessel day does not take all factors related to fishing fully into account. Thus for example, it does not fully address the opportunity cost associated with the fishing activity. Even so, a vessel day captures a significant element of the costs and profits associated with the fishing activity and it is thus a useful proxy for the overall production process and contains within it all the factors related to costs, normal rents and above normal rents. Focusing on the vessel day as the unit, which provides a key to profitability in the fishery, therefore appears justified. Where the number of vessel days is fixed or capped, it is expected that vessel owners will compete for the available days thereby driving prices upwards. The fleet or vessel, which most values the vessel day, will pay the highest price.

The current Pacific VDS is essentially a version of this approach with rights in use under access agreements currently calculable in terms of vessel days. VDS can be offered in incentive packages linked to onshore investment. With respect to the Western Indian Ocean there may be problems with adopting the VDS approach, notably the fact that a large proportion of tuna fishing is carried out on the high seas rather than EEZs in contrast to the Pacific.

22.2. The Pacific variant of the VDS¹⁸

The main features of the Pacific VDS are:

- Setting by the relevant Pacific countries of a sub-regional total allowable number of purse seine days that can be fished by purse seine vessels operating in the EEZs of their countries thereby controlling the amount of EEZ fishing effort
- The total allowable effort (TAE) is set each year by the parties at a special meeting convened for that purpose
- The scheme is run on a three year rolling basis: at each anniversary of the commencement of the scheme a TAE is set for the new three year period
- Sub-regionally coordinated national vessel day limits for each of the parties – the so-called Party Allowable Effort
- The TAE is set and apportioned between members for one-year periods up to three years in advance

- Parties have flexibility to carry over unused fishing days to future years, to borrow fishing days from future years, and to transfer fishing days between themselves on whatever terms they mutually agree
- No restrictions on the choice by parties of which vessels to licence on a bilateral basis, or with respect to vessel numbers
- National fishing days are supposed to be tradable with other Parties on a periodic basis although this aspect is not yet fully operational
- Balances are rolled into the new three-year period and Parties can utilise those balances as they see fit.
- All purse seine vessels (domestic, locally based and foreign which wish to undertake fishing activities in PNA waters (including EEZs, archipelagic waters, and territorial waters) must register and must pay a VDS registration fee (US\$2,400 for 3 yrs per vessel)
- The registration period is 1 Sept – 31 August for 3 years
- All vessels must be in good standing on the FFA Vessel Register
- Vessels must have an FFA approved Automatic Location Communicator (ALC) which transmits at least every 4 hours
- The ALC must operate at all times when the vessel is in the VDS Management Area
- Manual reporting must be undertaken by a vessel at 4 hour intervals if ALC fails
- The Administrator is to notify the vessel of any ALC transmission failure within 12 hours after the transmission was due
- Where a vessel is unable to comply with the manual reporting, it is required to stow fishing gear and head for the nearest designated port or other port as directed by the Administrator

The approach to calculation of the vessel day price used in the Pacific¹⁹

This study applied the vessel day calculation methodology used in the Pacific in 2005-2007 so it is useful to detail that approach here. Appendix 5 on vessel day valuations of returns to selected Pacific Island States with estimated rates of return sets out the country by country results for the Pacific that were arrived at by analysts employed by FFA to undertake the relevant policy work.

The method is quite simple. It involves establishing

- How many vessel days were spent by a fleet in a specific country EEZ
- Multiplying that quantum by an agreed price.

A key step was deciding the price to be applied to the different species that were likely to be caught. After much debate and modelling, FFA decided to focus only on ex-vessel prices for two species – skipjack and yellowfin. To simplify the scheme, bigeye was assumed to attract the same price as yellowfin. For the Japanese fleet price FFA decided to use the Yaizu ex-vessel prices for purse seine catch unloaded at that key port. For the Korean and Taiwan fleets the prices used were Thai import prices (c&f) since the main unloading ports are in Thailand.

Table 22. 1. Shows the results of the efforts to estimate a price series working backwards from 2005-1997.

¹⁸ FFA Rules and Aims of VDS <http://www.ffa.int/node/55>

¹⁹ Private communication to consultants by relevant consultants employed by FFA and PNA.

Table 22. 1 Prices used to estimate gross value of catch per day by fleet (USD)

	Taiwan		Japan	
	Skipjack	Yellowfin	Skipjack	Yellowfin
1997	1,130	1,130	1,454	1,454
1998	993	993	1,408	1,408
1999	652	652	935	935
2000	536	536	863	863
2001	788	788	960	960
2002	751	751	1,074	1,074
2003	700	700	1,093	1,093
2004	889	889	1,080	1,080
2005	873	873	1,278	1,278

The third step was to match the vessel day data (a form of CPUE data) to prices bearing in mind the need to establish profiles for each Pacific country's national waters. Estimates used came from the records of the South Pacific Fisheries Commission and were based on activity as recorded at the 1° x 1° level on the map grid. This is the map grid used in the IOTC as well for the purse seine fleets. Current Pacific work trialling a VDS for longline is also converting hooks to vessel day equivalents, a method used by this study as well immediately below.

22.3 Applying priced vessel day calculations to value the EU purse-seine fisheries in the WIO

The exercise here has been to calculate in an indicative way, the value per vessel day for 2003-2009 for yellowfin, bigeye and skipjack tuna caught by the EU purse seine fleet. The analysis used comprehensive data on the EU purse seine from two recent Spanish²⁰ and French²¹ fleet report setting out days steaming and fishing in detail. We only used the fishing days data, as this is an indicative exercise with respect to another approach that can be used for valuation purposes and also dividing returns between the Coastal State and the distant water fleet. More accurate work will need to be done to fully demonstrate the usefulness of this approach in the WIO context. A key consideration here is the fact that data from high sea activity will have to be much more robustly collected and analysed.

²⁰ Delgado de Molina, Alicia, Juan José Areso and Javier Ariz, 'Statistics of the Purse Seine Spanish Fleet in the Indian Ocean (1984-2009)' (Document No IOTC-2010-WPTT-19, Indian Ocean Tuna Commission, 2010). Spanish (see p. 5). We only used the actual fishing days in our calculations.

²¹ European Commission, 'Rapport de l'Union Européenne pour le Comité Scientifique de la CTOI de 2010 (Données 2009)' (Document No IOTC-2010-SC-Inf05, Indian Ocean Tuna Commission, 2010). French vessel days both steaming and fishing are set out in detail (see p. 14) we only used the actual fishing days in our calculations.

Table 22.2 Applying priced vessel day calculations to value the EU purse-seine fisheries in the WIO (USD).

CATCH VALUE/ FISHING DAYS	2003	2004	2005	2006	2007	2008	2009
French Purse Seiners	3,488	3,836	3,845	4,815	5,541	4,844	3,315
Spanish Purse Seiners	4,468	4,730	5,808	6,462	5,895	4,792	3,784
Total fishing days	7,956	8,566	9,653	11,277	11,436	9,636	7,099
Total Nominal Catch values (USD)	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109, 052, 092
Nominal catch value/ Fishing day (USD)	19,674.94	16,238.90	15,468.32	10,457.68	10,195.89	13,112.35	15, 361.61

22.4. Applying priced vessel day calculations to value the longline fisheries in the WIO

The indicative exercise undertaken here under this part of the investigation was slightly different as the analysis required conversion of the number of longline hooks per daily set into a vessel day equivalent in an effort to show the value of catch per vessel day for yellowfin, bigeye and skipjack tuna. Its focus is the longliners from Japan, Korea and Taiwan with some Spanish vessels reflagged with Seychelles flags. In this model, the impact of different sized sets (number of hooks per set) was used as a sensitivity test. It should be noted that these figures are very approximate. They are estimated from Seychelles data and include all longliners with licences excepting French and South African longliners.

The difference in catch rates per day is illustrated by tables 20.2 and 20.3, which give an estimate of the catch per day for Japanese and Taiwanese longliners. This data is based on logbooks. Consultation with experts familiar with the Indian Ocean suggests that an average catch per day of 1.15 tonnes for all longliners is a reasonable estimate. Assuming the catch ratio of 1.3:1 for bigeye to yellowfin and using an indicative landed price per tonnes of USD. **An approximate catch value per vessel day is therefore USD 14,000.²²** The data used is limited to EEZ data. There is thus no statement of vessel day results for the high seas.

²² It must be emphasised again that this is a very approximate value based in a variety of sources (IOTC, SFA and MRAG) (2011).

Table 22.3 - Estimated catches per day for longliners 2001 - 2009

ASSUMED CATCH PER DAY (MT)	2001	2002	2003	2004	2005	2006	2007	2008	2009
YFT	1.41	1.41	1.56	1.68	2.07	2.07	2.07	2.07	2.07
BET	1.83	1.83	2.03	2.18	2.69	2.69	2.69	2.69	2.69
Assumptions									
3000 hooks/set/day									
CPUE/3000 hooks 30% more for BET									
Than YFT									
ESTIMATED FISHING DAYS									
YFT	11,608	14,567	18,725	15,622	12,647	9,143	7,020	3,893	2,311
BET	4,882	8,006	8,677	8,443	5,936	4,941	4,823	2,571	1,842

Source: SFA and team estimates

Table 22.4 - A comparison of catch per set of 3000 hooks between Japanese and Taiwanese longliners

	2001 - 2007	2001 - 2007	2001 - 2007
	Overall	Japan	Taiwan
TOTAL NUMBER OF HOOKS	119,456,372	42,021,076	74,494,447
TOTAL SETS (3000 hooks)	39,819	14,007	24,831
TOTAL CATCH (tonnes)	42,787	17,162	27,138
CATCH PER SET (tonnes)	1.07	1.23	1.09

Source: SFA and team estimates

23. CONCLUSIONS

23. 1. Is it possible to provide a simple and easy freestanding total monetary amount for the value of WIO tuna at regional level?

The answer to this question is No. The data is not available and in any case the various sectors are highly diverse and no figures are available for the artisan sector.

23. 2. Estimating distribution of benefits between WIO countries and foreign fleets - the rate of return on leasing out EEZ resources.

Detailed country reports for the following countries accompany this report and provide a detailed answer to this question for each country. Summary indicators are provided in the Executive Summary and by Sections 13 to 21 of the Report.

23. 3. Vessel operating costs and benefits - the missing element

This is a key problem area; this data is not publicly available. Its availability would increase analytical rigour considerably.

23. 4. Economic Benefits from Tuna Resources by Country in the WIO Region

Analysing the diversity of regional situations more closely, key differences in the importance of tuna fisheries can be summarised as follows.

- Seychelles is in the tuna fisheries belt and has over time become a major hub for EU purse seiners with occasional visits from Asian longliners. Tuna has a significant place in the economy of Seychelles.
- Port Louis, Mauritius, is a base for Asian longliners, which also use the port for repair and cold storage. Dry dock facilities also serve the occasional EU purse seiner. Most tuna passing through Mauritius is shipped on reefers from Seychelles and enters as a raw material for the tuna processing industry and ancillary industries in Mauritius. Mauritius therefore benefits from port visits and expenditure as well as the value added from the tuna processing industry.
- Madagascar through Diego Suarez is a supplementary part of the regional system focused on Seychelles and Mauritius.
- Reunion is a major base for the EU fleets active in both the Indian Ocean and the Atlantic and receives significant amounts of EU aid to assist with maintaining the competitiveness of the fleet, its ports and harbours.
- For the other regional countries, tuna fisheries have had little impact to date with the exception of Kenya and South Africa. Tanzania plans to expand its tuna sector, while Comoros receives virtually no value added from tuna apart from the access and licence fees from DG Mare, EU and trawler owners. Mozambique is rapidly seeking its proportion of the tuna economy.

In terms of economic contribution to the national economies, the EU purse seiner fleets (principally French, Spanish and Seychelles flagged purse seiners) have a greater impact, notably in Seychelles and to a much lesser extent Madagascar while the economic impact of Asian longliner activities is concentrated in Port Louis, Mauritius. In other cases, Asian longliners tranship their catch at sea to other vessels (on the high seas in principle) and in some cases refuel at sea. Arguably the principal weakness of the tuna sector is that much of the value added is exported to EU countries and Asia, principally China/Taiwan, Japan and Korea. Another area of loss is caused by the lack of monitoring, control and surveillance (MCS). Significant economic leakage is therefore generated by illegal, unreported and unregulated (IUU) tuna fishing.

23.5. Economic Benefits from Tuna Resources by Country in the WIO Region

These can be summarised as follows:

Table 23.1 Economic Benefits from Tuna Resources by Country in the WIO Region

COUNTRY	Access Agreements (licence fees and/or access payments)	Reflagging revenue	Port and in country revenues	Other comments
Comoros	FPA with EU	Uncertain	Revenues from EU access agreements and licence fees.	No facilities for landings and/or transhipment by tuna fishing vessels.
France	EU member	No	Some revenue from tuna fishing at Le Port, Réunion and Dzaoudzi, Mayotte	Includes Réunion, Mayotte and the EEZs around disputed islands. Member of IOTC.
Kenya	Private licences	Uncertain	Some port revenue in Mombasa and processing facilities at Wananchi Products, Mombasa	Limited multiplier impacts linked to tuna processing and port activities in Mombasa. Member of IOTC.
Madagascar	FPA with EU. Large number of recently licensed private vessels.	Yes	Port and processing revenues in Antsiranana, tuna landings and transhipment, vessel repairs for Spanish purse seiners	Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities linked to tuna. Member of IOTC.
Mauritius	Agreement with Japan. Numerous private licensing arrangements. Agreement may be concluded with the EU.	Yes	Major centre for tuna processing in Port Louis including canned tuna, tuna loins and by products including tuna oil and fishmeal	Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities linked to tuna. Member of IOTC.
Mozambique	FPA with EU. Large number of recently licensed private vessels.	Uncertain	No processing facilities and no port bases	May become a member of IOTC soon. Reports of IUU fishing by EU purse seiners
Seychelles	FPA with EU	Yes	Highest levels of revenue from both access fees (EU, Asian, other) and port revenues	Employment and investment multipliers in other parts of the economy linked to tuna processing, port and other activities. Member of IOTC.
South Africa	No agreement with the EU	Uncertain	Some tuna processing	Some longliner fishing for southern Bluefin and albacore in Indian Ocean. May become a member of IOTC soon.
Tanzania	No agreement with the EU	Uncertain	No processing facilities and no port bases for tuna vessels	Some tuna fishing in EEZ. Member of IOTC.

23. 6 REGIONAL NOMINAL CATCH VALUES & VARYING RATES OF RETURN

The study found the following values based on the IOTC EEZ catch figures but excluding key areas of high seas.

Table 23.2 Regional Nominal Catch Values & Varying Rates Of Return - Longliners (USD)

LONGLINERS										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009
Comoros	3,776,020	9,323,089	21,837,898	8,664,919	17,625,210	14,175,966	16,504,150	5,131,233	1,653,031	
Reunion	5,579,353	3,643,440	3,200,992	3,024,318	3,598,635	2,709,065	3,422,514	1,967,257	2,246,144	
French territories	23,415,515	24,998,829	23,633,436	23,712,739	21,693,947	27,844,717	27,234,302	17,658,943	4,866,033	
Kenya	15,796,756	17,534,148	14,089,370	9,335,007	12,861,027	22,651,321	22,808,886	8,610,984	8,155,120	
Madagascar	41,219,658	41,121,294	32,993,900	28,041,046	41,520,521	34,856,677	46,761,330	28,328,939	28,824,553	
Mauritius	68,622,337	111,188,902	100,824,063	80,987,247	61,906,721	60,776,529	49,022,933	26,355,585	28,329,050	
Mozambique	25,311,738	26,803,623	32,456,527	25,660,127	39,066,662	36,328,915	33,655,516	20,711,851	7,036,923	
Seychelles	77,659,069	94,022,440	159,944,831	214,038,402	199,748,865	143,624,135	136,094,817	77,541,971	41,819,733	
Somalia	35,929,961	78,373,050	103,613,025	73,978,960	49,341,620	16,859,799	8,835,884	3,404,578	7,626,361	
South Africa	7,635,129	7,498,180	21,689,162	19,683,998	29,506,353	20,120,303	11,192,443	10,407,619	2,590,301	
Tanzania	8,339,737	15,318,158	48,817,777	43,170,350	68,132,248	41,226,806	22,794,694	17,418,208	1,719,173	
TOTAL	313,285,273	429,825,153	563,100,983	530,297,113	545,001,810	421,174,233	378,327,468	217,537,168	134,866,422	3,533,415,623
5% of Total	15,664,263.65	21,491,257.65	28,155,049.15	26,514,855.65	27,250,090.5	21,058,711.65	18,916,373.4	10,876,858.4	6,743,321.1	176,670,781.15
7% of Total	21,929,969.11	30,087,760.71	39,417,068.81	37,120,797.91	38,150,126.7	29,482,196.31	26,482,922.76	15,227,601.76	9,440,649.54	247,339,093.61
10% of Total	31,328,527.3	42,982,515.3	56,310,098.3	53,029,711.3	54,500,181	42,117,423.3	37,832,746.8	21,753,716.8	13,486,642.2	353,341,562.3

Table 23.2 Regional Nominal Catch Values & Varying Rates Of Return - Purse Seiners (USD)

PURSE SEINERS										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009
Comoros	9,083,136	15,276,636	8,550,237	2,362,886	2,637,459	9,417,760	9,451,801	8,194,555	7,625,377	
Reunion	918,084	875,283	270,554	159,903	125,475	133,865	717,167	378,565	754,114	
French territories	8,114,606	6,929,547	2,238,671	15,804	13,036,566	8,831,680	14,985,821	25,472,505	23,164,050	
Kenya	484,307	6,216,987	3,106,216	2,039,941	2,644,401	1,829,241	2,274,340	1,730,346	1,162,625	
Madagascar	7,682,917	6,530,828	4,231,835	4,210,508	10,066,117	4,478,165	7,995,625	17,392,979	15,687,648	
Mauritius	2,418,700	6,403,114	4,764,934	270,579	4,061,494	6,090,644	3,883,052	986,425	1,844,802	
Mozambique	5,134,443	5,501,335	3,117,898	19,169,683	3,085,144	2,513,247	2,283,223	12,492,471	8,738,370	
Seychelles	33,538,526	43,722,004	54,052,500	56,294,608	75,188,691	67,542,157	61,512,448	53,104,319	43,032,000	
Somalia	16,745,306	54,366,491	56,803,651	36,350,065	31,226,956	10,412,946	5,338,284	1,848,298	4,634,460	
South Africa	-	-	-	-	-	-	-	-	-	
Tanzania	2,004,659	8,370,580	19,397,297	18,228,446	7,243,351	6,681,520	8,158,457	4,750,182	2,408,646	
REGIONAL TOTAL	86,124,684	154,192,806	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109,052,092	1,155,203,538
5% of Total	4,306,234.2	7,709,640.3	7,826,689.55	6,955,121.15	7,465,782.7	5,896,561.2	5,830,010.9	6,317,532.3	5,452,604.6	57,760,176.9
7% of Total	6,028,727.88	10,793,496.42	10,957,365.37	9,737,169.61	10,452,095.78	8,255,185.68	8,162,015.26	8,844,545.22	7,633,646.44	80,864,247.66
10% of Total	8,612,468.4	15,419,280.6	15,653,379.1	13,910,242.3	14,931,565.4	11,793,122.4	11,660,021.8	12,635,064.6	10,905,209.2	115,520,353.8

23. 7. Estimations of tuna catches, gross value and estimated rates of return at country/EEZ level using the IOTC data

An extensive analysis was undertaken by the consultants and is set out in full by the Executive Summary and by sections 13-21 of the Report.

23. 8. Applying the vessel day approach – an alternative valuation approach

The indicative exercise undertaken here yielded the following results.

Applying priced vessel day calculations to value the EU purse-seine fisheries in the WIO (USD).

CATCH VALUE/ FISHING DAYS	2003	2004	2005	2006	2007	2008	2009
French Purse Seiners	3,488	3,836	3,845	4,815	5,541	4,844	3,315
Spanish Purse Seiners	4,468	4,730	5,808	6,462	5,895	4,792	3,784
Total fishing days	7,956	8,566	9,653	11,277	11,436	9,636	7,099
Total Nominal Catch values (USD)	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109,052,092
Nominal catch value/ Fishing day (USD)	19,674.94	16,238.90	15,468.32	10,457.68	10,195.89	13,112.35	15,361.61

Applying priced vessel day calculations to value the longline fisheries in the WIO

Estimated catches per day for longliners 2001 - 2009

ASSUMED CATCH PER DAY (MT)	2001	2002	2003	2004	2005	2006	2007	2008	2009
YFT	1.41	1.41	1.56	1.68	2.07	2.07	2.07	2.07	2.07
BET	1.83	1.83	2.03	2.18	2.69	2.69	2.69	2.69	2.69
Assumptions									
3000 hooks/set/day									
CPUE/3000 hooks 30% more for BET									
Than YFT									
ESTIMATED FISHING DAYS									
YFT	11,608	14,567	18,725	15,622	12,647	9,143	7,020	3,893	2,311
BET	4,882	8,006	8,677	8,443	5,936	4,941	4,823	2,571	1,842

24 Appendices

APPENDIX 1 NOMINAL CATCH VALUES LONGLINERS BY COUNTRY & AT REGIONAL LEVEL + ESTIMATED RATES OF RETURN (USD)

APPENDIX 2 NOMINAL CATCH VALUES PURSE SEINERS BY COUNTRY & AT REGIONAL LEVEL + ESTIMATED RATES OF RETURN (USD)

APPENDIX 3 NOMINAL CATCH VALUES BY COUNTRY & SPECIES (US\$) - LONGLINERS

APPENDIX 4 NOMINAL CATCH VALUES BY COUNTRY & SPECIES (US\$) - PURSE SEINERS

APPENDIX 5 MADAGASCAR – EU PAYMENTS BENCHMARKED AGAINST REFERENCE ROR DERIVED FROM IOTC EEZ CATCH DATA

APPENDIX 6 MOZAMBIQUE - EU PAYMENTS BENCHMARKED AGAINST REFERENCE ROR DERIVED FROM IOTC EEZ CATCH DATA

APPENDIX 7 COMOROS - EU PAYMENTS BENCHMARKED AGAINST REFERENCE ROR DERIVED FROM IOTC EEZ CATCH DATA

APPENDIX 8 VESSEL DAY VALUATIONS OF RETURNS TO SELECTED PACIFIC ISLAND STATES WITH ESTIMATED RATES OF RETURN

APPENDIX 1 NOMINAL CATCH VALUES LONGLINERS BY COUNTRY & AT REGIONAL LEVEL + ESTIMATED RATES OF RETURN (USD)

LONGLINERS											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009	
Comoros	3,776,020	9,323,089	21,837,898	8,664,919	17,625,210	14,175,966	16,504,150	5,131,233	1,653,031		
Reunion	5,579,353	3,643,440	3,200,992	3,024,318	3,598,635	2,709,065	3,422,514	1,967,257	2,246,144		
French territories	23,415,515	24,998,829	23,633,436	23,712,739	21,693,947	27,844,717	27,234,302	17,658,943	4,866,033		
Kenya	15,796,756	17,534,148	14,089,370	9,335,007	12,861,027	22,651,321	22,808,886	8,610,984	8,155,120		
Madagascar	41,219,658	41,121,294	32,993,900	28,041,046	41,520,521	34,856,677	46,761,330	28,328,939	28,824,553		
Mauritius	68,622,337	111,188,902	100,824,063	80,987,247	61,906,721	60,776,529	49,022,933	26,355,585	28,329,050		
Mozambique	25,311,738	26,803,623	32,456,527	25,660,127	39,066,662	36,328,915	33,655,516	20,711,851	7,036,923		
Seychelles	77,659,069	94,022,440	159,944,831	214,038,402	199,748,865	143,624,135	136,094,817	77,541,971	41,819,733		
Somalia	35,929,961	78,373,050	103,613,025	73,978,960	49,341,620	16,859,799	8,835,884	3,404,578	7,626,361		
South Africa	7,635,129	7,498,180	21,689,162	19,683,998	29,506,353	20,120,303	11,192,443	10,407,619	2,590,301		
Tanzania	8,339,737	15,318,158	48,817,777	43,170,350	68,132,248	41,226,806	22,794,694	17,418,208	1,719,173		
TOTAL	313,285,273	429,825,153	563,100,983	530,297,113	545,001,810	421,174,233	378,327,468	217,537,168	134,866,422	3,533,415,623	
5% of Total	15,664,263.65	21,491,257.65	28,155,049.15	26,514,855.65	27,250,090.5	21,058,711.65	18,916,373.4	10,876,858.4	6,743,321.1	176,670,781.15	
7% of Total	21,929,969.11	30,087,760.71	39,417,068.81	37,120,797.91	38,150,126.7	29,482,196.31	26,482,922.76	15,227,601.76	9,440,649.54	247,339,093.61	
10% of Total	31,328,527.3	42,982,515.3	56,310,098.3	53,029,711.3	54,500,181	42,117,423.3	37,832,746.8	21,753,716.8	13,486,642.2	353,341,562.3	

APPENDIX 2 NOMINAL CATCH VALUES PURSE SEINERS BY COUNTRY & AT REGIONAL LEVEL + ESTIMATED RATES OF RETURN (USD)

PURSE SEINERS										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total from 2001 to 2009
Comoros	9,083,136	15,276,636	8,550,237	2,362,886	2,637,459	9,417,760	9,451,801	8,194,555	7,625,377	
Reunion	918,084	875,283	270,554	159,903	125,475	133,865	717,167	378,565	754,114	
French territories	8,114,606	6,929,547	2,238,671	15,804	13,036,566	8,831,680	14,985,821	25,472,505	23,164,050	
Kenya	484,307	6,216,987	3,106,216	2,039,941	2,644,401	1,829,241	2,274,340	1,730,346	1,162,625	
Madagascar	7,682,917	6,530,828	4,231,835	4,210,508	10,066,117	4,478,165	7,995,625	17,392,979	15,687,648	
Mauritius	2,418,700	6,403,114	4,764,934	270,579	4,061,494	6,090,644	3,883,052	986,425	1,844,802	
Mozambique	5,134,443	5,501,335	3,117,898	19,169,683	3,085,144	2,513,247	2,283,223	12,492,471	8,738,370	
Seychelles	33,538,526	43,722,004	54,052,500	56,294,608	75,188,691	67,542,157	61,512,448	53,104,319	43,032,000	
Somalia	16,745,306	54,366,491	56,803,651	36,350,065	31,226,956	10,412,946	5,338,284	1,848,298	4,634,460	
South Africa	-	-	-	-	-	-	-	-	-	
Tanzania	2,004,659	8,370,580	19,397,297	18,228,446	7,243,351	6,681,520	8,158,457	4,750,182	2,408,646	
TOTAL	86,124,684	154,192,806	156,533,791	139,102,423	149,315,654	117,931,224	116,600,218	126,350,646	109,052,092	1,155,203,538
5% of Total	4,306,234.2	7,709,640.3	7,826,689.55	6,955,121.15	7,465,782.7	5,896,561.2	5,830,010.9	6,317,532.3	5,452,604.6	57,760,176.9
7% of Total	6,028,727.88	10,793,496.42	10,957,365.37	9,737,169.61	10,452,095.78	8,255,185.68	8,162,015.26	8,844,545.22	7,633,646.44	80,864,247.66
10% of Total	8,612,468.4	15,419,280.6	15,653,379.1	13,910,242.3	14,931,565.4	11,793,122.4	11,660,021.8	12,635,064.6	10,905,209.2	115,520,353.8

APPENDIX 3 NOMINAL CATCH VALUES BY COUNTRY & SPECIES (US\$) - LONGLINERS

NOMINAL CATCH VALUES									
LONGLINERS	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009
Comoros									
YFT	2,868,672	4,212,697	12,397,030	4,317,543	8,660,489	8,832,892	11,285,282	2,792,028	1,040,436
BET	907,313	5,110,371	9,440,769	4,347,190	8,964,312	5,342,331	5,218,207	2,337,066	611,198
SKJ	36	21	99	186	410	743	661	2,140	1,398
Reunion									
YFT	2,337,163	1,153,635	1,152,454	1,478,444	1,541,141	1,195,106	1,406,850	651,019	753,649
BET	3,227,766	2,351,762	1,980,121	1,536,658	2,041,142	1,497,413	1,948,617	1,229,058	1,309,700
SKJ	14,424	138,044	68,417	9,215	16,352	16,546	67,046	87,179	182,794
French territories									
YFT	12,254,074	13,193,617	10,971,850	10,932,371	12,797,474	19,782,244	17,850,461	10,908,945	-
BET	11,161,260	11,805,134	12,661,306	12,779,954	8,895,318	8,059,181	9,382,501	6,745,787	4,863,258
SKJ	180	78	280	415	1,155	3,292	1,339	4,211	2,775
Kenya									
YFT	15,756,365	17,275,249	13,215,184	7,968,067	11,831,046	20,796,223	22,162,233	7,991,289	7,955,944
BET	25,967	120,856	805,769	1,357,725	1,013,629	1,838,552	579,607	532,516	16,382
SKJ	14,424	138,044	68,417	9,215	16,352	16,546	67,046	87,179	182,794
Madagascar									
YFT	15,756,365	17,275,249	13,215,184	7,968,067	11,831,046	20,796,223	22,162,233	7,991,289	7,955,944
BET	22,301,878	21,539,995	19,694,081	20,023,689	22,370,014	12,856,481	17,439,444	11,454,145	10,718,432
SKJ	3,161,415	2,306,050	84,636	49,290	7,319,461	1,203,974	7,159,654	8,883,505	10,150,177
Mauritius									
YFT	28,938,384	22,087,850	27,530,071	28,511,456	26,184,895	20,189,251	8,255,332	9,006,518	8,094,107
BET	39,683,678	89,100,855	73,292,660	52,474,459	35,718,000	40,579,722	40,764,690	17,341,872	20,229,535
SKJ	275	197	1,333	1,332	3,826	7,556	2,911	7,195	5,409
Mozambique									
YFT	12,770,026	14,295,516	18,506,972	16,639,522	30,296,599	30,284,058	28,290,967	16,939,057	4,618,971
BET	12,541,565	12,508,054	13,949,436	9,020,249	8,769,406	6,041,505	5,362,459	3,766,269	2,413,828
SKJ	147	53	119	356	657	3,351	2,091	6,525	4,124
Seychelles									
YFT	27,770,373	24,055,868	41,812,362	63,805,156	60,663,799	35,818,047	25,274,007	17,097,175	6,815,731
BET	49,888,290	69,966,217	118,131,028	150,230,904	139,078,180	107,799,178	110,812,737	60,425,188	34,990,028
SKJ	406	355	1,441	2,343	6,886	6,911	8,074	19,608	13,974
Somalia									
YFT	26,351,511	61,532,876	88,398,403	56,438,861	40,259,778	12,411,257	5,289,994	1,104,564	4,915,961
BET	9,578,360	16,840,099	15,214,045	17,539,412	9,079,464	4,445,764	3,545,239	2,298,031	2,708,998
SKJ	90	75	578	688	2,378	2,778	651	1,982	1,402
South Africa									
YFT	7,121,077	6,618,007	20,934,332	18,545,890	28,908,632	19,828,960	10,863,554	10,126,951	2,359,328
BET	513,982	880,096	754,363	1,137,452	596,110	290,298	327,829	277,542	228,169
SKJ	70	77	467	655	1,611	1,045	1,059	3,127	2,805
Tanzania									
YFT	4,921,227	4,818,524	19,974,267	17,646,803	25,248,081	13,385,851	7,222,751	7,117,745	370,425
BET	3,418,477	10,499,551	28,843,491	25,523,520	42,884,101	27,840,868	15,571,943	10,300,463	1,348,748
SKJ	33	83	18	27	66	86	-	-	-

APPENDIX 4 NOMINAL CATCH VALUES BY COUNTRY & SPECIES (US\$) - PURSE SEINERS

PURSE SEINERS									
Comoros									
YFT	3,367,251	6,846,800	4,948,701	1,535,119	496,481	376,777	2,253,645	3,913,155	1,592,808
BET	918,084	875,283	270,554	159,903	125,475	133,865	717,167	378,565	754,114
SKJ	4,797,801	7,554,553	3,330,981	667,865	2,015,503	8,907,118	6,480,989	3,902,835	5,278,455
Reunion									
YFT	0	0	0	0	0	0	0	0	0
BET	918,084	875,283	270,554	159,903	125,475	133,865	717,167	378,565	754,114
SKJ	0	0	0	0	0	0	0	0	0
French territories									
YFT	2,491,957	1,948,274	1,661,050	213	2,820,579	766,901	2,487,804	6,038,116	5,366,845
BET	888,022	719,814	186,588	554	550,287	266,212	827,799	1,220,126	2,138,883
SKJ	4,734,627	4,261,458	391,033	15,038	9,665,701	7,798,567	11,670,219	18,214,263	15,658,322
Kenya									
YFT	18,992	57,090	475,699	1,263,471	1,292,065	1,007,743	367,999	528,063	11,734
BET	55,275	806,457	480,188	205,076	81,566	156,626	452,465	248,085	620,911
SKJ	410,040	5,353,440	2,150,329	571,394	1,270,770	664,873	1,453,877	954,198	529,980
Madagascar									
YFT	3,533,886	1,555,101	461,154	5,973	5,129,463	431,278	3,885,763	7,234,916	7,644,053
BET	1,847,870	1,973,987	1,786,534	2,097,720	2,693,723	1,562,675	2,752,941	2,037,202	1,424,020
SKJ	2,301,162	3,001,740	1,984,147	2,106,815	2,242,931	2,484,213	1,356,921	8,120,861	6,619,575
Mauritius									
YFT	1,995,454	5,438,107	3,972,359	145,396	2,041,308	4,352,387	2,062,817	707,492	1,533,793
BET	195,881	440,860	294,188	26,085	289,988	278,497	248,886	59,664	249,759
SKJ	227,366	524,146	498,386	99,098	1,730,198	1,459,760	1,571,349	219,270	61,250
Mozambique									
YFT	2,177,028	2,218,550	1,095,172	15,010,634	689,866	21,424	665,956	3,626,759	1,595,152
BET	656,253	281,044	38,580	2,052,234	152,346	7,610	260,346	744,851	523,643
SKJ	2,301,162	3,001,740	1,984,147	2,106,815	2,242,931	2,484,213	1,356,921	8,120,861	6,619,575
Seychelles									
YFT	6,718,094	9,240,348	22,270,532	13,063,889	21,485,011	22,893,847	13,760,734	14,733,705	9,168,087
BET	793,636	1,543,275	1,380,131	1,837,462	1,093,319	540,372	559,641	408,721	359,910
SKJ	26,026,796	32,938,381	30,401,836	41,393,257	52,610,361	44,107,939	47,192,073	37,961,893	33,504,003
Somalia									
YFT	4,366,822	11,278,097	16,037,996	11,825,285	9,695,897	3,017,117	1,670,127	392,909	1,306,241
BET	793,636	1,543,275	1,380,131	1,837,462	1,093,319	540,372	559,641	408,721	359,910
SKJ	11,584,848	41,545,119	39,385,524	22,687,318	20,437,740	6,855,457	3,108,516	1,046,667	2,968,310
South Africa									
YFT	-	-	-	-	-	-	-	-	-
BET	-	-	-	-	-	-	-	-	-
SKJ	-	-	-	-	-	-	-	-	-
Tanzania									
YFT	-	957,019	3,165,772	8,021,486	5,956,871	5,666,679	4,257,761	3,364,168	1,940,790
BET	390,475	922,474	2,564,040	2,133,985	169,197	93,183	822,252	127,508	175,981
SKJ	1,614,183	6,491,088	13,667,485	8,072,976	1,117,283	921,659	3,078,445	1,258,506	291,876

APPENDIX 5 PAYMENTS BY EU UNDER THE MADAGASCAR FPA AND RATE OF RETURN AGAINST IOTC EEZ CATCH DATA

MADAGASCAR						IOTC	CATCH	DATA
	Vessel Nos	2009	2009	2009				
		€	Total (€)	USD	RoR	2007	2008	2009
Financial contribution		1,197,000	1,197,000	1,520,190	5%	2,737,848	2,286,096	2,225,610
Ship owners seiners (per mt)		35	700,842	890,070	7%	3,832,987	3,200,534	3,115,854
Ship owners longliners (per mt)		35	338,418	429,790	10%	5,475,695	4,572,192	4,451,220
Advances (per purse seiner)	43	168,560	168,560	214,071				
Advances (per longliner) average	38	76,000	76,000	96,520				
Total			2,480,820	3,150,642				
Conversion €/USD (2009)	1.27							

Notes

Longliner advances are paid at different rates. The consultants took a rough figure between €3,500 and €680/year

The consultants did not know the actual number of EU purse seiners and longliners fishing in one year and there are other flagged vessels

The consultants were unable to ascertain the net returns to EU fishing vessels

APPENDIX 6 PAYMENTS BY EU UNDER THE FPA 2007 -2012 COMOROS – ASSESSMENT AGAINST RATE OF RETURN FROM IOTC EEZ CATCH DATA

	Vessel nos.	2009	2009	2009		IOTC	CATCH	DATA
		€	Total (€)	USD	RoR	2007	2008	2009
Financial contribution		315,250	315,250	400,368	5%	1,279,364	1,020,393	510,163
Ship owners seiners (per mt)	35	338,418	338,418	429,790	7%	1,791,110	1,428,551	714,229
Ship owners longliners (per mt)	35	124,618	124,618	158,265	10%	2,558,729	2,040,787	1,020,327
Advances (per purse seiner)	45	151,875	151,875	192,881				
Advances (per longliner) average	25	52,375	52,375	66,516				
Total				1,247,821				
Conversion €/USD (2009)	1.27							

APPENDIX 7 PAYMENTS BY EU UNDER THE MOZAMBIQUE FPA - ASSESSMENT AGAINST RATE OF RETURN FROM IOTC EEZ CATCH DATA

PAYMENTS BY EU UNDER THE FPA 2007 -2012 MOZAMBIQUE								
	Number	2009	2009	2009				
		€	Total (€)	USD	RoR	2007	2008	2009
Financial contribution		390,000	900,000	1,143,000	5%	1,796,937	1,660,216	788,765
Ship owners seiners (per mt)		35	164,432	208,828	7%	2,515,712	2,324,303	1,104,270
Ship owners longliners (per mt)		35	29,252	37,150	10%	3,593,874	3,320,432	1,577,529
Advances (per purse seiner)	45	189,000	189,000	240,030				
Advances (per longliner) average	45	67,500	67,500	85,725				
Total				1,714,733				
Conversion €/USD (2009)	1.27							

APPENDIX 8 VESSEL DAY VALUATIONS OF RETURNS TO SELECTED PACIFIC ISLAND STATES WITH ESTIMATED RATES OF RETURN

Federated States of Micronesia

Japanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value per day f	5 % of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	1,853	12.70	5.61	0.92	23,701	1185
1998	955	26.55	4.41	0.29	35,168	1758
1999	1,995	19.77	5.61	0.23	27,342	1367
2000	1,464	23.51	4.16	0.56	22,408	1120
2001	684	20.76	4.46	0.69	23,234	1162
2002	913	21.37	4.40	0.54	23,655	1183
2003	2,466	29.06	2.82	0.48	24,576	1229
2004	2,420	20.74	3.48	0.49	22,453	1123
2005	2,593	26.00	4.26	0.42	29,947	1497

Taiwanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value per day	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	1,921	8.93	3.73	0.77	15,514	931
1998	1,190	24.85	2.06	0.15	27,590	1655
1999	3,403	14.19	2.53	0.16	11,621	697
2000	2,186	21.53	1.90	0.09	13,172	790
2001	1,678	22.36	2.56	0.32	20,075	1205
2002	1,022	19.56	3.36	0.31	18,307	1098
2003	1,904	19.94	2.74	0.11	16,946	1017
2004	1,669	16.08	2.38	0.25	16,864	1012
2005	2,472	18.43	2.73	0.42	19,586	1175

Korean purse seine fleet

Days fished		CPUE (Mt/day)			Gross value per day	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	580	14.61	1.62	0.17	18,864	1132
1998	411	15.97	10.51	0.53	30,660	1840
1999	2,788	16.99	3.89	0.14	14,719	883
2000	1,502	19.20	3.33	0.09	13,160	790
2001	1,319	17.96	2.03	0.12	16,104	966
2002	937	19.04	2.25	0.13	16,722	1003
2003	1,750	25.36	1.66	0.02	19,559	1174
2004	1,313	14.06	3.02	0.19	15,758	945
2005	1,381	20.45	5.11	0.35	24,391	1463

Kiribati

Japanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	1,777	14.26	11.23	1.21	33,285	1664
1998	663	23.33	3.83	0.35	30,835	1542
1999	960	13.91	6.80	0.62	23,379	1169
2000	1,061	21.90	5.22	0.76	22,941	1147
2001	1,741	20.13	7.25	0.76	26,042	1302
2002	1,643	27.58	1.79	0.50	25,327	1266
2003	801	12.30	3.82	0.82	14,136	707
2004	337	17.25	2.83	0.71	18,588	929
2005	212	18.54	3.03	0.89	21,341	1067

Taiwanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	6 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	1,119	13.87	10.33	0.68	30,694	1842
1998	1,280	22.40	6.20	0.23	30,974	1858
1999	1,234	17.47	6.08	1.06	17,073	1024
2000	468	30.17	4.69	0.28	20,208	1212
2001	1,969	21.59	7.51	0.38	24,215	1453
2002	2,762	28.83	2.35	0.22	24,186	1451
2003	519	20.19	3.55	0.42	18,011	1081
2004	468	23.91	0.94	0.25	22,263	1336
2005	763	24.30	3.81	0.34	26,086	1565

Korean purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	2,270	18.67	6.71	0.81	30,854	1851
1998	1,002	33.69	6.38	0.34	42,453	2547
1999	321	12.22	6.12	0.73	13,690	821
2000	476	31.71	6.80	0.15	22,856	1371
2001	1,857	24.69	9.20	0.37	28,286	1697
2002	2,704	31.50	2.72	0.13	26,589	1595
2003	243	13.79	1.77	0.15	11,581	695
2004	87	2.83	0.10	0.03	2,620	157
2005	1,400	30.69	3.64	0.23	31,440	1886

Marshall Islands

Japanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	45	7.42	5.76	0.89	17,203	860
1998	912	24.45	7.37	0.18	37,213	1861
1999	581	17.58	4.55	0.54	23,675	1184
2000	641	24.65	2.20	0.45	20,199	1010
2001	368	22.49	3.73	1.22	23,840	1192
2002	464	23.99	2.53	0.62	23,328	1166
2003	71	7.87	1.56	0.64	7,789	389
2004	155	18.78	1.83	0.29	18,589	929
2005	68	23.15	2.64	1.67	24,830	1241

Taiwanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	5	1.00	0.97	0.03	2,534	152
1998	401	14.65	12.74	0.31	32,490	1949
1999	417	11.26	1.98	0.32	9,197	552
2000	276	12.25	0.65	0.08	7,123	427
2001	655	10.79	2.24	0.13	10,653	639
2002	442	16.45	0.74	0.07	13,155	789
2003	50	24.04	0.91	0.11	17,817	1069
2004	148	11.29	0.16	0.04	10,208	612
2005	111	14.67	0.25	0.08	13,126	788

Korean purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	6	15.40	0.00	0.00	17,400	1044
1998	749	26.87	10.95	0.52	42,114	2527
1999	413	20.93	2.74	0.25	16,211	973
2000	191	14.82	1.80	0.07	9,486	569
2001	529	25.73	1.11	0.05	21,338	1280
2002	497	23.67	0.58	0.07	18,404	1104
2003	40	1.47	3.08	0.01	4,390	263
2004	96	22.61	1.43	0.05	21,640	1298
2005	69	27.99	0.19	0.03	24,684	1481

Palau

Japanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	61	20.05	10.79	1.95	40,025	2001
1998						
1999	86	15.23	4.36	0.17	21,117	1056
2000						
2001						
2002						
2003	90	13.10	11.77	0.51	26,002	1300
2004	133	18.08	4.14	0.68	21,028	1051
2005	62	20.10	14.58	0.56	41,188	2059

PNG

Korean purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	1,554	21.22	3.44	0.48	28,976	1739
1998	1,075	22.42	4.07	0.27	28,006	1680
1999	87	27.01	3.90	0.25	21,260	1276
2000	2,346	27.97	5.37	0.24	19,617	1177
2001	716	17.28	7.77	0.55	21,071	1264
2002	660	19.41	4.61	0.45	19,530	1172
2003	3,097	22.25	8.64	0.10	25,011	1501
2004	3,302	24.86	3.02	0.23	25,356	1521
2005	2,267	22.27	5.77	0.45	26,829	1610

Taiwanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	4,651	14.12	2.66	0.46	19,825	1189
1998	1,805	16.85	5.71	0.43	24,774	1486
1999	724	35.42	4.04	0.55	26,881	1613
2000	3,179	24.65	4.73	0.14	17,290	1037
2001	1,392	26.01	6.05	0.60	26,306	1578
2002	1,718	25.33	4.04	0.51	23,364	1402
2003	4,178	20.90	4.60	0.15	19,654	1179
2004	2,923	26.85	1.79	0.20	25,805	1548
2005	3,010	20.11	3.74	0.67	22,337	1340

Solomon Islands

Japanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997						
1998	19	43.04	2.43	0.57	50,154	2508
1999	4	53.50	7.50	1.50	62,816	3141
2000	10	39.20	5.80	3.50	35,634	1782
2001	172	28.58	2.45	0.79	27,541	1377
2002	36	7.72	2.48	0.37	9,729	486
2003	237	14.23	5.62	0.43	18,058	903
2004	538	20.59	2.48	0.45	21,007	1050
2005	408	22.84	2.60	1.54	24,477	1224

Taiwanese purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	166	6.51	11.49	0.61	24,062	1444
1998	1,482	19.72	7.55	0.31	30,221	1813
1999	110	20.12	1.09	0.14	14,137	848
2000	12	31.32	3.34	0.29	19,654	1179
2001	199	19.00	3.51	0.16	18,339	1100
2002	29	7.24	0.27	0.07	5,736	344
2003	154	13.08	1.99	0.11	11,324	679
2004	369	18.09	2.87	0.27	19,175	1151
2005	540	21.61	2.72	0.55	22,351	1341

Korean purse seine fleet

Days fished		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
		SKJ	YFN	BET	(US\$)	(US\$)
1997	521	7.66	8.19	0.87	20,572	1234
1998	1,625	17.39	11.69	0.50	33,741	2024
1999	58	7.72	0.30	0.05	5,315	319
2000						
2001	223	22.18	6.72	0.34	23,925	1435
2002	29	13.30	2.34	0.43	12,501	750
2003	314	16.31	5.86	0.14	17,821	1069
2004	936	23.99	4.93	0.31	26,647	1599
2005	591	22.14	6.42	0.52	27,529	1652

Tuvalu

Japanese purse seine fleet

		CPUE (Mt/day)			Gross value of catch per day fished (US\$)	5 per cent of gross value (US\$)
	Days fished	SKJ	YFN	BET	(US\$)	(US\$)
1997						
1998	343	23.60	2.76	0.41	29,585	1479
1999	159	17.74	4.32	0.22	23,480	1174
2000	82	20.23	3.80	0.32	19,630	982
2001	75	19.24	1.61	0.77	18,498	925
2002	53	22.42	1.45	0.42	20,572	1029
2003	70	10.47	4.23	0.53	13,423	671
2004	58	16.98	2.29	0.90	17,657	883
2005	24	14.92	2.71	1.13	17,604	880

Nauru

Japanese purse seine fleet

		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
	Days fished	SKJ	YFN	BET	(US\$)	(US\$)
1997	615	13.94	12.53	1.81	34,626	1731
1998	427	18.18	8.60	0.58	32,215	1611
1999	478	11.82	8.42	0.72	23,699	1185
2000	835	16.14	8.21	0.60	23,572	1179
2001	651	19.96	7.97	1.13	26,762	1338
2002	827	30.45	3.66	1.02	30,204	1510
2003	331	13.07	3.04	0.75	13,576	679
2004	323	17.86	1.95	0.35	17,963	898
2005	227	21.71	3.48	0.83	24,884	1244

Taiwanese purse seine fleet

		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
	Days fished	SKJ	YFN	BET	(US\$)	(US\$)
1997	12	1.25	2.59	0.33	5,177	311
1998	549	16.55	14.62	0.38	37,024	2221
1999	873	10.15	4.43	0.65	10,760	646
2000	1,052	20.67	6.06	0.16	16,299	978
2001	704	13.16	5.93	0.30	16,063	964
2002	1,171	27.77	2.23	0.35	23,266	1396
2003	202	14.16	4.41	0.21	14,727	884
2004	627	29.56	1.50	0.21	27,897	1674
2005	289	23.78	2.60	0.38	24,084	1445

Korean purse seine fleet

		CPUE (Mt/day)			Gross value of catch per day fished	5 per cent of gross value
	Days fished	SKJ	YFN	BET	(US\$)	(US\$)
1997	20	15.92	1.56	0.06	20,262	1216
1998	14	0.00	0.00	0.00	0	0
1999	425	15.01	9.24	0.61	18,427	1106
2000	421	23.24	11.36	0.17	22,253	1335
2001	506	14.17	7.95	0.29	18,792	1128
2002	660	37.13	3.17	0.48	31,302	1878
2003	113	6.41	1.80	0.09	6,451	387
2004	349	26.16	1.56	0.10	24,946	1497
2005	251	10.85	4.71	0.32	15,487	929

24. REFERENCES

IOTC General

All IOTC Reports as per Working Party and Full sessions of the Commission 2000-2010 – as produced periodically by the Commission (<http://www.iotc.org/English/index.php>)
Report on the Working Party on Tropical Tunas (2000-2010)

Chassot, E, et al, 'Analysis of the Effects of Somali Piracy on the European Tuna Purse Seine Fisheries of the Indian Ocean' (Document No IOTC-2010-SC-09, Indian Ocean Tuna Commission, 2010).

Herrera, Miguel, and Lucia Pierre, 'Status of IOTC Databases for Tropical Tunas' (Indian Ocean Tuna Commission, undated).

France

Chassot, E, et al, 'Statistics of the French Purse Seine Fleet Targeting Tropical Tunas in the Indian Ocean (1991-2009)' (Report No IOTC-2010-WPTT-12, Indian Ocean Tuna Commission, October 2010).

Floch, L, P Dewals, and E Chassot, 'An Overview of the French Purse Seine Fleet Activities in the Indian Ocean during January-June 2010' (Report No IOTC-2010-WPTT-14-Victoria, Indian Ocean Tuna Commission, 2010).

China

Xu, Liuxiong, Xiaojie Dai, and Zou Lijin, 'China National Report to the Scientific Committee of the Indian Ocean Tuna Commission for 2009' (National Report No IOTC-2010-SC-Info7, Indian Ocean Tuna Commission, 2009).

China IOTC

Xu, Liuxiong, Xiaojie Dai, and Guoping Zhu, 'Chinese Tuna Longline Fishery in the Indian Ocean in 2008' (Report No IOTC-2010-S14-CoC19[E], Indian Ocean Tuna Commission, undated).

Japan

National Research Institute of Far Seas Fisheries (NFIFSF), Fisheries Research Agency (FRA) and Fisheries Agency, Government of Japan, 'National Report of Japan (2010)' (Report No IOTC-2010-SC-Inf11, Indian Ocean Tuna Commission, December, 2010).

Nishida, Tom, and Lisa Chang, 'Searching Comparable Standardized YFT CPUE between

Japanese and Taiwanese Tuna Longline Fisheries in their Common Fishing Grounds in the Indian Ocean' (Doc No IOTC-2010-WPTT-32, Indian Ocean Tuna Commission, October, 2010).

Nootmorn, Praulai, et al, 'Tuna Purse Seine Landings in Phuket, Thailand, from 1993 to 2006' (Paper presented at the 9th Working Party on Tropical Tunas, Seychelles, 16 to 20 July 2007, Doc No IOTC-2007-WPTT-25, Indian Ocean Tuna Commission, Victoria).

Kenya

Ndegwa, Stephen, 'National Report of Kenya (2008)' (Report No IOTC-2008-SC-INF22, Indian Ocean Tuna Commission, November 2008).

Ndegwa, Stephen, and Dorcus Sigana, 'National Report of Kenya (2010)' (Report No IOTC-2010-SC-Info6, Indian Ocean Tuna Commission, November 2010).

Korea

Hwang, Seonjae, and Tom Nishida, 'Yellowfin Tuna CPUE Standardization of the Korean Tuna Longline Fisheries in the Indian Ocean (1980-2009)' (Doc No IOTC-2010-WPTT-33, Indian Ocean Tuna Commission, October 2010).

Kim, Zang Geun, Seon Jae Hwang and Doo nam Kim, 'National Report of Korea' (Report No IOTC-2010-SC-Inf14, Indian Ocean Tuna Commission, 30 June 2010).

Madagascar

Ministère de la Pêche et des Ressources Halieutiques [Ministry of Fisheries and Halieutic Resources], 'Rapport National de Madagascar 2010' [National Report of Madagascar 2010] (Report No IOTC-2010-SC-Info10, Indian Ocean Tuna Commission, 2010).

Rahombanjanahary, Mamy Onjampitia Diary Mirindra, 'Report on the Unloading of Purse Seiners in the Antsiranana Harbor Over the Nine Last Years 2002-2010' (Report No IOTC-2010-WPTT-35, Indian Ocean Tuna Commission, 2010).

Section Planification Stratégique et Recherche, Le Secrétariat du Marche Commun pour l'Afrique Orientale et Australe (COMESA) [Strategic Planning and Research Unit, Secretariat of the Common Market for Oriental Africa and Australasia], 'Madagascar: Perspectives Régionales 2007-2008' [Madagascar: Regional Perspectives] (COMESA, undated).

Spain

Delgado de Molina, Alicia, Juan José Areso and Javier Ariz, 'Statistics of the Purse Seine Spanish Fleet in the Indian Ocean (1984-2009)' (Document No IOTC-2010-WPTT-19, Indian

Ocean Tuna Commission, 2010).

Ramos, M L, A Delgado de Molina and J Ariz, 'Analysis of Activity Data Obtained from Supply Vessels' Logbooks Implemented by the Spanish Fleet and Associated in Indian Ocean' (Document No IOTC-2010-WPTT-22, Indian Ocean Tuna commission, 2010).

Taiwan

Chang, Shui-Kai, 'Status Report of Taiwan Deep Sea Tuna Fishery in the Indian Ocean' (Document No WPDCS02-05, Indian Ocean Tuna Commission) (2002) IOTC Proceedings No 5 39.

Fonteneau, Alain, 'Potential Indicators of Fishing Efforts Targeting Yellowfin and Bigeye Tuna Exerted by Japanese and Taiwanese Longliners in the Indian Ocean' (Document No IOTC-2010-WPTT-28, Indian Ocean Tuna Commission, 2010).

Thailand

Bunluedaj, Chanthip, and Pattira Lirdwitayaprasit, 'Oversea Thai Tuna Fishery of Thailand during 2008-2009' (Document No IOTC-2010-WPTT-10, Indian Ocean Tuna Commission, 2010).

Nootmorn, Praulai, 'Tunas Unloading in Phuket, Thailand During 1995-2009' (Document No IOTC-2009-WPDCS-08, Indian Ocean Tuna Commission, 2009).

Nootmorn, Praulai, Supachai Rodpradit, and Thumawadee Chaiyen, 'Foreign Tuna Fleets Unloading in Phuket, Thailand During 1995-2009' (Document No IOTC-2010-WPDCS-07, Indian Ocean Tuna Commission, 2010).

Reunion

European Commission, 'Rapport de l'Union Européenne pour le Comité Scientifique de la CTOI de 2010 (Données 2009)' (Document No IOTC-2010-SC-Info5, Indian Ocean Tuna Commission, 2010).

IFREMER, IRD, FranceAgriMer, Etat du secteur des pêches françaises Document préparatoire des Assises de la pêche (2009)

République Française, Avis et Rapports du Conseil Economique et Social, La Pêche et L'aquaculture en Outre-Mer Rapport présenté par M. Gérard d'Aboville - N° 14 NOR : C.E.S. X07000114V Mercredi 4 juillet 2007.

Couliou Jean-Rene, . Le développement international d'une activité de production à ancrage local, l'exemple de la pêche thonière tropicale française : 110 /617 Annales de Géographie (2001). 38-56.

South Africa

Department of Environmental Affairs and Tourism (South Africa) Policy for the Allocation of Commercial Fishing Rights in the Large Pelagics (Tuna Longline And Swordfish) Fishery (2003).

Sauer, W.H.H., Hecht, T. Britz, P.J. & Mather, D. 2003. An Economic and Sectoral Study of the South African Fishing Industry. Volume 2: Fishery profiles. Report prepared for Marine and Coastal Management by Rhodes University.
www.envirofishafrica.co.za/projects/ess.html

Annual reports of the Department of Environmental Affairs and Tourism (South Africa) – various 2004-2009.

Artisan fisheries Indian Ocean

Jan Hoorweg, Barasa Wangila and Allan Degen, Artisanal Fishers on the Kenyan Coast Household Livelihoods and Marine Resource Management 14 *Afrika-Studiecentrum Series* (2009)

Cinner, J TR. McClanahan, A. Wamukota. (2010). Differences in livelihoods, socioeconomic characteristics, and environmental perceptions between fishers and non-fishers living near and far from marine parks on the Kenyan coast. *Marine Policy*: 34:22-28.

Cinner, J. (2010) Poverty and the use of destructive fishing gear near east African marine protected areas. *Environmental Conservation*.

Cinner, J, M.M.P.B. Fuentes, H. Randriamahazo. (2009). Exploring social resilience in Madagascar's marine protected areas. *Ecology & Society*: 14(1): 41.
 [online] URL: <http://www.ecologyandsociety.org/vol14/iss1/art41/>

Applicable approaches concepts from Pacific

Batty, Michael, 'Suggested Domestic Fisheries Development Case Studies: Domestic Fisheries Development Case Study #3' (DEVFISH Project document, undated).

FFA, 'Indexation Scheme' (Paper No ACT21/WP.4, FFA US Treaty Consultation 21st Annual Meeting, February 2009).

Philipson, Peter W, 'An Assessment of Development Options in the Longline Fishery' (Development of Tuna Fisheries in the Pacific ACP Countries (DEVFISH) Project Report, FFA, Pacific Islands Forum Secretariat, and Secretariat of the Pacific Community, November 2006).

Philipson, Peter W, 'An Assessment of the Economic Benefits of Tuna Purse Seine Fishing and

Onshore Processing of Catches' (Development of Tuna Fisheries in the Pacific ACP Countries (DEVFISH) Project Report, FFA, Pacific Islands Forum Secretariat, and Secretariat of the Pacific Community, July 2007).

Squires, Dale, et al, 'Price Linkages in Pacific Tuna Markets: Implications for the South Pacific Tuna Treat and the Western and Central Pacific Region (2006) 11 *Environment and Development Economics* 747.

Reports and author references – Barnes/Mfodwo

Agnew, D. J. and Barnes, C. T. (2004). Economic Aspects and Drivers of IUU Fishing in OECD (2004). Fish Piracy. Combating Illegal, Unreported and Unregulated Fishing. Paris: OECD.

Ardill, D. and Barnes, C. T. (2010). EU Regulations on IUU Fishing Policy and Practice with Reference to Tuna Processing in Mauritius. Report to MEXA.

Agathe, H. and Barnes, C. T. (2009/2010). Economic Valuation of the Coastal Zone in Flic en Flac, Mauritius. RECOMAP report to the Ministry of the Environment and National Development.

Athayde, T, 'Mission Report No 4: Madagascar' (Report No MRO03/RTTP/PTRO No.1, Regional Tuna Tagging Project Indian Ocean, 26 January to 3 February 2006).

Barnes, Colin, 'The Impact of Tuna and Tuna Like Species on the Economy: Country Report - Comoros' (Draft Report to Indian Ocean Commission and Marine Resources Assessment Group Ltd, March 2007).

Barnes, Colin, 'The Economic Impact of Tuna and Tuna Like Species on the Economy: Country Report - Madagascar' (Draft Report to Indian Ocean Commission and Marine Resources Assessment Group Ltd, June 2006).

Barnes, Colin, 'The Economic Impact of Tuna and Tuna Like Species on the Economy: Country Report - Mauritius' (Report to Indian Ocean Commission and Marine Resource Assessment Group Ltd, June 2006).

Barnes, Colin, 'The Economic Impact of Tuna and Tuna Like Species on the Economy: Country Report - Seychelles' (Draft Report to Indian Ocean Commission and Marine Resources Assessment Group Ltd, September 2006).

Campling, L., Mfodwo, K., and Barnes, C. T. (2009). Increasing the Net Benefits from Fisheries and Associated Sectors. Report to Seychelles Fisheries Authority and Government of Seychelles.

Barnes, C. T. (2009). Mauritius Seafood Hub. Issue No. 5 March, The Exporter. Mauritius

Export Association.

Barnes, C. T. (2008). Economic Valuation and Marine Protected Areas, Cu Lao Cham, Vietnam, Darwin College, University of Cambridge.

Barnes, C. and Campling, L. (2008). The Competitive Position of the Mauritius Seafood Hub, Present and Future Challenges, Development Options and Scenarios. Report to the Board of Investment, Commonwealth Secretariat.

Walmsley, S.F., Barnes, C.T., Payne, I.A., Howard, C.A. (2007) Comparative Study of the Impact of Fisheries Partnership Agreements.

Barnes, C. T., Ansell, N. and Ardill, D. (2006). The Political Economy of Tuna Exploitation in the Western Indian Ocean. Geopolitics and Resources. *International Institute for Fisheries Economics and Trade (IIFET)*, Conference at the University of Portsmouth.

Mfodwo, K. A new approach to maximize economic benefits from tuna resources - development of the concept – a report commissioned by the Forum Fisheries Agency, Honiara, Solomon Islands-November 2009 210 pp.

Mfodwo, K. *Increasing net benefits from Seychelles fisheries resources* - a report commissioned by the Seychelles Fishing Authority, May 2009 (with Campling L and Barnes, C). 320 pp.

Mfodwo, K. *Fairer Fishing?: The Impact on Developing Countries of the European Community Regulation on Illegal, Unreported and Unregulated Fisheries* (with Martin Tsamenyi, Mary Ann Palma, Ben Milligan) March 2009. 165 pp.



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