

Review of business feasibility of longline vessels operating out of the national waters of Palau

Maggie Skirtun, Forum Fisheries Agency

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Executive Summary

At the request of the Palau Bureau of Marine Resources, the Forum Fisheries Agency conducted an economic survey of the longline fishery operating inside the national waters of Palau in May 2017. The purpose of the survey is to provide an assessment of the business feasibility of the fleet under the proposed marine sanctuary, to be fully enforced by 2020. The information collected feeds into a larger body of work undertaken by the Forum Fisheries Agency and the Pacific Community, looking at the total impact of the proposed sanctuary.

Results from the business feasibility assessment suggest that longline vessels with the average cost structure as that surveyed will not be financially viable operating in the same manner as before once fishing is restricted to the proposed 20% zone and export is banned. If instead fishing operations is split between international waters and the 20% zone, then vessels can be financially viable. The most profitable scenario examined is purely operating on international waters. However, the result relies heavily on maintaining a high catch rate of 27.78kg/hhks all year round and in the long-run which is likely to be challenging, if possible at all. Moreover, it is not a necessary condition for vessels to be based in Palau to operate on international waters so they may choose to base elsewhere.

The analysis also looked at business feasibility under potential variations in economic conditions and found little variation. Boat business profit for vessels with base case operations became above breakeven under optimistic conditions, but only case 1 and case 3 operations remained fully viable as with average conditions. Financial viability of scenarios did not change under pessimistic conditions compared to average conditions, although case 3 was viable only at the marginal level. It is important to note that while the analysis looked at absolute financial viability of longline vessels to operate in Palau after the introduction of the marine sanctuary, it did not compare the potential profitability of being based and/or operating in other EEZs. Therefore, it is possible that even financially viable vessels may chose to leave Palau for more attractive opportunities in other EEZs.

¹ The author would like to thank the Palau fishing industry for their cooperation in providing financial profit and loss data for their fishing fleets, SPC for providing catch and effort logbook data, and the Palau Bureau of Marine Resources and the Nature Conservative for facilitating the process.

Background

In October 2015, the national congress of Palau approved the Palau National Marine Sanctuary Act which designates 80% of Palau's Exclusive Economic Zone (EEZ) as fully protected marine area. The area will be closed to all commercial fishing and other marine activities (e.g. oil drilling, deep sea mining). A four year transition period is set with the law being fully enforced in 2020. In addition, other restrictions have also been proposed. These are²:

- 1) All catch taken by licensed longline vessels operating in Palau, within Palau's EEZ or otherwise (e.g. high seas or other EEZs) must be landed at a port in Palau, and
- 2) Commercial export of any catch taken from within the 20% of the EEZ open to fishing will be prohibited.

There has been some discussion relating to permitting processed exports of tuna loins once they've been made available to the domestic market at the retail level, and the export price is no lower than the retail price charged domestically.

Concerns have been expressed as to the likely financial viability of longline vessels of other foreign flags fishing under the full set of the proposed restrictions, and if the restrictions are likely to lead to a total cessation of fishing throughout Palau's EEZ. The purpose of this paper is to provide an assessment of the business feasibility of the locally based foreign fleet currently operating in Palau under the proposed marine sanctuary and restrictions. The information presented feeds into a larger body of work undertaken by the Forum Fisheries Agency (FFA) and the Pacific Community (SPC), looking at the overall biological and economic impacts of the proposed sanctuary.

Financial performance – national waters of Palau

The average financial performance of longline vessels while operating inside the Palau's EEZ in recent years is presented in Table 1. These estimates reflect profit and loss statements collected for business activities relating to longline fishing in Palau's EEZ. Where boats have operated both inside and outside the Palau EEZ (i.e. other EEZs and international waters), cash receipts and costs were split to isolate only those related to fishing inside the Palau EEZ. Similarly, revenues and costs related to other business activities for vertically integrated companies, such as processing or fish trading activities, are also excluded from the financial performance measures.

The population of offshore longline vessels (excl. Japanese vessels not based in Palau) fishing more than 10 days per year was 55 in 2013, 42 in 2014 and 35 in 2015. The survey sample was 43 in 2013, and 40 in 2014 and 29 in 2015. This represents 78%, 95% and 83% of the population for 2013, 2014 and 2015 respectively. Financial performance results for the average vessel are weighted based on the catch of sampled vessels.

² Palau National Marine Sanctuary: transition period fishing regulations, Ministry of Natural Resources, Environment and Tourism. Noting that the first restriction currently applies for the period of time vessels are based and operating out of Palau, and does not appear in the transition regulations.

Table 1: financial performance for the average longline vessel while fishing in the national waters of Palau*

Nominal (in USD\$)	2015	2014	2013
Processing revenue			
Sales from fishing	311,324	454,075	388,622
Non-fishing receipts	0	0	0
Total cash receipts	311,324	454,075	388,622
Operating costs			
Admin	9,713	10,161	11,046
Bait	39,102	50,590	47,874
Crew costs	20,903	25,900	23,135
Equipment and gear	4,861	6,495	6,088
Food and stores	9,264	11,577	9,722
Fuel and oils	52,871	69,041	63,649
Freight and marketing	99,455	127,723	136,273
Leasing and rent	782	703	734
Insurance	1,319	1,279	1,073
Interest paid	0	0	0
Licence and levies	10,112	8,576	10,190
Packaging	17,245	22,743	23,899
Repairs and maintenance	11,820	14,107	14,623
Other costs	4,472	5,560	7,804
Total costs	281,919	354,454	356,110
Vessel profit			
Boat cash income	29,405	99,621	32,513
<i>less depreciation</i>	6,184	7,005	6,971
Boat business profit	23,221	92,616	25,541
<i>plus interest, leasing and rent</i>	782	703	734
Profit at full equity	24,003	93,319	26,276
Capital investment	37,916	50,232	60,729
Rate of return to capital ^a	24%	93%	26%
Sample size*	29	40	43
Population*	35	42	55

* excluding Japanese longline vessels, not based in Palau. Financial performance reflects **ONLY** fishing operations within the Palau EEZ and excludes profit and loss of fishing operations outside the national waters of Palau. **a.** Rate of return to capital calculated on the salvage value of capital, at US\$100,000 upon return of vessel to the Taiwanese government

The financial performance of the average longline vessel (excl. Japanese vessels not based in Palau) operating in the national waters of Palau fluctuated in the period examined, from 2013 to 2015. For 2013, cash income for the average vessel was estimated to be US\$32,513, or US\$25,541 after accounting for depreciation. Profit at full equity, a profit indicator that assumes all assets are fully owned by the operator (i.e. no interest or lease is paid under full ownership), was estimated at US\$26,276. This yielded a return to capital investment ratio of 26%, where the value of capital investment is evaluated at the salvage value of capital asset owned by the proprietor and employed in the fishing business for any given year. Given that it is understood that the

Taiwanese government will buy back Taiwanese flagged longline vessels for US\$100,000, this amount is taken to be the salvage value of the vessel. The results in Table 1 suggest that the average longline vessel has remained in the fishery because proprietors can generate more profit by doing so than by leaving and taking the US\$100,000 on offer and investing this elsewhere. However, the profits currently generated are unlikely to be sufficient to justify any significant new capital expenditure, such as the purchase of a new vessel or a major refit of their existing vessel. This means that, the profits currently earned are unlikely to be sufficient for proprietors to maintain their presence in the fishery in the longer term.

Financial performance for the average vessel improved considerably in 2014 relative to 2013, with boat cash income increasing to US\$99,621 and contributing to a boat business profit of US\$92,616, and a profit at full equity of US\$93,319. However, the situation worsened in 2015, with boat cash income and boat business profit falling to US\$29,405 and US\$23,221, respectively. This generated a profit at full equity of US\$24,003.

As the results are presented for the average vessel, there will be vessels making positive financial profits but also vessels generating large losses in each year. The financial performance indicator aims to capture the general picture for operating in the fishery. How representative the sample vessels are at epitomising the financial performance of the population can depend on the size of the operations (small, medium and large producers) and the business affiliations vessels have with downstream processors/exports. Therefore, care should be taken in interpreting the results.

Vessel prices and cost per hook

As part of the economic survey, ex-vessel prices for key target species were also collected from the sampled vessels (Table 2). For fresh export of bigeye into Japan, the price at market was US\$11,677 per mt in 2015 for the average longline vessel operating in Palau (excluding the Japanese fleet). The ex-vessel bigeye price – the price excluding cost of freight, packaging and commission – was US\$6,222 per mt in the same year. For fresh yellowfin exported into Japan, the price at market was US\$10,920 per mt for the average vessel in 2015, and the ex-vessel price was US\$5,509. This compares to the price of bigeye and yellowfin sold on the local market, which ranged from US\$4,294 to US\$5,104 per mt in 2015, for C and B grade products respectively.

However, it should be noted that while fresh yellowfin and bigeye are sold on the local market at the prescribed prices, the local demand for grade B and C tuna is limited. Anecdotal information from the companies surveyed suggests that the local market is close to full saturation, and at most can absorb only 5 mt of tuna products in total per month.

Table 2: fresh export and local prices for longline landed species (in nominal US\$) for 2013 to 2015*

Nominal (in US\$)	2015	2014	2013
Export price at market			
Bigeye	\$11,677	\$12,396	\$11,151
Yellowfin	\$10,920	\$11,140	\$10,449
Albacore	\$7,826	\$7,749	\$7,202
Other	\$7,826	\$7,749	\$7,202
Export price ex-vessel**			
Bigeye	\$6,222	\$7,267	\$5,465
Yellowfin	\$5,509	\$6,115	\$4,807
Albacore	\$2,458	\$3,107	\$1,725
Other	\$2,458	\$3,107	\$1,725
Local price at market (bigeye and yellowfin)			
B grade	\$5,104	\$5,116	\$5,178
C grade	\$4,294	\$4,298	\$4,314

* excluding Japanese longline vessels, not based in Palau

** excludes costs related to freight (incl. export taxes), packaging and commissions.

Cost per hook is calculated using the financial data reported in Table 1 and the weighted average number of hooks deployed per year from vessels surveyed (Table 3). Economic cost to proprietor is taken at the ex-vessel level – that is, it is calculated as total operating cost in Table 1 less freight and marketing; and packaging, but plus depreciation; and is inclusive an opportunity cost of capital of 10%, where capital value is set at the assumed salvage value of US\$100,000. The inclusion of an opportunity cost of capital of 10% reflects the assumed return that could have been attained by the proprietor had the money been invested in an industry or market of similar risks. Opportunity cost of labour of proprietors is not included under the assumption that a salary similar to working elsewhere for the proprietor is received. Economic cost at the fishery level is computed as the economic cost to proprietor excluding licence and levies costs found in Table 1. This is because licence fees and levies are simply a transfer of money between different parties within the fishery. From a societal perspective the cost of the labour utilised by the vessels should represent the opportunity cost of that labour to the Palau economy (that is, the value that the labour would be creating if it was available to other sectors of the economy). As there are no local crew hired aboard the average longline vessel, the opportunity cost of labour at the fishery level is also not included.

To the proprietor, the average annual ex-vessel economic cost of operating in the national waters of Palau over the period 2013 to 2015 was US\$205,102. This translates to a cost per hook of US\$1.30. At the fishery level, the cost per hook (i.e. economic cost to the fishery divided by the number of hooks set per year) for the average vessel is estimated to be US\$1.24 over the same period. An important thing to note is that the estimated cost per hook to the Palau economy of US\$1.24 presented in this paper is for the harvesting sector alone and does not take into consideration of benefits generated in the downstream marketing and exporting sector. There are also indirect benefits generated by the domestic fleet in upstream sectors. Upstream benefits include those generated through the provision of goods and services to vessel operators (e.g. slippage and maintenance services, the sale of food and rations, provision of live bait and so forth), where the economic cost of providing these goods and services are less than the purchase

price. These upstream and downstream benefits are examined in the accompanying report by the Forum Fisheries Agency and the Pacific Community, looking at the overall biological and economic impact of the proposed sanctuary.

Table 3: ex-vessel cost per hook calculations for the average longline vessel while fishing in the Palau EEZ*

Calculation breakdown (values in US\$)	2015	2014	2013	Average
Hooks per year	129,165	173,996	172,338	158,499
Hooks per day	1,389	1,392	1,402	1,395
Days fished per year	93	125	123	114
Catch per year (mt)	29	39	36	35
Catch rate (kg/hhks)	22.35	22.46	21.06	21.95
Economic cost per year to proprietor ^a	\$181,403	\$220,993	\$212,910	\$205,102
Cost per hook to proprietor ^a	\$1.40	\$1.27	\$1.24	\$1.30
- from fuel	\$0.41	\$0.40	\$0.37	\$0.39
- from labour	\$0.16	\$0.15	\$0.13	\$0.15
- from maintenance and gear	\$0.13	\$0.12	\$0.12	\$0.12
- from bait	\$0.30	\$0.29	\$0.28	\$0.29
- from other	\$0.40	\$0.32	\$0.33	\$0.35
Economic cost per year to fishery ^b	\$171,291	\$212,417	\$202,720	\$195,476
Cost per hook to fishery^b	\$1.33	\$1.22	\$1.18	\$1.24

Note: **a.** economic cost to the proprietor is taken at the ex-vessel level. That is, it is calculated as total operating cost in Table 1 *less* freight and marketing (incl. export taxes); and packaging, but *plus* depreciation; and an opportunity cost of capital of 10%. Opportunity cost of labour of proprietors/directors is not included under the assumption that a salary similar to working elsewhere for the proprietor is received. **b.** economic cost to fishery is computed as the economic cost to proprietor *excluding* licence and levies. Opportunity cost of labour is not included given that there are no local crew hired aboard the average longline vessel.

* excluding Japanese longline vessels, not based in Palau

Business feasibility under proposed marine sanctuary

As discussed in the background section of this paper, the proposed marine sanctuary will close 80% of Palau's EEZ to commercial fishing and other marine related activities. In addition, all catch taken by licensed longline vessels operating in Palau must be landed at a port in Palau, and commercial export of any catch taken from within the 20% of the EEZ open to fishing will be prohibited. The restriction for longline vessels operating in Palau to land all catch in a port in Palau is already applicable under current licensing conditions. However, the restriction under current licensing conditions does not extend to catch taken elsewhere when the longline vessel is not operating in Palau. Based on information provided by the companies surveyed, the average longline vessel surveyed only spend a portion of the year operating inside the Palau EEZ and its surrounding waters, with the rest of the time spent fishing in the domestic waters of Taiwan.

As there are no clear indication whether the first restriction under the proposed marine sanctuary – for all catch taken by licensed longline vessels operating in Palau to be landed at a port in Palau – applies to total annual catch taken by vessels or just all catch taken by vessels during the time they are based and operating out of Palau, the latter was assumed for the purpose of this analysis. Given that this restriction in itself does not create any additional burden on vessels, as vessels are already operating under such a restriction at the current time, only the restriction on export is examined alongside the 80% closure of Palau's EEZ in this business feasibility analysis.

Four scenarios of operation under the proposed marine sanctuary beyond 2020 are examined in this analysis. The scenarios and underlying assumptions for each are as follows:

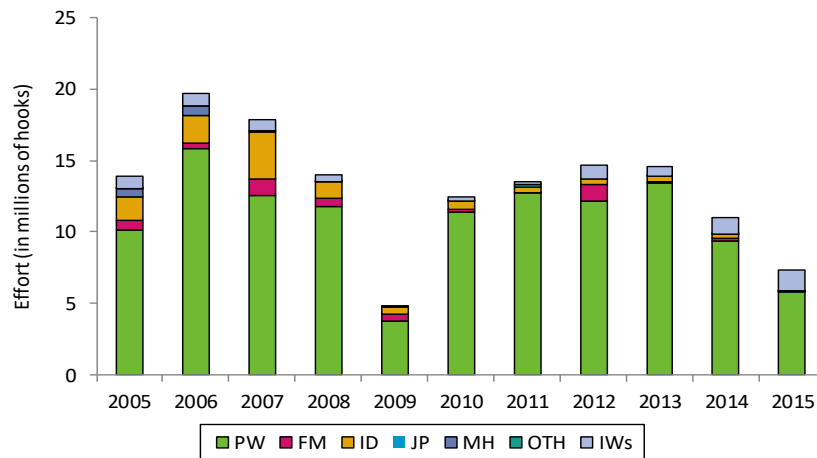
- i) Base case: vessels continue to fish in a similar manner as before but restrict fishing activities to the 20% zone instead of Palau's entire EEZ, and sell catch taken from the 20% zone as whole fish on the domestic market. Catch taken from international waters is permitted to be exported whole as in the past
 - a. It is assumed that fishers will spend 12% of effort fishing on international waters (i.e. the average for the period from 2013 to 2015, Figure 1) for the period they are based in Palau, and 88% of effort inside the proposed 20% zone
 - b. Total number of *fishing* days for the period vessels are based in Palau is 114, the average for the period from 2013 to 2015 (Table 3)
 - c. The average trip inside Palau's EEZ is made up of 8 days fishing and 4 days steaming, while the average trip to international waters is made up of 8 days fishing and 7 days steaming. That is, a total of 173 days at sea in Palau's EEZ and surrounding international waters
 - d. Nine crew members are assumed to be aboard the vessel on average, at a cost of US\$6,000 each per full operating year of 250 *fishing* days
 - e. Catch rates for inside the 20% zone and on international waters are adjusted proportionally using SPC logbook data (Table 4) and that reported by surveyed vessels (Table 3)³
 - f. The breakdown for bigeye and yellowfin export is 60% and 40%, respectively, at average Japanese market prices of US\$11,741 and US\$10,836 per mt⁴
 - g. A similar breakdown of 60% and 40% is applied to B and C grade tuna sold on the domestic market, at average local prices of US\$5,133 and US\$4,302 per mt
 - h. Cost of freight and marketing, and packaging are included only for the portion of fish taken from international waters and exported
 - i. Assumes the domestic market can absorb 100% of the 26 mt of whole tuna landed per vessel per year
- ii) Case 1: vessels fish only on international waters for the time vessels are based and operating out of Palau. Catch taken from international waters is permitted to be exported whole as in the past
 - a. It is assumed that fishers will spend 100% of effort fishing on international waters
 - b. Total number of fishing days is 114 and total number of days at sea is 210, calculated as 8 days fishing and 7 days steaming per trip
 - c. Catch rates on international waters are adjusted proportionally³
 - d. Breakdown of bigeye and yellowfin export (and prices) are that of the base case
 - e. Full cost of freight and marketing, and packaging are included

³ Proportional adjustments are made to catch rates for the remaining 88% of effort spent inside the proposed 20% zone. That is, the catch rates collected from the survey for the years 2013 to 2015 (22.35, 22.46 and 21.06) are divided by that reported in Table 4 (22.72, 24.7 and 22.8) and multiplied by the catch rate inside the 20% zone (21.83, 21.41 and 16.87). The average of the new proportionally adjusted rates is then used to estimate the expected catch for the average vessel inside the 20% zone. It is important to note that this calculation does not take into account changes in total effort for the fishery, i.e. it does not use a bio-economic model to estimate potential changes in catch rates from increased density of effort inside the proposed zone or potential reduction in effort as vessels exit.

⁴ The breakdown of bigeye and yellowfin export of 60% and 40% reflect the average of that exported in the period from 2013 to 2015, and is also consistent with the average catch composition under the 4 scenarios examined in accompanying 'Review of biological and economic impacts of the proposed sanctuary' report, Tables A1 to A4 of the Appendix.

- iii) Case 2: same fishing operations as the base case scenario, but catch taken inside the 20% zone is loined and permitted for export at retail prices after local market is supplied and domestic consumption is met. Catch taken on international waters is permitted for whole export as in the past
 - a. A loin recovery rate of 50% is assumed for catch taken inside the 20% zone (i.e. 50% of total landed weight is recovered as loins)
 - b. The breakdown of 90% loin and 10% belly is applied to loins recovered for the proportion of catch taken inside the 20% zone, at prices of US\$6.96 and US\$4.95 per lb, respectively
 - c. Cost of freight and marketing for catch taken inside the 20% zone is half of the average cost as only 50% of the weight is recovered as loins. Catch taken on international waters is subject to the average freight and marketing cost
 - d. Cost of packaging is 50% more than the average of 2013 to 2015 to reflect higher costs of processing and packaging the loins individually
 - e. Assumes there is sufficient demand on both the domestic and international market for loins at the prescribed prices
- iv) Case 3: a mix of the base case and cases 1 and 2, with fishing operations divided 50/50 on international waters and in the 20% zone. Half of the catch taken inside the 20% zone is sold whole on the domestic market and the other half loined and permitted for export at retail prices after local market is supplied and domestic consumption is met. Catch taken on international waters is permitted for whole export as in the past
 - a. It is assumed that fishers will spend 50% of effort fishing on international waters and 50% of effort inside the proposed 20% zone
 - b. Total number of fishing days is 114 and a total of 189 days at sea
 - c. Costs of freight and marketing, and packaging are adjusted to reflect exporting all catch taken on international waters whole, and half the catch taken within the 20% zone as loins. No freight and marketing or packaging cost is assigned for the 50% of catch taken in zone that is sold whole on the domestic market
 - d. Assumes sufficient demand for whole fish domestically, and loined fish on both the domestic and international market at the prescribed prices

Figure 1: annual effort expended within Palau and surrounding waters for longline vessels operating in Palau



Note: given that data for catch and effort inside Taiwan or China's EEZ for vessels operating in Palau is not available, and the existence of significant gaps in operational data for non-members of SPC (e.g. Indonesia and Philippines), the data presented more or less reflects the effort expended inside the Palau EEZ and its surrounding waters by longline vessels for the portion of time spent operating in Palau, where provision of logbook data are required as part of vessel licensing conditions

Table 4: catch rates (kilograms per 100 hooks) for national waters of Palau and surrounding areas

Year	Palau all	Inside 20% zone	Outside 20% zone	FSM	Indonesia	Other	IW
2005	28.13	27.11	28.59	23.53	33.03	21.90	25.60
2006	30.39	31.37	30.00	22.25	30.86	18.59	28.10
2007	27.86	26.23	28.30	42.27	27.37	24.69	26.78
2008	33.39	26.99	35.64	19.20	34.53	25.68	35.38
2009	35.03	22.89	39.24	26.98	36.52	14.42	27.75
2010	23.82	15.01	24.72	26.81	24.09	15.86	23.70
2011	23.55	22.07	24.16	37.84	23.84	20.07	18.73
2012	27.36	26.55	27.73	31.12	29.96	NA	34.87
2013	22.72	21.83	23.01	26.96	26.62	16.48	25.75
2014	24.70	21.41	26.38	36.25	27.24	63.54	31.07
2015	22.80	16.87	24.38	34.81	35.08	16.28	26.52

The business feasibility of the average vessel for the time they are based in Palau under the base case is negative US\$31,538 in terms of boat business profit (Table 5) or a US\$30,798 loss at full equity. This suggests that it is not financially viable for the average longline vessel, with the same cost and revenue structure as that surveyed, to operate in a similar manner as before under the proposed marine sanctuary beyond 2020. The key driver of this result is the low prices received for tuna on the domestic market. As pointed out earlier, this result assumes that the local market can absorb 100% of the 26 mt of tuna landed per vessel per year. The current volume sold to the domestic market is around 5 mt per month or 60 mt per year. Based on industry feedback, the current volume sold on the domestic market is at full saturation. This implies that a maximum of three vessels could be accommodated under the base case scenario, which is unlikely to support any financially viable downstream onshore processing or trading sector.

For case 1, the average longline vessel for the period based out of Palau is expected to generate a boat business profit of US\$140,122 or US\$140,862 at full equity. The key determinant of this optimistic outlook is the proportionally adjusted average catch rate of 27.78kg per hundred hooks (Table 5). It is often the case that operators will chase the fish where it swims such that the high catch rate of 27.78kg/hhks in international waters is unlikely to be sustained for every trip in every month. Moreover, this catch rate does take into account changes in total effort on international waters. That is, no bio-economic model was used to estimate potential changes in catch rate from increased density of effort on international waters post the introduction of the marine sanctuary.

Boat business profit for the average longline vessel operating out of Palau under case 2 is estimated at negative US\$44,618 or a US\$43,878 loss at full equity. The main factor underpinning this result is the high cost of processing, packaging and exporting relative to the price received for loins on the domestic and international market. The analysis does not consider or explore the demanded volume of loins locally or internationally. It may be harder to sell loins compared to whole fish as the Japanese auction market is predominantly a market for whole fish.

Table 5: business feasibility scenarios for the average longline vessel operating out of Palau beyond 2020*

Nominal (in US\$)	Base case	Case 1 (fish IW)	Case 2 (export loins)	Case 3 (mixed)
Processing revenue				
Sales from fishing	186,216	500,885	255,830	341,873
Government rebates (e.g. fuel)	0	0	0	0
Total cash receipts	186,216	500,885	255,830	341,873
Operating costs				
Admin	10,307	10,307	10,307	10,307
Bait @ \$0.28 per bait	44,366	44,366	44,366	44,366
Crew costs (9 @ \$6,000 per year)	24,542	24,542	24,542	24,542
Equipment and gear	5,815	5,815	5,815	5,815
Food and stores	10,188	12,735	10,188	11,461
Fuel and oils (@ \$2.90 per gallon)	71,299	92,408	71,299	80,414
Freight and marketing	14,538	121,150	67,844.08	75,719
Leasing and rent	740	740	740	740
Insurance	1,224	1,224	1,224	1,224
Interest paid	0	0	0	0
Licence and levies (@ \$60 per day)	5,999	0	5,999	3,409
Packaging	2,555	21,296	31,944	18,634
Repairs and maintenance	13,517	13,517	13,517	13,517
Other costs	5,945	5,945	5,945	5,945
Total costs	191,880	211,034	354,043	296,092
Vessel profit				
Boat cash income	(24,818)	146,842	(37,898)	45,781
less depreciation	6,720	6,720	6,720	6,720
Boat business profit	(31,538)	140,122	(44,618)	39,061
plus interest, leasing and rent	740	740	740	740
Profit at full equity	(30,798)	140,862	(43,878)	39,801
Average hooks per day (2013-2015)	1,395	1,395	1,395	1,395
Average days based in PW (2013-2015)	114	114	114	114
Average days at sea	173	210	173	189
Effort on IW (expressed in hooks)	19,014	158,451	19,014	79,225
Effort in 20% zone (in hooks)	139,437	0	139,437	79,225
Catch on IW @ 27.78kg per hhks (in kg)	5,282	44,018	5,282	22,009
Catch in 20% zone @ 18.84kg per hhks (in kg)	26,270	0	26,270	14,926
Gallons per trip (8 days fishing and 4 days steaming for inside 20% and 7 days for IW)	1,756	2,276	1,756	1,981

* excluding Japanese longline vessels, not based in Palau. Business feasibility reflect **ONLY** fishing operations for the time vessels are based in Palau and exclude profit and loss of fishing operations for time based elsewhere.

Lastly, given the uncertainty that surrounds maintaining a catch rate of 27.78kg/hhks for fishing on international waters under case 1 and the ample demand assumed to meet 100% of the loined products in case 2, case 3 offers a scenario that is somewhere in between. The results for this scenario suggest that the average longline vessel for the period operating out of Palau will be financially viable, with a boat business profit of US\$39,061 or a US\$39,801 profit at full equity.

It is important to note that while the profit levels under case 3 is only 17% less than the average financial performance reported in Table 1 for period from 2013 to 2015, the average financial performance is reflective of fishing activities inside the Palau EEZ only. Under the proposed marine sanctuary, operating purely inside the 20% zone alone is not financially feasible. In addition, the results are provided at the average level. Therefore, it is likely that only some vessels will be financially viable while others will be forced to exit. Further discussion and an assessment of the full economic impact of the proposed marine sanctuary is provided in the accompanying biological and economic impact report, jointly prepared by FFA and SPC.

Sensitivity analysis

The results in Table 5 assumes average economic conditions as that prevailed in the period from 2013 to 2015 will continue. As conditions vary, business feasibility of vessels will change. Table 6 summarises the cost implications and financial viability of vessels under different economic conditions:

- a. average (2013-2015): fuel and fish prices are equal to the average in 2013 to 2015
- b. optimistic: fuel price is 10% lower and fish prices are 10% higher
- c. pessimistic: fuel price is 10% higher and fish prices are 10% lower

Sensitivity results showed little variation across the different economic conditions. While financial viability of vessels with base case operations increases to marginally above breakeven under optimistic economic conditions, only vessels with operation structure as per case 1 and case 3 remain fully viable. Financial viability of scenarios remain unchanged under pessimistic economic conditions compared to average conditions, although case 3 becomes viable only at the marginal level. Again, it is important to note the high profitability of case 1 relies heavily on a maintained catch rate of 27.78kg/hhks, which may not be possible to sustain during the whole year as fish moves from area to area, or in the long-run if all vessels are forced to operate on the high seas and competing to deplete the stock. Furthermore, it is not a necessary condition for vessels to be based in Palau to operate on international waters. For example, a vessel could potentially generate the same returns, or higher, being based in the Federated States of Micronesia. It is apparent, when comparing the ex-vessel cost per hook to proprietor in Tables 3 and 6, that under average conditions the cost per hook for all scenarios is considerably higher under the marine sanctuary than the US\$1.30 for the average fresh longline operation previously, which may reflect that of operating in other EEZs.

Table 6: Sensitivity analysis under different economic conditions

Economic conditions		Base case	Case 1 (fish IW)	Case 2 (export loins)	Case 3 (mixed)
Average (2013-2015)	Total cost	211,034	354,043	293,729	296,092
	Cost per hook to proprietor	1.33	1.44	1.33	1.38
	Boat business profit	(31,538)	140,122	(44,618)	39,061
Optimistic	Total cost	203,904	344,803	286,599	288,050
	Cost per hook to proprietor	1.28	1.38	1.28	1.33
	Boat business profit	934	206,171	(5,185)	88,010
Pessimistic	Total cost	218,164	363,284	300,859	304,133
	Cost per hook to proprietor	1.37	1.50	1.37	1.43
	Boat business profit	(50,569)	87,513	(70,611)	3,553

Note: cost per hook to the proprietor is taken at the ex-vessel level. That is, it is calculated as total operating cost in Table 5 less freight and marketing; and packaging, but plus depreciation; and an opportunity cost of capital of 10%. Opportunity cost of labour of proprietors/directors is not included under the assumption that a salary similar to working elsewhere for the proprietor is received.

Conclusion

The purpose of this paper was to examine the current financial performance of vessels fishing in the national waters of Palau in recent years, and to provide an assessment of business feasibility or projected financial performance under the proposed marine sanctuary. The results of the analysis are discussed under four scenarios. The more realistic scenario, case 3, is a mixed approach combining fishing on international waters for which catches are exempt from export restrictions, and fishing inside the proposed 20% zone and splitting the sale of catch between whole fish on the domestic market and loins exported only at the retail level. The result for case 3 suggest that operators can be financially viable for the period they are based in Palau.

While the scenario in which vessels operated purely on international waters is expected to generate much greater profits, the results for this relies on the assumption of maintaining a catch rate of 27.78kg/hhks. This unlikely to be possible for the entire year as fish moves, or in the long-run if all vessels are forced to operate on the high seas and competing to deplete the stock. In addition, it is not a necessary condition for vessels to be based in Palau to operate on international waters so they may choose to base elsewhere.

The analysis looked at potential variations in economic conditions but did not consider the potential profit that could be earned operating in other EEZs. While the average vessel taking a mixed approach may be financially viable under average economic conditions, more attractive opportunities in other EEZs may draw vessels to leave Palau in pursuit of higher profits. This is especially the case for the profitable scenario of operating purely on international waters. A vessel could potentially generate the same returns, or more, being based in the Federated States of Micronesia. When comparing the ex-vessel cost per hook to proprietor currently and under the proposed marine sanctuary, it is evident that the cost per hook for all scenarios under average conditions is considerably higher with the introduction of the sanctuary. Lastly, it is important to note that the results are provided at the average level, and it is more than likely that only some vessels will be financially viable while others will be forced to exit in any case.