Analyzing the economic impacts of the 2015 ELAPS closure

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Abstract

Our study evaluated the economic impacts of the 2015 Effort Limit Area for Purse Seine (ELAPS) closure to purse seine vessels, canneries and vessel support facilities in American Samoa. Using data from a variety of sources, we estimated cumulative losses in 2015 as compared to two average recent time periods (2012-2014, 2013-2014). These losses were largely attributed to a steep rise in access fees and declines in ex-vessel fish prices. We adjusted fees and prices of the two counterfactual periods with the 2015 values, and the results suggested the ELAPS closure had an incremental (yet smaller) adverse impact on profitability. The estimated economic losses due to the ELAPS closure ranged from $11 to $110 million depending on the counterfactual period considered. Our results were robust to changes in profits and market conditions for vessel, cannery and vessel support operations. Our model was most sensitive to changes affecting vessels, as that portion of the model was most well-informed, but overall model results were fairly consistent, even though the cannery and vessel support portions lacked good profit and cost information, respectively. Changes in access to fishing areas, rising fishing access costs and El Niño, likely increased the value of the ELAPS for vessels in 2015. Under an assumption that the first two conditions continue in the future, it is likely that the ELAPS will continue to be important for the U.S. fleet. The ELAPS closure did induce some shift in fishing effort, to the Eastern Pacific as well as an increase in offloadings in Mexico, and this transfer of catch and effort represented lost opportunities for the canneries and vessel support sectors in American Samoa. We also conducted an economic analysis that used the opportunity cost of labor rather than market wages and removed any transfer payments, such as fuel taxes, and found the same result of losses.

Introduction

In 2008, continued concerns over the stock of bigeye tuna led the Western and Central Pacific Fisheries Commission (WCPFC) to adopt conservation and management measure (CMM) 2008-01, which required members, cooperating non-members, and participating territories to *inter alia*, constrain their fishing effort for and catch of bigeye and yellowfin tuna. As a member of the WCPFC, the United States of America implemented these provisions, and provisions in subsequently related CMMs (2011-01, 2012-01, 2013-01 and 2014-01) through regulation. Beginning in 2009, the National Marine Fisheries Service (NMFS) established a fishing day limit for its purse seine fleet operating in the U.S. EEZ as well as on the high seas areas within the convention area between the latitudes of 20°N and 20°S, an area referred to in U.S. regulations as the Effort Limit Area for Purse Seine (ELAPS) (74 FR 38544) (Figure 1). The ELAPS limits for the fleet were 2,588 fishing days per year from 2009-2013, and were 1,828 fishing days per year from 2014-2015 due to reductions agreed to in CMMs 2013-01 and 2014-01. The fleet expended fewer days in the ELAPS than the limits in 2009-2014, but met its limit in 2015[1], and the ELAPS was closed to fishing from June 15 – December 31, 2015.

Prior to the publication of the interim final rule establishing the ELAPS fishing day limit for 2015, NMFS received a petition from Tri Marine Management Company, Inc. (May 12, 2015), that 1) requested NOAA Fisheries to undertake an emergency rulemaking with respect to the 2015 ELAPS limit and 2) requested that NOAA Fisheries exempt from that high seas limit any U.S. flagged purse seine vessel that declares that it would deliver at least 50% of its catch to tuna processing facilities in American Samoa.

[1] And actually exceeded it by 52 fishing days in part based on the sensitivity of the monitoring system implemented to monitor fishing activities at sea.

On October 23, 2015, NMFS denied the petition, but acknowledged that some of the issues raised in the petition warranted further examination and announced that the agency intended to examine how the closure impacted the economy of American Samoa, as well as evaluate the connectivity between U.S. purse seine vessels and the economy of American Samoa.

NMFS initiated this analysis to gain a better understanding of the economic impacts of the ELAPS closure to vessels, processing facilities, vessel support sectors and the broader American Samoa economy. The goals of this study were to analyze the financial and economic impacts of the closure in order to look at impacts to the American Samoa economy as well as to identify linkages between fishing activity and the broader American Samoa economy to evaluate connectivity.

Data and Methods

NMFS staff visited American Samoa in October 2015, and met with representatives from vessel operators, canneries, vessel support companies, and members of the American Samoa Tuna Task Force. NMFS requested cost and earnings information from vessel management companies, canneries and several vessel support companies in Pago Pago to inform its financial and economic analysis. The financial analysis examined the impacts to individual companies while the economic analysis examined the impacts to the larger economy. NMFS received general cost and earnings information from an independent consultant who recently worked with the Parties to the Nauru Agreement Office in Majuro Republic of the Marshall Islands. Additionally, three vessel management companies (representing 70% of the fleet's vessels) provided cost/earnings data to evaluate the estimates. Each vessel management company responded with average estimates of their costs and earnings in 2014 and/or 2015. NMFS compiled information on catch and effort by individual vessels from logbook data. NMFS staff also met with StarKist and Samoa Tuna Processors (STP), and both canneries provided general employment numbers, as well as unloading estimates from domestic and foreign caught purse seine vessels from 2015. One cannery provided general cost information, however, the other cannery did not provide any cost data citing confidentiality concerns. Neither cannery provided any information on profits or markups for products produced at their facilities. We also summarized data from NMFS tuna tracking program to better understand processing volumes from 2011-2015 of domestic and foreign purse seine caught tuna. NMFS staff met with owners of 3 vessel support companies, and received general profit information from one firm, and general cost and profit information from a second firm. Additionally, NMFS received data for 2011-2015 on port visits to Pago from the American Samoa Port Authority, fuel rates from Clipper Oil, electricity and water rates from American Samoa Power Authority, and average monthly Bangkok fish prices from the Forum Fisheries Agency. The American Samoa Department of Commerce also provided insight on widely accepted economic multipliers.

We created two cash flow analyses that included vessels, canneries and vessel support companies (Appendix A). The “private” cash flow analysis, which used observed market prices and included transfer payments such as taxes, measured profits directly as firms see them. The “economic” cash flow analysis, which used the opportunity cost of labor for vessels and canners and excluded transfer payments such as taxes, measured producer benefits to American Samoa and vessels from the perspective of the economy. This second analysis, which corresponds to an economic cost-benefit analysis, gave the same qualitative results as the “private” analysis albeit with different numerical values. Because the results are the same for both the private and economic cash flow analyses, we limit our discussion to the private analysis in the balance of this report.

The vessel section included cash flows for each of the three companies that provided input, and was estimated on an average vessel basis where catch, cost and profit information were generated for an average vessel for each of those companies. Costs categories included fuel, wages and salary, monitoring control surveillance (MCS), transshipment levies and observer costs, access fees and other fees (including other costs, helicopter, port expenses, operating supplies and gear and repairs other than drydock). This study focused on variable costs (i.e. operating costs that exclude fixed costs such as capital) because we wanted to calculate the difference between scenarios and did not include capital servicing and other relevant fixed costs because they would net out when comparing the "with" ELAPS scenario and the "without" ELAPS scenario. Access fees were considered "quasi-fixed" and were included in the analyses, as they could change from year to year, but were assumed to be relatively fixed for a single calendar year. For vessel revenues, we estimated average total catch of all species, catch of skipjack and a combined bigeye and yellowfin, and then used the average Bangkok price for those species minus $150- ~$250 per ton to account for price adjustments due to delivery to American Samoa and to transshipment vessels, respectively (personal communications with TriMarine, SPTC and Sardinha and Cileu). We then calculated the variable profit (loss) per vessel (i.e. total revenue less variable costs, and excluding fixed costs, notably capital), and divided by the average tonnage to find the variable profit per ton. We then calculated the percent of tonnage that each company contributing to our analysis represented, and multiplied to weightings by the variable profit per ton to arrive at a weighted average total profit (loss) per ton. The total tonnage for the time period in question was then multiplied by the weighted average to arrive at the total vessel profit for that time period.

For the canneries, NMFS had very limited information on costs and no information on profits. NMFS used the general cost information from the one cannery and assumed that this cost information was similar for the second cannery. Cost categories included fish, labor, electricity, fuel, water, supplies, packaging, broth and filler lease. Based on information provided by STP, NMFS assumed a recovery of tuna for each ton of tuna unloaded. NMFS also assumed that revenues were a 20% markup over cost. For the vessel support companies, NMFS compiled information on profits per year on a per trip basis. Total variable profit for the vessels, canneries and vessel support companies were combined by calculating annual profit (loss) to determine an overall variable profit (loss) for all the sectors. This compilation was done in order to ensure confidentiality --particularly in the cannery and vessel support sectors.

NMFS evaluated 2015, and two recent average time periods, the average of 2012-2014 and the average of 2013-2014 (evaluated at 2015 prices). These two average periods served as the counterfactual of what would have happened without the ELAPS closure. Multiple counterfactuals were evaluated due to the uncertainty of what would have occurred without the ELAPS closure. The counterfactual models were first run using historical data, and then standardized for 2015 prices for fish, fuel, electricity, water and access to eliminate impacts due to changes in prices during those time periods. The differences between the total profit were calculated between 2015 and the two counterfactual time periods evaluated, giving the "with" and the "without" ELAPS. NMFS also assessed the impacts of the significant reduction of Kiribati days to the U.S. fleet in 2015 by calculating catch per fishing day, and substituting average catch attributed to Kiribati in those time periods to what average catch might have been if they had fished in other areas. We also evaluated the model's sensitivity to fluctuations in price of fish, fuel, electricity and water as well as fluctuations in the proportion of tuna recovered during processing and cannery profit margin and number of trips landing in Pago Pago using

Oracle Crystal Ball and running 10,000 simulations per scenario for this risk analysis. We used triangular distributions to bound the sensitivity of most of the factors except for the price of fish, amount of fish caught, proportion of fish recovered during processing and cannery profit where we assumed a range of ±20%.

Results

Tuna landings by the U.S. purse seine fleet have fluctuated from 60,000 mt to 300,000 mt per year, with catch levels largely following the number of vessels and levels of effort from 1988-2015 (Figures 2 and 3). U.S. vessels have continuously fished in the Western and Central Pacific Ocean since before the inception of the South Pacific Tuna Treaty, a multilateral treaty, allowing U.S. vessels the opportunity to fish in the exclusive economic zones of sixteen Pacific Island countries. In recent years, overall catch and effort were some of the highest on record, with the highest levels of catch and effort in the fleet's Treaty associated history occurring in 2014.

On average, 23% of the catch and effort in any given year comes from the ELAPS area and has ranged substantially-- from 3%-44% of catch and 5-32% of effort. From 2010-2014, catch and effort in the ELAPS area was lower than the historical average, but was higher than the historical average in 2015. Figure 4 depicts the catch by month in the ELAPS area from 2012-2015. The fleet caught in excess of than 60,000 mt in the ELAPS area in 1994, 1997-1998 and 2015.

Prices for key input factors of electricity, water, fuel, fish and access from 2012-2015 are shown in Figures 5-7. Electricity and water prices in American Samoa were relatively flat from 2012-2014, with water prices increasing and then decreasing in 2015, and electricity prices in 2015, declined slightly. Skipjack prices in Bangkok declined significantly from 2012-2015, and in 2015 were less than half the price of the highs in mid-2012. Fuel prices in American Samoa declined slightly from 2012-2014, and then declined more sharply in 2015. Access fees rose sharply from 2012-2015 with prices for treaty access in 2015 at more than 10 times the price of treaty access in 2012.

Tuna offloading and transshipments in American Samoa increased in recent years, and the number of trips by domestic purse seine vessels into American Samoa was high in 2014, and dropped in 2015 after the ELAPS closure, but on the whole was not dissimilar to the numbers of trips into American Samoa in the four previous years. Overall port visits of foreign and domestic purse seine vessels as well as transshipment vessels into American Samoa also fluctuated over time, and dropped in 2015 (Figure 8).

Using historical data, vessels, processors, and vessel supply companies combined show some profits in the two counterfactual periods, while as a group suffered a loss in 2015. The difference in total variable profits between 2015 and the 2012-2014 was a loss of almost $2.4 billion and the difference in total variable profit between 2015 and 2013-2014 was a loss of $2 billion (Table 1).

Using 2015 values for price and access fees, there were losses in 2015 in comparison to both counterfactual periods (loss of $11 million in comparison to 2012-2014, and a loss of $111 million in comparison to 2013-2014) suggesting that the loss in 2015 worsened because of the ELAPS closure.

Sensitivity analyses showed that total variable profit, the output of our model, was most sensitive to changes in fish price and fish catch. Decreasing fish price by 10% produced gains in 2015 relative to the average of 2012-2014, but not 2013-2014. Increasing the fish catch in 2015 also

produced gains in 2015 relative to the two counterfactual periods, but decreasing the fish catch in 2015 produced losses. Fluctuations in processor markup and substituting for Kiribati access still resulted in losses in comparison to 2015 though there were variations in the magnitude of those differences.

Discussion

Our analysis suggests that the U.S. vessels, canneries and support sectors, as a whole, suffered losses in 2015 in comparison to the recent average annual periods of 2012-2014 and 2013-2014. In reviewing historical values, this loss was primarily driven by increases in vessel access fees for fishing days, and declines in fish prices. After accounting for fee and price differences between the time periods by using 2015 values for fees and prices, the model continued to show losses between 2015 and the two counterfactual periods.

Our model was most sensitive to changes affecting vessels, and this was not surprising given that the vessel portion of the cash-flow analysis was the most well-informed (data from both internal and external data sources), contained both cost and profit information for vessels, and vessel profits/losses contributed to over 50% of the total variable profit. Although the model was most sensitive to changes affecting vessel costs and profits, our sensitivity analysis showed that losses occurred under almost all scenarios except where fish price for 2015 was adjusted to be 10% lower or where fish catch in 2015 had been higher suggesting that results were fairly consistent even if conditions had been slightly different than what was assumed.

Access fees for fishing areas in the Western and Central Pacific Ocean net out in our counterfactual scenarios because they were adjusted to 2015 values, but changes in access in recent years played a role in elevating the importance of the ELAPS for fishing in 2015. For the first 25 years of the treaty (from 1988-mid-2013), access to fish in the South Pacific Tuna Treaty area was generally unrestricted after license fees were paid and licenses were issued. Beginning in June 2013, however, fishing access also required the purchase of fishing days, and were divided into days in PNA and non-PNA day zones. Although fishing access fees increased, the fleet purchased more days than were used, and effort in the ELAPS area was relatively stable in 2013-2014. In 2015, however, two events occurred that increased interest in fishing in the ELAPS area. First, fishing access in Kiribati was restricted to 300 fishing days, a marked reduction as the fleet had historically fished 3,000-4,000 days in the Kiribati EEZ, and secondly, a strong El Niño began, which led to an eastward shift of fish (Lehodey et al. 1997). As vessels had very limited fishing opportunities in the Kiribati EEZ, U.S. vessels as well as other flagged vessels—including PIP flagged vessels, fished much more intensively in the high seas areas around Kiribati. We attempted to address the significant reduction in fishing opportunities in Kiribati waters by substituting the average catch per fishing day in Kiribati with the average catch per fishing day with other areas in the counterfactual periods, and found minimal difference because the average catches per fishing day inside Kiribati (31.3 mt/fishing day and 31.02 mt/fishing day, in 2012-2014 and 2013-2014, respectively) and outside Kiribati were not fundamentally different (31.66 mt/fishing day and 33.27 mt/fishing day, in 2012-2014 and 2013-2014, respectively). This approach did not account for any changes in fishing costs, such as fuel usage, or price received, such as due to timing of landing, or other factors that could have impacted variable profits fishing inside or outside of Kiribati. We were not able to address the changes in fishing distribution from El Niño, but believe that its presence also raised the importance of the ELAPS area as fishing grounds in 2015.

After the ELAPS closure, some U.S. Treaty-licensed vessels chose to fish in the Eastern Pacific, and seven trips were eventually unloaded in Mexico. Prior to the ELAPS closure in 2015, only one vessel had fished in the Eastern Pacific that year and none had unloaded in an Eastern Pacific port. Global skipjack markets are linked such that it is unlikely that differences in regional fish prices would have alone resulted in vessels offloading in the Eastern Pacific versus the Western Pacific (Jeon et al. 2008). If the ELAPS area remained open in 2015, it is likely that many if not all of these U.S. vessels that fished in and unloaded in the Eastern Pacific would have remained in the Western and Central Pacific and offloaded their catch in American Samoa. Thus, the closure impacted where a portion of the fleet decided to fish in 2015, and this shift to fishing and offloading in the east likely resulted in lost opportunities for the canneries and vessel support industries from this fish not being brought into Pago Pago. We were unable to account for this impact on American Samoa in our analysis.

In terms of data, the cannery and vessel support portions of our cash flow analyses were less informed than the vessel portion, and may be less robust than the vessel portion. In particular, the lack of profit information complicates evaluating whether any changes in unloadings have resulted in benefits or losses over time. Although domestic purse seine caught tuna represent the majority of fish processed at the canneries, both canneries can also purchase fish from foreign vessels and transshipment carriers. If the U.S. fleet were to decline, the canneries could potentially purchase fish from other vessels. The canneries also purchase and process fish from domestic and foreign longline boats and that inflow of fish was not accounted for in our model because we believed that that was separate from the impacts of the ELAPS closure. We did test for model sensitivity to fish price, profit markups and fish flow. Besides the previously mentioned gain seen when fish price was adjusted to be 90% of the 2015 value, we did not see any directional differences in losses (negative variable profit), suggesting that our model was not very sensitive to changes impacting the canneries from the ELAPS closure and from uncertainty over our assumed profit mark-ups.

Canneries rely on a steady inflow of tuna, and both canneries have limited storage capabilities. StarKist, in particular, has enough storage to cover 10 days of tuna for processing and interruptions to supply can result in decreased production. As STP began producing purse seine caught tuna in 2015, the presence of two canneries raised the importance of securing adequate fish supply to feed into their production lines. Both canneries were concerned over the closure of the ELAPS, and there were some reports of fish shortages at StarKist in August 2015. However we are not aware of any direct reductions in production from the ELAPS closure. As mentioned above, some vessels chose to fish and offload their catch in the Eastern Pacific, and this certainly represents lost opportunities for the canneries as this fish could have been offloaded in American Samoa had there not been a closure.

The number of port visits to Pago Pago by purse seine vessels was high during 2014 and through the middle of 2015 in comparison to the previous three years with port visits declining during the latter portion of 2015. Although the number of port visits does not necessarily represent the number of unloadings to the canneries or transshipment vessels as vessels may visit port mid-trip for various reasons and not unload, these numbers likely serve as a proxy for activity. Though the number of port visits by purse seine vessels declined after the ELAPS closure, vessels continued to visit Pago Pago. This

result suggests that the inflow of fish may have been dampened, but in no way substantially hindered, due to the closure.[2]

The flow of vessels into Pago Pago affects not only the canneries, but also the vessel support sectors, since they service and supply vessels while in port. As we only had limited profit and cost information, it is difficult to discern how the ELAPS closure affected their businesses financially. These industries are dependent on vessels visiting American Samoa, and again, the offloading of vessels in the Eastern Pacific at the end of 2015, represents lost opportunity for those businesses.

Conclusions

The closure of the ELAPS in 2015 resulted in overall losses to the combined sectors of vessels, canneries and vessel support companies in comparison to the two counterfactual periods. These results suggest that there were impacts from the closure on the American Samoa economy and a connection between U.S. purse seine vessels and the broader American Samoa economy. Our model showed consistent and robust results despite having limited information for the cannery and vessel support sectors. The results were most sensitive to changes affecting the vessel portion, which was the most well-informed portion of the model and accounted for over 50% of the total variable profit. The importance of the ELAPS for U.S. vessels grew in 2015, due to access and climactic reasons, and we attempted to evaluate the impacts of limited access to Kiribati, but were unable to tease out the impacts of El Niño. As lack of access to Kiribati and rising access costs are likely to continue for the U.S. fleet in the near future, this will continue to make the ELAPS important for the U.S. fleet. The ELAPS closure did result in some vessels shifting their effort eastward, and offloading in the Eastern Pacific, which suggests that there were lost opportunities for the canneries, vessel support sectors and the broader American Samoa economy from the ELAPS closure.

Acknowledgements

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[2] The increase in the number of port visits towards the end of 2015 may also be a result of the expiration of treaty licenses at the end of the calendar year, and most vessels had to return to port unless they had options to fish in the Eastern Pacific in early 2016.

Figure 1. The Effort Limits Area for Purse Seine (ELAPS) is the high seas area and the U.S. exclusive economic zone between 20° N and 20° S within the Western and Central Pacific Fisheries Commission Convention Area (diagonal stripes)

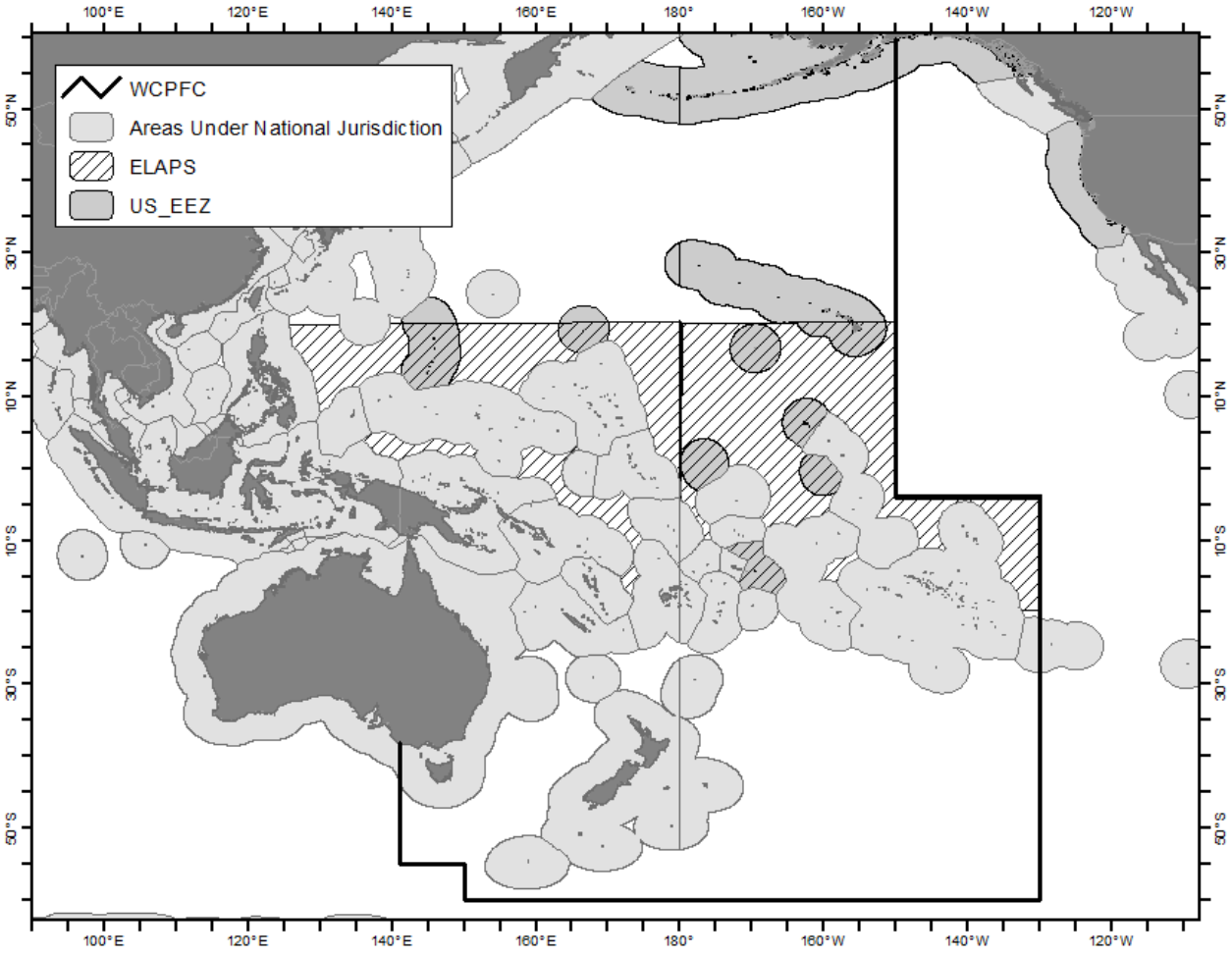
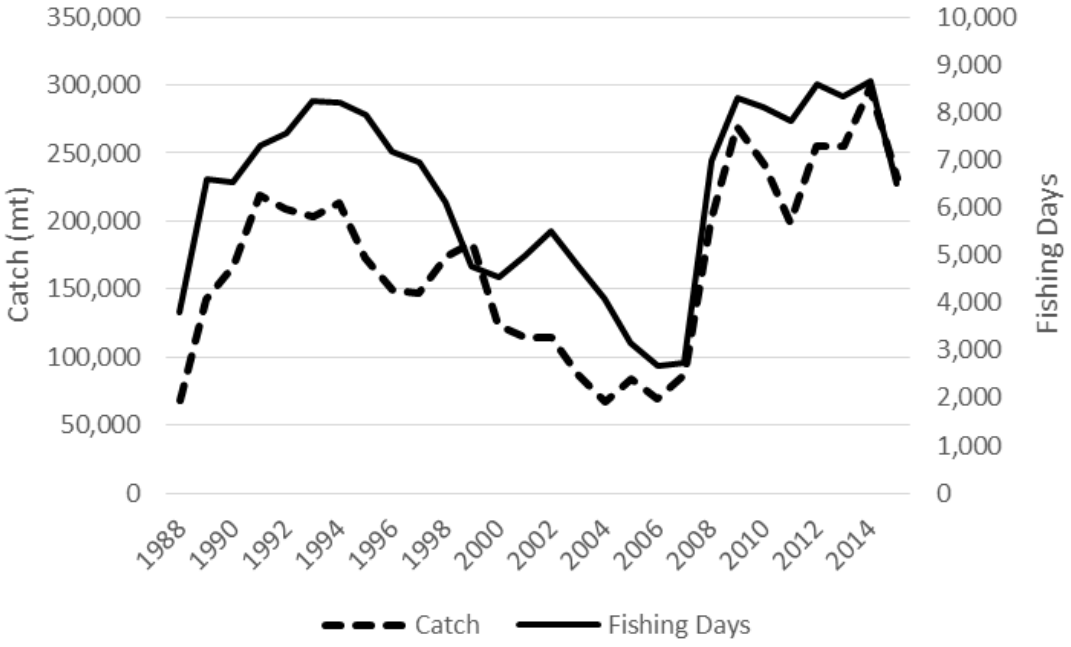
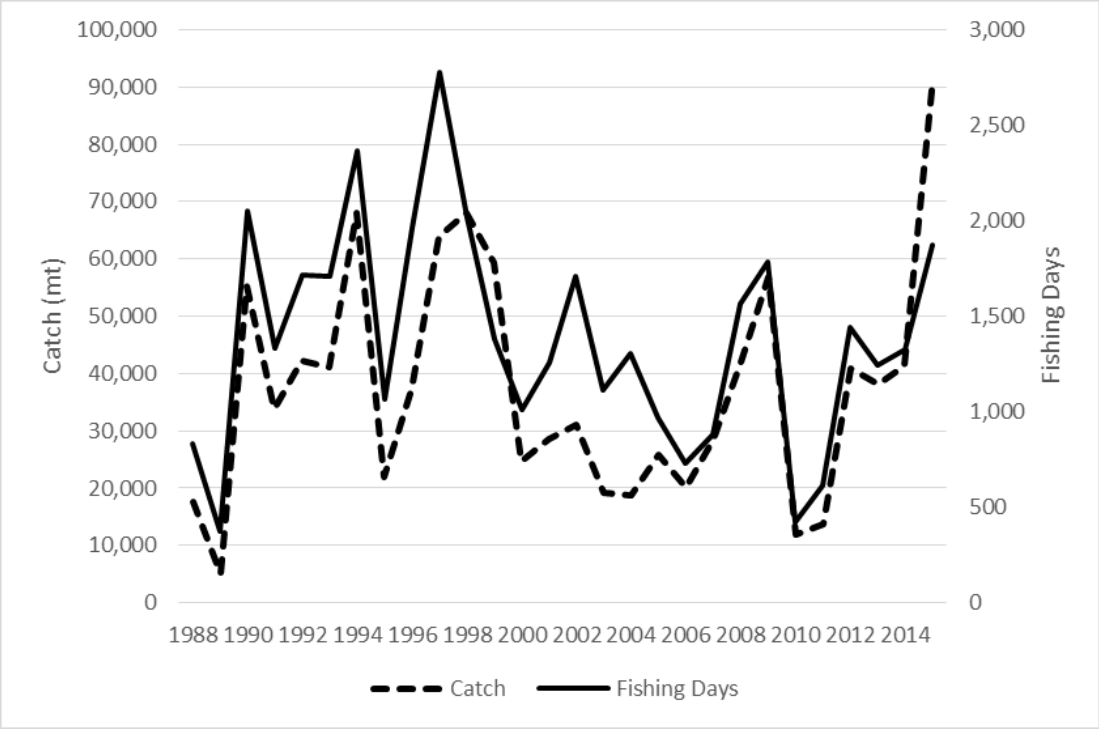


Figure 2. Catch and Effort in Fishing days for U.S. Purse Seine Vessels Fishing in the Western and Central Pacific Fisheries Convention Area from 1988-2015.



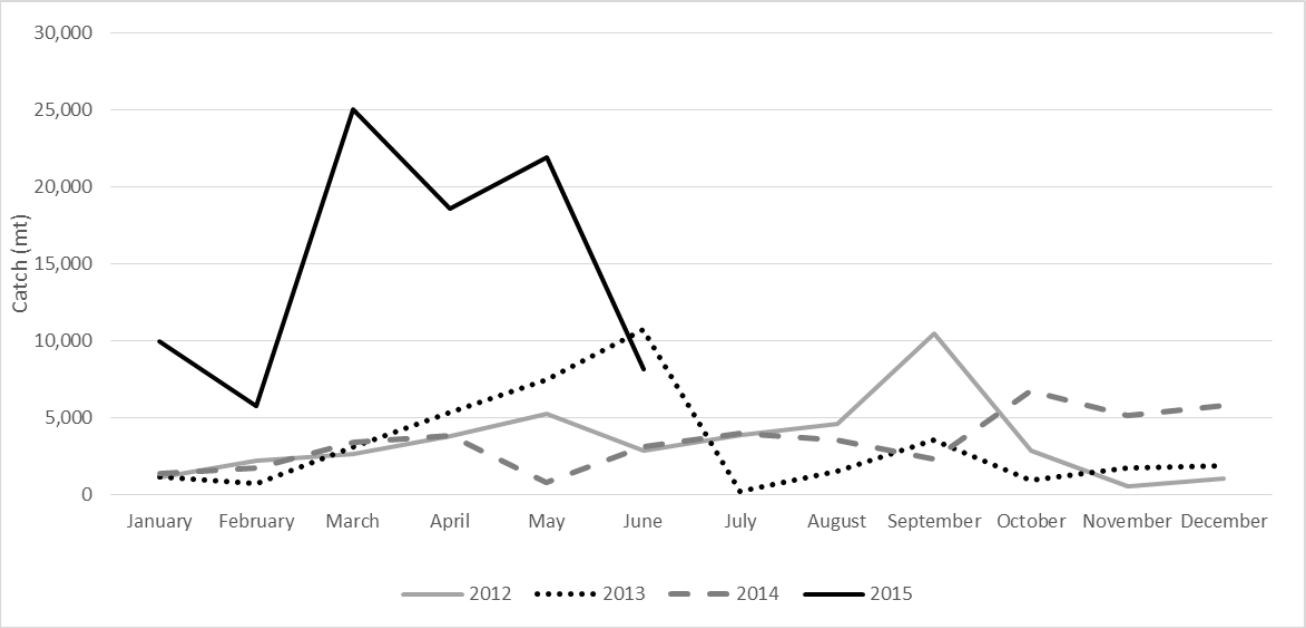
Data source: NMFS unpublished data

Figure 3. Catch and Effort for U.S. purse seine vessels fishing in the ELAPS area from 1988-2015



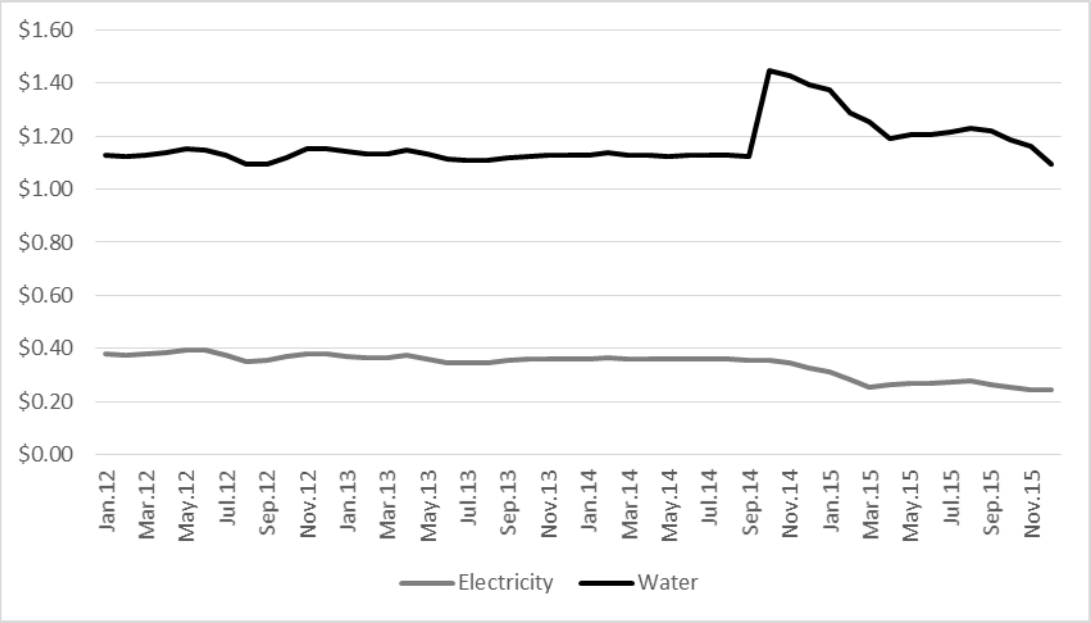
Data source: NMFS unpublished data

Figure 4. Catch by month in by the U.S. fleet in the ELAPs, 2012-2015



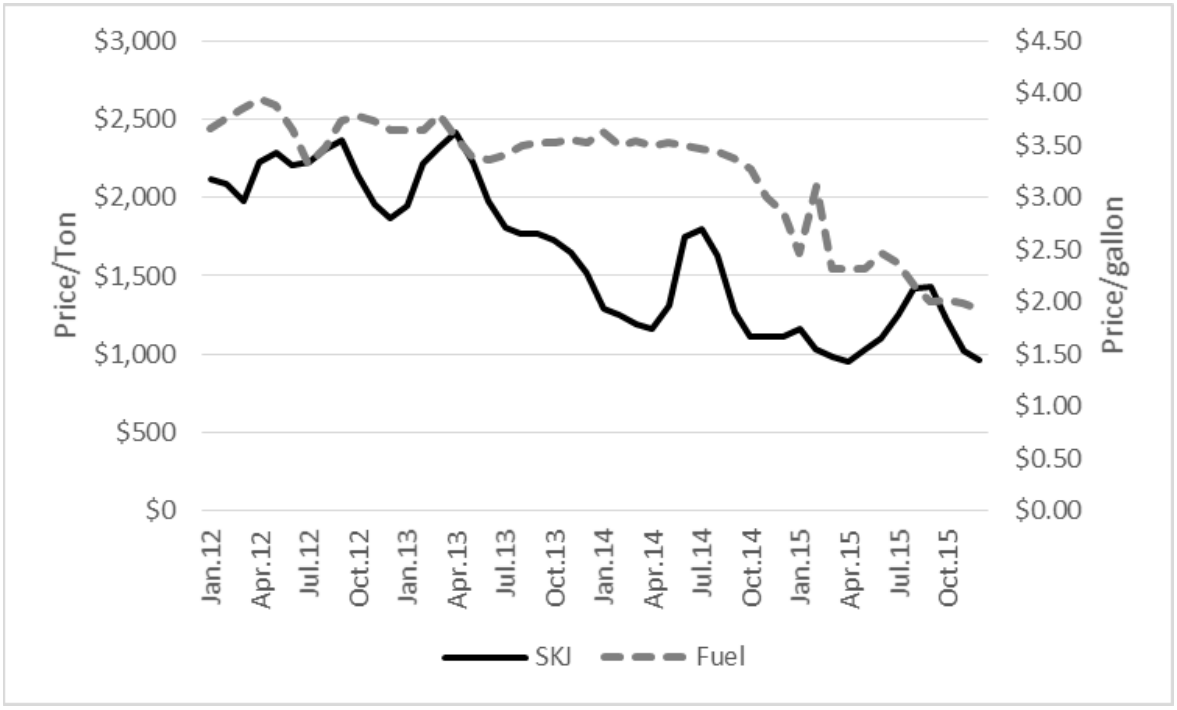
Data source: NMFS unpublished data

Figure 5. Electricity and water rates for commercial businesses in American Samoa, 2012-2015



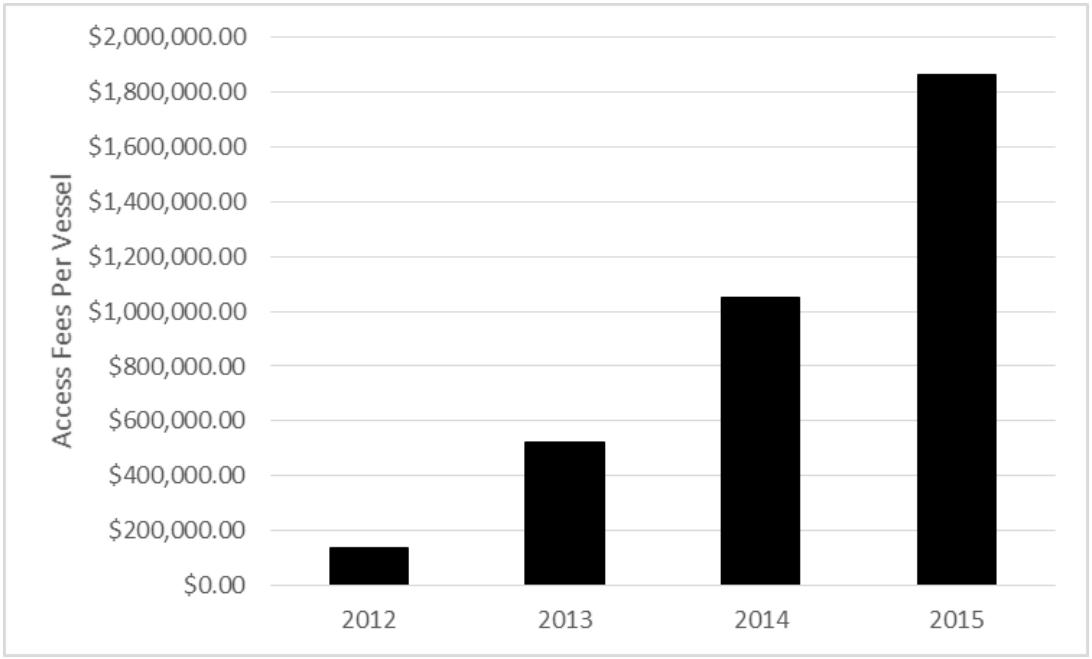
Data source: American Samoa Power Authority

Figure 6. Average Monthly Prices for Skipjack in Bangkok and Marine Diesel Fuel in American Samoa, 2012-2015



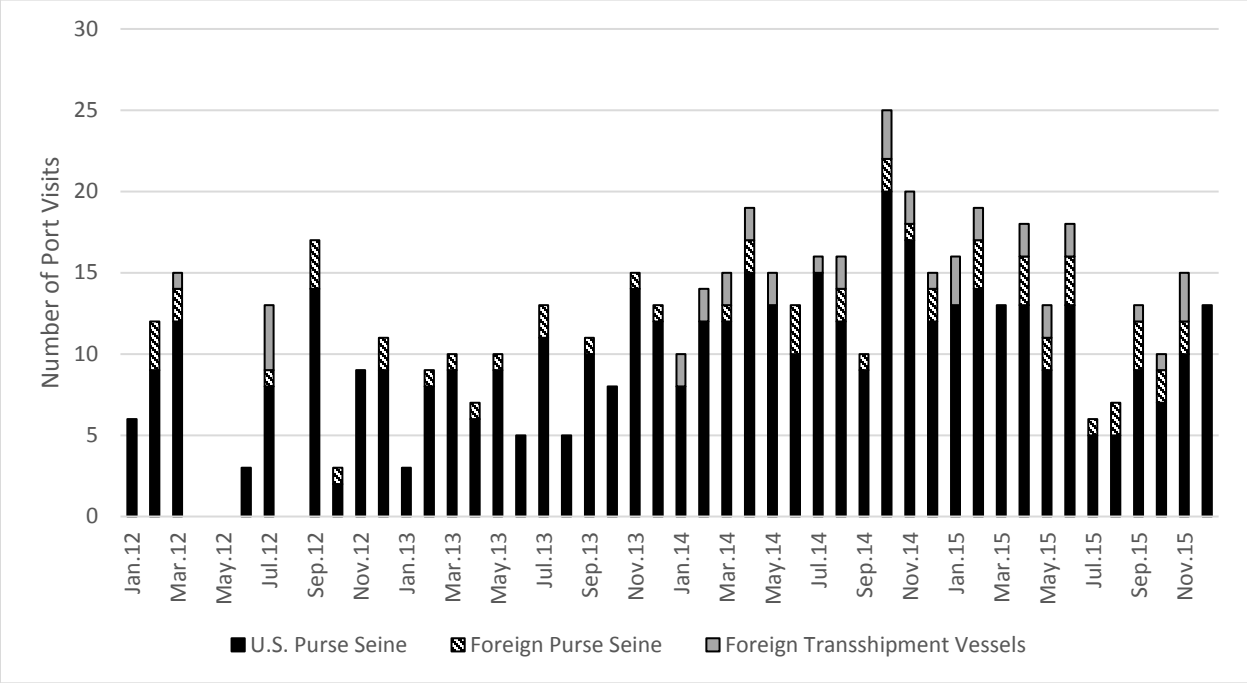
Data source: Forum Fisheries Agency and Clipper Oil

Figure 7. Average South Pacific Tuna Treaty access fees per U.S purse seine vessel, 2012-2015



Data source: American Tunaboat Association

Figure 8. Number of Port Visits by month from 2012-2015 in American Samoa by domestic and foreign purse seine vessels and foreign transshipment vessels.



Data source: American Samoa Port Authority

Table 1. Difference in total variable profit between 2015 and average of 2012-2014, and average of 2013-2014 average historically, under the counterfactual and other sensitivity scenarios

	Compare 2012-2014	% Change	Compare 2013-2014	% Change
Historical	$-2,397,926,885	20,727	$-2,012,892,202	17,399
Counterfactual	$-11,007,792	95	$-111,703,716	966
Counterfactual without Kiribati	$-5,707,418	5	$-111,919,755	100
Sensitivity Fish Price - 10%	$82,014,263	31	$-11,582,962	4
Sensitivity Fish Price +10%	$-104,029,848	43	$-211,824,470	88
Processor Mark-up -10%	$-13,612,507	27	$-113,341,405	228
Processor Mark-up - 0%	$-12,744,269	34	$-112,795,508	305
Processor Mark-up +10%	$-11,876,031	49	$-112,249,612	462
Processor Mark-up +30%	$-10,139,554	892	$-111,157,820	9,783
Fish Catch +10%	$199,919,537	100	$99,223,613	50
Fish Catch +20%	$410,846,966	100	$310,150,943	76
Fish Catch -10%	$-221,935,122	100	$-322,631,045	145
Fish Catch-20%	$-432,962,451	100	$-533,558,375	123

References:

Jeon, Y; Reid, C; Squires, D. 2008. Is there a global market for tuna? Policy implications for tropical tuna fisheries. Ocean Development and International Law 39:32-50

Lehodey, P; Bertignac, M; Hampton, J; Lewis, A; Picaut, J. 1997. El Niño Southern Oscillation and tuna in the western Pacific. Nature 389: 715-718

Appendix A:

Elements Included in the Cash Flow Analysis

Vessels
Costs per vessel
  Fuel Quantity
  Fuel Price
  Fuel and Oil Cost
 Wages and Salary
 MCS, Transshipment levies & Observer Costs
 Access Fee
 Other Fees
 Total Variable Costs
Capitol Servicing Costs

Output and Revenues per vessel
 Total Catch
 SKJ Catch
 BET/YFT Catch
 SKJ Price/ton
 BET/YFT Price/ton
 Sales

Variable Profit (Loss) per vessel

Variable Profit (Loss) per ton per vessel
Variable Profit (Loss) per ton

Weighted Average Total Profit (Loss) Per Ton

Average Fleet Tonnage
Total Vessel Profit

Canneries
 Cannery Costs
Domestic Tonnage
Foreign Tonnage
Costs per metric ton
Price of Tuna
Amount of Tuna Recovered
Labor Costs
Unit Labor Costs

Total Labor Costs
Electricity
Fuel
Water
Supplies
Packaging
Broth
Filler Lease
Total Variable Costs

Revenues
Cannery Selling Price
Price/ton
Quantity Sold

Cannery Variable Profit (Loss)

Vessel Support Services

Number of Trips

Net Profit Per Trip
Total Profit

Vessel Support Profit

Total Variable Profit (Vessels, Canneries, Support)