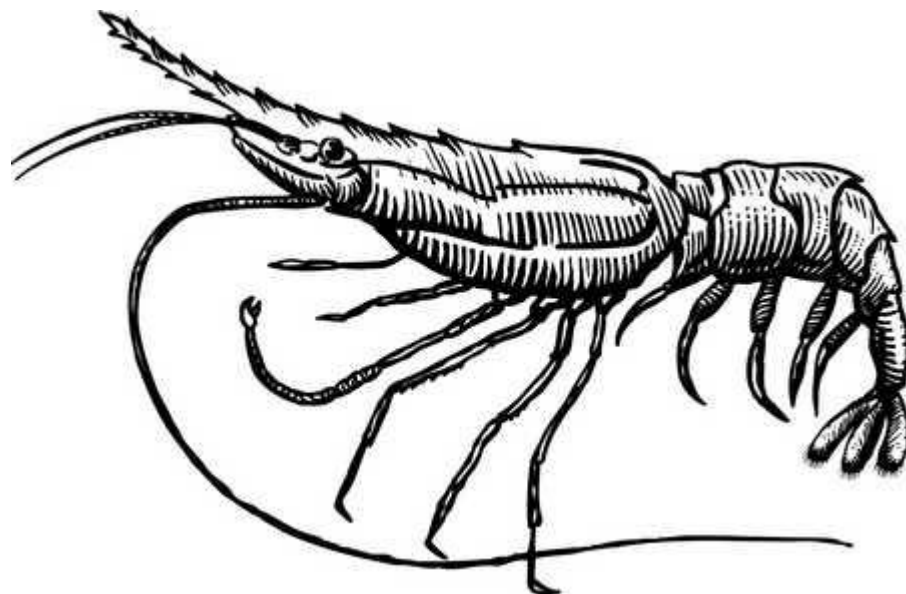


## Cost Benefit Analysis on Spot Prawn Fishing for Makah Fishermen



September 9, 2009

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## **Abstract**

The question I ask in this paper is: is it worth it for Makah fishermen to invest in the spot prawn fishery? I used a cost benefit analysis method to investigate whether or not this fishery is profitable. Most of my numbers are estimates, but they were well thought out. There are six graphs made to show the profit curve of this fishery at six different efficiency levels. You may find my results quite a surprise; I found that the spot prawn fishery is very profitable. Even with 10% catch efficiency, the breakeven point would be as early as the sixth trip. This fishery should be very successful and fishermen should look into it.

## **Introduction**

There is a need to evaluate the potential costs and benefits of investing in a new fishery for Makah fishermen. Our fishermen have relied on the same fisheries for many years now; for future stability the fishing fleet needs to diversify its fisheries. We need to find new fisheries that our waters are capable of maintaining, such as spot prawns.

Spot prawns, or *Pandalus platyceros*, are present in the Pacific Ocean from Alaska down to California and are considered a tasty treat (Jean McCrae 1994). They are found on the rocky bottoms from the intertidal to over 250 fm deep. They feed on shrimp, plankton, small mollusks, worms, sponges, and fish carcasses. Spot prawns are caught with traps and pots deployed on a long-line.

Is it worth it for Makah fishermen to invest in the spot prawn fishery? This paper investigates this question with cost benefit analyses under a variety of

plausible scenarios of catch efficiency I hypothesize that the cost of fishing these prawns, such as fuel, docking, pots, and other maintenance would be much higher than the actual profit from the prawns. Another very plausible scenario is that the spot prawn fishery is profitable.

## **Methods**

### **Site Description**

The Makah fisheries southern and western boundaries are located at 48° 02.50' N and extended 40 miles west into the Pacific Ocean. The northern boundary of the Makah fisheries is the Canadian border and the eastern boundary is Tongue Point.

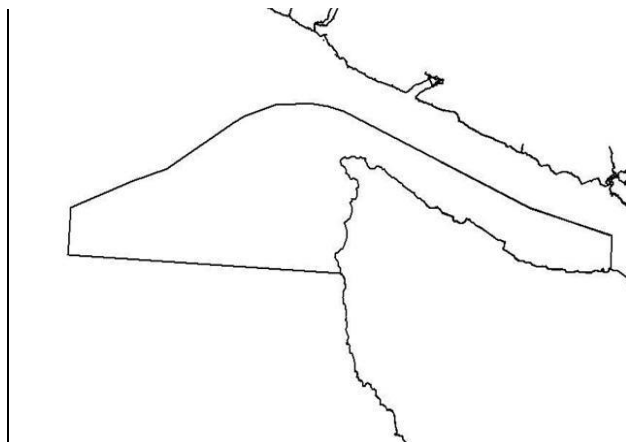


Figure 1: Map of the Makah usual and accustomed fishing grounds as adjudicated.

## **Determining Costs and Profits**

I performed a cost-benefit analysis comparing the cost of investing in and running a spot prawn fishery and the profit fishermen would receive from the fishery. I used Microsoft Excel to plot the cost curve and profit curve to determine at what time the fishery would be profitable for a fishermen and how much profit a fishermen would gain per trip. To determine the cost of spot prawn fishery I first considered the costs of fuel, docking, pots and other general maintenance fees used to run the boat and perform the fishery. I determined profit by finding the value of a pound of shrimp and multiplying by the total catch under six different scenarios of catch efficiency.

After looking at a few local retailers I found that a shrimp pot costs \$100.00 each, bait is \$5 per bag, buoys are \$25.85 each, line at \$362.31, a pot puller for \$875.00, and 1 mpg at \$2.18 for fuel that will be used for about 200 miles of travel per trip. We would also need to subtract 15% of total income for two crew members and 30% of total income for the skipper for a total of 60%.

One pot can hold up to 5,000 spot prawns, which is equal to about 250 pounds (pers comm. Jamnw1@aol.com). One pot would be able to make a top total of \$2,500 at \$10 per pound. One trip would be able to deploy about 25-50 pots, which is equal to a maximum of 12,500 pounds, so one trip would be able to make a maximum of \$125,000. At 75% of this rate one trip would catch 9,375 pounds and make \$93,750 and at 50% 6,250 pounds and make \$62,500. I have made six different charts, showing the cost/benefit analysis from 100% efficiency down to 5% efficiency.

## **Data Analysis**

Graphs were made to show the profit curve of the spot prawn fishery. The costs and profit mentioned above were charted on the graph for 25 trips which allows determination of how many trips must be fished before the fishery is profitable. I also created a cost chart and a profit chart using Microsoft Excel, which shows total income for each catch efficiency and total profit for each efficiency.

## **Results**

After collecting and calculating the costs of the spot prawn fishery by research, I found that startup costs are \$26,882.31 if we assume the fishermen is purchasing 200 pots, buoys, line, and a pot puller. Per trip expenses were determined by adding costs of bait, fuel, and crew costs. Per trip profit was determined by multiplying the total catch by the price per pound of the shrimp. I then found the profit money of the fishery by subtracting the total costs of the fishery, which includes all of the items previously mentioned, by the income from the spot prawns that are expected to be caught in that same particular time. Costs and profits are summarized in table 1.

Table 1: Catch, costs, and profits for six levels of catch efficiency.

Efficiency	100%	75%	50%	25%	10%	5%
Shrimp Per Pot	5000	3750	2500	1250	500	250
Value of shrimp per pound	\$10	\$10	\$10	\$10	\$10	\$10
Shrimp per pound	20	20	20	20	20	20
Pots deployed	50	50	50	50	50	50
Gross profit per trip	\$125,000	\$93,750	\$62,500	\$31,250	\$12,500	\$6,250
Startup Costs	\$26,407	\$26,407	\$26,407	\$26,407	\$26,407	\$26,407
Net per trip	\$75,511	\$56,761	\$38,011	\$19,261	\$8,011	\$4,261

Table 2: Number of trips to till the fishery is profitable and amount of profit for the boat per trip.

Efficiency	Number of trips till profitable	Profit per trip
100%	1	\$49,489
75%	1	\$36,989
50%	2	\$24,489
25%	3	\$11,989
10%	6	\$4,489
5%	21	\$1,989

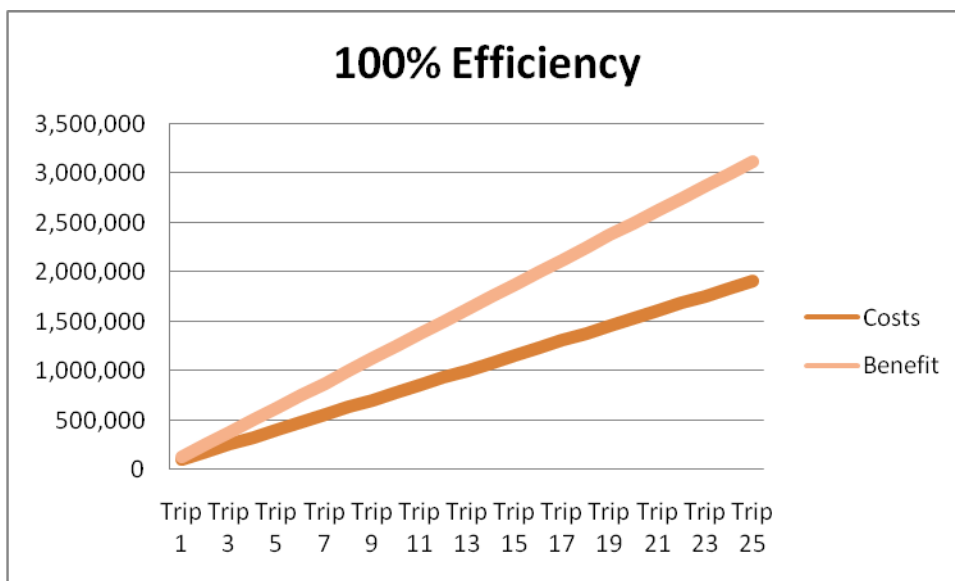


Figure 2: Cost-benefit analysis at 100% catch efficiency.

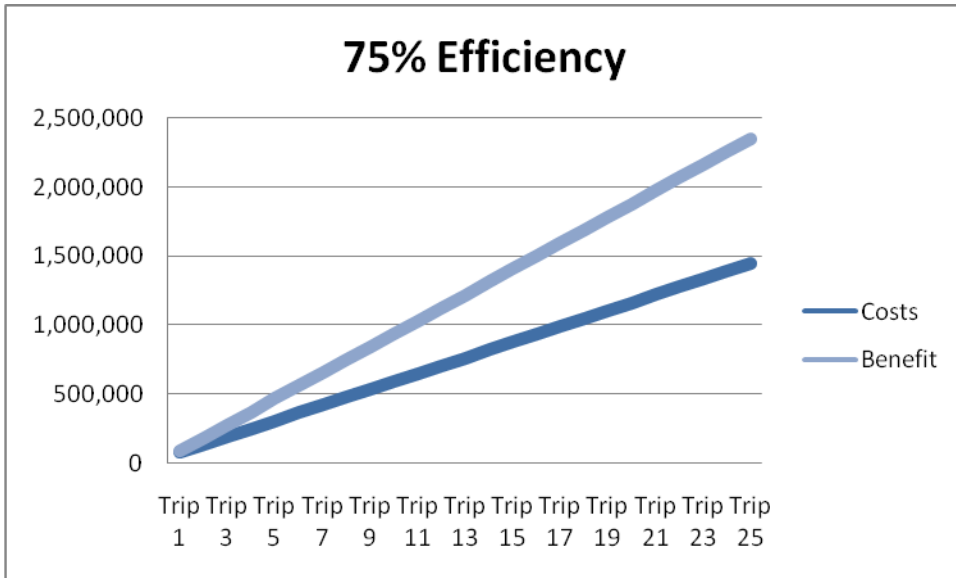


Figure 3: Cost-benefit analysis at 75% catch efficiency.

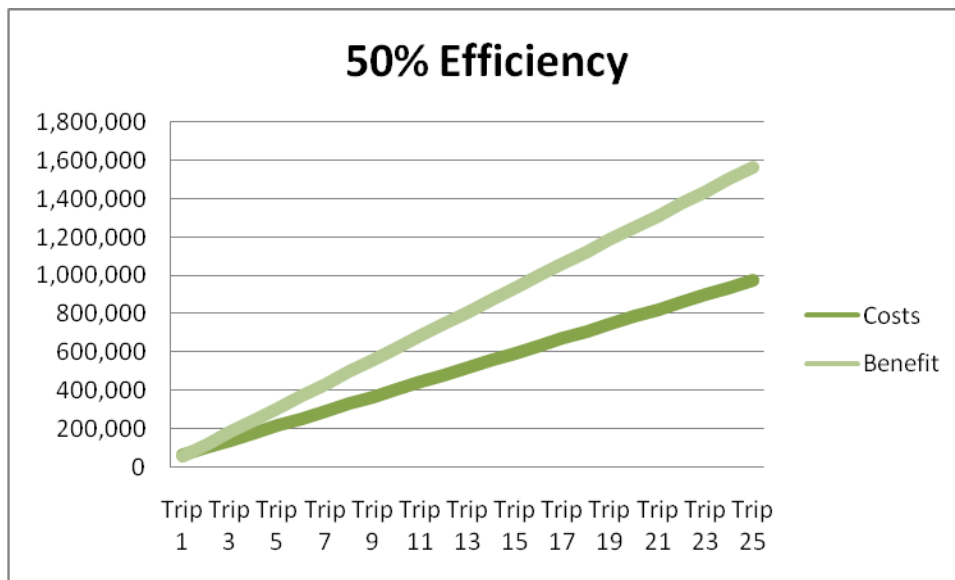


Figure 4: Cost-benefit analysis at 50% catch efficiency.

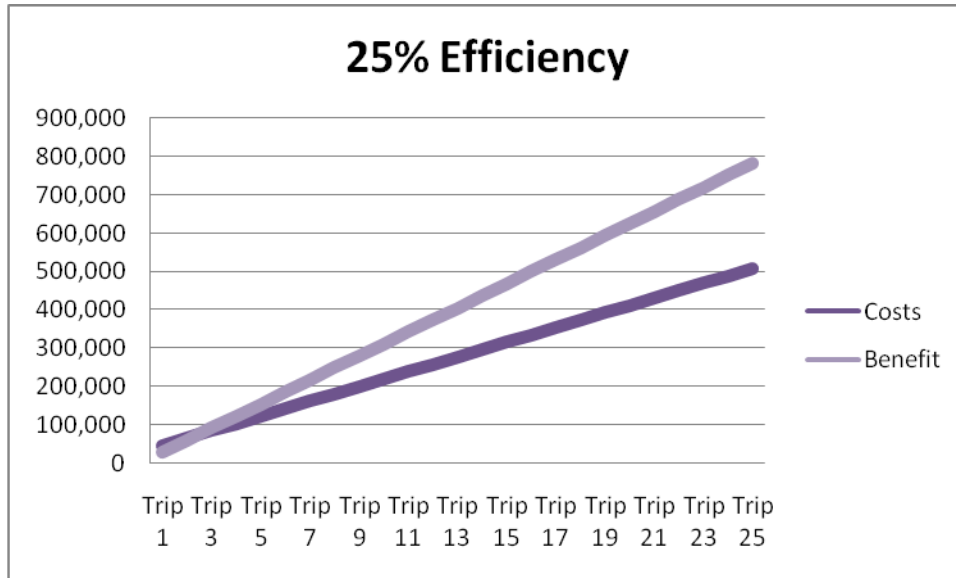


Figure 5: Cost-benefit analysis at 25% catch efficiency.

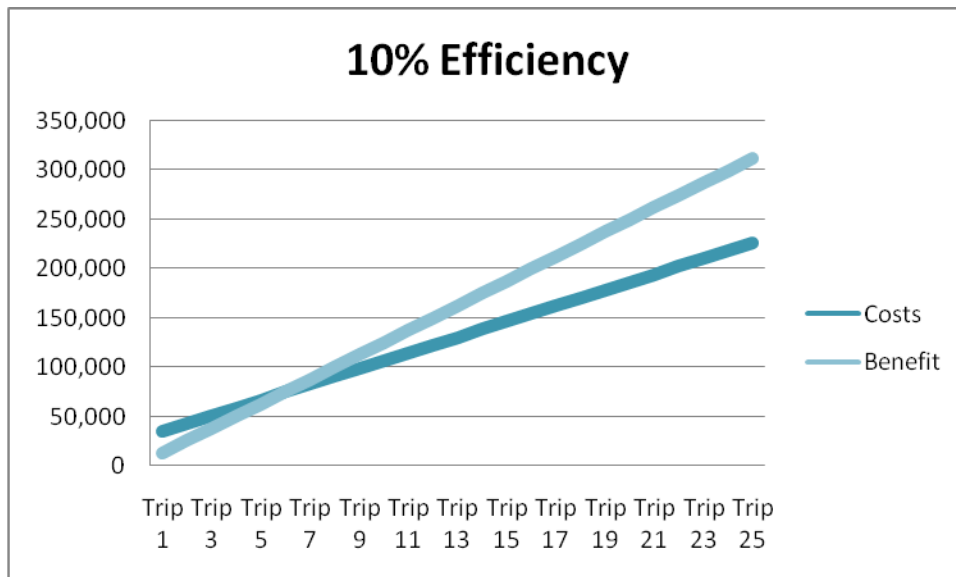


Figure 6: Cost-benefit analysis at 10% catch efficiency.



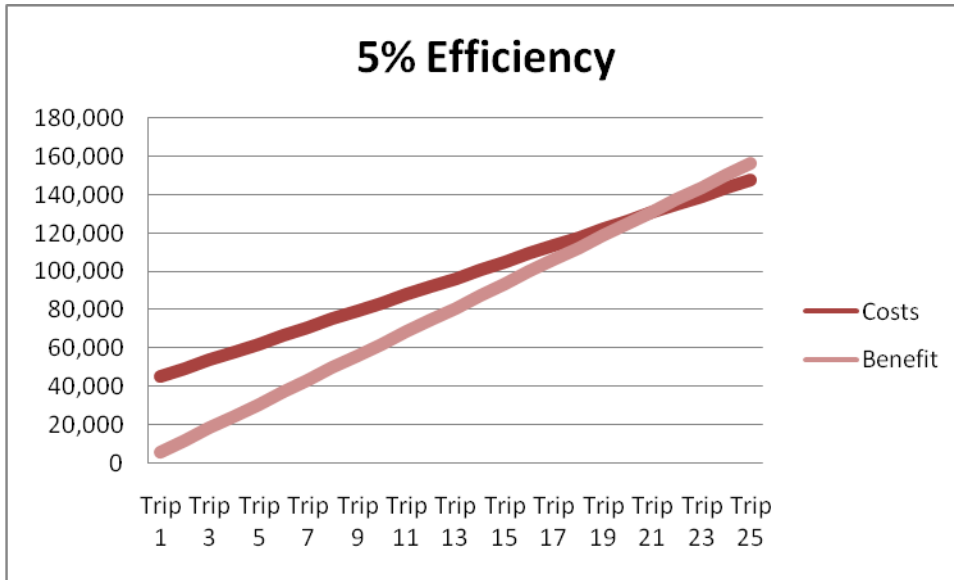


Figure 7: Cost-benefit analysis at 5% catch efficiency.

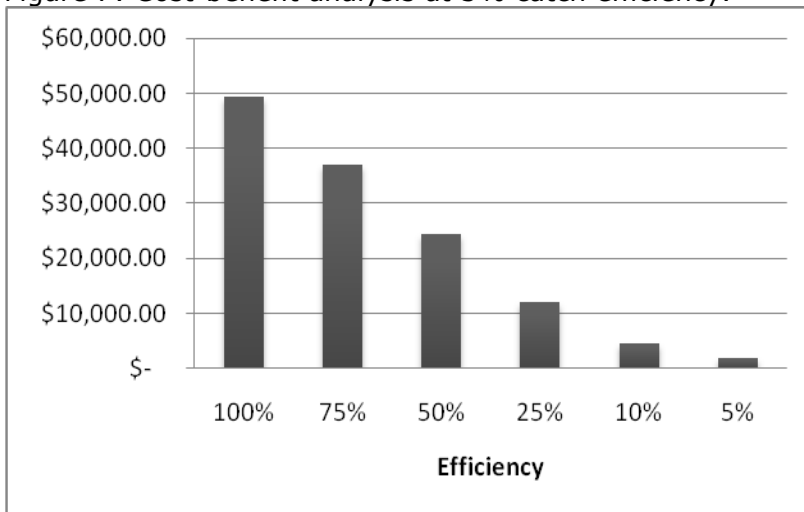


Figure 8: Dollars Profit per trip at each catch analyzed catch efficiency.

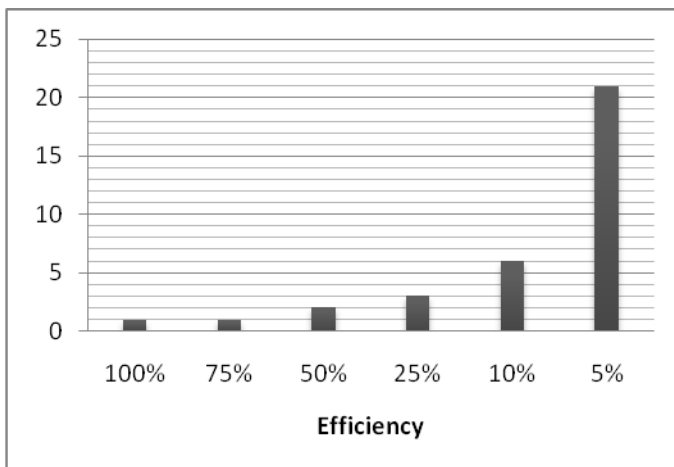


Figure 9: Number of trips to profit per efficiency.

Figures 2-7 above show cost-benefit analyses of catch efficiencies ranging from 100% to 5% pot efficiency. Obviously 100% catch efficiency had the best rates, however all efficiencies show that there is a profit made after a certain period of time (Figure 8). Each of these graphs show a different time of breakeven points (Figure 9). The less efficient the fishery becomes, the longer it takes to breakeven, as shown in figure 9. Figure 8 shows that as the efficiency decreases, as does the profit of the fishery.

### **Discussion**

Under the 100% catch efficiency it will only take one trip to profit from the fishery. At a rate of 75% catch efficiency it will only take one trip to profit from the fishery also. Under the 50% catch efficiency it will take just two trips to profit. At 25% it will take two trips to profit, at 10% it will take 6 trips, and with 5% it will take 21 trips (Table 2). By changing the cost of fuel, or bait, or the amount of prawns being caught will have a significant effect on each of these results, I controlled the costs for fuel, bait, and amount of prawns being caught. The thought that the spot prawn fishery would never reach high numbers and be profitable is obviously contradicted with my findings. Under the assumptions of this analysis, this fishery is actually very beneficial and should be put to use.

There are a few ups and downs in the shrimp business, as of right now the price is ranging from \$5.50 per pound to \$16.00 per pound, so If I was to change the price of spot prawn to \$5.50 per pound in each scenario, the breakeven

points would most certainly increase, compared to if the price went up to \$16.00 per pound the breakeven point would decrease. There are other cost factors that would have that same effect on this fishery, such as fuel. So keep in mind that there are other outcomes and possibilities to determining whether this fishery is profitable or not.

I believe that this would be a very good investment for the Makah fishermen. No matter how efficient you are with this fishery, you will be able to profit from it quick enough to say it was worth it. Another reason this fishery would be a very useful tool for future fishermen is because spot prawns are not a species of concern therefore this fishery has less chance on being limited in the future. Hopefully this can help our fishermen in the future look into investing in different fisheries, such as hag fish, sardines, or even sea urchins.

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