CHAPTER 19

Valuing wild salmon: the economic approach

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Introduction

The topic this chapter addresses is the issue of valuing wild salmon. First this paper complements Bill Rees's presentation (Chapter 14), which focused on the full costs associated with activities such as farm raised salmon, and measured those costs in terms of ecological, energetic or land equivalent costs. My perspective is on the other side of the coin; the benefit side of wild salmon. You will likely find that my interpretation of an economic perspective might be quite different from yours. I am not a fisheries economist. I do not study the fisheries industry and I do not count jobs and spending. I am an ecological economist and my perspective is to look at natural systems and what we can call natural capital stocks, such as stocks of fisheries, and begin to think about what the services are from those stocks and what the values are associated with those services. Being trained as an economist, my way of translating those values is to put natural service values into economic terms.

This chapter will illustrate ways to convert things that you may not have thought of converting before into economic or monetary valuations. I have to be very clear about what this is and what this is not. This is an attempt to look at natural systems and their services, and to illustrate the monetary valuation of those services. There are many aspects of natural systems that it would be foolish or trivial to value monetarily. For example, the cultural values, separate from the employment and food supplies, of First Nations are so moral and ethical based and so existence based that they lie on a moral and ethical plain that is above any attempt to trivialize them through monetization. I have no intention to address these broader cultural values nor to assess ecological values as ecologists think about them.

What does the public typically mean by value?

If we were to talk to people on the street or on the bus somewhere and ask them something about the value of some activity, they would refer to total spending, jobs, incomes and taxes. In the case of wild salmon they might think about how much money is spent on the recreational and commercial activities associated with wild salmon; and how many jobs and how much income is generated; or how much tax is generated. That is what the public interprets as value.

What do economists typically mean by value?

I am an economist and I think, translating fairly on their behalf, when economists are talking about a value they are referring to the contribution of something to human well being, or what we could call "welfare." In other words, how much better off are we because of something? In the context of the

salmon issue, how much better off are we with wild salmon than without it? That is the first definitional concept; value equals welfare enhancement. Secondly, however, economists try to go a step further and measure this welfare enhancement, mostly through monetization. We try to establish some monetary measures partly because of convenience. In many instances there are markets that give us this information. But at a deeper level, our traditional economic choices enable us to express, through our purchases, the relative values we place on various items. So the monetary values do reflect relative valuations of items, and people are familiar with the monetary metric.

Economists have put great effort into developing these monetary measures of value. These measures come in two basic forms: how much would people be willing to pay to have something, such as wild salmon, and how much would they be willing to accept in compensation for its loss? These are two very different kinds of measures, one is associated with a gain and one is associated with a loss, but all seek to put a value into a common monetary metric.

Impact *versus* value

I have organized this chapter around the issue of impact *versus* value. There is substantial difference between the two. Impact is a measure of the gross significance of something to the economic "scene." For example, we observe there are many jobs and incomes associated with the salmon fishing industry. But value is a measure of the "difference" something makes to the public welfare. For example, how many *more* jobs and incomes are available with the salmon industry than without it. Impact and value may be vastly different. While there may be 10,000 people employed in the salmon fishing industry, closing the industry down may result in only a loss of a small portion of those jobs, as people seek employment elsewhere. Of course, this is not always the case; an economically isolated community may have a net loss of all its salmon related jobs, so that impact and value are the same.

Politics *versus* policy

Political interests tend to focus on impacts and they focus on impacts because it is a metric and it is an image that is understandable and the stakeholders themselves can identify with impacts. How many jobs are at risk in the salmon industry? How much income is at risk in the wild salmon industry? These are images that are useful in a political context. What I am interested in is more the policy analysis measures that will help us in determining whether or not something is worth doing. Is it worth saving wild salmon? Is it worth having farm-raised salmon? The policy answers to these questions are: what is gained, what is lost and what is the net? These should be the basis of policy decisions. How one goes about measuring what is gained, what is lost and what is the net, is another thing altogether. Economists are critiqued for cost-benefit analyses because they try to squeeze everything into a dollar metric. Many of the benefits or losses are not appropriately measured. The policy issue is whether something is worth doing and always boils down to the question of what is gained and what is lost and what is the net.

Gross *versus* net values

What do we mean by gross *versus* net values? Net value is the difference between a gross value and a cost. Suppose that there is a chinook salmon and you are willing to pay $60 for it; that is a measure of its value to you in the sense of what you are willing to sacrifice in order to obtain it. Let us suppose that it costs you $40 to obtain that chinook salmon. The net value is the difference between the gross and the cost, that is, $20. When we look at salmon from a policy perspective and ask, "What is the measure of our loss by not having this kind of option available?", the answer is $20. It is always difficult to explain this to the public as they focus on the $60 and see the loss of $60 worth of salmon. But they have also saved $40 because they have not been able to buy the salmon, so they have $40 left in their pocket.

Sources of value

I now want to address further the various types of values and sources of values. Bill Rees went through an analysis of the full cost associated with an activity (Chapter 14). I want to take the other side of the

picture and consider the full benefits of natural services that are generated from this type of natural capital stock – the wild salmon. This is really a traditional economic analysis and divides the sources of value into two types: user values and non-user values. The user values include what probably much of the public discussion is associated with such as commodity values and recreational values. A number of the previous papers focused on some of the other values such as biodiversity values and ecological values that are much more difficult to place than economic evaluations. However, it is unfortunate that in public policy issues associated with natural capital stocks, whether it be forests or fisheries, the focus of attention is predominately on commodity and recreational values. This is partially because they are important, but also because they are more measurable than other values. The measurable items crowd out the immeasurable items even though they may be less important. Non-user values include two types: potential use values, or what we will call option values, and knowledge or existence values. Non-user values would include some desire for natural state conditions or the cultural values associated with First Nations' interests.

User values

When considering user values, economists have spent a lot of time developing ideas like the 'demand for things' and, when we are thinking about the user value of something to people, we can represent that user value based on what people would be willing to pay for these items. For example, Figure 19.1 illustrates the case of fish, where the demand for fish for commodity purposes is represented by the red line in the graph. That demand represents what people would be willing to pay for these fish. If there were a small number of fish, they would pay a higher value per fish and if there were a large number of fish and they were more abundant, then they would pay a smaller value. However, the area that is represented by 'A' in the graph is the gross user value of the supply of fish. Let us say that the user value here is consumption. However, the net value is this gross minus what people have to incur in costs to obtain these fish. For example, there is a cost to land a fish, a processing cost, a retail markup cost, and finally a retail price per fish. Given that retail price and people's demand for this commodity, 'B' in Figure 19.2 represents the net value of fish to consumers. If they are not provided with the opportunity to engage in this market as it is pictured here, then 'B' disappears and 'B' is a measure of their loss.

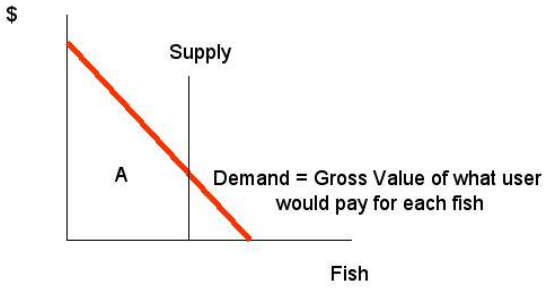

Figure 19.1. User value.

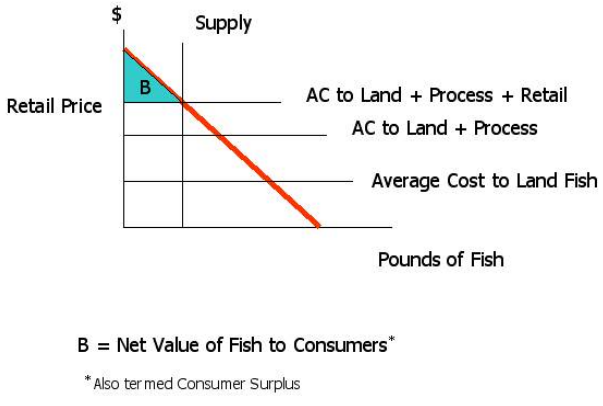

Figure 19.2. Commodity value of salmon.

An actual example is provided by a Vancouver economist (Gislason, 2001) who studied the values of British Columbian chinook salmon fisheries. In 1994, 7.15 million pounds of fish were bought and sold on markets and most of that was exported at a price of $3.90 per pound. Using basic geometry, we can determine the area under the demand curve up to 7.15 million pounds; roughly $35 million. The retail cost was $28 million, yielding a net value of $7 million for area 'B' (Figure 19.3).

The interpretation of this picture is that the $7 million would be the measure of the consumers' loss per year, if all of the BC chinook salmon were to suddenly disappear. That is the net consumer valuation

associated with this British Columbia chinook salmon. An interesting point is that if chinook salmon were not very distinctive in consumers' minds then the demand curve would be more horizontal and, as you can see, that would squeeze area 'B'. In fact, if there were perfect substitutes for British Columbia chinook salmon in consumption, for example chinook farm-raised salmon, then area B would almost disappear completely. That would mean, from a consumer perspective, the loss of wild salmon would be trivial to consumers if farm-raised salmon were a perfect substitute. I am not saying it is, but that is the answer to the question, "How much difference will something make to our well-being?"

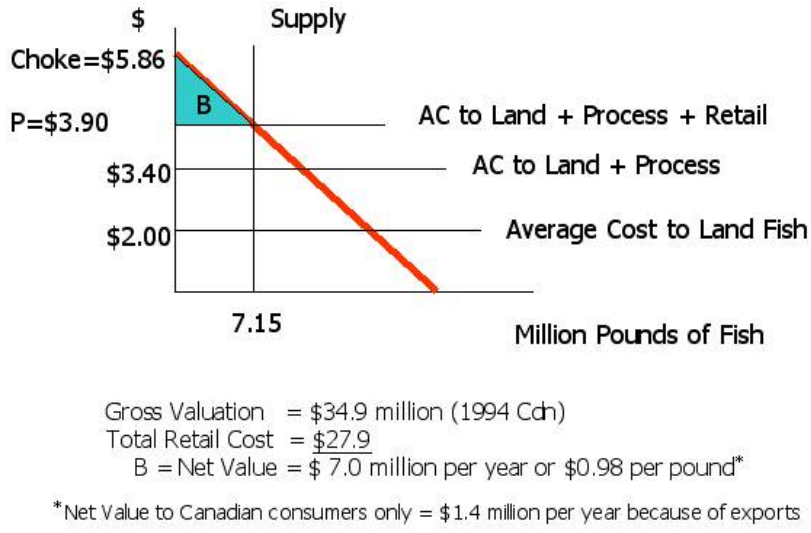

Figure 19.3. BC chinook salmon. (Source: Gislason 2001).

Producer value

The other side of the value picture is associated with the producer values. The net values to producers are revenues minus costs both to the firms and to the workers. In the chinook example above, Gislason (2001) noted that while firm revenues were roughly $28 million, they had costs of $25.5 million; the net value to firms per year of this BC chinook salmon fishery was $2.4 million per year. He also found that workers received increased wages over what their alternatives would have been, and this increased income was roughly $3.8 million per year. These are the net values to producers, both firms and workers.

Net commodity value for 1994 BC chinook harvest

The net commodity value of this chinook harvest, would be the sum of consumer, firm and worker values, or a net commodity value of $13.2 million in 1994 dollars Canadian, or $1.85 (Cdn) per pound. What is the usefulness of this kind of information? If this chinook fishery were closed for one year in 1994, this would be a measure of the net economic value of the consumption-based social loss in that year. In other words, society would be worse off by $13.2 million. If this fishery became extinct and these valuations were to have prevailed over time, then this annual loss would have to be converted to a present value. This present value would be $440 using a 3% discount rate. You can take this $13.2 million and it can become helpful to you in policy because it says, just considering this value alone - and I am not talking about the other values I will be getting into below – it would be worth at most $13.2 million per year to save this fishery for commercial use.

We can use the information in Figure 19.4 to establish the value of augmenting a salmon run. Suppose we were to add 5 million pounds per year to the run and one-fifth (20%) of that would be caught for commercial use each year, increasing annual supply from 7.15 to 8.15 million pounds. The retail price of

salmon would fall from $3.90 to $3.63 per pound. Areas 'C'+'D' in Figure 19.4 represents the net increase in value of chinook salmon, which is over $2 million per year. If this increased run prevailed into the future, then the present value, using 3% as a discount rate, would be $66.7 million. That is, it would be worth $66.7 million to enhance the run by this magnitude.

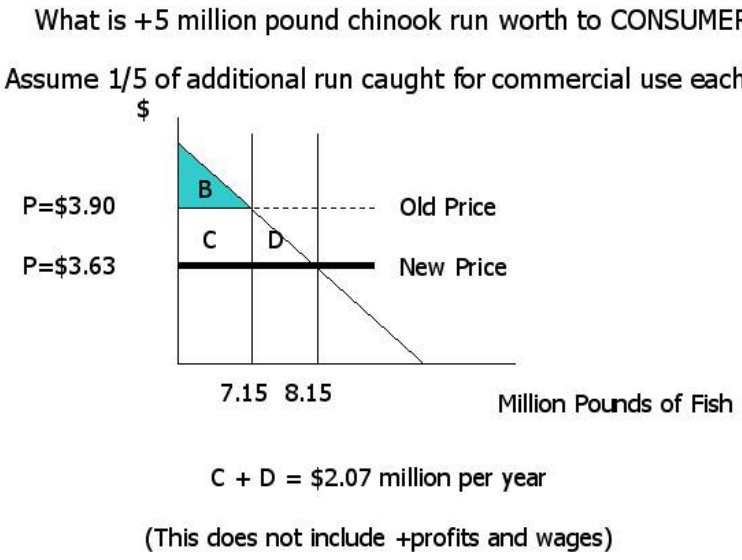

Figure 19.4. Commodity valuation and policy.

Recreational values

An earlier paper discussed how much spending there was in freshwater recreational fisheries (Chapter 11, Post). This spending represents the impact of fisheries and not its value in the terms that I am using. A study of the Copper River fishery in Alaska (Henderson et al. 2000) used a technique that economists refer to as a travel cost evaluation method, where we assess what people would be willing to pay to access a fishery and estimate the actual costs of access, including time and travel expenses. The difference between these two is the net value to a user. This study estimated that the net value to a typical household using the Copper River fishery for recreational purposes was $57 per household per trip. Some 6,000 households were using the fishery as a recreational fishery and they made 1.5 trips per year; therefore, the total net value was roughly $513,000 per year. This is a very different kind of value from the total recreational spending in the Copper River fishery.

A similar travel cost study of recreational chinook fishing on the Gulkana River, Alaska, estimated that the value of fishing under existing catch conditions was $61 per person per day (Layman et al. 1996). The study also determined that the value of fishing under a doubling of catch would have been $82 per person per day. Therefore, doubling the catch was worth an estimated $21 per person per day.

Biodiversity value

There are different concepts of biodiversity such as species, population and genes. Over 19,000 different Pacific salmon stocks have been documented. How does an economist go about thinking about the biodiversity value of these multiple populations or stocks? By protecting against single events, such as disease and climate, biodiversity provides some sort of insurance against the extirpation of large shares of salmon populations and stocks. Economists have not been able, that I have seen, to make economic valuation estimates of fishery biodiversity. Basically, we are talking about increasing genetic variability reducing the probability of extirpation and the saving of all of the natural service values associated with those populations and stocks. For example, suppose that having 100 stocks *versus* 40 stocks reduced the

probability of massive fishery extinctions from disease by 10%. If the annual value of these fisheries is $100 million, then the biodiversity value of an additional 60 stocks is an expected, probabilistic value of $10 million per year. Another way to consider biodiversity value is the effect on biomass productivity from extensive habitation and niche exploitation. The greater the genetic variety, the more niches salmon can inhabit and that increases biomass productivity– you can actually measure that economically on a per pound basis.

Ecological values

One role of wild salmon in the ecosystem is as a nutrient source for other species. Bears are dependent on salmon, and bears have value to us for recreational purposes. By implication, the salmon have value. Also, bears carry fish carcasses and fertilize the landscape. This activity does have an economic equivalency and we could actually go back into the ecosystem and try to measure the value of wild salmon as they enhance the fertilization of forested landscapes and, therefore, either save us money or increase biomass growth. The economic value could be measured either of those ways.

Non-user values

Option values are what a person would pay to preserve the opportunity to use a resource in the future, although they currently do not use it. Existence values stem from peoples' knowledge of the mere existence of gifts of nature and they would be willing to pay something to know that those gifts remain intact. Cultural values are a type of existence value; they may represent an ethical value that we cannot really monetize or that the culture would not tolerate being monetized.

There is an example of non-user values for salmon runs. A study in Oregon and Washington asked households what they would pay to double the size of the Columbia River Basin salmon and steelhead runs or what they would accept to forego the doubling of the runs (Olsen et al 1991). Option values and willingness to pay were roughly $5 per household per month for over 300,000 households, giving a total willingness to pay of roughly $20 million per year just to preserve the option of using this increased run. Given the size of the run, this would have represented $7 per fish each year. These valuation responses were from people who had no immediate intention of using the run. The same study evaluated existence values by asking persons who had absolutely no foreseeable intention of salmon fishing. While their willingness to pay for a doubling of the runs was only roughly $2 per household per month, there were nearly 1.6 million households who would never conceivably use the fisheries. This constituted an annual existence value of over $42 million per year. In contrast, current recreational users of the steelhead fisheries were willing to pay over $6 per month per household for a doubling of runs; this is a user value. This represented an annual value of nearly $111 million per year. As we might expect the valuation per household is the lowest for existence values and the highest for recreational use values.

The total value of doubling the steelhead run would include the recreational use value in addition to the option and existence values. In this example, the total value was over $171 million per year (1991 US$). This would represent roughly $68 per fish for the 2.5 million additional fish constituting the double run. If this doubling were to prevail into the future, then the present value of this doubling using a 3% discount rate would be $5.7 billion.

Impacts *versus* valuation

As noted above, Gislason (2001) looked at the harvest, landed values, processor margin and total market value of British Columbia chinook salmon. The total commercial market value in 1994 was $28 million for chinook. Recreational angler spending in 1994 was $285. Therefore, the total spending impact was $313 million for chinook salmon.

How do these impact measures compare to values, as I am using the term? While commercial impacts were $27.8 million, only $13.2 million of that represents increased incomes and consumer net gains. The

recreational spending impact was $285 million. However, the Gislason study showed that there was a recreational value in terms of willingness to pay, of only $60 million. There is a huge gap between what I call impacts and the value of the difference something makes in people's lives.

Conclusion

It is very important when talking about economic valuation of things, to make sure we understand whether we are referring to value, which I would say is the metric we would want to use in public policy decisions, or impact. Value reflects what difference something will make to us and is the proper measure to compare with whatever costs may be incurred to achieve it. Political systems may focus on impacts but values are the key to rational policy decisions. Many values may be monetized, especially if they reflect the relative valuations of economic goods or services. Of course, we cannot measure all values. Cultural values may be the most difficult to measure, and it may not be reasonable to even consider any type of monetization of these values.

Natural systems provide a huge array of values stemming from the services of these systems. Salmon are just one of many natural system services that we can value for diverse reasons. Traditional commodity and recreational values are understandable and meaningfully valued and monetized. However, other services, such as biodiversity and ecological values, may not be as easily measured or monetized, but may well exceed the values of those that can. It is also important to recognize that non-user types of values may be very important, especially cultural values. Salmon fisheries represent the complete range of issues associated with valuation.

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