What are salmon worth?

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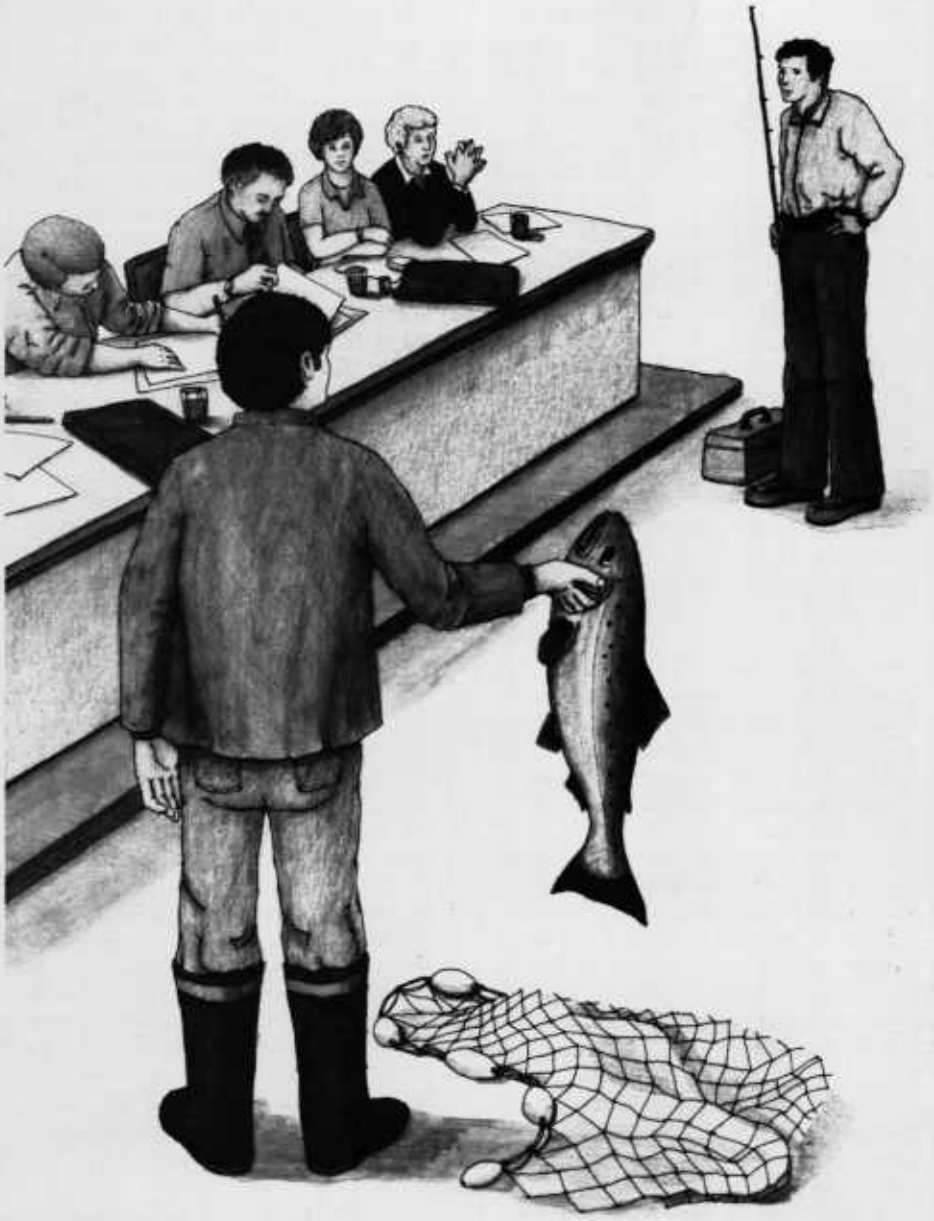

Another title in the series
Marine resource management

Statements about and estimates of the economic value of salmon have been used extensively in salmon-management discussions. What are salmon worth, to whom, and for what purpose? At least seven studies have attempted to answer these questions. Several new salmon-value studies are underway. However, surprisingly few of these studies satisfy the diverse industry groups, policymakers, or even the researchers themselves. The reason is often confusion over the appropriate use of salmon-value estimates and the research methods used. This bulletin attempts to explain these studies in nontechnical language by reviewing the various reasons for researching the value of salmon, then explaining the various valuation methods, and finally reviewing existing studies.

Why determine the economic value of salmon?

Some salmon-value studies are undertaken to improve research methods. However, most studies originate from the need to make better salmon-management decisions. The economic value of salmon is one of several important factors taken into consideration in salmon-management decisions. The following are some of the commoner issues in which the economic value of salmon plays an important role.

Allocating salmon between recreational harvest and commercial harvest. Anglers seek to demonstrate that salmon have a greater economic value when *they* harvest them. Commercial fishers seek to demonstrate a greater economic value for *commercially* harvested salmon. Each group seeks to convince management agencies that *it* should be allocated a larger share of the harvestable supply of salmon.

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Allocating salmon between harvest (commercial or recreational) and escapement for spawning. Although it is generally agreed that escapement should always be sufficient at least to maintain the stock, there is some debate as to whether escapement should be increased to enhance future stocks. Some wish to demonstrate that those salmon that are allowed to escape for the purpose of increasing future stocks have a greater economic value if harvested today.

Allocating salmon among commercial fisheries. Salmon are commercially harvested by hook and line, purse seine, and gill net. At one time, they were also harvested by traps and fish wheels. There is also a geographic character to salmon fisheries. The California salmon fishery is different from Oregon's, which is different from Washington's. Participants in each of these fisheries wish to demonstrate that salmon have a greater economic value when harvested by their methods and in their geographic area.

For example, the participants in the Oregon salmon troll fishery contend that their product is of higher quality and that escapement is "automatic." However, participants in the Columbia River gill net fishery contend that their product is at the peak of maturity (size) and that their methods are much more efficient.

Allocating salmon between Indian and non-Indian harvesters. Although this allocation is currently being determined by the courts, non-Indian harvesters would like to counter these court determinations by demonstrating a much greater economic value for non-Indian harvest.

Protecting salmon from adverse environmental action. Dam construction, diversion of water for irrigation, heating of water by power plants, siltation of spawning areas, and water pollution are a few of the human-caused environmental impacts that reduce or destroy salmon stocks. Advocates for salmon wish to demonstrate that the economic value of salmon is greater than the economic value of dams, power plants, and irrigation. At a minimum, they wish to demonstrate that the value of salmon is sufficient to justify investing in fish ladders, cooling towers, diversion screens, and other measures to protect the salmon and offset the impact of human-caused environmental degradation.

Justifying salmon enhancement (hatcheries, stream improvement, fish ladders, etc.). Salmon users wish to demonstrate that the economic benefit of salmon enhancement is greater than the cost. The term "benefit-cost ratio" is applicable in this case. The value of salmon is calculated in various ways (the benefit) and must be greater than the cost of enhancement.

Allocating scarce management, research, and enhancement resources between salmon and other fish. Proponents of salmon wish to demonstrate that the economic value of salmon is greater than those of crab, ground fish, shrimp, tuna, etc. This information can then be used to justify: management that favors salmon harvesters, increased salmon research relative to research on other fisheries, greater salmon enhancement, and more favorable treatment for salmon harvesters (such as lower fees, gear subsidies, and tax exemptions).

Justifying private salmon aquaculture. Salmon-aquaculture interests seek to demonstrate the economic value of salmon: to gain acceptance in the industry, to obtain favorable legislation, to obtain preferred treatment with regulatory agencies, and to rationalize their own long term investments.

How can economic values be determined?

There are various salmon-valuation methods that are appropriate to each of the issues identified above. However, there are few that will be equally appropriate for more than two or three of these issues at the same time—and none that will satisfy all. The fact is, most salmon-value research addresses only one issue at a time and has little relevance to others. However, people often misuse such research by applying results to issues unrelated to those for which the research was intended.

A discussion of various methods for placing an economic value on salmon follows. Included are some observations on the appropriate uses of these methods.

Salmon fishers' profits. This is a popular—and frequently misused—method of valuation. Researchers' calculations of fishers' profits can be arrived at by subtracting the cost of harvesting from the dockside value. However, researchers sometimes exclude certain costs from this calculation (for example, such fixed costs as depreciation, insurance, and interest). Also they sometimes include nonmonetary costs (for example, the value of owner-operator's time and investment).

The fisher's profit figure—no matter how it is calculated—may have some value in deciding how to allocate public resources between salmon and nonsalmon fisheries and in fisheries management. It is inappropriate as the sole criterion for allocating salmon among harvesters, since it assumes purely economic objectives (which is not very realistic for recreational salmon harvesters).

Dockside price. This measures the economic value that salmon buyers place on salmon. It is most often cited to demonstrate the value of salmon to the state or region (where it is multiplied by the weight). This method may also have some validity in allocating public resources between salmon and nonsalmon fisheries. It has also been used to justify enhancement and protective measures, although it may yield too conservative an estimate for such uses. It is inappropriate for allocating salmon between commercial and recreational harvesters because the price-setting mechanisms are different for each group. It also ignores secondary and other impacts of salmon-harvester sales.

Commercial fishers' expenditures. This measures the economic value commercial fishers place on salmon. As with the salmon fishers' profit method above, you should recognize that

some costs may not be included in this calculation. It is sometimes used as a proxy for harvesting efficiency. This is a very conservative estimate; commercial fishers do not consume the salmon but harvest for the benefit of others. They are adding value equal to expenditures, but only in the very first stage of salmon utilization. It may be an appropriate method of valuation if results are used to allocate salmon among the different commercial salmon fisheries.

Recreational fishers' expenditures. This is sometimes used to estimate the value that anglers place on salmon. The anglers' expenses incurred in getting to the fishing site, cost of gear and equipment, and the cost of room and board on location are usually (not always) included in this calculation. This method has been compared with the commercial fisher's expenditure or profit method as a basis for allocating salmon between these two groups.

How much more anglers would be willing to spend. It is useful to find out how much more an angler would be willing to pay over and above actual fishing expenditures. For example, if an angler actually pays $100 for a fishing experience but would be willing to pay an additional $80 before seeking some other recreational experience, he places a total value of $180 on the fishing experience.

The angler is the harvester, processor, and marketer as well as the consumer, so this method is useful in justifying salmon protection and enhancement. It is also useful in allocating salmon between recreational and commercial fisheries, but only if similar criteria are applied to the commercial fisheries.

Selling price of recreational fishing experience. The previous approach may be biased by the financial situation of anglers who participate in surveys (some have less money to spend than others). Researchers assume that, by asking anglers for the price at which they would sell recreational fishing rights, they can come up with a less biased value. Otherwise, this valuation approach has the same advantages and disadvantages as the above method.

How much more salmon consumers would be willing to spend. Regardless of the retail price of salmon, there will always be some consumers willing to pay more. By calculating the additional amount consumers would be willing to pay for commercially harvested salmon, researchers derive the value of salmon in its ultimate use. This is a valuation method comparable to the "how much more anglers would be willing to spend" method discussed above and is referred to as "consumer surplus." These two methods provide one fair but not comprehensive basis for allocating salmon between the recreational and commercial fishery. A common use of this valuation method is in justifying salmon protection and enhancement.

Increase in local and regional economic activity. The harvest, processing, marketing, and consumption of salmon generate employment and new wealth in the region. Expenditures for recreational fishing services also generate employment and new wealth. The increase in local and regional economic activity attributable to salmon represents a comprehensive regional measure of the value of salmon. It is useful in helping to justify certain management practices, salmon protection and enhancement, allocation between Indian and non-Indian, and allocation of public resources between salmon and nonsalmon fisheries.

How much the public is willing to pay. This method of salmon valuation involves a theoretical increase in cost to the general public (for protection, enhancement, management, research, etc.) up to the point where the public rebels. If the public refuses to expend more than $100 million, that is the value the public places on salmon. This method of valuation provides a basis for allocating public funds among fishery and nonfishery uses.

What economic valuation information is available?

The pioneering work of Brown, Singh, and Castle at Oregon State University indicated a gross expenditure of $18 million in 1962 by salmon and steelhead anglers. The authors estimated the demand for salmon and steelhead fishing days by Oregon anglers. Net economic benefits to the Oregon salmon and steelhead anglers were estimated to be as high as $5.7 million in 1962 dollars.

At the time when Brown, Singh, and Castle were starting their work, Donald Fry of the California Department of Fish and Game was analyzing the value of commercially harvested salmon in the Sacramento and San Joaquin Rivers system. By assuming the "most efficient" harvest system (gill nets) and size of fleet, Fry demonstrated that salmon could be landed for $.38 per pound less than the dockside price—a profit of approximately $8.45 per fish. He argued that this would be the loss if dams or other water projects were to reduce the salmon runs.

Jack Richards completed a study of the economic evaluation of Columbia River anadromous fisheries in 1968. Richards' objective was to determine the benefit-cost ratio of salmon-enhancement programs on the Columbia River, given the existence of dams and other salmon-degradation activities. Calculated benefits to commercial fishers were based on their profits, given the fishing inefficiency caused by overregulation. Richards' conclusions differed from Fry's, who assumed a "most efficient" fishery in his estimates. Richards calculated benefits to anglers based upon the amount anglers would be willing to pay a hypothetical owner of fishing rights for the opportunity to fish. He estimated the combined benefits of commercial harvest and angling (assuming some changes in the share of salmon going to each group) to be $13,805,098 in 1965. This compared favorably with enhancement cost of $9,508,320.

Mathews and Brown estimated the net benefits generated from salmon sport fishing in Washington. They estimated the total expenditures directly related to fishing to be $19,921,039 in 1967. Their

work included only direct cash costs to anglers, whereas earlier studies included indirect costs such as depreciation, meals, and motels. In estimating the net value of the salmon sport fishery, Mathews and Brown used the "For what price would you sell your fishing right?" approach. Answers ranged from $193 to $235 per year, depending on location in the state.

Francis M. Schuler provided further analysis of the benefits and costs of salmon enhancement on the Columbia River. Schuler goes beyond previous work by attempting to use the consumer-surplus concept in estimating benefits. Further, Schuler suggests a reallocation of Columbia River salmon between sport and commercial fishers based upon their relative contribution in offsetting enhancement-program costs (through taxes) *as well as* the relative benefits to consumers.

A 1976 report by Brown, Larson, Johnston, and Wahle provides improved harvest-benefit estimates for commercial and sport harvests of Columbia River salmon. They used the consumer-surplus approach for commercially harvested fish. They used 1962 data to estimate benefit to anglers, but they improved their estimates by using a more accurate measure of the effect of angler travel distance. Consumer benefits from increased commercial harvest were estimated to be $.80 per pound. Angler benefits were estimated to be $22 per day.

Youmans and others have completed economic impact studies of several coastal counties in Oregon (Youmans, Collin, and Stoevener for Clatsop; Youmans, Rompa, and Ives for Tillamook). These studies included all commercial fisheries (not salmon alone) as a sector in the county economies. The authors calculated multipliers (indexes of the rate at which the sector contributes to new economic activity) and net economic impacts of the commercial fishery.

In 1968 the Clatsop County income multiplier for commercial fishing was 1.23, and the level of economic activity was $3,600,000. The seafood processing multiplier was 1.81, and the level of economic activity generated was $39,800,000. The Tillamook County fishing industry multiplier was 2.72 in 1973.

Assumptions, biases, and other pitfalls

Since nobody has enough time or money to conduct a truly comprehensive study of salmon values, it is always necessary to make assumptions. Assumptions reduce the scope and complexity of the real world to a manageable size for research. If the assumptions are in error, the study results may also be in error, but not always. Never accept or reject results because the assumptions appear to be wrong.

All studies of salmon value require data from the industry. Before such data are gathered, researchers must develop methods for analyzing the data; such tools are often referred to as the "model" or "methodology." The model guides the researcher in collecting and analyzing the data so that specific questions can be answered. The model keeps the researcher on the right research track. However, if the researcher chooses a model inappropriate to the questions to be answered, any results are suspect.

In the final analysis, although the economic valuation of salmon is important, it is only one factor in the economic, social, and political decisionmaking process that affects this resource.

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