

SELECTED ECONOMIC ASPECTS OF THE ALSEA BAY CRAB FISHERIES

by

Christopher N. Carter

Hans Radtke

Oregon Department of Fish and Wildlife
2501 SW First Avenue
PO Box 59
Portland, OR 97207

July 1991

CONTENTS

	<u>Page</u>
SELECTED ECONOMIC ASPECTS OF THE ALSEA BAY CRAB FISHERIES.....	1
Economic Data Collected in the Survey of Alsea Bay Sport Crabbers....	1
Background - Measures of Value.....	2
Analysis of Recreational Fishery Survey Economic Data.....	2
The Commercial Fishery.....	7
Implications of the Recreational and Commercial Estimates.....	9
APPENDIX.....	11
Background - Economic Value Concepts.....	11
References.....	12

SELECTED ECONOMIC ASPECTS OF THE ALSEA BAY CRAB FISHERIES

This report provides information on some important economic aspects of the recreational and commercial crab fisheries in Alsea Bay. In 1989, the Department of Fish and Wildlife collected selected types of economic information from recreational crabbers who were surveyed in the Alsea Bay fishery. Commercial fishing data is based on department fish ticket data collected for all commercial fish landings.

Economic Data Collected in the Survey of Alsea Bay Sport Crabbers

In 1989 the Department expanded the Alsea Bay Sport Crab Survey to include the collection of economic data not obtained in 1988. Department interviewers asked people to provide the following information:

- Their zip code of residence
- The number of people in their party (crabbers and noncrabbers)
- Whether the trip was for crabbing only or a combination trip
- If they fished from a boat (their own, a charter or a rental boat)
- The primary purpose of the trip
- Whether Waldport was their destination for the day
- How many days they would be in the area
- If they had a fishing license

In addition, we obtained trip expenditure data for a subset of the interviewed parties. A few parties were interviewed for expenditure data on most sampling days. To avoid bias, the interviewer decided before talking to people who would be asked the questions on expenditures. A few people refused to answer the expenditure questions, but most were cooperative. The specific categories of expenditure were:

- Transportation
- Lodging
- Food from stores
- Food from restaurants
- Boat gas and oil
- Equipment rental
- Miscellaneous

The miscellaneous category was included to capture expenditure data on such things as launching fees, moorage fees, some minor equipment purchases, crab bait and crab cooking fees. We asked crabbers to partition their expenditures into those made in the coastal counties and those made elsewhere (inland).

Using the expenditure data collected, we estimated average per day trip expenditures by category, and aggregate expenditures by expanding the sample estimates to the estimated total number of angler days. We were also able to make some inferences about the expenditures of noncrabbers who accompanied the crabbers.

Background - Measures of Value

Two conceptually different measures of economic value are often usefully estimated in the evaluation of society's uses of fish and wildlife resources. One measure is the impact on personal income. Impacts on community personal income arise through the so-called "multiplier process" from people's expenditures on their recreational activities, and from the revenues and cash flows generated by commercial utilization of a resource. By income, we mean the personal income people receive in the form of wages, salaries and proprietary income (profits). Although the gross effect on economic output or total sales by businesses in a community may be of interest, personal income is probably a clearer measure of the impact of an action on economic well-being.

The second measure is net economic value. The difference between the gross value (willingness to pay) for an economic "commodity" (e.g. a fish or a day of recreational use) and the opportunity costs (properly defined and measured) of producing that commodity is net economic value. In economists' jargon, net economic value is the sum of consumer surpluses and producer surpluses. For commercial fish production activities both consumer surplus and producer surplus can be significant. For recreational evaluation, consumer surplus (willingness to pay above participation costs) is the appropriate measure of net economic value.

For a more detailed discussion of value concepts see the appendix entitled Background - Economic Value Concepts which follows the text of this report.

In this report we focus on the personal income impacts of the recreational and commercial fisheries for Alsea Bay crab. As suggested above, this is probably the most appropriate measure of the economic impacts on the coastal community per se, because personal income is a clearer measure of the effect on people's well-being than the total level of business activity. Further, an estimate of the effect on employment (in terms of full time jobs) can be approximated by dividing an aggregate personal income impact by a representative estimate of average income per full time job.

Analysis of Recreational Fishery Survey Economic Data

In the survey of recreational crabbers, the department collected several types of economic data:

Origin or residence of the crabber - described as either coastal or inland.

Composition of people in the recreational party as either crabber or non-crabber

Trip expenditure data for parties of recreationists for specific categories of expenditure.

We analyzed this information to produce estimates of the expenditure per recreational user day by expenditure category. We estimated the impact of these average daily trip expenditures on total personal income in the coastal

area and at the state level using input-output modelling techniques. The personal income impacts include the direct, indirect and induced effects of the expenditures on wages, salaries and proprietary income. We estimated the coastal area impacts using the U.S. Forest Service IMPLAN input-output model for Lincoln County. We developed statewide impact estimates using the IMPLAN model for Oregon.

Next, we produced estimates of the annual aggregate levels of expenditure and the associated personal income impacts by expanding the per day average estimates based on the number of user days for the year. These estimates were made separately for crabbers and for the non-crabbers who accompanied the crabbers, but who did not participate in crabbing.

Tables 1, 2 and 3 summarize the expenditure and economic impact estimates for the recreational fishery. Table 1 indicates the average daily trip expenditures made by recreational crabbers who travel from inland residences to the coastal area. The average daily trip expenditure for non-coastal residents is \$27.30, composed of \$6.41 made outside the coastal area, and \$20.89 made in the coastal area. The total impact on personal income per average user day in the coastal area is \$11.50. This impact resulted from the direct, indirect and induced effects of the \$20.89 per day average expenditure made in the coastal area. The associated personal income impact at the state level is \$20.54, based on the total average daily expenditure of \$27.30.

Table 1 also shows the estimated average daily expenditure by coastal resident crabbers. Based on a small sample of anglers, the average daily expenditure of \$14.60 has an associated personal income impact of \$4.72 in the coastal area and \$10.79 at the state level.

Strictly speaking, although these expenditures by coastal residents do not represent an amount attracted into the coastal area because of the recreational opportunities available, there is an associated effect on coastal personal income. But, we don't know to what extent these coastal crabbers would spend those dollars in other areas if the recreational crab fishery were not available. Nor can we tell instead if the expenditures would merely be reallocated to different goods or services in the coastal area. So, it may be less accurate to view these recreationists' expenditures as a significant contribution to the economic well-being of the coastal area, compared to the dollars brought into the coastal area by inland residents.

Table 2 shows the average daily expenditures for non-crabbers who accompanied the Alsea Bay recreational crabbers on their trips. We assumed that a prorated share of all party expenditures not specifically related to crabbing would be assigned to the non-crabbers as well as the crabbers. Thus, the average daily expenditure for inland resident non-crabbers was \$23.02, composed of \$5.69 spent inland and \$17.33 spent in the coastal area. The associated personal income impacts are \$10.22 for the coastal area and \$17.48 at the state level. Coastal resident non-crabbers spent an average of \$5.40 per day, with an associated personal income impact of \$2.14 on the coastal area and \$3.30 at the state level.

It may be appropriate to include the influence of non-crabbers' expenditures when estimating the impact of the recreational crab fishery. The assumption

Table 1. Average Daily Trip Expenditures and Associated Personal Income Impacts for Recreational Bay Crab Fishermen at the Lincoln County Level and the State of Oregon Level.

I. Inland Resident Crab Recreationists

Expenditure Category	Average Daily Per Person Expenditure	Impacts on Personal Income	
		Coastal Area	State Level
Inland Area Expenditures			
Transportation	\$ 5.18	\$ 0	\$ 3.04
Lodging	0.01	0	0.01
Food in stores	0.40	0	0.28
Food in restaurants	0.10	0	0.08
Boat expenses	0.54	0	0.21
Equipment expenses	0.17	0	0.14
Miscellaneous	0.01	0	0.01
Subtotal	\$ 6.41	\$ 0	\$ 3.77
Coastal Area Expenditures			
Transportation	\$ 0.38	\$ 0.18	\$ 0.22
Lodging	7.27	6.33	6.68
Food in stores	5.76	0.73	4.03
Food in restaurants	3.92	2.98	3.14
Boat expenses	0.88	0.16	0.34
Equipment expenses	2.13	0.58	1.81
Miscellaneous	0.55	0.54	0.55
Subtotal	\$ 20.89	\$ 11.50	\$ 16.77
TOTAL for Inland Resident Crabbers	\$ 27.30	\$ 11.50	\$ 20.54

II. Coastal Resident Crab Recreationists

Coastal Area Expenditures			
Transportation	\$ 4.20	\$ 1.99	\$ 2.46
Lodging	0.00	0.00	0.00
Food in stores	1.20	0.15	0.84
Food in restaurants	0.00	0.00	0.00
Boat expenses	0.80	0.14	0.31
Equipment expenses	8.20	2.24	6.98
Miscellaneous	0.20	0.20	0.20
TOTAL for Coastal Resident Crabbers	\$ 14.60	\$ 4.72	\$ 10.79

Table 2. Average Daily Trip Expenditures and Associated Personal Income Impacts for Non-crabbers Who Accompanied Recreational Bay Crab Fishermen at the Lincoln County Level and the State of Oregon Level.

I. Inland Resident Non-crab Recreationists

Expenditure Category	Average Daily Per Person Expenditure	Impacts on Personal Income	
		Coastal Area	State Level
Inland Area Expenditures			
Transportation	\$ 5.18	\$ 0	\$ 3.04
Lodging	0.01	0	0.01
Food in stores	0.40	0	0.28
Food in restaurants	0.10	0	0.08
Subtotal	\$ 5.69	\$ 0	\$ 3.41
Coastal Area Expenditures			
Transportation	\$ 0.38	\$ 0.18	\$ 0.22
Lodging	7.27	6.33	6.68
Food in stores	5.74	0.73	4.03
Food in restaurants	3.92	2.98	3.14
Subtotal	\$ 17.33	\$ 10.22	\$ 14.07
TOTAL for Inland Resident Crabbers	\$ 23.02	\$ 10.22	\$ 17.48

II. Coastal Resident Non-crabbers

Coastal Area Expenditures			
Transportation	\$ 4.20	\$ 1.99	\$ 2.46
Lodging	0.00	0.00	0.00
Food in stores	1.20	0.15	0.84
Food in restaurants	0.00	0.00	0.00
TOTAL for Coastal Resident Crabbers	\$ 5.40	\$ 2.14	\$ 3.30

Table 3. Estimates of Aggregate Use, Expenditures and Personal Income Impacts of the Recreational Bay Crab Fishery, Alsea Bay.

Activity/Economic Measure	Type of Recreationist	
	Inland Resident	Coastal Resident
Crabbers' User Days	18,409	5,189
Expenditures of Crabbers		
Coastal Area	\$ 384,564	\$ 75,759
Inland Areas	118,002	0
Total	\$ 502,566	\$ 75,759
Personal Income Impact of Crabbers' Expenditures		
Coastal Area	\$ 211,704	\$ 24,492
State Level	\$ 378,121	\$ 55,989
Ratio of Non-crabbers to Crabbers on Sampled Trips	0.16	0.10
Equivalent Activity Days for Associated Non-crabbers	2,945	519
Associated Expenditures by Non-crabbers		
Coastal Area	\$ 51,037	\$ 2,803
Inland Areas	16,757	0
Total	\$ 67,794	\$ 2,803
Personal Income Impact of Non-crabbers Expenditures		
Coastal Area	\$ 30,098	\$ 1,111
State Level	\$ 51,479	\$ 1,713
Total Expenditures Associated with Bay Crab Trips		
Coastal Area	\$ 435,601	\$ 78,562
Inland Areas	134,759	0
Total	\$ 570,360	\$ 78,562
Total Associated Impact on Personal Income		
Coastal Area	\$ 241,802	\$ 25,603
State Level	\$ 429,600	\$ 57,702

is that these people came to the coastal area primarily because other members of their party wanted to go crabbing in Alsea Bay. This overstates the influence of the fishery to the extent that these non-crabbers were attracted primarily to participate in other activities.

Table 3 summarizes the aggregate economic effects of the recreational fishery. Depending on how you want to view the activities of non-crabbers, the appropriate measures are either the expenditures and income impacts of crabbers, or the combined measures for both crabbers and non-crabbers. Similarly, the activities of coastal residents can be viewed as contributing economically to the coastal area or not.

For example, the estimated total expenditure in the coastal area by inland residents was \$435,601. These expenditures had an impact on coastal area personal income of \$241,802. If you also count the effect of coastal residents' expenditures, then the total personal income impact on the coastal economy was \$241,802 plus \$25,603, which equals \$267,405. The reader can easily make similar calculations for state level expenditures and income impacts.

The interested reader should keep in mind some of the implications of picking particular measures to describe the economic importance of the fishery. If you are concerned primarily with the economic well-being of the coastal area, it is better to focus on the measures which describe coastal area impacts. Many economists believe that these measures of secondary economic impact are more meaningful when the accounting stance taken is more limited geographically. The larger the area considered, the more valid is the argument that the economic effects of a change in the final demand for a product or service (such as a loss of recreational opportunity) will be "washed out" by an opposite change in purchases of some other good or service.

The Commercial Fishery

There has been some variation in the catch and ex-vessel value of bay crab landed at Waldport over the last few years. Table 4 below shows the landings, ex-vessel value and price of crab landed at Waldport for the four year period 1987 - 1990.

Table 4. Bay Crab Landings and Ex-Vessel Value and Price At Waldport, 1987 - 1990.

Year	Pounds	Value	Price
1987	31,827	\$58,059	\$1.82
1988	8,273	\$16,211	\$1.96
1989	15,348	\$30,328	\$1.98
1990	15,325	\$33,151	\$2.16
Average	17,693	\$34,437	\$1.98

In 1989, eight commercial fishing vessels reported landings of bay crab from Alsea Bay. The boats were all relatively small, ranging in length from 14 to 22 feet. Seven of the eight boats made significant landings, with five of the vessels having landed over 2,000 pounds each. Two of the boats reported landings in one or more other commercial fisheries. These landings were primarily of troll caught salmon.

We used the Commercial Fisheries Economic Assessment Model developed by Drs. Hans D. Radtke and William S. Jensen to estimate the personal income impact of the commercial bay crab landings for 1989 and 1990 on coastal area and state level personal income. This model captures the cash flows of commercial harvesters and processors and incorporates the IMPLAN input-output model of the coastal and state level economies. The crab was all assumed to have been converted to the whole cooked crab form for market. Table 5 shows the estimated impacts on personal income on a per pound basis:

Table 5.

Year	Ex-vessel Price (\$/Lb.)	Ex-processor Price (\$/Lb.)	Coastal Area Personal Income (\$/Lb.)	State Level Personal Income (\$/Lb.)
1989	\$ 1.98	\$ 2.75	\$ 3.56	\$ 4.75
1990	\$ 2.16	\$ 2.90	\$ 3.74	\$ 5.01

Given this information we computed the aggregate personal income impacts of Alsea Bay commercial bay crab harvests (Waldport landings) at the coastal and state levels for 1989 and 1990 (Table 6).

Table 6.

Year	Pounds Landed at Waldport	Coastal Area Personal Income	State Level Personal Income
1989	15,348	\$ 54,639	\$ 72,903
1990	15,325	\$ 57,316	\$ 76,778

As was the case for the interpretation of recreational fishery estimates, if you are concerned primarily with the economic well-being of the coastal area, it is better to focus on the measures which describe coastal area impacts.

In the next section we put the personal income impact estimates for the recreational and commercial fisheries on a comparable basis and discuss some of the implications of the comparison, particularly as it relates to allocation between sport and commercial interests.

Implications of the Recreational and Commercial Estimates

For purposes of comparison, we focus on the personal income impacts of the fisheries, especially the impacts on the coastal area. We discuss the overall magnitude of the fisheries as well as the impact per average crab caught. Finally, we discuss the implications of the comparison on potential allocation decisions.

On an aggregate basis, the recreational crabbing activities of inland residents in the Alsea Bay fishery produces about \$210,000 to \$240,000 of coastal area income annually, depending on whether or not the impact of the expenditures of noncrabbers who accompany crabbers is taken into account. The commercial fishery had an estimated coastal personal income impact of \$55,000 to \$57,000 in the two most recent years. These aggregate estimates suggest the overall importance of the two fisheries; however, they do not provide a guide to estimating the impact of shifting allocations between the fisheries - particularly the effect of a commercial fisheries closure.

In the commercial fishery, the average personal income per crab caught is:

Year	Area	Personal income per pound	Average pounds per crab	Personal income per crab
1989	Coastal	\$ 3.56	2.0	\$ 7.12
	State Level	\$ 4.75	2.0	\$ 9.50
1990	Coastal	\$ 3.74	2.0	\$ 7.58
	State level	\$ 5.01	2.0	\$ 10.02

On the recreational side, each sport crabber, on average, is accompanied by 0.16 noncrabbers. Therefore, using the estimates from Table 2, we can compute the average personal income impacts per recreational crabber day:

$$\$11.50 + (0.16 \times \$10.22) = \$ 13.14 \text{ coastal personal income per crabber day.}$$

$$\$20.54 + (0.16 \times \$17.48) = \$ 23.34 \text{ state personal income per crabber day}$$

The average recreational catch rate per angler day is 2.2 crabs per day. Thus, the average personal income impact per recreationally caught crab is:

Area	Personal income per crabber day	Average catch per day	Personal income per crab
Coastal	\$ 13.14	2.2	\$ 5.97
State level	\$ 23.24	2.2	\$ 10.61

Neither the commercial or recreational estimates are so precise that we should conclude that the average per crab impacts are significantly different for either fishery. So, the personal income impacts associated with an average commercially or recreationally caught bay crab are probably about equal.

The economic effects of a reallocation from one fishery to another depend on a number of factors. One of the most important points is that the overall economic magnitude of the fisheries should not be taken as an indicator of the marginal economic effects of reallocation.

The average measures of value may be useful, provided the effect on economic activity associated with the catch reductions in one fishery translates directly into an increase in economic activity associated with the fishery receiving the increased allocation. On this basis, using the average personal income impact per crab caught provides no convincing reasons for shifting catch between crab fisheries in Alsea Bay, because the average impacts are essentially equal per sport and commercial crab harvested.

The most appropriate analysis would be of the marginal effects of the policy change. In a marginal analysis, you ask the question, "What will we get for what we give up?" The answer to this question most often depends on more than aggregate or average values. The effect of the proposed policy also will typically depend on how people respond to the change.

A closure of the Alsea Bay commercial crab fishery would not have a beneficial effect on coastal personal income unless the recreational fishery attracted a sufficiently large number of sport crabbers from the inland area to offset the reduction in commercial personal income impacts. Unfortunately, there is no scientific basis for predicting whether or not such an increase in recreational crabbing activity would occur if the commercial fishery were closed. It can be argued that recreational catch rates or other aspects of the sport fishery will not be positively affected to the extent necessary to attract enough additional anglers to offset the reduction in personal income from a commercial closure. It can be also be argued that removal of the commercial harvesters will have such a positive psychological effect on sport crabbers that increased recreational activity will more than make up for the reduction in commercial activity.

APPENDIX

Background - Economic Value Concepts

The economic valuation of Oregon's fishery resources involves both financial (market) and nonfinancial (nonmarket) values. Financial values reflect actual exchanges of dollars that result from the commercial and recreational use of fish resources. For example, anglers purchase goods and services for their fishing trips. Commercial harvesters, processors and their customers make purchases during the production and distribution of a commercial fish product. These purchases or cash flows have direct and indirect economic impacts on businesses which are affected and, through the so-called "multiplier process", on the general economy. These economic impacts are often measured in terms of effects on gross output (total sales), employment or personal income.

A conceptually different measure of value, net economic value (NEV) may be defined as the "difference between the gross value of an economic activity and the costs (properly defined and measured) of carrying out that activity (Rettig, 1984). NEV is the measure of value appropriate for benefit-cost analysis. Benefit-cost analysis typically involves a comparison of the net benefits or economic *surpluses* associated with a project to the cost of the project; or, the net benefits of implementing a specific resource management option compared to other management options.

Most products of land and water use, such as timber and agricultural products, are priced in the market places of the nation's (or world's) economy. Conflicting demands for these products are resolved in the market, and prices are established when users bid against one another for the available supply. Therefore, it is conceptually easy to estimate the gross values and net economic values associated with timber and crop production, because market prices and production cost information tell us how society values such products.

However, this is usually not true for fish and wildlife associated recreation activities. Nonfinancial values are involved because recreational uses of fish such as angling are usually "nonmarket" commodities. That is, fish are considered to be property of the state, and angling rights are not typically sold through a competitive market. Thus, no market price exists to suggest how society values recreational use of the resource and to signal producers how much resource should be supplied. Conceptually, nonfinancial or nonmarket values represent people's willingness to pay for the use or availability of resources (such as fish) above and beyond participation costs. (Alternatively, people's willingness to accept compensation for a reduction or loss in resource use can be posed as a different conceptual measure of nonmarket value.)

The measure of net economic value which represents benefits or "user values" to recreational users of fish is often called "consumer surplus" by economists. Consumer surplus is difficult to understand as a real economic benefit because it represents money that has not been collected by anyone (such as the government) as payment for the benefit (such as recreational fishing) received. The fact that no one actually charges "consumers" the full amount they would be willing to pay does not make the consumer surplus any less real. In concept, the uncollected monies that could have been extracted

can be thought of as income that remains to be used by the consumer for other purposes.

For commercial fisheries, in addition to the consumer surplus associated with the consumption of fish, there is a "producer surplus" which represents the difference between the amount producers receive in payment and the "opportunity cost" of inputs.

Another kind of nonmarket value, generally referred to as preservation value, includes option value, existence value, and bequest value. Option value represents an amount people would pay to insure the availability of recreational opportunity for themselves in the future. Existence value is the benefit from knowing a fish or wildlife resource exists. Bequest value represents a willingness to pay for maintaining fish or wildlife for future generations.

References

- Loomis, John B., George Peterson and Cindy Sorg. 1984. A Field Guide to Wildlife Economic Analyses. Transactions of the 49th North American Wildlife and Natural Resources Conference. Wildlife Management Institute. Washington, D.C.
- Rettig, R. Bruce. April 1984. A Comprehensive Economic Study of the Ocean Salmon Fisheries Off the Coasts of California, Oregon and Washington and Related Inside Impacts. Report to the Pacific Fishery Management Council.