

Technical Document

A General Comparison of the Commercial and Sport Salmon  
Fisheries of the United States, 1940-70

By

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Introduction

The Pacific salmon resource supports the most valuable combined commercial and recreational fisheries of the United States.

The importance of the commercial fishery to the United States was shown by the technical document "Pacific Salmon Fishery: A Perspective" prepared by the Coastal Zone and Estuarine Studies Division (CZ&ES).<sup>1/</sup> In the United States, the commercial salmon fishery has consistently ranked first or second in landed value of all fin fish fisheries during the past 30 years and supports the largest number of fishing vessels and fishermen of any fishery. In the past decade it has ranked first or second in value at the manufactured level among canned fishery products and salted fishery products; ranked first in the value of smoked fish products and products from fish roe; and first in value of fish products exported from the United States. Clearly, the commercial salmon fishery is very important to the United States.

The increasing importance of recreational activities related to the Pacific salmon resource was shown in the CZ&ES technical document "Recreational Fishing Activities Related to the Pacific Salmon and Steelhead Resources of the United States and Canada."<sup>2/</sup> It was shown that public participation in sport salmon fishing is continually increasing along the Pacific coast, and

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<sup>1/</sup> Pacific Salmon Fishery: A Perspective. Coastal Zone and Estuarine Studies Division, Northwest Fisheries Center, National Marine Fisheries Service. Processed document (Nov. 1970).

<sup>2/</sup> Recreational Fishing Activities Related to the Pacific Salmon and Steelhead Resources of the United States and Canada. Coastal Zone and Estuarine Studies Division, Northwest Fisheries Center, National Marine Fisheries Service. Processed document (Aug. 1972).

in the Great Lakes where chinook and coho salmon were successfully introduced in the mid-sixties. Currently, salmon are being fished by nearly one million sport fishermen in the United States.

A third activity often not recognized is in the area of aesthetics especially along the Pacific coast where there are as many as 4,500 salmon streams and lakes. The anadromous nature of salmon, their observable return through many obstacles to their native streams and lakes to spawn and finally die, the millions of people, annually, who view salmon in fish ladders, hatcheries, spawning grounds, etc., all combine to impart a degree of social-psychological impact not found in any other fishery resource in the United States.

The purpose of this document is to provide a general perspective on the trend and comparative aspects on two of the three important activities related to the Pacific salmon resource--commercial fishing and recreational fishing. This is not a simple task since they are directed toward different social needs and wants. Commercial fishing is concerned with the harvesting and processing of the salmon resource into final products for human consumption and for industrial uses while recreational fishing is concerned primarily with satisfying a social need expressed through the total recreational experience associated with an outdoor activity. Along with satisfying the recreational need, a sport-caught salmon would also satisfy the food need if it is retained and consumed by the sportsman or others.

Thus, what is being attempted here is a comparison of activities with different consumer goals. Monetary values may help in part to serve as a common denominator in examining and comparing these activities. However,

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prior to this examination, the trend in commercial and sport salmon landings, and participation (angler day or trip) aspects of the sport fishery will be presented.

#### Trend in Landings and Sport Angler Participation

The trend in commercial landing (in weight) of Pacific salmon by state and by species for the period 1940-70 is presented in Table 1. Alaska clearly dominates the landings followed by Washington, Oregon and California. There are no commercial fisheries on salmon in Idaho and Michigan. Total landings have fluctuated between 200 and 400 million pounds during the past two decades. Pink and sockeye salmon are the dominant species in the commercial fishery followed by chum, coho, and chinook salmon.

The trend in sport catch of Pacific salmon in the United States during 1950-70 is presented in Table 2. In numbers of fish the total catch recently reached the two million mark led by the State of Washington. In terms of weight, sport salmon catch in the United States reached a high of 22.5 million pounds in 1970. Unlike the commercial fishery, the dominant species in the sport fishery were coho and chinook salmon.

A comparison of the trend in commercial and sport landings in terms of weight is given in Figure 1. Commercial landings were approximately 20 times that of sport landings in recent years. The sport salmon fishery, however, shows an average annual 20 percent increase in catch since the sharp decline in 1960.

An examination of the United States commercial salmon catch in context of world landings is made in Table 3. For the period covered (1965-69) the United States share was an average 33.9 percent of the world catch and was greatest for chinook, sockeye, and coho salmon.

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Comparison of the commercial and sport salmon catch (in weight) in the United States during 1965-69 is also shown in Table 3. Commercial catch made up 95.4 percent and sport catch 4.6 percent of the combined average annual landings of salmon in the United States. By species, the average annual sport catch of sockeye, pink, and chum salmon was less than one percent of the combined landings while sport catch of coho and chinook salmon was an average 17.4 percent and 19.6 percent respectively of the combined landings.

The trend in public participation in the sport salmon fishery in terms of angler days (or trips) is presented in Table 4. As indicated this information was not available for Oregon and Idaho, and in the case of Alaska and Michigan the data include steelhead angler days also. For years where data were available the average annual increase in number of angler days (or trips) was: Alaska 10.8 percent, Washington 5.5 percent, California 3.5 percent, and Michigan 123.3 percent.

For the section on valuations to be presented later the data most relevant to economic evaluation of the sport salmon fishery are angler days (or trips). However, since this data in Table 4 are inadequate (exception is Washington), the sport fishery value will be based on the catch data of Table 2 in conjunction with the catch-per-angler-day information reported for the Washington State sport salmon fishery.

#### Trend in Value of the Commercial and Sport Salmon Fisheries

Caution is advised in the interpretation of the information to follow as the economic evaluation of non-marketed, or public-type activity such as recreational fishing is still in its formative stages. Also, the estimates to

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be developed in this document are aggregate (gross) values which are approximations only of the general magnitude or apparent demand, in terms of monetary value, that consumers appear to place on the products of commercial and recreational salmon fisheries. Furthermore, these aggregate monetary values do not represent a higher need or use of the salmon resource by one fishery over the other, nor does it provide an adequate basis for decisions on resource development, allocation, or management of specific salmon stocks. For example, the values will not indicate, nor can they be used to determine, say, (1) the net economic benefits from increasing the productivity of the chinook salmon resource of the Columbia River, or (2) decisions on the allocation of a salmon stock between commercial and sport uses. In order to bring the values into proper perspective, however, a typology on socio-economic activities and valuations is first developed and presented.

#### Socio-Economic Activities and Valuations

In our society money is the medium of exchange in economic related activities (as contrasted to, say, power which is the medium of exchange in our political activities). Ours is a market economy based on the price system and, thus, prices delineate the units of money that are placed on a marketed commodity (good or service) of a certain quality. These prices, in a competitive market according to economic theory, are arrived through the interaction of supply and demand. On the demand side a price paid reflects the "utility" of the commodity to the consumer or buyer; i.e., utility is the property or capacity of the commodity to satisfy human needs or wants. On the supply side a price received for the commodity reflects the value of the various resources that went into its production or availability. From an accounting sense price is perceived differently. The price of a commodity represents monetary cost to the buyer while to the seller it represents monetary revenue.

For this document and for simplicity, the "value" of socio-economic activities will be viewed in terms of the consumer and the monetary price he is assumed to be willing to pay to consume the final product related to an activity. Table 5 sets the background for this through a typology on some selected socio-economic activities.

The first activity in Table 5, commercial salmon fishery, is related to a natural resource (salmon). Final products from this activity are "material goods"--canned, salted, smoked, fresh salmon, etc. These products are produced, and allocated and distributed through the private sector of our economy, and thus "marketed," to satisfy the oral experience of the consumer. The primary economic value indicator of the final product is retail price. Included in the retail price is the price of other goods and services (that went into producing and making the final product available) such as labor and materials in harvesting, processing, transportation, storage, brokerage, and administrative services, etc. Since the final consumptive act (eating) would most probably take place either at home or at a restaurant, the aggregate monetary value should consist of the retail price of the product plus the price of other goods and services related to personal transportation to and from, say, the fish market, the price of electricity used in baking the salmon, etc. However, since these salmon products are marketed and thus extensively distributed and made available at many outlets, the above mentioned price for other goods and services on personal transportation, etc., would be negligible and difficult to ascertain.

In contrast to commercial salmon the other examples in Table 5 are those of outdoor or indoor recreation activities where the final products are "events" rather than material goods.

Professional football is an activity using human resources to arrive at a final product which is an athletic contest. It is marketed and satisfies the social-psychological experience of the consumer through his consumptive action as a spectator. The primary economic value indicator of this final product is represented by the admission (ticket) price. Since the final product is not extensively distributed and made available (televised games excepted) as in material goods (e.g., canned salmon, clothing, shoes, etc.), other relevant economic values needed to determine the aggregate value on this product would be the price of goods and services related to personal transportation (and lodging) needs to and from the source of the final product--the athletic arena where the final consumptive act takes place.

A stage play is similar to professional football in all respects along the typology presented in Table 5 except for the final product which is a "performance." Again, admission (ticket) price is the primary economic value indicator of the final product with other relevant economic values being the price of goods and services related to personal transportation (and lodging) needs to the theatre.

The final product of the outdoor activity, skiing, is the action of skiing which is marketed and satisfies the social-psychological experience of the consumer through his consumptive action by way of participation (in contrast to the consumptive action as spectator in professional football and a stage play). In general, access to most ski areas are open to all and there is no admission price even though the slopes are privately owned or managed. Consumption of the final product, however, requires the use of a complementary



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service<sup>3/</sup> in the form of ski tow facilities. Therefore, the primary economic value indicator for this final product (skiing) is the facility-use price. Since the consumptive action is participatory, other relevant economic values would be the previously indicated price of goods and services related to personal transportation (and lodging) needs to the ski area plus, now, the price of goods and services related to the participatory aspects in consuming the final product by an individual (e.g., purchase or rental of ski equipment, clothing, etc.).

A trip to Disneyland is presented as an example where both admission and facility-use prices are placed on the final product. It is an activity where the final product is marketed entertainment with consumptive action carried out on the part of the consumer both as a spectator and participant. The primary economic value indicator of this final product is the admission price (to the grounds) plus facility-use price (for rides, etc.). Other economic values would be the price of goods and services related primarily to personal transportation (and lodging) needs to Disneyland.

Thus far, what has been shown for outdoor or indoor recreation were marketed final products in the form of events. There was also a price associated with each event such as price per football game, per stage play, per day on the ski slopes, per day at Disneyland, and per separate facility used at Disneyland. The remaining recreational activities and their final products in Table 5 are examples of events, where because they are related

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<sup>3/</sup> Complementary service in the sense that without the tow facilities the final product (skiing) cannot be consumed. An unlikely substitute to the use of the tow facilities is walking up the slope. Another example in the area of complementary is the tire and wheel of automobiles. Each alone serves no functional use.

primarily to "public" goods, market prices for the final products as such are absent. In its place economists have introduced the term "net economic value." For recreational fishing according to Brown et al.,

"'Net economic value' will be our best estimate of the monetary value of the sport fishery resource which might exist if the resource were owned by a single individual, and a market existed for the opportunity to fish for salmon and steelhead. This net economic value would approximate the value of the resource to a single owner who could charge sport anglers for his permission to fish for salmon and steelhead.

"The advantage of the above definition of net economic value is that it comes closest to imputing a value to the fishery resource <sup>4/</sup> comparable to what its value might be if it were privately owned."

The final product of the sport salmon fishery activity is fishing. More appropriately, a day, or half-a-day, or hours of fishing (or trip). As indicated in the table this final product is non-marketed in the United States. It satisfies the social-psychological experience of the consumer through the consumptive action of participation. If a salmon is caught and consumed by the sportsman, then his oral experience would also be satisfied. Currently, the primary economic value indicator of the final product is net economic value expressed on a per-day or -trip basis. For example, Brown et al. <sup>5/</sup> suggests a current, but interim net economic value (price) of \$20.00 per day for salmon and steelhead sport fishing. As in skiing, other economic values would be the price of goods and services related to personal transportation (and lodging) needs to the fishing sites as well as the price of goods and services related to the participatory aspects in consuming the final product by an individual (e.g., purchase or rental price of boat, fishing gear, bait, etc.).

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<sup>4/</sup> Brown, William G., Ajmer Singh, and Emery N. Castle. An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery. Agr. Exp. Sta., Ore. St. Univ., Tech. Bull. 78 (Sept. 1964), p. 28.

<sup>5/</sup> Brown, William G., Ashok K. Singh, and Jack A. Richards. Influence of Improved Estimating Techniques on Predicted Net Economic Values for Salmon and Steelhead. (May 26, 1972.) A processed "For Review Only" document.

Camping on public lands and parks is similar to sport salmon fishing along the typology of Table 5. A variation is also indicated in its allocation by the term semi-marketed. This covers those situations where a quasi-price is placed on the final product by way of a facility-use price (campground site) by public agencies. There is a general agreement that this price is extremely minimal and at most may probably cover only administration and enforcement costs and thus would not be comparable to the facility-use price associated with skiing.

The final example, hunting, is similar to sport salmon fishing and camping as to the typology. There are, however, many variations to this activity and final product. The polar examples being the non-marketed hunting of public animals on public lands to the marketed product (hunting) on private hunting preserves where admission or membership prices are placed in relation to the product.

Since the concern of this document is on commercial salmon and sport salmon fisheries, the summary to follow will be limited to these two activities.

The basic approach taken is to relate the aggregate monetary value (by way of price) to consumption of the final product of an activity. The final products of commercial salmon fishery are material goods such as canned salmon, salted salmon, etc. The aggregate monetary value of these products is assumed here to be represented by the retail price of these products since this price essentially covers most of the market related price of other goods and services that go into making the consumption of the final product possible. Recall that commercial salmon products are distributed extensively and made

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readily available to most consumers, therefore, prices associated with personal transportation to and from the retail outlet, etc., are assumed to be negligible in contrast to sport salmon fishing where personal transportation, etc., play an important part.

Sport salmon fishing, on the other hand, concerns a different product--fishing--which is an event rather than a material good. It is non-marketed at present so net economic value simulates a market price comparable to those marketed recreational products such as a professional football game, a stage play, etc. This net economic value, however, is not comparable to the retail price on commercial salmon products nor to the familiar ex-vessel (landed) or manufactured product values reported for salmon in commercial fishery statistics. From the standpoint of total recreational experience and as a product requiring participation on the part of the consumer, the price of goods and services related to personal transportation (and lodging) needs as well as those related to participatory needs (gear, boat, bait, etc.) on the part of an individual becomes relevant in determining the aggregate monetary value of the product of sport salmon fishing.

For informational purposes, the derivation of aggregate monetary values for all of the activities listed in Table 5 is summarized in Table 6.

The valuations and comparison to follow on commercial and sport salmon fisheries will be along aggregate monetary values. As indicated earlier, these are "gross" values which are approximations only of the general magnitude, or apparent demand (in terms of monetary value) that consumers appear to place on the products of commercial and recreational salmon fisheries.

### Aggregate Monetary Value of the Commercial and Sport Salmon Fisheries

The trend in value of the commercial and sport salmon fisheries of the United States is shown in Table 7. Three value estimates are given for the commercial fishery--landed (ex-vessel) value, manufactured products value, and estimated retail value. The last, retail value (or aggregate monetary value), is of concern in this document based on the rationale developed in earlier sections. These values are also shown in Figure 2.

Three value estimates are also presented in Table 7 for the sport salmon fishery. As explained earlier and as shown in Appendices A and B, net economic value simulates a market price for the final product of this activity which is fishing. Gross expenditure value is an estimate of the price of goods and services related to personal transportation, gear, boat, bait, etc., in pursuit of salmon fishing. The third value, aggregate monetary value, is the sum of the net economic value and gross expenditure value. These values are also shown in Figure 3.

A comparison of the estimated aggregate monetary value of the commercial salmon fishery and sport salmon fishery is presented in Figure 4. During the period 1950-70 the value of the commercial fishery was an average 3.8 times that of the sport fishery. In more recent years (1966-70), however, the ratio has dropped to 2.7.

Although the estimates presented are approximations with limitations, the annual value of the commercial salmon fishery has fluctuated between \$300 to \$500 million during the past decade with a high of \$672 million in 1970, while the annual value of the sport salmon fishery has increased steadily over the years from the estimated \$39.4 million in 1950 to the \$245.4 million of 1970.

Clearly, the Pacific salmon resource is very important to the United States as a source both for food and industrial products, and for recreation. In this context, the position taken in this document is that although conflicts between commercial and recreational uses do exist in many areas the value of the resource is such that public efforts be directed more to increasing the productivity of resource to further enhance both extremely important uses.

#### Discussion

As indicated earlier caution is advised in the use of the economic values developed in this document. The purpose was to provide a broad perspective and a general indication of the apparent total monetary value placed on salmon products by consumers. These values do not provide an adequate basis for determining how well off the consumer is, the benefits to a consumer from research or management actions, or the impact on the welfare and economy of the nation, a region, state, or community.

In recognition of the need for more precise estimates to assist in:

1. Resolving sport versus commercial conflicts,
2. Determining the impact of sport and commercial salmon activities on local, regional, or national economics,
3. Determining which salmon species should be produced in hatcheries,
4. Provide information needed in international negotiations (e.g., with Canada),
5. Provide some basis to guide public investment decisions as in the area of the Columbia River resource complex,
6. Etc.,

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economists from NMFS, academic institutions, state agencies, and the Canadian government are currently in the process of developing new methods or refining current valuation techniques on both recreational and commercial fisheries.

Table 1.--Commercial landing of Pacific salmon in the United States, 1940-70.

Year	By state				U.S. total	By species				
	Alaska	Washington	Oregon	California		Chinook	Chum	Pink	Sockeye	Coho
----- (million pounds) -----										
1940	395.7	34.9	19.7	6.7	457.0	41.8	77.5	216.8	76.7	44.2
41	526.1	57.9	24.8	3.8	612.6	48.8	68.9	356.9	97.3	40.7
42	392.3	48.4	22.7	6.6	470.0	49.0	88.6	208.4	83.7	40.3
43	418.2	30.2	12.2	6.6	467.2	38.2	77.6	176.3	145.0	30.1
44	379.2	22.8	16.6	10.3	428.9	40.8	82.0	155.7	117.0	33.4
45	353.1	65.0	17.9	13.4	449.4	47.5	62.5	200.4	90.5	48.5
46	326.2	55.2	17.7	13.4	412.5	54.4	69.1	152.0	100.7	36.3
47	338.0	84.1	20.6	11.5	454.2	54.9	45.0	179.6	139.0	35.7
48	313.2	38.8	18.8	7.8	378.6	46.7	70.5	97.0	125.4	39.0
49	347.6	76.6	12.8	6.4	443.4	40.3	43.5	244.5	78.1	37.0
1950	259.6	44.8	11.9	7.1	323.4	37.4	70.6	81.4	93.1	40.9
51	279.2	76.5	13.9	7.2	376.8	43.9	66.3	149.8	68.5	48.3
52	286.7	48.9	13.1	7.3	356.0	38.7	83.3	87.1	105.5	41.4
53	231.4	74.5	10.2	8.0	324.1	39.5	64.9	105.6	85.6	28.5
54	257.0	59.4	8.8	9.5	334.7	36.6	83.8	85.6	95.4	33.3
55	195.8	61.8	12.5	12.0	282.1	42.7	31.5	126.2	55.5	26.2
56	242.8	28.7	14.2	11.4	297.1	38.4	54.9	88.1	86.5	29.2
57	204.7	44.8	11.4	5.5	266.4	28.2	65.2	73.2	76.9	22.9
58	241.3	54.4	8.2	3.7	307.6	27.6	68.0	120.9	67.8	23.3
59	147.3	42.3	5.3	6.8	201.7	27.4	38.5	61.8	53.8	20.2
1960	207.1	16.5	5.6	6.2	235.4	24.1	49.8	52.6	95.2	13.7
61	264.8	30.0	7.0	8.6	310.4	27.0	48.1	108.4	103.7	23.2
62	277.8	22.8	7.2	6.7	314.5	25.1	60.3	143.3	58.0	27.8
63	223.1	55.0	8.3	7.9	294.3	27.2	38.8	156.8	43.4	28.1
64	311.6	21.3	9.9	9.5	352.3	28.7	65.8	162.3	57.4	38.1
65	274.8	30.4	11.8	9.7	326.7	29.3	31.3	79.6	148.0	38.5
66	333.3	32.4	12.4	9.4	387.5	27.2	56.5	163.0	102.0	38.8
67	138.5	53.4	17.4	7.4	216.7	26.2	34.5	51.7	66.0	38.3
68	285.3	25.8	9.6	7.0	327.7	25.8	61.5	148.6	54.0	37.8
69	211.9	31.9	10.5	7.1	261.4	28.7	24.9	112.3	74.0	21.5
1970	342.5	40.5	20.5	6.7	410.2	31.7	57.4	117.8	159.6	43.7

Data source: Fishery Statistics of the United States.



Table 2.---Sport catch of Pacific salmon in the United States, 1950-70<sup>1/</sup>

Year	Alaska	Washington	Oregon	Idaho	California	Michigan	U.S. total	Total weight <sup>2/</sup> (million lb.)
1950	( 16.2)	315.5	( 37.7)	4.4	62.0	--	435.8	4.4
51	( 17.9)	378.0	( 45.3)	6.8	111.0	--	559.0	5.7
52	( 19.8)	463.3	( 54.5)	7.1	133.0	--	677.7	6.9
53	( 21.9)	434.3	( 65.6)	8.7	152.0	--	682.5	6.9
54	( 24.2)	472.2	( 78.9)	15.0	185.0	--	775.3	7.9
55	( 26.7)	585.3	59.6	19.0	199.0	--	889.6	8.8
56	( 29.5)	703.9	118.2	21.0	176.0	--	1,048.6	10.4
57	( 32.6)	868.9	107.0	39.0	69.0	--	1,116.5	11.1
58	( 36.0)	531.3	95.9	24.0	81.0	--	768.2	7.6
59	( 39.7)	508.5	159.0	20.0	86.0	--	813.2	8.1
1960	( 43.8)	312.0	92.0	21.0	56.0	--	524.8	4.9
61	( 48.4)	508.3	164.4	13.0	59.0	--	793.1	7.4
62	( 53.4)	599.1	175.9	12.0	132.5	--	972.9	9.0
63	( 59.0)	1,115.9	225.9	12.0	116.4	--	1,529.2	14.2
64	( 65.1)	564.8	251.8	8.0	140.9	--	1,030.6	9.6
65	64.1	940.2	348.3	Closed	80.7	--	1,433.3	12.7
66	73.2	756.9	287.2	8.5	106.0	--	1,231.8	10.9
67	78.4	1,066.1	456.9	7.5	122.9	55.0	1,786.8	15.8
68	74.5	877.3	350.1	11.5	194.6	110.3	1,618.3	14.3
69	76.8	876.6	348.8	13.0	184.0	488.4	1,987.6	17.6
1970	101.8	978.0	(360.0)	(13.0)	(184.0)	789.0	2,542.8	22.5

<sup>1/</sup> Sport catch in parentheses were estimated as follows:

Alaska (1950-64): catches were extrapolated back from 1964 on an assumed 10.4 percent decrease per year using the average catch of 71.9 thousand fish (1965-67) as a base to estimate the 1964 catch, i.e.  $1964 \text{ catch} = \frac{71.9}{1.104} = 65.1$

Oregon (1950-54): based on the same technique for Alaska above but using an annual 20.3 percent decrease per year with a base estimate of 94.9 thousand fish (1955-57), i.e.

$$1954 \text{ catch} = \frac{94.9}{1.203} = 78.9$$

1970 estimates for Oregon, Idaho, and California are approximations. Other data are from the Technical "Working" Document on recreational fisheries, Coastal Zone and Estuarine Studies Division, NMFS, Seattle, WA, August 1972.

Table 2.--Sport catch of Pacific salmon in the United States, 1950-70.--Cont.

2/ Since information on catch by species was not available for many of the years and areas the following percentages were used to apportion the total catch by species for a selected time period as shown below:

<u>Period</u>	<u>Chinook</u>	<u>Coho</u>	<u>Pink</u>	<u>Sockeye &amp; chum</u>
	- - - - - (Percent of catch) - - - - -			
1950-54	53.5	42.8	3.7	0
1955-59	50.4	44.2	5.4	0
1960-64	42.4	44.8	12.8	0
1965-70	31.8	64.0	3.1	1.1

The following average weight per sport-caught fish was assumed for all years:

Chinook.....	13 lb./fish
Coho.....	7 lb./fish
Pink.....	5 lb./fish
Sockeye & chum.....	8 lb./fish

Average weight of chinook and coho salmon was estimated from the data of Haw, Frank, Henry O. Wendler, and Gene Deschamps, "Development of Washington State Salmon Sport Fishing through 1964," Res. Bull. No. 7, Wash. Dept. Fish. (May 1967).

Average weight of sockeye and chum salmon is based on the Alaska sport salmon fishery (personal communication).

Average weight of pink salmon was reported in Gebhards, Stacy V., "Status of the 1967 Salmon and Steelhead Sport Catches in the Pacific Coast States," Pac. Mar. Fish. Comm., 21st Ann. Rpt. for the year 1968 (Aug. 1969), p. 26-27.

Total weight is the sum of the estimated number of fish by species multiplied by its respective average weight.

Figure 1.--Trend in commercial and sport salmon landings in the United States, 1940-70.

(Logarithmic Scale)

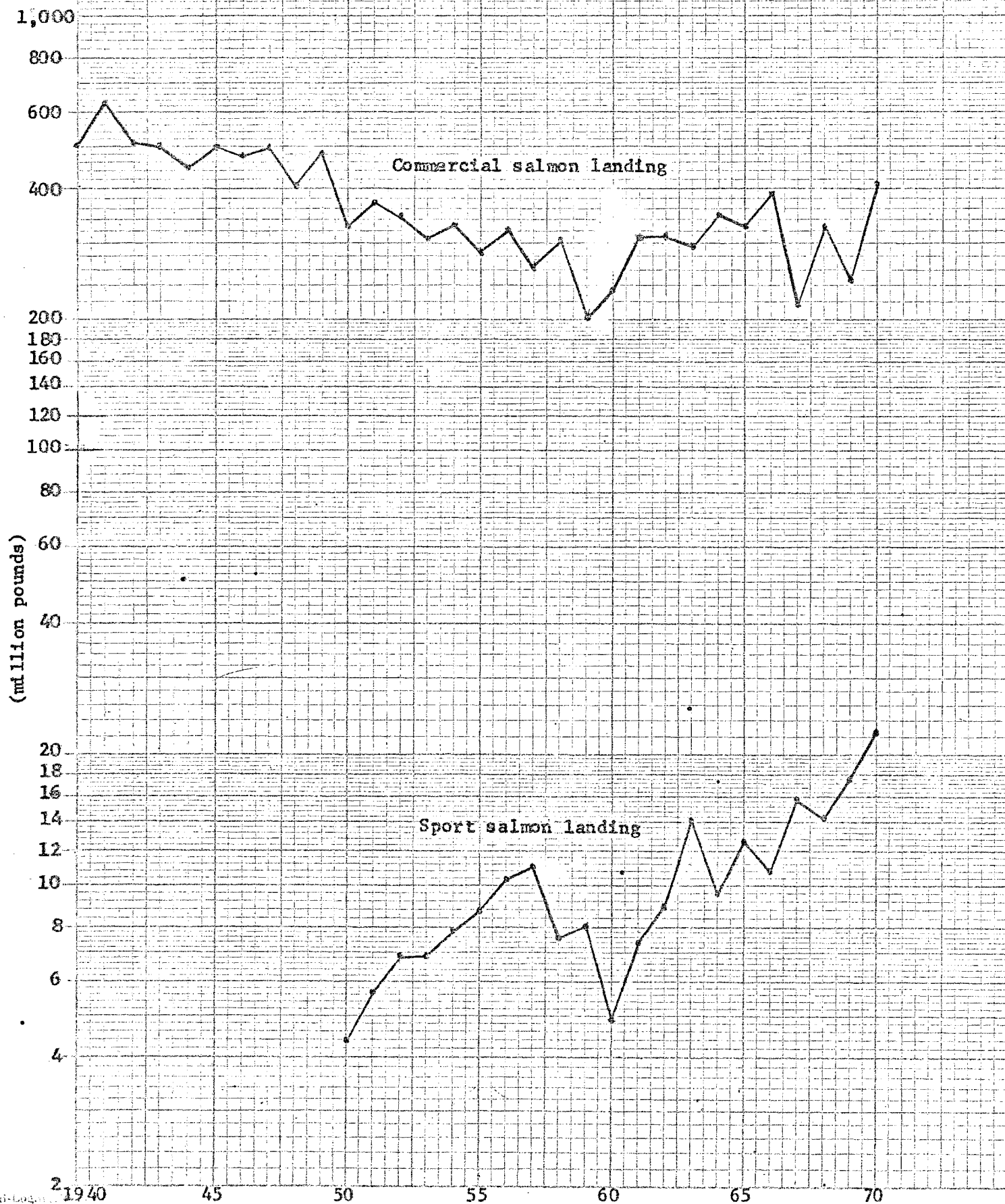


Table 3.--Average annual catch (in weight) of Pacific salmon; 1965-69.

	<u>Sockeye</u>	<u>Pink</u>	<u>Chum</u>	<u>Coho</u>	<u>Chinook</u>	<u>Total</u>	<u>Percent</u>
	-- (thousand pounds) --						
<u>Commercial</u>							
United States	88,940	111,069	41,688	35,417	27,538	304,652	33.9
Canada	28,905	43,495	16,814	29,775	16,562	135,551	15.1
Japan	41,658	134,132	110,551	13,628	2,699	302,668	33.7
U.S.S.R.	<u>6,924</u>	<u>88,465</u>	<u>49,833</u>	<u>7,365</u>	<u>2,249</u>	<u>154,836</u>	<u>17.3</u>
Total	166,427	377,161	218,886	86,185	49,048	897,707	100.0
Percent U.S.	53.4	29.4	19.0	41.1	56.1		
<u>United States</u>							
Commercial	88,940	111,069	41,688	35,417	27,538	304,652	95.4
Sport <sup>1</sup>	<u>113</u>	<u>228</u>	<u>1</u>	<u>7,468</u>	<u>6,703</u>	<u>14,513</u>	<u>4.6</u>
Total	89,053	111,297	41,689	42,885	34,241	319,165	100.0
Percent sport	0.1	0.2	0	17.4	19.6		

<sup>1</sup>/ Alaska, Washington, Oregon, Idaho, California, and Michigan sport salmon fisheries.

Table 4.--Public participation in sport salmon fishing--United States

Year	Number of angler trips or days					Michigan <sup>1/</sup>
	Alaska <sup>1/</sup>	Washington <sup>2/</sup>	Oregon	Idaho	California <sup>2/</sup>	
	(thousands)					
1938	-	303.0	-	-	-	0
39	-	231.0	-	-	-	0
1940	-	260.0	-	-	-	0
41	-	271.0	-	-	-	0
42	-	-	-	-	-	0
43	-	-	-	-	-	0
44	-	-	-	-	-	0
45	-	-	-	-	-	0
46	-	356.4	-	-	-	0
47	-	382.0	-	-	-	0
48	-	-	-	-	-	0
49	-	571.8	-	-	-	0
1950	-	576.8	-	-	-	0
51	-	658.0	-	-	-	0
52	-	716.6	-	-	-	0
53	-	707.0	-	-	-	0
54	-	807.8	-	-	-	0
55	-	837.1	-	-	-	0
56	-	956.0	-	-	-	0
57	-	964.1	-	-	-	0
58	-	814.4	-	-	-	0
59	-	750.1	-	-	-	0
1960	-	778.3	-	-	-	0
61	-	971.2	-	-	-	0
62	-	1107.0	-	-	172.2	0
63	-	1432.2	-	-	115.3	0
64	-	1252.7	-	-	144.7	0
65	67.9	1278.8	-	-	122.7	0
66	77.0	1147.6	-	-	114.9	0
67	84.8	1295.0	-	-	160.3	167.0
68	90.6	1091.2	-	-	185.0	500.0
69	99.3	1215.5	-	-	183.2	1000.0
1970	113.4	1509.8	-	-	-	1755.0
71						
72						
73						
74						
75						

<sup>1/</sup> Combined salmon and steelhead trips or days<sup>2/</sup> Angler trips or days in marine waters only

# activities and valuations

Aspect	Primary economic value indicator of the product	Other economic value indicators, re: to final consumptive act
Consumptive	Retail price	Price of goods and services related to personal transportation to and from the retail outlet
-----		
Spectator	Admission price	Price of goods and services related to personal transportation (and lodging) needs to and from the source of the final product(A)
il		Ditto(A)
Participatory	Facility-use price	Ditto(A)+ Price of goods and services related to the participatory aspects in consuming the final product(B)
il		Ditto(A)
Spectator-participatory	Admission price plus facility-use price	
il		Ditto(A)+ Ditto (B)
Participatory	[net economic value]	Ditto(A) + Ditto(B)
il		Ditto(A) + Ditto(B)
Participatory	Facility-use price <sup>2/</sup> (campground site)	Ditto(A) + Ditto(B)
il		Ditto(A) + Ditto(B)
Participatory	[net economic value]	Ditto(A) + Ditto(B)
il		Ditto(A) + Ditto(B)
Participatory	Admission or membership price to private hunting preserve	Ditto(A) + Ditto(B)
il		Ditto(A) + Ditto(B)

our economy. "Non-marketed" = largely through our public sector. lic sector.

Table 6.--Summary on derivation of aggregate monetary values for some selected socio-economic activities.

<u>Activity</u>	<u>Final product</u>	<u>Aggregate monetary value</u>
Commercial salmon fishery	Canned, salted, fresh, etc. salmon	(Retail price)
Sport salmon fishery	Fishing	(Net economic value) + (Price of goods and services related to personal transportation (and lodging) needs + (Prices of goods and services related to the participatory aspects (equipment, gear, clothing, etc.) in consuming the product
Professional football	Athletic contest	(Admission price) + (- - - - Ditto - - - -)
Stage play	Performance	(Admission price) + (- - - - Ditto - - - -)
Skiing	Skiing	(Facility-use price) + (- - - - Ditto - - - -) + (- - - - Ditto - - - -)
Trip to Disneyland	Entertainment	(Admission and facility-use prices) + (- - - - Ditto - - - -)
Camping (public)	Camping	(Net economic value) + (- - - - Ditto - - - -) + (- - - - Ditto - - - -)
Hunting (public)	Hunting	(Net economic value) + (- - - - Ditto - - - -) + (- - - - Ditto - - - -)

Table 7.--Trend in value of the commercial and sport salmon fisheries of the United States, 1940-70.

Year	Commercial salmon <sup>1/</sup>			Sport salmon <sup>2/</sup>		
	Landing (ex-value)	Manu- factured	Retail -(million dollars)-	Net economic value	Gross expenditure value	Aggregate monetary value
1940	\$12.8	\$ 44.0	\$ 87.2	--	--	--
41	20.0	74.0	136.3	--	--	--
42	23.5	68.0	160.1	--	--	--
43	21.2	68.0	144.4	--	--	--
44	20.7	62.0	141.0	--	--	--
45	25.7	60.0	175.1	--	--	--
46	31.9	81.0	217.3	--	--	--
47	39.3	128.0	317.7	--	--	--
48	38.2	128.0	332.7	--	--	--
49	46.7	111.0	412.3	--	--	--
1950	37.4	125.0	243.5	\$12.9	\$ 26.5	\$ 39.4
51	52.5	124.0	370.1	16.8	34.5	51.3
52	45.2	114.0	316.4	17.5	35.9	53.4
53	37.8	98.0	273.3	19.1	39.1	58.2
54	44.0	106.0	278.5	23.2	47.4	70.6
55	40.7	97.0	251.3	22.4	45.8	68.2
56	46.2	112.0	287.3	25.4	51.9	77.3
57	39.6	102.0	266.8	22.6	46.2	68.8
58	45.9	113.0	309.2	22.0	44.7	66.7
59	35.7	91.0	200.2	22.6	46.0	68.6
1960	44.7	109.0	249.7	25.3	51.3	76.6
61	52.0	143.0	370.1	29.9	60.7	90.6
62	56.4	131.0	386.1	36.0	73.0	109.0
63	49.0	113.0	334.7	40.0	80.8	120.8
64	56.0	125.0	344.9	49.8	100.6	150.4
65	65.1	154.0	423.9	43.9	88.8	132.7
66	73.5	168.0	461.6	43.5	88.0	131.5
67	48.5	112.0	293.6	53.1	108.2	161.3
68	67.0	158.0	487.9	45.6	93.7	139.3
69	54.7	( 129.3)	372.7	54.9	117.3	172.2
1970	98.7	( 233.3)	672.4	77.7	167.7	245.4

<sup>1/</sup> Landing (ex-vessel) and manufactured product values were obtained from Fishery Statistics of the United States (various years). Values in parentheses are estimates based on the average 136.4% spread between landed and manufactured values during 1960-68. Retail values for years 1947-68 are estimates based on the percentage spread (or value added) in price per pound of salmon at landing (ex-vessel) and retail levels as reported in Table II-3, "Basic Economic Indicators: Salmon," Master Plan Fishery 50-10-48, Working Paper No. 62, Division of Economic Research, NMFS, (May 1970). Retail values for 1940-46 and 1969-70 are estimates based on the average spread of 581.3% between ex-vessel and retail price per pound for salmon during 1947-68 as reported in the above mentioned Table II-3.

<sup>2/</sup> See Appendix A and B for estimates of unit values used in the valuations of the U.S. sport salmon fishery.



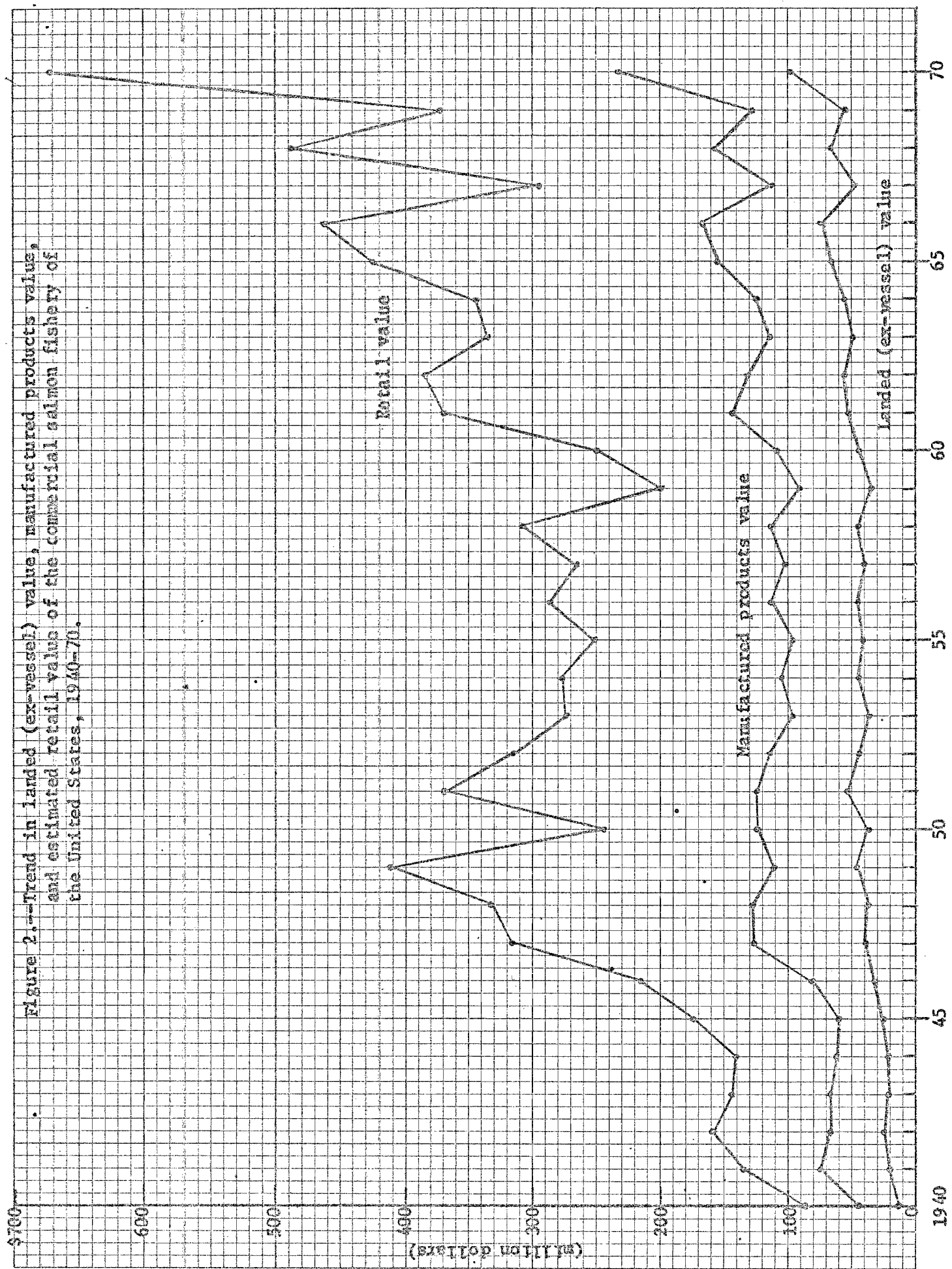
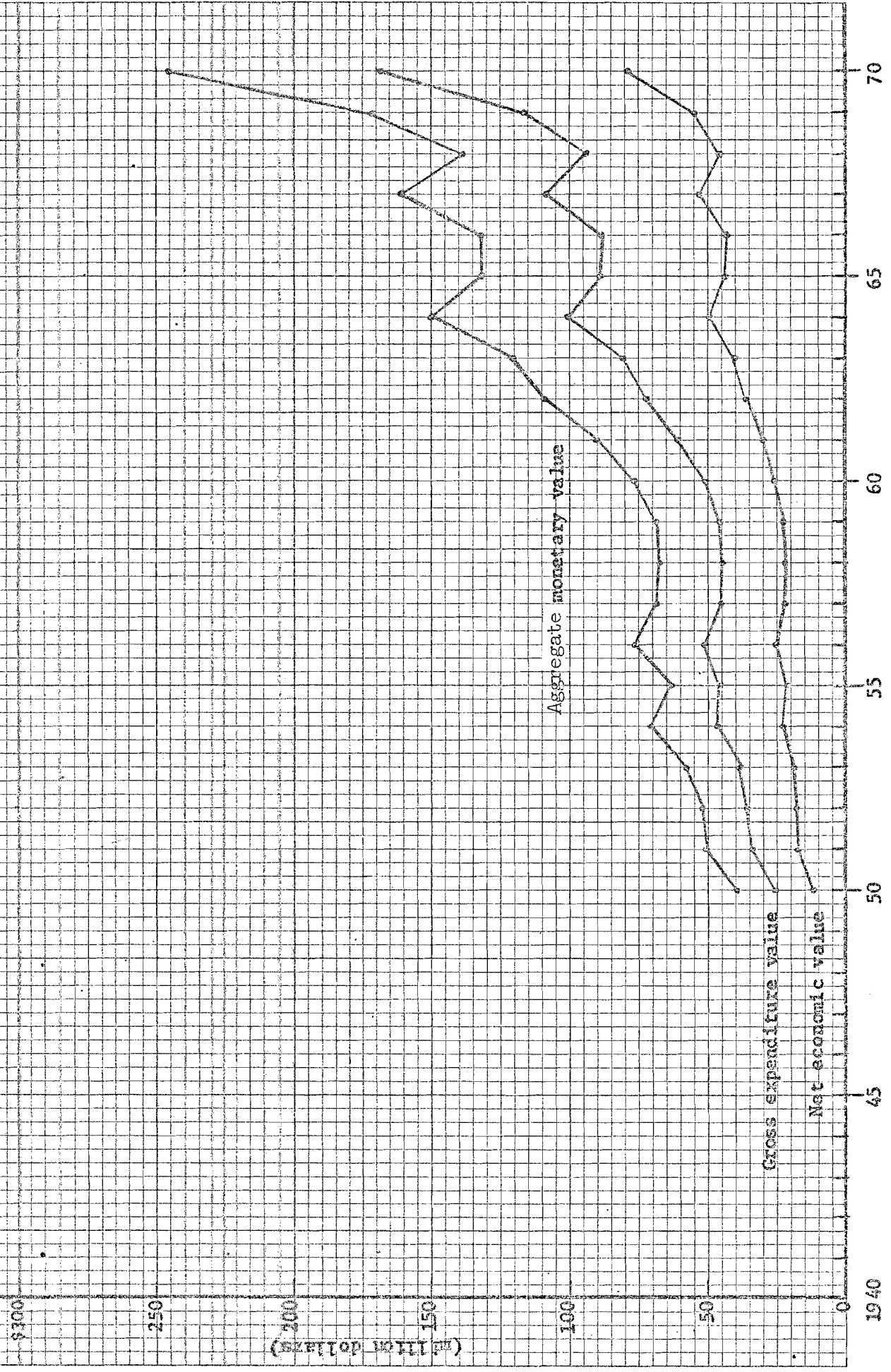
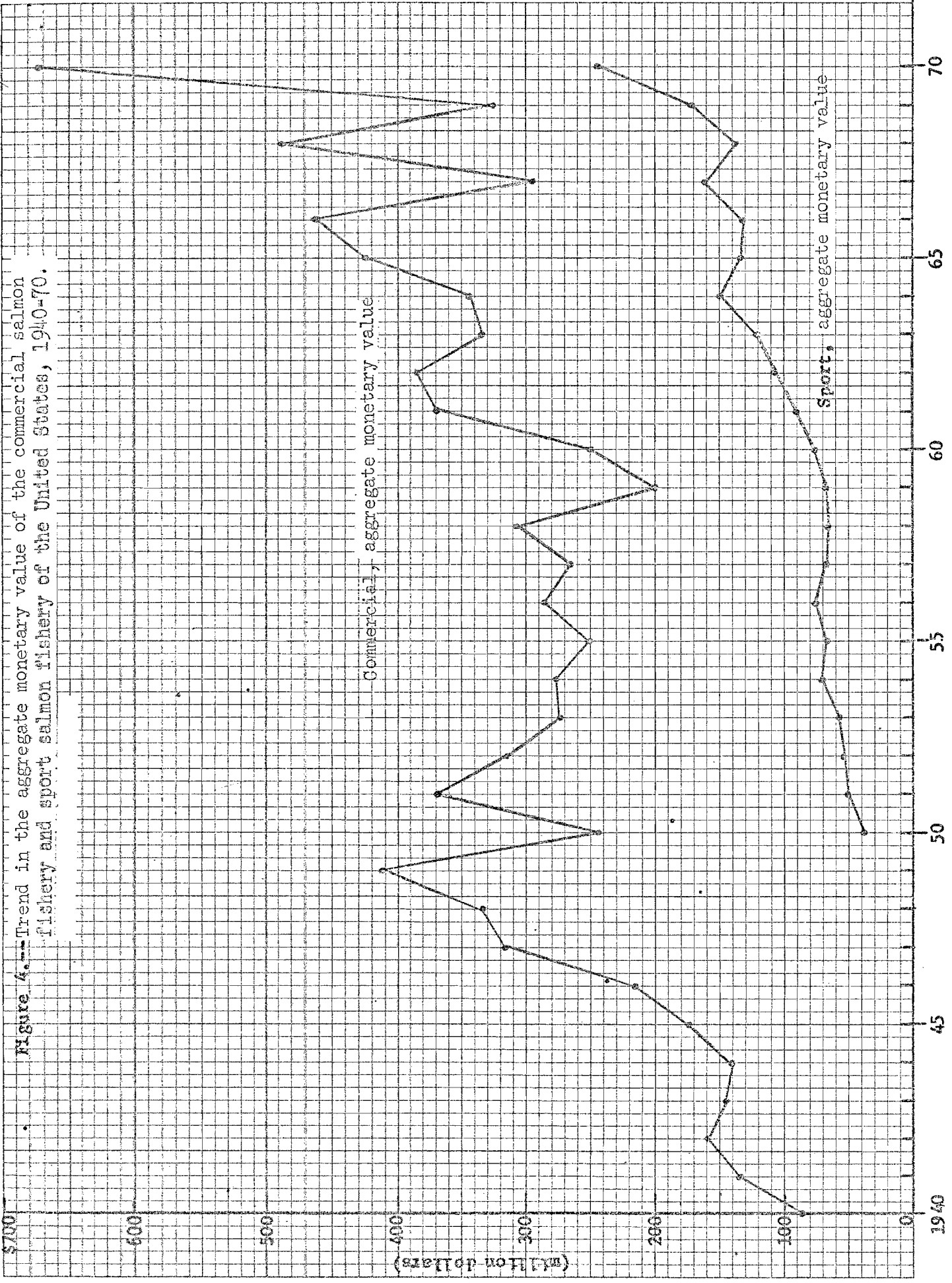


Figure 2.--Trend in landed (ex-vessel) value, manufactured products value, and estimated retail value of the commercial salmon fishery of the United States, 1940-70.

Figure 3.--Trend in net economic value, gross expenditure value, and aggregate monetary value of the sport salmon fishery of the United States, 1950-70.





Appendix A.--Estimated net and gross value per sport-caught salmon in the Pacific area (Alaska, Washington, Oregon, Idaho, and California), 1950-70.1

	Net economic value			Gross expenditure value			
	(A) Washington State salmon catch per day (trip)	(B) Net value per fish @ \$20/day (unadjusted)	(C) Adjustment factor	(D) Net value per fish @ \$20/day (adjusted)	(E) Gross value per fish @ \$43.57/day (unadjusted)	(F) Adjustment factor	(G) Gross value per fish @ \$43.57/day (adjusted)
1950	0.55	\$36.36	1.228	\$29.61	\$ 79.22	1.304	\$60.75
51	0.55	36.36	1.209	30.07	79.22	1.285	61.65
52	0.65	30.77	1.190	25.86	67.03	1.266	52.95
53	0.61	32.79	1.171	28.00	71.43	1.247	57.28
54	0.58	34.48	1.152	29.93	75.12	1.228	61.17
55	0.70	28.57	1.133	25.22	62.24	1.209	51.48
56	0.74	27.03	1.114	24.26	58.88	1.190	49.48
57	0.90	22.22	1.095	20.29	48.41	1.171	41.34
58	0.65	30.77	1.076	28.60	67.03	1.152	58.19
59	0.68	29.41	1.057	27.82	64.07	1.133	56.55
1960	0.40	50.00	1.038	48.17	108.92	1.114	97.77
61	0.52	38.46	1.019	37.74	83.79	1.095	76.52
62	0.54	37.04	1.000	37.04	80.68	1.076	74.98
63	0.78	25.64	1.019	26.13	55.86	1.057	52.85
64	0.43	46.51	1.038	48.28	101.33	1.038	97.62
65	0.69	28.99	1.057	30.64	63.14	1.019	61.96
66	0.61	32.79	1.076	35.28	71.43	1.000	71.43
67	0.72	27.78	1.095	30.42	60.51	1.019	61.66
68	0.75	26.67	1.114	29.71	58.09	1.038	60.30
69	0.66	30.30	1.133	34.33	66.02	1.057	69.78
1970	0.56	35.71	1.152	41.14	77.80	1.076	83.71

$$\text{Computations: } B = \frac{\$20.00}{A}$$

$$D = \frac{B}{C} \quad \text{or} \quad D = (B)(C)$$

$$E = \frac{\$43.57}{A}$$

$$G = \frac{E}{F} \quad \text{or} \quad G = (E)(F)$$

Appendix A.--(cont'd)

1/ Column: (A) Information on salmon catch per day for the years concerned was available only on the Washington fishery. Although there are variations between states, for the purpose of this report it will be assumed that the Washington data represent the entire Pacific area sport salmon fishery--Alaska, Washington, Oregon, Idaho, and California.

Data source: 1950-64 is from Haw, Frank, Henry O. Wendler, and Gene Deschamps, "Development of Washington State Salmon Sport Fishery Through 1964," Wash. St. Dept. Fish., Res. Bull. No. 7 (May 1967); 1965-70 data are from the annual reports on "Washington Salmon Sport Catch Report" by Nye, Gene D., and W. Dale Ward, Wash. St. Dept. Fish.

- (B) Based on the preliminary and suggested interim net value of \$20.00 per day for salmon and steelhead sport fishing as reported in the processed, "For Review Only" document by Brown, William G., Ashok K. Singh, and Jack A. Richards, "Influence of Improved Estimating Techniques on Predicted Net Economic Values for Salmon and Steelhead" (May 25, 1972). The \$20.00 per day value is based on information collected on the 1962 sport salmon and steelhead fisheries of Oregon. Estimates in this column (B) have not been adjusted for changes in the price level.
- (C) Adjustment factors to reflect changes in the price level during 1950-70. The factors presented in this column (C) are based on an estimated 1.9% average annual change (increase) in the Consumer Price Index (CPI) during 1950-69. Base year for column (C) is 1962. CPI data source: U.S. Bureau of the Census, "Statistical Abstract of the United States," Wash., D.C. (various years).
- (D) Adjusted net values per fish reflecting the average annual 1.9% increase in the price level during 1950-70. For years prior to 1962 the computation is  $D = B/C$  and for years after 1962 it is  $D = (B)(C)$ .
- (E) Based on the gross expenditure value per day of \$43.57 estimated for the 1966 Washington sport salmon fishery. This value is assumed to be representative of the entire sport salmon fishery in the Pacific area for purposes of this report. Data source: Crutchfield, James A., and Dougald MacFarlane, "Economic Evaluation of the 1965-1966 Salt-water Fisheries of Washington," Wash. St. Dept. Fish., Res. Bull. No. 8 (1968).
- (F) See column (C) for explanation. Base year for this column (F) is 1966.
- (G) Adjusted gross values per fish reflecting the changes in the price level during 1950-70. For years prior to 1966 the computation is  $G = E/F$  and for years after 1966 it is  $G = (E)(F)$ .

Appendix B.---Estimated net and gross value per sport-caught salmon in Michigan,  
1967-70.<sup>1/</sup>

Year	(A) Adjustment factor	Net economic value		Gross expenditure value	
		(B) Net value per fish (unadjusted)	(C) Net value per fish (adjusted)	(D) Gross value per fish (unadjusted)	(E) Gross value per fish (adjusted)
1967	1.057	\$7.12	\$6.74	\$26.44	\$25.01
68	1.038	7.12	6.86	26.44	25.47
69	1.019	7.12	6.99	26.44	25.95
1970	1.000	7.12	7.12	26.44	26.44

Computations:

$$C = \frac{B}{A}$$

$$E = \frac{D}{A}$$

<sup>1/</sup> Information on salmon catch per day (trip) which is needed to convert the per-day net and gross values to per-fish values on an annual basis was not available on the Michigan fishery. Therefore, the net value of \$7.12 per fish and approximate gross value of \$26.44 per fish (2 x \$13.22) as estimated from the data of Ellefson and Jameson (1971) on the 1970 Michigan fishery were used as the unit values for all years. The adjustment factor (column A) was explained earlier in Appendix A.

Data source: Ellefson, Paul V., and Gale C. Jansen, "Michigan's Salmon-Steelhead Trout Fishery: An Economic Evaluation," Mich. Dept. Nat. Resources. Presented at the 75th Annual Meeting of the Michigan Academy of Science, Arts, and Letters, Kalamazoo, Michigan, Apr. 23, 1971, 12 p.