

FINAL

FISHERY MANAGEMENT PLAN FOR
Commercial and Recreational Salmon Fisheries
Off the Coasts of Washington, Oregon, and California
Commencing in 1978

Pacific Fishery Management Council
526 S.W. Mill Street
Portland, Oregon 97201

March 1978

SUMMARY

This Fishery Management Plan for the ocean salmon fisheries off the coasts of Washington, Oregon and California is the second step in developing a comprehensive management regime for salmon fisheries under the jurisdiction of the Pacific Fishery Management Council. The purpose of the plan is to manage the salmon fisheries for optimum yield, conservation of the stocks, and allocation and harvest among domestic fishermen.

The plan addresses the need to control the ocean salmon fishery in order to maintain or increase escapement of salmon into many Washington, Oregon and Idaho streams. Severe passage problems at mainstem Columbia River dams in conjunction with some ocean harvests are resulting in inadequate spawning escapement of Snake River spring and summer runs of chinook salmon. Certain Puget Sound and coastal Washington stocks are also severely depressed in spite of extensive closures applied to inside fisheries. Additionally, Federal court rulings have required the states of Washington and Oregon to provide treaty Indians with the opportunity to take 50% of the total U.S. harvest allowed on stocks of fish destined for treaty Indian's usual and accustomed fishing areas.

Specific management objectives for the determination of optimum yield are as follows:

1. Maintain optimum spawning stock escapements. (Severe passage problems at mainstem Columbia River dams in conjunction with some ocean harvests are resulting in inadequate spawning escapements of Snake River spring and summer chinook salmon. Certain Puget Sound and coastal Washington stocks are also severely depressed in spite of extensive closures applied to "inside" fisheries.)
2. Reduce fishery-caused mortalities other than those fish landed.
3. Move toward fulfilling Indian treaty obligations. (Current Federal court judicial interpretations have ordered the states of Oregon and Washington to provide treaty Indians with an opportunity to take 50% of the total U.S. harvest allowed on stocks of fish destined for treaty Indian usual and accustomed fishing areas.)
4. Provide all ocean and "inside" fisheries the continuing opportunity to harvest salmon.
5. Plan management on the premise that yield of the salmon fishery includes food production, dollar value, recreational value, and certain sociological or cultural values and that all of these values must be considered in the regulation and management of the fisheries.
6. For the commercial fishery, maximize poundage yield by minimizing the taking in that fishery of chinook and coho having significant remaining growth potential; however, recognize that desired yield to commercial fisheries requires not only a consideration of pounds produced, but also quality of the product as indicated by consumer demand and prices.
7. In the recreational fishery, where desired yield includes not only the anticipation of acquiring a high-value, personal-use food item, but also significantly reflects the recreational value of the fishing experience, recognize that optimum value does not necessarily require harvesting only mature fish.
8. Achieve, for the long term, coordination with Canada and the North Pacific Fishery Management Council in the development of coastwide salmon management plans.

Alternative management measures which were considered to achieve optimum yield are addressed in the management plan. These include:

1. Troll chinook minimum size limit
2. Troll coho minimum size limit
3. Selective troll fishing gear
4. Troll chinook fishing season
5. Troll coho fishing season
6. Incidental catch allowance for coho
7. Troll fishery limited entry
8. Ocean sport season
9. Ocean sport fishery minimum size limits
10. Ocean sport fishery bag limit
11. Ocean sport fishery limited entry
12. Ocean sport fishery gear
13. River mouth closures
14. Barbless hooks
15. Ocean fishery catch quotas

The specific regulation recommendations adopted by the Pacific Fishery Management Council are listed as follows for fishing areas north and south of Cape Falcon, Oregon.

Washington and Columbia River Mouth (North of Cape Falcon, Oregon)

Commercial Troll

- a. An all-species commercial troll season from July 1 through September 15.
- b. Required use of barbless, single hooks on all terminal troll gear during any early season salmon fishing prior to July 1 (bait hooks and hooks on plugs may be barbed). A barbless hook can be a hook with a flattened barb.
- c. A 28-inch total length minimum size limit for chinook salmon; a 16-inch total length minimum size limit for coho; and no minimum size limit for other salmon species.
- d. An early season for all salmon species other than coho from May 1 through June 14.
- e. A late season all-species troll fishery from September 16 through October 31, south of Point Grenville in Washington.
- f. Unlawful to possess steelhead (a game fish).

- g. Foreign fishermen (Canadian trollers) subject to the same restrictions applicable to U.S. commercial fishermen.
- h. Indian treaty fishing:
- | | |
|---------------------|---|
| Minimum size limits | 28 inches for chinook
16 inches for coho |
| Season | May 1 to October 31 |
| Area | <u>Makah</u> : North of 48°07'36" north latitude (Sandy Point)
<u>Quileute and Hoh</u> : South of 48°07'36" north latitude (Sandy Point) to 47°31'42" north latitude (mouth of Queets River)
<u>Quinalt</u> : 47°40'5" north latitude (Destruction Island) south to 45°53'3" north latitude (Point Chehalis). |

Ocean Sport

- A general all-species season from the Saturday closest to May 1 through October 31.
- A 24-inch total length minimum size limit for chinook salmon; a 16-inch total length minimum for coho; and no minimum size limit for other salmon species.
- Angling gear defined as follows: angling shall mean fishing for personal use, and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish, to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.
- Adoption of current possession limits, annual limits, and other gear restrictions of the states of Oregon and Washington, respectively, except as noted above.
- A three-fish daily sport bag limit.

Ocean Nets

- Prohibited.

California and Oregon Coast (South of Cape Falcon)

Commercial Troll

	<u>Waters off Oregon</u>	<u>Waters off California</u>
Minimum size limits	26 inches for chinook 16 inches for coho None for other salmon	26 inches for chinook 22 inches for coho None for other salmon
All salmon except coho season	May 1-Oct. 31	April 15-Sept. 30
Coho season	June 15-Oct. 31	May 15-Sept. 30
Vessel certification	None	Beginning May 13
Steelhead	Unlawful to possess steelhead (a game fish)	
Gear	Barbless single hooks required prior to coho season (bait hooks and hooks on plugs may be barbed). A barbless hook can be a hook with a flattened barb.	

Ocean SportSeason:

Oregon: Saturday closest to May 1 through October 31
 California: North of Tomales Point - all year
 South of Tomales Point - Saturday closest to February 15
 through Sunday closest to November 15

Size Limits:

Oregon: 22 inches for chinook
 16 inches for coho
 No minimum size limit for other species
 California: 22 inches for all species (exception: see daily bag limit)

Gear:

Oregon:

Angling shall mean fishing for personal use, and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.

California:

Angling only by closely attended handline(s) or rod(s) and reel(s). No weight more than 4 pounds may be directly attached to the line by which the fish is retained.

Daily Bag Limit:

Oregon and California: Three fish (in California two must be greater than 22 inches, one may be between 20 and 22 inches).

Possession Limits, Annual Limits, and Other Gear Restrictions:

Oregon and California: Adoption of current regulations of the respective states, except as noted above.

Ocean Nets

Prohibited

The impacts of the specific regulatory proposals are described in the management plan in terms of changes from the average situation during the 5-year period 1971-1975.

The management plan also lists alternatives to the specific regulations that have been proposed. These alternatives are:

1. Extension of the troll chinook 28-inch minimum size limit to the Oregon coast and/or California.
2. Delay of the troll coho fishery off Oregon and California.

3. Retention of the Tillamook Head division line for chinook stock separation.
4. A reduction in early season troll fishing for chinook salmon off the Washington coast and Columbia River mouth.
5. Concurrent commercial and recreational ocean fishing seasons off the Washington coast and Columbia River mouth.
6. Proposals by the Government of Canada.
7. Other management alternatives, including limited access.

TABLE OF CONTENTS

- 1.0 INTRODUCTION
- 2.0 DESCRIPTION OF THE STOCKS OF FISH COMPRISING THE MANAGEMENT UNIT
 - 2.1 Species and their distribution
 - 2.1.1 Chinook Salmon
 - 2.1.2 Coho Salmon
 - 2.1.3 Pink Salmon
 - 2.1.4 Chum and sockeye salmon
 - 2.2 Trends in abundance and present condition
 - 2.2.1 Chinook Salmon
 - 2.2.2 Coho Salmon
 - 2.2.3 Pink Salmon
 - 2.3 Ecological relationships
 - 2.4 Estimate of maximum sustainable yield (MSY)
 - 2.5 Probable future conditions of the fishery
- 3.0 DESCRIPTION OF THE HABITAT
 - 3.1 Condition of the habitat
 - 3.2 Identification of habitat of particular concern: spawning grounds
 - 3.3 Description of existing programs to protect the habitat
- 4.0 EXISTING FISHERY MANAGEMENT JURISDICTION, LAWS, AND POLICIES
 - 4.1 Management Institutions
 - 4.1.1 Adjacent waters management
 - 4.1.2 Coordination with North Pacific Fishery Management Council
 - 4.2 Treaties or international agreements
 - 4.2.1 Treaty Indian fishing rights
 - 4.2.2 Agreements with Canada

TABLE OF CONTENTS (Continued)

- 4.3 Federal laws, regulations, and policies
- 4.4 State laws, regulations, and policies
- 4.5 Local and other applicable laws, regulations, and policies

- 5.0 DESCRIPTION OF FISHING ACTIVITIES
 - 5.1 History of harvests
 - 5.1.1 Troll fishery
 - 5.1.2 Ocean sport fishery
 - 5.1.3 Recent catch, effort, and C/U/E statistics
 - 5.2 Domestic commercial and recreational fishing
 - 5.2.1 Fishing areas
 - 5.2.2 Vessels and gear employed
 - 5.2.2.1 Troll fishery
 - 5.2.2.2 Ocean sport fishery
 - 5.2.3 Number of boats and fishery effort
 - 5.2.3.1 Troll fishery
 - 5.2.3.2 Ocean sport fishery
 - 5.3 Foreign fishing activities
 - 5.4 Interactions between domestic and foreign participants in the fishery

- 6.0 DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY
 - 6.1 Economic characteristics of the domestic harvesting sector
 - 6.1.1 Commercial fishery prices
 - 6.1.2 Sport fishery values
 - 6.2 Description of international trade in relevant fishery products
 - 6.3 Economic characteristics of processing activities

TABLE OF CONTENTS (Continued)

- 7.0 DESCRIPTION OF THE BUSINESSES, MARKETS, AND ORGANIZATIONS ASSOCIATED WITH THE FISHERY
 - 7.1 Relationships among harvesting, brokering, and processing sectors
 - 7.2 Fishery cooperatives or associations
 - 7.3 Labor organizations
 - 7.4 Foreign investment

- 8.00 DESCRIPTION OF SOCIAL AND CULTURAL FRAMEWORK OF DOMESTIC FISHERMEN AND THEIR COMMUNITIES
 - 8.1 Ethnicity, familial relationships, and community organizations
 - 8.2 Age and education profiles
 - 8.3 Employment opportunities and unemployment rates
 - 8.3.1 Associated employment of commercial ocean salmon fishermen
 - 8.4 Participation in and benefits of recreational fishing
 - 8.4.1 Development and current status of Washington coastal sport fishery
 - 8.4.1.1 Ilwaco-Columbia River mouth area
 - 8.4.1.2 Westport-Ocean Shores area
 - 8.4.1.3 LaPush area
 - 8.4.1.4 Neah Bay area
 - 8.4.2 Development and current status of Oregon coastal sport fishery
 - 8.5 Economic dependence on commercial recreational fishing and related activities
 - 8.6 Distribution of income
 - 8.6.1 Oregon-based troll fishery
 - 8.6.2 Washington-based troll fishery

- 9.0 DETERMINATION OF OPTIMUM YIELD
 - 9.1 Specific management objectives
 - 9.1.1 Ocean management areas
 - 9.1.2 Control of troll "shaker catches"

TABLE OF CONTENTS (Continued)

- 9.2 Alternate management measures available
 - 9.2.1 Troll chinook minimum size limit
 - 9.2.2 Troll coho minimum size limit
 - 9.2.3. Selective troll fishing gear
 - 9.2.4 Troll chinook fishing season
 - 9.2.5 Troll coho fishing season
 - 9.2.6 Incidental catch allowance for coho
 - 9.2.7 Troll fishery limited entry
 - 9.2.7.1 Washington license moratorium
 - 9.2.7.2 Limited entry considerations in Oregon
 - 9.2.8 Ocean sport fishing seasons
 - 9.2.9 Ocean sport fishery minimum size limits
 - 9.2.10 Ocean sport fishery bag limits
 - 9.2.11 Ocean sport fishery limited entry
 - 9.2.12 Ocean sport fishing gear
 - 9.2.13 River mouth closures
 - 9.2.14 Barbless hooks
 - 9.2.15 Ocean fishery catch quotas
- 9.3 Analysis of beneficial and adverse impacts of the management options
 - 9.3.1 Summary of information used in assessing and specifying MSY and OY
- 9.4 Tradeoffs between the beneficial and adverse ecological, social, and economic impacts of the preferred or optimal management options
 - 9.4.1 Specific regulation recommendations
 - 9.4.1.1 Washington and Columbia River mouth
 - 9.4.1.2 California and Oregon coast (south of Cape Falcon)
 - 9.4.2 Analysis of impacts of specific recommendations
 - 9.4.3 Selected alternatives and their impacts
 - 9.4.4 Specific regulations adopted by the Council.
- 9.5 Specification of optimum yield

TABLE OF CONTENTS (Continued)

- 10.0 MEASURES, REQUIREMENTS, CONDITIONS, OR RESTRICTIONS SPECIFIED TO ATTAIN THE OBJECTIVES OF THE PLAN
 - 10.1 Catch limitations, including total allowable level of foreign fishing
 - 10.2 Time and area restrictions
 - 10.3 Permits and fees
 - 10.4 Types of vessels, gear, and enforcement devices
 - 10.4.1 Prohibition of net fishing
 - 10.4.2 Emergency regulation changes
 - 10.5 Limited access in the commercial fishery
 - 10.6 Habitat preservation, protection, and restoration
 - 10.7 Development of fishery resources that are underutilized or not utilized by U.S. fishermen
 - 10.8 Estimated management costs and revenues associated with proposed measures
 - 10.9 State landing laws
 - 10.10 Research fisheries
- 11.0 SPECIFICATION AND SOURCE OF PERTINENT FISHERY DATA
 - 11.1.1 In-season requirements
 - 11.1.2 Finalized catch and effort statistics
 - 11.2 Domestic sector of the fishery
 - 11.2.1 In-season requirements
 - 11.2.2 Finalized catch and effort statistics
 - 11.3 Processors
- 12.0 RELATIONSHIP OF THE RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES
 - 12.1 Other fishery management plans prepared by a council or the Secretary
 - 12.2 International agreements
 - 12.3 Federal laws and policies
 - 12.4 State laws and policies
 - 12.5 Local and other applicable laws and policies

13.0 PROPOSAL FOR COUNCIL REVIEW AND MONITORING OF THE IMPLEMENTATION OF THE PLAN

13.1 Research activities

13.1.1 History of research and management

13.2 Management considerations

13.3 Conservation and management measures and regulations

13.4 MSY and optimum yield

13.5 U.S. harvesting capacity and extent of harvest

13.6 Allowable level of foreign fishing

13.7 Fishery data

14.0 REFERENCES

15.0 APPENDICES

- Appendix I: List of reference documents prepared for the comprehensive salmon management plan of the Pacific Fishery Management Council.
- Appendix II: Proposals forwarded by the Department of State reflecting the views of the Canadian Government.
- Appendix III: Indian treaty fishing regulations proposed by the Tribes.
- Appendix IV: Consensus report of Salmon Advisory Subpanel on the September 29, 1977 draft of the ocean salmon management plan.
- Appendix V: Summary of escapement and escapement goals for chinook and coho salmon in the states of California, Oregon, Washington, and Idaho.
- Appendix VI: Oregon Department of Fish and Wildlife letter regarding Columbia River treaty Indian fishery agreement.
- Appendix VII: Summary of Hearings

1.0 INTRODUCTION

This management plan for the ocean salmon fisheries off Washington, Oregon, and California (Figure 1) is a direct response to the Fisheries Conservation and Management Act of 1976 (U.S. Public Law 94-265). The Act extends U.S. fisheries jurisdiction and establishes an exclusive management authority. It mandates preparation of management plans for each individual fishery unit, and the ocean salmon fisheries off Washington, Oregon, and California constitute one such fishery unit. The Secretary of Commerce, upon approval of this fishery management plan, will issue regulations implementing the Plan in the Fishery Conservation Zone for 1978 and, if the Council is unable to complete a comprehensive plan by 1979, for that year.

The plan is the second step in developing a comprehensive management regime for salmon fisheries throughout the range of Pacific Fishery Management Council jurisdiction. It is intended to supersede a management plan adopted for the 1977 season only and is designed to ensure that adequate controls are maintained to meet allocation requirements mandated by recent court decisions and pressing conservation needs for Washington and Columbia River system salmon stocks. Furthermore, this plan is intended to provide a coastwide management system taking into account the historical and present management practices of the coastal states. It is envisioned that this plan will in turn be replaced by a more comprehensive plan in the near future.

The ocean salmon fisheries off Washington, Oregon, and California are important, both in their direct economic value and their effect upon the resource and other salmon fisheries. These fisheries have been conducted by U.S. and Canadian trollers since around the turn of the century and by substantial numbers of U.S. recreational anglers since World War II. In Washington, treaty Indians have fished commercially in recent years under individual tribal regulations. The troll fishery provides fresh, frozen, and cured salmon, all relatively high-priced prime products, to a receptive market over an extended period of time and provides employment to many small independent businessmen. The sport fishery provides valuable recreational benefits and has major support industries. Canada is the only foreign nation currently documented, in formalized catch and effort statistics, as catching significant numbers of Pacific Coast salmon in a target-species fishery (troll) on salmon stocks originating in Washington, Oregon, California, and Idaho rivers. Other foreign countries have also taken salmon, albeit primarily as incidental catches made during trawl fishing, but the massive nature of past foreign fishing efforts off the coasts of Washington, Oregon, and California has created serious concern in the fishing industry.

Canada has passed legislation establishing a fishery zone off her coasts. This became effective January 1, 1977; consequently, U.S. jurisdiction over its anadromous fish will not extend into these areas in accordance with PL 94-265.

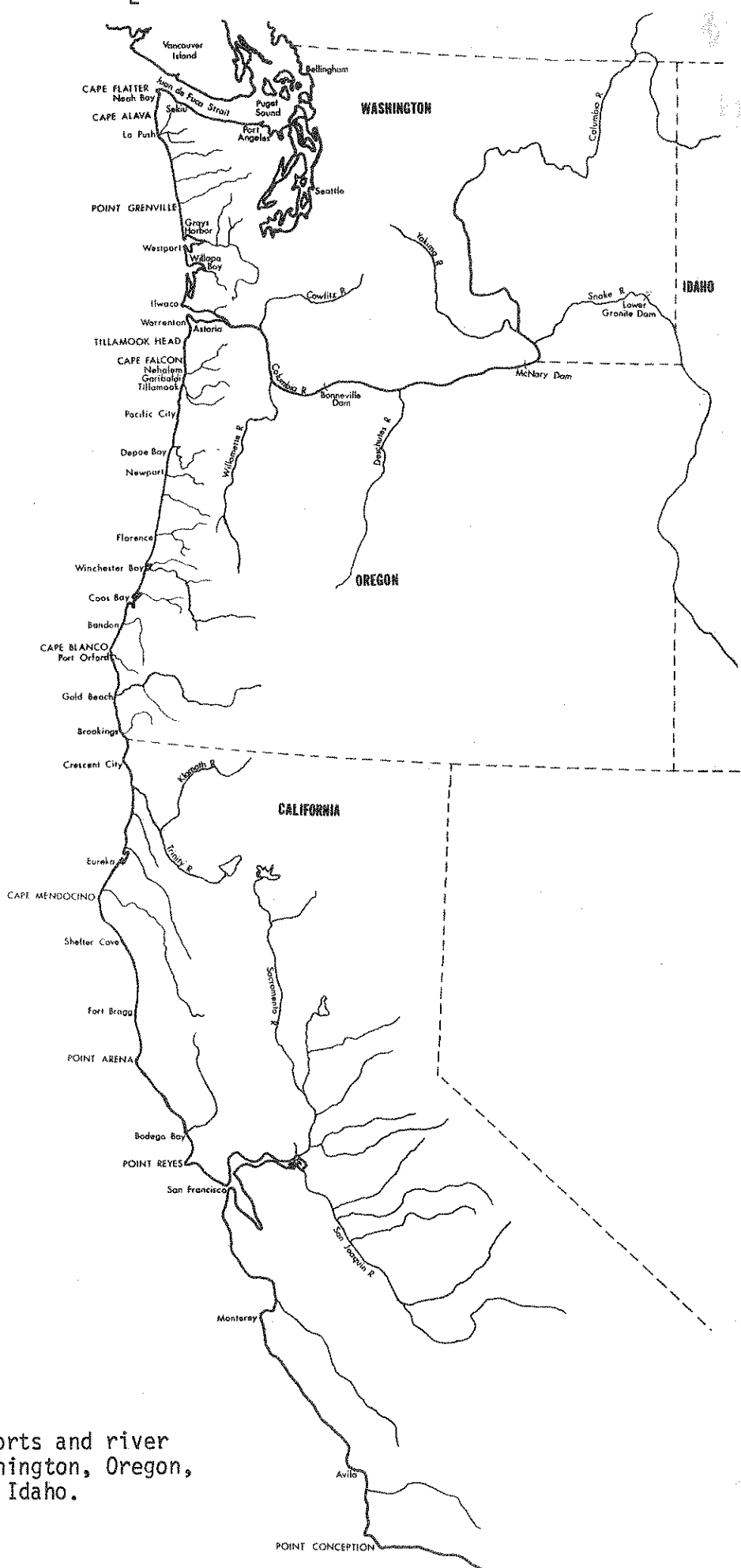


Figure 1. Main coastal ports and river systems of Washington, Oregon, California and Idaho.

2.0 DESCRIPTION OF THE STOCKS OF FISH COMPRISING THE MANAGEMENT UNIT

2.1 Species and Their Distribution

Chinook and coho salmon (*Oncorhynchus tshawytscha* and *O. kisutch*) are the main species caught in the ocean salmon fisheries operating off Washington, Oregon, and California. The catch of pink salmon (*O. gorbuscha*) in odd-numbered years is also significant.

2.1.1 Chinook Salmon. Basically, a single brood year of the predominant "sub-1" type chinook (e.g., fish migrating seaward in their first year and typical of fall- and some summer-run stocks) is harvested in a broad ocean area over a 4-year period as fish in their second to fifth years of life. All but fish in their fifth year have mature and immature components as well. An actual example for a marked experimental group is depicted in Table 1. The much less abundant "sub-2" type fish (e.g., fish migrating seaward in their second year and typical of spring- and some summer-run stocks) are harvested in the ocean mainly as immature fish in their third and fourth years of life.

Quantitative identification of rivers of origin contribution to the mixture of chinook entering ocean catches has been the object of considerable study. Comprehensive experiments with fin-marked hatchery fish have been of special value, particularly those described by Arp, Rose and Olhausen (1970), Bernhardt and Kolb (1970), Heyamoto and Kiemle (1955), Lander (1970), Pulford (1970), Rose and Arp (1970), Wahle, Arp and Olhausen (1972), Worlund, Wahle and Zimmer (1969), Wright and Bernhardt (1969a), and Wright, Bernhardt and Kolb (1969). More recent results with fin-marked fish are available as basic data (Oregon Department of Fish and Wildlife, 1972, 1973, 1974, 1975, 1976b, and 1977), but little comprehensive analysis work has been completed to date. By the mid-1970's, the coded-wire fish tag (Bergman et al., 1968) had largely replaced fin marks as a standard mechanism for identification of juvenile salmonids, and basic data results are currently available for a number of experimental groups (Washington Department of Fisheries, 1976a and 1976b; and Rasch, 1977). Older adult tagging studies have been reviewed by Godfrey (1968) and Milne (1957), while base data from more recent efforts have been provided by Argue and Heizer (1971 and 1974), Bourque and Pitre (1972a), and Heizer and Argue (1972). Comprehensive chinook evaluations of varying format have been presented by Cleaver (1969), Godfrey (1971), Informal Committee on Chinook and Coho (1969), Mason (1965), Pacific Northwest Regional Commission (1976), Van Hyning (1973), Washington Department of Fisheries (1972), and Wright (1968b and 1976).

These studies have led to the following conclusions:

Young chinook salmon generally tend to migrate predominantly northward on their feeding migrations and southward as maturing fish. Consequently, chinook salmon from the Sacramento-San Joaquin River systems contribute to ocean fisheries as far north as southern Washington; northern California coastal chinook stocks also contribute to these same areas and somewhat to the north because they tend to migrate slightly farther north.

The Columbia River chinook salmon stocks, particularly the lower river fall chinook, contribute heavily to the ocean fisheries off Washington and British Columbia. These lower river chinook do not migrate as far north as Alaska in any magnitude and thus do not appear in any substantial numbers in the Alaska troll catch. Other

Table 1. Calculated recoveries of Ad and AdRM marked 1961 brood year chinook from Lower Columbia River hatcheries in the British Columbia and Washington ocean fisheries by area and 2-week periods, 1963 through 1966 (from Wright and Bernhardt, 1969a).

Fishery	Period ending ^{a/}														Total				
	2/29	4/4	4/18	5/2	5/16	5/30	6/13	6/27	7/11	7/25	8/8	8/22	9/5	9/19		10/3	10/17	10/31	11/30
Wash. ocean sport - Neah Bay " - La Push " - Westport Wash. troll - La Push and Westport Wash. ocean sport - Columbia River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	113	30	48	161	277	346	384	446	511	579	626	685	713	766	823	899	947	1,016	
British Columbia troll - Alaska area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Northern B. C. (Zone 43)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Central B. C. (Zone 42)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W. coast Van. Isl. (Zone 40)	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Sekiu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - La Push and Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Ilwaco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Columbia River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	113	30	48	161	277	346	384	446	511	579	626	685	713	766	823	899	947	1,016	
British Columbia troll - Alaska area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Northern B. C. (Zone 43)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Central B. C. (Zone 42)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Georgia Strait (Zone 41)	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W. coast Van. Isl. (Zone 40)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Sekiu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - La Push	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - La Push	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Ilwaco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Ilwaco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	48	11	14	161	277	346	384	446	511	579	626	685	713	766	823	899	947	1,016	
B. C. troll - Northern B. C. (Zone 43)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Central B. C. (Zone 42)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Georgia Strait (Zone 41)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W. coast Van. Isl. (Zone 40)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Seattle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Neah Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - La Push	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. ocean sport - Westport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wash. troll - Ilwaco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

^{a/} Sport fishery periods begin and end 1 day later.

F 10

Columbia River chinook stocks, such as the spring, summer, and upper river fall runs, also contribute to the Washington ocean fishery and, to an even greater extent, to the British Columbia and Southeastern Alaska catches. It was the loss of upriver Columbia River chinook stocks (due to power dams) that had such an adverse effect on the troll catches off Southeastern Alaska. Some Columbia River chinook salmon also migrate southward on their feeding migrations and enter the Oregon and California ocean salmon fisheries.

Washington and Oregon coastal chinook stocks primarily contribute to the ocean fisheries off Washington, British Columbia, and Southeastern Alaska. Portions of these runs are also harvested off Oregon and northern California.

Puget Sound chinook stocks exhibit the generally typical northward migration pattern, with minor exception; thus, these stocks contribute mainly to the ocean catches off British Columbia.

The Fraser River chinook stocks contribute much more heavily to the British Columbia and Southeastern Alaska ocean fisheries than they do to the Washington area fishery.

In terms of overall management area importance, the California ocean catch of chinook salmon comes mainly from California and Oregon coastal stocks. The Oregon ocean fishery operates mainly on Oregon coastal stocks, California stocks, and fish from the Columbia River. There is no doubt of the predominance of Columbia River fish, particularly the fall-run race, in the Washington coastal chinook picture. Oregon and Washington coastal stocks are taken all along the coast from central California to southeastern Alaska but, except for brief periods, do not appear to contribute at a high level in terms of either numbers of fish or percent of total ocean catch. (NOTE: The "during brief periods" connotation refers to instances where localized river mouth fisheries impact coastal salmon runs when they are concentrated immediately prior to their entry into the streams. The best example would be Oregon's special late season troll fishery inside 3 miles for late-run Elk and Chetco River chinook stocks. On the Washington coast, examples would be late season fishing inside the Grays Harbor bar or immediately adjacent to the Quillayute River mouth. While none of these fisheries involve large numbers of fish, local stocks would contribute a substantial percentage to the total catch taken.) Sacramento-San Joaquin stocks are important off southern Washington, especially early in the season, and northern California stocks also contribute. Puget Sound and Canadian streams (primarily the Fraser River) contribute substantial numbers to catches off the northwest tip of Washington, but numbers contributed by these streams diminish quickly in importance from north to south along the Washington coast.

2.1.2 Coho Salmon. In contrast to the multiple age class-life history types for chinook, the ocean coho fishery off Washington, Oregon, and California is supported by a single age class (i.e., "3's", or 3-year-old fish) during any given season (Wright, 1970b). The ocean catch for several Puget Sound experimental groups is shown in Table 2. This simpler case leads to a chance for much greater year-to-year fluctuations in catch due to variability of freshwater environmental factors and resultant impact on juvenile coho. This variation has been "smoothed" to a great degree in recent years, however, due to the tremendous success of hatchery production and its accompanying circumvention of natural freshwater limitations.

Table 2. Calculated recoveries of 1964 brood year Puget Sound hatchery coho as 3-year-old fish in the ocean fisheries of British Columbia and Washington by area and 2-week period during 1967 (LVLM, LVRM, RVLM, RVRM) (from Wright and Bernhardt, 1969b).

Fishery ^{1/}	2-week period ending date ^{2/}												Total		
	6/3	6/17	7/1	7/15	7/29	8/12	8/26	9/9	9/23	After 9/23 ^{3/}					
British Columbia troll, Northern B. C. (Zone 43)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
British Columbia troll, Central B. C. (Zone 42)	-	-	-	-	34	31	12	-	-	-	-	-	-	-	77
British Columbia troll, Strait of Georgia (Zone 41)	-	-	-	-	30	-	2	-	-	-	-	-	-	-	32
British Columbia troll, W. C. Vancouver Isl. (Zone 40)	-	202	875	655	582	643	509	641	337	32	32	9	-	-	4,476
Wash. ocean sport, Sekiu	-	-	14	6	61	51	101	34	-	-	-	-	-	-	276
Wash. ocean troll, Neah Bay	-	6	26	85	343	130	57	128	-	67	67	13	-	-	842
Wash. ocean sport, Neah Bay	-	-	28	75	274	135	104	129	48	13	13	-	-	-	806
British Columbia troll, S. of Cape Flattery (Area C)	-	-	13	14	128	183	214	66	326	28	28	-	-	-	972
Wash. ocean troll, Seattle	-	-	26	40	67	39	24	14	-	62	62	-	-	-	272
Wash. ocean troll, La Push	-	8	126	249	545	367	298	224	146	24	24	-	-	-	1,987
Wash. ocean sport, La Push	-	-	8	44	78	130	112	16	-	3	3	-	-	-	391
Wash. ocean troll, Westport	-	-	81	123	121	58	24	15	11	-	-	-	-	-	433
Wash. ocean sport, Westport	12	26	30	122	21	37	83	24	9	-	-	-	-	-	364
Wash. ocean troll, Ilwaco	-	-	6	15	27	-	10	-	-	-	-	-	-	-	58
Wash. ocean sport, Ilwaco	-	-	6	28	17	21	-	-	-	-	-	-	-	-	72
Totals	12	242	1,239	1,456	2,328	1,825	1,550	1,291	877	238	-	-	-	-	11,058

^{1/} North to south arrangement generally corresponds to catch origin areas, not port of landing.

^{2/} Sport fishing periods begin and end one day later.

^{3/} Calculated for periods of variable duration.

1990

Again, fin-marking experiments are of prime importance in stock identification with key results being described by Heyamoto and Kiemle (1955), Johnson (1970), Senn (1970a and 1970b), Senn and Noble (1968), Senn and Satterthwaite (1971), Wahle, Vreeland and Lander (1974), Wright (1970c), and Wright and Bernhardt (1969b). Basic fin-mark experimental data of a more recent vintage were made available by the Oregon Department of Fish and Wildlife (1972, 1973, 1974, 1975, 1976b, and 1977). As previously noted for chinook, the coded-wire tag is now of prime importance for juvenile salmonid marking, and results are already available for many experimental groups (Washington Department of Fisheries, 1976a and 1976b; and Rasch, 1977). Adult tagging studies have also been of importance in stock identification, with analyses being provided by Godfrey (1968) and Milne (1957). Newer basic data were provided by Argue and Heizer (1971 and 1974), Bourque and Pitre (1972a), and Heizer and Argue (1972). Comprehensive evaluations of coho stocks were completed by Godfrey (1965 and 1971), Informal Committee on Chinook and Coho (1969), Pacific Northwest Regional Commission (1976), Washington Department of Fisheries (1972), and Wright (1968b and 1976).

These efforts have led to the following conclusions:

Coho salmon tend to be available as adults both northward and southward from their parent streams and tend to contribute most heavily to the more local fisheries (although Loeffel and Forester [1970] show ocean migrations of immature coho to be much more extensive than indicated by the recovery of marked adult fish in the various fisheries). Thus, California coho stocks are of minor importance to the ocean fishery north of Oregon. Columbia River and Oregon coastal coho stocks contribute mainly to the Oregon and California fisheries. The abundance of Oregon coastal coho stocks diminishes rapidly from south to north off the Washington coast. Although a sizable portion of the Columbia River coho stocks appears south of the Columbia as far as California on their feeding migration, Columbia River coho also contribute large numbers to the Washington ocean fishery. However, their abundance is relatively low off Cape Flattery.

Washington coastal coho stocks seem to be found more to the north and contribute significantly to the fisheries off Washington and the west coast of Vancouver Island. A portion of these stocks migrate south and enter Oregon coastal fisheries. Puget Sound coho also contribute large numbers to the north coastal Washington and British Columbia ocean fisheries, with minor contribution to Oregon waters.

British Columbia stocks of coho, particularly from the Fraser River, contribute to the Washington ocean fisheries, but their abundance diminishes rapidly from north to south. They also contribute heavily to the British Columbia ocean catches.

Relative abundance of the various stocks shows that California ocean catches of coho salmon come primarily from Oregon coastal, Columbia River, and California stocks. The Oregon ocean catch is composed primarily of Columbia River, Oregon coastal, Washington coastal, and Puget Sound stocks. Coho salmon originating in Columbia River, coastal Washington, Puget Sound, southern British Columbia, and Oregon coastal streams are the primary contributors to the Washington ocean catch.

2.1.3 Pink Salmon. Pinks are usually taken incidental to ocean fishing effort for chinook and coho, and catches reach significant proportions only during odd-years off Washington, Oregon, and California (DiDonato, 1968). Catches are composed of a single age group, maturing fish in their second year of life. These fish are of Canadian and Puget Sound origin almost entirely, since no important spawning stocks

occur further south. Although there was no minimum size limit and past seasons extended from April 15 to October 31, most of the Washington troll catch was taken in the 50-day period from July 10 to September 1. Since pink abundance fluctuates more than either chinook or coho, ocean fishery management is manifested mainly as a need for emergency protection in years of abnormally low abundance.

2.1.4 Chum and Sockeye Salmon. Small numbers of sockeye (*O. nerka*) and chum (*O. keta*) salmon are taken by the ocean fisheries off Washington, Oregon and California, but there is no significant impact on either abundance or management of these species.

2.2 Trends in Abundance and Present Condition

2.2.1 Chinook Salmon. The chinook salmon stocks in California are generally at a lower level of abundance than they were historically. The San Joaquin River system had historic returns of around 180,000 fish. These stocks have been reduced to an average escapement for the past 6 years (1971-76) of 15,000 fish. This decline is due partially to extensive water development with resultant lack of spring flows. The Sacramento River system escapements have declined from an average of 340,000 fish during the 1953-60 period to 213,400 fish during the last 10 years (1967-1976). The decline in this system is due to degraded environmental conditions in the upper river. Investigations are underway to determine the specific causes for the decline. California coastal stocks show a downward trend in streams where monitoring is done. However, most streams are not monitored and trends are unknown.

Oregon coastal stocks of chinook also have been adversely affected by past environmental changes (logging, fires, dams, pollutions, etc.). However, increasing control over logging, gravel removal, and other streamside activities has stabilized or even resulted in improved production capacity of most streams in recent years. Spawning ground counts indicate that most spawning populations are fairly stable, but some smaller streams may not receive enough spawners in some years (Cummings, 1976).

Many Columbia River chinook stocks are generally at a lower level of abundance than they were historically, and some of the upriver stocks have been lost completely because of dam construction. Furthermore, the spring and summer chinook runs to the Snake River system have been declining since 1969. Escapements to Idaho in 1974 through 1977 were dangerously low and below minimum escapement levels in most cases. This recent decline is attributed primarily to loss of juvenile salmon in passing dams on their seaward migrations. The summer run escapements in recent years have been much lower than in the mid-1950's. The natural spawning upriver fall runs are down from earlier years and in some instances have not met escapement goals. Continuing efforts toward improved fish passage facilities, pollution control, and hatchery production give promise, however, of increasing chinook salmon runs in these areas as well as in the Willamette system and other lower Columbia River tributaries. Lower Columbia River stocks are already heavily augmented by hatchery production, and improved hatchery practices should increase production of these fish even further. (NOTE: A basic reference for the Columbia River system is Oregon Department of Fish and Wildlife, 1976a.)

A few coastal Washington chinook runs appear to be in fairly good condition. Increased fishing pressure and accelerated logging and industrial development have depressed many runs. Unless adequate steps are taken to protect the stream and estuarine environment, continued declines can be expected. Certain races of fish, such as the early Satsop fall chinook and the spring and summer runs on the Queets and Hoh Rivers, are severely depleted.

For Puget Sound, the natural stocks of chinook are generally in a depressed state, whereas hatchery production continues to increase. Some continual degradation of the environment is to be expected although there are increasing efforts to minimize adverse effects on the stocks.

The chinook salmon stocks in British Columbia have not experienced the adverse effect on their environment to the same degree as the stocks to the south, but the escapement trend still appears to be slightly downward.

2.2.2 Coho Salmon. Most coho production in California is naturally-spawned fish produced in streams north of San Francisco. California's north coast coho are secondary in importance when compared to that state's chinook runs. Hatchery production of coho in California, approximately one million yearlings annually, is relatively low compared to production in Washington and Oregon. Counts made at dams and weirs along the north coast show that natural coho escapement in recent years has been extremely variable.

For Oregon coastal coho stocks, production capacity, which declined as a result of early deterioration of watersheds, appears to have stabilized in most cases. Hatchery production is at a high level. Increased ocean fishing pressure stimulated by successful hatchery programs may be depressing some Oregon wild stocks (Figure 2).

For the Columbia River coho stocks, the escapement for the natural spawning early run fish is down, whereas the escapement to the hatcheries has increased. For late running coho, the trend of natural escapements is level to slightly down, with reduced escapements occurring in both 1973 and 1974.

The abundance of natural coho stocks in most Washington coastal and Puget Sound streams has decreased due to loss of spawning areas through logging, road building, gravel removal, dams, and pollution. Additionally, over-harvest has resulted in some natural runs not meeting escapement requirements in several recent years. Hatchery escapement and production have been increasing.

In general, coho salmon spawning areas in British Columbia continue to remain productive and stock levels relatively stable. Increased industrialization and pollution of the Fraser River could cause lower production.

2.2.3 Pink Salmon. Puget Sound pink salmon stocks are at a very low level of abundance and have been low since a very large run in 1963. Severe winter flooding and the resultant adverse impact on eggs and fry is believed to be the primary cause of this decline. Fraser River pink salmon stocks experience rather wide fluctuations in abundance but have shown no significant trend, either upward or downward, in recent years.

2.3 Ecological Relationships

The ecological relationships associated with the salmon resources are highly complex and involve the interaction of numerous factors, both in freshwater and in the ocean, that can vary widely from year to year.

For example, conditions affect stream flows, temperatures, dam operations and estuarine conditions which in turn can affect migration, spawning, fry survival, food chains and outmigrant success.

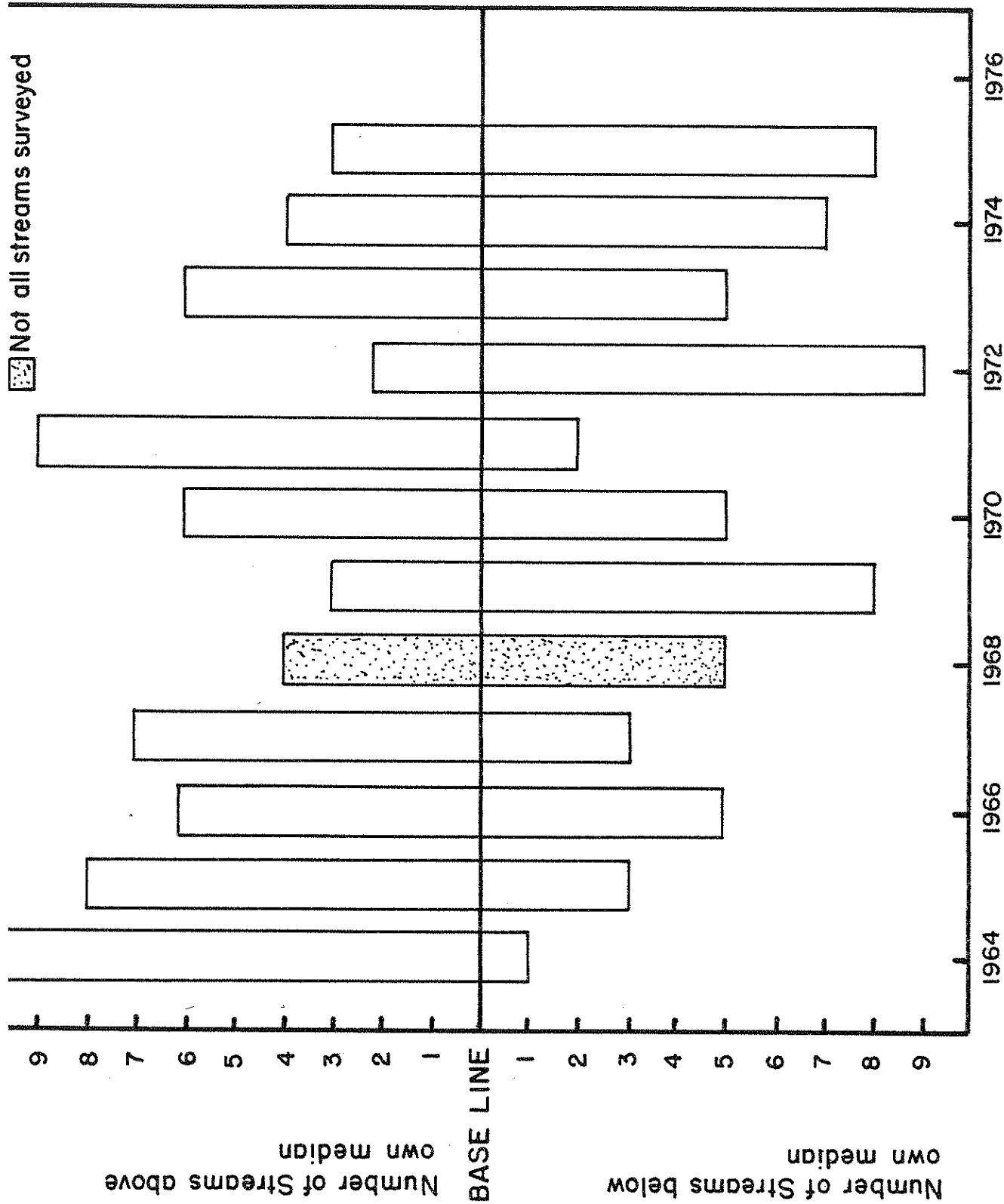


Figure 2. A comparison of the Number of Oregon Coastal Streams with Spawning Coho Salmon. Counts above and below their Individual Median Base Count 1964 - 1975. (from Oregon Department of Fish and Wildlife, 1976 e).

Ocean survival is also variable and food chains and predator-prey relationships may be altered by environmental factors or other fisheries which may or may not adversely affect salmon.

More information on these relationships is provided in the basic reference documents listed in Appendix I (Environmental Factors, Marine Mammals, Forage Species and Relationships).

2.4 Estimate of Maximum Sustainable Yield (MSY) (NOTE: see also Table 17, Section 9.5). Due to the annual variability experienced by salmon stocks, it is only possible to describe MSY for salmon as an average for a number of years. The normal management procedure is to set escapement goals by individual stock or aggregate of stocks for natural spawning and artificial production facilities. Management intent is then to permit any additional fish over and above these goals to be harvested. Pre-season predictions of expected run sizes subsequent to any ocean fishery interceptions are made for all major Washington and Columbia River salmon stocks to give fishermen and processors some idea of expected harvests and to provide fishery management agencies a basis for developing necessary regulatory controls. In practice, the ocean fisheries for chinook and coho salmon have never been actively managed in the context of either adjusting fishing rates up or down in response to similar fluctuations in salmon abundance or regulating the ocean fisheries to take a reasonably constant proportion of the fish actually available from year to year.

A good ocean catch can mean either a high abundance of salmon or a higher than normal fishing rate on an average run; an average catch can develop from a low catch rate on large runs, a high fishing rate on poor runs, or an average exploitation rate on average runs; and a poor ocean catch can result from a low catch rate on average runs or an average fishing rate on poor runs. The particular case for any specific year can only be evaluated after the fact when strengths of individual salmon runs returning to their respective streams of origin have been fully evaluated. With current technology, scientists lack a basis for accurately determining ocean fishing rates while the major ocean salmon fisheries are still in progress. Further, there is no correlation between annual fishing rates on chinook and coho. A high fishing rate on one species does not imply a high rate on the other.

Since the entire methodology is imprecise, there is often considerable difference between pre-season run size predictions and actual stock abundance subsequent to ocean fishery interceptions. Pre-season run size predictions for individual areas are commonly "updated" through analysis of catch and effort during the early portion of each run, test fishing, dam counts, early escapement indices, and/or other technical management tools. At this point, only restrictions on the inside fisheries can achieve the proper balance between total catch and escapement. For Washington and Columbia River salmon stocks, the highly efficient "inside" commercial net fisheries, plus a few river sport fisheries, have traditionally been closely monitored and regulated on a day-to-day basis to adequately harvest any levels of fish over and above needed escapement requirements. More recently, day-to-day management attention has been necessary for many of the new treaty Indian fisheries. The various "inside" fisheries have also borne virtually the entire brunt of restrictive measures deemed necessary to protect any depressed salmon runs. In some cases, there have not been enough fish reaching the spawning grounds to meet even minimum escapement requirements in spite of extensive closures of "inside" fisheries.

MSY for all individual chinook and coho salmon stocks found off the coasts of Washington, Oregon, and California at some time in their life history has been calculated with the best estimates for several major stocks being available from the Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis Model (Johnson, 1975 and 1977).

For example, Columbia River fall-run chinook (both upper and lower river) account for 70-75% of the ocean chinook catches made off Washington and these stocks have recently provided an estimated average annual yield to all U.S. and Canadian salmon fisheries in all areas of 16.1 million pounds round weight, or nearly 1.2 million fish. An aggregate of five major coho stocks which account for over 95% of the ocean coho catch made off the Washington coast and Columbia River mouth recently yielded an estimated 35.5 million pounds, or 5.7 million fish, annually to all U.S. and Canadian salmon fisheries. These coho stocks are from Puget Sound, southern British Columbia, Washington coastal, Columbia River, and Oregon coastal streams.

In the absence of all U.S. and Canadian ocean fishing, it is conservatively estimated that the same level of Columbia River fall-run chinook salmon resources could yield a harvest of 20.5 million pounds annually (1.0 million fish), or nearly 4.4 million pounds more than is presently achieved with the existing combination of all ocean and "inside" fisheries on these stocks. Further, it is conservatively estimated that the same five coho stocks listed above could produce 43.7 million pounds annually (5.4 million fish) in the absence of any domestic or Canadian ocean fishing in all areas or 8.2 million pounds more than is now produced with the current distribution of overall catches. The "conservative" connotation is utilized in both instances since the statistics utilized for this analysis were conservative in the case of both hooking mortality rates and magnitude of ocean "shaker" catches (Wright, 1972b) but relatively liberal with respect to natural mortality rates (average from nine studies in Table 25, page 48 from Cleaver [1969]). Both biases in combination produce the most favorable possible evaluation of ocean fishery yields when contrasted to fishing for mature adults.

A noted Canadian scientist, Dr. W. E. Ricker, recently examined some of these same data and concluded that "the increase in weight of total catch from discontinuing ocean trolling for Columbia River chinook salmon and increasing river fishing correspondingly is estimated tentatively as between 63 and 98%" (Ricker, 1976).

Regardless of the exact level of loss, fishery scientists generally agree that the "costs" of having major ocean fisheries on chinook and coho amount to millions of pounds of lost salmon production annually (Cleaver, 1969; Ricker, 1976; Henry, 1971 and 1972; Van Hying, 1973). The ratio of loss to potential yield is substantially less in the case of coho since virtually all fish are harvested in their third (i.e., final) year and, in comparison to chinook, the average date of harvest for adults is closer to the times when maximum size is attained.

Achieving maximum yield levels in pounds would require elimination of ocean troll and sport fishing and the taking of all fish at or near river mouths. This action would be required because rate of growth exceeds rate of natural mortality in the ocean.

F 10' 10'

2.5 Probable Future Conditions of the Fishery

With prevention of further environmental degradation and overfishing, salmon stocks can be expected to continue producing sustained yields to the fisheries at or near the levels of recent years. Provision of improved spawning escapements for currently depressed stocks will aid in rebuilding them to harvestable levels and a modest incremental gain in total resource base can be expected. Large increases in future salmon abundance must, however, come from widespread habitat improvements to benefit natural production and/or major new artificial production facilities.

Increased enhancement by artificial production as well as major efforts directed toward the multitude of environmental problems which beset the salmon resource are highly desirable. However, fishery enhancement needs to be a long-term and continuing project. Any new fish from enhancement cannot be expected for at least 3-5 years, and 10 years may be a more realistic projection for a significant gain in the overall resource base. In any event, the short-term objectives for 5-10 years must, by necessity, be on salmon fishery management and certain conservation needs must continue to be met by managing the fisheries as proposed in this plan.

3.0 DESCRIPTION OF THE HABITAT

3.1 Condition of the Habitat

See basic reference documents listed in Appendix I (Environmental Factors).

3.2 Identification of Habitat of Particular Concern: Spawning Grounds

Salmon require a spawning environment that offers specific ranges of water temperature, depth, velocity and gravel sizes with sufficient percolation to supply oxygen to the eggs and alevins, nest protection and shelter for newly-hatched fry.

The specific habitat requirements of the various species and races of salmon for spawning and migration, and the conditions of the habitat in the various river systems are covered in the basic reference documents listed in Appendix I (Catch and Escapement, Environmental Factors).

In general, however, the requirements for spawning as follows:

	<u>Chinook</u>	<u>Coho</u>
1. Temperature (°F)		
Migration	49 - 58	45 - 60
Spawning	42 - 57	40 - 49
Hatching	41 - 58	40 - 56
2. Water depth	9" - 3.5'	9" - 3.5'
3. Water velocity	1.5 - 3 fps	1.5 - 3 fps
4. Gravel size		
80%	1/2 - 2"	1/2 - 2"
20%	up to 4"	up to 4"
5. Oxygen	5 ppm Min.	5 ppm Min.

12/12/73

3.3 Description of Existing Programs to Protect the Habitat

See Section 3.1.

4.0 EXISTING FISHERY MANAGEMENT JURISDICTION, LAWS, AND POLICIES

4.1 Management Institutions

4.1.1 Adjacent Waters Management. A close degree of coordination and general unity of purpose will be required in overall salmon resource management since the stocks involved commonly migrate across jurisdictional zones of domestic fishery management agencies as well as international boundaries. Specific and effective cooperation efforts by the Pacific Fishery Management Council must involve the following management authorities:

1. The International Pacific Salmon Fisheries Commission, Fisheries Service of Canada, State of Washington, and treaty Indian tribes for management of Puget Sound and southern British Columbia salmon stocks and fisheries.
2. The State of Washington and treaty Indian tribes for management of coastal Washington salmon stocks and fisheries.
3. The States of Washington, Oregon, and Idaho, treaty Indian tribes, and the Columbia River Compact for management of Columbia River system salmon stocks and fisheries.
4. The State of Oregon for management of coastal Oregon salmon stocks and fisheries.
5. The State of California for management of California salmon stocks and fisheries.

In all cases, coordinated management of salmon stocks must consider the habitat necessary to maintain and enhance the salmon resource on a continuing basis.

4.1.2 Coordination with North Pacific Fishery Management Council. Significant numbers of chinook salmon originating in Washington, Oregon, and Idaho rivers are currently harvested by U.S. and Canadian commercial trollers operating in offshore waters adjacent to the coastline of Southeastern Alaska. Stocks involved include mainly those chinook salmon runs from the upper Columbia River system and Oregon and Washington coastal streams which still have significant numbers of 5-year-old fish in their spawning populations. The significant role of ocean fishing off Alaska on these stocks mandates close coordination between the North Pacific and Pacific Fishery Management Councils with respect to troll fishery chinook management. Further, changes in ocean fishery regulatory practices off either Alaska or off Washington, Oregon, and California would modify the coastwide distribution of troll fishing effort and must be carefully considered by both Councils.

Alaskan chinook and coho are not taken to any degree off Washington, Oregon, and California, and coho from these three southerly states are not present in any significant numbers off Alaska as adults.

4.2 Treaties or International Agreements

4.2.1 Treaty Indian Fishing Rights. Treaties of the United States with a number of Pacific Northwest Indian tribes secure to the latter certain rights to take fish, including salmon, on their reservations and at their usual and accustomed fishing grounds outside those reservations. These treaties include the Treaty of Medicine Creek (10 Stat. 1132), Treaty of Point Elliott (12 Stat. 927), Treaty of Point No Point (12 Stat. 933), Treaty of Neah Bay (12 Stat. 939), Treaty of Olympia (12 Stat. 971), Treaty with the Yakimas (12 Stat. 951), Treaty with the Walla Walla et al. (12 Stat. 945), Treaty with the Nez Percés (12 Stat. 957), Treaty with the Tribes of Middle Oregon (12 Stat. 963), and Treaty with the Eastern Band-Shoshonee and Bannock (15 Stat. 673).

Indian tribes have management and regulatory jurisdiction over fisheries on their reservations. The Federal courts have also recognized certain degrees of tribal regulatory jurisdiction over their members' exercise of off-reservation treaty fisheries vis-a-vis the States in the Olympic Peninsula and Puget Sound drainage areas and adjacent offshore waters and in the Columbia River Basin.

PL 94-265 specifically requires that any fisheries management plan promulgated under that Act describe the nature and extent of treaty Indian fishing rights affected by the plan and be consistent with applicable law. The Indian treaties and the Federal court decisions construing them, including most particularly United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974), affirmed 520 F.2d 676 (9th Cir. 1975), cert. denied 423 U.S. 1086 (1976), and Sohappy v. Smith and United States v. Oregon and Washington, Washington, 302 F.Supp. 899 (D.Or. (1969), 529 F.2d 570 (9th Cir. 1976), are "applicable law" of the United States within the meaning of section 303(a) of PL 94-265.

These treaty fishing rights apply to all stocks of salmon under U.S. control or jurisdiction (including jurisdiction exercised by the States) that, absent prior interception, would pass through or be available at any of the treaty tribes' usual and accustomed fishing grounds wherever located. Currently, the rights have been expressly held to apply to Washington salmon stocks originating from Grays Harbor northward (plus other salmon stocks passing through the usual and accustomed fishing areas) and to all Columbia River system salmon stocks originating above Bonneville Dam.

Some of the treaty tribes have usual and accustomed fishing places in the Pacific Ocean areas to which their treaty rights are directly applicable. Specific Federal court adjudications of such places have been made in U.S. v. Washington for the following:

Makah Tribe: Marine waters extending from the Strait of Juan de Fuca "out into the ocean to an area known as Swiftsure and then south along the Pacific Coast to an area intermediate to Ozette Village and the Quileute Reservation". (384 F. Supp. at 364)

Quileute and Hoh Tribes: Tidewater and saltwater areas adjacent to the coastal area that includes the Hoh, Quillayute, Queets and Quinault Rivers and Lake Ozette. (384 F.Supp. at 359, 372)

Quinault Tribe: "Ocean fisheries....in the waters adjacent to their territory" which for fishing purposes includes the area from the Clearwater-Queets River system to Grays Harbor. (384 F.Supp. at 374)

The above listing is the most explicit guidance available to the Council. This is not to be considered a complete inventory of such usual and accustomed fishing grounds, with a potential existing for further definition of such rights for treaty Indians.

The Court emphasized, however, that the treaty fishing rights extended to "all usual and accustomed grounds and stations...where members of a tribe customarily fished from time to time at or before treaty times, however distant from the then usual habitat of the tribe..." (384 F.Supp. at 332) It said that the Northwest Indians "harvested fish from the high seas, inland salt waters, rivers and lakes". (384 F. Supp. at 352) It found that no complete inventory of such places could be compiled today but that the Findings of Fact (from which the above tribal data were taken) describe "some" of the areas wherein those tribes "are entitled to exercise their treaty fishing rights today". (384 F.Supp. at 353, 402) The parties may invoke the continuing jurisdiction of the Court to determine the location of fishing grounds "not specifically determined previously". (384 F.Supp. at 419).

No Pacific Ocean fishing areas have been adjudicated for any Washington, Oregon, or Idaho treaty tribes other than the four named above, and the Indians of coastal California have no treaty fishing rights. However, the Yurok and Hoopa Indian Tribes in California have established rights to fish in the Klamath-Trinity River system.

The treaty fishing rights of Columbia River Indians have been recently established in a case settlement decree by the U.S. District Court for Oregon in United States v. Oregon and Washington. The following apply to chinook and coho salmon:

A Plan for Managing Fisheries on Stocks Originating from the Columbia River and Its Tributaries Above Bonneville Dam

The purpose of the plan shall be to maintain, perpetuate, and enhance anadromous fish and other fish stocks originating in the Columbia River and tributaries above Bonneville Dam for the benefit of present and future generations, and to insure that the Nez Perce Tribe of Idaho, Confederated Tribes of the Umatilla Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakima Indian Nation, hereinafter called Tribes, having the right to fish based on a treaty with the United States are accorded the opportunity for their fair share of harvest, and to provide for a fair share of the harvest by non-treaty user groups.^{1/}

This plan is based upon the unique circumstances relating to the Columbia River system and the parties hereto and does not necessarily have application in other fisheries.

The parties also recognize the substantial management problems resulting from the ocean harvest of mixed stocks of anadromous fish originating from the upper Columbia River and its tributaries and the wastage resulting from fishing on immature stocks. The parties will continue joint efforts to collect and gather data on this fishery and to reduce inefficient and wasteful harvest methods.

^{1/}The management plan did not address Indian Treaty fisheries of the Nez Perce and Shoshone-Bannock tribes within Idaho.

Due to environmental factors totally unrelated to the treaty or non-treaty fisheries, there has been a continual decline of some runs of anadromous fish in the Columbia River system. This trend could deprive not only the treaty Indians, but also other user groups of the opportunity to harvest anadromous fish. The parties pledge to work cooperatively to maintain the present production of each run, rehabilitate runs to their maximum potential and to work towards the enhancement and development of larger and additional runs where biologically and economically feasible.

1. The managing fishery agencies shall make every effort to allocate the available harvest as prescribed in this agreement on an annual basis. However, because run size cannot always be accurately calculated until some lower fishery has taken place, annual adjustment of the sharing formulas for each species may be required to provide the appropriate shares between treaty and non-treaty users. If treaty and non-treaty users are not provided the opportunity to harvest their fair share of any given run as provided for in this plan, every effort shall be made to make up such deficiencies during the next succeeding run of the same race. Overall adjustments shall be made within a 5-year time frame.
2. The treaty Indian tribes and state and federal agencies shall diligently pursue and promote through cooperative efforts the upriver maintenance and enhancement of fish habitat and hatchery rearing programs, and so far as practicable, maintain present production of each run and to rehabilitate runs to their maximum potential.
3. Hatchery salmon and steelhead released to maintain or restore runs above Bonneville Dam shall be shared pursuant to this plan.
4. A technical advisory committee shall be established to develop and analyze data pertinent to this agreement, including but not limited to the following: calculated run size for all species of fish, ocean catches, escapement goals, catch allocation and adjustments, dam loss, habitat restoration, and hatchery rearing programs. Such a committee shall make recommendations to the managing fishery agencies to assure that the allocations in this agreement are realized. Members shall be qualified fishery scientists familiar with technical management problems on the Columbia River. The committee shall be comprised of representatives named by each of the three states, Oregon, Washington, and Idaho, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and each of the Indian tribes.
5. Each party shall develop a catch record program that utilizes reliable statistical methods and effective enforcement procedures as developed by the committee. Indian tribes shall report on appropriate state forms for each species, ceremonial, subsistence, and any other catch not sold to state-licensed buyers. The states shall report and make available to all interested parties treaty and non-treaty sport and commercial catch for each species. All the above reports shall be made within an agreed-upon time schedule.

6. The states agree to enact or recommend for enactment by the Pacific Fisheries Management Council appropriate conservation regulations for the ocean fishery that will assure an efficient utilization of stocks and will provide for adequate escapement of mature fish into the Columbia River to achieve the goals and purpose of this plan. Marine regulations should attempt to harvest mature fish and reduce waste.
7. Fish escapement totals, dam loss estimates, or other technical aspects of this agreement may be modified by mutual agreement to reflect current data. In the event that significant management problems arise from this agreement that cannot be resolved by mutual agreement, the parties agree to submit the issues to federal court for determination. In any event, the court shall retain jurisdiction over the case of U.S. v. Oregon, Civil 68-513, (D.C. Or).
8. The sharing formulas as set forth in this plan are based upon the premise that the marine area catches in U.S.-controlled waters of fish originating above Bonneville Dam, other than fall chinook and coho runs, will be regulated by PFMC so as to be essentially de minimis portions of those runs. The parties acknowledge that if subsequent data should indicate that this premise is incorrect, these formulas may require revision.
9. Regulations affecting treaty users which are enacted in conformity with this comprehensive plan shall be considered as complying with the court's decree enunciated by U.S. v. Oregon Civil No. 68-513, District of Oregon.
10. Tribal members fishing pursuant to this agreement may employ only members of the tribes, while exercising their treaty fishing rights.
11. All fish numbers referred to in this agreement are adult fish.
12. The sharing formulas contained herein for determining the treaty fishery share refer to those fish caught in the Columbia River below McNary Dam and any other inland off-reservation catch placed in commercial channels.

Except as provided in subparagraph 5 under Spring Chinook, neither treaty nor non-treaty non-commercial harvest in tributaries, or in the mainstem Columbia River above McNary Dam, shall be considered in the sharing formulas contained herein.
13. Upon thirty days written notice by any party, after five years from date, this comprehensive plan may be withdrawn or may be renegotiated to assure that the terms set forth represent current facts, court decisions, and laws.

Fish Management Plans

A fish management plan has been adopted for those species of importance to assure future conservation of the resource and equitable sharing of the harvest between treaty Indians and non-treaty users. The formulas represent Available Fish for Harvest and may not reflect total catch if fishing effort is inadequate to harvest all available fish. All runs of fish described in this plan are those originating in the area of the Columbia River or its tributaries above Bonneville Dam.

Fall Chinook Salmon: The Columbia River fall chinook shall be managed under the following plan:

1. Run size shall be determined by the number of fish entering the Columbia River which are destined to pass Bonneville Dam.
2. Escapement of 100,000 fish above Bonneville Dam shall be subtracted from total in-river run size.
3. Additional fish above escapement are available for harvest and shall be shared 60% by treaty fishermen and 40% by non-treaty fishermen.
4. The states' goal is to manage the fisheries to provide and maintain a minimum average harvestable run size of 200,000 upriver fall chinook to the Columbia River.
5. The 60% treaty share shall include mainstem ceremonial, subsistence, and commercial harvest as allocated by the Indian tribes. The 40% non-treaty share shall include in-river commercial and sport harvest as allocated by the appropriate agencies.

Spring Chinook: The Columbia River spring chinook shall be managed under the following plan:

1. Run size shall be determined by the number of fish entering the Columbia River destined to pass Bonneville Dam.
2. Spawning escapement goals shall be a minimum of 120,000 and 30,000 fish above Bonneville and Lower Granite Dams, respectively.
3. The states' goal is to manage the fisheries to provide and maintain a minimum average run size of 250,000 upriver spring chinook to the Columbia River.
4. Treaty ceremonial and subsistence catch shall have first priority. These fisheries shall not exceed a catch of 2,000 fish on a run size of less than 100,000 fish; 5,000 on a run size of between 100,000 and 120,000 fish; and 7,500 fish on a run size of between 120,000 fish and 150,000 fish. Treaty ceremonial and subsistence fishing for spring chinook with gill nets as well as other normal gear may occur, but such gill net fishing shall be subject to a notification system similar to that presently used for ceremonial fishing. All catches shall be monitored cooperatively for the purpose of ascertaining the amount of the catch.

5. On a run size of between 120,000 and 150,000 fish passing Bonneville Dam, the non-treaty fisheries are limited to the Snake River system and may harvest fish which are in excess of the 30,000 spawning escapement passing Lower Granite Dam. (Under average river flow conditions, 120,000 fish at Bonneville Dam will generally provide 30,000 fish at Lower Granite Dam and 150,000 fish at Bonneville Dam will generally provide 37,500 fish at Lower Granite Dam.)
6. On a run size of more than 150,000 fish passing Bonneville Dam, all allocations as provided for in items 4 and 5 shall occur. All additional fish available for harvest below McNary Dam shall be shared 40% for treaty fishermen and 60% for non-treaty fishermen.

If river passage conditions improve so as to provide more than 40,000 fish at Lower Granite Dam on run sizes of 150,000 fish or less, the 40% and 60% allocation may occur on a run size of less than 150,000 fish at Bonneville Dam.

Summer Chinook Salmon: Summer chinook salmon runs are precariously low and do not warrant any fishery at the present time, with the exception of a treaty subsistence, ceremonial, and incidental catch not to exceed 2,000 fish during the months of June and July.

The parties agree that if the run size increases, a formula for sharing of the available harvest above present escapement goals for this race shall be similar to spring chinook.

Coho Salmon: Coho stocks are in the treaty fishing area simultaneously with other species which currently need protection from fishing effort. Parties agree to use their best efforts to develop methods to maximize coho harvest while protecting those other species.

4.2.2 Agreements with Canada. Canada and the U.S. have been discussing their salmon problems of mutual concern for a number of years, with the latest round of talks commencing in 1970. Subsequently, a bilateral agreement on reciprocal fishing privileges was signed, which permitted salmon fishing by Canada within the 3- to 12-mile area off the Washington coast while the United States was permitted to fish for salmon within the 3- to 12-mile area off the west coast of Vancouver Island. In 1973 the bilateral agreement was modified so that the area open within the 3- to 12-mile area for fishing by the other country was reduced. For Canada, the new area off Washington was reduced to north of approximately 48°N latitude, whereas the new area off Canada open to U.S. trollers was a small triangular area seaward from the Strait of Juan de Fuca.

The 1977 fishery was governed by a Reciprocal Fisheries Agreement Between the Government of the United States and the Government of Canada. The terms specified in the new reciprocal agreement applied to Canadian fishing in the U.S. Fishery Conservation Zone.

Pertinent ocean salmon management excerpts from this 1977 agreement are as follows:

Article II, No. 3

- "3. Fishing by nationals and vessels of each party in the zone of the other shall continue in accordance with existing patterns, with no expansion of effort nor initiation of new fisheries."

Article V

- "1. On the Pacific Coast, there shall be no fishing for salmon by nationals and vessels of either party in the zone of the other, except salmon taken by trolling beyond 12 nautical miles of the coast and salmon taken by trolling between 3 and 12 nautical miles in the area west of a line joining Bonilla Point and Tatoosh Island; north of a line projected due west from Carroll Island (latitude 48 degrees 00.3 minutes North, longitude 124 degrees 43.3 minutes West) and south of a line projected from Bonilla Point to latitude 48 degrees 29.7 minutes North, longitude 125 degrees 00.7 minutes West.
2. Each party shall have the right to limit such fishing for salmon in its zone by nationals and vessels of the other to the same time periods as its nationals and vessels are permitted such fishing for salmon in the zone of the other."

Article VIII (except second sentence of No. 2)

- "1. The two parties recognize that each shall manage fisheries within its jurisdiction within the terms of its domestic laws. They agree that in the application of their domestic laws they shall be guided by the following principles:
 - "a. preserving existing patterns of their reciprocal fisheries in keeping with the provisions of Article II; and
 - "b. in the case of reciprocal salmon fisheries, the interest of the state of origin in salmon spawned in its rivers."
- "2. Regulations affecting the size limits, seasons, areas, gear, and by-catch of existing fisheries established by the management entities of either party and pertaining to the taking or possession of fish in its zone shall apply equally to the nationals and vessels of both parties in the zone.
- "3. If either party proposes to introduce or alter any such regulations during the term of this Agreement, it shall notify the other party of the proposed regulatory measure as far in advance of its application as possible. At the request of either party, consultations shall be held expeditiously in order to review the proposed measure. In such consultations the parties shall be guided by the principles referred to in paragraph 1 above.

Consultations on regulations respecting reciprocal salmon fisheries shall take place at the technical and official levels during the process of preparing such regulations, and, prior to their final approval and application, at the Secretarial or Ministerial level upon request of either party.

- "4. Fishery conservation and management regulations other than those referred to in paragraph 2 above and those required for the implementation of this Agreement, shall not be applied by either party to vessels and nationals of the other fishing in its zone pursuant to this Agreement."

Article XI

"Each party agrees to waive for nationals and vessels of the other party fishing in its zone pursuant to this Agreement, permit and licensing requirements set forth in the respective domestic fishery laws of each country as applicable to foreign fishermen, provided that each vessel shall be clearly and conspicuously marked to indicate its name, nationality and home port."

Article XII

- "1. Recreational fishing by vessels of each party in all waters of the other shall continue.
- "2. Recreational fishing under this Agreement shall be conducted in accordance with applicable regulations and permit and licensing requirements imposed by the competent state, provincial and federal authorities, except that requirements for permits and licenses under the Fishery Conservation and Management Act of 1976, in the case of the United States, and the Coastal Fisheries Protection Act, in the case of Canada, shall be waived."

Article XIII

"The two parties agree to exchange appropriate fishery statistics on a timely and regular basis where necessary to permit an accurate determination to be made of the time at which an allocation or catch level referred to in this Agreement is reached, and otherwise to ensure the effective implementation of this Agreement."

Article XIV

"Each party shall allow access to its customs ports for nationals and vessels of the other party for the purposes of purchasing bait, supplies, outfits, fuel, and effecting repairs, unless more favorable access provisions are provided in other agreements in force between the two parties. Access under this provision is subject to general requirements regarding advance notice of port entry, availability of facilities, and the needs of domestic fishermen and flag vessels."

Article XV

"The two parties agree that cooperative fishery research and the exchange of fishery biological data and statistical information through existing institutional arrangements should continue and, where appropriate, be expanded."

Article XVI

"The two parties undertake to consult as necessary to ensure the harmonious implementation of this Agreement."

This Reciprocal Fisheries Agreement with Canada terminates on December 31, 1977. Terms of the agreement permit fishing by Canadian trollers in portions of the Fishery Conservation Zone off the coast of Washington in accordance with the United States regulations. In that the United States has declared no surplus of U. S. salmon, no Canadian fishing could occur on these stocks but for a reciprocal agreement in the nature of the 1977 agreement.

Dissatisfaction has been expressed by the Government of Canada regarding the application of the 1977 ocean salmon regulations to Canadian fishermen. By the Canadian Government's request to the State Department, an inter-governmental meeting was held on September 28, 1977. The Department of State has forwarded a proposal to the Pacific Council which reflects views the Government of Canada has taken with respect to the ocean troll regulations for 1978. That proposal is attached to this Plan as Appendix II.

4.3 Federal Laws, Regulations, and Policies

Actions proposed in this Fishery Management Plan will require preparation of an Environmental Impact Statement and an Economic Impact Analysis by appropriate Federal officials.

Although implementation of the Fishery Management Plan by Federal regulations is effected outside the boundaries of California, Oregon and Washington, the potential exists that the Plan could have direct effects on the coastal zones of the three states. The Coastal Zone Management Act of 1972 requires that federally planned, conducted or supported activities directly affecting the coastal zone of states be consistent to the maximum extent practicable with that state's Coastal Zone Management program if the program has been approved by the Department of Commerce. To date, the San Francisco Bay Conservation and Development Commission and the States of Washington, Oregon and California have approved State Management Programs. Each state or area with an approved program will be notified of the Plan at the earliest practicable time and a determination will be made as to whether the Plan is consistent with the approved Coastal Zone Management Program.

4.4 State Laws, Regulations and Policies

Washington issues a "vessel delivery permit" which is included automatically with each troll salmon license and the permit alone can be purchased separately. Washington presently has a moratorium on the issuance of new salmon licenses. Commencing in 1975, only those vessels which held a valid license and/or permit during the period of January 1, 1970 through May 6, 1974, and which had caught and landed salmon during that period could be relicensed. (NOTE: In 1977, legislation was passed to extend the existing moratorium on salmon licenses. Charter boats were also included.) Licenses, however, can be transferred from boat to boat or to new fishermen. For 1978, licensing requirements are as follows:

1. An inside troll license is required for all commercial salmon troll operations conducted inside the 3-mile limit. The deadline for obtaining these licenses is April 15. The fee is \$200 for residents and \$400 for non-residents. (NOTE: A vessel delivery permit is automatically included with an inside salmon troll license.) Salmon troll licenses are available only to those vessels which qualify under the salmon moratorium law.
2. A vessel delivery permit is required for bringing fish and shellfish (including salmon) into state waters from outside the 3-mile limit. There is no deadline for obtaining this permit. The fee for this permit is \$200 if purchased separately (see above). The vessel delivery permit is available only to those vessels which qualify under the salmon moratorium law. However, a one-delivery vessel delivery permit is available for \$100 to non-qualified boats.
3. A commercial delivery permit is required for bringing food fish and shellfish (except salmon) into state waters from outside the 3-mile limit. The fee for this permit is \$10.

Oregon does not issue commercial fishing licenses specifically for salmon fishing. There is no restriction on who may purchase commercial fishing licenses or commercial boat licenses in Oregon. Licenses are available throughout the year. For 1978, licensing requirements are as follows:

1. A commercial fishing license (\$40) or commercial fishing license for residents under 19 years of age (\$25) is required by each individual who for commercial purposes:
 - a. Takes or assists in the taking of salmon from the waters of this state.
 - b. Operates or assists in the operation of any boat or fishing gear for the taking of salmon in the waters of this state.
 - c. Lands salmon from the waters of the Pacific Ocean at any point in this state.
2. A commercial boat license (\$170), which by statute is the same as boat registration (Chapter 202, Oregon Laws, 1977), is required by the owner or operator of any boat used in taking salmon for commercial purposes.
3. A single delivery license (\$75) is required for persons and vessels not licensed under (1) and (2) above who have taken fish outside the 3-mile limit. This license must be purchased before fish are unloaded from the vessel and is valid for only one delivery.

California also issues commercial fishing licenses but not specifically for salmon fishing.

All three states will now have sport fishing licenses since the 1977 Washington legislature approved a new licensing system to be implemented for the 1978 season.

The three states also have commercial catch reporting requirements while both Washington and Oregon utilize "punch cards" to enumerate sport salmon landings.

4.5 Local and Other Applicable Laws, Regulations, and Policies

There are no known local laws, regulations, or policies significant to this fishery management plan.

5.0 DESCRIPTION OF FISHING ACTIVITIES

5.1 History of Harvests

5.1.1 Troll Fishery. The chinook catch by California trollers has shown some rather large fluctuations since the 1940's, but there does not appear to be any definite trend in the landings. During the late 1940's, the catch varied between 400,000 and 610,000 fish. The catch showed an upward trend in the 1950's, reaching a peak of 958,000 chinook in 1956. The landings dropped to an all-time low of 338,000 fish in 1967, but climbed to 816,000 fish in 1973.

Coho troll landings in California averaged about 80,000 fish from 1952-57. The catch dropped to a low of only 13,000 coho in 1958 and stayed at a low level through 1960. Catches then began to rise steadily, due to increased Columbia River and Oregon coastal hatchery production, reaching 445,000 fish in 1966. Since 1966, the catch has shown some rather wide fluctuations, from a low of 158,000 fish in 1972 to a high of 656,000 fish in 1974.

Pink salmon troll catches are very small in California, with the peak recorded catch of 30,000 fish occurring in 1967.

The catch of chinook salmon by the Oregon troll fleet was at its highest in the mid-50's. It then began to decline and reached its lowest level of 53,000 fish in 1962. Since then the trend has been upward and reached a peak of 363,000 fish in 1973.

The annual Oregon troll catch of coho salmon declined rapidly in the 1950's, and reached a low point of only 112,000 fish in 1960. Since then, the catch has increased markedly, especially after 1962, reflecting increased hatchery production. The Oregon catch subsequently fluctuated at a relatively high level, with peaks around 1.5 million coho in 1971 and 1976.

Pink salmon are only caught in quantity by Oregon trollers in odd-numbered years, and even then the recorded catch is relatively small. The peak landing was 201,000 fish in 1967, with the next highest catch being 58,000 fish in 1969. (NOTE: Basic references for historical catches are Cleaver, 1951 and Smith, 1956.)

The catch of chinook salmon by the Washington troll fishery, although showing some rather large fluctuations, gradually increased from about 200,000 fish in 1935 to around 400,000 fish in the early 1950's. The catches then experienced a

California also issues commercial fishing licenses but not specifically for salmon fishing.

All three states will now have sport fishing licenses since the 1977 Washington legislature approved a new licensing system to be implemented for the 1978 season.

The three states also have commercial catch reporting requirements while both Washington and Oregon utilize "punch cards" to enumerate sport salmon landings.

4.5 Local and Other Applicable Laws, Regulations, and Policies

There are no known local laws, regulations, or policies significant to this fishery management plan.

5.0 DESCRIPTION OF FISHING ACTIVITIES

5.1 History of Harvests

5.1.1 Troll Fishery. The chinook catch by California trollers has shown some rather large fluctuations since the 1940's, but there does not appear to be any definite trend in the landings. During the late 1940's, the catch varied between 400,000 and 610,000 fish. The catch showed an upward trend in the 1950's, reaching a peak of 958,000 chinook in 1956. The landings dropped to an all-time low of 338,000 fish in 1967, but climbed to 816,000 fish in 1973.

Coho troll landings in California averaged about 80,000 fish from 1952-57. The catch dropped to a low of only 13,000 coho in 1958 and stayed at a low level through 1960. Catches then began to rise steadily, due to increased Columbia River and Oregon coastal hatchery production, reaching 445,000 fish in 1966. Since 1966, the catch has shown some rather wide fluctuations, from a low of 158,000 fish in 1972 to a high of 656,000 fish in 1974.

Pink salmon troll catches are very small in California, with the peak recorded catch of 30,000 fish occurring in 1967.

The catch of chinook salmon by the Oregon troll fleet was at its highest in the mid-50's. It then began to decline and reached its lowest level of 53,000 fish in 1962. Since then the trend has been upward and reached a peak of 363,000 fish in 1973.

The annual Oregon troll catch of coho salmon declined rapidly in the 1950's, and reached a low point of only 112,000 fish in 1960. Since then, the catch has increased markedly, especially after 1962, reflecting increased hatchery production. The Oregon catch subsequently fluctuated at a relatively high level, with peaks around 1.5 million coho in 1971 and 1976.

Pink salmon are only caught in quantity by Oregon trollers in odd-numbered years, and even then the recorded catch is relatively small. The peak landing was 201,000 fish in 1967, with the next highest catch being 58,000 fish in 1969. (NOTE: Basic references for historical catches are Cleaver, 1951 and Smith, 1956.)

The catch of chinook salmon by the Washington troll fishery, although showing some rather large fluctuations, gradually increased from about 200,000 fish in 1935 to around 400,000 fish in the early 1950's. The catches then experienced a

sharp decline to a low of only 96,000 fish in 1965. Since that time, the catches have been generally increasing and reached a recent peak of 367,000 fish in 1976. These statistics include a small (i.e., less than 2% of the state's total troll landings) year-round tribal troll fishery by the Makah Indians centered in the vicinity of outer Juan de Fuca Strait.

The coho catch by Washington trollers is considerably more variable than the chinook catch. During the late 1930's and early 1940's, the catches generally declined. They improved during the late 1940's and 1950's, fluctuating around 600,000 fish annually. Since 1965, the overall trend of the catches has been generally upward with a record catch in 1976 of 1,388,000 coho salmon. This recent increase is attributable mainly to accelerated artificial production.

Pink salmon are caught by Washington troll fishermen primarily in the odd-numbered years. The catches began increasing in the early 1950's and reached a record catch of 630,000 fish in 1963. Following another large catch in 1967 of 381,000 fish, the catch has declined to less than 60,000 fish annually since 1967.

5.1.2 Ocean Sport Fishery. In addition to extensive commercial troll salmon fisheries, there are also increasingly important ocean recreational fisheries harvesting stocks of Pacific Coast salmon. For example, the reported ocean sport catch of chinook in California increased from around 100,000 fish in the early 1960's to 200,000 fish in 1972. Since 1972, the catch has declined each year to a low of 81,000 fish in 1976. The California ocean sport catch of coho also showed an increase during the 1960's, and reached a peak of 77,000 coho in 1974.

In Oregon, the ocean sport fishery depends heavily on coho, with recent landings exceeding 300,000 fish in 1967, 1971, and 1974. Chinook catches were smaller, averaging only 46,000 fish per year in the last decade.

The ocean recreational catch of salmon in Washington has increased rapidly since 1952, sometimes exceeding the total marine sport salmon catch for all other Pacific Coast states and British Columbia combined. The ocean chinook catch has increased since 1952 at a rate of approximately 7,000 fish per year and reached a peak of 262,000 chinook in 1975 after a low of 38,000 fish in 1953. Washington's ocean coho fishery has increased from a low of 26,000 fish in 1952 to a high of 943,000 coho in 1976.

5.1.3 Recent Catch, Effort, and C/U/E Statistics. The available basic chinook and coho salmon catch, effort, and catch per unit effort statistics for seven definable fisheries--troll and sport fisheries off three states plus the Canadian troll fishery--are depicted graphically in Figures 3 through 9 for the recent 10-year period, 1967-1976. Catch per unit of effort data do not necessarily reflect abundance levels due to changes in fishing technology which have altered efficiency of both the sport and troll fisheries. Weather and variations in fish distribution and availability are also factors which affect catch per unit of effort.

5.2 Domestic Commercial and Recreational Fishing

5.2.1 Fishing Areas. The Pacific Coast salmon troll fishery is a mobile fishery which extends from mid-California to Middleton Island in the Gulf of Alaska (Figure 10). It is conducted on feeding salmon intermingled from many parent streams. Some of the larger vessels participate in crab and albacore fisheries and these efforts also account for a substantial percentage of such fishermen's income. In many cases, salmon accounts for a substantial percentage of the fishermen's income.

The California troll fleet fishes mainly off its own coast, but a few boats have fished as far north as the southern coast of Washington.

Although most of the Oregon salmon troll fleet fishes primarily off the coast of Oregon, some vessels, particularly larger ones, follow the salmon runs from northern California to northern Washington.

The Washington troll fleet fishes waters from northern California to southeastern Alaska. Most of the catches by this fleet, however, occur off coastal Washington. Prior to the late 1960's, U.S. fishermen made substantial landings of both chinook and coho from waters north of the Strait of Juan de Fuca. Such landings have declined greatly in recent years.

Most of the salmon caught by the Canadian troll fleet are taken off the British Columbia coast but some Canadian boats also fish off Washington. A bilateral agreement between the U.S. and Canada, first signed in 1970, permitted salmon fishing since 1973 by Canadian troll vessels within the 3- to 12-mile zone in an area off the Washington coast north of approximately 48°N latitude.

Recreational fishing vessels are far less mobile, limited almost entirely to 1-day trips out of the major coastal ports.

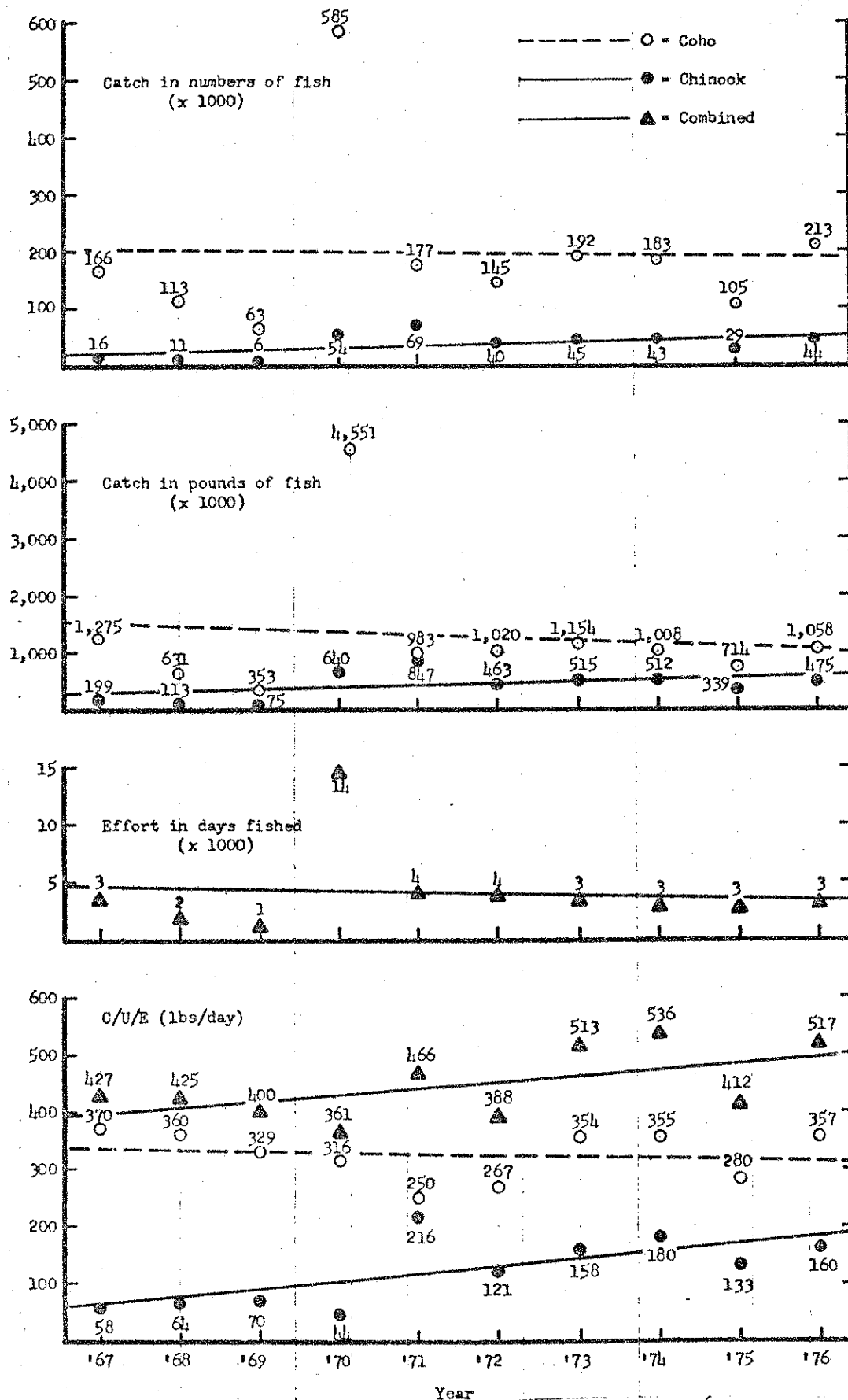
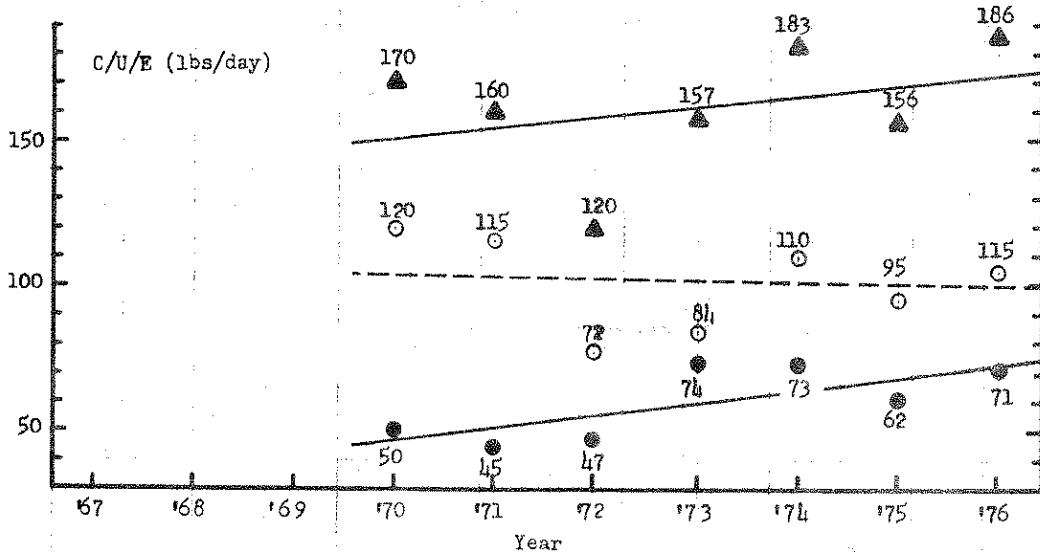
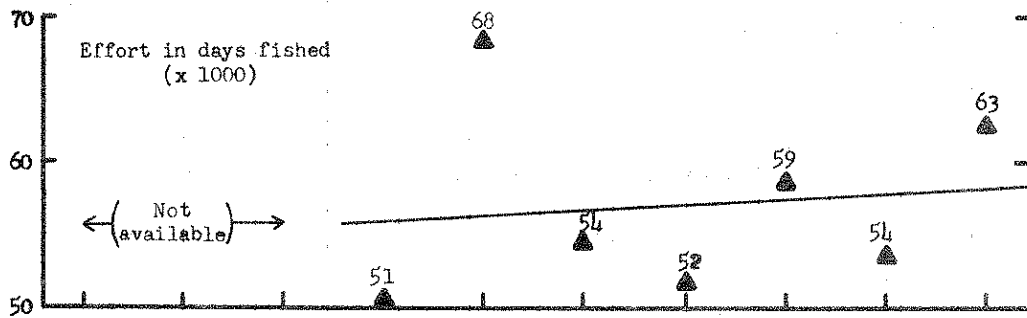
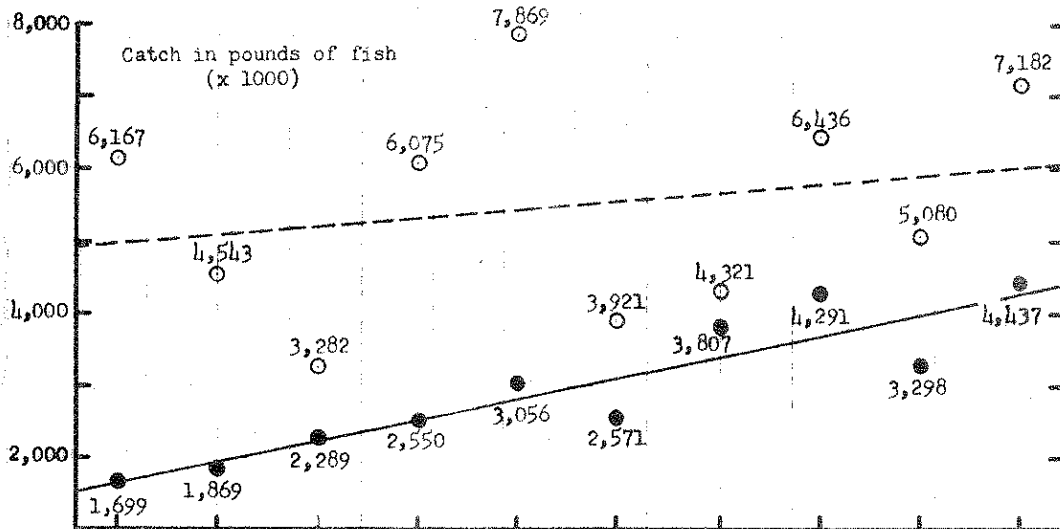
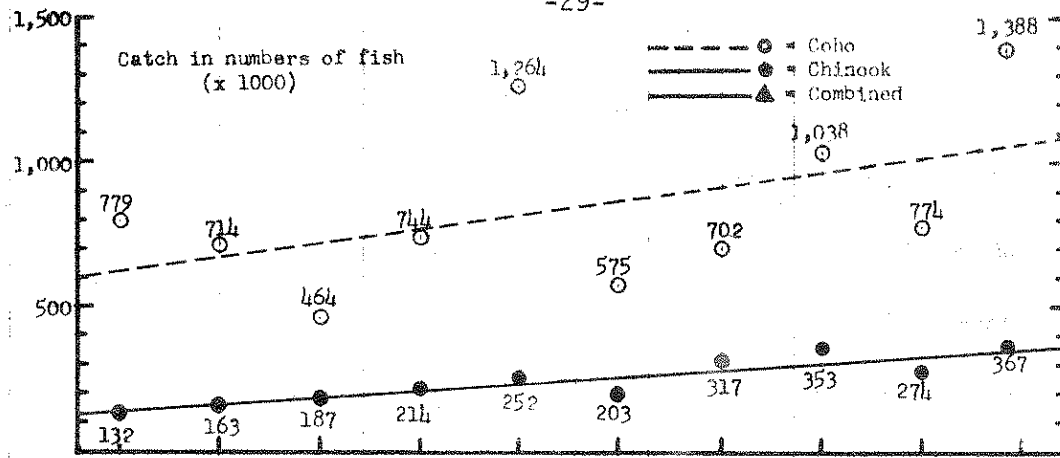


Figure 3. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the British Columbia commercial troll salmon fishery off Washington, Oregon and California, 1967-1976.

Figure 4. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the Washington commercial troll salmon fishery, 1967-1976.



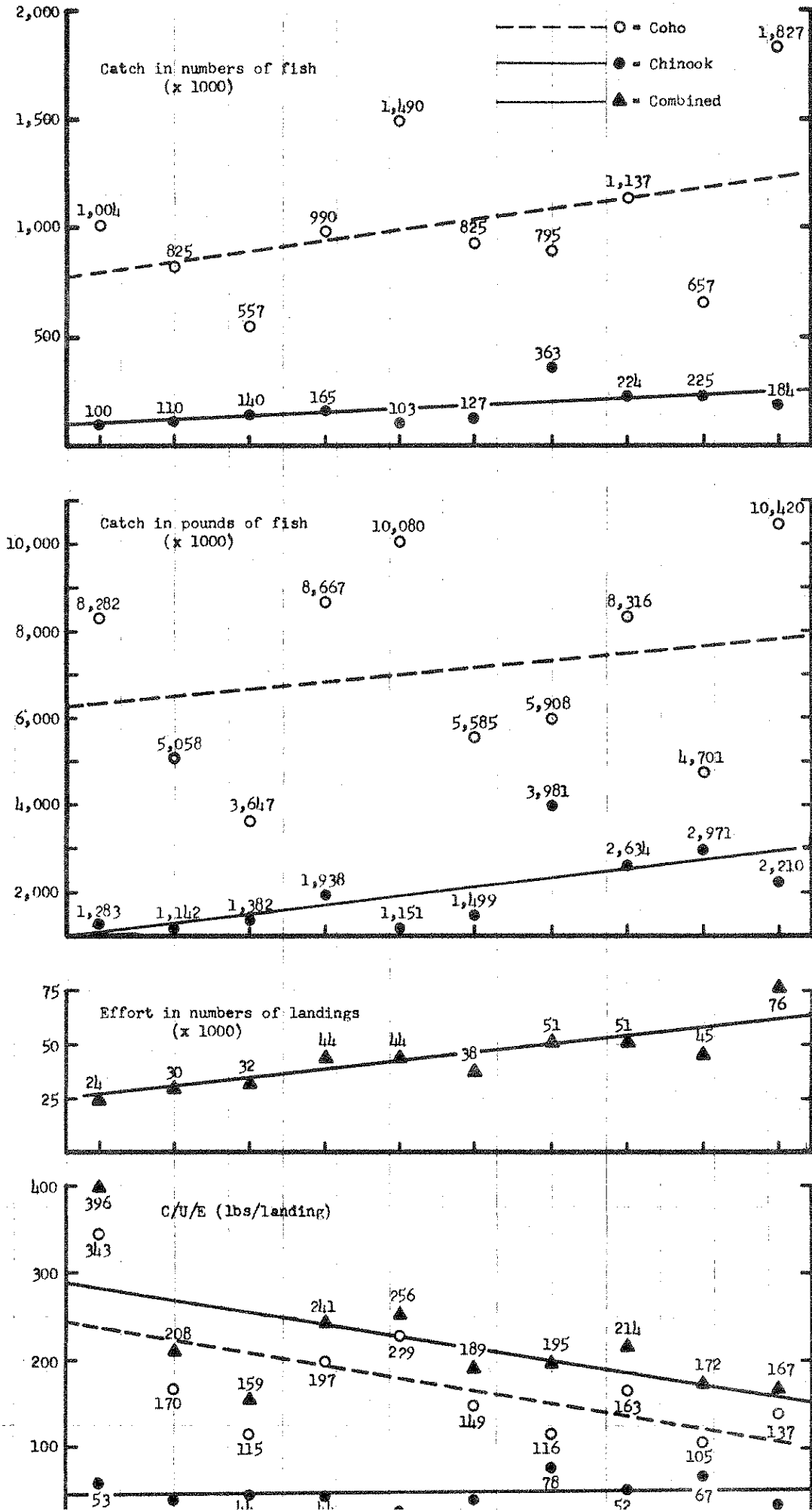


Figure 5. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the Oregon commercial troll salmon fishery, 1967-1976.

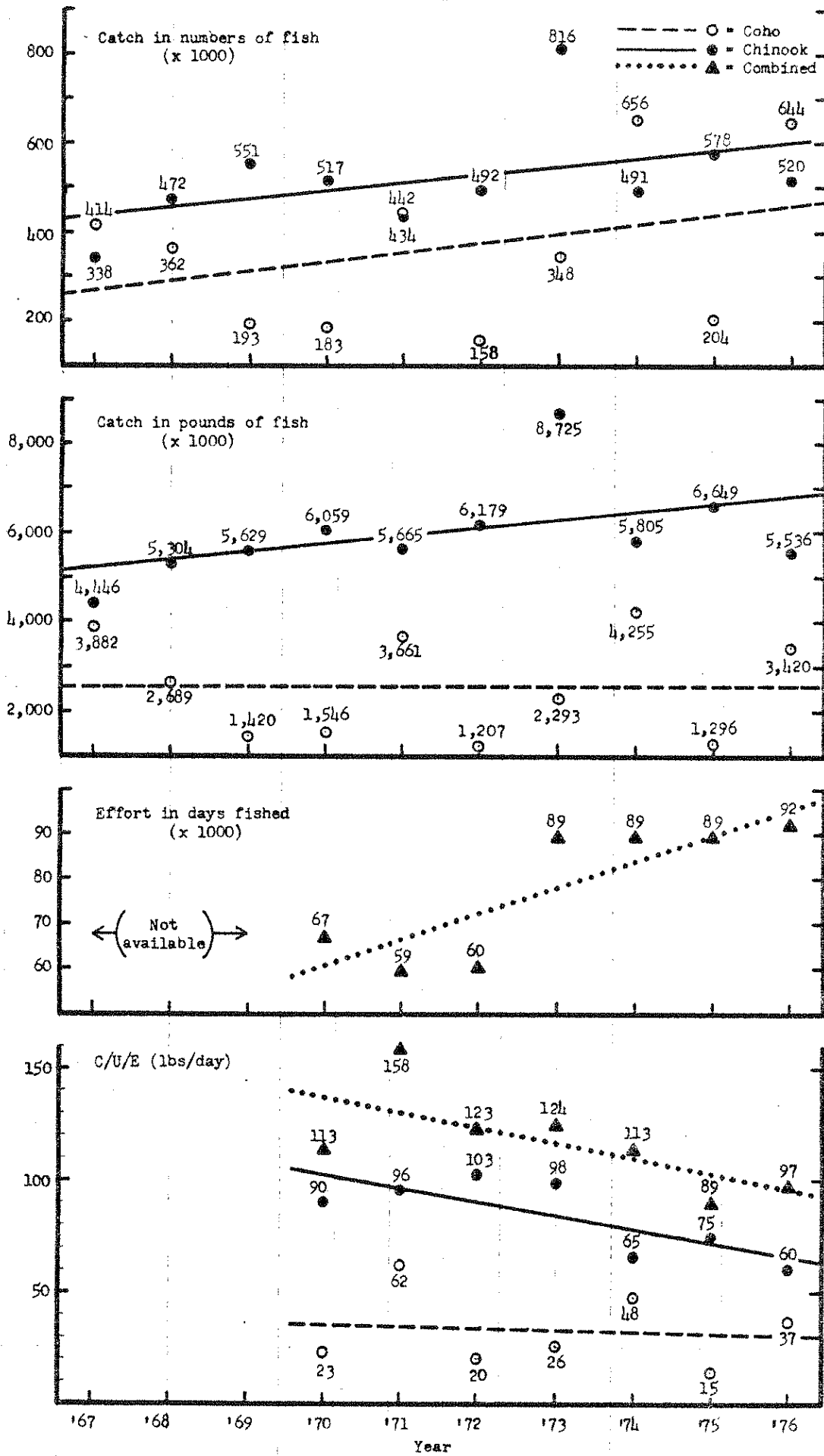


Figure 6. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the California commercial troll salmon fishery, 1967-1976.

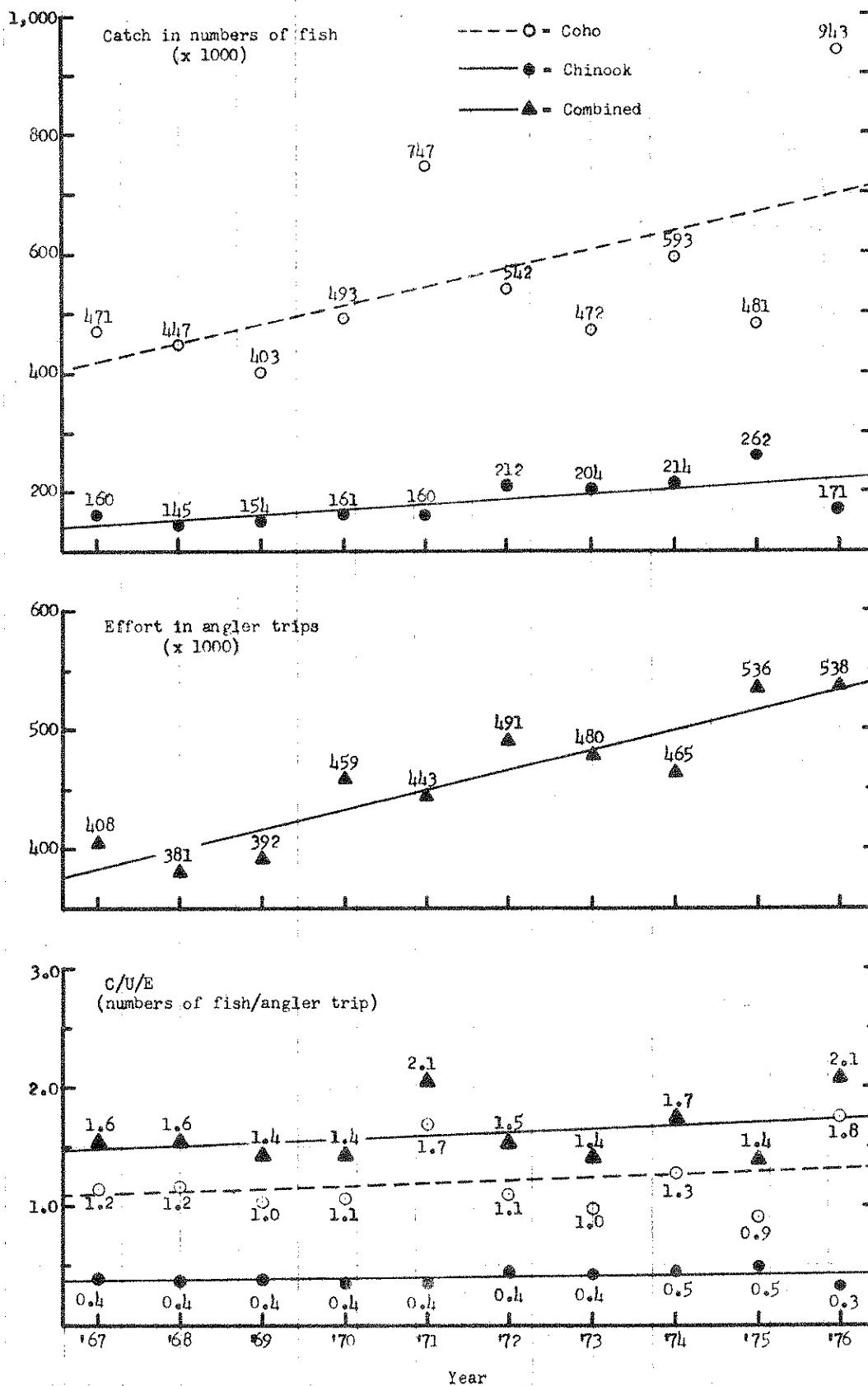


Figure 7. Basic chinook and coho salmon catch, effort and catch per unit of effort statistics for the Washington coastal sport salmon fishery, 1967-1976.

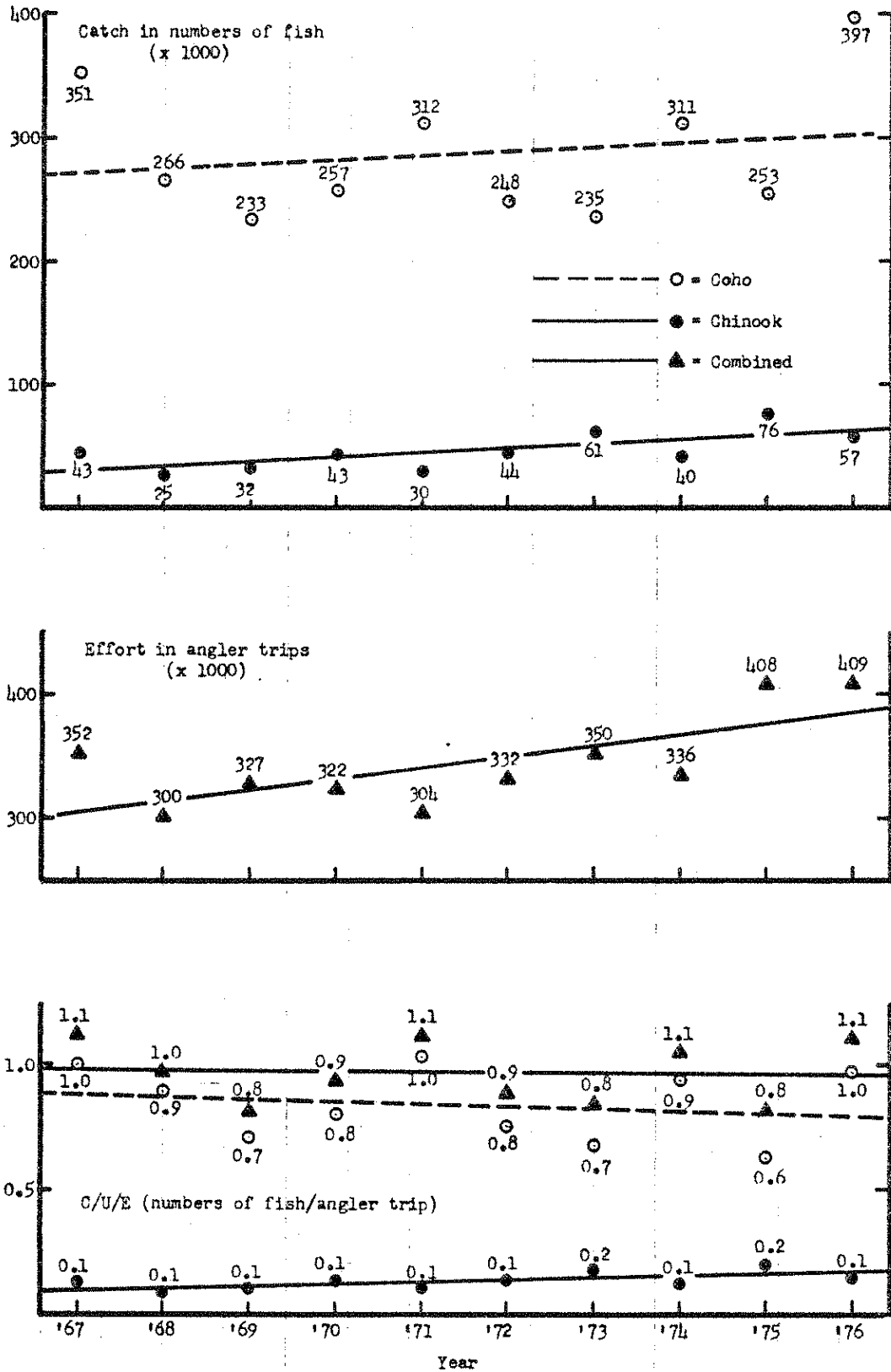


Figure 8. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the Oregon ocean sport salmon fishery, 1967-1975, and preliminary 1976.

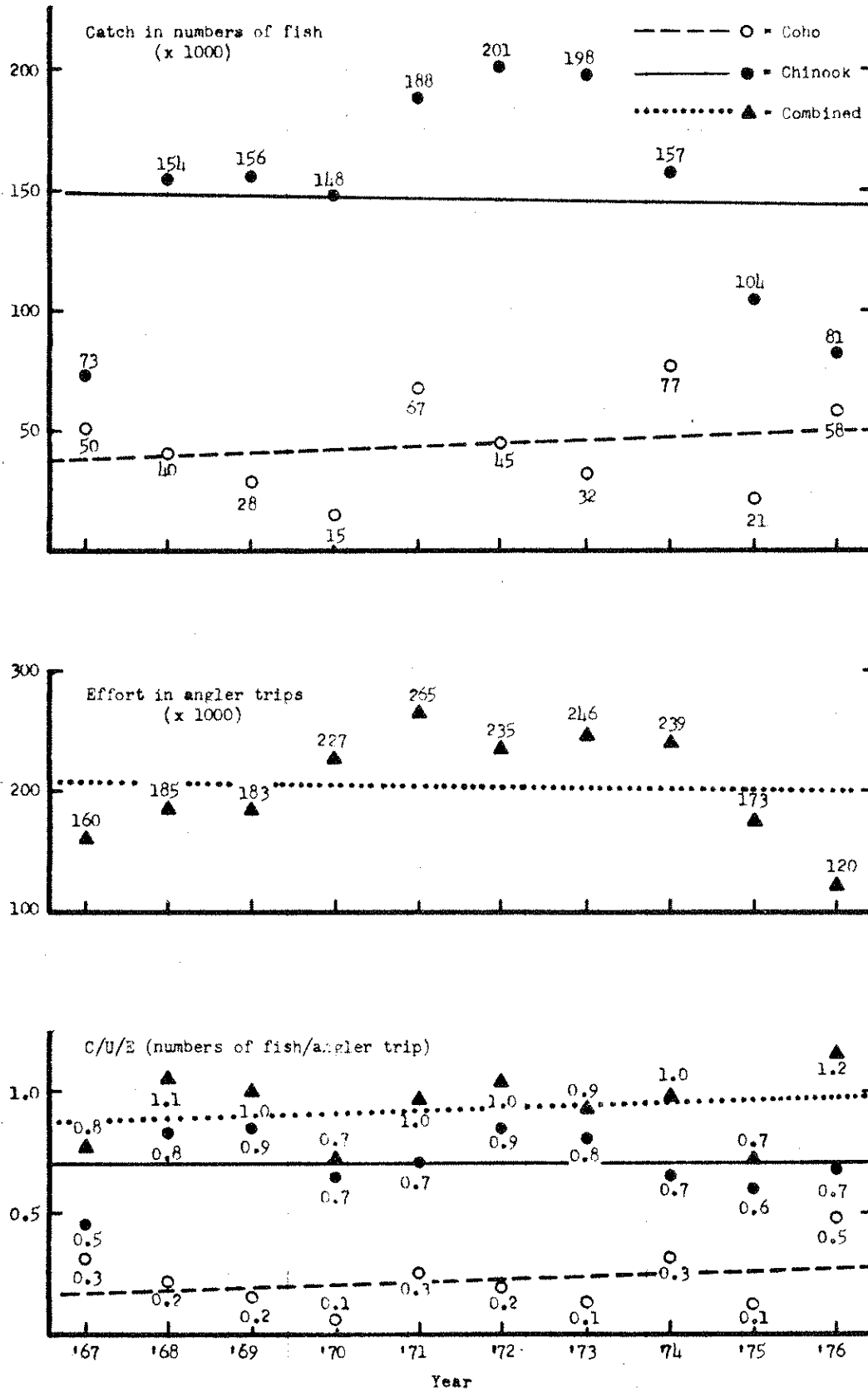


Figure 9. Basic chinook and coho salmon catch, effort, and catch per unit of effort statistics for the California coastal sport salmon fishery, 1967-1976.

120
17

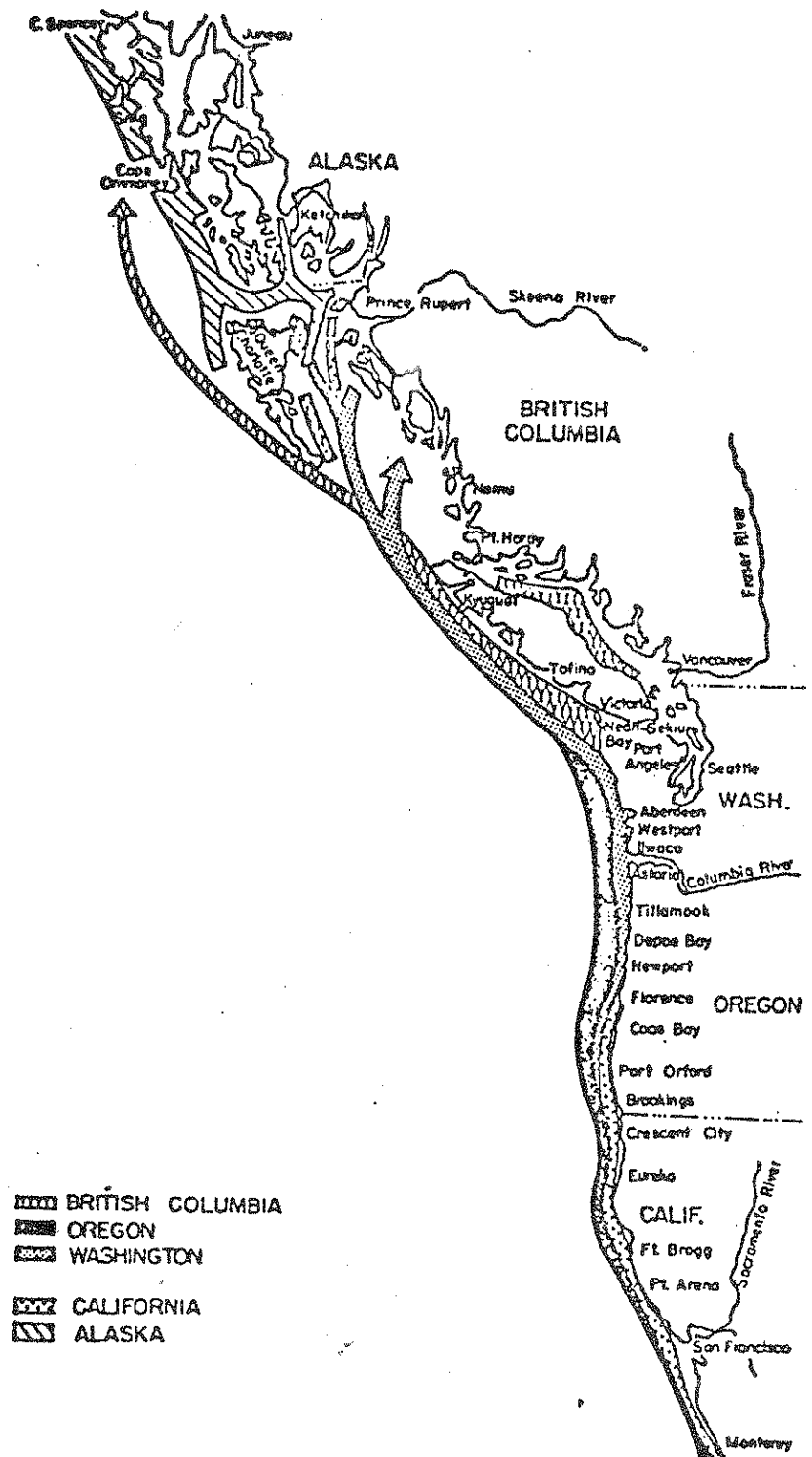


Figure 10. Troll fishing areas--United States and Canada.

5.2.2 Vessels and Gear Employed

5.2.2.1 Troll Fishery. Trolling for Pacific salmon is simply a method of dragging a number of baits or lures at desired depths behind a moving boat (Wigutoff, 1950; Scofield, 1956). The fishery developed rapidly following its inception, and Cobb (1921) attributed this to demands of the mild-cure processors for chinook in prime condition.

Terminal gear fished for chinook consists mainly of larger, metallic-finished spoons and flasher-bait or flasher-hootchie combinations. Trolling plugs are still used to some extent, but their importance has diminished greatly in the past decade. Compared to coho, chinook fishing is more inshore and individual "spreads" of gear have longer leaders and are attached to main wire lines with greater spacing. Terminal gear for coho consists mainly of brightly colored spoons but flasher-hootchie combinations are also popular. (See section 9.2.3 for discussion of gear selectivity.)

The following discussion by Wright (1970a) depicts the general situation for the Pacific Coast as a unit:

"Kauffman (1951), Van Hyning (1951), Fry and Hughes (1951), Milne and Godfrey (1964a), and Parker and Kirkness (1956) documented evolution of troll salmon fleets in Washington, Oregon, California, British Columbia, and Alaska, respectively. From their discussions, it was concluded that similar evolutionary trends were in evidence along the entire Pacific Coast. In all areas, fleets evolved from small craft of various description using inefficient gear for 1-day trips from coastal ports to much larger boats specifically designed and equipped for salmon trolling. The bigger vessels were more powerful and seaworthy, and had greater operating ranges. They provided more comfortable living quarters and carried ice for extended fishing on new grounds outside the 1-day operating range from ports. As a consequence, fishing intensity in any given area became dependent on the abundance of salmon relative to other areas. Gear evolved from strictly hand-pulling operations to almost exclusive use of power gurdies which allowed one man to operate six or more lines. Power gear, plus introduction of automatic pilots, allowed many boats to shift from two-man to one-man operations.

"Development and use of direction finders, radio-telephones, echo-sounders, LORAN station navigation, and radar allowed boats to assemble and remain in good fishing areas under poor visibility conditions. Introduction of stabilizers reduced roll and permitted fishing in heavy seas. The change from cotton to steel lines (plus power gear) allowed fishing at greater depths with less loss of gear, and many new materials were developed for lures and auxiliary hardware. Cost of operation increased and this meant greater catches had to be made to produce the same net return. Timing and extent of fishing effort also changed significantly. Smaller boats, with their restricted radius of operation, had depended on fishing during the late summer and fall when maturing fish were concentrated off harbor and river mouths. Larger boats,

however, found that salmon could be caught earlier and more efficiently on offshore banks. In the southern range of the fleet, development of the albacore fishery further accentuated the shift in fishing intensity from late summer and fall to spring and early summer, since larger trollers frequently switched to albacore fishing in July or August. Participation in other forms of commercial fishing, notably crab fishing and salmon gillnetting, further made troll salmon effort partially dependent on such factors as Dungeness crab abundance and strength of 'inside' salmon runs."

Some specifics of troll fishery development in Washington were described as follows by Kauffman (1951):

"Hook-and-line fishing for salmon by white men was adopted from the Indians who had used this method before the settlers reached the waters of Washington. Cobb (1921) reports that the Indians living at the reservation at Neah Bay had annually caught large numbers of silver and chinook salmon in the Strait of Juan de Fuca by trolling. Cobb says further: 'A large number of white fishermen also engage in the fishery at the present time in the same waters, while others troll for the same species, but more particularly silvers, in parts of Puget Sound proper.'"

It appears then, that the troll fishery in the early years of the 20th Century was developing simultaneously in outer waters of the Strait of Juan de Fuca and inside Puget Sound, particularly in the vicinity of Possession Point at the southern tip of Whidbey Island.

Support is offered by Milne and Godfrey (1964) who state:

"The efficiency of the trolling method has changed greatly in the last 50 years. Prior to 1900, the Indians fished from dugout canoes with primitive bone hooks and twisted bark lines. By 1900, small boats were operating in the open ocean off Cape Flattery and off the west coast of Vancouver Island."

From its localized beginnings, the Washington troll fleet evolved to a status of plying "coastal waters from the Columbia River to Cape Flattery and northward along the coast of Vancouver Island to Hecate Strait and Southeastern Alaska" (Kauffman, 1951). Fisheries operating from the three major Washington coastal ports of importance in the late 1940's and early 1950's (Ilwaco, Westport, and LaPush) have continued to prosper in recent years. The northern fishery has, however, undergone a drastic decline. In describing the fishery operating from Neah Bay, Kauffman (1951) stated:

"The three most heavily fished grounds are Umatilla Reef, a 2-hour run from Neah Bay, Swiftsure Bank, also a 2-hour run from Neah Bay, and Forty Mile or LaPerouse, usually less than 5 hours from the harbor. Proceeding north along the coast of Vancouver Island, there are several well-fished areas, the major ones being Amphitrite Point, Lennard Island, Sidney Inlet, Rafael Point, Esperanza Inlet, and Quatsino Sound. In Hecate Strait, the trollers fish the Horseshoe, a horseshoe-shaped bank about 2 hours east of Ramsey Island, and in the vicinity of Rose Spit."

By converting troll fishery statistics from area landed to area caught for the 10-year period, 1960-1969, Wright and Brix (1971) demonstrated a definite decline in percentage of Washington's troll landings originating off Canada. Chinook and coho taken off British Columbia declined from about 30 and 20%, respectively, of the state's total production in the early 1960's to negligible levels by the end of the same decade. Limited evidence indicates that percentages for chinook and coho taken off Canada may have reached levels of 50 and 30%, respectively, in the 1950's.

Recent status of the fishery, then, is primarily that of one operating off the Washington coast and based at four major ports: Ilwaco, Westport, LaPush, and Neah Bay. In addition, Puget Sound ports, such as Port Angeles, Bellingham, and Seattle, continue to receive deliveries from some larger trip-boats since fish prices are normally higher than at coastal buying stations. Troll fishing in Puget Sound was closed after the fishery itself ceased to exist due to its poor economic returns. Concerning this area, Kauffman (1951) reports:

"Through the ensuing years, the inside trollers gradually returned to more productive grounds offshore, and since about 1937, there have been only occasional commercial trollers fishing inside Puget Sound."

Trolling for salmon off the Oregon coast began in 1912 (Craig and Hacker, 1940). Early trolling occurred off the mouth of the Columbia River by small day-fishing vessels from the gill net fleet (Van Hyning, 1951). By 1919, the fleet size in this area exceeded 1,000 boats. After 1920, trollers began fishing offshore banks and larger, more efficient boats entered the fishery. The fleet expanded southward and Coos Bay and Newport became important ports of landing. There was a trend towards fewer but larger and more efficient vessels incorporating such advancements as diesel engines and power-driven winches called gurdies. These vessels were capable of trip-fishing for several days or even a week or more. After 1935, some of the larger trollers became combination boats fishing albacore and crab in addition to salmon. During the years following World War II, fleet growth and efficiency were stimulated by better markets and technological developments principally in the field of electronics. Boats began to use LORAN, depth sounders, radio direction finders, marine radio, and even radar. Some trip-boats had freezing units. Most fishermen derived their entire income from fishing. By the 1950's and early 1960's, trip-boats peaked in numbers and constituted a high proportion of the fleet. About 1965, dories rigged for trolling began to increase markedly in the fishery, and in recent years, small day-boats requiring a low capital investment have become very numerous. Many of these boats have small engine power take-off units for powering gurdies. Dories and other small trollers have increased the opportunity for persons to supplement other income sources by fishing for salmon. Currently, the fishery is characterized by a large number of small boats operated largely by part-time fishermen and fewer large boats operated by full-time fishermen that often engage in other commercial fisheries.

5.2.2.2 Ocean Sport Fishery. The sport fisheries off the coasts of Washington, Oregon, and California are of a much more recent vintage, generally growing to significant, wide-ranging proportions only after World War II in ocean waters historically fished only by commercial fishermen. Prior to that time, sport catches generally occurred either in or just off various coastal river mouths during the period when runs of salmon were expected on their annual spawning

migrations. The advent of larger, more seaworthy private boats with powerful, dependable engines, plus the rapid development of charter boat fleets, construction of small-boat basins, improvements in launching and moorage facilities, and increases in fishermen support industries, have combined to make recreational ocean fishing a major impact on salmon resources. Sophisticated navigational equipment and other electronic gear have been utilized by charter fishing craft as well as by commercial trollers and this, coupled with a distinct trend toward larger boats, has provided sportsmen with access to more of the ocean waters inhabited by feeding chinook and coho salmon.

The fishing gear utilized by individual sport anglers varies widely, but generally consists of a single rod held by hand and/or rod holder with a single bait or artificial lure. (NOTE: In the ocean, California has no limit on the number of rods at any time or on hook and line gear during the commercial troll salmon season.) Two basic patterns of fishing are common, "mooching" and "trolling". Mooching is fishing from a drifting craft, typically with bait, and is commonly practiced by many private craft and most larger charter boats. A variation is "motor mooching", where intermittent motor propulsion is utilized to improve the "action" of bait or lures. Trolling involves continual movement by individual craft at a somewhat constant rate of speed and is practiced by private craft as well as many smaller charter boats. This consistent gear movement within the water column necessitates use of much heavier weights and lines with various planing devices sometimes being employed to force the terminal gear downward. Accessories are often used which either release the heavy weights when a fish strikes or release the light fishing line from a heavier steel line utilized to carry the former to a desirable fishing depth.

5.2.3 Number of Boats and Fishing Effort

5.2.3.1 Troll Fishery. Available data on the size of Washington's troll fleet through 1967 were summarized as follows by Wright (1970a):

"To evaluate possible changes in size of Washington's troll fleet, several sources were available. Smith (1920a) estimated number of boats trolling in 1918 as 500 off Neah Bay, 20 to 30 off the mouth of Grays Harbor, and upwards of 2,000 off the mouth of the Columbia River. Smith also reported that in 1919 there were 25 to 30 commercial trollers fishing off Possession Point in Puget Sound. Although Oregon-based boats apparently were included in the Columbia River fishery, it was probable that the Washington fleet decreased in size or, at best, remained at relatively stable levels from 1918 to 1951 when Kauffman (1951) estimated that approximately 1,300 boats comprised the Washington troll fleet. A definite increase occurred between 1951 and 1964 when DiDonato (1965b) determined that a total of 1,722 boats were licensed to land troll-caught salmon in Washington, but the change occurred over a 13-year period and represented a relatively small average annual increase rate of about 30 boats per year. The rate of increase accelerated to over 100 boats per year for the 2-year period to 1966 when 1,931 boats were licensed. The fleet increased to 2,372 boats in 1967 for an increase of about 400 boats in 1 year. The available figures provided conclusive evidence that numbers of vessels licensed for salmon trolling were increasing at a rapidly accelerating rate."

Statistics for the 1967-1976 period are provided in Table 3.

Table 3. Washington troll salmon licenses and vessel delivery permits, 1967-1976.

Year	Number of licenses	Number of permits
1967 ^{1/}	1,635	1,762
1968	2,813	2,514
1969	2,808	2,575
1970	2,459	2,572
1971	4,222	1,419
1972 ^{2/}	3,518	235
1973	2,660	220
1974	3,260	227
1975	3,136	208
1976	3,016	192

^{1/} From 1967 to 1971 a vessel delivery permit was not automatically included with a troll license, being purchased separately. The total number of boats eligible to troll was substantially less than the total for licenses plus permits since many individual boats purchased both a license and permit.

^{2/} From 1972 on, a vessel delivery permit was automatically included with each troll license. In addition, the permit only could be purchased separately. In this instance, total boats eligible to troll equalled the sum of licenses plus permits. In addition, the number of licensing districts was reduced from four (Puget Sound, Grays Harbor, Willapa Harbor, Columbia River) to three (Puget Sound, Grays Harbor-Columbia River, Willapa Harbor-Columbia River) in 1972.

Net increase in fleet efficiency or impact has, however, been relatively minor. Wright (1968a, 1969b, and 1970a) found that trollers, which comprised less than 30% of boats licensed in 1967, accounted for 75.5% of total poundage. "Com-sports", the largest defined group in numbers, were a distant second with 11.2%. Dividing estimated number of vessels licensed by boat type into their respective calculated catches demonstrated that the season's catch per troller was about 4 times that of a dayboat, 10 times that of a com-sport, and 25 times that of a charter boat. These differences would have been higher on a coastwide basis since many trollers landed fish in more than one state. (NOTE: Beginning in 1973, a law banning hand-held [sport] angling gear for commercial fishing eliminated the com-sport group as such. The law was originally enacted in 1969, declared unconstitutional in 1970, and restored by the State Supreme Court in late 1972.)

More recent studies from a different perspective by Fraidenburg (1974) substantiated these earlier conclusions. A comparison of boats under 5 gross tons (which generally equates to the com-sport, kelper, and dayboat categories) with those over 5 tons (mainly troller category) clearly demonstrated that recent fleet size increases were attributable almost entirely to small boats. It is apparent that the recent doubling or tripling in fleet size has produced a much smaller increase in overall fleet effectiveness or impact on the salmon stocks.

Prior to 1970, fishing effort by the Washington troll fleet was traditionally reported in the form of number of landings by species. The resultant data created a number of analysis problems since an individual "landing" could represent any number of fishing days, and two landings for different species could represent a single boat taking both species or two different boats only landing one species each.

To remedy this and other problems associated with the troll fishery, a system of Troll Salmon Statistical Catch Areas was established in 1970, and fishing effort was reported as an independently derived statistic, "days fished."

A second major dimension of fishing effort is distance offshore and depth. Special research studies involving troll salmon logbooks were conducted in 1970 and 1971. One analysis of these data was directed at determining distribution of catch by both distance offshore and depth for major fishing areas off Washington's coast. Results were summarized by Wright and Brix (1973) as shown in Table 4.

Precise information on the number of vessels in the Oregon troll fleet is unavailable. This fleet is a diverse assemblage of vessels which recently stabilized in number after a steady increase during the 1950's and 1960's. Van Hyning (1951) estimated that 500 vessels fished for salmon from Oregon ports in 1951. Probably 2,500 vessels have been fishing for salmon from Oregon ports in recent years. Of all vessels landing salmon in 1971, Lewis (1973) reported that about 247 were combination salmon/tuna and salmon/crab vessels.

Data on areas fished by the Oregon troll fleet are not now reported by salmon buyers. Day-boats concentrate their fishing effort near the port where they will sell their catch; for these vessels, port of landing is indicative of area of catch. However, trip boats, which land a significant portion of the Oregon salmon catch, may deliver their catch a considerable distance from where it was caught. The number of salmon landings by Oregon trollers increased markedly from 15,000 in 1965 to almost 76,000 in 1976. Over 3,000 individual boats landed salmon in Oregon during 1975.

The number of troll salmon licenses for California is also not directly available, although the number of registered California commercial fishing vessels that landed salmon averaged around 2,000 in the late 1960's and then jumped from 2,900 in 1973 to 3,700 in 1975. A common measure of salmon fishing effort for California is the number of salmon landings. These have increased from 44,000 in 1965 to a peak of 56,000 in 1973. Since 1970, effort data on the troll salmon fishery have been collected through sampling programs. Effort (days fished by trollers) has shown an increase from 67,000 boat days in 1970 to 92,000 boat days in 1976 (Figure 6).

Table 4. Distribution of Washington coastal troll catches, 1970-1971.

Year	Species	Distribution by distance offshore			Distribution by bottom depth	
		Inside 3 miles	Between 3 & 12 miles	Outside 12 miles	Less than 200 meters	Over 200 meters
1970	Chinook salmon					
	Number	28,401	146,890	28,586	203,620	257
	Percent	13.9	72.0	14.0	99.9	0.7
1971	Chinook salmon					
	Number	32,410	195,978	5,226	233,158	456
	Percent	13.9	83.9	2.2	99.8	0.2
1970	Coho salmon					
	Number	72,338	514,824	145,514	722,863	9,813
	Percent	9.9	70.3	19.9	98.7	1.3
1971	Coho salmon					
	Number	89,939	1,111,173	38,799	1,233,566	6,345
	Percent	7.3	89.6	3.1	99.5	0.5
1970	Pink salmon					
	Number	164	3,651	1,745	5,205	355
	Percent	2.9	65.7	31.4	93.6	6.4
1971	Pink salmon					
	Number	3,075	14,804	152	16,753	1,278
	Percent	17.1	82.1	0.8	92.9	7.1

5.2.3.2 Ocean Sport Fishery. Fishing effort is traditionally expressed in terms of angler participation as an "angler day" or "angler trip". Either term denotes a single day's sport fishing effort by one angler. Fishing success is commonly measured as catch per angler trip or day, and is the product of dividing the total salmon catch landed by the number of angler trips or days. For example, Oregon ocean sport fishermen averaged 337,000 angler trips per year during the 10-year period, 1966 through 1975. The overall fishery south of Tillamook Head averaged 0.81 salmon per trip during this period, while anglers fishing the Columbia River area averaged a higher 1.50 fish per trip for the same time span.

Formalized effort statistics are not normally maintained for actual numbers of individual private boats participating in the ocean recreational fisheries. Data on numbers of charterboats are generally available, since operators are required to register and obtain licenses within each individual state. For example, it is known that Oregon had at least 226 charter boats during 1975 (Giles, Ball and York, 1976) and Washington licensed a total of 426 charter boats in 1976. A very high percentage of the latter operated from coastal fishing ports.

5.3 Foreign Fishing Activities (NOTE: A basic reference for this section is National Marine Fisheries Service, 1977.)

Canadian salmon fisheries, particularly commercial trolling, have a significant impact on domestic sport, treaty Indian, and commercial salmon fisheries. Stocks of U.S. salmon, in addition to being heavily exploited by Canadian trollers off the British Columbia coast and by Canadian seine and gill net fishermen in Juan de Fuca Strait, are also caught by Canadian trollers off the Washington coast where they are permitted to fish under the reciprocal fishing agreement.

Canadian fishermen take over half of the total catch of ocean-migrant Puget Sound chinook and coho salmon. Also, Canadian trollers catch about one-third of the total catch of the fall chinook salmon reared in Columbia River hatcheries. Thus, the large catch by Canadian fleets has a tremendous impact on the fisheries of the U.S. All the escapement requirements have to be taken from that portion of the run returning to U.S. waters. In years of small runs, this requirement can sometimes eliminate any domestic fishing opportunity.

In areas off the U.S. coast, and to a limited degree off the Canadian coast, troll vessels from the two nations fish side by side. In these areas they directly compete for the salmon available. However, the catch by Canadian trollers off the U.S. coast is much greater than the catch off Canada by U.S. trollers. Furthermore, the catch off the U.S. coast by Canada has increased in recent years, whereas the catch off Canada by U.S. trollers has declined. For example, from 1960 to 1962, a 3-year total of 120,000 chinook salmon, or 26% of the total catch of chinook salmon by U.S. trollers landing in the state of Washington, was caught off the west coast of Vancouver Island. By contrast, for the 3-year total of 1970-72, only 11,000 chinook were caught by U.S. trollers in these same areas and landed in the state of Washington. This amounted to less than 2% of the total Washington troll catch of chinook salmon. On the other hand, during 1960-62, Canadian trollers caught less than 1,000 chinook salmon off the Washington-Oregon coast; while from 1970-72, Canadian trollers caught a 3-year total of 163,000 chinook in the same area.

Coho catches by each country off the other nation's shores have shown a trend very similar to chinook, with Canadian troll salmon landings from the Washington and Oregon coasts peaking at nearly 600,000 fish in 1970, and Washington catches off Canada gradually fading to insignificant proportions by the early 1970's. It should be noted that accuracy of catches discussed is dependent upon fishermen properly reporting their catch-origin areas to troll fish buyers.

The large catches of U.S. chinook and coho salmon by Canadians have made it increasingly difficult for some U.S. fisheries in inside waters to maintain any type of open season and still obtain the desired levels of spawning escapement. This problem is magnified even more by the obligation to allocate a proportion of the available catch to treaty Indian fisheries in line with recent U.S. Federal Court decisions.

Foreign trawling also has an impact on U.S. salmon stocks. Trawling, particularly by Soviet vessels, began off the Washington-Oregon-California coast in the mid-1960's. Other countries, including Japan, Poland, East Germany, West Germany, and Bulgaria, subsequently entered this fishery. The magnitude of foreign fishing depends on time of year, and it affects the salmon fishery in two ways. There is physical interaction of large foreign vessels competing for space in certain areas and during certain months with smaller U.S. salmon trollers. This occurs because hake, the primary target species of the foreign trawlers, and salmon often occur together apparently due to similarities in food habits. Some salmon are caught by the foreign trawl fishery. Specific effort by the foreign fleet to catch salmon has not been documented, but an incidental catch of both chinook and coho salmon is known to occur. Some incidental salmon catches were recorded by American observers on foreign vessels. Observations off Oregon of the number of salmon caught during 1975 and 1976 ranged from no salmon to 0.43 salmon per metric ton (2,205 lb.) of hake. Chinook was the principal salmon species caught by foreign trawlers. A rough approximation of salmon catches by foreign trawlers might be the mid-point of these observations (0.215 salmon per metric ton) times the recent average catch level of 200,000 metric tons annually. This would yield an incidental catch of 43,000 salmon per year off Washington, Oregon, and California. However, for 1977, the allowable hake catch for all foreign trawl fishermen was substantially reduced from this 200,000 metric ton level and no retention of salmon was permitted. (NOTE: The Soviet and Polish Governing International Fisheries Agreements permit a hake fishery in the FCZ, but allow no retention of salmon.)

A recent report by French (1977) provides salmon incidental trawl catch estimates of a substantially lower magnitude than the above projection. An abstract of this report states as follows:

"During the summer of 1976 scientific observers under the auspices of the National Marine Fisheries Service were invited aboard selected Japanese, Polish and Soviet trawlers fishing off the coast of California, Oregon, Washington, and southern British Columbia for the purpose of sampling the catches. Pacific salmon (genus Oncorhynchus) were observed in trawl catches in the Eureka, Columbia, and Vancouver areas from June through September. The estimated catch of salmon, based on their incidence per metric ton of fish catch, totaled about 4,250 by the Polish fleet from June through September, about 284 salmon by the Soviet fleet during July and August, and no salmon on a Japanese vessel fishing in the Monterey area in July and August. Most salmon observed were chinook salmon (O. tshawytscha) which averaged about 64 cm long and 4 kg in weight."

5.4 Interactions Between Domestic and Foreign Participants in the Fishery

The large catches of U.S. chinook and coho salmon by Canadian vessels have had serious economic impact on the fisheries of the U.S. in that they have greatly reduced the number of salmon available for capture by U.S. fishermen. These large catches of salmon by Canadian vessels, a substantial portion of the catches being hatchery fish produced at substantial cost to the U.S. taxpayer, have reduced the benefit/cost ratio (as it pertains to benefits to U.S. fishermen) for U.S. hatchery operations and consequently made it more difficult to gain public support for such operations. Nevertheless, resource enhancement in terms of artificial production and habitat improvement can still be conducted on a positive domestic benefit/cost ratio and is essential to the future well-being of U.S. domestic user groups, providing Canadian catches of U.S. salmon do not accelerate to an even higher level. Care must be exercised, however, in the selection of facility sites, release points, salmon stocks, juvenile size at liberation, and timing of releases in order to maximize benefits to U.S. domestic fisheries.

The broader implications of the salmon interception problem are summarized graphically in Figure 11.

Further, a series of possible measures to reduce U.S. ocean fishing rates on chinook and coho salmon has been considered by state management agencies for several years. Virtually all of the alternatives which might be implemented to increase overall resource yields and/or transfer more salmon to internal state waters have one major flaw -- they also transfer varying but significant numbers of fish to Canadian salmon fisheries. In general, constraints on U.S. ocean fishermen will, in fact, result in a net transfer of salmon from the U.S. to Canada unless compensating regulations are initiated by Canada. Negotiations with Canada might provide methods for resolving these problems of salmon transfer between U.S. and Canadian fisheries.

6.0 DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

6.1 Economic Characteristics of the Domestic Harvesting Sector

6.1.1 Commercial Fishery Prices. Not only have troll salmon catches been increasing, but the prices paid to fishermen also have risen dramatically. For chinook salmon, the average coastwide price per pound dressed weight increased from 25 cents in 1947 to 80 cents by 1972 and has continued to increase since that time. For example, average ex-vessel price for troll-caught chinook in Washington for 1976 was \$1.59 per pound. For troll caught coho salmon, from an ex-vessel price of 22 cents in 1947, the price increased to 68 cents per pound by 1972, and these coho prices also have continued to increase sharply since then. The average ex-vessel troll price for Washington in 1976 was \$1.25 per pound. It should be pointed out that these prices are undoubtedly minimal since other factors such as bonuses, post-season settlements, etc., are not included.

While some of this price rise reflects price inflation in the national economy, troll salmon prices deflated by the wholesale price index rose, on the average, by over 2% per annum from the late 1940's to 1972.

5.4 Interactions Between Domestic and Foreign Participants in the Fishery

The large catches of U.S. chinook and coho salmon by Canadian vessels have had serious economic impact on the fisheries of the U.S. in that they have greatly reduced the number of salmon available for capture by U.S. fishermen. These large catches of salmon by Canadian vessels, a substantial portion of the catches being hatchery fish produced at substantial cost to the U.S. taxpayer, have reduced the benefit/cost ratio (as it pertains to benefits to U.S. fishermen) for U.S. hatchery operations and consequently made it more difficult to gain public support for such operations. Nevertheless, resource enhancement in terms of artificial production and habitat improvement can still be conducted on a positive domestic benefit/cost ratio and is essential to the future well-being of U.S. domestic user groups, providing Canadian catches of U.S. salmon do not accelerate to an even higher level. Care must be exercised, however, in the selection of facility sites, release points, salmon stocks, juvenile size at liberation, and timing of releases in order to maximize benefits to U.S. domestic fisheries.

The broader implications of the salmon interception problem are summarized graphically in Figure 11.

Further, a series of possible measures to reduce U.S. ocean fishing rates on chinook and coho salmon has been considered by state management agencies for several years. Virtually all of the alternatives which might be implemented to increase overall resource yields and/or transfer more salmon to internal state waters have one major flaw -- they also transfer varying but significant numbers of fish to Canadian salmon fisheries. In general, constraints on U.S. ocean fishermen will, in fact, result in a net transfer of salmon from the U.S. to Canada unless compensating regulations are initiated by Canada. Negotiations with Canada might provide methods for resolving these problems of salmon transfer between U.S. and Canadian fisheries.

6.0 DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

6.1 Economic Characteristics of the Domestic Harvesting Sector

6.1.1 Commercial Fishery Prices. Not only have troll salmon catches been increasing, but the prices paid to fishermen also have risen dramatically. For chinook salmon, the average coastwide price per pound dressed weight increased from 25 cents in 1947 to 80 cents by 1972 and has continued to increase since that time. For example, average ex-vessel price for troll-caught chinook in Washington for 1976 was \$1.59 per pound. For troll caught coho salmon, from an ex-vessel price of 22 cents in 1947, the price increased to 68 cents per pound by 1972, and these coho prices also have continued to increase sharply since then. The average ex-vessel troll price for Washington in 1976 was \$1.25 per pound. It should be pointed out that these prices are undoubtedly minimal since other factors such as bonuses, post-season settlements, etc., are not included.

While some of this price rise reflects price inflation in the national economy, troll salmon prices deflated by the wholesale price index rose, on the average, by over 2% per annum from the late 1940's to 1972.

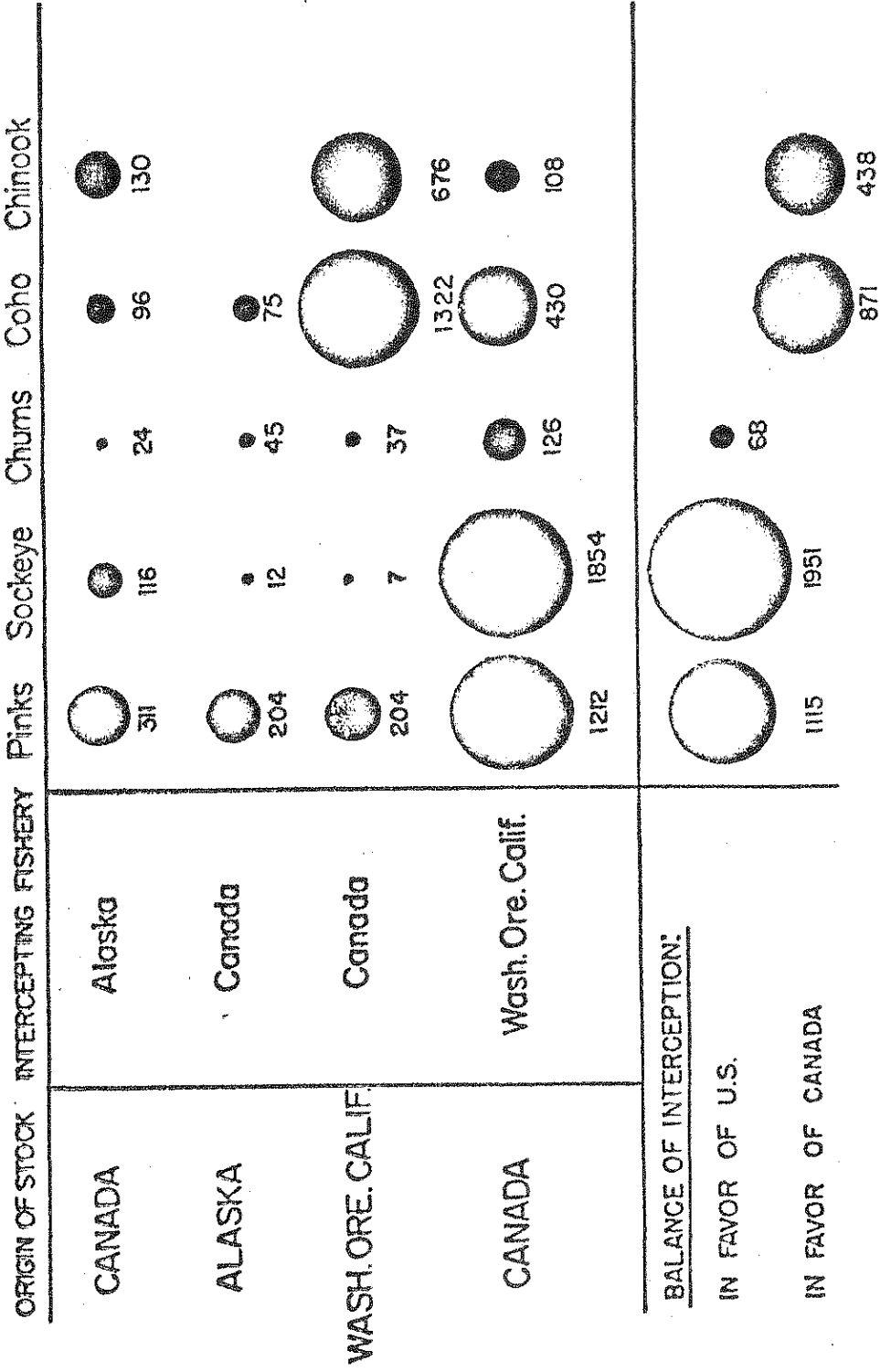


Figure 11. Interceptions of salmon by United States and Canadian fisheries. Average annual catches, 1964-1974 (1,000's of fish).

(Note: Average of U.S. and Canadian estimates and does not include salmon bound for streams which originate in Canada and flow through the Alaska Panhandle.)

Handwritten notes:
 1
 2
 3
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32
 33
 34
 35
 36
 37
 38
 39
 40
 41
 42
 43
 44
 45
 46
 47
 48
 49
 50

F
125

Within each troll season, differential prices are normally paid for "small", "medium", and "large" grades of red-fleshed chinook. Small numbers of "whites" are also landed in Washington and sold at a somewhat lower price structure. In addition, all troll fish prices, including coho, typically increase as the season progresses. Average monthly ex-vessel prices for the Washington troll fishery are shown in Table 5. For comparison purposes, commercial net fishery prices are provided in Table 6.

With respect to probable future prices, dialogue on the subject by Higgs (1977) is pertinent:

"Between 1960 and 1972, the real price of salmon fluctuated from year to year but showed no long-term tendency either upward or downward. In 1973 the real price approximately doubled, though of course the increase varied by species and method of harvest. During 1974 and 1975 the price fell somewhat from the extraordinary levels of 1973 but remained considerably above the levels of 1960-1972. Data on 1976 prices are incomplete, but preliminary indications are that the 1976 price, on average, was slightly above that of 1975. The extremely high price of 1973 arose from extraordinary developments in the market and cannot be regarded as likely to recur frequently in the future. However, it seems clear that the entire period after 1973 has been characterized by higher prices than those of the years 1960-1972. These generally higher prices in recent years apparently result from technical and economic developments that have broadened the markets for salmon, especially fresh salmon, and therefore it would be inappropriate to suppose that the price will return to the level experienced before 1973, at least in the near future."

6.1.2 Sport Fishery Values. The economic value of the ocean sport salmon fishery can be determined from expenditures made in conjunction with the fish expeditions. These traditionally have been computed on a per-day or per-trip basis. The expression of recreational values on a per-fish basis, even in relative terms, should be avoided.

^{1/}The problem of transferring dollars directly from the basic units of evaluation (days or trips) to the fish themselves is seen in the following example:

	<u>Salmon Sport Fishery</u>	
	<u>Year 1</u>	<u>Year 2</u>
"Value - per-day"	\$28.00	\$28.00
Same "N" angler days	N	N
Average catch per-day	.70	1.05
Value per-fish	40.00	26.67
	(\$28.00/0.70)	(\$28.00/1.05)

The above calculations imply the following: value per-fish decreased when catch per-day increased. But then, the drop to \$26.67 per-fish does not mean that in Year 2 a sport-caught salmon was worth less than a salmon caught the year before. The "real" value has remained the same (\$28.00 per-day) for both years.

Expenditures by charter boat customers typically include the price of the charter, the cost of gear and bait, motel accommodations, travel costs, and purchased food. Although 1977 charter fees vary by area and size of boat, the range of prices is typically between \$20.00 and \$30.00 per trip. (Washington charter rates are typically between \$25.00 and \$30.00.) Poles can be rented on the vessel or obtained elsewhere, and \$3.00 is estimated as an average for this expenditure. Fish cleaning might add \$1.00 to the amount paid to the vessel. If round-trip travel is assumed at 150 miles and \$.10 a mile, and a motel room is obtained for \$15.00 per night, another \$30.00 in expenses is added. Thus, an estimate of representative total expenditures per angler trip, not including food, is around \$60.00. Where private boats and gear are used in the ocean fishery, these costs per trip (viewing charter boats as the mass transit of the sports fishery) are probably exceeded substantially (Kramer, Chin and Mayo, Inc., 1976).

Using a selling price of fishing rights, rather than a value of expedition technique, Mathews and Brown (1970) developed an estimate of value per day for the ocean fishery of \$62.84 and a value of \$31.89 per day for the freshwater salmon fishery. Subsequent inflation should be considered in judging the probable values of these rights in 1977.

The combined ocean sport effort for Washington, Oregon and California in 1976 was an estimated 1,067,000 angler trips (Figures 7 through 9). Using \$60.00 as a conservative estimate of the economic value of an angler trip yields an estimated annual value for the fishery of approximately \$64.0 million.

Table 5. Average monthly ex-vessel prices per pound for chinook and coho salmon, Washington commercial troll fishery, 1972-1976 and preliminary 1977.

Year	April	May	June	July	August	September	October
<u>Large red No. 1 grade troll chinook (over 12 lb. dressed)</u>							
1972	.81	.84	.87	.87	.87	.94	.95
1973	.97	1.02	1.07	1.16	1.26	1.33	1.35
1974	1.05	1.05	1.12	1.16	1.18	1.21	1.21
1975	1.06	1.06	1.08	1.09	1.08	1.13	1.25
1976	Closed	1.42	1.52	1.82	1.76	1.81	1.94
1977	Closed	1.63	1.94	2.18	2.19	2.22	2.25
<u>Medium red No. 1 grade troll chinook (8-12 lb. dressed)</u>							
1972	.61	.65	.66	.66	.66	.71	.75
1973	.79	.83	.87	.90	.96	1.32	1.34
1974	.87	.89	.94	.97	.99	1.01	1.05
1975	.89	.90	.91	.98	1.03	1.13	1.27
1976	Closed	1.24	1.31	1.75	1.76	1.76	1.88
1977	Closed	1.33	1.63	1.73	1.76	1.79	1.82
<u>Small red No. 1 grade troll chinook (under 8 lb. dressed)</u>							
1972	.49	.54	.55	.54	.55	.59	.61
1973	.66	.71	.74	.77	.86	1.29	1.34
1974	.67	.69	.74	.77	.78	.81	.85
1975	.68	.70	.74	.81	.99	1.10	1.22
1976	Closed	.97	1.09	1.58	1.61	1.63	1.87
1977	Closed	1.08	1.15	1.34	1.50	1.55	1.76
<u>Troll coho (all grades)</u>							
1972	Closed	Closed	.47	.51	.59	.68	.75
1973	Closed	Closed	.68	.77	.89	1.03	1.11
1974	Closed	Closed	.73	.73	.78	.81	.86
1975	Closed	Closed	.73	.76	.83	.87	1.04
1976	Closed	Closed	1.11	1.26	1.26	1.32	1.46
1977	Closed	Closed	Closed	1.05	1.16	1.22	1.25

Table 6. Washington average ex-vessel commercial net fishery prices per pound for chinook and coho salmon, 1972-1976 and preliminary 1977.

	1972	1973	1974	1975	1976	1977
<u>Chinook salmon</u>						
Columbia River winter season non-treaty nets	.88	1.04	1.09	.90	1.98	2.40
Columbia River spring season non-treaty nets	.55	.77	.89	Closed		1.52
Columbia River early fall season non-treaty nets	.58	1.07	.84	.85	1.52	1.35
Columbia River late fall season non-treaty nets	.54	.92	.61	.83	1.30	1.07
Columbia River spring season treaty Indian nets	.53	.72	.77	Closed		1.51
Columbia River fall season treaty Indian nets	.29	.46	.34	.51	.50	0.71
Willapa Bay non-treaty nets	.66	1.10	.78	.92	1.50	1.83
Grays Harbor non-treaty nets	.75	1.06	.98	1.01	1.49	1.94
Grays Harbor treaty Indian nets	.56	.97	.60	.94	1.29	1.39
Puget Sound non-treaty nets	.69	1.11	.89	.92	1.33	1.60
Puget Sound treaty Indian nets	.60	1.05	1.09	1.08	1.52	1.71
<u>Coho salmon</u>						
Columbia River non-treaty nets	.55	.79	.68	.81	1.11	1.00
Columbia River treaty Indian nets	.38	.65	.41	.84	.90	0.86
Willapa Bay non-treaty nets	.62	.97	.74	.91	1.02	1.03
Grays Harbor non-treaty nets	.62	.85	.57	.80	1.12	1.06
Grays Harbor treaty Indian nets	.61	.95	.56	1.00	.96	0.83
Puget Sound non-treaty nets	.63	1.01	.65	.70	.98	1.09
Puget Sound treaty Indian nets	.56	.98	.59	1.05	.96	1.11

129

6.2 Description of International Trade in Relevant Fishery Products. More detailed information on economic aspects of the salmon fisheries currently is being collected and analyzed for inclusion in the 1979 salmon plan.

6.3 Economic Characteristics of Processing Activities. See Section 6.2.

7.0 DESCRIPTION OF THE BUSINESSES, MARKETS, AND ORGANIZATIONS ASSOCIATED WITH THE FISHERY

7.1 Relationships Among Harvesting, Brokering, and Processing Sectors. See Section 6.2.

7.2 Fishery Cooperatives or Associations

Commercial troll salmon fishermen from the states of Washington, Oregon, and California are represented by the following associations (NOTE: The associations listed are members of the Western Region of the National Federation of Fishermen):

- Washington Trollers Association
- Halibut Producers Cooperative
- Washington Kelpers Association
- All-Coast Fishermen's Marketing Association
- Pacific Coast Federation of Fishermen's Associations
- Ocean Harvesters

Organizations representing charterboat owners and operators are as follows:

- Washington Commercial Passenger Fishing Vessels Association
- Oregon Coast Charter Association
- Golden Gate Sportfishers Association

7.3 Labor Organizations

See Section 6.2

7.4 Foreign Investment

See Section 6.2

8.0 DESCRIPTION OF SOCIAL AND CULTURAL FRAMEWORK OF DOMESTIC FISHERMEN AND THEIR COMMUNITIES

8.1 Ethnicity, Familial Relationships, and Community Organizations

See basic reference documents listed in Appendix I (Miscellaneous). More detailed socio-cultural information is being collected for inclusion in the 1979 salmon plan.

8.2 Age and Education Profiles

See Section 8.1

8.3 Employment Opportunities and Unemployment Rates

8.3.1 Associated Employment of Commercial Ocean Salmon Fishermen: Troll salmon fishermen vary widely in the extent to which they derive income from the salmon fisheries. The 1975 figures from Washington State show 19% of the licenses (22% of the licenses landing salmon) landed 75% of the catch. Individuals landing the majority of troll salmon frequently also land crab and tuna and derive their primary income from fishing. However, a majority of troll salmon fishermen do not earn their primary income from fishing and must depend on associated employment.

8.4 Participation in and Benefits of Recreational Fishing

8.4.1 Development and Current Status of Washington Coastal Sport Fishery

(NOTE: Basic references for Sections 8.4.1 through 8.4.1.4 are Pressey, 1963; Haw, Wendler and Deschamps, 1967; and Phinney and Miller, 1977.)

8.4.1.1 Ilwaco-Columbia River Mouth Areas. The Columbia River mouth (or Ilwaco area) probably was the first ocean access point utilized by Washington recreational anglers to any significant extent. After 1950, this recreational fishery expanded rapidly as fishermen began to go out into the ocean to catch salmon. The earlier estuarine fishery was confined primarily to August and early September, coinciding with entry of fall chinook runs. Expansion into the ocean offered a much longer fishing season.

Recreational boating facilities expanded rapidly to meet the needs of this new local industry. This included construction and enlargement of boat basins along with development of boat launching facilities. In 1954, only 10 guide (or charterboat) licenses were issued for the Columbia River area of Washington. By 1964 this had increased to over 90, and approximately 140 charterboats operated out of this area in 1975.

The Ilwaco catch area includes the Columbia River downstream from Megler-Astoria Bridge and ocean waters south of Leadbetter Point. In recent years, most fishing activity has been in ocean waters. Coho are generally taken a mile or more offshore; however, the fishery may move in closer to the river mouth and on the Columbia River bar as runs enter the river. Chinook intermingle with schools of coho. Many chinook, however, are taken along the beach and in the river during spawning runs. Washington anglers are not permitted to fish within 3 miles of the Oregon coast unless they possess a valid Oregon license.

Statistics on Ilwaco area catch have been collected since 1946. Prior to 1964, when the salmon punch cards were introduced, estimates were based on Washington and Oregon anglers combined. The catch by only Washington anglers is not separable in these early data. Through 1952, estimates are available only from August 24 through the Labor Day weekend. These time periods, however, encompassed the majority of the angling activity during these years.

Since 1965, angling effort out of Washington shore ports has ranged from a low of 115,000 trips in 1969 to a high of 203,000 in 1975. During this period, effort has shown an increasing trend of 6,300 angler trips per year. In 1965 and 1966, charter boat anglers accounted for 33% of the Washington angler trips off the Columbia River mouth. By 1975, this had increased to 51% of the total angler trips. Anglers per boat increased from 5.8 in 1960 to 9.5 in 1975 as the percentage of larger boats in the fleet increased.

Angling aboard private boats exceeded total effort of the charter fleet until the early 1970's. This area remains, however, the largest private boat fishery along the Washington coast. The average number of anglers per private boat trip has remained at 3.3 during the past 15 years.

Early records of this fishery indicate that coho played an insignificant role. The fishery did not extend into the ocean and was conducted primarily from mid-August through Labor Day weekend or prior to the main coho spawning migration. From 1946 to 1953, the estimated coho catch for Washington and Oregon anglers combined averaged only 2,800 coho annually and accounted for only 17% of total salmon caught. By 1954, when the fishery was expanded to ocean waters, coho catch exceeded chinook catch and has continued to do so except for 1960, an extremely poor coho year coastwide. During the period of 1950 through 1975, coho catches have increased at the average annual rate of 14,500 fish annually and most of this increase occurred prior to 1965. Since 1965, there has been no significant trend in the coho harvest off the Columbia River mouth. During this latter era, catches by Washington anglers have ranged from 144,500 fish in 1966 to 302,600 fish in 1971. Average annual catch during this 11-year period was 208,700 coho. In 1975, charter boat anglers harvested 61% of the coho taken in the Ilwaco area.

Chinook catches remained fairly stable until the mid-1950's, ranging from 7,200 fish in 1951 to 23,400 fish in 1946. The landings since 1950 show an average annual increase of approximately 4,400 chinook. Washington landings from 1965 through 1975 ranged from 33,500 chinook in 1969 to a record high of 140,200 in 1975 and catches increased at a rate of nearly 6,200 chinook per year during this period. Charter boat anglers accounted for 66% of the 1975 landings.

Small numbers of pink salmon are taken in Ilwaco waters in odd-numbered years. Since 1963, when estimates were first made, pink landings have ranged from 34 in 1975 to 2,100 in 1967.

Angling effort and catches have historically peaked in this area during the month of August.

Catch per angler trip at Ilwaco has not been less than 1.00 since 1961. There has been no significant change in catch per angler trip for either coho or chinook in the period 1965 through 1975. In 4 of the past 11 years, average catch per angler trip has exceeded 2.00. Ilwaco experiences, on the average, the highest catch per angler trip of any Washington marine fishing area. In 1975, charter anglers landed an average of 0.91 chinook and 1.03 coho per trip compared to 0.48 chinook and 0.66 coho by private boat anglers.

8.4.1.2 Westport-Ocean Shores Area. The sport fishery off the entrance to Grays Harbor started in the late 1920's. Until 1952, this fishery was conducted from private craft probably including local gill net boats. In 1952, eight charter boats booked anglers out of Westport. By 1964, there were over 150 charter boats available for salmon chartering in Westport. With the parallel development of improved harbor, moorage, and launching facilities, the recreational importance of this area expanded rapidly. By 1975, nearly 200 vessels were available for charter to anglers. This increase in number of charter boats has been accompanied by a marked increase in the vessel capacity.

The boats originally used in this industry carried up to six anglers. By 1967, the majority of the boats had angling space for 10 or more fishermen. In 1975, a modern fleet of charter boats had almost completely replaced the older boats. Many of the newer vessels are equipped for overnight offshore trips and will easily accommodate 20 or more anglers on day trips.

While the town of Westport has experienced most of the recreational fishery expansion, Ocean Shores, located on the opposite or north side of Grays Harbor, has developed a charter fleet in the recent years. Since 1963, the number of charter boats operating out of Ocean Shores has increased from one or two to 21 boats in 1970. This stabilized at approximately 14 boats by 1976.

In 1953, the Westport Boat Basin had space for about 200 boats. Expansion of moorage facilities occurred virtually every year. By 1976, according to Port of Grays Harbor officials, there were 632 designated moorages with 672 assigned boats in facilities managed by the Port. Private facilities provided an additional 50 spaces. The Port of Grays Harbor facilities were leased by 428 commercial fishing vessels, 219 charter boats, and 25 private sport boats. An additional 140 moorage spaces were available at Ocean Shores Boat Basin. New boat basin construction at Westport designed for an eventual 2,500 boats has been proposed but is not being actively pursued at this time.

Trailered boats are commonly used in the ocean fishery out of Westport and Ocean Shores. Parking and launching facilities have been improved substantially at Westport. Launching fee collection by the Port of Grays Harbor indicates a minimum of 5,500 launches between Memorial Day weekend and mid-September 1976. This was an increase of about 1,500 private boat launches from a similar period in 1975. Many of these private boats find transient moorage available for overnight stays. A small boat ramp at Ocean Shores Boat Basin handles only a few boats per day.

Recreational angling out of Grays Harbor ports extends primarily from Leadbetter Point on the south to Point Grenville on the north. Boats may range as much as 10-15 miles offshore. Typically, anglers fishing primarily for chinook ply waters north and south of the harbor entrance in depths of 50 ft or less. Schools of chinook are frequently available "on the bar" at Grays Harbor and Willapa Bay. Chinook and, later in the season, coho are found in both Grays Harbor and Willapa Bay inside the harbor entrance.

Coho angling occurs in a broad expanse of ocean water usually several miles or more offshore. Fishing boats, particularly charter vessels, may run 20 miles or more from the harbor entrance to intercept a school of coho. Chinook are frequently intermingled with these schools.

Catch and angling effort statistics have been estimated for the Westport area since 1952. Prior to 1964, estimates were based on catch sampling data and U.S. Coast Guard boat counts. Since then, catch estimates have been based on salmon punch card records. The number of angler trips is computed with use of catch sampling data.

Angling effort peaked in 1975 with an estimated 228,000 trips. Participation increased steadily from 1952 to 1972 at the rate of approximately 9,300 angler trips per year. From 1971 through 1975, angling effort off Grays Harbor stabilized at a level of 202,000 to 228,000 angler trips per year.

Westport rapidly developed into the largest salmon charter fleet on the Pacific Coast. Anglers per charter boat trip increased from less than six in 1952-1953, to nine in 1965-1966, and to 11.2 anglers per trip in 1975. Total angler trips on charter boats increased from 7,500 in 1952 to 78,000 in 1956. From 1957 through 1961, charter angler trips ranged from 66,000 to 85,200 annually. Annual charter angler trips began to increase again in the early 1960's and reached 187,200 in 1975. Charter boat anglers accounted for 85%, 83%, 80%, and 82% of the total angler trips in 1964, 1965, 1966, and 1975, respectively.

Following an early peak of 26,400 angler trips in 1957, effort of private boats dropped to 10,800 trips in 1962. Since then, angling trips aboard private boats increased gradually to 41,100 in 1975. There has been no significant change in number of anglers aboard each private boat trip, ranging from 2.7 anglers per boat in 1964-1966 to 2.9 anglers per boat in 1975.

There is a significant difference between the angling success of private and charter boat anglers. This difference is most pronounced in the coho fishery which typically occurs further from the harbor. The smaller, private boats tend to remain inshore near the harbor entrance where chinook are more abundant. The charter boats, being much larger and more seaworthy, are capable of traveling much further to reach distant schools of salmon.

Coho catches increased steadily from the early 1950's until 1972 at an average rate of approximately 12,000 fish per year. A peak catch of 338,000 coho occurred in 1971 with catches leveling off at approximately 230,000 from 1972 through 1975. The lowest estimated catch, 10,000 coho, occurred in 1963. In 1975, charter anglers landed 93% of the area's coho catch.

The chinook catch similarly has shown a steady rate of increase through 1972, averaging 3,800 fish per year. Harvest ranged from a low of 10,000 fish in 1953 to a high of 123,000 chinook in 1972. Good catches were also experienced in the mid-1950's. Charter boat angling accounted for 90% of the chinook harvest in 1975.

Landings of pink salmon have been estimated for Westport waters since 1955. Small numbers are landed annually; however, most of the fish are taken on odd-numbered years. Odd-number year landings have ranged from 100 pinks in 1959 to 6,200 in 1967. Catch per angler trip has not exceeded 0.03.

Angling effort and catches in the Westport sport fishery typically peak during August, but extend throughout the open season.

Angling success (charter and private boat combined) has ranged from a low of 0.83 salmon per trip in 1960 to a high 2.02 salmon per trip in 1971. There has been no significant trend in overall angler success since 1952. Since 1965, however, catch per angler trip has not been less than 1.0 annually.

A small amount of fishing effort in the Westport-Ocean Shores statistical area occurs out of Tokeland on Willapa Harbor. The Tokeland Boat Basin has launching and mooring facilities for private boats. Charter operations have occasionally been conducted out of this port.

8.4.1.3 LaPush Area. Ocean waters in the LaPush area are accessible to recreational anglers from the town of LaPush at the mouth of the Quillayute River. James Island and river jetties permit easy access for small boats to outer ocean waters without the hazards of dangerous entrance bar conditions.

The recreational fishery out of LaPush began growing in about 1955. Unlike Westport and Ilwaco, however, the charter or party boat industry has shown little growth. Expansion of the fishery has been a result of increased boat rentals and private boat use. The entire recreational fishery complex operating in the ocean area off the Quillayute River is based on the Quillayute Indian Reservation.

Present recreational fishery facilities at LaPush include several small-boat moorage areas and boat rental resorts. Two boat ramps and two sling lifts are available for the private boat operator. A large boat basin in the Quillayute River caters primarily to the commercial troll fleet.

The recreational fishery in the Quillayute area is conducted primarily within 8-10 miles of the river mouth and generally 1/2 mile or more offshore. Unlike ocean waters off Grays Harbor and Columbia River, relatively little fishing occurs along beach areas. As the season progresses, the center of fishing activity moves shoreward.

Salmon catches and angling effort prior to 1963 were estimated from charter boat log books, boat rental and launching information, Coast Guard boat counts, and limited interviews with boathouse operators and anglers. In 1963-1964, angler interviews were conducted 5 days per week and these data were applied to Coast Guard boat counts. Salmon punch data are available since 1964.

Estimates of angling effort in the Quillayute area are not available until 1956. It is likely, however, that angler trips averaged more than 10,000 annually from 1953 through 1955. A decline to 9,000 trips in 1960 followed an early peak of 22,000 trips in 1957. Since 1960, angling effort has shown a gradual increase to a peak of 46,300 trips in 1975. Effort has increased at the average rate of 2,300 trips per year.

Only nine charter boats operated in 1976 with a total passenger capacity of 52 anglers. Up to eight boats chartered out of LaPush in the early 1960's. Anglers aboard charter boats caught approximately 21% of the chinook and 26% of the coho landed at LaPush in 1975, though they accounted for only 13% of the angler trips. As at Westport, angling success (fish per trip) is much higher among charter boat anglers.

During the period 1953-1975, coho landings at LaPush ranged from 2,900 fish in 1960 to 58,300 fish in 1974. A significant increase in catch has occurred since 1953 at the average rate of approximately 1,600 coho per year. The most rapid increase, however, has occurred since 1960. The coho catch trend has increased at the rate of approximately 2,500 fish per year during this latter period.

Chinook catches at LaPush fluctuated between 1,200 and 7,000 fish annually through the early 1960's. Landings began to increase sharply in the mid-1960's to a record high of 18,558 fish in 1975. Since 1964, chinook landings have shown an average increase of about 1,100 fish annually.

The LaPush area provides fair angling for pink salmon on odd-numbered years. Catches since 1957 have ranged from 400 in 1961 to 8,900 pinks in 1967. Good fishing occurred in 1967 when anglers landed an average of 0.28 pinks per trip. Overall, angler success at LaPush ranged from 0.91 to 1.79 salmon per angler trip during 1967-1975. Angler success has shown no significant trend in salmon per trip.

Most angling effort at LaPush occurs from early July through the Labor Day weekend. Less than 10% of the effort occurs during April, May, June, and October combined. In recent years, August has been the peak month of angling activity.

Similarly, August is also the month of highest coho landings. In the past few years, excellent chinook landings have occurred in September, but August is usually the peak month.

8.4.1.4 Neah Bay Area. Like all three other ocean fishing areas in Washington, marine waters off Cape Flattery did not receive intensive angling attention until the 1950's. The development of moorage and boat rental facilities has been sporadic. By 1964, approximately 19 charter boats operated out of the protected port of Neah Bay and most of the angling effort was provided by rental boats. Private boats became increasingly popular in the late 1950's. The ratio of private boat trips to rental boat trips increased from 0.31 in 1950 to 4.19 in 1963 in the marine waters of the Strait of Juan de Fuca. Neah Bay was, and still is, the major ocean fishing port for anglers using rental boats.

In 1975, an estimated eight charter boats operated out of Neah Bay. Most of the angling effort, however, occurred from private boats. Several boat launches and moorages are available for private boats.

Recreational angling out of Neah Bay occurs in both the Pacific Ocean and the outer Strait of Juan de Fuca. Many anglers do not venture out into the ocean, remaining east of Cape Flattery in the Straits. Chinook are taken along the rocky shoreline while coho are generally taken offshore. Other anglers ply ocean waters outside Tatoosh Island. Chinook are taken primarily along the beach and rocky islands between Tatoosh Island and Point of the Arches. Coho are pursued in offshore waters as far south as Point of the Arches.

Estimates of salmon catches in the Neah Bay area are available since 1950. These estimates do not distinguish between catches in the ocean and Strait of Juan de Fuca.

Angling effort in Neah Bay area for the period 1950 through 1975 has shown a significant increase. Average rate of increase through this entire period was 1,800 angler trips per year. For the period of 1965 to present, however, effort appears to have stabilized at an average level of approximately 59,000 angler trips per year. The highest angling effort (64,800 trips) occurred in 1969.

Coho landings also increased during this period at an overall rate of 1,900 fish per year. Again, however, it appears that the catches have stabilized in the past 10 years and that growth of the fishery has stopped. Coho catches in the period ranged from 5,700 coho in 1952 to 64,900 in 1968.

During the early 1950's, Neah Bay experienced excellent chinook fishing but landings dropped from a high of 15,500 in 1951 to a low of 4,100 in 1960. Since then, annual landings have shown a gradual increase to a high of 16,900 chinook in 1974. Chinook landings do not appear to be leveling off as have effort and coho landings. Since 1965, chinook catches have increased at an average rate of 850 fish per year.

Pink salmon have occasionally played a significant role in the Neah Bay sport fishery. Excellent catches were made in 1963 and 1967 when landings were 49,100 and 35,600, respectively. During these 2 years, catch per angler trip was 1.13 and 0.61, respectively. Most pink catches occur on odd-numbered years.

Angling success at Neah Bay has ranged annually from a low of 0.39 salmon per trip in 1960 to a high of 1.92 salmon per trip in 1963. During the mid-1950's, anglers at Neah Bay enjoyed the highest success ratio of any fishing area on the coast. Since 1965, success has averaged 1.2 salmon per trip. In 1975, charter boat anglers averaged 0.35 chinook and 1.20 coho per trip while private and rental boat anglers averaged 0.20 chinook and 0.63 coho.

Those waters in the Neah Bay area east of Koitlah Point are open year-round. Relatively little angling effort occurs, however, outside the April through October period. Peak fishing effort occurs in the month of August with relatively little effort until July. After mid-September, angling activity drops off sharply. Chinook landings are highest during July and August while coho landings generally peak in August.

Most angler access to ocean waters in the Neah Bay area is from Neah Bay itself. This bay lies entirely within the boundaries of the Makah Indian Reservation. Expansion and development of facilities for recreational fishermen are controlled by the Makah Indian Tribe. Limited development potential exists outside the reservation.

Charter boat operations are not as important in the Neah Bay fishery as they are in other ports. A small fleet of charter boats, however, does offer its services to the recreational angler. In 1975, approximately eight charter boats were available. These boats generally carry up to six passengers. There were 27 boats in operation in 1964. In 1975, charter boat anglers accounted for 10% of total angler trips, 17% of the chinook catch, and 18% of the coho catch.

8.4.2. Development and Current Status of Oregon Coastal Sport Fishery. Recreational fishing for salmon off Oregon in the early and mid 1900's was confined to Oregon bays, with few people venturing into the open ocean. Most of the fishing occurred in late August and early September when adult salmon were returning to their streams of origin to spawn.

The first charter boat operation was developed at Depoe Bay in 1936 and consisted of one boat. The fleet grew to 24 boats in 1977. The entire ocean charter boat fleet in 1977 was estimated to be 250 boats by Mr. Don Christenson, Manager, Oregon Coast Charter Association.

The private angler boat fleet off Oregon has grown from few in 1950 to an estimated 16,024 boats in 1975 (Pfister, et al., 1975).

An article in the June 1950 Oregon State Game Commission Bulletin reveals 20,000 angler trips were made out of Winchester Bay in 1949 and indicates only about 2,000 trips in 1946. There were 4 charter boats operating out of Winchester Bay in 1949 and about 60 rental boats were available. No charter boats and only 6 rental boats were present in 1946. In recent years there have been up to 24 charter boats at Winchester Bay and an undetermined number of private boats fishing out of this port. In 1976, the salmon angling trips were estimated at 15,500 for charter boats and 43,200 for private boats, totaling 58,700 recreation days.

Salmon Harbor at Winchester Bay was the first large, well developed facility for recreational fishermen. Development of this port started in 1951. Since that time excellent recreational facilities have also been developed at the nine major ports along the Oregon coast from the Columbia River to Brookings. Additional facilities are being planned at many of these ports.

8.5 Economic Dependence on Commercial and Recreational Fishing and Related Activities

See basic reference documents listed in Appendix I (Social and Cultural).

8.6 Distribution of Income

8.6.1 Oregon-Based Troll Fishery. Some indication of the economic status of the Oregon troll fishery is provided by an examination of salmon landing values from 1971 to 1976.

Year	Average price paid per pound		Value (\$) (X 1,000)
	Chinook	Coho	
1971	.59	.36	3,746
1972	.75	.51	3,457
1973	1.02	.78	7,532
1974	1.05	.76	7,938
1975	1.04	.77	5,806
1976 (prelim.)	1.77	1.26	14,868

These figures range from \$3.5 million worth of salmon in 1972 to \$7.9 million worth of salmon in 1974, and represent value to the fishermen at time of delivery. Preliminary information for 1976 indicates value of the landings may approach 15 million dollars. There were 62 Oregon buyers that bought troll-caught salmon in 1975, and 36 of these buyers purchased over 10,000 lb. of salmon during the season.

[Handwritten scribbles]

Few statistics are available on the income fishermen obtained from salmon trolling, other kinds of fishing, or from jobs outside of the fishing industry. A recent study provides limited information on the economic status of the troll fleet. Lewis (1973) reported that 80% of the troll salmon catch was landed by 31.1% of the fleet in 1971. Only 136 individuals received over \$5,000 gross income from salmon landings that year. However, salmon landings may provide a small, although important, part of the income of large combination-type (salmon/tuna and salmon/crab) vessel owners.

8.6.2 Washington-Based Troll Fishery. Ex-vessel values for the Washington troll fishery during the 6-year period, 1971-1976, were as follows:

Year	Total pounds round weight (X 1,000)	Value (\$) (X 1,000)	Days fished (X 1,000)	Catch/day (pounds)	Value/day (\$)
1971	11,029	4,154	68	163	61
1972	6,505	3,673	54	121	68
1973	8,438	6,719	51	165	131
1974	10,799	8,070	58	185	138
1975	8,817	6,590	54	165	123
1976	11,553	13,835	63	185	221

Comparable statistics for the entire Canadian troll salmon fishery during the 6-year period, 1971-1976, were as follows (Canada Department of Fisheries and Environment, 1977):

Year	Total pounds round weight (X 1,000)	Value (\$) Canadian (X 1,000)	Days fished (X 1,000)	Catch/day (pounds)	Value/day (\$)
1971	47,301	18,489	156	303	119
1972	33,391	17,409	141	237	123
1973	36,084	27,893	132	273	211
1974	37,574	27,007	126	298	214
1975	26,987	19,965	121	223	165
1976	32,607	39,405	134	243	294

In Washington, a detailed array of statistical analyses has been prepared in the course of considering a limited-entry program, and these provide insight into structure and gross economic returns for the Washington troll fleet. For example, an average of 3,366 boats per year was licensed for commercial salmon trolling during the 4-year period, 1972-1975, but an average of 267 boats (or only 8% of the fleet) landed 50% of the catch. During the same 4-year period, an average of 589 boats (17% of the fleet) accounted for 75% of the troll salmon landings (Washington Department of Fisheries, 1976c).

9.0 DETERMINATION OF OPTIMUM YIELD

9.1 Specific Management Objectives

Regulatory controls should satisfy the following basic objectives:

1. Maintain optimum spawning stock escapements. (Severe passage problems at mainstem Columbia River dams in conjunction with some ocean harvests are resulting in inadequate spawning escapements of Snake River spring and summer chinook salmon. Certain Puget Sound and coastal Washington stocks are also severely depressed in spite of extensive closures applied to "inside" fisheries.)
2. Reduce fishery-caused mortalities other than those fish landed.
3. Move toward fulfilling Indian treaty obligations. (Current Federal court judicial interpretations have ordered the States of Oregon and Washington to provide treaty Indians with an opportunity to take 50% of the total U.S. harvest allowed on stocks of fish destined for treaty Indian usual and accustomed fishing areas.)
4. Provide all ocean and "inside" fisheries the continuing opportunity to harvest salmon.
5. Plan management on the premise that yield of the salmon fishery includes food production, dollar value, recreational value, and certain sociological or cultural values and that all of these values must be considered in the regulation and management of the fisheries.
6. For the commercial fishery, maximize poundage yield by minimizing the taking in that fishery of chinook and coho salmon having significant remaining growth potential; however, recognize that desired yield to commercial fisheries requires not only a consideration of pounds produced, but also quality of the product as indicated by consumer demand and prices.
7. In the recreational fishery, where desired yield includes not only the anticipation of acquiring a high-value, personal-use food item, but also significantly reflects the recreational value of the fishing experience, recognize that optimum value does not necessarily require harvesting only mature fish.
8. Achieve, for the long term, coordination with Canada and the North Pacific Fishery Management Council in the development of coastwide salmon management plans.

9.1.1 Ocean Management Areas. A comparison of all chinook and coho stocks found off the coasts of Washington, Oregon, and California with major domestic fisheries shows the following:

Salmon stock origin	Major domestic fisheries				Total
	Commercial troll	Sport	Commercial nets	Treaty Indian	
California chinook	X	X			2
California coho	X	X			2
Oregon coastal chinook	X	X			2
Oregon coastal coho	X	X			2
Lower Col. R. spring chinook	X	X	X		3
Lower Col. R. fall chinook	X	X	X		3
Lower Col. R. coho	X	X	X		3
Puget Sound chinook	X	X	X	X	4
Southern Canadian chinook	X	X	X	X	4
Wash. coastal chinook	X	X	X	X	4
Upper Col. R. spring chinook	X	X	X	X	4
Upper Col. R. summer chinook	X	X	X	X	4
Upper Col. R. fall chinook	X	X	X	X	4
Puget Sound coho	X	X	X	X	4
Southern Canadian coho	X	X	X	X	4
Washington coastal coho	X	X	X	X	4
Upper Col. R. coho	X	X	X	X	4

NOTE: Some of the first seven stocks listed above may be intercepted while passing through usual and accustomed marine fishing areas of treaty Indians.

It will not be possible for equal ocean harvest rates to be applied to all the salmon stocks listed above without overfishing some, underfishing others, and/or eliminating several viable "inside" non-Indian fisheries currently managed by the States. There are no "perfect" geographical points for separating stocks supporting only major ocean fisheries (e.g., California chinook) from those also supporting a major commercial net fishery or significant inside recreational fisheries (e.g., Snake River system spring chinook). Likewise, there is no ideal separation point in the ocean for dividing stocks which are not required to support a treaty Indian fishery (e.g., lower Columbia River fall chinook) from those that are required to sustain Indian fishermen (e.g., upper Columbia River fall chinook). The two best areas for any alternatives which might be designed to achieve some degree of differential ocean fishing rates are probably the northern Oregon coast for chinook regulation changes and the southern Washington coast in the case of coho fishery considerations. Present ocean fishing rates are justified for some salmon stocks originating in southern Oregon and California. (NOTE: Available Oregon Department of Fish and Wildlife technical data on tagged and marked fish indicate a predominance of Columbia River origin chinook in fisheries off the Columbia River mouth with a marked shift to Oregon coastal and California chinook stocks in ocean fisheries off the Newport area. The best point for chinook stock separation must be between these two regions.)

The case for relatively high ocean fishing rates on California and Oregon coastal chinook and coho salmon stocks is certainly excellent since a large-scale reduction in ocean fishing off Oregon and California would produce an over-escapement in several major salmon runs due to an absence of major terminal fisheries capable of exerting the fishing rates required. (NOTE: Over-escapement as used here could mean either excessive returns to hatcheries or to natural spawning areas. These fish, which are

unneded for reproduction are therefore "wasted" instead of being harvested. For coho, excessive natural spawning will normally be manifested as juvenile production exceeding the rearing capacity of the freshwater environment. In the case of chinook, it appears that excessive escapement can even result in lowered production.)

In the case of Washington and Columbia River salmon runs, however, major stocks can be harvested by existing commercial, sport, and Indian fisheries operating in internal state waters. Specifically, these are commercial purse seine, gill net, and reef net fisheries in Puget Sound; gill net fisheries in Grays Harbor, Willapa Bay and the Columbia River below Bonneville Dam; freshwater recreational fisheries in rivers throughout the area; a marine sport fishery within Puget Sound; treaty Indian fisheries in all Washington waters from Grays Harbor northward; and treaty Indian fisheries above Bonneville Dam in the Columbia River system.

The treaty Indian catch has increased considerably in recent years but still has not reached the level of their treaty entitlement (as stated in U.S. v. Washington) in all areas. To date, the burden of regulatory constraints needed to secure the Indian treaty rights under recent Federal court decisions has fallen almost entirely on non-treaty commercial net fishermen in internal state waters. Continuation of the past division of non-treaty catch would require severe curtailment or elimination of the following non-treaty fisheries: the August gill net fishery in the lower Columbia River for upper Columbia River fall chinook, the Grays Harbor gill net fishery for chinook and coho, and the Puget Sound purse seine and gill net fisheries for Puget Sound-origin chinook and coho. Further, other non-treaty net fisheries such as those on chum salmon (which are not caught in the ocean) might have to be severely curtailed or eliminated in the future as "equitable adjustments" for heavy non-treaty ocean troll and sport harvest of chinook and coho. The Federal courts have approved the concept of such adjustments to compensate the Indians for loss of opportunity on other runs.

9.1.2 Control of Troll "Shaker Catches". A primary consideration for commercial troll fishery management is the inadvertent hooking of "shakers". This is a term commonly applied to any salmon which a troller is required to release because it is less than a minimum size limit or is taken incidentally during a closed season for a particular species.

Numbers of shakers caught and released have been established for the Washington fishery by Washington Department of Fisheries (1969) and Wright (1972b). Various projections for most other major Pacific coastal troll fishing areas have been documented by O'Brien, Taylor and Jensen (1972), Pacific Marine Fisheries Commission (1968), and Pitre (1970).

The specific problem with shakers is the associated mortalities inherent in the process of being hooked, then dragged for varying periods of time before being brought to the surface, possibly measured onboard a troller, and finally being released. The various aspects of hooking mortality are discussed in detail by Wright (1972a), and a large number of good references on the subject are available (Table 7). Additional research work has demonstrated that shaker catches can be markedly reduced through use of specific terminal gear such as large plugs and that use of barbless hooks can significantly reduce hooking mortality rates for coho (Boydston, 1972; Butler and Loeffel, 1972; Milne, 1955; Reed, 1972; and Wright, 1969a). At a minimum, prior to the coho troll season opening, trollers should be required to use barbless single hooks on all terminal gear. Barbless hooks will improve the survival rate of "shaker" coho salmon taken incidentally yet still take chinook as efficiently as barbed hooks.

12

Table 7. Summary of experimental work on hooking mortality for Pacific salmon in the commercial troll fishery (Wright, 1972a).

Percent mortality	Number fish in sample	Species	Type mortality determination	Reference
1.9	794	Coho	Immediate only, no holding period	Van Hyning (1951)
2.5	393	Chinook	Immediate only, no holding period	Van Hyning (1951)
3.3	389	Chinook	Immediate only, no holding period	Author
4.0	2,417	Chinook	Immediate only, brief holding period	Hollett (personal communication)
4.9	572	Chinook	Immediate only, no holding period	Jensen (1969)
6.4	918	Chinook	Immediate only, barbless hooks	Reed (personal communication)
7.0	158	Coho	Immediate only, no holding period	Jensen (1969)
7.9	901	Chinook	Immediate only, barbed hooks	Reed (personal communication)
8.2	962	Coho	Immediate only, barbless hooks	Reed (personal communication)
9.0	841	Chinook	Immediate only, barbless hooks	Bergman (1960)
9.0	2,258	Coho	Based on condition, brief holding period	Author
9.7	537	Coho	Immediate only, brief holding period	Hollett (personal communication)
12.0	2,107	Chinook	Based on condition, brief holding period	Author
12.4	983	Coho	Immediate only, barbed hooks	Reed (personal communication)
13.0	75	Chinook	Immediate including seriously injured	Loeffel (1961)
13.0	64	Coho	Immediate only, brief holding period	Heyamoto (1963)
13.0	16,796-27,078	Pink	Immediate including seriously injured & delayed	Hollett (personal communication)
16.0	32	Chinook	Immediate and delayed	Loeffel and Van Hyning (1962)
16.0	664-910	Coho	Immediate & delayed	Author
17.6	289	Coho	Immediate & delayed	Milne and Ball (1958)
20.0	91	Chinook	Immediate & delayed	Milne and Ball (1958)
20.8	461	Chinook	Immediate including seriously injured	Parker and Kirkness (1956)
22.0	18	Coho	Immediate and delayed	Loeffel and Van Hyning (1962)
23.0	22	Chinook	Immediate, only brief holding period	Heyamoto (1963)
25.7	564	Chinook	Immediate including seriously injured	Hollett (personal communication)
28.5	1,286-754	Coho	Immediate and delayed	Loeffel and Van Hyning (1962)
30.0	-	Chinook	Estimate based on physical damage to sublegals	Van Hyning and Naab (1967)
31.0	147	Chinook	Immediate including seriously injured	Loeffel (1961)
36.0	2,777-1,283	Coho	Immediate including seriously injured & delayed	Hollett (personal communication)
38.0	88	Coho	Delayed, extended tank holding period	Fry (personal communication)
38.0	2,777-2,633	Coho	Immediate including seriously injured & delayed	Hollett (personal communication)
42.0	67-55	Coho	Immediate & delayed	Milne and Ball (1958)
44.0	115	Coho	Delayed, extended tank holding period	Parker, Black and Larkin (1959)
44.0	96	Chinook	Delayed, extended tank holding period	Fry (personal communication)
71.0	66	Chinook	Delayed, extended tank holding period	Parker and Black (1959)

In the Washington fishery, primary management emphasis has been directed toward numbers of shaker salmon caught per legal fish retained. By area and time period, 1970-1971 study results can be summarized as follows in terms of shakers per legal fish:

Area	Chinook-only season			All-species season				
	April	May	June 1-14	June 15-30	July	Aug.	Sept.	Oct.
North of Point Grenville	6.6	1.5	2.3	0.1	0.2	0.3	0.6	6.5
Grays Harbor Area	0.5	0.8	1.4	0.2	0.3	0.2	0.3	0.2
Columbia River	0.7	1.5	1.8	0.1	0.2	0.2	0.3	1.2

The zone enclosed by a dotted line includes those areas and time periods where catches of less than one-half shaker per legal fish could normally be expected. All salmon fisheries have fishing-related losses (e.g., sport hooking mortality, gill net drop-outs, etc.), but some limit such as this must be set on what can be condoned in fishery management as an "allowable" fishing-related loss. At the 0.5 level and a hooking mortality rate of 20%, one shaker salmon would be killed for each 10 legal fish retained. This factor will be a key consideration in subsequent sections dealing with minimum size limits, fishing seasons, and incidental catch allowances.

9.2 Alternative Management Measures Available

Alternatives presented in this section are not generally intended to be area specific (unless noted otherwise) and should be considered for implementation off the coasts of Washington, Oregon, and California. This does not mean, however, that their respective merits are equal in all areas or that application to only a selected portion of the three state zones would be inappropriate. Each alternative should be considered somewhat independently but, due to varying degrees of interaction between alternatives, a specific impact analysis of each alone is not realistic.

It should also be emphasized that, off Oregon and California, salmon stocks are harvested almost entirely by commercial and recreational fisheries in the ocean. Except for Indian fisheries on the Klamath-Trinity River system in California, there are no existing "inside" commercial salmon net fisheries south of the Columbia River. Thus, management options for taking any desired quantities of harvestable salmon escaping the ocean fisheries are quite limited. Further, for practical purposes, Oregon coastal and California salmon stocks are not involved in meeting court allocation requirements. Present ocean fishing rates are justified for some salmon stocks originating south of the Columbia River. However, an assessment of appropriate harvest levels with respect to the importance and condition of wild salmon stocks and potential optimum yield of all salmon stocks originating south of the Columbia River needs further clarification.

9.2.1 Troll Chinook Minimum Size Limit (Table 8). The only minimum size limit of a controversial nature at present is the 26-inch standard imposed on chinook. Basis for the regulation is obscure, being generally explained as follows (Research Staffs, California, Oregon, and Washington, 1948):

Table 8. A chronological review of past salmon size limit changes through 1965 in Washington commercial fisheries (Jewell, Haw and DiDonato, 1965).

-
- 1915: Size of salmon set at 15 inches, all species.
- 1921: 18 inches, all species.
- 1922: 18 inches, all species, except during August and September of odd-numbered years when limit was set at 15 inches.
- 1940: 26 inches, chinook, except that chinook between 18 and 26 inches may be possessed for canning only. All other size limits as set in 1922.
- 1947: 26 inches, chinook, 18 inches all other species except 15 inches for pink salmon, August and September. Chinook 18-26 inches may be used for canning. Jack salmon of any size taken from Columbia River by lawful gear may be retained for commercial purposes.
- 1948: (January) - 27 inches, chinook. All other species same as in 1947.
- 1948: (May) - 27 inches, chinook south of 48°20'; 26 inches, chinook north of 48°20'; 22 inches coho. All other species same as in 1947.
- 1949: 26 inches, chinook, all waters. All other species same as in 1947.
- 1950: No change in minimum size limits from 1949 except: legal to possess under-sized salmon by Puget Sound net gear, not to exceed 5% by numbers of total catch, to be used for canning only.
- 1952: Removed minimum size limit on sockeye salmon.
- 1955: Removed minimum size limit on chum salmon; 26 inches, chinook; 22 inches, coho; 16 inches, pink. Except: mature jack salmon 15 to 26 inches, caught by gill net gear in Columbia River may be kept.
-

"For the present, a 27-inch minimum size (7-lb. dressed) limit has been adopted (in Oregon and Washington) in order to give the smaller fish a chance to grow before they are taken to market. California's troll regulations (25 inches), although different somewhat from those of Washington and Oregon, accomplish practically the same end."

Since the Pacific Marine Fisheries Commission subsequently recommended a 26-inch total length limit, its basis appears to be simply a compromise between the 27-inch standard of Washington and Oregon and the 25-inch limit of California. In all documents, the size limit considerations appeared to be based totally on marketing or economic considerations, not the basic growth and maturity characteristics of the species. Since the current market for small salmon is considerably better, the only remaining justification for the 26-inch limit is simply its long tenure.

Milne and Godfrey (1964) document the transition of the 26-inch limit to uniform coastwide status:

"Following the International Conference on the Coordination of Fishery Regulations between the United States and Canada in 1957, a closed season of November 1-April 14, and a minimum size limit of 26 inches in total length, was adopted for chinook salmon caught in waters outside the new offshore net fishing line."

A 28-inch size limit for chinook salmon was formally proposed as early as 1951 when the research staff of the Pacific Marine Fisheries Commission recommended to that body that "...revisions designed to further restrict the taking of immature salmon consisted of....(2) an increase in the minimum size limit for troll-caught chinook (king) salmon from 26 inches to 28 inches total length" (PMFC, 1951). Properly designed research studies to test the merits of this proposal failed to materialize in spite of further considerations of this change at both the 1952 and 1953 Pacific Marine Fisheries Commission's annual meetings (PMFC, 1952 and 1953).

In 1970 and 1971, the Washington Department of Fisheries conducted comprehensive studies on the age, growth, and maturity characteristics of ocean chinook populations. Results from these studies (Wright, Kolb and Brix, 1972; Wright and Bernhardt, 1972), as well as earlier work (Bernhardt, 1971), fully supported the 28-inch minimum, and it was subsequently proposed at a public regulation hearing. Commercial trollers opposed this change and it was not adopted at that time by the Department of Fisheries. Independent, but concurrent, studies of these same factors by the Fisheries Service of Canada produced solid factual support for the 28-inch chinook limit in its own offshore troll fishery.

Bourque and Pitre (1972b) keynote the aspects of the problem as well as its solution in the following sections for their report:

In discussing chinook fishery management implications, they report:

"However, any undersized fish which must be released from troll gear is subjected to possible mortality due to rough handling. This added mortality decreases the number of fish available to the fishery as 3 and 4 year olds. Handling mortality varies with fishermen and no accurate estimates of this loss to

the fishery are available. However, if this mortality does not exceed 50%, the increased price per pound of larger fish, and the rapid growth rate of chinook, more than compensate for handling mortality when undersized chinook are released."

Conclusions are:

"Only age 3 mature and immature chinook can be differentiated on the basis of length, and these fish form the largest part of the commercial troll catch off the lower west coast of Vancouver Island. Since most age 4 chinook are mature and larger than age 3 matures, and most age 2 chinook are immature and smaller than age 3 immatures, the size limit used by the troll fishery should be one that best divides immature from mature age 3 chinook.

"On the basis of data presented in this report, a minimum size limit of 66 cm fork length would increase the yield of mature chinook salmon above the present yield based on a minimum size limit of 61.5 cm fork length."

Their final recommendation is:

"Increasing the present size limit to 66 cm will realize greater yields from available stocks in the lower west coast area and should be implemented immediately." (NOTE: 66 cm is equivalent to 28 inches total length.)

The basic rationale for a 28-inch minimum size limit is as follows:

Three categories of fish comprised over 90% of the commercial fishery landings under past regulations (i.e., pre-1977)(Table 9). Their comparative size and growth in pounds round weight are as follows:

Month	Chinook Salmon Average Round Weight		
	Immature 3-year-old fall-run fish	Mature 3-year-old fall-run fish	Mature 4-year-old fall-run fish
April	5.1	7.7	14.1
May	6.1	9.2	15.9
June	7.1	10.7	17.8
July	8.1	12.3	19.6
August	9.1	13.8	21.5

From these basic facts, it appears that the first group (immature 3's) should not be harvested commercially. Most of these fish became the "smalls" (less than 8 lb. dressed weight) of past troll fishery landings but their retention could be substantially reduced by application of a 28-inch total length minimum size restriction. This change would also virtually eliminate any retention of immature spring- and summer-run chinook in their third year.

9.2.2 Troll Coho Minimum Size Limit. Since the 1965 review (Table 8), three minimum size limit changes were made for troll-caught coho. The first was on reduction from 22 to 20 inches total length in 1969; the second, in 1971, a removal of the size limit until August 1 and a 16-inch minimum thereafter; and the third, in 1976, a 16-inch minimum throughout the season.

157

Table 9. Percent age composition of Washington commercial troll chinook salmon fishery, 1950 through 1975.

Age group	Percent composition/reported period			
	1950-1955 ^{1/}	1956-1962 ^{2/}	1963-1969 ^{3/}	1970-1975 ^{4/}
		<u>Fall run-type chinook</u>		
2 ₁		1.2	0.9	1.7
3 ₁	43.3	55.3	61.8	69.2
4 ₁	35.4	31.7	19.6	23.3
5 ₁	4.2	2.7	2.0	1.7
Total	82.9	90.9	84.3	95.9
		<u>Spring run-type chinook</u>		
3 ₂	2.4	2.1	2.7	0.8
4 ₂	10.6	5.4	9.9	2.6
5 ₂	4.0	1.4	2.7	0.5
Total	17.0	8.9	15.3	3.9

^{1/} Source: Heyamoto and Wright (1970).

^{2/} Source: DiDonato (1970).

^{3/} Source: Wright, Kolb, and Brix (1972).

^{4/} Source: Miller (1977).

(NOTE: Small percentages of sub-3 and 6-year-old fish not included.)

The attainment of this logical end-point (e.g., elimination of a size limit cutting across the same age-maturity class) resulted from the following conclusions drawn by Wright (1970b).

"From a fishery management standpoint, data on sublegal fish emphasize the absurd nature of a 22-inch total length minimum size limit, the standard for the entire 19-year period of study. The differential protection afforded to many adults merely because they were slightly smaller than their counterparts and to substantial numbers of maturing 2-year-old males surely constituted some waste of a natural resource in addition to providing some interesting speculations on possible long-term genetic implications."

"It appears that a minimum size limit of approximately 16 inches total length would constitute the biological optimum solution, in that it would allow retention and subsequent marketing of virtually all small adult coho and many of the large maturing 2-year-old males, while affording protection to 2-year-old immature coho."

The 22-inch minimum size limit for troll coho in California was set in order that the commercial size limit would not be less than the prevailing sport fishery size limit.

9.2.3 Selective Troll Fishing Gear. A number of research efforts has dealt with selectivity and relative efficiency of various types of fishing gear utilized by salmon trollers. In Canada, Milne (1955) found that large trolling plugs were effective in avoiding small chinook and all sizes of coho salmon. For relative efficiency, he found that large plugs caught 75% as many chinook over 26 inches total length as large spoons, the most efficient gear tested for this size category of fish. Pitre (1970) also found that large plugs took substantially fewer coho and small chinook off the west coast of Vancouver Island. He found, in 1968 and 1969, that large plugs caught 63% and 67%, respectively, as many chinook over 26 inches total length as brass spoons, his most efficient lure for this size of chinook.

Gear selectivity studies off the Washington coast in 1948 and 1955 (Reed, 1972) produced data on selectivity of large plugs which were generally comparable to results from Canadian research. A more recent study off the California coast (Boydston, 1972) also showed consistency by demonstrating that large trolling plugs took only about 15% as many "shakers" as other gears tested but were only about 50% as efficient in taking large chinook salmon.

In 1968, a committee of biologists recommended to the Pacific Marine Fisheries Commission that no trolling lures except large plugs should be permitted for commercial troll fishing from April 15 to June 14 (PMFC, 1968). Currently, it continues to be widely accepted that selective use of large trolling plugs would greatly reduce numbers of unwanted coho and small chinook salmon which are inadvertently hooked prior to the troll coho season. Another question remains unresolved, however, and that is whether or not the plug's lower catch rate per unit effort on large chinook could be justified. Boydston (1972), for example, concludes that "compared to other trolling lures, plugs were found to take a smaller proportion of illegal salmon, but were too inefficient in the taking of legal salmon to suggest the drafting of any realistic 'plugs only' regulation".

In contrast, other studies have shown plugs taking a higher poundage. Parker (1949) states:

"Of a total of 243 chinook taken between the dates of May 23 to June 29, 94 were taken on plugs and 146 on spoons. Of the 97 taken on plugs, 91 or 94 percent were salable fish; of the 146 taken on spoons 76 or 52 percent were salable. In terms of what this means to a fisherman, the plugs produced approximately 1,310 pounds of fish compared to 806 pounds taken by spoon gear, and the fisherman was not troubled with removing small fish from the lines."

9.2.4 Troll Chinook Fishing Season. The evolution of seasonal closures in Washington's troll fishery was documented in detail by DiDonato (1965a). Excerpts from his report show:

"The Washington offshore troll fishery operated without seasonal restrictions through 1948. The stimulus for the initial winter-troll closure came about primarily as a result of pressure from Columbia River gill net interests....In addition to the pressure from gill net interests, some biologists believed a curtailment of the year-round offshore troll fishery was in orderAs a result, the first seasonal restrictions on offshore trolling (i.e., a November 1 through March 14 closure) occurred on November 1, 1949....The effect of this closure on pounds of troll chinook landed in Washington was minimal. An average of only 1.33% of the total troll-caught chinook catch occurred during January 1 through March 14 and 0.22% during November 1 through December 31...."

"After enactment of the November 1 through March 14 troll closure, chinook catches began to increase in the area off Grays and Willapa Harbors in March and April of each year...."

"Concurrent with the increasing troll chinook catch, a decline in Columbia River fall chinook counts over Bonneville Dam along with decreasing river gill net landings prompted concern over the status of these stocks. After investigation of a number of potential factors causing the decline, it was decided that the offshore troll fishery would have to be further restricted...."

"Although some of the assumptions to the data were questioned.... Restrictive action, however, was again taken by Washington and Oregon, and the 1956 troll season began on April 15."

In his section on results, DiDonato (1965a) states:

"The added March 15 to April 15 closure has reduced the spring troll catches off Grays Harbor. The peak landings are now distributed between May and August. With the additional 30-day closure, early season troll chinook catches in the Columbia River district are reduced to levels prior to 1950. Landings at Neah Bay, Port Angeles, and Seattle in the Puget Sound district have not been affected to any extent."

Examination of recent catch and escapement data, coupled with an updated analysis of a chinook tagging experiment conducted in the spring months of 1959-60 off southern Washington (Bergman and Loeffel, 1972), indicates that presently the condition of Columbia River fall chinook runs is no longer the basic issue. Thus, the initial reason given for the early season troll closure imposed on the fishery in 1956 cannot be supported. A delay in the chinook fishing season to allow for their additional rapid growth in the ocean was never seriously considered for the commercial troll fishery from early in the century (Smith [1920a and 1920b]) until the mid-1970's.

Due to the growth factor described previously, the strongest case for a commercial fishery in the ocean can now be made for a fishery set within the general framework of a 2-1/2-month season. A substantial catch of 3- to 5-year-old fish should be allowed, but at a time when they approach a reasonable percentage of their maximum size. The earlier in the year their capture occurs in the ocean, the more potential yields from the overall resource are sacrificed. These fish should be harvested commercially mainly during the period from July through mid-September. After this period, most mature chinook have emigrated from ocean waters and all sizes of fish remaining to be caught run heavily to immatures. Historically, spring- and summer-run chinook stocks comprised a much greater proportion of the troll catch, and this provided some logical basis for a longer ocean troll season. By the early 1970's, however, fish with the "sub-2" scale type indicative of the 1 year of freshwater rearing (typical to these spring and summer stocks) had declined to less than 5% of the Washington and Columbia River mouth ocean catch on an annual basis (Table 9).

There would be serious problems associated with immediate adoption of the short troll season described above. Basically, large fishing, processing, and support industries have developed for several generations under much more liberal regulatory controls. In addition, many of the potential resource "savings" which might be achieved through unilateral adoption of more restrictive ocean fishing controls for U.S. domestic fisheries would be transferred to Canadian salmon fishermen. Obviously, there is some justification for not making any ocean fishery changes unless Canada does something of a similar nature. A further complication would be shifts in early season U.S. trolling effort to ocean waters off Alaska with a resultant greater impact on salmon stocks and fishermen in that area. Many of the Oregon coastal and California chinook stocks could be under-harvested and excessive wasteful spawning escapements could easily result. A more liberal early troll season for the Oregon and California waters inhabited by these stocks could, however, create the same problems predicted for Alaska. Finally, a major reduction in only the troll fishery would result in a transfer of salmon to the ocean recreational fishery if it continued unchecked by new regulatory constraints.

An additional alternative needs consideration, at least in the context of short-range fishery management goals:

A troll chinook fishery of limited duration could be scheduled prior to July 1, particularly off Oregon and California. This should occur no earlier than May 1 off Washington and the Columbia River mouth in order to protect maturing upper Columbia River spring chinook present in the ocean until about May 1.

Continued early season commercial ocean fishing for chinook salmon is not, however, in the best long-term interest of the salmon resources. The chinook poundage yields which are sacrificed, plus hooking mortality losses on small chinook and coho, cannot be continually supported as sound resource management.

In its strictest interpretation, "conservation" obviously applies to early season restrictions since additional protection would be afforded several depressed upper Columbia River and Washington coastal spring and summer chinook runs. Reductions in commercial troll fishing times and the increased chinook size limit would be fully justified on this basis alone. In the "wise use" connotation or broader meaning of conservation, more restrictive regulations can be further justified since they would increase poundage yields from existing harvestable salmon resources.

(NOTE: In any considerations of open ocean, mixed-stock salmon fishing, the rate of exploitation for important natural stocks should be considered as a basis for setting maximum fishing rate allowances. These rates are now very high for artificially-produced fish, particularly the Kalama River stock which is most comparable to natural fall chinook runs in terms of age, size, and maturity characteristics [Table 10].)

Table 10. Ocean fishing rates on populations (catch plus escapement) of Pacific coastal fall run chinook salmon stocks, 1961-1964 brood years (determined from experimental groups of fin-marked fish)^{1/}.

Brood Years	Years in Fisheries	Deschutes (Puget Sound) ^{2/}	Kalama River	Spring Cr.	Lower Col. R.
1961	1963-1966	0.35	0.67	0.62	0.61
1962	1964-1967	0.61 ^{3/}	0.79	0.55	0.66
1963	1965-1968		0.82	0.68	0.71
1964	1966-1969		0.84	0.73	0.75

^{1/} Sources: Bernhardt and Kolb, 1970; Worland, Wahle and Zimmer, 1969; Wright and Bernhardt, 1969; Wright, Bernhardt and Kolb, 1969.

^{2/} Includes Puget Sound marine sport fishery catches.

^{3/} No escapement data for 5-year-old fish.

River commercial fisheries are prohibited by legislative statute on Oregon coastal streams. However, Oregon recently provided a late-season troll fishery off the mouths of two south coast streams. The extension was granted to allow the additional harvest of surplus fall chinook returning to the streams. The areas involved 3 miles around the mouths of these streams, and salmon catches were almost entirely mature fish from those streams.

9.2.5 Troll Coho Fishing Season. Rationale of any coho troll season is simply the coho's rapid growth during the summer of their final year and the advantage gained by delaying capture until a larger size is attained (Smith, 1920a and 1920b). No definite season appeared to exist in Washington prior to 1948 since catch statistics show landings of 151,927 and 112,784 lb. for May and November, respectively (Ward, Robison and Nye, 1977). For May 1948, only 276 lb. are shown, indicating imposition of a closure. In 1948, the Washington season is listed as from July 1 to November 15 (Research Staffs, California, Oregon, and Washington, 1948), but a footnote states:

"That it be the consensus that July 1 would be the proper opening date for the troll fishery for silver salmon, and that date be put in effect as soon as all parties are able to do so."

This basic recommendation was supported at the 1951 and 1952 annual PMFC meetings (PMFC, 1951 and 1952) as well as at its 1954 session (PMFC, 1954). By this time, the report stated, "This recommendation has been adopted by California to become effective upon its adoption by Oregon and Washington where it is under consideration at present." Unfortunately, Oregon and Washington were unable to reach a consensus and the opportunity for a constructive regulatory change was lost. California repealed its own legislative statute in the early 1970's and proceeded to enact a May 15 coho season which may be adversely impacting Washington and Oregon coho stocks.

In terms of justification for an ocean commercial fishery, coho salmon present a growth issue similar to chinook. Off Washington, Oregon, and California, the ocean catch is predominantly 3-year-old maturing fish. It does not make much sense to begin imposing a heavy commercial fishery on this species during June (or earlier) when they still have considerable growth potential (e.g., have attained only 50-60% of their ultimate size)(Figure 12).

By mid-September, many of the coho have emigrated from ocean waters. This is particularly true for stocks of hatchery origin which can generally withstand a much higher overall fishing rate than native fish. In addition, many of the 2-year-old immature coho present in the ocean have grown to a large enough size to be hooked on normal troll gear, and the desirability of a commercial fishery at this time is further diminished. Historically, many trollers off the Washington coast concentrated on chinook salmon until mid- or late July, and the problem of taking large quantities of half-grown coho was not manifested. As chinook abundance declined and coho hatchery production increased in the early 1960's, troll effort gradually shifted to coho in June and early July (Tables 11 and 12; Figures 13 and 14). A July troll opening for both species should reverse this process to some extent since initial July chinook abundance in the ocean would substantially exceed that which prevailed under the past April 15 season openings.

The following additional alternatives also merit consideration:

1. A June 15 season opening for the Oregon coast would continue the "status quo" in terms of past fishing rates and regulations but would continue the harvest of fish with a high remaining growth potential.
2. Subsequent to mid-September, a limited commercial troll fishery could be provided off the southern Washington coast, Columbia River mouth, and Oregon coast. In this area, the late season problem with "shakers" is not nearly as serious as commonly encountered in northern Washington waters. Further, substantial numbers of harvestable late-run Columbia River hatchery coho are still available off southern Washington subsequent to mid-September. The open area should be no further north than Point Grenville, however, to achieve some degree of protection for naturally spawning Washington coastal stocks.
3. The mid-May troll coho season opening for California could be continued to maintain the status quo situation prevailing since 1973. This commercial fishery begins when the population has attained an average size of about

Table 11. Percent of Washington commercial troll coho salmon round weight pound-
age landed by month, 1948-1975.

Year	Percent of yearly landings (round weight)/month						
	June	July	August	September	October	June-July combined	August-October combined
1948	11	25	25	26	12	36	64
1949	4	13	55	25	3	17	83
1950	6	12	49	25	8	18	82
1951	2	17	39	36	6	19	81
1952	5	18	40	24	13	23	77
1953	4	17	47	25	7	21	79
1954	2	30	37	27	4	32	68
1955	1	22	44	27	5	24	76
1956	4	34	35	20	7	38	62
1957	11	28	43	16	2	39	61
1958	5	22	49	21	3	27	73
1959	10	30	34	21	5	40	60
1960	5	23	46	22	4	28	72
1961	6	31	28	31	5	37	63
1962	13	30	40	15	2	43	57
1963	8	44	29	16	2	52	48
1964	4	33	33	23	7	37	63
1965	8	35	45	10	3	43	57
1966	15	33	21	30	2	48	52
1967	5	39	38	18	--	43	57
1968	12	31	36	19	1	44	56
1969	11	26	50	10	3	37	63
1970	17	26	37	18	2	44	56
1971	20	21	41	15	3	41	59
1972	12	33	36	12	7	45	55
1973	28	33	18	16	6	61	39
1974	9	38	39	13	1	47	53
1975	19	42	27	10	1	62	38

(NOTE: Very small pre-June 15 and November landings not included.)

Source: Ward, Robison, and Nye (1977).

Table 12. Percent of Oregon commercial troll coho salmon round weight poundage landed by month, 1952-1975.

Year	Percent of yearly landings (round weight)/month						June-July combined	Aug.-Oct. combined
	June	July	August	Sept.	Oct.			
1952	6	41	39	11	3	48	52	
1953	5	39	42	13	2	44	56	
1954	7	40	32	19	1	48	52	
1955	6	33	44	15	2	39	61	
1956	7	43	39	9	2	50	50	
1957	19	36	29	15	1	55	45	
1958	27	37	19	15	1	64	36	
1959	21	36	29	10	4	57	43	
1960	7	31	51	10	1	38	62	
1961	15	41	31	11	1	56	44	
1962	9	39	44	8	1	48	52	
1963	13	48	31	7	1	61	39	
1964	7	30	49	14	1	37	63	
1965	5	51	36	6	1	57	43	
1966	11	36	26	26	1	47	53	
1967	6	64	22	7	--	71	29	
1968	22	52	21	4	--	74	26	
1969	30	46	22	3	--	75	25	
1970	17	19	56	6	1	37	63	
1971	11	28	58	3	1	39	61	
1972	33	45	20	2	--	78	22	
1973	24	36	34	4	1	61	39	
1974	12	57	26	5	--	69	31	
1975	21	55	19	4	--	77	23	

Week Number	Dates Covered
23-24	May 28 - June 16
25-26	June 10 - June 30
27-28	June 25 - July 14
29-30	July 8 - July 28
31-32	July 23 - Aug. 11
33-34	Aug. 5 - Aug. 25
35-36	Aug. 20 - Sept. 8
37-38	Sept. 2 - Sept. 22
39-40	Sept. 16 - Oct. 6
41-42	Sept. 30 - Oct. 20
43-44	Oct. 14 - Nov. 3
45-46	Oct. 29 - Nov. 17

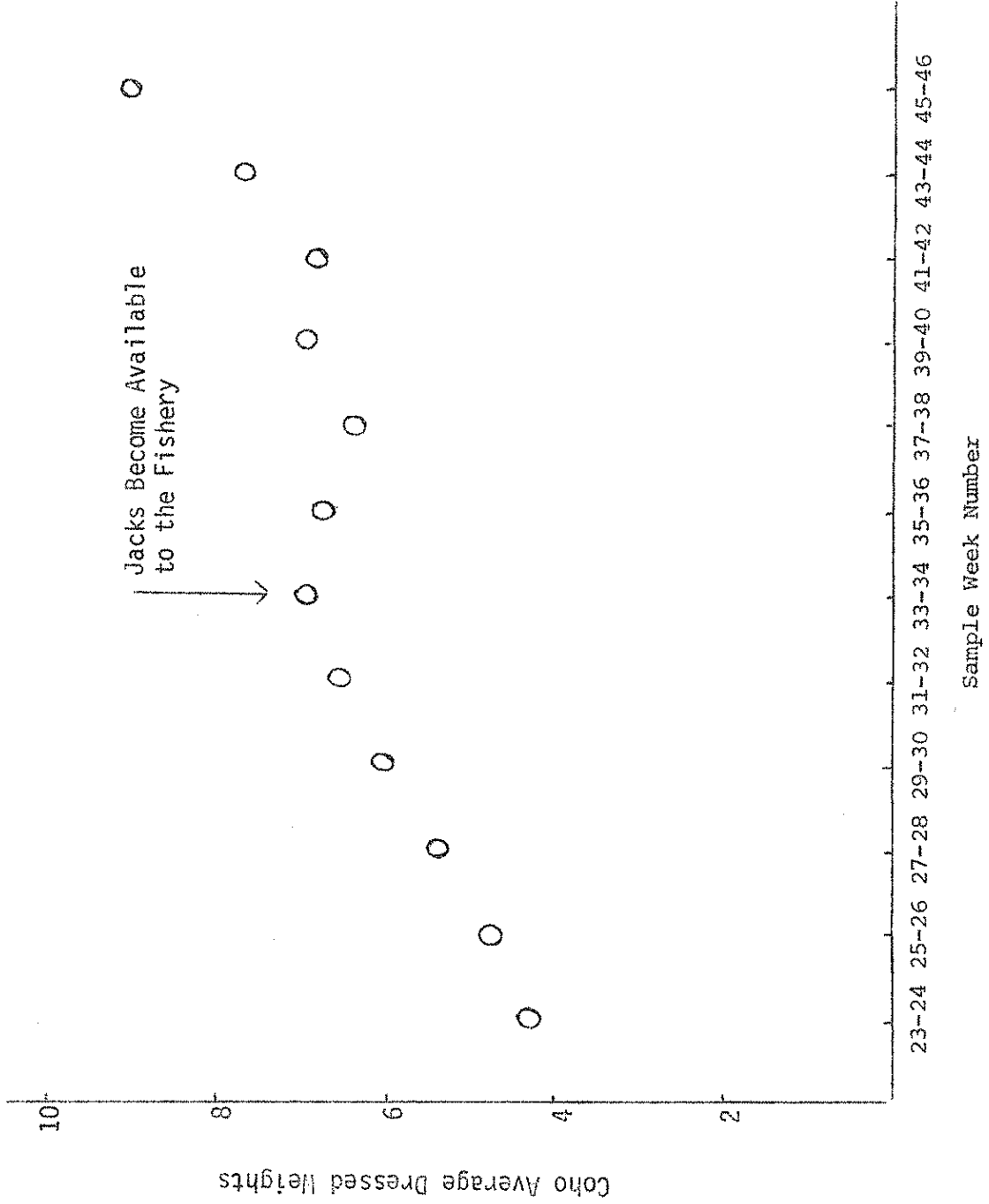


Figure 12. Coho Average Weights for 1968-1973 Oregon Troll Landings

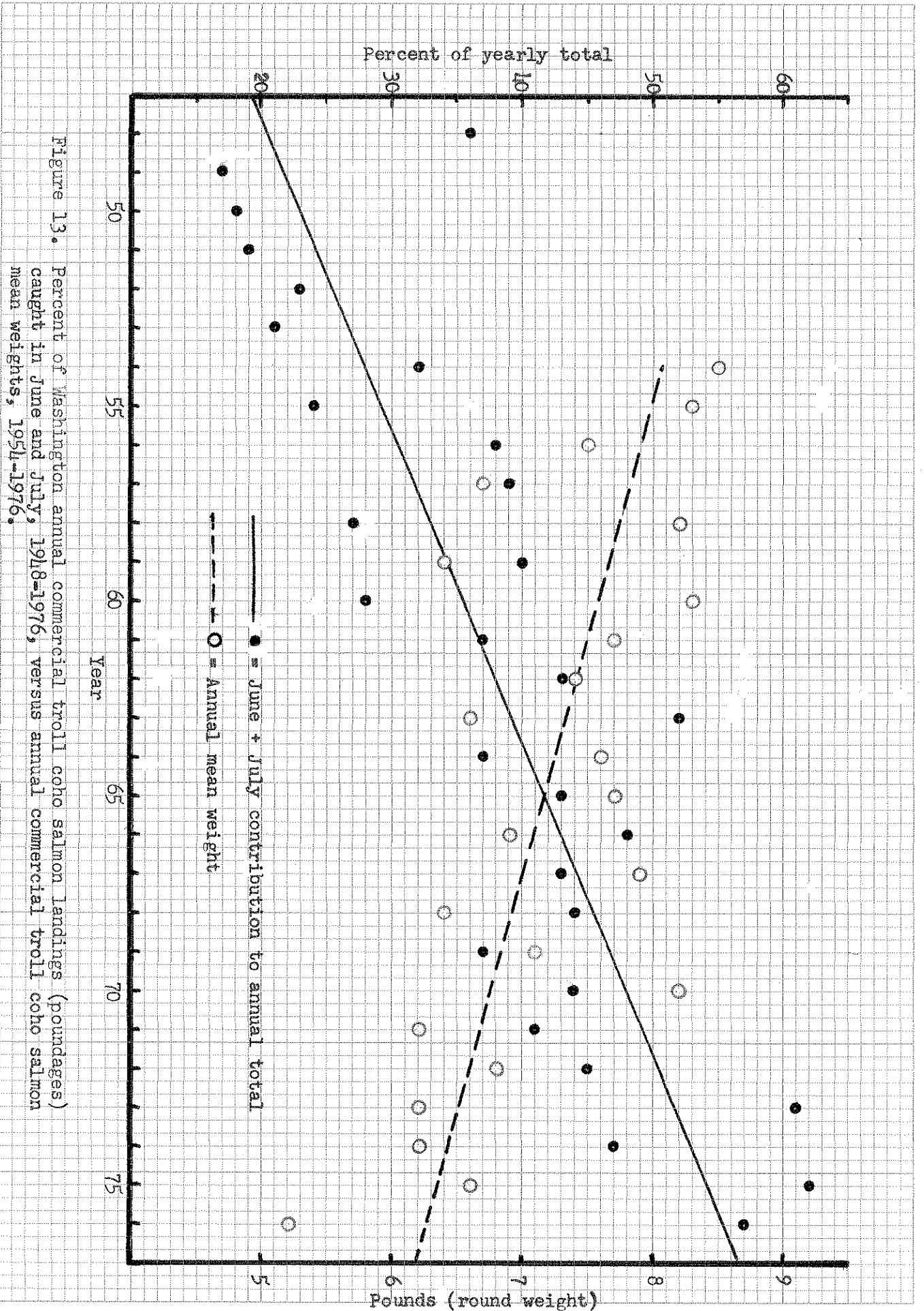


Figure 13. Percent of Washington annual commercial trolli coho salmon landings (poundages) caught in June and July, 1954-1976, versus annual commercial trolli coho salmon mean weights, 1954-1976.

46 0700

10 X 10 TO THE INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

KE

Pounds (round weight)

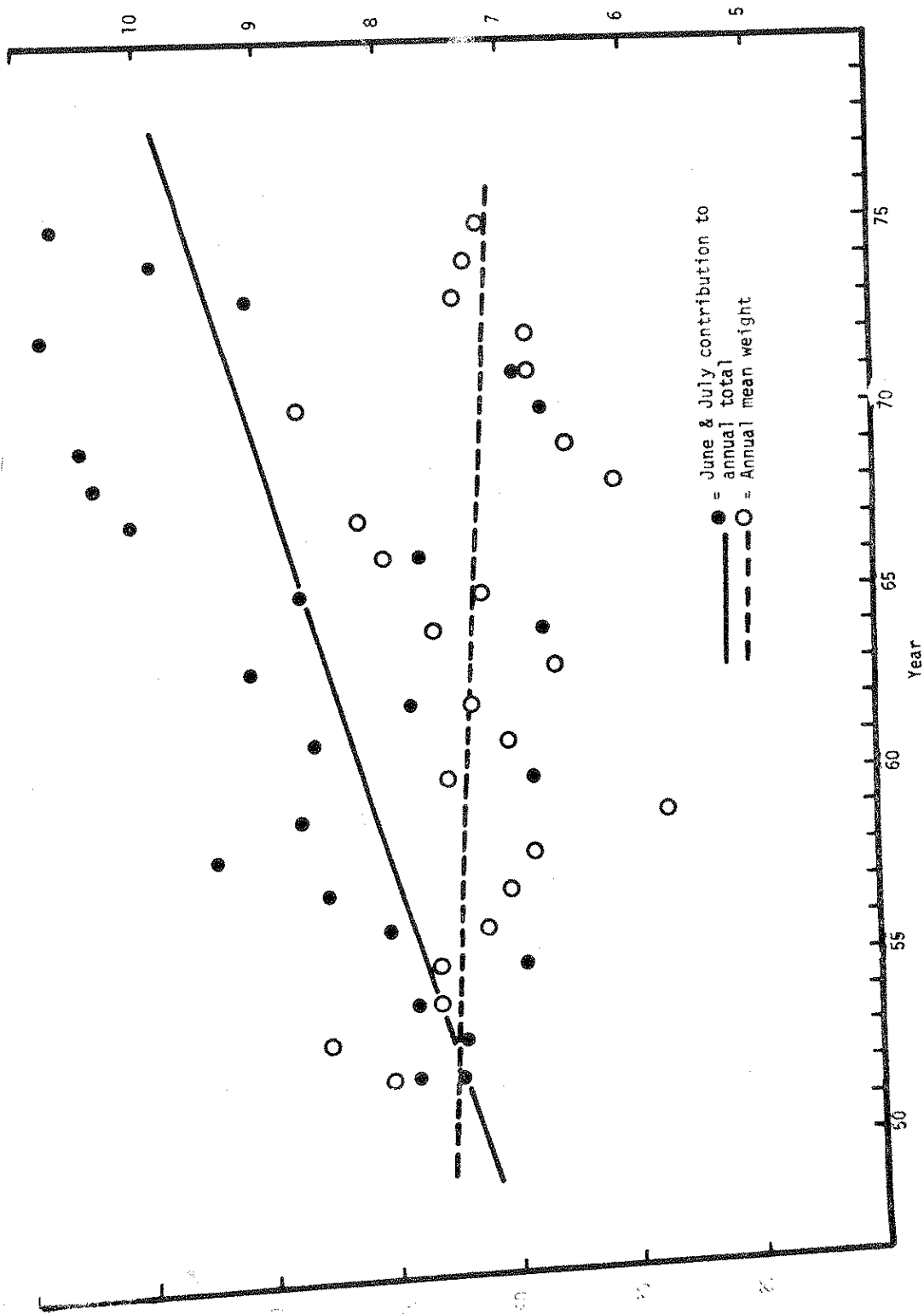


Figure 14. Percent of Oregon annual commercial troll coho salmon landings (poundages) caught in June and July versus annual commercial troll coho salmon mean weights, 1952-1975.

3-1/2 to 4 lb. dressed, or about 40% of their ultimate size. Any justification for this fishery could only be based on the following debatable logic:

- a. a troll chinook fishery must be continued during this period in order to adequately harvest the California and Oregon coastal stocks present in the area;
- b. trollers cannot avoid catching coho to any significant degree during this fishery; and
- c. the hooking mortality rate is too high to justify returning these incidentally-caught fish to the water.

In addition to the long-term season opening date issue which historically has been dealt with in the broader "wise-use" connotation of the word "conservation", recent data on ocean fishing rates (Table 13) point to a strict conservation issue with the possibility of biological overfishing. For areas where rates can be calculated for both the 1960's and 1970's, the general pattern is one of progressively higher ocean fishery pressure. Two areas, Willapa Bay and Oregon coastal streams, had rates in excess of 85% for the most recent years in which data were available (1975). The problem appears to be particularly acute in the latter area where data show an obvious general decline in coho salmon spawning escapement and a seriously depressed single 3-year cycle; i.e., the 1969-1972-1975 fish (Oregon Department of Fish & Wildlife, 1976). The next return year for this particular low cycle will be in 1978 (Figure 2).

9.2.6 Incidental Catch Allowance for Coho. In spite of the management decisions which might be made with respect to previous sections on troll fishing seasons, substantial numbers of dead and badly wounded coho will still be brought to the surface on troll hooks during any chinook-only season. A possible means for mitigating these shaker losses is an incidental catch allowance such as that described by Wright (1971). The basic management intent is to prevent fishermen from actively seeking a certain species or size of salmon but still allowing the landing and sale of these fish which are killed incidental to fishing operations directed toward a "target" species. An incidental catch allowance for pre-season troll-caught coho was recommended by the Pacific Marine Fisheries Commission during 1970 in a resolution (No. 17) entitled "Trial Regulation of the Troll Fishery to Reduce the Catch of Coho Shakers" (PMFC, 1972).

The following excerpt from Wright (1971) describes the issue and relevant data:

"This concept was based on the hypothesis that a coho's chances for survival could be determined reasonably well by visual observation as trolling gear brings them in. For example, recovery rates for three 'condition categories' of live coho tagged during 1968 in outer Juan de Fuca Strait were:

<u>Condition category</u>	<u>Number tagged</u>	<u>Number recovered</u>	<u>Percent recovered</u>
"Good"	332	95	28.6
"Fair"	208	41	19.7
"Poor"	84	10	11.9

Table 13. Ocean fishing rates on populations (catch plus escapement) of 3-year-old fish for Pacific coastal coho salmon stocks, 1949-1972 brood years (determined from experimental groups of fin-marked and coded-wire tagged fish).^{1/}

Brood year	Year in fisheries	Stock origin area					
		Puget ^{2/} Sound	Olympic Peninsula	Grays Harbor	Willapa Bay	Columbia River	Oregon coast
1949	1952	0.35 ^{3/}				0.43	
1950	1953	0.66 ^{3/}					
1961	1964					0.62	
1964	1967	0.38		0.51		0.72	
1965	1968	0.51		0.39	0.76	0.81	0.77
1966	1969	0.44			0.76	0.77	0.71
1967	1970					0.58	
1968	1971					0.80	
1969	1972					0.84	
1970	1973					0.71	
1971	1974	0.54	0.72	0.54	0.82	0.74	0.86
1972	1975	0.45	0.75	0.63	0.87	0.74	0.86

^{1/} Sources: Fredd and Kaiser (1973), Heyamoto and Kiemle (1955), Hopley (1975), Mathews and Hopley (1975), Oregon Department of Fish and Wildlife (1976b, 1977, and personal communications), Senn and Noble (1968), Senn and Satterthwaite (1971), Wahle, Vreeland and Lander (1974), Wright (1970c), and Wright and Bernhardt (1969b).

^{2/} Includes Puget Sound marine sport fishery catches.

^{3/} Includes Puget Sound sport catches of 2-year-old coho.

"In the same study, 40 coho, or 6% of total catch, were completely expired when brought on board. The intent, then, was to allow retention, and later sale, of coho brought onboard dead or badly injured--but to create no additional fishing effort (in terms of terminal gear, speed, depth, and/or changes) specifically for this species.

TEST FISHERY

"The incidental-catch concept received mixed blessings in non-salmonid fisheries. It generated considerable speculation among Pacific coast management agencies. So a special test fishery was planned from June 1 to 5, 1971, off Grays Harbor. This is the center of Washington's spring-season trolling effort for chinook salmon.

"Following a public information program, special permits were issued to 70 licensed troll vessels 16 to 50 feet long. These included members from tripboat, dayboat, kelper, and com-sport components and were representative of the total Grays Harbor fleet. The special permits stated: '...to retain coho salmon which are brought on board dead or in a badly injured condition during his normal fishing effort for chinook salmon in the period June 1 through 5, 1971. Total poundage of these coho in a dressed condition shall not, however, exceed ten percent of the legal dressed chinook salmon poundage in possession of the fisherman. Further, all such coho retained must be landed at the port of Westport, Washington, and relinquished to authorized Washington Department of Fisheries personnel. In compensation for the additional work effort required, the fisherman will be reimbursed at a rate per dressed weight pound equal to that established by industry for the regular coho season opening. There will be no minimum size limit for the coho.'

"From June 1 to 5, 51 permit holders landed chinook salmon at Westport, and 41 of these (80%) also landed coho. Weather conditions were exceptionally favorable. Both species were abundant throughout the 5-day period.

"For 93 individual landings, the following were recorded:

Number chinook	-	2,313
Pounds chinook	-	25,855
Average weight	-	11.18 lb.
Number coho	-	541
Pounds coho	-	2,268
Average weight	-	4.19 lb.

"Coho appeared in 67 landings, 8.8% of chinook catch on basis of weight, and 23.4% on basis of numbers. Ice boats, in 16 deliveries, accounted for 72.8% of chinook poundage, and 69.1% of coho poundage; day fishermen contributed the remainder in 77 individual landings. A few fishermen exceeded the 10% limit on coho deliberately or accidentally because they misunderstood the terms of the special permit.

"Subtracting these from the total indicates that the overall coho poundage level of 6% of chinook poundage would be realistic for predicting outcome of such a fishery on a regular basis.

"In spite of a period for continued growth, a sample of troll coho taken off Grays Harbor after the regular season opening on June 15 averaged only 3.80 lb. dressed. It appeared that terminal gear fished for chinook during the test fishery was more selective toward larger individuals of the available coho population."

9.2.7 Troll Fishery Limited Entry

9.2.7.1 Washington License Moratorium. It became obvious in recent years that the state's salmon runs could not continuously provide a good livelihood for an unlimited number of fishermen. Studies, such as that done by Fraidenburg (1972), showed that there were definite problems from an economic standpoint generated by unhindered expansion of the troll fleet. Some method of limiting the amount of gear capable of harvesting the salmon was necessary. Based on a request from the Washington State Senate's Interim Committee on Fisheries, Game and Game Fish, a document which enumerated several potential license limitation schemes for the state's salmon fisheries was compiled (Washington Department of Fisheries, 1971). This led to an interim solution, the Salmon License Moratorium Law (SSB 2940), which was signed on May 6, 1974. This bill provided time for the Department of Fisheries and representatives of the commercial salmon fishing industry to evaluate alternatives and recommend, prior to January 1, 1977, an approach to limit gear entry into the state's commercial salmon fisheries. A joint state-industry committee was formed and began putting together just such a limitation scheme based on Department statistics and industry input from fishermen.

The bill specifically stated that only those vessels that possessed a valid Washington commercial salmon fishing license at some time during the period January 1, 1970 through May 6, 1974, and had a valid fish receiving document that salmon were caught and landed from the vessel, could secure a license in 1975, 1976, and 1977. In addition, licenses would be issued during those years to any commercial vessel which was being built or was bought in good faith between April 16, 1973 and May 6, 1974. Licenses could be transferred to other vessels.

The 1977 Washington State Legislature extended this moratorium through the 1978 season to allow additional time for development of an acceptable limited-entry program.

Kramer, Chin and Mayo (1977) deal with the issue of limited entry in their proposal for a large-scale enhancement program in the state of Washington and offer the following insight:

"The marginal costs for commercial fishing include the costs of catching the additional fish produced by the enhancement program and of processing (canning, freezing, etc.) these additional fish. Assuming the restricted entry of fishermen, the additional fish will be caught by the existing fleet. The fleet will fish more hours and, hence, will use more gear, more fuel and more man-hours, so there will be some marginal costs incurred in the increased harvest.

"With non-restricted entry, there will be an expanded fleet to catch the additional fish. An expanded fleet means new investment costs to amortize, more crew members to pay, more fuel and more moorages, to name a few of the many additional costs. Thus, marginal costs under non-restricted entry will be higher than the marginal costs under restricted entry. In this study the marginal harvest cost without restricted entry is estimated to be 86 percent of current average commercial harvest cost. With restricted entry, the assumption is that the added fish will be caught by existing fishermen with only 38 percent of current average costs as the marginal value."

9.2.7.2. Limited Entry Considerations in Oregon. The State of Oregon was not under a moratorium or other form of limited entry program in 1977. The Oregon Department of Fish and Wildlife requested funds from the state legislature in 1977 to study limited entry but this request was denied. Normal legislative time constraints now preclude initiation of a state limited entry program before 1979.

The moratorium in Washington and discussion of limited-entry by various agencies appears to have stimulated sales of additional commercial fishing licenses in Oregon in 1977 (Table 14).

Table 14. Number of commercial fishing licenses sold in Oregon by year, 1969 to 1977.

Year	1969	1970	1971	1972	1973	1974	1975	1976	1977
Number of Licenses	5,663	5,584	6,428	5,989	6,668	5,556	5,540	5,990	6,812 ²

^{1/} Cannot be separated by fishery, but represents primarily salmon fishermen.

^{2/} As of August 24, 1977. Represents an estimated 97% of projected total 1977 sale.

9.2.8 Ocean Sport Fishing Seasons. (NOTE: In this and subsequent sections, regulations for sport anglers in the Washington coast-Columbia River mouth area shall be viewed in the context of changes from 1975 season statutes since several more restrictive rules were adopted by the States of Washington and Oregon for the 1977 fishery.)

The ocean sport fishing season off the Washington coast and Columbia River should be delayed until the Saturday nearest May 1, a change of 2-3 weeks from the 1975 opening on the second Saturday in April. This would provide protection for depressed upper Columbia River spring chinook runs. While these fish constitute a small percentage of any early season ocean chinook catch, this delay would reduce additional escapement of spring chinook into the Columbia River. Fishing pressure on depleted Columbia River summer chinook runs would also be reduced somewhat by the delay in season opening date.

A further delay in the ocean sport fishing season off Washington and the Columbia River mouth until early or mid-June has some merit with respect to the additional protection that could be afforded depressed upper Columbia River and Washington coastal spring and summer chinook stocks. Since yields are expressed in recreational benefits, not total poundage, other valid arguments applicable to delaying the commercial fishery do not readily apply.

9.2.9 Ocean Sport Fishery Minimum Size Limits (Tables 15 and 16). A minimum size limit on chinook salmon of 24 inches total length would improve quality of ocean sport fishing. It should reduce fishing effort on schools of small, immature chinook, particularly in such areas as the vicinity of the Columbia River mouth. Under past regulations, substantial numbers of small fish were retained and/or hooked and released. This resulted in a significant reduction in numbers of fish which would be available later at a larger size. This change would also reduce fishing pressure on some depleted chinook runs.

For coho salmon, a minimum size limit of 16 inches in length would permit retention of virtually all adult coho taken in their third and final year of life. The past size limits resulted in "sorting" of coho during early weeks of the sport fishery and small adult fish had to be released. This regulation would also allow anglers to keep mature 2-year-old "jack" coho taken during late summer and fall months. These fish are mainly between 16 and 20 inches in length.

An alternative to the above species-variable size limits would be a single "compromise" value such as California's 22-inch minimum total length standard which applies to all salmon species. While this approach may not fully meet the biological considerations of each species taken, it does have the distinct advantage of not relying on proper species identification by individual anglers.

9.2.10 Ocean Sport Fishery Bag Limits (Tables 15 and 16). A reduction in the daily bag limit from three to two salmon is a potential regulatory alternative. The rationale for such a reduction assumes that recreational benefits are more important than the fish caught. If there were no significant decline in angler participation levels with a two-versus three-fish daily bag limit, then the third fish allowed anglers in past seasons would prove to have been of relatively little real economic value. In this case, there would be some justification for "saving" these fish and transferring them to other fisheries, where a greater economic benefit would be derived. If, however, a reduction in the daily bag limit from three to two fish resulted in a substantial decline in angler participation levels then, in fact, the third fish in each angler's daily bag limit has a substantial economic value. There is a wide divergence of informed opinion but an absence of data adequate to support either side of this issue.

Salmon anglers fish for a variety of reasons. These include the expectation of acquiring a high-valued, quality food item, the excitement of the fishing experience, and the pleasure of being out on the open water. But, regardless of the reason, reducing the catch level will reduce the pleasure or satisfaction derived and will produce a negative impact on angler participation levels. What is not known is how negative that impact will be.

A two-fish bag limit was actually in effect in the ocean sport fishery beginning on June 15, 1974, but lasted less than one week due to a successful legal challenge in State court. Some impact on the fishery was evident, however, since angler trips declined slightly during the latter half of June when they are normally accelerating. Pre-trial publicity, continuation of a three-fish daily bag limit on the Oregon side of the Columbia River, and a serious national fuel shortage were three factors that also may have contributed to the observed decline. The key question, which remains unresolved, is whether or not the same number of anglers will continue to pay higher charter fees and travel costs for a maximum expectation of only two fish per day.

Table 15. Daily bag and minimum size regulations for the Washington ocean salmon sport fishery, 1921-1977.

Year	Minimum total length	Daily bag limit
1921 (7/15)	6 inches	Three salmon over 15 inches in length and 25 between 6 and 15 inches in length, provided the aggregate weight of those between 6 and 15 inches in length does not exceed 20 pounds.
1922 (2/20)	18 inches	Three salmon.
1922 (3/30)	10 inches	Twenty-five salmon, provided the aggregate weight of the catch does not exceed 20 pounds and one additional salmon.
1935	12 inches	Fifteen salmon, provided the aggregate weight of the catch does not exceed 20 pounds and one additional salmon.
1941	12 inches	Ten salmon, provided the aggregate weight of the catch does not exceed 20 pounds and one additional salmon.
1944	12 inches	Six salmon, provided no more than three exceed 24 inches in length.
1958 (7/10)	20 inches	Three salmon.
1976	24 inches for chinook; 16 inches for coho; none for other species	Three salmon.

Table 16. A chronology of Oregon ocean salmon sport regulations through 1977.

Years	Regulations
1946	Bag limit 3 salmon or steelhead in the aggregate per day; 9 in possession. No annual limit.
1947	Bag limit 2 salmon or steelhead in the aggregate per day; 6 in possession or in 7 consecutive days. No annual limit.
1948 through 1955	Bag limit 2 in the aggregate in any one day of steelhead and salmon 20 inches and over in length; 4 in possession or in 7 consecutive days; not more than 20 such fish in any one calendar year.
1955 through 1964	Bag limit 2 per day, 4 in possession or in 7 consecutive days and annual limit of 40 fish (not more than 20 salmon and 20 steelhead). Salmon less than 20 inches could not be taken from ocean.
1965 through 1969	Bag limit 3 per day, 6 in possession or in 7 consecutive days. Annual limit 20 salmon - 20 steelhead. Salmon less than 20 inches could not be taken from the ocean.
1970 through 1975	Bag limit 3 per day, no 7-day possession limit as in past, annual limit 40 fish. (40 salmon or 40 steelhead or an aggregate catch of salmon and steelhead not to exceed 40 fish.) Salmon less than 20 inches may be taken from the ocean south of Tillamook Head.
1976 and 1977	Size limit north of Tillamook Head increased to 24 inches for chinook and reduced to 16 inches for coho.

Handwritten notes:
10
11
12

An annual salmon bag limit restriction for sport anglers could produce some reduction in total sport catch. These fish would then be made available to other sport, commercial, and Indian salmon fishermen or to spawning escapements of depressed stocks. To evaluate merit of such a proposal, a basic judgment must be made as to management objectives. Are fishery resources to be managed for the "average" sportsman, who commonly takes only a few fish per year, or for all sportsmen, including those with salmon angling as their primary avocation?

During the 1975 sport salmon fisheries in Washington, statewide statistics show that an estimated 92,000 fish, or about 7% of the total catch of 1.4 million salmon, were taken by individual sport anglers who had previously taken at least 20 fish.

9.2.11 Ocean Sport Fishery Limited Entry. In 1977, the Washington State Legislature added commercial passenger fishing vessels (charter boats) to its extended license moratorium. The bill did not, however, attempt to limit future passenger capacity of charter vessels or restrict the number of private boats in any manner. The states of Oregon and California currently have no legislated controls on growth for any components of their recreational salmon fishing fleets.

9.2.12 Ocean Sport Fishing Gear. The definitions of legal recreational angling gear differ somewhat among the states of Washington, Oregon and California, and these produce slight differences in fishing power. For example, the 1977 regulation for Washington ocean waters was as follows:

"It shall be lawful to use one pole with one line (or one handline) to which is attached one lure while angling for food fish for personal use. The pole must be held in hand while landing the fish and no power operated devices may be used to retract the line."

The "one handline" provision legally allows the controversial use of stout lines and heavy weights (or "meatlines") from the stern of charter boats. Oregon also limits anglers to one rod in ocean waters.

The definition of angling in California presently reads: "...angling only by closely attended handline(s) or rod(s) and reel(s). No weight more than four pounds may be directly attached to the line by which the fish is retained."

While a common coastwide sport gear definition may have merit, some differences may be needed to best satisfy local situations. This is the case in Washington where Puget Sound marine sport fishery has the following gear provision:

"It shall be lawful to use two lines with one lure per line, or one line with two lures, while angling for food fish for personal use."

9.2.13 River Mouth Closures. An option for both commercial and recreational fisheries is small area closures of ocean waters in the immediate vicinity of river mouths. These localized closures have long been advocated as an effective means for protecting specific salmon stocks but, in actual fact, chinook and coho salmon from each river system are taken in ocean fisheries over a wide range in both time and geographic area (Tables 1 and 2). River mouth closures can only protect each stock from a small fraction of the overall ocean fishing pressure but may still have viable management potential in some specific instances. An example would be protection of depressed Washington coastal chinook or coho stocks by late-season river mouth closures. In the case of ocean waters off the Columbia River mouth, a "sanctuary area" total closure would only impact the ocean recreational fishery to a significant degree, not most commercial trollers, and salmon runs to the Columbia would only be increased slightly. Closures surrounding the mouths of smaller Washington coastal rivers would also impact mainly recreational anglers, as well as a few small-boat trollers, depending on timing and areas.

9.2.14 Barbless Hooks. During any early season chinook-only fishery, available data indicate that commercial salmon trollers should be required to use barbless hooks (see Section 9.1.2). This restriction may not be appropriate for all types of gear, however, particularly the long shank bait hooks commonly referred to by fishermen as "crow bars". The fish may achieve greater leverage on these hooks and further gear research is needed. Sound gear research is not yet available to adequately justify mandatory use of barbless hooks in the ocean sport fishery or in the regular all-species commercial troll fishery.

9.2.15 Ocean Fishery Catch Quotas. Catch quotas could be viable management tools for either the commercial troll or ocean sport fishery but their relative merit would depend, in part, on successful development of technology to accurately access in-season fishing rates (see Section 2.4). For the commercial troll fishery, extreme caution would be needed in order to prevent "filling a quota" with less valuable partially-grown salmon at the expense of a later ocean harvest of more desirable larger fish. This would occur, for example, if a troll coho season began in mid-June and the fleet filled its "quota" by mid-August.

In the ocean sport fishery, where charter boats and other support services depend heavily on advance planning and reservations, the most serious concern would be unexpected fishing closures on short notice. For both fisheries, the possible need for separate quotas by species could also present complex problems involving the filling of two quotas by the same date in order to prevent excessive hooking mortality losses.

9.3 Analysis of Beneficial and Adverse Impacts of the Management Options.

9.3.1 Summary of Information Used in Assessing and Specifying MSY and OY (see also Sections 2.4 and 9.5). Proposed regulations are evaluated by computerized analysis systems designed for that purpose. These are the Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis Model (Johnson, 1975 and 1977) and the California Department of Fish & Game Salmon Fisheries Population Simulation Model.

Washington's operational management system has the capability to evaluate changes in ocean salmon fisheries by adjustments in seasons, size limits, fishing areas, effort levels, etc. Proposed changes presently can be contrasted with existing regulations for eight mixed stocks by area and fishery in terms of numbers of fish taken, pounds landed, economic value of the catch, and fishing-related mortality losses. The computerized model presently contains the following 1976 recreational and commercial fishery economic data.

Average 1976 Washington ex-vessel commercial fish prices utilized in the analysis were:

District	<u>Price Per Pound</u>			
	<u>Chinook salmon</u>		<u>Coho salmon</u>	
Puget Sound	Nets: 1.43	Troll: 1.76	Nets: 0.97	Troll: 1.29
Grays Harbor	Nets: 1.36	Troll: 1.56	Nets: 1.00	Troll: 1.24
Willapa Harbor	Nets: 1.50	Troll: 1.67	Nets: 1.02	Troll: 1.24
Columbia River	Nets: 0.74	Troll: 1.45	Nets: 1.09	Troll: 1.24

Troll fishery prices were converted to a round weight basis in the model, and catches in non-Washington fisheries were assigned prices of the nearest district.

Value results shown are not, however, due entirely to economic factors. For example, 1976 average per-pound prices for chinook salmon in the Columbia River were \$1.37 for the non-treaty fishery below Bonneville Dam and \$0.50 for the treaty Indian fishery above Bonneville Dam. The composite in-river price of \$0.74 is a reflection of actual catch distribution due to treaty Indian fishing rights, not economics.

Recreational fishery values were based on a \$28.00 per-fish overall average weighted to reflect the higher observed value of larger fish in the following manner: \$13.00, \$24.00, \$35.00, \$45.00, and \$56.00 per fish for 0-4 lb., 4-8 lb., 8-12 lb., 12-16 lb., and 16-100 lb. salmon, respectively.

Biological data are included for the following stocks:

Puget Sound coho: based on current stock size as applied to a composite of 11 marked 1964, 1965, and 1966 brood year experimental groups as recovered in the 1967, 1968, and 1969 fisheries and escapements.

Columbia River coho: based on current stock size as applied to a composite of six marked 1965 and 1966 brood year experimental groups as recovered in the 1968 and 1969 fisheries and escapements.

Willapa Bay coho: based on current stock size as applied to a composite of two marked 1965 and 1966 brood year experimental groups as recovered in the 1968 and 1969 fisheries and escapements.

Grays Harbor coho: based on current stock size as applied to a composite of four marked 1964 and 1965 brood year experimental groups as recovered in the 1967 and 1968 fisheries and escapements.

Oregon coastal coho: based on current stock size as applied to a composite of four marked 1965 and 1966 brood year experimental groups as recovered in the 1968 and 1969 fisheries and escapements.

Southern British Columbia coho: current stock size based on a 65:35 ratio of Puget Sound:southern British Columbia coho in the Strait of Juan de Fuca. Ocean catch distribution was assumed to be equal to Puget Sound coho and terminal area catches based on actual catches of Canadian coho in U.S. northern Puget Sound fisheries and Canada's Fraser River commercial fishery.

Lower Columbia River fall chinook: based on current stock size as applied to a composite of 16 marked 1961 through 1964 brood year experimental groups as recovered in the 1963 through 1969 fisheries and escapements.

Upper Columbia River fall chinook: based on current stock size as applied to a mixture of 50% lower Columbia River fall chinook, and 50% of a composite of four marked 1961 through 1964 brood year Kalama River experimental groups as recovered in the 1963 through 1969 fisheries and escapements. No experimental data base for naturally spawning upper Columbia River fall chinook was available but the age composition of these fish as returning adults is similar to the Kalama River stock. This implies a comparable ocean catch distribution pattern.

Additional data are:

Ocean migration patterns: based primarily on an analysis of adult fish tagging experiments in the ocean. To simulate a stock correctly, it is essential to properly evaluate the "sub-stocks"; e.g., Puget Sound coho moving northward and feeding off the west coast of Vancouver Island versus those moving southward to areas off the Washington coast. Each sub-stock is not equally available to all ocean fisheries harvesting the overall stock.

Growth rates: reflected in monthly average fork lengths in centimeters and entered separately for each of the following groups: 3-year-old coho from each geographic area specified previously; 2-year-old immature chinook; 3-year-old immature chinook; 3-year-old mature chinook; 4-year-old immature chinook; 4-year-old mature chinook; and 5-year-old mature chinook.

Age class composition: all coho stocks were assumed to be harvested as 3-year-old maturing adults. Chinook age composition was based on actual catch and escapements of marked experimental groups as specified in stock descriptions.

Maturation schedules: maturity by area and time based directly (Washington fisheries) on or by extrapolation (non-Washington fisheries) from basic data provided in Wright and Bernhardt (1972).

Natural mortality rates: for chinook salmon, an annual natural mortality rate of 0.342 was utilized for all age and maturity categories. This was derived from the average instantaneous rate (on a yearly basis) for nine studies cited in Table 25, page 48, of Cleaver (1969).

Natural mortality rates significantly higher than the 0.342 rate were tested in both the Washington and California models and could not reproduce the age class composition and sex ratios actually observed in catches and escapements. The natural mortality rate could, however, be significantly

lower than 0.342, particularly in the case of larger fish. For coho salmon, an annual natural mortality rate of 0.30 was utilized for fish in their third and final year to reflect a 10% rate during their 4-month period of primary harvest. The actual rate could be significantly higher or lower.

Fishing-related mortality factors: numbers of salmon hooked and released were derived from estimates by the fishermen themselves through voluntary troll salmon logbook programs and field interviews of sport anglers (O'Brien, Taylor and Jensen, 1972; Pitre, 1970; and Wright, 1972b). Hooking mortality rates recommended by Wright (1972a) were utilized.

No additional losses were computed for fish taken by predators or unobserved losses of hooked fish.

Catch distribution (including average lengths and weights) and fishing rates by time, fishery, and geographic area: based on actual catches and escapements of marked fish experimental groups as specified in stock descriptions.

This computerized model will soon be expanded to include other major salmon stocks such as Puget Sound chinook, Sacramento chinook, Oregon coastal chinook, upper Columbia and Snake River spring chinook, Fraser River chinook, and northern California coho.

The California model is oriented toward predicting the effects of regulation changes on catch and ocean escapement of chinook and coho. Biological data utilized include growth rates, age-class composition, natural mortality rates, fishing rates, fishing-related mortality factors, and catch by specified time intervals.

Obviously, computer model predictions should only be construed as an approximation of what might be expected to happen, on the average, over a period of time. Possible changes in fishing effort and seasonal fishing patterns are especially difficult to quantify in advance, particularly since the ocean salmon fisheries do not have a history of active management and its associated technical data base. Several factors are inherent in all combinations of options examined and the following received serious consideration in decisions concerning regulatory proposals for 1978:

1. Any reduction in only the U.S. recreational or commercial ocean fishery will produce a transfer of salmon to the other fishery which will continue unchecked by new regulatory constraints.
2. Any meaningful overall restriction of U.S. ocean fisheries will provide additional salmon to Canada's ocean fisheries as well as increased returns to rivers of origin within the U.S. Some new limitations on Canadian salmon interceptions would be needed to prevent this transfer.
3. Effects of two or more regulatory changes are not additive but must be evaluated in terms of impact as a combination.
4. Transfers from domestic ocean fisheries to "inside" fisheries will nearly always increase total poundage yields from existing salmon resources.
5. Any differentials in coastwide ocean fishing seasons would produce redistributions in troll fishing effort, and the effects of these differential seasons must be considered.

5/13/77
131

9.4 Tradeoffs Between the Beneficial and Adverse Ecological, Social, and Economic Impacts of the Preferred or Optimal Management Options

9.4.1 Specific Regulation Recommendations (Adopted regulations in Sec. 9.4.4)

9.4.1.1 Washington and Columbia River Mouth. (NOTE: The specific division point should be Cape Falcon, southerly of the expected single day fishing range from Columbia River mouth ports. This will provide more effective chinook stock separation than the Tillamook Head line utilized in 1976 and 1977.)

Commercial troll

- a. An all-species commercial troll season, from July 1 through September 15.
- b. Required use of barbless, single hooks on all terminal troll gear during any early season salmon fishing prior to July 1 (long shank bait hooks may be barbed).
- c. A 28-inch total length minimum size limit for chinook salmon, 16-inch total length minimum size limit for coho, and no minimum size limit for other salmon species. (NOTE: State laws prohibiting the landing of chinook less than 28 inches total length will be needed for Washington and Oregon ports north of Cape Falcon.)
- d. An early season for all salmon species other than coho from May 1 through June 14.
- e. A late season all-species troll fishery from September 16 through October 31, south of Point Grenville in Washington
- f. Unlawful to possess steelhead (a game fish).
- g. Foreign fishermen (Canadian trollers) subject to the same restrictions applicable to U.S. commercial fishermen.
- h. Regulations applied to Indian treaty fishing. (Regulations in effect for 1977 and proposals of the coastal tribes for this Plan are included in Appendix III.)

Ocean sport

- a. A general all-species season from the Saturday closest to May 1 through October 31.
- b. A 24-inch total length minimum size limit for chinook salmon, a 16-inch total length minimum for coho, and no minimum size limit for other salmon species
- c. Angling gear defined as follows: angling shall mean fishing for personal-use and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish, to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.

[Handwritten notes and signatures]

- d. Adoption of current possession limits, annual limits, and other gear restrictions of the States of Oregon and Washington respectively, except as noted above.
- e. A three-fish daily sport bag limit.

Ocean Nets

- a. Prohibited (see Section 10.4.1).

9.4.1.2 California and Oregon Coast (South of Cape Falcon).

Commercial troll

	<u>Waters off Oregon</u>	<u>Waters off California</u>
Minimum size limits	26 inches for chinook 16 inches for coho None for other salmon (NOTE: Continuance of the existing 22-inch total length minimum size limit for California troll coho should also be considered as a viable alternative for that area.)	
All salmon except coho season	May 1-October 31	April 15-Sept. 30
Coho season	June 15-Oct. 31	May 15-Sept. 30
Vessel certification	None	Beginning May 13
Steelhead	Unlawful to possess steelhead (a game fish).	
Gear	Barbless single hooks required prior to coho season (long shank bait hooks may be barbed).	
Foreign fishermen	Canadian trollers subject to the same restrictions applicable to U.S. commercial fishermen, with the exception of vessel certification (see Section 10.1).	

Ocean sport

Season

- Oregon: Saturday closest to May 1 through October 31
- California: North of Tomales Point - all year
 South of Tomales Point - Saturday closest to Feb. 15 through Sunday closest to Nov. 15

Size limits

- Oregon: 24 inches for chinook
 16 inches for coho
 No minimum size limit for other species
- California: 22 inches for all species (exception, see daily bag limit)

10/1/77
1/1/78
1/1/79

Gear

Oregon:

Angling shall mean fishing for personal-use, and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish, to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.

California:

Angling only by closely attended handline(s) or rod(s) and reel(s). No weight more than four pounds may be directly attached to the line by which the fish is retained. (Note: The more restrictive proposal for Washington and Oregon should also be considered as a viable alternative for California anglers.)

Daily bag limit

Oregon and California: Three fish (in California two must be greater than 22 inches, one may be between 20 and 22 inches).

Possession limits, annual limits, and other gear restrictions

Oregon and California: Adoption of current regulations of the respective states, except as noted above.

Ocean nets

Prohibited (see Section 10.4.1)

9.4.2 Analysis of Impacts of Specific Recommendations. Due to a number of complex interacting variables, catches and escapements in any single year cannot be expected to match these predictions.

The following detailed technical analysis of the previous specific regulatory proposals is intended to predict what might reasonably be anticipated as an average for a period of future years as contrasted to past "base" years. In this case, the base selected was an average for the five-year period (1971-1975) in which there was no substantive change in key ocean salmon fishing regulations. Changes of a more restrictive nature for the Washington coast and Columbia River mouth began in 1976 with new state and federal court constraints, and proceeded to a level approximating current specific proposals in 1977 through Pacific Fishery Management Council action. Current proposals for the Oregon coast and California are similar to those of the base years and little change can be expected for these areas.

1. Harvestable numbers of adult fall chinook returning to the Columbia River system would increase by 28%. Total run size (catch plus escapement) would increase by 17%. This would permit fulfillment of treaty Indian fishing

rights and also permit the Columbia River Compact to provide a viable August non-Indian gill net fishery below Bonneville Dam on upper river chinook stocks. In-river poundage yields from lower and upper river fall runs combined would be expected to increase from the past level of 4.9 million lb. annually to a new level of 6.3 million lb. per year.

2. Run size increases of similar magnitude would also be expected for Washington coastal fall chinook runs, with treaty Indian and non-treaty commercial catches in terminal areas increasing by over 200,000 lb. annually to a new average level of nearly 1.1 million lb. per year. The ban on April fishing would protect Columbia River spring chinook in their final year and the reduction in early season commercial fishing time prior to July 1 (when most Columbia River summer chinook have entered the river) would amount to 40% less fishing time than the 2-1/2-month troll season for 1975 and prior years. The significant reductions in early season fishing time, plus increased minimum size limits, would also benefit several currently depressed Washington coastal early run chinook stocks. In some of the stocks noted above, the additional fish are needed to bolster spawning escapements, at least for a temporary period while they are rebuilding to harvestable levels.
3. Small reductions in ocean fishing rates on Canadian, Puget Sound, Oregon coastal and California stocks would occur but these would have only a minimal effect on overall management of these resources. Any reduction in fishing rates off Washington for the latter two stocks would be counterbalanced to some extent by an expected increase in ocean fishing off Oregon and possibly California.
4. The commercial troll fishery off the Washington coast and Columbia River mouth could sustain a reduction of up to 1/4 in the recent average for pounds of chinook landed if there is no increase in effort during remaining open fishing periods. An increase is expected but this factor is impossible to quantify in advance for a fishery lacking an "active" management history profile. In any case, the potential dollar loss would be substantially less than the poundage reduction. Progressively higher prices are traditionally paid for the larger grades of troll-caught chinook and prices within poundage grade normally increase during the season. The new regulations would largely eliminate the landing of immatures or "smalls" (less than 8 lb. dressed weight), which are the least valuable grade, and would shift the overall catch later in the season and to the larger, more valuable size categories of maturing chinook. For example, three 7-lb. chinook totaling 21 lb. (dressed, heads off) would bring \$42.00 at the recent New York wholesale price of \$2.00 per pound. A single 14-lb. chinook would bring \$46.90 at their wholesale price of \$3.25 per pound, or nearly \$5.00 more than three small fish totaling 50% more in poundage. The average size of individual fish landed would increase by 22% and hooking mortality losses would decline by 5%. The poundage reduction could be as high as 900,000 lb. annually for the Washington coastal troll fishery (a decline from 3.2 to 2.5 million lb.), but this would amount to only about a 5% decline for the combined U.S. commercial troll landings for the states of Washington, Oregon, California, and Alaska (a decline from 16.9 to 16.0 million lb.) (Note: A 10% increase in average price per pound will translate a 25% reduction in poundage into only an 18% reduction in landed value of the catch. An increase in average price of at least 10% can reasonably be expected with elimination of the low-priced "smalls" from the troll landings.)

5. Sport fisheries off the Columbia River mouth and Washington coast would sustain a 24% reduction in numbers of chinook caught, but the poundage loss (estimated at 300,000 lb. annually) would be less than that percentage due to a 1-1/2-lb. increase in average size of sport chinook landed. Hooking mortality losses would increase, however, by an estimated 13%. (Note: These and other projections are based on continuance of the 20-inch total length minimum size limit for chinook presently in effect for U.S. marine sport fisheries in Puget Sound and Juan de Fuca Strait. Prior to 1976, there was no minimum size limit and about 50% of the fish taken were less than 20 inches in length.)
6. Major coho salmon stocks contributing to ocean fishery catches in the Washington coast-Columbia River mouth area would show varying results from the regulatory controls. Harvestable numbers of Puget Sound coho reaching U.S. "inside" waters would increase by 6% with an emphasis toward later, natural spawning stocks due to the troll closure after mid-September off northern Washington. During low-run cycles, State management would be directed toward utilizing these additional fish for spawning escapement requirements. Southern British Columbia coho runs would increase in a similar manner with some of the ocean fishery "savings" being transferred to U.S. northern Puget Sound commercial net fisheries. Washington coastal coho runs would show the largest percentage increase in returning harvestable numbers, averaging 15%, but varying by area and run timing. Late-running native stocks from Grays Harbor tributaries and Olympic Peninsula rivers would receive the most protection. Again, some potential savings would be transferred to needed spawning escapements during low-run cycles. Harvestable coho runs to the Columbia River system and Oregon coastal streams would increase by 4% and 2%, respectively. Annually, coho poundage yields for treaty and non-treaty "inside" fisheries are predicted to increase by 400,000 lb. (to a 6.5-million pound total) for Puget Sound, by 200,000 lb. (to a 1.2 million pound total) for Washington coastal areas, and by 100,000 lb. (to a 2.0 million lb. total) in the Columbia River system.
7. The commercial troll fishery off the Washington coast and Columbia River mouth could sustain a reduction of up to 15% from the recent average for coho poundage if effort did not increase after July 1 over past year's levels. The potential economic loss would be significantly less since coho prices traditionally increase as the season progresses and larger, better quality fish approaching maturity are landed. For example, in 1975, a major fish buyer at LaPush on the Washington coast began paying trollers \$0.73 per pound for coho on June 15 and increased prices by incremental steps during the season to reach a high of \$1.05 per pound on September 30. In terms of Washington state troll landings, a reduction of up to 800,000 lb. per year could be anticipated by a decline from 5.5 to 4.7 million lb. annually. In the context of U.S. coastwide troll coho catches, as reflected in total landings for the states of Washington, Oregon, California, and Alaska, this decline would be 4% or less (a decline from 19.2 to 18.4 million lb. annually).
8. The sport fisheries catch of coho salmon off the Columbia River and northward would increase by 9% with the new regulations. This change would result from the combination of larger chinook minimum size limits causing a shift in effort to coho and the greater abundance of coho available due to a delay in the troll season opening date. The coho size limit reduction would be of secondary importance. For the combined ocean sport catch of chinook and coho, little or no change in numbers of fish would be expected since the loss of small chinook would be largely counter-balanced by increased coho catches. It is

expected that the overall U.S. sport catch of coho would realize an additional 500,000 lb. under the new regulations.

9. For all U.S. and Canadian fisheries harvesting salmon stocks that are present at some time off the Washington coast, the proposed ocean fishing regulatory changes would result in a total poundage yield increase of about 1.1 million lb. annually from existing levels of chinook and coho salmon resources. This occurs primarily because chinook and coho would be caught at a larger average size. Three types of catch shifts are involved: (a) from early to later in the ocean fishing season for maturing chinook and coho; (b) from immature chinook to mature fish taken one season later in the ocean; and (c) from ocean fisheries to "inside" fisheries. Additional benefits would be derived by increasing spawning escapements to begin rebuilding currently depressed native salmon stocks. Minimum annual yield increases to U.S. fisheries would approximately net results for "gains" and "losses" predicted in Nos. 1 through 8, or about 400,000 lb. in the case of chinook and 400,000 lb. for coho.
10. The aggregate of Canadian salmon fisheries participating in the harvest of these stocks will also benefit from these increased yields to the extent of about 300,000 additional pounds annually (mainly chinook), even though one specific element, the troll fishery off the U.S. coast, will have to fish under somewhat more restrictive regulations than those prevailing in the past.

9.4.3 Selected Alternatives and their Impacts. A number of important alternative approaches to the specific regulations recommended in Section 9.4.1 merit serious consideration. In some cases, these alternatives may well prove, on further analysis, to be technically superior to the specific recommendations. In other cases, they offer means to solve controversial problems causing serious friction between competing resource user groups. Important alternatives to consider and their respective impacts are as follows:

1. Extension of the troll chinook 28-inch minimum size limit to the Oregon coast and/or California. A 28-inch total length minimum size limit for troll-caught chinook salmon off the Oregon coast and California would provide a better enforcement situation than differential size limits between the northern and southern management areas. However, strict enforcement of landing laws would also assist in alleviating the size limit differential problem. It is possible that a 28-inch size limit is partially justified off California and the Oregon coasts for the reason cited in Section 9.2.1 (Troll Chinook Minimum Size Limit), particularly with respect to the analysis by Bourque and Pitre (1972b).

The Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis Model, based on Columbia River chinook data, indicates that losses to the Oregon-California troll fishery would reach 8% for total pounds landed and 6% for landed value of the catch. The California Department of Fish and Game Salmon Population Simulation Model is in the process of being recalibrated with recently collected data on California and Oregon chinook stocks. An analysis based on these data is obviously preferable. However, it will be at least 3 months before processing and evaluation of these data will be completed.

expected that the overall U.S. sport catch of coho would realize an additional 500,000 lb. under the new regulations.

9. For all U.S. and Canadian fisheries harvesting salmon stocks that are present at some time off the Washington coast, the proposed ocean fishing regulatory changes would result in a total poundage yield increase of about 1.1 million lb. annually from existing levels of chinook and coho salmon resources. This occurs primarily because chinook and coho would be caught at a larger average size. Three types of catch shifts are involved: (a) from early to later in the ocean fishing season for maturing chinook and coho; (b) from immature chinook to mature fish taken one season later in the ocean; and (c) from ocean fisheries to "inside" fisheries. Additional benefits would be derived by increasing spawning escapements to begin rebuilding currently depressed native salmon stocks. Minimum annual yield increases to U.S. fisheries would approximately net results for "gains" and "losses" predicted in Nos. 1 through 8, or about 400,000 lb. in the case of chinook and 400,000 lb. for coho.
10. The aggregate of Canadian salmon fisheries participating in the harvest of these stocks will also benefit from these increased yields to the extent of about 300,000 additional pounds annually (mainly chinook), even though one specific element, the troll fishery off the U.S. coast, will have to fish under somewhat more restrictive regulations than those prevailing in the past.

9.4.3 Selected Alternatives and their Impacts. A number of important alternative approaches to the specific regulations recommended in Section 9.4.1 merit serious consideration. In some cases, these alternatives may well prove, on further analysis, to be technically superior to the specific recommendations. In other cases, they offer means to solve controversial problems causing serious friction between competing resource user groups. Important alternatives to consider and their respective impacts are as follows:

1. Extension of the troll chinook 28-inch minimum size limit to the Oregon coast and/or California. A 28-inch total length minimum size limit for troll-caught chinook salmon off the Oregon coast and California would provide a better enforcement situation than differential size limits between the northern and southern management areas. However, strict enforcement of landing laws would also assist in alleviating the size limit differential problem. It is possible that a 28-inch size limit is partially justified off California and the Oregon coasts for the reason cited in Section 9.2.1 (Troll Chinook Minimum Size Limit), particularly with respect to the analysis by Bourque and Pitre (1972b).

The Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis Model, based on Columbia River chinook data, indicates that losses to the Oregon-California troll fishery would reach 8% for total pounds landed and 6% for landed value of the catch. The California Department of Fish and Game Salmon Population Simulation Model is in the process of being recalibrated with recently collected data on California and Oregon chinook stocks. An analysis based on these data is obviously preferable. However, it will be at least 3 months before processing and evaluation of these data will be completed.

A technical analysis by the Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis Model of a common July 1 troll coho season opening off all three states predicts the following major impacts (as changes from specific proposals given in Section 9.8.1 and analyzed in Section 9.4.2).

- a. California troll coho poundage would decline by at least 25%, with increased hooking mortality losses for coho and increased fishing effort for chinook salmon expected. (NOTE: Evaluation by the California Department of Fish and Game indicates these losses would approach 50%.)
 - b. Oregon troll coho poundage would decline by 5 to 10%, but coho returns to Oregon coastal streams would increase by an estimated 15%.
 - c. California and Oregon coastal sport catches of coho would increase by about 15% due to a greater number of fish being available.
 - d. Both troll and sport fisheries off the southern Washington coast and Columbia River mouth would have somewhat increased catches since they operate on the same major stock as the Oregon and California fisheries (i.e., Columbia River coho), but have a mid-point in their normal seasonal catch pattern that is significantly late.
 - e. Harvestable returns of coho to the Columbia River system would increase by as much as 25%, while Washington coastal runs would increase slightly and Puget Sound or Canadian runs would not change significantly. (NOTE: Again, these changes are in addition to those projected for regulations listed in Section 9.4.1.)
 - f. Short-term yields from the coho resources would increase by at least an additional 400,000 pounds annually. Greater long-term benefits would depend upon whether or not additional coho spawners are needed in Oregon and California coastal streams (see Section 2.2.2, Coho Salmon; and Figure 1).
3. Retention of the Tillamook Head division line for chinook stock separation.

The Tillamook Head line for chinook stock separation was originally proposed on the assumptions that (a) it was the southerly extent of significant Columbia River chinook harvest; (b) it was a good landmark in terms of observation from the ocean; (c) it did not divide a major fishing area in which chinook salmon are normally abundant; (d) it was outside the single day fishing range from Columbia River mouth ports in Oregon and Washington; and (e) it provided the least possible impact on the troll coho fishery. Assumptions (a), (c) and (d) were not satisfied in 1977. Some of the best troll chinook catches of the season were taken immediately south of the Tillamook Head line, often during single day fishing trips from Columbia

River mouth ports. Available evidence indicates that these catches still had a high incidence of Columbia River chinook. While the area south of Tillamook Head was outside the normal single day operating range observed in the past, it was not outside the capabilities of fishermen as they responded to new, more restrictive ocean regulations in 1977.

The Tillamook Head stock separation line could be retained if 1977's good chinook catches were a rare exception and the normal situation in virtually all years was a consistent void in chinook abundance south of the line. If the 1977 situation was repeated with any degree of frequency, however, the changes predicted in Section 9.4.2 for chinook salmon will definitely not be realized. (NOTE: State laws prohibiting the landing of chinook less than 28 inches total length will be needed for Washington and Oregon ports north of either Tillamook Head or Cape Falcon.)

4. A reduction in early season troll fishing time for chinook salmon off the Washington coast and Columbia River mouth.

In analyzing predicted impacts of new ocean fishery regulatory controls, it is virtually impossible to forecast expected fishing effort changes that may occur in response to these controls.

In 1976, for example, trollers did not fish in April off the Washington coast and Columbia River mouth due to more restrictive state regulations and also lost a week of fishing time at the end of June due to a Federal court order (issued by the U.S. District Court of Oregon in U.S. v Oregon and Washington). In spite of losing three weeks from their normal season of recent years, total troll days fished for 1976 exceeded those of any seasonal total for the previous three years (Figure 15). (NOTE: The base comparison is limited to the 3-year period, 1973-1975, since mobile sport angling gear was legal for commercial fishing in the ocean prior to 1973.) The mid-season fishing effort was substantially above average in 1976 although contributing factors were (a) exceptionally favorable weather conditions on the ocean; (b) a good abundance of coho; (c) a late arrival of albacore in northern waters; and (d) high salmon prices.

In Section 9.2.4 (Troll Chinook Fishing Season), the evidence indicates that any further reductions in troll fishing for chinook salmon should initially be applied to the early season from May 1 to mid-June, not to an all-species fishery beginning on July 1. If increased effort during remaining open fishing periods approaches anything near that observed in 1976 as a "normal" situation, changes predicted in Section 9.5.1 will not occur. If reductions in the May 1 to mid-June troll season are needed to compensate for subsequent increases in fishing effort, the initial reduction should be a 10 to 15 day increment at the beginning of this early season (i.e., a closure until May 10 or 15).

In the event a 28-inch minimum size limit on chinook is not enforceable or achievable north of Tillamook Head or Cape Falcon, additional restrictions in the early troll and recreational chinook fisheries may be considered.

5. Concurrent commercial and recreational ocean fishing seasons off the Washington coast and Columbia River mouth.

Comparable fishing season dates were a traditional practice for commercial and recreational fisheries off the Washington coast and Columbia River mouth through 1975. Minimum size limits differed, however, and the trollers could not retain coho salmon until June 15. Justification for the equal

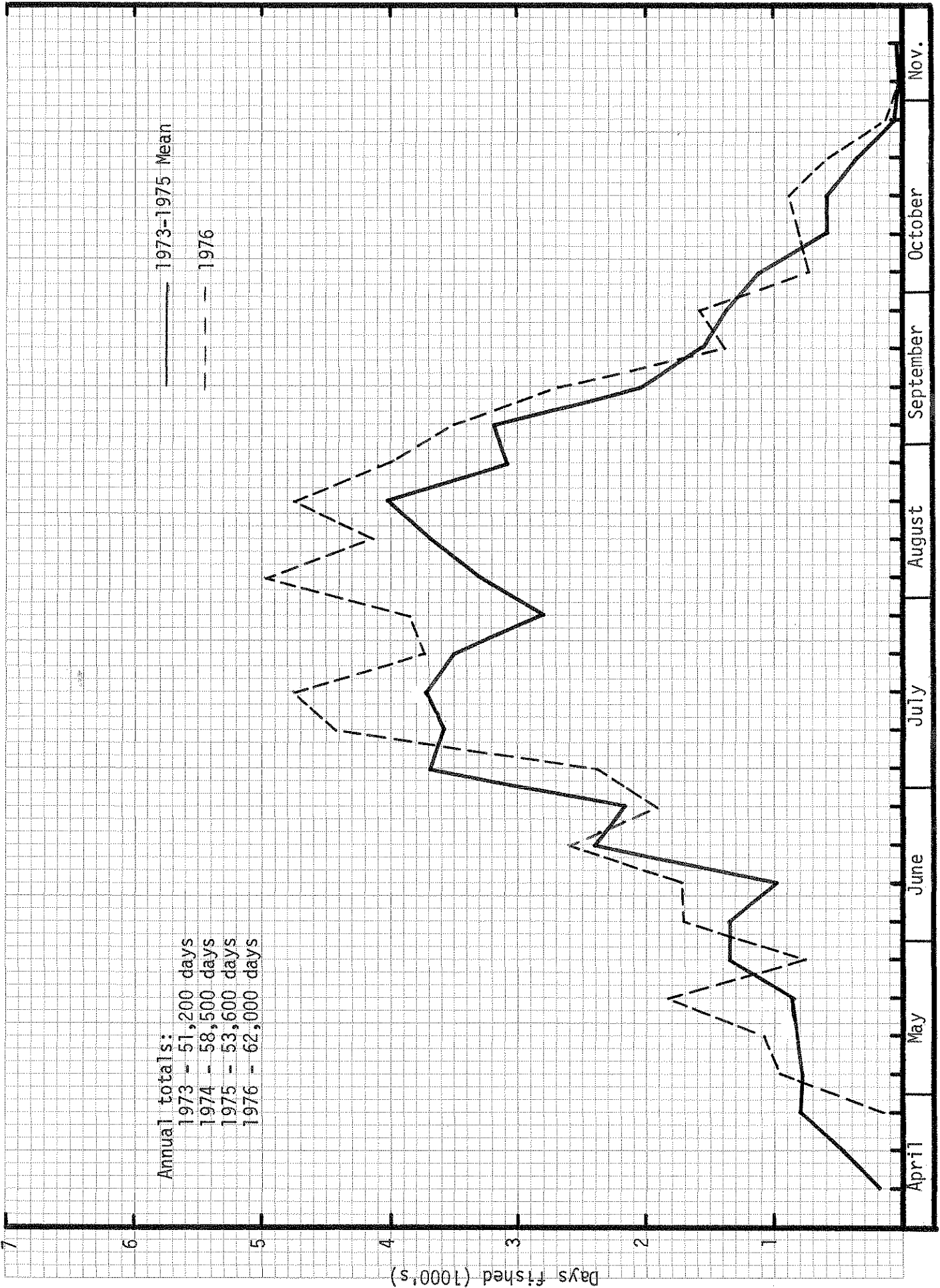


Figure 15. Washington's commercial troll effort, 1973-1975 mean and 1976, in days fished per week.

fishing seasons of the past is not well documented but appears to involve an intent to prevent possible friction between two major user groups. Until recently, equal seasons were not a problem, particularly since there was little interest in recreational angling in the ocean outside the troll season span and sport effort levels were very low at both the beginning and end of the common season.

With new demands on the salmon resources and higher ocean fishing rates, the issue of equal season has become a major problem. Section 9.1, Specific Management Objectives, indicates that the greatest weight should be given to managing each fishery on its own merits and for its own particular values. If this direction is to be followed, equal fishing seasons for both groups should occur only by coincidence, not by deliberate intent. The unequal seasons of 1977 caused serious friction between competing user groups, however, particularly during the two-week troll closure in late June when recreational anglers continued to fish. A return to equal seasons might, therefore, be justified for sociological reasons.

A shorter closure for both fisheries would not, however, yield the same degree of end results as a two-week troll closure alone. Sport fishing effort is much more compressed on a seasonal basis than troll effort, being comparable to troll effort by boats under 28 feet in length (Figure 16). (NOTE: Detailed average effort patterns for the four Washington coastal recreational fisheries are shown in Figures 4, 6, 8, and 10 of Phinney and Miller, 1977.)

6. Proposals Forwarded by the Department of State Reflecting the Views of the Canadian Government (See Section 4.2.2 and Appendix II).
7. Other Management Alternatives: (1) Alternatives included in Section 9.2 that are not discussed above will also be considered as management options during the plan finalization process. (2) Limited access as discussed in Section 10.5 will also be considered by the Council as a management option.

9.4.4 Specific Regulations Adopted by the Council

9.4.4.1 Washington and Columbia River Mouth (North of Cape Falcon, Oregon)

Commercial Troll

- a. An all-species commercial troll season, from July 1 through September 15.
- b. Required use of barbless, single hooks on all terminal troll gear during any early season salmon fishing prior to July 1 (bait hooks and hooks on plugs may be barbed). A barbless hook can be a hook with a flattened barb.
- c. A 28-inch total length minimum size limit for chinook salmon, 16-inch total length minimum size limit for coho, and no minimum size limit for other salmon species.
- d. An early season for all salmon species other than coho from May 1 through June 14.
- e. A late season all-species troll fishery from September 16 through October 31, south of Point Grenville in Washington.

187

- f. Unlawful to possess steelhead (a game fish).
- g. Foreign fishermen (Canadian trollers) subject to the same restrictions applicable to U.S. commercial fishermen.
- h. Indian treaty fishing

Minimum size limits	28 inches for chinook 16 inches for coho
Season	May 1 to October 31
Area	<u>Makah</u> : North of 48°07'36" north latitude (Sandy Point)
	<u>Quileute and Hoh</u> : South of 48°07'36" north latitude (Sandy Point) to 47°31'42" north latitude (mouth of Queets River)
	<u>Quinault</u> : 47°40'5" north latitude (Destruction Island) south to 46°53'3" north latitude (Point Chehalis).

Ocean Sport

- a. A general all-species season from the Saturday closest to May 1 through October 31.
- b. A 24-inch total length minimum size limit for chinook salmon, a 16-inch total length minimum for coho, and no minimum size limit for other salmon species.
- c. Angling gear defined as follows: angling shall mean fishing for personal-use and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish, to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.
- d. Adoption of current possession limits, annual limits, and other gear restrictions of the States of Oregon and Washington respectively except as noted above.
- e. A three-fish daily sport bag limit.

Ocean Nets

Prohibited.

9.4.4.2 California and Oregon Coast (South of Cape Falcon)

<u>Commercial Troll</u>	<u>Waters off Oregon</u>	<u>Waters off California</u>
-------------------------	--------------------------	------------------------------

Minimum size limits	26 inches for chinook 16 inches for coho None for other salmon	26 inches for chinook 22 inches for coho None for other salmon
---------------------	--	--

All salmon except coho season	May 1-October 31	April 15-September 30
-------------------------------	------------------	-----------------------

Coho Season	June 15-October 31	May 15-September 30
-------------	--------------------	---------------------

Vessel Certification	None	Beginning May 13
----------------------	------	------------------

Steelhead	Unlawful to possess steelhead (a game fish)	
-----------	---	--

Gear	Barbless single hooks required prior to coho season (bait hooks and hooks on plugs may be barbed). A barbless hook can be a hook with a flattened barb.	
------	---	--

Ocean Sport

Season

Oregon: Saturday closest to May 1 through October 31

California: North to Tomales Point - all year
South of Tomales Point - Saturday closest to February 15 through Sunday closest to November 15

Size limits

Oregon: 22 inches for chinook
16 inches for coho
No minimum size limit for other species

California: 22 inches for all species (exception, see daily bag limit)

Gear

Oregon:

Angling shall mean fishing for personal-use, and not for sale or barter, with one line attached to a pole held in hand or within immediate control while fighting or landing a fish, to which may be attached not more than one artificial or natural bait with no more than four single or multiple hooks.

California:

Angling only by closely attended hand line(s) or rod(s) and reel(s). No weight more than 4 pounds may be directly attached to the line by which the fish is retained.

Daily bag limit

Oregon and California: Three fish (in California two must be greater than 22 inches, one may be between 20 and 22 inches).

Possession limits, annual limits, and other gear restrictions

Oregon and California: Adoption of current regulations of the respective states, except as noted above.

Ocean Nets

Prohibited.

9.5 Specification of Optimum Yield (see Section 2.4, Estimate of Maximum Sustainable Yield)

This plan deviates from MSY by maintaining ocean troll and sport fisheries and recommends fishing rates to provide current availability of fish to "inside" fisheries and spawning escapements.

The net effect of these recommendations on certain major salmon stocks provides an example of the effect of modifying MSY to reflect economic and social (including legal) factors to achieve OY. The plan projects optimum yields (OY) of 16.7 million pounds for Columbia River fall chinook (3.8 million pounds less than MSY) and 35.9 million pounds for the five coho stocks described previously (7.8 million pounds less than MSY). The reasons for proposing a harvest of less than MSY are reflected in (1) the high recreational values; and (2) the higher market value per pound for troll relative to net-caught Columbia River fall chinook (due to both real and perceived quality differences and different market channels). Values under the plan include an estimated \$24.2 million for Columbia River fall run chinook (\$8.7 million more than the MSY value of \$15.4 million) and \$56.2 million for the five coho stocks (\$9.7 million more than the MSY value of \$46.6 million). Statistics cited are based on an analysis by the Washington State Department of Fisheries-National Bureau of Standards Catch/Regulation Analysis model. (NOTE: The optimum yield statistics are based on the specific regulation recommendations in Section 9.4.1. The Council-adopted regulations in Section 9.4.4 do not change these values.)

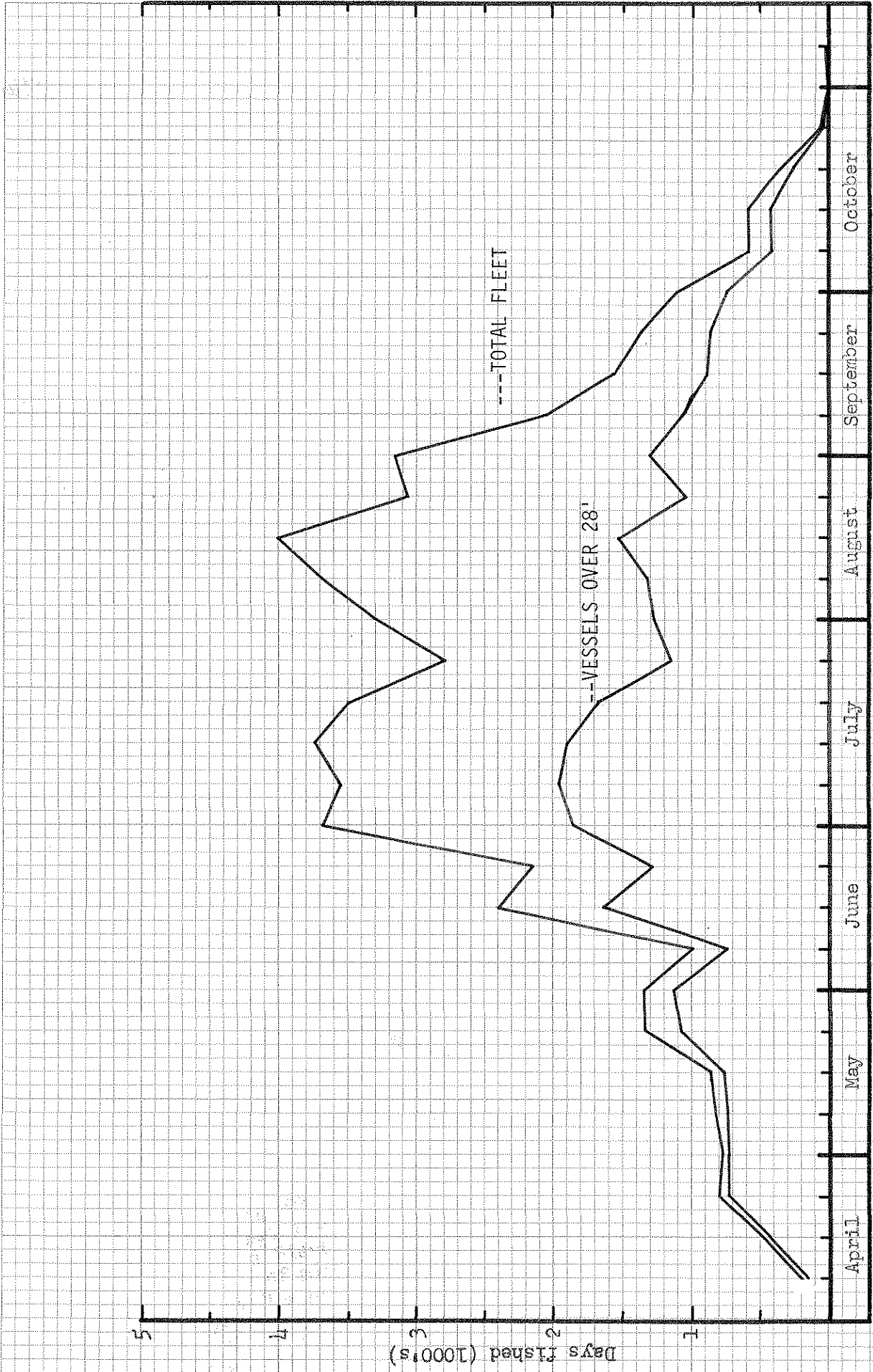


Figure 16. Washington commercial troll effort (days fished per week) by entire fleet and by vessels over 28 feet in length, 1973-1975 means.

10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFEL & ESSER CO. MADE IN U.S.A.

46 0700

Other considerations involved in preserving ocean troll and sport fisheries to achieve OY are:

1. Availability of salmon over a longer annual time period and in greater variety with a troll fishery.
2. The dislocation and community impact which would follow elimination of industries (troll fishery and charter boats) which form significant sectors of coastal employment alternatives.
3. Preservation of a life-style represented by troll fishing and charter boat operation; activities accessible with modest capital investments.

Factors justifying some significant transfer of fish to the inside fisheries and spawning escapements to achieve OY include:

1. Reduced catches of depleted fish stocks that will provide increased salmon production over the long-term.
2. Legal rulings that require certain quantities of fish to be provided for treaty Indian fisheries.
3. A reversal of past trends resulting in the brunt of conservation restrictions falling on inside fisheries in order to assure that adequate spawning escapements are provided.
4. Increased ocean fishing rates.

Current technology and availability of data do not permit direct quantification of all these factors. Thus, final determination of OY reflects the professional judgments and experience of the working team which prepared the plan, the Scientific and Statistical Committee, the Council, the Salmon Advisory Subpanel, and the citizen input through public hearings. The concept of optimum yield recognizes explicitly the multiple objectives of fishery management that were included in the Fishery Conservation and Management Act of 1976. The Act requires that relevant biological, economic and social factors must be considered in determining the "optimum" yield from a fishery which will provide the greatest overall benefit to the nation with particular reference to food production and recreational opportunities. The Act does not, however, specify precisely how various factors should be included or how they should be balanced against one another in the determination of optimum yield.

This fishery management plan represents OY by recommending management policies that modify estimates of MSY and reflect all the criteria established by PL 94-265 to the extent that information is available and the state of the art permits. To meet a mandatory requirement of this Act, best available estimates of MSY and OY for all salmon stocks present are provided in Table 17.

10.0 MEASURES, REQUIREMENTS, CONDITIONS, OR RESTRICTIONS SPECIFIED TO ATTAIN THE OBJECTIVES OF THE PLAN

10.1 Catch Limitations, Including Total Allowable Level of Foreign Fishing

The abundance of the stocks of U.S. Pacific Coast salmon that are available to the Washington, Oregon, and California ocean fisheries will vary considerably from

Other considerations involved in preserving ocean troll and sport fisheries to achieve OY are:

1. Availability of salmon over a longer annual time period and in greater variety with a troll fishery.
2. The dislocation and community impact which would follow elimination of industries (troll fishery and charter boats) which form significant sectors of coastal employment alternatives.
3. Preservation of a life-style represented by troll fishing and charter boat operation; activities accessible with modest capital investments.

Factors justifying some significant transfer of fish to the inside fisheries and spawning escapements to achieve OY include:

1. Reduced catches of depleted fish stocks that will provide increased salmon production over the long-term.
2. Legal rulings that require certain quantities of fish to be provided for treaty Indian fisheries.
3. A reversal of past trends resulting in the brunt of conservation restrictions falling on inside fisheries in order to assure that adequate spawning escapements are provided.
4. Increased ocean fishing rates.

Current technology and availability of data do not permit direct quantification of all these factors. Thus, final determination of OY reflects the professional judgments and experience of the working team which prepared the plan, the Scientific and Statistical Committee, the Council, the Salmon Advisory Subpanel, and the citizen input through public hearings. The concept of optimum yield recognizes explicitly the multiple objectives of fishery management that were included in the Fishery Conservation and Management Act of 1976. The Act requires that relevant biological, economic and social factors must be considered in determining the "optimum" yield from a fishery which will provide the greatest overall benefit to the nation with particular reference to food production and recreational opportunities. The Act does not, however, specify precisely how various factors should be included or how they should be balanced against one another in the determination of optimum yield.

This fishery management plan represents OY by recommending management policies that modify estimates of MSY and reflect all the criteria established by PL 94-265 to the extent that information is available and the state of the art permits. To meet a mandatory requirement of this Act, best available estimates of MSY and OY for all salmon stocks present are provided in Table 17.

10.0 MEASURES, REQUIREMENTS, CONDITIONS, OR RESTRICTIONS SPECIFIED TO ATTAIN THE OBJECTIVES OF THE PLAN

10.1 Catch Limitations, Including Total Allowable Level of Foreign Fishing

The abundance of the stocks of U.S. Pacific Coast salmon that are available to the Washington, Oregon, and California ocean fisheries will vary considerably from

Table 17. Estimated MSY and OY in millions of pounds round weight for all chinook and coho salmon stocks taken in ocean salmon fisheries off Washington, Oregon and California (see specific regulation proposals in Section 9.4.1)^{1/}

	Maximum Sustainable Yield (All Fisheries)	Optimum Yield (All Fisheries)
Chinook Salmon Stocks:		
Columbia River fall run	20.54	16.74
Oregon coast and California ^{2/}	13.12	9.84
Southern British Columbia ^{3/}	9.24	7.53
Puget Sound ^{4/}	6.16	5.02
Washington coast ^{5/}	3.70	3.01
Columbia River spring-summer run ^{6/}	2.88	2.34
TOTAL CHINOOK	55.64	44.48
Coho Salmon Stocks:		
Columbia River	17.97	14.49
Puget Sound	10.41	8.78
Southern British Columbia	8.18	6.79
Washington Coast	3.73	3.20
Oregon Coast	3.43	2.60
California ^{7/}	2.30	1.74
TOTAL COHO	46.02	37.60

^{1/} Source: Unless specifically noted otherwise, statistics are from the Washington State Department of Fisheries/National Bureau of Standards Catch/Regulation Analysis Model (see details in Section 9.3.1, Summary of Information Used in Assessing and Specifying MSY and OY). The OY yields were determined by simulating the fisheries expected to result from Section 9.4.1, Specific Regulation Recommendations. MSY yields were determined by setting all ocean fishing rates in the model at zero, thus simulating potential yields of fully mature fish escaping the ocean and being harvested only by "inside" fisheries.

^{2/} OY estimated at 90% of the average 1971-75 ocean troll and sport catches of chinook salmon off Oregon and California. OY estimated at 75% of MSY. Average size of sport caught chinook estimated at 8.55 lb., round weight.

^{3/} MSY and OY estimated at 45% of MSY and OY for Columbia River fall chinook. Based on comparative 1971-75 spawning escapement levels for the two areas.

^{4/} MSY and OY estimated at 30% of MSY and OY for Columbia River fall chinook. Based on comparative 1971-75 spawning escapement levels for the two areas.

^{5/} MSY and OY estimated at 18% of MSY and OY for Columbia River fall chinook. Based on comparative 1971-75 terminal fishery catches for the two areas.

^{6/} MSY and OY estimated at 14% of MSY and OY for Columbia River fall chinook. Based on a ratio of 7 to 1 for fall to spring-summer run chinook off the Washington coast.

^{7/} MSY estimated at 5% of all coho stocks. Ratio of MSY to OY comparable to Oregon coast stock.

year to year. At the highest conceivable level of present or future abundance they can be completely or adequately harvested by U.S. domestic fisheries. No specific quotas are needed.

Thus, there is no surplus of these stocks available for harvest by foreign fishermen. However, part of the foreign fishery will be affected by a reciprocal fisheries agreement between the Government of the United States and the Government of Canada. A previous agreement provides that Canadian fishermen may continue to fish within a portion of the Fishery Conservation Zone until December 31, 1977. The terms specified in any new reciprocal agreement will apply to Canadian fishing in the U.S. Fishery Conservation Zone.

Any of the regulatory measures adopted should also be applied as minimum standards for any Canadian troll fishery which is allowed to operate in waters under U.S. jurisdiction.

10.2 Time and Area Restrictions

See Section 9.4 for details.

10.3 Permits and Fees

No new domestic licenses, permits, or other forms of catch tax are proposed in the management plan above and beyond prevailing license and landing fee requirements of the individual states.

10.4 Types of Vessels, Gear, and Enforcement Devices

10.4.1 Prohibition of Net Fishing. Net fishing in the ocean has been banned since the late 1950's through an agreement between the Government of the United States and the Government of Canada. Further, the United States has formally objected to high seas fishing by Japan on U.S. stocks of salmon in the North Pacific.

While details of the Japanese fisheries vary from fisheries which might be considered by the Council, underlying principles of management are the same.

The basic reasons for the U.S. position on ocean net fishing are as follows:

1. Salmon fished on the high seas are mixtures of many stocks originating in different streams of greatly varying productivity and accordingly the stocks vary widely in allowable catch fractions. Thus it is difficult or impossible to harvest mixed stocks at any high rate without overharvesting some stocks. Greater total harvest can be achieved by catching the salmon where stocks have separated, typically as they move toward the streams of origin.
2. The maximum commercial utilization potential for salmon stocks occurs as the fish near maturity, typically as they approach or enter their streams of origin. Flesh quality of maturing salmon, just prior to the degeneration associated with spawning, is either at maximum or nearly equivalent to less mature stages. Additionally, it is adequately established that the greatest harvest weight occurs near sexual maturity because fish growth exceeds the weight lost from non-fishing mortality.

For these reasons, fishing with nets for salmon should not be permitted in waters under Council jurisdiction. A specific regulation should be adopted to prohibit such action.

10.4.2 Emergency Regulation Changes. It is recognized that there is a considerable chance of error in predicted impacts of new regulatory measures. Refinement of these pre-season expectations, such as through in-season analysis of catch and effort data, may indicate the need for emergency in-season changes in regulations. The authority of the Secretary of Commerce to enact such emergency regulations subsequent to appropriate Pacific Fishery Management Council recommendations is authorized under this plan.

It is not known at this time if any other types of emergency changes will be required during future ocean fishing seasons. This additional management flexibility should be present to meet unforeseen circumstances, however, particularly if practical methods to determine in-season ocean fishing rates are developed during tenure of the plan. An example would be the abnormally high ocean fishing rates which occurred in 1976. Record coho catches totaling 2.2 million fish were made by trollers and sport anglers off the Washington coast during 1976, yet coho returns to inside waters ranged from below average to record lows.

Another potential problem would be vulnerability of mature salmon due to abnormal weather conditions. In the past, low stream flows have occasionally caused milling problems for maturing adults off coastal river mouths and in coastal estuaries. A prolonged dry spell in Washington during 1958 even resulted in adults being taken in the ocean fisheries which exhibited pronounced spawning colorations and well-developed secondary sexual characteristics.

Members of the Salmon Management Plan Development Team appointed by the Pacific Fishery Management Council will be responsible for close in-season monitoring of the ocean salmon fisheries off Washington, Oregon, and California. Upon detecting any unexpected situation requiring consideration for emergency regulation action, the Team will immediately contact the Council's Executive Director. The Executive Director will plan for consideration of the problem at the next regularly-scheduled Council meeting or, if this approach is not appropriate, will convene an emergency telephone conference meeting of available Council members. In the case of emergency telephone conference meetings, all actions will be by a majority of those members polled and voting provided a quorum is achieved. The Executive Director shall exert a reasonable effort to contact all Council members, including non-voting members, and provide at least a forty-eight hour period to allow members to respond. In either case, the Team will provide a technical report specifying the problem. Each of the three State management agency directors may also bring critical situations requiring emergency regulation directly to the Pacific Council's attention. In this case, the State agency's professional management staff will provide its own unilateral technical report specifying the problem. Any action taken by the Council will be in the form of a recommendation to the U.S. Secretary of Commerce for emergency regulation change.

10.5 Limited Access of the Commercial Fishery. This plan demonstrates that excessive units of commercial gear exist in the ocean salmon fishery. It is becoming apparent that a limit of gear in this fishery might be a useful management tool.

The Fishery Conservation and Management Act of 1976 provides for limiting access to the fishery. An alternative for consideration is access limitation in the form of a moratorium on new participants in the ocean salmon troll and commercial passenger fishing vessel fleets to be instituted commencing in the 1979 season. In determining entrants to the fishery, the Council and the Secretary must take into account:

- (A) Present participation in the fishery;
- (B) Historical fishing practices in, and dependence on, the fishery;
- (C) The economics of the fishery;
- (D) The capability of fishing vessels used in the fishery to engage in other fisheries;
- (E) The cultural and social framework relevant to the fishery; and
- (F) Any other relevant considerations.

The Council declares an intent to limit access in the commercial troll and commercial passenger fishing vessel ocean salmon fisheries commencing in 1979. Qualifications for access will be, among other things, active vessel participation in the fishery in one or more base years which are declared to be 1974-1977 inclusive. The criteria for determination of "active vessel participation" shall be established in the 1979 comprehensive salmon plan. Access will also be permitted to those vessels purchased, contracted for construction, or actually under construction prior to December 16, 1977, in good faith anticipation of participating in the commercial salmon fishery or commercial passenger fishing vessel fishery in the Fishery Conservation Zone in 1979 as determined by the Pacific Fishery Management Council. The Council's limited access program shall also address such matters as transferability of permits, conditions to safeguard against any individual acquiring a disproportionate share of total fishing capability, criteria for determining "good faith" permit eligibility, the possible need for requiring no dual licensing and other factors as may be required under the Fishery Conservation and Management Act of 1976.

The Council also declares its intent to establish an appeals procedure to deal with "hardship cases." Details of the appeals procedure will be addressed in the 1979 comprehensive salmon management plan.

The moratorium could be instituted in one of two ways: by a federal permit system or by state imposed limitation on license issuance. It is envisioned that if a federal permit were necessary it would apply solely to fishing in the Fishery Conservation Zone (3-200 miles). It would not affect state licensing and landing systems.

10.6 Habitat Preservation, Protection, and Restoration

See basic reference documents listed in Appendix I (Environmental)

10.7 Development of Fishery Resources that are Underutilized or not Utilized by U.S. Fishermen.

Salmon are fully utilized by U.S. fishermen.

10.8 Estimated Management Costs and Revenues Associated with Proposed Measures

The high economic value of salmon resources, plus the complexities of their management, make salmon a dominant budget item for a number of Pacific Coast management agencies. Much of the work required for short-term management needs of the ocean salmon fisheries can be handled under existing programs already funded. Needs arising from additional management requirements under this plan, however, necessitate additional funding.

For example, estimated expenditures by the Pacific Fishery Management Council (as of 11/18/77) for the fiscal year beginning October 1, 1977, were as follows:

Phase I: Description of the socio-economic characteristics of the commercial and recreational salmon fisheries of Washington, Oregon, Idaho and California (contract to Oregon State Univ.)	\$119,837.
Study of the economics of the Washington State Charterboat Industry	17,963.
Phase II: Correct socio-economic information gaps identified by Phase I study	30,000.
Travel expenses for Salmon Management Plan Development Team	12,000.
Travel expenses for Salmon Advisory Subpanel	46,000.
TOTAL	<u>\$225,800.</u>

Enforcement of fishing regulations under this management plan will be a cooperative effort between the State enforcement agencies and the National Marine Fisheries Service. Various State fishing regulations, such as landing laws to enforce fishing closures and gear restrictions, will be required to make this plan effective. It is expected that these additional enforcement duties will require some increase in enforcement staffs; however, it is not known when increases in personnel and funding will be available.

10.9 State Landing Laws. The coastal states should structure landing laws and regulations to permit landing of only those fish which are permitted, under Department of Commerce Regulations, to be taken and retained in the FCZ waters adjacent to the port of landing, with the exception of ports adjacent to FCZ waters which are closed to all salmon fishing. Fish taken legally in other portions of the FCZ and state waters may be landed at such ports during periods when adjacent waters are closed to all salmon fishing.

10.10 Research Fisheries. The Secretary may, upon recommendation of the Pacific Council, allow in the Pacific Council Management Area limited research fisheries for scientific and research purposes as may be proposed by the Pacific Council, the Federal Government, State Governments, and Treaty Indian Tribes having usual and accustomed fishing grounds in the Pacific Council Management Area.

11.0 SPECIFICATION AND SOURCE OF PERTINENT DATA

11.1 Foreign Sector of the Fishery

11.1.1 In-Season Requirements. Canadian troll fishing effort will be continuously monitored via aerial boat counts in the U.S. fishery management zone by the Coast Guard and National Marine Fisheries Service. These counts will be provided to the Washington Department of Fisheries which will be responsible for providing current projections of total Canadian troll salmon fishing effort as needed for management considerations.

11.1.2 Finalized Catch and Effort Statistics. Basic catch and effort data will be collected by the Canadian Department of Fisheries and Environment under normal, established data systems. Statistics will be provided for troll salmon catches by species (in numbers of fish and pounds) and days fished. If effort data fail to equate with boat counts made by aerial monitoring, new measures will be needed to determine actual Canadian catch and effort in the U.S. fishery management zone.

11.2 Domestic Sector of the Fishery

11.2.1 In-Season Requirements. In order to provide the basic real-time catch and effort data base necessary for achieving rational management of the ocean salmon fisheries, a coastwide data system will be achieved by expansion of the Washington Department of Fisheries' Auxiliary Fish Catch Record System (AFCRS)(Pratt, 1975). This operational, on-line, computerized system has, in the past, successfully handled in-season catch and effort for all Washington salmon fisheries and the Oregon ocean sport fisheries.

Washington troll catch estimates by species are made on a weekly basis for five district-area categories (Puget Sound, LaPush, Westport, Willapa, Columbia River) through field examination of "key buyer" landing records. Washington ocean sport effort (angler trips) and catch estimates by species are made on a weekly basis for four ports (Neah Bay, LaPush, Westport, and Ilwaco) by application of field sample data (anglers per boat for charter and private boats, catch by species per angler) to WDF and U.S. Coast Guard boat counts. Oregon ocean sport effort data (angler trips) and catch estimates by species are made on a bi-monthly basis for eight ports (Columbia River, Garibaldi, Depoe Bay, Newport, Florence, Winchester Bay, Coos Bay, Brookings) by application of field sample data (anglers per boat for charter, skiff and pleasure boats, catch by species per angler) to ODF&W and U.S. Coast Guard boat counts.

Basic data are entered by common format from many agency sources to a central computer at the University of Washington and can be readily assessed in a variety of summary formats through the use of remote terminals. Data from the Oregon troll fishery as well as California and British Columbia ocean fisheries will be added to this system as methods of providing real-time catch and effort data are developed for each area. Remote terminal capabilities can be expanded to encompass any concerned fishery management agency, and appropriate new summary formats will be developed as new management needs arise.

Specifically, the basic statistical data required are salmon catches (in numbers of fish by species, existing statistical catch area, time period, fishing gear, and user group) plus effort data (days fished or number of landings for commercial fisheries, angler days for recreational fisheries).

11.2.2 Finalized Catch and Effort Statistics. Basic catch and effort data will be collected by the respective State fishery management agencies responsible

through normal, established data systems. Statistics will be provided annually on numbers of salmon taken in the commercial and recreational ocean salmon fisheries. Effort data will include number of licenses issued for both sectors of the fishery and participation levels in the form of days fished or number of deliveries for commercial vessels and angler trips for sportsmen.

11.3 Processors

State fishery management agencies and the National Marine Fisheries Service will continue ongoing programs of data collection and analysis at the salmon processor level.

12.0 RELATIONSHIP OF THE RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

12.1 Other Fishery Management Plans Prepared by a Council or the Secretary

To date, no salmon fishery management plans have been approved for the Pacific Coast except for salmon off Washington, Oregon, and California. A Fishery Management Plan for Commercial Troll Fisheries off the Coast of Alaska is being prepared by the North Pacific Fishery Management Council. A close degree of coordination will be required in this instance.

12.2 International Agreements

It is anticipated that the Government of the United States and the Government of Canada will maintain some form of reciprocal fisheries agreement which will deal with Canadian troll salmon fishing in the U.S. Fishery Conservation Zone. In no case, however, should Canadian trollers be permitted to fish under any less restrictive regulations than those applicable to U.S. fishermen.

12.3 Federal Laws and Policies

Responsibilities specified in Section 4.0 must be fulfilled.

12.4 State Laws and Policies

Responsibilities specified in Section 4.0 must be fulfilled. In addition, a number of "orderly fishery" issues must be considered. Washington permits a maximum of six troll lines. There is no limit on the number of lures or baited hooks that can be fished from each line. The use of angling or sport gear is prohibited for commercial salmon trolling in all waters. Further, commercial trolling and sport salmon fishing cannot be conducted simultaneously from the same boat, nor can sport salmon fishing be conducted from a vessel having commercially caught salmon aboard.

Regulations in the 3- to 200- mile offshore area must be coordinated with regulations inside Washington State waters in the following manner:

1. Coastal Fishing Area - Includes Washington Coast Commercial Salmon Management and Catch Reporting Areas 1, 2, 3, 4, and 4A:

Must conform to regulations recommended by the Pacific Fishery Management Council and adopted by the Secretary of Commerce.

2. Columbia River Troll Fishing Area - Includes Washington State waters inside and easterly of a line drawn from the tip of the north jetty to the tip of the south jetty and outside and westerly of a line projected from the inshore end of the north jetty to the knuckle of the south jetty:

Same as Coastal Fishing Area (above).