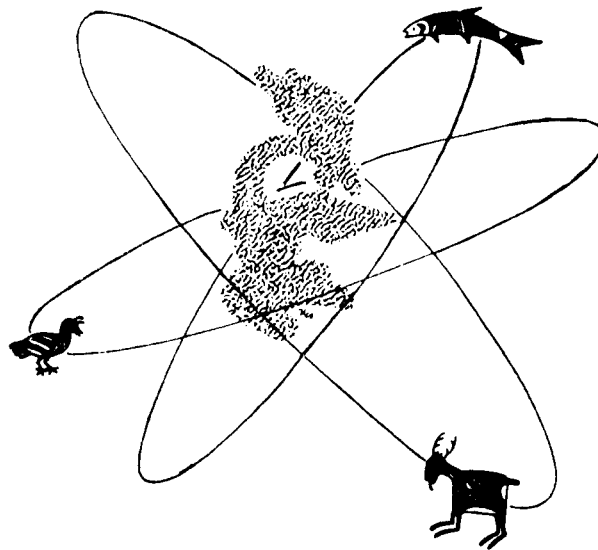


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Evaluation of a Selective Troll Fishery for Chinook
Salmon off the Oregon Coast during June 1980

EVALUATION OF A SELECTIVE TROLL FISHERY FOR CHINOOK SALMON
OFF THE OREGON COAST DURING JUNE 1980

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ABSTRACT

An experimental chinook-only season was established from June 16 to June 30, 1980, between Cape Falcon and Cape Blanco, with gear limited to 6-inch minimum plugs and whole bait. During this special season, 921 boats landed salmon in Oregon, representing 3,679 days of effort and 29,667 chinook salmon. The special season accounted for 9% of the total 1980 effort and 14% of the season's chinook landings. Logbooks provided information on the incidence of coho released per chinook landed. The coho:chinook ratio for dayboats was 0.47 and the ratio for trip boats was 0.36. From these ratios, the number of coho hooked and released was estimated to be 11,600. Applying a mortality factor of 30%, approximately 3,500 coho were lost during the special season, a relatively minor part of the 1980 coho stock. The concept of a selective fishery for chinook salmon appears promising. However, the scope of the evaluation in 1980 was limited and more detailed studies are necessary before the concept of a selective chinook fishery can be widely implemented during periods of concurrent coho abundance.

INTRODUCTION

In recent years, demands on Oregon's salmon resources have increased with the expansion of the commercial and sport fisheries. These demands, together with stream habitat degradation and unfavorable environmental conditions have resulted in the depressed condition of various salmon stocks. More restrictive regulations have been imposed on all user groups to provide adequate escapement for these depressed stocks. For the troll fishery, this has meant, among other restrictions shorter seasons, which have limited the trollers' ability to harvest all salmon stocks, including those in good condition. A selective fishery is a means of harvesting one stock or species, and at the same time, limiting the harvest of another. The extent to which it can be used as an effective management tool will depend upon the ability of the fishery to avoid incidental mortality of the depressed stock.

Traditionally, trollers have harvested coho and chinook salmon off the Oregon coast during June. The 1971-75 average troll landings for June were 227,843 coho and 27,528 chinook. However, in recent years, coho stocks in the OPI area^{1/} have declined to record low levels. Management decisions to provide adequate wild coho escapement during this period led to a June closure of the troll season for coho in 1979 and 1980.

However, Oregon coastal chinook stocks remain in a generally favorable status. Spawning escapements have increased in recent years and are at levels adequate to meet management goals for maximum production. In order to allow the harvest of these chinook, a special chinook-only troll season

^{1/} Includes all adult coho accounted for South of Leadbetter Point, WA through California.

was implemented in 1980 between Cape Falcon and Cape Blanco from June 16-30 (Figure 1). The southern boundary at Cape Blanco was established to protect Klamath River chinook stocks, and the northern boundary, at Cape Falcon, was established to protect Columbia River stocks. Columbia and Klamath River chinook stocks required protection to achieve escapement goals.

Selective fishing has long been practiced by salmon trollers for various reasons, including a desire to avoid undersize fish or to select for a species preferred for personal or price reasons (Zirges 1980). Techniques include basically four components: (1) selection of type and size of gear, (2) selection of depth the gear is fished, (3) selection of trolling speed, and (4) selection of areas with high concentrations of target species or low concentrations of the species to be avoided. Selectivity, in any case, depends on a combination of gear selection, technique, and commitment to avoid the unwanted species.

Gear selectivity studies were conducted by Boydston (1972) from April 24 to May 12 off northern California, Parker (1949) from May 23 to June 29 off southern Vancouver Island and northern Washington, Milne (1955) from June 29 to August 2, and Pitre (1970) from April 15 to June 15 off the west coast of Vancouver Island. These studies found differences in the selectivity of certain gear types for chinook and coho, although in some cases selectivity was also associated with lower catch efficiency. Generally, large plugs were found to be the most selective gear for chinook, particularly legal size fish. Whole bait was also fairly selective, followed by small plugs and large spoons (Table 1).

Based on the results of these studies, terminal gear during the June special season was limited to whole bait and 6-inch minimum plugs. These regulations, together with other techniques and fishing skills would hopefully

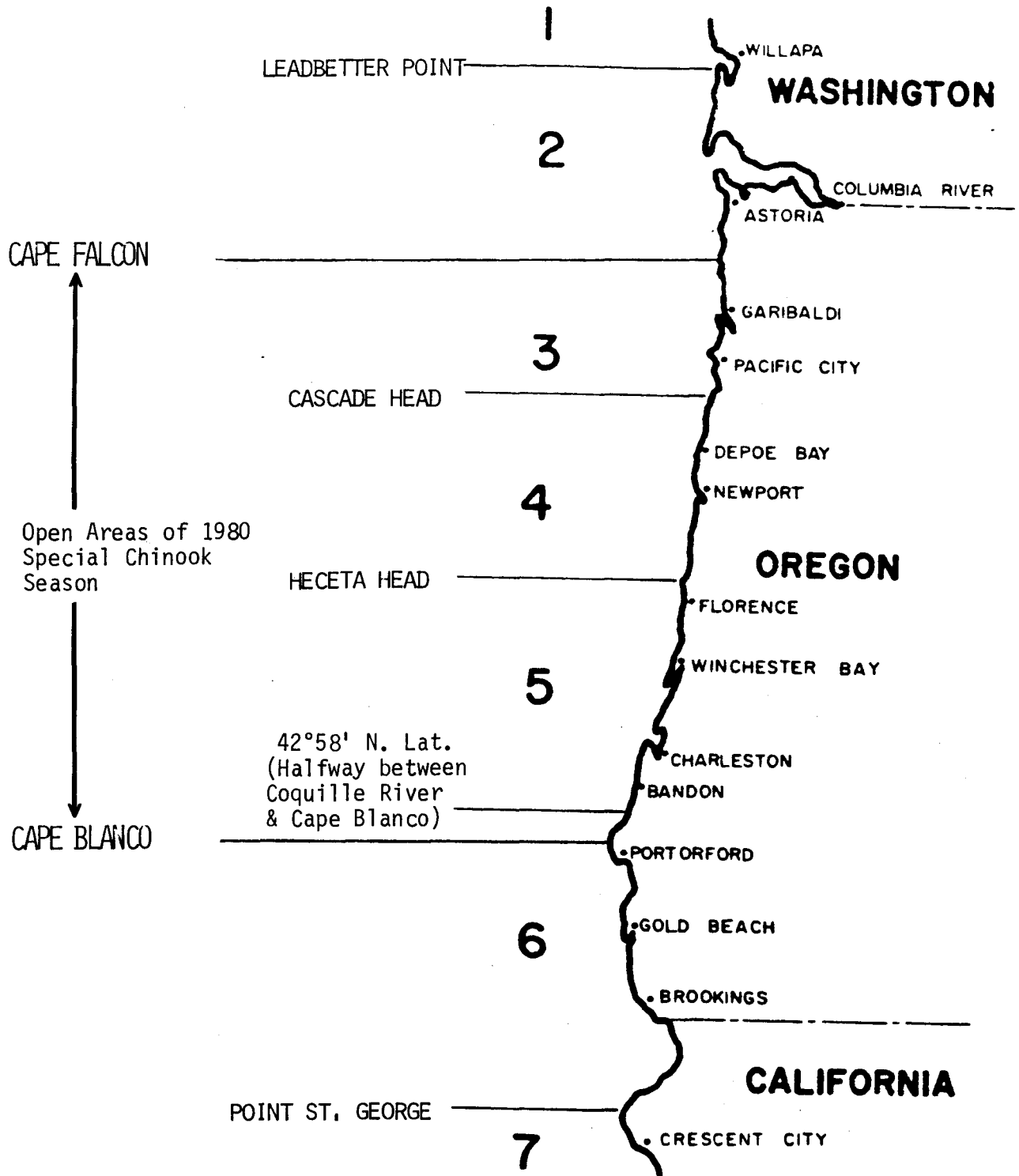


Figure 1. Troll Salmon Management Areas and Boundaries of 1980 Special Chinook Season.

limit the harvest of coho but at the same time allow a fishery on surplus coastal chinook stocks.

Table 1. Percentage chinook in the total salmon catch by each gear type tested by Boydstun (1972), Milne (1955), Parker (1949) and Pitre (1970).

Gear Type	Researcher			
	Boydstun	Milne	Parker	Pitre
Large Plugs	86%	91%	95%	42%
Small Plugs	-	71%	-	-
Whole Bait	83%	-	-	-
Large Spoons	79% ^{1/}	64%	-	39%
Small Spoons	70%	53%	44% ^{2/}	-
Hootchies	see large spoons	-	-	23%

^{1/} Large spoons and hootchies in combination on same trolling line
^{2/} Spoon sizes were mixed

Selective fishing for a species or stock is a potentially valuable management tool which may become increasingly important to ocean fisheries off Oregon. The evaluation of this special chinook-only season is therefore very important to ocean managers and fishermen alike. Some of the questions and concerns that were analyzed are:

1. What type of vessels participated in this selective fishery, and how was effort and catch distributed along the coast?
2. What were the benefits to trollers, in terms of the number and value of chinook landed?
3. How successful were trollers at selectively harvesting chinook, and what factors enabled fishermen to target on chinook: gear, location, ocean conditions?
4. How many coho were hooked and released during the June fishery, and what effect did this have on coho stocks?

METHODS

Effort, landings and value of chinook during the June season were summarized from fish receiving tickets returned by Oregon buyers from June 16 to July 6, 1980. Effort was derived from fish tickets in boat days by area and trip type. Effort and catch from tickets with unknown trip type were assigned to day boats and trip boats, based on the contribution of known day and trip boats. Dayboats were considered to be those vessels which reported one day fished, compared with trip boats which reported more than one day fished on fish receiving tickets. Ex-vessel value was calculated by multiplying pounds reported on fish tickets by the price paid per pound for each species and grade of salmon landed. Information about length and origin of boats was derived from license and permit files. All data presented in this report are preliminary, and subject to minor revision.

Observer and voluntary logbook programs were implemented to assess the incidental catch of coho salmon during the experimental chinook fishery. Logbooks were distributed to trollers who expressed interest in the evaluation, and several employees of Oregon Department of Fish and Wildlife served as on-board observers. Logbook fishermen and observers were asked to record information on days fished, general location of catch, gear, number of chinook landed, and coho released.

ODFW staff observed fishing operations on 14 vessels: 7 trip boats, 2 day boats in area 4; and 3 trip boats, 2 day boats in area 5. Of the 921 boats that landed salmon during the season, 35 (4%) participated in the voluntary logbook program, representing 6% of the total days fished and 6% of the total chinook catch. These 35 boats provided information on 97 trips: 24 trip boats, 11 day boats in area 4; and 29 trip boats, 33 day boats from areas 5 and 6. Estimates of incidental coho catch were based

on the ratios of coho released per chinook landed, as reported by observers and by fishermen who returned logbooks. Confidence intervals associated with coho:chinook ratios from logbooks were calculated by applying the following formula:

$$95\% \text{ CI} = (t.05) \sqrt{\frac{1}{n(n-1)} \bar{X}^2 \left(\sum_{i=1}^n Y_i^2 - 2R \sum_{i=1}^n X_i Y_i + R^2 \sum_{i=1}^n X_i^2 \right)}$$

where n = trips, X = chinook, Y = coho, $R = \frac{\text{coho}}{\text{chinook}}$.

RESULTS

Effort

A total of 3,700 boat days of effort were expended during the special chinook season, representing 9% of all boat days fished in 1980. The majority of effort (59%) occurred in area 5 (Heceta Head to halfway between the Coquille River and Cape Blanco) (Table 2, Figure 1).

Table 2. Estimated Effort and Chinook Catch by Area During 1980 Special Chinook Season.

Area	Effort		Chinook Catch	
	Est. Days	Percentage of assigned effort	Numbers	Percentage of catch assigned to areas
3-Cape Falcon to Cascade Head	113	3.6%	244	1.0%
4-Cascade Head to Heceta Head	953	30.5%	7,179	30.1%
5-Heceta Head to halfway between Coquille R. and Cape Blanco	1,836	58.7%	13,875	58.1%
6-Halfway between Coquille and Cape Blanco to Cape Blanco	225	7.2%	2,569	10.8%
Unassigned	552		5,800	
Total	3,679	-	29,667	-

The profile of vessels participating in the June season differs in several ways from the fleet profile for the entire 1980 season. The special season includes somewhat larger boats, as well as a higher proportion of trip boats, out-of-state vessels, and top-producing boats.

Although day boat effort predominated during the entire 1980 season, trip boats made up the majority of effort during the special season (Table 3). During June, approximately 61% of the reported boat days on fish receiving tickets were from trip boats and 39% were from day boats. In the entire 1980 season, 35% of the reported boat days were from trip boats and 65% were from day boats. A chi-square analysis showed that the trip-type distributions of June and the entire 1980 season were significantly different ($P < 0.01$).

Table 3. Effort (boat days) by trip type during the special season and the entire 1980 season.

Trip Type	Cape Falcon to Cape Blanco (June 16 - July 7)		Statewide (May 1 - November 30)	
	Boat days	Percentage	Boat days	Percentage
Day boats	1,453	39	25,789	65
Trip boats	2,226	61	13,847	35
Total	3,679	-	39,636	-

Boats participating in the special season were generally larger than those fishing during the entire 1980 season. The majority (69%) of vessels landing salmon during the June season were 30 to 50 feet in length (Figure 2). Of the total boats landing in Oregon during the special season, 74% were 30 feet or more in length, compared with 45% during the entire 1980 season.

A significantly larger percentage of out-of-state vessels participated in the special season than in the entire 1980 season ($P < 0.01$). Of all boats landing in Oregon during the June season, 27% were from Washington

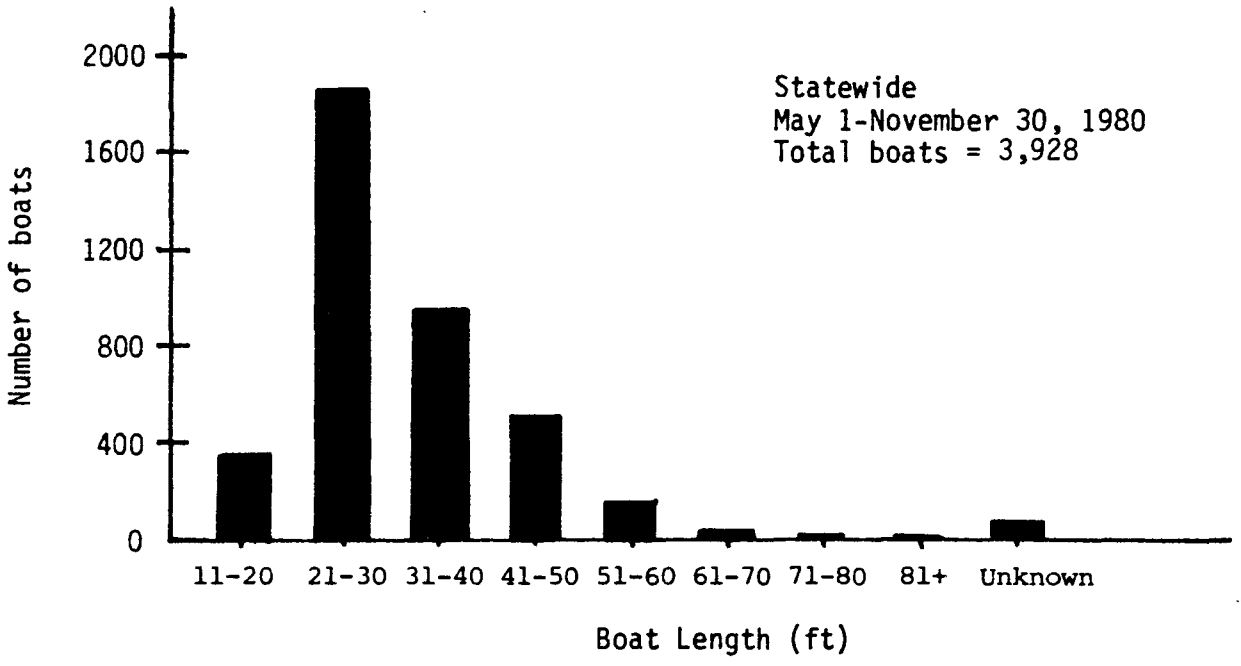
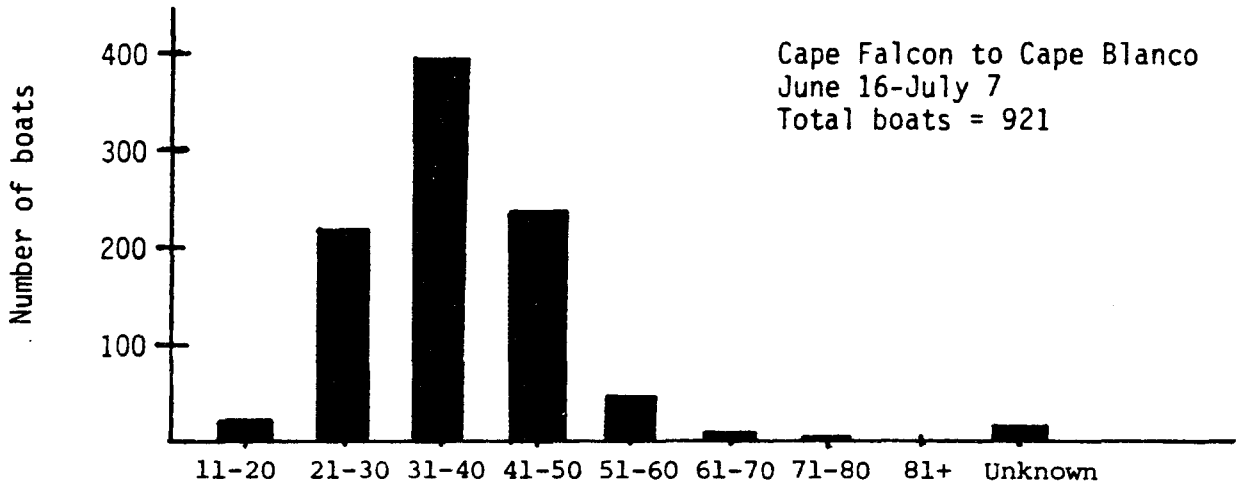


Figure 2. Oregon Troll vessel boat length distribution in June 1980 and entire season 1980.

and California, compared with 19% during the entire 1980 season (Table 4).

Table 4. The number of boats landing salmon in Oregon during the special chinook season and the entire 1980 season.

Vessel home state	Cape Falcon to Cape Blanco (June 16 - July 6)		Statewide (May 1 - November 30)	
	No. of boats	Percentage	No. of boats	Percentage
Oregon	659	72	3,159	80
Washington	137	15	376	10
California	115	12	335	9
Others & unassigned	10	1	58	1
Total	921	-	3,928	-

Several boats landing salmon in Oregon during the June season were among the largest producers of 1980. Of the top 200 boats (accounting for 33% of Oregon's total landings in 1980), 168 (84%) were Oregon vessels. Of these 168 boats, 142 (85%) landed fish during the special season.

Chinook Catch

The number of chinook landed in Oregon during the special season was 29,700 (311,300 pounds dressed), approximately 14% of Oregon's troll chinook landings for 1980. Area 5 showed the highest catch of chinook during the special season, representing 58% of the total landed in Oregon, followed by Area 4 (30%) and Area 6 (11%) (Table 2).

Trip boats landed 71% of the total catch during the June season compared to 29% for day boats. For the entire 1980 season, however, a much larger segment of the chinook catch was landed by day boats (42%), reflecting a relative increase in day boat effort after the opening of the all-species season July 14 (Table 5).

Oregon troll vessels accounted for 66% of the total catch, compared

with 19% and 15%, respectively, for Washington and California vessels. However, the catch by out-of-state vessels may be underestimated since boats from California and Washington may have landed fish in their home states during the 2-week season.

Table 5. Chinook catch (numbers) by trip type during special season and entire 1980 season.

Trip Type	Cape Falcon to Cape Blanco (June 16 - July 7)		Statewide (May 1 - November 30)	
	Number of Chinook	Percentage	Number of Chinook	Percentage
Day boats	8,465	29	87,424	42
Trip boats	21,202	71	122,046	58
Total	29,667	-	209,470	-

The estimated ex-vessel value of chinook landings in Oregon from the special season was \$686,000, approximately 13% of the total value of chinook and 8% of the total value of all troll-caught salmon landed in Oregon in 1980. No attempt was made to determine if the value generated was adequate to make the fishery profitable for individual participating vessels.

Impact on Coho Stocks

Logbook and observer data were used to assess the impact of the experimental fishery on coho stocks. Both programs resulted in small sample sizes and may not have adequately represented the fishery in terms of trip type, area or vessel origin. Since most vessels utilized only bait, there was not an opportunity to evaluate the relative efficiency and selectivity of bait and plugs. The combined data from all observers indicated that approximately 0.4 coho was released for every chinook landed, similar to data compiled from logbooks. Since logbooks provided larger sample sizes

than observer information in all trip-type and area categories, logbook information was used to estimate the number of coho released.

Trip boats in the more northerly areas 3 and 4 (Cape Falcon to Heceta Head) showed significantly lower ratios of coho per legal chinook (0.19) than trip boats in areas 5 and 6 to the south (0.46) (Heceta Head to Cape Blanco) (Table 6). There was no difference in the ratio for day boats by area (0.47 vs. 0.50). The higher incidence of coho per chinook for trip boats in the southern part of the state may be due to a more southerly distribution of coho along the coast during early summer.

Trip boats fishing for chinook in offshore reef areas such as Heceta Banks reported a low incidence of coho. Perhaps oceanographic conditions and resultant coho stock distribution patterns in 1980 allowed offshore fishermen to better target for chinook than those fishing in nearshore waters. However, this may not be the case in all years.

The ratios of coho per legal chinook from logbooks were applied to chinook landings by day boats and trip boats to estimate the incidental catch of coho (Table 6). The estimated coho hooked and released during the special chinook season was 11,600 with 1,700 from Cape Falcon to Heceta Head, 7,600 from Heceta Head to Blanco and 2,300 from unassigned areas. Trip boats accounted for 7,600 of the coho, compared to 4,000 for day boats. Estimates of mortality for coho hooked and released range from 16% to 44% (Wright 1972). Therefore, assuming a mortality rate of 30%, an estimated 3,500 coho were lost during the 2-week season, approximately 1% of the total coho landed by the troll fishery in 1980. However, confidence intervals associated with coho:chinook ratios are large, due to the high variability between fishermen sampled. It should also be noted that voluntary logbook data may involve two biases which we were not able to

assess quantitatively:

1. Fishermen may not report all coho caught and released.
2. The data from a voluntary logbook program may not be representative of the entire fleet.

Since both of these factors may tend to underestimate the coho catch, estimates presented are probably conservative.

Table 6. Numbers of chinook, ratios of coho to chinook, and estimates of coho caught by area and trip type during special 1980 chinook season.

Area	Trip type	Chinook	Ratio (Coho/Chinook)	95% Confidence Interval of Ratio	Estimated Coho Catch
Cape Falcon to Heceta Head ^{a/} (Area 3-4)	Day	802	0.50	±0.68	401
	Trip	6,621	0.19	±0.16	1,258
Heceta Head to Cape Blanco ^{b/} (Area 5-6)	Day	5,975	0.47	±0.24	2,808
	Trip	10,469	0.46	±0.15	4,816
Unassigned areas	Day	1,688	0.47 ^{c/}	-	793
	Trip	4,112	0.36 ^{c/}	-	1,480
Combined areas	Day	8,465	0.47 ^{c/}	-	4,002
	Trip	21,202	0.36 ^{c/}	-	7,554
Grand Total		29,667	0.39 ^{c/}	-	11,556

^{a/} Chinook catch from areas 3 and 4 were combined, and coho:chinook ratios from area 4 were applied to catch from the combined areas, since no logbooks were collected from area 3.

^{b/} Chinook catch from areas 5 and 6 were combined, and ratios from areas 5 and 6 were applied to the catch from combined areas.

^{c/} Ratios were estimated by pooling data from known areas.

Discussion and Recommendations

The selective chinook season in June 1980 was implemented to allow the harvest of coastal chinook and limit the harvest of depressed Oregon coho stocks. Based on observations and logbooks returned by trollers, the June fishery had a minimal impact on coho. The concept of a selective troll fishery for chinook salmon, therefore, appears promising. However, the scope of the evaluation in 1980 was limited, and more detailed studies are necessary before the concept of a selective chinook fishery can be widely implemented during periods of concurrent coho abundance.

In 1980, no special funds or manpower were allocated for the purpose of assessing the selective fishery. Since the observer program depended primarily on available agency volunteers, the amount of data collected by the observers was inadequate to fully assess the fishery. The logbook program also was limited in scope, due to the lack of manpower available for implementation and coordination of the assessment project.

If a special June troll season for chinook is considered in the future, a more detailed evaluation should be conducted to better estimate the impact on coho stocks. This will require:

1. An expanded onboard observer program
2. An expanded voluntary logbook program
3. Specific studies on gear selectivity and efficiency

An onboard observer program should be an integral part of the assessment, as a means of verifying logbook data. Additional seasonal personnel should be assigned as observers for the duration of the special season. Other agency personnel will also be encouraged to volunteer as observers. The objective of the assessment should be to observe as many vessels as possible, and to obtain data from a representative sample of the fleet.

The voluntary logbook program should also be expanded to adequately represent all areas and trip types, and to include out-of-state vessels. Logbooks and instructions should be mailed to all fishermen who participated in the 1980 special season, to attain maximum cooperation on a voluntary basis. For new participants in 1981, logbooks would be available through ODFW personnel (i.e. troll samplers) at each port. By modifying the format of logbooks, more specific information could be collected on techniques which allow fishermen to avoid catching coho: type and depth of gear, location, and distance offshore.

Additionally, a study should be implemented to determine the selectivity and efficiency of various gear types for chinook salmon. This would involve sampling aboard chartered vessels to test the effects of terminal gear combinations, depth of gear, and speed of trolling on species composition of the catch. The results of this study would provide a better basis upon which to recommend gear restrictions for a selective fishery.

Coordination of such an evaluation is a major task. Additional personnel will be needed to design and distribute logbooks, supervise observers, coordinate with fishermen, process data, and publish results.

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