OBSERVATIONS ON CHINOOK SALMON HOOK AND RELEASE IN THE 1988 SOUTHEAST ALASKA TROLL FISHERY

By

M. Seibel, A. Davis

J. Kelly and J.E. Clark

Regional Information Report No.[1] 1J89-41

Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

September 1989

---

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

AUTHOR

Mel Seibel is a biometrician for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 20, Douglas, Ak 99824.

Alan Davis is the troll fishery biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 304 Lake Street, Room 103, Sitka, AK 99835.

Jeff Kelly is an analyst/programmer for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 304 Lake Street, Room 103, Sitka, AK 99835.

John E. Clark is a biometrician for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 20, Douglas, Ak 99824.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the assistance of commercial trollers who volunteered to participate in the observer program. Appreciation is also extended to ADF&G fishery technicians who served as onboard observers.

PROJECT SPONSORSHIP

This investigation was financed with U.S./Canada Pacific Salmon Treaty funds, under Cooperative Agreement NA-88-ABH-00045.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

An onboard observer program was conducted to monitor incidental hook and release of chinook salmon during chinook non-retention periods of the 1988 Southeast Alaska summer troll fishery. Chinook non-retention regulations were implemented after chinook catch ceilings established by the Pacific Salmon Commission were reached and the troll fishery was closed to chinook but remained open for other species. Twenty volunteer troll vessels participated with observers logging 116.9 gear days (13.7 fishing hours per gear day). Observers recorded numbers, size and condition of chinook hooked and released, catch of other species, type of fishing gear, and fishing time and area. Average numbers of chinook hooked and released per unit fishing effort obtained from observer vessels were combined with estimates of total fleet fishing effort to estimate total numbers of chinook hooked and released. Average troll hook and release mortality rates obtained from an independent study were used to calculate total hook and release mortalities.

Chinook non-retention occurred during 47 days of the 1988 summer troll season. This was 13 days less than in 1987. The reduction in 1988 was due to a later summer season starting date (July 1 versus June 20 in 1987), and additional all species troll closures for coho conservation. An estimated 61.7 thousand legal size chinook (28 inch. or longer) and 91.7 thousand sublegal chinook (less than 28 inch.) were hooked and released during 1988 chinook non-retention periods. Using the Wertheimer (1989) hook and release mortality rate estimates of 22.1% and 26.0% for legal and sublegal size chinook respectively yielded estimated mortalities of 13.6 thousand legal size chinook and 23.9 thousand sublegal chinook. Minimum and maximum estimates of mortalities were also calculated using 90% confidence interval estimates for numbers of chinook hooked and released, and minimum and maximum mortality rate estimates derived by Wertheimer.

Estimated 1988 hook and release mortalities during chinook non-retention periods declined by 68 and 48 percent for legal and sublegal size chinook respectively compared to 1987. Reductions were due to fewer non-retention days and reduced chinook encounter rates during non-retention periods.

A number of measures were taken to reduce and minimize chinook hook and release mortalities during the 1988 season. The opening date of the 1988 general summer troll season was delayed 11 days until July 1, compared to June 20 in 1987, to reduce the duration of the chinook non-retention period. Several areas of frequent high chinook abundance were closed to all trolling during chinook non-retention periods to reduce chinook encounters while the troll fleet fished for coho and other non-chinook species. A public information program was continued in 1988 to advise fishermen of ways to reduce chinook encounters and to minimize hook and release injuries.

INTRODUCTION

An onboard observer program was conducted by the Alaska Department of Fish and Game (ADF&G) to monitor incidental hook and release of chinook salmon during chinook non-retention periods of the 1988 Southeast Alaska summer troll fishery. Chinook non-retention regulations were implemented during the 1988 season to ensure that the troll chinook catch, combined with chinook salmon catches in other Southeast Alaska fisheries, did not exceed the all-gear catch ceiling of 263,000 chinook salmon (excluding an allowance for Alaska hatchery chinook). This ceiling was established under the U.S./Canada Pacific Salmon Treaty. Chinook salmon catch ceilings and other chinook conservation measures have been implemented under the Treaty since 1985 as part of a 15-year coastwide rebuilding program for depressed natural chinook stocks.

Provisions of the Pacific Salmon Treaty require that incidental mortalities of chinook salmon be monitored in all fisheries on a coastwide basis, and that potential impacts of such mortalities on the natural stock rebuilding program be assessed. The Chinook Technical Committee of the Pacific Salmon Commission (the Treaty implementing body) is currently conducting this assessment. Treaty provisions also require that measures be taken to minimize the effects of such incidental mortalities on the rebuilding program.

Several measures were taken in 1988 to minimize incidental hook and release mortalities of chinook salmon by the Southeast Alaska troll fishery. First, several areas of frequent high chinook abundance were closed to all trolling for the remainder of the summer season. (Descriptions of these 1988 area closures are included as Appendix A.) Second, a public information program was conducted by ADF&G, in cooperation with the Alaska Trollers Association (ATA), to assist trollers in reducing chinook hook and release and associated mortalities. Trollers were advised to avoid areas of high chinook abundance encountered while fishing for coho and other non-chinook species. They were also advised to utilize fishing techniques, such as light leaders and small hooks, which would reduce incidental chinook hook and release. Finally, information was provided on release techniques which would help minimize injuries and mortalities of incidentally hooked chinook salmon. (A copy of an ATA informational leaflet distributed to trollers is included as Appendix B.)

Following the 1988 summer troll chinook season July 1-12, chinook non-retention regulations were implemented during the remainder of the summer season: July 13 through August 25, August 5-14, August 25-31, and September 4-20 (Table 1). (Complete troll closures were implemented during the other periods for coho management.) After the chinook closure, the troll fishery targeted primarily on coho salmon harvesting approximately 450 thousand coho, or 90 percent of the total season catch of 500 thousand coho salmon. During the same period, approximately 443,000 pink salmon (87% of the season total), 64,000 chum salmon (73%) and 6,400 sockeye salmon (70%) were also harvested. While fishing for other species, trollers were required to immediately release any incidentally hooked chinook salmon.

Funding for the 1988 onboard observer program to monitor incidental hook and release of chinook salmon in the troll fishery was provided by Pacific Salmon Treaty implementation funds. These funds are administered by the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration.

METHODS

Methods employed to monitor hook and release of chinook salmon during chinook non-retention periods of the 1988 Southeast Alaska troll fishery were similar to those used since 1985 as described in Davis et al. (1986) and (1987) and Seibel et al. (1988). ADF&G observers on board volunteer commercial troll vessels recorded hook and release of chinook salmon while vessels were engaged in fishing operations for other species of salmon. Observer effort was distributed throughout time and area to the extent possible given the availability of observers and volunteer vessels. Fishermen participating in the program received renumeration to compensate for additional expenses incurred as a result of accommodating onboard observers.

Trollers participating in the observer program received no special instructions regarding fishing areas or techniques, but were encouraged to conduct normal commercial fishing operations for coho and other non-chinook species. Salmon, excluding chinook salmon, legally retained by the fishermen were sold in the usual commercial markets with proceeds accruing to the fishermen. Incidentally hooked chinook salmon were released by fishermen using a standard technique of bringing the fish to the stern of the boat and disengaging the hook with a gaff, or release stick, without removing the fish from the water.

Observers recorded information on numbers, approximate size, and apparent condition of chinook salmon incidentally hooked and released by volunteer vessels while targeting on other species. Information on area and fishing time was also recorded. Fishing time was used to compute chinook hook and release rates per unit of fishing effort. Other information recorded included catches of coho and other non-chinook species, type of fishing gear, and depth of gear. A copy of the daily data collection form is included as Figure 1.

Observers were instructed to record the approximate size of chinook salmon incidentally hooked and released by two size categories: 28 inches or greater in overall length (legal size during troll chinook fisheries); or less than 28 inches (sublegal size). To prevent excessive handling of fish required for direct measurement, fishermen were asked to judge the size of incidentally hooked chinook salmon as to legal or sublegal size while releasing the fish.

The apparent condition of chinook salmon hooked and released was recorded by observers according to one of three categories.

1. Minor Injury - the fish was hooked near the outer portion of the mouth, little or no bleeding was observed, and the fish swam away quickly after being released;

2. Serious Injury - the fish was hooked in or near the gills or eyes, severe bleeding was observed, and the fish swam away slowly or appeared stunned after release;

3. Dead - the fish appeared to be dead, no swimming activity was observed, and the fish floated or sank upon release.

The estimated numbers of chinook salmon hooked and released per gear day for each period/area strata were calculated by dividing the total number of chinook salmon hooked by the total number of observer gear days in each strata. The variances of these estimates were calculated by averaging the squared deviation from this estimate of each daily observer estimate of chinook salmon hooked and released per gear day, weighted by the

number of hours in each daily observation. Standard errors of the estimates (square root of the variance divided by the square root of the number of observations) are also presented.

Average numbers of chinook hooked and released per unit fishing effort by observer troll vessels was expanded by the estimated total troll fleet fishing effort to estimate total numbers of chinook salmon hooked and released by all troll vessels during chinook non-retention periods. Estimates were initially calculated by time/area strata to account for spatial and temporal differences in chinook encounter rates; time/area estimates were then aggregated to yield total estimates. Strata sample variances were then used to calculate sample variances, standard errors and confidence intervals for estimates of total chinook hooked and released

To estimate total mortalities of chinook salmon hooked and released during 1988 chinook non-retention periods, total numbers of chinook hooked and released estimated from onboard observer data were multiplied by hook and release mortality rates obtained from an independent study by Wertheimer et al. (1988). (Although the observer program provides estimates of immediate mortality rates, i.e. the proportion of hooked and released chinook which are dead when released, it does not provide a direct estimate of delayed mortality rates, i.e. the proportion of live chinook released which subsequently die.)

RESULTS

Observers spent approximately 116.9 gear days (13.7 fishing hours per gear day) on board volunteer commercial troll vessels to monitor incidental hook and release of chinook salmon during chinook non-retention periods of the 1988 Southeast Alaska summer troll season (Table 2). Twenty different commercial troll vessels participated in the program. A total of 750 chinook salmon of all sizes were hooked and released by observer vessels during observer coverage periods (Table 3).

For purposes of this analysis, observer data on incidental hook and release of chinook salmon was combined within each of six different areas, three outside and three inside areas (Figure 2). Data was also combined within four different time periods, July 13-25, August 5-14, August 25-31, and September 4-20.

Distribution of observer effort among area strata in 1988 was similar to the distribution of fleet effort as shown in the table below:

Comparison of area distribution of onboard observer effort and troll fleet effort during the 1988 season.

	Observer Gear Days		Estimated[1/] Fleet Gear Days	
	Number	Percent	Number	Percent
North Outside	31.2	27%	4007	18%
Central Outside	20.3	17%	4281	20%
South Outside	22.0	19%	4352	20%
North Inside	35.3	30%	6606	30%
Central Inside	2.2	2%	803	4%
South Inside	5.9	5%	1726	8%
Totals	116.9		21775	

[1/] Fleet gear days estimated from aerial overflights and open fishing days (Appendix C).

The majority of the observer effort (63%), as well as the fleet effort (58%), occurred in the outside areas. Approximately 37 percent of the observer effort and 42 percent of the fleet effort occurred in inside areas.

Average catch and release rates for chinook salmon of all sizes by observer vessels during July 13-25 ranged from 3.8 chinook per gear day in the northern outside area to 15.5 in the northern inside area (Table 2) The second observation period, August 5-14 catch and release rates ranged from 5.1 in the central outside area to 13.5 in the southern outside. During the fourth period September 4-20, only the northern areas were open to fishing.

For all periods combined the average catch and release rate weighted by fleet effort was 6.3 chinook of all sizes per gear day (Table 2). Comparison of 1988 chinook hook and release rates during chinook non-retention periods with observations as reported by Davis et al. 1985, 1986, and Seibel et al. 1987 are shown below.

Comparison of chinook hook and release rates during chinook non-retention periods of the Southeast Alaska troll fishery.

Year	Average Numbers of Chinook Salmon Hooked and Released Per Gear Day		
	Legal Size (≥ 28 in.)	Sublegal Size (< 28 in.)	Total
1985	4.7	4.1	8.8
1986	3.5	4.7	8.2
1987	6.2	5.6	11.8
1988	2.8	4.2	7.0

The average catch and release rate of 7.0 chinook of all sizes per gear day in 1988 represented a decrease of 15 and 41 percent below the 1986 (8.2) and 1987 (11.8) rates respectively. For legal size chinook, the average rate of 2.8 fish per gear day in 1988 was a decrease of 55 percent from the 1987 rate of 6.2 fish per gear day, and 6 percent below the 1986 chinook per gear day. The 1988 rate of 4.2 sublegal chinook per gear day represented a decrease of 11 and 25 percent below 1986 and 1987 respectively.

The percentage of legal size versus sublegal size chinook hooked and released by observer boats in 1988 varied considerably by time and area. Percentages of legal size chinook ranged from 100 percent in the central outside area during the second period to 6.5 percent in the southern inside area during the first period. However, the overall season percentage of legal size chinook hooked and released, weighted by fleet effort for each time/area strata, was 40.2 percent. This is equivalent to a sublegal to legal chinook ratio of 1.5:1. As shown below, the relative proportion of legal size chinook hooked and released in 1988 declined from 1985 and 1987 but was similar to 1986 (Seibel et al. 1988).

Comparison of percentages of legal and sublegal chinook hooked and released during chinook non-retention periods of the Southeast Alaska troll fishery, 1985-88.

Year	Percentages of Chinook Salmon Hooked and Released: Legal Size (≥ 28 in.)	Sublegal Size (< 28 in.)	Ratio of Sublegal to Legal
1985	53.8%	46.2%	0.9:1
1986	42.7%	57.3%	1.3:1
1987	52.5%	47.5%	0.9:1
1988	40.2%	59.8%	1.5:1

Estimated Total Numbers of Chinook Hooked and Released

Total numbers of chinook salmon hooked and released during chinook non-retention periods of the 1988 Southeast Alaska summer troll season were derived from average chinook catch and release rates obtained from the onboard observer program, expanded by estimates of total fleet fishing effort in each of the time/area strata (Table 4). Estimates of fleet fishing effort were obtained from vessel counts made during aerial overflights expanded for total fishing days (for non-chinook species) during chinook non-retention periods (Appendix C).

An estimated 61.7 thousand legal size chinook salmon were hooked and released during 47 days of troll chinook non-retention in 1988 (Table 4). Lower and upper 90 percent confidence intervals were 50.1 and 73.2 thousand respectively. Approximately 91.7 thousand sublegal chinook were estimated to have been hooked and released during the non-retention periods. Ninety percent confidence intervals for sublegal chinook were 78.5 and 105.0 thousand.

Observed Condition of Chinook Hooked and Released

Observers recorded apparent condition of chinook salmon hooked and released according to three categories: minor injury, serious injury, or dead. Visual characteristics associated with each injury category were described in the Methods section. Within each size category, legal and sublegal, observer data on condition of released chinook was combined for all time/area strata. Hook and release injury rates are assumed to be independent of time or area.

For legal size chinook 28 inches and larger, 291 of which were observed during 1988, injury category percentages were as follows: minor - 89.3%; serious - 9.6%; dead - 1.0% (Table 5). For the 459 sublegal size chinook observed, injury category percentages were: minor - 75.2%; serious - 15.9%; dead - 8.9%.

Observer condition ratings in 1988 were similar to those reported by Davis et al. (1987) for 1985 and 1986 and by Seibel et al. (1988) for 1987 as shown below:

Comparison of observer condition ratings for chinook salmon hooked and released during chinook non-retention periods of the Southeast Alaska troll fishery, 1985-88

Year	Sample Size	Condition Categories: Minor	Serious	Dead	Serious + Dead
		Legal Size (28 inches or larger)			
1985	373	86.8%	10.7%	2.4%	13.1%
1986	121	84.3%	11.6%	4.1%	15.7%
1987	763	89.3%	9.0%	1.5%	10.6%
1988	291	89.3%	9.6%	1.0%	10.6%
Weighted Percents		88.3%	9.7%	1.8%	11.5%
		Sublegal Size (less than 28 inches)			
1985	791	71.8%	17.5%	12.9%	28.1%
1986	318	75.8%	12.9%	11.3%	24.2%
1987	831	73.0%	17.9%	9.0%	26.9%
1988	459	75.1%	15.9%	8.9%	24.8%
Weighted Percents		73.4%	16.7%	10.6%	27.3%

The percentage of incidentally hooked chinook salmon recorded by observers as dead when released was higher for sublegal than for legal size chinook in each of the four years. Davis et al. (1986) noted "The higher percent of sublegal size chinook categorized as dead appeared to be the result of more of the smaller fish drowning while being dragged on the gear." It is also noted that the percentage of seriously wounded was higher for

sublegal than legal chinook (average 16.7 versus 9.7 percent). Consequently, the percentage of seriously wounded plus dead was also higher, with an average of 27.3 percent for sublegal versus 11.6 percent for legal size chinook.

Estimation of Hook and Release Mortality Rates

To estimate total mortalities resulting from hook and release of chinook salmon by all vessels during troll chinook non-retention periods, it is necessary to estimate (1) total numbers of chinook hooked and released; and (2) total (immediate plus delayed) mortality rates for those fish. Numbers of chinook hooked and released during 1988 chinook non-retention periods can be estimated directly from the observer program as presented above. However, observer data does not allow direct estimation of total mortality rates. Although "immediate" mortality rates can be estimated from the percentage of chinook observed to be dead when released, the "delayed" mortality rate for chinook released alive but incurring either minor or serious injuries cannot be estimated from the observer study.

Numerous studies have been conducted which provide information on hook and release mortalities. Based on an extensive review of most studies conducted prior to 1970, Wright (1970) concluded that 15 to 45 percent was the most probable range of mortality rates for hook and release fisheries. He further concluded however, that for studies reviewed, "estimates above 30% are probably somewhat excessive since they are based either on control group experiments where seriously injured fish were included as total mortalities or on tank-holding experiments where the stress caused by artificial experimental conditions may have contributed materially to observed losses."

During 1986 and 1987, Wertheimer (1989 In Prep.) conducted studies in Southeast Alaska designed specifically to estimate total mortality rates of chinook salmon hooked and released by commercial troll gear. In these studies, chinook salmon hooked by chartered commercial troll vessels were transferred to large (1700 cubic meter) holding pens and held for five days to observe delayed mortalities. In 1986 observations were made on 506 chinook (108 legal size; 398 sublegal size) and in 1987 913 chinook (550 legal and 363 sublegal), for a total of 1,419 chinook of all sizes.

Maximum likelihood estimates of mortality rates (with 95% confidence intervals in parentheses) from the 1987 holding pen study were: legal size chinook - 19.0% (15.5 - 22.5%); sublegal size chinook - 18.3% (14.0 - 22.6%). By comparison, corresponding estimates from the 1986 study were: legal size chinook - 20.4% (9.0 - 31.9%); sublegal size chinook - 24.6% (20.1 - 29.0%).

In an attempt to adjust for potential negative bias in mortality rate estimates due to unmeasured mortalities occurring after the five-day holding period, Wertheimer also utilized information from two earlier tag/recovery studies used to estimate hook and release mortalities (Butler and Loeffel 1972 and Wright 1970).

Based on his 1986-87 studies, and information from the two earlier mortality studies, Wertheimer (op cit.) concluded that the most likely range of total (immediate plus delayed) hook and release mortality rates for troll gear fished commercially is as follows:

Total Mortality Rate Estimates			
Chinook Size Category	Low	Point	High
Legal size (≥ 28 inch.)	18.5%	22.1%	26.0%
Sublegal size (< 28 inch.)	22.1%	26.0%	26.4%

All studies used to estimate hook and release mortality rates contain some potential for bias due to different handling procedures used in the studies compared to normal commercial trolling operations. For example, additional handling of chinook salmon during studies for measurement or transfer to holding pens would be expected to contribute some positive bias (overestimation) in mortality estimates. Shorter time on gear during controlled studies compared to actual commercial trolling operations would be expected to result in some negative bias (underestimation). However, the net effect of these type of biases is thought to be small relative to total effects estimated by the Wertheimer studies.

The Wertheimer studies are considered to provide the best current information on probable mortality rates of chinook salmon hooked and released in the Southeast Alaska troll fishery. Therefore, mortality rate estimates provided by Wertheimer (op cit.) were used to derive estimates of total chinook hook and release mortalities during chinook non-retention periods of the 1988 troll fishery.

Estimation of Total Hook and Release Mortalities

Total mortalities of chinook salmon hooked and released during chinook non-retention periods of the 1988 Southeast Alaska summer troll fishery were estimated using (1) total numbers of chinook hooked and released as calculated from the 1988 onboard observer data, and (2) estimates of total mortality rates reported by Wertheimer (1989). Minimum and maximum estimates of total mortalities were also calculated using 90 percent lower and upper confidence interval estimates of total chinook hooked and released and minimum and maximum mortality rate estimates from Wertheimer (op cit.). Computations are summarized in Table 6.

An estimated 13.6 thousand legal size (≥ 28 inch.) chinook salmon incurred fatal hook and release injuries during chinook non-retention periods in the 1988 Southeast Alaska summer troll fishery. Minimum and maximum estimates for legal size chinook mortalities were 9.3 and 19.3 thousand respectively (Table 6).

A point estimate of 23.9 thousand was calculated for sublegal chinook (< 28 inch.) incurring fatal hook and release injuries during 1988 chinook non-retention periods. Minimum and maximum estimates for sublegal size chinook mortalities were 17.3 and 27.7 thousand respectively (Table 6).

Estimated incidental hook and release mortalities of chinook salmon during chinook non-retention periods of the Southeast Alaska troll fishery declined in 1988 compared to 1987. Legal size chinook mortalities declined by

68 percent from 42.8 thousand in 1987 (Seibel et al. 1988) to 13.7 thousand in 1988 (Table 6). Sublegal size chinook mortalities declined by 48 percent from 45.8 thousand in 1987 to 23.9 thousand in 1988. The decline in mortalities was due to fewer chinook non-retention days (47 in 1988 compared to 60 in 1987) combined with lower chinook encounter rates during non-retention periods. Average encounter rates declined from 6.2 legal size chinook in 1987 to 2.8 in 1988, and from 5.6 to 4.2 sublegal size chinook.

DISCUSSION

Chinook salmon catch limits and other chinook conservation measures have become progressively more restrictive in Southeast Alaska since 1980. Troll chinook seasons have been reduced and, concomitantly, chinook non-retention periods have increased. During 1982-88, non-retention periods averaged 44 days compared to no non-retention periods in 1980 and prior years (Figure 3).

Chinook conservation measures have increased since 1980 in response to both regional and coastwide conservation problems occurring during the 1970s and early 1980s for many natural chinook salmon stocks from Southeast Alaska to the Columbia River. Since 1985, chinook conservation measures have coordinated on a coastwide basis as part of a 15-year natural chinook stock rebuilding program initiated under the Pacific Salmon Treaty (Anon. 1985). Because of their wide-ranging ocean migration patterns, many north migrating chinook stocks contribute to numerous fisheries north of their rivers of origin, thus necessitating a coordinated coastwide management approach.

As a result of recent coastwide conservation measures, escapements for many natural chinook salmon stocks have increased. Based on analysis of data for chinook indicator stocks through 1987, the Chinook Technical Committee of the Pacific Salmon Commission concluded "For the 43 indicator stocks, average escapements since the Treaty increased over pre-Treaty averages for 34 (79%) and decreased for 9 (21%) stocks" (Anon. 1988). The Committee further concluded "Spawning escapements to the majority of indicator stocks remain below their spawning escapement goals, but the percentage of indicator stocks achieving escapement goals has increased from 8 percent in 1982 to 42 percent in 1987."

Because the troll fishery is the major directed chinook salmon fishery in Southeast Alaska, accounting for approximately 80 to 90 percent of the region's chinook harvest, this fishery has been the most heavily impacted by recent chinook conservation measures. However, these measures have reduced troll fishery impacts on chinook stocks contributing to this fishery.

For example, in 1988 the Southeast Alaska troll fishery, operating under imposed catch limits, harvested 232 thousand chinook salmon of which 162,000 or about 70 percent occurred during a 12-day summer season. By comparison, the fishery operating year around during 1951-53 harvested an average of 450 thousand chinook annually. As recently as 1978, the troll harvest reached 375 thousand chinook salmon during a year around fishery. Given current fleet efficiency and chinook abundance, it is likely that the 1988 troll harvest in the absence of any conservation measures would have substantially exceeded these levels. Thus, even taking into account the estimated hook and release mortality of approximately 13.6 thousand legal size chinook in 1988, the total impact of the troll fishery on legal size chinook in 1988 was reduced by perhaps half or more as a result

of catch ceilings and other conservation measures. Reductions in hook and release impacts on sublegal chinook have also occurred due to shortened troll seasons.

Although savings of chinook salmon due to current conservation measures in the troll fishery outweigh losses due to resulting incidental mortalities, the magnitude of such mortalities is substantial. To the extent that incidental mortalities can be reduced, benefits to users and chinook conservation can be increased. Therefore, incidental chinook mortalities should be reduced and minimized to the extent possible given other requirements for conduct of the fishery.

Measures Taken to Minimize Incidental Chinook Mortalities in the Southeast Alaska Troll Fishery

Regulatory actions have been taken to structure the overall Southeast Alaska troll season in a manner which minimizes incidental mortalities of chinook salmon. This structuring has taken into account the following overall troll fishery management objectives: (1) allow a troll chinook harvest consistent with all-gear catch ceilings established under the Pacific Salmon Treaty, and with catch allocations established by the Board of Fisheries; (2) provide troll fishery access to chinook salmon produced by Alaska hatcheries; (3) provide for a historical winter troll chinook season; (4) provide for troll harvest of coho and other non-chinook salmon species consistent with conservation objectives and Board-established catch allocations.

Chinook fishing time during the general, all-species summer troll season, defined by regulation as April 15 through September 30, has been reduced 93 percent from a full season of 169 days prior to 1980 to 12 days in 1988 (Figure 3). To help accomplish this, the opening date of the general summer troll season has been progressively delayed. During 1981-83, the opening date occurred on May 15; in 1984 and 1985 it occurred on June 5 and June 3 respectively; it was moved to June 20 during 1986-87; and in 1988 it was delayed until July 1. The July 1 opening in 1988 also represents a delay of fifteen days for beginning the troll coho season which normally opened June 15 by regulation. The Board has established later opening dates for the general, all-species summer troll season to reduce and minimize incidental chinook mortalities recognizing that some loss in harvest of non-chinook species would occur.

A winter troll season occurs in Southeast Alaska from October 1 through April 14 during which approximately 10 to 15 percent of the troll chinook catch normally occurs. (The percentage increased to approximately 25 percent in 1988 as a result of increased chinook abundance, and increased fishing effort due to increased chinook abundance and mild weather conditions.) The Alaska Board of Fisheries has placed a high priority on maintaining the winter troll fishery because of its historical importance to the small rural communities of Southeast Alaska. Under catch ceiling management, increased winter troll catches do reduce the number of chinook available for the summer season, with the potential for increasing chinook non-retention. Therefore, the Board has considered the possible need to limit the winter troll catches if it continues to increase above historical levels. (Preliminary data for 1989 indicates the percentage of the troll catch occurring during the winter season declined to 15 percent from 25 percent in 1988.)

In 1988, as in previous years, the Board authorized closure of several outer coastal areas of frequent high chinook abundance to all trolling during any chinook non-retention periods when the fleet continued fishing for other species (Appendix A). These closures are designed to reduce incidental hook and release of chinook salmon and further minimize incidental chinook mortalities.

Coastwide Incidental Chinook Salmon Mortalities

One objective of the coordinated, coastwide chinook salmon management program implemented under the Pacific Salmon Treaty is minimization of incidental chinook mortalities. Of immediate concern is the potential impact of such mortalities on the Treaty's 15-year coastwide natural chinook stock rebuilding program. A more general, long term concern, however, is the potential loss of chinook resource benefits resulting from incidental fishing mortalities.

Incidental chinook mortalities occur to some extent in virtually all commercial and recreational fisheries. The most common and probably largest source is that due to catch and release of sublegal size chinook salmon in fisheries with regulated chinook size limits. Incidental mortalities due to release of both legal and sublegal size chinook in chinook non-retention fisheries targeting on other species is also an importance source, and one which has increased with implementation of chinook catch ceilings under the Treaty. There is concern that this latter source of mortalities will increase further as chinook abundance increases in response to Treaty-imposed chinook conservation measures.

At the request of the Pacific Salmon Commission, the Commission's inter-agency Chinook Technical Committee conducted an initial investigation into the coastwide problem of incidental chinook mortalities in all troll, net and recreational fisheries from Southeast Alaska to central Oregon. The initial focus was on potential effects of such mortalities on the Treaty's coastwide natural chinook stock rebuilding program. Although this analysis has not yet been completed, the Committee did report some preliminary findings.

While complete information on coastwide mortalities was not available, the Chinook Technical Committee (1987) did conclude: "Information available from agency reports indicate that the coastwide magnitude of incidental fishing mortality for all sizes of fish is likely to be in the range of 30 to 50 percent of the reported catch." The Committee noted "Although a large portion of this incidental catch is young fish, this still represents a significant source of mortality". (For 1987, a preliminary catch of 2.2 million chinook salmon was reported to the Commission for fisheries from central Oregon to Southeast Alaska.)

It is not possible to totally eliminate all incidental fishing mortalities and still allow conduct of fisheries to harvest salmon surplus to spawning needs. However, to the extent that losses due to such mortalities can be reduced and minimized, additional resource benefits can be realized. In its report, the Chinook Technical Committee (op cit.) concluded: "The most practical and productive approach to address incidental mortality is to minimize such losses so as to achieve maximum productive utilization of the available abundance." The Committee recommended: "In particular, research and management programs to develop ways of minimizing incidental mortality losses should be designed in cooperation with the industry. Also, educational programs should be developed and expanded to disseminate information on methods of minimizing incidental mortalities."

The Pacific Salmon Commission is currently investigating ways of providing positive incentives for jurisdictions to reduce incidental mortalities of chinook salmon.

LITERATURE CITED

Anon. 1985. Treaty between the government of the United States of America and the government of Canada concerning Pacific Salmon. Pacific Salmon Commission. 600-1155 Robson Street, Vancouver, B.C. Canada V6E1B9.

Anon. 1988. 1987 Annual Report. Joint Chinook Technical Committee Report TCCHINOOK (88)-2. Pacific Salmon Commission. 600-1155 Robson Street, Vancouver, B.C. Canada V6E1B9.

Butler, J.A., and T.E. Loeffel. 1972. Experimental use of barbless hooks in Oregon's troll salmon fishery. Bulletin of the Pacific Marine Fisheries Commission. 8:24-30.

Chinook Technical Committee. 1987. Incidental fishing mortalities of chinook salmon in fisheries of concern to the Pacific Salmon Commission. Pages 1-29 of Chapter 2 in The Joint Chinook Technical Committee Report to the Pacific Salmon Commission. TCCHINOOK (87)-5.

Davis, A., J. Kelly, and M. Seibel. 1986. Observations on chinook salmon hook and release in the 1985 Southeast Alaska troll fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Southeast Region, Juneau, Alaska. 12 pp + appendix.

Davis, A., J. Kelly, and M. Seibel. 1987. Observations on chinook salmon hook and release in the 1986 Southeast Alaska troll fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Southeast Region, Juneau, Alaska. 19 pp + appendix.

Seibel, M., A. Davis, J. Kelly and J.E. Clark. 1988. Observations on chinook salmon hook and release in the 1987 Southeast Alaska Troll Fishery. Alaska Department of Fish and Game. Regional Information Report 1J88-22. Juneau, Alaska. 41 pp.

Wertheimer, A., A. Clewycz, H. Jaenicke, D. Mortensen, and J. Orsi. 1989. Size-related hooking mortality of incidently caught chinook salmon. In Prep. National Marine Fisheries Service, Auke Bay Lab., Juneau, Alaska. Draft Manuscript. 40 pp + figures.

Table 1. Preliminary 1988 Southeast Alaska troll fishery chinook and coho salmon catches by period.

Period (Number of Days)	Thousands of Fish Chinook	Coho[1/]
Winter Season		
October 1, 1987 - April 14, 1988	60.4	-
Summer Season		
April 15 - June 5 (52 days)	Closed	Closed
June 6 - June 29 (24 days)[2/]	8.7	-
July 1 - July 12 (12 days)	162.2	50.9
July 13 - July 25 (13 days)	Closed	96.9
July 26 - August 4 (10 days)	Closed	Closed
August 5 - August 14 (10 days)	Closed	189.9
August 15 - August 24 (10 days)	Closed	Closed
August 25 - August 31 (7 days)	Closed	101.3
September 1 - September 3 (3 days)	Closed	Closed
September 4 - September 20 (14 days)[3/]	Closed	60.8
September 21 - September 30 (10 days)	Closed	Closed
Summer Season Subtotals	170.9	499.8
1988 Season Totals	231.3	499.8[4/]

1/ Coho catches reported on fish tickets by date of catch, October 27, 1988.

2/ Experimental hatchery openings; open several days each week in six areas near hatcheries; open for chinook only June 6-14; open all species June 15-29.

3/ During September 4-20 the troll fishery was open to all species except chinook only in northern portions of the region (Districts 12, 14, 15, 16), Yakutat area, and EEZ north of Cape Spencer.

4/ Troll catches of other species included: Sockeye - 9,234; Pink - 508,077; Chum - 87,839.

Table 2. Observations on incidental hook and release rates for chinook salmon, and coho salmon catch rates in the 1988 Southeast Alaska troll fishery, from July 13 through September 20.

Area	Boat Days	Gear Days Observed	Average Catch Per Gear Day Chinook	Average Catch Per Gear Day Coho	Chinook/Coho Ratio Chinook Per 100 Coho	Chinook/Coho Ratio Coho Per Chinook
Sample Period: July 13 through July 25						
Northern Outside	16	16.0	3.8	18.0	21.2	4.7
Central Outside	8	5.6	3.6	5.4	66.7	1.5
Northern Inside	8	2.7	15.1	3.4	444.4	.2
Southern Inside	5	4.8	3.7	39.7	9.4	10.6
	---Period Subtotals---		----------Period Averages----------			
	37	29.1	4.8	17.8	26.8	3.7
Sample Period: August 5 through August 14						
Northern Outside	6	5.2	6.6	28.7	22.8	4.4
Central Outside	18	14.7	5.1	25.2	20.2	4.9
Southern Outside	17	17.3	13.5	20.4	66.2	1.5
Northern Inside	10	9.7	7.7	16.5	46.9	2.1
Central Inside	2	1.1	9.4	1.9	50.0	.2
Southern Inside	1	1.1	7.9	26.4	3.0	3.3
	---Period Subtotals---		----------Period Averages----------			
	54	49.1	8.9	21.7	41.0	2.4
Sample Period: August 25 through August 31						
Northern Outside	7	507	2.1	51.4	4.1	24.3
Central Outside	5	4.7	6.1	24.7	24.8	4.0
Northern Inside	14	10.9	6.7	2.2	30.4	3.3
Southern Inside	2	1.1	8.5	4.7	18.0	.6
	---Period Subtotals---		----------Period Averages----------			
	28	22.4	5.5	29.2	18.8	5.3
Sample Period: September 4 through September 20						
Northern Outside	5	4.3	2.3	9.7	23.8	4.2
Northern Inside	13	12.0	3.6	36.0	10.0	10.0
	---Period Subtotals---		----------Period Averages----------			
	18	16.3	3.2	29.0	11.2	8.9
	-----1988 Totals-----		----------1988 Averages----------			
	137	116.9	6.4	23.2	27.7	3.6

Note: An average gear day of 13.7 fishing hours is used based on past Fishery Performance Data.

Table 3. Numbers of chinook salmon hooked and released by onboard observer vessels during chinook closures of the 1988 Southeast Alaska summer troll fishery, estimated number of chinook salmon hooked and released per gear day, and standard error associated with this estimate.

Area[1/]	Observer Gear Days[2/]	Total Chinook	Chinook/ Gear Day	Standard Error	Chinook 28 Inches or Larger: Hooked and Released	% of Total	Gear Day	Standard Error	Chinook Less Than 28 Inches: Hooked and Released	% of Total	Gear Day	Standard Error
Period 1: July 13 - July 25 (13 days)												
Outside:												
Northern	16.02	61	3.81	0.96	37	60.7%	2.31	0.72	24	39.3%	1.50	0.34
Central	4.81	19	3.95	1.21	4	21.1%	0.83	0.46	15	78.9%	3.12	1.08
Southern	NA	---	---	---	---	---	---	---	---	---	---	---
Inside:												
Northern	2.61	40	15.3	5.51	25	62.5%	9.57	5.30	15	37.5%	5.74	1.12
Central	NA	---	---	---	---	---	---	---	---	---	---	---
Southern	4.81	18	3.74	1.66	6	33.3%	1.25	0.63	12	66.7%	2.49	1.04
Subtotal	28.26	138			72	52.2%			66	47.8%		
Period 2: August 5 - August 14 (10 days)												
Outside:												
Northern	5.19	34	6.55	1.95	20	58.8%	3.85	1.00	14	41.2%	2.70	1.26
Central	14.73	75	5.09	0.83	58	77.3%	3.94	0.70	17	22.7%	1.15	0.24
Southern	17.27	233	13.49	2.64	42	18.0%	2.43	0.58	191	82.0%	11.06	2.52
Inside:												
Northern	9.68	75	7.75	0.65	17	22.7%	1.76	0.55	58	77.3%	5.99	0.88
Central	1.06	10	9.43	5.68	8	80.0%	7.54	5.31	2	20.0%	1.89	0.37
Southern	1.14	9	7.92	NA	9	100.0%	7.92	NA	0	0.0%	0.00	NA
Subtotal	49.07	436			154	35.3%			282	64.7%		

--Continued--

Table 3. (page 2 of 2.)

Area[1]	Observer Gear Days[2]	Total Chinook	Chinook/ Gear Day	Standard Error	Chinook 28 Inches or Larger: Hooked and Released	Chinook 28 Inches or Larger: % of Total	Chinook 28 Inches or Larger: Gear Day	Chinook 28 Inches or Larger: Standard Error	Chinook Less Than 28 Inches: Hooked and Released	Chinook Less Than 28 Inches: % of Total	Chinook Less Than 28 Inches: Gear Day	Chinook Less Than 28 Inches: Standard Error
Period 3: August 25 - august 31 (7 days)												
Outside:												
Northern	5.68	12	2.11	0.68	11	91.7%	1.94	0.74	1	8.3%	0.18	0.15
Central	NA	---	---	---	---	---	---	---	---	---	---	---
Southern	4.73	29	6.12	1.65	29	100.0%	6.12	1.35	0	0.0%	0.00	0.00
Inside:												
Northern	10.91	73	6.69	0.91	11	15.1%	1.01	0.36	62	84.9%	5.68	0.71
Central	1.06	9	8.49	1.39	2	22.2%	1.89	0.45	7	77.8%	6.60	0.94
Southern	NA	---	---	---	---	---	---	---	---	---	---	---
Subtotal	22.39	123			53	43.1%			70	56.9%		
Period 4: September 4 - September 20 (17 days)[3]												
Outside:												
Northern	4.32	10	2.32	0.29	7	70.0%	1.62	0.49	3	30.0%	0.69	0.56
Central	NA	---	---	---	---	---	---	---	---	---	---	---
Southern	NA	---	---	---	---	---	---	---	---	---	---	---
Inside:												
Northern	12.01	43	3.58	0.91	5	11.6%	0.42	0.14	38	88.4%	3.16	0.85
Central	NA	---	---	---	---	---	---	---	---	---	---	---
Southern	NA	---	---	---	---	---	---	---	---	---	---	---
Subtotal	16.33	53			12	22.6%			41	77.4%		

[1] Refer to Figure 2 for description of areas.
[2] One gear day defined as 13.7 fishing hours based on past fishery performance information.
[3] Central and southern areas closed to all trolling September 4-20 for coho conservation.

Table 4. Estimated numbers of chinook salmon hooked and released by all vessels during chinook non-retention periods of the 1988 Southeast Alaska summer troll fishery.

Area	Estimated Number of Chinook Hooked and Released Per Gear Day: Total	Less Than 28"	28" or Larger	Estimated Fleet Gear Days	Estimated Total Numbers of Chinook Salmon Hooked & Released and Standard Error of Estimate: Total Number	Standard Error	Less Than 28" Number	Standard Error	28" or Larger Number	Standard Error
Period 1: July 13 - July 25 (13 days)										
Outside:										
Northern	3.81	2.31	1.50	1,040	3,959	999	2,402	748	1,558	356
Central	3.95	0.83	3.12	1,430	5,648	1,729	1,189	651	4,459	1,458
Southern[v]	13.49	2.43	11.06	2,184	29,461	5,776	5,311	1,262	24,150	5,506
Inside:										
Northern	15.30	9.57	5.74	897	13,728	4,940	8,580	4,755	5,148	1,001
Central[y]	9.43	7.54	1.89	273	2,574	1,550	2,059	1,450	515	100
Southern	3.74	1.25	2.49	845	3,162	1,404	1,054	533	2,108	875
Subtotal				6,669	58,532	8,132	20,594	5,251	37,938	5,883
Period 2: August 5 - August 14 (10 days)										
Outside:										
Northern	6.55	3.85	2.70	1,250	8,190	2,432	4,818	1,247	3,372	1,577
Central	5.09	3.94	1.15	1,990	10,129	1,653	7,833	1,383	2,296	471
Southern	13.49	2.43	11.06	1,720	23,202	4,549	4,182	994	19,020	4,336
Inside:										
Northern	7.75	1.76	5.99	1,120	8,679	724	1,967	575	6,712	988
Central[y]	9.43	7.54	1.89	390	3,677	2,214	2,942	2,072	735	143
Southern	7.92	7.92	0.00	650	5,148	3,100	5,148	3,100	0	0
Subtotal				7,120	59,025	6,662	26,890	4,323	32,135	4,744

--Continued--

Table 4. (page 2 of 3.)

Area	Estimated Number of Chinook Hooked and Released Per Gear Day: Total	Less Than 28"	28" or Larger	Estimated Fleet Gear Days	Estimated Total Numbers of Chinook Salmon Hooked & Released and Standard Error of Estimate: Total Number	Standard Error	Less Than 28" Number	Standard Error	28" or Larger Number	Standard Error
Period 3: August 25 - August 31 (7 days)										
Outside:										
Northern	2.11	1.94	0.18	714	1,508	484	1,382	526	126	104
Central[v]	5.09	3.94	1.15	861	4,382	715	3,389	598	993	204
Southern	6.12	6.12	0.00	448	2,744	606	2,744	606	0	0
Inside:										
Northern	6.69	1.01	5.68	1,750	11,710	1,584	1,765	635	9,946	1,234
Central	8.49	1.89	6.60	140	1,188	195	264	63	924	132
Southern[w]	7.92	7.92	0.00	231	1,830	1,102	1,830	1,102	0	0
Subtotal				4,144	23,364	2,208	11,373	1,620	11,989	1,262
Period 4: September 4 - September 20 (17 days)[x]										
Outside:										
Northern	2.32	1.62	0.69	1,003	2,323	291	1,626	494	697	564
Inside:										
Northern	3.58	0.42	3.16	2,839	10,167	2,595	1,102	389	8,984	2,403
Subtotal				2,464	12,489	2,612	2,808	629	9,681	2,468

--Continued--

Table 4. (page 3 of 3.)

Area	Estimated Number of Chinook Hooked and Released Per Gear Day: Total	Less Than 28"	28" or Larger	Estimated Fleet Gear Days	Estimated Total Numbers of Chinook Salmon Hooked & Released and Standard Error of Estimate: Total Number	Standard Error	Less Than 28" Number	Standard Error	28" or Larger Number	Standard Error
Totals For All Periods (47 days)										
Outside:										
Northern	3.99	2.55	1.44	4,007	15,980	2,689	10,227	1,623	5,753	1,716
Central	4.71	2.90	1.81	4,281	20,159	2,496	12,411	1,642	7,748	1,631
Southern	12.73	2.81	9.92	4,352	55,407	7,377	12,237	1,717	43,170	7,008
Inside:										
Northern	6.70	2.04	4.66	6,606	44,285	5,846	13,494	4,847	30,790	3,045
Central	9.26	6.56	2.71	803	7,439	2,710	5,265	2,529	2,174	219
Southern	5.87	4.65	1.22	1,726	10,139	3,577	8,031	3,333	2,108	875
Subtotal				21,775	153,409	11,054	61,666	7,020	91,743	8,050

[1] The estimated number of chinook salmon hooked and released in the Central Area in Period 2 are used due to no observations in the Central Area in Period 3.

[2] The estimated number of chinook salmon hooked and released in the South Area in Period 2 are used due to no observations in the South Area in Period 3.

[3] Only one estimate of catch and release of chinook salmon per boat day was obtained. Therefore, the standard deviation was calculated using the coefficient of variation for the central area.

[4] Central and Southern Areas were closed to all trolling September 4-20 for coho conservation.

Table 5. Comparison of the injury status of chinook salmon less than 28 inches versus chinook 28 inches or longer; hooked and released by onboard observer vessels while fishing for other species during the 1988 Southeast Alaska summer troll fishery.

Size	Hooked and Released by ---Observer Vessels---- Number	Percent	Injury Status----- Minor Injuries---- Number	Percent	Serious Injuries--- Number	Percent	Dead Number	Percent
Period 1: July 13 - July 25 (13 days)								
28" or Larger	72	52.2%	66	91.7%	5	6.9%	1	1.4%
Less than 28"	66	47.8%	47	71.2%	12	18.2%	7	10.6%
Period 2: August 5 - August 14 (10 days)								
28" or Larger	154	35.3%	137	89.0%	16	10.4%	1	0.6%
Less than 28"	282	64.7%	215	76.2%	37	13.1%	30	10.6%
Period 3: August 25 - August 31 (7 days)								
28" or Larger	53	43.1%	46	86.8%	6	11.3%	1	1.9%
Less than 28"	70	56.9%	52	74.3%	16	22.9%	2	2.9%
Period 4: September 4 - September 20 (17 days)								
28" or Larger	12	22.6%	11	91.7%	1	8.3%	0	0.0%
Less than 28"	41	77.4%	31	75.6%	8	19.5%	2	4.9%
Total For All Periods Combined (47 days)								
28" or Larger	291		260	89.3%	28	9.6%	3	1.0%
Less than 28"	459		345	75.2%	73	15.9%	41	8.9%

Table 6. Estimates of total mortalities of chinook salmon hooked and released during chinook non-retention periods of the 1988 Southeast Alaska summer troll fishery.

	Total	28" or Larger	Less Than 28"
Estimated Total Chinook Hooked and Released			
Point Estimate	153,409	61,666	91,743
Lower 90% C.I.	135,225	50,118	78,501
Upper 90% C.I.	171,593	73,213	104,986
Estimated Mortality Rates (Wertheimer 1989)			
Point Estimate		22.1%	26.0%
Minimum Estimate		18.5%	22.1%
Maximum Estimate		26.4%	26.4%
Estimated Total Hook and Release Mortalities			
Point Estimate[1/]	37,481	13,628	23,853
Minimum Estimate[2/]	27,988	9,272	17,349
Maximum Estimate[3/]	45,301	19,328	27,716

Computational formulas for each size category:

1/ (Total mortality point estimate) = (Point estimate of total chinook hooked and released) x (mortality rate point estimate)

2/ (Total mortality minimum estimate) = (Lower 90% C.I. estimate of total chinook hooked and released) x (Minimum mortality rate estimate)

3/ (Total mortality maximum estimate) = (Upper 90% C.I. estimate of total chinook hooked and released) x (Maximum mortality rate estimate)

Figure 1

Daily Data Log
Troll Fishery Observer Program
Incidental Hook and Release of Chinook Salmon

Date____/_____/_____ Approx. Hours Fished_____

Locations Fished: Stat. Area(s)_____
Common Names (Nearest headlands)_____

Catch of non-chinook species: Coho_____; Pink_____; Chum_____; Sockeye_____

Incidental Chinook Hook and Release Data

	Size		Injuries			Distance to Shore	Gear Depth	Depth Fish Hooked	Gear				Gear Description / Comments
	Legal	Sublegal	Minor	Serious	Dead	(miles)	(fath.)	(fath.)	Herring	Hootchy	Spoon	Plug	
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13.													
14.													
15.													
16.													
17.													
18.													
19.													

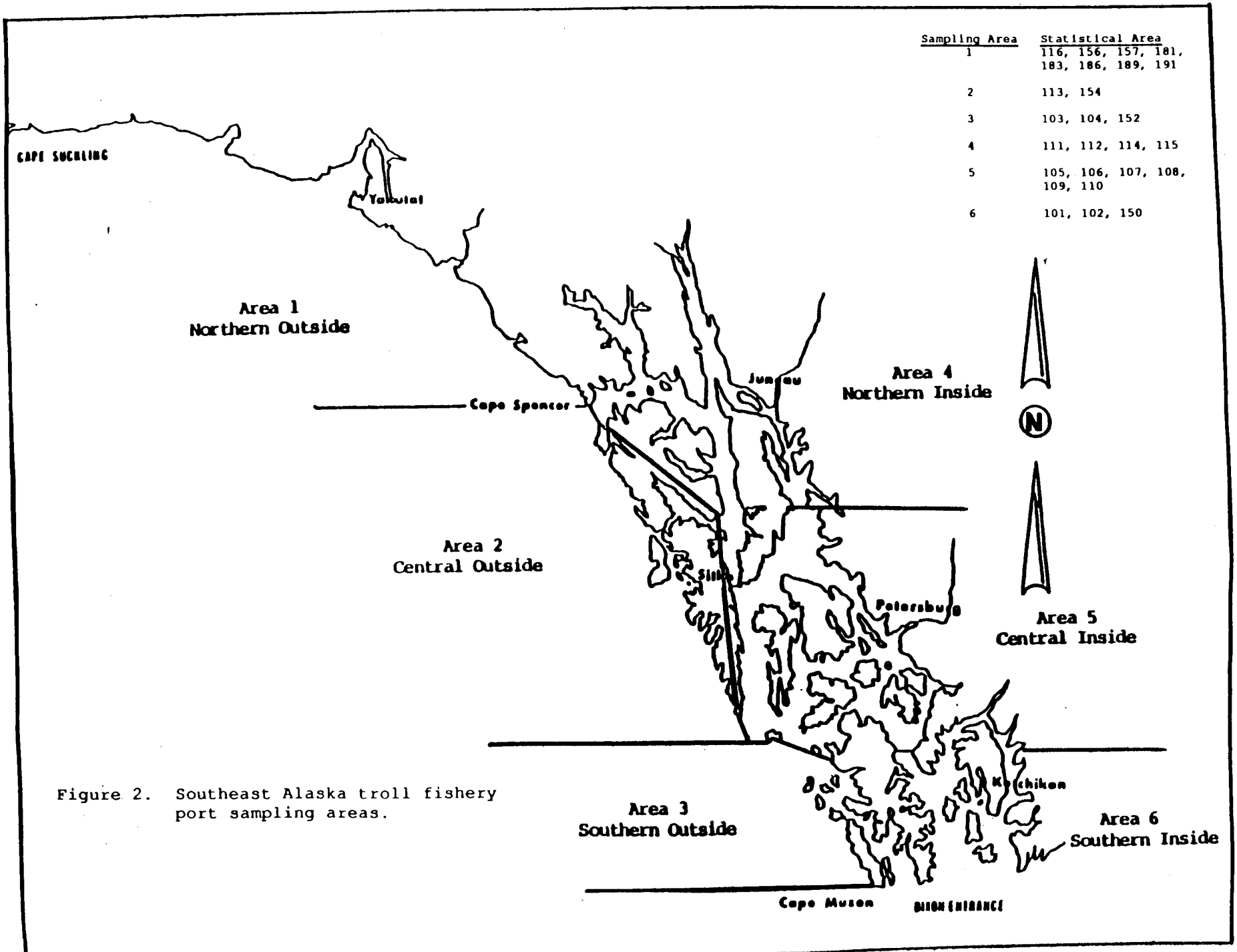


Figure 2. Southeast Alaska troll fishery port sampling areas.

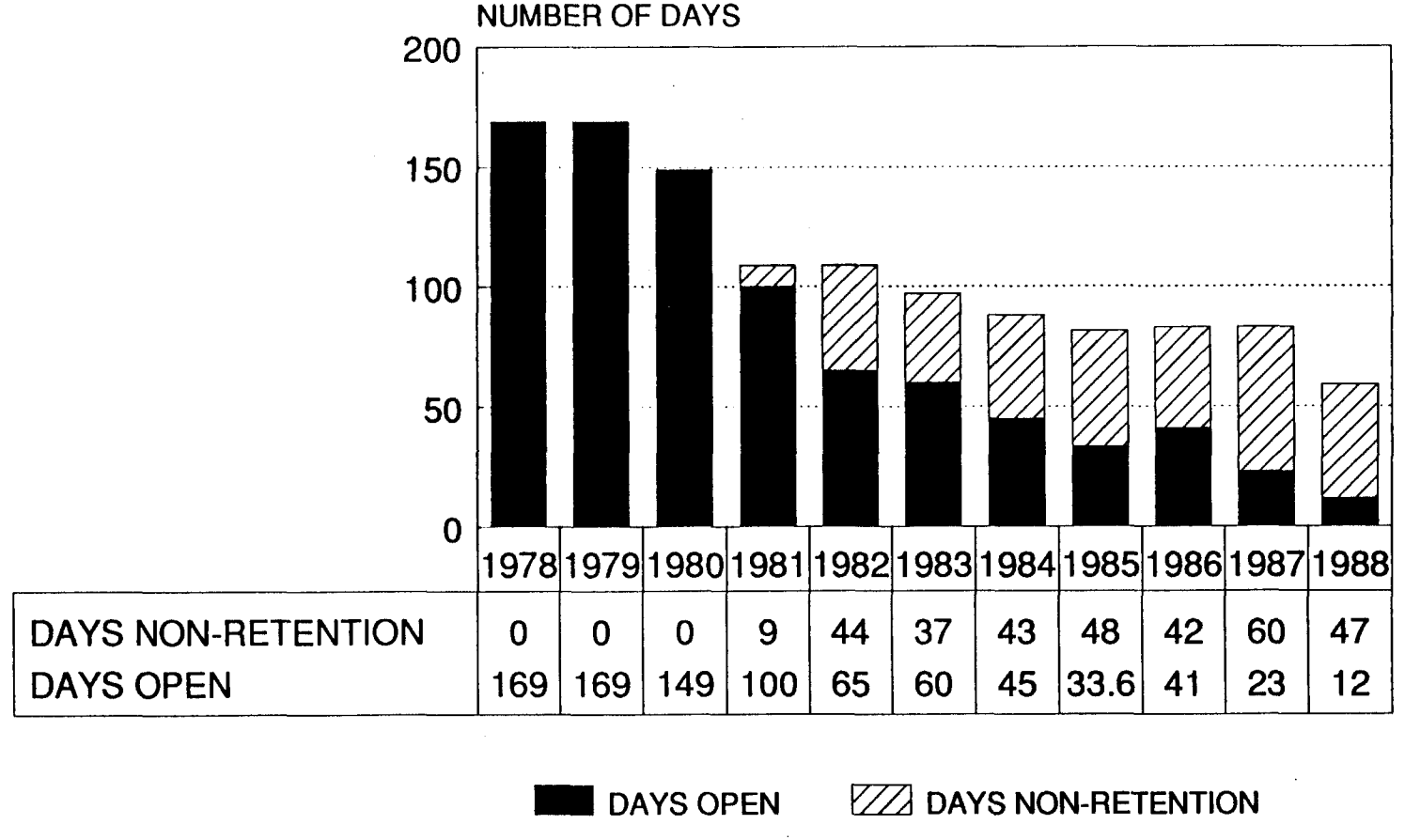


Figure 3. S.E. Alaska summer troll chinook fishing days and non-retention days, 1978-88.

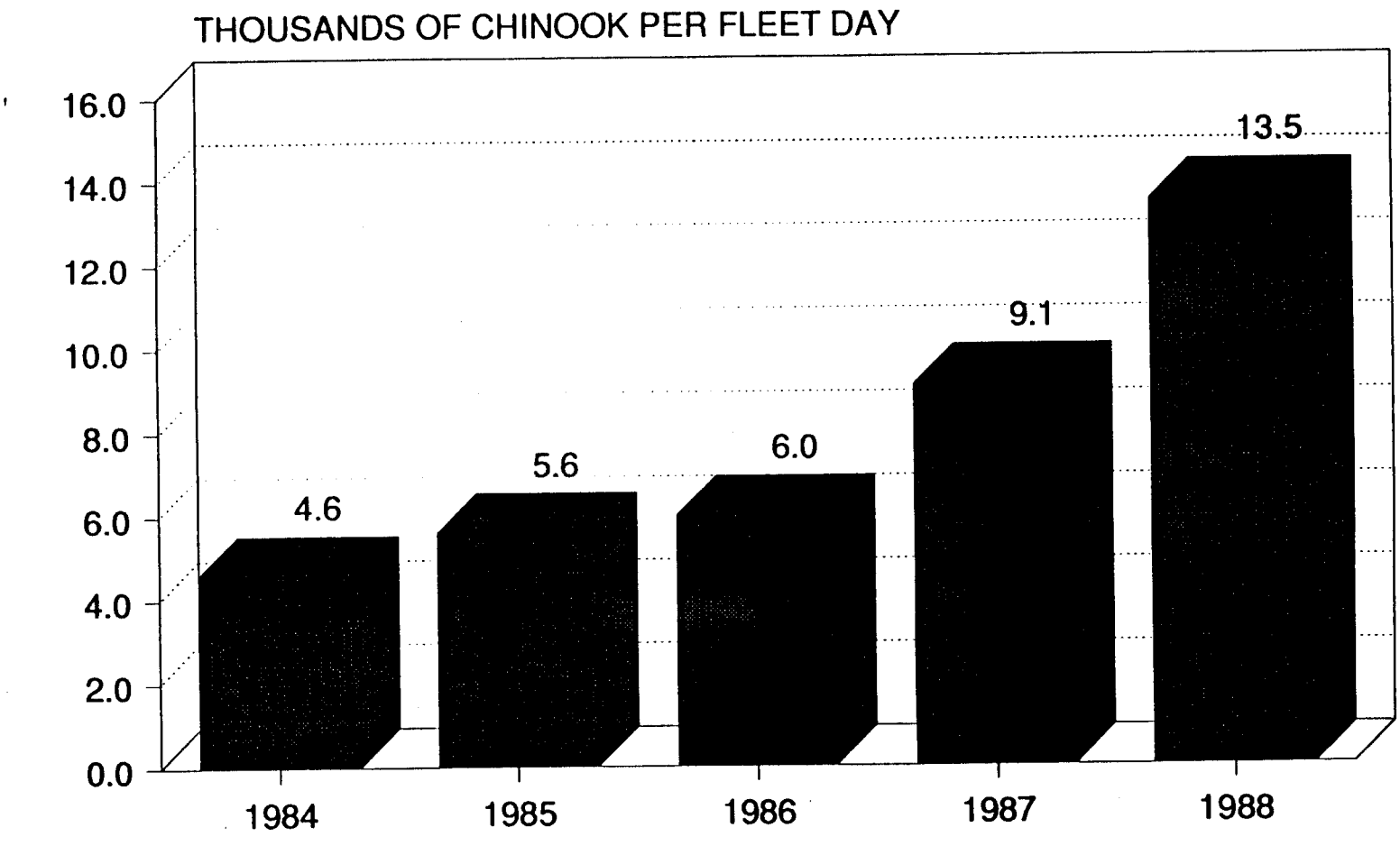
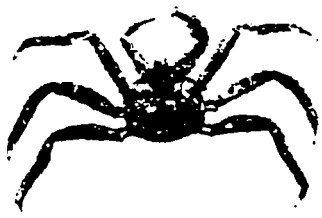


Figure 4. S.E. Alaska summer troll chinook salmon catch rates during comparable June/July periods, 1984-88.

APPENDICES

COMMERCIAL FISHERIES



NEWS RELEASE

ALASKA DEPARTMENT OF FISH & GAME

STATE OF ALASKA
Department of Fish and Game
Don W. Collinsworth, Commissioner

Ken Parker
Director

Southeast Regional Office
P.O. Box 20
Douglas, Alaska 99824

Contact: Paul Larson
(907) 465-4250

FOR IMMEDIATE RELEASE

July 8, 1988

SOUTHEAST ALASKA TROLL FISHERY CLOSED TO CHINOOK SALMON

The Alaska Department of Fish and Game and the National Marine Fisheries Service announced today the Southeast Alaska and Yakutat troll fishery will be closed to the taking of chinook salmon effective 11:59 p.m., Tuesday, July 12. Preliminary catch reports and catch projections indicate this action is necessary to ensure that the chinook salmon catch by all Southeast Alaska fisheries does not exceed the catch ceiling established by the U.S./Canada Pacific Salmon Commission and approved by the Alaska Board of Fisheries. If complete catch tabulations after the closure indicate that the allowable chinook harvest has not been fully taken, an additional trolling period for chinook will be announced later in the season.

In addition to the region wide troll closure for chinook salmon only, a number of areas of frequent high chinook availability will be closed to all trolling. These area closures, the same as utilized during the 1987 season, are intended to help minimize the incidental hook and release of chinook which occurs as trollers continue to harvest coho salmon and other non-chinook species. Areas closed to all trolling effective 11:59 p.m., Tuesday, July 12 are as follows:

1. Waters off the west coast of Baranof Island between the latitude of Point Lauder and the latitude of Redfish Cape to a distance of one mile off the shore.

2. Waters off the Kruzof Island shore from Shoals Point west to Cape Edgecumbe and from Cape Edgecumbe north to Cape Georgiana to a distance of one mile off the shore.

3. Waters off the west coast of Yakobi Island between the latitude of Yakobi Rock and the latitude of Cape Cross to a distance of one mile from the main Yakobi Island shore.

4. The waters off Palma Bay, Dixon Harbor, Torch Bay, Murk Bay and Graves Harbor will be closed east of a line beginning at the mouth of Kaknau Creek located approximately one mile northeast of Icy Point at 58°23'53" N. latitude, 137°04'27" W. longitude to Astrolabe Point to a point on the south shore of Dixon Harbor at 58°20' N. latitude, 136°51'10" W. longitude to Venisa Point to the westernmost tip of Polka Point.

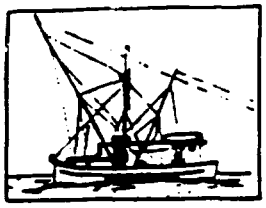
5. The outer banks of the Fairweather Grounds bounded by the following lines:

   Loran C line 7960-Y-29800 on the north
   Loran C line 7960-Y-29150 on the south
   Loran C line 7960-X-14660 on the inshore side
   Loran C line 7960-X-14400 on the seaward side

6. That portion of Section 14-B in Icy Strait north of the latitude of Noon Point on Pleasant Island and east of 135°40' W. longitude. This closes the Icy Passage - Excursion Point area.

Fishermen are remined that during the chinook salmon closure, chinook salmon may not be on board a vessel which is fishing for other species. All chinook salmon incidentally hooked during the closure must be released. Fishermen are encouraged to utilize fishing techniques which minimizes the incidental hooking of chinook and to carefully release any chinook which are hooked.

The Department of Fish and Game wishes to contact fishermen willing to participate in an onboard observer program to monitor incidental chinook hook and release as required under the Pacific Salmon Treaty. Fishermen will be reimbursed for expenses incurred while participating in the program. Fishermen interested in participating should contact Al Davis, Troll Fishery Biologist, at the Sitka ADF&G office (ph. 747-6688) or biologists at other Department offices.

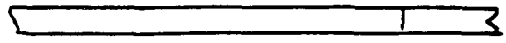


Alaska
Trollers
Association

SUBJECT: COHO ONLY FISHERY

The ATA Board of Directors has determined through our experience that the following guidelines, when adopted, will greatly reduce the likelihood of hooking king salmon and will virtually eliminate the mortality of king salmon caught during a coho only fishery.

Although mortality caused by hook wounds decreases as fish size increases, we have found that mortality increases with the size of fish due to fighting of the gear. Therefore, large fish must be released as soon as they hit the gear. How? By breaking them off. Use small hooks (No. 6) on your coho spoons (No. 5 spoon). Use DURANICKEL brand hooks on your coho spoons or hootchies. These are a soft hook which king salmon will straighten out, or use blued or bright hooks (not stainless) behind your flashers; these will quickly disappear from the fish's mouth. Use light leaders for flasher tails (50-60 lb. test). In the event you hook a large king that is sluggish and doesn't break off, release it without lifting it out of the water. This is easy on a boat with a low stern, If your boat has a high stern, we recommend that you make a fish releaser, which looks like this:



The handle should be wood and the length to suit your individual needs. The business end is: 1/8 inch by 1 inch by 6 inch flat bar with a notch. By inserting the "V" notch in the bend of the hook and giving a sharp push, the fish is released. This also works well for saving that favorite spoon, plug, etc.. from a big halibut.

Since the general rule is that greater catches of king salmon will occur closer to the beach and closer to the bottom; it is best to stay at least 1/2 to 3/4 miles from shore. Stay out of shallow beach drags such as: Surge Bay, Hoktahine, Soapstone, the immediate area of Cape Edgecumbe, Cape Addington, Noyes, Whale Bay, Redfish Cape, Etc... Fish shallow in deeper water!!!! The coho catch is primarily along the 100 fathom edge; here you would fish from 24 fathoms to the surface. In a 50-60 fathom drag, fish only 18-20 fathoms from the surface.

Use short leaders, spaced close together on your wire; use more flashers. The leader length should be 1 1/2 to 2 fathoms. The spacing of leaders down the wire should be 1 1/2 to 2 1/2 fathoms.

The shaking of king salmon off coho gear will give a very high survival rate due to the lighter gear and smaller hooks

which have shallow penetration into the fish's mouth. If all else fails, cut off the spoon or hootchie to release the fish; don't lift the fish out of the water.

There are undoubtedly other ideas within the fleet, and we would like to hear of them. If you have one, call or write the office, or call your board member.

Appendix C.1. Estimated number of gear days by period and gear days in the 1988 Southeast Alaska troll fishery during chinook salmon non-retention periods.

Area[1/]	Average No. Boat[2/]	Days	Estimated Gear Days
Period 1: July 13 - July 25 (13 days)			
Outside:			
Northern	80	13	1,040
Central	110	13	1,430
Southern	168	13	2,184
Inside:			
Northern	69	13	897
Central	21	13	273
Southern	65	13	845
Subtotal	513	13	6,669
Period 2: August 5 - August 14 (10 days)			
Outside:			
Northern	125	10	1,250
Central	199	10	1,990
Southern	172	10	1,720
Inside:			
Northern	112	10	1,120
Central	39	10	390
Southern	65	10	650
Subtotal	683	10	7,120
Period 3: August 25 - August 31 (7 days)			
Outside:			
Northern	102	7	714
Central	123	7	861
Southern	64	7	448
Inside:			
Northern	250	7	1,750
Central	20	7	140
Southern	33	7	231
Subtotal	592	7	4,144

--Continued--

Appendix C.1. (page 2 of 2.)

Area[1]	Average No. Boat[2]	Days	Estimated Gear Days
Period 4: September 4 - September 20 (17 days)			
Outside:			
Northern	59	17	1,003
Inside:			
Northern	167	17	2,839
Subtotal	226	17	3,842
Total For All Periods Combined (47 days)			
Outside:			
Northern			4,007
Central			4,281
Southern			4,352
Inside:			
Northern			6,606
Central			803
Southern			1,726
Subtotal			21,775

[1] Area boundaries shown in Figure 2.

[2] Number of boats estimated from overflights; numbers shown represent average number of boats actually fishing on a given day.