

## **TECHNICAL FISHERY REPORT 90-03**

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Alaska Department of Fish and Game  
Division of Commercial Fisheries  
P.O. Box 3-2000  
Juneau, Alaska 99802

February 1990

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### **Chinook Salmon Catch and Mortality Associated with the 1988 Southeast Alaska Purse Seine Fishery**

by

**Melinda L. Rowse**

The Technical Fishery Report Series was established in 1987, replacing the Technical Data Report Series. The scope of this new series has been broadened to include reports that may contain data analysis, although data oriented reports lacking substantial analysis will continue to be included. The new series maintains an emphasis on timely reporting of recently gathered information, and this may sometimes require use of data subject to minor future adjustments. Reports published in this series are generally interim, annual, or iterative rather than final reports summarizing a completed study or project. They are technically oriented and intended for use primarily by fishery professionals and technically oriented fishing industry representatives. Publications in this series have received several editorial reviews and at least one *blind* peer review refereed by the division's editor and have been determined to be consistent with the division's publication policies and standards.

CHINOOK SALMON CATCH AND MORTALITY ASSOCIATED WITH  
THE 1988 SOUTHEAST ALASKA PURSE SEINE FISHERY

By:

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Technical Fishery Report No. 90-03

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## **AUTHORS**

Melinda L. Rowse is a Region I Fisheries Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 20, Douglas, Alaska, 99824.

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## ABSTRACT

Provisions of the 1985 Pacific Salmon Treaty require that incidental fishing mortalities of chinook salmon be monitored and assessed as part of a coordinated coastwide natural stock rebuilding program. During the 1988 fishing season, chinook salmon (*Oncorhynchus tshawytscha*) non-retention regulations were implemented in the Southeast Alaska purse seine fishery. These regulations limited the purse seine sale (landed catch) of large ( $\geq 28$  in total length) chinook salmon to 11,400 fish (excluding Alaska hatchery add-on). Small chinook salmon ( $\leq 21$  in) could be retained and sold at all times throughout the season. Medium chinook salmon (21-28 in) could be retained for personal use but could not be sold at any time.

Through dockside observations of catch and skipper interviews, the gross chinook salmon catch (all chinook salmon caught, including those landed and sold, retained for personal use, released alive, and discarded) was estimated to be 34,405 fish during the 1988 fishing season. A delayed mortality rate among chinook salmon released alive was not evaluated in this study but was assumed to be 70% for all fish released alive; 1,900 (15.8%) small, 2,607 (21.7%) medium, and 7,531 (62.6%) large fish were assumed to have died after release. We combined these estimated mortalities of fish released alive with the estimated catch (derived from dockside data) that were either retained for personal use, discarded, or sold, to obtain a total estimated mortality of 29,266 chinook salmon by the Southeast Alaska purse seine fleet in 1988.

KEY WORDS: Chinook salmon, incidental fishing mortality, catch, release, Southeast Alaska, dockside sampling

## INTRODUCTION

Provisions of the 1985 Pacific Salmon Treaty between the United States of America and Canada (U.S. Senate Treaty Doc. No. 99-2, entered into force, March 18, 1985), hereafter referred to as Pacific Salmon Treaty or Treaty, require that incidental fishing mortalities of chinook salmon (*Oncorhynchus tshawytscha*) be monitored and assessed. These provisions are part of an agreement to rebuild depressed natural chinook salmon stocks by 1998 through a coordinated coastwide program. According to Annex IV, Chapter 3, (1),(e), the Parties agree to "monitor, assess, and report incidental fishing mortalities." Furthermore, "the Commission shall annually take into account, starting in 1988, the impacts of fishing mortalities, as determined by the Chinook Technical Committee in implementing the rebuilding program."

A major concern of the commission is estimating the coastwide magnitude of various sources of *incidental fishing mortality*: i.e., all fish that die as a result of fishing that are neither sold nor retained for personal use. This concern stems from initial estimates that coastwide incidental fishery mortality may account for an additional kill of 50 to 100% of the landed catch (CTC/PSC 1987). Landed catch refers to all fish brought to the dock to be sold and reported on fish tickets. In the seine fishery, incidental fishing mortality includes immediate or delayed mortalities of sublegal chinook salmon that have been released alive, large chinook salmon released alive during non-retention fishing periods, dead fish discarded at sea or at the dock, and non-reporting of small chinook salmon that can be sold and processed as pink salmon. Incidental fishing mortalities of chinook salmon also occur in troll, gill net, and sport fisheries in Southeast Alaska and include immediate and delayed mortality of fish released alive, dropout from gill nets, loss of fish from troll lines, and fish discarded at sea or at the dock. Such sources, if large, could affect harvest rate reductions (translated to catch ceilings in some areas) which are necessary to rebuild depressed stocks. Existing sources of incidental mortality that occur at a relatively stable rate were implicitly taken into account when the current chinook salmon catch ceilings related to the scheduled stock rebuilding were derived.

In the Southeast Alaska purse seine fishery, complex regulations involving size restrictions, and retention and non-retention periods of chinook salmon harvest have been instituted by the Alaska Board of Fisheries to conserve chinook salmon stocks. The traditional sales receipt (fish ticket) method of catch enumeration has not been adequate in recent years because fish tickets do not accurately record the gross catch of chinook salmon: i.e., all chinook salmon caught by seiners including fish that were landed and sold, discarded at the dock or at sea, retained for personal use, or released alive.

The Alaska Department of Fish and Game (ADF&G) began research in 1985 to determine catches and incidental mortalities of chinook salmon in the Southeast Alaska purse seine fishery (Van Alen and Seibel 1986). A seine observer program and analyses of fish tickets were used to estimate the magnitude of the gross catch and the fate of all size classes of chinook salmon taken during the large ( $\geq 28$  in) chinook salmon non-retention period (hereafter referred to as non-retention period). In 1986 onboard observations were combined with a dockside interview program and analysis of fish tickets to estimate the gross catch and incidental mortality of chinook salmon (Van Alen and Seibel 1987). In 1987 a

dockside observation and skipper interview sampling program was combined with an analysis of fish tickets to estimate the gross catch and incidental mortality of chinook salmon (Rowse and Marshall 1989). We used a dockside observation and skipper interview program in 1988.

Regulation of the Southeast Alaska purse seine fishery is based primarily on harvesting surplus numbers of pink salmon (*O. gorbuscha*), and to a lesser degree, on surplus numbers of sockeye (*O. nerka*), chum (*O. keta*), and coho (*O. kisutch*) salmon. Annual catches of all species by purse seine since 1970 are shown in Table 1. Incidental catches of chinook salmon occur in the seine fishery throughout Southeast Alaska (Figure 1). In recent years, 52% to 72% of the purse seine chinook salmon catch has occurred in District 104.

The amount of fishing effort and chinook abundance influence annual chinook catches in the purse seine fishery. Increased coastwide chinook abundance in response to the rebuilding program and lack of a directed troll fishery in the seine areas have probably been significant factors affecting the seine fishery catches of chinook salmon. Catchability of chinook salmon is not believed to have changed in recent years because no gear changes have been instituted in the seine fleet. Since 1976 the number of chinook salmon landed by the purse seine fishery has ranged from 1,400 to 31,400 (Table 1; Figure 2). During these same years, chinook salmon have accounted for 0.02% to 0.13% of total salmon landings (Table 1). The primary factor contributing to the number of chinook salmon landed appears to be the amount of fishing effort exerted in a given year to harvest high pink salmon returns (Figure 3). The recent increased landings may also be partially attributed to increased prices for chinook salmon which may have encouraged more careful sorting of chinook salmon in the seine catch. Finally, removal of the size limit on seine caught chinook salmon from 1979 to 1985 may also have contributed to the increased landings during those years.

Chinook salmon size limits were in effect for the seine fishery prior to 1979 and since 1986. From 1960 through 1970, the minimum legal size was 26 in measured from tip of snout to fork of tail; from 1971 to 1977 the minimum legal size was reduced to 26 in from tip of snout to tip of tail. In 1978 the minimum legal size was raised to 28 in from tip of snout to tip of tail. From 1979 to 1985, no size limits were in effect. Since 1986, regulations promulgated by the Alaska Board of Fisheries have established three size classes of chinook salmon based on measurements from tip of snout to tip of tail: small fish ( $\leq 21$  in) could be retained at all times; medium fish ( $>21$  in but  $<28$  in) could be retained for personal uses but could not be sold at any time; and large chinook salmon ( $\geq 28$  in) could be retained and sold only during periods specified by the ADF&G in an effort to constrain the landed catch to 11,400 fish.

## METHODS

### *1988 Purse Seine Fishery*

As in 1987, the Alaska Board of Fisheries directed that the 1988 purse seine catch of large chinook salmon be limited to 11,400; this excluded the Alaskan hatchery add-on (defined as an adjustment to the quota based on predicted Alaskan

hatchery production). To accomplish this, non-retention regulations were imposed for the first weeks of the fishery when pink salmon catches were small and a greater proportion of the incidentally caught chinook salmon could be released alive. The fishery was closed to the taking of large chinook salmon in all fishing periods prior to 6 August, except in the waters adjacent to the Hidden Falls Hatchery (District 112-22) and in Neets Bay (District 101-90; Appendices A.1 to A.3). Retention of large chinook salmon was allowed for four fishing periods on 7, 10-11, 14, and 18 August (during statistical weeks 33 and 34); non-retention was imposed for the first fishing period in statistical week 35 (21 August) to assess the landed catch, and reopened to retention during the second fishing period of statistical week 35 (24-25 August). Non-retention was again imposed on 28 August (statistical week 36) for the remainder of the season. Data are reported by statistical weeks which begin at 00:01 AM each Sunday and end the following Saturday at midnight. Statistical weeks are numbered sequentially beginning with the week encompassing the first Sunday in January. Inclusive dates for 1988 are listed in Appendix A.4. Throughout the 1988 season seine fishermen were encouraged to immediately release chinook salmon smaller than 28 in even though small chinook salmon could be retained and sold. The regulation to allow retention of small chinook salmon was implemented by the Board of Fisheries to prevent fishermen from being legally liable for those small chinook salmon which were incidentally retained and processed as pink salmon. Medium chinook salmon could be kept for personal use but could not be sold at any time.

#### *Dockside Sampling*

To estimate the gross catch of chinook salmon in the seine fishery, we monitored the unloading process of vessels and interviewed skippers at fish processing facilities in Petersburg, Craig, Ketchikan, Sitka, and Excursion Inlet. Monitoring of the vessel unloading process involved three basic elements. First, all fish sold to the processors as chinook salmon were counted, and the species and size classes were verified by ADF&G personnel. Second, as individual seine boats were off-loaded at the docks and sorted by processor personnel, catches of sockeye, pink, chum, and coho salmon were observed by ADF&G personnel for chinook salmon which had not been correctly sorted. Third, a visual inspection of the vessel deck (from the dock) was conducted to identify chinook salmon which were retained onboard by the vessel crew for personal use. The size class (large, medium, or small) was recorded for each chinook salmon observed. During interviews, skippers were asked if they had previously sold any chinook salmon during the opening and if any chinook salmon caught during the opening had been retained for personal use, given away, discarded at sea, released alive, or disposed of in some other way. Ancillary information (e.g., permit numbers, dates, and sales of other species) needed to later identify the associated fish ticket(s) was recorded. This enabled a comparison of alternative estimates of catch (Appendix B.1). Sampling was conducted throughout the season during both non-retention and retention periods. Pink salmon off-loaded from tender boats were also observed to identify and count the numbers of small chinook salmon that were sold as pink salmon (Appendix B.2). Tenders boats that had fish from more than one district of catch were not sampled. No individual skipper interviews or information on gross catch of chinook salmon were available from tender boat samples. Throughout this report the combined dockside observation and skipper interview process will be referred to as *dockside sampling*.

A total of 381 skippers were interviewed during the 1988 purse seine season; 271 of these dockside samples were conducted during the non-retention period and 110 samples were conducted during the retention period (Appendices C.1, C.2). Throughout the season interviews were made for 16 landings in District 101, 11 landings in District 102, 18 landings in District 103, 123 landings in District 104, 5 landings in District 105, 101 landings in District 109, 52 landings in District 112 (excluding 112-22), 21 landings in District 112-22 (Hidden Falls terminal hatchery area), 20 landings in District 113, and 14 landings in District 114 (Appendix C.3). A total of 35 tenders were sampled, including 8 tenders in District 101, 2 tenders in District 102, 2 tenders in District 103, 10 tenders in District 104, 6 tenders in District 112, 4 tenders in District 112-22, and 3 tenders in District 114 (Appendix C.4).

Goals of the dockside sampling program were to sample several individual seine boats per statistical week in each district. Due to time and personnel constraints this was not always accomplished. In cases when no dockside samples were collected during a statistical week in a district that was open to fishing, the average rate of chinook salmon per boat-hour was calculated from samples obtained during all other weeks sampled for that district. The estimated catch of each size class of chinook salmon was calculated by multiplying this average rate by the total reported fishing effort in respective districts and statistical weeks. This problem occurred primarily in Districts 102, 112, and 113 (Appendix D.1). Sample variability between districts was high and was tied to the availability of "acceptable" boats to sample in a given port. That is, many boats off-load partial or entire catches to tenders on the fishing grounds or fish more than one district during an opening. The extent that seine boats off-loaded pink salmon catches to tenders depended on specific processing facilities and on the quantity of the catches in a given week. During periods of high pink salmon catches, pink salmon were often sold to tenders so that fishermen could quickly resume fishing for the remainder of the opening. "Money fish" (sockeye, coho, chinook, and chum salmon) were typically brought to the docks after the fishing period, where fishermen usually got a higher price. This occurred primarily in Districts 101, 104, 112, and 114. To include these samples in our analysis, we combined rates of pink to small chinook salmon sampled from tender boats and the number of pink salmon sold and reported on individual fish tickets to estimate numbers of small chinook salmon caught by individual seine boats. Goals were to sample at least one tender boat per district per week when we could not obtain adequate samples from individual seine boats with complete catches. We assumed that the abundance and catchability of small chinook salmon was constant within any discrete statistical week and district.

Total sample effort was related to the total number of boats that fished in a district in a given week (Appendix A.3). The more boats that fished, the more observations and interviews were conducted due to increased availability (Table 2).

#### *Catch Estimation By Size Class*

An estimate of gross catch was made by using dockside sampling data. Catch estimation was made by size class and by final disposition. Fish fell into either one of two categories based on final disposition: (1) chinook salmon released alive from the net or vessel deck, and (2) chinook salmon that were dead,

including dead fish sorted at sea and discarded, fish kept for personal use, fish sold, and fish sorted and discarded at the dock.

### Small

Gross catch estimates for small chinook salmon based on dockside sampling data were stratified by fishing districts and statistical weeks. Stratification by district was used to account for possible differences in abundance. Temporal stratification was used because seiners' attitudes may differ regarding the amount of care taken to sort small chinook salmon from pink salmon catches during retention and non-retention periods. Stratification by time also reduced our reliance on the assumption that small chinook salmon abundance was constant through time. Gross catch of small chinook salmon within each seine fishing district by statistical week and final disposition (fish released alive, or dead fish) were transformed into catch per boat hour of fishing effort (CPUE). CPUE rates were then expanded over the total number of boat hours of fishing effort reported in each district for each statistical week. In using the CPUE estimate, we assumed that fishermen did not target on chinook salmon in any district at any time during the fishing season. This assumption represents the goal of the regulations established by the Board of Fisheries. Another assumption made was that all small fish captured were accounted for in the dockside sampling program.

### Medium

An estimated gross catch of medium chinook salmon was also made using dockside sampling data. Again, estimates were stratified by fishing district, statistical week, and final disposition. The assumptions and justifications for temporal and spatial stratification stated above for small chinook salmon applied also to medium fish. We assumed that medium fish were representatively accounted for in the dockside sampling program. Gross catch estimates of medium fish were derived by expanding CPUE rates from dockside sampling data with the total fishing effort in each strata.

### Large

CPUE rates derived from dockside sampling data for large chinook salmon by final disposition were expanded over total fishing effort by district and statistical week to obtain a gross catch estimate. Justifications for temporal and spatial stratification of large chinook salmon are the same as stated above for small and medium chinook salmon. Another assumption was that all large chinook salmon caught during the non-retention period were reported by skippers during the dockside interviews.

Standard deviations associated with the gross catch estimates from dockside sampling data were calculated using the binomial formula:

$$SD = \sqrt{\sum(N_{ij} \cdot \%p)} = \sqrt{\sum V(N_{ij})} \quad (1)$$

- $i$  = size class,  
 $j$  = final disposition,  
 $n_{ij}$  = number of fish caught by sampled boats of size class  $i$  and disposition  $j$ ,  
 $N_{ij}$  = estimated catch of size class  $i$  and disposition  $j$ , or  $n_{ij}/p$ ,  
 $p$  = number of boats sampled / total number of boats fished in a district during a given statistical week,  
 $q$  =  $1 - p$ ,  
 $V(N_{ij})$  = variance of the estimated catch of size class  $i$  and disposition  $j$ , or  $(N_{ij} \cdot q/p)$ .

In applying these calculations, we assumed that boats were randomly sampled by observers on the docks and that chinook salmon were randomly caught by fishermen. Variances were calculated for each size class by final disposition of chinook salmon and summed for each statistical week (by district) sampled. In cases where boats were sampled but no chinook salmon were caught, we replaced values of zero with values of one to obtain a variance of that sample. Variances of the total catch per statistical week were then summed over all weeks that were sampled by district. Since samples were not obtained for all weeks (in some districts) that were open to fishing, the summed variances by district were weighted by the total weeks open to fishing. The weighted variances for each district were then summed to provide a variance of the total estimated gross catch of chinook salmon.

#### *Mortality Estimation By Size Class*

In a report to the Pacific Salmon Commission (PSC), ADF&G and NMFS (1987) related the paucity of information on mortality of chinook salmon caught and released in the commercial seine fishery. The PSC adopted a rate of catch-and-release mortality ranging from 50% to 90%, which reflects the expected high levels of delayed mortality. For this study we selected the median of this range, a 70% mortality rate, for the sole purpose of presenting a point estimate of catch-and-release chinook mortality.

Mortality of chinook salmon that were released alive was estimated for each size class by district. Stratifying the mortality estimates by size class and district offered two advantages.

- (1) Estimates of chinook catch per seine set derived from onboard observer data documented a difference between size classes and injury status of fish released alive. Van Alen and Seibel (1987) reported that injury status of small chinook salmon released alive was 60% injured while that of large chinook salmon released alive was 24% injured. Medium chinook salmon released alive were 68% injured.

- (2) Stratification by district reduced possible sources of error caused from geographical differences in abundance.

Stratification by time period (i.e., retention and non-retention) was not included because of the limited amount of retention time allowed in 1988. Also, accurate stratification of catches by retention and non-retention periods was made difficult by management decisions to open and close retention in fishery openings within the same statistical week. Catches are reported by statistical week, and landing date is often not accurate in the fish ticket system.

## RESULTS

### *1988 Purse Seine Fishery*

In 1988, purse seine gear harvested 11.8 million salmon in Southeast Alaska, including 9.3 million pink salmon, 1.6 million chum salmon, 657 thousand sockeye salmon, 158 thousand coho salmon, and 12 thousand chinook salmon (Table 3). Prior to 7 August when retention of large chinook salmon became legal, 1.5 million pink salmon were harvested. Over 6 million pink salmon were harvested between 7 and 28 August during the chinook salmon retention periods (Table 4).

The total reported fish ticket harvest of large chinook salmon was 11,136 fish (Table 5), including 10,513 (94.4%) fish harvested during the retention period, 185 (1.7%) fish harvested in the Neets Bay terminal hatchery area (101-95), and 337 (3.0%) fish harvested in the Hidden Falls terminal hatchery area (District 112-22) between 3 July and 23 July, and 67 (0.6%) fish that were either illegally sold or misreported by size class and/or district on fish tickets during the non-retention period. Of the large chinook salmon 89% were harvested in District 104, 5% in District 112 (including the Hidden Falls subdistrict), 3% in District 101, 2% in District 102, 1% in District 103, and <1% in all of the remaining districts (Districts 107, 109, 113, and 114) (Table 5). A total of 903 small chinook salmon were reported caught by seine gear in 1988, including 135 (15%) fish caught in the Hidden Falls terminal hatchery area (District 112-22), 209 (23%) fish caught in District 104, 213 (23%) fish caught in District 109, 132 (14%) fish caught in District 102, 79 (8%) fish caught in District 114, 76 (8%) fish caught in District 112, and <1% in all other districts (Districts 101, 103, 105, 110, and 113) (Table 6).

### *Dockside Sampling*

#### Non-retention Periods

During the chinook salmon non-retention periods (3 July to 6 August, 21 August, and 28 August to 9 September) a total of 2,415 chinook salmon were observed or accounted for through the dockside sampling program (Appendix C.1). Of the 237 small chinook salmon recorded, 58.7% were released alive, 8.9% were discarded, and 32.5% were kept or sold. Small chinook salmon were mostly caught in Districts 104 (49%), 112-22 (19.8%), 109 (14.8%), and 112 (10.6%). Of the 637 medium chinook salmon recorded, 72.4% were released alive, 7.2% were discarded, and 20.4% were kept (Appendix C.1). Medium chinook salmon were mostly caught in

Districts 104 (77.6%), 112-22 (9.4%), and 109 (7.2%). Of the 1,541 large chinook salmon recorded, 86.2% were released alive, 10.9% were discarded, and 2.9% were kept (Appendix C.1). The majority (94.4%) of large chinook salmon were caught in District 104.

#### Retention Periods

During the retention periods (7 to 18 August, and 24-25 August), a total of 288 chinook salmon were observed or accounted for through the dockside sampling program (Appendix C.2). Of the 145 small chinook salmon recorded, 73.1% were released alive, 2.1% were discarded, and 24.8% were kept or sold. Small chinook salmon were mostly caught in Districts 102 (85.5%) and 104 (12.4%). Of the 98 medium chinook salmon recorded, 32.7% were released alive, 1.0% were discarded, and 66.3% were kept (Appendix C.2). Medium chinook salmon were mostly caught in Districts 104 (37.8%), 112 (25.5%), and 109 (23.4%). Of the 45 large chinook salmon recorded, 28.9% were released alive, and 71.1% were kept or sold. The majority (35.6%) of large chinook salmon were caught in District 109 (Appendix C.2).

#### *Catch Estimation by Size Class*

The total gross catch estimate based on dockside sampling data was 34,426 chinook salmon (Table 7; Appendix D.1).

#### Small

The gross catch estimate derived from dockside sampling data includes an estimated 9,847 (28.6%) small chinook salmon. Dockside sampling data based CPUE estimates indicated that small chinook salmon were primarily captured in Districts 102 (35.2%), 104 (29.8%), 112 (15.5%), 103 (6.8%), 101 (6.0%), and 109 (5.4%). The balance, 1.2%, were captured in all the other districts (Table 7; Figure 4). Estimated catches of small chinook salmon were fairly even throughout the season; no trends in catch by statistical week were observed (Figure 5).

The dockside sampling data estimate of small chinook salmon caught included 24 sampled boats that had off-loaded pink salmon catches previously (during the same fishing period) to tenders. This included 3 boats that fished in District 101, 17 boats that fished in District 104, 1 boat from District 102, 2 boats from District 112, and 1 boat from District 114. Rates of pink to small chinook salmon from tender boat catches and fish ticket reported catches of pink salmon were used to estimate small chinook salmon catches on these boats (Appendix C.4).

#### Medium

The gross catch estimate derived from dockside sampling data includes an estimated 5,792 (16.8%) medium chinook salmon. Dockside sampling data based CPUE estimates indicated that medium chinook salmon were primarily captured in Districts 104 (71.3%), 112 (15.8%), and 102 (7.2%). The balance, 5.7%, were

medium chinook salmon occurred evenly throughout the season, except during statistical week 32 in District 104 where several skippers reported high catches of medium chinook salmon (Figure 5).

### Large

The gross catch estimate derived from dockside sampling data includes an estimated 18,787 (54.6%) large chinook salmon. Dockside sampling data based CPUE estimates indicated that large chinook salmon were primarily captured in Districts 104 (85.8%), 101 (6.0%), and 112 (3.9%). The balance, 4.4%, were captured in all the other districts (Table 7; Figure 4). Estimated catches of large chinook salmon in the Southeast Alaska region were low in the first 4 weeks of the fishery (27.2%), and rose sharply just prior to the retention period during statistical week 32 (36.5%) (Figure 5). However, with the fishery open for retention of large chinook salmon for the next 3 weeks (statistical weeks 33, 34, and 35), only 35.6% of the estimated gross catch of large fish occurred.

Standard deviations of the dockside sampling data estimates of gross catch of chinook salmon are presented by district in Appendix D.1. The standard deviation of the total catch estimate (34,426 fish) was 725.4, which indicates our sample technique was adequate for catch estimation. When examined by district, the standard deviation was higher in proportion to the estimated catch when there were few weeks sampled in relation to the total weeks fished, and when the number of boats sampled was small.

### *Disposition of Estimated Catches*

Forty-nine percent (17,198) of the gross catch of chinook salmon was estimated to have been released alive during the 1988 purse seine season. The remaining portion of the catch (50%) was either discarded, kept for personal use, or sold (Table 7). Of the fish released alive, 2,714 (15.8%) were small fish, 3,725 (21.7%) were medium fish, and 10,759 (62.6%) were large fish (Table 7).

### *Mortality Estimation by Size Class*

The mortality estimate for all chinook salmon released alive was 12,038 fish (Table 8). This includes 1,900 (22.6%) small, 2,607 (21.7%) medium, and 7,531 (62.6%) large chinook salmon. The highest mortalities of small chinook salmon occurred in Districts 102 (63.6%), 104 (16.7%), and 112-22 (14.7%). For medium and large chinook salmon, the highest mortality levels occurred in District 104 (83.7% and 90.8%, respectively). Combined with the estimated catch (derived from dockside sampling data) of fish that were either retained for personal use, discarded, or sold, we estimated a total mortality of 29,266 chinook salmon by the seine fleet in 1988.

## DISCUSSION

### *Catch Estimation*

The dockside sampling program was fairly comprehensive this year regarding collection of samples in comparison to past years of the program. We have based catch estimates solely on dockside sampling data and expanded by CPUE. However, because of the nature of interview data and the sensitivity of chinook salmon catch and mortality issues, we still recommend caution in applying the findings presented. While dockside sample sizes were limited in some districts and periods, there were other possible sources of error. Fishermen may not have provided accurate enumeration and size class information for fish that were released alive and discarded. Failure to report small chinook salmon on fish tickets and use of average weights of fish by processor personnel to determine total catch (as opposed to counting individual fish) were also potential problems. Inability of Fish and Game personnel to accurately observe catches of medium chinook salmon may have caused errors. Single boats catching a disproportionately high number of chinook salmon (i.e., possible targeting) would have driven gross catch estimates high in some districts.

We feel the true gross catch estimate of small chinook salmon was closely approximated by the dockside sampling data estimate. The catch of small chinook salmon sold and reported on fish tickets (landed) appeared to be considerably lower than the true landed catch due to underreported sales of small chinook salmon. Because medium chinook salmon could not be sold and reporting of them was not required, the estimate derived from dockside sampling data may have underestimated the true gross catch. Medium fish could be kept or given away, and some fishermen may have chosen not to disclose such information. The dockside skipper interviews offered the only means for obtaining catch information on medium chinook salmon. It was not known what percentage of the fleet periodically obtained high incidental catches of medium chinook salmon. Such high catches were dependent upon individual fishing strategies, and district and time of fishing in relation to local abundance and distribution of sub-legal chinook salmon.

We assumed the fish ticket reported catch of large chinook salmon during the retention period (11,039 fish) was the best estimate of gross catch because fishermen generally sell the highly valued large chinook salmon when it is legal to do so. Our dockside sampling data gross catch estimate of large chinook salmon for the entire season (8,028 dead fish and 10,759 fish released alive) was low. This may be attributed to small sample sizes in several districts and statistical weeks which resulted in lower estimates of CPUE from dockside sampling data than in fish ticket data (Table 9). It may also be attributed to skippers that were interviewed not reporting catches of large chinook salmon. Since no large chinook salmon could be legally retained or landed during non-retention periods, the dockside sampling data estimate relied completely on the validity of skipper interviews. We were unable to evaluate the validity of skipper interview data in this study.

### *Mortality Estimation By Size Class*

The estimates of mortality provide only a possible magnitude of true mortality of chinook salmon released alive from the Southeast Alaska purse seine fishing boats. The delayed mortality level used in this study was based on the assumption that chinook salmon released alive in the purse seine fishery are subjected to very high rates of mortality. It was not in the scope of this study to determine delayed mortality levels, and past research does not provide conclusive results of mortality levels. Research has been hampered because there is no adequate means of examining fish after release. On the other hand, fish retained for observation can be subjected to other non-fishing related stresses such as temperature increases, being handled, loss of scales or other injuries, and crowding in tanks.

We need to be able to determine the extent of total catch and incidental fishing mortality imposed on chinook salmon populations under the complex regulations set by the Alaska Board of Fisheries. Without the dockside sampling program incidental fishing mortality can be estimated solely on the basis of reported fish ticket sales of small and large chinook salmon. These do not account for any incidental fishing mortality associated with non-retention regulations, the apparent underreporting of small chinook salmon in the fish ticket system, the regulation allowing fishermen to keep or give away small and medium chinook salmon, or the regulation allowing small chinook salmon to be sold as pink salmon. The dockside sampling program allows a closer examination of these incidental fishing mortalities. While problems will continue to exist concerning the validity of the skipper interview data, the program allows us to approximate the rates of the various mortalities of chinook salmon incidental to the purse seine fishery. This can be done at a relatively low cost to the department because the data can be collected ancillary to other port sampling projects.

### **CONCLUSIONS**

1. The estimates of catch derived from dockside sampling data can be useful to managers provided the limitations discussed above are taken into consideration.
2. The dockside sampling data estimation method was best used for estimating the gross catch of small chinook salmon.
3. To estimate catches of medium chinook salmon throughout the season and large chinook salmon during non-retention periods, dockside data is currently the only data source available.
4. The dockside sampling data derived catch estimate may have underestimated the gross catch of medium and large chinook salmon. The extent of error was not measured.

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Table 1. Annual landed salmon catches reported on fish tickets by species in numbers (thousands) and percents in the Southeast Alaska purse seine fishery, 1970-88.

Year	Chinook		Sockeye		Coho		Pink		Chum		Total Number
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
1970	6	0.05	308	2.53	295	2.42	9,629	79.09	1,937	15.91	12,175
1971	5	0.05	163	1.55	326	3.11	8,506	81.04	1,496	14.25	10,496
1972	17	0.12	324	2.27	390	2.73	11,371	79.67	2,170	15.20	14,272
1973	9	0.12	349	4.77	130	1.78	5,610	76.66	1,220	16.67	7,318
1974	7	0.13	236	4.23	167	2.99	4,174	74.75	1,000	17.91	5,584
1975	2	0.05	62	1.58	70	1.78	3,411	86.88	381	9.70	3,926
1976	1	0.02	136	2.71	88	1.75	4,288	85.32	513	10.21	5,026
1977	5	0.04	329	2.65	161	1.29	11,600	93.27	342	2.75	12,437
1978	14	0.07	274	1.36	245	1.22	19,045	94.71	530	2.64	20,108
1979	10	0.10	397	3.96	177	1.77	9,000	89.77	442	4.41	10,026
1980	13	0.09	527	3.74	194	1.38	12,315	87.49	1,027	7.30	14,076
1981	10	0.06	445	2.51	286	1.61	16,453	92.80	535	3.02	17,729
1982	31	0.13	463	1.91	449	1.85	22,475	92.57	862	3.55	24,280
1983	14	0.04	794	2.18	399	1.09	34,635	95.02	610	1.67	36,452
1984	21	0.08	467	1.88	373	1.50	21,509	86.72	2,434	9.81	24,804
1985	23	0.05	690	1.40	387	0.79	46,827	95.06	1,334	2.71	49,261
1986	13	0.03	590	1.27	560	1.21	43,078	92.83	2,164	4.66	46,405
1987	6	0.07	311	3.54	131	1.49	7,082	80.64	1,252	14.26	8,782
Average 1970-87	12	0.07	381	2.56	268	1.76	16,167	86.91	1,125	8.70	17,953
Prelim. 1988	12	0.10	657	5.58	158	1.34	9,313	79.07	1,637	13.90	11,778

Table 2. Sample effort (boat-hours sampled/total boat-hours fished) by district for the purse seine dockside sampling program in Southeast Alaska, 1988. The total number of boats that fished by district and week were obtained from fish ticket data.

District	Percent of Total Boat-Hours Sampled (all season)
101	2.88
102	4.29
103	7.89
104	10.46
105	14.37
109	42.43
112	23.57
112-22	11.13
113	33.84
114	28.38

Table 3. Landed salmon catches reported on fish tickets for the Southeast Alaska purse seine fishery by district, 1988.

District	Numbers of Fish					Totals
	Chinook <sup>a</sup>	Sockeye	Coho	Pink	Chum	
101	156	31,116	5,509	1,495,176	175,228	1,707,185
102	416	14,798	16,550	1,305,168	236,010	1,572,942
103	128	2,377	11,808	1,117,502	63,091	1,194,906
104	10,106	591,285	94,263	3,543,934	272,572	4,512,160
105	10	255	332	18,592	7,881	27,070
109	291	7,049	9,317	597,188	191,933	805,778
110	2	33	0	128	2,947	3,110
112 <sup>b</sup>	248	2,294	12,084	557,858	150,196	722,680
113	11	1,130	502	6,321	44,126	52,090
114	94	1,244	2,154	81,898	66,760	152,150
101-10 <sup>c</sup>	2	1,475	1,352	42,611	166,485	211,925
101-48 <sup>d</sup>	44	0	0	10	678	732
101-95 <sup>e</sup>	146	84	55	574	13,632	14,491
Annette Is. <sup>f</sup>	5	2,373	1,431	491,507	11,503	506,819
103-65 <sup>f</sup>	0	6	658	1,371	36,075	38,110
107-45 <sup>g</sup>	8	0	1,503	116	84	1,711
112-22 <sup>h</sup>	494	1,567	913	52,860	198,087	253,921
Totals	12,161	657,086	158,431	9,312,814	1,637,288	11,777,780

<sup>a</sup> Includes 930 small (<21 in) chinook salmon.

<sup>b</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

<sup>c</sup> Nakat Bay special harvest area.

<sup>d</sup> Carrol Inlet special harvest area.

<sup>e</sup> Neets Bay special harvest area.

<sup>f</sup> Klawock terminal hatchery area.

<sup>g</sup> Earl West Cove special harvest area.

<sup>h</sup> Hidden Falls terminal hatchery area.

Table 4. Landed catch of pink salmon reported on fish tickets in the 1988 Southeast Alaska commercial purse seine fishery by district and week.

Stat Week	Inclusive Dates	Landed Catch by District (numbers of pink salmon) <sup>a</sup>											Totals
		101	102	103	104	105	109	110	112 <sup>b</sup>	112-22	113	114	
28	3 Jul - 9 Jul	18,351	0	0	9,526	0	0	0	29,979	5,015	0	892	63,763
29	10 Jul - 16 Jul	147,456	2,094	0	44,328	0	6,647	128	148,305	6,123	2,425	6,264	363,770
30	17 Jul - 23 Jul	123,560	1,034	0	54,993	0	6,830	0	2,649	8,320	0	4,840	202,226
31	24 Jul - 30 Jul	141,050	0	0	16,761	258	38,801	0	4,258	0	912	9,411	211,451
32	31 Jul - 6 Aug	334,140	115,882	0	374,272	0	16,323	0	0	0	0	0	840,617
33	7 Aug - 13 Aug	602,171	286,173	0	864,652	0	208,444	0	54,472	17,169	883	0	2,033,964
34	14 Aug - 20 Aug	128,448	191,240	123,914	604,267	0	55,425	0	263,092	11,960	1,708	0	1,380,054
35	21 Aug - 27 Aug		422,962	653,713	1,339,243	0	158,396	0	29,750	3,869	224	58,611	2,666,768
36	28 Aug - 3 Sep		51,655	258,699	235,892	7	105,241	0	25,353	404	161	0	677,412
37	4 Sep - 10 Sep		185,655	81,176			1,070				8	0	267,909
38	11 Sep - 17 Sep		35,194				0					1,880	37,074
39	18 Sep - 24 Sep		12,407				11						12,418
40	25 Sep - 1 Oct		839										839
Totals		1,495,176	1,305,135	1,117,502	3,543,934	265	597,188	128	557,858	52,860	6,321	81,898	8,758,265

<sup>a</sup> Excludes all special harvest areas [Nakat Inlet(101-10), Carrol Inlet(101-48), Neets Bay(101-95), Annette Island, Klawock Hatchery(103-65), Earl West Cove(107-45), and Hidden Falls Hatchery(112-22)].

<sup>b</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

Table 5. Landed catch of large ( $\geq 28$  in) chinook salmon reported on fish tickets in the 1988 Southeast Alaska commercial purse seine fishery by district and statistical week.

Stat Week	District										Totals
	101	102	103	104	107	109	112 <sup>a</sup>	112-22	113	114	
28	185 <sup>b</sup>				8			169 <sup>c</sup>			362
29							48	117 <sup>c</sup>			165
30						1	4	51 <sup>c</sup>			56
31									1	5	6
32				9		1					10
33	112	116		5,025		28	7	16			5,304
34	8	23	3	2,063		23	105	5			2,230
35		55	103	2,785		24	8	1		7	2,983
36			4	15		1					20
37											0
38											0
39											0
40											0
Totals	305	194	110	9,897	8	78	172	359	1	12	11,136

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

<sup>b</sup> Neets Bay terminal hatchery area; retention of large chinook allowed.

<sup>c</sup> Hidden Falls terminal hatchery area; retention of large chinook allowed.

Table 6. Landed catch of small ( $\leq 21$  in) chinook salmon reported on fish tickets in the 1988 Southeast Alaska commercial purse seine fishery by district and statistical week.

Stat Week	District											Totals
	101	102	103	104	105	109	110	112 <sup>a</sup>	112-22	113	114	
28	7	4		10				11	75			107
29	35			68		10	2	31	44	2	8	200
30	1			64		53		1	15			134
31				1	3	34		1		5		44
32	3	11		15		2			1			32
33		29		21		54		8				112
34				20		3		22		1		46
35		8		10		39		2			71	130
36			5		7	13				2		27
37		80	13			5						98
38												0
39												0
40												0
Total	46	132	18	209	10	213	2	76	135	10	79	930

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

Table 7. Summary of estimated gross catches of chinook salmon in the 1988 Southeast Alaska purse seine fishery based on catch per unit of effort data collected as part of the dockside sampling program.

Dist	Disposition <sup>a</sup>	Estimated Chinook Gross Catch			
		Sm	Med	Lg	Total
101	Released	0	0	758	758
	Alive	587	44	362	993
	Dead	587	44	1,120	1,751
102	Gross Catch	1,726	175	52	1,953
	Released	1,743	243	190	2,176
	Alive	3,469	418	242	4,129
103	Dead	0	0	0	0
	Released	666	37	295	998
	Alive	666	37	295	998
104	Gross Catch	454	3,119	9,766	13,338
	Released	2,479	1,008	6,357	9,844
	Alive	2,933	4,127	16,123	23,182
105	Dead	0	0	0	0
	Released	6	0	0	6
	Alive	6	0	0	6
109	Gross Catch	72	88	126	286
	Released	464	109	123	696
	Alive	535	197	249	981
112	Gross Catch	44	15	31	91
	Released	371	117	155	642
	Alive	415	132	186	733
112-22	Gross Catch	400	302	0	702
	Released	714	481	541	1,736
	Alive	1,114	783	541	2,438
113	Gross Catch	3	0	7	10
	Released	8	1	3	13
	Alive	11	1	10	23
114	Gross Catch	15	26	18	60
	Released	95	27	3	125
	Alive	110	53	22	185
Totals:					
Released		2,714	3,725	10,759	17,198
Dead		7,133	2,067	8,028	17,228
Grand Totals:		9,847	5,792	18,787	34,426

<sup>a</sup> Dead includes all fish in the gross catch that were not released alive (i.e., landed catch, discarded fish, and fish retained for personal use).

Table 8. Estimated numbers of chinook salmon that were caught and released alive and estimated incidental mortality by size class and district in the 1988 Southeast Alaska purse seine fishery.

Dist	Estimated No. Small Chinook Released Alive <sup>a</sup>	Est. Mortality Small Chinook Released Alive <sup>b</sup>	Estimated No. Medium Chinook Released Alive <sup>a</sup>	Est. Mortality Medium Chinook Released Alive <sup>b</sup>	Estimated No. Large Chinook Released Alive <sup>a</sup>	Est. Mortality Large Chinook Released Alive <sup>b</sup>
101	0	0	0	0	758	531
102	1,726	1,208	175	122	52	36
103	0	0	0	0	0	0
104	454	318	3,119	2,183	9,766	6,836
105	0	0	0	0	0	0
109	72	50	88	62	126	88
112	44	31	15	11	31	22
112-22	400	280	302	211	0	0
113	3	2	0	0	7	5
114	15	11	26	18	18	13
Total:	2,714	1,900	3,725	2,607	10,758	7,531
Total Estimated Mortality: (all size classes)			12,038			

<sup>a</sup> Catch estimate derived from dockside sampling data.

<sup>b</sup> Estimated mortality calculated assuming a 70% rate of mortality of fish released alive.

Table 9. Comparison of dockside sampling program and fish ticket system catch per unit of effort data for small and large chinook salmon caught by the 1988 Southeast Alaska purse seine fishery. Data for medium chinook salmon are included for the dockside sampling program.

Sample Method	Sample Results	Districts										Totals
		101	102	103	104	105	109	112 <sup>a</sup>	112-22	113	114	
Dockside Sampling Data	Landings	16	11	18	123	5	101	52	21	20	14	381
	Boat-Hrs. Sampled	474	483	813	4,665	120	2,841	1,467	330	330	252	11,775
	Chinook Salmon (gross catch):											
3 Jul - 10 Sep (all season)	sm	5	124	0	133	0	36	27	47	2	7	381
	med	2	17	3	531	0	69	37	61	1	14	735
	lg	27	9	2	1,461	0	60	13	1	6	7	1,586
	total	34	150	5	2,125	0	165	77	109	9	28	2,702
	Chinook Salmon/Boat-Hour:											
	sm	0.011	0.257	0.000	0.029	0.000	0.013	0.018	0.142	0.006	0.028	0.032
	med	0.004	0.035	0.004	0.114	0.000	0.024	0.025	0.185	0.003	0.056	0.062
	lg	0.057	0.019	0.002	0.313	0.000	0.021	0.009	0.003	0.018	0.028	0.135
	total	0.072	0.311	0.006	0.456	0.000	0.058	0.052	0.330	0.027	0.111	0.229
Fish Ticket Data:												
3 Jul - 10 Sep (all season)	Boat-Hours Fished	16,443	11,264	10,301	44,607	835	6,696	6,224	2,964 <sup>b</sup>	975	888	101,197
	Chinook Salmon (gross catch):											
	sm	46	132	18	209	10	213	76	135	10	79	928
	Chinook/Boat-Hr:											
	sm	0.003	0.012	0.002	0.005	0.012	0.032	0.012	0.046	0.010	0.089	0.009
7 - 25 Aug (retention period)	Boat-Hours Fished	6,129	6,392	5,857	19,306	0	3,508	3,087	2,932 <sup>b</sup>	218	107,880	47,537
	Chinook Salmon (gross catch):											
	lg	116	194	106	9,873	0	75	120	358	0	7	10,849
	Chinook/Boat-Hr:											
	lg	0.019	0.030	0.018	0.511		0.021	0.039	0.122	0.000	0.065	0.228

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

<sup>b</sup> Includes fishing effort during statistical weeks 28-30 when Hidden Falls was open to retention of large chinook salmon.

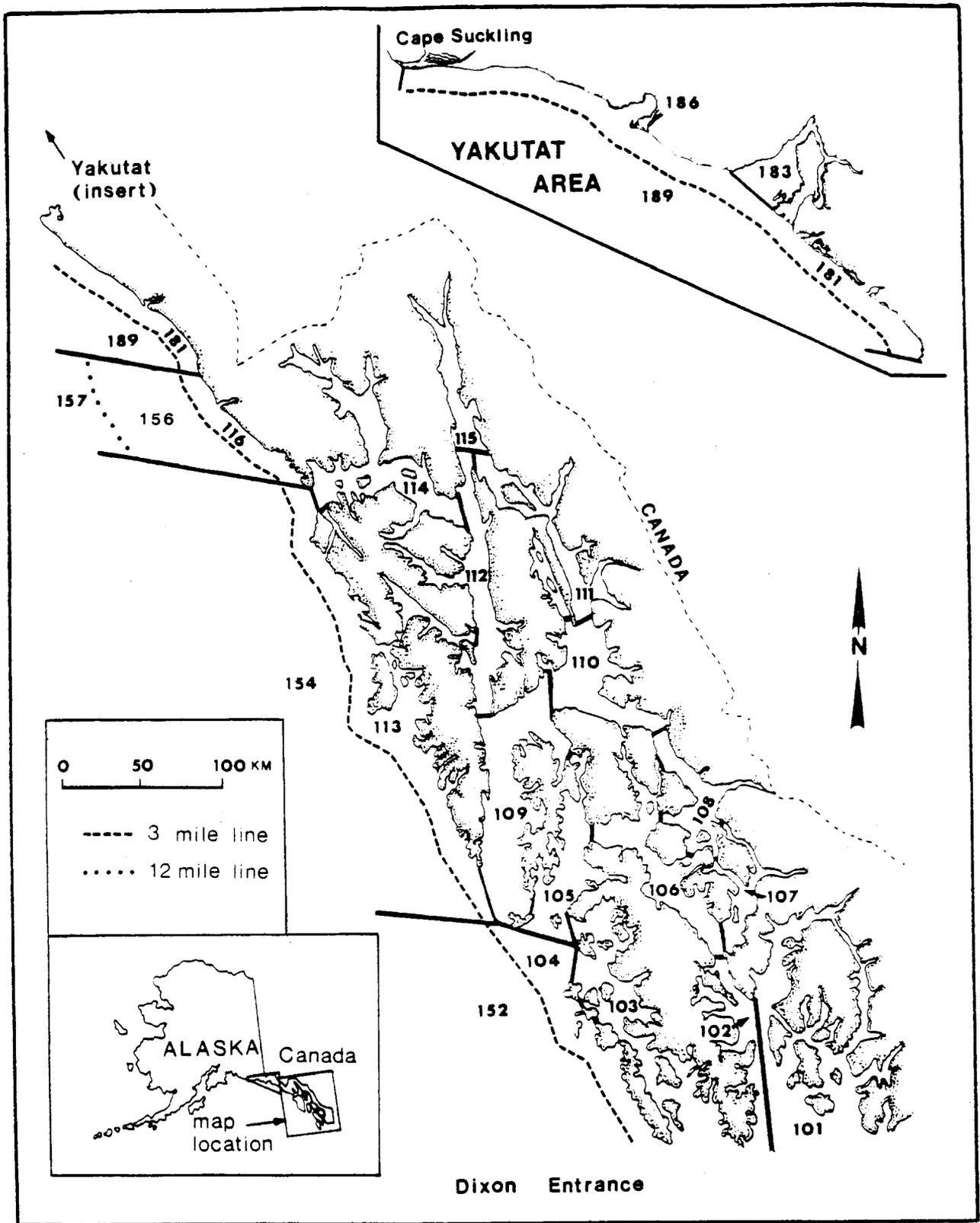


Figure 1. Map of Southeast Alaska showing the statistical fishing districts.

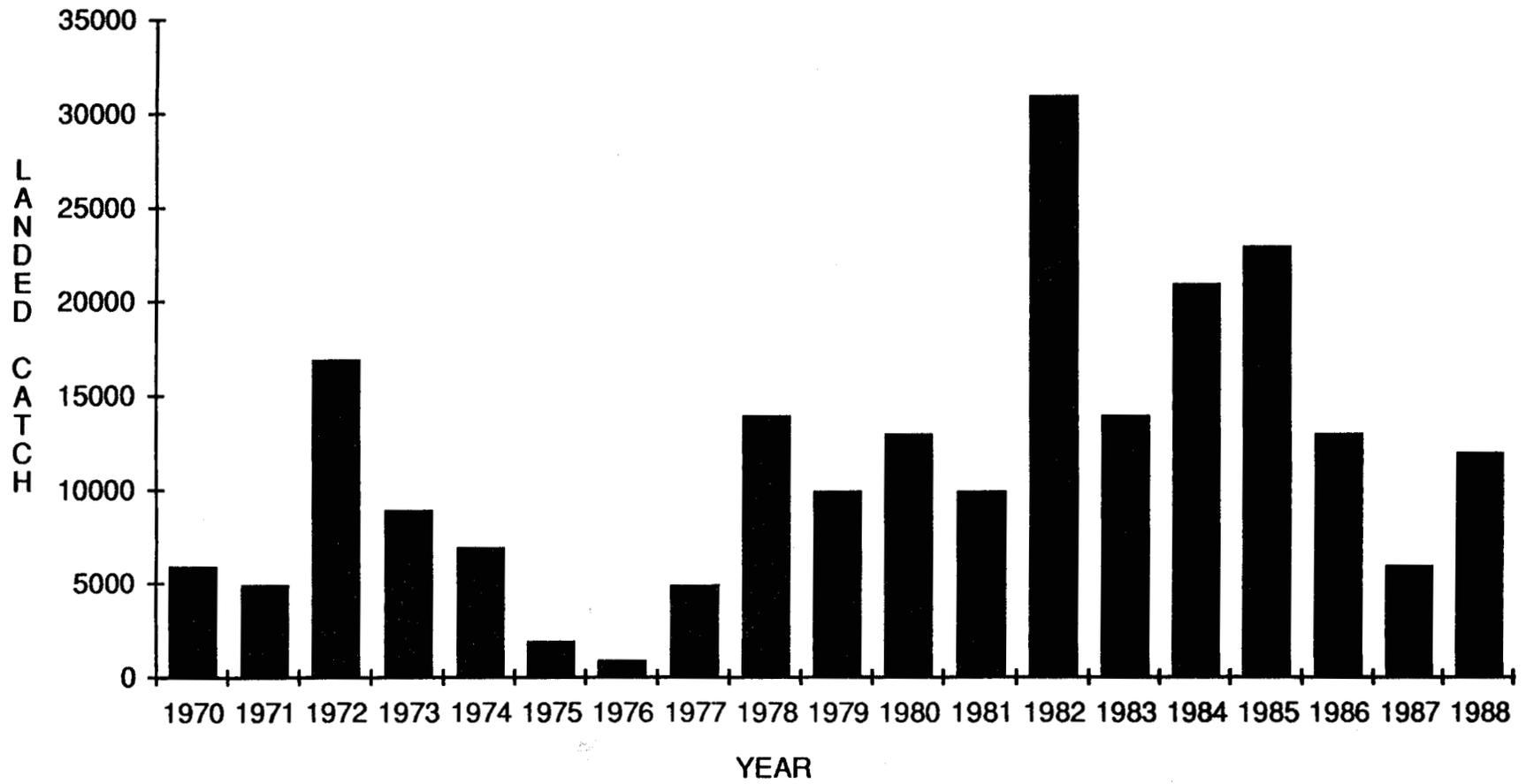


Figure 2. Annual landed catch of chinook salmon by the Southeast Alaska purse seine fishery, 1970 to 1988.

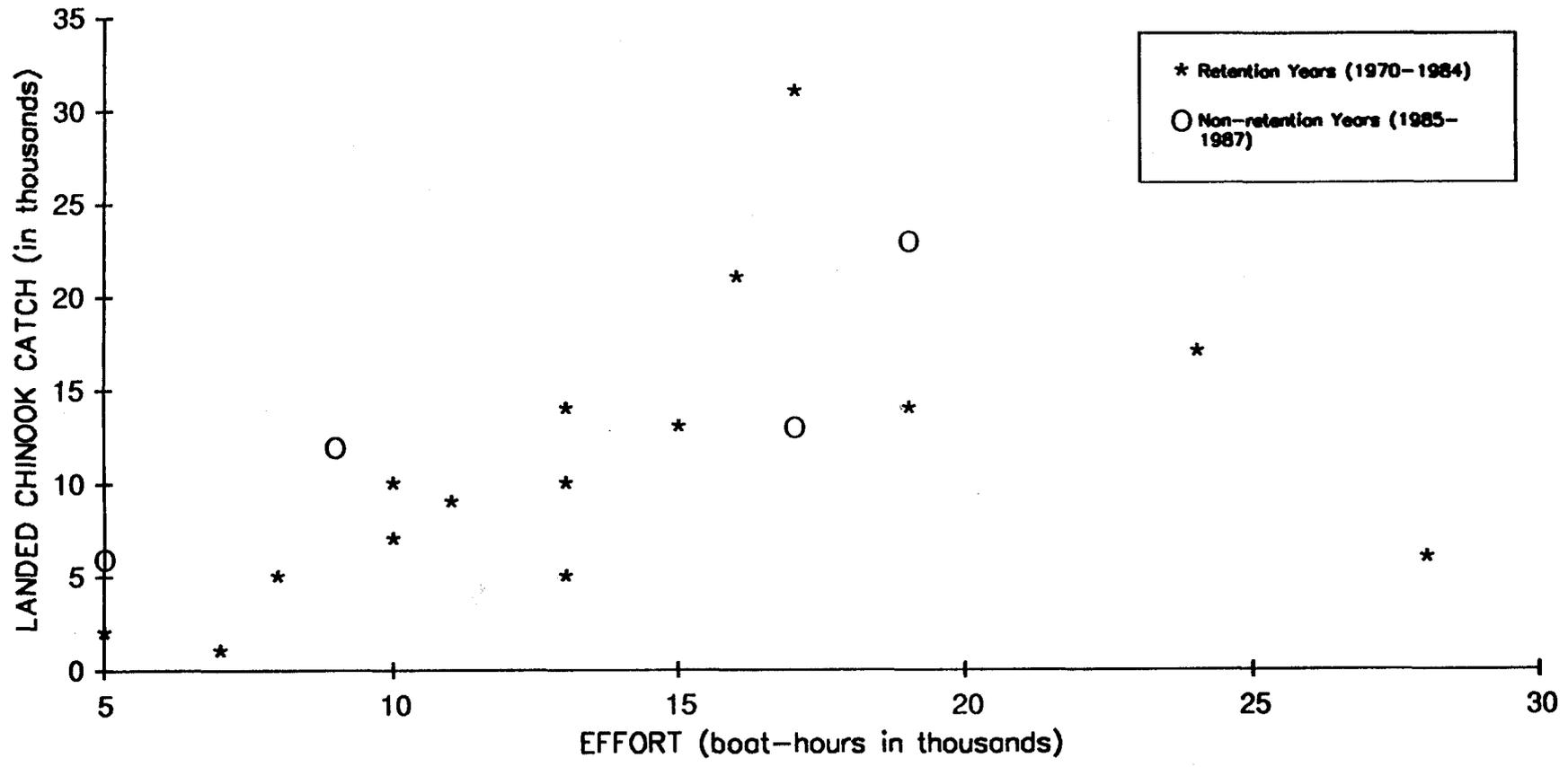


Figure 3. Relationship between number of boat-hours fished and landed catch of chinook salmon by the Southeast Alaska purse seine fishery, 1970 to 1988.

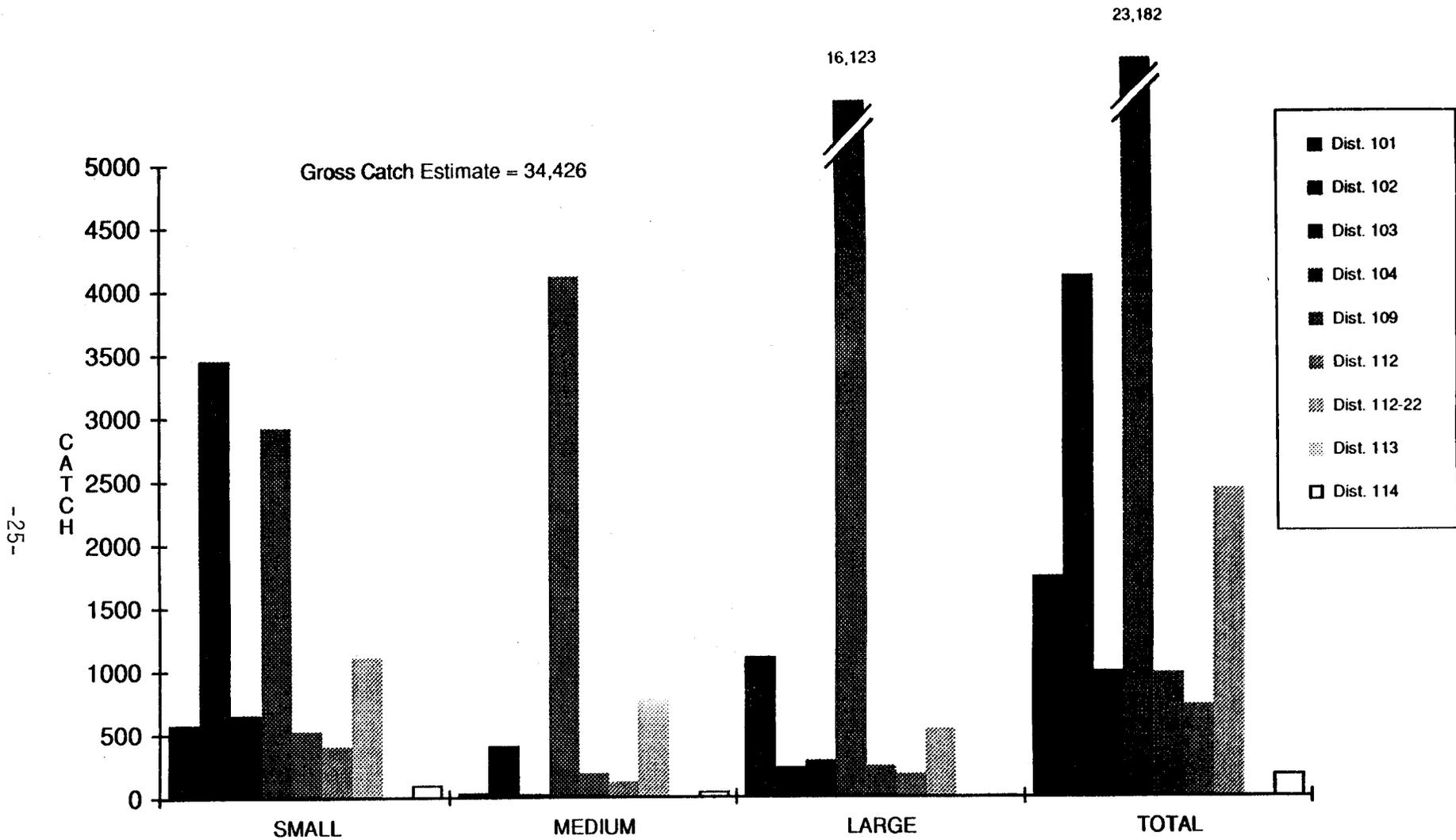


Figure 4. Estimated gross catch of chinook salmon in the 1988 Southeast Alaska purse seine fishery by size class and district. Data was collected as part of the dockside observation/skipper interview program and expanded by boat-hour of effort.

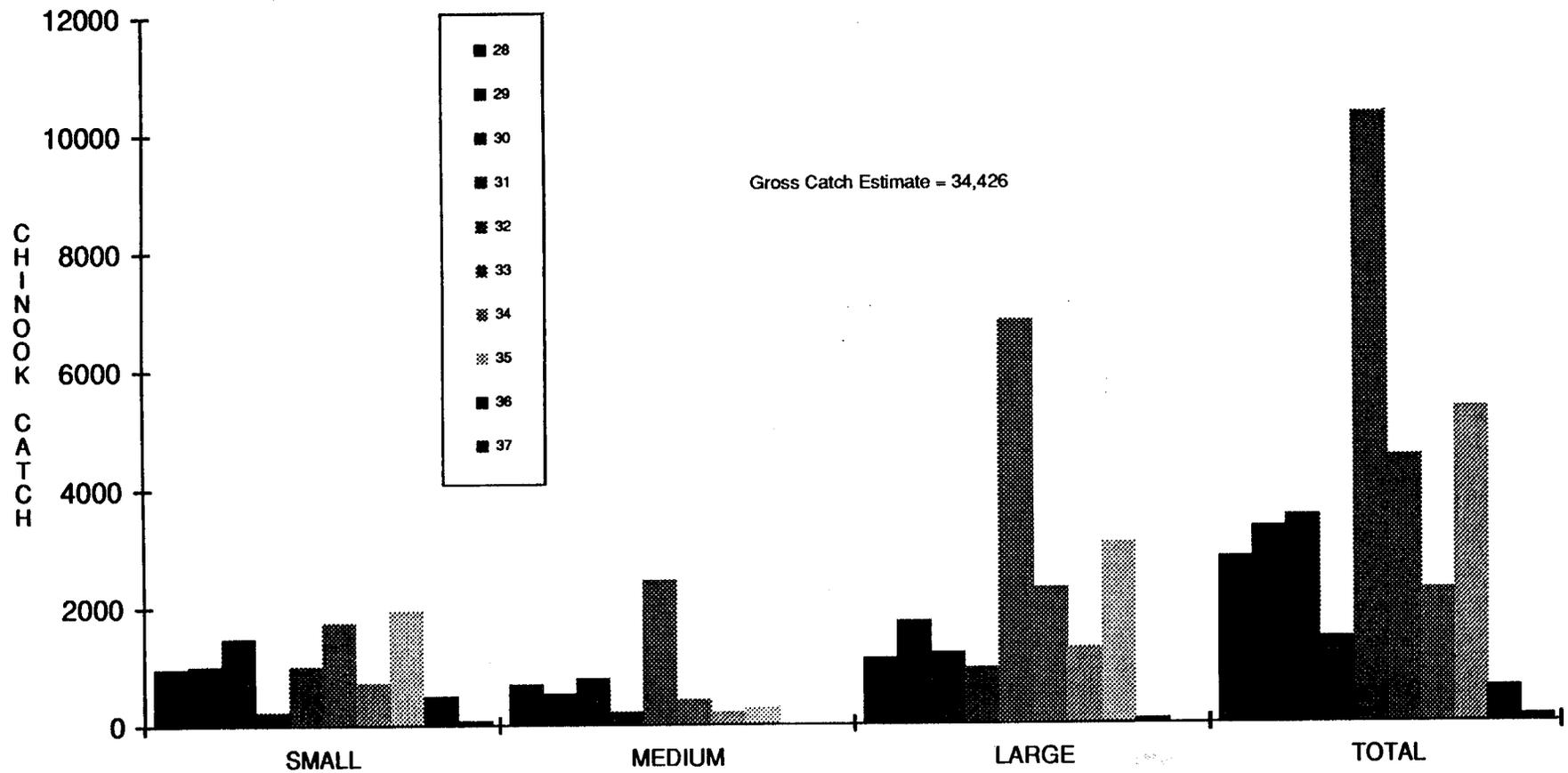


Figure 5. Estimated gross catch of chinook salmon in the 1988 Southeast Alaska purse seine fishery by size class and statistical weeks. Data was collected as part of the dockside observation/skipper interview program and expanded by boat-hour of effort.

## APPENDICES

Appendix A.1. Number of days fished by district and statistical week for the Southeast Alaska purse seine fishery, 1988.

	Stat Week	Fishing Dates	District											Total	
			101	102	103	104	105	109	110	112 <sup>a</sup>	112-22	113	114		
Non-Retention	28	Jul 3	1			2					1	1 <sup>d</sup>	1	1	7
		Jul 9	1 <sup>b</sup>												1
	29	Jul 10	1	1		2		1	1	1	1 <sup>d</sup>	1	1	10	
		Jul 14	1	1		1				1		1	1	6	
	30	Jul 17	1	1		1		1		1	1 <sup>d</sup>		1	7	
		Jul 23-24	2 <sup>c</sup>											2	
	31	Jul 24	1	1		1	1	1		1		1	1	8	
32	Jul 31-Aug 1	2	2		2		1						7		
	Jul 31-Aug 1	2 <sup>c</sup>											2		
Retention	33	Aug 7	1	1		1		1		1	1	1	1	7	
		Aug 10-11	2	2		2		1		1	1		9		
	34	Aug 14						1		1	1	1	4		
		Aug 18	1	1	1	1		1		1	1		7		
Non-Reten	35	Aug 21		1	1	1		1					4		
Retention	35	Aug 24-25		2	2	2		2		2	2	1	1	12	
Non-Reten.	36	Aug 28		1	1	1	1	1		1	1			7	
		Sep 1		1	1	1	1	1		1	1	1	8		
	37	Sep 8-9		2	2			1				1		6	
Total Days:			16	17	8	18	3	14	1	13	11	9	6	116	

<sup>a</sup> Includes all of District 112, except 112-22 (Hidden Falls).

<sup>b</sup> Neets Bay terminal hatchery area opening (101-95).

<sup>c</sup> Nakat Inlet special harvest area opening (101-10).

<sup>d</sup> Hidden Falls terminal hatchery area opening (112-22).

Appendix A.2. Number of boat hours fished by district and statistical week for the Southeast Alaska purse seine fishery, 1988.

	Stat Week	Fishing Dates	District										Total		
			101	102	103	104	105	109	110	112 <sup>a</sup>	112-22	113		114	
Non-Retention	28	Jul 3	15			39					15	15 <sup>d</sup>	15	15	114
		Jul 9	12 <sup>b</sup>												12
	29	Jul 10	15	15		39		15	15	15	15 <sup>d</sup>	15	15	15	159
		Jul 14	15	15		15				15		15	15		90
	30	Jul 17	15	15		15		15		15	15 <sup>d</sup>		15		105
		Jul 23-24	24 <sup>c</sup>												24
	31	Jul 24	15	15		15	15	15		15			15	15	120
32	Jul 31-Aug 1	39	39		39		15							132	
	Jul 31-Aug 1	24 <sup>c</sup>												24	
Retention	33	Aug 7	15	15		15		15		15	15	15			105
		Aug 10-11	39	39		39		15		15	15				162
	34	Aug 14						15		15	15	15			60
		Aug 18	15	15	15	15		15		15	15				105
Non-Reten	35	Aug 21		15	15	15		15				15	12	87	
Retention	35	Aug 24-25		39	39	39		39		39	39			234	
Non-Reten.	36	Aug 28		15	15	15	15	15		15	15				105
		Sep 1		15	15	15	15	15		15	15		15		120
	37	Sep 8-9		36	36			12					12		96
	38	Sep 12		12	12								12		36
	Sep 15		12	12										24	
Total Boat-Hours:			243	312	159	315	45	216	15	204	174	144	87	1,914	

<sup>a</sup> Includes all of District 112, except 112-22 (Hidden Falls).  
<sup>b</sup> Neets Bay terminal hatchery area opening (101-95).  
<sup>c</sup> Nakat Inlet special harvest area opening (101-10).  
<sup>d</sup> Hidden Falls terminal hatchery area opening (112-22).

Appendix A.3. Effort (number of unique boats fished) by district and by statistical week in the Southeast Alaska purse seine fishery, 1988.

Dist	Stat Week	Effort	District Totals	Dist	Stat Week	Effort	District Totals
101	28	63.99	575.79	112	28	33.00	225.62
	29	72.66			29	69.32	
	30	55.00			30	3.50	
	31	110.00			31	4.00	
	32	120.50			33	13.50	
	33	98.06			34	80.31	
	34	55.58			35	6.99	
102	29	4.33	342.95	112-22	28	87.50	189.96
	30	4.00			29	42.64	
	32	26.00			30	51.00	
	33	41.22			33	2.00	
	34	36.58			34	5.16	
	35	66.99			35	1.16	
	36	38.33			36	0.50	
103	34	16.07	262.22	113	29	12.66	
	35	103.99			31	7.00	
	36	112.16			33	2.00	
	37	30.00			34	10.50	
104	28	75.16	1,259.25	114	35	2.00	50.49
	29	131.15			36	7.00	
	30	178.50			37	14.00	
	31	116.00			28	6.00	
	32	210.50			29	10.50	
	33	176.23			30	14.00	
	34	140.89			31	11.00	
	35	142.16			35	8.99	
105	31	17.00	36.33				
	36	19.33					
109	29	10.32	269.47				
	30	46.00					
	31	44.50					
	32	12.00					
	33	32.83					
	34	20.83					
	35	35.16					
	36	37.83					
37	30.00						

Appendix A.4. Numbered calendar weeks (i.e., Statistical Weeks) used to report commercial catches, 1988.

Week Number	From	To	Week Number	From	To
1	Jan 1	Jan 2	28	Jul 3	Jul 9
2	Jan 3	Jan 9	29	Jul 10	Jul 16
3	Jan 10	Jan 16	30	Jul 17	Jul 23
4	Jan 17	Jan 23	31	Jul 24	Jul 30
5	Jan 24	Jan 30	32	Jul 31	Aug 6
6	Jan 31	Feb 6	33	Aug 7	Aug 13
7	Feb 7	Feb 13	34	Aug 14	Aug 20
8	Feb 14	Feb 20	35	Aug 21	Aug 27
9	Feb 21	Feb 27	36	Aug 28	Sep 3
10	Feb 28	Mar 5	37	Sep 4	Sep 10
11	Mar 6	Mar 12	38	Sep 11	Sep 17
12	Mar 13	Mar 19	39	Sep 18	Sep 24
13	Mar 20	Mar 26	40	Sep 25	Oct 1
14	Mar 27	Apr 2	41	Oct 2	Oct 8
15	Apr 3	Apr 9	42	Oct 9	Oct 15
16	Apr 10	Apr 16	43	Oct 16	Oct 22
17	Apr 17	Apr 23	44	Oct 23	Oct 29
18	Apr 24	Apr 30	45	Oct 30	Nov 5
19	May 1	May 7	46	Nov 6	Nov 12
20	May 8	May 14	47	Nov 13	Nov 19
21	May 15	May 21	48	Nov 20	Nov 26
22	May 22	May 28	49	Nov 27	Dec 3
23	May 29	Jun 4	50	Dec 4	Dec 10
24	Jun 5	Jun 11	51	Dec 11	Dec 17
25	Jun 12	Jun 18	52	Dec 18	Dec 24
26	Jun 19	Jun 25	53	Dec 25	Dec 31
27	Jun 26	Jul 2			

Appendix B.1. Purse seine dockside observation and skipper interview form.

ALASKA DEPARTMENT OF FISH AND GAME  
 INCIDENTAL CHINOOK MORTALITY ASSESSMENT  
 1988 DOCKSIDE INTERVIEW PROGRAM

CONFIDENTIAL

INDIVIDUAL SEINE BOAT FORM:

Interviewer: \_\_\_\_\_ Date Sampled: \_\_\_\_\_  
 Port: \_\_\_\_\_ Opening Dates: \_\_\_\_\_  
 Processor: \_\_\_\_\_ District of Catch: \_\_\_\_\_  
 subdistrict: \_\_\_\_\_  
 ADF&G #: \_\_\_\_\_ Vessel Name: \_\_\_\_\_

Was the ENTIRE DELIVERY observed and all CHINOOK counted? YES NO

Did this boat sell to a tender previously during this opening? YES NO  
 If YES, 1) how many previous deliveries? \_\_\_\_\_

2) did he sell PINKS ONLY, MONEY FISH ONLY, ALL FISH?

3) were any small chinooks sorted from pinks? YES NO

How many hours of fishing does this delivery represent? \_\_\_\_\_

DISPOSITION OF CHINOOK AND OBSERVED CATCHES:

	# Fish Counted on Dock	+	Other/ Kept	+	# Fish Released Alive	+	# Fish Released Dead	-	Total Catch
Small <21"	_____		_____		_____		_____		_____
Medium >21-<28"	_____		_____		_____		_____		_____
Large >28"	_____		_____		_____		_____		_____

OBSERVER COUNT\*      FISH TICKET COUNT

CHUM: \_\_\_\_\_  
 PINK: \_\_\_\_\_  
 COHO: \_\_\_\_\_  
 SOCKEYE: \_\_\_\_\_

\* Note if partial or complete count.

COMMENTS:

Appendix B.2. Purse seine dockside observation form for tender boats.

ALASKA DEPARTMENT OF FISH AND GAME  
 INCIDENTAL CHINOOK MORTALITY ASSESSMENT  
 1988 DOCKSIDE INTERVIEW PROGRAM

CONFIDENTIAL

TENDER FORM:

Interviewer: \_\_\_\_\_ Date Sampled: \_\_\_\_\_  
 Port: \_\_\_\_\_ Opening Dates: \_\_\_\_\_  
 Processor: \_\_\_\_\_ District of Catch: \_\_\_\_\_  
 subdistrict: \_\_\_\_\_  
 ADF&G #: \_\_\_\_\_ Vessel Name: \_\_\_\_\_

Was the ENTIRE PINK DELIVERY observed and all chinook counted? YES NO

What seine boats sold to this tender?

Boat Name	ADF&G #	Date Sold	Dist/sub	NO. or LBS. Fish		
				CHUM	PINKS*	COHO
SOCKEYE						

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

\* BE CERTAIN THAT NO'S. OR LBS. OF PINKS ARE RECORDED.

DISPOSITION OF CHINOOK AND OBSERVED CATCHES:

	# Fish Counted on Dock	+	Other/ Kept	-	Total Catch
Small <21"	_____		_____		_____
Medium >21-<28"	_____		_____		_____
Large ≥28"	_____		_____		_____

COMMENTS:

Appendix C.1. Summary of dockside sampling data collected during the large chinook salmon non-retention period (3 July to 6 August, 21-23 August, and 28 August to 10 September) of the 1988 Southeast Alaska purse seine fishery.

	District										
	101	102	103	104	105	109	112 <sup>a</sup>	112-22	113	114	Totals
No. Landings Sampled:	12	6	8	94	5	76	21	20	15	14	271
Gross Catch and Percent of Total Catch by Participating Vessels <sup>b</sup> :											
Chum Salmon:	No. 5,041	2,502	813	12,429	1,626	53,521	28,739	31,532	6,487	20,493	163,183
	% 15.41	17.85	3.68	6.46	42.20	32.60	49.92	90.33	94.56	37.28	27.96
Pink Salmon:	No. 26,777	10,936	20,956	98,267	2,164	105,907	28,436	2,972	260	33,491	330,166
	% 81.87	78.00	94.77	51.05	56.16	64.52	49.40	8.51	3.79	60.93	56.57
Coho Salmon:	No. 48	276	283	6,015	60	2,732	236	52	104	492	10,298
	% 0.15	1.97	1.28	3.13	1.56	1.66	0.41	0.15	1.52	0.90	1.76
Sockeye Salmon:	No. 797	276	35	73,548	2	1,756	84	141	2	428	77,069
	% 2.44	1.97	0.16	38.21	0.05	1.07	0.15	0.40	0.03	0.78	13.21
Chinook Salmon:	No. 45	30	26	2,216	1	239	71	210	7	62	2,907
	% 0.14	0.21	0.12	1.15	0.03	0.15	0.12	0.60	0.10	0.11	0.50
Gross Catch:	No. 32,708	14,020	22,113	192,475	3,853	164,155	57,566	34,907	6,860	54,966	583,623
Gross Catch and Percent of Chinook Salmon (by disposition and size class):											
Released Alive											
Small:	No. 0	0	0	61	0	23	8	40	2	5	139
	%			52.59		65.71	32.00	85.11	100.00	71.43	58.65
Medium:	No. 0	5	0	401	0	19	0	28	0	8	461
	%	71.43		81.17		41.30		46.67		57.14	72.37
Large:	No. 18	0	0	1,268	0	30	5	0	1	6	1,328
	%	66.67		87.21		68.18	83.33		50.00	85.71	86.18
Released Dead											
Small:	No. 0	0	0	12	0	7	2	0	0	0	21
	%			10.34		20.00	8.00				8.86
Medium:	No. 0	0	0	31	0	13	0	1	0	1	46
	%			6.28		28.26		1.67		7.14	7.22
Large:	No. 8	0	0	157	0	2	1	0	0	0	168
	%	29.63		10.80		4.55	16.67				10.90
Kept/Other/Sold											
Small:	No. 5	0	0	43	0	5	15	7	0	2	77
	%	100.00		37.07		14.29	60.00	14.89		28.57	32.49
Medium:	No. 2	2	2	62	0	14	12	31	0	5	130
	%	100.00	28.57	100.00	12.55	30.43	100.00	51.67		35.71	20.41
Large:	No. 1	0	0	29	0	12	0	1	1	1	45
	%	3.70		1.99		27.27		100.00	50.00	14.29	2.92
Totals											
Small:	No. 5	0	0	116	0	35	25	47	2	7	237
Medium:	No. 2	7	2	494	0	46	12	60	0	14	637
Large:	No. 27	0	0	1454	0	44	6	1	2	7	1541

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).  
<sup>b</sup> Chum, pink, sockeye, and coho salmon catches reported as landed on fish tickets were assumed equivalent to gross catch. Chinook salmon gross catches were obtained from dockside sampling data and include all size classes and dispositions.

Appendix C.2. Summary of dockside sampling data collected during the large chinook salmon retention period (7 to 20 August, 24 to 27 August) of the 1988 Southeast Alaska purse seine fishery.

	District										Totals
	101	102	103	104	105	109	112 <sup>a</sup>	112-22	113	114	
No. Landings Sampled:	4	5	10	29	0	25	31	1	5	0	110
<b>Gross Catch and Percent of Total Catch by Participating Vessels<sup>b</sup>:</b>											
Chum Salmon:	No. 671	1,436	2,152	3,779	0	7,559	2,033	103	1,892	0	19,625
	% 4.92	4.15	4.67	4.60		7.02	2.87	1.98	58.36		5.40
Pink Salmon:	No. 12,854	32,133	42,529	71,987	0	98,513	67,109	5,063	1,029	0	331,217
	% 94.26	92.78	92.22	87.54		91.52	94.68	97.50	31.74		91.10
Coho Salmon:	No. 16	393	1,179	2,072	0	1,031	1,314	18	126	0	6,149
	% 0.12	1.13	2.56	2.52		0.96	1.85	0.35	3.89		1.69
Sockeye Salmon:	No. 94	495	217	3,963	0	414	316	7	189	0	5,695
	% 0.69	1.43	0.47	4.82		0.38	0.45	0.13	5.83		1.57
Chinook Salmon:	No. 2	178	42	432	0	121	107	2	6	0	890
	% 0.01	0.51	0.09	0.53		0.11	0.15	0.04	0.19		0.24
Gross Catch:	No. 13,637	34,635	46,119	82,233	0	107,638	70,879	5,193	3,242	0	363,576
<b>Gross Catch and Percent of Chinook Salmon (by disposition and size class):</b>											
<b>Released Alive</b>											
Small:	No. 0	100	0	5	0	1	0	0	0	0	106
	%	80.65		27.78		100.00					73.10
Medium:	No. 0	0	0	16	0	7	9	0	0	0	32
	%			43.24		30.43	36.00				32.65
Large:	No. 0	3	0	0	0	5	1	0	4	0	13
	%	33.33				31.25	14.29		100.00		28.89
<b>Released Dead</b>											
Small:	No. 0	0	0	1	0	0	2	0	0	0	3
	%			5.56			100.00%				2.07
Medium:	No. 0	0	0	1	0	0	0	0	0	0	1
	%			2.70							1.02
Large:	No. 0	0	0	0	0	0	0	0	0	0	0
	%										0
<b>Kept/Other/Sold</b>											
Small:	No. 0	24	0	12	0	0	0	0	0	0	36
	%	19.35		66.67							24.83
Medium:	No. 0	10	1	20	0	16	16	1	1	0	65
	%	100.00	100.00	54.05		69.57	64.00	100.00	100.00		66.33
Large:	No. 0	6	2	7	0	11	6	0	0	0	32
	%	66.67	100.00	100.00		68.75	85.71				71.11
<b>Totals</b>											
Small:	No. 0	124	0	18	0	1	2	0	0	0	145
Medium:	No. 0	10	1	37	0	23	25	1	1	0	98
Large:	No. 0	9	2	7	0	16	7	0	4	0	45

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).  
<sup>b</sup> Chum, pink, sockeye, and coho salmon catches reported as landed on fish tickets were assumed equivalent to gross catch. Chinook salmon gross catches were obtained from dockside sampling data and include all size classes and dispositions.

Appendix C.3. Summary of dockside sampling data collected during the 1988 Southeast Alaska purse seine fishery (non-retention and retention periods combined, 3 July to 10 September).

	District										Totals
	101	102	103	104	105	109	112 <sup>a</sup>	112-22	113	114	
No. Landings Sampled:	16	11	18	123	5	101	52	21	20	14	381
Gross Catch and Percent of Total Catch by Participating Vessels <sup>b</sup> :											
Chum Salmon:	No. 5,712	3,938	2,965	16,208	1,626	61,080	30,772	31,635	8,379	20,493	182,808
	% 12.32	8.09	4.35	5.90	42.20	22.47	23.96	78.89	82.94	37.28	19.30
Pink Salmon:	No. 39,631	43,069	63,485	170,254	2,164	204,420	95,545	8,035	1,289	33,491	661,383
	% 85.51	88.52	93.04	61.98	56.16	75.21	74.39	20.04	12.76	60.93	69.83
Coho Salmon:	No. 64	669	1,462	8,087	60	3,763	1,550	70	230	492	16,447
	% 0.14	1.37	2.14	2.94	1.56	1.38	1.21	0.17	2.28	0.90	1.74
Sockeye Salmon:	No. 891	771	252	77,511	2	2,170	400	148	191	428	82,764
	% 1.92	1.58	0.37	28.22	0.05	0.80	0.31	0.37	1.89	0.78	8.74
Chinook Salmon:	No. 47	208	68	2648	1	360	178	212	13	62	3,797
	% 0.10	0.43	0.10	0.96	0.03	0.13	0.14	0.53	0.13	0.11	0.40
Total Catch:	No. 46,345	48,655	68,232	274,708	3,853	271,793	128,445	40,100	10,102	54,966	947,199
Gross Catch and Percent of Chinook Salmon (by disposition and size class):											
Released Alive											
Small:	No. 0	100	0	66	0	24	8	40	2	5	245
	%	80.65		49.62		66.67	29.63	85.11	100.00	71.43	64.30
Medium:	No. 0	5	0	417	0	26	9	28	0	8	493
	%	29.41		78.53		37.68	24.32	45.90		57.14	67.07
Large:	No. 18	3	0	1268	0	35	6	0	5	6	1,341
	%	66.67	33.33	86.79		58.33	46.15		83.33	85.71	84.55
Released Dead											
Small:	No. 0	0	0	13	0	7	4	0	0	0	24
	%			9.77		19.44	14.81				6.30
Medium:	No. 0	0	0	32	0	13	0	1	0	1	47
	%			6.03		18.84		1.64		7.14	6.39
Large:	No. 8	0	0	157	0	2	1	0	0	0	168
	%	29.63		10.75		3.33	7.69				10.59
Kept/Other/Sold											
Small:	No. 5	24	0	54	0	5	15	7	0	2	112
	%	100.00	19.35	40.60		13.89	55.56	14.89	0.00	28.57	29.40
Medium:	No. 2	12	3	82	0	30	28	32	1	5	195
	%	100.00	70.59	15.44		43.48	75.68	52.46	100.00	35.71	26.53
Large:	No. 1	6	2	36	0	23	6	1	1	1	77
	%	3.70	66.67	100.00	2.46	38.33	46.15	100.00	16.67	14.29	4.85
Totals											
Small:	No. 5	124	0	133	0	36	27	47	2	7	381
Medium:	No. 2	17	3	531	0	69	37	61	1	14	735
Large:	No. 27	9	2	1461	0	60	13	1	6	7	1,586

<sup>a</sup> Includes all waters of District 112, except 112-22 (Hidden Falls).

<sup>b</sup> Chum, pink, sockeye, and coho salmon catches reported as landed on fish tickets were assumed equivalent to gross catch. Chinook salmon gross catches were obtained from dockside sampling data and include all size classes and dispositions.

Appendix C.4. Summary of data collected and number of pink salmon per small chinook salmon caught from tender boats during the 1988 purse seine dockside sampling program in Southeast Alaska.

Dist	Stat Week	No. of Tenders Sampled	Landed Catch <sup>a</sup>		No. Pink Salmon per Small Chinook Salmon
			Pink Salmon <sup>a</sup>	Small Chinook Salmon <sup>b</sup>	
101	29	2	35,900	81	443
	30	1	16,496	58	284
	31	1	21,050	10	2,105
	33	3	37,016	12	3,085
102	33	1	6,853	39	176
	35	1	3,575	2	1,788
103	34	1	9,428	8	1,179
	35	1	5,910	4	1,478
104	29	2	3,796	41	93
	30	3	7,480	44	170
	31	1	1,806	7	258
	32	1	4,921	17	289
	33	1	17,755	23	772
	35	2	55,008	8	6,876
112 <sup>c</sup>	29	4	13,677	54	253
	30	1	839	4	210
	33	1	9,831	9	1,092
	34	4	54,280	21	2,585
114	29	1	1,916	3	639
	31	2	4,981	17	293
Totals		34	312,518	462	676

<sup>a</sup> Catch totals were obtained from fish ticket data.

<sup>b</sup> All fish were observed during unloading, including those sold and not sold.

<sup>c</sup> Includes all waters of District 112.

Appendix C.5. Comparison of data collected from dockside sampling data and recorded on fish tickets for individual seine boat deliveries from the 1988 Southeast Alaska purse seine fishery.

Dist	No. Landings Sampled	Landed Catch of Small Chinook Salmon		Small Chinook Salmon Never Landed	
		Reported on Fish Tickets <sup>a</sup>	Observed on Docks <sup>b,c</sup>	Released Alive <sup>b</sup>	Kept or Discarded <sup>b</sup>
101	16	0	12	0	5
102	11	20	53	100	24
103	18	5	37	0	0
104	123	79	186	66	67
105	5	2	1	0	0
109	101	118	174	24	12
112 <sup>d</sup>	52	43	65	8	19
112-22	21	28	57	40	7
113	20	2	4	2	0
114	14	63	34	5	2
Total	381	360	623	245	136

Dist	No. Landings Sampled	Landed Catch of Large Chinook Salmon		Large Chinook Salmon Never Landed	
		Reported on Fish Tickets <sup>a</sup>	Observed on Docks <sup>b,c</sup>	Released Alive <sup>b</sup>	Kept or Discarded <sup>b</sup>
101	16	2	1	18	9
102	11	8	5	3	6
103	18	50	26	0	2
104	123	269	336	1,268	193
105	5	0	0	0	0
109	101	13	21	35	25
112 <sup>d</sup>	52	27	36	6	7
112-22	21	39	46	0	1
113	20	0	0	5	1
114	14	0	0	6	1
Total	381	408	471	1,341	245

- <sup>a</sup> Catch totals were obtained directly from fish ticket data.
- <sup>b</sup> Catch totals were obtained directly from dockside sampling data.
- <sup>c</sup> All fish were observed during unloading, including those sold and not sold.
- <sup>d</sup> Includes all waters of District 112, including 112-22 (Hidden Falls).



Dist	No. St Wk	No. Boats Samp.	No. Hours Fished	Boat-Hours Samp.	Sample Effort (Bt-Hr)	District Totals		Disposition	Sampled Chinook Catches			Chinook Per Boat-Hr			Estimated Chinook Catch			Standard Deviation	
						No. Boats Fished	Total Boat-Hr		Sm	Med	Lg	Sm	Med	Lg	Sm	Med	Lg		Totals:
103	34	1	15	15	0.06	16.07	241.05	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	1	1	2	0.067	0.067	0.133	16	16	32	64	
	35	12	54	648	0.12	103.99	5,615.46	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	15	2	26	0.023	0.003	0.040	130	17	225	373	
	36	5	30	150	0.04	112.16	3,364.80	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	21	0	0	0.140	0.000	0.000	471	0	0	471	
	37	0	36	0	0.00	30.00	1,080.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead				0.046	0.004	0.034	49	4	37	90	
								Rel Alive							0	0	0	0	
								Dead							666	37	295	998	
								Total							666	37	295	998	151.66
104	28	5	39	195	0.07	75.16	2,931.24	Rel Alive	0	15	25	0.000	0.077	0.128	0	225	376	601	
								Dead	13	7	3	0.067	0.036	0.015	195	105	45	346	
	29	29	54	1566	0.22	131.15	7,082.10	Rel Alive	42	86	279	0.027	0.055	0.178	190	389	1,262	1,841	
								Dead	55	25	31	0.035	0.016	0.020	249	113	140	502	
	30	18	15	270	0.10	178.50	2,677.50	Rel Alive	15	23	64	0.056	0.085	0.237	149	228	635	1,012	
								Dead	62	13	19	0.230	0.048	0.070	615	129	188	932	
	31	9	15	135	0.08	116.00	1,740.00	Rel Alive	2	5	61	0.015	0.037	0.452	26	64	786	876	
								Dead	7	2	8	0.052	0.015	0.059	90	26	103	219	
	32	29	39	1131	0.14	210.50	8,209.50	Rel Alive	2	269	787	0.002	0.238	0.696	15	1,953	5,713	7,680	
								Dead	50	45	122	0.044	0.040	0.108	363	327	886	1,575	
	33	14	54	756	0.08	176.23	9,516.42	Rel Alive	2	13	0	0.003	0.017	0.000	25	164	0	189	
								Dead	24	11	168	0.032	0.015	0.222	302	138	2,115	2,555	
	34	10	15	150	0.07	140.89	2,113.35	Rel Alive	1	3	0	0.007	0.020	0.000	14	42	0	56	
								Dead	27	7	77	0.180	0.047	0.513	380	99	1,085	1,564	
	35	8	54	432	0.06	142.16	7,676.64	Rel Alive	2	3	51	0.005	0.007	0.118	36	53	906	995	
								Dead	16	4	101	0.037	0.009	0.234	284	71	1,795	2,150	
	36	1	30	30	0.01	88.66	2,659.80	Rel Alive	0	0	1	0.000	0.000	0.033	0	0	89	89	
								Dead	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Rel Alive							454	3,119	9,766	13,338	
								Dead							2,479	1,008	6,357	9,844	
								Total							2,933	4,127	16,123	23,182	512.59
105	31	2	15	30	0.12	17.00	255.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	0	0	0	0.000	0.000	0.000	0	0	0	0	
	36	3	30	90	0.16	19.33	579.90	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	1	0	0	0.011	0.000	0.000	6	0	0	6	
								Rel Alive							0	0	0	0	
								Dead							6	0	0	6	
								Total							6	0	0	6	24.35

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Dist	St	No. Boats Samp.	No. Hours Fished	Boat-Hours Samp.	Sample Effort (Bt-Hr)	District Totals		Disposition	Sampled Chinook Catches			Chinook Per Boat-Hr			Estimated Chinook Catch			Standard Deviation	
						No. Boats Fished	Total Boat-Hr		Sm	Med	Lg	Sm	Med	Lg	Sm	Med	Lg		Totals:
109	29	1	15	15	0.10	10.32	154.80	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	1	0	1	0.067	0.000	0.067	10	0	10	21	
	30	13	15	195	0.28	46.00	690.00	Rel Alive	16	1	17	0.082	0.005	0.087	57	4	60	120	
								Dead	35	3	13	0.179	0.015	0.067	124	11	46	180	
	31	12	15	180	0.27	44.50	667.50	Rel Alive	0	15	12	0.000	0.083	0.067	0	56	45	100	
								Dead	17	13	4	0.094	0.072	0.022	63	48	15	126	
	32	1	15	15	0.08	12.00	180.00	Rel Alive	0	1	1	0.000	0.067	0.067	0	12	12	24	
								Dead	1	0	0	0.067	0.000	0.000	12	0	0	12	
	33	18	30	540	0.55	32.83	984.90	Rel Alive	1	7	1	0.002	0.013	0.002	2	13	2	16	
								Dead	52	13	23	0.096	0.024	0.043	95	24	42	161	
	34	4	30	120	0.19	20.83	624.90	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	1	0	0	0.008	0.000	0.000	5	0	0	5	
	35	18	54	972	0.51	35.16	1,898.64	Rel Alive	5	2	4	0.005	0.002	0.004	10	4	8	21	
								Dead	63	10	5	0.065	0.010	0.005	123	20	10	152	
	36	22	30	660	0.58	37.83	1,134.90	Rel Alive	2	0	0	0.003	0.000	0.000	3	0	0	3	
								Dead	11	4	0	0.017	0.006	0.000	19	7	0	26	
	37	12	12	144	0.40	30.00	360.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	5	0	0	0.035	0.000	0.000	13	0	0	13	
								Rel Alive							72	88	126	286	
								Dead							464	109	123	696	
								Total							535	197	249	981	57.10
112	28	8	15	120	0.24	33.00	495.00	Rel Alive	3	0	2	0.025	0.000	0.017	12	0	8	21	
								Dead	15	10	2	0.125	0.083	0.017	62	41	8	111	
	29	11	30	330	0.16	69.32	2,079.60	Rel Alive	5	0	3	0.015	0.000	0.009	32	0	19	50	
								Dead	28	2	0	0.085	0.006	0.000	176	13	0	189	
	30	0	15	0	0.00	3.50	52.50	Rel Alive				0.005	0.003	0.004	0	0	0	1	
								Dead				0.057	0.022	0.029	3	1	2	6	
	31	0	15	0	0.00	4.00	60.00	Rel Alive				0.005	0.003	0.004	0	0	0	1	
								Dead				0.057	0.022	0.029	3	1	2	7	
	33	6	30	180	0.44	13.50	405.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	15	5	0	0.083	0.028	0.000	34	11	0	45	
	34	22	30	660	0.27	80.31	2,409.30	Rel Alive	0	4	1	0.000	0.006	0.002	0	15	4	18	
								Dead	24	9	32	0.036	0.014	0.048	88	33	117	237	
	35	3	39	117	0.43	6.99	272.61	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	2	7	8	0.017	0.060	0.068	5	16	19	40	
	36	2	30	60	0.13	15.00	450.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	0	0	1	0.000	0.000	0.017	0	0	8	8	
								Rel Alive							44	15	31	91	
								Dead							371	117	155	642	
								Total							415	132	186	733	61.87

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Dist	No. St Wk	No. Boats Samp.	No. Hours Fished	Boat-Hours Samp.	Sample Effort (Bt-Hr)	District Totals		Disposition	Sampled Chinook Catches			Chinook Per Boat-Hr			Estimated Chinook Catch			Standard Deviation	
						No. Boats Fished	Total Boat-Hr		Sm	Med	Lg	Sm	Med	Lg	Sm	Med	Lg		Totals:
112-22	28	9	15	135	0.10	87.50	1,312.50	Rel Alive	32	25	0	0.237	0.185	0.000	311	243	0	554	
								Dead	17	9	26	0.126	0.067	0.193	165	88	253	506	
	29	8	15	120	0.19	42.64	639.60	Rel Alive	5	0	0	0.042	0.000	0.000	27	0	0	27	
								Dead	23	1	6	0.192	0.008	0.050	123	5	32	160	
	30	3	15	45	0.06	51.00	765.00	Rel Alive	3	3	0	0.067	0.067	0.000	51	51	0	102	
								Dead	24	22	14	0.533	0.489	0.311	408	374	238	1,020	
	33	0	30	0		2.00	60.00	Rel Alive				0.121	0.085	0.000	7	5	0	12	
								Dead				0.194	0.100	0.142	12	6	9	26	
	34	1	30	30	0.19	5.16	154.80	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	0	1	1	0.000	0.033	0.033	0	5	5	10	
	35	0	15	0		1.16	17.40	Rel Alive				0.121	0.085	0.000	2	1	0	4	
								Dead				0.194	0.100	0.142	3	2	2	8	
36	0	30	0		0.50	15.00	Rel Alive				0.121	0.085	0.000	2	1	0	3		
							Dead				0.194	0.100	0.142	3	2	2	7		
								Rel Alive				400	302	0	702				
								Dead				714	481	541	1,736				
								Total				1,114	783	541	2,438	223.46			
113	29	3	30	90	0.24	12.66	379.80	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	0	0	0	0.000	0.000	0.000	0	0	0	0	
	31	0	15	0	0.00	7.00	105.00	Rel Alive				0.006	0.000	0.015	1	0	2	2	
								Dead				0.012	0.003	0.003	1	0	0	2	
	33	2	15	30	1.00	2.00	30.00	Rel Alive	0	0	4	0.000	0.000	0.133	0	0	4	4	
								Dead	0	1	0	0.000	0.033	0.000	0	1	0	1	
	34	3	15	45	0.29	10.50	157.50	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	1	0	0	0.022	0.000	0.000	4	0	0	4	
	35	0	15	0	0.00	2.00	30.00	Rel Alive				0.006	0.000	0.015	0	0	0	1	
								Dead				0.012	0.003	0.003	0	0	0	1	
	36	7	15	105	1.00	7.00	105.00	Rel Alive	2	0	1	0.019	0.000	0.010	2	0	1	3	
								Dead	3	0	0	0.029	0.000	0.000	3	0	0	3	
37	5	12	60	0.36	14.00	168.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0		
							Dead	0	0	1	0.000	0.000	0.017	0	0	3	3		
								Rel Alive				3	0	7	10				
								Dead				8	1	3	13				
								Total				11	1	10	23	15.17			

-continued-

Appendix D.1. (pg. 5 of 5).

Dist	St Wk	No. Boats Samp.	No. Hours Fished	Boat-Hours Samp.	Sample Effort (Bt-Hr)	District Totals		Disposition	Sampled Chinook Catches			Chinook Per Boat-Hr			Estimated Chinook Catch			Standard Deviation	
						No. Boats Fished	Total Boat-Hr		Sm	Med	Lg	Sm	Med	Lg	Sm	Med	Lg		Totals:
114	28	3	15	45	0.50	6.00	90.00	Rel Alive	0	2	2	0.000	0.044	0.044	0	4	4	8	
								Dead	8	0	0	0.178	0.000	0.000	16	0	0	16	
	29	4	30	120	0.38	10.50	315.00	Rel Alive	3	6	3	0.025	0.050	0.025	8	16	8	32	
								Dead	6	3	1	0.050	0.025	0.008	16	8	3	26	
	30	0	15	0	0.00	14.00	210.00	Rel Alive				0.020	0.032	0.024	4	7	5	16	
								Dead				0.143	0.024	0.004	30	5	1	36	
	31	1	15	15	0.09	11.00	165.00	Rel Alive	0	0	0	0.000	0.000	0.000	0	0	0	0	
								Dead	0	1	0	0.000	0.067	0.000	0	11	0	11	
	35	6	12	72	0.67	8.99	107.88	Rel Alive	2	0	1	0.028	0.000	0.014	3	0	1	4	
								Dead	22	2	0	0.306	0.028	0.000	33	3	0	36	
															Rel Alive	15	26	18	60
														Dead	95	27	3	125	
														Total	110	53	22	185	31.73
														Grand Total:	9,847	5,792	18,787	34,426	725.35

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