

**Fishery Data Series No. 92-44**

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# **Harvest Estimates for Selected Marine Boat Sport Fisheries in Southeast Alaska During 1991**

by

**Paul M. Suchanek  
and  
Allen E. Bingham**

October 1992

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Alaska Department of Fish and Game

Division of Sport Fish



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Division of Sport Fish  
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## ABSTRACT

Creel surveys of the Juneau and Ketchikan marine boat sport fisheries in Southeast Alaska were conducted during 1991. Dockside interviews of boat-parties completing trips were used to estimate angler effort for and harvest of Pacific salmon and trout *Oncorhynchus* species, Pacific halibut *Hippoglossus stenolepis*, rockfish *Sebastes* species, and Dolly Varden *Salvelinus malma*. In addition, harvests of crab were estimated, and in Ketchikan, harvest of shrimp was also estimated. The contributions of hatchery chinook salmon *Oncorhynchus tshawytscha* and coho salmon *Oncorhynchus kisutch* to these sport fisheries were estimated from coded wire tag recovery information. Chinook salmon taken during derbies in Sitka, Petersburg, and Wrangell were also sampled for coded wire tags. Scale samples and lengths were taken from chinook salmon for age composition and length at age estimates. Lengths of Pacific halibut *Hippoglossus stenolepis* were taken to estimate total round weight of the Pacific halibut harvest from existing length-weight relationships.

An estimated 24,964 (SE = 1,347) chinook salmon, 66,186 (SE = 5,896) coho salmon, 44,040 (SE = 5,113) pink salmon *Oncorhynchus gorbusha*, 18,261 (SE = 1,413) Pacific halibut, and 13,244 (SE = 1,331) rockfish were harvested in the Juneau and Ketchikan boat fisheries. Harvests of chinook salmon were over twice the long-term averages in Juneau and Ketchikan. The largest number of hatchery chinook salmon was taken in Ketchikan, where an estimated 66% of the harvest was of hatchery origin and 55% was of Alaska hatchery origin. Hatcheries produced about 37% of the chinook salmon harvest in Juneau, with Southeast Alaska hatcheries contributing 26% of the total harvest. Alaska hatchery contributions of chinook salmon to derbies in Sitka and Wrangell totaled 22%, while 44% of the chinook salmon taken in the Petersburg derby were of Alaska hatchery origin. In Ketchikan the total harvest of coho salmon was the highest on record, and hatcheries produced 43% of the harvest. Harvest per unit effort of coho salmon was higher in Ketchikan than in Juneau. Hatcheries produced 12% of the coho salmon harvest in Juneau, the highest level of hatchery contribution on record for the area, and the total harvest was also well above average. Pacific halibut harvest in Juneau was well below the long-term average, although the Ketchikan harvest was about average. The total number of rockfish harvested in Ketchikan was about average. Crab harvest in the Juneau and Ketchikan fisheries totaled 21,064 Dungeness crab *Cancer magister*, 1,294 Tanner crab *Chionoecetes* species, and 2,467 king crab *Paralithodes* species.

KEY WORDS: Creel survey, angler effort and harvest, harvest per unit effort, age composition, length at age estimation, round weight, boat sport fishery, derby, hatchery, enhancement, coded wire tag, chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *Oncorhynchus kisutch*, pink salmon, *Oncorhynchus gorbusha*, Pacific halibut, *Hippoglossus stenolepis*, Dolly Varden, *Salvelinus malma*, rockfish, *Sebastes*, Dungeness crab, *Cancer magister*, Tanner crab, *Chionoecetes* species, king crab, *Paralithodes* species, Juneau, Ketchikan, Sitka, Petersburg, Wrangell, Southeast Alaska.

## INTRODUCTION

The waters of Southeast Alaska support important commercial, sport, personal use, and subsistence fisheries for a variety of salmonid, bottomfish, and shellfish species. The largest sport fishery in Southeast Alaska is the Juneau marine boat fishery, but other important marine boat fisheries occur around Ketchikan, Sitka, Petersburg, Wrangell, and Haines (Figure 1).

Creel survey information from the marine sport fisheries is used for a variety of management and reporting purposes. The U.S./Canada Pacific Salmon Treaty requires careful monitoring of commercial and recreational harvests of chinook salmon *Oncorhynchus tshawytscha*. Inseason and postseason estimates of the harvests of wild and hatchery chinook salmon by marine sport fisheries in Southeast Alaska are needed to monitor Alaska's compliance with catch limits established by the treaty. Monitoring of the marine fisheries is also needed to evaluate hatchery contributions to the coho salmon *O. kisutch* harvest.

Harvest per unit effort (HPUE) data for coho salmon in marine boat recreational fisheries, along with HPUE data from commercial troll and net fisheries, are used to monitor the relative abundance and migratory patterns of coho salmon into inside waters. Pacific halibut *Hippoglossus stenolepis* harvest information is provided to the International Pacific Halibut Commission (IPHC) during its consideration of proposed modifications to sport fishing regulations.

Sport fishing regulations during 1991 were identical to those described in Suchanek and Bingham (1990b). Terminal harvest areas near Juneau and Ketchikan were again opened by emergency order on 1 June 1991 to 30 September 1991, to provide increased harvest of hatchery chinook salmon by allowing harvest of chinook salmon of any size within these areas. The bag limit within these terminal areas was 2 chinook salmon <28 inches (71 cm) in length and 2 chinook salmon  $\geq$ 28 inches in total length. The general bag limit for chinook salmon outside of the terminal areas was restricted to 2 per day, 2 in possession with a 28-inch minimum size limit.

General bag limits for salmon species other than chinook salmon remained at 6 fish per day, 12 in possession for fish  $\geq$ 16 inches (41 cm) in length. The Pacific halibut bag limit also remained at 2 fish per day, 4 in possession. Anglers were limited to 5 rockfish per day, 10 in possession, only 2 fish per day (4 in possession) of which could be yelloweye rockfish *Sebastes ruberrimus*. An area adjacent to Ketchikan was further restricted to a rockfish *Sebastes* spp. bag and possession limit of 3 fish per day, only one of which could be a yelloweye rockfish. Sport, personal use, and subsistence regulations for the harvest of crab in Southeast Alaska were summarized by Suchanek and Bingham (1989, 1990b).

This report presents the findings of creel surveys of marine boat recreational fisheries conducted in 1991 by the Division of Sport Fish of the Alaska Department of Fish and Game (ADF&G) in the Ketchikan and Juneau areas. Results from sampling of chinook salmon during salmon derbies in Sitka, Petersburg, and Wrangell are also presented in this report. Results from harvest surveys associated with a variety of roadside marine and freshwater sport fisheries in Southeast Alaska are presented in other ADF&G Fisheries Data Series reports.

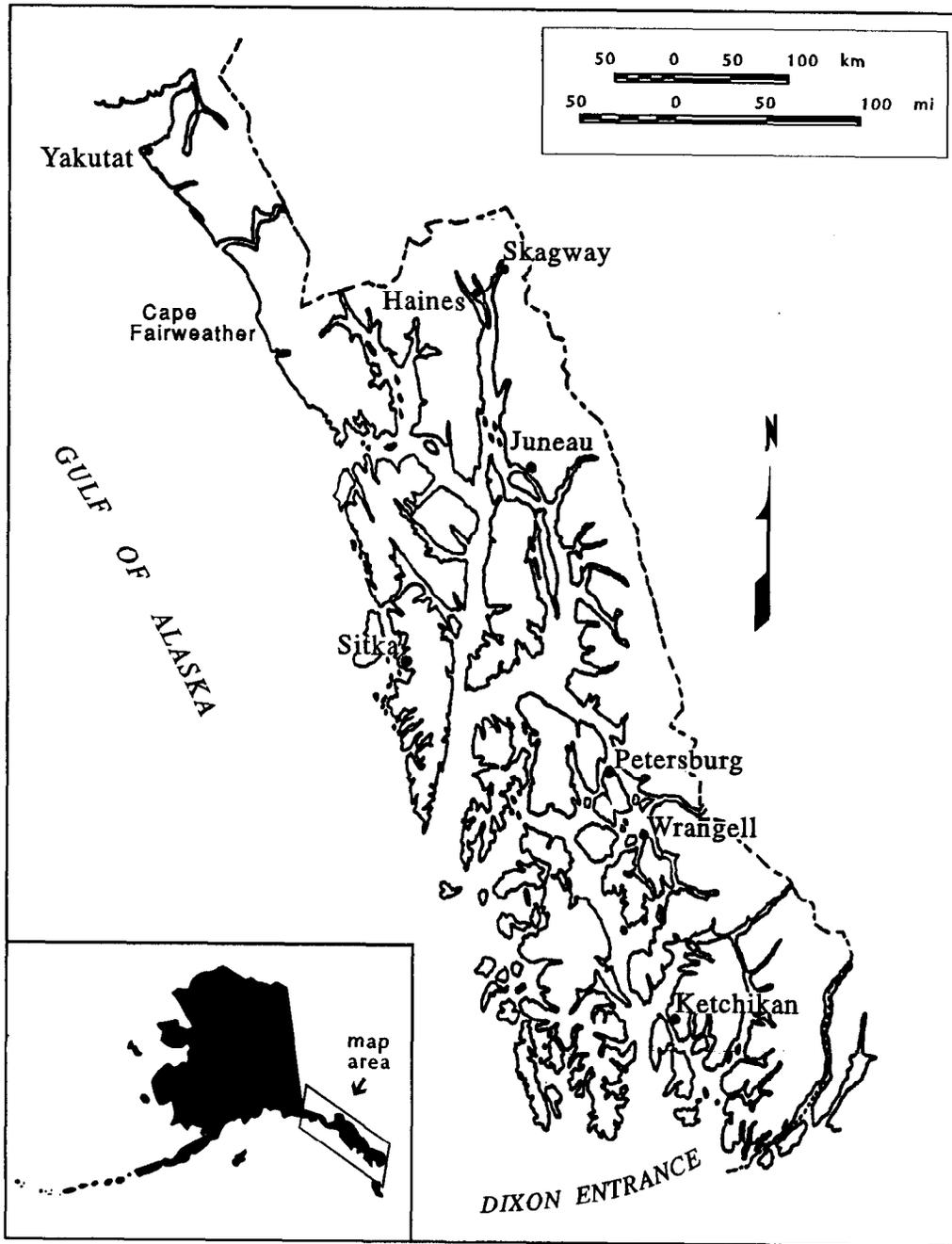


Figure 1. Location of Juneau and Ketchikan in relationship to other major communities in Southeast Alaska.

## OBJECTIVES

The specific objectives for the 1991 marine boat sport fishery surveys were:

1. To estimate the total angler effort, catch, and harvest of Pacific salmon, Pacific halibut, rockfish, Dolly Varden *Salvelinus malma*, and lingcod *Ophiodon elongatus* in the Juneau marine fishery from 15 April to 29 September 1991 and in the Ketchikan marine fishery from 29 April to 29 September 1991.
2. To estimate the contribution of hatchery chinook and coho salmon by coded wire tag code for the Juneau and Ketchikan fisheries during the time periods listed in objective 1.
3. To estimate biweekly HPUE for coho salmon in the Juneau and Ketchikan fisheries for the time periods listed in objective 1.
4. To estimate the contribution of hatchery chinook salmon by coded wire tag code to salmon derbies in Petersburg, Wrangell, and Sitka.
5. To estimate the total round weight of Pacific halibut harvested in the Juneau and Ketchikan fisheries for the time periods listed in objective 1.
6. To estimate the major species composition of the rockfish harvest in the Ketchikan marine fishery from 29 April to 29 September 1991.

## METHODS

### Study Design

Two separate creel surveys of marine boat sport fisheries were conducted in Southeast Alaska during 1991. Site descriptions and maps of the Juneau and Ketchikan fisheries can be found in Bingham et al. (1988).

The primary sampling design used for the Juneau and Ketchikan marine boat surveys was a direct expansion creel survey. This design is based on sampling major access points into the fishery to interview boat parties that had completed fishing trips. The estimates obtained from these surveys represent the effort and harvest by boat-parties that returned to the sampled access locations and may not represent the entire fishery, as a few boats return to unsampled private moorages, docks, or unimproved access points. Some boats may also return at times when the harbors are not sampled (i.e., the middle of the night).

During the surveys, interviews of boat parties provided effort, harvest, catch, and HPUE information. Effort and harvest information was recorded only for boat parties; not for individual anglers. Efforts and harvests by all boat parties interviewed during the sample periods were expanded to include periods of time and access locations that were not sampled.

Major salmon derbies in Juneau and Ketchikan were treated as separate seasonal strata. A ratio estimation procedure was used to generate estimates of angler effort, harvest, and catch for these two strata. The daily ratio of the total salmon entered in the derby to the total entered salmon sampled during creel surveys was used to expand sampled effort and take-home harvests of salmon and other species.

## Juneau Marine Boat Fishery:

Harvest estimates were made for 12 seasonal time periods of 2 weeks each, starting on 15 April and ending on 29 September. The Juneau Golden North Salmon Derby on 9-11 August was treated as an additional stratum.

During the early portion of the season through 23 June, there was no stratification by heavy- and low-use access locations. The 12 sampled access locations in the Juneau marine boat fishery were: Auke Bay Launch, Tee Harbor, Douglas Harbor, Fisherman's Bend, DeHarts Marina, Aurora Harbor 1, Harris Harbor, Amalga Harbor, North Douglas Launch, Auke Bay Government Dock, Tee Harbor Launch, and Aurora Harbor 2.

Each biweekly period had an early-day stratum, a late-weekday stratum, and a late-weekend/holiday stratum. The late-weekend/holiday stratum included all Fridays, Saturdays and Sundays, and the date of 27 May; the late-weekday stratum included the rest of the days. The fishing day for the early-day stratum was defined as starting at 0700 and ending midway to the cessation of civil twilight rounded to the nearest one-half hour (the definition is consistent within a biweekly time period). The fishing day for the two late-day strata was defined as the period from the end of the early-day stratum to the cessation of civil twilight.

Within each stratum, there was a three-stage sampling allocation. The primary stage was days, the secondary stage was access locations, and the third stage was boat-parties. Within the primary stage (days) and secondary stage, samples were selected without replacement at random with equal probability. Almost all third-stage units (boat-parties) exiting an access point were sampled.

After 23 June, a stratification by heavy- and low-use access locations was made because fishing patterns change somewhat after the early portion of the fishing season, when anglers primarily target on maturing chinook salmon. In July, August, and September, anglers also target other salmon species and Pacific halibut. The heavy-use access locations were: Auke Bay Launch, Tee Harbor, Fisherman's Bend, DeHarts Marina, Amalga Harbor, North Douglas Launch, and Auke Bay Government Dock.

The sampling design for heavy-use access locations was identical to that used during the early portion of the season, although sampling effort by stratum differed. With the exception of biweek 5-18 August, each biweekly period had an early-day stratum, a late-weekday stratum, and a late-weekend/holiday stratum. Due to removal of 3 weekend days during the Golden North Salmon Derby, there were only early-day and late-day strata in the 5-18 August biweek. In the other biweeks, the late-day weekend/holiday stratum included all Fridays, Saturdays and Sundays, along with the dates of 4 July and 3 September. A three-stage sampling allocation was again used.

The low-use access locations sampled during 24 June to 29 September were: Douglas Harbor, Aurora Harbor 1, Harris Harbor, Tee Harbor Launch, Aurora Harbor 2, and Echo Cove Launch. Echo Cove Launch is a boat launch that was substantially improved in 1990 with federal aid funds and had not been sampled prior to 1991.

Due to its location about 40 miles from Juneau, it was thought to receive only a relatively "low" amount of use.

Estimates for the low-use harbors were also made for the same biweekly periods defined for the heavy-use strata, but there was no further stratification. Instead, each fishing day was divided into three sampling periods. Length of the fishing day was a maximum of 15 hours, so each sampling period was a maximum of 5 hours. The fishing day began at 0700 or 15 hours prior to cessation of civil twilight, whichever was latest, and ended at the cessation of civil twilight. Within each biweek, two days were selected for sampling, and within each of these two days, two of the three periods in the fishing day were selected for sampling at two access locations. A three-stage sampling design was used, with the first-stage units being days, the second-stage units being access locations, and the third-stage units being periods within each sampled day. Boat-parties were not treated as fourth-stage units, in that all boat-parties were interviewed.

In addition to these surveys, the managers of two sport fishing lodges on Shelter Island in the Juneau area agreed to voluntarily report the sport harvests of boats fishing from the lodges. Since this fishing effort could not be easily monitored with normal creel surveys, the information proved very valuable. Shelter Island lodge harvests were grouped with the rest of the Juneau sport fishery, as boats from these lodges fished areas used by other Juneau marine anglers. Eagle Valley Lodge, located on the Juneau roadside near Amalga Harbor, reported harvests in 1990 but did not do so in 1991.

#### Ketchikan Marine Boat Fishery:

Harvest estimates were made for 11 seasonal time periods of two weeks each, starting on 29 April and ending on 29 September. The Ketchikan King Salmon Derby held on 25-27 May, 1-2 June, and 8-9 June was treated as an additional stratum.

Within each biweek, there was a maximum of three sampling strata. These strata included early-days, late-weekdays, and late-weekend/holidays. The late-weekend/holiday strata included Fridays, Saturdays, Sundays, and the dates of 4 July and 3 September. The length of the fishing day was defined as for the Juneau fishery, although cessation of civil twilight varied from that in Juneau since Ketchikan is 3° of latitude farther south and 3° longitude farther east.

Ten important access locations into the Ketchikan marine boat fishery were sampled: Bar Harbor I, Bar Harbor II, Bar Harbor III, Knudson Cove, Clover Pass, Salmon Falls, Thomas Basin, Mountain Point, Hole in the Wall, and Ship Dock. Bar Harbor is a single very large harbor; it was split into three access locations for sampling purposes. The Ship Dock access location in downtown Ketchikan was sampled for the first time in 1991 and is primarily used by charter boats.

The three-stage sampling design was identical to that used in Juneau for the early portion of the season and for the heavy-use harbors later in the season. However, the distribution of sampling effort within each of the three strata each biweek differed from that in Juneau.

#### Data Collection

The following information was collected for each boat-party interviewed:

1. number of rods fished;
2. number of hours fished for targets of salmon, Pacific halibut, rockfish, or lingcod (effort recorded separately if different targets were fished);

3. for each type of targeted fishing, the number of each fish species that were kept and the number released during this effort;
4. if sport, personal use, or subsistence effort was expended for crab (and additionally for shrimp in the Ketchikan area), the number of pots or rings fished;
5. if crab effort occurred, the number of Dungeness *Cancer magister*, tanner *Chionoecetes* sp., or king crab *Paralithodes* sp. harvested (numbers of crab released were not recorded). Harvests of shrimp (rounded to the nearest 10) were also recorded in the Ketchikan area;
6. general area fished for the different target species, including crab or shrimp (hours fished were recorded separately if different areas were fished); and
7. whether the fishing trip was a charter (i.e., if the angler hired a licensed operator) or a personal boat trip.

All harvests of Pacific salmon, Pacific halibut, steelhead *O. mykiss*, cutthroat trout *O. clarki*, Dolly Varden, lingcod, and rockfish were documented. Chinook salmon <28 inches (71 cm) in total length were categorized as small chinook salmon, while those at least 28 inches in total length were categorized as large chinook salmon.

In Ketchikan, rockfish harvests were identified as time allowed, using Kramer and O'Connell (1988) to identify the following species: black rockfish *S. melanops*, copper rockfish *S. caurinus*, dusky rockfish *S. ciliatus*, quillback rockfish *S. maliger*, silvergrey rockfish *S. brevispinus*, yelloweye rockfish, and tiger rockfish *S. nigrocinctus*. If the rockfish harvested were not any of the above species, they were recorded in an "other rockfish" category.

Chinook salmon taken by Juneau and Ketchikan anglers were also measured to the nearest 5 mm and scale samples were taken from the preferred area above the lateral line (INPFC 1963). Harvested chinook and coho salmon were also checked for missing adipose fins during the Juneau and Ketchikan surveys. Harvested Pacific halibut were measured to the nearest 5 mm (total length).

#### Harvest Estimate Data Analysis

Juneau Early Season, Juneau Heavy-use Access Locations, and Ketchikan Non-derby:

Estimates of angler effort, catch and harvest by species were obtained by the following standard direct expansion equations using a three-stage estimation procedure. First, the mean angler effort was obtained over all boat-parties interviewed at each access location within each sampled day:

$$\bar{e}_{hij} = \frac{\sum_{k=1}^{m_{hij}} e_{hijk}}{m_{hij}} \quad (1)$$

where  $e_{hijk}$  = angler-effort expended by interviewed boat-party  $k$  at access location  $j$  during sampled day  $i$  within stratum  $h$ , and  $m_{hij}$  = number of interviewed boat-parties during each sample.

Then the sample was expanded to all counted boat-parties to obtain the angler effort estimate for each sample:

$$\hat{E}_{hij} = M_{hij} \bar{e}_{hij}$$

where  $M_{hij}$  = number of boat-parties counted within each sample.

Next the mean angler effort over all access locations sampled within each sampled day was obtained:

$$\bar{\hat{E}}_{hi} = \frac{\sum_{j=1}^{n_{hi}} \hat{E}_{hij}}{n_{hi}} \quad (3)$$

where  $n_{hi}$  = number of access locations sampled during sampled day  $i$ .

The estimated angler effort for the sampled day within each stratum was then obtained by expanding by the number of access locations:

$$\hat{E}_{hi} = N_{hi} \bar{\hat{E}}_{hi} \quad (4)$$

where  $N_{hi}$  = total number of possible access locations available for sampling.

Then the stratum mean angler effort was obtained:

$$\bar{\hat{E}}_h = \frac{\sum_{i=1}^{d_h} \hat{E}_{hi}}{d_h} \quad (5)$$

where  $d_h$  = number of days sampled within each stratum.

Finally, the estimated angler effort for each stratum was obtained by expanding for days:

$$\hat{E}_h = D_h \bar{\hat{E}}_h \quad (6)$$

where  $D_h$  = total number of days in each stratum.

Estimates of catch and harvest by species were obtained similarly by substituting the appropriate catch and harvest statistics for each species into equations (1) through (6), above.

The variance of the stratum estimates of angler effort was obtained using the standard three-stage equation (adapted from Cochran 1977, equation 11.24, page 303):

$$\hat{V}[\hat{E}_n] = \left\{ (1 - f_{1h}) D_h^2 \frac{S_{1h}^2}{d_h} \right\} +$$

$$\left\{ f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} (1 - f_{2hi}) N_{hi}^2 \frac{S_{2hi}^2}{n_{hi}} \right\} +$$

$$\left\{ f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} f_{2hi} \frac{N_{hi}^2}{n_{hi}^2} \sum_{j=1}^{n_{hi}} (1 - f_{3hij}) M_{hij}^2 \frac{S_{3hij}^2}{m_{hij}} \right\}$$
(7)

where  $f_{1h}$ ,  $f_{2hi}$ , and  $f_{3hij}$  are the sampling fractions for days, access locations and boat-parties, respectively (i.e.,  $f_{1h} = d_h / D_h$ ;  $f_{2hi} = n_{hi} / N_{hi}$ ;  $f_{3hij} = m_{hij} / M_{hij}$ );  $S_{1h}^2$  = the among-day variance component for the angler effort estimate, which was obtained by

$$S_{1h}^2 = \frac{\sum_{i=1}^{d_h} (\hat{E}_{hi} - \bar{E}_h)^2}{d_h - 1}$$
(8)

$S_{2hi}^2$  = the among access location (within-day) variance component for the angler effort estimate, which was obtained by

$$S_{2hi}^2 = \frac{\sum_{j=1}^{n_{hi}} (\hat{E}_{hij} - \bar{E}_{hi})^2}{n_{hi} - 1}$$
(9)

and  $S_{3hij}^2$  = the among boat-party variance component for the angler effort estimate, which was obtained by

$$S_{3hij}^2 = \frac{\sum_{k=1}^{m_{hij}} (e_{hijk} - \bar{e}_{hij})^2}{m_{hij} - 1}$$
(10)

Variances of the stratum estimates of catch and harvest by species were obtained similarly, by substituting the appropriate catch and harvest statistics into equations (7) through (10) above.

Juneau Low-use Access Locations:

The following procedures were used to obtain the same estimates for the low-use access location strata. First, the mean angler effort was obtained over all periods sampled at each access location within each sampled day:

$$\bar{E}_{hij} = \frac{\sum_{o=1}^{p_{hij}} \left\{ \sum_{k=1}^{M_{hijo}} e_{hijok} \right\}}{p_{hij}}$$
(11)

where  $e_{hijok}$  = angler-effort expended by interviewed boat-party  $k$  during sample period  $o$  at access location  $j$  during sampled day  $i$  within stratum  $h$ ,  $P_{hij}$  = number of periods sampled within each sampled access location, and  $M_{hijo}$  = number of boat-parties exiting the fishery at the sampled access location during each sampled period.

Then the data were expanded over all periods in each day to obtain the angler effort estimate for the access location within each sampled day:

$$\hat{E}_{hij} = P_{hij} \bar{E}_{hij} \quad (12)$$

where  $P_{hij}$  = number of periods within the day.

The daily mean angler effort, estimated daily angler effort, stratum mean angler effort, and stratum estimate of angler effort were then obtained by the procedures outlined in equations (3) through (6) above.

The variance of the stratum estimates of angler effort by species for late season low-use access location strata was obtained by the standard three-stage equation:

$$\begin{aligned} \hat{V}[\hat{E}_h] = & \left\{ (1 - f_{1h}) D_h^2 \frac{S_{1h}^2}{d_h} \right\} + \\ & \left\{ f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} (1 - f_{2hi}) N_{hi}^2 \frac{S_{2hi}^2}{n_{hi}} \right\} + \\ & \left\{ f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} f_{2hi} \frac{N_{hi}^2}{n_{hi}^2} \sum_{j=1}^{n_{hi}} (1 - f_{3hij}) P_{hij}^2 \frac{S_{3hij}^2}{p_{hij}} \right\} \end{aligned} \quad (13)$$

where  $f_{1h}$ ,  $f_{2hi}$ , and  $f_{3hij}$  are the sampling fractions for days, access locations and sampling periods respectively (i.e.,  $f_{1h} = d_h / D_h$ ;  $f_{2hi} = n_{hi} / N_{hi}$ ;  $f_{3hij} = P_{hij} / p_{hij}$ );

$S_{1h}^2$  = the among-day variance component for the angler effort estimate, obtained from equation (8), above;

$S_{2hi}^2$  = the among access location (within-day) variance component for the angler effort estimate, obtained from equation (9) above; and

$S_{3hij}^2$  = the among sampling period variance component for the angler effort estimate, obtained by

$$S_{3hij}^2 = \frac{P_{hij} \left[ \sum_{o=1}^{M_{hijo}} \left( \sum_{k=1}^{P_{hij}} e_{hijok} \right) - \bar{E}_{hij} \right]^2}{P_{hij} - 1} \quad (14)$$

Estimates of catch and harvest by species and their variances by stratum for the late season low-use access locations were obtained by substituting the catch and harvest statistics into equations (11) through (14) above.

#### Juneau and Ketchikan Derby Fisheries:

Estimates of angler effort, catch and harvest by species and their variances for the Juneau and Ketchikan salmon derbies were obtained by a one-stage ratio estimation approach which combined the known number of salmon entered in the derbies, and effort, catch, and harvest information obtained from angler interviews. During the Juneau Golden North Salmon Derby, the number of coho salmon entered was used to estimate statistics of interest while in the Ketchikan King Salmon Derby, the number of large chinook salmon entered was used to estimate effort and harvest statistics. Each day of the derby was treated as a stratum. The interviewed boat-parties were treated as first-stage sampling units.

Our sampling program was actually a two-stage survey, with access locations the first-stage units and boat-parties the second-stage units. However, since we did not have values of known entered salmon by access location we had to ignore the two-stage nature of the sampling program. This simplification of the estimation procedure has likely resulted in some unknown biases in both the point and variance estimates of harvest. However, the degree of bias may be small, as Bandyopadhyay (1990) indicated that for this type of estimator sampling stages can sometimes be "ignored."

Estimates of ratio of angler effort to number of salmon entered in the derby were obtained from a jackknife estimator. The jackknife approach for estimating the ratio was used because it has been shown to be less biased than other estimators, and procedures exist to correct some of this bias (see Cochran 1977 [section 6.15, pages 174-177]; Smith 1980). The jackknife estimated ratio was obtained as follows from the interview information:

$$R_{ik}^* = \frac{\sum_{q=1}^{m_i} e_{iq}}{\sum_{q \neq k}^{m_i} s_{iq}} \quad (15)$$

where  $R_{ik}^*$  is the jackknifed ratio estimate for boat-party  $k$  during day  $i$  of the derby;  $e_{iq}$  and  $s_{iq}$  = angler effort and number of salmon entered, respectively, reported by interviewed boat-party  $q$ ; and  $m_i$  = number of boat-parties interviewed during each day of the derby.

The jackknife mean ratio for each day was then obtained:

$$\bar{R}_i^* = \frac{\sum_{k=1}^{m_i} R_{ik}^*}{m_i} \quad (16)$$

Then the bias correction (adapted from Efron 1982, equation 2.8, page 6) was performed unless it resulted in a negative value (in which case the uncorrected value was used):

$$^{(17)}\bar{R}_i^{*\dagger} = [m_i(\bar{R}_i - \bar{R}_i^*)] + [\bar{R}_i^*]$$

where  $\bar{R}_i$  is the standard ratio estimator, obtained by

$$\bar{R}_i = \frac{\sum_{q=1}^{m_i} e_{iq}}{\sum_{q=1}^{m_i} s_{iq}} \quad (18)$$

The estimated angler effort for each day of the derby was then obtained by expansion:

$$\hat{E}_i = S_i \bar{R}_i^{*\dagger} \quad (19)$$

where  $S_i$  = the number of salmon entered in the derby during day  $i$  (from the derby information).

The variance of estimated angler effort for each day of the derby was then obtained by the standard formula for the product of a constant and a random variate (Kish 1965, equations 2.8.5 and 2.8.7, pages 60 and 61):

$$\hat{V}[\hat{E}_i] = S_i^2 \hat{V}[\bar{R}_i^{*\dagger}] \quad (20)$$

where  $\hat{V}[\bar{R}_i^{*\dagger}]$  = the jackknife variance estimate for each access location sample within each day, obtained by the following equation (adapted from Efron 1982, equation 3.2, page 13):

$$\hat{V}[\bar{R}_i^{*\dagger}] = \frac{(m_i - 1)}{m_i} \sum_{k=1}^{m_i} (R_{ik}^* - \bar{R}_i^*)^2 \quad (21)$$

Estimates of catch and "take-home" harvest estimates of each species of fish, and their variances, were obtained similarly by substituting the appropriate catch and harvest statistics into equations (15) through (25), above.

Juneau and Ketchikan Harvest Per Unit Effort Estimates:

Harvest per unit effort (HPUE) in terms of coho salmon harvested per angler-hour of effort was estimated for each biweek by using equations 26-30 in Suchanek and Bingham (1991). Harvest instead of total catch was used, because relatively few coho salmon are released and those salmon released may not have been correctly identified to species. Estimates obtained by these procedures are indicative of the abundance of coho salmon.

### Assumptions:

The assumptions necessary for the estimates of angler effort, catch, harvest, and HPUE to be unbiased for these surveys (i.e., direct expansion and ratio estimator) include the following:

1. anglers accurately report their hours of fishing effort and the number by species of fish released; and
2. no significant fishing effort occurred between the evening civil twilight and 0700 hours (or morning civil twilight), or at different access locations than surveyed during the direct expansion surveys.
3. for the derby sampling programs: either we sampled the boat-trips proportionally among all possible access locations or the ratio (of various estimated parameters to numbers of salmon entered in the derby) is the same among the access locations.

### Contributions of Coded Wire Tagged Stocks

Adipose-clipped chinook and coho salmon sampled were measured to the nearest 5 mm (tip of snout to fork of tail), and their heads were retained. A locking plastic strap with a unique number was inserted through the jaw. Heads and coded wire tag (CWT) recovery data were sent to the ADF&G CWT Processing Laboratory in Juneau for tag removal and decoding.

Heads were classified as random (randomly sampled during regularly scheduled creel sampling periods) or select (voluntarily provided by unsampled anglers). Only random recoveries were used to estimate CWT contributions. The contribution of chinook and coho salmon with a particular tag code to the marine fisheries was estimated using procedures similar to those outlined in Clark and Bernard (1987). Contributions by tag code, combinations of tag codes, and their associated variances and standard errors were calculated by the procedures outlined in Suchanek and Bingham (1990a, equations 21-27).

### Petersburg, Wrangell, and Sitka Derby Sampling

The Petersburg Salmon Derby was held on 24-27 May, and the Sitka Salmon Derby was held on 25-27 May and 1-2 June. In Petersburg, chinook salmon were checked for missing adipose fins if participants brought them to the harbormaster office for entry into the derby. Similarly, in Sitka chinook salmon were checked for missing adipose fins if participants entered chinook salmon at Crescent Harbor during any of the five days of the derby. In Sitka, chinook salmon entered were sold commercially while in Petersburg, entered chinook salmon remained the property of the participant. In Petersburg, heads from adipose-clipped chinook salmon were taken at the entry station. In Sitka, heads were collected from the processor after the fish were sold.

Somewhat different procedures were used during the Wrangell Salmon Derby, which ran from 11-27 May, since this derby is much less intense. During the weekends of 11-12, 18-19, and 25-27 May, a sampler contacted as many boats as possible at either Town Harbor or Shoemaker Harbor in Wrangell and checked all chinook salmon in the bag of boat-parties contacted for missing adipose fins. Heads from adipose-clipped chinook salmon were then taken.

Adipose-clipped chinook salmon from all three derbies were measured, heads were collected and marked with cinch straps, and then the tags were decoded at the CWT Processing Laboratory in Juneau. Data from the heads were analyzed as detailed for the Juneau and Ketchikan fisheries, and sample data in Petersburg and Sitka was expanded up to the known total number of fish entered. In Wrangell, the sampled harvest exceeded the entered harvest in the derby (many anglers do not enter their fish), so the harvest in the stratum was assumed to be the number of fish sampled and a relative contribution was calculated.

#### Chinook Salmon Age Composition and Mean Length at Age

Tip of snout to fork-of-tail lengths of chinook salmon, rounded to the nearest 5 mm, were used to estimate size composition of the marine sport harvest. Age composition of the sport chinook salmon harvest was estimated from analysis of the scales. Standard statistical procedures were followed to estimate mean length at age, age composition, and their variances.

#### Pacific Halibut Size and Weight Composition

Pacific halibut total lengths were measured on most of the sampled sport harvest. Each individual length was converted to a round weight using procedures outlined in Quinn et al. (1983). A mean round weight was calculated from these estimates, and then multiplied by the estimated harvest to estimate total round weight of the harvest.

### RESULTS

Detailed tables presenting effort and finfish harvest and total catch for all species monitored can be found in Appendices A1 and A2 for the Ketchikan fishery and Appendices A3 and A4 for the Juneau fishery. A summary of the most important effort and harvest results is presented here.

#### Angler Effort

An estimated 737,973 (SE = 28,233) angler-hours of effort were expended in the Juneau and Ketchikan marine boat fisheries combined (Table 1). These two fisheries were about equal in size. Effort for halibut in Ketchikan was about the same as that expended in Juneau, but salmon effort was only 85% of that expended in Juneau. About 81% (600,644 salmon-hours) of the total angler effort in both fisheries was targeted on salmon. Pacific halibut were the other important target as no boat-parties reported targeting on either rockfish or lingcod. Major salmon derbies in Ketchikan and Juneau substantially increased the amount of effort targeted on salmon, as 14% and 18% of the total salmon fishing effort, respectively, occurred during these short time periods.

#### Chinook Salmon Fisheries

An estimated 24,964 chinook salmon (SE = 1,347) were harvested in the Ketchikan and Juneau marine fisheries (Table 2). Harvests were about the same in both communities. Most of the chinook salmon harvested were at least 28 inches in length, but an estimated 526 small chinook salmon were harvested. The total catch of small chinook salmon was over 2.5 times the total catch of large chinook salmon. These small chinook salmon usually had to be released as they were not of legal size.

Table 1. Summary of estimated total and derby angler effort by target for the Ketchikan and Juneau marine boat sport fisheries during 1991.

<u>Total effort</u>		Angler-hours by target <sup>b</sup>								Total <sup>a</sup> angler-hours		Percent of combined total <sup>d</sup>
Sport fishery	Time period	Boat-hours	SE	Salmon-hours	SE	Halibut-hours	SE	hours	SE			
Ketchikan	4/29 - 9/29	128,265	8,017	275,856	18,754	67,842	6,682	343,698	21,606	47%		
Juneau	4/15 - 9/29	153,534	7,348	324,788	16,266	69,475	5,370	394,275	18,174	53%		
TOTAL		281,799	10,876	600,644	24,825	137,317	8,572	737,973	28,233			

<u>Derby effort</u>		Angler-hours by target						Total <sup>c</sup> angler-hours		Percent of total salmon fishery <sup>d</sup>
Major salmon derby (derby dates)		Boat-hours	SE	Salmon-hours	SE	Halibut-hours <sup>b</sup>	SE	hours	SE	
Ketchikan King Salmon Derby (5/25-27, 6/01-02, 6/08-09)		16,706	2,169	39,301	5,044	2,052	773	41,354	5,491	14%
Juneau Golden North Salmon Derby (8/09-11)		21,231	1,647	58,857	4,440	1,505	440	60,362	4,615	18%
TOTAL		37,937	2,724	98,158	6,720	3,557	889	101,716	7,173	16%

<sup>a</sup> Includes all targeted and non-targeted effort, including derby effort. The sum of salmon-hours and halibut-hours does not necessarily total angler-hours, as some fishing effort was untargeted or targeted on species such as Dolly Varden.

<sup>b</sup> No lingcod-hours or rockfish-hours reported.

<sup>c</sup> Includes all targeted and non-targeted effort for derby only.

<sup>d</sup> For salmon-hours only.

Table 2. Summary of estimated catches and harvests of chinook salmon in the Juneau and Ketchikan marine sport fisheries during 1991.

<u>Total chinook salmon catches and harvests</u>							
Sport		Chinook >28"		Chinook <28"		Total chinook harvested	
		Catch	Harvest	Catch	Harvest	Number	SE
fishery	Time period						
Ketchikan	4/29 - 9/29	13,118	12,576	32,985	154	12,730	1,056
Juneau	4/15 - 9/29	12,012	11,862	30,887	372	12,234	836
TOTAL		25,130	24,438	63,872	526	24,964	1,347

<u>Derby chinook salmon harvests</u>							
Major salmon derby (derby dates)	Chinook >28"		Chinook <28"		Total chinook harvested		Percent of fishery <sup>b</sup>
	Entered	Total <sup>a</sup>	Entered	Total <sup>a</sup>	Number	SE	
Ketchikan King Salmon Derby (5/25-27, 6/01-02, 6/08-09)	794	2,124	0	11	2,135	265	17%
Sitka Salmon Derby (5/25-27, 6/01-02)	1,250	--- <sup>c</sup>	0	---	---	---	---
Petersburg Salmon Derby (5/24-27)	650	--- <sup>c</sup>	0	---	---	---	---
Juneau Golden North Salmon Derby (8/09-11)	399	521	1	1	522	32	4%

<sup>a</sup> Includes entered and take-home harvests.

<sup>b</sup> For total chinook salmon harvested only.

<sup>c</sup> Not available.

The Ketchikan King Salmon Derby bolstered chinook salmon harvests in the Ketchikan marine fishery substantially as 17% of the harvest occurred during this event. Only about 4% of the total harvest of chinook salmon were taken during the Juneau Golden North Salmon Derby, even though 18% of the total salmon fishing effort was expended during this event. From a total harvest of 2,657 fish during the derby time periods, 1,194 chinook salmon were entered in the Ketchikan and Juneau derbies. The largest derby in Southeast Alaska in terms of fish entered was the Sitka Salmon Derby, where 1,250 chinook salmon were entered.

About 18% of the chinook salmon harvested in Ketchikan were sampled for coded wire tags (Appendix A5). In Juneau, 15% of the estimated chinook salmon harvested were sampled (excluding 803 chinook salmon taken at the lodges which were not sampled for coded wire tags). From the total derby catch in Sitka, Petersburg, and Wrangell, 1,668 chinook salmon were also checked for coded wire tags.

Of the estimated 26,282 chinook salmon taken in strata monitored for coded wire tags, an estimated 40% were of Alaska hatchery origin (Table 3). Additional hatchery fish originated in Oregon, Washington, and British Columbia, and, in aggregate, 55% of the monitored chinook salmon harvest originated in hatcheries. The Ketchikan fishery had the highest percentage of Alaska hatchery fish (55%), and the overall hatchery contribution to the Ketchikan fishery totaled 66%. Most of the Alaskan hatchery chinook salmon taken in Ketchikan originated in Neets Bay, Whitman Lake, and Carroll Inlet (release site only) hatcheries owned by Southern Southeast Regional Aquaculture Association. About 26% of the monitored chinook salmon harvest in Juneau was of Alaska hatchery origin. Alaska hatchery fish taken in Juneau came primarily from the Crystal Lake and Snettisham hatcheries owned by ADF&G.

The percentage of Alaska hatchery fish taken in the salmon derbies monitored in Petersburg, Wrangell, and Sitka varied from 22% in Wrangell and Sitka to 44% in Petersburg. Due to the large number of non-Alaskan hatchery fish, the estimated total contribution of hatchery fish to the Sitka derby exceeded 100%. This may have been due to chance as the relative precision of the estimated non-Alaskan hatchery contribution of 1,129 was  $\pm 42\%$ . It also may have been due to a sampling bias caused by checking only fish entered in the derby for coded wire tags and not checking fish taken home. Derby participants may have been more likely to enter fish missing their adipose fins in the derby as there was a small prize for the largest adipose-clipped chinook salmon.

Detailed contribution estimates by tag code are presented in the appendix for the Ketchikan fishery (Appendix A6), Wrangell Derby (Appendix A7), Petersburg Derby (Appendix A8), Sitka Derby (Appendix A9), and Juneau fishery (Appendix A10). In addition to the recoveries of hatchery origin fish, wild coded wire tagged chinook salmon were recovered from the Ketchikan fishery (Appendix A11). Total contributions of these tagged wild stocks could not be estimated as tagging fractions will not be determined for several years.

Harvests of small chinook salmon in terminal areas near hatchery release sites opened by emergency regulation totaled an estimated 372 (SE = 107) (Table 4). Only about 26% of the total catch of small chinook salmon in the terminal harvest areas were retained, although all (up to the bag limit) could have been legally retained. Over 1,000 large chinook salmon were harvested in the terminal areas.

Age composition of the chinook salmon harvest varied considerably among the surveyed fisheries (Table 5 and Appendix A12). About 66% of the chinook salmon

Table 3. Contributions of hatchery chinook salmon to sampled marine sport fisheries of Southeast Alaska, 1991.

Region or hatchery	Marine boat sport fishery					Total <sup>d</sup>
	Ketchikan 4/29-9/29	Petersburg Derby <sup>a</sup>	Wrangell Derby <sup>b</sup>	Sitka Derby <sup>c</sup>	Juneau 4/15-9/29	
Oregon	10	0	0	1	302	313
Washington	164	0	0	41	0	205
British Columbia	1,164	30	0	1,087	1,020	3,301
Non-Alaskan total (SE)	1,338 (480)	30 (30)	0 ---	1,129 (238)	1,322 (590)	3,819 (797)
Alaska						
Crystal Lake (ADF&G <sup>e</sup> )	291	211	42	71	1,438	2,053
Deer Mountain (ADF&G)	232	0	0	1	0	233
Hidden Falls (ADF&G or NSRA <sup>f</sup> )	0	2	0	2	79	83
Jerry Myers (ADF&G)	0	0	0	0	21	21
Snettisham (ADF&G)	0	0	0	0	984	984
Port Armstrong (AKI <sup>g</sup> )	0	0	0	0	75	75
Tamgas Creek (MIC <sup>h</sup> )	383	15	0	17	0	415
L. Port Walter (NMFS <sup>i</sup> )	4	40	0	2	152	198
Medvejie (NSRA)	0	0	0	133	0	133
Sheldon Jackson (SJJ <sup>j</sup> )	0	0	0	7	0	7
Carroll Inlet (SSRA <sup>k</sup> )	4,156	14	0	21	208	4,399
Neets Bay (SSRA)	1,454	0	0	10	0	1,464
Whitman Lake (SSRA)	515	6	6	6	0	533
Alaskan total (SE)	7,035 (1,048)	288 (68)	48 (21)	270 (50)	2,957 (664)	10,598 (1,243)
All areas total (SE)	8,373 (1,152)	318 (74)	48 (21)	1,399 (243)	4,279 (888)	14,417 (1,477)
Chinook salmon harvest (SE)	12,730 (1,056)	650 ---	221 ---	1,250 ---	11,431 <sup>l</sup> (836)	26,282 (1,347)
Percent Alaska hatchery	55%	44%	22%	22%	26%	40%
Percent total hatchery	66%	49%	22%	100% <sup>m</sup>	37%	55%

<sup>a</sup> Includes only fish entered in Petersburg Salmon Derby on 24-27 May.

<sup>b</sup> Includes only some fish harvested during Wrangell Salmon Derby on 11-27 May.

<sup>c</sup> Includes only fish entered in Sitka Salmon Derby on 25-27 May and 1-2 June.

<sup>d</sup> Includes both large and small chinook salmon.

<sup>e</sup> Alaska Department of Fish and Game.

<sup>f</sup> Northern Southeast Regional Aquaculture Association.

<sup>g</sup> Armstrong Keta, Inc.

<sup>h</sup> Metlakatla Indian Community.

<sup>i</sup> National Marine Fisheries Service.

<sup>j</sup> Sheldon Jackson College.

<sup>k</sup> Southern Southeast Regional Aquaculture Association.

<sup>l</sup> Does not include 803 chinook salmon harvests in strata which were not sampled for coded wire tags.

<sup>m</sup> Hatchery contribution exceeded actual harvest in this instance due to random chance or sampling bias.

Table 4. Summary of estimated effort and catches and harvests of chinook salmon in terminal harvest areas near Juneau and Ketchikan opened by regulatory action to the harvest of small chinook salmon during 1991.

Terminal area sport fishery	Effort (Salmon-hours)		Small chinook (<28")				Large chinook (>28")	
			Harvest		Total catch		Harvest	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Juneau	4,404	1,095	328	103	859	179	307	81
Ketchikan	6,175	1,737	44	26	555	222	776	263
<b>TOTAL</b>	<b>10,579</b>	<b>2,053</b>	<b>372</b>	<b>107</b>	<b>1,414</b>	<b>285</b>	<b>1,083</b>	<b>275</b>

Table 5. Summary of the age composition of chinook salmon sampled in selected marine sport fisheries of Southeast Alaska during 1991.

Freshwater age composition

Sport fishery	Age 0._		Age 1._		Total sampled
	Sample size	Percent	Sample size	Percent	
Ketchikan	340	34%	648	66%	988
Petersburg Derby	23	18%	102	82%	125
Wrangell Derby	10	8%	115	92%	125
Sitka Derby	208	66%	108	34%	316
Juneau non-Derby	53	12%	375	88%	428
Juneau Derby <sup>a</sup>	14	12%	106	88%	120
<b>Total</b>	<b>648</b>	<b>31%</b>	<b>1,454</b>	<b>69%</b>	<b>2,102</b>

Saltwater age composition

Sport Sport fishery	Age _.3 or less		Age _.4 or more		Total sampled
	Sample size	Percent	Sample size	Percent	
Ketchikan	746	76%	242	24%	988
Petersburg Derby	74	59%	51	41%	125
Wrangell Derby	68	54%	57	46%	125
Sitka Derby	157	50%	159	50%	316
Juneau non-Derby	278	65%	150	35%	428
Juneau Derby <sup>a</sup>	119	99%	1	1%	120
<b>Total</b>	<b>1,442</b>	<b>69%</b>	<b>660</b>	<b>31%</b>	<b>2,102</b>

<sup>a</sup> Juneau Golden North Salmon Derby.

sampled during the Sitka Salmon Derby lacked a freshwater annulus (age-0.), which usually indicates non-Alaskan origin (Van Alen 1988). On the other hand, only 8% of the sampled Wrangell Salmon Derby harvest was of age-0. fish.

Saltwater ages also varied considerably (Table 5). An estimated 99% of the chinook salmon harvested during the Juneau Golden North Salmon Derby were age-.3 or less while only 50% of the chinook salmon sampled in the Sitka Salmon Derby were age-.3 or less. Mean length at age of sampled chinook salmon for a given age class varied somewhat among the fisheries surveyed (Appendix A13).

### Coho Salmon Fisheries

Harvests of coho salmon in the Juneau and Ketchikan fisheries totaled an estimated 66,186 fish (SE = 5,896) (Table 6). The only monitored derby in which coho salmon are heavily targeted is the Juneau Golden North Salmon Derby, and an estimated 2,567 coho salmon (SE = 98) were taken during this event. Harvests of hatchery coho salmon were estimated by sampling about 15% of the coho salmon harvest (excluding 1,111 fish harvested at lodges in the Juneau area) for missing adipose fins (Appendix A14). Estimates of coho salmon hatchery contributions by tag code and time period are presented in Appendix A15 for the Ketchikan fishery and in Appendix A16 for the Juneau fishery. Wild stocks of coho salmon greatly dominated the harvest in Juneau, but over 21,000 hatchery coho salmon were taken in the two fisheries combined.

An estimated 12% of the sampled harvest of coho salmon in the Juneau fishery (excludes 1,111 coho salmon taken by lodges in the Juneau area) were of hatchery origin; 43% of the Ketchikan harvest were of hatchery origin (Table 7). All hatchery coho salmon in the Juneau area were produced by Southeast Alaska hatcheries, but an estimated 442 (SE = 409) hatchery coho salmon taken in the Ketchikan fishery originated in British Columbia. The Neets Bay hatchery contributed the most coho salmon to the Ketchikan fishery; the Gastineau hatchery owned by Douglas Island Pink and Chum contributed the most coho salmon to the Juneau fishery. Additionally, some recoveries of coho salmon from wild stocks were obtained in the Ketchikan and Juneau fisheries (Appendix A17). As tagging fractions are currently unknown, total contributions of these wild-tagged stocks could not be estimated.

The HPUE for coho salmon for the Ketchikan and Juneau fisheries ranged to a maximum of 0.457 (SE = 0.026) coho salmon per angler-hour of effort (Table 8). The peak in HPUE for coho salmon in both Juneau and Ketchikan occurred from 2 to 15 September. Ketchikan anglers experienced higher HPUE's for coho salmon than did Juneau anglers for nearly the entire season.

### Bottomfish Fisheries

Almost all of the bottomfish effort in Southeast Alaska is targeted on Pacific halibut, and an estimated 18,261 (SE = 1,413) were taken in the Ketchikan and Juneau marine fisheries (Table 9). Estimated average round weight of the Pacific halibut in the Juneau fishery was 32.0 pounds, and in Ketchikan 28.8 pounds (Table 10). About 556,100 pounds of Pacific halibut were taken during these two fisheries. The total weight of the harvest was almost identical in both Juneau and Ketchikan.

Although rockfish are not a primary target of most marine anglers, an estimated 23,156 (SE=1,835) rockfish were caught in the Ketchikan marine fishery (Table 9).

Table 6. Summary of estimated harvests and catches of coho salmon in the Ketchikan and Juneau marine sport fisheries during 1991.

Sport fishery	Time period	Coho Salmon Harvest						Coho salmon total catch	
		Wild		Hatchery		Total		Number	SE
		Number	SE	Number	SE	Number	SE		
Ketchikan	4/29 - 9/29	25,162	4,364	18,627	3,582	43,789	5,646	45,902	5,688
Juneau									
non-Derby	4/15 - 9/29	17,477	1,635	2,353	443	19,830	1,694	20,197	1,726
Derby <sup>a</sup>	8/09 - 8/11	2,394	90	173	39	2,567 <sup>b</sup>	98	2,652	106
	Subtotal	19,871 <sup>c</sup>	1,637	2,526	445	22,397	1,696	22,849	1,729
TOTAL		45,033	4,662	21,153	3,610	66,186	5,896	68,751	5,945

<sup>a</sup> Juneau Golden North Salmon Derby.

<sup>b</sup> Of the 2,567 coho salmon harvested, 2,055 were entered in the derby.

<sup>c</sup> 1,111 coho salmon classified as wild were lodge harvests which were not sampled for coded wire tags.

Table 7. Contributions of hatchery coho salmon to the Ketchikan and Juneau marine boat sport fisheries of Southeast Alaska, 1991.

Region or hatchery	Sport Fishery					
	Ketchikan		Juneau		Total	
	Estimate	SE	Estimate	SE	Estimate	SE
British Columbia	442	409	0	---	442	409
Alaska						
Burnett Inlet (AAI <sup>a</sup> )	63	62	0	---	63	62
Deer Mountain (ADF&G <sup>b</sup> )	1,901	472	0	---	1,901	472
Klawock (ADF&G)	1,426	1,427	0	---	1,426	1,427
Snettisham (ADF&G)	0	---	274	43	274	43
Gastineau (DIPAC <sup>c</sup> )	0	---	2,252	443	2,252	443
Tamgas Creek (MIC <sup>d</sup> )	1,038	362	0	---	1,038	362
Earl West Cove (SSRAA <sup>e</sup> )	414	309	0	---	414	309
Nakat Inlet (SSRAA)	313	169	0	---	313	169
Neets Bay (SSRAA)	11,726	3,143	0	---	11,726	3,143
Whitman Lake (SSRAA)	1,304	524	0	---	1,304	524
Subtotal: SE Alaska	18,185	3,559	2,526	445	20,711	3,587
TOTAL	18,627	3,582	2,526	445	21,153	3,610
Coho salmon harvest	43,789	5,646	21,286 <sup>f</sup>	1,696	65,075	5,896
Percent hatchery	43%		12%		33%	

<sup>a</sup> Adult Anadromous, Inc.

<sup>b</sup> Alaska Department of Fish and Game.

<sup>c</sup> Douglas Island Pink and Chum.

<sup>d</sup> Metlakatla Indian Community.

<sup>e</sup> Southern Southeast Regional Aquaculture Association.

<sup>f</sup> An additional 1,111 coho salmon were reported harvested from strata which were not sampled for coded wire tags.

Table 8. Harvest per unit effort (HPUE) for coho salmon (harvest per angler-hour of effort) by biweekly period in the Ketchikan and Juneau marine boat fisheries during 1991.

Seasonal period	Harvest of coho salmon per angler-hour of effort <sup>a</sup>			
	Ketchikan		Juneau	
	HPUE	SE	HPUE	SE
6/10-6/23	0.005	0.002	0.000	0.000
6/24-7/07	0.026	0.006	0.012	0.002
7/08-7/21	0.068	0.007	0.043	0.007
7/22-8/04	0.062	0.009	0.081	0.008
8/05-8/18	0.119	0.013	0.144	0.021
8/19-9/01	0.216	0.017	0.202	0.013
9/02-9/15	0.457	0.026	0.350	0.027
9/16-9/29	0.455	0.038	0.294	0.044
All periods	0.172	0.007	0.114	0.005

<sup>a</sup> Does not include derby effort or harvest.

Table 9. Summary of estimated harvests of Pacific halibut, rockfish, and lingcod in the Ketchikan and Juneau marine sport fisheries during 1991.

Sport fishery	Time period	Catch	SE	Harvest	SE
<u>Pacific Halibut</u>					
Ketchikan	4/29 - 9/29	10,775	1,364	9,650	1,152
Juneau	4/15 - 9/29	10,974	1,051	8,611	817
	Total	21,749	1,723	18,261	1,413
<u>Rockfish</u>					
Ketchikan	4/29 - 9/29	23,156	1,835	12,442	1,326
Juneau	4/15 - 9/29	873	112	802	105
	Total	24,029	1,839	13,244	1,331
<u>Lingcod</u>					
Ketchikan	4/29 - 9/29	1,664	354	1,433	337
Juneau	4/15 - 9/29	16	12	16	12
	Total	1,680	354	1,449	337

Table 10. Average length, round weight, and total round weight for Pacific halibut harvested in the Ketchikan and Juneau marine sport fisheries of Southeast Alaska during 1991.

Sport fishery	Time period	Sample size	Total length		Average round wt. (lbs)	Estimated number harvested	Estimated total round weight (thousand lbs)
			Mean (cm)	SE (cm)			
Ketchikan	4/29 - 9/29	215	94.7	1.6	28.8	9,650	277.9
Juneau	4/15 - 9/29	295	95.2	1.6	32.0	8,611	275.6
	Total	510	95.0	1.2	30.6	18,261	556.1

Only 12,442 (SE = 1,326) of the rockfish caught were retained (54%). Juneau anglers retained an estimated 92% (802) of the 873 rockfish caught.

Major species composition of the rockfish harvest was determined for the Ketchikan fishery (Table 11). Quillback rockfish were most frequently taken in the Ketchikan fishery and constituted 47% (5,897) of the harvest. Yelloweye rockfish were the second most frequently taken rockfish (4,259) in the harvest of the Ketchikan fishery. Other minor species in the sport harvest included black, copper, dusky, silvergrey, and tiger rockfish, along with a variety of other unidentified species. Lingcod was another bottomfish species also most frequently harvested in the Ketchikan fishery (Table 9).

#### Other Salmonid Fisheries

Although not usually primary targets, other salmonids such as pink, chum, and sockeye salmon, and Dolly Varden were harvested in the Ketchikan and Juneau fisheries (Table 12). Pink salmon were taken in large numbers in Ketchikan and the estimated harvest totaled 39,015 (SE = 5,100). Only 5,025 pink salmon were taken in Juneau, as the retention rate was only 53%, in comparison to 87% in Ketchikan. Harvests of both chum and sockeye salmon were much less, totaling 2,846 chum salmon and 239 sockeye salmon for the two fisheries combined. All of the 1,023 (SE = 214) Dolly Varden taken were harvested by Juneau anglers.

#### Shellfish Fisheries

Effort for and harvests of Dungeness, Tanner, and king crab were estimated for the Ketchikan and Juneau boat fisheries (Table 13). Shellfish effort in boat-days for the Juneau fishery (3,812 boat-days) was over 2.7 times that estimated for the Ketchikan fishery (1,394 boat-days). Since some effort was expended by divers, effort in boat-days is more comparable from fishery to fishery than effort in number of pots or rings fished. Substantial numbers of Dungeness, Tanner and king crabs were harvested in the Juneau fishery, but only Dungeness crabs were taken in the Ketchikan area. Ketchikan area boaters were able to harvest an estimated 69,450 shrimp (SE = 20,940).

### DISCUSSION

On-site creel surveys of the Juneau marine boat sport fishery have been conducted every year since 1960 (Schmidt, et al. 1973; Schmidt and Robards 1974, 1975; Mattson 1975; Robards 1976, 1977, 1978; Marriott, et al. 1979; Schwan 1980, 1981, 1982; Neimark and Schwan 1983; Neimark 1984, 1985; Mecum and Suchanek 1986, 1987; Bingham, et al. 1988; and Suchanek and Bingham 1989, 1990b, 1991). The Ketchikan fishery has been monitored for the entire spring and summer season since 1986 (and also in 1984).

The Juneau and Ketchikan marine boat fisheries have been consistently surveyed from approximately mid-April or early May through late September. Among-year comparisons of angler effort and harvest for a given fishery are confounded by some variation in the time periods surveyed from year to year. Effort and harvest at either the beginning or the end of the survey season is small, however, in comparison to effort during the middle of the season. Among-year comparisons are generally valid, but the variations in survey periods should be noted. Variances for the harvest estimates have only been generated since 1987, so it is not possible to do statistical comparisons with prior years. In the

Table 11. Rockfish species composition in the Ketchikan marine sport fishery during 1991.<sup>a</sup>

Species	Harvest	Percent
Black rockfish	226	2%
Copper rockfish	187	2%
Dusky rockfish	244	3%
Quillback rockfish	5,897	47%
Silvergrey rockfish	833	7%
Yelloweye rockfish	4,259	34%
Tiger rockfish	56	<1%
Other rockfish	613	5%
Total	12,442	100%

<sup>a</sup> Due to time constraints, approximately 34% of the rockfish harvest in the Ketchikan area was not keyed out to species; the unidentified rockfish harvest was allocated to species by expanding the appropriate percentage of harvest in the identified harvest to the total harvest.

Table 12. Summary of estimated total catch and harvests of pink salmon, chum salmon, sockeye salmon, and Dolly Varden in the Ketchikan and Juneau marine sport fisheries during 1991. Variances may be found in Appendix A1 for the Ketchikan fishery and in Appendix A3 for the Juneau fishery.

Sport fishery	Time period	Pink salmon		Chum salmon		Sockeye salmon		Dolly Varden	
		Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
Ketchikan	4/29 - 9/29	44,641	39,015	1,817	1,763	184	184	4	0
Juneau	4/15 - 9/29	9,462	5,025	1,301	1,083	55	55	1,520	1,023
	Total	54,103	44,040	3,118	2,846	239	239	1,524	1,023

Table 13. Estimated effort for, and harvests of, Dungeness, king, and Tanner crab and shrimp in the Ketchikan and Juneau personal use, sport, and subsistence fisheries during 1991.

	Estimate	Standard error	Relative precision
<u>Ketchikan (4/29-9/29)</u>			
Boat-days fished	1,394	292	42%
Dungeness crab kept	7,631	1,166	31%
King crab kept	0	0	---
Tanner crab kept	0	0	---
Shrimp kept	69,450	20,940	60%
<u>Juneau (4/15-9/29)</u>			
Boat-days fished	3,812	342	18%
Dungeness crab kept	13,433	1,748	26%
King crab kept	2,467	524	42%
Tanner crab kept	1,294	196	30%
Shrimp kept	--- <sup>a</sup>	---	---

<sup>a</sup> Shrimp harvest not estimated in Juneau.

following discussion it should be noted that, in some instances, it might not be possible to show a statistical difference between years.

### Angler Effort

Total effort in the Juneau fishery during 1991 was about 12% higher than the 1983-1990 average of 351,192 angler-hours, while in Ketchikan, total effort was a record for the area and totaled about 47% above the long-term average (Table 14). Average effort through 1990 (as determined from available data) for the Ketchikan fishery was 233,606 angler-hours, or about 67% of the Juneau effort. In 1991, however, total effort in Ketchikan was about 87% of that seen in Juneau.

In both Juneau and Ketchikan, the estimated amount of salmon effort was at an all-time high totaling 21% and 66% above average, respectively. In contrast, the amount of bottomfish effort in the Juneau area was lower than any recorded during the 1983 to 1990 period as it totaled only 84% of average. In Ketchikan, bottomfish effort was about average. It appears that the salmon fisheries in these two areas are expanding while the bottomfish fisheries are remaining about the same or declining. At least 80% of the 1991 effort was targeted on salmon, in comparison to long-term averages of 76% in Juneau and 71% in Ketchikan.

### Chinook Salmon Fisheries

Due in part to the shift in effort to salmon, total harvests of chinook salmon for both the Juneau and Ketchikan marine boat fisheries were both record totals (Table 15). The Juneau harvest of 12,234 chinook salmon exceeded the previous record of 8,893 fish taken in 1987 by 3,300 fish and was more than twice the long-term average. Similarly, the Ketchikan harvest exceeded the 1990 record by nearly 2,900 fish and was also over twice the long-term average. Harvest of chinook salmon in the Juneau Golden North Salmon Derby, however, was only 67% of average.

Harvests of chinook salmon in both the Juneau and Ketchikan fisheries have been increasing due to larger contributions of hatchery chinook salmon, and record numbers of hatchery chinook salmon were taken in both fisheries in 1991 (Table 16). An estimated 37% of the 1991 chinook salmon harvest in Juneau originated in hatcheries compared to the 1983-1990 average of 17%. Similarly, in Ketchikan, an estimated 66% of the 1991 harvest originated in hatcheries in comparison to the average of 42%. Over time, both Alaskan and non-Alaskan hatchery fish are comprising a larger portion of the harvest, although it is the increases in Alaska hatchery chinook salmon which are of most value as most of these fish do not count toward U.S./Canada Pacific Salmon Treaty catch totals. Total harvests of wild and non-Alaskan hatchery fish taken by all gear groups in Southeast Alaska are limited to a quota.

Sampling of chinook salmon taken during derbies in Sitka, Petersburg, and Wrangell showed that substantial numbers of Alaska and non-Alaska hatchery fish are being taken during these fisheries. A calculated hatchery contribution of greater than 100% in the Sitka Salmon Derby indicates that the fish entered in the derby may not have been representative of the entire derby harvest since many chinook salmon are taken home and not entered during the derby. If possible, another technician should sample chinook salmon taken home during the derby for coded wire tags. A combination of contribution estimates for both the take-home and entered harvests would more likely be representative of the entire harvest.

Table 14. Estimated angler effort in the Juneau and Ketchikan marine sport fisheries as determined by on-site creel surveys for comparable sample periods.

Sport fishery	Year	Survey dates	Salmon-hours		Bottomfish-hours		Total angler-hours
			Estimate	Percent	Estimate	Percent	
Juneau	1983	4/17-10/01	236,344	74%	84,259	26%	320,603
	1984	4/29-9/29	246,732	77%	72,090	23%	318,822
	1985	4/15-9/29	269,077	79%	72,381	21%	341,458
	1986	4/14-10/05	240,921	76%	77,165	24%	318,086
	1987	3/16-9/27	307,124	76%	94,658	24%	401,840
	1988	4/11-9/25	254,196	72%	96,188	27%	351,247
	1989	4/24-9/24	287,676	77%	85,354	23%	373,504
	1990	4/23-9/23	300,167	78%	83,106	22%	383,976
		Average	267,780	76%	83,150	24%	351,192
	1991	4/15-9/29	324,788	82%	69,475	18%	394,275
	% of Average	121%		84%		112%	
Ketchikan	1984	4/29-9/29	161,100	72%	62,625	28%	223,725
	1985		----- No comparable survey -----				
	1986	4/28-9/28	133,518	72%	51,208	28%	184,726
	1987	4/20-9/27	157,306	65%	84,954	35%	242,274
	1988	4/11-9/25	153,086	68%	71,611	32%	225,779
	1989	4/24-9/24	195,974	71%	79,958	29%	276,516
	1990	5/07-9/23	199,063	80%	49,347	20%	248,618
		Average	166,675	71%	66,617	29%	233,606
	1991	4/29-9/29	275,856	80%	67,842	20%	343,698
		% of Average	166%		102%		147%

Table 15. Estimated harvests of chinook salmon in the Juneau and Ketchikan marine sport fisheries as determined by on-site creel surveys for comparable sample periods.

Year	Juneau marine <sup>a</sup>	Juneau Golden North Derby	Ketchikan marine
1977	4,845	516	---
1978	3,020	250	---
1979	4,644	1,007	---
1980	5,552	477	---
1981	4,165	873	---
1982	4,670	1,016	---
1983	4,316	872	---
1984	6,474	855	1,820
1985	8,133	1,222	---
1986	5,050	1,073	5,006
1987	8,893	1,005	4,723
1988	5,683	677	5,245
1989	7,074	609	5,752
1990	7,335	493	9,869
Average	5,704	782	5,403
1991	12,234	522	12,730
% of Average	214%	67%	236%

<sup>a</sup> Includes Juneau Golden North Salmon Derby harvest.

Table 16. Estimated contributions of hatchery-produced chinook salmon to selected marine sport fisheries of Southeast Alaska as determined by on-site creel surveys, 1983-1991.

Year	Juneau marine		Ketchikan marine	
	Total hatchery contrib.(%)	Alaska hatchery contrib.(%)	Total hatchery contrib.(%)	Alaska hatchery contrib.(%)
1983	46 ( 1%)	25 ( 1%)	350 (10%)	233 ( 6%)
1984	577 ( 9%)	444 ( 7%)	432 (24%)	333 (18%)
1985	1,037 (13%)	831 (10%)	862 (34%)	838 (33%)
1986	1,032 (20%)	918 (18%)	2,226 (44%)	1,638 (33%)
1987	2,060 (23%)	2,015 (23%)	1,409 (30%)	999 (21%)
1988	1,210 (21%)	979 (17%)	1,747 (33%)	1,405 (27%)
1989	1,018 (14%)	865 (12%)	2,992 (52%)	2,082 (36%)
1990	2,011 (27%)	1,584 (22%)	6,023 (61%)	4,511 (46%)
Average	1,124 (17%)	958 (14%)	2,005 (42%)	1,505 (31%)
1991	4,279 (37%) <sup>a</sup>	2,957 (26%) <sup>a</sup>	8,373 (66%)	7,035 (55%)

<sup>a</sup> Percentage calculated without including 803 chinook salmon taken in strata which were not sampled for coded wire tags.

Estimated total catch of small chinook salmon in the Ketchikan fishery declined from 54,047 in 1990 (Suchanek and Bingham 1991) to 32,985 in 1991. On the other hand, total catch of small chinook salmon in the Juneau fishery nearly doubled from 16,841 in 1990 to 30,887 in 1991. If these catches are an indicator of juvenile chinook salmon abundance, then chinook salmon harvests in the Juneau area should increase in 1992 while the Ketchikan area may show a decline in harvest.

### Coho Salmon Fisheries

The 1991 harvest of 43,789 coho salmon in the Ketchikan area was an all-time record at 175% above the 1984 to 1990 average (excluding 1985, when the fishery was not sampled) (Table 17). The Juneau area also had an above-average harvest of coho salmon (22,397 fish), which was very similar to harvests in 1989 and 1990. The Juneau Golden North Salmon derby harvest of 2,567 coho salmon was about average. Average harvests for both the Juneau and Ketchikan fisheries totaled about 15,000-16,000 coho salmon.

Relatively large harvests in both the Juneau and Ketchikan areas were also due in part to increases in hatchery contributions (Table 18). The estimated harvest of 2,526 (12% of total) hatchery coho salmon taken in Juneau was a record for the fishery and exceeded the previous record of 1,353 (8% of total) taken in 1985 and the 1983-1990 average of 430. The increase in hatchery coho salmon harvests in the Juneau area was due primarily to excellent returns to the Gastineau Hatchery owned by Douglas Island Pink and Chum, Inc. These returns also generated a very large shoreline fishery in Gastineau Channel for the returning coho salmon in late September and October.

The Ketchikan fishery has been much more dependent upon hatchery coho salmon than the Juneau fishery, as about 25% of the 1984 to 1990 Ketchikan harvest originated in hatcheries (Table 18). The estimated 1991 harvest of 18,627 hatchery coho salmon taken in Ketchikan was a record for the area, although, in relative terms, the 45% hatchery contribution in 1987 was statistically the same as the 43% contribution in 1991.

### Bottomfish Fisheries

In contrast to harvests of chinook and coho salmon, Pacific halibut harvests in the Juneau and Ketchikan fisheries were not exceptional in 1991 (Table 19). Total estimated harvest and catch of Pacific halibut in the Juneau fishery was lower than estimates for any of the years from 1983 to 1990 and the harvest was only 65% of average. The harvest and catch of Pacific halibut in Ketchikan was slightly above average. Retention rates for Pacific halibut were above average in both Juneau and Ketchikan at 78% and 90%, respectively.

Rockfish harvests declined in Ketchikan from 1987 to 1990, but in 1991, the estimated harvest of rockfish increased (Table 20). Retention of rockfish increased to 54% in 1991 from the average of 47%. Targeted HPUE (as expressed in harvest per hour of bottomfish effort) for rockfish matched the long-term average, although the targeted CPUE (as expressed in catch per hour of all bottomfish effort) was slightly below average during 1991. Non-targeted HPUE and CPUE for rockfish were below average partially due to the relatively large amount of salmon effort during 1991. Quillback and yelloweye rockfish made up over 80% of the Ketchikan rockfish harvest in 1991 (Table 11) which was similar to previous years (Suchanek and Bingham 1991).

Table 17. Estimated harvests of coho salmon in the Juneau and Ketchikan marine sport fisheries as determined by on-site creel surveys for comparable sample periods.

Year	Juneau <sup>a</sup> marine	Juneau Golden North Derby	Ketchikan marine
1977	13,084	3,625	---
1978	16,697	2,855	---
1979	10,150	3,224	---
1980	11,694	2,277	---
1981	8,661	1,764	---
1982	20,747	5,320	---
1983	12,662	2,964	---
1984	10,100	1,594	14,231
1985	17,138	2,919	---
1986	9,763	367	20,814
1987	17,610	3,056	10,464
1988	12,017	1,453	5,525
1989	23,819	3,173	10,781
1990	26,343	1,914	33,661
Average	15,035	2,609	15,913
1991	22,397	2,567	43,789
% of Average	149%	98%	275%

<sup>a</sup> Includes Juneau Golden North Salmon Derby harvest.

Table 18. Estimated contributions of hatchery-produced coho salmon to the Juneau and Ketchikan marine sport fisheries as determined by on-site creel surveys.

Year	Juneau marine		Ketchikan marine	
	Hatchery contrib.	Percent of harvest	Hatchery contrib.	Percent of harvest
1983	227	2%	--	--
1984	52	1%	5,181	36%
1985	1,353	8%	--	--
1986	37	<1%	3,200	15%
1987	94	1%	4,663	45%
1988	262	2%	292	5%
1989	930	4%	1,147	11%
1990	482	2%	9,515	28%
Average	430	3%	4,000	25%
1991	2,526	12% <sup>a</sup>	18,627	43%

<sup>a</sup> Percentage calculated without including 1,111 coho salmon taken in strata which were not sampled for coded wire tags.

Table 19. Estimated harvests and catches of Pacific halibut in the Juneau and Ketchikan marine sport fisheries, 1983-1991.

Year	Juneau marine				Ketchikan marine			
	Kept	Released	Total catch	Percent retained	Kept	Released	Total catch	Percent retained
1983	16,414	4,674	21,088	78%	---	---	---	---
1984	14,609	9,100	23,709	62%	8,913	748	9,661	92%
1985	11,931	3,955	15,886	75%	---	---	---	---
1986	13,132	6,868	20,000	66%	8,208	1,577	9,785	84%
1987	13,513	10,357	23,870	57%	10,493	3,390	13,883	76%
1988	12,672	5,027	17,699	72%	7,317	1,338	8,655	85%
1989	12,484	2,406	14,890	84%	10,797	1,256	12,053	90%
1990	11,774	4,018	15,792	75%	7,419	1,281	8,700	85%
Average	13,316	5,801	19,117	70%	8,858	1,598	10,456	85%
1991	8,611	2,363	10,974	78%	9,650	1,125	10,775	90%
% of Avg.	65%	41%	57%		109%	70%	103%	

Table 20. Comparative catch and effort statistics for the Ketchikan rockfish sport fishery.

Year	Survey dates	Angler effort		Total rockfish harvest and catch				HPUE		CPUE	
		Total angler-hours	Bottomfish-hours	Kept	Released	Total catch	Retention rate	Targeted <sup>a</sup>	Non-targeted <sup>b</sup>	Targeted <sup>c</sup>	Non-targeted <sup>d</sup>
1984	4/29-9/29	223,725	62,625	9,805	---	---	---	0.16	0.04	---	---
1985 <sup>e</sup>	4/15-6/30	---	---	---	---	---	---	---	---	---	---
1986	4/28-9/28	184,726	51,208	6,017	7,527	13,544	44%	0.12	0.03	0.26	0.07
1987	4/20-9/27	242,274	84,954	18,591	27,539	46,130	40%	0.22	0.08	0.54	0.19
1988	4/11-9/25	225,779	71,611	17,477	15,516	32,993	53%	0.24	0.08	0.46	0.15
1989	4/24-9/24	276,516	79,958	11,224	6,742	17,966	62%	0.14	0.04	0.22	0.06
1990	5/07-9/23	248,618	49,347	9,561	9,132	18,693	51%	0.19	0.04	0.38	0.08
Average		233,606	66,617	12,113	13,291	25,865	47%	0.18	0.05	0.39	0.12
1991	4/29-9/29	343,698	67,842	12,442	10,714	23,156	54%	0.18	0.04	0.34	0.07

<sup>a</sup> Rockfish harvest per angler-hour of effort.

<sup>b</sup> Rockfish harvest per bottomfish-hour of effort.

<sup>c</sup> Rockfish total catch per angler-hour of effort.

<sup>d</sup> Rockfish total catch per bottomfish-hour of effort.

<sup>e</sup> Data not comparable since creel surveys extended only through June 30 instead of late September.

## Shellfish Fisheries

Estimated shellfish effort in the Juneau area was the highest recorded as were harvests of Dungeness and king crab (Table 21). Harvest of Tanner crab in the Juneau area, however, was the lowest recorded. In Ketchikan, shellfish effort was very similar to that seen in 1988, although well above the level of effort estimated in 1989 and 1990. Dungeness crab harvest in Ketchikan was also below the total seen during 1988, but well above the 1989 and 1990 totals. Shrimp harvest in the Ketchikan area during 1991 was the highest recorded although shrimp harvests are estimated with very poor precision.

## CONCLUSIONS AND RECOMMENDATIONS

Large changes in Southeast Alaska sport fisheries have occurred over the past decade. Wild stocks of fish have historically supported most of the sport fisheries, but increasing enhancement efforts have led to increases in harvests of hatchery chinook and coho salmon. In both 1990 and 1991, over 60% of the chinook salmon taken in the Ketchikan area originated in hatcheries. These enhancement efforts are costly and catch monitoring through the use of creel survey programs is one of the few means to evaluate the success of hatchery programs in producing fish for sport anglers. During 1991, both the number and percent contributions of hatchery chinook salmon to monitored boat sport fisheries were the highest recorded. The number of hatchery coho salmon contributed to both the Ketchikan and Juneau sport fisheries was also the highest on record. Creel surveys of marine boat fisheries will continue to be necessary to evaluate and improve the effectiveness of stocking programs.

In March of 1992, the Alaska Board of Fisheries allocated the Southeast Alaska chinook salmon quota, established under the U.S./Canada Pacific Salmon Treaty, between the commercial and recreational fisheries. The board also adopted a management plan for the chinook salmon sport fishery which requires inseason management by the Department of Fish and Game so that the sport fishery does not exceed its allocation. In 1992, sampling of other major boat sport fisheries including those in Sitka, Petersburg, and Wrangell will be necessary to estimate the sport harvest of chinook salmon so that the sport fishery can be effectively managed. These increased sampling efforts will also be necessary to better document harvests of Alaska hatchery fish for catch reporting required by the Pacific Salmon Treaty.

Data from marine boat surveys are also used for a variety of other purposes from commenting on proposed regulation changes to public information documents. Current data on sport fisheries for coho salmon and Pacific halibut are also necessary to improve management planning for these species. Continuing shellfish harvest estimates as a component of the marine harvest studies will provide valuable information to evaluate performance of this fishery and to comment upon potential regulation changes during Alaska Board of Fisheries meetings.

## ACKNOWLEDGMENTS

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Table 21. Comparison of estimated shellfish effort and harvest 1988-1991 for the Juneau and Ketchikan marine boat fisheries.

	1988	1989	1990	Mean	1991
<u>Juneau</u>					
Effort (boat-days)	2,287	2,652	2,622	2,520	3,812
Dungeness crab harvest	6,459	8,356	6,289	7,035	13,433
Tanner crab harvest	3,042	3,369	1,883	2,765	1,294
King crab harvest	552	1,849	1,960	1,454	2,467
<u>Ketchikan</u>					
Effort (boat-days)	1,398	508	614	840	1,394
Dungeness crab harvest	9,043	2,688	3,367	5,033	7,631
Shrimp harvest	27,643	12,730	17,130	19,168	69,450

their invaluable data collection efforts and many suggestions to improve survey techniques. The efforts of the following coded wire tag samplers are also appreciated: Glenn Freeman (Petersburg Derby), Cleo Stokes (Sitka Derby), and Kim Fisher (Wrangell Derby). Staff from the two Alaska Connections lodges on Shelter Island are also acknowledged for their work in voluntarily reporting harvests of salmon, Pacific halibut, and rockfish. The ADF&G staff of the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division CWT lab are gratefully acknowledged for their work on dissecting salmon heads, coded wire tag decoding, and their data reduction efforts. We thank Donna Buchholz and Gail Heineman of the Research and Technical Services Unit (RTS) of the Division of Sport Fish for their diligence in mark-sense form processing and data control.

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APPENDIX A  
CREEL SURVEY STATISTICS



Appendix A1. Estimated finfish effort, harvest, and total catches for the Ketchikan marine boat sport fishery, 29 April-29 September 1991.

	Estimate	Standard error	Relative precision <sup>a</sup>
<b>Finfish Effort<sup>b</sup></b>			
Boat-hours	128,265	8,017	13%
Salmon-hours	275,856	18,754	14%
Halibut-hours	67,842	6,682	20%
Angler-hours	343,698	21,606	13%
Boat-Days	30,255	1,867	12%
<b>Finfish Harvests<sup>c</sup></b>			
Total Large Chinook Salmon	12,576	1,054	17%
Derby Take-home	1,330	265	40%
Derby Entered	794	0	0%
Derby Take-home & Entered	2,124	265	25%
Total Small Chinook Salmon	154	56	74%
Derby Take-home & Entered	11	6	113%
Coho Salmon	43,789	5,646	26%
Chum Salmon	1,763	418	47%
Sockeye Salmon	184	57	62%
Pink Salmon	39,015	5,100	26%
Pacific Halibut	9,650	1,152	24%
Dolly Varden	0	0	0%
Steelhead	17	13	157%
Lingcod	1,433	337	47%
Total Rockfish	12,442	1,326	21%
Black Rockfish	149	69	93%
Copper Rockfish	123	50	82%
Dusky Rockfish	244	76	63%
Quillback Rockfish	3,885	586	30%
Silvergrey Rockfish	549	149	55%
Tiger Rockfish	37	16	87%
Yelloweye Rockfish	2,806	385	27%
Other Rockfish	404	91	45%
Unidentified Rockfish	4,245	857	40%
<b>Finfish Total Catch<sup>b</sup></b>			
Small Chinook Salmon	32,985	2,780	17%
Large Chinook Salmon	13,118	1,055	16%
Coho Salmon	45,902	5,688	25%
Chum Salmon	1,817	420	46%
Sockeye Salmon	184	57	62%
Pink Salmon	44,641	5,017	22%
Pacific Halibut	10,775	1,364	25%
Dolly Varden	4	3	173%
Steelhead	17	13	157%
Lingcod	1,664	354	43%
Total Rockfish	23,156	1,835	16%

<sup>a</sup> Relative precision = (Standard error \* 2 / Estimate) \* 100.

<sup>b</sup> No lingcod-hours or rockfish-hours reported.

<sup>c</sup> No cutthroat trout harvested or caught.

Appendix A2.

Estimated finfish effort and catches for the Ketchikan marine boat sport fishery by seasonal period, 29 April-29 September 1991.

	Seasonal Period												Total
	29APR91 - 12MAY91	13MAY91 - 26MAY91	Derby <sup>a</sup>	27MAY91 - 09JUN91	10JUN91 - 23JUN91	24JUN91 - 07JUL91	08JUL91 - 21JUL91	22JUL91 - 04AUG91	05AUG91 - 18AUG91	19AUG91 - 01SEP91	02SEP91 - 15SEP91	16SEP91 - 29SEP91	
Boat-hours Fished													
Estimate	1,891	3,504	16,706	2,568	14,968	18,479	16,537	8,360	11,180	12,158	15,967	5,947	128,265
Variance	77,182	429,933	4,705,667	965,036	7,990,904	11,542,202	2,969,649	1,414,747	4,364,912	8,572,595	16,639,061	4,605,357	64,277,245
Salmon-hours Fished													
Estimate	3,188	6,594	39,301	6,335	32,230	40,026	35,777	20,041	22,296	25,928	33,448	10,692	275,856
Variance	211,223	1,587,303	25,446,062	8,893,428	24,777,475	47,578,371	86,498,320	20,912,013	13,677,203	31,309,102	73,394,597	17,435,544	351,720,641
Halibut-hours Fished													
Estimate	895	1,224	2,052	383	7,228	11,597	14,894	4,811	10,568	5,965	5,801	2,425	67,842
Variance	147,540	277,680	597,112	15,803	11,593,308	5,767,293	6,324,456	401,839	6,870,882	9,406,918	2,720,946	519,003	44,642,780
Angler-hours Fished													
Estimate	4,083	7,818	41,354	6,717	39,458	51,624	50,671	24,852	32,863	31,893	39,248	13,117	343,698
Variance	559,871	3,028,281	30,150,688	8,466,936	66,813,681	56,577,160	70,293,140	19,683,349	27,907,011	64,705,996	95,031,159	23,586,474	466,803,746
Boat-days Fished													
Estimate	563	1,008	2,803	770	3,636	4,075	4,121	2,115	3,096	2,711	3,840	1,517	30,255
Variance	10,271	57,408	141,696	48,329	664,581	328,907	203,839	60,234	284,680	467,019	926,879	293,463	3,487,306
Large Chinook Salmon Harvested													
Estimate	115	456	2,124	450	3,203	3,516	1,459	176	672	214	122	69	12,576
Variance	485	23,568	70,445	69,455	387,543	429,497	58,024	7,496	56,191	5,263	1,865	1,388	1,111,220
L. Chinook Salmon Total Catch													
Estimate	115	468	2,187	510	3,280	3,712	1,561	199	681	214	122	69	13,118
Variance	485	22,668	71,829	47,615	395,317	444,314	62,921	5,217	55,992	5,263	1,865	1,388	1,114,874
Small Chinook Salmon Harvested													
Estimate	3	0	11	45	33	32	12	0	0	13	5	0	154
Variance	7	0	39	1,890	524	472	108	0	0	164	17	0	3,221
S. Chinook Salmon Total Catch													
Estimate	645	1,032	5,031	783	3,832	6,571	4,879	1,442	2,397	2,606	2,311	1,456	32,985
Variance	97,015	30,276	461,552	98,699	826,361	1,167,098	2,619,438	306,257	387,821	1,001,838	141,598	592,154	7,730,109
Coho Salmon Harvested													
Estimate	0	0	18	0	194	1,087	4,780	1,610	4,194	7,458	19,138	5,310	43,789
Variance	0	0	328	0	2,775	48,321	1,711,493	130,361	711,695	4,142,770	21,875,077	3,259,417	31,882,237
Coho Salmon Total Catch													
Estimate	0	0	44	0	202	1,136	5,003	1,637	4,323	7,555	20,322	5,680	45,902
Variance	0	0	823	0	2,768	49,536	1,668,756	128,699	721,102	4,178,418	21,524,956	4,083,210	32,358,268
Chum Salmon Harvested													
Estimate	0	0	0	0	8	91	566	218	327	235	261	57	1,763
Variance	0	0	0	0	21	757	145,205	13,059	4,419	6,859	3,865	961	175,146
Chum Salmon Total Catch													
Estimate	0	0	0	0	8	91	590	218	327	235	272	76	1,817
Variance	0	0	0	0	21	757	145,721	13,059	4,419	6,859	4,185	1,451	176,472
Sockeye Salmon Harvested & Total Catch													
Estimate	0	0	0	0	0	58	43	51	4	0	28	0	184
Variance	0	0	0	0	0	1,370	1,238	121	12	0	540	0	3,281
Pink Salmon Harvest													
Estimate	0	0	0	0	8	861	9,375	9,213	10,583	5,279	3,569	127	39,015
Variance	0	0	0	0	48	46,088	11,509,478	8,350,389	3,392,839	1,273,463	1,428,916	9,383	26,010,604
Pink Salmon Total Catch													
Estimate	0	0	0	15	8	1,078	10,097	9,852	11,916	6,551	4,924	200	44,641
Variance	0	0	0	210	48	83,000	11,451,615	6,393,959	3,253,285	1,650,357	2,326,007	19,685	25,178,166
Steelhead Harvest and Total Catch													
Estimate	0	0	0	0	0	0	0	13	0	4	0	0	17
Variance	0	0	0	0	0	0	0	164	0	13	0	0	177

-continued-

Appendix A2. (Page 2 of 2).

	Seasonal Period												Total
	29APR91 - 12MAY91	13MAY91 - 26MAY91	Derby <sup>a</sup>	27MAY91 - 09JUN91	10JUN91 - 23JUN91	24JUN91 - 07JUL91	08JUL91 - 21JUL91	22JUL91 - 04AUG91	05AUG91 - 18AUG91	19AUG91 - 01SEP91	02SEP91 - 15SEP91	16SEP91 - 29SEP91	
Pacific Halibut													
Harvested													
Estimate	13	120	411	60	1,095	1,441	2,117	840	1,770	1,115	560	108	9,650
Variance	40	4,824	28,785	3,045	240,727	163,217	261,377	15,699	120,298	445,109	39,772	5,622	1,328,515
Pacific Halibut													
Total Catch													
Estimate	26	120	420	60	1,452	1,602	2,400	900	1,917	1,141	588	149	10,775
Variance	70	4,824	28,966	3,045	609,570	201,211	344,618	18,548	141,319	461,899	41,854	6,875	1,862,799
Dolly Varden Total Catch													
Estimate	0	0	0	0	4	0	0	0	0	0	0	0	4
Variance	0	0	0	0	12	0	0	0	0	0	0	0	12
Lingcod Harvested													
Estimate	0	12	49	0	117	351	482	45	217	94	51	15	1,433
Variance	0	132	302	0	3,794	84,106	16,660	598	5,491	2,013	424	93	113,613
Lingcod Total Catch													
Estimate	0	12	118	0	125	356	563	49	256	119	51	15	1,664
Variance	0	132	3,777	0	3,801	84,107	23,163	603	6,709	2,679	424	93	125,488
Unidentified Rockfish													
Harvested													
Estimate	6	156	124	15	270	1,113	659	254	648	168	429	402	4,244
Variance	28	13,404	1,737	210	12,289	476,419	50,644	4,851	44,754	3,749	28,403	97,118	733,606
Black Rockfish													
Harvested													
Estimate	0	12	3	0	4	94	0	0	15	12	9	0	149
Variance	0	132	14	0	12	4,348	0	0	170	59	68	0	4,803
Copper Rockfish													
Harvested													
Estimate	19	0	0	0	0	0	0	13	62	4	16	9	123
Variance	253	0	0	0	0	0	0	164	1,957	13	110	51	2,548
Dusky Rockfish													
Harvested													
Estimate	14	0	5	0	35	14	64	26	4	27	47	9	244
Variance	110	0	19	0	592	79	2,218	226	12	534	1,991	51	5,832
Quillback Rockfish													
Harvested													
Estimate	35	60	269	106	234	518	630	320	1,250	159	180	125	3,885
Variance	852	2,868	31,850	9,816	5,545	34,816	23,429	21,712	199,085	4,122	3,577	5,868	343,540
Silvergrey Rockfish													
Harvested													
Estimate	16	132	16	0	4	9	34	73	151	38	35	41	549
Variance	118	11,604	323	0	13	68	380	2,309	6,044	285	1,120	153	22,417
Yelloweye Rockfish													
Harvested													
Estimate	14	48	94	45	211	748	361	133	579	208	253	112	2,806
Variance	42	684	1,600	1,890	11,135	74,171	9,952	1,697	18,716	16,999	6,924	4,459	148,269
Tiger Rockfish													
Harvested													
Estimate	0	0	0	0	0	0	4	0	20	4	9	0	37
Variance	0	0	0	0	0	0	13	0	165	13	68	0	259
Other Rockfish Harvested													
Estimate	0	0	0	0	12	98	73	12	118	38	40	13	404
Variance	0	0	0	0	108	3,086	2,077	57	1,772	470	583	164	8,317
All Rockfish Harvested													
Estimate	105	408	512	166	770	2,593	1,824	832	2,847	658	1,017	710	12,442
Variance	2,046	33,312	53,668	20,484	57,268	807,500	97,467	43,581	380,827	70,645	69,703	122,835	1,759,336
All Rockfish Total Catch													
Estimate	493	588	1,831	275	1,973	5,058	3,483	1,200	4,470	1,306	1,577	902	23,156
Variance	87,640	38,028	200,322	34,101	219,123	1,384,380	299,002	93,690	520,104	158,951	187,526	147,189	3,370,056

<sup>a</sup> Derby held on weekends of 25-27 May, 1-2 June, and 8-9 June 1991.

Appendix A3. Estimated finfish effort, harvest, and total catches for the Juneau marine boat sport fishery, 15 April-29 September 1991.

	Estimate	Standard error	Relative precision <sup>a</sup>
<b>Finfish Effort<sup>b</sup></b>			
Boat-hours	153,534	7,348	10%
Salmon-hours	324,788	16,266	10%
Halibut-hours	69,475	5,370	15%
Angler-hours	394,275	18,174	9%
Boat-Days	35,889	1,741	10%
<b>Finfish Harvests<sup>c</sup></b>			
Total Large Chinook Salmon	11,862	829	14%
Derby Take-home	122	31	52%
Derby Entered	399	0	0%
Derby Take-home & Entered	521	31	12%
Total Small Chinook Salmon	372	109	59%
Derby Take-home	0	0	0%
Derby Entered	1	0	0%
Total Coho Salmon	22,397	1,696	15%
Derby Take-home	512	98	38%
Derby Entered	2,055	0	0%
Derby Take-home & Entered	2,567	98	8%
Total Chum Salmon	1,083	147	27%
Derby Take-home	38	13	73%
Derby Entered	115	0	0%
Derby Take-home & Entered	153	13	17%
Total Sockeye Salmon	55	15	58%
Derby Take-home	3	3	200%
Derby Entered	11	0	0%
Derby Take-home & Entered	14	3	43%
Total Pink Salmon	5,025	362	14%
Derby Take-home	729	107	29%
Derby Entered	0	0	0%
Pacific Halibut	8,611	817	19%
Dolly Varden	1,023	214	42%
Lingcod	16	12	154%
Rockfish	802	105	26%
<b>Finfish Total Catch<sup>c</sup></b>			
Large Chinook Salmon	12,012	853	14%
Small Chinook Salmon	30,882	2,936	19%
Coho Salmon	22,849	1,729	15%
Chum Salmon	1,301	140	22%
Sockeye Salmon	55	15	58%
Pink Salmon	9,462	792	17%
Pacific Halibut	10,974	1,051	19%
Dolly Varden	1,520	261	34%
Lingcod	16	12	154%
Rockfish	873	112	26%

<sup>a</sup> Relative precision = (Standard error \* 2 / Estimate) \* 100.

<sup>b</sup> No lingcod-hours or rockfish-hours reported.

<sup>c</sup> No steelhead or cutthroat trout harvested or caught.

Appendix A4. Estimated finfish effort and catches for the Juneau marine boat recreational fishery by seasonal period, 15 April-29 September 1991.

	Seasonal Period						
	15APR91 - 28APR91	29APR91 - 12MAY91	13MAY91 - 26MAY91	27MAY91 - 09JUN91	10JUN91 - 23JUN91	24JUN91 - 07JUL91	08JULY - 21JULY
Boat-hours Fished							
Estimate	5,413	11,309	9,646	14,279	16,939	16,360	14,685
Variance	3,423,991	13,139,191	1,103,010	4,071,930	7,571,478	3,663,184	3,474,276
Salmon-hours Fished							
Estimate	12,368	25,532	22,523	33,192	33,510	21,736	27,031
Variance	19,309,255	78,309,410	5,513,396	21,894,096	44,969,521	2,713,484	11,550,048
Halibut-hours Fished							
Estimate	51	134	636	2,722	8,323	19,646	13,689
Variance	843	8,156	56,892	736,312	3,346,121	10,843,186	6,174,594
Angler-hours Fished							
Estimate	12,418	25,666	23,159	35,914	41,845	41,380	40,720
Variance	19,336,909	78,513,827	5,734,458	28,576,899	37,211,767	16,819,551	27,082,039
Boat-days Fished							
Estimate	1,441	2,723	2,184	3,284	4,156	4,260	3,945
Variance	223,981	661,103	73,005	181,037	391,075	320,847	271,197
Large Chinook Salmon Harvested							
Estimate	164	810	1,187	2,281	1,921	1,192	1,935
Variance	3,870	64,647	23,645	147,484	122,088	12,657	215,467
Large Chinook Salmon Total Catch							
Estimate	164	810	1,187	2,303	1,921	1,192	2,027
Variance	3,870	64,647	23,645	150,271	122,088	12,657	251,499
Small Chinook Salmon Harvested							
Estimate	0	0	6	90	89	91	57
Variance	0	0	30	6,830	2,466	1,870	450
Small Chinook Salmon Total Catch							
Estimate	0	554	945	8,091	5,375	2,166	4,421
Variance	0	164,971	27,102	2,169,964	1,523,139	92,812	3,548,262
Coho Salmon Harvested							
Estimate	0	0	0	2	3	574	1,705
Variance	0	0	0	0	0	40,062	42,407
Coho Salmon Total Catch							
Estimate	0	0	0	2	3	586	1,782
Variance	0	0	0	0	0	40,492	60,086

	Seasonal Period						
	22JUL91 - 04AUG91	05AUG91 - 18AUG91	Derby <sup>a</sup>	19AUG91 - 01SEP91	02SEP91 - 15SEP91	16SEP91 - 29SEP91	Total
Boat-hours Fished							
Estimate	10,157	11,002	21,231	14,793	5,181	2,539	153,534
Variance	5,801,620	5,194,746	2,713,913	2,847,446	831,394	167,607	54,003,786
Salmon-hours Fished							
Estimate	18,967	22,077	58,857	33,378	11,383	4,234	324,788
Variance	2,544,952	27,643,539	19,717,836	16,067,597	3,845,476	495,517	264,574,127
Halibut-hours Fished							
Estimate	7,619	7,162	1,505	5,424	1,203	1,361	69,475
Variance	3,854,115	2,600,929	194,007	795,459	123,672	103,733	28,838,019
Angler-hours Fished							
Estimate	26,586	29,239	60,362	38,805	12,587	5,594	394,275
Variance	7,439,140	40,723,944	21,296,403	21,839,254	4,882,731	822,927	330,279,849
Boat-days Fished							
Estimate	2,703	2,725	2,902	3,564	1,346	656	35,889
Variance	399,850	294,134	57,167	98,625	49,189	10,364	3,031,574
Large Chinook Salmon Harvested							
Estimate	935	507	521	317	59	33	11,862
Variance	60,003	34,018	1,003	1,477	846	350	687,555
Large Chinook Salmon Total Catch							
Estimate	935	507	557	317	59	33	12,012
Variance	60,003	34,018	2,255	1,477	846	350	727,626
Small Chinook Salmon Harvested							
Estimate	7	9	1	22	0	0	372
Variance	15	65	0	320	0	0	12,046
Small Chinook Salmon Total Catch							
Estimate	2,643	1,296	4,088	1,116	76	111	30,882
Variance	521,038	329,454	211,937	29,404	779	2,401	8,621,263
Coho Salmon Harvested							
Estimate	2,039	3,529	2,567	6,870	3,865	1,243	22,397
Variance	111,799	1,364,371	9,662	417,365	828,441	65,233	2,879,340
Coho Salmon Total Catch							
Estimate	2,157	3,580	2,652	6,945	3,878	1,264	22,849
Variance	151,116	1,402,302	11,279	415,419	839,709	69,167	2,989,570

-continued-

Appendix A4. (Page 2 of 2).

	Seasonal Period						
	15APR91 - 28APR91	29APR91 - 12MAY91	13MAY91 - 26MAY91	27MAY91 - 09JUN91	10JUN91 - 23JUN91	24JUN91 - 07JUL91	08JULY - 21JULY
Chum Salmon Harvested							
Estimate	0	0	0	9	45	345	315
Variance	0	0	0	62	868	11,311	7,818
Chum Salmon Total Catch							
Estimate	0	0	0	9	45	366	392
Variance	0	0	0	62	868	11,516	1,994
Sockeye Salmon Harvest and Total Catch							
Estimate	0	0	0	0	0	22	0
Variance	0	0	0	0	0	161	0
Pink Salmon Harvested							
Estimate	0	0	0	0	0	191	1,415
Variance	0	0	0	0	0	972	47,511
Pink Salmon Total Catch							
Estimate	0	0	0	28	16	285	2,011
Variance	0	0	0	728	240	3,066	231,484
Pacific Halibut Harvested							
Estimate	0	5	24	361	995	2,219	1,909
Variance	0	18	60	31,845	50,632	259,077	185,984
Pacific Halibut Total Catch							
Estimate	0	5	32	470	1,415	2,587	2,900
Variance	0	18	72	39,636	160,518	351,589	345,213
Dolly Varden Harvested							
Estimate	0	76	132	411	107	151	48
Variance	0	1,291	696	39,439	892	120	277
Dolly Varden Total Catch							
Estimate	0	117	200	487	312	151	59
Variance	0	3,014	1,632	41,874	16,749	120	340
Lingcod Harvested and Total Catch							
Estimate	0	0	4	0	0	12	0
Variance	0	0	14	0	0	137	0
All Rockfish Harvested							
Estimate	0	0	0	105	92	78	65
Variance	0	0	0	995	1,221	103	129
All Rockfish Total Catch							
Estimate	0	0	0	105	92	86	65
Variance	0	0	0	995	1,221	168	129

	Seasonal Period						
	22JUL91 - 04AUG91	05AUG91 - 18AUG91	Derby <sup>a</sup>	19AUG91 - 01SEP91	02SEP91 - 15SEP91	16SEP91 - 29SEP91	Total
Chum Salmon Harvested							
Estimate	52	18	153	132	11	3	1,083
Variance	185	76	194	1,307	37	9	21,867
Chum Salmon Total Catch							
Estimate	109	18	184	156	19	3	1,301
Variance	2,817	76	477	1,752	95	9	19,666
Sockeye Salmon Harvest and Total Catch							
Estimate	6	10	14	3	0	0	55
Variance	9	65	9	9	0	0	253
Pink Salmon Harvested							
Estimate	1,137	806	729	695	52	0	5,025
Variance	19,119	37,422	11,536	14,469	114	0	131,143
Pink Salmon Total Catch							
Estimate	1,755	1,452	2,389	1,460	66	0	9,462
Variance	46,234	125,701	58,512	161,649	167	0	627,781
Pacific Halibut Harvested							
Estimate	925	913	246	798	135	81	8,611
Variance	52,838	24,975	3,819	53,545	4,586	717	668,096
Pacific Halibut Total Catch							
Estimate	1,147	956	276	957	141	88	10,974
Variance	89,222	20,625	3,981	89,029	4,564	810	1,105,277
Dolly Varden Harvested							
Estimate	97	1	0	0	0	0	1,023
Variance	3,082	0	0	0	0	0	45,797
Dolly Varden Total Catch							
Estimate	139	1	31	23	0	0	1,520
Variance	4,407	0	200	287	0	0	68,623
Lingcod Harvested and Total Catch							
Estimate	0	0	0	0	0	0	16
Variance	0	0	0	0	0	0	151
All Rockfish Harvested							
Estimate	171	74	83	119	5	10	802
Variance	3,921	749	2,215	1,707	0	38	11,078
All Rockfish Total Catch							
Estimate	175	74	132	129	5	10	873
Variance	3,941	749	3,616	1,904	0	38	12,761

<sup>a</sup> Derby held on 9-11 August 1991.

Appendix A5. Numbers of chinook salmon examined for coded wire tags in Southeast Alaska marine sport fisheries in 1991.

Fishery	Seasonal period	Large chinook <sup>a</sup>			Small chinook <sup>b</sup>		
		Estimated harvest	Number sampled	Percent	Estimated harvest	Number sampled	Percent
Ketchikan	Non-derby 4/29-6/23	4,224	421	10	81	6	7
	Derby Entered <sup>c</sup>	794	794	100	0	0	---
	Derby Take-Home <sup>c</sup>	1,330	396	30	11	2	18
	6/24-8/04	5,151	464	9	44	7	16
	8/05-9/29	1,077	138	13	18	1	6
	Total	12,576	2,213	18	154	16	10
Juneau	4/15-6/23	6,107	669	11	185	15	8
	6/24-8/04	3,375	436	12	155	20	13
	Non-derby 8/04-9/29	856	112	13	31	4	13
	Derby Entered <sup>d</sup>	399	395	99	1	1	100
	Derby Take-Home <sup>d</sup>	122	24	20	0	0	---
	Total	11,059 <sup>e</sup>	1,636	15	372	40	11
Petersburg	Derby Entered <sup>f</sup>	650	458	70	0	0	---
Wrangell	Derby Take-Home <sup>g</sup>	221	221	100	0	0	---
Sitka	Derby Entered <sup>h</sup>	1,250	989	79	0	0	---
Grand Total		25,756	5,517	21	526	56	11

<sup>a</sup> Chinook salmon at least 28 inches in total length.

<sup>b</sup> Chinook salmon <28 inches in total length.

<sup>c</sup> Derby held on weekends of 25-27 May, 1-2 June, and 8-9 June.

<sup>d</sup> Derby held on 9-11 August weekend.

<sup>e</sup> Juneau total does not included 803 chinook salmon reported harvested at lodges which were not sampled for coded wire tags.

<sup>f</sup> Derby held on weekend of 24-27 May.

<sup>g</sup> Derby held during 11-27 May.

<sup>h</sup> Derby held on weekends of 25-27 May and 1-2 June.

Appendix A6. Estimates of hatchery-produced chinook salmon contributed to the Ketchikan marine sport fishery from 29 April to 29 September 1991.

Region	Agency <sup>b</sup>	Hatchery/ Release Site	Tag Code	Non-derby 4/29-6/23			Derby <sup>a</sup>			6/24-8/04			8/05-9/29			Total			
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	
Oregon	ODFW	Cole Rivers	07-43-34	---	---	---	1	3	6	---	---	---	---	---	---	1	3	6	
		Willamette	07-50-37	---	---	---	---	---	---	---	---	---	1	7	40	1	7	40	
	Oregon Total				---	---	---	1	3	6	---	---	---	1	7	40	2	10	47
Washington	FWS	Quinault	21-28-35	1	5	22	---	---	---	---	---	---	---	---	---	1	5	22	
	NMFS	Bonneville	23-28-31	---	---	---	---	---	---	1	6	30	---	---	---	1	6	30	
	WDF	Cowlitz	63-42-04	---	---	---	---	---	---	---	---	---	1	153	---	1	153	---	
	Washington Total				1	5	22	---	---	---	1	6	30	1	153	---	3	164	51
British	CDFO	Clayoquot	02-49-23	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0	
		Conuma River	02-37-25	---	---	---	1	2	1	---	---	---	---	---	---	1	2	1	
		Kincolith CDP	02-48-25	1	13	163	---	---	---	---	---	---	---	---	---	1	13	163	
			02-48-26	1	18	296	1	1	---	1	17	284	---	---	---	3	36	580	
			02-52-28	---	---	---	---	---	---	---	---	---	1	8	52	1	8	52	
			02-52-29	1	6	27	---	---	---	---	---	---	---	---	---	1	6	27	
			02-52-31	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0	
		02-52-32	---	---	---	---	---	---	---	---	---	1	8	52	1	8	52		
		Kitimat River	02-42-18	---	---	---	1	25	602	---	---	---	---	---	---	1	25	602	
			02-42-22	---	---	---	1	5	19	---	---	---	---	---	---	1	5	19	
			02-51-53	---	---	---	---	---	---	1	195	37,766	---	---	---	1	195	37,766	
			02-55-31	---	---	---	---	---	---	---	---	---	1	18	293	1	18	293	
		Pallant Creek	02-59-08	---	---	---	1	9	68	---	---	---	---	---	---	1	9	68	
		Quinsam River	02-53-61	---	---	---	---	---	---	---	1	254	64,343	---	---	---	1	254	64,343
			02-53-63	1	38	1,387	---	---	---	---	---	---	---	---	---	1	38	1,387	
		Robertson Creek	02-46-48	---	---	---	---	---	---	---	1	8	60	---	---	---	1	8	60
			02-48-05	---	---	---	1	1	---	---	---	---	---	---	---	1	1	---	
			02-53-26	---	---	---	---	---	---	---	1	341	115,661	---	---	---	1	341	115,661
			02-53-29	---	---	---	1	76	5,751	---	---	---	---	---	---	1	76	5,751	
		Tenderfoot Creek	02-53-44	---	---	---	1	8	56	---	---	---	---	---	---	1	8	56	
			02-55-10	---	---	---	1	2	2	---	---	---	---	---	---	1	2	2	
			02-57-33	1	18	322	---	---	---	---	---	---	---	---	---	1	18	322	
			02-57-35	---	---	---	---	---	---	---	---	---	---	1	28	751	1	28	751
02-57-36	---		---	---	---	---	---	---	---	---	1	29	813	1	29	813			
02-60-31	---		---	---	1	34	1,132	---	---	---	---	---	---	1	34	1,132			
British Columbia Total				5	93	2,194	12	165	7,631	5	815	218,114	5	91	1,961	27	1,164	229,900	

-continued-

Appendix A6. (Page 2 of 2).

Region	Agency <sup>b</sup>	Hatchery/ Release Site	Tag Code	Non-derby 4/29-6/23			Derby <sup>a</sup>			6/24-8/04			8/05-9/29			Total			
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	
Southeast Alaska (cont.)	ADF&G	Crystal Lake	04-24-57	---	---	---	1	8	57	---	---	---	---	---	---	1	8	57	
			04-30-04	2	255	42,974	2	23	238	---	---	---	---	---	---	4	277	43,212	
			83-05-13	1	5	20	---	---	---	---	---	---	---	---	---	1	5	20	
			Deer Mountain	04-27-13	---	---	---	---	---	---	1	151	22,973	---	---	---	1	151	22,973
				04-27-54	---	---	---	5	25	163	1	55	3,008	---	---	---	6	80	3,171
				04-27-55	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
	MIC	Tangas Creek	07-16-36	1	179	31,929	---	---	---	---	---	---	---	---	---	1	179	31,929	
			07-16-39	1	11	104	---	---	---	---	---	---	---	---	---	1	11	104	
			07-16-42	1	54	2,831	6	140	4,243	---	---	---	---	---	---	7	193	7,074	
	NMFS	Little Port Walter	03-62-13	---	---	---	1	4	11	---	---	---	---	---	---	1	4	11	
			SSRAA	Carroll Inlet	04-26-26	---	---	---	5	154	6,899	---	---	---	---	---	5	154	6,899
	04-28-22	---	---		---	3	50	1,178	2	201	24,919	---	---	---	5	251	26,097		
	04-28-25	---	---		---	2	6	10	---	---	---	---	---	---	2	6	10		
	04-31-01	4	496		73,891	5	74	1,584	3	494	79,947	---	---	---	12	1,064	155,423		
	04-31-07	7	1,454		440,186	15	267	7,513	3	458	115,466	---	---	---	25	2,179	563,164		
	04-31-41	1	97		9,349	1	8	57	---	---	---	1	53	2,775	3	158	12,181		
	04-31-42	---	---		---	2	39	963	3	253	25,867	1	53	2,775	6	344	29,605		
	Neets Bay	04-26-28	---		---	---	1	7	48	---	---	---	---	---	---	1	7	48	
		04-26-32	1		288	82,632	2	78	3,999	---	---	---	---	---	---	3	366	86,631	
		04-29-08	1		54	2,831	---	---	---	---	---	---	---	---	---	1	54	2,831	
		04-29-09	---	---	---	1	10	98	---	---	---	---	---	---	1	10	98		
		04-30-58	---	---	---	1	30	889	---	---	---	---	---	---	1	30	889		
		04-30-59	---	---	---	---	---	---	1	139	19,065	---	---	---	1	139	19,065		
		04-31-02	3	310	40,018	2	37	877	---	---	---	---	---	---	5	347	40,895		
	04-31-04	4	179	10,538	1	4	12	---	---	---	---	---	---	5	183	10,550			
	04-31-47	1	31	947	4	79	1,910	2	64	2,059	2	84	3,953	9	258	8,869			
	04-31-49	1	60	3,550	---	---	---	---	---	---	---	---	---	1	60	3,550			
Whitman Lake	04-26-31	---	---	---	2	4	4	2	52	1,458	---	---	---	4	56	1,462			
	04-31-08	4	139	5,459	6	34	262	7	264	15,277	---	---	---	17	436	20,998			
	04-31-44	1	5	22	1	2	---	1	9	66	---	---	---	4	23	131			
Southeast Alaska Total				34	3,616	747,281	70	1,084	31,015	26	2,138	310,105	5	197	9,546	135	7,035	1,097,946	
All Regions Grand Total				40	3,714	749,497	83	1,252	38,652	32	2,959	528,248	12	448	11,547	167	8,373	1,327,944	

<sup>a</sup> Derby held on weekends of 25-27 May, 1-2 June, and 8-9 June.

<sup>b</sup> ODFW = Oregon Department of Fish and Wildlife. FWS = U.S. Fish and Wildlife Service.  
 NMFS = National Marine Fisheries Service. WDF = Washington Department of Fisheries.

CDFO = Canadian Department of Fisheries and Oceans.

ADF&G = Alaska Department of Fish and Game.

MIC = Metlakatla Indian Community.

SSRAA = Southern Southeast Regional Aquaculture Association.

<sup>c</sup> Recov = Number of fish recovered of noted tag code.

<sup>d</sup> Contr = Estimated harvest of the release of the noted tag code.

<sup>e</sup> Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix A7. Estimates of hatchery-produced chinook salmon taken during the Wrangell Salmon Derby, 11-27 May 1991.

Region	Agency <sup>a</sup>	Hatchery Release Site	Tag Code	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>
Southeast Alaska	ADF&G	Crystal Lake	04-27-35	1	8	57
			04-30-04	3	34	357
	SSRAA	Whitman Lake	04-31-08	2	6	11
Southeast Alaska Total				6	48	425
All Regions Grand Total				6	48	425

<sup>a</sup> ADF&G = Alaska Department of Fish and Game.

SSRAA = Southern Southeast Regional Aquaculture Association.

<sup>b</sup> Recov = Number of fish recovered of noted tag code.

<sup>c</sup> Contr = Estimated harvest of the release of noted tag code.

<sup>d</sup> Var. of Contr = Variance of estimated harvest of release of noted tag code.

Appendix A8. Estimates of hatchery-produced chinook salmon taken during the Petersburg Salmon Derby, 24-27 May 1991.

Region	Agency <sup>a</sup>	Hatchery Release Site	Tag Code	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>		
British Columbia	CDFO	Robertson Creek	02-49-52	1	30	893		
			British Columbia Total			1	30	893
Southeast Alaska	ADF&G	Crystal Lake	04-26-14	1	4	16		
			04-27-33	1	16	254		
			04-29-60	5	125	2,999		
			04-30-04	4	64	955		
			83-06-09	1	1	1		
			Hidden Falls	04-28-63	1	2	1	
		MIC	Tamgas Creek	47-16-42	1	15	219	
		NMFS	Little Port Walter	03-20-02	1	1	1	
	03-20-27			2	3	1		
	03-20-28			1	1	1		
	03-20-31			2	3	1		
	03-21-19			3	4	2		
	03-21-21			2	3	1		
	03-21-22			1	1	1		
	03-62-13			6	9	4		
	03-62-22			4	6	2		
	03-62-25			1	1	1		
	03-62-31			1	1	1		
	03-63-10			1	1	1		
		SSRAA	Carroll Inlet	04-31-07	1	14	182	
				Whitman Lake	04-26-31	2	6	11
	Southeast Alaska Total				45	288	4,654	
All Regions Grand Total				46	318	5,547		

- <sup>a</sup> CDFO = Canadian Department of Fisheries and Oceans.  
ADF&G = Alaska Department of Fish and Game.  
MIC = Metlakatla Indian Community.  
NMFS = National Marine Fisheries Service.  
SSRAA = Southern Southeast Regional Aquaculture Association
- <sup>b</sup> Recov = Number of fish recovered of noted tag code.  
<sup>c</sup> Contr = Estimated harvest of the release of noted tag code.  
<sup>d</sup> Var. of Contr = Variance of estimated harvest of release of noted tag code.

Appendix A9. Estimates of hatchery-produced chinook salmon contributed to entered harvest of Sitka Salmon Derby, 25-27 May and 1-2 June 1991.

Region	Agency <sup>a</sup>	Hatchery Release Site	Tag Code	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>
Oregon	ODFW	Bonneville	07-37-54	1	1	0
		Oregon Total		1	1	0
Washington	FWS	Drano Lake	B5-01-04	1	1	0
	NMFS	Bonneville	23-20-63	1	1	0
			23-21-30	1	1	0
	WDF	Priest Rapids	63-41-28	1	37	1,357
Washington Total			4	41	1,358	
British Columbia	CDFO	Chilliwack River	02-42-45	1	2	3
		Clayoquot CDP	02-49-22	2	3	1
		Conuma River	02-37-24	1	11	112
			02-43-26	1	55	2,966
			02-55-03	1	5	19
		Fort Babine CDP	02-49-34	1	1	0
		Kitimat River	02-42-18	1	27	709
			02-45-42	1	43	1,818
			02-45-43	2	112	6,183
		Robertson Creek	02-54-02	1	60	3,576
			02-42-56	1	76	5,747
			02-42-57	2	134	9,095
			02-43-11	1	17	283
			02-43-61	1	57	3,227
			02-43-62	1	80	6,394
			02-45-18	2	3	1
			02-46-45	1	2	1
			02-46-47	1	2	1
			02-48-03	1	1	0
			02-48-04	1	2	1
			02-48-09	1	17	283
			02-48-10	1	17	283
			02-49-48	1	2	1
		02-49-49	2	3	2	
		02-49-52	2	45	953	
		02-49-60	3	130	5,702	
		02-49-61	3	146	7,127	
02-53-29	1	31	909			
Terrace CDP	02-33-53	1	2	1		
	02-37-04	1	1	0		
British Columbia Total			40	1,087	55,397	

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Region	Agency <sup>a</sup>	Hatchery Release Site	Tag Code	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>	
Southeast Alaska	ADF&G	Crystal Lake	04-27-31	1	11	120	
			04-27-33	1	13	149	
			04-30-04	3	47	710	
			Deer Mountain	04-27-55	1	1	1
			Hidden Falls	04-28-29	1	2	1
		MIC	Tamgas Creek	47-16-42	1	17	261
		NMFS	Little Port Walter	03-20-28	1	1	0
	03-21-19			1	1	0	
		NSRAA	Medvejie CIF	04-13-21	2	6	13
				04-13-22	1	14	169
				04-28-13	9	50	232
				04-28-14	6	35	175
				04-30-12	2	28	370
		SJ	Sheldon Jackson	04-20-14	1	1	0
				04-27-61	1	1	0
				04-32-21	1	5	19
		SSRAA	Carroll Inlet	04-31-01	1	10	96
				04-31-07	1	10	96
			Neets Bay	04-31-04	2	10	45
			Whitman Lake	04-31-08	2	6	14
Southeast Alaska Total				39	270	2,471	
All Regions Grand Total				84	1,399	59,226	

- <sup>a</sup> ODFW = Oregon Department of Fish and Wildlife.  
 FWS = U.S. Fish and Wildlife Service.  
 NMFS = National Marine Fisheries Service.  
 WDF = Washington Department of Fisheries.  
 CDFO = Canadian Department of Fisheries and Oceans.  
 ADF&G = Alaska Department of Fish and Game.  
 MIC = Metlakatla Indian Community  
 NSRAA = Northern Southeast Regional Aquaculture Association  
 SJ = Sheldon Jackson College  
 SSRAA = Southern Southeast Regional Aquaculture Association
- <sup>b</sup> Recov = Number of fish recovered of noted tag code.  
<sup>c</sup> Contr = Estimated harvest of the release of noted tag code.  
<sup>d</sup> Var. of Contr = Variance of estimated harvest of release of noted tag code.

Appendix A10.

Estimates of hatchery-produced chinook salmon contributed to the Juneau marine sport fishery from 15 April to 29 September 1991.

Region	Agency <sup>b</sup>	Hatchery/ Release Site	Tag Code	4/15-6/23			6/24-8/04			Derby <sup>a</sup>			Non-Derby 8/05-9/29			Total <sup>1</sup>			
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	
Oregon	OAF	Oregon Aqua Foods	60-39-03	---	---	---	---	---	---	---	---	1	4	---	1	4	---		
	ODFW	Dexter Ponds	07-50-28	1	297	89,420	---	---	---	---	---	---	---	---	---	1	297	89,420	
		Willamette	07-50-37	---	---	---	---	---	---	1	1	0	---	---	---	1	1	0	
	Oregon Total				1	297	89,420	---	---	---	1	1	0	1	4	---	3	302	89,421
British Columbia	CDFO	Kincolith CDP	02-48-25	1	28	761	---	---	---	---	---	---	---	---	---	1	28	761	
		Kitimat River	02-51-53	---	---	---	---	---	---	---	1	24	559	---	---	---	1	24	559
			02-54-09	---	---	---	---	1	168	27,977	---	---	---	---	---	---	1	168	27,977
	02-55-29		---	---	---	---	---	---	---	---	---	---	1	414	171,168	1	414	171,168	
	Robertson Creek	02-48-02	1	57	3,252	---	---	---	---	---	---	---	---	---	---	1	57	3,252	
		02-48-10	1	215	46,321	---	---	---	---	---	---	---	---	---	---	1	215	46,321	
		02-56-63	---	---	---	1	4	12	---	---	---	---	---	---	---	1	4	12	
	Snootli Creek	02-47-22	1	12	136	---	---	---	---	---	---	---	---	---	---	1	12	136	
	Tenderfoot Creek	02-53-49	---	---	---	1	90	8,156	---	---	---	---	---	---	---	1	90	8,156	
		02-57-35	---	---	---	---	---	---	---	1	4	15	---	---	---	1	4	15	
		02-57-36	---	---	---	---	---	---	---	1	4	15	---	---	---	1	4	15	
	British Columbia Total				4	312	50,470	3	262	36,146	3	32	589	1	414	171,168	11	1,020	258,373
Southeast	ADF&G	Crystal Lake	04-27-57	---	---	---	1	45	2,006	---	---	---	---	---	---	1	45	2,006	
			04-29-60	3	720	272,625	2	297	56,084	2	36	602	---	---	---	7	1,053	329,312	
			04-30-04	2	189	18,446	1	46	2,031	---	---	---	1	104	10,759	4	338	31,236	
			84-13-12	---	---	---	---	---	---	---	1	1	0	---	---	---	1	1	0
	ADF&G/ NSRA	Hidden Falls	04-17-62	1	6	34	---	---	---	2	3	1	---	---	---	3	9	35	
			04-28-28	2	18	143	---	---	---	---	---	---	---	---	---	2	18	143	
			04-28-29	1	9	67	---	---	---	---	---	---	---	---	---	1	9	67	
			04-28-30	1	9	67	---	---	---	---	---	---	---	1	20	424	2	29	491
			04-28-63	1	5	18	---	---	---	---	---	---	---	---	---	1	5	18	
			04-32-38	---	---	---	---	---	---	---	---	---	---	1	9	78	1	9	78
	ADF&G	Jerry Myers	04-30-11	2	15	98	1	6	31	---	---	---	---	---	---	3	21	129	
			04-22-26	1	138	19,054	---	---	---	---	---	---	---	---	---	1	138	19,054	
			04-26-12	2	60	2,613	1	7	48	---	---	---	---	---	---	3	67	2,661	
			04-27-44	1	5	19	---	---	---	---	---	---	---	---	---	1	5	19	
			04-27-48	1	5	22	---	---	---	---	---	---	---	---	---	1	5	22	
			04-29-61	3	52	1,159	3	55	1,121	2	3	2	1	6	27	9	116	2,310	
			04-29-62	5	47	439	1	10	83	5	9	7	---	---	---	11	65	528	
			04-29-63	---	---	---	---	---	---	1	1	0	---	---	---	1	1	0	
			04-30-01	5	198	12,852	4	78	2,254	4	11	21	---	---	---	13	288	15,128	
			04-30-02	5	34	222	2	40	16	3	3	0	---	---	---	10	77	238	
			04-30-03	4	59	836	1	12	143	3	9	20	---	---	---	8	81	999	
			04-31-58	1	6	26	---	---	---	---	---	---	---	---	---	1	6	26	
	04-31-61	1	8	55	---	---	---	---	---	---	---	1	14	---	2	21	55		
04-31-62	---	---	---	2	52	99	---	---	---	---	---	---	2	52	99				
04-32-01	1	33	1,083	1	14	233	---	---	---	---	1	14	185	3	62	1,501			
04-38-63	---	---	---	---	---	---	1	1	---	---	---	---	---	1	1	---			

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Appendix A10. (Page 2 of 2).

Region	Agency <sup>b</sup>	Hatchery/ Release Site	Tag Code	4/15-6/23			6/24-8/04			Derby <sup>a</sup>			Non-Derby 8/05-9/29			Total			
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	
Southeast Alaska (continued)	AKI	Port Armstrong	04-32-14	---	---	---	1	72	---	1	3	6	---	---	---	2	75	6	
	NMFS	Little Port Walter	03-20-29	2	9	31	---	---	---	---	---	---	---	---	---	---	2	9	31
			03-20-32	1	8	61	---	---	---	---	---	---	---	---	---	---	1	8	61
			03-20-41	---	---	---	---	---	---	---	---	---	---	---	---	---	1	4	10
			03-21-13	1	4	15	---	---	---	---	---	---	---	---	---	---	1	4	15
			03-21-19	2	14	85	---	---	---	---	---	---	---	---	---	---	2	14	85
			03-21-22	---	---	---	---	---	---	1	1	0	---	---	---	---	1	1	0
			03-21-32	---	---	---	1	4	12	1	1	0	---	---	---	---	2	5	12
			03-21-35	---	---	---	1	4	12	1	1	0	1	4	9	---	3	9	22
			03-62-16	---	---	---	1	6	25	1	1	0	---	---	---	---	2	7	25
			03-62-21	1	4	15	2	8	25	1	1	0	---	---	---	---	4	14	40
			03-62-31	1	8	61	---	---	---	---	---	---	---	---	---	---	1	8	61
			03-62-32	1	5	21	3	14	51	2	2	0	2	13	86	8	34	158	
			03-63-14	---	---	---	---	---	---	1	1	0	---	---	---	---	1	1	0
			03-63-16	---	---	---	1	25	595	---	---	---	---	---	---	---	1	25	595
			03-63-17	1	5	21	---	---	---	---	---	---	---	---	---	---	1	5	21
			03-63-23	---	---	---	---	---	---	---	---	---	1	4	9	---	1	4	9
			03-63-28	---	---	---	---	---	---	---	---	1	1	0	---	---	1	1	0
				SSRAA	Carroll Inlet	04-31-07	1	180	32,231	---	---	---	---	---	---	---	---	---	1
	04-31-42	---	---			---	---	---	---	---	---	---	1	28	768	1	28	768	
Southeast Alaska Total				54	1,853	362,420	30	795	64,869	34	89	659	12	220	12,355	130	2,957	440,304	
All Regions Grand Total				59	2,462	502,310	33	1,057	101,015	38	122	1,249	14	638	183,524	144	4,279	788,098	

<sup>a</sup> Derby held on 9-11 August weekend.

<sup>b</sup> OAF = Oregon Aqua Foods, Inc.

ODFW = Oregon Department of Fish and Wildlife.

CDFO = Canadian Department of Fisheries and Oceans.

ADF&G = Alaska Department of Fish and Game.

AKI = Armstrong Keta, Incorporated.

NMFS = National Marine Fisheries Service.

SSRAA = Southern Southeast Regional Aquaculture Association.

<sup>c</sup> Recov = Number of fish recovered of noted tag code.

<sup>d</sup> Contr = Estimated harvest of the release of the noted tag code.

<sup>e</sup> Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix All. Estimates of the number of wild coded wire tagged chinook salmon contributed to the Ketchikan marine sport fishery from 29 April to 29 September 1991.

Region	Agency <sup>b</sup>	Release Site	Tag Code	Non-derby 4/15-6/23			Derby <sup>a</sup>			6/24-8/04			8/05-9/29			Total		
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>
Washington	WDF	Columbia River	63-52-32	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
Southeast Alaska	ADF&G	Chickamin River	04-29-38	---	---	---	1	4	11	1	6	29	---	---	---	2	10	40
Total				---	---	---	2	5	11	1	6	29	---	---	---	3	11	40

<sup>a</sup> Derby held on weekends of 25-27 May, 1-2 June, and 8-9 June.

<sup>b</sup> WDF = Washington Department of Fisheries.

ADF&G = Alaska Department of Fish and Game.

<sup>c</sup> Recov = Number of fish sampled of noted tag code.

<sup>d</sup> Contr = Estimated number of recoveries of the noted tag code, not corrected for tagging fraction.

<sup>e</sup> Var. of Contr = Variance of estimated recoveries of the release of the noted tag code, not corrected for tagging fraction.

Appendix A12. Age composition of chinook salmon from selected Southeast Alaska sport fisheries, 1991.

Sport Fishery	Brood Year													Sample Size
	1988		1987		1986		1985			1984		1983		
	0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	0.6	1.5	1.6		
Ketchikan	Males	n	2		34	25	15	83		19		2		180
		Percent	1.1		18.9	13.9	8.3	46.1		10.6		1.1		
		SE <sup>a</sup>	0.8		2.9	2.6	2.1	3.7		2.3		0.8		
	Females	n	1		34	11	30	92		30		1	2	201
		Percent	0.5		16.9	5.5	14.9	45.8		14.9		0.5	1.0	
		SE <sup>a</sup>	0.5		2.7	1.6	2.5	3.5		2.5		0.5	0.7	
	Total <sup>b</sup>	n	22	1	199	111	112	413	6	116		1	7	988
		Percent	2.2	0.1	20.1	11.2	11.3	41.8	0.6	11.7		0.1	0.7	
		SE <sup>a</sup>	0.5	0.1	1.3	1.0	1.0	1.6	0.2	1.0		0.1	0.3	
Petersburg Derby	Males	n			4	3	1	18	1	6		2	1	36
		Percent			11.1	8.3	2.8	50.0	2.8	16.7		5.6	2.8	
		SE <sup>a</sup>			5.3	4.7	2.8	8.5	2.8	6.3		3.9	2.8	
	Females	n			4	1	2	20	1	16				44
		Percent			9.1	2.3	4.5	45.5	2.3	36.4				
		SE <sup>a</sup>			4.4	2.3	3.2	7.6	2.3	7.3				
	Total <sup>b</sup>	n			14	6	7	54	2	36		5	1	125
		Percent			11.2	4.8	5.6	43.2	1.6	28.8		4.0	0.8	
		S.E.			2.8	1.9	2.1	4.4	1.1	4.1		1.8	0.8	
Wrangell Derby	Males	n		1	1		10		4		3		19	
		Percent			5.3	5.3		52.6		21.1		15.8		
		SE <sup>a</sup>			5.3	5.3		11.8		9.6		8.6		
	Females	n					1	11		8		1		21
		Percent					4.8	52.4		38.1		4.8		
		SE <sup>a</sup>					4.8	11.2		10.9		4.8		
	Total <sup>b</sup>	n			5	2	5	61		43		9		125
		Percent			4.0	1.6	4.0	48.8		34.4		7.2		
		SE <sup>a</sup>			1.8	1.1	1.8	4.5		4.3		2.3		

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Sport Fishery	Brood Year													Sample Size	
			1988		1987		1986		1985			1984			1983
			0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	0.6	1.5		1.6
Sitka Derby	Males	n	1		34	5	37	26	6	16			1		126
		Percent	0.8		27.0	4.0	29.4	20.6	4.8	12.7			0.8		
		SE <sup>a</sup>	0.8		4.0	1.7	4.1	3.6	1.9	3.0			0.8		
	Females	n			58		68	32	2	25				3	188
		Percent			30.9		36.2	17.0	1.1	13.3				1.6	
		SE <sup>a</sup>			3.4		3.5	2.7	0.8	2.5				0.9	
	Total <sup>b</sup>	n	1		93	5	106	58	8	41				4	316
		Percent	0.3		29.4	1.6	33.5	18.4	2.5	13.0				1.3	
		SE <sup>a</sup>	0.3		2.6	0.7	2.7	2.2	0.9	1.9				0.6	
Juneau	Males	n			3	3	4	28		36			2	76	
		Percent			3.9	3.9	5.3	36.8		47.4			2.6		
		SE <sup>a</sup>			2.2	2.2	2.6	5.6		5.8			1.8		
	Females	n	1		2		1	36		33				6	79
		Percent	1.3		2.5		1.3	45.6		41.8				7.6	
		SE <sup>a</sup>	1.3		1.8		1.3	5.6		5.6				3.0	
	Total <sup>b</sup>	n	5		37	54	11	181		127	1			12	428
		Percent	1.2		8.6	12.6	2.6	42.3		29.7	0.2			2.8	
		SE <sup>a</sup>	0.5		1.4	1.6	0.8	2.4		2.2	0.2			0.8	
Juneau Derby	Males	n			2	13	1	12						28	
		Percent			7.1	46.4	3.6	42.9							
		SE <sup>a</sup>			5.0	9.6	3.6	9.5							
	Females	n	1		2	9		17						29	
		Percent	3.4		6.9	31.0		58.6							
		SE <sup>a</sup>	3.4		4.8	8.7		9.3							
	Total <sup>b</sup>	n	4		9	58	1	48						120	
		Percent	3.3		7.5	48.3	0.8	40.0							
		SE <sup>a</sup>	1.6		2.4	4.6	0.8	4.5							

<sup>a</sup> Standard error in percent.

<sup>b</sup> Includes sexed and unsexed chinook salmon.

Appendix A13. Length at age in millimeters (from tip of snout to fork-of-tail), by sex, for chinook salmon from select Southeast Alaska sport fisheries, 1991.

Sport Fishery			Brood Year										Sample Size		
			1988		1987		1986		1985			1984		1983	
			0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	0.6		1.5	1.6
Ketchikan	Males	Mean	685		833	744	949	913		1,007			1,109		
		SE	25		10	13	26	8		22			98		
		n	2		34	25	15	83		19			2	180	
	Females	Mean	686		813	752	958	887		966		718	1,007		
		SE			10	17	15	7		12			18		
		n	1		34	11	30	92		30		1	2	201	
	Total <sup>a</sup>	Mean	711	545	822	734	955	887	977	978		718	1,025		
		SE	7		5	6	7	3	42	6			39		
		n	22	1	197	111	111	412	6	116		1	7	984	
Petersburg Derby	Males	Mean			716	693	1,045	825	1,040	968		1,057	1,065		
		SE			12	14		17		18		18			
		n			4	3	1	18	1	6		2	1	36	
	Females	Mean			762	725	905	804	1,075	901					
		SE			15		35	13		10					
		n			4	1	2	20	1	16				44	
	Total <sup>a</sup>	Mean			747	701	901	815	1,057	914		976	1,065		
		SE			8	9	32	9	18	10		39			
		n			14	6	7	54	2	36		5	1	125	
Wrangell Derby	Males	Mean			890	720		882	1,047		1,188				
		SE						20	37		24				
		n			1	1		10		4		3		19	
	Females	Mean					995	897		934		1,085			
		SE						17		21					
		n					1	11		8		1		21	
	Total <sup>a</sup>	Mean			846	777	1,045	886		994		1,141			
		SE			25	57	31	9		13		25			
		n			5	2	5	61		43		9		125	

-continued-

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Sport Fishery	Brood Year												Sample Size
	1988		1987		1986		1985			1984		1983	
	0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	0.6	1.5	1.6	
Sitka Derby	Males	Mean	695		801	709	964	881	1,022	992		1,170	
		SE			7	13	13	12	26	25			
		n	1		34	5	37	26	6	16		1	
	Females	Mean			810		916	888	1,060	956		947	
		SE			6		6	8	20	11		53	
		n			58		68	32	2	25		3	
Total <sup>a</sup>	Mean	695		806	709	932	885	1,032	970		1,002		
	SE			5	13	6	7	20	12		67		
	n	1		93	5	106	58	8	41		4		
Juneau	Males	Mean			747	748	925	795		966		1,000	
		SE			2	8	36	14		12		10	
		n			3	3	4	28		36		2	
	Females	Mean	780		747		945	791		916		927	
		SE			37			10		13		30	
		n	1		2		1	36		33		6	
Total <sup>a</sup>	Mean	698		775	689	920	782		943	710	957		
	SE	33		11	9	15	5		7		25		
	n	5		37	54	11	179		127	1	12		
Juneau Derby	Males	Mean			805	723	940	777					
		SE			45	12		22					
		n			2	13	1	12					
	Females	Mean	705		700	748		786					
		SE			20	10		11					
		n	1		2	9		17					
Total <sup>a</sup>	Mean	709		745	729	940	777						
	SE	18		18	5		8						
	n	4		9	58	1	48						

<sup>a</sup> Includes sexed and unsexed chinook salmon.

Appendix A14. Numbers of coho salmon examined for coded wire tags in the Ketchikan and Juneau marine sport fisheries in 1991.

Fishery	Seasonal period	Coho salmon		
		Estimated harvest	Number sampled	Percent
Ketchikan	4/29-8/04	7,689	558	7%
	8/05-9/29	36,100	3,743	10%
	Total	43,789	4,301	10%
Juneau	4/29-8/04	3,794	517	14%
	Non-derby 8/05-9/29	14,925	2,756	18%
	Derby Entered <sup>a</sup>	2,055	1,976	96%
	Derby Take-Home <sup>a</sup>	512	120	23%
	Total	21,286 <sup>b</sup>	5,369	25%
Grand Total		65,075	9,670	15%

<sup>a</sup> Derby held on weekend 9-11 August 1991.

<sup>b</sup> Juneau total does not include 1,111 coho salmon caught at lodges which were not sampled for coded wire tags.

Appendix A15. Estimates of hatchery-produced coho salmon contributed to the Ketchikan marine sport fishery from 29 April to 29 September 1991.

Region	Agency <sup>a</sup>	Hatchery/ Release Site	Tag Code	4/29-8/04			8/05-9/29			Total			
				Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>	Recov <sup>b</sup>	Contr <sup>c</sup>	Var. of Contr <sup>d</sup>	
British Columbia	CDFO	Fort Babine	02-61-12	1	9	72	---	---	---	1	9	72	
		Kitimat River	02-01-39	1	20	364	---	---	---	1	20	364	
		Snootli Creek	02-60-03	---	---	---	1	404	166,855	1	404	166,855	
		Toboggan Creek	02-61-07	1	9	73	---	---	---	1	9	73	
		British Columbia Total			3	38	510	1	404	166,855	4	442	167,364
Southeast Alaska	AAI	Burnett Inlet	04-34-42	---	---	---	1	63	3,897	1	63	3,897	
		ADF&G	Deer Mountain	04-33-25	3	24	180	1	7	42	4	31	223
			04-33-26	6	140	6,643	1	25	684	7	165	7,327	
			04-33-27	5	280	28,493	1	10	94	6	290	28,586	
			04-33-28	5	338	49,445	---	---	---	5	338	49,445	
			04-33-29	5	247	24,833	1	72	6,046	6	319	30,879	
			04-33-30	2	47	1,498	---	---	---	2	47	1,498	
			04-33-32	11	711	104,435	---	---	---	11	711	104,435	
			Klawock	04-33-16	1	1,426	2,035,134	---	---	---	1	1,426	2,035,134
	MIC SSRAA		Tangas Creek	47-16-12	1	96	9,038	11	943	122,184	12	1,038	131,222
			Earl West Cove	04-32-61	---	---	---	1	140	19,391	1	140	19,391
		04-32-62		---	---	---	1	274	76,032	1	274	76,032	
		Nakat Inlet	04-32-59	---	---	---	1	34	1,121	1	34	1,121	
			04-32-60	---	---	---	4	279	27,320	4	279	27,320	
		Neets Bay	04-32-56	---	---	---	5	2,095	1,159,141	5	2,095	1,159,141	
			04-32-63	---	---	---	11	5,376	3,881,784	11	5,376	3,881,784	
			04-33-01	---	---	---	2	850	460,662	2	850	460,662	
	Whitman Lake	04-33-07	---	---	---	5	3,405	4,373,785	5	3,405	4,373,785		
		04-32-57	---	---	---	4	597	161,025	4	597	161,025		
		04-32-58	---	---	---	6	707	113,449	6	707	113,449		
Southeast Alaska Total			39	3,307	2,259,699	56	14,877	10,406,658	95	18,185	12,666,357		
Total				42	3,344	2,260,208	57	15,282	10,573,513	99	18,627	12,833,722	

<sup>a</sup> CDFO = Canadian Department of Fisheries and Oceans.

AAI = Adult Anadromous Inc.

ADF&G = Alaska Department of Fish and Game.

MIC = Metlakatla Indian Community.

SSRAA = Southern Southeast Regional Aquaculture Association.

<sup>b</sup> Recov = Number of fish recovered of noted tag code.

<sup>c</sup> Contr = Estimated harvest of the release of the noted tag code.

<sup>d</sup> Var. of Contr = Variance of estimated harvest of the release of the noted tag code.



Appendix A17. Estimates of the number of wild coded wire tagged coho salmon contributed to the Ketchikan and Juneau marine sport fisheries from 15 April to 29 September 1991.

Sport Fishery	Agency <sup>b</sup>	Release Site	Tag Code	Non-derby 4/15-9/29			Derby <sup>a</sup>			Total		
				Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>	Recov <sup>c</sup>	Contr <sup>d</sup>	Var. of Contr <sup>e</sup>
Ketchikan	ADF&G	Hugh Smith Lake	04-27-20	2	18	187	---	---	---	2	18	187
Juneau	CDFO	Taku River	02-56-23	1	6	29	---	---	---	1	6	29
			02-56-28	1	4	13	---	---	---	1	4	13
		Tatsamenie Lake	02-50-48	1	4	13	1	1	0	2	5	13
	ADF&G	Auke Lake	04-28-40	1	4	12	---	---	---	1	4	12
		Berners River	04-26-62	---	---	---	2	2	0	2	2	0
04-29-31	1		19	346	---	---	---	1	19	346		
Grand Total				7	55	600	3	3	0	10	58	600

<sup>a</sup> Derby held on 9-11 August weekend in Juneau.

<sup>b</sup> ADF&G = Alaska Department of Fish and Game.

CDFO = Canadian Department of Fisheries and Oceans.

<sup>c</sup> Recov = Number of fish sampled of noted tag code.

<sup>d</sup> Contr = Estimated number of recoveries of the noted tag code, not corrected for tagging fraction.

<sup>e</sup> Var. of Contr = Variance of estimated recoveries of the release of the noted tag code, not corrected for tagging fraction.