Fishery Data Series No. 91-48

Harvest Estimates for Selected Marine Boat Sport Fisheries in Southeast Alaska During 1990

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[1] This investigation was financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-6, Job Nos. S-1-1 and S-1-2.

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ABSTRACT

Creel surveys of the Juneau and Ketchikan marine boat sport fisheries in Southeast Alaska were conducted during 1990. Dockside interviews of boat parties completing trips were used to estimate 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 harvest and hatchery contributions to the spring Haines marine boat fishery were also evaluated. The hatchery composition of chinook salmon in the Sitka derby was also estimated. Scale samples and lengths were taken from chinook salmon caught by marine recreational anglers for age and size composition 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 17,204 (SE = 1,165) chinook salmon, 60,004 (SE = 3,693) coho salmon, 23,918 (SE = 2,002) pink salmon *Oncorhynchus gorbuscha*, 19,193 (SE = 1,350) Pacific halibut, and 11,028 (SE = 1,018) rockfish were harvested in the Juneau and Ketchikan boat fisheries. An additional 266 (SE = 58) chinook salmon were harvested in the Haines marine fishery which was closed by emergency order on 22 June. Harvests of chinook salmon were above long-term averages in Juneau and Ketchikan, but in Haines the chinook salmon harvest was only 25% of the 1984-1989 average. Hatcheries produced about 47% of the monitored chinook salmon harvest, with Southeast Alaska hatcheries contributing 34% of this total harvest. The largest numbers of hatchery chinook salmon were taken in Ketchikan where an estimated 61% of the harvest was of hatchery origin. In both Juneau and Ketchikan, the harvest of coho salmon was the highest on record. Hatcheries produced 28% and 2% of the coho salmon harvest in Ketchikan and Juneau. Pacific halibut harvests were below long-term averages in both Juneau and Ketchikan. Total rockfish harvest in Ketchikan was also below average. Crab harvest in the Juneau and Ketchikan fisheries totaled 9,656 Dungeness crab *Cancer magister*, 1,883 Tanner crab *Chionoecetes* species, and 1,960 king crab *Paralithodes* species.

KEY WORDS: Creel survey, angler effort and harvest, harvest-per-unit-effort, HPUE, 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 gorbuscha*, Pacific halibut, *Hippoglossus stenolepis*, Dolly Varden, *Salvelinus malma*, rockfish, *Sebastes*, Juneau, Ketchikan, Haines, Sitka, 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*. In-season and post-season 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 their consideration of proposed modifications to sport fishing regulations.

Sport fishing regulations during 1990 were identical to those presented in Suchanek and Bingham (1990a). Terminal harvest areas near Juneau and Ketchikan were again opened by emergency order on 1 June 1990 to provide for increased harvests of hatchery chinook salmon by allowing harvests of chinook salmon of any size within these areas. The bag limit within these terminal areas was 2 chinook salmon less than 28 inches (71 cm) in length and 2 chinook salmon 28 inches or more 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 size limit.

General bag limits for salmon species other than chinook salmon remained at 6 fish per day, 12 in possession for fish 16 inches (41 cm) or more 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 of which (4 in possession) could be yelloweye rockfish. An area adjacent to Ketchikan was further restricted to a rockfish *Sebastes* spp. bag and possession limit of 3 fish per day, only 1 of which could be a yelloweye rockfish *S. ruberrimus*. The sport, personal use, and subsistence regulations for the harvest of crab in Southeast Alaska have been summarized by Suchanek and Bingham (1989 and 1990a).

In the Haines area, additional special regulations designed to limit the sport harvest of chinook salmon bound for the Chilkat River were placed into effect. Chilkat Inlet, north of a line extending from Anchorage Point to a department marker directly north of the Letnikof Cove boat ramp, was closed to fishing for chinook salmon from 15 April to 31 July. The seasonal bag limit was 2 chinook salmon per angler from 15 April to 31 July in all salt waters south of the latitude of Taiya Point and north of the latitude of the northern tip of Sullivan Island. Upon catching a chinook salmon within this area, anglers were required to record the date and location of their catch on a Haines Area Chinook Salmon Harvest Record.

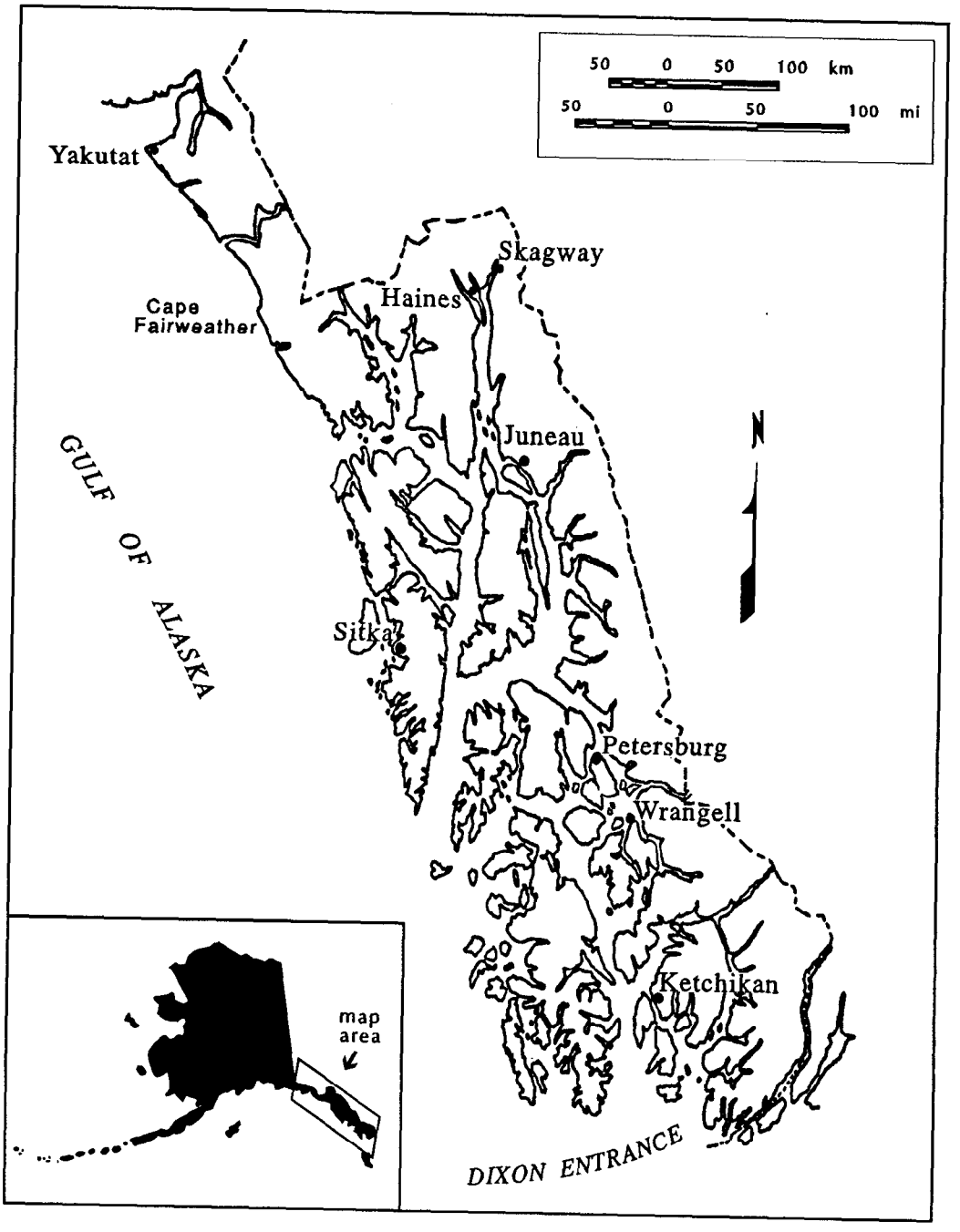

Figure 1. Location of Juneau, Ketchikan, and Haines, in relationship to other major communities in Southeast Alaska.

This report presents the findings of harvest surveys of marine boat recreational fisheries conducted in 1990 by the Division of Sport Fish of the Alaska Department of Fish and Game (ADFG) in the Ketchikan, Juneau, and Haines areas. Results from harvest surveys associated with a variety of roadside marine and freshwater sport fisheries in Southeast Alaska are presented in other reports. Results from sampling of chinook salmon entered in the 1990 Sitka Salmon Derby are also presented in this report.

OBJECTIVES

The specific objectives for the 1990 marine boat sport fishery surveys were:

1. To estimate the total sport angler effort, catch, and harvest of Pacific salmon, Pacific halibut, rockfish, Dolly Varden *Salvelinus malma*, and lingcod *Ophiodon elongatus* in the Juneau marine boat fishery during 23 April to 23 September 1990 and in the Ketchikan marine boat fishery during 7 May to 23 September 1990.

2. To estimate the total sport angler effort for, catch, and harvest of chinook salmon in the Haines marine boat fishery during the period from 23 April to 21 June 1990.

3. To estimate the contribution of hatchery chinook salmon by coded-wire tag lot to the Juneau, Ketchikan, and Haines sport fisheries for the time periods listed in Objectives 1 and 2.

4. To estimate the contribution of hatchery coho salmon by coded-wire tag lot to the Juneau and Ketchikan sport fisheries for the time periods listed in Objective 1.

5. To estimate biweekly harvest-per-unit-effort (HPUE) for coho salmon for the Juneau and Ketchikan fisheries for the time periods listed in Objective 1.

6. To estimate the age composition and mean length-at-age of the chinook salmon harvest for the Juneau, Ketchikan, and Haines fisheries for the time periods listed in Objectives 1 and 2.

7. To estimate the total round weight of Pacific halibut harvested for the Juneau and Ketchikan fisheries for the time periods listed in Objective 1.

8. To estimate the major species composition of the rockfish harvest in the Ketchikan marine fishery from 7 May to 23 September 1990.

METHODS

Study Design

Three separate creel surveys of marine boat sport fisheries were conducted in Southeast Alaska during 1990. Site descriptions and maps of the Juneau, Ketchikan, and Haines fisheries can be found in Bingham et al. (1988).

The primary sampling design used for the marine boat surveys was a modified 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). In the Juneau and Ketchikan fisheries, at least 90% of the fishery harvest and effort was thought to be produced by anglers using the access locations during the time periods covered.

During the surveys, interviews of boat parties provided effort, harvest, and HPUE information. Effort and harvest information was recorded only for boat parties and 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 and harvest 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 11 seasonal time periods, each of two weeks in length, starting on 23 April and ending on 23 September. Additionally, the Juneau Golden North Salmon Derby on 3-5 August was treated as an additional stratum.

Within each biweek, there was a maximum of four sampling strata. These strata included early-weekdays, early weekend/holidays, late-weekdays, and late-weekend/holidays. Prior to June 18, early-weekend/holiday strata included all Saturdays and Sundays and the date of 28 May. Beginning on 18 June, the two early day strata were combined so that there was no weekday or weekend/holiday stratification. This change in stratification structure 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 late-weekend/holiday strata included Fridays, Saturdays, Sundays, and the dates of 28 May, 4 July, and 3 September.

The fishing day within a given biweek was defined to begin at 0700 and end at the cessation of civil twilight rounded to the nearest one-half hour. The early strata encompassed the hours within each fishing day from 0700 to a period midway to the cessation of civil twilight while the late strata was composed of the rest of the fishing day.

Within each of the sampling strata, there was a three-stage sampling allocation. The primary stage was days sampled, the secondary stage was access locations sampled, and the third stage was boat parties interviewed. Within the primary stage, days were sampled with equal probability while in the secondary stage, access locations were sampled with unequal probabilities based on the estimated

number of boat parties expected to use the access location. Almost all boat parties were interviewed, and boat parties not interviewed were counted.

There were 11 important access locations into the Juneau marine boat fishery that were sampled in 1990 (Table 1). During the late strata, Aurora Harbor was split into two parts so that boats would not be missed being counted during sampling. Additionally, during the early stratum, the Auke Bay Launch and DeHart's Marina access points were combined into one access point (Auke Bay Docks) as both could be sampled at the same time. For the late strata, large numbers of returning boats makes this combination difficult to sample, so Auke Bay Launch and DeHart's Marina and the two portions of Aurora Harbor were sampled independently at these times.

In order to more efficiently sample the access locations, information from the 1989 creel surveys was used to rank the locations by the number of boats exiting the fishery per hour. Sampling probabilities were then assigned based on these averages (Table 1). Since the regulation change modifying the Taku Inlet spring closure for chinook salmon had such a large impact in 1989 on the distribution of effort, the probabilities were assigned differently for the period through 17 June, compared to the rest of the season.

Scheduling. It would have been ideal to balance the design by sampling two or three harbors within each day selected for sampling. Manpower, administrative, and scheduling constraints dictated that this was an impossible goal. At least two harbors were sampled within at least one of the sampling days within each stratum so that within day between harbor variation could be estimated.

The sampling schedule was generated for the early season (through 17 June) by first randomly selecting one day in the early-weekday stratum for sampling in two harbors and then three more days in this stratum for sampling in one harbor. Next two days were randomly selected in the late-weekday stratum for sampling in two harbors and then two more days were selected in this stratum for sampling in one harbor. Next one day was randomly selected in the early-weekend/holiday stratum for sampling in two harbors and then two more days were selected in this stratum for sampling in one harbor. Next, all remaining available sampling days were assigned to the late-weekend/holiday stratum. Finally, harbors to be sampled for both the early and the late strata were then assigned (with replacement) from a random listing of harbors selected with the probabilities from Table 1.

The 27 samples in each biweek for the time period 23 April to 17 June were thus allocated:

	Percentage of boat parties	No. of days sampled	Total no. of samples	Percentage of sampling effort
Early day				
Weekdays	11%	3-4	5	19%
Weekend/holidays	18%	3	4	15%
Late day				
Weekdays	17%	4	6	22%
Weekend/holidays	54%	6	12	44%

Table 1. Access locations and assigned sampling probabilities for the Juneau marine fishery during 1990.

Access location	Sampling probabilities			
	23 April to 17 June		18 June to 23 Sept	
	Early[a]	Late[a]	Early	Late
Auke Bay docks	0.25		0.30	
Auke Bay launch		0.15		0.21
Dehart's Marina		0.07		0.08
Tee Harbor	0.12	0.10	0.20	0.12
Douglas Harbor	0.18	0.20	0.15	0.05
Fisherman's Bend	0.14	0.10	0.08	0.10
Aurora Harbor	0.05		0.04	
Aurora Harbor 1		0.02		0.02
Aurora Harbor 2		0.03		0.03
Harris Harbor	0.05	0.05	0.03	0.02
Amalga Harbor	0.05	0.10	0.04	0.12
North Douglas launch	0.03	0.05	0.03	0.08
Auke Bay government dock	0.10	0.10	0.10	0.14
Tee Harbor launch	0.03	0.03	0.03	0.03
Total	1.00	1.00	1.00	1.00

[a] Refers to early day or late day stratum.

During the biweek with Memorial Day, the sampling allocation was modified somewhat so that all 7 weekend/holidays were sampled.

The sampling schedule was generated for the late season (18 June through 23 September) by first randomly selecting one day in the early stratum for sampling in two harbors and then two more days for sampling in one harbor. Next, all late-weekend/holiday days were sampled in at least 2 harbors unless precluded by the early stratum selections. Next, at least 4 days in the late-weekday stratum were sampled with at least one day with 2 harbors sampled. From 13 August on, there were a total of 30 samples per biweek instead of 27. Harbors were then assigned for sampling as for the early season.

The 27 samples (slightly different with 30 samples per biweek) in each biweek for the time period 19 June to 23 September were thus allocated (with some variation from biweek to biweek):

	Percentage of boat parties	No. of days sampled	Total no. of samples	Percentage of sampling effort
Early day	15%	3	4	15%
Late day				
Weekdays	31%	6-7	9	33%
Weekend/holidays	54%	6	14	52%

The Juneau Golden North Salmon Derby was sampled in three access locations each day. These access locations were sampled by selecting harbors with probabilities based on the estimated number of boats, using the given access location. These probabilities were: Auke Bay launch - 0.09, Tee Harbor - 0.11, Douglas Harbor - 0.05, Fisherman's Bend - 0.12, DeHart's Marina - 0.06, Aurora 1 - 0.04, Aurora 2 - 0.08, Harris - 0.03, Amalga - 0.09, North Douglas launch - 0.09, Auke Bay government dock - 0.18, and Tee Boat launch - 0.06. Harbors were selected (without replacement) from this probability distribution. Shifts of 8.0 hours duration were worked beginning 6 hours before derby entry docks closed and ending 2 hours after closure. Only fishing effort expended during each individual sampling day was recorded.

In addition to these surveys, the managers of two sport fishing lodges on Shelter Island and one near Amalga Harbor (Eagle Valley Lodge) 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. Both Eagle Valley and 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.

Ketchikan Marine Boat Fishery:

Harvest estimates were made for 10 seasonal time periods, each of two weeks in length, starting on 7 May and ending on 23 September. Additionally, the Ketchikan King Salmon Derby held on 26-28 May, 2-3 June, and 9-10 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 the cessation of civil twilight varied from that in Juneau, since Ketchikan is 3 degrees of latitude further south and 3 degrees of longitude further east.

Nine important access locations into the Ketchikan marine boat fishery were sampled (Table 2). Although Bar Harbor is a single very large harbor, it was split into three access locations for sampling purposes. A three-stage sampling allocation was also used in the Ketchikan fishery and access locations were sampled with unequal probabilities based on the estimated number of boat parties expected to use the access location. As in the Juneau fishery, information from the 1989 creel surveys was used to rank the access locations by the number of boats exiting the fishery per hour for both the early and late strata. Sampling probabilities were then assigned based on these averages (Table 2).

Scheduling. The sampling schedule was generated by sampling two harbors in each day selected for sampling. First, two days in the early stratum were randomly selected, then three days in the late-weekday stratum, and finally four or five days were randomly selected in the late-weekend/holiday stratum. Harbors to be sampled for both the early and the late strata were then assigned (with replacement) by reading them from a random listing of harbors selected with the probabilities given in Table 2.

The 27 to 30 samples in each biweek were thus allocated:

	Percentage of boat parties	No. of days sampled	Total no. of samples	Percentage of sampling effort
Early day	16%	2	4	22%
Late day				
Weekdays	40%	3	6	33%
Weekend/holidays	44%	4	8	44%

During the Ketchikan King Salmon Derby, two access locations were sampled on all 7 days of the derby. Access locations were selected for sampling (without replacement) from the probability distributions for the late strata. Shifts of 7.0 hours duration were worked beginning 5 hours before derby entry docks closed and ending 2 hours after closure. Only fishing effort expended during each individual sampling day was recorded.

Haines Marine Fishery:

A modification to the basic sampling stratification used in the other fisheries was made to allow for weekly estimates of chinook salmon harvests, as the Haines fishery was managed on a quota harvest of 500 mature chinook salmon. Harvest estimates were made beginning on 23 April for weekly periods beginning on Mondays and ending on Sundays. Within each weekly period, there were two strata: weekdays and weekend-holidays. The weekend-holiday strata included all Saturdays and Sundays, and the dates of 21 May (Victoria Day), 28 May, and 4 July, with all other days classified as weekdays. Due to conservation concerns for chinook salmon, there was no Haines King Salmon Derby during 1990.

Table 2. Access locations and assigned sampling probabilities for the Ketchikan marine fishery during 1990.

Access location	Sampling probabilities	
	Early[a]	Late[a]
Bar Harbor		
Section 1	0.05	0.12
Section 2	0.05	0.11
Section 3	0.02	0.05
Clover Pass	0.32	0.20
Knudsen Cove	0.32	0.23
Thomas Basin	0.02	0.03
Mountain Point	0.07	0.10
Salmon Falls	0.08	0.12
Hole in the Wall	0.07	0.04
Total	1.00	1.00

[a] Refers to early day or late day stratum.

During each week, each fishing day was defined as starting at 0700 and ending on the nearest one-half hour increment to the end of civil twilight or 2300, whichever is earlier. The day was then evenly subdivided into 2 sampling periods (early and late).

The most important access point into the Haines marine sport fishery is the Letnicof Cove harbor and boat launch. Other access points into the fishery include the Chilkat State Park boat launch and the Haines small boat harbor. Data from the 1988 and 1989 creel surveys indicated that about 85% of the effort and harvest originated from the Letnicof access point. Since man-power was limited, the Letnicof Cove access location was the only one of the three locations surveyed during 1990. Estimates from this sampling were expanded by a ratio approach based on the 1988 and 1989 sampling.

As for the other fisheries a three stage sampling design was used, although here days were the first stage, periods within days the second stage, and boat parties the third stage. Samples were allocated in each week by selecting all weekend-holidays for sampling along with two weekdays. One of the two sampling periods within a selected day was then randomly selected for sampling with equal probability. For each of the first four weeks of sampling, one of the randomly selected weekday sample days was selected for sampling of the entire day. This allowed some comparison of within-day sampling variation to between-day sampling variation for the weekday strata. Since usually only one period in each day (second stage units) was sampled because of limited resources, a potentially important source of variation in the estimate could not be estimated.

Data Collection

The following information was collected for each boat party interviewed:

1. The number of rods fished;

2. the number of hours fished for the targets of either salmon, Pacific halibut, rockfish, or lingcod (effort was 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, Tanner, or king crab harvested (numbers of crab released were not recorded);

6. the 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 ≥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 yellowtail rockfish *S. flavidus*. If the rockfish harvested were not any of the above species, they were recorded in an "other rockfish" category.

Harvested chinook and coho salmon were also checked for missing adipose fins during the Juneau, Ketchikan, and Haines surveys. Additionally 717 chinook salmon entered in the Sitka Salmon Derby were checked for missing adipose fins by personnel from the Northern Southeast Region Aquaculture Association.

Chinook salmon taken by Juneau, Ketchikan, and Haines anglers were also measured to the nearest 5 mm in fork length, and scale samples were taken from the preferred area above the lateral line (INPFC 1963). Similarly, total length of harvested Pacific halibut was measured to the nearest 5 mm.

Harvest Estimate Data Analysis

Since study designs varied for fisheries and/or time periods within fisheries, several different data analysis procedures were used. These procedures are detailed by fishery or time period in the following sections.

Juneau and Ketchikan Marine Non-Derby Fisheries:

The following equations were used for estimation of harvest and effort for the creel surveys conducted during the non-derby periods of the Juneau and Ketchikan fisheries. First, the mean angler effort in angler-hours 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} is the angler-effort expended by interviewed boat party k at access location j during sampled day i within stratum h; and m_{hij} equals the number of interviewed boat parties during each sample.

Then the mean was expanded by the total counted boat parties to obtain the angler effort estimate for each sample:

$$\hat{E}_{hij} = M_{hij}\,\bar{e}_{hij} \quad (2)$$

where M_{hij} equals the number of boat parties counted within each sample.

Next, the samples were weighted by sampling probabilities for the access location (see Cochran 1977, equation 11.31, page 306):

$$\hat{E}'_{hij} = \frac{\hat{E}_{hij}}{z_{hij}} \quad (3)$$

where z_{hij} is the sampling probability of access location j during day i within stratum h.

Next, the estimated daily total angler effort was obtained by averaging these weighted totals (again see Cochran 1977, equation 11.31, page 306):

$$\hat{E}'_{hi} = \frac{\sum_{j=1}^{n_{hi}} \hat{E}'_{hij}}{n_{hi}} \tag{4}$$

where n_{hi} equals the number of access locations sampled each day.

Next, the mean angler effort exiting the fishery within each stratum was estimated:

$$\bar{\hat{E}}_h = \frac{\sum_{j=1}^{d_h} \hat{E}'_{hi}}{d_h} \tag{5}$$

where d_h is the number of days sampled within stratum h.

Finally, the stratum angler effort was estimated by expanding for the total number of days within each stratum:

$$\hat{E}_h = D_h \bar{\hat{E}}_h \tag{6}$$

where D_h equals the total number of days in stratum h.

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. Similarly, estimates of angler effort in boat-hours, targeted salmon-hours, targeted halibut-hours, and boat-days were obtained by substituting in place of angler-hours in the above equations.

The variances of the stratum estimates of angler effort were obtained using the following equation appropriate for probability proportional to estimated size sampling of the second-stage units (adapted from Cochran 1977, equation 11.35, page 307):

$$\hat{V}[\hat{E}_h] = (1 - f_{1h})\, D_h^2 \frac{S_{e1h}^2}{d_h} + f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} \left\{ \frac{S_{e2hi}^{2'}}{n_{hi}} \right\} \tag{7}$$

where f_{1h} is the sampling fraction for days (i.e., $f_{1h} = d_h / D_h$) and S_{e1h}^2 equals the among-day variance component for the angler effort estimate, which was obtained as follows:

$$S_{e1h}^2 = \frac{\sum_{i=1}^{d_h} \left(\hat{E}'_{hi} - \bar{\hat{E}}_h \right)^2}{d_h - 1} \tag{8}$$

and $S_{e2hi}^{2'}$ equals the among access location (within-day) variance component for the angler effort estimate, obtained as follows, for sampling with probability proportional to estimated size:

$$S^{2'}_{e2hi} = \frac{\sum_{j=1}^{n_{hi}} (\hat{E}'_{hij} - \hat{E}'_{hi})^2}{n_{hi} - 1} \qquad (9)$$

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 (9) above.

Estimates of angler effort (in terms of boat-hours, angler-hours, and targeted angler-hours), harvest, and total catch by species across all strata or select combinations of strata were obtained by summing the corresponding stratum estimates. Variances were obtained similarly by summing the corresponding variance components (assuming independence). Standard errors were obtained by taking the square root of the variance estimates.

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 the following procedures. These procedures use a two-stage ratio estimation approach, involving the combination of information from the known numbers of entered salmon and the effort, catch, and harvest 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. Different access locations sampled were treated as first stage sampling units while the interviewed boat parties were treated as second stage sampling units.

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

$$R^*_{ijk} = \frac{\sum_{\substack{q=1 \\ q \neq k}}^{m_{ij}} e_{ijq}}{\sum_{\substack{q=1 \\ q \neq k}}^{m_{ij}} s_{ijq}} \qquad (10)$$

where R^*_{ijk} is the jackknifed ratio estimate for boat party k at sampled access location j during day i of the derby; e_{ijq} and s_{ijq} equal the angler effort and number of salmon entered, respectively, reported by interviewed boat party q; and m_{ij} equals the number of boat parties interviewed in each sample.

The jackknife mean ratio for each sampled access location during each day was then obtained:

$$\overline{R}^*_{ij} = \frac{\sum_{k=1}^{m_{ij}} R^*_{ijk}}{m_{ij}} \qquad (11)$$

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

$$\bar{R}_{ij}^{*\dagger} = \left[m_{ij}\left(\bar{R}_{ij} - \bar{R}_{ij}^{*}\right)\right] + \left[\bar{R}_{ij}^{*}\right] \tag{12}$$

where $\bar{R}_{ij}$ is the standard ratio estimator, obtained as

$$\bar{R}_{ij} = \frac{\sum_{q=1}^{m_{ij}} e_{ijq}}{\sum_{q=1}^{m_{ij}} s_{ijq}} \tag{13}$$

The bias-corrected jackknife mean was then averaged over all access locations sampled within each day:

$$\bar{\bar{R}}_{i}^{*\dagger} = \frac{\sum_{j=1}^{n_i} \bar{R}_{ij}^{*\dagger}}{n_i} \tag{14}$$

where n_i equals the number of access locations sampled during day *i*.

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

$$\hat{E}_i = S_i \bar{\bar{R}}_{i}^{*\dagger} \tag{15}$$

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

The variance of the 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 (see Kish 1965, equations 2.8.5 and 2.8.7, pages 60 and 61):

$$\hat{V}\left[\hat{E}_i\right] = S_i^2 \hat{V}\left[\bar{\bar{R}}_{i}^{*\dagger}\right] \tag{16}$$

where $\hat{V}\left[\bar{\bar{R}}_{i}^{*\dagger}\right]$ is the estimated variance of the ratio estimate, obtained by the following two-stage equation:

$$\hat{V}\left[\bar{\bar{R}}_{i}^{*\dagger}\right] = \left\{(1 - f_{1i})\frac{s_{r1i}^2}{n_i}\right\} + \left\{\frac{f_{1i}}{n_i^2}\sum_{j=1}^{n_i} s_{r2ij}^{*2}\right\} \tag{17}$$

where f_{1i} equals the sampling fraction for access locations within each day (i.e., $f_{1i} = n_i / N_i$); s_{r1i}^2 is the among access location variance component, obtained as

$$s_{r1i}^2 = \frac{\sum_{j=1}^{n_i}\left(\bar{R}_{ij}^{*\dagger} - \bar{\bar{R}}_{i}^{*\dagger}\right)^2}{n_i - 1} \tag{18}$$

and s^{*2}_{r2ij} equals 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):

$$s^{*2}_{r2ij} = \frac{(m_{ij} - 1)}{m_{ij}} \sum_{k=1}^{m_{ij}} \left(R^{*}_{ijk} - \overline{R}^{*}_{ij}\right)^2 \tag{19}$$

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 (10) through (19) above.

Haines Marine Fishery:

The harvest in each stratum was estimated as follows:

$$\hat{C}_h = D_h \overline{C}_h \tag{20}$$

$$\overline{C}_h = \frac{\sum_{i=1}^{d_h} \hat{C}_{hi}}{d_h} \tag{21}$$

$$\hat{C}_{hi} = P_{hi} \overline{C}_{hi} = P_{hi} \frac{\sum_{j=1}^{p_{hi}} \hat{C}_{hij}}{p_{hi}} \tag{22}$$

$$\hat{C}_{hij} = M_{hij} \overline{c}_{hij} \tag{23}$$

$$\overline{c}_{hij} = \frac{\sum_{k=1}^{m_{hij}} c_{hijk}}{m_{hij}} \tag{24}$$

where c_{hijk} is the harvest on boat k in sampling period j day i stratum h, m_{hij} is the number of boat parties interviewed in period j, M_{hij} is the number of boat parties completing trips in period j, p_{hi} is the number of periods sampled in a day, P_{hi} is the number of periods in a day, d_h is the number of days sampled in stratum h, and D_h is the number of days in stratum h. The variance of the harvest by stratum was estimated:

$$V[\hat{C}_h] = (1-f_{1h}) \frac{D_h^2}{d_h} \frac{\sum_{i=1}^{d_h} (\hat{C}_{hi} - \overline{C}_h)^2}{(d_h - 1)}$$

$$+ f_{1h} \frac{D_h^2}{d_h^2} \sum_{i=1}^{d_h} f_{2hi} \frac{P_{hi}^2}{p_{hi}^2} \sum_{j=1}^{p_{hi}} (1-f_{3hij}) \frac{M_{hij}^2}{m_{hij}} \frac{\sum_{k=1}^{m_{hij}} (c_{hijk} - \overline{c}_{hij})^2}{m_{hij} - 1} \tag{25}$$

where f_{1h} = the sampling fraction for days, f_{2hi} = sampling fraction for periods, and f_{3hij} = sampling fraction for boat parties.

Note that in equation (25) there is no second-stage variance term, since only one period was sampled within each sampled day. Accordingly, our variance estimates are negatively biased by an unknown, although presumably appreciable amount[1].

To obtain the estimated angler effort in the entire fishery (i.e., at all access locations in the Haines area), a ratio estimator was employed. Data from 1988 and 1989 indicated that the estimated ratio of effort in the entire Haines fishery to the effort originating from Letnicof harbor was 1.363, with a variance of 0.0144. Similarly, the ratio for harvested chinook salmon was 1.146 with a variance of 0.1129. These ratios were then multiplied by the applicable stratum estimates to compute totals for the entire fishery, using Goodman's (1960) formula for the product of two independent random variables. Harvest and effort for the season (and their variances) are the sums across strata.

Juneau and Ketchikan Harvest-per-unit-effort (HPUE) Estimates:

Harvest-per-unit-effort (HPUE) in terms of coho salmon harvested per angler-hour of effort was estimated by the following procedures for each biweek. 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. The estimates obtained by these procedures are indicative of the abundance of coho salmon. The anglers are treated as individual units in a test fishery operating under the traditional linear model

$$[H / e]_i = qN + \epsilon_i \qquad (26)$$

where H/e is the harvest-per-unit-effort during the *ith* angler-trip, N is the abundance (of the fish), q is the catchability coefficient, and ϵ is random error with mean = 0 and variance = σ^2.

Hence the estimates of HPUE were obtained from unweighted means as follows, by first obtaining the mean HPUE for all anglers in each interviewed boat party:

$$\overline{HPUE}_{hijk} = \frac{H_{hijk}}{e_{hijk} v_{hijk}} \qquad (27)$$

where H_{hijk} equals the entire harvest of the interviewed boat party k, during the sample at access location j, during day i within stratum h; e_{hijk} is the effort (in boat-hours) of each interviewed boat party; and v_{hijk} is the number of anglers in the interviewed boat party.

The mean HPUE for the biweekly period was obtained over all boat parties interviewed within each biweekly period:

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[1] The negative bias for estimating variances is assumed to be quite severe during the weekend strata, since in these instances all days (within each stratum) and all anglers (within each sampled period) are sampled and therefore the only sampling variance remaining is the inestimable within day (among period) variance.

$$\widehat{HPUE} = \frac{\sum_{h=1}^{s}\sum_{i=1}^{d_h}\sum_{j=1}^{n_{hi}}\sum_{k=1}^{m_{hij}}\overline{HPUE}_{hijk}}{m} \quad (28)$$

where m_{hij} equals the number of boat parties interviewed; n_{hi} equals the number of access locations sampled during each day; d_h equals the number of days sampled within each stratum; s equals the number of strata within each biweekly period; and m equals all the boat parties interviewed within a biweekly period, obtained as

$$m = \sum_{h=1}^{s}\sum_{i=1}^{d_h}\sum_{j=1}^{n_{hi}} m_{hij} \quad (29)$$

The variances of the biweekly estimates of HPUE were obtained by the following equation:

$$\hat{V}[\widehat{HPUE}] = \frac{\sum_{h=1}^{s}\sum_{i=1}^{d_h}\sum_{j=1}^{n_{hi}}\sum_{k=1}^{m_{hij}}\left(\overline{HPUE}_{hijk} - \widehat{HPUE}\right)^2}{m\,(m-1)} \quad (30)$$

Standard errors were obtained by taking the square root of the variance estimates.

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 number of fishing trips were completed between evening civil twilight and 0700 hours (or morning civil twilight), or at different access locations than surveyed during the direct expansion surveys.

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 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 ADFG 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 (1990b, equations 21-27). Contributions of tagged chinook salmon to the 717 fish sampled during the Sitka Salmon Derby were also estimated.

Chinook Salmon Age Composition and Mean Length at Age

Tip of snout to fork-of-tail lengths of chinook salmon 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 standard errors.

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 of the sampled marine boat fisheries can be found in the appendix for the following fisheries: Ketchikan (Appendices A1 and A2), Juneau (Appendices A3 and A4), and Haines (Appendices A5 and A6). Only a summary of the most important effort and harvest results are presented here.

Angler Effort

An estimated 632,594 (SE = 24,496) angler-hours of effort were expended in the Juneau and Ketchikan marine boat fisheries combined (Table 3). About 79% (499,230 salmon-hours) of the angler effort was targeted on salmon. Pacific halibut were the other important target as no boat parties reported targeting on either rockfish or lingcod. Effort for halibut in Ketchikan was 59% of that expended in Juneau, while salmon effort totaled 66% of that expended in Juneau. Major salmon derbies in Ketchikan and Juneau substantially increased the amount of effort targeted on salmon, as 18% and 13% of the total fishing effort, respectively, occurred during the monitored events.

An estimated 11,972 (SE = 1,169) salmon-hours of effort were expended in the Haines marine sport fishery during the period from 23 April to 21 June (Appendix A5). Estimates of variation in effort are probably biased low. This fishery was closed by emergency order on 22 June when it appeared that chinook salmon returns were extremely poor.

Chinook Salmon Fisheries

An estimated 17,470 chinook salmon (SE = 1,167) were harvested in the Ketchikan, Juneau, and Haines marine fisheries (Table 4). Ketchikan anglers took 56% (9,869 fish, SE = 1,027) of the total harvest. Most of the chinook salmon harvested were at least 28 inches in length, but an estimated 717 small chinook salmon were harvested. Ketchikan anglers caught an estimated 54,047 (SE = 5,163) small chinook salmon, over three times the number caught by Juneau anglers.

The Ketchikan King Salmon Derby bolstered harvests in the Ketchikan marine fishery substantially, as 17% of the harvest occurred during this event. Only about 7% of the total harvest of chinook salmon was taken during the Juneau

Table 3. Summary of estimated total and derby angler effort by target for the Ketchikan and Juneau marine sport fisheries during 1990.

Total effort

Sport fishery	Time period	Boat-hours	SE	Angler-hours by target: Salmon-hours	SE	Halibut-hours[b]	SE	Total[a] angler-hours	SE	Percent of combined total[d]
Ketchikan	5/07 - 9/23	95,883	6,937	199,063	15,453	49,347	4,361	248,618	18,110	39%
Juneau	4/23 - 9/23	146,175	5,609	300,167	14,147	83,106	4,798	383,976	16,494	61%
TOTAL		242,058	8,921	499,230	20,951	132,453	6,483	632,594	24,496	

Derby effort

Major salmon derby (derby dates)	Boat-hours	SE	Angler-hours by target: Salmon-hours	SE	Halibut-hours[b]	SE	Total[c] angler-hours	SE	Percent of total fishery[d]
Ketchikan King Salmon Derby (5/26-28, 6/02-03, 6/09-10)	17,745	4,887	40,133	11,434	5,464	2,306	45,598	13,713	18%
Juneau Golden North Salmon Derby (8/03-05)	17,936	1,582	48,754	4,454	2,065	663	50,819	4,537	13%
TOTAL	35,681	5,137	88,887	12,271	7,529	2,399	96,417	14,444	15%

[a] Includes all targeted and non-targeted effort, including derby effort.
[b] Includes halibut-hours, lingcod-hours, and rockfish-hours combined.
[c] Includes all targeted and non-targeted effort for derby only.
[d] For angler-hours only.

Table 4. Summary of estimated catches and harvests of chinook salmon in sampled marine sport fisheries of Southeast Alaska during 1990.

Total chinook salmon catches and harvests

Sport fishery	Time period	Chinook >28" Catch	Chinook >28" Harvest	Chinook <28" Catch	Chinook <28" Harvest	Total chinook harvested Number	Total chinook harvested SE
Ketchikan	5/07 - 9/23	10,028	9,481	54,047	388	9,869	1,027
Juneau	4/23 - 9/23	7,060	7,031	16,841	304	7,335	551
Haines	4/23 - 6/22	248	241	526	25	266	58
TOTAL		17,336	16,753	71,414	717	17,470	1,167

Derby chinook salmon harvests

Major salmon derby (derby dates)	Chinook >28" Entered	Chinook >28" Total[a]	Chinook <28" Entered	Chinook <28" Total[a]	Total chinook harvested Number	Total chinook harvested SE	Percent of fishery[b]
Ketchikan King Salmon Derby (5/26-28, 6/02-03, 6/09-10)	551	1,667	0	52	1,719	451	17%
Sitka Salmon Derby (5/26-28, 6/02-03)	717	---[c]	0	---	---	---	---
Juneau Golden North Salmon Derby (8/03-05)	311	485	0	8	493	71	7%

[a] Includes entered and take-home harvests.
[b] For total chinook salmon harvested only.
[c] Not available.

Golden North Salmon Derby, even though 13% of the total angler effort was expended during this event. A total of 862 chinook salmon were entered in the Ketchikan and Juneau derbies. The largest number of chinook salmon, however, were entered in the Sitka Salmon Derby, where at least 717 were turned in.

The portion of the total harvest of large chinook salmon sampled for adipose clips varied from fishery to fishery, but the overall sampling fraction totaled 24% (Appendix A7). An estimated 47% of the total (large and small) chinook salmon harvest was of hatchery origin, although this varied greatly from fishery to fishery (Table 5). Although some hatchery fish originated in Oregon, Washington, and British Columbia, an estimated 34% of the harvest monitored originated from Southeast Alaska hatcheries. The Ketchikan fishery had the highest percentage of Alaska hatchery fish (46%) while the the overall hatchery contribution totaled 61%. Only about 6% of the chinook salmon taken in Haines were of hatchery origin.

Largest of the Alaskan hatchery contributors to the harvest of chinook salmon, included the Neets Bay, Whitman Lake, and Carroll Inlet hatcheries owned by Southern Southeast Regional Aquaculture Association and the Crystal Lake and Snettisham hatcheries owned by Alaska Department of Fish and Game. Detailed contribution estimates by tag code and time period are presented in the appendix for the Ketchikan (Appendix A8), Sitka Salmon Derby (Appendix A9), Juneau (Appendix A10), and Haines (Appendix A11) marine fisheries. In addition to the recoveries of hatchery origin fish, wild adipose-clipped chinook salmon were recovered during the Ketchikan and Juneau fisheries (Appendix A12). Total contributions of these wild-tagged stocks could not be estimated as tagging fractions have not yet been determined.

Harvests of small chinook salmon in terminal areas near hatchery release sites opened by emergency regulation totaled an estimated 333 (SE = 108) (Table 6). In the Juneau area, most of the small chinook salmon caught in the terminal areas were retained, but in Ketchikan only 11% of the 1,284 (SE = 398) small chinook salmon caught were retained.

The age composition of the chinook salmon harvest varied considerably among the surveyed fisheries (Table 7 and Appendix A13). About 45% of the chinook salmon sampled during the Juneau Golden North Salmon Derby lacked a freshwater annulus (age-0.), which usually indicates non-Alaskan origin (Van Alen 1988). Only 4% of the sampled Haines harvest, on the other hand, was of age-0. fish. An estimated 93% of the chinook salmon harvested during the Juneau Derby were age-.3 or less while only 57% of the chinook salmon sampled in Haines had a similar age structure. The age structure of the Ketchikan and Juneau non-derby chinook salmon harvests were intermediate between the extremes noted in the Juneau Derby and the Haines fisheries. Mean length at age of sampled chinook salmon for a given age class varied somewhat among the fisheries surveyed (Appendix A14).

Coho Salmon Fisheries

Harvests of coho salmon in the Juneau and Ketchikan fisheries totaled an estimated 60,004 fish (SE = 3,693) (Table 8). The only monitored derby in which coho salmon are heavily targeted is the Juneau Golden North Salmon Derby, and an estimated 1,914 coho salmon (SE = 149) were taken during this event. Wild stocks of coho salmon dominated the harvest, but almost 10,000 hatchery chinook salmon were taken.

Table 5. Contributions of hatchery chinook salmon to sampled marine sport fisheries of Southeast Alaska, 1990.

Region or hatchery	Marine boat sport fishery				
	Ketchikan 5/07-9/23	Sitka Derby[a]	Juneau 4/23-9/23	Haines 4/23-6/22	Total[b]
Oregon	17	3	32	0	52
Washington	138	7	0	0	145
British Columbia	1,357	469	395	0	2,221
Non-Alaskan total	1,512	479	427	0	2,418
(SE)	(658)	(165)	(249)		(723)
Alaska					
Crystal Lake (ADFG[c])	554	12	322	11	899
Deer Mountain (ADFG)	82	0	4	0	86
Hidden Falls (ADFG)	0	0	51	0	51
Jerry Myers (ADFG)	0	0	4	3	7
Snettisham (ADFG)	0	0	815	2	817
Tamgas Creek (MIC[d])	301	0	2	0	303
L. Port Walter (NMFS[e])	11	1	209	0	221
Medvejie (NSRA[f])	0	19	0	0	19
Neets Bay (SSRA[g])	929	25	96	0	1,050
Carroll Inlet (SSRA)	1,845	15	70	0	1,930
Whitman Lake (SSRA)	789	4	11	0	804
Alaskan total	4,511	76	1,584	16	6,187
(SE)	(725)	(29)	(309)	(7)	(788)
All areas total	6,023	555	2,011	16	8,605
(SE)	(979)	(167)	(397)	(7)	(1,069)
Chinook salmon harvest	9,869	717	7,335	266	18,187
(SE)	(1,027)	---	(551)	(58)	(1,167)
Percent Alaska hatchery	46%	11%	22%	6%	34%
Percent total hatchery	61%	77%	27%	6%	47%

[a] Includes only fish entered in Sitka Salmon Derby on 26-28 May and 2-3 June.
[b] Includes both large and small chinook salmon.
[c] Alaska Department of Fish and Game.
[d] Metlakatla Indian Community.
[e] National Marine Fisheries Service.
[f] Northern Southeast Regional Aquaculture Association.
[g] Southern Southeast Regional Aquaculture Association.

Table 6. 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 1990.

Terminal area sport fishery	Effort (Salmon-hours)		Small chinook (<28") Harvest		Small chinook (<28") Total catch		Large chinook (>28") Kept	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Juneau	1,726	852	190	89	201	90	52	24
Ketchikan	5,093	1,583	143	61	1,284	398	341	128
TOTAL	6,819	1,798	333	108	1,485	407	393	131

Table 7. Summary of the age composition of chinook salmon sampled in selected marine sport fisheries of Southeast Alaska during 1990.

Freshwater age composition

Sport fishery	Age 0._ Sample size	Age 0._ Percent	Age 1._ Sample size	Age 1._ Percent	Total sampled
Ketchikan	200	29%	483	71%	683
Juneau non-Derby	90	19%	379	81%	469
Juneau Derby[a]	45	45%	55	55%	100
Haines	2	4%	51	96%	53
Total	337	26%	968	74%	1,305

Saltwater age composition

Sport fishery	Age _.3 or less Sample size	Age _.3 or less Percent	Age _.4 or more Sample size	Age _.4 or more Percent	Total sampled
Ketchikan	541	79%	142	21%	683
Juneau non-Derby	318	68%	151	32%	469
Juneau Derby[a]	93	93%	7	7%	100
Haines	30	57%	23	43%	53
Total	982	75%	323	25%	1,305

[a] Juneau Golden North Salmon Derby.

Table 8. Summary of estimated harvests and catches of coho salmon in the Ketchikan and Juneau marine sport fisheries during 1990.

Sport fishery	Time period	Coho Salmon Harvest: Wild Number	Wild SE	Hatchery Number	Hatchery SE	Total Number	Total SE	Coho salmon total catch Number	Coho salmon total catch SE
Ketchikan	5/07 - 9/23	24,146	2,149	9,515	2,015	33,661	2,946	35,351	3,070
Juneau									
non-Derby	4/23 - 9/23	23,965	2,220	464	88	24,429	2,222	24,782	2,289
Derby[a]	8/03 - 8/05	1,896	149	18	10	1,914[b]	149	1,960	145
	Subtotal	25,861	2,225	482	89	26,343	2,227	26,742	2,294
TOTAL		50,007	3,094	9,997	2,017	60,004	3,693	62,093	3,832

[a] Juneau Golden North Salmon Derby.
[b] Of the 1,914 coho salmon harvested, 1,168 were entered in the derby.

Table 9. Contributions of hatchery coho salmon to the Ketchikan and Juneau marine sport fisheries of Southeast Alaska, 1990.

Region or hatchery	Sport Fishery: Ketchikan Estimate	Ketchikan SE	Juneau Estimate	Juneau SE	Total Estimate	Total SE
British Columbia	63	32	0	---	63	32
Alaska						
Deer Mountain (ADFG[a])	733	195	0	---	733	195
Snettisham (ADFG)	0	---	402	86	402	86
Gastineau (DIPC[b])	0	---	80	23	80	23
Tamgas Creek (MIC[c])	282	163	0	---	282	163
Nakat Inlet (SSRAA[d])	133	67	0	---	133	67
Neets Bay (SSRAA)	7,702	1,978	0	---	7,702	1,978
Whitman Lake (SSRAA)	602	278	0	---	602	278
Southeast Alaska total	9,452	2,015	482	89	9,934	2,017
Grand total	9,515	2,015	482	89	9,997	2,017
Coho salmon harvest	33,661	2,946	26,343	2,227	60,004	3,693
Percent hatchery	28%		2%		17%	

[a] Alaska Department of Fish and Game.
[b] Douglas Island Pink and Chum.
[c] Metlakatla Indian Community.
[d] Southern Southeast Regional Aquaculture Association.

Harvests of hatchery coho salmon were estimated by sampling about 19% of the coho salmon harvest of the monitored fisheries for missing adipose fins (Appendix A15). Estimates of coho salmon hatchery contributions by tag code and time period are presented in the appendix for the Ketchikan (Appendix A16) and Juneau (Appendix A17) fisheries. Only 2% of the harvest of coho salmon in the Juneau fishery was of hatchery origin while 28% of the Ketchikan harvest was of hatchery origin (Table 9). All of the hatchery coho salmon in the Juneau area were produced by Southeast Alaska hatcheries, but an estimated 63 (SE = 32) hatchery chinook salmon taken in the Ketchikan fishery originated in British Columbia. The Neets Bay hatchery contributed the most coho salmon to the Ketchikan fishery while the Snettisham hatchery contributed the most coho salmon to the Juneau fishery. Additionally, some recoveries of coho salmon from wild stocks were obtained in the Juneau fishery (Appendix A18). As tagging fractions were unknown, total contributions of these wild-tagged stocks could not be estimated.

Harvest-per-unit-effort (HPUE) of coho salmon for the Ketchikan and Juneau fisheries ranged up to a maximum of 0.450 (SE = 0.039) coho salmon per angler-hour of effort (Table 10). The HPUE's for coho salmon peaked in both Juneau and Ketchikan from 10 September to 23 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 19,193 (SE = 1,350) were taken in the Ketchikan and Juneau marine fisheries (Table 11). Estimated average round weight of the Pacific halibut in the Juneau fishery was 24.1 pounds, and in Ketchikan 36.7 pounds (Table 12). Almost 0.6 million pounds of Pacific halibut were taken during these two fisheries. Due to the larger size of the average Pacific halibut taken in Ketchikan, the total weight of the harvest was very similar to that taken by Juneau anglers, even though the harvest was an estimated 4,355 fish less.

Although rockfish are not a primary target of most marine anglers, an estimated 18,693 (SE = 2,028) rockfish were caught in the Ketchikan marine fishery (Table 11). Only 9,561 (SE = 997) of the rockfish caught were retained (51%). Juneau anglers retained an estimated 89% (1,467) of the 1,650 rockfish caught.

Major species composition of the rockfish harvest was determined for the Ketchikan fishery (Table 13). Yelloweye rockfish were most frequently taken in the Ketchikan fishery comprising 38% (3,613) of the harvest. Quillback rockfish were the second most frequently found rockfish (3,420) in the harvest of the Ketchikan fishery. In addition to the two species mentioned, the sport harvest also included substantial numbers of silvergrey and black rockfish. Other minor species in the sport harvest included dusky rockfish, copper rockfish, and yellowtail rockfish along with a variety of other unidentified species. Lingcod were also harvested in the highest numbers in the Ketchikan fishery (Table 11).

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 14). Pink salmon are often taken by marine boat anglers, and an estimated 23,918 (SE = 2,002) were taken in the Juneau and Ketchikan fisheries. Retention rates for pink salmon were high (78%), as were retention rates for other incidentally harvested salmonids. An estimated 1,328 (SE = 220) Dolly Varden were harvested by Juneau anglers, while Ketchikan anglers only harvested 8 Dolly Varden.

Table 10. 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 1990.

Seasonal period	Harvest of coho salmon per angler-hour of effort[a]			
	Ketchikan		Juneau	
	HPUE	SE	HPUE	SE
5/21-6/03	0.000	0.000	0.000	0.000
6/04-6/17	0.026	0.014	<0.001	<0.001
6/18-7/01	0.058	0.011	0.003	0.001
7/02-7/15	0.079	0.011	0.006	0.001
7/16-7/29	0.085	0.011	0.028	0.003
7/30-8/12	0.152	0.016	0.177	0.012
8/13-8/26	0.321	0.026	0.193	0.010
8/27-9/09	0.421	0.023	0.220	0.013
9/10-9/23	0.450	0.039	0.241	0.044
All periods	0.205	0.008	0.083	0.003

[a] Does not include derby effort or harvest.

Table 11. Summary of estimated harvests of Pacific halibut, rockfish, and lingcod in the Ketchikan and Juneau marine sport fisheries during 1990.

Sport fishery	Time period	Catch	SE	Harvest	SE
Pacific Halibut					
Ketchikan	5/07 - 9/23	8,700	1,050	7,419	793
Juneau	4/23 - 9/23	15,792	1,551	11,774	1,093
	Total	24,492	1,873	19,193	1,350
Rockfish					
Ketchikan	5/07 - 9/23	18,693	2,028	9,561	997
Juneau	4/23 - 9/23	1,650	223	1,467	223
	Total	20,343	2,040	11,028	1,018
Lingcod					
Ketchikan	5/07 - 9/23	1,496	298	1,334	271
Juneau	4/23 - 9/23	59	29	53	28
	Total	1,555	300	1,387	272

Table 12. Average length, round weight, and total round weight for Pacific halibut harvested in the Ketchikan and Juneau marine sport fisheries of Southeast Alaska during 1990.

Sport fishery	Time period	Sample size	Total length Mean (cm)	Total length SE (cm)	Average round wt. (lbs)	Estimated number harvested	Estimated total round weight (thousand lbs)
Ketchikan	5/07 - 9/23	190	101.2	1.9	36.7	7,419	272.3
Juneau	4/23 - 9/23	564	87.2	1.1	24.1	11,774	283.8
	Total	754	90.7	1.0	27.2	19,193	556.1

Table 13. Rockfish species composition in the Ketchikan marine sport fishery during 1990.[a]

Species	Harvest	Percent
Black rockfish	564	6%
Copper rockfish	20	<1%
Dusky rockfish	377	4%
Quillback rockfish	3,420	36%
Silvergrey rockfish	689	7%
Yelloweye rockfish	3,613	38%
Yellowtail rockfish	4	<1%
Other rockfish	874	9%
Total	9,561	100%

[a] Due to time constraints, approximately 44% 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 14. 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 1990. Standard errors 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	5/07 - 9/23	16,487	14,629	264	244	71	71	8	8
Juneau	4/23 - 9/23	14,220	9,289	879	745	24	24	2,121	1,328
	Total	30,707	23,918	1,143	989	95	95	2,129	1,336

Shellfish Fisheries

Shellfish effort and harvests of Dungeness, Tanner, and king crab were estimated for the Ketchikan and Juneau boat fisheries (Table 15). Crabbing effort in boat-days for the Juneau fishery (2,622 boat-days) was over four times that estimated for the Ketchikan fishery (614 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 17,130 shrimp (SE = 5,800).

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, 1990a). The Ketchikan fishery has been monitored for the entire spring and summer season since 1986 (and also in 1984), while the spring Haines fishery has been monitored since 1985.

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.

Angler Effort

The Juneau and Ketchikan marine boat fisheries have been consistently surveyed from approximately mid-April or early May through late September (Table 16). Total effort in the Juneau fishery during 1990 was about 11% higher than the 1983-1989 average of 346,509 angler-hours. Average effort through 1989 (as determined from available data) for the Ketchikan fishery was 230,604 angler-hours, or about 67% of the Juneau effort. Although 1990 effort in Ketchikan was about 8% above the average for the 1984-1989 period, estimated effort was about 28,000 angler-hours less than in 1989. Total effort declined primarily due to a decrease in the amount of effort targeted on bottomfish (halibut) as the estimated amount of salmon effort was at an all time high. The percentage of effort expended for salmon in both the Juneau and Ketchikan fisheries during 1990 was above long-term averages.

The Haines fishery has been consistently surveyed only during the spring from approximately mid-April until late June or mid-July (Table 16). In Haines, restrictive regulations, in combination with poor runs of chinook salmon and elimination of the local salmon derby, limited the salmon-hours of effort in 1990 to about 51% of the average for the years 1985-1989.

Chinook Salmon Fisheries

Total harvests of chinook salmon for the Juneau and Ketchikan marine boat fisheries were well above average (Table 17). The Haines fishery harvest of chinook salmon was only about 25% of average. The low harvest of chinook salmon in the Haines fishery was due to very restrictive sport regulations coupled with a poor run of chinook salmon into the Chilkat River. Low HPUE's led to in-season management in the form of a complete closure of the chinook salmon fishery in the

Table 15. 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 1990.

	Estimate	Standard error	Relative precision
Ketchikan (5/07-9/23)			
Boat-days fished	614	227	74%
Dungeness crab kept	3,367	1,944	116%
King crab kept	0	0	---
Tanner crab kept	0	0	---
Shrimp kept	17,130	5,800	68%
Juneau (4/23-9/23)			
Boat-days fished	2,622	233	18%
Dungeness crab kept	6,289	871	28%
King crab kept	1,960	585	60%
Tanner crab kept	1,883	508	54%
Shrimp kept	---	---	---

Table 16. 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 Estimate	Salmon-hours Percent	Bottomfish-hours Estimate	Bottomfish-hours Percent	Total angler-hours
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
		Average	263,153	76%	83,156	24%	346,509
	1990	4/23-9/23	300,167	78%	83,106	22%	383,976
		% of Average	114%		100%		111%
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
		Average	160,197	69%	70,071	30%	230,604
	1990	5/07-9/23	199,063	80%	49,347	20%	248,618
		% of Average	124%		70%		108%
Haines	1985	4/15-7/15	20,582	95%	1,016	5%	21,598
	1986	4/14-7/13	32,533	96%	1,324	4%	33,857
	1987	4/20-7/12	22,848	86%	3,773	14%	26,621
	1988	4/11-7/10	32,723	90%	3,435	9%	36,222
	1989	4/24-6/25	9,363	89%	1,108	11%	10,526
		Average	23,610	92%	2,131	8%	25,765
	1990	4/23-6/21	11,972		---------- No Data ----------		
		% of Average	51%		---------- No Data ----------		

Table 17. Estimated harvests of chinook salmon in selected marine sport fisheries of Southeast Alaska as determined by on-site creel surveys for comparable sample periods.

Year	Juneau marine[a]	Juneau Golden North Derby	Ketchikan marine	Haines 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	1,082
1985	8,133	1,222	---	1,709
1986	5,050	1,073	5,006	1,655
1987	8,893	1,005	4,723	1,098
1988	5,683	677	5,245	488
1989	7,074	609	5,752	252
Average	5,578	804	4,509	1,047
1990	7,335	493	9,869	266
% of Average	131%	61%	219%	25%

[a] Includes Juneau Golden North Salmon Derby harvest.

Chilkat and Chilkoot inlets on 22 June. Harvest of chinook salmon in the Juneau Golden North Salmon Derby was only 61% of average and the lowest since 1980.

Harvests of chinook salmon in the Ketchikan fishery have been increasing due to larger contributions of hatchery chinook salmon (Table 18). In 1990, an estimated 61% of the harvest was of hatchery origin with a total contribution of an estimated 6,023 fish. This hatchery contribution exceeds past total chinook salmon harvests in the Ketchikan fishery. An estimated 27% of the harvest in Juneau was also of hatchery origin and this was also a record for this fishery. Estimated total catch of small chinook salmon in the Ketchikan and Juneau fisheries increased from a combined total of 38,546 in 1989 (Suchanek and Bingham 1990a) to 70,888 in 1990 (Table 4). If these catches are an indicator of juvenile chinook salmon abundance, then chinook salmon harvests in both the Ketchikan and Juneau areas should continue to increase as juvenile fish reach legal size.

Coho Salmon Fisheries

Harvests of coho salmon in both the Ketchikan and Juneau areas were the highest ever recorded (Table 19). Due to excellent HPUE's throughout the season (Table 10), Ketchikan coho salmon harvests were over 2.5 times the 1984 to 1989 average. Coho salmon harvest in the Juneau fishery was almost twice the long term average, although it only exceeded the 1989 harvest by about 2,500 fish. The Juneau Golden North Salmon derby harvest of 1,914 coho salmon was only 72% of average as coho salmon did not appear in above average numbers until after this event.

Nearby hatcheries contributed well to the Ketchikan fishery during 1990, producing 28% of the coho salmon taken (Table 20). This contribution exceeds the 23% contribution average for the past few years. In Juneau, the total number of hatchery coho salmon harvested was slightly above average, but these totaled only about 2% percent of the harvest.

Bottomfish Fisheries

In contrast to harvests of chinook and coho salmon, Pacific halibut harvests in the Juneau and Ketchikan fisheries were below average in 1990 (Table 21). Total estimated harvest of Pacific halibut in the Juneau fishery was lower than estimates for any of the years from 1983 to 1989. Total catch of Pacific halibut in both the Juneau and Ketchikan fisheries was only about 80% of average. The below average catch in Ketchikan was due to halibut effort totaling only about 70% of average (Table 16). The total halibut effort in the Juneau fishery was average, however, indicating that catch rates in Juneau were below average. In Ketchikan, an average of about 85% of the Pacific halibut caught are harvested, while in Juneau, the average retention rate is about 69%.

Rockfish harvests and catches have been declining in the Ketchikan area since 1987 (Table 22). Total catch of rockfish during 1990 was also below average although it remained at about 1989 levels. Only about half of the total rockfish catch is retained. Targeted (as expressed in total catch or harvest per hour of bottomfish or halibut effort) HPUE and CPUE for rockfish was about average during 1990. Non-targeted HPUE and CPUE for rockfish was below average partially due to the relatively large amount of salmon effort during 1990.

Available data on species composition indicate that quillback and yelloweye rockfish make up about 77% of the Ketchikan rockfish harvest (Table 23). Harvests of both these species were below average in 1990 although the harvest of quillback rockfish was very similar to that seen in 1989. Both of these species have limited home ranges and grow slowly, making them of conservation concern.

Table 18. Estimated contributions of hatchery produced chinook salmon to selected marine sport fisheries of Southeast Alaska as determined by on-site creel surveys, 1983-1990.

	Juneau marine		Ketchikan marine		Haines marine	
Year	Hatchery contrib.	% of harvest	Hatchery contrib.	% of harvest	Hatchery contrib.	% of harvest
1983	46	1%	350	10%	--	--
1984	577	9%	432	24%	0	0
1985	1,037	13%	862	34%	0	0
1986	1,032	20%	2,226	44%	0	0
1987	2,060	23%	1,409	30%	14	1%
1988	1,210	22%	1,747	33%	0	0
1989	1,018	14%	2,992	52%	8	3%
Average	997	15%	1,431	35%	4	<1%
1990	2,010	27%	6,023	61%	16	6%

Table 19. 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[a] 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
Average	14,165	2,662	12,363
1990	26,343	1,914	33,661
% of Average	186%	72%	272%

[a] Includes Juneau Golden North Salmon Derby harvest.

Table 20. Estimated contributions of hatchery produced coho salmon to the Juneau and Ketchikan marine sport fisheries as determined by on-site creel surveys.

	Juneau marine		Ketchikan marine	
Year	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%
Average	422	3%	2,897	23%
1990	482	2%	9,515	28%

Table 21. Estimated harvests and catches of Pacific halibut in the Juneau and Ketchikan marine sport fisheries, 1983-1990.

	Juneau marine				Ketchikan marine			
Year	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%
Average	13,536	6,055	19,591	69%	9,146	1,662	10,808	85%
1990	11,774	4,018	15,792	75%	7,419	1,281	8,700	85%
% of Avg.	87%	66%	81%		81%	77%	80%	

Table 22. Comparative catch and effort statistics for the Ketchikan rockfish sport fishery.

Year	Survey dates	Angler effort: Total angler-hours	Angler effort: Bottomfish-hours	Total rockfish harvest and catch: Kept	Released	Total catch	Retention rate	HPUE: Targeted[a]	HPUE: Non-targeted[b]	CPUE: Targeted[c]	CPUE: Non-targeted[d]
1984	4/29-9/29	223,725	62,625	9,805	---	---	---	0.16	0.04	---	---
1985[e]	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
Average		230,604	70,071	12,623	14,331	27,658	46%	0.18	0.05	0.39	0.12
1990	5/07-9/23	248,618	49,347	9,561	9,132	18,693	51%	0.19	0.04	0.38	0.08

[a] Rockfish harvest per angler-hour of effort.
[b] Rockfish harvest per bottomfish-hour of effort.
[c] Rockfish total catch per angler-hour of effort.
[d] Rockfish total catch per bottomfish-hour of effort.
[e] Data not comparable since creel surveys extended only through June 30 instead of late September.

Table 23. Species composition of the rockfish harvest in the Ketchikan sport fishery for comparable time periods, 1987-1990.

Species	1987	1988	1989	Mean	%	1990	% of mean
Black rockfish	698	449	467	538	3	564	105
Copper rockfish	262	778	30	356	2	20	6
Dusky rockfish	215	774	21	337	2	377	112
Quillback rockfish	10,202	8,306	3,237	7,248	46	3,420	47
Silvergrey rockfish	---[a]	1,117	1,867	1,492	9	689	46
Yelloweye rockfish	5,516	4,310	4,813	4,880	31	3,613	74
Yellowtail rockfish	122	142	6	90	1	4	4
Other rockfish	1,577	1,601	784	1,321	8	874	66
Total	18,591	17,477	11,224	15,764	102[b]	9,561	61

[a] Harvest of this species not estimated during this year.
[b] Totals more than 100% because silvergrey rockfish harvest not estimated in 1987.

Table 24. Comparison of estimated shellfish effort and harvest 1988-1990 for the Juneau and Ketchikan marine boat fisheries.

	1988	1989	Mean	1990	% of mean
Juneau					
Effort (boat-days)	2,287	2,652	2,470	2,622	106
Dungeness crab harvest	6,459	8,356	7,408	6,289	85
Harvest/boat-day	2.82	3.15	3.00	2.40	80
Tanner crab harvest	3,042	3,369	3,206	1,883	59
Harvest/boat-day	1.33	1.27	1.30	0.72	55
King crab harvest	552	1,849	1,201	1,960	163
Harvest/boat-day	0.24	0.70	0.49	0.75	153
Ketchikan					
Effort (boat-days)	1,398	508	953	614	64
Dungeness crab harvest	9,043	2,688	5,866	3,367	57
Harvest/boat-day	6.47	5.29	6.16	5.48	89
Shrimp harvest	27,643	12,730	20,187	17,130	85
Harvest/boat-day	19.77	25.06	21.18	27.90	132

Shellfish Fisheries

Data were collected on personal use and subsistence crab harvests in the marine boat fisheries for the third year (Table 24). Estimated shellfish effort in the Juneau area was slightly above average, but harvests of both Dungeness and Tanner crab were both below average. King crab harvest, however, increased in 1990 and totaled 163% of the 1988 and 1989 average. Harvest per boat-day of the three crab species groups also showed the same trends.

In Ketchikan, shellfish effort and Dungeness crab harvest in 1990 was higher than in 1989 but still much lower than in 1988. Harvest per boat-day for shrimp showed an increasing trend, although the total harvest was still below that shown in 1988.

CONCLUSIONS AND RECOMMENDATIONS

Large changes in Southeast Alaska sport fisheries have occurred over the past decade. Wild stocks of fish support most of the sport fisheries, but increasing enhancement efforts have led to increases in harvests of hatchery chinook and coho salmon. These enhancement efforts can be costly, and creel surveys are one of the few means to evaluate the success of these programs. During 1990, 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 the Ketchikan sport fishery was also the highest on record. By quantifying contributions of hatchery chinook and coho salmon by tag lot to the sport fisheries, creel surveys of marine boat fisheries continue to be necessary to evaluate and improve the effectiveness of stocking programs.

Given U.S./Canada treaty catch limits on chinook salmon, current user group conflicts over catch allocations may intensify. Rational management of combined sport and commercial chinook salmon fisheries will partially depend on current information on sport fish harvests. Current data on sport fisheries for coho salmon and Pacific halibut will also be necessary to improve management of these species. In the future, sampling of other major boat sport fisheries, such as those in Sitka, Petersburg, and Wrangell may be necessary to provide a more comprehensive view of the entire region. Future surveys of the Haines marine boat fishery should also include an ability to measure all components of sampling variability.

Data from existing marine boat surveys are also used for a variety of other purposes, from commenting on proposed regulation changes, to public information documents. Continuing the shellfish harvest estimates as a component of the ongoing 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. The Juneau and Ketchikan marine boat fisheries are the largest and most controversial sport fisheries in the region, and monitoring of these complex fisheries is essential.

ACKNOWLEDGMENTS

We wish to thank the creel survey staff of Sue Millard, Dale Brandenburger, Linda Wendeborn, Evon Zerbetz, Liz Marcotte, Jeanne Kitayama, and Lynda Reid for their invaluable data collection efforts and many suggestions to improve survey techniques. Area management staff, including Steve Hoffman, Dennis Hubartt, and Randy Ericksen, are also appreciated for supervising creel survey personnel and ensuring data collection procedures were followed. Bob Marshall analyzed data from the Haines marine harvest survey. Staff from the two Alaska Connections lodges on Shelter Island and from Eagle Valley Lodge near Amalga Harbor are also acknowledged for their work in voluntarily reporting harvests of salmon and

Pacific halibut. Bruce Bachen and staff from the Northern Southeast Region Aquaculture Association are also acknowledged for sampling the chinook salmon entered in the Sitka Salmon Derby. The ADFG 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 data reduction efforts. Craig Farrington from the Stock Biology Section of the Division of Commercial Fisheries is also acknowledged for age determination of chinook salmon scale samples. We thank Donna Buchholz and Gail Heineman of the Research and Technical Services (RTS) Unit 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, 7 May-23 September 1990.

	Estimate	Standard error	Relative precision[a]
Finfish Effort[b]			
Boat-hours	95,883	6,937	14%
Salmon-hours	199,063	15,453	16%
Halibut-hours	49,347	4,361	18%
Angler-hours	248,618	18,110	15%
Boat-Days	21,876	1,555	14%
Finfish Harvests[c]			
Total Large Chinook Salmon	9,481	1,015	21%
Derby Take-home	1,116	450	81%
Derby Entered	551	---	---
Derby Take-home & Entered	1,667	450	54%
Total Small Chinook Salmon	388	158	81%
Derby Take-home & Entered	52	32	123%
Coho Salmon	33,661	2,946	18%
Chum Salmon	244	46	38%
Sockeye Salmon	71	29	82%
Pink Salmon	14,629	1,781	24%
Pacific Halibut	7,419	793	21%
Dolly Varden	8	8	208%
Steelhead	10	7	146%
Lingcod	1,334	271	41%
Total Rockfish	9,561	997	21%
Black Rockfish	314	71	46%
Copper Rockfish	11	8	149%
Dusky Rockfish	210	81	77%
Quillback Rockfish	1,905	265	28%
Silvergrey Rockfish	384	122	63%
Yelloweye Rockfish	2,012	275	27%
Yellowtail Rockfish	2	2	200%
Other Rockfish	487	100	41%
Unidentified Rockfish	4,236	644	30%
Finfish Total Catch[b]			
Small Chinook Salmon	54,047	5,163	19%
Large Chinook Salmon	10,028	1,167	23%
Coho Salmon	35,351	3,070	17%
Chum Salmon	264	48	36%
Sockeye Salmon	71	29	82%
Pink Salmon	16,487	1,881	23%
Pacific Halibut	8,700	1,050	24%
Dolly Varden	8	8	208%
Steelhead	10	7	146%
Lingcod	1,496	298	40%
Total Rockfish	18,693	2,028	22%

[a] Relative precision = (Standard error * 2 / Estimate) * 100.
[b] No lingcod-hours or rockfish-hours reported.
[c] No cutthroat trout harvested or caught.

Appendix A2. Estimated finfish effort and catches for the Ketchikan marine boat sport fishery by seasonal period, 7 May-23 September 1990.

	Seasonal period											
	07MAY90 - 20MAY90	21MAY90 - 03JUN90	Derby[a]	04JUN90 - 17JUN90	18JUN90 - 01JUL90	02JUL90 - 15JUL90	16JUL90 - 29JUL90	30JUL90 - 12AUG90	13AUG90 - 26AUG90	27AUG90 - 09SEP90	10SEP90 - 23SEP90	Total
Boat-hours Fished												
Estimate	7,165	3,173	17,745	6,867	9,896	11,571	8,366	7,224	9,884	10,173	3,818	95,883
Variance	11,077,548	246,371	23,886,343	816,183	1,809,848	5,202,986	1,274,185	1,027,155	1,512,038	684,920	578,959	48,116,536
Salmon-hours Fished												
Estimate	11,482	4,822	40,133	15,282	21,436	23,617	14,490	16,997	21,635	20,773	8,396	199,063
Variance	23,241,608	565,180	130,746,822	5,366,444	5,307,949	41,874,051	4,450,454	7,312,391	12,758,651	4,961,593	2,195,811	238,780,954
Halibut-hours Fished												
Estimate	3,113	1,066	5,464	3,221	3,650	6,148	9,638	3,602	6,832	5,386	1,227	49,347
Variance	1,306,954	47,752	5,316,851	374,101	1,152,845	1,285,779	4,426,946	985,091	1,697,009	2,169,990	254,685	19,018,004
Angler-hours Fished												
Estimate	14,595	5,887	45,598	18,504	25,093	29,766	24,328	20,599	28,467	26,159	9,623	248,618
Variance	34,793,673	547,123	188,044,091	7,152,845	8,472,054	39,586,930	11,366,117	8,685,095	18,034,890	8,276,474	3,018,377	327,977,668
Boat-days Fished												
Estimate	1,866	769	2,749	1,703	2,446	2,770	2,028	1,639	2,521	2,330	1,056	21,876
Variance	740,665	19,507	734,149	49,530	170,262	401,512	60,173	63,249	91,860	47,417	40,085	2,418,409
Large Chinook Salmon Harvested												
Estimate	313	280	1,667	1,538	1,717	1,781	1,068	404	539	155	19	9,481
Variance	5,254	21,995	202,238	76,906	127,884	204,508	283,965	38,442	55,157	13,075	120	1,029,543
L. Chinook Salmon Total Catch												
Estimate	313	280	1,695	1,686	1,840	1,780	1,322	404	539	155	19	10,028
Variance	5,254	21,995	195,928	98,781	173,003	204,508	554,572	38,442	55,157	13,075	120	1,362,835
Small Chinook Salmon Harvested												
Estimate	6	11	52	33	40	177	0	0	44	0	25	388
Variance	39	127	1,030	1,111	544	20,069	0	0	1,393	0	625	24,938
S. Chinook Salmon Total Catch												
Estimate	3,330	1,766	8,483	4,144	5,201	7,881	6,628	3,553	5,154	5,832	2,075	54,047
Variance	4,869,570	1,031,276	4,346,492	1,522,534	810,873	4,065,424	6,878,855	957,068	1,088,827	850,239	231,712	26,652,871
Coho Salmon Harvested												
Estimate	0	0	19	452	1,243	2,916	2,081	3,719	9,515	9,457	4,258	33,661
Variance	0	0	284	54,503	302,720	634,462	276,689	1,478,395	2,797,897	2,104,070	1,031,442	8,680,463
Coho Salmon Total Catch												
Estimate	0	0	21	464	1,310	3,092	2,100	3,890	9,709	10,158	4,607	35,351
Variance	0	0	288	54,639	324,725	697,642	274,851	1,710,282	2,818,434	2,481,514	1,064,895	9,427,272
Chum Salmon Harvested												
Estimate	0	0	17	13	17	6	50	26	49	62	4	244
Variance	0	0	228	137	120	19	356	251	369	608	21	2,109
Chum Salmon Total Catch												
Estimate	0	0	17	13	17	6	50	26	49	75	11	264
Variance	0	0	228	137	120	19	356	251	369	773	54	2,307
Sockeye Salmon Harvested & Total Catch												
Estimate	0	0	0	0	14	28	6	12	11	0	0	71
Variance	0	0	0	0	129	426	39	134	120	0	0	848
Pink Salmon Harvested												
Estimate	6	0	11	54	171	964	2,985	6,284	3,395	725	34	14,629
Variance	34	0	46	623	4,254	26,201	814,831	1,701,305	578,924	44,581	264	3,171,062
Pink Salmon Total Catch												
Estimate	6	0	11	63	209	1,154	3,115	6,664	4,304	903	59	16,487
Variance	34	0	46	762	6,467	39,729	861,374	1,784,378	797,166	48,088	1,116	3,539,160

-continued-

Appendix A2. (Page 2 of 2).

	Seasonal Period											
	07MAY90 - 20MAY90	21MAY90 - 03JUN90	Derby[a]	04JUN90 - 17JUN90	18JUN90 - 01JUL90	02JUL90 - 15JUL90	16JUL90 - 29JUL90	30JUL90 - 12AUG90	13AUG90 - 26AUG90	27AUG90 - 09SEP90	10SEP90 - 23SEP90	Total
Pacific Halibut Harvested												
Estimate	227	56	497	670	693	1,235	1,509	621	931	728	252	7,419
Variance	7,556	2,489	39,398	61,664	52,424	113,938	138,846	100,755	44,661	47,141	19,520	628,394
Pacific Halibut Total Catch												
Estimate	273	66	527	670	742	1,287	2,433	621	949	819	313	8,700
Variance	12,570	1,729	40,734	61,664	66,078	129,168	559,510	100,755	43,709	55,789	30,623	1,102,328
Dolly Varden Harvest and Total Catch												
Estimate	0	0	0	8	0	0	0	0	0	0	0	8
Variance	0	0	0	69	0	0	0	0	0	0	0	69
Lingcod Harvested												
Estimate	134	11	96	94	25	345	250	90	105	173	11	1,334
Variance	4,902	127	509	4,373	221	45,157	11,128	1,006	673	5,214	63	73,372
Lingcod Total Catch												
Estimate	158	11	151	119	25	392	250	90	105	184	11	1,496
Variance	6,510	127	3,092	8,206	221	52,622	11,128	1,006	673	5,388	63	89,035
Unidentified Rockfish Harvested												
Estimate	243	127	381	757	191	756	819	214	554	166	29	4,236
Variance	14,532	12,854	65,553	76,227	10,406	108,364	72,963	7,532	37,418	8,108	393	414,351
Black Rockfish Harvested												
Estimate	30	0	11	14	0	68	50	73	41	27	8	314
Variance	486	0	68	168	0	1,193	631	1,567	761	229	47	5,103
Copper Rockfish Harvested												
Estimate	0	0	0	0	0	0	4	0	0	7	0	11
Variance	0	0	0	0	0	0	14	0	0	53	0	67
Dusky Rockfish Harvested												
Estimate	74	0	0	26	0	25	4	63	10	7	0	210
Variance	2,603	0	0	439	0	193	9	3,108	100	53	0	6,506
Quillback Rockfish Harvested												
Estimate	103	84	66	20	98	270	273	305	264	292	130	1,905
Variance	3,892	2,892	1,111	92	2,534	16,714	7,383	14,140	6,176	9,514	5,596	70,045
Silvergrey Rockfish Harvested												
Estimate	85	0	8	47	3	137	9	84	5	0	6	384
Variance	2,376	0	59	428	9	10,809	38	1,042	25	0	59	14,845
Yelloweye Rockfish Harvested												
Estimate	189	7	92	65	92	167	430	167	310	371	123	2,012
Variance	13,422	49	1,601	819	1,848	3,653	15,122	4,371	8,173	22,822	3,587	75,467
Yellowtail Rockfish Harvested												
Estimate	0	0	2	0	0	0	0	0	0	0	0	2
Variance	0	0	4	0	0	0	0	0	0	0	0	4
Other Rockfish Harvested												
Estimate	0	0	4	25	0	22	112	86	58	143	36	487
Variance	0	0	15	86	0	479	1,731	1,502	840	3,886	1,508	10,046
All Rockfish Harvested												
Estimate	725	218	563	954	385	1,444	1,700	992	1,242	1,013	325	9,561
Variance	91,754	28,024	80,428	72,487	25,600	205,582	203,577	55,793	81,756	130,226	18,863	994,090
All Rockfish Total Catch												
Estimate	1,556	947	1,492	2,273	1,100	2,022	3,157	1,438	2,249	2,010	449	18,693
Variance	414,753	573,741	366,347	759,993	131,933	318,209	834,098	147,797	243,654	296,132	26,868	4,113,526

[a] Derby held on weekends of 26-28 May, 2-3 June, and 9-10 June 1990.

Appendix A3. Estimated finfish effort and catches for the Juneau marine boat sport fishery, 23 April-23 September 1990.

	Estimate	Standard error	Relative precision[a]
Finfish Effort[b]			
Boat-hours	146,175	5,609	8%
Salmon-hours	300,167	14,147	9%
Halibut-hours	83,106	4,798	12%
Angler-hours	383,976	16,494	9%
Boat-Days	33,923	1,444	9%
Finfish Harvests[c]			
Total Large Chinook Salmon	7,031	542	15%
Derby Take-home	174	71	81%
Derby Entered	311	---	---
Derby Take-home & Entered	485	71	29%
Total Small Chinook Salmon	304	99	65%
Derby Take-home	8	8	211%
Derby Entered	0	---	---
Total Coho Salmon	26,343	2,227	17%
Derby Take-home	746	149	40%
Derby Entered	1,168	---	---
Derby Take-home & Entered	1,914	149	16%
Total Chum Salmon	745	96	26%
Derby Take-home	46	24	104%
Derby Entered	43	---	---
Derby Take-home & Entered	89	24	54%
Total Sockeye Salmon	24	24	209%
Derby Take-home	0	---	---
Derby Entered	3	---	---
Total Pink Salmon	9,289	914	20%
Derby Take-home	1,566	149	19%
Derby Entered	0	---	---
Pacific Halibut	11,774	1,093	19%
Dolly Varden	1,328	220	33%
Steelhead	1	0	---
Lingcod	53	28	105%
Rockfish	1,467	223	27%
Finfish Total Catch[b]			
Large Chinook Salmon	7,060	545	15%
Small Chinook Salmon	16,841	1,546	18%
Coho Salmon	26,742	2,294	17%
Chum Salmon	879	118	27%
Sockeye Salmon	24	24	209%
Pink Salmon	14,220	1,465	21%
Pacific Halibut	15,792	1,551	20%
Dolly Varden	2,121	394	37%
Steelhead	1	0	---
Lingcod	59	29	98%
Rockfish	1,650	223	27%

[a] Relative precision = (Standard error * 2 / Estimate) * 100.
[b] No lingcod-hours or rockfish-hours reported.
[c] No cutthroat trout harvested or caught.

Appendix A4. Estimated finfish effort and catches for the Juneau marine boat recreational fishery by seasonal period, 23 April-23 September 1990.

	Seasonal Period												
	23APR90 - 06MAY90	07MAY90 - 20MAY90	21MAY90 - 03JUN90	04JUN90 - 17JUN90	18JUN90 - 01JUL90	02JUL90 - 15JUL90	16JUL90 - 29JUL90	30JUL90 - 12AUG90	Derby[a]	13AUG90 - 26AUG90	27AUG90 - 09SEP90	10SEP90 - 23SEP90	Total
Boat-hours Fished													
Estimate	3,907	9,577	12,536	10,668	10,685	14,394	22,769	13,420	17,936	18,320	9,914	2,048	146,175
Variance	457,651	6,310,902	1,202,063	1,377,275	1,060,373	2,888,426	5,563,702	3,087,309	2,501,497	5,505,993	1,163,357	345,929	31,464,477
Salmon-hours Fished													
Estimate	7,857	21,108	26,831	21,150	14,719	21,574	40,686	29,456	48,754	42,102	21,706	4,224	300,167
Variance	2,412,528	40,881,277	6,470,395	6,016,816	4,026,915	8,548,002	39,158,695	28,071,551	19,839,009	37,719,135	5,511,562	1,487,312	200,143,199
Halibut-hours Fished													
Estimate	438	469	3,385	4,769	12,547	17,067	22,746	7,319	2,065	7,460	4,423	418	83,106
Variance	45,340	12,558	991,371	740,965	1,663,159	6,424,132	6,868,255	4,312,420	439,243	646,806	808,669	63,682	23,016,599
Angler-hours Fished													
Estimate	8,361	21,735	30,339	25,936	27,266	38,666	63,483	36,792	50,819	49,792	26,128	4,659	383,976
Variance	2,441,583	42,191,089	8,360,826	8,372,337	8,889,533	22,407,214	61,613,933	45,080,045	20,582,715	42,401,195	7,951,477	1,767,671	272,059,619
Boat-days Fished													
Estimate	1,177	2,348	3,057	2,785	2,644	3,668	5,692	2,831	2,589	4,203	2,314	615	33,923
Variance	44,633	311,183	78,762	103,905	78,080	159,657	557,952	180,711	50,921	428,619	68,806	23,112	2,086,342
Large Chinook Salmon Harvested													
Estimate	334	482	1,117	765	544	998	1,130	522	485	443	170	41	7,031
Variance	19,392	49,897	54,542	16,845	10,247	40,933	54,707	17,322	5,005	18,183	5,061	1,371	293,504
Large Chinook Salmon Total Catch													
Estimate	334	482	1,126	777	547	998	1,135	522	485	443	170	41	7,060
Variance	19,392	49,897	54,542	20,771	10,003	40,933	54,705	17,322	5,005	18,183	5,061	1,371	297,184
Small Chinook Salmon Harvested													
Estimate	44	3	6	13	6	24	17	5	8	54	124	0	304
Variance	1,235	9	1	16	18	187	385	25	71	1,928	5,870	0	9,746
Small Chinook Salmon Total Catch													
Estimate	58	161	827	1,226	1,185	1,754	3,027	2,153	1,949	3,478	651	372	16,841
Variance	1,355	8,887	48,438	72,725	95,683	113,823	204,463	328,095	262,714	1,162,870	36,955	54,201	2,390,211
Coho Salmon Harvested													
Estimate	0	0	0	6	88	378	2,223	5,804	1,914	10,125	4,779	1,026	26,343
Variance	0	0	0	216	569	2,979	128,066	582,761	22,145	3,564,634	502,380	153,642	4,957,392
Coho Salmon Total Catch													
Estimate	0	0	0	6	116	438	2,238	5,862	1,960	10,275	4,803	1,046	26,742
Variance	0	0	0	216	984	5,698	128,200	578,204	21,137	3,860,490	502,915	162,474	5,260,318
Chum Salmon Harvested													
Estimate	0	0	10	10	55	119	97	83	89	80	197	5	745
Variance	0	0	0	0	679	2,073	1,750	434	575	660	3,035	36	9,242
Chum Salmon Total Catch													
Estimate	0	0	10	10	57	119	109	186	99	86	198	5	879
Variance	0	0	0	0	706	2,073	1,773	4,845	630	810	3,035	36	13,907
Sockeye Salmon Harvest and Total Catch													
Estimate	0	0	0	3	0	5	9	2	3	2	0	0	24
Variance	0	0	0	50	0	25	553	0	0	0	0	0	628
Pink Salmon Harvested													
Estimate	0	0	0	0	558	647	2,671	1,723	1,566	1,914	210	0	9,289
Variance	0	0	0	0	29,298	7,146	257,722	170,224	22,340	341,003	7,910	0	835,643
Pink Salmon Total Catch													
Estimate	0	0	15	6	579	803	3,600	2,481	2,789	3,476	463	8	14,220
Variance	0	0	825	216	29,970	29,577	434,745	196,662	25,471	1,401,673	25,680	100	2,144,918

-continued-

Appendix A4. (Page 2 of 2).

	Seasonal Period												
	23APR90 - 06MAY90	07MAY90 - 20MAY90	21MAY90 - 03JUN90	04JUN90 - 17JUN90	18JUN90 - 01JUL90	02JUL90 - 15JUL90	16JUL90 - 29JUL90	30JUL90 - 12AUG90	Derby[a]	13AUG90 - 26AUG90	27AUG90 - 09SEP90	10SEP90 - 23SEP90	Total
Pacific Halibut Harvested													
Estimate	5	5	649	408	1,600	2,501	3,430	1,053	547	996	532	48	11,774
Variance	30	12	155,380	6,734	75,537	176,098	408,922	316,407	15,067	21,844	17,780	1,253	1,195,064
Pacific Halibut Total Catch													
Estimate	5	5	1,153	484	2,018	3,875	4,313	1,512	609	1,156	614	48	15,792
Variance	30	12	543,939	10,370	109,739	664,832	555,217	457,871	11,376	29,455	21,386	1,253	2,405,480
Dolly Varden Harvested													
Estimate	93	192	251	347	169	122	31	10	7	97	9	0	1,328
Variance	2,155	16,454	3,674	9,603	561	553	37	69	52	15,396	58	0	48,613
Dolly Varden Total Catch													
Estimate	93	207	509	594	203	148	48	35	7	239	38	0	2,121
Variance	2,155	15,920	5,665	31,930	1,297	824	591	504	52	96,073	422	0	155,434
Steelhead Harvested and Total Catch													
Estimate	0	0	0	0	0	0	0	0	1	0	0	0	1
Variance	0	0	0	0	0	0	0	0	0	0	0	0	0
Lingcod Harvested													
Estimate	3	0	45	1	0	4	0	0	0	0	0	0	53
Variance	16	0	749	0	0	13	0	0	0	0	0	0	778
Lingcod Total Catch													
Estimate	3	0	45	8	0	4	0	0	0	0	0	0	59
Variance	16	0	749	64	0	13	0	0	0	0	0	0	842
All Rockfish Harvested													
Estimate	0	10	6	71	147	353	309	79	67	260	165	0	1,467
Variance	0	0	67	1,976	2,341	25,646	3,693	254	1,248	6,988	379	0	42,590
All Rockfish Total Catch													
Estimate	0	18	22	74	163	386	368	79	98	277	165	0	1,650
Variance	0	177	541	2,024	2,979	27,679	3,281	254	4,030	8,462	379	0	49,806

[a] Derby held on 3-5 August 1990.

Appendix A5. Estimated salmon-hours of effort and chinook salmon harvests and catches for the Haines marine boat sport fishery, 23 April-21 June 1990.

	Estimate	Standard error[a]	Relative precision[b]
Salmon-hours of effort	11,972	1,169	20%
Harvests			
Large chinook salmon	241	57	47%
Small chinook salmon	25	8	60%
Catches			
Large chinook salmon	248	60	48%
Small chinook salmon	526	139	52%

[a] Estimates of both standard error and relative precision may be biased.
[b] Relative precision = (Standard error * 2 / Estimate) * 100.

Appendix A6. Estimated salmon-hours of effort and chinook salmon harvests and catches for the Haines marine boat sport fishery by biweek, 23 April-21 June 1990.

	Seasonal period					
	23APR90 - 06MAY90	07MAY90 - 20MAY90	21MAY90 - 03JUN90	04JUN90 - 17JUN90	18JUN90 - 21JUN90	Total
Salmon-hours Fished						
Estimate	309	2,104	5,563	3,552	445	11,972
Variance[a]	3,317	62,154	1,109,100	154,339	283,185	1,365,770
Large Chinook Harvested						
Estimate	2	2	138	89	9	241
Variance[a]	1	1	2,378	895	16	3,291
Large Chinook Total Catch						
Estimate	2	2	144	89	9	248
Variance[a]	1	1	2,723	895	16	3,635
Small Chinook Harvested						
Estimate	0	10	9	6	0	25
Variance[a]	0	24	14	22	0	60
Small Chinook Total Catch						
Estimate	0	13	339	171	3	526
Variance[a]	0	27	14,797	4,531	3	19,358

[a] Estimates of variance probably biased.

Appendix A7. Numbers of chinook salmon examined for coded-wire tags in Southeast Alaska marine sport fisheries in 1990.

		Large chinook[a]			Small chinook[b]		
Fishery	Seasonal period	Estimated harvest	Number sampled	Percent	Estimated harvest	Number sampled	Percent
Ketchikan	Non-derby 5/07-6/17	2,131	205	10	50	4	8
	Derby Entered[c]	551	551	100	0	0	---
	Derby Take Home[c]	1,116	144	13	52	4	8
	6/18-7/29	4,566	488	11	217	10	5
	7/30-9/23	1,117	98	9	69	3	4
	Total	9,481	1,486	16	388	21	5
Sitka	Derby Entered[d]	717	717	100	0	0	---
Juneau	4/23-6/17	2,670	326	12	66	6	9
	6/18-7/29	2,175	357	16	46	9	20
	Non-derby 7/30-9/23	885	164	19	183	12	7
	Derby Entered[e]	311	311	100	0	0	---
	Derby Take Home[e]	174	33	19	8	1	13
	Shelter Lodge	646	646	100	0	0	---
	Eagle Valley Lodge	170	170	100	1	1	100
	Total	7,031	2,007	29	304	29	10
Haines	4/23-6/22	241	69	29	25	6	24
Grand Total		17,470	4,279	24	717	56	8

[a] Chinook salmon at least 28 inches in total length.

[b] Chinook salmon less than 28 inches in total length.

[c] Derby held on weekends of 26-28 May, 2-3 June, and 9-10 June.

[d] Derby held on weekends of 26-28 May and 2-3 June.

[e] Derby held on 3-5 August weekend.

Appendix A8. Estimates of hatchery produced chinook salmon contributed to the Ketchikan marine sport fishery from 7 May to 23 September 1990.

Region	Agency[b]	Hatchery/ Release Site	Tag Code	Non-derby 5/07-6/17			Derby[a]			6/18-7/29			7/30-9/23			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]
Oregon	ODFW	Bonneville	07-40-38	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
		Trask	07-35-27	---	---	---	---	---	---	1	16	235	---	---	---	1	16	235
		Oregon Total		---	---	---	1	1	0	1	16	235	---	---	---	2	17	236
Washington	FWS	Makah NFH	05-19-07	---	---	---	1	6	27	---	---	---	---	---	---	1	6	27
	NMFS	Bonneville	23-21-43	---	---	---	---	---	---	1	8	59	---	---	---	1	8	59
			23-21-50	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
			23-25-11	1	11	118	---	---	---	---	---	---	---	---	---	1	11	118
	WDF	Priest Rapids	63-41-02	---	---	---	1	111	12,373	---	---	---	---	---	---	1	111	12,373
		Washington Total		1	11	118	3	118	12,400	1	8	59	---	---	---	5	138	12,577
British Columbia	CDFO	Kincolith CDP	02-48-24	1	11	115	---	---	---	---	---	---	---	---	---	1	11	115
		Kitimat River	02-36-35	---	---	---	1	10	81	---	---	---	---	---	---	1	10	81
			02-51-10	---	---	---	---	---	---	1	123	15,345	---	---	---	1	123	15,345
		Little Qualicum R	02-42-53	---	---	---	---	---	---	1	135	18,118	---	---	---	1	135	18,118
		Nitinat River	02-36-39	---	---	---	---	---	---	1	29	845	---	---	---	1	29	845
		Pallant Creek	02-41-62	---	---	---	1	8	61	---	---	---	---	---	---	1	8	61
		Puntledge River	02-41-03	---	---	---	1	3	5	---	---	---	---	---	---	1	3	5
			02-47-10	---	---	---	1	32	1,011	---	---	---	---	---	---	1	32	1,011
			02-47-14	---	---	---	---	---	---	1	99	9,781	---	---	---	1	99	9,781
		Robertson Creek	02-37-35	---	---	---	---	---	---	1	566	320,192	---	---	---	1	566	320,192
			02-43-11	---	---	---	---	---	---	---	---	---	1	182	35,456	1	182	35,456
			02-45-16	---	---	---	---	---	---	---	---	---	1	6	36	1	6	36
			02-46-44	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
			02-53-26	---	---	---	---	---	---	1	139	19,272	---	---	---	1	139	19,272
		Shuswap River	02-45-34	---	---	---	1	12	128	---	---	---	---	---	---	1	12	128
		British Columbia Total		1	11	115	6	66	1,287	6	1,092	383,554	2	188	35,492	15	1,357	420,447

-continued-

Appendix A8. (Page 2 of 2).

Region	Agency[b]	Hatchery/ Release Site	Tag Code	Non-derby 5/07-6/17			Derby[a]			6/18-7/29			7/30-9/23			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]
Southeast Alaska	ADFG	Crystal Lake	04-30-04	---	---	---	1	88	7,639	3	467	78,068	---	---	---	4	554	85,708
		Deer Mountain	04-25-35	1	11	122	---	---	---	1	10	100	---	---	---	2	22	222
			04-25-37	---	---	---	---	---	---	1	7	48	---	---	---	1	7	48
			04-25-38	---	---	---	1	2	2	1	7	48	---	---	---	2	9	50
			04-25-39	---	---	---	1	2	2	---	---	---	---	---	---	1	2	2
			04-27-54	1	17	279	1	25	584	---	---	---	---	---	---	2	42	862
	MIC	Tamgas Creek	47-16-31	---	---	---	1	9	77	---	---	---	---	---	---	1	9	77
			47-16-39	---	---	---	1	4	13	2	125	14,230	---	---	---	3	129	14,243
			47-16-42	---	---	---	---	---	---	1	163	26,384	---	---	---	1	163	26,384
	NMFS	Little Port Walter	03-20-01	1	11	115	---	---	---	---	---	---	---	---	---	1	11	115
	SSRAA	Carroll Inlet	04-26-26	1	78	6,041	4	60	840	3	322	37,687	---	---	---	8	460	44,567
			04-28-25	2	68	2,232	5	33	480	1	21	417	---	---	---	8	122	3,130
			04-31-01	1	106	11,142	6	322	30,243	3	279	29,207	1	112	12,597	11	819	83,189
			04-31-07	---	---	---	---	---	---	2	162	13,475	---	---	---	2	162	13,475
			04-31-41	---	---	---	---	---	---	1	161	---	---	---	---	1	161	---
			04-31-42	---	---	---	1	121	28,174	---	---	---	---	---	---	1	121	28,174
		Neets Bay	04-03-44	---	---	---	1	33	1,041	---	---	---	---	---	---	1	33	1,041
			04-03-45	---	---	---	2	151	17,959	---	---	---	---	---	---	2	151	17,959
			04-13-27	---	---	---	1	52	2,644	---	---	---	---	---	---	1	52	2,644
			04-13-30	---	---	---	1	386	148,708	---	---	---	---	---	---	1	386	148,708
			04-26-32	---	---	---	---	---	---	1	120	14,324	---	---	---	1	120	14,324
			04-31-02	1	96	9,220	---	---	---	---	---	---	---	---	---	1	96	9,220
			04-31-04	1	45	1,948	---	---	---	1	46	2,117	---	---	---	2	91	4,065
		Whitman Lake	04-03-29	---	---	---	---	---	---	1	22	486	---	---	---	1	22	486
			04-03-33	---	---	---	1	2	3	---	---	---	---	---	---	1	2	3
			04-03-47	---	---	---	---	---	---	1	7	46	---	---	---	1	7	46
			04-03-49	---	---	---	1	2	2	---	---	---	---	---	---	1	2	2
			04-13-31	---	---	---	---	---	---	1	47	2,183	---	---	---	1	47	2,183
			04-26-31	1	26	639	1	2	2	---	---	---	---	---	---	2	28	641
			04-31-08	5	141	5,583	9	69	1,306	15	380	14,321	3	91	2,220	32	681	23,430
Southeast Alaska Total				15	599	37,321	39	1,363	239,719	39	2,347	233,140	4	203	14,817	97	4,511	524,997
All Regions Grand Total				17	621	37,553	49	1,548	253,406	47	3,463	616,988	6	391	50,309	119	6,023	958,257

[a] Derby held on weekends of 26-28 May, 2-3 June, and 9-10 June.
[b] 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.
ADFG = Alaska Department of Fish and Game.
MIC = Metlakatla Indian Community.
SSRAA = Southern Southeast Regional Aquaculture Association.
[c] Recov = Number of fish recovered of noted tag code.
[d] Contr = Estimated harvest of the release of the noted tag code.
[e] Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix A9. Estimates of hatchery produced chinook salmon contributed to entered harvest of Sitka Salmon Derby, 26-28 May and 2-3 June 1990.

Region	Agency[a]	Hatchery Release Site	Tag Code	Recov[b]	Contr[c]	Var. of Contr[d]
Oregon	ODFW	Bonneville	07-36-36	1	1	0
			07-38-29	1	2	2
		Oregon Total		2	3	2
Washington	NMFS	Bonneville	23-21-01	1	1	0
			23-21-62	1	1	0
			23-22-06	1	1	0
	WDF	Humptulips	63-32-31	1	1	0
		Willapa	63-38-17	1	3	7
		Washington Total		5	7	7
British Columbia	CDFO	Conuma River	02-37-24	1	10	95
		Devereux Creek	02-40-16	1	1	0
		Kitimat River	02-36-34	1	5	20
		Nitinat River	02-36-37	2	148	10,875
			02-45-41	1	40	1,545
		Puntledge R.	02-46-63	1	3	5
			02-47-14	1	9	64
		Robertson Creek	02-42-57	1	51	2,589
			02-43-61	1	53	2,743
			02-43-63	1	57	3,155
			02-44-01	1	78	5,994
			02-45-16	1	1	0
			02-45-20	1	1	0
			02-46-44	4	4	0
			02-46-45	1	1	0
			02-46-47	1	1	0
			02-46-48	2	2	0
		Shuswap River	02-35-52	1	1	0
		Snootli Creek	02-36-43	2	2	0
		Terrace CDP	02-37-04	1	1	0
		British Columbia Total		26	469	27,085
Southeast Alaska	ADF&G	Crystal Lake	04-27-33	1	12	126
	NMFS	Little Port Walter	03-19-19	1	1	0
	NSRAA	Medvejie CIF	04-13-21	1	3	5
			04-23-39	1	3	4
			04-28-13	2	9	31
			04-28-14	1	4	16
	SSRAA	Carroll Inlet	04-26-26	1	15	197
		Neets Bay	04-03-42	1	21	419
			04-31-04	1	4	12
		Whitman Lake	04-03-29	2	4	5
		Southeast Alaska Total		12	76	816
		All Regions Grand Total		45	555	27,910

[a] ODFW = Oregon Department of Fish and Wildlife.
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.
NSRAA = Northern Southeast Regional Aquaculture Association
SSRAA = Southern Southeast Regional Aquaculture Association

[b] Recov = Number of fish recovered of noted tag code.

[c] Contr = Estimated harvest of the release of noted tag code.

[d] 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 23 April to 23 September 1990.

Region	Agency[b]	Hatchery/ Release Site	Tag Code	4/23-6/17			6/18-7/29			Non-derby 7/30-9/23			Derby[a]			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var.of Contr[e]
Oregon	ODFW	Bonneville	07-33-18	---	---	---	1	11	102	---	---	---	---	---	---	1	11	102
			07-36-34	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
			07-45-36	---	---	---	1	10	97	---	---	---	---	---	---	1	10	97
			07-47-25	---	---	---	1	5	27	---	---	---	---	---	---	1	5	27
		Marion Forks	07-49-62	---	---	---	1	5	22	---	---	---	---	---	---	1	5	22
		Oregon Total		---	---	---	4	31	249	---	---	---	1	1	0	5	32	249
British Columbia	CDFO	Devereux Creek	02-37-49	---	---	---	---	---	---	1	3	7	---	---	---	1	3	7
		Kitimat River	02-42-18	---	---	---	1	90	8,052	---	---	---	---	---	---	1	90	8,052
			02-42-21	---	---	---	1	2	3	---	---	---	---	---	---	1	2	3
			02-42-22	---	---	---	---	---	---	---	---	---	1	5	19	1	5	19
			02-51-51	---	---	---	1	225	50,820	---	---	---	---	---	---	1	225	50,820
		Pallant Creek	02-54-30	---	---	---	1	2	1	1	6	35	---	---	---	2	8	35
		Quinsam River	02-47-36	---	---	---	---	---	---	1	12	128	---	---	---	1	12	128
			02-58-19	---	---	---	---	---	---	1	41	2,625	---	---	---	1	41	2,625
		Tenderfoot Creek	02-53-44	---	---	---	1	8	56	---	---	---	---	---	---	1	8	56
		British Columbia Total		---	---	---	5	327	58,932	4	63	2,795	1	5	19	10	395	61,746
Southeast Alaska	ADF&G	Crystal Lake	04-27-31	---	---	---	---	---	---	1	31	936	---	---	---	1	31	936
			04-27-33	---	---	---	2	111	1,640	---	---	---	1	12	126	3	123	1,767
			04-27-37	---	---	---	---	---	---	1	34	1,780	---	---	---	1	34	1,780
			04-27-38	---	---	---	---	---	---	---	---	---	1	9	79	1	9	79
			04-29-60	---	---	---	2	96	6,300	---	---	---	1	18	295	3	113	6,595
			04-30-04	---	---	---	1	11	119	---	---	---	---	---	---	1	11	119
		Deer Mountain	83-14-08	---	---	---	---	---	---	---	---	---	1	4	9	1	4	9
		Hidden Falls	04-27-25	---	---	---	1	5	16	---	---	---	---	---	---	1	5	16
			04-28-28	---	---	---	1	2	3	2	14	90	---	---	---	3	16	93
			04-28-29	---	---	---	4	12	36	---	---	---	---	---	---	4	12	36
			04-28-63	---	---	---	1	10	93	1	6	34	1	1	0	3	17	127
			04-34-63	1	1	---	---	---	---	---	---	---	---	---	---	1	1	---
		Jerry Myers	04-27-59	---	---	---	---	---	---	1	4	16	---	---	---	1	4	16

-continued-

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Region	Agency[b]	Hatchery/ Release Site	Tag Code	4/23-6/17			6/18-7/29			Non-derby 7/30-9/23			Derby[a]			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var.of Contr[e]
Southeast Alaska (continued)	ADF&G (continued)	Snettisham	04-22-26	1	46	2,106	1	32	1,008	---	---	---	---	---	---	2	79	3,114
			04-26-01	---	---	---	1	46	2,742	---	---	---	1	1	0	2	47	2,742
			04-26-02	---	---	---	1	5	19	---	---	---	---	---	---	1	5	19
			04-26-05	1	5	27	---	---	---	---	---	---	---	---	---	1	5	27
			04-26-06	2	9	36	1	13	163	---	---	---	---	---	---	3	23	199
			04-26-07	---	---	---	1	1	0	---	---	---	2	2	0	3	3	0
			04-26-08	1	5	18	1	4	10	---	---	---	2	2	0	4	10	28
			04-26-12	---	---	---	1	17	276	---	---	---	---	---	---	1	17	276
			04-27-42	1	1	0	1	1	0	---	---	---	1	1	0	3	4	1
			04-27-43	---	---	---	1	7	40	---	---	---	1	2	2	2	9	42
			04-27-44	2	12	63	1	4	11	1	5	67	1	1	0	5	22	141
			04-27-45	1	7	40	4	12	40	---	---	---	1	1	0	6	20	80
			04-27-46	---	---	---	2	10	45	---	---	---	---	---	---	2	10	45
			04-27-48	4	30	225	4	24	161	1	33	---	4	5	1	13	92	387
			04-27-49	1	248	62,723	---	---	---	---	---	---	1	16	240	2	264	62,964
			04-27-50	2	6	23	1	4	16	---	---	---	---	---	---	3	10	39
			04-29-61	1	8	62	6	33	438	1	7	49	2	3	2	10	51	551
			04-29-62	1	24	557	2	15	101	3	21	166	2	11	77	8	71	902
			04-29-63	---	---	---	1	4	16	---	---	---	---	---	---	1	4	6
			04-30-01	---	---	---	---	---	---	1	11	101	---	---	---	1	11	101
			04-30-02	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
			04-30-03	---	---	---	1	12	168	---	---	---	---	---	---	1	12	168
			04-35-63	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
			04-36-63	---	---	---	1	4	16	1	5	24	---	---	---	2	10	39
			04-39-63	---	---	---	1	8	63	---	---	---	1	10	---	2	18	63
			04-47-63	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
			04-48-63	---	---	---	1	5	17	---	---	---	1	1	0	2	6	18
			04-51-63	1	7	49	---	---	---	---	---	---	---	---	---	1	7	49
			04-55-63	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
	MIC	Tamgas Creek	47-16-39	---	---	---	---	---	---	---	---	---	1	2	3	1	2	3
	NMFS	Little Port Walter	03-19-08	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
			03-19-58	---	---	---	---	---	---	---	---	---	1	1	0	1	1	0
			03-19-59	1	9	77	1	4	16	---	---	---	---	---	---	2	14	93
			03-19-61	---	---	---	---	---	---	1	10	75	---	---	---	1	10	175
			03-20-27	---	---	---	1	3	9	---	---	---	---	---	---	1	3	9
			03-20-30	---	---	---	1	9	82	---	---	---	---	---	---	1	9	82
			03-20-31	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
			03-20-34	---	---	---	---	---	---	1	1	---	1	1	---	2	2	---
			03-21-01	---	---	---	---	---	---	1	1	0	---	---	---	1	1	0
			03-21-08	---	---	---	1	3	9	---	---	---	1	1	---	2	4	9
			03-21-13	---	---	---	1	4	10	---	---	---	---	---	---	1	4	10
			03-21-14	---	---	---	1	4	10	2	34	1,150	---	---	---	3	38	1,160
			03-21-22	1	6	34	---	---	---	---	---	---	---	---	---	1	6	34
			03-21-32	---	---	---	---	---	---	1	5	---	---	---	---	1	5	---
			03-62-13	---	---	---	3	14	91	---	---	---	6	6	0	9	20	91
			03-62-14	---	---	---	5	19	107	---	---	---	---	---	---	5	19	107
			03-62-16	---	---	---	1	4	15	1	1	---	---	---	---	2	5	15
			03-62-19	---	---	---	1	3	9	2	7	30	1	1	---	4	11	39
			03-62-21	---	---	---	---	---	---	---	---	---	1	5	24	1	5	24
			03-62-22	---	---	---	1	4	10	---	---	---	1	1	0	2	5	10
			03-62-25	---	---	---	2	7	22	1	6	30	---	---	---	3	13	52
			03-62-26	1	7	40	---	---	---	---	---	---	---	---	---	1	7	40
			03-63-10	---	---	---	---	---	---	---	---	---	2	6	24	2	6	24
			03-63-11	---	---	---	---	---	---	2	9	36	---	---	---	2	9	36
			03-63-12	---	---	---	1	1	---	---	---	---	---	---	---	1	1	---
			03-63-13	---	---	---	1	1	---	---	---	---	---	---	---	1	1	---
			03-63-14	---	---	---	---	---	---	---	---	---	1	1	---	1	1	---
			03-63-15	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
			03-63-17	---	---	---	1	1	---	1	3	5	---	---	---	2	4	5

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Region	Agency[b]	Hatchery/ Release Site	Tag Code	4/23-6/17			6/18-7/29			Non-derby 7/30-9/23			Derby[a]			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var.of Contr[e]
Southeast Alaska (continued)	SSRAA	Carroll Inlet	04-31-01	---	---	---	1	42	1,713	1	9	81	1	9	81	3	61	1,874
			04-31-07	---	---	---	---	---	---	---	---	---	1	9	81	1	9	81
		Neets Bay	04-31-02	---	---	---	---	---	---	---	---	---	1	8	52	1	8	52
			04-31-04	1	88	7,728	---	---	---	---	---	---	---	---	---	1	88	7,728
		Whitman Lake	04-31-08	---	---	---	1	11	102	---	---	---	---	---	---	1	11	102
		Southeast Alaska Total		24	520	73,810	73	647	15,760	28	258	4,770	48	158	1,096	173	1,584	95,436
		All Regions Grand Total		24	520	73,810	82	1,006	74,941	32	321	7,565	50	164	1,115	188	2,011	157,431

[a] Derby held on 3-5 August weekend.

[b] ODFW = Oregon Department of Fish and Wildlife.
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.

[c] Recov = Number of fish recovered of noted tag code.

[d] Contr = Estimated harvest of the release of the noted tag code.

[e] Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix A11. Estimates of hatchery produced chinook salmon contributed to the Haines marine sport fishery from 23 April to 22 June 1990.

Region	Agency[a]	Hatchery/ Release Site	Tag Code	23 April - 22 June			Total		
				Recov[b]	Contr[c]	Var. of Contr[d]	Recov[b]	Contr[c]	Var. of Contr[d]
Southeast Alaska	ADF&G	Crystal Lake	B3-06-12	2	8	36	2	8	36
			B4-11-14	1	3	4	1	3	4
		Jerry Myers	04-30-11	1	3	5	1	3	5
		Snettisham	04-27-48	1	2	---	1	2	---
		Southeast Alaska Total		5	16	45	5	16	45
		All Regions Grand Total		5	16	45	5	16	45

[a] ADF&G = Alaska Department of Fish and Game.
[b] Recov = Number of fish recovered of noted tag code.
[c] Contr = Estimated harvest of the release of the noted tag code.
[d] Var. of Contr = Variance of estimated harvest of the release of noted tag code.

Appendix A12. Estimates of the number of wild coded-wire tagged chinook salmon contributed to the Ketchikan and Juneau marine sport fisheries from 23 April to 23 September 1990.

Sport Fishery	Agency[b]	Release Site	Tag Code	Non-derby 4/23-6/17			Derby[a]			6/18-7/29			7/30-9/23			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]
Ketchikan	ADFG	Chickamin River	04-29-38	---	---	---	1	1	0	---	---	---	---	---	---	1	1	0
		Unuk River	04-29-40	---	---	---	---	---	---	---	---	---	1	6	36	1	6	36
		Ketchikan Total		---	---	---	1	1	0	---	---	---	1	6	36	2	7	36
Juneau	ADFG	Tatsamenie R., B.C.	04-25-50	1	5	17	---	---	---	---	---	---	---	---	---	1	5	17
		Chickamin River	04-27-11	---	---	---	---	---	---	1	4	9	---	---	---	1	4	9
		Juneau Total		1	5	17	---	---	---	1	4	9	---	---	---	2	9	26
		All Fisheries Grand Total		1	5	17	1	1	0	1	4	9	1	6	36	4	16	62

[a] Derby held on weekends of 26-28 May, 2-3 June, and 9-10 June.
[b] ADFG = Alaska Department of Fish and Game.
[c] Recov = Number of fish sampled of noted tag code.
[d] Contr = Estimated number of recoveries of the noted tag code, not corrected for tagging fraction.
[e] Var. of Contr = Variance of estimated recoveries of the release of the noted tag code, not corrected for tagging fraction.

Appendix A13. Age composition of chinook salmon from selected Southeast Alaska sport fisheries, 1990.

Sport Fishery		Brood Year													Sample Size
		1988	1987		1986		1985			1984			1983		
		0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	0.5	1.4	2.3	1.5	2.4	
Ketchikan															
Males	n		1		2	3		3							9
	Percent		11.1		22.2	33.3		33.3							100
	SE[a]		11.1		14.7	16.7		16.7							
Females	n		1		1	4		4			2				12
	Percent		8.3		8.3	33.3		33.3			16.7				100
	SE[a]		8.3		8.3	14.2		14.2			11.2				
Total[b]	n		39		119	263	42	119			97	1	2	1	683
	Percent		5.7		17.4	38.5	6.1	17.4			14.2	0.1	0.3	0.1	100
	SE[a]		0.9		1.5	1.9	0.9	1.5			1.3	0.1	0.2	0.1	
Juneau															
Males	n		5		8	13	4	17			21		1		69
	Percent		7.2		11.6	18.8	5.8	24.6			30.4		1.4		100
	SE[a]		3.1		3.9	4.7	2.8	5.2			5.6		1.4		
Females	n		2		6	9	2	34	1		58	1	1	1	115
	Percent		1.7		5.2	7.8	1.7	29.6	0.9		50.4	0.9	0.9	0.9	100
	SE[a]		1.2		2.1	2.5	1.2	4.3	0.9		4.7	0.9	0.9	0.9	
Total[b]	n	1	22	2	52	112	15	125	3		131	1	4	1	469
	Percent	0.2	4.7	0.4	11.1	23.9	3.2	26.7	0.6		27.9	0.2	0.9	0.2	100
	SE[a]	0.2	1.0	0.3	1.5	2.0	0.8	2.0	0.4		2.1	0.2	0.4	0.2	

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Sport Fishery		Brood Year 1988	1987		1986		1985			1984			1983		Sample Size
		0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	0.5	1.4	2.3	1.5	2.4	
Juneau Derby															
Males	n		3		7	6	1	5			1				23
	Percent		13.0		30.4	26.1	4.3	21.7			4.3				100
	SE[a]		7.2		9.8	9.4	4.3	8.8			4.3				
Females	n		4		10	6	1	8			2				31
	Percent		12.9		32.3	19.4	3.2	25.8			6.5				100
	SE[a]		6.1		8.5	7.2	3.2	8.0			4.5				
Total[b]	n		11		30	31	4	21			3				100
	Percent		11.0		30.0	31.0	4.0	21.0			3.0				100
	SE[a]		3.1		4.6	4.6	2.0	4.1			1.7				
Haines															
Males	n					3		10			6				19
	Percent					15.8		52.6			31.6				100
	SE[a]					8.6		11.8			11.0				
Females	n				1	5	1	11			16				34
	Percent				2.9	14.7	2.9	32.4			47.1				100
	SE[a]				2.9	6.2	2.9	8.1			8.7				
Total[b]	n				1	8	1	21			22				53
	Percent				1.9	15.1	1.9	39.6			41.5				100
	SE[a]				1.9	5.0	1.9	6.8			6.8				

[a] Standard error in percent.
[b] Includes sexed and unsexed chinook salmon.

Appendix A14. Length at age in millimeters (from tip of snout to fork-of-tail), by sex, for chinook salmon from select Southeast Alaska sport fisheries, 1989.

Sport Fishery		Brood Year													Sample Size
		1988	1987		1986		1985			1984			1983		
		0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	0.5	1.4	2.3	1.5	2.4	
Ketchikan															
Males	Mean		700		925	743		907							
	SE				85	3		28							
	n		1		2	3		3							9
Females	Mean		750		790	703		881			1,022				
	SE					17		20			13				
	n		1		1	4		4			2				12
Total[a]	Mean		720		827	729	945	871			985	835	1,032	1,063	
	SE		8		8	3	14	7			7		57		
	n		38		119	261	42	119			96	1	2	1	679
Juneau															
Males	Mean		716		825	731	973	851			964		1,040		
	SE		12		28	12	66	20			15				
	n		5		8	13	4	17			21		1		69
Females	Mean		725		814	716	940	827	775		914	920	977	945	
	SE		15		37	17	25	13			7				
	n		2		6	9	2	34	1		58	1	1	1	115
Total[a]	Mean	425	708	502	800	708	937	815	763		923	920	979	945	
	SE		8	133	11	5	22	7	20		7		25		
	n	1	22	2	51	110	14	122	3		131	1	4	1	462

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Sport Fishery		Brood Year 1988	1987		1986		1985			1984			1983		Sample Size
		0.1	0.2	1.1	0.3	1.2	0.4	1.3	2.2	0.5	1.4	2.3	1.5	2.4	
Juneau Derby															
Males	Mean		678		803	747	855	881			840				
	SE		16		9	29		12							
	n		3		7	6	1	5			1				23
Females	Mean		699		790	712	940	808			927				
	SE		43		25	17		12			8				
	n		4		10	6	1	8			2				31
Total[a]	Mean		692		794	721	931	823			898				
	SE		17		11	9	26	12			29				
	n		10		30	31	4	21			3				99
Haines															
Males	Mean					675		865			992				
	SE					10		27			38				
	n					3		10			6				19
Females	Mean				760	637	965	836			970				
	SE					42		22			11				
	n				1	5	1	11			16				34
Total[a]	Mean				760	651	965	850			976				
	SE					26		17			13				
	n				1	8	1	21			22				53

[a] Includes sexed and unsexed chinook salmon.

Appendix A15. Numbers of coho salmon examined for coded-wire tags in the Ketchikan and Juneau marine sport fisheries in 1990.

Fishery	Seasonal period	Coho salmon		
		Estimated harvest	Number sampled	Percent
Ketchikan	4/23-7/29	6,711	756	11%
	7/30-9/23	26,950	2,965	11%
	Total	33,661	3,721	11%
Juneau	4/23-7/29	2,362	335	14%
	Non-derby 7/30-9/23	20,021	3,825	19%
	Derby Entered[a]	1,168	1,123	96%
	Derby Take Home[a]	746	157	21%
	Shelter Lodge	1,817	1,817	100%
	Eagle Valley Lodge	229	229	100%
	Total	26,343	7,486	28%
Grand Total		60,004	11,207	19%

[a] Derby held on weekend 3-5 August 1990.

Appendix A16. Estimates of hatchery produced coho salmon contributed to the Ketchikan marine sport fishery from 7 May to 23 September 1990.

Region	Agency[a]	Hatchery/ Release Site	Tag Code	5/07-7/29 Recov[b]	5/07-7/29 Contr[c]	5/07-7/29 Var. of Contr[d]	7/30-9/23 Recov[b]	7/30-9/23 Contr[c]	7/30-9/23 Var. of Contr[d]	Total Recov[b]	Total Contr[c]	Total Var. of Contr[d]
British Columbia	CDFO	Kispiox River	02-56-06	---	---	---	1	11	103	1	11	103
		Pallant Creek	02-55-48	1	28	747	---	---	---	1	28	747
		Terrace CDP	02-48-57	2	14	86	---	---	---	2	14	86
		Toboggan Creek	02-56-04	1	11	109	---	---	---	1	11	109
		British Columbia Total		4	52	942	1	11	103	5	63	1,045
Southeast Alaska	ADFG	Deer Mountain	04-30-23	8	320	27,771	4	124	4,191	12	444	31,961
			04-30-24	11	164	3,531	1	18	310	12	182	3,841
			04-30-25	4	85	1,903	1	21	445	5	107	2,348
	MIC	Tamgas Creek	47-16-06	---	---	---	3	282	26,514	3	282	26,514
	SSRAA	Nakat Inlet	04-30-50	---	---	---	2	60	1,733	2	60	1,733
			04-30-51	---	---	---	2	73	2,696	2	73	2,696
		Neets Bay	04-30-56	---	---	---	4	1,354	468,457	4	1,354	468,457
			04-30-57	1	918	842,845	4	1,989	1,032,967	5	2,906	1,875,811
			04-30-60	---	---	---	3	1,350	632,468	3	1,350	632,468
			04-30-61	---	---	---	2	708	260,215	2	708	260,215
			04-30-62	---	---	---	3	1,384	675,504	3	1,384	675,504
		Whitman Lake	04-30-54	---	---	---	3	352	43,847	3	352	43,847
			04-30-55	---	---	---	2	250	33,560	2	250	33,560
		Southeast Alaska Total		24	1,487	876,049	34	7,965	3,182,907	58	9,452	4,058,957
			Total	28	1,539	876,991	35	7,976	3,183,010	63	9,515	4,060,002

[a] CDFO = Canadian Department of Fisheries and Oceans.
ADFG = Alaska Department of Fish and Game.
SSRAA = Southern Southeast Regional Aquaculture Association.
MIC = Metlakatla Indian Community.
[b] Recov = Number of fish recovered of noted tag code.
[c] Contr = Estimated harvest of the release of the noted tag code.
[d] Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix A17. Estimates of hatchery produced coho salmon contributed to the Juneau marine sport fishery from 23 April to 23 September 1990.

Region	Agency[b]	Hatchery/ Release Site	Tag Code	4/23-7/29			Non-derby 7/30-9/23			Derby[a]			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]
Southeast	ADFG	Snettisham	04-29-49	---	---	---	3	33	345	---	---	---	3	33	345
			04-29-51	---	---	---	1	4	13	---	---	---	1	4	13
			04-31-53	1	8	57	5	72	1,304	2	12	90	8	92	1,451
			04-31-54	---	---	---	8	117	2,704	---	---	---	8	117	2,704
			04-31-55	---	---	---	14	138	2,535	---	---	---	14	138	2,535
			04-31-56	---	---	---	1	17	273	---	---	---	1	17	273
	DIPC	Gastineau	04-32-31	---	---	---	10	74	533	3	6	5	13	80	538
			Total	1	8	57	42	456	7,706	5	18	96	48	482	7,859

[a] Derby held on 3-5 August weekend.
[b] ADFG = Alaska Department of Fish and Game.
DIPC = Douglas Island Pink and Chum.
[c] Recov = Number of fish recovered of noted tag code.
[d] Contr = Estimated harvest of the release of the noted tag code.
[e] Var. of Contr = Variance of estimated harvest of the release of the noted tag code.

Appendix A18. Estimates of the number of wild coded-wire tagged coho salmon contributed to the Juneau marine sport fishery from 23 April to 23 September 1990.

Sport Fishery	Agency[b]	Release Site	Tag Code	Non-derby 4/23-9/23			Derby[a]			Total		
				Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]	Recov[c]	Contr[d]	Var. of Contr[e]
Juneau	CDFO	Taku Drainage	02-48-43	---	---	---	1	1	0	1	1	0
			02-56-24	1	6	34	1	1	0	2	7	34
			02-56-26	1	5	21	---	---	---	1	5	21
	ADFG	Auke Lake	04-28-54	12	57	340	---	---	---	12	57	340
		Berners River	04-29-26	4	24	197	---	---	---	4	24	197
			04-29-27	5	24	131				5	24	131
		Chilkoot Lake	04-28-26	1	4	10	---	---	---	1	4	10
		Dudidontu R. B.C.	04-26-45	2	5	12	---	---	---	2	5	12
		Tatsamenie L. B.C.	04-29-20	1	4	11	---	---	---	1	4	11
			04-29-21	1	4	10	---	---	---	1	4	10
		Yehring Creek	04-28-55	6	24	81	2	2	0	8	27	81
	NMFS	Taku Drainage	03-15-03	5	21	83	1	1	0	6	22	83
			Grand Total	39	178	930	5	5	0	44	183	930

[a] Derby held on 3-5 August weekend in Juneau.
[b] ADFG = Alaska Department of Fish and Game.
CDFO = Canadian Department of Fisheries and Oceans.
NMFS = National Marine Fisheries Service.
[c] Recov = Number of fish sampled of noted tag code.
[d] Contr = Estimated number of recoveries of the noted tag code, not corrected for tagging fraction.
[e] Var. of Contr = Variance of estimated recoveries of the release of the noted tag code, not corrected for tagging fraction.