Fishery Data Series No. 99-15

Harvest Estimates for Selected Marine Sport Fisheries in Southeast Alaska During 1998

by

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August 1999

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

FISHERY DATA SERIES NO. 99-15

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ABSTRACT

Creel surveys of the Juneau, Ketchikan, and Sitka marine sport fisheries for chinook salmon *Oncorhynchus tshawytscha* were conducted during 1998. Estimates from these surveys were necessary to provide data for inseason management of the chinook salmon sport fishery in Southeast Alaska to meet an allocation determined by the Alaska Board of Fisheries. The estimated harvest of chinook salmon was 27,114 in the combined Ketchikan, Sitka, and Juneau boat sport fisheries. Harvests of chinook salmon were less than half of the long-term average in the Ketchikan fishery, well below average in the Juneau fishery, and 178% of the long-term average in the Sitka fishery. Hatcheries in British Columbia, Washington, and Oregon produced about 37% of the monitored chinook salmon harvest, with an additional 13% of the total harvest of Alaska hatchery origin. Alaska hatcheries produced 49% of the chinook salmon harvest in Ketchikan, 37% in Juneau, and 4% in Sitka. Non-Alaskan hatcheries accounted for 45% of the chinook salmon harvest in Sitka and 31% of the harvest in Ketchikan, but produced only 2% in Juneau. Coded wire tag sampling in Petersburg, Wrangell, and Craig revealed that chinook salmon from Alaska hatcheries contributed about 8%, 14% and 1% of the harvest, respectively.

An estimated 82,313 coho salmon *Oncorhynchus kisutch*, 41,261 pink salmon *Oncorhynchus gorbuscha*, 34,618 Pacific halibut *Hippoglossus stenolepis*, and 15,674 rockfish *Sebastes* species, were also harvested in the combined Ketchikan, Juneau, and Sitka marine boat fisheries. Hatcheries produced 52%, 23% and 21% of the coho salmon harvest in Ketchikan, Juneau, and Sitka, respectively. The Pacific halibut harvest of 8,200 in Juneau was 71% of the long-term average, the Ketchikan harvest of 6,778 was 65% of average, and the Sitka harvest of 19,640 was the second highest recorded and 156% of the long-term average. Shellfish effort was above average in the Juneau fishery, but below average in the Ketchikan fishery. Dungeness crab *Cancer magister* harvest was below average in both Juneau and Ketchikan.

Key words: creel survey, angler effort and harvest, harvest per unit effort, age composition, length-at-age estimation, round weight, boat sport fishery, hatchery, enhancement, coded wire tag, chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *Oncorhynchus kisutch*, salmon, *Oncorhynchus*, Pacific halibut, *Hippoglossus stenolepis*, Dolly Varden, *Salvelinus malma*, lingcod, *Ophiodon elongatus,* rockfish, *Sebastes*, Dungeness crab, *Cancer magister*, Tanner crab, *Chionoecetes* species, king crab, *Paralithodes* species, shrimp, *Pandalus* species, Juneau, Ketchikan, Sitka, Petersburg, Wrangell, Craig, Southeast Alaska.

INTRODUCTION

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

Data on sport harvests of fish species in Southeast Alaska have been collected both by postal surveys and by various onsite creel surveys. The Statewide Harvest Survey (SWHS) is a postal survey which has provided annual estimates of sport effort and harvest by area since 1977 (Howe et al. 1998). This statewide survey has been an economical means of comprehensively monitoring often remote sport fisheries, and SWHS estimates are used for official regional and statewide sport harvests. The SWHS estimates, however, cannot be used directly for inseason management because estimates for a given year are not available until the following summer.

Estimates from onsite creel surveys can be used for inseason management and can also be used to gather a variety of other biological and fishery performance data. Creel surveys, however, are relatively expensive and usually less comprehensive than the SWHS. For instance, it is virtually impossible to survey all access points

into the sport fishery for chinook salmon *Oncorhynchus tshawytscha* in Southeast Alaska, which remains open year-round in nearly all marine waters. In fisheries where comparisons of harvest estimates from the SWHS and onsite creel surveys are possible, the two surveys have shown very similar results (Mills and Howe 1992).

Expansion of the onsite creel survey program in Southeast Alaska was necessary beginning in 1992 to monitor sport harvests of chinook salmon on an inseason basis. The Alaska Board of Fisheries allocated the Pacific Salmon Treaty catch quota for chinook salmon in Southeast Alaska between the sport and commercial fisheries in March of 1992. They also passed a chinook salmon management plan for the sport fishery in Southeast Alaska which required inseason monitoring of the sport fishery to ensure the allocation was not exceeded.

In order to monitor the entire Southeast Alaska chinook salmon fishery with adequate precision to ensure compliance with the sport fishery allocation, it was determined that creel surveys or catch sample programs were needed in the Ketchikan, Craig, Petersburg, Wrangell, Sitka, and Juneau boat fisheries during the major portion of the fishery for chinook salmon. In 1997, 90% of the total sport harvest of chinook salmon of Southeast Alaska occurred in the SWHS areas represented by these fisheries (Howe et al. 1998). Sport harvests in other SWHS areas (Haines/ Skagway, Glacier Bay, and Yakutat) were determined to be too small or too dispersed to be effectively monitored with onsite programs.

In addition to total harvest estimates for the sport fishery, estimates of the number of Alaska hatchery chinook salmon taken were also necessary since most of this harvest does not count toward the sport fishery allocation. Sampling of sport-harvested chinook salmon for coded wire tags by creel samplers was necessary to provide this information, as a portion of all hatchery releases of chinook salmon in Southeast Alaska are coded wire tagged. Several terminal sport fisheries for Alaska hatchery fish in the Petersburg and Juneau areas were not monitored with creel surveys, as these harvests do not count toward the sport allocation, and post-season estimates from the SWHS will be adequate to document harvests within these fisheries.

Inseason estimates of the harvest of chinook salmon for all of Southeast Alaska were obtained by combining information from past SWHS and onsite creel surveys. This report, however, will only present information from the onsite creel surveys conducted in 1998, because current estimates of total harvests will be revised when final SWHS estimates are completed.

Creel survey information from the marine boat sport fisheries is used for a variety of other management and reporting purposes. Coho salmon *Oncorhynchus kisutch* harvests by the boat sport fisheries are also of special interest, as coho salmon management has become another high priority within the region. 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 (see Shaul 1998). Analyses of coded wire tag data from coho salmon harvested in these sport fisheries are used for determinations of stock composition (e.g., McPherson et al. 1998).

Creel survey effort and harvest information on the Pacific halibut *Hippoglossus stenolepis* fishery is provided to the North Pacific Fisheries Management Council during their consideration of proposed changes to sport fishing regulations and in resolving allocation issues. Estimated average weight of sport-caught Pacific halibut in Southeast Alaska is reported to the International Pacific Halibut Commission (IPHC) on an annual basis as in Frenette and Suchanek (*Unpublished*).

The personal use or sport harvest of shellfish is a very important activity, both for residents of Southeast Alaska and for visitors to the region. Shellfish harvest information is gathered so that the Alaska Department of Fish and Game (ADF&G), in conjunction with the Alaska Board of Fisheries, will have the information necessary

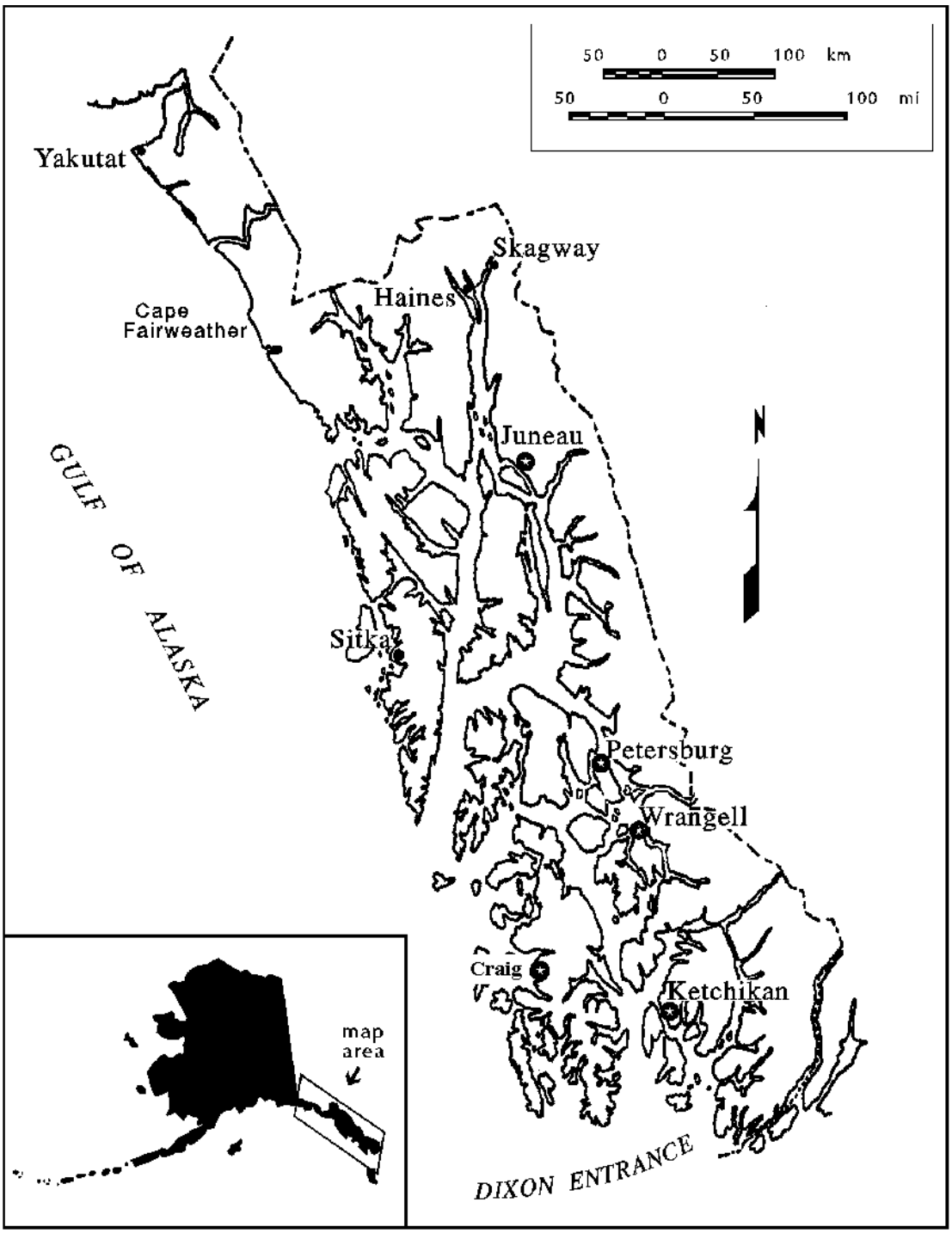

Figure 1.–Location of Juneau, Sitka, Petersburg, Wrangell, Ketchikan, and Craig in Southeast Alaska.

to effectively manage these fisheries. Data on the personal use and sport harvest of shellfish in Southeast Alaska have been gathered from onsite creel surveys since 1988.

This report presents the findings of creel surveys of marine boat sport fisheries conducted in 1998 by the Division of Sport Fish of ADF&G in the Ketchikan, Juneau, and Sitka areas. Also covered

are the results from coded wire tag sampling programs conducted at Petersburg, Wrangell, and Craig. Results from creel surveys in the Haines area and other sport fisheries in Southeast Alaska are presented in other ADF&G Fishery Data Series reports (e.g., Frenette 1998, Ericksen 1998).

REGULATIONS

The daily bag and possession limit in marine waters of two chinook salmon ≥28″ was increased by emergency order (E.O. #1-15-98) to three chinook salmon ≥28″ on 3 July 1998. This regulation was enacted to increase sport harvests to a management target of 41,700 treaty chinook salmon. When harvests were greater than expected, the bag limit was reduced to one chinook salmon ≥28″ (E.O. #1-24-98) from 9 September through 31 December 1998. There was an annual limit of four chinook salmon for nonresidents only, and charter vessel operators and crew members were prohibited from retaining king salmon while clients were on board. Filleting, mutilating, or heading sport caught chinook or coho salmon was prohibited at ports sampled by the creel program (E.O. #1-3-98) until marine sport boats reached the dock.

The following marine terminal areas (i.e., areas near hatcheries or hatchery release sites) were regulated by emergency orders to harvest surplus hatchery-produced chinook salmon:

- Emergency order (E.O.#1-6-98) increased the chinook salmon bag and possession limit to two ≥28″ and two <28″ in Wrangell Narrows terminal area near Petersburg from 1 June through 31 July 1998.
- Emergency order (E.O.#1-8-98) increased the chinook salmon bag and possession limit to two ≥28″ and two <28″ in terminal areas near Juneau from 6 June to 31 August 1998.
- Emergency order (E.O.#1-13-98) increased chinook salmon bag and possession limits to two ≥28″ and two <28″ for the Medvijie and Hidden Falls terminal areas near Sitka from 21 June through 31 July 1998.

Bag limits for salmon species other than chinook salmon were six fish per day, 12 in possession for fish 16″ or more in length .

The Pacific halibut bag limit was two fish per day, four in possession. The bag and possession limit for lingcod *Ophiodon elongatus* was two per day, four in possession during the open season from 1 May through 30 November. The lingcod bag limit for nonresidents in Sitka Sound was 1 per day, 2 in possession. New regulations also closed "the Pinnacles" off Mount Edgecumbe near Sitka to the taking of rockfish *Sebastes* and lingcod. Anglers were limited to five pelagic rockfish per day, 10 in possession, and five nonpelagic rockfish, 10 in possession. Only two of the nonpelagic rockfish per day (four in possession) could be yelloweye rockfish *Sebastes ruberrimus*. Areas adjacent to Ketchikan and Sitka were further restricted to a nonpelagic rockfish bag and possession limit of three fish per day, only one of which could be a yelloweye rockfish.

Sport, personal use, and subsistence regulations for the harvest of crab in Southeast Alaska have been summarized by Suchanek and Bingham (1989, 1990). A daily bag and possession limit of six male king crab *Paralithodes* was in effect with local exceptions of 2 males in the Yakutat area and in subdistrict 11-A near Juneau and 3 males in subdistricts 12-B and 15-C near Juneau. Also a harvest permit was required for subdistrict 11-A near Juneau which included an annual limit of 10 per individual and 20 per household. E.O.#1-C-22-98 closed several bays south of Juneau to the taking of king crab.

OBJECTIVES

The primary goals of the 1998 Southeast Alaska marine boat sport fishery surveys were to obtain: (1) inseason estimates of the regionwide harvest of chinook salmon; (2) estimates of the regionwide harvest of chinook salmon of Alaska hatchery origin; and (3) estimates of the harvest of coho salmon of Alaska hatchery origin in the Ketchikan, Sitka, and Juneau fisheries. To help measure program performance and achieve project goals, the following objectives were identified:

1. Estimate total sport harvest of chinook salmon landed in the Ketchikan, Sitka, and Juneau marine boat sport fisheries from 27 April to 27 September 1998, such that each individual estimate for the surveyed period was within ±20% of the true value 90% of the time;
2. estimate the contribution of Alaska hatchery chinook salmon by coded wire tag lot to each fishery noted above, such that the estimated contribution in relative terms[1] for each indi-vidual fishery was within ±25 percentage points of the true value 90% of the time;
3. estimate the percentages of Alaska hatchery chinook salmon by coded wire tag lot to the following marine boat sport fisheries during the noted time periods:
   - Wrangell from 27 April to 5 July
   - Petersburg from 4 May to 12 July
   - Craig from 27 April to 13 September

   such that the total relative contribution estimate was within ±25 percentage points of the true value 90% of the time;
4. estimate the contribution of Alaska hatchery coho salmon by coded wire tag lot to the Ketchikan, Sitka, and Juneau fisheries, such that the contribution estimate in relative terms for each individual fishery was within ±25 percentage points of the true value 90% of the time; and
5. estimate the percentages of Alaska hatchery coho salmon by coded wire tag lot to the Craig fishery, such that the total relative contribution estimate was within ±25 percentage points of the true value 90% of the time.

TASKS

In addition to meeting the primary objectives for monitoring the chinook and coho salmon fisheries (discussed above), there were a number of tasks that addressed secondary data needs. To fulfill these data needs, additional tasks in 1998 included:

1. estimating biweekly harvest per unit effort (HPUE) for coho salmon in the Juneau, Sitka, and Ketchikan marine boat sport fisheries during the periods surveyed;
2. estimating total sport angler effort, harvest and catch of coho salmon, pink salmon *O. gorbuscha*, chum salmon *O. keta*, sockeye salmon *O. nerka*, Pacific halibut, lingcod, rockfish, and Dolly Varden *Salvelinus malma* by the Juneau, Ketchikan, and Sitka marine boat sport fisheries during the periods surveyed;
3. estimating personal use effort and harvest of Dungeness crab *Cancer magister*, Tanner crab *Chionoecetes* spp., and king crab in the Juneau and Ketchikan marine boat sport fisheries during the periods surveyed, and of shrimp landed by the Ketchikan marine boat fishery;
4. estimating the age composition and mean length-at-age of chinook salmon harvested in the Juneau and Ketchikan marine boat sport fisheries during the periods surveyed; and
5. estimating average weights of Pacific halibut harvested in the Juneau, Sitka, and Ketchikan marine boat sport fisheries during the periods surveyed.

METHODS

Procedures for obtaining estimates associated with each of the study objectives were similar for each of the surveyed locations. The following sections detail procedures that were common to multiple surveys. Site-specific differences in procedures are outlined in later sections of this report.

ONSITE CREEL SURVEY ANGLER EFFORT, CATCH, AND HARVEST ESTIMATES

Direct expansion creel surveys were conducted of the Ketchikan, Sitka, and Juneau marine boat sport fisheries. The harvest of chinook salmon by sport anglers was estimated from information collected via stratified random multistage sample

[1] Contribution in relative terms equals the contribution estimate divided by total harvest.

surveys. Strata were defined according to unique combinations of biweekly periods, type of day (e.g., weekday vs. weekend-holiday), time of day (early vs. late) and, in some instances, derby versus non-derby periods.

Two general sampling designs were used within each stratum. For the Ketchikan and Juneau surveys, a three-stage sample survey was conducted. Within any stratum for these two surveys, days to sample represented the first sampling stage, and were selected at random without replacement (WOR). The various access locations at which marine boat sport anglers land their harvested fish represented the second sampling stage. As such, within any selected day within each stratum, at least two harbors were selected at random WOR for surveying. During each sampled day, a creel technician attempted to interview all exiting boat-parties[2] at each of the selected access locations during the sampled days within each stratum. If all boat-parties could not be interviewed, any missed boat-parties were counted. Boat-parties represented the third sampling stage in these three-stage surveys.

A four-stage sample survey was conducted at Sitka. For this survey, access locations to sample represented the first sampling stage, with days within each stratum at each sampled location representing the second stage sampling units. Periods within the sampling day represented the third sampling stage. At some sites and for some strata, only one sampling period existed; for these strata at any sampled day-location combination, the entire period was sampled. Minimally, two periods were sampled for each day-location combination for strata with more than one period per sampling day. Finally, boat-parties to interview represented the fourth sampling stage units in this survey.

The sampling designs for the surveys conducted in Juneau and Ketchikan were essentially equivalent to the surveys conducted in previous years at these locations (see Hubartt et al. 1993, 1994, 1995, 1996, 1997, 1998). One important access location, Clover Pass Resort near Ketchikan, could not be sampled because of access problems.

The survey at Sitka represented a slight restructuring compared to the survey conducted at this location in 1994 but was the same as surveys in 1995, 1996 and 1997. In Sitka the "type of day" stratum and the definition of sampling day were modified. The reasons for continuing to use the restructured survey in Sitka were primarily directed at obtaining unbiased estimates of angler effort, catch, and harvest in the most efficient manner possible.

Data collected from each interviewed boat-party included number of rods fished, hours fished, trip type (guided or unguided), number of days fished in trip, location fished, target (e.g., salmon, bottomfish, crab or shrimp), and number of fish kept and/or released by species. Crab effort (boat-days fished and number of pots or rings fished) and harvest was recorded in Juneau and Ketchikan. In Ketchikan, numbers of shrimp harvested were also recorded in multiples of 10. All data-recording procedures were outlined in detail in site-specific Creel Technician Manuals, and computer data files and analysis programs are listed in Appendix C1.

Estimates of harvested chinook salmon at each of the three surveyed marine boat sport fisheries were calculated according to standard direct expansion equations for stratified multistage sampling designs (Appendices A1 and A2). Mean harvest of boat-parties interviewed during a sample was expanded by the number of boat-parties counted exiting the fishery during each sample to obtain the estimates for each sample. Means across sample periods were similarly expanded by the number of periods within a sampling day to obtain the estimates at a sampled access location for the four-stage surveys. Means across days within a sampled location were then expanded by the number of possible days, to obtain the location estimate of catch, effort, or harvest for the four-stage surveys. Finally, across-location means were expanded by the number of access locations in a stratum to obtain the stratum estimates. Across-stratum estimates of harvest were obtained by

[2] A boat-party is defined as all sport anglers from one boat exiting a fishery at an access location.

summation across strata. Estimates were obtained similarly for the three-stage designs, with appropriate reordering of calculations.

Estimates of harvest of other species by surveyed boat anglers were estimated similarly. Additionally, estimates of the total catch (caught and released as well as caught and kept) of all species of interest were calculated in a similar manner.

Biweekly Estimates of Coho Salmon Harvest Per Unit Effort

Data collected during creel surveys of the Ketchikan, Juneau and Sitka marine boat sport fisheries were used to calculate mean biweekly coho salmon harvest per unit effort (HPUE) of boat anglers in harvest per angler-hour. Harvest instead of total catch was used, because relatively few coho salmon were released, and those salmon released may not have been correctly identified to species. Estimates obtained by these procedures were indicative of the abundance of coho salmon (L. D. Shaul, Alaska Department of Fish and Game, Douglas, personal communication). Mean HPUE from these fisheries was considered to be an index of abundance under the traditional linear model:

$$hpue_k = qN + \varepsilon_k \qquad (1)$$

where $hpue_k$ is the harvest per unit of effort during the k^{th} angler-trip, N is the abundance of fish, q is the catchability coefficient, and ε is a random error with mean equal to zero and variance equal to σ^2.

In this case, each angler-trip was considered a separate, replicated sample in a test fishery.

All boat-parties interviewed within each biweek surveyed at each location were treated as equally weighted test samples (i.e., ignoring strata and sampling stages). HPUE in terms of coho salmon harvested per angler-hour of effort was estimated for each biweek using procedures outlined in Appendix A3.

Hatchery Contribution Estimates

Creel technicians attempted to inspect each harvested chinook and coho salmon for a missing adipose fin indicating the probable presence of an internal coded wire tag (CWT). Catches of chinook salmon and coho salmon checked for clipped adipose fins were recorded as "sampled," while catches not checked were recorded as "not sampled." Numbers of chinook and coho salmon inspected for a clipped adipose fin were recorded, and heads from salmon with clipped adipose fins were collected and identified with a uniquely numbered cinch strap. These heads were forwarded to the ADF&G Commercial Fisheries (CF) Division coded wire tag laboratory for eventual dissection, tag removal, and decoding.

Information from the sampling programs as well as the coastwide coded wire tag database was used to estimate the contributions of both Alaskan and non-Alaskan hatchery chinook salmon according to procedures described by Bernard and Clark (1996). Since not all hatchery releases from Oregon, Washington, and Idaho are coded wire tagged, the estimates of non-Alaskan contributions should be considered as minimal estimates.

The contribution of chinook and coho salmon with a particular tag code to the marine fisheries surveyed was estimated using procedures outlined in Appendix A4, which essentially followed the approach proposed by Bernard and Clark (1996).

Additional Coded Wire Tag Sampling

Technicians sampled for clipped adipose fins on chinook and coho salmon taken by boat parties returning to Wrangell harbors from 27 April through 15 June, Petersburg harbors from 4 May through 12 July, and Craig harbors from 27 April through 13 September. Some additional sampling for adipose-clipped fish was also conducted in Ketchikan from 23 May to 27 September, and in Juneau from 30 April through 13 September. Specific equations for estimating the relative contributions of hatchery stocks in Wrangell, Petersburg, and Craig are detailed in Appendix A4.

AGE, LENGTH, AND WEIGHT ESTIMATES

Estimates of Chinook Salmon Age Composition and Mean Length-at-age

As time permitted, harvested chinook salmon were sampled for scales for age determination. Four scales were taken from the preferred area (Welander 1940 and INPFC 1958) of each chinook salmon sampled. Scales were then mounted on gum cards, and impressions were made in cellulose acetate (Clutter and Whitesel 1956). The ages were determined by reading the scales using procedures from Olsen (1995). Lengths in millimeters (tip of snout to fork of tail) of these chinook salmon were also recorded.

For the estimation of age composition and mean length-at-age, all data collected from harvested chinook salmon within each of these fisheries were treated as one sample (i.e., ignoring internal stratification and sampling stages). Age composition estimates were calculated from the sample data using the procedures outlined in Cochran (1977). Estimates of mean length by age group of chinook salmon sampled from the harvest were calculated following procedures outlined by Sokal and Rohlf (1981). Each survey's entire sample was used in an unweighted fashion to obtain the length-at-age statistics.

Pacific Halibut Harvest by Weight

As time permitted, Pacific halibut landed by boat anglers interviewed were sampled by recording total lengths in millimeters. To obtain repre-sentative samples, creel survey personnel were instructed to measure all halibut in the creel and not to record data from any parties who had already cleaned part of their harvest. Procedures outlined by Quinn et al. (1983) were used to convert length of each Pacific halibut sampled to round weight in pounds. The mean round weight of the sampled halibut was then multiplied by harvest to estimate total weight by fishery.

ASSUMPTIONS

The assumptions necessary for estimates of angler effort, catch, harvest, and HPUE from these surveys to be unbiased were:

1. Anglers accurately reported their hours of fishing effort and the number by species of fish harvested and released.
2. No significant number of boat-parties returned between evening civil twilight (i.e., ½ hour after sunset) and the beginning of early-day surveys, or at access locations other than those surveyed (this assumption was violated in Ketchikan in 1997 and 1998 because a major access location, Clover Pass, refused access to staff).

In addition to the above assumptions, the following conditions must be met for unbiased estimates of contributions of CWT stocks to the harvest:

3. Relative contributions of different stocks of salmon associated with a CWT release lot to the harvest did not vary appreciably within a biweekly period, or that fish were sampled proportionally throughout the biweekly period.

Similarly, the following assumptions are necessary for unbiased estimates of length-at-age and age composition:

4. Length-at-age and age composition did not vary substantially within the sampling season, or sampling was proportional to harvest throughout the season.
5. Measured fish were representative of the entire harvest.

RESULTS

Detailed tables presenting total estimates of finfish effort, harvest, and catch for all species monitored in the Juneau, Sitka, and Ketchikan areas, as well as shellfish effort and harvest, can be found in Appendices B1 through B3. Appendices B4 through B6 present biweekly and total estimates and variances for effort, harvest, and catch for all species monitored for each boat fishery surveyed. Summary data from catch

sampling programs are presented in Appendices B7 (Petersburg), B8 (Wrangell), and B9 (Craig).

ANGLER EFFORT

An estimated 705,110 (SE = 23,786) angler-hours of effort were expended in the Ketchikan, Sitka, and Juneau marine boat sport fisheries during the time periods sampled (Table 1). Eighty percent of the total effort in angler-hours was targeted on salmon in Ketchikan, 75% in Juneau, and 71% in Sitka. In 1998, total effort in Ketchikan and Sitka was 69% and 68%, respectively, of that expended in Juneau.

Bottomfish (primarily Pacific halibut) were the other major target of anglers. Major salmon derbies in Ketchikan, Juneau, and Sitka increased the amount of effort targeted on salmon, as 13%, 19%, and 12% of the total salmon fishing effort, respectively, occurred during these short time periods.

CHINOOK SALMON FISHERIES

An estimated 27,114 chinook salmon (SE = 1,451) were harvested in the Ketchikan, Sitka, and Juneau marine boat sport fisheries (Table 2). Relative precisions of the estimated chinook salmon harvests were within our goal of ± 20% of

Table 1.–Summary of estimated total and derby angler effort by target for the Ketchikan, Sitka, and Juneau marine boat sport fisheries during 1998.

		TOTAL EFFORT BY TARGET AND TIME PERIOD			
		Ketchikan[a] 4/27–9/27	Juneau 4/27–9/27	Sitka 4/27–9/27	Total
Boat-hours		77,022	116,200	68,316	261,538
	SE	4,404	6,336	2,980	8,272
Salmon-hours		163,855	221,598	144,850	530,303
	SE	11,459	14,565	6,895	19,774
Bottomfish-hours[b]		41,194	75,288	57,378	173,860
	SE	3,456	5,552	4,077	7,706
Angler-hours[c]		205,063	297,229	202,818	705,110
	SE	12,871	17,461	9,760	23,786
% salmon-hours[d]		80%	75%	71%	75%

		DERBY EFFORT BY TARGET AND TIME PERIOD			
		Ketchikan[a] 5/23–25, 5/30, 5/31, 6/06–07	Juneau 8/21–23	Sitka 5/23–25, 5/30-31	Total
Boat-hours		10,091	15,005	7,963	33,059
	SE	1,305	3,239	861	3,596
Salmon-hours		21,211	41,036	17,962	80,209
	SE	2,565	9,847	1,842	10,341
Bottomfish-hours		2,668	1,324	1,712	5,704
	SE	343	230	319	522
Angler-hours		23,880	42,385	19,673	85,938
	SE	2,833	10,023	1,752	10,562
% of total salmon fishery[e]		13%	19%	12%	15%

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] Includes hours fished for Pacific halibut, rockfish, and other bottomfish.

[c] Includes all targeted and non-targeted effort.

[d] (salmon-hours/total angler-hours) * 100.

[e] (derby salmon-hours/total salmon-hours) * 100.

Table 2.–Summary of estimated harvests of chinook salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed during 1998.

CHINOOK SALMON HARVESTS

Sport fishery	Time period	Harvest of chinook ≥28″	Harvest of chinook <28″	Combined	SE	Relative precision ($\alpha = 0.10$)
Ketchikan[a]	4/27–9/27	2,052	20	2,072	182	14%
Juneau	4/27–9/27	3,847	281	4,128	299	12%
Sitka	4/27–9/27	20,848	66	20,914	1,408	11%
Total		26,747	367	27,114	1,451	9%

DERBY CHINOOK SALMON HARVESTS

		Chinook ≥28″		Chinook <28″		Total harvested		
Major salmon derbies	Time period	Entered	Total[b]	Entered	Total[b]	Number	SE	%[c]
Ketchikan King Salmon Derby	5/23–25, 5/30, 5/31, 6/06–07	269	294	0	0	294	10	14
Juneau Golden North Salmon Derby	8/21–8/23	327	406	0	3	409	29	10
Sitka Salmon Derby	5/23–25, 5/30-31	1,037	2,359	0	0	2,359	191	11
Petersburg Salmon Derby[d]	5/22–5/25	222		0				

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] Includes entered and take-home harvests.

[c] (total derby harvest/total area harvest) * 100.

[d] Number taken home was not estimated.

the true value 90% of the time at all locations. About 77% (20,914) of the monitored harvest of chinook salmon was taken in the Sitka fishery, the Juneau fishery accounted for an additional 15% of the harvest, and 8% was taken in the Ketchikan fishery. Most chinook salmon harvested were at least 28″ in length, but an estimated 367 small (<28″) chinook salmon were also harvested.

Harvest of chinook salmon during the Ketchikan King Salmon Derby constituted 14% of the total chinook salmon harvest in the Ketchikan marine fishery, and 10% of the chinook salmon harvest in the Juneau marine boat sport fishery was taken during the Juneau Golden North Salmon Derby (Table 2). In Sitka, 11% of the total chinook salmon harvest was taken during the Sitka Salmon Derby and 1,037 chinook were entered in the derby. Anglers entered a total of 1,633 chinook salmon in the Ketchikan, Juneau and Sitka derbies from a harvest of 3,073 fish during the derby time periods. In the Petersburg Salmon Derby, 222 chinook salmon were entered.

About 28% of the estimated harvest of chinook salmon in the Ketchikan boat fishery was sampled for coded wire tags (Appendix B10); 33% of the estimated harvest of chinook salmon was sampled in the Juneau boat fishery, and 29% in Sitka.

An estimated 13% of chinook salmon harvested in the Ketchikan, Sitka, and Juneau marine boat fisheries were of Alaska hatchery origin (Table 3). The contribution estimates for Alaska hatchery chinook salmon were within ±25 percentage points

Table 3.–Contributions of hatchery chinook salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1998.

	Marine boat sport fishery			
Region or hatchery	Juneau (4/27–9/27)	Ketchikan[a] (4/27–9/27)	Sitka (4/27–9/27)	**Total**
Oregon	49	0	226	275
Washington	0	5	720	725
British Columbia	49	628	8,481	9,158
Non-Alaskan total	98	633	9,427	10,158
SE	55	376	1,232	1,289
Alaska				
Big Boulder instream	2	0	0	2
Carroll Inlet	0	612	38	650
Crystal Lake	83	0	50	133
Crystal Lake/Earl West Cove	44	70	0	114
Deer Mountain	0	77	0	77
Gastineau	1,050	0	0	1,050
Hidden Falls	105	0	83	188
Jerry Myers	3	0	0	3
Little Port Walter	64	0	4	68
Medvejie	0	0	638	638
Neets Bay	9	0	43	52
Snettisham	147	0	0	147
Tamgas Creek	0	11	19	30
Whitman Lake	2	244	0	246
Alaskan total	1,509	1,014	875	3,398
SE	207	234	220	382
Relative precision (%)[b]	8	19	2	2
Total all areas	1,607	1,647	10,302	13,556
SE	216	443	1,279	1,371
Relative precision (%)[b]	9	35	10	8
Chinook salmon harvest	4,128	2,072	20,914	27,114
SE	299	182	1,408	1,451
% Alaska hatchery	37	49	4	13
% total hatchery	39	79	49	50

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] ((SE * 1.645) / total harvest) * 100, $\alpha = 0.10$.

points of the true value 90% of the time at all locations (Table 3). Relative precision of Alaska hatchery contribution estimates at all sites ranged from 2% to 19%. Large numbers of hatchery fish also originated in British Columbia, Washington, and Oregon, and, in aggregate, 50% of the chinook salmon harvested in these three fisheries originated in hatcheries.

Four percent of the harvest of chinook salmon in Sitka came from Alaska hatcheries, and the overall hatchery contribution was 49% of the harvest. Most Alaska hatchery chinook salmon harvested in Sitka were produced at the Medvejie hatchery. In Ketchikan, 49% of the harvest of chinook salmon was from Alaska hatcheries, and the overall hatchery contribution to the Ketchikan fishery totaled 79%. Most of the Alaska hatchery chinook salmon taken in Ketchikan originated from Whitman Lake and Carroll Inlet (release site only) hatcheries. About 37% of the chinook salmon harvest in the Juneau boat fishery was of Alaska hatchery origin. Most of the Alaska hatchery fish taken in Juneau came from the Gastineau, Snettisham, Crystal Lake, Little Port Walter, and Hidden Falls hatcheries.

Detailed hatchery contribution estimates by tag code appear in appendices for the Ketchikan fishery (Appendix B11), Juneau fishery (Appendix B12), and the Sitka fishery (Appendix B13).

In the Petersburg marine boat sport fishery, 389 chinook salmon were examined for clipped adipose fins, and about 14% of the sampled fish came from hatcheries with about 8% from Alaska hatcheries (Appendix B14). The Crystal Lake hatchery was the largest contributor to the Petersburg harvest. About 14% of the 140 chinook salmon sampled from the Wrangell marine boat sport fishery came from Alaska hatcheries and 21% were from all hatcheries combined (Appendix B15). Overall, 50% of the 1,310 chinook salmon sampled in Craig came from hatcheries, but the only Alaska hatchery contributors were Little Port Walter and Neets Bay (Appendix B16).

In total, 1,734 chinook salmon were successfully aged from the six fisheries sampled (Table 4; Appendix B17). About 48% of chinook salmon sampled lacked a freshwater annulus (age-0.), which usually indicates non-Alaskan origin (Van Alen 1988). Saltwater ages varied considerably; an estimated 100% of the chinook salmon harvested during the Juneau Golden North Salmon Derby were age-.3 or less, whereas only 17% of chinook salmon sampled in the Petersburg fishery were age-.3 or less. The sampled harvest across all surveyed fisheries consisted of 44% males and 56% females. Mean length-at-age of sampled chinook salmon varied only slightly among the fisheries surveyed (Appendix B18). In general, fish of a given age were smaller in Juneau than in the other fisheries.

Table 4.–Summary of the age composition of chinook salmon sampled in selected marine sport fisheries in Southeast Alaska during 1998.

	FRESHWATER AGE COMPOSITION				
	----------Age 0.----------		**--------Age 1. or more--------**		
Sport fishery	Sample size	Percent	Sample size	Percent	Total sampled
Ketchikan	67	27	178	73	245
Juneau non-derby	15	4	336	96	351
Juneau Derby[a]	2	5	41	95	43
Sitka	693	80	176	20	869
Petersburg	13	12	100	88	113
Wrangell	0	0	56	100	56
Craig	36	63	21	37	57
Total	826	48	908	52	1,734

	SALTWATER AGE COMPOSITION				
	---------Age .3 or less---------		**--------Age .4 or more--------**		
Sport fishery	Sample size	Percent	Sample size	Percent	Total sampled
Ketchikan	187	76	58	24	245
Juneau non-derby	192	55	159	45	351
Juneau Derby[a]	43	100	0	0	43
Sitka	528	61	341	39	869
Petersburg	19	17	94	83	113
Wrangell	25	45	31	55	56
Craig	33	58	24	42	57
Total	1,027	59	707	41	1,734

[a] Juneau Golden North Salmon Derby.

COHO SALMON FISHERIES

Harvests of coho salmon in the Ketchikan, Sitka, and Juneau fisheries totaled an estimated 82,313 fish (SE = 5,209) (Table 5). The only monitored derby in which coho salmon were heavily targeted was the Juneau Golden North Salmon Derby, and an estimated 4,419 coho salmon (SE = 409) were taken during this event (Appendix B2).

Harvests of hatchery coho salmon were estimated from an overall sample of 33% of the coho salmon harvest (Appendix B19). Estimates of coho salmon hatchery contributions by tag code and time period are presented in Appendix B20 for the Ketchikan fishery, Appendix B21 for the Juneau fishery, and Appendix B22 for the Sitka fishery. An estimated 24,958 (SE = 2,332) hatchery coho salmon were taken in the combined Ketchikan, Sitka, and Juneau fisheries (Table 6).

Hatchery contributions ranged from 21% in Sitka to 23% in Juneau and 52% in Ketchikan. A few hatchery coho salmon taken in Sitka and Ketchikan originated in British Columbia hatcheries. The Neets Bay hatchery contributed the most coho salmon to the Ketchikan fishery, while Gastineau contributed the most coho salmon to the Juneau fishery, and Medvejie, Neets Bay, and Tamgas Creek hatcheries were the major contributors in Sitka. About 6% of the 2,630 coho salmon examined for clipped adipose fins from the Craig marine boat sport fishery were from Alaska hatcheries (Appendix B23). Sixteen coho salmon were sampled in Petersburg, but none were sampled in Wrangell. Additionally, some recoveries of coho salmon from wild stocks were obtained in the Ketchikan, Juneau, Sitka, and Craig fisheries (Appendices B20, B21, B22, B23). Contributions of these wild-tagged stocks were estimated only when an estimate of the tagging fraction, θ_c, was available (Appendix A4).

The biweekly harvest per unit of effort (HPUE) for coho salmon in the Ketchikan, Juneau, and Sitka fisheries reached highs of 0.406 (SE = 0.024), 0.204 (SE = 0.020), and 0.463 (SE = 0.027) coho salmon, respectively, per angler-hour of effort (Table 7). The peak in HPUE for coho salmon occurred in early September in Ketchikan and Juneau and in August in Sitka.

Table 5.–Summary of estimated catch and harvest of coho salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed 27 April–27 September 1998.

Sport fishery	TOTAL CATCH		TOTAL HARVEST		
	Estimate	SE	Estimate	SE	% retained
Ketchikan[a]	26,300	3,022	24,059	2,778	91
Juneau	16,139	1,968	15,730	1,905	97
Sitka	44,973	4,059	42,524	3,972	95
TOTAL	87,412	5,429	82,313	5,209	94

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Sitka and Ketchikan anglers experienced higher HPUEs for coho salmon than did Juneau anglers for much of the season.

BOTTOMFISH FISHERIES

Most bottomfish effort in Southeast Alaska targets on Pacific halibut, and an estimated 34,618 (SE = 2,046) halibut were harvested in Ketchikan, Sitka, and Juneau (Table 8). Estimated average round weight of harvested Pacific halibut ranged from 21.8 pounds in Ketchikan to 53.4 pounds in the Petersburg and Wrangell areas (Table 9). About 1,087,000 pounds of Pacific halibut were taken in Ketchikan, Sitka, and Juneau, and about 71% of this poundage was landed in Sitka. Although rockfish are not a primary target of most Southeast Alaska sport anglers, an estimated 41,030 (SE = 2,285) rockfish were caught in the combined Ketchikan, Sitka, and Juneau fisheries (Table 8). Only 38% (15,674, SE = 1,014) of the rockfish caught were retained. Retention in Juneau, where few rockfish were caught, was higher, at 57%.

Major species composition of the rockfish harvest was estimated for the Ketchikan and Sitka fisheries (Table 10). Yelloweye rockfish composed 46% of the harvest in both Ketchikan and Sitka. Quillback rockfish *S. maliger* (28%) were the next most frequently taken species in

Table 6.–Contributions of hatchery coho salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1998.

Region or hatchery		Marine boat sport fishery: Juneau (4/27–9/27)	Ketchikan[a] (4/27–9/27)	Sitka (4/27–9/27)	Total
British Columbia		0	25	92	117
Non-Alaskan total		0	25	92	117
	SE	0	12	29	32
Alaska					
Crystal Lake/Earl West Cove		0	0	210	210
Deer Mountain		0	542	4	546
Fort Richardson		0	0	17	17
Gastineau		3,267	0	105	3,372
Gunnuk Creek		0	0	14	14
Hidden Falls		329	0	630	959
Jerry Myers		1	0	0	1
Medvejie		0	0	3,083	3,083
Medvejie CIF		0	0	51	51
Nakat Inlet		0	151	158	309
Neets Bay		0	10,086	2,998	13,084
Port Armstrong		0	224	260	484
Sheldon Chinson		0	0	26	26
Tamgas Creek		0	752	1,050	1,802
Whitman Lake		0	675	208	883
Alaskan total		3,597	12,430	8,814	24,841
	SE	583	1,920	1,183	2,329
Relative precision[b]		6	13	5	5
Total all areas		3,597	12,455	8,906	24,958
	SE	583	1,920	1,188	2,332
Relative precision[b]		6	13	5	5
Coho salmon harvest		15,730	24,059	42,524	82,313
	SE	1,905	2,778	3,972	5,209
% Alaska hatchery		23	52	21	30
% total hatchery		23	52	21	30

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] ((SE ∗ 1.645) / total harvest) ∗ 100, $\alpha = 0.10$.

Ketchikan, whereas black rockfish *S. melanops* (24%) were second in harvest frequency in Sitka. Other species in the sport harvest included copper *S. caurinus*, dusky *S. ciliatus*, and silvergrey *S. brevispinis* rockfish, along with a variety of other unidentified species. An estimated 3,777 (SE = 395) lingcod were harvested in Sitka, and 452 (SE = 91) in Ketchikan (Table 8).

OTHER SALMONID FISHERIES

Although not usually primary targets, other salmonids such as pink, chum, and sockeye salmon, and Dolly Varden were harvested in Ketchikan, Sitka and Juneau (Table 11). Pink salmon were abundant in Ketchikan, as the estimated harvest totaled 32,740 (SE = 8,198). Only 3,114 (SE = 464) pink salmon were harvested in Juneau. Retention rates for pink salmon were 58% in Juneau, 44% in Sitka, and 70% in Ketchikan. Harvests of both chum and sockeye salmon were much less, totaling 8,697 chum salmon and 603 sockeye salmon for the three fisheries combined. About 90% of the 345 Dolly Varden harvested were taken by Juneau anglers.

Table 7.–Harvest per unit effort (HPUE) for coho salmon (harvest per angler-hour of effort) by biweekly period in the Ketchikan, Juneau, and Sitka marine boat sport fisheries during 1998.

Seasonal period	HARVEST OF COHO SALMON PER ANGLER-HOUR OF EFFORT [a]					
	Ketchikan[b]		Juneau		Sitka	
	HPUE	SE	HPUE	SE	HPUE	SE
5/25–6/07	0.000	0.000	0.000	0.000	0.000	0.000
6/08–6/21	0.002	0.001	0.000	0.000	0.002	0.001
6/22–7/05	0.022	0.004	0.002	0.001	0.021	0.005
7/06–7/19	0.052	0.009	0.015	0.003	0.255	0.027
7/20–8/02	0.078	0.014	0.039	0.009	0.404	0.047
8/03–8/16	0.102	0.014	0.126	0.013	0.463	0.027
8/17–8/30	0.163	0.021	0.189	0.023	0.459	0.044
8/31–9/13	0.406	0.024	0.204	0.020	0.388	0.080
9/14–9/27	0.355	0.024	0.135	0.026	0.137	0.042
All periods	0.164	0.007	0.047	0.003	0.217	0.011

[a] Does not include derby effort or harvest.

[b] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 8.–Summary of estimated catch and harvest of Pacific halibut, rockfish, and lingcod in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed 27 April–27 September 1998.

	Sport fishery	Total catch	SE	Harvest	SE	% retained
Pacific halibut	Ketchikan[a]	9,113	1,219	6,778	780	74
	Juneau	10,398	1,061	8,200	802	79
	Sitka	29,344	2,635	19,640	1,713	67
	Total	48,855	3,091	34,618	2,046	71
Rockfish	Ketchikan[a]	10,828	856	3,864	352	36
	Juneau	1,163	296	659	106	57
	Sitka	29,039	2,098	11,151	945	38
	Total	41,030	2,285	15,674	1,014	38
Lingcod	Ketchikan[a]	907	193	452	91	50
	Juneau	69	45	45	27	65
	Sitka	4,567	425	3,777	395	83
	Total	5,543	469	4,274	406	77

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 9.–Average length, round weight, and total round weight of Pacific halibut harvested in sampled Southeast Alaska marine boat sport fisheries during 1998.

Sport fishery	Survey period	Sample size	Total length		Average round weight (lb)	Estimated number harvested	Estimated total round weight (thousand lb)
			Mean (cm)	SE (cm)			
Ketchikan[a]	4/27-9/27	302	88.0	1.0	21.8	6,778	147.8
Juneau	4/27–9/27	767	95.3	0.7	28.1	8,200	230.4
Sitka	4/27–9/27	407	101.8	1.4	39.2	19,640	770.0
Petersburg/ Wrangell	5/04–7/19/ 4/27–6/15	114	114.4	2.7	53.4		
Craig	4/27–9/13	97	93.3	2.6	29.0		
All areas combined		1,687	96.8	0.6	31.4	34,618	1,087.0

[a] Ketchikan harvest estimate is biased low because a major access site (Clover Pass) was not sampled.

Table 10.–Rockfish species composition in the Ketchikan and Sitka marine boat sport fisheries during 1998. (An estimated 659 rockfish harvested in the Juneau marine boat sport fishery were not identified by individual species .)

	Ketchikan[a]		Sitka	
Rockfish species	Harvest[b]	%	Harvest[b]	%
Quillback	1,068	27.6	628	5.6
Dusky	281	7.3	111	1.0
Copper	239	6.2	219	2.0
Black	63	1.6	2,662	23.8
Yelloweye	1,770	45.8	5,190	46.4
Silvergrey	55	1.4	301	2.7
Other nonpelagic	216	5.6	171	1.5
Other pelagic	174	4.5	1,902	17.0

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] The unidentified rockfish harvest was allocated to species by expanding the appropriate percentage of harvest in the identified harvest to the total harvest.

SHELLFISH FISHERIES

Shellfish effort and harvests of Dungeness, Tanner, and king crab were estimated for Ketchikan and Juneau (Table 12). Shellfish effort in boat-days for the Juneau fishery was 5,551 boat-days—more than seven times that estimated for the Ketchikan fishery (743 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 no king crab and only a few Tanner crab were taken in the Ketchikan area. Shrimp harvest was recorded only in Ketchikan (99,680 shrimp, SE = 10,266).

Table 11.–Summary of estimated total catch and harvest of pink salmon, chum salmon, sockeye salmon, and Dolly Varden in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed 27 April–27 September 1998.

	Sport fishery	Total catch	SE	Harvest	SE	% retained
Pink salmon	Ketchikan[a]	46,873	10,618	32,740	8,198	70
	Juneau	5,397	901	3,114	464	58
	Sitka	12,411	1,631	5,407	816	44
	Total	64,681	10,780	41,261	8,251	64
Chum salmon	Ketchikan[a]	8,440	1,684	7,130	1,419	84
	Juneau	576	68	480	60	83
	Sitka	1,351	181	1,087	147	80
	Total	10,367	1,695	8,697	1,428	84
Sockeye salmon	Ketchikan[a]	20	11	20	11	100
	Juneau	42	20	42	20	100
	Sitka	562	183	541	175	96
	Total	624	184	603	177	97
Dolly Varden	Ketchikan[a]	35	24	17	15	49
	Juneau	532	95	309	70	58
	Sitka	477	307	19	15	4
	Total	1,044	322	345	73	33

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 12.–Estimated shellfish effort in boat-days, and harvest of Dungeness crab, king crab, Tanner crab and shrimp in the Ketchikan and Juneau marine boat fisheries, 27 April – 27 September 1998.

Sport fishery	Effort		Harvest			
	Boat-days	SE	Dungeness crab	Tanner crab	King crab	Shrimp
Ketchikan[a]	743	99	4,190	210	0	99,680
Juneau[b]	5,551	370	8,112	768	5,310	
Total	6,294	382	12,302	978	5,310	99,680

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

[b] Shrimp harvest not estimated in Juneau.

DISCUSSION

Onsite creel surveys provide data necessary for inseason management, and they also can provide detailed fishery performance and biological information which is difficult to obtain with postal surveys.

For inseason management, the usefulness of onsite surveys lies in their consistency of method and coverage, so that inseason estimates can be compared with the Statewide Harvest Survey (SWHS) and onsite creel estimates from previous years. Because the Clover Pass access location was not sampled in the Ketchikan fishery during 1998 (as in 1997), it is known that estimates were biased low in comparison to previous surveys. The probable bias could have ranged up to 40%, but was more likely in the range of 20%. Therefore, in comparisons with past Ketchikan creel surveys, estimates are going to be highly affected by the bias in the 1997 and 1998 estimates.

Effort, harvest and total catch estimates from the three creel surveys reported here should not be considered to encompass all these three fisheries. Overall statistics are best estimated by the SWHS (Howe et al. 1998). Estimates for chinook salmon in the Juneau and Ketchikan fisheries are incomplete because there were no surveys of: (1) harvests occurring outside of the survey periods; (2) private moorages on the road system or remote moorages, docks, or lodges inaccessible from the road system; (3) the night period from the end of civil twilight to the beginning of surveys at about 0800 hr; and (4) boat parties which are not sampled due to being missed by creel samplers. As previously discussed, omission of the Clover Pass access location in Ketchikan during 1998 had the largest impact. Mills and Howe (1992) reported that SWHS estimates were generally about 10% higher than creel survey estimates for comparable surveys from the same geographic areas in Southeast Alaska.

Onsite 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; Suchanek and Bingham 1989, 1990, 1991, 1992; and Hubartt et al. 1993, 1994, 1995, 1996, 1997, 1998). These reports also present results from other surveys which have been done more sporadically. The Ketchikan fishery has been monitored for the entire spring and summer season since 1984, except for a one-year hiatus in 1985. The Sitka fishery was not surveyed in 1990, 1991, or prior to 1986, but was surveyed in the spring in 1986 and 1989, and for most of the season (April or

May through August or September) in 1987-1988 and 1992-1998. The Petersburg and Wrangell fisheries were not surveyed in 1990 or 1991, but were consistently surveyed in the spring from 1983–1989 and during 1992-1994; and in Petersburg in 1995. Additional catch sampling results are presented in these reports for Wrangell from 1995-1997, Petersburg from 1996-1997, and Craig from 1993-1997.

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

Angler Effort

Angler-hours of fishing effort in the Juneau and Ketchikan marine fisheries have been relatively stable or declining for the past few years while effort in the Sitka fishery has been generally increasing (Table 13; Figure 2). Total effort in the Juneau fishery during 1998 was 3% lower than in 1997, and 16% lower than the 1983–1997 average of 354,272 angler-hours. In Ketchikan, total 1998 effort was up 3% from 1997, but 19% below the 1984–1997 average of 253,962 angler-hours. This apparent decline may have been due entirely to the failure to sample Clover Pass. Effort in the Sitka fishery dropped slightly, as total effort during 1998 was 2% lower than in 1997 but 44% higher than the 1987–1997 average.

Estimated effort for both salmon and bottomfish was below average in Juneau and Ketchikan in 1998 (Table 13; Figure 2). In Juneau, 75% of the 1998 effort targeted salmon, while 80% of Ketchikan effort targeted salmon, both slightly below average. In the Sitka fishery, salmon effort and bottomfishing effort were above average by 46% and 39%, respectively.

Chinook Salmon Fisheries

Total harvest of chinook salmon in the Juneau marine boat fishery has shown little trend since 1983, whereas the Ketchikan harvest increased to a peak in 1991 and has since steadily declined to l6% of the 1991 peak with the 1998 harvest as the lowest since 1984 (Table 14, Figure 3).

The Juneau harvest of 4,128 chinook salmon was the lowest harvest recorded since 1978 (Marriott et al. 1979).

Chinook harvests in the Sitka fishery have been generally increasing. The 1998 Sitka harvest of 20,914 was 19% lower than the record sport harvest of 1997, but 78% above average.

Hatchery contributions of chinook salmon to the Juneau and Ketchikan fisheries increased steadily during the late 1980s but have remained fairly consistent since about 1990 (Figure 4; Table 15). An estimated 39% of the 1998 chinook salmon harvest in Juneau originated in hatcheries, compared to the 1983–1997 average of 25%. Harvests of Alaska hatchery chinook salmon are of higher value, because these fish do not count toward U.S./Canada Pacific Salmon Treaty catch totals. An estimated 49% of the 1998 chinook salmon harvest in Ketchikan originated in Alaskan hatcheries, a percentage substantially higher than the average of 35%. In Ketchikan, an estimated 79% of the 1998 harvest originated in hatcheries, in comparison to the average of 47%. The 1998 estimated hatchery percentage of 79% is the highest ever measured during Southeast Alaska creel surveys.

Table 13.–Estimated angler effort in the Juneau, Ketchikan and Sitka marine boat sport fisheries as determined by onsite 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
	1990	4/23-9/23	300,167	78	83,106	22	383,976
	1991	4/15-9/29	324,788	82	69,475	18	394,275
	1992	4/27-9/27	301,588	78	84,718	22	388,498
	1993	4/26-9/26	270,838	77	78,820	23	349,965
	1994	4/25-9/25	320,385	83	63,398	16	384,528
	1995	4/24-9/24	265,923	81	60,158	18	326,807
	1996	4/22-9/22	287,481	81	67,555	19	355,381
	1997	4/28-9/28	226,921	74	78,435	26	305,097
	Average		276,011	78	77,851	22	354,272
	1998	4/27-9/27	221,598	75	75,288	25	297,229
	% of average		80		97		84
Ketchikan	1984	4/29-9/29	161,100	72	62,625	28	223,725
	1985	----------no comparable survey----------					
	1986	4/28-9/28	133,518	72	51,208	28	184,726
	1987	4/20-9/27	157,306	65	84,954	35	242,274
	1988	4/11-9/25	153,086	68	71,611	32	225,779
	1989	4/24-9/24	195,974	71	79,958	29	276,516
	1990	5/07-9/23	199,063	80	49,347	20	248,618
	1991	4/29-9/29	275,856	80	67,842	20	343,698
	1992	4/27-9/27	192,269	73	69,366	27	261,635
	1993	4/26-9/26	198,960	72	78,002	28	276,969
	1994	4/25-9/25	230,372	80	56,092	20	286,464
	1995	4/24-9/24	175,765	63	101,381	37	277,146
	1996	5/6-10/6	188,947	74	62,673	25	253,977
	1997[a]	4/28-9/28	144,735	72	55,242	28	199,977
	Average		185,150	73	68,485	27	253,962
	1998[a]	4/27-9/27	163,855	80	41,194	20	205,063
	% of average		88		60		81
Sitka	1987	4/20-9/13	33,130	56	24,266	41	58,814
	1988	4/11-9/25	35,763	65	18,493	34	54,766
	1989	----------no comparable survey----------					
	1990	no survey					
	1991	no survey					
	1992	5/11-8/30	74,183	64	40,756	35	115,031
	1993	4/26-9/26	107,184	71	44,480	29	151,829
	1994	4/25-9/25	123,971	74	43,363	26	168,146
	1995	4/24-9/24	135,866	72	51,710	28	188,000
	1996	4/22-9/22	136,585	75	45,075	25	182,513
	1997	4/28-9/28	145,114	70	61,711	30	207,288
	Average		98,975	70	41,232	29	140,798
	1998	4/27-9/27	144,850	71	57,378	28	202,818
	% of average		146		139		144

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

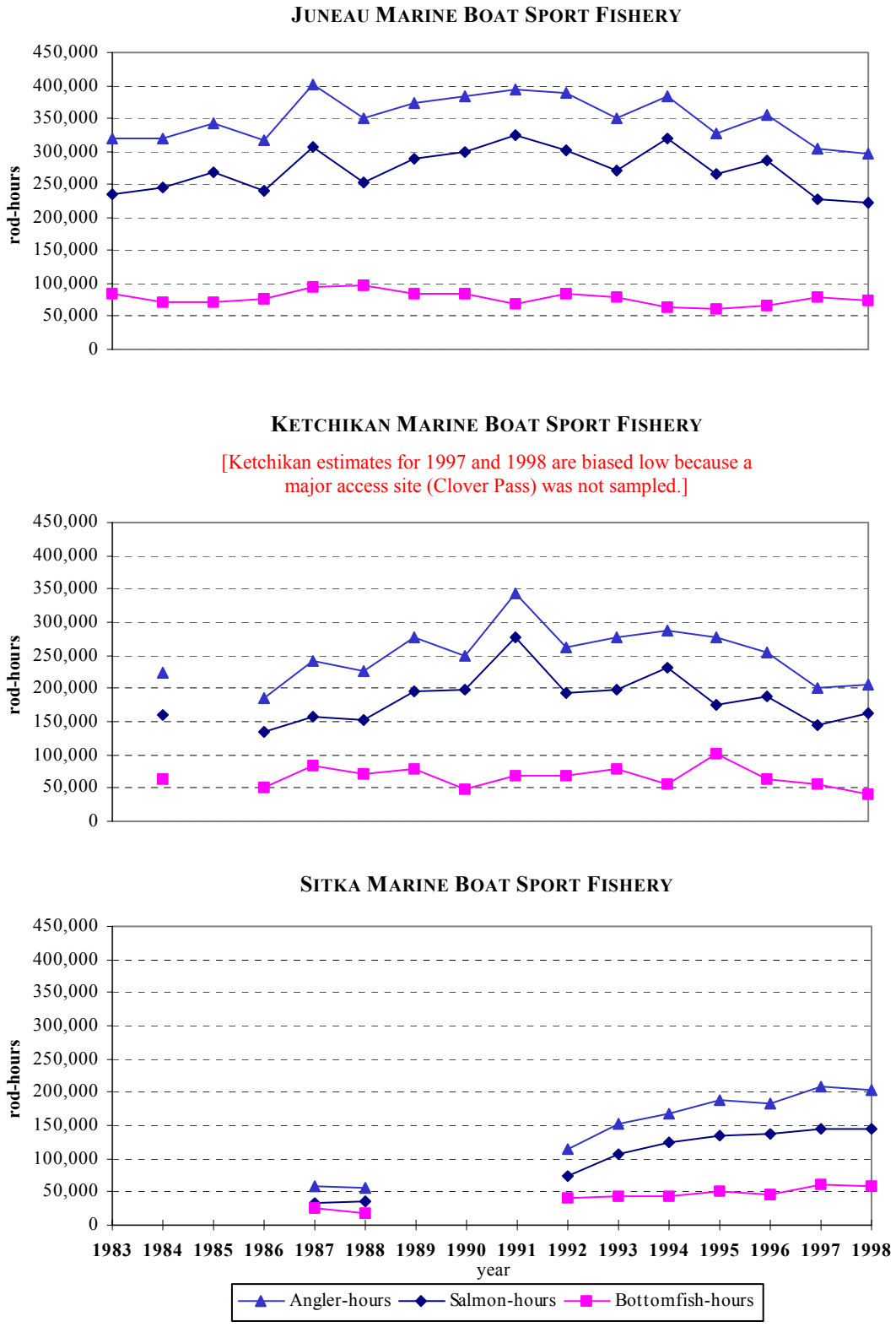

Figure 2.–Estimated effort in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.

Table 14.–Estimated harvest of chinook salmon in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.

Year	Juneau marine[a]	Juneau Golden North Derby	Ketchikan marine	Sitka marine
1983	4,316	872		
1984	6,474	855	1,820	
1985	8,133	1,222		
1986	5,050	1,073	5,006	
1987	8,893	1,005	4,723	2,466
1988	5,683	677	5,245	3,177
1989	7,074	609	5,752	
1990	7,335	493	9,869	
1991	12,234	522	12,730	
1992	7,114	603	5,670	9,588
1993	8,337	243	5,277	13,779
1994	5,819	678	3,374	13,139
1995	6,371	334	3,499	16,048
1996	8,464	784	2,931	10,078
1997[b]	7,952	472	3,245	25,850
Average	7,283	696	5,319	11,766
1998[b]	4,128	409	2,072	20,914
% of average	57	59	39	178

[a] Includes Juneau Golden North Salmon Derby harvest.

[b] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

In Sitka, a higher proportion of chinook salmon originate in non-Alaska hatcheries than in Ketchikan or Juneau (Table 15; Figure 4). In 1998, the total hatchery percentage of 49% in Sitka was about average, but the Alaska hatchery percentage of 4% was well below average.

COHO SALMON FISHERIES

The 1998 harvest of 24,059 coho salmon in the Ketchikan area was 4% above the average of 23,148 (Table 16), and the Juneau area harvest of coho salmon (15,730) was 20% below the average of 19,661. The Juneau Golden North Salmon derby harvest of 4,419 coho salmon was 58% above the average of 2,793. The Sitka area harvest of 42,524 coho salmon was nearly triple the average, and was the highest recorded harvest for this fishery.

Harvests of coho salmon are being increasingly supplemented in the Juneau, Ketchikan and Sitka areas by hatchery contributions (Table 17). The relative contribution (23% of total harvest) of hatchery coho salmon in Juneau was the highest recorded. The Ketchikan fishery has been much more dependent upon hatchery coho salmon than has the Juneau fishery. About 34% of the 1984–1997 Ketchikan harvest originated in hatcheries (Table 17). The estimated harvest of 12,455 hatchery coho salmon in 1998 was above average, but in terms of the percent of harvest (52%), this hatchery contribution was the highest ever recorded. The contribution of hatchery-produced coho salmon to the Sitka fishery (8,906) was also the highest recorded, and above average as well in terms of percent of harvest (21%).

BOTTOMFISH FISHERIES

The 1998 harvest of Pacific halibut in the Juneau fishery (8,200) was 29% below the 1983–1997 average of 11,542 (Table 18). The record low

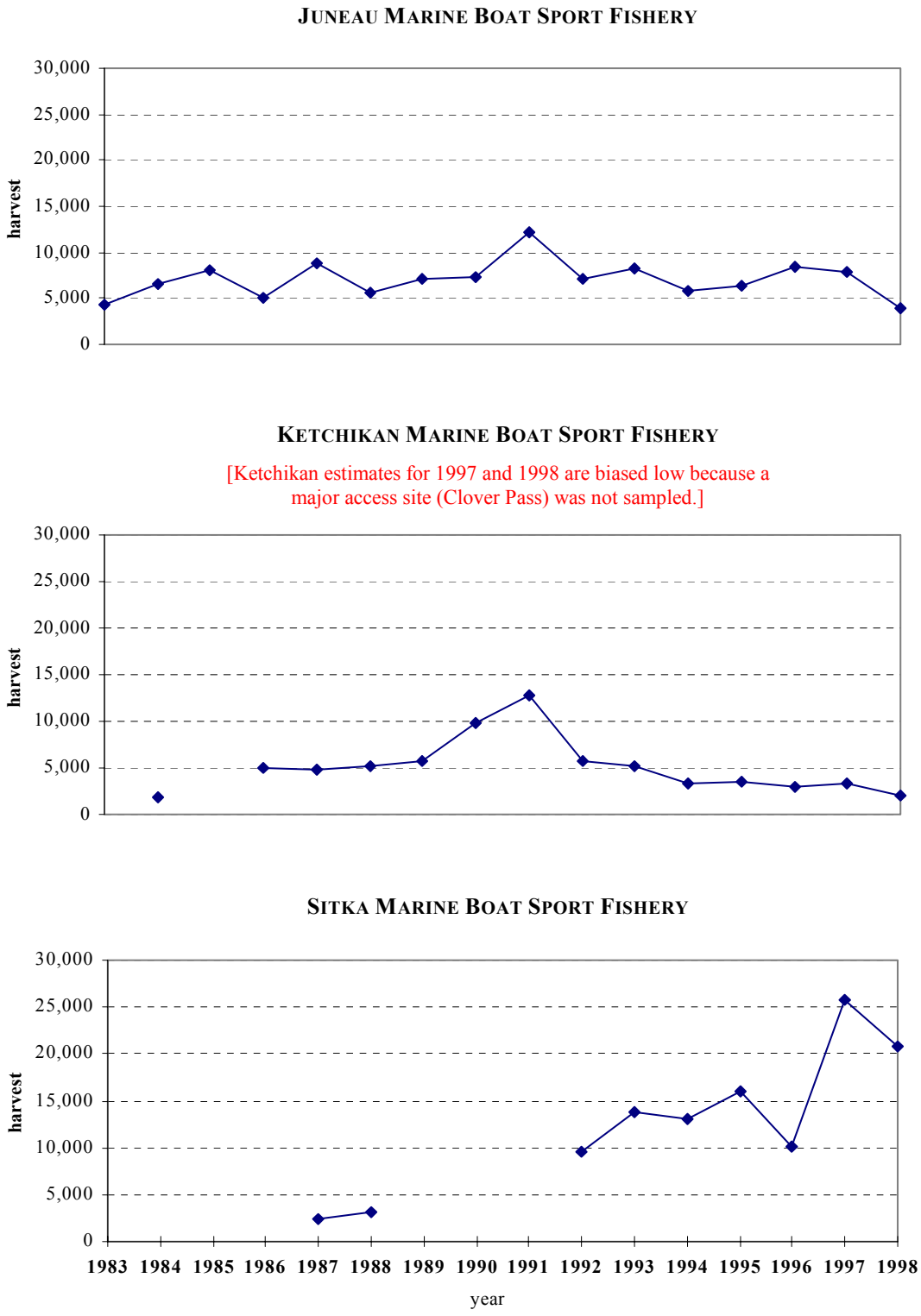

Figure 3.–Estimated harvest of chinook salmon in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.

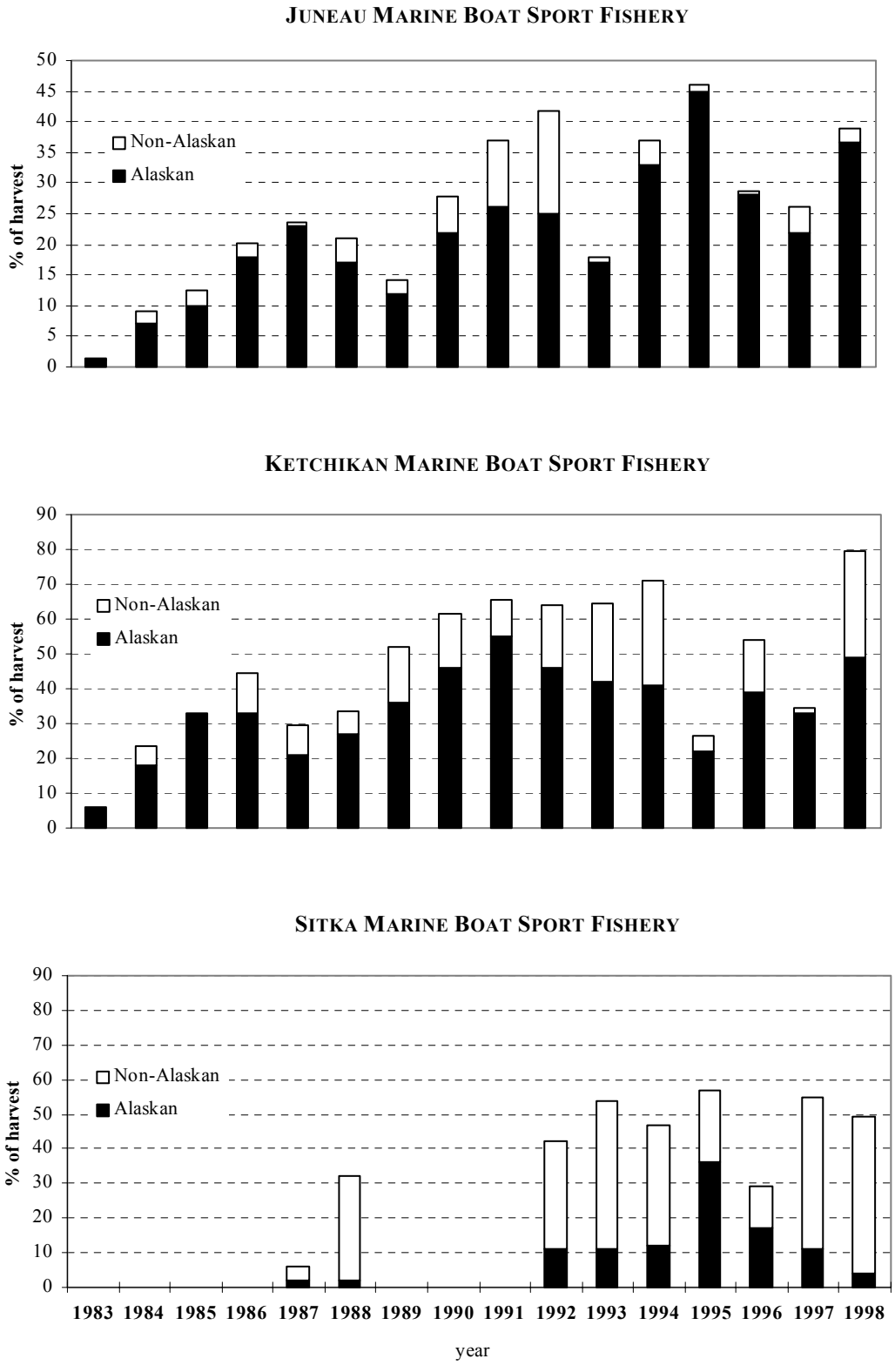

Figure 4.–Estimated percentages of hatchery-produced chinook salmon contributing to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.

Table 15.–Estimated contributions of hatchery-produced chinook salmon to Juneau, Ketchikan and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1998.

Year	Juneau marine				Ketchikan marine				Sitka marine			
	Total	% of harvest	Alaska	% of harvest	Total	% of harvest	Alaska	% of harvest	Total	% of harvest	Alaska	% of harvest
1983	46	1	25	1	350	10	233	6				
1984	577	9	444	7	432	24	333	18				
1985	1,037	13	831	10	862	34	838	33				
1986	1,032	20	918	18	2,226	44	1,638	33				
1987	2,060	23	2,015	23	1,409	30	999	21	150	6	53	2
1988	1,210	21	979	17	1,747	33	1,405	27	1,026	32	66	2
1989	1,018	14	865	12	2,992	52	2,082	36				
1990	2,011	27	1,584	22	6,023	61	4,511	46				
1991[a]	4,279	37	2,957	26	8,373	66	7,035	55				
1992	2,958	42	1,762	25	3,628	64	2,604	46	4,074	42	1,092	11
1993	1,511	18	1,446	17	3,425	65	2,234	42	7,351	53	1,468	11
1994	2,127	37	1,895	33	2,393	71	1,378	41	6,210	47	1,642	12
1995	2,933	46	2,873	45	888	25	723	22	9,052	56	5,702	36
1996	2,430	29	2,360	28	1,576	54	1,131	39	2,966	29	1,730	17
1997[b]	2,055	26	1,730	22	1,098	35	1,059	34	14,131	55	2,755	11
Average	1,819	25	1,512	21	2,495	47	1,880	35	5,620	48	1,814	15
1998[b]	1,607	39	1,509	37	1,647	79	1,014	49	10,302	49	875	4

[a] Juneau percentages for 1991 were calculated without including 803 chinook salmon taken in strata which were not sampled for coded wire tags.

[b] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 16.–Estimated harvest of coho salmon, 1983–1998, in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.

Year	Juneau marine[a]	Juneau Golden North Derby	Ketchikan marine	Sitka marine
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	1,185
1988	12,017	1,453	5,525	616
1989	23,819	3,173	10,781	
1990	26,343	1,914	33,661	
1991	22,379	2,567	43,789	
1992	18,482	2,166	22,688	4,336
1993	15,921	2,031	18,703	14,166
1994	62,218	8,358	44,673	23,080
1995	15,172	2,914	19,165	12,015
1996	18,816	4,505	42,220	28,981
1997[b]	12,477	1,919	14,204	30,789
Average	19,661	2,793	23,148	14,396
1998[b]	15,730	4,419	24,059	42,524
% of average	80	158	104	295

[a] Includes Juneau Golden North Salmon Derby harvest.

[b] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 17.–Estimated contributions of hatchery-produced coho salmon to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1998.

	Juneau marine		Ketchikan marine		Sitka marine	
Year	Total	% of harvest	Total	% of harvest	Total	% 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	57	5
1988	262	2	292	5	218	35
1989	930	4	1,147	11		
1990	482	2	9,515	28		
1991[a]	2,526	12	18,627	43		
1992	905	5	9,588	42	1,264	29
1993	1,577	10	4,325	23	1,650	12
1994	8,260	13	14,491	32	4,773	21
1995	1,010	7	7,327	38	2,270	19
1996	3,276	17	16,841	40	5,224	18
1997[b]	2,162	17	5,822	41	4,798	16
Average	1,544	8	7,771	34	2,532	18
1998[b]	3,597	23	12,455	52	8,906	21

[a] Juneau percentages for 1991 were calculated without including 1,111 coho salmon taken in strata which were not sampled for coded wire tags.

[b] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

harvest in Ketchikan (6,778) was 35% below the 1984–1997 average of 10,433. As with angler effort, this low estimate may have been entirely due to the failure to sample Clover Pass. Total estimated catches of Pacific halibut in the Juneau and Ketchikan fisheries were also well below average. The retention rate of 79% for Pacific halibut in Juneau was above the average of 71%, and the retention rate in Ketchikan (74%) was below the 1984–97 average of 79%. The Sitka harvest of halibut in 1998 (19,640) was 56% above the average harvest of 12,589 but 10% lower than the 1997 record. The retention rate of 67% in 1997 was about average.

Rockfish harvest in the 1998 Ketchikan fishery (3,864) was 62% below the 1984–97 average of 10,122 (Table 19). Retention of rockfish at 36% was below the 1986–1997 average of 45%. Targeted and non-targeted HPUE and CPUE for rockfish were both below average, continuing a trend of declining rockfish catch rates.

SHELLFISH FISHERIES

Shellfish harvests in the Juneau and Ketchikan areas have been estimated with creel surveys since 1988 (Table 20). In 1998, the estimated shellfish effort of 5,551 boat-days in the Juneau area was above average, as was the harvest of 5,310 king crab. Dungeness and Tanner crab harvests for Juneau were below average. In Ketchikan, shellfish effort of 743 boat-days was below the average of 1,412 boat-days. Dungeness crab harvest in Ketchikan of 4,190 was below the average of 7,490. Shrimp harvest in the Ketchikan area during 1998 (99,680) was above average.

CONCLUSIONS AND RECOMMENDATIONS

The primary goals of this project to estimate harvest and Alaska hatchery contributions of

chinook salmon in selected sport fisheries of Southeast Alaska, with specified levels of precision, were obtained.

Many changes have occurred in Southeast Alaska marine boat sport fisheries over the past decade. While the monitored Juneau and Ketchikan sport fisheries have declined a bit in the last few years, the Sitka fishery has grown greatly. Due in part to its location near fish migration corridors for abundant stocks, sport harvests of chinook salmon, coho salmon, and Pacific halibut in the Sitka fishery were again the largest in the region during 1998. It is expected that this growth in the Sitka fishery will continue as tourism increases in Southeast Alaska.

Wild stocks of fish have historically supported most of the sport fisheries, but increasing enhancement efforts have led to increased harvests of hatchery chinook and coho salmon. In 1998, the contributions of hatchery chinook and coho salmon to the Ketchikan fishery were 79% and 52%, respectively, both record highs. During 1998, about 13% of the chinook salmon and 30% of the coho salmon taken in the combined Ketchikan, Sitka, and Juneau marine fisheries originated in Alaska hatcheries. An additional 37% of the chinook harvest originated in non-Alaskan hatcheries. These enhancement efforts are costly, and catch monitoring through the use of onsite survey programs is one of the few means to evaluate and document the success of hatchery programs in producing fish for sport anglers.

Wild stock evaluation programs which include coded wire tagging of both chinook and coho salmon have been implemented in Southeast Alaska, and others are being planned. Tag recoveries from the sport fisheries are necessary to improve knowledge of wild stock contributions to the fisheries. It is recommended that onsite creel surveys and catch sampling programs of marine boat sport fisheries be continued in order to both evaluate the effectiveness of stocking programs and to provide information about wild stock composition.

In March of 1992, the Alaska Board of Fisheries allocated the Southeast Alaska chinook salmon quota, established under the U.S./Canada Pacific Salmon Treaty, between commercial and sport fisheries. The board also adopted a management plan for the chinook salmon sport fishery which requires inseason management by the Department of Fish and Game to ensure the sport fishery does not exceed its allocation. In 1998, sampling of all major boat sport fisheries, including those in Ketchikan, Juneau, and Sitka, was necessary in order to estimate the total Southeast Alaska sport harvest of chinook salmon so the sport fishery could be effectively managed. These sampling efforts, along with coded wire tag sampling programs in Craig, Petersburg, and Wrangell, were also necessary to better document harvests of Alaska hatchery fish for catch reporting required by the Pacific Salmon Treaty. We recommend continuation of this expanded program.

Data from marine boat surveys are also used for a variety of other purposes, including preparation of position statements on proposed regulation changes and public information documents. It is recommended that collection of current data on sport fisheries for coho salmon, Pacific halibut, rockfish, and lingcod be continued, in order to improve management of these species.

It is also recommended that estimation of the shellfish harvest as a component of the marine harvest studies be continued, to provide information for evaluating the performance of this fishery and for addressing potential regulation changes during Alaska Board of Fisheries meetings.

Table 18.–Estimated harvest and catch of Pacific halibut in the Juneau, Ketchikan, and Sitka marine boat sport fisheries, 1983–1998.

	Juneau marine				Ketchikan marine				Sitka marine			
Year	Kept	Released	Total catch	Percent retained	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	8,314	7,214	15,528	54
1988	12,672	5,027	17,699	72	7,317	1,338	8,655	85	6,923	5,962	12,885	54
1989	12,484	2,406	14,890	84	10,797	1,256	12,053	90				
1990	11,774	4,018	15,792	75	7,419	1,281	8,700	85				
1991	8,611	2,363	10,974	78	9,650	1,125	10,775	90				
1992	9,265	2,554	11,819	78	10,257	2,582	12,839	80	12,549	3,927	16,476	76
1993	6,928	2,652	9,580	72	12,783	4,443	17,226	74	12,720	4,289	17,009	75
1994	8,843	4,047	12,890	69	10,960	2,849	13,809	79	13,185	5,233	18,418	72
1995	9,252	3,234	12,486	74	19,675	7,089	26,764	74	13,151	5,963	19,114	69
1996	11,158	3,183	14,341	78	11,177	4,052	15,229	73	12,015	5,859	17,874	67
1997[a]	12,547	5,701	18,248	69	7,983	3,566	11,549	69	21,852	13,518	35,370	62
Average	11,542	4,676	16,218	71	10,433	2,715	13,148	79	12,589	6,496	19,084	66
1998[a]	8,200	2,198	10,398	79	6,778	2,335	9,113	74	19,640	9,704	29,344	67
% of average	71	47	64		65	86	69		156	149	154	

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 19.–Comparative effort and catch statistics for the Ketchikan rockfish sport fishery, 1984–1998.

		Angler effort		Total rockfish harvest and catch				Harvest per unit effort		Catch per unit effort	
Year	Survey dates	Total angler-hours	Bottomfish-hours	Harvest	Released	Total catch	% harvest	Targeted[a]	Non-targeted[b]	Targeted[c]	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	0.54	0.19
1987	4/20–9/27	242,274	84,954	18,591	27,539	46,130	40	0.22	0.08	0.26	0.07
1988	4/11–9/25	225,779	71,611	17,477	15,516	32,993	53	0.24	0.08	0.46	0.15
1989	4/24–9/24	276,516	79,958	11,224	6,742	17,966	62	0.14	0.04	0.22	0.06
1990	5/07–9/23	248,618	49,347	9,561	9,132	18,693	51	0.19	0.04	0.38	0.08
1991	4/29–9/29	343,698	67,842	12,442	10,714	23,156	54	0.18	0.04	0.34	0.07
1992	4/27–9/27	261,635	69,366	8,149	15,272	23,424	35	0.12	0.03	0.34	0.09
1993	4/26–9/26	276,969	78,002	10,573	15,192	25,765	41	0.14	0.04	0.33	0.09
1994	4/25–9/25	286,464	56,092	5,604	8,283	13,887	40	0.10	0.02	0.25	0.05
1995	4/24–9/24	277,146	101,381	10,132	13,015	23,147	44	0.10	0.04	0.23	0.08
1996	5/06–10/06	253,977	62,673	5,492	7,401	12,893	43	0.09	0.02	0.21	0.05
1997[f]	4/28–9/28	199,977	55,242	6,514	9,806	16,320	40	0.12	0.03	0.30	0.08
Average		253,962	68,485	10,122	12,178	22,327	45	0.15	0.04	0.32	0.09
1998[f]	4/27-9/27	205,063	41,194	3,864	6,964	10,828	36	0.09	0.02	0.26	0.05
% of average		81	60	38	57	48		64	46	82	60

[a] Rockfish harvest per bottomfish-hour of effort.

[b] Rockfish harvest per angler-hour of effort.

[c] Rockfish total catch per bottomfish-hour of effort.

[d] Rockfish total catch per angler-hour of effort.

[e] Data in 1985 are not comparable because the creel survey lasted only through 30 June, instead of late September.

[f] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

Table 20.–Comparison of estimated shellfish effort and harvest for the Juneau and Ketchikan marine boat fisheries, 1988–1998.

JUNEAU FISHERY

Year	Effort (boat-days)	Dungeness crab harvest	Tanner crab harvest	King crab harvest	Shrimp harvest
1988	2,287	6,459	3,042	552	
1989	2,652	8,356	3,369	1,849	
1990	2,622	6,289	1,883	1,960	
1991	3,812	13,433	1,294	2,467	
1992	5,411	12,675	1,034	5,673	
1993	6,013	11,980	1,557	8,963	
1994	5,486	6,786	2,328	5,925	
1995	5,161	10,460	2,161	4,598	
1996	5,036	15,605	2,134	4,826	
1997	5,382	12,440	1,348	4,839	
Average	4,386	10,448	2,015	4,165	
1998	5,551	8,112	768	5,310	

KETCHIKAN FISHERY

Year	Effort (boat-days)	Dungeness crab harvest	Tanner crab harvest	King crab Harvest	Shrimp harvest
1988	1,398	9,043	0	0	27,643
1989	508	2,688	100	0	12,730
1990	614	3,367	0	0	17,130
1991	1,394	7,631	0	0	69,450
1992	1,387	10,227	0	0	130,720
1993	1,973	8,897	0	0	37,060
1994	1,439	7,032	0	0	34,580
1995	2,590	14,258	0	0	164,390
1996	1,255	5,528	0	0	76,840
1997[a]	1,566	6,224	0	0	51,150
Average	1,412	7,490	10	0	62,169
1998[a]	743	4,190	210	0	99,680

[a] Ketchikan estimates are biased low because a major access site (Clover Pass) was not sampled.

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