

Fishery Data Series No. 97-16

Harvest Estimates for Selected Marine Sport Fisheries in Southeast Alaska During 1996

by

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Alaska Department of Fish and Game

Division of Sport Fish



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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H _A
deciliter	dL			base of natural logarithm	e
gram	g	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	catch per unit effort	CPUE
hectare	ha	and	&	coefficient of variation	CV
kilogram	kg	at	@	common test statistics	F, t, χ^2 , etc.
kilometer	km	Compass directions:		confidence interval	C.I.
liter	L			correlation coefficient	R (multiple)
meter	m	east	E	correlation coefficient	r (simple)
metric ton	mt	north	N	covariance	cov
milliliter	ml	south	S	degree (angular or temperature)	°
millimeter	mm	west	W	degrees of freedom	df
		Copyright	©	divided by	÷ or / (in equations)
		Corporate suffixes:		equals	=
		Company	Co.	expected value	E
		Corporation	Corp.	fork length	FL
		Incorporated	Inc.	greater than	>
		Limited	Ltd.	greater than or equal to	≥
		et alii (and other people)	et al.	harvest per unit effort	HPUE
		et cetera (and so forth)	etc.	less than	<
		exempli gratia (for example)	e.g.,	less than or equal to	≤
		id est (that is)	i.e.,	logarithm (natural)	ln
		latitude or longitude	lat. or long.	logarithm (base 10)	log
		monetary symbols (U.S.)	\$, ¢	logarithm (specify base)	log ₂ , etc.
		months (tables and figures): first three letters	Jan, ..., Dec	mideye-to-fork	MEF
		number (before a number)	# (e.g., #10)	minute (angular)	'
		pounds (after a number)	# (e.g., 10#)	multiplied by	x
		registered trademark	®	not significant	NS
		trademark	™	null hypothesis	H ₀
		United States (adjective)	U.S.	percent	%
		United States of America (noun)	USA	probability	P
		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	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
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				

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IN SOUTHEAST ALASKA DURING 1996**

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TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	2
REGULATIONS	4
OBJECTIVES.....	5
TASKS	5
METHODS.....	6
Onsite Creel Survey Angler Effort, Catch, and Harvest Estimates	6
Biweekly Estimates of Coho Salmon Harvest Per Unit Effort.....	7
Hatchery Contribution Estimates.....	7
Additional Coded Wire Tag Sampling	8
Age, Length, and Weight Estimates.....	8
Estimates of chinook salmon age composition and mean length-at-age	8
Pacific halibut harvest by weight.....	8
Assumptions	8
RESULTS.....	9
Angler Effort	9
Chinook Salmon Fisheries.....	9
Coho Salmon Fisheries.....	11
Bottomfish Fisheries.....	14
Other Salmonid Fisheries	16
Shellfish Fisheries.....	16
DISCUSSION.....	17
Angler Effort	18
Chinook Salmon Fisheries.....	18
Coho Salmon Fisheries.....	21
Bottomfish Fisheries.....	25
Shellfish Fisheries.....	25
CONCLUSIONS AND RECOMMENDATIONS.....	28
ACKNOWLEDGMENTS	29
LITERATURE CITED.....	29
APPENDIX A. DATA ANALYSIS PROCEDURES	33
APPENDIX B. CREEL SURVEY STATISTICS.....	43
APPENDIX C. DATA FILES	77

LIST OF TABLES

Table	Page
1. Summary of estimated total and derby angler effort by target for the Ketchikan, Sitka, and Juneau marine boat sport fisheries during 1996	10
2. Summary of estimated harvests of chinook salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed during 1996.....	11
3. Contributions of hatchery chinook salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1996.....	12
4. Summary of the age composition of chinook salmon sampled in selected marine sport fisheries in Southeast Alaska during 1996	13
5. Summary of estimated catch and harvest of coho salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed during 1996.....	13
6. Contributions of hatchery coho salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1996	14
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 1996.....	15
8. Summary of estimated catch and harvest of Pacific halibut, rockfish, and lingcod in the Ketchikan, Sitka, and Juneau marine boat sport fisheries during 1996.....	15
9. Average length, round weight, and total round weight of Pacific halibut harvested in sampled Southeast Alaska marine boat sport fisheries during 1996	16
10. Rockfish composition in the Ketchikan and Sitka marine boat sport fisheries during 1996.....	16
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 sampled during 1996.....	17
12. Estimated effort for, and harvest of Dungeness crab, king crab, Tanner crab and shrimp in the Ketchikan and Juneau marine boat sport fisheries during 1996	17
13. Estimated angler effort in the Juneau, Ketchikan and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.....	19
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.....	21
15. Estimated contributions of hatchery-produced chinook salmon to Juneau, Ketchikan and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1996.	24
16. Estimated harvest of coho salmon in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.....	24
17. Estimated contributions of hatchery-produced coho salmon to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1996.	25
18. Estimated harvest and catch of Pacific halibut in the Juneau, Ketchikan, and Sitka marine boat sport fisheries, 1983–1996	26
19. Comparative effort and catch statistics for the Ketchikan rockfish sport fishery.....	27
20. Comparison of estimated shellfish effort and harvest for the Juneau and Ketchikan marine boat fisheries, 1988–1996	28

LIST OF FIGURES

Figure	Page
1. Map showing location of Juneau, Sitka, Petersburg, Wrangell, Ketchikan, and Craig in Southeast Alaska.....	3
2. Estimated angler effort in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.....	20
3. Estimated harvest of chinook salmon in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.....	22
4. Estimated contributions of hatchery-produced chinook salmon to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.	23

LIST OF APPENDICES

Appendix	Page
A1. Data analysis procedures for angler effort, catch, and harvest estimates for the Sitka marine boat sport fishery during 1996.....	35
A2. Data analysis procedures for angler effort, catch, and harvest estimates for the Ketchikan and Juneau marine boat sport fisheries during 1996.	38
A3. Data analysis procedures for coho salmon harvest per unit effort estimates for the Ketchikan and Juneau marine boat sport fishery surveys during 1996.....	40
A4. Data analysis procedures for hatchery contribution estimates for the surveys of the marine boat sport fisheries during 1996.....	41
B1. Estimated effort, harvest, and total catches for the Ketchikan marine boat sport fishery, 6 May–6 October, 1996.....	45
B2. Estimated effort, harvest, and total catches for the Juneau marine boat sport fishery, 22 April–22 September 1996.....	46
B3. Estimated effort, harvest, and total catches for the Sitka marine boat sport fishery, 22 April–22 September 1996.....	47
B4. Estimated effort, harvest and catch for the Ketchikan marine boat sport fishery by seasonal period, 6 May–6 October, 1996.....	48
B5. Estimated effort, harvest and catch for the Juneau marine boat sport fishery by seasonal period, 22 April–22 September, 1996.	52
B6. Estimated effort, harvest and catch for the Sitka marine boat sport fishery by seasonal period, 22 April–22 September, 1996.	55
B7. Recorded effort and harvest from the Petersburg marine boat catch sampling program by biweekly period, 1 May–14 July, 1996.....	58
B8. Recorded effort and harvest from the Wrangell marine boat catch sampling program by biweekly period, 1 May–14 July, 1996.....	58
B9. Recorded effort and harvest from the Craig marine boat catch sampling program by biweekly period, 1 May–8 September, 1996.....	59
B10. Numbers of chinook salmon examined for coded wire tags in Southeast Alaska marine boat sport fisheries in 1996.....	60
B11. Estimates of hatchery produced chinook salmon contributed to the Ketchikan marine boat sport fishery from 6 May to 6 October 1996.....	61

LIST OF APPENDICES (Continued)

Appendix	Page
B12. Estimates of hatchery produced chinook salmon contributed to the Juneau marine boat sport fishery from 22 April to 22 September 1996.....	62
B13. Estimates of hatchery produced chinook salmon contributed to the Sitka marine boat sport fishery from 22 April to 22 September 1996.....	64
B14. Estimates (from sampled fish only) of hatchery produced and wild tagged chinook salmon contributed to 354 chinook salmon examined during the Petersburg marine boat sport fishery from 1 May to 14 July 1996.....	66
B15. Estimates (from sampled fish only) of hatchery produced chinook salmon contributed to 213 chinook salmon examined during the Wrangell marine boat sport fishery from 1 May to 14 July 1996.....	66
B16. Estimates (from sampled fish only) of hatchery produced chinook salmon contributed to 509 chinook salmon examined during the Craig marine boat sport fishery from 1 May to 8 September 1996.....	67
B17. Age composition of chinook salmon from selected Southeast Alaska sport fisheries, 1996.....	68
B18. Length-at-age in millimeters (from tip of snout to fork-of-tail) by sex for chinook salmon from selected Southeast Alaska sport fisheries, 1996.....	70
B19. Numbers of coho salmon examined for coded wire tags in Southeast Alaska marine boat sport fisheries in 1996.....	72
B20. Estimates of hatchery produced coho salmon contributed to the Ketchikan marine boat sport fishery from 6 May to 6 October 1996.....	73
B21. Estimates of hatchery produced coho salmon contributed to the Juneau marine boat sport fishery from 22 April to 22 September 1996.....	74
B22. Estimates of hatchery produced coho salmon contributed to the Sitka marine boat sport fishery from 22 April to 22 September 1996.....	74
B23. Estimates of the number of wild coded wire tagged coho salmon contributed to sampled marine boat sport fisheries of Southeast Alaska, 1996.....	75
B24. Estimates (from sampled fish only) of hatchery produced coho salmon contributed to 4,541 coho salmon examined during the Craig marine boat sport fishery from 1 May to 8 September 1996.....	76
C1. Computer data files and analysis programs developed for the 1996 Southeast Alaska marine boat sport fishery survey.....	79

ABSTRACT

Creel surveys of the Juneau, Ketchikan, and Sitka marine sport fisheries for chinook salmon *Oncorhynchus tshawytscha* were conducted during 1996. 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. Dockside interviews of boat-parties completing trips were used to estimate angler effort for and total catch and harvest of chinook salmon. Harvest and total catches of other Pacific salmon and trout *Oncorhynchus* species, Pacific halibut *Hippoglossus stenolepis*, lingcod *Ophiodon elongatus*, rockfish *Sebastes* species, and Dolly Varden *Salvelinus malma* were also estimated. In addition, harvests of Dungeness crab *Cancer magister* and shrimp *Pandalus* species were estimated in Ketchikan; while harvest of king, Dungeness, and Tanner crab (*Paralithodes* species, *Cancer magister*, and *Chionoecetes* species, respectively) were estimated in Juneau. The contributions of hatchery chinook salmon and coho salmon *Oncorhynchus kisutch* to these sport fisheries were estimated from coded wire tag recovery information. Coded wire tag sampling programs conducted at Petersburg, Wrangell, and Craig also provided hatchery contribution estimates. Scale samples and lengths were taken from chinook salmon for age composition and length-at-age estimates in all fisheries. Lengths of Pacific halibut were taken to estimate total round weight of the harvest from existing length-weight relationships.

The estimated harvest of chinook salmon was 21,473 (SE = 955) in the three boat sport fisheries monitored. Harvests of chinook salmon were about half of the long-term average in the Ketchikan fishery, but about average in the Juneau and Sitka fisheries. Hatcheries in Alaska, British Columbia, Washington, and Oregon produced about 32% of the monitored chinook salmon harvest with 24% of the total harvest of Alaska hatchery origin. In the Juneau fishery hatcheries produced about 29% of the chinook salmon harvest with Southeast Alaska hatcheries contributing 28% of the total harvest. In the Ketchikan fishery 54% of the harvest was of hatchery origin, and the percentage of Alaska hatchery chinook salmon harvested was 39%. The estimated Alaska hatchery contribution of chinook salmon was 17% in Sitka and coded wire tag sampling in Petersburg, Wrangell, and Craig revealed that chinook salmon from Alaska hatcheries contributed about 28% , 38% and 7% of the harvest, respectively.

An estimated 90,017 (SE = 5,289) coho salmon, 54,146 (SE = 5,719) pink salmon *Oncorhynchus gorbuscha*, 34,350 (SE = 1,772) Pacific halibut, and 13,020 (SE = 836) rockfish were also harvested in the three marine boat fisheries surveyed. Hatcheries produced 40%, 17% and 18% of the coho harvest in Ketchikan, Juneau, and Sitka, respectively. The Pacific halibut harvest of 11,158 (SE = 1,053) in Juneau was slightly below the long-term average, but the Ketchikan harvest of 11,177 (SE = 1,069) and the Sitka harvest of 12,015 (SE = 943) were above average. Shellfish effort was above average in the Juneau fishery, but below average in the Ketchikan fishery. Dungeness crab harvest was the highest recorded in Juneau but below average in 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. The largest sport fishery in Southeast Alaska is the Juneau marine boat fishery, but other important marine boat sport fisheries occur around Ketchikan, Sitka, Petersburg, Wrangell, Craig, and Haines (Figure 1).

Data on sport harvests of fish species in Southeast Alaska have been collected by both postal surveys and 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. 1996). 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, however, 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 quota 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 1994, 95% of the total sport harvest of chinook salmon of Southeast Alaska occurred in the SWHS areas represented by these fisheries (Howe et al. 1995). 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 1996, 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

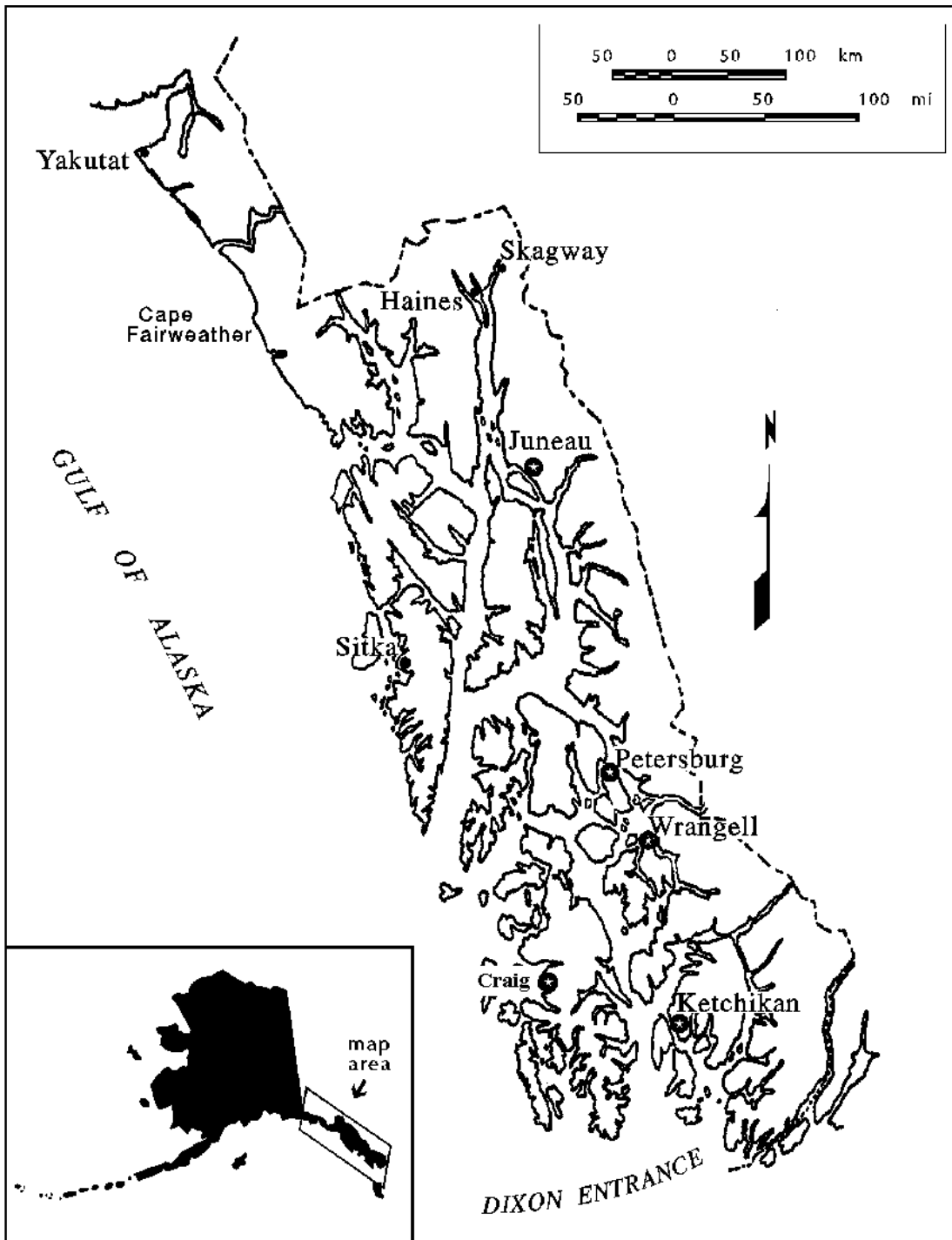


Figure 1.—Location of Juneau, Sitka, Petersburg, Wrangell, Ketchikan, and Craig in Southeast Alaska.

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. Analyses of coded wire tag data from coho salmon harvested in these

sport fisheries are used for determinations of stock composition.

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

The personal use or sport harvest of shellfish is a very important activity for both residents of Southeast Alaska and visitors to the region. Shellfish harvest information is needed so that the Department, in conjunction with the Board of Fisheries, will have the necessary tools to take a more active role in managing these fisheries. Data on the 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 1996 by the Division of Sport Fish of the Alaska Department of Fish and Game (ADF&G) in the Ketchikan, Juneau, and Sitka areas. 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., Beers 1996, Ericksen 1996).

REGULATIONS

Sport fishing regulations for chinook salmon in marine waters during 1996 were identical to those described in Suchanek and Bingham (1992) until 15 June when an emergency order (E.O. #1-16-96) reduced the Southeast Alaska bag and possession limit for chinook salmon in all marine waters to one chinook salmon >28" and prohibited vessel operators and crew members from retaining king salmon while clients were on board. This E.O. was in effect from 15 June through 31 December 1996.

The following terminal areas (i.e., areas near hatcheries or hatchery release sites) where two chinook salmon >28" and two chinook salmon

≤28" could be taken were also opened by emergency order as follows:

- Emergency order (E.O.#1-14-96) increased the king salmon bag and possession limits in a terminal fishery area adjacent to Ketchikan to harvest surplus hatchery-produced king salmon. This emergency order was in effect from 15 June through 31 July 1996.
- Emergency order (E.O. #1-6-96) to harvest surplus hatchery-produced king salmon increased the bag and possession limits in Wrangell Narrows near Petersburg from 1 June through 31 July.
- Emergency order (E.O. #1-10-96) to harvest surplus hatchery-produced king salmon increased the bag and possession limits in Eastern Passage and selected fresh water drainages on Wrangell Island from 15 June through 31 August.
- Emergency order (E.O. #1-12-96) to harvest surplus hatchery-produced king salmon increased the bag and possession limits in a terminal area around Juneau from 15 June through 31 August.

Also an emergency order (E.O. #1-23-96) to harvest stray surplus hatchery-produced king salmon provided for a daily bag and possession limit of ten king salmon ≤16 inches in length and five king salmon ≥16 inches in length in specific areas of Sawmill Creek and Salmon Lake Creek near Sitka from 20 July through 31 December.

General bag limits for salmon species other than chinook salmon remained at six fish per day, 12 in possession for fish ≥16 inches (41 cm) in length, and the Herring Bay Special Harvest Area near Ketchikan was opened by emergency order (E. O. #1-26-96) from 29 October through 31 December to allow for harvest of hatchery coho salmon.

The Pacific halibut bag limit also remained at 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. Anglers were limited to five pelagic rockfish (*Sebastes* spp.) per day, 10 in possession, and five

non-pelagic rockfish, 10 in possession; only two fish per day (four in possession) of which could be yelloweye rockfish *Sebastes ruberrimus*. Areas adjacent to Ketchikan and Sitka were further restricted to a non-pelagic rockfish bag and possession limit of three fish per day, only one of which could be a yelloweye rockfish.

The sport, personal use, and subsistence regulations for the harvest of crab in Southeast Alaska have been summarized by Suchanek and Bingham (1989 and 1990). A daily bag and possession limit of 3 king crab *Paralithodes* species was in effect for the Juneau area in 1996 until 30 August when the personal use red king crab fishery was closed in Section 11-A through 30 September (E.O. #1-C-26-96).

OBJECTIVES

The primary goals of the 1996 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 Alaskan 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 the total sport harvest of chinook salmon landed in the following marine boat sport fisheries during the noted time periods in 1996:
 - Ketchikan from 6 May to 6 October
 - Sitka from 22 April to 22 September
 - Juneau from 22 April to 22 Septembersuch that each individual estimate for the surveyed period was within $\pm 20\%$ of the true value 90% of the time;
2. estimate the contribution of Alaska hatchery chinook salmon by coded wire tag lot to each of the fisheries noted above, such that the estimated contribution in relative terms for

each individual fishery¹ was within ± 25 percentage points of the true value 90% of the time;

3. estimate the relative contribution of Alaska hatchery chinook salmon by coded wire tag lot to the following marine boat sport fisheries during the noted time periods:
 - Wrangell from 1 May to 14 July
 - Petersburg from 1 May to 14 July
 - Craig from 1 May to 8 Septembersuch 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 fisheries in Ketchikan, Sitka, and Juneau, 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 relative contribution of Alaska hatchery coho salmon by coded wire tag lot to the fishery in Craig, 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 also a number of additional tasks which addressed secondary data needs. To fulfill these data needs, additional tasks in 1996 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,

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

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 shrimp landed by the Ketchikan marine boat fishery.
4. estimating age composition and mean length-at-age of chinook salmon harvested in the Juneau and Ketchikan marine boat sport fisheries during the periods surveyed.
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 landed by sport anglers was estimated from information collected via stratified random multistage sample surveys. Strata were defined according to unique combinations of biweekly periods, type of day (e.g., weekday versus weekend-holiday), time of day (early versus late) and, in some instances, type of access location (e.g., heavy use versus low use harbors).

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-parties² 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. 1994, 1995, and 1996). The survey at Sitka represented a slight restructuring compared to the survey conducted at this location in 1994, but was the same as the survey in 1995 and 1996. In Sitka access locations were not used as a level of stratification and 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,

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

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, Pacific halibut, or rockfish), 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 all areas sampled except Sitka. 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. Mean harvest of boat-parties interviewed during a sample were 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 summation across strata. Estimates were obtained similarly for the three-stage designs, with the appropriate reordering of calculations. Specific calculation procedures for the point estimates and their variances are described in detail in Appendices A1 and A2.

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. The estimates obtained by these procedures were indicative of the abundance of coho salmon (L. D. Shaul, Alaska Department of Fish & Game, Douglas, personal communication). Mean HPUE from these fisheries was considered to be an index of abundance under the traditional linear model:

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

where $hpue_k$ is the harvest per unit of effort during the k th angler-trip, N is abundance of the 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). Harvest per unit effort (HPUE) in terms of coho salmon harvested per angler-hour of effort was estimated for each biweek using the 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.” The number of chinook and coho salmon inspected for a clipped adipose fin was 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 Commercial Fisheries Management and Development (CFMDD) 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 catches of chinook and coho salmon for the presence of a clipped adipose fin from boat parties returning to Wrangell and Petersburg harbors from 1 May through 14 July, and to Craig harbors from 1 May through 8 September. Some additional sampling for adipose clipped fish was also conducted in Ketchikan from 15 July to 6 October and in Juneau from 22 August through 22 September. The specific equations for estimating the relative contributions of hatchery stocks are detailed in Appendix A4.

AGE, LENGTH, AND WEIGHT ESTIMATES

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

As time permitted, chinook salmon harvested by anglers surveyed in the sampled marine boat sport fisheries were sampled for scales for age determination. Three 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 designed by Van Allen and McPherson (ADF&G Commercial

Fisheries, Douglas, Alaska, personal communication). Lengths in millimeters (tip of snout to fork of tail) of these chinook salmon were also recorded.

For the estimation of age composition of the harvest and for the estimation of 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 procedures outlined in Cochran (1977). Estimates of mean length by age group of chinook salmon sampled from the harvest were calculated following the 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 in the sampled fisheries were sampled for length. Total lengths in millimeters from Pacific halibut sampled were also recorded. Procedures as outlined by Quinn, et al. (1983), were used to convert the harvest and the mean length estimates to an estimate of the round weight of Pacific halibut harvested.

ASSUMPTIONS

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

1. anglers accurately reported their hours of fishing effort and the number by species of fish released; and
2. no significant number of boat-parties returned between evening civil twilight (i.e., one-half hour after sunset) and the beginning of early-day surveys, or at access locations other than those surveyed.

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

3. the relative contribution of different stocks of salmon associated with a CWT release lot to the harvest did not vary appreciably within a biweekly period.

Similarly, the following assumption must be true for unbiased length-at-age and age composition estimates:

4. length-at-age and age composition did not vary substantially within the sampling season.

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 791,871 (SE = 26,440) angler-hours of effort were expended in the three marine boat sport fisheries during the time periods sampled (Table 1). Seventy-four percent of the total effort in angler-hours was targeted on salmon in Ketchikan, 81% in Juneau, and 75% in Sitka. 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 5%, 18%, and 16% of the total salmon fishing effort, respectively, occurred during these short time periods.

CHINOOK SALMON FISHERIES

An estimated 21,473 chinook salmon (SE = 955) were harvested in the three surveyed marine boat sport fisheries (Table 2). Relative precision of the estimated chinook harvests were within our goal of $\pm 20\%$ of the true value 90% of the time at all locations. About 47% (10,078) of the

monitored harvest of chinook salmon were taken in the Sitka fishery, the Juneau fishery accounted for an additional 39% of the harvest, and 14% were taken in the Ketchikan fishery. Most of the chinook salmon harvested were at least 28 inches in length, but an estimated 412 small (<28 inches) chinook salmon were also harvested.

Harvest of chinook salmon in the Ketchikan King Salmon Derby comprised 21% of the total chinook salmon harvested in the Ketchikan marine fishery. Nine percent of the harvest of chinook salmon in the Juneau marine boat sport fishery was taken during the Juneau Golden North Salmon Derby, while 18% of the total salmon fishing effort was expended during this event (Table 1). A total of 932 chinook salmon were entered in the Ketchikan and Juneau derbies from a harvest of 1,406 fish during the derby time periods (Table 2). A total of 465 chinook salmon were entered in the Sitka Salmon Derby from a total harvest of 1,246 chinook salmon during the derby time period. A total of 264 chinook salmon were entered in the Petersburg Salmon Derby.

About 20% of the estimated harvest of chinook salmon in the Ketchikan boat fishery were sampled for coded wire tags (Appendix B10). In the Juneau boat fishery, 19% of the estimated harvest of chinook salmon were sampled, and 17% in Sitka.

An estimated 24% of the chinook salmon harvested in the marine boat fisheries were of Alaska hatchery origin (Table 3). Contribution estimates of Alaska hatchery chinook salmon were within ± 25 percentage points of the true value 90% of the time at all locations (Table 3). Absolute precision of the Alaska hatchery contribution estimates at all sites ranged from 7% to 19%. Additional hatchery fish originated in Oregon, Washington, and British Columbia, and, in aggregate, 32% of chinook salmon harvested in boat fisheries originated in hatcheries.

Seventeen percent of the harvest of chinook salmon in Sitka came from Alaska hatcheries, and the overall hatchery contribution was 29% of the harvest. Most Alaska hatchery chinook salmon harvested in Sitka were produced at the Medvejie hatchery. This year in Ketchikan 39% of the

Table 1.—Summary of estimated total and derby angler effort by target for the Ketchikan, Sitka, and Juneau marine boat sport fisheries during 1996.

TOTAL EFFORT BY TARGET AND TIME PERIOD					
		Ketchikan 5/06-10/06	Juneau 4/22-9/22	Sitka 4/22-9/22	Total
Boat-hours		96,189	138,856	62,320	297,365
	SE	5,483	7,411	2,718	9,611
Salmon-hours		188,947	287,481	136,585	613,013
	SE	12,080	17,486	6,854	22,331
Bottomfish-hours ^a		62,673	67,555	45,075	175,303
	SE	4,548	5,328	2,989	7,616
Angler-hours ^b		253,977	355,381	182,513	791,871
	SE	14,400	20,480	8,502	26,440
% salmon-hours ^c		74%	81%	75%	77%

DERBY EFFORT BY TARGET AND TIME PERIOD					
		Ketchikan 5/25-26,6/01, 6/08,6/15,6/22-23	Juneau 8/16-18	Sitka 5/25-27, 6/01-02	Total
Boat-hours		12,626	18,845	9,047	40,518
	SE	2,080	3,829	977	4,131
Salmon-hours		9,005	51,785	22,071	82,861
	SE	3,874	11,628	2,356	12,074
Bottomfish-hours		5,640	1,612	1,375	8,627
	SE	1,133	374	303	840
Angler-hours		29,352	53,397	23,429	106,178
	SE	4,293	11,859	2,348	12,344
% of total salmon fishery ^d		5%	18%	16%	14%

^a Includes hours fished for Pacific halibut, rockfish, and other bottomfish.

^b Includes all targeted and non-targeted effort.

^c (salmon-hours/total angler-hours) * 100.

^d (derby salmon-hours/total salmon-hours) * 100.

harvest of chinook salmon were from Alaska hatcheries, and the overall hatchery contribution to the Ketchikan fishery totaled 54%. Most Alaska hatchery chinook salmon taken in Ketchikan originated from Whitman Lake and Carroll Inlet (release site only) hatcheries operated by the Southern Southeast Regional Aquaculture Association. About 28% of the chinook salmon harvest in the Juneau boat fishery was of Alaska hatchery origin. Most 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 Sitka fishery (Appendix B13).

A total of 354 chinook salmon (Appendix B10) was examined for clipped adipose fins at the Petersburg marine boat sport fishery, and about 28% of the sampled fish came from hatcheries (Appendix B14). In addition to the recoveries of hatchery origin fish, one wild coded wire tagged chinook salmon was recovered from the Petersburg fishery (Appendix B14). Relative contribution of this wild stock could not be estimated as the tagging fraction was unknown. The largest contributor to the Petersburg harvest was the Crystal Lake hatchery. A total of 213 chinook salmon were examined for clipped adipose fins at the Wrangell marine boat sport fishery, and about 38% of the sampled fish came from hatcheries (Appendix B15). The largest

Table 2.—Summary of estimated harvests of chinook salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed during 1996.

CHINOOK SALMON HARVESTS						
Sport fishery	Time period	Harvest of chinook ≥ 28"	Harvest of chinook < 28"	Combined	SE	Relative precision
Ketchikan	5/06–10/06	2,575	356	2,931	274	15%
Juneau	4/22–9/22	8,417	47	8,464	517	10%
Sitka	4/22–9/22	10,069	9	10,078	755	12%
Total		21,061	412	21,473	955	7%

DERBY CHINOOK SALMON HARVESTS									
Major salmon derbies	Time period	Chinook ≥ 28"		Chinook < 28"		Total harvested		SE	% ^b
		Entered	Total ^a	Entered	Total ^a	Number			
Ketchikan King Salmon Derby	5/25–26, 6/01, 6/08, 6/15, 6/22–23	268	590	0	32	622	39	21	
Juneau Golden North Salmon Derby	8/16–8/18	653	769	11	15	784	42	9	
Sitka Salmon Derby	5/25–5/27 6/01–6/02	465	1,246	0	0	1,246	120	12	
Petersburg Salmon Derby ^c	5/24–5/27	264		0					

^a Includes entered and take-home harvests.

^b (total derby harvest/total area harvest) * 100.

^c Number taken home was not estimated.

contributors to the Wrangell harvest included the Crystal Lake/Earl West Cove and Neets Bay hatcheries. A total of 509 chinook salmon (Appendix B10) was examined for clipped adipose fins at the Craig marine boat sport fishery. Overall, 44% of the sample came from hatcheries, and while only 7% were from Alaska hatcheries, the Medvejie hatchery was the largest Alaskan contributor (Appendix B16).

A total of 1,282 chinook salmon was successfully aged from the sampled fisheries (Table 4 and Appendix B17). About 14% of the chinook salmon sampled lacked a freshwater annulus (age-0.), which usually indicates non-Alaskan origin (Van Alen 1988). Saltwater ages varied considerably; an estimated 99% of the chinook salmon harvested during the Juneau Golden North Salmon Derby were age-.3 or less, whereas only 5% of chinook salmon sampled in the Wrangell

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 among the fisheries surveyed (Appendix B18).

COHO SALMON FISHERIES

Harvests of coho salmon in the surveyed fisheries totaled an estimated 90,017 fish (SE = 5,289) (Table 5). The only monitored derby in which coho salmon were heavily targeted was the Juneau Golden North Salmon Derby, and an estimated 4,505 coho salmon (SE = 327) were taken during this event (Appendix B2).

Harvests of hatchery coho salmon were estimated from an overall sample of 17% of the coho salmon harvest (Appendix B19). Estimates of coho salmon hatchery contributions by tag code

Table 3.—Contributions of hatchery chinook salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1996.

Region or hatchery	Marine boat sport fishery			Total
	Juneau (4/22–9/22)	Ketchikan (5/06–10/06)	Sitka (4/22–9/22)	
Oregon	17	0	88	105
Washington	0	0	302	302
British Columbia	53	445	846	1,344
Non-Alaskan total	70	445	1,236	1,751
SE	56	382	445	589
Alaska				
Burro Creek	4	0	0	4
Carroll Inlet	11	813	0	824
Crystal Lake	278	0	0	278
Crystal Lake/Earl West Cove	9	0	0	9
Deer Mountain	0	86	0	86
Gastineau	976	0	0	976
Hidden Falls	151	0	0	151
Jerry Myers	1	0	0	1
Little Port Walter	169	0	17	186
Medvejie	0	0	1,574	1,574
Neets Bay	4	0	0	4
Port Armstrong	47	0	0	47
Sheldon Jackson	0	0	108	108
Snettisham	703	0	0	703
Whitman Lake	7	232	31	270
Alaskan total	2,360	1,131	1,730	5,221
SE	351	337	488	689
Absolute precision ^a ($\alpha = 0.10$)	577	554	803	1,133
% absolute precision ^b	7	19	8	5
Total all areas	2,430	1,576	2,966	6,972
SE	358	512	675	920
Absolute precision ($\alpha = 0.10$)	589	842	1,110	1,513
% absolute precision	7	29	11	7
Chinook salmon harvest	8,464	2,931	10,078	21,473
SE	517	274	755	955
% Alaska hatchery	28	39	17	24
% total hatchery	29	54	29	32

^a SE * 1.645.

^b (Absolute precision / total harvest) * 100.

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 25,341 (SE = 3,461) hatchery coho salmon were taken in all sampled fisheries combined (Table 6). Wild stocks of coho salmon dominated the harvest in all areas, but hatchery contributions ranged from 17% in Juneau to 18% in Sitka and 40% 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 hatchery owned by Douglas Island Pink and Chum, Inc. contributed the most coho salmon to the Juneau fishery, and Hidden Falls hatchery was the major contributor in Sitka. Additionally, some recoveries of coho salmon from wild stocks were obtained in the Ketchikan, Juneau, and Sitka fisheries (Appendix B23). Tagging fractions are currently unknown, so total contributions of these wild-tagged stocks were not estimated.

Table 4.—Summary of the age composition of chinook salmon sampled in selected marine sport fisheries in Southeast Alaska during 1996.

FRESHWATER AGE COMPOSITION						
Sport fishery	-----Age 0.-----		-----Age 1. or more-----		Total sampled	
	Sample size	Percent	Sample size	Percent		
Ketchikan	27	28	68	72	95	
Juneau non-derby	2	1	338	99	340	
Juneau Derby ^a	7	4	174	96	181	
Sitka	95	23	321	77	416	
Petersburg	1	1	78	99	79	
Wrangell	4	5	75	95	79	
Craig	47	51	45	49	92	
Total	183	14	1,099	86	1,282	

SALTWATER AGE COMPOSITION						
Sport fishery	-----Age .3 or less-----		-----Age .4 or more-----		Total sampled	
	Sample size	Percent	Sample size	Percent		
Ketchikan	65	68	30	32	95	
Juneau non-derby	275	81	65	19	340	
Juneau Derby ^a	179	99	2	1	181	
Sitka	255	61	161	39	416	
Petersburg	37	47	42	53	79	
Wrangell	4	5	75	95	79	
Craig	55	60	37	40	92	
Total	870	68	412	32	1,282	

^a Juneau Golden North Salmon Derby.

Table 5.—Summary of estimated catch and harvest of coho salmon in the Ketchikan, Sitka, and Juneau marine boat sport fisheries surveyed during 1996.

Sport fishery	Time period	HARVEST							
		Wild		Hatchery		Total		Total catch	
		Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Ketchikan	5/06–10/6	25,379	3,483	16,841	2,900	42,220	4,532	44,263	4,657
Juneau	4/22–9/22	15,540	1,354	3,276	941	18,816	1,649	19,362	1,648
Sitka	4/22–9/22	23,757	1,428	5,224	1,637	28,981	2,172	31,450	2,460
TOTAL		69,734	4,000	25,341	3,461	90,017	5,289	95,075	5,518

Table 6.—Contributions of hatchery coho salmon to the Ketchikan, Sitka, and Juneau marine boat sport fisheries of Southeast Alaska, 1996.

Region or hatchery	Marine boat sport fishery			Total
	Juneau (4/22–9/22)	Ketchikan (5/06–10/06)	Sitka (4/22–9/22)	
British Columbia	0	18	39	57
Non-Alaskan total	0	18	39	57
SE	0	13	28	30
Alaska				
Crystal Lake	0	0	12	12
Deer Mountain	0	2,641	26	2,667
Gastineau	2,141	0	0	2,141
Hidden Falls	314	0	2,483	2,797
Medvejie	0	0	897	897
Medvejie CIF	816	0	0	816
Nakat Inlet	0	208	0	208
Neets Bay	0	10,441	587	11,028
Port Armstrong	0	0	235	235
Sheep Creek	5	0	0	5
Sheldon Jackson	0	0	76	76
Tamgas Creek	0	2,362	869	3,231
Whitman Lake	0	1,171	0	1,171
Alaskan total	3,276	16,823	5,185	25,284
SE	941	2,899	1,636	3,460
Absolute precision ^a ($\alpha = 0.10$)	1,548	4,769	2,691	5,692
% absolute precision ^b	8	11	9	7
Total all areas	3,276	16,841	5,224	25,341
SE	941	2,900	1,637	3,461
Absolute precision ($\alpha = 0.10$)	1,548	4,771	2,693	5,693
% absolute precision	8	11	9	6
Coho salmon harvest	18,816	42,220	28,981	90,017
SE	1,649	4,532	2,172	5,289
% Alaska hatchery	17	40	18	28
% total hatchery	17	40	18	28

^a SE * 1.645.

^b (Absolute precision / total harvest) * 100.

From the Craig marine boat sport fishery, 4,541 coho salmon were examined for clipped adipose fins, and tag codes recovered, and the relative contributions to the fishery are presented in Appendix B24. About 14% of the coho salmon harvested in Craig were from hatcheries, with Klawock River, Neets Bay, and Tamgas Creek hatcheries contributing the largest numbers of coho salmon. No coho salmon were sampled in Petersburg or Wrangell this year.

The HPUEs for coho salmon in the Ketchikan, Juneau, and Sitka fisheries reached highs of 0.532 (SE = 0.023), 0.138 (SE = 0.012), and 0.421 (SE = 0.044) coho salmon, respectively, per angler-

hour of effort (Table 7). The peak in HPUE for coho salmon occurred in late August for Juneau and Sitka, and in early September for Ketchikan. Ketchikan anglers experienced higher HPUEs for coho salmon than did Juneau and Sitka anglers for the peak of the season.

BOTTOMFISH FISHERIES

Most bottomfish effort in Southeast Alaska targets on Pacific halibut, and an estimated 34,350 (SE = 1,772) were harvested in Ketchikan, Sitka, and Juneau (Table 8). Estimated average round

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 1996.

HARVEST OF COHO SALMON PER ANGLER-HOUR OF EFFORT ^a						
Seasonal period	Ketchikan		Juneau		Sitka	
	HPUE	SE	HPUE	SE	HPUE	SE
5/20–6/02	0.001	0.001	0.000	0.000	0.001	0.000
6/03–6/16	0.005	0.002	0.002	0.001	0.019	0.008
6/17–6/30	0.027	0.005	0.004	0.001	0.038	0.006
7/01–7/14	0.163	0.015	0.017	0.002	0.054	0.011
7/15–7/28	0.225	0.043	0.038	0.004	0.238	0.024
7/29–8/11	0.133	0.022	0.094	0.009	0.364	0.031
8/12–8/25	0.238	0.029	0.138	0.012	0.421	0.044
8/26–9/08	0.532	0.023	0.135	0.069	0.316	0.041
9/09–9/22	0.308	0.026	0.137	0.021	0.170	0.077
9/23–10/6	0.040	0.013				
All periods	0.217	0.008	0.047	0.002	0.137	0.007

^a Does not include derby effort or harvest.

weight of Pacific halibut ranged from 22.7 pounds in Craig to 39.4 pounds in the Petersburg and Wrangell areas (Table 9). About 992,700 pounds of Pacific halibut were taken in Ketchikan, Sitka, and Juneau, with about 46% of this harvest landed in Sitka.

Although rockfish are not a primary target of most Southeast Alaska marine boat sport anglers, an estimated 36,069 (SE = 1,879) rockfish were caught in the marine boat sport fisheries surveyed (Table 8). Only 13,020 (SE = 836) of the rockfish caught were retained (36%). Ketchikan anglers

Table 8.—Summary of estimated catch and harvest of Pacific halibut, rockfish, and lingcod in the Ketchikan, Sitka, and Juneau marine boat sport fisheries during 1996.

Sport fishery	Time period	Total catch	SE	Harvest	SE
Pacific halibut					
Ketchikan	5/06-10/06	15,229	1,619	11,177	1,069
Juneau	4/22-9/22	14,341	1,486	11,158	1,053
Sitka	4/22-9/22	17,874	1,528	12,015	943
Total halibut		47,444	2,677	34,350	1,772
Rockfish					
Ketchikan	5/06-10/06	12,893	1,043	5,492	576
Juneau	4/22-9/22	805	141	774	140
Sitka	4/22-9/22	22,371	1,557	6,754	590
Total rockfish		36,069	1,879	13,020	836
Lingcod					
Ketchikan	5/06-10/06	965	157	783	149
Juneau	4/22-9/22	11	10	11	10
Sitka	4/22-9/22	5,320	499	4,377	419
Total lingcod		6,296	523	5,171	445

Table 9.—Average length, round weight, and total round weight of Pacific halibut harvested in sampled Southeast Alaska marine boat sport fisheries during 1996.

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	5/06–10/06	188	93.0	1.6	27.2	11,177	304.0
Juneau	4/22–9/22	300	90.9	1.5	27.0	11,158	301.3
Sitka	4/22–9/22	118	101.7	2.6	38.4	12,015	461.4
Petersburg/ Wrangell	5/01–7/14	158	104.9	2.0	39.4		
Craig	5/01–9/08	312	88.3	2.3	22.7		
All areas combined		1,076	93.8	0.7	28.9	34,350	1,066.7

retained an estimated 43% (5,492) of the 12,893 rockfish caught. Sitka anglers retained an estimated 30% (6,754) of the 22,371 rockfish caught. Retention in Juneau, where few were caught, was 96%.

Major species composition of the rockfish harvest was estimated for the Ketchikan and Sitka fisheries (Table 10). Quillback rockfish *S. maliger* (36%) and yelloweye rockfish (34%) were most frequently taken in Ketchikan. Yelloweye rockfish were most frequently taken in Sitka, constituting 54%, and black rockfish *S. melanops* composed an additional 28% of the Sitka rockfish harvest. 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. Lingcod was another bottomfish species frequently harvested in the Sitka (4,377) and Ketchikan (783) fisheries (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 taken in large numbers in Ketchikan, and the estimated harvest totaled 43,156 (SE = 5,559). Only 3,029 (SE = 435) pink salmon were harvested in Juneau, and the retention rate was 55%, in comparison to the 57% observed in Ketchikan. Harvests of both chum and sockeye salmon were much less, totaling 11,686 chum salmon and 884 sockeye salmon for the three

fisheries combined. About 92% of the 645 Dolly Varden harvested were taken by Juneau anglers.

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 5,036 boat-days—four times that estimated for the Ketchikan fishery (1,255 boat-days). Since some

Table 10.—Rockfish composition in the Ketchikan and Sitka marine boat sport fisheries during 1996.

An estimated 774 rockfish were harvested in the Juneau marine boat sport fishery, but individual species were not identified. The unidentified rockfish harvest was allocated to species by expanding the appropriate percentage of harvest in the identified harvest to the total harvest.

Rockfish species	Ketchikan		Sitka	
	Harvest	%	Harvest	%
Quillback	1,994	36.3	537	8.0
Dusky	335	6.1	118	1.7
Copper	197	3.6	22	0.3
Black	158	2.9	1,910	28.3
Yelloweye	1,839	33.5	3,623	53.6
Silvergrey	188	3.4	167	2.5
Other non-pelagic	350	6.4	92	1.4
Other pelagic	432	7.8	285	4.2
Total	5,492		6,754	

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 sampled during 1996.

Sport fishery	Time period	Pink salmon		Chum salmon		Sockeye salmon		Dolly Varden	
		Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
Ketchikan	5/06–10/06	75,811	43,156	3,214	2,624	252	252	0	0
Juneau	4/22–9/22	5,469	3,029	4,037	2,898	60	60	869	592
Sitka	4/22–9/22	18,576	7,961	8,666	6,164	638	572	88	53
Total		99,856	54,146	15,917	11,686	950	884	957	645

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 or Tanner crab were taken in the Ketchikan area. Shrimp harvest was recorded only in Ketchikan (76,840 shrimp, SE = 10,641).

DISCUSSION

Onsite creel surveys provide data necessary for inseason management, and they also can provide detailed fishery performance and biological information 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 Statewide Harvest Survey (SWHS) and onsite creel estimates from previous years.

Effort, harvest and total catch estimates from the three creel surveys reported here should not be considered to be representative of the total Southeast Alaska marine boat sport fisheries. This number is best estimated by the SWHS (Howe et al. 1996).

The 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; and (4) boat parties which are not counted or interviewed due to being missed by creel samplers. 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.

Table 12.—Estimated effort for, and harvest of Dungeness crab, king crab, Tanner crab and shrimp in the Ketchikan and Juneau marine boat sport fisheries during 1996.

Sport fishery	Time period	Effort		Harvest			
		Boat-days	SE	Dungeness crab	Tanner crab	King crab	Shrimp
Ketchikan	5/06–10/06	1,255	145	5,528	0	0	76,840
Juneau	4/22–9/22	5,036	348	15,605	2,134	4,826	— ^a
Total		6,291	377	21,133	2,134	4,826	76,840

^a Shrimp harvest not estimated in Juneau.

Onsite creel surveys of the Juneau and other selected Southeast Alaska marine boat sport fisheries 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). These reports also present some sporadic surveys of the Ketchikan fishery, although it 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, 1992, 1993, 1994, and 1995. 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, 1993, and 1994; and in Petersburg in 1995.

Juneau and Ketchikan marine boat fisheries have been consistently surveyed from approximately 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 1996 was 9% higher than in 1995, but 1% lower than the 1983–1995 average of 357,970 angler-hours. In Ketchikan, total 1996 effort was down 8% from estimated effort in 1995, and 2% below the 1984–1995 average of 258,868 angler-hours. Growth in the Sitka fishery has slowed; total effort during 1996 was 3% lower than in 1995, reversing a trend of at least three years of steady growth. In 1996, total effort in Ketchikan and Sitka was 71% and 51%, respectively, of that expended in Juneau.

In both the Juneau and Ketchikan fisheries, estimated salmon fishing effort was about average in 1996 (Table 13; Figure 2). Bottom-fish effort was below average in both fisheries during 1996. In Juneau, 81% of the 1996 effort targeted salmon, while 74% of Ketchikan effort targeted salmon, both slightly above average. Most of the growth noted in the overall Sitka fishery has been due to growth in the salmon fishery, as bottomfishing effort has remained stable. Due to this growth, a record high (75%) of total effort in Sitka was directed toward salmon.

CHINOOK SALMON FISHERIES

Total harvest of chinook salmon in the Juneau marine boat fishery has shown little trend over the past 10 years, while the Ketchikan harvest increased to a peak in 1991 and has since steadily declined to less than 25% of the 1991 peak (Table 14; Figure 3). The Juneau harvest of 8,464 chinook salmon was above average, but the Ketchikan harvest was 49% below the 1984–1995 average, and the second lowest harvest recorded. Chinook harvests in the Sitka fishery had been steadily increasing through 1995, but in 1996 they declined 37% from the 1995 peak. The 1996 Sitka harvest of 10,078 was still more than triple that of the 1988 harvest of 3,177.

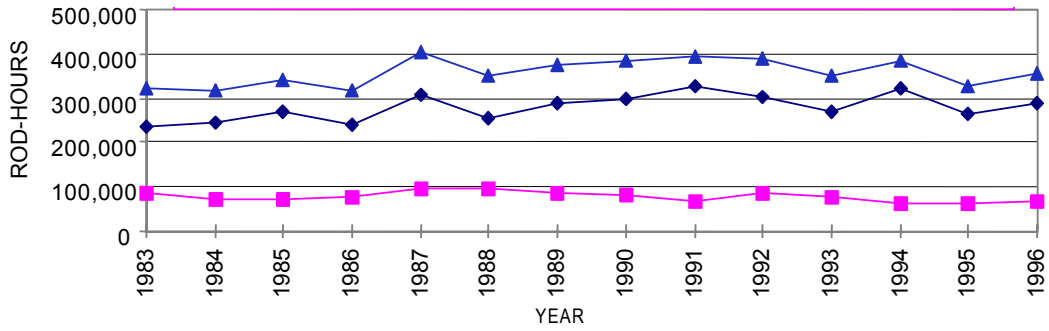
Hatchery contributions of chinook salmon to the Juneau and Ketchikan fisheries increased steadily during the late 1980s but have remained fairly consistent since about 1990 (Table 15; Figure 4).

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.

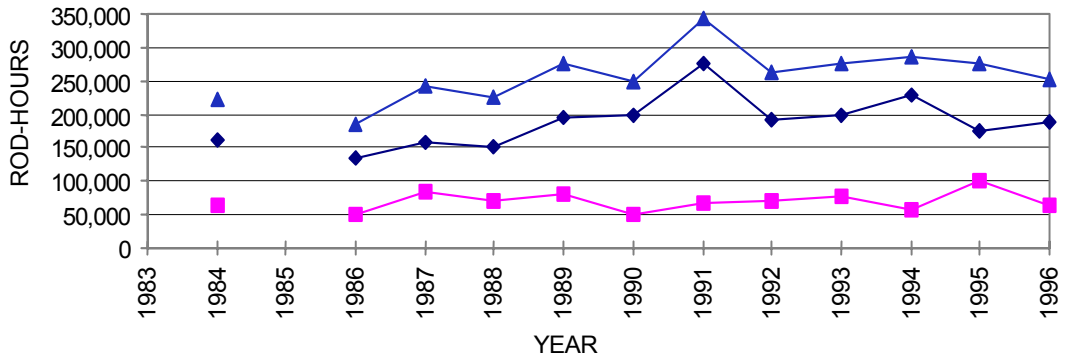
Sport fishery	Year	Survey dates	Salmon-hours		Bottomfish-hours		Total angler-hours
			Estimate	Percent	Estimate	Percent	
Juneau	1983	4/17-10/01	236,344	74	84,259	26	320,603
	1984	4/29-9/29	246,732	77	72,090	23	318,822
	1985	4/15-9/29	269,077	79	72,381	21	341,458
	1986	4/14-10/05	240,921	76	77,165	24	318,086
	1987	3/16-9/27	307,124	76	94,658	24	401,840
	1988	4/11-9/25	254,196	72	96,188	27	351,247
	1989	4/24-9/24	287,676	77	85,354	23	373,504
	1990	4/23-9/23	300,167	78	83,106	22	383,976
	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
	Average		278,905	78	78,598	22	357,970
	1996	4/22-9/22	287,481	81	67,555	19	355,381
	% of average		103		86		99
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
		Average		188,479	73	70,217	27
	1996	5/6-10/6	188,947	74	62,673	25	253,977
	% of average		100		89		98
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	4/24-7/02 ^a	34,946	84	6,177	15	41,362
	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
		Average		85,016	69	37,178	30
	1996	4/22-9/22	136,585	75	45,075	25	182,513
	% of average		161		121		149

^a Not used to calculate average.

JUNEAU MARINE BOAT SPORT FISHERY



KETCHIKAN MARINE BOAT SPORT FISHERY



SITKA MARINE BOAT SPORT FISHERY

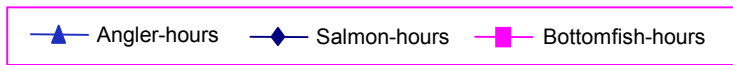
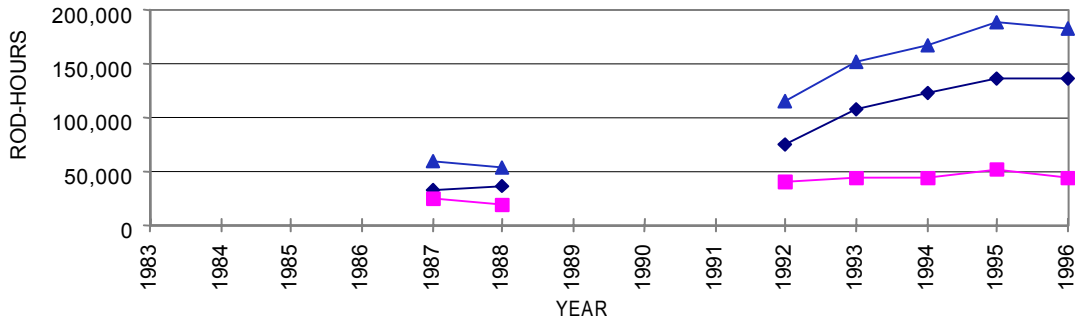


Figure 2.—Estimated angler effort in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys for comparable sample periods.

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 ^b	7,074	609	5,752	3,501
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
Average	7,141	707	5,724	9,700
1996	8,464	784	2,931	10,078
% of average	119	111	51	104

^a Includes Juneau Golden North Salmon Derby harvest.

^b Not used to calculate Sitka average.

An estimated 29% of the 1996 chinook salmon harvest in Juneau originated in hatcheries, compared to the 1983–1995 average of 21%. In Ketchikan, an estimated 54% of the 1996 harvest originated in hatcheries, in comparison to the average of 47%. 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 39% of the 1996 chinook salmon harvest in Ketchikan originated in Alaskan hatcheries, a percentage substantially higher than in Juneau or Sitka. In Juneau, an estimated 28% of the 1996 harvest originated in Alaskan hatcheries, compared to the average of 17%.

In Sitka, a higher proportion of chinook salmon originate in non-Alaska hatcheries than in Ketchikan or Juneau (Table 15 and Figure 4). The overall percentage of hatchery chinook declined in Sitka in 1996, due primarily to a large decline in the percentage of non-Alaskan hatchery chinook taken. In 1996, 29% of the Sitka harvest originated in hatcheries, with 17% coming from Alaska hatcheries. Both of these estimates **represented** large declines from the 1995 season.

COHO SALMON FISHERIES

The 1996 harvest of 42,220 coho salmon in the Ketchikan area was 90% above the 1984–1995 average of 22,227 (Table 16), and the Juneau area harvest of coho salmon (18,816 fish) was 7% below the 1983–1995 average of 20,279. The Juneau Golden North Salmon derby harvest of 4,505 coho salmon was 65% above the 1983–1995 average of 2,729. The Sitka area harvest of 28,981 coho salmon was more than triple the 6-year average (1987, 1988, 1992, 1993, 1994, and 1995), and was **Sitka's** highest recorded harvest.

Harvest of coho salmon in the Juneau, Ketchikan and Sitka areas continued to be supplemented by hatchery contributions (Table 17). The relative contribution (17% of total harvest) of hatchery coho salmon in Juneau was the highest ever recorded. The Ketchikan fishery has been much more dependent upon hatchery coho salmon than the Juneau fishery. About 32% of the 1984 to 1995 Ketchikan harvest originated in hatcheries (Table 17). In 1996, both the estimated harvest of 16,841 hatchery coho salmon and the hatchery contribution of 40% in Ketchikan were above

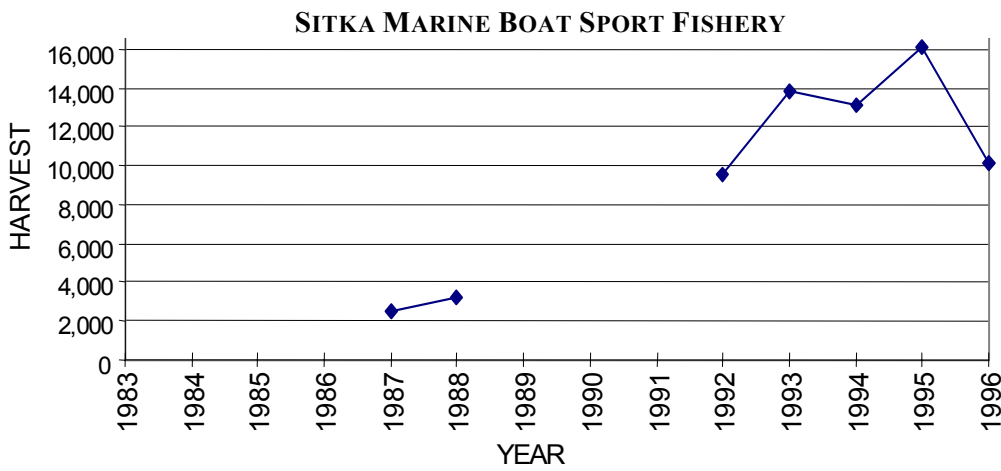
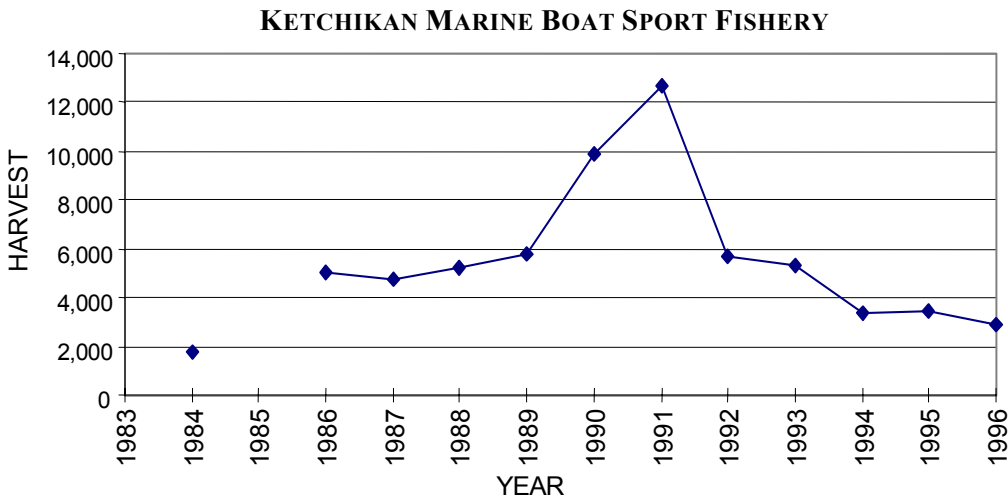
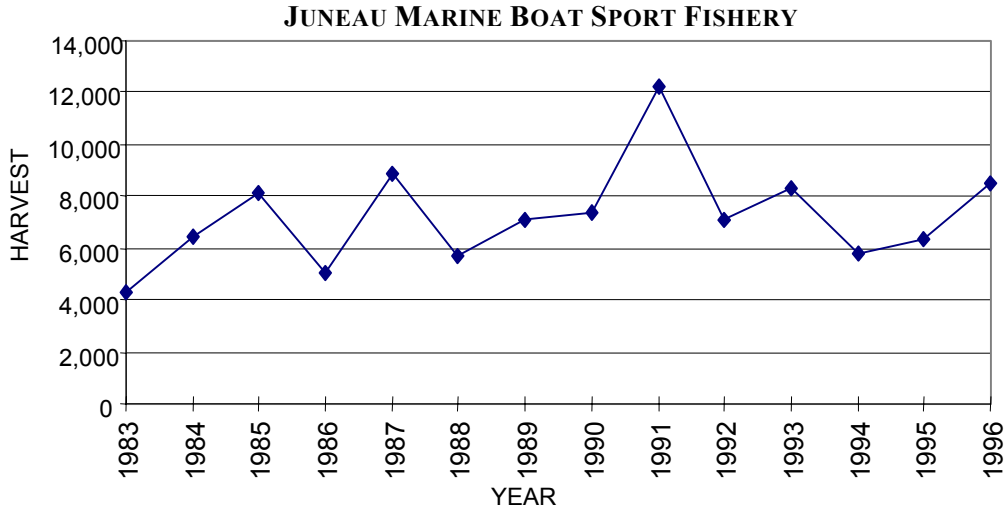
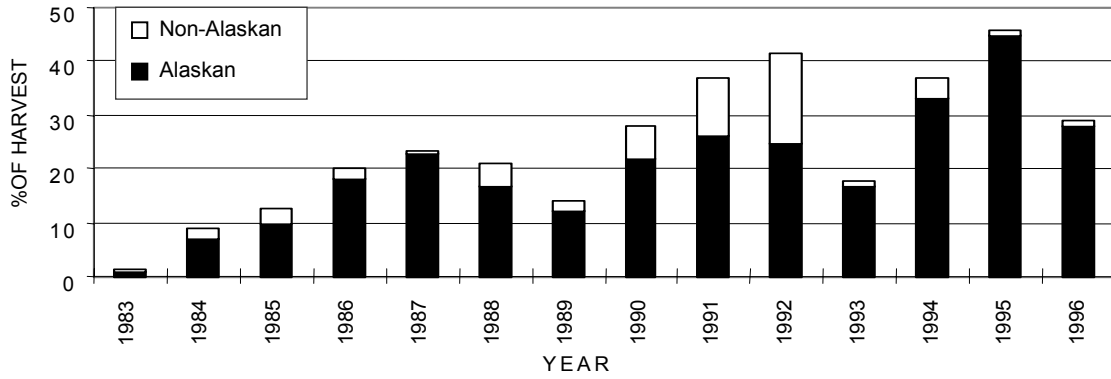
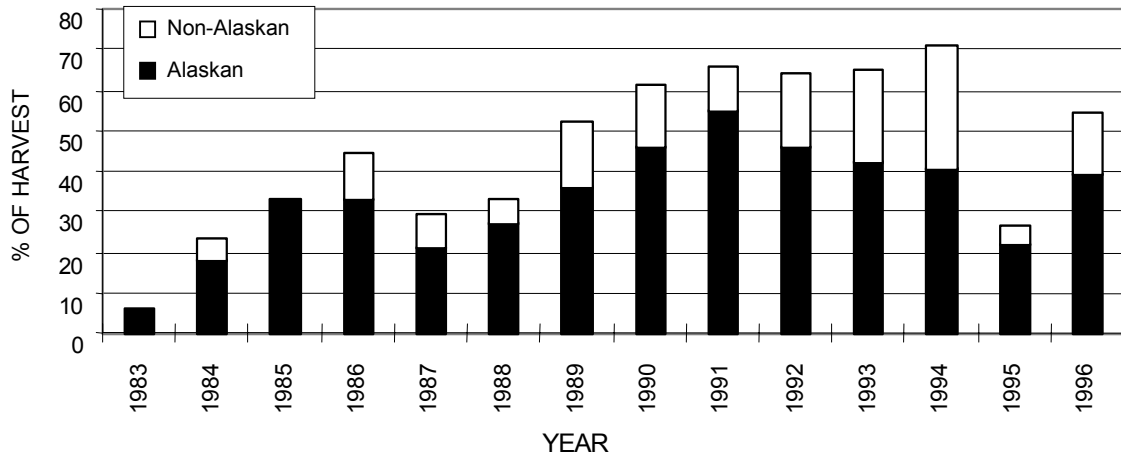


Figure 3.—Estimated harvest of chinook salmon in the Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.

JUNEAU MARINE BOAT SPORT FISHERY



KETCHIKAN MARINE BOAT SPORT FISHERY



SITKA MARINE BOAT SPORT FISHERY

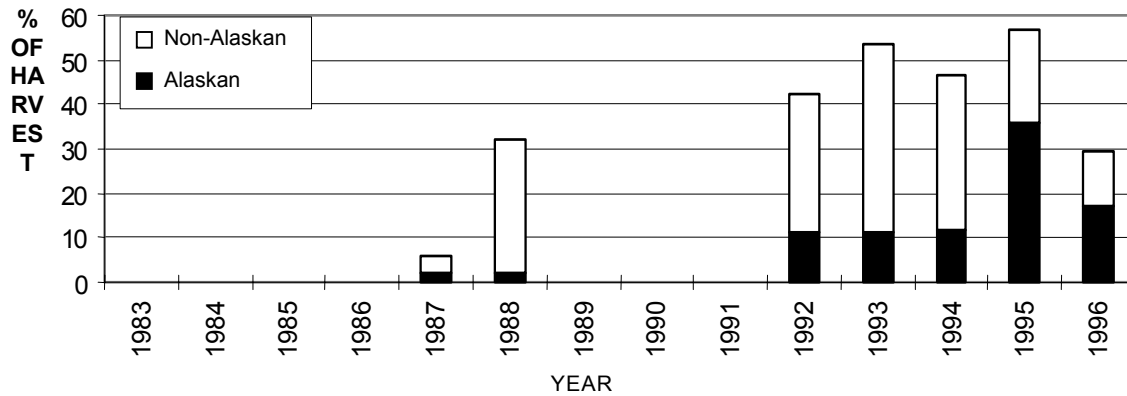


Figure 4.—Estimated contributions of hatchery-produced chinook salmon to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys.

Table 15.—Estimated contributions of hatchery-produced chinook salmon to Juneau, Ketchikan and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1996.

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	1,186 ^a	34	215	6
1990	2,011	27	1,584	22	6,023	61	4,511	46		no survey		
1991 ^b	4,279	37	2,957	26	8,373	66	7,035	55		no survey		
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
Average	1,754	21	1,430	17	2,673	47	2,001	35	4,644	46	1,671	17
1996	2,430	29	2,360	28	1,576	54	1,131	39	2,966	29	1,730	17

^a Not used to calculate average.

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

Table 16.—Estimated harvest of coho salmon, 1983–1996, 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	104 ^b
1990	26,343	1,914	33,661	no survey
1991	22,379	2,567	43,789	no survey
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
Average	20,279	2,729	22,227	9,233
1996	18,816	4,505	42,220	28,981
% of average	93	165	190	314

^a Includes Juneau Golden North Salmon Derby harvest.

^b Not used to calculate Sitka average.

Table 17.—Estimated contributions of hatchery-produced coho salmon to Juneau, Ketchikan, and Sitka marine boat sport fisheries as determined by onsite creel surveys, 1983–1996.

Year	Juneau marine		Ketchikan marine		Sitka marine	
	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	no survey	
1990	482	2	9,515	28	no survey	
1991 ^a	2,526	12	18,627	43	no survey	
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
Average	1,363	7	7,123	32	1,705	18
1996	3,276	17	16,841	40	5,224	18

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

average. The contribution of hatchery-produced coho salmon to the Sitka fishery was about average at 18% of the total harvest.

BOTTOMFISH FISHERIES

The 1996 harvest of Pacific halibut in the Juneau fishery (11,158) was similar to the 1983–1995 average of 11,494 (Table 18). The Ketchikan harvest (11,177) was 6% above the 1984–1995 average of 10,588. Total estimated catch of Pacific halibut in the Juneau fishery (14,341) was 12% below the 1983–1995 average (16,206). The 1996 catch of Pacific halibut in Ketchikan (15,229) was 16% above the 1984–1995 average (13,105). The retention rate for Pacific halibut was slightly above the average of 71% in Juneau at 78%, and the retention rate in Ketchikan (73%) was below the 1984–95 average of 81%. The Sitka harvest of halibut in 1996 (12,015) was 8% above the average harvest of 11,140, and retention rate of 67% in 1996 was average.

Rockfish harvest in the 1996 Ketchikan fishery (5,492) was 49% below the 1984–95 average of 10,870 (Table 19). Retention of rockfish at

43% was below the 1986–1995 average of 46%. Targeted and non-targeted HPUE and CPUE for rockfish were both well below average, continuing a trend of declining rockfish catches.

SHELLFISH FISHERIES

Harvests of shellfish in the Juneau and Ketchikan areas have been consistently estimated with creel surveys since 1988 (Table 20). In 1996, the estimated shellfish effort of 5,036 boat-days in the Juneau area was above average, as were the harvests of 4,826 king crab, 2,134 Tanner crab, and 15,605 Dungeness crab. The Dungeness crab harvest for Juneau was the highest on record. In Ketchikan, shellfish effort of 1,255 boat-days was below the 1988–1995 average of 1,413 boat-days. Dungeness crab harvest in Ketchikan of 5,528 was 30% below the 1988–1995 average of 7,893. Shrimp harvest in the Ketchikan area during 1996 (76,840) was above average.

Table 18.—Estimated harvest and catch of Pacific halibut in the Juneau, Ketchikan, and Sitka marine boat sport fisheries, 1983–1996.

Year	Juneau marine				Ketchikan marine				Sitka marine			
	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	2,694 ^a	1,411 ^a	4,105 ^a	66
1990	11,774	4,018	15,792	75	7,419	1,281	8,700	85		no survey		
1991	8,611	2,363	10,974	78	9,650	1,125	10,775	90		no survey		
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
Average	11,494	4,712	16,206	71	10,588	2,516	13,105	81	11,140	5,431	16,572	67
1996	11,158	3,183	14,341	78	11,177	4,052	15,229	73	12,015	5,859	17,874	67
% of average	97	68	88		106	161	116		108	108	108	

^a Not used to calculate average.

LITERATURE CITED (Continued)

Table 19.—Comparative effort and catch statistics for the Ketchikan rockfish sport fishery, 1984–1996.

Year	Survey dates	Angler effort		Total rockfish harvest and catch				Harvest per unit effort		Catch per unit effort	
		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
Average		258,868	70,217	10,870	12,893	23,871	46	0.15	0.04	0.34	0.09
1996	5/06–10/06	253,977	62,673	5,492	7,401	12,893	43	0.09	0.02	0.21	0.05
% of average		98	89	51	57	54		60	50	62	56

^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.

LITERATURE CITED (Continued)

Table 20.—Comparison of estimated shellfish effort and harvest for the Juneau and Ketchikan marine boat fisheries, 1988–1996.

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	
Average	4,181	9,555	2,084	3,998	
1996	5,036	15,605	2,134	4,826	

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
Average	1,413	7,893	13	0	61,713
1996	1,255	5,528	0	0	76,840

CONCLUSIONS AND RECOMMENDATIONS

The primary goals of this project were to obtain estimates of the harvest and of Alaska hatchery contributions of chinook salmon in selected sport fisheries of Southeast Alaska, with specified levels of precision for management of the fisheries.

Several changes have occurred in Southeast Alaska marine boat sport fisheries over the past decade. 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. For example, from 1990 through 1994, over 60% of the chinook salmon taken in the Ketchikan area originated in hatcheries. These enhancement efforts are costly, and catch

monitoring through the use of onsite creel survey programs is one of the few means to evaluate the success of hatchery programs in producing fish for sport anglers. During 1996, the percent contribution of Alaskan hatchery chinook salmon to Ketchikan, Sitka, and Juneau marine boat sport fisheries averaged 24%, and the total hatchery contribution averaged 32%. The percentages of hatchery coho salmon contributed to the Ketchikan, Juneau, and Sitka sport fisheries were 40%, 17%, and 18%, respectively, of the harvest. It is recommended that onsite creel surveys and catch sampling programs of marine sport boat fisheries be continued, in order to evaluate the effectiveness of stocking programs.

In March of 1992, the Alaska Board of Fisheries allocated the Southeast Alaska chinook salmon quota, established under the U.S./Canada Pacific Salmon Treaty, between the commercial and

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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 1996, 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 that 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. It is recommended that this expanded program be continued.

Data from marine boat surveys are also used for a variety of other purposes, including the 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 and Pacific halibut be continued, **in order to** improve management planning for 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.

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