Fishery Management Report No. 96-1

Area Management Report for the Sport Fisheries of Southeast Alaska, 1994

by

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Steve Hoffman,

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Mike Dean, and

Robert Johnson

February 1996

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

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by

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February 1996

The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone regional peer review.

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This document should be cited as:
Bentz, Robert, Paul Suchanek, Mike Bethers, Steve Hoffman, Art Schmidt, Mike Dean, and Robert Johnson. 1996. Area Management Report for the Sport Fisheries of Southeast Alaska, 1994. Alaska Department of Fish and Game, Fishery Management Report No. 96-1, Anchorage.

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MANAGEMENT AREA OVERVIEW

Description

The Southeast Alaska sport fish regional area consists of all marine waters of Alaska east of the longitude of Cape Suckling and north of the International Boundary at Dixon Entrance, and all freshwater drainages flowing into these marine waters. The Southeast Alaska area comprises eight statewide harvest survey reporting areas (Mills 1994). These areas are: (A) Ketchikan; (B) Prince of Wales Island; (C) Kake, Petersburg, Wrangell, and Stikine areas; (D) Sitka; (E) Juneau; (F) Haines and Skagway; (G) Glacier Bay; and (H) Yakutat (Figure 1).

Sport fish management and research programs for the Southeast Alaska area are conducted from five Alaska Department of Fish and Game offices located in Ketchikan, Petersburg, Sitka, Juneau, Haines, and Yakutat.

Angler Effort and Sport Harvests

Estimates of angler effort in terms of angler-days have been generated for eight areas in Southeast Alaska since 1977 by postal surveys. An average of 80% of sport fishing effort in Southeast Alaska is expended in marine waters (Table 1), with the Juneau, Ketchikan, and Sitka fisheries being the largest marine fisheries in the region. Total marine sport fishing effort during the 1992 season totaled 382,562 angler-days, more than double the average of 184,000 angler-days recorded in the late 1970s. In 1992, about 59% of total Alaska marine sport fishing effort occurred in Southeast Alaska.

Freshwater fishing effort is more evenly distributed around the region, with the largest fisheries occurring in the Haines/Skagway, Prince of Wales, and Ketchikan areas (Table 2). Due to the lack of large clear river systems, freshwater fishing effort is very dispersed on lakes and streams throughout the region. Freshwater fishing effort had increased by about 76% in 1992 over the average of 49,000 angler-days expended during the late 1970s. Important finfish species targeted by anglers in Southeast Alaska include the five major species of anadromous Pacific salmon, among which coho, pink, and chinook salmon are taken in the largest numbers (Table 3). Pacific halibut, along with bottomfish species such as rockfish and lingcod, are also harvested in substantial numbers by marine anglers. Smelt and other species of fish such as grey cod and greenling are also taken; however, harvests of these species are not managed. With the exception of razor clams (Table 3), harvests of other shellfish species have only recently been estimated, primarily through use of creel surveys.

Trout and char species harvested in Southeast Alaska include steelhead, cutthroat, rainbow trout, Dolly Varden, and brook trout (Table 4); Dolly Varden and cutthroat are taken in the largest numbers. Landlocked chinook or coho salmon have also been stocked into Twin Lakes near Juneau, and kokanee are found in lakes scattered throughout the region. Other freshwater species harvested include small numbers of Arctic grayling, whitefish, and northern pike.

Although effort targeted on specific species was not estimated through the postal surveys, creel survey information and local knowledge by area management biologists has been used to estimate effort for the major species of sport fish in Southeast Alaska during 1992 (Table 5). Over 75% of the regionwide fishing effort was targeted on chinook salmon, coho salmon, or bottomfish (primarily Pacific halibut) during 1992. Target species varied substantially depending on whether anglers were fishing from a boat or shore in marine waters or in freshwater. About 50% of freshwater fishing effort was for trout or char, while only about 5% of marine fishing effort was for these species. About two-thirds of all fishing effort was for anadromous salmon species.

Alaska Board of Fisheries Activities

The Alaska Board of Fisheries met at Sitka in November, 1993 and at Ketchikan in January, 1994 to consider over 100 proposals for sport finfish fisheries in Southeast Alaska. The largest changes were due to adoption of a regionwide management plan for cutthroat, rainbow, and steelhead trout to provide

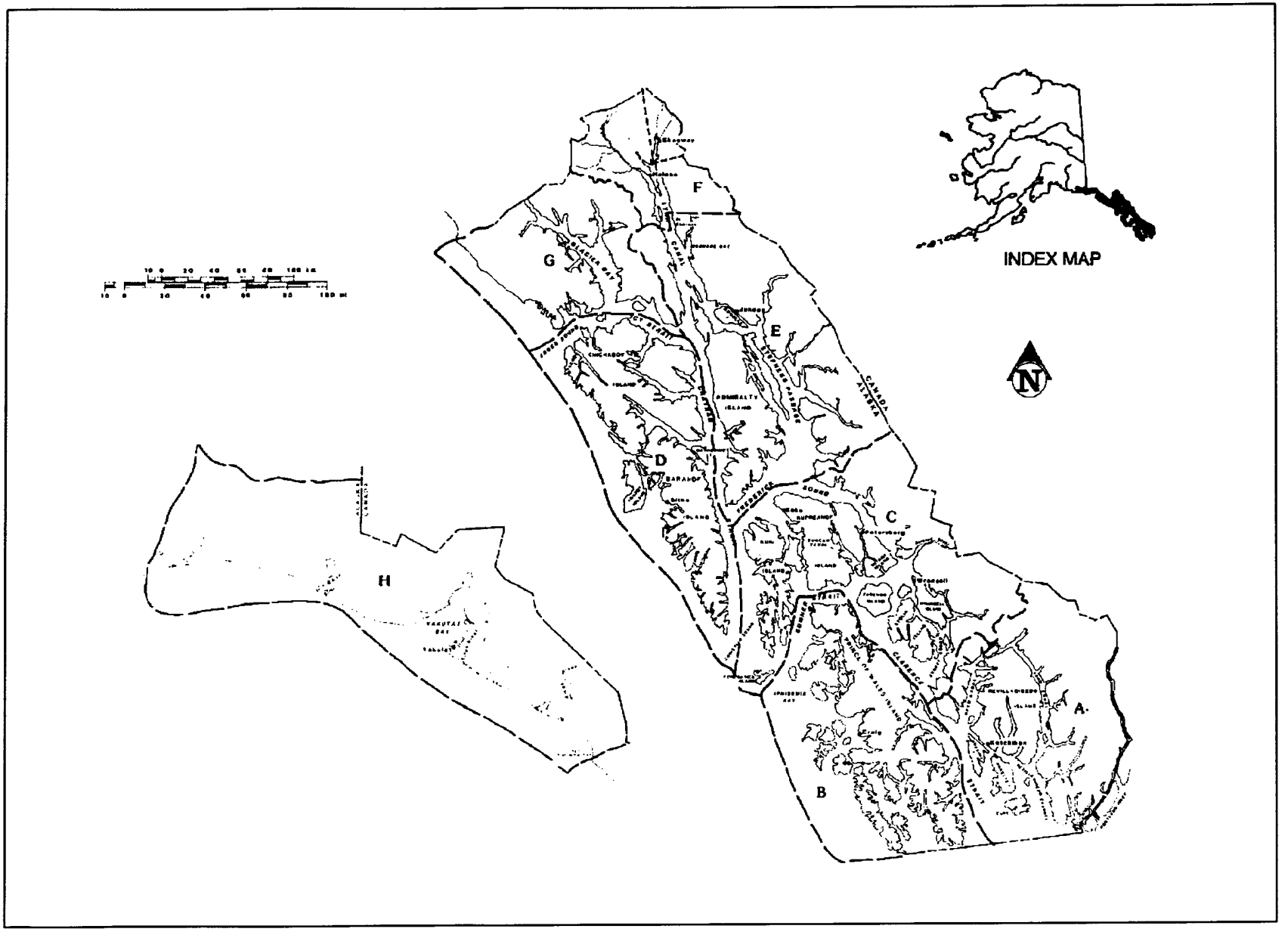

Figure 1. *Statewide harvest survey map showing the eight harvest reporting areas (A-H).*

Table 1. Estimated marine angler-days fished in Southeast Alaska by area, 1977–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total	Percent effort
1977	41,860	6,015	19,378	30,817	81,303	5,594	3,013	842	188,822	76%
1978	35,261	10,619	21,368	27,638	72,568	8,035	1,529	1,098	178,116	79%
1979	36,219	7,955	18,266	36,564	76,855	5,203	2,563	911	184,536	82%
1980	44,600	12,984	20,325	33,172	83,212	7,654	2,299	985	205,231	80%
1981	52,741	13,573	21,120	34,650	71,439	10,144	2,242	1,505	207,414	81%
1982	64,282	11,226	26,112	37,686	86,814	10,339	2,747	2,371	241,577	82%
1983	60,539	16,333	23,099	39,160	95,309	13,100	3,237	3,524	254,301	79%
1984	65,164	15,834	27,615	35,791	99,668	17,629	2,848	2,540	267,089	82%
1985	71,805	12,727	23,794	31,935	116,974	17,344	3,468	1,193	279,240	80%
1986	70,619	14,390	24,749	35,173	111,429	23,827	3,213	1,303	284,703	80%
1987	74,476	15,761	31,704	39,972	107,435	17,130	5,333	4,953	296,764	78%
1988	81,356	25,970	33,537	43,603	98,584	21,368	8,267	2,494	315,179	79%
1989	82,791	35,848	48,242	54,076	107,542	21,171	8,008	1,470	359,148	81%
1990	79,924	36,056	48,973	57,502	113,705	29,986	6,486	2,030	374,662	81%
1991	87,749	31,062	42,845	61,223	104,992	18,181	19,630	5,142	370,824	82%
1992	74,651	28,157	46,612	71,607	134,179	9,961	13,250	4,145	382,562	82%
1993	65,961	48,819	39,341	65,500	117,546	25,884	13,142	4,939	381,132	81%
Mean	64,118	20,196	30,416	43,298	98,797	15,444	5,957	2,438	280,665	80%
Percent	23%	7%	11%	15%	35%	6%	2%	1%	100%	

Table 2. Estimated freshwater angler-days fished in Southeast Alaska by area, 1977–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total	Percent effort
1977	13,880	6,028	7,834	6,927	11,076	6,008	1,362	5,037	58,152	24%
1978	7,711	5,859	4,373	5,303	9,262	9,866	129	5,535	48,038	21%
1979	6,805	6,131	5,140	3,946	8,180	4,526	79	5,282	40,089	18%
1980	9,757	7,216	6,178	5,510	6,883	10,510	143	4,884	51,081	20%
1981	6,834	7,203	6,340	3,844	5,923	10,617	196	6,184	47,141	19%
1982	8,530	10,612	4,297	5,663	7,028	9,315	17	5,902	51,364	18%
1983	7,602	12,563	4,655	4,998	12,864	17,081	253	6,170	66,186	21%
1984	6,948	9,152	7,084	4,258	8,344	15,073	535	7,655	59,049	18%
1985	9,498	11,481	6,055	4,680	5,807	23,068	433	9,505	70,527	20%
1986	12,295	10,612	5,753	4,587	9,626	20,043	651	9,717	73,284	20%
1987	9,221	15,084	5,477	5,611	7,321	28,881	1,845	9,523	82,963	22%
1988	16,810	9,601	5,467	5,077	10,276	18,801	1,009	15,573	82,614	21%
1989	9,856	14,811	5,713	5,154	7,818	26,847	887	10,672	81,758	19%
1990	11,203	14,158	10,992	4,404	8,340	26,760	1,371	10,655	87,883	19%
1991	10,535	16,235	5,168	6,970	8,921	21,443	2,335	11,920	83,527	18%
1992	9,831	16,313	9,694	6,674	15,203	15,935	2,029	10,351	86,030	18%
1993	11,184	13,725	8,041	9,444	16,350	15,771	1,912	13,644	89,964	19%
Mean	9,912	10,987	6,368	5,474	9,366	16,503	893	8,718	68,221	20%
Percent	15%	16%	9%	8%	14%	24%	1%	13%	100%	

Table 3. Estimated harvest of anadromous salmon, bottomfish, and miscellaneous marine species, 1977–1993.

	Anadromous salmon					Bottomfish species					
Year	Chinook	Coho	Pink	Sockeye	Chum	Pacific halibut	Rockfish	Lingcod	Smelt	Other fish	Razor clams
1977	17,449	36,152	34,031	5,803	1,116	5,832	8,962		55,034	11,456	10,309
1978	16,639	48,508	43,006	5,890	4,431	6,131	16,886		14,431	7,259	9,576
1979	16,581	23,112	31,351	3,479	1,398	13,102	30,981		80,006	11,979	13,393
1980	20,213	32,808	34,561	4,175	2,084	24,862	41,791		20,306	31,502	8,606
1981	21,300	28,158	33,717	3,173	2,607	21,842	45,671		1,468	20,306	8,597
1982	25,756	53,436	53,581	4,146	1,567	37,160	51,602		1,531	29,602	4,684
1983	22,321	55,403	51,815	5,701	3,270	41,995	50,268		62,708	19,590	8,791
1984	22,050	59,812	44,197	4,695	4,936	46,925	36,899		37,670	19,015	2,543
1985	24,858	59,910	69,253	4,250	5,608	46,114	34,039		11,410	26,076	11,830
1986	22,551	58,322	33,483	6,300	5,032	45,028	41,568		8,952	19,610	8,422
1987	24,324	50,284	57,060	9,374	5,207	44,347	42,261		60,412	53,650	2,149
1988	26,160	43,688	45,023	7,711	9,913	56,580	56,839		6,869	32,800	3,284
1989	31,071	90,789	70,822	13,114	8,932	74,304	39,504		4,564	17,579	5,104
1990	51,218	105,212	65,208	9,848	4,962	66,490	25,959		3,678	20,167	4,428
1991	60,492	123,936	57,859	9,715	5,593	74,038	26,828	9,758	6,202	14,204	618
1992	42,892	99,939	54,101	9,318	6,041	71,861	31,213	13,193	36,940	8,892	2,445
1993	49,246	121,874	51,436	17,419	9,380	87,779	32,030	14,969	2,374	13,237	1,001
Mean	29,125	64,197	48,853	7,301	4,828	44,964	36,077	12,640	24,386	20,996	6,222

Table 4. Estimated harvest of trout and char, landlocked salmon, and miscellaneous freshwater species, 1977–1993.

	Trout and char species					Landlocked salmon				
Year	Steelhead	Cutthroat	Rainbow	Dolly Varden	Brook trout	Chinook or coho	Kokanee	Arctic grayling	Whitefish	Northern pike
1977	1,750	23,377	7,741	34,734	759	0	574	775	0	0
1978	1,618	23,188	6,220	34,919	1,691	0	181	669	0	0
1979	1,424	19,345	4,071	31,405	672	0	645	281	118	0
1980	2,769	24,433	6,542	44,175	2,273	0	439	129	551	0
1981	1,537	16,436	3,600	33,398	861	0	288	49	0	0
1982	2,368	22,816	3,722	37,524	818	0	492	482	524	0
1983	3,469	18,605	4,672	49,752	1,606	1,301	73	947	31	0
1984	4,160	16,994	5,991	46,066	636	568	139	381	21	0
1985	3,088	20,479	5,584	60,675	1,058	69	433	225	140	0
1986	4,722	14,610	6,244	61,139	526	56	257	447	34	0
1987	4,677	14,247	4,885	46,721	298	0	385	742	0	18
1988	4,309	16,317	5,927	59,371	1,273	728	474	527	91	18
1989	5,409	18,861	7,085	51,636	887	528	520	214	61	42
1990	4,274	15,660	4,204	48,300	450	413	99	368	16	0
1991	4,632	9,672	5,352	45,954	477	1,222	362	81	60	136
1992	2,439	12,957	4,292	26,238	1,026	1,536	769	512	18	0
1993	1,249	15,351	4,190	26,893	762	1,454	206	95	0	0
Mean	3,170	17,844	5,313	43,465	945	463	373	407	98	13

Table 5. Estimated angler-days and percentage of effort by target in marine and freshwater Southeast Alaska sport fisheries during 1992.

Target	Marine angler-days		Freshwater angler-days		Total angler-days	
	Number	Percent	Number	Percent	Number	Percent
Chinook salmon	160,289	41.9	917	1.1	161,207	34.4
Coho salmon	78,311	20.5	24,818	28.8	103,128	22.0
Pink salmon	27,059	7.1	7,924	9.2	34,983	7.5
Chum salmon	3,862	1.0	1,420	1.7	5,282	1.1
Sockeye salmon	164	0.0	6,900	8.0	7,063	1.5
Subtotal: anadromous salmon	269,684	70.5	41,979	48.8	311,663	66.5
Bottomfish	93,787	24.5	0	0.0	93,787	20.0
Steelhead trout	1,231	0.3	12,945	15.0	14,176	3.0
Cutthroat trout	1,597	0.4	12,561	14.6	14,157	3.0
Rainbow trout	0	0.0	4,100	4.8	4,100	0.9
Dolly Varden	16,263	4.3	11,218	13.0	27,482	5.9
Brook trout	0	0.0	879	1.0	879	0.2
Landlocked chinook or coho salmon	0	0.0	1,485	1.7	1,485	0.3
Kokanee	0	0.0	445	0.5	445	0.1
Arctic grayling	0	0.0	419	0.5	419	0.1
Subtotal: trout, char, and landlocked salmon	19,091	5.0	44,051	51.2	63,142	13.5
Total	382,562		86,030		468,592	

additional protection to these stocks. The management plan provided for reduced bag limits, minimum size limits, and bait restrictions in fresh water. A number of lakes were designated as either 'trophy' or 'high-use' lakes. Regulations for these lakes were more restrictive than the general regional regulations.

The board also (1) increased the sport fishery allocation of king salmon by 1% per year beginning in 1994, (2) established a bag limit and a spawning season closure for lingcod, (3) reduced the bag limit for Dolly Varden in marine waters adjacent to the Juneau road system and in the Chilkoot Lake drainage, (4) established spawning season closures for cutthroat trout in several streams in the Haines/Skagway area, and (5) prohibited the use of bait in all fresh water drainages crossed by the Yakutat road system and the Situk and Lost River drainages.

Access programs

Much of Southeast Alaska is accessible only by water and air. There are no roads which connect cities and communities along the coastline, so marine waterways act as an extension of the road system. Because of this fact, there are over one hundred boating facilities, both public and private, located throughout Southeast Alaska.

The Alaska Department of Fish and Game, Division of Sport Fish, administers a program funded through the Federal Aid in Sport Fish Restoration Act, to provide better access to Alaska's fish and wildlife resources. The purpose of this program, entitled 'Recreational Boating and Sport Fishing Access Program,' is to improve public access by acquiring land, improving existing sites, and developing new sites. A five-year summary of projects funded for the Southeast region is listed in Table 6.

The Federal Aid in Sport Fish Restoration Program operates through a 'user pay–user benefits' cycle of tax collection and disbursement. Anglers and boaters (the users) initiate the cycle by paying taxes on items such as fishing rods and reels, terminal tackle, downriggers, tackle boxes, outboard motors, sonar devices, and boat gas, to name a few. These tax

Table 6. Projects funded through the Federal Aid in Sport Fish Restoration program.

Year	Project	Location	Amount ($K)	Project status
FY92	N. Douglas mooring float	Juneau	160	completed in 1993
	Chilkoot Lake boat ramp	Haines	60	completed in 1993
	Beaver Lake trail	Sitka	26.5	completed in 1992
FY93	Banana Point boat ramp	Petersburg	350	completed in 1994
	Swanson Harbor Refuge float	Juneau	200	completed in 1994
	Dewey Lakes trail improvement	Skagway	25	completed in 1994
FY94	Klawock marine boat ramp	POW Island	250	not started
FY95	Gustavus float expansion	Gustavus	150	project approved
	Harriett Hunt Lake boat ramp	Ketchikan	145	not started
	Skagway harbor improvement	Skagway	15	not started
FY96	Knudson Cove boat ramp	Ketchikan	200	not started
	Yakutat Harbor improvements	Yakutat	75	not started
	Coffman Cove boat ramp	POW Island	175	not started

dollars are collected from the manufacturer by the U.S. Treasury and are disbursed to the states under the authority of the Sport Fish Restoration Act by the United States Fish and Wildlife Service, Division of Federal Aid. The states use these allocations for sport fish research, management, aquatic education and public access projects. The cycle is completed with a return of benefits to the users through increased sport fishing opportunities and better public access facilities.

Charter Vessel and Freshwater Guide Registrations

Owners of charter boats within the Southeast Alaska area have been required since 1982 to register annually with the department. The number of charter registrations remained fairly constant from 1984 through 1990 (Figure 2). Beginning in 1991, the number of registrations in Southeast Alaska increased steadily, to a record of 727 registrations in 1994. The cause for the rapid increase is probably twofold: (1) dramatic declines of salmon stocks in Washington, Oregon, and California led to severe fishing restrictions, which prompted some charter operators there to move their operation to Southeast Alaska; and, more importantly, (2) rumors of some form of limited entry for charter operators in the region caused many boat owners to register—although they were not actively chartering—in hopes of receiving a limited entry permit which could be sold at a later date.

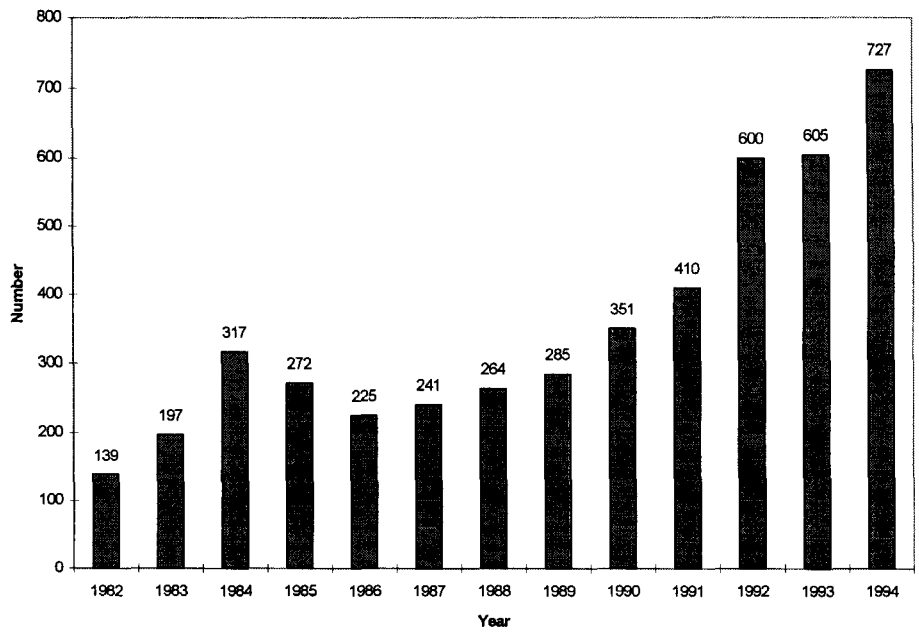

Figure 2. Number of registered charter boats in Southeast Alaska, 1982–1994.

King salmon harvests by clients aboard charter boats have been estimated since 1987 through the creel survey program at towns throughout the region. The percentage of harvest taken by clients on charter boats has ranged from less than 10% in the Petersburg/Wrangell area to nearly 40% in Ketchikan.

Fishing guides who operate in the fresh waters of Southeast Alaska have been required to register annually with the department since 1989. The number of guide registrations has increased slowly during the past six years, with a high of 146 registrations received in 1992 (Figure 3).

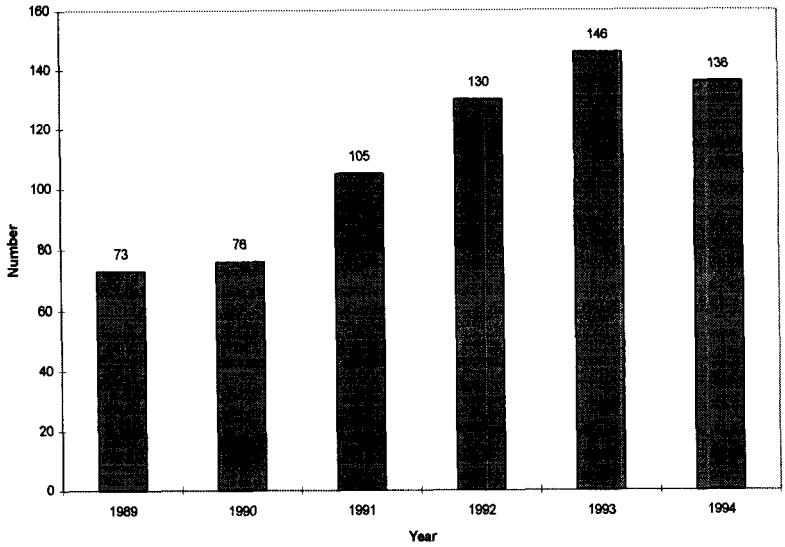

Figure 3. *Number of registered freshwater guides in Southeast Alaska, 1989–1994.*

The geographic distribution of the charter fleet throughout Southeast Alaska in 1994 was:

Town or location	Number of charter registrations
Ketchikan	141
Prince of Wales Island	90
Yes Bay (near Ketchikan)	21
Petersburg	34
Wrangell	35
Sitka	160
Elfin Cove	19
Glacier Bay	3
Gustavus	21
Angoon	23
Hoonah	12
Pelican	5
Tenakee Springs	4
Juneau	103
Haines	11
Skagway	4
Yakutat	15

CHINOOK SALMON FISHERIES

Chinook salmon are available year-round in salt water throughout Southeast Alaska; however, the vast majority of the recreational harvest occurs between mid-April and the end of September. During spring, most anglers troll from boats in salt water for large maturing chinook salmon that are returning to spawn in mainland river systems. By late June, most mature fish have passed through the fisheries on inside waters, but immature fish known as 'feeders' have become available. These immature fish are typically smaller, and anglers usually fish deeper than for maturing fish, using a variety of methods. Since there is a 28-inch minimum size limit for the marine sport fishery, substantial numbers of sublegal fish known as 'shakers' are also caught and released. Freshwater fishing opportunities for chinook salmon in Southeast Alaska are very limited.

Most chinook salmon fisheries in Southeast Alaska take place on mixed stocks, some of which originate in British Columbia, Oregon, or Washington. Due to this mixing of stocks, management of the sport fishery (and commercial fisheries) for chinook salmon in Southeast Alaska is one of the most controversial issues in the region. Under guidelines set through the Pacific Salmon Treaty, annual catch quotas for chinook salmon harvest have been set since 1985 for the combined sport and commercial fisheries in Southeast Alaska. Catch quotas have been allocated by the Alaska Board of Fisheries since 1992 on a fixed percentage basis between the sport and commercial fisheries. A management plan passed in 1992 is used to regulate levels of sport harvests of chinook salmon in Southeast Alaska through changes in regulations so that the quota is obtained.

In 1988, an estimated $22.9 million (28% of the total for all species) was spent by anglers fishing for chinook salmon in Southeast Alaska. Anglers also indicated that they had an additional net willingness to pay (over and above what they currently pay) $15.3 million to ensure continued availability of sport fishing for chinook salmon. Angler spending on fishing trips for chinook salmon was highest in the Juneau ($7.4 million) and Ketchikan ($6.4 million) areas.

Angler Effort

During the last five years, over 40% of regional sport fishing effort in marine waters of Southeast Alaska has been targeted on chinook salmon (Table CH1). Since fishing opportunities are limited, only about 1% (an average 845 angler-days for 1989–1993) of freshwater sport fishing effort targets on chinook salmon. About 53% of the sport fishing effort for chinook salmon occurs in the Juneau and Ketchikan areas, with Sitka and Petersburg/Wrangell fisheries contributing another 34% of the fishing effort. Effort for chinook salmon increased by about 17% (25,000 angler-days) from 1989 to 1993.

Sport and Commercial Harvests

Annual sport harvests of chinook salmon in Southeast Alaska from 1977 to 1987 were relatively stable, averaging 21,277 fish (Table CH2). In 1989, harvests began increasing rapidly, and the average harvest from 1989–1993 was 46,984 fish. The preliminary estimate of chinook salmon sport harvest for 1994 is 40,630. The largest harvest of chinook salmon occurred in 1991 when 60,492 were taken. Since 1991, regulatory restrictions have been used to stabilize the sport harvest of chinook salmon as mandated by the Southeast Alaska King Salmon Management Plan. The Juneau and Ketchikan sport fisheries have historically been the largest sport fisheries in Southeast Alaska, but in recent years the largest increase in harvests has occurred in the Sitka and Prince of Wales sport fisheries.

During the late 1970s, sport harvests of chinook salmon totaled about 4% to 6% of the combined sport and commercial harvests of chinook salmon (Table CH3). The percentage of chinook salmon harvested by sport fisheries slowly increased during the 1980s to about 7% to 8%. The combined harvest by sport and commercial fisheries has been limited since 1985 by the Pacific Salmon Treaty. In the 1990s, the sport harvest of chinook salmon has constituted about 15%

Table CH1. Estimated marine, freshwater, and combined (marine plus freshwater) angler-days of sport fishing effort for chinook salmon in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	Percent of total[a]
MARINE ANGLER-DAYS									
1989	32,171	14,579	25,215	25,334	42,522	5,854	52	145,727	41
1990	35,470	14,589	28,878	26,464	45,875	8,719	91	160,086	43
1991	39,777	12,621	24,013	27,490	54,176	5,141	223	163,440	44
1992	30,724	11,428	27,394	31,304	56,284	2,963	191	160,289	42
1993	26,630	19,998	23,850	33,206	57,298	9,620	198	170,799	45
Mean	32,954	14,643	25,870	28,760	51,231	6,460	151	160,068	43
Percent	21	9	16	18	32	4	<0.5		
FRESHWATER ANGLER-DAYS									
1989	54	0	0	0	229	0	375	658	0.8
1990	118	0	0	0	286	0	440	844	1.0
1991	61	0	0	0	261	0	394	716	0.9
1992	68	0	0	0	495	0	354	917	1.1
1993	83		0	0	507	0	500	1,090	1.2
Mean	77	0	0	0	356	0	413	845	1
Percent	9	0	0	0	42	0	49		
COMBINED ANGLER-DAYS									
1989	32,225	14,579	25,215	25,334	42,751	5,854	427	146,385	33
1990	35,588	14,589	28,878	26,464	46,161	8,719	531	160.930	35
1991	39,838	12,621	24,013	27,490	54,437	5,141	617	164,156	36
1992	30,792	11,428	27,394	31,304	56,779	2,963	545	161,206	34
1993	26,713	19,998	23,850	33,206	57,805	9,620	698	171,889	36
Mean	33,031	14,643	25,870	28,760	51,587	6,460	564	160,913	35
Percent	21	9	16	18	32	4	10		

[a] Percent of total regional effort for marine, freshwater, or total angler days.

Table CH2. Estimated sport harvest of chinook salmon in Southeast Alaska by area, 1977–1994 (1994 estimates are preliminary).

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total
1977	4,672	811	2,671	1,738	6,377	471	356	353	17,449
1978	3,845	1,817	2,109	1,841	5,686	769	315	257	16,639
1979	4,165	863	2,173	2,054	5,935	664	282	445	16,581
1980	5,415	1,274	3,495	1,489	7,068	792	241	439	20,213
1981	5,683	1,294	2,906	1,955	7,722	1,372	184	184	21,300
1982	6,215	933	4,076	1,781	10,614	1,592	147	398	25,756
1983	7,968	1,543	3,332	2,108	5,431	1,426	157	356	22,321
1984	5,063	1,095	3,067	2,251	8,948	1,313	129	184	22,050
1985	6,170	534	4,060	1,430	10,376	2,041	186	61	24,858
1986	6,197	987	3,906	1,902	7,213	2,054	183	109	22,551
1987	5,826	649	3,534	2,537	9,857	1,419	258	244	24,324
1988	7,422	1,135	4,668	3,539	7,884	789	438	285	26,160
1989	7,642	2,599	4,702	5,569	9,375	758	344	82	31,071
1990	12,784	5,564	10,185	8,041	12,349	1,809	369	117	51,218
1991	11,887	6,749	8,011	13,243	16,914	679	2,385	624	60,492
1992	8,010	4,381	5,746	11,139	11,886	181	1,071	478	42,892
1993	6,028	8,367	6,132	13,464	13,118	844	716	577	49,246
Mean	6,764	2,388	4,398	4,475	9,221	1,116	457	305	29,125
Percent	23	8	15	15	32	4	2	1	100
1994	3,939	8,555	2,409	13,798	10,032	500	1,065	332	40,630

Table CH3. Sport and commercial harvests of chinook salmon in Southeast Alaska, 1977–1994 (1994 totals are preliminary). Commercial harvests do not include salmon that were confiscated or caught in commercial test fisheries and sold.

					Breakdown of commercial harvest by gear type					
Year	Sport	(%)	Total commercial	(%)	Seine[a]	Drift gillnet	Set gillnet	Troll[b]	Annette Island	Hatchery controlled
1977	17,449	6%	285,178	94%	5,242	5,578	2,549	271,735	74	0
1978	16,639	4%	400,925	96%	13,972	8,266	3,057	375,433	197	0
1979	16,581	4%	362,761	96%	10,079	13,738	4,299	334,306	339	0
1980	20,213	6%	323,999	94%	11,701	5,433	2,800	303,885	180	0
1981	21,300	7%	267,742	93%	10,264	6,317	2,069	248,791	301	0
1982	25,756	8%	291,314	92%	31,165	15,238	1,456	242,315	1,140	0
1983	22,321	7%	289,445	93%	13,578	4,734	976	269,790	367	0
1984	22,050	8%	268,964	92%	20,762	10,338	1,062	235,629	236	937
1985	24,858	9%	254,164	91%	23,073	10,411	1,231	216,086	705	2,658
1986	22,551	8%	261,974	92%	13,342	8,437	1,428	237,557	117	1,093
1987	24,324	8%	262,364	92%	6,292	8,430	2,072	242,667	532	2,371
1988	26,160	9%	263,805	91%	12,163	9,076	893	231,300	731	9,642
1989	31,071	10%	284,070	90%	17,556	9,613	798	235,609	892	19,602
1990	51,218	13%	345,421	87%	14,793	14,692	664	287,092	1,840	26,340
1991	60,492	15%	330,597	85%	17,147	18,593	1,750	263,091	1,880	28,136
1992	42,892	15%	235,240	85%	20,308	11,256	2,025	183,496	1,210	16,945
1993	49,246	15%	280,662	85%	12,568	17,984	1,311	226,037	639	22,123
Mean	29,125	9%	294,625	91%	14,941	10,478	1,791	259,107	669	7,638
1994	40,630	14%	246,153	86%	21,089	16,733	3,897	186,167	230	18,037

[a] Includes chinook 21 inches or less in length.

[b] Troll harvest shown by calendar year for 1977–1979 and by season (Oct. 1–Sept. 30) for 1980–1994.

of combined sport and commercial harvests. Further growth of sport harvests is now regulated by Board of Fisheries allocation guidelines in conjunction with a Management Plan.

Because there is a 28-inch minimum size limit for chinook salmon, and large numbers of small chinook salmon rear in Southeast Alaska marine waters, large numbers of sublegal chinook salmon are caught and released by sport anglers (Table CH4). Chinook salmon less than 28 inches in length are only taken legally in terminal hatchery areas opened by emergency order or in fresh water in the Yakutat area; therefore, harvests have averaged only about 1,200 from 1990–1993. Due primarily to large variations in abundance, the number of sublegal chinook salmon caught has varied between 43,000 and 124,000 from 1990–1993. Postal survey data indicate that retention of chinook salmon 28 inches or more in length has averaged about 71% since 1990, with the total catch remaining stable. Retention rate information gathered during creel surveys, however, suggests that retention rates may be higher. It is possible that some anglers incorrectly report released sublegal chinook as legal chinook salmon released on their postal surveys.

Table CH4. Estimated sport total catch and harvest of small and large chinook salmon in Southeast Alaska, 1990–1993.

	Small chinook salmon (less than 28 inches in length)		Large chinook salmon (28 inches or more in length)		
Year	Total catch	Harvest	Total catch	Harvest	Retention rate
1990	123,975	2,833	71,789	48,385	67.4%
1991	46,559	1,957	68,699	58,535	85.2%
1992	54,465	54	70,003	42,838	61.2%
1993	43,536	145	68,990	49,101	71.2%
Mean	67,134	1,247	69,870	49,715	71.2%

Wild Stock Status

Chinook salmon stocks in Southeast Alaska and the entire west coast of Oregon, Washington, and British Columbia were thought to be depressed in numbers during the late 1970s. A wild stock rebuilding program was therefore implemented in Southeast Alaska in 1981 and for the rest of the West Coast in 1985. Since enactment of the rebuilding program, run sizes have increased in most of the indicator stocks in Southeast Alaska, and total escapement index counts peaked at over 32,000 fish in 1993 (Table CH5).

Escapement index goals are still not being met for some of the systems, but escapement goals for some stocks are currently being reevaluated, as they may have been set too high. Preliminary expansions of escapement index counts to all Southeast Alaska systems indicate escapements totaled over 100,000 fish in 1993.

Chinook salmon stocks in Southeast Alaska can be divided into two general stock categories: inside rearing and outside rearing (Table CH5). Juveniles from outside rearing stocks are thought to rear in the Gulf of Alaska, and therefore only maturing adults returning to spawn in April through July are vulnerable to the sport fishery. Inside rearing stocks are found in Southeast Alaska waters throughout their marine residence and are therefore more heavily exploited, as they are vulnerable to sport and commercial fisheries for a much longer period.

The largest runs occur in outside rearing stocks such as those from the Taku and Stikine rivers, which are transboundary rivers where much of the spawning occurs in Canada. Since 1977, an average of 70% of chinook salmon index counts in Southeast Alaska occurred in these two systems. Escapement has trended steadily upward in the Taku and Stikine rivers since 1983, as escapement into these two rivers seems to be correlated. Escapement into inside rearing stocks in Behm Canal peaked in 1986 and has generally declined since. The Chilkat River appears to have the largest run of inside rearing fish, with average escapements of about 5,000 for the years 1991–1994 (although this is a total estimate rather than an index).

Sport fisheries in Southeast Alaska are also dependent upon wild stocks of chinook salmon from British Columbia, Washington, and Oregon. Response of these stocks to the coastwide rebuilding program has been highly variable, and several stocks in the Snake River

Table CH5. Escapement indices for chinook salmon greater than 28 inches in length to outside rearing and inside rearing indicator systems in Southeast Alaska, 1977–1994.

	Outside Rearing					Inside Rearing				
Year	Taku	Stikine	Alsek	Situk	Subtotal	Behm Canal[a]	Northern[b]	Total	% Taku and Stikine	Chilkat River[c]
1977	5,671	1,600	2,894	1,732	11,897	1,679	590	14,166	51%	
1978	3,305	1,264	2,676	814	8,059	1,949	445	10,453	44%	
1979	4,156	2,332	4,274	1,400	12,162	1,295	398	13,855	47%	
1980	7,544	4,274	2,487	905	15,210	1,742	352	17,304	68%	
1981	9,786	6,668	1,963	702	19,119	1,603	626	21,348	77%	
1982	4,813	5,660	1,969	434	12,876	3,021	901	16,798	62%	
1983	2,062	1,188	2,237	592	6,079	3,135	611	9,825	33%	
1984	3,909	2,588	1,572	1,726	9,795	4,057	639	14,491	45%	
1985	7,208	3,114	1,283	1,521	13,126	3,473	491	17,090	60%	
1986	7,520	2,891	2,607	2,067	15,085	5,839	952	21,876	48%	
1987	5,743	4,783	2,491	1,884	14,901	5,065	981	20,947	50%	
1988	8,626	7,292	1,994	885	18,797	3,491	681	22,969	69%	
1989	9,480	4,715	2,289	652	17,136	3,582	768	21,486	66%	
1990	12,249	4,392	1,742	700	19,083	2,018	832	21,933	76%	
1991	10,153	4,506	2,248	875	17,782	1,653	534	19,969	73%	5,897
1992	11,058	6,627	1,246	1,400	20,331	1,596	877	22,804	78%	5,204
1993	13,204	11,449	3,302	790	28,745	2,122	1,235	32,102	77%	4,472
1994	9,913	6,450	3,675	1,200	21,238	1,566	712	23,516	70%	6,400
Escapement goal = 13,200	5,300	4,700	600	23,800	2,000	625	26,425	70%	none	

[a] Includes Chickamin, Unuk, Blossom, and Keta rivers.

[b] Includes Andrew Creek and King Salmon River escapements.

[c] Chilkat River totals are estimates of total escapement generated only since 1991.

Table CH6. Releases (in thousands) of age 1.- chinook salmon smolts by release year and area in Southeast Alaska. Releases for 1994 are projections.

Release	Ketchikan area hatcheries				Central inside hatcheries				Sitka area hatcheries			Northern hatcheries			Total
year	SSRAA[a]	Tamgas	Deer Mtn.	Sub-total	Crystal Lake	Hidden Falls	Other central[b]	Sub-total	Medvejie	Sheldon Jackson	Sub-total	Snettisham	Other[c]	Sub-total	releases
1981	0	0	66	66	42	0	31	73	0	0	0	27	0	27	165
1982	146	0	119	264	274	0	20	294	0	0	0	39	0	39	598
1983	214	0	147	361	138	81	130	348	0	0	0	234	0	234	943
1984	140	49	0	189	666	70	176	912	27	0	27	286	0	286	1,414
1985	259	391	0	650	135	97	193	425	22	0	22	109	0	109	1,206
1986	1,265	573	46	1,885	650	92	213	955	108	54	162	387	0	387	3,389
1987	1,649	1,446	42	3,137	684	97	205	986	228	47	275	1,047	6	1,054	5,451
1988	1,751	164	121	2,036	1,033	159	287	1,479	175	32	207	431	5	436	4,157
1989	1,458	889	191	2,538	1,100	344	422	1,865	744	97	840	1,224	2	1,226	6,469
1990	2,688	1,132	121	3,941	1,628	351	503	2,482	921	101	1,022	1,631	108	1,739	9,183
1991	2,076	671	154	2,901	837	185	349	1,371	866	51	917	398	51	449	5,638
1992	2,102	527	128	2,757	888	1,544	443	2,875	1,145	94	1,239	593	211	804	7,675
1993	1,775	185	102	2,062	1,000	1,754	302	3,056	800	80	880	1,616	242	1,858	7,856
1994	1,486	300	90	1,876	823	1,092	160	2,075	1,083	103	1,186	284	253	536	5,673

[a] Includes Neets Bay and Whitman Lake hatcheries owned by Southern Southeast Regional Aquaculture Association (SSRAA).

[b] Includes releases from the Little Port Walter, Port Armstrong, and Burnett Inlet hatcheries.

[c] Includes releases from the Gastineau, Jerry Meyers, and Burro Creek hatcheries.

in Idaho have been declared threatened or endangered under the Endangered Species Act. Other stocks in the Lower 48 have also been petitioned for listing under the Endangered Species Act. On the other hand, a number of stocks in British Columbia and the Lower 48 have been well above escapement goals. Since most wild stocks of chinook salmon have not been coded wire tagged, it is not possible to determine accurately what wild stocks from these areas contribute to the sport fishery in Southeast Alaska.

Enhancement and Stock Composition of the Harvest

Because of the value of chinook salmon both to sport and commercial fisheries, large enhancement efforts have supplemented wild chinook salmon stocks throughout the Pacific coast from Southcentral Alaska south to northern California. Hatchery chinook salmon caught in Southeast Alaska originate primarily in Southeast Alaska and British Columbia, although some hatchery fish from Washington and Oregon are also taken.

Fifteen hatcheries in Southeast Alaska have released chinook salmon smolts in the last decade (Table CH6). Total releases of 1-check smolts have ranged up to 9.2 million smolts in 1990, although in 1992 and 1993 about 7.7 to 7.8 million smolts were released. The total rearing capacity of these hatcheries is about 12 million age 1.- smolts. Additional releases have included age 0.- smolts; however, success of these releases has been very limited.

As with wild stocks, sport fisheries in Southeast Alaska are also dependent upon hatcheries in British Columbia, Washington, and Oregon. Of most importance to the sport fishery has been the Robertson Creek hatchery on the west coast of Vancouver Island where about 8 million smolts are released annually. Other hatcheries in British Columbia, including the Kitimat and Nitinat hatcheries, have also been important contributors to the sport fishery in Southeast Alaska.

Sampling of chinook salmon harvests for coded wire tags has provided information on distribution and contribution patterns of hatcheries to major sport fisheries (Table CH7). With the exception of the Petersburg/Wrangell area, average hatchery contributions have increased substantially from 1983–1988 to 1989–1993. In general, smolts disperse primarily in a northerly direction; hatcheries therefore contribute primarily to sport fisheries located north of the hatchery. For

Table CH7. Estimated percentages of chinook salmon harvest contributed to selected major Southeast Alaska boat sport fisheries by Ketchikan, Central Inside, Sitka, Northern, and non-Alaskan area hatcheries for the periods 1983-1988, 1989-1993, and 1994 (1994 data are preliminary).

		General location of hatcheries					
Sport fishery	Years	Ketchikan	Central inside	Sitka	Northern	Non-Alaskan	Total
Juneau	1983–1988	2.1%	7.4%	0.0%	4.0%	1.9%	15.5%
	1989–1993	2.0%	8.1%	0.0%	10.7%	7.7%	28.5%
	1994	1.1%	13.1%	1.1%	17.2%	4.0%	36.6%
Ketchikan	1983–1988	23.2%	0.5%	0.0%	0.0%	6.9%	30.6%
	1989–1993	44.2%	2.7%	0.0%	0.0%	15.2%	62.2%
	1994	35.6%	2.7%	0.0%	0.0%	30.1%	68.4%
Petersburg/ Wrangell	1983–1988	2.9%	11.6%	0.0%	0.0%	4.0%	18.6%
	1989–1993	3.3%	14.9%	0.0%	0.0%	1.0%	19.2%
	1994	2.3%	19.4%	0.0%	0.0%	1.4%	23.1%
Sitka	1983–1988	0.7%	1.1%	0.1%	0.0%	17.4%	19.3%
	1989–1993	1.3%	1.1%	8.3%	0.1%	39.7%	50.5%
	1994	0.0%	0.2%	12.2%	0.0%	34.8%	47.2%

example, Northern (Juneau and Sitka) area hatcheries primarily contribute only to sport fisheries in the local area, while Ketchikan and Central Inside hatcheries contribute throughout the region. Large increases in non-Alaskan hatchery contributions have occurred in all fisheries with the exception of the Petersburg/ Wrangell fishery.

Coded wire tag sampling programs have provided enough data to estimate the overall mixture of wild, Alaska hatchery, and non-Alaskan hatchery stocks (Table CH8). Harvests of Alaskan and non-Alaskan hatchery chinook salmon both have increased greatly since 1983 and peaked in 1991 when an estimated 55% of the harvest was of hatchery origin. Harvests of non-Alaskan hatchery stocks exceeded harvests of Alaska hatchery stocks in 1993 for the first time when they composed about 20% of the harvest in comparison to 18% for the Alaska hatchery stocks.

Most hatchery chinook salmon produced in Alaska after 1985 do not count against the U.S./ Canada Pacific Salmon Commission catch quota for chinook salmon. Harvests of non-Alaskan hatchery fish, however, do count against catch quotas. Regional sport harvests of wild chinook salmon have increased

Table CH8. Estimated harvests of wild, Alaska hatchery, and non-Alaskan (British Columbia, Washington, and Oregon) hatchery stocks of chinook salmon by the sport fishery in Southeast Alaska, 1983–1994 (1994 estimates are very preliminary). Harvests were estimated by expanding coded wire tag data from sampled sport fisheries to the entire region, and due to a lack of sampling, are poorly estimated for the years 1990 and 1991.

	Wild stocks[a]		Alaska hatchery		Non-Alaskan hatchery		
Year	Harvest	(%)	Harvest	(%)	Harvest	(%)	Total
1983	20,953	94%	872	4%	496	2%	22,321
1984	19,566	89%	1,904	9%	580	3%	22,050
1985	20,802	84%	3,372	14%	684	3%	24,858
1986	16,440	73%	5,010	22%	1,101	5%	22,551
1987	18,389	76%	5,108	21%	827	3%	24,324
1988	18,212	70%	5,545	21%	2,403	9%	26,160
1989	21,531	69%	6,351	20%	3,189	10%	31,071
1990	28,309	55%	14,276	28%	8,633	17%	51,218
1991	27,365	45%	18,777	31%	14,350	24%	60,492
1992	25,836	60%	9,459	22%	7,597	18%	42,892
1993	30,484	62%	9,064	18%	9,698	20%	49,246
1994	24,262	60%	7,769	19%	8,599	21%	40,630

[a] Wild stock harvests may include some untagged hatchery stocks from outside Alaska.

from about 20,000 fish in the mid-1980s to a peak of 30,500 in 1993.

Recent Board of Fisheries Actions

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 sport fisheries. A total of 20,000 chinook salmon was allocated to the commercial net fisheries, and the rest of the available chinook salmon was divided as follows: 83% to the commercial troll fishery and 17% to the sport fishery. Prior to this time, the estimated sport harvest of chinook salmon was subtracted from the allowable quota and the commercial troll fishery was managed to take the balance of the quota available. The 1992 and 1993 Southeast Alaska chinook salmon quota was 263,000 fish; therefore, the annual quota for the sport fishery was 41,310 [(263,000 – 20,000) × 17%]. Because past all-gear Southeast Alaskan harvests of chinook salmon exceeded quota levels, the Board of Fisheries specified that 1,700 treaty fish be deducted from the 1993 sport quota. In January of 1994, the Board of Fisheries increased the percentage of the allocation to the sport fishery from 17% to 18% in 1994, 19% in 1995, and 20% in 1996.

The Board of Fisheries directed that the harvest of 'treaty' fish (those which count toward the Pacific Salmon Treaty quota) and the 'Alaska hatchery addon' (those Alaska hatchery fish which do not count against the quota) be calculated separately for the sport and commercial fisheries. All wild and non-Alaskan hatchery chinook salmon are counted against the sport fish quota, along with a portion of the Alaska hatchery fish taken.

The Alaska hatchery addon is calculated by subtracting a 'base catch' and a 'risk adjustment factor' from the total estimated harvest of Alaska hatchery chinook salmon. The base catch is the estimated annual harvest of Alaska hatchery chinook salmon prior to the Treaty—for the sport fishery, it equals 17% of 5,000 fish in 1992 and 1993. The risk adjustment factor is an estimate of the uncertainty in the estimated harvest of Alaska hatchery fish, and totals approximately 18% of the Alaska hatchery fish harvest.

The Board of Fisheries also adopted a management plan which outlined how ADF&G was to manage the marine sport fishery for its chinook salmon harvest allocation and provided regulatory authorities to implement the plan. The regulatory authorities included several options in bag limits, size limits, and gear restrictions designed to increase or reduce the sport harvest to meet the quota. Objectives of this plan were (1) to allow uninterrupted sport fishing in marine waters for chinook salmon, without exceeding the allocation, and (2) to minimize regulatory restrictions on unguided anglers, who harvest chinook salmon at a lower catch per unit of effort than do guided anglers fishing from charter vessels.

Bag limits of two chinook salmon per day, two in possession, with a minimum size limit of 28 inches, were to remain in effect in Southeast Alaska/Yakutat marine waters until it was projected (either preseason or inseason) that the total harvest would deviate from the allocation by more than the management range. The management range was set by regulation at 7.5% (3,100 fish for an allocation of 41,310 fish).

Table CH9 summarizes available data on sport quotas, sport harvests of treaty fish, annual deviations from sport quotas, cumulative deviations, and additional statistics on the Alaska hatchery fish addon and total harvest since the management plan went into effect for the 1992 season (1994 estimates are very preliminary).

Table CH9. Chinook salmon summary statistics from 1992 to 1994.

Year	Sport quota	Sport treaty harvest	Deviation from quota	Cumulative deviation	Alaska hatchery addon	Total harvest	Total Alaska hatchery	Basis of quota
1992	41,310	35,930	-5,380	-5,380	6,962	42,892	9,459	17% of 243,000
1993	39,610	42,607	+2,997	-2,383	6,639	49,246	9,064	17% of 243,000 minus 1,700
1994	39,600	35,052	-4,548	-6,931	5,578	40,630	7,769	18% of 220,000
Total	120,520	113,589			19,179	132,768	26,292	

The cumulative 1992–1994 sport fish harvest has deviated less than 6% from the cumulative quota of 120,520 chinook salmon. More than 19,000 Alaska hatchery chinook salmon have been taken as addon fish which do not count against sport quotas. In 1995, an additional 6,931 treaty chinook salmon may be taken by sport anglers in addition to the 1995 quota to make up for past deviations below previous quotas.

Management Approach

Management of the sport fishery for chinook salmon in Southeast Alaska has been governed by the Southeast Alaska/Yakutat King Salmon Management Plan since 1992. This plan is used to limit or increase total sport harvests to a fixed percentage of the Pacific Salmon Treaty quota. Sport harvests were limited by regulatory actions such as decreases in the bag limit from two to one fish in 1992 and 1993, as well as a ban on downriggers in 1993. In 1994, management actions taken to meet the sport quota for chinook salmon included a one-fish bag limit and prohibition on take by charter crews from April 15 through June 30 and a three-fish bag limit from July 30 through December 31. Prior to 1992, the sport harvest was limited by a two-fish bag limit and 28-inch minimum size limit. There also are spring closures in Taku Inlet near Juneau and in Gray's Pass near Wrangell—and a year-round closure in a portion of Behm Canal near Ketchikan.

Additionally, special regulations in Upper Lynn Canal are used to provide protection for Chilkat River stocks, and a management plan regulates harvests of chinook salmon in the Situk River near Yakutat. Freshwater fishing for chinook salmon in Southeast Alaska has been prohibited, except for wild stocks in the Yakutat area and for terminal hatchery returns in other areas of Southeast Alaska. Special regulations in both fresh and salt water are used to allow increased harvest of hatchery stocks in terminal areas. In 1994, a number of areas were opened to provide for terminal harvests of Alaska hatchery chinook salmon.

Although the primary goal of management of the sport fishery for chinook salmon in Southeast Alaska is to meet its allocation, there are a number of factors which also should be considered in setting regulations. These include: (1) meeting escapement goals for Southeast Alaska stocks, (2) maximizing harvests of enhanced stocks while providing for brood stock, and (3) minimizing incidental mortality of undersized chinook salmon.

Current Issues

There are a number of regionwide issues that concern the sport and commercial fisheries for chinook salmon. These issues are mostly related to the fact that chinook salmon fisheries in Southeast Alaska are fully allocated and occur on mixed stocks of many origins.

Pacific Salmon Treaty

Renegotiation of annexes to the Pacific Salmon Treaty has been very difficult. The catch quota for chinook salmon has sometimes not been set until after the sport fishery has been well under way. The U.S. delegation has been attempting to negotiate annexes on a five-year basis and move to an abundance based management approach. Analyses of the rebuilding program and interim escapement goals now in place for Southeast Alaska stocks also need to be completed subsequent to the 1996 season to evaluate adherence to treaty goals of chinook rebuilding.

Enhancement

Chinook salmon produced by Alaska hatcheries are 'bonus' fish, because most of them do not count toward Pacific Salmon Treaty catch quotas. There is thus a substantial benefit to producing enhanced chinook salmon for sport anglers. Anglers fishing for chinook salmon in 1988 spent an average of $875 per harvested chinook salmon, making it an extremely highly valued species. Sport anglers are currently paying for the operation of Crystal Lake hatchery as well as for the stocking of approximately 600,000 chinook salmon smolts annually on the Juneau roadside.

These programs are extremely expensive: it costs about $0.50 per smolt produced or $50 per chinook salmon harvested if return to the creel averages 1%. Unfortunately, returns to the creel are not likely to average 1%, because the efficiency of sport anglers is limited and many stocks are intercepted in commercial fisheries at fairly high rates. In recent years, the cost per hatchery fish harvested in the sport fishery has been between $250 and $300. Given that the quality of the stocking program has been improved and production costs lowered, this cost per fish harvested estimate is probably higher than might be expected in future years. Survival of hatchery stocks, however, has been extremely poor for the last several years.

Endangered Species Act

The fall run of chinook salmon from the Snake River in Idaho has been declared a threatened species under the Endangered Species Act. This stock has been shown by coded wire tags to occur in small numbers in Southeast Alaska, and tagged individuals of indicator stocks have been taken in the Sitka sport fishery.

In 1994, the National Marine Fisheries Service reduced the quota of 263,000 chinook salmon for Southeast Alaska by 23,000 fish to reduce impacts on fall Snake River chinook salmon. This action reduced the quota for the sport fishery by about 4,000 fish. In the future, additional runs of chinook salmon could be listed under the Endangered Species Act. Since some of these stocks may rear in waters of Southeast Alaska, it is possible that management of the sport fishery could also be impacted by these listings.

Public Comment on Management Activities

Management actions taken to obtain the sport fish quota since 1992 have been highly controversial. The most controversial management action taken was a ban on the use of downriggers for all species during the period from June 17 through August 15, 1993. Before management actions were announced for the 1994 season, input was solicited from a variety of sport fishing groups, charter operators, and the general public. No consensus was evident from this process.

Research and Management Activities

Extensive research is being conducted on chinook salmon stocks in Southeast Alaska. Stock assessment programs are conducted in the Unuk River in Behm Canal near Ketchikan and in the Taku River near Juneau. In 1994, these stock assessment programs included coded wire tagging of juvenile chinook salmon in these systems.

A mark and recovery program to estimate escapement is also conducted annually in the Chilkat River near Haines, and aerial escapement surveys in ten river systems in Southeast Alaska are undertaken annually by helicopter.

Creel survey programs are conducted in the Juneau, Ketchikan, Sitka, Petersburg, Wrangell, and Haines sport fisheries. Additionally, coded wire tags are collected in the Craig area and in a voluntary program from a few lodges scattered throughout the region. Information from creel surveys and catch sampling programs is used to project total harvest for the region and to estimate impacts from specific regulatory actions to obtain the quota.

Area Specific Information and Issues

Ketchikan

Fishery Trends

The Ketchikan area chinook salmon sport fishery is one of the larger sport fisheries in the region and is predominantly a marine fishery. The average harvest of chinook salmon in the Ketchikan area sport fishery from 1989–1993 was 9,270 fish, from an average of 32,954 angler-days expended annually. The largest number of chinook harvested for this period was in 1990 when 12,784 were harvested through 35,470 angler-days of effort, whereas the lowest harvest occurred in 1993, when only 6,028 chinook were harvested through 26,630 angler-days of fishing effort (Tables CH1 and CH2). The decline over time in harvest and effort is attributed to two separate impacts:

(1) the Board of Fisheries management plan, adopted in 1992, that mandated managing inseason for a regionwide chinook salmon harvest quota, which was implemented by ADF&G in the form of bag limit reductions and gear restrictions; and

(2) a dramatic drop in adult returns to the area's hatcheries.

A small freshwater fishery occurs within Ketchikan Creek. This fishery is opened by emergency order whenever a surplus of Deer Mountain hatchery chinook salmon is available. It was opened only once during the period between 1989 and 1993, when 197 chinook salmon were harvested in 118 angler-days of effort.

Stock Composition and Enhancement

There are two primary components to the Ketchikan area chinook salmon sport fishery. For the 1989–1993 average, 62% of the harvest represented hatchery production—both Alaskan and non-Alaskan. The remaining 38% originated from wild stocks in Alaska, primarily Behm Canal systems such as the Unuk and Chickamin rivers, and from wild stocks

originating in British Columbia, namely the Nass and Skeena rivers. In addition, it is highly probable that wild stock production from other systems contributes to this area's sport fishery.

The hatchery component of this fishery comprises both Alaskan (average 47%) and non-Alaskan (average 15%) hatchery production. Between 1989 and 1993, the top six hatcheries, in order of importance, have been Neets Bay (SSRAA), Carroll Inlet (SSRAA), Tamgass Creek (Annette Island), Deer Mountain (ADF&G), Whitman Lake (SSRAA), and Crystal Lake (ADF&G), their order of importance shifting slightly between years.

The non-Alaskan component of the chinook harvest originates from facilities in British Columbia, Washington, and Oregon. Over the last two years, non-Alaskan hatchery contributions have increased—especially production from British Columbia. This change from a 15% contribution to a 30% contribution reflects a dramatic decline in returns to Alaskan facilities producing chinook salmon. Because this decline is typical of most Southeast Alaska facilities, poor marine survival and/or predator increases are thought to account for this change in contribution by Alaskan facilities.

Behm Canal Stock Concerns

Because of their close proximity to Ketchikan, Behm Canal river systems such as the Unuk and Chickamin dominate wild stock production. The department has been monitoring escapement levels to these rivers and several other smaller systems in the Boca de Quadra area south of Ketchikan since 1975. During the mid-1980s, these stocks consistently exceeded escapement goals (see Table CH5). Beginning in 1990, however, escapement counts into index streams in the Behm Canal area experienced sharp declines that have continued through 1994 (Table CH5). In response to these declines, the department has become more conservative in managing the fisheries that harvest these stocks (i.e., fewer days for June troll fisheries, reduced bag limits for sport fishers as part of quota management, and closures of areas historically opened to fishing). In addition, a major research project was implemented on the Unuk River in 1993/1994.

The goal of the Unuk River project is to determine if index counts on clear water tributaries are indicative of total escapement, to conduct a mark-recapture population estimate study, and to coded-wire-tag (CWT) chinook produced by this river to better determine the areas where these fish are intercepted and where they migrate once they leave fresh water. This information will be expanded to other chinook salmon systems in Behm Canal so the department can refine its management of these stocks and reverse the current decline in escapement index counts for chinook salmon returning to these streams.

Prince of Wales Island

Fishery Trends

The Prince of Wales Island chinook salmon sport fishery is one of the smaller chinook salmon fisheries in the region, but it is expanding rapidly because of increases in population, charter vessels, sport fishing lodges, and knowledge of this area through advertising and popular literature articles. Actual harvests of chinook salmon between 1989 and 1993 ranged from a high of 8,367 in 1993 (with 19,998 angler-days of effort) to a low of 2,599 in 1989, with 14,579 angler-days (Tables CH1 and CH2). Average annual harvest for this period was 5,532, and an average 14,643 angler-days of effort were expended annually to harvest these fish.

Stock Composition and Enhancement

The Prince of Wales Island sport chinook salmon harvest is composed of two different stock mixes. Anglers fishing on the east side of Prince of Wales Island utilize the same general stocks found in the Ketchikan fishery, mainly because of the migration pattern of chinook salmon returning to the Ketchikan area. The second component of the Prince of Wales Island chinook salmon sport fishery occurs on the west side of the island, where anglers harvest a much higher percentage of fish destined for systems in British Columbia, Washington, and Oregon. Prince of Wales Island does not contain any endemic wild stocks, so chinook harvested on its west coast are destined primarily to streams below Southeast Alaska in Canada or the Pacific Northwest.

On the east side of Prince of Wales Island, the composition of enhanced chinook salmon harvested in this fishery is similar to Ketchikan's, but it differs dramatically on the west side of the island. In 1994, catch sampling revealed that 35% of the harvest is of hatchery origin, 3% originates in Alaska, and 32% comes from non-Alaskan hatcheries such as Robertson Creek in British Columbia.

Petersburg/Wrangell

Fishery Trends

The Petersburg/Wrangell area chinook salmon sport fishery represents a moderate fishery in comparison to other fisheries within the region. The chinook salmon harvest for the period 1989–1993 in this fishery averaged 6,956, from an average 25,870 angler-days of effort annually. The peak harvest year was 1990—when 10,185 chinook were harvested during 28,878 angler-days of effort, whereas the lowest harvest occurred in 1989, when 4,702 chinook were harvested during 25,215 angler-days (Tables CH1 and CH2).

The chinook fishery within the Petersburg/Wrangell area has generally declined over the last three years because of declining hatchery returns from Crystal Lake hatchery production, plus bag and/or gear limitations imposed inseason as part of the department's mandate to limit the overall sport harvest of chinook salmon.

The Petersburg/Wrangell freshwater fishery for chinook salmon is limited to hatchery returns near Petersburg.

Stock Composition and Enhancement

The Petersburg/Wrangell sport chinook salmon fishery is primarily supported by two sources. The primary stock harvested in this fishery is wild chinook salmon produced within the Stikine River drainage, which enters salt water near Wrangell. This system produces a substantial number of fish which are harvested more frequently by Wrangell anglers than by Petersburg-based sport fishers.

The second largest component of this fishery is composed of production from the Crystal Lake hatchery near Petersburg. This facility releases large numbers of chinook (Stikine River brood source) in the immediate Petersburg area and in Earl West Cove, located 10 miles from Wrangell. Sport harvest of these fish is dramatically higher in the Petersburg area, primarily because Wrangell anglers target their fishing effort on Stikine River fish, instead of Crystal Lake production returning to Earl West Cove.

Only a minor contribution from other facilities such as Neets Bay (SSRAA), Carroll Inlet (SSRAA), Little Port Walter (federal), and Medvejie (NSRAA) hatcheries have been detected by onsite creel sampling programs.

Blind Slough/Wrangell Narrows Terminal Fishery

The Blind Slough/Wrangell Narrows sport fishery for chinook salmon represents the most concentrated fishery for this species within the Petersburg/Wrangell area. The Blind Slough fishery is composed of two segments, the shoreline fishery and the boat fishery which operates mainly at the mouth of Blind Slough in Wrangell Narrows.

The Wrangell Narrows fishery is composed of an intense boat fishery, with the highest level of effort occurring in the vicinity of the entrance to Blind Slough. Competition for chinook salmon returning to Crystal Lake is intense, with both commercial and sport fishermen operating in a small area of Wrangell Narrows. This has resulted in numerous incidents and near-collisions, particularly with barge and ferry vessels traveling through Wrangell Narrows. The Coast Guard has warned that they will take action to close the area if vessel traffic becomes too concentrated. The harvest of chinook salmon in the Narrows has ranged from a high of 2,972 adult chinook salmon in 1990 to a low of 1,044 in 1989. The average harvest for the period 1989–1993 was 1,946 adult chinook salmon. Residents and nonresidents alike concentrate on this fishery, which is supported primarily from returns to the Crystal Lake Hatchery.

Inseason management of this fishery occurred in 1993 and in 1994 in reaction to brood stock shortages at the Crystal Lake Hatchery. In 1993, the Blind Slough portion of this fishery was closed for the month of July, and in 1994 both Blind Slough and a major portion of Wrangell Narrows were closed from June 1 through July 31. Future brood stock shortages may trigger additional closures in this fishery. Current regulations are more liberal in the Blind Slough section of this fishery than in other areas of the region. Retention of snagged fish is allowed, and retention of two chinook over 28 inches and two chinook under 28 inches is allowed by regulation. The purpose of these regulations is to allow maximum harvest of surplus returns to the Crystal Lake Hatchery.

Sitka

Fishery Trends

The chinook fishery in Sitka has changed drastically in the past eight years. Between 1977 and 1987 the annual harvest of chinook was less than 3,000 fish on an annual basis, with a low of 1,430 fish taken in 1985.

Fishing during these years was characterized by low effort and very low incidence of hatchery-produced fish. Around 1987, the charter fishery began to develop in Sitka, and effort increased substantially. Angler effort for chinook salmon increased from 25,334 angler-days in 1989 to 33,206 angler-days in 1993 (Table CH1). Chinook salmon harvest during the same period increased from 5,569 fish in 1989 to 13,464 in 1993 (Table CH2).

Chinook salmon are present all year in waters off Sitka, but fishing improves greatly with spring weather in late April. In recent years, sport fishermen have had the waters to themselves during this spring period until the first part of July when commercial trolling starts. Average catch rates for anglers can approach one fish for five hours of fishing during June.

Stock Composition and Enhancement

There are no local resident stocks of chinook salmon in the Sitka area, but Sitka Sound and the surrounding area have traditionally been a feeding ground for chinook from other areas. Hatchery production of these non-local stocks of chinook has greatly increased fish density in the Sitka area, as the hatchery-produced fish also migrate along the coast where their ancestors fed. The majority of hatchery contribution to the local sport fishery has come from non-Alaskan hatcheries. Between 1983 and 1988, hatcheries contributed an estimated 19% of the chinook catch in Sitka; 17% came from non-Alaskan hatcheries. During 1989–1993, hatcheries contributed 50% of the chinook catch in Sitka, and 40% came from non-Alaskan hatcheries.

Hatcheries in the Sitka area, Medvejie and Sheldon Jackson, are now important contributors to the local fishery. During the 1994 fishing season an estimated 47% of the chinook harvested came from hatchery production. The Sitka area hatcheries contributed nearly all of the Alaskan contribution, whereas Robertson Creek contributed over half of the non-Alaskan contribution.

Juneau /Glacier Bay

Fishery Trends

Timing data from creel surveys have been used since 1983 in conjunction with data from postal surveys to estimate harvests in the spring (late April through June) and summer (July through September) in Juneau area marine waters (Figure CH1). Spring harvests have increased substantially—from about 2,000–3,000 in the period 1983–1989, to 5,000–11,000 during the period 1990–1993. Spring harvests have more than doubled due to a combination of two factors. A regulation change in 1989 substantially decreased the area closed to the spring chinook salmon fishery around the mouth of Taku Inlet, and allowed a large increase in spring fishing opportunity in the Juneau area. This increase in opportunity was coupled with substantial increases in escapement to the Taku and Stikine rivers, which has resulted in increased CPUE for chinook salmon.

On the other hand, summer harvests, which were substantially greater than those of the spring months during the mid-1980s, have declined substantially since 1990 (Figure CH1). Harvests of chinook salmon during July through September of 1993 were lower than any of the years studied, due in part to the ban on downriggers during July. The reason for the lack of growth in the summer harvests is unknown; however, it is probably due in part to low stock abundance of feeder chinook salmon and possibly to targeting of abundant stocks of coho salmon during the past few years. In the future, an increase in harvests during the summer months is to be expected, especially if survival of inside rearing wild and hatchery stocks increases and the size of coho salmon runs returns to average or below average levels.

Stock Composition and Enhancement

Stock composition of the Juneau area harvest varies greatly between the spring and summer time periods. Many of the chinook salmon taken in the spring are maturing fish, with the primary stock being bound for the Taku River, while those taken in the summer are mostly immature 'feeder' chinook salmon. Both scale and coded wire tag data indicate that a wide variety of stocks and age classes are taken in the Juneau fishery. Age 0.- chinook salmon are usually of non-Alaskan origin, and scale age data indicate that as many as 3,000 of these fish are taken annually in the Juneau area. The percentage of frequency of these fish in the harvest averages about 16% but has varied from 4% to 34%. Age 0.- stocks are present in relatively higher numbers in the summer months (19% of harvest) than in the spring (11% of harvest).

Terminal Fisheries for Hatchery Chinook Salmon on the Juneau Roadside

Since 1986, hatchery chinook salmon smolts have been released at several sites on the Juneau road system to improve fishing opportunities, as no natural

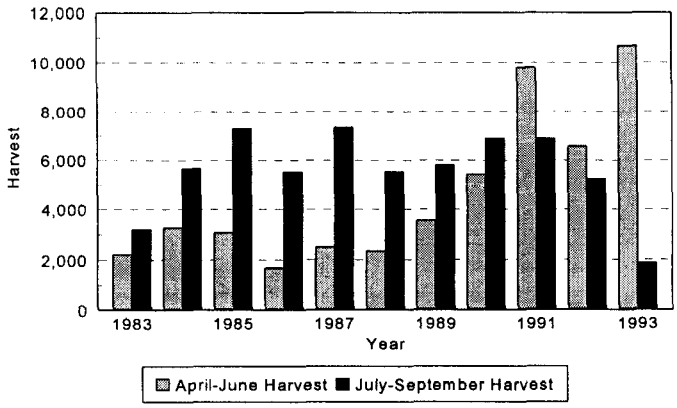

Figure CH1. Estimated harvests of chinook salmon in Juneau area sport fishery (expanded to entire postal survey area) during periods of April–June and July–September, 1983–1993.

runs of chinook salmon occur in roadside streams. This has improved fishing opportunities for boat and shore anglers in the terminal areas, as well as contributing to mixed stock marine sport and commercial fisheries. Stocking at Montana Creek was discontinued in 1990 because smolt survival was poor in comparison to the other sites. Sheep Creek was discontinued as a stocking site in 1992 because no roadside terminal fishery was generated at the site since fish returned to the Gastineau hatchery instead of Sheep Creek hatchery. Feeding fish at the stocking sites also proved beneficial in increasing contributions to various fisheries.

From 1986 through 1994, the Snettisham hatchery produced chinook salmon for stocking on the Juneau road system. In 1991, the Gastineau hatchery began releasing fish at Sheep Creek which it had raised from brood stock obtained from Snettisham hatchery fish. In 1994, funding for the stocking of chinook salmon from Snettisham hatchery was transferred to the Gastineau hatchery. The Gastineau hatchery provides larger smolt and also has the advantage of reduced transportation costs to stocking sites. Because of this transfer, Sheep Creek and Gastineau hatcheries have been reinstated as release sites.

Fishing at Auke Bay occurs only in marine waters, because Auke Creek is closed to fishing and fish returning to the weir on the creek are killed. Advantages of the Auke Bay release site include very easy access for Mendenhall Valley residents and high harvest rates for returning fish since snagged fish may be retained by anglers. Disadvantages of the Auke Bay release site include incidental snagging of wild Auke Creek sockeye salmon and conflicts due to crowding on the docks in Auke Bay.

Much of the Fish Creek fishery occurs in a freshwater pond where fish ripen before spawning upstream, but during the ripening period fish frequently do not bite readily and some anglers are enticed to illegally snag the chinook salmon present. Chinook salmon return to the sites beginning in late June and early July and are usually present until early to mid-August when most make their upstream spawning runs.

Upper Lynn Canal (Haines/Skagway area)

Chilkat Inlet Spring Fishery

Commercial gillnet and troll fisheries and marine sport fisheries historically harvested returning mature Chilkat River chinook salmon in Chilkat inlet, and a subsistence fishery occurred inriver. The commercial gillnet fishery for spring chinook in Chilkat inlet ended in 1976. During this time, most commercial troll effort moved to more outside areas, while the sport fishery in Chilkat Inlet gained in popularity. In 1984 the Department began monitoring the sport fishery targeting spring spawners in Chilkat Inlet. By 1986, it was apparent that sport fishing effort and harvest were increasing and that surveyed escapement indices in Big Boulder and Stonehouse Creek were decreasing:

Year	Effort (angler-hours)	Harvest	HPUE[a]	Escapement index
1984	10,253	1,082	0.106	333
1985	20,582	1,709	0.083	120
1986	32,533	1,655	0.051	29

[a] Harvest per angler-hour of salmon fishing effort.

In response to this trend, the sport fishery was first restricted in 1987 to reduce harvest and increase escapements of Chilkat River chinook salmon. Restrictions on the sport fishery have continued. Chilkat Inlet and part of Chilkoot Inlet were closed to chinook salmon fishing during spring 1991 and 1992 due to anticipated weak returns. In addition, the lower Chilkat River (terminus to mile 20) was closed to subsistence fishing until August 1 in 1991 and 1992.

Inriver research designed to show areas of spawning and abundance of spawners in the river began in 1991. This program showed that 5,897 spawners

were present in 1991 and 5,400 in 1992. It was apparent that the Big Boulder Creek and Stonehouse Creek index areas did not accurately reflect chinook salmon escapement in the Chilkat River. With this level of escapement, the sport fishery was reopened in 1993 with a seasonal bag limit of two, a large sanctuary area, and a maximum harvest of 500 spawners allowed by management plan. In 1993, over 9,000 angler hours of effort were expended in harvesting 313 mature chinook. In 1994, 7,600 angler hours were expended in harvesting 269 mature chinook.

The closure to chinook salmon fishing in upper Chilkat Inlet is very important in providing protection for maturing spawners. With the closure in place and the level of angling effort observed the last few years, it probably is not necessary to cap the harvest at 500 mature spawners. It would be very prudent, however, to monitor the sport harvest and effort very closely. It is also critical that the lower river tagging program continue to be used as an indicator of abundance.

Summer Chinook Salmon Fishery

Upper Lynn Canal sometimes provides good fishing in the summer for feeder chinook. These fisheries seem to occur on years that large quantities of bait show up around Haines and in Taiya Inlet. Chinook salmon feeders are also intercepted in large numbers in some years in the Lynn Canal drift gillnet fishery.

Yakutat

Chinook salmon are harvested both in marine and freshwater systems in the Yakutat area. The largest freshwater fishery for chinook salmon in Southeast Alaska occurs in the Situk River each spring. The Akwe and East Alsek rivers also support small chinook fisheries in the Yakutat area. Situk River chinook salmon are managed according to the Situk River Management Plan, which sets specific management actions for the sport and commercial fisheries based on inseason run strength criteria (Table CH10).

Table CH10. Details of the Situk-Ahrnklin Inlet and Lost River king salmon commercial fishery management plan.

The inriver escapement goal for Situk River king salmon is 600 large fish (3 ocean fish and older) with a range of 450 to 750. The Department shall manage the commercial set gillnet fishery in the Situk-Ahrnklin Inlet and Lost River, the commercial troll fishery off Yakutat, and the sport fishery in the Situk River prior to July 15 as follows:

(1) If the projected escapement of king salmon to the Situk River weir is less than 350 large king salmon, the Department will close the Situk River subsistence, recreational, and commercial set gillnet fisheries, and the commercial troll fishery in state waters between Loran lines 7960-Y-30390 and 7960-30200;

(2) If the projected escapement of king salmon to the Situk River weir is between 350 and 450 large king salmon, the department shall:

- (A) Implement emergency order restrictions in the commercial fisheries using one or more of the following:
  - (i) Establish a "non-sale" king salmon season in the Situk-Ahrnklin Inlet and Lost River set gillnet fisheries;
  - (ii) Close the commercial troll fishery periods in state waters between loran lines 7960-Y-30390 and 7960-30200;
  - (iii) Restrict the weekly fishing periods in the Situk-Ahrnklin Inlet and Lost River set gillnet fisheries.
- (B) Close the sport fishery for king salmon in the Situk River.

(3) If the projected escapement of king salmon to the Situk River weir is between 450 and 750 large king salmon, the department shall:

- (A) Implement emergency order restrictions in the commercial fisheries using one or more of the following:
  - (i) Establish a "non-sale" king salmon season in the Situk-Ahrnklin Inlet and Lost River set gillnet fisheries;
  - (ii) Close the commercial troll fishery periods in state waters between loran lines 7960-Y-30390 and 7960-30200;
  - (iii) Restrict the weekly fishing periods in the Situk-Ahrnklin Inlet and Lost River set gillnet fisheries.
- (B) Restrict the sport harvest of king salmon in the Situk River by one or more of the following options:
  - (i) Portions of the River may be closed to king salmon sport fishing;
  - (ii) Only unbaited, artificial lures may be used;
  - (iii) Only catch and release sport fishing for king salmon over 16 inches in length may be allowed.

(4) When the projected escapement of king salmon to the Situk River weir is greater than 750 large king salmon, the department shall:

- (A) Manage the commercial set gillnet fisheries in the Situk-Ahrnklin Inlet and Lost River based on sockeye salmon run strength;
- (B) Provide a sport fishery for king salmon during which the bag limit is one king salmon over 16 inches in length and the seasonal limit from June 1 through August 31 is two king salmon over 16 inches in length. If a king salmon seasonal limit is imposed, each angler shall immediately record the catch on a Situk River king salmon catch record.

COHO SALMON FISHERIES

Coho salmon are available in salt water from late June through September; the largest harvests occur in August and September by anglers trolling from boats. Freshwater fishing opportunities for coho salmon in Southeast Alaska are limited along the Ketchikan and Sitka road systems, but they are extensive in remote areas and along the Yakutat and Haines road systems. The largest freshwater harvests are taken in September and early October, although a few coho stocks begin entering fresh water in July. Southeast Alaska anglers spent an average of $11.1 million on sport fishing trips for coho salmon in 1988, a total exceeded only by the amount spent for chinook salmon and halibut.

Angler Effort

Coho salmon are a favored target of both marine and freshwater anglers in Southeast Alaska (Table CO1). About 30% of total freshwater effort and 20% of total marine effort in Southeast Alaska is targeted on this species. The Juneau and Ketchikan areas together account for more than 50% of all Southeast Alaska sport fishing effort for coho salmon. The largest freshwater sport fisheries for coho salmon occur in the Yakutat area (33% of total freshwater effort), and the biggest marine sport fisheries occur in the Juneau area (43% of total marine effort). Angler effort for coho salmon has been fairly stable over the last few years.

Sport and Commercial Harvests

Before 1989, annual sport harvests of coho salmon in Southeast Alaska never exceeded 60,000 fish (Table CO2). Since 1989, however, harvests of coho salmon have averaged over 100,000; a record total of 123,946 was taken in 1991. From 1977 to 1993, the Juneau and Ketchikan fisheries together took an average 59% of the total harvest, and the Prince of Wales area averaged 16% (Table CO2). The largest increases in coho harvests have occurred in the Prince of Wales area, where harvests grew from fewer than 3,000 fish in the late 1970s to more than 40,000 fish in 1993.

Sport fisheries in Southeast Alaska take 2–4% of the combined sport and commercial harvest of coho salmon (Table CO3). The major portion (61%) of the commercial harvest is taken in the troll fishery. The 1991 to 1993 combined harvests of coho salmon were some of the highest on record for Southeast Alaska. Although preliminary, 1994 harvest totals for coho salmon in sport (242,000) and commercial (5.7 million) fisheries each were record highs.

An estimated average of 78% of coho salmon caught in salt water are retained by anglers, while fewer than half (47%) of coho salmon caught in fresh water are retained (Table CO4). These statistics indicate that catch-and-release fishing for coho salmon is much more popular in fresh water than in salt water. During the period from 1990 to 1993, an average of only 11.5% of the entire coho salmon sport harvest was taken in fresh water. Small freshwater harvests result in part from lower retention rates and also from limited opportunities, which cause freshwater fishing effort to total only about a third of that expended in marine waters (Table CO1).

Wild Stock Status

Sport and commercial fisheries in Southeast Alaska depend upon a large number of small stocks of coho salmon, along with a few major stocks such as those in the Taku and Chilkat rivers. Escapements of coho salmon are extremely difficult to estimate because of the secretive nature of coho salmon and their normal run timing of October through November, when intense storms keep stream levels very high. In recent years, escapement counts of portions of indicator streams in Southeast Alaska have generally been above average.

Enhancement

Enhancement programs for coho salmon have changed rapidly in the last few years as state hatcheries such as Klawock, Crystal Lake, and Snettisham have greatly reduced or eliminated releases of coho

Table CO1. Estimated marine, freshwater, and combined (marine plus freshwater) angler-days of sport fishing effort for coho salmon in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	Percent of total[a]
MARINE ANGLER-DAYS									
1989	18,165	8,978	5,854	7,447	32,379	413	815	74,052	21%
1990	20,211	9,048	4,474	7,847	34,955	615	988	78,138	21%
1991	22,335	7,782	4,601	8,925	28,023	363	2,552	74,582	20%
1992	17,914	7,058	4,191	9,264	37,696	209	1,979	78,311	20%
1993	15,360	12,193	3,180	10,086	29,870	679	2,567	73,934	19%
Mean	18,797	9,012	4,460	8,714	32,585	456	1,780	75,803	20%
Percent	25	12	6	11	43	1	2		
FRESHWATER ANGLER-DAYS									
1989	1,586	3,886	995	333	2,704	6,337	7,791	23,633	29%
1990	1,980	3,601	2,096	323	3,336	6,561	7,340	25,237	29%
1991	1,882	4,512	763	605	3,982	5,293	8,852	25,889	31%
1992	1,727	4,139	1,591	526	5,587	3,579	7,669	24,818	29%
1993	1,916	3,937	1,221	877	5,984	3,867	9,730	27,531	31%
Mean	1,819	4,015	1,333	533	4,318	5,127	8,276	25,421	30%
Percent	7	16	5	2	17	20	33		
COMBINED ANGLER-DAYS									
1989	19,751	12,865	6,849	7,780	35,083	6,750	8,606	97,684	22%
1990	22,192	12,649	6,570	8,170	38,290	7,176	8,328	103,375	22%
1991	24,218	12,295	5,364	9,530	32,006	5,656	11,403	100,471	22%
1992	19,641	11,196	5,783	9,790	43,282	3,789	9,648	103,128	22%
1993	17,276	16,129	4,401	10,963	35,854	4,546	12,296	101,465	22%
Mean	20,615	13,027	5,793	9,247	36,903	5,583	10,056	101,225	22%
Percent	20	13	6	9	36	6	10		

[a] Percent of total regional effort for marine, freshwater, or total angler-days.

Table CO2. Estimated sport harvest of coho salmon in Southeast Alaska by area, 1977–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total
1977	4,583	1,917	3,048	3,116	20,068	1,270	744	1,406	36,152
1978	7,667	2,677	5,493	2,364	24,348	1,898	880	3,181	48,508
1979	2,336	1,681	2,9 17	1,708	10,825	455	227	2,963	23,112
1980	6,914	3,986	2,874	2,202	13,750	551	216	2,315	32,808
1981	5,132	2,561	1,864	3,306	10,066	2,172	573	2,484	28,158
1982	11,442	4,125	3,051	3,887	25,015	1,944	1,163	2,809	53,436
1983	14,181	8,374	4,133	4,648	18,861	2,259	619	2,328	55,403
1984	21,296	7,487	4,046	2,644	15,677	1,616	371	6,675	59,812
1985	17,751	7,360	1,580	3,680	19,744	2,888	336	6,571	59,910
1986	21,191	8,639	2,215	4,077	12,959	2,420	391	6,430	58,322
1987	13,435	6,557	2,540	2,715	19,485	1,521	1,044	2,987	50,284
1988	7,785	3,094	2,581	2,745	20,862	1,673	1,345	3,603	43,688
1989	13,328	15,099	2,602	8,291	39,063	2,047	2,376	7,983	90,789
1990	35,197	17,049	5,387	7,808	33,961	1,498	1,746	2,566	105,212
1991	26,839	24,964	5,117	11,474	40,269	3,678	5,653	5,952	123,946
1992	22,016	13,419	4,967	9,167	40,170	3,067	1,507	5,626	99,939
1993	19,459	40,566	4,241	14,518	30,428	3,133	2,720	6,809	121,874
Mean	14,738	9,974	3,450	5,197	23,268	2,005	1,289	4,276	64,197
Percent	23	16	5	8	36	3	2	7	100

Table CO3. Sport and commercial harvests of coho salmon in Southeast Alaska, 1977–1994 (1994 totals are preliminary). Commercial harvests do not include salmon that were confiscated or caught in commercial test fisheries and sold.

Year	Sport	(%)	Total commercial	(%)	Breakdown of commercial harvest by gear type: Seine[a]	Drift gillnet	Set gillnet	Troll[b]	Annette Island	Hatchery controlled
1978	48,508	3%	1,713,168	97%	242,961	221,134	139,500	1,100,902	8,671	0
1979	23,112	2%	1,283,938	98%	176,354	81,324	95,873	918,845	5,649	5,893
1980	32,808	3%	1,115,424	97%	184,570	109,516	119,684	696,391	5,263	0
1981	28,158	2%	1,358,224	98%	237,402	114,503	132,579	860,898	7,839	5,003
1982	53,436	2%	2,114,734	98%	428,700	194,672	148,854	1,316,013	14,345	12,150
1983	55,403	3%	1,946,900	97%	356,946	210,332	81,541	1,276,363	17,498	4,220
1984	59,812	3%	1,907,860	97%	350,037	190,971	182,256	1,132,637	25,123	26,836
1985	59,910	2%	2,595,371	98%	418,725	309,693	202,835	1,600,294	30,679	33,145
1986	58,322	2%	3,402,629	98%	568,333	395,932	92,087	2,127,922	145,545	72,810
1987	50,284	3%	1,539,222	97%	122,254	165,138	124,406	1,041,175	35,794	50,455
1988	43,688	4%	1,043,218	96%	156,997	163,786	205,866	500,267	8,671	7,631
1989	90,789	4%	2,200,532	96%	330,761	234,424	176,804	1,415,511	23,870	19,162
1990	105,212	4%	2,864,731	96%	372,473	351,080	148,820	1,831,492	35,104	125,762
1991	123,946	4%	3,183,320	96%	405,727	544,247	166,172	1,718,963	62,339	285,872
1992	99,939	3%	3,693,913	97%	488,103	644,964	290,288	1,929,043	71,282	270,233
1993	121,874	3%	3,566,155	98%	471,562	415,305	237,390	2,391,417	16,341	34,140
Mean	64,197	3%	2,145,529	97%	321,320	266,468	155,128	1,315,587	30,949	56,077
1994	242,000	4%	5,708,578	96%	967,711	698,094	343,843	3,461,270	48,900	188,760

salmon (Table CO5). On the other hand, releases of coho salmon by private hatcheries have increased substantially in the central inside, Sitka, and Juneau areas during the last few years. Total releases of hatchery age 1 coho salmon have ranged from 2.8 to 6.0 million since 1984.

In contrast to harvests of hatchery chinook salmon, most hatchery coho salmon taken by sport anglers in a given area are from hatchery releases in that local area. This is primarily because coho salmon are only taken as maturing fish returning to hatcheries where they originated. There is some interception of non-local hatchery stocks, and a few coho salmon originating from hatcheries in British Columbia are taken by sport anglers in the Ketchikan, Sitka, and Prince of Wales Island areas.

Hatchery stocks are taken in highest numbers in the Ketchikan marine boat sport fishery, where an average 29% of the coho salmon harvest was of hatchery origin from 1989 to 1993 (Table CO6). In the Sitka area from 1989 to 1993, an average 20% of the coho salmon sport harvest was composed of hatchery fish, and the Juneau sport harvest averaged about 7% hatchery fish. In 1994, the percentage of hatchery fish in the Juneau harvest increased to 13%, owing to a relatively large contribution from the Gastineau hatchery.

Table CO4. Estimated total sport catch and harvest of coho salmon in salt waters and fresh waters of Southeast Alaska during 1990–1993 and estimated percentage of total harvest taken in fresh water.

Year	Salt water: Total catch	Salt water: Harvest	Salt water: Retention rate	Fresh water: Total catch	Fresh water: Harvest	Fresh water: Retention rate	Percent freshwater harvest
1990	140,179	98,252	70.1%	16,557	6,960	42.0%	6.6%
1991	133,819	109,197	81.6%	29,236	14,749	50.4%	11.9%
1992	102,695	84,667	82.4%	31,211	15,272	48.9%	15.3%
1993	132,348	107,026	80.9%	32,765	14,848	45.3%	12.2%
Mean	127,260	99,786	78.4%	27,442	12,957	47.2%	11.5%

Table CO5. Releases (in thousands) of age 1 coho salmon smolts in Southeast Alaska, by release year and area.

Release year	Ketchikan area hatcheries			Central inside hatcheries				Sitka area hatcheries			Northern hatcheries			
	SSRA[a]	Other[b]	Subtotal	Klawock	Crystal Lake	Other central[c]	Subtotal	Medvejie	Sheldon Jackson	Subtotal	DIPAC[d]	Other[e]	Subtotal	Total
1983	0	0	0	101	398	0	398	12	0	12	0	563	563	1,074
1984	958	0	958	1,401	502	0	502	0	0	0	0	234	234	3,095
1985	2,907	0	2,907	766	703	0	703	0	0	0	0	234	234	4,610
1986	2,356	0	2,356	818	121	0	121	0	0	0	0	191	191	3,486
1987	2,485	0	2,485	926	34	9	43	0	0	0	0	909	909	4,363
1988	1,426	8	1,434	1,005	90	0	90	0	0	0	0	394	394	2,923
1989	2,729	128	2,857	1,158	108	40	148	0	0	0	37	195	232	4,395
1990	2,204	136	2,340	0	96	121	217	120	0	120	0	84	84	2,761
1991	2,216	88	2,304	677	79	271	350	101	0	101	1,012	6	1,018	4,450
1992	2,951	162	3,113	0	83	349	432	731	71	802	983	2	985	5,332
1993	3,273	90	3,363	0	108	486	594	419	31	450	1,046	0	1,046	5,453
1994	2,900	85	2,985	260	72	225	297	1,438	96	1,534	944	8	952	6,028

[a] Includes Neets Bay and Whitman Lake hatcheries owned by Southern Southeast Aquaculture Association (SSRA).

[b] Includes Deer Mountain and Bell Island hatcheries.

[c] Includes releases from the Burnett Inlet, Port Armstrong, and Hidden Falls hatcheries.

[d] Includes releases from the Gastineau and Sheep Creek hatcheries owned by Douglas Island Pink and Chum, Inc. (DIPAC).

[e] Includes releases from the Snettisham and Burro Creek hatcheries.

Table CO6. Estimated percentages of coho salmon harvest contributed to selected major Southeast Alaska marine boat sport fisheries, 1989–1994.

Year	Ketchikan	Craig	Sitka	Juneau
1989	11%	—	—	4%
1990	28%	—	—	2%
1991	43%	—	—	12%
1992	42%	—	29%	5%
1993	23%	22%	10%	10%
Average	29%	—	20%	7%
1994	32%	11%	20%	13%

Management Approach

Since sport fisheries take only about 3% of the combined sport and commercial harvest in Southeast Alaska, the sport fish harvest in salt water has little impact on the sustained yield of coho salmon stocks. Sport catches of coho salmon in salt water are generally not limited by the 6-fish daily bag limit and 12-fish possession limit. The commercial harvest of coho salmon is currently managed to limit exploitation rates to about 70%.

Because of limited coho salmon stocks in roadside systems, daily bag limits in many freshwater systems along Southeast Alaska roadsides are reduced to two or three fish. In these instances, bag limits are used frequently to restrict the catch or to spread it out among anglers. Emergency closures of roadside fisheries are sometimes needed to conserve local coho salmon stocks. If coho salmon are overharvested in mixed stock commercial fisheries, there is often no alternative but to close terminal sport fisheries to conserve escapement. Indicator stock programs might provide data necessary to prevent overharvest; however, these programs have thus far not provided sufficient predictive capability to manage commercial fisheries.

Recent Board of Fisheries Actions

No actions were taken at the 1994 Board of Fisheries meeting which affect coho salmon fisheries in Southeast Alaska, except to implement a bait ban in most freshwater systems from November 16 through September 14 to protect cutthroat trout. This ban will prevent some coho salmon anglers from using roe for bait during August and early September.

Current Issues

Because of the excellent strength of coho salmon runs since 1988, coho salmon management has not been a very controversial issue in Southeast Alaska in the past few years. Escapements and harvests both have been well above historic averages. Survival of coho salmon smolts over the past few years has been estimated to range to about 20%. Given that coho salmon survival will eventually decline to below 10%, future management problems will occur when it is time for fisheries to be cut back to conserve stocks of coho salmon. User group conflicts between and within sport and commercial fisheries are likely to occur as each group wishes to see cutbacks in other fisheries without themselves being reduced.

Another issue of concern to marine sport anglers on inside waters are the generally below-average catch rates for coho salmon in July when fishing effort is highest. The best catch rates for coho salmon seem to be shifting later and later in the season to early–late September, when fishing effort declines rapidly because of the onset of fall storms.

Some enhancement efforts to produce early-run coho salmon have been initiated and appear to be fairly successful. It is unlikely that production can be increased enough, however, to make up for changes in timing of the wild stock fishery.

Research and Management Activities

Research activities by Division of Sport Fish staff on coho salmon are limited primarily to the Taku River near Juneau. Stocks from the Taku River are thought to be primary contributors to the Juneau marine sport coho salmon fishery; a stock assessment program is therefore being undertaken to determine the patterns of harvest in the sport and commercial fisheries.

Management activities include escapement counts for coho salmon in a number of indicator streams throughout Southeast Alaska. Coho salmon harvests from marine boat fisheries in the Juneau, Ketchikan, and Sitka areas are also sampled for coded wire tags, as are coho salmon harvests through the end of August from the boat fishery in Craig.

Area Specific Information and Issues

Ketchikan

Fishery Trends

The Ketchikan area coho salmon sport fishery comprises two different types of fisheries: a marine fishery and a freshwater fishery. The larger of the two is the marine fishery, where the coho salmon harvest occurs from mid-June through mid-October. Within this time period are two subgroups: summer-run fish that appear from mid-June to mid-August and typically range from 3 to 6 pounds, and fall-run fish that return from mid-August through mid-October and range in size from 8 to 16 pounds (the larger fish occur primarily after September 1). Each subgroup is composed of wild and hatchery-produced coho salmon that originate both from state and private hatchery facilities.

Harvests of summer- and fall-run coho salmon combined between 1989 and 1993 in Ketchikan area marine waters ranged from a high of 34,159 (from 20,211 angler-days of effort) in 1990 to a low of 13,060 (from 18,165 angler-days expended) in 1989 (Table CO7). The average annual marine harvest for this period was 22,770 coho salmon, from an average yearly angler effort of 18,797 angler-days.

The smaller component of the Ketchikan area coho salmon fishery occurs in fresh water, where both summer- and fall-run stocks of coho salmon are available. Timing and size range of these fish is quite similar to that of coho salmon harvested in marine waters.

Coho salmon harvests in fresh water during the five-year period from 1989 to 1993 ranged from a high of 1,038 in 1990 (from 1,980 angler-days of effort) to a low of 268 (from 1,586 angler-days expended) in 1989 (Table CO7). The average freshwater harvest during this period was 598, and an average 1,818 angler-days were expended annually to harvest these fish (Table CO7).

Marine fisheries in the Ketchikan area have exhibited a downward trend in harvests since 1990, as has effort expressed in angler-days. This probably reflects the fact that coho salmon returns in marine waters have become two to four weeks later in the last three years. Many anglers have put their boats away for the season by this time, the number of non-

resident anglers has decreased, and periods of wet and windy weather have increased.

Stock Composition and Enhancement

The Ketchikan area sport fishery for coho salmon depends upon both wild stock and hatchery production. Wild stock production constitutes from 57% to 89% (mean 71%) of total coho salmon harvest in this fishery. Several hundred systems in the Ketchikan area contribute to this production. These systems vary in size from small creeks less than two feet in width to major rivers such as the Unuk, Chickamin, Wilson and Keta. Escapement monitoring of wild stock production on 17 streams in the Ketchikan area in 1994 was compared with 1989–1993 average escapements, and 13 of the 17 streams had above-average escapements in 1994, and the total 1994 escapement index was 49% above average (Table CO8).

Hatchery-produced coho salmon represent from 11% to 43% (mean 29%) of the sport fishery harvest in the Ketchikan area. Composition of this harvest has remained fairly stable; Neets Bay (SSRAA facility) and Deer Mountain (state facility) represent the major contributions to the area's sport fishery.

Prince of Wales

Fishery Trends

The Prince of Wales Island coho salmon sport fishery comprises an intense marine fishery as well as an increasingly popular freshwater fishery. The marine harvest of this species has ranged from 9,745 in 1992 (from 7,058 angler-days of effort) to 38,417 in 1993 (from 12,193 angler-days of effort) (Table CO7). The mean harvest of coho salmon in salt water from 1989 to 1993 was 19,567, and an average 9,012 angler-days were expended yearly to harvest these fish.

The freshwater component of the Prince of Wales Island fishery is substantially smaller, but popular with resident as well as nonresident anglers. The harvest in fresh water has ranged from a low of 972 with 3,601 angler-days of effort expended in 1990 to a peak of 3,674 with 4,139 angler-days expended in 1992 (Table CO7). The mean harvest for the period 1989–1993 was 2,652 coho salmon harvested from an average annual effort of 3,975 angler-days. Overall interest in this fishery has tended to increase with time as well as harvest, except in 1993 when total harvest decreased despite average levels of effort.

Table CO7. Coho salmon sport fishery effort and harvest data for Ketchikan, Prince of Wales and Petersburg/Wrangell 1989–1993.

Year	Ketchikan				Prince of Wales				Petersburg/Wrangell			
	Marine		Freshwater		Marine		Freshwater		Marine		Freshwater	
	Harvest	Angler-days	Harvest	Angler-days	Harvest	Angler-days	Harvest	Angler-days	Harvest	Angler-days	Harvest	Angler-days
1989	13,060	18,165	268	1,586	11,752	8,978	3,347	3,686	2,322	5,854	280	995
1990	34,159	20,211	1,038	1,980	16,077	9,048	972	3,601	4,284	4,474	1,103	2,096
1991	26,462	22,335	377	1,882	21,846	7,782	3,118	4,512	4,204	4,601	877	763
1992	21,654	17,914	364	1,727	9,745	7,058	3,674	4,139	3,260	4,191	1,707	1,591
1993	18,516	15,360	943	1,916	38,417	12,193	2,149	3,937	2,924	3,180	1,317	1,190
Mean	22,770	18,797	598	1,818	19,567	9,012	2,652	3,975	3,399	4,460	1,057	1,327

Table CO8. Coho salmon escapement index data for Ketchikan, Prince of Wales, and Petersburg/Wrangell area streams.

Stream	Stream no.	89-93 avg. escapement index	1994 escapement index	1994 % of avg.
		KETCHIKAN AREA		
Fish Creek (Hyder)	101-15-085	152	496	327%
Tombstone R.	101-15-019	862	850	99%
Keta River	101-30-030	670	1,100	164%
Marten River	101-30-060	1,027	2,205	215%
Hugh Smith L.	101-30-095	950	1,679	177%
Humpback Cr.	101-30-083	461	560	121%
Caroll Creek	101-45-078	223	475	213%
Blossom R.	101-55-040	805	775	96%
Choca Creek	101-71-04E	218	225	103%
Humpy Creek	101-71-04H	73	155	212%
Indian Creek	101-71-04I	567	560	99%
King Creek	101-71-04K	241	325	135%
Herman Cr.	101-75-005	135	265	196%
Grant Creek	101-75-010	125	220	176%
Eulachon R.	101-75-015	426	755	177%
Klahini River	101-75-050	71	200	282%
Hatchery Cr. (Yes Bay)	101-80-070	543	381	70%
KETCHIKAN TOTAL		7,549	11,226	149%
		PRINCE OF WALES AREA		
Lagoon Creek	102-40-060	301	650	216%
Twelvemile Cr.	102-60-072	257	210	82%
Harris River	102-60-082	309	410	133%
Maybeso Cr.	102-60-084	115	216	187%
Port St.Nicholas Creek	103-60-059	63	233	368%
108 Creek (Whale Pass)	106-30-080	266	118	44%
PRINCE OF WALES TOTAL		1,311	1,837	140%
		PETERSBURG/WRANGELL AREA		
3 Mile Arm	105-32-073	147	133	90%
Navy Creek	106-22-016	70	91	130%
PETERSBURG/WRANGELL TOTAL		217	224	103%

Stock Composition and Enhancement

A wide variety of stocks contribute to the Prince of Wales Island coho salmon sport fishery. The marine fishery on the west coast of Prince of Wales Island is supported by wild stocks from this area, Alaska hatchery production, and wild stocks destined for Canadian streams. The marine fishery on the east coast of Prince of Wales Island mainly targets wild stocks returning to Southeast Alaska and hatchery stocks originating in the Ketchikan area.

Escapement surveys were conducted on seven index streams located on the east and west side of the island in 1994. Comparisons of six streams with indices for 1989–1993 indicated that 1994 escapements were generally above average (Table CO8). The only index count well below average was in 108 Creek near Whale Pass, on the northeast side of Prince of Wales Island. The 1994 index for all streams combined was 40% above average.

Hatchery production contributing to the Prince of Wales Island area fishery originates primarily from production at the Klawock Hatchery (state facility), Neets Bay and Whitman Lake hatcheries (SSRAA facilities), and Tamgas Creek (Annette Island hatchery). Occasionally, a small number of southern bound hatchery stocks are also harvested in this fishery.

Petersburg/Wrangell

Fishery Trends

The Petersburg/Wrangell area coho salmon sport fishery consists of a marine fishery and a freshwater fishery. The primary fishery occurs in marine waters, where harvests ranged from 2,322 in 1989 (from 5,854 angler-days of effort) to 4,284 in 1990 (from 4,474 angler-days of effort) (Table CO7). The average yearly marine harvest for this area from 1989 to 1993 was 3,399 coho salmon, and an annual average of 4,460 angler-days of effort was expended.

The freshwater coho salmon fishery in the Petersburg/Wrangell area takes place within various systems throughout the area. Freshwater coho salmon harvest has ranged from 280 (with 995 angler-days of effort) in 1989 to 1,707 (with 1,591 angler-days of effort) in 1992 (Table CO7). Average freshwater harvest for the area from 1989 to 1993 was 1,057 coho salmon, and an average effort of 1,327 angler-days was expended yearly to catch these fish.

Stock Composition and Enhancement

The coho salmon sport fishery in the Petersburg/Wrangell area is supported by a multitude of small systems, a few larger rivers such as the Stikine, Harding, and Bradfield, plus hatchery production originating at Crystal Lake Hatchery near Petersburg and releases by SSRAA at Earl West Cove. Consistent escapement surveys have been done on only two streams within this area, and 1994 escapements appeared to be about average (Table CO8).

Hatchery contributions to this area have been only minimally documented due to budgetary restrictions that do not allow creel surveys to cover the later part

Table CO9. Angler-days of fishing effort targeted at coho salmon in the Juneau and Glacier Bay areas from 1989 to 1993.

	Juneau		Glacier Bay	
Year	Salt water	Fresh water	Salt water	Fresh water
1989	30,723	2,438	1,656	266
1990	33,557	2,925	1,398	411
1991	23,826	3,281	4,197	701
1992	34,889	4,918	2,807	609
1993	26,965	5,368	2,905	574

of the summer fishing season when the majority of coho salmon are harvested. The best estimates at this time from limited onsite creel survey results and statewide harvest study data indicate that 10–12% of the saltwater harvest are hatchery fish, primarily from the Crystal Lake Hatchery and Earl West Cove releases.

Sitka

Fishery Trends

The coho salmon fishery in the Sitka area is primarily a marine fishery; little effort is directed toward fresh water (Table CO1). Angler effort for coho salmon has shown a continued increase from 1989 through 1993, similar to that for chinook salmon. Total angler effort in the Sitka area for coho salmon increased from 7,780 angler-days in 1989 to 10,963 days in 1993 (Table CO1).

Coho salmon begin to appear in the sport catch in late June, when anglers are fishing for chinook salmon. Their availability and catch rates continue to increase through late August. The sport harvest occurs primarily in open salt water away from shore and in areas where coho salmon are migrating and feeding prior to returning to their natal streams to spawn. By early to mid-September, coho salmon begin a rapid movement toward their home streams and congregate in estuaries.

Coho salmon harvests in the Sitka area seldom exceeded 4,000 fish prior to 1989. In 1989, the harvest jumped to 8,291 fish and continued at higher levels in subsequent years; 14,518 coho salmon were harvested in 1993. This increase in harvest is thought to be a function of increased effort attributable to the expanding charter fishery, as well as increased abundance of coho salmon throughout the region.

Stock Composition and Enhancement

Nearly every stream in the Sitka area produces coho salmon, and it is this wild stock production that has supported the fishery over the years. Hatchery production of coho salmon by Sitka area hatcheries has increased substantially in recent years, and this hatchery production is being targeted by recreational anglers. About 20% of the monitored coho salmon fishery in the Sitka area came from hatchery production in 1994—mostly from local hatcheries.

Wild Stock Escapements

Escapement indices for coho salmon in Sitka area streams monitored during 1994 were all above recent five-year averages:

Stream	Stream no.	89-93 avg. escapement index	1994 escapement index	1994 % of avg.
Starrigavin Creek	113-41-015	156	304	195
Nakwasina River	113-43-002	400	404	101
Black River	113-81-011	669	758	113
Eagle River	113-62-005	388	717	185
Sinitsin Creek	113-62-008	144	313	217
St John Creek	113-66-006	86	227	264
Ford Arm Creek	113-73-003	3,025	3,155	104
Total		4,868	5,878	121

Juneau /Glacier Bay

Fishery Trends

Coho salmon fisheries in the Juneau and Glacier Bay areas are predominantly saltwater; more than 32,000 angler-days were expended in salt water, compared to 4,300 in fresh water. There has been a general increase in fishing effort over the long term; however, the greatest increases since 1989 appear to be in the freshwater coho salmon fishery (Table CO9).

The harvest of coho salmon in these areas averages about 39,600 fish annually (Table CO10). Annual harvests of 33,000 to 46,000 coho salmon since 1989 are attributed to excellent marine survival and strong returns. Increases in effort and harvest since 1991 in the Glacier Bay area are likely due to development of the charter boat industry in the Gustavus, Hoonah, and Elfin Cove areas.

Postal survey data show that 53% of coho salmon caught in Juneau area fresh waters are released and 30% of those caught in Glacier Bay area fresh waters are released (Table CO11). These percentages are probably realistic; however, the release rates of 16%

Table CO10. Harvests of coho salmon in salt water and fresh water in the Juneau and Glacier Bay areas from 1989 to 1993.

	Juneau			Glacier Bay			
Year	Salt water	Fresh water	Subtotal	Salt water	Fresh water	Subtotal	Total
1989	37,506	1,557	39,063	1,817	559	2,376	41,439
1990	33,438	523	33,961	1,251	495	1,746	35,707
1991	38,386	1,883	40,269	4,873	780	5,653	45,922
1992	38,722	1,448	40,170	1,158	349	1,507	41,677
1993	28,899	1,529	30,428	2,508	212	2,720	33,148
Mean	35,390	1,388	36,778	2,321	479	2,800	39,579

for Juneau salt water and 30% for Glacier Bay salt water are too high. This high a rate of release in salt water has never been documented in onsite creel surveys in Juneau. Most likely, fewer than 5% of the coho salmon taken in salt water are released.

As in most other areas, coho salmon escapements in 1994 were well above recent averages:

Stream	Stream no.	89-93 avg. escape-ment index	1994 escape-ment index	1994 % of avg.
Peterson Creek	111-50-010	298	318	107
Jordan Creek	111-50-062	356	371	104
Montana Creek	111-50-052	1,511	1,829	121
Switzer Creek	111-40-007	118	197	167
Auke Creek	111-50-042	773	1,437	186
Total		3,408	4,352	128

Because escapements were in excess of spawning needs, the bag limit for coho salmon in Montana Creek was increased from two to four per day.

A weir operates on the outlet of Auke Lake from March 1 through October 31 each year for counting and sampling coho salmon smolt that leave the Auke lake drainage in spring and adults that return in fall. The number of smolt and adult coho salmon counted at the weir from 1990 through 1994 was:

Year	Smolt	Adults
1990	5,132	697
1991	5,722	806
1992	6,271	1,020
1993	8,103	859
1994	7,416	1,447
Average	6,529	966
SD	1,218	293

Stock Composition and Enhancement

Wild stocks constitute most of the harvest in the Juneau marine boat fishery; hatchery stocks contribute 13% or less of the harvest (see Table CO4).

Table CO11. Catch and release of coho salmon in the Juneau and Glacier Bay areas from 1990 to 1993.

	Juneau saltwater areas			Juneau freshwater areas		
Year	Catch	Harvest	% released	Catch	Harvest	% released
1990	43,797	33,438	24%	1,081	523	51%
1991	44,129	38,386	13%	3,515	1,883	46%
1992	44,950	38,722	13%	3,869	1,448	63%
1993	34,070	28,899	15%	2,879	1,529	47%
Mean	41,736	34,861	16%	2,836	1,346	53%

	Glacier Bay saltwater areas			Glacier Bay freshwater areas		
Year	Catch	Harvest	% released	Catch	Harvest	% released
1990	1,682	1,251	26%	842	495	41%
1991	7,203	4,873	32%	1,045	780	25%
1992	1,748	1,158	34%	462	349	24%
1993	3,268	2,508	23%	273	212	22%
Mean	3,475	2,448	30%	656	459	30%

Hatchery contributions have become more significant since 1991 when coho salmon first began returning to Gastineau hatchery in large numbers. A creel survey in 1994 indicated that about 3,500 coho salmon were caught in a terminal shoreline fishery in front of the hatchery.

The most important wild stocks of coho salmon contributing to Juneau sport fisheries are those from the Taku River, although a large number of other stocks also contribute.

Haines/Skagway

The Chilkat and Chilkoot rivers near Haines support the largest coho salmon runs in Upper Lynn Canal. More than 90% of the coho salmon harvest in the Haines/Skagway area is taken in fresh water—the majority from the Chilkat River. The Chilkat River coho salmon fishery begins in September and extends well into winter on late-run fish. The saltwater bag limit is six per day and twelve in possession. In the Chilkat River, the bag limit is three coho salmon per day and six in possession, and in the Chilkoot the limit is two per day and two in possession. The bag limit on the Chilkoot River is based to some degree on conservation concerns for the run; the three-fish limit on the Chilkat River, however, was based on allocation issues between user groups.

There have been increases in coho salmon harvest over the last few years, but fishing effort has declined (Table CO12). Coho salmon returns to Upper Lynn Canal have been strong in recent years, and there have been no closures of the sport fishery. Coho salmon destined for Upper Lynn Canal are intercepted in the District 15 commercial gillnet fishery, which targets fall chum salmon. In some years of high chum salmon abundance, coho salmon stocks were harvested at a very high level. The Chilkoot River sport fishery was closed by emergency order for conservation concerns after large harvests occurred in the net fishery.

Table CO12. Freshwater and saltwater angler effort and harvest of coho salmon in the Haines/Skagway area from 1989 to 1993.

	Fresh water		Salt water	
Year	Angler-days	Harvest	Angler-days	Harvest
1989	6,337	1,468	413	579
1990	6,561	1,133	615	365
1991	5,293	3,069	363	609
1992	3,579	2,185	209	882
1993	3,867	2,913	679	220
Mean	5,127	2,154	456	531

The accuracy of surveys in coho salmon escapement indicator streams is very dependent on good weather. Coho salmon escapements have been strong the last three years, and the 1994 surveyed escapements ran 121–349% above the 1989–93 average:

Stream	Stream no.	89-93 avg. escapement index	1994 escapement index	1994 % of avg.
Spring Creek	115-32-2019	114	398	349
Kelsall River	115-32-2045	257	440	171
Tahini River	115-32-2057	1,432	4,419	309
Clear Creek	115-32-10280	316	381	121
Total		2,119	5,638	266

Yakutat

The coho salmon fishery accounts for most angler effort and harvest in the Yakutat area. Angler density on all area systems is highest during the coho salmon season as anglers arrive in Yakutat from around the world for this fishery. During the 1980s, the peak of angling pressure centered around Labor Day weekend. During 1994, coho salmon anglers were present in large numbers from August 20 through October 7. Fortunately, coho salmon production is at a peak, with record harvests and good escapements during the past few years.

Most escapement surveys are performed by airplane in the Yakutat area, and because of weather patterns on the Yakutat Foreland, varying survey conditions are typical. An index of coho salmon abundance based on these surveys was recently developed to establish escapement goals for specific Yakutat area coho salmon systems (Clark and Clark 1994). Coho salmon escapement indices into the Situk and Lost rivers were both well above average during 1994:

Stream	Stream no.	89-93 avg. escapement index	1994 escapement index	1994 % of avg.
Situk River	182-70-035	7,470	26,000	348
Lost River	182-80-033	4,499	6,000	133
Total		11,969	32,000	267

Coho salmon bag limits in the Situk River were liberalized to six per day during 1994, as the newly

established escapement goal of 3,300 to 9,800 (mid-range goal) was greatly exceeded with a float count of 26,000 fish tallied on August 30. Lost River/ Tawah Creek coho salmon effort and harvest may soon exceed the Situk River, because guided float trips are now being offered on this system. Historically, Lost River and Tawah Creek accounted for about the same level of coho salmon effort and harvest as the Situk River.

Angling effort in remote Yakutat area coho salmon fisheries is increasing, as the angler density increases near Yakutat. The Tsiu River and Eight Mile Creek near Cape Suckling support growing recreational coho salmon fisheries, as do the Ahrnklin and Italio rivers closer to Yakutat.

Most of the angling effort in the Cape Suckling area is supported through established commercial fishing camps at Cordova.

PINK SALMON FISHERIES

The Southeast Alaska pink salmon sport fishery consists of a saltwater and a freshwater fishery. The importance of these two fisheries varies by location within the region. The sport fish harvest of pink salmon in marine water occurs primarily while anglers are targeting other species (king and coho salmon) around Ketchikan, Juneau, and Prince of Wales Island. Targeted freshwater harvest by sport fishers occurs primarily in the Haines/Skagway, Juneau, and Prince of Wales Island fisheries (Table PS1). Overall, marine harvest of pink salmon represents approximately 7% of the entire marine sport fishery and 10% of the entire freshwater sport fishery effort.

Sport Harvest and Effort

Harvests of pink salmon within the Southeast Alaska marine and freshwater sport fisheries have fluctuated dramatically over the past several years in some fisheries. Annual harvests of pink salmon among fisheries have ranged from a low of 222 in the Yakutat fishery (1990) to a high of 25,174 in the Ketchikan fishery (1989); the five-year average combined marine and freshwater harvest of pink salmon from 1989 to 1993 ranged from 512 in Yakutat to 20,714 in the Juneau fishery, followed by Ketchikan at 20,109. Averages for the remaining fisheries, in descending order, were: Prince of Wales Island (7,753), Haines/Skagway (5,181), Sitka (3,466), and Petersburg/Wrangell (2,150) (Table PS 2). Sport fishing interest in this species has changed substantially from 1989 to 1993.

The number of angler-days expended to harvest pink salmon in marine and fresh water ranged from a low of 11 days in the Yakutat fishery in 1990 to a high of 13,608 in the Juneau fishery during 1992 (Table PS2). Overall, the number of angler-days spent fishing for pink salmon has decreased in Ketchikan, Petersburg/ Wrangell, Juneau, and Haines/Skagway but increased in the Prince of Wales Island and Sitka fisheries and remained fairly stable in the Yakutat area (Table PS2).

Table PS1. Estimated sport harvest of pink salmon in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau/ Glacier Bay	Haines/ Skagway	Yakutat	Total
MARINE HARVEST								
1989	24,191	7,743	1,488	3,496	20,048	630	84	57,680
1990	13,608	3,520	1,721	2,964	21,248	9,863	0	52,924
1991	20,980	3,914	1,174	4,258	17,728	1,265	447	49,766
1992	17,622	2,682	639	2,580	21,925	1,594	64	47,106
1993	18,185	13,285	734	2,599	10,904	126	9	45,842
Mean	18,917	6,229	1,151	3,179	18,371	2,696	121	50,664
FRESHWATER HARVEST								
1989	983	2,595	932	198	3,353	2,553	510	11,124
1990	1,638	1,327	1,705	119	1,774	6,866	222	13,651
1991	984	1,149	715	218	2,628	1,863	493	8,050
1992	888	1,017	1,419	119	1,042	2,217	293	6,995
1993	1,466	1,532	221	777	924	234	440	5,594
Mean	1,192	1,524	998	286	1,944	2,747	392	9,083
COMBINED HARVEST								
1989	25,174	10,338	2,420	3,694	25,401	3,201	594	70,822
1990	15,246	4,847	3,426	3,083	23,022	15,362	222	65,208
1991	21,964	5,063	1,889	4,476	20,356	3,171	940	57,859
1992	18,510	3,699	2,058	2,699	22,967	3,811	357	54,101
1993	19,651	14,817	955	3,376	11,824	360	449	51,436
Mean	20,109	7,753	2,150	3,466	20,714	5,181	512	59,885
Percent	34	13	4	6	35	9	1	

Table PS2. Estimated angler-days of sport fishing effort for pink salmon in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	Percent of total[a]
MARINE ANGLER-DAYS									
1989	10,169	2,565	1,045	1,826	7,932	5,590	0	29,487	8%
1990	8,994	2,626	550	2,412	7,156	7,244	0	28,983	8%
1991	8,542	2,230	778	2,516	9,103	4,622	0	27,791	8%
1992	6,411	2,029	580	3,978	11,730	2,301	0	27,059	7%
1993	6,540	3,404	304	2,206	7,165	2,953	0	22,572	6%
Mean	8,137	2,571	624	2,588	8,617	4,542	0	27,079	7%
Percent	30	9	2	10	32	17	0		
FRESHWATER ANGLER-DAYS									
1989	1,532	1,238	289	120	871	3,962	60	8,073	10%
1990	1,659	1,265	658	105	1,130	4,259	11	9,088	10%
1991	1,593	1,383	293	214	1,369	3,149	88	8,089	10%
1992	1,573	1,297	502	169	1,878	2,450	55	7,924	9%
1993	1,790	1,194	374	263	1,933	2,362	55	7,971	9%
Mean	1,629	1,275	423	171	1,436	3,236	54	8,229	10%
Percent	20	15	5	2	17	39	1		
COMBINED ANGLER-DAYS									
1989	11,701	3,803	1,694	1,989	8,804	9,552	60	37,560	9%
1990	10,653	3,892	1,209	2,517	8,286	11,504	11	38,070	8%
1991	10,136	3,612	1,701	2,730	10,472	7,771	88	35,880	8%
1992	8,014	3,326	1,083	4,416	13,608	4,752	55	34,983	7%
1993	8,330	4,589	678	2,469	9,098	5,315	55	30,543	6%
Mean	9,767	3,844	1,273	2,824	10,045	7,779	54	35,408	8%
Percent	26	11	4	8	28	22	<0.5		

[a] Percentage of total regional effort for marine, freshwater, or total angler-days.

Despite these variations, the number of pink salmon harvested per angler day has increased slightly from 0.55 per angler day in 1989 to 0.59 per angler day in 1993. This increase is probably attributable to increased efficiency of sport anglers and increased effort by growing charter boat fleets in Ketchikan, Juneau, Prince of Wales Island, and Sitka to harvest pink salmon.

Beginning in 1990, the statewide harvest survey format was expanded to collect data on catch and harvest of individual species throughout the region. Catch and harvest data collected between 1990 and 1993 indicate the number of pink salmon caught was 1.7 to 3.6 times greater than the number harvested, depending upon which section of the region anglers were utilizing. Ketchikan area anglers had the smallest catch-to-harvest ratio (1.7:1), and Yakutat had the largest (3.6:1). The remaining fisheries, in descending order, were: Sitka (3.3:1), Petersburg/Wrangell (3.2:1), Prince of Wales (2.9:1), Juneau (2.6:1), Haines/Skagway (2.4:1), and Glacier Bay (2.2:1). This information indicates that, on average, anglers are catching and releasing 2.7 pink salmon for each fish harvested.

Commercial Harvest

The commercial harvest of pink salmon in Southeast Alaska ranged from a low of 33.4 million in 1990 to a high of 62.7 million in 1991 (Table PS3). The commercial harvest includes seine, gillnet, troll, Annette Island traps, and hatchery cost recovery fisheries. Seine gear is the primary method of harvest for this species—averaging 91% of the total commercial harvest for the period 1989–1993 (Table PS3). Overall, commercial harvest of pink salmon accounts for an average 99.86% of the total harvest, and sport harvest constitutes the remaining 0.14%.

Wild Stock Status

Monitoring of pink salmon wild stock status is conducted entirely by the Commercial Fisheries Management and Development Division as part of their

Table PS3. Southeast Alaska pink salmon sport fish and commercial harvest 1989–1993.

Year	Sport	Commercial				Hatchery cost recovery	Total commercial harvest	Sport fish % total harvest	Comm. fishery % total harvest
		Seine	Gillnet	Troll	Trap				
1989	70,822	54,498,590	4,415,967	1,771,181	496,262	247,752	61,429,752	0.1	99.9
1990	65,208	28,871,934	2,398,996	772,477	452,225	923,643	33,419,275	0.2	99.8
1991	57,859	59,684,799	1,416,193	426,707	93,935	1,112,852	62,734,486	0.1	99.9
1992	54,101	30,410,535	2,504,769	673,855	67,951	2,189,891	35,847,001	0.2	99.8
1993	51,436	54,828,241	1,999,963	902,704	329,476	293,600	58,353,984	0.1	99.9
Mean	59,885	45,800,000	2,547,178	909,385	287,970	953,598	50,362,400	0.14	99.86

inseason management of commercial fisheries. Aerial surveys are conducted inseason on a regular basis to monitor escapement levels and determine if escapement goals for different sections of the region are being met. Commercial fisheries openings are established inseason as aerial surveys determine escapement levels to different drainages within the region. To date, no inseason monitoring of pink salmon stocks has been undertaken as a management tool for the region's sport fisheries.

Enhancement

Pink salmon enhancement in Southeast Alaska consists primarily of releases from private non-profit (PNP) hatcheries whose goal is to enhance commercial fisheries and to maximize cost recovery earnings in terminal fisheries located at these facilities, for hatchery funding. Six PNP facilities release pink salmon each year, as do a private college hatchery located in Sitka and a federal hatchery located in Juneau. Four other small release sites permitted under Sci-Ed permits currently release pink salmon in the region. Ancillary benefits to sport fisheries result from these releases, but they are not situated or funded to benefit Southeast Alaska sport fisheries.

Management Approach

Management has been minimal for Southeast Alaska's pink salmon sport fisheries. Standard bag and possession limits of 6 daily and 12 in possession are currently utilized to manage harvest of this species by the region's sport fisheries. Increases in bag limits by emergency order (E.O.) are allowed by regulation when escapement goals have been exceeded by 25%. Expansion of bag limits should be considered whenever abundant returns are predicted and materialize inseason. Management of commercial fisheries within Southeast Alaska that harvest pink salmon is conducted through various means: escapement counts by aerial survey, monitoring the buildup of fish in saltwater terminal areas, collecting sex ratio data from landed fish, and implentation of the Board of Fisheries Pink Salmon Management Plan. Preseason forecasts are made on expected run strength to facilitate management of the region's commercial seine, gillnet, and troll fisheries, and inseason E.O.s are issued to open and close commercial fisheries throughout the region.

Board of Fisheries Actions

The Board of Fisheries (BOF) has not modified regional regulations governing pink salmon sport fisheries over the last several BOF cycles. Current bag and possession limits, coupled with inseason catch data from onsite creel surveys and postseason statewide harvest survey data, have allowed the department to maintain a healthy sport fishery for this species.

Area Specific Information and Issues

Ketchikan Area

Marine fishery harvest of pink salmon averaged 18,917 fish for 8,137 angler-days of effort from 1989 to 1993, with a peak of 24,191 fish and 10,169 angler-days in 1989 and a low of 13,608 fish and 8,994 angler-days in 1990 (see Tables PS1 and PS2). Although these data illustrate a decrease in harvest and effort for pink salmon, this species continues to be very important in the Ketchikan area sport fishery. Pink salmon arrive in Ketchikan in early July in large numbers, which results in anglers targeting on this

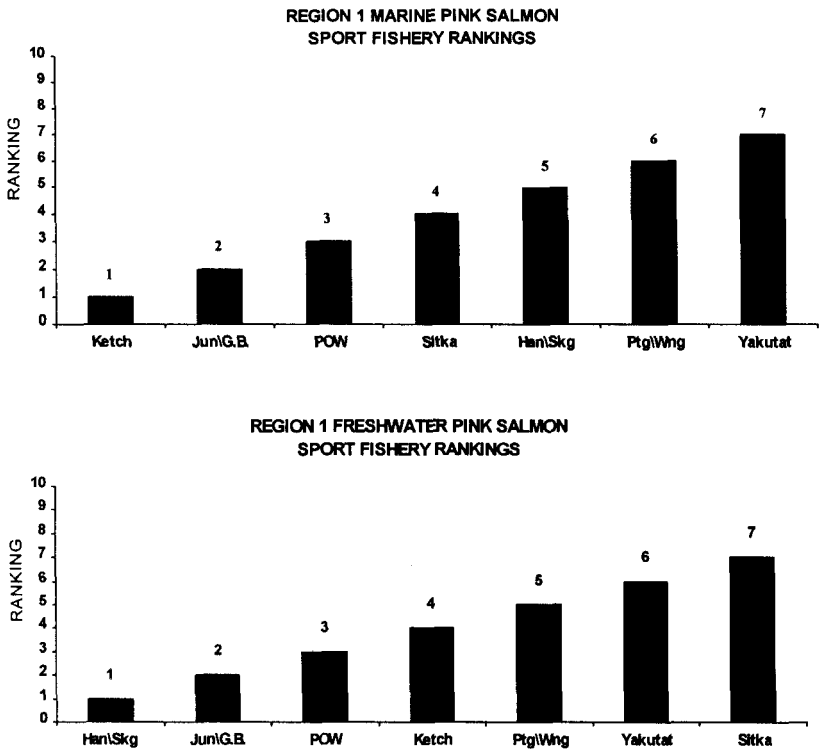

Figure PS1. *Southeast Alaska marine and freshwater sport fishery ranking for pink salmon harvest by community, 1989–1993 (1 = most important, 7 = least important).*

species—especially guided and shoreline anglers. The Ketchikan area marine pink salmon fishery ranks first among seven regional fisheries for the number of pinks harvested during 1989–1993 (Figure PS1).

The freshwater sport fishery in the Ketchikan area has ranged from a high of 1,638 pink salmon harvested with 1,659 angler-days of effort in 1990 to a low of 888 pink salmon harvested and 1,573 angler-days of effort in 1992. The five-year mean for 1989–1993 was 1,192 fish harvested and 1,629 angler-days of effort expended. The freshwater sport fishery in the Ketchikan area harvests a limited number of pink salmon, primarily by sport fishers targeting other species. It ranks fourth among the seven regional fisheries for total pink salmon harvested during 1989–1993 (see Figure PS1).

Prince of Wales Island

The Prince of Wales Island marine fishery pink salmon harvest for the period 1989–1993 ranged from a low of 2,682 in 1992, with 2,029 angler-days of effort, to a high of 13,285 in 1993, with 3,404 angler-days of effort (see Tables PS1 and PS2). Mean annual harvest of pink salmon for this period was 6,218, with an annual mean of 2,571 angler-days of effort expended. The pink salmon fishery in marine waters is best described as an ancillary fishery where most anglers do not target pink salmon but catch them while pursuing king or coho salmon.

The freshwater fishery for pink salmon, on the other hand, is more directed and is primarily associated with the numerous roadside fisheries on Prince of Wales Island. Between 1989 and 1993, the freshwater pink salmon harvest ranged from a high of 2,595 in 1989, with 1,238 angler-days of effort, to a low of 1,017 in 1992, with 1,297 angler-days of effort (see Tables PS1 and PS2). Mean annual harvest for this period was 1,524, and an average 1,275 angler-days were expended annually.

Marine and freshwater pink salmon fisheries for the Prince of Wales Island area each ranked third among seven regional fisheries for number of pink salmon harvested between 1989 and 1993 (see Figure PS1).

Petersburg/Wrangell Area

The Petersburg/Wrangell area marine fishery consists mainly of ancillary harvest by anglers targeting other species such as king and coho salmon. Between 1989 and 1993, pink salmon harvest ranged from a high of 1,721 (1990), with 550 angler-days of effort, to a low of 639 (1992), with 580 angler-days expended (see Tables PS1 and PS2). The mean annual harvest of pink salmon during this period was 1,019, from an annual mean effort of 624 angler-days. This fishery ranks sixth among seven regional fisheries for the harvest of this species (see Figure PS1).

The freshwater fishery for pink salmon in this area is similar in magnitude to the marine fishery but slightly more targeted, mainly at roadside sites. Freshwater harvests of pink salmon between 1989 and 1993 ranged from 1,705 in 1990, with 658 angler hours of effort, to 221 in 1993, with 374 angler-days of effort (see Tables PS1 and PS2). Annual harvests of pink salmon for this time period averaged 998, with an average 423 angler-days of effort expended annually (see Tables PS1 and PS2). The freshwater pink salmon fishery for the Petersburg/Wrangell area ranks fifth among seven regional fisheries that harvest this species (Figure PS1).

Sitka Area

Between 1989 and 1993, the marine fishery harvest ranged from 4,258 in 1991, with 2,516 angler-days of effort, to a low of 2,580 in 1992, with 3,978 angler-days expended (see Tables PS1 and PS2). The mean annual harvest for this period was 3,179 fish, from an annual mean of 2,588 angler hours expended. The bulk of this harvest occurred while anglers were targeting other species such as king and coho salmon.

Whereas the Sitka area marine fishery ranks fourth in the region, its freshwater fishery ranks seventh (Figure PS1). The freshwater fishery for pink salmon in the Sitka area is limited. During the period 1989 through 1993, the peak harvest of 777 occurred in 1993, with 263 angler-days of effort, and the lowest occurred in 1990 and 1992 at 119, with 105 and 169 angler-days, respectively (see Tables PS1 and PS2). The mean annual harvest for this period in fresh water was 286 pink salmon, and an average of 171 angler-days was expended annually to harvest these fish.

Juneau/Glacier Bay Area

A substantial pink salmon marine fishery takes place in the Juneau/Glacier Bay area. During the period 1989 through 1993, the peak harvest was 21,925 (1992), with 11,730 angler-days of effort, and the lowest occurred in 1993 when 10,904 fish were harvested from 7,165 angler-days of effort (see Tables PS1 and PS2). The average annual harvest of this species from 1989 to 1993 was 18,370, with an average 8,617 angler-days of effort annually. This fishery can be categorized as an ancillary fishery for anglers when king and coho salmon are present, but it also represents a fill-in fishery during periods of low abundance for king and coho salmon. This marine fishery ranks second among seven regional fisheries that harvest this species.

The pink salmon freshwater fishery in the Juneau/Glacier Bay area is substantially lower—but still moderately good in comparison to other parts of the region. The peak harvest in fresh water occurred in 1989 when 3,353 pink salmon were harvested from 871 angler-days of effort, and the lowest occurred in 1993 when only 924 fish were harvested from 1,933 angler-days of effort (see Tables PS1 and PS2). The annual mean harvest for this period was 1,944, with a mean of 1,436 angler-days expended annually to harvest these fish. This fishery occurs to a large degree in streams associated with the Juneau area road system; it ranks along with the marine fishery as second out of seven regional fisheries that harvest this species (see Figure PS1).

Haines/Skagway Area

The marine fishery for pink salmon in the Haines/Skagway area is definitely of lower importance than the freshwater fishery. Between 1989 and 1993, the peak marine harvest was in 1990, at 9,863 fish, with 7,244 angler-days of effort, but bottomed out at its lowest in 1993, when only 126 fish were harvested with 2,953 angler-days of effort (see Tables PS1 and PS2). Average annual harvest for the five-year period from 1989 to 1993 was 2,696 pink salmon, and an average 4,542 angler-days of effort were expended annually, ranking this fishery fifth among the seven regional fisheries that harvest pink salmon (see Figure PS1).

The freshwater pink salmon fishery, on the other hand, is a very important fishery. The peak harvest between 1989 and 1993 occurred in 1990 when 6,866 fish were harvested from 4,259 angler-days of effort, and the lowest harvest occurred in 1993, when only 234 fish were harvested from 2,362 angler-days of effort (see Tables PS1 and PS2). This fishery ranks at the top of the seven regional fisheries, with a mean annual harvest for 1989–1993 of 2,747 pink salmon, with an annual mean of 3,236 angler-days expended to harvest these fish (Tables PS1, PS2 and Figure PS1).

Yakutat area

The pink salmon sport fishery in the Yakutat area represents a fairly small fishery when compared to other parts of the region. The marine harvest for the period 1989–1993 ranged from a high of 447 in 1991 to a low of zero in 1990 (see Table PS1). This harvest is ancillary (average annual harvest of 121 fish) to other targeted fisheries and ranks last among seven fisheries in the region that harvest this species (Figure PS1).

The freshwater sport fishery in this area is almost as small as the marine fishery and is ranked sixth out of seven regional fisheries (Figure PS1). The harvest of pink salmon in fresh water has ranged from a high of 510 with 60 angler-days of effort in 1989 to a low of 222 with 11 angler-days of effort in 1990 (see Tables PS1 and PS2). The mean annual harvest for this period was 392 fish, with an annual mean of 54 angler-days expended. The freshwater fishery, like the marine fishery, is ancillary to other targeted species.

CUTTHROAT TROUT FISHERIES

Cutthroat trout occur as sea-run and resident (non-sea-run) forms in streams and lakes along the coastal range throughout Southeast Alaska and are the most common trout species in the region. Resident cutthroat trout live in a wide variety of habitats—from small headwater tributaries and bog ponds to large lakes and rivers. Sea-run cutthroat trout are usually found in river and stream systems with accessible lakes, mostly south of Frederick Sound. In some watersheds the two forms are found together. Resident stocks are found primarily in lakes but may also be found in some streams above barriers. Resident cutthroat do not migrate to sea like sea-run cutthroat, but spend their lives entirely in fresh water. Sea-run cutthroat typically reside in lakes over winter but leave in early spring and migrate through saltwater feeding areas to streams for spawning.

Cutthroat trout spawn in spring, from March to late May or early June. The young fish rear in small streams and tributaries for the first couple of years. Resident fish then move into lakes or remain in streams, where they spend the remainder of their lives. Sea-run fish migrate out of fresh water as smolt (age 2 or 3) into salt water to feed and grow. Sea-run cutthroat move back into lakes to overwinter; they migrate to sea once or twice before becoming sexually mature.

Populations of resident coastal cutthroat trout in Southeast Alaska are relatively small compared to those found in other areas of the West Coast. Average population size for most lakes the department has studied (excluding Florence and Baranof lakes) is only about 2,400 fish of catchable size (Table CT1). Florence Lake has an estimated population of over 14,000 cutthroat trout, and Baranof Lake about 12,000.

Sea-run cutthroat trout populations are usually smaller than resident populations. The average outmigration from Auke Lake near Juneau over the past 14 years was only 201 cutthroat trout (Taylor and Lum Carney 1995). Lake Eva near Sitka had the largest documented runs of sea-run cutthroat trout: 1,594 (1962), 1,210 (1963), and 1,233 in 1964 (Armstrong 1971). Sea-run cutthroat trout numbers usually represent only a very small fraction of the Dolly Varden populations in the same systems.

Table CT1. Estimated abundance of cutthroat in ten Southeast Alaska lakes.

Lake	Nearest community	Estimated population
Virginia Lake	Wrangell	5,631
Buck Lake	Sitka	490
Little Lake Eva	Sitka	380
Harvey Lake	Ketchikan	669
Margaret Lake	Ketchikan	3,000
Mirror Lake	Ketchikan	5,633
Upper Wolf Lake	Ketchikan	1,233
Florence Lake	Juneau	14,780
Jims Lake	Juneau	2,816
Turner Lake	Juneau	1,414
Average		2,363

Cutthroat trout in Southeast Alaska are slow-growing. Most fish don't reach catchable size until they are about 4 years old (Figure CT1). ADF&G studies in several trophy lakes found that it takes at least 12 years for a cutthroat to reach the 3-pound trophy size. The oldest fish aged was from Turner Lake; it measured 24 inches and was 18 years old.

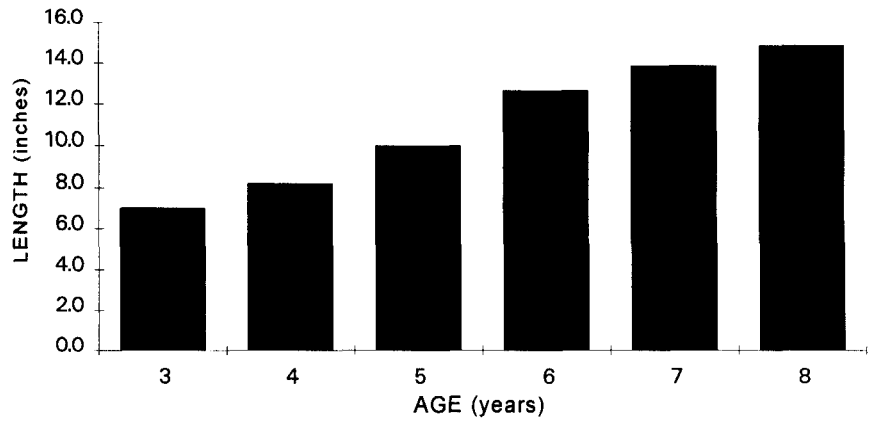

Figure CT1. *Approximate length at age for cutthroat trout in Southeast Alaska.*

Sport Harvest and Effort

Harvests of cutthroat trout have declined regionwide from 1977 until 1993 (Table CT2, Figure CT2). This decline is gradual, and harvests appear to oscillate in approximate four-year cycles, with maximum harvests decreasing in each cycle. Anglers have expressed increasing concern over poor catches.

During the early years of the statewide harvest survey program, only harvest was monitored, so we cannot compare catches with harvests until 1990. Anecdotal evidence shows that many of the cutthroat trout systems which were once very popular with anglers for large fish now produce only smaller cutthroat trout. This pattern is evident in cutthroat trout literature and is attributed to the fact that cutthroat trout are easily overfished.

The number of angler-days expended by recreational anglers fishing for cutthroat trout in Southeast Alaska was estimated for the period 1989–1993 at nearly 13,000 days per year. Table CT3 shows the pattern of fishing for each management area and identifies proportional effort in salt water and fresh water. The Juneau area had the highest level of effort, followed by Prince of Wales Island. Angling effort occurred almost exclusively fresh water with the exception of the Petersburg/Wrangell area, where saltwater effort sometimes exceeds freshwater effort. The Petersburg/Wrangell area has several locations where anglers can concentrate effort on cutthroat feeding and milling in intertidal areas.

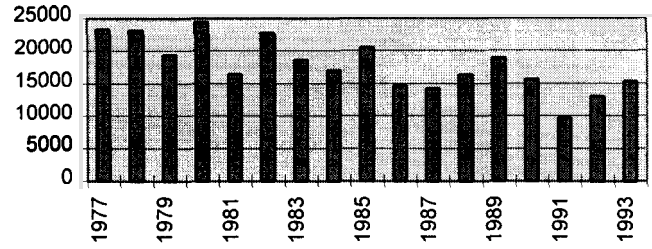

Figure CT2. *Harvest of cutthroat trout in Southeast Alaska, 1977–1993.*

An analysis of cutthroat trout catch and percentage of catch released for the period 1990–1993 indicated that catch in the major producing areas has increased since 1991 and that cutthroat catches are now quite high (Figure CT3, Table CT4). Percentage of cutthroat trout released has also increased dramatically, from a low in 1991 of 48.6% to a high in 1993 of 78.2%

Table CT2. Estimated marine, freshwater, and combined sport harvest of cutthroat trout in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau/ Glacier Bay	Haines/ Skagway	Yakutat	Total
MARINE HARVEST								
1989	900	21	373	43	560	0	0	1,897
1990	319	16	178	85	498	16	0	1,112
1991	189	12	386	251	514	31	48	1,431
1992	348	119	731	310	577	37	0	2,122
1993	216	0	1,015	99	1,141	52	45	2,568
Mean	394	34	537	158	658	27	19	1,826
FRESHWATER HARVEST								
1989	2,880	4,532	3,182	2,124	2,715	1,531	0	16,964
1990	3,420	2,519	3,547	1,447	2,442	1,114	59	14,548
1991	2,267	1,280	1,437	807	1,325	786	339	8,241
1992	1,373	1,868	3,015	1,474	2,180	907	18	10,835
1993	2,264	987	2,342	2,164	4,470	478	78	12,783
Mean	2,441	2,237	2,705	1,603	2,626	963	99	12,674
COMBINED HARVEST								
1989	3,780	4,553	3,555	2,167	3,275	1,531	0	18,861
1990	3,739	2,535	3,725	1,532	2,940	1,130	59	15,660
1991	2,456	1,292	1,823	1,058	1,839	817	387	9,672
1992	1,721	1,987	3,746	1,784	2,757	944	18	12,957
1993	2,480	987	3,357	2,263	5,611	530	123	15,351
Mean	2,835	2,271	3,241	1,761	3,284	990	118	14,500
Percent	20	16	22	12	23	7	1	

Table CT3. Estimated angler-days of sport fishing effort for cutthroat trout in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	Percent of total [a]
MARINE ANGLER-DAYS									
1989	0	156	2,328	0	122	370	0	2,975	0.8%
1990	0	192	1,168	0	155	474	0	1,988	0.5%
1991	0	141	1,524	0	201	304	0	2,170	0.6%
1992	0	133	1,105	0	209	149	0	1,597	0.4%
1993	0	146	656	0	180	162	0	1,144	0.3%
Mean	0	155	1,356	0	173	292	0	1,975	0.5%
Percent	0	8	69	0	9	15	0		
FRESHWATER ANGLER-DAYS									
1989	1,383	3,496	1,011	951	1,678	1,946	7	10,472	13%
1990	1,282	3,064	1,615	1,492	1,292	1,361	21	10,130	12%
1991	1,081	3,231	952	1,441	1,362	787	25	8,879	11%
1992	1,064	3,526	1,528	1,769	3,232	1,435	7	12,561	15%
1993	1,230	2,848	1,652	2,765	3,251	942	41	12,729	14%
Mean	1,208	3,233	1,352	1,684	2,163	1,294	20	10,954	13%
Percent	11	30	12	15	20	12	<0.5		
COMBINED ANGLER-DAYS									
1989	1,383	3,652	3,339	951	1,800	2,316	7	13,448	3%
1990	1,282	3,255	2,782	1,492	1,451	1,834	21	12,117	3%
1991	1,081	3,372	2,476	1,441	1,563	1,091	25	11,049	2%
1992	1,064	3,659	2,633	1,769	3,441	1,584	7	14,157	3%
1993	1,230	2,994	2,308	2,765	3,431	1,104	41	13,873	3%
Mean	1,208	3,386	2,708	1,684	2,337	1,586	20	12,929	3%
Percent	9	26	21	13	18	12	<0.5		

[a] Percent of total regional effort for marine, freshwater, or total angler days.

(Figure CT3, Table CT4). Release rates are expected to increase with adoption of more restrictive regulations by the Board of Fisheries in 1994.

History of Cutthroat Trout Management

Regulations for cutthroat trout have changed many times over the years, largely in response to increased angling pressure. The primary changes have been reductions in bag limits, originally set at 20 fish in the early 1940s and eventually reduced to five fish with only one over 16 inches in 1985 (Table CT5).

Sam Wright (1993) states that bag limit reductions, when used alone, are probably the most common mistake made in attempts to prevent overfishing of trout populations. He indicates that bag limits are most effective in distributing the allowable catch among more participants.

Studies show that cutthroat trout are the most easily caught of the trout species. They are therefore very susceptible to angling pressure, and because of their susceptibility even moderate fishing pressure can cause rates of harvest to exceed replacement rates. They are aggressive feeders and can be caught with a variety of gear. They are particularly vulnerable to bait: their mortality rate is 48% when caught and released by anglers using bait (Mongillo 1984) (Figure CT4).

Cutthroat trout have very special habitat requirements. They are dependent on small tributaries for

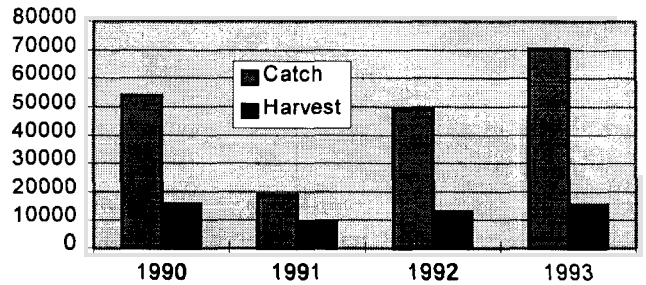

Figure CT3. Catch and harvest of cutthroat trout in Southeast Alaska, 1990–1993.

Table CT4. Estimated catch, harvest, and percentage of catch released for cutthroat trout in Southeast Alaska lakes, 1989–1993.

	1989	1990	1991	1992	1993
Ketchikan					
Catch	n/a[a]	10,998	3,933	9,402	16,341
Harvest	3,780	3,739	2,456	1,721	2,480
% released	n/a	66.0	37.6	81.7	84.8
Prince of Wales					
Catch	n/a	11,519	4,159	8,577	8,745
Harvest	4,553	2535	1,292	1,987	987
% released	n/a	78.0	68.9	76.8	88.7
Petersburg/Wrangell					
Catch	n/a	9,484	3,772	11,123	10,671
Harvest	3,555	3,725	1,823	3,746	3,357
% released	n/a	60.7	51.7	66.3	68.5
Sitka					
Catch	n/a	5,311	3,097	7,632	14,375
Harvest	2,167	1,532	1,058	1,784	2,263
% released	n/a	71.1	65.8	76.6	84.3
Juneau					
Catch	n/a	12,442	2,418	10,630	18,674
Harvest	3,057	2873	1,774	2,564	5,516
% released	n/a	76.9	26.6	75.9	70.5
Haines/Skagway					
Catch	n/a	3,543	852	1,127	1,045
Harvest	1,531	1,130	817	944	530
% released	n/a	68.1	4.1	16.2	49.3
Glacier Bay					
Catch	n/a	84	182	413	161
Harvest	218	67	65	193	95
% released	n/a	20.2	64.3	53.3	41.0
Yakutat					
Catch	n/a	639	420	119	414
Harvest	0	59	387	18	123
% released	n/a	90.8	7.9	84.9	70.3
Total Southeast					
% released	n/a	71.0	48.6	73.6	78.2

[a] Data not available.

spawning and rearing, where some populations are affected by inappropriate timber harvest practices.

In situations where cutthroat trout occur with other species, they are often displaced to less productive areas by other more aggressive rearing species like coho salmon and steelhead trout. The number of eggs per female is typically a few hundred to a thousand—far less than steelhead trout or coho salmon, which produce five to ten times that number of eggs. Cutthroat trout populations need to be protected in such a way that reproduction can be assured. Restrictive bag limits have been tried by several other management agencies, but bag limits alone were not able to slow a decline in cutthroat trout abundance.

Literature on cutthroat trout indicates that a size limit is the best single regulation for preventing excessive angler harvest. The management approach that will provide for some continued consumptive harvest is to set the minimum size limit at a level that will allow all females to spawn at least once and thus ensure maintenance of a population's reproductive potential. Males typically mature when they are somewhat younger and smaller; thus any regulation designed to protect females will also produce adequate male spawners.

Trout Management Plan

In January 1994 the Alaska Board of Fisheries adopted a Division of Sport Fish regulatory proposal for managing cutthroat and steelhead trout Southeast Alaska. The proposed changes were based on results of department research on cutthroat and steelhead trout in Southeast, published literature on trout, and an

Table CT5. Historical trends in trout regulations in Southeast Alaska, 1940s to present.

Years	Bag limits	Additional restrictions	Possession limit
1940s–1959	20	3 over 20 inches	2 daily bag limits
1960–1970	15	3 over 20 inches	2 daily bag limits
1971–1974	15	3 over 20 inches	2 daily bag limits
1975–1979	10	2 over 20 inches	2 daily bag limits
1980–1982	4	1 over 16 inches	2 daily bag limits
1983–1984	4	1 over 16 inches	2 daily bag limits
1985–1993	5	1 over 16 inches	2 daily bag limits
1994 — General regulations:	2	12 inches to 22 inches, no bait Nov. 16–Sept. 14	2 fish
1994 — High-use lakes[a]	2	14 inches to 22 inches, no bait at any time	2 fish
— Trophy lakes[b]	1	25 inches minimum, no bait	1 fish
— Stocked lakes[c]	5	no size limit, bait allowed all year	5 fish
— Florence Lake	5	no size limit, bait allowed all year	10 fish

[a] Kook Lake, Sitkoh Lake, Lake Eva, Little Lake Eva, Salmon Lake (Sitka), Baranof Lake, Red Lake, Salmon Bay Lake, Sarkar Lake, Kegan Lake, Jordan Lake, Heckman Lake, Bakewell Lake, Anan Lake, Thoms Lake, Virginia Lake, Kah Sheets Lake, Thayer Lake, Alexander Lake, Youngs Lake, Windfall Lake, Chilkat Lake, Mosquito Lake, and all waters on Juneau road system.

[b] Hassleborg Lake, Guerin Lake, Distin Lake, Jim's Lake, Eagle Lake, Reflection Lake, Orchard Lake, Patching Lake, Wilson Lake, Mirror Lake, Ella Lake, and Humpback Lake.

[c] Carlana Lake (Ketchikan) and Twin Lakes (Juneau).

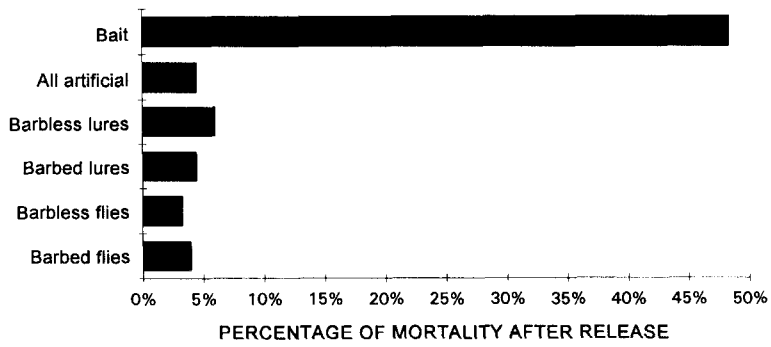

Figure CT4. *Mortality rates of released cutthroat caught with different gear types (Mongillo 1984).*

intensive public review process conducted in the Southeast Alaska region by the Division of Sport Fish.

The core element of the new trout regulations is a regional 12-inch minimum size limit which accomplishes two important goals: it protects juvenile steelhead so they cannot be harvested before they migrate to the ocean, and it protects approximately 85% of female cutthroat trout until they can spawn at least one time. The 12-inch minimum size is a common element in trout regulations in other states and provinces on the West Coast. The new bag and possession limit is two trout a day, and it was based on public response to our surveys.

A 12-inch minimum size limit can only be effective, however, if hooking mortality can be reduced to relatively low levels. A ban on using bait in fresh water is therefore an essential element of the new regulations. The new regulations include a 10-month bait ban in fresh water, with an opening from September 15 to November 15 allowing the use of bait to catch coho salmon in most freshwater drainages.

A special category was established in the new regulations for 13 'trophy' cutthroat trout lakes. These 13 lakes have all produced trophy-sized cutthroat trout which were entered in the Alaska Department of Fish and Game Trophy Fish Program. Anglers indicated in our surveys that the opportunity to catch a trophy-sized cutthroat trout is important. Many indicated that they were willing to spend large sums of money to fly to these lakes specifically to pursue these large cutthroat trout. Research in Southeast Alaska has shown that cutthroat trout don't reach the 3-pound trophy size until they are about 12 years old. As a result, lakes in this category have a minimum size limit of 25 inches, except Turner Lake—which was left as catch-and-release for all cutthroat trout. Bait is prohibited in trophy lakes throughout the year.

A larger size limit is appropriate for areas with developed access and/or more intensive fisheries. In Southeast, department research has shown that a 14-inch minimum size limit is required to protect all female cutthroat trout until they have had the opportunity to spawn at least one time. Twenty-three lakes were included in a 'high-use' category, and the use of bait is prohibited in these systems throughout the year.

The final new regulatory category is 'specific exceptions,' which includes Florence Lake on Admiralty Island, Twin Lakes in Juneau, the Juneau roadside drainages, and Carlanna Lake in Ketchikan. The use of bait is specifically allowed year-round in Florence Lake, no minimum size is required, and the bag limit is five cutthroat trout per day and ten in possession. The more liberal regulations for Florence Lake were set because population estimates by the department show that there is a large population of cutthroat trout in Florence Lake, and minimal fishing effort. Twin and Carlanna lakes are stocked, so anglers are encouraged to use bait and to keep the fish they catch. Bag limits in both lakes are five per day. The Juneau roadside has one of the most intensive sport fisheries in Southeast Alaska, and there are wild cutthroat trout populations in local lakes. The 14-inch minimum size for the roadside was set to allow all females in the local cutthroat trout populations to spawn at least once prior to harvest. The Juneau roadside regulations include a 10-month bait ban in fresh water, with an opening from September 15 to November 15 allowing the use of bait to catch coho salmon.

Cutthroat Trout Research Program

Armstrong (1971) counted emigrant and immigrant cutthroat trout at the Lake Eva system for a 3-year period during a research project on Dolly Varden from 1962 to 1964. Little study was done on cutthroat trout for several years after this investigation, until Darwin Jones conducted a life history study of anadromous cutthroat trout at Petersburg Creek from 1971 to 1976 (Jones 1972–1976). Jones (1976) concluded: "From information gathered at Petersburg Creek, it is apparent that wild cutthroat will be hard to maintain in any number or quality under heavy fishing pressure." After deciding that a hatchery program may be desirable

to augment trout populations, Jones spent a considerable amount of time looking for a brood source to use in the hatchery program and studying development of techniques for management and enhancement (Jones 1977–1982).

Evaluation of cutthroat trout in lakes in Southeast Alaska began in the late 1970s. Limnological productivity and recreational analyses studies provided preliminary length-age, length-weight, and stomach content information on cutthroat trout in the Naha drainage (Patching Lake, Chamberlain Lake, Jordan Lake, and Roosevelt Lagoon) (Schmidt 1976); Finger, Tammy, Moss, Raven, and Sarkar lakes (Schmidt 1977); Ella, Manzanita, and Wilson lakes and Duncan Creek and Saltchuck (Schmidt 1978); and Red Lake, Salmon Bay Lake, and Big Bay Lake (Schmidt 1979).

Development of techniques for estimating cutthroat trout populations in lakes began in 1978 at Red Lake (Schmidt 1979a) and was continued by Jones (1980, 1981) at Virginia, Harvey, and Jim's lakes. This program was expanded to include preliminary analyses of the cutthroat trout population and disease testing on Florence Lake (Jones 1981), and a study of Wilson Lake which has not been reported. Cutthroat trout populations in the Yakutat area (Aka Lake, Square Lake, Hart Lake, and Akwe River) were documented, and preliminary data were gathered during limnological analyses (Schmidt 1979). Ancillary information on cutthroat trout populations in several lakes (Bear, Helen, Hoffstad, Streets) was gathered during special investigations (Schmidt 1982). Preliminary evaluation of cutthroat trout populations was also conducted at Sitkoh and Baranof lakes in 1982 (Schmidt 1982) and Salmon Lake (Schmidt 1983). Jones (1982) concluded: "Fishing effort on these lakes is increasing and without an enhancement program underway it will be necessary to maintain restrictive bag and possession limits in order to maintain the fishery at its present level."

Cutthroat trout research in Southeast Alaska was basically ignored from 1983 until 1988, when a research project was initiated on Turner Lake in response to proposed sockeye introductions to that system (Jones et al. 1989). Cutthroat trout at Turner Lake have been studied for several years, as have the cutthroat of Florence Lake (Jones et al. 1990, Jones and Harding 1991). The cutthroat trout population of Chilkoot Lake was evaluated by Erickson and Bingham (1990) and Erickson and Marshall (1991), and the population of cutthroat trout in Wilson Lake was evaluated by Hoffman and Marshall (1994). Size and abundance of cutthroat trout in small Southeast Alaska lakes was studied in 1993 (Schmidt 1994).

Research on anadromous cutthroat trout populations has been lacking, with the exception of annual counting of anadromous cutthroat trout out of Auke Lake by weir (Taylor and Lum Carney 1995). Unpublished research conducted in 1994 on the Auke Lake cutthroat trout shows that these fish leave Auke Lake and spawn in several nearby streams in the Juneau area.

Area Specific Information and Issues

Ketchikan

Fishery Trends

The Ketchikan area sport fishery for cutthroat trout comprises two fisheries, a small marine fishery and a much larger freshwater fishery. According to data collected from the SWHS for 1989-1993, the marine harvest of cutthroat trout ranged from a low of 189 in 1991 to a high of 900 in 1989, with an average annual harvest of 394 for this time period (see Tables CT2 and CT3). The freshwater fishery is substantially larger, ranging from 1,373, with 1,064 angler-days of effort, in 1992 to 3,420, with 1,282 angler-days of effort, in 1990. The average annual harvest from 1989 to 1993 was 2,441, and an average 1,208 angler-days were expended annually to harvest these fish.

Stock Status

The cutthroat trout fishery in the Ketchikan area is composed of three different fisheries: trophy lakes, high-use lakes, and smaller, more numerous lake/stream systems. A total of 60 documented cutthroat trout systems has been identified in the Ketchikan area. Included within this total are seven trophy lakes, three high-use lakes, and 16 anadromous systems. The remaining 34 systems represent smaller populations in streams and/or lakes. Studies conducted in the late 1980s by the department on several roadside lakes noted populations of 200–500 fish were present within many of these small lake systems. In contrast, research conducted in 1993 on Wilson Lake (one of seven trophy lakes) noted a population greater than 7,000—although very few of these fish exceeded 20 inches. This information supported decisions in 1992 and 1993 to restrict Wilson Lake to catch-and-release for cutthroat trout, by emergency order to protect the population.

Prince of Wales

Fishery Trends

Cutthroat trout fishing in the Prince of Wales area comprises a small marine fishery and a major freshwater fishery. SWHS data for 1989–1993 noted that marine harvests ranged from none in 1993, with 146 angler-days of effort, to 119 in 1992, with 133 angler-days of effort (see Tables CT2 and CT3). Average marine harvest for this period was 34, with an average 154 angler-days of effort annually.

The freshwater cutthroat trout fishery is much larger. Harvests for this period ranged from 987, with 2,848 angler-days of effort, in 1993 to 4,532, with 3,496 angler-days of effort, in 1989. The average freshwater harvest for this period was 2,237, and an average of 3,233 angler-days were expended annually to harvest these fish (see Tables CT2 and CT3).

Stock Status

There are 75 streams and 46 lakes on Prince of Wales Island that have documented cutthroat trout populations. Within those 75 streams are 20 anadromous populations, the majority of which occur in larger streams on the island. Additional studies on roadside-accessible lakes will be conducted to gain current information on stock status for a variety of lakes on Prince of Wales Island.

Petersburg/Wrangell

Fishery Trends

SWHS data for the Petersburg/Wrangell area from 1989 to 1993 recorded marine harvests from 178 cutthroat trout, with 1,168 angler-days of effort in 1990 to 1,015, with 656 angler-days of effort in 1993 (see Tables CT2 and CT3). Average harvest for the period was 537, and average annual angler-days were 1,356.

The freshwater cutthroat trout fishery is substantially larger. Between 1989 and 1993, anglers harvested from 1,437 cutthroat trout (1991), with 952 angler-days of effort, to 3,547 (1990), with 1,615 angler-days expended. The average annual harvest for this period was 2,705 fish, with an average of 1,352 angler-days expended annually (Tables CT2 and CT3).

Stock Status

Documented cutthroat trout populations exist in 90 streams and 30 lakes in the Petersburg/Wrangell area. Within these 90 streams are 23 anadromous populations; one trophy lake and four high-use lakes are also among the 30 cutthroat trout lakes in this area. Current information on the cutthroat populations is minimal, consisting mainly of harvest data from the statewide harvest survey. Many of these systems represent small populations in either streams or small lakes. Additional research on the status of these populations will be conducted in future years to determine the status of these populations.

Sitka

Fishery Trends

Harvests of cutthroat trout in the Sitka area have varied over the years; most of the harvest comes from fresh water (Figure CT5). No definite harvest pattern is evident, although effort has been increasing and certain systems appear to be targeted more heavily than others. The relative proportion of fish harvested (harvest/catch) has decreased over the past 3 years, which indicates that more anglers may be practicing catch-and-release fishing.

High-use Lakes

Sitka has five lakes which have been classified for management purposes as 'high-use' lakes: Baranof Lake, Lake Eva, Little Lake Eva, Sitkoh Lake, and Salmon Lake.

Baranof Lake produced the highest harvest of cutthroat trout of any lake in Southeast Alaska in 1993 (Mills 1994). Harvests of cutthroat trout from Baranof Lake have increased from 8% of the total freshwater harvest of this species in the Sitka Management Area in 1984 to 39% in 1993 (Mills 1985–1994).

Research was conducted at Baranof Lake during the summer of 1994 to estimate the number of cutthroat trout and other parameters because of the lake's importance to recreational anglers (DerHovanisian and Marshall 1995). Results of the investigation indicate that Baranof is quite unique and has a large population of cutthroat trout. Baranof is the only large lake in Southeast known to contain no other species of fish and therefore to have no interspecific competition which would limit cutthroat trout production.

Little Lake Eva is the only lake in the Sitka area which contains both cutthroat trout and kokanee, and is considered an excellent sport fishery. The cutthroat

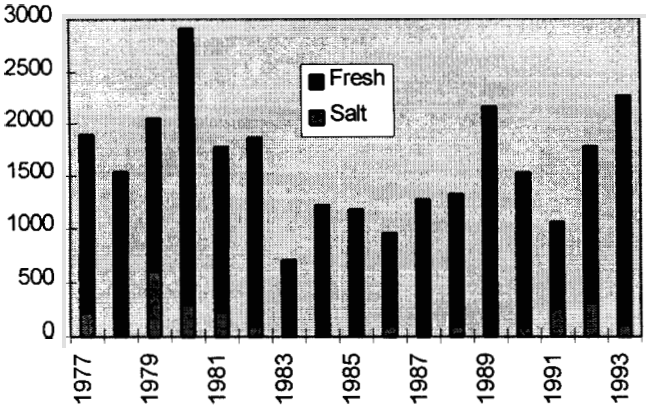

Figure CT5. *Harvests of cutthroat trout in salt water and fresh water in the Sitka area, 1977–1993.*

Table CT6. Wild and hatchery cutthroat trout outmigrants from Auke Creek, 1980–1994.

Year	Wild	Hatchery	Total
1980	85	0	85
1981	157	0	157
1982	157	0	157
1983	149	77	226
1984	198	104	302
1985	112	49	161
1986	99	39	138
1987	250	692	942
1988	294	396	690
1989	259	152	411
1990	417	89	506
1991	237	23	260
1992	219	7	226
1993	174	16	190
1994	422	9	431

trout population in Little Lake Eva was estimated at 380 catchable fish (Schmidt 1993).

Lake Eva, Salmon Lake, and Sitkoh Lake are all anadromous systems with several rearing species; cutthroat trout in these lakes have more competition. The anadromous population of cutthroat trout in Eva Creek was counted by weir during 1962–1964 (Armstrong 1971); 1,210 to 1,594 emigrating fish and 1,203 to 1,682 immigrating fish were counted per year.

Juneau/Glacier Bay

Admiralty Island, located in the Juneau area, has several large lakes which provide excellent cutthroat trout fishing. Approximately 2,292 cutthroat trout were taken from Admiralty Island waters. The Taku River drainage provided a harvest of 1,072 cutthroat trout in 1993. Cutthroat trout are targeted in other small fisheries in the Juneau and Glacier Bay areas, but in most instances they are taken incidentally by anglers targeting Dolly Varden, steelhead trout, or coho salmon.

Auke Creek Cutthroat Trout

Four hundred forty two outmigrating cutthroat trout were counted at the Auke Creek weir in 1994. This is the highest count of wild cutthroat that have left Auke Lake since 1980 (Table CT6, Figure CT6, Table CT8). Regulations were also implemented for cutthroat trout in 1994 which reduced the daily bag limit from five fish per day to two per day and set a 14-inch minimum size limit in fresh waters on the Juneau roadside.

Some hatchery experimentation was done with cutthroat trout from Auke Creek (Table CT7, Figure CT7). Eggs taken from ripe adult cutthroat trout leaving Auke Lake were hatched in the hatchery; the fry were released back into Auke Lake late in summer or fall. The final stocking in Auke Lake of hatchery-produced cutthroat trout fry was in 1994, but the numbers of hatchery fry leaving Auke Lake has been small in the past four to five years. No additional hatchery work is anticipated for cutthroat trout from Auke Lake.

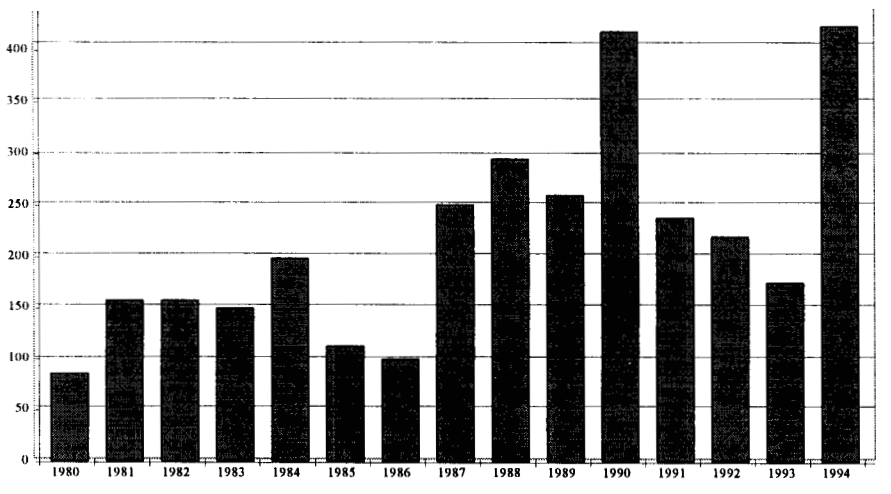

Figure CT6. *Auke Creek wild cutthroat trout outmigrants, 1980–1994.*

Haines/Skagway

Table CT7. Summary of cutthroat trout enhancement in Auke Lake, 1981–1993.

Brood year	No. fish released	Fin mark	Date of release	Age (mo)	Length (mm)	Wt. (g)
1981	1,286	RV	4/26/83	24	120	21
1982	4,078	LV	8/02/83	15	96	10
1985	3,489	Ad	11/21/86	18	129	22
1986	1,719	Ad	8/21/87	15	140	25
1991	2,465	RV	11/6/91	6	-	-
1993	3,100	LV	6/22/94	8	-	-

The majority of cutthroat trout taken in the Haines/Skagway area are taken in the Chilkat River drainage. Harvest data are presented in Table CT2.

Cutthroat trout are taken incidentally in other fisheries in the Haines and Skagway areas.

Yakutat

Fishery Trends

Populations of cutthroat trout are scattered across the Yakutat Foreland, primarily in beaver pond systems. There is little targeted effort on this species and therefore no observed fishery trend. The largest known population of cutthroat trout exists in the Akwe River drainage, including Square Lake. The Akwe River system seems to support both resident and anadromous cutthroat trout populations, but formal investigations have yet to be conducted. Interestingly, cutthroat trout are rare in the Situk River system and have not been documented between Yakutat Bay and Cape Suckling. Harvests of cutthroat trout in the Yakutat area have been variable and at low levels over the period of the statewide harvest survey (Figure CT8), with annual reported sport harvests ranging from 0 to 274. Reported cutthroat trout harvest in 1993 was 123, while 291 were caught; accordingly, 42% of cutthroat trout caught were kept in the Yakutat area.

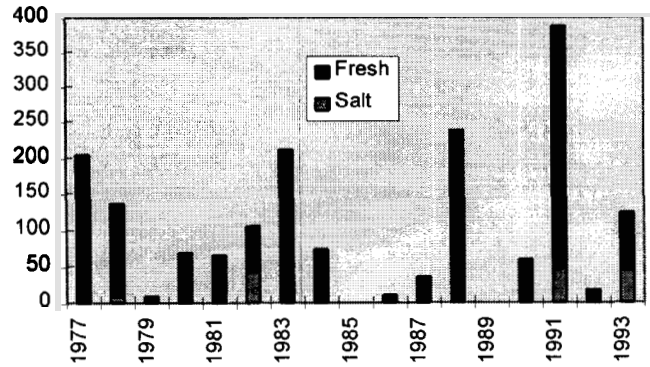

Figure CT8. *Harvests of cutthroat trout in salt water and fresh water in the Yakutat area, 1977–1993.*

Other Issues

Occasional guided fishing trips targeting cutthroat trout take place on the Akwe River system. To date, these trips have been primarily catch-and-release.

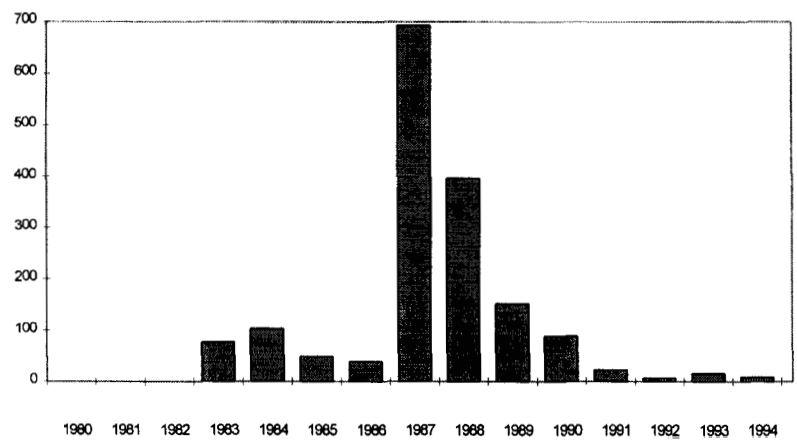

Figure CT7. *Auke Creek hatchery cutthroat trout outmigrants, 1980–1994.*

Table CT8. Auke Creek cutthroat outmigration counts, 1987–1994.

Date	1987	1989	1990	1991	1992	1993	1994
23-Mar							
24-Mar	2						
25-Mar							
26-Mar							
27-Mar							
28-Mar	1						
29-Mar	3						
30-Mar	2						
31-Mar							
1-Apr	9						
2-Apr	5		1		1		
3-Apr	2			1	2		
4-Apr	3						
5-Apr	22						
6-Apr	17						
7-Apr	4		1				
8-Apr	4						
9-Apr	8		2		1		
10-Apr	9		3				
11-Apr	6						
12-Apr	6						4
13-Apr	5						
14-Apr	5						1
15-Apr	10		7		1		1
16-Apr	10	1	8		10		
17-Apr	5	2	4		3		
18-Apr	7	1	15		8		2
19-Apr	6	0	13		6		
20-Apr	3	1	7		2	2	1
21-Apr	8	1	3		3	1	2
22-Apr	3	2	2	1	3	2	8
23-Apr	23	2	5		1	1	1
24-Apr	4	2	7		5	3	18
25-Apr	8	1	6		2	4	10
26-Apr	2	1	8	1	7	7	7
27-Apr	6	10	1	1	0	6	9
28-Apr	12	1	4	2	2	7	11
29-Apr	8	4	8	1	9	8	10
30-Apr	11	19	6		4	11	9
1-May	20	12	8	2	4	17	23
2-May	29	30	4	11	0	4	1
3-May	23	15	12	9	2	4	9
4-May	24	6	10	9	0	3	25
5-May	29	10	16	8	5	1	4
6-May	18	5	6	4	0		7
7-May	13	23	9	6	1	1	6
8-May	10	19	9	20	0	4	3
9-May	28	12	12	1	4	1	11
10-May	12	7	7	8	2		5
11-May	10	11	8	12	6	3	11
12-May	17	1	8	2	6	2	12
13-May	23	10	20	1	2	1	8
14-May	24	2	10	8	5	9	19
15-May	30	14	12	4	8	9	21
16-May	17	13	36	3	20		30
17-May	21	4	6	4	11	8	22
18-May	36	5	11	5	6	8	15
19-May	14	6	15	6	11	3	14
20-May	23	5	23	4	6		11
21-May	28	5	31	3	12	4	11
22-May	27	7	31	2	1	6	5
23-May	15	14	10	4	1	3	10
24-May	14	4	6	11	6	4	7
25-May	9	8	1	13	7	3	12
26-May	10	16	8	14	11	2	3
27-May	14	8	1	4	2	5	5
28-May	13	8	4	16	4	1	4
29-May	8	6	10	10	2	3	4
30-May	5	18	3	3	2	3	1
31-May	8	23	2	7	4	1	4
1-Jun	9	6	4	1	1	2	2
2-Jun	13	1	2	2		2	2
3-Jun	7	0	1	2			
4-Jun	6	4	1	4		1	1
5-Jun	18	8	1	3		1	1
6-Jun	13	0		5		3	1
7-Jun	3	2		2		1	1
8-Jun	4	0		2		6	1
9-Jun	7	1		2	1	4	
10-Jun	7	0		3			1
11-Jun	4	0		2			1
12-Jun	3	1		1		3	3
13-Jun	9	0					
14-Jun	5	2					
15-Jun	2	2	2	2			
16-Jun	3	3	1			1	
17-Jun	3	0	4	1			
18-Jun	2	0					
19-Jun	4	1	19	1			
20-Jun		0		1	1		
21-Jun	1	0	1	1			
22-Jun	3	1	5			1	
23-Jun		0	4				
24-Jun		1	1	3			
25-Jun		0					
26-Jun		2					
27-Jun		1					
28-Jun				2			
Cumulative totals:							
	937	411	506	261	224	190	431

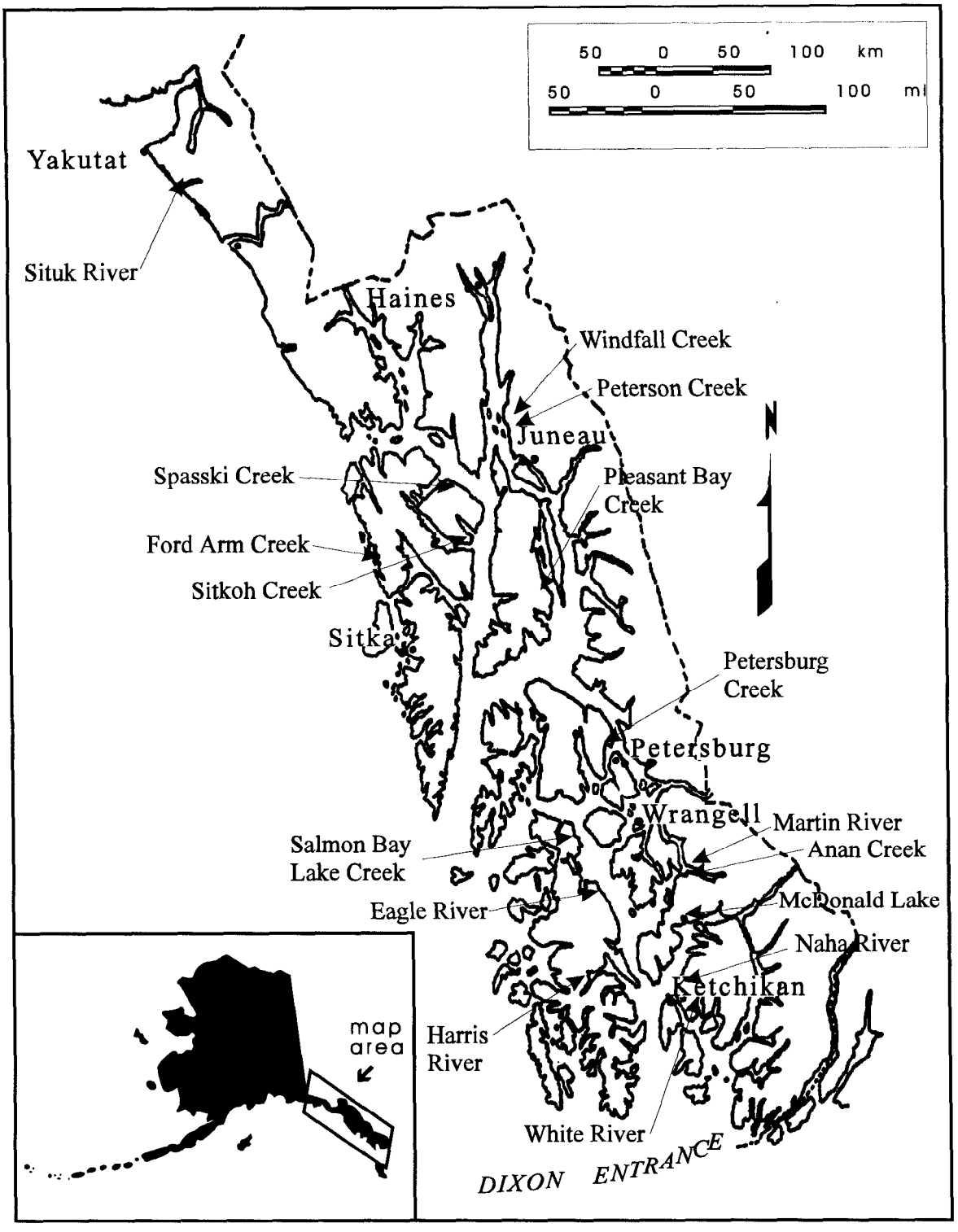

Figure SH1. *Location of steelhead index streams in Southeast Alaska.*

STEELHEAD AND RAINBOW TROUT FISHERIES

Steelhead and rainbow trout occur in streams and lakes throughout most of the Southeast Alaska and Yakutat areas (Figure SH1) and are available year-round to anglers. Most of the 331 known steelhead populations in Southeast Alaska contain 200 or fewer adults, but some larger systems like the Naha River, Karta River, and Thorne River probably support runs in excess of a thousand spawning adult steelhead. The largest known steelhead producer in Southeast Alaska is the Situk River in Yakutat, which supports a run of 3,000–8,000 adult steelhead. Resident rainbow trout populations are generally the result of stocking/enhancement projects over the years, but several indigenous populations of resident rainbow trout also exist in the region.

Steelhead in Alaska generally spend 2 to 5 years in fresh water before migrating to the ocean as smolt; a 3-year freshwater residency is most common. Adult steelhead return to spawn after spending 1 to 3 years at sea. The timing of adult immigration may be categorized as either spring or fall. In stocks that display a spring run timing, immigrations of adult fish are typically at their highest levels from late April to mid-May. Immigrations of adult fall-run steelhead are typically greatest from September through October. Both stock types spawn during spring, and adult steelhead that survive spawning (kelts) emigrate to the sea again from mid-May through June. For populations from which significant numbers of samples have been collected, initial spawning fish are evenly divided between males and females. In Southeast Alaska and Yakutat, steelhead stocks displaying spring-run timing are most common, but fish displaying fall-run timing do constitute a minor component of some populations. North and west of Yakutat, fall-run timing patterns are prevalent.

Adult steelhead kelts may survive to spawn again; steelhead that have spawned as many as five times have been observed in some Southeast Alaska systems. Repeat spawning fish usually compose 25–33% (sampled range 11–38%) of the total adult return (Van Hulle 1985). Typically, 65–80% of repeat spawning fish are female.

Sport Harvest and Effort

Sport steelhead harvests in Southeast Alaska typically occur in fresh water. Between 1977 and 1989, estimated Southeast Alaska sport steelhead harvests nearly quadrupled, from 1,424 in 1979 to 5,409 in 1989 (Figure SH2). The record harvest in 1989 was followed by a declining trend (Table SH1), and harvests are currently near 1970s levels (Mills 1978–1994). Much of the reduction in harvest can be attributed to emergency orders that closed numerous Southeast streams to steelhead retention starting in 1991.

In 1990, the statewide harvest survey began estimating total numbers of steelhead caught as well as numbers harvested; Figure SH3 displays a graphed comparison of steelhead catch estimates to steelhead harvest estimates for the years 1990–1993. In 1990, the statewide harvest survey estimated total steelhead catch by sport anglers in Southeast Alaska and Yakutat at 21,989; anglers retained 4,272 (19%) of these fish and released the rest.

In 1991, total steelhead catch was estimated at 12,573—an apparent decline (Mills 1992); however, it was later acknowledged that the 1990 estimates had been inflated, and much of the reduction in steelhead catch during 1991 may therefore be attributed to this

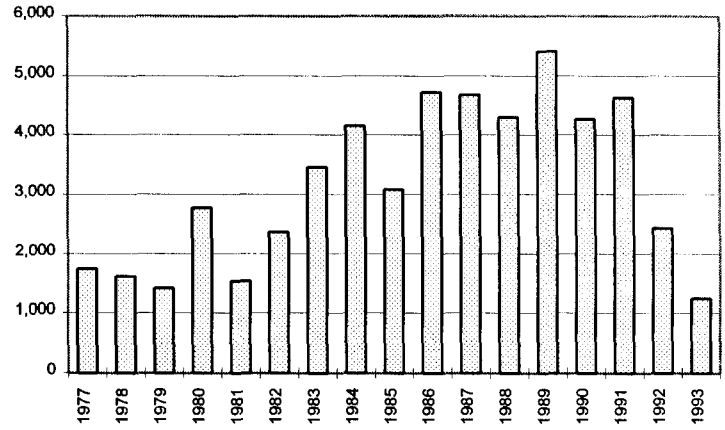

Figure SH2. *Southeast Alaska estimated sport steelhead harvests, 1983–1993.*

Table SH1. Estimated sport harvest of steelhead and rainbow trout in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total
STEELHEAD								
1989	1,654	1,277	609	193	322	142	1,212	5,409
1990	1,423	789	1,046	153	240	32	591	4,272
1991	793	1,666	394	388	573	253	565	4,632
1992	786	739	390	156	289	24	55	2,439
1993	69	260	351	243	277	28	21	1,249
Mean	945	746	558	227	340	96	489	3,600
Percent	26	26	16	6	9	3	14	
RAINBOW TROUT								
1989	2,201	2,963	197	1,282	229	182	31	7,085
1990	1,199	707	1,014	970	258	32	24	4,204
1991	962	1,958	583	1,596	68	34	151	5,352
1992	641	667	601	1,932	372	79	0	4,292
1993	1,346	703	417	1,288	167	192	77	4,190
Mean	1,270	1,400	562	1,414	219	104	57	5,025
Percent	25	28	11	28	4	2	1	

overestimate; anglers kept 4,067 (32%) of these fish. Estimated steelhead catches in 1992 and 1993 remained relatively constant at 12,281 and 12,942 fish, respectively, while retention rates declined to 19% and 10%, respectively. Estimated catch, harvest, and percentage of catch released for specific Southeast Alaska steelhead fishery areas appear in Table SH2, and Table SH3 contains the catch, harvest, and percentage of catch released estimates for specific Southeast Alaska rainbow trout fishery areas.

Combined marine and freshwater angler-days of steelhead/rainbow trout effort in Southeast Alaska during 1989–1993 ranged from a low of 10,773 in 1989 to 14,176 in 1992 and averaged 13,120 annually

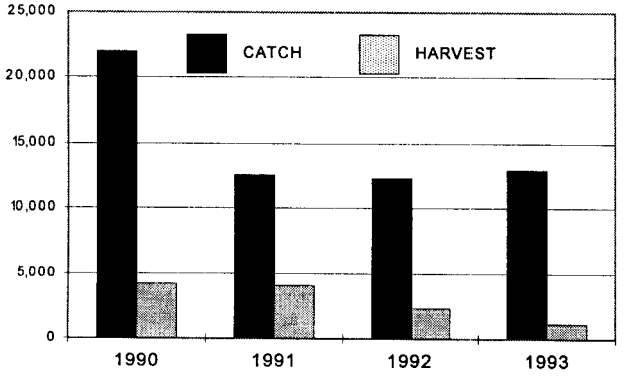

Figure SH3. Comparison of estimated steelhead sport catch and harvest in Southeast Alaska, 1990–1993.

Table SH 2. Estimated steelhead catch, harvest, and percentage of catch released in Southeast Alaska, 1989–1993.

	1989	1990	1991	1992	1993
Ketchikan					
Catch	n/a[a]	4,215	1,689	2,067	1,809
Harvest	1,654	1,423	793	786	69
% released	n/a	66.2	53.0	62.0	96.2
Prince of Wales					
Catch	n/a	7,004	4,809	3,609	2,077
Harvest	1,277	789	1,666	739	260
% released	n/a	88.7	65.4	79.5	87.5
Petersburg/Wrangell					
Catch	n/a	3,821	861	1,478	1,386
Harvest	609	1,046	394	390	351
% released	n/a	72.6	54.2	73.6	74.7
Sitka					
Catch	n/a	664	1,131	685	1,847
Harvest	193	153	388	156	243
% released	n/a	77.0	65.7	77.2	86.8
Juneau					
Catch	n/a	463	681	1,267	1,051
Harvest	280	240	400	258	258
% released	n/a	48.2	41.3	79.6	75.5
Haines/Skagway					
Catch	n/a	97	293	132	123
Harvest	142	32	253	24	28
% released	n/a	67.0	13.7	81.8	77.2
Glacier Bay					
Catch	n/a	0	193	70	134
Harvest	42	0	173	31	19
% released	n/a	0.0	10.4	55.7	85.8
Yakutat					
Catch	n/a	5,725	2,916	2,973	4,515
Harvest	1,212	591	565	55	21
% released	n/a	89.7	80.6	98.2	99.5

[a] Data not available.

Table SH3. Estimated catch, harvest, and percentage of catch released for rainbow trout in Southeast Alaska, 1989–1993.

	1989	1990	1991	1992	1993
Ketchikan					
Catch	–[a]	5,060	4,378	4,031	7,714
Harvest	2,201	1,199	962	641	1,346
% Released	–	76.3	78.0	84.1	82.6
Prince of Wales					
Catch	–	3,692	3,269	2,472	2,925
Harvest	2,963	707	1,958	667	703
% released	–	80.9	40.1	73.0	76.0
Petersburg/Wrangell					
Catch	–	2,549	2,257	1,226	1,871
Harvest	197	1,014	583	601	417
% released	–	60.2	74.2	51.0	77.7
Sitka					
Catch	–	2,333	4,400	5,249	7,142
Harvest	1,282	970	1,596	1,932	243
% released	–	58.4	63.7	63.2	96.6
Juneau					
Catch	–	464	255	775	492
Harvest	229	241	46	372	258
% released	–	48.1	82.0	52.0	47.6
Haines/Skagway					
Catch	–	49	56	79	453
Harvest	182	32	34	143	192
% released	–	34.7	39.3	81.0	57.6
Glacier Bay					
Catch	–	17	44	56	53
Harvest	0	17	22	0	0
% released	–	0.0	50.0	100.0	100.0
Yakutat					
Catch	–	279	251	55	890
Harvest	31	24	151	0	77
% released	–	91.4	39.8	100.0	91.3

[a] Catch data not estimated for 1989.

(Table SH4). Southeast Alaska freshwater angling effort for steelhead/rainbow trout more than doubled during the past 15 years, and has stabilized at an average 12,194 angler-days annually during the period 1989–1993 (Table SH4).

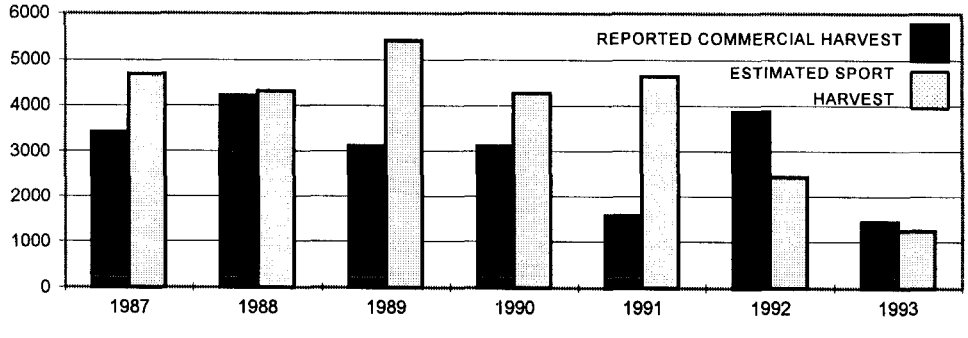

Figure SH4. Estimated sport harvests and reported commercial harvests of steelhead trout in Southeast Alaska, 1987–1993.

Commercial Harvest

Steelhead are also harvested incidental to targeted species in the marine commercial fisheries of Southeast Alaska. Reported steelhead harvests in commercial fisheries averaged approximately 1,500 fish per year from 1975 to 1983, increasing annually from 1982 through 1986 to a peak of 11,540 fish in 1986. From 1987 through 1994, reported commercial steelhead harvests averaged 2,133 fish.

Total reported steelhead harvests in commercial and sport fisheries of Southeast Alaska ranged from an estimated 2,455 steelhead in 1979 to 16,262 in 1986; between 1987 and 1992, commercial harvests were smaller than sport harvests, but in 1992 and 1993, the commercial harvest increased as sport harvests declined (Figure SH4).

Power trollers reported harvesting from 23 to 82 steelhead annually (average 56) during an average of 23,000 annual boat-days of trolling between 1986 to 1992. Power trollers reported no harvest of steelhead for 1993 and 1994 during 22,000 and 17,000 boat-days of trolling, respectively.

Most reported commercial landings of steelhead were made by drift gillnet (1987–1994 average 66.0%, range 53.3–85.6%), and of these, 84.3% took place in Districts 101–108 (Table SH5). Seine gear took the next highest percentage (1987–1994 average 26.4%, range 0.5–38.4%), and the combination of all other gear types took an average 7.6 % (range 4.0–14.1%) of the commercial harvest.

Most commercial steelhead landings took place in Districts 101 and 104 in southern Southeast Alaska. Steelhead were also taken regularly in the District 106 fishery near the Stikine River and in the District 111 fishery at the mouth of the Taku River. The Situk River commercial sockeye and coho set net fishery also regularly harvests steelhead (1987–1994 average of 157 steelhead, range of 95–241).

Commercial coded wire tagged recoveries between 1969 and 1992 originated primarily (93%) from British Columbia release sites; most of these were Vancouver Island systems (Puntledge River, Somass River, Robertson Creek).

Table SH4. Estimated angler-days of sport fishing effort for steelhead and rainbow trout in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	Percent of total [a]
MARINE ANGLER-DAYS									
1989	0	78	110	29	628	0	0	845	0.2%
1990	0	96	171	36	533	0	0	835	0.2%
1991	0	70	179	36	674	0	0	959	0.3%
1992	0	67	117	82	965	0	0	1,231	0.3%
1993	0	73	100	39	548	0	0	760	0.2%
Mean	0	77	135	44	670	0	0	926	0.3%
Percent	0	8	15	5	72	0	0		
FRESHWATER ANGLER-DAYS									
1989	2,744	3,908	1,148	201	484	0	1,443	9,928	12%
1990	3,627	4,002	2,833	356	542	0	1,691	13,050	15%
1991	3,500	4,854	1,222	323	675	0	1,555	12,129	15%
1992	3,190	4,625	2,471	402	874	0	1,383	12,945	15%
1993	3,580	3,700	1,949	783	983		1,921	12,916	14%
Mean	3,328	4,218	1,925	413	712	0	1,599	12,194	14%
Percent	27	36	16	3	6	0	13		
COMBINED ANGLER-DAYS									
1989	2,744	3,986	1,258	229	1,122	0	1,443	10,773	2%
1990	3,627	4,098	3,004	391	1,075	0	1,691	13,886	3%
1991	3,500	4,924	1,401	359	1,349	0	1,555	13,088	3%
1992	3,190	4,692	2,588	483	1,839	0	1,383	14,176	3%
1993	3,580	3,773	2,409	822	1,531	0	1,921	13,676	3%
Mean	3,328	4,295	2,132	457	1,383	0	1,599	13,120	3%
Percent	25	33	16	3	11	0	12		

[a] Percent of total regional effort for marine, freshwater, or total angler days.

Southeast Alaska release sites composed only 3% of identified commercial steelhead recoveries. Steelhead were also recovered from release sites in Washington, Idaho, and California.

Steelhead harvests reported through landing records for commercial fisheries should be considered minimum estimates of the actual harvest. Since steelhead are not consistently purchased by processors, some portion of the harvest is probably not sold and goes unreported. There may also be some misidentification and sale of steelhead as other species.

Wild Stock Status

There have been few evaluations of the status of steelhead stocks in individual stream systems in Southeast Alaska. Weir or visual counts have been conducted sporadically on the Situk River (Yakutat), Sitkoh Creek (Chichagof Island), Karta River (Prince of Wales Island), and Peterson Creek (Juneau) (see map, Figure SH1). In 1993 the department expanded the number of visual count index streams to include more than 20 steelhead systems throughout the region (Table SH 6).

Table SH 5. Reported proportions of steelhead harvested in Southeast Alaska by commercial gear group, 1987–1994.

Area	Purse seine	Drift gillnet	Hand troll	Power troll	Set gillnet	Total
Northern Southeast Alaska (commercial fishing districts 109–191)	0.3%	8.5%	0.2%	0.9%	5.8%	15.7%
Southern Southeast Alaska (commercial fishing districts 101–108)	26.1%	57.5%	0.1%	0.6%	0.0%	84.3%
Total Southeast Alaska harvest	26.4%	66.0%	0.3%	1.5%	5.8%	100.0%

Table SH 6. Steelhead trout index streams in Southeast Alaska, by area, and the frequency of survey counts.

Area	Stream	Survey type	Counts per season
Prince of Wales I.	Eagle Creek	foot	Multiple, when F.B. I hired on PWI, two surveys in 1995
Prince of Wales I.	Harris River	foot	Two counts at peak run timing
Ketchikan	McDonald Lake Cr.	foot	Two counts at peak run timing
Ketchikan	Naha River	foot	Two counts at peak run timing
Ketchikan	White River	foot	Multiple if suitable index system otherwise two surveys
Wrangell	Martin River	foot	Two counts at peak run timing
Wrangell	Anan Creek	foot	Two counts at peak run timing
Petersburg	Petersburg Creek	foot	Multiple when F.B. II hired in Psg, two surveys in 1995
Petersburg	Salmon Bay Lake Cr.	foot	Two counts at peak run timing
Sitka	Sitkoh Creek	foot	Two counts at peak run timing
Sitka	Ford Arm Creek	foot	Two to three counts/season at peak run timing
Juneau	Peterson Creek	snorkel	Multiple starting in 1995
Juneau	Pleasant Bay Cr.	foot/snorkel	Walk up snorkel downstream
Juneau	Windfall Creek	snorkel	Two counts at peak run timing
Hoonah	Spasski Creek	snorkel	Multiple starting in 1995
Yakutat	Situk River	float	Multiple counts continuing in 1995

The overall trend for Southeast Alaska steelhead stocks from 1989 through 1994 seems to be one of decline in southern and central Southeast Alaska, and one of decline followed by a dramatic increase in northern Southeast. These observations seem to be similar to those views expressed by the angling public.

Enhancement

The U.S. Forest Service (USFS) incubated and reared 450,000 steelhead fry in the Ward Creek Hatchery near Ketchikan and released them into both Ward Creek and Ward Lake in 1937. In 1938, the USFS transplanted 673 medium-sized rainbow trout to lakes on Baranof Island. Similarly, the USFS, in conjunction with the U.S. Navy, transplanted 50,000 eyed-eggs from Sashin Lake to Blue Lake near Sitka (Tate 1939). Steelhead were first stocked in northern Southeast Alaska in 1941 as eyed-eggs at Peterson Creek and Windfall Lake, near Juneau.

In an attempt to create a resident trout fishery, the ADF&G stocked Peterson Lake with approximately 161,000 steelhead fry and fingerlings from 1961 through 1968, using brood stocks that originated from Pleasant Bay, Lake Eva, "a remote Southeast Alaska lake," and the Cowlitz Hatchery in Washington (Juneau area files). A small indigenous steelhead run reportedly existed in Peterson Creek at that time.

Before the 1961 stocking, Peterson Lake and Creek were treated with rotenone, but that did not totally eradicate resident species. Peterson Creek currently supports an annual steelhead return of approximately 200 fish (Harding et al. 1989, Harding and Jones 1990). It is not known what portion of the current population are descendants of the stocked fish.

No additional steelhead stocking occurred in Southeast Alaska until after construction in 1972 of the ADF&G Crystal Lake Hatchery at Petersburg. The first steelhead brood stock for the hatchery was acquired from Petersburg Creek in 1974. Between 1974 and 1984, approximately 99,200 steelhead smolt were produced at the hatchery, almost all of which were stocked in the immediate Petersburg area (Petersburg area files).

Montana Creek near Juneau was stocked with 6,500 steelhead smolts from Crystal Lake Hatchery in 1976. This introduction was not evaluated, and the single steelhead known to have been caught in Montana Creek may or may not have been stocked.

Steelhead enhancement began in the Ketchikan area in 1980 as mitigation for a major chlorine spill in Ward Creek by the Ketchikan Pulp Company. Enhancement of Ketchikan Creek, as well as the Klawock River on Prince of Wales Island, also began in 1980. All three sites were stocked at varying levels from a variety of brood sources. From 1980 to 1984, approximately 93,500 fry or smolts averaging from just under 5 g to over 155 g were stocked (Ketchikan area files).

The ADF&G Division of Sport Fish conducted a steelhead workshop in 1985, a primary objective of which was to establish an optimum size for steelhead smolt released from Alaskan hatcheries. A size standard of 170–180 mm for hatchery-reared steelhead smolt was established, based on hatchery steelhead

programs in Oregon and Washington and on limited size data from wild steelhead smolt in Alaska (Van Hulle 1985). Based on the experience of Oregon and Washington, a smolt-to-adult survival goal of 5% was also established. To date, these standards have not been consistently achieved in Southeast Alaska.

For the period 1984–1989, approximately 485,000 steelhead eggs were collected for incubation and rearing in Crystal Lake Hatchery that have resulted in the release of 178,200 smolt (36.7% egg-to-smolt survival). The weighted average of smolt released from 1985 through 1988 was 9.4 g, and their average length was 98.6 mm—decidedly less than the desired 170–180 mm. Mechanical equipment and fish culture practices have been changed at Crystal Lake Hatchery in order to produce 2-year-old steelhead smolt of the desired size (R. Zorich, personal communication).

Steelhead eggs were taken from Peterson Creek on the Juneau road system annually from 1983 through 1987. The objective of the program was to produce steelhead smolts at Snettisham Hatchery for release into Montana Creek. The overall success of the program was low, because of the small brood stock, the extended rearing time needed to produce smolts in the cold water at Snettisham Hatchery, and disease problems incurred in the hatchery.

Approximately 27,000 steelhead smolts were transplanted to Montana Creek from Klawock Hatchery in 1987. Additional stockings of less than 2,500 fish occurred in 1986 from Crystal Lake Hatchery and in 1987 from Snettisham Hatchery. A creel program on Montana Creek during 1989 showed that only 16 steelhead were taken in the sport fishery. Additional steelhead were observed in the stream, but the overall return from enhancement efforts was poor (Suchanek 1990). Additional returns of adult steelhead are expected through 1991.

From 1985 through 1989, both Ward Creek and the Klawock River were stocked with 20,000 to 50,000 steelhead smolts of various sizes. Resulting returns have been evaluated by means of on-site creel survey projects. Contributions to angler catches at the Klawock River approached 50% (Freeman and Hoffman 1989), but only 10–20% of angler catches in Ward Creek were of hatchery origin (Hubartt 1989, 1990). The best enhancement results appear to have been produced when steelhead smolts averaging at least 45 g and 170–180 mm in length were released.

Data were available to estimate cost per adult steelhead returning and cost per fish harvested by sport anglers from two stocking cohorts released from Crystal Creek Hatchery (Bentz et al. 1991). In 1983, 10,026 steelhead smolt averaging 47.4 g were released. The total return of adult steelhead from this release was estimated at 336 fish (3.4% survival rate). The cost per returning fish was $64.59. Anglers harvested 117 of these adult steelhead (1.2% harvest rate). The cost per fish to the creel was $185.48. In 1994, 3,322 steelhead smolt averaging 29 g were released. The total return was estimated at 32 fish (1.0% survival rate). The cost per returning fish was $67.22. Anglers harvested 3 of these fish (0.1% harvest rate). The cost per fish to the creel was $717.00.

Approximately 12,000 steelhead smolt were stocked into Ward Creek in May 1991. These fish had an average weight of 46 g and an average length of 160 mm. Division of Sport Fish staff sampled Ward Creek and Ward Lake in July and August and estimated that 11% of these fish had not migrated out of Ward Creek into salt water and presumably would remain in fresh water and compete with other fish for rearing habitat and food until spring 1992, at least. Department staff operated a weir and conducted a creel surveys at Ward Creek in spring 1993 and 1994 to estimate the total number of adults returning and number of hatchery fish from the 1991 release harvested by anglers. Estimated returns were 33 fish in 1993 and 85 fish in 1994—a total return of 1%. Fish stocked in 1991 constituted 16% of all steelhead observed at the weir in 1993 and 1994. We estimate that anglers harvested 5 fish in 1993 and 12 fish in 1994—a 0.14% harvest rate—from the 1991 release. Based on these data, the cost per returning fish is $82.12, and the cost per fish to the creel is $569.99.

A listing of southern Southeast Alaska steelhead and rainbow trout enhancement releases appears in Table SH 7.

Management Approach: Trout Management Plan

Beginning in 1990, declining catches of steelhead trout in Southeast Alaska caused anglers to express concern to the department. Until 1994, the bag limit for steelhead/rainbow trout in Southeast Alaska was five per day and ten in possession, with only one daily and two in possession over 16 inches (two fish over 16 inches if at least one fish had a healed adipose clip scar). Regulations for steelhead and rainbow trout are combined in the Southeast Alaska and Yakutat regulatory areas, because it is very difficult to tell them apart at certain life stages.

Table SH 7. Southern Southeast Alaska steelhead and rainbow trout hatchery releases from 1989–1993.

Release year	Brood year	Release site	Rearing facility	Number released	Species	Average wt. (g) or stage released
1989	1988	Ketchikan Cr.	Deer Mountain	19,000	steelhead	fingerling
	1988	Ward Cr.	Klawock	38,667	steelhead	14.7 fingerling
	1988	Klawock R.	Klawock	50,333	steelhead	14.7 fingerling
1990	1989	Ketchikan Cr.	Deer Mountain	4,525	steelhead	smolt
	1990	Ketchikan Cr.	Deer Mountain	13,700	steelhead	fingerling
	1989	Klawock R.	Klawock	15,994	steelhead	smolt/pre-smolt
	1988	Crystal Cr.	Crystal Lake	12,581	steelhead	smolt
1991	1991	Carlanna Lk.	Ft. Rich\Deer Mt.	5,480	rainbow	4.5 fed fry
	1989	Ketchikan Cr.	Deer Mountain	5,020	steelhead	45.7 smolt
	1990	Ward Cr.	Klawock	12,047	steelhead	46.0 smolt
	1990	Klawock R.	Klawock	13,653	steelhead	45.6 smolt
	1989	Klawock R.	Klawock	3,560	steelhead	200.0
	1990	Crystal Cr.	Crystal Lake	2,180	steelhead	66.5 smolt
	1989	One Duck Lk.	Klawock	1,000	rainbow	227.0 catchable
1992	1990	Ketchikan Cr.	Deer Mountain	1,030	steelhead	17.9
	1991	Ward Cr.	Klawock	9,632	steelhead	41.0
	1991	Klawock Lk.	Klawock	9,278	steelhead	40.0
	1990	One Duck Lk.	Klawock	1,810	rainbow	190.0
	1992	Carlanna Lk.	Ft. Rich\Deer Mt.	5,166	rainbow	5.9
	1992	H. Hunt Lk.	Ft. Rich\Deer Mt.	29,026	rainbow	6.2 fed fry
1993	1992	Ketchikan Cr.	Deer Mountain	0	steelhead	released in '94
	1991	Ward Cr.	Klawock	300	steelhead	68.2 2 y.o. 'smolt'
	1992	H. Hunt Lk.	Klawock	11,406	steelhead	46.3
	1993	Carlanna Lk.	Deer Mountain	29,194	rainbow	7.9
	1993	Carlanna Lk.	Deer Mountain	5,559	rainbow	7.9
	1990	One Duck Lk.	Klawock	914	rainbow	859.0
	1991	Crystal Cr.	Crystal Lake	9,370	steelhead	smolt

In 1991, regulations for steelhead/rainbow trout in the Situk River drainage were restricted to catch and release with unbaited, artificial lures from April 13 through December 31. These restrictions were implemented because the department had documented declining numbers of steelhead in established index areas and declining catch rates in the inriver sport fishery, although fishing effort continued to increase.

In 1992, regulations for steelhead/rainbow trout in the Situk River drainage were again restricted to catch-and-release with unbaited, artificial lures. These regulations were in effect from April 1 through July 10. A section of the river that contained an important steelhead spawning area was closed to all fishing from April 15 through May 31 to provide additional protection to spawning steelhead. Catch-and-release with unbaited, artificial lures restrictions were reintroduced from October 1 through December 31 to protect the fall-run segment of the Situk River steelhead population. Based on department data and information from a number of anglers, steelhead regulations for 23 additional drainages in Southeast were restricted to catch-and-release from May 8 through December 31.

The abundance of steelhead in many Southeast Alaska streams continued to decline in 1992. Declines in abundance of steelhead populations coastwide and documented declines in some Southeast Alaska populations convinced the department to restrict 48 drainages in 1993 to catch-and-release steelhead

regulations. Unbaited, artificial lures were required in these drainages from November 1 through June 15 to minimize hooking mortality rates.

Recent Board of Fisheries Actions

Based on department research and numerous meetings with interested organizations, individuals, and advisory committees throughout the region, Alaska Department of Fish and Game staff proposed the following regionwide regulations for rainbow/steelhead trout, which were adopted for the 1994 season:

1. Establish a bag and possession limit of two rainbow trout greater than 12 inches in length but not more than 22 inches in length. This regulation protects almost all steelhead smolt and approximately 95% of adult steelhead. It also protects almost all resident rainbow trout until they have the opportunity to spawn at least once.

2. Prohibit the use of bait in fresh water from November 16 through September 14. (The department originally proposed a total ban on use of bait in fresh water because catch-and-release mortality is high, but during the public planning process a number of individuals expressed the desire to use bait for coho fishing in freshwater streams during fall.).

3. Established a bag limit of one steelhead per day 36 inches or more in length and an annual limit of two per year. For licensed anglers, the steelhead harvest record is printed on the back of the sport fishing license. For anglers not required to be licensed, a harvest card is issued.

Specific exceptions were also established for the following waters:

1. All freshwater drainages crossed by the Juneau road system have depressed stocks of rainbow trout that are easily accessible. The board established a bag and possession limit of two rainbow trout more than 14 inches in length and not more than 22 inches in length, and a ban on the use of bait in fresh water from November 16 through September 14.

2. Twin Lakes in Juneau was stocked with cutthroat in 1976 and 1992 and Carlanna Lake near Ketchikan is stocked with rainbow trout. These lakes have more liberal limits of five fish daily and in possession. There is no size limit or bait restriction for these stocked lakes.

Current Issues

Major issues concerning steelhead and rainbow trout in Southeast Alaska include maintenance of rearing and spawning habitat, monitoring and reducing incidental harvest during commercial fisheries, and protecting the genetic integrity of wild steelhead stocks from deterioration by hatchery/enhancement projects.

Additional interests for steelhead researchers include accurately assessing steelhead population sizes, gaining more knowledge of early life history habitat requirements, and increasing the accuracy of steelhead and rainbow trout aging techniques.

Research Program for Steelhead/Rainbow Trout

Steelhead research in Southeast Alaska currently focuses on improving techniques for detecting trends in stock abundance throughout the region. Standardization of foot/float/snorkle survey techniques on specific river index sections during specific 'peak abundance' time periods is presently being implemented throughout Southeast Alaska.

New weir technology (resistance board) is being tested on the Situk River near Yakutat to improve accuracy of kelt counts. These counts have frequently been compromised by the inability of current weir designs to withstand high-water events, which are typical during the spring season in Alaska. Standardized float counts performed concurrently with dependable weir counts should lead to development of a 'float count' index of steelhead abundance for the Situk River, and eventually make operation of a steelhead weir on this popular river unnecessary. A project was implemented during spring in 1989 and 1990 on the Situk River to determine the feasibility of using a low-cost sonar to count both immigrant and emigrant steelhead trout. Unfortunately, physical and technical problems ruled out this technique.

A project was conducted on the Karta River on Prince of Wales Island during spring 1989 to collect steelhead population size, age, and stream distribution data. Angler catch and harvest data and angler preference and opinion data were also gathered. Limited steelhead trout tracking by radio telemetry was also conducted on the Situk River system during 1989 and 1990.

Area Specific Information and Issues

Ketchikan

Fishery Trends

The Ketchikan area freshwater steelhead and rainbow trout sport fishery is a major fishery in this area. Data obtained from the statewide harvest survey noted that marine harvests of steelhead trout ranged from 19 in 1993 to 899 in 1989. The average harvest for the period 1989–1993 was 343. No marine harvest of rainbow trout was reported.

Freshwater harvests of both species are substantial: Steelhead trout harvests ranged from 69 (with 3,425 angler-days of effort) in 1993 to 1,654 (with 3,535 angler-days) in 1989 (see Table SH2). The average harvest for 1989–1993 was 602, and an average 3,328 angler-days were expended annually to harvest these fish. Rainbow trout harvest in fresh water was equally impressive. Harvests of these fish ranged from 641 (with 809 angler-days of effort) in 1992 to 2,201 (from 1,024 angler-days expended) in 1989. The average harvest for 1989–1993 was 1,270, and an average 907 angler-days were expended annually to harvest these fish (see Table SH2).

Stock Status

Seventy-six steelhead systems have been documented in the Ketchikan area. All 76 contain spring-run fish, and eight of these systems also contain fall-run populations. Overall, steelhead populations in the Ketchikan area during the period 1989–1993 showed a general decline, as noted in departmental surveys of four index streams (Naha River, White River, Humpback Creek and McDonald Lake) and by numerous reports from the general public. In fact, the department issued emergency order restrictions in 1993 which limited many of the primary steelhead streams to catch-and-release, barbless hooks, and no bait allowed, in an attempt to stem the downward trend in escapement counts.

Only limited information is currently available on rainbow trout stocks in the Ketchikan area. Research conducted in the late 1980s on a limited number of lakes in the Ketchikan area noted populations of 200–500 fish, with only light to moderate fishing pressure occurring on these systems. The majority of steelhead streams in this area also contain resident rainbow trout populations that are harvested incidentally to the steelhead fishery. The fall-run steelhead streams are the most noted for these populations, which contain resident rainbows to 20 inches or more in length in many areas.

Enhancement

Introduction of hatchery produced steelhead in the Ketchikan area has been limited to releases in Ward and Ketchikan Creeks. Between 1989 and 1993, a total of 60,646 steelhead pre-smolts and smolts was released in Ward Creek. An additional 43,275 fingerling and smolt steelhead were released in Ketchikan Creek. Adult returns from these releases have been minimal. Research conducted on Ward Creek noted that only 10–20% of the harvest were hatchery fish. Similar reports from the public on both Ward and Ketchikan Creek indicate that enhancement has not been beneficial at these locations. Rainbow trout enhancement in the Ketchikan area has been limited to releases of triploid (sterile) fingerlings in Carlanna and Harriet Hunt lakes. Both of these systems are located on the Ketchikan road system, and yearly releases have occurred since 1991. Between 1991 and 1993, 16,205 triploid rainbow trout averaging 6.8 g (4–5 inches) were stocked in Carlanna Lake. Cursory checks by department staff and public reports indicate that 10–20% of these fish have survived and range from 6 to 9 inches in length. During 1992 and 1993, a two-year total of 58,220 triploid rainbow trout averaging 6.9 g (4–5 inches) was released in Harriet Hunt Lake. Cursory department reviews and public input indicate that 10–30% of these fish have survived and now range from 5 to 8 inches in length. Substantial angler harvest from this system is 3 to 5 years into the future, when sufficient growth will have occurred to put these fish into legal length categories.

Prince of Wales Island

Fishery Trends

The Prince of Wales Island (POW) area steelhead and rainbow trout fishery represents the largest fishery for these species in southern Southeast Alaska. SWHS data noted that the marine harvest of steelhead ranged from 16 with 96 angler-days of effort in 1990 to 303 with 67 angler-days in 1992. The average harvest for the period 1989 throughout 1993 was 149, and angler effort averaged 77 angler-days annually. Freshwater harvest for the same time was substantially

higher. Harvests ranged from a low of 127 with 3,700 angler-days of effort in 1993 to 1,510 with 4,854 angler-days in 1991. The 1989–1993 average harvest was 797, and angler effort averaged 4,218 angler-days annually (see Table SH2). The low harvest in 1993, coupled with substantial effort in angler-days, reflects reduced abundance of these fish, in addition to the effects of catch-and-release regulations implemented by Emergency Order on many of the island's steams during the year.

Rainbow trout harvest is substantial in fresh water in this area also. Harvests ranged from 667 with 654 angler-days of effort in 1992 to 2,963 with 665 angler-days of effort in 1989. The average harvest for the period 1989–1993 was 1,400, and an average of 573 angler-days was expended annually (see Table SH2). Most fishing pressure on this species is ancillary to other targeted species such as steelhead trout and salmon.

Stock Status

Prince of Wales Island (POW) contains a total of 75 documented wild steelhead trout streams. All of these streams contain spring runs of steelhead, and 11 of these streams also contain fall-run stocks. Overall, steelhead populations on POW have declined the past several years. Index system escapement counts from the Harris River, Salmon Bay Lake Creek, Eagle Creek, weir counts on Karta River, and public reports have noted a general decline in steelhead populations. This information—plus public requests for action—prompted emergency orders in 1993 which limited many streams on POW to catch-and-release, barbless hooks, and no bait allowed, to help reduce the impact of freshwater harvest in this area. Twenty-six systems on POW contain rainbow trout, and many of these streams also contain steelhead trout. Ten lakes on POW are also known to contain rainbow trout populations from pre-statehood and early 1960 introductions. Only a limited amount of information is available on any of the rainbow trout populations, especially the stocked lake systems. Future research work is planned to determine the status of these stocks.

Enhancement

Hatchery steelhead produced by the Klawock River Hatchery have been released only in Klawock Lake and River. Between 1989 and 1993, 92,818 fingerling, pre-smolt, and smolt steelhead averaging 30 g were introduced. Adult returns from these releases were monitored only through public reports and reference to an onsite creel survey conducted in 1987/88 to evaluate earlier releases in Klawock River. This information indicates that 25%–50% of the harvest in the Klawock River are hatchery fish, which suggests that enhancement is working at this location. Nevertheless, the question remains, did enhancement actually produce more fish to the angler's creel or just replace wild stock production in this system.

Rainbow trout stocking on POW has been limited entirely to One Duck Lake between 1989 and 1993. During this period, 3,724 rainbow trout averaging 1,667 g (8–10 inches) were stocked in One Duck Lake, primarily to support the annual "Kids' Fishing Day" derby. Angling pressure is intense during the derby, with 200–400 anglers, young and old, targeting these fish. Fishing pressure outside of this window (early June) is intermittent at the lake, although POW residents strongly support this program. Annual harvest from One Duck Lake ranges from 400 to 600 fish, based on counts made during derby time and public information provided to department staff.

Petersburg/Wrangell Area

Fishery Trends

The Petersburg/Wrangell area sport fishery for steelhead and rainbow trout represents the smallest fishery for these species in southern Southeast Alaska. Data derived from the statewide harvest survey indicate that between 1989 and 1993, marine harvests of steelhead trout ranged from 36 (with 179 angler-days of effort) in 1991 to 373 (with 110 angler-days of effort) in 1989. During the same period, freshwater steelhead harvest ranged from 131 (with 1,949 angler-days of effort) in 1993 to 691 (with 2,833 angler-days) in 1990. The average harvest for this period was 350, and an average 1,925 angler-days were expended annually (see Table SH 2). The downward trend in harvest noted for this period reflects decreased stock abundance and the effect of emergency order restrictions implemented in 1993 that placed many area streams on catch-and-release. Information derived from escapement counts in four index streams (Petersburg Creek, Anan Creek, Marten Creek and Kah Sheets Creek), plus public information, indicated a definite decline in stock abundance. Emergency order restrictions were implemented in 1993 to help stem the general decline in this resource.

Rainbow trout harvest from 1989 through 1993 has ranged from 417 (with 375 angler-days of effort) in

1993 to 1,014 (with 526 angler-days of effort) in 1990. The average harvest for this period was 526, with an average of 448 angler-days expended to harvest these fish (see Table SH2). Similar to other areas of southern Southeast Alaska, harvest of this species is mainly ancillary to other targeted species.

Stock Status

The Petersburg/Wrangell area contains 90 documented steelhead streams. All of these systems contain spring-run stocks, and three of them also contain fall-run populations. Steelhead populations here have generally been in a state of decline over the last five years; information from index stream counts and public comment support this statement.

Rainbow trout populations in this area are scattered among the 90 steelhead streams, plus an additional eight lakes which contain populations from pre-statehood and early 1960 stocking projects carried out by ADF&G. Information on these populations is limited to occasional harvest data information collected from the statewide harvest survey and public comments provided to the department. Additional information on lakes containing rainbow trout will be collected during future years' research activities on small lake systems in this area.

Enhancement

The Crystal Lake Hatchery, located in Petersburg, produced a total of 24,131 smolts for release into Crystal Creek as part of an enhancement evaluation project between 1989 and 1993. Size at release and time of release were manipulated to determine if there is an optimum size and time of release for this species. Adult returns to Crystal Creek will begin in 1995. Project evaluation will consist of public return of CWT fish and returns to the Crystal Lake Hatchery. Complete review of this project will follow five years of adult returns to the Crystal Lake Hatchery.

Sitka

Steelhead Fishery Trends

Harvest of steelhead has increased considerably from the low harvests in the late 1970s and early 1980s to the highs in the early 1990s (Figure SH5). This pattern of increasing harvests is similar to the harvest pattern for most other species in the Sitka area. Mills (1994) identifies most of the harvest of steelhead as coming from salt water (132 fish), with lesser numbers coming from fresh water (111 fish). The harvest of steelhead in 1983 was only 13% of catch, indicating that most steelhead caught were released. It is interesting to note that anglers reported harvesting more steelhead from the Eva system than from Sitkoh, although Sitkoh has a much larger population of steelhead. It is possible that the presence of a weir on Sitkoh reduced angler effort at that site.

Sitkoh Creek

Sitkoh Creek supports one of the largest steelhead trout runs in northern Southeast Alaska (next to the Situk River), with an average escapement of about 800 fish. Sitkoh Creek is located on Chichagof Island (see map, Figure SH1) about 56 km northeast of Sitka and 88 km southwest of Juneau. Most steelhead return to Sitkoh Creek in a spring run that begins in April and peaks during early May. There are unconfirmed reports of a smaller winter steelhead run that enters the system in mid-December.

A weir was operated to count adult steelhead trout at Sitkoh Creek in 1936, 1937, 1982, 1990, and 1993. In 1936, 760 steelhead trout were counted; 1,108 were counted in 1937, 690 in 1982, 661 in 1990, and 520 in 1993. Six creel surveys have been conducted at Sitkoh Creek since 1976 (1976, 1978, 1982, 1987, 1990, and 1991). These surveys indicated that most of the Sitkoh Creek steelhead fishery occurs in the lower sections

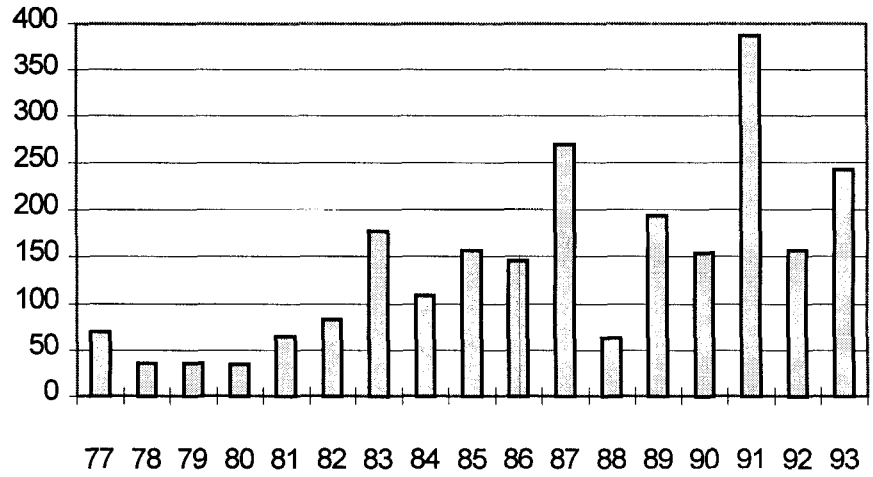

Figure SH5. *Harvests of steelhead trout in the Sitka area, 1977–1993.*

of the creek, but some effort occurs from the USFS recreation cabins at Sitkoh Lake.

Rainbow Trout Fishery Trends

Harvest of rainbow trout in the Sitka Area has remained fairly stable over the period of the Statewide Harvest Survey (Figure SH6) with average annual harvests of about 1,400 fish. Harvest in 1993 was 1,288, of 7,142 rainbow trout caught; only 18% were kept. Blue Lake, which is accessible from the Sitka road system, contributes more to the fishery than any other lake.

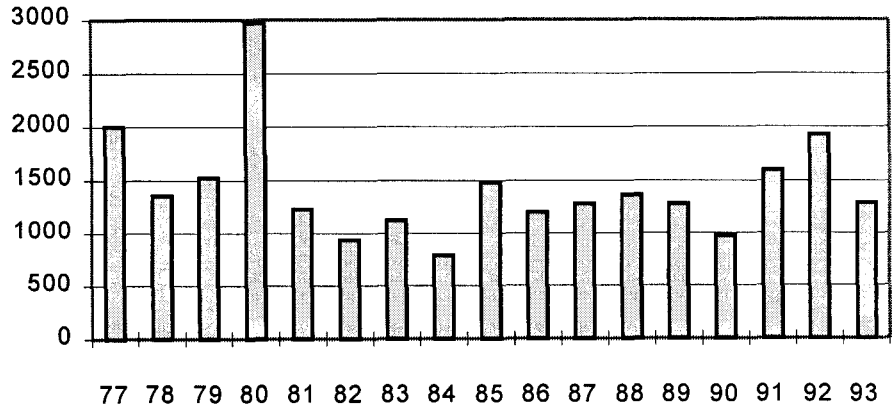

Figure SH6. *Harvests of rainbow trout in the Sitka area, 1977–1993.*

Blue Lake

The population of rainbow trout in Blue Lake was the object of an M.S. thesis completed in 1994 by John DerHovanisian. According to this thesis:

> ". . . . Blue Lake is a multiple-use reservoir near Sitka, Alaska that supports an important sport fishery sustained by a reproducing population of rainbow trout *Oncorhynchus mykiss*. Although harvest levels appeared high, the effects of exploitation were unknown before this study took place. Mark-recapture, size-age-sex, maturity, and harvest data were collected during 1991 and 1992 to assess stock status. Closed population abundance estimators proved more useful than open population models. Abundance in spring 1992 was estimated at 4,708 fish ≥180 mm FL with a coefficient of variation of 17.0%. Maximum scale age was 7, age- and length-at-maturity at the 50% level were 3.4 years and 233 mm FL, natural mortality was 0.26, and full-recruitment occurred at age 5. The critical exploitation rate beyond which sustained yield may not be possible was estimated at 0.32. The estimated 1992 exploitation rate with hooking mortality taken into account was 0.26."

Juneau/Glacier Bay

Annual harvests of steelhead trout in these areas have increased from less than 100 fish in the late 1970s to 250–400 fish annually in recent years. Since 1977, the average harvest of steelhead has been 196 fish. The increase in steelhead harvest since 1977 corresponds to overall increases in angling effort during the same time period.

Harvest data indicate that the majority of the steelhead harvest in the Juneau and Glacier Bay areas comes from saltwater areas. However, these large reported saltwater harvests are likely due to misidentification or misreporting of other species. A small number may be taken in salt water adjacent to mouths of parent streams, but nearly 100% of the steelhead harvest occurs in fresh water.

The Juneau area has several small runs of steelhead trout. The largest run is in Peterson Creek, averaging about 200 fish annually. Other small runs are located on Admiralty Island and are accessed by boat or aircraft. We have no long-term data on the various streams to indicate population trends, but populations appear to be stable.

Haines/ Skagway

The reported steelhead trout harvest in the Haines/Skagway area comes primarily from the Chilkat River, and to a lesser degree from the Chilkoot River. Catch which is reported in the Skagway area is probably taken from the Taiya River.

Between 1985 and 1993, the annual reported Haines/Skagway steelhead trout harvest ranged from 0 to 132 fish, with an average of 36 fish annually (Table SH3). The small reported steelhead trout harvest will probably decline in the future with the new regionwide freshwater bait restriction, because the water is glacial and anglers using bait accounted for the majority of the reported harvest.

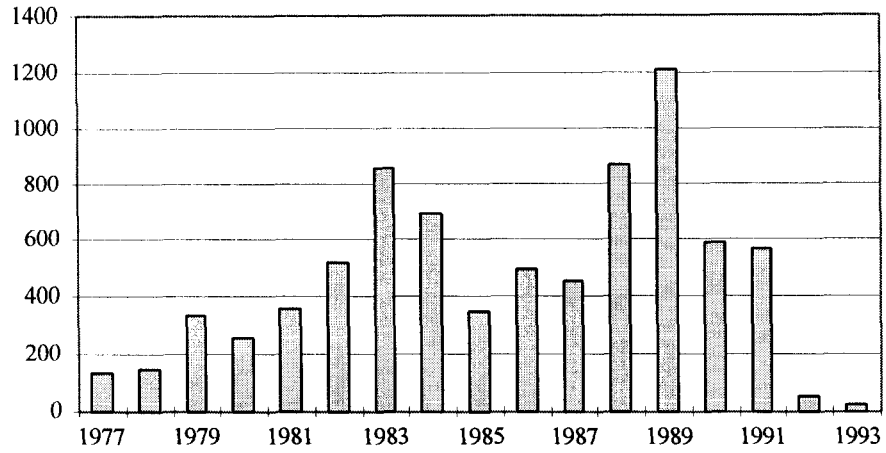

Figure SH7. Estimated recreational harvests of steelhead trout in the Yakutat area, 1977–1993.

weir located on the lower river was used to count steelhead emigrating downstream after they had spawned. Harvests and levels of effort on the Situk River increased steadily through the 1980s, while visual estimates and weir counts appeared to indicate that the steelhead population was declining. Conservative regulations imposed during the early 1990s reduced both harvest and effort on Situk River steelhead trout, which came back in the greatest numbers in decades during 1994.

Current Issues

The recreational steelhead fishery is currently managed under regulations restricting annual harvest to two fish, at least 36 inches long. Commercial sale of steelhead incidentally harvested in the Situk/Ahrnklin Lagoon commercial set gillnet fishery is allowed. Comments from anglers concerning the sale of steelhead are increasing in frequency. There is consensus amongst these anglers that sale of steelhead from commercial harvest should cease, since the recreational steelhead fishery is managed so conservatively.

The creation of a Situk River steelhead subsistence fishery is being sought by local natives.

A Situk River Management Plan is being developed by the U.S. Forest Service. This plan would address angler access, use of outboard motors, outfitter guides, and other activities that would affect angler density. High levels of angler density on the Situk River during the steelhead fishery can reduce catch rates and otherwise reduce angling enjoyment.

Yakutat

Fishery Trends

Significant populations of steelhead and rainbow trout are found in the Situk, Ahrnklin, Akwe, and Tsiu rivers, and smaller populations occur in most systems supporting anadromous salmon populations. The Situk River is the primary producer of steelhead trout reported caught and harvested in the Yakutat area. Rainbow trout are generally not a targeted species in the Yakutat area, but some are caught in the Situk River system, upstream from Nine Mile Bridge.

Steelhead harvests in the Yakutat area exhibited a generally increasing trend through the 1980s, but dropped off sharply in the early 1990s with the adoption of conservative management (Figure SH7). This management action was in response to a perceived decline in steelhead trout population through 1993. Estimated catches from 1990 to 1993 have varied between good and excellent at 5,725 (1990), 2,916 (1991), 2,973 (1992), and 4,515 (1993) steelhead trout annually for the past four years. Reported rainbow trout harvests since 1977 have been between 0 and 200.

Situk River

Adult steelhead enter the Situk River from the ocean during August–December (fall run) and again during March–June (spring run). The Division of Sport Fish has conducted visual float counts of steelhead in the Situk River annually since 1984, with the exception of 1986 when water levels prevented a full estimate. Visual counts ranged from a high of 4,702 in 1994 to a low of 883 in 1992. From 1989 through 1994, a

DOLLY VARDEN FISHERIES

Dolly Varden are locally abundant in all coastal waters of Alaska. Two basic forms of Dolly Varden occur in Alaskan waters. The southern form ranges from lower Southeast Alaska to the tip of the Aleutian chain, and the northern form is distributed on the North Slope drainages of the Aleutian Range northward along Alaska's coast to the Canadian border. Anadromous and freshwater resident varieties of both forms exist, with lake, river, and dwarf populations having been found among the freshwater residents. Little is known of the habits of Alaskan nonmigratory Dolly Varden.

Young Dolly Varden have eight to ten wide, dark parr marks or oval blotches which contrast with their mottled olive-brown body. Sea-run fish are silvery with olive-green-to-brown on their dorsal surface and numerous red to orange spots on their sides. Mature males become brilliant red on the lower body surface, and their lower fins become reddish black with white along the leading edges. Mature females are similar, but less brightly colored. Males develop an extended lower jaw which hooks upward, fitting into a groove in the upper jaw. A hook also forms in the females but is considerably less developed.

Dolly Varden spawn in streams, usually during fall, from mid-August to November. A female, depending on her size, may deposit 600 to 6,000 eggs in depressions, or redds, which she constructs in the streambed gravel by digging with her tail fin. The male usually takes no part in these nest-building activities and spends most of his time fighting and chasing other males. When the female is ready to deposit her eggs, the male moves to her side and spawning begins. Sperm and eggs are released simultaneously into the redd.

The eggs develop slowly in the water, which is usually cold during the incubation period. Hatching takes place in March, 4 to 5 months after fertilization. After hatching, the young Dolly Varden obtain food from their yolk sac and usually do not emerge from the gravel until this food source is consumed—usually in April or May. Young sea-run Dolly Varden rear in streams for 2 to 4 years before beginning their first migration to sea. During this rearing period, their growth is slow, a fact which may be attributed to their relative inactivity. Young Dolly Varden remain on the bottom, often hidden from view under stones and logs, or in undercut areas along the streambank, and appear to select most of their food from the stream bottom.

Most Dolly Varden migrate to sea in their third or fourth year of life, but some wait as long as six years. At this time, the smolt are about five inches long. This migration usually occurs in May or June, although significant but smaller numbers have been recorded migrating to sea in September and October. Once at sea, they begin a fascinating pattern of migration. After their first seaward migration, Dolly Varden usually spend the rest of their life wintering in and migrating to and from fresh water. Dolly Varden in Southeast Alaska usually overwinter in lakes, whereas most northern Dolly Varden overwinter in rivers. Those hatched and reared in a lake system continue annual feeding migrations to sea, returning to a lake or river each year for the winter. At maturity, Dolly Varden return to spawn in the stream from which they originated. These fish possess the ability to find their 'home' stream without randomly searching. In Southeast Alaska, those which survive the rigors of spawning return to a lake shortly thereafter.

Most Dolly Varden in Southeast reach maturity at age five or six. At this age they may be 12 to 16 inches long and may weigh from 0.5 to 1 pound. Mortality after spawning varies, depending on size and age of the fish. Males suffer much higher mortality after spawning, partly due to fighting and the subsequent damage inflicted upon each other. It is doubtful that many more than 50% of Dolly Varden live to spawn a second time. Few Dolly Varden in Southeast Alaska live longer than 8 years. Their maximum size in Southeast is between 15 and 22 inches and around 4 pounds; however, 9- to 12-pound lunkers are occasionally reported, especially in northern populations.

Sport Harvest and Effort

Dolly Varden are one of Alaska's most important and sought-after sport fish. The fish is unique, as it is the only member of the family *Salmonidae,* excluding salmon, that has readily adapted to the

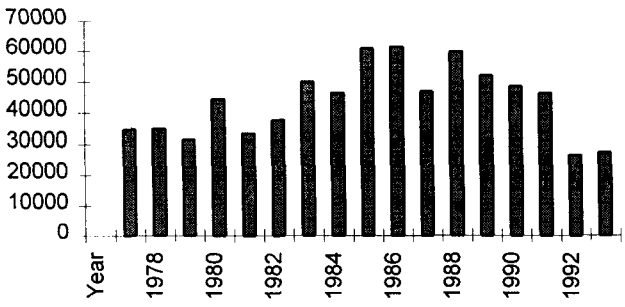

Figure DV1. Estimated harvest of Dolly Varden in Southeast Alaska, 1977–1993.

numerous small to medium-sized non-lake streams that enter our saltwater areas. Its importance and popularity can only increase as pressure on resources rises. Harvest of Dolly Varden increased from a low of about 31,000 in 1979 to a high of 61,000 in 1986 (Figure DV1). Since 1986 there has been a general decline in harvests to a record low of about 26,000 in both 1992 and 1993 (Table DV1).

Although harvest has been declining in recent years, this may simply be a function of anglers releasing more of their catch. Figure DV2 suggests that anglers are releasing an increasing portion of their catch in recent years. Catch of Dolly Varden has increased substantially, although harvest has shown a general decrease.

Because Dolly Varden migrate from lakes to the sea in spring, outlet streams, stream mouths, and beaches are good fishing spots from April through June. Good Dolly Varden fishing can be found in salt water during May, June, and July. As mature fish return to their home stream in August and September to spawn and feed, most coastal streams provide good fishing for Dolly Varden. Lake fishing for Dolly Varden can be good from late July through November. The fish begin entering lakes in late July and are in prime condition after their spring and summer growing season. Ice fishing in lakes during the winter can also provide excellent sport fishing for those willing to brave the elements.

Angler effort for Dolly Varden in Southeast has averaged about 25,000 angler-days during the past 5 years with a decrease in effort of about 5,000 angler-days from 1992 to 1993 (Table DV2).

Table DV1. Estimated marine, freshwater, and combined sport harvest of Dolly Varden in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total
MARINE HARVEST								
1989	52	485	3,025	3,738	12,829	2,181	177	22,487
1990	368	65	1,515	3,268	11,197	4,145	12	20,570
1991	429	101	1,176	1,511	10,269	4,576	133	18,195
1992	271	269	1,818	2,047	6,842	1,016	82	12,345
1993	153	331	982	1,113	7,020	1,295	9	10,903
Mean	255	250	1,703	2,335	9,631	2,643	83	16,900
FRESHWATER HARVEST								
1989	2,046	5,522	1,433	1,975	3,225	13,935	1,013	29,149
1990	1,901	1,546	3,498	2,197	1,783	14,740	2,065	27,730
1991	1,714	1,545	1,189	2,028	2,869	17,291	1,123	27,759
1992	657	1,049	1,130	2,046	1,793	6,169	1,049	13,893
1993	2,213	1,541	283	1,695	1,931	7,344	983	15,990
Mean	1,706	2,241	1,507	1,988	2,320	11,896	1,247	22,904
COMBINED HARVEST								
1989	2,098	6,007	4,458	5,713	16,054	16,116	1,190	51,636
1990	2,269	1,611	5,013	5,465	12,980	18,885	2,077	48,300
1991	2,143	1,646	2,365	3,539	13,138	21,867	1,256	45,954
1992	928	1,318	2,948	4,093	8,635	7,185	1,131	26,238
1993	2,366	1,872	1,265	2,808	8,951	8,639	992	26,893
Mean	1,961	2,491	3,210	4,324	11,952	14,538	1,329	39,804
Percent	5	6	8	11	30	37	3	

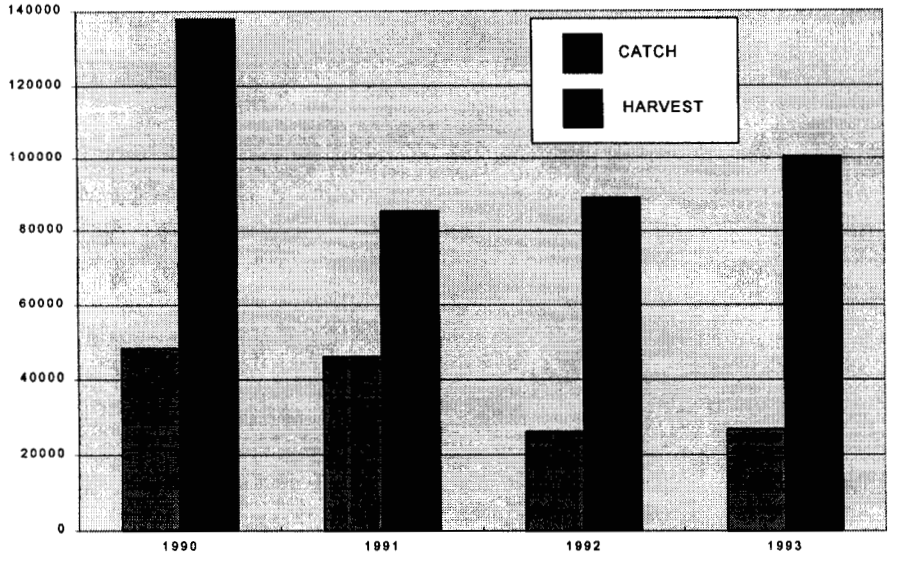

Figure DV2. *Harvest and catch of Dolly Varden in Southeast Alaska, 1990–1993.*

Commercial Harvest

The commercial harvest of Dolly Varden is not very large and is difficult to determine, as most Dolly Varden caught in commercial gear are not sold. At present, in the Juneau area, large Dolly Varden are intercepted in the gillnet fisheries and returned and sold to specialty processors who smoke them for the tourist trade.

During the early 1900s some special fisheries were attempted near the mouths of outlets from overwintering lakes to catch Dolly Varden. These fisheries were largely unsuccessful, because most Dolly Varden emigrate during a very short time frame which does not allow the continuing harvest needed for market. Special permits were required after statehood for anyone attempting to take Dolly Varden for commercial purposes. There were some targeted commercial fisheries in the Haines area in the 1970s and early 1980s. These permitted fisheries were discouraged once the department became aware of the life history and migration patterns of Dolly Varden. Dolly Varden concentrate from a large area to overwinter in a limited number of lakes, and it would be very easy to seriously deplete many populations with a single fishery.

History of Management

The general regulations for Dolly Varden in Southeast Alaska have been quite liberal compared to the trout species (with some exceptions in the Juneau area, noted below). Prior to 1968, the general regulation for Dolly Varden caught in freshwater areas was a bag limit of 20 fish (3 over 20 inches) with possession limit of two daily bag limits. Between 1968 and 1974, the bag limit was reduced to 15 fish (3 over 20 inches) with a possession limit of two bag limits. A more conservative management approach was introduced in 1975 when a bag limit was established for salt water, and the bag limit in both fresh water and salt water was set at 10 fish (2 over 20 inches) with a possession limit of two bag limits. In 1980, the general bag limit was reduced to 10 fish in both bag and possession in fresh water and salt water. No size limit was attached to the bag limit at this time, as most of the justification for size limits in earlier restrictions had been aimed at cutthroat and rainbow trout. This general limit of 10 Dolly Varden in bag and possession is still in effect today.

Juneau Exceptions

Regulations further limiting harvest of Dolly Varden in the Juneau area began in 1978. At this time it appeared Dolly Varden were being overharvested, so a limit of five Dolly Varden in bag and possession, with two fish over 12 inches was adopted for all lakes and streams from Pt. Bishop to Sawmill Creek, and including Douglas Island. This special regulation also extended in salt water to ¼ mile offshore.

This regulation remained in effect until 1980, when the bag limit was reduced to two Dolly Varden of any size, and fresh water was closed to fishing for Dolly Varden from September 1 to May 30. A seasonal closure was adopted for April and May in the ¼-mile saltwater zone, and specific freshwater streams (Montana Creek and McGinnis Creek) were closed to any Dolly Varden harvest.

Regulations were changed again in 1983, when the 2-month closure and restrictive limit of two Dolly Varden in salt water was relaxed, except in the Auke Bay and Eagle Beach areas, where the two-fish bag limit and the April 1 to May 30 closure were retained.

Table DV2. Estimated angler-days of sport fishing effort for Dolly Varden in Southeast Alaska by area, 1989-1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total	Percent of total [a]
MARINE ANGLER-DAYS									
1989	0	156	3,030	1,978	6,072	1,686	88	13,009	4%
1990	0	192	1,443	2,466	5,589	2,202	42	11,933	3%
1991	0	141	1,913	3,246	7,120	1,389	136	13,945	4%
1992	0	133	1,395	4,449	9,519	702	65	16,263	4%
1993	0	146	808	2,315	5,923	989	197	10,378	3%
Mean	0	155	1,717	2,891	6,845	1,394	106	13,106	4%
Percent	0	12	13	22	52	11	1		
FRESHWATER ANGLER-DAYS									
1989	758	915	1,546	1,335	907	5,900	60	11,422	13%
1990	834	927	2,249	1,160	1,096	5,902	11	12,179	14%
1991	801	1,036	1,194	2,320	1,565	5,067	88	12,071	14%
1992	716	1,094	2,202	1,757	1,757	3,626	55	11,218	13%
1993	832	889	1,865	1,841	1,841	3,520	55	12,024	13%
Mean	788	972	1,811	1,683	1,433	4,803	54	11,783	14%
Percent	7	8	15	14	12	41	<0.5		
COMBINED ANGLER-DAYS									
1989	758	1,071	4,577	3,312	6,979	7,586	148	24,43	16%
1990	834	1,118	3,692	3,626	6,685	8,104	54	24,112	5%
1991	801	1,117	3,107	5,566	8,685	6,465	224	26,025	6%
1992	716	1,227	3,597	6,218	4,328	4,328	120	27,482	6%
1993	832	1,035	2,673	5,337	4,509	4,509	252	22,402	5%
Mean	788	1,126	3,529	4,812	6,237	6,198	160	24,890	5%
Percent	3	5	14	19	25	25	1		

[a] Percentage of total regional effort for marine, freshwater, or total angler-days.

At that time, Auke Lake and its tributary streams and outlet stream to Glacier Highway and Mendenhall Lake were closed to harvest of Dolly Varden, and several other streams along the Juneau roadside were closed to harvest of all species of fish.

Other Exceptions

Other areas in Southeast have had few, if any, regulation changes directed specifically at Dolly Varden. Many streams have been closed seasonally to fishing for all species of fish—including Dolly Varden. Reasons for these closures include protecting fish from excessive access, closing areas near hatcheries to protect brood stock, and closure to protect spawning and migration of wild stocks. Examples of streams closed to fishing under this rationale include Herring Cove and Ketchikan Creek in the Ketchikan area, and Pullen Creek in the Haines area.

The Chilkoot system near Haines also has a limit of two Dolly Varden daily and in possession.

Present Management Approach

Little effort has been directed at management of Dolly Varden in recent years. The approach has been to watch the statewide effort and harvest data and react if there appear to be problem areas. Most public involvement and management planning has been directed towards trout and steelhead for the past several years.

Recent Board of Fisheries Actions

The Board of Fisheries adopted more restrictive regulations in the Juneau and Haines areas for the 1994 season. All salt waters adjacent to the Juneau City and Borough road system to a line ¼ mile off-shore now have a bag and possession limit of two Dolly Varden of any size (similar to 1982 bag and possession limits). The two-fish bag and possession limit also was adopted for Chilkoot Lake and River in the Haines area.

Research Program on Dolly Varden

Although Armstrong and others conducted extensive life history studies and abundance monitoring with weirs during the early 1960s, little has been done since. Populations of Dolly Varden are not well understood. Erickson et al. (1990) conducted harvest studies in the Haines and Sitka areas and estimated the overwintering abundance of Dolly Varden in Chilkat Lake (46,700 Dolly Varden). Schmidt and Marshall (1991) documented another creel study in Sitka and estimated the overwintering abundance of Dolly Varden in Salmon Lake near Sitka at 33,400.

A study is planned for a weir count of emigrating Dolly Varden and cutthroat on Eva Creek during March through August of 1995, so comparisons can be made to counts from 1962–1964. No other Dolly Varden research is presently being conducted; information about Dolly Varden is being collected, however, incidental to the ongoing cutthroat trout research program.

Area Specific Information and Issues

Ketchikan

The Ketchikan area Dolly Varden sport fishery comprises two fisheries, one that occurs in marine waters and one in fresh water, which is the larger fishery. Data collected from the Statewide Harvest Study indicate that marine harvests ranged from a low of 52 in 1989 to a high of 429 in 1991, with an average harvest for 1989–1993 of 255 (Table DV1).

These data noted that freshwater harvests of Dolly Varden ranged from 657 in 1992, with 716 angler-days effort, to 2,213 in 1993, with 832 angler-days expended (Tables DV1 and DV2). Average harvest for 1989–1993 was 1,706 Dolly Varden, from an annual average effort of 788 angler-days. Although freshwater harvest is substantially higher than marine harvest, it nonetheless represents an ancillary harvest associated with anglers targeting other species—most notably summer and fall salmon fishing.

Prince of Wales Island

The Prince of Wales Island Dolly Varden sport fishery was similar to the Ketchikan area fishery. Marine harvests were small, ranging from 65 fish harvested from 192 angler-days of effort in 1990 to 485 fish from 156 angler-days in 1989 (Tables DV1 and DV2). The average annual harvest during the period 1989–1993 was 250, and an average 154 angler-days were expended annually to harvest these fish.

The freshwater Dolly Varden sport fishery is substantially larger. Harvests ranged from 1,049 in 1992, with 1,094 angler-days of effort, to 5,522 in 1989, with 915 angler-days expended (Tables DV1 and DV2). The 1989–1993 average harvest was 2,241, and an annual average of 972 angler-days was expended to harvest these fish. Angler interest in these species centered primarily around ancillary harvest while targeting other species. Springtime steelhead fishing and fall salmon fishing account for the majority of the ancillary harvest of Dolly Varden on Prince of Wales Island.

Petersburg/Wrangell Area

The Dolly Varden sport fishery in the Petersburg/Wrangell area represents the largest targeted fishery for this species in southern Southeast Alaska. Information from the statewide harvest survey noted that marine harvest ranged from 982 with 808 angler-days of effort in 1993 to 3,025 with 3,030 angler-days of effort in 1989 (Tables DV1 and DV2). The average annual harvest for the period 1989–1993 was 1,703, and 1,718 angler-days (average) were expended annually to harvest these fish (Tables DV1 and DV2).

The freshwater Dolly Varden fishery is equally important. Harvest data noted a range from 283 with 1,865 angler-days in 1993 to 3,498 with 2,249 angler-days in 1990 (Tables DV1 and DV2). Average harvest for 1989–1993 was 1,507 fish, and an average 1,811 angler-days were expended annually to harvest these fish (Tables DV1 and DV2). The Dolly Varden sport fishery is an important component of the Petersburg/Wrangell sport fishery.

Warming temperatures in springtime account for considerable marine effort, especially shoreline fishing, and ancillary harvest occurs from anglers targeting steelhead trout. Fall salmon fishing in fresh water is the other important component of this fishery in the Petersburg/Wrangell area, in which substantial numbers of Dolly Varden are harvested.

Sitka

Harvests of Dolly Varden in the Sitka area have varied considerably, ranging from highs of about

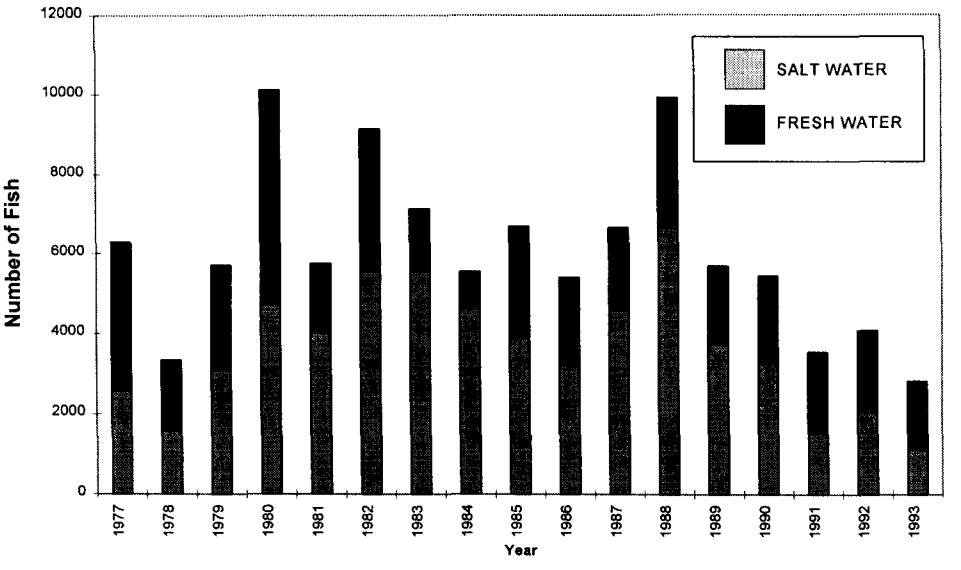

Figure DV3. *Harvest of Dolly Varden in salt water and fresh water in Sitka, 1977–1993.*

10,000 fish in 1980 and 1988 to a low of less than 3,000 fish in 1993. The main Dolly Varden fishery near Sitka occurs along the road system near creek outlets during spring and in estuary and lower river areas during fall.

Figure DV3 indicates a decline in the saltwater component of the catch in Sitka in recent years. Although no creel surveys are conducted for Dolly Varden, local anglers who fish specifically for Dolly Varden in local estuary areas have reported a lack of Dolly Varden in these areas the past two seasons. The reason for this apparent absence of fish during late July in the estuaries and lower rivers is unknown.

Although there is an apparent decrease in harvest in the Sitka area, Table DV2 indicates that catch has not decreased from 1990 to 1993; in fact, the percentage of fish released has increased from 1990 (64.7%) to 1993 (84.7%).

Identified overwintering lakes in the Sitka area include Salmon Lake and Redoubt Lakes near Sitka and Eva, Sitkoh, and Ford Arm, more distant from town. Lake Eva has the largest known concentration of overwintering Dolly Varden.

Juneau/Glacier Bay

Dolly Varden regulations specific to the Juneau area have been evolving since 1978. The current bag limit is two per day in all fresh waters open to fishing and in salt waters adjacent to the road system and Douglas Island, extending for ¼ mile offshore. Saltwater closures apply from April 1 through May 30 in Auke Bay and Eagle River beach to protect Dolly Varden outmigrating from overwintering areas of Auke Lake and Eagle River/ Herbert River drainages.

Dolly Varden fishing along local marine shorelines runs from late April into early June, and in fresh water from midsummer through October.

Auke Creek Dolly Varden

A weir on the outlet of Auke Lake operates each year from March 1 through October 31 to count and sample Dolly Varden and cutthroat trout exiting and entering the Auke Lake watershed (Figure DV4). These data are very useful in monitoring the status of these fish populations in the Juneau roadside fishery.

The total number of Dolly Varden leaving Auke Lake in the spring of 1994 (7,601) was the highest in

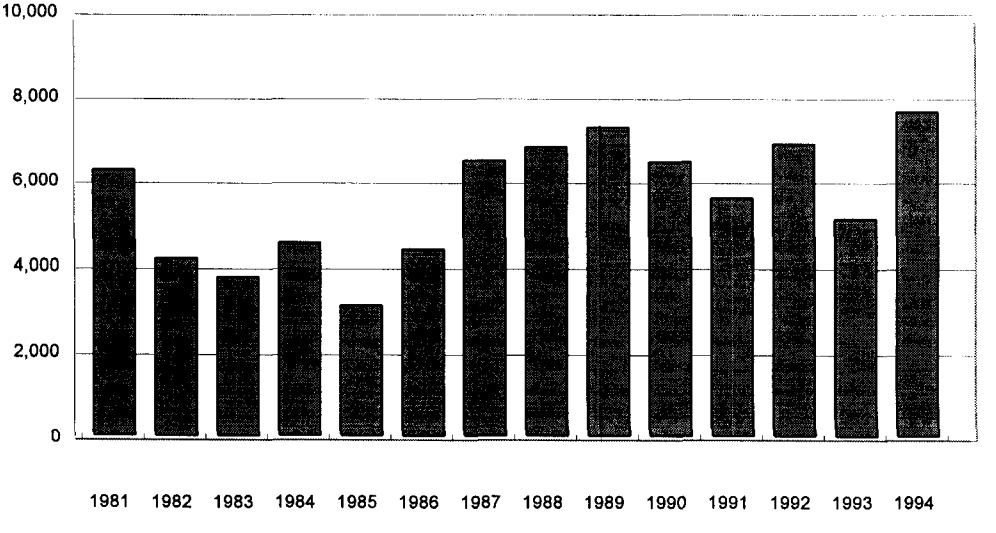

Figure DV4. *Auke Creek Dolly Varden outmigrants, 1980–1994.*

the 15-year weir operation (Figure DV4, Table DV4). Daily bag limits for Dolly Varden in salt water adjacent to the Juneau roadside were adjusted downward in 1994 by the Alaska Board of Fisheries—from 10 per day and in possession to 2 per day. Auke Lake has been closed to the harvest of Dolly Varden since 1983 (Table DV3), and there have been restrictions in Auke Bay at the outlet of Auke Creek since 1983 to protect outmigrating Dolly Varden.

Haines/Skagway

The Chilkoot and Chilkat rivers near Haines are the largest producers of Dolly Varden in Upper Lynn Canal. Both systems have large lakes, are accessible, and support intensive sport fisheries. The Chilkoot River supports the larger sport fishery with more than 17,000 total angler-days of effort in some years and annual harvests of more than 9,000 Dolly Varden (Table DV3). The bag limit for Dolly Varden in the Chilkoot River drainage was reduced to two fish per day in 1994 in response to the high levels of effort and the declining catch rates in the 1990s.

The harvest of Dolly Varden in the Chilkat system has decreased steadily since 1986 (Table DV5). The bag limit was not reduced to two Dolly Varden per day as it was on the Chilkoot River, because a 1991 population study of Chilkat Lake found an overwintering population of more than 150,000 Dolly Varden. A large proportion of the harvest is taken from

Table DV3. Dolly Varden regulations in Southeast Alaska.

Years	Bag limit	Additional restrictions	Possession limit
1971-1974	15 trout or char	Only 3 over 20 inches	2 daily bag limits
1975-1977	10 trout or char	Only 2 over 20 inches	2 daily bag limits
1978-1979	10 trout or char[1]	Only 2 over 20 inches	2 daily bag limits
1980-1982	10 trout or char[2]	No size limit	1 daily bag limit
1983-1984	10 Dolly Varden daily[3]	No size limit	1 daily bag limit
1985	10 Dolly Varden daily[4]	No size limit	1 daily bag limit
1986-1993	10 Dolly Varden daily[4]	No size limit	1 daily bag limit
1994	10 Dolly Varden daily[5]	No size limit	1 daily bag limit

[1] In the Juneau area—All streams and lakes from Pt. Bishop north to Sawmill Creek, including Douglas Island; the bag and possession limit is 5 Dolly Varden, only 2 over 12 inches. Salt water to ½ mile offshore between Pt. Bishop and Sawmill Creek including ½-mile zone around Douglas Island; the bag and possession limit is 5 Dolly Varden, only 2 over 12 inches.

[2] In the Juneau area—All streams and lakes from the tip of Pt. Bishop north to Sawmill Creek, including Douglas Island are closed to taking Dolly Varden from September 1 through May 30. Bag and possession limit is 2 Dolly Varden of any size. Montana Creek closed to taking Dolly Varden. Salt water to ¼ mile offshore between Pt. Bishop and Sawmill Creek including ¼-mile saltwater zone around Douglas Island is closed to taking Dolly Varden from April 1– May 30. Daily bag and possession limit is 2 Dolly Varden of any size.

[3] In the Juneau area—Juneau fresh waters restricted to 2 Dolly Varden per day and in possession. Auke Lake, Mendenhall Lake closed to taking Dolly Varden. Auke Bay north of line from mouth of Wadleigh Creek to marking 1/3 mile south of Auke Creek closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for the remainder of the year. Eagle Beach from the scout camp north to latitude of Sentinel Island light closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for the remainder of the year.

[4] In the Juneau area—Juneau roadside fresh waters restricted to 2 Dolly Varden per day and in possession. Auke Lake, Mendenhall Lake closed to taking Dolly Varden. Montana Creek opened to fishing only with artificial unbaited lures. Auke Bay north of line from mouth of Wadleigh Creek to marking 1/3 mile south of Auke Creek closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for the remainder of the year. Eagle Beach from the scout camp north to latitude of Sentinel Island light closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for remainder of the year.

[5] In the Juneau area—Juneau roadside salt waters restricted to 2 Dolly Varden per day and in possession. Auke Lake, Mendenhall Lake closed to taking Dolly Varden. Montana Creek opened to fishing only with artificial unbaited lures. Auke Bay north of line from mouth of Wadleigh Creek to marking 1/3 mile south of Auke Creek closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for the remainder of the year. Eagle Beach from the scout camp north to latitude of Sentinel Island light closed to Dolly Varden fishing April 1–May 30. Two Dolly Varden per day and in possession for the remainder of the year. All salt waters adjacent to CBJ road system to ¼ mile offshore 2 Dolly Varden per day and in possession.

Table DV4. Auke Creek weir daily Dolly Varden downstream counts, 1970–1994.

Date	1970	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
01-Mar															
02-Mar															
03-Mar															
04-Mar															
05-Mar									1						
06-Mar											1				
07-Mar															
08-Mar															
09-Mar															
10-Mar															
11-Mar												1			
12-Mar															
13-Mar								1		1					
14-Mar					6										
15-Mar								2		1		2			
16-Mar								2		2		2			
17-Mar															
18-Mar															
19-Mar	6							1		2					
20-Mar	11				1				1		3				
21-Mar	4				5				3				1		
22-Mar	6				6				1						
23-Mar	0								2						
24-Mar	4				1				2		2	2			
25-Mar	0				4		7				1		1		
26-Mar	1				9		7		1				1	1	
27-Mar	49								2		1		3		1
28-Mar	39				3				1			1			
29-Mar	52							3	1		4	1	1		2
30-Mar	19				2		4	14	4		7	0	1		1
31-Mar	9						4	3	3		3	0	1		1
01-Apr	15			1	8			5	32		5	3	1		2
02-Apr	8			2				1	37		1	0	3		9
03-Apr	20			2			2	0	19			0	10	2	5
04-Apr	17							10	26	1	1	0	11	3	7
05-Apr	30	3		21			2	19	35	1		0	1	5	6
06-Apr	25	1		33			1	29	6	2		1	14		4
07-Apr	0	4		14	1	3	4	0	12	2	2	0	2		13
08-Apr	8			12		1	11	8	4	6	16	0	1		6
09-Apr	11	4		7	3	4	2	11	5	1	17	1	2	2	12
10-Apr	13	9		5	6	3	6	7	1	1	2	2	1	3	10
11-Apr	5	33	1	8	4	2	4	1	19	3	2	0	1		18
12-Apr	12	8		3	1	3	4	7	8	3		1	0	4	48

-continued-

Table DV4. Auke Creek weir daily Dolly Varden downstream counts, 1970–1994 *(continued)*

Date	1970	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
13-Apr	5					2	2	0	33	25	11	12	2	2	5
14-Apr	0			7		4	1	2	27	12	20	18	0	9	7
15-Apr	4			27	7	3		29	36	14	99	7	2	16	4
16-Apr	30			61	7	3		14	37	46	69	14	78	3	9
17-Apr	54		5		13	7	1	8	74	19	11	12	61	16	
18-Apr	47		2		3	3	5	23	113	9	152	7	80	53	10
19-Apr	200		2	17	29	6	3	2	122	21	101	5	89	36	28
20-Apr	180	25	4	26	1	7	21	0	207	4	44	15	103	23	27
21-Apr	61	34	36	2	9	2	16	3	227	27	8	10	109	33	41
22-Apr	79	94	22	30	3	24	7	1	156	136	14	3	75	76	58
23-Apr	52	67	8	21	21	11	6	35	83	22	33	16	32	54	92
24-Apr	12	111	4	57	82	3	3	1	309	36	19	29	197	147	204
25-Apr	7	31	4	94	110	9	6	206	101	82	210	11	63	81	81
26-Apr	138	3	2	29	21	6	12	34	22	26	98	20	469	140	93
27-Apr	160	49	21	58	4	17	1	32	21	103	110	37	103	243	267
28-Apr	124	61	27	92	46	24	10	351	48	18	63	41	424	143	158
29-Apr	102	148	21	257	93	26	17	79	861	128	31	86	701	72	586
30-Apr	162	203	6	17	279	1	25	229	677	209	39	21	545	540	148
01-May	568	315	31	99	28	15	136	652	111	69	76	6	65	260	588
02-May	289	588	88	337	540	61	174	341	144	683	150	83	7	119	196
03-May	201	652	10	207	142	52	24	811	185	317	52	152	143	99	565
04-May	185	594	6	35	26	160	13	152	385	65	164	71	592	3	638
05-May	214	298	34	199	25	37	321	86	298	17	1084	61	93	15	253
06-May	92	471	113	240	182	5	235	223	239	159	80	68	14	28	112
07-May	100	280	63	24	197	404	345	153	518	666	149	293	100	48	68
08-May	135	431	198	85	478	70	72	60	108	803	754	517	67	315	104
09-May	138	80	157	245	235	172	123	311	203	62	538	55	629	14	557
10-May	31	93	37	204	325	64	142	219	352	217	124	48	490	127	130
11-May	239	39	42	217	233	517	197	281	263	166	175	291	132	272	427
12-May	19	191	11	255	253	175	164	196	60	5	68	121	128	325	335
13-May	464	138	22	143	259	50	67	236	92	359	317	17	67	391	188
14-May	328	102	44	93	196	15	96	163	61	100	34	296	86	725	243
15-May	162	112	77		149	145	105	275	59	1,137	81	50	181	279	309
16-May	258	61	30	11	78	39	323	30	37	134	170	91	176	34	296
17-May	187	177	19	55	56	181	137	178	19	52	80	453	174	109	151
18-May	40	53	88	48	27	303	240	303	35	53	86	402	115	107	141
19-May	16	60	322	175	23	75	86	92	28	162	224	94	140	19	41
20-May	100	54	99	2	37	125	57	78	19	128	171	274	39	22	36
21-May	72	16	235	18	8	41	276	76	12	254	280	177	70	7	32
22-May	103	17	15	6	10	46	126	29	14	225	179	211	9	9	26
23-May	67	63		32	12	12	196	24	20	126	27	261	18	7	28
24-May	35	27	154	6	4	15	135	71	15	51	28	356	32	10	21
25-May	7	46	21	19	16	18	89	21	14	34	31	166	11	7	36

-continued-

Table DV4. Auke Creek weir daily Dolly Varden downstream counts, 1970–1994 *(continued)*

Date	1970	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
26-May	11	71	85	22	19	12	48	36	19	51	43	307	25	1	44
27-May	21	357	81	4	14	14	67	57	11	36	15	36	17		23
28-May	24	32	15	7		13	54	47	9	26	7	34	3	6	12
29-May	8	68	43	6	8	6	25	15	9	12	4	32	1	1	6
30-May	0	24		4	10	6	30	12	11	26	7	20	4		4
31-May	33	14	1009	3	6	2	21	15	14	40	1	25			2
01-Jun		6	308	2	3	7	8	7	2	19	1	16	6	1	9
02-Jun	37	5	173	2	58	4	6	2	3	10		6	2		2
03-Jun	26	4	87		50	2	10	4	3	2		9	2		2
04-Jun	197	6	43		9	1		4	5	2		18	3	3	2
05-Jun	8	6	23		2	3	2	1	1	0		15			3
06-Jun	5	6	26		3	3	4	1	3	3		12		1	
07-Jun	10	7	15		1	2		4		1		3			1
08-Jun	3	4	20	1	1	1		4		1		14			2
09-Jun	2		13	1	1	1	1	0		0		5		1	
10-Jun	0	4	28			1	1	1				1		1	
11-Jun		1	28			1		2				1			
12-Jun			11			1	1	1					2		1
13-Jun			26			1		0	1			6			1
14-Jun			3					1	1						1
15-Jun			9					1	1			2			
16-Jun			3					0							
17-Jun			3					0				1			
18-Jun								0							
19-Jun								1				1			
20-Jun															
21-Jun												1			
22-Jun															
23-Jun															1
24-Jun												1			1
25-Jun															
26-Jun															
27-Jun															
28-Jun												1			
Cumulative totals	6,216	6,461	4,133	3,710	4,512	3,052	4,351	6,444	6,770	7,230	6,406	5,555	6,839	5,073	7,601

Table DV5. Angler effort (angler-days) and harvest of Dolly Varden from the Chilkoot and Chilkat systems near Haines, 1986–1993 (Mills 1993).

	Chilkoot		Chilkat	
Year	Angler-days	Harvest	Angler-days	Harvest
1986	8,755	9,543	9,800	14,498
1987	16,878	9,743	6,846	7,606
1988	9,768	6,849	7,167	9,095
1989	17,775	7,665	7,138	4,989
1990	16,084	8,171	8,906	5,606
1991	15,219	10,222	4,925	3,353
1992	7,832	3,064	4,843	2,089
1993	9,891	5,092	4,692	1,828

the Chilkat River before spring outmigration begins from Chilkat Lake; thus, Dolly Varden that overwinter in the Chilkat River support a large part of the fishery.

Yakutat

Populations of Dolly Varden are found in most stream and lake systems on the Yakutat Foreland. There is minimal targeted effort on this species in the Yakutat area, but many anglers enjoy catching them while in pursuit of other species. Major populations exist in most drainages which have at least one large lake at the headwater, glacial or clear. The Situk River supports most of the Yakutat area Dolly Varden effort and harvest.

Harvests of Dolly Varden in the Yakutat area have ranged from 447 to 2,077 during the period of the statewide harvest survey (Figure DV5). Reported Dolly Varden harvest in 1993 was 992, while 5,304 were caught. Only 19% of Dolly Varden caught in the Yakutat area were kept in 1993.

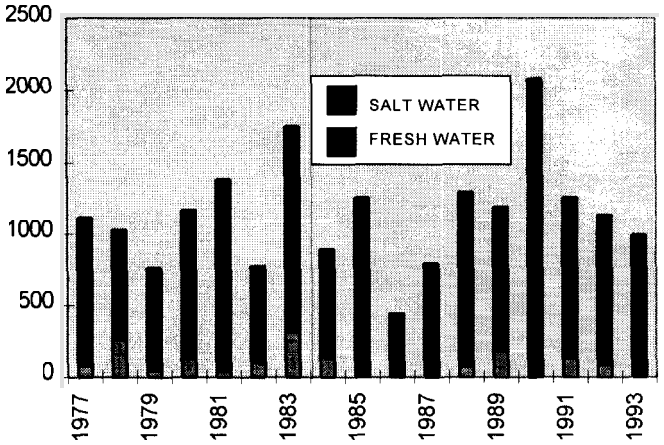

Figure DV5. *Saltwater and freshwater harvests of Dolly Varden in the Yakutat area, 1977–1993.*

STOCKED LAKES

Stocking fish to enhance Alaskan sport fisheries dates back to 1917 when Eastern brook trout were first introduced into Southeast Alaska. Since then, private individuals, clubs, canneries, federal agencies, and the state of Alaska have stocked brook trout, rainbow trout, and Arctic grayling, as well as king and coho salmon into numerous lakes. In many cases, these enhancement efforts have resulted in self-perpetuating stocks that support sport fisheries throughout the region. The department presently conducts a minor lake enhancement program for recreational fisheries—involving some transfers of wild fish to urban lakes, stocking of Arctic grayling sac-fry into two lakes, and stocking of catchable-size coho salmon and king salmon into Twin Lakes near Juneau. According to the 1994 stocking plan for the southeast region, the following releases for stocked lakes are planned: 18,000 Arctic grayling, 11,000 cutthroat trout, 60,500 rainbow trout, and 10,000 landlocked salmon.

Fishing effort on stocked lakes takes place at a rather low level and is dispersed throughout the region. The only estimates of effort and harvest come from the statewide harvest survey, and these estimates are usually only provided on an area-by-area (rather than lake-by-lake) basis. Total fishing effort on stocked lakes in Southeast Alaska is only about 2,500 angler-days, with the vast majority (1,724) of fishing effort resulting from the Twin Lakes stocking project (Table SL1).

Historic Stocking or Data Records

Information on the southeast region relative to stocking records resides in several data bases at several locations. The southeast regional portion of the statewide stocking plan for recreational fisheries is maintained at the regional office in a shared data base. The Commercial Fisheries, Management, and Development division maintains historic hatchery data in a data base called 'FISH,' which is accessed through a software program entitled Paradox. This data base is maintained and kept at the headquarters office and is considered the official record for the Department of Fish and Game. Some historic stocking records, a few of which have been transcribed into computer data bases, are also available in each of the region's area offices.

Rainbow Trout

The U. S. Forest Service (USFS) stocked rainbow trout into a number of lakes on Baranof Island and Chichagof Island during the 1930s. These fish originated from steelhead that had been transplanted into Sashin Lake from Sashin Creek. Details of these stocking activities are summarized in Schmidt (1981).

The department initiated a rainbow trout stocking program in 1965. Brood sources included Ennis,

Table SL1. Estimated angler-days of sport fishing effort at stocked lakes in Southeast Alaska by area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total	Percent of total[a]
1989	308	14	61	161	780	441	0	1,765	2%
1990	265	10	64	51	972	436	0	1,798	2%
1991	233	10	63	218	886	422	0	1,832	2%
1992	213	13	43	100	1,947	731	0	3,047	4%
1993	255	4	138	117	1,724	281	0	2,519	3%
Mean	255	8	74	124	1,262	462	0	2,192	3%
Percent	12	0	3	6	58	21	0		

[a] Percentage of total regional effort for freshwater angler-days.

Montana; Winthrop, Washington; Willamette, Oregon; Winther, Wisconsin; Mt. Whitney, California; Oakridge, Oregon and an Alaska/Ennis strain.

Specific stocking data and subsequent test netting evaluations in northern Southeast Alaska are summarized by Schmidt (1978). Over 176,000 rainbow trout were stocked into ten lakes in northern Southeast Alaska from 1959 through 1974. Most were never evaluated; however, some are known to have provided sport fishing opportunity for a few seasons after they were stocked.

Enhancement of rainbow trout in the Ketchikan area by the Division of Sport Fish began in 1961 and continued through 1972. During this period, 57 different lakes were stocked with rainbow trout eggs, eyed eggs, fry, or fingerlings (Ketchikan area files). Although very little specific evaluation work was conducted to determine the relative success of these stocking activities, many self-sustaining rainbow trout populations developed and are documented as ancillary information in other reports (Siedelman 1974–1987). Rainbow trout also appear in the Ketchikan area of the Statewide Harvest Surveys (Mills 1978–1988).

Beginning in 1991, the department became involved in development of roadside trout enhancement projects in the Ketchikan area, using triploid (sterile) rainbow trout. Between 1991 and 1993, 16,000 triploid rainbow trout fingerlings (3–5 inches) were stocked into Carlanna Lake. Cursory reviews of this project coupled with public comments have documented that fish have survived and grown to 8–10 inches in length. Between 1992 and 1993, 58,000 triploid rainbow trout fingerlings were also released into Harriet Hunt Lake, located 15 miles northwest of Ketchikan at the end of the Ward Creek USFS road system. Preliminary reports indicate that some of these fish have survived, but several years will be required for these fish to reach the 12-inch minimum legal length for harvest.

The only other enhancement project conducted since 1972 using rainbow trout is at One Duck Lake on Prince of Wales Island. Beginning in 1991, the department, in cooperation with the USFS and the local Trout Unlimited chapter, began stocking rainbow trout from Klawock Hatchery into One Duck Lake. Between 1991 and 1993, a total of 3,724 rainbow trout ranging from 8 to 12 inches was released into this lake, which is located at mile 3 on the Hydaburg USFS road. The purpose of the stocking was to support the annual "Kids Fishing Day" operated each year in early June. Fishing effort from this event results in an annual harvest of 300 to 500 fish.

Arctic Grayling

Arctic grayling are not endemic to Southeast Alaska. Many lakes were stocked with grayling from 1950 into the mid 1970s. Most of the grayling stocked in Southeast Alaska were Tolsona Lake stock from Fire Lake Hatchery or were wild fish transported from British Columbia lakes.

Arctic grayling were stocked in nearly 40 lakes throughout the region between 1920 and 1972. Age at stocking ranged from eyed-egg to adult. The earliest introductions were transplanted from McDonald Lake in British Columbia (Juneau area files). Subsequent stockings were conducted with eggs taken from Tolsona Lake near Glennallen and reared at the Fire Lake Hatchery (Petersburg and Ketchikan area files). Currently there are 17 lakes known to contain populations of grayling (Table SL2).

Management

Of seventeen known grayling populations, only four or five are known to receive any level of fishing pressure. Less than 1% of freshwater fishing effort was targeted on grayling from 1989 to 1993 (Table SL3). Arctic grayling ranked last in species preference in a sport fish survey conducted in 1984. The harvest of Arctic grayling in Southeast Alaska averaged 254 fish from 1989 through 1993 (Table SL4). It appears that grayling are fished only when they are easily

Table SL2. Lakes in Southeast Alaska known to contain Arctic grayling.

Community	Lake	Stock date	Fish source
Juneau	Antler Lake	1962, 64, 65, 66	Fire Lake
Sitka	Beaver Lake	1965, 67, and annually since 1990	Fire Lake Clear Hatchery
Haines	Herman Lake	1976	Fire Lake
Petersburg/	Tyee Lake	1962	unknown
Wrangell	Kane Peak Lake	1962	"
Ketchikan	Goat Lake	1961	unknown
	Half-moon Lake	1964	"
	Little Goat Lake	1968	"
	Manzoin Lake	1965	"
	Marge Lake (Prince of Wales I.)	1965	"
	Minne Lake	1969	"
	Mellen Lake (Prince of Wales I.)	1965	"
	Orton Lake	1966	"
	Snow Lake	1966	"
	Summit Lake (Prince of Wales I.)	1962	"
	Shinaku Lake	1970	"

Table SL3. Angler-days of fishing effort for Arctic grayling in Southeast Alaska by management area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total	% of fresh-water fishery
1989	91	0	61	54	0	247	0	453	0.6
1990	75	0	64	17	0	163	0	319	0.4
1991	55	0	63	73	0	226	0	417	0.5
1992	61	0	43	33	0	269	0	406	0.5
1993	74	0	138	39	0	55	0	306	0.3
Mean	71	0	74	43	0	192	0	380	0.5
Percent	19	0	19	11	0	50	0	100	.

accessible. About 40% of the grayling caught are retained.

The standard limit for grayling is 10 per day and in possession with no size limit. Given the very low harvest of grayling which is dispersed throughout Southeast Alaska in very small fisheries, there is no active management of this species.

Enhancement

All populations of Arctic grayling in Southeast Alaska are a result of enhancement efforts. The last introduction of Arctic grayling was made at Herman Lake, near Haines, in 1976. However, Beaver Lake in Sitka, which was originally stocked in 1965, has been stocked annually with Arctic grayling since 1990. There are no Arctic grayling being reared in hatcheries in Southeast Alaska and present stocking policies prevent transfer of fish between regions, so hatchery-reared Arctic grayling are usually not approved for stocking in Southeast Alaska.

The department is currently involved in a cooperative enhancement project with the United States Forest Service and the City of Skagway at Goat Lake, near Skagway. Plans call for grayling from Herman Lake, in Haines, to be transported to Goat Lake in 1995 or 1996. If successful, this project would provide another angling opportunity for Skagway, where fishing opportunities are very limited.

Area Specific Information

Ketchikan/Prince of Wales Island

The Ketchikan and Prince of Wales Island areas have at least nine lakes with confirmed populations of Arctic grayling. All harvest reported in the Statewide Harvest Survey is from the lakes near Ketchikan. There have been no harvests reported in recent years from Prince of Wales Island.

Petersburg/Wrangell/Kake

There are four lakes in the Petersburg/Wrangell/Kake area which are known to contain populations of Arctic grayling (Table SL2). Harvests have been reported for only two years since 1989, averaging 36 fish. Tyee Lake is the only lake known to receive any fishing pressure.

Table SL4. Harvests of Arctic grayling in Southeast Alaska management areas, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Yakutat	Total
1989	182	0	0	11	0	0	0	193
1990	224	0	81	0	0	63	0	368
1991	0	0	0	18	0	63	0	81
1992	91	0	98	8	0	225	0	422
1993	0	0	0	95	0	0	0	95
Mean	99	0	36	26	0	70	0	232
Percent	43	0	15	11	0	30	0	100

Sitka

Beaver Lake is the only lake in the Sitka area known to contain Arctic grayling. The Arctic grayling stock found in Beaver Lake was first introduced in 1965. Since that time it has been stocked several additional times including: 10,000 in 1986 and 15,000 annually since 1990.

Beaver Lake is accessible by Sitka road and USFS trail systems. In 1987 the USFS and ADF&G jointly placed a barrier in the outlet stream to prevent Arctic grayling from migrating over the falls. Because of major trail improvements in 1990 and 1991, extension of the trail in 1992 and 1993, and the addition of a 13-foot Boston Whaler on site, angler access has increased. Mills (1994) indicates that catch of grayling was 149 fish in 1993, with harvest of 95 fish.

Juneau

Antler Lake, north of Juneau, is the only lake in this area known to contain grayling. Antler Lake lies at about 2,200 feet elevation on a north slope and is ice-free from early August into October. There is a very low level of angling effort at Antler Lake; however, no harvest is reported in the Statewide Harvest Survey.

Haines/Skagway

The Herman Lake system, near Haines, is the only lake in this area known to contain Arctic grayling. The average harvest for this area was 70 grayling per year, with harvest reported for three of five years from 1989 through 1993. Herman Lake grayling are from 7 to 12 inches in length. Public use of Herman Lake could be increased through improvement of the trail.

Yakutat

There are no known populations of Arctic grayling in the Yakutat area.

Brook Trout

Brook trout are not endemic to Southeast Alaska. Federal biologists and local residents stocked scores of lakes in Southeast Alaska from about 1916 to the late 1950s. Most of these enhancement efforts failed, but not all were evaluated. Presently there are 21 lakes throughout the region that are known to contain brook trout (Table SL5). Brook trout lakes receive little fishing effort. An estimated 682 angler-days, or about 1% of the freshwater effort, was directed toward brook trout during the last five years (Table SL6). The harvest of brook trout from 1989 through 1993 averaged 720 fish per year (Table SL7).

Table SL5. Lakes in Southeast Alaska known to contain brook trout.

Community	Lake	Stock date	Fish source
Skagway	Upper Dewey Lake	1920	
	Lower Dewey Lake	1917, 20, 26, 27 32, 36, 39	Colorado Yes Bay, AK
Haines	Rustabuch Lake	1932	
Juneau	Salmon Creek Res.	1917, 27	Colorado
	Dorothy Lake	1931	Yes Bay, AK
	Annex Lake	1917	Colorado
Sitka	Green Lake	1932	Yes Bay, AK
	Heart Lake	1932	Yes Bay, AK
	Thimbleberry Lake	1932	Yes Bay, AK
	Long Lake	1931	Yes Bay, AK
	Deep Lake	1931	Yes Bay, AK
Petersburg	Crystal Lake	1931	unknown
Wrangell	Nellie Lake	1931, 32	unknown
Ketchikan	Bugge Lake	1931	unknown
	Claude Lake	1931	"
	Grace Lake	1932	"
	Ketchikan Lake	1931	"
	Perseverance Lake	1931, 32	"
	Whitman Lake	1931	"
	Mahoney Lake	1931, 32	"
	Upper Mahoney L.	1966, 69	"

Management

The regional limit for brook trout is 10 per day and 10 in possession with no size limit. Given the low level of fishing effort, spread out over 21 lakes, there is no active inseason management of brook trout.

Enhancement

Brook trout are not endemic to Southeast Alaska, but they were clearly a favorite of new immigrants to the region, who commonly imported brook trout and stocked them near local communities. From 1917 to 1953, Eastern brook trout were stocked by local residents into at least 24 streams and lakes on at least 41 occasions in the Juneau and Skagway areas. Many other small streams were also stocked, but the specific streams can not be identified. In 1920, the USFS successfully transplanted 50,000 fry into four lakes in the Skagway area (Petersburg area files).

Table SL6. Angler-days of fishing effort for brook trout in Southeast Alaska by management area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total	% of freshwater fishery
1990	190	0	0	34	114	273	0	612	0.7%
1991	178	0	0	145	104	196	0	623	0.7%
1992	152	0	0	67	198	462	0	879	1.0%
1993	181	0	0	78	203	226	0	688	0.8%
Mean	184	0	0	86	142	270	0	682	0.8%
Percent	27	0	0	13	21	40	0	100	

An estimated 50,000 eyed Eastern brook trout eggs were shipped from Colorado to Skagway, by the USFS, in November of 1939 (Kimmerich 1939, Edwards 1940). Approximately 35 lakes in Southeast Alaska, most of them in southern Southeast, were stocked with Eastern brook trout fry incubated and reared at Yes Bay Hatchery during 1931 and 1932 (Petersburg area files).

The only evaluation information available on the success or failure of the early brook trout stocking program is that 17 lakes throughout the region still have populations of brook trout (Schwan 1984). With the exception of a transfer of 400 brook trout from upper Dewey Lake to Devil's Punchbowl in the lower Dewey Lake drainage (Skagway area), there has been no brook trout enhancement in Southeast Alaska since statehood.

Area Specific Information

The estimated number of brook trout harvested from Southeast Alaska management areas is presented in Table SL7. The accuracy of these harvest estimates from the statewide harvest survey is questionable, because the numbers of respondents from smaller fisheries are low and there could be a problem with anglers misidentifying brook trout as Dolly Varden, or vice versa.

Ketchikan

Eight lakes in the Ketchikan area are known to contain populations of brook trout. The annual harvest of brook trout in the Ketchikan area averages 80 fish. The distribution of the brook trout harvest among the various lakes in the Ketchikan area is not known.

Petersburg/Wrangell/Kake

Crystal and Nelle lakes are the only lakes in this area known to contain brook trout. From 1989 through 1993, the average annual harvest of brook trout was 55 fish.

Sitka

Five lakes in the Sitka area contain brook trout. Brook trout were stocked in Deep and Long lakes near Red Bluff Bay from Yes Bay hatchery in 1931 and in Heart, Thimbleberry, and Green lakes near Sitka in 1932. Each of these enhancement efforts produced viable populations; fish are still present in all systems.

Table SL7. Estimated harvest of brook trout in Southeast Alaska by management area, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Yakutat	Total
1989	195	0	59	352	169	112	0	887
1990	16	0	16	307	17	94	0	450
1991	25	0	178	66	114	94	0	477
1992	97	0	0	118	292	519	0	1,026
1993	67	0	22	134	182	357	0	762
Mean	80	0	55	195	155	235	0	720
Percent.	11	0	8	27	22	33	0	100

A population estimate of brook trout was attempted in Thimbleberry Lake by David Winney (May 1984). The abundance of catchable fish in this 10-acre lake was estimated to be 487. Anglers fish Thimbleberry Lake primarily during winter under ice.

Green Lake was a natural body of water prior to 1979, when a hydroelectric dam was constructed at the lake outlet. This development greatly increased the size, and likely the productivity, of the system. Prior to dam construction, a study of brook trout was conducted by the U.S. Fish and Wildlife Service (Hughes 1993 *unpublished*). That study estimated a pre-impoundment abundance of 1,446 brook trout over 65 mm in length. A limited investigation of Green Lake reservoir conducted by Arnold et al. (1987) showed that brook trout survived the reservoir drawdown and are reproducing in the new reservoir. Sport fishing effort on the system is limited because of poor access. The road which was built during the dam construction period is not open to traffic, so the only way to access fishing is by foot. Three skiffs at the lake are used periodically by anglers and hunters. Anglers report seeing large fish in the system, and a post-impoundment population evaluation should be conducted.

The Statewide Harvest Study estimates a harvest of only 134 brook trout in the Sitka area during 1993. An average of 195 brook trout was harvested annually from 1989 through 1993. The accuracy of the harvest estimate is questionable, because a substantial portion of the harvest is reported to be from streams where brook trout are not known to exist.

Juneau

Salmon Creek Reservoir and Annex and Dorothy lakes are known to contain populations of brook trout. Salmon Creek Reservoir is the only location on the Juneau road system, and it is assumed that the majority of the area's reported harvest comes from this site. An average of 155 brook trout was taken annually in the Juneau area from 1989 through 1993.

A hydropower generation dam created the 192-acre Salmon Creek Reservoir. In 1976, the abundance of brook trout in Salmon Lake Reservoir was estimated at 1,250 catchable-sized fish. Most are 8–10 inches in length, but occasionally a 3- to 5-pound brook trout is reported to have been harvested.

Haines/Skagway

The largest annual harvest of brook trout in Southeast Alaska comes from the Skagway area, specifically from the Dewey Lakes system. Lower Dewey Lake is reached by a steep 1-mile trail from the community of Skagway. This lake was stocked eight times from 1917 through 1939 and appears to have a healthy, naturally reproducing population of brook trout. Upper Dewey Lake was stocked in 1920; it is accessed by a 2-mile-long trail from lower Dewey Lake.

The department attempted (unsuccessfully) to chemically eradicate the brook trout population in lower Dewey Lake in 1966 so that the lake could be re-stocked with rainbow. Rainbow trout provided a fishery for two to three seasons, and then brook trout again begun to dominate the population. In 1989, sampling in lower Dewey Lake documented numerous brook trout up to 12 inches in length.

Prince of Wales Island and Yakutat

There are no brook trout in these areas.

Landlocked Coho and King Salmon

Landlocked salmon were first stocked into the Juneau area in 1974, when 976 sub-smolt coho salmon from the Mendenhall Lakes rearing facility were released into Marshall Ponds in the Mendenhall Valley. These fish were known to have survived, however, harvest studies were not conducted.

Landlocked coho salmon were stocked into Twin Lakes in 1982, and coho and/or king salmon have been stocked annually through 1993. In 1982, juvenile coho salmon were reared in the Little Port Walter hatchery. From 1983 through 1993 the hatchery facility was the Snettisham Hatchery. In 1994, all sport fish enhancement programs at Snettisham were transferred to DIPAC Hatchery, and future stocking at Twin Lakes will be performed by DIPAC. Landlocked salmon released into Twin Lakes are held in the hatchery for an additional year and released into Twin Lakes as age 2+ sub-catchables, ranging from 8 to 10 inches.

Table SL8. Estimated freshwater fishing effort (angler-days) and harvest of landlocked coho/chinook in Twin Lakes, 1989–1993.

Year	Angler-days	Harvest
1989	688	528
1990	858	413
1991	782	1,222
1992	1,485	1,536
1993	1,521	1,454
Average	1,067	1,031

Cutthroat Trout

The first cutthroat trout enhancement efforts in Southeast Alaska began in the 1910s by sportsmen at New Port Walter. They continued stocking cutthroat trout eyed-eggs and catchables into various lakes in the early 1930s (Petersburg area files). The USFS also stocked fingerlings and catchable-sized cutthroat trout into a number of lakes in Southeast from 1922 through 1966 (Petersburg area files, Chipperfield 1938).

Cutthroat trout enhancement activities by ADF&G were restricted to stocking one lake on Prince of Wales Island in 1964 (Ketchikan area files), transferring adult cutthroat trout into Mendenhall Ponds from nearby Shelter Island (Douglas area files), and transferring 500 8- to 12-inch cutthroat trout from Florence Lake to Twin Lakes in 1994.

Cutthroat trout enhancement was conducted at Auke Lake (near Juneau) from 1983 through 1987 in cooperation with the National Marine Fisheries Service's Auke Creek Hatchery. Eggs were collected from wild cutthroat trout captured in the Auke Creek weir, hatched in the Auke Creek Hatchery, and then stocked into Auke Lake for natural rearing. This treatment increased the number of cutthroat trout in Auke Lake available to the sport fishery and the number of outmigrant cutthroat trout captured in the Auke Creek weir (Bethers 1987). The Auke Lake enhancement program was revived in the early 1990s, through a cooperative program between the department and Trout Unlimited. The department withdrew its support for this project in 1994 because of the limited success of the stocking program, the continued decline in outmigrating cutthroat trout from Auke Lake, and new information on the spawning patterns of cutthroat trout overwintering at Auke Lake.

BOTTOMFISH FISHERIES

Pacific halibut are frequently targeted by marine boat anglers throughout Southeast Alaska. Other bottomfish species such as rockfish and lingcod are much less often targeted; however, they make up an important component of the sport harvest of bottomfish in some areas of Southeast Alaska. Pacific halibut are managed on a coastwide basis by the International Pacific Halibut Commission (IPHC).

In 1988, sport anglers spent $13.8 million on sport fishing trips for halibut in Southeast Alaska, a total exceeded only by the $22.9 million spent fishing on chinook salmon. An additional $0.3 million was spent on fishing trips for rockfish.

Angler Effort

About 25% of all marine fishing effort is targeted on bottomfish, primarily halibut (Table BO1). The largest bottomfish fisheries are in the Juneau, Ketchikan, and Sitka areas, where a total of about 63% of the bottomfishing effort occurs. Effort for bottomfish has been slowly increasing over the last few years.

Sport and Commercial Harvests

As with the five salmon species, sport harvests of bottomfish are generally much smaller than commercial harvests.

Pacific Halibut

Sport harvests of Pacific halibut have increased greatly since 1977, and a record harvest of 87,779 was taken in 1993 (Table BO2). The harvest of Pacific halibut had remained fairly stable at about 70,000 fish from 1989 to 1992, but then increased in 1993 due to a doubling of harvests in the Prince of Wales area. The largest numbers of Pacific halibut have been taken in the Juneau, Sitka, and Ketchikan sport fisheries. Over the period from 1990 to 1993, an average 65% of Pacific halibut caught by sport anglers were retained. Retention rates for halibut are lower than for such species as chinook and coho salmon because halibut less than 10 pounds are often released by anglers trying to catch a larger individual.

In order to compare sport and commercial harvests of Pacific halibut in Southeast Alaska, it is necessary to estimate the net weight (headed and gutted) in pounds of the sport harvest, as the total harvest of the commercial catch in numbers is not tabulated. The commercial harvest of halibut has been limited by catch quotas since 1932 (Hoag et al. 1993). IPHC Area 2 was split into three areas in 1981: A—Lower 48, B—British Columbia, and C—Southeast Alaska. IPHC Area 2C (Southeast Alaska) does not include the Yakutat area, which is in area 3A.

Commercial longline harvests of Pacific halibut in area 2C have varied between 3.5 and 11.4 million pounds annually since 1981 (Table BO3). Quotas for

Table BO1. Estimated angler-days of sport fishing effort by area for bottomfish in Southeast Alaska and percentages of total marine fishing effort for years 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total	% total marine effort
1989	22,287	9,336	10,300	17,405	20,084	7,257	2,672	516	89,857	25%
1990	15,249	9,314	12,290	18,207	20,923	10,732	2,342	909	89,965	24%
1991	17,095	8,077	9,838	18,939	14,971	6,352	6,983	2,232	84,485	23%
1992	19,573	7,310	11,829	22,366	22,532	3,635	4,632	1,910	93,787	25%
1993	17,431	12,859	10,443	17,571	22,540	11,480	4,972	1,978	99,276	26%
Mean	18,327	9,379	10,940	18,898	20,210	7,891	4,320	1,509	91,474	25%
Percent	20%	10%	12%	21%	22%	9%	5%	2%		

Table BO2. Estimated sport harvest of Pacific halibut in Southeast Alaska by area, 1977–1993.

Year	Ketchikan	Prince of Wales	Petersburg-Wrangell	Sitka	Juneau	Haines-Skagway	Glacier Bay	Yakutat	Total
1977	1,360	277	447	992	1,976	81	271	428	5,832
1978	751	230	1,103	339	3,066	448	170	24	6,131
1979	1,359	593	1,380	3,179	5,832	49	632	78	13,102
1980	5,260	1,085	3,193	4,976	9,333	361	620	34	24,862
1981	4,634	1,321	2,299	4,288	8,122	670	443	65	21,842
1982	5,963	2,242	3,845	6,330	16,988	650	744	398	37,160
1983	6,760	1,849	4,147	7,945	18,651	1,426	535	682	41,995
1984	11,719	2,724	5,649	8,197	15,618	2,029	748	241	46,925
1985	12,600	3,073	4,757	6,091	16,695	1,023	1,355	520	46,114
1986	11,014	2,902	3,624	6,617	16,574	2,189	1,331	777	45,028
1987	9,676	2,760	3,039	7,545	14,382	3,567	2,184	1,194	44,347
1988	11,544	2,778	3,877	10,572	18,697	3,201	4,238	1,673	56,580
1989	13,699	9,213	5,548	17,727	20,273	2,588	4,484	772	74,304
1990	9,872	10,264	5,768	17,492	16,248	1,972	3,415	1,459	66,490
1991	9,733	11,875	6,433	20,283	13,637	1,199	8,766	2,112	74,038
1992	9,455	11,661	6,153	22,092	14,850	926	4,863	1,861	71,861
1993	12,763	22,501	5,984	19,366	16,340	2,195	5,878	2,752	87,779
Mean	8,127	5,138	3,956	9,649	13,370	1,446	2,393	886	44,964
Percent	18%	11%	9%	21%	30%	3%	5%	2%	100%

the commercial fishery over this period have varied from 3.4 to 11.5 million pounds. Net weight of the annual sport harvest in Area 2C has increased from less than 100,000 pounds in 1977–1978 to an estimated 1.9 million pounds in 1993. Although sport harvests in numbers had been fairly stable from 1989 to 1992, the net weight increased because average weight of the Pacific halibut taken increased. In aggregate, the commercial longline fishery took 110.5 million pounds over the period from 1981 to 1993, 6.5 million pounds over the aggregate quota of 104 million pounds. During this same period, the sport fishery took about 13.6 million pounds, or 11% of the combined sport and commercial longline harvest. Additional Pacific halibut

Table BO3. Estimated net weight (in thousands of pounds) of Pacific halibut harvested in IPHC Area 2C (Southeast Alaska) by sport and commercial longline fisheries, 1977–1993. (Area 2 not split into sections A, B, and C until 1981.)

	Sport harvest		Commercial longline harvest			
Year	Weight	(%) [a]	Weight	(%) [a]	Quota	Difference [b]
1977	72	2%	3,190	98%	[c]	[c]
1978	82	2%	4,320	98%	[c]	[c]
1979	175	4%	4,576	96%	3,600	976
1980	315	9%	3,260	91%	3,200	60
1981	314	7%	4,010	93%	3,400	610
1982	485	12%	3,500	88%	3,400	100
1983	560	8%	6,398	92%	3,400	2,998
1984	696	11%	5,847	89%	5,700	147
1985	745	7%	9,207	93%	9,000	207
1986	766	7%	10,611	93%	11,200	(589)
1987	863	7%	10,685	93%	11,500	(815)
1988	1,084	9%	11,369	91%	11,500	(131)
1989	1,520	14%	9,532	86%	9,500	32
1990	1,364	12%	9,734	88%	8,000	1,734
1991	1,656	16%	8,687	84%	7,400	1,287
1992	1,669	15%	9,819	85%	10,000	(181)
1993	1,900	13%	11,135	87%	10,000	1,135
Total 81-93	13,623	11%	110,534	89%	104,000	6,534

[a] Percent of combined sport and commercial longline harvest

[b] Difference between commercial quota and actual harvest

[c] No specific commercial quota for U.S. waters in Area 2 until 1979.

mortality is due to bycatch in other commercial fisheries (3.17 million pounds in 1992), waste from lost gear and incidental mortality of small halibut (0.5 million pounds in 1992), and personal use by commercial fishermen (0.37 million pounds in 1992).

Rockfish

More than thirty species of rockfish are found in Alaskan marine waters, but postal survey harvests are estimated for rockfish only as a species group (Table BO4). Sport harvests of rockfish have been highly variable since 1977, with harvests peaking in 1988 at 56,839 fish. Regionwide bag limits for rockfish were instituted in 1989, and harvests have since declined to 26,000–32,000 in the 1990s. Because of problems in species identification, it is thought that some harvests of sculpins or walleye pollock may be misreported as rockfish in certain areas such as Juneau. The largest sport harvests of rockfish are taken in the Ketchikan, Sitka, and Prince of Wales areas.

Rockfish fall into two general groups: pelagic rockfish and demersal shelf rockfish. Pelagic rockfish are generally brown, blackish, or gray, whereas demersal shelf rockfish are often yellow or orange. Creel surveys have shown that yelloweye, quillback, and black rockfish are taken in the largest numbers by sport anglers. Black rockfish are a pelagic species; yelloweye and quillback are demersal shelf species. Demersal shelf rockfish are extremely vulnerable to overharvest because they exhibit a strong home site preference, take 20 or more years to mature, and are highly prone to hooking mortality when brought to the surface and released. Yelloweye rockfish, the species most desired by sport anglers for its large size, is especially prone to overexploitation for these reasons. These characteristics make it difficult for resource agencies to manage yelloweye and other demersal shelf rockfish on a sustained yield basis. Pelagic rockfish are less vulnerable to overharvest, because they do not have a home site affinity and quickly repopulate small areas where they might be overharvested.

Due to anglers catching unwanted rockfish while fishing for salmon or Pacific halibut, or to sorting for desirable species such as yelloweye rockfish, rockfish retention rates are low in comparison to other species. For the period from 1990 to 1993, the average retention rate for rockfish was only about 37% (about two out of three caught were released). As noted above, released demersal rockfish frequently die upon release.

Commercial harvests of rockfish have been increasing since 1990, with most of the catch composed of demersal shelf rockfish species, and yelloweye rockfish composing the majority of the catch by weight (Table BO5). Round weight of the sport harvest was estimated by assuming that yelloweye rockfish make up about 30% of the sport harvest and have an average weight of 6 pounds, with the average weight of other rockfish taken at 3 pounds.

Table BO4. Estimated sport harvest of rockfish in Southeast Alaska by area, 1977-1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Glacier Bay	Yakutat	Total
1977	834	571	762	3,635	2,996	130	34	0	8,962
1978	6,898	2,504	2,106	2,784	2,169	362	63	0	16,886
1979	8,491	1,882	1,881	8,372	9,627	364	182	182	30,981
1980	18,415	4,968	2,841	8,481	6,724	319	43	0	41,791
1981	20,581	4,544	1,937	11,837	5,649	820	259	44	45,671
1982	21,023	8,027	1,581	13,027	6,141	1,583	168	52	51,602
1983	18,824	12,040	1,008	9,855	7,859	168	409	105	50,268
1984	16,295	5,197	2,265	6,375	5,978	558	85	146	36,899
1985	16,632	4,168	2,663	5,085	4,704	315	472	0	34,039
1986	17,861	9,841	2,106	5,997	4,847	794	78	44	41,568
1987	18,231	9,984	2,525	5,944	4,709	289	307	272	42,261
1988	26,378	8,692	480	9,319	10,224	854	801	91	56,839
1989	17,159	8,955	1,726	6,196	4,638	465	357	8	39,504
1990	9,043	9,062	1,150	3,948	1,881	488	306	81	25,959
1991	8,504	7,200	1,222	4,879	3,408	415	936	264	26,828
1992	9,927	7,968	1,838	6,852	3,532	181	501	414	31,213
1993	6,764	9,589	2,070	6,622	5,717	569	448	251	32,030
Mean	14,227	6,776	1,774	7,012	5,341	510	321	115	36,077
Percent	39%	19%	5%	19%	15%	1%	1%	0%	100%

Table BO5. Round weight in thousands of pounds of sport and commercial harvests of rockfish in Southeast Alaska, 1987–1993.

Year	Sport	(%)	Total commercial	(%)	Breakdown of commercial harvest: Demersal shelf	Other
1987	165	6%	2,688	94%	2,600	88
1988	222	12%	1,685	88%	1,603	82
1989	154	10%	1,346	90%	1,247	99
1990	101	9%	1,056	91%	971	85
1991	105	7%	1,316	93%	1,020	296
1992	122	7%	1,708	93%	1,551	157
1993	125	6%	1,876	94%	1,353	523

Lingcod

Most lingcod are taken incidentally by anglers fishing for halibut or chinook salmon, although their popularity as a target species is increasing. Sport harvests of lingcod in Southeast Alaska have only been estimated since 1991 (Table BO6). Lingcod are found primarily on the outer coast and taken by sport anglers primarily in the Prince of Wales, Sitka, and Ketchikan areas. Harvests of lingcod in areas such as Juneau are probably overestimated by the postal survey due to anglers misreporting their harvests of Pacific cod. The 1991–1993 average retention rate for lingcod was about 63%—which is about the same as the 65% retention rate for Pacific halibut. Some anglers fishing for salmon or halibut release their incidental catches of lingcod, and small lingcod also are frequently released.

In order to compare sport and commercial harvests, sport harvests of lingcod were converted to round weight using length information collected in 1993 (Table BO7). The round weight of the sport harvest has increased from about 12% of the combined total harvest in 1991 to 20% in 1993. Average round weight of lingcod taken by sport anglers in 1993 ranged from 12.3 pounds in the Prince of Wales area to 17.2 pounds in the Sitka area and averaged 14.5 pounds.

Stock Status

Abundance of Pacific halibut is thought by the IPHC to be cyclic. Stocks of Pacific halibut in Southeast Alaska (as measured by fish 8 years of age or older) have been declining slowly since 1988 from a peak biomass of nearly 80 million pounds. Abundance has declined, both from reductions in recruitment and increases in removals. Estimates of abundance by the IPHC have increased substantially in recent years; abundance during the mid-1980s was once thought to have peaked at about 50 million pounds. Stocks are expected to decline until approximately 1997.

Little is known about the stock status of lingcod and rockfish in Southeast Alaska.

Management Approach

ADF&G provides information to the IPHC to help manage the Pacific halibut fishery, but takes no direct management actions for the Pacific halibut fishery. Sport fishing regulations for Pacific halibut were first adopted in 1973 when a daily bag limit of three fish and a fishing season from March through October was enacted. The sport bag limit for Pacific halibut was reduced to two fish per day in 1975, where it has remained; the possession limit was raised in 1988 from two to four halibut. The sport fishing season for halibut was extended in 1986 to February through December. Charter vessels which participate in the halibut fishery have been required to register with the IPHC since 1984.

Regulations governing the sport take of rockfish were first imposed during the 1988 season, when an eight-fish bag and possession limit was implemented in Sitka Sound. A regional rockfish bag limit of

Table BO6. Estimated sport harvest of lingcod in Southeast Alaska by area, 1991–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Glacier Bay	Yakutat	Total
1991	1,977	3,245	201	2,448	1,047	353	327	160	9,758
1992	2,381	4,048	486	4,683	1,129	102	56	308	13,193
1993	2,171	6,422	653	3,901	840	268	216	498	14,969
Mean	2,176	4,572	447	3,677	1,005	241	200	322	12,640
Percent	17%	36%	4%	29%	8%	2%	2%	3%	100%

Table BO7. Round weight in thousands of pounds of sport and commercial harvests of lingcod in Southeast Alaska, 1987-1993.

Year	Sport	(%)	Total commercial	(%)	Breakdown of commercial harvest by gear type: Directed jig catch	Troll catch	Longline catch
1987			556		160	91	305
1988			712		253	97	362
1989			700		182	132	386
1990			747		331	111	305
1991	139	12%	1,054	88%	487	93	474
1992	192	15%	1,061	85%	438	96	527
1993	211	20%	820	80%	486	72	262

five per day, ten in possession (of which only two per day, four in possession may be yelloweye rockfish) was instituted in 1989. The sport take of lingcod was not regulated until the 1994 season (see below).

Recent Board of Fisheries Actions

The Board of Fisheries made substantial changes to the sport regulations for rockfish and lingcod in the fall of 1993. Bag limits for rockfish were split into pelagic (five species) and 'other' categories. Pelagic rockfish are generally brown, blackish, or gray, while 'other' rockfish have some yellow or orange color. Bag limits for 'other' rockfish remained at five per day (three in areas around Ketchikan and Sitka), but an additional bag limit for pelagic rockfish of five per day, ten in possession was instituted. Pelagic rockfish are much less vulnerable to overfishing, and on this basis an additional bag limit was justified for these species.

Prior to fall 1993, there were no sport regulations governing the harvest of lingcod in Southeast Alaska. A two-fish bag limit and a seasonal closure from December 1 through April 30 were instituted for the 1994 season to help provide for sustained yield of lingcod.

Current Issues

Limits or Moratorium on Halibut Charter Vessel Effort or Harvest

The North Pacific Fisheries Management Council (NPFMC) received a petition from the Alaska Longline Fishermen's Association in May 1993 to cap the charter fishery for halibut in Alaska. The NPFMC initially discussed placing a moratorium on the registration of charter vessels, as a means of capping the charter fishery for halibut. A cutoff date of September 23, 1993 was set, but no further action has been taken on this moratorium. Other means of limiting charter harvests are also being discussed. Negotiations in the council process are scheduled to continue during the next few years.

Stock Concerns in Areas of High Fishing Pressure

Most issues concerning bottomfish arise in areas such as Sitka Sound where large commercial fisheries and sport fisheries operate within the same area. This intense fishing pressure can lead to localized depletion of non-migratory stocks of demersal shelf rockfish and lingcod. Migratory stocks of halibut and pelagic rockfish are less likely to be overfished; however, declines in both sport and commercial catch rates for halibut in the Juneau area indicate that large declines in abundance of halibut have occurred. Of special concern, however, will be the impact of the Individual Fishery Quota (IFQ) system for commercial fisheries on species such as halibut. This system may lead to increased commercial fishing pressure near communities, which may further reduce local halibut abundance and reduce catch rates for sport anglers.

Incidental Mortality of Rockfish

Rockfish suffer high rates of incidental mortality when caught and released, because their air bladders do not adapt rapidly to changes in pressure. Since rockfish are generally caught incidentally by anglers fishing for either halibut or salmon, large numbers of

rockfish are released by sport anglers and presumably do not survive. In the Ketchikan area, about 48% of rockfish caught are retained, whereas in the Sitka area only about 23% are retained. Commercial longline and troll fisheries that target on other species also cause large numbers of incidental mortalities.

Research and Management Activities

No research is being conducted by Division of Sport Fish staff on bottomfish in Southeast Alaska, although a project on stock status of Pacific halibut in the Juneau area has been proposed. Management activities are limited to obtaining catch rate statistics and length measurements from Pacific halibut and lingcod during creel surveys of chinook salmon fisheries. Species composition of the rockfish harvest and rockfish catch statistics in the Ketchikan, Sitka, and Craig areas are also determined during creel surveys or catch sampling programs.

Area Specific Information and Issues

Ketchikan

The primary species of bottomfish that Ketchikan anglers pursue is halibut, followed by rockfish, and lastly, lingcod. Bottomfish harvests in the Ketchikan area have ranged from a low of 20,214 fish harvested from 17,095 angler-days of effort in 1991 to a high of 30,858 fish from 22,287 angler-days expended in 1989. The average annual harvest for this area between 1989 and 1993 was 23,191, and an average of 18,327 angler-days was expended annually to harvest these fish.

The decreasing trend in harvest for bottomfish in the Ketchikan area is attributed primarily to Board of Fisheries regulation changes that started in 1990. These regulations established a three-fish bag limit on rockfish in the Ketchikan area, which reduced both harvest and effort. Coupled with reduced halibut availability, angler success for bottomfish has decreased over the past several years.

Prince of Wales

The bottomfish sport fishery in the Prince of Wales Island area also targets primarily halibut, followed by rockfish and lingcod. Harvests of these species have ranged from 18,168 fish harvested from 9,336 angler-days of effort in 1989 to 38,512 fish from 12,859 angler-days of effort in 1993. The average yearly harvest for the five years from 1989 to 1993 was 24,931 fish, harvested in an average 9,379 angler-days of effort annually. This information denotes an increasing level of harvest and effort which is accounted for by a dramatic increase in sport fishing pressure on this area's fishery resources. Guided and unguided angler interest in POW fishing has increased threefold in the last five years.

Petersburg/Wrangell

The Petersburg/Wrangell area sport fishery for bottomfish targets three different species. The primary interest is centered on halibut, followed by rockfish, and finally, lingcod. The harvest of these species has ranged from a low of 6,918 with 12,290 angler-days of effort in 1990 to a high of 8,707 with 10,443 angler-days expended, in 1993. The average annual harvest of these fish from 1989 to 1993 was 7,846, and an annual average of 10,940 angler-days was expended to harvest these fish. Angler interest in this area definitely centers around halibut; the remaining species are taken incidentally to halibut and salmon fishing. All three species are viewed primarily as ancillary or fill-in fisheries when salmon fishing is slow.

Sitka

Distribution of bottomfishing effort and Pacific halibut harvest is changing in the Sitka area. In 1993, 95% of bottomfishing effort and 92% of the Pacific halibut harvest occurred inside Sitka or Salisbury sounds. In 1994, however, anglers began regularly fishing outer coastal areas such as the western coast of Kruzof Island. During 1994, the percentage of bottomfishing effort occurring inside Sitka or Salisbury sounds had declined to 76%, while the harvest percentage had declined to 63%.

The charter fishery for bottomfish is extremely well developed and growing in the Sitka area, and the charter fleet is an even larger component of the sport fishery than in Ketchikan. In 1994, the local Sitka charter fleet expended 55% of the total bottomfishing effort in the local area and took 76% of the Pacific halibut harvest. Total bottomfish effort expended by the charter fleet had nearly quadrupled by 1994 from that observed in 1987 (non-charter

effort has increased relatively little over the same period). In 1994, about 36% of all charter effort in Sitka was targeted on bottomfish.

Juneau

Juneau anglers are currently traveling longer distances to more productive grounds for halibut where HPUE (harvest per unit effort) is higher, because halibut abundance is low in the local area (especially for halibut larger than 10 pounds). In 1984, 96% of the Juneau sport harvest of Pacific halibut was taken inside a local fishing area stretching from Doty Cove on the south to Berners Bay on the north and then west to Point Retreat. By 1993, only 60% of the halibut sport harvest was taken in this area, and in 1994, only 49% of the harvest was taken in this area. Bottomfish effort within this local area experienced a dramatic 36% decline from 1993 to 1994, while bottomfishing effort outside the area (>20 miles from Juneau ports) increased by 15%. Due to the long distances involved, many anglers are discouraged from fishing these more distant grounds, so overall bottomfish effort declined in 1994. There is very little effort for either rockfish or lingcod in the Juneau area.

Because of the time and distance involved in travel to productive halibut fishing grounds, charter fishing effort for halibut in the local Juneau area is very limited. In 1994, only 6% of charter angling effort in the Juneau area was targeted on bottomfish; the rest was targeted on salmon. Only 3% of the total bottomfishing effort in the Juneau area was expended by the charter fleet during 1994, and they harvested 7% of the Pacific halibut taken (including halibut taken as incidental harvest by anglers fishing for salmon).

Haines/Skagway

Harvests of Pacific halibut in the Haines/Skagway area have been ranging from 1,000 to 3,600 since 1983 (Table BO2). Few rockfish or lingcod are harvested in this area.

Yakutat

Although Pacific halibut, rockfish, and lingcod are abundant in this area, harvests are limited due to limited fishing effort (Table BO1). The fishery is expected to continue to grow.

SHELLFISH FISHERIES

A wide variety of shellfish species are available to personal use and sport fisheries in Southeast Alaska. The most popular fisheries target Dungeness, Tanner, and king crab with the use of primarily pots, rings, and dive gear. Other shellfish taken include shrimp, hardshell clams, razor clams, scallops, and abalone. The presence of paralytic shellfish poisoning (PSP) toxins in many species of clams and mussels makes consumption of these species hazardous, and ADF&G does not recommend use of clams and mussels at any time.

Noncommercial (Personal Use and Sport) and Commercial Harvests

Postal survey estimates of noncommercial shellfish harvests in Southeast Alaska are only available for 1992 and 1993 for king crab and for 1992 for Dungeness crab (Table SF1). In addition, razor clam harvests in the Sitka area have been estimated since 1977. Creel survey estimates have been made for the Juneau and Ketchikan noncommercial fisheries since 1988, and other areas have been intermittently monitored since this time. Harvests of scallops, abalone, and hard shell clams are not estimated.

Creel survey estimates for the Juneau and Ketchikan areas were used to generate estimates of regional noncommercial harvests of Dungeness crab for 1988–1991 and 1993 based on the ratio of total estimated Southeast Alaska harvest for 1992 to total Juneau and Ketchikan creel survey harvests for 1992.

Similar estimates of regional noncommercial king crab harvests were made using 1992 and 1993 data from Juneau. Estimated noncommercial harvests in numbers (Table SF1) were then converted to pounds, for comparison to commercial harvests (Table SF2). The noncommercial harvest of Dungeness crab has constituted about 2–4% of the combined harvest of these crab species. Noncommercial harvest of king crab has often exceeded the commercial harvest, because the commercial red king crab fishery was closed from 1985 through 1992. The harvest of king crab in the 'sport fishery' (open to nonresidents) has been prohibited since 1989, although residents may take king crab under personal use regulations. Noncommercial harvests of Tanner crab are unlikely to exceed 20,000 pounds; thus noncommercial harvests constitute 1% or less of the total Tanner crab harvest in Southeast Alaska.

Stock Status

Little is known about the stock status of Dungeness and Tanner crab in Southeast Alaska, except from the performance of commercial fisheries, which appear to be fairly stable. Abundance of red king crab is

Table SF1. Estimated noncommercial harvest (numbers) of Dungeness crab and king crab in Southeast Alaska by area, 1992–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Glacier Bay	Yakutat	Total
KING CRAB									
1992	177	141	212	495	9,151	494	106	0	10,776
1993	0	60	121	2,671	9,522	527	0	0	12,901
Mean	89	101	167	1,583	9,337	511	53	0	11,839
Percent	1%	1%	1%	13%	79%	4%	0%	0%	
DUNGENESS CRAB									
1992	9,760	3,337	8,937	6,974	19,452	481	2,789	1,143	52,873
Percent	18%	6%	17%	13%	37%	1%	5%	2%	

Table SF2. Estimated noncommercial and commercial harvest of Dungeness, king, and Tanner crab in thousands of pounds in Southeast Alaska, 1977–1993. Noncommercial data unavailable prior to 1988; noncommercial harvests of crab for years 1988–1991 and 1993 were projected by expanding Juneau and Ketchikan creel survey harvests to the entire regional harvest by using average expansion factors from 1992 and/or 1993 postal surveys. Average weight of noncommercially caught king crab was estimated to be 7.5 pounds; average Dungeness crab weight estimated at 2.2 pounds.

	Dungeness crab				Red (and blue) king crab				Tanner crab
Year	Noncommercial	(%)	Commercial	(%)	Noncommercial	(%)	Commercial	(%)	Commercial
1977			127				285		2,142
1978			750				452		1,560
1979			802				671		1,773
1980			512				529		2,010
1981			2,935				538		3,302
1982			3,644				457		1,222
1983			2,150				320		1,615
1984			1,836				277		1,125
1985			2,313				2		1,007
1986			2,458				1		1,124
1987			3,390				2		1,330
1988	79	2%	3,320	98%	8	49%	8	51%	1,646
1989	56	3%	1,919	97%	26	51%	25	49%	1,994
1990	49	2%	2,677	98%	28	96%	1	4%	2,242
1991	107	2%	4,662	98%	35	94%	2	6%	2,109
1992	116	4%	3,088	96%	81	99%	1	0%	1,563
1993	106	4%	2,537	96%	97	31%	212	69%	1,997

estimated on an annual basis by a stock survey program. King crab are most abundant in inside waters of northern Southeast Alaska. Razor clams are found only on a limited number of outer coast beaches in the Sitka and Yakutat areas. The abundance of razor clams in the Sitka area has declined dramatically since 1993.

Management Approach

Noncommercial harvests of shellfish are generally limited only by bag limits and by legal means and methods of take. Given that commercial harvests of Dungeness and Tanner crab are substantially higher than noncommercial harvests, stock conservation for these species is provided by management of commercial fisheries. In the Juneau area, personal use fisheries for red king crab were restricted in 1993 and 1994 to provide for stock conservation.

Recent Board of Fisheries Actions

In fall 1993, the Board of Fisheries closed bays near Ketchikan, Juneau, and Haines to commercial Dungeness crabbing to allow for personal use or sport harvests. Personal use shrimp pot limits were also increased to 10 per person, 20 per vessel, and longlining of these pots was allowed. Bag limits for rock scallops of 5 per day, 5 in possession were imposed for both sport and personal use fisheries, along with a limit of 10 per day, 10 in possession for weathervane scallops.

Current Issues

Conflicts between personal use and commercial crabbers seem to be at the core of many shellfish management issues in Southeast Alaska. Many proposals are submitted by personal use crabbers to the Board of Fisheries to restrict commercial fisheries from operating near communities throughout Southeast Alaska. In the past, the Board of Fisheries has closed commercial shellfish fisheries in limited areas of Southeast Alaska to reduce such conflicts.

Another issue of concern arises from the rapid growth of the personal use fishery for red king crab in the Juneau area since 1988. Coupled with increased red king crab stock abundance in Southeast Alaska waters that has supported a commercial fishery, this rapid growth has led to potential conservation and allocation problems. Red king crab stocks could be overharvested if both personal use and commercial fisheries are allowed to fish areas near Juneau; both have therefore been restricted for the last several years.

Research and Management Activities

No research is being conducted by Division of Sport Fish staff on shellfish in Southeast Alaska, with the exception of a study of razor clams in Sitka. Management activities are limited to obtaining effort, harvest, and CPUE statistics for shellfish during creel surveys of chinook salmon fisheries in the Juneau, Ketchikan, and Petersburg/Wrangell areas. An additional stock monitoring program for red king crab is being planned for the Juneau area.

Area Specific Information and Issues

Ketchikan

Sport and personal use fishing interest for shellfish in the Ketchikan area centers primarily on harvest of Dungeness crab and shrimp. Only 1992 data on Dungeness crab are available from the statewide harvest survey, but additional information has been gathered during operation of onsite creel surveys. Information obtained during this program noted that harvest of Dungeness crab has varied from 2,688 in 1989 to 10,227 in 1992, with an average harvest of 6,562 (Table SF3). Tanner crab harvest has been minimal, averaging 24 yearly. Shrimp harvest has varied dramatically during this period: 12,730 were reported in 1989 and 130,720 in 1992. The average annual harvest was 53,418 (Table SF3). Angler harvest of all species in this area varies greatly, primarily on the basis of time spent conducting other activities such as setting crab and shrimp pots while actively sport fishing for salmon and bottomfish species.

Prince of Wales

Only limited data are available on the harvest of shellfish by sport and personal use anglers utilizing Prince of Wales Island. Onsite creel survey data summarized in Table SF3 indicate that shrimp are an important species (4,120 harvested), followed by Dungeness crab (1,120 harvested). Ancillary information provided to the department indicates that a small harvest of king crab also occurs during winter and spring months, which are periods outside of the dates when the onsite creel survey project operates in this area. Furthermore, information in Table SF3 on shrimp and Dungeness crab should be viewed as a minimum figure, since considerable effort for shellfish occurs outside of the onsite creel survey project operational period.

Petersburg/Wrangell

Onsite creel survey information contained in Table SF3 indicates that shellfish harvest in this area is an important component of the activities undertaken by local residents (personal use) and nonresidents (sport

Table SF3. Shellfish harvest for major sport fisheries in southern Southeast Alaska monitored by creel surveys, 1989–1993.

	Year					
Area and species	1989	1990	1991	1992	1993	Mean
KETCHIKAN						
Dungeness crab	2,688	3,367	7,631	10,227	8,897	6,562
Tanner crab	100	0	0	22	0	24
King crab	0	0	0	0	0	0
Shrimp	12,730	17,130	69,450	130,720	37,060	53,418
PRINCE OF WALES						
Dungeness crab	no data	no data	no data	1,120	no data	—
Tanner crab	no data	no data	no data	0	no data	—
King crab	no data	no data	no data	0	no data	—
Shrimp	no data	no data	no data	4,120	no data	—
PETERSBURG						
Dungeness crab	1,388	no data	no data	694	2,375	1,152
Tanner crab	31	no data	no data	778	70	293
King crab	0	no data	no data	0	0	0
Shrimp	no data	no data	no data	6,180	7,340	6,670

fishers) alike. Shrimp harvest is the most important component of shellfish harvest, with an average yearly harvest of 6,760. Next in importance are Dungeness crab (1,152 average yearly harvest) and Tanner crab (293 average yearly harvest). Residents of this area also engage in harvest of king crab, but mainly in the winter and spring months, which are outside of the operational period for the onsite creel program, and a considerable Dungeness crab and shrimp harvest similarly occurs in winter and spring.

Sitka

Some Dungeness crab are taken in the local Sitka area, and king and Tanner crab are available about 40 miles from Sitka. Generally no management actions are taken to regulate these fisheries.

Sitka Sound Razor Clam Fishery

The razor clam fishery in the Sitka Area is dependent on a very limited resource. Razor clams occur on beaches in the Sitka Sound, primarily on Kruzof Island. The majority of the fishery takes place on Kamenoi Beach in an area about 0.7 km long. This fishery is very popular with local residents when weather and tide conditions are favorable. Bad weather during the few good tides in the spring months can limit harvest, as a -2.0-foot tide is desirable and clam beaches are exposed to the ocean swell.

Statewide harvest study data (Mills) show that harvests were quite high in the late 1970s and early 1980s but have been much lower in recent years (Figure SF1). There is believed to be no recruitment from outside of the area, for this population of clams is hundreds of miles from any other known population. Reproductive failures in some years likely contribute to population fluctuations and variable harvest.

Clam diggers became alarmed by an apparent lack of razor clams in spring 1993, and the Department received numerous calls expressing concern and wondering what had happened to the clam population. Department surveys during the April and May low tide series documented the lack of success diggers were having; experienced diggers interviewed on the beach had been able to find only a very few clams. Members of the public suggested that the Department close the area to digging for razor clams to allow the few remaining individuals to spawn and hopefully repopulate the beaches.

Theoretical causes of the decline in abundance could include changes in tidal currents which washed out clams, high populations of sea otters which prey on clams, overexploitation by diggers, unfavorable weather, and disease.

There is anecdotal evidence for some of these theoretical factors. In fall 1993, Marlene Campbell, who works with the City of Sitka, reported that many razor clams were washed out on the left end of the razor clam beach. Clams were lying on the surface as if they had been washed out by a dredge. This may have been the result of a change in tidal currents, and similar phenomenon have been observed on the Kenai (Dave Nelson, personal communication).

Sea otters were observed near Low Island about 6 miles from the clam beach in 1987 and 1988, and a group of about 200 were seen in inner Sitka Sound by October 1991. We do not have systematic surveys on the otter population's location and movements, but we assume they moved into Sitka Sound sometime between 1988 and the October 1991 observation.

A local clam digger described a strange occurrence of razor clams being exposed with about half of their shells out of the sand at Kamenoi Beach during December 1991. He reported that when he went to dig clams they were exposed in this manner and that the weather at the time was about 15°F with a cold north wind blowing. He said it appeared that every clam on the beach was exposed at the time. He mentioned this incident on July 6, 1993, because he was trying to figure out why no one could find razor clams during spring 1993 and wondered if there might be a connection. This incident sounds very

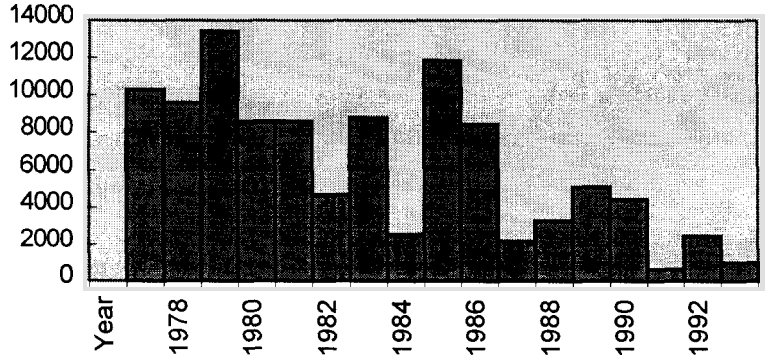

Figure SF1. Razor clam harvests from Sitka Sound for years 1977–1993.

similar to one described by Doug Simons, Project Manager for Razor Clam Management in Washington. In Washington during 1985, clams had already been diagnosed with nuclear inclusion X (NIX), but extreme cold conditions actually froze the clams as they exposed themselves on the beaches at low tide.

A dive survey was conducted in the subtidal area of the clam beach on June 4, 1993, to determine if the subtidal population of clams was still present. Diving in the area below the -2.6 tide level did not produce encouraging observations. Three divers spent a total time of over 3 hours (each dove one tank in shallow water) exploring the area and found a very limited area with razor clams. Essentially none were found in the nearshore area (above -5 feet) where good concentrations were observed in the past. The past observations were also made with SCUBA gear, but about 18 years ago. At that time there were extensive beds of clams in this depth range. A few individual clams and two areas of heavier concentration were found at depths of -7 to -12-foot tide. The area offshore of the southern end of the beach contained the majority of clams observed.

At a depth of about -12 feet, an unidentified animal had been digging something out of the substrate. At several of these digs there was dirt piled to one side of the hole and what appeared to be depressions or 'tracks' in the excavated mound. A sea otter was observed in the area. These digs were at the same depth as the majority of the razor clams seen although there were also some horse clams showing at this depth.

The upper beach appears to have changed configuration. The beach at about zero tide level is composed of coarser material than before, and the sloping, smooth sand which was once exposed between 0 and -3-foot tide level is now very limited. The upper part of this zone seems steeper, with a more gravelly substrate.

In summary, the apparent lack of clams was not a simple matter of clams not 'showing.' Our dive survey did not find the extensive subtidal clam beds which were once present. There appears to have been a change in the composition and configuration of the southern half of the beach. Sea otters are present in the immediate area, although the concentrations of sea otters which were in Sitka Sound beginning in October 1991 are no longer present. Something has been digging holes in the subtidal areas where razor clams and some horse clams are still present.

A sample of razor clams was dug and sent live to Battelle Laboratory for disease analysis on July 23, 1993. Thirty-seven clams were examined for shell length and sex, and tissues from the gill, gonad, digestive gland, mantle and siphon were prepared for histological examination. The tissues were then examined for the presence of known infectious diseases of razor clams such as nuclear inclusion X, tapeworms, or other abnormalities (Table SF4).

There was no evidence of NIX in any of the clams. In addition, only one of the 37 clams examined showed a significant lesion. This clam had a trematode infec-

Table SF4. Analyses of razor clams sampled for disease July 21, 1993.

		Presence of disease by tissue type				
				Digestive		
Length (mm)	Reproductive condition	Gill	Gonad	gland	Mantle	Siphon
109	Mature female	none	none	none	none	none
106	Developing female	none	none	none	none	none
86	Mature male	none	none	none	none	none
124	Mature male	none	none	none	none	none
102	Mature female	none	none	none	none	none
120	Mature female	none	none	none	none	none
90	Spawned male	none	none	none	none	none
95	Developing female	none	none	none	none	none
140	Mature female	none	none	none	none	none
121	Mature female	none	none	none	none	none
72	Developing male	none	none	none	none	none
113	Developing female	none	none	none	none	none
98	Mature female	none	none	none	none	none
74	Mature female	none	none	none	none	none
105	Mature male	none	none	none	none	none
62	Developing male	none	none	none	none	none
47	Not developing	none	none	none	none	none
44	Not developing	none	none	none	none	none
37	Not developing	none	none	none	none	none
43	Not developing	none	none	none	none	none
106	Mature male	none	none	none	none	none
90	Mature female	none	none	none	none	none
74	Mature female	none	none	none	none	none
89	Mature male	none	none	none	none	none
91	Mature female	none	none	none	none	none
120	Mature female	none	none	none	none	none
85	Mature male	none	none	none	none	none
105	Mature female	none	none	none	none	none
102	Mature female	none	none	none	none	none
106	Spawned male	none	none	none	none	none
67	Not developed	none	none	none	none	none
89	Mature female	none	none	none	none	none
124	Spawned male	none	none	none	none	none
85	Mature female	none	none	none	none	none
82	Developing male	none	none	none	none	none
134	Unable to develop	trematode	trematode	none	none	none
65	Developing male	none	none	none	none	none

tion in the gill and gonadal tissue. Such infections can have a serious impact on clam populations if they occur at a sufficiently high frequency. This trematode can eliminate reproductive development in clams and at high intensities can be fatal to clams.

Table SF5. Age and length of razor clams dug during two hours of effort at Kamenoi Beach, July 22, 1994.

Age	Total length (mm)	Length of shell at annulus formation 1	2	3	4	5	6	7	8
1	54	8.5							
1	50	8.3							
1	63	12.7							
1	54	14.2							
1	55	14.4							
1	56	17.3							
1	48	8.1							
2	79	13.7	39						
2	81	7.8	43						
2	84	11.3	48						
2	88	10.9	45						
2	75	13.5	49						
2	90	16.2	52						
2	83	14.9	47						
2	78	12.8	43						
2	89	16.2	51						
2	88	13.7	54						
2	87	14.5	46						
2	77	13.0	29						
2	83	13.8	36						
2	83	13.5	46						
2	90	7.5	53						
2	83	14.1	41						
2	72	7.1	43						
2	91	8.1	54						
2	86	12.6	45						
2	87	9.7	41						
2	83	11.1	42						
2	83	9.8	42						
2	91	11.1	51						
2	83	10.3	46						
2	86	15.0	58						
2	84	13.4	44						
3	97	11.4	35	76					
3	107	6.7	46	83					
3	106	broken	51	84					
3	101	11.8	32	77					
3	101	5.6	27	75					
3	105	7.6	44	80					
3	110	8.0	48	91					
3	104	10.9	36	77					
3	101	5.9	45	77					
3	97	9.3	29	75					
3	103	14.7	41	84					
4	113	11.2	41	82	100				
4	108	9.2	49	82	95				
4	110	14.9	40	77	93				
5	113	14.0	34.9	78	98	109			
5	118	7.3	43	83	100	110			
5	111	12.5	40	77	96	105			
6	122	14	54	90	103	110	118		
6	129	15	52	93	108	117	124		
6	136	23	47	99	117	125	130		
6	125	13	37	77	97	110	118		
7	137	19.0	47	76	96	113	122	128	
7	136	19	46	93	117	126	129	133	
8	143	23	49	92	109	117	123	131	137

In summary, the clams examined appeared healthy by gross and histological criteria. It is possible, however, that these clams represent the survivors of a mortality event which might have killed a segment of the population.

Current Research Program

A monitoring program was begun in 1994 to monitor general abundance, size, and age of razor clams on Kamenoi Beach. A sample of razor clams is collected periodically during favorable tides by two diggers digging for one hour each and covering the entire known razor clam distribution. All clams are then measured and aged for comparison with other samples (Table SF5). This program will identify successful reproduction and relative strength of age classes. Age composition of the sample dug in July 1994 was 77% ages 1 through 3 and only 23% ages 4 through 8 (Table SF5). Mean size of clams at time of annulus formation was: first annulus, 12.3 mm (N = 56); 2nd annulus, 44 mm (N = 50); 3rd annulus, 82 mm (N = 24); 4th annulus, 102 mm (N = 13); 5th annulus, 114 mm (N = 10); 6th annulus, 123 mm (N = 7); 7th annulus, 131 mm (N = 3); and 8th annulus, 137 mm (N = 1).

Management and Regulations

After the population problem was documented, an emergency order was written which closed Sitka Sound beaches to digging or retention of razor clams. This closure will remain in effect until a documented increase in the population and observed reproduction in the population. The Board of Fisheries in November 1993 modified the bag and possession limit for razor clams in the Sitka Sound Area such that when the season is reopened the limit will be reduced from 50 to 10 clams.

Juneau /Glacier Bay

Dungeness and king crab are the crab species most often targeted in the Juneau area, although Tanner crab are occasionally taken. Shrimp are not generally found in large numbers in the Juneau area. Dungeness crab is the primary shellfish species targeted in Glacier Bay.

Personal Use Red King Crab Fishery

The summer personal use king crab fishery in the local Juneau area has been intensively monitored by creel surveys since 1988. Harvests of king crab along

with crab fishing effort in the local Juneau area fishery have increased dramatically since 1988 (Table SF6). Some of the increase in crab fishing effort documented during the past seven years is probably due to increased effort on Dungeness crab, as the personal use fishery for this species is also growing in the Juneau area (personal use fishing effort for Dungeness crab in May and June approximately doubled from 1988 to 1994). A large part of the increase in effort, however, is probably due to increases in the number of participants in the king crab fishery. One indicator that more people are targeting king crab is a noticeable increase during the past five years in personal use boats outfitted with crab blocks and winches suitable for pulling king crab pots from deep water. In 1994, about 67% of the total crab fishery effort after July 1 was targeted on king crab. Under personal use fishing regulations, only residents of Alaska are allowed to take red king crab.

Table SF6. Estimated crab fishing effort (for all species) and harvests of king crab in the Juneau area for months of July through September, 1988–1994.

Year	Survey dates	Effort (boat-days) [a]	King crab harvest	
			Number	Weight [b]
1988	7/01-9/25	1,586	552	4,140
1989	7/01-9/24	1,485	1,849	13,868
1990	7/01-9/23	1,796	1,960	14,700
1991	7/01-9/29	2,728	2,467	18,503
1992	7/01-9/27	3,540	5,673	42,548
1993	7/01-9/26	4,533	8,963	67,223
1994	7/01-9/25	3,978	5,925	44,438

[a] Includes some fishing effort for Dungeness and Tanner crab.

[b] Weight estimated using an average round weight of 7.5 pounds.

In the summer of 1993, surveys of red king crab abundance in a number of bays in Southeast Alaska indicated that stocks had rebuilt to adequate levels to support a commercial red king crab fishery. The commercial red king crab fishery in Southeast Alaska had been closed since the fall of 1984. Prior to 1984, the commercial red king crab fishery in the Juneau area was substantial. The growth of the personal use fishery since 1988 led to concerns that allowing both personal use and commercial fisheries to operate in the local Juneau area could lead to overharvest of local king crab stocks. The commercial harvest rate for red king crab is set at approximately 30% on a regional basis.

Emergency orders were therefore issued to limit harvests of red king crab in the Juneau area by both personal use and commercial fishers. From October 4, 1993 through March 31, 1994, an emergency order prohibited the use of crab pots and rings by personal use fishers in waters deeper than 100 feet in an area surrounding Auke Bay. This area and additional waters in commercial fishing District 11A were also closed during the November 1–9 and November 27– December 3, 1993 commercial red king crab season. In 1994, a similar conflict occurred, and all personal use harvest of king crab was prohibited in the Auke Bay area by emergency order from October 25, 1994 through March 31, 1995, while the commercial fishery was again closed in a somewhat larger area.

Since user group conflicts will probably occur on an annual basis, given king crab stocks adequate to support a commercial fishery, proposals concerning the personal use fishery for red king crab in the Juneau area were scheduled for consideration during the Alaska Board of Fisheries meeting in March of 1995.

CHUM SALMON

Chum salmon are abundant throughout Southeast Alaska. Fisheries are based on maturing adult fish in their final year of life. In Southeast Alaska, most chum salmon mature in four years, with some variation in the number of saltwater years. Chum salmon are commonly taken in fisheries from late June into September and weigh from 6 to 20 pounds. Chum salmon are primarily plankton feeders, and as such, are taken in large numbers in net fisheries while hook and line catches are quite small.

Management

Commercial seine and gillnet fisheries target chum salmon in weekly fishing periods which vary from a few hours to several days, depending on run strength. Chum salmon harvested in the commercial troll and marine sport fisheries are taken incidentally, for the most, by fishermen who are targeting coho and pink salmon. Recently the troll fleet began targeting chum salmon in the early summer fisheries in some areas. Commercial trollers are also beginning to target large returns of hatchery produced chum salmon.

Commercial fisheries in Southeast Alaska account for virtually 100% of the chum salmon harvest. From 1989 through 1993, commercial fisheries harvested over 4,000,000 chum annually (Table CS1), while the sport fishery harvested only 7,000 fish (Table CS2).

Overall, only a small portion of sport fishery effort is directed toward chum salmon, either marine or freshwater fisheries (Table CS3). Two of the most important chum salmon fisheries in the region are provided by hatchery returns in Juneau (since 1985) and a wild run of chum salmon in the Chilkat River near Haines.

The regionwide bag limit for chum salmon is 6 fish per day and 12 in possession. This limit applies to both marine and fresh waters that are open to fishing and has been in effect since 1983. Based on the level of sport effort and harvest and sport fishery impact on annual returns of chum salmon, there is no active in-season sport fishery management program. Only in hatchery special harvest areas have sport fisheries been closed to protect returning hatchery brood stocks.

Enhancement

Chum salmon enhancement is conducted by six operators in 17 different locations in Southeast Alaska. In total, these facilities are permitted for release of 586.6 million chum salmon fry. Facilities that release chum salmon in Southeast Alaska are listed in Table CS4.

Area Specific Information

There are no targeted sport fisheries for chum salmon in the Petersburg/Wrangell, Prince of Wales Island, or Yakutat areas. A summary of chum salmon sport fisheries in other Southeast Alaska areas follows.

Ketchikan

The Ketchikan area lacks a targeted marine chum salmon sport fishery; however, Fish Creek, near Hyder, supports a targeted freshwater sport fishery. This fishery runs from about July 1 through September, with a peak of the run in the first week of August. Fish Creek chum salmon are quite large, ranging from 10 to 30 pounds, with an average weight of about 18 pounds. Snagging has been a problem at Fish Creek; since 1991 Fish Creek has been restricted to use of single hooks only.

Sitka

Sitka historically had no targeted chum salmon sport fisheries; however, in 1993 local anglers harvested 2,038 chum salmon. Nearly 1,900 of these fish were taken in the marine fishery and were fish destined for Medvejie Hatchery located south of Sitka in Silver Bay. Most angling for chum salmon takes place from Viskari Rocks into Silver Bay

Juneau/Glacier Bay

The Glacier Bay area has a large return of chum salmon to Excursion Inlet; however, this run is not targeted by sport fishermen. Chum salmon harvested

Table CS1. Southeast Alaska region annual commercial chum salmon catches by gear, 1960 to 1993.

Year	Seine		Drift gillnet		Set gillnet		Troll		Annette Island		Hatchery controlled		Miscellaneous fishery[a]		Total
1960	726,017	(78%) [b]	199,887	(21%)	277	(0%)	2,453	(0%)	3,796	(0%)	0	(0%)	0	(0%)	932,430
1961	2,172,066	(89%)	251,900	(10%)	11,038	(0%)	2,679	(0%)	8,648	(0%)	0	(0%)	0	(0%)	2,446,331
1962	1,593,386	(87%)	233,421	(13%)	616	(0%)	2,676	(0%)	6,911	(0%)	0	(0%)	0	(0%)	1,837,010
1963	1,186,182	(81%)	265,251	(18%)	10,294	(1%)	6,230	(0%)	2,282	(0%)	0	(0%)	0	(0%)	1,470,239
1964	1,661,431	(86%)	250,045	(13%)	1,481	(0%)	2,576	(0%)	12,301	(1%)	0	(0%)	0	(0%)	1,927,834
1965	1,185,569	(81%)	269,986	(18%)	4,094	(0%)	6,359	(0%)	248	(0%)	0	(0%)	0	(0%)	1,466,256
1966	2,846,425	(88%)	365,070	(11%)	3,396	(0%)	5,203	(0%)	7,308	(0%)	0	(0%)	0	(0%)	3,227,402
1967	1,545,057	(86%)	250,050	(14%)	4,459	(0%)	7,051	(0%)	323	(0%)	0	(0%)	0	(0%)	1,806,940
1968	2,251,556	(85%)	363,713	(14%)	13,866	(1%)	2,791	(0%)	4,281	(0%)	0	(0%)	0	(0%)	2,636,207
1969	332,679	(59%)	209,510	(37%)	17,211	(3%)	1,708	(0%)	258	(0%)	0	(0%)	0	(0%)	561,366
1970	1,936,903	(79%)	494,438	(20%)	10,147	(0%)	3,235	(0%)	1,387	(0%)	0	(0%)	0	(0%)	2,446,110
1971	1,496,399	(77%)	435,737	(22%)	6,367	(0%)	7,602	(0%)	0	(0%)	0	(0%)	0	(0%)	1,946,105
1972	2,168,751	(74%)	744,150	(25%)	12,887	(0%)	11,634	(0%)	5,290	(0%)	0	(0%)	0	(0%)	2,942,712
1973	1,219,552	(67%)	592,982	(32%)	8,995	(0%)	10,460	(1%)	226	(0%)	0	(0%)	0	(0%)	1,832,215
1974	999,601	(59%)	666,336	(40%)	4,185	(0%)	13,818	(1%)	375	(0%)	0	(0%)	0	(0%)	1,684,315
1975	381,109	(56%)	297,544	(43%)	3,761	(1%)	2,784	(0%)	1,306	(0%)	0	(0%)	0	(0%)	686,615
1976	511,805	(50%)	503,265	(49%)	7,746	(1%)	4,251	(0%)	3,810	(0%)	0	(0%)	0	(0%)	1,030,877
1977	338,657	(46%)	364,590	(49%)	8,651	(1%)	11,617	(2%)	15,208	(2%)	0	(0%)	0	(0%)	738,723
1978	521,880	(60%)	288,959	(33%)	6,181	(1%)	26,193	(3%)	25,605	(3%)	0	(0%)	145	(0%)	868,963
1979	438,175	(49%)	401,164	(45%)	7,399	(1%)	24,661	(3%)	16,437	(2%)	0	(0%)	437	(0%)	888,273
1980	1,002,091	(61%)	548,389	(33%)	20,151	(1%)	12,048	(1%)	57,064	(3%)	0	(0%)	1,771	(0%)	1,641,514
1981	517,002	(62%)	270,230	(32%)	10,655	(1%)	8,680	(1%)	30,312	(4%)	1	(0%)	360	(0%)	837,240
1982	826,721	(62%)	448,818	(34%)	6,320	(0%)	5,701	(0%)	40,829	(3%)	773	(0%)	339	(0%)	1,329,501
1983	577,649	(49%)	516,639	(44%)	11,195	(1%)	20,308	(2%)	24,237	(2%)	18,269	(2%)	244	(0%)	1,168,541
1984	2,433,719	(60%)	1,030,248	(25%)	32,230	(1%)	28,028	(1%)	104,949	(3%)	453,204	(11%)	968	(0%)	4,083,346
1985	1,852,511	(57%)	1,134,275	(35%)	12,466	(0%)	52,908	(2%)	86,386	(3%)	130,363	(4%)	6,055	(0%)	3,274,964
1986	2,199,489	(65%)	815,519	(24%)	16,616	(0%)	51,391	(2%)	117,201	(3%)	157,155	(5%)	1,566	(0%)	3,358,937
1987	1,234,800	(45%)	747,484	(27%)	14,555	(1%)	12,843	(0%)	109,168	(4%)	594,436	(22%)	6,943	(0%)	2,720,229
1988	1,624,865	(46%)	1,142,634	(32%)	29,247	(1%)	88,393	(3%)	127,266	(4%)	514,054	(15%)	6,650	(0%)	3,533,109
1989	1,078,656	(55%)	542,839	(28%)	16,233	(1%)	68,988	(4%)	65,415	(3%)	193,428	(10%)	3,262	(0%)	1,968,821
1990	1,062,522	(48%)	616,441	(28%)	5,813	(0%)	62,811	(3%)	84,519	(4%)	376,499	(17%)	4,308	(0%)	2,212,913
1991	2,126,653	(64%)	712,125	(21%)	2,979	(0%)	28,460	(1%)	82,120	(2%)	373,764	(11%)	8,226	(0%)	3,334,327
1992	3,204,261	(65%)	845,535	(17%)	7,620	(0%)	85,013	(2%)	102,274	(2%)	695,451	(14%)	7,455	(0%)	4,947,609
1960–1992 average	1,371,338	(68%)	509,675	(25%)	9,974	(0%)	20,653	(1%)	34,780	(2%)	106,285	(5%)	1,477	(0%)	2,054,182
Preliminary 1993	4,556,840	(60%)	1,398,530	(18%)	4,065	(0%)	525,847	(7%)	63,083	(1%)	1,054,398	(14%)	9,827	(0%)	7,612,590

[a] Includes salmon that were confiscated, caught in sport fish derbies, or commercial test fisheries, and sold.

[b] Percentages may not total 100, due to rounding.

Table CS2. Recreational fishing effort expended in chum salmon fisheries in Southeast Alaska, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau	Haines/ Skagway	Glacier Bay	Yakutat	Total	Percent of total
MARINE ANGLER-DAYS (boat and shore)										
1989	0	0	0	0	3,139	0	0	0	3,139	0.9
1990	0	0	0	0	2,663	0	0	0	2,663	0.7
1991	0	0	0	0	3,371	0	0	0	3,371	0.9
1992	0	0	0	0	3,862	0	0	0	3,862	1.0
1993	0	0	0	0	2,191	0	0	0	2,191	0.6
FRESHWATER ANGLER-DAYS										
1989	97	88	59	80	229	689	0	0	1,244	1.5
1990	105	81	194	42	286	1,081	0	0	1,789	2.0
1991	171	108	66	129	261	524	0	0	1,257	1.5
1992	97	89	130	85	495	524	0	0	1,420	1.7
1993	129	75	86	117	507	518	0	0	1,432	1.6

Table CS3. Recreational harvest of chum salmon in Southeast Alaska, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau/ Glacier Bay	Haines/ Skagway	Yakutat	Total
1989	1,966	640	614	1,541	3,426	675	70	8,932
1990	872	234	178	762	2,267	637	12	4,962
1991	1,168	326	207	373	3,001	420	98	5,593
1992	1,268	207	321	459	3,573	213	0	6,041
1993	1,882	961	140	2,038	3,565	725	69	9,380

in the Glacier Bay area are taken incidentally in salt waters while anglers are targeting other species of salmon. Chum salmon have been returning to PNP enhancement facilities in Juneau since 1985. Douglas Island Pink and Chum Salmon Inc. (DIPAC) release sites for chum salmon include: Fish Creek, hatcheries in Gastineau Channel, Boat Harbor in Lynn Canal, and at Amalga Harbor on the Juneau road system. In total, DIPAC is permitted for a 111,000,000 chum release annually. Sport anglers began targeting chum salmon destined for Sheep Creek and Gastineau hatcheries, as well as returns to Amalga Harbor, in 1985. There is a high rate of catch-and-release of chum salmon at the Juneau enhancement sites. The Boat Harbor remote chum release site is intended to benefit the gillnet fleet, and no sport effort is directed on returns to this site.

Haines/Skagway

The Chilkat River, near Haines, has a large run of wild chum salmon which supports a freshwater sport fishery. The Haines Highway parallels the Chilkat River for several miles and provides excellent access to the river. The sport fishery for chum salmon runs from late summer through fall, and as many as several hundred fish are harvested annually.

Table CS4. Permitted capacities of facilities that conduct chum salmon enhancement in Southeast Alaska.

Operator	Area	Site	Permitted capacity (m)
SSRAA	Ketchikan	Whitman Lake	45.8
	Ketchikan	Nakat Inlet	
	Wrangell	Gail West Cove	
	Pr. of Wales I.	Kendrick Bay	
	Ketchikan	Neets Bay	80.0
NSRAA	Sitka	Medvejie Creek	38.0
	Chatham	Hidden Falls	141.0
	Haines	Haines Project	1.3
AAI	Wrangell	Burnett Inlet	60.0
BCF	Skagway	Burro Creek	5.0
DIPAC	Juneau	Sheep Creek	151.0
	Juneau	Gastineau	
	Stephens Pass	Limestone Inlet	
	Lynn Canal	Boat Harbor	
KNFC	Kake	Gunnuk Creek	59.5
		Southeast Cove	
SJC	Sitka	Indian River	5.0

SOCKEYE SALMON

Sockeye salmon stocks occur throughout Southeast Alaska. The largest runs are at McDonald Lake, Chilkoot and Chilkat Lakes, the Taku and Stikine rivers, and the Situk River. Smaller runs are located throughout Southeast Alaska on smaller drainages containing lakes.

Juvenile sockeye feed on plankton in freshwater lakes for one or two years before outmigrating to salt water, but a small percentage outmigrate to salt water as 'O' checks the same year they hatch. In salt water, sockeye feed on plankton for two or three years before returning to parent streams to spawn. It is in their final year of life that they are targeted in commercial and sport fisheries.

Management

As plankton feeders, sockeye salmon are rarely caught on commercial trolling or sport fishing gear used for other salmon species (Table SO1). Nearly 100% of the sockeye salmon harvested in Southeast Alaska are taken in commercial net fisheries. Since 1989, commercial harvests have averaged 2,440,254 sockeye salmon, while recreational harvests have averaged 17,419 (Table SO2).

In recent years, the commercial troll catch has been increasing, owing to increased abundance of sockeye and the targeting of sockeye, chum and pink salmon by some fishermen, especially early in the troll season (Table SO1).

Sockeye are a prized sport fish but are rarely taken in salt water (Table SO2), and sport fishing effort—especially in salt water—is minimal (Table SO3). In fresh water, about 10% of annual fishing effort regionally is directed at sockeye salmon. The region-wide bag limit for sockeye salmon in Southeast Alaska and Yakutat is 6 per day and 12 in possession. In the Juneau area, the bag and possession limit is one sockeye per day and a seasonal limit of 5 sockeye over 16 inches; catches must be recorded on the back of fishing license or harvest ticket.

Enhancement

Sockeye salmon are currently produced by the Northern and Southern Southeast Regional Aquaculture Associations at ten locations in Southeast Alaska. Most enhancement of sockeye salmon is conducted for the benefit of commercial seine and gillnet fisheries, and those fisheries harvest approximately 355,000 sockeye from enhancement projects annually (Annual Hatchery Reports). The annual hatchery reports also list an estimated sport harvest of 800 and subsistence-personal use contribution of nearly 16,000 sockeye salmon in 1993.

Area Specific Information

A summary of the known sockeye salmon sport fisheries in Southeast Alaska and Yakutat is shown in Table SO4.

Ketchikan

The Ketchikan area lacks a targeted saltwater sport fishery for sockeye salmon; however, an average of 1,189 sockeye are reportedly taken annually from salt water. Freshwater fisheries occur at McDonald Lake and in the Naha River drainage. Annual harvests from McDonald Lake and the Naha River drainages average 6 and 144 sockeye, respectively. Sockeye enhancement is conducted at McDonald Lake, and a portion of the sport harvest may be from stocked fish.

Prince of Wales Island

Prince of Wales Island has no targeted saltwater sockeye salmon fisheries. Freshwater fisheries occur at the Sarkar and Karta rivers and, to a much smaller degree, at Klawock River (Table SO5). The Karta River drainage has produced an average harvest of 470 sockeye salmon from 1989 to 1993; however, during that same time frame the harvest dropped from 1,104

Table SO1. Southeast Alaska regional annual commercial sockeye salmon catches by gear, in numbers and percent, 1960 to 1993.

Year	Seine		Drift gillnet		Set gillnet		Troll		Annette Island		Hatchery controlled		Miscellaneous fishery[a]		Total
1960	358,697	(67%) [b]	127,058	(24%)	44,671	(8%)	939	(0%)	1,753	(0%)	0	(0%)	0	(0%)	533,118
1961	418,952	(61%)	169,724	(25%)	82,403	(12%)	1,264	(0%)	9,949	(1%)	0	(0%)	0	(0%)	682,292
1962	411,748	(57%)	233,082	(32%)	73,937	(10%)	1,181	(0%)	7,489	(1%)	0	(0%)	0	(0%)	727,437
1963	422,605	(63%)	194,420	(29%)	52,517	(8%)	2,014	(0%)	4,194	(1%)	0	(0%)	0	(0%)	675,750
1964	570,250	(62%)	246,250	(27%)	90,175	(10%)	1,004	(0%)	11,445	(1%)	0	(0%)	0	(0%)	919,124
1965	672,001	(62%)	279,349	(26%)	120,417	(11%)	1,872	(0%)	3,359	(0%)	0	(0%)	0	(0%)	1,076,998
1966	480,024	(46%)	334,702	(32%)	185,360	(18%)	679	(0%)	45,310	(4%)	0	(0%)	0	(0%)	1,046,075
1967	600,602	(62%)	274,038	(28%)	88,431	(9%)	157	(0%)	3,170	(0%)	0	(0%)	0	(0%)	966,398
1968	494,851	(60%)	245,865	(30%)	80,776	(10%)	574	(0%)	4,129	(0%)	0	(0%)	0	(0%)	826,195
1969	338,217	(42%)	348,298	(43%)	123,303	(15%)	444	(0%)	970	(0%)	0	(0%)	0	(0%)	811,232
1970	307,793	(46%)	240,700	(36%)	115,992	(17%)	477	(0%)	2,947	(0%)	0	(0%)	0	(0%)	667,909
1971	162,823	(26%)	328,774	(53%)	130,743	(21%)	929	(0%)	0	(0%)	0	(0%)	0	(0%)	623,269
1972	323,927	(35%)	449,019	(49%)	134,536	(15%)	1,060	(0%)	8,178	(1%)	0	(0%)	0	(0%)	916,720
1973	348,679	(34%)	532,164	(53%)	128,412	(13%)	1,222	(0%)	1,118	(0%)	0	(0%)	0	(0%)	1,011,595
1974	235,934	(34%)	363,857	(53%)	82,413	(12%)	2,603	(0%)	2,615	(0%)	0	(0%)	0	(0%)	687,422
1975	61,877	(25%)	108,334	(44%)	73,260	(30%)	1,098	(0%)	622	(0%)	0	(0%)	0	(0%)	245,191
1976	135,811	(23%)	322,984	(54%)	130,176	(22%)	1,266	(0%)	5,022	(1%)	0	(0%)	0	(0%)	595,259
1977	327,966	(30%)	538,301	(50%)	185,377	(17%)	5,701	(1%)	27,798	(3%)	0	(0%)	0	(0%)	1,085,143
1978	272,197	(35%)	358,917	(46%)	130,681	(17%)	2,804	(0%)	23,619	(3%)	0	(0%)	101	(0%)	788,319
1979	397,137	(37%)	472,610	(44%)	165,069	(15%)	7,018	(1%)	31,345	(3%)	0	(0%)	478	(0%)	1,073,657
1980	513,266	(46%)	408,296	(37%)	159,564	(14%)	2,921	(0%)	23,734	(2%)	0	(0%)	568	(0%)	1,108,349
1981	438,921	(41%)	438,824	(41%)	149,273	(14%)	7,476	(1%)	37,528	(4%)	1	(0%)	178	(0%)	1,072,201
1982	457,198	(31%)	748,963	(50%)	211,613	(14%)	2,366	(0%)	69,689	(5%)	1	(0%)	204	(0%)	1,490,034
1983	775,780	(50%)	586,594	(38%)	152,527	(10%)	8,017	(1%)	32,478	(2%)	1	(0%)	1,157	(0%)	1,556,554
1984	457,160	(38%)	593,278	(49%)	102,565	(8%)	9,654	(1%)	49,740	(4%)	7	(0%)	2,283	(0%)	1,214,687
1985	714,714	(38%)	830,285	(45%)	234,896	(13%)	7,724	(0%)	67,885	(4%)	18	(0%)	6,115	(0%)	1,861,637
1986	587,720	(41%)	658,561	(46%)	150,776	(10%)	6,889	(0%)	36,171	(3%)	6	(0%)	2,236	(0%)	1,442,359
1987	310,622	(23%)	736,745	(53%)	259,979	(19%)	9,727	(1%)	54,292	(4%)	1,121	(0%)	5,221	(0%)	1,377,707
1988	654,731	(45%)	601,019	(41%)	162,168	(11%)	9,306	(1%)	30,979	(2%)	90	(0%)	2,065	(0%)	1,460,358
1989	822,490	(39%)	893,996	(42%)	329,461	(16%)	20,197	(1%)	50,466	(2%)	724	(0%)	7,469	(0%)	2,124,803
1990	965,902	(45%)	767,491	(36%)	344,604	(16%)	9,174	(0%)	59,625	(3%)	75	(0%)	8,806	(0%)	2,155,677
1991	1,051,167	(51%)	714,669	(35%)	229,903	(11%)	9,886	(0%)	45,153	(2%)	1,459	(0%)	9,351	(0%)	2,061,588
1992	1,337,224	(50%)	922,018	(35%)	314,187	(12%)	22,829	(1%)	61,169	(2%)	2,108	(0%)	7,158	(0%)	2,666,693
1960 to 1992 average	497,848	(44%)	456,642	(40%)	152,126	(13%)	4,863	(0%)	24,665	(2%)	170	(0%)	1,618	(0%)	1,137,932
Preliminary 1993	1,692,017	(53%)	1,021,743	(32%)	345,897	(11%)	25,642	(1%)	95,063	(3%)	7,545	(0%)	4,603	(0%)	3,192,510

[a] Includes salmon that were confiscated, caught in sport fish derbies, or commercial test fisheries, and sold.

[b] Percentages may not total 100, due to rounding.

Table SO2. Sport harvest of sockeye salmon in Southeast Alaska, 1989–1993.

Year	Ketchikan	Prince of Wales	Petersburg/ Wrangell	Sitka	Juneau/ Glacier Bay	Haines/ Skagway	Yakutat	Total
1989	1,010	3,332	1,001	2,148	1,677	1,692	2,254	13,114
1990	1,134	1,402	488	1,344	995	3,062	1,423	9,848
1991	2,480	1,021	612	810	1,149	1,272	2,371	9,715
1992	1,313	1,740	1,133	434	1,364	1,436	1,898	9,318
1993	1,057	3,591	1,208	1,126	2,844	538	7,055	17,419
Mean	1,399	2,217	888	1,173	1,606	1,600	3,000	11,883

Table SO3. Average harvests of sockeye salmon, by area, in fresh and salt waters of Southeast Alaska, 1989–1993.

Area	Fresh water	Salt water	Total
Yakutat	2,842	158	3,000
Haines/Skagway	1,351	249	1,600
Juneau/Glacier Bay	622	984	1,606
Sitka	167	1,006	1,173
Petersburg/Wrangell	498	390	888
P.O.W. Islands	1,807	410	2,217
Ketchikan	209	1,190	1,399
Total for all areas	7,496	4,387	11,883

Table SO4. Summary of Southeast Alaska sockeye salmon sport fisheries.

Area	Salt water	Fresh water
Ketchikan	no targeted fishery	McDonald Lake Naha River
Prince of Wales I.	no targeted fishery	Sarkar River Karta River
Petersburg/ Wrangell	no targeted fishery	Kah Sheets Petersburg Creek Lake Thomas Creek
Sitka	Redoubt Bay	Redoubt Falls Klag Bay
Haines/ Skagway	no targeted fishery	Chilkat River/Lake Chilkoot River/Lake
Juneau/ Glacier Bay	no targeted fishery	potential at Windfall Lake potential at Auke Bay Gilbert Bay
Yakutat	no targeted fishery	Situk River

Table SO5. Location of sockeye harvests in Prince of Wales Island fresh waters, 1989–1993.

Year	Karta	Sarkar	Klawock	Other fresh waters
1989	1,104	X	X	1,863
1990	586	X	20	577
1991	282	X	0	428
1992	189	173	0	1,166
1993	191	1,523	0	932

fish to 191, which reflects declines in escapement. Data on sockeye harvest in the Sarkar River are available only since 1992. In 1993, the Sarkar River produced a harvest of 1,523 sockeye salmon.

Petersburg/Wrangell

The Petersburg/Wrangell area has no targeted saltwater sockeye salmon fisheries, but an average of 483 fish are harvested annually in fresh water. Most of the harvest is taken at Petersburg Creek; lesser harvests come from Kah Sheets, Thomas Creek and perhaps Salmon Bay Creek. Harvest data are available only for Petersburg Creek, and the reported annual harvest of 15 sockeye salmon is quite likely lower than what is really taken.

Sitka

The average annual harvest of sockeye in salt water in the Sitka area was 1,006 fish from 1989 to 1993. This harvest was taken from throughout the Sitka area, but most of it came from stream mouths in Redoubt Bay and Klag Bay. Probably a good portion of the sockeye harvest in salt water is taken by snagging. An average of 166 sockeye salmon are taken annually in Sitka area fresh waters. Primary freshwater harvest sites are lake Eva and Surge Lake. Sitkoh River and Lake once provided a relatively large sockeye salmon sport fishery; however, this stream has been designated as a sockeye subsistence fishing area since 1990.

Juneau/Glacier Bay

The recreational fishery in the Juneau/Glacier Bay area takes an annual average of 1,606 sockeye salmon, 622 of which are taken in fresh water and 984 in salt water. The reported saltwater harvest is substantially larger than that actually taken. The Glacier Bay area lacks large-scale targeted sockeye salmon fisheries. A very limited amount of effort is targeted toward sockeye salmon at Bartlett Lake, in Glacier Bay

National Park. The Juneau area lacks a targeted saltwater sockeye salmon fishery, and freshwater sockeye fisheries are very depressed at the current time.

Auke Lake once provided a popular fishery at the mouth of Auke Creek. This fishery was mostly a snag fishery. An estimated 2,000 to 3,000 fish were taken annually. In the late 1970s, sockeye salmon production in Auke Lake dropped drastically, even though escapements ranged from 6,000 to 9,000 fish. The decrease in production was likely due to pollution associated with the University of Alaska sewage treatment facility. ADF&G and National Marine Fisheries Service Auke Creek Hatchery staff cooperated in an enhancement program which curtailed the decline in sockeye abundance at Auke Creek. The return now numbers 5,000 to 9,000 adults and could be opened for a limited sport fishery.

A weir on the outlet of Auke Lake operates each year from March 1 through October 31 to count and sample sockeye salmon smolt leaving the Auke Lake drainage in spring and adults returning in fall. Auke Lake weir counts from 1990 through 1994 were:

Year	Smolt	Adults
1990	28,343	3,383
1991	25,987	5,425
1992	13,248	4,853
1993	33,616	9,113
1994	32,009	6,993
Average	26,641	5,953
SD	8,065	2,189

The outlet of Windfall Lake supported a sockeye fishery until 1990. In 1991 and 1992, the fishery was closed inseason, and in 1993 and 1994 the fishery was not opened. Since 1991, the escapement index area has not received the escapement goal of 1,000 sockeye. The poor escapements are likely due to heavy fishery mortality in prior years and to changing water flows preventing spawners from reaching the spawning area in Slate Creek.

The sport fishery at Windfall Lake occurred at the confluence of Windfall Lake outlet and the Herbert River in a pool where virtually every spawner mills for a period of time prior to ascending the lake outlet. During low water years, fish build up in the pool and are extremely vulnerable to sport gear. Only a small number of fish were caught in the mouth; most were snagged and released several times, making them susceptible to fungus infection prior to spawning. Given that Windfall Lake has not had good escapement since 1991, it will be several years before the system can be opened to sockeye salmon fishing.

Table SO6. Sport fishing effort and harvest and weir counts of sockeye salmon on the Chilkoot River drainage from 1989 through 1993.

Year	Angler-days of effort	Sport harvest	Weir count
1989	17,775	1,192	54,900
1990	16,084	2,689	76,118
1991	15,219	836	90,820
1992	7,832	542	67,021
1993	9,891	360	52,026
Average	13,360	1,124	68,177

In 1993, sport anglers began targeting enhancement sockeye returning to Gilbert Bay, south of Juneau. The statewide harvest survey reports that 78 anglers took 530 sockeye salmon at Gilbert Bay in 1993. It is not known whether these fish were sport caught, snagged, or taken under a personal use permit and reported as sport caught.

Haines/Skagway

Recreational anglers harvest an average of 1,600 sockeye salmon annually in the Haines and Skagway areas. The Chilkoot and Chilkat rivers in Haines produce annual harvests, respectively, of 1,123 and 158 sockeye salmon. The Chilkoot River is paralleled by a road which provides excellent angler access. The Chilkoot River supports the largest freshwater sport fishery in Southeast, at an annual average of 13,360 angler-days from 1989 through 1993. There has been a decrease in angler effort on the Chilkoot River and a decrease in sockeye harvest; however, the sockeye weir count has not shown the same trend (Table SO6).

The Chilkat River system produces about 160 sockeye salmon annually to the sport fishery. Sockeye fisheries occur both in the river and in the lake, and the harvest is nearly equally divided between the two.

Yakutat

The Yakutat area has no targeted sockeye salmon sport fishery in salt water, but reported harvests average 158 sockeye annually. Here, as in other saltwater fisheries, there is a problem with fish identification, and the actual number of sockeye caught in salt water is probably smaller than the reported harvest.

The Situk River, accessed at two points by the Yakutat road system, provides the largest sockeye salmon sport fishery in Southeast Alaska. Total sockeye returns to the Situk River average about 165,000

Table SO7. Summary of sport fishery effort, catch, and harvest of sockeye salmon on the Situk River from 1986 through 1993.

Year	Angler-days of effort	Sockeye catch	Sockeye harvest
1986	7,166	—	306
1987	6,284	—	1,105
1988	9,550	—	582
1989	6,744	—	1,683
1990	7,884	2,268	1,403
1991	7,587	4,403	2,134
1992	6,626	2,572	1,709
1993	8,938	14,630	6,727
Average	7,597	5,968	1,956

(1988–1992) fish, with an escapement goal of 40,000 to 55,000. The sport fishery harvested an average 1,956 sockeye annually from 1986 through 1993 (Table SO7). The Situk River sockeye salmon fishery is increasingly popular. This is due partly to the strong Situk River sockeye runs being advertised by local lodges, the reopening of the king salmon fishery—which provides for multiple species fishing opportunity, and an increase in fly fishing, an effective gear for sockeye salmon.

The Situk River weir, which is used to monitor the sockeye salmon escapement in the summer, is located in the lower river. The weir slows down the upstream movement of fish during lower water levels, and concentrations of fish below the weir provide excellent angling opportunities. Some anglers who target sockeye salmon also float the Situk River from the Ninemile bridge to the lower landing. Approximately 50% of sockeye salmon caught on the Situk River since 1990 have been released. Some of these were likely snagged, as snagging is often a problem on the lower Situk. Also, a growing contingent of anglers in Southeast Alaska and Yakutat prefer to catch and release.

NORTHERN PIKE

In Southeast Alaska northern pike are found only near the Yakutat area. They are endemic to the Pike Lakes system in the headwaters of the Antlen River. This area evidently escaped the most recent glacial advances and now supports relict populations of plants and animals, including the only population of northern pike found west of the coastal mountains. Because of the unique environment around the Pike Lakes, the area has been designated as a Research Natural Area (RNA) by the U.S. Forest Service. A population study done by the U.S. Forest Service in 1991 estimated about 200 northern pike in Big Pike Lake, the largest of the lakes. The Pike Lakes system is accessible by a ½-mile trail leading from Forest Highway 10.

Management

An accurate harvest estimate of northern pike from the Pike Lakes area is not available; however, harvest is reported in the statewide harvest survey for two of five years from 1989 through 1993. The average harvest during that period was 36 pike.

The area is known to receive some fishing pressure annually that is not reported in the statewide harvest survey. Interest in the Pike Lakes area is increasing, as fishing guides begin to take clients into the area. Local residents also occasionally fish the lakes.

ADF&G expressed concern to the Board of Fisheries in 1994 about possible overharvest of northern pike in Pike Lakes. In response, the Board of Fisheries designated the lakes as a catch-and-release area for northern pike. This decision was based on the fact that the area is unique, the pike populations were small, interest in the area was increasing, and the Department had no good method of monitoring harvest in such a small fishery. Managing the area under these terms will continue to provide angling opportunity, but should prevent overharvest and maintain the size and age composition of the Pike Lake stocks.

Enhancement

Northern pike from Pike Lakes were transported to two small lakes in the community of Yakutat. Populations of northern pike remain in the two small ponds, but it appears that the fish are quite small. It is not known what portion of the Yakutat area northern pike harvest comes from these ponds, but it is assumed to be very small.

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