

Fishery Data Series No. 96-4

**Estimates of Commercial Harvest and Escapement
of Coho Salmon Stocked Into Northern Cook Inlet
Streams, 1994**

by

Barry L. Stratton,

Paul A. Cyr,

and

James J. Hasbrouck

March 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)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H_0
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY DATA SERIES NO. 96-4

**ESTIMATES OF COMMERCIAL HARVEST AND ESCAPEMENT OF
COHO SALMON STOCKED INTO NORTHERN COOK INLET
STREAMS, 1994**

by

Barry L. Stratton,

Paul A. Cyr,

and

James J. Hasbrouck

Division of Sport Fish, Anchorage

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska 99518-1599

March 1996

This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-10, Job No. E-2-5.

The Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Fishery Data Series reports are intended for fishery and other technical professionals. 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 editorial and peer review.

*Barry L. Stratton, Paul A. Cyr, and James J. Hasbrouck
Alaska Department of Fish and Game, Division of Sport Fish,
333 Raspberry Road, Anchorage, AK 99518-1599, USA*

This document should be cited as:

Stratton, B. L., P. A. Cyr, and J. J. Hasbrouck. 1996. Estimates of commercial harvest and escapement of coho salmon stocked into Northern Cook Inlet streams, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 96-4, Anchorage.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, contact the department ADA Coordinator at (voice) 907-465-4120, or (TDD) 907-465-3646. Any person who believes s/he has been discriminated against should write to: ADF&G, PO Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of the Interior, Washington, DC 20240.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES	iii
LIST OF APPENDICES.....	iv
ABSTRACT	1
INTRODUCTION	1
OBJECTIVES.....	4
Escapement	4
Commercial Harvest Assessment.....	7
METHODS	7
Study Design.....	7
Data Collection	7
Stocking and Marking	7
Escapement	8
Commercial Harvest Sampling.....	9
Data Analysis	11
Straying	11
Estimating Commercial Harvest of Stocked Coho Salmon.....	11
RESULTS	14
Escapement	14
Straying.....	14
Returns	14
Commercial Harvest of Stocked Coho Salmon.....	18
Marine Survival	29
DISCUSSION.....	33
Sport Fishery.....	33
Escapement	33
Straying.....	34
Tag Loss	34
Commercial Catch Assessment	34
ACKNOWLEDGMENTS	36
LITERATURE CITED.....	36
APPENDIX A. COHO SALMON ESCAPEMENT COUNT AT CAMPBELL AND SHIP CREEKS, 1994.....	39
APPENDIX B. ESTIMATES BY RELEASE SITE OF THE NUMBER OF COHO SALMON STOCKED IN 1992 AND 1993 THAT WERE HARVESTED IN UPPER COOK INLET COMMERCIAL FISHERIES IN 1994	43

LIST OF TABLES

Table	Page
1. Summary of coded wire tagging data by release site for coho salmon reared at Big Lake, Elmendorf, and Fort Richardson hatcheries and stocked in Northern Cook Inlet, 1992.....	5
2. Summary of coded wire tagging data by release site for coho salmon reared at Big Lake, Elmendorf, and Fort Richardson hatcheries and stocked in Northern Cook Inlet, 1993.....	6
3. Number of coded wire tagged coho salmon sampled (n) and tag retention (%) at release in 1993 and at recovery in Northern Cook Inlet escapements in 1994.....	13
4. Summary of coho salmon weir counts and sampling efforts in monitored Northern Cook Inlet streams, 1994.....	15
5. Number of coho salmon with decodable coded wire tags recovered from monitored escapements by release site in Northern Cook Inlet in 1994.	15
6. Total harvest of coho salmon in commercial fisheries of Upper Cook Inlet in 1994 that were sampled to recover fish marked with an adipose finclip.	19
7. Commercial harvest, sampling data, and coded wire tag recoveries for selected coho salmon fisheries of Upper Cook Inlet (UCI) in 1994.....	21
8. Estimated commercial harvest of urban stocked coho salmon in Upper Cook Inlet in 1994 by release site and year.....	22
9. Total estimated commercial harvest (n_1) and variance of harvest [$V(n_1)$] of urban stocked coho salmon in Upper Cook Inlet in 1994 by release site and year.	27
10. Estimated marine survival, with associated standard error in parentheses, of coho salmon stocked into four systems of Northern Cook Inlet in 1993.	29

LIST OF FIGURES

Figure	Page
1. Map of Upper Cook Inlet commercial salmon fishing districts and statistical areas.	2
2. Map of Northern Cook Inlet urban areas.	3
3. Distribution of coho salmon returns among commercial and sport fisheries and the escapement in four stocked streams.	16
4. Sport harvest and effort from 1988 to 1994 in Anchorage urban streams stocked with coho salmon.	17
5. Distribution of coho salmon harvest and hatchery contribution among three Upper Cook Inlet fisheries, Central District driftnet (CDD), Central District setnet (CDS), and Northern District setnet (NDS), 1994.	20
6. Portion of 1994 Upper Cook Inlet coho salmon commercial harvest represented by urban stocked fish.	28
7. Portion of 1994 Central District drift net coho salmon commercial harvest represented by urban stocked fish.	30
8. Portion of 1994 Central District, Upper Subdistrict setnet coho salmon commercial harvest represented by urban stocked fish.	31
9. Portion of 1994 Northern District setnet coho salmon commercial harvest represented by urban stocked fish.	32

LIST OF APPENDICES

Appendix	Page
A1. Coho salmon escapement counts at Campbell and Ship creeks, 1994.	40
B1. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District drift net (244-00, 245-00) commercial harvest, 1994.	44
B2. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Ninilchik Beach (244-21) set net commercial harvest, 1994.	45
B3. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Cohoe Beach (244-22) set net commercial harvest, 1994.	46
B4. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Kalifonski Beach (244-30) set net commercial harvest, 1994.	47
B5. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Salamatof Beach (244-40) set net commercial harvest, 1994.	48
B6. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District westside set net (245-60, 247-10, 247-20, 247-30) commercial harvest, 1994.	49
B7. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Susitna Flats (247-41) set net commercial harvest, 1994.	50
B8. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Point MacKenzie (247-42) set net commercial harvest, 1994.	51
B9. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Fire Island (247-43) set net commercial harvest, 1994.	52
B10. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District eastside (247-70, 247-80, 247-90) set net commercial harvest, 1994.	53
B11. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District drift net (244-00, 245-00) commercial harvest, 1994.	54
B12. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Ninilchik Beach (244-21) set net commercial harvest, 1994.	55
B13. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Cohoe Beach (244-22) set net commercial harvest, 1994.	56
B14. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Kalifonski Beach (244-30) set net commercial harvest, 1994.	57
B15. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Salamatof Beach (244-40) set net commercial harvest, 1994.	58
B16. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District westside set net (245-60, 247-10, 247-20, 247-30) commercial harvest, 1994.	59
B17. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Susitna Flats (247-41) set net commercial harvest, 1994.	60
B18. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Point MacKenzie (247-42) set net commercial harvest, 1994.	61
B19. Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Fire Island (247-43) set net commercial harvest, 1994.	62
B20. Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District eastside (247-70, 247-80, 247-90) set net commercial harvest, 1994.	63

ABSTRACT

Juvenile coho salmon *Oncorhynchus kisutch* reared in hatcheries and released into several freshwater systems of Northern Cook Inlet in 1992 and 1993 returned to Upper Cook Inlet in 1994. Some fish in each release group were marked with an adipose finclip and a coded wire tag. Marked coho salmon were recovered in 1994 from commercial fisheries and escapements. Fish were sampled from the escapement to assess straying and long-term tag retention after release. Recoveries of marked fish from the commercial harvest were used to estimate the harvest of hatchery-produced coho salmon in Upper Cook Inlet commercial fisheries.

In 1994 the Central District driftnet fishery, Central District Upper Subdistrict (eastside) setnet fishery, and Northern District setnet fishery harvested a total of 303,935; 69,281; and 149,288 coho salmon, respectively. Coho salmon from the hatchery stocking programs contributed an estimated 26,331 (SE = 1,170; 9%) fish to the Central District driftnet fishery, 3,123 (SE = 424; 5%) to the Central District eastside setnet fishery, and 12,423 (SE = 545; 8%) to the Northern District setnet fishery.

An escapement of 654 coho salmon at Ship Creek and 3,054 coho salmon at Campbell Creek exceeded the biological escapement goal of 200 coho salmon in each stream. Estimates of effort and harvest from the Statewide Harvest Survey increased in 1994 relative to the prestocking 5-year average at Ship, Campbell, and Bird creeks, likely due to the return of stocked coho salmon. Straying of stocked coho salmon was not significant ($P < 0.05$) in any of the sampled streams. Recovery of 507 coho salmon with decodable tags from escapements to Northern Cook Inlet streams indicated that hatchery-reared coho salmon did not stray into Campbell or Jim creeks or the Little Susitna River. Only one (0.5%) of 215 tags recovered from the escapement of coho salmon at Ship Creek was from a fish not stocked at Ship Creek; therefore, straying rate into Ship Creek was likely $< 5\%$.

Key words: coho salmon, *Oncorhynchus kisutch*, commercial harvest, sport harvest, escapement, coded wire tag, Northern Cook Inlet, stocking, straying.

INTRODUCTION

Upper Cook Inlet (UCI) includes all waters of Cook Inlet north of a line at the latitude of Anchor Point light. Coho salmon *Oncorhynchus kisutch* stocks are distributed throughout UCI and support large commercial and sport harvests. In 1993, approximately 36% of the total central region commercial harvest (ADF&G 1994) and 57% of the total statewide sport harvest (Mills 1994) of coho salmon occurred in UCI. The primary UCI coho salmon commercial fisheries are (1) Central District drift gillnet, (2) Central District Upper Subdistrict (eastside) set gillnet, and (3) Northern District set gillnet fisheries (Figure 1). Directed sport fisheries occur throughout UCI with Kenai, Susitna, and Little Susitna rivers being most popular (Howe et al. 1995).

The Northern Cook Inlet (NCI) urban area extends from Ingram Creek in Turnagain Arm north to the Little Susitna River drainage (Figure 2). Recreational fishing effort in this area increased from an average of 178,000 angler-days from 1977-1985 to over 390,000 angler-days annually from 1986-1993 (Mills 1979-1994). Anglers fishing in NCI target five species of Pacific salmon *Oncorhynchus*, rainbow trout *O. mykiss*, Dolly Varden *Salvelinus malma*, Arctic grayling *Thymallus arcticus*, and northern pike *Esox lucius*. Sport fisheries for these species are supported by a combination of wild and hatchery-produced stocks.

As the NCI population grows, the demand for sport fishing opportunities increases. Hatchery-produced stocks play an important role in supporting these growing sport fisheries as wild stocks become fully utilized. While anadromous fish have been stocked in NCI waters since the 1970s, the first successful hatchery-produced fishery was not developed until the mid 1980s in Ship Creek. A coho salmon smolt stocking program was initiated in 1992 to increase recreational sport fishing opportunities in the NCI urban area. The goal was to create or enhance terminal

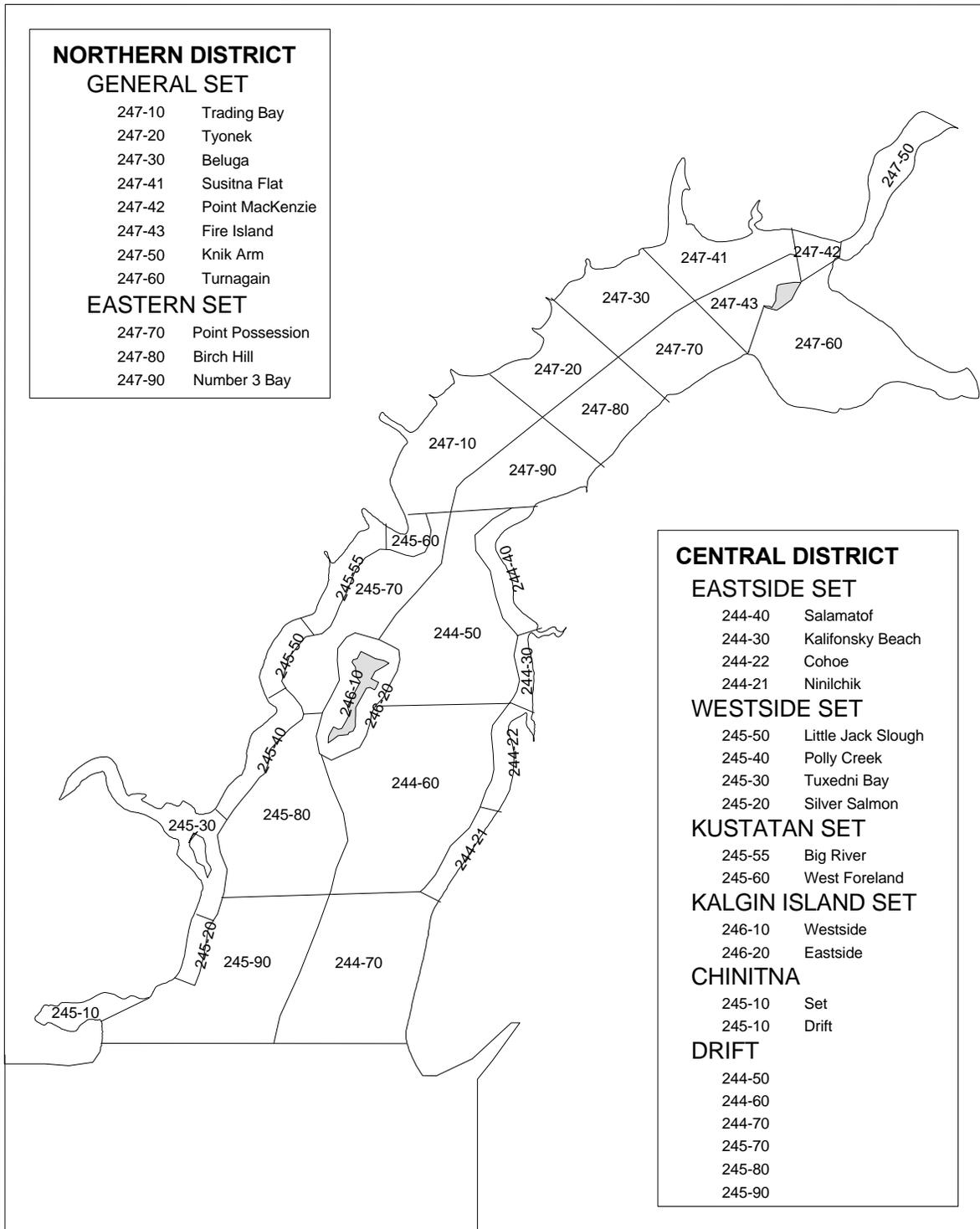


Figure 1.-Map of Upper Cook Inlet commercial salmon fishing districts and statistical areas.

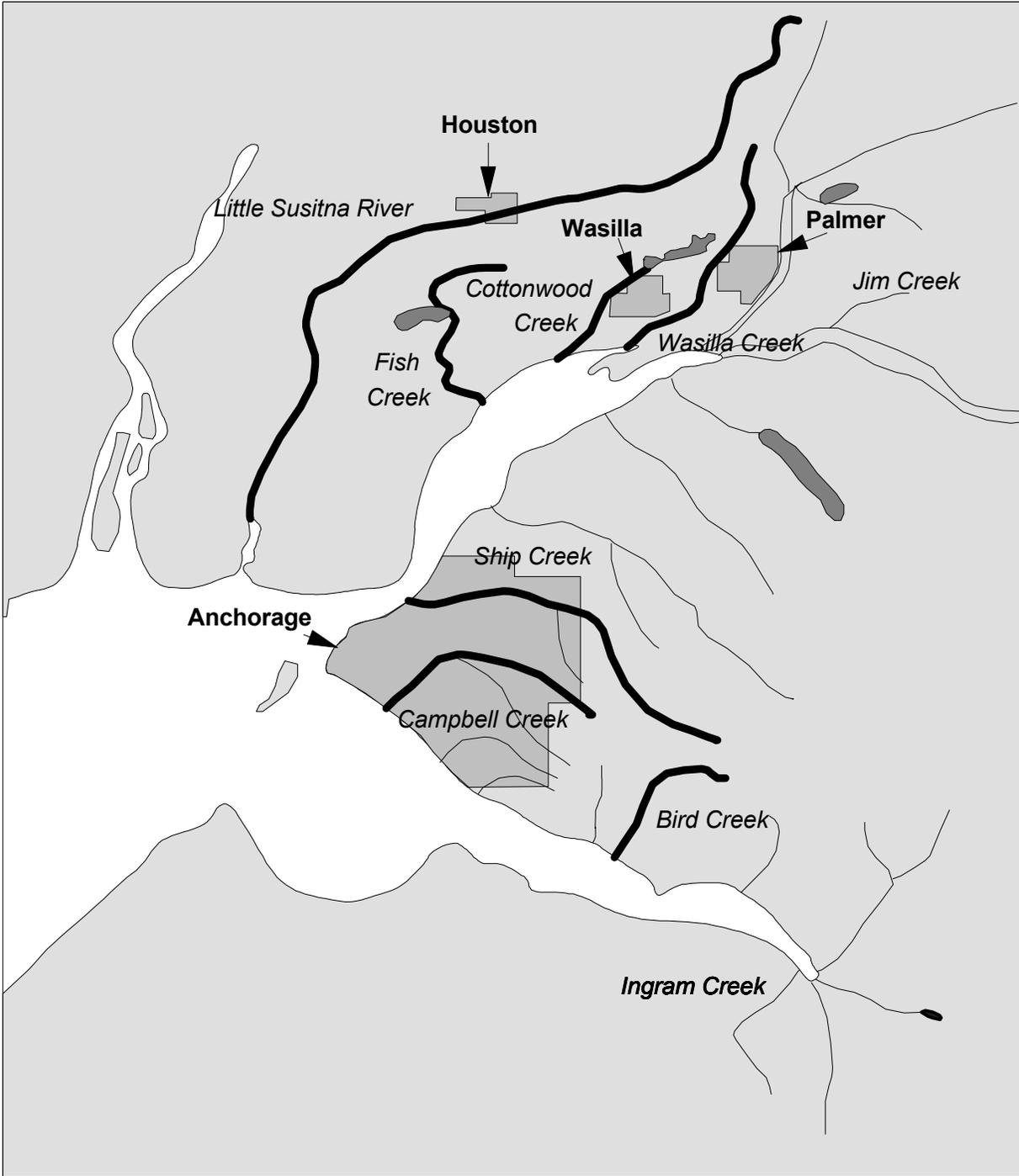


Figure 2.-Map of Northern Cook Inlet urban areas.

sport fisheries in select NCI urban area streams and attract additional recreational fishing participation. To succeed, the stocking program must be cost-effective, have minimal impact on wild stocks and/or other fisheries, and maintain historic levels of natural spawning escapements in stocked streams.

The program is targeted to increase recreational angler effort by 20,000 angler-days and harvest by 10,000 coho salmon among all streams. The Statewide Harvest Survey (SWHS) is used to evaluate targeted increases in angler effort and harvest. During each year a portion of the smolt released into each stream are marked with an adipose finclip and a coded wire tag unique to each stream (Tables 1 and 2; Peltz and Starkey 1993, Peltz and Hansen 1994).

The original stocking program included seven NCI streams. The Little Susitna River at Houston and Nancy Lake, and Ship, Bird, and Campbell creeks were stocked with coho salmon reared at Elmendorf and Fort Richardson hatcheries. Cottonwood, Fish, and Wasilla creeks were stocked for two years with coho salmon smolt reared at the Big Lake Hatchery. This facility closed in 1993, reducing the scope of the stocking program to the remaining four systems and two hatcheries.

No comprehensive coho salmon stock assessment program existed in NCI despite the importance of this area to UCI sport and commercial fisheries. While limited harvest information was available, there was no quantifiable information of stock composition from the mixed-stock commercial harvests and virtually no information on the magnitude of inriver runs or spawning escapements. To provide information needed to manage these fisheries, an assessment program was initiated in 1991 to evaluate coho salmon stocks in UCI (Meyer et al. *Unpublished*). This program was designed to estimate harvest of selected wild and hatchery-reared coho salmon stocks in major UCI commercial fisheries and to evaluate the success of the coho salmon hatchery stocking programs in NCI. The overall program consists of five distinct but interrelated components: (1) estimation of commercial and inriver sport harvest and escapement of coho salmon stocked in NCI streams; (2) marking of wild stock juvenile coho salmon, inriver recovery of marked adults, and estimation of UCI commercial harvests of wild stock coho salmon from Kenai River; (3) estimation of sport harvest and escapement, and evaluation of the coho salmon stocking program at Little Susitna River; (4) enumeration of coho salmon escapement into Jim Creek; and (5) production, marking, and release of coho salmon smolt by the hatcheries.

This report focuses on the first component above and primarily on results of coho salmon stocked in 1993 that returned to UCI in 1994. The remaining four program components are reported elsewhere (Carlson and Hasbrouck 1993, *In prep*; Bartlett *In prep*, *Unpublished*; Peltz and Starkey 1993; Peltz and Hansen 1994).

OBJECTIVES

Objectives for the 1994 urban coho salmon assessment fall into two categories, escapement and commercial catch sampling.

ESCAPEMENT

1. Enumerate coho salmon spawning escapements through weirs at Campbell and Ship creeks and collect heads from a proportion of coho salmon missing their adipose fin.

Table 1.-Summary of coded wire tagging data by release site for coho salmon reared at Big Lake, Elmendorf, and Fort Richardson hatcheries and stocked in Northern Cook Inlet, 1992.

	Big Lake Hatchery			Elmendorf Hatchery	Fort Richardson Hatchery			
	Cottonwood Creek	Wasilla Creek	Fish Creek	Ship Creek	Little Su. at Houston	Nancy Lake	Bird Creek	Campbell Creek
Tag Codes	31-20-08 31-20-09	31-20-10 31-20-11	31-20-12 31-20-13	31-19-63 31-20-01	31-20-07	31-20-06	31-20-02 31-20-03	31-20-04 31-20-05
Total marked and tagged ^a	45,500	45,044	46,651	44,807	22,073	21,924	45,173	43,912
Mortalities ^b	10,159	896	1,113	721	189	326	270	231
Marked fish released	35,341	44,148	45,538	44,086	21,884	21,598	44,903	43,681
Tag retention sample size	1,890	1,786	1,798	1,723	842	934	1,684	1,717
Tag retention at release	93.2%	95.1%	95.8%	87.2%	89.4%	89.0%	83.8%	90.3%
Tagged fish released	32,938	41,985	43,625	38,443	19,564	19,222	37,629	39,444
Total fish released ^c	53,900	76,315	74,953	67,178	154,466	158,459	95,377	97,076
Percent tagged	61.1%	55.0%	58.2%	57.2%	12.7%	12.1%	39.5%	40.6%
Tagging dates	3/4-20	4/3-15	3/20-4/3	1/29-2/7	2/27-3/9	2/25-27	3/9-13	3/16-19
Date of tag retention check	6/18	6/18	6/18	5/18-19	5/19-20	5/19-20	5/19-20	5/19-20
Days elapsed ^d	90	64	76	101	71	82	67	61

From: Peltz and Starkey 1993.

^a Marked refers to fish with an adipose finclip and tagged refers to fish with an adipose finclip and a coded wire tag.

^b An estimated 7,368 tagged smolt destined for Cottonwood Creek were not released due to their small size.

^c Number released estimated by mark-recapture experiments.

^d Number of days between last tagging date and tag retention check date.

Table 2.-Summary of coded wire tagging data by release site for coho salmon reared at Big Lake, Elmendorf, and Fort Richardson hatcheries and stocked in Northern Cook Inlet, 1993.

	Big Lake Hatchery			Elmendorf Hatchery	Fort Richardson Hatchery			
	Cottonwood Creek	Fish Creek	Wasilla Creek	Ship Creek	Bird Creek	Campbell Creek	Houston	Nancy Lake
Tag Codes	31-21-41	31-21-40	31-21-42	31-21-36	31-21-39	31-21-38	31-21-37	31-21-37
Total marked and tagged ^a	43,253	44,102	43,139	42,633	43,584	43,554	21,794	21,151
Mortalities	136	52	138	521	143	114	390	150
Marked fish released	43,117	44,050	43,001	42,112	43,441	43,440	21,404	21,001
Tag retention sample size	1,679	2,009	1,647	1,555	1,546	1,544	1,620	1,751
Tag retention at release	94.8%	98.2%	97.0%	98.1%	97.5%	98.8%	96.5%	93.5%
Tagged fish released	40,875	43,257	41,711	41,322	42,350	42,916	20,312	19,930
Total fish released ^b	74,198	67,934	77,174	54,764	140,382	140,797	148,282	131,591
Percent tagged	55.1%	63.7%	54.0%	75.5%	30.2%	30.5%	13.7%	15.1%
Tagging dates	4/21-5/03	5/10-5/17	5/03-5/10	2/16-3/02	3/22-3/31	3/16-3/22	3/08-3/10	3/11-3/16
Date of tag retention check	6/07	6/03	6/07	5/25	5/26	5/27	5/21	5/20
Days elapsed ^c	35	17	28	84	56	66	72	65

From: Peltz and Hansen 1994.

^a Marked refers to fish with an adipose finclip and tagged refers to fish with an adipose finclip and a coded wire tag.

^b Number released estimated by mark-recapture experiments except for Ship Creek which was censused by a total count.

^c Number of days between last tagging date and tag retention check date.

2. Test the null hypothesis that hatchery-produced coho salmon stocked into Ship and Campbell creeks do not stray from the stream of origin upon return.

COMMERCIAL HARVEST ASSESSMENT

3. Estimate harvest in the Northern District setnet fishery, the Central District Upper Subdistrict (eastside) setnet fishery, and the Central District driftnet fishery of hatchery-produced coho salmon stocked into NCI urban streams.

Data collected from other components of the overall UCI coho salmon assessment program are also pertinent to this project. Coho salmon were examined for missing adipose fins from both the escapement and sport harvest at Little Susitna River and from the Jim Creek escapement. Data collected from these projects were used in this report to assess straying. The coho salmon hatchery stocking program in Little Susitna River is evaluated in a separate report (Bartlett *In prep*). Data collected at Jim Creek were part of the coho and sockeye salmon assessment studies conducted by Bartlett (*Unpublished*).

METHODS

STUDY DESIGN

The overall goals of the urban stocking program are to increase angler participation in the Little Susitna River and Bird, Campbell, and Ship creeks through increased sport fishing opportunities for coho salmon and to increase harvest of coho salmon in these streams. The SWHS is used to determine if targeted increases in angler effort and harvest are achieved.

This project is designed to estimate the harvest in the UCI mixed-stock commercial fishery of hatchery-produced coho salmon stocked into NCI streams and to estimate the total run of stocked fish to Bird, Ship, and Campbell creeks. Survival of hatchery-reared coho salmon from smolt to adult is estimated. Data from this project are also used by hatchery staff to assess the impact of smolt production and release on the marine survival of smolt.

The basic study design involved marking coho salmon smolt by inserting a coded wire tag into their snout and removing their adipose fin. Marked fish were released with unmarked fish into each stream in 1992 and 1993 and emigrated to marine waters. Catch sampling programs of adult coho salmon in the commercial harvest and the escapement were conducted in 1994 to recover marked fish. Heads were collected from coho salmon missing their adipose fin and sent to the Department of Fish and Game Coded Wire Tag Laboratory (Tag Lab) in Juneau. The Tag Lab determined if a tag was present and decoded recovered tags to determine year and stream of release. Catch sampling data were used to test assumptions of the model to estimate harvest of marked cohorts and to determine the stratification necessary to provide an unbiased estimate of harvest with the best precision. Final estimates of harvest and their variances were then calculated.

DATA COLLECTION

Stocking and Marking

Coho salmon from Little Susitna River were used as brood stock for stocking efforts at Bird and Campbell creeks and Little Susitna River. Eggs collected from coho salmon near Nancy Lake were reared at Fort Richardson Hatchery. Coho salmon from Ship Creek were used as brood

stock for stocking at Ship Creek. Eggs were collected and reared at Elmendorf Hatchery. Coho salmon of Fish Creek origin were used as brood stock for stocking at Cottonwood, Fish, and Wasilla creeks. Eggs were collected and reared at Big Lake Hatchery. Eggs collected in 1990 produced coho salmon smolt that were stocked in 1992 (Peltz and Starkey 1993). The majority of these fish returned as adults in 1993, however, coho salmon stocked into Cottonwood, Fish, and Wasilla creeks in 1992 returned primarily in 1994. Eggs collected in 1991 produced coho salmon smolt that were stocked in 1993 (Peltz and Hansen 1994) and returned as adults in 1994.

A portion of smolt from each release cohort were marked with an adipose finclip and a uniquely numbered coded wire tag inserted in their snout. While the tagging goal of 40,000 smolt per release stream was not met for all releases in 1992, the targeted fraction marked (30%) was generally exceeded (Table 1; Peltz and Starkey 1993). The tagging goal of 40,000 smolt per release stream was exceeded for all releases in 1993 (Table 2; Peltz and Hansen 1994). The total number of smolt released from cohorts primarily recovered in 1994 ranged from 53,900 smolt released into Cottonwood Creek in 1992 (Table 1) to 279,873 smolt released into Little Susitna River in 1993 (Table 2). Details of the rearing, marking, and release of hatchery-stocked coho salmon are discussed in detail by Peltz and Starkey (1993) and Peltz and Hansen (1994).

Escapement

A floating weir constructed on Campbell Creek near Folker Street and the Ship Creek fish pass live box were used to enumerate coho salmon escapements. As both weirs were located above instream sport fisheries, weir counts were assumed to equal the entire escapement. The Ship Creek weir was operated from 13 June through 26 September and the Campbell Creek weir was operated from 21 July through 25 September (Appendix A). Both weirs were operated 24 hours a day to make daily counts of all coho salmon passing these weirs and to examine all coho salmon for a missing adipose fin. Counts of other salmon species were also recorded.

Heads were collected from some of the coho salmon with missing adipose fins that passed through each weir to test the hypothesis of straying. Biological escapement goals (BEGs) have been set at 200 naturally spawning coho salmon for both streams. Given the expected number of coho salmon in the escapement of each stream and the need to collect a minimum of 60 coho salmon with coded wire tags from each stream to test the hypothesis of straying, heads were systematically collected from every third coho salmon missing the adipose fin at Campbell Creek and every second coho salmon missing the adipose fin at Ship Creek. This level of sampling allowed us to test the hypothesis of straying while ensuring that the BEG would be met in both streams.

A uniquely numbered cinch strap was affixed to the jaw of each coho salmon head collected. Each head was placed in an individual clear plastic bag with the cinch strap number visible. Collected data included: date, creek, number of coho salmon examined, number of coho salmon missing the adipose fin, number of heads collected from coho salmon missing their adipose fin, and the cinch strap number of each head collected. All heads with cinch straps were returned to the Anchorage ADF&G office and frozen until shipment to the Tag Lab.

Weirs were also operated on Little Susitna River (Bartlett *In prep*) and Jim Creek (Bartlett *Unpublished*) to enumerate coho salmon escapements and examine coho salmon for missing adipose fins. Jim Creek supports a wild coho salmon run and has not been stocked. Data

collected at the Jim Creek weir were used to determine if stocked coho salmon strayed from their stream of release.

Commercial Harvest Sampling

Catch sampling of the UCI coho salmon harvest was conducted from mid-July to early September 1994. Coho salmon were sampled on sorting lines at processors, at buying stations, or on board tenders. All regular commercial fishing periods (7:00 a.m. to 7:00 p.m., Mondays and Fridays) that occurred from mid-July through early September in the Central District driftnet and eastside setnet fisheries and the Northern District setnet fishery were sampled (Figure 1). Additional fishing periods were sampled as time and budget allowed.

Coho salmon delivered to processors, buying stations, or tenders were counted and examined for the absence of the adipose fin. As many fish as possible were examined from deliveries during the sampling shift. All coho salmon observed with a missing adipose fin were retrieved, the head removed, and a uniquely numbered cinch strap affixed to the head. Each head was placed in an individual clear plastic bag with the cinch strap number visible. Collected data included: date of harvest, date of sampling, processor, delivery location, name of tender or buying station, statistical area, number of coho salmon examined, number of coho salmon missing their adipose fin, number of heads collected from coho salmon missing their adipose fin, and the cinch strap number of each head collected. All coho salmon heads with cinch straps were returned to Alaska Department of Fish and Game (ADF&G) offices in Soldotna or Anchorage. The heads were frozen and shipped weekly to the Tag Lab for tag removal and decoding. After each commercial fishing period, the preliminary commercial harvest of coho salmon in UCI by statistical area was obtained from Division of Commercial Fisheries Management and Development (CFMD) staff in Soldotna. Final commercial harvest data by statistical area and date were obtained on 3 November 1994.

In general, totes sampled from setnet harvests of coho salmon were pure loads of fish harvested from a single statistical area. Totes of coho salmon sampled from the Central District driftnet fishery were a mixture of fish harvested in different statistical areas. Thus, for samples from setnet harvests of coho salmon we knew the total number of coho salmon harvested, the number examined, and the number with a missing adipose fin from each statistical area. We had the same data for coho salmon harvested in the Central District driftnet fishery but, because sampled coho salmon were from a mixture of statistical areas, we summed the harvest of statistical areas 244-50, 244-60, 244-70, 245-70, 245-80, and 245-90.

Northern District

The Northern district is subdivided into 11 statistical areas (Figure 1). By regulation, commercial fishing periods occur between 7:00 a.m. and 7:00 p.m. on Mondays and Fridays from 25 June until closed by emergency order (5 AAC 21.320, *Weekly Fishing Periods*). Additional fishing periods are allowed and/or regularly scheduled periods may be closed by emergency order; however, no additional fishing periods may be allowed after 15 August (5 AAC 21.363, *Upper Cook Inlet Management Plan*). Only set gillnet gear is allowed in Northern District waters (5 AAC 21.330, *Gear*). Statistical area 247-50 is only opened through emergency order (5 AAC 21.364, *Fish Creek Sockeye Salmon Management Plan*) and statistical area 247-60 is closed to commercial fishing (5 AAC 21.350, *Closed Waters*).

Coho salmon processed in the Anchorage area during 1994 were comprised entirely of fish harvested in Northern District statistical areas. Three technicians stationed in Anchorage sampled commercial harvests with efforts concentrated on two shorebased processors: Whitney Foods and North Alaska Fisheries. Additional sampling was periodically conducted on board their tenders. Cook Inlet Processors in Nikiski was sampled regularly by personnel from Soldotna for setnet harvest from statistical areas 247-70, 247-80, and 247-90. Some coho salmon harvested from statistical areas 247-10, 247-20, and 247-30 were sampled at Deep Creek Processors in Ninilchik and at Icicle Seafoods in Homer by Soldotna-based technicians.

Objectives were to sample 15% of the harvest of each Northern District statistical area. Harvest from the Northern District was sampled in Anchorage and Homer from 18 July through 29 August when all processors closed for the season. Sampling was conducted at Cook Inlet processors from 1 August until 5 September. Technicians contacted the processors throughout the season to coordinate sampling logistics and to ensure that all possible fish were examined.

Central District

Two commercial gear types are used in the Central District: drift gillnet and set gillnet. The Central District driftnet fleet operates in seven statistical areas and the setnet fishery occurs in 13 statistical areas (Figure 1). Coho salmon harvested by driftnet were sampled from six statistical areas (244-50, 244-60, 244-70, 245-70, 245-80, and 245-90) and those harvested by set net were sampled from the four statistical areas (244-21, 244-22, 244-30, and 244-40) composing the Upper Subdistrict (eastside) fishery.

Commercial fishing periods of both the driftnet and Upper Subdistrict setnet fisheries occur between 7:00 a.m. and 7:00 p.m. on Mondays and Fridays (5 AAC 21.320, *Weekly Fishing Periods*). Additional fishing periods are allowed through emergency order authority and regularly scheduled periods may be closed by emergency order. The *Upper Cook Inlet Management Plan* (5 AAC 21.363) restricts the dates of the setnet fishery from 1 July through 15 August. Several management plans affect time and area closures or openings of both fisheries (5 AAC 21.359, *Kenai River Late Chinook Salmon Management Plan*; 5 AAC 21.360, *Kenai River Sockeye Salmon Management Plan*; 5 AAC 21.361, *Russian River Sockeye Salmon Management Plan*; 5 AAC 21.363, *Upper Cook Inlet Management Plan*; and 5 AAC 21.365, *Kasilof River Sockeye Salmon Special Harvest Area Management Plan*).

Most coho salmon harvested from the Central District driftnet and Upper Subdistrict setnet fisheries as well as some coho salmon harvested by Northern District setnet fisheries are processed at facilities on the Kenai Peninsula. Commercial catch sampling of these coho salmon harvests was conducted under the supervision of Division of Commercial Fisheries Management and Development biologists in Soldotna. Sampling of the driftnet harvest occurred at Carlson Seafoods, Cook Inlet Processing, Deep Creek, Dagnet Fisheries, Icicle Seafoods, Inlet Fisheries, Pacific Star, Royal Pacific Fisheries, Salamatof Seafoods, Snug Harbor, Trans-Aqua International, Wards Cove Packing, and Whitney Seafoods. The Upper Subdistrict setnet harvest was sampled at buying stations of major fish processors. These processors included: Cook Inlet Processing, Deep Creek, Dagnet Fisheries, Fishhawk Fisheries, Icicle Seafoods, Inlet Fisheries, Pacific Star, R & J Seafoods, Royal Pacific Fisheries, Salamatof Seafoods, Snug Harbor, Trans-Aqua International, Wards Cove Packing, and Whitney Seafoods.

The driftnet harvest was sampled by six technicians from 8 July through 29 August. The harvest of the Upper Subdistrict setnet fishery was sampled by four technicians from 15 July until the fishery closed on 15 August.

DATA ANALYSIS

Straying

Straying from stream of release into a different stream upon return is possible with any hatchery release of anadromous fish. A chi-square statistic was used to test the null hypothesis that stocked coho salmon did not stray from the stream of stocking upon return such that a stray rate of 0.05 could be detected 95% of the time at $\beta = 0.05$. Only recoveries from the escapement at Ship and Campbell creeks were used for this test. A sample size of at least 60 decodable tags from heads collected at each weir on these two creeks was sufficient for this test. If all 60 tagged coho salmon recovered at a weir were originally stocked in that creek, then the straying rate was likely $< 5\%$. If one or more of the 60 tagged coho salmon was stocked into a different creek, then the straying rate was likely $\geq 5\%$.

Estimating Commercial Harvest of Stocked Coho Salmon

Estimating the commercial harvest of a cohort of fish required determining the proportion of fish marked with a coded wire tag and adipose finclip. The proportion of tagged coho salmon stocked at each location was known prior to release (Peltz and Starkey 1993, Peltz and Hansen 1994). However, if significant tag loss occurred after release the proportion of tagged coho salmon was estimated by sampling the inriver return of adults.

A chi-squared statistic was used to test the hypothesis that tag retention at return and release was the same. Tag retention data prior to smolt release and adult recovery data from escapements at Campbell and Ship creeks and Little Susitna River were used for the test. Data from the releases in the Little Susitna River at Houston and at Nancy Lake were pooled to estimate tag retention at release of fish stocked into Little Susitna River.

Harvest of a single marked cohort (release group) of fish in a stratum was estimated by (Clark and Bernard 1987; Bernard and Clark *In prep*):

$$\hat{n}_1 = N\theta^{-1} \left(\frac{a_1 m_1 m_c}{a_2 m_2 n_2} \right) = N\theta^{-1} \hat{p}, \quad (1)$$

where:

- N = total number of fish in the harvest,
- θ = proportion of the cohort marked and released with a coded wire tag,
- a_1 = number of heads collected in the sample from fish with a missing adipose fin,
- a_2 = number of heads that arrived at the Tag Lab,
- m_1 = number of heads with coded wire tags detected,
- m_2 = number of coded wire tags found and decoded,
- m_c = number of decoded coded wire tags from the cohort,

- n_2 = number of fish in the harvest examined for a missing adipose fin, and
 \hat{p} = the proportion of examined fish found to have a CWT from this cohort.

This estimator is statistically unbiased when sampling is from a simple random or pseudo-random process (Clark and Bernard 1987).

If tag retention at return was not statistically different from tag retention at time of release, the proportion of marked coho salmon in each cohort at time of release was treated as a known constant. When the harvest (N) and the proportion marked (θ) are known without error an unbiased estimate of the variance is:

$$V(\hat{n}_1) = \left[\left(\frac{m_2}{m_2 - 1} \right) \left(\frac{m_1 - 1}{m_1} \right) \left(\frac{a_2}{a_2 - 1} \right) \left(\frac{a_1 - 1}{a_1} \right) \left(\frac{n_2}{n_2 - 1} \right) \left(\frac{N - 1}{N} \right) \right] \left[m_c \left(\frac{Nm_1 a_1}{m_2 a_2 n_2 \theta} \right)^2 \right] \times \left[1 - m_c + \left(\frac{(m_2 - 1)(a_2 - 1)(n_2 - 1)}{(m_1 - 1)(a_1 - 1)(N - 1)} \right) \left(\frac{m_1 a_1 N m_c}{m_2 a_2 n_2} - \theta \right) \right]. \quad (2)$$

Values of harvest from the fish ticket database are assumed known and measured without error. We found a significant difference in tag retention (Table 3) between release from the hatchery and adult escapement samples at Campbell ($\chi^2 = 7.12$, $df = 1$, $P = 0.008$) and Ship ($\chi^2 = 7.57$, $df = 1$, $P = 0.006$) creeks, and at the Little Susitna River ($\chi^2 = 18.59$, $df = 1$, $P < 0.001$). We concluded that the differences in tag retention estimates at Campbell and Ship creeks were too small to be of biological significance or lead to biased estimates of commercial harvest of these cohorts, and that the statistical results were a function of the large sample size of marked coho salmon examined for tags at the hatcheries. The values of θ at the time of release (Peltz and Starkey 1993, Peltz and Hansen 1994) were used and treated as known values measured without error for Campbell and Ship creeks and for systems where tag retention after release was not evaluated.

Coho salmon released into Little Susitna River had significant tag loss after release. For coho salmon stocked into Little Susitna River in 1993, the proportion of marked coho salmon was estimated from fish sampled during the egg take at Nancy Lake. Because stocked coho salmon smolt were released at Nancy Lake and few, if any, naturally produced coho salmon spawn in Nancy Lake, we assumed all fish sampled at the egg take were stocked coho salmon. Commercial harvest of this cohort of fish was estimated using equation 1 substituting $\hat{\theta}$ for θ . An unbiased estimate of the variance of harvest when θ is estimated is (Bernard and Clark *In prep*):

$$V[\hat{n}_1] = \hat{n}_1^2 \left[G(\hat{p}) + G(\hat{\theta}^{-1}) - G(\hat{p})G(\hat{\theta}^{-1}) \right], \quad (3)$$

where:

$$G(\hat{p}) = \frac{1 - \lambda \phi \hat{\theta}}{\lambda n_2 \hat{p}},$$

$$\lambda = \frac{m_2 a_2}{m_1 a_1},$$

$$\phi = \frac{n_2}{N}, \text{ and}$$

$$G(\hat{\theta}^{-1}) = \frac{V(\hat{\theta}^{-1})}{\hat{\theta}^{-2}}.$$

Based on adult coho salmon sampled at the egg take, the estimated proportion of tagged coho salmon stocked into Little Susitna River in 1993 was $\hat{\theta} = 0.110$ and the variance of its inverse was $V(\hat{\theta}^{-1}) = 2.0517$.

Harvest of each cohort was stratified by date and statistical area for each sampled fishery. Statistical area was unknown when catch sampling the Central District driftnet fishery so harvest of this fishery was stratified only by date. The total harvest of a cohort in a fishery was estimated by summing the estimates among the strata. Variance of the total estimate was also calculated by summing the variances of the strata estimates since strata were assumed independent and there were no additional covariance terms.

We investigated whether data could be combined among statistical areas of setnet harvested coho salmon, particularly in the Northern District. Total harvest of marked cohorts and their variances were estimated with the data stratified and with the data combined. For example, to determine if three statistical areas could be combined, estimates calculated with the data stratified by statistical area and then summed were compared to the estimate with data from the three statistical areas combined. If the estimates of harvest were not significantly different and combining the data improved the precision of the estimate, the data were combined. Otherwise, estimates were stratified.

Table 3.-Number of coded wire tagged coho salmon sampled (n) and tag retention (%) at release in 1993 and at recovery in Northern Cook Inlet escapements in 1994.

Release Site	Release ^a		Recovery	
	n	%	n	%
Bird Creek ^b	1,546	98		
Campbell Creek	1,544	99	187	96
Ship Creek	1,555	98	226	95
Little Susitna River	3,371	95	120	86

^a Peltz and Hansen 1994.

^b Escapement at Bird Creek was estimated with foot surveys and had no tag recovery program.

RESULTS

ESCAPEMENT

In 1994, 3,244 coho salmon reached the Campbell Creek weir of which 687 were missing their adipose fin (Table 4, Appendix A). A total of 190 heads were collected from coho salmon missing the adipose fin and shipped to the Tag Lab (Table 4). The remaining 3,054 coho salmon were passed through the weir. At Ship Creek, 572 of the 880 coho salmon counted at the weir were missing their adipose fin. A total of 226 heads were collected from coho salmon missing their adipose fin and sent to the Tag Lab. The remaining 654 coho salmon were passed through the weir. Coho salmon were also examined for a missing adipose fin at weirs on Little Susitna River and Fish and Jim creeks. A total of 120, 9, and 0 heads, respectively, were collected from coho salmon missing their adipose fin.

The contribution of hatchery fish to the escapement was calculated from tag recovery data for Campbell and Ship creeks. At Ship Creek an estimated 718 (SE = 18) of the coho salmon in the escapement were stocked into Ship Creek, 23 (SE = 23) were originally stocked into Little Susitna River, and the remaining 139 were from natural production. In Campbell Creek an estimated 2,227 of the 3,244 coho salmon in the escapement were of hatchery origin, the remaining 1,017 fish were from natural production. Because all coho salmon in the Campbell Creek escapement were examined for a missing adipose fin and all marked fish recovered were released into Campbell Creek, no variance was calculated for the estimate of stocked fish contributing to the escapement.

STRAYING

A total of 507 decodable tags were recovered from coho salmon escapements monitored at Campbell, Ship, and Fish creeks, and the Little Susitna River (Table 5). In Campbell Creek and Little Susitna River all tags recovered were from fish stocked into the recovery stream. Of the 215 coho salmon recovered with tags from the Ship Creek escapement, only one (0.5%) was from a fish not originally stocked into Ship Creek. None of the 200 coho salmon examined for marks at the Jim Creek weir had a missing adipose fin (Table 4). Therefore, straying of stocked coho salmon among these streams was likely < 5%. Too few tagged fish were collected at Fish Creek to make any definitive conclusions on straying. Finally, of the 465 tags recovered from the Kenai River sport harvest, one tag was from a coho salmon stocked at Bird Creek and one tag was from a fish stocked at Ship Creek (J. Carlon, ADF&G, Soldotna, personal communication).

RETURNS

Total returns of coho salmon to urban area streams are made up of three measurable components: spawning escapement, commercial harvest, and inriver sport harvest. The spawning escapement and estimates of commercial harvest are presented in this report. Total inriver sport harvest was estimated by the Statewide Harvest Survey (Howe et al. 1995). Overall, most of the returns to Ship, Bird, and Campbell creeks and Little Susitna River were harvested by the commercial fishery (Figure 3).

Inseason observations of the sport fishery at the Anchorage urban streams indicated that the coho salmon stocking program met expectations. Sport harvest of coho salmon at Bird and Ship creeks remained at the increased levels observed in 1993, the first year stocked fish returned (Mills 1989-1994, Howe et al. 1995; Figure 4). Sport harvest at Campbell Creek in 1994

Table 4.-Summary of coho salmon weir counts and sampling efforts in monitored Northern Cook Inlet streams, 1994.

Stream	Number to Weir	Number Examined	Number Missing Adipose	Heads Collected	Tags Decoded	Total Through Weir	Operation Dates
Campbell Creek	3,244	3,244	687	190	180	3,054	7/21-9/25
Ship Creek	880	880	572	226	215	654	7/29-9/26
Little Susitna	29,068	6,077	134	120	103	28,948	5/25-9/06
Fish Creek ^b	349	276	11	9	9	340	7/08-8/14
Jim Creek ^c	6,451	200	0	0	0	6,451	7/23-9/12

^a Bartlett *In prep.*

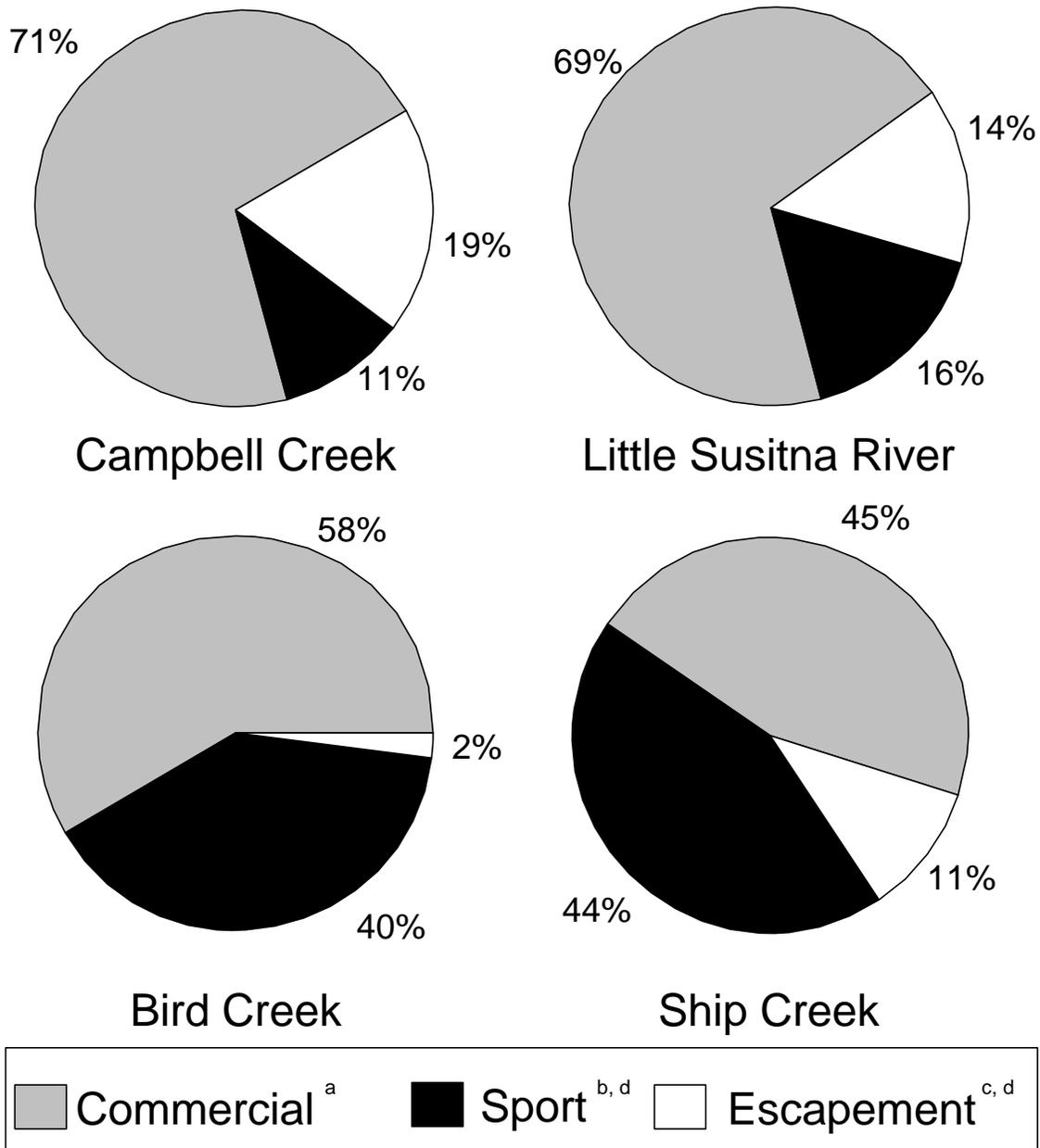
^b Weir operated to count sockeye salmon. An unknown number of coho salmon entered the system after weir was removed (L. Peltz, Alaska Department of Fish and Game, Palmer, personal communication).

^c Bartlett *Unpublished.*

Table 5.-Number of coho salmon with decodable coded wire tags recovered from monitored escapements by release site in Northern Cook Inlet in 1994.

Release Site	Recovery Site				Total Recoveries
	Campbell Creek	Ship Creek	Little Susitna River ^a	Fish Creek	
Campbell Creek	180				180
Ship Creek		214			214
Little Susitna River		1	103		104
Fish Creek				8	8
Wasilla Creek				1	1
Total	180	215	103	9	507

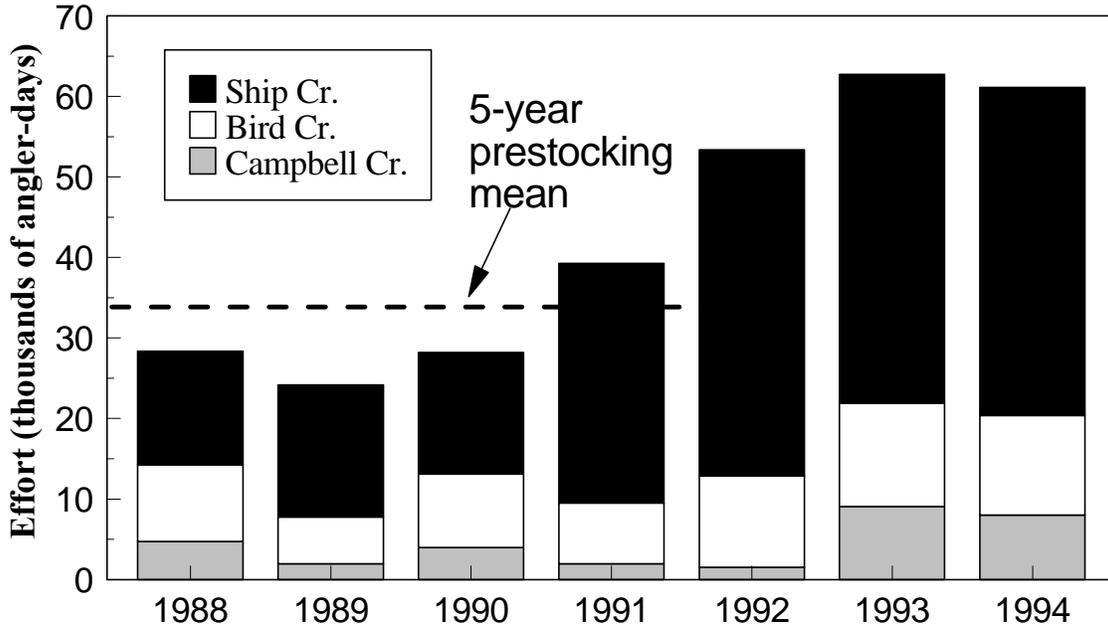
^a Bartlett *In prep.*



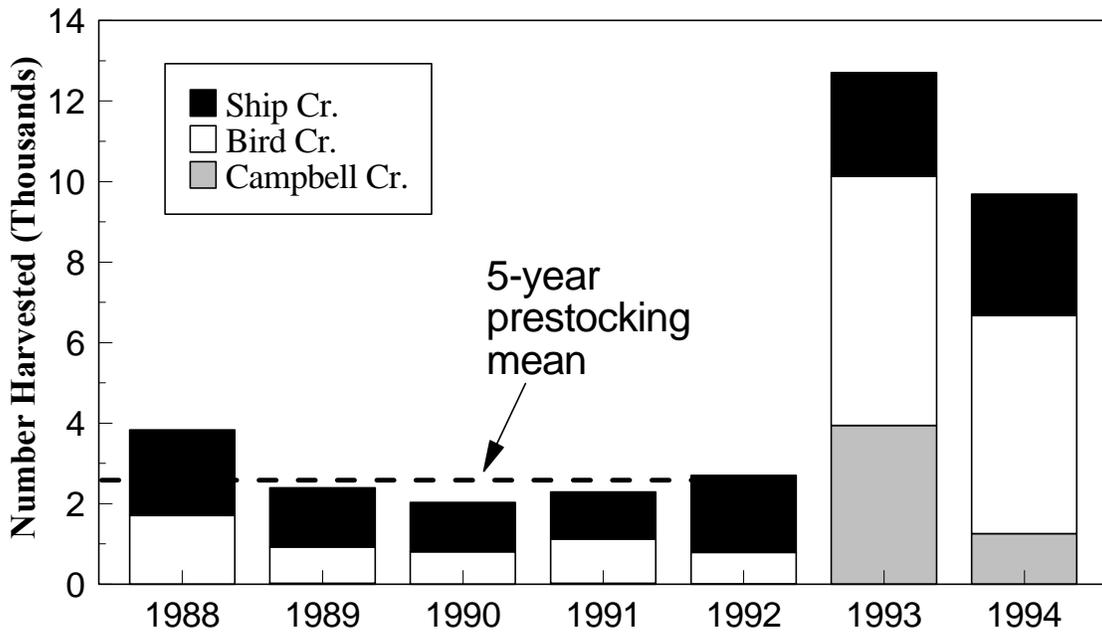
^a Estimate of hatchery contribution to the UCI coho salmon commercial harvest from catch sampling data.
^b Estimate of sport harvest of coho salmon from SWHS (estimates of hatchery contribution not calculated).
^c Estimate of hatchery contribution to the escapement (Bird Creek is a minimum estimate of the total escapement from a foot survey).
^d Estimates of hatchery contribution to Little Susitna River sport harvest and escapement from Bartlett (*In prep*).

Figure 3.-Distribution of coho salmon returns among commercial and sport fisheries and the escapement in four stocked streams.

Fishing Effort



Coho Salmon Harvest



Source: Mills 1989-1994, Howe et al. 1995

Figure 4.-Sport harvest and effort from 1988 to 1994 in Anchorage urban streams stocked with coho salmon.

declined by nearly 2,700 fish relative to the estimated harvest in 1993, but was still much greater than harvest prior to stocking when Campbell Creek was closed to sport fishing for coho salmon. Effort at all three systems also remained high. Total effort again exceeded 61,000 angler-days compared to the 5-year prestocking annual average of 34,700 angler-days.

COMMERCIAL HARVEST OF STOCKED COHO SALMON

A total of 522,504 coho salmon was harvested by the Central District driftnet, the Central District eastside setnet, and the Northern District setnet commercial fisheries in 1994 (Table 6, Appendix B). Catch sampling did not occur over the entire fishing season; however only 13% of the overall UCI coho salmon harvest occurred on days not sampled. Harvest on days not sampled was combined with the nearest day the harvest was sampled to estimate harvest of marked cohorts for the entire season.

Nearly all samples collected from the commercial setnet harvest in statistical areas 247-10, 247-20, and 247-30 were mixed loads from these three areas. Several of these samples also contained coho salmon harvested from 245-60. Many samples from statistical areas 247-70, 247-80, and 247-90 were a mixture of fish harvested in these three statistical areas. For the 3 days when pure loads were sampled from 247-10, 247-20, and 247-30, there was no significant difference ($|z| \leq 0.49$, $P \geq 0.31$) in the estimated harvest of coho salmon stocked into Bird, Campbell, and Ship creeks, and Little Susitna River between data stratified by statistical area or with the data combined among areas. Likewise, for the 9 days when pure loads were sampled from 247-70, 247-80, and 247-90, there was no significant difference ($|z| \leq 1.20$, $P \geq 0.12$) in the estimated harvest of these same four release cohorts between data stratified by statistical area or with the data combined among areas. These results indicate that combining harvest and sample data from statistical areas 247-10, 247-20, and 247-30 (and we assume from 245-60) together, and combining harvest and sample data from statistical areas 247-70, 247-80, and 247-90 together, will not introduce significant bias in estimating commercial harvest of marked cohorts. Combining these statistical areas in this fashion also allowed us to use sample data collected from mixed loads of these areas. Statistical areas from the Central District eastside setnet fishery were not pooled because precision of the estimates did not improve appreciably when the areas were combined. Therefore, harvest estimates of marked cohorts in setnet fisheries were stratified by statistical area, except those when the data were combined as described above, and by date.

The majority of the UCI coho salmon harvest was taken in the Central District driftnet fishery, followed by the Northern District setnet fishery (Figure 5). Similarly, most of the coded wire tags recovered (Table 7) and most of the harvest of hatchery-produced coho salmon occurred in the Central District driftnet and Northern District setnet fisheries (Tables 8 and 9, Figure 5). Most of the harvest of stocked coho salmon occurred in the driftnet fishery from 24 July to 31 July, in the Central District Eastside setnet fishery from 24 July to 8 August, and in the Northern District setnet fishery from 1 August to 8 August (Table 8). Over 50% of the stocked coho salmon harvest in the eastside setnet fishery occurred in statistical area 244-40, the northernmost area. In general, peak harvest of fish stocked into Ship Creek occurred 1-2 weeks after the peak harvest of all other release cohorts. Fish released into Ship Creek were from a different brood stock and have a later run timing than those stocked into Bird and Campbell creeks.

Overall, stocked coho salmon contributed 8% to the UCI coho salmon harvest (Figure 6, Table 9). When estimated by fishery, 9% of the Central District driftnet fishery harvest, 5% of the

Table 6.-Total harvest of coho salmon in commercial fisheries of Upper Cook Inlet in 1994 that were sampled to recover fish marked with an adipose finclip.

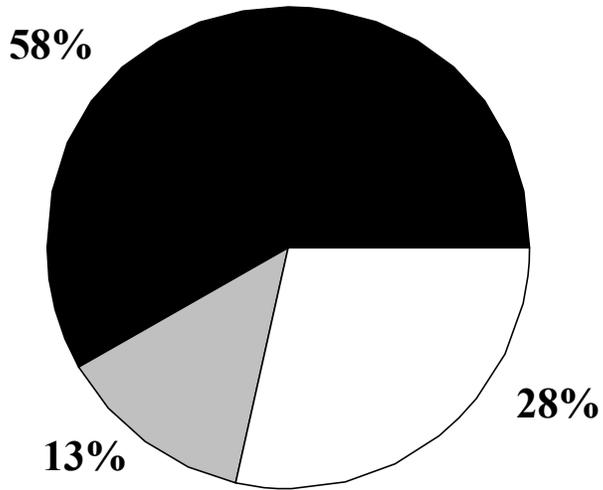
Gear	Statistical Area	Dates		Time Interval ^a						Total
		Begin	End	1	2	3	4	5	6	
Driftnet	244 & 245 ^b	6/27	9/09	55,697	44,368	147,031	39,443	11,091	6,305	303,935
Set Net	244-21	7/01	8/15		137	1,324	2,738	7,489	2,884	14,572
	244-22	7/01	8/15		286	2,438	2,833	4,367	2,680	12,604
	244-30	7/01	8/15		256	2,685	3,465	5,696	2,875	14,977
	244-40	7/01	8/15		2,104	2,099	7,865	10,706	4,354	27,128
	Total				2,783	8,546	16,901	28,258	12,793	69,281
	247-10/20/30 ^c	6/27	9/07	45,255		10,803	29,782	5,976	2,585	94,401
	247-41	6/27	9/02	634		859	3,319	740	528	6,080
	247-42	7/08	8/26	2,780		874	3,888	1,097	509	9,148
	247-43	7/01	9/02	2,644		1,613	3,159	1,343	1,595	10,354
	247-70/80/90 ^d	6/27	9/30	8,603			2,986	5,347	12,369	29,305
	Total			59,916		14,149	43,134	14,503	17,586	149,288
Grand Total										522,504

^a Time interval 1 is 6/27-7/15 for driftnet gear and statistical area 244 for setnet gear, 6/27-7/25 for all statistical areas of 247 except 247-70/80/90, and 6/27-8/01 for statistical areas 247-70/80/90; interval 2 is 7/16-7/23 for driftnet gear and statistical area 244 for setnet gear; interval 3 is 7/24-7/31 for driftnet gear and statistical area 244 for setnet gear, and 7/26-7/31 for all statistical areas of 247 except 247-70/80/90; interval 4 is 8/01-8/08 for all statistical areas except 247-70/80/90 and 8/02-8/08 for statistical areas 247-70/80/90; interval 5 is 8/09-8/15 for all statistical areas; and interval 6 is 8/16-9/09 for driftnet gear and 8/16-9/30 for all statistical areas of 247.

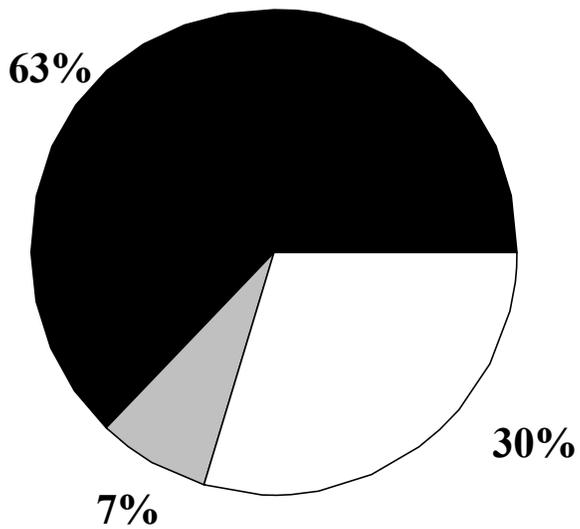
^b Combination of statistical areas 244-50, 244-60, 244-70, 245-70, 245-80, and 245-90.

^c Combination of statistical areas 247-10, 247-20, 247-30, and 245-60.

^d Combination of statistical areas 247-70, 247-80, and 247-90.



Distribution of Total Harvest



Distribution of Hatchery Contribution



Figure 5.-Distribution of coho salmon harvest and hatchery contribution among three Upper Cook Inlet fisheries, Central District drift net (CDD), Central District setnet (CDS), and Northern District setnet (NDS), 1994.

Table 7.-Commercial harvest, sampling data, and coded wire tag recoveries for selected coho salmon fisheries of Upper Cook Inlet (UCI) in 1994.

Fishery	Harvest during sampling	Coho observed	Heads Collected	1992 Release Sites						1993 Release Sites						Tag not detected	Tag or head lost	Total ^a	
				Little Susitna River	Ship Creek	Bird Creek	Cotton wood Creek	Fish Creek	Wasilla Creek	Little Susitna River	Ship Creek	Campbell Creek	Bird Creek	Cotton wood Creek	Fish Creek				Wasilla Creek
Central District																			
Driftnet	294,977	66,423	2,051	2	0	1	37	74	28	283	273	368	316	4	3	1	207	44	1,641
Set Net																			
244-21	12,873	2,269	120	0	0	0	0	3	2	5	4	1	3	0	0	0	18	1	37
244-22	11,292	3,231	201	0	0	0	0	1	0	10	7	4	5	0	0	0	29	1	57
244-30	12,874	2,149	78	0	0	0	0	2	1	11	0	4	10	0	0	0	9	3	40
244-40	22,964	3,530	124	0	0	0	2	0	2	15	2	15	9	0	0	0	11	0	56
Total	60,003	11,179	523	0	0	0	2	6	5	41	13	24	27	0	0	0	67	5	190
District Total	354,980	77,602	2,574	2	0	1	39	80	33	324	286	392	343	4	3	1	274	49	1,831
Northern District ^b																			
247-10/20/30	56,440	33,296	848	1	0	0	31	34	27	98	333	81	77	4	2	3	134	0	825
247-41	4,639	3,139	215	0	0	0	11	14	10	58	22	47	33	1	0	0	19	0	215
247-42	5,935	2,255	153	0	0	0	10	16	12	26	28	26	21	2	1	1	10	0	153
247-43	8,051	3,413	355	0	1	0	16	13	11	31	116	66	69	1	1	1	21	6	353
247-70/80/90	23,406	17,301	384	0	1	0	4	7	1	8	224	26	55	1	2	0	36	1	366
District Total	98,471	59,404	1,955	1	2	0	72	84	61	221	723	246	255	9	6	5	220	7	1,912
UCI Total	453,451	137,006	4,529	3	2	1	111	164	94	545	1,009	638	598	13	9	6	494	56	3,743

^a Total does not include heads collected with coded wire tags from coho salmon marked and released at the Kenai River or Crooked Creek.

^b Combination of statistical areas 247-10, 247-20, 247-30, and 245-60 for fishery denoted 247-10/20/30 and combination of statistical areas 247-70, 247-80, and 247-90 for fishery denoted 247-70/80/90.

Table 8.-Estimated commercial harvest of urban stocked coho salmon in Upper Cook Inlet in 1994 by release site and year.

Release Site	Release Year	Gear	Statistical ^b Area	Time Interval ^a						Total		
				1	2	3	4	5	6			
Bird Creek	1992	Driftnet	244 & 245			15				15		
	1993	Driftnet	244 & 245	562	531	3,248	714	79	5	5,139		
		Set Net	244-21			18	27			45		
				244-22		12	42	13		67		
				244-30		35	69			104		
				244-40	16	9	77	115		217		
				Subtotal	16	56	206	155		433		
				247-10/20/30	263		34	277	42	8	624	
				247-41			32	143	18		193	
				247-42	73		41	79	21	8	222	
				247-43	242		94	316	15		667	
				247-70/80/90	540			89	45	53	727	
				Subtotal	1,118		201	904	141	69	2,433	
	Campbell Creek	1993	Driftnet	244 & 245	798	841	3,378	830	71		5,918	
			Set Net	244-21		23					23	
					244-22			49			49	
					244-30		14	18			32	
				244-40	16	9	148	134		307		
				Subtotal	16	46	215	134		411		
				247-10/20/30	100		50	278	85	8	521	
				247-41	61		50	185	11	22	329	
				247-42	73		55	140	5		273	
				247-43	206		53	271	35		565	
				247-70/80/90	356			68	11	8	443	
			Subtotal	796		208	942	147	38	2,131		
Ship Creek	1992	Set Net	247-43						13	13		
			247-70/80/90						2	2		
			Subtotal						15	15		
	1993	Driftnet	244 & 245	5		291	539	428	61	1,324		
			Set Net	244-21			14	11	7		32	
					244-22		7	10	6		23	
					244-40			18			18	
					Subtotal		21	39	13		73	
					247-10/20/30	8		40	254	316	111	729
					247-41				26	11	27	64
			247-42				20	17	47	84		

-continued-

Table 8.-Page 2 of 5.

Release Site	Release Year	Gear	Statistical ^b Area	Time Interval ^a						Total	
				1	2	3	4	5	6		
			247-43			5	56	156	217	434	
			247-70/80/90	36			35	86	237	394	
			Subtotal	44		45	391	586	639	1,705	
Cottonwood Creek	1992	Driftnet	244 & 245	6	35	188	61	5		295	
			Set Net	244-40			7	12			19
				247-10/20/30	10			45	25	6	86
				247-41				32	3		35
				247-42				42	19		61
				247-43	11			16	12	67	106
				247-70/80/90				11		2	13
				Subtotal	21			146	59	75	301
		1993	Driftnet	244 & 245			26		6		32
	Set Net			247-10/20/30				3	7		10
				247-41				4			4
				247-42			3	16			19
				247-43				5			5
				247-70/80/90	16						
			Subtotal	16		3	28	7			54
Fish Creek	1992	Driftnet	244 & 245	26	18	332	176	17	8	577	
			Set Net	244-21		12		14			26
				244-22			9			9	
				244-30			10	20		30	
				Subtotal		12	19	34			65
				247-10/20/30	21		9	68	18		116
				247-41			2	19	8	24	53
				247-42	19		5	60	8	22	114
				247-43			7	16	16	20	59
				247-70/80/90	31			7	4	2	44
				Subtotal	71		23	170	54	68	386
		1993	Driftnet	244 & 245				7	5	2	14

-continued-

Table 8.-Page 3 of 5.

Release Site	Release Year	Gear	Statistical ^b Area	Time Interval ^a						Total
				1	2	3	4	5	6	
		Set Net	247-10/20/30				6			6
			247-42						4	4
			247-43				5			5
			247-70/80/90	14			4			18
			Subtotal	14			15		4	33
Wasilla Creek	1992	Driftnet	244 & 245	21	19	96	83	13		232
		Set Net	244-21			15		9		24
			244-30				17			17
			244-40				24			24
			Subtotal			15	41	9		65
			247-10/20/30	11		9	60	11		91
			247-41			3	13	9		25
			247-42			6	4	20	18	48
			247-43	6		7	14	13	10	50
			247-70/80/90				5			5
			Subtotal	17		25	96	53	28	219
	1993	Driftnet	244 & 245			10				10
		Set Net	247-10/20/30				12			12
			247-42				5			5
			247-43				1			1
			Subtotal				18			18
Little Susitna River	1992	Driftnet	244 & 245			38	21			59
		Set Net	247-10/20/30				15			15
	1993	Driftnet	244 & 245	1,196	1,554	7,885	1,902	165	14	12,716
		Set Net	244-21		64	76	37	47		224
			244-22		112	181	64			357
			244-30		93	179	190			462
			244-40	87	49	423	455			1,014
			Subtotal	87	318	859	746	47		2,057

-continued-

Table 8.-Page 4 of 5.

Release Site	Release Year	Gear	Statistical ^b Area	Time Interval ^a						Total
				1	2	3	4	5	6	
			247-10/20/30	334		230	1,114	160	23	1,861
			247-41			126	706	104	62	998
			247-42	201		112	725	108		1,146
			247-43	317		222	283	38		860
			247-70/80/90	165			41	21	21	248
			Subtotal	1,017		690	2,869	431	106	5,113
Total	1992 Driftnet		244 & 245	53	72	669	341	35	8	1,178
		Set Net	244-21		12	15	14	9		50
			244-22			9				9
			244-30			10	37			47
			244-40			7	36			43
			Subtotal		12	41	87	9		149
			247-10/20/30	42		18	188	54	6	308
			247-41			5	64	20	24	113
			247-42	19		11	106	47	40	223
			247-43	17		14	46	41	110	228
			247-70/80/90	31			23	4	6	64
			Subtotal	109		48	427	166	186	936
	1993 Driftnet		244 & 245	2,561	2,926	14,838	3,992	754	82	25,153
		Set Net	244-21		87	108	75	54		324
			244-22		124	279	87	6		496
			244-30		142	266	190			598
			244-40	119	67	648	722			1,556
			Subtotal	119	420	1,301	1,074	60		2,974
			247-10/20/30	705		354	1,944	610	150	3,763
			247-41	61		208	1,064	144	111	1,588
			247-42	347		211	985	151	59	1,753
			247-43	765		374	937	244	217	2,537
			247-70/80/90	1,127			237	163	319	1,846
			Subtotal	3,005		1,147	5,167	1,312	856	11,487

-continued-

Table 8.-Page 5 of 5.

- ^a Time interval 1 is 6/27-7/15 for driftnet gear and statistical area 244 for setnet gear, 6/27-7/25 for all statistical areas of 247 except 247-70/80/90, and 6/27-8/01 for statistical areas 247-70/80/90; interval 2 is 7/16-7/23 for driftnet gear and statistical area 244 for setnet gear; interval 3 is 7/24-7/31 for driftnet gear and statistical area 244 for setnet gear, and 7/26-7/31 for all statistical areas of 247 except 247-70/80/90; interval 4 is 8/01-8/08 for all statistical areas except 247-70/80/90 and 8/02-8/08 for statistical areas 247-70/80/90; interval 5 is 8/09-8/15 for all statistical areas; and interval 6 is 8/16-9/09 for driftnet gear and 8/16-9/30 for all statistical areas of 247.
- ^b Combination of statistical areas 244-50, 244-60, 244-70, 245-70, 245-80, and 245-90 for driftnet gear; statistical areas 247-10, 247-20, 247-30, and 245-60 for those designated as 247-10/20/30; and statistical areas 247-70, 247-80, and 247-90 for those designated as 247-70/80/90.

Table 9.-Total estimated commercial harvest (n_1) and variance of harvest [$V(n_1)$] of urban stocked coho salmon in Upper Cook Inlet in 1994 by release site and year.

Release Site	Year	Statistical Area							
		244				247			
		Driftnet		Set net		Set net		Total	
		n_1	$V(n_1)$	n_1	$V(n_1)$	n_1	$V(n_1)$	n_1	$V(n_1)$
Bird Creek	1992	15	207					15	207
	1993	5,139	80,183	433	9,801	2,433	36,754	8,005	126,738
	Total	5,154	80,390	433	9,801	2,433	36,754	8,020	126,945
Campbell Creek	1993	5,918	91,903	411	9,480	2,131	28,383	8,460	129,766
Ship Creek	1992					15	151	15	151
	1993	1,324	5,707	73	493	1,705	4,161	3,102	10,361
	Total	1,324	5,707	73	493	1,720	4,312	3,117	10,512
Cottonwood Creek	1992	295	2,161	19	170	301	1,641	615	3,972
	1993	32	231			54	565	86	796
	Total	327	2,392	19	170	355	2,206	701	4,768
Fish Creek	1992	577	4,273	65	735	386	2,688	1,028	7,696
	1993	14	71			33	242	47	313
	Total	591	4,344	65	735	419	2,930	1,075	8,009
Wasilla Creek	1992	232	1,784	65	841	219	810	516	3,435
	1993	10	90			18	53	28	143
	Total	242	1,874	65	841	237	863	544	3,578
Little Susitna River	1992	59	1,806			15	196	74	2,002
	1993	12,716	1,191,603	2,057	158,938	5,113	225,515	19,886	1,576,056
	Total	12,775	1,193,409	2,057	158,938	5,128	225,711	19,960	1,578,058
Total	1992	1,178	10,206	149	1,746	936	5,443	2,263	17,395
	1993	25,153	1,358,885	2,974	177,713	11,487	291,385	39,614	1,827,983
Grand Total		26,331	1,369,091	3,123	179,459	12,423	296,828	41,877	1,845,378

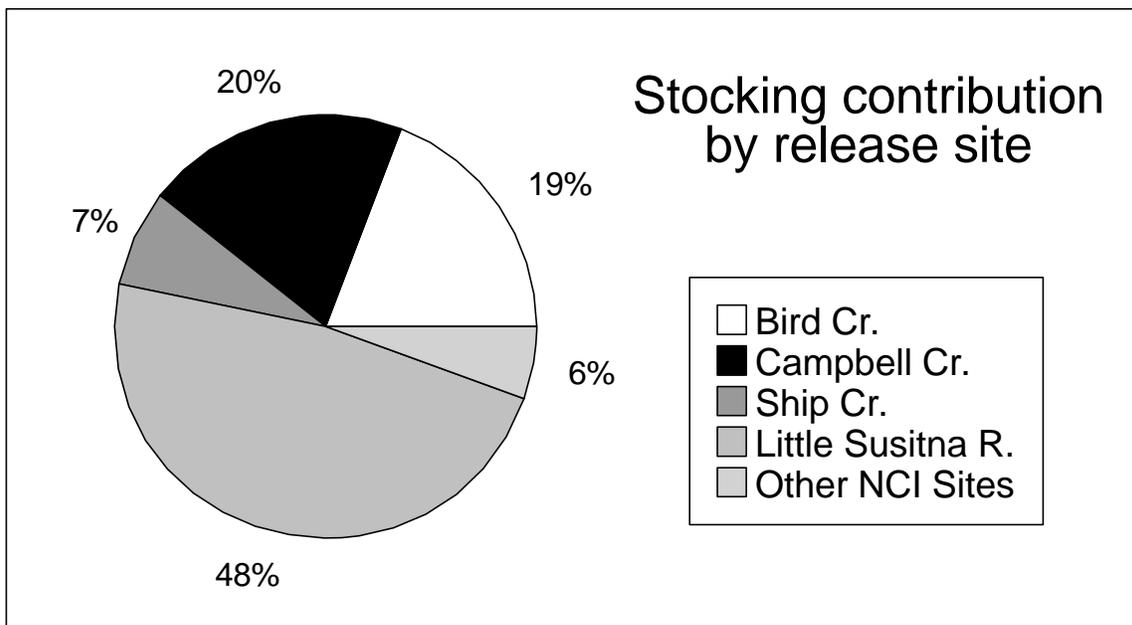
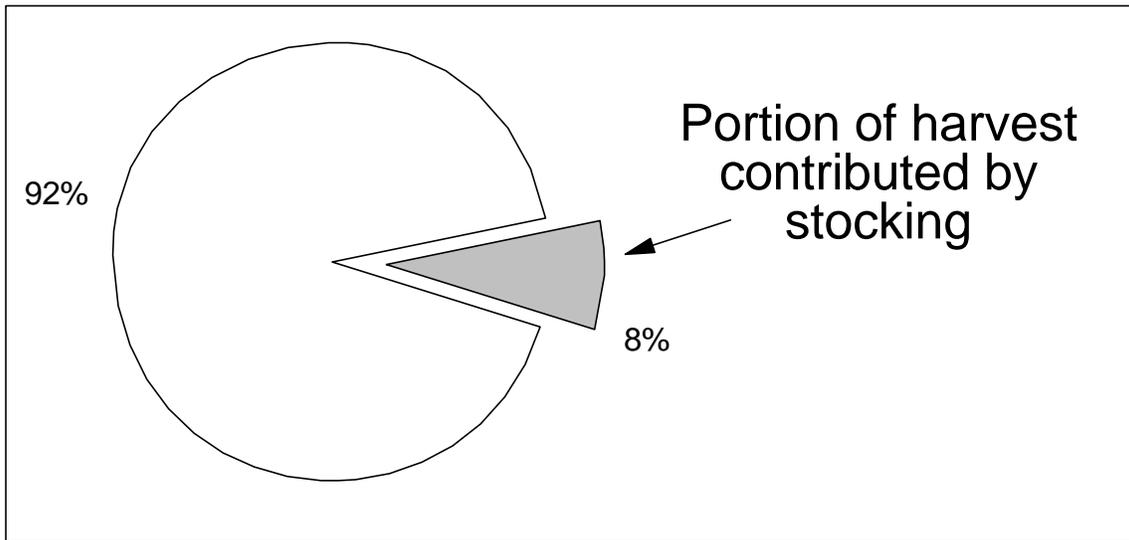


Figure 6.-Portion of 1994 Upper Cook Inlet coho salmon commercial harvest represented by urban stocked fish.

Central District Eastside setnet harvest, and 8% of the Northern District setnet harvest was composed of hatchery-produced fish (Figures 7, 8, and 9, respectively). The largest contributors to the commercial harvest were coho salmon stocked in three Anchorage urban area streams (Bird, Campbell, and Ship creeks), and the 1993 smolt releases into Little Susitna River. The returns to Little Susitna River composed over 40% of the hatchery returns in all of the fisheries. Coho salmon stocked into Bird and Campbell creeks provided nearly equal numbers of fish to each fishery. Relatively few coho salmon stocked into Ship Creek were harvested by the Central District fisheries. Very few (< 2,400) coho salmon stocked into Cottonwood, Fish, and Wasilla creeks in 1992 and 1993 were harvested in the sampled commercial fisheries.

MARINE SURVIVAL

Overall marine survival of the four major coho salmon cohorts released in 1993 and recovered in 1994 was 0.106 (SE = 0.005; Table 10). Survival estimates ranged from 0.085 (SE = 0.010) for smolt released at Campbell Creek to 0.125 (SE = 0.024) for smolt released at Ship Creek. Estimates of the total run, and thus survival, of stocked coho salmon at Bird, Campbell, and Ship creeks are biased somewhat high because sport harvest in all three systems was assumed to be solely stocked coho salmon.

Table 10.-Estimated marine survival, with associated standard error in parentheses, of coho salmon stocked into four systems of Northern Cook Inlet in 1993.

Release Site	Number Smolt Released	Total Hatchery Run	Smolt Survival
Bird Creek	140,382 (1,670)	13,707 (1,541)	0.098 (0.011)
Campbell Creek	140,797 (1,700)	11,943 (1,355)	0.085 (0.010)
Ship Creek	54,764 (0)	6,831 (1,332)	0.125 (0.024)
Little Susitna River	279,873 (4,259)	28,782 (1,521)	0.103 (0.006)
Total	619,186 (4,880)	65,491 (2,881)	0.106 (0.005)

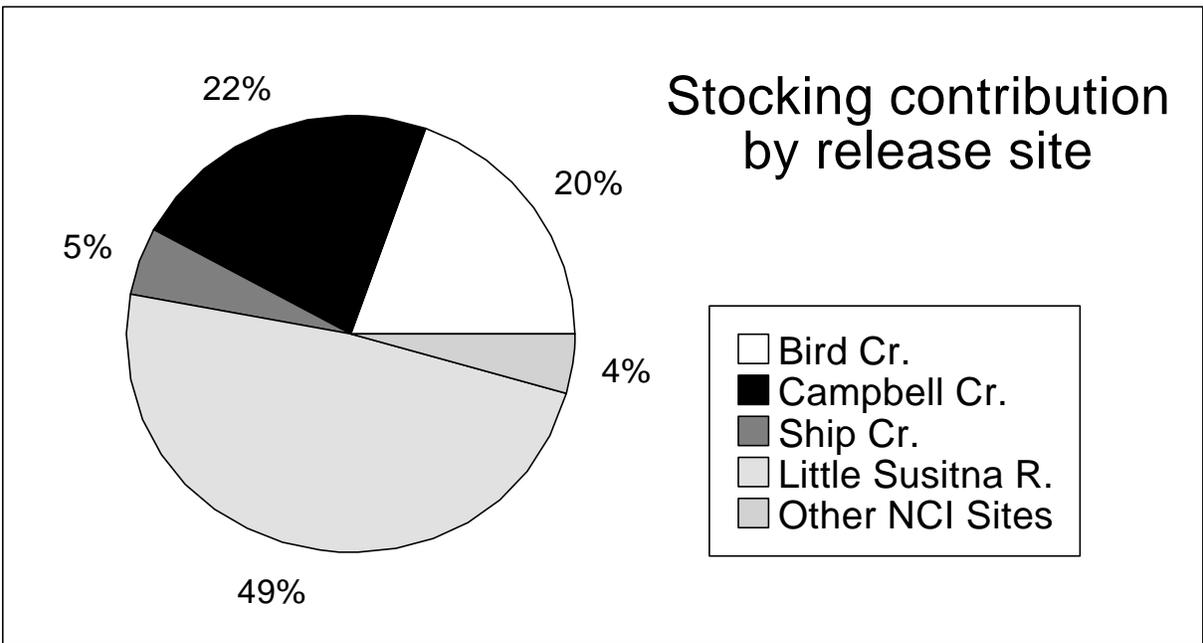
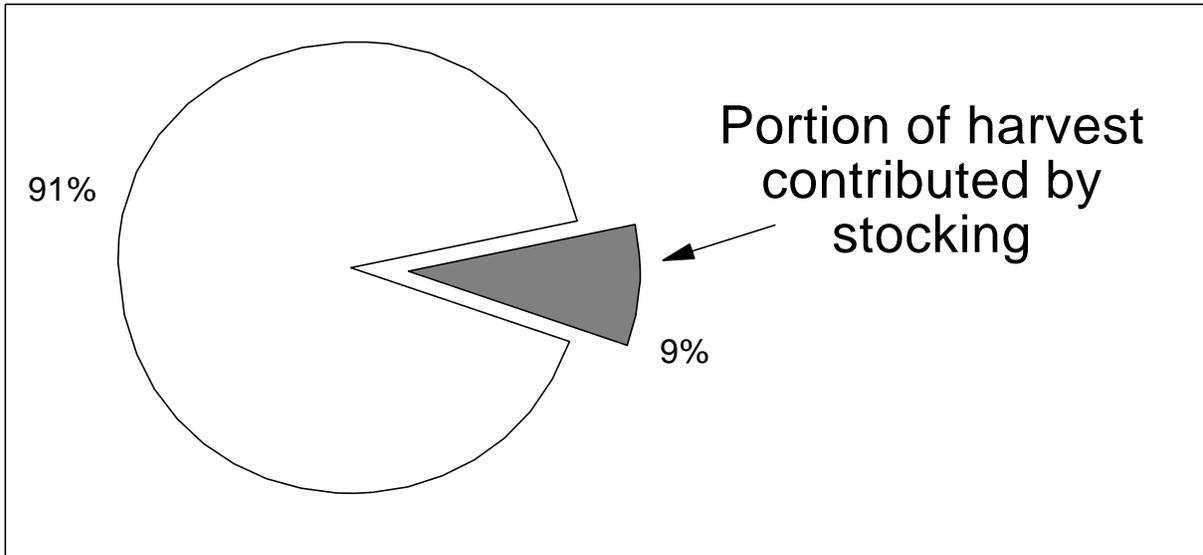


Figure 7.-Portion of 1994 Central District drift net coho salmon commercial harvest represented by urban stocked fish.

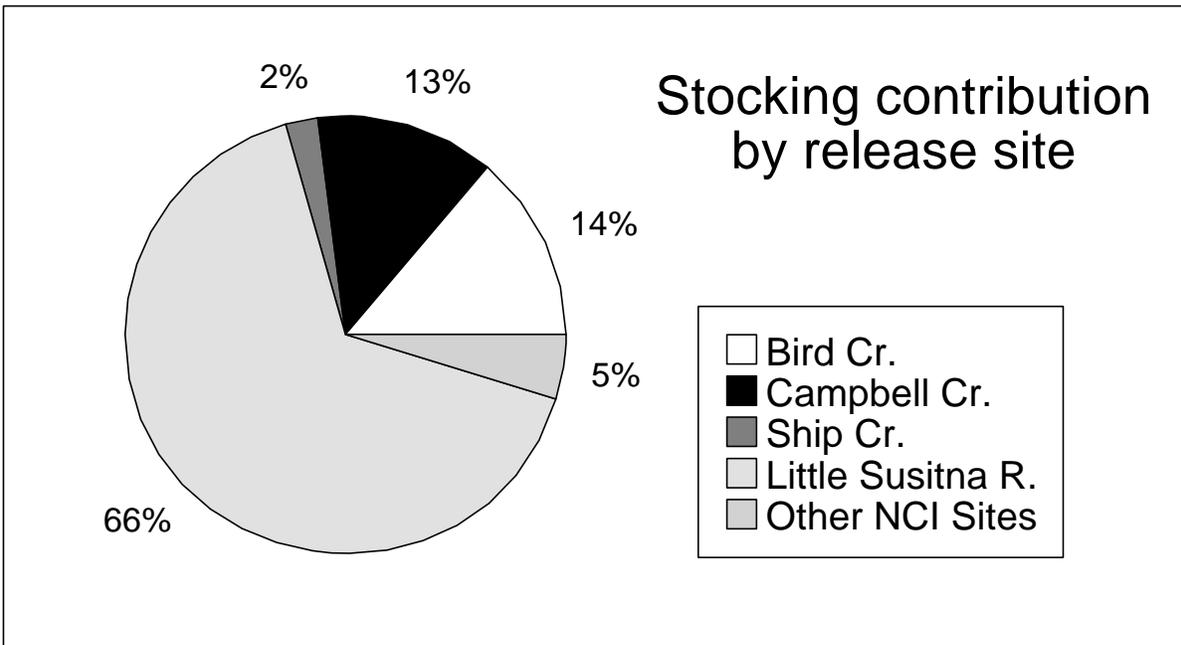
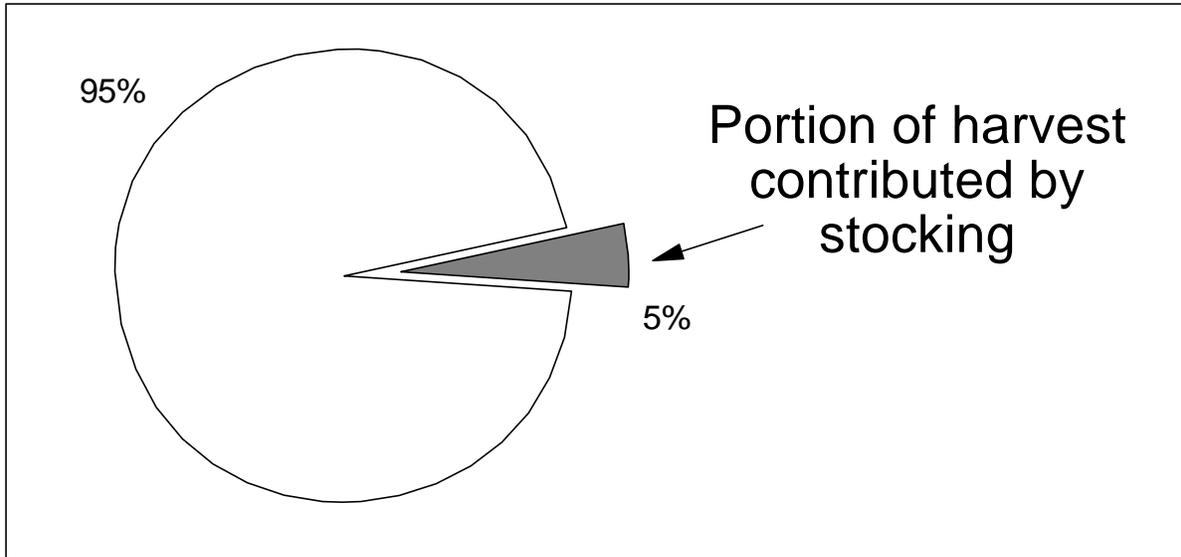


Figure 8.-Portion of 1994 Central District, Upper Subdistrict setnet coho salmon commercial harvest represented by urban stocked fish.

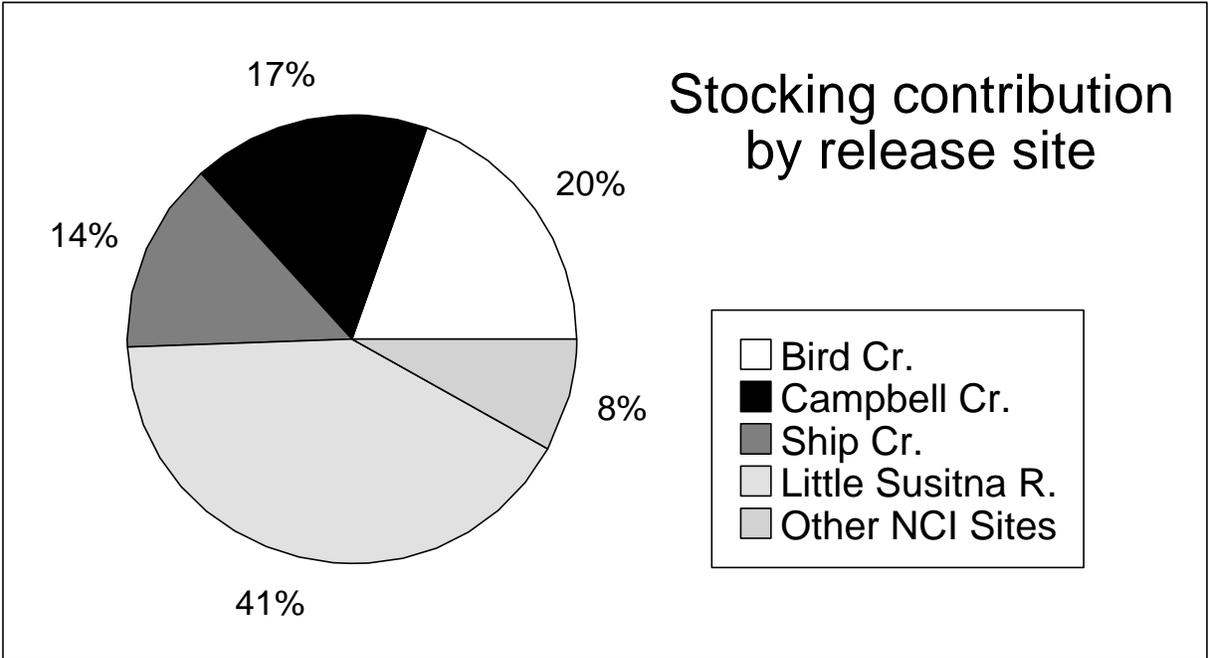
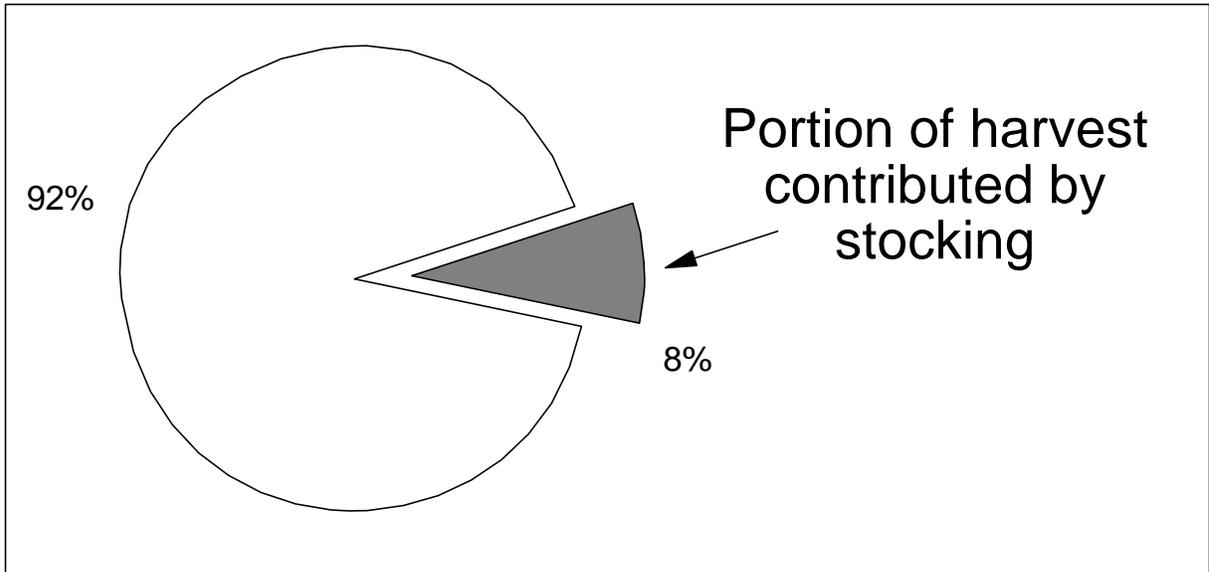


Figure 9.-Portion of 1994 Northern District setnet coho salmon commercial harvest represented by urban stocked fish.

DISCUSSION

SPORT FISHERY

The measure of success of the coho salmon stocking program is an increase in angler effort and harvest. The targeted increase in harvest of 10,000 fish was nearly achieved: harvest increased by 7,040 coho salmon in 1994 relative to the prestocking 5-year mean. The estimated harvest is species specific so this increase is easily quantified. The ultimate measure of success, however, is the increase in angler effort. The Statewide Harvest Survey estimates angling effort for all species combined. Increased angler effort for a specific species is not easily quantified and may be masked or exaggerated by fluctuations in effort of other fisheries. The targeted increase in angler effort of 20,000 angler-days was achieved when compared to the 5-year mean, but there was only a 7,740 angler-day increase over effort in 1992, the last year before stocked fish returned. The true increase in angler effort for coho salmon may be masked by the continually increasing popularity of the chinook salmon fishery in Ship Creek. This fishery has grown dramatically in recent years and is included in the estimate of angler effort. In addition, a weakness of using the Statewide Harvest Survey is that the survey targets licensed anglers. Urban creeks, especially Campbell Creek, are fished primarily by young anglers who are not required to purchase a license. Thus, these estimates of harvest and effort are considered minimal estimates. We believe results presented in this report and field observations of the sport fisheries indicate that the urban coho salmon stocking program succeeded in 1994.

Weather affected the sport fishery at Campbell Creek and the overall success of the stocking program in 1994. At Campbell Creek, fish stayed in Campbell Lake during low water level and high water temperatures and moved into the fishery when water temperature decreased after heavy precipitation. Few rain events occurred in 1994 between mid July and late August, so many of the coho salmon stayed in Campbell Lake, which is closed to fishing, and began to sexually mature. When heavy rain events did occur and the creek water temperature decreased, these fish quickly migrated through the fishery. Of the estimated 4,725 coho salmon caught by anglers at Campbell Creek in 1994 (Howe et al. 1995), nearly 75% (3,469) were released. Overall angler effort in 1994 also declined at Campbell Creek by over 1,000 angler-days compared to 1993. Conversely, the fisheries in Bird and Ship creeks, being essentially intertidal, were more closely related to the tides. Greatest success was during the low tide, although during the peak of the return fish were available at all tide stages. Only 25%-30% of the coho salmon caught in these two creeks were released and overall angler effort in 1994 was nearly identical to that in 1993.

ESCAPEMENT

The biological escapement goal (BEG) of 200 coho salmon was exceeded in both Ship and Campbell creeks. Hatchery staff at Ship Creek have seen chinook salmon jumping over the dam and passing through the flow control gates of the dam when the gates are open. Although no coho salmon were observed jumping over the dam at Ship Creek during high tides, coho salmon may act similarly to chinook salmon, therefore this escapement count is considered a minimum rather than a total count.

The escapement count at Campbell Creek is also considered a minimum because the weir was removed before all coho salmon passed the weir. This minimum escapement count was 16 times

greater than the BEG, indicating that returns from this stocking effort were more than adequate for supporting the fishery.

STRAYING

The straying of hatchery-reared coho salmon was tested because of concerns that hatchery fish may compete with wild stocks for spawning areas. Our results indicate that straying is not a major concern. No straying occurred in any of the systems evaluated for straying except Ship Creek. The trap box at Ship Creek is located at the upper extent of the intertidal area. Salmon stay or mill in the mouths of nonnatal systems (Sandercock 1991), thus the tagged fish released at Little Susitna River and recovered in Ship Creek may not have been destined to enter Ship Creek to spawn.

TAG LOSS

Tag loss was detected by the absence of coded wire tags in adipose clipped fish. Tag loss estimated from escapement samples ranged from 4% to 14% while tag loss in these same groups ranged between 1%-5% at release (Peltz and Hansen 1994). Therefore, tag loss of most release cohorts occurred primarily before the fish were released and tag loss after release was relatively low. Grading smolt into size classes and using different head mold sizes when tagging fish to improve tag placement likely improved tag retention of smolt releases in 1993 compared to those released in 1992 (Peltz and Hansen 1994).

Results from Little Susitna River were likely caused by significant tag loss after release. One raceway of smolt released into Little Susitna River in 1993 rubbed their snouts against the hatchery raceway prior to release (L. Peltz, Alaska Department of Fish and Game, Palmer, personal communication), a condition that probably decreased long-term tag retention of this cohort (Peltz and Hansen 1994).

COMMERCIAL CATCH ASSESSMENT

Catch sampling of the UCI coho salmon fishery in 1994 was conducted when 87% of the coho salmon harvest occurred. Technicians examined 26% of the total harvest and nearly 3% of the fish examined had a missing adipose fin. In the Northern District, 40% of the coho salmon harvested were examined for a missing adipose fin, and in the Central District 22% were sampled in the driftnet and 16% were examined in the eastside setnet fisheries. It was possible to sample a greater proportion of the Northern District harvest than the Central District harvest because fewer processors purchased fish, there were generally fewer fishing periods, and most fishing periods were scheduled openings rather than through emergency order.

The sampling effort of the commercial harvest provided relatively precise estimates. Relative precision of the total harvest of hatchery-produced fish by the UCI commercial fisheries was 6%. Estimates were most precise for the Central District driftnet (9%) and the Northern District setnet fisheries (9%), and much less precise for the Central District eastside setnet fishery (27%). The estimated harvest by the eastside setnet fishery was not as precise because a lower proportion of the harvest was sampled and because fewer tags were recovered from this fishery.

Harvest estimates of coho salmon stocked into Bird, Campbell, and Ship creeks had good precision (relative precision < 10%) because over 30% of the smolt in each release group were tagged and because of the large sample from the commercial harvest. Estimates of harvest of fish stocked into Little Susitna River were also relatively precise (12%). Precision of this cohort

of stocked fish was somewhat higher (i.e. worse) than the above cohorts because a lower proportion of the release cohort were tagged and because more of these fish were harvested by the Central District eastside setnet fishery, where a lower proportion of harvested coho salmon were sampled relative to other stocked groups. Harvest estimates of coho stocked into Cottonwood, Fish, and Wasilla creeks were fairly precise (16%-22%): estimates were not as precise as other stocked cohorts because relatively few tagged fish of these cohorts were observed in the commercial fisheries. Based on estimates of commercial and sport harvest (3,000; Howe et al. 1995) of coho salmon, it appears returns of stocking efforts at these three systems may have been low. Peltz and Starkey (1993) hypothesized that smolt stocked into these systems in 1993 would hold over in fresh water an additional year after release and have poor marine survival because of their small size and poor health.

The pattern of the commercial harvest was typical of previous years. Of the total coho salmon harvest, 58% occurred in the Central District driftnet fishery, 13% in the Central District eastside setnet fishery, and 28% in the Northern District setnet fishery. The majority of the hatchery stocked fish harvested by the UCI commercial fishery was taken in the Central District driftnet fishery: 62% of the total commercial harvest of coho salmon stocked into Anchorage urban systems and 64% of the total commercial harvest of coho salmon stocked into Little Susitna River. The Northern District setnet fishery took 33% of the estimated total commercial harvest of coho salmon stocked into Anchorage urban systems and 26% of the estimated total commercial harvest of coho salmon stocked into Little Susitna River. Fish stocked into Bird, Campbell, and Ship creeks were primarily harvested along both the west and east sides of the Northern District and around Fire Island, near Anchorage. Fish stocked into Cottonwood, Fish, and Wasilla creeks were harvested primarily along the west side of the Northern District and around Point MacKenzie. Coho salmon stocked into Little Susitna River were harvested primarily along the west side of the Northern District and around both Fire Island and Point MacKenzie. The Central District eastside setnet fishery took only 5% of the total commercial harvest of coho salmon stocked into the Anchorage urban systems and 10% of the coho salmon stocked into Little Susitna River, with most of the harvest occurring in the statistical area 244-40 which is nearest the Northern District.

Some results from the estimates of the commercial harvest of hatchery-produced coho salmon should be noted. First, pooling data among statistical areas generally did not improve precision of the estimates of the Central District eastside setnet fisheries. In addition, incorporating covariance terms when summing estimated variances among release groups within strata did not reduce the variance estimates greatly. Estimates of harvest of marked cohorts within the statistical area/day strata are not independent, so the total variance estimate has an additional covariance component (Clark and Bernard 1987; Bernard and Clark *In prep*). The small reduction in total variance resulting from incorporation of the covariance terms occurred because the catch sampling program recovers a large number of tagged fish from each cohort and the Tag Lab loses few heads due to good quality control.

Our results justify continuation of the stocking program. The terminal and commercial assessment programs should continue to evaluate the stocking program and determine if the success of the stocking program continues. Recommendations for the future include increasing sampling of several statistical areas in the Northern District (i.e., 247-10, 247-20, 247-30, 247-70, 247-80, and 247-90) to obtain samples from each statistical area. This could be

accomplished by placing technicians onboard tenders more frequently, closely following buying patterns of processors inseason, maintaining good rapport with processors, and stationing technicians in Homer and Soldotna. These steps would improve our ability to sample pure loads of coho salmon harvested in these statistical areas.

ACKNOWLEDGMENTS

The data presented here result from the efforts of many individuals. Terry Bradley coordinated the Campbell Creek weir installation and operation. Don Perrin, Brad Fisher, and Matt Miller conducted catch sampling, operated the Ship Creek weir, and filled in at the Campbell Creek weir. Mike Seine worked at the Campbell Creek weir. Dave Waltemyer, Kim Rudge, and Jay Carlon supervised a host of technicians from the Soldotna ADF&G office who collected data from the Central District. Anna Sharp, Sam Bertoni, Karen Crandall, and the rest of the staff at the Tag Lab in Juneau were always helpful and patient in helping us deal with coded wire tag data.

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 1994. Preliminary run forecasts and harvest projections for 1994 Alaska salmon fisheries and review of the 1993 season. H. J. Geiger and E. Simpson, editors. Commercial Fisheries Management and Development Division, Regional Information Report No. 5J94-0B, Juneau.
- Bartlett, L. D. *In prep.* Escapement and stock statistics for coho salmon from the Little Susitna River and selected Matanuska-Susitna Valley, Alaska streams during 1994. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Bartlett, L. D. *Unpublished.* Coho and sockeye salmon stock assessment studies in the Jim Creek drainage, Knik Arm, Alaska, during 1993. Located at: Alaska Department of Fish and Game, Division of Sport Fish, Palmer.
- Bernard, D. R. and J. E. Clark. *In prep.* Estimating salmon harvest based on return of coded-wire tags. *Can. J. Fish. Aquat. Sci.*
- Carlon, J. and J. J. Hasbrouck. 1993. Marking juvenile coho salmon in the Kenai River with coded, microwire tags. Alaska Department of Fish and Game, Fishery Data Series No. 93-52, Anchorage.
- Carlon, J. and J. J. Hasbrouck. *In prep.* Recovery and estimation of commercial harvest of coho salmon from the Kenai River in the Upper Cook Inlet fishery in 1994. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Clark, J. E. and D. R. Bernard. 1987. A compound multivariate binomial-hypergeometric distribution describing coded microwire tag recovery from commercial salmon catches in Southeastern Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet No. 261. Juneau.
- Howe, A. L., G. Fidler, and M. J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.
- Meyer, S., D. Vincent-Lang, and D. McBride. *Unpublished.* Goal statement and study plan for the development of a stock assessment program for Upper Cook Inlet coho salmon stocks (1991). Located at: Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.
- Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-1), Juneau.

LITERATURE CITED (Continued)

- Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-1), Juneau.
- Mills, M. J. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.
- Mills, M. J. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.
- Mills, M. J. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (SW-I-A), Juneau.
- Mills, M. J. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (SW-I-A), Juneau.
- Mills, M. J. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (SW-I-A), Juneau.
- Mills, M. J. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985, Project F-9-17, 26 (SW-I-A), Juneau.
- Mills, M. J. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (RT-2), Juneau.
- Mills, M. J. 1987. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau.
- Mills, M. J. 1988. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau.
- Mills, M. J. 1989. Alaska statewide sport fisheries harvest report. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau.
- Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage.
- Mills, M. J. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage.
- Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40, Anchorage.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage.
- Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-28, Anchorage.
- Peltz, L. R. and P. A. Hansen. 1994. Marking, enumeration, and size estimation for coho and chinook salmon smolt releases into Upper Cook Inlet, Alaska in 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-21. Anchorage.
- Peltz, L. R. and D. Starkey. 1993. Summary and synthesis of production, marking, and release data for coho and chinook salmon smolt releases into Upper Cook Inlet, Alaska, in 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-51. Anchorage.
- Sandercock, F. K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). In C. Groot and L. Margolis, editors. Pacific salmon life histories. UBC Press. Vancouver, B.C., Canada.

**APPENDIX A. COHO SALMON ESCAPEMENT COUNT AT
CAMPBELL AND SHIP CREEKS, 1994**

Appendix A1.-Coho salmon escapement counts at Campbell and Ship creeks, 1994.

Date	Campbell Creek					Ship Creek				
	Adipose fin		Total Coho	Heads Collected	Coho Escapement	Adipose fin		Total Coho	Heads Collected	Coho Escapement
	Present	Absent				Present	Absent			
7/20						1	0	1	0	1
7/21	0	0	0	0	0	0	0	0	0	0
7/22	0	0	0	0	0	0	0	0	0	0
7/23	0	0	0	0	0	0	0	0	0	0
7/24	0	0	0	0	0	0	0	0	0	0
7/25	0	0	0	0	0	0	0	0	0	0
7/26	0	0	0	0	0	0	0	0	0	0
7/27	0	0	0	0	0	0	0	0	0	0
7/28	0	0	0	0	0	0	0	0	0	0
7/29	0	1	1	0	1	1	0	1	0	1
7/30	1	0	1	0	1	0	0	0	0	0
7/31	0	0	0	0	0	0	0	0	0	0
8/01	0	0	0	0	0	1	1	2	0	2
8/02	0	0	0	0	0	0	1	1	0	1
8/03	0	0	0	0	0	1	0	1	0	1
8/04	0	0	0	0	0	0	2	2	2	0
8/05	0	0	0	0	0	0	2	2	2	0
8/06	0	0	0	0	0	3	3	6	3	3
8/07	0	0	0	0	0	7	11	18	11	7
8/08	0	0	0	0	0	0	4	4	4	0
8/09	0	0	0	0	0	2	4	6	4	2
8/10	0	0	0	0	0	0	2	2	2	0
8/11	0	0	0	0	0	2	5	7	5	2
8/12	0	0	0	0	0	3	6	9	3	6
8/13	0	0	0	0	0	9	12	21	6	15
8/14	0	0	0	0	0	3	10	13	5	8
8/15	0	0	0	0	0	3	4	7	2	5
8/16	0	0	0	0	0	5	11	16	5	11
8/17	0	0	0	0	0	4	7	11	3	8
8/18	0	0	0	0	0	18	20	38	10	28
8/19	0	0	0	0	0	6	13	19	6	13
8/20	0	0	0	0	0	11	17	28	8	20
8/21	0	0	0	0	0	17	39	56	12	44
8/22	0	0	0	0	0	14	51	65	17	48
8/23	0	0	0	0	0	9	30	39	10	29
8/24	0	0	0	0	0	5	23	28	7	21

-continued-

Appendix A1.-Page 2 of 2.

Date	Campbell Creek					Ship Creek				
	Adipose fin		Total	Heads	Coho	Adipose fin		Total	Heads	Coho
	Present	Absent	Coho	Collected	Escapement	Present	Absent	Coho	Collected	Escapement
8/25	0	0	0	0	0	36	55	91	17	74
8/26	0	0	0	0	0	24	33	57	11	46
8/27	32	10	42	3	39	31	62	93	19	74
8/28	1	0	1	0	1	6	9	15	3	12
8/29	6	0	6	0	6	5	6	11	3	8
8/30	4	0	4	0	4	7	6	13	3	10
8/31	2	0	2	0	2	2	10	12	4	8
9/01	5	0	5	0	5	10	23	33	7	26
9/02	1	0	1	0	1	0	4	4	1	3
9/03	3	0	3	0	3	0	0	0	0	0
9/04	0	0	0	0	0	0	2	2	1	1
9/05	16	2	18	1	17	4	14	18	4	14
9/06	6	1	7	0	7	1	3	4	1	3
9/07	10	2	12	1	11	1	2	3	1	2
9/08	164	38	202	12	190	1	5	6	2	4
9/09	47	11	58	4	54	0	0	0	0	0
9/10	1	0	1	0	1	4	4	8	1	7
9/11	240	57	297	19	278	3	5	8	2	6
9/12	421	105	526	35	491	3	2	5	1	4
9/13	164	30	194	10	184	4	1	5	1	4
9/14	472	112	584	2	582	6	7	13	3	10
9/15	104	26	130	8	122	5	8	13	3	10
9/16	142	53	195	18	177	9	10	19	3	16
9/17	43	20	63	7	56	3	3	6	1	5
9/18	58	15	73	5	68	0	0	0	0	0
9/19	35	17	52	5	47	2	3	5	2	3
9/20	193	68	261	22	239	2	3	5	1	4
9/21	87	23	110	8	102	4	4	8	1	7
9/22	70	35	105	11	94	3	5	8	2	6
9/23	78	23	101	7	94	5	3	8	1	7
9/24	90	22	112	7	105	0	1	1	0	1
9/25	61	16	77	5	72	0	0	0	0	0
9/26						2	1	3	0	3
Total	2,557	687	3,244	190	3,054	308	572	880	226	654

**APPENDIX B. ESTIMATES BY RELEASE SITE OF THE
NUMBER OF COHO SALMON STOCKED IN 1992 AND 1993
THAT WERE HARVESTED IN UPPER COOK INLET
COMMERCIAL FISHERIES IN 1994**

Appendix B1.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District drift net (244-00, 245-00) commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-7/08	17,040	145	85	0		174	53	141	48	0		0		0		460	111	2.7%
7/10	38	0		0		0		0		0		0		0		0		0.0%
7/11	195	0		0		43	42	0		0		0		0		43	42	22.1%
7/15	38,424	1,051	250	5	5	581	82	421	70	0		0		0		2,058	272	5.4%
7/18	44,368	1,554	363	0		841	117	531	94	0		0		0		2,926	393	6.6%
7/24	2,353	100	71	0		36	25	73	35	0		0		0		209	83	8.9%
7/25	53,725	2,481	506	95	23	1,177	131	1,236	135	26	14	0		0		5,015	540	9.3%
7/26	2,196	127	127	0		0		0		0		0		0		127	127	5.8%
7/27-7/28	56,838	3,264	657	125	29	1,351	156	1,189	148	0		0		0		5,929	692	10.4%
7/29	31,919	1,913	425	71	21	814	115	750	111	0		0		10	9	3,558	455	11.1%
8/01	15,385	716	204	184	31	380	73	337	69	0		7	7	0		1,624	229	10.6%
8/02	1,073	29	28	0		21	14	10	10	0		0		0		60	33	5.6%
8/03	1,566	122	71	12	8	29	20	30	20	0		0		0		193	79	12.3%
8/04	2,169	51	51	15	10	37	25	74	36	0		0		0		177	68	8.2%
8/05	9,011	571	179	115	25	159	48	128	44	0		0		0		973	192	10.8%
8/06-8/07	420	0		0		11	11	11	11	0		0		0		22	15	5.2%
8/08	9,819	413	117	213	23	193	39	124	31	0		0		0		943	129	9.6%
8/12	6,202	91	53	234	28	44	21	66	26	6	6	5	5	0		446	69	7.2%
8/15	4,889	74	52	194	29	27	18	13	13	0		0		0		308	64	6.3%
8/19	2,577	14	13	61	8	0		5	4	0		2	2	0		82	16	2.7%
8/22-8/24	1,361	0		0		0		0		0		0		0		0		0.0%
8/26	436	0		0		0		0		0		0		0		0		0.0%
8/29-9/09	1,931	0		0		0		0		0		0		0		0		0.0%
Total	303,935	12,716	1,092	1,324	76	5,918	303	5,139	283	32	15	14	8	10	9	25,153	1,176	8.3%

Appendix B2.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Ninilchik Beach (244-21) set net commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution			
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent	
7/01-7/15	137	0		0		0		0		0		0		0		0		0	0.0%
7/16-7/17	106	0		0		0		0		0		0		0		0		0	0.0%
7/18	127	0		0		0		0		0		0		0		0		0	0.0%
7/19	105	0		0		0		0		0		0		0		0		0	0.0%
7/20	257	0		0		0		0		0		0		0		0		0	0.0%
7/21	190	0		0		0		0		0		0		0		0		0	0.0%
7/22-7/23	539	64	64	0		23	22	0		0		0		0		87	67	16.1%	
7/24-7/25	508	0		0		0		18	18	0		0		0		18	18	3.5%	
7/26	512	76	76	0		0		0		0		0		0		76	76	14.8%	
7/27-7/28	1,069	0		14	14	0		0		0		0		0		14	14	1.3%	
7/29	649	0		0		0		0		0		0		0		0		0	0.0%
8/01	733	0		0		0		0		0		0		0		0		0	0.0%
8/02	1,129	37	37	0		0		0		0		0		0		37	37	3.3%	
8/03	1,019	0		0		0		0		0		0		0		0		0	0.0%
8/04	706	0		0		0		0		0		0		0		0		0	0.0%
8/05	958	0		5	5	0		27	18	0		0		0		32	19	3.3%	
8/06-8/07	1,643	0		0		0		0		0		0		0		0		0	0.0%
8/08	1,301	0		6	6	0		0		0		0		0		6	6	0.5%	
8/12	1,631	47	47	7	6	0		0		0		0		0		54	47	3.3%	
8/15	1,253	0		0		0		0		0		0		0		0		0	0.0%
Total	14,572	224	115	32	17	23	22	45	25	0		0		0		324	121	2.2%	

Appendix B3.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Coho Beach (244-22) set net commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution			
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent	
7/01-7/15	286	0		0		0		0		0		0		0		0			0.0%
7/16-7/17	202	0		0		0		12	11	0		0		0		12	11		5.9%
7/18	156	23	23	0		0		0		0		0		0		23	23		14.7%
7/19	276	32	32	0		0		0		0		0		0		32	32		11.6%
7/20	239	0		0		0		0		0		0		0		0			0.0%
7/21	492	0		0		0		0		0		0		0		0			0.0%
7/22	629	57	40	0		0		0		0		0		0		57	40		9.1%
7/23	444	0		0		0		0		0		0		0		0			0.0%
7/24	484	40	40	0		0		14	14	0		0		0		54	42		11.2%
7/25	502	0		0		22	15	11	11	0		0		0		33	18		6.6%
7/26	213	0		4	3	10	9	0		0		0		0		14	10		6.6%
7/27-7/28	1,275	141	83	0		17	16	17	17	0		0		0		175	86		13.7%
7/29	359	0		3	4	0		0		0		0		0		3	4		0.8%
8/01	444	0		0		0		0		0		0		0		0			0.0%
8/02	717	0		5	5	0		13	12	0		0		0		18	13		2.5%
8/03	413	18	18	0		0		0		0		0		0		18	18		4.4%
8/04	609	0		0		0		0		0		0		0		0			0.0%
8/05	666	0		0		0		0		0		0		0		0			0.0%
8/06-8/07	1,214	46	46	0		0		0		0		0		0		46	46		3.8%
8/08	304	0		5	4	0		0		0		0		0		5	4		1.6%
8/12	1,959	0		0		0		0		0		0		0		0			0.0%
8/15	721	0		6	3	0		0		0		0		0		6	3		0.8%
Total	12,604	357	118	23	8	49	24	67	29	0		0		0		496	124		3.9%

Appendix B4.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Kalifonski Beach (244-30) set net commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution		percent
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	
7/01-7/15	256	0		0		0		0		0		0		0		0		0.0%
7/16-7/17	224	0		0		0		0		0		0		0		0		0.0%
7/18	381	29	29	0		0		11	10	0		0		0		40	30	10.5%
7/19	171	11	11	0		0		0		0		0		0		11	11	6.4%
7/20	171	0		0		0		0		0		0		0		0		0.0%
7/21	385	0		0		0		0		0		0		0		0		0.0%
7/22-7/23	1,353	53	27	0		14	7	24	10	0		0		0		91	29	6.7%
7/24	747	0		0		0		0		0		0		0		0		0.0%
7/25	587	0		0		0		0		0		0		0		0		0.0%
7/26	431	0		0		18	18	19	18	0		0		0		37	25	8.6%
7/27-7/28	1,295	148	105	0		0		27	26	0		0		0		175	109	13.5%
7/29	405	31	31	0		0		23	15	0		0		0		54	34	13.3%
8/01	558	0		0		0		0		0		0		0		0		0.0%
8/02	701	0		0		0		0		0		0		0		0		0.0%
8/03	664	86	86	0		0		0		0		0		0		86	86	13.0%
8/04	814	104	104	0		0		0		0		0		0		104	104	12.8%
8/05	928	0		0		0		0		0		0		0		0		0.0%
8/06-8/07	1,555	0		0		0		0		0		0		0		0		0.0%
8/08	476	0		0		0		0		0		0		0		0		0.0%
8/12	1,518	0		0		0		0		0		0		0		0		0.0%
8/15	1,357	0		0		0		0		0		0		0		0		0.0%
Total	14,977	462	178	0		32	19	104	38	0		0		0		598	183	4.0%

Appendix B5.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Central District Salamatof Beach (244-40) set net commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution		percent
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	
7/01-7/15	2,104	87	62	0		16	15	16	15	0		0		0		119	65	5.7%
7/18	2,099	49	34	0		9	8	9	8	0		0		0		67	36	3.2%
7/24-7/25	3,251	344	246	0		62	61	63	62	0		0		0		469	261	14.4%
7/26	1,113	0		0		0		0		0		0		0		0		0.0%
7/27-7/28	2,443	0		0		0		0		0		0		0		0		0.0%
7/29	1,058	79	56	0		86	33	14	14	0		0		0		179	67	16.9%
8/01	1,656	300	140	9	8	65	36	22	21	0		0		0		396	146	23.9%
8/02	1,327	0		0		24	23	24	23	0		0		0		48	33	3.6%
8/03	1,877	63	63	0		45	31	46	31	0		0		0		154	77	8.2%
8/04	1,026	0		0		0		0		0		0		0		0		0.0%
8/05	1,611	0		9	9	0		23	22	0		0		0		32	24	2.0%
8/06-8/07	2,212	92	92	0		0		0		0		0		0		92	92	4.2%
8/08	997	0		0		0		0		0		0		0		0		0.0%
8/12	2,397	0		0		0		0		0		0		0		0		0.0%
8/15	1,957	0		0		0		0		0		0		0		0		0.0%
Total	27,128	1,014	317	18	12	307	90	217	83	0		0		0		1,556	339	5.7%

Appendix B6.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District westside set net (245-60, 247-10, 247-20, 247-30) commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Campbell Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-7/25	45,255	334	143	8	8	100	44	263	71	0		0		0		705	166	1.6%
7/29	10,803	230	107	40	15	50	28	34	23	0		0		0		354	114	3.3%
8/01	14,982	470	107	66	8	140	24	106	21	3	2	2	2	3	2	790	111	5.3%
8/03	4,504	216	74	31	8	47	18	47	18	0		4	3	9	5	354	79	7.9%
8/05	7,612	285	80	98	12	54	17	67	18	0		0		0		504	85	6.6%
8/08	2,684	143	47	59	7	37	12	57	15	0		0		0		296	51	11.0%
8/12	3,110	103	35	105	7	59	13	37	10	4	2	0		0		308	39	9.9%
8/15	2,866	57	29	211	15	26	10	5	5	3	2	0		0		302	34	10.5%
8/19-8/22	1,735	23	22	90	14	8	8	8	8	0		0		0		129	29	7.4%
8/26	448	0		13	3	0		0		0		0		0		13	3	2.9%
8/29	402	0		8	2	0		0		0		0		0		8	2	2.0%
Total	94,401	1,861	245	729	33	521	66	624	84	10	4	6	4	12	6	3,763	269	4.0%

Appendix B7.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Susitna Flats (247-41) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Campbell Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-7/25	634	0		0		61	34	0		0		0		0		61	34	9.6%
7/29	859	126	43	0		50	13	32	11	0		0		0		208	46	24.2%
8/01-8/03	2,242	559	139	20	7	153	33	90	25	4	4	0		0		826	145	36.8%
8/05	627	80	29	6	2	32	9	29	9	0		0		0		147	32	23.4%
8/08	450	67	67	0		0		24	24	0		0		0		91	71	20.2%
8/12	411	85	27	4	1	8	5	8	5	0		0		0		105	28	25.5%
8/15	329	19	13	7	2	3	3	10	5	0		0		0		39	14	11.9%
8/19-9/02	528	62	62	27	15	22	22	0		0		0		0		111	67	21.0%
Total	6,080	998	177	64	16	329	55	193	38	4	4	0		0		1,588	190	26.1%

Appendix B8.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Point MacKenzie (247-42) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Campbell Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		percent
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	
7/08-7/18	1,905	0		0		0		0		0		0		0		0		0.0%
7/25	875	201	143	0		73	50	73	51	0		0		0		347	160	39.7%
7/29	874	112	42	0		55	15	41	13	3	2	0		0		211	46	24.1%
8/01-8/03	2,552	658	251	0		59	41	30	29	16	16	0		0		763	256	29.9%
8/05-8/08	1,336	67	39	20	7	81	24	49	19	0		0		5	4	222	50	16.6%
8/12	536	79	46	0		0		10	9	0		0		0		89	47	16.6%
8/15	561	29	20	17	4	5	5	11	7	0		0		0		62	22	11.1%
8/19-8/26	509	0		47	10	0		8	8	0		4	3	0		59	13	11.6%
Total	9,148	1,146	299	84	13	273	71	222	65	19	16	4	3	5	4	1,753	314	19.2%

Appendix B9.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District Fire Island (247-43) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Campbell Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/25	2,644	317	109	0		206	46	242	50	0		0		0		765	129	28.9%
7/29	1,613	222	95	5	5	53	25	94	33	0		0		0		374	104	23.2%
8/01-8/03	1,764	270	93	16	7	215	43	177	39	5	5	5	4	0		688	110	39.0%
8/05	1,118	0		31	17	25	25	103	50	0		0		0		159	58	14.2%
8/08	277	13	9	9	2	31	10	36	11	0		0		1	1	90	17	32.5%
8/12	1,022	18	18	110	13	13	9	0		0		0		0		141	24	13.8%
8/15	321	20	14	46	5	22	8	15	6	0		0		0		103	18	32.1%
8/19	893	0		130	28	0		0		0		0		0		130	28	14.6%
8/22-9/02	702	0		87	26	0		0		0		0		0		87	26	12.4%
Total	10,354	860	174	434	45	565	74	667	88	5	5	5	4	1	1	2,537	213	24.5%

Appendix B10.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District eastside (247-70, 247-80, 247-90) set net commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Campbell Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent		
6/27-8/01	8,603	165	117	36	20	356	101	540	124	16	16	14	14	0	1,127	200	13.1%	
8/03	1,242	23	23	13	6	25	14	59	21	0		4	3	0	124	34	10.0%	
8/05	1,119	0		9	4	23	12	23	13	0		0		0	55	18	4.9%	
8/08	625	18	18	13	5	20	10	7	6	0		0		0	58	22	9.3%	
8/12	2,433	10	9	22	3	7	4	37	10	0		0		0	76	14	3.1%	
8/15	2,914	11	11	64	6	4	3	8	5	0		0		0	87	14	3.0%	
8/19	5,300	11	10	139	9	4	3	12	6	0		0		0	166	15	3.1%	
8/22	2,015	0		51	5	4	3	30	9	0		0		0	85	11	4.2%	
8/26	2,107	10	9	23	3	0		4	3	0		0		0	37	10	1.8%	
8/29	1,359	0		11	2	0		0		0		0		0	11	2	0.8%	
9/02	986	0		13	2	0		7	4	0		0		0	20	5	2.0%	
9/05-9/30	602	0		0		0		0		0		0		0	0	0	0.0%	
Total	29,305	248	122	394	25	443	103	727	128	16	16	18	14	0	1,846	207	6.3%	

Appendix B11.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District drift net (244-00, 245-00) commercial harvest, 1994.

Date	Coho Catch	Little Susitna River		Ship Creek		Bird Creek		Cottonwood Creek		Fish Creek		Wasilla Creek		NCI Hatchery Contribution		percent
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	
6/27-7/08	17,040	0		0		0		0		0		0		0		0.0%
7/10	38	0		0		0		0		0		0		0		0.0%
7/11	195	0		0		0		0		0		0		0		0.0%
7/15	38,424	0		0		0		6	6	26	12	21	11	53	18	0.1%
7/18	44,368	0		0		0		35	16	18	12	19	13	72	24	0.2%
7/24	2,353	0		0		0		9	8	0		0		9	8	0.4%
7/25	53,725	38	37	0		0		55	19	66	22	35	16	194	50	0.4%
7/26	2,196	0		0		0		0		0		0		0		0.0%
7/27-7/28	56,838	0		0		15	14	106	30	192	42	32	18	345	58	0.6%
7/29	31,919	0		0		0		18	12	74	25	29	16	121	32	0.4%
8/01	15,385	0		0		0		30	14	56	20	42	18	128	30	0.8%
8/02	1,073	0		0		0		5	5	0		0		5	5	0.5%
8/03	1,566	0		0		0		0		0		0		0		0.0%
8/04	2,169	0		0		0		0		10	9	0		10	9	0.5%
8/05	9,011	0		0		0		8	7	50	19	26	14	84	25	0.9%
8/06-8/07	420	0		0		0		0		0		0		0		0.0%
8/08	9,819	21	21	0		0		18	8	60	15	15	7	114	27	1.2%
8/12	6,202	0		0		0		5	5	17	9	6	6	28	12	0.5%
8/15	4,889	0		0		0		0		0		7	7	7	7	0.1%
8/19	2,577	0		0		0		0		8	4	0		8	4	0.3%
8/22-8/24	1,361	0		0		0		0		0		0		0		0.0%
8/26	436	0		0		0		0		0		0		0		0.0%
8/29-9/09	1,931	0		0		0		0		0		0		0		0.0%
Total	303,935	59	42	0		15	14	295	46	577	65	232	42	1,178	102	0.4%

Appendix B12.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Ninilchik Beach (244-21) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/15	137	0		0		0		0		0		0		0		0.0%
7/16-7/17	106	0		0		0		0		0		0		0		0.0%
7/18	127	0		0		0		0		0		0		0		0.0%
7/19	105	0		0		0		0		0		0		0		0.0%
7/20	257	0		0		0		0		0		0		0		0.0%
7/21	190	0		0		0		0		0		0		0		0.0%
7/22-7/23	539	0		0		0		0		12	12	0		12	12	2.2%
7/24-7/25	508	0		0		0		0		0		0		0		0.0%
7/26	512	0		0		0		0		0		15	15	15	15	2.9%
7/27-7/28	1,069	0		0		0		0		0		0		0		0.0%
7/29	649	0		0		0		0		0		0		0		0.0%
8/01	733	0		0		0		0		0		0		0		0.0%
8/02	1,129	0		0		0		0		0		0		0		0.0%
8/03	1,019	0		0		0		0		0		0		0		0.0%
8/04	706	0		0		0		0		0		0		0		0.0%
8/05	958	0		0		0		0		14	9	0		14	9	1.5%
8/06-8/07	1,643	0		0		0		0		0		0		0		0.0%
8/08	1,301	0		0		0		0		0		0		0		0.0%
8/12	1,631	0		0		0		0		0		9	9	9	9	0.6%
8/15	1,253	0		0		0		0		0		0		0		0.0%
Total	14,572	0		0		0		0		26	15	24	17	50	23	0.3%

Appendix B13.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Coho Beach (244-22) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creel</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/15	286	0		0		0		0		0		0		0		0.0%
7/16-7/17	202	0		0		0		0		0		0		0		0.0%
7/18	156	0		0		0		0		0		0		0		0.0%
7/19	276	0		0		0		0		0		0		0		0.0%
7/20	239	0		0		0		0		0		0		0		0.0%
7/21	492	0		0		0		0		0		0		0		0.0%
7/22	629	0		0		0		0		0		0		0		0.0%
7/23	444	0		0		0		0		0		0		0		0.0%
7/24	484	0		0		0		0		0		0		0		0.0%
7/25	502	0		0		0		0		0		0		0		0.0%
7/26	213	0		0		0		0		0		0		0		0.0%
7/27-7/28	1,275	0		0		0		0		9	8	0		9	8	0.7%
7/29	359	0		0		0		0		0		0		0		0.0%
8/01	444	0		0		0		0		0		0		0		0.0%
8/02	717	0		0		0		0		0		0		0		0.0%
8/03	413	0		0		0		0		0		0		0		0.0%
8/04	609	0		0		0		0		0		0		0		0.0%
8/05	666	0		0		0		0		0		0		0		0.0%
8/06-8/07	1,214	0		0		0		0		0		0		0		0.0%
8/08	304	0		0		0		0		0		0		0		0.0%
8/12	1,959	0		0		0		0		0		0		0		0.0%
8/15	721	0		0		0		0		0		0		0		0.0%
Total	12,604	0		0		0		0		9	8	0		9	8	0.1%

Appendix B14.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Kalifonski Beach (244-30) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/15	256	0		0		0		0		0		0		0		0.0%
7/16-7/17	224	0		0		0		0		0		0		0		0.0%
7/18	381	0		0		0		0		0		0		0		0.0%
7/19	171	0		0		0		0		0		0		0		0.0%
7/20	171	0		0		0		0		0		0		0		0.0%
7/21	385	0		0		0		0		0		0		0		0.0%
7/22-7/23	1,353	0		0		0		0		0		0		0		0.0%
7/24	747	0		0		0		0		0		0		0		0.0%
7/25	587	0		0		0		0		0		0		0		0.0%
7/26	431	0		0		0		0		10	9	0		10	9	2.3%
7/27-7/28	1,295	0		0		0		0		0		0		0		0.0%
7/29	405	0		0		0		0		0		0		0		0.0%
8/01	558	0		0		0		0		0		0		0		0.0%
8/02	701	0		0		0		0		0		0		0		0.0%
8/03	664	0		0		0		0		0		17	17	17	17	2.6%
8/04	814	0		0		0		0		20	19	0		20	19	2.5%
8/05	928	0		0		0		0		0		0		0		0.0%
8/06-8/07	1,555	0		0		0		0		0		0		0		0.0%
8/08	476	0		0		0		0		0		0		0		0.0%
8/12	1,518	0		0		0		0		0		0		0		0.0%
8/15	1,357	0		0		0		0		0		0		0		0.0%
Total	14,977	0		0		0		0		30	21	17	17	47	27	0.3%

Appendix B15.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Central District Salmatof Beach (244-40) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/15	2,104	0		0		0		0		0		0		0		0.0%
7/18	2,099	0		0		0		0		0		0		0		0.0%
7/24-7/25	3,251	0		0		0		0		0		0		0		0.0%
7/26	1,113	0		0		0		0		0		0		0		0.0%
7/27-7/28	2,443	0		0		0		0		0		0		0		0.0%
7/29	1,058	0		0		0		7	7	0		0		7	7	0.7%
8/01	1,656	0		0		0		0		0		24	16	24	16	1.4%
8/02	1,327	0		0		0		12	11	0		0		12	11	0.9%
8/03	1,877	0		0		0		0		0		0		0		0.0%
8/04	1,026	0		0		0		0		0		0		0		0.0%
8/05	1,611	0		0		0		0		0		0		0		0.0%
8/06-8/07	2,212	0		0		0		0		0		0		0		0.0%
8/08	997	0		0		0		0		0		0		0		0.0%
8/12	2,397	0		0		0		0		0		0		0		0.0%
8/15	1,957	0		0		0		0		0		0		0		0.0%
Total	27,128	0		0		0		19	13	0		24	16	43	21	0.2%

Appendix B16.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District westside set net (245-60, 247-10, 247-20, 247-30) commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-7/25	45,255	0		0		0		10	9	21	14	11	11	42	20	0.1%
7/29	10,803	0		0		0		0		9	8	9	9	18	12	0.2%
8/01	14,982	0		0		0		17	5	26	6	22	6	65	10	0.4%
8/03	4,504	0		0		0		12	6	16	7	9	5	37	11	0.8%
8/05	7,612	15	14	0		0		9	4	16	6	13	6	53	17	0.7%
8/08	2,684	0		0		0		7	3	10	4	16	5	33	7	1.2%
8/12	3,110	0		0		0		17	4	10	3	8	3	35	6	1.1%
8/15	2,866	0		0		0		8	3	8	4	3	2	19	6	0.7%
8/19-8/22	1,735	0		0		0		4	4	0		0		4	4	0.2%
8/26	448	0		0		0		2	1	0		0		2	1	0.4%
8/29	402	0		0		0		0		0		0		0		0.0%
Total	94,401	15	14	0		0		86	15	116	21	91	18	308	34	0.3%

Appendix B17.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Susitna Flats (247-41) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-7/25	634	0		0		0		0		0		0		0		0.0%
7/29	859	0		0		0		0		2	2	3	2	5	3	0.6%
8/01-8/03	2,242	0		0		0		28	9	13	6	9	6	50	12	2.2%
8/05	627	0		0		0		4	2	6	2	4	2	14	3	2.2%
8/08	450	0		0		0		0		0		0		0		0.0%
8/12	411	0		0		0		0		6	2	3	2	9	3	2.2%
8/15	329	0		0		0		3	1	2	1	6	2	11	3	3.3%
8/19-9/02	528	0		0		0		0		24	16	0		24	16	4.5%
Total	6,080	0		0		0		35	9	53	17	25	7	113	21	1.9%

Appendix B18.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Point MacKenzie (247-42) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creek</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/08-7/18	1,905	0		0		0		0		0		0		0		0.0%
7/25	875	0		0		0		0		19	19	0		19	19	2.2%
7/29	874	0		0		0		0		5	3	6	3	11	4	1.3%
8/01-8/03	2,552	0		0		0		30	20	47	26	0		77	33	3.0%
8/05-8/08	1,336	0		0		0		12	6	13	6	4	4	29	10	2.2%
8/12	536	0		0		0		14	7	5	4	11	7	30	11	5.6%
8/15	561	0		0		0		5	3	3	2	9	4	17	6	3.0%
8/19-8/26	509	0		0		0		0		22	8	18	8	40	12	7.9%
Total	9,148	0		0		0		61	23	114	34	48	12	223	43	2.4%

Appendix B19.-Estimates (n) and standard error (SE) of coho salmon stocked in 1992 by release site in Upper Cook Inlet Northern District Fire Island (247-43) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creel</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
7/01-7/25	2,644	0		0		0		11	7	0		6	6	17	9	0.6%
7/29	1,613	0		0		0		0		7	6	7	7	14	9	0.9%
8/01-8/03	1,764	0		0		0		15	7	15	8	11	7	41	13	2.3%
8/05	1,118	0		0		0		0		0		0		0		0.0%
8/08	277	0		0		0		1	1	1	1	3	2	5	2	1.8%
8/12	1,022	0		0		0		10	5	10	5	11	5	31	9	3.0%
8/15	321	0		0		0		2	1	6	2	2	1	10	3	3.1%
8/19	893	0		0		0		19	13	20	13	10	10	49	21	5.5%
8/22-9/02	702	0		13	12	0		48	22	0		0		61	25	8.7%
Total	10,354	0		13	12	0		106	28	59	18	50	16	228	39	2.2%

Appendix B20.-Estimates (n) and standard error (SE) of coho salmon stocked in 1993 by release site in Upper Cook Inlet Northern District eastside (247-70, 247-80, 247-90) set net commercial harvest, 1994.

Date	Coho Catch	<u>Little Susitna River</u>		<u>Ship Creek</u>		<u>Bird Creek</u>		<u>Cottonwood Creel</u>		<u>Fish Creek</u>		<u>Wasilla Creek</u>		<u>NCI Hatchery Contribution</u>		
		n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	n	SE	percent
6/27-8/01	8,603	0		0		0		0		31	21	0		31	21	0.4%
8/03	1,242	0		0		0		8	5	0		5	4	13	7	1.0%
8/05	1,119	0		0		0		0		0		0		0		0.0%
8/08	625	0		0		0		3	3	7	4	0		10	5	1.6%
8/12	2,433	0		0		0		0		2	1	0		2	1	0.1%
8/15	2,914	0		0		0		0		2	1	0		2	1	0.1%
8/19	5,300	0		0		0		0		0		0		0		0.0%
8/22	2,015	0		0		0		2	1	2	1	0		4	2	0.2%
8/26	2,107	0		0		0		0		0		0		0		0.0%
8/29	1,359	0		2		0		0		0		0		2	1	0.1%
9/02	986	0		0		0		0		0		0		0		0.0%
9/05-9/30	602	0		0		0		0		0		0		0	0	0.0%
Total	29,305	0		2		0		13	6	44	22	5	4	64	23	0.2%