**Fishery Data Series No. 96-46**

# Angler Effort and Harvest of Chinook Salmon and Pacific Halibut in the Marine Recreational Fishery of Central Cook Inlet, 1995

**by**

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**December 1996**

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

# Symbols and Abbreviations

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**Weights and measures (metric)**

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

**Weights and measures (English)**

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

Spell out acre and ton.

**Time and temperature**

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

Spell out year, month, and week.

**Physics and chemistry**

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

**General**

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

**Mathematics, statistics, fisheries**

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

*FISHERY DATA SERIES NO. 96-46*

# ANGLER EFFORT AND HARVEST OF CHINOOK SALMON AND PACIFIC HALIBUT IN THE MARINE RECREATIONAL FISHERY OF CENTRAL COOK INLET, 1995

by

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December 1996

This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-11, Job No. S-2-6a.

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.

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*This document should be cited as:*
*McKinley, T. R. 1996. Angler effort and harvest of chinook salmon and Pacific halibut in the marine recreational fishery of Central Cook Inlet, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-46, Anchorage.*

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# ABSTRACT

Direct expansion creel surveys were conducted from 1 May through 31 July at two separate public beaches (Deep Creek marine and Anchor Point) that provide access to the Central Cook Inlet marine recreational fishery. Boat parties that had completed fishing were interviewed as they exited the fishery; data recorded were trip type (guided/private), the number of anglers that fished, the target species (chinook salmon *Oncorhynchus tshawytscha*, Pacific halibut *Hippoglossus stenolepis*, or both), the number of chinook salmon kept and/or released, and the number of Pacific halibut kept and/or released. No biological samples were collected. In addition, total harvest and effort information was collected from fishing lodges that operate from a private, closed access beach.

Two distinct runs of chinook salmon occur in this fishery. The early run fishery is a mixed stock fishery that likely harvests chinook salmon returning to streams in several drainages of Cook Inlet. The late run fishery is presumed to harvest primarily late run Kenai River fish, and to a lesser extent late run Kasilof River fish, the only late run stocks known in Cook Inlet. For 1995, the early run was considered to be from 1 May-18 June, and the late run from 19 June-31 July. The estimated harvest of chinook salmon was 8,117 (SE = 237), with 6,048 (SE = 228) harvested during the early run, and 2,069 (SE = 65) during the late run. An estimated 75,709 (SE = 1,955) Pacific halibut were harvested. Total effort for the fishery during this time frame, for all species combined, was 70,384 angler-days (SE = 1,355). Guided anglers accounted for 41% of the fishing effort, 52% of the chinook salmon harvest, and 58% of the Pacific halibut harvest. Anglers released 8% of the chinook salmon landed and 42% of the halibut landed. Although most of the chinook salmon fishing occurs during the three months sampled, additional harvest and effort occurs in this fishery outside of our sampling time frame, as well as from three other access sites. Also, a considerable amount of fishing effort for Pacific halibut does occur after 31 July.



KEY WORDS: Creel survey, angler effort and harvest, chinook salmon, *Oncorhynchus tshawytscha*, Pacific halibut, *Hippoglossus stenolepis*, mixed stock fishery, early run, late run, Central Cook Inlet.


# INTRODUCTION

The Central Cook Inlet marine chinook salmon *Oncorhynchus tshawytscha* recreational fishery has been expanding in recent years, with the greatest effort occurring in the Deep Creek marine area (Figure 1). The Cook Inlet marine fishery for chinook salmon began in the early 1970s and remained fairly stable through the late 1980s (Nelson 1995). However, increased marketing by the sport fish guiding and tourism industries, availability of commercial boat launching services that accommodate the use of larger vessels, development of sport fishing lodges along Cook Inlet beaches, and restrictions in the Kenai River fishery following implementation of the Kenai River Chinook Salmon Management Plan, have resulted in recent growth in this fishery, most notably the guided segment. As this fishery expanded, controversy surrounding the increasing harvest and fishing effort, and the stock of origin of chinook salmon in the catch, also increased significantly.

The Cook Inlet marine recreational fishery is assumed to harvest mixed stocks of chinook salmon that migrate along the east coast of Central Cook Inlet from late April through early August (Hammarstrom et al. 1987). Early-run (late April through late June) fish are believed to originate from several small lower Kenai Peninsula drainages adjacent to the fishery (Stariski Creek, Deep Creek, Anchor River, Ninilchik River), and larger drainages in Upper and Northern Cook Inlet (Kasilof, Kenai, and Susitna rivers). The majority of late-run (late June through early August) fish are presumed to originate from the Kenai River and, to a lesser extent, the Kasilof River and late-run hatchery releases. A conservation concern is the proximity of the fishery to the natal streams of the small contributing stocks of the lower Kenai Peninsula. An allocative concern is the potential harvest of chinook salmon of already

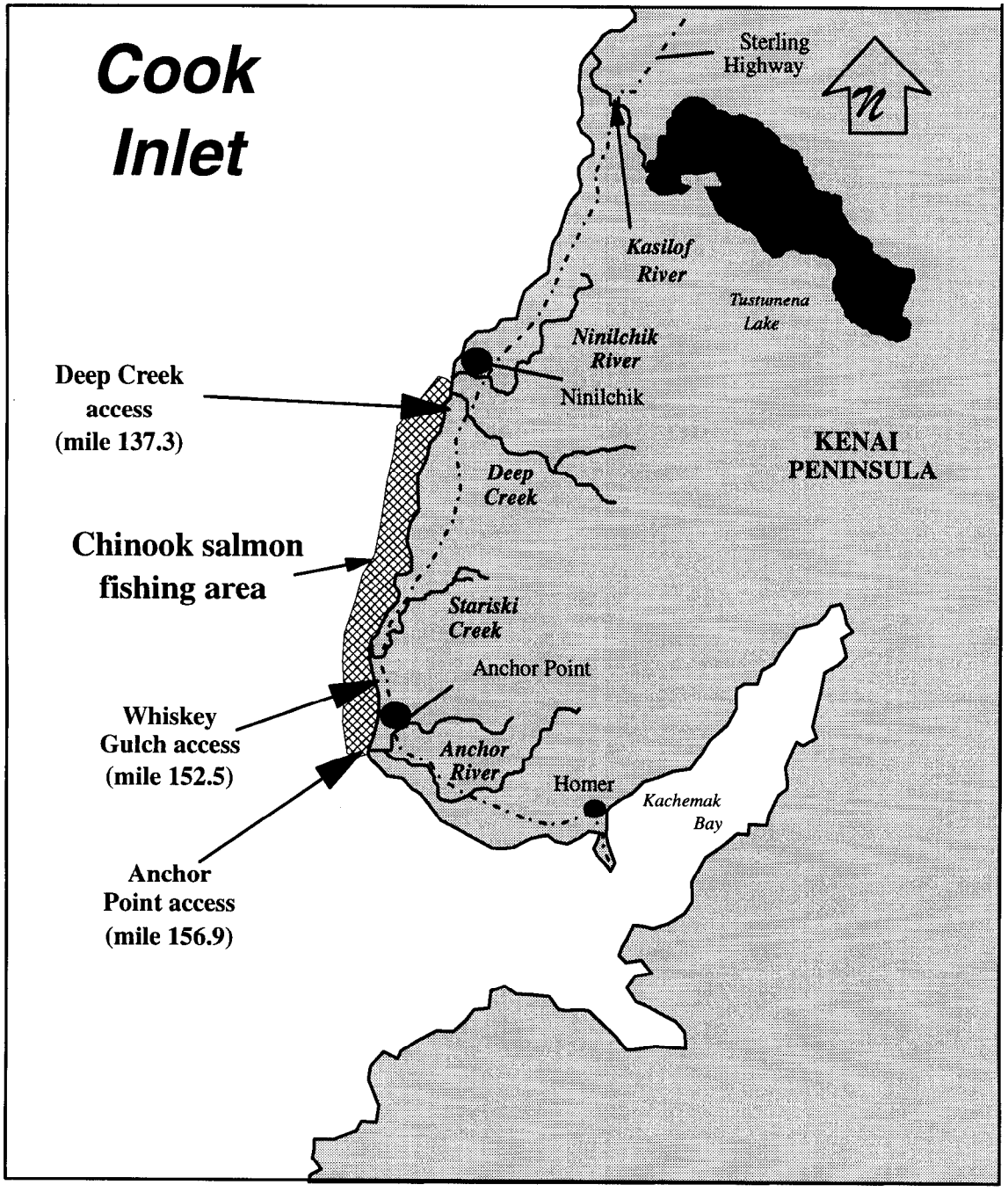


**Figure 1.-Map of the central Cook Inlet marine chinook salmon recreational fishery.**

fully-exploited stocks from the Kenai Peninsula and Upper/Northern Cook Inlet.

There is currently a lack of stock-specific harvest information for this fishery. The effects of increased angler participation and harvest on specific chinook salmon stocks remain unknown and are of particular concern to fishery managers.

An annual, onsite creel survey was conducted at Deep Creek from 1972-1986 (Hammarstrom 1974-1981; Hammarstrom and Larson 1982-1984, 1986; and Hammarstrom et al. 1985). Since 1987, estimates of harvest and effort provided by the Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1996) have been used to track this fishery. An onsite creel was conducted in 1994 to check the accuracy of the SWHS estimates of chinook salmon harvest (McKinley 1995). The Statewide Harvest Survey provides estimates of total annual catch, harvest, and effort for this fishery, information that is adequate for managing terminal or single-stock fisheries. However, the mixed-stock nature of this fishery necessitates stock-specific harvest information for better understanding and management. This need has led to the initiation of this project and the related chinook salmon coded wire tagging projects, to monitor the fishery.

Pacific halibut *Hippoglossus stenolepis* are also highly sought after at this time by recreational anglers in Cook Inlet. Anglers fishing for Pacific halibut launch and exit at the same access sites as anglers fishing for chinook salmon, and many anglers fish for both species during the same trip. A conservation concern has been raised about the growing Pacific halibut harvest in Central Cook Inlet and the possibility of localized overfishing (Vincent-Lang 1994). Additionally, the North Pacific Fishery Management Council (NPFMC) recently broached the issue of possibly allocating to the sport charter industry a finite harvest of Pacific halibut. A general lack of knowledge of this growing fishery has impeded efforts at more refined management.

The long-term goal of this study is to estimate the proportional harvest of contributing stocks of chinook salmon in this fishery. When wild stock, coded wire tagged chinook salmon enter the fishery (beginning in 1996, as 2-ocean fish), we can begin to estimate the proportional harvest of marked chinook salmon stocks. However, in this second consecutive year of an onsite creel survey, our goals are to: (1) test the validity of harvest estimates of chinook salmon already provided in the Statewide Harvest Survey and (2) apportion the harvest of chinook salmon in this fishery between early-run and late-run stocks.

The research objectives for 1995 were to estimate:

1) the total catch and harvest of chinook salmon and Pacific halibut by anglers exiting at the Deep Creek marine wayside area (mile 137.3 Sterling Highway) from 1 May to 31 July 1995;

2) the total catch and harvest of chinook salmon and Pacific halibut by anglers exiting at the Anchor Point marine access area (mile 156.9 Sterling Highway) from 1 May to 31 July 1995; and

In addition, the following tasks were addressed in the 1995 survey:

1) to estimate angler effort (by species) in the sport fishery at the access sites in Objectives 1 and 2.

2) to collect total catch, harvest, and effort data of guided anglers accessing the marine chinook salmon and Pacific halibut fishery via a private beach between the Bluff Point at Homer and the Ninilchik River.

# METHODS

In order to meet the above objectives two separate, direct expansion creel surveys were set up at the primary access sites to this fishery (Deep Creek marine wayside and Anchor Point; Figure 1). A creel census was not conducted at the Whiskey Gulch access site (mile 152.5 Sterling Highway) in 1995 because of the small amount of harvest that occurs there, estimated by the 1994 creel (McKinley 1995). Although there are differences in study design and logistics between the two access sites, the data collection and analysis procedures were similar. The 1995 creel survey designs are based on spatial and temporal boat exit and harvest patterns discerned from the 1994 creel surveys at the Deep Creek and Anchor Point marine access sites. At each access area the sampling effort was stratified both to derive a more precise estimate (stratification by time of day/tidal state, exit location, weekly period, and holidays), and to provide separate estimates for management purposes (stratification by early-run/late-run chinook salmon fisheries).

## DEEP CREEK MARINE CREEL SURVEY

A two-stage stratified random creel survey was conducted at the Deep Creek marine access site (mile 137.3 Sterling Highway) from 1 May through 31 July. Effort, harvest, and catch of chinook salmon and Pacific halibut in this fishery were estimated. Within the sampling design, days were the first stage units and boat-parties the second stage units. The sampling day ran from 0800 hours to midnight. All strata were defined such that within any calendar day the 16 hour sampling day (0800-2359 hours) is segmented into two of the sampling strata. There were two possible breakdowns for the 8 hour segments within any one day:

1. (a) 0800-1559 hours, and (b) 1600-2359 hours; or
2. (a) 0800-1159 & 2000-2359 hours, and (b) 1200-1959 hours.

The breakdown used depended on the timing of tides within the day. The 8 hour segment that matched best to the time period after the falling tide was classified as the "prime-tide" period for that day, whereas the remaining 8 hours was classified as the "non-prime tide" period. All prime-tide periods were grouped across all days within other levels of stratification to form the prime-tide strata. Similarly the non-prime periods were also grouped to form the non-prime tide strata. There were three dimensions of stratification: tidal state (falling or rising), exit area, and seasonal (weekly periods and holidays).

All strata were defined by the unique combinations of the three levels of stratification, with the exception that at the harbor location only prime-tide periods were sampled, since nearly all of the boats exit within four hours of the high tide at this location. The resultant number of strata was 98 (Table 1). A total of six personnel were assigned to sample at the Deep Creek marine access area. A minimum of two samples (two daily 8-hour shifts) per stratum were scheduled, with most strata sampled more heavily (Table 1).

## ANCHOR POINT MARINE CREEL SURVEY

A stratified systematic creel survey was conducted at the Anchor Point access site (mile 156.9 Sterling Highway) from 1 May

**Table 1.-Summary of strata and sampling schedule for the 1995 marine boat creel survey at the Deep Creek marine access area.**

| Stratum | Location | Seasonal Period | Type of Tidal Period | Number of Days in Stratum | Number of Days Sampled |
|---|---|---|---|---|---|
| 1 | Harbor | 1-7 May | Prime | 7 | 2 |
| 2 | | 8-14 May | Prime | 7 | 2 |
| 3 | | 15-21 May | Prime | 7 | 2 |
| 4 | | 22-26 May | Prime | 5 | 2 |
| 5 | | 27-29 May | Prime | 3 | 2 |
| 6 | | 30 May-4 June | Prime | 6 | 2 |
| 7 | | 5-11 June | Prime | 7 | 2 |
| 8 | | 12-18 June | Prime | 7 | 2 |
| 9 | | 19-25 June | Prime | 7 | 2 |
| 10 | | 26 June-2 July | Prime | 7 | 5 |
| 11 | | 3-9 July | Prime | 7 | 5 |
| 12 | | 10-16 July | Prime | 7 | 5 |
| 13 | | 17-23 July | Prime | 7 | 5 |
| 14 | | 24-31 July | Prime | 8 | 7 |
| 15 | North of | 1-7 May | Nonprime | 7 | 2 |
| 16 | Tractors | | Prime | 7 | 2 |
| 17 | | 8-14 May | Nonprime | 7 | 2 |
| 18 | | | Prime | 7 | 2 |
| 19 | | 15-21 May | Nonprime | 7 | 2 |
| 20 | | | Prime | 7 | 2 |
| 21 | | 22-26 May | Nonprime | 5 | 2 |
| 22 | | | Prime | 5 | 2 |
| 23 | | 27-29 May | Nonprime | 3 | 2 |
| 24 | | | Prime | 3 | 2 |
| 25 | | 30 May-4 June | Nonprime | 6 | 2 |
| 26 | | | Prime | 6 | 4 |
| 27 | | 5-11 June | Nonprime | 7 | 2 |
| 28 | | | Prime | 7 | 4 |
| 29 | | 12-18 June | Nonprime | 7 | 2 |
| 30 | | | Prime | 7 | 4 |
| 31 | | 19-25 June | Nonprime | 7 | 2 |
| 32 | | | Prime | 7 | 4 |
| 33 | | 26 June-2 July | Nonprime | 7 | 2 |
| 34 | | | Prime | 7 | 2 |
| 35 | | 3-9 July | Nonprime | 7 | 2 |
| 36 | | | Prime | 7 | 2 |
| 37 | | 10-16 July | Nonprime | 7 | 2 |
| 38 | | | Prime | 7 | 2 |
| 39 | | 17-23 July | Nonprime | 7 | 2 |
| 40 | | | Prime | 7 | 2 |
| 41 | | 24-31 July | Nonprime | 8 | 2 |
| 42 | | | Prime | 8 | 2 |

-continued-

**Table 1.-Page 2 of 2.**

| Stratum | Location | Seasonal Period | Type of Tidal Period | Number of Days in Stratum | Number of Days Sampled |
|---|---|---|---|---|---|
| 43 | Tractors | 1-7 May | Nonprime | 7 | 4 |
| 44 | | | Prime | 7 | 7 |
| 45 | | 8-14 May | Nonprime | 7 | 4 |
| 46 | | | Prime | 7 | 7 |
| 47 | | 15-21 May | Nonprime | 7 | 4 |
| 48 | | | Prime | 7 | 7 |
| 49 | | 22-26 May | Nonprime | 5 | 3 |
| 50 | | | Prime | 5 | 4 |
| 51 | | 27-29 May | Nonprime | 3 | 3 |
| 52 | | | Prime | 3 | 3 |
| 53 | | 30 May-4 June | Nonprime | 6 | 3 |
| 54 | | | Prime | 6 | 4 |
| 55 | | 5-11 June | Nonprime | 7 | 4 |
| 56 | | | Prime | 7 | 5 |
| 57 | | 12-18 June | Nonprime | 7 | 4 |
| 58 | | | Prime | 7 | 5 |
| 59 | | 19-25 June | Nonprime | 7 | 4 |
| 60 | | | Prime | 7 | 5 |
| 61 | | 26 June-2 July | Nonprime | 7 | 3 |
| 62 | | | Prime | 7 | 6 |
| 63 | | 3-9 July | Nonprime | 7 | 3 |
| 64 | | | Prime | 7 | 6 |
| 65 | | 10-16 July | Nonprime | 7 | 3 |
| 66 | | | Prime | 7 | 6 |
| 67 | | 17-23 July | Nonprime | 7 | 3 |
| 68 | | | Prime | 7 | 6 |
| 69 | | 24-31 July | Nonprime | 8 | 3 |
| 70 | | | Prime | 8 | 7 |
| 71 | South of | 1-7 May | Nonprime | 7 | 2 |
| 72 | Tractors | | Prime | 7 | 5 |
| 73 | | 8-14 May | Nonprime | 7 | 2 |
| 74 | | | Prime | 7 | 5 |
| 75 | | 15-21 May | Nonprime | 7 | 2 |
| 76 | | | Prime | 7 | 5 |
| 77 | | 22-26 May | Nonprime | 5 | 2 |
| 78 | | | Prime | 5 | 3 |
| 79 | | 27-29 May | Nonprime | 3 | 2 |
| 80 | | | Prime | 3 | 3 |
| 81 | | 30 May-4 June | Nonprime | 6 | 2 |
| 82 | | | Prime | 6 | 3 |
| 83 | | 5-11 June | Nonprime | 7 | 2 |
| 84 | | | Prime | 7 | 5 |
| 85 | | 12-18 June | Nonprime | 7 | 2 |
| 86 | | | Prime | 7 | 5 |
| 87 | | 19-25 June | Nonprime | 7 | 2 |
| 88 | | | Prime | 7 | 5 |
| 89 | | 26 June-2 July | Nonprime | 7 | 2 |
| 90 | | | Prime | 7 | 4 |
| 91 | | 3-9 July | Nonprime | 7 | 2 |
| 92 | | | Prime | 7 | 4 |
| 93 | | 10-16 July | Nonprime | 7 | 2 |
| 94 | | | Prime | 7 | 4 |
| 95 | | 17-23 July | Nonprime | 7 | 2 |
| 96 | | | Prime | 7 | 4 |
| 97 | | 24-31 July | Nonprime | 8 | 3 |
| 98 | | | Prime | 8 | 6 |

through 31 July. The design for this survey is virtually identical to the design for the Deep Creek harbor location, except that some boats exit outside of the eight hours around high tide, and so we will be sampling "non-prime tide" periods as well. Within this design, days were the first stage units and boat-parties the second stage units. There were two dimensions of stratification: tidal state, and seasonal (weekly periods and holidays).

The resulting number of strata was 28. A total of 2 staff were assigned to sample at the Anchor Point marine access area. A minimum of 2 samples per stratum were scheduled, many strata sampled more heavily (Table 2).

## General Data Collection

For any selected day within a stratum the entire 8 hours of that stratum was sampled. Boat-parties were interviewed as they exited the fishery at each exit area. Every attempt was made to interview all of the boat-parties that exited the fishery during the scheduled period; when it was not possible to interview every boat-party (during busy periods) non-interviewed boat-parties were counted. In order to avoid congestion due to the interview process, the interviews were brief and conducted as anglers were securing their boats, gear, etc. for exiting the beach. Data collected from each boat-party included trip type (guided or unguided), the number of people that fished, what species they fished for (chinook salmon, Pacific halibut, or both), number of fish kept (by species, chinook salmon and/or Pacific halibut), and the number of fish of these species that were released. Interview data were recorded on Marine Interview mark-sense forms (version 1.0).

Log books were provided to each private lodge for recording the same types of fishery information that were collected at the public access sites (Appendix A).

The final data were read into a Statistical Analysis System (SAS) data set using PC SAS for Windows. After final checking of the SAS data set the data were analyzed according to procedures outlined below.

## General Data Analysis

Standard procedures outlined in Bernard et al. (*In prep*) were used to calculate estimates of angler effort, and catch and harvest by species for the direct expansion creel surveys at Deep Creek and Anchor Point. The data were analyzed as a stratified two-stage random sample survey with days and boat-parties as the first and second stage sampling units, respectively. First, the mean harvest of each species was obtained over all boat-parties interviewed during each sampled day:

$$\bar{y}_{hi} = \frac{\sum_{j=1}^{m_{hi}} y_{hij}}{m_{hi}} \qquad (1)$$

where: $y_{hij}$ was the number of fish harvested by interviewed boat-party j on sampled day i within stratum h; and $m_{hi}$ was the number of boat-parties interviewed in stratum h during day i.

Then the mean estimate was expanded over all counted boat-parties to obtain the harvest estimate for each sampled day:

$$\hat{Y}_{hi} = M_{hi}\bar{y}_{hi} \qquad (2)$$

where: $M_{hi}$ equaled the number of boat-parties counted during day i within stratum h.

Then, the mean harvest by species was obtained over all sampled days within stratum h:

$$\bar{Y}_h = \frac{\sum_{i=1}^{d_h} \hat{Y}_{hi}}{d_h} \qquad (3)$$

**Table 2.-Summary of strata and sampling schedule for the 1995 marine boat creel survey at the Anchor Point marine access area.**

| Stratum | Seasonal Period | Type of Tidal Period | Number of Days in Stratum | Number of Days Sampled |
|---|---|---|---|---|
| 1 | 1-7 May | Nonprime | 7 | 2 |
| 2 | | Prime | 7 | 6 |
| 3 | 8-14 May | Nonprime | 7 | 2 |
| 4 | | Prime | 7 | 6 |
| 5 | 15-21 May | Nonprime | 7 | 2 |
| 6 | | Prime | 7 | 6 |
| 7 | 22-26 May | Nonprime | 5 | 2 |
| 8 | | Prime | 5 | 4 |
| 9 | 27-29 May | Nonprime | 3 | 2 |
| 10 | | Prime | 3 | 3 |
| 11 | 30 May-4 June | Nonprime | 6 | 2 |
| 12 | | Prime | 6 | 4 |
| 13 | 5-11 June | Nonprime | 7 | 2 |
| 14 | | Prime | 7 | 6 |
| 15 | 12-18 June | Nonprime | 7 | 2 |
| 16 | | Prime | 7 | 6 |
| 17 | 19-25 June | Nonprime | 7 | 2 |
| 18 | | Prime | 7 | 6 |
| 19 | 26 June-2 July | Nonprime | 7 | 2 |
| 20 | | Prime | 7 | 6 |
| 21 | 3-9 July | Nonprime | 7 | 2 |
| 22 | | Prime | 7 | 6 |
| 23 | 10-16 July | Nonprime | 7 | 2 |
| 24 | | Prime | 7 | 6 |
| 25 | 17-23 July | Nonprime | 7 | 2 |
| 26 | | Prime | 7 | 6 |
| 27 | 24-31 July | Nonprime | 8 | 3 |
| 28 | | Prime | 8 | 7 |

where: $d_h$ was the number of days sampled within stratum h.

Finally, the estimated total harvest within stratum h was obtained by expanding for days:

$$\hat{Y}_h = D_h \overline{Y}_h \qquad (4)$$

where: $D_h$ equaled the number of days within stratum h.

Estimates of the catch of each species, as well as effort in angler-days, were obtained by substituting the appropriate catch and effort statistics into equations (1) through (4) above.

The sample design for estimation of the number of boats was single-stage, stratified random. Estimates of the number of boats fishing were obtained by letting $y_{hij}$ in equation (1) equal one for each boat interviewed.

The variance of the stratum estimates of harvest was obtained as follows (adapted from Cochran 1977):

$$\hat{V}[\hat{Y}_h] = (1-f_{1h})D_h^2\frac{S_{1h}^2}{d_h} + f_{1h}D_h^2\frac{1}{d_h}\frac{\sum_{i=1}^{d_h'} M_{hi}^2(1-f_{2hi})\frac{s_{2hi}^2}{m_{hi}}}{d_h'} \qquad (5)$$

where: $f_{1h}$, and $f_{2hi}$ were the sampling fractions for days and boat-parties, respectively (i.e., $f_{1h} = d_h/D_h$ and $f_{2hi} = m_{hi}/M_{hi}$); $S_{1h}^2$ was the among-day variance component:

$$S_{1h}^2 = \frac{\sum_{i=1}^{d_h}\left(\hat{Y}_{hi} - \overline{Y}_h\right)^2}{d_h - 1}; \qquad (6)$$

$s_{2hi}^2$ was the among-boat variance component:

$$s_{2hi}^2 = \frac{\sum_{j=1}^{m_{hi}}\left(y_{hij} - \overline{y}_{hi}\right)^2}{m_{hi} - 1}; \qquad (7)$$

and $d_h'$ was the number of days sampled within stratum h in which $s_{2hi}^2$ could be calculated (days in which $m_{hi}$ was 2 or greater, or $m_{hi} = M_{hi}$).

Variances of stratum estimates of catch and angler effort, and number of boats were obtained similarly, by substituting the appropriate catch, effort, and boat statistics into equations (5) through (7) above. The second term of equation (5) drops out (it is zero) for the variance of the estimated number of boats.

Estimates of angler effort, catch and harvest by species, and their variances across all strata were obtained by summing the individual stratum estimates. Standard errors were obtained by taking the square root of the variance estimates.

Harvest and effort data collected from the private lodges were treated as though they came from a census, not a sample survey. For simplicity these data were combined with the estimates of harvest and effort for the Deep Creek access site.

# RESULTS

## ESTIMATES OF EFFORT, HARVEST, AND CATCH

Between 1 May and 31 July, fishing effort and harvest information was collected from 45,211 anglers participating in the Central Cook Inlet marine recreational fishery. Creel technicians were present for at least part of the day for all 92 days of the survey at Deep Creek, and 84 days at Anchor Point. Bad weather kept nearly all boats from fishing from the Deep Creek access location on 5 May, 6 May, 7 May, 25 June, 26 June, 22

July, and 29 July. Interviewed anglers reported harvesting 5,621 chinook salmon and 48,309 halibut. During these surveys, we documented 64% of the estimated total effort, 69% of the estimated chinook salmon harvest, and 64% of the estimated halibut harvest for the fishery.

Total estimated effort for all locations was 70,384 angler-days (SE = 1,355) (Table 3). An estimated 14,604 boats (SE = 265) exited at the Deep Creek marine access location from 1 May-31 July. Total estimated chinook salmon harvest for all locations surveyed was 8,117 (SE = 237); 6,048 (SE = 228) from the early run, and 2,069 (SE = 65) from the late run (Table 3). Total estimated Pacific halibut harvest was 75,709 (SE = 1,955; Table 3).

The Deep Creek location (including private lodges) accounted for roughly four times the harvest and effort that occurred out of Anchor Point (Table 3).

For all locations combined, guided anglers represented 41% of the fishing effort, but harvested over half of the chinook salmon and halibut. The guided component of the harvest and effort varied considerably between the two locations. Approximately 90% of the guided effort and harvest occurred at the Deep Creek access location. At the Deep Creek access location, guided anglers accounted for 48% of the fishing effort, 56% of the chinook salmon harvest, and 67% of the halibut harvest (Tables 4 through 6). Roughly one-third of boats exiting at the Deep Creek access location were charter boats. The remainder of the guided effort occurred at Anchor Point. At the Anchor Point access location, guided anglers accounted for 15% of the fishing effort, 37% of the chinook salmon harvest, and 20% of the halibut harvest (Tables 7 through 9).

For all locations combined, anglers released 8% (704 fish) of the chinook salmon landed and 42% (54,304 fish) of the halibut landed. At the Deep Creek access location, anglers released 5% of the chinook salmon landed and 39% of the halibut landed (Tables 5 and 6). Anchor Point anglers released 20% of the chinook salmon landed and 50% of the halibut landed (Tables 8 and 9). Guided anglers released similar fractions of the catch as unguided anglers.

Of the total angler effort of 70,384 angler-days, 20% of the angler-days targeted only chinook salmon, 20% targeted only halibut, and 40% targeted both species in the same trip.

### EARLY-RUN/LATE-RUN CHINOOK SALMON HARVEST

The reported harvest of chinook salmon by interviewed anglers for the Deep Creek access location peaked in late May and again in July (Figure 2). These numbers are probably affected by weather, fishing pressure, and the amount of sampling effort that day, as well as the abundance of chinook salmon passing through the fishery. However these data likely serve as a good index for separating the harvest between early and late runs of chinook salmon. Based on these data 1 May-18 June was classified as the "early run" of the marine chinook salmon fishery and June 19-July 31 was classified as the "late run." These dates are somewhat arbitrary, and are likely to vary from year-to-year as run timing and catch rate patterns vary. The last day of the early run in 1994 was June 22 (McKinley 1995).

Although 43% of the fishing effort (measured in angler-days) occurred in the early run, (1 May-18 June), 75% of the chinook salmon harvest occurred in the early run. It should be noted that there are 49 calendar days in the early-run period, and 43 calendar days in the

**Table 3.-Summary of estimates of effort and harvest of chinook salmon and Pacific halibut for the Central Cook Inlet marine recreational fishery, 1 May-31 July 1995.**

| | Deep Creek | SE | Anchor Point | SE | Total | SE | Relative Precision[c] |
|---|---|---|---|---|---|---|---|
| Chinook Salmon Harvest | | | | | | | |
| Early run[a] | 4,958 | 215 | 1,090 | 76 | 6,048 | 228 | 7.4% |
| Late run[b] | 1,723 | 59 | 346 | 27 | 2,069 | 65 | 6.2% |
| Total | 6,681 | 223 | 1,436 | 81 | 8,117 | 237 | 5.7% |
| Pacific Halibut Harvest | | | | | | | |
| 1 May-31 July | 61,387 | 1,732 | 14,322 | 908 | 75,709 | 1,955 | 5.1% |
| Fishing Effort (angler-days) | | | | | | | |
| Early run[a] | 23,428 | 755 | 6,320 | 269 | 29,748 | 801 | 5.3% |
| Late run[b] | 31,116 | 850 | 9,520 | 686 | 40,636 | 1,092 | 5.3% |
| Total | 54,544 | 1,136 | 15,840 | 737 | 70,384 | 1,355 | 3.8% |

[a] 1 May-18 June.

[b] 19 June-31 July.

[c] Relative precision at $\alpha = 0.05$ = SE * 1.96 * 100/Total.

**Table 4.-Summary of estimates of fishing effort (angler-days) for the Deep Creek marine access location, 1 May-31 July 1995.**

| Dates | Effort by Guided Anglers | SE | Effort by Unguided Anglers | SE | Total Effort | SE |
|---|---|---|---|---|---|---|
| 1-7 May | 304 | 39 | 341 | 43 | 645 | 79 |
| 8-14 May | 1,072 | 31 | 1,549 | 136 | 2,621 | 153 |
| 15-21 May | 1,596 | 114 | 3,144 | 243 | 4,740 | 298 |
| 22-26 May | 1,035 | 106 | 1,073 | 175 | 2,114 | 244 |
| 27-29 May | 847 | 7 | 898 | 63 | 1,753 | 69 |
| 30 May-4 June | 1,622 | 186 | 2,204 | 103 | 3,831 | 260 |
| 5-11 June | 2,594 | 250 | 2,851 | 291 | 5,452 | 498 |
| 12-18 June | 1,283 | 134 | 982 | 167 | 2,272 | 266 |
| 19-25 June | 2,130 | 198 | 2,041 | 179 | 4,171 | 334 |
| 26 June-2 July | 2,485 | 210 | 2,260 | 196 | 4,745 | 346 |
| 3-9 July | 3,179 | 217 | 3,987 | 232 | 7,166 | 387 |
| 10-16 July | 2,058 | 160 | 2,263 | 115 | 4,321 | 225 |
| 17-23 July | 3,446 | 203 | 3,460 | 243 | 6,906 | 401 |
| 24-31 July | 2,568 | 295 | 1,238 | 113 | 3,807 | 361 |
| Total | 26,219 | 653 | 28,291 | 668 | 54,544 | 1,137 |

**Table 5.-Summary of estimates of catch and harvest of chinook salmon for the Deep Creek marine access location, 1 May-31 July 1995.**

| Dates | Catch by Guided Anglers | SE | Catch by Unguided Anglers | SE | Total Catch | SE | Harvest by Guided Anglers | SE | Harvest by Unguided Anglers | SE | Total Harvest | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-7 May | 117 | 10 | 83 | 17 | 200 | 23 | 108 | 10 | 79 | 15 | 187 | 22 |
| 8-14 May | 463 | 13 | 324 | 55 | 787 | 61 | 430 | 13 | 293 | 47 | 723 | 53 |
| 15-21 May | 716 | 58 | 692 | 55 | 1,408 | 90 | 638 | 52 | 655 | 53 | 1,293 | 82 |
| 22-26 May | 350 | 39 | 245 | 56 | 595 | 86 | 339 | 39 | 223 | 49 | 562 | 79 |
| 27-29 May | 295 | 3 | 136 | 12 | 431 | 12 | 294 | 3 | 132 | 11 | 426 | 11 |
| 30 May-4 June | 617 | 82 | 467 | 52 | 1,084 | 88 | 594 | 78 | 434 | 51 | 1,028 | 85 |
| 5-11 June | 502 | 117 | 231 | 44 | 733 | 155 | 497 | 116 | 210 | 38 | 707 | 149 |
| 12-18 June | 19 | 4 | 13 | 6 | 32 | 7 | 19 | 4 | 13 | 6 | 32 | 7 |
| 19-25 June | 37 | 4 | 34 | 8 | 71 | 9 | 37 | 4 | 32 | 8 | 69 | 9 |
| 26 June-2 July | 190 | 18 | 223 | 28 | 413 | 35 | 190 | 18 | 218 | 27 | 408 | 34 |
| 3-9 July | 165 | 13 | 246 | 19 | 411 | 24 | 162 | 13 | 240 | 20 | 402 | 25 |
| 10-16 July | 214 | 15 | 209 | 24 | 423 | 32 | 213 | 15 | 207 | 24 | 420 | 32 |
| 17-23 July | 127 | 11 | 169 | 22 | 296 | 24 | 127 | 11 | 165 | 22 | 292 | 23 |
| 24-31 July | 82 | 5 | 50 | 6 | 132 | 9 | 82 | 5 | 50 | 6 | 132 | 9 |
| Total | 3,894 | 163 | 3,122 | 129 | 7,016 | 236 | 3,730 | 158 | 2,951 | 119 | 6,681 | 223 |

**Table 6.-Summary of catch and harvest estimates of Pacific halibut for the Deep Creek marine access location, 1 May-31 July 1995.**

| Dates | Catch by Guided Anglers | SE | Catch by Unguided Anglers | SE | Total Catch | SE | Harvest by Guided Anglers | SE | Harvest by Unguided Anglers | SE | Total Harvest | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-7 May | 444 | 111 | 184 | 33 | 628 | 128 | 305 | 60 | 137 | 23 | 442 | 79 |
| 8-14 May | 1,825 | 84 | 1,025 | 222 | 2,850 | 249 | 1,211 | 47 | 664 | 120 | 1,875 | 137 |
| 15-21 May | 3,388 | 342 | 1,777 | 193 | 5,165 | 508 | 2,102 | 203 | 1,314 | 116 | 3,416 | 297 |
| 22-26 May | 1,703 | 350 | 848 | 196 | 2,589 | 502 | 1,136 | 222 | 623 | 139 | 1,759 | 319 |
| 27-29 May | 1,637 | 10 | 550 | 28 | 2,196 | 28 | 1,106 | 8 | 406 | 20 | 1,512 | 21 |
| 30 May-4 June | 3,627 | 398 | 2,646 | 224 | 6,282 | 553 | 2,460 | 294 | 1,762 | 116 | 4,222 | 380 |
| 5-11 June | 7,537 | 785 | 5,064 | 724 | 12,622 | 1,448 | 4,353 | 477 | 3,093 | 458 | 7,446 | 903 |
| 12-18 June | 3,614 | 455 | 927 | 202 | 4,564 | 609 | 1,993 | 235 | 737 | 165 | 2,730 | 360 |
| 19-25 June | 6,565 | 676 | 4,241 | 371 | 10,806 | 906 | 3,809 | 361 | 2,482 | 200 | 6,291 | 510 |
| 26 June-2 July | 7,335 | 658 | 2,488 | 270 | 9,823 | 827 | 4,030 | 358 | 1,673 | 185 | 5,703 | 477 |
| 3-9 July | 9,764 | 782 | 5,057 | 454 | 14,821 | 1,127 | 5,509 | 421 | 3,042 | 253 | 8,551 | 612 |
| 10-16 July | 4,659 | 528 | 820 | 64 | 5,479 | 569 | 2,897 | 308 | 597 | 41 | 3,494 | 335 |
| 17-23 July | 9,358 | 536 | 5,197 | 544 | 14,555 | 916 | 5,777 | 321 | 3,055 | 319 | 8,832 | 549 |
| 24-31 July | 7,192 | 993 | 1,732 | 298 | 8,927 | 1,245 | 4,186 | 569 | 928 | 119 | 5,114 | 646 |
| Total | 68,648 | 2,072 | 32,556 | 1,244 | 101,307 | 2,975 | 40,874 | 1,193 | 20,513 | 745 | 61,387 | 1,732 |

**Table 7.-Summary of estimates of fishing effort (angler-days) for the Anchor Point marine access location, 1 May-31 July 1995.**

| Dates | Effort by Guided Anglers | SE | Effort by Unguided Anglers | SE | Total Effort | SE |
|---|---|---|---|---|---|---|
| 1-7 May | 35 | 15 | 92 | 8 | 127 | 20 |
| 8-14 May | 70 | 27 | 441 | 98 | 511 | 123 |
| 15-21 May | 141 | 11 | 1,112 | 106 | 1,253 | 109 |
| 22-26 May | 35 | 9 | 250 | 34 | 285 | 42 |
| 27-29 May | 83 | 3 | 515 | 34 | 598 | 33 |
| 30 May-4 June | 222 | 30 | 1,088 | 123 | 1,310 | 128 |
| 5-11 June | 223 | 84 | 1,256 | 72 | 1,479 | 131 |
| 12-18 June | 99 | 22 | 658 | 83 | 757 | 94 |
| 19-25 June | 114 | 32 | 1,244 | 359 | 1,358 | 391 |
| 26 June-2 July | 198 | 28 | 1,273 | 133 | 1,471 | 143 |
| 3-9 July | 411 | 55 | 2,591 | 309 | 3,002 | 363 |
| 10-16 July | 341 | 80 | 1,308 | 302 | 1,649 | 380 |
| 17-23 July | 158 | 35 | 1,027 | 101 | 1,185 | 135 |
| 24-31 July | 160 | 11 | 695 | 51 | 855 | 57 |
| Total | 2,290 | 149 | 13,550 | 630 | 15,840 | 737 |

**Table 8.-Summary of catch and harvest estimates of chinook salmon for the Anchor Point marine access location, 1 May-31 July 1995.**

| Dates | Catch by Guided Anglers | SE | Catch by Unguided Anglers | SE | Total Catch | SE | Harvest by Guided Anglers | SE | Harvest by Unguided Anglers | SE | Total Harvest | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-7 May | 23 | 1 | 9 | 0 | 32 | 18 | 23 | 15 | 6 | 1 | 29 | 15 |
| 8-14 May | 44 | 1 | 155 | 2 | 199 | 39 | 33 | 15 | 106 | 19 | 139 | 27 |
| 15-21 May | 64 | 1 | 255 | 2 | 319 | 36 | 59 | 15 | 185 | 11 | 244 | 19 |
| 22-26 May | 18 | 0 | 43 | 0 | 61 | 10 | 17 | 5 | 30 | 3 | 47 | 8 |
| 27-29 May | 69 | 0 | 93 | 0 | 162 | 3 | 56 | 4 | 79 | 7 | 135 | 4 |
| 30 May-4 June | 163 | 24 | 283 | 58 | 446 | 53 | 127 | 15 | 194 | 40 | 321 | 36 |
| 5-11 June | 91 | 33 | 112 | 34 | 203 | 66 | 67 | 31 | 92 | 25 | 159 | 56 |
| 12-18 June | 7 | 1 | 11 | 2 | 18 | 2 | 7 | 1 | 9 | 2 | 16 | 2 |
| 19-25 June | 12 | 4 | 40 | 7 | 52 | 10 | 12 | 4 | 29 | 4 | 41 | 6 |
| 26 June-2 July | 25 | 3 | 69 | 7 | 94 | 8 | 23 | 3 | 64 | 6 | 87 | 8 |
| 3-9 July | 18 | 6 | 50 | 4 | 68 | 10 | 18 | 6 | 49 | 4 | 67 | 10 |
| 10-16 July | 51 | 11 | 41 | 12 | 92 | 22 | 51 | 11 | 41 | 12 | 92 | 22 |
| 17-23 July | 11 | 2 | 23 | 4 | 34 | 5 | 11 | 2 | 23 | 4 | 34 | 5 |
| 24-31 July | 20 | 3 | 5 | 1 | 25 | 4 | 20 | 3 | 5 | 1 | 25 | 4 |
| Total | 616 | 51 | 1,189 | 79 | 1,805 | 106 | 524 | 46 | 912 | 55 | 1,436 | 81 |

**Table 9.-Summary of catch and harvest estimates of Pacific halibut for the Anchor Point marine access location, 1 May-31 July 1995.**

| Dates | Catch by Guided Anglers | SE | Catch by Unguided Anglers | SE | Total Catch | SE | Harvest by Guided Anglers | SE | Harvest by Unguided Anglers | SE | Total Harvest | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-7 May | 20 | 5 | 39 | 9 | 59 | 12 | 14 | 3 | 23 | 5 | 37 | 7 |
| 8-14 May | 139 | 26 | 319 | 77 | 458 | 99 | 51 | 12 | 194 | 44 | 245 | 56 |
| 15-21 May | 104 | 14 | 645 | 79 | 749 | 77 | 46 | 5 | 379 | 39 | 425 | 39 |
| 22-26 May | 48 | 3 | 92 | 33 | 140 | 62 | 27 | 17 | 73 | 25 | 100 | 40 |
| 27-29 May | 84 | 0 | 324 | 2 | 408 | 22 | 47 | 3 | 230 | 13 | 277 | 14 |
| 30 May-4 June | 687 | 7 | 1,614 | 21 | 2,301 | 274 | 258 | 29 | 971 | 125 | 1,229 | 142 |
| 5-11 June | 884 | 39 | 3,540 | 41 | 4,424 | 175 | 353 | 136 | 1,567 | 93 | 1,920 | 122 |
| 12-18 June | 271 | 3 | 1,165 | 14 | 1,436 | 143 | 146 | 29 | 629 | 71 | 775 | 72 |
| 19-25 June | 344 | 9 | 3,403 | 0 | 3,747 | 1,441 | 132 | 45 | 1,631 | 599 | 1,763 | 642 |
| 26 June-2 July | 625 | 11 | 1,691 | 23 | 2,316 | 253 | 285 | 45 | 960 | 118 | 1,245 | 131 |
| 3-9 July | 1,673 | 37 | 5,257 | 0 | 6,930 | 1,652 | 617 | 84 | 2,545 | 462 | 3,162 | 544 |
| 10-16 July | 709 | 11 | 877 | 13 | 1,586 | 228 | 326 | 47 | 576 | 86 | 902 | 127 |
| 17-23 July | 649 | 19 | 1,400 | 16 | 2,049 | 345 | 280 | 70 | 856 | 103 | 1,136 | 169 |
| 24-31 July | 494 | 8 | 1,609 | 17 | 2,103 | 236 | 228 | 41 | 878 | 65 | 1,106 | 89 |
| Total | 6,731 | 620 | 21,975 | 1,962 | 28,706 | 2,290 | 2,810 | 201 | 11,512 | 801 | 14,322 | 908 |

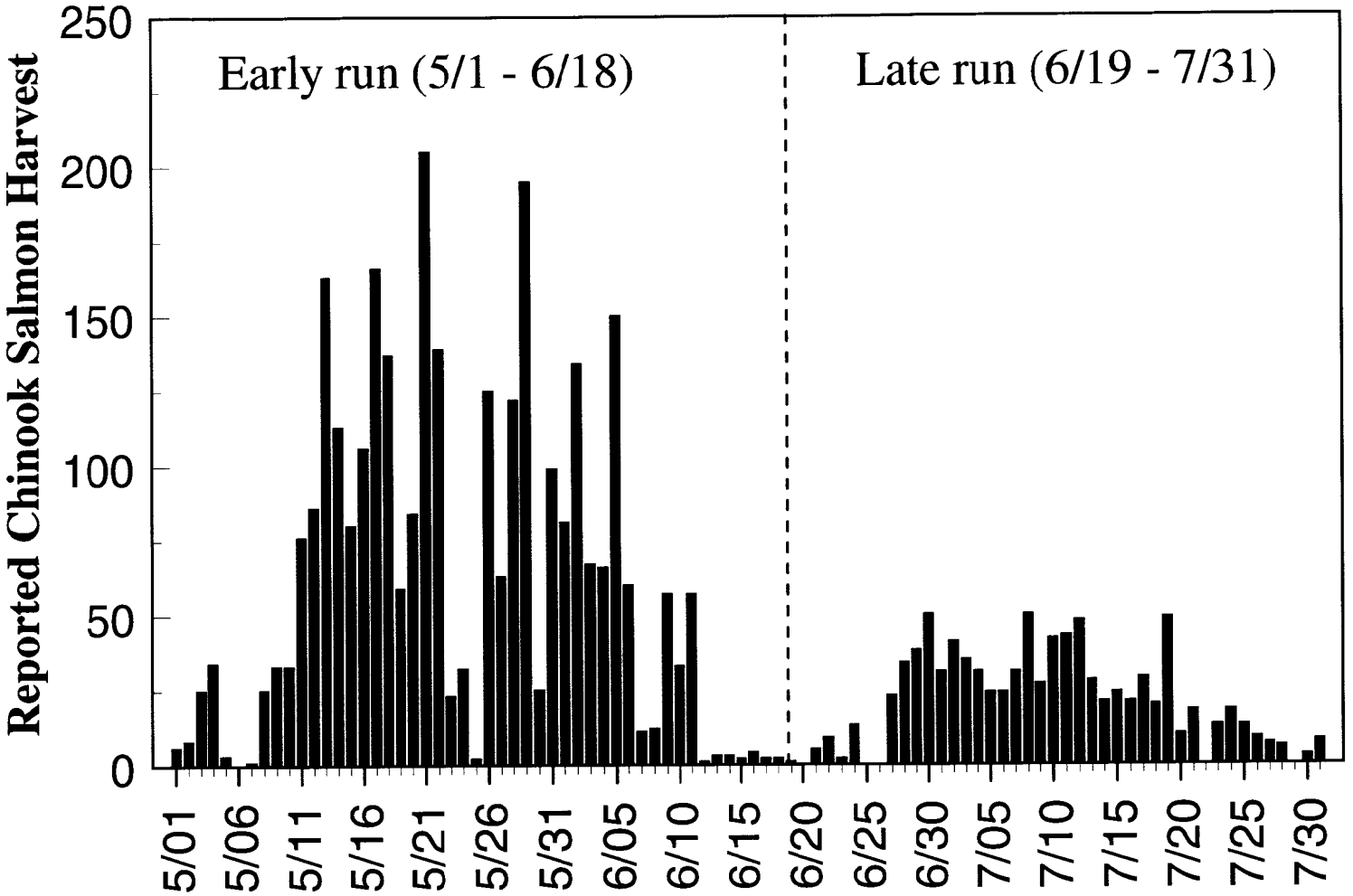


**Figure 2.-Reported harvest of chinook salmon by interviewed anglers at the Deep Creek marine access location, 1995.**

late run. The Deep Creek access location accounted for 82% of the early run chinook salmon harvest and 83% of the late run harvest (Table 3). Guided anglers accounted for 55% of the early-run chinook salmon harvest, and 65% of the late-run harvest (Tables 5 and 8).

# DISCUSSION

## SURVEY ACCURACY

The creel surveys described in this report were designed primarily to estimate the total recreational harvest of chinook salmon in the marine waters of Central Cook Inlet. However, due to reasonable time and budget constraints, our sampling was restricted to a 16-hour day, at the access sites described, from 1 May through 31 July. Our sampling did not estimate the harvest and effort of: (1) anglers that exit before or after our sampling day begins; (2) anglers that exit at other locations (Ninilchik River access, Whiskey Gulch access, Homer small boat harbor); and (3) anglers that fished before 1 May or after 31 July. Because of this, our estimates of chinook salmon and halibut harvest should not be treated as a season total.

One of the short-term goals of this project is the validation of the Statewide Harvest Survey as an accurate tool for estimating chinook salmon harvest in this fishery. As expected, the estimate of chinook salmon harvest from the onsite creel is less than the estimate from the SWHS (by 26%; Table 10). In 1994 the surveys were different by only 19%, but in 1994 we had a creel survey at the Whiskey Gulch access site also. The estimates of harvest from the SWHS are probably more accurate because the sampling design does not have the time/area/seasonal restrictions of the onsite creel survey.

**Table 10.-Comparison between fishery Parameter estimates from an onsite creel survey and the statewide harvest survey (Howe et al. 1996) for the Central Cook Inlet marine recreational fishery in 1995.**

| Source | Chinook salmon harvest | SE | Guided component |
|---|---|---|---|
| Onsite creel survey | 8,117 | 237 | 53% |
| Statewide Harvest Survey | 10,903 | NA[a] | 49% |

[a] Estimate of standard error not available at time of publication.

## TRENDS IN THE FISHERY

The Central Cook Inlet Marine recreational fishery has grown steadily in recent years, with most of the growth occurring in the guided segment of the fishery (Mills 1988-1994, Howe et al. 1995-1996). Between 1987 and 1995, the harvest of chinook salmon increased by 130% (6,157 fish), while the guided fraction of the chinook salmon harvest increased from 5% to 49% (Table 11). During these same years, the harvest of halibut in this fishery has increased by 149% (approximately 47,000 fish).

Chinook salmon harvests from last year's onsite creel are very close to this years estimated harvest (Table 11). The fraction of guided to nonguided harvest, fractions of fish that were released, and the proportional harvests between Deep Creek and Anchor Point were also very similar to the 1994 estimates from the 1994 onsite creel. Even some of the same days that had rough weather

**Table 11.-Recent harvest and effort estimates for the Central Cook Inlet marine recreational fishery.**

| Year | Chinook Harvest | | Halibut Harvest | | Effort | |
|---|---|---|---|---|---|---|
| | Total | % Guided | Total | % Guided | Total | % Guided |
| 1987[a] | 4,746 | 5 | 31,276 | 2 | 78,869 | 1 |
| 1988[a] | 5,674 | 4 | 41,691 | 5 | 54,128 | 3 |
| 1989[a] | 5,356 | 6 | 48,761 | 5 | 61,879 | 3 |
| 1990[a] | 6,194 | 8 | 51,639 | 8 | 80,825 | 4 |
| 1991[a] | 6,367 | 35 | 55,732 | 17 | 82,938 | 14 |
| 1992[a] | 7,796 | 39 | 58,971 | 40 | 91,173 | 30 |
| 1993[a] | 11,336 | 43 | 63,952 | 43 | 81,707 | 35 |
| 1994[a] | 9,168 | 45 | 77,845 | 50 | 109,726 | 40 |
| 1994[b] | 7,446 | 49 | 63,831 | 54 | 62,292 | 37 |
| 1995 [a] | 10,903 | 49 | 77,939 | 54 | 117,415 | 40 |
| 1995 [b] | 8,117 | 53 | 75,709 | 58 | 70,384 | 41 |

[a] Estimates for the entire calendar year from the Statewide Harvest Survey (Mills 1988-1994, Howe et al. 1995-1996).

[b] 1994 and 1995 estimates from the onsite creel census.

and were "unfishable" in 1994 were also unfishable in 1995. However the halibut harvest and angler effort, estimated from these surveys, continues to grow. With the increase in effort, the potential for increase in the chinook salmon harvest also increases.

Between 1993 and 1995, the number of boats that exited the fishery at the Deep Creek access site increased by 39% (10,480 boats vs. 14,604), respectively). Concurrent with the increase in boats, however, the chinook salmon harvests were actually very similar (11,336 chinook in 1993 vs. 10,903) in 1995). Participants in the fishery claim that there were an unusually high number of good weather days (making for better fishing conditions) during 1993; this may help explain the large harvest of chinook salmon in 1993 relative to 1995 and the previous years.

## RECOMMENDATIONS

The estimates from the onsite creel projects from the last two years confirm that the SWHS provides chinook salmon harvest estimates that are accurate, and actually more complete than what is reasonably possible with an onsite creel survey. Therefore the onsite creel should be dropped, and a coded wire tag recovery program begun, to provide stock contribution and stock of origin estimates for this mixed stock fishery.

Consideration should also been given to the large and growing harvest of halibut in this fishery, and what impacts the current harvests may have on sustaining a recreational harvest of halibut in Cook Inlet, of fish of a reasonable size.

## ACKNOWLEDGMENTS

I would like to thank Larry Larson for being an excellent supervisor, and assisting in the planning, organization, and implementation of this project. I would also like to thank Allen Bingham and Steve Fleischman for their expedient help in all things biometric, from forming the sampling design to writing SAS code for the final estimates. Thanks also to Saree Timmons for a thorough review of a draft of this manuscript. I would like to thank all of the creel technicians for doing an excellent job of collecting such a large volume of information and representing the Department: Greg Corner, Julie Cowan, Janice Higby, Dave Lyon, Jim Martin, Phyllis McCutchan, Tom McCutchan, and Kathy Thunstrom.

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# APPENDIX A. VOLUNTARY LOGBOOK FORM FOR THE PRIVATE LODGES

**Appendix A1.-Logbook form provided to the fishing lodges accessing the Central Cook Inlet marine recreational fishery via a closed access, private beach.**

| DATE | TIME AT END OF TRIP | # RODS | KINGS KEPT | KINGS RELEASED | HALIBUT KEPT | HALIBUT RELEASED |
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Each row represents a day of fishing for a boat of people. Even if someone fishes for only ten minutes, that counts as a day of fishing. If someone goes out more than once in the same day, and fishes for both kings and halibut, we count that as only one rod being fished.

# OF RODS — the maximum number of rods that were fished from the boat at any time during the trip (if 3 rods were fished for kings, and then 4 rods for halibut, report 4). The data recorded should reflect how many people actually fished from the boat for either kings or halibut.

KINGS KEPT — the number of kings that were kept and killed.

KINGS RELEASED — kings that were released after being landed; strikes, or kings that slipped the hook or otherwise escaped before being landed do not count as being released.

HALIBUT KEPT — the number of halibut that were kept and killed.

HALIBUT RELEASED — halibut that were released after being landed; strikes, or halibut that slipped the hook or otherwise escaped before being landed do not count as being released.

Thank you for taking part in our creel survey of the Central Cook Inlet chinook salmon fishery. I'd like to assure you that any and all information that you provide the Department will be strictly confidential and not a part of the public record.

# APPENDIX B. DATA FILE LISTING

**Appendix B1.-Data files used to estimate harvest and effort estimates for the Central Cook Inlet marine recreational fishery, 1995.**

| Data File | Description |
|---|---|
| 10010M.ARC[a] | Data file (ASCII) containing interview information recorded on mark-sense interview forms (MARINE INTERVIEW VERSION 1.0) for 1995. |
| 95CCIM.XLS[b] | Excel (5.0) worksheet file containing the interview information for 1995 and information collected from the private lodges. |

[a] Data file archived at, and available from, the Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services, 333 Raspberry Road, Anchorage, 99518-1599.

[b] Data file available from the author: Alaska Department of Fish and Game, Sport Fish Division, 34828 Kalifornsky Beach Road, Soldotna, AK, 99669.