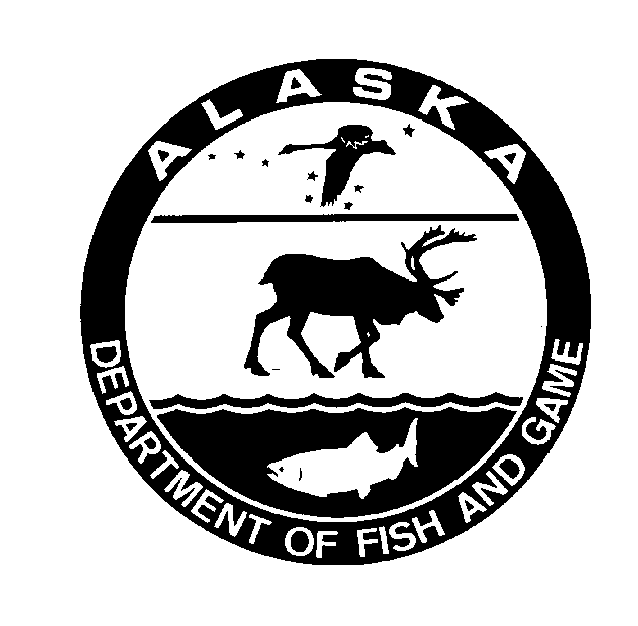
Fishery Data Series No. XX-YY

Upper Cook Inlet Personal Use Salmon Fisheries, 2007- 2009

by  
Kristine J. Dunker

May 2010

Alaska Department of Fish and Game Divisions of Sport Fish and Commercial Fisheries



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**Weights and measures (metric)**

centimeter cm

deciliter dL

gram g

hectare ha

kilogram kg

kilometer km

liter L

meter m

milliliter mL

millimeter mm

**Weights and measures (English)**

cubic feet per second ft3/s

foot ft

gallon gal

inch in

mile mi

nautical mile nmi

ounce oz

pound lb

quart qt

yard yd

**Time and temperature**

day d

degrees Celsius °C

degrees Fahrenheit °F

degrees kelvin K

hour h

minute min

second s

**Physics and chemistry**

all atomic symbols

alternating current AC

ampere A

calorie cal

direct current DC

hertz Hz

horsepower hp

hydrogen ion activity pH

(negative log of)

parts per million ppm

parts per thousand ppt,

‰

volts V

watts W

**General**

Alaska Administrative

Code AAC

all commonly accepted

abbreviations e.g., Mr., Mrs., AM, PM, etc.

all commonly accepted

professional titles e.g., Dr., Ph.D.,

R.N., etc.

at @

compass directions:

east E

north N

south S

west W

copyright ©

corporate suffixes:

Company Co.

Corporation Corp.

Incorporated Inc.

Limited Ltd.

District of Columbia D.C.

et alii (and others) et al.

et cetera (and so forth) etc.

exempli gratia

(for example) e.g.

Federal Information

Code FIC

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

registered trademark ®

trademark ™

United States

(adjective) U.S.

United States of

America (noun) USA

U.S.C. United States Code

U.S. state use two-letter abbreviations (e.g., AK, WA)

**Measures (fisheries)**

fork length FL

mideye-to-fork MEF

mideye-to-tail-fork METF

standard length SL

total length TL

**Mathematics, statistics**

*all standard mathematical*

*signs, symbols and*

*abbreviations*

alternate hypothesis HA

base of natural logarithm *e*

catch per unit effort CPUE

coefficient of variation CV

common test statistics (F, t, χ2, etc.)

confidence interval CI

correlation coefficient

(multiple) R

correlation coefficient

(simple) r

covariance cov

degree (angular ) °

degrees of freedom df

expected value *E*

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) log2, etc.

minute (angular) '

not significant NS

null hypothesis HO

percent %

probability P

probability of a type I error

(rejection of the null

hypothesis when true) α

probability of a type II error

(acceptance of the null

hypothesis when false) β

second (angular) "

standard deviation SD

standard error SE

variance

population Var

sample var

FISHERY DATA SERIES NO. XX-10

Upper Cook Inlet personal use salmon fisheries, 2007-2009

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September 2010

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# ABSTRACT

From 2007 to 2009 participants in the Upper Cook Inlet personal use salmon fisheries were required to record their harvest and effort on a free permit that was returned to the Alaska Department of Fish and Game after the fisheries closed. The number of permits issued increased every year of the study with over 29,600 permits issued in 2009. The response rate for returned permits averaged 86% during this study. Returned permits were used to estimate total harvest and effort for the Kasilof River set gillnet, Kasilof River dip net, Kenai River dip net , and Fish Creek dip net fisheries. Sockeye salmon harvest from 2007 to 2009 averaged 21,674 fish for the Kasilof River set gillnet fishery, 56,793fish for the Kasilof River dip net fishery, 288,457 fish for the Kenai River dip net fishery, and 9,898 for the Fish Creek dip net fishery. Most permits were issued to residents of Anchorage followed by residents of the Kenai Peninsula and the Matanuska-Susitna Valley. Most permit holders did not fill their seasonal bag limit, and differences in their success varied with respect to the number of fisheries they participated in, which fisheries they participated in and the amount of effort spent fishing.

Key words: Kenai River, Kasilof River, Fish Creek, personal use, dip net, set gillnet, subsistence, sockeye salmon, coho salmon, Chinook salmon, pink salmon, chum salmon, flounder, permit.

# INTRODUCTION

Subsistence and personal use (PU) fishing in Cook Inlet has undergone numerous regulatory changes over the past two decades, reflecting the efforts by the state and federal governments and the court system to develop a legal definition of subsistence use (Brannian and Fox 1996). In 1996, most of Cook Inlet was closed to subsistence harvest of salmon. In lieu of subsistence fisheries, four personal use fisheries were opened to all Alaska residents: Fish Creek dip net, Kasilof River set gillnet, Kasilof River dip net, and Kenai River dip net. All of these fisheries target sockeye salmon *Oncorhynchus nerka,* although Chinook salmon *O. tshawytscha*, coho salmon *O. kisutch*, pink salmon *O. gorbuscha*, chum salmon *O. keta,* and flounder Pleuronectidae are harvested incidentally. All participants in the Upper Cook Inlet personal use (UCIPU) fisheries are required to get a free permit or be a member of a household with a permit. UCIPU permits are household permits that allow all members of the household to fish under the same permit. Completed permits must be returned to the Alaska Department of Fish and Game (ADF&G) following each fishing season. This report presents harvest, effort and other summary information from UCIPU salmon permits issued during the 2007-2009 seasons for the Kenai, Kasilof, and Fish Creek personal use fisheries (Figure 1).

## Management Plans

All UCIPU salmon fisheries are managed under the provisions of the Upper Cook Inlet Personal Use Salmon Fishery Management Plan (5 AAC 77.540).

### Kasilof River

In-season management of the set gillnet fishery is the responsibility of the Alaska Department of Fish and Game, Commercial Fisheries Division (CFD). CFD also operates a sonar counter on the Kasilof River. From 1996-2001 the set gillnet fishery was opened and closed by emergency order based on a target harvest range. In 2002, the Alaska Board of Fisheries (BOF) changed the management plan so that the set gillnet fishery opens and closes by regulation, therefore in-season management is required only if the sonar count and biological escapement goal cannot be met. In-season management of the dip net fishery is the responsibility of the Alaska Department of Fish and Game, Sport Fish Division (SFD). The dip net fishery also opens and closes by regulation, and in-season management is only required if the sonar count and biological escapement goal cannot be projected.

### Kenai River

In-season management of this fishery is the responsibility of SFD. The fishery opens and closes by regulation, and in-season management by SFD is only required if it is projected that the in-river escapement goal for sockeye salmon will not be met.

### Fish Creek

In-season management of this fishery is the responsibility of SFD. SFD is also responsible for operation of a weir in Fish Creek. Prior to 2002, the fishery opened and closed by regulation, however frequent inseason management actions were required due to poor inriver returns. In 2002 the BOF changed the management plan so that the fishery would be opened by emergency order only if the department projected that the escapement of sockeye salmon into Fish Creek will exceed 70,000 fish.

## Fishing Regulations

Regulations for these fisheries are outlined in 5 AAC 77.015, 5 AAC 77.525, and 5 AAC 77.540. The fisheries are open to Alaskan residents only. A legal dip net is a bag-shaped net supported on all sides by a rigid frame. The net opening may not exceed 5-feet across, and the depth of the net must be at least one-half the net opening. The mesh used to construct the net may not exceed 4.5 inches stretched. Dip nets must be operated by hand. The total annual limit for all UCIPU fisheries is 25 salmon for the head of the household and 10 salmon for each additional household member. There is an annual limit of one Chinook salmon from the Kenai River dip net fishery, and no Chinook salmon can be retained from the Kasilof River dip net fishery. However, there is no annual limit for Chinook salmon caught in the Kasilof River set gillnet fishery.

### Kasilof River Set Gillnet

The legal fishing area is from ADF&G regulatory markers located at the river mouth to ADF&G commercial fishing regulatory markers located approximately one mile from the mouth in either direction (Figure 1; Panel A). Additionally, fishing is prohibited more than one mile from the mean high tide mark and within any flowing waters of the Kasilof River at any tide stage. Only one set gillnet can be operated per permit. The set gillnet has to be attended by the permit holder or a person named on the permit at all times it is being used to harvest fish. No set gillnet can be operated within 100 feet of another set gillnet. The gillnet cannot exceed 10 fathoms in length, have larger than a six-inch stretched mesh size, or be more than 45 meshes deep. By regulation, the fishery is open from June 15 through June 24, from 0600 to 2300 hours.

### Kasilof River Dip Net

Dip netting is allowed in the area from regulatory markers located on the Cook Inlet beaches outside of the terminus of the river upstream for one mile (Figure 1; Panel B). The dip-netting season begins on June 25 and ends on August 7. During this season, dip netting is open 24 hours a day.

### Kenai River Dip Net

Dip nets can only be used from shore in the area from ADF&G regulatory markers located on the Cook Inlet beaches outside of the terminus of the river upstream to the Warren Ames Bridge (Figure 1, Panel C). The north shoreline is closed to dip netting from shore between an ADF&G marker located below Main Street in Kenai upstream to ADF&G markers near the Kenai City Dock. This regulation is implemented to minimize erosion to the bluffs below the city of Kenai.

Dipnetting from a boat is only allowed from ADF&G markers located near the Kenai City Dock upstream to the Warren Ames Bridge. Salmon may not be taken from a boat powered by a two-stroke motor other than one that is manufactured as a direct fuel injection motor. The fishery is open from July 10 through July 31, from 0600 to 2300 hours.

### Fish Creek

Prior to 2002, dip netting was allowed in the area from ADF&G regulatory markers located on both sides of the terminus of the creek upstream to ADF&G regulatory markers located approximately ¼ mile upstream of the Knik-Goose Bay Road. Regulations for 1996-2001 allowed personal use dip netting from July 10 through July 31 from the hours of 1100-2300.

Beginning in 2002 regulations were modified so that the fishery would open only by emergency order when the escapement of sockeye salmon into Fish Creek would exceed 70,000 fish. The area and location of the fishery remained the same. Fish Creek was opened in 2009 for the first time since 2001, and the fishery ran from August 1 through August 8.

## 

## Objectives

From 2007-2009 the objectives of the study were to:

1. Make permits available to Alaskan residents that qualified to participate in the upper Cook Inlet personal use fisheries;
2. Estimate participation (household days fished) and harvest for the upper Cook Inlet personal use fisheries.

# 

# METHODS

## Study Design

All participants in the UCIPU salmon fisheries were required to get a permit or be a member of a household with a permit. Permits were free to residents with valid Alaska sport fishing licenses and were issued by more than 60 vendors and ADF&G offices located in Anchorage, Fairbanks, the Kenai Peninsula, and the Matanuska-Susitna Valley.

Each permit was divided into numbered halves (Appendix A1). Permits were sequentially numbered, and vendors were given known sequences. The top half was a vendor copy which was retained by the vendor and contained the permit holder’s contact information, sport fishing license number, and the angler’s signature. Vendor copies were returned to the Anchorage ADF&G office periodically throughout the summer using courtesy reply envelopes provided by the Division of Sport Fish. Data from the returned vendor copies were entered into an electronic database periodically throughout the summer.

The bottom half of each permit was a harvest card that was given to the permit holder. The permit holder was required to have this permit in their possession when personal use fishing. Permit holders were also required to record harvest information including fishery, dates fished, and salmon harvest by species immediately upon harvesting a fish. A check box was provided for households that did not fish. All permits, even for households that did not fish, were required to be returned to ADF&G by August 15.

Permit holders who did not return their permits received up to two reminder letters. Reminder letters were essentially copies of the original permits with the original permit numbers. These stated that ADF&G had not received harvest information and encouraged permit holders to fill out and immediately send back their reminders. Reminder letters were mailed to allow an approximately four-week response period for the previous mailing. Data from returned permits were entered into an electronic database as they were received. In some cases returned permits reported that the household harvested in excess of their seasonal bag limit, fished out of season, were not Alaskan residents, or some other regulatory violation. This information was entered into the database as it was recorded on the permit.

All permit-holders who returned their permits before the second reminder letter were considered “compliant” households. Information obtained by permit-holders who returned their permits after the second reminder letter was mailed were considered “non-compliant” households. Participation and harvest by non-compliant households was estimated by calculating the mean participation (household days fished) and harvest by species for non-compliant permits that were returned. These were then expanded to include all non-respondents. Total estimates of participation and harvest by species for each fishery were obtained by summing the estimates for the non-compliant households with the information obtained from compliant households.

Occasionally vendors failed to return vendor copies from some of the permits they issued. This resulted in some permit holders returning permits that lacked a vendor copy. The total number of permits issued was estimated by assuming that the response rate (prior to mailing the first reminder letter) among known permits was the same as the response rate among the permits lacking a vendor copy (the “orphan permits”). This response rate was applied to the orphan permits to estimate the total number of permits issued but lacked a vendor copy.

## 

## Data Analysis

Because some vendors did not return all of their permits, the total number of permits issued was estimated as:

|  |  |
| --- | --- |
|  | (1) |

where:

|  |  |  |
| --- | --- | --- |
| = | the total number of permits issued, | |
| = | the number of permits issued and returned by permit holders before the first reminder letter, but with no vendor card (the “orphan permits”), | |
| = | = | the response rate before the first reminder letter among permits with vendor cards, |
| = | the number of permits returned before the first reminder letter mailing with vendor cards, | |
| = | the total number of permits with vendor cards. | |

With variance estimated as:

|  |  |
| --- | --- |
| , | (2) |

where,

|  |
| --- |
| . |

The estimated number of permits issued was divided in four groups:

|  |  |
| --- | --- |
| , | (3) |

where:

|  |  |
| --- | --- |
| = | the number of compliant permits who reported fishing, |
| = | the number of compliant permits who reported they did not fish, |
| = | , |
|  | the estimated number of non-compliant permits who reported fishing, and, |
|  | where |
|  | = the number of non-compliant households responding to the last reminder, and,  = the number of non-compliant households who responded to the last reminder and reported fishing. |
| = | the estimated number of non-compliant permits who reported they did not fish. |

Harvest for each species or participation for each fishery was estimated by the following procedure (with subscripts denoting parameter of estimation deleted for simplicity):

|  |  |
| --- | --- |
|  | (4) |

where:

|  |  |
| --- | --- |
| = | estimated total harvest or participation; |
| = | harvest or participation reported by compliant permits, and; |
| = | estimated harvest by non-compliant households = |
|  | where  = the mean harvest or participation per household for non-compliant households that fished. |
| = | reported harvest by responding non-compliant household *j*, and | |
| = | the number of non-compliant households responding to the reminder mailings. | |

Variance was calculated as (Goodman 1960):

|  |  |
| --- | --- |
| , | (5) |

where:

|  |  |
| --- | --- |
| , | (6) |
| , |  |

and

|  |  |
| --- | --- |
| , | (7) |
|  |  | |
| . | (8) |

Standard errors were the square root of the variance estimates. Permit holders who failed to indicate which fishery they participated in were estimated as “unknown fishery” by the procedure outlined above.

# RESULTS

## Permits Issued and Returned

The numbers of permits issued for the UCIPU fisheries increased every year of this study with an estimated 23,046 (SE=1) permits issued in 2007, 23,722 (SE=1) permits issued in 2008, and 29,619 (SE=1) permits issued in 2009 (Table 1). The return rates decreased slightly from 88% in 2007 to 85% in 2008 and 2009. On average, 61% of permit holders returned their permits voluntarily, 17% were returned after the first reminder letter, and 8% were returned after the second reminder. On average 18% of the households that were issued UCIPU permits during this study period did not fish (Table 2).

## Estimated Harvest and Effort

All five species of salmon were harvested with sockeye comprising the majority (Figure 2). Effort for all fisheries averaged 31,641 household days. As with the harvest, fishing effort was greatest in 2009 (37,754 days fished, SE=46), and lowest in 2008 (28,491 days fished, SE=34; Table 3). The Kenai River dip net fishery was the most popular of the UCIPU fisheries, and most of the salmon harvest and effort occurred there (Table 3). Since 2005, it has been legal to harvest flounder in the UCIPU fisheries with the exception of Fish Creek. During this study period, the greatest harvest of flounder occurred in the Kenai dip net fishery (Table 4).

### Kasilof River Set Gillnet

During this study period, participation in the Kasilof River set gillnet fishery averaged 1,622 household days with a range of 1,534 (SE=7) household days in 2008 to 1,761 (SE=9) household days in 2009 (Table 3). Sockeye salmon harvests during the same period averaged 21,674 fish and ranged from 14,943 (SE=66) fish in 2007 to 26,646 (SE=167) fish in 2009 (Table 3). Chinook salmon harvests had the opposite trend. Harvests averaged 207 fish but ranged from 127 (SE=2) fish in 2009 to 343 (SE=3) fish in 2007 (Table 3).

The Kasilof River set gillnet fishery has the shortest season of the UCIPU fisheries. In 2007, over 50% of the sockeye harvest was taken by June 19. In 2008 and 2009, this harvest level was achieved by June 20 which is the median date for this fishery (Figure 3; Appendix B1).

### Kasilof River Dip Net

Between 2007 and 2009, participation in the Kasilof River dip net fishery averaged 5,943 household days with a range of 4,627 (SE=9) days in 2007 to 7,650 (SE=21) days in 2009 (Table 3). Sockeye harvest during this period averaged 56,793 fish with the greatest harvest occurring in 2009 (73,035 sockeye salmon, SE=246). Harvests of other species were all under 1,000 fish, except for the harvest of coho salmon in 2009 which was 1,441 (SE = 30).

The harvest timing of the Kasilof River dip net fishery was relatively consistent between years. Over half the sockeye harvested were taken by July 20th in 2007, July 18th in 2008, and July 17th in 2009 (Figure 4; Appendix B2). The exploitation rate for both of the Kasilof River personal use fisheries (set gillnet and dip net combined) averaged 12% of the total Kasilof harvest and increased from 9% in 2007 to 18% in 2010 (Table 5).

### Kenai River Dip Net

Participation in the Kenai River dip net fishery averaged 22,950 household days and ranged from 20,772 (SE=27) household days in 2008 to 26,171 (SE=35) days in 2009 (Table 3). Sockeye salmon harvest averaged 288,457 fish with a range of 234,109 (SE=338) fish in 2008 to 339,993 (SE=524) fish in 2009 (Table 3). Harvests of other species were comparatively small. For example, pink salmon had the second highest harvest rate, but the mean was only 6,017 fish.

The harvest timing of the Kenai River dip net fishery was relatively consistent between 2008 and 2009, although the majority of sockeye salmon were harvested later in the season in 2007 (Figure F5; Appendix B3). In 2008 and 2009, over half of the sockeye harvest had occurred by July 20th which is the median date of the fishery. In 2007, this same harvest level was achieved on July 22nd. Sockeye harvest in the Kenai River dip net fishery resulted in exploitation rates ranging from 10.% (2007) to 18% (2009) of the total Kenai harvest (Table 5). The mean exploitation rate was 14%, slightly higher than the mean exploitation rate from the Kenai sport fishery (12%). The commercial sockeye fishery had the largest exploitation rate for the total Kenai harvest and averaged 74% during the study period.

### Fish Creek Dip Net

In 2009, Fish Creek was opened for the first time since 2001 to personal use harvest. It was open from August 1st through August 7th. Participation in the Fish Creek dip net fishery was 1,452 household days (Table 3). 9,898 (SE=73) sockeye salmon were harvested (Table 3), with over half of these taken by August 5th (Figure 6; Appendix B4). Harvests of other salmon species were minimal with less than 70 of each species taken during the fishery, although these harvests were technically violations because the Fish Creek emergency order (EO 2-RS-2-25-09) was issued for sockeye only (Table 3).

## Characteristics of Permit Holders

### Residency of Permit Holders

Approximately 97% of all UCIPU permit holders resided in Southcentral Alaska (Region II) during each year of the study (Table 6). Less than three percent of the participants lived in the Interior, and only 0.2% resided in Southeast. Of the participants from Southcentral, the majority were from Anchorage, followed by the Kenai Peninsula, and the Matanuska-Susitna Valley. The percentage of permit holders from Anchorage decreased by about 2% from 2007 to 2009, which differs from the increasing trend in Anchorage participants that had been observed during the first ten years of the UCIPU fisheries (Reimer and Sigurdsson 2004 and Dunker and Lafferty 2007).

Despite the 2% decrease in participation, Anchorage residents represented the majority of the participants in the Kenai River and Kasilof River personal use dip net fisheries (Table 7; Figure 7). They also comprised the majority of permit holders who did not participate in any of the UCIPU fisheries. Of the permit holders from Anchorage that participated in the fisheries, they harvested an average of 20.8 (SE = 0.12) salmon (Figure 8). Residents of the Kenai Peninsula were the predominate participants in the Kasilof River personal use set gillnet fishery in 2008, but participation in this fishery by Kenai Peninsula residents did not differ substantially from Anchorage residents in 2007 and 2009 (Figure 7). Kenai residents who fished harvested an average of 22.2 (SE = 0.14) salmon, which was about 1% higher than Anchorage residents (Figure 8). Permit Holders from the Matanuska-Susitna Valley were the dominant participants in the Fish Creek Dip net fishery (Figure 7), and only about 1% of the Fish Creek dip net participants were from the Kenai Peninsula. Matanuska-Susitna Valley residents and residents from Regions 1 and 3 had the highest average harvests of 23.5 (SE = 0.48) salmon each. The mean harvests for all residency areas decrease when permits that did not fish are included. In these cases, mean harvests were 15.8 (SE = 0.09) for Anchorage, 16.2 (SE = 0.13) for Kenai, and 18 (SE = 0.02) for Matanuska Susitna Valley residents. In general, patterns in the residency of participants in the UCIPU fisheries were relatively consistent throughout this study and did not differ much from patterns observed during previous studies (Dunker and Lafferty 2007).

### Seasonal Variation

The overall mean harvest per permit from permit holders who actually fished was 21.7 (SE = 0.07) and 16.3 (SE = 0.07) for all permits, including those that did not fish. Participants in the UCIPU fisheries were the most successful in 2009, when, on average, they harvested 38.8% (SE = 0.2%) of their limits (Table 8). Participants were the least successful in 2008 when they only harvested an average of 34.5% (SE =0.2%) of their limits (Table 8). Over 25% of permit holders did not harvest any of their allowable bag limits in 2007 and 2008. In 2009, that percent dropped to approximately 24%. (Figure 9). During all years, 18% or less of permit holders harvested the majority of their limits (81-100%; Figure 9). The Kasilof River gill net fishery was the least utilized of all the UCIPU fisheries (Table 3). However, on average, those participants fishing the Kasilof River set gillnet fishery were the most successful, except for 2007 when there was slightly greater success in the Kenai dip net fishery (Figure 10). In 2008 and 2009, participants in the Kasilof River gillnet fishery harvested an average of 65% (SE = 0.01)of their bag limits. In contrast, during all years, participants fishing the dip net fisheries harvested less than half of what they were allowed (Figure 10).

Of all of the salmon harvested in the UCIPU fisheries, over 75% came from the Kenai River dip net fishery each year whereas less than 25% were typically harvested from the Kasilof River fisheries (Figure 11). In 2009, when Fish Creek opened to dipnetting, only 2% of the total harvested salmon where taken there (Figure 11).

### Household Size

Permits were most commonly issued to two-person households during this study (Table 8). While some very large households did obtain permits, households of five people or less obtained 93.1% of the total permits issued during this period (Table 8). For all permits issued, the average percentage of the bag limit harvested varied only about 7% for households of different sizes with households of two having the greatest success and households of six having the least success (Table 7). When data were analyzed separately by fishery using data from permit holders who actually fished and participated in only one fishery, households of one tended to be slightly more successful than households of other sizes in filling their limits (Figure 12). Overall patterns in the percentage of permits and the percentage of salmon harvested according to household size were remarkably similar between fisheries (Figure 12).

### Number of Days Fished/Fisheries Visited

Many permit holders fished multiple days per season although 45.7% of permit holders fished only one day (Table 8). Those permit holders who did fish more than one day increased their success from 38.6% (SE=0.2%) of their bag limit for households that fished one day to 69.3% (SE=0.6%) for households that fished at least five days. When data were analyzed separately by fishery for those permit holders that participated in only one fishery, the average percentage of the bag limit filled increased as the effort (days fished) increased for all UCIPU fisheries (Figure 13). People fishing the Kasilof gill net fishery for five or more days were the most successful in filling their bag limits. Dipnetters, in general, increased their success with added days of fishing effort. Dipnetters in the Kenai filled a higher percentage of their limits than those fishing the Kasilof when they fished between one and three days. However, if participants dipnetted for four days or longer, there was no difference in their average harvests (Figure 13). Overall, the patterns in the percentage of permits and the percentage of salmon harvested over multiple days were, again, quite similar between all the UCIPU fisheries (Figure 13).

Few UCIPU permit holders participated in more than one fishery during this study (Table 8). Of those who participated in two fisheries, 90% fished the Kenai River along with another fishery (most often Kasilof River dip net). Of those who participated in three fisheries, combinations involving the Kenai River accounted for 100% During this study period, fishing in multiple fisheries increased the average percentage of the bag limit filled from 46.1% (SE = 0.2$) for one fishery to 68.8% (SE = 2.7) for three fisheries (Table 8).

# DISCUSSION

More UCIPU permits were issued during this study than ever before, indicating that these fisheries are continuing to increase in popularity. On average, 25,462 permits were issued each year from 2007–2009 (Table 1). In previous years, the number of permits issued was less than 22,000 (Dunker and Lafferty 2007 and Reimer and Sigurdsson 2004). Return rates for UCIPU permits remain high although the average permit return rate of 86% during this study decreased slightly from the previously reported average return rate of 88% (Dunker and Lafferty 2007).

With the growing popularity of the UCIPU fisheries, the effort and harvest estimates have also increased. Average total effort during this study was 31,641 days fished (Table 3) whereas Dunker and Lafferty (2007) reported an average of 24,385 days fished between 2004 and 2006 and Reimer and Sigurdsson (2004) reported an average of 18,761 days fished for the years 1996-2003. With that, the average salmon harvest was substantially higher, averaging 390,343 salmon per year during this study compared with an average of 323,273 salmon and 207,543 salmon harvested per year from 2004- 2006 and 1996–2003, respectively (Dunker and Lafferty 2007 and Reimer and Sigurdsson (2204). Mean effort and harvest has increased by about 40% from the effort and harvest reported in Reimer and Sigurdsson (2004) for the first years of these fisheries.

During 2007 and 2009, effort and harvest of sockeye salmon in the Kenai River dip net fishery was higher than ever before (Appendices C1 and C2). In particular, the greatest effort and sockeye harvest occurred during the 2009 Kenai River dip net season (Appendices C1 and C2). Coho salmon harvests were also high during the 2007–2009 period, with the greatest harvest occurring in 2008 (Appendix C3). Chinook salmon harvests hit at record high in the Kenai dip net fishery in 2007, but then decreased during the remainder of the study (Appendix C4). Chum and pink salmon harvests were not substantially higher in any of the UCIPU fisheries than they were in previous years (Appendices C5 and C6). However, the second highest pink salmon harvest in the Kenai dip net fishery occurred in 2008 (Appendix C6).

There are fishery related explanations for the increased harvest and effort levels observed. Interest in the UCIPU fisheries increased during this study as indicated by the numbers of permits issued (Table 1; Dunker and Lafferty 2007 and Reimer and Sigurdsson 2004), and most of the effort occurred in the Kenai River dip net fishery (Table 3, Figure 11). Also, the percentage of permit holders who were issued permits but did not fish was lower than previously reported (Table 2; Dunker and Lafferty 2007 and Reimer and Sigurdsson 2004).

The Kenai dip net fishery has grown since the fishery began with a few exceptions. One notable exception occurred in 2006 and was likely the result of an in-season closure that resulted in lower effort and harvest levels (Dunker and Lafferty 2007). During this study. effort and harvest was lowest in 2008 which was also the year with the lowest total sockeye run in the last three years(Table 5). In 2009, effort and harvest were at an all time high (Table 3). This could be attributed to a myriad of factors including anything from growing interest and awareness of the fishery to a growing desire to try and fill the freezer in light of the economic recession. . Regardless of the reason for the increased participation, the success of participants in filling their bag limits from the Kenai remained similar to previous years (Figures 9 and 10; Dunker and Lafferty 2007).

With the exception of 2006, the UCIPU fisheries in the Kasilof increased beyond previous levels during this study as well. The exception in 2006 was, again, likely driven by the Kenai closure which drew more people to fish the Kasilof dip net fishery that year (Dunker and Lafferty 2007). Despite 2006 yielding higher effort and harvest estimates, the period from 2007 to 2009 showed steady growth in the harvest and effort of the Kasilof Fisheries. Again, however, this is best attributed to the overall increase in the number of UCIPU participants. The success of Kasilof dipnetters did not appear to differ much from previous years, and the success of Kasilof gillnetters, in fact, was lower during this study period (Figure 10; Dunker and Lafferty 2007). However, as with previous years, participants in the Kasilof gillnet fishery still have greater success than participants in the dip net fisheries despite that this has always been and remains the least popular of the Kenai UCIPU fisheries (Dunker and Lafferty 2007 and Reimer and Sigurdsson 2004). In 2009, Fish Creek opened for the first time since 2001. This likely also played a substantial role in the high number of permits issue that year. Despite that this fishery only contributed to about 2% of the total UCIPU salmon harvest, the opening of this fishery likely motivated participants from the Matanuska-Susitna Valley to obtain UCIPU permits who ordinarily might not have. This is illustrated by the higher percentage of participants from the Matanuska-Susitna Valley in 2009 than in previous years (Table 6; Dunker and Lafferty 2007).

Analysis of UCIPU fisheries indicates that the bag limit exceeds most permit holders’ actual harvest (Figures 8 and 9). In addition, the current bag limit increases at a faster rate than larger households increase their harvest (Table 8, Figure 12). Most permit holders did not fill their seasonal bag limit although differences in the percentage of the bag limit filled varied with respect to the number of fisheries fished and the amount of effort spent fishing (Table8, Figure 9). Residency trends observed during this study were similar to those reported by Dunker and Lafferty (2007) and Reimer and Sigurdsson (2004), with the exception of the higher percentage of Matanuska-Susitna valley participants in 2009 (Table 6). Regardless, most permits were issued to residents of Anchorage followed by residents of the Kenai Peninsula and the Matanuska-Susitna Valley, and relatively few permits were issued to Alaskans who did not reside in Southcentral Alaska (Table 6, Figure 7). However, participants residing outside of Southcentral and participants from the Matanuska-Susitna Valley harvested more salmon, on average, than residents from Anchorage and the Kenai Peninsula. This is likely attributed to expending greater effort fishing when traveling from further distances to the Kenai UCIPU fisheries and/ or the Fish Creek dip net fishery opening after harvesting salmon from the Kenai fisheries. This is speculation, however, as residents from these areas did not, on average, spend more days fishing than residents from Anchorage and the Kenai Peninsula.

In the past, public perception with regard to the UCIPU fisheries is that regulatory violations are common (Dunker and Lafferty 2007, Barrett 2001 a-b in Reimer and Sigurdsson 2004). Reimer and Sigurdsson (2004) discussed that regulatory violations were often recorded on harvest cards between 1996 and 2003, and violations were also observed from the period between 2004 and 2006 (Dunker and Lafferty 2007). As to be expected, some regulatory violations were also observed during this study. For example, 38 Chinook salmon were reported harvested from the Kasilof River dip net fishery where regulations do not allow retention of Chinook (Table 3, Appendix C4). Also, a very small number (less than 1%)of permit holders reported harvesting over 100% of their seasonal bag limit (Figure 9). In addition, a few permits holders each year (less than 0.5%) gave out-of-state addresses on the vendor copy of their permit (Table 6).

While the aforementioned regulatory violations display a lack of understanding of personal use fishing regulations by some permit holders, accurate reporting is essential to the accuracy of the estimates, and regulatory violations of this nature are enforced during the fisheries by the Alaska Wildlife Troopers (AWT) and the Alaska Department of Fish and Game, Division of Sport Fish. More significant problems would occur if large numbers of fishermen were not obtaining permits or failing to return obtained permits. Local AWT officers indicate that they rarely encounter personal use fishermen who do not have a permit. For example, in 2009, they spent over 460 hours enforcing the personal use fishing regulations. Of 1,200 contacts made, they only had to issue 131 citations, and many of these were for using a 2-stroke motor. The return rate for permits did decrease slightly during this study period. However, the current return rate is, nonetheless, high and sufficient to generate accurate harvest and effort estimates. The return rate will continue to be monitored. If it continues to decrease in the future, ADF&G will begin enforcement efforts against permit holders who fail to return their permits. In cooperation with the Department, AWT officers could begin issuing citations to those permit holders that received permits but failed to return their permits for at least two consecutive years. If this were to happen, the goal of this enforcement action would be to make the public more aware of the regulations, the importance of following them, and, ultimately, increase compliance with the UCIPU fishery regulations.

# ACKNOWLEDGEMENTS

Thanks to all individuals involved with the success of this project. ADF&G staff who worked as principal investigators included Kristine Dunker and Kirk Brogdon. Pat Hansen served as project biometrician. In addition, Margie Nussbaum, Diane Novinska, and Raili Kedizor were charged with entering the data from approximately 25,000 permits per year. In addition, there were over 60 vendors who were responsible for the distribution of Upper Cook Inlet personal use permits. Their help was invaluable, and they deserve many thanks.

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**Table 1.** Number of Upper Cook Inlet personal use salmon fishery permits issued by year and number of permits returned by mailing and year, 2007-2009.

*Publications Staff Note: Insert Table 1 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T1*

**Table 2.** Number of Upper Cook Inlet personal use salmon fishery permits that did not fish by year, 2007-2009.

*Publications Staff Note: Insert Table 2 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T2)*

**Table 3.** Effort and harvest in Upper Cook Inlet personal use salmon fisheries, 2007-2009.

*Publications Staff Note: Insert Table 3 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T3)*

**Table 4.** Flounder harvests, standard errors, and relative precision in Upper Cook Inlet personal use fisheries, 2007-2009.

*Publications Staff Note: Insert Table 4 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T4)*

**Table 5.** Sockeye salmon exploitation rate by Upper Cook Inlet personal use fisheries, 2007-2009.

*Publications Staff Note: Insert Table 5 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T5)*

**Table 6**.- Residence areas for Upper Cook Inlet personal use salmon fishery permit holders by year, 2007-2009.

*Publications Staff Note: Insert Table 6 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T6)*

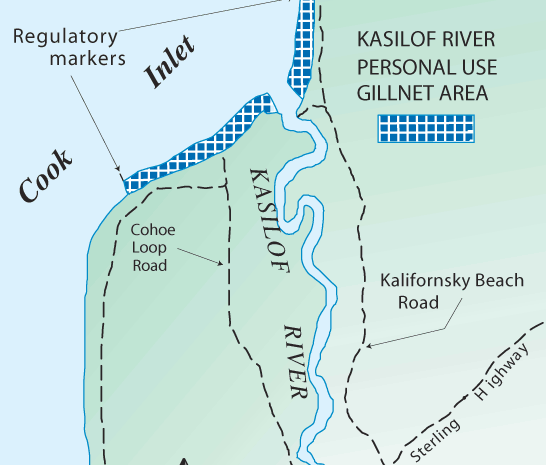
**Table 7**. Effort and harvest by residence of participants in the Upper Cook Inlet Personal Use Fisheries, 2007- 2009.

*Publications Staff Note: Insert Table 7 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T7)*

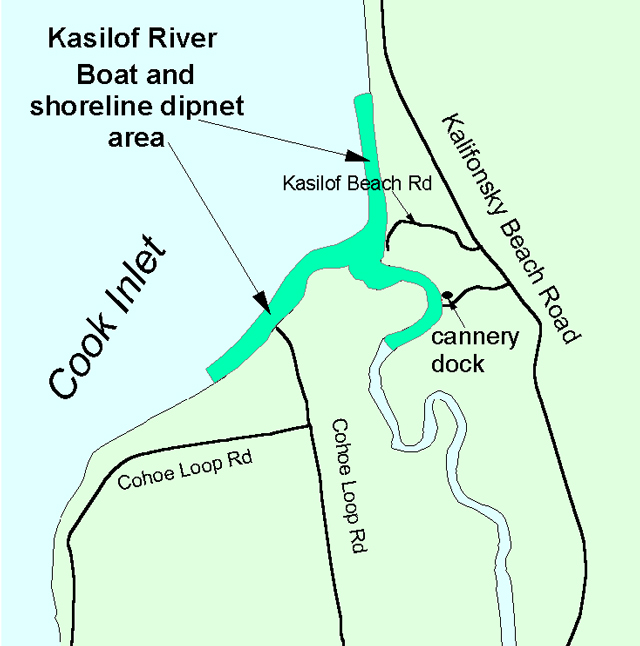
**Table 8**.-Summary of Upper Cook Inlet personal use permit holders by year, number of fisheries fished, number of days fished, and household size, 2007-2009.

*Publications Staff Note: Insert Table 8 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet T8)*

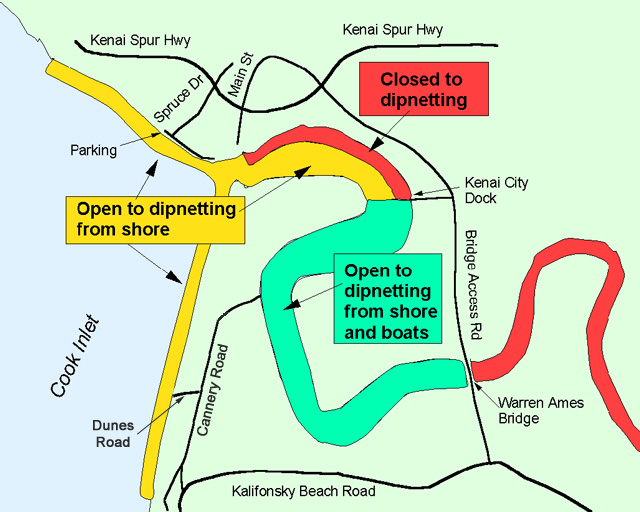
Panel A



Panel B



Panel C



**Figure 1.** Maps of Upper Cook Inlet personal use salmon fisheries: Kasilof River set gillnet fishery (Panel A), Kasilof River dip net fishery (Panel B), and Kenai River dip net fishery (Pancel C).

*Publications Staff Note: Insert Figure 2 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F2)*

**Figure 2.** Total estimated salmon harvest for all Upper Cook Inlet personal use fisheries combined. Top figure shows harvest of sockeye salmon, and the bottom figure shows harvest for all other salmon species. Note the difference in the y-axis scales.

*Publications Staff Note: Insert Figure 3 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F3)*

**Figure 3.** Cumulative harvest timing for sockeye salmon during the Kasilof River personal use set gillnet fishery, 2007-2009.

*Publications Staff Note: Insert Figure 4 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F4)*

**Figure 4.** Cumulative harvest timing for sockeye salmon during the Kasilof River personal use dip net fishery, 2007-2009.

*Publications Staff Note: Insert Figure 5 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F5)*

**Figure 5.** Cumulative harvest timing for sockeye salmon during the Kenai River personal use dip net fishery, 2007-2009.

*Publications Staff Note: Insert Figure 6 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F6)*

**Figure 6.** Cumulative harvest timing for sockeye salmon during the Fish Creek personal use dip net fishery, 2007-2009.

*Publications Staff Note: Insert Figure 7 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F7)*

**Figure 7**. Proportion of salmon harvested in the Upper Cook Inlet Personal Use Fisheries by residence of permit holders.

*Publications Staff Note: Insert Figure 8 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F8)*

**Figure 8**. Mean Harvest and days fished per permit by residence of participants in the Upper Cook Inlet Personal Use Fisheries.

*Publications Staff Note: Insert Figure 9 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F9)*

**Figure 9**. Percent of bag limits filled by Upper Cook Inlet personal use salmon fishery permit holders, 2007-2009.

*Publications Staff Note: Insert Figure 10 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F10)*

**Figure 10.**  Average percent of bag limit filled by fishery, 2007-2009.

*Publications Staff Note: Insert Figure 11 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F11)*

**Figure 11**. Percent of salmon harvest by fishery, 2007-2009.

*Publications Staff Note: Insert Figure 12 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F12)*

**Figure 12**. Percent of permits, percent of total harvest, and average percent of bag limit filled by personal use salmon fishery and household size, 2007-2009.

*Publications Staff Note: Insert Figure 13 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet F13)*

**Figure 13**. Percent of permits, percent of total harvest, and average percent of bag limit filled by personal use salmon fishery and number of days fished, 2007-2009.

# APPENDIX A. Example OF AN upper cook inlet personal use permit

**Appendix A1.** Example of the 2009 Upper Cook Inlet personal use salmon permit.

**Appendix A1.** Page 2 of 2.



# APPENDIX B. SOCKEYE HARVEST BY DATE During the Upper Cook Inlet personal use fisheries, 2007-2009

**Appendix B1.** Sockeye harvest by date during the Kasilof River set gillnet fishery, 2007-2009.

*Publications Staff Note: Insert Appendix B1 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet B1)*

**Appendix B2.**─Sockeye harvest by date during the Kasilof River dip net fishery, 2007-2009.

*Publications Staff Note: Insert Appendix B2 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet B2)*

**Appendix B3.**─Sockeye harvest by date during the Kenai River dip net fishery, 2007-2009.

*Publications Staff Note: Insert Appendix B3 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet B3)*

**Appendix B4.**─Sockeye harvest by date during the Fish Creek dip net fishery, 2007-2009.

*Publications Staff Note: Insert Appendix B4 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet B4)*

# APPENDIX C. EFFORT AND HARVEST TRENDS During the Upper Cook Inlet personal use fisheries, 1996-2009

**Appendix C1**. Trends in fishing effort during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C1 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C1)*

**Appendix C2**. Trends in sockeye salmon harvest during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C2 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C2)*

**Appendix C3**. Trends in coho salmon harvest during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C3 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C3)*

**Appendix C4**. Trends in Chinook salmon harvest during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C4 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C4)*

**Appendix C5**. Trends in Chum salmon harvest during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C5 from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C5)*

**Appendix C6.** Trends in Pink salmon harvest during the Upper Cook Inlet personal use salmon fisheries, 1996-2009.

*Publications Staff Note: Insert Appendix C6from “FDS Report Tables\_Figures\_07\_09.KD” Worksheet C6)*