Fishery Data Series No. 10-56

# Migratory Timing and Abundance Estimates of Sockeye Salmon into Upper Cook Inlet, Alaska, 2009

by

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and

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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 | $ft^3/s$ |
| 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 (negative log of) | pH |
| 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 | $H_A$ |
| base of natural logarithm | *e* |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | 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) | $log_2$, etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

# *FISHERY DATA SERIES NO. 10-56*

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# ABSTRACT

In 2009, an Offshore Test Fishery was conducted during the Upper Cook Inlet (UCI) commercial salmon fishing season. The test fishery was conducted from 1 July through 30 July and captured 3,727 sockeye salmon *Oncorhynchus nerka*, representing 2,487 catch per unit of effort (CPUE) index points. The midpoint of the 2009 sockeye salmon run occurred on 13 July, which was 2 days early relative to the historical mean date of 15 July. Two formal estimates of the size and timing of the 2009 sockeye salmon run were made during the commercial fishing season, with the first best-fit estimator from each analysis forecasting a total run to UCI of 9.11 and 3.61 million sockeye salmon. These estimates deviated from the actual total run of 3.86 million by +136% and -6%, respectively. Two estimates of the total Kenai River sockeye salmon run were also made using 5 best fit models. Based on data through 23 July, the total Kenai River run was projected to range between 1.92 and 5.29 million fish. The second estimate, made using data through 26 July, predicted the total Kenai River run would range between 1.92 and 4.84 million fish. These estimates deviated from the preliminary postseason Kenai River total run estimate of 2.38 million fish by -19% to +122% for the 23 July estimate and by -20 to +103% using 26 July data. In summary, 8 of the 10 Kenai River inseason run projections were within 20% of the actual run size. The final test fish passage rate was estimated at approximately 1,554 sockeye salmon per CPUE point.

Key Words: Salmon, *Oncorhynchus* spp., Upper Cook Inlet, Alaska, test fishery, migratory behavior

# INTRODUCTION

In 1979, the Alaska Department of Fish and Game (ADF&G) began an Offshore Test Fish (OTF) project near the southern boundary of the Upper Cook Inlet (UCI) salmon management area (Figure 1). The project was designed to estimate the total sockeye salmon *Oncorhynchus nerka* run (including run timing) returning to UCI during the commercial salmon fishing season. These data have become extremely important to ADF&G staff, helping to adjust commercial fishing times and areas to most efficiently harvest surplus sockeye salmon or restrict fisheries that may over-harvest specific stocks. In recent years, the Alaska Board of Fisheries (BOF) has assembled various management plans requiring inseason abundance estimates of the annual sockeye salmon run to implement specific plan provisions. The OTF project has increasingly become one of the most important tools fishery managers utilize to make inseason fishery management decisions that comply with BOF management directives.

Test fishing results have been reported annually since 1979 (Waltemyer 1983–1986; Hilsinger and Waltemyer 1987; Hilsinger 1988; Tarbox and Waltemyer 1989; Tarbox 1990–1999; Tarbox and King 1992; Shields 2000–2003; Shields and Willette 2004–2009a, b). This report presents the results of the 2009 test fishing project.

## OBJECTIVES

The primary objective of the project is to:

1. Make an inseason estimate of the 2009 UCI sockeye salmon total run (including run timing).

# METHODS

## TEST FISHING

Sockeye salmon returning to UCI were sampled by fishing 6 geographically fixed stations between Anchor Point and the Red River Delta (Figure 1). These stations have been fished since 1992 (Tarbox 1994) and were established based on analyses that showed they provided the most reliable estimates of inseason run size and timing. Stations were numbered consecutively from east to west, with station locations (latitude and longitude) determined with global positioning system technology. A chartered test fishing vessel, *FV Americanus*, sampled all 6 stations (numbered 4, 5, 6, 6.5, 7 and 8) daily, traveling east to west on odd-numbered days and west to east on even-numbered days. Sampling started on 1 July and continued through 31 July. The vessel fished 366 m (1,200 ft or 200 fathoms) of multi-filament drift gillnet with a mesh size of 13 cm (5 1/8 inches). The net was 45 meshes deep and constructed of double knot Super Crystal[1] shade number 1, with filament size 53/S6F.

The following physical and chemical readings were taken at the start of each set: air temperature, water temperature, salinity (all at 1 m below the surface), wind velocity and direction, tide stage, water depth, and water clarity. Air and water temperatures (°C) and salinity (ppt) were measured using an YSI salinity/temperature meter. Wind speed was measured in knots and direction was recorded as 0 (no wind), 1 (north), 2 (northeast), 3 (east), 4 (southeast), 5 (south), 6 (southwest), 7 (west), or 8 (northwest) using a Kestrel 4000 pocket weather tracker. Tide stage was classified as 1 (high slack), 2 (low slack), 3 (flooding), or 4 (ebbing) by observing the movement of the vessel while drifting with the gill net. Water depth was measured in fathoms (fm) using a Simrad echo sounder, and water clarity was measured in meters (m) using a 17.5 cm secchi disk.

All salmon captured in the drift gillnet were identified by species and enumerated. Sockeye salmon ($n$<50 at each station) were measured for fork length (mideye to fork of tail) to the nearest mm and also had an axillary process removed for genetic analysis (as described by Habicht et al. 2007).

The number of fish captured at each station ($s$) on each day ($i$) was expressed as a catch per unit of effort (CPUE) statistic, or index point, and standardized to the number of fish caught in 100 fathoms of gear in one hour of fishing time.

$$CPUE_{s,i} = \frac{100\,fm \;\; x \;\; 60\,\text{min} \;\; x \;\; number\ of\ fish}{fm\ of\ gear \;\; x \;\; MFT} \tag{1}$$

Where mean fishing time ($MFT$) was calculated as:

$$MFT = (C - B) + \frac{(\mathrm{B} - \mathrm{A}) + (\mathrm{D} - \mathrm{C})}{2} \tag{2}$$

Where: A = time net deployment started,

B = time net fully deployed,

C = time net retrieval started, and

D = time net fully retrieved.

Once deployed at a station, the drift gillnet was fished 30 minutes before retrieval started. However, the net was capable of capturing fish prior to being fully deployed, as it was during the time it was being retrieved. *MFT* was therefore adjusted by summing the total time it took to set and retrieve the

[1] Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

net, then dividing this time in half, and adding it to the time when the entire net was deployed and fished.

Daily $CPUE_i$ data were summed for all m stations (typically 6) as follows:

$$CPUE_i = \sum_{s=1}^{m} CPUE_{s,i} \tag{3}$$

Cumulative $CPUE_i$ ($CCPUE_d$) was given by:

$$CCPUE_d = \sum_{i=1}^{d} CPUE_i \tag{4}$$

Where: $d$ = day for which estimate is being made.

## DESCRIBING THE SALMON MIGRATION AND PROJECTING TOTAL RUN

The sockeye salmon run was described for each of the previous years based on the respective test fishing data, as described in Mundy (1979):

$$Y_{yr,d} = 1 \big/ (1 + e^{-(a + bd)}) \tag{5}$$

Where: $Y_{yr,d}$ = modeled cumulative proportion of $CCPUE_{yr,f}$ ($f$ = final day of season) for year $yr$ as of day $d$,

$a$ and $b$ = model parameters.

Variables without the subscript $yr$ indicating year refer to the current year's estimate. To determine which of the previous run timing models most closely fit the current year's data, and to estimate total run for the entire season ($TR_f$), a projection of the current year's $CCPUE_d$ at the end of the season ($CCPUE_f$) was estimated as per Waltemyer (1983a):

$$CCPUE_f = \frac{\sum_{i=0}^{d} CCPUE_d^{\,2}}{\sum_{i=0}^{d} Y_{yr,d} \cdot CCPUE_d} \tag{6}$$

This model assumes that the average day of return and its variance for previous year $yr$ is the same as for the current year (Mundy 1979). To test this assumption, in season $Y_d$ was estimated as:

$$Y_d = \frac{CCPUE_d}{CCPUE_f} \tag{7}$$

and mean squared error ($MSE$) between $Yd$ and $Yyr,d$ was estimated as:

$$MSE = \frac{\sum_{i=0}^{d} \left(Y_{yr,d} - Y_d\right)^2}{d+1} \tag{8}$$

Years were ranked from lowest *MSE* (best model) to highest (worst), and the best fit years were used to estimate $CCPUE_f$ for the current year. Catchability, or the fraction of the available population taken by a defined unit of fishing effort, was estimated as:

$$q_d = \frac{CCPUE_d}{r_d} \tag{9}$$

Where: $q_d$ = estimated cumulative catchability as of day *d*,

$r\text{–}_d$ = cumulative total run as of day *d*.

The cumulative total run on day *d* was estimated from the sum of all commercial, recreational, and personal use harvests to date, the estimated total escapement to date, and an estimate of the number of sockeye salmon residual (i.e., residing) in the district at that time. Commercial harvest data was estimated inseason from catch reports called or faxed into the ADF&G office. All commercially harvested salmon in UCI, whether sold or kept for personal use, are required to be reported to the Soldotna ADF&G office by the fishermen or processors within 12 hours of the close of a fishing period. Recreational harvests were estimated inseason and provided by Division of Sport Fish staff. Personal use harvests were also estimated inseason using data from previous years' personal use fisheries on similar sized runs. Total escapement to date included estimated escapements into all monitored systems (Crescent, Susitna, Kenai and Kasilof Rivers, and Fish Creek) and unmonitored systems, which are assumed to be 5% of the escapement into monitored systems (Tobias and Willette 2003). The number of fish residual in the district was estimated by assuming exploitation rates of 70% in set net fisheries, 35–40% in districtwide drift net fisheries (based on the number of boats that fished), and 25% in reduced district drift net fisheries (Mundy et al. 1993). For example, if the drift gillnet fleet harvested 500 thousand sockeye salmon on an inlet-wide fishing period, the number of sockeye salmon originally in the district would have been estimated at 1,250 (500/0.40=1,250) and the number remaining, or the residual, would have been estimated at 750,000 (1,250–500=750).

Passage rate, the expansion factor used to convert CPUE into estimated numbers of salmon passing the test fishing transect line into UCI, was calculated as:

$$PR_d = 1/q_d \tag{10}$$

Total run at the end of the season ($TR_f$) was then estimated from:

$$TR = PR \cdot CCPUE_f \tag{11}$$

To calculate the midpoint of the run, which is the day on which approximately 50% of the total run had passed the OTF transect, the following formula was used:

$$M = a/b \tag{12}$$

where: $M$ = midpoint date of run,

$a$ and $b$ = model parameters.

Because the test fishery did not encompass the entire sockeye salmon run, the total $CCPUE_f$ for the test fishery was estimated postseason using the following 2 methods:

$$CCPUE_f^h = CCPUE_f \cdot \frac{H_t}{H_L} \tag{13}$$

where: $CCPUE_f^h$ = total estimated $CCPUE_f$ for the season, based on harvest,

$H_t$ = total commercial harvest for the season,

$H\neg_L$ = total commercial harvest through final day of test fishery (*f*+2), and

$L$ = number of days (lag time) it took salmon to travel from test fishery to commercial harvest areas (2 days).

$$CCPUE_t^r = CCPUE_f \cdot \frac{E_t + H_t}{\sum_{S=1}^{6} E_L + H_L} \qquad (14)$$

where: $CCPUE_t^r$ = total estimated $CCPUE_f$ for the season, based upon total run,

$E_t$ = total escapement for the season,

$H_t$ = total commercial harvest for the season,

$E\neg_L$ = total UCI escapement through the final day of the test fishery,

$H\neg_L$ = total UCI commercial harvest through the final day of the test fishery, and

$L$ = number of days (lag time) it took salmon to travel from the test fishery to spawning streams or to be available for commercial harvest.

The total run adjustment to $CCPUE_f$ (Equation 14) has replaced adjustments based on harvest alone (Equation 9) primarily due to modifications to commercial fishing management plans made by the BOF. Management plans now provide much less fishing time in August than in the past; therefore, adjustments based on harvest alone would not have accurately reflected the additional fish that entered the district after the test fishery ceased. The total run to date on the last day of the test fishery was computed by summing all commercial harvest data and estimates of escapement from the 4 sockeye salmon sonar enumeration sites, one weir site, and an estimate of escapement to all unmonitored systems through day *d*. An estimate of escapement to all non-monitored systems in UCI is considered to be 5% of the monitored runs. Lag times are the approximate time for fish to migrate from the test fish transect to a particular destination. As suggested by Mundy et al. (1993), lag times must be considered when estimating the total run passing the test fish transect on day *d*. A lag time of up to 2 days was assumed for fish harvested in the commercial fishery. We estimated lag times between the test fishery and escapement projects as follows: Crescent River, 1 day; Kasilof and Kenai Rivers, 2 days; and Susitna River and Fish Creek, 7 days (15% of these totals are allocated to unmonitored systems) (Mundy et al. 1993). The number of sockeye salmon harvested in sport and personal use fisheries after test fishing has ceased that have not been estimated in the escapement are assumed to be insignificant, and therefore are not utilized in the $CCPUE_f$ post test fishery adjustment.

Adjusted estimates of $CCPUE_f$ ($CCPUE_t^h$ and $CCPUE_t^r$) were used for postseason estimates of $TR_f$.

# RESULTS AND DISCUSSION

In 2009, rough seas prevented the test boat from fishing 2 stations on 13 July, 1 station on 16 July, 3 stations on 19 July, all 6 stations on 21 July and 26 July, and 2 stations on 29 July (Table 1). Catch data for missed stations were interpolated by averaging catches from the day before and the day after for each station not fished. After interpolating the data for the missed stations, a total of 3,727 sockeye salmon were estimated to have been captured during the 2009 test fishery, as well as 701 pink salmon *O. gorbuscha*, 454 chum salmon *O. keta*, 512 coho salmon *O. kisutch*, and 11 Chinook salmon *O. tshawytscha* (Tables 1–2, Appendices A1–A12). Sockeye salmon daily catches ranged from 13 on 2 July to 472 fish on 14 July. The total sockeye salmon $CCPUE_f$ for the 2009 project was 2,487 with daily CPUE values ranging from 11 to 277. The $CCPUE_f$ of 2,487 represented the third highest unadjusted $CCPUE_f$ since 1992 (Tables 3 and 4), which is when the number of stations sampled by the test fish boat was standardized to the current 6 (Tarbox 1994). The 1992–2009 annual test fish unadjusted $CCPUE_f$ and the total annual run of sockeye salmon to UCI (Figure 2) were not significantly ($\alpha$=0.05) correlated ($P$=0.122 and $R^2$=0.14), with 86% of the variation unexplained, indicating that the $CCPUE_f$ statistic by itself would not be a reliable predictor of the total annual sockeye salmon run.

As expected, the distribution of sockeye salmon catches along the test fish transect was similar to the distribution of CPUE values (Tables 2 and 3), since fishing occurs at fixed intervals at each station.

## INSEASON ABUNDANCE ESTIMATES

Tarbox and Waltemyer (1989) provided detail about the assumptions used in the curve fitting procedures to estimate the $CCPUE_f$ statistic during the season. One of the major assumptions is that 24 June represents the first day of the sockeye salmon run to UCI. Variability in actual runs can therefore result in an average or early run being misclassified as late, especially during the first couple weeks of the test fish program. For this reason, 20 July was chosen as the earliest date that inseason formal estimates of each year's total run size and run timing should be made. By then, there are enough data points in the current year's run timing curve to provide a more accurate estimate of season's end $CCPUE_f$. In addition, Tarbox and King (1992) and later OTF annual reports demonstrated that the initial first choice (best fit) estimate of the $CCPUE_f$ statistic and total run made around mid July was often not the best fit estimate later in July. Therefore, the current method when making formal inseason estimates of the total run is to examine the top 5 or 6 best fits. Careful consideration is given to years whose fits reveal the least day to day change in the predicted $CCPUE_f$. These years are identified as potentially being the final best fit at the end of the season, especially if the *MSE* (Equation 8), also referred to as the mean sum of squares, statistic is also improving. Run timing from other areas of the state is also considered to see if a consistent pattern exists (Table 4).

The first formal abundance estimate of the 2009 UCI sockeye salmon run occurred on 21 July, using commercial, sport and personal use harvests, escapement, and test fishery data through 20 July (Table 5). The 2009 test fish *CCPUE* curve was mathematically compared to run curves from 1979 through 2008, with the estimates ranked from best to worst based on *MSE*. The passage rate was 1,436 based on a run of 2.93 million through 20 July (includes residual fish abundance in the district). The 2009 test fish *CCPUE* curve most closely tracked the 2006 run, estimating a $CCPUE_f$ of 6,343 index points. Given a passage rate of 1,436, the total run estimate was 9.11 million fish. As cautioned earlier, the first best fit (lowest *MSE*) on approximately 20 July often turns out not to be the best fit at the end of July, so the top 5 fits were considered, including runs from 2000, 1996, 1994, and 2003 (in order of best fit). Using these data, total run estimates ranged from 3.61 to 9.11 million sockeye salmon. Unfortunately, the best fits included runs from 2 days early to 9 days late, raising concerns about which run timing curve to use. Because many sockeye salmon runs in other areas of the state were characterized as early, fits from the early-run curves were given more credence.

The second formal estimate of the total run of sockeye salmon to UCI in 2009 followed the 23 July inlet-wide commercial fishing period (Table 5). At that time, the run was estimated at 3.32 million with a *CCPUE* of 2,283. The passage rate was therefore estimated to be 1,455 fish per CPUE point. The current *CCPUE* curve most closely tracked the 2000 run, which had been the second best fit using data through 20 July, and projected a $CCPUE_f$ of 2,481 and a total run of 3.61 million fish. The top 5 best fits included 2002, moving from the 17th best fit to 4th, while the 1994 fit (4 days late run) dropped from the 4th to the 10th best fit. The estimated total run using the top 5 best fits projected a run ranging from 3.61 to 8.54 million fish, with 4 of the 5 estimates projecting early runs.

Postseason, the total sockeye salmon run (preliminary data) to UCI in 2009 was estimated at approximately 3.86 million fish, including commercial, sport, and personal use harvests, as well as escapement to all systems. Therefore, the first best fit total run estimate from the 2 formal inseason projections of the 2009 run were approximately 136% higher and 6% lower, respectively, than the actual run size. However, because the top 5 best fits from each analysis are given careful consideration inseason, the range in error from these data presents a more realistic picture. Based on data through 20 July, the difference between the projected total run to UCI and the actual value ranged from -136% to +6%. Using the test fish data through 23 July, the error ranged from -121% to +6%, with 4 of the top 5 best fits projecting a total run that was within 7% of the actual value.

## KENAI RIVER RUN ESTIMATE

In addition to making inseason estimates of the total size of the annual sockeye salmon run, UCI commercial fishery management plans compel the department to make an inseason estimate of the number of Kenai River sockeye salmon. Various management actions in both sport and commercial fisheries are tied to the total abundance of Kenai River sockeye salmon, which is characterized by 3 different size ranges: less than 2 million fish, between 2 and 4 million fish, and greater than 4 million fish (Shields 2010). As previously described, the *CCPUE* curves from the top 5 best fits of previous year's test fish data were used to project the $CCPUE_f$ for 2009, which was then used to estimate the UCI total run. The Kenai River component of the run is determined in part from a weighted age composition allocation method to estimate the stock composition of the commercial harvest (Tobias and Tarbox 1999). This method (Bernard 1983) allocates the commercial harvest to various stocks by comparing the age composition of the escapement in the major river systems of UCI to the age composition of sockeye salmon harvested commercially (Tobias and Willette 2004). Three important assumptions of the weighted age-composition method are that: (1) the age composition of fish escaping the various river systems are representative of the age composition in the commercial harvest, (2) the commercial harvest in specific areas is composed of nearby stocks, and (3) exploitation rates are equal among stocks within age classes. The Kenai River run to date is estimated by summing: (1) the commercial harvest of Kenai River stocks, (2) the estimated passage in the Kenai River, and (3) an estimate of sport and personal use harvest below the river mile 19 sonar site. Finally, the remainder of the run that will be Kenai River origin is projected by subtracting the run to date from the total run estimate, and then applying an estimate of the proportion of the run remaining that will be Kenai River by reviewing previous years' data for runs of similar timing.

Using the 23 July total UCI run estimate, the total Kenai River sockeye salmon run was projected to range between 1.92 and 5.29 million fish (Table 6). Assuming a 1.47 million Kenai River run to date, 0.45 to 3.81 million fish remained in the run, which was somewhat problematic. The preseason forecast for Kenai River had projected a total run of 3.06 million fish, requiring commercial fisheries management to follow guidelines for a run of 2 to 4 million. However, 2 of the top 5 best fit estimators from the 23 July assessment were projecting a Kenai River run slightly less than 2 million fish, while 2 others estimated the run at slightly greater than 2 million fish, and one predicted a final run greater than 5 million. The large forecast ranges alerted staff to a precautionary commercial fishery management approach. A few days later (26 July), the Kenai River run assessment was updated. No commercial fishing had taken place during the interim, so only escapement data was added to the run assessment. Using data through 26 July, the total Kenai River run was now projected to range between 1.92 and 4.84 million fish (Table 6). Approximately 1.51 million sockeye salmon had been accounted for in the run to date, which left 0.41 to 3.33 million Kenai River fish remaining in the 2009 run (assuming 69% of the run remaining would be Kenai River stock). With the first best fit again suggesting a total run of less than 2 million, and considering that 4 of the top 5 estimates projected the run to be close to 2 million fish, these inseason projections suggested that staff follow the guidelines for a Kenai River run of less than 2 million.

Preliminary postseason data showed the 2009 Kenai River sockeye salmon run to be approximately 2.38 million fish; however, this included estimates of sport, personal use, and educational fishery annual harvests, with final data not available until later in 2010. The inseason estimates of the Kenai River run deviated from the actual by -19% to +122% using data through 23 July, and by -20% to +103% using data through 26 July. However, 8 of the 10 inseason projections were within 20% of the preliminary Kenai River total run (Table 6). Once again, test fish projections were important in alerting staff that the run was smaller than expected.

## OTF ERROR

Table 7 and Figure 3 show the OTF absolute percent error (APE) in projecting the total sockeye salmon run using the CCPUE first best fit estimate on or soon after 20 July. The APE in the 20 July estimate has been >30% only for runs 2 or more days early. For all early runs, the mean APE was 44% (median=9%), while for runs on time or late, the 20 July mean APE is only 9% (median=7%). As stated earlier, the 20 July first best fit estimator has proven over time to not be the best fit of the data just a few days later. Thus, although the 2009 APE of 136% using the first best fit estimator on 20 July was the largest APE ever measured in the test fish project, it did not have any significant bearing on commercial fisheries management decisions. The 2009 run was 2 days early and the first best fit estimator using the 20 July data tracked a run that was 9 days late. Just a few days later the first best fit estimator tracked a run that was 2 days early and projected a total run that was only 6% less than the actual run.

## RUN TIMING

The last day of test fishing typically occurs on 30 July each year, which means the "tail-end" of the sockeye salmon run is not assessed by the project. In 2009, the test fish project ended on 30 July, but escapement monitoring continued through 5 August in the Yentna River, 13 August in the Kenai and Kasilof Rivers, and 13 September at Fish Creek. Meanwhile, commercial fishing continued into September. Therefore, to estimate the proportion of the run that occurred after the test fishery ceased, 2 methods were used to adjust the *CCPUE* statistic to reflect what it would have been had the project continued through the end of the run.

The first method used the number of fish harvested commercially after the test fishery ended (Equation 13), while the second method enumerated both escapement and commercial catch (total run) after the test fishery terminated (Equation 14). The sport and personal use harvest of sockeye salmon occurring after the test fishery was assumed to be minimal, and therefore was not considered. Table 4 shows the differences in the annual $CCPUE_f$ statistic after postseason adjustments were made using either the harvest or total run method. Although the differences were often relatively minor, they affected calculations of the *a* and *b* coefficients in the equations used to describe historical run timing curves, which in turn had an effect on estimates of subsequent $CCPUE_f$ values. Beginning in 2002, the total run method was used to make postseason adjustments to all previous years' $CCPUE_f$ statistics (Shields 2003). For the 2009 season, the test fish $CCPUE_f$ of 2,487 was adjusted to 2,618 based on the number that were commercially harvested and escaped after the test fishery ceased. Therefore, this method estimated that approximately 5% of the sockeye salmon run occurred after the test fishery terminated. Historical *a* and *b* coefficients calculated using total run-adjusted $CCPUE_f$ values are now used for all inseason run projections. Using the total run-adjusted values, the relationship between total run (logged) and test fishery $CCPUE_f$ ($P$=0.072) improved slightly from the unadjusted values ($P$=0.188).

A nonlinear mathematical model (Mundy 1979) was fit to the *CCPUE* proportions of the 2009 sockeye salmon run to UCI. Using the total run-adjusted $CCPUE_f$, this analysis suggested that 6.5% of the run had passed the OTF transect line prior to the start of test fishing on 1 July, and that the run was 97.4% complete at project termination on 30 July (Figure 4 and Appendix A13). Therefore, the 2009 test fishery covered approximately 90.9% of the run. The test fish passage rate for the season can be calculated by dividing the total number available to capture by the test fishery by the $CCPUE_f$ . In 2009, the estimated final passage rate was 1,554.

The midpoint of the 2009 UCI sockeye salmon run, or the day on which approximately 50% of the total run had entered UCI at the test fish transect, occurred on day 20.3, or 13 July, which was 2 days early relative to the historical average mean date of 15 July (Table 8). This was the second consecutive year where the UCI run was early, preceded by 4 consecutive late years.

## ENVIRONMENTAL VARIABLES

Surface water temperatures measured along the test fish transect ranged from 8.2°C to 13.5°C and averaged 10.0°C for the year (Appendices A14 and A15). These water temperature data were very similar to the 1992–2008 average surface water temperature of 10.3°C (Appendix A16). Water temperatures are believed by many to play a significant role in the timing of salmon runs (Burgner 1980), so these data have been closely monitored. In general, warmer water temperatures are thought to result in early runs, while cooler temperatures produce later runs. For example, in Bristol

Bay, Burgner (1980) reported that the arrival dates of sockeye salmon were early during years when water temperatures were warmer than average. In a later Bristol Bay study, Ruggerone (1997) found that the change in temperature from winter to spring was a better predictor of run timing than water temperature alone. However, water temperature data alone may or may not be an accurate predictive tool for gauging the run timing of UCI salmon stocks. The 2005 UCI sockeye salmon run was the second latest run ever observed, yet surface water temperatures along the test fish transect were the warmest ever measured, while the 2008 run was 4 days early, yet surface water temperatures were much cooler than average. Therefore, it appears that factors other than just water temperature likely play a role in determining salmon run timing in UCI. Pearcy (1992) summarized some of the factors that affect the coastal migration of returning adult salmon. He reviewed the orientation mechanisms used by salmon in coastal waters and concluded that prior to entering estuaries adult salmon probably rely on cues that are different from those used in the open ocean phases of their migration. Salinity, temperature, currents, and bathymetry were all thought to play a role in migration. Another dynamic to consider that could affect run timing is the age composition of the run, which relates to fish size; larger fish swim faster than smaller fish (Flynn and Hilborn 2004). Finally, it should be noted that when classifying sockeye salmon run timing in UCI, the magnitude of the Kenai River run should be considered. Kenai River sockeye salmon return to UCI later than any other numerically significant stock, and because the Kenai River run is the largest in UCI, runs classified as late in general tend to be large Kenai River runs. For example, from 1979 to 2009, the average Kenai River annual run for years where the UCI return was classified as early (*n*=12), was 2.3 million fish, yet for UCI runs classified as on time or late (*n*=19), the Kenai River run averaged 3.8 million fish. Thus, a combination of these factors (water temperature, salinity, currents, bathymetry, fish size, and stock composition of the run) likely affects fish migration and ultimately classifying the run timing as early or late.

In an attempt to better understand and predict sockeye salmon migrations into UCI, ADF&G conducted a companion study on the test fish vessel from 2002 to 2005. Using side-scan sonar, fish distribution in the water column was measured in relation to various oceanographic data, such as water temperature, salinity, tide stage, and water clarity. These data have not been published yet, but one of the objectives of the study was to determine whether or not the OTF inseason run forecasting model could be improved using this additional information.

A summary of the physical data that has been collected at each of the 6 test fish stations can be found in Appendices A14–A16. In 2009, air temperatures along the test fish transect ranged from 9° to 14°C and averaged 11.4°C, or the eighth coldest average air temperature since the test fishery began in 1979. Wind velocity averaged 6.1 knots for the month, which were the second calmest conditions in the past 10 years and the sixth least windy year since 1979. Wind direction was variable, but in general, winds originated out of the south, the predominate wind orientation in UCI during July. The 2009 seasonal average salinity of 31.8 ppt was the highest ever observed. Koenings et al. (1987) describe a secchi disk as a black and white circular plate that is used to easily estimate the degree of visibility in natural waters. Secchi disk readings in 2009 were similar to the averages from all previous years. In general, water clarity along the test fish transect decreases as you travel from east to west (the average secchi disk depth was 8.2 m at station 4 (Figure 1) and decreased to 3.0 m at station 8) as a result of numerous glacial watersheds draining into the west side of Cook Inlet. Finally, station 4 was the shallowest station, averaging 23.7 fathoms (144 feet) in depth. It should be noted, though, that changes in depth are a result of different stages of tide as well as minor differences in set location from day to day.

## GSI ANALYSIS

ADF&G has developed and refined sockeye salmon genetic stock identification techniques (GSI) since the early 1990s (Seeb et al. 1997; Seeb et al. 2000; Habicht et al. 2007; Barclay et al. 2010). Beginning in 2006, fish captured in the test fishery that were utilized for mean length data were also sampled for GSI analysis. Approximately 5,200 of the samples collected in 2006, 2007, and 2008 were successfully genotyped (Table 9). Samples were pooled into discrete time periods to meet sample size goals, resulting in 4 periods in 2006 and 2008, and 5 periods in 2007. The data from these 3 years revealed similar findings, i.e., as you progressed into the month of July, the proportion of Kasilof River stocks decreased while Kenai River stocks increased. GSI analyses also revealed that Susitna River sockeye salmon stocks (JCL and SusYen in Table 9) comprised 11% of all fish captured in 2006, 12% in 2007, and 13% in 2008 (unweighted average). GSI analysis of the 2009 test fish samples had not been completed at the time this report was prepared.

The efficacy of using GSI analyses in combination with the test fishery for inseason management of the UCI commercial fishery remains unclear. While it could be useful to know when specific stocks are entering the Central District, inter and intra-annual variability in migration routes through the district could make adjusting commercial fishing periods to increase or decrease stock-specific exploitation problematic. Nonetheless, GSI data will undoubtedly serve as the foundation for future research projects aimed at more clearly understanding stock-specific run timing and migration through UCI.

The UCI test fishery continues to provide fishery managers with very important data about sockeye salmon abundance and timing. Since commercial, sport, and personal use fishery management plans depend on inseason sockeye salmon run estimates, the UCI test fishery project remains one of the most essential tools available for their management.

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# TABLES AND FIGURES

Table 1.–Summary of sockeye salmon fishing effort, daily and cumulative catch and CPUE, and fish length, Upper Cook Inlet offshore test fish project, 2009.

| Date | Number of Stations | Mean Fishing Time (min) | CATCH | | CPUE | | Mean Length (mm) |
|---|---|---|---|---|---|---|---|
| | | | Daily | Cum | Daily | Cum | |
| 7/1 | 6 | 230.0 | 86 | 86 | 65 | 65 | 559 |
| 7/2 | 6 | 230.5 | 13 | 99 | 10 | 75 | 553 |
| 7/3 | 6 | 233.5 | 107 | 206 | 80 | 155 | 566 |
| 7/4 | 6 | 220.5 | 35 | 241 | 28 | 183 | 559 |
| 7/5 | 6 | 247.0 | 196 | 437 | 135 | 318 | 589 |
| 7/6 | 6 | 228.5 | 85 | 522 | 67 | 385 | 575 |
| 7/7 | 6 | 230.0 | 153 | 675 | 113 | 498 | 574 |
| 7/8 | 6 | 256.5 | 338 | 1,013 | 204 | 702 | 564 |
| 7/9 | 6 | 229.5 | 68 | 1,081 | 49 | 751 | 574 |
| 7/10 | 6 | 257.5 | 318 | 1,399 | 185 | 936 | 580 |
| 7/11 | 6 | 223.5 | 55 | 1,454 | 41 | 978 | 583 |
| 7/12 | 6 | 235.5 | 148 | 1,602 | 105 | 1,082 | 572 |
| 7/13 | 2[a] | 109.5 | 371 | 1,973 | 207 | 1,289 | 586 |
| 7/14 | 6 | 280.5 | 472 | 2,445 | 277 | 1,567 | 586 |
| 7/15 | 6 | 228.5 | 98 | 2,543 | 72 | 1,639 | 582 |
| 7/16 | 5[a] | 198.5 | 131 | 2,674 | 91 | 1,730 | 589 |
| 7/17 | 6 | 238.5 | 216 | 2,890 | 142 | 1,872 | 581 |
| 7/18 | 6 | 235.0 | 101 | 2,991 | 70 | 1,941 | 575 |
| 7/19 | 3[a] | 119.5 | 50 | 3,041 | 37 | 1,979 | 568 |
| 7/20 | 6 | 227.5 | 82 | 3,123 | 61 | 2,040 | 579 |
| 7/21 | 0[a] | 0.0 | 92 | 3,215 | 66 | 2,106 | nd |
| 7/22 | 6 | 240.5 | 99 | 3,314 | 71 | 2,178 | 572 |
| 7/23 | 6 | 255.0 | 159 | 3,473 | 106 | 2,284 | 579 |
| 7/24 | 6 | 238.5 | 85 | 3,558 | 62 | 2,346 | 566 |
| 7/25 | 6 | 210.0 | 52 | 3,610 | 47 | 2,394 | 562 |
| 7/26 | 0[a] | 0.0 | 34 | 3,644 | 29 | 2,423 | nd |
| 7/27 | 6 | 226.5 | 14 | 3,658 | 11 | 2,433 | 572 |
| 7/28 | 6 | 231.0 | 29 | 3,687 | 23 | 2,456 | 566 |
| 7/29 | 4[a] | 74.5 | 19 | 3,706 | 14 | 2,470 | 567 |
| 7/30 | 6 | 228.5 | 21 | 3,727 | 16 | 2,487 | 572 |

[a] Not all stations fished because of rough weather; the data for missing stations were interpolated.

Table 2.–Estimated sockeye salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0 | 33 | 36 | 10 | 4 | 3 | 86 |
| 7/2 | 1 | 6 | 1 | 3 | 1 | 1 | 13 |
| 7/3 | 0 | 44 | 13 | 39 | 9 | 2 | 107 |
| 7/4 | 3 | 14 | 16 | 2 | 0 | 0 | 35 |
| 7/5 | 10 | 31 | 17 | 45 | 86 | 7 | 196 |
| 7/6 | 4 | 24 | 4 | 29 | 18 | 6 | 85 |
| 7/7 | 0 | 0 | 62 | 15 | 62 | 14 | 153 |
| 7/8 | 4 | 63 | 6 | 83 | 179 | 3 | 338 |
| 7/9 | 0 | 48 | 2 | 4 | 11 | 3 | 68 |
| 7/10 | 1 | 11 | 2 | 137 | 147 | 20 | 318 |
| 7/11 | 0 | 40 | 11 | 1 | 0 | 3 | 55 |
| 7/12 | 1 | 70 | 38 | 9 | 28 | 2 | 148 |
| 7/13[a] | 40 | 101 | 93 | 87 | 42 | 8 | 371 |
| 7/14 | 27 | 65 | 148 | 164 | 55 | 13 | 472 |
| 7/15 | 18 | 62 | 12 | 2 | 0 | 4 | 98 |
| 7/16[a] | 29 | 6 | 67 | 13 | 12 | 4 | 131 |
| 7/17 | 39 | 157 | 0 | 7 | 12 | 1 | 216 |
| 7/18 | 8 | 65 | 9 | 6 | 2 | 11 | 101 |
| 7/19[a] | 3 | 1 | 14 | 22 | 1 | 9 | 50 |
| 7/20 | 7 | 6 | 18 | 44 | 0 | 7 | 82 |
| 7/21[a] | 5 | 5 | 13 | 45 | 8 | 16 | 92 |
| 7/22 | 3 | 3 | 8 | 45 | 15 | 25 | 99 |
| 7/23 | 7 | 81 | 7 | 12 | 47 | 5 | 159 |
| 7/24 | 2 | 29 | 6 | 12 | 10 | 26 | 85 |
| 7/25 | 8 | 4 | 8 | 12 | 16 | 4 | 52 |
| 7/26[a] | 4 | 3 | 9 | 7 | 9 | 2 | 34 |
| 7/27 | 0 | 1 | 10 | 2 | 1 | 0 | 14 |
| 7/28 | 1 | 9 | 10 | 5 | 4 | 0 | 29 |
| 7/29[a] | 0 | 9 | 0 | 5 | 4 | 1 | 19 |
| 7/30 | 1 | 8 | 2 | 4 | 4 | 2 | 21 |
| Total | 226 | 999 | 642 | 871 | 787 | 202 | 3,726 |
| % | 6% | 27% | 17% | 23% | 21% | 5% | 100% |

[a] Not all stations fished because of rough weather; the data for missing stations was interpolated.

Table 3.–Estimated sockeye salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0.0 | 24.8 | 27.0 | 7.9 | 3.2 | 2.4 | 65 |
| 7/2 | 0.8 | 3.8 | 0.8 | 2.4 | 0.8 | 0.8 | 10 |
| 7/3 | 0.0 | 33.0 | 10.4 | 28.2 | 7.3 | 1.6 | 80 |
| 7/4 | 2.5 | 11.4 | 12.6 | 1.6 | 0.0 | 0.0 | 28 |
| 7/5 | 7.6 | 24.2 | 13.8 | 33.3 | 51.1 | 5.1 | 135 |
| 7/6 | 2.9 | 18.9 | 3.3 | 22.3 | 14.0 | 5.0 | 67 |
| 7/7 | 0.0 | 0.0 | 44.8 | 18.4 | 40.9 | 9.0 | 113 |
| 7/8 | 3.2 | 47.3 | 4.9 | 49.8 | 96.8 | 2.4 | 204 |
| 7/9 | 0.0 | 33.1 | 1.6 | 3.2 | 8.6 | 2.5 | 49 |
| 7/10 | 0.8 | 8.5 | 1.6 | 75.4 | 83.2 | 15.6 | 185 |
| 7/11 | 0.0 | 29.3 | 8.7 | 0.8 | 0.0 | 2.5 | 41 |
| 7/12 | 0.9 | 47.2 | 26.8 | 6.8 | 21.3 | 1.7 | 105 |
| 7/13[a] | 27.9 | 45.6 | 52.6 | 47.3 | 27.7 | 6.1 | 207 |
| 7/14 | 20.0 | 46.4 | 78.4 | 87.8 | 34.0 | 10.5 | 277 |
| 7/15 | 14.0 | 43.8 | 9.6 | 1.7 | 0.0 | 3.2 | 72 |
| 7/16[a] | 21.0 | 4.9 | 42.3 | 9.8 | 9.6 | 3.2 | 91 |
| 7/17 | 28.1 | 98.1 | 0.0 | 5.8 | 9.2 | 0.8 | 142 |
| 7/18 | 6.3 | 41.1 | 7.0 | 4.9 | 1.6 | 8.8 | 70 |
| 7/19[a] | 2.3 | 0.8 | 10.5 | 15.8 | 0.8 | 7.2 | 37 |
| 7/20 | 5.8 | 5.0 | 14.0 | 31.1 | 0.0 | 5.5 | 61 |
| 7/21[a] | 4.0 | 3.7 | 10.3 | 31.2 | 5.6 | 11.6 | 66 |
| 7/22 | 2.2 | 2.4 | 6.6 | 31.4 | 11.1 | 17.6 | 71 |
| 7/23 | 5.5 | 51.2 | 4.8 | 8.7 | 32.4 | 3.7 | 106 |
| 7/24 | 1.6 | 20.0 | 4.6 | 9.1 | 8.0 | 19.0 | 62 |
| 7/25 | 6.5 | 12.0 | 5.8 | 8.9 | 10.9 | 3.2 | 47 |
| 7/26[a] | 3.3 | 6.4 | 6.7 | 5.3 | 5.9 | 1.6 | 29 |
| 7/27 | 0.0 | 0.8 | 7.5 | 1.6 | 0.8 | 0.0 | 11 |
| 7/28 | 0.8 | 6.8 | 8.0 | 4.3 | 3.0 | 0.0 | 23 |
| 7/29[a] | 0.0 | 6.3 | 0.0 | 3.7 | 3.1 | 0.8 | 14 |
| 7/30 | 0.8 | 5.9 | 1.6 | 3.2 | 3.2 | 1.6 | 16 |
| TOTAL | 169 | 682 | 427 | 562 | 494 | 153 | 2,487 |
| % | 7% | 27% | 17% | 23% | 20% | 6% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Table 4.–A comparison of models used to make postseason adjustments to the offshore test fish final CPUE.

| Year | Final OTF CPUE | Postseason OTF CPUE Adjustment | | Harvest Adjusted | | Total Run Adjusted | |
|---|---|---|---|---|---|---|---|
| | | Harvest-adjusted | Total Run-adjusted | *a* | *b* | *a* | *b* |
| 1979 | 602 | 651 | 664 | -3.2451 | 0.1876 | -3.3380 | 0.2004 |
| 1980 | 740 | 770 | 777 | -2.2537 | 0.1640 | -2.2403 | 0.1612 |
| 1981 | 364 | 383 | 387 | -2.5459 | 0.1856 | -2.5243 | 0.1819 |
| 1982 | 651 | 775 | 786 | -3.6839 | 0.1522 | -3.7156 | 0.1633 |
| 1983 | 2,464 | 2,472 | 2,474 | -4.2719 | 0.1883 | -4.2732 | 0.1884 |
| 1984 | 1,331 | 1,334 | 1,341 | -3.4257 | 0.1855 | -3.4018 | 0.1834 |
| 1985 | 1,422 | 1,575 | 1,563 | -3.4581 | 0.1523 | -3.5633 | 0.1626 |
| 1986 | 1,653 | 1,731 | 1,714 | -3.7671 | 0.1633 | -3.8642 | 0.1719 |
| 1987 | 1,404 | 1,422 | 1,428 | -4.3442 | 0.1689 | -4.6385 | 0.1785 |
| 1988 | 1,131 | 1,145 | 1,169 | -3.3682 | 0.1639 | -3.5655 | 0.1662 |
| 1989 | 619 | 682 | 692 | -2.7114 | 0.1258 | -2.7031 | 0.1238 |
| 1990 | 1,358 | 1,404 | 1,426 | -5.7913 | 0.2259 | -5.7085 | 0.2211 |
| 1991 | 1,574 | 1,759 | 1,740 | -4.5806 | 0.1885 | -4.6331 | 0.1919 |
| 1992 | 2,021 | 2,186 | 2,195 | -5.4366 | 0.2235 | -5.4043 | 0.2217 |
| 1993 | 1,815 | 1,882 | 1,913 | -4.0776 | 0.1906 | -3.9018 | 0.1797 |
| 1994 | 1,012 | 1,145 | 1,199 | -4.0770 | 0.1553 | -3.9757 | 0.1453 |
| 1995 | 1,712 | 1,828 | 1,850 | -4.7036 | 0.2131 | -4.6219 | 0.2078 |
| 1996 | 1,723 | 1,765 | 1,796 | -4.6328 | 0.2266 | -4.4605 | 0.2144 |
| 1997 | 1,656 | 1,705 | 1,826 | -3.8265 | 0.1621 | -3.7000 | 0.1496 |
| 1998 | 1,158 | 1,355 | 1,313 | -3.6700 | 0.1473 | -3.7142 | 0.1515 |
| 1999 | 2,226 | 2,475 | 2,419 | -5.3100 | 0.2175 | -5.1500 | 0.2081 |
| 2000 | 1,520 | 1,532 | 1,565 | -5.1094 | 0.2614 | -4.9141 | 0.2480 |
| 2001 | 1,586 | 1,594 | 1,630 | -3.9323 | 0.2002 | -3.9823 | 0.2041 |
| 2002 | 1,736 | 1,749 | 1,825 | -4.3694 | 0.2292 | -4.0642 | 0.2068 |
| 2003 | 1,787 | 1,824 | 1,848 | -4.5091 | 0.2117 | -4.4402 | 0.2068 |
| 2004 | 2,028 | 2,220 | 2,345 | -4.6374 | 0.1903 | -4.6374 | 0.1903 |
| 2005 | 2,643 | 3,032 | 3,191 | -3.7460 | 0.1354 | -3.7152 | 0.1302 |
| 2006 | 1,507 | 1,756 | 1,969 | -4.2031 | 0.1438 | -4.0762 | 0.1308 |
| 2007 | 2,584 | 2,774 | 2,924 | -4.9217 | 0.1962 | -4.6427 | 0.1793 |
| 2008 | 1,594 | 1,612 | 1,675 | -2.9601 | 0.1665 | -2.8021 | 0.1521 |
| 2009 | 2,487 | 2,561 | 2,618 | -4.5578 | 0.2275 | -4.4130 | 0.2173 |

Table 5.–Total run estimates for sockeye salmon to Upper Cook Inlet, Alaska, made during the 2009 season.

| Based on data through 7/20/2009 | |
|---|---|
| Escapement | 773,929 |
| Cumulative Catch (Commercial, Sport, & PU) | 1,840,474 |
| Residual in District | 314,422 |
| Total Run Through 7/20/2009 | 2,928,825 |
| 2009 Cumulative OTF CPUE through 7/20 | 2,039 |
| Passage Rate (Total Run/Cumulative CPUE) through 7/20 | 1,436 |

Run Estimates Based on Model Results (Fit of Current Year to Past Years)

| | | Estimated Total CPUE | | | | Estimated |
|---|---|---|---|---|---|---|
| Year | *MSE* | Current | Previous Day | Difference | Timing | Total Run |
| 2006 | 0.000639 | 6,343 | 6,492 | -149 | Late 9 days | 9,110,814 |
| 2000 | 0.000692 | 2,513 | 2,535 | -22 | Early 2 days | 3,609,565 |
| 1996 | 0.000897 | 2,764 | 2,796 | -32 | Early 2 days | 3,970,145 |
| 1994 | 0.000942 | 4,724 | 4,824 | -100 | Late 4 days | 6,785,494 |
| 2003 | 0.000994 | 2,931 | 2,974 | -43 | Early 2 days | 4,209,679 |
| 2005 | 0.001089 | 4,972 | 5,052 | -80 | Late 7 days | 7,141,837 |
| 1983 | 0.001092 | 3,259 | 3,316 | -58 | On Time | 4,680,791 |
| 1995 | 0.001217 | 3,143 | 3,207 | -64 | On Time | 4,513,938 |
| 1987 | 0.001248 | 4,480 | 4,628 | -148 | Late 2 days | 6,434,825 |
| 2007 | 0.001263 | 4,442 | 4,589 | -147 | Late 4 days | 6,381,032 |
| 1991 | 0.001376 | 3,760 | 3,866 | -106 | Late 2 days | 5,401,132 |
| 2004 | 0.001376 | 3,842 | 3,954 | -111 | Late 2 days | 5,519,319 |
| 1986 | 0.001405 | 3,187 | 3,223 | -37 | Late 1 day | 4,577,125 |
| 1993 | 0.001424 | 2,997 | 3,026 | -29 | Early 1 day | 4,304,740 |
| 1998 | 0.001440 | 3,719 | 3,768 | -50 | Late 3 days | 5,341,306 |
| 1997 | 0.001441 | 3,777 | 3,827 | -51 | Late 1 day | 5,424,919 |
| 2002 | 0.001521 | 2,535 | 2,543 | -8 | Early 1 days | 3,640,893 |
| 1982 | 0.001651 | 3,249 | 3,282 | -33 | Late 2 days | 4,666,269 |
| 2001 | 0.001806 | 2,513 | 2,518 | -5 | Early 2 days | 3,609,694 |
| 1999 | 0.002170 | 4,088 | 4,249 | -161 | Late 3 days | 5,871,999 |
| 1985 | 0.002242 | 3,043 | 3,062 | -19 | On Time | 4,370,930 |
| 1988 | 0.002375 | 2,940 | 2,955 | -15 | Early 2 days | 4,222,779 |
| 1992 | 0.002771 | 3,971 | 4,138 | -167 | Late 2 days | 5,704,069 |
| 1990 | 0.003007 | 4,761 | 5,022 | -260 | Late 3 days | 6,839,345 |
| 1984 | 0.005444 | 2,393 | 2,381 | 12 | Early 4 days | 3,437,254 |
| 1989 | 0.007561 | 3,016 | 3,001 | 16 | On Time | 4,332,334 |
| 1979 | 0.010392 | 2,117 | 2,091 | 26 | Early 5 days | 3,041,195 |
| 2008 | 0.010692 | 2,449 | 2,426 | 23 | Early 4 days | 3,518,209 |
| 1981 | 0.033668 | 1,913 | 1,870 | 43 | Early 9 days | 2,747,953 |
| 1980 | 0.036159 | 1,967 | 1,923 | 44 | Early 9 days | 2,825,375 |

-continued-

Table 5.–Page 2 of 2.

| Based on data through 7/23/2009 | | | | | | |
|---|---|---|---|---|---|---|
| Escapement | | | | | | 827,834 |
| Cumulative Catch (Commercial, Sport, & PU) | | | | | | 2,122,299 |
| Residual in District | | | | | | 371,342 |
| Total Run Through 7/23/2009 | | | | | | 3,321,475 |
| 2009 Cumulative OTF CPUE through 7/23 | | | | | | 2,283 |
| Passage Rate (Total Run/Cumulative CPUE) through 7/23 | | | | | | 1,455 |

Run Estimates Based on Model Results (Fit of Current Year to Past Years)

| | | Estimated Total CPUE | | | | Estimated |
|---|---|---|---|---|---|---|
| Year | *MSE* | Current | Previous Day | Difference | Timing | Total Run |
| 2000 | 0.000730 | 2,481 | 2,483 | -2 | Early 2 days | 3,610,139 |
| 1996 | 0.001099 | 2,698 | 2,711 | -14 | Early 2 days | 3,925,650 |
| 2006 | 0.001216 | 5,870 | 6,022 | -152 | Late 9 days | 8,541,488 |
| 2002 | 0.001345 | 2,526 | 2,523 | 3 | Early 1 days | 3,676,172 |
| 2003 | 0.001401 | 2,834 | 2,857 | -23 | Early 2 days | 4,124,491 |
| 2005 | 0.001459 | 4,710 | 4,793 | -83 | Late 7 days | 6,852,922 |
| 1993 | 0.001518 | 2,924 | 2,941 | -18 | Early 1 day | 4,254,214 |
| 2001 | 0.001587 | 2,511 | 2,506 | 5 | Early 2 days | 3,654,375 |
| 1986 | 0.001613 | 3,089 | 3,115 | -26 | Late 1 day | 4,494,874 |
| 1994 | 0.001648 | 4,425 | 4,517 | -92 | Late 4 days | 6,438,580 |
| 1983 | 0.001734 | 3,116 | 3,154 | -38 | On Time | 4,534,468 |
| 1998 | 0.001749 | 3,571 | 3,614 | -43 | Late 3 days | 5,195,931 |
| 1997 | 0.001750 | 3,625 | 3,670 | -45 | Late 1 day | 5,274,202 |
| 1982 | 0.001761 | 3,156 | 3,181 | -25 | Late 2 days | 4,592,410 |
| 1995 | 0.002034 | 2,995 | 3,033 | -38 | On Time | 4,358,342 |
| 1985 | 0.002091 | 2,989 | 3,002 | -13 | On Time | 4,349,247 |
| 1988 | 0.002161 | 2,898 | 2,907 | -9 | Early 2 days | 4,217,385 |
| 1991 | 0.002804 | 3,497 | 3,571 | -75 | Late 2 days | 5,087,846 |
| 2004 | 0.002857 | 3,564 | 3,643 | -79 | Late 2 days | 5,185,309 |
| 1987 | 0.002900 | 4,091 | 4,205 | -115 | Late 2 days | 5,952,370 |
| 2007 | 0.002919 | 4,059 | 4,172 | -113 | Late 4 days | 5,905,952 |
| 1999 | 0.004501 | 3,701 | 3,811 | -109 | Late 3 days | 5,385,765 |
| 1984 | 0.004925 | 2,431 | 2,415 | 17 | Early 4 days | 3,537,486 |
| 1992 | 0.005399 | 3,582 | 3,690 | -108 | Late 2 days | 5,212,185 |
| 1990 | 0.006493 | 4,148 | 4,322 | -174 | Late 3 days | 6,035,471 |
| 1989 | 0.006605 | 3,040 | 3,031 | 9 | On Time | 4,424,040 |
| 2008 | 0.009664 | 2,507 | 2,486 | 22 | Early 4 days | 3,648,089 |
| 1979 | 0.010202 | 2,195 | 2,166 | 29 | Early 5 days | 3,194,284 |
| 1980 | 0.033052 | 2,032 | 1,991 | 41 | Early 9 days | 2,956,519 |
| 1981 | 0.033052 | 2,032 | 1,991 | 41 | Early 9 days | 2,956,519 |

Table 6.–Projected total Kenai River sockeye salmon run (millions) in 2009 estimated from total offshore test fish CPUE and age composition stock allocation data through 23 July and 26 July, 2009.

Data through 23 July

| | | Est. Total OTF CPUE | | | | Estimated | Estimated | Estimated | Estimated | | Estimated | Estimated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | MSS | Current | Prev. Day | Timing | Passage Rate | UCI Total run | UCI Run to Date[a] | UCI Run Remaining | Kenai Run to Date | Prop. Kenai | Kenai Run Remaining | Total Kenai Run |
| 2000 | 0.00073 | 2,481 | 2,483 | Early 2 days | 1,455 | 3.61 | 2.95 | 0.66 | 1.47 | 68% | 0.450 | 1.924 |
| 1996 | 0.00110 | 2,698 | 2,711 | Early 2 days | 1,455 | 3.93 | 2.95 | 0.98 | 1.47 | 68% | 0.665 | 2.139 |
| 2006 | 0.00122 | 5,870 | 6,022 | Late 9 days | 1,455 | 8.54 | 2.95 | 5.59 | 1.47 | 68% | 3.814 | 5.288 |
| 2002 | 0.00135 | 2,526 | 2,523 | Early 1 days | 1,455 | 3.68 | 2.95 | 0.73 | 1.47 | 68% | 0.495 | 1.969 |
| 2003 | 0.00140 | 2,834 | 2,857 | Early 2 days | 1,455 | 4.12 | 2.95 | 1.17 | 1.47 | 68% | 0.801 | 2.275 |

Data through 26 July

| | | Est. Total OTF CPUE | | | | Estimated | Estimated | Estimated | Estimated | | Estimated | Estimated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | MSS | Current | Prev. Day | Timing | Passage Rate | UCI Total run | UCI Run to Date[a] | UCI Run Remaining | Kenai Run to Date | Prop. Kenai | Kenai Run Remaining | Total Kenai Run |
| 2000 | 0.00073 | 2,485 | 2,482 | Early 2 days | 1,455 | 3.62 | 3.02 | 0.59 | 1.51 | 69% | 0.407 | 1.915 |
| 1996 | 0.00110 | 2,672 | 2,680 | Early 2 days | 1,455 | 3.89 | 3.02 | 0.87 | 1.51 | 69% | 0.594 | 2.102 |
| 2006 | 0.00122 | 5,421 | 5,570 | Late 9 days | 1,455 | 7.89 | 3.02 | 4.87 | 1.51 | 69% | 3.334 | 4.842 |
| 2002 | 0.00135 | 2,540 | 2,537 | Early 1 days | 1,455 | 3.70 | 3.02 | 0.67 | 1.51 | 69% | 0.462 | 1.971 |
| 2003 | 0.00140 | 2,784 | 2,800 | Early 2 days | 1,455 | 4.05 | 3.02 | 1.03 | 1.51 | 69% | 0.705 | 2.214 |

*Note*: MSS is the mean sum of squares.

[a] Does not include residual fish resident in the Central District.

Table 7.–Absolute Percentage Error (APE) using the first best fit estimate of test fish data on or after July 20 to project the total annual UCI sockeye salmon run.

| Year | Actual Run (millions) | July 20 estimate | APE | Run Timing |
|---|---|---|---|---|
| 1988 | 8.52 | 11.30 | 32.6% | 1 day early |
| 1990 | 5.00 | 4.90 | 1.9% | 4 day late |
| 1991 | 3.66 | 3.90 | 6.5% | 2 day late |
| 1992 | 10.90 | 11.40 | 4.5% | 2 day late |
| 1993 | 6.48 | 6.40 | 1.2% | on time |
| 1994 | 5.51 | 5.30 | 3.8% | 5 day late |
| 1995 | 4.51 | 4.50 | 0.2% | on time |
| 1996 | 5.63 | 8.50 | 51.0% | 1 day early |
| 1997 | 6.41 | 6.00 | 6.4% | 3 day late |
| 1998 | 3.00 | 3.40 | 13.3% | 3 day late |
| 1999 | 4.57 | 5.20 | 13.7% | 3 day late |
| 2000 | 2.94 | 3.20 | 8.8% | 2 day early |
| 2001 | 3.53 | 6.20 | 75.4% | 2 day early |
| 2002 | 4.84 | 5.50 | 13.6% | 2 day early |
| 2003 | 6.29 | 6.79 | 8.0% | 1 day early |
| 2004 | 7.92 | 8.94 | 12.8% | 2 day late |
| 2005 | 7.92 | 9.17 | 15.8% | 7 day late |
| 2006 | 4.96 | 3.60 | 27.5% | 9 day late |
| 2007 | 5.44 | 4.65 | 14.6% | 4 day late |
| 2008 | 4.11 | 5.17 | 25.8% | 4 day early |
| 2009 | 3.86 | 9.11 | 135.9% | 2 day early |

| | Average | Median |
|---|---|---|
| All runs | 22.5% | 13.3% |
| On time/Late | 9.4% | 6.5% |
| All early | 43.9% | 29.2% |

Table 8.–Midpoint dates of the sockeye salmon run across the Anchor Point test fish transect in Upper Cook Inlet, 1979–2009.

| | Midpoint Date[a] | |
|---|---|---|
| Year | Coded | Calendar |
| 1979 | 16.7 | 10 Jul |
| 1980 | 13.9 | 7 Jul |
| 1981 | 13.9 | 7 Jul |
| 1982 | 22.8 | 16 Jul |
| 1983 | 22.7 | 16 Jul |
| 1984 | 18.5 | 12 Jul |
| 1985 | 21.9 | 15 Jul |
| 1986 | 22.5 | 15 Jul |
| 1987 | 26.0 | 19 Jul |
| 1988 | 21.5 | 14 Jul |
| 1989 | 21.8 | 15 Jul |
| 1990 | 25.8 | 19 Jul |
| 1991 | 24.1 | 17 Jul |
| 1992 | 24.4 | 17 Jul |
| 1993 | 21.7 | 15 Jul |
| 1994 | 27.4 | 20 Jul |
| 1995 | 22.2 | 15 Jul |
| 1996 | 20.8 | 14 Jul |
| 1997 | 24.7 | 18 Jul |
| 1998 | 24.5 | 18 Jul |
| 1999 | 24.7 | 18 Jul |
| 2000 | 19.8 | 13 Jul |
| 2001 | 19.5 | 13 Jul |
| 2002 | 19.7 | 13 Jul |
| 2003 | 21.5 | 14 Jul |
| 2004 | 24.4 | 17 Jul |
| 2005 | 28.5 | 22 Jul |
| 2006 | 31.2 | 24 Jul |
| 2007 | 25.9 | 19 Jul |
| 2008 | 18.4 | 11 Jul |
| 2009 | 20.3 | 13 Jul |
| Average | 22.3 | 15 Jul |

[a] Day 1 = June 24.

Table 9.–Stock composition estimates, standard deviation (SD), 90% credibility interval (CI), sample size (*n*), and effective sample size ($n_{eff}$) for mixtures of sockeye salmon captured in the Upper Cook Inlet offshore test fishery in 2006, 2007, and 2008.

| | | | Reporting Group[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crescent | West | JCL | SusYen | Fish | KTNE | Kenai | Kasilof |
| | | | 2006 | | | | | | | |
| Start Date | 07/01 | Proportion | 0.04 | 0.06 | 0.01 | 0.05 | 0.00 | 0.03 | 0.30 | 0.51 |
| End Date | 07/09 | S.D. | 0.01 | 0.02 | 0.01 | 0.02 | 0.00 | 0.01 | 0.04 | 0.04 |
| n | 325 | Lower 90% CI | 0.02 | 0.03 | 0.00 | 0.02 | 0.00 | 0.01 | 0.24 | 0.45 |
| $n_{eff}$ | 325 | Upper 90% CI | 0.06 | 0.09 | 0.02 | 0.08 | 0.00 | 0.06 | 0.36 | 0.57 |
| Start Date | 07/10 | Proportion | 0.00 | 0.11 | 0.06 | 0.11 | 0.00 | 0.05 | 0.33 | 0.33 |
| End Date | 07/16 | S.D. | 0.00 | 0.04 | 0.02 | 0.04 | 0.00 | 0.02 | 0.04 | 0.04 |
| n | 266 | Lower 90% CI | 0.00 | 0.06 | 0.03 | 0.04 | 0.00 | 0.02 | 0.27 | 0.27 |
| $n_{eff}$ | 263 | Upper 90% CI | 0.01 | 0.18 | 0.09 | 0.18 | 0.01 | 0.09 | 0.39 | 0.39 |
| Start Date | 07/17 | Proportion | 0.02 | 0.07 | 0.05 | 0.07 | 0.00 | 0.02 | 0.60 | 0.17 |
| End Date | 07/23 | S.D. | 0.01 | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 | 0.03 | 0.03 |
| n | 401 | Lower 90% CI | 0.00 | 0.05 | 0.03 | 0.04 | 0.00 | 0.01 | 0.55 | 0.13 |
| $n_{eff}$ | 397 | Upper 90% CI | 0.04 | 0.10 | 0.08 | 0.11 | 0.00 | 0.03 | 0.66 | 0.21 |
| Start Date | 07/24 | Proportion | 0.00 | 0.07 | 0.05 | 0.02 | 0.00 | 0.03 | 0.70 | 0.12 |
| End Date | 08/01 | S.D. | 0.00 | 0.02 | 0.01 | 0.02 | 0.00 | 0.02 | 0.03 | 0.02 |
| n | 393 | Lower 90% CI | 0.00 | 0.04 | 0.03 | 0.00 | 0.00 | 0.01 | 0.65 | 0.09 |
| $n_{eff}$ | 391 | Upper 90% CI | 0.01 | 0.11 | 0.08 | 0.05 | 0.00 | 0.06 | 0.75 | 0.16 |

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Table 9.–Page 2 of 3.

| | | | Reporting Group[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crescent | West | JCL | SusYen | Fish | KTNE | Kenai | Kasilof |
| 2007 | | | | | | | | | | |
| Start Date | 07/01 | Proportion | 0.08 | 0.16 | 0.03 | 0.03 | 0.02 | 0.05 | 0.39 | 0.23 |
| End Date | 07/09 | S.D. | 0.02 | 0.03 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 |
| n | 374 | Lower 90% CI | 0.05 | 0.11 | 0.02 | 0.01 | 0.00 | 0.02 | 0.34 | 0.19 |
| $n_{eff}$ | 372 | Upper 90% CI | 0.12 | 0.22 | 0.05 | 0.05 | 0.03 | 0.09 | 0.45 | 0.28 |
| Start Date | 07/10 | Proportion | 0.03 | 0.08 | 0.05 | 0.10 | 0.01 | 0.03 | 0.53 | 0.17 |
| End Date | 07/13 | S.D. | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.03 |
| n | 444 | Lower 90% CI | 0.02 | 0.04 | 0.03 | 0.07 | 0.00 | 0.01 | 0.47 | 0.13 |
| $n_{eff}$ | 437 | Upper 90% CI | 0.06 | 0.11 | 0.07 | 0.14 | 0.02 | 0.05 | 0.59 | 0.22 |
| Start Date | 07/14 | Proportion | 0.04 | 0.02 | 0.07 | 0.11 | 0.00 | 0.03 | 0.61 | 0.12 |
| End Date | 07/18 | S.D. | 0.01 | 0.01 | 0.02 | 0.03 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 404 | Lower 90% CI | 0.02 | 0.01 | 0.05 | 0.06 | 0.00 | 0.01 | 0.56 | 0.08 |
| $n_{eff}$ | 399 | Upper 90% CI | 0.06 | 0.05 | 0.10 | 0.15 | 0.00 | 0.05 | 0.66 | 0.16 |
| Start Date | 07/19 | Proportion | 0.05 | 0.02 | 0.04 | 0.08 | 0.00 | 0.03 | 0.67 | 0.10 |
| End Date | 07/23 | S.D. | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 429 | Lower 90% CI | 0.04 | 0.01 | 0.03 | 0.05 | 0.00 | 0.02 | 0.62 | 0.06 |
| $n_{eff}$ | 427 | Upper 90% CI | 0.08 | 0.04 | 0.07 | 0.11 | 0.00 | 0.05 | 0.72 | 0.13 |
| Start Date | 07/24 | Proportion | 0.05 | 0.04 | 0.05 | 0.06 | 0.00 | 0.02 | 0.69 | 0.09 |
| End Date | 08/02 | S.D. | 0.02 | 0.01 | 0.01 | 0.02 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 438 | Lower 90% CI | 0.03 | 0.02 | 0.03 | 0.03 | 0.00 | 0.00 | 0.64 | 0.06 |
| $n_{eff}$ | 434 | Upper 90% CI | 0.08 | 0.06 | 0.08 | 0.09 | 0.00 | 0.04 | 0.74 | 0.13 |

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Table 9.–Page 3 of 3.

| | | | Reporting Group[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crescent | West | JCL | SusYen | Fish | KTNE | Kenai | Kasilof |
| | | | | | | 2008 | | | | |
| Start Date | 07/01 | Proportion | 0.03 | 0.11 | 0.05 | 0.04 | 0.01 | 0.03 | 0.27 | 0.45 |
| End Date | 07/07 | S.D. | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.03 |
| n | 422 | Lower 90% CI | 0.02 | 0.07 | 0.04 | 0.02 | 0.00 | 0.02 | 0.22 | 0.40 |
| $n_{eff}$ | 418 | Upper 90% CI | 0.05 | 0.15 | 0.08 | 0.08 | 0.03 | 0.05 | 0.32 | 0.50 |
| Start Date | 07/08 | Proportion | 0.04 | 0.12 | 0.07 | 0.10 | 0.00 | 0.01 | 0.43 | 0.22 |
| End Date | 07/12 | S.D. | 0.01 | 0.02 | 0.01 | 0.02 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 465 | Lower 90% CI | 0.02 | 0.09 | 0.05 | 0.07 | 0.00 | 0.00 | 0.39 | 0.18 |
| $n_{eff}$ | 457 | Upper 90% CI | 0.06 | 0.16 | 0.10 | 0.14 | 0.00 | 0.02 | 0.48 | 0.26 |
| Start Date | 07/13 | Proportion | 0.05 | 0.13 | 0.10 | 0.05 | 0.00 | 0.03 | 0.49 | 0.15 |
| End Date | 07/17 | S.D. | 0.01 | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 436 | Lower 90% CI | 0.03 | 0.09 | 0.07 | 0.01 | 0.00 | 0.01 | 0.44 | 0.11 |
| $n_{eff}$ | 429 | Upper 90% CI | 0.07 | 0.16 | 0.14 | 0.09 | 0.00 | 0.05 | 0.54 | 0.19 |
| Start Date | 07/18 | Proportion | 0.03 | 0.13 | 0.06 | 0.04 | 0.00 | 0.02 | 0.58 | 0.14 |
| End Date | 07/31 | S.D. | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.03 | 0.02 |
| n | 438 | Lower 90% CI | 0.01 | 0.10 | 0.04 | 0.02 | 0.00 | 0.01 | 0.54 | 0.11 |
| $n_{eff}$ | 426 | Upper 90% CI | 0.05 | 0.16 | 0.08 | 0.06 | 0.00 | 0.03 | 0.63 | 0.18 |

.*Source*: Reproduced from Barclay et al. 2010.

*Note*: Effective sample size (*neff*) is number of samples successfully screened from each stratum after excluding individuals with <80% scorable markers (see text). Proportions for a given mixture may not sum to 1 due to rounding error.

[a] Crescent = largest producer on the west side of Cook Inlet; West = the remaining West Cook Inlet producers; JCL= the lakes with weirs in the Susitna/Yentna Rivers (Judd/Chelatna/Larson); SusYen = the remaining producers in the Susitna/Yentna Rivers; Fish = the only major creek with a weir in the Knik/Turnagain/Northeast Cook Inlet area; KTNE = the remaining Knik/Turnagain/Northeast Cook Inlet producers; Kenai = the composite of all populations within the Kenai River; Kasilof = the composite of all populations within the Kasilof River.

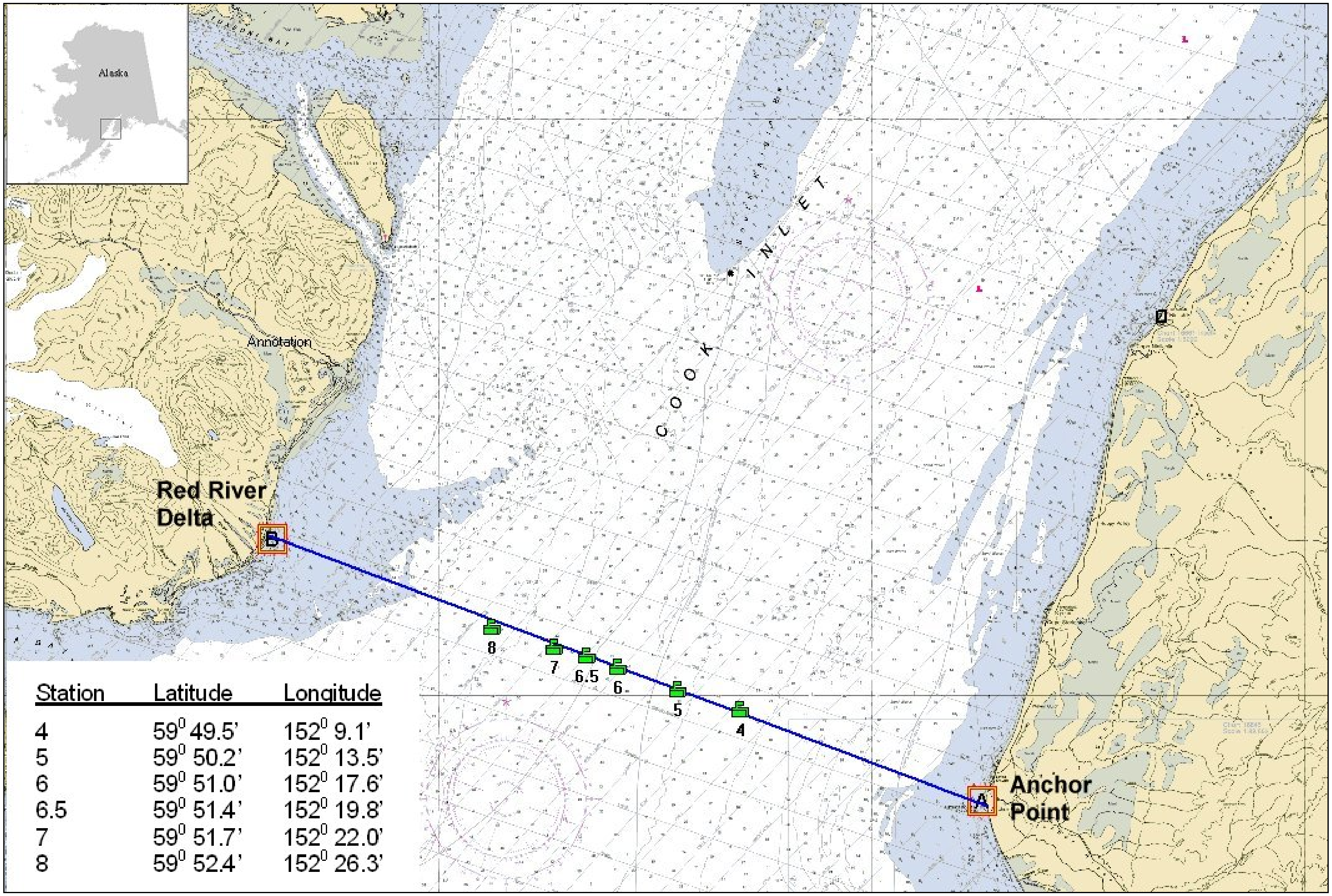


Figure 1.–Location of offshore test fish transect and fishing stations in Cook Inlet, Alaska, 2009.

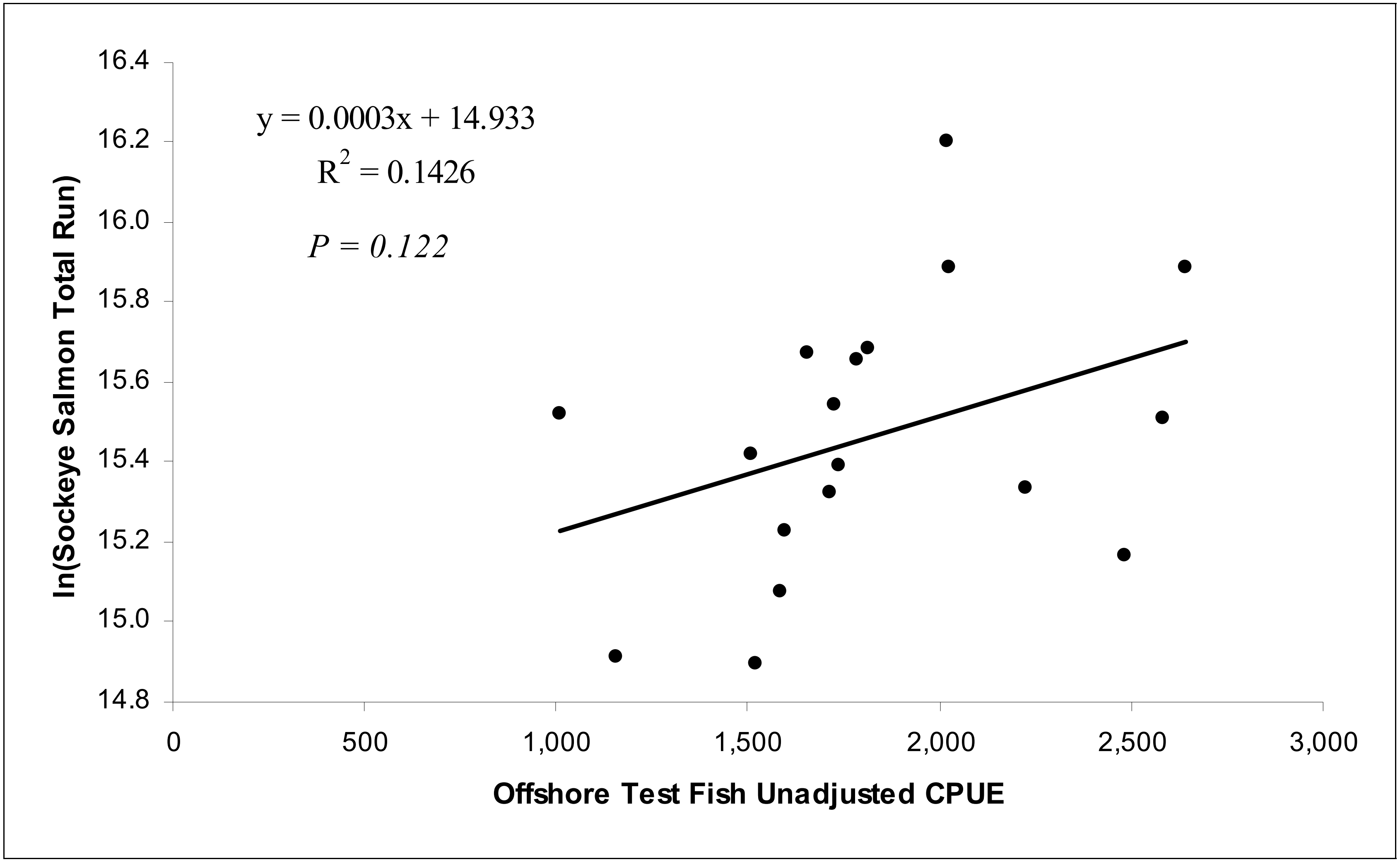


Figure 2.–Linear regression of the relationship between offshore test fish unadjusted cumulative CPUE and Upper Cook Inlet logged sockeye salmon total annual run, 1992–2009.

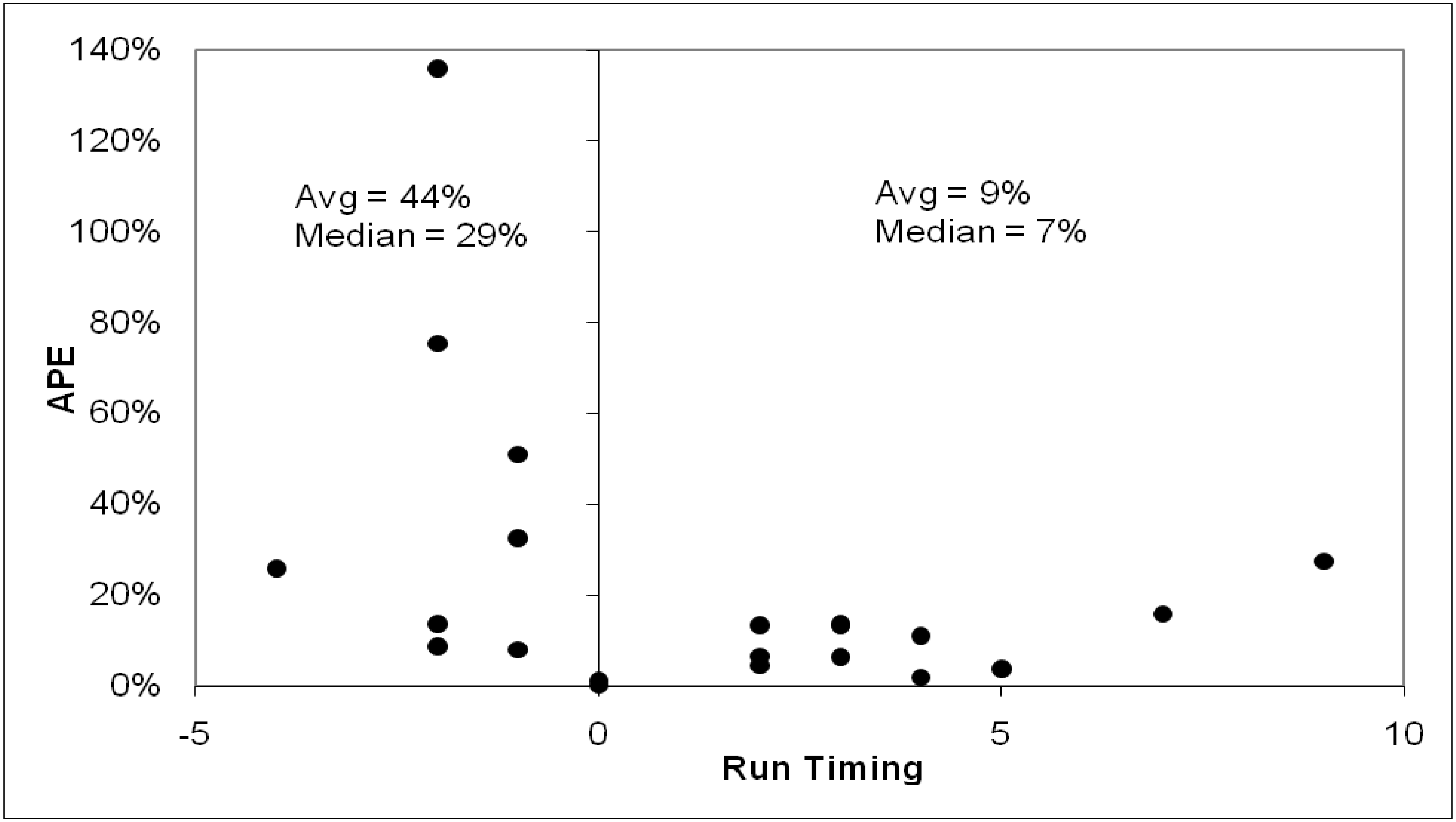


Figure 3.–Actual Percentage Error (APE) in forecasting the total sockeye salmon run to Upper Cook Inlet using the 20 July best fit estimate.

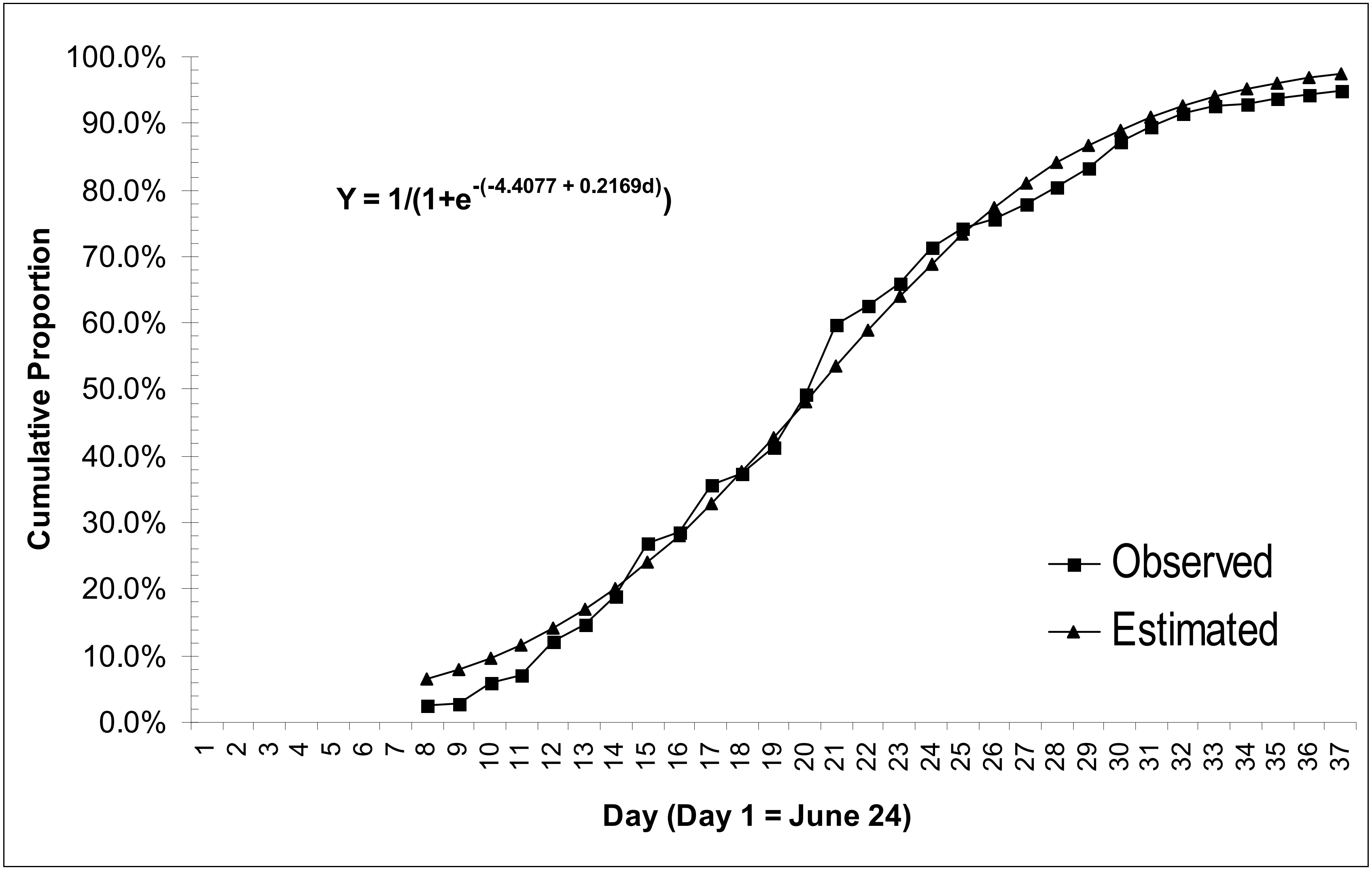


Figure 4.–Cumulative proportions estimated for the sockeye salmon run to Upper Cook Inlet, Alaska, 2009.

# APPENDIX A

Appendix A1.–Summary of pink salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2009.

| Date | Number of Stations | Mean Fishing Time (min) | CATCH | | CPUE | |
|---|---|---|---|---|---|---|
| | | | Daily | Cum | Daily | Cum |
| 7/1 | 6 | 230.0 | 12 | 12 | 9 | 9 |
| 7/2 | 6 | 230.5 | 4 | 16 | 3 | 12 |
| 7/3 | 6 | 233.5 | 10 | 26 | 8 | 20 |
| 7/4 | 6 | 220.5 | 15 | 41 | 12 | 32 |
| 7/5 | 6 | 247.0 | 11 | 52 | 8 | 40 |
| 7/6 | 6 | 228.5 | 7 | 59 | 5 | 45 |
| 7/7 | 6 | 230.0 | 15 | 74 | 12 | 57 |
| 7/8 | 6 | 256.5 | 21 | 95 | 14 | 71 |
| 7/9 | 6 | 229.5 | 11 | 106 | 8 | 79 |
| 7/10 | 6 | 257.5 | 20 | 126 | 12 | 91 |
| 7/11 | 6 | 223.5 | 8 | 134 | 6 | 98 |
| 7/12 | 6 | 235.5 | 7 | 141 | 5 | 103 |
| 7/13 | 2[a] | 109.5 | 31 | 172 | 18 | 120 |
| 7/14 | 6 | 280.5 | 57 | 229 | 34 | 155 |
| 7/15 | 6 | 228.5 | 8 | 237 | 6 | 161 |
| 7/16 | 5[a] | 198.5 | 23 | 260 | 16 | 177 |
| 7/17 | 6 | 238.5 | 9 | 269 | 7 | 184 |
| 7/18 | 6 | 235.0 | 37 | 306 | 26 | 210 |
| 7/19 | 3[a] | 119.5 | 17 | 323 | 12 | 222 |
| 7/20 | 6 | 227.5 | 14 | 337 | 11 | 232 |
| 7/21 | 0[a] | 0.0 | 31 | 368 | 22 | 254 |
| 7/22 | 6 | 240.5 | 45 | 413 | 33 | 286 |
| 7/23 | 6 | 255.0 | 79 | 492 | 84 | 370 |
| 7/24 | 6 | 238.5 | 55 | 547 | 41 | 411 |
| 7/25 | 6 | 210.0 | 37 | 584 | 27 | 438 |
| 7/26 | 0[a] | 0.0 | 27 | 611 | 18 | 456 |
| 7/27 | 6 | 226.5 | 12 | 623 | 9 | 466 |
| 7/28 | 6 | 231.0 | 22 | 645 | 17 | 483 |
| 7/29 | 4[a] | 74.5 | 24 | 669 | 18 | 501 |
| 7/30 | 6 | 228.5 | 32 | 701 | 25 | 526 |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A2.–Estimated pink salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0 | 3 | 3 | 2 | 3 | 1 | 12 |
| 7/2 | 2 | 1 | 1 | 0 | 0 | 0 | 4 |
| 7/3 | 2 | 1 | 1 | 2 | 1 | 3 | 10 |
| 7/4 | 3 | 1 | 1 | 1 | 6 | 3 | 15 |
| 7/5 | 1 | 0 | 2 | 5 | 3 | 0 | 11 |
| 7/6 | 0 | 0 | 0 | 3 | 3 | 1 | 7 |
| 7/7 | 0 | 0 | 7 | 3 | 3 | 2 | 15 |
| 7/8 | 0 | 6 | 1 | 6 | 7 | 1 | 21 |
| 7/9 | 0 | 4 | 2 | 1 | 2 | 2 | 11 |
| 7/10 | 0 | 2 | 2 | 7 | 6 | 3 | 20 |
| 7/11 | 1 | 4 | 2 | 0 | 1 | 0 | 8 |
| 7/12 | 0 | 0 | 3 | 1 | 3 | 0 | 7 |
| 7/13[a] | 3 | 1 | 10 | 6 | 10 | 1 | 31 |
| 7/14 | 5 | 8 | 16 | 11 | 16 | 1 | 57 |
| 7/15 | 0 | 4 | 0 | 4 | 0 | 0 | 8 |
| 7/16[a] | 0 | 1 | 12 | 7 | 3 | 0 | 23 |
| 7/17 | 0 | 0 | 1 | 4 | 3 | 1 | 9 |
| 7/18 | 3 | 23 | 2 | 7 | 1 | 1 | 37 |
| 7/19[a] | 3 | 1 | 1 | 8 | 1 | 3 | 17 |
| 7/20 | 0 | 3 | 0 | 7 | 0 | 4 | 14 |
| 7/21[a] | 2 | 4 | 1 | 8 | 5 | 11 | 31 |
| 7/22 | 3 | 5 | 1 | 9 | 9 | 18 | 45 |
| 7/23 | 0 | 22 | 4 | 25 | 23 | 5 | 79 |
| 7/24 | 1 | 14 | 4 | 7 | 11 | 18 | 55 |
| 7/25 | 6 | 0 | 5 | 7 | 12 | 7 | 37 |
| 7/26[a] | 4 | 2 | 6 | 4 | 7 | 4 | 27 |
| 7/27 | 1 | 3 | 7 | 0 | 1 | 0 | 12 |
| 7/28 | 1 | 1 | 2 | 4 | 7 | 7 | 22 |
| 7/29[a] | 0 | 3 | 1 | 6 | 7 | 7 | 24 |
| 7/30 | 0 | 4 | 7 | 8 | 7 | 6 | 32 |
| Total | 41 | 118 | 102 | 161 | 158 | 109 | 701 |
| % | 6% | 17% | 15% | 23% | 23% | 16% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A3.–Estimated pink salmon CPUE by date and station, Upper Cook Inlet offshore test fish project 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0.0 | 2.3 | 2.3 | 1.6 | 2.4 | 0.8 | 9.2 |
| 7/2 | 1.6 | 0.6 | 0.8 | 0.0 | 0.0 | 0.0 | 3.1 |
| 7/3 | 1.5 | 0.8 | 0.8 | 1.4 | 0.8 | 2.4 | 7.7 |
| 7/4 | 2.5 | 0.8 | 0.8 | 0.8 | 4.9 | 2.5 | 12.3 |
| 7/5 | 0.8 | 0.0 | 1.6 | 3.7 | 1.8 | 0.0 | 7.8 |
| 7/6 | 0.0 | 0.0 | 0.0 | 2.3 | 2.3 | 0.8 | 5.4 |
| 7/7 | 0.0 | 0.0 | 5.0 | 3.7 | 2.0 | 1.3 | 12.0 |
| 7/8 | 0.0 | 4.5 | 0.8 | 3.6 | 3.8 | 0.8 | 13.5 |
| 7/9 | 0.0 | 2.7 | 1.6 | 0.8 | 1.6 | 1.6 | 8.3 |
| 7/10 | 0.0 | 1.5 | 1.6 | 3.9 | 2.8 | 2.3 | 12.1 |
| 7/11 | 0.8 | 2.9 | 1.6 | 0.0 | 0.8 | 0.0 | 6.1 |
| 7/12 | 0.0 | 0.0 | 2.1 | 0.8 | 2.3 | 0.0 | 5.2 |
| 7/13[a] | 2.1 | 0.5 | 5.3 | 3.3 | 6.1 | 0.4 | 17.6 |
| 7/14 | 3.7 | 5.7 | 8.5 | 5.8 | 9.8 | 0.8 | 34.3 |
| 7/15 | 0.0 | 2.8 | 0.0 | 3.3 | 0.0 | 0.0 | 6.1 |
| 7/16[a] | 0.0 | 0.8 | 7.6 | 5.3 | 2.4 | 0.0 | 16.0 |
| 7/17 | 0.0 | 0.0 | 0.8 | 3.3 | 2.3 | 0.8 | 7.2 |
| 7/18 | 2.3 | 14.5 | 1.5 | 5.7 | 0.8 | 0.8 | 25.7 |
| 7/19[a] | 2.3 | 0.8 | 0.8 | 5.8 | 0.4 | 2.0 | 12.0 |
| 7/20 | 0.0 | 2.5 | 0.0 | 4.9 | 0.0 | 3.1 | 10.5 |
| 7/21[a] | 1.1 | 3.3 | 0.4 | 5.6 | 3.4 | 7.9 | 21.7 |
| 7/22 | 2.2 | 4.1 | 0.8 | 6.2 | 6.7 | 12.6 | 32.5 |
| 7/23 | 0.0 | 13.7 | 2.7 | 18.0 | 45.6 | 3.7 | 83.7 |
| 7/24 | 0.8 | 9.5 | 3.0 | 5.3 | 8.8 | 13.1 | 40.5 |
| 7/25 | 4.9 | 0.0 | 3.7 | 5.2 | 8.2 | 5.6 | 27.5 |
| 7/26[a] | 2.9 | 1.2 | 4.4 | 2.6 | 4.5 | 2.8 | 18.4 |
| 7/27 | 0.8 | 2.4 | 5.3 | 0.0 | 0.8 | 0.0 | 9.2 |
| 7/28 | 0.8 | 0.8 | 1.6 | 3.1 | 5.3 | 5.5 | 16.9 |
| 7/29[a] | 0.0 | 1.9 | 0.8 | 4.7 | 5.5 | 5.2 | 18.1 |
| 7/30 | 0.0 | 3.0 | 5.5 | 6.2 | 5.8 | 4.9 | 25.3 |
| Total | 31 | 83 | 72 | 117 | 142 | 82 | 526 |
| Percent | 6% | 16% | 14% | 22% | 27% | 16% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A4.–Summary of chum salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2009.

| Date | Number of Stations | Mean Fishing Time (min) | CATCH | | CPUE | |
|---|---|---|---|---|---|---|
| | | | Daily | Cum | Daily | Cum |
| 7/1 | 6 | 230.0 | 1 | 1 | 1 | 1 |
| 7/2 | 6 | 230.5 | 1 | 2 | 1 | 2 |
| 7/3 | 6 | 233.5 | 0 | 2 | 0 | 2 |
| 7/4 | 6 | 220.5 | 1 | 3 | 1 | 2 |
| 7/5 | 6 | 247.0 | 2 | 5 | 1 | 4 |
| 7/6 | 6 | 228.5 | 1 | 6 | 1 | 5 |
| 7/7 | 6 | 230.0 | 8 | 14 | 6 | 11 |
| 7/8 | 6 | 256.5 | 8 | 22 | 6 | 16 |
| 7/9 | 6 | 229.5 | 3 | 25 | 2 | 19 |
| 7/10 | 6 | 257.5 | 13 | 38 | 7 | 26 |
| 7/11 | 6 | 223.5 | 3 | 41 | 2 | 28 |
| 7/12 | 6 | 235.5 | 15 | 56 | 11 | 39 |
| 7/13 | 2[a] | 109.5 | 55 | 111 | 30 | 69 |
| 7/14 | 6 | 280.5 | 73 | 184 | 42 | 110 |
| 7/15 | 6 | 228.5 | 11 | 195 | 8 | 118 |
| 7/16 | 5[a] | 198.5 | 24 | 219 | 16 | 135 |
| 7/17 | 6 | 238.5 | 28 | 247 | 20 | 155 |
| 7/18 | 6 | 235.0 | 20 | 267 | 14 | 169 |
| 7/19 | 3[a] | 119.5 | 7 | 274 | 5 | 174 |
| 7/20 | 6 | 227.5 | 15 | 289 | 11 | 185 |
| 7/21 | 0[a] | 0.0 | 25 | 314 | 17 | 202 |
| 7/22 | 6 | 240.5 | 32 | 346 | 23 | 225 |
| 7/23 | 6 | 255.0 | 24 | 370 | 16 | 241 |
| 7/24 | 6 | 238.5 | 17 | 387 | 13 | 254 |
| 7/25 | 6 | 210.0 | 13 | 400 | 10 | 264 |
| 7/26 | 0[a] | 0.0 | 12 | 412 | 8 | 272 |
| 7/27 | 6 | 226.5 | 9 | 421 | 7 | 279 |
| 7/28 | 6 | 231.0 | 10 | 431 | 8 | 287 |
| 7/29 | 4[a] | 74.5 | 12 | 443 | 9 | 295 |
| 7/30 | 6 | 228.5 | 11 | 454 | 8 | 303 |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A5.–Estimated chum salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2009

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7/2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7/3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7/5 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 7/6 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7/7 | 1 | 0 | 2 | 1 | 4 | 0 | 8 |
| 7/8 | 1 | 3 | 1 | 0 | 3 | 0 | 8 |
| 7/9 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| 7/10 | 0 | 0 | 1 | 7 | 5 | 0 | 13 |
| 7/11 | 0 | 2 | 0 | 0 | 0 | 1 | 3 |
| 7/12 | 0 | 5 | 5 | 1 | 4 | 0 | 15 |
| 7/13[a] | 0 | 15 | 13 | 15 | 10 | 2 | 55 |
| 7/14 | 0 | 5 | 20 | 29 | 16 | 3 | 73 |
| 7/15 | 1 | 7 | 3 | 0 | 0 | 0 | 11 |
| 7/16[a] | 2 | 0 | 15 | 5 | 2 | 0 | 24 |
| 7/17 | 3 | 6 | 3 | 0 | 15 | 1 | 28 |
| 7/18 | 4 | 11 | 2 | 0 | 2 | 1 | 20 |
| 7/19[a] | 1 | 0 | 2 | 2 | 1 | 1 | 7 |
| 7/20 | 0 | 2 | 2 | 10 | 0 | 1 | 15 |
| 7/21[a] | 1 | 1 | 2 | 14 | 5 | 2 | 25 |
| 7/22 | 1 | 0 | 1 | 18 | 10 | 2 | 32 |
| 7/23 | 1 | 7 | 0 | 2 | 13 | 1 | 24 |
| 7/24 | 0 | 0 | 3 | 6 | 5 | 3 | 17 |
| 7/25 | 1 | 0 | 2 | 7 | 2 | 1 | 13 |
| 7/26[a] | 1 | 0 | 5 | 4 | 1 | 1 | 12 |
| 7/27 | 0 | 0 | 7 | 1 | 0 | 1 | 9 |
| 7/28 | 1 | 0 | 0 | 3 | 5 | 1 | 10 |
| 7/29[a] | 0 | 4 | 1 | 3 | 3 | 1 | 12 |
| 7/30 | 0 | 7 | 0 | 2 | 1 | 1 | 11 |
| Total | 21 | 75 | 95 | 130 | 108 | 25 | 454 |
| Percent | 5% | 17% | 21% | 29% | 24% | 6% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A6.–Estimated chum salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.8 |
| 7/2 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 |
| 7/3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/4 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 |
| 7/5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.7 | 1.3 |
| 7/6 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.8 |
| 7/7 | 0.8 | 0.0 | 1.4 | 1.2 | 2.6 | 0.0 | 6.1 |
| 7/8 | 0.8 | 2.3 | 0.8 | 0.0 | 1.6 | 0.0 | 5.5 |
| 7/9 | 0.0 | 0.0 | 2.4 | 0.0 | 0.0 | 0.0 | 2.4 |
| 7/10 | 0.0 | 0.0 | 0.8 | 3.9 | 2.8 | 0.0 | 7.5 |
| 7/11 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.8 | 2.3 |
| 7/12 | 0.0 | 3.4 | 3.6 | 0.8 | 3.0 | 0.0 | 10.7 |
| 7/13[a] | 0.0 | 6.8 | 7.1 | 8.1 | 6.4 | 1.2 | 29.6 |
| 7/14 | 0.0 | 3.6 | 10.6 | 15.4 | 9.8 | 2.4 | 41.7 |
| 7/15 | 0.8 | 4.9 | 2.4 | 0.0 | 0.0 | 0.0 | 8.1 |
| 7/16[a] | 1.5 | 0.0 | 9.5 | 3.8 | 1.6 | 0.0 | 16.3 |
| 7/17 | 2.2 | 3.8 | 2.1 | 0.0 | 11.4 | 0.8 | 20.3 |
| 7/18 | 3.1 | 6.9 | 1.5 | 0.0 | 1.6 | 0.8 | 14.0 |
| 7/19[a] | 0.8 | 0.0 | 1.5 | 1.4 | 0.8 | 0.8 | 5.3 |
| 7/20 | 0.0 | 1.7 | 1.5 | 7.0 | 0.0 | 0.8 | 11.0 |
| 7/21[a] | 0.4 | 0.9 | 1.2 | 9.7 | 3.7 | 1.1 | 17.0 |
| 7/22 | 0.7 | 0.0 | 0.8 | 12.4 | 7.4 | 1.4 | 22.8 |
| 7/23 | 0.8 | 4.4 | 0.0 | 1.4 | 8.8 | 0.7 | 16.2 |
| 7/24 | 0.0 | 0.0 | 2.3 | 4.5 | 4.0 | 2.2 | 13.0 |
| 7/25 | 0.8 | 0.0 | 1.5 | 5.2 | 1.4 | 0.8 | 9.6 |
| 7/26[a] | 0.4 | 0.0 | 3.4 | 3.0 | 0.7 | 0.8 | 8.3 |
| 7/27 | 0.0 | 0.0 | 5.3 | 0.8 | 0.0 | 0.8 | 6.9 |
| 7/28 | 0.8 | 0.0 | 0.0 | 2.3 | 3.8 | 0.8 | 7.6 |
| 7/29[a] | 0.0 | 2.6 | 0.8 | 2.0 | 2.3 | 0.8 | 8.5 |
| 7/30 | 0.0 | 5.2 | 0.0 | 1.6 | 0.8 | 0.8 | 8.4 |
| Total | 16 | 48 | 62 | 84 | 75 | 19 | 303 |
| Percent | 5% | 16% | 20% | 28% | 25% | 6% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A7.–Summary of coho salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2009.

| Date | Number of Stations | Mean Fishing Time (min) | CATCH | | CPUE | |
|---|---|---|---|---|---|---|
| | | | Daily | Cum | Daily | Cum |
| 7/1 | 6 | 230.0 | 0 | 0 | 0 | 0 |
| 7/2 | 6 | 230.5 | 0 | 0 | 0 | 0 |
| 7/3 | 6 | 233.5 | 0 | 0 | 0 | 0 |
| 7/4 | 6 | 220.5 | 0 | 0 | 0 | 0 |
| 7/5 | 6 | 247.0 | 1 | 1 | 1 | 1 |
| 7/6 | 6 | 228.5 | 0 | 1 | 0 | 1 |
| 7/7 | 6 | 230.0 | 2 | 3 | 1 | 2 |
| 7/8 | 6 | 256.5 | 9 | 12 | 5 | 7 |
| 7/9 | 6 | 229.5 | 2 | 14 | 2 | 9 |
| 7/10 | 6 | 257.5 | 9 | 23 | 6 | 15 |
| 7/11 | 6 | 223.5 | 8 | 31 | 6 | 20 |
| 7/12 | 6 | 235.5 | 4 | 35 | 3 | 23 |
| 7/13 | 2[a] | 109.5 | 28 | 63 | 14 | 37 |
| 7/14 | 6 | 280.5 | 27 | 90 | 15 | 52 |
| 7/15 | 6 | 228.5 | 12 | 102 | 9 | 61 |
| 7/16 | 5[a] | 198.5 | 25 | 127 | 18 | 78 |
| 7/17 | 6 | 238.5 | 9 | 136 | 6 | 84 |
| 7/18 | 6 | 235.0 | 26 | 162 | 18 | 102 |
| 7/19 | 3[a] | 119.5 | 18 | 180 | 13 | 115 |
| 7/20 | 6 | 227.5 | 23 | 203 | 18 | 133 |
| 7/21 | 0[a] | 0.0 | 30 | 233 | 22 | 154 |
| 7/22 | 6 | 240.5 | 33 | 266 | 25 | 179 |
| 7/23 | 6 | 255.0 | 39 | 305 | 27 | 206 |
| 7/24 | 6 | 238.5 | 51 | 356 | 37 | 243 |
| 7/25 | 6 | 210.0 | 27 | 383 | 20 | 263 |
| 7/26 | 0[a] | 0.0 | 27 | 410 | 20 | 283 |
| 7/27 | 6 | 226.5 | 24 | 434 | 19 | 302 |
| 7/28 | 6 | 231.0 | 33 | 467 | 26 | 327 |
| 7/29 | 4[a] | 74.5 | 22 | 489 | 16 | 343 |
| 7/30 | 6 | 228.5 | 23 | 512 | 18 | 361 |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A8.–Estimated coho salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/5 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7/6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/7 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| 7/8 | 0 | 0 | 0 | 3 | 6 | 0 | 9 |
| 7/9 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| 7/10 | 0 | 0 | 3 | 3 | 3 | 0 | 9 |
| 7/11 | 0 | 8 | 0 | 0 | 0 | 0 | 8 |
| 7/12 | 0 | 2 | 0 | 0 | 2 | 0 | 4 |
| 7/13[a] | 2 | 11 | 7 | 5 | 3 | 0 | 28 |
| 7/14 | 0 | 2 | 13 | 9 | 3 | 0 | 27 |
| 7/15 | 0 | 8 | 4 | 0 | 0 | 0 | 12 |
| 7/16[a] | 1 | 1 | 16 | 5 | 1 | 1 | 25 |
| 7/17 | 2 | 5 | 0 | 1 | 1 | 0 | 9 |
| 7/18 | 2 | 18 | 1 | 5 | 0 | 0 | 26 |
| 7/19[a] | 3 | 0 | 3 | 8 | 1 | 3 | 18 |
| 7/20 | 8 | 1 | 5 | 3 | 1 | 5 | 23 |
| 7/21[a] | 6 | 6 | 4 | 6 | 3 | 5 | 30 |
| 7/22 | 3 | 11 | 2 | 8 | 5 | 4 | 33 |
| 7/23 | 2 | 16 | 2 | 10 | 4 | 5 | 39 |
| 7/24 | 0 | 8 | 3 | 12 | 2 | 26 | 51 |
| 7/25 | 4 | 0 | 6 | 7 | 6 | 4 | 27 |
| 7/26[a] | 2 | 2 | 8 | 10 | 3 | 2 | 27 |
| 7/27 | 0 | 3 | 9 | 12 | 0 | 0 | 24 |
| 7/28 | 0 | 4 | 14 | 1 | 12 | 2 | 33 |
| 7/29[a] | 0 | 8 | 2 | 3 | 7 | 2 | 22 |
| 7/30 | 1 | 12 | 3 | 5 | 1 | 1 | 23 |
| Total | 36 | 127 | 108 | 116 | 64 | 61 | 512 |
| Percent | 7% | 25% | 21% | 23% | 13% | 12% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A9.–Estimated coho salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/5 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.8 |
| 7/6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/7 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 1.4 |
| 7/8 | 0.0 | 0.0 | 0.0 | 1.8 | 3.2 | 0.0 | 5.0 |
| 7/9 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.8 | 1.5 |
| 7/10 | 0.0 | 0.0 | 2.5 | 1.6 | 1.7 | 0.0 | 5.8 |
| 7/11 | 0.0 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 5.8 |
| 7/12 | 0.0 | 1.3 | 0.0 | 0.0 | 1.5 | 0.0 | 2.8 |
| 7/13[a] | 1.4 | 4.9 | 3.5 | 2.4 | 1.7 | 0.0 | 13.9 |
| 7/14 | 0.0 | 1.4 | 6.9 | 4.8 | 1.8 | 0.0 | 14.9 |
| 7/15 | 0.0 | 5.6 | 3.2 | 0.0 | 0.0 | 0.0 | 8.8 |
| 7/16[a] | 0.7 | 0.8 | 10.8 | 3.7 | 0.8 | 0.8 | 17.6 |
| 7/17 | 1.4 | 3.1 | 0.0 | 0.8 | 0.8 | 0.0 | 6.1 |
| 7/18 | 1.6 | 11.3 | 0.8 | 4.0 | 0.0 | 0.0 | 17.7 |
| 7/19[a] | 2.2 | 0.0 | 2.3 | 5.8 | 0.4 | 2.0 | 12.7 |
| 7/20 | 6.6 | 0.8 | 3.8 | 2.1 | 0.8 | 3.9 | 18.0 |
| 7/21[a] | 4.4 | 4.9 | 2.7 | 3.8 | 2.3 | 3.4 | 21.5 |
| 7/22 | 2.2 | 8.9 | 1.6 | 5.5 | 3.7 | 2.8 | 24.7 |
| 7/23 | 1.6 | 10.1 | 1.4 | 7.2 | 2.7 | 3.7 | 26.7 |
| 7/24 | 0.0 | 5.4 | 2.3 | 9.0 | 1.6 | 19.0 | 37.3 |
| 7/25 | 3.2 | 0.0 | 4.4 | 5.2 | 4.1 | 3.2 | 20.1 |
| 7/26[a] | 1.6 | 1.2 | 5.6 | 7.5 | 2.1 | 1.6 | 19.6 |
| 7/27 | 0.0 | 2.4 | 6.7 | 9.7 | 0.0 | 0.0 | 18.8 |
| 7/28 | 0.0 | 3.0 | 11.2 | 0.8 | 9.0 | 1.5 | 25.5 |
| 7/29[a] | 0.0 | 6.0 | 1.6 | 2.4 | 4.9 | 1.2 | 16.1 |
| 7/30 | 0.8 | 8.9 | 2.3 | 3.9 | 0.8 | 0.8 | 17.5 |
| Total | 28 | 87 | 76 | 82 | 44 | 45 | 361 |
| Percent | 8% | 24% | 21% | 23% | 12% | 12% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A10.–Summary of Chinook salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2009.

| Date | Number of Stations | Mean Fishing Time (min) | CATCH Daily | CATCH Cum | CPUE Daily | CPUE Cum |
|---|---|---|---|---|---|---|
| 7/1 | 6 | 230.0 | 0 | 0 | 0 | 0 |
| 7/2 | 6 | 230.0 | 0 | 0 | 0 | 0 |
| 7/3 | 6 | 233.0 | 1 | 1 | 1 | 1 |
| 7/4 | 6 | 220.0 | 2 | 3 | 2 | 2 |
| 7/5 | 6 | 247.0 | 0 | 3 | 0 | 2 |
| 7/6 | 6 | 228.0 | 0 | 3 | 0 | 2 |
| 7/7 | 6 | 230.0 | 0 | 3 | 0 | 2 |
| 7/8 | 6 | 256.0 | 0 | 3 | 0 | 2 |
| 7/9 | 6 | 229.0 | 0 | 3 | 0 | 2 |
| 7/10 | 6 | 257.0 | 1 | 4 | 1 | 3 |
| 7/11 | 6 | 223.0 | 2 | 6 | 2 | 5 |
| 7/12 | 6 | 235.0 | 1 | 7 | 1 | 5 |
| 7/13 | 2[a] | 109.0 | 1 | 8 | 0 | 6 |
| 7/14 | 6 | 280.0 | 0 | 8 | 0 | 6 |
| 7/15 | 6 | 228.0 | 0 | 8 | 0 | 6 |
| 7/16 | 5[a] | 198.0 | 0 | 8 | 0 | 6 |
| 7/17 | 6 | 238.0 | 1 | 9 | 1 | 6 |
| 7/18 | 6 | 235.0 | 0 | 9 | 0 | 6 |
| 7/19 | 3[a] | 119.0 | 0 | 9 | 0 | 6 |
| 7/20 | 6 | 227.0 | 0 | 9 | 0 | 6 |
| 7/21 | 0[a] | 0.0 | 0 | 9 | 0 | 6 |
| 7/22 | 6 | 240.0 | 0 | 9 | 0 | 6 |
| 7/23 | 6 | 255.0 | 0 | 9 | 0 | 6 |
| 7/24 | 6 | 238.0 | 0 | 9 | 0 | 6 |
| 7/25 | 6 | 210.0 | 0 | 9 | 0 | 6 |
| 7/26 | 0[a] | 0.0 | 1 | 10 | 0 | 7 |
| 7/27 | 6 | 226.0 | 1 | 11 | 1 | 8 |
| 7/28 | 6 | 231.0 | 0 | 11 | 0 | 8 |
| 7/29 | 4[a] | 74.0 | 0 | 11 | 0 | 8 |
| 7/30 | 6 | 228.0 | 0 | 11 | 0 | 8 |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A11.–Estimated Chinook salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2009.

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/3 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 7/4 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| 7/5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/10 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 7/11 | 0 | 0 | 1 | 0 | 0 | 1 | 2 |
| 7/12 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7/13[a] | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7/14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/16[a] | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/17 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7/18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/19[a] | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/21[a] | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/26[a] | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7/27 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7/28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/29[a] | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 2 | 3 | 2 | 3 | 1 | 11 |
| Percent | 0% | 18% | 27% | 18% | 27% | 9% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A12.–Estimated Chinook salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2009

| | Station Number | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | 4 | 5 | 6 | 6.5 | 7 | 8 | Total |
| 7/1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/3 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.7 |
| 7/4 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 |
| 7/5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/10 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.5 |
| 7/11 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.8 | 1.6 |
| 7/12 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.7 |
| 7/13[a] | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.4 |
| 7/14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/16[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/17 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.8 |
| 7/18 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/19[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/21[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/22 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/23 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/24 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/25 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/26[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.4 |
| 7/27 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.8 |
| 7/28 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/29[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7/30 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 0 | 2 | 2 | 1 | 2 | 1 | 8 |
| Percent | 0% | 21% | 25% | 16% | 27% | 11% | 100% |

[a] Not all stations fished because of weather; the data for missing stations was interpolated.

Appendix A13.–Entry pattern of sockeye salmon into Upper Cook Inlet, Alaska, 2009 estimated from daily CPUE measured at the latitude of Anchor Point

| Day | Date | Input y | Estimated y | Residual | Change in Input Y | Change in Estimated Y |
|---|---|---|---|---|---|---|
| 8 | 1 Jul | 0.0483 | 0.1701 | -0.1208 | | |
| 9 | 2 Jul | 0.1875 | 0.1927 | -0.0051 | 0.1393 | 0.0226 |
| 10 | 3 Jul | 0.2277 | 0.2174 | 0.0103 | 0.0402 | 0.0248 |
| 11 | 4 Jul | 0.2859 | 0.2444 | 0.0415 | 0.0582 | 0.0270 |
| 12 | 5 Jul | 0.2893 | 0.2736 | 0.0157 | 0.0034 | 0.0292 |
| 13 | 6 Jul | 0.2912 | 0.3048 | -0.0136 | 0.0019 | 0.0313 |
| 14 | 7 Jul | 0.3107 | 0.3380 | -0.0273 | 0.0195 | 0.0332 |
| 15 | 8 Jul | 0.3602 | 0.3728 | -0.0126 | 0.0495 | 0.0348 |
| 16 | 9 Jul | 0.3916 | 0.4090 | -0.0175 | 0.0313 | 0.0362 |
| 17 | 10 Jul | 0.4370 | 0.4463 | -0.0092 | 0.0455 | 0.0372 |
| 18 | 11 Jul | 0.4860 | 0.4841 | 0.0019 | 0.0490 | 0.0378 |
| 19 | 12 Jul | 0.5415 | 0.5221 | 0.0194 | 0.0555 | 0.0380 |
| 20 | 13 Jul | 0.5914 | 0.5599 | 0.0315 | 0.0499 | 0.0378 |
| 21 | 14 Jul | 0.6279 | 0.5970 | 0.0310 | 0.0365 | 0.0371 |
| 22 | 15 Jul | 0.6780 | 0.6330 | 0.0450 | 0.0501 | 0.0360 |
| 23 | 16 Jul | 0.7014 | 0.6675 | 0.0338 | 0.0234 | 0.0346 |
| 24 | 17 Jul | 0.7418 | 0.7004 | 0.0414 | 0.0404 | 0.0329 |
| 25 | 18 Jul | 0.7461 | 0.7313 | 0.0148 | 0.0044 | 0.0309 |
| 26 | 19 Jul | 0.7477 | 0.7602 | -0.0125 | 0.0015 | 0.0288 |
| 27 | 20 Jul | 0.7704 | 0.7868 | -0.0164 | 0.0227 | 0.0266 |
| 28 | 21 Jul | 0.7905 | 0.8112 | -0.0207 | 0.0201 | 0.0244 |
| 29 | 22 Jul | 0.8369 | 0.8334 | 0.0035 | 0.0463 | 0.0222 |
| 30 | 23 Jul | 0.8393 | 0.8535 | -0.0141 | 0.0025 | 0.0201 |
| 31 | 24 Jul | 0.8456 | 0.8715 | -0.0259 | 0.0063 | 0.0180 |
| 32 | 25 Jul | 0.8556 | 0.8876 | -0.0320 | 0.0100 | 0.0161 |
| 33 | 26 Jul | 0.8639 | 0.9019 | -0.0380 | 0.0082 | 0.0143 |
| 34 | 27 Jul | 0.8699 | 0.9146 | -0.0447 | 0.0060 | 0.0127 |
| 35 | 28 Jul | 0.8984 | 0.9257 | -0.0273 | 0.0286 | 0.0112 |
| 36 | 29 Jul | 0.9107 | 0.9355 | -0.0248 | 0.0123 | 0.0098 |
| 37 | 30 Jul | 0.9364 | 0.9441 | -0.0078 | 0.0256 | 0.0086 |
| 38 | 31 Jul | 0.9517 | 0.9516 | 0.0001 | 0.0153 | 0.0075 |

Appendix A14.–Chemical and physical observations made in Upper Cook Inlet, Alaska, during the 2009 offshore test fish project.

| Date | Sta | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Tide Stage | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1 Jul | 4 | 10 | 8.2 | 3 | south | flood | 33.4 | 25.8 | 8.0 |
| | 5 | 10 | 8.9 | 5 | south | flood | 32.4 | 37.2 | 5.0 |
| | 6 | 10 | 10.1 | 6 | south | flood | 32.6 | 47.3 | 4.5 |
| | 6.5 | 10 | 9.6 | 6 | south | high | 31.8 | 44.3 | 5.0 |
| | 7 | 9 | 9.6 | 8 | south | high | 32.1 | 45.4 | 4.0 |
| | 8 | 9 | 9.5 | 9 | south | high | 32.0 | 26.1 | 4.5 |
| 2 Jul | 8 | 10 | 9.0 | 15 | south | ebb | 32.0 | 29.1 | 4.0 |
| | 7 | 10 | 9.0 | 12 | southwest | ebb | 31.8 | 44.6 | 3.0 |
| | 6.5 | 10 | 9.3 | 12 | southwest | ebb | 30.8 | 42.5 | 5.0 |
| | 6 | 10 | 9.4 | 10 | southwest | high | 30.8 | 47.9 | 3.0 |
| | 5 | 10 | 9.6 | 10 | southwest | flood | 31.1 | 35.1 | 5.0 |
| | 4 | 10 | 9.2 | 10 | west | flood | 32.7 | 25.0 | 7.0 |
| 3 Jul | 4 | 10 | 9.3 | 5 | south | high | 31.2 | 24.4 | 8.0 |
| | 5 | 10 | 10.1 | 5 | south | high | 30.3 | 36.4 | 3.5 |
| | 6 | 10 | 10.3 | 5 | south | flood | 29.9 | 47.5 | 4.0 |
| | 6.5 | 11 | 10.1 | 4 | south | flood | 30.3 | 43.3 | 3.0 |
| | 7 | 11 | 10.3 | 4 | south | flood | 30.4 | 45.6 | 4.0 |
| | 8 | 11 | 10.1 | 8 | south | flood | 30.1 | 26.2 | 4.0 |
| 4 Jul | 8 | 10 | 9.5 | 7 | south | ebb | 31.8 | 28.9 | 5.0 |
| | 7 | 10 | 9.4 | 8 | southeast | ebb | 31.9 | 43.8 | 4.0 |
| | 6.5 | 10 | 9.7 | 7 | southeast | ebb | 31.0 | 41.6 | 3.0 |
| | 6 | 11 | 10.2 | 11 | southeast | ebb | 30.1 | 46.4 | 3.0 |
| | 5 | 11 | 10.3 | 6 | east | high | 30.6 | 36.2 | 4.0 |
| | 4 | 11 | 8.8 | 3 | east | flood | 33.4 | 25.7 | 8.0 |
| 5 Jul | 4 | 10 | 9.2 | 1 | southeast | ebb | 32.8 | 24.0 | 6.0 |
| | 5 | 14 | 9.2 | 0 | southeast | high | 32.2 | 35.9 | 6.0 |
| | 6 | 14 | 9.5 | 1 | southeast | flood | 32.0 | 47.1 | 4.0 |
| | 6.5 | 14 | 10.2 | 1 | southeast | flood | 31.3 | 43.6 | 4.0 |
| | 7 | 13 | 10.5 | 3 | southeast | flood | 31.3 | 46.8 | 4.0 |
| | 8 | 13 | 10.8 | 3 | southeast | flood | 30.7 | 32.9 | 4.0 |
| 6 Jul | 8 | 10 | 9.7 | 10 | southeast | ebb | 31.7 | 31.0 | 3.0 |
| | 7 | 10 | 9.8 | 8 | southeast | ebb | 31.3 | 43.6 | 3.5 |
| | 6.5 | 10 | 9.5 | 8 | southeast | ebb | 31.5 | 42.3 | 4.0 |
| | 6 | 10 | 9.6 | 6 | southeast | ebb | 31.5 | 47.3 | 4.0 |
| | 5 | 9 | 8.9 | 5 | southeast | ebb | 32.9 | 35.4 | 7.0 |
| | 4 | 10 | 9.0 | 3 | southeast | high | 33.5 | 28.4 | 8.0 |

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| Date | Sta | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Tide Stage | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|---|
| 7 Jul | 4 | 11 | 9.0 | 2 | southwest | high | 33.4 | 23.6 | 8.0 |
| | 5 | 12 | 8.9 | 0 | southwest | high | 33.6 | 36.2 | 7.0 |
| | 6 | 12 | 8.7 | 2 | southwest | flood | 33.1 | 48.8 | 5.0 |
| | 6.5 | 13 | 10.1 | 2 | southwest | flood | 32.0 | 43.5 | 4.0 |
| | 7 | 13 | 10.3 | 2 | southwest | flood | 31.5 | 46.4 | 4.0 |
| | 8 | 13 | 10.2 | 3 | southwest | flood | 31.8 | 29.6 | 3.0 |
| 8 Jul | 8 | 11 | 9.7 | 6 | south | high | 31.8 | 30.6 | 4.0 |
| | 7 | 11 | 9.9 | 3 | south | ebb | 31.7 | 45.3 | 4.0 |
| | 6.5 | 11 | 9.6 | 8 | south | ebb | 32.0 | 38.5 | 4.0 |
| | 6 | 11 | 9.7 | 8 | south | ebb | 31.8 | 45.1 | 3.0 |
| | 5 | 11 | 9.8 | 7 | southwest | ebb | 32.1 | 35.6 | 4.0 |
| | 4 | 11 | 9.0 | 6 | southwest | high | 33.5 | 23.9 | 8.0 |
| 9 Jul | 4 | 10 | 8.6 | 13 | south | ebb | 33.8 | 23.3 | 8.0 |
| | 5 | 10 | 9.7 | 10 | south | ebb | 32.1 | 35.0 | 4.0 |
| | 6 | 10 | 10.7 | 8 | south | ebb | 30.9 | 45.7 | 3.0 |
| | 6.5 | 12 | 10.8 | 6 | south | high | 30.8 | 40.4 | 3.0 |
| | 7 | 12 | 11.0 | 6 | south | flood | 30.8 | 45.0 | 3.0 |
| | 8 | 12 | 10.4 | 4 | south | flood | 31.4 | 26.4 | 2.0 |
| 10 Jul | 8 | 11 | 9.8 | 4 | south | flood | 31.8 | 31.8 | 5.0 |
| | 7 | 11 | 9.9 | 6 | south | ebb | 31.9 | 44.3 | 4.0 |
| | 6.5 | 11 | 9.8 | 9 | south | ebb | 32.0 | 43.2 | 4.0 |
| | 6 | 13 | 9.9 | 8 | south | ebb | 31.8 | 46.1 | 3.0 |
| | 5 | 10 | 9.9 | 7 | south | ebb | 33.2 | 33.9 | 5.0 |
| | 4 | 11 | 9.4 | 7 | south | ebb | 33.7 | 23.0 | 7.0 |
| 11 Jul | 4 | 11 | 8.7 | 5 | south | ebb | 33.6 | 24.2 | 7.0 |
| | 5 | 11 | 10.1 | 7 | south | ebb | 31.6 | 32.9 | 3.0 |
| | 6 | 11 | 10.3 | 7 | south | ebb | 31.6 | 46.0 | 3.5 |
| | 6.5 | 12 | 10.6 | 5 | southwest | high | 31.0 | 41.9 | 3.5 |
| | 7 | 11 | 10.6 | 5 | south | flood | 31.1 | 45.0 | 3.0 |
| | 8 | 12 | 10.0 | 2 | south | flood | 31.9 | 30.7 | 2.0 |
| 12 Jul | 8 | 10 | 10.1 | 4 | southwest | high | 31.7 | 30.9 | 2.5 |
| | 7 | 10 | 10.2 | 6 | southwest | flood | 31.6 | 46.0 | 3.5 |
| | 6.5 | 11 | 10.6 | 2 | southwest | flood | 31.0 | 43.8 | 4.0 |
| | 6 | 10 | 10.6 | 4 | southeast | high | 31.1 | 49.3 | 4.0 |
| | 5 | 10 | 10.2 | 2 | southeast | ebb | 31.7 | 33.1 | 5.0 |
| | 4 | 9 | 8.6 | 2 | south | ebb | 33.6 | 22.9 | 8.0 |

-continued-

| Date | Sta | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Tide Stage | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|---|
| 13 Jul | 4 | 10 | 8.5 | 12 | southwest | flood | 33.7 | 25.3 | 7.0 |
| | 5 | 10 | 10.3 | 15 | south | high | 31.5 | 33.2 | 5.5 |
| | 6 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 6.5 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 7 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 8 | nd | nd | nd | nd | nd | nd | nd | nd |
| 14 Jul | 8 | 11 | 10.2 | 8 | south | flood | 31.9 | 31.5 | 3.0 |
| | 7 | 12 | 10.9 | 7 | south | high | 30.5 | 45.7 | 3.5 |
| | 6.5 | 12 | 10.8 | 4 | south | high | 30.7 | 43.2 | 3.5 |
| | 6 | 12 | 10.3 | 3 | south | ebb | 31.2 | 46.2 | 3.5 |
| | 5 | 12 | 11.0 | 6 | south | ebb | 30.7 | 35.0 | 4.0 |
| | 4 | 13 | 11.5 | 7 | south | ebb | 30.5 | 23.2 | 4.0 |
| 15 Jul | 4 | 13 | 9.1 | 1 | south | ebb | 33.3 | 24.4 | 9.5 |
| | 5 | 13 | 11.8 | 1 | south | ebb | 30.0 | 35.5 | 3.5 |
| | 6 | 14 | 11.8 | 3 | south | ebb | 29.9 | 47.1 | 3.0 |
| | 6.5 | 14 | 11.9 | 3 | south | ebb | 31.3 | 42.9 | 4.0 |
| | 7 | 14 | 12.4 | 3 | south | ebb | 29.4 | 45.0 | 3.5 |
| | 8 | 14 | 12.0 | 2 | south | high | 31.2 | 26.9 | 4.0 |
| 16 Jul | 8 | 13 | 11.5 | 1 | southwest | ebb | 29.9 | 29.5 | 4 |
| | 7 | 12 | 11.4 | 5 | south | high | 30.6 | 45.3 | 3.5 |
| | 6.5 | 12 | 11.8 | 5 | south | flood | 30.1 | 43.1 | 4.0 |
| | 6 | 12 | 11.8 | 7 | south | flood | 29.9 | 43.4 | 4.5 |
| | 5 | 11 | 9.2 | 8 | south | flood | 33.3 | 35.6 | 7.0 |
| | 4 | nd | nd | nd | nd | nd | nd | nd | nd |
| 17 Jul | 4 | 13 | 10.5 | 4 | southwest | flood | 32.5 | 25.2 | 6.0 |
| | 5 | 13 | 9.8 | 8 | southwest | flood | 33.3 | 37.0 | 8.0 |
| | 6 | 11 | 13.5 | 8 | southwest | flood | 30.0 | 47.6 | 4.0 |
| | 6.5 | 13 | 12.2 | 8 | southwest | flood | 28.9 | 40.6 | 5.0 |
| | 7 | 12 | 13.0 | 8 | southwest | high | 30.3 | 45.6 | 3.5 |
| | 8 | 12 | 13.1 | 9 | southwest | ebb | 28.8 | 27.8 | 3.5 |
| 18 Jul | 8 | 12 | 12.7 | 5 | south | ebb | 29.7 | 28.0 | 4.0 |
| | 7 | 12 | 11.6 | 2 | south | ebb | 29.4 | 42.0 | 4.5 |
| | 6.5 | 12 | 11.5 | 8 | northeast | ebb | 28.3 | 42.4 | 3.5 |
| | 6 | 13 | 12.2 | 7 | northeast | high | 28.5 | 46.9 | 4.0 |
| | 5 | 12 | 11.4 | 8 | northeast | flood | 30.8 | 36.7 | 6.0 |
| | 4 | 12 | 9.3 | 6 | northeast | flood | 33.5 | 25.1 | 8.0 |

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Appendix A14.–Page 4 of 5.

| Date | Sta | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Tide Stage | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|---|
| 19 Jul | 4 | 12 | 9.3 | 15 | northwest | high | 33.6 | 24.5 | 8.0 |
| | 5 | 12 | 8.9 | 15 | northwest | high | 33.5 | 36.5 | 6.0 |
| | 6 | na | na | na | na | na | na | na | na |
| | 6.5 | 13 | 10.3 | 17 | northwest | flood | 31.4 | 41.5 | 3.0 |
| | 7 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 8 | nd | nd | nd | nd | nd | nd | nd | nd |
| 20 Jul | 8 | 13 | 11.3 | 9 | northwest | ebb | 30.4 | 28.0 | 3.5 |
| | 7 | 13 | 10.8 | 6 | northwest | ebb | 30.6 | 43.5 | 4.0 |
| | 6.5 | 14 | 11.5 | 4 | northwest | ebb | 30.2 | 41.4 | 4.0 |
| | 6 | 13 | 9.2 | 1 | northwest | ebb | 32.9 | 45.1 | 5.5 |
| | 5 | 12 | 8.8 | 4 | north | flood | 33.8 | 36.2 | 8.5 |
| | 4 | 12 | 9.5 | 3 | north | flood | 33.7 | 25.1 | 6.0 |
| 21 Jul | 4 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 5 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 6 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 6.5 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 7 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 8 | nd | nd | nd | nd | nd | nd | nd | nd |
| 22 Jul | 4 | 11 | 9.5 | 2 | east | flood | 33.7 | 23.9 | 6.0 |
| | 5 | 11 | 9.5 | 3 | east | flood | 32.8 | 47.9 | 4.0 |
| | 6 | 11 | 8.7 | 5 | northeast | flood | 33.2 | 50.4 | 6.0 |
| | 6.5 | 11 | 8.4 | 5 | northeast | flood | 33.4 | 43.6 | 3.5 |
| | 7 | 12 | 9.4 | 3 | northeast | flood | 32.2 | 46.4 | 3.5 |
| | 8 | 13 | 9.4 | 1 | northeast | ebb | 32.1 | 32.0 | 3.5 |
| 23 Jul | 8 | 11 | 9.6 | 13 | northeast | high | 32.0 | 32.8 | 3.0 |
| | 7 | 11 | 9.4 | 9 | northeast | ebb | 32.2 | 45.2 | 3.0 |
| | 6.5 | 11 | 10.2 | 8 | northeast | ebb | 31.1 | 42.6 | 3.0 |
| | 6 | 11 | 9.5 | 7 | northeast | ebb | 32.4 | 45.3 | 4.0 |
| | 5 | 11 | 9.0 | 7 | northeast | low | 33.3 | 36.4 | 6.0 |
| | 4 | 11 | 9.3 | 10 | northeast | flood | 33.5 | 24.5 | 6.0 |
| 24 Jul | 4 | 10 | 8.8 | 10 | northeast | ebb | 33.6 | 22.2 | 5.5 |
| | 5 | 11 | 9.1 | 11 | northeast | ebb | 33.5 | 33.7 | 5.0 |
| | 6 | 11 | 9.6 | 8 | north | high | 32.5 | 45.5 | 2.5 |
| | 6.5 | 11 | 9.9 | 11 | north | flood | 32.1 | 42.5 | 2.5 |
| | 7 | 14 | 9.8 | 8 | north | flood | 32.1 | 45.5 | 2.5 |
| | 8 | 12 | 10.0 | 8 | north | flood | 31.0 | 28.9 | 2.5 |

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Appendix A14.–Page 5 of 5.

| Date | Sta | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Tide Stage | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|---|
| 25 Jul | 8 | 11 | 10.9 | 2.0 | north | flood | 31.1 | 30.9 | 2.5 |
| | 7 | 11 | 9.6 | 5.0 | north | flood | 32.4 | 43.9 | 3.5 |
| | 6.5 | 11 | 9.9 | 4.0 | north | flood | 31.4 | 43.2 | 4.0 |
| | 6 | 12 | 9.9 | 2.0 | north | ebb | 31.7 | 45.7 | 3.0 |
| | 5 | 11 | 9.2 | 7.0 | north | ebb | 33.3 | 31.8 | 6.0 |
| | 4 | 11 | 9.2 | 6.0 | north | ebb | 33.3 | 22.4 | 5.0 |
| 26 Jul | 4 | 11 | 9.0 | 11 | south | ebb | 33.2 | 22.7 | 5.0 |
| | 5 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 6 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 6.5 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 7 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 8 | nd | nd | nd | nd | nd | nd | nd | nd |
| 27 Jul | 4 | 11 | 8.4 | 8 | north | flood | 33.8 | 26.2 | 6.0 |
| | 5 | 11 | 8.3 | 8 | north | high | 33.8 | 36.9 | 6.0 |
| | 6 | 12 | 11.1 | 9 | north | ebb | 30.1 | 44.1 | 3.5 |
| | 6.5 | 12 | 10.1 | 7 | north | ebb | 31.2 | 41.4 | 2.5 |
| | 7 | 14 | 10.0 | 2 | north | high | 31.7 | 44.6 | 2.5 |
| | 8 | 13 | 9.9 | 4 | north | flood | 31.7 | 27.5 | 2.0 |
| 28 Jul | 8 | 12 | 10.9 | 7 | southwest | flood | 30.6 | 31.5 | 3.0 |
| | 7 | 12 | 10.4 | 6 | southwest | flood | 31.6 | 45.6 | 3.5 |
| | 6.5 | 14 | 10.0 | 2 | southwest | flood | 32.3 | 44.4 | 5.0 |
| | 6 | 12 | 8.4 | 1 | southeast | flood | 33.6 | 50.2 | 8.0 |
| | 5 | 12 | 8.4 | 1 | southeast | high | 33.8 | 37.3 | 10.0 |
| | 4 | 11 | 8.6 | 3 | southwest | ebb | 33.6 | 23.9 | 11.0 |
| 29 Jul | 4 | 11 | 8.7 | 6 | south | flood | 33.6 | 25.6 | 8.0 |
| | 5 | 11 | 8.6 | 14 | southwest | flood | 33.7 | 36.6 | 8.0 |
| | 6 | 11 | 9.3 | 16 | southwest | flood | 32.8 | 42.6 | 5.0 |
| | 6.5 | 12 | 10.4 | 15 | southwest | ebb | 31.5 | 43.5 | 3.0 |
| | 7 | nd | nd | nd | nd | nd | nd | nd | nd |
| | 8 | nd | nd | nd | nd | nd | nd | nd | nd |
| 30 Jul | 8 | 11 | 11.1 | 4 | southwest | ebb | 30.0 | 29.6 | 2.5 |
| | 7 | 12 | 11.2 | 3 | southwest | ebb | 30.3 | 45.6 | 3.0 |
| | 6.5 | 11 | 11.7 | 3 | northwest | ebb | 28.9 | 43.0 | 3.0 |
| | 6 | 12 | 11.6 | 3 | northwest | flood | 29.1 | 48.4 | 4.0 |
| | 5 | 10 | 9.6 | 6 | southwest | high | 33.2 | 35.7 | 11.0 |
| | 4 | 11 | 8.8 | 9.0 | northeast | flood | 33.3 | 24.7 | 11.0 |
| Averages | | 11.4 | 10.0 | 6.1 | southeast | ebb | 31.8 | 37.2 | 4.7 |
| Min | | 9.0 | 8.2 | 0.0 | 1.0 | 1.0 | 28.3 | 22.2 | 2.0 |
| Max | | 14.0 | 13.5 | 17.0 | 8.0 | 4.0 | 33.8 | 50.4 | 11.0 |

Appendix A15.–Yearly mean values of physical observations made during the conduct of the 2000-2009 offshore test fish project.

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 4 | 2000 | 13.8 | 9.7 | 10.0 | SE | 31.5 | 23.5 | 10.0 |
| | 2001 | 12.9 | 9.8 | 11.1 | SE | 31.5 | 23.6 | 8.4 |
| | 2002 | 12.6 | 9.5 | 12.6 | S | 31.4 | 23.6 | 8.1 |
| | 2003 | 14.1 | 10.6 | 12.0 | S | 31.2 | 23.4 | 8.3 |
| | 2004 | 10.7 | 9.6 | 7.1 | E | 31.3 | 23.8 | 7.9 |
| | 2005 | 12.9 | 10.9 | 6.2 | S | 31.0 | 24.5 | 7.4 |
| | 2006 | 11.1 | 9.9 | 6.0 | SE | 30.7 | 23.9 | 7.7 |
| | 2007 | 10.8 | 8.6 | 4.7 | SE | 31.2 | 23.9 | 8.1 |
| | 2008 | 11.0 | 9.3 | 8.0 | SE | 30.6 | 22.8 | 8.5 |
| | 2009 | 11.0 | 9.1 | 6.2 | SE | 33.3 | 24.4 | 7.3 |
| | Avg | 12.1 | 9.7 | 8.4 | SE | 31.4 | 23.7 | 8.2 |

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 6 | 2000 | 13.5 | 10.6 | 11.1 | SE | 29.9 | 45.4 | 4.9 |
| | 2001 | 12.8 | 10.7 | 10.7 | S | 30.5 | 46.2 | 5.2 |
| | 2002 | 12.8 | 10.1 | 13.4 | S | 30.4 | 45.1 | 4.2 |
| | 2003 | 14.7 | 11.5 | 12.9 | S | 29.5 | 46.4 | 4.9 |
| | 2004 | 10.6 | 10.3 | 8.0 | SE | 30.1 | 46.6 | 4.6 |
| | 2005 | 12.8 | 11.6 | 8.0 | S | 29.4 | 45.8 | 4.7 |
| | 2006 | 12.8 | 11.6 | 8.0 | S | 29.8 | 45.8 | 4.7 |
| | 2007 | 11.0 | 9.5 | 6.0 | S | 30.0 | 47.2 | 4.8 |
| | 2008 | 10.4 | 9.3 | 6.2 | S | 29.5 | 47.3 | 5.0 |
| | 2009 | 11.5 | 10.2 | 6.0 | SE | 31.3 | 46.7 | 4.0 |
| | Avg | 12.3 | 10.6 | 9.0 | S | 30.1 | 46.3 | 4.7 |

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 5 | 2000 | 13.5 | 10.1 | 11.8 | SE | 30.7 | 35.9 | 7.1 |
| | 2001 | 12.9 | 10.1 | 11.2 | SE | 31.0 | 35.5 | 6.9 |
| | 2002 | 12.8 | 9.7 | 13.9 | S | 30.9 | 35.8 | 6.3 |
| | 2003 | 14.0 | 11.0 | 13.3 | SE | 30.6 | 35.7 | 6.3 |
| | 2004 | 10.7 | 9.9 | 7.2 | SE | 30.7 | 34.7 | 7.1 |
| | 2005 | 13.1 | 11.1 | 5.9 | S | 30.6 | 36.3 | 6.5 |
| | 2006 | 11.1 | 10.2 | 7.6 | S | 30.2 | 35.4 | 5.6 |
| | 2007 | 10.8 | 8.7 | 4.6 | S | 30.9 | 35.4 | 7.2 |
| | 2008 | 10.4 | 8.8 | 6.7 | SE | 30.4 | 35.4 | 6.4 |
| | 2009 | 11.1 | 9.6 | 6.6 | SE | 32.4 | 35.9 | 5.8 |
| | Avg | 12.0 | 9.9 | 8.9 | SE | 30.8 | 35.6 | 6.5 |

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 6.5 | 2000 | 13.6 | 10.8 | 13.0 | S | 29.7 | 42.9 | 3.7 |
| | 2001 | 12.8 | 11.1 | 11.8 | S | 29.4 | 42.7 | 4.0 |
| | 2002 | 12.6 | 10.4 | 13.7 | S | 30.0 | 42.6 | 3.3 |
| | 2003 | 14.4 | 11.7 | 14.9 | S | 29.1 | 41.3 | 4.1 |
| | 2004 | 10.7 | 10.8 | 10.1 | SE | 29.4 | 41.6 | 3.6 |
| | 2005 | 13.2 | 12.2 | 7.4 | S | 28.7 | 42.8 | 4.2 |
| | 2006 | 11.2 | 10.3 | 8.5 | SE | 29.7 | 41.6 | 3.4 |
| | 2007 | 11.1 | 9.7 | 6.2 | S | 29.8 | 42.9 | 4.3 |
| | 2008 | 10.4 | 9.6 | 6.3 | S | 29.2 | 42.3 | 4.4 |
| | 2009 | 11.8 | 10.4 | 6.4 | S | 31.0 | 42.5 | 3.7 |
| | Avg | 12.2 | 10.7 | 9.8 | S | 29.6 | 42.3 | 3.9 |

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Appendix A15.–Page 2 of 2.

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 7 | 2000 | 13.1 | 10.9 | 13.6 | S | 29.4 | 43.3 | 3.0 |
| | 2001 | 13.1 | 11.4 | 9.9 | SE | 29.0 | 43.6 | 3.5 |
| | 2002 | 12.4 | 10.4 | 12.4 | SE | 29.9 | 44.0 | 2.8 |
| | 2003 | 14.3 | 11.6 | 13.0 | S | 29.0 | 44.3 | 3.6 |
| | 2004 | 10.6 | 11.0 | 9.7 | SE | 28.8 | 44.7 | 2.7 |
| | 2005 | 12.9 | 12.3 | 7.6 | S | 28.3 | 44.8 | 3.6 |
| | 2006 | 10.8 | 9.9 | 6.8 | S | 29.4 | 42.4 | 3.1 |
| | 2007 | 11.2 | 9.9 | 6.2 | S | 29.5 | 45.5 | 3.8 |
| | 2008 | 10.6 | 9.8 | 6.2 | S | 29.4 | 44.9 | 4.2 |
| | 2009 | 11.7 | 10.4 | 5.5 | S | 31.2 | 45.0 | 3.5 |
| | Avg | 12.1 | 10.8 | 9.1 | S | 29.4 | 44.2 | 3.4 |

| Sta | Year | Air Temp (c) | Water Temp (c) | Wind Vel. (knots) | Wind Dir | Salinity (ppt) | Water Depth (f) | Secchi (m) |
|---|---|---|---|---|---|---|---|---|
| 8 | 2000 | 13.2 | 11.0 | 14.0 | S | 29.5 | 29.1 | 2.6 |
| | 2001 | 12.8 | 11.3 | 9.5 | SE | 29.0 | 28.9 | 3.1 |
| | 2002 | 12.1 | 10.3 | 11.8 | SE | 30.0 | 29.4 | 2.4 |
| | 2003 | 13.7 | 11.2 | 11.6 | SE | 28.1 | 28.9 | 3.1 |
| | 2004 | 10.8 | 11.0 | 9.1 | SE | 29.3 | 28.7 | 2.4 |
| | 2005 | 12.8 | 12.1 | 7.7 | S | 28.5 | 29.8 | 3.3 |
| | 2006 | 11.8 | 10.5 | 6.7 | S | 29.0 | 30.4 | 3.0 |
| | 2007 | 11.2 | 9.9 | 5.5 | S | 29.5 | 29.8 | 3.2 |
| | 2008 | 10.9 | 9.7 | 5.9 | SW | 29.2 | 29.9 | 3.7 |
| | 2009 | 11.6 | 10.5 | 5.9 | S | 31.2 | 29.6 | 3.4 |
| | Avg | 12.1 | 10.8 | 8.8 | S | 29.3 | 29.4 | 3.0 |

Appendix A16.–Yearly mean values for selected chemical and physical variables collected during the offshore test fish project, 1979–2009.

| Year | Air Temp. (c) | Water Temp. (c) | Wind Vel. (knots) | Salinity (ppt) | Secchi (m) |
|---|---|---|---|---|---|
| 1979 | 12.4 | 12.2 | 5.9 | 25.0 | 5.7 |
| 1980 | 12.4 | 10.0 | 8.2 | 24.8 | 4.2 |
| 1981 | 13.4 | 11.0 | 10.1 | 23.1 | 4.1 |
| 1982 | 12.0 | 8.5 | 9.0 | 20.3 | 5.0 |
| 1983 | 14.9 | 10.9 | 9.4 | 20.6 | 4.7 |
| 1984 | 13.5 | 10.8 | 9.1 | 14.3 | 5.3 |
| 1985 | 10.8 | 8.2 | 9.2 | 28.0 | 5.5 |
| 1986 | 10.6 | 9.1 | 8.2 | - | 5.4 |
| 1987 | 12.6 | 10.1 | 4.1 | 28.4 | 5.1 |
| 1988 | 14.2 | 9.1 | 8.9 | 30.2 | 4.7 |
| 1989 | 13.1 | 10.0 | 4.4 | 27.7 | 4.7 |
| 1990 | 12.3 | 11.4 | 8.5 | 21.3 | 4.6 |
| 1991 | 10.9 | 9.9 | 6.6 | 13.1 | 4.1 |
| 1992 | 12.0 | 11.1 | 5.4 | 28.4 | 4.3 |
| 1993 | 13.5 | 10.5 | 6.9 | 26.2 | 5.0 |
| 1994 | 13.0 | 10.0 | 9.3 | 29.0 | 6.0 |
| 1995 | 13.1 | 9.5 | 7.9 | 26.5 | 4.6 |
| 1996 | 12.6 | 10.0 | 9.1 | 30.8 | 4.7 |
| 1997 | 13.8 | 10.5 | 10.0 | 30.6 | 4.0 |
| 1998 | 12.5 | 10.3 | 8.3 | 30.0 | 5.4 |
| 1999 | 13.4 | 10.3 | 12.4 | 30.2 | 4.5 |
| 2000 | 13.5 | 10.5 | 12.2 | 30.1 | 5.2 |
| 2001 | 12.9 | 10.7 | 10.7 | 30.1 | 5.2 |
| 2002 | 12.5 | 10.1 | 13.0 | 30.4 | 4.5 |
| 2003 | 14.2 | 11.3 | 12.9 | 29.6 | 5.0 |
| 2004 | 10.7 | 10.4 | 8.5 | 30.0 | 4.7 |
| 2005 | 13.0 | 11.7 | 7.1 | 29.4 | 5.0 |
| 2006 | 11.3 | 10.3 | 7.2 | 28.4 | 4.6 |
| 2007 | 11.0 | 9.4 | 5.5 | 30.2 | 5.3 |
| 2008 | 10.5 | 9.3 | 6.3 | 29.7 | 5.3 |
| 1992-2008 Avg | 12.6 | 10.3 | 9.0 | 29.4 | 4.9 |
| 2009 | 11.4 | 10.0 | 6.1 | 31.8 | 4.7 |