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An Estimate of the Migratory Timing and Abundance of Sockeye Salmon into Upper Cook Inlet, Alaska, 2004

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, χ^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

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ABSTRACT

A test fishery was conducted during the 2004 Upper Cook Inlet (UCI) commercial salmon fishery, marking the 26th year for the project. The primary objective of the test fishery was to estimate the abundance and run timing of the sockeye salmon *Oncorhynchus nerka* return, measured along a transect at the southern boundary of the UCI management area. The test fishery was conducted from 1 July to 30 July and captured 2,894 sockeye salmon, representing 2,028 CPUE (catch per unit of effort) points. The midpoint of the 2004 return occurred on 17 July, which was 2 days late relative to the historical mean date of 15 July, as measured at the test fish transect. A non-linear mathematical model estimated that 4.3% of the sockeye salmon run had entered UCI prior to the start of the test fish project and was 91.7% complete at the termination of the project. Therefore, the 2004 test fish project spanned approximately 87.4% of the run. The test fish final passage rate was estimated at more than 3,300 sockeye salmon per CPUE point. Numerous formal estimates of the size and timing of the 2004 sockeye salmon run were made during the commercial fishing season. The test fish project once again provided valuable data used to aid in critical inseason management decisions.

Key words: Salmon, *Oncorhynchus*, sockeye salmon, *O. nerka*, 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 objective of the project has been to estimate the total run and run timing of sockeye salmon *Oncorhynchus nerka* returning to UCI during the commercial salmon fishing season. These data have become extremely important to ADF&G management biologists as they set and adjust commercial fishing times and areas to most efficiently harvest sockeye salmon that are surplus to spawning needs. Moreover, the Alaska Board of Fisheries (BOF) has assembled management plans which require inseason estimates of the size of the sockeye salmon run in order to implement specific components of the various plans. The OTF project has increasingly become one of the most important tools fishery managers utilize to make inseason fishery management decisions.

Test fishing results have been reported annually since 1979 (Hilsinger 1988; Hilsinger and Waltemyer 1987; Shields 2000, 2001, 2003; Shields and Willette 2004; Tarbox 1990, 1992, 1994, 1995, 1996, 1997, 1998a, 1998b, 1999; Tarbox and Waltemyer 1989; Waltemyer 1983a, 1983b, 1986a, 1986b). This report presents the results of the 2004 test-fishing project.

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). 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 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 30 July. The chartered vessel, *F/V Corrina Kay*, fished 366 m (1,200 ft) of 13 cm (5 ⅛ in) multi-filament drift

gillnet gear. The net was 45 meshes deep and was constructed of double knot Super Crystal shade number 1 with a filament size of number 53/S6F[1].

The following physical and chemical readings were taken at the start of each set: air temperature, water temperature (at 1 m below the surface), wind velocity and direction, tide stage, water depth, and water clarity. Air and water temperatures were measured using a 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). 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 enumerated and identified by species and sex. Sockeye salmon ($n \leq 30$ at each station) were measured for length (mideye to tail fork) to the nearest mm and a scale removed for age determination as described by Koo (1955). Scales were mounted on gum cards and impressions made in cellulose acetate, as described by Clutter and Whitesel (1956). The age of each fish was determined after examining scales with a microfiche viewer under 40x magnification. Ages were reported in European notation (Koo 1962) and followed criteria established by Mosher (1969) and Tobias et al. (1994).

The number of fish caught at each station was expressed as a catch per unit of effort (CPUE) statistic, or index, which standardized catch reporting to the number of fish caught in 100 fathoms of gear in 1 hour of fishing time.

$$\mathrm{CPUE}_S = \frac{100\ \mathrm{fm}\ \ x\ \ 60\ \mathrm{min}\ \ x\ \ \mathrm{number\ of\ fish}}{\mathrm{fm\ of\ gear}\ \ x\ \ MFT} \tag{1}$$

where:

CPUE_s = CPUE for station *s*, and

MFT = mean fishing time.

Mean fishing time (MFT) was calculated as:

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

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, and during the time it was being

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

retrieved. MFT was therefore adjusted by summing the total time it took to set and retrieve the net, then dividing this time in half, and adding it to the time when the entire net was deployed and fished.

Daily CPUE data were summed for all 6 stations ($CPUE_d$) as follows:

$$CPUE_d = \sum_{s=1}^{n} CPUE_s \tag{3}$$

DESCRIBING THE SALMON MIGRATION

Beginning about 20 July, total CPUE on the final day of the test fishery ($CPUE_f$) was estimated each day by fitting a non-linear model (Mundy 1979) to the time series of cumulative daily $CPUE_d$, i.e.,

$$y_d = 1 / (1 + e^{-(a+bd)}) \tag{4}$$

where:

y_d = cumulative daily $CPUE_d$ on day d,

a and b = coefficients of model,

d = day of observation.

To determine which of the previous year's run-timing curves (curve of cumulative CPUE through day d) most closely fits the current year's data, a mean sum of squares statistic (Zar 1984) is computed. The best fits, as demonstrated by the lowest mean sum of squares values, are then ranked from best to worst fit. Based on the best fit years, the final test fishery $CPUE_f$ for the current year can be estimated.

Catchability (q_d), or the fraction of the available population taken by a defined unit of fishing effort, was estimated as:

$$q_d = c_d / r_d \tag{5}$$

where:

q_d = estimated cumulative catchability on day d,

c_d = cumulative $CPUE_d$ on day d, and

r_d = cumulative total return on day d.

The cumulative total return 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 in the district at that time. Commercial harvest data is estimated inseason from catch reports called or faxed to ADF&G. 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 fishermen or the processors they sell their fish to within 12 hours of the close of a fishing period. For a complete list of reporting requirements, please see the following statute: 16.05.690(a) and regulation: 5 AAC 39.130. Recreational harvest data was estimated inseason and provided by Division of Sport Fish staff. Personal use harvests were also estimated

inseason by assessing previous year's catches for runs of similar strength. 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 15% 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 setnet fisheries, 40% in district-wide driftnet fisheries, and 25% in reduced district driftnet fisheries (Mundy et al. 1993). For example, if the drift gillnet fleet harvested 500,000 sockeye salmon during an inlet wide fishing period (40% exploitation rate), the number of sockeye salmon remaining in the district, or the residual, would have been estimated at 1.25 million, which is derived by dividing 500,000 by 40%. The same mathematical exercise is then applied to the set gillnet harvest for that time period and the total residual from both fisheries is summed.

Passage rate (*PR*), the expansion factor used to convert CPUE into estimated numbers of salmon passing the test fishing transect, was calculated as:

$$PR = 1/q_d \tag{6}$$

Total return at the end of the season (*TR*) was then estimated from

$$TR = PR \; x \; \text{CPUE}_f \tag{7}$$

To calculate mean date of return (*M*), which is the day on which approximately 50% of the total run had passed the OTF transect, the following formula was used:

$$M = a/b \tag{8}$$

where:

M = mean date of return, and

a and *b* = coefficients of model.

Since the test fishery did not encompass the entire sockeye salmon run, the total CPUE for the test fishery was estimated after the season using the following two methods:

$$\text{CPUE}_t^h = \text{CPUE}_f \; x \; \frac{H_t}{H_L} \tag{9}$$

where:

CPUE_t^h = total estimated CPUE for the season, based on harvest,

CPUE_f = cumulative CPUE through final day, *f*, of test fishing,

H_t = total commercial harvest for the season,

H_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).

$$\text{CPUE}_t^r = \text{CPUE}_f \; x \; \frac{E_t + H_t}{\sum_{S=1}^{6} E_L + HL} \tag{10}$$

where:

CPUE_t^r = total estimated CPUE for the season, based upon total return,

CPUE_f = cumulative CPUE through final day, *f*, of test fishing,

E_t = total escapement for the season,

H_t = total commercial harvest for the season,

E_L = total Upper Cook Inlet escapement through final day of test fishery,

H_L = total Upper Cook Inlet commercial harvest through final day of test fishery, and

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

The total return adjustment to the total estimated CPUE (Equation 10) has replaced adjustments based on harvest alone (Equation 9) because of BOF modifications to commercial fishing management plans as well as the result of weak sockeye salmon returns to the Kenai River in 2000 and 2001. Current management plans allow for much less fishing in August than in the past, and weak returns in 2000 and 2001 resulted in closures to the fishery in late July and August. 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 return 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 sockeye salmon escapement to all non-monitored systems in UCI is considered to be 15% of the monitored escapement. Lag times are the approximate time needed for fish to migrate from the test fish transect to a destination. A lag time of up to 2 days was assumed for fish harvested in the commercial fishery. The following lag times were assumed for fish entering the escapement: Crescent River, 1 day; Kasilof and Kenai Rivers, 2 days; and Yentna River and Fish Creek, 7 days. As suggested by Mundy et al. 1993, lag times must be accounted for when estimating the total return passing the test fish transect on day *d*.

Two methods were used to estimate the adjusted final proportion of cumulative CPUE_d on the last day of the test fishery. The harvest-based method used the ratio of CPUE_f and CPUE_t^h and the return-based method used the ratio of CPUE_f and CPUE_t^r. Two sets of *a* and *b* coefficients were then calculated by substituting the two estimates of adjusted final proportion of cumulative CPUE_d into Equation 4. This was done for the current year and for all historical years.

RESULTS AND DISCUSSION

A total of 2,894 sockeye salmon were captured during the 2004 test fishery, as well as 650 pink salmon *O. gorbuscha*, 652 chum salmon *O. keta*, 1,119 coho salmon *O. kisutch*, and 4 Chinook salmon *O. tshawytscha* (Table 1; Appendices A1–A12). The test boat was unable to fish on 26 July due to adverse weather conditions, so catches for this day were interpolated from 25 July and 27 July data. Sockeye salmon daily catches ranged from 11 to 415 fish (Table 1). The unadjusted cumulative total sockeye salmon CPUE_f for the 2004 project was 2,028, with daily

CPUE values ranging from 9 to 242. The distribution of sockeye salmon catches along the test fish transect was similar to the distribution of CPUE values (Tables 2 and 3), which would be expected when fishing occurs at fixed intervals at each station.

Tarbox and Waltemeyer (1989) provided further detail into to some of the assumptions the curve fitting procedures utilize to estimate the total CPUE 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 has been the approximate date that Commercial Fisheries staff use for the first formal estimate of each year's total run. By this time in the run, there are enough data points in the current year's run-timing curve to provide a more accurate estimate of what the total CPUE will be. In addition, Tarbox and King (1992) and later OTF annual reports all suggested that the initial first best fit estimate made around mid-July was not always the most accurate and that using the second or third best fit estimate was often more useful. Therefore, the method now used to make the first formal inseason estimate of the total run each year includes an examination of the top five or six best fits. Other factors are then considered to determine which of the fits will most likely provide the best estimate. For example, sockeye salmon run-timing from other areas of the state is evaluated to see if a consistent pattern of run-timing has occurred. Moreover, from the top five or six best fits, the amount of variation in the estimate of the final test fish CPUE from the previous day to the current day is compared (Table 4). Those years that reveal the least change are identified as potentially better fits, especially if the mean sum of squares statistic is also improving. Although these other factors that are considered may seem somewhat subjective, until more years of data are collected from various runs, caution is advised when choosing which of the top fits to place the most emphasis on when making a projection of the final test fish CPUE, especially during the 15 July to 20 July time frame.

In 2004, the first formal estimate of the total run of sockeye salmon to UCI was made after the 23 July inlet-wide drift gillnet fishing period (Table 4). The regular period that was to have been fished on 22 July was moved to 23 July via emergency order (Shields and Fox 2005). Again, the passage rate is an estimate of how many sockeye salmon had entered the district per test fish CPUE index point. Based on the total run of 5.765 million sockeye salmon through 23 July, and a cumulative test fish CPUE of 1,754 points, a passage rate of 3,287 was estimated.

Sockeye salmon run timing curves from 1979 through 2003 were mathematically compared (mean sum of squares statistic) to the 2004 run and were ranked from best to worst fits. Based on the top five best year fits to the 2004 run through 23 July, the final CPUE estimate ranged from 1,988 to 2,740 and thus, a total run of 6.6 to 8.9 million sockeye salmon was projected. The second best fit tracked the 1991 run, which was 2-days late. This estimate, based upon a fit to the 1991 run timing, exhibited the least change in the prediction of the final CPUE from the previous day (2,332 to 2,331) and was therefore felt to be a more reliable predictor of what the final CPUE would be. Based on the passage rate estimate of 3,287 and a final test fish CPUE of 2,331 index points, a total run estimate of 7.66 million was derived using the second best fit. This ended up being very close to the 2004 total sockeye salmon run to UCI of approximately 7.88 million (Shields and Fox 2005).

The second formal estimate (27 July) predicting the size and timing of the 2004 total run was made following the commercial fishery on 26 July. By now, the total run had reached 6.344 million sockeye salmon with a test fish cumulative CPUE of 1,970 and a passage rate estimate of 3,221. The first best

fit curve tracked the 1991 run (the second best fit from the previous estimate), which was a 2-day late run, and estimated a 2004 total run of 7.4 million fish. The second best fit tracked a 3-day late run (1999) and estimated a total run of 7.6 million fish.

Current commercial fishery management plans, which direct how the commercial fisheries in UCI are to be prosecuted, not only require inseason estimates of the total sockeye salmon run, but they compel ADF&G to make an inseason estimate of the number of sockeye salmon in each year's run that are of Kenai River origin. 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 ranges: (1) under 2.0 million fish, (2) between 2.0 and 4.0 million fish, and (3) greater than 4.0 million fish (Shields and Fox 2005).

The first best fit from the total sockeye salmon run projection made on 23 July estimated the portion of the run through that date that was of Kenai River origin at 2.8 million fish, with a total Kenai River run estimate for the year at 5.1 million fish (Table 5). The second best fit from the 23 July projection predicted a total Kenai River run of 4.3 million fish. The actual final run of sockeye salmon that were Kenai River stock was estimated at 4.9 million fish. The 27 July run projection from the top two best fits estimated the total Kenai River sockeye salmon run to be 4.4 to 4.5 million fish. Both run projections were critical to inseason management decisions, as the number of hours that the set gillnet fishery in the Upper Subdistrict of the Central District of UCI can be fished increase when the Kenai River sockeye salmon run is greater than 4.0 million fish. These additional hours provided to the commercial fishery ended up being extremely valuable; even so, both the Kenai and Kasilof River's sockeye salmon escapement goals were widely exceeded (Shields and Fox 2005).

The test boat has typically ceased fishing on approximately 30 July each year, which means that the "tail end" of the sockeye salmon run has not been assessed by the project. Two methods were developed to estimate the percentage of the run that occurred after the test fishery ceased so that postseason adjustments could be made to the cumulative CPUE statistic. The first method accounts for post-test fishery commercial harvest while the second method enumerates both escapement and commercial catch (total return) after the test fishery terminates. The sport and personal use harvest of sockeye salmon that occurs after the test fishery is assumed to be very minimal and therefore is not considered. Table 6 shows the differences in the annual test fish cumulative CPUE statistic after postseason adjustments were made using either the harvest or total return method. Although the changes are relatively minor, they do have an effect on the algorithms that are used to fit the current year's cumulative test fish CPUE to run-timing curves from previous years, because the *a* and *b* coefficients in the equation describing the historical run timings are changed. Beginning in 2002, the total return method was used to make postseason adjustments to all previous years' CPUE statistic (Shields 2003). For the 2004 season, the final test fish CPUE of 2,028 was adjusted to 2,345; in other words, approximately 13.5% of the total sockeye salmon run occurred after the test fishery ceased.

A non-linear mathematical model (Mundy 1979) was also used to examine the daily and cumulative test fish CPUE proportions of the sockeye salmon run to UCI. Using the total return-adjusted final test fish CPUE, this analysis suggested that 4.3% of the run had passed the transect prior to the start of test fishing on 1 July and that the run was 91.7% complete at project termination (Figure 2 and Appendix A13). Therefore, the mathematical model indicated that test fishing spanned 87.5% of the run. The mean date of the 2004 UCI sockeye salmon return at the Anchor Point transect occurred on day 24, or 17 July, which was 2 days late relative to the

historic average mean date of 15 July (Table 7). Again, the mean date of the return refers to the day on which approximately 50% of the total run has entered UCI at the test fish transect.

Figure 3 depicts the OTF error in projecting the total sockeye salmon run based on the best fits of the data on or soon after 20 July. As can be seen in this figure, the error in the 20 July estimate has been significant (>30%) only for runs that were 2 or more days early. In fact, for runs that are 1 day early, on time, or late, the error in the 20 July estimate of the total return ranges from -6.4% to +13.7% (average = 4.2%) of the actual return. Conversely, for runs that enter the district 2 or more days earlier than average, the OTF curve-fitting estimator does not perform nearly as well, with a range in error of +8.8% to 75.4%, or an average of 36.5%. It is quite likely that as additional data representing returns with more variable run timing are added to the database, the OTF projections will become more accurate for early returns.

Water temperatures measured along the test fish transect ranged from 8.5 to 13.0°C and averaged 10.4°C for the year (Appendices A14–A16), with the average water temperature at each station being very close to the previous 10-year average. Air temperatures ranged from 6.0 to 18.0°C and averaged 10.7°C, which was the coolest average air temperature observed since 1986 (Appendix A16). This reported average air temperature is somewhat problematic, however, as air temperatures over land during July 2004 were some of the warmest on record. Wind velocities averaged 8.5 knots for the month, which was the second lowest average since 1994. Wind direction was variable, but in general winds originated out of the southeast.

Appendices A14 and A15 provide a summary of the physical data that has been collected at each of the 6 test fish stations for the past 10 years. Station 4, which is on the east side of Cook Inlet, was the shallowest station, averaging 24.1 fathoms (145 feet) in depth. It should be noted that changes in depth are a result of different stages of tide as well as minor differences in set location from day to day. Station 4 also had the clearest water, with a 1995–2004 secchi disk average depth of 8.2 m. In general, water clarity along the test fish transect decreases from east to west (secchi disk average depth decreases from 8.2 m at station 4 to 2.7 m at station 8) as a result of numerous glacial watersheds draining into the west side of Cook Inlet.

Since 2002, scale samples have been collected from all sockeye salmon that are measured to estimate mean length. The dominant age-class of sockeye salmon entering UCI at the test fish transect in 2004 was age 1.3 (5-year olds), comprising nearly 73% of the run (Table 8). This estimate compared favorably with age composition samples collected from sockeye salmon harvested commercially by the drift gillnet fleet in UCI, which revealed the 1.3 age class comprised 70% of the 2004 harvest (T. Tobias, Commercial Fisheries Technician, ADF&G, Soldotna; personal communication). The scale samples from the OTF program were also analyzed with the intent of assessing whether or not Kenai River sockeye salmon, which are the dominant stock in Cook Inlet runs, might be identified using "size at age" criteria as they entered the district at the test fish transect. Statistical analyses will be conducted comparing the average size of each age-class of sockeye salmon collected at various escapement monitoring sites throughout UCI to the average size of the same age-classes collected at the 6 stations along the test fish transect. The results of this "mixture-model" analysis will be summarized in future test fish annual reports.

This was the 26th year of test fishing in UCI. Interestingly, all 26 years of the project have been completed with the same F/V and captain. An invitation to bid on the test fish project is distributed to the fishing community with the lowest qualified bidder awarded the test fish

contract for up to 4 years before a new invitation to bid is released. There have been various "tweaks" to the test fishery project over time, mostly regarding the number and location of stations fished, but the basic design has remained intact. The UCI test fishery continues to provide fishery managers with very important data about the strength and timing of each year's sockeye salmon run. These data are significantly relied upon by fishery managers, as commercial, sport, and personal use fishery management plans are intrinsically linked to the strength of the annual sockeye salmon run.

REFERENCES CITED

Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. Bulletin International Pacific Salmon Fisheries Commission, No. 9, New Westminster, B.C.

Hilsinger, J. R. 1988. Run strength analysis of the 1987 sockeye salmon return to Upper Cook Inlet, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A88-19, Anchorage.

Hilsinger, J. R. and D. Waltemyer. 1987. Run strength analysis of the 1986 sockeye salmon return to Upper Cook Inlet, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Area Data Report No. 87-6, Soldotna.

Koo, T. S. Y. 1955. Biology of the red salmon, *Oncorhynchus nerka* (Walbaum), of Bristol Bay, Alaska as revealed by a study of their scales. Doctoral dissertation, University of Washington, Seattle.

Koo, T. S. Y. 1962. Age Determination in Salmon. Pages 37-48 [*in*] Studies of Alaska Red Salmon, T. S. Y. Koo, *editor*. University of Washington Press, Seattle.

Mosher, K. 1969. Identification of Pacific salmon and steelhead trout by scale characteristics. United States Department of the Interior, Circular 317, Washington, D.C.

Mundy, P. R. 1979. A quantitative measure of migratory timing illustrated by application to the management of commercial salmon fisheries. Doctoral dissertation, University of Washington, Seattle, Washington.

Mundy, P. R., K. K. English, W. J. Gazey, and K. E. Tarbox. 1993. Evaluation of the harvest management strategies applied to sockeye salmon populations of Upper Cook Inlet, Alaska, using run reconstruction analysis. [*In*] G. Kruse, D. M. Eggers, R. J. Marasco, C. Pautzke, and T. J. Quinn II *editors*. Proceedings of the international symposium on management strategies for exploited fish populations. Alaska Sea Grant College Program, University of Alaska, Fairbanks.

Shields, P. A. 2000. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 2000. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 2A00-30, Anchorage.

Shields, P. A. 2001. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A01-14, Anchorage.

Shields, P. A. 2003. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A03-01, Anchorage.

Shields, P. and J. Fox. 2005. Upper Cook Inlet commercial fisheries annual management report, 2004. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A05-01, Anchorage.

Shields, P. A. and T. M. Willette. 2004. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A04-15, Anchorage.

Tarbox, K. E. 1990. An estimate of the migratory timing of sockeye salmon into Upper Cook, Alaska, in 1989 using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2S90-4, Anchorage.

Tarbox, K. E. 1992. An estimate of the migratory timing of sockeye salmon into Upper Cook Inlet, Alaska, in 1991 using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A92-07. Anchorage.

Tarbox, K. E. 1994. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1993. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A94-13, Anchorage.

REFERENCES CITED (Continued)

Tarbox, K. E. 1995. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1994. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A95-15, Anchorage.

Tarbox, K. E. 1996. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A96-07, Anchorage.

Tarbox, K. E. 1997. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1996. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A97-01, Anchorage.

Tarbox, K. E. 1998a. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A98-22, Anchorage.

Tarbox, K. E. 1998b. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A98-30, Anchorage.

Tarbox, K. E. 1999. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A99-13, Anchorage.

Tarbox, K. E. and B. King. 1992. An estimate of the migratory timing of sockeye salmon into Upper Cook Inlet, Alaska, in 1991 using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A92-07, Anchorage.

Tarbox, K. E. and D. Waltemyer. 1989. An estimate of the 1988 total sockeye salmon return to Upper Cook Inlet, Alaska using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2S89-4, Anchorage.

Tobias, T. M., D. L. Waltemyer, and K. E. Tarbox. 1994. Scale aging manual for Upper Cook Inlet Sockeye Salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Regional Information Report No. 2A94-36, Anchorage.

Tobias, T. M., and M. Willette. 2003. An estimate of total return of sockeye salmon to Upper Cook Inlet, Alaska, 1976-2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 2A03-11, Anchorage.

Waltemyer, D. L. 1983a. Migratory timing and abundance estimation of the 1982 sockeye salmon return to Upper Cook Inlet based on a test fishing program. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report No. 83-1, Soldotna.

Waltemyer, D. L. 1983b. Describing the migrations of salmon and estimating abundance of sockeye salmon returning in 1983 to Upper Cook Inlet based on a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report No. 84-1, Soldotna.

Waltemyer, D. L. 1986a. Use of a test fishery to describe and estimate the sockeye salmon total return to Upper Cook Inlet in 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report No. 86-1, Soldotna.

Waltemyer, D. L. 1986b. Run strength analysis of the 1985 sockeye salmon return to Upper Cook Inlet, Alaska based on a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report No. 86-5, Soldotna.

Zar, J. H. 1984. Biostatistical Analysis, Second Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 718pp.

TABLES AND FIGURES

Table 1.–Summary of sockeye salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2004.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE		Mean Length (mm)
			Daily	Cumulative	Daily	Cumulative	
7/01	6	222.0	46	46	37	37	545
7/02	6	220.0	35	81	28	65	536
7/03	6	223.0	17	98	14	79	551
7/04	6	194.0	11	109	9	88	531
7/05	6	227.0	37	146	29	117	542
7/06	6	209.0	54	200	43	160	555
7/07	6	220.5	42	242	34	194	552
7/08	6	222.5	31	273	24	218	542
7/09	6	228.5	125	398	89	308	567
7/10	6	230.0	146	544	110	417	543
7/11	6	231.5	198	742	141	558	560
7/12	6	214.5	127	869	90	648	557
7/13	6	251.0	312	1,181	214	862	579
7/14	6	230.5	100	1,281	67	929	562
7/15	6	212.0	12	1,293	10	939	560
7/16	6	238.5	276	1,569	182	1,121	556
7/17	6	219.0	43	1,612	35	1,156	570
7/18	6	249.5	269	1,881	171	1,327	585
7/19	6	216.0	30	1,911	24	1,352	563
7/20	6	208.0	98	2,009	91	1,443	576
7/21	6	219.5	30	2,039	24	1,466	561
7/22	6	260.5	415	2,454	242	1,708	550
7/23	6	226.0	72	2,526	53	1,761	577
7/24	6	236.5	96	2,622	60	1,821	553
7/25	6	233.5	71	2,693	52	1,873	577
7/26[a]	0	0.0	68	2,761	52	1,925	562
7/27	6	220.5	67	2,828	52	1,977	555
7/28	6	213.5	23	2,851	19	1,996	565
7/29	6	227.5	30	2,881	21	2,017	550
7/30	6	214.0	13	2,894	11	2,028	550

[a] The test fish boat was unable to fish on this day; the data was interpolated from the day before and day after catches.

Table 2.–Estimated sockeye salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	9	26	5	4	1	1	46
7/02	8	3	6	7	11	0	35
7/03	0	11	5	0	1	0	17
7/04	0	0	3	7	0	1	11
7/05	0	7	13	10	3	4	37
7/06	0	2	43	3	5	1	54
7/07	16	6	0	10	9	1	42
7/08	18	5	6	0	1	1	31
7/09	24	15	85	0	1	0	125
7/10	7	52	19	44	24	0	146
7/11	8	11	40	101	38	0	198
7/12	7	22	0	4	87	7	127
7/13	49	78	71	94	14	6	312
7/14	1	79	7	7	2	4	100
7/15	0	8	2	2	0	0	12
7/16	0	0	97	156	23	0	276
7/17	3	14	18	7	0	1	43
7/18	0	0	48	122	90	9	269
7/19	0	15	6	3	0	6	30
7/20	1	42	15	34	6	0	98
7/21	1	0	2	8	12	7	30
7/22	2	1	137	20	43	212	415
7/23	0	5	0	35	31	1	72
7/24	0	1	18	76	0	1	96
7/25	0	2	43	12	9	5	71
7/26[a]	0	1	39	7	17	4	68
7/27	0	0	35	2	26	4	67
7/28	0	2	6	13	0	2	23
7/29	0	0	1	5	20	4	30
7/30	0	0	12	1	0	0	13
Total	154	408	782	794	474	282	2,894
Percent	5.3	14.1	27.0	27.4	16.4	9.7	100.0

[a] The test fish boat was unable to fish on this day; the data was interpolated from the day before and day after catches.

Table 3.–Estimated sockeye salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	7.0	20.8	4.1	3.3	0.8	0.8	36.9
7/02	6.4	2.2	4.9	5.7	8.8	0.0	28.0
7/03	0.0	8.8	4.1	0.0	0.8	0.0	13.7
7/04	0.0	0.0	2.4	5.8	0.0	0.8	9.1
7/05	0.0	5.7	10.3	8.1	2.2	3.2	29.4
7/06	0.0	2.8	32.6	2.4	4.0	0.8	42.7
7/07	13.2	4.7	0.0	8.1	7.2	0.8	34.0
7/08	14.0	4.1	4.6	0.0	0.8	0.8	24.4
7/09	18.9	12.3	57.3	0.0	0.8	0.0	89.4
7/10	5.7	38.0	15.2	32.2	18.7	0.0	109.7
7/11	6.8	9.3	30.0	66.6	28.2	0.0	140.8
7/12	5.9	17.6	0.0	3.2	57.3	5.6	89.6
7/13	37.2	54.4	47.3	59.4	10.9	4.8	214.0
7/14	0.8	49.9	5.8	5.6	1.7	3.3	67.1
7/15	0.0	6.9	1.7	1.7	0.0	0.0	10.3
7/16	0.0	0.0	64.7	100.7	16.8	0.0	182.1
7/17	2.5	11.1	14.4	5.8	0.0	0.8	34.5
7/18	0.0	0.0	33.5	76.3	54.6	7.2	171.5
7/19	0.0	12.0	5.0	2.6	0.0	4.9	24.4
7/20	0.8	30.7	30.3	24.3	4.8	0.0	90.9
7/21	0.9	0.0	1.7	6.3	9.1	5.8	23.7
7/22	1.7	0.8	81.4	15.6	30.0	112.6	242.0
7/23	0.0	4.1	0.0	25.6	22.4	0.8	52.9
7/24	0.0	0.8	12.9	45.6	0.0	0.8	60.1
7/25	0.0	1.6	30.0	8.6	7.2	4.2	51.6
7/26[a]	0.0	0.8	29.0	5.1	13.1	3.8	51.8
7/27	0.0	0.0	28.0	1.7	19.0	3.3	52.0
7/28	0.0	1.7	5.0	10.7	0.0	1.7	19.1
7/29	0.0	0.0	0.8	3.6	13.8	3.2	21.4
7/30	0.0	0.0	10.0	0.8	0.0	0.0	10.8
Total	122	301	567	535	333	170	2,028
Percent	6.0	14.8	28.0	26.4	16.4	8.4	100

[a] The test fish boat was unable to fish on this day; the data was interpolated from the day before and day after catches.

Table 4.–Total return estimates for sockeye salmon to Upper Cook Inlet, Alaska, made during the 2004 season.

07/23/04		**Number of Fish**
Escapement		**1,560,046**
Cumulative Catch		**3,701,836**
Residual in District		**503,135**
TOTAL RUN THROUGH	**7/23/2004 =**	**5,765,017**

2004 Cumulative Offshore Test Fish CPUE = **932** through 15-Jul
2004 Cumulative Offshore Test Fish CPUE = **1,754** through 23-Jul

Passage Rate (Total Run/Cumulative CPUE): **3,287** Based on 23-Jul harvest
Total CPUE for season, if 15-Jul is 50% point: **1,864**

Run Estimate Based on Average Timing (15 July 50% Point): **6,127,069**

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

	Mean Sum	Estimated Total CPUE				Estimated
Year	of Squares	Current	Previous Day	Difference	Timing	Total Run
1987	0.000936	2,719	2,740	-21	Late 2 days	8,937,402
1991	0.000998	2,331	2,332	-1	Late 2 days	7,660,546
1999	0.001045	2,451	2,472	-21	Late 3 days	8,056,833
1992	0.001215	2,368	2,390	-21	Late 2 days	7,784,632
1995	0.001464	2,005	1,988	17	On Time	6,591,004
1994	0.001488	2,964	2,966	-3	Late 4 days	9,741,909
1990	0.001958	2,726	2,783	-58	Late 3 days	8,959,163
1983	0.002046	2,091	2,072	18	On Time	6,871,949
2003	0.002489	1,904	1,879	25	Early 1 day	6,259,932
1997	0.003030	2,440	2,421	19	Late 1 day	8,021,892
1998	0.003070	2,404	2,384	20	Late 3 days	7,902,868
1996	0.003266	1,816	1,786	30	Early 2 days	5,969,127
1986	0.003725	2,082	2,056	26	Late 1 day	6,842,563
2000	0.003865	1,672	1,636	35	Early 2 days	5,494,476
1982	0.004225	2,129	2,102	27	Late 2 days	6,999,125
1993	0.004352	1,972	1,943	29	Early 1 day	6,483,156
1985	0.006066	2,022	1,989	33	On Time	6,647,805
1988	0.006723	1,963	1,928	35	Early 2 days	6,451,042
2002	0.007553	1,711	1,672	39	Early 2 days	5,625,169
2001	0.008442	1,703	1,663	40	Early 2 days	5,597,163
1989	0.014450	2,078	2,029	49	On Time	6,829,546
1984	0.016296	1,659	1,612	47	Early 4 days	5,453,092
1979	0.028755	1,507	1,455	52	Early 5 days	4,953,821
1981	0.064014	1,410	1,351	59	Early 9 days	4,633,958
1980	0.064431	1,448	1,388	59	Early 9 days	4,758,044

-continued-

Table 4.–Page 2 of 2.

7/27/04		Number of Fish
Escapement		**1,731,424**
Cumulative Catch		**4,344,732**
Residual in District		**267,975**
TOTAL RUN THROUGH	**7/27/2004 =**	**6,344,131**

2004 Cumulative Offshore Test Fish CPUE = **932** through 15-Jul
2004 Cumulative Offshore Test Fish CPUE = **1,970** through 27-Jul

Passage Rate (Total Run/Cumulative CPUE): **3,221** Based on 27-Jul harvest
Total CPUE for season, if 15-Jul is 50% point: **1,864**

Run Estimate Based on Average Timing (15 July 50% Point): **6,004,143**

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

	Mean Sum	Estimated Total CPUE				Estimated
Year	of Squares	Current	Previous Day	Difference	Timing	Total Run
1991	0.000878	2,300	2,308	-8	Late 2 days	7,409,705
1999	0.001265	2,357	2,374	-16	Late 3 days	7,593,566
1987	0.001312	2,591	2,617	-26	Late 2 days	8,346,081
1992	0.001346	2,286	2,299	-13	Late 2 days	7,363,998
1995	0.001467	2,060	2,052	8	On Time	6,635,287
1994	0.001512	2,861	2,889	-27	Late 4 days	9,216,038
1983	0.001848	2,138	2,133	5	On Time	6,886,630
1997	0.002521	2,455	2,460	-5	Late 1 day	7,908,590
1998	0.002558	2,424	2,427	-3	Late 3 days	7,807,286
2003	0.002825	1,991	1,978	13	Early 1 day	6,412,869
1990	0.003117	2,511	2,545	-34	Late 3 days	8,086,846
1986	0.003412	2,151	2,143	8	Late 1 day	6,927,441
1982	0.003784	2,197	2,190	7	Late 2 days	7,077,351
1996	0.004127	1,924	1,907	17	Early 2 days	6,198,183
1993	0.004296	2,062	2,050	12	Early 1 day	6,641,858
1985	0.005718	2,118	2,106	12	On Time	6,821,885
2000	0.006347	1,810	1,787	23	Early 2 days	5,830,848
1988	0.006533	2,069	2,055	14	Early 2 days	6,663,246
2002	0.009222	1,854	1,831	22	Early 2 days	5,970,933
2001	0.010153	1,849	1,826	23	Early 2 days	5,955,150
1989	0.013253	2,219	2,202	17	On Time	7,146,573
1984	0.017942	1,826	1,801	26	Early 4 days	5,883,094
1979	0.032453	1,705	1,673	32	Early 5 days	5,491,053
1980	0.065477	1,669	1,634	35	Early 9 days	5,377,412
1981	0.066650	1,634	1,597	36	Early 9 days	5,261,936

Table 5.–Total Kenai River sockeye salmon run (millions) in 2004 estimated from total offshore test fish CPUE and age composition run allocation by stock.

Data through July 23

		Estimated Total Offshore Test Fish CPUE			Passage	Estimated UCI	Estimated UCI Run	Estimated UCI Run	Estimated Kenai	Prop.	Estimated Kenai Run	Estimated Total Kenai
Year	MSS	Current	Previous Day	Timing	Rate	Total run	to Date	Remaining	Run to Date	Kenai	Remaining	Return
1987	0.000936	2,719	2,740	Late 2 days	3,287	8.937	5.162	3.775	2.822	60%	2.280	5.102
1991	**0.000998**	**2,331**	**2,332**	**Late 2 days**	**3,287**	**7.661**	**5.162**	**2.499**	**2.822**	**60%**	**1.509**	**4.331**
1999	0.001045	2,451	2,472	Late 3 days	3,287	8.057	5.162	2.895	2.822	60%	1.748	4.570
1992	**0.001215**	**2,368**	**2,390**	**Late 2 days**	**3,287**	**7.785**	**5.162**	**2.623**	**2.822**	**60%**	**1.584**	**4.406**
1995	**0.001464**	**2,005**	**1,988**	**On Time**	**3,287**	**6.591**	**5.162**	**1.429**	**2.822**	**60%**	**0.863**	**3.685**

Data through July 27

		Estimated Total Offshore Test Fish CPUE			Passage	Estimated UCI	Estimated UCI Run	Estimated UCI Run	Estimated Kenai	Prop.	Estimated Kenai Run	Estimated Total Kenai
Year	MSS	Current	Previous Day	Timing	Rate	Total run	to Date	Remaining	Run to Date	Kenai	Remaining	Return
1991	**0.000878**	**2,300**	**2,308**	**Late 2 days**	**3,222**	**7.411**	**6.019**	**1.392**	**3.479**	**63%**	**0.877**	**4.356**
1999	**0.001265**	**2,357**	**2,374**	**Late 3 days**	**3,222**	**7.595**	**6.019**	**1.576**	**3.479**	**63%**	**0.993**	**4.472**
1987	0.001312	2,591	2,617	Late 2 days	3,222	8.347	6.019	2.328	3.479	63%	1.467	4.946
1992	0.001346	2,286	2,299	Late 2 days	3,222	7.365	6.019	1.346	3.479	63%	0.848	4.327
1995	0.001467	2,060	2,052	On Time	3,222	6.636	6.019	0.617	3.479	63%	0.389	3.868

Note: Most probable estimates indicated in bold.

Table 6.–A comparison of methods used to make postseason adjustments to the offshore test fish final CPUE.

	Final	Postseason OTF CPUE Adjustment		Harvest Adjusted		Total Run Adjusted	
Year	OTF CPUE	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	-4.9087	0.2081	-4.6374	0.1903

Table 7.–Mean date of the sockeye salmon run across the Anchor Point transect, Upper Cook Inlet offshore test fish project, 1979–2004.

	Mean 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	16-Jul
1987	26.0	19-Jul
1988	21.4	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
1979–2003 Average	21.7	15-Jul
2004	24.4	17-Jul

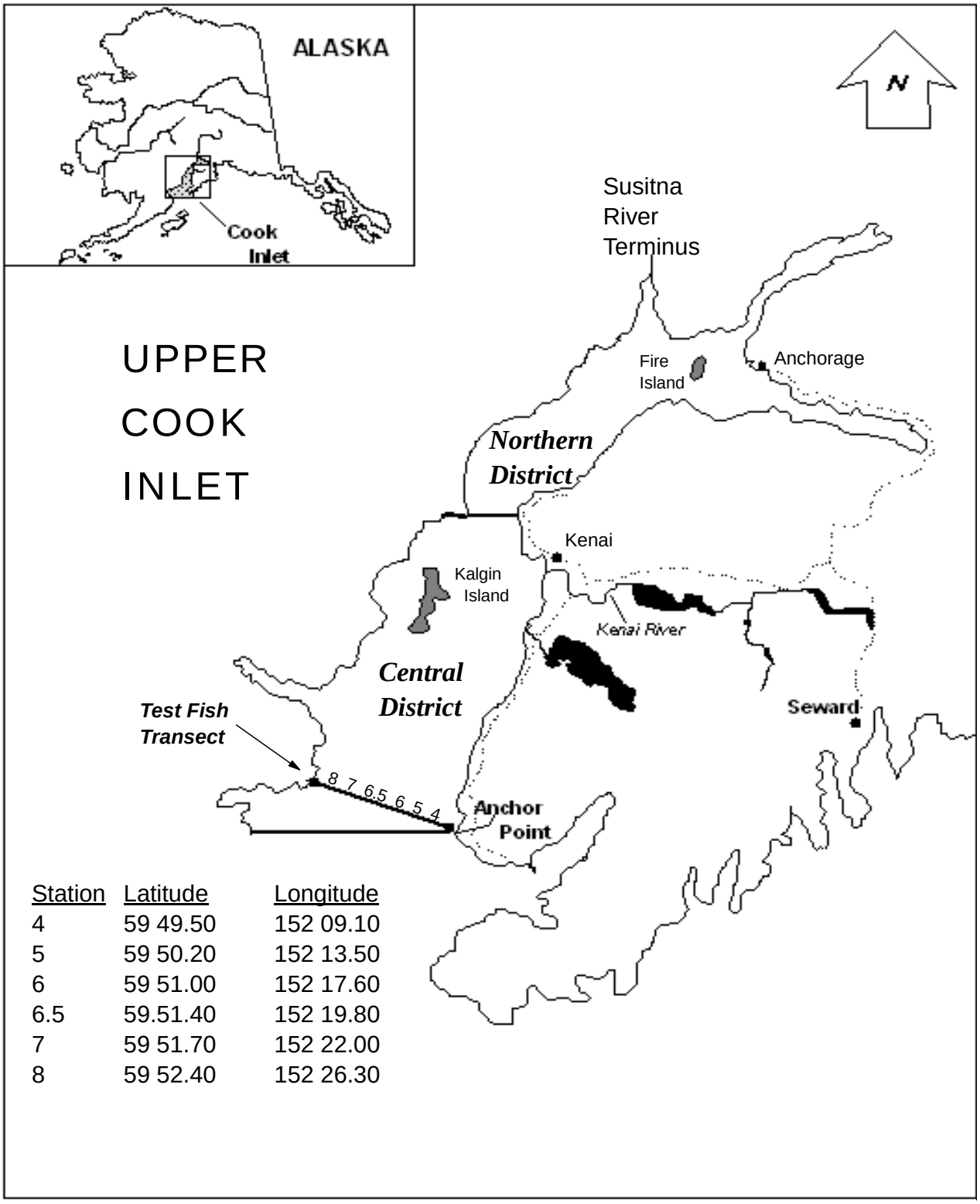
[a] Day (1) = June 24.

Table 8.–Age composition and mean length of sockeye salmon, by station, Upper Cook Inlet offshore test fish project, 2004.

Station	Sample	Age Composition (%)							
Number	Size	0.2	0.3	1.2	1.3	2.2	1.4	2.3	2.4
4	117		0.7	11.0	68.2	8.4		11.7	
5	237	0.5	0.7	8.4	75.4	4.2	0.5	9.8	0.5
6	326			5.8	70.1	7.0	1.6	14.9	0.5
6.5	299		0.4	8.9	74.8	6.0	0.4	9.2	0.4
7	259		0.4	8.5	72.9	5.7	1.8	10.7	
8	82			6.1	74.5	6.1	2.2	11.2	
Station Average		0.1	0.4	8.0	72.8	6.1	1.0	11.4	0.3

Station	Sample	Mean Length (mm)							
Number	Size	0.2	0.3	1.2	1.3	2.2	1.4	2.3	2.4
4	154		515	500	575	490		560	
5	407	465	578	498	575	500	625	574	570
6	743			496	573	511	599	570	600
6.5	787		575	505	573	495	595	566	580
7	457		555	495	569	500	591	557	
8	278			516	562	506	588	560	
Station Average		465	556	502	571	500	600	565	583

Station	Sample	Age Composition - Number for Each Age Class							
Number	Size	0.2	0.3	1.2	1.3	2.2	1.4	2.3	2.4
4	154		1	13	80	10		14	
5	407	1	2	20	179	10	1	23	1
6	743			19	229	23	5	49	2
6.5	787		1	27	224	18	1	27	1
7	457		1	22	189	15	5	28	
8	278			5	61	5	2	9	
Station Total		1	5	105	961	80	14	150	4



Station	Latitude	Longitude
4	59 49.50	152 09.10
5	59 50.20	152 13.50
6	59 51.00	152 17.60
6.5	59.51.40	152 19.80
7	59 51.70	152 22.00
8	59 52.40	152 26.30

Figure 1.–Location of fishing districts and offshore test fish transect in Upper Cook Inlet, Alaska, 2004.

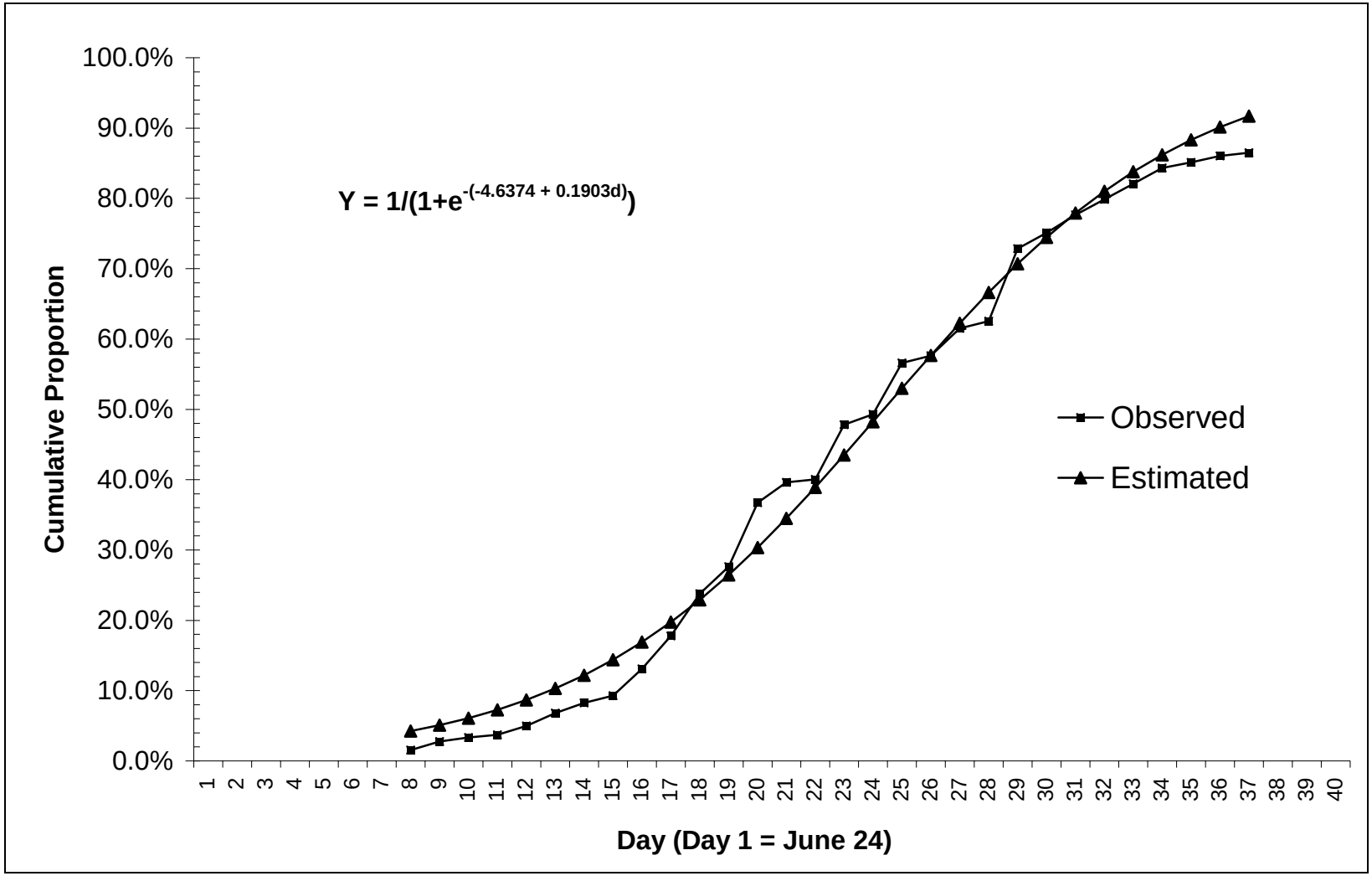


Figure 2.–Cumulative proportions estimated for the sockeye salmon return to Upper Cook Inlet, Alaska, 2004.

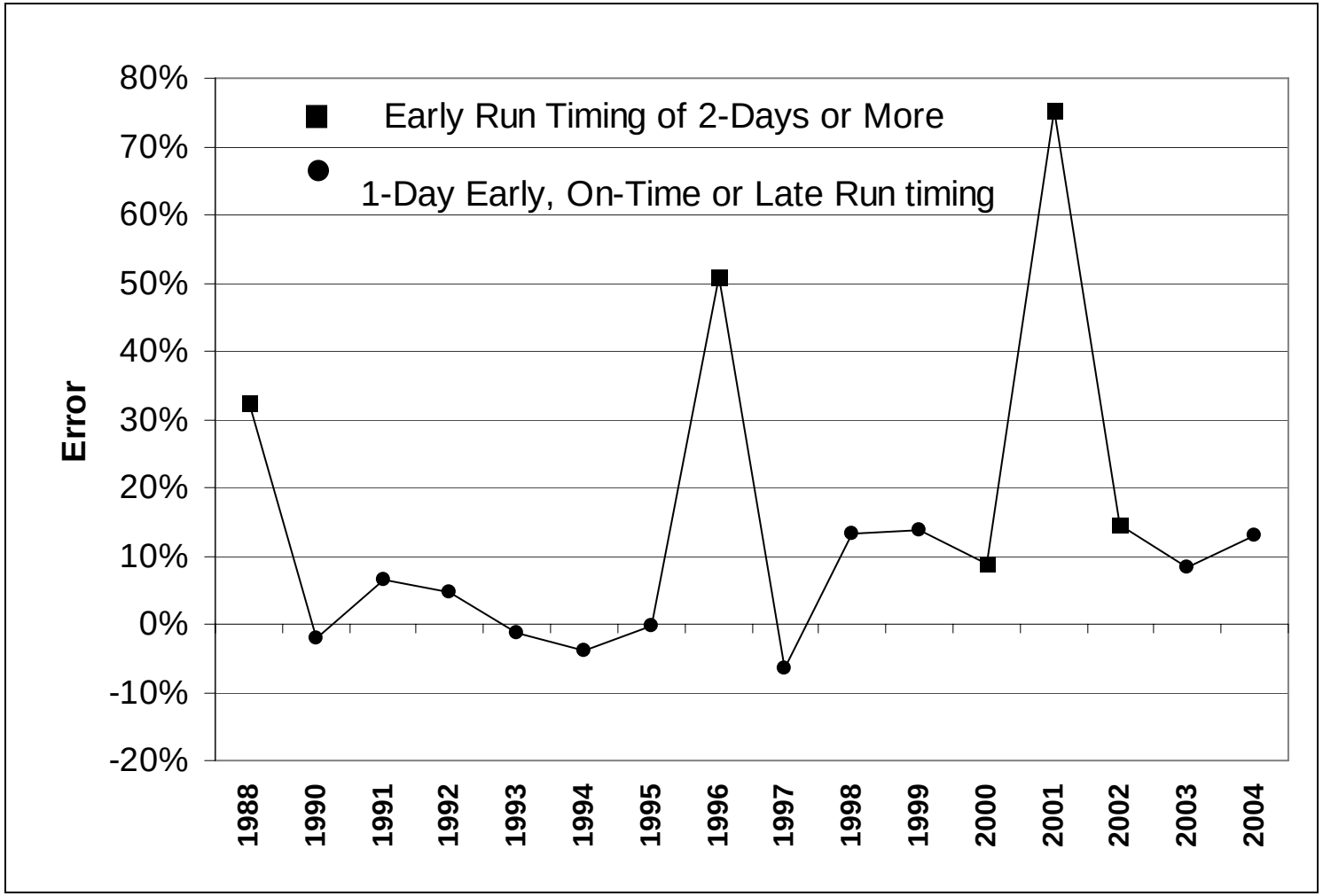


Figure 3.–Offshore test fish error in forecasting the total run of sockeye salmon to Upper Cook Inlet using the July 20 best-fit estimate.

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, 2004.

	Number of	Mean Fishing Time	Catch		CPUE	
Date	Stations	(min)	Daily	Cumulative	Daily	Cumulative
7/01	6	222.0	0	0	0.0	0.0
7/02	6	220.0	1	1	0.8	0.8
7/03	6	223.0	0	1	0.0	0.8
7/04	6	194.0	0	1	0.0	0.8
7/05	6	227.0	1	2	0.8	1.6
7/06	6	209.0	1	3	0.8	2.4
7/07	6	220.5	0	3	0.0	2.4
7/08	6	222.5	1	4	0.8	3.2
7/09	6	228.5	3	7	2.4	5.6
7/10	6	230.0	6	13	4.6	10.2
7/11	6	231.5	9	22	6.3	16.5
7/12	6	214.5	6	28	4.4	20.9
7/13	6	251.0	9	37	6.2	27.1
7/14	6	230.5	17	54	10.9	38.0
7/15	6	212.0	13	67	11.2	49.1
7/16	6	238.5	39	106	26.6	75.7
7/17	6	219.0	6	112	4.7	80.4
7/18	6	249.5	50	162	33.4	113.8
7/19	6	216.0	10	172	8.3	122.1
7/20	6	208.0	28	200	20.5	142.6
7/21	6	219.5	12	212	3.2	145.7
7/22	6	260.5	189	401	110.2	255.9
7/23	6	226.0	40	441	29.3	285.2
7/24	6	236.5	44	485	31.4	316.6
7/25	6	233.5	58	543	42.2	358.7
7/26[a]	0	0.0	38	581	27.6	386.4
7/27	6	220.5	17	598	13.1	399.5
7/28	6	213.5	13	611	11.0	410.5
7/29	6	227.5	35	646	25.2	435.8
7/30	6	214.0	4	650	3.1	438.9

[a] The test fish boat was unable to fish on this day; the data was interpolated from day before and day after catches.

Appendix A2.–Estimated pink salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0	0	0	0	0	0	0
7/02	0	0	0	0	1	0	1
7/03	0	0	0	0	0	0	0
7/04	0	0	0	0	0	0	0
7/05	0	0	0	0	0	1	1
7/06	0	0	0	0	1	0	1
7/07	0	0	0	0	0	0	0
7/08	0	0	0	0	0	1	1
7/09	1	0	0	2	0	0	3
7/10	0	3	1	1	0	1	6
7/11	0	1	0	6	2	0	9
7/12	0	0	0	1	3	2	6
7/13	0	1	3	3	1	1	9
7/14	0	16	1	0	0	0	17
7/15	0	11	1	1	0	0	13
7/16	0	2	7	20	10	0	39
7/17	0	5	1	0	0	0	6
7/18	0	0	15	18	10	7	50
7/19	0	3	3	2	1	1	10
7/20	0	24	0	3	1	0	28
7/21	0	2	0	1	9	0	12
7/22	0	4	37	14	17	117	189
7/23	0	2	0	8	29	1	40
7/24	2	2	19	12	1	8	44
7/25	0	0	3	47	6	2	58
7/26[a]	0	0	2	24	8	4	38
7/27	0	0	1	0	10	6	17
7/28	0	0	0	2	3	8	13
7/29	0	1	0	17	14	3	35
7/30	0	0	1	3	0	0	4
Total	3	77	95	185	127	163	650
Percent	0.5	11.9	14.6	28.4	19.6	25.1	100

Appendix A3.–Estimated pink salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/02	0.0	0.0	0.0	0.0	0.8	0.0	0.8
7/03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/04	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/05	0.0	0.0	0.0	0.0	0.0	0.8	0.8
7/06	0.0	0.0	0.0	0.0	0.8	0.0	0.8
7/07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/08	0.0	0.0	0.0	0.0	0.0	0.8	0.8
7/09	0.8	0.0	0.0	1.6	0.0	0.0	2.4
7/10	0.0	2.2	0.8	0.7	0.0	0.9	4.6
7/11	0.0	0.8	0.0	4.0	1.5	0.0	6.3
7/12	0.0	0.0	0.0	0.8	2.0	1.6	4.4
7/13	0.0	0.7	2.0	1.9	0.8	0.8	6.2
7/14	0.0	10.1	0.8	0.0	0.0	0.0	10.9
7/15	0.0	9.4	0.9	0.9	0.0	0.0	11.2
7/16	0.0	1.7	4.7	12.9	7.3	0.0	26.6
7/17	0.0	3.9	0.8	0.0	0.0	0.0	4.7
7/18	0.0	0.0	10.5	11.3	6.1	5.6	33.4
7/19	0.0	2.4	2.5	1.7	0.9	0.8	8.3
7/20	0.0	17.6	0.0	2.1	0.8	0.0	20.5
7/21	0.0	1.7	0.0	0.8	0.7	0.0	3.2
7/22	0.0	3.3	22.0	10.9	11.9	62.1	110.2
7/23	0.0	1.6	0.0	5.8	21.0	0.8	29.3
7/24	1.7	1.7	13.6	7.2	0.9	6.4	31.4
7/25	0.0	0.0	2.1	33.6	4.8	1.7	42.2
7/26[a]	0.0	0.0	1.4	16.8	6.1	3.3	27.6
7/27	0.0	0.0	0.8	0.0	7.3	5.0	13.1
7/28	0.0	0.0	0.0	1.6	2.5	6.9	11.0
7/29	0.0	0.9	0.0	12.3	9.7	2.4	25.2
7/30	0.0	0.0	0.8	2.3	0.0	0.0	3.1
Total	2.5	58.0	63.6	129.2	85.6	99.9	438.9
%	0.6	13.2	14.5	29.4	19.5	22.8	100

Appendix A4.–Summary of chum salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2004.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumulative	Daily	Cumulative
7/01	6	222.0	6	6	4.8	4.8
7/02	6	220.0	9	15	7.3	12.1
7/03	6	223.0	6	21	4.9	17.0
7/04	6	194.0	11	32	9.0	26.0
7/05	6	227.0	9	41	7.1	33.1
7/06	6	209.0	20	61	16.2	49.2
7/07	6	220.5	2	63	1.6	50.8
7/08	6	222.5	15	78	11.7	62.5
7/09	6	228.5	7	85	5.1	67.7
7/10	6	230.0	19	104	14.5	82.1
7/11	6	231.5	26	130	17.8	100.0
7/12	6	214.5	37	167	25.7	125.7
7/13	6	251.0	22	189	14.8	140.4
7/14	6	230.5	24	213	16.1	156.5
7/15	6	212.0	5	218	3.5	160.0
7/16	6	238.5	35	253	23.9	183.9
7/17	6	219.0	2	255	1.6	185.5
7/18	6	249.5	60	315	38.6	224.0
7/19	6	216.0	3	318	2.5	226.5
7/20	6	208.0	28	346	22.9	249.4
7/21	6	219.5	16	362	6.2	255.7
7/22	6	260.5	107	469	60.2	315.9
7/23	6	226.0	19	488	14.0	329.9
7/24	6	236.5	64	552	41.7	371.6
7/25	6	233.5	33	585	24.6	396.2
7/26[a]	0	0.0	24	609	18	414.0
7/27	6	220.5	14	623	11.0	425.0
7/28	6	213.5	4	627	3.4	428.4
7/29	6	227.5	22	649	16.1	444.5
7/30	6	214.0	3	652	2.6	447.0

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A5.–Estimated chum salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	2	0	3	0	1	0	6
7/02	2	0	3	2	2	0	9
7/03	0	4	0	0	2	0	6
7/04	0	0	5	2	1	3	11
7/05	0	2	0	3	2	2	9
7/06	0	1	12	5	2	0	20
7/07	1	1	0	0	0	0	2
7/08	2	2	10	0	1	0	15
7/09	0	0	4	2	1	0	7
7/10	1	6	6	4	2	0	19
7/11	0	0	3	18	5	0	26
7/12	0	6	1	4	25	1	37
7/13	0	3	11	6	2	0	22
7/14	0	19	1	3	0	1	24
7/15	0	4	0	1	0	0	5
7/16	1	0	17	10	6	1	35
7/17	0	1	1	0	0	0	2
7/18	0	0	5	19	29	7	60
7/19	0	0	0	2	0	1	3
7/20	0	16	2	10	0	0	28
7/21	0	0	0	6	9	1	16
7/22	0	0	20	2	10	75	107
7/23	0	1	1	5	12	0	19
7/24	0	2	25	37	0	0	64
7/25	0	0	1	20	12	0	33
7/26[a]	0	0	4	11	8	1	24
7/27	0	0	7	2	4	1	14
7/28	0	0	0	1	3	0	4
7/29	0	2	1	5	12	2	22
7/30	0	1	1	0	1	0	3
Total	9	71	144	180	152	96	652
%	1	11	22	28	23	15	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A6.–Estimated chum salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	1.6	0.0	2.5	0.0	0.8	0.0	4.8
7/02	1.6	0.0	2.5	1.6	1.6	0.0	7.3
7/03	0.0	3.2	0.0	0.0	1.7	0.0	4.9
7/04	0.0	0.0	4.0	1.7	0.8	2.5	9.0
7/05	0.0	1.6	0.0	2.4	1.5	1.6	7.1
7/06	0.0	1.4	9.1	4.1	1.6	0.0	16.2
7/07	0.8	0.8	0.0	0.0	0.0	0.0	1.6
7/08	1.6	1.6	7.7	0.0	0.8	0.0	11.7
7/09	0.0	0.0	2.7	1.6	0.8	0.0	5.1
7/10	0.8	4.4	4.8	2.9	1.6	0.0	14.5
7/11	0.0	0.0	2.3	11.9	3.7	0.0	17.8
7/12	0.0	4.8	1.4	3.2	15.5	0.8	25.7
7/13	0.0	2.1	7.3	3.8	1.6	0.0	14.8
7/14	0.0	12.0	0.8	2.4	0.0	0.8	16.1
7/15	0.0	3.4	0.0	0.1	0.0	0.0	3.5
7/16	0.8	0.0	11.3	6.5	4.4	0.8	23.9
7/17	0.0	0.8	0.8	0.0	0.0	0.0	1.6
7/18	0.0	0.0	3.5	11.9	17.6	5.6	38.6
7/19	0.0	0.0	0.0	1.7	0.0	0.8	2.5
7/20	0.0	11.7	4.0	7.1	0.0	0.0	22.9
7/21	0.0	0.0	0.0	4.7	0.7	0.8	6.2
7/22	0.0	0.0	11.9	1.6	7.0	39.8	60.2
7/23	0.0	0.8	0.8	3.7	8.7	0.0	14.0
7/24	0.0	1.7	17.9	22.2	0.0	0.0	41.7
7/25	0.0	0.0	0.7	14.3	9.6	0.0	24.6
7/26[a]	0.0	0.0	3.2	8.0	6.3	0.4	17.8
7/27	0.0	0.0	5.6	1.7	2.9	0.8	11.0
7/28	0.0	0.0	0.0	0.8	2.5	0.0	3.4
7/29	0.0	1.7	0.8	3.6	8.3	1.6	16.1
7/30	0.0	0.9	0.8	0.0	0.9	0.0	2.6
Total	7.2	52.9	106.4	123.4	100.7	56.4	447.0
%	2	12	24	28	23	13	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A7.–Summary of coho salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2004.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumulative	Daily	Cumulative
7/01	6	222	1	1	0.8	0.8
7/02	6	220	3	4	2.4	3.2
7/03	6	223	2	6	1.7	4.9
7/04	6	194	4	10	3.2	8.1
7/05	6	227	7	17	5.3	13.5
7/06	6	209	17	34	14.2	27.6
7/07	6	220.5	2	36	1.6	29.2
7/08	6	222.5	30	66	23.4	52.5
7/09	6	228.5	8	74	5.4	57.9
7/10	6	230	69	143	51.7	109.6
7/11	6	231.5	37	180	24.5	134.1
7/12	6	214.5	30	210	21.6	155.8
7/13	6	251	70	280	48.3	204.1
7/14	6	230.5	23	303	15.5	219.6
7/15	6	212	4	307	3.4	223.0
7/16	6	238.5	56	363	38.8	261.9
7/17	6	219	16	379	12.7	274.6
7/18	6	249.5	143	522	91.0	365.6
7/19	6	216	27	549	22.2	387.8
7/20	6	208	48	597	45.5	433.3
7/21	6	219.5	17	614	13.0	446.3
7/22	6	260.5	149	763	85.0	531.2
7/23	6	226	44	807	33.8	565.0
7/24	6	236.5	109	916	68.4	633.4
7/25	6	233.5	33	949	23.6	657.0
7/26[a]	0	0	39	988	28.6	685.6
7/27	6	220.5	44	1,032	33.6	719.2
7/28	6	213.5	14	1,046	11.8	731.0
7/29	6	227.5	68	1,114	50.2	781.3
7/30	6	214	5	1,119	4.1	785.4

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A8.–Estimated coho salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0	1	0	0	0	0	1
7/02	1	0	2	0	0	0	3
7/03	0	0	0	0	2	0	2
7/04	0	0	3	1	0	0	4
7/05	0	1	0	1	4	1	7
7/06	0	1	4	12	0	0	17
7/07	0	2	0	0	0	0	2
7/08	1	7	22	0	0	0	30
7/09	0	0	8	0	0	0	8
7/10	3	16	4	31	15	0	69
7/11	0	1	6	25	5	0	37
7/12	1	2	0	8	17	2	30
7/13	0	12	8	31	8	11	70
7/14	0	18	2	1	0	2	23
7/15	0	1	2	1	0	0	4
7/16	0	0	11	16	29	0	56
7/17	0	10	5	1	0	0	16
7/18	1	0	22	29	83	8	143
7/19	0	9	16	1	1	0	27
7/20	0	14	8	15	11	0	48
7/21	0	0	0	0	16	1	17
7/22	0	0	19	10	13	107	149
7/23	0	0	1	5	20	18	44
7/24	0	1	21	85	0	2	109
7/25	0	3	23	5	2	0	33
7/26[a]	0	2	15	4	15	4	39
7/27	0	1	6	2	28	7	44
7/28	0	1	6	0	5	2	14
7/29	0	0	6	26	22	14	68
7/30	2	0	0	2	0	1	5
Total	9	103	220	312	296	180	1,119
%	1	9	20	28	26	16	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A9.–Estimated coho salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0.0	0.8	0.0	0.0	0.0	0.0	0.8
7/02	0.8	0.0	1.6	0.0	0.0	0.0	2.4
7/03	0.0	0.0	0.0	0.0	1.7	0.0	1.7
7/04	0.0	0.0	2.4	0.8	0.0	0.0	3.2
7/05	0.0	0.8	0.0	0.8	2.9	0.8	5.3
7/06	0.0	1.4	3.0	9.7	0.0	0.0	14.2
7/07	0.0	1.6	0.0	0.0	0.0	0.0	1.6
7/08	0.8	5.7	16.9	0.0	0.0	0.0	23.4
7/09	0.0	0.0	5.4	0.0	0.0	0.0	5.4
7/10	2.4	11.7	3.2	22.7	11.7	0.0	51.7
7/11	0.0	0.8	4.5	15.5	3.7	0.0	24.5
7/12	0.8	1.6	0.0	6.4	11.2	1.6	21.6
7/13	0.0	8.4	5.3	19.6	6.2	8.8	48.3
7/14	0.0	11.4	1.7	0.8	0.0	1.7	15.5
7/15	0.0	0.9	1.7	0.9	0.0	0.0	3.4
7/16	0.0	0.0	7.3	10.3	21.2	0.0	38.8
7/17	0.0	7.9	4.0	0.8	0.0	0.0	12.7
7/18	0.8	0.0	15.4	18.1	50.3	6.4	91.0
7/19	0.0	7.2	13.3	0.9	0.9	0.0	22.2
7/20	0.0	10.2	16.1	10.3	8.8	0.0	45.5
7/21	0.0	0.0	0.0	0.0	12.2	0.8	13.0
7/22	0.0	0.0	11.3	7.8	9.1	56.8	85.0
7/23	0.0	0.0	0.8	3.7	14.5	14.8	33.8
7/24	0.0	0.8	15.0	51.0	0.0	1.6	68.4
7/25	0.0	2.4	16.1	3.5	1.6	0.0	23.6
7/26[a]	0.0	1.6	10.4	2.6	11.0	2.9	28.6
7/27	0.0	0.9	4.8	1.7	20.5	5.8	33.6
7/28	0.0	0.9	5.0	0.0	4.2	1.7	11.8
7/29	0.0	0.0	5.1	18.8	15.2	11.2	50.2
7/30	1.8	0.0	0.0	1.5	0.0	0.8	4.1
Total	7.4	76.9	170.4	208.1	206.8	115.8	785.4
%	1	10	22	26	26	15	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A10.–Summary of Chinook salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 2004.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumulative	Daily	Cumulative
7/01	6	222.0	0	0	0.0	0.0
7/02	6	220.0	0	0	0.0	0.0
7/03	6	223.0	0	0	0.0	0.0
7/04	6	194.0	1	1	0.8	0.8
7/05	6	227.0	1	2	0.7	1.5
7/06	6	209.0	0	2	0.0	1.5
7/07	6	220.5	0	2	0.0	1.5
7/08	6	222.5	0	2	0.0	1.5
7/09	6	228.5	0	2	0.0	1.5
7/10	6	230.0	0	2	0.0	1.5
7/11	6	231.5	0	2	0.0	1.5
7/12	6	214.5	0	2	0.0	1.5
7/13	6	251.0	0	2	0.0	1.5
7/14	6	230.5	0	2	0.0	1.5
7/15	6	212.0	0	2	0.0	1.5
7/16	6	238.5	0	2	0.0	1.5
7/17	6	219.0	0	2	0.0	1.5
7/18	6	249.5	0	2	0.0	1.5
7/19	6	216.0	0	2	0.0	1.5
7/20	6	208.0	0	2	0.0	1.5
7/21	6	219.5	0	2	0.0	1.5
7/22	6	260.5	0	2	0.0	1.5
7/23	6	226.0	1	3	0.8	2.4
7/24	6	236.5	1	4	0.7	3.1
7/25	6	233.5	0	4	0.0	3.1
7/26[a]	0	0.0	0	4	0.0	3.1
7/27	6	220.5	0	4	0.0	3.1
7/28	6	213.5	0	4	0.0	3.1
7/29	6	227.5	0	4	0.0	3.1
7/30	6	214.0	0	4	0.0	3.1

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A11.–Estimated Chinook salmon catch by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0	0	0	0	0	0	0
7/02	0	0	0	0	0	0	0
7/03	0	0	0	0	0	0	0
7/04	0	0	1	0	0	0	1
7/05	0	0	0	0	1	0	1
7/06	0	0	0	0	0	0	0
7/07	0	0	0	0	0	0	0
7/08	0	0	0	0	0	0	0
7/09	0	0	0	0	0	0	0
7/10	0	0	0	0	0	0	0
7/11	0	0	0	0	0	0	0
7/12	0	0	0	0	0	0	0
7/13	0	0	0	0	0	0	0
7/14	0	0	0	0	0	0	0
7/15	0	0	0	0	0	0	0
7/16	0	0	0	0	0	0	0
7/17	0	0	0	0	0	0	0
7/18	0	0	0	0	0	0	0
7/19	0	0	0	0	0	0	0
7/20	0	0	0	0	0	0	0
7/21	0	0	0	0	0	0	0
7/22	0	0	0	0	0	0	0
7/23	0	0	0	0	0	1	1
7/24	0	0	1	0	0	0	1
7/25	0	0	0	0	0	0	0
7/26[a]	0	0	0	0	0	0	0
7/27	0	0	0	0	0	0	0
7/28	0	0	0	0	0	0	0
7/29	0	0	0	0	0	0	0
7/30	0	0	0	0	0	0	0
Total	0	0	2	0	1	1	4
%	0	0	50	0	25	25	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A12.–Estimated Chinook salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 2004.

	Station Number						
Date	**4**	**5**	**6**	**6.5**	**7**	**8**	**Total**
7/01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/04	0.0	0.0	0.8	0.0	0.0	0.0	0.8
7/05	0.0	0.0	0.0	0.0	0.7	0.0	0.7
7/06	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/08	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/09	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/13	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/18	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/19	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	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	0.8	0.8
7/24	0.0	0.0	0.7	0.0	0.0	0.0	0.7
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	0.0	0.0	0.0
7/27	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/29	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	0.0	0.0	1.5	0.0	0.7	0.8	3.1
%	0	0	49	0	24	27	100

[a] The test fish boat was unable to fish on these days; the data was interpolated from day before and day after catches.

Appendix A13.–Entry pattern of sockeye salmon into Upper Cook Inlet, Alaska, 2004 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	01-Jul	0.0157	0.0425	-0.0268		
9	02-Jul	0.0277	0.0509	-0.0233	0.0119	0.0084
10	03-Jul	0.0335	0.0610	-0.0274	0.0059	0.0100
11	04-Jul	0.0374	0.0728	-0.0354	0.0039	0.0118
12	05-Jul	0.0499	0.0867	-0.0368	0.0125	0.0139
13	06-Jul	0.0681	0.1030	-0.0349	0.0182	0.0163
14	07-Jul	0.0826	0.1220	-0.0394	0.0145	0.0190
15	08-Jul	0.0930	0.1439	-0.0509	0.0104	0.0219
16	09-Jul	0.1311	0.1689	-0.0378	0.0381	0.0251
17	10-Jul	0.1779	0.1974	-0.0194	0.0468	0.0284
18	11-Jul	0.2380	0.2292	0.0087	0.0600	0.0319
19	12-Jul	0.2762	0.2646	0.0116	0.0382	0.0353
20	13-Jul	0.3675	0.3032	0.0643	0.0913	0.0386
21	14-Jul	0.3961	0.3448	0.0513	0.0286	0.0416
22	15-Jul	0.4005	0.3890	0.0115	0.0044	0.0442
23	16-Jul	0.4781	0.4350	0.0431	0.0777	0.0461
24	17-Jul	0.4929	0.4822	0.0106	0.0147	0.0472
25	18-Jul	0.5660	0.5298	0.0362	0.0731	0.0475
26	19-Jul	0.5764	0.5768	-0.0003	0.0104	0.0470
27	20-Jul	0.6152	0.6224	-0.0072	0.0388	0.0456
28	21-Jul	0.6253	0.6660	-0.0407	0.0101	0.0436
29	22-Jul	0.7285	0.7069	0.0216	0.1032	0.0409
30	23-Jul	0.7511	0.7447	0.0064	0.0226	0.0378
31	24-Jul	0.7767	0.7792	-0.0025	0.0256	0.0345
32	25-Jul	0.7987	0.8102	-0.0115	0.0220	0.0310
33	26-Jul	0.8208	0.8377	-0.0169	0.0221	0.0276
34	27-Jul	0.8430	0.8619	-0.0190	0.0222	0.0242
35	28-Jul	0.8511	0.8831	-0.0319	0.0081	0.0211
36	29-Jul	0.8603	0.9013	-0.0411	0.0091	0.0183
37	30-Jul	0.8649	0.9170	-0.0521	0.0046	0.0157

Appendix A14.–Chemical and physical observations made in Upper Cook Inlet, Alaska during the conduct of the 2004 offshore test fish project.

Date	Station	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Tide Stage	Salinity (ppt)	Water Depth (ft)	Secchi (m)
1-Jul	4	6	8.7	10	southwest	ebb	31.0	23	9.0
	5	6	9.3	10	southwest	ebb	30.5	31	4.0
	6	6	9.2	8	southwest	ebb	30.3	45	3.0
	6.5	6	9.4	10	southwest	ebb	30.0	41	2.0
	7	7	9.2	10	southwest	low	30.2	44	2.0
	8	7	9.5	5	southwest	low	29.6	28	2.0
2-Jul	8	8	9.2	0	none	high	30.5	30	3.0
	7	8	9.3	0	none	ebb	30.1	46	3.5
	6.5	7	9.2	8	south	ebb	30.3	42	3.5
	6	8	9.1	3	south	ebb	30.6	46	3.5
	5	7	9.1	0	none	ebb	31.4	34	5.0
	4	9	9.2	0	none	ebb	31.4	22	5.0
3-Jul	4	9	9.3	0	none	ebb	31.5	22	5.0
	5	9	9.2	5	southwest	ebb	31.0	34	5.0
	6	10	9.4	0	none	low	30.4	46	2.0
	6.5	10	9.4	0	none	flood	30.2	42	2.0
	7	9	9.4	2	southwest	flood	30.3	45	2.0
	8	10	9.5	0	none	flood	30.3	30	2.0
4-Jul	8	7	9.2	8	northeast	flood	30.2	32	3.0
	7	8	9.2	8	north	high	30.6	46	3.5
	6.5	8	9.2	8	north	ebb	30.6	44	5.0
	6	8	9.2	4	northwest	ebb	30.7	47	4.0
	5	9	8.6	5	northwest	ebb	31.8	31	10.0
	4	9	8.8	10	northwest	ebb	31.8	33	7.0
5-Jul	4	10	8.5	20	south	ebb	31.7	23	5.0
	5	10	9.5	20	southeast	ebb	30.6	34	3.0
	6	9	9.9	25	southeast	ebb	30.3	46	2.0
	6.5	10	9.8	23	southeast	low	31.1	41	1.0
	7	9	9.9	20	southeast	flood	30.0	45	1.5
	8	10	10.1	12	southeast	flood	29.7	29	1.5
6-Jul	4	10	9.4	8	southeast	ebb	31.3	22	7.0
	5	11	9.4	5	southeast	ebb	31.2	31	5.0
	6	11	10.1	5	southeast	low	30.2	46	2.5
	6.5	14	10.1	0	none	flood	30.1	43	2.0
	7	13	10.2	0	none	flood	29.8	45	1.5
	8	13	10.3	0	none	flood	29.6	31	2.0

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Date	Station	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Tide Stage	Salinity (ppt)	Water Depth (ft)	Secchi (m)
7-Jul	8	8	10.1	4	south	flood	29.6	28	1.5
	7	8	9.9	2	south	flood	29.9	46	2.0
	6.5	10	9.9	3	south	flood	30.4	43	3.0
	6	9	9.1	4	southeast	flood	31.2	48	5.0
	5	8	8.9	0	none	flood	31.5	36	8.0
	4	8	8.7	0	none	high	31.7	24	12.0
8-Jul	4	10	9.1	8	northwest	high	31.5	25	7.0
	5	10	9.5	0	none	high	31.2	35	6.0
	6	12	10.6	0	none	ebb	29.7	46	3.0
	6.5	14	10.6	0	none	ebb	29.5	41	2.0
	7	12	10.6	0	none	ebb	29.7	44	2.0
	8	15	10.4	0	none	low	29.8	28	1.5
9-Jul	8	10	10.3	4	northwest	ebb	29.8	28	2.0
	7	10	10.8	7	northwest	ebb	29.2	45	3.0
	6.5	11	10.6	15	northwest	low	29.8	43	3.0
	6	11	10.2	12	northwest	flood	30.0	49	3.0
	5	10	9.2	15	northwest	flood	31.2	37	7.0
	4	10	9.4	15	northwest	flood	31.4	25	8.5
10-Jul	4	16	9.4	15	northwest	flood	31.3	24	7.0
	5	14	9.7	15	northwest	flood	31.2	36	7.0
	6	13	10.9	8	northwest	flood	29.8	47	4.0
	6.5	14	11.8	12	northwest	ebb	29.6	43	4.0
	7	15	11.3	0	none	ebb	29.2	45	2.5
	8	18	11.1	0	none	ebb	29.2	28	4.0
11-Jul	8	11	11.2	12	southeast	ebb	29.0	27	2.0
	7	12	11.4	15	southeast	ebb	28.7	44	2.5
	6.5	13	11.8	4	northeast	low	28.9	42	4.0
	6	12	10.8	0	none	flood	30.1	46	5.0
	5	15	9.7	5	northeast	flood	31.1	36	8.0
	4	12	9.5	5	northeast	flood	31.7	25	9.0
12-Jul	4	14	10.1	10	southeast	flood	31.2	25	6.0
	5	11	10.1	10	southwest	flood	31.3	36	6.0
	6	10	9.8	5	southwest	flood	31.4	49	5.5
	6.5	11	11.5	13	southwest	flood	28.8	44	3.0
	7	13	12.3	10	southwest	high	27.2	45	3.0
	8	13	12.3	18	southeast	ebb	27.4	30	3.0

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Date	Station	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Tide Stage	Salinity (ppt)	Water Depth (ft)	Secchi (m)
13-Jul	8	9	11.4	20	southwest	ebb	28.6	28	3.0
	7	9	11.8	25	southwest	ebb	27.4	40	3.0
	6.5	8	11.8	22	southwest	ebb	27.3	41	3.0
	6	11	11.6	20	southwest	ebb	27.4	46	3.0
	5	10	11.4	8	south	flood	26.8	36	4.0
	4	12	10.0	0	none	flood	31.3	24	10.0
14-Jul	4	14	11.2	0	none	flood	29.4	24	5.0
	5	12	11.6	15	southwest	ebb	27.3	35	5.0
	6	12	11.9	15	southwest	ebb	27.4	48	4.0
	6.5	11	11.6	15	southwest	low	28.5	43	3.0
	7	10	11.6	15	southwest	flood	28.6	45	3.0
	8	10	11.3	15	southwest	flood	29.0	29	1.0
15-Jul	8	12	11.2	10	southeast	ebb	29.2	28	2.5
	7	11	11.4	10	northeast	ebb	28.4	43	3.5
	6.5	12	12.6	5	southeast	ebb	26.5	41	3.5
	6	12	12.7	5	southeast	ebb	26.2	46	3.5
	5	12	12.1	0	none	low	28.6	35	4.5
	4	13	10.2	4	southwest	flood	31.1	23	7.0
16-Jul	4	13	10.8	2	southwest	ebb	30.2	23	5.0
	5	14	10.1	2	southwest	ebb	28.8	35	4.0
	6	13	11.4	8	southwest	flood	29.0	47	3.5
	6.5	12	11.7	5	southwest	flood	28.7	43	4.0
	7	12	13.0	10	southwest	flood	25.5	45	2.0
	8	11	12.3	10	southwest	flood	27.4	29	3.0
17-Jul	8	11	11.5	8	southwest	flood	28.7	29	3.0
	7	11	11.4	0	none	high	28.4	45	3.0
	6.5	6	10.0	11	none	ebb	28.5	43	3.5
	6	10	11.7	5	southeast	ebb	28.3	46	3.5
	5	10	11.6	5	northeast	ebb	28.5	34	4.0
	4	10	10.0	15	north	ebb	31.4	22	7.5
18-Jul	4	10	11.3	20	northwest	ebb	31.2	22	5.0
	5	10	9.9	25	northwest	ebb	31.0	34	5.0
	6	10	9.6	20	northwest	low	31.0	45	4.0
	6.5	10	9.7	18	northwest	flood	30.9	43	4.0
	7	11	9.7	18	north	flood	29.7	46	4.0
	8	12	11.0	18	north	flood	29.1	30	2.5

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Date	Station	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Tide Stage	Salinity (ppt)	Water Depth (ft)	Secchi (m)
19-Jul	8	10	11.3	8	northwest	high	28.9	30	3.0
	7	10	10.8	5	northwest	ebb	29.2	46	3.0
	6.5	10	10.5	3	north	ebb	29.8	23	4.0
	6	10	10.8	4	north	ebb	31.3	47	4.0
	5	12	11.1	0	none	ebb	31.2	35	9.0
	4	9	9.8	0	none	ebb	31.6	22	9.0
20-Jul	4	12	9.9	5	south	ebb	31.7	22	8.5
	5	14	11.0	10	southeast	ebb	29.7	34	3.5
	6	11	10.6	10	southeast	ebb	30.2	44	4.0
	6.5	12	12.1	11	southeast	low	28.3	42	2.5
	7	10	12.0	12	southwest	flood	27.8	45	2.5
	8	12	11.5	3	south	flood	28.9	29	2.5
21-Jul	8	10	11.2	0	none	flood	28.8	29	3.5
	7	10	11.0	0	none	flood	29.4	46	3.5
	6.5	10	9.5	0	none	flood	31.6	44	9.0
	6	10	9.3	0	none	high	31.8	49	10.0
	5	10	9.4	0	none	ebb	31.8	36	10.0
	4	10	9.7	14	north	ebb	31.7	23	9.0
22-Jul	4	10	9.9	28	northwest	ebb	31.6	23	5.0
	5	10	9.7	25	northwest	ebb	31.7	33	5.0
	6	10	10.2	22	northeast	ebb	30.5	46	3.5
	6.5	12	10.3	28	northwest	ebb	30.4	41	2.5
	7	10	10.5	32	northwest	low	30.1	45	2.0
	8	10	11.0	25	northwest	flood	29.4	29	1.5
23-Jul	8	10	11.1	12	northeast	flood	29.0	29	2.0
	7	11	10.6	10	northeast	flood	30.0	45	3.0
	6.5	11	9.5	12	northwest	high	31.5	43	7.5
	6	11	9.2	10	northwest	high	31.8	47	8.0
	5	10	9.2	5	northwest	ebb	31.9	36	11.0
	4	10	9.6	0	none	ebb	31.7	23	11.0
24-Jul	4	12	9.3	0	none	high	31.6	24	12.0
	5	13	9.5	5	south	ebb	31.8	36	12.0
	6	14	11.6	5	south	ebb	29.0	47	4.0
	6.5	15	11.6	12	southeast	ebb	29.0	42	3.0
	7	13	12.1	14	southwest	ebb	28.3	44	3.0
	8	12	11.6	15	southwest	ebb	29.1	28	2.5

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Date	Station	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Tide Stage	Salinity (ppt)	Water Depth (ft)	Secchi (m)
25-Jul	8	11	12.5	5	northeast	ebb	27.7	24	2.5
	7	11	12.9	10	northeast	low	27.1	44	3.0
	6.5	10	12.6	12	northeast	flood	27.6	43	3.0
	6	10	10.4	10	northeast	flood	31.0	46	7.0
	5	10	9.4	8	northeast	flood	31.8	36	12.0
	4	10	9.4	8	north	high	31.6	24	11.0
26-Jul	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
27-Jul	4	8	9.7	10	northwest	flood	31.3	25	7.0
	5	10	9.5	10	northwest	flood	31.6	37	12.0
	6	10	9.3	15	northeast	flood	31.7	46	11.0
	6.5	10	11.2	8	northeast	high	29.3	41	3.5
	7	10	11.4	10	northeast	ebb	29.0	45	2.5
	8	10	11.6	10	northeast	ebb	28.2	27	2.0
28-Jul	8	11	12.1	12	northwest	ebb	27.3	28	3.0
	7	11	12.1	12	northwest	ebb	27.5	43	3.0
	6.5	11	10.2	13	northwest	low	30.0	41	6.5
	6	11	9.6	0	none	flood	31.5	48	9.0
	5	11	9.6	0	none	flood	31.5	35	11.0
	4	11	9.4	0	none	flood	31.5	25	12.0
29-Jul	4	10	9.7	0	none	flood	31.3	25	9.0
	5	11	9.6	0	none	flood	31.5	35	9.5
	6	12	9.8	0	none	flood	31.4	47	7.0
	6.5	12	12.7	12	southeast	flood	28.4	43	3.5
	7	12	12.6	10	southeast	flood	26.6	46	3.0
	8	12	11.7	14	southeast	high	28.0	29	2.5
30-Jul	8	11	11.7	15	south	flood	38.2	29	2.5
	7	10	11.4	15	southwest	ebb	28.6	45	3.0
	6.5	10	11.4	10	southwest	ebb	28.4	42	3.0
	6	10	11.6	10	southwest	ebb	27.6	49	2.5
	5	10	9.7	0	none	ebb	31.4	34	9.0
	4	13	9.8	0	none	ebb	31.3	23	8.0

Appendix A15.–Yearly mean values of physical observations made during the conduct of the 1995–2004 offshore test fish project.

Station	Year	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Salinity (ppt)	Water Depth (ft)	Secchi (m)
4	1995	13.1	9.1	5.6	E	27.1	25.0	7.9
	1996	12.8	9.4	7.4	E	31.5	24.6	7.9
	1997	13.7	9.5	8.9	SE	31.6	24.6	6.2
	1998	12.5	9.7	9.7	SE	31.0	24.4	9.5
	1999	13.1	9.6	10.6	SE	31.4	24.3	7.6
	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
Average		**12.9**	**9.6**	**9.5**	**SE**	**31.0**	**24.1**	**8.2**
5	1995	13.2	9.2	6.9	E	26.8	37.9	6.0
	1996	12.8	9.4	8.6	NE	31.3	36.3	6.3
	1997	13.7	9.9	10.1	SE	31.3	36.8	5.2
	1998	12.8	9.8	9.8	SE	31.1	35.2	8.5
	1999	13.4	10.0	12.9	SE	30.6	38.9	6.2
	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
Average		**13.0**	**9.9**	**10.6**	**SE**	**30.5**	**36.2**	**6.6**
6	1995	13.1	9.5	7.8	E	26.5	47.2	3.9
	1996	12.4	10.2	9.7	E	30.6	47.1	4.2
	1997	13.8	10.5	11.1	SE	30.8	45.9	3.7
	1998	12.4	10.3	10.9	S	30.0	46.1	4.7
	1999	13.5	10.3	12.5	SE	29.8	44.4	4.3
	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
Average		**13.0**	**10.4**	**10.8**	**SE**	**29.8**	**46.1**	**4.5**

Station	Year	Air Temp (°C)	Water Temp (°C)	Wind Velocity (knots)	Wind Direction	Salinity (ppt)	Water Depth (ft)	Secchi (m)
6.5	1995	13.8	10.2	8.5	SE	27.5	43.3	3.3
	1996	13.2	10.3	8.4	E	30.5	42.9	3.2
	1997	13.9	10.7	9.4	E	29.6	43.4	3.2
	1998	12.7	10.5	7.7	SE	29.5	43.3	3.5
	1999	13.4	10.5	13.0	SE	29.7	43.2	3.5
	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
Average		**13.1**	**10.7**	**11.0**	**SE**	**29.5**	**42.7**	**3.5**
7	1995	12.7	9.8	10.1	SE	26.1	44.8	3.1
	1996	12.7	10.4	10.7	SE	30.3	44.9	3.4
	1997	14.0	10.9	10.3	SE	30.2	44.8	2.9
	1998	12.3	10.7	8.4	SE	29.1	44.3	3.0
	1999	13.3	10.6	13.0	S	29.5	42.7	2.9
	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
Average		**12.8**	**10.8**	**11.1**	**SE**	**29.1**	**44.1**	**3.1**
8	1995	12.9	9.9	9.2	E	25.9	28.4	2.7
	1996	12.2	10.4	9.3	SE	30.3	29.9	2.7
	1997	13.7	11.1	9.6	SE	30.1	30.1	2.6
	1998	12.5	10.7	9.1	S	29.1	29.3	2.8
	1999	13.6	10.5	11.8	SE	30.0	25.9	2.6
	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
Average		**12.8**	**10.7**	**10.5**	**SE**	**29.1**	**28.9**	**2.7**

Appendix A16.–Yearly mean values for selected chemical and physical variables collected during conduct of the offshore test fish project, 1979–2004.

Year	Air Temperature (°C)	Water Temperature (°C)	Wind Velocity (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
1992–2003 Average	13.1	10.4	9.8	29.3	4.9
2004	10.7	10.4	8.5	30.0	4.7