AN ESTIMATE OF THE MIGRATORY TIMING OF SOCKEYE SALMON INTO UPPER COOK INLET, ALASKA, IN 1989 USING A TEST FISHERY

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ABSTRACT

During the 1989 Upper Cook Inlet, Alaska commercial salmon fishing season a test fishery was used to estimate the timing of sockeye salmon (*Oncorhynchus nerka*) to the Inlet. The fishery operated from 23 June to 28 July and captured 766 sockeye salmon (619.4 CPUE points). Mean date of the return was 14 July and the test fishery encompassed approximately 84.4% of the run. Average exploitation by the Upper Subdistrict set gill net fishery was estimated at approximately 72%.

KEY WORDS: Salmon, *Oncorhynchus*, Upper Cook Inlet, Alaska, test fishery, migratory behavior

INTRODUCTION

In 1979, the Alaska Department of Fish and Game (ADF&G) began a test fishing project near the southern boundary of the Upper Cook Inlet (UCI) salmon management area (Figure 1). The objective of this project was to estimate the total return of sockeye salmon (*Oncorhynchus nerka*) to UCI during the fishing season before they reached commercial fishing areas. Such information would help ADF&G management biologists determine how best to set fishing time and area for commercial harvests of sockeye salmon surplus to spawning goals. Test fishing results have been reported annually since 1979 (Waltemyer 1983a, 1983b, 1986a, 1986b, Hilsinger and Waltemyer 1987, Hilsinger 1988, Tarbox and Waltemyer 1989). This report presents the results of the 1989 test fishing project.

Unique to the 1989 field season was the presence of oil in the fishing districts as a consequence of the grounding of the tanker Exxon Valdez in Prince William Sound on March 24, 1989. As a result of oil contamination ADF&G closed the Central District to drift gill net fishing and restricted the area within which the set gill net fishery could operate. Without drift gill net fishery harvest data it was not possible to use test fishing information to make inseason estimates of total sockeye salmon returns in 1989.

METHODS

Test Fish Sampling

Sockeye salmon returning to Upper Cook Inlet were sampled by fishing geographically fixed stations between Anchor Point and Red River Delta (Figure 1). Stations were numbered consecutively from east to west. Station locations were determined from LORAN C coordinates. The test fishing vessel sampled stations 2, 4, 5, 6, 7 and 8 on one day. The following day, the vessel sampled stations 9, 7, 6, 5 and 3. This same routine was followed throughout the sampling period.

Sampling started on 23 June in 1989, one day earlier than the starting date used in previous years, and continued through 28 July. The chartered vessel, *F/V Sea Venture*, used 200 fm (4 shackles at 50 fm each) of 2.1 cm (5 1/8 in) multifilament gill net during test fishing. Drift gill net web specifications were: filament size number 53/S6F, 45 meshes deep, double knot construction, and Super Crystal shade number 1.

All salmon captured were identified by species. All sockeye salmon were measured for length (mid-eye to fork of tail in mm). The number of each species caught at each station was expressed as a catch per unit of effort (CPUE) statistic:

$$CPUE_s = \frac{100 \text{ fm} \times 60 \text{ min} \times \text{number of fish}}{\text{fm of gear} \times \text{MFT}} ,$$

where: $CPUE_s$ = CPUE for station s, and
MFT = mean fishing time.

Mean fishing time was calculated as:

$$MFT = (C - B) + \frac{[B - A] + [D - C]}{2} ,$$

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, gill nets fished 30 min before retrieval started.

Daily CPUE ($CPUE_d$) was calculated as:

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

If a station was not fished, the CPUE value for that station was estimated by a simple linear interpolation procedure (i.e., the mean value of the previous and following day's CPUE values).

The following physical and chemical measurements were taken at the start of each set: air and water temperature (at 1 m below the surface), wind velocity and direction, tide stage, water depth and clarity, and salinity. Air temperature, water temperature, and salinity 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 classed as flood, ebb or slack 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.

Describing the Salmon Migration

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

$$q_d = c_d/r_d ,$$

where: q_d = estimated catchability on day d,
r_d = adjusted cumulative total return on day d, and
c_d = cumulative CPUE on day d.

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

$$PR = 1/q_d = \text{passage rate}$$

Because 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 relationship:

$$CPUE_t = CPUE_f \times \frac{H_t}{H_{(f+2)}} ,$$

where: $CPUE_t$ = total estimated CPUE for the season,
$CPUE_f$ = cumulative CPUE through final day, f, of test fishing,
H_t = total commercial harvest for the season
$H_{(f+2)}$ = total commercial catch through final day of test fishery (f+2), and
2 = number of days it takes salmon to travel from test fishery to commercial harvest areas.

Estimates of $CPUE_t$ and $CPUE_d$ values were used to estimate daily and cumulative proportions of $CPUE_t$, based on a non-linear model:

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

where: Y_d = cumulative proportion of CPUE or return on day d,
a and b = coefficients of model, a = - 2.714, b = 0.1258
d = day of observation.

To calculate mean date of return, the following formula was used:

$$M = a/b$$

where: M = mean date of return,

Estimation of Exploitation Rates

The absence of a drift gill net harvest resulted in most salmon being harvested by the Upper Subdistrict set gill net fishery. This fishery occurs near to the

Kenai and Kasilof Rivers. An estimate of the total number of fish available to the fishery was made by lagging daily spawning escapement estimates (sonar counts, Bruce King, ADF&G, Soldotna, personal communication) back in time three days to the fishery.

RESULTS

A total of 766 sockeye salmon, 25 pink salmon, 227 chum salmon, and 82 coho salmon were captured during the 1989 test fishery in (Table 1, Appendix A-C). Daily sockeye salmon catches ranged from 0 to 94 fish (Table 1).

Sockeye salmon daily CPUE values ranged from 0 on 25 June to 69.9 on 12 July. Cumulative total CPUE for the duration of the project was 619.4 (Table 1, Figure 2 and 3). Using post season commercial harvest and escapement figures, test fishing spanned approximately 90.8% of the total run. Therefore, total CPUE for the test fishery would have been 682.5 if test fishing had continued throughout the duration of the run.

The distribution of the test fishing sockeye salmon catches along the transect was similar to the distribution of CPUE values. Approximately 81% of the total sockeye salmon catch and 76% of the total CPUE occurred at stations 5, 6, and 7 (Table 2 and 3).

Examination of daily and cumulative proportions (estimated post season) of the sockeye salmon run to UCI suggested that only 6.2% of the run had passed the transect prior to the start of test fishing on 23 June and that the return was 84.4% completed at the termination of the project (Appendix D; Figures 4 and 5). The mean date of the run was 14 July 1989 which was the same as the historic average (Table 4).

The total sockeye salmon run to UCI in 1989 was estimated at 7.1 million fish of which 5,010,698 were harvested in the commercial fishery (Table 5). Estimate of passage rate for the season was 10,403 sockeye salmon per CPUE index point.

Water temperatures measured along the transect generally increased during the season from a low of 8°C early in June to a high of 12°C in mid-July (Figure 6; Appendix E). Air temperatures fluctuated between 9°C and 18°C during the project (Figure 6; Appendix E). Salinity measurements ranged from 22.5 ppt to 32 ppt with a noticeable decline in average salinities as the season progressed (Figure 7; Appendix E). Wind velocities were generally light; only 1 day of 20 knot winds was recorded at one station during fishing operations (Appendix E). Wind direction was typically from the southwest or northwest.

The estimated number of sockeye salmon available to the Upper Subdistrict set gill net fishery was estimated at approximately 6,299,000 of which 4,543,000 (72.1%) were harvested. The mean date of the run to the fishery occurred on 20 July, 5 days later than the mean date at the test fishing transect (Figure 9). Daily exploitation rates varied depending on hours and number of areas opened for fishing. During the peak of the run, with continuous fishing allowed in all areas (23 July to 2 August), daily exploitation rates ranged from 69.1% to 88.6% (Figure 10).

DISCUSSION

One of the primary objectives of this test fishing project has been to estimate the daily and total run of sockeye salmon into UCI several days before they reach fishing areas. Unfortunately, in 1989 the alteration in commercial fishing patterns necessitated by oil contamination made it impossible to generate estimates comparable with previous years. This also made it impossible to evaluate new test fishing methodologies, developed following the 1988 season, for estimating the total sockeye salmon run to UCI.

However, the absence of a drift gill net fishery provided a unique opportunity to assess exploitation rates of the Upper Subdistrict set gill net fishery. Previous investigators (Hilsinger and Waltemyer 1987, Tarbox and Waltemyer 1989) had assumed that average exploitation rates were between 60% and 70% for this fishery. This assumption appears reasonable in light of results obtained during the present study, although substantial daily variations can occur (Figure 10).

The passage rate of 10,403 sockeye salmon was the highest recorded since the inception of the test fishing project. The reason for this high passage rate during 1989 is not known. Although a change in fishing vessel and skipper occurred in 1989, gear specifications, fishing methods, and stations were the same as those used in previous years.

The mean date of the sockeye salmon run at the test fishing transect in 1989 (14 July) was similar to that observed in previous years, as was the mean date of the run to the Upper Subdistrict set gill net fishery (20 July). The distance from the middle of the transect to the middle of the set gill net fishing area was approximately 70 km. Therefore, using a 6 day average travel time, the migratory rate would have been 11.7 km/day. Tarbox (1988) reported that mean migratory rates based on tagging studies in 1983 and 1984 ranged between 13.4 and 17.3 km/day, depending on capture location along the Upper Subdistrict set net fishery.

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Table 1. Summary of sockeye salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1989.

Date	Number of Stations	Mean[a] Fishing Time (min)	Catch		CPUE		Mean Length (mm)
			Daily	Cum	Daily	Cum	
23-Jun	6	241.0	19	19	14.7	14.7	568
24-Jun	1	20.0	1	20	7.7	22.4	
25-Jun	0	.0	0	20	8.9	31.3	
26-Jun	6	228.0	5	25	3.8	35.1	628
27-Jun	5	181.5	0	25	0.0	35.1	
28-Jun	6	227.0	18	43	12.9	48.1	577
29-Jun	5	193.5	32	75	24.3	72.4	557
30-Jun	5	185.5	6	81	4.8	77.2	558
01-Jul	5	188.5	9	90	7.1	84.3	549
02-Jul	6	236.0	74	164	47.9	132.2	553
03-Jul	0	.0	0	164	22.8	155.0	
04-Jul	6	225.0	2	166	1.6	156.6	522
05-Jul	5	181.5	0	166	0.0	156.6	
06-Jul	6	224.0	14	180	11.1	167.7	546
07-Jul	5	185.5	9	189	7.3	175.0	572
08-Jul	6	222.5	42	231	32.9	207.9	561
09-Jul	5	194.0	39	270	27.5	235.4	541
10-Jul	6	232.0	29	299	21.4	256.8	582
11-Jul	5	200.0	8	307	6.4	263.2	551
12-Jul	6	224.0	90	397	69.9	333.0	576
13-Jul	5	187.0	14	411	11.2	344.2	590
14-Jul	6	221.0	2	413	1.6	345.8	565
15-Jul	5	193.0	30	443	22.9	368.7	556
16-Jul	6	224.0	20	463	15.3	384.0	575
17-Jul	5	181.0	0	463	0.0	384.0	
18-Jul	6	226.5	37	500	27.5	411.5	570
19-Jul	5	180.5	8	508	6.6	418.1	581
20-Jul	6	223.0	16	524	12.7	430.8	558
21-Jul	5	183.5	39	563	27.6	458.4	580
22-Jul	6	219.5	8	571	6.6	464.9	547
23-Jul	5	147.0	35	606	25.9	490.9	583
24-Jul	6	222.5	26	632	20.2	511.1	586
25-Jul	5	180.0	11	643	9.1	520.1	584
26-Jul	1	38.5	11	654	19.2	539.4	
27-Jul	5	183.5	18	672	14.2	553.5	573
28-Jul	6	233.0	94	766	65.9	619.4	573

[a] Total fishing time.

Table 2. Estimated sockeye salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	1		0	3	0	8	7		19
24-Jun								1	1
25-Jun									0
26-Jun	0		0	5	0	0	0		5
27-Jun		0		0	0	0		0	0
28-Jun	0		0	1	17	0	0		18
29-Jun		1		1	3	18		9	32
30-Jun	0		1	3	1	1			6
01-Jul		0		0	7	1		1	9
02-Jul	0		3	7	63	0	1		74
03-Jul									0
04-Jul	0		0	0	0	1	1		2
05-Jul		0		0	0	0		0	0
06-Jul	1		1	2	5	5	0		14
07-Jul		8		0	0	1		0	9
08-Jul	5		18	18	0	0	1		42
09-Jul		0		1	33	4		1	39
10-Jul	0		5	18	3	0	3		29
11-Jul		0		0	0	4		4	8
12-Jul	0		25	47	16	2	0		90
13-Jul		0		5	7	2		0	14
14-Jul	1		0	0	0	1	0		2
15-Jul		2		8	5	14		1	30
16-Jul	0		5	0	1	14	0		20
17-Jul		0		0	0	0		0	0
18-Jul	0		4	0	32	0	1		37
19-Jul		3		5	0	0		0	8
20-Jul	0		5	3	2	1	5		16
21-Jul		0		3	33	0		3	39
22-Jul	0		1	3	3	1	0		8
03-Jul		0		0	35	0		0	35
24-Jul	0		3	1	0	17	5		26
25-Jul		0		1	1	3		6	11
26-Jul	0		0	0	11	0	0		11
27-Jul		1		4	3	10		0	18
28-Jul	0		1	0	19	74	0		94
Total	8	15	72	139	300	182	24	26	766
%	1.0	2.0	9.4	18.1	39.2	23.8	3.1	3.4	100.0

Table 3. Estimated sockeye salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0.7		0.0	2.3	0.0	6.4	5.3		14.7
24-Jun								1.5	7.7
25-Jun									8.9
26-Jun	0.0		0.0	3.8	0.0	0.0	0.0		3.8
27-Jun		0.0		0.0	0.0	0.0		0.0	0.0
28-Jun	0.0		0.0	0.8	12.1	0.0	0.0		12.9
29-Jun		0.8		0.8	2.4	13.3		7.0	24.3
30-Jun	0.0		0.8	2.4	0.8	0.9			4.8
01-Jul		0.0		0.0	5.5	0.8		0.8	7.1
02-Jul	0.0		2.2	5.5	39.4	0.0	0.8		47.9
03-Jul									22.8
04-Jul	0.0		0.0	0.0	0.0	0.8	0.8		1.6
05-Jul		0.0		0.0	0.0	0.0		0.0	0.0
06-Jul	0.8		0.8	1.5	4.1	3.9	0.0		11.1
07-Jul		6.5		0.0	0.0	0.8		0.0	7.3
08-Jul	3.9		14.4	13.7	0.0	0.0	0.9		32.9
09-Jul		0.0		0.8	22.8	3.1		0.8	27.5
10-Jul	0.0		3.8	12.9	2.4	0.0	2.4		21.4
11-Jul		0.0		0.0	0.0	3.2		3.2	6.4
12-Jul	0.0		18.7	36.6	12.8	1.7	0.0		69.9
13-Jul		0.0		3.8	5.8	1.6		0.0	11.2
14-Jul	0.8		0.0	0.0	0.0	0.8	0.0		1.6
15-Jul		1.5		5.7	4.0	10.8		0.8	22.9
16-Jul	0.0		3.8	0.0	0.8	10.6	0.0		15.3
17-Jul		0.0		0.0	0.0	0.0		0.0	0.0
18-Jul	0.0		3.2	0.0	23.4	0.0	0.8		27.5
19-Jul		2.5		4.2	0.0	0.0		0.0	6.6
20-Jul	0.0		3.9	2.4	1.7	0.8	3.9		12.7
21-Jul		0.0		2.5	22.7	0.0		2.5	27.6
22-Jul	0.0		0.8	2.4	2.5	0.8	0.0		6.6
23-Jul		0.0		0.0	25.9	0.0		0.0	25.9
24-Jul	0.0		2.4	0.8	0.0	12.9	4.1		20.2
25-Jul		0.0		0.9	0.8	2.4		4.9	9.1
26-Jul	0.0		1.6	2.1	8.6	5.0	2.0		19.2
27-Jul		0.8		3.3	2.5	7.5		0.0	14.2
28-Jul	0.0		0.8	0.0	12.8	52.2	0.0		65.9
Total	6.2	12.1	57.5	109.1	213.6	140.3	20.9	21.6	619.4
%	1.0	2.0	9.3	17.6	34.5	22.7	3.4	3.5	100.0

Table 4. Mean date of the sockeye salmon return across Anchor Point transect by year, Upper Cook Inlet, Alaska offshore test fish project.

Year	Mean Date[a] (t)	Calendar Date
1979	18.47	July 11
1980	22.71	July 15
1981	13.72	July 06
1982	24.20	July 17
1983	22.69	July 15
1984	18.47	July 11
1985	22.71	July 15
1986	23.07	July 16
1987	25.72	July 18
1988	20.60	July 13
1989	21.60	July 14
1979-1989	21.27	July 14

[a] Day (t) 1 = June 24.

Table 5. The 1989 Upper Cook Inlet, Alaska commercial salmon harvest[a].

Date	Number of Deliveries	CHINOOK Daily	CHINOOK Cumulative	SOCKEYE Daily	SOCKEYE Cumulative	COHO Daily	COHO Cumulative	PINK Daily	PINK Cumulative	CHUM Daily	CHUM Cumulative	TOTAL Daily	TOTAL Cumulative
5-26 Fri	22	128	128	142	142							270	270
5-29 Mon	22	162	290	236	378							398	668
5-31 Wed	26	146	436	389	767							535	1,203
6-02 Fri	19	83	519	259	1,026							342	1,545
6-05 Mon	128	4,226	4,745	1,615	2,641							5,841	7,386
6-07 Wed	21	52	4,797	597	3,238							649	8,035
6-09 Fri	14	48	4,845	238	3,476							286	8,321
6-12 Mon	128	4,984	9,829	1,091	4,567					3	3	6,078	14,399
6-14 Wed	13	32	9,861	90	4,657						3	122	14,521
6-16 Fri	26	110	9,971	538	5,195					4	7	652	15,173
6-19 Mon	130	2,318	12,289	1,037	6,232			1	1	2	9	3,358	18,531
6-21 Wed	5	77	12,366	347	6,579				1		9	424	18,955
6-23 Fri	31	322	12,688	1,808	8,387			4	5	10	19	2,144	21,099
6-26 Mon	124	1,759	14,447	5,799	14,186	3	3	23	28	40	59	7,624	28,723
6-30 Fri	106	515	14,962	8,872	23,058	17	20	114	142	175	234	9,693	38,416
7-03 Mon	331	700	15,662	35,632	58,690	65	85	362	504	197	431	36,956	75,372
7-07 Fri	316	499	16,161	26,517	85,207	612	697	908	1,412	601	1,032	29,137	104,509
7-10 Mon	486	1,091	17,252	51,057	136,264	936	1,633	3,519	4,931	402	1,434	57,005	161,514
7-11 Tue	39	57	17,309	8,858	145,122	1	1,634	118	5,049		1,434	9,034	170,548
7-12 Wed	284	530	17,839	71,865	216,987	37	1,671	1,574	6,623	6	1,440	74,012	244,560
7-13 Thu	583	858	18,697	256,828	473,815	588	2,259	3,608	10,231	778	2,218	262,660	507,220
7-14 Fri	717	335	19,032	260,918	734,733	4,787	7,046	4,496	14,727	3,326	5,544	273,862	781,082
7-15 Sat	510	225	19,257	192,371	927,104	5,474	12,520	1,598	16,325	4,050	9,594	203,718	984,800
7-16 Sun	440	234	19,491	279,622	1,206,726	1,921	14,441	1,045	17,370	388	9,982	283,210	1,268,010
7-17 Mon	855	584	20,075	353,357	1,560,083	9,101	23,542	5,712	23,082	5,496	15,478	374,250	1,642,260
7-18 Tue	321	186	20,261	100,312	1,660,395	489	24,031	744	23,826	193	15,671	101,924	1,744,184
7-19 Wed	450	204	20,465	257,730	1,918,125	2,208	26,239	1,045	24,871	282	15,953	261,469	2,005,653
7-20 Thu	674	505	20,970	415,519	2,333,644	2,715	28,954	2,154	27,025	309	16,262	421,202	2,426,855
7-21 Fri	914	634	21,604	423,001	2,756,645	22,247	51,201	6,958	33,983	10,502	26,764	463,342	2,890,197
7-22 Sat	418	102	21,706	242,610	2,999,255	2,459	53,660	710	34,693	217	26,981	246,098	3,136,295
7-23 Sun	590	486	22,192	268,391	3,267,646	5,477	59,137	2,262	36,955	496	27,477	277,112	3,413,407
7-24 Mon	731	518	22,710	208,067	3,475,713	19,452	78,589	6,342	43,297	15,332	42,809	249,711	3,663,118
7-25 Tue	545	421	23,131	214,147	3,689,860	3,002	81,591	1,353	44,650	982	43,791	219,905	3,883,023
7-26 Wed	692	446	23,577	324,203	4,014,063	7,775	89,366	1,367	46,017	1,184	44,975	334,975	4,217,998
7-27 Thu	535	408	23,985	157,976	4,172,039	2,953	92,319	985	47,002	951	45,926	163,273	4,381,271
7-28 Fri	677	413	24,398	141,206	4,313,245	34,599	126,918	6,393	53,395	16,243	62,169	198,854	4,580,125
7-29 Sat	487	375	24,773	109,572	4,422,817	10,772	137,690	2,110	55,505	2,783	64,952	125,612	4,705,737
7-30 Sun	438	323	25,096	124,765	4,547,582	10,894	148,584	2,537	58,042	2,634	67,586	141,153	4,846,890
7-31 Mon	622	297	25,393	162,207	4,709,789	38,180	186,764	3,852	61,894	18,994	86,580	223,530	5,070,420
8-01 Tue	431	285	25,678	97,595	4,807,384	4,633	191,397	1,459	63,353	964	87,544	104,936	5,175,356
8-02 Wed	411	311	25,989	67,004	4,874,388	5,386	196,783	713	64,066	670	88,214	74,084	5,249,440
8-03 Thu	168	83	26,072	25,672	4,900,060	2,187	198,970	291	64,357	326	88,540	28,559	5,277,999
8-04 Fri	494	343	26,415	57,003	4,957,063	22,243	221,213	1,487	65,844	13,396	101,936	94,472	5,372,471
8-07 Mon	373	193	26,608	31,737	4,988,800	23,676	244,889	767	66,611	9,853	111,789	66,226	5,438,697
8-08 Tue	2		26,608	48	4,988,848	242	245,131	17	66,628	15	111,804	322	5,439,019
8-11 Fri	280	90	26,698	10,149	4,998,997	24,718	269,849	412	67,040	6,292	118,096	41,661	5,480,680
8-14 Mon	233	35	26,733	8,837	5,007,834	19,665	289,514	260	67,300	2,631	120,727	31,428	5,512,108
8-18 Fri	65	3	26,736	758	5,008,592	4,761	294,275	32	67,332	618	121,345	6,172	5,518,280
8-21 Mon	76	2	26,738	1,019	5,009,611	10,885	305,160	46	67,378	171	121,516	12,123	5,530,403
8-23 Wed	52	2	26,740	357	5,009,968	6,750	311,910	18	67,396	131	121,647	7,258	5,537,661

- continued -

Table 5. (p. 2 of 2)

Date	Number of Deliveries	CHINOOK Daily	CHINOOK Cumulative	SOCKEYE Daily	SOCKEYE Cumulative	COHO Daily	COHO Cumulative	PINK Daily	PINK Cumulative	CHUM Daily	CHUM Cumulative	TOTAL Daily	TOTAL Cumulative
8-25 Fri	55		26,740	316	5,010,284	7,822	319,732	17	67,413	98	121,745	8,253	5,545,914
8-28 Mon	59	1	26,741	105	5,010,389	6,549	326,281	13	67,426	200	121,945	6,868	5,552,782
8-30 Wed	35	1	26,742	142	5,010,531	4,314	330,595		67,426	15	121,960	4,472	5,557,254
9-01 Fri	15		26,742	52	5,010,583	504	331,099	2	67,428	3	121,963	561	5,557,815
9-04 Mon	38		26,742	75	5,010,658	3,877	334,976	2	67,430	44	122,007	3,998	5,561,813
9-06 Wed	22		26,742	18	5,010,676	1,877	336,853		67,430	7	122,014	1,902	5,563,715
9-08 Fri	19		26,742	16	5,010,692	1,148	338,001		67,430	9	122,023	1,173	5,564,888
9-11 Mon	13		26,742	6	5,010,698	633	338,634		67,430	4	122,027	643	5,565,531
9-13 Wed	8		26,742		5,010,698	405	339,039		67,430		122,027	405	5,565,936
9-15 Fri	2		26,742		5,010,698	162	339,201		67,430		122,027	162	5,566,098

[a] Source of data: Upper Cook Inlet Fish Ticket System (Ruesch, Alaska Department of Fish and Game, personal communication).

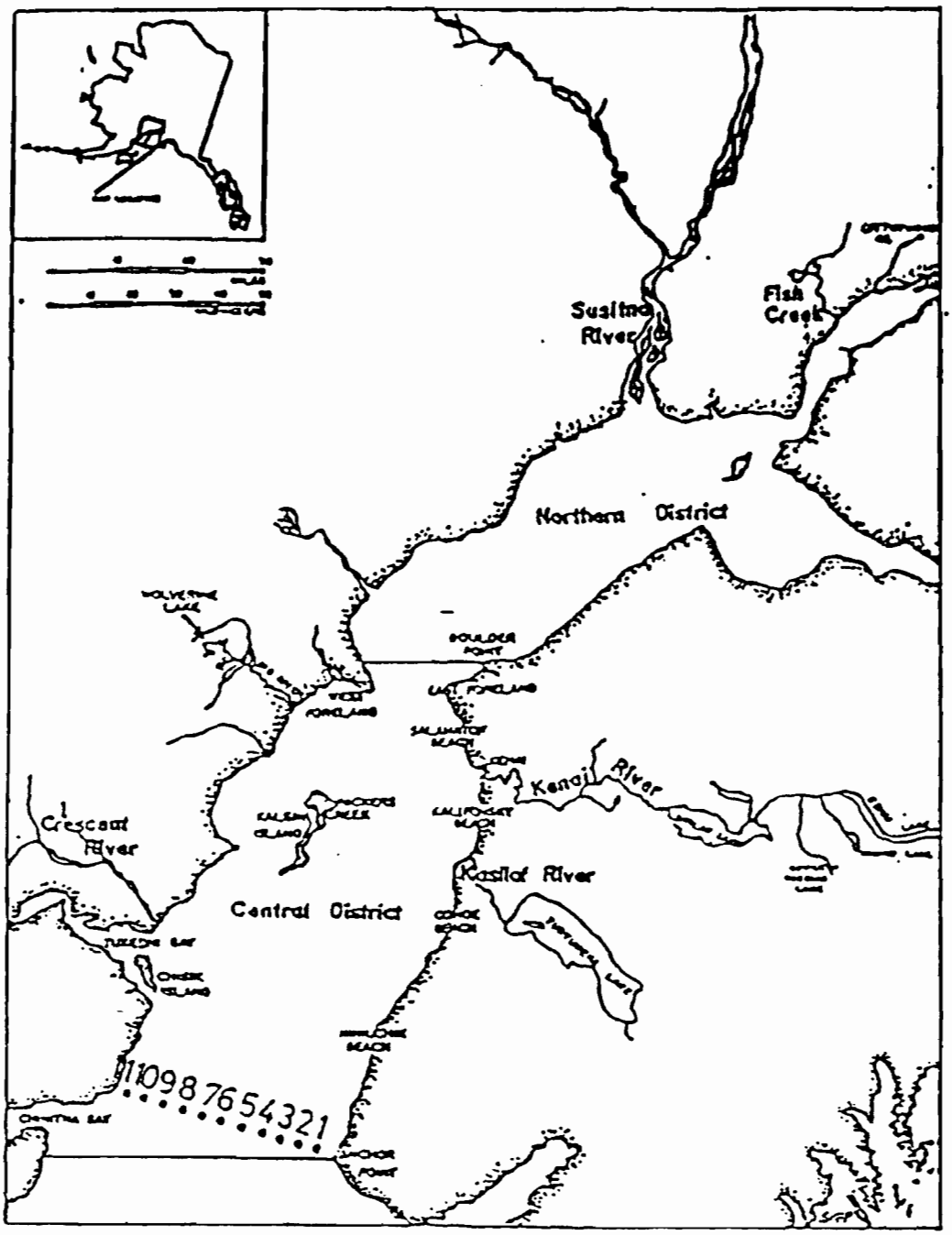

Figure 1. Map of Upper Cook Inlet, Alaska, showing location of Offshore Test Fish transect.

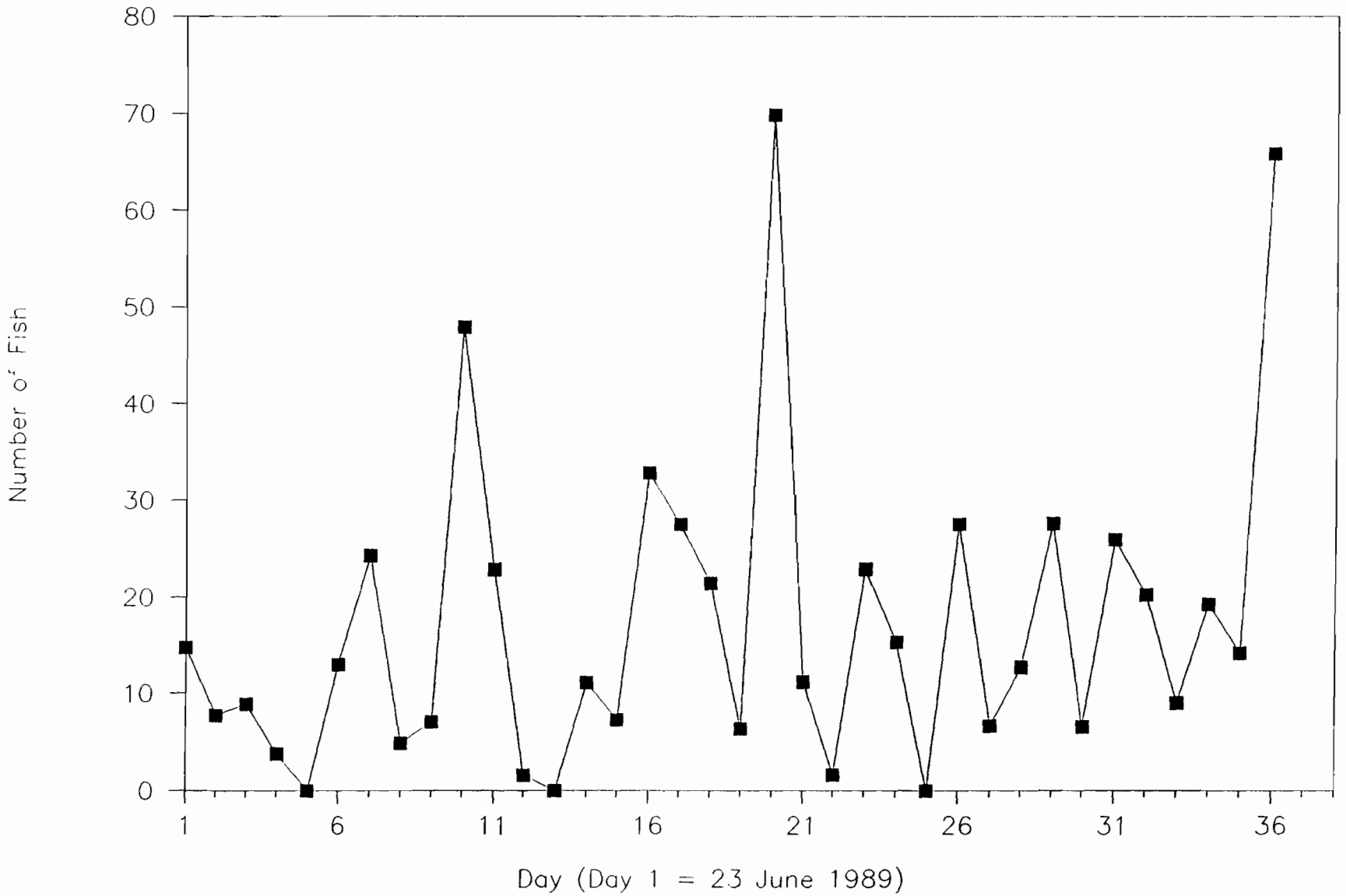

Figure 2. Daily CPUE for sockeye salmon recorded during the 1989 Offshore Test project, Upper Cook Inlet, Alaska.

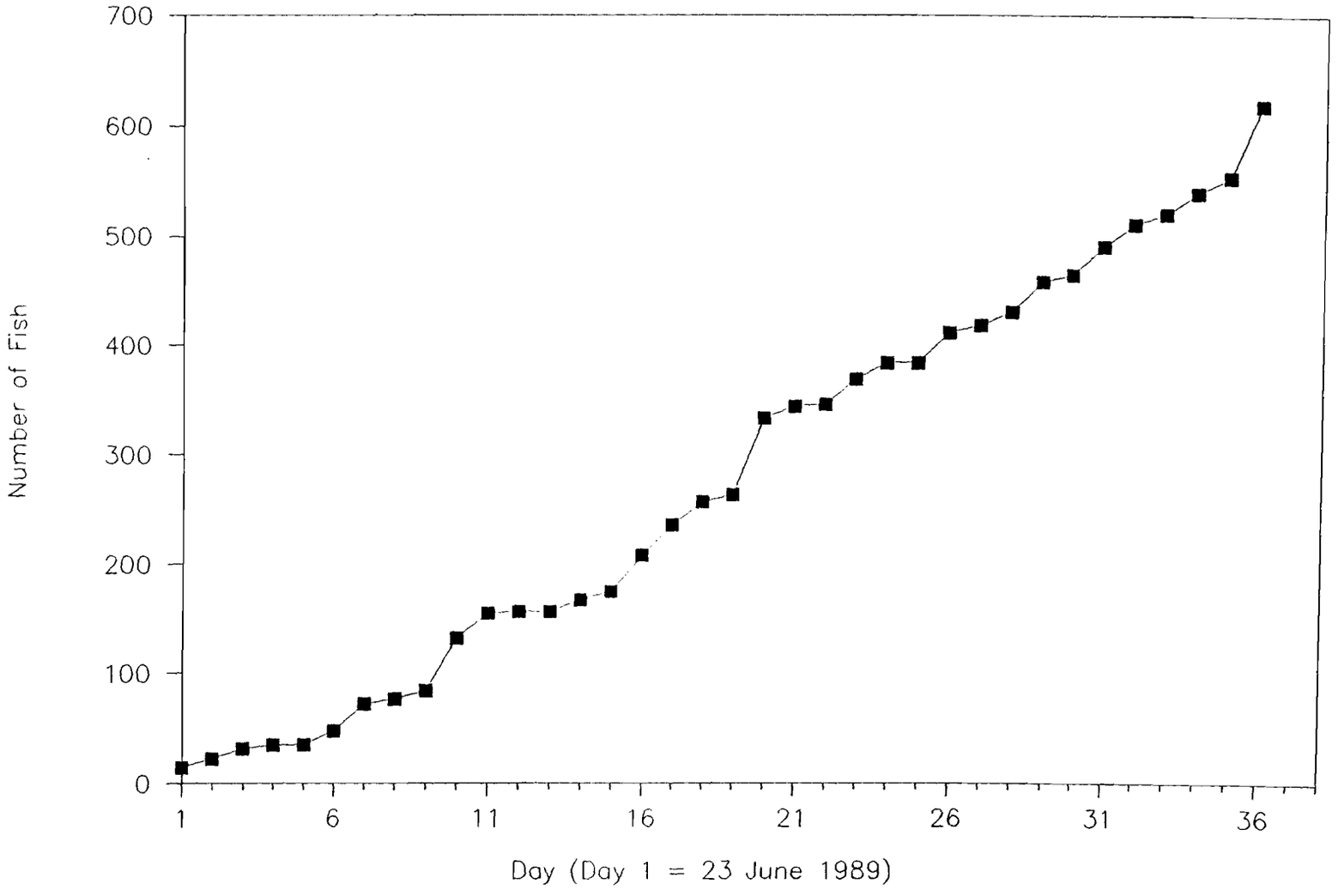

Figure 3. Cumulative CPUE for sockeye salmon recorded during the 1989 Offshore Test Fish project, Upper Cook Inlet, Alaska.

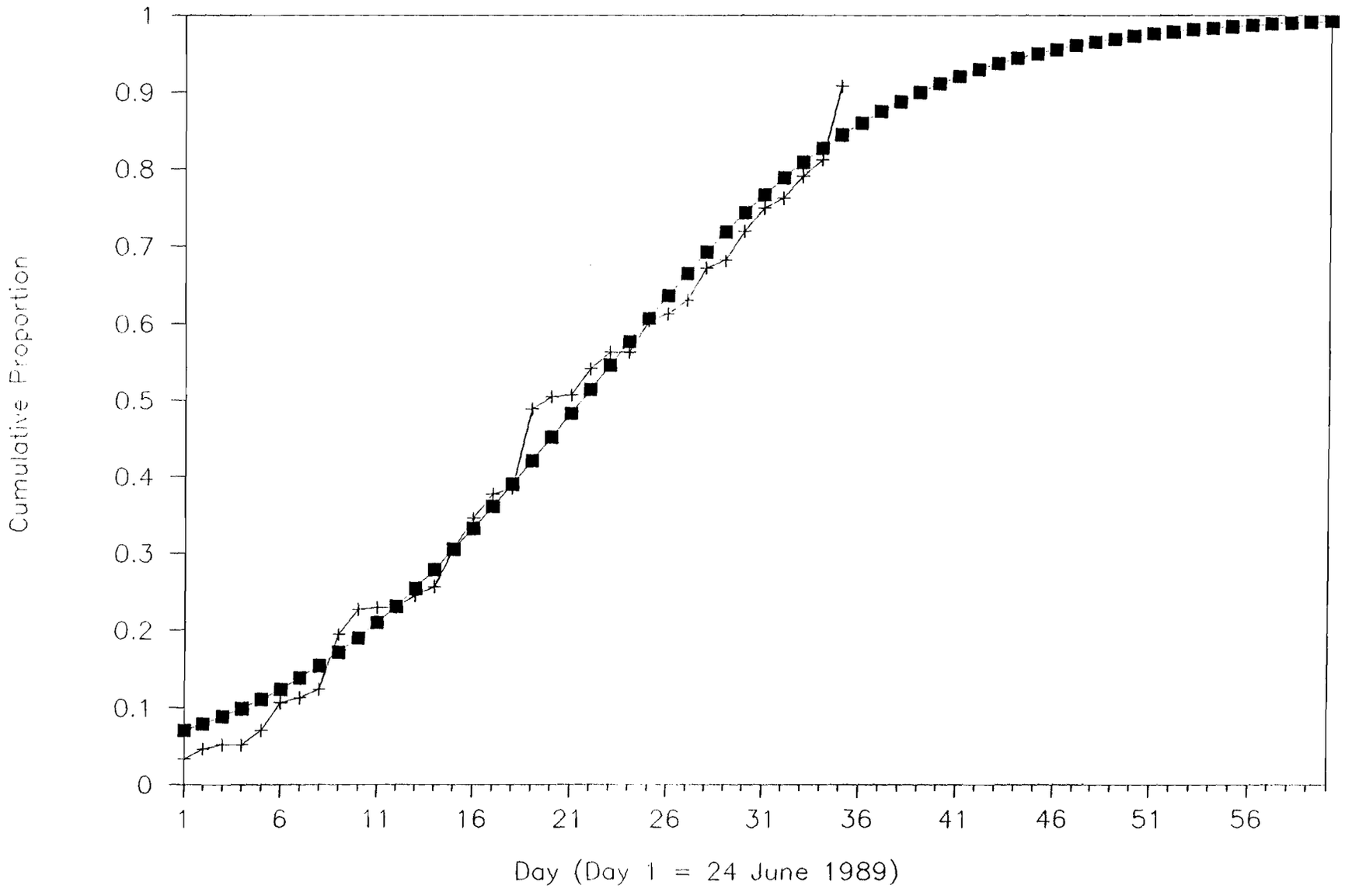

Figure 4. Sockeye salmon entry pattern into Upper Cook Inlet, Alaska in 1989.

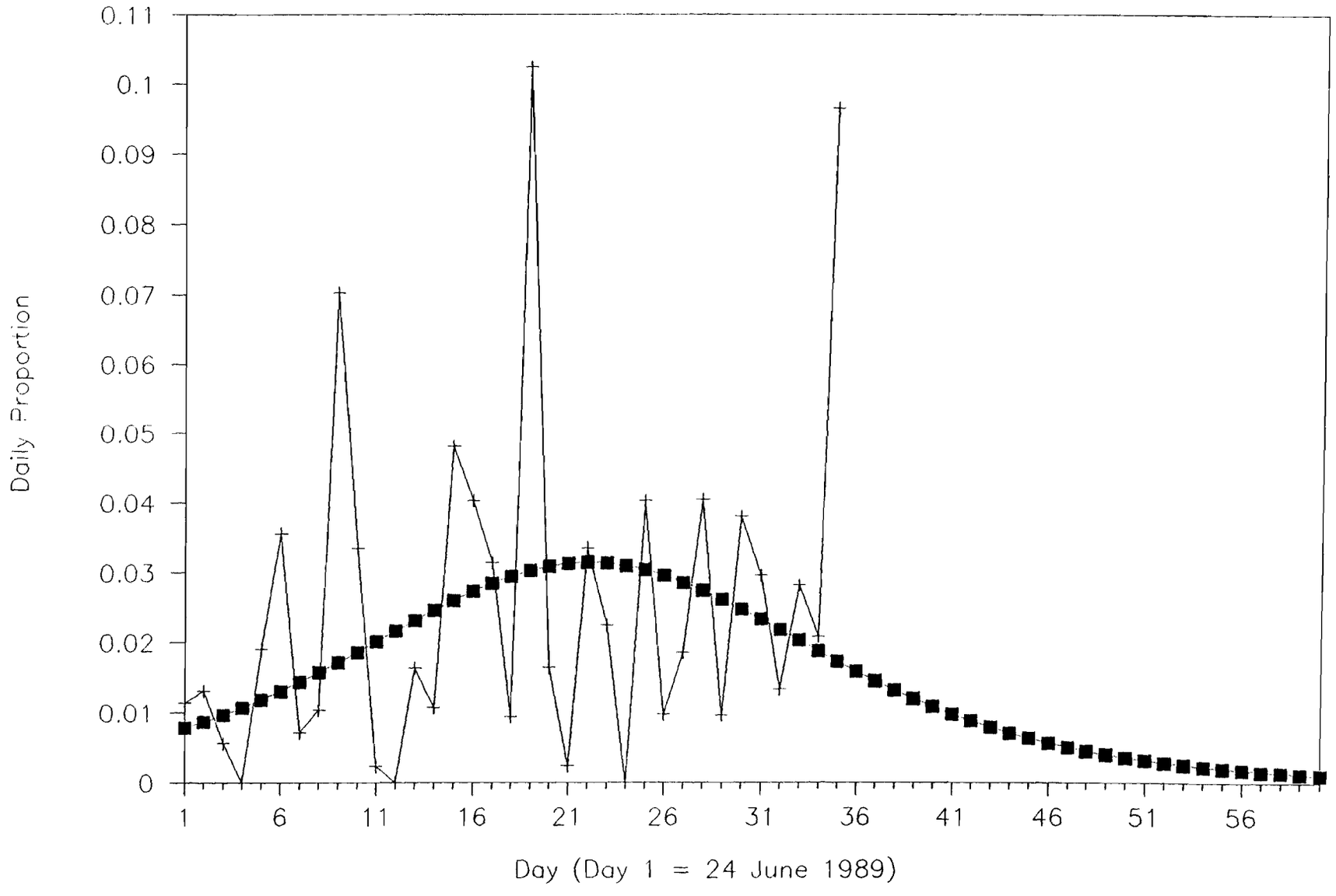

Figure 5. Daily entry pattern of sockeye salmon into Upper Cook Inlet, Alaska in 1989.

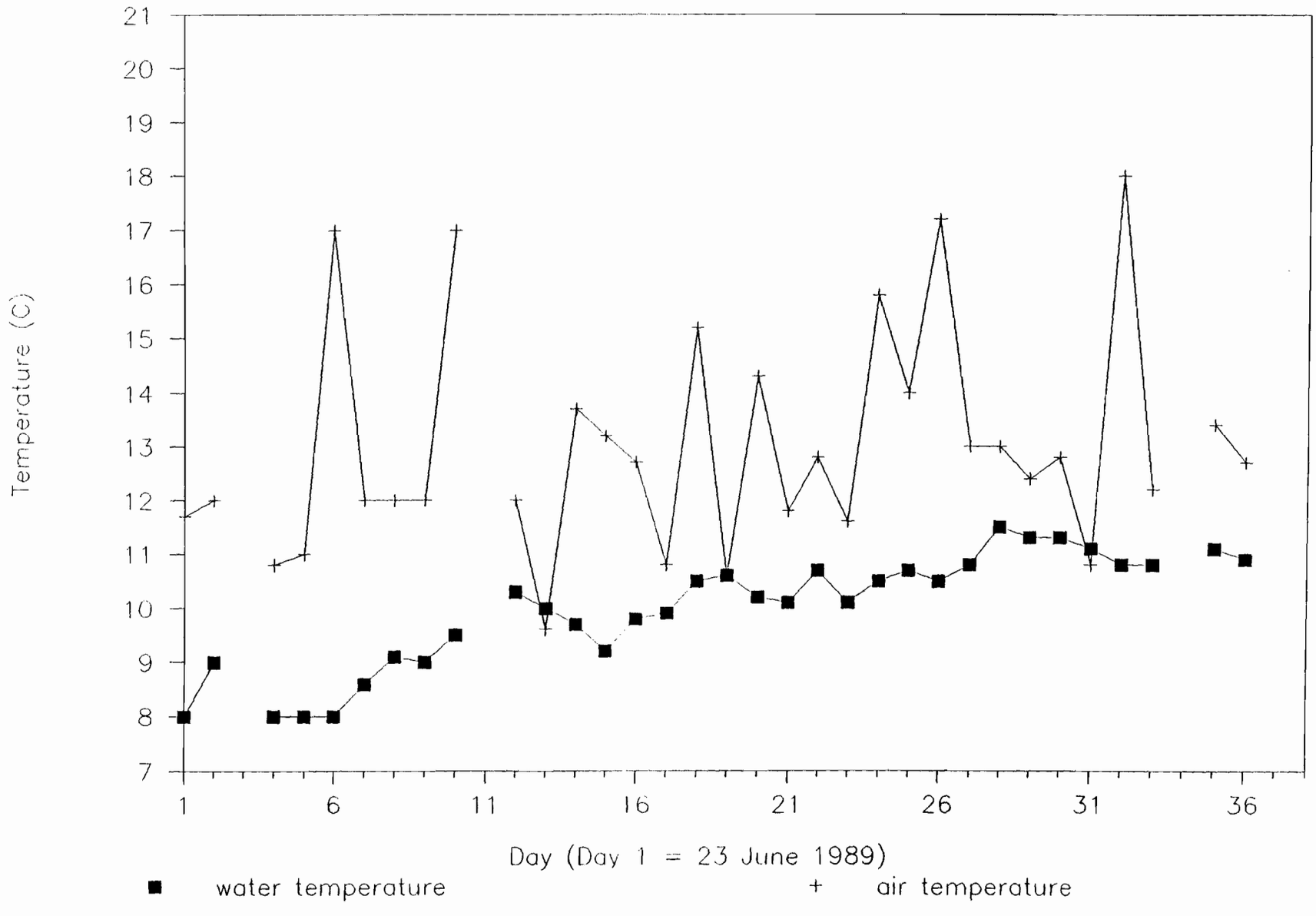

Figure 6. Water and air temperatures measured in Upper Cook Inlet, Alaska, during the Offshore Test Fish project, 1989.

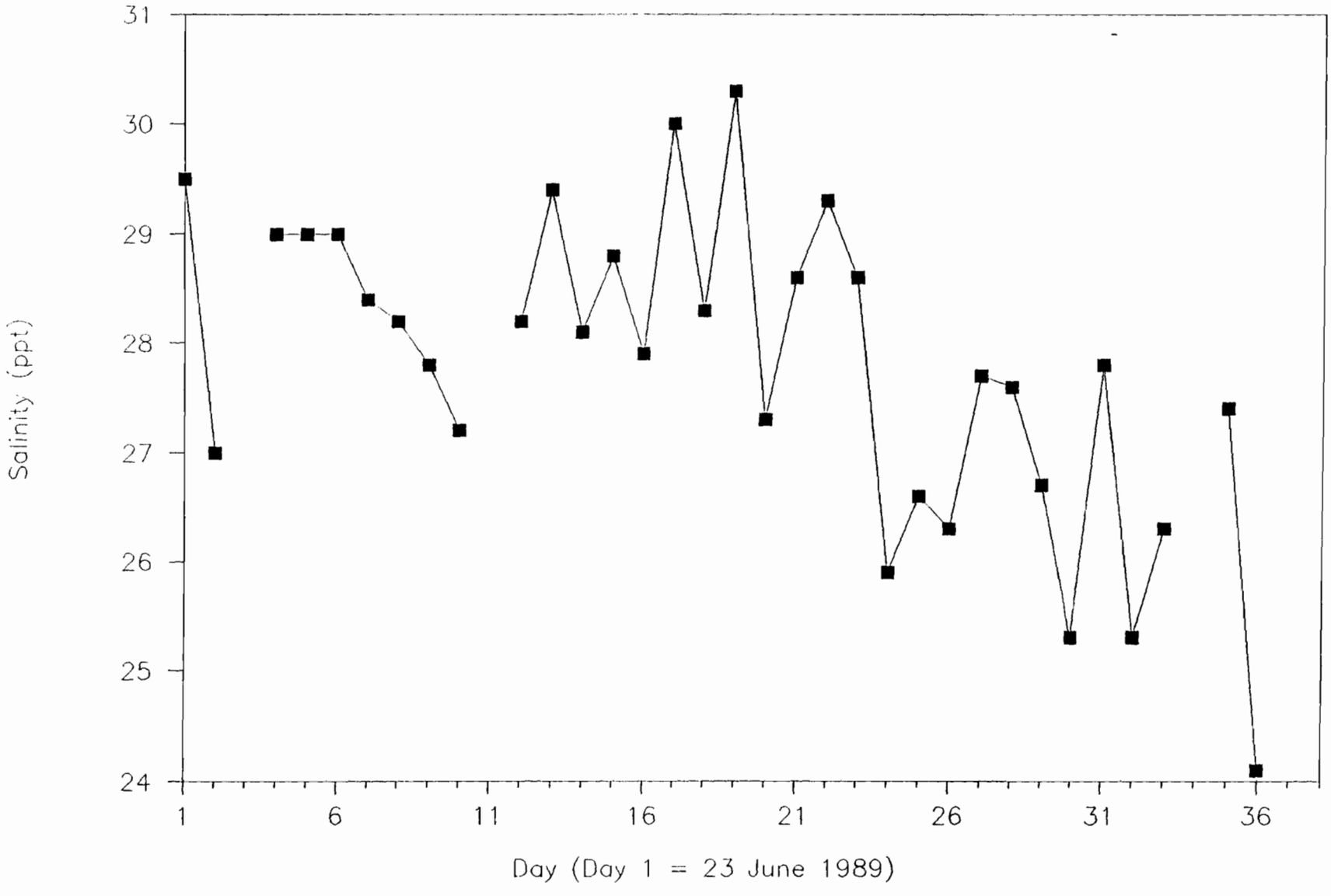

Figure 7. Salinity measured in Upper Cook Inlet, Alaska, during the Offshore Test fish project, 1989.

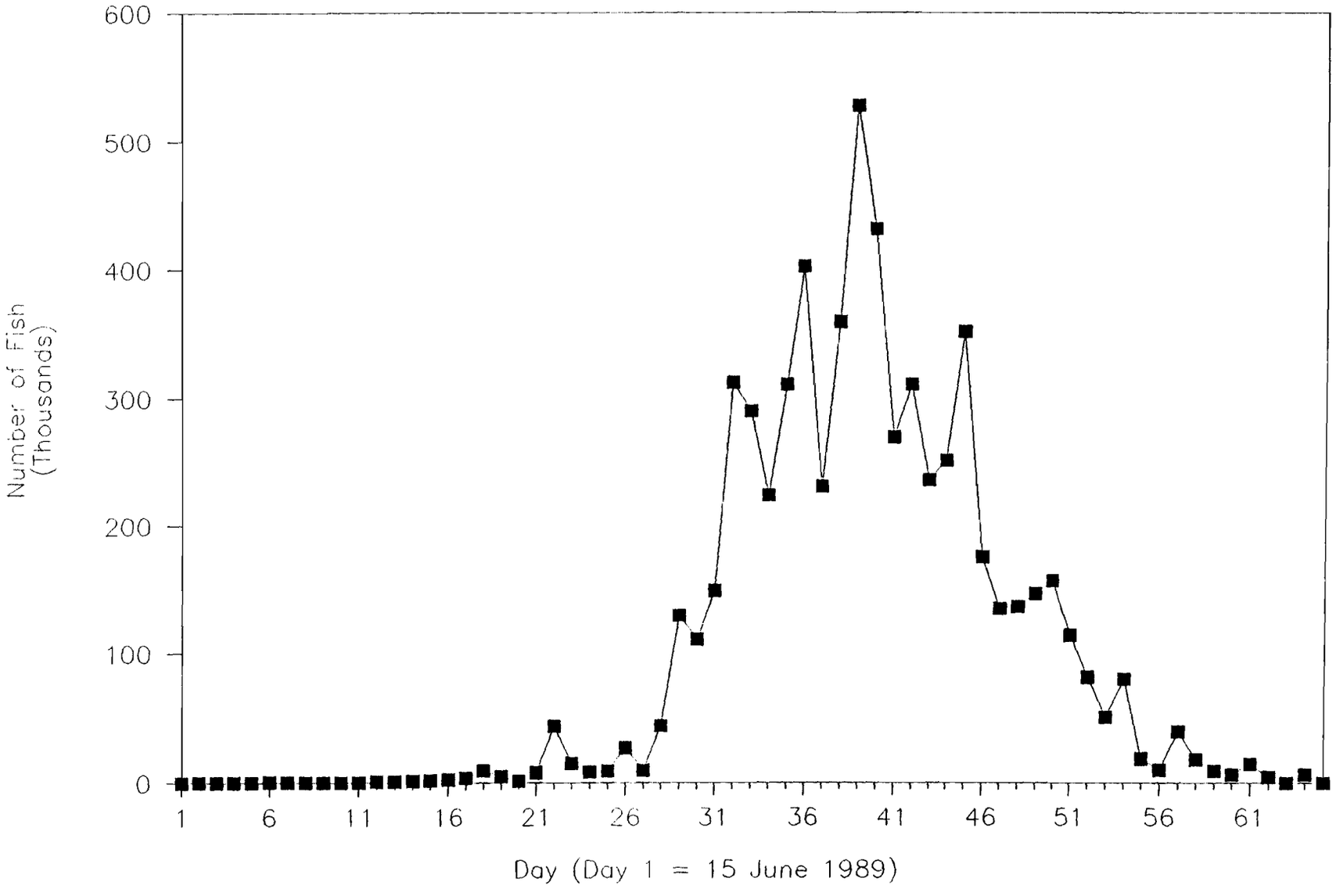

Figure 8. Total return of sockeye salmon to the Upper Subdistrict set gill net fishery, Upper Cook Inlet, Alaska, in 1989 (escapement lagged 3 days).

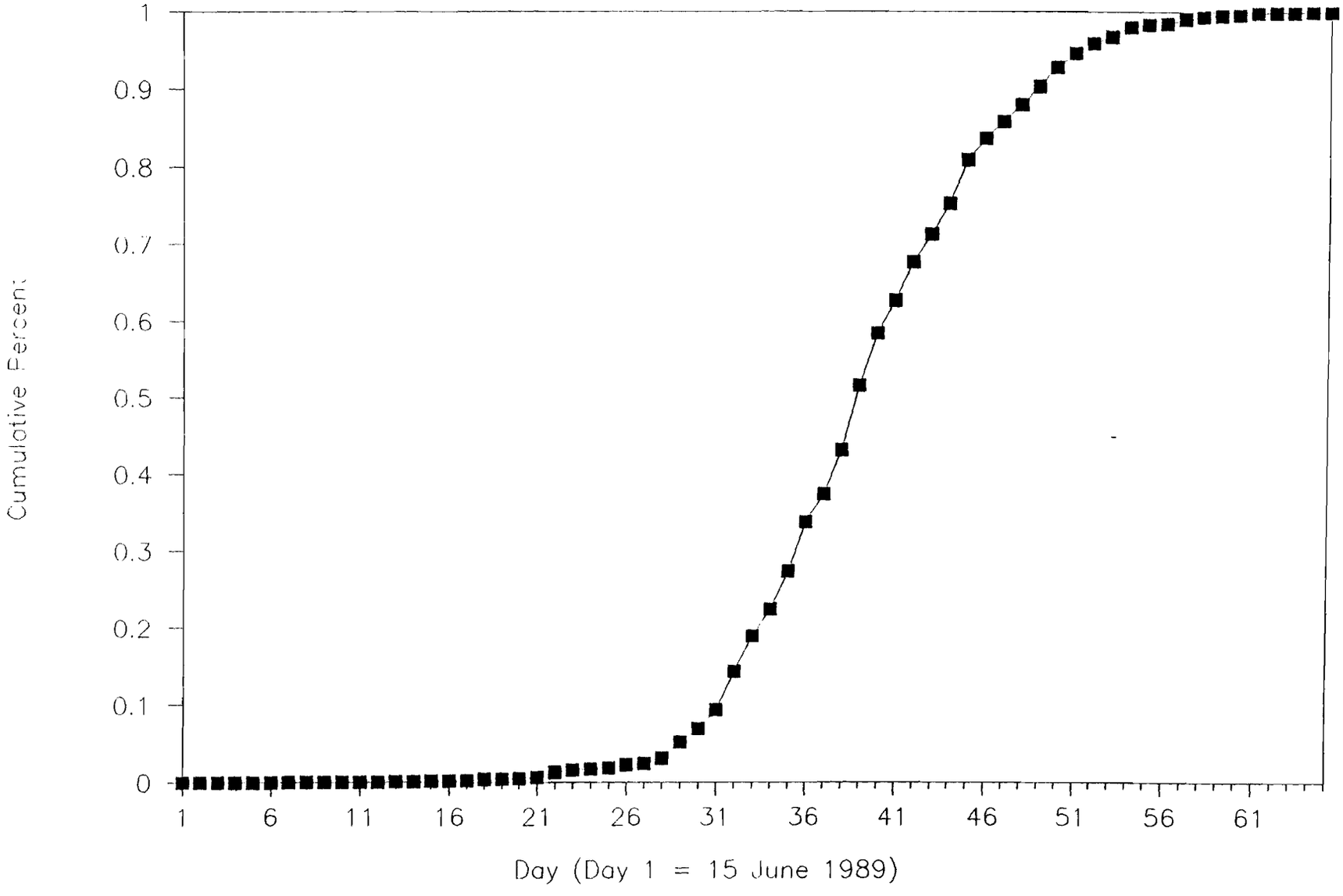

Figure 9. Cumulative proportions of the total return of sockeye salmon to the Upper Subdistrict set gill net fishery, Upper Cook Inlet, Alaska, in 1989.

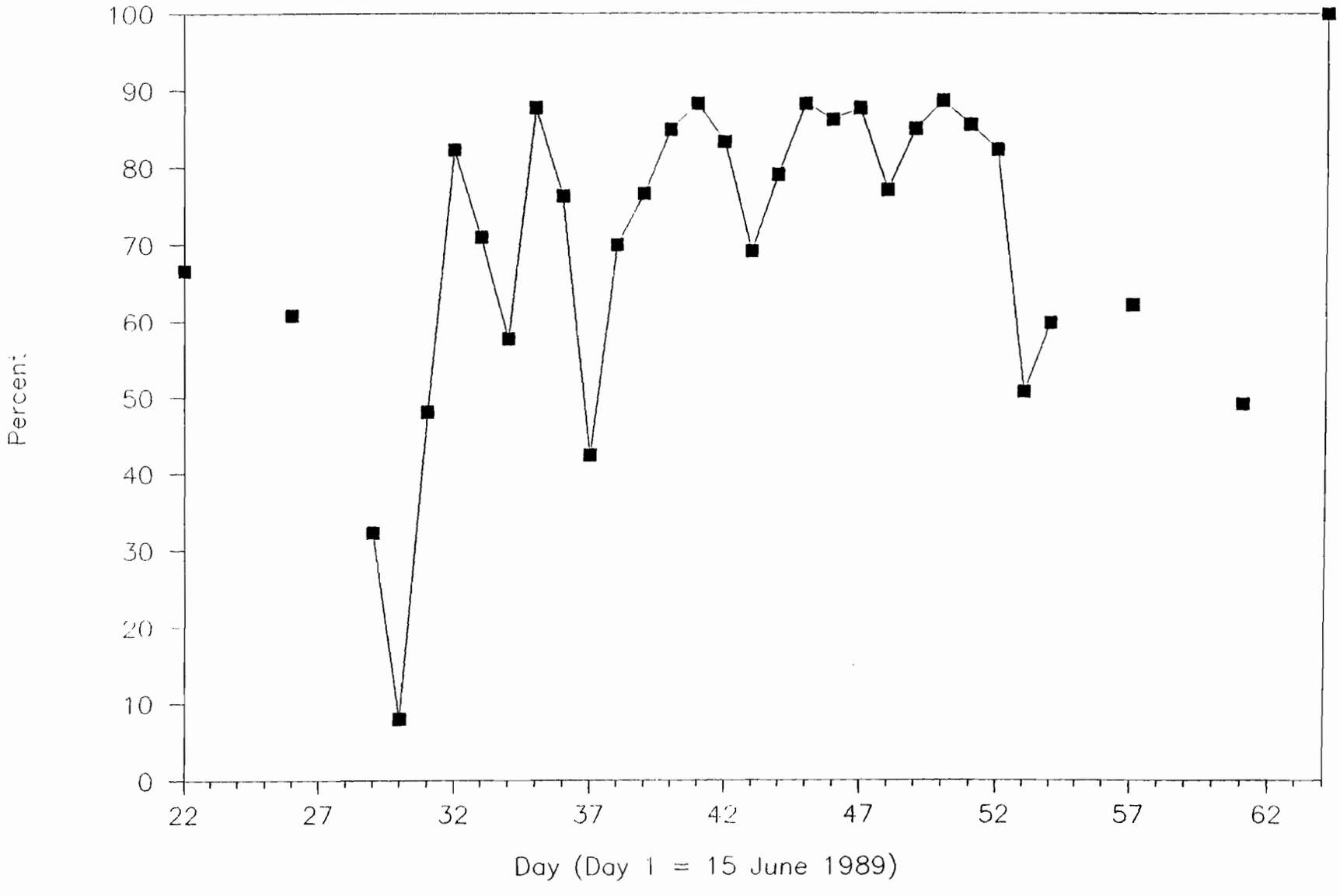

Figure 10. Daily exploitation rate of the Upper Subdistrict set gill net sockeye salmon fishery, Upper Cook Inlet, Alaska, in 1989.

Appendix A.1. Summary of pink salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1989.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cum	Daily	Cum
23-Jun	6	241.0	0	0	0.0	0.0
24-Jun	1	20.0	0	0	0.0	0.0
25-Jun	0	.0	0	0	0.0	0.0
26-Jun	6	228.0	0	0	0.0	0.0
27-Jun	5	181.5	0	0	0.0	0.0
28-Jun	6	227.0	0	0	0.0	0.0
29-Jun	5	193.5	0	0	0.0	0.0
30-Jun	5	185.5	0	0	0.0	0.0
01-Jul	5	188.5	0	0	0.0	0.0
02-Jul	6	236.0	0	0	0.0	0.0
03-Jul	0	.0	0	0	0.0	0.0
04-Jul	6	225.0	0	0	0.0	0.0
05-Jul	5	181.5	0	0	0.0	0.0
06-Jul	6	224.0	3	3	2.3	2.3
07-Jul	5	185.5	1	4	0.8	3.1
08-Jul	6	222.5	0	4	0.0	3.1
09-Jul	5	194.0	0	4	0.0	3.1
10-Jul	6	232.0	0	4	0.0	3.1
11-Jul	5	200.0	0	4	0.0	3.1
12-Jul	6	224.0	2	6	1.5	4.7
13-Jul	5	187.0	0	6	0.0	4.7
14-Jul	6	221.0	1	7	0.8	5.5
15-Jul	5	193.0	2	9	1.6	7.1
16-Jul	6	224.0	0	9	0.0	7.1
17-Jul	5	181.0	0	9	0.0	7.1
18-Jul	6	226.5	0	9	0.0	7.1
19-Jul	5	180.5	1	10	0.8	7.9
20-Jul	6	223.0	1	11	0.8	8.7
21-Jul	5	183.5	0	11	0.0	8.7
22-Jul	6	219.5	6	17	4.9	13.6
23-Jul	5	147.0	0	17	0.0	13.6
24-Jul	6	222.5	1	18	0.8	14.4
25-Jul	5	180.0	0	18	0.0	14.4
26-Jul	1	38.5	0	18	0.0	14.4
27-Jul	5	183.5	3	21	2.3	16.7
28-Jul	6	233.0	4	25	2.7	19.5

Appendix A.2. Estimated pink salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0		0	0	0	0	0		0
24-Jun								0	0
25-Jun									0
26-Jun	0		0	0	0	0	0		0
27-Jun		0		0	0	0		0	0
28-Jun	0		0	0	0	0	0		0
29-Jun		0		0	0	0		0	0
30-Jun	0		0	0	0	0			0
01-Jul		0		0	0	0		0	0
02-Jul	0		0	0	0	0	0		0
03-Jul									0
04-Jul	0		0	0	0	0	0		0
05-Jul		0		0	0	0		0	0
06-Jul	0		1	2	0	0	0		3
07-Jul		0		1	0	0		0	1
08-Jul	0		0	0	0	0	0		0
09-Jul		0		0	0	0		0	0
10-Jul	0		0	0	0	0	0		0
11-Jul		0		0	0	0		0	0
12-Jul	0		1	1	0	0	0		2
13-Jul		0		0	0	0		0	0
14-Jul	0		0	0	1	0	0		1
15-Jul		0		0	2	0		0	2
16-Jul	0		0	0	0	0	0		0
17-Jul		0		0	0	0		0	0
18-Jul	0		0	0	0	0	0		0
19-Jul		1		0	0	0		0	1
20-Jul	0		1	0	0	0	0		1
21-Jul		0		0	0	0		0	0
22-Jul	0		0	4	0	0	2		6
23-Jul		0		0	0	0		0	0
24-Jul	1		0	0	0	0	0		1
25-Jul		0		0	0	0		0	0
26-Jul	0		0	0	0	0	0		0
27-Jul		0		0	0	2		1	3
28-Jul	0		0	0	3	1	0		4
Total	1	1	3	8	6	3	2	1	25
%	4.0	4.0	12.0	32.0	24.0	12.0	8.0	4.0	100.0

Appendix A.3. Estimated pink salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
24-Jun								0.0	0.0
25-Jun									0.0
26-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
27-Jun		0.0		0.0	0.0	0.0		0.0	0.0
28-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
29-Jun		0.0		0.0	0.0	0.0		0.0	0.0
30-Jun	0.0		0.0	0.0	0.0	0.0			0.0
01-Jul		0.0		0.0	0.0	0.0		0.0	0.0
02-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
03-Jul									0.0
04-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
05-Jul		0.0		0.0	0.0	0.0		0.0	0.0
06-Jul	0.0		0.8	1.5	0.0	0.0	0.0		2.3
07-Jul		0.0		0.8	0.0	0.0		0.0	0.8
08-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
09-Jul		0.0		0.0	0.0	0.0		0.0	0.0
10-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
11-Jul		0.0		0.0	0.0	0.0		0.0	0.0
12-Jul	0.0		0.7	0.8	0.0	0.0	0.0		1.5
13-Jul		0.0		0.0	0.0	0.0		0.0	0.0
14-Jul	0.0		0.0	0.0	0.8	0.0	0.0		0.8
15-Jul		0.0		0.0	1.6	0.0		0.0	1.6
16-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
17-Jul		0.0		0.0	0.0	0.0		0.0	0.0
18-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
19-Jul		0.8		0.0	0.0	0.0		0.0	0.8
20-Jul	0.0		0.8	0.0	0.0	0.0	0.0		0.8
21-Jul		0.0		0.0	0.0	0.0		0.0	0.0
22-Jul	0.0		0.0	3.2	0.0	0.0	1.6		4.9
23-Jul		0.0		0.0	0.0	0.0		0.0	0.0
24-Jul	0.8		0.0	0.0	0.0	0.0	0.0		0.8
25-Jul		0.0		0.0	0.0	0.0		0.0	0.0
26-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
27-Jul		0.0		0.0	0.0	1.5		0.8	2.3
28-Jul	0.0		0.0	0.0	2.0	0.7	0.0		2.7
Total	.8	.8	2.3	6.4	4.4	2.2	1.6	.8	19.5
%	4.3	4.2	12.0	32.7	22.8	11.3	8.4	4.3	100.0

Appendix B.1. Summary of chum salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1989.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cum.	Daily	Cum.
23-Jun	6	241.0	0	0	0.0	0.0
24-Jun	1	20.0	0	0	0.0	0.0
25-Jun	0	.0	0	0	0.0	0.0
26-Jun	6	228.0	0	0	0.0	0.0
27-Jun	5	181.5	0	0	0.0	0.0
28-Jun	6	227.0	0	0	0.0	0.0
29-Jun	5	193.5	0	0	0.0	0.0
30-Jun	5	185.5	0	0	0.0	0.0
01-Jul	5	188.5	0	0	0.0	0.0
02-Jul	6	236.0	2	2	1.2	1.2
03-Jul	0	.0	0	2	0.0	1.2
04-Jul	6	225.0	0	2	0.0	1.2
05-Jul	5	181.5	0	2	0.0	1.2
06-Jul	6	224.0	7	9	5.5	6.7
07-Jul	5	185.5	3	12	2.4	9.2
08-Jul	6	222.5	4	16	3.2	12.3
09-Jul	5	194.0	6	22	4.5	16.8
10-Jul	6	232.0	17	39	12.9	29.7
11-Jul	5	200.0	3	42	2.4	32.1
12-Jul	6	224.0	5	47	3.7	35.8
13-Jul	5	187.0	9	56	7.1	43.0
14-Jul	6	221.0	7	63	3.2	46.2
15-Jul	5	193.0	25	88	19.4	65.7
16-Jul	6	224.0	8	96	6.4	72.0
17-Jul	5	181.0	0	96	0.0	72.0
18-Jul	6	226.5	2	98	1.6	73.7
19-Jul	5	180.5	5	103	4.2	77.8
20-Jul	6	223.0	10	113	7.9	85.8
21-Jul	5	183.5	6	119	4.7	90.4
22-Jul	6	219.5	3	122	2.5	92.9
23-Jul	5	147.0	0	122	0.0	92.9
24-Jul	6	222.5	13	135	10.3	103.1
25-Jul	5	180.0	1	136	0.8	104.0
26-Jul	1	38.5	7	143	5.5	109.4
27-Jul	5	183.5	19	162	14.7	124.1
28-Jul	6	233.0	65	227	44.9	169.0

Appendix B.2. Estimated chum salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0		0	0	0	0	0		0
24-Jun								0	0
25-Jun								0	
26-Jun	0		0	0	0	0	0		0
27-Jun		0		0	0	0		0	0
28-Jun	0		0	0	0	0	0		0
29-Jun		0		0	0	0		0	0
30-Jun	0		0	0	0	0			0
01-Jul		0		0	0	0		0	0
02-Jul	0		0	0	2	0	0		2
03-Jul									0
04-Jul	0		0	0	0	0	0		0
05-Jul		0		0	0	0		0	0
06-Jul	0		1	2	1	3	0		7
07-Jul		0		0	0	3		0	3
08-Jul	0		3	1	0	0	0		4
09-Jul		0		0	2	4		0	6
10-Jul	0		3	6	8	0	0		17
11-Jul		0		0	0	2		1	3
12-Jul	0		5	0	0	0	0		5
13-Jul		0		1	2	6		0	9
14-Jul	1		0	3	0	2	1		7
15-Jul		1		1	9	14		0	25
16-Jul	0		3	2	2	1	0		8
17-Jul		0		0	0	0		0	0
18-Jul	0		1	1	0	0	0		2
19-Jul		1		2	2	0		0	5
20-Jul	0		3	7	0	0	0		10
21-Jul		0		1	5	0		0	6
22-Jul	0		0	1	1	1	0		3
23-Jul		0		0	0	0		0	0
24-Jul	0		2	3	1	6	1		13
25-Jul		0		0	0	1		0	1
26-Jul	0		0	0	7	0	0		7
27-Jul		0		3	2	14		0	19
28-Jul	0		0	1	40	22	2		65
Total	1	2	21	35	84	79	4	1	227
%	.4	.9	9.3	15.4	37.0	34.8	1.8	.4	100.0

Appendix B3. Estimated chum salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
24-Jun								0.0	0.0
25-Jun									0.0
26-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
27-Jun		0.0		0.0	0.0	0.0		0.0	0.0
28-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
29-Jun		0.0		0.0	0.0	0.0		0.0	0.0
30-Jun	0.0		0.0	0.0	0.0	0.0			0.0
01-Jul		0.0		0.0	0.0	0.0		0.0	0.0
02-Jul	0.0		0.0	0.0	1.2	0.0	0.0		1.2
03-Jul									0.0
04-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
05-Jul		0.0		0.0	0.0	0.0		0.0	0.0
06-Jul	0.0		0.8	1.5	0.8	2.3	0.0		5.5
07-Jul		0.0		0.0	0.0	2.4		0.0	2.4
08-Jul	0.0		2.4	0.8	0.0	0.0	0.0		3.2
09-Jul		0.0		0.0	1.4	3.1		0.0	4.5
10-Jul	0.0		2.3	4.3	6.3	0.0	0.0		12.9
11-Jul		0.0		0.0	0.0	1.6		0.8	2.4
12-Jul	0.0		3.7	0.0	0.0	0.0	0.0		3.7
13-Jul		0.0		0.8	1.6	4.7		0.0	7.1
14-Jul	0.8		0.0	0.0	0.0	1.6	0.8		3.2
15-Jul		0.8		0.7	7.2	10.8		0.0	19.4
16-Jul	0.0		2.3	1.7	1.6	0.8	0.0		6.4
17-Jul		0.0		0.0	0.0	0.0		0.0	0.0
18-Jul	0.0		0.8	0.8	0.0	0.0	0.0		1.6
19-Jul		0.8		1.7	1.7	0.0		0.0	4.2
20-Jul	0.0		2.3	5.6	0.0	0.0	0.0		7.9
21-Jul		0.0		0.8	3.8	0.0		0.0	4.7
22-Jul	0.0		0.0	0.8	0.8	0.8	0.0		2.5
23-Jul	0.0		0.0	0.0	0.0			0.0	0.0
24-Jul	0.0		1.6	2.5	0.8	4.6	0.8		10.3
25-Jul		0.0		0.0	0.0	0.8		0.0	0.8
26-Jul	0.0		0.0	0.0	5.5	0.0	0.0		5.5
27-Jul		0.0		2.5	1.7	10.5		0.0	14.7
28-Jul	0.0		0.0	0.8	27.0	15.5	1.6		44.9
Total	.8	1.6	16.3	25.2	61.4	59.6	3.2	.8	169.0
%	.5	.9	9.7	14.9	36.4	35.3	1.9	.5	100.0

Appendix C.1. Summary of coho salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1989.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cum.	Daily	Cum.
23-Jun	6	241.0	0	0	0.0	0.0
24-Jun	1	20.0	0	0	0.0	0.0
25-Jun	0	.0	0	0	0.0	0.0
26-Jun	6	228.0	0	0	0.0	0.0
27-Jun	5	181.5	0	0	0.0	0.0
28-Jun	6	227.0	0	0	0.0	0.0
29-Jun	5	193.5	0	0	0.0	0.0
30-Jun	5	185.5	0	0	0.0	0.0
01-Jul	5	188.5	0	0	0.0	0.0
02-Jul	6	236.0	0	0	0.0	0.0
03-Jul	0	.0	0	0	0.0	0.0
04-Jul	6	225.0	0	0	0.0	0.0
05-Jul	5	181.5	0	0	0.0	0.0
06-Jul	6	224.0	0	0	0.0	0.0
07-Jul	5	185.5	0	0	0.0	0.0
08-Jul	6	222.5	0	0	0.0	0.0
09-Jul	5	194.0	0	0	0.0	0.0
10-Jul	6	232.0	0	0	0.0	0.0
11-Jul	5	200.0	0	0	0.0	0.0
12-Jul	6	224.0	0	0	0.0	0.0
13-Jul	5	187.0	1	1	0.8	0.8
14-Jul	6	221.0	0	1	0.0	0.8
15-Jul	5	193.0	0	1	0.0	0.8
16-Jul	6	224.0	1	2	0.8	1.6
17-Jul	5	181.0	0	2	0.0	1.6
18-Jul	6	226.5	8	10	6.1	7.7
19-Jul	5	180.5	2	12	1.7	9.4
20-Jul	6	223.0	7	19	5.6	14.9
21-Jul	5	183.5	6	25	4.7	19.7
22-Jul	6	219.5	4	29	3.3	23.0
23-Jul	5	147.0	0	29	0.0	23.0
24-Jul	6	222.5	2	31	1.6	24.5
25-Jul	5	180.0	0	31	0.0	24.5
26-Jul	1	38.5	0	31	0.0	24.5
27-Jul	5	183.5	8	39	6.1	30.6
28-Jul	6	233.0	43	82	30.1	60.7

Appendix C.2. Estimated coho salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0		0	0	0	0	0		0
24-Jun								0	0
25-Jun									0
26-Jun	0		0	0	0	0	0		0
27-Jun		0		0	0	0		0	0
28-Jun	0		0	0	0	0	0		0
29-Jun		0		0	0	0		0	0
30-Jun	0		0	0	0	0			0
01-Jul		0		0	0	0		0	0
02-Jul	0		0	0	0	0	0		0
03-Jul									0
04-Jul	0		0	0	0	0	0		0
05-Jul		0		0	0	0		0	0
06-Jul	0		0	0	0	0	0		0
07-Jul		0		0	0	0		0	0
08-Jul	0		0	0	0	0	0		0
09-Jul		0		0	0	0		0	0
10-Jul	0		0	0	0	0	0		0
11-Jul		0		0	0	0		0	0
12-Jul	0		0	0	0	0	0		0
13-Jul		0		1	0	0		0	1
14-Jul	0		0	0	0	0	0		0
15-Jul		0		0	0	0		0	0
16-Jul	0		0	0	1	0	0		1
17-Jul		0		0	0	0		0	0
18-Jul	0		0	3	5	0	0		8
19-Jul		0		0	2	0		0	2
20-Jul	0		1	6	0	0	0		7
21-Jul		0		2	4	0		0	6
22-Jul	0		0	0	3	1	0		4
23-Jul		0		0	0	0		0	0
24-Jul	0		0	0	1	1	0		2
25-Jul		0		0	0	0		0	0
26-Jul	0		0	0	0	0	0		0
27-Jul		0		1	0	7		0	8
28-Jul	0		1	2	19	21	0		43
Total	0	0	2	15	35	30	0	0	82
%	.0	.0	2.4	18.3	42.7	36.6	.0	.0	100.0

Appendix C.3. Estimated coho salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1989.

	Station Number								
Date	2	3	4	5	6	7	8	9	Total
23-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
24-Jun								0.0	0.0
25-Jun									0.0
26-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
27-Jun		0.0		0.0	0.0	0.0		0.0	0.0
28-Jun	0.0		0.0	0.0	0.0	0.0	0.0		0.0
29-Jun		0.0		0.0	0.0	0.0		0.0	0.0
30-Jun	0.0		0.0	0.0	0.0	0.0			0.0
01-Jul		0.0		0.0	0.0	0.0		0.0	0.0
02-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
03-Jul									0.0
04-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
05-Jul		0.0		0.0	0.0	0.0		0.0	0.0
06-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
07-Jul		0.0		0.0	0.0	0.0		0.0	0.0
08-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
09-Jul		0.0		0.0	0.0	0.0		0.0	0.0
10-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
11-Jul		0.0		0.0	0.0	0.0		0.0	0.0
12-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
13-Jul		0.0		0.8	0.0	0.0		0.0	0.8
14-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
15-Jul		0.0		0.0	0.0	0.0		0.0	0.0
16-Jul	0.0		0.0	0.0	0.8	0.0	0.0		0.8
17-Jul		0.0		0.0	0.0	0.0		0.0	0.0
18-Jul	0.0		0.0	2.5	3.7	0.0	0.0		6.1
19-Jul		0.0		0.0	1.7	0.0		0.0	1.7
20-Jul	0.0		0.8	4.8	0.0	0.0	0.0		5.6
21-Jul		0.0		1.6	3.1	0.0		0.0	4.7
22-Jul	0.0		0.0	0.0	2.5	0.8	0.0		3.3
23-Jul		0.0		0.0	0.0	0.0		0.0	0.0
24-Jul	0.0		0.0	0.0	0.8	0.8	0.0		1.6
25-Jul		0.0		0.0	0.0	0.0		0.0	0.0
26-Jul	0.0		0.0	0.0	0.0	0.0	0.0		0.0
27-Jul		0.0		0.8	0.0	5.2		0.0	6.1
28-Jul	0.0		0.8	1.6	12.8	14.8	0.0		30.1
Total	.0	.0	1.6	12.2	25.3	21.7	.0	.0	60.7
%	.0	.0	2.7	20.0	41.7	35.7	.0	.0	100.0

Appendix D.1. Entry pattern of sockeye salmon into Upper Cook Inlet, Alaska in 1989 as estimated from daily CPUE measured at the latitude of Anchor Point.

Date	Daily Proportion	Cumulative Proportion
6 24	.07007	.07007
6 25	.00865	.07872
6 26	.00962	.08835
6 27	.01067	.09902
6 28	.01180	.11082
6 29	.01302	.12384
6 30	.01431	.13814
7 1	.01567	.15381
7 2	.01710	.17091
7 3	.01857	.18948
7 4	.02008	.20956
7 5	.02160	.23116
7 6	.02311	.25426
7 7	.02458	.27884
7 8	.02599	.30483
7 9	.02729	.33212
7 10	.02847	.36059
7 11	.02948	.39007
7 12	.03031	.42038
7 13	.03092	.45130
7 14	.03130	.48261
7 15	.03144	.51405
7 16	.03133	.54537
7 17	.03097	.57635
7 18	.03038	.60673
7 19	.02958	.63631
7 20	.02858	.66490
7 21	.02742	.69232
7 22	.02613	.71845
7 23	.02473	.74319
7 24	.02327	.76645
7 25	.02176	.78822
7 26	.02024	.80845
7 27	.01873	.82718
7 28	.01725	.84443
7 29	.01582	.86025
7 30	.01445	.87470
7 31	.01315	.88785
8 1	.01193	.89978
8 2	.01079	.91057
8 3	.00973	.92030
8 4	.00875	.92905

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Appendix D.1. (p 2 of 2)

Date	Daily Proportion	Cumulative Proportion
8 5	.00786	.93691
8 6	.00704	.94395
8 7	.00630	.95024
8 8	.00562	.95587
8 9	.00501	.96088
8 10	.00446	.96534
8 11	.00397	.96931
8 12	.00353	.97284
8 13	.00313	.97598
8 14	.00278	.97876
8 15	.00246	.98122
8 16	.00218	.98340
8 17	.00193	.98534
8 18	.00171	.98705
8 19	.00151	.98856
8 20	.00134	.98990
8 21	.00118	.99108
8 22	.00105	.99213

Appendix E.1. Chemical and physical observations made in Upper Cook Inlet, Alaska during the conduct of the 1989 offshore test fish project.

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
23-Jun	2	11	8	0	0	3	30	22	8
	4	11	8	2	6	4	31	24	6
	5	12	8	2	6	4	29	33	5
	6	12	8	2	6	4	29	37	5
	7	12	8	2	6	4	29	46	4
	8	12	8	2	6	4	29	26	4
24-Jun	9	12	9	20	6	4	27	22	4
26-Jun	2	10	8	0	8	3	29	22	8
	4	11	8	0	8	3	29	27	8
	5	11	8	0	8	3	29	28	5
	6	11	8	0	6	3	29	46	3
	7	11	8	1	6	4	29	42	3
	8	11	8	0	4	4	29	24	3
27-Jun	9	11	8	15	6	4	29	20	3
	7	11	8	10	6	4	29	45	3
	6	11	8	0	6	4	29	46	4
	5	11	8	0	6	4	29	38	4
	3	11	8	0	6	3	29	21	8
28-Jun	2	14	8	1	5	4	29	21	7
	4	14	8	0	0	4	29	33	8
	5	16	8	0	0	1	29	53	6
	6	18	8	0	0	3	29	39	4
	7	20	8	0	0	3	29	27	4
	8	20	8	0	0	3	29	35	4
29-Jun	9	12	8	0	0	3	29	20	3
	7	12	8	0	0	3	29	43	3
	6	12	9	0	0	4	28	43	6
	5	12	9	6	8	4	28	31	7
	3	12	9	3	8	4	28	20	6
30-Jun	2	12	9	4	6	4	28	25	6
	4	12	9	6	6	4	28	26	7
	5	12	9	10	6	4	28	42	3
	6	12	9	10	4	4	29	60	3
	7	12	9.5	14	4	4	28	33	3
01-Jul	9	12	9.5	0	0	3	27	20	3
	7	12	9.5	0	0	3	27	45	4
	6	12	8.5	0	0	4	28	40	5
	5	12	8.5	0	0	4	28.5	19	8
	3	12	9	0	0	4	28.5	17	8
02-Jul	2	16	9.5	5	6	4	27	12	6
	4	17	9	6	8	4	27.5	19	7

- Continued -

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
02-Jul	5	17	9	10	8	4	27.5	30	6
	6	16	9.5	12	8	4	27.5	35	7
	7	18	10	0	0	4	27	53	3
	8	18	10	0	0	4	26.5	30	2
04-Jul	2	12	10	8	6	4	28.5	25	4
	4	12	10	8	6	4	28.5	27	4
	5	12	10.5	10	6	4	28	50	3
	6	12	10.5	10	6	4	28	43	3
	7	12	10.5	8	6	4	28	30	3
	8	12	10.5	10	6	1	28	18	3
05-Jul	9	10	10	15	4	3	29.5	18	4
	7	9	10	18	4	3	29.5	46	3
	6	9	10	16	4	3	29	48	3
	5	10	10	12	6	3	29.5	30	5
	3	10	10	0	0	2	29.5	16	7
06-Jul	2	15	9.5	0	0	3	29	19	7
	4	13	9	6	4	3	28.5	24	6
	5	13	9.5	6	4	3	28	46	3
	6	12	10	6	4	2	27.5	45	3
	7	14	10	2	4	4	28	34	3
	8	15	10	0	0	4	27.5	26	3
07-Jul	9	11	9.5	6	4	4	27.5	26	3
	7	14	9.5	6	4	4	28	46	4
	6	14	9	0	0	1	29.5	49	6
	5	14	9	0	0	3	29.5	33	9
	3	13	9	0	0	3	29.5	17	7
08-Jul	2	11	9	2	4	3	27.5	20	9
	4	11	9	8	5	3	29	25	6
	5	13	10	5	5	3	28.5	35	3
	6	13	10	5	5	4	28	43	2
	7	15	10.5	6	5	4	27	45	3
	8	13	10	6	4	4	27.5	26	3
09-Jul	9	10	10	10	5	4	27	22	4
	7	10	10.5	10	5	4	29	46	3
	6	10	10	12	5	1	31.5	41	5
	5	11	9.5	8	5	3	31.5	37	7
	3	13	9.5	6	4	3	31	20	9
10-Jul	2	15	9.5	5	4	3	27.5	20	9
	4	15	10	6	5	4	27.5	28	4
	5	15	11	4	5	4	29	50	4
	6	16	11	5	5	4	28.5	44	3
	7	15	11	4	5	4	28.5	27	3
	8	15	10.5	6	6	4	28.5	18	2

- Continued -

Appendix E.1. (p 3 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
11-Jul	9	10	10.5	6	5	3	28.5	20	3
	7	11	11.5	12	4	4	31	43	3
	6	10	11	12	4	5	29	47	3
	5	11	10.5	12	5	4	31	34	4
	3	11	9.5	14	6	4	32	20	9
12-Jul	2	13	9	0	0	4	27.5	21	8
	4	15	9	0	0	1	27.5	31	5
	5	14	11	0	0	3	27	51	3
	6	15	10.5	0	0	3	27.5	43	3
	7	15	11	0	0	2	27	31	3
	8	14	10.5	0	0	3	27.5	25	3
13-Jul	9	11	10.5	0	0	2	26.5	20	4
	7	12	10.5	0	0	4	28	45	3
	6	12	10	0	0	4	28	47	4
	5	12	9	0	0	4	30.5	32	6
	3	12	10.5	0	0	4	30	19	4
14-Jul	2	12	10	10	8	4	29	21	7
	4	13	10.5	12	8	4	29.5	27	4
	5	13	10.5	12	8	4	29.5	44	4
	6	13	11	18	8	4	28.5	40	3
	7	13	11	16	8	3	28	31	3
	8	13	11	8	8	3	31	22	3
15-Jul	9	11	11	10	8	3	26	19	4
	7	11	10	8	8	3	28	46	3
	6	11	9.5	6	8	3	28.5	43	6
	5	12	10	6	8	2	29.5	31	7
	3	13	10	7	1	4	31	20	7
16-Jul	2	14	10	6	6	4	26	25	8
	4	14	10	4	6	4	26.5	35	7
	5	15	10	2	6	4	26.5	46	7
	6	16	11	2	6	4	26.5	47	4
	7	18	11	0	0	4	25	33	3
	8	18	11	2	4	4	25	14	3
7-Jul	9	13	11	5	6	3	24.5	18	2
	7	14	11	0	0	3	25.5	44	4
	6	15	11	2	6	3	27.5	47	4
	5	15	10.5	2	6	3	28.5	28	8
	3	13	10	0	0	4	27	18	8
8-Jul	2	15	10	2	2	4	27	26	7
	4	18	10	0	0	2	26.5	25	9
	5	18	10.5	0	0	4	26	50	7
	6	19	10.5	0	0	4	26	43	4
	7	18	11	4	6	4	25	40	4

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Appendix E.1. (p 4 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
18-Jul	8	15	11	4	6	4	27	21	2
19-Jul	9	13	10	10	6	3	27.5	16	3
	7	13	-	10	6	3	28	36	3
	6	13	-	10	6	3	27	40	3
	5	13	-	8	6	3	29	31	4
	3	13	11.5	12	4	3	27	12	5
20-Jul	2	12	11	8	6	3	26	25	4
	4	12	11	5	6	2	28	25	4
	5	12	11.5	4	6	4	29.5	43	4
	6	14	11.5	2	6	4	27.5	42	3
	7	14	12	4	6	4	27.5	30	2
	8	14	12	2	6	4	27	22	2
21-Jul	9	10	11.5	2	5	4	26.5	19	2
	7	12	12	0	0	1	25	30	3
	6	12	11	0	0	1	27	42	6
	5	14	10.5	0	0	3	28	50	7
	3	14	11.5	0	0	3	27	22	5
22-Jul	2	11	10.5	4	6	3	25	20	6
	4	12	11	0	0	3	24.5	24	6
	5	13	11	0	0	3	24	35	4
	6	13	11.5	0	0	2	24.5	46	3
	7	14	11.5	5	6	4	24.5	43	2
	8	14	12	8	6	4	29	27	2
23-Jul	9	11	11.5	4	8	4	31.5	18	2
	7	11	12	6	8	4	32	33	3
	6	11	11	5	8	4	25.5	43	4
	5	11	11	5	6	4	25.5	50	4
	3	10	10	5	6	3	24.3	19	8
24-Jul	2	14	10	4	8	3	23.5	27	7
	4	16	10	0	0	3	25	25	7
	5	18	11	2	6	3	26	35	6
	6	20	11	2	6	3	24.5	45	3
	7	20	12	0	0	3	26	46	3
	8	20	10.5	2	6	4	27	32	3
25-Jul	9	11	11.5	2	8	4	24	20	3
	7	12	11.5	2	8	4	25	44	3
	6	12	10.5	2	8	4	26.5	40	6
	5	13	10	2	8	4	28	29	8
	3	13	10.5	2	8	1	28	20	8
27-Jul	9	11	11.5	5	6	3	26	21	2
	7	12	11.5	5	6	4	25	48	3
	6	12	11.5	2	6	4	26	49	3
	5	15	10.5	0	0	4	28.5	37	9

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Appendix E.1. (p 5 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
27-Jul	3	17	10.5	0	0	4	31.5	20	9
28-Jul	2	12	10	5	8	4	22.5	22	7
	4	12	10	2	8	4	25	30	7
	5	13	11	4	8	4	25.5	50	3
	6	13	11.5	4	8	4	24	45	3
	7	13	12	2	8	1	23	31	4
	8	13	11	2	8	3	24.5	26	3

^ Wind direction code 1=north,2=northeast,3=east,4=southeast,
5=south,6=southwest,7=west,8=northwest
~ Tide stage code 1=high,2=low,3=ebb,4=flood