

# Pilot Station Extended Operations:

## URM 19-12

**Project Proponent:** Bruce McIntosh, ADF&G Alaska Dept. of Fish and Game – Commercial Fisheries Division, 1300 College Rd. Fairbanks, AK 99701, [bruce.mcintosh@alaska.gov](mailto:bruce.mcintosh@alaska.gov), (907) 459-7286, Fax: (907) 459-7271

**Project Partner:** Current partners in the project include the Association of Village Council Presidents (AVCP) and USFWS, who work together to provide a fisheries technician.

Blair Flannery, USFWS - Conservation Genetics Laboratory,  
Anchorage [Blair.Flannery@fws.org](mailto:Blair.Flannery@fws.org)

Casie Stockdale, Association of Village Council Presidents, Bethel [cstockdale@avcp.org](mailto:cstockdale@avcp.org)

### 1. Introduction:

*Summary:* This project employs sonar equipment and a gillnet testfishery on the Yukon River mainstem to generate timely, in-season passage estimates of Chinook (*Oncorhynchus tshawytscha*), summer and fall chum (*O. keta*), and coho (*O. kisutch*) salmon, which includes fish bound for Canadian waters. Fish passage estimates at Pilot Station are based upon a sampling design in which the sonar equipment is operated daily during three 3-hour intervals, and drift gillnets are fished twice each day between sonar periods to apportion the sonar estimates to species. An assortment of gillnets, 25 fathoms long with mesh sizes ranging from 2.75 in to 8.5 in, are drifted through the sonar sampling areas twice daily between sonar data collection periods.

Historically, the project began operations during the first or second week of June, and ran continuously through August 31. In 2004, concerns with early arriving Chinook salmon prompted the Yukon Delta Fisheries Association (YDFA) to provide additional funding that allowed the start date to be advanced to June 1. Prior to that, operations had begun as early as June 5 in 2003, and as late as June 12 in 1999. Yukon Panel R&M funding was first received in 2008, allowing for both a June 1 start date and an extension of operations for an additional week through September 7.

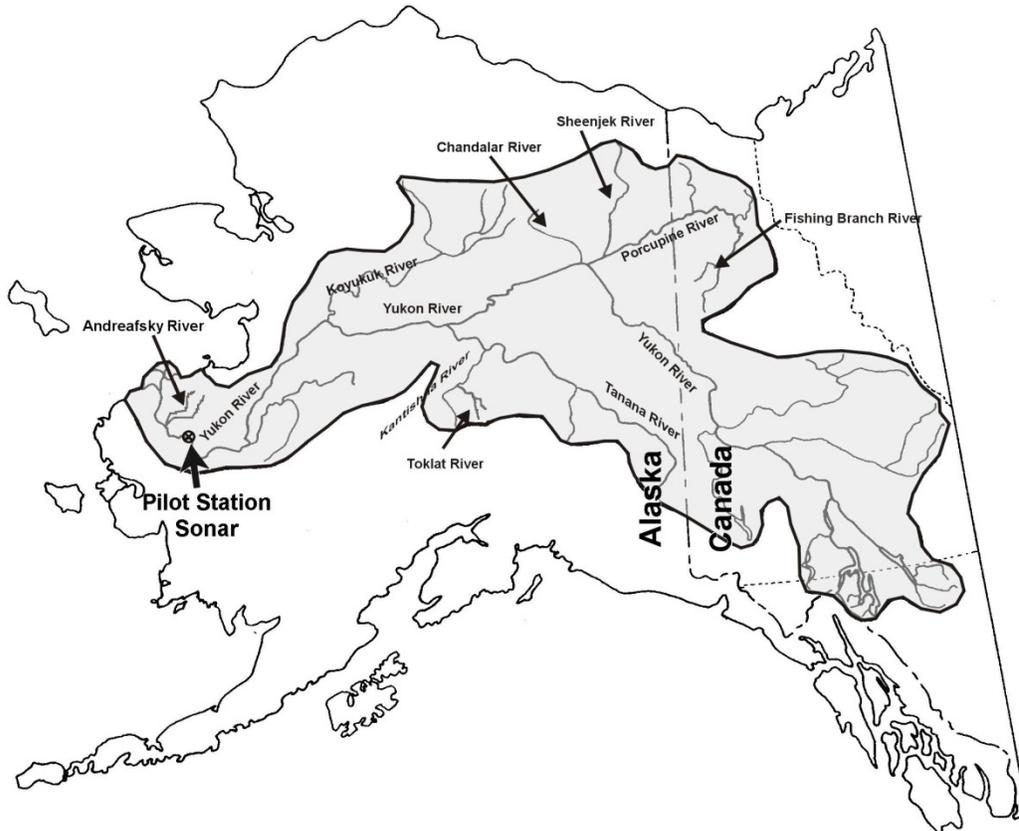
*Objectives:* The primary objective of this project was to increase the accuracy of Chinook and chum salmon passage estimates generated at the Pilot Station sonar project by starting field operations on June 1 and extending operations one week at the end of the field season, from August 31 until September 7. This was to provide managers with greater confidence in both abundance and MSA estimates for Chinook salmon and the late season fall chum salmon run. This project addressed the following priorities identified in the 2012 Request for Proposals:

#### Assess and achieve fishery management objectives

2. Identify stock composition of salmon runs through genetic stock identification.
3. Improve in-season run size and stock specific estimates at the mouth of the Yukon River.

6. Refine in-season border passage assessment/estimates.

**2. Study Area:** This project is located approximately 197 km from the mouth of the Yukon River and 1.5 km upstream from the village of Pilot Station (Figure 1). The sonar project camp is located upriver of the village of Pilot Station, at approximately lat 61.9472, long -162.8408. Transducers were deployed on both banks of the river at approximately lat 61.9512, long -162.8582 on the right bank and at lat 61.9475, long -162.8402 on the left bank (Figure 2).



**Figure 1.** Yukon River drainage and major tributaries, showing location of sonar project.

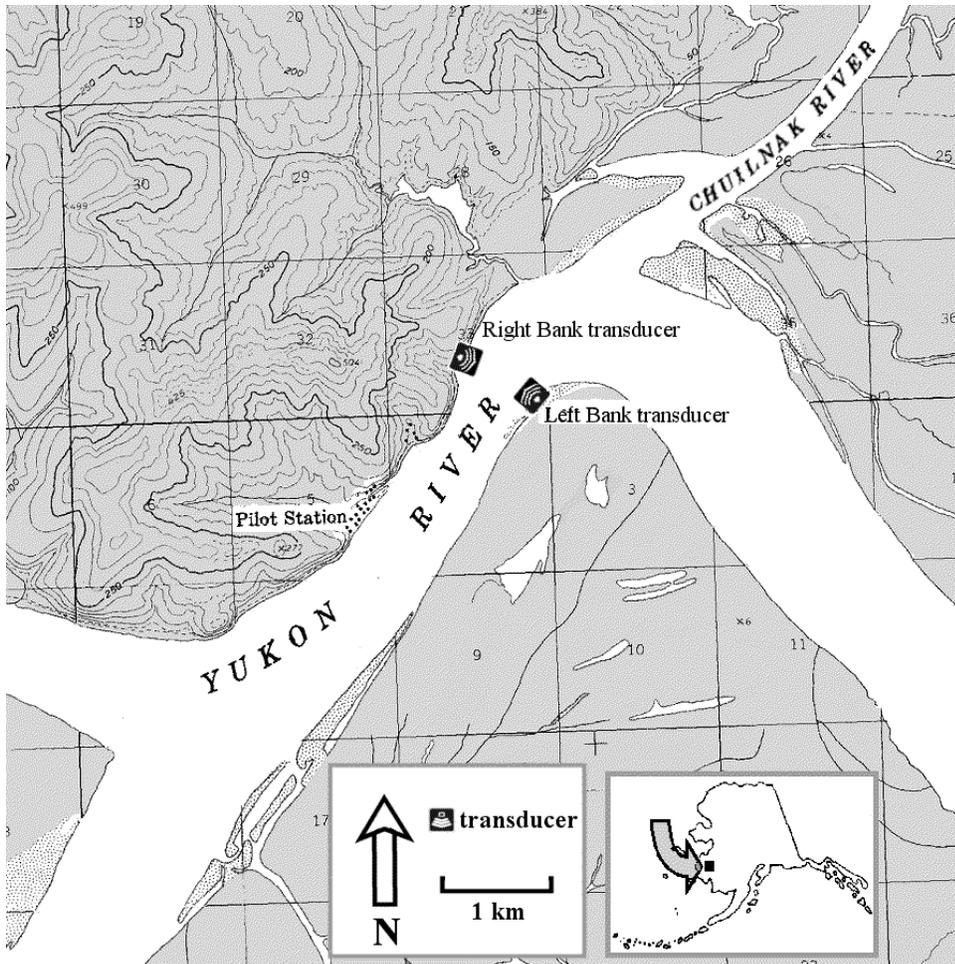


Figure 2. Location of sonar transducers at project.

**3. Licenses and Permits:** No additional licenses or permits were required for this project.

**4. Methods:**

*Operation:* June 1 through September 7, 2012

*Data Analysis:* Daily estimates of upstream migration of targeted fish species are produced from a combination of independently generated estimates of fish movement past the sonar site using hydroacoustic equipment and species proportions based upon the results of drift gillnetting in the same area. Acoustic sampling is conducted simultaneously on both banks during three 3-h periods each day. Sonar sample periods are scheduled from 0530 to 0830, 1330 to 1630, and 2130 to 0030 hours. Testfishing is conducted twice daily between sonar periods, from 0900 to 1200 hours and 1700 to 2000 hours.

Sonar equipment consists of Hydroacoustic Technology Inc. (H.T.I.) Model 244 echosounders (configured to transmit and receive at 120 kHz) controlled via software installed on laptop PCs. H.T.I. split-beam transducers, mounted on metal tripods and remotely aimed with dual-axis

rotators, are installed on the left bank ( $2.8^{\circ} \times 10^{\circ}$  nominal beam width) and on the right bank ( $6^{\circ} \times 10^{\circ}$  nominal beam width). Additionally, in conjunction with the HTI split beam system, a DIDSON-LR (Long Range) unit is installed on the left bank to sample the area 0-20 m offshore.

Transducers are deployed on both the left bank and the right bank in an area where the river is approximately 1,000 m wide. Split beam and DIDSON sonar data is processed by electronic echogram. Fish traces are tallied and output from the echogram software, checked daily for data entry or tallying errors, then processed directly in SAS® using statistical routines developed by the regional Biometrician.

To estimate species composition, gillnets are drifted through three zones (right bank, left-bank nearshore, and left-bank offshore) corresponding to sonar sampling strata. A total of eight different mesh sizes are fished throughout the season to effectively capture all size classes of fish present and detectable by the hydroacoustic equipment. Gillnet mesh size ranges from 2.75" to 8.5" with all nets constructed to be 25 fathoms (45.7 m) long and approximately 8 m deep. During each sampling period, four different nets are drifted within each of three zones for a total of 24 drifts per day. Each mesh size is fished in all three zones before switching to the next mesh size and drifts are approximately eight minutes in duration.

Captured fish are identified to species and measured to the nearest one mm length. Salmon species are measured from mid-eye to fork of tail (MEFL); non-salmon species are measured from snout to fork of tail (FL). Fish species, length, and sex are recorded onto field data sheets. Each drift record includes the date, sampling period, drift start and end times, mesh size, length of net, and captain's initials.

For the catch of each species  $i$  of length  $l$ , the associated effort is adjusted by applying a length-based selectivity parameter and the CPUE of the catch of each species  $i$  of length  $l$  is then calculated. The proportion of species  $i$  is estimated as the ratio of the CPUE for species  $i$  summed over all lengths to the CPUE of all species combined. Although there is some temporal overlap between the summer and fall runs of chum salmon, for the purposes of estimating passage all chum salmon encountered through July 18 are designated as summer chum and post July 18 are designated as fall chum.

Scale samples are collected from Chinook salmon, with genetic tissue samples collected from both Chinook and chum salmon. Age, sex, and length data is cross-referenced with each tissue sample. Processing and analysis of these samples is conducted by both the ADF&G Gene Conservation Laboratory and the USFWS Conservation Genetics Laboratory. Handling mortalities among the captured fish are distributed to the local community when possible, with fish dispersal documented daily

## **5. Results:**

In 2012 the crew arrived in St. Marys and began working to set up camp on May 24. On June 1 sonar was operational on both banks and testfishing began. The first Chinook salmon was captured until June 10 and the first summer chum salmon was captured June 12. The sonar operated continuously on both banks throughout the season until September 7. Camp breakdown was completed by September 11.

During the first week of June, passage estimates were dominated by other non-salmon species, principally sheefish *Stenodus leucichthys* and cisco *Coregonus spp.* Both the fall chum and coho salmon runs were well underway when the extended operation period began September 1. Cumulative passage estimates for each targeted species for the period September 1 through September 7 were 20,911 fall chum salmon, 22,542 coho salmon, and 27,627 other non-salmon fish species (Table 1). Estimates made during this 7-day period accounted for 3.1% of the total 2012 fall chum salmon estimate, and 21.1% of the 2012 coho salmon estimate (Table 2). Daily estimates for the full 2012 season can be found in Appendix A.

No Chinook or chum salmon were captured during the period June 1 through June 7 in any mesh size. Drift gillnetting during the fall period resulted in a catch of 308 fish including 91 fall chum salmon, 123 coho salmon, and 94 other non-salmon species (Table 3). Full catch data by day for 2012 can be found in Appendix B. Genetic samples were taken from all Chinook and chum salmon for MSA. Any captured fish not successfully released were distributed daily to nearby residents in Pilot Station.

**Table 1.** Daily and total passage estimates during the extended operation period, 2012.

Date	Fall chum	Coho	Other spp
9/1	1,771	2,092	5,899
9/2	3,502	1,129	5,169
9/3	3,982	3,100	2,620
9/4	2,891	3,774	3,954
9/5	2,447	3,906	4,609
9/6	3,937	4,638	1,763
9/7	2,381	3,903	3,613
Total	20,911	22,542	27,627

**Table 2.** Contribution of estimates during performance period to entire season's estimates, 2012.

Species	Period	
	6/1 - 6/7	9/1 - 9/7
Large Chinook <sup>a</sup>	0.0%	
Small Chinook <sup>b</sup>	0.0%	
Total Chinook	0.0%	
Summer chum <sup>c</sup>	0.0%	
Fall chum <sup>d</sup>		3.1%
Coho		21.1%
Other <sup>e</sup>	3.9%	4.1%

<sup>a</sup> Chinook salmon greater than 655 mm mid eye to tail fork length.

<sup>b</sup> Chinook salmon less than or equal to 655 mm mid eye tail fork length.

<sup>c</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>d</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

<sup>e</sup> Other non-salmon species.

**Table 3.** Daily and total testfish catches during the extended operation period, 2012.

Date	Fall chum	Coho	Other spp
9/1	9	16	21
9/2	14	11	23
9/3	17	17	14
9/4	13	18	13
9/5	19	29	17
9/6	14	18	4
9/7	5	14	2
Total	91	123	94

## 6. Discussion:

This project was operational prior to the beginning of the Chinook and summer chum salmon runs in early June and provided daily and seasonal estimates of salmon passage by species for fall chum and coho salmon through September 7, meeting its objectives satisfactorily. Seasonal estimates of passage are compared with other estimates of run strength such as total catch and escapement for

fall chum and coho salmon and test fishery indices. The increased accuracy of the overall estimate of fall chum salmon was beneficial to fishery managers and met the goals and objectives of the R&M extended operations funding.

**References:**

Data and detailed information about the project can be obtained from the project proponents. The project report should be referenced as follows:

*Lozori, Jody D., and Bruce C. McIntosh. In prep. Sonar estimation of salmon passage in the Yukon River near Pilot Station, 2012. Alaska Department of Fish and Game, Fishery Data Series No. 13-XX, Anchorage.*

**Appendix A.** Daily passage estimates at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
6/01	0	0	-	0	0	5,296	5,296
6/02	0	0	-	0	0	4,179	4,179
6/03	0	0	-	0	0	3,920	3,920
6/04	0	0	-	0	0	3,113	3,113
6/05	0	0	-	0	0	3,635	3,635
6/06	0	0	-	0	0	3,386	3,386
6/07	0	0	-	0	0	2,675	2,675
6/08	0	0	-	0	0	2,083	2,083
6/09	0	0	-	0	0	2,361	2,361
6/10	22	0	-	0	0	2,191	2,213
6/11	32	0	-	0	0	2,623	2,655
6/12	0	955	-	0	0	1,509	2,464
6/13	458	1,973	-	0	0	656	3,087
6/14	152	1,382	-	0	0	1,352	2,886
6/15	36	1,079	-	0	0	1,277	2,392
6/16	1,828	11,006	-	0	0	438	13,272
6/17	1,165	45,385	-	0	0	833	47,383
6/18	779	42,105	-	0	0	1,767	44,651
6/19	1,331	56,263	-	0	0	2,432	60,026
6/20	2,398	65,323	-	0	0	11,084	78,805
6/21	2,194	71,861	-	378	0	2,107	76,540
6/22	2,808	100,329	-	0	0	269	103,406
6/23	6,556	114,772	-	0	0	985	122,313
6/24	7,436	99,712	-	0	0	925	108,073
6/25	4,108	75,954	-	1,928	0	1,291	83,281
6/26	9,099	72,545	-	979	0	2,892	85,515
6/27	7,730	94,446	-	2,422	0	610	105,208
6/28	15,428	155,152	-	3,808	0	0	174,388
6/29	6,505	153,646	-	4,227	0	3,145	167,523
6/30	3,882	107,512	-	3,321	0	811	115,526
7/01	1,972	89,615	-	4,049	0	4,178	99,814
7/02	5,003	72,279	-	5,944	0	782	84,008
7/03	2,004	61,258	-	26,284	0	1,487	91,033
7/04	1,657	50,429	-	9,065	0	1,621	62,772
7/05	1,621	62,523	-	26,783	0	3,240	94,167
7/06	6,171	126,342	-	11,883	0	1,756	146,152
7/07	2,194	69,105	-	31,973	0	10,148	113,420
7/08	1,733	42,351	-	14,142	0	8,248	66,474
7/09	994	49,116	-	5,685	0	10,363	66,158
7/10	2,782	50,195	-	9,184	0	5,782	67,943

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<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

**Appendix A (cont'd).** Daily passage estimates at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
7/11	206	62,981	-	19,442	0	5,677	88,306
7/12	820	44,228	-	8,721	0	4,855	58,624
7/13	940	24,397	-	10,039	0	7,395	42,771
7/14	902	13,827	-	9,718	0	11,212	35,659
7/15	722	10,984	-	7,845	0	9,006	28,557
7/16	63	6,329	-	9,698	0	5,500	21,590
7/17	636	14,354	-	9,977	0	3,314	28,281
7/18	425	8,691	-	7,724	0	2,425	19,265
7/19	278	-	21,064	5,428	0	4,498	31,268
7/20	346	-	41,471	11,969	0	12,008	65,794
7/21	454	-	23,934	9,584	237	13,753	47,962
7/22	339	-	17,386	6,741	181	10,192	34,839
7/23	247	-	5,874	7,615	0	12,726	26,462
7/24	0	-	4,824	3,893	16	10,698	19,431
7/25	0	-	3,964	3,224	0	8,438	15,626
7/26	0	-	4,979	4,244	0	10,336	19,559
7/27	112	-	13,760	5,726	0	8,655	28,253
7/28	0	-	35,015	9,061	326	12,700	57,102
7/29	93	-	38,243	11,967	525	11,762	62,590
7/30	65	-	21,806	6,621	304	6,296	35,092
7/31	0	-	9,910	5,180	409	12,440	27,939
8/01	0	-	7,165	4,046	287	9,077	20,575
8/02	0	-	10,936	4,314	198	15,130	30,578
8/03	0	-	32,316	1,817	1,187	10,715	46,035
8/04	0	-	12,798	2,078	835	14,798	30,509
8/05	0	-	7,175	1,402	498	9,344	18,419
8/06	0	-	4,440	426	750	11,169	16,785
8/07	0	-	6,228	559	1,106	14,337	22,230
8/08	0	-	11,926	202	598	13,899	26,625
8/09	0	-	3,820	417	636	12,031	16,904
8/10	0	-	2,812	290	1,659	10,944	15,705
8/11	0	-	1,792	0	1,083	15,747	18,622
8/12	0	-	1,694	413	896	14,813	17,816
8/13	0	-	1,029	32	2,211	15,694	18,966
8/14	0	-	502	50	498	17,307	18,357
8/15	0	-	3,050	0	6,331	9,982	19,363
8/16	0	-	2,640	0	1,426	11,627	15,693
8/17	0	-	1,078	0	3,036	8,933	13,047
8/18	0	-	51,645	0	1,987	9,854	63,486
8/19	0	-	95,367	0	4,105	19,050	118,522
8/20	0	-	79,913	0	8,056	15,214	103,183

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<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

**Appendix A (cont'd).** Daily passage estimates at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
8/21	0	-	26,603	0	12,605	22,145	61,353
8/22	0	-	12,817	0	6,494	12,115	31,426
8/23	0	-	8,269	0	3,951	8,940	21,160
8/24	0	-	5,219	0	3,275	8,362	16,856
8/25	0	-	6,750	0	4,155	5,613	16,518
8/26	0	-	3,727	0	1,339	6,630	11,696
8/27	0	-	4,086	0	1,388	6,289	11,763
8/28	0	-	2,742	0	4,800	7,129	14,671
8/29	0	-	2,389	0	3,998	4,636	11,023
8/30	0	-	2,349	0	1,936	5,273	9,558
8/31	0	-	6,092	0	918	2,622	9,632
9/01	0	-	1,771	0	2,092	5,899	9,762
9/02	0	-	3,502	0	1,129	5,169	9,800
9/03	0	-	3,982	0	3,100	2,620	9,702
9/04	0	-	2,891	0	3,774	3,954	10,619
9/05	0	-	2,447	0	3,906	4,609	10,962
9/06	0	-	3,937	0	4,638	1,763	10,338
9/07	0	-	2,381	0	3,903	3,613	9,897
<b>Total</b>	<b>106,726</b>	<b>2,130,404</b>	<b>682,510</b>	<b>352,518</b>	<b>106,782</b>	<b>678,382</b>	<b>4,057,322</b>

<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

**Appendix B.** Daily testfish catch at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
6/01	0	0	-	0	0	7	7
6/02	0	0	-	0	0	27	27
6/03	0	0	-	0	0	22	22
6/04	0	0	-	0	0	18	18
6/05	0	0	-	0	0	9	9
6/06	0	0	-	0	0	17	17
6/07	0	0	-	0	0	9	9
6/08	0	0	-	0	0	12	12
6/09	0	0	-	0	0	4	4
6/10	1	0	-	0	0	4	5
6/11	0	0	-	0	0	5	5
6/12	0	1	-	0	0	4	5
6/13	3	7	-	0	0	5	15
6/14	1	6	-	0	0	3	10
6/15	1	6	-	0	0	6	13
6/16	27	86	-	0	0	5	118
6/17	10	192	-	0	0	2	204
6/18	5	120	-	0	0	4	129
6/19	9	175	-	0	0	9	193
6/20	15	195	-	0	0	5	215
6/21	16	203	-	1	0	6	226
6/22	13	186	-	0	0	2	201
6/23	17	153	-	0	0	2	172
6/24	22	142	-	0	0	3	167
6/25	19	138	-	5	0	5	167
6/26	30	100	-	1	0	4	135
6/27	28	139	-	4	0	2	173
6/28	49	211	-	5	0	0	265
6/29	20	200	-	7	0	4	231
6/30	18	175	-	8	0	2	203
7/01	12	170	-	8	0	4	194
7/02	24	149	-	10	0	1	184
7/03	13	152	-	55	0	4	224
7/04	13	136	-	33	0	5	187
7/05	7	125	-	50	0	8	190
7/06	22	155	-	22	0	3	202
7/07	10	100	-	57	0	12	179
7/08	9	99	-	53	0	10	171
7/09	5	119	-	22	0	13	159

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<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

**Appendix B (cont'd).** Daily testfish catch at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
7/10	10	81	-	22	0	10	123
7/11	2	137	-	43	0	9	191
7/12	4	81	-	23	0	4	112
7/13	2	42	-	27	0	7	78
7/14	5	42	-	45	0	16	108
7/15	4	22	-	21	0	7	54
7/16	1	30	-	46	0	8	85
7/17	3	34	-	22	0	6	65
7/18	2	10	-	31	0	1	44
7/19	1	-	75	16	0	7	99
7/20	2	-	141	44	0	9	196
7/21	2	-	101	44	0	14	161
7/22	1	-	57	36	1	8	103
7/23	1	-	41	67	0	21	130
7/24	0	-	35	43	1	20	99
7/25	0	-	21	11	0	9	41
7/26	0	-	36	41	0	26	103
7/27	1	-	61	26	0	16	104
7/28	0	-	133	42	1	17	193
7/29	1	-	145	44	2	15	207
7/30	0	-	63	26	4	14	107
7/31	0	-	32	21	1	26	80
8/01	0	-	15	31	1	26	73
8/02	0	-	36	31	3	45	115
8/03	0	-	113	9	7	15	144
8/04	0	-	51	3	4	29	87
8/05	0	-	18	18	6	39	81
8/06	0	-	19	6	2	40	67
8/07	0	-	23	3	6	20	52
8/08	0	-	39	1	4	25	69
8/09	0	-	19	3	5	38	65
8/10	0	-	18	3	10	30	61
8/11	0	-	19	0	10	47	76
8/12	0	-	15	2	13	54	84
8/13	0	-	5	1	19	55	80
8/14	0	-	4	1	9	84	98
8/15	0	-	7	0	20	20	47
8/16	0	-	12	0	10	28	50
8/17	0	-	6	0	20	17	43
8/18	0	-	142	0	14	32	188

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<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.

**Appendix B (cont'd).** Daily testfish catch at Pilot Station sonar, 2012.

	Chinook	Chum		Pink	Coho	Other spp	Total
		summer <sup>a</sup>	fall <sup>b</sup>				
8/19	0	-	121	0	3	8	132
8/20	0	-	104	0	19	30	153
8/21	0	-	64	0	36	22	122
8/22	0	-	20	0	24	10	54
8/23	0	-	17	0	20	36	73
8/24	0	-	15	0	23	19	57
8/25	0	-	15	0	16	9	40
8/26	0	-	3	0	4	14	21
8/27	0	-	12	0	6	21	39
8/28	0	-	13	0	20	44	77
8/29	0	-	3	0	15	9	27
8/30	0	-	9	0	13	17	39
8/31	0	-	19	0	7	10	36
9/01	0	-	9	0	16	21	46
9/02	0	-	14	0	11	23	48
9/03	0	-	17	0	17	14	48
9/04	0	-	13	0	18	13	44
9/05	0	-	19	0	29	17	65
9/06	0	-	14	0	18	4	36
9/07	0	-	5	0	14	2	21
<b>Total</b>	<b>461</b>	<b>4,119</b>	<b>2,008</b>	<b>1,194</b>	<b>502</b>	<b>1524</b>	<b>9,808</b>

<sup>a</sup> All chum salmon pre- 7/19 are classified as summer chum in daily reporting.

<sup>b</sup> All chum salmon post- 7/18 are classified as fall chum in daily reporting.