

TECHNICAL FISHERY REPORT 94-03



Alaska Department of Fish and Game
Commercial Fisheries Management
and Development Division
P.O. Box 25526
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March 1994

Bristol Bay Sockeye Salmon Spawning Escapement Test Fishing in 1992

by

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and

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ABSTRACT

Drift gillnets were fished daily at two stations, or test-fish sites, located on opposite river banks prior to every high slack tide in Kvichak, Egegik, Ugashik, and Igushik Rivers, Bristol Bay, Alaska, from mid-June to mid-July to estimate 1992 sockeye salmon spawning escapements. Accurate escapement estimates were made at counting towers. However, because it took sockeye salmon 1–5 d to reach tower sites after passing test fish sites, the test-fish projects provided fishery managers with preliminary escapement information. This early information enabled managers to better control commercial harvests and achieve escapement goals. The daily test-fish index for each river was the mean of catch per unit effort values obtained from all sets made the same day. Numbers of sockeye salmon that escaped the commercial fishery were estimated using (1) travel time analysis in which the most recent cumulative tower count was divided by cumulative test-fish indices and lagged back in time by daily increments, (2) a power curve (catchability model) calculated from mean length (independent variable) and escapement per index point (EPI) values from past years (dependent variable), and (3) the mean EPI value. Escapement estimates based on travel time for Kvichak, Egegik, Ugashik, and Igushik Rivers were more accurate and less biased than estimates based on catchability models or mean EPI values. However, catchability and mean EPI estimates were available on the first day of each project, whereas travel-time estimates could not be made until 5 d of test fishing data and tower counts were collected.

KEY WORDS: Sockeye salmon *Oncorhynchus nerka*, test fishing, spawning escapement estimation, fisheries management, Bristol Bay

INTRODUCTION

In rivers, test fishing by the Alaska Department of Fish and Game (ADF&G) is used in some areas to estimate numbers of salmon that have escaped commercial fishing districts and entered river systems to spawn; in Bristol Bay, river test fisheries are used to manage sockeye salmon *Oncorhynchus nerka*. Test-fishery data are available approximately 1 d after sockeye salmon have passed through the commercial fishing district and several days earlier than estimates based on visual counts from towers located at the head of the river systems. Spawning escapement estimates based on test-fish data assist management biologists in regulating commercial fishing periods to maximize harvests and achieve escapement goals. Test-fishing projects have been operated on Kvichak River since 1960, on Egegik River since 1963, on Ugashik River since 1961, and on Igushik River since 1976 (McBride 1978; Paulus 1965). This report summarizes test-fish data collected in 1992 and evaluates the accuracy of forecasting methods used during the 1992 season.

MATERIALS AND METHODS

Test Fishing

Two stations on opposite river banks were fished in the lower section of Kvichak, Egegik, Ugashik, and Igushik Rivers in 1992. Test-fish stations were close to the commercial fishing district boundary but above sockeye salmon milling areas. Stations fished at all four rivers have remained the same since 1987 (Fried and Bue 1988a).

Gillnets were drifted at all test-fish sites to estimate sockeye salmon abundance. All drifts were made perpendicular and close to shore because sockeye salmon migrate parallel to and near the river bank. Drifts at all stations were ended when about 30 sockeye were caught or when the inshore end of the net drifted about 25 m offshore and lost efficiency. Two short drifts of <15 min duration were made at each Igushik River station about 1.5 h before every high slack tide for the entire season to minimize currents carrying the gillnet offshore. Two drifts were made at each station about 1.5 h before every high slack tide early in the season at Egegik and Ugashik Rivers. When the estimated sockeye escapement reached 10–15% of the point goal, only one drift was made at each station for the remainder of the year. One drift was made at each Kvichak River station about 1.5 h before every high slack tide for the entire season.

All gillnets were 45.7 m (150 ft or 25 fathoms) in length and 29 meshes deep. Monotwist web, hung even with #50 twine and dyed Momoï shade #1, was used for test fishing on all rivers. Multistrand monofilament was used until 1989; however, this web type is now illegal for commercial use and is no longer stocked by suppliers. A stretched mesh size of 12.70 cm (5 in) was used on Kvichak River and 13.02 cm (5-1/8 in) was used on Egegik, Ugashik, and Igushik Rivers.

Catch per unit of effort (CPUE), or the number of sockeye salmon caught in 180 m (600 ft or 100 fathoms) of gillnet fished for 1 h, was calculated for each set. Most sockeye salmon captured during test-fishing were sampled for sex and length data. At Igushik River most sockeye salmon test fish catches

were sampled daily for age information whereas at Kvichak, Egegik, and Ugashik Rivers a maximum of 40 sockeye salmon were sampled for age information. At least 20–30% of these sockeye salmon were also weighed.

Climatological data was collected at all test-fish camps. Observations were recorded for sky condition, wind velocity (km/h), wind direction, and water temperature (°C).

Data Analyses

Mean fishing time (MT), in minutes, was calculated for each set as

$$MT = SI - FO + \frac{(FO - SO) + (FI - SI)}{2}, \quad (1)$$

where

SO = time the gillnet first entered water,

FO = time the gillnet was fully deployed,

SI = time the gillnet retrieval began, and

FI = time the gillnet retrieval completed.

The CPUE value, C_j , or the number of sockeye salmon caught per 100 fathom hours, was calculated for set j as follows:

$$C_j = 6,000 \frac{N}{G \times MT}, \quad (2.1)$$

where

N = number of sockeye salmon caught, and

G = gillnet length in fathoms.

Then the daily test-fish index, I_i , for day i was calculated as the mean of individual CPUE values obtained from sets made the same day, or

$$I_i = \frac{\sum_{j=1}^s C_j}{s}, \quad (2.2)$$

where

s = number of sets made during day *i* (usually four sets per day).

Weighted daily mean length and weight were calculated as

$$D_i = \frac{\sum_{j=1}^s S_j \times C_j}{\sum_{j=1}^s C_j}, \quad (3.1)$$

where

D_i = weighted daily mean length or weight for day *i*, and

S_j = mean length or weight for set *j*.

As new information became available weighted seasonal mean length and weight were recalculated daily

$$M_i = \frac{\sum_{k=1}^i D_k \times I_k}{\sum_{k=1}^i I_k}, \quad (3.2)$$

where

M_i = weighted seasonal mean length or weight through day *i*, and

D_i = mean length or weight for day *i*.

Three methods were used to estimate daily spawning escapements: (1) travel-time (EPI_d), (2) a catchability model (EPI_m), and (3) mean EPI value (EPI_a).

Travel-time estimates of spawning escapements were based on the number of days it took sockeye salmon to travel from test fish sites to counting tower sites. A range of travel-time estimates was calculated by matching daily test-fish indices to daily tower counts. The number of sockeye salmon represented by each index point was calculated by dividing the most recent cumulative tower count by cumulative test-fish indices lagged back in time by daily increments such that

$$EPI_d = \frac{\sum_{i=1}^t E_i}{\sum_{i=1}^{t-d} I_i}, \quad (4)$$

where

EPI_d = number of sockeye salmon represented by each test fishing index point based on a travel-time of d days,

E_i = number of sockeye salmon traveling past counting tower on day i , and

t = day of most recent escapement estimate.

The best initial estimate of travel time produced the smallest squared sum of errors between daily cumulative test-fish indices and tower counts. However, travel times that seemed unrealistic based on results of past studies or produced unreasonable escapement estimates (e.g., less than observed escapement) were rejected even if they produced the best statistical fit to the data.

Total spawning escapement was then estimated as

$$\hat{E}_{t+d} = EPI_d \sum_{i=1}^t I_i, \quad (5)$$

where \hat{E}_{t+d} = estimated number of sockeye salmon that will travel past counting tower on day $t+d$.

Catchability models were based on the relationship between weighted mean season length (independent variable) of sockeye salmon caught during test fishing and corresponding historical EPI values (dependent variable); these models were used to estimate daily spawning escapements in Egegik and Ugashik Rivers. The following power curve was used:

$$EPI_m = aM_i^b, \quad (6)$$

where a and b = constants derived from a linear regression of 1979–1991 natural logarithm transformed data.

EPI estimates based on catchability models were not used if weighted mean lengths were outside of the range of data used to build models.

Total spawning escapement was then estimated as:

$$\hat{E}_t = EPI_m \sum_{i=1}^t I_i, \quad (7)$$

where \hat{E}_t = estimated number of sockeye salmon to have traveled past test fish site by day t .

We assumed that changes in gillnet web type did not affect CPUE or mean size of sockeye salmon caught. A previous study by Bue (1986) found no obvious differences in fishing efficiency or sockeye salmon size selectivity between web types used in Bristol Bay.

For equation (7) mean EPI_a values of 112 for Kvichak, 72 for Egegik, and 43 for Ugashik Rivers were used based on results of the past 7 years of test fishing (1985–1991); a mean EPI_a value of 49, based only on results of 1988–1989 and 1991 test fishing, was used for Igushik River (project not operated in 1990).

Estimates based on catchability models and mean EPI values were used to estimate escapements until estimates based on travel time became available. Travel time was preferred because it has usually provided more accurate escapement estimates (Stratton 1990; Stratton and Woolington 1992). Also, when aerial surveys were flown, escapement estimates made by management biologists were compared to test fishing estimates.

Three statistics were used to measure performance of the various escapement estimators. Percent error, PE, was used to measure daily performance:

$$PE = 100 \times \frac{T_{t,a} - \sum_{i=1}^{t-d} E_i}{\sum_{i=1}^{t-d} E_i}, \quad (8)$$

where $T_{t,a}$ = estimated cumulative spawning escapement on day t based on method a .

Mean percent error, MPE, was used to measure bias:

$$MPE = \sum_{t=1}^n \left(\frac{100 \times T_{t,a} - \sum_{i=1}^{t-d} E_i}{\sum_{i=1}^{t-d} E_i} \right), \quad (9)$$

where n = total number of days that escapement estimates based on test fishing were available

Mean absolute percent error, MAPE, was used to measure overall accuracy because it treated under- and over-estimation errors similarly:

$$MAPE = \sum_{i=1}^n \left| \left(100 \times \frac{T_{i,a} - \sum_{i=1}^{i-d} E_i}{\frac{\sum_{i=1}^{i-d} E_i}{n}} \right) \right| \quad (10)$$

RESULTS AND DISCUSSION

Kvichak River

Test fishing began 20 June and ended 16 July. A total of 1,935 sockeye salmon were caught, producing 46,755 index points (Table 1; Appendix A.1). A total of 709 sockeye salmon were sampled for sex, age, and length information; 150 were weighed (Appendix A.2). Weighted mean weight and length for the season were 2.6 kg and 523 mm (Table 1; Appendix A.3).

Spawning escapement estimates for 20 to 28 June were based on the 1985–1991 mean EPI_a value of 112 (Table 2; Figure 1). Sufficient spawning escapement data was collected by 29 June to allow estimation of EPI_a values based on travel time (Table 3; Figure 2). Estimated travel times during the season ranged from 2 to 5 d. On the last day of the season, the best estimate of travel time was 4 d.

Daily spawning escapement estimates based on the 1985–1991 mean EPI value ranged from 89% less to 61% greater than visual counts from towers, assuming actual travel time was 4 d (Table 2; Figure 1). Daily escapement estimates based on travel time ranged from 32% less to 47% greater than tower counts (Table 3; Figure 2).

When both methods were compared, estimates based on travel time analysis were more accurate (MAPE=17) and less biased (MPE=-3) than estimates based on the 1985–1991 mean EPI value (MAPE=27, MPE=-7; Tables 2, 3; Figures 1, 2).

Estimated travel time on 16 July, the last day of the project, was 4 d. The cumulative tower count on 20 July was 4,662,972 sockeye salmon. The travel-time analysis estimate of 4,989,400 was 7% greater, and the 1985–1991 mean EPI value estimate of 5,236,447 was 12% greater than the observed tower count.

Both air and water temperatures collected during the project averaged 13°C (Appendix A.4). Winds usually blew southeast. Test-fishery project operations were not seriously hampered by weather conditions in 1992.

Egegik River

Test fishing began 16 June and ended 11 July. A total of 24,498 daily index points were produced from a catch of 1,708 sockeye salmon (Table 4; Appendix B.1). A total of 713 sockeye salmon were sampled

for sex and age information; 679 of these were sampled for length; 302 were sampled for weight (Appendix B.2). Weighted mean weight and length for the season were 2.3 kg and 518 mm (Table 4; Appendix B.3).

Sockeye salmon escapement estimates based on a catchability model and the 1985–1991 mean EPI_a value (72) were calculated as early as 16 June (Tables 5, 6; Figures 3, 4), and the average of the two estimates was used to estimate escapement from 16 to 26 June. Travel-time estimates were first available on 26 June (Table 7; Figure 5), and used to estimate escapements from 26 June until the end of the season. Estimated travel times ranged from 1 to 3 d during the season. On the last day of the season, the best travel time estimate was 3 d.

Assuming travel time was 3 d, daily escapement estimates based on catchability ranged from 21% less to 1,370% greater than visual counts from towers (Table 5; Figure 3). Daily escapement estimates based on the 1985–1991 mean EPI value ranged from 53% less to 1,141% greater than visual counts from towers (Table 6; Figure 4). Daily escapement estimates based on travel time ranged from 43% less to 33% greater than visual tower counts (Table 7; Figure 5). Estimates based on the 1985–1991 mean EPI value were less than tower counts from 23 June to the end of the season, and catchability estimates were greater than tower counts from 27 June to the end of the season.

When all methods were compared, estimates based on travel time were more accurate (MAPE=12) and less biased (MPE=0) than those based on either catchability (MAPE=96; MPE=93) or the 1985–1991 mean EPI (MAPE=78, MPE=47; Tables 5–7; Figures 3–5).

On 11 July, the last day of the project, estimated travel time was 3 d. The cumulative tower count on 14 July was 1,795,542 sockeye salmon. When compared to the observed tower count, the catchability estimate (2,323,638) was 29% greater, the 1985–1991 mean EPI value estimate (1,763,331) was 2% lower, and the travel time estimate (2,196,450) was 22% greater.

Both air and water temperatures collected during the project averaged 11°C (Appendix A.4). Winds usually blew northeast. Test-fishery project operations were not seriously hampered by weather conditions in 1992.

Ugashik River

Test fishing began 23 June and ended 18 July. A total of 1,222 sockeye salmon were caught, producing 21,601 daily index points (Table 8; Appendix C.1). A total of 430 sockeye salmon were sampled for sex, age, and length data; 206 were weighed (Appendix C.2). Weighted mean length and weight of captured sockeye salmon for the season were 537 mm and 2.7 kg (Table 8; Appendix C.3).

Sockeye salmon escapement estimates based on a catchability model, the 1985–1991 mean EPI_a value (43), and travel time were used during the season to estimate spawning escapement (Tables 9–11; Figures 6–8). Abundance estimates based on the 1985–1991 mean EPI value and catchability were made as early as 23 June. Travel-time estimates were first available on 7 July. Estimated travel-times during the season ranged from 1 to 4 d. On the last day of the season, the best estimate of travel time was 2 d.

Assuming travel time was 2 d, escapement estimates from the catchability model ranged from 74% less to 1,092% greater than tower counts (Table 9; Figure 6). Estimates based on the 1985–1991 mean EPI value ranged from 72% less to 1,038% greater than tower counts (Table 10; Figure 7). Travel-time estimates ranged from 48% less to 8% greater than tower counts (Table 11; Figure 8).

Catchability estimates and the 1985–1991 mean EPI value estimates were higher than tower counts from 23 June through 11 July, then lower for the remainder of the season.

When all methods were compared, estimates based on travel time were more accurate (MAPE=22) and less biased (MPE=-20) than the 1985–1991 mean EPI value (MAPE=186; MPE=141) and the catchability model (MAPE=199, MPE=152; Tables 9–11; Figures 6–8) estimates.

On the last day of the project, estimated travel time was 2 d. The cumulative tower count on 20 July was 1,997,058 sockeye salmon. When compared to the observed tower count, the 1985–1991 mean EPI value estimate (841,443) was 58% lower, the catchability estimate (928,846) was 53% lower, and the travel-time estimate (2,158,765) was 8% greater.

The average air and water temperatures during the project were 13°C (Appendix C.4). Test-fishery project operations were not hampered by weather in 1992.

Igushik River

Test fishing began 18 June and ended 13 July. A total of 890 sockeye salmon were caught, producing 5,175 daily index points (Table 12; Appendix D.1). A total of 458 sockeye salmon were sampled for sex, age, and length data; 140 were weighed (Appendix D.2). Weighted mean length and weight of captured sockeye salmon for the season were 534 mm and 2.6 kg (Table 12; Appendix D.3).

Sockeye salmon escapement estimates based on the 1988–1989 and 1991 mean EPI_a value (49) and travel time (EPI_d) were used during the season to estimate spawning escapement (Tables 13–14; Figures 9–10). There was insufficient data to estimate a catchability curve because 1992 was only the fourth season that drift gillnet gear was used. An abundance estimate based on the 1988–1989 and 1991 mean EPI value was made as early as 19 June. Travel-time estimates were first available on 25 June. Estimated travel-times during the season ranged from 1 to 4 d. On the last day of the season, the best estimate of travel time was 4 d.

Estimates based on the 1988–1989 and 1991 mean EPI value ranged from 95% less to 5% greater than tower counts (Table 13; Figure 9). Travel-time estimates ranged from 37% less to 75% greater than tower counts (Table 14; Figure 10). Accuracy of travel-time analysis estimates increased during the season. The 1988–1989 and 1991 mean EPI value estimates were low for most of the 1992 sampling season.

When both methods were compared, estimates based on the 1988–1989 and 1991 mean EPI value were more accurate (MAPE=36) and less biased (MPE=-35) than those based on travel time (MAPE=121; MPE=104; Tables 13–14; Figures 9–10). However, travel time estimates were more accurate and less biased (MAPE=17; MPE=-7) from 30 June to 13 July.

On the last day of the project, estimated travel time was 4 d. The cumulative tower count on 17 July was 289,644 sockeye salmon. When compared to the observed tower count, the 1988–1989 and 1991 mean EPI value estimate (253,607) was 12% lower and the travel time estimate (293,173) was 1% higher.

Mean water temperature during the project was 13°C; mean air temperature was 16°C (Appendix D.4). Test fish project operations were not hampered by weather during 1992; however two drifts were not completed on 2 July due to outboard motor problems.

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TABLES AND FIGURES

Table 1. Sockeye salmon spawning escapement test-fishing data summary, Kvichak River, 1992.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/20	45.9	1	6	6	1.8	497	1.8	497
6/21	69.6	2	7	13	3.4	532	2.9	521
6/22	68.4	0	0	13			2.9	521
6/23	69.7	3	11	24	2.0	501	2.4	510
6/24	76.6	19	58	82	2.2	505	2.3	506
6/25	36.0	30	202	284	2.5	516	2.4	512
6/26	33.1	184	3,155	3,439	2.5	506	2.5	506
6/27	35.9	117	2,559	5,998	2.6	536	2.5	519
6/28	41.7	94	761	6,759	2.3	510	2.5	518
6/29	24.0	120	3,576	10,335	2.4	511	2.5	516
6/30	33.7	129	5,411	15,746	2.7	529	2.6	520
7/01	52.0	23	212	15,958	2.1	509	2.6	520
7/02	36.5	71	2,854	18,812	2.4	521	2.5	520
7/03	12.3	189	10,777	29,589	2.9	536	2.7	526
7/04	29.1	120	1,502	31,091	2.2	520	2.6	526
7/05	29.5	109	1,298	32,389	2.3	527	2.6	526
7/06	42.9	67	412	32,801	2.0	506	2.6	525
7/07	57.5	46	193	32,994	2.2	493	2.6	525
7/08	56.7	15	64	33,058	2.1	495	2.6	525
7/09	28.9	10	83	33,141	1.8	496	2.6	525
7/10	34.8	103	4,133	37,274	2.1	509	2.6	523
7/11	8.4	101	3,422	40,696	2.9	520	2.6	523
7/12	25.0	140	1,627	42,323	2.6	526	2.6	523
7/13	30.3	79	1,133	43,456	2.2	517	2.6	523
7/14	31.6	76	1,759	45,215	2.2	512	2.6	523
7/15	39.9	53	396	45,611	2.1	514	2.6	522
7/16	32.9	34	1,144	46,755	2.3	552	2.6	523

Table 2. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1991: EPI=112) for test-fishing data and visual counts from observation towers, Kvichak River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time ^a	Cumulative Number of Sockeye Salmon	
6/20	640	6/24	1,218	-47
6/21	1,378	6/25	2,478	-44
6/22	1,378	6/26	9,558	-86
6/23	2,578	6/27	16,524	-84
6/24	9,126	6/28	81,486	-89
6/25	31,781	6/29	255,408	-88
6/26	385,159	6/30	446,904	-14
6/27	671,736	7/01	635,460	6
6/28	756,981	7/02	754,866	0
6/29	1,157,539	7/03	798,792	45
6/30	1,763,578	7/04	1,093,458	61
7/01	1,787,317	7/05	1,663,272	7
7/02	2,107,012	7/06	2,244,402	-6
7/03	3,313,984	7/07	2,688,006	23
7/04	3,482,232	7/08	2,879,718	21
7/05	3,627,589	7/09	2,959,590	23
7/06	3,673,704	7/10	2,984,802	23
7/07	3,695,329	7/11	3,175,200	16
7/08	3,702,441	7/12	3,662,166	1
7/09	3,711,712	7/13	4,066,266	-9
7/10	4,174,614	7/14	4,329,810	-4
7/11	4,557,914	7/15	4,437,774	3
7/12	4,740,119	7/16	4,516,488	5
7/13	4,866,959	7/17	4,577,646	6
7/14	5,063,991	7/18	4,625,406	9
7/15	5,108,300	7/19	4,662,972	10
7/16	5,236,447	7/20	4,686,828	12
Mean Percent Error (MPE)				- 7
Mean Absolute Percent Error (MAPE)				27

^a Best travel-time estimate at end of season was 4 d.

Table 3. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Kvichak River, 1992.

Date	Test Fishing			Observation Towers		Percent Error (PE) of Test Fishing Estimate
	Travel Time (d)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
6/29	3	74	767,590	7/02	754,866	2
6/30	3	74	1,173,302	7/03	798,792	47
7/01	3	94	1,500,392	7/04	1,093,458	37
7/02	3	73	1,374,045	7/05	1,663,272	-17
7/03	2	50	1,481,093	7/05	1,663,272	-11
7/04	2	58	1,807,144	7/06	2,244,402	-19
7/05	2	56	1,820,669	7/07	2,688,006	-32
7/06	3	75	2,488,022	7/09	2,959,590	-16
7/07	3	86	2,852,499	7/10	2,984,802	-4
7/08	4	92	3,061,825	7/12	3,662,166	-16
7/09	4	91	3,028,222	7/13	4,066,266	-26
7/10	4	90	3,391,780	7/14	4,329,810	-22
7/11	4	96	3,916,374	7/15	4,437,774	-12
7/12	5	110	4,697,579	7/17	4,577,646	3
7/13	5	123	5,345,216	7/18	4,625,406	16
7/14	3	106	4,810,559	7/17	4,577,646	5
7/15	4	109	4,973,652	7/19	4,662,972	7
7/16	4	106	4,989,400	7/20	4,686,828	7
Mean Percent Error (MPE)						- 3
Mean Absolute Percent Error (MAPE)						17

Table 4. Sockeye salmon spawning escapement test-fishing data summary, Egegik River, 1992.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/16	24.3	10	115	115	2.4	517	2.4	517
6/17	52.8	37	170	285	2.6	524	2.5	522
6/18	46.8	26	178	463	2.6	523	2.6	522
6/19	49.1	28	145	608	2.1	496	2.4	515
6/20	69.8	16	60	668	2.3	523	2.4	516
6/21	55.4	13	60	728	2.2	515	2.4	516
6/22	62.8	53	292	1,020	2.2	513	2.4	515
6/23	66.2	28	100	1,120	2.4	511	2.4	514
6/24	52.8	156	735	1,855	2.2	497	2.3	507
6/25	25.9	26	268	2,123	2.3	515	2.3	508
6/26	14.6	58	1,041	3,164	2.3	516	2.3	509
6/27	14.6	125	2,824	5,988	2.4	514	2.3	511
6/28	18.5	78	1,278	7,266	2.2	517	2.3	512
6/29	26.8	28	252	7,518	2.3	519	2.3	512
6/30	16.0	94	2,260	9,778	2.3	516	2.3	513
7/01	26.8	18	157	9,935	2.5	519	2.3	513
7/02	35.7	45	289	10,224	2.0	497	2.3	512
7/03	41.4	12	79	10,303	2.0	507	2.3	512
7/04	25.5	52	584	10,887	2.1	498	2.3	511
7/05	25.8	199	2,449	13,336	2.3	546	2.3	517
7/06	27.9	48	411	13,747	2.1	514	2.3	517
7/07	23.9	207	2,631	16,388	2.3	512	2.3	516
7/08	20.8	66	858	17,236	2.7	520	2.3	516
7/09	13.0	216	4,716	21,952	2.2	520	2.3	517
7/10	5.6	39	1,646	23,608	2.5	532	2.3	518
7/11	7.8	30	890	24,498			2.3	518

Table 5. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Egegik River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon ^a	Date Plus Travel Time ^b	Cumulative Number of Sockeye Salmon	
6/16	11,102	6/19	^c	
6/17	24,343	6/20	1,656	1,370
6/18	39,515	6/21	11,520	243
6/19	61,166	6/22	14,724	315
6/20	66,062	6/23	29,028	128
6/21	72,242	6/24	44,088	64
6/22	103,509	6/25	66,120	57
6/23	114,790	6/26	107,262	7
6/24	224,542	6/27	225,936	- 1
6/25	254,651	6/28	322,230	-21
6/26	371,443	6/29	452,850	-18
6/27	667,746	6/30	582,840	15
6/28	794,133	7/01	727,206	9
6/29	818,034	7/02	773,004	6
6/30	1,042,099	7/03	780,696	33
7/01	1,056,935	7/04	791,928	33
7/02	1,098,320	7/05	845,508	30
7/03	1,107,907	7/06	929,748	19
7/04	1,191,097	7/07	1,044,720	14
7/05	1,275,889	7/08	1,134,294	12
7/06	1,317,935	7/09	1,244,058	6
7/07	1,601,447	7/10	1,399,662	14
7/08	1,679,865	7/11	1,545,984	9
7/09	2,107,572	7/12	1,687,626	25
7/10	2,239,161	7/13	1,770,918	26
7/11	2,323,638	7/14	1,795,542	29
Mean Percent Error (MPE)				93
Mean Absolute Percent Error (MAPE)				96

^a Catchability model was: $EPI_m = (5.845 \times 10^{34}) M_i^{-12.080}$ where M_i = weighted mean length (Stratton and Woolington 1992).

^b Best travel-time estimate at end of season was 3 d.

^c Observation towers not in operation.

Table 6. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1991: EPI=72) for test-fishing data and visual counts from observation towers, Egegik River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time ^a	Cumulative Number of Sockeye Salmon	
6/16	8,296	6/19	^c	
6/17	20,545	6/20	1,656	1141
6/18	33,389	6/21	11,520	190
6/19	43,851	6/22	14,724	198
6/20	48,179	6/23	29,028	66
6/21	52,529	6/24	44,088	19
6/22	73,563	6/25	66,120	11
6/23	80,781	6/26	107,262	-25
6/24	133,676	6/27	225,936	-41
6/25	152,953	6/28	322,230	-53
6/26	227,905	6/29	452,850	-50
6/27	431,241	6/30	582,840	-26
6/28	523,247	7/01	727,206	-28
6/29	541,407	7/02	773,004	-30
6/30	704,158	7/03	780,696	-10
7/01	715,477	7/04	791,928	-10
7/02	736,266	7/05	845,508	-13
7/03	741,984	7/06	929,748	-20
7/04	784,007	7/07	1,044,720	-25
7/05	960,358	7/08	1,134,294	-15
7/06	989,934	7/09	1,244,058	-20
7/07	1,179,373	7/10	1,399,662	-16
7/08	1,241,130	7/11	1,545,984	-20
7/09	1,580,701	7/12	1,687,626	- 6
7/10	1,699,224	7/13	1,770,918	- 4
7/11	1,763,331	7/14	1,795,542	- 2
Mean Percent Error (MPE)				47
Mean Absolute Percent Error (MAPE)				78

^a Best travel-time estimate at end of season was 3 d.

^b Observation towers not in operation

Table 7. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Egegik River, 1992.

Test Fishing				Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Travel Time (d)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
6/26	2	57	182,870	6/28	322,230	-43
6/27	1	71	427,514	6/28	322,230	33
6/28	1	53	390,977	6/29	452,850	-14
6/29	1	62	468,567	6/30	582,840	-20
6/30	2	80	784,355	7/02	773,004	1
7/01	1	74	738,895	7/02	773,004	- 4
7/02	2	79	808,251	7/04	791,928	2
7/03	2	78	809,619	7/05	845,508	- 4
7/04	2	77	843,277	7/06	929,748	- 9
7/05	2	82	1,094,349	7/07	1,044,720	5
7/06	2	85	1,173,955	7/08	1,134,294	3
7/07	2	78	1,282,974	7/09	1,244,058	3
7/08	2	82	1,422,121	7/10	1,399,662	2
7/09	1	72	1,584,429	7/10	1,399,662	13
7/10	2	81	1,916,268	7/12	1,687,626	14
7/11	3	89	2,196,450	7/14	1,795,542	22
Mean Percent Error (MPE)						0
Mean Absolute Percent Error (MAPE)						12

Table 8. Sockeye salmon spawning escapement test-fishing data summary, Ugashik River, 1992.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/23	76.5	1	3	3	3.3	583	3.3	583
6/24	85.3	2	6	9	2.7	520	2.9	539
6/25	114.8	4	9	18	2.8	541	2.8	540
6/26	61.6	14	54	72	2.5	520	2.6	528
6/27	119.4	27	50	122	2.4	523	2.5	525
6/28	111.0	14	28	150	2.5	522	2.5	524
6/29	120.4	9	18	168	2.5	527	2.5	525
6/30	123.6	14	26	194	2.5	538	2.5	527
7/01	101.9	4	9	203	3.0	558	2.5	528
7/02	112.8	5	10	213	2.3	537	2.5	529
7/03	118.7	12	24	237	2.3	519	2.5	528
7/04	109.9	7	15	252	2.7	549	2.5	529
7/05	122.1	14	25	277	2.8	532	2.5	529
7/06	113.6	12	25	302	2.5	529	2.5	529
7/07	97.6	7	17	319	2.0	508	2.5	528
7/08	108.9	11	24	343	2.4	532	2.5	528
7/09	51.3	2	9	352	1.5	436	2.5	527
7/10	113.9	22	46	398	2.3	521	2.5	526
7/11	84.2	44	124	522	2.1	500	2.4	521
7/12	42.9	66	388	910	2.8	534	2.5	525
7/13	16.7	154	2,265	3,175	6.8	544	2.7	537
7/14	9.7	249	6,209	9,384	2.8	537	2.8	537
7/15	8.8	251	6,993	16,377	2.5	538	2.7	537
7/16	4.5	52	2,779	19,156	2.0	554	2.7	539
7/17	18.2	123	1,996	21,152	2.7	532	2.7	538
7/18	54.5	102	449	21,601	2.4	522	2.7	537

Table 9. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon ^a	Date Plus Travel Time ^b	Cumulative Number of Sockeye Salmon	
6/23	62	6/25	c	
6/24	334	6/26	c	
6/25	647	6/27	c	
6/26	3,229	6/28	c	
6/27	5,746	6/29	c	
6/28	7,174	6/30	c	
6/29	7,976	7/01	c	
6/30	8,909	7/02	c	
7/01	9,085	7/03	762	1,092
7/02	9,472	7/04	1,710	454
7/03	10,768	7/05	2,388	351
7/04	11,198	7/06	2,814	298
7/05	12,250	7/07	3,738	228
7/06	13,384	7/08	4,632	189
7/07	14,455	7/09	5,574	159
7/08	15,482	7/10	6,408	142
7/09	16,217	7/11	7,206	125
7/10	18,568	7/12	10,272	81
7/11	26,539	7/13	19,698	35
7/12	43,343	7/14	85,428	-49
7/13	124,500	7/15	487,206	-74
7/14	369,818	7/16	1,016,568	-64
7/15	641,371	7/17	1,565,532	-59
7/16	731,949	7/18	1,914,384	-62
7/17	818,613	7/19	1,958,538	-58
7/18	841,443	7/20	1,997,058	-58
			Mean Percent Error (MPE)	152
			Mean Absolute Percent Error (MAPE)	199

^a Catchability model was: $EPI_m = (1.257 \times 10^{25}) M_i^{-8.609}$ where M_i = weighted mean length (Stratton and Woolington 1992).

^b Best travel-time estimate at end of season was 2 d.

^c Observation towers not in operation.

Table 10. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1991: EPI=43) for test-fishing data and visual counts from observation towers, Ugashik River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time ^a	Cumulative Number of Sockeye Salmon	
6/23	138	6/25	b	
6/24	378	6/26	b	
6/25	744	6/27	b	
6/26	3,051	6/38	b	
6/27	5,188	6/29	b	
6/28	6,399	6/30	b	
6/29	7,153	7/01	b	
6/30	8,280	7/02	b	
7/01	8,671	7/03	762	1,038
7/02	9,115	7/04	1,710	433
7/03	10,164	7/05	2,388	326
7/04	10,823	7/06	2,814	285
7/05	11,898	7/07	3,738	218
7/06	12,981	7/08	4,632	180
7/07	13,732	7/09	5,574	146
7/08	14,777	7/10	6,408	131
7/09	15,158	7/11	7,206	110
7/10	17,152	7/12	10,272	67
7/11	22,482	7/13	19,698	14
7/12	39,147	7/14	85,428	-54
7/13	136,550	7/15	487,206	-72
7/14	403,520	7/16	1,016,568	-60
7/15	704,218	7/17	1,565,532	-55
7/16	823,697	7/18	1,914,384	-57
7/17	909,528	7/19	1,958,538	-54
7/18	928,846	7/20	1,997,058	-53
			Mean Percent Error (MPE)	141
			Mean Absolute Percent Error (MAPE)	186

^a Best travel-time estimate at end of season was 2 d.

^b Observation towers not in operation.

Table 11. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1992.

Test Fishing			Observation Towers		Percent Error (PE) of Test Fishing Estimate	
Travel Date	Time (d)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time		Cumulative Number of Sockeye Salmon
7/07	1	12	3,954	7/08	4,632	-15
7/08	2	15	5,272	7/10	6,408	-18
7/09	4	20	7,101	7/13	19,698	-64
7/10	2	18	7,438	7/12	10,272	-28
7/11	1	18	9,444	7/12	10,272	- 8
7/12	1	19	17,885	7/13	19,698	- 9
7/13	1	21	68,709	7/14	85,428	-20
7/14	1	26	252,448	7/15	487,206	-48
7/15	1	51	850,265	7/16	1,016,568	-16
7/16	1	62	1,189,040	7/17	1,565,532	-24
7/17	2	95	2,021,952	7/19	1,958,538	3
7/18	2	99	2,158,765	7/20	1,997,058	8
Mean Percent Error (MPE)						-20
Mean Absolute Percent Error (MAPE)						22

Table 12. Sockeye salmon spawning escapement test-fishing data summary, Igushik River, 1992

Date	Fishing Time (min)	Catch (No)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight (kg)	Length (mm)
6/18	40.9	0	0	0				
6/19	116.4	4	8	8	2.8	539	2.8	538
6/20	118.7	0	0	8			2.8	538
6/21	120.3	2	4	12	2.3	490	2.6	522
6/22	115.4	12	25	37	2.6	530	2.6	527
6/23	119.9	2	4	41	3.5	588	2.7	530
6/24	114.7	1	2	43	2.5	520	2.6	530
6/25	48.9	18	91	134	2.8	548	2.8	539
6/26	66.8	57	206	340	2.7	539	2.8	538
6/27	70.7	104	732	1,072	2.8	546	2.8	543
6/28	59.5	56	211	1,283	2.7	538	2.8	542
6/29	80.8	60	320	1,603	2.7	534	2.8	541
6/30	94.1	11	65	1,668	2.5	528	2.8	540
7/01	107.4	9	20	1,688	2.5	527	2.8	540
7/02	81.3	13	35	1,723	2.6	535	2.7	540
7/03	114.7	9	18	1,741	2.4	527	2.7	540
7/04	111.1	7	17	1,758	3.0	545	2.7	540
7/05	66.7	98	1,224	2,982	2.6	540	2.7	540
7/06	43.2	79	717	3,699	2.5	527	2.7	537
7/07	56.0	76	342	4,041	2.6	536	2.7	537
7/08	77.1	44	190	4,231	2.3	519	2.6	536
7/09	47.4	40	192	4,423	2.4	522	2.6	536
7/10	85.8	77	305	4,728	2.7	535	2.6	536
7/11	76.7	84	340	5,068	2.3	515	2.6	534
7/12	76.8	25	93	5,161	2.4	524	2.6	534
7/13	34.0	2	14	5,175	2.5	533	2.6	534

Table 13. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1988-90 and 1991: EPI=49) for test-fishing data and visual counts from observation towers, Igushik River, 1992.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time ^a	Cumulative Number of Sockeye Salmon	
6/18	0	6/22	546	
6/19	398	6/23	1,656	- 76
6/20	398	6/24	7,638	- 95
6/21	604	6/25	11,232	- 95
6/22	1,820	6/26	12,624	- 86
6/23	2,019	6/27	14,046	- 86
6/24	2,125	6/28	17,256	- 88
6/25	6,604	6/29	29,202	- 77
6/26	16,693	6/30	40,434	- 59
6/27	52,553	7/01	53,964	- 3
6/28	62,901	7/02	72,150	- 13
6/29	78,600	7/03	90,462	- 13
6/30	81,766	7/04	98,334	- 17
7/01	82,723	7/05	100,782	- 18
7/02	84,453	7/06	108,228	- 22
7/03	85,327	7/07	117,486	- 27
7/04	86,150	7/08	135,780	- 37
7/05	146,134	7/09	159,306	- 8
7/06	181,273	7/10	172,914	5
7/07	198,036	7/11	202,830	- 2
7/08	207,350	7/12	224,538	- 8
7/09	216,770	7/13	250,590	- 13
7/10	231,709	7/14	264,450	- 12
7/11	248,359	7/15	275,922	- 10
7/12	252,907	7/16	283,380	- 11
7/13	253,607	7/17	289,644	- 12
Mean Percent Error (MPE)				- 35
Mean Absolute Percent Error (MAPE)				36

^a Best travel-time estimate at end of season was 4 d.

Table 14. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Igushik River, 1992.

Test Fishing			Observation Towers		Percent Error (PE) of Test Fishing Estimate	
Date	Travel Time (d)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time		Cumulative Number of Sockeye Salmon
6/25	2	272	36,737	6/27	14,046	162
6/26	3	306	104,361	6/29	29,202	257
6/27	3	323	347,224	6/30	40,434	759
6/28	4	397	510,576	7/02	72,150	608
6/29	4	216	347,510	7/03	90,462	284
6/30	1	25	42,062	7/01	53,964	- 22
7/01	2	33	56,794	7/03	90,462	- 37
7/02	3	44	77,522	7/05	100,782	- 23
7/03	3	54	94,401	7/06	108,228	- 13
7/04	4	58	103,606	7/08	135,780	- 24
7/05	4	59	178,035	7/09	159,306	- 12
7/06	4	62	232,304	7/10	172,914	34
7/07	4	67	272,673	7/11	202,830	34
7/08	3	45	192,657	7/11	202,830	- 5
7/09	4	53	236,308	7/13	250,590	- 6
7/10	2	40	193,227	7/12	224,538	- 14
7/11	3	47	242,945	7/14	264,450	- 8
7/12	3	50	261,969	7/15	275,922	- 5
7/13	4	56	293,173	7/17	289,644	1
6/25-7/13					Mean Percent Error (MPE)	104
					Mean Absolute Percent Error (MAPE)	121
6/30-7/13					Mean Percent Error (MPE)	- 7
					Mean Absolute Percent Error (MAPE)	17

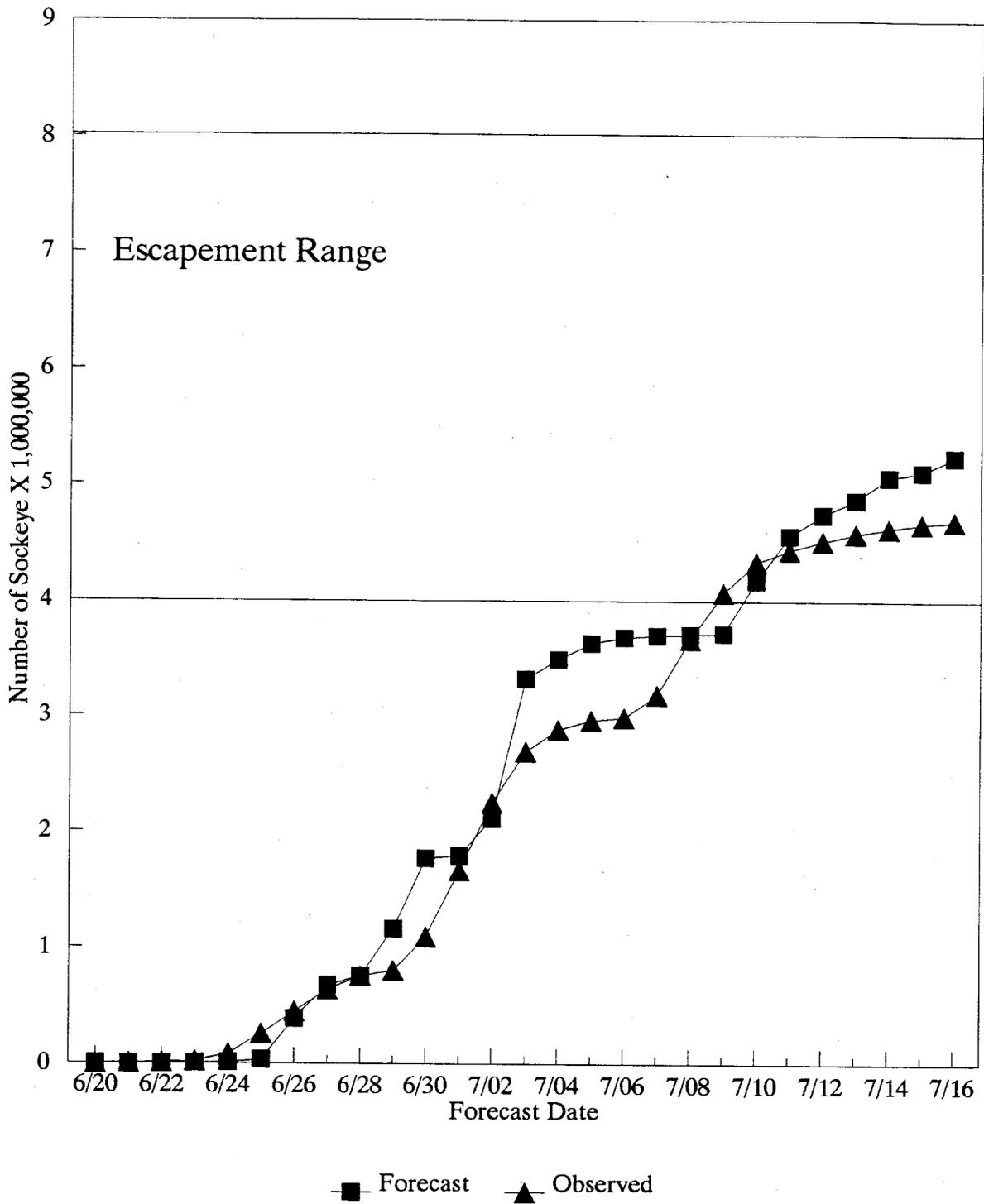


Figure 1. Comparison of 1985-1991 mean EPI value sockeye salmon escapement forecast and observed escapement, Kvichak River, 1992.

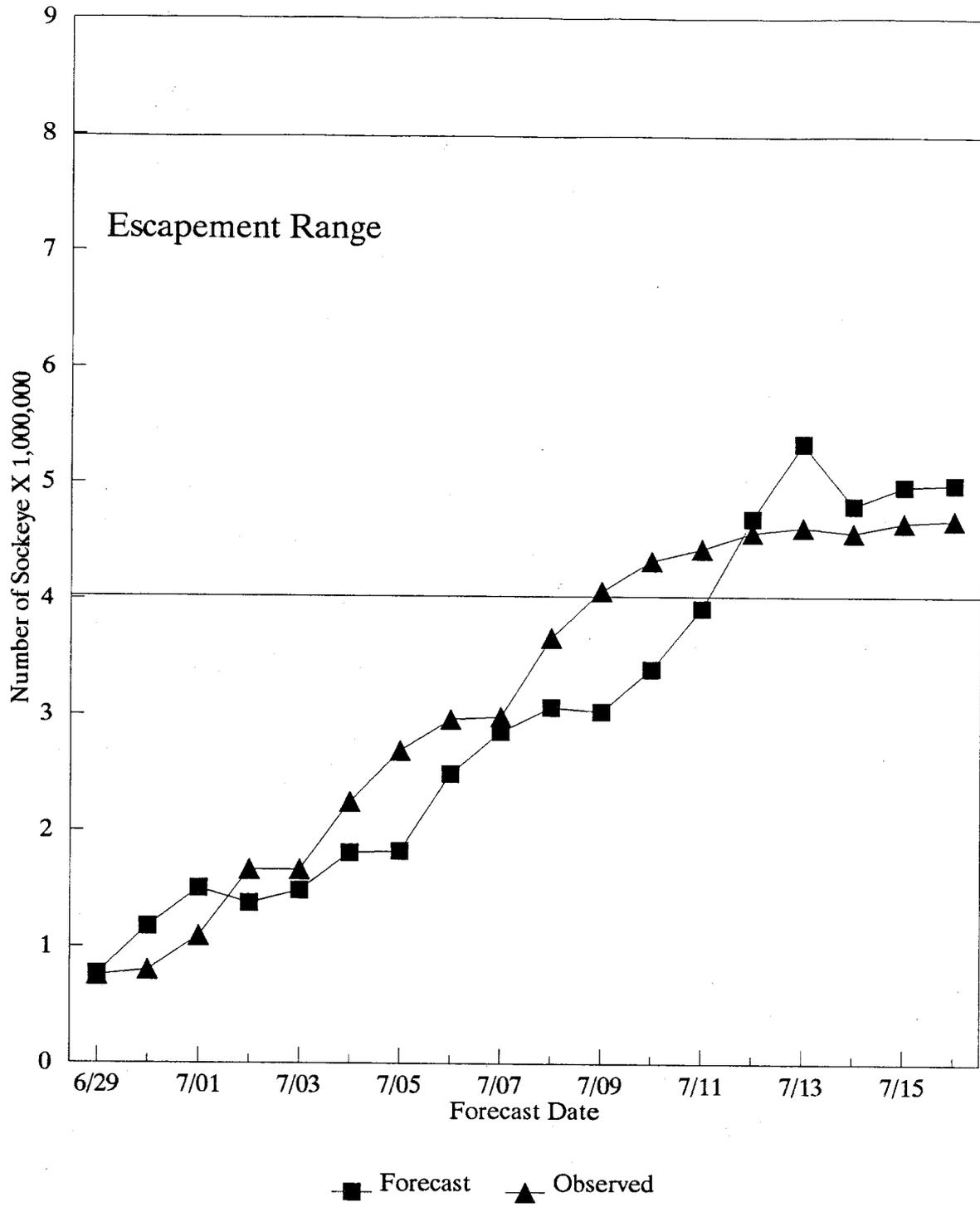


Figure 2. Comparison of travel-time analysis sockeye salmon escapement forecast and observed escapement, Kvichak River, 1992.

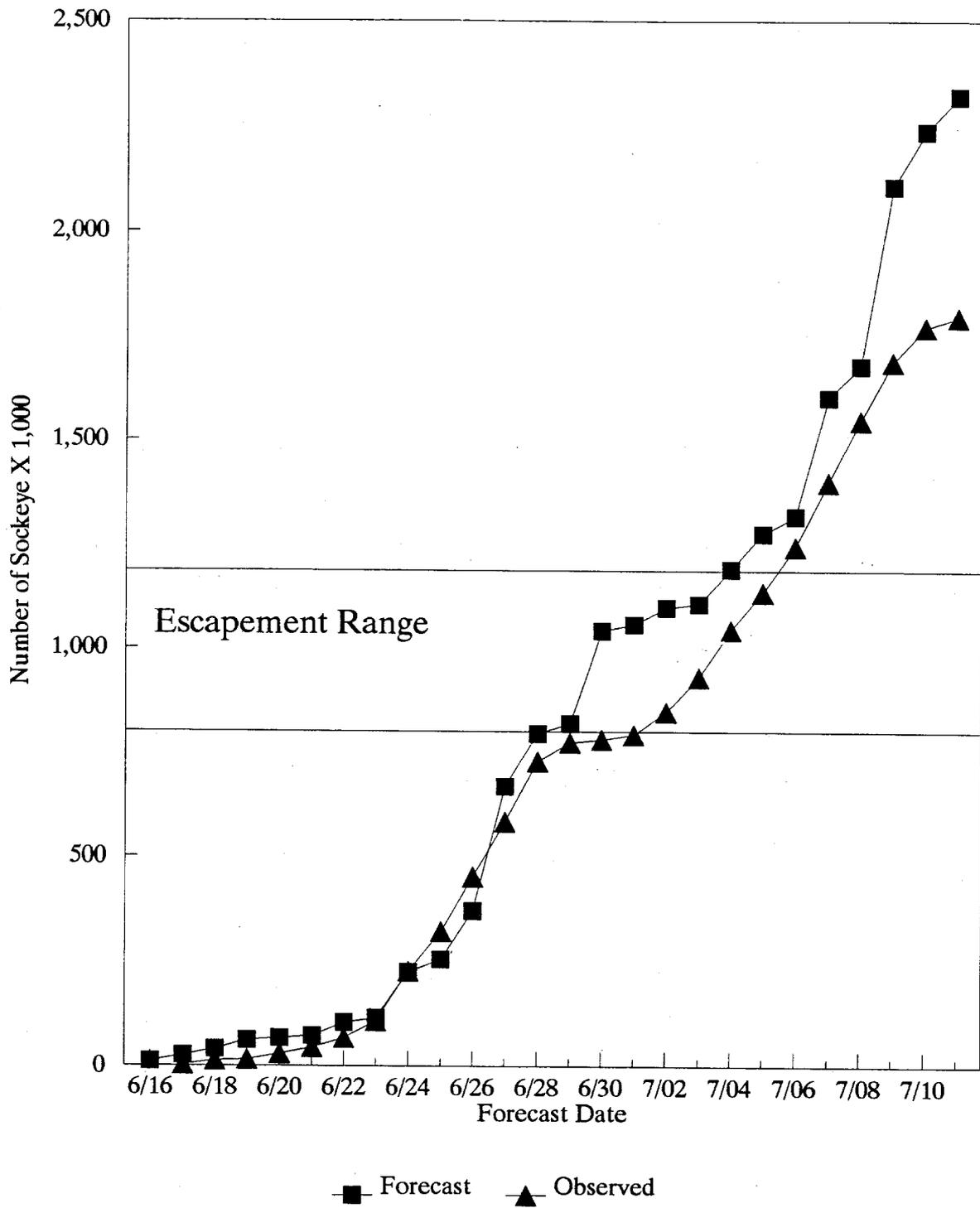


Figure 3. Comparison of catchability analysis sockeye salmon escapement forecast and observed escapement, Egegik River, 1992.

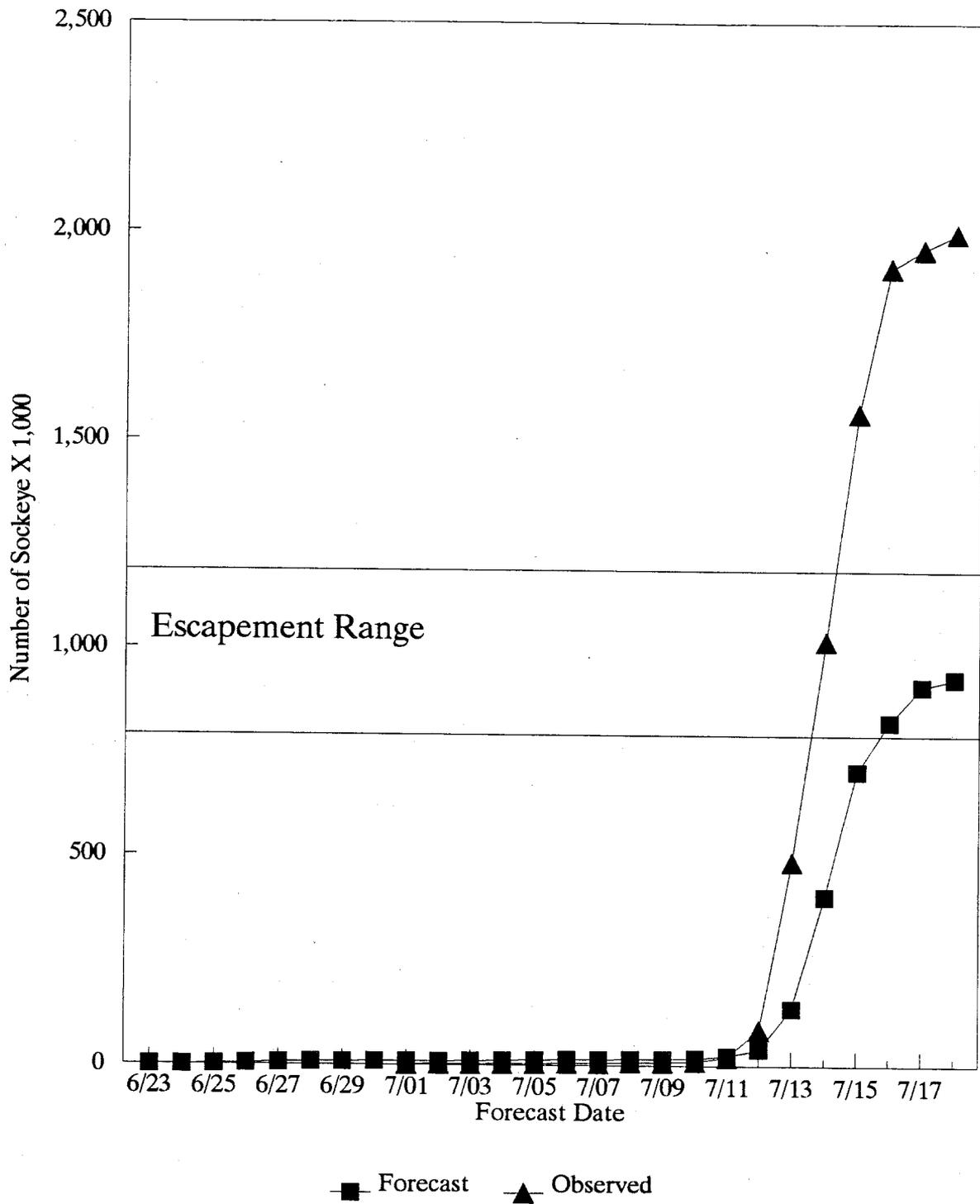


Figure 4. Comparison of 1985-1991 mean EPI value sockeye salmon escapement forecast and observed escapement, Egegik River, 1992.

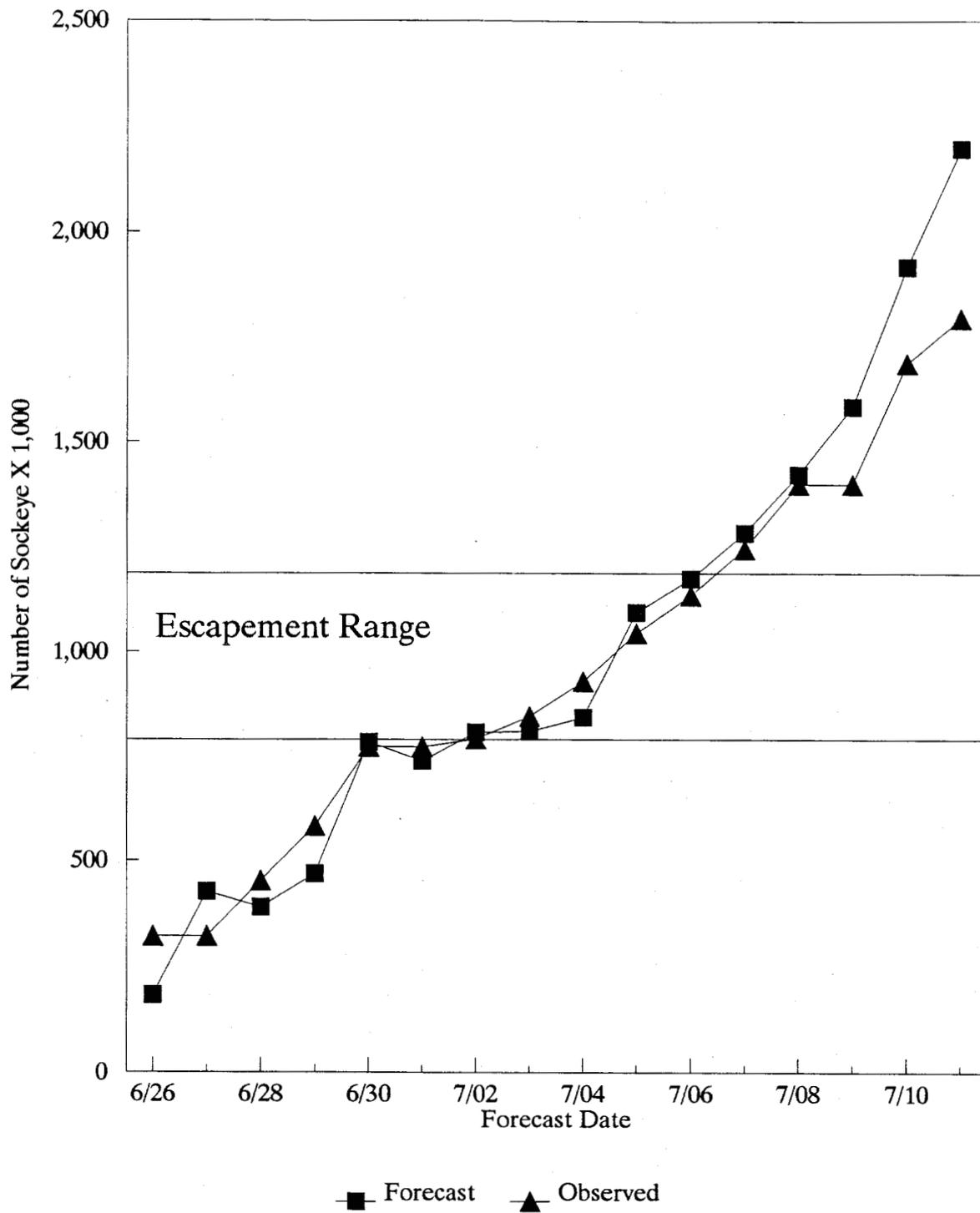


Figure 5. Comparison of travel-time analysis sockeye salmon escapement forecast and observed escapement, Egegik River, 1992.

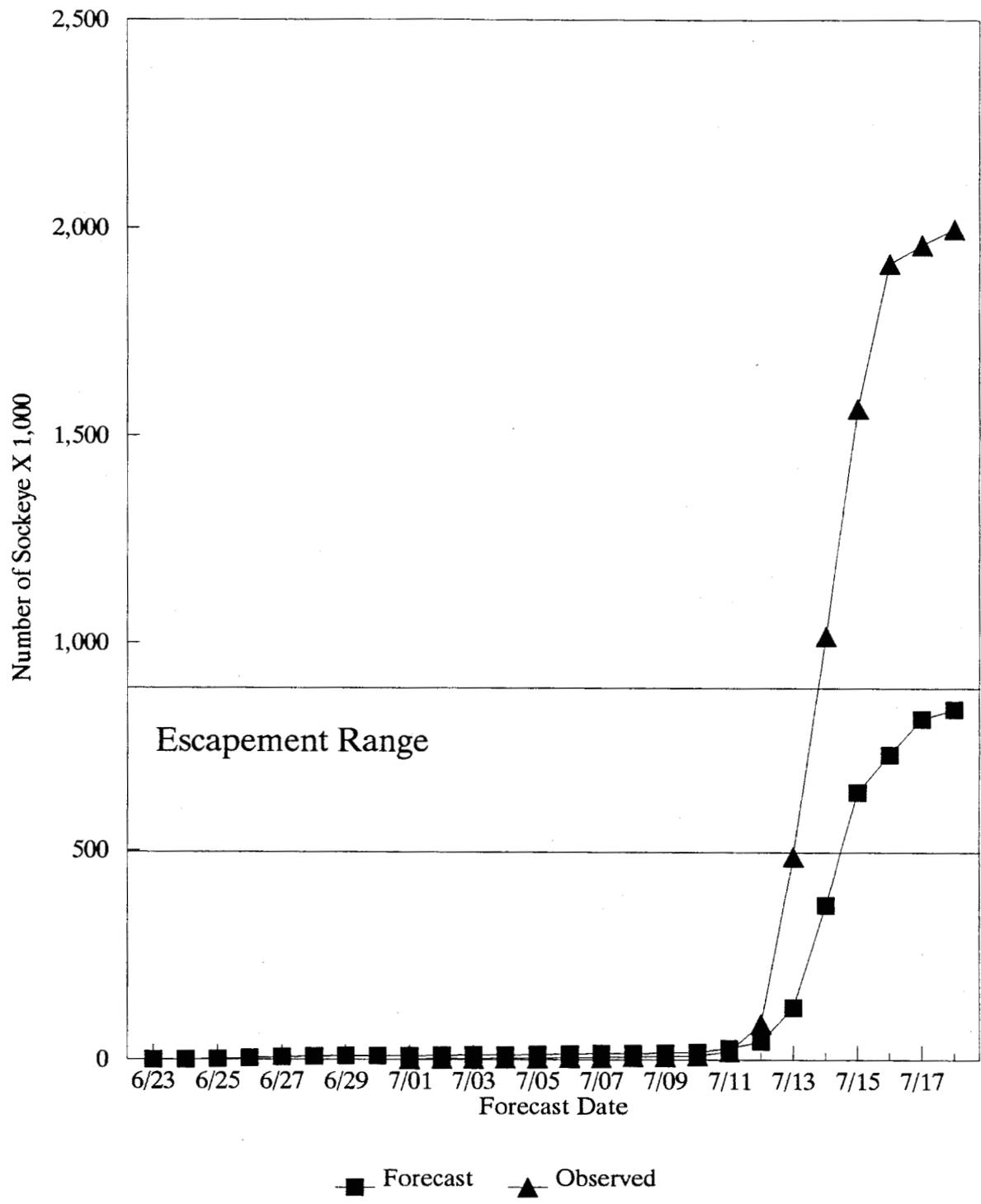


Figure 6. Comparison of catchability analysis sockeye salmon escapement forecast and observed escapement, Ugashik River, 1992.

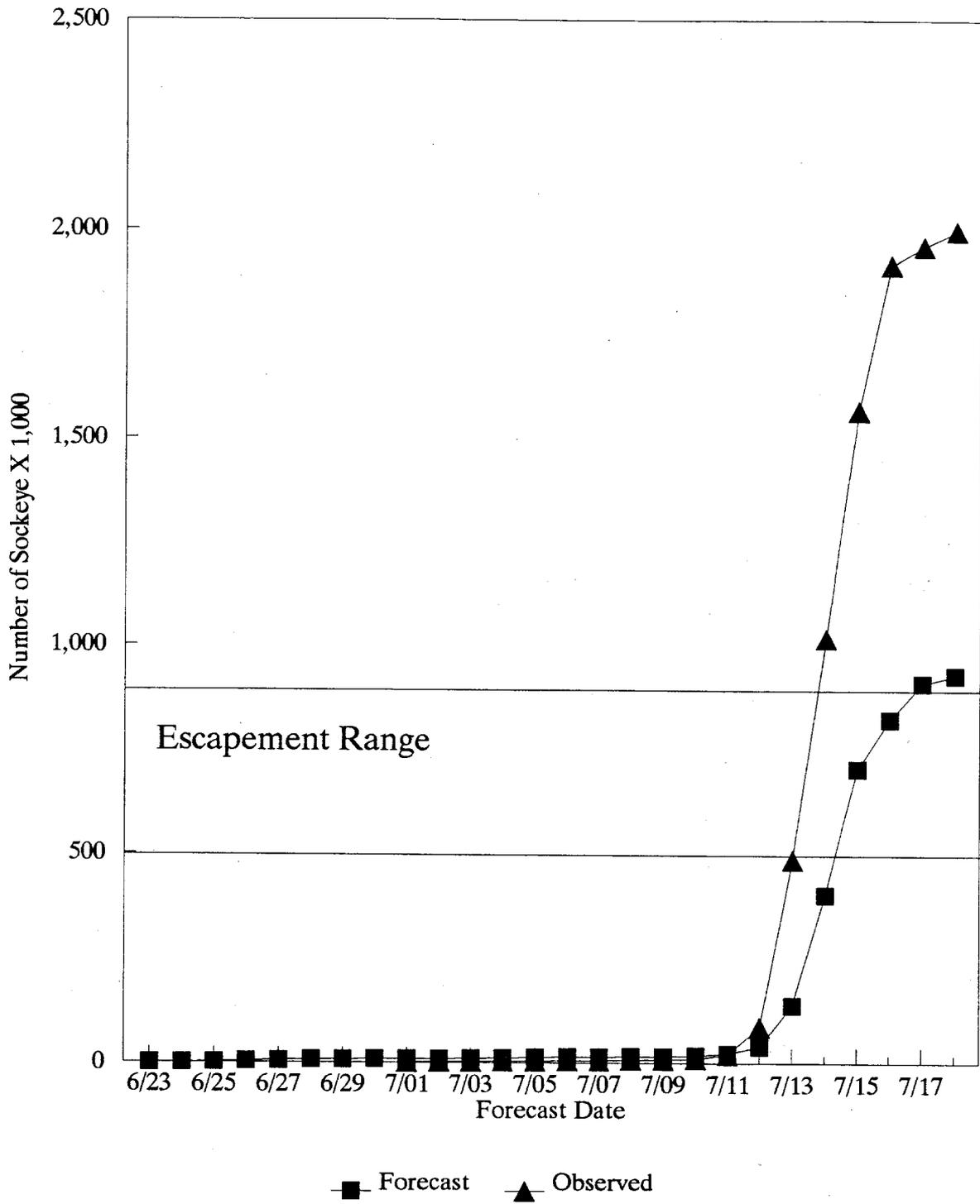


Figure 7. Comparison of 1985-1991 mean EPI value sockeye salmon escapement forecast and observed escapement, Ugashik River, 1992.

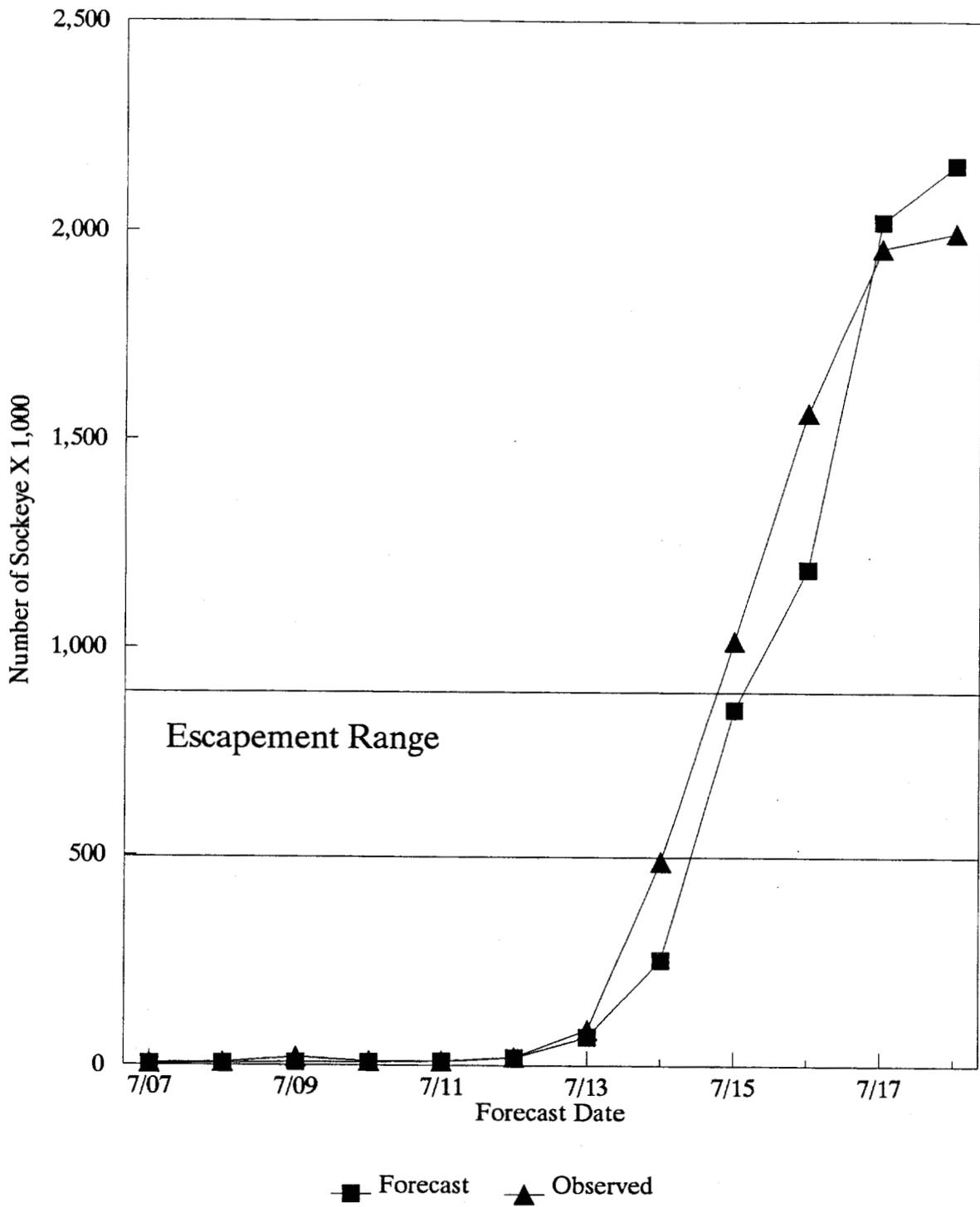


Figure 8. Comparison of travel-time analysis sockeye salmon escapement forecast and observed escapement, Ugashik River, 1992.

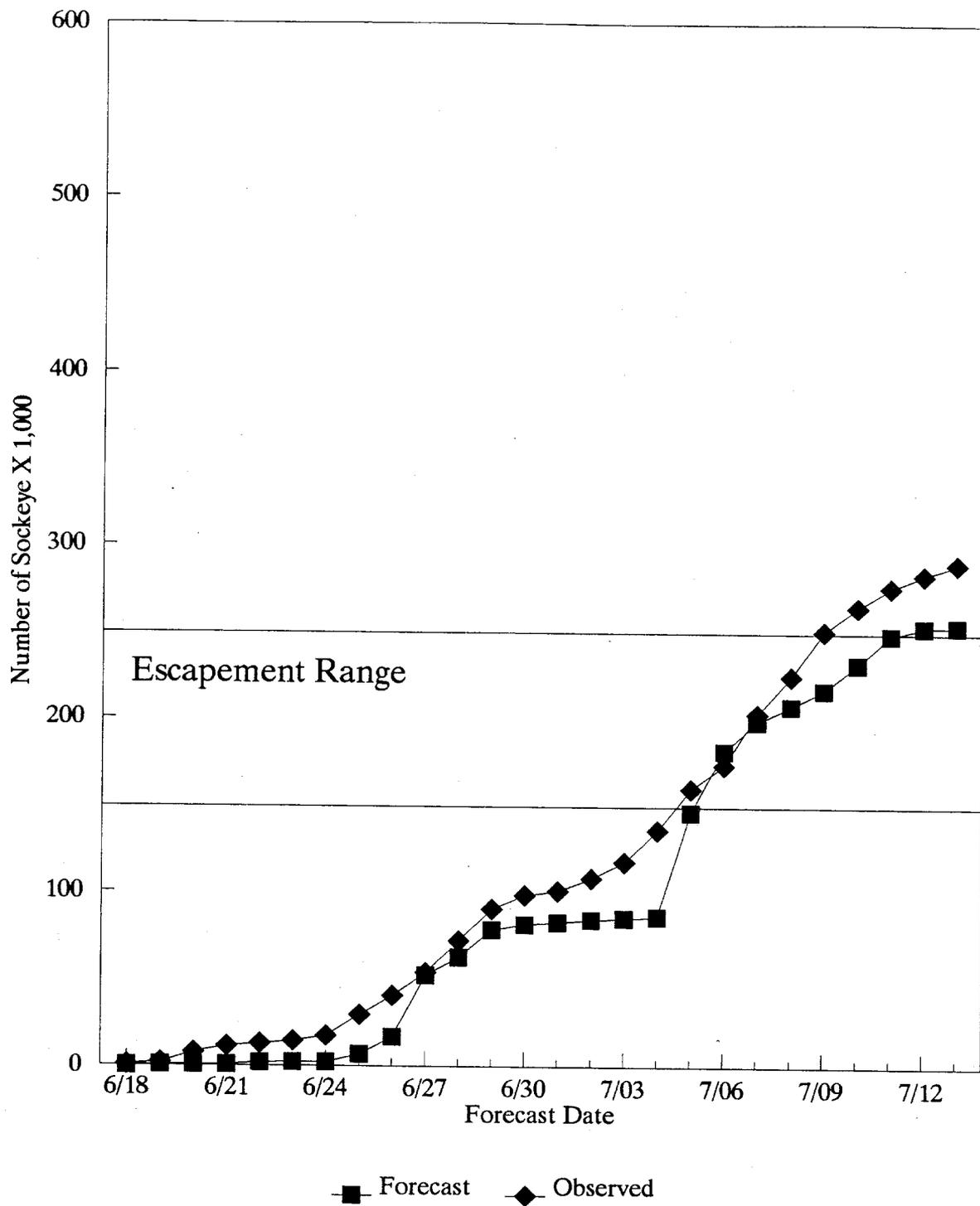


Figure 9. Comparison of 1988-1989 and 1991 mean EPI value sockeye salmon escapement forecast and observed escapement, Igushik River, 1992.

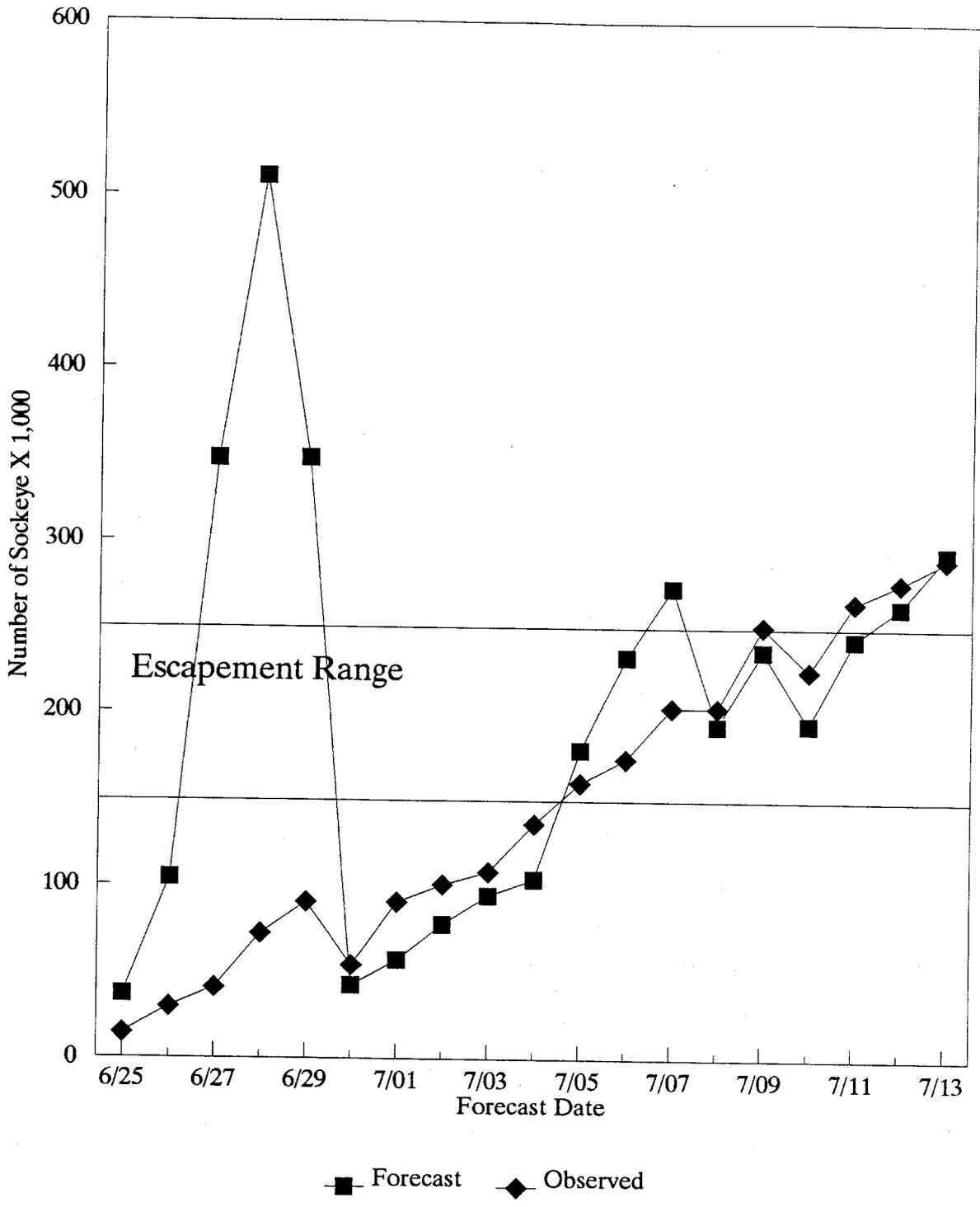


Figure 10. Comparison of travel-time analysis sockeye salmon escapement forecast and observed escapement, Igushik River, 1992.

APPENDIX

APPENDIX A: KVICHAK RIVER

A.1. Sockeye salmon test-fishing data, Kvichak River, 1992.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/20	1	1	21.0	1	11.4	1.8	497
6/20	2	2	24.9	0			
6/21	3	1	18.1	0			
6/21	4	2	14.5	0			
6/21	5	1	18.8	0			
6/21	6	2	18.2	2	26.4	3.4	532
6/22	7	1	17.5	0			
6/22	8	2	14.4	0			
6/22	9	1	19.2	0			
6/22	10	2	17.3	0			
6/23	11	1	15.3	0			
6/23	12	2	18.7	0			
6/23	13	1	18.9	0			
6/23	14	2	16.8	3	42.9	2.0	501
6/24	15	1	18.7	0			
6/24	16	2	19.5	11	135.4	2.3	512
6/24	17	1	18.9	0			
6/24	18	2	19.5	8	98.5	2.1	497
6/25	19	1	18.3	5	65.6	2.1	502
6/25	20	2	17.7	25	339.0	2.6	519
6/26	21	1	13.8	48	834.8	2.2	489
6/26	22	2	13.7	15	262.8	2.2	508
6/26	23	1	2.5	116	11,136.0	2.5	507
6/26	24	2	3.1	5	387.1	2.1	532
6/27	25	1	16.1	11	164.0	2.1	501
6/27	26	2	15.5	18	278.7	1.9	512
6/27	27	1	2.1	37	4,228.6	2.5	535
6/27	28	2	2.2	51	5,563.6	2.8	540
6/28	29	1	15.2	19	300.0	2.3	506
6/28	30	2	4.5	24	1,280.0	2.3	516
6/28	31	1	6.7	33	1,182.1	2.5	507
6/28	32	2	15.3	18	282.4	2.0	501
6/29	33	1	3.3	43	3,127.3	2.3	511
6/29	34	2	17.3	3	41.6	2.1	500
6/29	35	1	2.3	44	4,591.3	2.3	520
6/29	36	2	1.1	30	6,545.5	2.6	505
6/30	37	1	14.0	3	51.4	2.3	532
6/30	38	2	15.2	3	47.4	1.8	485

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APPENDIX A: KVICHAK RIVER (p 2 of 6)

A.1. (p 2 of 3).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/30	39	1	3.3	24	1,745.5	2.6	536
6/30	40	2	1.2	99	19,800.0	2.7	529
7/01	41	1	12.9	1	18.6	2.3	558
7/01	42	2	15.1	1	15.9	1.6	475
7/01	43	1	18.0	1	13.3	1.5	453
7/01	44	2	6.0	20	800.0	2.1	510
7/02	45	1	14.2	0	0.0		
7/02	46	2	16.7	3	43.1	1.6	478
7/02	47	1	4.5	21	1,120.0	2.4	538
7/02	48	2	1.1	47	10,254.5	2.4	520
7/03	49	1	3.0	20	1,600.0	2.0	519
7/03	50	2	6.5	24	886.2	2.4	538
7/03	51	1	2.0	16	1,920.0	3.2	534
7/03	52	2	0.8	129	38,700.0	2.9	537
7/04	53	1	4.8	18	900.0	2.5	521
7/04	54	2	10.1	24	570.3	2.4	518
7/04	55	1	10.8	20	444.4	2.6	539
7/04	56	2	3.4	58	4,094.1	2.1	519
7/05	57	1	3.5	38	2,605.7	2.3	521
7/05	58	2	3.6	22	1,466.7	2.5	536
7/05	59	1	15.4	30	467.5	2.2	521
7/05	60	2	7.0	19	651.4	2.0	536
7/06	61	1	12.1	15	297.5	1.8	506
7/06	62	2	10.2	14	329.4	2.4	519
7/06	63	1	7.0	21	720.0	1.9	503
7/06	64	2	13.6	17	300.0	1.8	503
7/07	65	1	14.0	13	222.9	1.7	468
7/07	66	2	14.2	17	287.3	2.2	489
7/07	67	1	14.8	8	129.7	2.8	514
7/07	68	2	14.5	8	132.4	2.7	527
7/08	69	1	14.5	5	82.8	1.8	483
7/08	70	2	14.0	8	137.1	2.1	498
7/08	71	1	14.7	1	16.3	3.9	592
7/08	72	2	13.5	1	17.8	1.3	452
7/09	73	1	14.7	6	98.0	2.1	499
7/09	74	2	14.2	4	67.6	1.5	493
7/10	75	1	14.9	2	32.2	1.9	496
7/10	76	2	14.9	0	0.0		

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APPENDIX A: KVICHAK RIVER (p 3 of 6)

A.1. (p 3 of 3).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/10	77	1	1.0	58	13,920.0	2.1	507
7/10	78	2	4.0	43	2,580.0	2.4	522
7/11	79	1	2.1	29	3,314.3	3.0	520
7/11	80	2	3.2	21	1,575.0	2.8	522
7/11	81	1	1.8	12	1,600.0	3.0	520
7/11	82	2	1.3	39	7,200.0	2.8	521
7/12	83	1	3.1	28	2,167.7	2.7	504
7/12	84	2	14.7	63	1,028.6	2.5	531
7/12	85	1	4.7	31	1,583.0	2.7	548
7/12	86	2	2.5	18	1,728.0	2.5	531
7/13	87	1	8.0	14	420.0	2.9	536
7/13	88	2	15.0	18	288.0	2.1	509
7/13	89	1	4.8	15	750.0	2.3	523
7/13	90	2	2.5	32	3,072.0	2.1	515
7/14	91	1	14.2	6	101.4	2.3	515
7/14	92	2	13.7	26	455.5	2.1	516
7/14	93	1	2.7	27	2,400.0	1.9	513
7/14	94	2	1.0	17	4,080.0	2.4	511
7/15	95	1	13.4	11	197.0	2.3	536
7/15	96	2	11.9	4	80.7	1.6	508
7/15	97	1	9.0	20	533.3	2.1	515
7/15	98	2	5.6	18	771.4	2.1	510
7/16	99	1	14.9	0	0.0		
7/16	100	2	14.4	1	16.7	1.5	468
7/16	101	1	2.0	13	1,560.0	2.7	586
7/16	102	2	1.6	20	3,000.0	2.1	535

APPENDIX A: KVICHAK RIVER (p 4 of 6)

A.2. Age, sex, and size composition of sockeye salmon caught in the Kvichak River test fishery, 1992.

	Age Group						Total	
	0.2	0.3	1.2	1.3	2.2	1.4		2.3
All Periods Combined								
<u>MALES</u>								
Percent	0.14		18.20	8.04	23.56	0.14	3.67	53.74
Sample Size	1		129	57	167	1	26	381
Mean Length	429		498	563	514	604	566	520
Std. Error			3	5	3		6	2
Sample Size	1		129	57	167	1	26	381
Mean Weight			2.06	3.14	2.28		3.18	2.40
Std. Error			0.08	0.15	0.07		0.23	0.05
Sample Size			27	16	32		7	82
<u>FEMALES</u>								
Percent		0.14	14.39	8.60	19.75	0.14	3.24	46.26
Sample Size		1	102	61	140	1	23	328
Mean Length		545	495	537	503	590	551	511
Std. Error			3	4	2		5	2
Sample Size		1	102	61	140	1	23	328
Mean Weight		2.70	1.82	2.99	2.05		2.41	2.18
Std. Error			0.06	0.40	0.07		0.81	0.10
Sample Size		1	20	11	34		2	68
<u>ALL FISH</u>								
Percent	0.14	0.14	32.58	16.64	43.30	0.28	6.91	100.00
Sample Size	1	1	231	118	307	2	49	709
Mean Length	429	545	497	549	509	597	559	515
Std. Error			2	3	2		4	1
Sample Size	1	1	231	118	307	2	49	709
Mean Weight		2.70	1.95	3.06	2.18		2.82	2.30
Std. Error			0.05	0.22	0.05		0.40	0.05
Sample Size		1	47	27	66		9	150

APPENDIX A: KVICHAK RIVER (p 5 of 6)

A.3. Kvichak River sockeye salmon test-fishing data, 1979-1992.

Year	Weighted Season Mean		Travel Time (d)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date ^a		
1979 ^b	2.5	520	2	21,901	6/29	5,330,532	7/01	243	Meacham (1980)
1980	2.2	514	2	106,315	7/09	18,508,524	7/11	174	Bue and Meacham (1981)
1981	2.6	529	2	20,813	7/01	1,723,506	7/13	83	Bue (1982)
1982	2.6	532	2	17,718	7/21	1,119,996	7/23	63	Bue (1984)
1983	2.3	514	2	13,234	7/12	2,853,198	7/14	216	Yuen (1985)
1984	2.3	519	3	45,584	7/12	10,111,152	7/15	222	Yuen et al. (1985)
1985 ^c	2.5	538	5	41,649	7/16	7,120,506	7/23	171	Bue et al. (1988)
1986	2.5	530	1	25,923	7/15	1,102,242	7/16	43	Yuen et al. (1988)
1987	2.1	509	2	55,881	7/14	5,945,994	7/16	106	Fried and Bue (1988a)
1988	2.7	548	1	38,743	7/17	4,045,500	7/18	104	Fried and Bue (1988b)
1989	2.4	516	2	58,044	7/16	8,163,918	7/18	141	Stratton et al. (1990)
1990	2.3	510	3	44,794	7/15	6,673,872	7/18	149	Stratton (1990)
1991	2.3	529	2	56,669	7/17	4,114,932	7/19	71	Stratton and Woolington (1992)
Mean	2.4	524	2					137	
1992 ^d	2.6	523	4	46,755	7/16	4,686,828	7/20	100	Current Report

^a Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

^b Two sites used from 1979-1984: station 1 on west bank above Nakeen; station 2 on east bank about 2 km above Sea Gull Flat Island.

^c Data from 1985 to present may not be comparable with those from 1979-1984. Test fishing sites were relocated in 1985 about 20 km upriver from old sites, and gillnets with smaller stretched mesh size (12.70 cm instead of 13.65 cm) and different web material (multistrand monofilament instead of multifilament nylon) were used.

^d Catchability model for 1993: $EPI_m = (1.200 \times 10^{30}) M_i^{-10.301}$ where M_i = weighted mean length.

APPENDIX A: KVICHAK RIVER (p 6 of 6)

Appendix A.4. Climatological and hydrological observations made at Kvichak River sockeye salmon test-fishing site, 1992.

Date	Cloud Cover ^a		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation ^b	Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6/20	2	2	calm	calm	9	19	-	15	A	murky
6/21	4	3	5 S	5-10 SE	7	19	11	12	0	murky
6/22	4	4	5 E	calm	7	16	-	-	A	dk. brown
6/23	3	3	calm	calm	8	20	-	13	0	dk. brown
6/24	2	2	5 SE	5-10 S	8	21	12	12	0	dk. brown
6/25	3	4	10 SE	5-10 S	8	16	11	11	A	dk. brown
6/26	4	4	0- 5 NE	0- 5 SE	11	15	11	11	A	dk. brown
6/27	4	4	0- 5 SE	5-10 SE	13	14	11	12	B	dk. brown
6/28	4	4	5-10 E	15-20 SE	10	14	-	-	B	dk. brown
6/29	4	3	calm	0- 5 S	11	14	-	-	B	dk. brown
6/30	3	4	calm	5-10 S	7	15	-	-	0	dk. brown
7/01	1	2	calm	calm	4	21	-	13	0	dk. brown
7/02	3	4	calm	0- 5 S	7	14	12	12	A	dk. brown
7/03	4	1	calm	calm	10	18	13	13	0	dk. brown
7/04	3	2	calm	10-20 SE	11	20	14	13	0	dk. brown
7/05	4	4	5-15 SE	10-20 SE	11	13	13	13	A	dk. brown
7/06	4	4	0- 5 SE	0- 5 SE	12	14	13	13	A	dk. brown
7/07	4	2	calm	10-15 N	11	16	13	14	0	dk. brown
7/08	4	3	10-20 NE	0- 5 NE	10	15	13	14	B	dk. brown
7/09	4	-	0- 5 E	calm	12	17	14	-	A	dk. brown
7/10	4	1	calm	calm	13	16	14	13	A	dk. brown
7/11	5	4	calm	5-10 W	12	15	13	13	A	dk. brown
7/12	5	2	5-10 S	5-10 S	8	15	14	14	0	dk. brown
7/13	4	4	5-10 SE	0- 5 SE	9	14	14	14	A	dk. brown
7/14	3	3	10-20 SE	calm	10	15	14	14	0	dk. brown
7/15	3	4	calm	calm	11	16	13	14	0	dk. brown
7/16	4	4	calm	5-10 SE	8	16	13	14	0	dk. brown

^a 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

^b 0 = none; A = intermittent rain; B = continuous rain

APPENDIX B: EGEGIK RIVER

B.1. Sockeye salmon test-fishing data, Egegik River, 1992.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/16	1	1	7.4	1	33.3	2.3	512
6/16	2	2	4.7	6	202.8	2.5	528
6/16	3	1	6.6	1	35.8	2.9	528
6/16	4	2	5.6	2	85.7	1.8	477
6/17	5	1	11.8	4	81.4	2.5	521
6/17	6	2	8.6	15	418.6	2.4	517
6/17	7	1	6.7	1	36.4	1.4	438
6/17	8	2	4.5	6	320.0	3.2	547
6/17	9	1	5.7	0	0.0		
6/17	10	2	5.3	7	317.0	2.4	527
6/17	11	1	5.1	2	94.1	3.1	550
6/17	12	2	5.1	2	94.1	1.7	482
6/18	13	1	6.0	2	80.0	3.6	589
6/18	14	2	2.6	6	553.8	2.8	534
6/18	15	1	10.0	2	48.0	1.6	499
6/18	16	2	6.6	5	181.8	2.4	535
6/18	17	1	5.2	5	235.3	2.2	500
6/18	18	2	4.1	5	333.3	2.5	493
6/18	19	1	6.3	0	0.0		
6/18	20	2	6.0	1	40.0	3.2	556
6/19	21	1	6.8	0	0.0		
6/19	22	2	5.7	6	244.1	1.8	490
6/19	23	1	2.1	1	39.3	1.6	445
6/19	24	2	5.0	7	329.4	2.3	507
6/19	25	1	7.8	2	62.3	2.1	504
6/19	26	2	8.2	4	117.1	2.3	518
6/19	27	1	7.2	5	171.4	2.5	487
6/19	28	2	6.3	3	114.3	1.6	513
6/20	29	1	5.0	0	0.0		
6/20	30	2	5.3	3	135.8	2.5	530
6/20	31	1	6.3	0	0.0		
6/20	32	2	6.7	2	77.4	2.2	520
6/20	33	1	9.4	10	230.8	2.3	521
6/20	34	2	13.3	1	17.8	2.1	512
6/20	35	1	9.6	0	0.0		
6/20	36	2	14.2	0	0.0		
6/21	37	1	5.7	4	168.4	2.0	500
6/21	38	2	6.4	0	0.0		
6/21	39	1	6.0	1	40.0	2.4	534

-Continued-

APPENDIX B: EGEGIK RIVER (p 2 of 7)

B.1. (p 2 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/21	40	2	6.9	5	173.9	2.2	518
6/21	41	1	6.4	2	70.6	2.3	519
6/21	42	2	7.6	0	0.0		
6/21	43	1	7.2	0	0.0		
6/21	44	2	9.2	1	26.1	2.7	550
6/22	45	1	6.8	8	282.4	2.1	508
6/22	46	2	7.8	13	400.0	2.2	513
6/22	47	1	7.6	3	94.7	2.0	496
6/22	48	2	4.2	26	1,485.7	2.3	513
6/22	49	1	10.1	1	23.8	2.0	517
6/22	50	2	10.2	0	0.0		
6/22	51	1	9.5	2	50.5	2.9	571
6/22	52	2	6.6	0	0.0		
6/23	53	1	7.9	3	91.1	2.6	535
6/23	54	2	8.6	10	266.7	2.5	519
6/23	55	1	9.8	5	122.4	2.7	520
6/23	56	2	10.1	3	71.3	2.6	530
6/23	57	1	9.5	0	0.0		
6/23	58	2	6.1	3	118.0	2.4	495
6/23	59	1	6.2	0	0.0		
6/23	60	2	8.0	4	120.0	1.6	468
6/24	61	1	8.1	24	711.1	2.3	478
6/24	62	2	5.7	22	926.3	1.9	456
6/24	63	1	5.0	17	816.0	2.1	483
6/24	64	2	5.9	7	284.7	2.2	515
6/24	65	1	6.8	3	105.9	2.7	534
6/24	66	2	8.6	10	279.1	2.5	527
6/24	67	1	6.8	40	1,432.8	2.4	517
6/24	68	2	5.9	33	1,342.4	2.1	512
6/25	69	1	10.1	2	47.5	2.3	528
6/25	70	2	7.5	20	640.0	2.2	510
6/25	71	1	8.3	4	114.3	2.6	536
6/26	72	1	6.1	40	1,573.8	2.5	518
6/26	73	2	8.5	18	508.2	1.6	508
6/27	74	1	4.5	24	1,280.0	2.3	513
6/27	75	2	2.1	72	8,228.6	2.4	512
6/27	76	1	4.4	12	654.5	2.4	527
6/27	77	2	3.6	17	1,133.3	2.4	527

-Continued-

APPENDIX B: EGEKIK RIVER (p 3 of 7)

B.1. (p 3 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/28	78	1	6.4	26	975.0	2.3	536
6/28	79	2	2.8	32	2,742.9	2.1	514
6/28	80	1	6.2	4	154.8	2.1	499
6/28	81	2	3.1	16	1,238.7	2.3	510
6/29	82	1	6.3	9	342.9	2.6	513
6/29	83	2	5.7	10	421.1	2.2	525
6/29	84	1	9.7	8	197.9	1.8	500
6/29	85	2	5.1	1	47.1	3.5	579
6/30	86	1	7.1	8	270.4	2.3	539
6/30	87	2	4.5	6	320.0	2.2	533
6/30	88	1	1.8	26	3,466.7	2.4	511
6/30	89	2	2.6	54	4,984.6	2.3	518
7/01	90	1	5.5	4	174.5	2.4	525
7/01	91	2	6.1	1	38.1	1.8	464
7/01	92	1	7.8	4	123.1	3.0	547
7/01	93	2	7.4	9	291.9	2.5	510
7/02	94	1	8.1	4	118.5	2.0	505
7/02	95	2	8.9	25	674.2	1.8	491
7/02	96	1	8.1	0	0.0		
7/02	97	2	10.6	16	362.3	2.4	505
7/03	98	1	9.3	3	76.6	2.2	518
7/03	99	2	5.3	3	135.8	2.0	514
7/03	100	1	15.9	4	60.4	1.8	484
7/03	101	2	10.9	2	44.0	2.0	497
7/04	102	1	7.3	2	65.8	2.0	498
7/04	103	2	4.6	31	1,617.4	2.2	501
7/04	104	1	6.6	0	0.0		
7/04	105	2	7.0	19	651.4	2.0	489
7/05	106	1	6.9	16	556.5	1.8	502
7/05	107	2	4.1	101	5,912.2	2.4	534
7/05	108	1	9.3	14	365.2	1.7	501
7/05	109	2	5.5	68	2,967.3	2.3	583
7/06	110	1	6.8	2	70.6	1.6	487
7/06	111	2	6.8	22	776.5	2.6	524
7/06	112	1	6.7	9	322.4	1.9	504
7/06	113	2	7.6	15	473.7	1.5	510
7/07	114	1	9.5	28	707.4	1.8	483
7/07	115	2	6.6	48	1,745.5	2.3	497
7/07	116	1	3.8	67	4,231.6	2.5	513
7/07	117	2	4.0	64	3,840.0	2.3	523

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APPENDIX B: EGEGIK RIVER (p 4 of 7)

B.1. (p 4 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/08	118	1	3.9	18	1,136.8	2.7	508
7/08	119	2	3.7	21	1,400.0	2.2	516
7/08	120	1	6.2	8	309.7	3.6	546
7/08	121	2	7.0	19	651.4	2.7	535
7/09	122	1	3.5	54	3,702.9	2.0	508
7/09	123	2	5.5	60	2,618.2	2.1	506
7/09	124	1	2.5	59	5,664.0	2.2	526
7/09	125	2	1.5	43	6,880.0	2.4	527
7/10	126	1	2.6	14	1,292.3	2.3	534
7/10	127	2	3.0	25	2,000.0	2.7	531
7/11	128	1	3.4	9	635.3		
7/11	129	2	4.4	21	1,145.5		

APPENDIX B: EGEGIK RIVER (p 5 of 7)

B.2. Age, sex, and size composition of sockeye salmon caught in the Egegik River test fishery, 1992.

	Age Group							Total
	1.2	2.1	1.3	2.2	1.4	2.3	3.2	
All Periods Combined								
<u>MALES</u>								
Percent	1.82	0.28	11.22	33.38	0.42	8.70	0.14	55.96
Sample Size	13	2	80	238	3	62	1	399
Mean Length	479	370	558	492	599	561	467	516
Std. Error	10	15	3	2	15	5		2
Sample Size	13	2	76	228	3	57	1	380
Mean Weight	2.03		3.09	2.12	3.40	3.04		2.47
Std. Error	0.28		0.07	0.17		0.15		0.11
Sample Size	4		36	116	1	27		184
<u>FEMALES</u>								
Percent	1.12	0.14	9.12	24.54		8.84	0.28	44.04
Sample Size	8	1	65	175		63	2	314
Mean Length	479	384	533	486		539	491	506
Std. Error	4		4	2		3	1	1
Sample Size	8	1	62	169		57	2	299
Mean Weight	1.63	0.75	2.37	1.86		2.48	1.60	2.08
Std. Error	0.03		0.09	0.09		0.10		0.06
Sample Size	3	1	34	54		25	1	118
<u>ALL FISH</u>								
Percent	2.95	0.42	20.34	57.92	0.42	17.53	0.42	100.00
Sample Size	21	3	145	413	3	125	3	713
Mean Length	479	374	547	489	599	550	483	511
Std. Error	6	15	2	1	15	3	1	1
Sample Size	21	3	138	397	3	114	3	679
Mean Weight	1.88	0.75	2.77	2.01	3.40	2.76	1.60	2.30
Std. Error	0.17		0.05	0.11		0.09		0.06
Sample Size	7	1	70	170	1	52	1	302

APPENDIX B: EGEGIK RIVER (p 6 of 7)

B.3. Test-fishing data, 1979-1992, to estimate constants for Egegik River catchability model.

Year ^a	Weighted Season Mean		Travel Time (d)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date ^b		
1979	2.7	548	1	23,980	7/10	905,034	7/11	38	Meacham (1980)
1980	2.3	525	4	13,312	7/16	1,060,860	7/20	80	Bue and Meacham (1981)
1981	2.6	544	3	18,921	7/13	691,764	7/16	37	Bue (1982)
1982	3.0	569	3	30,361	7/12	1,029,684	7/15	34	Bue (1984)
1983	2.6	537	1	16,276	7/10	718,368	7/11	44	Yuen (1985)
1984	2.6	543	3	26,947	7/12	1,151,028	7/15	43	Yuen et al. (1985)
1985 ^c	2.4	529	4	19,974	7/09	1,052,250	7/13	53	Bue et al. (1988)
1986	2.5	541	1	16,370	7/14	981,841	7/15	60	Yuen et al. (1988)
1987	2.7	551	2	21,810	7/14	1,162,464	7/16	53	Fried and Bue (1988a)
1988	2.8	553	1	21,024	7/16	1,591,752	7/17	76	Fried and Bue (1988b)
1989	2.7	551	3	30,343	7/12	1,590,234	7/15	52	Stratton et al. (1990)
1990	2.4	525	3	17,578	7/16	2,155,062	7/19	123	Stratton (1990)
1991	2.5	533	4	31,066	7/12	2,722,476	7/16	88	Stratton and Woolington (1992)
Mean	2.6	542	3					60	
1992 ^d	2.3	518	3	24,498	7/11	1,795,542	7/14	73	Current Report

^a Two sites located about 3 km upriver from tip of Egg Island used: station 1 on south bank and station 2 on north bank.

^b Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

^c Data from 1985 to present may not be comparable with those from 1979-1984 because gillnets with a smaller stretched mesh size (13.02 cm instead of 13.65 cm) and different web material (multi-strand monofilament instead of multifilament nylon) were used.

^d Catchability model for 1993: $EPI_m = (9.175 \times 10^{30}) M_i^{-10.690}$ where M_i = weighted mean length.

APPENDIX B: EGEGIK RIVER (p 7 of 7)

Appendix B.4. Climatological and hydrological observations made at Egegik River sockeye salmon test-fishing site, 1992.

Date	Cloud Cover ^a		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation ^b	Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6/16	-	2	-	20 NE	12	16	-	-	A	lt. brown
6/17	4	-	15 NE	15 NE	12	10	10	-	A	lt. brown
6/18	4	3	15 NE	15 NE	8	10	10	-	A	lt. brown
6/19	3	3	20 NE	20 NE	10	11	10	-	A	brown
6/20	4	3	2 NE	1 SE	12	14	10	11	A	lt. brown
6/21	4	3	2 NE	15 NNE	13	10	10	11	0	brown
6/22	4	2	10 NE	10 NE	10	11	10	10	A	brown
6/23	2	2	calm	calm	11	11	12	13	A	lt. brown
6/24	1	3	calm	10 NE	11	12	13	12	A	lt. brown
6/25	3	3	30 NE	calm	11	11	12	-	0	lt. brown
6/26	3	4	25 NE	calm	11	-	-	-	A	lt. brown
6/27	3	4	10 NE	25 NE	10	10	11	-	A	lt. brown
6/28	4	4	15 NE	2 NE	10	10	11	11	A	lt. brown
6/29	4	2	calm	calm	8	14	11	12	A	brown
6/30	3	1	calm	4 SSW	7	17	10	-	A	brown
7/01	-	1	calm	5-10 NE	-	21	-	-	0	lt. brown
7/02	4	4	20 NE	5 NE	10	11	-	12	A	lt. brown
7/03	4	1	2- 5 SW	2 SW	-	19	-	13	A	brown
7/04	3	2	30 NE	30 NE	11	-	12	12	0	brown
7/05	4	4	15 NE	10 NE	11	9	-	-	A	brown
7/06	4	4	2 NE	calm	10	10	11	11	A	brown
7/07	3	3	4 NE	10 NE	-	11	11	11	A	lt. brown
7/08	3	4	2 NE	calm	12	12	-	12	A	brown
7/09	2	3	15 NE	20 NNE	11	10	13	13	A	brown
7/10	4	-	calm	-	12	-	13	13	A	brown

^a 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast

^b 0 = none; A = intermittent rain

APPENDIX C: UGASHIK RIVER

C.1. Sockeye salmon test-fishing data, Ugashik River, 1992.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/23	1	1	13.0	0	0.0		
6/23	2	2	15.7	0	0.0		
6/23	3	1	10.8	0	0.0		
6/23	4	2	13.5	0	0.0		
6/23	5	1	11.1	0	0.0		
6/23	6	2	12.4	1	19.4	3.3	583
6/24	7	1	10.8	0	0.0		
6/24	8	2	10.9	1	22.0	3.3	514
6/24	9	1	11.0	0	0.0		
6/24	10	2	11.2	0	0.0		
6/24	11	1	9.1	0	0.0		
6/24	12	2	10.5	0	0.0		
6/24	13	1	10.6	1	22.6	2.1	527
6/24	14	2	11.2	0	0.0		
6/25	15	1	8.8	0	0.0		
6/25	16	2	11.4	0	0.0		
6/25	17	1	10.8	1	22.2	3.2	568
6/25	18	2	13.8	1	17.4	2.6	495
6/25	19	1	16.0	0	0.0		
6/25	20	2	16.9	2	28.4	2.6	549
6/25	21	1	16.2	0	0.0		
6/25	22	2	20.9	0	0.0		
6/26	23	1	17.4	2	27.6	2.9	553
6/26	24	2	18.3	7	91.8	1.9	493
6/26	25	1	13.5	1	17.8	2.6	557
6/26	26	2	12.4	4	77.4	3.0	534
6/27	27	1	10.0	0	0.0		
6/27	28	2	12.3	2	39.0	2.1	529
6/27	29	1	15.2	1	15.8	3.2	577
6/27	30	2	17.7	4	54.2	2.3	543
6/27	31	1	15.6	7	107.7	2.6	497
6/27	32	2	17.4	4	55.2	2.2	536
6/27	33	1	13.4	1	17.9	2.2	520
6/27	34	2	17.8	8	107.9	2.5	523
6/28	35	1	12.6	0	0.0		
6/28	36	2	12.5	1	19.2	2.0	486
6/28	37	1	15.4	3	46.8	2.8	528
6/28	38	2	16.3	1	14.7	2.0	502

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APPENDIX C: UGASHIK RIVER (p 2 of 9)

C.1. (p 2 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/28	39	1	12.2	0	0.0		
6/28	40	2	14.1	2	34.0	3.0	525
6/28	41	1	12.0	1	20.0	2.4	547
6/28	42	2	15.9	6	90.6	2.4	524
6/29	43	1	14.1	0	0.0		
6/29	44	2	15.6	0	0.0		
6/29	45	1	15.9	1	15.1	2.0	515
6/29	46	2	17.3	3	41.6	2.2	536
6/29	47	1	14.0	1	17.1	2.2	523
6/29	48	2	14.8	2	32.4	2.2	508
6/29	49	1	14.6	0	0.0		
6/29	50	2	14.1	2	34.0	3.6	543
6/30	51	1	15.0	1	16.0	2.5	560
6/30	52	2	16.6	2	28.9	2.9	551
6/30	53	1	15.2	2	31.6	3.3	590
6/30	54	2	17.0	3	42.4	2.3	513
6/30	55	1	15.8	4	60.8	2.3	532
6/30	56	2	16.0	2	30.0	1.9	512
6/30	57	1	14.0	0	0.0		
6/30	58	2	14.0	0	0.0		
7/01	59	1	12.0	0	0.0		
7/01	60	2	12.6	1	19.0	3.9	572
7/01	61	1	13.1	1	18.3	3.0	606
7/01	62	2	12.1	0	0.0		
7/01	63	1	12.1	0	0.0		
7/01	64	2	12.6	0	0.0		
7/01	65	1	12.5	1	19.2	2.5	529
7/01	66	2	14.9	1	16.1	2.4	524
7/02	67	1	14.6	1	16.4	2.4	557
7/02	68	2	14.9	0	0.0		
7/02	69	1	14.0	1	17.1	1.7	489
7/02	70	2	15.8	0	0.0		
7/02	71	1	12.3	0	0.0		
7/02	72	2	12.4	0	0.0		
7/02	73	1	13.3	1	18.0	2.3	527
7/02	74	2	15.5	2	31.0	2.6	561
7/03	75	1	16.4	1	14.6	2.1	510
7/03	76	2	15.0	0	0.0		
7/03	77	1	15.0	1	16.0	2.3	535
7/03	78	2	15.9	2	30.2	2.1	515

-Continued-

APPENDIX C: UGASHIK RIVER (p 3 of 9)

C.1. (p 3 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/03	79	1	12.1	2	39.7	1.8	488
7/03	80	2	13.9	0	0.0		
7/03	81	1	15.3	3	47.1	2.7	517
7/03	82	2	15.1	3	47.7	2.6	548
7/04	83	1	14.5	1	16.6	3.4	557
7/04	84	2	12.0	1	20.0	3.5	581
7/04	85	1	13.9	2	34.5	2.5	542
7/04	86	2	15.4	0	0.0		
7/04	87	1	12.5	1	19.2	1.8	489
7/04	88	2	12.9	1	18.6	2.6	561
7/04	89	1	11.1	0	0.0		
7/04	90	2	17.6	1	13.6	2.4	582
7/05	91	1	15.0	3	48.0	3.4	557
7/05	92	2	13.1	0	0.0		
7/05	93	1	15.7	0	0.0		
7/05	94	2	16.2	1	14.8	2.4	553
7/05	95	1	14.2	0	0.0		
7/05	96	2	12.9	2	37.2	2.4	522
7/05	97	1	15.8	0	0.0		
7/05	98	2	19.2	8	100.0	2.7	522
7/06	99	1	15.6	2	30.8	2.2	530
7/06	100	2	14.6	3	49.3	2.0	504
7/06	101	1	13.7	2	35.0	2.4	526
7/06	102	2	11.5	1	20.9	3.4	575
7/06	103	1	15.8	1	15.2	2.4	528
7/06	104	2	13.7	2	35.0	3.0	532
7/06	105	1	15.6	1	15.4	2.9	547
7/06	106	2	13.1	0	0.0		
7/07	107	1	14.8	0	0.0		
7/07	108	2	14.4	2	33.3	2.0	509
7/07	109	1	14.5	1	16.6	2.5	542
7/07	110	2	14.4	1	16.7	1.8	492
7/07	111	1	9.5	1	25.3	1.9	512
7/07	112	2	10.6	1	22.6	2.0	487
7/07	113	1	9.5	1	25.3	2.0	513
7/07	114	2	9.9	0	0.0		
7/08	115	1	12.5	1	19.2	1.9	488
7/08	116	2	14.1	1	17.0	2.0	502
7/08	117	1	13.5	2	35.6	2.3	534
7/08	118	2	13.7	1	17.5	2.8	565

-Continued-

APPENDIX C: UGASHIK RIVER (p 4 of 9)

C.1. (p 4 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/08	119	1	13.6	3	52.9	2.6	545
7/08	120	2	13.7	1	17.5	2.2	522
7/08	121	1	14.2	1	16.9	2.6	539
7/08	122	2	13.6	1	17.6	2.5	540
7/09	123	1	13.1	1	18.3	0.7	357
7/09	124	2	14.0	0	0.0		
7/09	125	1	14.0	1	17.1	2.3	521
7/09	126	2	10.2	0	0.0		
7/10	127	1	13.0	1	18.5	2.0	487
7/10	128	2	15.6	6	92.3	2.0	501
7/10	129	1	13.6	2	35.3	2.9	547
7/10	130	2	12.2	3	59.0	3.1	561
7/10	131	1	16.1	1	14.9	1.6	500
7/10	132	2	15.6	4	61.5	2.8	555
7/10	133	1	14.4	0	0.0		
7/10	134	2	13.4	5	89.6	1.9	496
7/11	135	1	14.8	3	48.6	1.7	478
7/11	136	2	14.6	8	131.5	3.0	534
7/11	137	1	14.1	7	119.1	2.4	513
7/11	138	2	13.2	4	72.7	2.7	540
7/11	139	1	13.1	3	55.0	2.5	541
7/11	140	2	14.4	19	316.7	1.6	470
7/12	141	1	10.0	23	552.0	2.9	536
7/12	142	2	9.8	16	391.8	3.1	542
7/12	143	1	12.7	4	75.6	2.2	508
7/12	144	2	10.4	23	530.8	2.6	532
7/13	145	1	4.8	28	1,400.0	2.6	528
7/13	146	2	3.9	35	2,153.8	2.8	539
7/13	147	1	4.1	31	1,814.6	2.7	536
7/13	148	2	3.9	60	3,692.3	3.0	558
7/14	149	1	2.1	46	5,257.1	3.0	541
7/14	150	2	2.3	76	7,930.4	2.7	521
7/14	151	1	2.8	53	4,542.9	2.7	551
7/14	152	2	2.5	74	7,104.0	2.8	543
7/15	153	1	2.2	61	6,654.5		
7/15	154	2	2.9	69	5,710.3		
7/15	155	1	1.8	46	6,133.3	2.4	541
7/15	156	2	1.9	75	9,473.7	2.6	537

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APPENDIX C: UGASHIK RIVER (p 5 of 9)

C.1. (p 5 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/16	157	1	2.1	25	2,857.1	2.7	547
7/16	158	2	2.4	27	2,700.0	3.3	562
7/17	159	1	3.2	39	2,925.0	2.4	522
7/17	160	2	3.7	52	3,373.0	2.7	533
7/17	161	1	3.3	17	1,236.4	3.3	545
7/17	162	2	8.0	15	450.0	2.7	559
7/18	163	1	14.6	25	411.0	2.6	511
7/18	164	2	15.6	35	538.5	2.5	536
7/18	165	1	13.0	16	295.4	2.3	528
7/18	166	2	11.3	26	552.2	2.3	515

APPENDIX C: UGASHIK RIVER (p 6 of 9)

C.2. Age, sex, and size composition of sockeye salmon caught in the Ugashik River test fishery, 1992.

	Age Group					Total
	1.2	1.3	2.2	1.4	2.3	
All Periods Combined						
<u>MALES</u>						
Percent	12.33	17.91	21.16	0.23	11.63	63.26
Sample Size	53	77	91	1	50	272
Mean Length	509	567	511	627	569	537
Std. Error	5	3	2		5	2
Sample Size	53	77	91	1	50	272
Mean Weight	2.19	2.99	2.17		3.23	2.60
Std. Error	0.08	0.08	0.05		0.14	0.04
Sample Size	25	36	44		27	132
<u>FEMALES</u>						
Percent	5.58	10.93	10.93	0.93	8.37	36.74
Sample Size	24	47	47	4	36	158
Mean Length	482	536	500	555	540	518
Std. Error	4	4	4	7	4	2
Sample Size	24	47	47	4	36	158
Mean Weight	1.69	2.38	1.86	2.80	2.44	2.14
Std. Error	0.07	0.07	0.07		0.09	0.04
Sample Size	12	28	19	1	14	74
<u>ALL FISH</u>						
Percent	17.91	28.84	32.09	1.16	20.00	100.00
Sample Size	77	124	138	5	86	430
Mean Length	500	555	507	569	557	530
Std. Error	3	2	2	7	3	1
Sample Size	77	124	138	5	86	430
Mean Weight	2.03	2.76	2.06	2.80	2.90	2.43
Std. Error	0.06	0.06	0.04		0.09	0.03
Sample Size	37	64	63	1	41	206

APPENDIX C: UGASHIK RIVER (p 7 of 9)

C.3. Test-fishing data, 1979-1992, to estimate constants for Ugashik River catchability model.

Year	Weighted Season Mean		Travel Time (d)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date ^a		
1979 ^b	2.6	538	9	42,880	7/13	1,662,348	7/22	39	Meacham (1980)
1980	2.4	519	3	85,711	7/17	2,550,174	7/20	30	Bue and Meacham (1981)
1981 ^c	2.9	560	3	73,861	7/16	1,304,022	7/19	18	Bue (1982)
1982 ^d	3.1	572	4	48,057	7/15	1,120,680	7/19	23	Bue (1984)
1983	2.4	522	1	15,485	7/16	831,744	7/17	54	Yuen (1985)
1984	2.4	523	8	20,138	7/17	1,223,286	7/25	61	Yuen et al. (1985)
1985 ^e	2.3	536	7	30,903	7/16	997,026	7/26	32	Bue et al. (1988)
1986	2.9	562	9	36,786	7/15	1,001,492	7/24	27	Yuen et al. (1988)
1987 ^f	2.6	547	6	14,393	7/17	587,964	7/23	41	Fried and Bue (1988a)
1988	2.7	549	2	16,106	7/24	625,752	7/26	39	Fried and Bue (1988b)
1989	2.4	532	5	36,562	7/21	1,669,350	7/26	46	Stratton et al. (1990)
1990	2.7	533	3	20,113	7/20	692,310	7/23	34	Stratton (1990)
1991	2.6	534	4	27,359	7/15	2,255,216	7/19	82	Stratton and Woolington (1992)
Mean	2.6	541	5					40	
1992 ^g	2.7	537	2	21,601	7/18	1,997,058	7/20	92	Current Report

^a Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

^b Three fishing sites used from 1979-1980: station 1 on east bank about 1 km below Ugashik Village; stations 2 and three on west bank about 4 km and 5 km above Ugashik Village.

^c Two sites used from 1981-present: station 1 on east bank located about 7 km upriver of Ugashik Village; station 2 on west bank located about 8 km upriver of Ugashik Village.

^d Stations 1 and 2 moved about 2 km and 3 km downriver, respectively.

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C.3. (page 2 of 2)

- ^e Data from 1985-present may not be comparable with those from 1979-1984 because gillnets with a smaller stretched mesh size (13.02 cm instead of 13.65 cm) and different web material (multi-strand monofilament instead of multifilament nylon) were used.
- ^f Stations 1 and 2 moved about 3 km upriver.
- ^g Catchability model for 1993: $EPI_m = (2.095 \times 10^{26}) M_i^{-9.047}$ where M_i = weighted mean length.

APPENDIX C: UGASHIK RIVER (p 9 of 9)

Appendix C.4. Climatological and hydrological observations made at Ugashik River sockeye salmon test-fishing site, 1992.

Date	Cloud Cover ^a		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation ^b	Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6/22	2	-	5-10 SW	0- 5 SW	-	-	-	-	A	dk. brown
6/23	4	2	0- 5 SE	5-10 N	-	-	12	12	A	dk. brown
6/24	2	1	calm	10-15 SW	13	10	12	12	0	dk. brown
6/25	4	3	20-25 NW	10-15 SW	9	11	12	12	A	dk. brown
6/26	4	4	5-10 SW	0- 5 SW	7	12	12	12	0	dk. brown
6/27	4	4	0- 5 SW	25-30 E	8	11	13	12	A	dk. brown
6/28	4	4	15-20 E	15-20 NE	9	10	13	12	A	dk. brown
6/29	1	4	0- 5 SW	0- 5 W	15	11	13	13	A	dk. brown
6/30	1	1	0- 5 SW	calm	7	17	12	12	0	dk. brown
7/01	1	4	calm	0- 5 SW	4	15	12	12	0	dk. brown
7/02	3	4	-	5-10 SW	7	16	12	12	A	dk. brown
7/03	4	2	0- 5 SW	calm	4	16	12	12	A	dk. brown
7/04	1	4	5-10 W	25-30 W	9	15	12	12	0	dk. brown
7/05	4	4	10-15 W	10-15 SW	9	12	12	14	A	dk. brown
7/06	4	4	0- 5 SE	0- 5 SE	9	12	12	-	A	dk. brown
7/07	4	4	calm	10-15 SE	9	14	13	-	0	dk. brown
7/08	4	2	0- 5 SW	5-10 W	12	18	13	14	0	dk. brown
7/09	1	4	5-10 NE	10-15 SE	14	17	13	14	A	dk. brown
7/10	4	4	calm	calm	8	15	14	14	A	dk. brown
7/11	4	4	10-15 W	15-20 W	7	14	14	14	A	dk. brown
7/12	4	4	15-20 W	10-15 W	11	15	14	14	A	dk. brown
7/13	5	4	15-20 W	10-15 W	10	14	14	14	A	dk. brown
7/14	5	4	10-20 SW	15-20 SW	12	14	14	14	A	dk. brown
7/15	4	2	-	-	9	12	14	14	0	dk. brown
7/16	2	3	-	-	7	14	14	14	A	dk. brown
7/17	5	4	10-15 SW	20-25 SW	7	12	14	14	A	dk. brown
7/18	5	4	20-25 W	10-15 W	8	11	14	14	A	dk. brown
7/19	-	-	calm	-	-	-	-	-	0	dk. brown

^a 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

^b 0 = none; A = intermittent rain; B = continuous rain

APPENDIX D: IGUSHIK RIVER

D.1. Sockeye salmon test-fishing data, Igushik River, 1992.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/18	1	1	12.7	0	0.0		
6/18	2	2	8.3	0	0.0		
6/18	3	1	9.5	0	0.0		
6/18	4	2	10.4	0	0.0		
6/19	5	1	15.2	0	0.0		
6/19	6	2	15.0	0	0.0		
6/19	7	1	12.8	0	0.0		
6/19	8	2	13.9	0	0.0		
6/19	9	1	15.2	0	0.0		
6/19	10	2	13.8	1	17.3	1.7	470
6/19	11	1	15.4	0	0.0		
6/19	12	2	15.1	3	47.8	3.2	564
6/20	13	1	14.5	0	0.0		
6/20	14	2	14.0	0	0.0		
6/20	15	1	14.9	0	0.0		
6/20	16	2	14.9	0	0.0		
6/20	17	1	15.7	0	0.0		
6/20	18	2	14.5	0	0.0		
6/20	19	1	15.6	0	0.0		
6/20	20	2	14.6	0	0.0		
6/21	21	1	14.6	0	0.0		
6/21	22	2	15.0	0	0.0		
6/21	23	1	15.3	0	0.0		
6/21	24	2	15.1	0	0.0		
6/21	25	1	16.4	0	0.0		
6/21	26	2	14.3	0	0.0		
6/21	27	1	15.3	0	0.0		
6/21	28	2	14.3	2	33.6	2.3	490
6/22	29	1	14.3	0	0.0		
6/22	30	2	12.6	0	0.0		
6/22	31	1	14.7	0	0.0		
6/22	32	2	13.8	0	0.0		
6/22	33	1	15.6	0	0.0		
6/22	34	2	14.5	11	182.2	2.6	532
6/22	35	1	15.4	0	0.0		
6/22	36	2	14.5	1	16.6	2.5	510
6/23	37	1	14.7	1	16.3	3.5	588
6/23	38	2	15.6	0	0.0		
6/23	39	1	14.9	1	16.1		

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APPENDIX D: IGUSHIK RIVER (p 2 of 9)

D.1. (p 2 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/23	40	2	15.4	0	0.0		
6/23	41	1	14.5	0	0.0		
6/23	42	2	14.8	0	0.0		
6/23	43	1	14.1	0	0.0		
6/23	44	2	15.9	0	0.0		
6/24	45	1	14.4	0	0.0		
6/24	46	2	13.8	1	17.3	2.5	520
6/24	47	1	14.7	0	0.0		
6/24	48	2	14.0	0	0.0		
6/24	49	1	14.8	0	0.0		
6/24	50	2	14.0	0	0.0		
6/24	51	1	15.1	0	0.0		
6/24	52	2	13.9	0	0.0		
6/25	53	1	10.3	8	187.0	2.6	530
6/25	54	2	13.9	1	17.3	2.5	520
6/25	55	1	13.7	8	140.4	3.4	588
6/25	56	2	11.0	1	21.8	1.8	470
6/25	57	1	8.7	1	27.6	2.6	523
6/25	58	2	2.5	4	390.5	2.6	534
6/25	59	1	8.1	0	0.0		
6/25	60	2	2.3	3	320.0	2.5	530
6/26	61	1	13.0	12	222.0	3.7	580
6/26	62	2	8.9	3	80.7	2.5	527
6/26	63	1	13.9	30	519.9	2.7	540
6/26	64	2	9.4	4	102.3	2.4	500
6/27	65	1	12.5	0	0.0		
6/27	66	2	11.7	0	0.0		
6/27	67	1	12.9	0	0.0		
6/27	68	2	11.9	0	0.0		
6/27	69	1	2.5	30	2,938.8	2.6	540
6/27	70	2	4.2	12	679.0	3.1	560
6/27	71	1	5.4	38	1,683.7	3.4	570
6/27	72	2	9.6	24	597.9	1.7	490
6/28	73	1	9.6	3	75.1	2.8	535
6/28	74	2	7.4	1	32.5	2.7	528
6/28	75	1	6.6	6	219.3	2.5	526
6/28	76	2	7.9	2	60.9	3	550
6/28	77	1	9.4	24	615.5	2.7	533
6/28	78	2	5.7	2	84.3	2	512

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APPENDIX D: IGUSHIK RIVER (p 3 of 9)

D.1. (p 3 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/28	79	1	7.4	16	520.1	3	553
6/28	80	2	5.5	2	87.7	2.8	542
6/29	81	1	14.3	2	33.6	2.3	490
6/29	82	2	14.3	0	0.0		
6/29	83	1	12.6	0	0.0		
6/29	84	2	14.7	0	0.0		
6/29	85	1	4.4	12	658.3	2.5	530
6/29	86	2	9.9	10	243.2	2.3	514
6/29	87	1	5.5	18	781.9	2.6	548
6/29	88	2	5.1	18	848.4	3	531
6/30	89	1	15.1	0	0.0		
6/30	90	2	15.0	0	0.0		
6/30	91	1	12.9	0	0.0		
6/30	92	2	13.7	0	0.0		
6/30	93	1	14.4	1	16.7	2.6	535
6/30	94	2	4.7	5	256.2	2.7	541
6/30	95	1	13.4	0	0.0		
6/30	96	2	4.9	5	245.7	2.3	514
7/01	97	1	13.9	0	0.0		
7/01	98	2	12.3	0	0.0		
7/01	99	1	13.6	0	0.0		
7/01	100	2	12.4	0	0.0		
7/01	101	1	14.2	3	50.8	2.4	523
7/01	102	2	12.6	1	19.0	2.2	498
7/01	103	1	15.4	2	31.3	3.3	551
7/01	104	2	13.0	3	55.5	2.3	527
7/02	105	1	13.4	0	0.0		
7/02	^a 106	2	7.4	0	0.0		
7/02	107	1	14.9	2	32.2	3	566
7/02	108	2	13.9	3	52.0	2.4	510
7/02	109	1	17.3	2	27.8	2.5	530
7/02	110	2	14.4	6	99.9	2.6	540
7/03	111	1	12.8	0	0.0		
7/03	112	2	13.3	0	0.0		
7/03	113	1	16.6	2	28.9	2.4	549
7/03	114	2	14.9	0	0.0		
7/03	115	1	16.6	0	0.0		
7/03	116	2	14.9	2	32.3	2.3	543
7/03	117	1	10.9	0	0.0		

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APPENDIX D: IGUSHIK RIVER (p 4 of 9)

D.1. (p 4 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/03	118	2	14.7	5	81.7	2.4	513
7/04	119	1	15.2	0	0.0		
7/04	120	2	13.7	0	0.0		
7/04	121	1	15.3	0	0.0		
7/04	122	2	15.1	0	0.0		
7/04	123	1	11.1	0	0.0		
7/04	124	2	14.6	1	16.4	2.2	500
7/04	125	1	14.9	2	32.3	3.5	569
7/04	126	2	11.2	4	85.8	2.9	544
7/05	127	1	14.3	0	0.0		
7/05	128	2	14.1	0	0.0		
7/05	129	1	12.8	0	0.0		
7/05	130	2	14.5	0	0.0		
7/05	131	1	1.9	14	1,745.5	2.3	525
7/05	132	2	3.1	20	1,548.4	2.8	545
7/05	133	1	3.8	11	697.8	2.4	555
7/05	134	2	2.2	53	5,674.3	2.7	542
7/06	135	1	8.5	4	112.5	2.3	500
7/06	136	2	2.9	6	499.4	1.6	485
7/06	137	1	3.1	7	539.0	2.4	530
7/06	138	2	5.2	10	460.8	3.4	562
7/06	139	1	9.7	2	49.6	3.5	557
7/06	140	2	8.3	7	203.4	2.3	518
7/06	141	1	2.5	27	2,566.3	2.6	532
7/06	142	2	3.0	16	1,283.6	2.3	522
7/07	143	1	8.3	5	144.9	2.6	530
7/07	144	2	5.9	5	202.5	2.5	520
7/07	145	1	7.1	15	506.4	2.5	535
7/07	146	2	8.9	8	216.7	2.4	515
7/07	147	1	5.3	14	630.0	2.8	560
7/07	148	2	8.2	8	233.2	2.8	555
7/07	149	1	6.9	14	487.0	2.5	520
7/07	150	2	5.4	7	313.0	2.7	530
7/08	151	1	5.3	18	813.8	2	490
7/08	152	2	8.2	0	0.0		
7/08	153	1	6.9	12	418.9	2.7	552
7/08	154	2	5.4	0	0.0		
7/08	155	1	11.6	11	228.6	2.8	561

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APPENDIX D: IGUSHIK RIVER (p 5 of 9)

D.1. (p 5 of 5).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/08	156	2	13.9	0	0.0		
7/08	157	1	11.9	3	60.6	2.7	533
7/08	158	2	13.9	0	0.0		
7/09	159	1	12.5	9	172.5	2.4	518
7/09	160	2	9.8	5	122.6	2.7	542
7/09	161	1	13.3	24	433.1	2.4	520
7/09	162	2	11.8	2	40.6	2	492
7/10	163	1	12.6	12	228.4	2.4	515
7/10	164	2	12.8	0	0.0		
7/10	165	1	11.9	4	80.4	2.3	492
7/10	166	2	13.6	0	0.0		
7/10	167	1	11.2	6	128.8	2.8	562
7/10	168	2	6.4	25	937.5	2.4	520
7/10	169	1	10.8	3	66.5	2.8	545
7/10	170	2	6.5	27	990.6	3	553
7/11	171	1	13.1	4	73.5	2.7	535
7/11	172	2	9.9	3	72.6	3	552
7/11	173	1	12.3	1	19.5	2.8	544
7/11	174	2	11.3	4	85.3	2.7	533
7/11	175	1	8.8	9	246.9	2.5	531
7/11	176	2	7.5	19	609.4	2.1	495
7/11	177	1	7.4	7	227.5	2.2	512
7/11	178	2	6.4	37	1,382.1	2.3	516
7/12	179	1	7.9	3	90.8	2.3	524
7/12	180	2	7.4	5	161.4	2.1	510
7/12	181	1	7.7	4	124.4	2.4	520
7/12	182	2	6.6	6	218.5	2.6	535
7/12	183	1	10.6	3	68.0	2.5	532
7/12	184	2	13.3	3	54.0	2.4	521
7/12	185	1	9.9	1	24.3	2.4	514
7/12	186	2	13.4	0	0.0		
7/13	187	1	9.6	0	0.0		
7/13	188	2	8.4	2	57.3	2.5	533
7/13	189	1	8.1	0	0.0		
7/13	190	2	7.9	0	0.0		

^a Two drifts missed due to mechanical problems with the outboard motor.

APPENDIX D: IGUSHIK RIVER (p 6 of 9)

D.2. Age, sex, and size composition of sockeye salmon caught in the Igushik River test fishery, 1992

	Age Group								Total
	0.2	0.3	1.2	0.4	1.3	2.2	1.4	2.3	
<u>MALES</u>									
Percent		0.24	11.52	0.18	25.96	0.18	0.61	0.24	38.93
Sample Size		1	52	1	120	1	3	1	179
Mean Length		443	535	528	536	488	489	600	535
Std. Error			6		5		35		4
Sample Size		1	52	1	120	1	3	1	179
Mean Weight		1.60	2.45		2.70	2.10	2.60	1.90	2.61
Std. Error			0.16		0.12				0.09
Sample Size		1	18		42	1	1	1	64
<u>FEMALES</u>									
Percent	0.24	0.18	22.49		35.12	0.18	2.06	0.79	61.07
Sample Size	1	1	99		164	1	9	4	279
Mean Length	475	420	506		515	550	497	515	511
Std. Error			4		3		17	38	3
Sample Size	1	1	99		164	1	9	4	279
Mean Weight	1.60		2.26		2.30		2.57	2.00	2.29
Std. Error			0.10		0.07		0.55		0.06
Sample Size	1		20		51		3	1	76
<u>ALL FISH</u>									
Percent	0.24	0.42	34.01	0.18	61.07	0.36	2.67	1.03	100.00
Sample Size	1	2	151	1	284	2	12	5	458
Mean Length	475	433	516	528	524	519	495	535	520
Std. Error			4		3		16	38	2
Sample Size	1	2	151	1	284	2	12	5	458
Mean Weight	1.60	1.60	2.32		2.47	2.10	2.58	1.97	2.41
Std. Error			0.09		0.07		0.55		0.05
Sample Size	1	1	38		93	1	4	2	140

APPENDIX D: IGUSHIK RIVER (p 7 of 9)

D.3. Igushik River sockeye salmon test-fishing data, 1979-1992.

Year	Weighted Season Mean		Travel Time(d) ^a	Indices		Spawning Escapement		EPI	Test Fishing Data Reference ^c
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date ^b		
1979 ^d	3.4	556	2	45,013	7/13	787,542	7/15	17	McBride and Clark (1980)
1980	3.1	560	4	38,673	7/15	1,945,758	7/19	50	McBride (1981)
1981	3.2	572	4	37,975	7/14	532,896	7/18	14	Minard (1982)
1982	3.5	579	5	12,638	7/12	411,420	7/17	33	Bucher (1984)
1983	2.8	546	4	15,322	7/13	161,754	7/17	11	Bucher and Frederickson (1985)
1984	3.2	570	3	25,743	7/14	162,054	7/17	6	Yuen et al. (1985)
1985 ^e	2.6	543	5	15,347	7/11	199,386	7/16	13	Bue et al. (1988)
1986	3.2	574	4	18,288	7/14	262,104	7/18	14	Yuen et al. (1988)
1987		557	5	6,609	7/14	138,186	7/19	21	Fried and Bue (1988a)
1988 ^f		552	2	6,186	7/13	160,446	7/15	26	Fried and Bue (1988b)
1989		547	1	11,802	7/08	296,658	7/09	25	Stratton et al. (1990)
1990 ^g									
1991	3.1	557	3	7,431	7/15	721,314	7/18	97	Stratton and Woolington (1992)
Mean	3.1	559	4					27	
1992	2.6	534	4	5,175	7/13	289,644	7/17	56	Current Report

^a Estimates for 1979-83 based on correlation coefficients; estimates for 1984-present based on travel time analysis.

^b Cumulative spawning escapement data = last date fished at test fishing site plus travel time to counting tower site.

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D.3 (p 2 of 2).

- ^c Weighted season mean length, weight, travel time, and EPI values for 1979-86 were recalculated for 1987 report (Fried and Bue 1988a), and may differ from those in original reports.
- ^d From 1987 to 1984 only one site, station 1, used on south bank about 30 km upstream from district boundary.
- ^e In 1985 Station 1 moved about 2 km downstream, and Station 2 added on north bank about 1 km downstream of Station 1.
- ^f Data from 1988 to 1992 may not be comparable with 1979 to 1987 due to change in fishing method (drifting gillnet from boat rather than anchoring one end on shore).
- ^g Igushik test fish project not operated in 1990 due to budget cuts.

APPENDIX D: IGUSHIK RIVER (p 9 of 9)

D.4. Climatological and hydrological observations made at Igushik River sockeye salmon test-fishing site, 1992.

Date	Cloud Cover ^a		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation ^b		Amt. (mm)	Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6/18	-	3	-	5 NW	-	18	-	12	-	0	13	dk. brown
6/19	2	2	15 SW	20 SW	13	17	12	12	A	A	6	dk. brown
6/20	2	2	10 E	15 E	13	18	12	12	0	A	6	dk. brown
6/21	1	1	5 NW	10 NW	13	18	11	13	0	0	0	dk. brown
6/22	2	2	0	15 SE	12	18	12	12	0	A	6	dk. brown
6/23	0	1	0	20 SE	12	18	12	13	0	A	6	dk. brown
6/24	1	2	0	15 SE	12	18	13	13	0	A	13	dk. brown
6/25	2	2	30 SE	20 SE	12	18	13	13	A	A	6	dk. brown
6/26	1	2	15 SE	25 SE	12	17	12	13	A	A	6	dk. brown
6/27	4	4	15 SE	25 SE	12	18	13	13	A	A	6	dk. brown
6/28	4	4	25 SE	30 SE	12	17	13	13	B	B	13	dk. brown
6/29	4	4	25 SE	25 SE	12	18	13	13	A	A	13	dk. brown
6/30	3	3	10 SE	15 SE	12	18	13	13	A	A	13	dk. brown
7/01	2	4	0	0	14	23	12	12	0	0	0	dk. brown
7/02	4	4	10 SE	10 SE	14	23	12	13	A	A	13	dk. brown
7/03	4	3	10 SE	10 SE	12	23	13	14	A	A	13	dk. brown
7/04	4	3	10 SE	10 SE	13	23	13	13	A	A	13	dk. brown
7/05	4	4	10 SE	10 SE	13	23	13	13	A	A	13	dk. brown
7/06	4	4	10 SE	10 SE	12	23	12	13	A	A	13	dk. brown
7/07	4	4	10 SE	10 SE	12	23	12	12	A	A	13	dk. brown
7/08	4	4	25 SE	25 SE	13	18	12	12	A	A	13	dk. brown
7/09	2	3	15 SE	15 SE	14	17	14	13	0	A	13	dk. brown
7/10	3	3	15 SE	10 SW	14	18	14	13	A	0	13	dk. brown
7/11	1	2	15 SE	10 SW	14	17	14	13	0	0	0	dk. brown
7/12	2	-	0	-	14	-	13	-	0	-	0	dk. brown

^a 1 = cloud cover not more than 1/10,
 2 = cloud cover not more than 1/2,
 3 = cloud cover more than 1/2,
 4 = completely overcast, and
 5 = fog

^b 0 = none; A = intermittent rain; B = continuous rain

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