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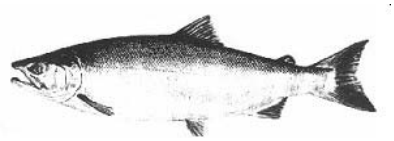

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2012 UPPER COOK INLET SOCKEYE SALMON FORECAST

The preliminary forecast of the 2012 Upper Cook Inlet sockeye salmon run is as follows:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	6.2	4.0–10.0
Escapement	1.8	
Harvest	4.4	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, Susitna, and Crescent rivers, and Fish Creek. Escapement (spawner abundance), return, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the run of sockeye salmon to UCI in 2012: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fry, (3) the relationship between adult returns and smolts, and (4) the relationship between sibling adult returns. Several forecast models were evaluated for each stock and age class. Models providing the smallest mean absolute percent error (MAPE) between the forecast and actual runs over the past 10 years were generally used. In most cases, these were sibling models. Forecast model predictions based on spawners, fry, smolt or siblings were compared to evaluate uncertainty.

The returns of ages 1.3 and 2.2 sockeye salmon to the Kenai River in 2012 were forecasted using sibling models. For example, the sibling-model prediction of the return of age-1.3 sockeye salmon was based on the abundance of age-1.2 sockeye salmon in 2011. A spawner-recruit model prediction of the age-1.2 sockeye salmon return was based upon escapement in 2008. The return of age-2.3 sockeye salmon to the Kenai River was forecasted using a fry-smolt model based upon age-1 fall fry abundance in Skilak and Kenai lakes and smolt data when available (after brood year 2002). Smolt models were used to forecast the returns of age 1.2, 1.3, and 2.3

sockeye salmon to the Kasilof River. The return of age-2.2 sockeye salmon to the Kasilof River was forecasted using a sibling model based upon the abundance of age-2.1 sockeye salmon in 2011.

The total escapement of sockeye salmon to the Susitna River was forecasted using the recent 5-year average aggregate escapement into Judd, Shell, Chelatna, and Larson lakes expanded to the entire Susitna River watershed using mark–recapture abundance estimates from 2006–2010. The total run of Susitna River sockeye salmon to UCI was forecasted using the escapement and the mean harvest rate estimated from genetic stock composition of the commercial harvest in 2007–2010.

The sockeye salmon forecast for unmonitored systems in UCI was estimated as 15% of the aggregate forecast for the 5 major stocks. The fraction of the total run destined for unmonitored systems was estimated using genetic estimates of the stock composition of offshore test fishery harvests.

The 2012 total harvest by all user groups was estimated by subtracting the aggregate escapement from the total run forecast for all stocks. Aggregate escapements were estimated from the sum of the midpoints of the escapement goal ranges for each of the major sockeye salmon-producing systems in UCI and the escapement into unmonitored systems (estimated as 15% of the aggregate escapement into monitored systems). The estimated sport harvest upstream of the sonar at river mile 19 on the Kenai River was subtracted from the aggregate escapement into monitored systems. The total run forecast range was calculated by multiplying the forecast with the upper and lower values of the percent error of the actual runs from published forecast runs from 2002 through 2011.

Forecast Discussion

In 2011, the harvest of sockeye salmon by all user groups in UCI was 6.1 million, while the preseason forecast was 4.4–4.8 million. The higher than expected harvest in 2011 was largely due to an above forecast run of age-2.3 sockeye salmon to the Kenai River (actual run 2.9 million; sibling model forecast was 275,000). In 2011, the total run was 5.9 million to the Kenai River; 860,000 to the Kasilof River; 564,000 to the Susitna River; 126,000 to the Crescent River; and 203,000 to Fish Creek. The 2011 run forecast was 3.9 million to the Kenai River; 929,000 to the Kasilof River; 463,000 to the Susitna River; 131,000 to the Crescent River; and 105,000 to Fish Creek.

A run of 6.2 million sockeye salmon is forecasted to return to UCI in 2012, with a harvest by all user groups of 4.4 million. The forecasted harvest in 2012 is 0.4 million fish above the 20-year average harvest by all user groups of 4.0 million.

The run forecast for the Kenai River is approximately 4.0 million, which is 6% greater than the 20-year average run of 3.8 million. Age-1.3 sockeye salmon typically comprise about 63% of the run to the Kenai River. A sibling model based upon the return of age-1.2 sockeye salmon in 2011 (290,000; 20-year average is 358,000) predicted a return of 2.0 million age-1.3 sockeye salmon. A fry model based upon the abundance of age-0 fry rearing in Skilak and Kenai lakes in the fall of 2008 (20.1 million; 20-year average is 17.9 million) predicted a return of 2.2 million age-1.3 sockeye salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (27%) than the fry model (53%). Age-2.3 sockeye salmon typically comprise about 19% of the run to the Kenai River. A sibling model based upon

the return of age-2.2 sockeye salmon in 2011 (241,000; 20-year average is 246,000) predicted a return of 466,000 age-2.3 sockeye salmon in 2012. A fry-smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2009 (5.3 million: 95% confidence interval 2.6-8.0 million) predicted a return of 1.4 million age-2.3 sockeye salmon. The fry-smolt model was used for this forecast due to the high age-2 smolt abundance in 2009 and the failure of the sibling model to accurately predict large returns of age-2.3 sockeye salmon like that seen in 2011. However, there is considerable uncertainty in the age-2.3 sockeye salmon forecast due to the large difference between the sibling and smolt model forecasts and uncertainty in the 2009 smolt abundance estimate. The forecasted age-2.3 return is 194% greater than the 20-year average return for this age class (736,500). The predominant age classes in the 2012 run should be age 1.3 (50%), age 1.2 (8%), and age 2.3 (35%). The 10-year MAPE for the set of models used for the 2012 Kenai sockeye salmon run forecast was 23%.

The sockeye salmon run forecast for the Kasilof River is 754,000, which is 21% less than the 20-year average run of 950,000. Age-1.3 sockeye salmon typically comprise about 35% of the run to the Kasilof River. The forecast for age-1.3 sockeye salmon is 255,000, which is 23% less than the 20-year average return (332,000) for this age class. A smolt model based upon the abundance of age-1 sockeye salmon smolts in 2009 was used to forecast the return of age-1.3 sockeye salmon in 2012. The abundance of age-1 smolts in 2009 was 2.1 million, which is 51% less than the 20-year average abundance (4.3 million) for this age class. A sibling model predicted a return of 187,000 age-1.3 sockeye salmon. The smolt model was used for this forecast because the 10-year MAPE was lower for the smolt model (21%) than the sibling model (26%). Age-1.2 sockeye salmon typically comprise about 30% of the run. The forecast for age-1.2 sockeye salmon is 148,000, which is 47% less than the 20-year average return (280,000) for this age class. A smolt model based upon the abundance of age-1 smolts (1.8 million) in 2010 was used to forecast the return of age-1.2 sockeye salmon in 2012. A sibling model forecasted a return of 114,000 age-1.2 sockeye salmon. The smolt model was used for this forecast because the 10-year MAPE was lower for the smolt model (47%) than the sibling model (63%). Age-2.2 sockeye salmon typically comprise about 24% of the run. The forecast for age-2.2 sockeye salmon is 253,000, which is 12% greater than the 20-year average return (227,000) for this age class. A sibling model based upon the abundance of age-2.1 sockeye salmon in 2011 was used to forecast the return of age-2.2 sockeye salmon in 2012. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (34%) than the smolt model (38%). The smolt-model forecast for age 2.2 sockeye salmon was 186,000. The predominant age classes in the 2012 run should be age 1.2 (20%), age 1.3 (34%), and age 2.2 (34%). The 10-year MAPE for the set of models used for the 2012 Kasilof sockeye salmon run forecast was 17%.

The sockeye salmon run forecast for the Susitna River is 443,000, which is 50% less than the 20-year average run of 881,000. This forecast was derived from historical aggregate weir counts, rather than sonar and age composition catch allocation models, because recent mark–recapture studies have shown that the Yentna sonar project underestimated sockeye salmon escapement, causing estimates of adult returns to also be underestimated. Although, this is only the third year a weir-based method has been used, the MAPE for this method based on 2010–2011 data was 41%. The 20-year average run was calculated by expanding sonar abundance estimates using mark-recapture and genetic stock composition estimates.

The sockeye salmon run forecast for Fish Creek is 84,000, which is 27% less than the 20-year average run of 116,000. Age-1.2 and -1.3 sockeye salmon typically comprise 78% of the run to Fish Creek. A fry model based upon the estimated abundance of age-0 fry entering Big Lake in 2009 (2.8 million; 15-year average: 10.3 million) predicted a return of 37,000 age-1.2 sockeye salmon. A sibling model based upon the abundance of age-1.2 sockeye salmon returning in 2011 predicted a return of 28,000 age-1.3 sockeye salmon in 2012. The age-1.2 forecast is 38% less than the 20-year average return (61,000) for this age class, while the age-1.3 forecast is 5% less than the 20-year average return (30,000) for this age class. The predominant age classes in the 2012 run should be age 1.2 (44%), age 1.3 (34%), and age 2.2 (14%).

The sockeye salmon run forecast for Crescent River is 81,000, which is 27% less than the 20-year average run of 110,000. Age-1.3 and -2.3 sockeye salmon typically comprise 75% of the run to Crescent River. Sibling models based upon returns of age-1.2 and -2.2 sockeye salmon in 2011 were used to forecast returns of age-1.3 (37,000) and -2.3 (21,000) sockeye salmon in 2012. The predominant age classes in the 2012 run should be age 1.3 (46%) and age 2.3 (26%).

Run forecasts to individual freshwater systems are as follows:

System	Run	Escapement Goals
Crescent River	81,000	30,000–70,000
Fish Creek	84,000	20,000–70,000
Kasilof River	754,000	160,000–340,000
Kenai River	4,026,000	1,000,000-1,200,000[1]
Susitna River	443,000	NA[2]
Larson Lake	NA	15,000–50,000
Chelatna Lake	NA	20,000–65,000
Judd Lake	NA	25,000–55,000
Unmonitored Systems	808,000	NA
Total	6,196,000	

[1] This is the inriver sockeye salmon escapement goal measured using sonar at river mile 19 on the Kenai River.

[2] Susitna sockeye salmon are managed to achieve escapement goals at Larson, Chelatna and Judd lakes.

OTHER SALMON SPECIES

The preliminary forecast of the 2012 commercial harvest of other salmon species is as follows:

	Commercial Harvest Forecasts
Natural Production:	
Pink Salmon	334,000
Chum Salmon	113,000
Coho Salmon	159,000
Chinook Salmon	12,000

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2012. The forecast for pink salmon was based upon the average harvest during the past 5 even-numbered years.

Forecast Discussion

The recent 5-year average commercial harvest was used in the forecast, because regulatory changes have substantially restricted harvests of these species in recent years.

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