MARK-RECAPTURE POPULATION ESTIMATES OF COHO, PINK, AND CHUM SALMON RUNS TO UPPER COOK INLET IN 2002

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ABSTRACT

This project estimated the total population sizes, escapements, and exploitation rates for coho, pink, and chum salmon returning to Upper Cook Inlet (UCI) in 2002 as a first step toward determining escapement levels needed to achieve sustained yields for these species. Mark-recapture techniques were used to estimate the total population sizes for each species returning to UCI as a whole. Salmon were tagged along a transect running from Anchor Point to the Red River delta on the west side of Cook Inlet during July and early August. Total population sizes for each species were estimated from recoveries of passive integrated transponder (PIT) tags in commercial fishery harvests. Recoveries of radio telemetry tags were used to estimate the total escapement of coho salmon into all UCI streams for comparison to the estimate derived from PIT tags. Radio telemetry tag data were also used to estimate coho salmon escapements into 33 streams and 5 areas around UCI. Our best PIT tag estimate of the total population size of coho salmon returning to UCI was 2.52 million (95% CI: 2.16-2.87 million). Given a commercial harvest of 0.25 million, the total escapement of coho salmon into all UCI streams was 2.27 million (95% CI: 1.91-2.62 million), and the exploitation rate in the commercial fishery was about 10%. Our radio tag estimate of the total escapement of coho salmon into all UCI streams was 1.36 million (95% CI: 0.98-1.96 million). Thus, our PIT tagging experiment estimated a population size for coho salmon entering UCI streams that was higher than the estimate obtained from radio tagging. Although, the 95% confidence intervals around the two estimates overlapped slightly, the z-test statistic indicated the two estimates were significantly different. Of the total coho salmon escapement into all UCI streams, 56% (0.76 million) returned to the Susitna and Little Susitna River drainages, 19% (0.26 million) returned to streams along the west side of UCI, 17% (0.24 million) returned to streams along Knik Arm, 5% (0.07 million) returned to streams along Turnagin Arm, and 3% (0.04 million) returned to streams on the Kenai Peninsula. However, these estimates for Turnagin Arm and Kenai Peninsula streams do not include the entire escapement, because we stopped tagging before the runs to these areas were complete. Our PIT tag estimate of the total population size of pink salmon returning to UCI was 21.28 million (95% CI: 1.60-40.96 million). However, this estimate was of questionable value due to its very low precision resulting from problems with tag recovery. Therefore, we estimated a maximum exploitation rate on pink salmon in the commercial fishery by simply summing escapements that were actually enumerated in 3 streams. Given a commercial harvest of 0.45 million, the maximum exploitation rate in the commercial fishery was about 12%. However, the actual exploitation rate must have been much lower, because we did not include escapements into numerous other streams around UCI. Our PIT tag estimate of the total population size of chum salmon returning to UCI was 3.88 million (95% CI: 3.30-4.47 million). Given a commercial harvest of 0.24 million, the total escapement of chum salmon into all UCI streams was 3.64 million (95% CI: 3.06-4.23 million), and the exploitation rate in the commercial fishery was about 6%. Despite uncertainty in our salmon population estimates, it is reasonable to conclude that exploitation rates on coho, pink, and chum salmon in the UCI commercial fishery were substantially below optimal rates in 2002.

KEY WORDS: Coho salmon, *Oncorhynchus kisutch*, pink salmon, *O. gorbuscha*, chum salmon, *O. keta*, mark-recapture, passive integrated transponder tags, radio telemetry tags, total population size, escapement, exploitation rate.