adjustments were necessary at Ocean Beauty and Snug Harbor, because all detection tests were conducted with actual salmon heads at these plants. An ANOVA indicated that mean detection rates differed significantly ($p<0.001$) among processors and recovery strata. At Icicle Seafoods and Ocean Beauty, detection rates also differed ($p<0.05$) among processing lines. Mean detection rates (d_{kj}) ranged from 0.37 on line 3 to 0.98 on line 2 both at Icicle Seafoods (Table 8). The low rate on line 3 was due to the configuration of the processing equipment. This line was only used to process pink salmon.

Objective 5: Estimation of salmon population sizes and evaluation of sources of error

Of the 4,925 PIT tags applied to coho salmon, we detected 167 at the 7 salmon processors included in our study (Appendix A). When the total number of tags applied was adjusted for short-term tag mortality and tag loss, the effective number of tags released was reduced to 3,944 (Table 9). A short-term survival rate of 0.88 (SE=0.05) was used in this analysis, because this was the survival of coho salmon held less than 83 mins prior to tagging in our net pen study, and most of the coho salmon tagged in UCI were held for less time. When the number of tags recovered was adjusted for tag detection, the effective number of recovered tags was increased to 214. In every case, the peak number of recoveries from each release stratum occurred one week after release, and tags from each release stratum were recovered over a 3-4 week period after release. No tags were recovered from the first release stratum during the first week of July, and no tags were detected at processors during the first two recovery strata. These strata were dropped from the analysis. The remaining strata included 98% of the harvest that was scanned for tags. We attempted several different poolings. The final model, which produced the lowest standard error of the population estimate, involved pooling recovery strata for the weeks beginning July 14 and 21 (Table 10). This model resulted in 1 of 12 cells with $E[m_{ij}]<5$. The G^2 statistic for this model indicated no significant difference ($p=0.08$) between observed and fitted recoveries (m_{ij}). The estimated population size was 3.22 million with a 95% confidence interval from 2.76-3.68 million. The estimated population size was greatest during the middle of July. For comparison, the pooled Petersen population estimate was 3.19 million.

We also estimated the coho salmon population after adjusting the number of tags released for long-term tag mortality and tag loss. Long-term tag mortality was estimated from recoveries of radio-tagged coho salmon. We located 518 of 729 radio-tagged coho salmon released resulting in a long-term minimum survival of 0.71 (SE=0.02). The strata retained and the final pooling were the same as in the previous analysis. The G^2 statistic also indicated no significant difference ($p=0.08$) between observed and fitted recoveries (Table 11). The estimated population size was 2.52 million with a 95% confidence interval from 2.16-2.87 million. The estimated population size was greatest during the middle of July. For comparison, the pooled Petersen population estimate was 2.58 million.

Of the 5,333 PIT tags applied to pink salmon, we detected only 45 at processing plants (Appendix A). When the total number of tags applied was adjusted for short-term tag mortality and tag loss, the effective number of tags released was reduced to 4,809 (Table 12). When the number of tags recovered was adjusted for tag detection, the effective number of recovered tags was increased to 85. This relatively large adjustment to the tag recoveries for pink salmon resulted in large part, because the greatest numbers of pink salmon were processed at Icicle Seafoods, and all of these fish were processed on line 3, which had a fairly low tag detection rate. The peak number of recoveries from most release strata occurred one week after release with one exception. The peak number of recoveries from the last release strata occurred during the same week the fish were released. Also, the period of time over which tags were recovered was less for pink than coho salmon. Tags from each release strata were recovered over a 1-3 week period after release. As with coho salmon, no tags were recovered from the first release stratum, and no tags were detected at processors during the first two recovery strata. These strata were dropped from the analysis. The remaining strata included 99% of the harvest that was scanned for tags. Several different poolings were attempted, the final model involved

pooling recovery strata for the weeks beginning July 21 and 28 (Table 13). This model resulted in 6 of 12 cells with $E[m_{ij}]<5$. The G^2 statistic for this model indicated no significant difference ($p=0.61$) between observed and fitted recoveries (m_{ij}). The estimated population size was 21.28 million, but the precision was poor with a 95% confidence interval from 1.60-40.96 million. The estimated population size was greatest during the first week of August. For comparison, the pooled Petersen population estimate was 13.92 million.

Of the 5,071 PIT tags applied to chum salmon, we detected 154 at the 7 salmon processors included in our study (Appendix A). When the total number of tags applied was adjusted for short-term tag mortality and tag loss, the effective number of tags released was reduced to 4,568 (Table 14). When the number of tags recovered was adjusted for tag detection, the effective number of recovered tags was increased to 197. Tags were recovered in all recovery strata. Similar to pink salmon, the peak number of recoveries from most release strata occurred one week after release with one exception. The peak number of recoveries from the last release strata occurred during the same week the fish were released. Recovery strata beginning July 1 and August 4 were dropped from the analysis, because of the relatively small number of chum salmon scanned for tags and small number of tags recovered in these strata. The remaining strata included 92% of the harvest that was scanned for tags. We attempted several different poolings. The final model involved pooling release strata for weeks beginning July 1 and 7, and July 21 and 28. Also, recovery strata were pooled for weeks beginning July 7 and 14, and July 21 and 28 (Table 15). This model resulted in no cells with $E[m_{ij}]<5$. The G^2 statistic for this model indicated no significant difference ($p=0.95$) between observed and fitted recoveries (m_{ij}). The estimated population size was 3.88 million with a 95% confidence interval from 3.30-4.47 million. The estimated population size was greatest during early July. For comparison, the pooled Petersen population estimate was 3.74 million.

The probability of recapturing PIT tagged coho, pink, and chum salmon was not significantly related to the latitude where the fish were captured. However, the probability of recapturing PIT tagged chum salmon was significantly greater ($p<0.01$) when the fish were captured during a flood or slack tide (Table 16). When the data from all species were pooled, recapture probabilities were still significantly related to stage of tide ($p<0.01$). For all 3 species of salmon, the probability of recapturing PIT tagged salmon increased with the time fish were held on the tagging vessel, but the differences were only significant for chum salmon ($p=0.02$) and when data from all species ($p=0.01$) were pooled (Table 17). Results from a chi-square test also indicated that the probability of recapturing PIT tagged salmon was significantly different ($p<0.01$) among six length classes of salmon (Table 18). Comparison of recovery probabilities and salmon length distributions indicated that the numbers of tags recovered from the smaller pink salmon were likely reduced due to the selective nature of gillnet harvests. The tagged-to-untagged ratio for coho salmon did not differ ($p>0.05$) among seven processors, but this ratio did differ ($p<0.05$) among processors for pink and chum salmon (Table 19). This result did not change when the number of tag recoveries was adjusted for tag detection rates measured at each processor. Tagged-to-untagged ratios were consistently higher at Icicle Seafoods and Ocean Beauty.

Objective 6: Radio telemetry study on coho salmon

In 2001, 67 coho salmon were radio tagged and 41 (68%) were later located in the UCI area. Nine percent of these fish were returned from commercial fishery and 54% were found in streams. In 2002, 729 coho salmon were radio tagged and 518 (71%) were later located in the UCI area. Seven percent of these fish were returned from the commercial fishery, 4% were returned from the recreational fishery, 69% were located in freshwater by either an aircraft or fixed receiver, 17% were located by aircraft in the intertidal zone but were not later located in freshwater, and 3% were either returned to ADF&G without any additional information or were imprecisely located by other means. The fates of the tagged salmon were somewhat related to their dates of release from the tagging vessel. Sixty-four percent of the tags returned