Exxon Valdez Oil Spill
Restoration Project Final Report

Coded Wire Tag Recoveries from Pink Salmon in
Prince William Sound Salmon Fisheries, 1994 to 1997

Restoration Project 97186
Final Report

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Study History: The coded wire tag program in Prince William Sound was initiated in 1986 to partition returns of pink salmon into wild and hatchery stocks. After the *Exxon Valdez* oil spill, the program was incorporated into Natural Resource Damage Assessment Fish/Shellfish Study 3 (Coded wire tag studies on Prince William Sound salmon), which documented effects of the spill on wild pink salmon by comparing survival rates at oiled and unoiled streams, as well as through estimation of hatchery and wild stock returns. The project effort was continued under Restoration Studies R60A (Coded wire tag studies on Prince William Sound pink salmon, 1992), 93067 (Coded wire tag recoveries from pink salmon in Prince William Sound salmon fisheries, 1993), 94320B (Coded wire tag recoveries from pink salmon in Prince William Sound salmon fisheries, 1994), 95320B (Coded wire tag recoveries from pink salmon in Prince William Sound salmon fisheries, 1995), 96186 (Coded wire tag recoveries from pink salmon in Prince William Sound salmon fisheries, 1996), 97186 and currently, 98186 (Coded Wire Tag Recoveries from Pink Salmon in Prince William Sound Salmon Fisheries, 1994 to 1997).

Abstract: From 1993 to 1996, between 0.49 and 0.64 billion pink salmon fry were released annually into Prince William Sound from the A.F. Koernig, W.H. Noerenberg, Cannery Creek, and Solomon Gulch hatcheries, of which 0.940 to 1.07 million were tagged with half length coded wire tags. Tags were recovered in Prince William Sound fisheries the year after their release, and estimates of hatchery contributions based upon detected tags were given to management biologists on an inseason basis. Except for 1995, these preliminary estimates agreed well with postseason estimates derived from fully decoded tags. Preliminary estimates were much higher than postseason estimates in 1995 in certain districts because of extremely high survival rates of experimental release lots that had been tagged at three times the normal rate. Total annual catches of hatchery pink salmon between 1994 to 1997 ranged from 13 million to 30 million adults, while total catches of wild pink salmon ranged from 3 million to 8 million. A historical adjustment factor was used to compensate for differential mortality and tag loss and was calculated as the average of available adjustment factors for W.H. Noerenberg hatchery from 1989 to 1996. Between 1994 and 1996, the pink salmon hatchery survival rates dropped for Solomon Gulch hatchery, rose for A.F. Koernig hatchery, and fluctuated for Cannery Creek and W.H. Noerenberg hatcheries.

Key Words: Coded wire tag, commercial harvest, hatchery, *Oncorhynchus gorbuscha*, pink salmon, Prince William Sound, wild stock.

Project Data: The collected data are stored in two Rbase™ database tables. One table contains data about the fishery samples, while the other contains data about the individual salmon heads collected from these samples. The sample table fields include: sample identity number, number of heads collected, number of heads which contained tags, species, harvest type, harvest location, week, processor, date sold, number of salmon sampled, gear type, tender name, port, and percentage of catch coming from the separate Prince William Sound districts. The table with

information on individual salmon heads contains the following fields: sample identity number, head number, harvest type, district, week, date sold, processor, tag code, hatchery of origin, length of salmon, quality of adipose finclip, and stream number (as catalogued by the Alaska Department of Fish and Game). In addition to the sample and head tables, data taken from fish tickets, daily brood stock information, processor codes, hatchery codes, species codes, and statistical week designations are also included in the Rbase^{TM} database. A separate RBase^{TM} database exists for each year. The data are available in database format, or as ASCII files.

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EXECUTIVE SUMMARY

This report summarizes Restoration Studies 94320B, 95320B, 96186, and 97186. The projects provided information to management biologists attempting to restore stocks of wild Prince William Sound pink salmon *Oncorhynchus gorbuscha* to their pre-spill status. Coded wire tags were applied from 1993 to 1996 at four hatcheries in Prince William Sound, the W.H. Noerenberg, Cannery Creek, A.F. Koernig, and Solomon Gulch facilities. The tags were recovered in the commercial catch from 1994 to 1997 and used to provide inseason estimates of hatchery contributions. These estimates were used by fishery managers to target numerically superior hatchery returns, and thus to reduce the pressure placed upon oil-damaged wild stocks. Inseason estimates were made in two stages. Preliminary estimates were based solely on detected tags (not extracted) and were made available to managers upon completion of sampling. These estimates were updated three to seven days later with coded information obtained from extracted tags.

Postseason analysis revealed that between 1994 and 1997, wild pink salmon comprised between 3.1 million and 8.06 million adults in the commercial harvest. The annual hatchery pink salmon component ranged from 13.8 million to 29.9 million adults. Solomon Gulch released the largest number of pink salmon, and provided the largest portion of the hatchery component. Returns to the A.F.Koernig hatchery were the lowest of all of the hatcheries from 1994 to 1996, increasing to the second largest hatchery component in 1997. The pink salmon returns to Cannery Creek and W.H. Noerenberg hatcheries fluctuated between 3.2 million and 9.4 million adults for Cannery Creek, and 2.4 million and 6.2 million adults for W.H. Noerenberg. Between 1994 and 1996, the pink salmon hatchery survival rates dropped for the Solomon Gulch hatchery, rose for the A.F. Koernig hatchery, and fluctuated for the Cannery Creek and W.H. Noerenberg hatcheries.

INTRODUCTION

Between 1961 and 1976, prior to the establishment of hatcheries in Prince William Sound, the commercial seine harvest averaged about 3.4 million pink salmon *Oncorhynchus gorbuscha*. In the early 1970's, run failures led to an aggressive enhancement program that included construction of hatcheries. By 1986, five hatcheries were operating (Figure 1): the Solomon Gulch hatchery produced pink salmon, and later, also chum salmon *O. keta* and coho salmon *O. kisutch;* the A.F. Koernig hatchery produced pink salmon; the W.H. Noerenberg hatchery produced pink salmon, and later, also chum, coho and chinook salmon *O. tschawytsch;* the Cannery Creek hatchery produced pink salmon; the Main Bay hatchery, which originally produced chum presently raises sockeye salmon *O. nerka*.

Supplemental hatchery salmon production complicated management of commercial salmon fisheries in Prince William Sound. Hatchery salmon stocks can tolerate much higher harvest rates than wild salmon stocks, and different management strategies should be applied to them. Such a management regime requires knowledge of the location of hatchery and wild stocks in time and space. In order to collect information about the spatial and temporal distributions of hatchery and wild pink salmon, a coded wire tagging program was initiated in 1986 for hatchery releases of pink salmon, with recovery of tagged returning adults in commercial and cost recovery fisheries beginning in 1987. Tag recovery data enabled managers to estimate hatchery and wild contributions to catches from strata within the fishery.

The March 24, 1989, *Exxon Valdez* oil spill exacerbated the many problems faced in management of the Prince William Sound pink salmon fishery. The spill contaminated intertidal portions of streams where most wild pink salmon stocks in western Prince William Sound spawn as well as the marine waters traversed by juvenile pink salmon on their migration seaward through the Sound. Decisions made by fishery managers suddenly became more complicated insofar as they affected wild populations injured by the oil spill. The coded wire tagging program was expanded under the Natural Resource Damage Assessment study F/S 3 (Sharr et al, 1995a) and Restoration Study R60A (Sharr et al, 1995b) to include tagging of wild pink salmon in order to examine survival rates of wild salmon in oiled versus unoiled streams. In recent years, the emphasis of the program has been to provide management biologists with timely data on the relative abundance of wild and hatchery stocks, so that they could target fishing effort on hatchery stocks and protect recovering wild stocks. From 1994 to 1997, the program was supported by the *Exxon Valdez* Oil Spill Trustee Council, along with matching funds from the Prince William Sound Aquaculture Corporation (PWSAC), Valdez Fisheries Development Association (VFDA), and the State of Alaska.

This report documents the activities and results of the coded wire tag program for the recovery years 1994 through 1997. It focuses primarily upon hatchery contributions to the different fisheries, survival rates of different hatchery release groups, and inseason

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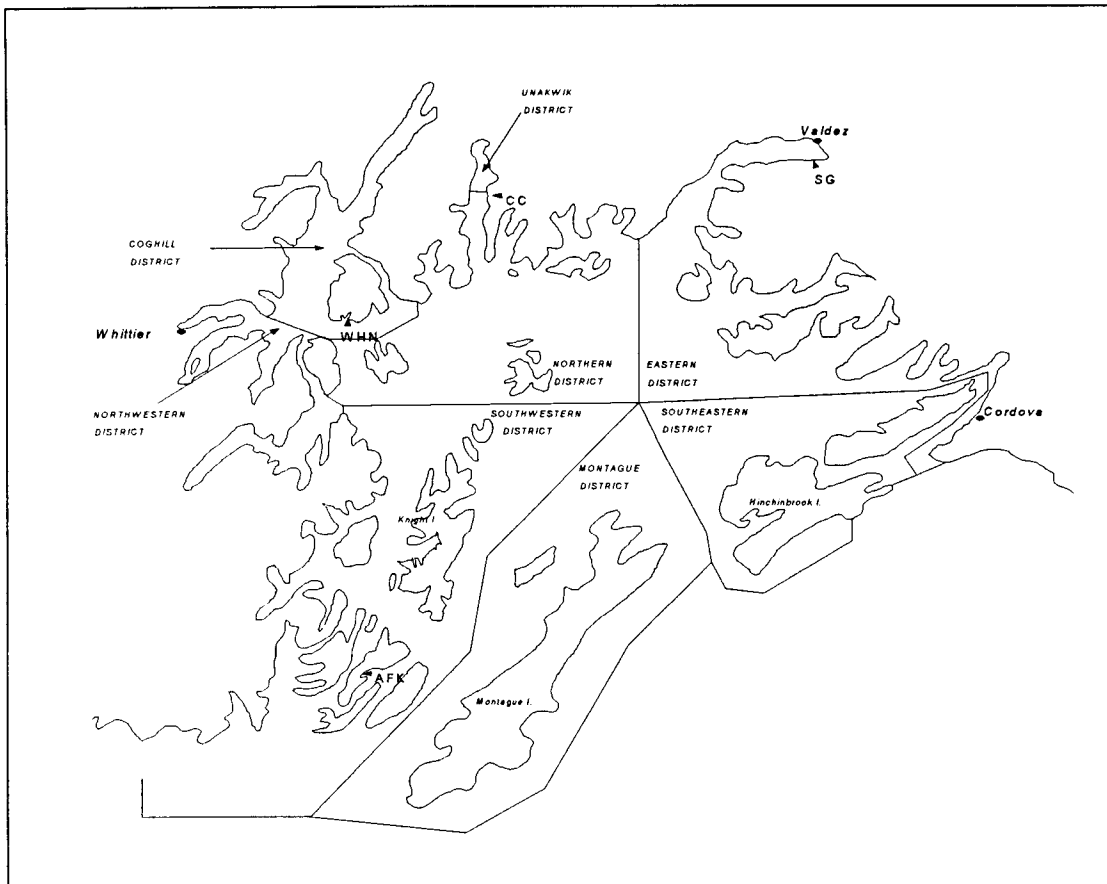
Figure 1. Fishing districts and hatcheries of Prince William Sound, Alaska. Pink salmon hatcheries: W.H.N.=W.H. Noerenberg, SG=Solomon Gulch, CC=Cannery Creek, AFK=A.F. Koernig.

estimates of contributions. Aggregated data are presented in the main body of the document, while more specific data are placed in the appendices

OBJECTIVES

1. To provide estimates of wild and hatchery components of the pink salmon commercial fisheries from 1994 through 1997 to fishery managers on an inseason basis, so that fishing effort could be directed towards hatchery stocks.

2. To estimate marine survival rates for each uniquely coded hatchery release group returning in years 1994 through 1997.

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3.   To evaluate the method selected in 1993 for inseason analysis of coded wire tag data, whereby a historical adjustment factor and numbers of detected (undecoded) tags are used to estimate the hatchery and wild contributions.

METHODS

Tagging

Technicians hired by the aquaculture associations tagged pink salmon fry at the three PWSAC facilities (W.H. Noerenberg, Cannery Creek, and A.F. Koernig hatcheries) and at the VFDA facility (Solomon Gulch hatchery). Tagging rates and recovery efforts were selected that would yield contribution estimates of sufficient precision to allow fishery managers to make meaningful inseason decisions. Assuming a potential sampling rate of 20% for commercial and cost recovery harvests, and following an analysis of the performance of previous tagging studies (Peltz and Miller 1990; Peltz and Geiger 1990; Geiger and Sharr 1990), an overall tagging rate of approximately one coded wire tag per 600 pink salmon (a tagging rate of 0.001667) was chosen. A different tag code was given to each release group that represented a batch of pink salmon subjected to a certain feeding regimen (early feeding, late feeding or no feeding), and release timing. A portion of the pink salmon fry released between 1993 and 1995 were part of a continuing Sound Ecosystem Assessment (SEA) experiment to ascertain whether juveniles above 60 mm in length experienced greater survival rates than smaller juveniles. The 1993 and 1994 SEA experimental releases were tagged at a much higher rate than other release groups.

Pink salmon fry to be tagged were randomly selected as they emerged from incubators. Fry were anesthetized in a 1 ppm solution of MS-222 prior to removal of adipose fins and application of tags. Half-length coded wire tags were applied with a Northwest Marine Technology (Shaw Island, Washington) tag injector (model MKIV). Adipose fin-clipped and tagged salmon were passed through an electronic quality control device to test for tag retention. Rejected salmon were held and retested later. If rejected a second time, they were killed to minimize the number of untagged clipped salmon in the release. Fry which retained tags were held in fresh water overnight at the PWSAC hatcheries and for 72 hours at the VFDA hatchery, to determine short-term mortality and tag shedding. Hatchery personnel determined mortality rates by counting the number of pink salmon floating on the surface (floaters) after the holding period. The tag shedding rate was estimated by randomly selecting 200 pink salmon and testing them with the quality control device before release into saltwater rearing pens. Tag placement was checked periodically, but not quantified.

At the PWSAC hatcheries, after the overnight holding period and prior to release, all tagged fry were introduced into small saltwater pens within larger pens holding their unmarked cohorts. This additional separation allowed determination of short-term saltwater mortalities through enumeration of floaters. At VFDA's Solomon Gulch hatchery, tagged fry were transferred to the saltwater net pen holding their unmarked cohorts following a 72 hr. mortality check in freshwater; no saltwater mortality estimate

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was made on tagged pink salmon. The number of fry released with tags of tag code t, Tr_t, was estimated for each release group by deducting both short-term tagging and saltwater rearing mortalities (for PWSAC facilities) from the number of fry initially tagged and accounting for tag loss :

$$\hat{Tr}_t = (T_t - Mo_t - Msw_t)(1 - \hat{Lo}_t),\qquad (1)$$

where

T_t	=	total number of tagged (t) salmon
Mo_t	=	number of deaths during holding period among tagged (t) salmon
Msw_t	=	number of deaths during saltwater rearing period among tagged (t) salmon (PWSAC only); and,
Lo_t	=	proportion of tagged (t) salmon which lost their tags during the holding period.

At the PWSAC hatcheries, unmarked pink salmon fry entering the large saltwater rearing pens were enumerated with electronic fry counters. Fry mortalities were estimated visually immediately prior to release and were applied equally to tagged and untagged pink salmon to obtain final release estimates. With the exception of experimental release groups, fry releases were timed to coincide with peak plankton abundance near the hatcheries. The VFDA hatchery estimated the number of pink salmon entering the large saltwater pens by estimating the number of fry that emerged from the incubators supplying pink salmon to the pens.

Tag Recovery

Commercial and Cost Recovery Harvests

Recoveries were stratified by district, week, and processor. This stratification was chosen as a result of the findings of Peltz and Geiger (1990), who detected significant differences between the proportions of some tag codes among such strata. These differences indicated that processors tend to receive catches from only certain parts of a district, and is believed to be the result of traditional tendering patterns.

Recoveries of pink salmon tags from commercial and cost recovery harvests were made after each fishery opening, as salmon were pumped from tenders onto conveyor belts at land based processors located in Cordova, Valdez, Seward, Whittier, and aboard one or two floating processors in PWS. Technicians sampled pink salmon that were moving down the conveyer belt, and subjected each sampled pink salmon to a visual and tactile examination for a missing adipose fin.

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Data recorded for each tender included harvest type (i.e. commercial or cost recovery catch), fishing district(s), catch date, processor, and the number of salmon examined. Catch data were later verified from fish tickets.

Technicians excised the heads of pink salmon marked with an adipose fin clip, identified them with a uniquely numbered cinch strap and placed them in plastic bags. Once sampling was completed, individual heads were passed through a Northwest Marine Technology field sampling tag detector. The detector produced an audible signal upon detection of a metal tag in the head. This procedure yielded actual numbers of tags in the sample, and could be implemented immediately after the sample was taken.

All heads were then frozen, and together with sample data, were shipped twice weekly from each site to the Alaska Department of Fish and Game Coded Wire Tag Processing Laboratory in Juneau (Tag Lab). Tag Lab staff located and removed tags from heads, decoded extracted tags, and entered tag code and sample data into a database accessible to biologists in Cordova.

Brood Stock Harvests

Hatchery brood stocks were scanned for tags in order to estimate adjustment factors that could be used to account for loss of tags from the population. Three assumptions inherent in the use of the brood stock for this purpose are: a) the brood stock consists only of pink salmon reared at the hatchery, b) the tendency for a tagged pink salmon to lose a tag or to die is similar for all pink salmon marked at the same hatchery, and c) for a specific tag code, the marking rate in the commercial fishery is the same as that in the brood stock. Work by Sharr et al. (1995b) indicates that the first of these assumptions is likely violated at all facilities except the W.H. Noerenberg hatchery. Consequently, only the adjustment factor calculated from the brood stock at the W.H. Noerenberg hatchery was used as the basis of adjustments for tag shedding and differential mortality at all hatcheries. A historical average W.H. Noerenberg adjustment factor was used for both inseason and postseason estimations..

The adjustment factor for hatchery h, a_h, was estimated as the ratio of sampled pink salmon in the brood stock to the expanded number of pink salmon based on tags found in the sample :

$$\hat{a}_h = \frac{s_h}{\sum_i^T \frac{x_i}{p_i}} \qquad (2)$$

where

T = number of tag codes released from hatchery h,

$$p_i \quad = \quad \text{tagging rate at release for the } i\text{th tag code (defined as}$$

p_i = tagging rate at release for the ith tag code (defined as number of tagged pink salmon released with the ith code divided by the total number of salmon in release group i),

x_i = number of tags of the ith code found in s_h and,

s_h = number of brood stock pink salmon examined in hatchery h.

The W.H. Noerenberg historical average adjustment factor was then used to adjust contribution estimates (Equation 3), if it was significantly greater than 1.0 at the 90% level. An appropriate test of the hypothesis : $Ho : a_h \leq 1$ is given in Sharr *et al.* (1995a).

Estimation of Contributions and Survival Rates

Postseason Hatchery Contributions and Survival Rates

The contribution of release group t to the sampled common property, cost recovery, brood stock and special harvests, as well as the escapement, C_t, was estimated as:

$$\hat{C}_t = \sum_{i=1}^{L} x_{it} \left(\frac{N_i \hat{a}}{s_i p_t} \right), \tag{3}$$

where

x_{it} = number of group t tags recovered in the ith stratum,

N_i = total number of pink salmon in the ith stratum,

s_i = number of pink salmon sampled from the ith stratum,

p_t = proportion of group t tagged,

a = historical adjustment factor associated with W.H. Noerenberg facility,

L = number of recovery strata associated with common property, cost-recovery, brood stock, special harvests and escapement in which tag code t was found.

The contribution of release group t to unsampled strata, Cu_t, was estimated from contribution rates associated with strata which were sampled from the same district-week openings as the unsampled strata:

$$\hat{Cu}_t = \sum_{i=1}^{U} \left[N_i \left(\frac{\sum_{j=1}^{s} \hat{C}_{tj}}{\sum_{j=1}^{s} N_j} \right) \right], \tag{4}$$

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where

U = number of unsampled strata,

N_i = number of pink salmon in ith unsampled stratum

S = number of strata sampled in the period in which the unsampled stratum resides,

C_{tj} = contribution of release coded with tag t to the sampled stratum j, and

N_j = number of pink salmon in jth sampled stratum.

When a district-week opening was not sampled at all (an infrequent occurrence), the catch from that opening was treated as unsampled catch from the subsequent opening in the same district.

An estimate of the contribution of tag group t to the total Prince William Sound return for each year was obtained through summation of contribution estimates for sampled and unsampled strata. An estimate of the total hatchery contribution to the Prince William Sound return was calculated through summation of contributions over all release groups.

A variance approximation for $\hat{C}_t$, derived by Clark and Bernard (1987) and simplified by Geiger (1990) was used:

$$\hat{V}(\hat{C}_t) = \sum_{i=1}^{L} x_{it} \left[\frac{N_i \hat{a}}{s_i p_t} \right] \left[\frac{N_i \hat{a}}{s_i p_t} - 1 \right].$$ (5)

Assuming that covariances between contributions of different release groups to a stratum could be ignored, summation of variance components over all tag codes provided an estimate of the variance of the total hatchery contribution. Inspection of the formula given by Clark and Bernard (1987) for the aforementioned covariances shows them to be negligible for large N and s, and to be consistently negative, so that when ignored, conservative estimates of variance are obtained. Variances associated with unsampled strata are believed to be small (Sharr et al,1995c).

The survival rate of the release group coded with tag t (S_t), was estimated as:

$$\hat{S}_t = \frac{\hat{C}_t + \hat{C}u_t}{R_t},$$ (6)

where,

C_t = contribution of release group coded with tag t to sampled strata,

Cu_t = contribution of release group coded with tag t to unsampled strata,

R_t = total number of pink salmon in release group coded with tag t released from hatchery.

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Assuming the total release of pink salmon associated with a tag code is known with negligible error, and that the cumulative variance contributions associated with the unsampled strata are small, a suitable variance estimate for S_t is given by:

$$\hat{V}(\hat{S}_t) = \frac{\sum_{i=1}^{L} x_{it} \left[\frac{N_i \hat{a}}{s_i p_t} \right] \left[\frac{N_i \hat{a}}{s_i p_t} - 1 \right]}{R_t^2}. \tag{7}$$

Inseason Hatchery Contributions

Two inseason estimates of hatchery contributions of pink salmon were generated for each opening. The first and most timely estimate was made using the method suggested by Sharr et al. (1995c). This method depended on the number of (unread) detected tags. These are tags revealed by a Northwest Marine Technology field tag detector in heads of adipose-clipped pink salmon recovered during sampling. Estimates using (unread) detected tags required that assumptions be made about adjustment (a) and expansion ($1/p_t$) factors (see Equation 3). For inseason estimation, the average historical factor associated with the W.H. Noerenberg hatchery calculated from previous years data was used in the calculations. For example, in the 1997 season, the 1989 to 1996 W.H. Noerenberg historical adjustment factor was used. For fishery openings in the western and northern portions of Prince William Sound, late run hatchery returns to the PWSAC facilities were assumed to be the only hatchery contributors. For openings in the Southwestern district in 1997, an expansion factor of 599 was used; this is a weighted average of all expansion factors associated with tags released at the A.F. Koernig (593), W.H. Noerenberg (591) and Cannery Creek (626) hatcheries in 1996. The weighting scheme depended upon historical contributions of hatcheries to the Southwestern district. Using a similar weighting scheme for the Coghill and Northern districts, expansion factors of 598 and 619 were calculated and used in the 1997 season. For openings in the Eastern district, the early run hatchery returns to Solomon Gulch were assumed to be the only hatchery contributors, and an expansion factor of 594 was used. This number (594) is the average of all expansion factors associated with releases from the VFDA facility in 1996. The second method, which used fully decoded data, was presented less frequently to the management biologists during the season. Fully decoded data were usually available about one week after heads were collected, and results were not as useful in making management decisions. Calculations of inseason contributions were consistent with those used to generate postseason results (Equation 3). Postseason estimation is a more thorough, but less timely method which uses data from extracted and fully decoded tags, and which allowed tag specific expansion factors to be used.

RESULTS

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Tagging and Sampling Rates

Tagging Rates

Table 1 presents information on the pink salmon fry released from the A.F. Koernig, W.H. Noerenberg, Cannery Creek and Solomon Gulch hatcheries between 1993 and 1996. During this time, the Solomon Gulch hatchery has consistently increased the number of pink salmon released. The size of the releases at the other hatcheries has fluctuated.

Tagging rates for all hatchery releases are set at about 0.0017, or one pink salmon fry tagged for every 600 released. However, five lots of pink salmon, comprising 1.7 million fry in 1993 and 14.7 million fry in 1994 were tagged at much higher rates. The tagging rate was about 0.007 for the 1993 release, and about 0.005 for the 1994 release. Also, in the 1994 release at the W.H. Noerenberg hatchery, a group of about 20,000 tagged pink salmon fry was inadvertently dumped into the wrong pen. The tag code was voided, so that the individuals tagged with the voided tag code did not represent any untagged cohorts. From 1995 onward, the tagging rate returned to 0.007 for all release lots.

Sampling Rates

The sampling rates achieved for various Prince William Sound fisheries are presented in Table 2. The coded wire tag estimates for individual strata were sometimes associated with wide confidence intervals, often encompassing 30% of the harvest. A sampling goal of 20% was established to partially offset the low tagging rate of 0.0017. Given the speed at which pink salmon were moved during offloading at the processors, it was physically impossible for one or two samplers to examine more fish during the offloading stage, and virtually every tender load had to be examined to achieve a sampling rate of 20%. During years of large returns, the 20% sampling rate could not be achieved; however, precision did not necessarily suffer because larger catches were associated with a greater absolute number of recovered tags. Nearly all of the brood stocks were examined for coded wire tags, in part to ensure the calculation of accurate adjustment factors.

Table 1.   Pink salmon tagging data for hatchery releases into Prince William Sound, from 1993 to 1996.

Hatchery	Fry Released (in Millions)	Fry Tagged	Number of Tag Codes	Range of Tagging Rates
Released in 1993, returned in 1994.				
Solomon Gulch	141.865	235,764	6	0.00162 – 0.00168
Cannery Creek	140.030	232,526	14	0.00161 – 0.00168
W. H. Noerenberg	172.087	284,957	14	0.00164 – 0.00168
A.F. Koernig	113.337	197,779	16	0.00163 – 0.00657
Total	567.320	951,026	50	
Released in 1994, returned in 1995				
Solomon Gulch	149.474	305,678	6	0.00169 – 0.00233
Cannery Creek	84.617	141,104	9	0.00166 – 0.00169
W.H. Noerenberg	162.407	316,171	17	0.00165 – 1.000 [1]
A.F. Koernig	92.078	178,858	16	0.00159 – 0.005
Total	488.576	941,811	48	
Released in 1995, returned in 1996				
Solomon Gulch	205.371	337,834	8	0.00169 – 0.00168
Cannery Creek	130.339	217,554	14	0.00164 – 0.00169
W.H. Noerenberg	162.548	270,481	14	0.00151 – 0.00171
A.F. Koernig	102.598	171,119	15	0.00167 – 0.00168
Total	600.856	996,988	51	
Released in 1996, returned in 1997				
Solomon Gulch	223.088	376,203	4	0.00159 – 0.00169
Cannery Creek	140.441	224,045	14	0.00148 – 0.00167
W.H.Noerenberg	169.509	285,130	26	0.00163 – 0.00184
A.F. Koernig	108.637	183,098	13	0.00163 – 0.00175
Total	641.675	1,068,476	57	

[1] The tagging rate of 1.00 was due to a group of tagged fish being inadvertently dumped into the wrong pen. The tag code was then voided and the tagged fish represented only themselves, resulting in a tagging rate of 1.0. The next highest tagging rate was 0.005.

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Table 2. Percent of harvest sampled for coded wire tags in Prince William Sound pink salmon fisheries from 1994 to 1997.

Year	Common Property	Cost Recovery	Rack
1994	16.5	19.1	88.6
1995	25.4	24.3	98.7
1996	18.3	23.7	80.6
1997	16.3	17.4	86.9

Tag Recoveries

Overall Contributions

The total annual pink salmon harvest between 1994 and 1997 ranged from 17 to 37 million adults (Table 3). The 1995 harvest of 17 million was slightly below the median catch for 1980 through 1997, when hatchery production comprised an important part of the harvest. The 1994 pink salmon harvest of 37 million was the second highest on record. Of the four hatcheries, the Solomon Gulch facility has been the largest contributor of pink salmon to the catch (Figure 2). Hatchery contribution for the Cannery Creek and W.H. Noerenberg hatcheries were estimated to be either second or third largest for 1994 to 1996. The A.F. Koernig hatchery produced the smallest number of hatchery pink salmon from 1994 to 1996, but rebounded from its slump to become the second largest contributor to the pink salmon catch in 1997.

In general, the inseason estimates calculated from detected tags corresponded closely to postseason estimates using fully decoded tags, provided the pink salmon had been tagged at roughly the same rate. Of all of the districts, the Eastern district inseason estimates agreed most closely with postseason estimates (Figure 3). The inseason estimates for the Southwestern district generally agreed with the postseason estimates, except for 1995 (Figure 4).

Test Fishery Catches

In order to facilitate decisions regarding the opening of the Southwestern district to commercial fishing, the Alaska Department of Fish and Game developed a test fishery. The utility of the test fishery depends upon temporal differences in the migration of wild and hatchery stocks through the fishery. A successful example of a district-wide test fishery occurred in 1994, when the passage of hatchery pink salmon into Prince William Sound was monitored using detected coded wire tags recovered in the test fishery (Figure 5). The test fishery was terminated after the number of wild pink salmon caught dropped markedly, and the number of hatchery pink salmon increased. The 1995 test fishery data were more difficult to interpret. An overzealous crew on a seine boat made considerably more than three sets at its designated sampling station. Unfortunately, the catch for that boat could not be separated from those from other boats, and the data point for 7/31 – 8/01 was therefore biased. More in depth data on the test fishery catches can be found in Appendix A.

A test fishery was not conducted during 1996 and 1997. Poor market prices for pink salmon reduced the number of boats fishing, and those that did so clustered around the hatcheries. This situation reduced the interception of pink salmon stocks migrating through the district, thereby reducing the need for temporal and/or spatial closures within the fishing districts.

Table 3.　　Estimates of hatchery contributions (in millions of fish) to the Prince William Sound pink salmon fisheries from 1994 to 1997.

Contributor	Common Property	Cost Recovery	Brood Stock	Special or Test Fishery	Total Contribution	95% Bounds
1994						
Solomon Gulch	9.647	2.658	0.256	0.006	12.568	11.89 – 3.25
Cannery Creek	6.800	2.423	0.160	0.019	9.401	8.87 – 9.94
W.H. Noerenberg	4.163	1.582	0.394	0.013	6.223	5.87 – 6.57
A.F. Koernig	0.563	0.950	0.203	0.019	1.735	1.54 – 1.94
Hatchery	21.173	7.614	1.013	0.056	29.926	28.97– 30.89
Wild	5.005	2.811	0.366	0	8.060	
Grand Total	26.178	10.425	1.380	0.056	37.986	
1995						
Solomon Gulch	3.809	2.536	0.408	0.004	6.757	5.97 – 7.54
Cannery Creek	2.621	0.411	0.123	0.017	3.173	2.94 – 3.41
W.H. Noerenberg	1.188	0.856	0.314	0.01	2.367	2.21 – 2.53
A.F. Koernig	0.199	0.449	0.131	0.002	0.782	0.67 – 0.90
Hatchery	7.818	4.252	0.976	0.034	13.081	12.24 – 13.92
Wild	2.976	0.838	0.147	0.106	4.069	
Grand Total	10.799	5.090	1.122	0.140	17.150	
1996						
Solomon Gulch	4.869	2.017	0.349		7.234	6.71 – 7.79
Cannery Creek	3.679	0.854	0.166		4.699	4.29 – 5.11
W.H. Noerenberg	2.991	2.264	0.477		5.730	5.26 – 6.20
A.F. Koernig	1.971	0.004	0		1.976	1.73 – 2.22
Hatchery	13.510	5.139	0.992		19.641	18.86 – 20.42
Wild	4.199	3.144	0.276		7.619	
Grand Total	17.709	8.283	1.267		27.259	
1997						
Solomon Gulch	4.326	2.430	0.253		7.008	6.51 – 7.49
Cannery Creek	3.140	1.144	0.231		4.156	3.82 – 5.21
W.H. Noerenberg	3.070	2.142	0.412		5.624	5.05 – 6.20
A.F. Koernig	3.418	3.188	0		6.606	4.94 – 7.20
Hatchery	13.954	8.904	0.896		23.754	22.23 – 25.28
Wild	1.926	0.911	0.191		3.029	
Grand Total	18.880	9.815	1.087		26.783	

Figure 2.   Estimated hatchery and wild stock contributions to Prince William Sound pink salmon commercial catches from 1994 to 1997.
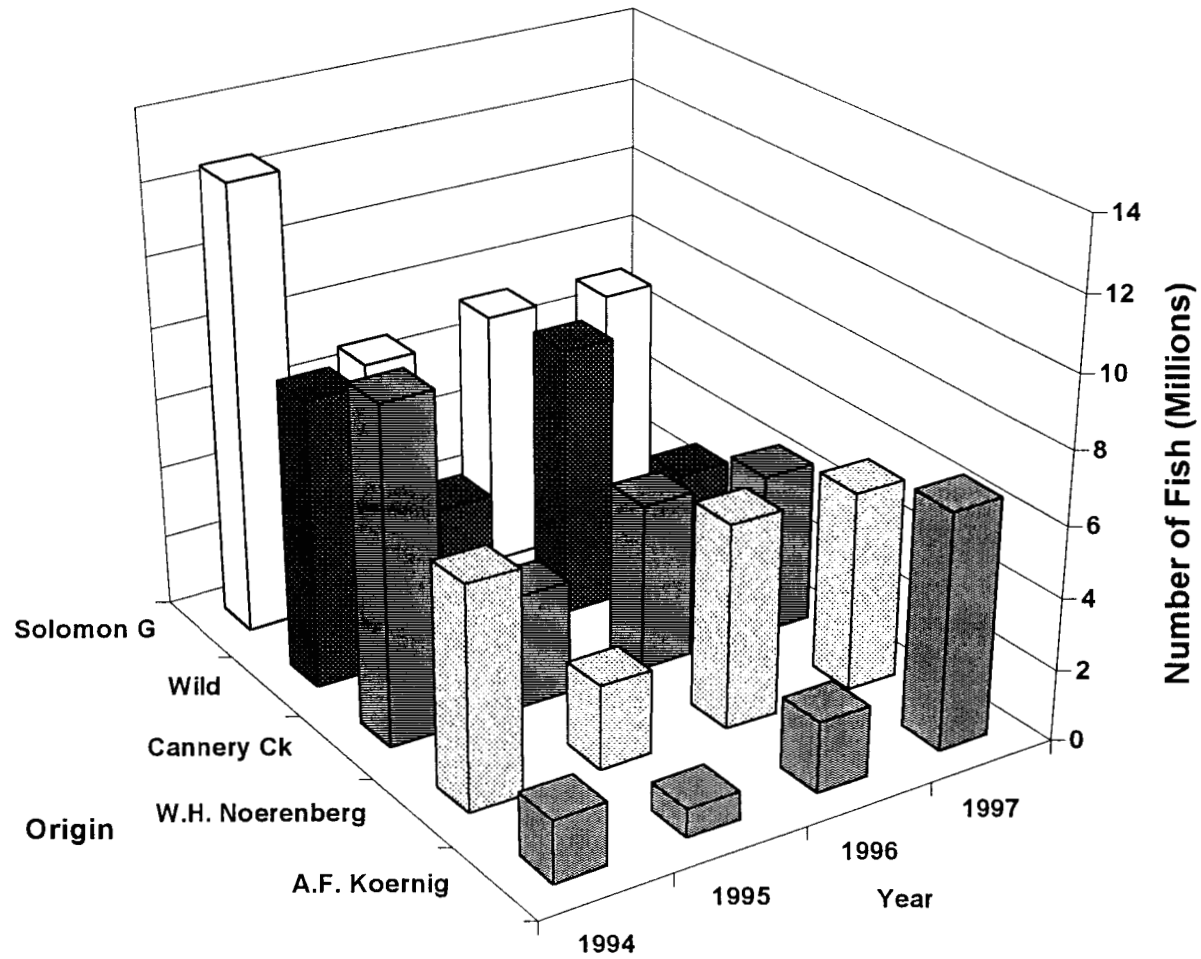
Figure 3.   Comparison of inseason and postseason estimates of hatchery contributions to the Eastern district common property fishery from 1994 to 1997.

1994

1995

1996

1997

◆ Inseason   ◼ Postseason
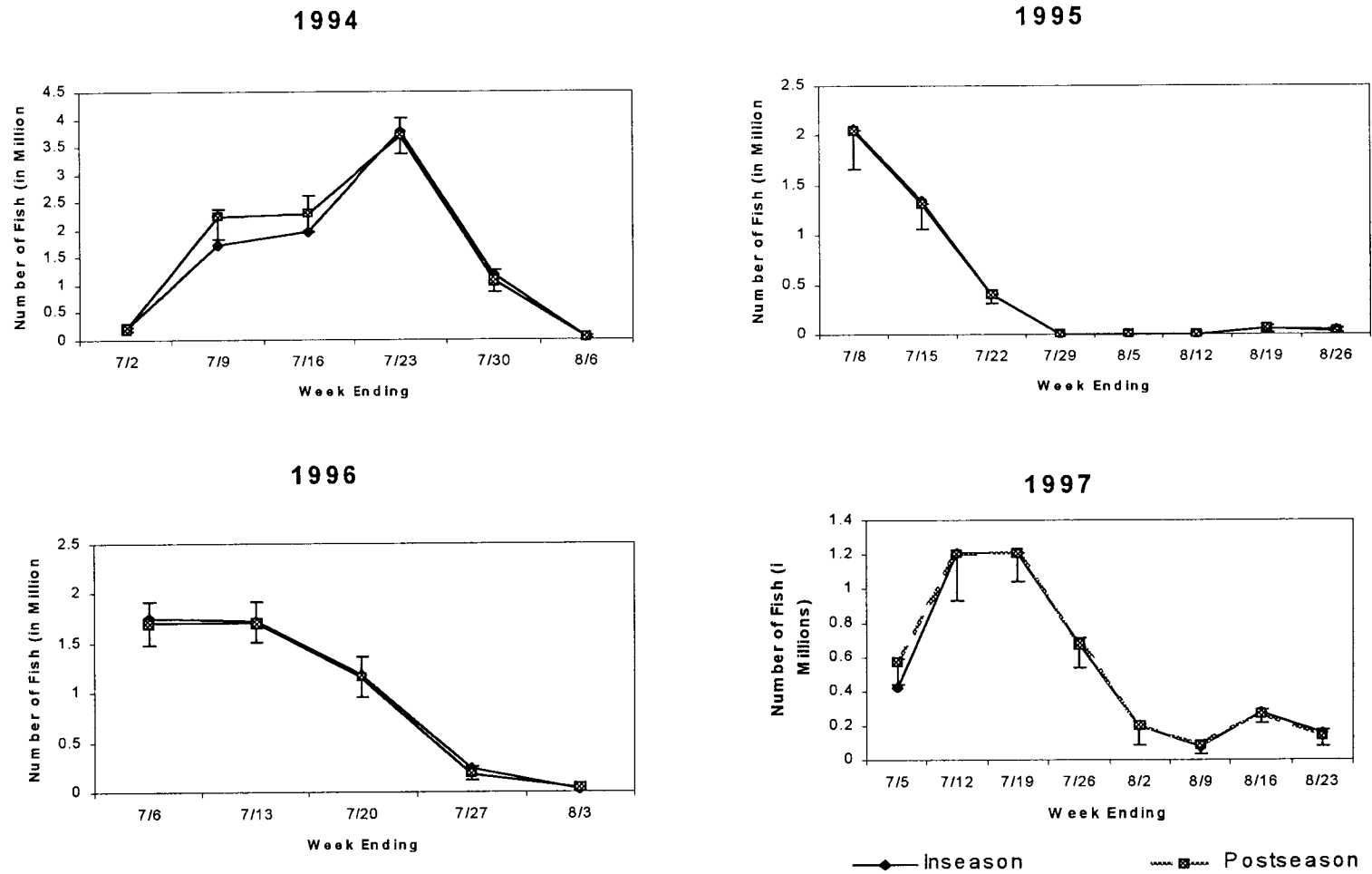
Figure 4.   Comparison of inseason and postseason estimates of hatchery contributions to the Southwestern district common property fishery from 1994 to 1997.
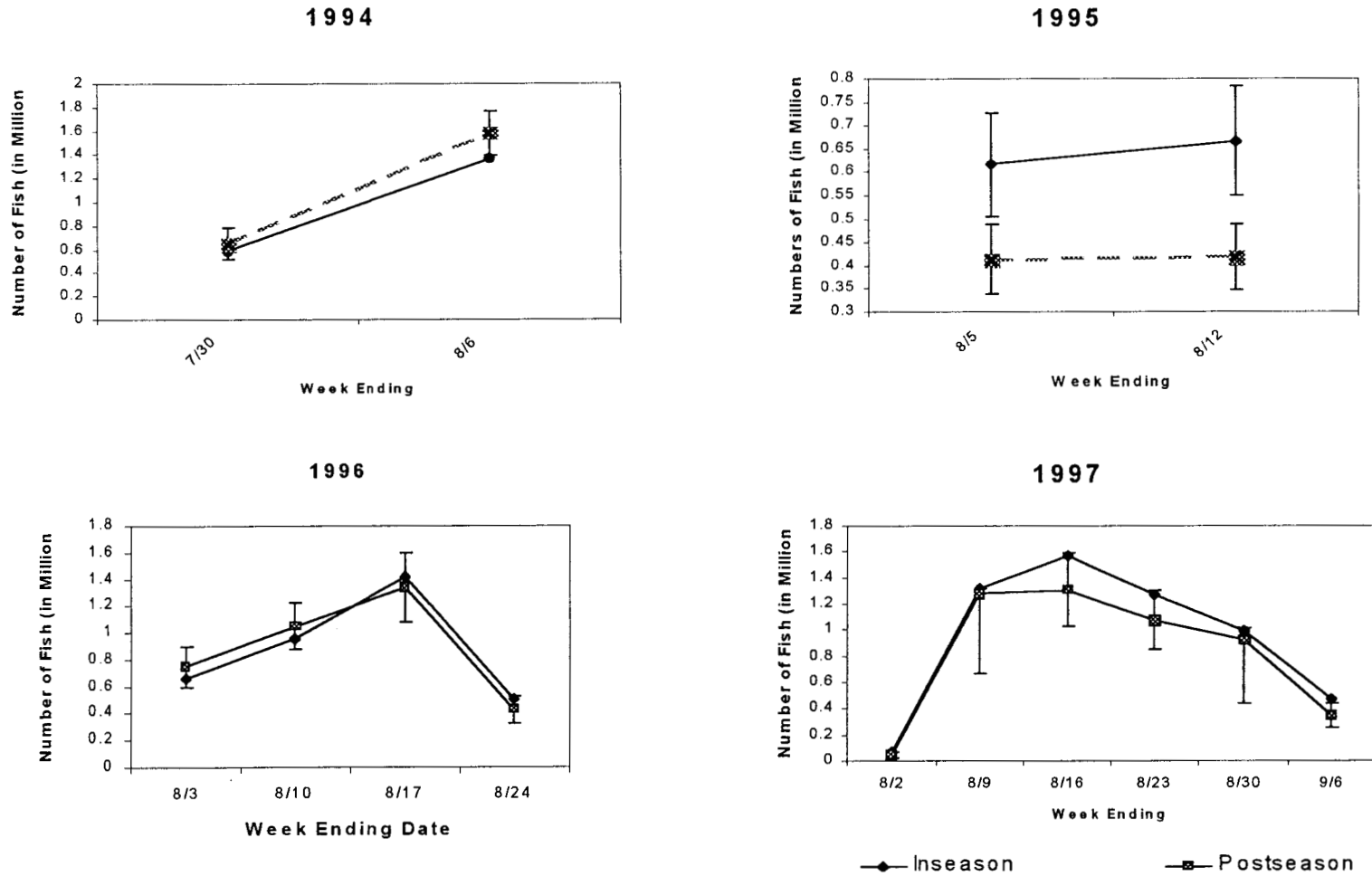
Figure 5.   Estimated hatchery and wild stock contributions to the Southwestern
              district test fishery in 1994 and 1995.

1994

1995

18
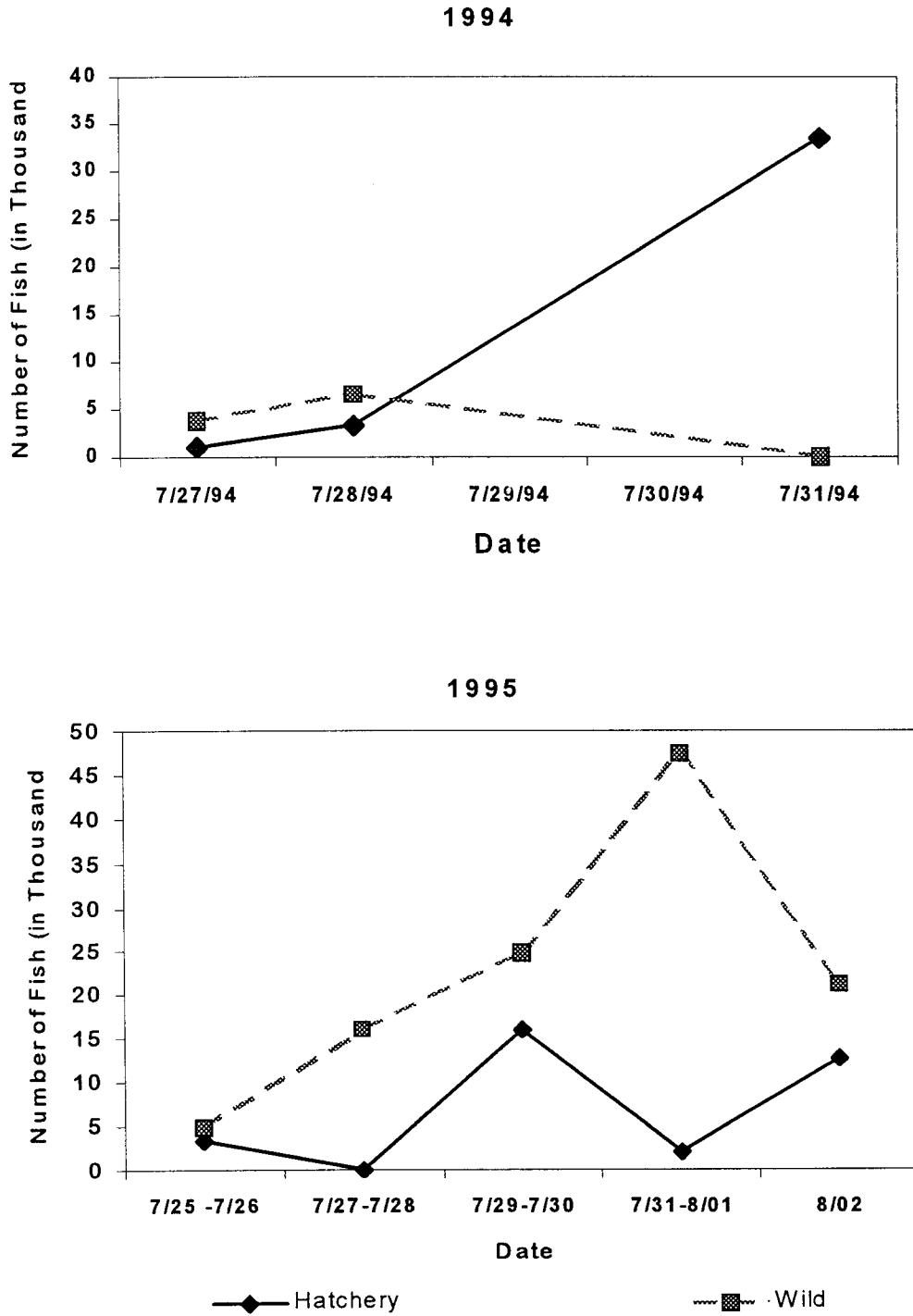
Common Property Contributions

Estimates of the hatchery composition of the catch vary considerably between districts.
For example, the Eastern district common property pink salmon catch is comprised
primarily of Solomon Gulch fish, some wild fish, and a small number of pink salmon
from other hatcheries (Figure 6). In contrast, the Southwestern district common property
pink salmon catches include large numbers of wild pink salmon as well as hatchery pink
salmon bound for other districts (Figure 7). Northern and Coghill district catches are
dominated by hatchery stocks from the resident hatchery, with wild pink salmon and
hatchery pink salmon originating from adjacent districts present in roughly comparable
proportions (Figures 8 and 9). Hatchery contribution estimates to the common property
catches by district and statistical week for the years 1994 to 1997 are presented in
Appendix B.

Cost Recovery Contributions

The portion of the returns harvested by the hatcheries in their cost recovery fisheries,
have a much different stock composition compared to the common property fisheries.
Since cost recovery fisheries are conducted near hatcheries, harvests tend to be comprised
almost exclusively of returns to that hatchery. From 1994 to 1997, the Eastern district
cost recovery fishery contained no pink salmon from other hatcheries, and small numbers
of wild pink salmon (Figure 10). Cost recovery catches in the Northern district
consistently had more wild pink salmon, relative to the number of pink salmon from the
resident hatchery, than seen in cost recovery catches in the other districts (Figure 11).
Small numbers of W.H. Noerenberg pink salmon were also found in the Northern district
cost recovery catches in 1994 and 1997. In the Coghill district cost recovery catches, the
number of wild pink salmon was high in 1994 and 1996, and low in 1995 and 1997
(Figure 12). Between 1994 and 1997, Cannery Creek returns always occurred in the
Coghill cost recovery catches, while pink salmon from the other hatcheries appeared
sporadically. In the Southwestern district, between 1994 and 1997, A.F. Koernig
hatchery returns predominate in the cost recovery catches, followed by wild pink salmon,
and small numbers of Cannery Creek and W.H. Noerenberg hatchery pink salmon. No
cost recovery fishery was conducted in the Southwestern district during 1996 (Figure 13).
In-depth information on cost recovery catches by district and week from 1994 to 1997 is
presented in Appendix C.

Survival Rates

The estimated overall hatchery survival rates for pink salmon ranged from 8.86% for the
Solomon Gulch facility in 1994 to 0.83% for the A.F. Koernig hatchery in 1995 (Table 4,
Figure 14). The overall survival rates for three of the hatcheries, Solomon Gulch,
Cannery Creek, and W.H. Noerenberg converged in 1996 and 1997. A.F. Koernig
hatchery pink salmon were associated with the lowest survival rates of all the hatcheries
until 1997, when it was associated with the highest survival rate. The estimated survival

Figure 6.   Estimated hatchery and wild stock contributions to the Eastern district common property fishery from 1994 to 1997.
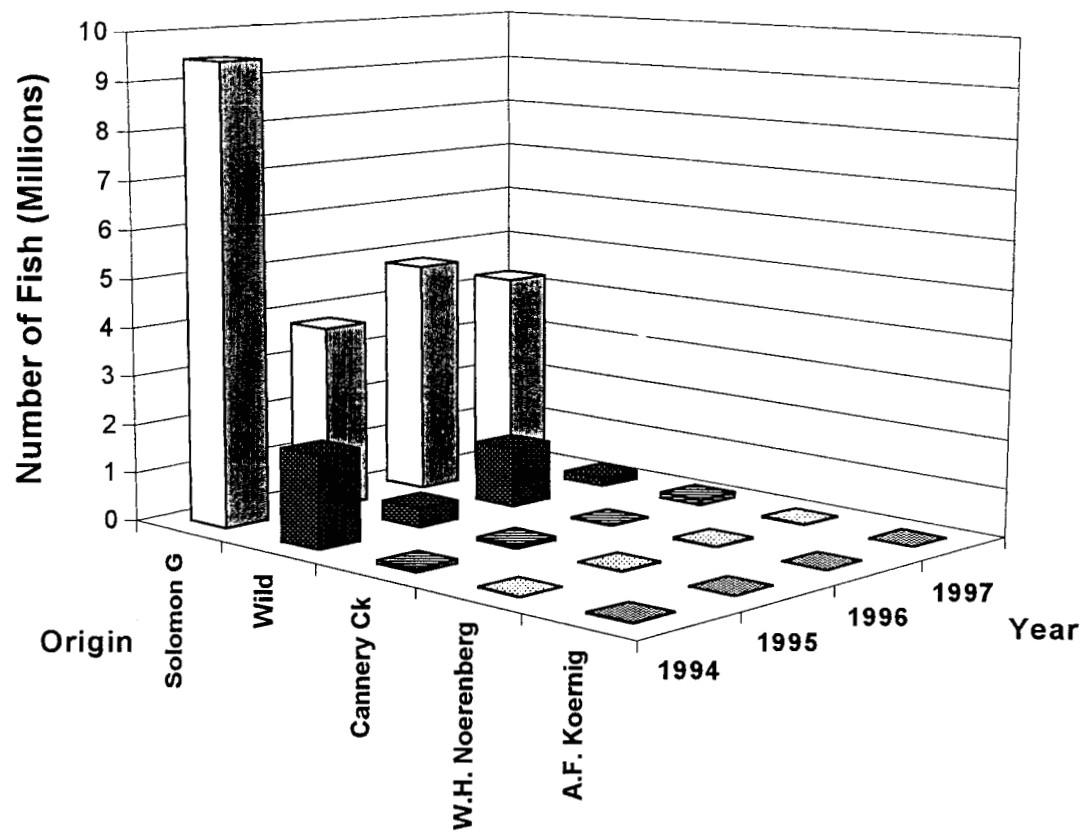
Figure 7.   Estimated hatchery and wild stock contributions to the Southwestern district common property fishery from 1994 to 1997.
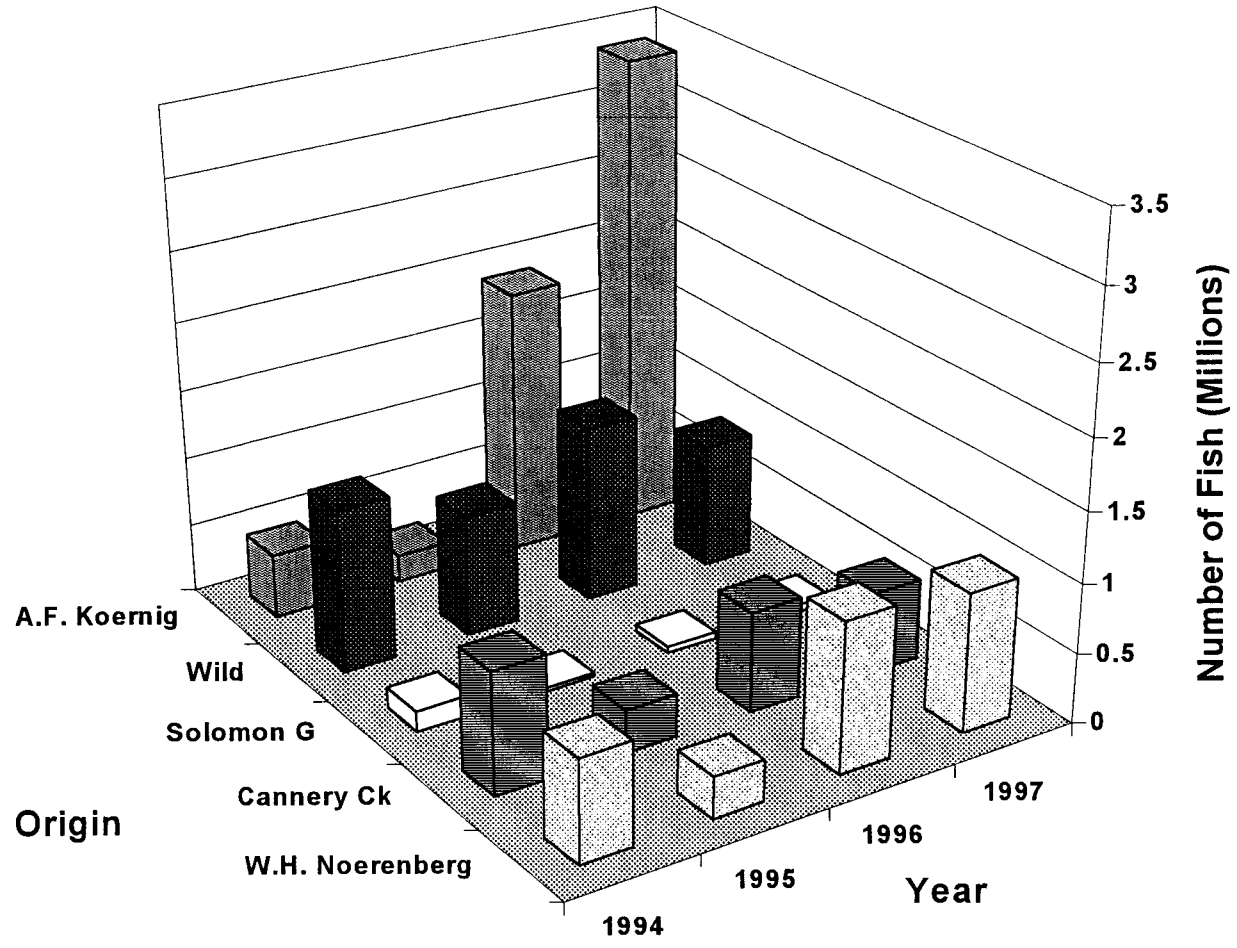
Figure 8.   Estimated hatchery and wild stock contributions to the Northern district common property fishery from 1994 to 1997.
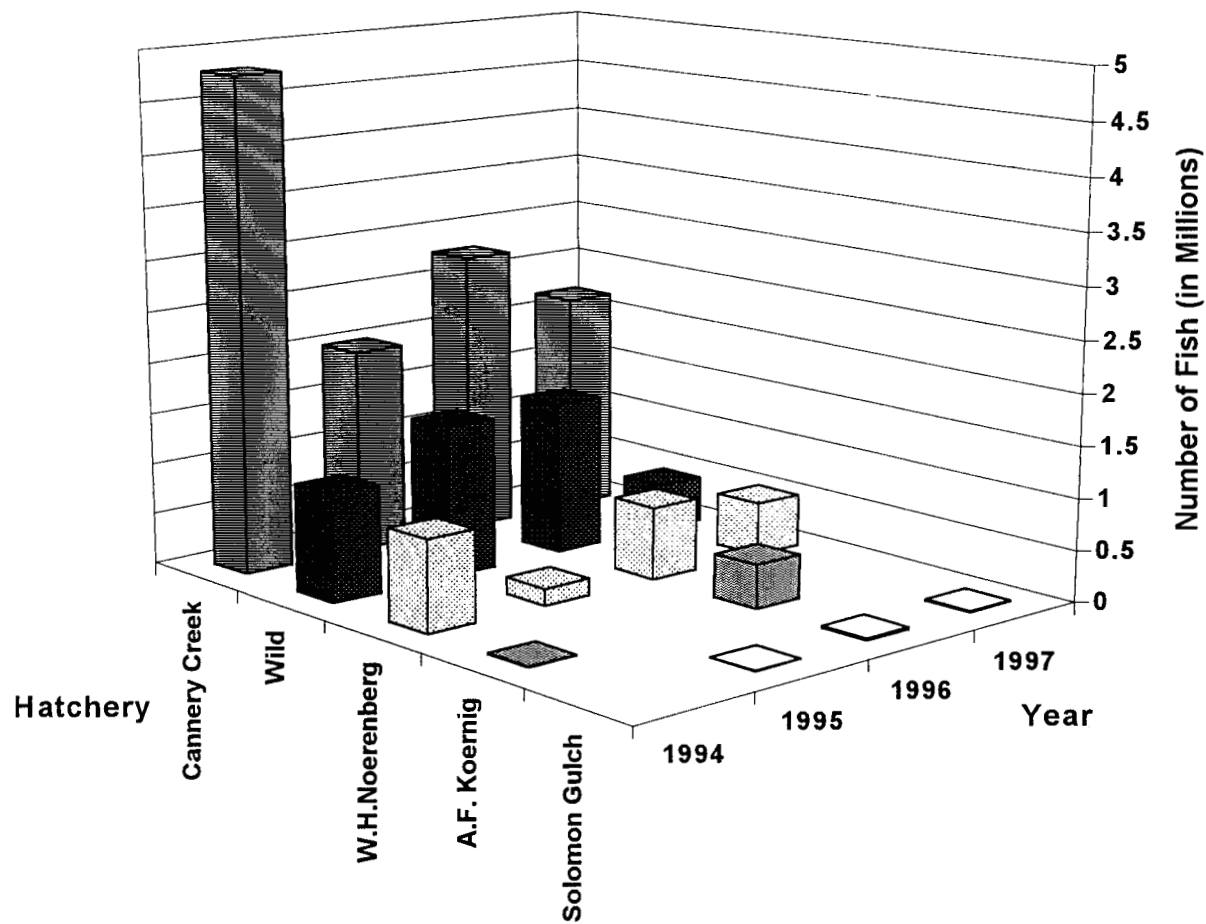
Figure 9. Estimated hatchery and wild stock contributions to the Coghill district common property fishery from 1994 to 1997.
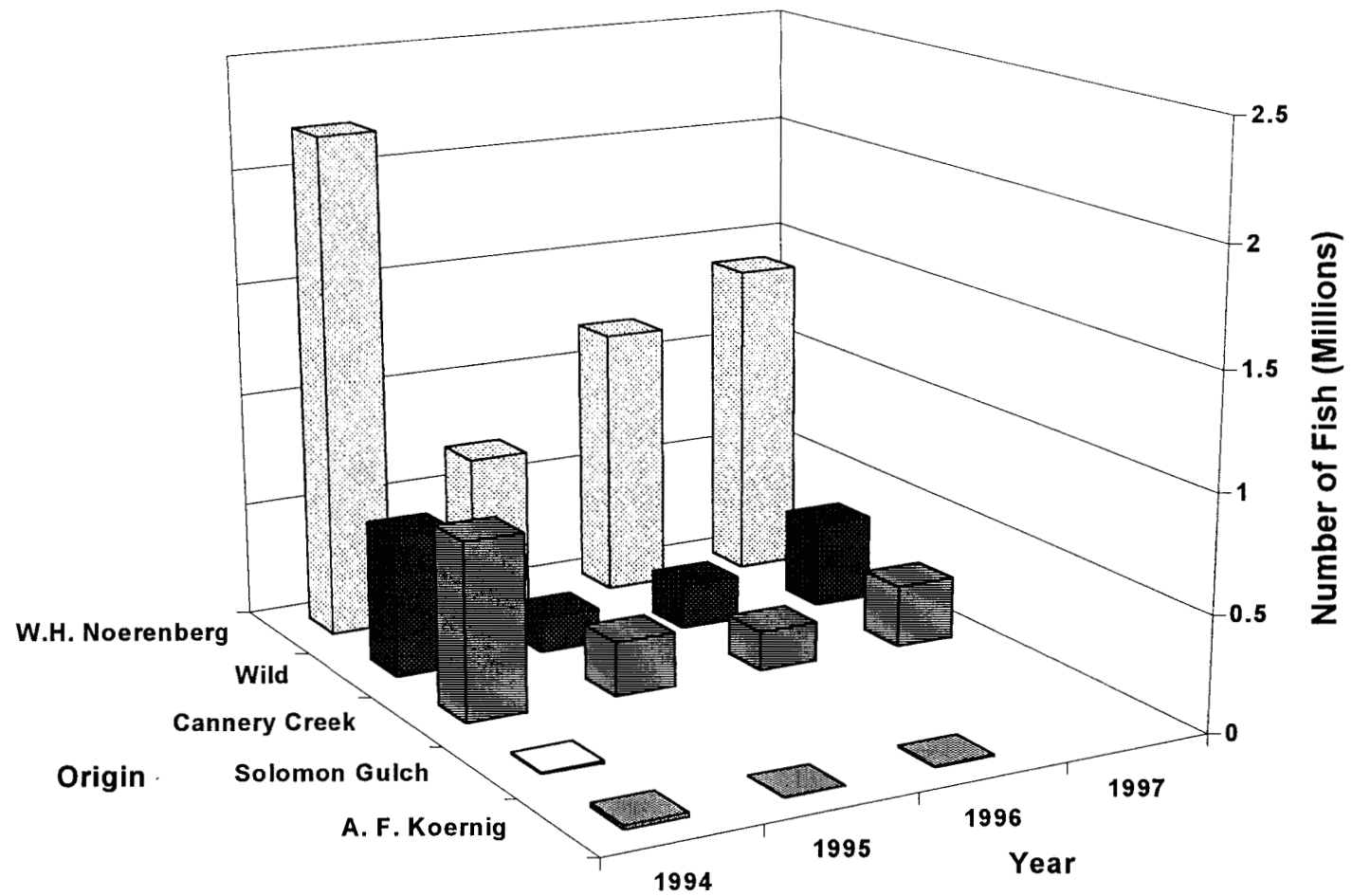
Figure 10.   Estimated hatchery and wild stock contributions to the Eastern district cost recovery fishery from 1994 to 1997.
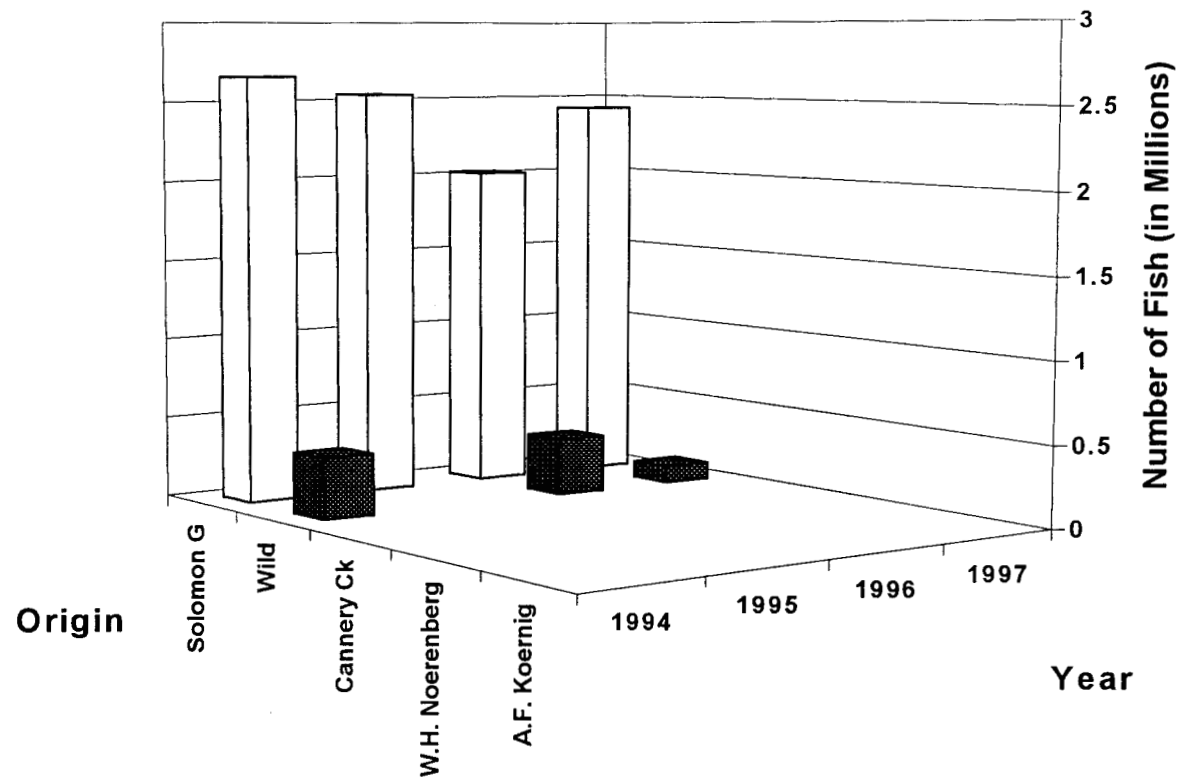
Figure 11.   Estimated hatchery and wild stock contributions to the Northern district cost recovery fishery from 1994 to 1997.
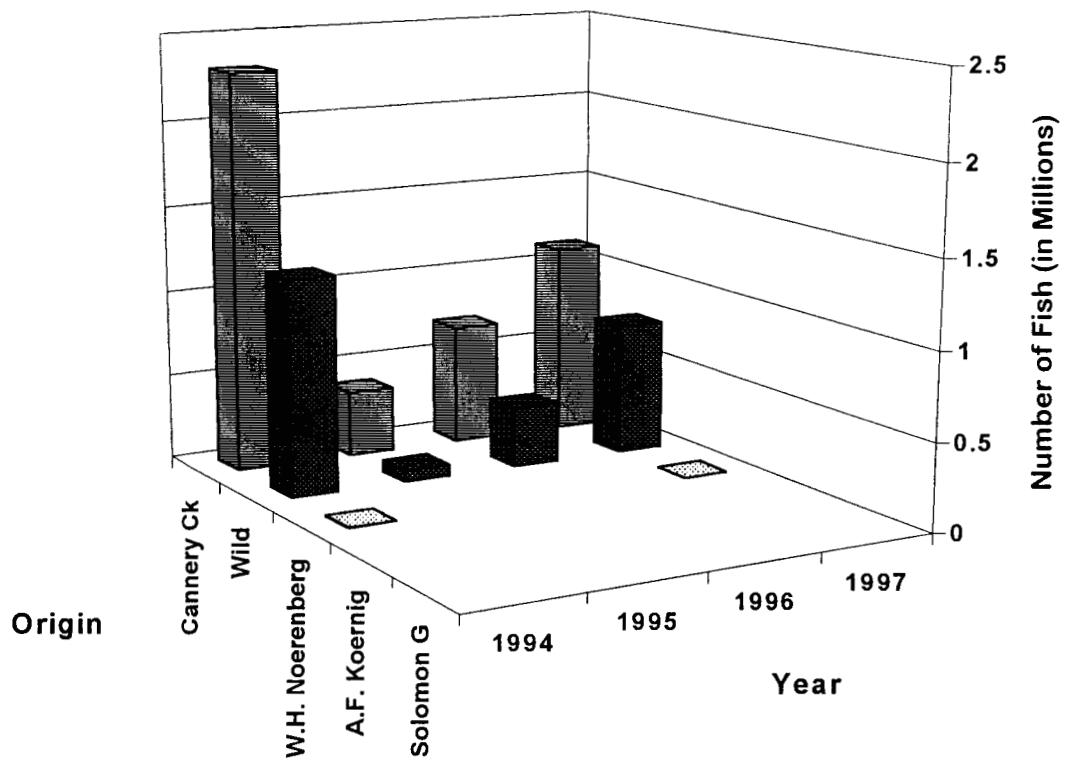
Figure 12. Estimated hatchery and wild stock contributions to the Coghill district cost recovery fishery from 1994 to 1997.
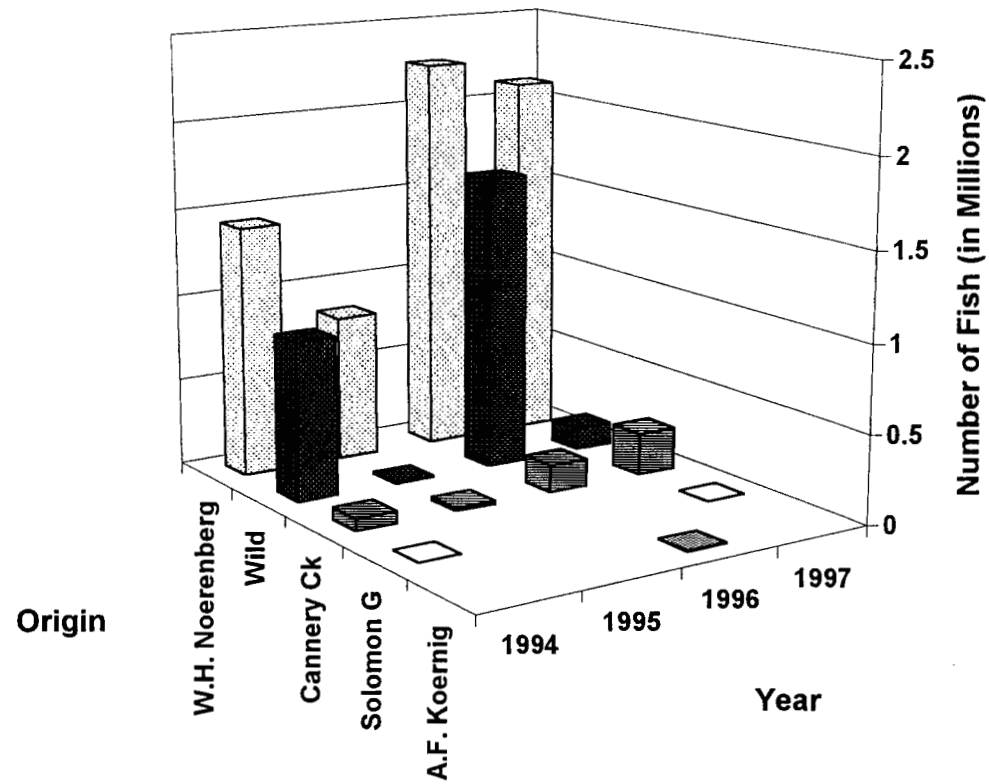
Figure 13. Estimated hatchery and wild stock contributions to the Southwestern district cost recovery fishery from 1994 to 1997.
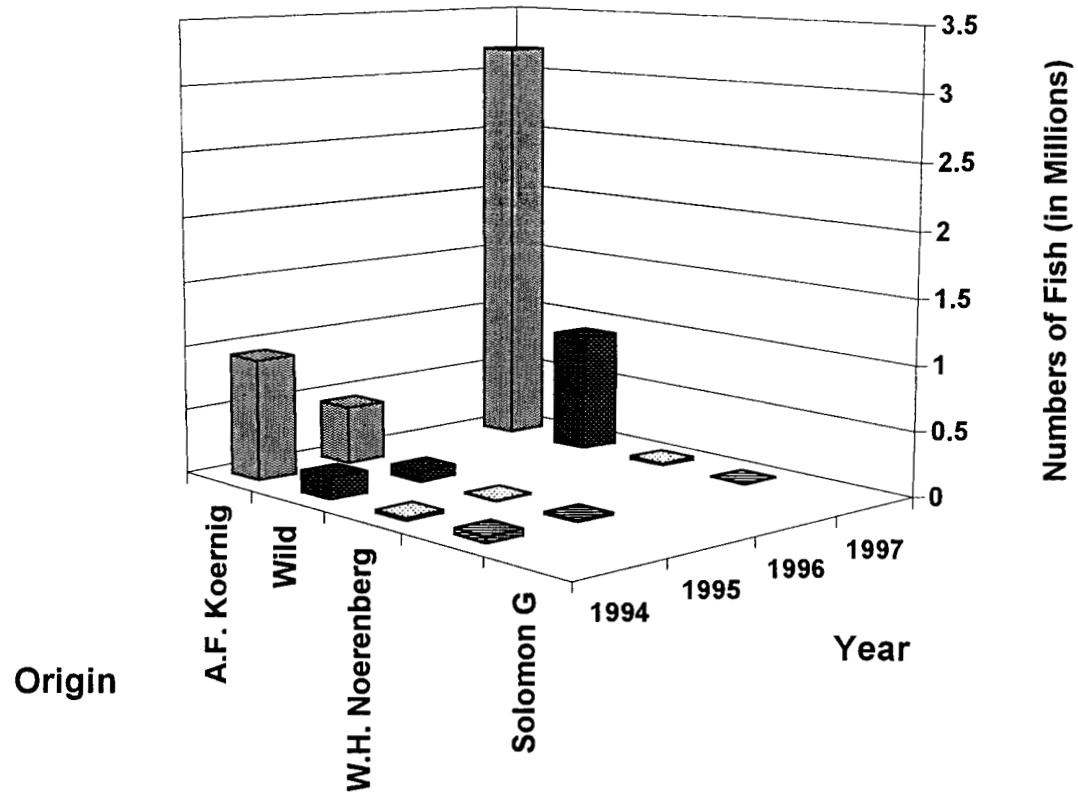
Table 4.   Estimated percent survival rates by hatchery of origin of pink salmon returning to Prince William Sound from 1994 to 1997.

Hatchery	Survival Rate	95% Bounds
1994		
Solomon Gulch	8.86	8.38 – 9.34
Cannery Creek	6.60	6.22 – 6.98
W.H. Noerenberg	3.55	3.35 – 3.75
A.F. Koernig	1.53	1.36 – 1.69
1995		
Solomon Gulch	4.52	4.0 – 5.04
Cannery Creek	3.75	3.48 – 4.02
W.H. Noerenberg	1.42	1.33 – 1.52
A.F. Koernig	0.83	0.71 – 0.96
1996		
Solomon Gulch	3.50	3.33 – 3.71
Cannery Creek	3.60	3.28 – 3.92
W.H. Noerenberg	3.29	3.01 – 3.57
A.F. Koernig	1.82	1.60 – 2.04
1997		
Solomon Gulch	3.15	2.93 – 3.36
Cannery Creek	3.12	2.79 – 3.45
W.H. Noerenberg	2.97	2.65 – 3.30
A.F. Koernig	6.07	5.03 – 7.10

Figure 14.   Estimated pink salmon survival rates by hatchery in Prince William Sound
             from 1994 to 1997.
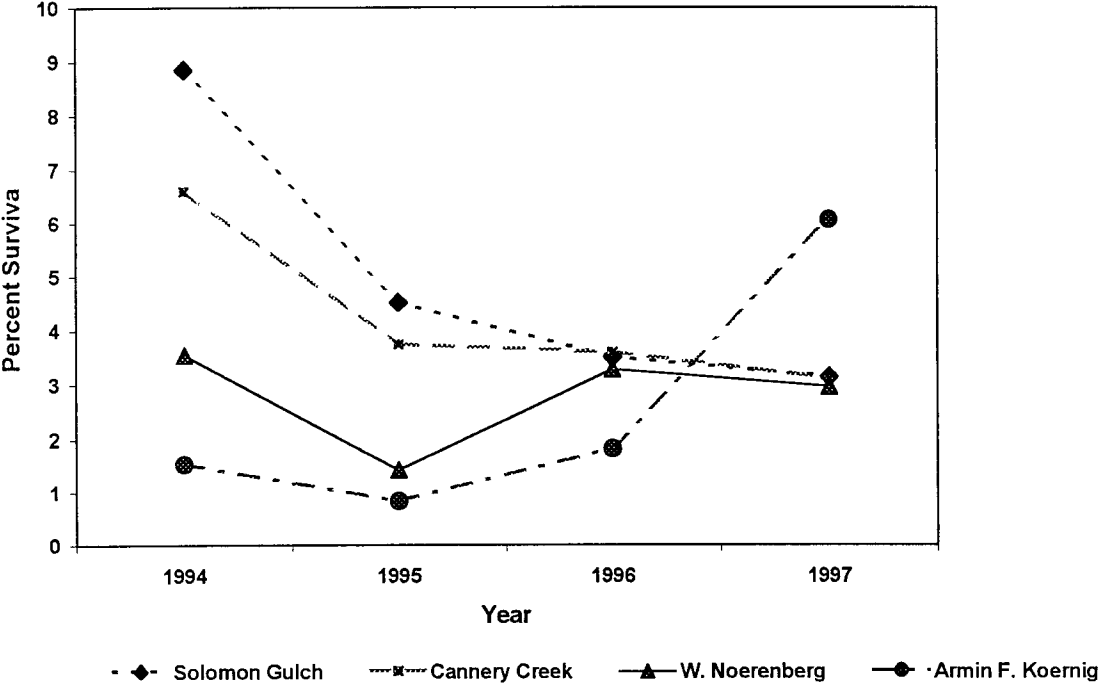
rates for Cannery Creek pink salmon were the second highest from 1994 through 1997. Survival rates for individual release lots can be found in Appendix E. Of the pink salmon returning to the A.F. Koernig facility in 1995, only the SEA experimental release lots displayed good survival rates. The survival rates for the SEA release lots were 7.5% and 6.3%, while the median survival rate for all A.F. Koernig release lots was 0.23%. The 1995 W.H. Noerenberg hatchery survival rate was similarly buoyed by high survival rates of the SEA experimental release lots. The SEA release lots had survival rates of 23.5% and 21.2%, while the median survival rate for the W.H. Noerenberg pink salmon in 1995 was 0.49%. A second set of SEA experimental pink salmon fry was released in 1995, returning in 1996. These 1995 experimental releases exhibited the highest survival rates for release lots from their respective hatcheries, but the rates were not as radically different as in 1995.

Adjustment Factors

Adjustment factors were calculated to correct for apparent violations of assumptions in the tagging experiment. The calculations were made using tag recoveries from hatchery brood stocks and from some cost recovery fisheries (Table 5). There appears to be an upward trend in the W.H. Noerenberg and A.F. Koernig adjustment factors, between 1989 and 1997 (Figure 15). The four largest adjustment factors during that time were calculated for 1994 through 1997.

Tag Shedding

Adipose-clipped pink salmon adults recovered from the Northern district (the location of Cannery Creek hatchery) consistently possessed the fewest tags. Between 40% and 73% of pink salmon with adipose clips recovered from the Northern district did not possess coded wire tags. By comparison, the percentage of adipose-clipped pink salmon adults without tags recovered from other areas has been as little as 11%, depending on the district, fishery, and year.

Table 5.   Adjustment factors estimated from brood and cost recovery harvests by facility for hatchery pink salmon from 1989 through 1997.

| | Brood | | | | Cost-Recovery | |
Year	WHN[a]	AFK[b]	SG[c]	CC[d]	SG[c]	CC[d]
1989	1.73	1.36	1.13	2.12	1.11	1.81
1990	1.28	1.58	1.82	1.96	1.23	1.71
1991	1.82	1.45	1.94	2.28	1.55	1.97
1992	1.63	1.43	2.55	2.74	1.25	1.58
1993	1.78	2.06	3.82	2.91	2.41	2.36
1994	2.05	1.75	3.15	2.38	1.89	2.64
1995	1.96	2.13	1.45	3.21	1.89	5.55
1996	2.60		2.30	4.01	2.19	4.62
1997	2.15		2.83	2.47	1.21	3.02

[a] W.H. Noerenberg
[b] A.F. Koernig
[c] Solomon Gulch
[d] Cannery Creek

Figure 15.   Annual hatchery pink salmon adjustment factors for Prince William Sound
from 1989 to 1997.
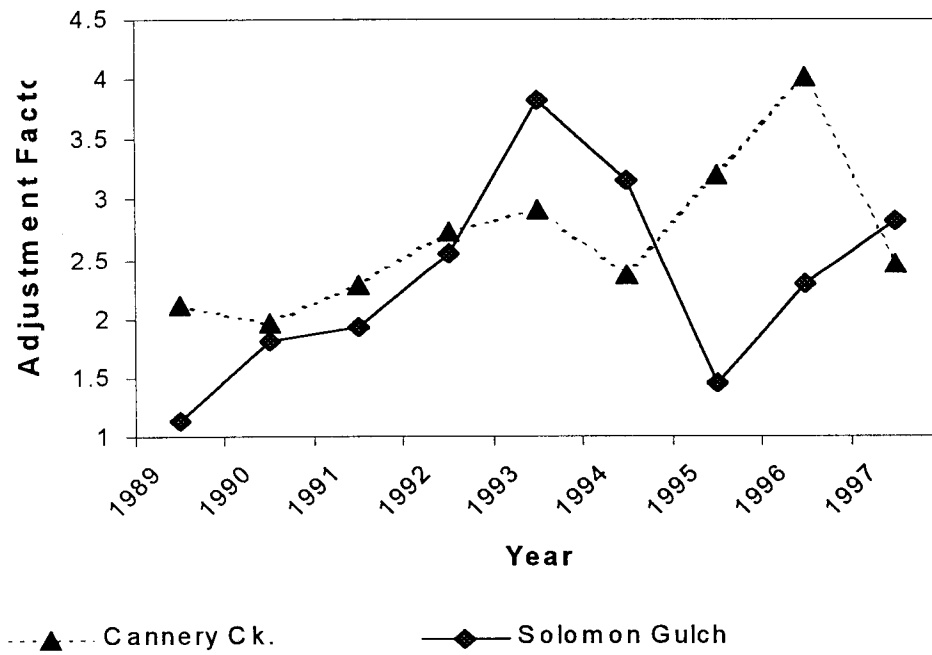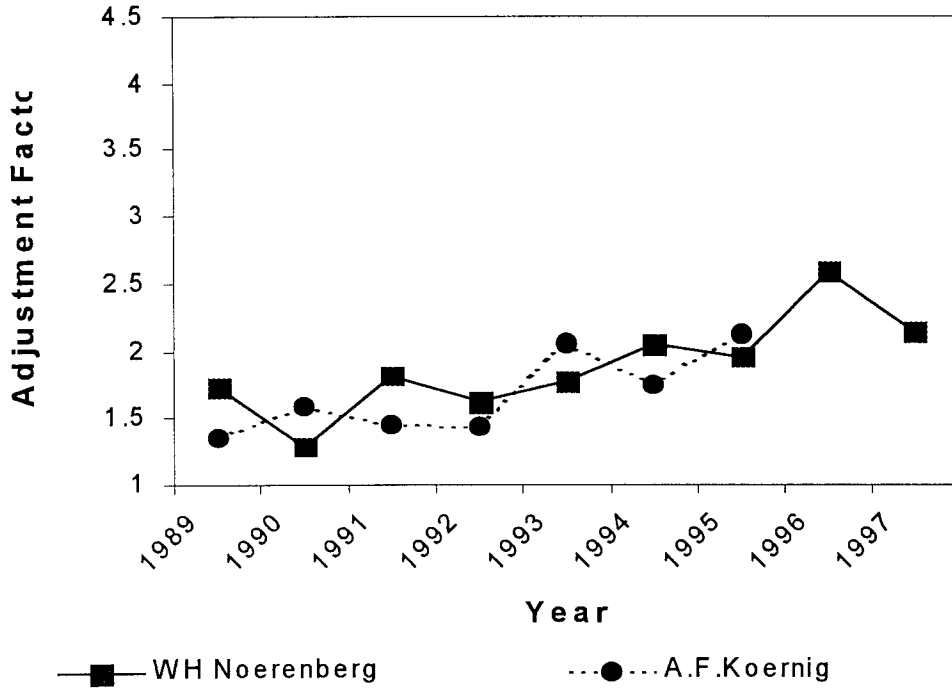
DISCUSSION

Factors Affecting Need for Hatchery Contribution Estimates

Mingling of hatchery and wild pink salmon stocks fuels the need for tagging information in making management decisions. Since wild pink salmon from throughout Prince William Sound were used to develop the PWSAC and VFDA brood stocks, there are few temporal distinctions between wild stocks and hatchery stocks. Had the spatial or temporal differences between hatchery and resident wild pink salmon been more distinct, wild and hatchery stocks could have been managed separately, and the need for inseason tagging information would have been reduced.

The need for hatchery contribution information in Prince William Sound is district-dependent. The Eastern district fishery resembles a terminal fishery, in which the fleet concentrates close to the resident hatchery. While a few local wild stocks are impacted, the larger component of the Eastern district wild migration return to areas away from Port Valdez and Valdez Arm and are managed separately. While information on hatchery contributions is necessary to ascertain hatchery production and survival rates, the estimates are generally not required for making inseason management decisions. In contrast, the Southwestern district encompasses the major migration corridor through which both wild and hatchery salmon enter Prince William Sound, and is the location of one of the pink salmon hatcheries. Due to the presence of a hatchery in the district, protection of wild stocks cannot be instigated by a blanket closure. In order to protect wild stocks, as well as allowing for an efficient harvest of hatchery stocks, the management biologist must know the composition of the pink salmon migrating through the district in time to make meaningful decisions. In the event of strong returns to the A.F. Koernig hatchery, the management biologist will likely institute partial area closures, opening only areas adjacent to the hatchery. Poor returns to the A.F. Koernig hatchery in conjunction with poor wild stock returns to Southwestern district can result in an early closure of the district, as happened in 1994 and 1995. During 1996, the fleet was allowed to continue fishing around the A.F. Koernig hatchery despite weak returns of both Southwestern district wild and hatchery pink salmon stocks, because PWSAC dispensed with a cost recovery fishery and brood stock at that hatchery. Strong wild stock returns in combination with poor returns to the A. F. Koernig hatchery could result in an area closure of the major migration route to the hatchery, as well as the areas adjacent to the hatchery. For this scenario to occur, returns to the hatchery would be so low as to as to make attainment of brood stock goals questionable. Coded wire tag information rapidly became invaluable for inseason management of areas such as Southwestern district.

The management biologist must also try to fulfill different harvest goals of the two aquaculture associations by allocating catches between the commercial fleet and the aquaculture associations. Certain harvest goals require more hatchery contribution information than others. VFDA has always operated on a revenue goal. Combining known migratory timing patterns of the pink salmon with actual and projected cost

recovery revenue allows the management biologist to schedule common property fisheries. If the number of returning pink salmon is not sufficient to fulfill the hatchery's revenue goal, the commercial fishing fleet is not allowed to fish. PWSAC's harvest goal in 1994 and 1995 was set at 40% of the returning hatchery pink salmon. The management biologist had to juggle commercial fishery openings in three separate fishing districts to ensure that a 40% share of the hatchery return was caught by PWSAC in cost recovery fisheries. This management strategy demanded a constant infusion of the most recent data available. In 1996, PWSAC switched its management strategy from a percentage goal to a revenue goal. The shift simplified the inseason management of Prince William Sound commercial fisheries and reduced the demands upon the coded wire tag project for inseason information.

Market conditions for pink salmon have also reduced the degree to which management biologists needed hatchery contribution information to make inseason decisions. The low price paid for pink salmon in 1996 and 1997 reduced the size of the active fleet. Only 34% of the seine permit holders fished during 1996, and 43% fished during 1997. The boats that did fish clustered around the hatcheries, further reducing pressure on wild stocks. Also, a fisherman's strike in 1997 idled the fleet for seven days, from July 28 to August 4. As market conditions for pink salmon improve, and fishing effort increases, management biologists will rely more on hatchery contribution information to make and justify their inseason decisions.

Tagging and Sampling Rates

In contrast to coded wire tag experiments in sport fisheries, which often involve creel surveys and escapement sampling, the coded wire tagging program in Prince William Sound offers only two points at which the precision of hatchery contribution estimates can be changed. The first occurs at the tagging stage and the second at the catch-sampling stage. In Prince William Sound, hatchery-released pink salmon were tagged at a rate of one tag per 600 fry, while the sampling rate goal was approximately 20% of the commercial catch. The tagging rate of one tag per 600 pink salmon fry may appear low compared to that used in many experiments involving coded wire tags, but the sheer volume of harvested hatchery pink salmon, along with the significant sampling rate means that sufficient tags are usually recovered to make useful estimates of contributions. An informative way of gauging the combined adequacy of tagging and catch-sampling programs is to examine the relative precision (RP_α) of estimated contributions. For a $RP_{0.05}$ of x %, the contribution estimate is within x % of the true value 95% of the time. The $RP_{0.05}$ of estimates of annual hatchery contributions ranged from 3.2 to 6.4 %, meaning that the program yielded highly precise estimates of hatchery contributions at this level aggregation. Precision worsens for less aggregated strata, although for important mixed-stock fisheries such as those yielding catches in the Southwestern District, the average $RP_{0.05}$ for 1994 through 1997 was 29%. Increasing precision through enhanced sampling effort would have been practically impossible. The rapid rate at which tenders unloaded pink salmon, and the lack of physical space at sampling stations would have precluded the use of extra samplers. Tagging was conducted and paid for by

the aquaculture corporations, and considerable effort was expended in the process. It would have been very difficult to persuade the aquaculture corporations to allocate additional resources in this endeavor particularly with new marking technologies being developed, but if greater precision in estimation was to have been achieved, it would have had to occur at this point.

Predictions of the effect of enhanced tagging requires anticipation of certain events in the fishery of interest, specifically, the probabilities that members of a cohort will appear in a sample taken from any given stratum catch. The easiest way to obtain estimates of these probabilities is through historical data, modified by anticipated changes in survival, movement, exploitation, and sampling rates. Such methods have recently been outlined in detail in Bernard *et al.* (in review). The Prince William Sound coded wire tag program has provided a wealth of data that could be used to ascertain effects of changing tagging rates on the precision of contribution estimates. With the advent of otolith marking, and cessation of the coded wire tag program, such an analysis would, however, be academic at this point.

Tag Recoveries

Test Fishery Catches

The purpose of the Prince William Sound pink salmon test fishery is to provide managers with information that enables them to protect wild stocks. The test fishery routinely continues until the proportion of wild pink salmon in test fish catches decreases to an acceptable level. The difference in migratory timing between some (early) wild stocks and the hatchery stocks has allowed for temporary closures of areas through which those wild stocks were migrating. A major problem in executing a successful test fishery is that large numbers of pink salmon must be caught and examined to ensure that useful estimates are obtained. If the catch consisted entirely of hatchery pink salmon, about 1,000 pink salmon had to be examined to recover one tag. Therefore, tens of thousands of pink salmon needed to be inspected during the test fishery. The sample sizes needed for a valid estimate also precluded stratification into separate sampling sites.

Inseason Estimates

A major bottleneck in the Prince William Sound coded wire tag program proved to be the distance between the sampling sites and the lab where recovered tags are decoded. The flow of data from time of tag recovery and presentation to management biologists was delayed for several days to a week. While it is possible to obtain timely information on test fisheries, data from decoded tags recovered from commercial fisheries was often only available after its utility had expired. The inseason estimation method based only on detected tags was initiated to avoid this delay.

Inseason estimates using detected tags were a reasonable substitute for decoded tags, provided that tagging rates remained relatively uniform for all release lots. The poorest

agreement between inseason estimates and postseason estimates was seen in 1995 for the Southwestern district common property catches. The disagreement was due to the presence of pink salmon in SEA experimental studies, which had been tagged at three times the normal tagging rate, and had survived at rates 10 to 30 times that of non-experimental groups. The problem was compounded by the presence of a voided tag code. Each recovered voided tag represented only one pink salmon. Pink salmon tagged with the voided tag code also had high survival rates, since they had been inadvertently placed in the same pen as a release lot used in SEA experimental studies. As individual tag codes cannot be distinguished during on-site scanning, all detected tags were assigned the same expansion factor. For the 1995 Southwestern district common property catches, the inseason estimates from detected tags overestimated the actual hatchery values by as much as 30% when compared with estimates derived from decoded tags.

The discrepancy between detected tag estimates and decoded tag estimates was not discovered until the first decoded information was received, which was after the third fishing period announcement for the Southwestern district. Besides postponing closure of the Southwestern district, the differential tagging rates negated the use of detected coded wire tags in making management decisions for the rest of the season. The 1995 Eastern district estimate based on detected tags was similar to that of fully decoded tags because it occurred early in the season prior to the arrival of the experimental tag groups.

In contrast to the situation for the 1995 return, the experimental lot released in 1993 had no noticeable effect on the inseason estimates of 1994. The proportion of pink salmon fry in SEA experimental studies in 1993 was much smaller than in 1994, and the survival rates between experimental and non-experimental lots were more similar for pink salmon released in 1993.

A major failing of estimates from detected tags is the absence of information concerning contributions from individual hatcheries. In the Southwestern district, which includes a major migration corridor and a hatchery, detected tag estimates that indicate large numbers of pink salmon can falsely suggest strong returns to the resident hatchery. This situation occurred in 1994 and in 1995. The Southwestern common property fishery could have been closed sooner had the decoded tag information been available in a more timely fashion.

Common Property and Cost Recovery Postseason Estimates

The coded wire tag program yielded valuable estimates of hatchery contributions to the Prince William Sound commercial catches. Pink salmon catches from the Eastern district common property presented the fewest management concerns because of the natural spatial restrictions of the fishery and the near exclusive catch contribution by one hatchery. Complexities in management decisions regarding the Coghill and Southwestern districts were the result of the potential for harvesting pink salmon bound for other districts. Management decisions were further complicated in the Southwestern and Northern districts by the consistently high number of sampled heads that did not contain

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tags. The high number of sampled heads not containing tags were thought to be of Cannery Creek origin. No method of compensating for the apparent enhanced tag loss in Cannery Creek pink salmon was found, and management biologists assumed that coded wire tag estimates underestimated actual contributions of Cannery Creek pink salmon to the catches.

Survival Rates

Hatchery rearing practices and conditions in the marine environment affect pink salmon survival rates. The reductions in the Solomon Gulch survival rates between 1994 and 1997 may be due as much to rearing practices as to marine conditions. Personnel at the hatchery will postpone setting up rearing pens because of weather conditions, and will not feed pink salmon fry until they are in rearing pens. The fry are often emaciated before they are placed in the pens, thereby reducing their fitness (Joyce, *pers. comm.*). The low survival rates for pink salmon from the A.F. Koernig hatchery are more likely due to the marine environment; between 1994 and 1996, wild pink salmon returns to the Southwestern district were weak, in conjunction with the low A.F. Koernig hatchery returns. SEA project information suggests that concentrations of predators feeding on migrating juvenile pink salmon may have been the causative factor. The actual survival rates for Cannery Creek pink salmon are likely higher than calculated because of an assumed tag loss over and above that corrected for by the adjustment factor.

Adjustment Factors

Adjustment factors were developed to counter some obvious violations of the assumptions inherent in tagging experiments, namely that individuals do not lose their tags, nor do they die at different rates than their untagged counterparts (Seber 1982). Several studies on tag loss and differential mortality for coded wire tagged salmon indicates a rapid drop in tag loss rates about 4 weeks following tagging (Blankenship 1990, Dunning et al. 1990, Kaill et al. 1990). Tagged Prince William Sound hatchery pink salmon are often released two weeks following tagging, and thus cannot be held until tag loss rates decline. One way to circumvent the tag loss problem is to use rates of tag occurrence at the end of the experiment. In the case of the Prince William Sound coded wire tag program, adjustment factors are calculated from brood stocks. The rates at which tags are found in the brood stock should be comparable to those found in the fishery, given that the fishery takes place immediately preceding examination of brood stocks. The value of the adjustment factor should be greater than or equal to 1. A value of 1.0 would be appropriate in the event of zero tag shedding and differential mortality. If an adjustment factor is significantly less than 1.0, it may indicate that the tagged pink salmon survived at higher rates than their untagged cohorts or that biased samples were collected.

Use of adjustment factors assumes that the hatchery brood pond contains only pink salmon originating from that facility. Inclusion of stray pink salmon among those

scanned in the brood stock will artificially inflate the adjustment factor. Given the possibility of wild pink salmon being included in the Cannery Creek, A.F. Koernig and Solomon Gulch hatchery brood stocks, the W.H. Noerenberg pink salmon brood stock was used to calculate a standardized adjustment factor as it was believed to have the most pure brood stock of all of the hatcheries.

The use of a standardized adjustment factor assumes that rates of tag loss and differential mortality are roughly equal and stable at all hatcheries. However, there were strong indications that Cannery Creek pink salmon shed their tags at higher rates. In any district or fishery, a certain percentage of the heads excised from pink salmon that were missing adipose fins did not contain coded wire tags. Heads collected from pink salmon missing an adipose fin and a tag in the Cannery Creek brood stock exceeded 50% of the total heads recovered in seven of ten years. A similar situation existed for the Northern district common property and cost recovery fisheries. Over the years, tagging crews and tagging machinery have been changed at Cannery Creek, with no resultant change in the percentage of sampled heads missing tags. Based on this anecdotal evidence, research and management biologists assumed the coded wire tag protocol underestimated the Cannery Creek contributions to the catch. Rearing practices at the Solomon Gulch hatchery also occasionally caused concerns over bias. During 1995, a portion of the tagged pink salmon fry were held separately from their untagged counterparts, and were not fed for a longer period of time (Joyce, *pers. Comm.*). Consequently, additional fry had to be tagged to compensate for high initial mortalities. Such practices violate the assumptions that tagged individuals are selected randomly from the population of interest, and that tagged and untagged individuals are treated similarly.

Another concern was the upward trend in annual W.H. Noerenberg adjustment factors, which also occurred to a lesser degree with A.F. Koernig adjustment factors. The reason for this trend is unknown. A possible explanation is increased tag loss due to improper tag placement. Tagging crews will often increase their tagging speed as they gain experience, but at the cost of care in proper tag placement. Another possible reason for the trend may be increasing numbers of wild pink salmon in the W.H. Noerenberg brood stock, although that is believed unlikely. The Cannery Creek and Solomon Gulch hatchery adjustment factors fluctuate too much to discern trends. The adjustment factors for those hatcheries do not appear to correlate with percentages of wild pink salmon in the catch.

To thoroughly investigate adjustment factors, methods are needed which allow separation of the effects of tag loss, differential mortality and the presence of wild pink salmon in brood ponds. The latter is currently under investigation through recoveries of otolith thermal marks from the brood ponds of the W.H. Noerenberg, Cannery Creek and Solomon Gulch facilities.

In order to maintain the integrity of the coded wire tagging program, research biologists must monitor tagging and sampling operations to ensure assumptions are met. Subsampling newly tagged pink salmon once or twice a week is necessary to check for proper tag placement. Hatchery tagging operations should be monitored to ensure efforts are made to randomly select juvenile pink salmon to be tagged, to increase the likelihood of identical treatment of tagged and untagged individuals, and to minimize tag loss. Monitoring of sampling programs should include checking for random and independent sampling, recognition of all pink salmon missing adipose fins in the sample, assessment of head and tag loss after recovery, correct identification of tag codes, and accurate recording of catch and sample data (Clark and Bernard 1987). Novice sampling technicians must be encouraged to maintain a comfortable speed in checking for adipose fin clips, and not to attempt to achieve sampling speeds of more experienced technicians. Individual fishery samples should be checked for equal rates of tag recovery between samplers; tag recovery from samples from the same fishing period at the same processor should be similar if samplers are behaving similarly.

CONCLUSIONS

The pink salmon coded wire tag program in Prince William Sound has been large and complex, involving 16 to 24 tagging personnel at four separate hatcheries, and upwards of 20 samplers located in four to seven separate ports to sample the catch. The biggest problems involved the differential tagging rates between experimental and normal release lots, the probable different rates of tag loss between hatcheries, and the time lag between sampling and decoding the tags. The best information will be obtained if rearing and tagging procedures, as well as brood sampling protocols are kept as uniform as possible between hatcheries.

The major objective of this study was to provide fishery managers with time and location specific data relating to the occurrence of wild pink salmon stocks in the commercial fishery. These data were to be provided in a timely fashion for inseason management using a technique based upon detected (undecoded) tags. With the exception of 1995, inseason estimates generally agreed with postseason estimates. Hatchery survival rates between 1994 and 1997 decreased for the Solomon Gulch and Cannery Creek hatcheries, fluctuated for W.H. Noerenberg hatchery, and rose for the A.F. Koernig facility. Apparent tag retention problems in Cannery Creek pink salmon continued throughout the study, and suggests underestimation of Cannery Creek pink salmon production over the history of the coded wire tag program.

ACKNOWLEDGEMENTS

LITERATURE CITED

Blankenship, H.L. 1990. Effects of time and fish size on coded wire tag loss from chinook and coho salmon American Fisheries Symposium 7: 237 – 243.

Clark, J.E. and D.R. Bernard. 1987. A compound multivariate binomial-hypergeometric distribution describing microwire tag recovery from commercial salmon catches in southeast Alaska. Information Leaflet 261. Alaska Department of Fish and Game, Juneau.

Dunning, D.J., Q.E. Ross, B. R. Friedmann, and K.L. Marcellus. 1990 Coded wire tag Retention by, and tagging mortality of, striped bass reared at the Hudson River Hatchery. American Fisheries Society Symposium 7: 262 – 266.

Geiger, H.J. 1990. Parametric bootstrap confidence intervals for estimating contributions to fisheries from marked salmon populations. American Fisheries Society Symposium 7:667-676.

Geiger, H.J. and S. Sharr. 1990. The 1988 Tag Study of Pink Salmon from the Solomon Gulch Hatchery in Prince William Sound, Alaska. *In* Pilot Studies in Tagging William Sound Hatchery Pink Salmon with Coded Wire Tags. Fishery Research Bulletin No. 90-02.

Kail, W.M., K. Rawson, and T. Joyce. Retention rates of half-length coded wire tags Implanted in emergent pink salmon. American Fisheries Society Symposium 7: 253 – 258

Peltz, L. and H.J. Geiger. 1990. A Tagging Study of the Effects of Hatcheries on the 1987 Pink Salmon Fishery in Prince William Sound, Alaska, *In* Pilot Studies in Tagging Prince William Sound Hatchery Pink Salmon with Coded Wire Tags. Fishery Research Bulletin No. 90-02.

Peltz, L. and J. Miller. 1990. Performance of half-length coded wire tags in a pink salmon hatchery marking program. American Fisheries Society Symposium 7:244-252.

Seber. G.A.F. 1982. The estimation of animal abundance and related parameters. Mcmillan, New York.

Sharr, S., T.M. Willette, C.J. Peckham, D.G. Sharp, J.L. Smith, D.G. Evans, and B.G. Bue. 1995a. Coded Wire Tag Studies on Prince William Sound Salmon. Natural Resource Damage Assessment Fish/Shellfish Study Number 3, Alaska Department of Fish and Game, Cordova.

Sharr, S., C.J. Peckham, D.G. Sharp, J.L. Smith, D.G. Evans, and B.G. Bue. 1995b.

Stock Identification of Chum, Sockeye, Coho and Chinook Salmon in Prince William Sound. Natural Resource Damage Assessment Restoration Study 93068, Alaska Department of Fish and Game, Cordova.

Sharr, S., C.J. Peckham, D.G. Sharp, J.L. Smith, D.G. Evans, and B.G. Bue. 1995c. Coded Wire Tag Studies on Prince William Sound Salmon. Natural Resource Damage Assessment Restoration Study R60A, Alaska Department of Fish and Game, Cordova.

Appendix A: Pink Salmon Hatchery and Wild Stock Contributions to Prince William Sound Test Fisheries by District and Week for 1994 to 1997.

Appendix A.1.   **Pink salmon hatchery and wild stock contributions to Prince William Sound test fisheries by district and week during 1994.**

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/23/94	30													
7/30/94	31	2,192	2.4E+06	2,075	2.2E+06					4,267	4.6E+06	10,306	14,573	3
8/06/94	32	11,149	6.9E+07	7,433	4.6E+07	11,149	6.9E+07	3,716	2.3E+07	33,447	2.1E+08	0	33,447	9
Subtotals		13,341	7.1E+07	9,508	4.8E+08	11,149	6.9E+07	3,716	2.3E+07	37,714	2.1E+08	10,306	48,020	12

Appendix A.2. Pink salmon hatchery and wild stock contributions to Prince William Sound test fisheries by district and week during 1995.

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/29/95	30	707	5.0E+05	4,958	9.5E+06	2,127	4.5E+06	4,896	1.4E+07	12,685	2.8E+07	27,644	40,329	8
8/05/95	31	1,966	1.5E+06	4,545	6.7E+06	14,354	1.4E+04			20,865	8.2E+06	86,701	107,566	11
Grand Totals		2,673	2.0E+06	9,503	1.6E+07	16,481	4.5E+06	4,896	1.4E+07	33,550	3.6E+07	114,345	147,895	19

Appendix B: Pink Salmon Hatchery and Wild Stock Contributions to Prince William Sound Common Property

Fisheries by District and week for 1994 to 1997.

Appendix B.1. Pink salmon hatchery and wild stock contributions to Prince William Sound common property fisheries by district and week during 1994.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/25/94	26													
7/02/94	27							205,028	6.3E+08	205,028	6.3E+08	32,995	238,023	101
7/09/94	28							2,228,423	4.0E+10	2,228,423	4.0E+10	133,072	2,361,495	346
7/16/94	29							2,300,085	2.7E+10	2,300,085	2.7E+10	363,149	2,663,234	353
7/23/94	30	11,964	7.2E+07					3,684,426	2.7E+10	3,693,390	2.7E+10	947,864	4,641,254	586
7/30/94	31	2,255	4.7E+06	11,457	8.7E+07	33,656	9.5E+07	1,024,575	1.1E+10	1,071,943	1.1E+10	255,309	1,327,252	231
8/06/94	32					33,385	1.4E+08	15,422	5.6E+07	48,807	2.0E+08	155,609	204,416	11
8/13/94	33 1/					85	9.4E+02	39	1.3E+03	124	2.2E+03	307	521	0
Subtotals		14,219	7.6E+07	1,457	8.7E+07	67,126	2.4E+08	9,547,800	1.1E+11	9,547,800	1.1E+11	1,888,395	11,436,195	1,628

1/ Proportions from week 32 were used to allocate the catch for week 33.

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/16/94	29													
7/23/94	30							29,108	1.2E+08	29,108	1.2E+08	9,065	38,173	7
7/30/94	31			11,516	5.6E+07	209,868	1.1E+09			221,384	1.2E+09	78,880	300,264	28
8/06/94	32			48,958	2.7E+08	913,846	4.8E+09	5,321	2.8E+07	968,125	5.1E+09	335,210	1,303,335	199
8/13/94	33	2,210	4.8E+06	504,333	3.7E+09	2,719,998	3.8E+10			3,226,541	4.2E+10	250,518	3,477,059	333
8/20/94	34	5,882	7.3E+06	300,517	1.5E+09	779,684	3.9E+09			1,086,083	5.5E+09	164,502	1,250,585	212
8/27/94	35			23,907	1.9E+08	176,043	1.2E+09			199,950	1.3E+09	212,462	412,412	31
Subtotals		8,092	1.2E+07	889,231	5.8E+09	4,799,439	4.9E+10	34,429	1.5E+08	5,731,191	5.5E+10	1,050,637	6,781,828	810

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/11/94	24													
6/18/94	25							45	7.3E+02	45	7.3E+02	0	45	1
6/25/94	26											35	35	0
7/02/94	27											294	294	0
7/09/94	28							72	6.3E+02	72	6.3E+02	315	387	1
7/16/94	29							171	7.3E+03	171	7.3E+03	525	696	1
7/23/94	30							3,067	4.7E+06	3,067	4.7E+06	336	3,403	2
7/30/94	31					2,149	4.6E+06	1,051	2.8E+05	3,200	2.8E+05	1,768	4,968	2
8/06/94	32													
8/13/94	33	5,648	3.8E+06	902,178	4.8E+09	356,126	1.2E+09	2,272	1.3E+06	1,266,044	6.0E+09	121,394	1,387,438	290
8/20/94	34	5,527	2.8E+07	618,294	2.8E+09	193,698	6.5E+08			817,519	3.5E+09	307,704	1,125,223	180
8/27/94	35	5,591	4.9E+06	448,756	2.0E+09	180,122	9.1E+08			634,469	2.9E+09	149,633	784,102	103
9/03/94	36			216,572	8.7E+08	31,987	3.8E+07			248,559	9.1E+08	26,946	275,505	84
9/10/94	37			13,439	5.0E+07	1,180	348,520			14,619	5.0E+07	365	14,984	6
Subtotals		16,586	3.8E+07	2,199,239	1.0E+10	765,262	2.8E+09	6,678	6.3E+06	2,987,765	1.3E+10	609,315	3,597,080	670

Eshamy District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/02/94	27													
7/09/94	28											676	676	0
7/16/94	29											7,777	7,444	0
7/23/94	30											13,080	13,080	0
7/30/94	31											9,731	9,731	0
8/06/94	32	2,720	5,034,087							20,249	5.4E+07	28,972	49,221	6
8/13/94	33	21,847	8.3E+07							176,644	6.6E+08	24,888	201,532	12
8/20/94	34	10,734	3.8E+07							89,750	3.2E+08	50,027	139,777	02
8/27/94	35	25,668	6.5E+07							125,912	3.1E+08	7,950	133,862	.2
9/03/94	36									0		10,338	10,338	0
Subtotals		60,969	1.9E+08							412,555	1.3E+09	153,106	565,661	114

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/23/94	30													
7/30/94	31	101,886	6.7E+08	237,595	1.7E+09	192,618	1.3E+09	118,796	7.9E+08	650,895	4.5E+09	254,789	905,684	97
8/06/94	32	361,340	1.9E+09	499,800	2.8E+09	685,829	4.2E+09	32,253	2.0E+08	1,579,222	9.1E+09	923,183	2,502,405	266
Subtotals		463,226	2.6E+09	737,395	4.5E+09	878,447	5.5E+09	151,049	9.9E+08	2,230,117	1.4E+10	1,177,972	3,408,089	363

Unakwik District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/18/94	25													
6/25/94	26									0		1	1	0
7/02/94	27													
7/09/94	28													
7/16/94	29													
7/23/94	30													
7/30/94	31													
8/06/94	32													
8/13/94	33 1/					63,184	7.5E+07			63,184	7.5E+07	44,205	107,389	0
8/20/94	34					103,682	2.0E+08			103,682	2.0E+08	72,536	176,218	11
8/27/94	35					91,459	6.0E+08			91,459	6.0E+08	8,123	99,582	11
9/03/94	36 2/					5,520	2,187,580			5,520	2,187,580	490	6,010	0
Subtotals		0	0	0	0	263,845	8.8E+08	0	0	263,845	8.8E+08	125,355	389,200	22
Grand Totals		563,092	2.9E+09	4,162,803	2.2E+10	6,800,224	5.9E+10	9,647,154	1.1E+11	21,173,273	1.9E+11	5,004,780	26,178,053	3,607

1/ Proportions from week 34 were used to allocate catch in week 33.

2/ Proportions from week 35 were used to allocate catch in week 36.

Appendix B.2. Pink salmon hatchery and wild stock contributions to Prince William Sound common property fisheries by district and week during 1995.

Eastern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/08/95	27							2,048,084	3.76E+10	2,048,084	3.76E+10	0	2,048,084	884
7/15/95	28							1,312,439	1.68E+10	1,312,439	1.68E+10	0	1,312,439	648
7/22/95	29					1,228	3.5E+05	401,677	2.29E+09	402,905	2.29E+09	1,160	404,065	334
7/29/95	30									0		96,105	96,105	0
8/05/95	31													
8/12/95	32													
8/19/95	33			2,344	3.4E+06	35,681	2.23E+08	16,353	9.49E+07	54,378	3.21E+08	241,176	295,554	10
8/26/95	34	1,091	4.6E+05	8,867	1.45E+07	24,960	1.05E+09			34,918	1.20E+08	44,161	79,079	9
9/02/95	35													
9/09/95	36									0		312	312	0
Subtotals		1,091	4.6E+05	11,211	1.8E+07	61,869	3.3E+08	3,778,553	5.69E+10	3,852,724	5.72E+10	382,914	4,235,638	1,885

Northern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/12/95	32			36,318	1.57E+08	793,870	3.63E+09			830,188	3.78E+09	469,885	1,300,073	194
8/19/95	33			91,223	3.89E+08	1,069,141	5.20E+09	4,204	1.48E+07	1,164,568	5.60E+09	825,853	1,990,421	229
8/26/95	34			36,041	4.8E+07	114,392	3.29E+08			150,433	3.78E+08	156,929	307,362	28
9/02/95	35					28,913	21630000			28,913	21630000	29,349	58,262	11
Subtotals		0		163,582	5.95E+08	2,006,316	9.18E+09	4,204	1.48E+07	2,174,102	9.79E+09	1,482,016	3,656,118	462

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/17/95	24											1	1	0
6/24/95	25											27	27	0
7/01/95	26											11	11	0
7/08/95	27											60	60	0
7/15/95	28											103	103	0
7/22/95	29											304	304	0
7/29/95	30													
8/05/95	31											5,619	5,619	0
8/12/95	32	1,680	2.4E+06	213,997	7.69E+08	78,772	1.39E+08			294,449	9.1E+08	31,729	326,178	183
8/19/95	33			403,334	2.21E+09	151,969	3.13E+08			555,303	2.53E+09	28,730	584,033	281
8/26/95	34			38,691	1.7E+07					38,691	1.7E+07	7,496	46,187	15
9/02/95	35 1/			32,599	9.1E+07	4,253	1.6E+07			36,852	1.07E+08	70,844	107,696	15
9/09/95	36			2,558	5.6E+05	334	9.6E+04			2,892	6.6E+05	5,560	8,452	0
9/16/95	37											22	22	0
Subtotals		1,680	2.4E+06	691,179	3.09E+09	235,328	4.67E+08	0		928,187	3.57E+09	150,506	1,078,693	494

1/   Proportions from week 34 were used to allocate the catch.

Eshamy District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/08/95	27									0		271	271	0
7/15/95	28									0		1,656	1,656	0
7/22/95	29 2/	34	484	1,292	3.0E+05	327	1.1E+04			1,653	3.1E+05	2,900	4,553	0
8/29/95	30 2/	18	148	713	9.3E+04	180	3.3E+03			911	1.3E+04	1,604	2,515	0
8/05/95	31													
8/12/95	32	594	1.5E+05	22,649	9.3E+07	5,736	3.3E+06			28,979	6.9E+07	50,856	79,835	15
Subtotals		646	1.5E+05	24,654	9.3E+07	6,243	3.3E+06	0		31,543	6.9E+07	57,287	88,830	15

2/   Proportions from week 32 were used to allocate the catch.

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Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number Of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/05/95	31	73,269	1.68E+08	118,077	2.75E+08	212,231	1.04E+09	10,051	4.8E+07	413,628	1.53E+09	465,052	878,680	149
8/12/95	32	122,602	3.56E+08	179,440	4.23E+08	99,770	4.59E+08	16,442	9.5E+07	418,254	1.33E+09	410,811	829,065	188
Subtotals		195,871	5.23E+08	297,517	6.98E+08	312,001	1.50E+09	26,494	1.44E+08	831,882	2.86E+09	875,863	1,707,745	337

Montague District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/26/95	34										0	12292	12292	0
9/02/95	35										0	5947	5947	0
Subtotals		0		0		0		0		0		18,239	18,239	0

Southeastern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/19/95	33													
Subtotals		0		0		0		0		0		11418	11418	0
Grand Totals		199,288	5.26E+08	1,188,143	4.49E+09	2,621,757	1.15E+10	3,809,250	5.7E+10	7,818,438	7.4E+10	2,978,243	10,796,681	3,193

Appendix B.3. Pink salmon hatchery and wild stock contributions to Prince William Sound common property fisheries by district and week during 1996.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/06	27							1,700,412	1.23E+10	1,700,412	1.23E+10	445,823	2,146,235	295
7/13	28							1,711,825	1.04E+10	1,711,825	1.04E+10	295,818	2,007,643	392
7/20	29					3,733	1.39E+07	1,153,736	1.08E+10	1,157,469	1.08E+10	324,667	1,482,136	225
7/27	30							183,796	1.26E+09	183,796	1.26E+09	102,595	286,391	30
8/03	31							37,550	1.41E+08	37,550	1.41E+08	25,600	63,150	13
8/10	32 1/							12,848	1.65E+07	12,848	1.65E+07	8,760	21,608	0
8/17	33			22,163	2.46E+08	11,087	1.23E+08			33,250	3.69E+08	17,116	50,366	3
8/24	34 2/			659	2.2E+05	330	1.1E+05			989	3.3E+05	508	1,497	0
8/31	35												0	
9/07	36											37	37	0
Subtotals		0		22,822	2.46E+08	15,150	1.37E+08	4,800,167	3.49E+10	4,838,139	3.53E+10	1,220,924	6,059,063	958

1/ Proportions from week 31 were used to allocate the catch.
2/ Proportions from week 33 were used to allocate the catch.

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/20	29 1/					708	1.5E+05			708	1.5E+05	2,501	3,209	0
7/27	30					30,562	2.78E+08			30,562	2.78E+08	107,867	138,429	4
8/03	31			3,744	1.4E+07	187,971	3.96E+09	7,318	2.68E+07	199,033	4.0E+09	244,405	443,438	39
8/10	32			83,802	9.14E+08	1,154,894	1.21E+10			1,238,696	1.3E+10	485,945	1,724,642	185
8/17	33	19,902	1.65E+08	460,841	6.66E+09	747,092	6.43E+09	10,994	1.32E+08	1,238,829	1.34E+10	337,811	1,576,640	196
8/24	34	19,105	7.75E+07	134,587	8.95E+08	552,056	6.44E+09			705,748	7.41E+09	270,288	976,036	137
8/31	35 2/	3,476	2.6E+06	24,535	2.96E+07	100,439	2.13E+08			128,450	2.45E+08	49,127	177,577	0
Subtotals		42,483	2.45E+08	707,509	8.52E+09	2,773,722	2.94E+10	18,312	1.59E+08	3,542,026	3.84E+10	1,497,945	5,039,971	561

1/ Proportions from week 30 were used to allocate the catch.
2/ Proportions from week 34 were used to allocate the catch.

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/15	24													
6/22	25											13	13	0
6/29	26 1/											556	556	0
7/06	27 1/											1,120	1,120	0
7/13	28 1/											2,176	2,176	0
7/20	29 1/											10,152	10,152	0
7/27	30 2/	96	9.1E+03	10,579	1.6E+06	1,837	2.2E+05			12,512	1.8E+06	1,129	13,641	0
8/03	31 2/	13	1.8E+02	1,491	3.1E+04	259	4,302			1,763	35,272	160	1,923	0
8/10	32	5,492	3.02E+07	607,728	5.11E+09	105,547	7.14E+08			718,767	5.86E+09	64,859	783,626	138
8/17	33			483,554	7.51E+09	48,327	7.79E+08			531,881	8.29E+09	109,599	641,480	38
8/24	34			51,971	9.83E+08	10,364	1.95E+08			62,335	1.18E+09	0	62,335	6
8/31	35 3/			5,441	1.07E+07	1,085	2,141,731			6,526	1.29E+07	0	6,526	0
9/07	36 3/			16,120	9.45E+07	3,215	1.88E+07			19,335	1.13E+08	0	19,335	0
9/14	37											986	986	0
Subtotals		5,601	3.02E+07	1,176,884	1.37E+10	170,634	1.71E+09	0		1,353,119	1.54E+10	190,750	1,543,869	182

1/ Proportions from week 25 were used to allocate the catch.
2/ Proportions from week 32 were used to allocate the catch.
3/ Proportions from week 34 were used to allocate the catch.

Eshamy District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/06	27											4,578	4,578	0
7/13	28											2,943	2,943	0
7/20	29											4,521	4,521	0
7/27	30											1,429	1,429	0
8/03	31 1/	31	943	3,398	159,869	590	22,340			4,019	183,152	363	4,382	0
8/10	32 2/			897	25,833	90	2,679			987	28,512	203	1,190	0
Subtotals		31	943	4,295	185,702	680	25,019	0		5,006	211,664	14,037	19,043	0

1/ Proportions from week 32 of the Coghill district common property catch were used to allocate catch 2/ Proportions from week 33 of the Coghill district common property catch were used to allocate catch

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	No. Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/27	30	15,415	5.94E+07	17,589	9.78E+07	32,658	1.51E+08			65,662	3.08E+08	42,230	107,892	16
8/03	31	222,406	9.36E+08	205,405	2.32E+09	289,467	3.45E+09	37,374	2.08E+08	754,652	6.91E+09	145,737	900,389	156
8/10	32	501,678	3.55E+09	324,486	2.37E+09	210,736	1.64E+08	12,788	1.64E+08	1,049,688	7.63E+09	428,304	1,477,992	187
8/17	33	698,391	7.68E+09	503,628	7.39E+09	138,826	2.19E+09			1,340,845	1.73E+10	316,970	1,657,815	174
8/24	34	364,367	2.32E+09	20,342	1.04E+08	47,240	2.98E+08			431,949	2.72E+09	255,483	687,432	74
8/31	35	121,080	4.73E+08	7,789	3.03E+07					128,869	5.03E+08	86,530	215,399	33
Subtotals		1,923,337	1.5E+10	1,079,239	1.23E+10	718,927	7.64E+09	50,162	3.71E+08	3,771,665	3.53E+10	1,275,254	5,046,919	640
Grand Totals		1,971,452	1.53E+10	2,990,749	3.48E+10	3,679,113	3.89E+10	4,868,641	3.51E+10	13,509,955	1.24E+11	4,198,910	17,708,865	2,341

Appendix B.4. Pink salmon hatchery and wild stock contributions to Prince William Sound common property fisheries by district and week during 1997.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/28/98	26													
7/05/98	27							574,821	4.8E+09	574,821	4.8E+09	19,933	594,754	125
7/12/98	28							1,198,163	1.9E+10	1,198,163	1.9E+10	11,081	1,209,244	253
7/19/98	29					4,627	3.8E+07	1,202,821	7.1E+09	1,207,448	7.2E+09	0	1,207,448	370
7/26/98	30					6233	3.2E+07	681,133	5.5E+09	687,366	5.5E+09	33,932	721,298	205
8/02/98	31							200,519	3.4E+09	200,519	3.4E+09	7,186	207,705	50
8/09/98	32							83,533	5.5E+08	83,533	5.5E+08	25,976	109,509	19
8/16/98	33			14,049	4.0E+07	35,315	1.1E+08	221,841	7.3E+08	271,205	8.8E+08	26,519	297,724	94
8/23/98	34					61,781	5.1E+08	78,002	5.1E+08	139,783	1.0E+09	36,999	176,782	25
8/30/98	35					4,347	1.9E+07			4,347	1.9E+07	5,413	9,760	1
9/06/98	36 1/					63	4.0E+03			63	4.0E+03	79	142	0
Subtotals				14,049	4.0E+07	112,366	7.1E+08	4,240,833	4.2E+10	4,367,248	4.2E+10	167,118	4,534,366	1,142

1/ Proportions from week 35 were used to allocate the catch for week 36

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/26/98	30													
8/02/98	31					194,237	2.1E+09	9,198	2.8E+07	203,435	2.2E+09	50,456	253,891	40
8/09/98	32			71,278	2.9E+09	989,443	6.5E+10			1,060,721	6.8E+10	116,187	1,176,908	167
8/16/98	33			302,395	3.8E+09	138,154	1.1E+09			440,549	4.9E+09	4,796	445,345	72
8/23/98	34			146,013	1.6E+09	523,658	4.2E+09			669,671	5.8E+09	192,269	861,940	81
8/30/98	35					288,626	2.9E+09			288,626	2.9E+09	61,673	350,299	36
9/06/98	36									0			0	
9/13/98	37									0			0	
9/20/98	38 2/			1,631	2.6E+06	48,361	8.4E+07			49,992	8.6E+07	24,448	74,440	
Subtotals				521,317	8.3E+09	2,182,479	7.6E+10	9,198	2.8E+07	2,712,994	8.4E+10	449,829	3,162,823	396

2/ Proportions from week 38 of brood stock were used to allocate the catch

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/07/98	23													
6/14/98	24											1	1	0
6/21/98	25											2	2	0
6/28/98	26											60	60	0
7/05/98	27											267	267	0
7/12/98	28 1/			5,230	1.9E+06					5,230	1.9E+06	1,942	7,172	0
7/19/98	29 1/			19,546	2.7E+07					19,546	2.7E+07	7,260	26,806	0
7/26/98	30			151,670	1.6E+09					151,670	1.6E+09	56,333	208,003	16
8/02/98	31			46,054	1.9E+09					46,054	1.9E+09	2,179	48,233	2
8/09/98	32			218,299	2.6E+09	23,886	3.5E+08			242,185	2.9E+09	35,308	277,493	39
8/16/98	33			84,043	5.6E+09	89,425	5.4E+08			173,468	1.2E+09	4,222	177,690	49
8/23/98	34			261,684	4.6E+09	54,832	1.1E+09			316,516	537E+09	102,604	419,120	38
8/30/98	35			221,706	2.7E+09	65,672	8.2E+08			287,378	3.6E+09	142,311	429,689	41
9/06/98	36			346,054	1.9E+09	23,189	1.3E+08			369,243	2.0E+09	0	369,243	85
9/13/98	37			42,738	3.7E+08	8,632	7.5E+07			51,370	4.4E+08	15,437	66,807	6
Subtotals				1,397,024	1.6E+10	265,636	3.0E+09	0	0	1,662,660	1.9E+10	367,926	2,030,586	276

1/ Proportions from week 30 were used to allocate the catch

Eshamy District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/28/98	26													
7/05/98	27									0		328	328	0
7/12/98	28 2/			2,250	5.1E+06					2,250	5.1E+06	2,300	4,550	0
7/19/98	29 2/			710	5.0E+06					710	5.0E+06	727	1,437	0
7/26/98	30			8,150	6.6E+07					8,150	6.6E+07	8,334	16,484	1
8/02/98	31			11,454	6.6E+07			23,074	5.9E+08	34,528	6.5E+08	16,132	50,660	3
8/09/98	32			17,191	1.8E+08					17,191	1.8E+08	11,500	28,691	2
8/16/98	33			22,532	7.4E+08					22,532	7.4E+08	0	22,532	8
8/23/98	34	9,912	1.1E+08	52,591	6.9E+08					62,503	8.0E+08	0	62,503	7
8/30/98	35	10,481	1.1E+08	20,746	2.2E+08					31,227	3.3E+08	4,522	35,749	3
Subtotals		20,393	2.2E+08	135,624	2.0E+09	0	0	23,074	5.9E+08	179,091	2.8E+09	43,843	222,934	24

2/ Proportions from week 30 were used to allocate the catch

Southwestern District

| Week | Stat | AFK Hatchery | | WN Hatchery | | CC Hatchery | | SG Hatchery | | Total Hatchery | | Total | Total | Number |
Ending	Week	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Wild	Catch	of Tags
7/26/98	30													
8/02/98	31	11,443	4.6E+07	22,452	8.8E+07	7,358	2.7E+07	3,626	1.3E+07	44,879	1.7E+08	35,368	80,247	12
8/09/98	32	1,040,915	7.7E+10	121,203	1.1E+10	114,654	1.3E+10	9,001	1.7E+08	1,285,773	1.0E+11	29,791	1,315,564	226
8/16/98	33	966,448	1.5E+10	197,405	3.4E+09	115,798	1.3E+09	26,220	3.4E+08	1,305,871	2.1E+10	308,192	1,614,063	275
8/23/98	34	653,581	7.8E+09	263,607	2.8E+09	145,971	2.2E+09	13,668	1.4E+08	1,076,827	1.3E+10	292,438	1,369,265	136
8/30/98	35	364,164	2.4E+10	381,702	2.4E+09	180,366	1.5E+10			926,232	6.3E+10	83,570	1,009,802	25
9/06/98	36	316,910	2.1E+09	13,443	9.0E+07	13,866	9.6E+07			344,219	2.3E+09	130,220	474,439	51
9/13/98	33 1/	44,195	4.2E+07	1,875	1.8E+06	1,934	1.9E+06			48,004	4.5E+07	18,160	66,164	
Subtotals		3,397,656	1.3E+11	1,001,687	4.1E+10	579,947	3.1E+10	52,515	6.7E+08	5,031,805	2.0E+11	897,739	5,929,544	725
Grand Totals		3,418,049	1.3E+11	3,069,701	6.8E+10	3,140,428	1.1E+11	4,325,620	4.3E+10	13,953,798	3.5E+11	1,926,455	15,880,253	2,563

1/   Proportions from week 36 were used to allocate the catch

Appendix C: **Pink Salmon Hatchery and Wild Stock Contributions to Prince William Sound Cost Recovery Fisheries**

by District and Week for 1994 to 1997

Appendix C.1. **Pink salmon hatchery and wild stock contributions to Prince William Sound cost recovery fisheries by district and week during 1994.**

Eastern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/18/94	25													
6/25/94	26							265,139	5.4E+09	265,139	5.4E+09	0	265,139	120
7/02/94	27							1,081,582	5.2E+09	1,081,582	5.2E+09	16,732	1,098,314	225
7/09/94	28							480,299	1.6E+09	480,299	1.6E+09	42,518	522,817	141
7/16/94	29							637,373	2.1E+09	637,373	2.1E+09	293,613	930,986	195
7/23/94	30							193,328	5.3E+08	193,328	5.3E+08	20,841	214,169	70
Subtotals								2,657,721	1.5E+10	2,657,721	1.5E+10	373,704	3,031,425	751

Northern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/23/94	30													
7/30/94	31					36,503	1.1E+08			36,503	1.1E+08	32,737	69,240	16
8/06/94	32			3,316	5.1E+06	316,863	5.1E+08			316,863	5.1E+08	354,363	674,542	88
8/13/94	33					1,508,758	1.3E+10			1,508,758	1.3E+10	532,410	2,041,168	208
8/20/94	34					317,031	2.0E+09			317,031	2.0E+09	229,434	546,465	51
8/27/94	35 1/					98,054	1.9E+08			98,054	1.9E+08	70,961	169,015	0
9/03/94	36 1/					33,650	2.3E+07			33,650	2.3E+07	24,353	58,003	0
Subtotals				3,316	5.1E+06	2,310,859	1.6E+10			2,310,859	1.6E+10	1,244,258	3,558,433	363

1/ Proportions from week 34 were used to allocate the catch.

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/25/94	26													
7/02/94	27							34	3.0E+02	34	3.0E+02	17	51	1
7/09/94	28													
7/16/94	29													
7/23/94	30													
7/30/94	31			9,505	56E+06					9,505	5,596,253	555	10,060	8
8/06/94	32			263,745	1.1E+09	5,069	2.3E+07			268,814	1.1E+09	51,760	320,574	66
8/13/94	33			576,842	5.3E+09	27,084	2.1E+08			603,926	5.5E+09	251,531	855,457	95
8/20/94	34			459,012	2.9E+09	6,024	3.1E+07			465,036	2.9E+09	399,456	864,495	67
8/27/94	35			124,381	3.2E+08	30,511	7.5E+07			154,892	3.9E+08	200,005	354,897	15
9/03/94	36													
9/10/94	37 2/			25	1.3E+01	6	3			31	1.6E+01	41	72	0
9/17/94	38 2/			689	9.8E+03	169	2.3E+03			858	1.2E+04	1,109	1,967	0
Subtotals				1,434,199	9.6E+09	68,863	3.4E+08	34	3.0E+02	1,503,096	1.0E+10	904,474	2,407,570	252

1/ Proportions from week 35 were used to allocate the catch.

Eshamy District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/09/94	28													
7/16/94	29									0		330	330	0
7/23/94	30													
7/30/94	31									0		2,654	2,654	0
8/06/94	32									0		12,517	12,517	0
8/13/94	33 2/	1,736	8.7E+05	12,231	6.2E+06					13,966	7.1E+06	19,513	33,479	0
8/20/94	34 2/	4,365	5.5E+06	30,769	3.9E+07					35,134	4.5E+07	49,086	84,220	0
8/27/94	35	10,829	3.4E+07	76,337	2.4E+08					87,166	2.8E+08	34,613	121,779	8
9/03/94	36 2/	657	1.8E+06	4,632	1.3E+07					5,289	1.5E+07	7,389	12,678	0
Subtotals		17,586	4.2E+07	123,969	3.0E+08					141,555	3.4E+08	126,102	267,657	8

2/ Proportions from week 35 were used to allocate the catch.

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/23/94	30													
7/30/94	31	61,492	3.2E+08							61,492	3.2E+08	12,095	73,587	15
8/06/94	32	110,742	5.6E+08	5,479	7.5E+06	13,751	1.9E+07			129,972	5.8E+08	42,564	172,536	43
8/13/94	33	228,371	1.5E+09	14,158	2.8E+07	14,156	1.7E+07			256,685	1.5E+09	12,190	268,875	51
8/20/94	34	333,052	2.4E+09							333,052	2.4E+09	75,251	408,303	65
8/27/94	35	173,035	1.0E+09	1,.359	4.6E+05	15,225	1.2E+08			189,619	1.2E+09	21,217	210,836	58
9/03/94	36	26,215	4.3E+07							26,215	4.3E+07	0	26,215	4
Subtotals		932,907	5.8E+09	20,996	3.6E+07	43,132	1.5E+08			997,035	6.0E+09	163,317	1,160,352	236
Grand Totals		950,493	5.8E+09	1,582,480	1.0E+10	2,422,854	1.6E+10	2,657,755	1.5E+10	7,613,582	4.7E+10	2,811,855	10,425,437	1,610

Appendix C.2. **Pink salmon hatchery and wild stock contributions to Prince William Sound cost recovery fisheries by district and week during 1995.**

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
6/24/95	25							8,282	1.1E+07	8,282	1.1E+07	0	8,282	6
7/01/95	26							878,823	4.04E+10	878,823	4.04E+10	0	878,823	497
7/08/95	27							1,054,189	4.29E+10	1,054,189	4.29E+10	0	1,054,189	416
7/15/95	28							494,839	1.59E+10	494,839	1.59E+10	0	494,839	212
7/22/95	29							99,445	6.86E+08	99,445	6.86E+08	0	99,445	39
Subtotals		0		0		0		2,535,578	9.99E+10	2,535,578	9.99E+10	0	2,535,578	1170

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
8/05/95	31					5,380	9.6E+06			5,380	9.6E+06	51,249	56,629	3
8/12/95	32					305,680	2.14E+09			305,680	2.14E+09	417,212	722,892	57
8/19/95	33					20,003	4.4E+07			20,003	4.4E+07	54,650	74,653	9
8/26/95	34					47,524	1.79E+08			47,524	1.79E+08	134,913	182,437	12
Subtotals		0		0		378,587	2.38E+09	0		378,587	2.38E+09	658,024	1,036,611	81

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
7/22/95	29 1/			444	1.1E+04					444	1.1E+04	0	444	0
7/29/95	30 1/			4,788	1.3E+06					4,788	1.3E+06	0	4,788	0
8/05/95	31			134,385	1.0E+09					134,385	1.02E+09	0	134,385	21
8/12/95	32			160,433	2.3E+08					160,433	2.29E+08	14,504	174,937	15
8/19/95	33			392,949	5.0E+08	5,784	1.6E+06			398,733	5.06E+08	52,232	450,965	170
8/26/95	34			81,176	1.1E+08	10,611	6.0E+06			91,788	1.18E+08	0	91,788	21
9/02/95	35			59,036	2.9E+07					59,036	29650000	6,256	65,292	36
9/09/95	36 2/			5,732	2.5E+06					5,732	2.5E+06	607	6,339	0
Subtotals		0		838,943	1.9E+09	16,396	7.7E+06	0		855,339	1.9E+09	73,599	928,938	263

1/ Proportions from week 31 were used to allocate the catch.
2/ Proportions from week 35 were used to allocate the catch.

Eshamy District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/05/95	31									0		619	619	0
8/12/95	32									0		1,946	1,946	0
8/19/95	33													
8/26/95	34 3/	152	9,782	5,806	6,133,447	1,470	216,134			7,428	6,359,663	13,037	20,465	0
9/02/95	35 3/	152	9,782	5,779	6,077,232	1,464	214,450			7,395	6,301,464	12,976	20,371	0
Subtotals		304	19,564	11,585	12,210,679	2,934	430,884	0		14,823	12,661,127	28,578	43,401	0

3/ Proportions from week 35 of Eshamy district common property fishery were used to allocate the catch.

Southwestern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/29/95	30	708	2.5E+05							708	250042	1,841	2,549	2
8/05/95	31	34,075	1.38E+08							34,075	1.38E+08	70,918	104,993	8
8/12/95	32	95,739	5.83E+08			10,170	2.6E+07			105,910	6.09E+08	0	105,910	21
8/19/95	33	187,585	1.97E+09	5,644	5.0E+06					193,503	1.97E+09	0	193,503	103
8/26/95	34	116,543	2.01E+08			2,938	8.6E+06			119,481	2.10E+08	4,507	123,988	90
9/02/95	35 4/	13,799	2.8E+06			348	4.6E04			14,147	3.0E+06	534	14,681	0
Subtotals		448,728	2.89E+09	5,644	5.0E+06	13,456	3.4E+07	0		467,824	2.93E+09	77,800	545,624	224
Grand Totals		449,028	2.89E+09	856,172	1.91E+09	411,373	2.42E+09	2,53,5578	9.99E+10	4,252,151	1.01E+11	838,001	5,090,152	1,738

4/ Proportions from week 34 were used to allocate the catch

Appendix C.3. **Pink salmon hatchery and wild stock contributions to Prince William Sound cost recovery fisheries by district and week during 1996.**

Eastern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
6/22	25							10,688	5.37E+07	10,688	5.37E+07	0	10,688	5
6/29	26							533,839	1.89E+09	533,839	1.89E+09	72,041	605,880	151
7/06	27							518,848	1.53E+09	518,848	1.53E+09	107,481	626,329	176
7/13	28							668,909	2.87E+09	668,909	2.87E+09	17,504	686,413	156
7/20	29							284,643	1.17E+07	284,643	1.17E+07	151,078	435,721	68
Subtotals		0		0		0		2,016,927	1.17E+09	2,016,927	1.17E+09	348,104	2,365,031	556

Northern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/27	30 1/					4,843	8.1E+05			4,843	8.1E+05	6,177	11,020	0
8/03	31					124,767	5.37E+08			124,767	5.37E+08	159,110	283,877	29
8/10	32					111,872	3.21E+08			111,872	3.21E+08	196,568	308,440	39
8/17	33					210,604	9.86E+08			210,604	9.86E+08	516,440	727,044	45
8/24	34					153,751	6.71E+08			153,751	6.71E+08	226,924	380,675	51
8/31	35					94,103	3.11E+08			94,103	3.11E+08	0	94,103	30
Subtotals		0		0		699,940	2.83E+09	0		699,940	2.83E+09	1,105,219	1,805,159	194

1/ Proportions from week 31 were used to allocate the catch.

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/03	31			73,816	1.09E+09	14,694	2.16E+08			88,510	1.31E+09	134,501	223,011	6
8/10	32			224,318	1.03E+09					224,318	1.03E+09	402,605	626,923	54
8/17	33			754,679	1.09E+10	123,322	8.0E+08			878,001	1.17E+10	441,588	1,319,589	114
8/24	34			479,438	5.75E+09	11,979	1.44E+08			491,417	5.89E+09	694,875	1,186,292	41
8/31	35	4,127	2.52E+07	469,686	2.87E+09	4,136	2.53E+07			477,949	2.92E+09	0	477,949	116
9/07	36			227,097	1.8E+09					227,097	1.8E+09	0	227,097	57
9/14	37			34,987	1.75E+08					34,987	1.75E+08	11,301	46,288	7
Subtotals		4,127	2.52E+07	2,264,021	2.36E+10	154,131	1.19E+09			2,422,279	2.48E+10	1,684,870	4,107,149	395

Eshamy District 1/

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/06	27											4	4	0
7/13	28													
7/20	29													
7/27	30											329	329	0
8/03	31											184	184	0
8/10	32													
8/17	33											5,472	5,472	0
8/24	34													
8/31	35													
9/07	36													
9/14	37											20	20	0
Subtotals		0		0		0		0		0		6,039	6,039	0
Grand Totals		4,127	2.52E+07	2,264,021	2.36E+10	854,071	4.01E+09	2,016,927	3.52E+10	5,139,146	3.52E+10	3,144,232	8,283,378	1,145

1/ Catches were not allocated to hatcheries due to lack of samples taken in Eshamy district.

Appendix C.4. Pink salmon hatchery and wild stock contributions to Prince William Sound cost recovery fisheries by district and week during 1997.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
6/14/98	24													
6/21/98	25							8,614	2.9E+07	8,614	2.9E+07	0	8,614	5
6/28/98	26							432,329	4.9E+09	432,329	4.9E+09	0	432,329	161
7/05/98	27							908,645	6.0E+09	908,645	6.0E+09	0	908,645	281
7/12/98	28							845,016	5.6E+09	845,016	5.6E+09	0	845,016	285
7/19/98	29							221,321	1.6E+09	221,321	1.6E+09	0	221,321	83
8/23/98	34 1/							8,877	2.2E+06	8,877	2.2E+06	1,541	10,418	0
8/30/98	35													
9/06/98	36													
9/13/98	37							2,515	3.2E+06	2,515	3.2E+06	2,149	4,664	2
Subtotals								2,427,317	1.8E+10	2427317	1.8E+11	3,690	2,431,007	817

1/ Proportions from Solomon Gulch hatchery brood stock for week 34 were used to allocate the catch

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/26/98	30													
8/02/98	31					166,325	2.7E+09			166,325	2.7E+09	184,621	350,946	20
8/09/98	32					600,741	8.0E+09			600,741	8.0E+09	391,364	992,105	102
8/16/98	33 2/					272,694	4.3E+09			272,694	4.3E+09	123,939	396,633	34
8/23/98	34					71,465	1.7E+09			71,465	1.7E+09	62,177	133,642	6
9/27/98	39			203	4.1E+04	6,023	1.3E+06			6,226	1.4E+06	3,045	9,271	0
Subtotals		0	0	203	4.1E+04	1,117,248	1.7E+10	0	0	1,117,451	1.7E+10	765,146	1,882,597	162

2/ Proportions from Cannery Creek hatchery brood stock for week 38 were used to allocate the catch

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/12/98	28													
7/19/98	29 1/			3,048	1.8E+05	22	6.6E+02	21	64E+02	3,091	1.8E+05	1	3,092	0
7/26/98	30 1/			5,619	6.3E+05	40	2.2E+03	39	2.2E+03	5,698	6.3E+05	2	5,700	0
8/02/98	31			325,637	2.1E+09	2,301	7.6E+06	2,268	7.4E+06	330,206	2.1E+09	93	330,299	130
8/09/98	32			541,035	5.1E+09					541,035	5.1E+09	0	541,035	174
8/16/98	33 1/			707,359	5.2E+09					707,359	5.2E+09	98,376	805,735	101
8/23/98	34			449,219	4.4E+09	19,275	2.0E+08			468,494	4.6E+09	21,117	489,611	
8/30/98	35													
9/06/98	36 2/			21,871	1.0E+07	938	4.7E+05			22,809	1.1E+07	1,028	23,837	0
9/13/98	37													
9/20/98	38 3/			32,553	2.3E+07	721	5.2E+05			33,274	2.4E+07	1,953	35,227	0
9/27/98	39 3/			19,850	1.1E+07	440	3.3E+05			20,290	1.1E+07	1,191	21,481	0
Subtotals				2,106,191	1.7E+10	23,737	2.1E+08	2,328	7,365,147	2,132,256	1.7E+10	123,761	2,256,017	502

1/ Proportions from week 30 of Coghill cost recovery catch were used to allocate the catch
2/ Proportions from week 34 of Coghill cost recovery catch were used to allocate the catch
3/ Proportions from W.H. Noerenberg hatchery brood stock for week 38 were used to allocate the catch

Eshamy District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/05/98	27													
7/12/98	28											23	23	0
8/02/98	31											1,779	1,779	0
8/09/98	32			8,320	2.2E+07					8,320	2.2E+07	5574	13,894	13
8/16/98	33			11,944	1.4E+08					11944	1.4E+08	11,218	23,162	1
Subtotals				20,264	1.6E+08					20,264	1.6E+08	18,594	38,858	14

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/19/98	29													
7/26/98	30	206,374	4.5E+09							206,374	4.5E+09	0	206,374	12
8/02/98	31	852,371	6.4E+10							852,371	6.4E+10	0	852,371	110
8/09/98	32	555,573	5.1E+10	5,199	1.7E+08					560,772	5.1E+10	0	560,772	98
8/16/98	33	723,988	3.9E+10			3,054	1.3E+08			727,042	3.9E+10	0	727,042	80
8/23/98	34	849,380	4.5E+10	10,744	2.4E+08					860,124	4.5E+10	0	860,124	85
Subtotals		3,187,686	2.0E+11	15,943	4.2E+08	3,054	1.3E+08	0	0	3,206,683	2.0E+11	0	3,206,683	385
Grand Totals		3,187,686	2.0E+11	2,142,601	1.7E+10	1,144,039	1.7E+10	2,429,645	1.8E+10	8,903,971	2.6E+11	911,191	9,815,162	1,880

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Appendix D: Pink Salmon Hatchery and Wild Stock Contributions to Prince William Sound Hatchery Brood Stock by District and Week for 1994 to 1997.

Appendix D.1. Pink salmon hatchery and wild stock contributions to Prince William Sound hatchery brood stock by district and week during 1994.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
7/16/94	29													
7/23/94	30							5,864	6.9E+06	5,864	6.9E+06	1,162	7,026	5
7/30/94	31							55,325	6.4E+07	55,325	6.4E+07	62,549	117,874	48
8/06/94	32							50,407	5.8E+07	50,407	5.8E+07	37,173	87,580	44
8/13/94	33							69,348	8.6E+07	69,348	8.6E+07	20,367	89,715	56
8/20/94	34							51,585	7.2E+07	51,585	7.2E+07	57,809	109,394	37
8/27/94	35							19,572	2.9E+07	19,572	2.9E+07	28,313	47,885	13
9/03/94	36							4,406	6.5E+06	4,406	6.5E+06	12,492	16,898	3
Subtotals								256,507	3.2E+08	256,507	3.2E+08	219,865	476,372	206

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
8/20/94	34													
8/27/94	35			1,069	1.1E+06	20,052	2.1E+07			21,121	2.2E+07	2555	23,676	20
9/03/94	36			1,057	1.2E+06	70,883	7.6E+07			71,940	7.7E+07	19707	91,647	67
9/10/94	37					40,357	4.9E+07			40,357	4.9E+07	25985	66,342	33
9/17/94	38			1,236	1.6E+06	24,458	3.0E+07			25,694	3.1E+07	10605	36,299	21
Subtotals				3,362	3.8E+06	155,750	1.8E+08			159,112	3.2E+08	58852	217,964	141

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	AFK Hatchery Variance	WN Hatchery Contrib.	WN Hatchery Variance	CC Hatchery Contrib.	CC Hatchery Variance	SG Hatchery Contrib.	SG Hatchery Variance	Total Hatchery Contrib.	Total Hatchery Variance	Total Wild	Total Catch	Number of Tags
8/20/94	34													
8/27/94	35			65,963						65,963			65,963	39
9/03/94	36			117,601						117,601			117,601	76
9/10/94	37			118,362						118,362			118,362	97
9/17/94	38			79,509						79,509			79,509	79
9/24/94	39			54,024						54,024			54,024	26
Subtotals				435,459						435,459			435,459	317

Eshamy District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/20/94	34													
8/27/94	35					892	2.0E+05			892	2.0E+05	0	892	1
9/03/94	36	1,119	1.2E+06	6,834	7.8E+06					7,953	9.0E+06	9,535	17,488	7
9/10/94	37	971	2.4E+05	12,481	4.4E+06	950	2.3E+05			14,402	4.8E+06	0	14,402	15
9/17/94	38	885	2.0E+05	4,484	1.4E+06					5,369	1.6E+06	0	5,369	6
9/24/94	39			255	1.6E+04					255	1.6E+04	0	255	1
Subtotals		2,975	1.7E+06	24,054	1.4E+07	1,842	4.2E+05			28,871	1.6E+07	9,535	38,406	30

Southwestern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/20/94	34													
8/27/94	35	14,647	1.1E+07							14,647	1.1E+07	0	14,647	19
9/03/94	36	56,159	5.4E+07	1,037	1.1E+06					57,196	5.5E+07	962	58,158	69
9/10/94	37	45,423	4.3E+07							45,423	4.3E+07	7,629	53,052	57
9/17/94	38	83,549	4.2E+08	1,060	2.8E+05	1,046	2.7E+05			85,655	4.2E+08	0	85,655	98
9/24/94	39									0		480	480	0
Subtotals		199,778	5.2E+08	2,097	1.4E+06	1,046	2.7E+05			202,921	5.3E+08	9,071	211,992	243
Grand Totals		202,753	5.3E+08	464,972	5.8E+08	158,638	1.8E+08	256,507	3.2E+08	1,082,870	1.6E+09	297,323	1,380,193	937

Appendix D.2. **Pink salmon hatchery and wild stock contributions to Prince William Sound hatchery brood stock by district and week during 1995.**

Eastern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/29/95	30							38,936	3.3E+07	38,936	3.3E+07	4,145	43,801	47
8/05/95	31							89,593	5.15E+08	89,593	5.15E+08	0	89,593	138
8/12/95	32							106,101	7.70E+08	106,101	7.70E+08	0	106,101	162
8/19/95	33							63,287	3.28E+08	63,287	3.28E+08	0	63,287	134
8/26/95	34							71,543	6.6E+07	71,543	6.6E+07	15,853	87,396	77
9/02/95	35							37,589	1.25E+08	37,589	1.25E+08	0	37,589	75
9/09/95	36							551	7.6E+04	551	7.6E+04	0	551	1
9/16/95	37											16	16	0
Subtotals		0	0	0	0	0	0	407,600	1.84E+09	407,600	1.84E+09	20,014	427,614	634

Northern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/26/95	34					1,008	2.5E+05			1,008	2.5E+05	0	1,008	1
9/02/95	35					11,702	1.2E+07			11,702	1.2E+07	4,459	16,161	11
9/09/95	36					49,947	5.3E+07			49,947	5.3E+07	40,128	90,075	47
9/16/95	37					56,372	6.0E+07			56,372	6.0E+07	50,646	107,018	53
9/23/95	38					4,254	4.5E+06			4,254	4.5E+06	5,392	9,646	4
Subtotals		0	0	0	0	123,283	1.3E+08	0	0	123,283	1.3E+08	100,625	223,908	116

Coghill District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
7/15/95	28			1						1		0	1	0
7/22/95	29			7						7		0	7	0
7/29/95	30			3						3		0	3	0
8/05/95	31			21						21		0	21	0
8/12/95	32			4						4		0	4	0
8/19/95	33													
8/26/95	34			18,920						18,920		0	18,920	38
9/02/95	35			58,645						58,645		0	58,645	137
9/09/95	36			102,929						102,929		0	102,929	258
9/16/95	37			117,913						117,913		0	117,913	282
9/23/95	38			15,576						15,576		0	15,576	34
Subtotals		0		314,019		0		0		314,019		0	314,019	749

Southwestern District

Week Ending	Stat Week	AFK Hatchery		WN Hatchery		CC Hatchery		SG Hatchery		Total Hatchery		Total Wild	Total Catch	Number of Tags
		Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance	Contrib.	Variance			
8/26/95	34	1,819	1.5E+06							1,819	1.5E+06	1,083	2,902	3
9/02/95	35	41,128	2.4E+07							41,128	2.4E+07	4,965	46,093	92
9/09/95	36	74,185	4.8E+07							74,185	4.8E+07	11,527	85,712	152
9/16/95	37	13,857	9.5E+06							13,857	9.5E+06	8,793	22,650	27
Subtotals		130,989	8.3E+07	0		0		0		130,989	8.3E+07	26,368	157,357	274
Grand Totals		130,989	8.3E+07	314,019		123,283	1.30E+08	407,600	1.84E+09	975,891	2.05E+09	147,007	1,122,898	1,773

Appendix D.3. Pink salmon hatchery and wild stock contributions to Prince William Sound hatchery brood stock by district and week during 1996.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/27	30							91,415	1.25E+08	91,415	1.25E+08	6,778	98,193	67
8/03	31							87,363	1.29E+08	87,363	1.29E+08	28,513	115,876	59
8/10	32							73,770	1.11E+08	73,770	1.11E+08	13,642	87,412	49
8/17	33							52,144	6.63E+07	52,144	6.63E+07	19,528	71,672	41
8/24	34							26,976	3.31E+07	26,976	3.31E+07	17,072	44,048	22
8/31	35							17,229	3.95E+07	17,229	3.95E+07	0	17,229	14
Subtotals		0		0		0		348,897	5.04E+08	348,897	5.04E+08	85,533	434,430	252

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/31	35			1,515	2.3E+06	32,772	4.88E+07			34,287	5.11E+07	32,334	66,621	23
9/07	36					37,866	5.31E+07			37,866	5.31E+07	50,849	88,715	27
9/14	37			3,346	5.6E+06	66,569	1.11E+08			69,915	1.16E+08	49,182	119,097	42
9/21	38					28,534	5.43E+07			28,534	5.43E+07	57,933	86,467	15
Subtotals				4,861	7.9E+06	165,741	2.67E+08			170,602	2.75E+08	190,298	360,900	107

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/24	34			14,268						14,268		0	14,268	22
8/31	35			67,564						67,564		0	67,564	57
9/07	36			107,754						107,754		0	107,754	71
9/14	37			108,101						108,101		0	108,101	74
9/21	38			130,136						130,136		0	130,136	47
9/28	39			44,256						44,256		0	44,256	10
Subtotals		0	0	472,079	0	0	0	0	0	472,079	0	0	472,079	281
Grand Totals		0	0	476,940	7.89E+06	165,741	2.67E+08	348,897	5.04E+08	991,578	7.79E+08	275,831	1,267,409	640

Appendix D.4. Pink salmon hatchery and wild stock contributions to Prince William Sound hatchery brood stock by district and week during 1997.

Eastern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
7/19/98	29													
7/26/98	30							44,309	5.3E+07	44,309	5.3E+07	8,332	52,641	37
8/02/98	31							48,514	5.5E+07	48,514	5.5E+07	33,703	82,217	43
8/09/98	32							82,862	9.5E+07	82,862	9.5E+07	35,624	118,486	72
8/16/98	33							26,716	4.2E+07	26,716	4.2E+07	19,256	45,972	17
8/23/98	34							50,849	7.2E+07	50,849	7.2E+07	8,824	59,673	36
Subtotals		0	0	0	0	0	0	253,250	3.2E+08	253,250	3.2E+08	105,739	358,989	205

Northern District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/23/98	34													
8/30/98	35					6,114	2.0E+07			6,114	2.0E+07	0	6,114	6
9/06/98	36					89,193	1.4E+08			89,193	1.4E+08	187	89,380	57
9/13/98	37			1,655	2.8E+06	76,463	1.5E+08			78,118	1.5E+08	55,009	133,127	41
9/20/98	38			2,009	4.0E+06	59,569	1.3E+08			61,578	1.3E+08	30,114	91,692	29
Subtotals		0	0	3,664	6.8E+06	231,339	4.3E+08	0	0	235,003	4.4E+08	85,310	320,313	133

Coghill District

Week Ending	Stat Week	AFK Hatchery Contrib.	Variance	WN Hatchery Contrib.	Variance	CC Hatchery Contrib.	Variance	SG Hatchery Contrib.	Variance	Total Hatchery Contrib.	Variance	Total Wild	Total Catch	Number of Tags
8/23/98	34			6,723						6,723			6,723	10
8/30/98	35			33,427						33,427			33,427	33
9/06/98	36			134,240						134,240			134,240	113
9/13/98	37			159,889						159,889			159,889	119
9/20/98	38			44,815						44,815			44,815	47
9/27/98	39			29,377						29,377			29,377	
Subtotals		0	0	408,471	0	0	0	0	0	408,471	0	0	408,471	322
Grand Totals		0	0	412,135	6.8E+06	231,339	4.3E+08	253,250	3.2E+08	896,724	7.6E+08	191,049	1,087,773	660

Appendix E: Percent Survival by Tag Code of Pink Salmon Returning to Prince William Sound from 1994 to 1997.

Appendix E.1 Percent survival by tag code of pink salmon returning to Prince William Sound in 1994.

Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Conf. Interval	Upper 95% Conf. Interval
A. F. Koernig	1301020811	13,509	7,976,770	3.145698	0.441131	2.28108	4.010316
	1301020812	13,371	8,178,517	1.705346	0.283914	1.148874	2.261818
	1301020813	13,371	7,992,494	0.138387	0.099071	0	0.332566
	1301020814	13,248	7,975,690	0.438167	0.154242	0.135851	0.740482
	1301020815	13,385	7,975,497	0.257798	0.096229	0.069188	0.446408
	1301020901	13,146	7,975,242	0.160592	0.075795	0.012033	0.30915
	1301020902	11,859	7,006,119	0.590062	0.214705	0.169239	1.010885
	1301020903	11,813	6,981,010	0.357228	0.149917	0.063389	0.65107
	1301020904	11,662	6,999,822	0.171454	0.078777	0.01751	0.325856
	1301020905	11,943	7,168,239	0.372202	0.184151	0.011266	0.733138
	1301020906	12,373	7,363,609	0.422415	0.148131	0.132077	0.712752
	1301020907	11,709	7,111,484	0.102991	0.082256	0	0.264214
	1301020908	11,701	7,045,612	6.993602	0.742799	5.537715	8.449489
	1301020909	11,860	6,975,193	0.371924	0.156926	0.064348	0.679499
	1301020910	11,538	6,916,286	7.066813	0.767675	5.562169	8.571458
	1301020911	11,109	1,695,761	8.720289	0.946697	6.864763	10.57582
Wally Noerenberg	1301021012	20,757	12,688,033	5.344273	0.510004	4.344664	6.343881
	1301021013	19,901	12,036,519	5.248547	0.479511	4.308705	6.188389
	1301021014	19,562	11,900,957	3.4548	0.356042	2.756957	4.152643
	1301021015	20,087	12,105,181	3.405236	0.341749	2.735407	4.075065
	1301021101	19,973	12,003,572	1.693484	0.243266	1.216682	2.170286
	1301021102	19,910	11,976,571	2.204503	0.288845	1.3914	2.769866
	1301021103	19,819	12,016,427	1.85995	0.243324	1.383033	2.336866
	1301021104	21,118	12,727,191	2.837786	0.324476	2.201812	3.473761
	1301021105	20,036	12,167,539	2.265819	0.283359	1.710434	2.821203
	1301021106	19,690	12,003,914	3.076506	0.335001	2.419903	3.733109
	1301021107	19,901	12,020,607	1.588383	0.239975	1.118032	2.058735
	1301021108	20,194	12,022,492	1.532489	0.229462	1.082742	1.982236
	1301021109	19,808	12,063,272	8.870708	0.657025	7.582938	10.15848
	1301021110	24,201	14,352,158	6.99958	0.509936	6.000104	7.999056

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Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Conf. Interval	Upper 95% Conf. Interval
Cannery Creek	1301020912	16,457	9,951,523	8.05868	0.764006	6.561227	9.556131
	1301020913	16,713	9,982,219	5.755855	0.658355	4.465477	7.046233
	1301020914	16,618	9,941,026	5.528337	0.617083	4.318883	6.737852
	1301020915	16,808	10,031,625	7.200574	0.706065	5.816685	8.584463
	1301021101	16,449	9,974,576	7.242904	0.766623	5.740323	8.745486
	1301021102	16,055	9,977,249	5.390296	0.668785	4.079476	6.701115
	1301021103	16,596	9,974,215	7.12651	0.736764	5.682452	8.570568
	1301021104	16,534	9,967,084	9.539519	0.915365	7.745402	11.33364
	1301021105	16,767	10,073,965	7.724174	0.741958	6.269935	9.178412
	1301021106	16,600	9,973,185	9.441556	0.981971	7.516891	11.36622
	1301021107	16,945	10,162,835	6.636293	0.632046	5.397482	7.875104
	1301021108	16,648	9,957,657	6.116417	0.637359	4.867194	7.365641
	1301021109	16,802	10,066,503	5.692704	0.634167	4.449735	6.935672
	1301021110	16,534	9,996,737	3.644717	0.439522	2.783253	4.506181
Solomon Gulch	1301020508	51,650	31028437	7.934947	0.508379	6.938523	8.931373
	1301020509	50,158	29948159	11.15499	0.600435	9.978139	12.33185
	1301020511	30,358	18237547	9.841	0.657663	8.551979	11.13002
	1301021302	66,651	40031900	9.773089	0.504779	8.78372	10.76246
	1301021305	6,724	4161909	7.780141	1.034944	5.751651	9.808632
	1301021310	30,223	18457283	5.604424	0.441809	4.738479	6.470371

Appendix E.2   Percent survival by tag code of pink salmon returning to Prince William Sound in 1995.

Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Conf. Interval	Upper 95% Conf. Interval
A. F. Koernig	1301030108	13,427	6,618,697	0.049596	0.36406	0.	0.120954
	1301030109	10,541	60324,498	0.016791	0		
	1301030110	9,213	5,527,509	0.019212	0		
	1301030111	9,741	5,844,629				
	1301030113	9,179	5,507,274	0.095969	0.038343	0.20816	0.171122
	1301030114	10,208	6,125,031	0.231033	0.095736	0.043389	0.418677
	1301030115	8,570	5,142,018	0.226232	0.082136	0.065245	0.387219
	1301030201	8,243	4,946,477	0.197874	0.11882	0.	0.430762
	1301030202	10,577	6,345,996	0.16298	0.05695	0.051356	0.274603
	1301030203	10,794	6,476,718	0.146823	0.065212	0.019006	0.274640
	1301030204	11,143	6,685,569	0.650078	0.205886	0.246541	1.053616
	1301030205	10,450	6,270,226	0.747400	0.15818	0.437366	1.057433
	1301030206	11,368	6,821,127	0.644830	0.200624	0.251606	1.038054
	1301030207	10,191	6,398,894	1.303599	0.251904	0.809865	1.797333
	1301030303	17,732	3,547,896	7.461411	1.119573	5.26705	9.655774
	1301030304	17,481	3,496,392	6.291389	0.893904	4.539336	8.043441
Wally Noerenberg	1301020401	15,977	9,371,637	0.534149	0.099969	0.33821	0.730089
	1301021214	2,229	1,300,230	0.793112	0.183494	0.433464	1.152761
	1301021312	18,674	11,211,336	1.113184	0.153949	0.811441	1.414925
	1301021313	19,208	11,540,914	0.906253	0.137294	0.637156	1.175351
	1301021314	19,917	12,040,148	0.294916	0.068438	0.160777	0.429056
	1301021315	19,744	11,872,060	0.324124	0.084269	0.158955	0.489293
	1301021401	20,181	12,163,694	0.156990	0.0875	0.	0.328491
	1301021402	19,977	19,977	1.996349	0.133013	1.735642	2.257056
	1301021403	20,324	12,055,003	0.206729	0.073913	0.061859	0.351599
	1301021404	20,706	12,328,148	0.179387	0.043744	0.093648	0.265126
	1310121405	20,214	12,126,815	0.094160	0.046921	0.002193	0.186127
	1301021406	20,098	12,106,415	0.065842	0.039793	0.	0.143838
	1301021407	20,113	12,214,122	0.315546	0.078754	0.161187	0.469905
	1301021408	20,385	12,336,261	0.495401	0.10529	0.289032	0.701770
	1301021409	19,965	12,010,977	0.332658	0.069442	0.196550	0.468766
	1301030305	18,990	3,803,426	23.53498	1.343817	20.9011	26.16886
	1301030306	19,469	3,905,582	21.15258	1.247775	18.70694	23.59822

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Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Conf. Interval	Upper 95% Conf. Interval
Cannery Creek	1301021513	16,084	9,485,711	0.364058	0.119929	0.128997	0.599122
	1301021514	15,523	9,329,671	0.425376	0.139545	0.151867	0.698886
	1301021515	15,793	9,492,115	1.464074	0.273948	0.927134	2.001013
	1310130101	15,691	9,429,516	5.993971	0.525123	4.964729	7.023213
	1301030102	45,797	9,494,035	4.886346	0.482306	3.941026	5.831666
	1301030103	16,252	9,767,701	4.605903	0.460585	3.703154	5.508651
	1301030104	16,434	9,876,333	3.60213	0.402492	2.813245	4.391015
	1301030105	15,961	9,580,712	6.481187	0.548845	5.405451	7.556923
	1301030106	13,569	8,160,820	6.165203	0.551855	5.083567	7.24684
Solomon Gulch	1301030209	49,718	28,140,000	1.67472	0.303499	1.079862	2.269578
	1301030210	49,513	29,370,000	1.309377	0.223177	0.871948	1.746805
	1301030211	50,381	24,170,000	2.017086	0.269197	1.489458	2.544713
	1301030212	53,421	23,740,000	8.600124	1.023131	6.594788	10.60546
	1301030213	68,860	29,553,648	8.166784	0.899825	6.403126	9.930443
	1301030214	33,785	14,500,000	7.397067	0.735555	5.955378	8.838755

Appendix E.3. Percent survival by tag code of pink salmon returning to Prince William Sound in 1996.

Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Confidence. Interval	Upper 95% Confidence. Interval
A. F. Koernig	1301030112	10,805	6,482,867	0.6273	0.2274	0.1815	1.0731
	1301030208	5,484	3,290,381	0.8551	0.3639	0.1418	1.5684
	1301030611	4,949	2,961,191	3.8069	0.8506	2.1340	5.4741
	1301030612	5,056	3,024,130	3.4228	0.8582	1.7408	5.1049
	1301030613	12,844	7,706,875	1.4195	0.4634	0.5112	2.3278
	1301030614	13,227	7,935,957	1.8131	0.4983	0.8365	2.7898
	1301030615	13,150	7,890,002	2.5186	0.5286	1.4825	3.5547
	1301030701	13,267	7,959,660	1.8989	0.4217	1.0724	2.7254
	1301030702	11,523	6,914,076	2.9554	0.5969	1.7854	4.1253
	1301030703	11,489	6,896,169	1.8450	0.3621	1.1353	2.5547
	1301030704	11,568	6,940,882	1.7759	0.4081	0.9761	2.5757
	1301030705	11,971	7,182,752	1.8385	0.5290	0.8017	2.8753
	1301030706	11,497	6,898,064	1.3965	0.3246	0.7604	2.0326
	1301030707	11,596	6,884,266	2.0239	0.3855	1.2683	2.7794
	1301030708	10,712	6,427,763	1.9541	0.5675	0.8419	3.0663
	1301030709	10,362	6,217,053	1.4790	0.3808	0.7326	2.2253
	1301030710	11,624	6,974,024	0.6808	0.2419	0.2067	1.1549
W. H. Noerenberg	1301030412	18,306	11,204,511	3.7630	0.6002	2.5866	4.9393
	1301030413	19,685	11,784,356	4.2798	0.6263	3.0522	5.5074
	1301030414	19,554	11,835,217	3.6413	0.6085	2.4487	4.8339
	1301030415	19,626	11,858,128	3.8029	0.5899	2.6466	4.9592
	1301030501	19,655	11,965,054	2.3725	0.4245	1.5405	3.2044
	1301030502	19,615	11,910,616	2.3392	0.4835	1.3916	3.2868
	1301030503	21,607	12,939,147	1.8215	0.3846	1.0678	2.5753
	1301030504	20,170	12,045,477	2.2398	0.4491	1.3596	3.1199
	1301030505	20,192	12,055,098	2.4580	0.4506	1.5748	3.3412
	1301030506	20,258	12,094,688	3.0890	0.5150	2.0796	4.0985
	1301030507	19,983	12,032,630	3.4294	0.5377	2.3755	4.4833
	1301030508	20,160	12,041,789	3.6520	0.5534	2.5673	4.7366
	1301030509	20,152	12,058,282	4.0573	0.6107	2.8603	5.2544
	1301030510	11,518	6,723,354	2.6206	0.5475	1.5475	3.6936
	1301030511	5,443	3,153,255	8.0870	1.7299	4.6964	11.4777
	1301030512	5,346	3,162,934	6.9855	1.4687	4.1069	9.8641

Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Confidence. Interval	Upper 95% Confidence. Interval
Cannery Creek	1301030903	15,972	9,557,693	4.9891	0.9055	3.2144	6.7638
	1301030904	16,382	9,791,611	3.9179	0.6266	2.6898	5.1460
	1301030905	16,244	9,699,256	2.5472	0.5084	1.5508	3.5436
	1301030906	16,740	10,028,649	2.4096	0.4786	1.4715	3.3476
	1301030907	16,366	9,833,723	2.6805	0.5191	1.6630	3.6980
	1301030908	16,661	9,865,363	2.7152	0.4314	1.8696	3.5607
	1301030909	16,345	9,827,507	6.2311	0.7479	4.7652	7.6971
	1301030910	16,785	10,026,368	4.4486	0.5800	3.3118	5.5853
	1301030911	16,480	9,864,051	5.5536	0.7644	4.0553	7.0519
	1301030912	16,394	9,831,138	3.9557	0.5473	2.8830	5.0284
	1301030913	16,668	10,101,033	3.1075	0.5214	2.0856	4.1294
	1301030914	16,247	9,765,141	3.1258	0.5488	2.0501	4.2016
	1301030915	16,094	9,610,718	1.5995	0.3718	0.8708	2.3282
	1301031001	4,176	2,537,200	1.8674	0.7923	0.3145	3.4202
Solomon Gulch	1301030602	38,238	24,064,548	3.4483	0.3090	2.8426	4.0540
	1301030603	41,773	25,360,456	4.1628	0.2939	3.5867	4.7389
	1301030604	42,204	25,937,816	3.9351	0.3346	3.2792	4.5909
	1301030605	44,606	26,999,046	2.6309	0.2227	2.1945	3.0674
	1301030606	45,160	27,148,395	3.1727	0.2822	2.6197	3.7258
	1301030607	40,824	24,333,581	2.3821	0.2613	1.8699	2.8943
	1301030608	52,218	31,917,113	5.0820	0.3011	4.4918	5.6722
	1301030609	32,811	19,610,175	2.6692	0.2591	2.1613	3.1771

Appendix E.4. Percent survival by tag code of pink salmon returning to Prince William Sound in 1997.

Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Confidence. Interval	Upper 95% Confidence. Interval
A. F. Koernig	1301031315	17,818	10,768,841	9.200	2.138	5.009	13.390
	1301031401	16,976	10,374,384	8.145	2.290	3.656	12.634
	1301031402	17,090	10,325,538	7.886	1.896	4.169	11.603
	1301031403	18,284	10,912,648	6.464	1.602	3.324	9.604
	1301031404	18,130	10,626,187	6.419	1.688	3.109	9.728
	1301031405	14,476	8,312,086	5.549	1.858	1.907	9.191
	1301031406	15,080	8,638,583	4.660	1.538	1.645	7.675
	1301031407	14,990	8,594,441	4.093	1.547	4.060	7.126
	1301031408	15,855	9,745,337	5.223	4.395	2.489	7.956
	1301031409	13,319	7,877,679	1.956	0.758	0.471	3.441
	1301031410	6,857	4,088,687	6.208	2.977	0.373	12.042
	1301031411	6,955	4,150,370	4.336	2.442	0	9.123
	1301031412	7,268	4,222,195	5.754	2.578	0.702	10.806
W. H. Noerenberg	1301031202	4,957	2,851,883	4.828	2.687	0	10.095
	1301031203	5,050	2,996,758	1.556	0.610	0.361	2.751
	1301031204	4,731	2,850,133	4.031	1.247	1.588	6.474
	1301031205	4,945	2,689,583	2.729	2.181	0	7.004
	1301031206	12,273	7,146,802	3.159	1.016	1.168	5.151
	1301031207	11,711	7,131,155	3.180	0.703	1.803	4.558
	1301031208	12,371	6,768,978	3.955	0.821	2.345	5.564
	1301031209	11,649	6,958,899	3.190	0.634	1.949	4.432
	1301031210	11,758	7,089,362	2.716	0.652	4.438	3.994
	1301031211	11,677	7,010,355	2.456	0.569	1.342	3.571
	1301031212	11,247	6,737,469	3.906	1.315	1.328	6.484
	1301031213	11,863	7,093,496	3.492	0.743	2.034	4.949
	1301031214	10,748	6,400,600	3.908	0.731	2.475	5.341
	1301031215	11,674	6,922,926	3.112	0.914	1.319	4.904
	1301031301	12,664	7,585,848	4.078	1.267	1.595	6.562
	1301031302	12,115	7,173,971	3.676	0.659	2.383	4.968
	1301031303	12,266	7,227,585	3.917	0.764	2.419	5.415
	1301031304	12,368	7,320,089	2.954	0.623	1.733	4.174
	1301031305	12,319	7,304,017	1.894	0.491	0.930	2.857
	1301031306	12,309	7,310,726	2.996	0.632	1.757	4.234
	1301031307	11,967	7,342,976	3.105	0.697	1.738	4.471
	1301031308	12,253	7,372,255	2.544	0.520	1.526	3.563
	1301031309	12,138	7,288,100	3.369	1.175	1.065	5.673
	1301031310	13,372	7,998,210	0.732	0.303	0.137	1.326
	1301031311	12,620	7,757,000	1.422	0.485	0.472	2.372
	1301031312	12,085	7,179,817	1.705	0.416	0.890	2.519

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Origin	Tag Code	# Tagged	# Released	Estimated Percent Survival	Standard Error	Lower 95% Confidence. Interval	Upper 95% Confidence. Interval
Cannery Creek	1301031413	16,086	9,615,650	4.330	0.644	3.067	5.592
	1301031414	16,557	9,934,444	3.107	0.467	2.192	4.023
	1301031415	16,632	9,971,524	4.349	0.788	3.105	6.192
	1301031501	16,623	9,978,551	3.857	0.680	2.524	5.190
	1301031502	16,636	9,973,804	2.028	0.446	1.154	2.902
	1301031503	16,628	10,291,792	2.958	0.495	1.989	3.928
	1301031504	16,477	10,764,086	4.672	0.956	2.798	3.546
	1301031505	16,931	10,703,108	3.193	0.502	2.210	4.176
	1301031506	16,637	10,979,642	4.387	0.723	2.970	5.803
	1301031507	16,642	11,213,439	2.277	0.838	0.634	3.920
	1301031508	15,230	10,232,285	2.182	0.417	1.364	3.000
	1301031509	16,732	11,018,655	1.872	0.394	1.100	2.645
	1301031510	16,592	9,978,652	1.752	0.391	0.987	2.518
	1301031511	9,642	5,785,499	2.053	0.637	0.804	3.302
Solomon Gulch	1301031113	53,278	31,830,481	2.486	0.247	2.002	2.970
	1301031114	53,562	31,989,818	4.630	0.396	3.857	5.410
	1301031115	136,086	80,464,628	2.574	0.163	2.254	2.895
	1301031201	133,277	78,803,400	3.393	0.187	3.026	3.760