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FORECAST OF THE 2000 RUN OF SOCKEYE SALMON TO BRISTOL BAY

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ANNUAL REPORT TO

BRISTOL BAY PROCESSORS

ACKNOWLEDGMENTS

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KEY WORDS

Alaska, Bristol Bay fishery, forecasts, Port Moller, sockeye salmon, recruits-per-spawner

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INTRODUCTION

Salmon runs are characterized by large year-to-year variation in numbers. During the past 30 years, the largest annual catches of sockeye salmon (*Oncorhynchus nerka*) in the major Alaskan fisheries have been more than ten times greater than the smallest catch (Fig. 1). The Bristol Bay sockeye fishery is the largest in the world, and has seen catches of less than 1 million fish in 1973 and greater than 40 million fish 10 years later (Rogers 1998). This high variability in runs and catches poses severe challenges to both managers and the fishing industry. Managers need an idea of the run size early in the season to determine when it is appropriate to begin fishing. For the commercial fishing industry, preseason forecasts are even more important. Fishermen must decide how many crew to employ, and in some cases even whether it is worth gearing up for the fishing season. Fishermen must also decide the appropriate value for a fishing license, which depends greatly on the expected catch in future years. Fish processors face myriad decisions regarding the number of people to employ, fiber and cans to ship to Bristol Bay, how many floating processors to send to the bay, and how many canneries to operate and tenders to employ. In 1997 and 1998, when the industry was geared for catches of roughly 20+ million and the total catch was half of that, tens of millions of dollars were lost.

The return of sockeye salmon to Bristol Bay depends upon the number of eggs laid in the brood years that will return, the freshwater survival, the ocean survival, and the number of years the fish spend in the ocean. Scientists use a variety of measurements to attempt to determine these factors. We generally have good estimates of the brood year escapements, and in the Kvichak and Egegik systems we have estimates of the number of smolts migrating to sea. The dominant factor affecting return has been survival in the ocean. The paucity of current data from high-seas sampling of salmon precludes our applying this information to the preseason index of abundance. We have also not found any strong correlation between ocean conditions and Bristol Bay sockeye ocean survival. We rely primarily on the return of siblings for run prediction. This involves examining the relationship between the number of jacks who return in one year (fish who have spent 1 year in the ocean) and the number of 2-ocean fish in the subsequent year. Similarly we generally rely on the number of 2-ocean fish in one year to predict the number of 3-ocean fish the next year.

Measurements needed to forecast the Bristol Bay sockeye salmon runs were not made routinely until about 1950; the first forecasts were made by biologists from the Fisheries Research Institute (FRI) and from what is now the National Marine Fisheries Service (NMFS) later in that decade. About 1962, the Alaska Department of Fish and Game (ADF&G) assembled a staff of biologists to make annual forecasts of the runs from inshore observations (escapements, smolt, age, etc.) and in 1984, salmon processors asked FRI to make forecasts from these same data to provide a second opinion.

This report provides forecasts of the 2000 run to Bristol Bay, which are based primarily on the preliminary statistics provided by ADF&G. In a document to be published in the near term, we will review the performance of the Pt. Moller test fishery and evaluate the 1999 fishing season.

FORECAST FOR YEAR 2000

The forecast for 2000 is challenging because of a number of potentially conflicting signals. The very strong return of 2-ocean fish in 1999 may indicate either a strong return of 3-ocean fish in 2000 or that these cohorts matured dominantly as 2-ocean fish. Similarly, the very weak return of jacks in 1999 would be expected to indicate a poor return of 2-ocean fish in 2000—but the small size of the 2-ocean fish may indicate poor growth of the 1-ocean fish, and a smaller than usual fraction of these fish may have returned as jacks. In addition to these uncertainties, the specter of another poor return as in 1997 and 1998 is present, and since we have no explanation for the poor returns in those two years, we cannot say with any certainty that it will not happen again.

In the sections below, we review the key issues affecting our forecast for 2000, then discuss the alternative methods of doing the forecast. We then explain how we weighted the alternative forecasting methods and provide our forecast for 2000. As in 1999, we present a probability distribution for the forecast. History shows us that we cannot forecast the Bristol Bay sockeye run without the potential for major error, so we will provide our best estimate of the chance different magnitudes of return.

General Factors Affecting the Expected Return

In the sections below, we discuss the various factors that may influence the total return of sockeye to Bristol Bay.

Freshwater Conditions Affecting the 2000 Return

The return to Bristol Bay in 2000 will consist primarily of 3 brood years: the 1994 brood year (2.3 fish), the 1995 brood (2.2 and 1.3 fish), and the 1996 brood (1.2 fish). The temperatures have continued to be warm which is generally correlated with good subsequent brood year survival (see Figs. 2 and 3).

Review of Oceanographic Conditions Affecting the 2000 Return

The return in the year 2000 will consist of fish that migrated to sea in 1997 and 1998. The year 1997 was remarkable in the very high marine water temperatures at the time of the smolt migration and concern was expressed at the time that this might adversely affect the return of those fish (Figs. 4 and 5). However, the 1.2 return in 1999 was very strong and there is no reason to believe that these warm conditions caused poor survival. The summer of 1997 was particularly unusual with the high water temperatures, low wind, and low mixing. Several oceanographic cruises noted the presence of blooms of coccolithophores, and similar blooms were found in the summer of 1998. It is argued by some that these blooms were responsible for considerable mortality of maturing fish in both summers. We do not know of similar reports in the summer of 1999. We are actively engaged in exploring oceanographic data that might provide a clue to changes in ocean survival, but at present we have not found any variables with explanatory power

Interception Fisheries

One of the hypotheses for the poor returns in 1997 and 1998 was increased interception of Bristol Bay fish in the Japanese driftnet fishery within the Russian Exclusive Economic Zone. While such interception definitely exists and may amount to several million fish, we know of no evidence that 8–15 million sockeye have appeared on world markets and, in the absence of firm data, we do not use these interception fisheries as a factor in our forecasting.

Indicators of Ocean Survival from Pink Returns

The return of pink (*O. gorbuscha*) salmon throughout Alaska in 1999 was extremely strong. Since pink salmon in 1999 entered the ocean the same year as the 2-ocean fish that will return to Bristol Bay, this could indicate generally favorable ocean conditions in spring 1998. We have explored the relationship between Bristol Bay sockeye returns and pink salmon returns to various regions of Alaska, and pink salmon recruits-per-spawner, and do not find any correlations strong enough to include in our forecasting this year. Certainly, if one goes back prior to the regime shift in 1977, then there is a strong correlation: both pink salmon and Bristol Bay sockeye increased significantly after 1977. However, since 1977 there has been at best a very weak correlation between any of Alaska's pink salmon runs and the Bristol Bay sockeye. However, we do infer that the strong pink salmon returns in 1999 do not indicate a shift back to an unproductive ocean regime, and this points to continued strong Bristol Bay average returns in upcoming years.

Indicators of Ocean Survival from High-Seas Sampling

If we could sample the salmon in the high seas extensively, we should be able to provide greatly improved run forecasting. To know the relative abundance, size, and stock composition of sockeye salmon on the high seas would provide direct information about the expected strength of different stocks. Unfortunately, there is only minimal high seas sampling for salmon and sockeye in particular. We have obtained the sockeye data from the *Wakatake Maru*, a Japanese research ship that annually conducts experimental fishing along the 180° line of longitude through the Gulf of Alaska and the Bering Sea (Ueno et al. 1998). We hoped that these data would provide some indications of the relative growth, abundance, and age composition of sockeye from this region of the ocean, but at present we have found no relationship between the *Wakatake* data and subsequent Bristol Bay returns. We will continue to try to assemble the existing ocean salmon collection data. In addition, we are developing a proposal for a major program

of high-seas salmon sampling that will be put before congressional delegations for direct funding.

Return of Jacks

The return of jacks generally provides good prediction of the next year's return of 2-ocean fish. In general, the relationship is strong for most major Bristol Bay systems (Fig. 6). The 1999 season had very few jacks return to the entire system, thus suggesting a poor return of 2-ocean fish in 2000. Since the 2-ocean fish in 1999 were small (Fig. 7), it is possible that growth from May 1998 to May 1999 was less than average, and that a smaller than usual fraction of the 1998 smolts matured and returned as jacks in 1999. However, historical data does not support this hypothesis.

2-ocean Fish as Indicators of 3-ocean Fish Return

Generally, a strong relationship exists between the return of 2-ocean fish and subsequent return of 3-ocean fish from the same cohorts from 1981 onwards (Fig. 8). The strong 2–ocean return in 1999 would indicate a strong 3-ocean return in the year 2000. However, if we look farther back in history, there have been two years of particularly large 2-ocean return that did not result in large 3-ocean returns the following year. Thus, we think it quite possible that the 3-ocean returns for the year 2000 will not be as strong as this sibling relationship might suggest (Fig. 9).

Alternative Methods for Predicting the Return

We have explored a number of methods for forecasting the year 2000 return. These are discussed below.

Don Rogers' Traditional Method

Since 1985, Don Rogers has provided a run forecast based on examining the best correlating factors on a system-by-system and age-by-age basis (Fig. 10) The forecasts have on average been 4.6% low and the average deviation between predicted and observed has been ± 23.3%. Rogers has again done these calculations for this year. The use of jacks and 2-ocean returns in 1999 to forecast 2000 2-ocean and 3-ocean fish are the primary factors used (Table 1). Rogers' method provides an forecast of 43 million fish, and the system and age composition is shown in the first column of Table 2.

With and Without Jack returns and 2-ocean returns

We have calculated forecasts for each age and system based on using or not using jack returns to forecast 2-ocean fish, and using or not using 2-ocean fish to forecast 3-ocean fish. When jacks or 2-ocean fish were not used for forecasting, we used a 5-year average return as the forecast. If we use jacks and 2-ocean, we obtain a forecast of 42 million fish, close to Rogers' method. If we don't use jacks but use 2-ocean's, we forecast 52 million. If we use jacks but don't use 2-ocean's, we forecast 25 million, and if we don't use either, we forecast 34 million. The system and age details are shown in the columns 2–5 of Table 2.

Recruits-per-Spawner Trends

If we look at the historical pattern in recruits-per-spawner, we see a strong downward trend in the last 8 years (Fig. 11). As in 1998, we have run forecasts by averaging the recruits-per-spawner over different time horizons. Figure 12 shows the relationship between the recruits-per-spawner average over the past n-years, and the resulting total run forecast. Table 3 shows the system and age-specific forecasts for the 5- and 15-year recruits-per-spawner. Rogers' method is included for reference in the left-hand column. Here, we see that the 5-year recruits-per-spawner will begin to forecast higher 2-ocean returns and lower 3-ocean returns than Rogers' method, but on average provide a considerably lower forecast than Don's method (31 million). This is because of the heavy weighting given to the 1997 and 1998 returns in a 5-year running average.

Total Return Trends

Figure 12 shows the total return by brood year. Note that the strong decline in recruits-per-spawner (Fig. 11) is not nearly as evident here—due in part to higher escapements. In many situations for forecasting, regardless of whether it is the stock market or the weather, the best forecast is often just an average of the recent past. We have included, for reference, what the forecast would be if we simply assume the returns will be the average of the last 5 or last 15 years (34 million and 37 million, Table 3, columns 4 and 5, respectively).

The Possibility of a Repeat of the 1997 and 1998 Returns

The biological and physical events that caused the poor returns in 1997 and 1998 remain unknown; thus we are not able to say with confidence that such poor returns will not happen again, and we believe that in business planning, the industry must allow for this possibility.

Our Best Estimate of the Return for the Year 2000

In our final analysis, we consider four hypotheses: the forecast Don Rogers provided, which considers the jack and 2-ocean predictions; the forecast with no jacks but 2-ocean fish; the forecast with jacks but no 2-ocean fish; and the forecast with neither jacks nor 2-ocean fish. Our assessment of the probabilities of these cases being true is an 80% chance that the jack forecast is correct for 2-ocean fish, and a 60% chance that the 2-ocean forecast is correct for 3-ocean fish. This provides the following table:

Hypothesis	Forecast	Catch	Probability
Rogers' jacks and 2-ocean	43.0	29.7	0.48
No jacks, 2-ocean	51.9	38.6	0.12
Jacks, no 2-ocean	24.5	11.2	0.32
No jacks, no 2-ocean	34.1	20.8	0.08

The average expected run from this is 37.7 million with an expected catch of 24.4 million. Tables 6-11 show the brood tables for each system and the forecast numbers by system and age.Table 4 shows the expected return by age and system for our average forecast.

We recognize that this uncertainty makes preseason planning extremely difficult, but we believe it is the best assessment given available data.

It is clear that the primary goal of the scientific community in the next few years should be to provide better data on which to base the forecast. For example, if we had a good systematic sample of sockeye salmon from the high seas last summer, and we could identify Bristol Bay fish, then we would have a much better idea of how many of the 2-ocean fish were maturing and thus whether to expect a large 3-ocean return this year.

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Ueuo, Y., N.D. Davis, M. Sasaki, and I. Tokuhiro. 1998 Japan-U.S. cooperative High-Seas salmonids research aboard the R/V Wakatake Maru from June 9 to July 25, 1998. (NPAFC Doc. 326). National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimizu, Shizuoka, 424, Japan. 55 p.

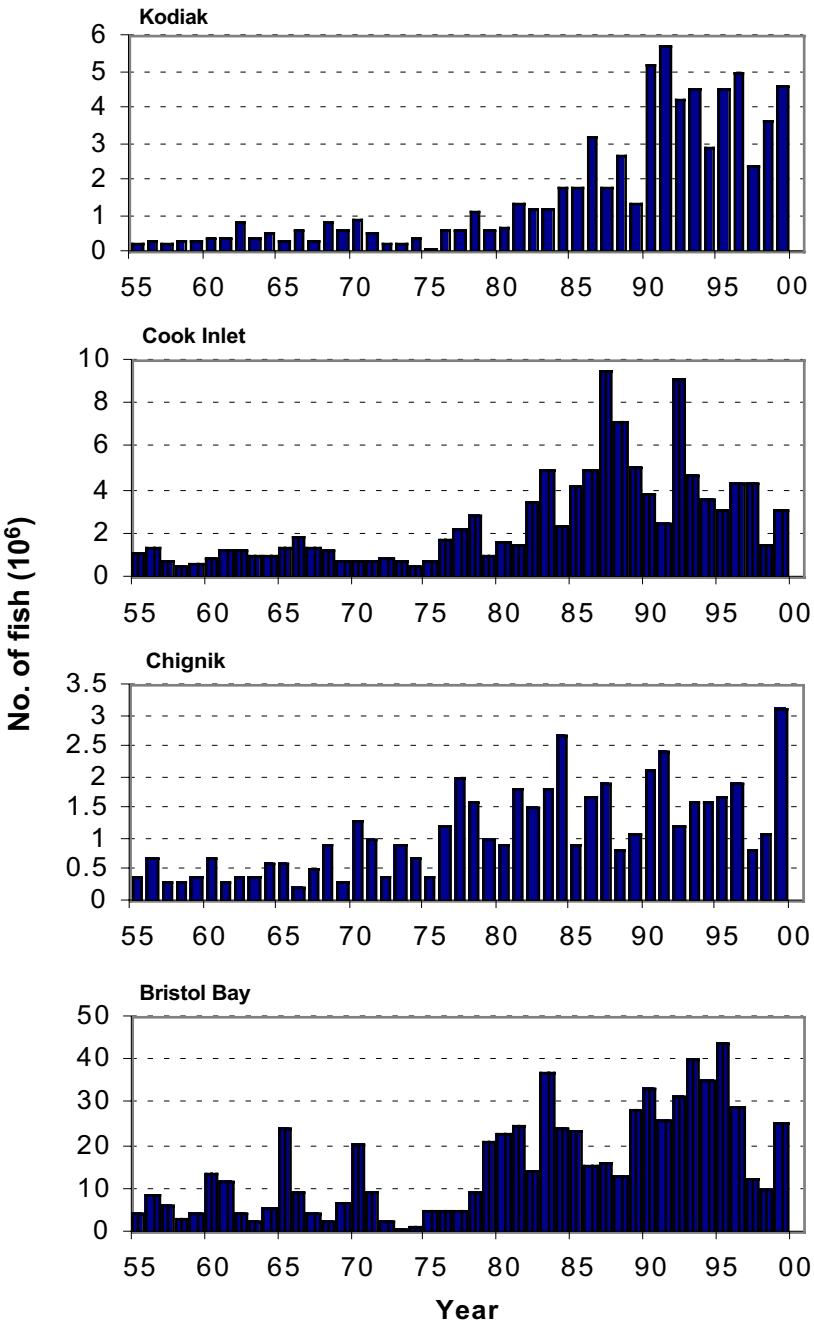

FIGURE 1. Annual commercial catches of sockeye salmon (*Oncorhynchus nerka)* in the major Alaskan fisheries, 1956–99.

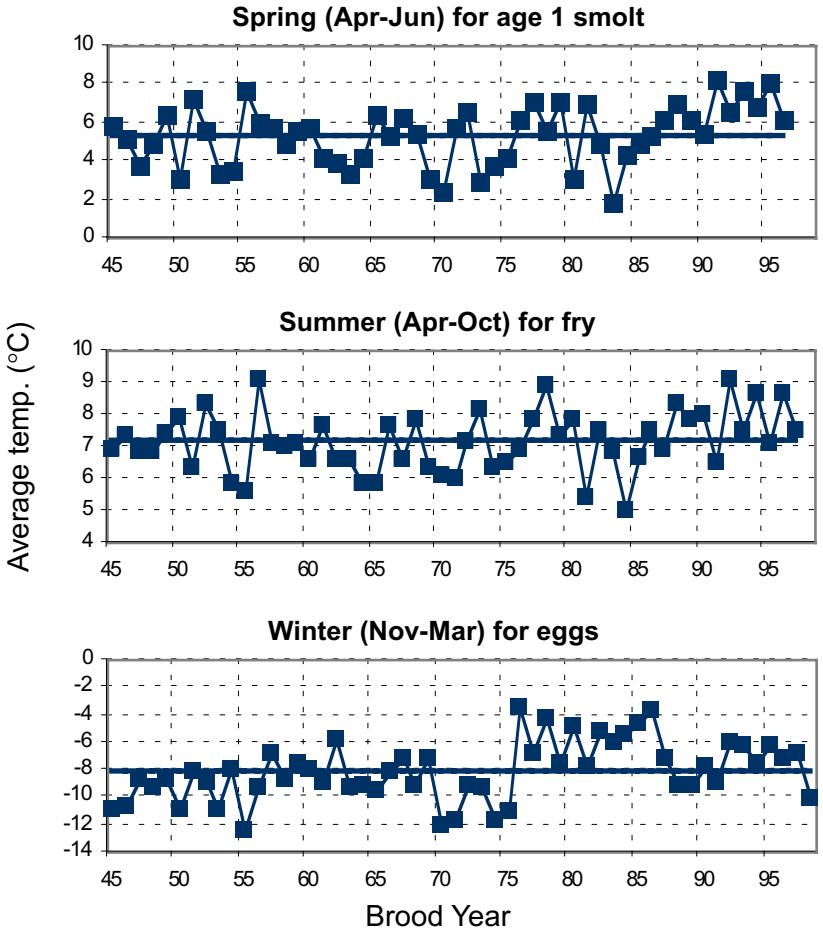

FIGURE 2. Air temperatures in Bristol Bay for sockeye salmon brood years 1945–98.

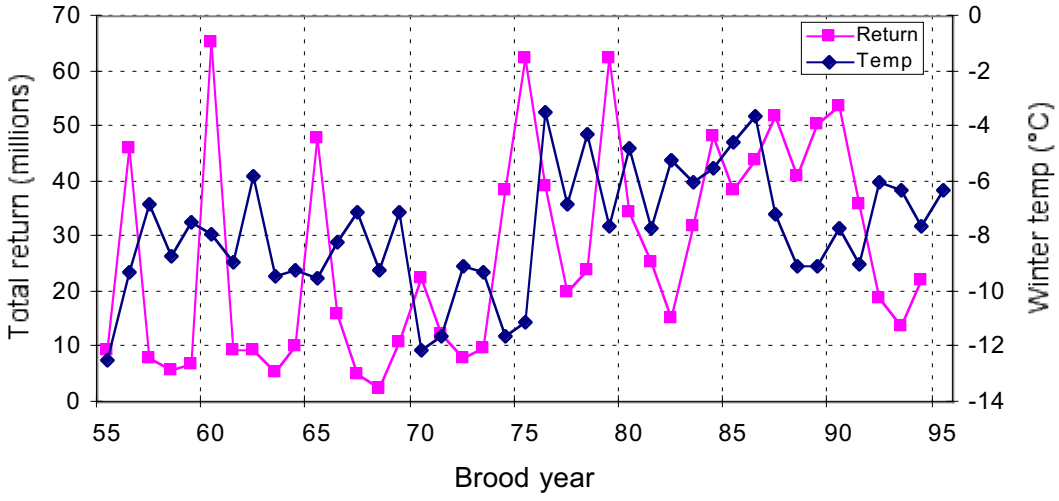

FIGURE 3. Total return and average winter air temperatures in Bristol Bay for sockeye salmon brood years 1956–94.

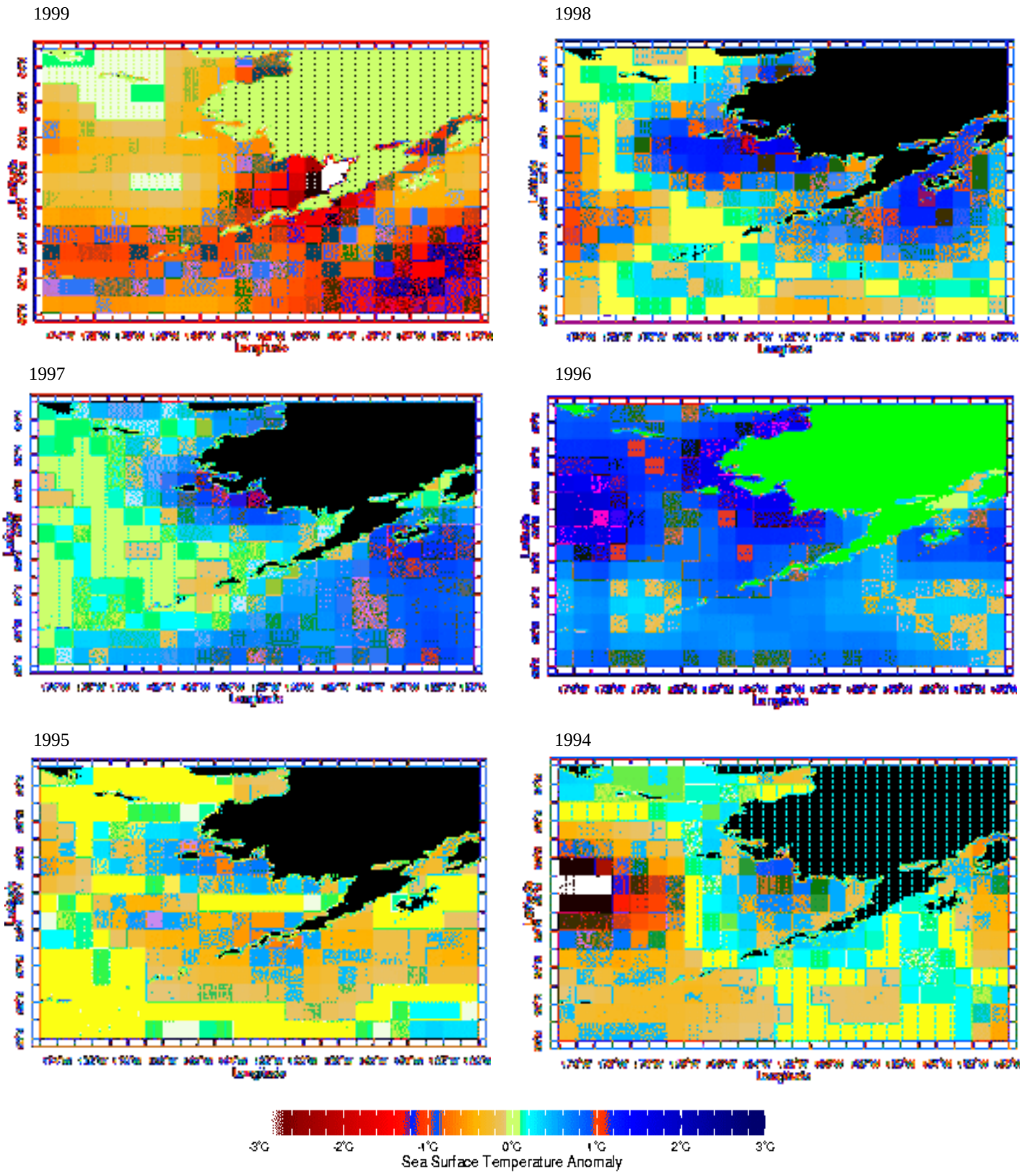

FIGURE 4. Sea surface temperature anomolies in the Bering Sea, May, 1994-99. Source: International Research Institute for Climate Prediction.

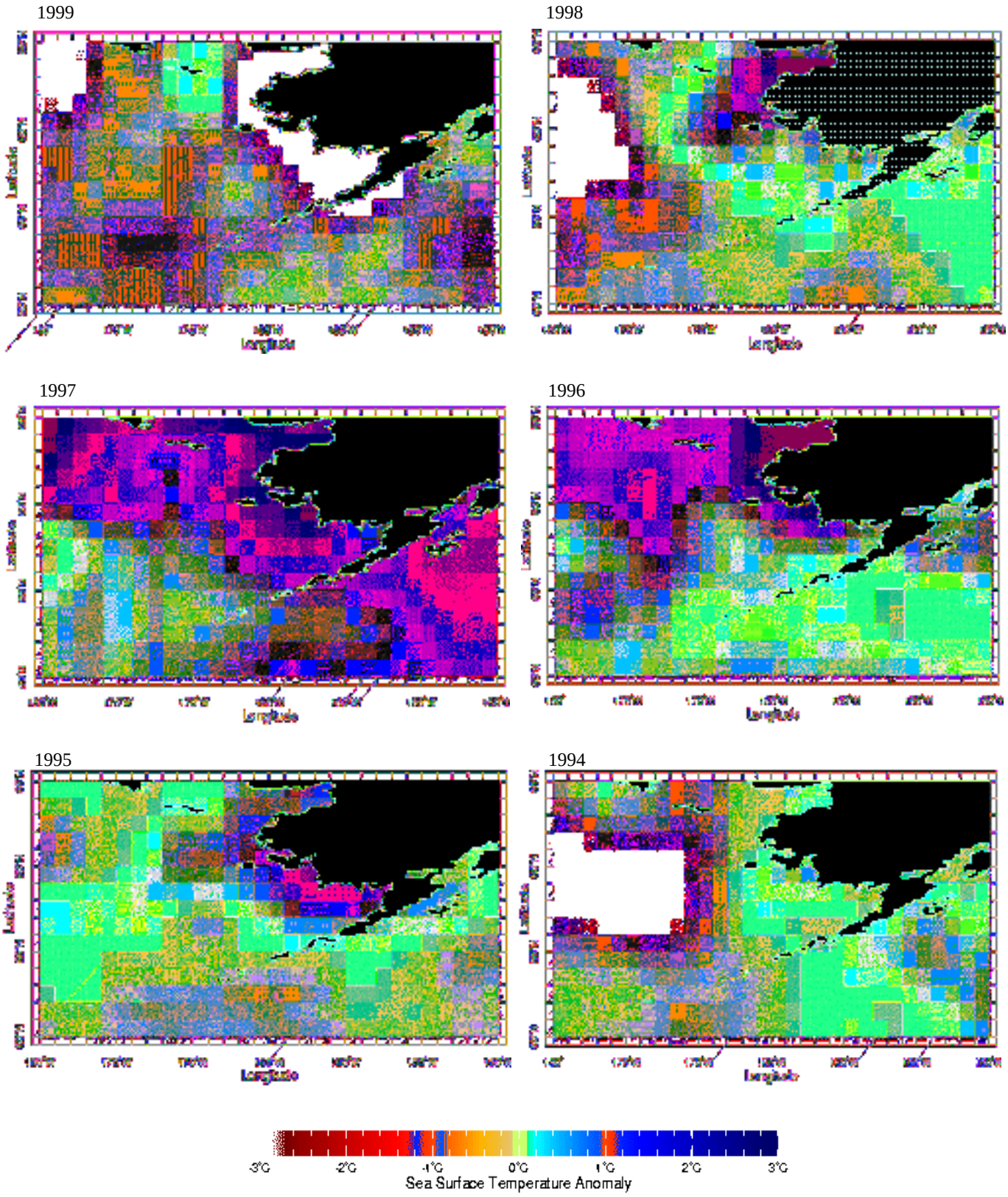

FIGURE 5. Sea surface temperature anomolies in the Bering Sea, June, 1994-99. Source: International Research Institute for Climate Prediction.

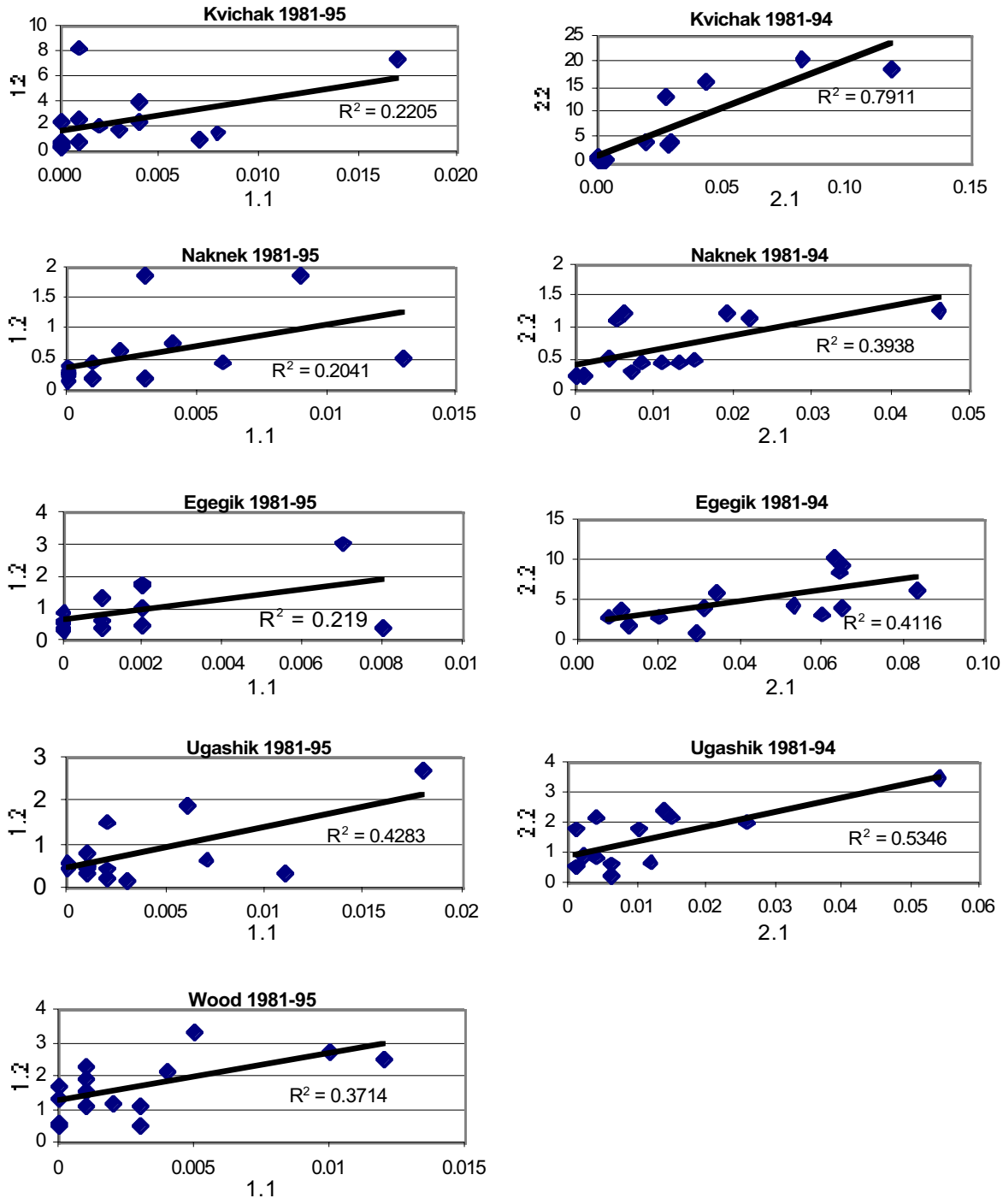

FIGURE 6. Numbers of returning 2-ocean fish plotted against number of jack returns from same brood year for major Bristol Bay systems (1981–94, 1995), all numbers in millions of fish.

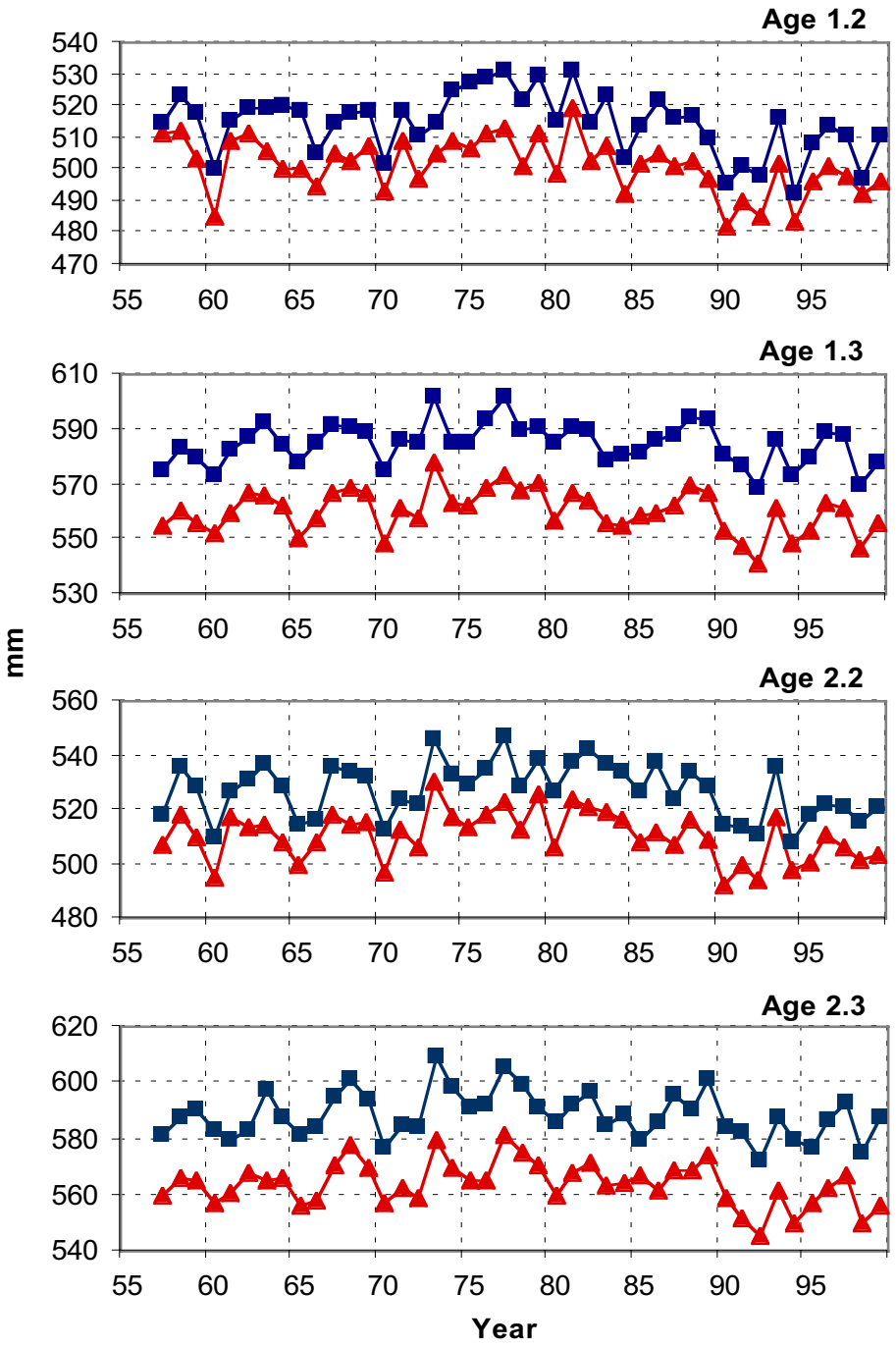

FIGURE 7. Annual mean lengths by age and sex for sockeye salmon in the Bristol Bay runs. Symbols: ▲ = female, ■ = male.

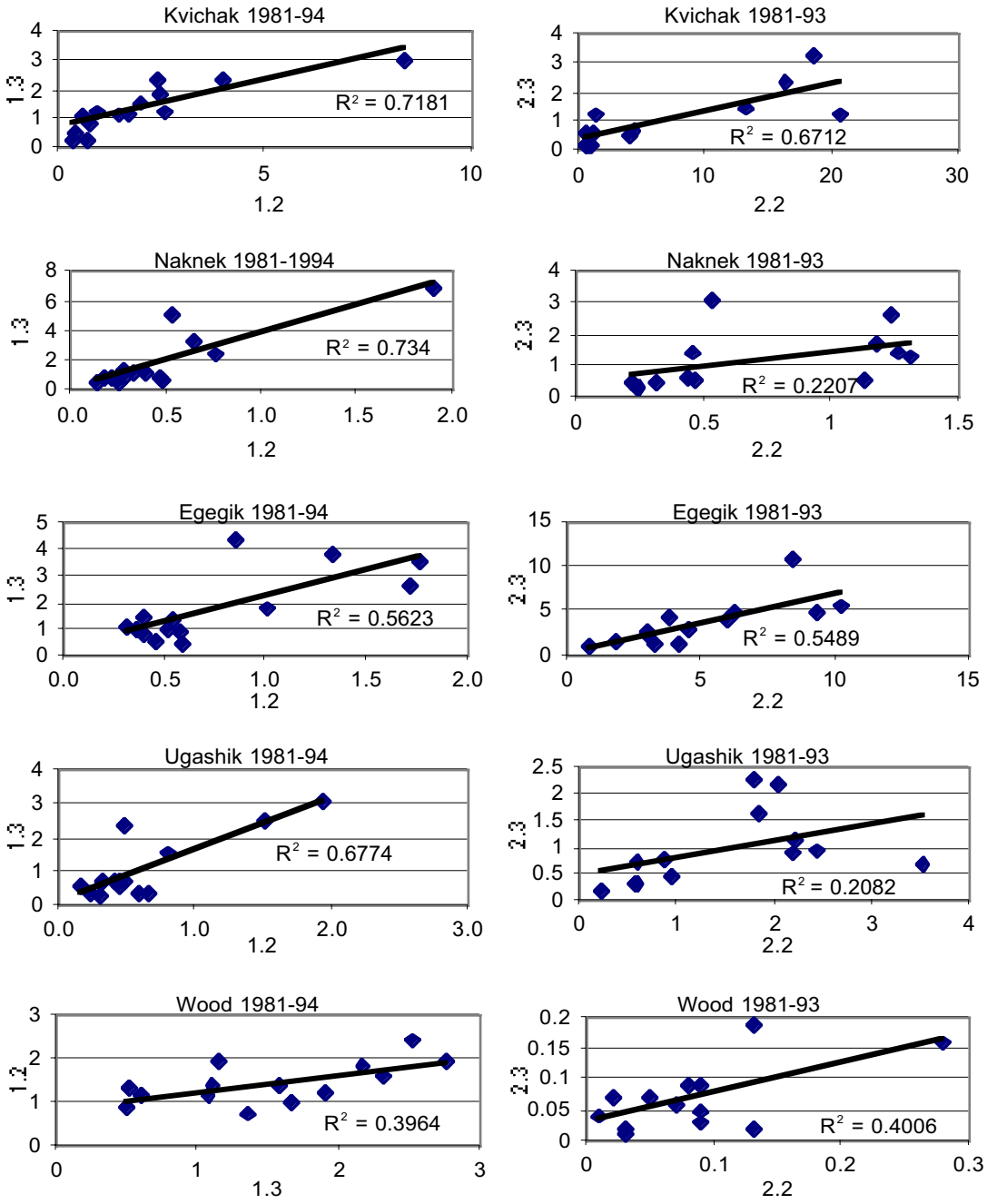

FIGURE 8. Numbers of returning 3-ocean fish plotted against number of 2-ocean returns from same brood year for major Bristol Bay systems (1981–93, 1994), in millions of fish.

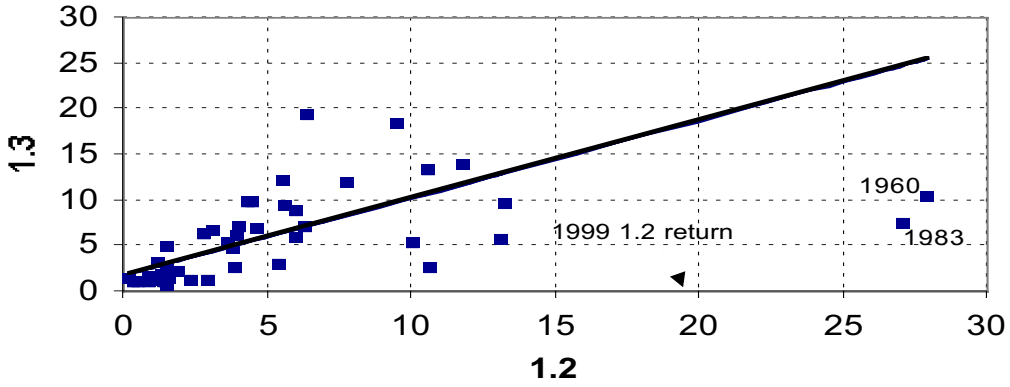

FIGURE 9. Total Bristol Bay 1.3 returns vs. 1.2 returns, 1951-98, in millions of fish. Returns of 1.2 for year 1960 and 1983, trend line not including return years 1960 and 1983, and 1999 1.2 return displayed.

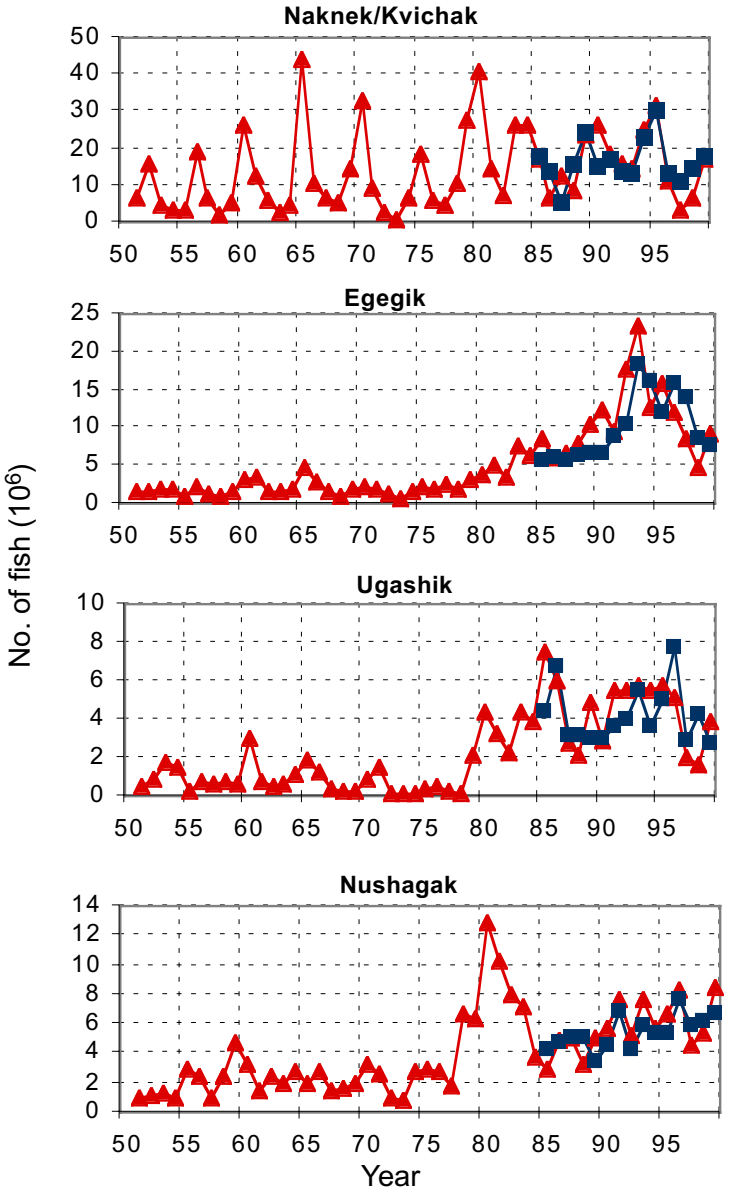

FIGURE 10. Sockeye salmon runs, 1951–99, and the School of Fisheries preseason forecasts, 1985–99. Symbols: ▲ = run, ■ = forecasts.

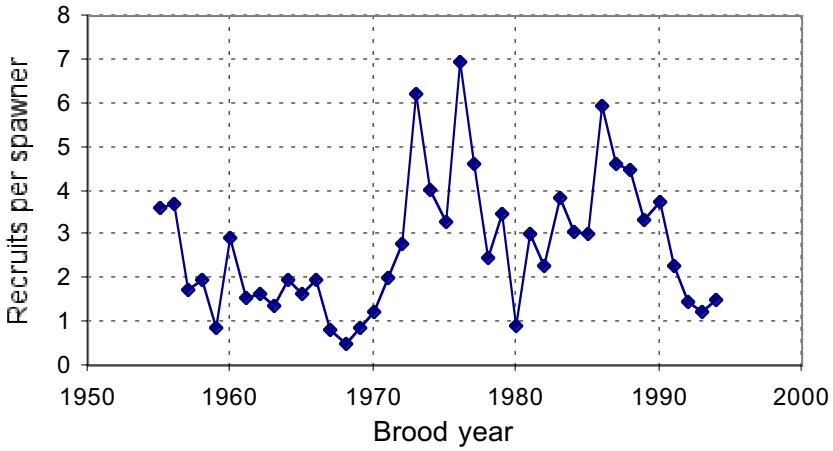

FIGURE 11. Historical Bristol Bay recruits-per-spawner, 1955–94 brood years.

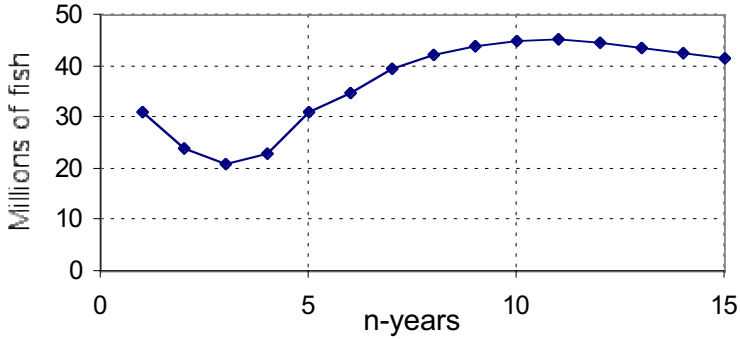

FIGURE 12. Year 2000 Bristol Bay recruits-per-spawner forecasts using number of n-years running average.

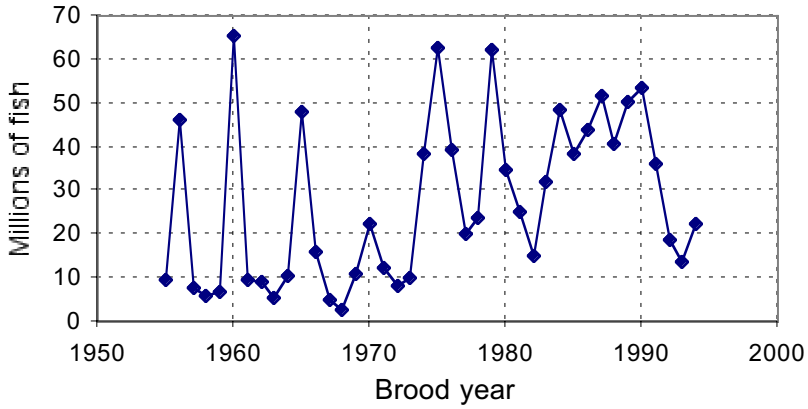

FIGURE 13. Bristol Bay total brood year returns, brood years 1955–94.

TABLE 1. Summary of the methods used by Don Rogers to forecast the year 2000 Bristol Bay run.

age	Kvichak	Naknek	Branch	Egegik	Ugashik	Wood	Igushik	Togiak	Nushagak
1.2	**Regression** 1.2 returns on 1-ocean jack returns for 1974 - 1995 **2.05** R^2 = .49	**Average returns** average of 1.2 returns for last 5 years **0.69**	**Average returns** average of 1.2 returns for last 5 years **0.24**	**Average returns** average of 1.2 returns for last 5 years **1.10**	**Regression** 1.2 returns on 1-ocean jacks for 1981 - 1995 **0.44** R^2 = .37	**Multiple regression** 1-ocean jacks and percent of 2-ocean escapement **1.10** R^2 = .74	**Average returns** average of 1.2 returns for last 5 years **0.27**	**Average returns** average of 1.2 returns for last 5 years **0.13**	**Average returns** average of 1.2 returns for the last 5 years **0.13**
1.3	**Regression** 1.3 returns on 1.2 returns for 1981-1994 **3.01** R^2 = .72	**Multiple regression** 1.2 returns and brood year escapement for 1981 - 1994 **5.64** R^2 = .92	**Average returns** average of 1.3 returns for last 5 years **0.17**	**Multiple regression** 1.2 returns and age-1 smolt for 1981 - 1994 **5.02** R^2 = .69	**Multiple regression** 1.3 returns on 1.2 returns and mean length of 1.2's for 1981 - 1994 **4.47** R^2 = .73	**Multiple regression** 1.2 returns and percent of 2-ocean escapement **2.19** R^2 = .78	**Average returns** average of 1.3 returns for last 5 years **0.06**	**Regression** 1.3 returns on 1.2 returns for 1981 -94 **0.94** R^2 = .82	**Regression** 1.3 returns on 1.2 returns for 1981 -94 **0.82** R^2 = .42
2.2	**Multiple regressio** age-2 smolt and 2-ocean jacks for 1981 - 1994 **3.02** R^2 = .91	**Regression** 2.2 returns on 2-ocean jacks for 1981 - 1994 **0.45** R^2 = .40	**Average returns** average of 2.2 returns for last 5 years **0.13**	**Regression** 2.2 returns on age-2 smolt for 1981 - 1994 **4.40** R^2 = .54	**Multiple regression** age 2 smolt and 2-ocean jacks for 1979 - 1994 **0.43** R^2 = .80	**Average returns** average of 2.2 returns for last 5 years **0.20**	**Average returns** average of 2.2 returns for last 5 years. **0.79**	**Average returns** average of 2.2 returns for last 5 years **0.03**	
2.3	**Regression** 2.3 returns on 2.2 returns for 1981-1993 **0.68** R^2 = .68	**Average returns** average of 2.3 returns for last 5 years **0.62**	**Average returns** average of 2.3 returns for last 5 years **0.04**	**Regression** 2.3 returns on 2.2 returns for 1981-1993 **3.07** R^2 = .55	**Average ratio** Average ratios of 2.3 returns on 2.2 returns **0.37**	**Regression** 2.3 returns on 2.2 returns **0.24** R^2 = .40	**Regression** 2.3 returns on 2.2 returns for 1981 - 1993 **0.08** R^2 = .86	**Regression** 2.3 returns on 2.2 returns for 1981 - 1993 **0.05** R^2 = .51	
sum	**8.76**	**7.40**	**0.58**	**13.59**	**5.71**	**3.73**	**1.20**	**1.15**	**0.95**

Total Bristol Bay run = 43.07

High R value (close to 1.0) indicates strong correlation of the data.
R value of 0.5 or less indicates a weak correlation of the data.

TABLE 2. Bristol Bay forecasts by system and age using Don Rogers' method and four other methods using different combinations of jack and 2-ocean fish correlation factors.

			Using ocean 2s		Not using ocean 2s	
System	Age	Don's	using jacks	no jacks	using jacks	no jacks
Kvichak	1.2	2.1	1.6	2.6	1.6	2.6
	1.3	3.0	3.0	3.0	0.9	0.9
	2.2	3.0	1.3	5.2	1.3	5.2
	2.3	0.7	0.7	0.7	1.1	1.1
	Sum	**8.8**	**6.6**	**11.5**	**4.9**	**9.8**
Naknek/	1.2	0.9	0.4	0.7	0.4	0.7
Branch	1.3	5.8	7.2	7.2	1.7	1.7
	2.2	0.6	0.6	0.5	0.6	0.5
	2.3	0.6	1.0	1.0	0.6	0.6
	Sum	**7.9**	**9.2**	**9.4**	**3.3**	**3.5**
Egegik	1.2	1.1	0.8	1.1	0.8	1.1
	1.3	5.0	6.3	6.3	1.4	1.4
	2.2	4.4	2.1	4.3	2.1	4.3
	2.3	3.1	3.1	3.1	3.0	3.0
	Sum	**13.6**	**12.3**	**14.8**	**7.3**	**9.8**
Ugashik	1.2	0.4	0.4	1.1	0.4	1.1
	1.3	4.5	4.3	4.3	1.0	1.0
	2.2	0.4	1.0	0.9	1.0	0.9
	2.3	0.4	0.7	0.7	0.7	0.7
	Sum	**5.7**	**6.4**	**7.0**	**3.1**	**3.7**
Wood	1.2	1.1	1.2	2.5	1.2	2.5
	1.3	2.2	2.2	2.2	1.6	1.6
	2.2	0.2	0.2	0.2	0.2	0.2
	2.3	0.2	0.2	0.2	0.1	0.1
	Sum	**3.7**	**3.8**	**5.1**	**3.1**	**4.4**
Igushik	1.2	0.3	0.3	0.3	0.3	0.3
	1.3	0.8	1.5	1.5	0.8	0.8
	2.2	0.1	0.1	0.2	0.1	0.2
	2.3	0.1	0.1	0.1	0.6	0.6
	Sum	**1.3**	**2.0**	**2.1**	**1.8**	**1.9**
Nush/Nuy	1.2	0.1	0.1	0.1	0.1	0.1
	1.3	0.8	0.8	0.8	0.5	0.5
	2.2	0.0	0.0	0.0	0.0	0.0
	2.3	0.0	0.0	0.0	0.0	0.0
	Sum	**0.9**	**0.9**	**0.9**	**0.6**	**0.6**
Togiak	1.2	0.1	0.1	0.1	0.1	0.1
	1.3	0.9	0.9	0.9	0.3	0.3
	2.2	0.0	0.0	0.0	0.0	0.0
	2.3	0.1	0.1	0.1	0.0	0.0
	Sum	**1.1**	**1.1**	**1.1**	**0.4**	**0.4**
Bristol Bay Totals		**43.0**	**42.3**	**51.9**	**24.5**	**34.1**

TABLE 3. Bristol Bay forecasts by system and age using recruits per spawner (5 and 15 years running average) and average returns (5 and 15 years).

			Recruits per spawner		Total returns	
System	Age	Don's	5 yr ave	15 yr ave	5 yr ave	15 yr ave
Kvichak	1.2	2.1	0.5	0.7	2.6	2.4
	1.3	3.0	1.7	3.2	0.9	1.3
	2.2	3.0	7.6	9.3	5.2	6.2
	2.3	0.7	1.3	1.8	1.1	1.1
	Sum	**8.8**	**11.1**	**15.0**	**9.8**	**11.0**
Naknek/	1.2	0.9	0.6	0.4	0.7	0.6
Branch	1.3	5.8	0.8	1.1	1.7	1.9
	2.2	0.6	0.4	0.5	0.5	0.7
	2.3	0.6	0.4	0.8	0.6	1.1
	Sum	**7.9**	**2.2**	**2.8**	**3.5**	**4.3**
Egegik	1.2	1.1	0.8	0.8	1.1	0.9
	1.3	5.0	0.8	1.8	1.4	1.8
	2.2	4.4	2.6	4.5	4.3	4.9
	2.3	3.1	2.9	4.7	3.0	3.3
	Sum	**13.6**	**7.1**	**11.8**	**9.8**	**10.9**
Ugashik	1.2	0.4	0.5	0.4	1.1	0.8
	1.3	4.5	0.8	1.2	1.0	1.1
	2.2	0.4	1.2	1.8	0.9	1.6
	2.3	0.4	0.6	1.0	0.7	0.9
	Sum	**5.7**	**3.1**	**4.4**	**3.7**	**4.4**
Wood	1.2	1.1	3.2	2.3	2.5	1.6
	1.3	2.2	1.9	1.8	1.6	1.4
	2.2	0.2	0.2	0.1	0.2	0.1
	2.3	0.2	0.1	0.1	0.1	0.1
	Sum	**3.7**	**5.4**	**4.3**	**4.4**	**3.2**
Igushik	1.2	0.3	0.2	0.3	0.3	0.2
	1.3	0.8	0.8	1.2	0.8	0.8
	2.2	0.1	0.3	0.1	0.2	0.1
	2.3	0.1	0.1	0.1	0.6	0.4
	Sum	**1.3**	**1.4**	**1.7**	**1.9**	**1.5**
Nush/Nuy	1.2	0.1	0.1	0.3	0.1	0.1
	1.3	0.8	0.2	0.1	0.5	0.7
	2.2	0.0	0.2	0.4	0.0	0.0
	2.3	0.0	0.1	0.1	0.0	0.0
	Sum	**0.9**	**0.6**	**0.9**	**0.6**	**0.8**
Togiak	1.2	0.1	0.1	0.1	0.1	0.1
	1.3	0.9	0.3	0.3	0.3	0.3
	2.2	0.0	0.0	0.0	0.0	0.0
	2.3	0.0	0.0	0.0	0.0	0.0
	Sum	**1.0**	**0.4**	**0.4**	**0.4**	**0.4**
Bristol Bay Totals		**42.9**	**31.3**	**41.3**	**34.1**	**36.5**

TABLE 4. Forecasts of the 2000 Bristol Bay sockeye runs.

River System	District	Runs by age group (millions) 1.2	2.2	2-ocean	0.3	1.3	2.3	3-ocean	Total	Catch
Kvichak		2.0	2.9	4.9		2.2	0.9	3.1	8.0	
Naknek		0.5	0.5	1.0		4.1	0.6	4.7	5.7	
Branch		0.2	0.1	0.3		0.2	0.0	0.2	0.5	
	Naknek/Kvichak	2.7	3.5	6.2		6.5	1.5	8.0	14.2	6.5
	Egegik	1.0	3.6	4.6		3.7	3.1	6.8	11.4	9.8
	Ugashik	0.5	0.7	1.2		3.1	0.6	3.7	4.9	3.5
Wood		1.4	0.2	1.6		2.0	0.2	2.2	3.8	
Igushik		0.3	0.1	0.4		0.9	0.3	1.2	1.6	
Nush/Nuy		0.1	0.0	0.1	0.1	0.7	0.0	0.8	0.9	
	Nushagak	1.8	0.3	2.1	0.1	3.6	0.5	4.2	6.3	4.1
	Togiak	0.1	0.0	0.1		0.7	0.1	0.8	0.9	0.5
	Bristol Bay	**6.1**	**8.1**	**14.2**	**0.1**	**17.6**	**5.8**	**23.5**	**37.7**	**24.4**

TABLE 5. Bristol Bay sockeye runs (in millions) by age group, 1958–99 and forecasts for year 2000.

Year	1-ocean	Age 1.2	Age 2.2	Total 2-ocean	Age 1.3	Age 2.3	Total 3-ocean	4-ocean	Total	Catch
58		1.5	1.5	3.0	1.4	1.3	2.7		5.7	3
59		4.8	5.8	10.9	1.0	0.9	1.9		12.8	5
60		30.0	2.0	32.0	2.8	1.5	4.3		36.4	14
61	+	0.4	5.6	6.1	10.9	1.0	12.0	+	18.1	12
62	+	2.4	4.8	7.3	1.0	2.1	3.1	+	10.4	5
63	+	1.9	1.9	3.9	1.1	1.7	2.9	+	6.9	3
64	0.2	5.6	2.8	8.4	1.5	0.7	2.3	+	10.9	6
65	+	1.2	47.6	48.9	3.1	1.1	4.2	+	53.1	24
66	+	1.3	3.0	4.4	3.5	9.6	13.1	+	17.5	9
67	+	1.1	5.7	6.8	1.3	2.0	3.5	+	10.3	4
68	0.2	3.1	1.9	5.0	1.7	1.1	2.8	+	8.0	3
69	0.6	10.8	5.3	16.2	1.2	1.0	2.2	+	19.0	7
70	+	3.4	32.2	35.6	2.7	1.0	3.7	0.0	39.4	21
71	+	1.6	4.8	6.4	6.8	2.6	9.4	+	15.8	10
72	+	1.0	1.7	2.7	1.2	1.4	2.7	+	5.4	2
73	+	0.2	0.2	0.4	1.0	0.9	2.0	+	2.4	1
74	0.1	2.0	6.8	8.8	1.4	0.6	2.0	+	10.9	1
75	+	1.6	17.2	19.1	2.3	2.7	5.1	+	24.2	5
76	+	1.6	5.3	7.3	2.6	1.5	4.2	+	11.5	6
77	+	1.6	2.8	4.5	1.8	3.2	5.1	+	9.6	5
78	0.4	10.5	1.5	12.0	4.9	2.3	7.2	0.2	19.8	10
79	0.3	11.0	21.1	32.2	5.3	2.0	7.3	+	39.8	22
80	0.3	12.0	34.1	46.2	13.6	2.2	15.9	+	62.4	24
81	+	5.7	10.2	15.9	13.8	4.5	18.4	+	34.3	26
82	0.1	4.2	1.2	5.4	12.8	3.6	16.4	0.2	22.1	15
83	0.1	27.6	9.8	37.4	6.6	1.3	7.9	0.3	45.7	37
84	0.1	6.2	22.2	28.4	7.9	4.2	12.2	+	40.7	25
85	0.1	4.7	16.7	21.4	9.2	5.8	15.0	+	36.6	24
86	+	3.0	7.0	10.0	10.1	3.1	13.5	0.1	23.6	16
87	+	13.5	3.2	16.7	7.0	3.5	10.5	+	27.3	16
88	0.2	4.9	5.1	10.0	9.7	3.0	12.7	0.2	23.2	14
89	0.1	4.7	27.3	32.1	7.0	4.0	11.6	0.1	43.9	29
90	+	7.0	19.7	27.0	9.9	9.5	20.6	0.2	47.8	33
91	0.1	7.9	8.6	16.6	19.5	4.8	25.4	0.1	42.2	26
92	0.1	5.8	15.3	21.3	12.1	10.0	22.7	1.1	45.1	32
93	0.2	6.7	17.2	24.0	9.6	17.1	27.3	0.6	52.1	41
94	0.2	4.3	28.3	32.8	7.2	8.9	17.0	0.3	50.3	35
95	+	9.8	34.2	44.3	7.2	8.8	16.3	0.2	60.8	44
96	0.1	3.9	4.7	8.7	18.7	8.7	28.1	0.1	37.0	30
97	0.1	3.8	6.3	10.1	4.8	3.4	8.3	0.4	18.9	12
98	0.2	6.2	2.3	8.6	5.3	4.1	9.4	0.1	18.3	10
99	+	20.1	9.5	29.6	6.8	2.7	9.6	0.2	39.4	25
00		**6.1**	**8.1**	**14.2**	**17.6**	**5.8**	**23.5**		**37.7**	**24.4**
Means 1987-99	0.1	7.6	14.0	21.7	9.6	6.8	16.9	0.3	38.9	26.7

TABLE 6. Kvichak sockeye salmon data to forecast year 2000 runs by freshwater age.

Brood year	Escapement Number millions	Escapement Percent age .2	Age 1 smolt Number millions	Age 1 smolt Mean weight	Adult return (millions) 1.1	1.2	1.3	Total	Smolt/ adult survival (%)	Mean length age 1.2
74	4.43	91	108	5.8	.009	6.14	1.93	8.08	7.5	501
75	13.14	96	78	5.5	.005	5.50	1.18	6.69	8.6	517
76	1.97	81	32	6.0	.005	5.04	.76	5.81	18.1	500
77	1.34	86	29	6.0	.039	1.82	.84	2.70	9.3	518
78	4.15	81	182	5.9	.000	1.66	1.09	2.75	1.5	513
79	11.22	90	220	5.4	.057	17.60	2.14	19.80	9.0	510
80	17.50	96	150	5.1	.002	2.81	1.49	4.30	2.9	478
81	1.75	82	7	4.9	.000	.77	.22	.99	14.1	523
82	1.14	65	52	6.8	.000	.44	.52	.96	1.8	528
83	3.57	93	24	5.3	.001	8.38	2.98	11.36	47.3	515
84	10.49	80	83	5.5	.000	2.46	1.87	4.33	5.2	512
85	7.21	68	11	4.5	.007	1.00	1.24	2.25	20.4	505
86	1.18	74	13	5.6	.000	.66	1.05	1.71	13.2	490
87	6.07	96	147	5.5	.004	4.04	2.38	6.42	4.4	493
88	4.06	56	47	5.8	.004	2.43	2.37	4.80	10.2	495
89	8.32	92	87	5.5	.002	2.01	1.56	3.57	4.1	511
90	7.00	91	18	5.6	.008	1.50	1.14	2.65	14.7	487
91	4.20	77	22	6.0	.001	2.59	1.23	3.82	17.4	506
92	4.73	77	54	5.7	.000	.41	.21	.62	1.1	517
93	4.05	69	210	6.2	.001	.79	.84	1.63	0.8	518
94	8.34	94	277	6.5	.003	1.75	1.12	2.87	1.0	506
95	10.04	87	269	6.6	.017	7.31	**2.20**			501
96	1.45	40	192	6.7	.000	**2.00**				

Brood year	Escapement Number millions	Escapement Percent age .2	Age 2 smolt Number millions	Age 2 smolt Mean weight	Adult return (millions) 2.1	2.2	2.3	Total	Smolt/ adult survival (%)	Mean length age 2.2
74	4.43	91	114	10.1	.301	16.38	.72	17.40	15.3	528
75	13.14	96	213	7.8	.298	28.18	.55	29.03	13.6	508
76	1.97	81	26	10.3	.043	3.85	.24	4.13	15.9	532
77	1.34	86	10	10.7	.002	.18	.09	.27	2.7	531
78	4.15	81	32	10.2	.016	1.24	.80	2.06	6.4	524
79	11.22	90	89	9.1	.073	17.01	3.28	20.36	22.9	504
80	17.50	96	76	8.5	.020	7.79	.38	8.19	10.8	523
81	1.75	82	38	10.0	.000	.91	.16	1.07	2.8	536
82	1.14	65	2	9.2	.001	.50	.14	.64	32.1	521
83	3.57	93	53	10.4	.003	1.13	.54	1.67	3.2	533
84	10.49	80	330	7.0	.043	16.35	2.39	18.78	5.7	513
85	7.21	68	87	8.3	.028	13.08	1.51	14.62	16.8	497
86	1.18	74	7	10.0	.000	1.34	1.23	2.57	36.7	506
87	6.07	96	41	10.5	.030	4.24	.68	4.95	12.1	514
88	4.06	56	34	9.9	.019	4.02	.53	4.57	13.4	538
89	8.32	92	61	9.3	.117	18.47	3.24	21.83	35.8	502
90	7.00	91	205	8.2	.082	20.55	1.22	21.85	10.7	510
91	4.20	77	30	9.5	.002	.67	.16	.83	2.8	522
92	4.73	77	11	9.8	.002	.51	.14	.65	5.9	533
93	4.03	69	96	11.3	.001	.59	.55	1.14	1.2	520
94	8.34	94	94	10.7	.029	3.60	**.90**			518
95	10.04	87	103	11.9	.000	**2.90**				

TABLE 7. Naknek and Branch sockeye salmon data to forecast year 2000 runs.

Naknek

Brood year	Escapement Number millions	% age .2	Smolt millions age 1	Smolt millions age 2	Adult return (millions) 1.1	1.2	1.3	2.1	2.2	2.3	Total	Mean length 1.2	Mean length 2.2
81	1.80	29	37	49	.004	.76	2.48	.008	.46	1.46	5.17	475	502
82	1.16	13	32	13	.003	.18	.75	.000	.21	.45	1.59	477	487
83	.89	65	6	19	.000	.14	.48	.007	.32	.45	1.40	475	506
84	1.24	65	22		.001	.46	.88	.022	1.17	1.76	4.29	480	491
85	1.85	58			.002	.64	3.41	.019	1.26	2.68	8.01	471	472
86	1.98	21			.003	1.90	6.95	.006	1.23	2.61	12.70	451	475
87	1.06	20			.000	.32	1.18	.004	.53	3.11	5.14	461	476
88	1.04	48			.000	.27	.76	.013	.47	.52	2.03	448	493
89	1.16	68			.001	.21	.87	.005	1.13	.55	2.77	467	470
90	2.09	56		29	.001	.39	1.18	.046	1.30	1.30	4.22	454	490
91	3.58	23	24	42	.013	.53	5.08	.001	.24	.33	6.19	484	491
92	1.61	28	33		.000	.25	.52	.001	.23	.32	1.32	460	503
93	1.54	21			.000	.27	1.27	.011	.44	.62	2.61	486	480
94	.99	65			.006	.48	.57	.015	.50	**.60**		464	482
95	1.11	59			.009	1.90	**4.10**	.001	**.50**			472	
96	1.08	7			.001	**.50**							

Branch River

Brood year	Escapement Number millions	% age .2	Adult return (millions) 1.1	1.2	1.3	2.1	2.2	2.3	Total
81	.08	49	.000	.05	.17	.000	.05	.01	.28
82	.24	15	.000	.17	.13	.000	.00	.00	.30
83	.10	85	.000	.14	.13	.000	.03	.00	.30
84	.22	37	.001	.15	.14	.000	.04	.02	.35
85	.12	30	.003	.35	.11	.000	.09	.01	.56
86	.23	64	.001	.33	.26	.000	.19	.01	.79
87	.15	63	.000	.15	.16	.000	.16	.08	.55
88	.19	60	.001	.15	.14	.000	.26	.04	.59
89	.20	79	.005	.33	.16	.002	.17	.16	.83
90	.17	85	.002	.26	.12	.000	.32	.00	.70
91	.28	69	.000	.19	.22	.004	.16	.00	.57
92	.22	75	.002	.09	.07	.000	.06	.01	.23
93	.35	76	.004	.12	.14	.000	.08	.05	.39
94	.24	84	.001	.15	.25	.002	.04	**.04**	
95	.22	83	.004	.67	**.10**	.000	**.20**		
96	.19	66	.003	**.20**					

TABLE 8. Egegik sockeye salmon data to forecast year 2000 runs by freshwater age.

Brood Year	Escapement Number millions	Escapement Percent age .2	Age 1 smolt Number millions	Age 1 smolt Mean weight	Adult return (millions) 1.1	1.2	1.3	Total	Smolt/ adult survival (%)	Mean length age 1.2
81	0.69	71	2	9.5	.000	.52	.95	1.47	73.5	519
82	1.03	88	17	10.1	.002	1.01	1.79	2.80	16.5	510
83	0.79	88	55	10.4	.002	1.72	2.69	4.41	8.0	509
84	1.17	69	14	9.0	.001	.58	.93	1.51	10.8	502
85	1.10	67	4	11.6	.000	.54	1.33	1.87	46.8	511
86	1.15	74	36	10.2	.002	1.76	3.59	5.35	14.9	483
87	1.27	54	72	8.9	.000	.86	4.34	5.20	7.2	496
88	1.61	57	4	9.6	.001	.40	1.43	1.83	45.7	472
89	1.61	58	5	10.3	.000	.59	.43	1.02	20.4	522
90	2.19	70	6	9.7	.000	.40	.84	1.24	20.7	480
91	2.79	56	20	9.3	.001	1.33	3.87	5.20	26.0	502
92	1.94	63	55	9.7	.000	.32	1.04	1.36	2.5	508
93	1.52	44	7	9.3	.002	.46	.53	0.99	14.1	502
94	1.90	70	22	10.5	.008	.36	.94	1.30	5.9	484
95	1.27	76	12	9.2	.007	3.05	**3.70**			498
96	1.08	37	50	9.0	.001	**1.00**				

Brood Year	Escapement Number millions	Escapement Percent age .2	Age 2 smolt Number millions	Age 2 smolt Mean weight	Adult return (millions) 2.1	2.2	2.3	Total	Smolt/ adult survival (%)	Mean length age 2.2
81	0.70	71	32	12.2	.060	3.30	1.39	4.69	14.7	528
82	1.03	29	11	16.8	.012	1.74	1.59	3.33	30.3	529
83	0.79	88	30	15.7	.007	3.03	2.61	5.64	18.8	520
84	1.17	69	45	14.1	.083	6.17	4.74	10.91	24.2	524
85	1.10	67	13	14.3	.031	4.17	1.22	5.39	41.5	498
86	1.15	74	27	15.4	.010	3.79	4.21	8.00	29.6	502
87	1.27	54	52	14.5	.064	8.41	10.73	19.20	36.9	492
88	1.61	58	89	15.6	.063	10.24	5.48	15.78	17.7	520
89	1.61	54	18	12.4	.034	5.98	3.92	9.90	55.0	488
90	2.19	70	38	12.2	.065	9.28	4.61	13.89	36.6	512
91	2.77	56	39	13.7	.020	2.98	2.49	5.47	14.0	520
92	1.95	65	50	11.6	.053	4.51	2.80	7.36	14.7	502
93	1.52	44	8	16.1	.029	0.84	0.98	1.85	23.1	502
94	1.90	70	15	13.7	.065	4.13	**3.10**			500
95	1.27	76	28	13.7	.004	**3.60**				

TABLE 9. Ugashik sockeye salmon data to forecast year 2000 runs by freshwater age.

Brood year	Escapement Number millions	Escapement Percent age .2	Age 1 smolt Number millions	Age 1 smolt Mean weight	Adult return (millions) 1.1	1.2	1.3	Total	Smolt/ adult survival (%)	Mean length age 1.2
81	1.33	42	31	7.6	.002	1.51	2.51	4.02	13.0	514
82	1.16	20	75	6.8	.001	.41	.69	1.10	1.5	514
83	1.00	90	13	8.3	.000	.60	.34	0.94	7.2	512
84	1.24	81	38	5.8	.000	.45	.55	1.00	2.6	512
85	1.00	75	6	7.9	.001	.49	.69	1.18	19.7	507
86	1.00	41	183	5.7	.001	.48	2.38	2.86	1.6	488
87	0.67	56	89	6.5	.001	.81	1.55	2.36	2.7	502
88	0.64	54	15	6.7	.002	.45	.67	1.12	7.5	498
89	1.68	84	26	7.7	.007	.66	.37	1.04	4.0	517
90	0.73	60			.001	.34	.67	1.01		488
91	2.48	57	58	8.0	.006	1.93	3.08	5.02	8.6	504
92	2.17	49	24	6.7	.003	.18	.54	0.72	3.0	498
93	1.41	48	7	7.8	.002	.24	.32	0.56	8.0	490
94	1.08	79	1	9.9	.011	.32	.31	0.64	53.4	488
95	1.30	80	14	7.8	.018	2.71	**3.10**			509
96	0.67	16	10	6.4	.000	**.50**				

Brood year	Escapement Number millions	Escapement Percent age.2	Age 2 smolt Number millions	Age 2 smolt Mean weight	Adult return (millions) 2.1	2.2	2.3	Total	Smolt/ adult survival (%)	Mean length age 2.2
79	1.70	53			.008	1.39	.52	1.91		502
80	3.32	59	13	13.3	.039	3.19	.78	3.97	30.5	520
81	1.33	42	83	10.3	.004	2.20	.90	3.10	3.7	524
82	1.16	22	21	11.8	.001	.58	.72	1.30	6.2	517
83	1.00	90	15	10.9	.006	.59	.30	.89	5.9	528
84	1.24	80	21	11.1	.054	3.50	.69	4.24	20.2	523
85	1.00	75	33	10.8	.002	.95	.46	1.41	4.3	504
86	1.00	41	32	10.7	.001	1.83	1.63	3.46	10.8	506
87	0.67	56	39	11.8	.010	1.78	2.26	4.04	10.4	499
88	0.64	58	48	11.6	.026	2.03	2.18	4.24	8.8	527
89	1.68	84			.014	2.43	.93	3.37		490
90	0.73	61	12	12.5	.015	2.23	1.18	3.43	27.6	517
91	2.48	57	6	11.2	.001	.57	.30	.87	15.3	512
92	2.17	49	15	11.1	.004	.88	.74	1.62	10.6	506
93	1.41	48	1	13.5	.006	.23	.20	.44	31.1	508
94	1.08	79	1	12.7	.012	.67	**.60**			509
95	1.30	80	2	11.1	.001	**.70**				

TABLE 10. Wood and Igushik sockeye salmon data for forecasting year 2000 runs.

Wood River

Brood year	Escapement Number millions	Escapement Percent age .2	Temperatures for Fry Apr-Oct	Temperatures for Smolt Apr-June	Adult return (millions) 1.1	1.2	2.2	1.3	2.3	Total	Mean length of 1.2
81	1.23	37	5.4	7.0	.000	.60	.08	1.14	.09	1.91	490
82	.98	34	7.5	4.9	.003	.50	.13	.90	.02	1.55	501
83	1.36	75	6.8	1.8	.001	1.91	.02	1.23	.07	3.23	495
84	1.00	22	5.0	4.3	.000	.52	.03	1.32	.02	1.89	502
85	.94	49	6.7	4.9	.003	1.11	.03	1.37	.01	2.52	501
86	.82	36	7.5	5.3	.002	1.16	.07	1.94	.06	3.23	480
87	1.34	82	6.9	6.1	.000	1.36	.09	.74	.09	2.28	486
88	.87	37	8.3	6.9	.001	1.59	.09	1.39	.03	3.10	482
89	1.19	49	7.8	6.1	.004	2.17	.01	1.82	.04	4.04	496
90	1.07	50	8.0	5.4	.001	1.08	.28	1.15	.16	2.67	477
91	1.16	36	6.5	8.2	.012	2.53	.05	2.43	.07	5.08	496
92	1.29	73	9.1	6.5	.001	2.32	.09	1.60	.05	4.06	495
93	1.18	59	7.5	7.6	.000	1.67	.13	.98	.19	2.97	491
94	1.47	52	8.7	6.8	.010	2.77	.43	1.93	**.20**		488
95	1.48	73	7.1	8.0	.005	3.37	**.20**	**2.00**			501
96	1.65	49	8.7	6.1	.000	**1.40**					

Igushik

Brood Year	Escapement Number millions	Escapement Percent age.2	Mean air temp. for: Fry Apr-Oct	Mean air temp. for: Smolt Apr-June	Adult returns (millions) 1.2	2.2	1.3	2.3	Total	Mean length of 1.2
81	.59	24	5.4	7.0	.15	.00	.83	.05	1.03	512
82	.42	5	7.5	4.9	.05	.01	.48	.01	.55	548
83	.18	73	6.8	1.8	.15	.01	.33	.03	.52	508
84	.19	9	5.0	4.3	.03	.05	.63	.03	.74	525
85	.21	37	6.7	4.9	.51	.08	.90	.08	1.57	525
86	.31	7	7.5	5.3	.23	.03	2.20	.03	2.49	494
87	.17	40	6.9	6.1	.16	.01	.57	.03	.77	516
88	.17	12	8.3	6.9	.19	.04	1.02	.04	1.29	503
89	.46	49	7.8	6.1	.48	.06	1.05	.05	1.64	519
90	.37	25	8.0	5.4	.16	.18	1.36	.15	1.85	494
91	.76	6	6.5	8.2	.31	.00	1.31	.02	1.64	507
92	.31	26	9.1	6.5	.04	.01	.13	.02	.20	517
93	.41	31	7.5	7.6	.12	.02	.29	.04	.47	507
94	.45	27	8.7	6.8	.24	.09	.84	**.30**		488
95	.47	30	7.1	8.0	.65	**.10**	**.90**			512
96	.40	3	8.7	6.1	**.30**					

Table 11. Nushagak and Togiak sockeye salmon data for forecasting year 2000 runs.

Nushagak/Nuyakuk

Brood year	Escapement Number millions	Escapement Percent age .2	Adult return (millions) 0.2	0.3	0.4	1.2	1.3	1.4	Total	Mean length 1.2	1.3
81	1.01	13	.01	.12	.01	.16	1.43	.06	1.79	487	554
82	.60	7	.04	.33	.05	.16	.85	.06	1.49	497	572
83	.40	35	.10	.57	.12	.11	.62	.02	1.54	502	570
84	.59	16	.01	.22	.03	.12	.55	.02	.95	493	568
85	.50	48	.06	.49	.06	.06	.59	.01	1.27	459	558
86	.99	6	.06	.83	.06	.11	.67	.21	1.94	471	554
87	.39	28	.14	.92	.25	.04	.52	.10	1.97	462	541
88	.48	16	.07	.52	.12	.21	1.39	.06	2.37	468	573
89	.50	14	.07	.47	.03	.12	.66	.02	1.37	480	555
90	.67	22	.05	.75	.10	.04	.24	.01	1.19	454	556
91	.50	5	.01	.13	.01	.17	.99	.12	1.43	461	569
92	.70	31	.08	.49	.01	.22	.59	.05	1.44	486	563
93	.72	11	.04	.03	.00	.06	.68	.12	.93	474	546
94	.51	6	.00	.04	.00	.08	.66	**.06**	.84	456	565
95	.28	39	.00	.01		.14	**.70**			462	
96	.50	18	.00	**.10**		**.10**					
97	.37	9									

Togiak

Brood year	Escapement Number millions	Escapement Percent age .2	Adult return (millions) 0.2	0.3	1.2	1.3	2.2	2.3	Total	Mean length 1.2	1.3
81	.31	19	.002	.01	.05	.24	.01	.02	.33	501	568
82	.29	30	.000	.02	.11	.24	.01	.02	.40	513	579
83	.21	28	.001	.00	.28	.91	.01	.02	1.22	516	586
84	.15	41	.000	.01	.02	.11	.00	.02	.16	520	583
85	.15	20	.000	.01	.03	.21	.04	.08	.37	513	579
86	.20	27	.000	.03	.08	.44	.08	.11	.74	504	572
87	.28	39	.000	.01	.19	.53	.03	.08	.84	514	567
88	.31	73	.001	.01	.11	.39	.03	.05	.59	515	592
89	.10	3	.000	.04	.12	.31	.01	.04	.52	522	561
90	.19	24	.001	.02	.10	.43	.07	.04	.66	495	570
91	.28	41	.001	.00	.18	.42	.03	.03	.66	516	589
92	.20	23	.001	.03	.05	.11	.03	.03	.25	525	581
93	.19	24	.000	.00	.06	.25	.01	.02	.34	512	561
94	.17	45	.000	.00	.04	.16	.03	**.10**	.33	515	552
95	.21	36	.000	.00	.33	**.70**	**.03**			498	
96	.19	20	.001		**.10**						

TABLE 12. Forecasts and actual runs of sockeye salmon to Bristol Bay, 1990-99.

		Pre-season forecasts							
		ADF&G		FRI		Actual		Port Moller forecast (7/2-6)	
Year	District	Run	Catch	Run	Catch	Run	Catch	Run	Catch
1990	Nak/Kvi	13.0	5.8	15.3	8.1	26.4	17.1	23.0	14.0
	Egegik	5.6	4.6	6.6	5.5	12.3	10.1	8.0	6.5
	Ugashik	3.1	2.4	3.0	2.3	2.9	2.1	3.0	2.0
	Nushagak	3.4	1.7	4.6	3.0	5.7	3.6	4.0	2.5
	Togiak	0.3	0.2	0.3	0.1	0.4	0.2	0.5	+
	TOTAL	25.4	14.7	29.8	19.0	47.6	33.1	38.5	25.0
1991	Nak/Kvi	14.1	8.9	17.0	9.5	18.6	10.6	17.0	7.0
	Egegik	8.2	7.2	8.9	7.8	9.6	6.8	7.0	5.0
	Ugashik	3.5	2.8	3.6	2.7	5.5	3.0	5.0	4.0
	Nushagak	3.8	2.1	6.8	4.8	7.7	5.3	8.0	4.5
	Togiak	0.4	0.2	0.4	0.2	0.8	0.5	+	+
	TOTAL	30.0	21.2	36.7	25.0	42.2	26.2	37.0	20.5
1992	Nak/Kvi	16.9	9.7	13.8	7.2	15.9	9.4	14.0	8.0
	Egegik	10.7	9.7	10.4	9.0	17.5	15.7	16.0	14.0
	Ugashik	4.3	3.6	4.0	3.0	5.5	3.4	5.0	4.0
	Nushagak	4.6	2.9	4.3	2.5	5.2	2.9	5.0	3.0
	Togiak	0.6	0.4	0.5	0.3	1.0	0.7	0.5	+
	TOTAL	37.1	26.3	33.0	22.0	45.1	32.0	41.0	29.0
1993	Nak/Kvi	15.5	9.3	13.1	6.9	14.6	8.9	12.0	7.0
	Egegik	15.8	14.8	18.2	16.2	23.3	21.8	18.5	17.0
	Ugashik	4.9	4.2	5.5	4.5	5.7	4.3	5.0	4.0
	Nushagak	5.1	3.3	6.0	4.0	7.6	5.3	6.0	4.0
	Togiak	0.5	0.4	0.5	0.3	0.7	0.5	0.5	0.3
	TOTAL	41.8	32.0	43.3	31.9	51.9	40.8	42.0	32.3
1994	Nak/Kvi	22.5	13.3	23.1	13.1	25.6	16.3	25.2	14.0
	Egegik	18.5	17.5	16.2	14.2	12.7	10.8	11.3	10.0
	Ugashik	5.5	4.8	3.6	2.9	5.4	4.4	3.0	2.0
	Nushagak	5.5	3.8	5.3	3.5	5.9	3.4	5.0	3.0
	Togiak	0.5	0.4	0.6	0.4	0.5	0.3	0.5	0.3
	TOTAL	52.5	39.7	48.8	34.1	50.1	35.2	45.0	29.3
1995	Nak/Kvi	30.8	19.6	30.2	17.7	31.8	20.4	25.1	13.8
	Egegik	13.1	12.1	12.1	10.0	15.7	14.5	13.0	11.5
	Ugashik	5.4	4.7	5.0	3.4	5.8	4.5	5.0	4.0
	Nushagak	5.3	3.5	5.3	3.0	6.7	4.4	5.6	3.6
	Togiak	0.5	0.4	0.5	0.3	0.8	0.6	0.5	0.3
	TOTAL	55.1	40.3	53.1	34.4	60.8	44.4	49.2	33.2
1996	Nak/Kvi	13.9	8.7	13.2	7.5	11.0	8.2	11.5	8.0
	Egegik	16.9	15.9	15.7	13.8	11.9	10.8	15.0	14.0
	Ugashik	6.2	5.5	7.8	6.1	5.1	4.4	6.4	5.5
	Nushagak	5.8	4.1	7.7	5.4	8.3	5.8	7.7	5.7
	Togiak	0.6	0.4	0.8	0.6	0.7	0.5	0.6	0.4
	TOTAL	43.4	34.6	45.2	33.4	37.0	29.7	41.2	33.6
1997	Nak/Kvi	10.8	5.6	11.9	6.3	3.4	0.6	4.6	0.8
	Egegik	12.8	11.8	13.9	12.9	8.7	7.6	10.5	9.5
	Ugashik	3.8	3.1	2.9	2.1	2.0	1.4	5.2	3.0
	Nushagak	5.7	3.9	5.9	3.8	4.6	2.6	5	4
	Togiak	0.5	0.4	0.5	0.3	0.2	0.1	0.4	0.2
	TOTAL	33.6	24.8	35.1	25.4	18.9	12.3	25.7	17.5
1998	Nak/Kvi	12.6	6.9	14.5	8.2	6.3	2.6	5.5	1.1
	Egegik	8.6	7.5	8.4	7.4	4.7	3.6	5.3	4.3
	Ugashik	3.2	2.4	4.3	3.3	1.6	0.7	3.0	2.2
	Nushagak	5.3	3.5	6.2	4.4	5.4	3.0	5.7	2.8
	Togiak	0.5	0.3	0.4	0.2	0.3	0.1	0.5	0.3
	TOTAL	30.2	20.6	33.8	23.5	18.3	10.0	20.0	10.7
1999	Nak/Kvi	14.7	7.4	17.7	8.5	16.2	9.6		
	Egegik	3.6	2.5	7.7	6.4	9.2	7.5		
	Ugashik	1.4	0.6	2.7	1.8	4.0	2.3		
	Nushagak	4.9	3.1	6.7	4.4	8.5	6.2		
	Togiak	0.3	0.2	0.3	0.1	0.5	0.3		
	TOTAL	24.9	13.8	35.1	21.2	38.4	25.9		