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SOCKEYE SALMON OF THE NORTH PENINSULA, 1995

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Director

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KEY WORDS

Bristol Bay, distribution, fisheries, North Peninsula, sockeye salmon, timing

INTRODUCTION

The salmon fisheries on the north side of the Alaska Peninsula have been conducted annually since the early 1900s. Most of the sockeye salmon (*Oncorhynchus nerka*) are caught in the Northern District, which is along the migratory route of the much more abundant Bristol Bay stocks (Fig. 1). Early in the history of the North Peninsula sockeye fishery, there was controversy as some Bristol Bay fishermen claimed the majority of the catch was from Bristol Bay stocks, while the Peninsula fishermen maintained that they were fishing on local stocks (Murphy and Barrett 1994). Several early tagging experiments and studies of the migrations of Bristol Bay sockeye (Straty 1975, Eggers 1984, Rogers 1987 and 1995) demonstrated that most Bristol Bay sockeye salmon migrate well offshore and are unlikely to enter the nearshore salmon fisheries on the North Peninsula. However, some very large catches in this past decade and some scale pattern analyses indicating a significant presence of Bristol Bay sockeye (Geiger 1989, Swanton and Murphy 1992) have renewed the controversy over the origins of sockeye caught in the North Peninsula fishery.

The most reliable method to determine the origins of salmon in a fishery is the use of tagging experiments, but they are expensive and are unlikely to be conducted along the North Peninsula in the near future. However, methods other than scale pattern analysis can be used to examine this question. We examined the North Peninsula runs and fisheries through 1994 and determined that recent changes were typical of other sockeye salmon stocks on the Alaska Peninsula; in addition, the age composition, timing, and offshore distribution of Bristol Bay sockeye migrations indicated a low degree of vulnerability to North Peninsula fisheries (Rogers 1995). This report presents additional observations from 1995 and the beginning of a study of the productivity of North Peninsula sockeye systems.

METHODS

The description of the North Peninsula sockeye salmon runs and fisheries was based on reports by the Alaska Department of Fish and Game (ADFG). The recent North Peninsula runs and harvest rates (exploitation rate or percentage caught) were compared with adjacent Bristol Bay stocks. The North Peninsula fishery targets a mixture of local and perhaps non-local stocks, and it is difficult to construct brood tables for the individual rivers that would be desirable to compare with other sockeye salmon rivers. Therefore, most comparisons were made between composite North Peninsula and Bristol Bay runs.

Bristol Bay run timing past Port Moller was estimated annually (1987–94) by combining inshore run statistics collected by ADFG (e.g., Stratton 1991) with Port Moller test boat catches collected by the Fisheries Research Institute (FRI). The Port Moller statistics begin in 1968; however, FRI has conducted the program only since 1987 (Helton 1991, Rogers 1994). Fishing began June 11 and ended about July 5–10, and all statistics were summarized by 5-day periods. The daily runs in each fishing district were estimated by adding the catch to the escapement, which was lagged back to the fishing district from the counting towers. The daily runs to the Naknek/Kvichak, Egegik, and Nushagak districts were combined by setting the Egegik runs 1 d earlier and the Nushagak

runs 1 d later than the Naknek/Kvichak run. Daily proportions were calculated and then the Togiak and Ugashik runs were added. This combined cumulative daily run was then graphically compared with the cumulative daily index catches at Port Moller to determine the best travel time to reconstruct the run past Port Moller. Since the Port Moller sampling did not extend to the end of the Bristol Bay run, the estimated travel time was greatly influenced by the timing of the early part of the run. Adjustments were made for some years based on the difference between the mid-point in the inshore runs and the 50% date of the Port Moller catches through July 5.

The onshore-offshore distribution of the Bristol Bay run along the North Peninsula was estimated from the index catches at four stations spaced 33 to 63 nm out from Port Moller (about 13 to 43 nm out from the Alaska Peninsula coastline, point-to-point). An index catch is the number caught by 100 fm fished for 1 h with a monofilament net of 5-in mesh. To expand the onshore-offshore distribution, index catches at stations 10 nm inshore (station 0) and 10 nm offshore (station 10) of the standard 4 stations were made in 1995. This provided an estimate of the onshore-offshore distribution from 3 to 53 nm off the coastline. Surface water temperature was measured with each gillnet set, and salinities were also measured at most stations in 1995 with instrumentation provided by NOAA.

The ages of sockeye caught in the Port Moller test fishery were summarized by 5-d periods to correspond with the test-boat catches. The annual age compositions of the sockeye caught in the North Peninsula fisheries were provided in ADFG reports by weekly periods for two subdistricts; Bear River (Harbor Point to Cape Seniavin), and Ilnik/Three Hills (Cape Seniavin to Strogonof Point) (Fig. 2). Age compositions from the two subdistricts were averaged through July 11 by weighting the subdistrict compositions by the catch. Catches made within Nelson Lagoon were not included because these were very unlikely to contain Bristol Bay fish. The annual age compositions of the North Peninsula escapements were estimated by weighting the individual river age compositions by the number in the escapement. Age compositions for the annual Bristol Bay catches are available in annual ADFG reports (e.g., Stratton and Crawford 1992); however, I used statistics from annual run summaries provided by B. Cross (ADFG Anchorage) to calculate the age compositions in the catches.

A limnological and fish survey was made in Bear Lake during June 20–22, 1995. Methods were the same as those used in our Bristol Bay research. Water samples were collected from seven depths between 1 and 20 m to measure chlorophyll concentration and six vertical hauls from 40 m were made with a 0.5-m net (#6 mesh) to measure zooplankton density and species composition. Beach seine hauls were made with a 37-m x 4-m net with a 9-m bunt of 3-mm mesh. Gillnet sets were made perpendicular and near the shoreline with variable mesh monofilament nets that each contained 6 panels, 10 m x 2.4 m, with stretch mesh sizes of 26, 32, 42, 51, 77, and 102 mm.

RESULTS

NORTH PENINSULA SOCKEYE FISHERIES

In the North Peninsula commercial fisheries, sockeye salmon are caught primarily by drift gillnets and secondarily by set gillnets (mainly Nelson Lagoon) although some areas are open to purse seine gear. The drift fleet is virtually the same fleet that fishes the South Peninsula June fishery (False Pass). Since this June fishery often does not end until late June, fishing effort on the north side is light until the last week of June. The largest concentration of sockeye on the North Peninsula is in the area of Port Moller (Nelson Lagoon and Bear River); however, most of the catch is made northeast of Port Moller (towards Bristol Bay). The early historical catches from the North Peninsula averaged just under 1 million sockeye with the highest annual catch at 2 million. This was followed by a period of relatively low production (1950–77); since 1978, several annual catches have exceeded the highest catches made in the early history of the fishery. The large recent catches in the North peninsula fishery are not unique to that fishery; rather, they have occurred in nearly all major sockeye fisheries in the Bering Sea and upper Gulf of Alaska. The recent increase in North Peninsula catches is in fact modest compared with the increases in catches from the neighboring Ugashik and Egegik systems (Fig. 3). Recent harvest rates on North Peninsula stocks have been lower than those at Egegik and a little higher than at Ugashik; however, Ugashik has experienced overescapement (low harvest rate) in 3 of the past 9 yr (1989, 1991, 1992).

The North Peninsula runs extend over a much longer period than the Bristol Bay runs, which typically end in the bay by July 20. Bear River has an early and late run with a dividing date of July 31. The early Bear River run, as well as most of the other North Peninsula runs, tends to overlap the period when Bristol Bay sockeye are migrating past the North Peninsula, June 20–July 11. The timing of the North Peninsula sockeye runs was approximated by the weekly catch plus escapements (with no lag time for travel from the fishing district to the counting stations) for three recent years with very large runs (Fig. 4). Much of the North Peninsula run and catch takes place while the Bristol Bay sockeye migration is underway; however, the division of catch and escapement is in line with similar large runs within Bristol Bay. Along with the recent large runs to the North Peninsula, there have been escapements in excess of management escapement goals (Table 1). The same thing has happened in Bristol Bay with the recent large runs (Rogers et al. 1994). In both areas, fishermen have not harvested all the fish available in excess of management escapement goals with these large runs. Management based on fixed escapement goals should have low harvest rates when runs are small and high harvest rates when runs are large. This has been the case for the North Peninsula runs, but less so for Bristol Bay (Fig. 2).

BRISTOL BAY SOCKEYE MIGRATIONS

General Routes from the Pacific

The return migration of adult sockeye salmon to Bristol Bay begins in May as the maturing fish are distributed across the North Pacific from the eastern Gulf of Alaska to the western Aleutian Islands

(French et al. 1976). The majority of the sockeye migrate through the Aleutian Island passes and the Bering Sea, but those located in the eastern and central Gulf of Alaska move north concentrating along the south side of the Alaska Peninsula, and then west to Unimak Pass and into the Bering Sea. The fish returning from the Gulf of Alaska represent about 25% of the Bristol Bay run and are the sockeye that are fished by the False Pass fisheries at South Unimak and the Shumagin Islands (Rogers 1987). During 1957–78 when there was a large high-seas fishery north and south of the western Aleutians, 10% of the runs were caught by this fishery while 2% of the runs were caught by the False Pass fisheries (40% were caught in Bristol Bay and 48% went to the escapement). During 1979–94, when the Bristol Bay runs commonly exceeded 40 million and the high seas catch was negligible, the False Pass catch accounted for 3% of the runs with 62% going to the inshore catch and 34% to the escapement. In 1995, ~70% of the Bristol Bay run went to the inshore catch (44 million).

The very abundant Bristol Bay sockeye are joined on their migration by North Peninsula sockeye, Bristol Bay chum salmon (*O. keta*), and perhaps Kuskokwim chum salmon as well (Eggers et al. 1991). The migration route into Bristol Bay along the north side of the Alaska Peninsula is offshore with the main body of sockeye concentrated 10 to 50 nm from the coastline. In 1995, the migration was concentrated well offshore and Bristol Bay sockeye were quite scarce nearshore (Fig. 5). This offshore distribution caused an underestimation of the strength of the 1995 run.

The adults actively feed at least as far in as the area off Port Moller (Helton 1991). In 1995, we again collected stomach samples but the results are not yet available. Salinity and temperatures are given in Table 2. The influence of coastal freshwater runoff can be seen by the lower salinity nearshore with increasing salinity offshore. Plankton hauls were also made at each station in 1995, and although the counts were not completed, it was obvious that plankton density was greater at the farthest offshore stations where the sockeye were concentrated. There is a strong tendency for the adult sockeye salmon from peninsula rivers (e.g., Bear, Ugashik, and Nelson Lagoon) to swim offshore past their river of origin into inner Bristol Bay and then back to these peninsula rivers (Rogers 1995).

Run Timing

The timing of the annual return of salmon to Bristol Bay is relatively precise, usually varying from year-to-year by only a few days (Table 3). Compared with other salmon runs, Bristol Bay sockeye return over a very short period as the majority of the sockeye pass through the fishing districts in 2 wk. Since the early 1950s, very early runs occurred in 1968, 1979, and 1993 whereas very late runs occurred in 1956, 1971, 1986, and 1994. The runs tend to begin earlier and end later when the runs are very large (>40 million). In the large runs since 1987, there have been days when as many as 4 million sockeye swam past Port Moller (Table 4). The large runs in 1993 and 1994 (~50 million) illustrate the extremes in the daily passage rates. The 1993 run was one of the earliest runs on record and the 1994 run was one of the latest runs. The 1995 run, the second largest in history, was average in timing. For all recent runs, the daily passage rate by Port Moller declined to <500,000 after July 11, and the runs were mostly over by July 15. On average, the fish took 7 d to travel from Port Moller into the fishing districts with a range of ±2 d (Table 3). During the course

of an annual run, water temperatures off Port Moller increase and there is a tendency for travel time to decrease (Rogers 1994). The early fish appear to take a day or two longer to reach the inner bay and the late arriving fish take a day of two less than the majority of fish in the middle of the migration.

AGE COMPOSITION

If Bristol Bay sockeye constituted a major portion of the North Peninsula catch as indicated by some scale pattern analyses (Geiger 1989, Swanton and Murphy 1992), then we should expect the age composition in the North Peninsula catch to be similar to that in Bristol Bay or at least an average of ages in Bristol Bay and the North Peninsula escapements. A comparison of age compositions can not be used to estimate the possible contribution of Bristol Bay sockeye, but it can rule out a majority contribution if the ages in Bristol Bay and North Peninsula are quite different.

A very high correlation in the freshwater ages of sockeye caught in the Port Moller test fishery and in the Bristol Bay catch has been demonstrated (Rogers 1995). This was further evidence that the test fishing is on a composite of all Bristol Bay stocks. The sockeye in the North Peninsula catches were (with one exception) older than the sockeye in the Port Moller and Bristol Bay catches but were comparable with the freshwater ages in the North Peninsula escapement. Ages for North Peninsula escapements (1993–95) and the catch in 1995 are summarized (Tables 5 and 6). The additional data do not alter our earlier conclusion that the North Peninsula fishery targets North Peninsula stocks with only a minor contribution from Bristol Bay stocks (Table 7).

In addition to differences in freshwater age, the North Peninsula catches have exhibited a very different species composition (sockeye and chum percentages) than that in the Port Moller or Bristol Bay catches (Table 8). In recent years chum salmon have been scarce in the early season North Peninsula catches, constituting only ≤1% of the salmon catch. Bristol Bay chum percentages have been more than double the North Peninsula percentages (1991–94). Since 1991, the percentages of chum salmon in the closest station off Port Moller (Station 2) have been seven times greater than in the North Peninsula catches.

BEAR LAKE

Bear lake was visited during 20–22 June, but a planned second visit was not made as a result of heavy fog during late August. Limnologically, Bear Lake was similar to Bristol Bay lakes in June in terms of water temperatures, water clarity (Secchi depth) and phytoplankton standing crop as measured by chlorophyll *a* (Table 9). The zooplankton volumes were also similar, but only two species (genera) were present—*Cyclops* sp. and *Bosmina* sp. Commonly, five species of zooplankton are present in Bristol Bay lakes.

The fish sampling was not extensive; however, we encountered few species with a notable absence of the threespine stickleback (*Gasterosteus aculeatus*), which are prevalent in Bristol Bay lakes and at Chignik (Rogers et al. 1994). Juvenile sockeye were preponderant in the beach seine and

gillnet catches (Table 10). There may be more than one form of Arctic char (*Salvelinus alpinus*), but further study is necessary to clarify this.

The large runs to most Alaska Peninsula systems in recent years may be related to the recent mild winters and early springs (Fig. 6). King Salmon and Cold Bay are weather stations at each end of the peninsula. Spring temperatures (April–May) are similar for the two locations while King Salmon has colder fall and winter temperatures. There were close correlations in average annual winter (Nov–Mar) temperatures ($R^2 = .55$) and spring (April–May) temperatures ($R^2 = .59$), but a poor correlation in fall (Sep–Oct) temperatures between the two locations.

DISCUSSION

The preponderance of evidence has indicated that the North Peninsula sockeye fishery targets local stocks. Recent increases in the catches are little different than those seen in other sockeye salmon fisheries, and harvest rates, as well as escapement levels, are consistent with other sockeye salmon fisheries in the region. Observations made in 1995 did not change this conclusion. The major routes followed by Bristol Bay sockeye on their return migration from the North Pacific takes them well offshore of the North Peninsula and effectively keeps them from contributing larger numbers to the nearshore North Peninsula fishery. The migration was even farther offshore in 1995 with few sockeye present at the nearest inshore station (~3 nm from the coastline). There was considerable evidence for an offshore migration into Bristol Bay and then an inshore migration back out of Bristol Bay for stocks bound for rivers along the north side of the Alaska Peninsula from Nelson Lagoon to Ugashik but no new observations were made in 1995.

Future investigations of the sockeye salmon of the North Peninsula should examine the timing of North Peninsula runs by river, especially separating the early and late Bear River runs. It would be helpful to reconstruct the runs in the North Peninsula fishing districts by combining daily catches and lagged daily escapements. The Port Moller data should be examined to determine if there is any difference in age composition between inshore and offshore stations. More work is needed in assessing the primary and secondary productivity of Bear and other North Peninsula lakes, as well as the fish populations inhabiting these lakes. The North Peninsula lakes are small relative to the sockeye runs they produce. Thus, these lakes may contain fewer competitor and predator species for sockeye than the lakes in Bristol Bay.

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FIGURES

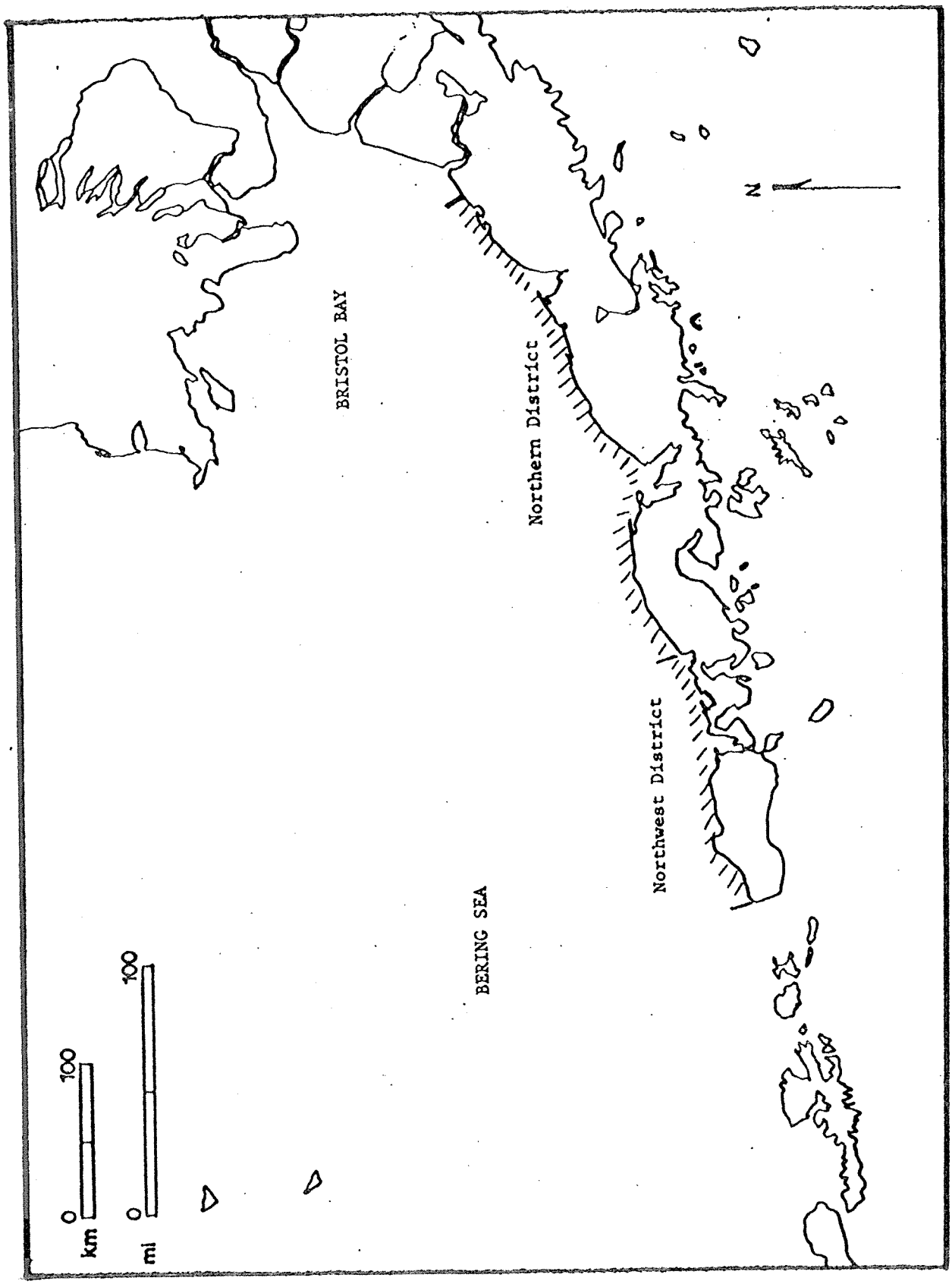

Figure 1. North Alaska Peninsula fishing districts.

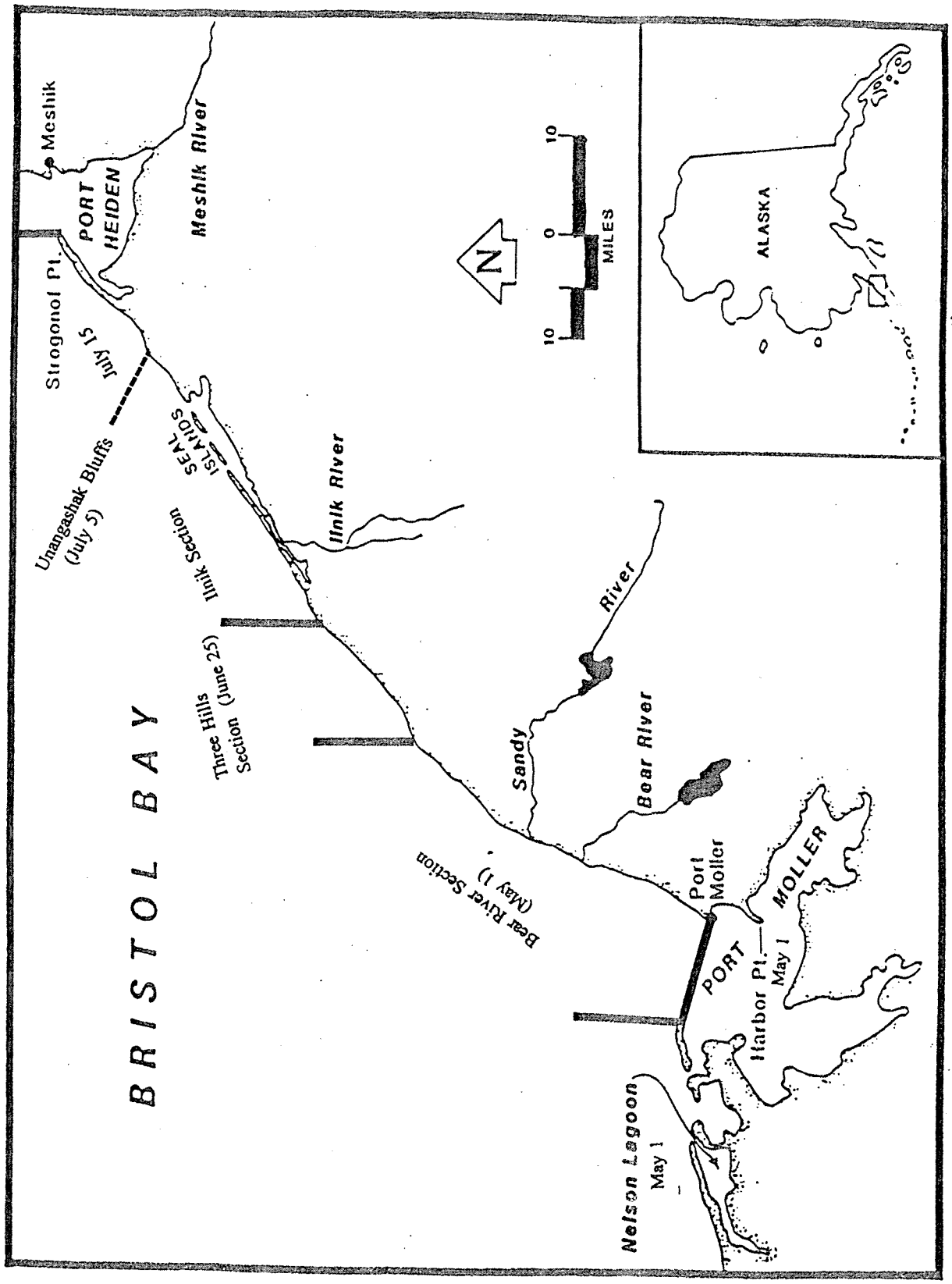

Figure 2. Fishing sections within the Northern District. Source: Murphy (1995), Fig. 2.

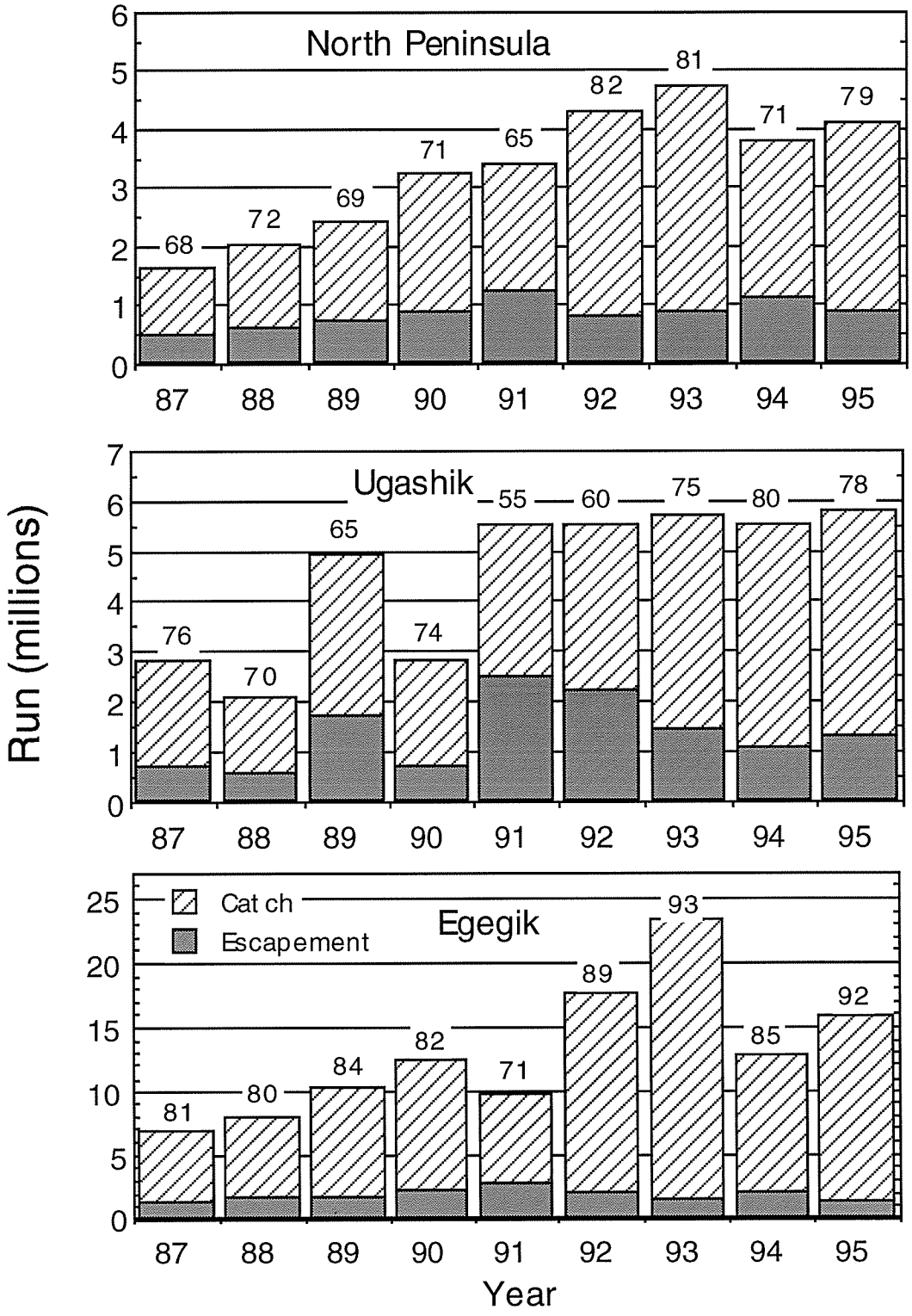

Figure 3. Annual sockeye salmon runs to Egegik, Ugashik and North Peninsula, 1987–95, with the percentage caught.

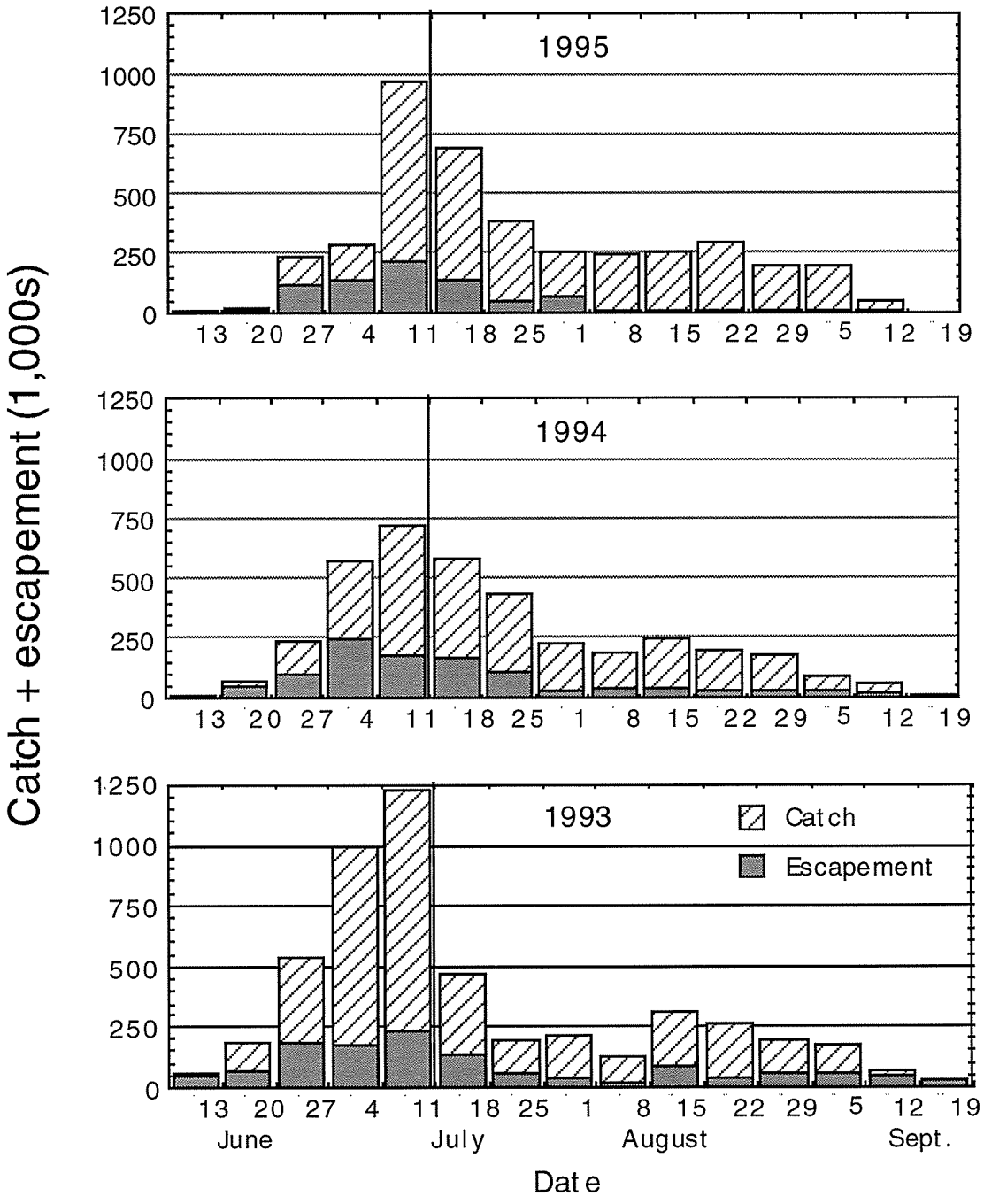

Figure 4. North Peninsula sockeye catch and escapement by weekly periods, 1993–95.

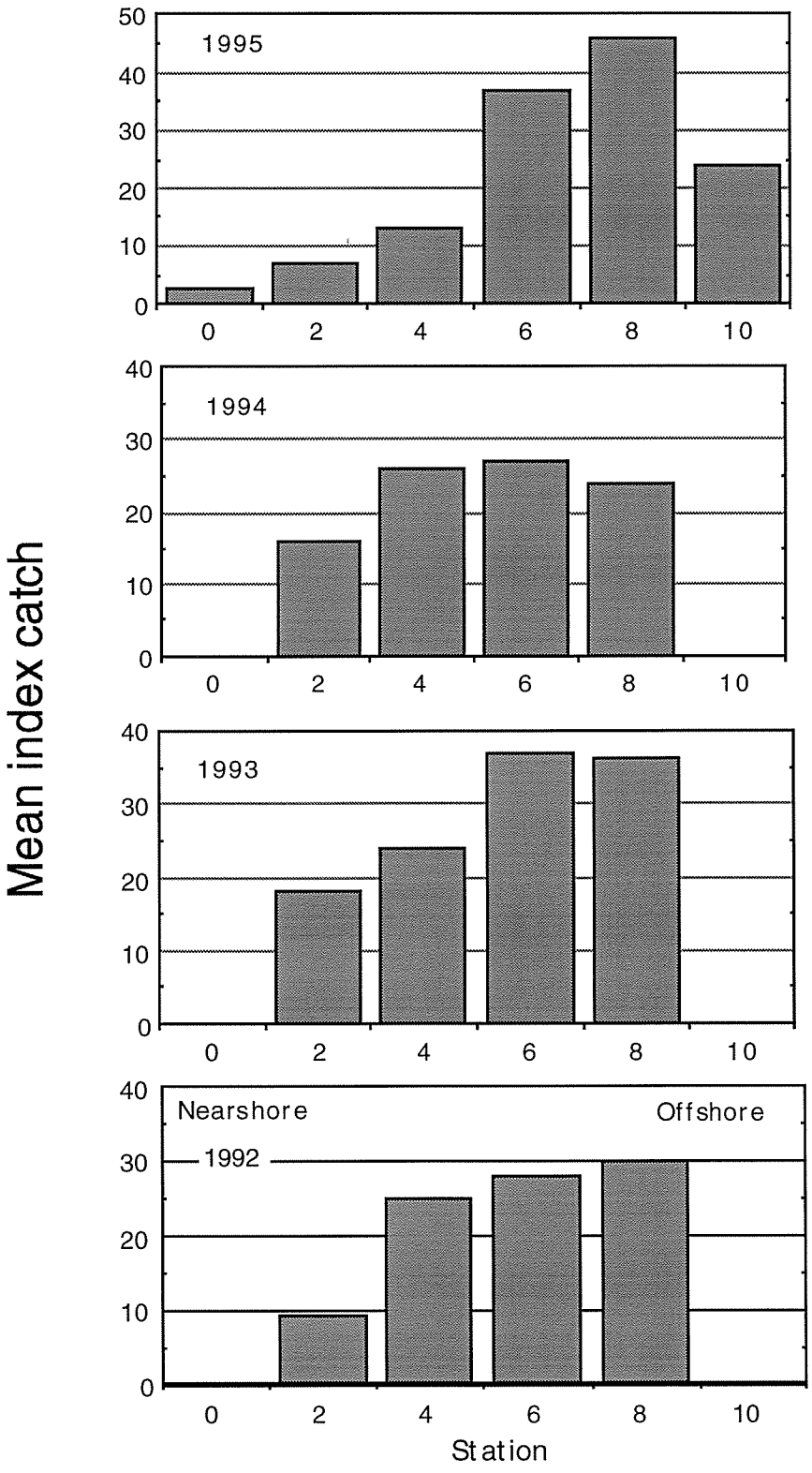

Figure 5. Port Moller sockeye index catches averaged over stations, 1992–95.

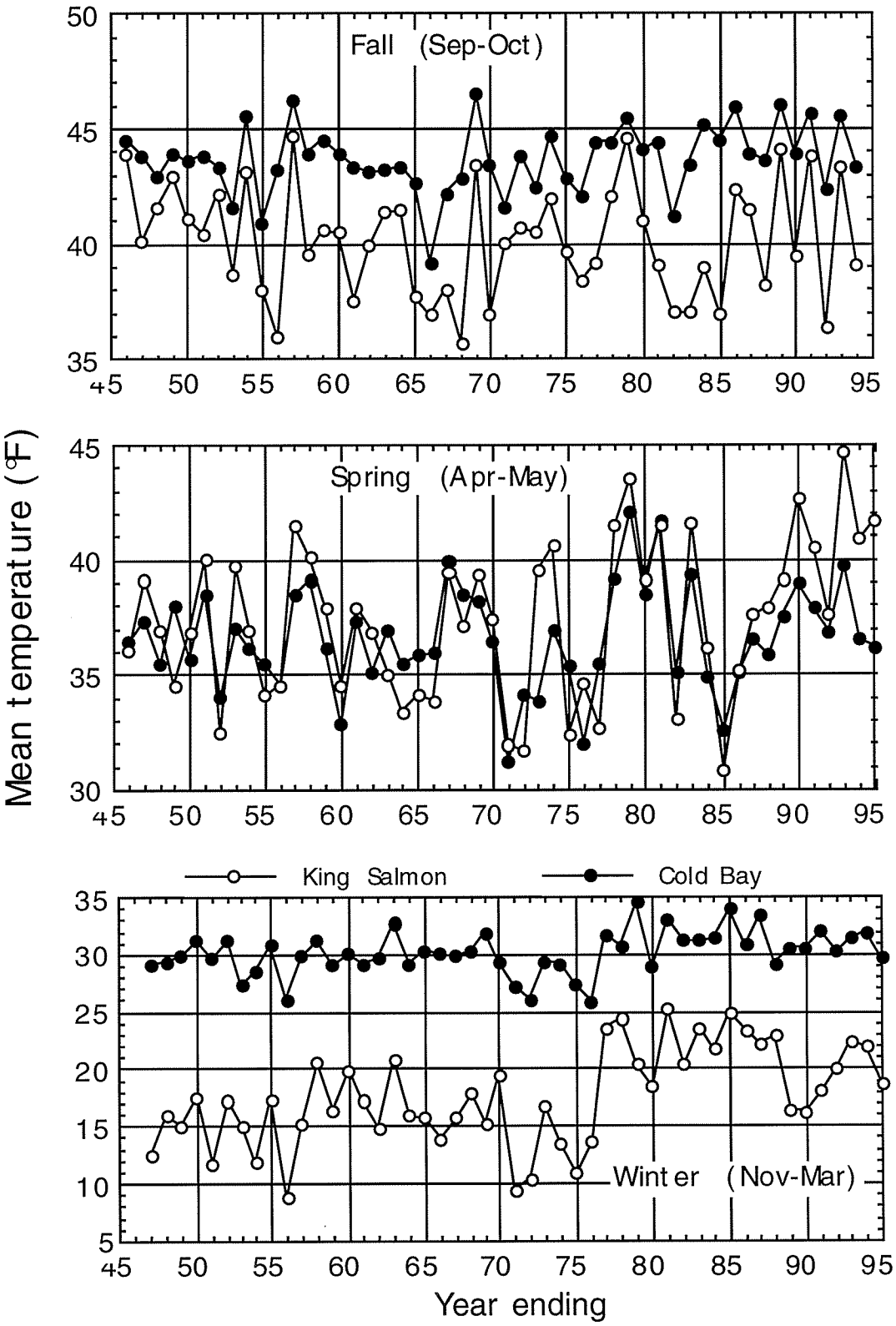

Figure 6. Average air temperatures on the Alaska Peninsula, 1946–95.

TABLES

Table 1. Northern District sockeye salmon escapements and catches, 1987–95.

System	Escapement goal range (1,000s)	Escapement (1,000s) 87	88	89	90	91	92	93	94	95
Nelson Lagoon	114-178	156	151	207	269	268	190	225	325	329
Bear River	200-250	267	310	451	547	606	450	452	465	305
Sandy River	40-60	9	43	45	22	94	35	80	115	124
Ilnik River	40-60	31	39	19	49	135	45	70	75	38
Subtotal	394-548	463	543	722	887	1103	720	827	980	796
Other rivers		43	19	12	29	76	41	93	144	139
District total		506	562	734	916	1179	761	920	1124	935
District catch		1065	1450	1668	2258	2210	3496	3798	2718	3242
District run		1571	2012	2402	3174	3389	4257	4718	3842	4177

Sources: McCullough (1990 and1991), Murphy (1991), Swanton and Murphy (1992), Murphy (1994), Barrett and Murphy (1994), Barrett and Murphy (1992), Murphy and Barrett (1993 and 1994), McMullough et al (1994), Murphy, Shaul and Berceli (1995), and P. Nelson (ADF&G, Kodiak) for 1995 preliminary data.

Table 2. Surface salinities and temperatures at Port Moller test fishing stations, 1995.

		Salinity (‰)						Temperature (°C)					
		Station						Station					
	Date	0	2	4	6	8	10	0	2	4	6	8	10
June	12		31.90	31.66	31.84	31.83			7.39	6.58	7.15	7.18	
	13	30.97		31.87	31.86	31.89		7.55	7.0	7.10	6.81	6.86	
	14		31.48	31.68	31.81	31.87			6.84	6.78	7.14	7.37	
	15	31.10	31.52	31.75	31.82	31.89		7.50	7.35	7.15	7.04	6.96	
	16		31.41	31.57	31.84	31.88			7.58	7.50	7.56	7.67	
	17		31.46	31.74	31.84	31.89		7.0	8.29	7.73	7.56	7.21	
	18		31.32						6.95	7.0	7.0	6.2	
	19								6.8	7.2	6.4	6.2	
	20		31.39	31.45	31.85	31.84	31.89		5.93	8.16	7.41	7.89	8.18
	21	31.20	31.31	31.56	31.87	31.86		5.93	6.88	7.39	7.49	7.65	
	22								6.0	6.5	7.0	7.0	
	23								7.0	7.0	7.0	6.88	
	24		31.32	31.46	31.79	31.85	31.93		7.68	7.83	8.21	7.55	7.14
	25		31.34	31.32	31.77	31.87			8.44	7.85	7.33	7.48	
	26		30.07						8.53	9.0	8.5	7.88	
	27					31.87			6.50	8.00	7.50	7.50	
	28								7.0	7.06	7.0	7.0	7.0
	29								7.48	7.31	7.08	7.86	
	30			31.40	31.41	31.76			7.60	7.57	7.90	8.11	8.0
July	1	31.32		31.49	31.52	31.67		8.22	7.5	7.67	8.46	8.48	
	2	31.41	31.55	31.56	31.53			8.5	8.54	8.28	7.79	8.0	
	3								7.5	7.5	8.0	8.0	
	4				31.54	31.78		8.0	8.10	8.57	8.87	8.81	
	5		31.48	31.53	31.47	31.47			8.48	8.05	8.43	8.42	
	6	31.41	31.40					8.06	8.41	7.5	8.0	8.0	
	7								7.5	8.0	8.0	8.0	
	8	31.49	31.61	31.59	31.64	31.82		7.75	8.33	8.26	9.08	9.63	
	9			31.56	31.42	31.84			7.0	8.60	9.03	9.35	
	Means	31.27	31.37	31.58	31.71	31.82	31.91	7.61	7.47	7.58	7.62	7.62	7.58

Temperatures recorded by hand-held thermometer are reported to the nearest tenth of a degree while those measured by NOAA instrumentation are reported by the nearest hundredth of a degree.

Table 3. Timing of Bristol Bay runs and between Bristol Bay and Port Moller.

Year	Mean date of run (July)				Mean date at P.M.*	Days P.M. to B.B.	P.M. mean temp. (C) 6/11 to 7/5
	Egegik	Nak/Kvi	Nush.	Wt'd mean			
85	2.1	3.0	4.3	2.9	27.1	5.8	5.8
86	6.6	6.4	8.3	7.0			
87	3.4	5.5	4.3	4.7	25.5	9.2	5.7
88	1.5	2.0	5.1	2.3	26.8	5.5	7.5
89	3.4	1.4	3.0	2.1	27.0	5.1	6.3
90	6.0	5.0	6.4	5.5	28.0	7.5	7.3
91	4.1	3.6	5.4	4.1	25.8	8.3	5.3
92	5.4	5.0	6.0	5.3	26.7	8.6	7.6
93	0.3	0.6	1.4	0.6	25.3	5.3	7.7
94	6.4	7.0	8.0	7.0	28.0	9.0	6.6
95	4.4	5.0	4.0	4.7	26.3	8.4	7.3
Means 1987-95	3.9	3.9	4.8	4.0	26.6	7.4	6.8

* Date in June of 50% of index through July 5.

Table 4. Estimates of the daily passage of sockeye salmon off Port Moller, 1987–95.

Date		Daily passage 0-70 mi off coast (millions)								
		87	88	89	90	91	92	93	94	95
June	11	.08	.07	.26	.07	.05	.26	.22	.04	.10
	12	.07	.12	.33	.03	.04	.12	.19	.07	.12
	13	.08	.19	.48	.05	.07	.21	.29	.09	.36
	14	.11	.30	.59	.10	.12	.34	.58	.10	.61
	15	.11	.45	.83	.10	.18	.64	1.09	.07	.91
	16	.19	.56	.97	.12	.30	.68	1.50	.10	.87
	17	.39	.69	.97	.17	.50	.92	1.31	.09	1.40
	18	.72	.74	1.29	.36	.74	.69	1.33	.26	1.99
	19	.89	.73	1.53	.72	1.01	.97	1.53	.74	2.49
	20	1.16	.82	1.98	1.00	1.28	.98	2.12	1.42	2.44
	21	1.08	.94	2.72	1.44	1.72	1.50	2.46	1.76	2.29
	22	.99	.93	2.87	1.99	2.08	1.72	2.69	2.15	2.75
	23	1.28	1.07	2.92	1.87	2.36	2.00	2.84	2.77	2.96
	24	1.51	1.30	2.62	1.95	2.54	1.94	3.02	2.88	3.09
	25	1.97	1.72	2.79	2.61	2.64	2.25	3.57	2.89	3.14
	26	1.62	1.45	2.71	3.55	2.97	2.93	4.03	2.95	3.42
	27	1.63	1.19	2.19	4.06	2.82	3.34	4.08	3.48	3.68
	28	1.35	1.00	1.93	3.32	2.66	3.17	3.51	3.97	3.16
	29	1.19	.97	1.94	3.28	2.19	2.51	2.86	3.48	2.80
	30	1.06	.98	1.54	2.78	2.15	2.47	2.47	3.38	2.54
July	1	.91	.81	1.24	2.87	2.13	2.42	2.22	2.62	2.59
	2	1.00	.76	1.02	2.07	2.14	2.54	1.97	2.17	2.56
	3	1.15	.71	1.18	2.36	1.99	2.16	1.60	1.59	2.39
	4	1.29	.66	1.37	1.75	1.73	1.76	1.20	1.51	2.13
	5	1.31	.70	1.37	1.84	1.39	1.35	.83	1.60	1.94
	6	1.11	.59	1.14	1.28	.99	1.13	.59	1.57	1.84
	7	.86	.68	.84	1.38	.73	1.08	.44	1.51	1.65
	8	.65	.58	.52	1.16	.58	.94	.34	1.31	1.27
	9	.42	.55	.48	.99	.56	.73	.25	1.03	.85
	10	.38	.35	.38	.67	.48	.49	.18	.64	.75
	11	.22	.27	.34	.58	.35	.24	.14	.45	.61
	12	.17	.17	.25	.41	.21	.16	.11	.40	.45
	13	.13	.11	.14	.28	.13	.10	.09	.35	.24
	14	.12	.08	.07	.17	.10	.07	.08	.24	.07
	15 +	.29	.18	.21	.34	.38	.16	.18	.39	.23
Totals		27	23	44	48	42	45	52	50	61

Table 5. Age compositions of sockeye salmon from North Peninsula rivers, 1993–95.

		1-ocean			2-ocean				3-ocean			4-ocean			Escape.
Year	River	1.1	2.1	3.1	0.2	1.2	2.2	3.2	0.3	1.3	2.3	0.4	1.4	2.4	1,000s
93	Ilnik	.001				.017	.014		.066	.379	.445	.007	.058	.013	73
	Bear		.111	.001		.019	.351	.016		.026	.470		.002	.004	448
	Nelson		.032			.039	.530	.022	.001	.094	.283				208
	Combined	.000	.077	.001		.025	.368	.016	.007	.081	.414	.001	.006	.002	729
94	Ilnik					.083			.350	.317	.033	.017	.117	.083	75
	Sandy	.017	.002		.001	.899	.019		.001	.060	.001		.001		115
	Bear	.006	.060			.010	.573			.046	.288		.002	.015	465
	Nelson		.047			.020	.843	.005		.010	.069		.004	.001	325
	Combined	.005	.044		.000	.123	.554	.002	.027	.056	.162	.001	.011	.014	980
95	Ilnik				.022	.129	.010		.125	.650	.037	.015	.012		38
	Sandy	.033			.006	.320	.030			.603	.007				124
	Bear	.001	.122			.021	.488			.006	.350		.005	.007	305
	Nelson	.001	.086		.001	.013	.826	.002		.014	.056			.002	338
	Combined	.006	.082		.002	.069	.537	.001	.006	.132	.159	.001	.002	.003	805

Source: P. Nelson, ADF&G Kodiak

Table 6. Age compositions in the Northern District by week, 1995.

Section	Week ending	2-ocean 0.2	1.2	2.2	3.2	3-ocean 0.3	1.3	2.3	3.3	4-ocean 0.4	1.4	2.4	Catch 1,000s
Nelson Lagoon													
June	13	.002	.042	.281	.002	.008	.263	.397	.004	.000	.006	.000	3
	20	.002	.041	.302	.002	.007	.253	.384	.004	.000	.005	.004	7
	27		.027	.484	.004	.003	.161	.313	.005	.000	.001	.002	38
July	4		.024	.560	.004	.001	.120	.283	.004	.000	.001	.001	79
	11		.027	.580	.005	.001	.114	.269	.001	.000	.002	.001	154
	18		.048	.489	.003	.004	.211	.243	.002	.000	.001	.000	88
	25		.099	.328	.001	.002	.372	.191	.004	.001	.001	.000	26
Aug.	1		.169	.141	.000	.001	.592	.093	.002	.001	.001	.000	19
	8		.200	.027	.000	.002	.728	.042	.000	.000	.000	.000	13
	15		.157	.021	.000	.001	.740	.080	.000	.000	.000	.000	12
	22		.136	.024	.000	.000	.740	.101	.000	.000	.000	.000	6
Sept.	12		.136	.024	.000	.000	.740	.101	.000	.000	.000	.000	4
Total number		0	23	210	2	1	101	110	1	0	1	0	449
Proportion		.000	.052	.468	.003	.002	.225	.245	.002	.000	.001	.001	
Harbor Point to Strogonof Point													
June	27	.000	.133	.195	.000	.021	.304	.327	.007	.001	.007	.005	79
July	4	.000	.130	.201	.000	.020	.298	.331	.007	.001	.007	.005	65
	11	.000	.104	.263	.000	.005	.226	.386	.005	.001	.005	.003	587
	18	.001	.064	.307	.000	.001	.159	.455	.004	.000	.006	.002	468
	25	.000	.052	.267	.001	.001	.191	.476	.004	.000	.006	.002	314
Aug.	1	.000	.047	.400	.001	.000	.114	.432	.001	.001	.002	.001	162
	8	.000	.100	.419	.000	.000	.168	.307	.000	.000	.005	.001	221
	15	.000	.044	.614	.001	.001	.104	.232	.000	.000	.003	.002	232
	22	.001	.012	.704	.001	.000	.037	.242	.000	.000	.000	.004	265
	29	.000	.006	.724	.001	.000	.011	.254	.001	.000	.000	.002	178
Sept.	19	.000	.004	.740	.002	.000	.004	.246	.000	.000	.000	.003	223
Total number		0	171	1191	2	7	403	992	7	1	11	7	2792
Proportion		.000	.072	.500	.001	.003	.169	.417	.003	.000	.005	.003	

Source: P. Nelson, ADF&G Kodiak

Table 7. Comparison of age compositions, 1987–95.

		Age composition							Age composition				
Year	Location	1.2	2.2	1.3	2.3	Other	Year	Location	1.2	2.2	1.3	2.3	Other
87	BB catch	.368	.133	.295	.161	.043	91	BB catch	.145	.186	.503	.128	.038
	PM catch	.505	.189	.176	.119	.011		PM catch	.127	.143	.535	.152	.043
	NP catch	.103	.113	.303	.385	.096		NP catch	.092	.129	.500	.266	.013
	NP escape.	.082	.547	.144	.193	.034		NP escape.	.091	.535	.274	.088	.012
88	BB catch	.159	.235	.418	.159	.029	92	BB catch	.080	.344	.284	.251	.041
	PM catch	.180	.196	.481	.115	.028		PM catch	.069	.298	.329	.269	.035
	NP catch	.056	.188	.159	.573	.024		NP catch	.053	.346	.233	.329	.039
	NP escape.	.110	.348	.136	.368	.038		NP escape.	.086	.609	.070	.186	.049
89	BB catch	.097	.611	.166	.108	.018	93	BB catch	.128	.331	.184	.329	.028
	PM catch	.110	.511	.199	.158	.022		PM catch	.072	.274	.190	.443	.021
	NP catch	.026	.305	.181	.419	.069		NP catch	.016	.156	.065	.732	.031
	NP escape.	.078	.589	.092	.200	.041		NP escape.	.027	.400	.088	.450	.035
90	BB catch	.132	.354	.229	.252	.033	94	BB catch	.054	.534	.155	.225	.032
	PM catch	.104	.363	.225	.278	.030		PM catch	.056	.435	.210	.269	.030
	NP catch	.023	.262	.060	.614	.041		NP catch	.040	.154	.208	.546	.052
	NP escape.	.110	.502	.076	.270	.042		NP escape.	.130	.582	.059	.171	.058
							95	BB catch	.153	.548	.123	.163	.013
								PM catch	.136	.492	.151	.211	.010
								NP catch	.109	.250	.241	.375	.025
								NP escape.	.075	.589	.144	.174	.018

BB= Bristol Bay, PM=Port Moller, NP= North Peninsula

NP catch for Bear River and Ilnik/Three Hills sections through July 11 or14 only.

NP escapement for Ilnik, Sandy (88,89,94,95), Bear, and Nelson Rivers for entire season.

Escapement age composition excludes jacks (1-ocean fish)

Table 8. Percentages of chum salmon in the catches of sockeye and chum salmon.

	Bristol Bay catches			North Peninsula catches (Port Moller to Strogonof -7/4)			Percent chum salmon in Port Moller test catches through 7/5, by station				
Year	Sockeye	Chum	% chum	Sockeye	Chum	% chum	2	4	6	8	Total
85	23703	1068	4.3	515	52	9.2	2.6	1.7	4.3	15.2	4.3
86	15776	1227	7.2	618	42	6.4					
87	16069	1529	8.7	225	59	20.8	2.5	3.5	7.4	11.7	6.2
88	13990	1469	9.5	250	42	14.4	6.2	13.0	11.5	23.8	13.0
89	28735	1259	4.2	734	21	2.8	3.7	3.8	3.1	7.5	4.5
90	33523	1058	3.1	130	4	2.7	1.9	2.2	7.9	9.6	4.7
91	25821	1290	4.8	196	2	1.2	4.8	6.6	9.0	12.1	7.8
92	31880	921	2.8	899	12	1.3	8.2	3.4	5.8	7.7	6.1
93	40462	838	2.0	1143	8	0.7	4.3	2.4	4.0	5.7	4.3
94	35265	833	2.3	347	2	0.6	4.7	4.8	10.5	5.1	6.9
95	44427	950	2.1				2.6	3.1	2.1	2.5	2.6

Table 9. Chlorophyll a measurements at 1–20 m from southwest Alaska lakes, June 1995.

		Date	Secchi	Chlorophyll a (mg/m^3)							0-10 m	0-20 m
Lake	Sta.	(June)	depth	1	3	5	7	10	15	20	mg/m^2	mg/m^2
Chignik Lakes												
Chignik	CB	8	2.2	5.50		5.64		5.85		4.54	56.50	108.5
	DEL	8	1.2	4.46		4.56		3.92		4.64	41.12	86.6
Black	AB	9	1.2	1.39								
	HP	9	1.8	4.49								
	Outlet	9	1.2	5.12								
Wood River Lakes												
Little Togiak	5	20	6.5	1.07	.98	.72	1.44	2.19	2.88	1.91	12.42	37.1
Lynx	2	20	6.5	1.43	1.33	.77	1.39	6.27			19.94	
Grant	2	22	7.5	.78	.78	1.30	1.74	2.44	2.08	1.58	13.73	34.2
Elva	2	22		.80	1.30	1.54	1.71	1.83	1.92	1.66	14.30	32.6
Aleknagik	3	23	7.5	.76	1.26	1.27	1.41	1.34	.87	.87	12.12	22.0
	5	23	7.0	.75	1.06	1.23	1.73	1.61	1.32	.80	12.82	25.4
Tikchik Lakes												
Chikuminuk	2	22	15.0	.43	.35	.44	.37	.36	.47	.51	3.91	8.4
Alaska Peninsula												
Bear	2	21	7.5	.94	.76	1.38	1.47	1.27	1.60	.89	11.74	25.1

Lynx Lake sample at 10 m was near bottom.
Black Lake station AB is off the mouth of the Alec River.

Table 10. Catches from beach seine and gill net sampling in Bear Lake, June 20–22, 1995.

Gear	Number of hauls/sets	Catch			
		Species		Lengths (mm)	Number
Beach seine	5	Sockeye salmon			
			age 0	23-35	2397
			age 1	83	1
		Coho salmon			
			age 0	36-45	6
			age 1	58-86	11
		Coastrange sculpin		24-56	17
		Ninespine stickleback		31-62	11
		Arctic char		65-79	2
		Alaska blackfish		54	1
Gill net	7	Sockeye salmon			
	2-14 h		adults		30
			smolt		70
		Coho salmon			
			smolt		16
		Arctic char			
			adult		22