

THE INCIDENCE OF IMMATURE SALMON IN SOUTH PENINSULA
PURSE SEINE FISHERIES, 1963-91

By
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ABSTRACT

By state policy, commercial purse seine fisheries in South Peninsula waters of the Alaska Peninsula Management Area will be closed by emergency order when excessive by-catch of immature salmon occurs (ADF&G 1990). In making a decision to close a fishery the department considers average number of immatures per set, fleet distribution, and historical dates of immature salmon occurrence. The Alaska Department of Fish and Game has been instructed by the Alaska Board of Fisheries to utilize results from subsistence, commercial periods, and test fishing to evaluate the abundance of immature salmon. Because the catch of immature salmon is limited to purse seine gear, gill net gear may continue to operate during periods when the seine fishery is closed by emergency order due to the presence of immature salmon.

In 1963, the South Peninsula commercial salmon fishery was closed for the first time due to the presence of immature salmon. The fishery was also closed in 1968, 1969, 1974, 1979, 1989, 1990, and 1991 due to immature salmon by-catch problems. Sockeye (*Oncorhynchus nerka*) and chum (*O. keta*) salmon were the primary immature salmon species caught in purse seine gear.

In recent years a change in the species composition of immature salmon has occurred. Prior to 1975, about 90% of the immature salmon caught in the Shumagin Islands Section were sockeye salmon. After 1988, the immature catch has been about 50% sockeye and 50% chum salmon.

Immature salmon stock identification studies have not occurred.

KEY WORDS: Alaska Peninsula, sockeye, chum, salmon, immature, seine, by-catch

INTRODUCTION

The South Peninsula area of the Alaska Peninsula Management Area consists of Pacific Ocean coastal waters extending west of Kupreanof Point to Scotch Cap on Unimak Island (Figure 1).

During normal fishing operations, immature salmon of three species are inadvertently caught in purse seine gear: chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), and chum salmon (*O. keta*; M. Stopha, Alaska Department of Fish and Game, Sand Point, personal communication).

In the Shumagin Islands Section, most purse seine fishing effort occurs in the near shore waters of Popof Island at Popof Head, Middle Set, and Red Bluff (Figure 2). Deep water offshore of the beach allows nets to be deployed close to the shore. Twenty-minute sets, in vessel rotation, are used to catch salmon migrating westward.

Historically, the presence of immature salmon in South Peninsula waters has caused the curtailment of all commercial fishing in effected areas during late June or July in 1963, 1968, 1969, 1974, and 1979 and purse seine fishing in 1989-91 (Shaul et al. 1991, McCullough 1991). After 1979, regulations were adapted curtailing only purse seine fishing in effected areas. The problem associated with immature salmon is restricted to the purse seine fleet. Immature salmon are gilled in the seine webbing resulting in what is likely a 90-100% mortality factor (R. Guthrie, Alaska Department of Fish and Game, Sand Point, personal communication). By regulation, seine mesh size may not be more than 3 1/2 inches except the first 25 meshes above the lead line which may not be more than 7 inches (ADF&G 1990). By regulation, gill net mesh size can not be less than 5 1/4 inches; the larger mesh size in gill net gear allows for unrestricted passage of immature salmon through gill net gear (M. Stopha, Department of Fish and Game, Sand Point, personal communication).

Historically, immature salmon cause the greatest problem in the Shumagin Islands Section. Catches of immature salmon were first brought to the attention of the Alaska Department of Fish and Game (ADF&G) in 1963. Currently, about 55 purse seine permit holders must either remain on the beach or move to other open areas that are not as productive as the Shumagin Islands Section or the waiting period at favored sites is extended by their presence. Immature salmon usually migrate out of the Shumagin Islands Section by July 23 (G. Davenport, Alaska Department of Fish and Game, Sand Point, personal communication). In 1990 purse seine gear closures remained in effect until July 25 (Shaul et al. 1991).

Test fishing results in the Shumagin Islands Section is also used as a indication of the likelihood of the presence of immature salmon in other management areas. In 1991, the Mitrofanina Section of the Western District of the Chignik Management Area was closed due to immature salmon from July 11 to August 8, and the entire Western and Perryville Districts were closed from August 8-11.

The objective of this report is to present personal communications and test fish results on the occurrence of immature salmon from the South Peninsula. This information will provide a data base for evaluating management goals and is intended as a reference document; interpretation and discussion of the data are therefore limited.

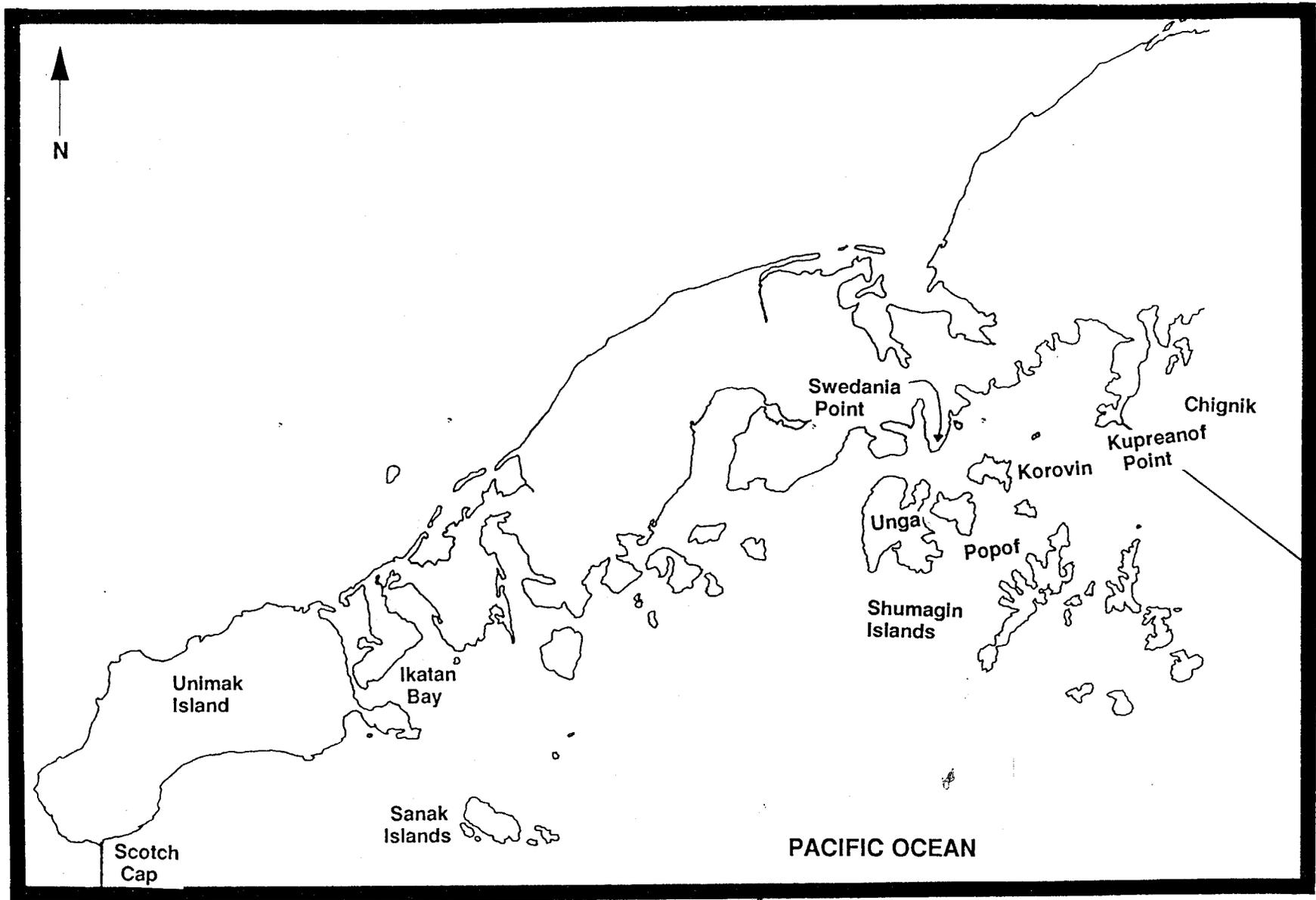


Figure 1. Map of the South Peninsula, the study area on the Pacific Ocean portion of map is from Kupreanof Point to Unimak Island.

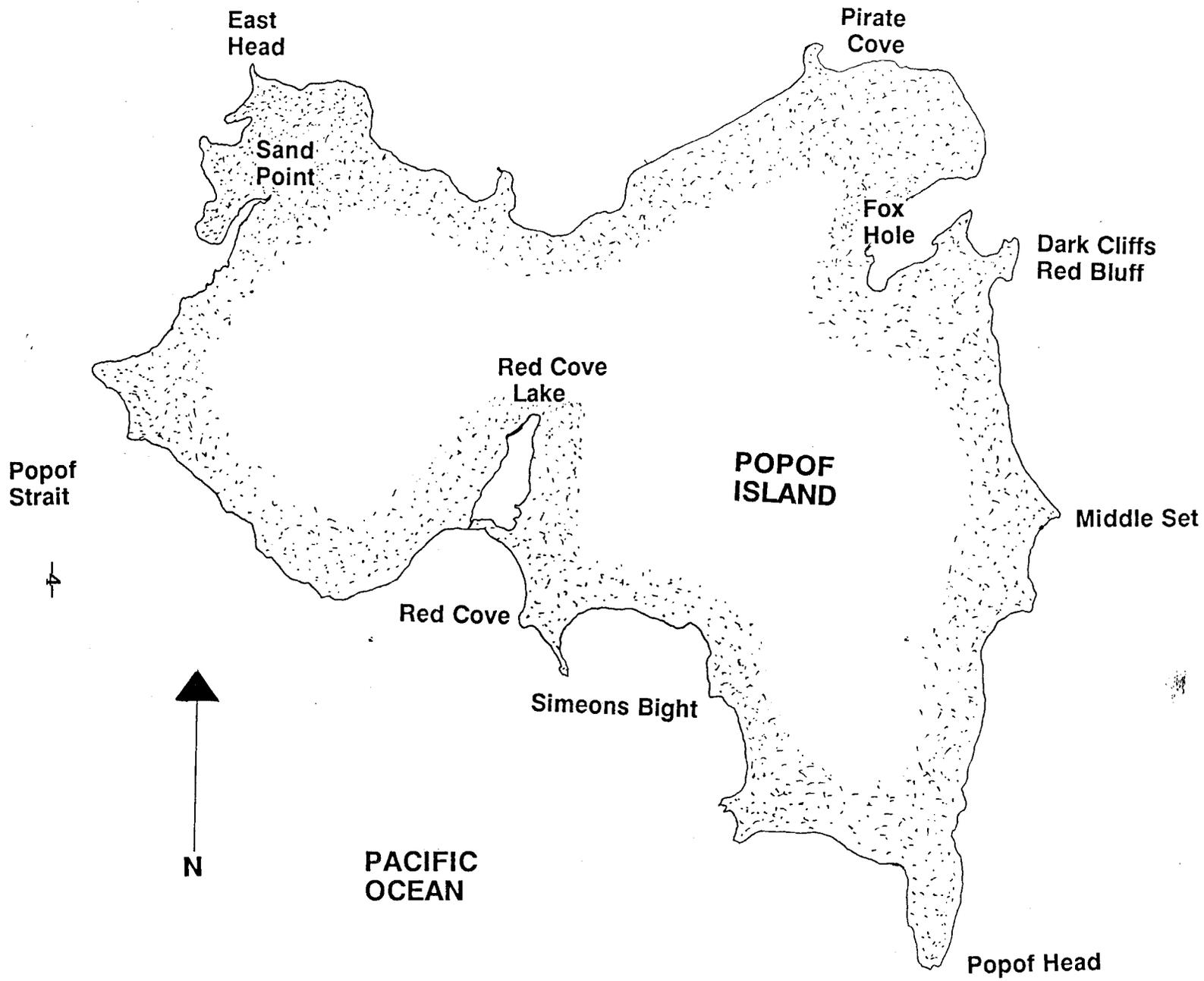


Figure 2. Map of Popof Island with the test fishing sites defined.

METHODS

In 1990, test fishing was standardized to purse seine gear making 20 minute sets and fully pursing the gear. The test fish project used commercial purse seines that are 250 fathoms in length and 375 meshes in depth. The seine mesh is 3 1/2 inches except the first 25 meshes above the lead line is usually seven inch mesh. The test fish project and commercial fishermen do not use leads in the Shumagin Islands Section. Sites used to set the gear included: Popof Head, Middle Set, and Red Bluff; additional sets were made if time allowed. If large numbers (greater than 1,000) of immature salmon were observed being gilled during any set, the set could be terminated prior to the 20 minute time limit. Each day a permit holder was randomly selected from a list of permit holders interested in the test fishery. The standard ADF&G short term vessel charter agreement between the State of Alaska and the vessel owner was used. The permit holder supplied all necessary fishing material and crew, while ADF&G supplied a biologist to count and identify by species the number of immature and mature salmon per set. Immature salmon were defined as any salmon gilled in seine webbing and weighing less than three pounds per fish; this was also the weight below which buyers refused to pay for salmon. Mature salmon were sold to pay charter cost and immature salmon were dumped at sea unless they could be given away for subsistence use. During off-loading the mature catch was separated by species, counted, and weighed.

Prior to 1990 test fishing was not documented in detail. Although similar to current test fishing in sites fished and duration of sets, the pre-1990 test fishery differed in that a single vessel was chartered for the duration of the test fishery.

Catches were occasionally sampled from purse seine gear in the Shumagin Islands Section. Immature salmon gilled in seine web were randomly sampled. Since all catch sampling occurred before sorting within the fishing vessel and cannery, there was no preselection of immature salmon; although not tested, each sample was assumed to be representative of the by-catch within the Shumagin Islands Section. While this insured that samples were randomly selected from each fishing vessel sampled, the samples may not be characteristic of the population structure because the distribution of the population is unknown in the fishery.

Age was determined by examining scales (Bilton and Ricker 1965; Mosher 1968). Scales were removed from the preferred area, which was located on the left side of the salmon two rows above the lateral line in an area transacted by the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). One scale was taken from each salmon. A microfiche reader was used to read an acetate impression of the scale (Clutter and Whitesel 1956). Ages were recorded in European notation in which the first digit is the number of winters the salmon spent in freshwater, and the second digit is the number of winters the salmon spent in the ocean (Mosher 1968). The total age is the sum of these two numbers plus one to account for the incubation time. The accuracy of age determination was not tested, but prior data on sockeye salmon indicate a 98% agreement rate between experienced readers (McCullough 1989).

Length measurements were taken from mid-eye to the fork of the tail using a caliper or meter stick measuring to the nearest 1 mm. Accuracy of a length

measurement was within ± 5 mm. Mean lengths were calculated from an unweighted composite of the data collected from the samples.

Gonad weight measurements were taken using a triple beam balance scale with 0.1 g gradations; weights were recorded to the nearest 0.1 g. Accuracy of a weight measurement was within ± 0.2 g. Mean weights were calculated from an unweighted composite of the data collected from the samples.

Sex compositions and sexual maturity were computed for each sample. Sex and sexual maturity was determined by internal observation of the gonads.

RESULTS AND DISCUSSION

1963 Season

On July 9, 1963, ADF&G reported that about 50% of the 16,000 salmon caught on July 5 was composed of small sockeye salmon (G. Davenport, Alaska Department of Fish and Game, Sand Point, personal communication). The salmon were reportedly gilled in the 3 1/2 inch web of purse seine gear but not in the 4 inch web. Some of these small salmon were examined by the Area Management Biologist, Glen Davenport, on July 6 and identified as immature sockeye salmon, full of feed, and stomach-burned by time of delivery in King Cove. Attempts to process the immature salmon were unsuccessful. Area processors subsequently agreed not to buy immature salmon in an attempt to move fishing vessels away from the problem areas. Fishermen continued fishing in problem areas and ADF&G closed the Southeastern District until most of the immature salmon migrated out of the area (July 11-14).

1968 Season

In 1968, Richard Guthrie, Assistant Area Management Biologist, in Sand Point was informed by several commercial fishermen of immature sockeye salmon in the Shumagin Islands on July 2, and that they increased in abundance through July 5 (R. Guthrie, Alaska Department of Fish and Game, Sand Point, personal communication). By July 5, up to 500 immature salmon per set were caught.

The fishery was closed through the weekend (July 6-7). On July 8, the fishery reopened with Mr. Guthrie aboard a purse seine vessel as an observer. While waiting to make a set, Mr. Guthrie observed other sets and estimated 220 immature salmon in one set, about 270 in a second set, and 700 in a third set. About 560 immature salmon were caught during the first set of the vessel he was aboard. The immature catch was about 90% sockeye salmon, and the remainder chinook and chum salmon. The Shumagin Islands Section was closed to all gear types on July 8.

From July 9-19, a daily test fishery was conducted. During the July 9 through July 16 test fishery, each set averaged 450 immature salmon, of which 90% were sockeye salmon and the remainder chinook and chum salmon. From July 17-19, the catch of immature salmon decreased to less than 50 per set, and by July 22 the catch was less than 10 per set (mostly chinook and chum salmon).

In a commercial opening on July 20, an average of 56 immature salmon per set were caught during the morning sets; with the average decreasing during the day. Observations on July 21-23 indicated a decreasing incidence of immature salmon, with only 10 per set caught on July 23. The mortality of the gilled salmon was estimated at about 95%.

A total of 160 immature sockeye salmon were sampled. The sample was 66% females and 34% males. Males averaged 348 mm in length and females 332 mm. Female egg skeins were about 1/4 inch wide and two inches in length. The sockeye were age 2.1 (88%), age 2.2 (3%), age 1.1 (7%), and age 1.2 (2%). Of 12 immature chinook salmon sampled, 92% were females and 8% were males; the 12 fish sample averaged 334 mm in length. Of 8 chum salmon sampled, 75% were females and 25% were males; average length was 346 mm.

In 1968, about 16 to 18 purse seine permit holders normally fished the Shumagin Islands Section, making about 60 sets per day. Mr. Guthrie estimated that if the fishery had not been closed 25,000 to 30,000 immature salmon per day would have been caught. The fishery was closed July 8-19, allowing an estimated 400,000 immature salmon to escape the fishery.

Mr. Guthrie reported that fishermen made sets up to two miles offshore and still found large numbers of immature salmon, although the immature salmon were not as abundant as inshore sets.

1969 Season

On July 8, 1969, Richard Guthrie monitored six fishing vessels at Popof Head. He observed seven sets and noted that the number of gilled immature salmon per set exceeded 200, with two sets catching more than 500 immature salmon. The Shumagin Islands Section was closed to commercial salmon fishing on July 9. On July 9, a test fishery was conducted using a commercial purse seine vessel and the usual vessel crew. One to two sets per day were made with the net held open for 20 minutes each set, but less when there were indications were that an excessive number of immature salmon would be caught. Results of the test fishery are as follows:

Date	Number Sets	Time Per Set (min)	Number Immature Salmon Per Set	Total Number Adults
July 9	2	20	371	30
July 10	1	20	450	68
July 11	1	20	2,500	190
July 12	1	25	770	55
July 13	1	15	1,100	40
July 14	1	10	740	120
July 15	1	10	320	200
July 16	2	20	157	78
July 17	2	10, 15	140	287
July 18	2	20	115	220
July 19	2	20	29	44

In 1969, the Shumagin Islands Section was reopened to commercial salmon fishing on July 19. Observations and test fishing on July 19 indicated that about 20 to 25 immature salmon per set were caught. These catch levels justified reopening the commercial fishery (reopened the evening of July 19). Observations by ADF&G on July 20-23 indicated that the number of gilled salmon continued to decrease. Samples of immature salmon showed that an estimated 96% of the fish were sockeye salmon and the remainder were chinook and chum salmon. The estimated age of immature sockeye salmon was 90% age 2.2 and 2.1; on July 17 age 1.1 comprised 33% of the catch and on July 18 age 1.1 comprised 17% of the catch.

In 1969, an average of 17 purse seine vessels were involved in the Shumagin Islands Section fishery.

1974 Season

In 1974, immature salmon in the Shumagin Islands Section were a concern from July 11-22. ADF&G was informed of immature salmon in the commercial catch on July 11 (B. De Jong, Alaska Department of Fish and Game, Sand Point, personal communication). One commercial fisherman reported a catch of over 1,000 immature sockeye salmon per vessel at Popof Head. The fisherman also noted that prior to July 11, catches of immature salmon were not significant. On July 11, seven purse seine permit holders were fishing the Popof Head area. On July 12, an ADF&G observer aboard a purse seine vessel reported that large numbers of immature salmon were in the Popof Head to Red Bluff area, both inshore and offshore; adult salmon catches were low, averaging about 60 per set. The Shumagin Islands Section was closed to commercial salmon fishing from July 12-15.

Test fishing on July 15 resulted in a catch of 73 immature salmon and 60 adult salmon. Observations by ADF&G were that most of the immature salmon were gilled in the first three fathoms of webbing below the cork line and in the ends of the net in the last 10 fathoms. Three sets were made during the test fishery; a total of 159 immature and 220 mature salmon were caught. The immature salmon were estimated to be 97% sockeye salmon.

Fishermen also reported immature salmon at Swedania Point, with a catch of 40 immature salmon in one set (estimated total catch of 500 for the day); two purse seine permit holders reported a few immature salmon at Fox Bay (estimated total catch of 100 for the day).

The Shumagin Islands Section reopened to commercial salmon fishing on July 16, and the catch of immature salmon decreased. During the evening of July 17, immature salmon again moved into the Popof Head area in abundance similar to the July 12 catches. The Shumagin Islands Section was again closed to commercial salmon fishing from July 18-21. The area was reopened on July 22 as a commercial test fishery, and about 100 to 200 immature salmon per set were observed. Fishermen reported that sets made near slack tide had caught immature salmon in significant numbers and an estimated 1,000 adult salmon per set. Fishermen reported that they had made no effort to pick the gilled immature salmon out of the seines, and sets after slack tide had produced a range of zero to 21 immature salmon per set with an average of eight per set.

From July 11-22, ADF&G estimated that 21,000 immature salmon were caught and due to the closures 35,000 escaped the fishery.

1979 Season

In 1979, large numbers of immature salmon were reportedly gilled in seine gear along the east side of Popof Island during June 25-26. On June 25, ADF&G had no personnel in the Sand Point area. On June 26, Tyler Gilmer, the Assistant Area Management Biologist, returned to Sand Point to assess the catch of immature salmon. The commercial fishery along the east shore of Popof Island was closed after June 26 due to excessive catches of immature salmon.

Following the closure of the east shore of Popof Island, most purse seine permit holders quit fishing the Shumagin Islands Section; however, four permit holders continued to fish the southeast shore of Unga Island. These fishermen caught substantial numbers of immature salmon on June 27. After June 27, the entire Shumagin Islands Section was closed to commercial salmon fishing.

The occurrence of immature salmon in the Shumagin Islands Section during June was not anticipated by ADF&G because in prior years immature salmon had not migrated into the area until July.

Due to vessel charter problems (vessels chartered by ADF&G had to be Coast Guard approved), ADF&G allowed short commercial fishing periods, monitored by ADF&G personnel, to determine the abundance of immature salmon in the fishery.

On July 4, a six hour opening was allowed, but a substantial number of immature salmon were caught and the fishery was not extended. On July 9, a second test fishery was allowed; immature salmon were not caught in substantial numbers and the fishery returned to normal periods. No other substantial numbers of immature salmon were observed by ADF&G or reported by fishermen during 1979.

After 1979, a regulation was passed allowing gill net fishermen to continue fishing in the Shumagin Islands Section when it became necessary to close the area to purse seine gear due to the presence of immature salmon.

1989 Season

In late June of 1989, large numbers of immature sockeye salmon were reported in the Shumagin Islands Section. A Department of Public Safety vessel monitoring the July 6-7 commercial salmon fishing period noted 20 to 25 immature salmon harvested per set. On July 12, about 200 immature salmon per set were observed by ADF&G, resulting in a purse seine gear closure in the Shumagin Islands Section fishery 24 hours earlier than originally scheduled. Test fishing results indicated a high number of immature salmon present through July 22. Test fishing on July 23 indicated a decreasing trend in the catch of immature salmon. The Shumagin Islands Section was reopened to purse seine gear on July 25. On July 25, about 15 immature salmon per set were observed, and purse seine gear was allowed to continue fishing during open periods for the remainder of the commercial salmon season. During the purse seine gear closure, the Shumagin Islands Section was open to set gill net permit holders on July 13-14, and 20-21.

From 1975 to 1989 the species composition of the immature catch changed. Prior to 1975, about 90% of the immature salmon caught in the Shumagin Islands Section were sockeye salmon. After 1988, the immature catch was about 50% sockeye and 50% chum salmon.

The following two tables list data from immature sockeye salmon harvested in 1989:

Estimated age composition, in percent, of immature sockeye salmon catches from the Shumagin Islands Section, 1989.

Sample Size	Ages					Total
	1.1	1.2	2.1	2.2	3.1	
54	5.6	5.6	83.3	1.9	3.7	100.0

Estimated length (mm; mid eye to tail fork) by age of immature sockeye salmon catches from the Shumagin Islands Section, 1989.

	Ages					Total
	1.1	1.2	2.1	2.2	3.1	
Mean Length	357	420	362	430	393	368
SE	7	8	2	-	3	3
Range	350-370	405-430	320-400	430	390-395	320-430
Sample Size	3	3	44	1	2	53

1990 Season

During the February 1990 Alaska Board of Fisheries meeting a discussion on the problem of immature salmon in the Shumagin Islands Section resulted in a policy statement by the Alaska Board of Fisheries (Department of Fish and Game policy on the incidental harvest of immature salmon in the South Peninsula area of the Alaska Peninsula/Aleutian Islands Area; ADF&G 1990). The policy gives ADF&G authority to close by emergency order areas of the South Peninsula when the incidental by-catch of immature salmon is considered excessive. ADF&G will consider average immature salmon caught per set, fleet distribution, and historical dates of occurrence. ADF&G will also utilize results from subsistence and commercial openings to evaluate the abundance of immature salmon and their possible presence in future openings. ADF&G was given the authority to open all areas in the South Peninsula to gill net gear during fishing periods when

the seine fishery is closed by emergency order due to the presence of immature salmon.

In early July of 1990, subsistence fishermen reported catches of immature salmon along the east shore of Popof Island. A test fishery was established with chartered purse seine permit holders making at least one-20 minute set at each test site (Popof Head, Middle Set, and Red Bluff; Figure 2). Additional sets were made if time permitted. To standardize the test fishery, ADF&G chartered only those vessels with full purse seine gear rather than half pursing the gear. The July 3 test fishery indicated that the average catch of immature salmon per set was two sockeye and six pink salmon (Table 1). Most immature salmon were gilled at mid-body and had to be removed by hand from the web. The July 5 test fishery resulted in an average immature catch of six sockeye, six pink, and nine chum salmon. The catch of immature salmon from the test fishery did not warrant closure of the area to purse seine gear and the fishing periods on July 6 and July 9-10 did not produce substantial numbers of immature salmon in the commercial catch. The next fishing period on July 13-14 resulted in an increased catch of immature chum salmon. The average weight of chum salmon in the catch from both the Shumagin Islands Section and the South Unimak area decreased substantially from the July 9-10 fishing period. In the Shumagin Islands Section, the average weight of chum salmon was 7.3 pounds on July 9 and decreased to 3.7 pounds on July 13.

The July 16 test fishery indicated that the average catch of immature salmon per set was 315 salmon. The July 17 test fishery resulted in an average immature salmon catch of 377 salmon per set. Based on these results the Shumagin Islands Section was closed to purse seine gear during the July 18-19 fishing period. The test fishery on July 20 resulted in an average immature salmon catch of 34 salmon per set. The July 21 test fishery resulted in an average immature salmon catch of 12 sockeye and 43 chum salmon. The results did not warrant continued closure of the Shumagin Islands Section to purse seine gear. On July 24, a fishing period for July 23-25 was announced. Observations by ADF&G on July 23 from five sets indicated that about 150 immature salmon per set were caught. These salmon were about 39% sockeye and 61% chum salmon. The Shumagin Islands Section were again closed to purse seine gear on July 23. The immature salmon were believed to have returned to the Shumagin Islands Section due to strong Southeast winds on July 22. A test fishery on July 25 indicated the average catch of immature salmon per set was six salmon. The Shumagin Islands reopened to purse seine gear on July 25 and no further purse seine closures were required to protect immature salmon. The Shumagin Island Section was closed to purse seine gear from July 15 until 5:00 AM, July 23 and from 10:30 PM, July 23 until 4:00 PM, July 25.

Large numbers of immature chum salmon were also reported in the commercial catch from the Otter Cove and Sanak Island Sections of the Unimak District on July 6. Based on reports from purse seine fishermen; these sections were closed to purse seine gear from July 6-31.

Closure of the Shumagin Islands Section affected about 40 to 50 purse seine permit holders, while the Otter Cove and Sanak Island Sections closure affected about 9 purse seine permit holders. About 50% of the fishermen affected by the closure stayed in port while the remainder fished other open areas. Additional effort in areas open to purse seine gear caused longer waiting lines at preferred fishing sites and smaller individual catches.

Table 1. Shumagin Islands Section July salmon test fish catch results, by set, date, and location, 1990-91.

Year/ Date	Set	Number of Adult Salmon						Immature Salmon					Percent	
		Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Pink	Chum	Total	Sockeye	Chum
1990														
July 3	Popof Head	0	53	0	25	238	316	0	1	14	0	15	6.7	0.0
	Popof Head	0	45	0	16	117	178	0	3	7	0	10	30.0	0.0
	Popof Head	0	80	0	11	202	293	0	2	1	0	3	66.7	0.0
	Popof Head	0	68	0	7	115	190	0	2	0	0	2	100.0	0.0
	Average	0	62	0	15	168	244	0	2	6	0	8	26.7	0.0
July 5	Popof Head	0	49	0	31	318	398	0	13	14	17	44	29.5	38.6
	Popof Head	0	7	0	7	48	62	0	2	0	3	5	40.0	60.0
	Middle Set	0	20	0	12	114	146	0	3	4	7	14	21.4	50.0
	Average	0	25	0	17	160	202	0	6	6	9	21	28.6	42.9
July 16	Popof Head	0	206	273	160	321	960	8	222	16	61	307	72.3	19.9
	Cape Devine	0	88	117	68	138	411	6	198	1	117	322	61.5	36.3
	Average	0	147	195	114	230	686	7	210	9	89	315	66.8	28.3
July 17	Popof Head	6	97	206	303	387	999	11	261	0	346	618	42.2	56.0
	Red Bluff	2	32	68	101	129	332	7	94	2	155	258	36.4	60.1
	Middle Set	2	33	69	101	129	334	2	61	1	191	255	23.9	74.9
	Average	3	54	114	168	215	555	7	139	1	231	377	36.8	61.2
July 20	Popof Head	3	41	108	149	73	374	1	6	0	9	16	37.5	56.3
	Middle Set	2	24	65	90	44	225	1	14	0	15	30	46.7	50.0
	Red Bluff	4	57	151	209	102	523	2	39	0	16	57	68.4	28.1
	Red Bluff	2	41	108	149	73	373	0	14	0	19	33	42.4	57.6
	Average	3	41	108	149	73	374	1	18	0	15	34	53.7	43.4

-Continued-

Table 1. (page 2 of 5)

Year/ Date	Set	----- Number of Adult Salmon -----						----- Immatuare Salmon -----					----- Percent -----	
		Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Pink	Chum	Total	Sockeye	Chum
July 21	Red Bluff	0	8	13	66	34	121	0	14	0	71	85	16.5	83.5
	Red Bluff	1	22	36	184	95	338	0	16	0	71	87	18.4	81.6
	Middle Set	0	13	22	112	58	205	0	7	0	0	7	100.0	0.0
	Popof Head	1	35	59	296	152	543	0	10	0	29	39	25.6	74.4
	Average	1	20	33	165	85	302	0	12	0	43	55	21.6	78.4
July 25	Popof Head	0	0	31	124	16	171	0	3	0	8	11	27.3	72.7
	Middle Set	0	0	56	79	11	146	0	2	0	3	5	40.0	60.0
	Cape Devine	0	0	59	194	30	283	0	0	0	0	0	0.0	0.0
	Average	0	0	49	132	19	200	0	2	0	4	5	31.3	68.8
August 13	Kelly's Rock	0	48	57	279	46	3	0	3	0	1	4	75.0	25.0
	Kelly's Rock	0	83	106	429	38	656	1	1	0	1	3	33.3	33.3
	Popof Head	0	18	21	279	31	349	0	2	0	1	3	66.7	33.3
	Red Bluff	0	7	41	188	20	256	0	2	0	1	3	66.7	33.3
	Cape Devine	0	3	34	186	7	230	0	1	0	3	4	25.0	75.0
	Elephant Rock	0	16	8	661	18	703	0	0	0	2	2	0.0	100.0
	Average	0	29	45	337	27	437	0	2	0	2	3	47.4	47.4
1991														
July 1	Popof Head							0	260	0	91	351	74.1	25.9
	Middle Set							0	230	0	57	287	80.1	19.9
	Red Bluff							4	236	0	53	293	80.5	18.1
	Average	3	797	2	559	260	1,620	1	242	0	67	310	78.0	21.6

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Table 1. (page 3 of 5)

Year/ Date	Set	Number of Adult Salmon					Immature Salmon							
		Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Pink	Chum	Total	Percent Sockeye	Chum
July 2	Popof Head							0	399	0	127	526	75.9	24.1
	Middle Set							0	871	0	87	958	90.9	9.1
	Red Bluff							0	572	0	118	690	82.9	17.1
	Average	2	987	4	829	209	2,031	0	614	0	111	725	84.7	15.3
July 3	Popof Head							0	238	0	63	301	79.1	20.9
	Middle Set							1	678	0	2	681	99.6	0.3
	Red Bluff							0	823	0	90	913	90.1	9.9
	Average	17	451	6	994	326	1,794	0	580	0	52	632	91.8	8.2
July 4	Popof Head							0	552	0	37	589	93.7	6.3
	Middle Set							5	487	0	100	592	82.3	16.9
	Red Bluff							7	332	0	440	779	42.6	56.5
	Average	6	380	16	645	849	1,897	4	457	0	192	653	69.9	29.4
July 5	Popof Head							0	272	0	331	603	45.1	54.9
	Middle Set							2	392	0	125	519	75.5	24.1
	Red Bluff							2	56	0	66	124	45.2	53.2
	Average	6	112	20	495	405	1,038	1	240	0	174	415	57.8	41.9
July 6	Popof Head							2	861	0	751	1,614	53.3	46.5
	Middle Set							1	490	0	239	730	67.1	32.7
	Red Bluff							0	235	0	67	302	77.8	22.2
	Average	10	256	12	523	272	1,073	1	529	0	352	882	59.9	39.9
July 8	Popof Head							5	280	0	277	562	49.8	49.3
	Middle Set							3	222	0	132	357	62.2	37.0
	Red Bluff							3	155	0	191	349	44.4	54.7
	Average	14	75	38	44	287	457	4	219	0	200	423	51.8	47.3

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Table 1. (page 4 of 5)

Year/ Date	Set	----- Number of Adult Salmon -----						----- Immatuure Salmon -----					----- Percent -----	
		Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Pink	Chum	Total	Sockeye	Chum
July 9	Popof Head							5	314	0	248	567	55.4	43.7
	Middle Set							4	73	0	23	100	73.0	23.0
	Red Bluff							0	73	0	125	198	36.9	63.1
	Average	2	21	7	13	53	96	3	153	0	132	288	53.2	45.8
July 10	Popof Head							4	116	0	10	130	89.2	7.7
	Middle Set							4	42	0	5	51	82.4	9.8
	Red Bluff							3	79	0	192	274	28.8	70.1
	Average	3	36	49	36	42	166	4	79	0	69	152	52.1	45.5
July 11	Popof Head							9	311	0	13	333	93.4	3.9
	Middle Set							1	205	0	4	210	97.6	1.9
	Red Bluff							17	140	0	97	254	55.1	38.2
	Average	3	87	47	75	56	267	9	219	0	38	266	82.3	14.3
July 12	Popof Head							12	699	0	963	1,674	41.8	57.5
	Middle Set							8	169	0	47	224	75.4	21.0
	Red Bluff							10	70	0	50	130	53.8	38.5
	Average	5	63	53	118	119	357	10	313	0	353	676	46.3	52.3
July 13	Popof Head							20	210	0	281	511	41.1	55.0
	Middle Set							9	92	0	16	117	78.6	13.7
	Red Bluff							10	108	0	42	159	67.9	25.8
	Average	21	149	188	614	294	1,266	13	137	0	113	262	52.1	42.9
July 14	Popof Head							15	139	0	93	247	56.3	37.7
	Middle Set							15	335	0	100	450	74.4	22.2
	Red Bluff							20	454	0	336	810	56.0	41.5
	Average	17	212	117	1,201	245	1,792	17	309	0	176	502	61.6	35.1

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Table 1. (page 5 of 5)

Year/ Date	Set	----- Number of Adult Salmon -----						----- Immatu re Salmon -----						
		Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Pink	Chum	Total	----- Percent -----	
													Sockeye	Chum
July 16	Popof Head							28	33	0	253	314	10.5	80.6
	Middle Set							8	40	0	142	190	21.1	74.7
	Red Bluff							5	149	0	170	324	46.0	52.5
	Average	7	52	206	291	377	932	14	74	0	188	276	26.8	68.2
July 17	Popof Head							33	207	0	247	487	42.5	50.7
	Middle Set							7	136	0	105	248	54.8	42.3
	Red Bluff							12	185	0	226	423	43.7	53.4
	Average	8	40	82	233	143	506	17	176	0	193	386	45.6	49.9
July 18	Popof Head							8	77	0	73	158	48.7	46.2
	Middle Set							4	6	0	3	13	46.2	23.1
	Red Bluff							1	16	0	31	48	33.3	64.6
	Average	4	28	140	126	31	329	4	33	0	36	73	45.2	48.9
July 19	Popof Head							14	26	0	47	87	29.9	54.0
	Middle Set							11	4	0	13	28	14.3	46.4
	Red Bluff							3	18	0	12	33	54.5	36.4
	Average	20	45	435	281	124	905	9	16	0	24	49	32.4	48.6

In 1991, only immature salmon per set were counted, mature salmon were estimated.

1991 Season

In late June, subsistence fishermen reported immature salmon in waters along the east side of Popof Island. ADF&G chartered purse seine vessels from July 1-19 to determine the abundance of immature salmon. Test fish results from the Shumagin Islands were used as an indication of the presence of immature salmon in the South Central, Southwestern, and Unimak Districts of the Alaska Peninsula Management Area and the Western and Perryville Districts of the Chignik Management Area. Portions of the South Central, Southwestern, and the Unimak District and portions of the Western and Perryville Districts were, closed at times, to purse seine gear due to the presence of immature salmon. In 1991, the presence of immature salmon was wide spread, with reported catches from Kodiak Island to Unimak Island.

During commercial salmon periods in South Peninsula waters on July 6, July 8-9, July 10, and July 15-16, only gill net gear was allowed in the Shumagin Islands Section and the Unimak District. Test fishing on July 19 indicated that most immature salmon had migrated through the Shumagin Islands Section (average catch was 49 immature salmon). Purse seine fishermen were allowed to fish the section during the opening of July 21-23 (Table 1). On July 21, ADF&G personnel observed several commercial purse seine sets near Popof Island and reported that the number of immature salmon per set was less than five salmon.

Test fish results indicated that from July 1-6, most of the immature salmon caught were sockeye salmon, (59.9 to 91.8%). After July 6, the catch of immature sockeye and chum salmon was nearly equal.

The catch of immature salmon in the commercial salmon fishery for the rest of the salmon season was minor (probably averaging less than 1 immature salmon per set) and did not warrant further closures of South Peninsula waters to purse seine gear.

ADF&G observed that during the day, most of the immature salmon were caught in the upper 25 feet of the purse seine. All test sets were made close to shore, at some sites within 30 feet of the beach. During days of good visibility, immature salmon could be seen jumping off-shore at least one mile from the beach (M. Stopha, Alaska Department of Fish and Game, personal communication). Although no sets were made offshore to compare near-shore and off-shore sets, it is likely that substantial numbers of immature salmon would still be caught offshore.

During the 1991 purse seine closures, discussions between fishermen and ADF&G resulted in an agreement that fishermen (with ADF&G observers aboard) could experiment with net modifications during the 1992 season in an attempt to catch adult salmon while not restricting the migration of immature salmon. If a change in gear produced the desired results, purse seine gear regulations could be passed through the Alaska Board of Fisheries to allow modifications. One gear modification used in Puget Sound Washington uses four inch web in the upper strip of the purse seine to catch adult salmon while giving unrestricted passage to immature coho salmon. Board of Fish action during the November 1991 meeting closed most of the South Peninsula for all gear types from July 6-19. Although the closure was based on considerations other than immature salmon catches, the new regulation should solve most immature salmon problems; immature salmon

usually migrated out of the Shumagin Islands waters by July 23. With the closure in effect net modifications are not necessary.

The Shumagin Islands and Sanak Island Sections were closed to purse seine gear due to immature salmon from July 6 to until July 21. The Otter Cove Section and portions of the Volcano Bay and Ikatán Bay Sections were similarly closed from July 15 until July 21.

Closure of the Shumagin Islands Section impacted about 40 to 50 purse seine permit holders, while the Otter Cove and Sanak Island Sections impacted about 9 purse seine permit. In the Alaska Peninsula Management Area about 50% of the purse seine fishermen remained in port, and the remainder fished open areas.

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