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Report # 3

ORIGINS OF CHINOOK SALMON IN THE AREA OF THE JAPANESE MOTHERSHIP SALMON FISHERY

by

Donald E. Rogers, Kenneth J. Bruya,
Katherine W. Myers, and Tsutomu Nishida

ANNUAL REPORT

Contract No. 82-0421
October 1, 1982 to June 30, 1982
Alaska Department of Fish and Game
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UNIVERSITY OF WASHINGTON
COLLEGE OF FISHERIES
FISHERIES RESEARCH INSTITUTE

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Director

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INTRODUCTION

This was the first year of a 3-year study to determine the origins of stocks of chinook salmon caught by the Japanese mothership and research vessels in the Bering Sea and North Pacific Ocean. This work is conducted concurrently with a study funded by the North Pacific Fisheries Management Council (NPFMC) to determine the stocks of chinook salmon incidentally caught in the foreign trawl fishery in the Alaska Fishery Conservation Zone (FCZ), and some of the information submitted to the NPFMC in Quarterly Reports (Rogers et al. 1982 a, b) will be included in this report.

The objectives of the first segment of the study were to: 1) collect and organize the acetate impressions of chinook scales and associated biological data from Asian and North American known origin chinook from 1975 to the present for the Fisheries Research Institute (FRI) and the Stock Separation Lab of Alaska Department of Fish and Game (ADF&G). The standards will be determined from these known origin fish and used to analyze the unknowns from the mothership and foreign trawl fisheries; 2) identify the weak points in chinook scale sampling and recommend improvements in the sampling coverage for future years; 3) obtain and summarize information on North Pacific chinook populations, especially age compositions and abundance data from the different geographical areas; 4) coordinate methods of scale measurement and data collection with the ADF&G Stock Separation Lab; 5) analyze the biological data collected from chinook caught in the 1972-1980 research and commercial operations of the Japanese mothership fishery; and 6) review and summarize published and unpublished information on the origins and biology of chinook in the past and present mothership fishery area.

This report summarizes the work completed toward these objectives. Because funding was late and there was an unexpected level of requests from fishery agencies to have our personnel collect the scale impressions, work on these objectives will continue into the first part of the next funding period. Additional information will then be presented in our future reports (1983).

RESULTS

North American Chinook Scale Collection

We have completed the search for historical chinook scale collections and sent the explanation of the goals and needs of FRI's and

ADF&G's separation studies, as well as the subsequent request for scales to the various agencies that have scale collections. At the beginning of this project, we assumed most of the scale impressions would be provided by the agencies, but, with the exception of Alaska and a few small samples from Washington, all other agencies requested that we send a person to review their scale collections to obtain the samples we needed and make the impressions for us and Alaska at their offices.

Additional acetate was ordered to make the needed impressions of the chinook scales and our first supplier provided us with an acetate substitute called PETG (although we ordered acetate) which bonded or laminated to the gummed cards in the heated press. Acetate was reordered through a different supplier and no lamination problem has occurred.

The approximate number of scale samples that has been collected is listed in Table 1. This table was based on the numbers of fish scales in our files that were aged by the various agencies, but it does not reflect the numbers of regenerated scales that are not usable for scale pattern analysis.

The number of scales from stocks in Western Alaska is quite large; however, the frequency of regenerated scales is very high. Due to the importance of these stocks, and all of Alaskan stocks from known origins, we recommend that in future scale sampling, two scales be taken from each fish sampled. If one scale was taken from the preferred area on each side of the fish, this would increase the chances of obtaining a useful scale. We are also implementing this technique through the observer program to increase the numbers of usable, unknown scale samples and we will make a similar request to TINRO for the Russian samples, if they wish to send us impressions instead of scales.

The other weak point in the present scale collection is the lack of historical chinook samples from southeastern Alaska. At the present time we have not sent requests to the various southeastern ADF&G offices to locate these samples, but we will coordinate our efforts with the Stock Separation Lab to determine the best way to obtain these samples.

In this report we have included Appendix 1 which contains a listing of the scale samples we have at FRI, organized by river, card number, and date of sampling. Missing from Table 1 and Appendix 1 are the recently received scale samples from central Alaskan rivers. Also, the last areas to be sampled for the completion of the North American west coast chinook collection are the Columbia River and the coastal streams of Oregon. These scales are scheduled to be collected after the completion of this report.

Asian Chinook Scale Collection

Presently our Asian chinook scale samples are from two major rivers, the Kamchatka and Bol'shaya (Appendix 1). We have approximately 200 samples from each river from 1975, 1976, 1978, 1979, and 1980 at FRI.

Table 1. Numbers of North American chinook salmon scale samples collected at FRI.

	1975	1976	1977	1978	1979	1980	1981
Western Alaska							
Yukon River							
(lower Yukon River) Emmonak	*	900	700	970	*	1,100	1,150
Flat Island		190	260	270			
E. Fk. Andreafsky River							200
W. Fk. Andreafsky River							100
Anvik River							300
(middle Yukon River) Salcha River							230
Chena River							100
Big Eddy Creek							230
(upper Yukon River) Dawson	190	160	50	80		50	60
Whitehorse			40	55		20	280
Chandidu Creek & Woodchopper Creek				120		10	
Cassiar Creek						20	
Cliff Creek						15	
Kuskokwim River							
Bethel	200	*	240	270			
Quinhagak	200	350	480	210			
Goodnews			40	30			
Kweegooyuk	500	*			*		
Togiak River					315	25	190
Nushagak	330	840	710	650	720	550	1,010
Southeastern Alaska							
Nahlin River							90
Crystal Creek							180
Andrews Creek							260
Steep Creek							10
Sashin Creek (Little Port Walter Htchy.)							170
Cripple Creek							60
Taku River					5	30	30

Table 1. Numbers of North American chinook salmon scale samples collected at FRI - continued.

	1975	1976	1977	1978	1979	1980	1981
<u>Southeastern Alaska</u>							
Stikine River							
Little Tahltan & Nakina Rivers	35	160	20	10	130	120	760
Alsek River							
Klukshu River		70	120	110	100	60	60
<u>British Columbia</u>							
Yakoun River				15	45	60	25
Nass River			25	40	70	140	80
Skeena River	100	160	90	130	180	120	140
Bella Coola		30	120	150	110	120	160
Robertson Creek Htchy.	230	120	160	70	80	80	70
Fraser River	460	370	380	370	390	350	430
<u>Washington</u>							
Quileute River			180	220	*	*	*
Quinault River	10	40	200	200	200	200	200
Queets River	70	80	200	200	200	200	200
Humptulips River	15	20	30	70	15	200	150
Chehalis River		20	50	200		200	160
Gray's Harbor	130	80				100	
Willapa Bay	170	230			70		160
Nooksack & Samish Rivers	150	170	170	150	170	160	140
Skagit River	140	180	180			160	170
Stillaguamish & Snohomish Rivers	110	70	50	170	150	160	160
Lake Washington Stocks	140	40	160				
Duwamish & Green Rivers	140	150	150	90	80	180	140
Puyallup River							100
Hood Canal Stocks	120	170	220	150	160	170	140
<u>California</u>							
Klamath River					200	200	200
Sacramento River				70	200	200	200

* Denotes collection not complete

Mr. Bruya attended a meeting at Friday Harbor on May 28th and 29th, 1982, to discuss our stock separation study with Dr. Burgner (FRI) and Drs. Konovalov and Tumanov from Russia. The Russian scientists were questioned about the fact that we have chinook scale samples from only two river systems in Russia. They said there was one other major chinook-producing river in the Oliutorskii area (the Apuka River) which produces 5-7 metric tons of chinook per year, but besides the Kamchatka area, no other major catch of chinook is reported from their commercial operations. A verbal agreement was given to our request for samples from the Oliutorskii area, as well as continued samples from the Bol'shaya and Kamchatka rivers for 1981, 1982, and 1983. They asked that a formal request be sent, describing what we would like to receive from them, in detail, including what biological information, number of scale samples, run size information, etc. They also requested we send them a supply of acetate with a description of our methodology so that they could do the pressings to our specifications and send us the acetate impressions. We have ordered 5,000 2.5" x 5" pieces of acetate to be cut for their use in Russia and are planning to send the formal request, acetate, and methodology to them via one of their vessels which will be leaving Seattle for Russia around July.

Abundance and Age

The regional and temporal distributions of chinook salmon abundance are important for the construction of scale standards since the probability that a fish from a particular stock (river system) is caught by the mothership fishery is likely to depend on the abundance, location, and migratory behavior of the stock. The annual abundance of a stock is the sum of the catch and escapement. Unfortunately, a high proportion of the world chinook salmon catch is not made near coastal spawning areas but rather in high seas gill-net or offshore troll fisheries, and most of the fish caught by these fisheries are immature (Tables 2 and 3; Fig. 1). Escapements for most chinook salmon stocks are either unknown or imprecisely known (Table 4); therefore, we must rely largely on catch statistics to estimate the relative abundances of the various stocks contributing to the mixed stocks fisheries.

Commercial catches of chinook salmon recently have declined in Oregon, southeastern Alaska, and central Alaska. (In the latter area, the decline is caused largely by severe restrictions on the Cook Inlet fishery since the 1960's.) Catches in California and Washington have changed little since 1921; however, catches in British Columbia have increased dramatically (Fig. 2). Based on commercial catches, it appears that British Columbia now produces the largest abundance of chinook salmon around the North Pacific, but this is unlikely because most of the British Columbia catch comes from troll fisheries that catch predominantly immature and maturing fish (Fig. 3).

Chinook salmon from southern regions tend to migrate north in their seaward migration and are distributed as far north and westward as the

Table 2. Commercial catches of chinook salmon in thousands of fish, 1961-1980.

Year	S.E. Alaska		British Columbia		Washington		Oregon		California
	Troll	Net	Troll	Net	Troll	Net*	Troll	Net	Troll
1961	204	26	449	237	109	262	132	152	774
62	174	32	446	254	90	240	52	196	556
63	244	14	540	263	129	268	132	196	662
64	329	28	615	352	105	244	67	296	687
65	259	28	678	302	69	248	58	242	705
66	282	26	867	297	115	250	81	150	554
67	275	26	768	363	113	243	100	170	338
68	304	28	770	312	147	247	126	123	472
69	290	24	837	263	170	280	161	178	551
70	301	21	818	395	214	328	165	240	517
71	311	23	1270	323	252	313	103	212	434
72	243	44	1223	327	203	283	127	197	492
73	309	35	1091	334	317	367	363	295	816
74	322	25	1178	289	353	259	224	116	527
75	287	14	1103	310	274	407	225	166	579
76	231	11	1248	293	361	420	184	118	540
77	272	38	1111	386	267	420	340	157	563
78	375	14	1033	334	166	344	192	113	519
79	338	36	988	346	148	283	245	102	659
80	299	28	1006	236	133	360	209	82	575
81	259	-	-	-	-	-	-	-	-

*Includes Puget Sound troll catches, 1961-69.

Table 3. Commercial catches of chinook salmon in thousands of fish, 1961-1981.

	Alaska (gill net fisheries)			High seas			U.S.S.R.
Year	Central	Bristol Bay and Peninsula	Yukon-Kuskokwim	Mother-ship gill net	Land-based gill net	trawl	coastal seine-trap fisheries
1961	31	95	148	31	85	-	67
62	42	90	123	122	129	-	104
63	35	66	143	87	105	-	128
64	22	143	117	410	208	-	164
65	31	119	143	185	102	-	112
66	24	87	121	208	118	-	98
67	26	123	161	128	115	-	96
68	20	108	151	362	97	-	86
69	38	130	158	554	88	-	127
70	33	145	146	437	148	-	146
71	45	125	158	206	139	-	205
72	42	71	153	261	107	-	202
73	30	49	128	119	165	-	221
74	29	48	132	361	188	-	186
75	28	32	94	162	137	-	241
76	49	101	140	285	201	-	210
77	40	136	158	93	146	49	306
78	55	206	174	100	210	81	320
79	41	219	193	130	160	117	301
80	28	113	207	704	160	145	-
81	46	257	246	87	191	72	-

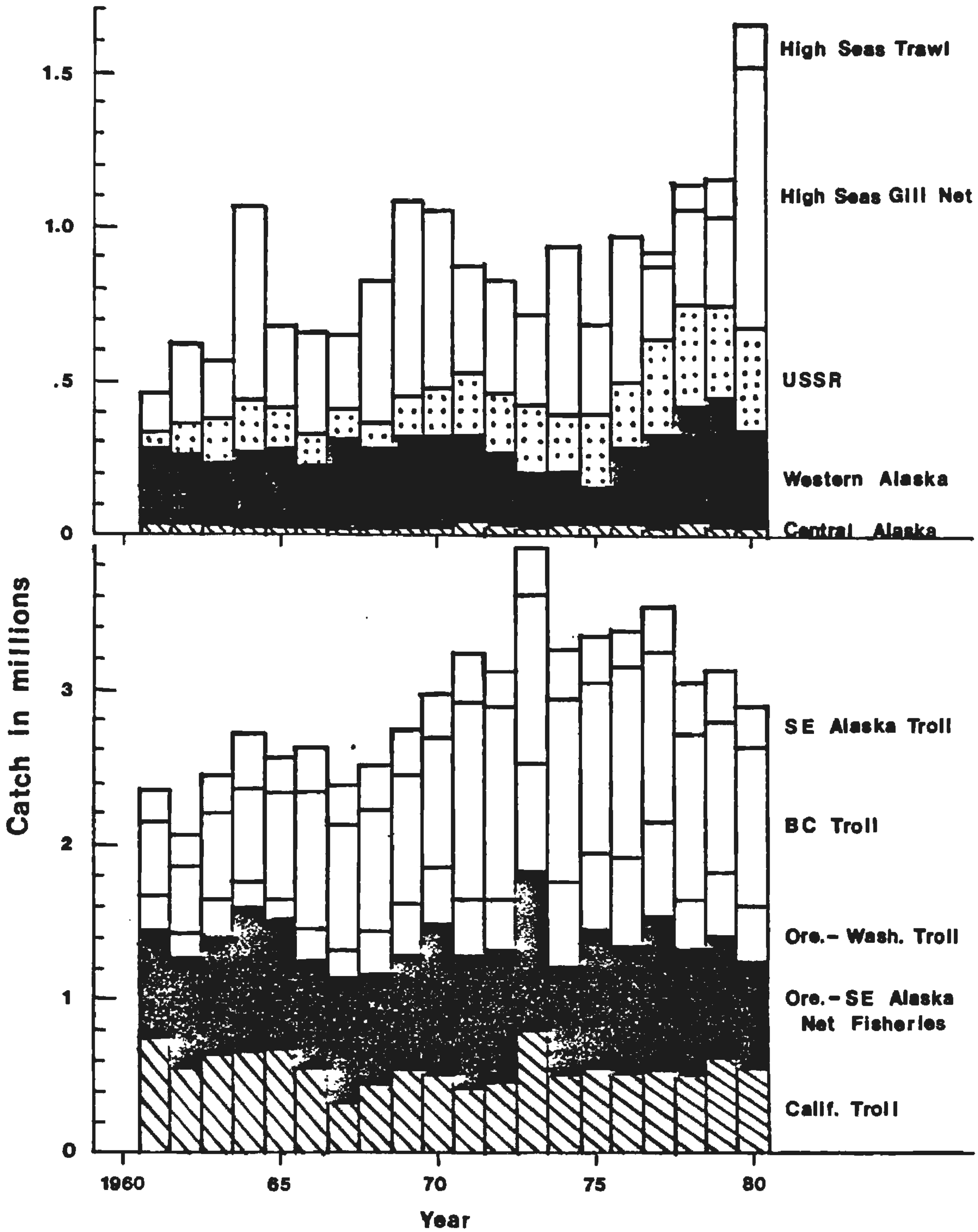

Fig. 1. Annual commercial catches of chinook salmon in the northern (top) and southern (bottom) regions of the North Pacific, 1961-80.

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81	259	-	-	-	-	-	-	-	-

*Includes Puget Sound troll catches, 1961-69.

Table 4. Estimates[1] of chinook salmon escapements (wild and hatchery), 1976-1980. (Fish in thousands.)

Year	California	Oregon-Washington	British Columbia	Southeast Alaska	Total
1976	258*	593	164	18	1,033
1977	258*	660	224	30	1,172
1978	290	702	196	20	1,208
1979	269	581	177	25	1,052
1980	216	643	190*	39	1,088
Average 1976-80	258	636	190	26	1,111
Average catch (all gear)	671	1,361	1,719**	339	4,090

*Estimate from average of other years.
**1976-1978 average only.
[1]Data sources: Fredin (1980, INPFC (1979), Major et al. (1978), INPFC Statistical Yearbooks, PFMC proposed management plan for 1981, and personal communication with fisheries agencies (1978-1980 data).

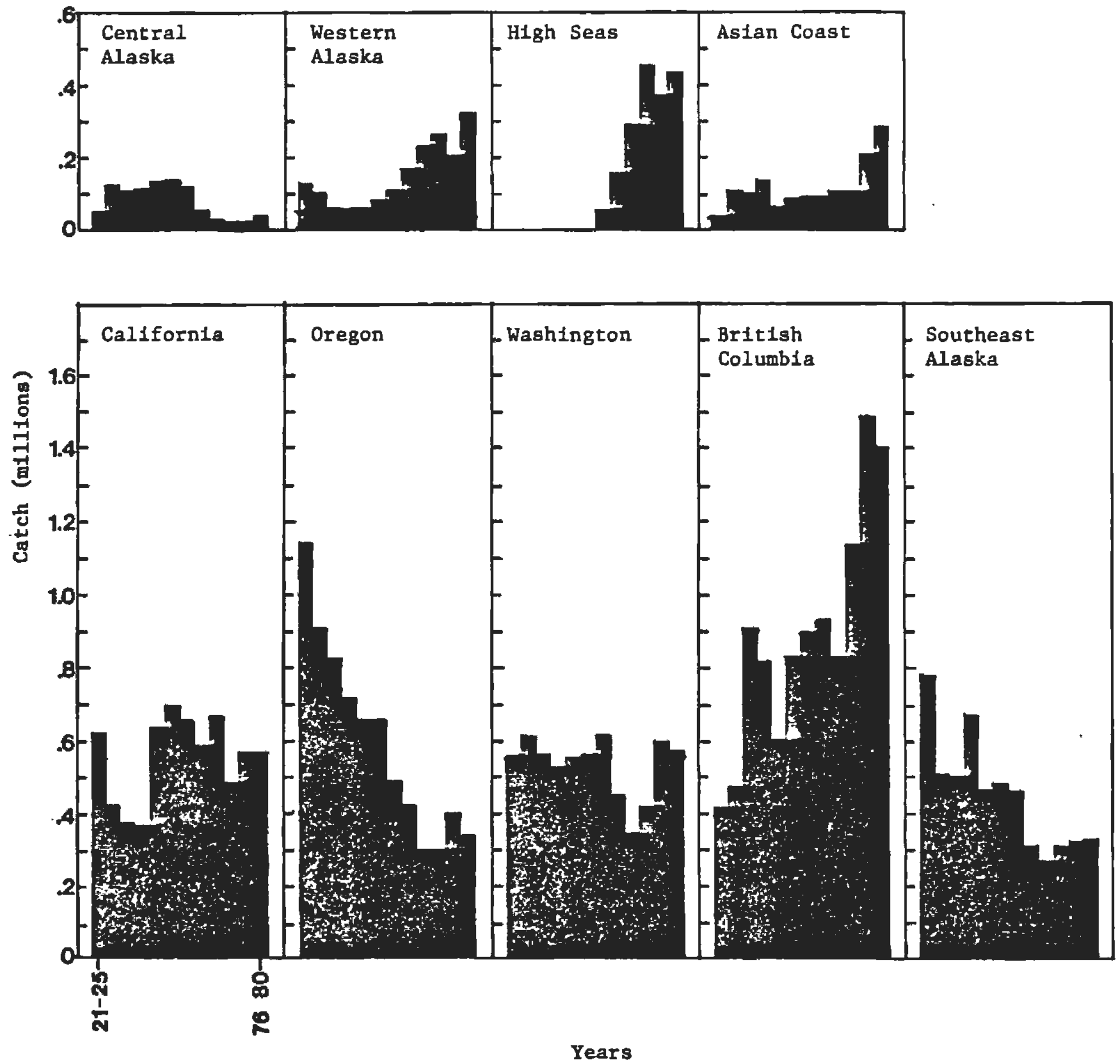

Fig. 2. Annual commercial catches of chinook salmon by 5-year periods beginning 1921-1925 and ending 1976-1980.

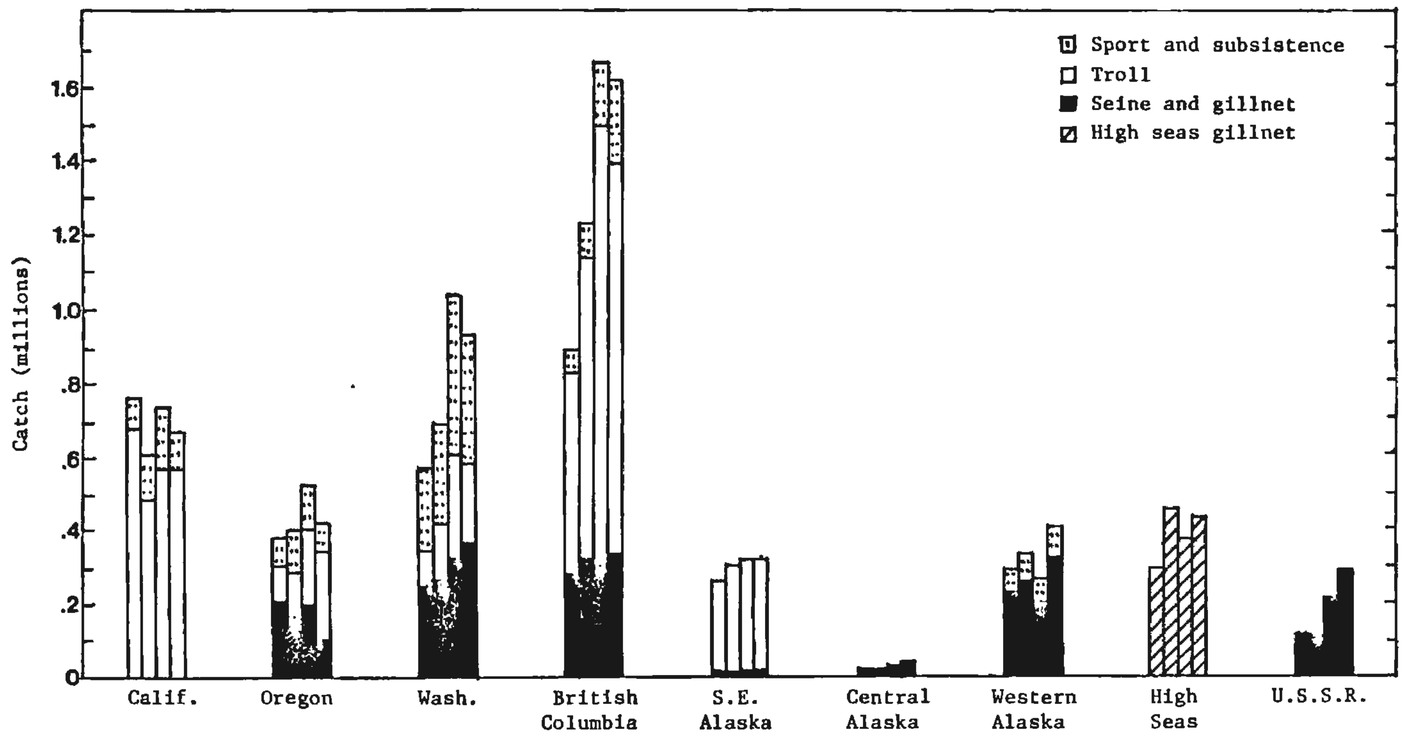

Fig. 3. Catches of chinook salmon by 5-year periods beginning 1961-1965 and ending 1976-1980. (Russian fishery is seine and trap.)

central Aleutians during their ocean residence.[1] Then, while maturing, they tend to migrate south along the North American coast and are thus vulnerable to several offshore and some coastal fisheries (Major et al. 1978). The center of chinook salmon production in the southern region is in the Oregon-Washington area (to include the Columbia River) based on estimated escapements and the location of catches (Table 4). For the entire region, the annual abundance in recent years was about 5 million and the rate of exploitation was nearly 80%.

Initially we are assuming that chinook salmon caught in the Bering Sea are from either Asian (USSR) or western Alaskan stocks. The 1976-1980 average catch of chinook salmon in the northern region (including high seas catches, 38%) was about 1.3 million and, assuming a rate of exploitation of 65%, the average annual abundance was about 2 million. Inshore catches of USSR and western Alaskan chinook salmon have both increased in recent years, but the increase was been relatively greater for the USSR stocks. If the inshore catches reflect abundances of the stocks, then there may have been a significant change in the proportions of Asian and Alaskan stocks in the Bering Sea fisheries between the 1960's and the late 1970's.

The annual fluctuations in the catches of chinook salmon generally have been much less than the fluctuations in the catches of other species of salmon; however, the high seas catch of chinook salmon in 1980 (primarily immature fish) coupled with the western Alaska catch in 1981 (USSR catch in 1981 is presently unknown) provide a major exception. The annual commercial catches since 1960 are shown by area and gear in Fig. 4. The 1981 catches are unavailable except for Alaska. Catches in 1973 were exceptionally high in the southern region but exceptionally low in the northern region, and there is some indication of an inverse relationship between the abundances in the two regions. The 1980 catch on the high seas (including the trawl catch) was nearly 1 million and was thus higher than any recent catch of any inshore fishery with the exception of the British Columbia troll fishery.

One of our objectives is to estimate the annual abundances of western Alaskan chinook salmon stocks. In the Nushagak and Togiak Districts of Bristol Bay, annual aerial surveys have been conducted to estimate the escapements of chinook salmon. The estimates were obtained from the Annual Management Report, 1980, Bristol Bay Area (ADF&G) and were made by Michael L. Nelson, Senior Area Management Biologist. Estimates of the annual Bristol Bay runs since 1966 were made from these data, and estimates for some earlier years were made by applying the average rates of exploitation to the catches (Table 5).

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[1] Of the four inshore recoveries of chinook salmon tagged near Adak, one each was recovered from Kamchatka, Bristol Bay, southeastern Alaska, and the Columbia River.

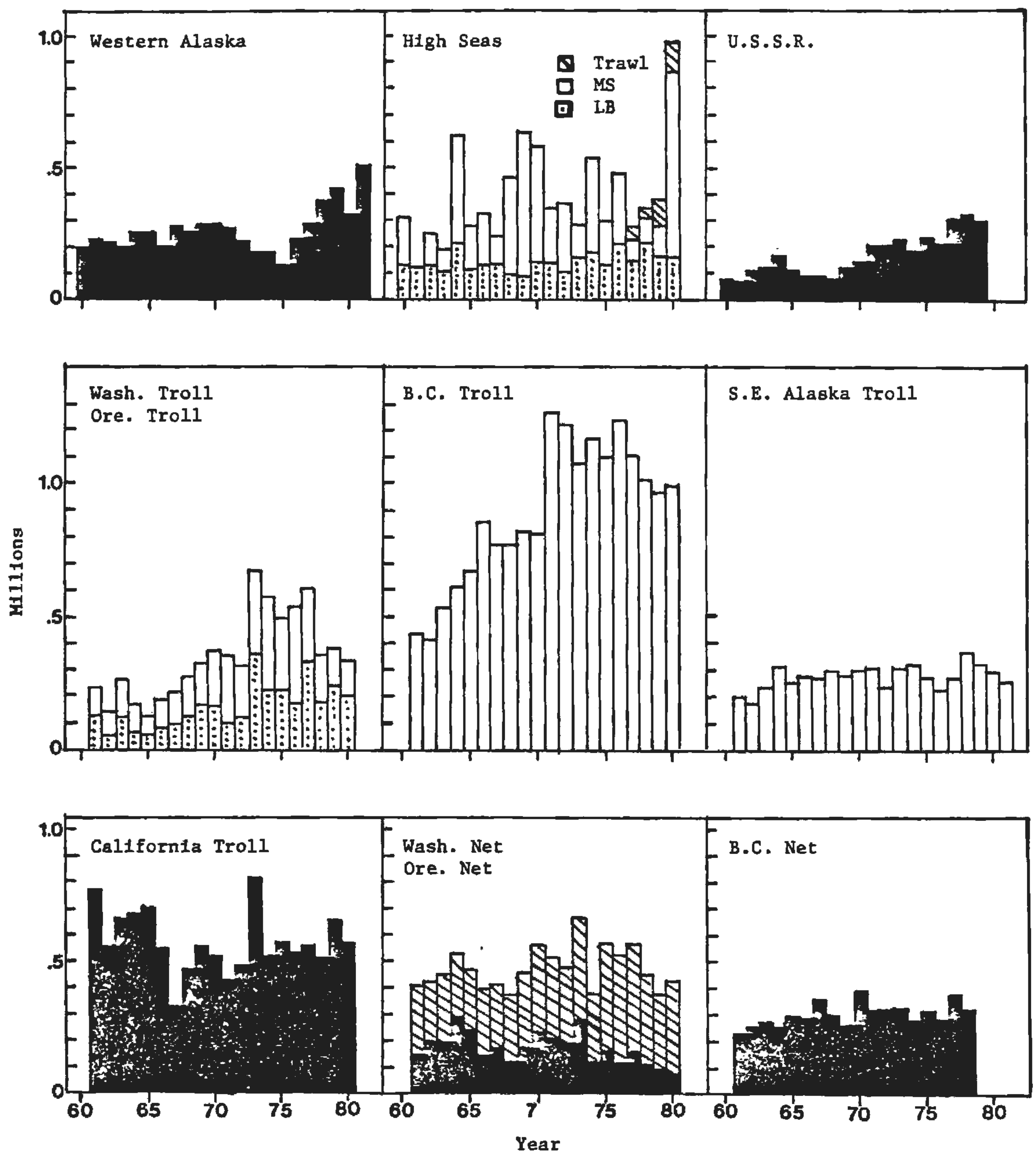

Fig. 4. Annual commercial catches of chinook salmon by area and gear, 1960-1981.

Table 5. Estimates of Bristol Bay chinook salmon runs (numbers of fish in thousands), 1961-81.

	Nushagak District				Togiak District			Other Districts		Total	
	Catch		Escape-			Escape-					
Year	Comm.	Subsist.	ment	Run[1]	Catch	ment	Run[1]	Catch	Run[2]	Catch	Run
1961	61	4	-	120	11	-	21	17	39	93	180
62	61	4	-	120	9	-	17	14	32	88	169
63	46	4	-	93	6	-	12	10	23	66	128
64	109	3	-	207	11	-	21	21	48	144	276
65	86	5	-	167	11	-	21	16	36	118	224
66	58	4	40	102	10	-	19	10	21	82	142
67	96	4	65	165	14	10	24	8	16	122	205
68	78	7	70	155	14	16	30	12	29	111	214
69	81	7	35	123	21	8	29	24	39	133	191
70	87	7	50	144	29	15	44	24	44	147	232
71	83	4	-	117	28	20	48	13	23	128	188
72	46	4	25	75	21	14	35	4	8	75	118
73	30	7	35	72	11	11	23	3	7	51	102
74	32	8	70	110	12	15	27	4	13	56	150
75	22	7	70	99	8	11	19	3	12	40	130
76	61	7	100	168	30	14	44	6	14	104	226
77	85	5	65	155	36	20	56	12	24	138	235
78	119	6	130	255	57	40	97	17	39	199	391
79	155	9	95	259	31	20	51	17	33	212	343
80	64	12	141	217	13	12	25	20	59	109	301
81	195	12	(150)	357	25	(21)	46	21	44	253	447

[1]Runs in 1961-65, 71 estimated from catch and average rate of exploitation (1966-80) of 54%.

[2]Runs estimated from catch and the average rate of exploitation in Nushagak and Togiak minus 10%.

The runs in the Nushagak District (primarily the Nushagak River) have constituted about 71% of the chinook salmon runs to Bristol Bay since 1961 and about 73% of the large runs since 1978. Rates of exploitation have ranged from .29 to .72 and over all years have been independent of the size of the run (only since 1975 is there a positive correlation between exploitation and size of run).

The most extensive data on chinook salmon from western Alaska come from the Nushagak District of Bristol Bay. Scale samples have been collected from the commercial catch (gillnets) each year since 1956. Sample sizes were relatively small in early years (50-400), but since 1967, the annual scale sample sizes have ranged from 500 to 2,500 fish.[2] The Nushagak chinook salmon run usually beings in early June, reaches a peak in mid- to late-June, and continues on through July. Prior to about June 20, the fishery uses large mesh (about 8 1/2") and after that, smaller mesh is used (about 5 3/8") because the more abundant sockeye and chum salmon runs begin then.

The change in mesh size is usually accompanied by a change in the age composition in the catch; particularly evident is an increase in the percentage of the small age .2 fish (Fig. 5). With the change from large to small mesh, the mean lengths of age .4 and age .3 females tends to increase, whereas the mean lengths of age .3 males decreases (Fig. 6). Annual mean lengths by sex for the major age groups are given in Table 6. The annual age compositions of the Nushagak catches are affected by the proportions of the catch made with chinook and sockeye gear (ocean age) and the person aging the scales (freshwater age). The age compositions for the 1956-1965 catches were estimated from a composite scale sample for each year (sexes combined) and applied to the year's catch to estimate the annual commercial catches by age (Table 7). For the years after 1966, the age compositions by sex for periods within each year were weighted by the period catches to obtain estimates of the annual catches by sex and age (Table 8). Finally, catch and effort statistics were compiled to estimate CPUE for the chinook and sockeye seasons since 1966 (Table 9).

Only catch statistics are available for the Kuskokwim and Yukon Rivers (Fig. 7). Since the 1960's, when commercial fishing became significant in the Kuskokwim area, the commercial catches of chinook salmon have been about half of the total catch. The Kuskokwim subsistence fishery for chinook salmon is the largest in Alaska. It is unlikely that the annual catches in the Kuskokwim reflect annual variation in the runs, nor the abundance of the runs relative to the Nushagak River, since the commercial fishery has been on almost a quota basis, and typically, only about 24 hours of fishing time has been allowed during the chinook season.

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[2]Data provided by ADF&G (D. McBride) and collected by Mr. M. Nelson.

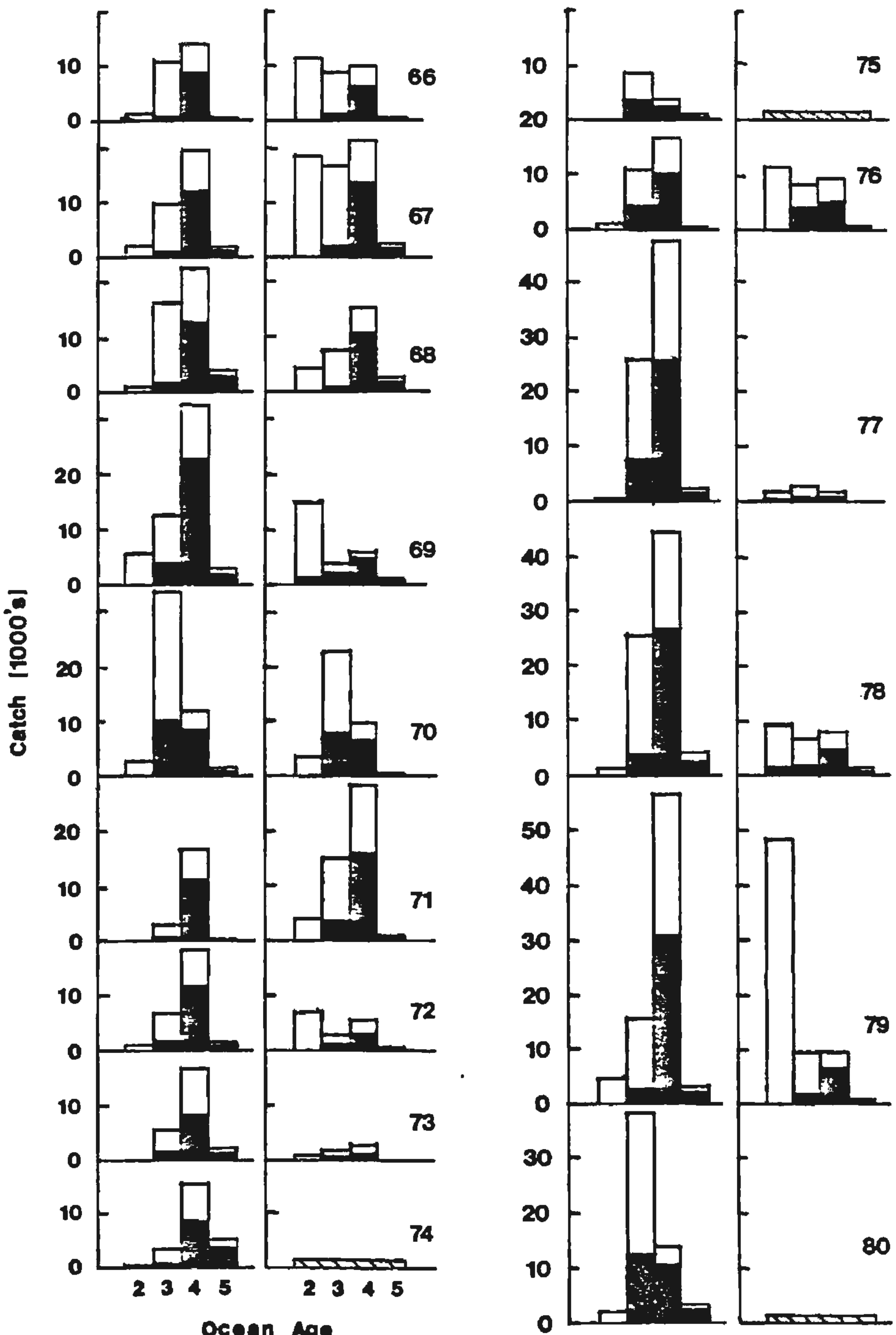

Fig. 5. Annual catches of chinook salmon in the Nushagak District during the chinook season (left) and sockeye season (right) by ocean age and sex (males - open bar, females - solid bar), 1966-80.

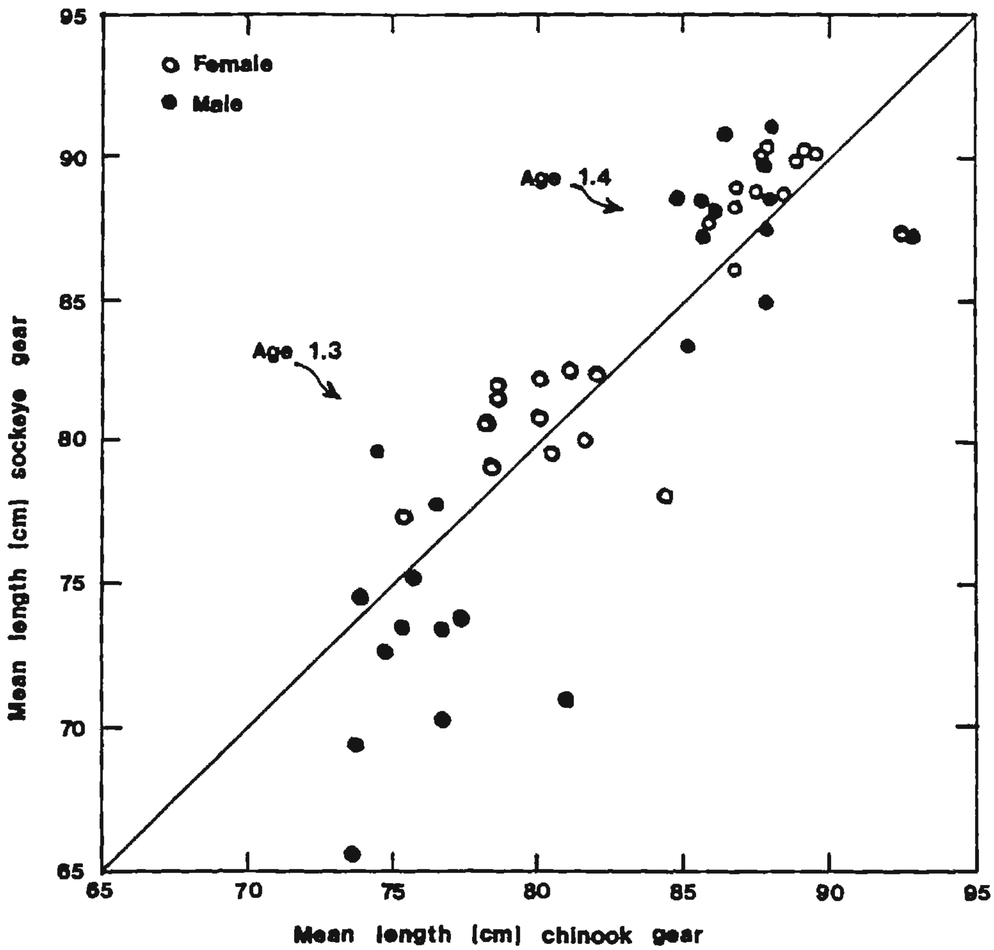

Fig. 6. Plot of the mean lengths of chinook salmon (by age and sex) caught during the sockeye season (sockeye gear) on the mean lengths of chinook salmon caught by chinook gear, 1967-81 (excluding 1974-75, 77 and 80).

Table 6. Mean lengths of chinook salmon in the Nushagak catches (mid-eye to tail fork, mm).

	Age 1.2	Age 1.3			Age 1.4			Age 1.5		
Year	M	M	F	$\bar{X}$	M	F	$\bar{X}$	M	F	$\bar{X}$
1967	547	711	800	721	865	885	877	952	916	926
68	559	742	799	749	862	880	873	948	927	932
69	596	753	808	772	870	883	879	948	914	922
70	590	771	822	788	894	893	893	955	923	930
71	557	741	802	754	858	898	881	933	906	913
72	543	715	762	731	861	870	867	904	924	917
73	521	756	793	767	849	860	855	917	903	909
74	573	754	789	760	838	891	869	910	928	923
75	581	769	776	772	872	870	871	936	905	912
76	558	743	787	762	881	884	883	983	911	954
77	581	769	812	780	878	867	872	880	921	910
78	583	745	803	754	881	893	888	962	937	947
79	588	747	817	782	924	915	919	1070	1003	1019
80	563	745	768	753	850	867	863	912	919	918
Means	567	749	796	760	870	883	878	944	923	931

Table 7. Annual catches (in hundreds) of chinook salmon in the Nushagak District by age as estimated by a composite sample for each year, 1956-1965.

Year	Age										Total
	0.2	1.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	
1956		179	26	187	4	10	159	4		4	573
57		93	24	242	4	50	347	2		30	792
58		65	14	225	4	29	488	4	3	41	873
59		44	12	185	4	7	256		4	32	544
60		33	30	343	7	26	357		2	16	814
61	2	64	6	142	4	29	352	4		6	609
62		42	2	91		9	417	7		44	612
63*		210		60			140			50	460
64		546		196		10	293		5	36	1086
65		106	7	313	4		363			67	860

*Sample size of 46, other year n = 211 to 686.

Table 8. Catches of chinook salmon (in hundreds) in the Nushagak District by sex and age, 1966-1981.

Year	Sex	Age														Total
		1.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	2.5	1.6	
1966	M			131		2	177			94	1		2			407
	F						20			148	1		6			175
67	M			208		9	229	2	8	162	+	1	13			632
	F			+		2	30	1	10	250	1	1	34		+	329
68	M	4		57	1	8	216	1	4	146		1	17		1	456
	F					+	29		11	229	1	2	52			324
69	M	+	1	190		1	103	1	2	114	3		9			424
	F			13		4	56		13	263	3	1	30		+	383
70	M			64		31	351	1	1	61	+	1	4			514
	F			1		15	173	1	8	145	+	1	16		1	361
71	M			45		1	146		8	185	1		1	+		387
	F			1			7		20	252	1		5			286
72	M		1	81		4	66	+	4	88			7		+	251
	F			2		1	34	+	6	149			14			206
73	M			6			52			95	1	1	11		1	167
	F						23	1	1	97	1	+	15			138
74	M			6			40			80	1		11	1	1	140
	F			1			8			116	+		54		2	181
75	M			3			66			21	1		4		1	96
	F			2			59	2		44	1		11			119
76	M			118	1		112	2	1	106	1		6			347
	F			8			86	2		158	+		4			258
77	M			22		3	213	7		226	3		7			481
	F			3			76			270	3		17			369
78	M	3		92		1	278	11		209	3		22			619
	F			12			49			320	24		33	3		441
79	M	9		533	10		205			288	11		10			1066
	F			3			50			376	24		30			483
80	M			22			284			42			4			352
	F						142			116			33			291
81	M			609	8		460	12		277	8		5			1379
	F			7			140	8		405	4		7			571

+Less than 100.

Table 9. Nushagak chinook salmon fishery statistics.

	Chinook season					Sockeye season				
Year	Dates	Fishing days[1]	Average boats[2]	Chinook catch	CPUE[3]	Dates[4]	Fishing days	Average boats	Chinook catch	CPUE
1966	6/ 6-18	10	93	26,600	29	6/20-7/ 9	9	264	30,100	13
67	6/ 5-17	10	177	32,200	18	6/20-7/10	5.5	443	28,000	12
68	6/ 3-18	11	140	41,700	27	6/21-7/10	4.5	235	10,900	10
69	6/ 2-19	12	165	53,600	27	7/ 1-11	3	312	17,200	18
70	6/ 1-19	13	195	50,300	20	6/22-7/ 8	10.7	215	33,700	15
71	6/ 7-23	12	181	20,700	10	6/25-7/10	6	290	56,200	32
72	6/12-24	9	180	28,200	17	6/26-7/10	3	260	14,000	18
73	6/ 4-20	11	178	24,000	12	6/22-7/10	1.5	229	3,000	9
74	6/ 3-18	11	103	25,700	23	7/ 4-7	3	168	3,100	6
75	6/ 9-21	8	162	12,600	10	7/ 8-12	4	294	4,400	4
76	6/ 7-18	8	155	29,600	24	6/22-7/10	2.5	299	23,100	31
77	6/ 6-22	10.5	252	71,300	27	7/ 1-10	1	356	3,200	9
78	6/ 5-16	9	250	74,000	33	6/20-7/ 8	6.5	374	22,900	9
79	6/ 4-15	9	365	72,000	22	6/19-7/10	16.5	(367)	59,000	10
80	6/ 2-23	9.5	371	56,900	16	7/ 2-10	8	360	2,700	1
81	6/ 1-17	10	(370)	78,300	21	6/19-7/10	18	(360)	94,500	15

[1]Number of days (24 hour periods) open to fishing during the dates indicated (excludes openings for the Igushik section only and dates open for fishing but no fishing took place because of a strike).

[2]Average number of drift gill net boats fishing (excludes set net effort) 150 fathom gill nets or equivalent.

[3]Catch divided by days x boats.

[4]Between the last date of the chinook season and the first date of the sockeye season there was no fishing. Last date for the sockeye season was chosen as 7/7-12 depending on the timing of the chinook run.

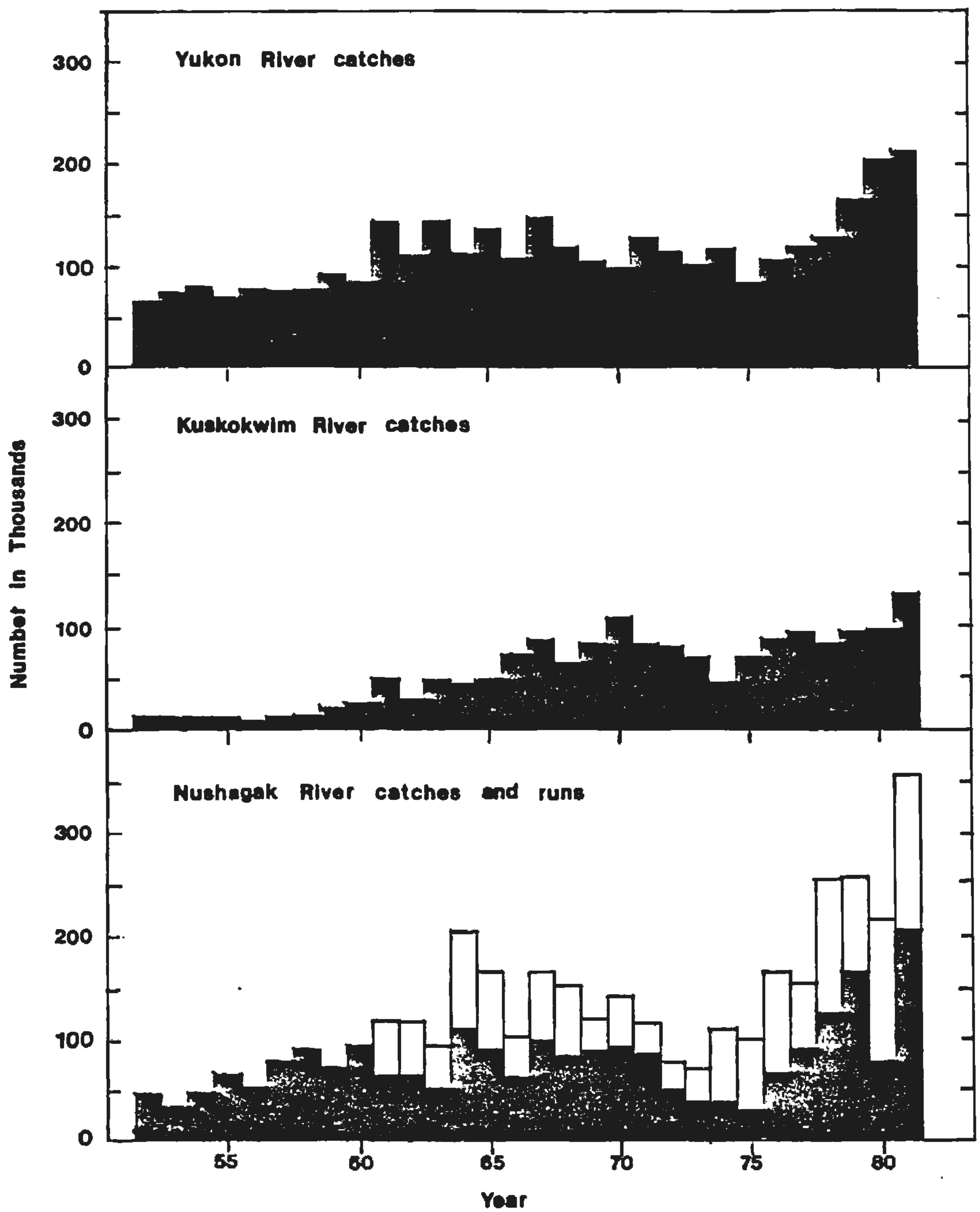

Fig. 7· Annual catches (commercial and subsistance) of chinook salmon from the Yukon and Kuskokwim rivers and estimates of the runs (catch and escapement) to the Nushagak River 1952-81.

From the magnitude of the catches and its size, the Yukon River probably has the largest stock of chinook salmon in western Alaska, but the annual escapements and rates of exploitation are unknown. The larger catches in recent years probably reflect larger runs since large runs of all species, and in most areas, have been typical for western Alaska since 1978. We have not yet compiled age composition data for the Yukon or Kuskokwim River stocks.

In Russian rivers, mature chinook salmon start their upstream migration as soon as the ice is gone. Though this species is found in streams from the Anadyr River (64°05′ N) in the north to the Amur River (53° N) in the south, there are only three major chinook rivers. These rivers, the Kamchatka, Bol′shaya and Apuka, produce the largest commercial catches of chinook in Russia.[3] In the Kamchatka River, chinook enter between mid-May to September and peak during the second half of June. They enter the Bol′shaya River during the first of May through the end of July, and entrance timing on the Oliutorskii region (Apuka River) is from the second half of June to the second half of July (Atkinson 1981). Because of their entrance timing, most of these mature fish would be out of the present mothership fishing area by early spring.

Presently we have scale samples from two important chinook salmon rivers in the USSR which were received via the Japan Fishery Agency. The samples have been aged by two readers and we plan to make a third reading by a different person to determine the variability in aging. Preliminary age compositions from the first reader were calculated (Tables 10 and 11). Mean weights and lengths by sex and ocean age are presented in Tables 12 and 13. The USSR fisheries are believed to be non-selective (for age and size) seine and trap fisheries. The Kamchatka River samples from 1980 included both mid-eye to tail fork and tip of snout to tail fork measurements. Regressions were calculated from these data, as well as from some 1979 Nushagak catch samples to convert between the two length measurements (Table 14).

Scale Measurements and Data Management

Project personnel visited the ADF&G Stock Separation Lab in Anchorage on December 16-18 to receive Alaska scale samples and to consult with lab personnel regarding scale characters to be examined, microcomputer software required, scale measurement procedures, and criteria for interpreting chinook scale growth zones. The main objective of this coordination was to standardize techniques so that exchanged data will be compatible. The following sections describe the results of this coordination effort and the materials and methods that will be used in FY 82-83.

Scale Characters to be Examined

The ADF&G lab personnel at Anchorage have decided to measure the following growth zones on the scales of chinook salmon:

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[3]Personal communication with Dr. Stanislav Konovalov and Dr. Victor Tumanov, TINRO.

Table 10. Age compositions (%) by sex of chinook salmon from U.S.S.R. in-river catch samples.

		Males								Females						
Year	River	n	1.2	1.3	1.4	1.5	2.2	2.3	2.4	n	1.2	1.3	1.4	1.5	2.3	2.4
1975	Kamchatka	103	25.2	52.4	20.4	0	0	1.0	1.0	53	0	50.9	45.3	0	0	3.8
	Bolshaya	77	16.9	57.1	20.8	5.2	0	0	0	87	0	42.5	52.9	3.4	1.2	0
1976	Kamchatka	92	8.7	78.3	10.9	0	0	2.1	0	85	0	64.7	29.4	0	5.9	0
	Bolshaya	117	40.2	32.5	26.5	0	.8	0	0	62	1.6	25.8	62.9	6.5	1.6	1.6
1978	Kamchatka	106	17.9	50.0	24.5	1.0	0	6.6	0	61	0	31.1	65.6	0	0	3.3
	Bolshaya	77	5.2	45.5	44.2	3.9	0	0	1.2	69	0	8.7	84.1	4.3	0	2.9
1979	Kamchatka	77	7.8	64.9	23.4	1.3	0	2.6	0	49	0	36.7	63.3	0	0	0
	Bolshaya	92	3.3	50.0	45.7	1.0	0	0	0	79	0	19.0	77.2	3.8	0	0
1980	Kamchatka	90	28.9	47.8	21.1	0	2.2	0	0	68	0	29.4	64.7	0	1.5	4.4
	Bolshaya	65	23.1	10.8	61.5	0	0	1.5	3.1	63	0	6.3	92.1	0	0	1.6
Means	Kamchatka		17.7	58.7	20.1	0.5	.4	2.5	.2		0	42.6	53.7	0	1.5	2.3
	Bolshaya		17.7	39.2	39.7	2.0	.2	.3	.9		.3	20.5	73.8	3.6	.6	1.2

Table 11. Age composition (%) of chinook salmon from U.S.S.R. in-river catch samples.

		Age								
Year	River	1.2	1.3	1.4	1.5	2.2	2.3	2.4	Aged n	Total n
1975	Kamchatka	15.5	52.0	30.0	0	0	0.5	1.5	156	200
	Bolshaya	8.5	50.0	37.0	4.0	0	0.5	0	164	200
1976	Kamchatka	4.5	71.5	20.0	0	0	4.0	0	177	200
	Bolshaya	26.6	30.3	39.4	2.1	0.5	0.5	0.5	179	188
1978	Kamchatka	11.4	43.1	39.5	0.6	0	4.2	1.2	167	199
	Bolshaya	2.7	28.1	63.0	4.1	0	0	2.1	146	149
1979	Kamchatka	4.7	54.0	39.3	0.7	0	1.3	0	126	150
	Bolshaya	1.5	36.0	60.5	2.0	0	0	0	171	200
1980	Kamchatka	16.5	39.9	39.9	0	1.3	.6	1.8	158	197
	Bolshaya	11.0	8.5	77.5	0	0	1.0	2.0	128	200
Means	Kamchatka	10.5	52.1	33.7	0.3	0.3	2.1	0.9		
	Bolshaya	10.1	30.6	55.5	2.4	0.1	.4	0.9		

Table 12. Mean weights (kg) of chinook salmon from U.S.S.R. in-river catch samples.

Year	River	Males .2	Males .3	Males .4	Males .5	Males All*	Females .2	Females .3	Females .4	Females .5	Females All*	All
1975	Kamchatka	3.37	8.45	13.56	-	8.35	-	9.83	12.83	-	10.85	9.33
	Bolshaya	3.62	8.06	12.81	18.30	8.78	-	10.63	12.78	16.03	12.00	10.41
1976	Kamchatka	3.98	9.60	11.28	-	9.33	-	9.48	12.02	-	10.32	9.81
	Bolshaya	3.90	7.24	12.13	-	7.52	6.30	10.62	12.66	14.65	12.19	9.13
1978	Kamchatka	3.24	6.64	10.33	13.10	7.00	-	8.59	9.71	-	9.18	7.84
	Bolshaya	4.20	7.20	14.97	14.27	10.88	-	10.77	13.02	15.67	13.00	11.89
1979	Kamchatka	4.07	7.10	10.83	15.40	8.08	-	8.80	11.10	-	10.54	9.06
	Bolshaya	3.30	7.74	11.66	12.60	9.71	-	10.21	13.07	15.90	12.73	11.10
1980	Kamchatka	2.87	6.25	10.74	-	6.24	-	9.45	11.02	-	10.46	8.10
	Bolshaya	3.57	6.60	13.22	-	9.97	-	9.68	13.08	-	13.14	11.60
Means	Kamchatka	3.51	7.61	11.35	14.25	7.80	-	9.23	11.34	-	10.27	8.83
	Bolshaya	3.72	7.37	12.96	15.06	9.37	-	10.38	12.92	15.56	12.61	10.83

*Including unaged fish.

Table 13. Mean lengths (tip of snout to tail fork, mm) of chinook salmon from U.S.S.R. in-river catch samples.

		Males					Females					
Year	River	.2	.3	.4	.5	All*	.2	.3	.4	.5	All*	All
1975	Kamchatka	679	839	991	-	834	-	876	963	-	907	862
	Bolshaya	691	880	1013	1150	886		955	1022	1067	998	943
1976	Kamchatka	623	873	922	-	858	-	867	953	-	894	875
	Bolshaya	638	798	952	-	784	760	903	977	1035	959	845
1978	Kamchatka	606	782	918	980	786	-	847	888	-	872	819
	Bolshaya	654	804	1031	1030	908	-	916	982	1029	980	942
1979	Kamchatka	637	811	928	1050	835	-	859	933	-	908	864
	Bolshaya	660	858	980	1080	916	-	929	1017	1090	1008	958
1980	Kamchatka	635	812	959	-	791	-	926	983	-	963	867
	Bolshaya	658	838	1040	-	941	-	920	1012	-	1013	978
Means	Kamchatka	636	823	944	1015	821	-	875	944	-	909	857
	Bolshaya	660	836	1003	1087	887	-	925	1002	1055	992	933

*Including unaged fish.

Table 14. Equations to convert chinook salmon length measurements between mid-eye to tail fork (ME-TF) and tip of snout to tail fork (TS-TF). Lengths in mm.

A. Samples from 1979 Nushagak catch	
1. Males n = 152	ME-TF = 32.3 + .877 (TS-TF)
Ranges:	Sy.x = 7.1
ME-TF 412-1094	
TS-TF 437-1205	
	TS-TF = 34.4 + 1.137 (ME-TF)
	Sy.x = 8.1
2. Females n = 76	ME=TF = 13.7 + .940 (TS-TF)
Ranges:	Sy.x = 10.4
ME-TF 618-1055	
TS-TF 678-1131	
	TS-TF = 35.9 + 1.039 (ME-TF)
	Sy.x = 10.9
B. Samples from 1980 Kamchatka River catch	
1. Males n = 110	
Ranges:	ME-TF = 21.6 + .879 (TS-TF)
ME-TF 520-1065	Sy.x = 4.9
TS-TF 575-1185	
	TS-TF = -23.5 + 1.137 (ME-TF)
	Sy.x = 5.6
2. Females n = 87	ME-TF = 13.0 + .899 (TS-TF)
Ranges:	Sy.x = 5.0
ME-TF 710-1025	
TS-TF 780-1125	TS-TF = -7.2 + 1.104 (ME-TF)
	Sy.x = 5.6

Zone 1 = center of focus through last circulus in the freshwater annulus.

Zone 2 = first circulus in freshwater plus growth zone through last freshwater circulus.

Zone 3 = first ocean circulus through last circulus in first ocean annulus.

Within these zones, measurements are made to the outer edge of every circulus. After Zone 3, they measure the total distance to each successive readable marine year.

Because of the smaller size of the digitizing tablets at FRI (35 x 35 cm of usable area), the second marine year is often the last readable year on chinook scales magnified at 100x. Therefore, we have decided not to measure past the second marine year on the scale. In a few cases, the second marine year will not fit completely onto our digitizing screen. Therefore, we decided to measure the distance to each readable circulus in this zone (Zone 4). The number of circuli in Zone 4 (if any) that could not be digitized will also be noted. Zones 1-3 will be the same as those defined by ADF&G.

Microcomputer Software

During our visit to the Anchorage Lab, we were provided with a copy of their FORTRAN digitizing program (SCALE 3). However, because there are differences between operating systems, this program would not work on our computer. Therefore, a new digitizing program (SALMON) was constructed by Mr. Colin Harris and Mr. Robert Walker.

SALMON is a general purpose scale digitizing program patterned after ADF&G's flexible format program, SCALE 3. SALMON can be used for any species and at different magnifications. The function of the numbered digitizer keys (1-9) are undefined and can be assigned to nine different growth zones. The program has two different formats, a detailed format that stores distances between each pair of circuli and an alternative format that stores only circulus count and total zone width for nine possible zones. The Chinook Origins Project will use the detailed format.

The detailed data format, codes, and explanations for the multipurpose scale digitizing program are shown in Table 15. On the first record for a fish, the first 40 columns contain header information, including sample identifier and biological data. The last 40 columns are for 10 fields of four columns. The first position in the field is the key or zone code, and the second is distance in units of inches (.001 inches at 100x) from the previous point. The points are located at the intersections of circuli with the measurement axis of the scale. On subsequent (up to 8) records, there are 20 (key, distance) fields. The last record for each fish is blank filled after the last data point.

Table 15. Data format, codes, and explanation for the Fisheries Research Institute's multi-purpose scale digitizing program, SALMON.

IDENTIFIER	COLUMN(S)	EXPLANATION
District or Sub-district / INPFC area	1-3 4-5	ADF&G district and sub-district codes are used for Alaskan samples; Columns 1-5 are used for INPFC statistical area including E or W to designate hemisphere when digitizing high seas unknowns.
Stream or Region	6-8	ADF&G stream codes are used for Alaskan samples; Region Codes: 03 = West Kamchatka 04 = East Kamchatka Codes for other regions not yet established.
Location or Stock	9-11	ADF&G location codes are used for Alaskan samples: Stock Codes: West Kamchatka 02 = Bolshaya River East Kamchatka 01 = Kamchatka River Codes for other stocks not yet established.
Month	12-13	Month sampled (numeric)
Day	14-15	Day sampled
Year	16-17	Year sampled
Sample No.	18-22	The sample number (scale card number) used by the agency providing the scale samples. Each scale card usually has a corresponding A-W-L form of the same number.
Fish No.	23-24	1-50 (usually) allows identification of which scale on a card was digitized.
Gear Code	25	ADF&G gear codes are used: 0 = Trap 1 = Purse seine 2 = Beach seine 3 = Drift gillnet 4 = Set gillnet 5 = Troll 6 = Longline skates 7 = Otter trawl 8 = Fish wheel 9 = Pots
Species	26	INPFC species codes are used: 1 = Red 2 = Chum 3 = Pink 4 = Silver 5 = King 6 = Steelhead 7 = Unknown 8 = Masu
Sex and Maturity	27	INPFC sex and maturity codes are used: 1 = Male, maturity unknown 2 = Male, mature 3 = Male, immature 4 = Female, maturity unknown 5 = Female, mature 6 = Female, immature 7 = Unknown sex and maturity 8 = Unknown sex, mature 9 = Unknown sex, immature

Table 15. Data format, codes, and explanation for the Fisheries Research Institute's multi-purpose scale digitizing program, SALMON - continued.

IDENTIFIER	COLUMN(S)	EXPLANATION
Length type code	28	ADF&G length codes are used: 1 = Snout to fork of tail 2 = Mid-eye to fork of tail 3 = Orbit to fork of tail 4 = Mid-eye to hypural plate 5 = Orbit to hypural plate
Length	29-32	Fish body length in mm
Age	33-34	Koo system: Col. 33 = number of freshwater annuli Col. 34 = number of ocean annuli
Supplementary Age Code	35	Codes used to describe appearance of edge of scale and to clarify interpretation and age designation by indidvidual readers: P = Plus growth is present at the edge of the scale, and one year was added to ocean age of fish. C = A check is present at the edge of the scale, and this check was included in the ocean age of the fish. G = Plus growth is present at the edge of the scale, and one year was not added to the ocean age of the fish. A = A check is present at the edge of the scale, and this check was not included inthe ocean age of the fish. Other codes may be established.
Scale type	36	INPFC codes that designate position on body sampled: A = preferred area B = adjacent to preferred area C = other or Codes that indicate the condition or appearance of a scale sample: R = scale may be slightly regenerated X = scale slightly damaged Other codes may be established.
Reader	37	A number identifying the individual who digitized the scale.
No. of data pairs (No. of circuli)	38-40	Up to 210 data pairs for a total of 11 records of 80 columns each.
Key		Each zone (up to 9 zones) is designated by a different cursor key (Keys 1-9). Chinook key code: 1 = Focus to outer edge of last circulus in first freshwater annulus. 2 = Outer edge of first circulus in freshwater plus growth zone to outer edge of last freshwater circulus. 3 = Outer edge of first ocean circulus in first ocean year to outer edge of last circulus in first ocean annulus. 4 = Outer edge of first circulus in second ocean year to outer edge of last circulus in second ocean annulus.
Incremental distance	42-44	Incremental distance between each successive pair of circuli in units of .001 inches at 100x.
Key	77	Same as above.
Incremental distance	78-80	Same as above.

(Up to 10 subsequent records have 20 fields of 4 for data (key, distance) pairs.)

The header format of FRI's SALMON is not identical to the header format of ADF&G's SCALE 3, but it contains all of the same information (Fig. 8). Several additional identifiers were included in the header format of SALMON. A sample number (scale card number) and a fish number were included to allow identification of which scale on a card was digitized. One column was reserved for a supplementary age code, and is currently being used to describe the appearance of the edge of the scale and to clarify interpretation and age designation by individual readers. A column for ADF&G length type codes was included; and a column for a scale type code was included to designate position on the body sampled or to indicate the condition or appearance of a scale sample (Table 15).

Codes for various identifiers will also vary somewhat between the two programs. ADF&G district, subdistrict, stream, and location codes will be used when digitizing Alaskan samples; however, new codes will be established for standards from non-Alaskan areas. To save space, International North Pacific Salmon Fisheries Commission (INPFC) codes will be used to designate species, sex and maturity (Table 15). Age will be designated by the Koo system (European method, Koo 1962).

Scale Measurement Procedures

A chinook scale file will consist of samples of one age class from a particular sample location in the same year. The scale files are named with a three-letter abbreviation for the river, a two-number code designating the age class, and a two-number code designating the year that the sample was collected. For example, YUK1375.DAT is the CP/M file name for age 1.3 chinook sampled in the Yukon in 1975.

The scales will be rear-projected onto the digitizing surface at a 100x magnification, and the system will be calibrated periodically to verify precision.

After a scale of the correct age is chosen from the age-weight-length form (AWL), the reader will examine the scale to determine if he agrees with the age designation and to determine if the scale can be digitized. Scales that are regenerated, damaged, resorbed, dirty, or those with bad impressions will not be used unless there are not enough scales to complete the number needed for a standard sample. If a scale that is slightly regenerated or damaged is used, this will be coded in column 36 of the header information (Table 15). If the reader does not agree with the age on the AWL form, the scale will not be digitized and the reader will note his age determination on the AWL form. When a sample consists of scales from more than one date, scale samples will be distributed evenly among the AWL's included. An attempt will also be made to distribute the samples evenly among the sexes, although this will not be possible for age classes or samples where one sex predominates.

When a scale has been chosen for digitizing, the image is aligned on the digitizing screen so that the measurement axis (the perpendicular to the posterior edge of the sculptured field) bisects the focus of the scale. Header information is filled out on the form displayed on the

Fig. 8. Comparison of the header format of the Alaska Department of Fish and Game's (ADF&G) flexible format digitizing program, SCALE3, and the Fisheries Research Institute's (FRI) multi-purpose digitizing program, SALMON.

ADF&G SCALE 3:

3	5		9	12	14	16	18	19	22	23	25	27		31	32
DISTRICT	SUB-DIST.	X	STREAM	LOC'TN	YR	SP	AGE	GEAR	NO. CIRCULI	READER NO.	MO	DAY	X	LENGTH	SEX

FRI SALMON:

3	5	8	11	13	15	17	22	24	25	26	27	28	32	34	35	36	37	40
DISTRICT	SUB-DIST.	STREAM	LOC'TN	MO	DAY	YR	SAMPLE NO.	FISH NO.	GEAR	SP	SEX MAT.	LENGTH TYPE	LENGTH	AGE	AGE CODE	SCALE TYPE	READ. NO.	NO. CIRC.

CRT screen. The growth zones are marked on the scale image with a water soluble overhead projection pen; and the digitizer keys are depressed to establish the focus (key 0) and to measure to the outer edge of each circulus in the four growth zones (keys 1-4). The digitized data are displayed on the CRT, and if correct, is saved on the data diskette. After the scale has been measured, a check mark is made on the AWL to show that the scale has been digitized.

Fisheries Research Institute readers using these scale measurement procedures have been able to digitize an average of 10 chinook scales per hour.

Raw scale data will be stored on magnetic media and will be provided to ADF&G upon request.

<u>Criteria for Interpreting Chinook Scale Growth Zones</u>

In general, age determinations and interpretation of growth zones on chinook scales will be made by the well-known techniques for salmon scales described by Clutter and Whitesel (1956) and Major et al. (1972). We have also gained a considerable amount of experience and insight into techniques and problems specifically associated with chinook salmon scales by reviewing historical and recent literature on chinook salmon scales (Gilbert 1912; Fraser 1917; Rich 1920, 1925; Snyder 1922; Rich and Holmes 1928; Mottley 1929; Pritchard 1940; Koo and Isarankura 1967; Reimers 1973; Schluchter and Lichatowich 1977; Tutty and Yole 1978).

Fisheries Research Institute scale readers are attempting to use the same criteria for interpreting chinook scale growth zones that are used by the ADF&G Stock Separation Lab. The only criterion that we are somewhat hesitant to use is identifying the end of the freshwater zone by a change in direction of circuli "tails" (3.c, Table 16). Welander's (1940) study of the development of chinook salmon scales showed that at approximately 80 mm standard length, the epidermis begins to fold in under the scale, cutting off direct contact of the scale with the dermis. The result is that no circuli are formed in the posterior field. If this results in the apperance of a change in the direction of circuli "tails," then this criterion may show only that the fish has reached a particular size, rather than that the fish has left freshwater.

During our December visit to Anchorage, we met with the Lab's chinook scale reader, Ms. Debbie Hicks, and spent one day with her examining scales, observing measurement techniques, and discussing criteria for interpreting chinook scale growth zones. In addition, Ms. Hicks has provided us with photographs of chinook scales with marks placed at her interpretations of the boundaries of growth zones. After examining these photographs, we think that the only major source of variability in interpretation may arise when defining the end of freshwater growth. Many chinook scales have a gradual increase in thickness and spacing of circuli after the freshwater annulus or have one or more bands of circuli of thickness and spacing intermediate between typical freshwater or ocean

Table 16. Alaska Department of Fish and Game Statewide Stock Separation Project's outline of criteria used to interpret scale growth zones.

A. Freshwater Zone

1. Focus

a. Center of circle or elipse defined by innermost recognizable circuli.

2. First freshwater winter check.

a. Decrease in circuli spacing
b. Breakage and inter-braiding of circuli
c. Thinner circuli
d. Pinching together of circuli at their ends or "tails"

3. End of freshwater zone

a. Sudden increase in circuli spacing
b. Sudden increase in circuli thickness
c. Change in direction of circuli "tails"

B. Ocean Zone

1. Marine winter checks

a. Closer spacing of circuli
b. Thinner circuli
c. Increase in breakage and braiding of circuli (especially at beginning and end of checks)
d. Pinching together of circuli or sudden change in direction of circuli "tails"

thickness and spacing. Because of these characters, delimiting the end of freshwater growth is often very subjective, and, because there is variability in these characters between fish, it may even be difficult for individual readers to remain consistent in their interpretations. To avoid these inconsistencies in interpretation, measurements coded as zone 2 (freshwater plus growth zone) could be combined with zone 3 measurements (first ocean zone). This zone would represent the entire year in which the fish first emigrated to the ocean, and would include measurements from the outer edge of the first circulus after the freshwater annulus (from the focus in the case of age 0. chinook) through the last circulus in the first ocean annulus.

Chinook Scale Samples

We have only recently begun digitizing chinook scales, and so relatively few samples are available. These are listed in Table 17. The number of scales from a particular location, age class, and year needed to create a regional standard will vary, depending on estimates of abundance. However, for the present, we are collecting data on up to 100 scales for each major stream, age class, and year (1975 - present). Because ages 1.3 and 1.4 appear to be the predominant age classes of returning adults in Asian and Alaskan samples, our initial data collection will be limited primarily to fish of those age classes.

Chinook Scale Sampling by U.S. Observers on Japanese Motherships

Because of personnel time and budget restrictions on the FRI High Seas Salmon Project, the Chinook Origins Project provided for chinook scale sampling by U.S. observers on Japanese motherships during the 1982 season. A new computer-coded data form was designed; and observers were provided with data forms printed on waterproof paper, gummed scale cards, forceps, and metal scale card holders. Scale sampling instructions to observers were similar to those given in 1981 except that observers were requested to sample two scales per fish instead of one.

Japanese Fishery in the Bering Sea

The Japanese high seas fishery has been in operation since 1952 and the changes in the areas fished have previously been described by Rogers (1981b). The catch and effort data we will discuss in this section concerns the fishery and areas fished in the Bering Sea from 1972 to 1980 and has been supplied by the Fishery Agency of Japan (1981a).

Mothership Fishery

The area fished by the mothership fleet has changed from 1972 to 1980. To account for this change in areas and to provide us with larger sample sizes, we divided the fishing area into zones shown by Fig. 9. We analyzed the chinook fishery from each zone over the years and months that fishing occurred.

Table 17. Region, location, age class, year, sample size, and CP/M file name of digitized chinook salmon scale samples.

REGION	LOCATION	AGE CLASS	YEAR SAMPLED	SAMPLE SIZE*	CP/M FILE NAME
Asia	Bolshaya R.	1.3	1980	22	BOL1380.DAT
Asia	Bolshaya R.	1.4	1980	100	BOL1480.DAT
Asia	Kamchatka R.	1.3	1980	59	KAM1380.DAT
Asia	Kamchatka R.	1.4	1980	69	KAM1480.DAT
Western Alaska	Nushagak	1.3	1980	100	NUS1380.DAT
Western Alaska	Nushagak	1.4	1980	66	NUS1480.DAT
Western Alaska	Yukon	1.3	1980	100	YUK1380.DAT
Western Alaska	Yukon	1.4	1980	100	YUK1480.DAT

*When sample size is less than 100, all readable scales for this location, age class, and year were digitized.

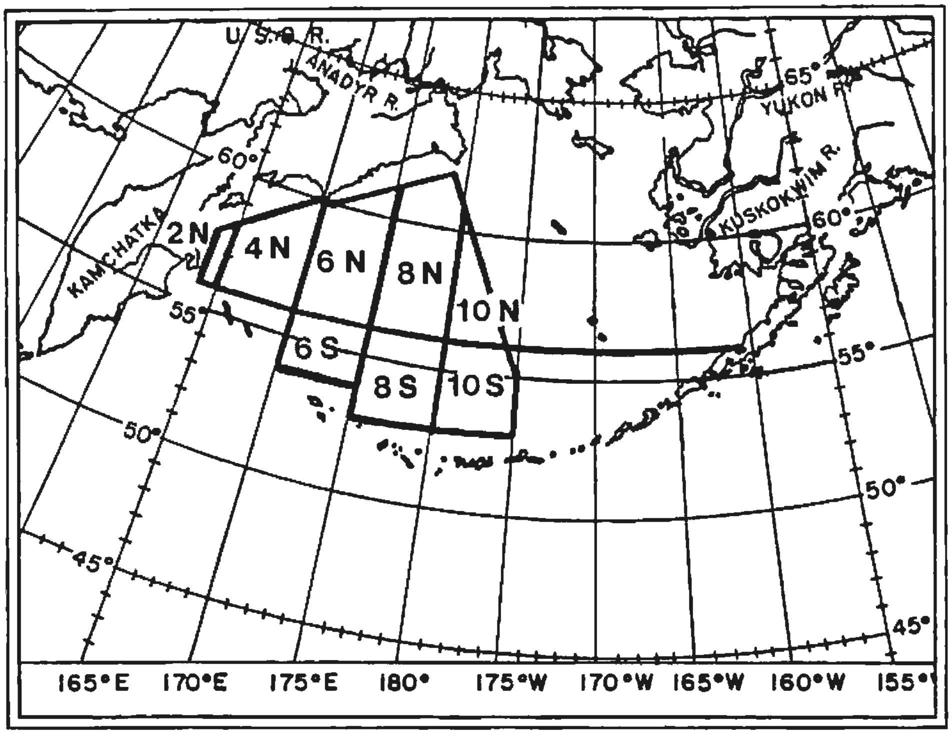

Fig. 9. Delineation of the geographical zones in the Bering Sea used to analyze the Japanese mothership chinook catch data, 1972-1980.

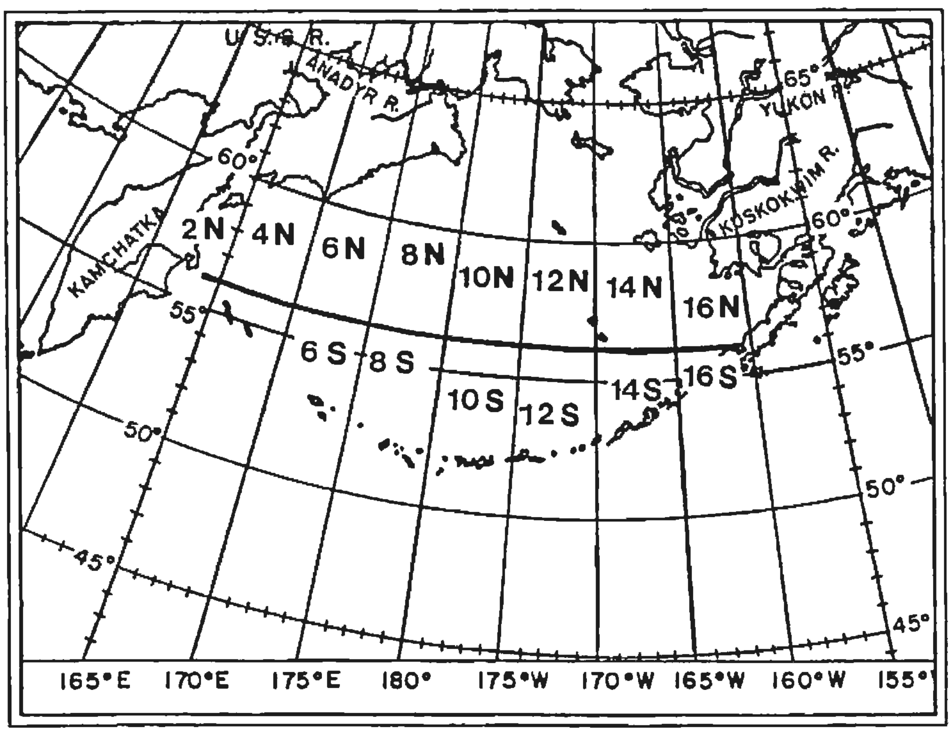

Fig. 10. Delineation of the geographical zones in the Bering Sea used to analyze the Japanese research vessel chinook catch data, 1972-1980.

Though the age and maturity data for the mothership fishery from 1972 to 1980 were provided by the Fishery Japan Agency (1981a), the catch and effort data were obtained from statistical yearbooks and other INPFC documents (Gunstrom 1975; Forrester 1975, 1977, 1978, 1979, 1981a and b; Fishery Agency of Japan 1980 and 1981c).

The numbers of fish of each particular age class-maturity category (e.g. 1.1 immature, 1.2 immature) for the $2^{o} \times 5^{o}$ areas and $1^{o} \times 1^{o}$ areas reported in the data sources were calculated from the proportion of fish of that particular age class-maturity classification x the total chinook caught in the same area and time period and summed to obtain the numbers of those fish for the eight zones (Fig. 9). The effort (number of tans fished) was similarly summed and the catch per unit effort (CPUE) was calculated by dividing the numbers of fish of each category by the accumulated effort x 1,000.

The percent of the total CPUE x 1,000 for fish from the major age-maturity categories is presented in Table 18. These results show the mothership catch is primarily composed of 1.2 immature chinook for all areas fished during each month and year fishing occurred, with the exception of area 2N. This zone, which is next to the Kamchatka coast, was fished with a relatively low pressure, 183,000 tans, with a resulting catch of 5,000 fish. This difference may or may not be representative of the zone due to the small numbers of fish (24) that were aged from the catches collected in the four months over the three years that fishing occurred.

Immature 1.3 fish were the next major age component of the mothership catch followed by 1.2 mature fish.

The other category which showed a major difference from the other age compositions in Table 18 was that 1.2 mature fish comprised 30% of the CPUE during May. The supposition that mature fish are in the Bering Sea at this time of year is again suspect due to the small sample of fish aged (18), small area fished (8N and 8S), small catch (650 fish from 76,000 tans), and that the May fishery only occurred in one year (1974).

Figures 11 to 13 depict the ranges of CPUE for these different age classes. The dramatic rise in the chinook catch is reflected in the CPUE data from 1979 and 1980. The CPUE differences between the catch of 1.2 immature chinook and the other age categories is clearly shown by these figures.

Research Vessel Catch

The CPUE data in the research vessel age class-catch as provided by the Fishery Agency of Japan (1981a) was used to analyze the research vessels catches. The CPUE data per age class for the chinook catch were added for each category and divided by the number of times fishing occurred in that category to determine the average CPUE.

Table 18. Percent of CPUE by age class for the Japanese mothership chinook catch.

	% CPUE 1.2 Immature	% CPUE 1.3 Immature	% CPUE 1.2 Mature	% CPUE All other age classes mature and immature	Total CPUE (x 1000)	Total Catch (#'s fish)
Years						
1972	62.66	33.20	2.67	1.47	83.78	181,396
1973	52.83	29.88	10.19	7.10	21.67	19,944
1974	91.35	3.20	3.43	2.02	117.00	210,506
1975	89.39	2.40	7.33	0.88	81.48	101,729
1976	86.10	6.06	2.90	4.94	62.10	91,272
1977	80.09	10.66	7.90	1.35	39.18	52,526
1978	91.16	6.77	1.66	5.82	42.31	8,388
1979	97.64	1.92	0.22	0.22	187.44	67,950
1980	87.85	10.89	0.36	0.90	650.55	412,716
Months						
May	70.88		28.77	0.35	8.54	652
June	77.45	14.47	5.92	2.16	51.30	174,613
July	88.24	8.97	1.21	1.58	145.87	971,112
Areas						
Western Bering Sea						
2	22.44	49.02	10.92	17.62	28.11	5,115
4N	71.89	8.92	14.47	4.72	37.55	39,032
6N	85.14	6.58	4.16	4.12	86.15	73,380
6S	86.24	5.90	5.79	2.07	71.55	32,039
Central Bering Sea						
8N	84.80	13.68	0.64	0.88	170.10	394,110
8S	84.12	10.57	3.11	2.20	18.89	27,765
10N	91.63	6.94	0.37	1.06	157.95	484,128
10S	84.13	11.08	3.79	1.00	119.23	89,808
All data	85.07	10.54	2.64	1.75	113.08	1,146,377

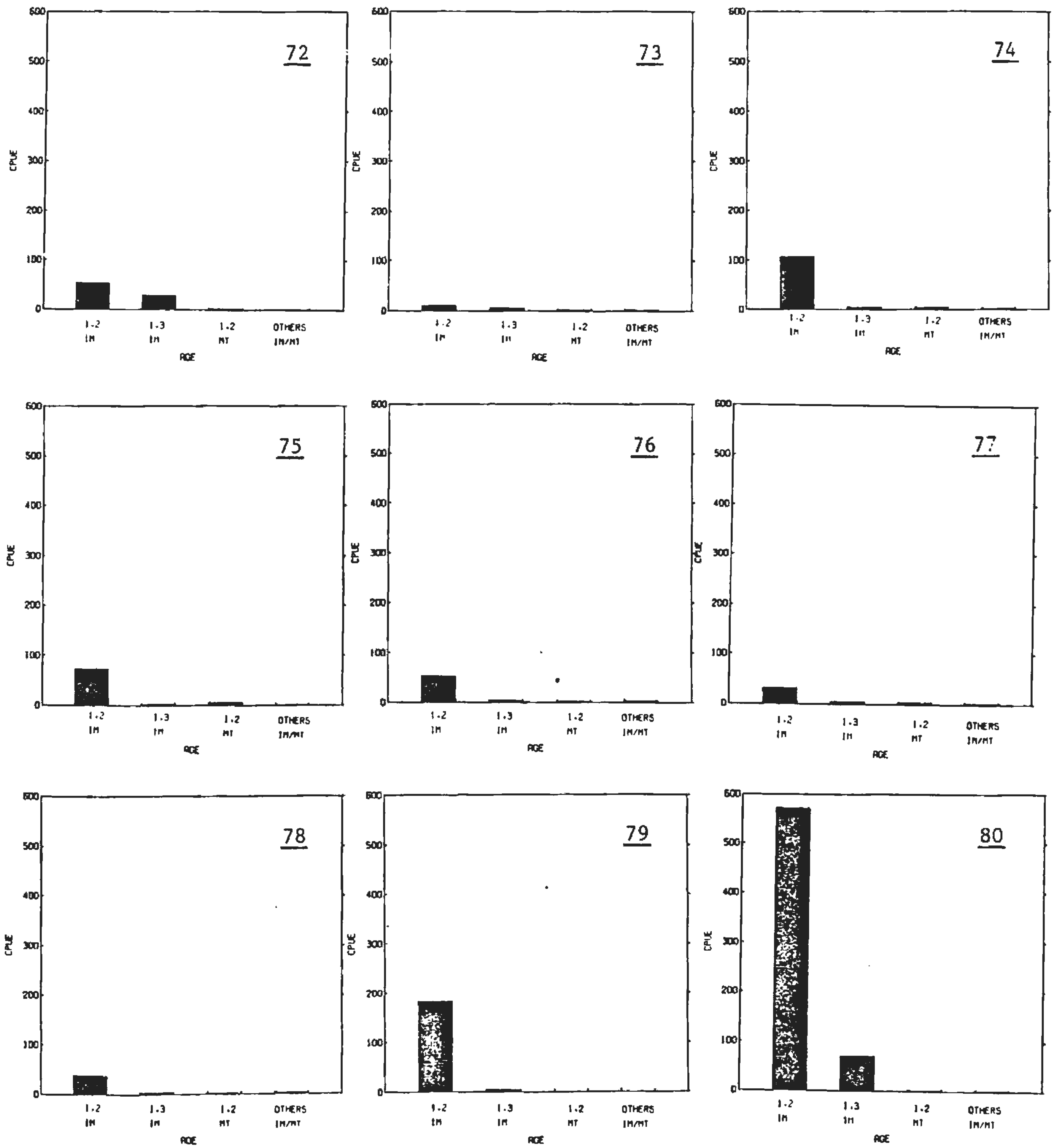

Fig. 11. Histograms of average CPUE for the mothership fishery, 1972-1980, by major age-maturity categories.

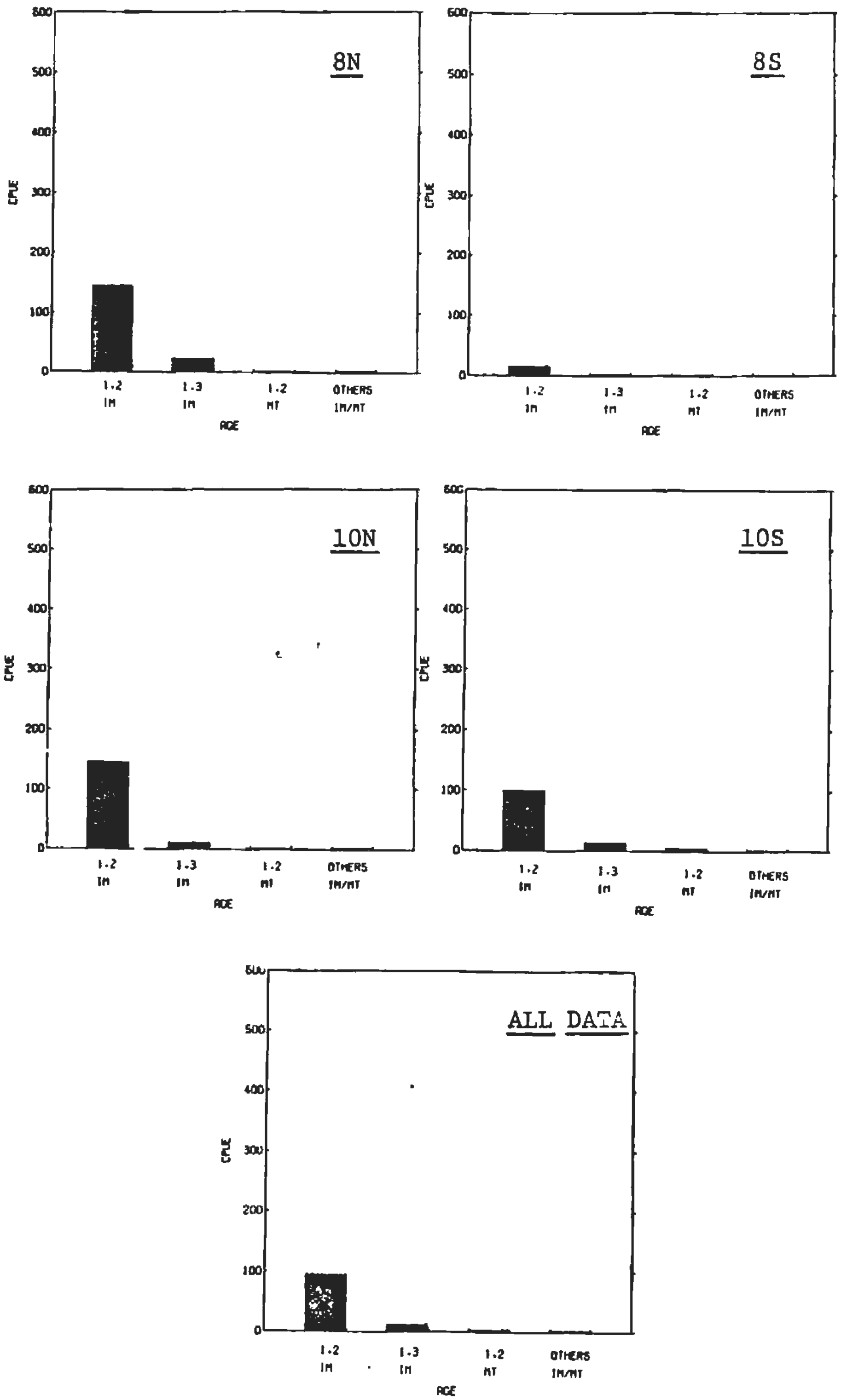

Fig. 13. Histograms of average CPUE for the mothership fishery, by area in the central Bering Sea and all data combined (bottom), by major age-maturity categories.

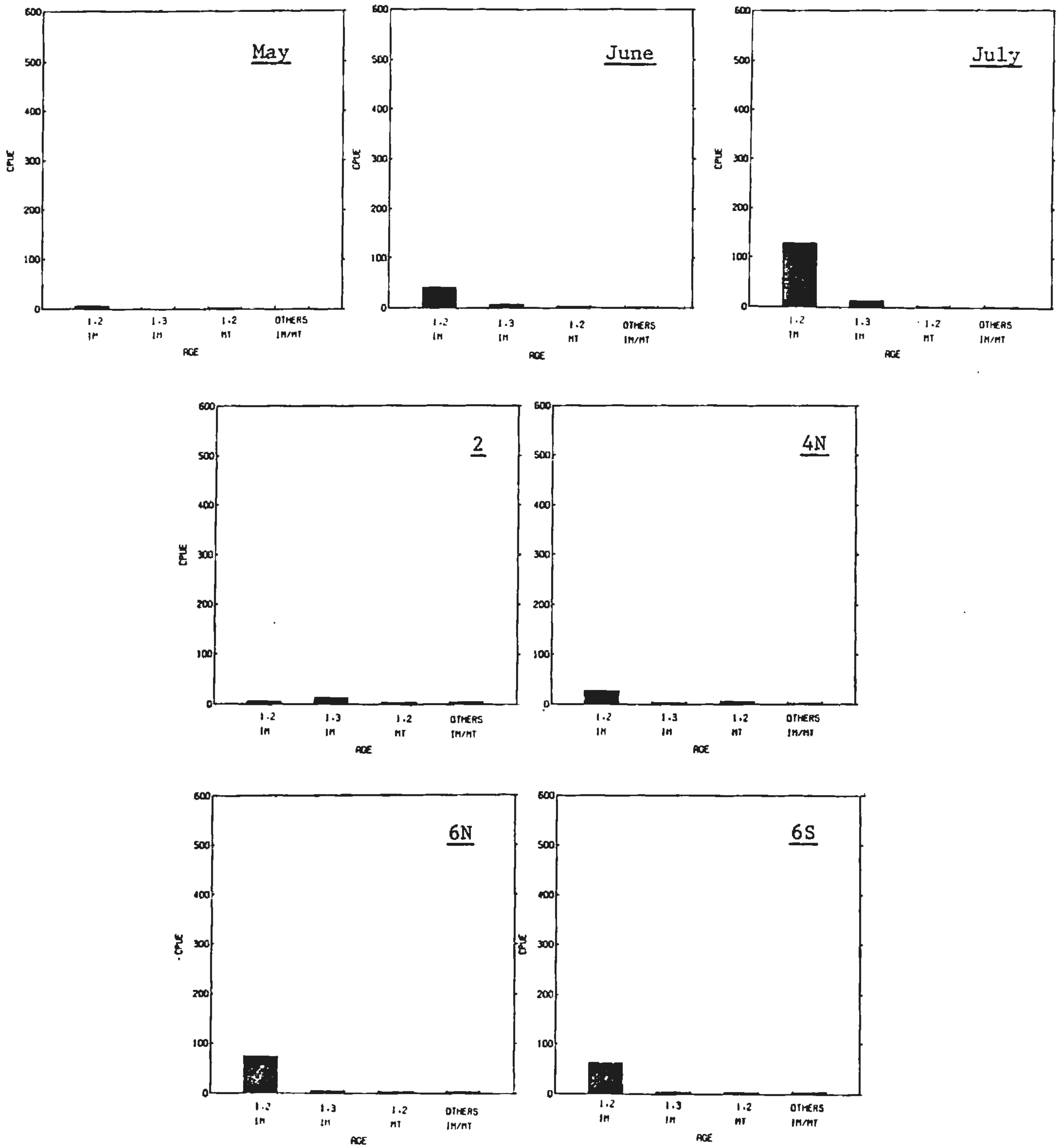

Fig. 12. Histograms of average CPUE for the mothership fishery, by month (top), by area in the western Bering Sea, by major age-maturity categories.

The research vessels did not have the same area limitations as the mothership fishery. To analyze these data, we used similar zones to those used in the mothership fishery analysis and these zones are depicted in Fig. 10.

The research vessels use two different net types. Type "A" net is basically the same as the mothership net, mesh size of 121 mm and 130 mm. Type "C" net is a variable mesh net with 10 mesh sizes of 48, 55, 63, 72, 82, 93, 106, 121, 138, and 158 mm (Ito and Takagi 1981), and catches from this net are different than those from "A" net. We will discuss the catch from "A" net first, due to its similarity to the mothership catch, and then discuss the results from the "C" net catches.

Research Vessel "A" Net

The percent of CPUE by age class for the Japanese research vessel "A" net catch is given in Table 19. The shifts in the percent of 1.3 immature fish as shown by the mothership data (yearly range 1.92% to 33.20% $\bar{x}$ = 10.54%) are shown to a greater degree in the research vessels catch (yearly range 0.22% to 53.82% $\bar{x}$ = 11.12%) with a greater than average catch of 1.3 fish occurring in the central Bering Sea zones of 8N and 8S, for both the research vessel "A" net and the mothership catches.

Figs. 14 to 18 depict the CPUE for these different age classes. The increase in chinook catch, as in the mothership fishery, for the years 1979 to 1980 are shown by these histograms.

Research Vessel "C" Net

The percent of CPUE by age class for the Japanese research vessel "C" net is given in Table 20. The difference in age classes caught by the "C" net versus the "A" net is due to the catch of 1.1 fish (2.49% of total CPUE for reserach vessel "A" net versus 49.02% of total CPUE for research vessel "C" net). The variation between immature age classes is more pronounced with the "C" net catches than the "A" net catches. The catch is mainly composed of 1.1 immature chinook (5 out of 9 years) and 1.2 immature chinook are the second largest catch (major composition of catch 3 out of 9 years). The catch of mature 1.2 chinook was small for all years, months, and areas except for zone 16S, which had a 100% mature catch (66.67% 1.1 mature and 33.33% 1.2 mature).

The research vessels fish further east than the mothership boats, and the catches in the eastern Bering Sea appear to be different. They are reporting a catch of primarily 1.3 fish, and both the catches from "A" net and "C" nets concur.

Figures 19 to 23 depict the CPUE for the different major age classes. These histograms show the increase in the 1.2 immature fish for 1979 and 1980, which was the major composition of the "A" net catches in those years. However, the "C" net catches show a higher total CPUE in 1979

Table 19. Percent of CPUE by age class for the Japanese research vessel catch, type A net.

Category		Immature % 1.1	Immature % 1.2	Immature % 1.3	Mature (%) 1.2	Others (%)[1]	Number of days (n)	Average CPUE[2]
Total		2.49	83.51	11.12	0.76	2.12	650	36.29
Year	1972	0.00	58.91	28.84	2.72	9.53	111	13.90
	1973	0.00	36.05	53.82	2.82	7.31	99	6.08
	1974	0.00	86.69	6.13	3.03	4.15	96	15.81
	1975	0.97	87.26	8.18	0.95	2.64	108	45.86
	1976	0.00	68.00	18.67	6.67	6.66	116	0.65
	1977	0.00	71.77	27.31	0.42	0.50	44	54.09
	1978	10.19	82.05	5.47	0.00	2.29	30	94.53
	1979	5.13	94.14	0.22	0.00	0.51	26	172.46
	1980	0.40	89.04	10.12	0.23	0.21	20	259.95
Month	May	0.00	90.16	0.00	0.00	9.84	7	17.43
	June	0.00	75.55	18.65	2.23	3.58	232	23.02
	July	3.18	85.80	9.22	0.32	1.48	298	57.01
	August	4.22	85.94	5.27	0.44	4.13	112	10.16
	Sept.	0.00	0.00	0.00	0.00	0.00	1	0.00
Western Bering	2N	100.00	0.00	0.00	0.00	0.00	15	0.33
	2S	-	-	-	-	-	0	-[4]
	4N	5.34	51.15	7.63	0.00	35.88	53	2.47
	4S	0.00	0.00	0.00	0.00	0.00	8	0.00
	6N	0.78	83.80	10.16	0.99	4.27	63	30.48
	6S	0.00	85.37	9.49	3.39	1.75	20	36.60
Central Bering Sea	8N	0.60	83.46	12.34	1.19	2.41	114	47.99
	8S	0.00	71.99	25.26	1.18	1.57	42	36.38
	10N	4.82	84.43	8.93	0.35	1.47	180	60.86
	10S	0.00	90.41	8.37	0.45	0.77	67	33.00
	12N	0.00	78.84	18.43	1.37	1.36	27	10.85
	12S	0.00	81.46	11.92	0.00	6.62	18	16.78
Eastern Bering Sea	14N	0.00	0.00	0.00	0.00	0.00	4	0.00
	14S	0.00	10.81	89.19	0.00	0.00	5	7.40
	16N	0.00	0.00	0.00	0.00	0.00	26	0.00
	16S	0.00	0.00	0.00	0.00	0.00	8	0.00
3		-	-	-	-	-	-	-[4]

[1]All other age classes mature and immature.

[2]Average CPUE = $\frac{\sum_{1}^{n} CPUE}{n} \times 1000$

[3]South of Aleutian Islands.
[4]No fishing.

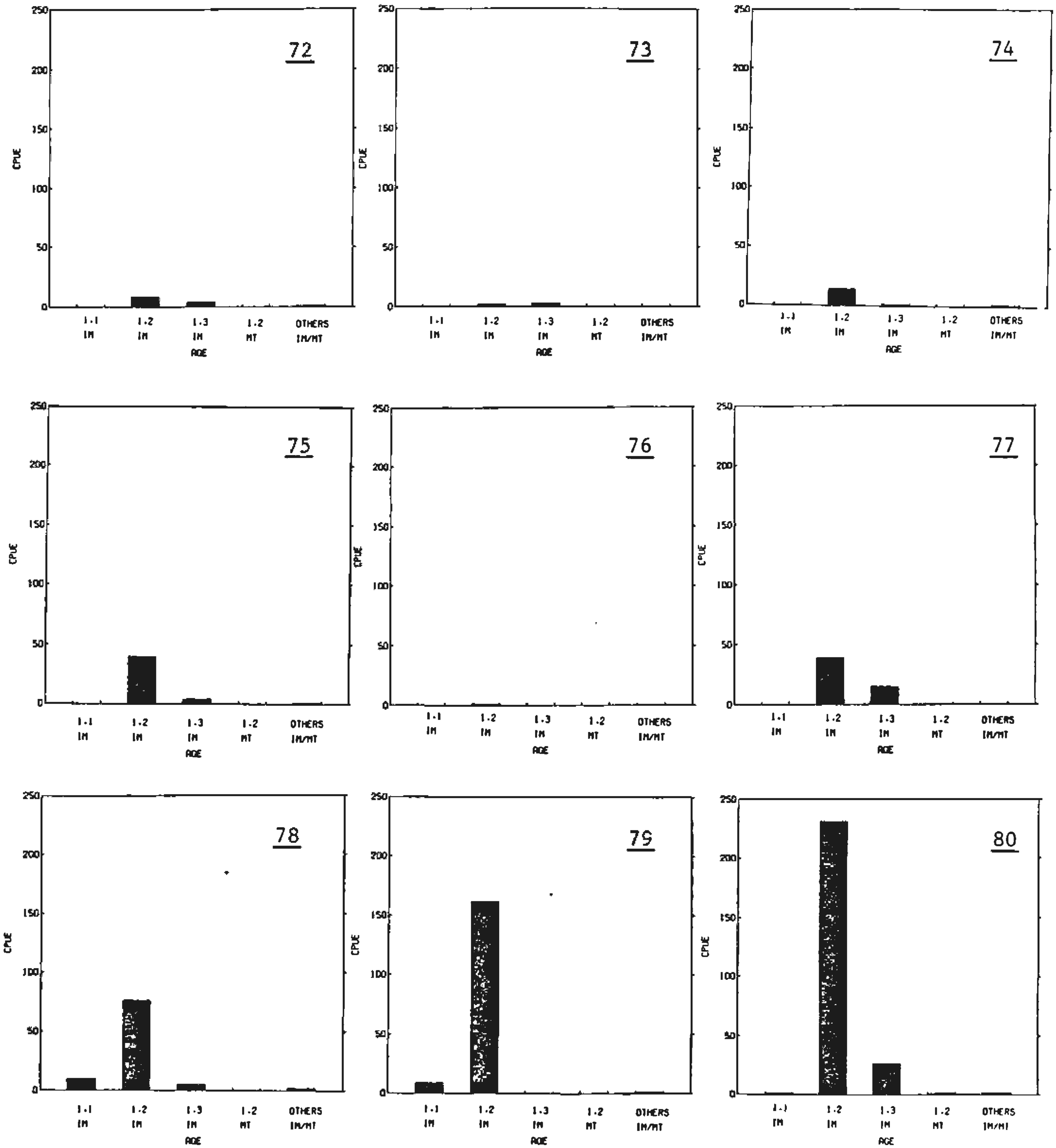

Fig. 14. Histograms of average CPUE for the research vessel (type A-net) 1972-1980, by major age-maturity categories.

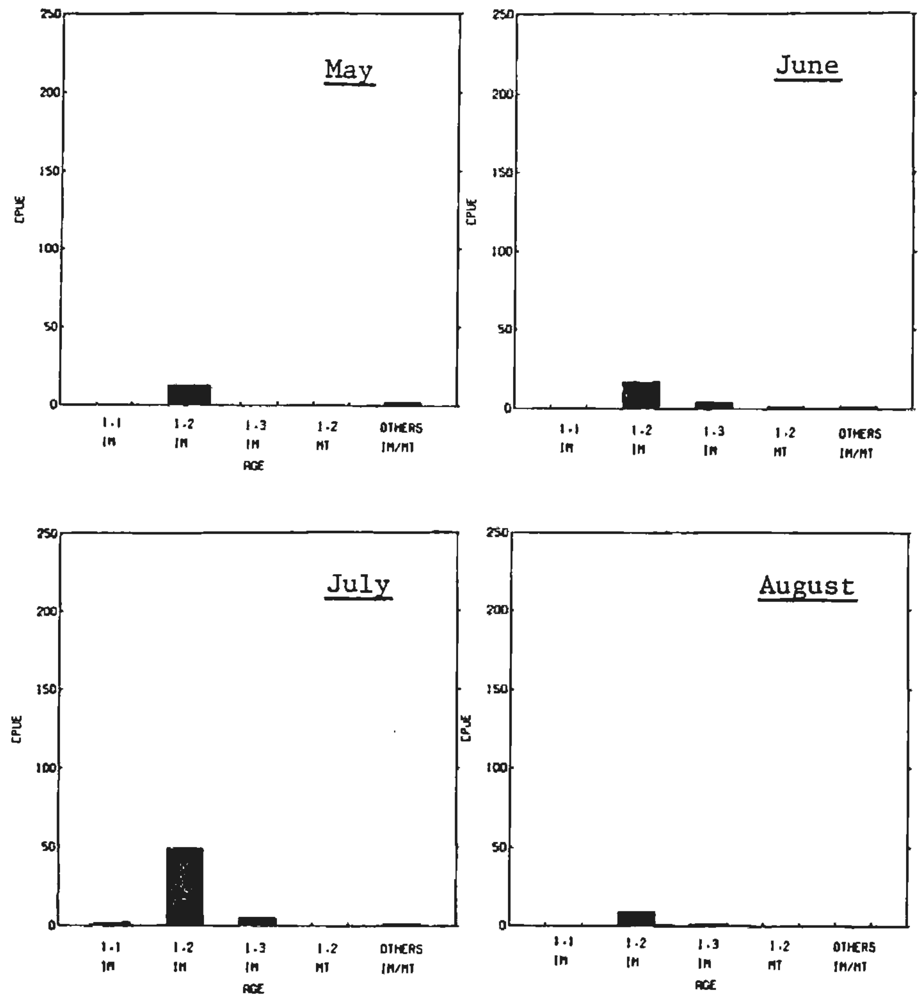

Fig. 15. Histograms of average CPUE for the research vessel (type A-net) by month, by major age-maturity categories.

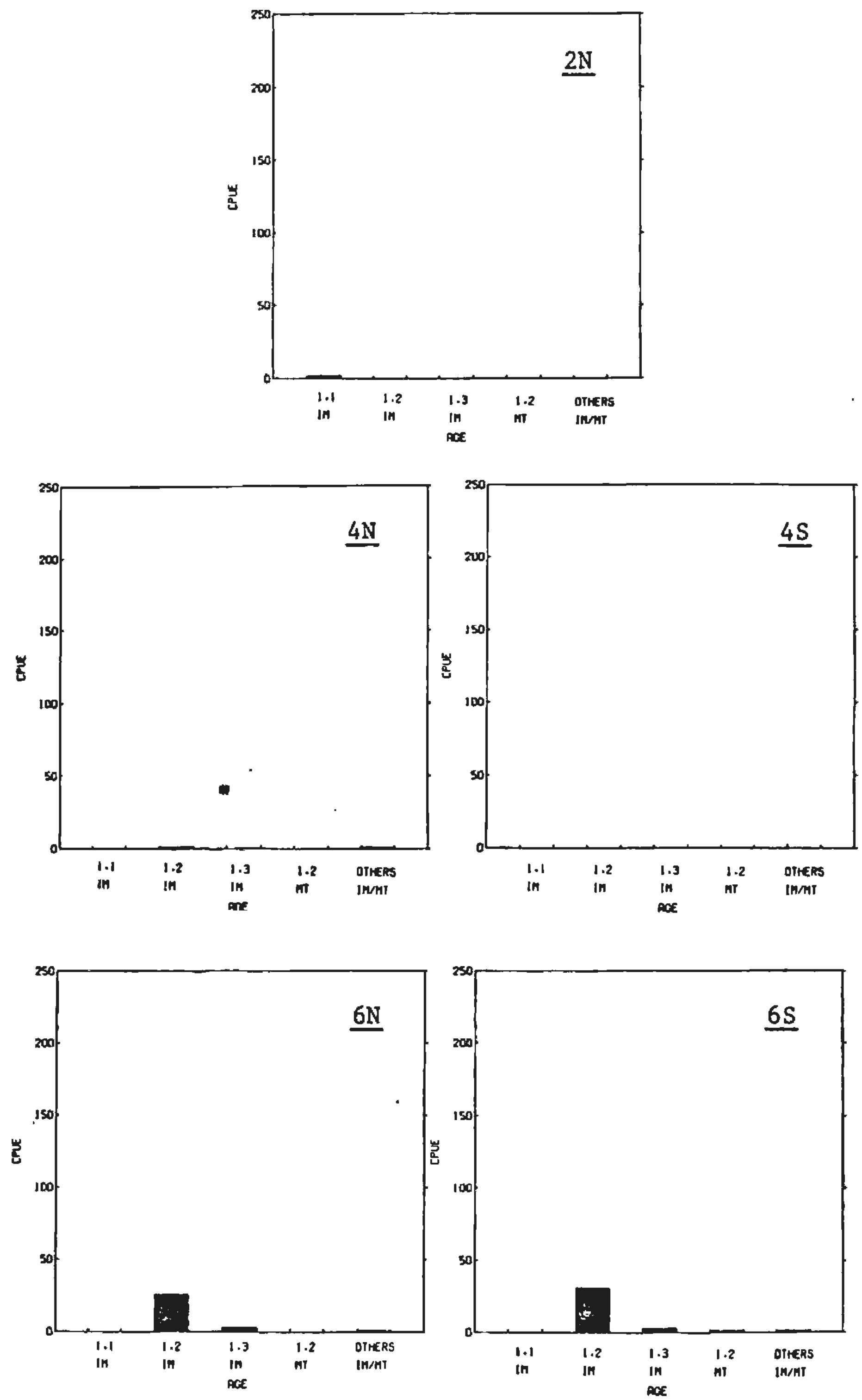

Fig. 16. Histograms of average CPUE for the research vessel (type A-net) by area in the western Bering Sea, by major age-maturity categories.

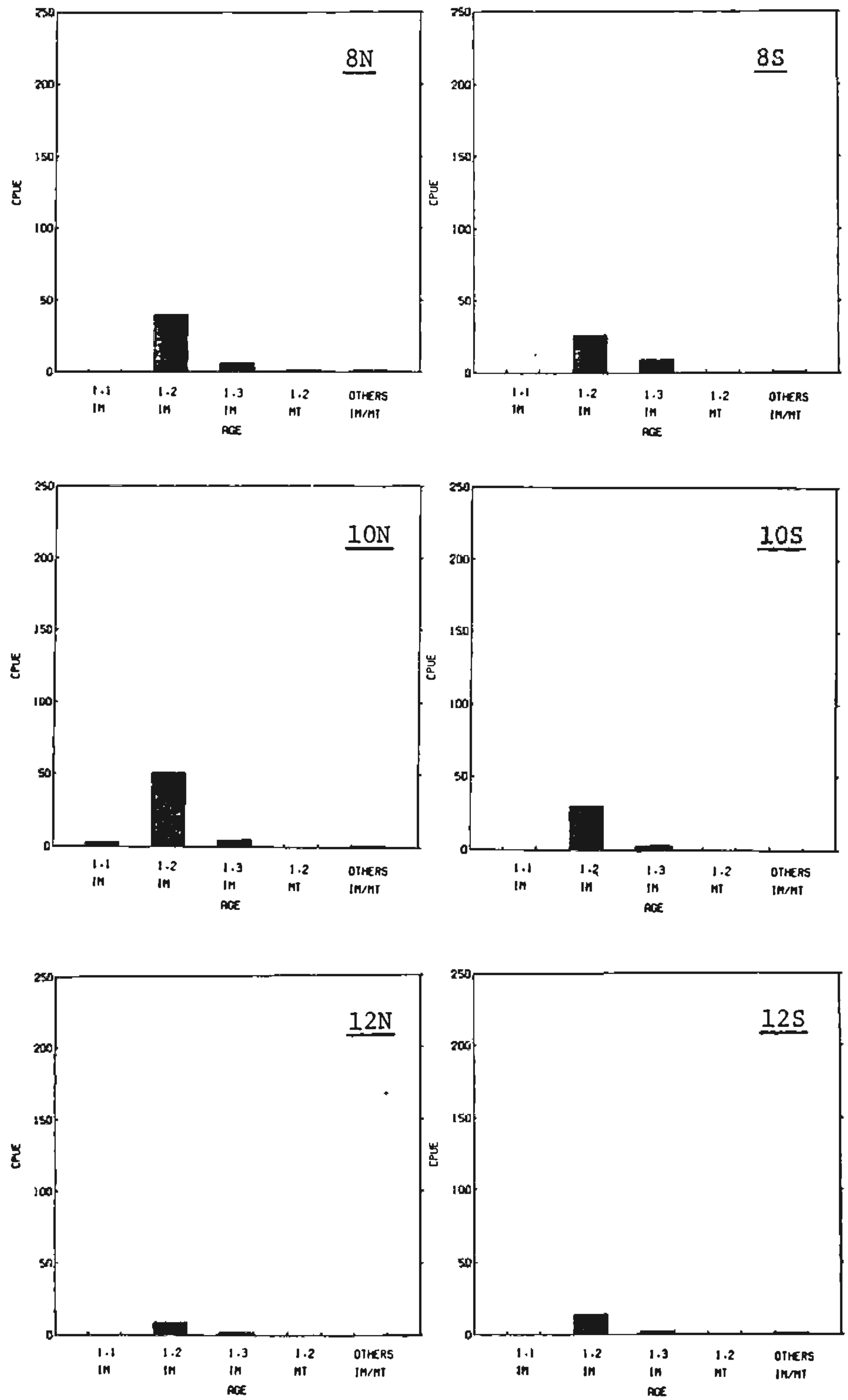

Fig. 17. Histograms of average CPUE for the research vessel (type A-net) by area in the central Bering Sea, by major age-maturity categories.

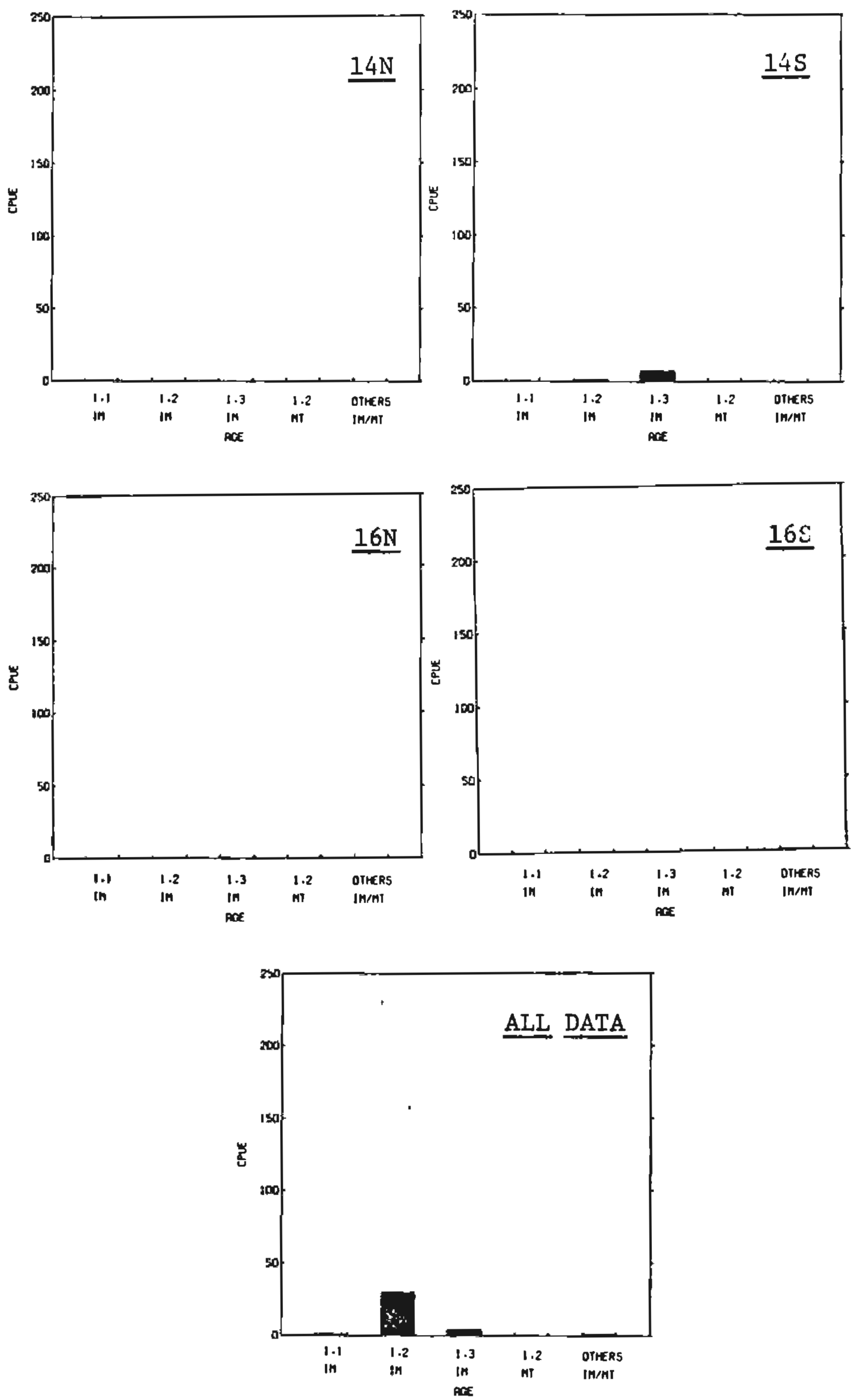

Fig. 18. Histograms of average CPUE for the research vessel (type A-net) by area in the eastern Bering Sea, and all data combined (bottom), by major age-maturity categories.

Table 20. Percent of CPUE by age class for the Japanese research vessel catch, type C net.

Category		Immature % 1.1	Immature % 1.2	Immature % 1.3	Mature (%) 1.2	Others (%)[1]	Number of days (n)	Average CPUE[2]
Total		49.02	38.51	6.13	2.41	3.93	652	18.68
Year	1972	36.15	29.65	17.22	4.80	12.18	115	13.20
	1973	73.39	14.48	2.08	3.35	6.70	98	11.28
	1974	53.20	36.66	4.35	1.44	4.35	96	23.93
	1975	64.21	29.80	1.08	1.24	3.67	107	28.54
	1976	33.33	66.67	0.00	0.00	0.00	116	0.52
	1977	52.17	37.08	10.74	0.00	0.01	44	35.55
	1978	0.00	0.00	0.00	0.00	0.00	30	0.00
	1979	27.30	68.04	0.00	4.67	0.00	26	55.23
	1980	16.37	65.87	13.88	3.89	0.00	20	54.05
Month	May	0.00	0.00	0.00	0.00	0.00	7	0.00
	June	62.64	27.67	6.51	1.51	1.67	229	21.94
	July	37.34	48.18	5.32	3.25	5.91	297	22.49
	August	69.10	17.33	13.57	0.00	0.00	118	4.06
	Sept.	0.00	0.00	0.00	0.00	0.00	1	0.00
Western Bering Sea	2N	100.00	0.00	0.00	0.00	0.00	14	2.86
	2S	-	-	-	-	-	0	-[4]
	4N	86.39	0.00	13.61	0.00	0.00	56	3.02
	4S	0.00	0.00	0.00	0.00	0.00	8	0.00
	6N	39.66	33.38	5.51	0.00	21.45	70	9.33
	6S	54.47	38.97	6.56	0.00	0.00	22	22.86
Central Bering Sea	8N	34.67	50.46	4.88	5.15	4.84	113	23.04
	8S	86.30	12.23	1.47	0.00	0.00	40	34.13
	10N	44.68	42.05	8.99	2.14	2.14	178	26.24
	10N	51.85	39.86	2.20	2.20	3.89	66	15.17
	12N	58.40	33.33	8.27	0.00	0.00	26	15.35
	12S	50.00	50.00	0.00	0.00	0.00	17	35.29
Eastern Bering Sea	14N	100.00	0.00	0.00	0.00	0.00	5	6.60
	14S	0.00	0.00	100.00	0.00	0.00	5	6.60
	16N	0.00	5.71	94.29	0.00	0.00	24	4.63
	16S	0.00	0.00	0.00	33.33	66.67	8	0.00
[3]		-	-	-	-	-	-	-[4]

[1]All other age classes mature and immature.

[2]Average CPUE = $\frac{\sum_{1}^{n} CPUE}{n} \times 1000$

[3]South of Aleutian Islands.

[4]No fishing.

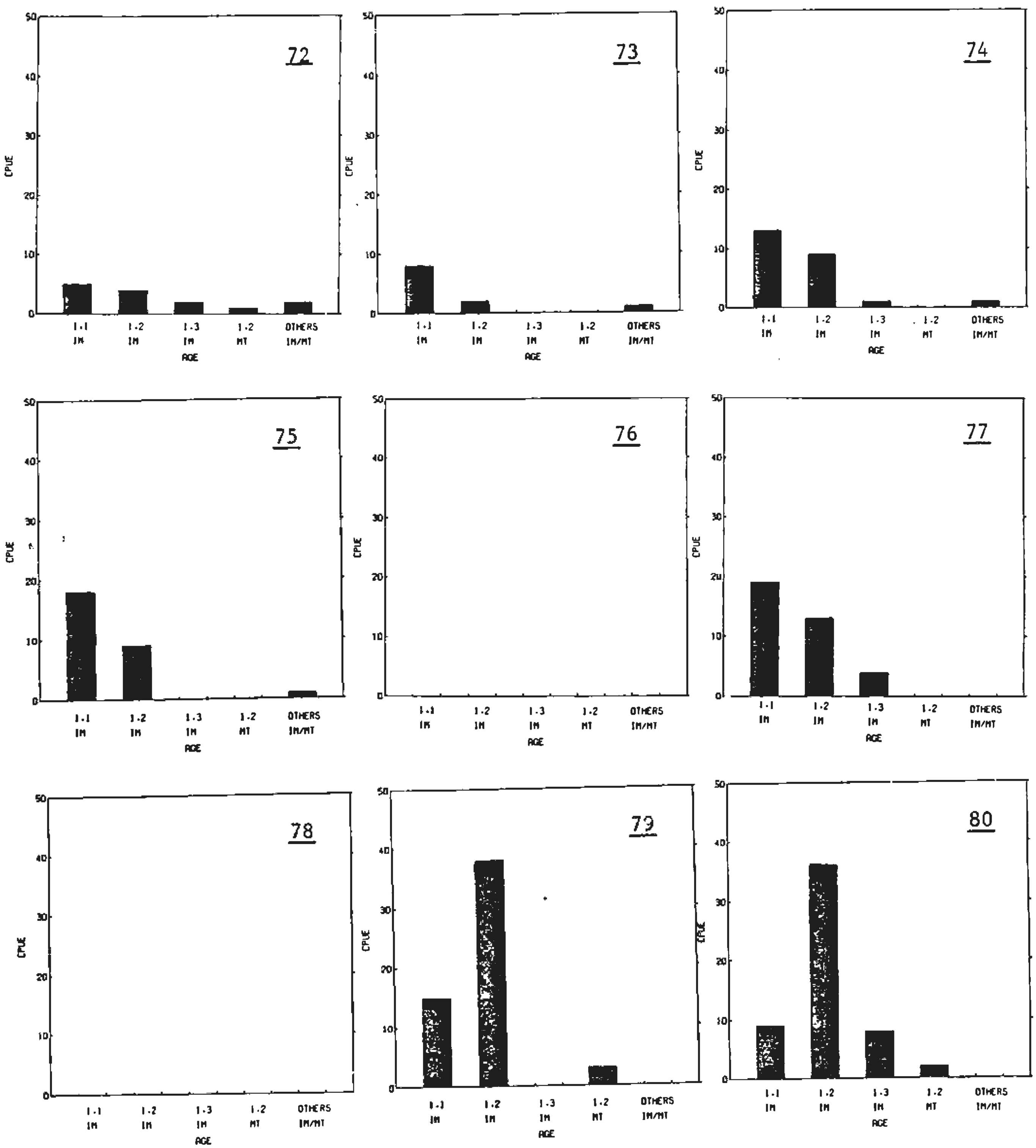

Fig. 19. Histograms of average CPUE for the research vessel (type C-net) 1972-1980, by major age-maturity categories.

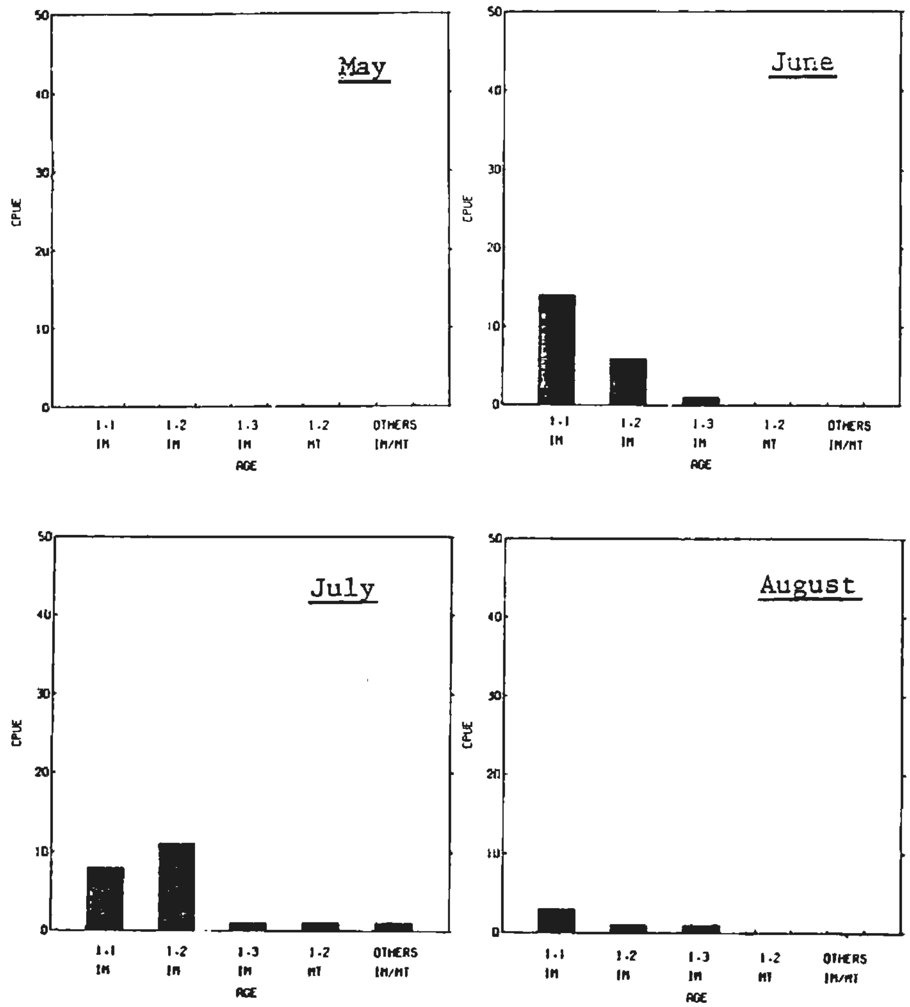

Fig. 20. Histograms of average CPUE for the research vessel (type C-net) by month, by major age-maturity categories.

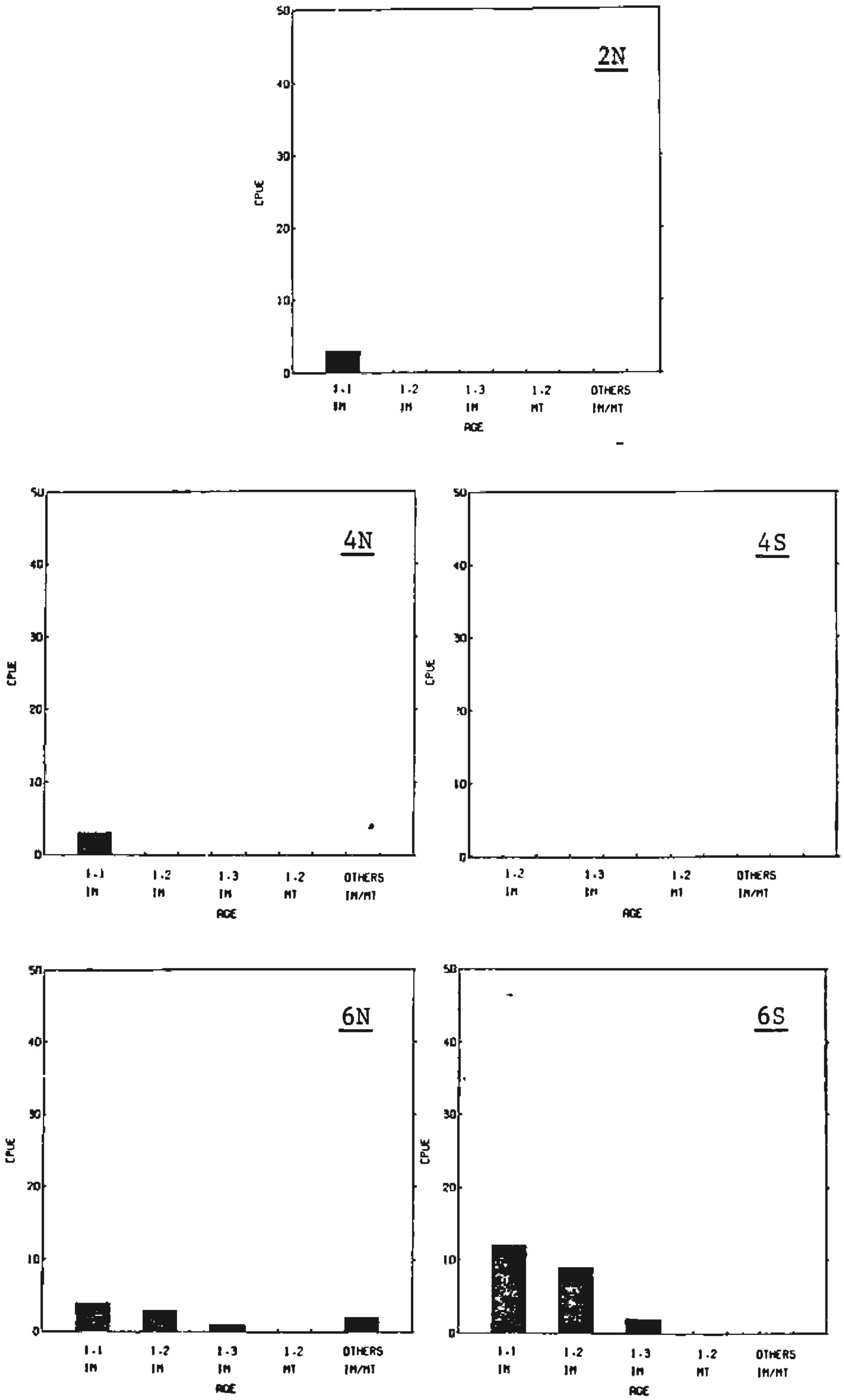

Fig. 21. Histograms of average CPUE for the research vessel (type C-net) by area in the western Bering Sea, by major age-maturity categories.

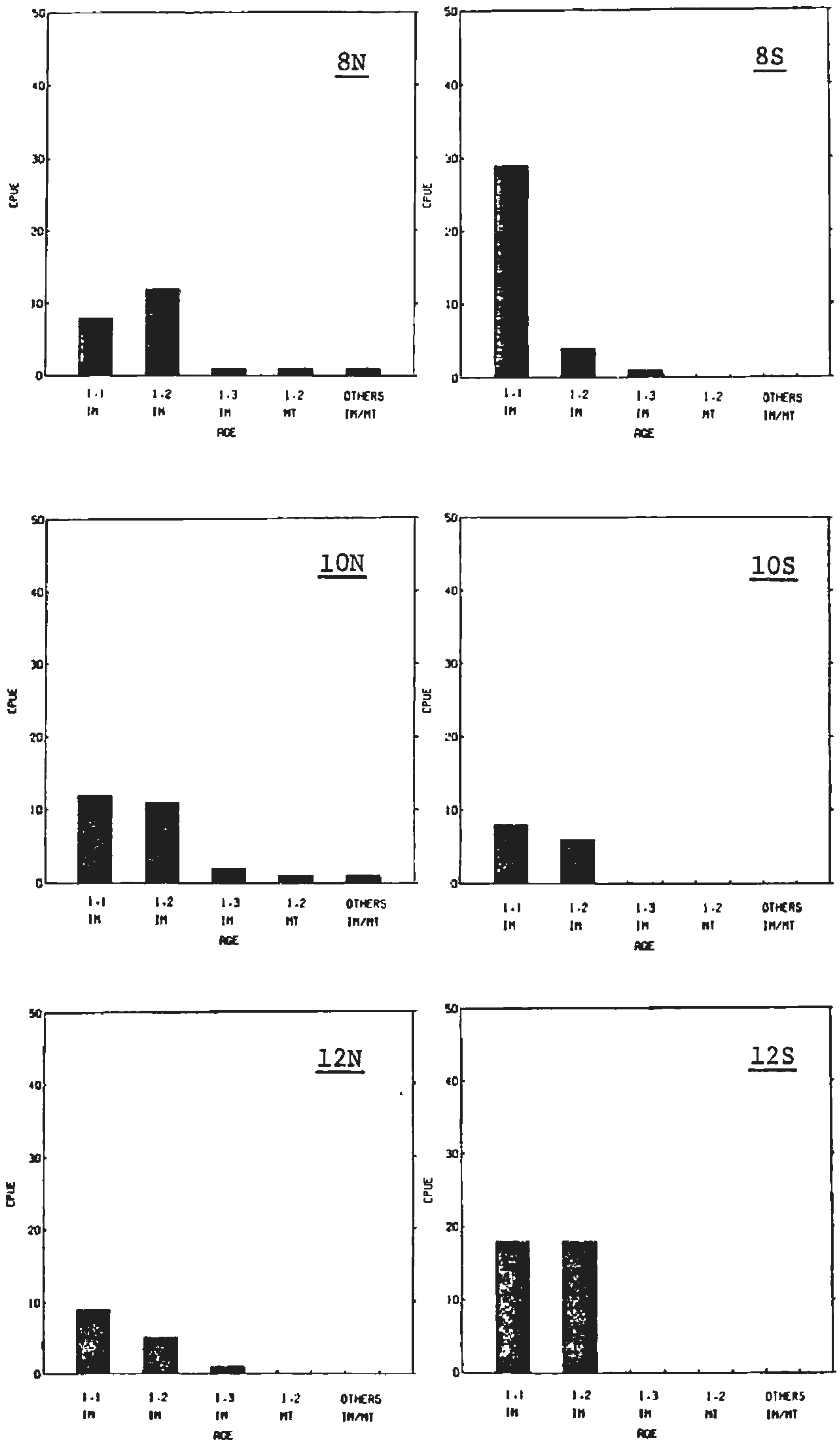

Fig. 22. Histograms of average CPUE for the research vessel (type C-net) by area in the central Bering Sea, by major age-maturity categories.

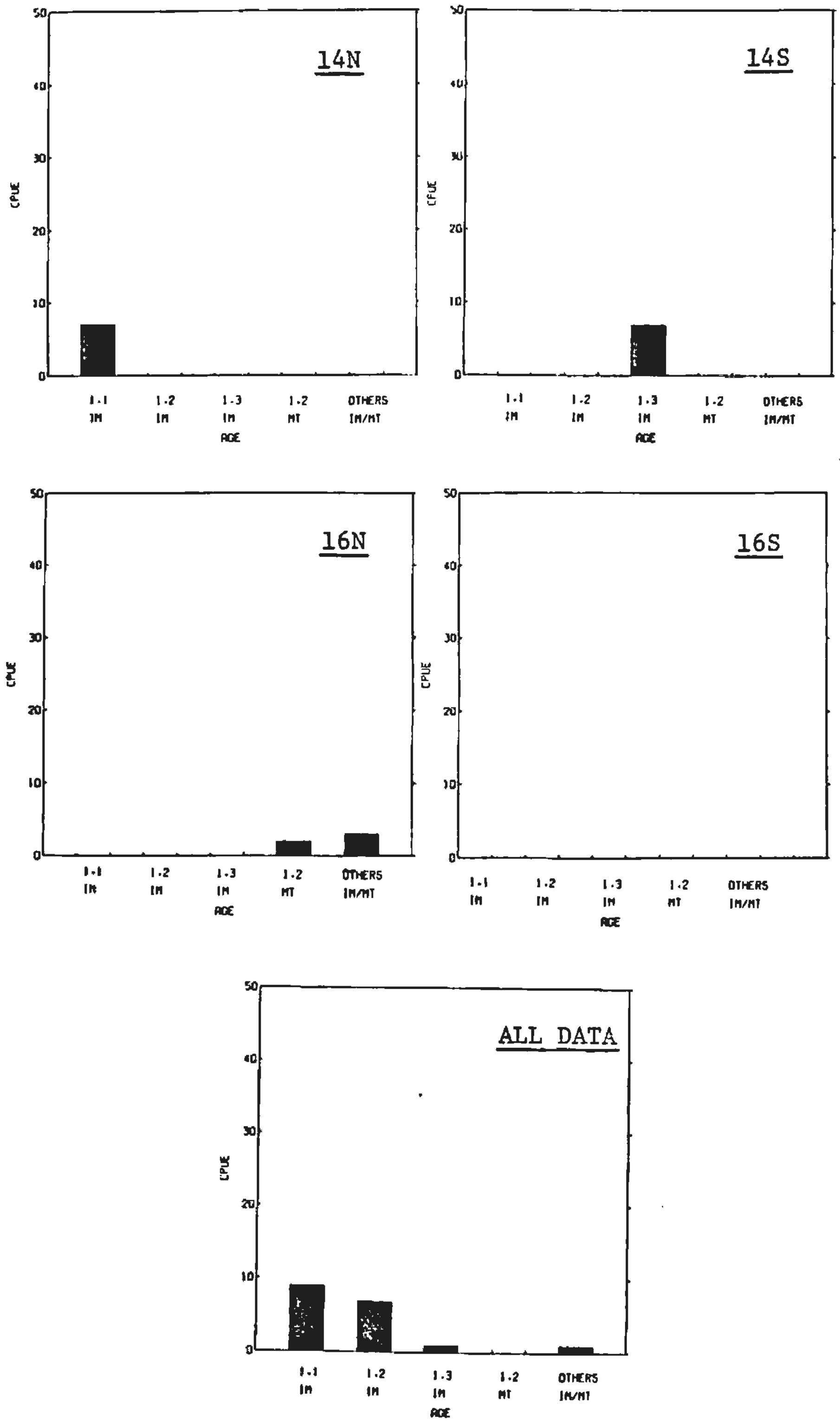

Fig. 23. Histograms of average CPUE for the research vessel (type C-net) by area in the eastern Bering Sea and all data combined (bottom), by major age-maturity categories.

than in 1980, which was not shown by the mothership or research "A" net catches.

The greatest CPUE occurs in the months of June and July for chinook in the mothership catch and the research vessel "A" and "C" net catches. The July "C" net average CPUE is higher than June's by 0.55 CPUE, which is lower than the 33.99 CPUE difference between these months for the research vessel "A" nets CPUE and the 94.57 CPUE difference between July and June for the mothership.

The highest CPUE for the research vessel "C" nets occurs in the central Bering Sea zones which concurs with the research vessel "A" nets CPUE and the mothership CPUE.

Differences occurred in all three catches of chinook (mothership and research "A" and "C" nets) in the Bering Sea, but important similarities in the data show areas of highest chinook concentrations (central Bering Sea), increases in CPUE between the various years and months the fishery occurs in the Bering Sea, and that the catch shifts from primarily 1.1 and 1.2 immature chinook in the western and central Bering Sea to 1.3 immature chinook in the eastern Bering Sea.

SUMMARY

Scales from chinook of known rivers of origin have been collected from Russia to California from 1972 to 1981. Only the Columbia River and coastal Oregon have not been sampled, but sampling is scheduled early in the next funding period. Additional samples from Russia are being requested, also. An appendix which contains the list of scales at FRI is included with this report.

We recommend that two chinook scales be taken in future sampling, one from the preferred area on each side of the fish, because we frequently encountered regenerated scales in our samples. Regenerated scales are unsuitable for scale pattern measurements. The methods of scale measurement and data collection have been coordinated with the Stock Separation Lab, ADF&G.

The mothership fishery age distribution-catch data have been weighted by effort to examine trends in the Bering Sea fishery. Additional analysis will occur after the complete data is received from the Fishery Agency of Japan.

A review of the biology and information on the origins of chinook in the past and present mothership fishery area is discussed and this report contains a bibliography which references information collected during the first year of the study.

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APPENDIX 1

Appendix 1. Listing of Chinook Scale Samples

Sample Site	cd#	Date
Kamchatka R.	1	June 5, 1975
"	2	" "
"	3	June 15, "
"	4	" "
"	5	June 30, "
"	6	" "
"	7	July 15, "
"	8	" "
Kamchatka R.	1	June 10, 1976
"	2	" "
"	3	June 19, "
"	4	" "
"	5	June 23, "
"	6	" "
"	7	July 1, "
"	8	" "
Kamchatka R.	1	June 1, 1978
"	2	" "
"	3	June 13, "
"	4	" "
"	5	June 16, "
"	6	" "
"	7	July 11, "
"	8	" "
Kamchatka R.	1	June 29, 1979
"	2	" "
"	3	July 5, "
"	4	" "
"	5	July 16, "
"	6	" "
Kamchatka R.	1	June 16, 1980
"	2	" "
"	3	June 18, "
"	4	" "
"	5	July 7, "
"	6	" "
"	7	July 12, "
"	8	" "
Bol'shaya R.	9	June 10, 1975
"	10	" "
"	11	June 20, "
"	12	" "
"	13	June 25, "
"	14	" "
"	15	June 29, "
"	16	" "

Sample Site	cd#	Date
Bol'shaya R.	9	June 15, 1976
"	10	" "
"	11	June 16, "
"	12	" "
"	13	June 25, "
"	14	" "
"	15	" "
"	16	June 28, "
"	17	" "
Bol'shaya R.	9	May 31-June 2, 1978
"	10	" "
"	11	June 22, "
"	12	" "
"	13	June 26-29, "
"	14	" "
Bol'shaya R.	7	May 30, 1979
"	8	" "
"	9	June 11, "
"	10	" "
"	11	June 21, "
"	12	" "
"	13	July 1, "
"	14	" "
Bol'shaya R.	1	June 11, 1980
"	2	" "
"	3	June 17, "
"	4	" "
"	5	June 21, "
"	6	" "
"	7	June 25, "
"	8	" "

Sample Site		cd#	Date
Western Alaska			
Lower Yukon R.			
Emmonak	8-1/2 in mesh	1-4	1975
"	"	6-7	"
"	"	9-15	"
"	"	17-18	"
"	"	23-29	"
"	"	34-39	"
"	"	40	"
"	"	45-51	"
Emmonak	8-1/2 in mesh	1	1976
"	"	3-8	"
"	"	11-17	"
"	"	22-28	"
"	"	34-39	"
"	"	44-50	"
Emmonak	8-1/2 in mesh	1-12	1977
"	"	17-23	"
"	"	28-34	"
"	"	54	"
"	"	58	"
"	5-1/2 in mesh	40-41	"
"	"	54-55	"
"	"	60	"
"	"	65	"
Emmonak Preseason	5-1/2 in mesh	1	1978
"	"	3	"
"	"	7	"
"	8-1/2 in mesh	10	"
			"
Emmonak Commercial	"	17-20	"
"	"	25-29	"
"	"	34-40	"
"	"	45-46	"
"	"	51-57	"
"	"	62-63	"
"	5-1/2 in mesh	62	"
"	"	68	"
"	"	70-74	"

Sample Site		cd#	Date
Emmonak Commercial	5-1/2 in mesh	78-79	1978
"	"	85	"
"	"	90-91	"
"	"	96	"
"	"	101	"
"	"	106	"
"	"	111	"
"	"	114	"
Emmonak Commercial	8-1/2 in mesh	1A	1979
"	"	1-7	"
"	"	9-15	"
"	"	17-23	"
"	"	28-34	"
"	"	39-45	"
"	"	50-55	"
"	"	64	"
"	5-1/2 in mesh	65-70	"
"	"	75-77	"
"	"	82-86	"
"	"	91-93	"
Emmonak Commercial	5-1/2 in mesh	1-51	1981
Flat Island Test Fishing	8-1/2 in mesh	11	1976
"	"	14	"
"	"	16	"
"	"	18	"
"	"	22	"
"	"	28-29	"
"	"	33	"
"	"	36	"
"	"	42-43	"
"	"	46	"
"	5-1/2 in mesh	1	"
"	"	4	"
"	"	8	"
"	"	12-13	"
"	"	20	"
"	"	24	"
"	"	26	"
"	"	30	"
"	"	41	"
Emmonak Commercial	"	34-35	"

Appendix 1 (cont.'d)

Sample Site		cd #	Date
Western Alaska			
Lower Yukon R.			
Emmonak Commercial	5-1/2 in mesh	45	1976
"		50	
Flat Island Test Fishing	8-1/2 in mesh	1	1977
"	"	6-8	"
"	"	12	"
"	"	16	"
"	"	21	"
"	"	25	"
"	"	29	"
"	"	32	"
"	"	36	"
"	"	39	"
"	"	43	"
"	"	47	"
"	"	51	"
"	"	55	"
"	"	59	"
"	"	63	"
"	"	67	"
"	"	69	"
"	"	73	"
"	"	75	"
"	"	78	"
"	"	80	"
"	"	83	"
"	5-1/2 in mesh	10	"
"	"	15	"
"	"	23	"
"	"	27	"
"	"	32	"
"	"	37	"
"	"	41	"
"	"	45	"
"	"	49	"
"	"	53	"
"	"	62	"
"	"	2 unrdbl #'s	"
Flat Island Commercial	"	71	"
"	"	77	"
"	"	84	"

Sample Site		cd#	Date
Flat Island Commercial	5-1/2 in mesh	1 unrdbl #	1977
Flat Island Test Fishing	8-1/2 in mesh	2	1978
"	"	4	"
"	"	6	"
"	"	8-9	"
"	"	12-13	"
"	"	17	"
"	"	20	"
"	"	23	"
"	"	26	"
"	"	28	"
"	"	31	"
"	"	36	"
"	"	38	"
"	"	41	"
"	"	44	"
"	"	45	"
"	"	48	"
"	"	52	"
"	"	55	"
"	"	58	"
"	"	60	"
"	"	62	"
"	"	66	"
"	"	68	"
"	"	1 unrdbl #	"
"	5-1/2 in mesh	35	"
"	"	65	"
East Fork Andreafsky R.		1-5	1981
"		10	"
"		13-17	"
"		19-20	"
"		26-36	"
West Fork Andreafsky R.		1-2	1981
Anvik R.		1-30	1981
"		1 unrdbl #	"
Middle Yukon R.			
Chena R. Escap.		1-14	1981

Sample Site	cd #	Date
Western Alaska		
Middle Yukon R.		
Salcha R. Escap.	odd #'s from 1-63	1981
Big Eddy Creek	1-19	"

Appendix 1 (cont.'d)

Sample Site	Bk #	Date
Yukon Territory		
Upper Yukon R.		
Dawson	1	July 1975
	2	"
	3	"
	4	"
	5	"
	6	"
	7	"
	8	"
	9	"
	10	"
	11	31 July- 1 Aug
	12	1 Aug
	13	1-2 Aug
	14	2,4 Aug
	15	4-5 Aug
	16	5 Aug
	17	5-6 Aug
	18	6-7 Aug
	19	8 Aug
	20	"
	2 (GN)	July
	4 (Wheel)	"
	5 GN	"
	6 GN	1975
	8 GN	31 July- 6 Aug
	10 GN	7 Aug
Dawson Studies	1	2 Aug 1976
	2	5 Aug
	3	6 Aug
	4	7 Aug
	5	8 Aug
	6	8 Aug
	7	8 Aug
	8	9 Aug
Dawson Fishway	9	3 Aug
Dawson Fishery	10	3 Aug
	11	8 Aug
	12	4 Aug
	13	4 Aug
	14	4 Aug
	15	4-5 Aug
Yukon R. (Dead Recov)	1	9 Sep
	2	13 Sep
Fresno Cr.	6	1 Aug
	8	2 Aug
	11	(fish # 95-105)

Appendix 1 (cont.'d)

Sample Site	Bk #	Date
Yukon Territory		
Upper Yukon R.		
Yukon R. Mainstem	one	4 Aug 1977
Whitehorse fshwy	1	17 Aug
	2	Aug
	3	"
10-14 mi downstream Yukon, Dawson	2	29 July
28 mi downstream Yukon, Dawson	3	30 "
Yukon-Dawson	4	5 Aug
28-35 mi downstream Yukon, Dawson	5	5 "
10 mi downstream Yukon, Dawson	6	5 "
10 mi downstream Yukon, Dawson	7	6 "
10 mi downstream Yukon, Dawson	8	6 "
3.5 mi downstream Yukon, Dawson	9	6 "
35 mi downstream Yukon, Dawson	10	6 "
10 mi downstream Yukon, Dawson	11	6 "
12-15 mi downstream Yukon, Dawson	12	13 "
Chanidu Cr.	2	29 July 1978
	3	30 "
	4	30 "
	8	30 "
	9	31 "
Woodchopper Cr.	W-1	8 Aug
	W-2	1978
	W-3	5 Aug
	5	30 Jul
	6	30 "
	7-1	28 "
	7-2	30 "
	10	31 "
	13	4 Aug
	14	4 Aug
Whitehorse fishway	1	Aug
	2	7 Aug
	3	8 Aug?
	4	Aug
	5	"
	6	Sept
	7	Aug
Dawson	11	2-3 Aug
	12	4 Aug
	15	4 "
	16	4 "
	A	1978
Yukon	B	1978
	C	1978
	D	1978
	E	1978

Sample Site	Bk #	Date
Yukon Territory		
Upper Yukon R.		
Yukon	1	9 July 1980
	2	10 July
	5	19 July
	6	21 July
	7	21 July
Cassiar Cr.	9	28 July
Yukon	10	28 July
	12	30 July
	13	30 July
Woodchopper Cr.	1	31 July
	2	"
	1	11 Aug
Cassiar Cr.	III	31 July
Cliff Cr.	4	1 Aug
	5	1 Aug
Yukon (Cliff?)	6	1 Aug
Christian Camp	1	2 Aug
Peterson's, Yukon	2	4 Aug
	4	1 Aug
Fresno Cr.	1	25 Aug
Cassiar Cr.	2	7 Aug
	3	8 Aug
Yukon	1	3 July 1981
	2	3 July
	4	4 July
	6	4-5 July
	10	8 July
	13	9-11 July
	14	11 July
	15	11 July
	16	13 July
	18	13 July
	19	13 July
	22	14 July
	23	15 July
	27	16 July
	42	25 July
	43	27 July
	45	28 July
	58	10 Aug
	59	12 Aug
	60	14 Aug
Dawson Comm	1-8	1981
	2 #9's*	"
	10-30	"
	42-43	"
Whitehorse Fishway	1-34	"

*Two cards, same number, with different scales

Sample Site	cd #	Date
Kuskokwim R.		
Bethel Comm.	4-6	1975
"	10-16	"
Bethel Comm.	1	1976
"	3-10	"
"	1 unrdbl #	"
Bethel Comm	1-13	1977
Bethel Comm.	1-12	1978
Quinhagak Comm.	1A	1975
"	1-9	"
Quinhagak Comm.	1-2	1976
"	5-6	"
"	9-10	"
"	13-14	"
"	19-20	"
Quinhagak Comm.	25-26	1976
"	28	"
"	31	"
Quinhagak Comm.	1-21	1977
Quinhagak Comm.	A	1978
"	1-4	"
"	2 # 6's*	"
"	2 # 7's*	"
"	8	"
"	10-15	"
Goodnews Bay Comm.	1-2	1977
Goodnews Bay Comm.	1	1978
"	4	"
Kwegooyuk Test Fish	1-3	1975
"	2 # 4's*	"
"	5-34	"

Sample Site	cd #	Date
Kwegooyuk Test Fish	36-42	1975
"	2 # 43's*	"
"	44-46	"
"	48	"
"	50	"
Bristol Bay		
Nushagak R.	1	1975
"	2 # 2-8's*	"
"	9	"
"	2 # 10-12's*	"
"	13-15	"
Nushagak R.	1-34	1976
Nushagak R.	1-32	1977
Nushagak R.	1-6	1978
"	8-25	"
Nushagak R.	1-29	1979
Nushagak R.	1-21	1980
Nushagak R.	1-27	1981
"	31-48	"
Togiak R.	1-3	1975
Togiak R.	1-20	1976
Togiak R.	1	1977
"	3-18	"
Togiak R.	1-19	1978
Togiak R.	1-15	1979
Togiak R.	1-2	1980
Togiak R.	1-9	1981
Central Alaska		
Kenai R.	1	June 26-July 14, 1981

*Two cards, same number, with different scales.

Appendix 1 (cont.'d)

Sample Site	cd #	Date
Southeast Alaska		
Crystal Cr.	1-27	July 27- Aug 18, 1981
Steep Cr.	1-2	Aug 10, 1981
Little Tahltan R.	1-35	Aug 4-11, 1981
"	37-90	Aug 11-12, 1981
Sashin Cr.	1-44	Aug 6- Sept 5, 1981
Andrew Cr.	1F-6F	July 16- Aug 21, 1981
"	1M-5M	July 16- Aug 17, 1981
"	1-12	Aug 6-20 1981
Nahlin R.	1-12	Aug 3, 1981
Carroll R.	1	July 21- Aug 8, 1981
Cripple Cr.	1-13	Aug 7-15, 1981

Appendix 1 (cont.'d)

Taku R.

Sample Site	Bk	Date
Taku R Pier	1	25 June 1980
Taku R Barge	2	"
"	3	"
"	4	29 June
Taku R Canyon	1	12 July 1981
Taku R Barge	1	29 June
"	2	"
"	3	7-12 July
"	4	13 July
"	5	3 Aug

Stikine River

Sample Site	Bk	Date
Stikine R	one	7-13 1975
	1-A	9 July
	2	13 June
	3	8 July
	4	12 July
Blanchard R	Al	July, Aug 1976
Bucks Bar	SR-2	8-28 July
Stikine R	1	27 May 1977
	19	30 June
	25	4 July
	100	11-21 July
	101	21 July
Stikine R	1	9 July 1979
	2	"
	1	23 July
	1	30 July
Lower Stikine	I	23 June 1980
	IV	24 June
	V	"
	VI	"
	11	30 June
	12	"
	13	"
	16	2 July
	17	"
	18	7 July
	19	8 July
	20	9 July
	22	15 July
	23	15 July
	24	16 July
	26	12 Aug
	27	2 Sep
Stikine Upper Fish.	2	2 July
	3	3 July
Lower Stikine	1	1 July 1981
	2	2-7 July
	3	7-8 July
	4	9-21 July
	5A	22 July - 1-17 Aug
	5B	1-17 Aug
Upper Stikine	1	25 June
	2	29 June
	3	2 July

Klukshu River

Sample Site	Bk	Date	Sample Site	Bk	Date
Klushu R	C 1	July-Aug '76	Klukshu Mouth	6	1-4 July
	F 1	29 July		8	5-11 July
	F 2	Aug '76		9	11 July
	F 3	"		10	13 July
	F 4	"		11	19-26 July
	F 5	"		12	26-28 July
	F 6	"			
	F 7	23 July			
	F 8	12 Aug - 30 Sept			
Tatshenshini	G 1	18 July - 4 Aug			
	3	July			
Klukshu Village	3	13 July '77			
Klukshu R (Motherall)	6	18 July			
Klukshu Village (Motherall)	7	"			
Klukshu Village	8	21-22 July			
	10	22 July			
Klukshu Mouth	2	9 July			
Klukshu	4	July			
Klukshu Mouth	5	July			
	6	July			
	7	23-26 July			
	8	26 July			
	10	29 July			
	11	30 July			
	12	Fall			
	14	Fall ?			
	15	Fall ?			
Klukshu R (Tatshenshini)	1	20 June '80			
Klukshu	2	12 July			
	3	"			
	4	8 July			
	5	13 July			
	6C	4 Aug			
	7 C	6 Aug			
	8 C	7 Aug			
	9 C	13 Aug			
	10 C	15 Aug			
	11(11C)	21 Aug			
Weir Carcass (Klukshu?)	1	29 July-1 Aug '81			
Weir (Klukshu)	2	1-6 Aug			
	3	6 Aug			

Yakoun River

Sample Site	Bk	Date
Yakoun	1	5 Oct 78
	4	Oct
	5	"
	6	"
	7	"
	8	"
Yakoun R Branch 47	two	24 Sept 79
	three	25 Sept
Yakoun R (holding pen)	four	29 Sept
Yakoun R	5	4 Oct
	six	5 Oct
Yakoun R (holding pen)	seven	7 Oct
Yakoun R (mile 22 bridge)	eight	9 Oct
Yakoun R.	nine	5 Oct
Yakoun R. (Beach seine)	1	Aug 80
	2	"
	1	18 Sept
Yakoun (area 1)	2	23 Sept
	3	24 Sept
	4	25 Sept
	5	26 Sept
	6	30 Sept
	7	30 Sept
	8	
Yakoun 2 W	9	1 Oct
Yakoun R	10	"
	11	"
	12	"
	13	3 Oct

Nass River

Sample Site	Bk	Date	Sample Site	Bk	Date
3 Z-Nass	1	1 July,1977	Greenville	10	2 July 1981
	2	5 July		11	3 July
	3	7 July		12	"
	4	13 July		13	4 July
	5	14 July			
3 Z-Nass	1A	19 June, 1978			
"	3	28 June			
3 Z - Comm.	13	12 July			
3 Y	4	3 July			
Meziadin R	1	23 Sept.			
	2	"			
	3	"			
	4	"			
Meziadin R	1	Sum/Fall 1979			
	2	"			
	3	20 Aug			
Cranberry R	1	Fall			
Tseax R	1	"			
	2	"			
	3	"			
	4	"			
	5	"			
	6	"			
Cranberry R	02	11,12 July 1980			
	11	21 July			
	18	25 July			
	23	27,28 July			
	28	29,30 July			
Greenville R	2	19 July			
	3	"			
	4	"			
	5	"			
	6	"			
	7	"			
	8	"			
	9	"			
	10	"			
Meziadin R	1	2-17 July			
	2	18-24 July			
Tseax R	1	25 July			
	3	16-17 Aug			
	4	17 Aug			
	6	30 Aug			
Greenville R	1	19 June 1981			
	2	"			
	3	"			
Nass R @ Grnvl	4	20 June			
	5	20 June			
	6	20 June			
	7	27 June			
	8	"			
Greenville	9	1 July			

Appendix 1 (cont.'d)

Skeena R.

Sample Site	Bk	Date	Sample Site	Bk	Date
Tyee-Skeena	3 C-2	19 June 1975	Tyee (Skeena)	14	5,7,8 July 1977
	3 C-9	7-10 July		15	7-10 July
	3 C-10	11-13 "		16	10-11 July
	3 C-11	13-14 "		17	11-12 July
	3 C-12	15 "		18	12-16 July
	3 C-13	16-17 "		19	16-17 July
	3 C-14	17 "		20	16,18 July
	3 C-15	18 "		21	18,19,21 July
	3 C-15	July		22	20-21 July
	3 C-16	18-19 July	Skeena-Tyee	1	14 June 1978
	3 C-17	19 July	Skeena Test	2	19 June
	3 C-18	20-27 July		3	24 June
	3 C-19	27-29 July		4	26 June
Skeena Test	1	16 June 1976		5	28 June
	2	22-27 June		6	29 June
	3	26-30 "		7	30 June
	4	2-5 July		8	2 July
	5	6-7 July	Skeena	9	4 July
	6	7-9 July	Skeena Test	10	10 July
	7	9-11 July		11	10-14 July
	8	11-12 July		12	15-18 July
	9			13	19-23 July
	10	14-16 July		14	23-24 July
	11	16-17 July		15	29 July-1 Aug
	12	17-18 July	Skeena Test		
	13	19 July	Jack	1	4-21 July
	14	20 July	Skeena Test	2	11-14 June 1979
	15	20-22 July		3	17-19 June
	16	22-24 July		4	19-20 June
	17	24-26 July		5	20-22 June
	18	27 July-1 Aug		7	24 June
	19	1-4 Aug		8	25 June
Tyee (Skeena)	Chin 1	15-19 June 1977		9	26 June
	Chin 2	19-22 June		10	27-29 June
	Chin 3	22-24 June		11	29 June-1 July
	Chin 4	25-26 June		13	2-3 July
	Chin 5	26-29 June		15	5-6 July
	Chin 6	27-28 June		16	6-7 July
	Chin 7	28-29 June		17	6-7 July
	8	29-30 June		20	9-10 July
	9	30 June-1 July		21	10-12 July
	10	30 June-2 July		22	13 July
	11	2 July		24	15 July
	12	2-4 July		25	16-18 July
	13	4-5 July		27	19-21 July
				29	23-28 July
				30	30 July-3 Aug

Skeena R.

Sample Site	Bk	Date
Skeena Test	1	12-15 June 1980
	2	15-17 June
	3	18-20 June
	4	21-22 June
	5	23-25 June
	6	26-28 June
	7	1-4 July
	8	5-6 July
	9	7-8 July
	10	10-11 July
	11	12-13 July
	12	14-18 July
	13	18-20 July
	14	20 July
	15	23-27 July
	16	28 July-2 Aug
	17	3-5 Aug
	18	6-8 Aug
Skeena Test	4	21-23 June 1981
	V(5)	23-26 June
	VI(6)	26-27 "
	7	27-28 "
	8	28 "
	9	29 "
	10	" "
	11	1 July
	12	1-3 "
	13	4-5 "
	14	6 "
	15	7 "
	16	7-8 "
	17	8-9 "
	18	10-11 "
	19	11-12 "
	20	13-19 "
	21	20-26 "
	22	4-6 Aug
	23	15 Aug

Appendix 1 (cont.'d)

Bella Coola

Sample Site	Bk	Date	Sample Site	Bk	Date
Bella Coola	1	Dec 1976,	Bella Coola	20	3 Jun 1979
		Jan & Feb 77		21	4 Jun
	1	19 Jul 76		46	13 Jun
	2	19 Jul 76		47	9-11 Jun
	3	19 Jul 76		56	22-28 Jun
				103	19 Jun
Bella Coola	1	23 May 1977		122	10 Jul
	3	24 May		9	12-20 May (80?)
	4	24 May			
	5	24 May	Bella Coola	1	7 May 1980
	1	14 Jun		2	14 May
	4	27 Jun		1	20 May
	6	21 Jun	Bella Coola-		
	7	19 Jun	Atnarko	2	24 May
	1	3 Jul	Bella Coola	3	28 May
	2	4 Jul		4	28 May
	3	4 Jul		1-S	3-24 Jun
	4	6 Jul		1	18 May, 2 Jun
	A	25 Jun		2	11 Jun
	1	7 Jul		3	11 Jun
	1	Jun		4	11 Jun
	2	3 Jul		2	29 Jun-11 Jul
				1	26 Jun-16 Jul
Bella Coola	1	5? Jun 1978		1	1 Jul
	2	5 Jun		2	1 Jul
	3	6 Jun		3	1 Jul
	1-A	4-5 Jun		9	12-20 May (79?)
	2	3-6 Jun			
	3	7 Jun	Bella Coola	1	18 May 1981
	4	7-8 Jun		2	18 May
	5	8-11 Jun		4	18 May
	6	11-13 Jun		1	25 May
	7	14,15,18 Jun?		2	25 May
	8	18 Jun		3	25 May
	9	20,21,22,25 Jun		1	1 Jun
	10	25-28 Jun		2	1 Jun
	11	29 Jun,		3	1 Jun
		2-4 Jul		4	1 Jun
	12	4-6 Jul		4	8 Jun
	13	9,10,11 Jul		5	8 Jun
	14	11-13,16 Jul		6	8 Jun
	15	16-17,23 Jul		7	8 Jun
	16	23 Jul - 10 Aug		1	15 Jun
	1	25 Jun		2	15 Jun
				1	25 Jun
Bella Coola	2	6 May 1979		2	29 Jun
	12	20, 27 May		3	29 Jun
	16	30 May		1	7 Jul
	18	6 Jun		1	13 Jul
	19	19 Jun			

Appendix 1 (cont.'d)

Robertson Htchy (Area 23)

Sample Site	Bk	Date
Robertson Cr		6 Aug-17 Oct 1975
Brailer(Jacks)	1A	
Robertson Cr		
Htchy	01-B	15-24 Oct
	02-B	24 Oct
	03-B	29-30 Oct
	04-B	30-31 Oct
	05-B	31 Oct
	06-B	6-21 Nov
Robertson		
Creek(MKD)	01-B	27 Aug-29 Oct 1976
	02-B	3-19 Oct
	03-B	29 Noct-8 Nov
	04-B	19-22 Oct
	05-B	9 Nov-Dec
	06-B	22 Oct-3 Nov
	08-B	3 Nov
Roberston Cr		27 Aug-13 Oct 1977
(marked Jacks)	01-A	
Robertson Cr	02-B	15-16 Nov
	03-B	16 Oct
	05-B	17-18 Oct
Robertson Cr		27-31 Oct
(marked)	15-B	
	17-B	4-5 Nov
	20-B	14 Nov-14 Dec
Chin test		
fishery		
area 23	1	15 Aug 1978
	2	15 Aug
	3	"
	4	"
	5	15-16 Aug
	1	20 Sept
	2	20-21 Sept
	1	Oct
	2	16 Oct
	3	24 Oct
Alberni Canal	III	14 Aug 1979
	8	16 Aug
	20	21 Aug
	44	24 Aug
	53	24 Aug
Alberni Inlet	604	7 Sept
	608	9 Sept
	609	"
Alberni Inlet	6	20 Aug 1980
	7	"
	41	24 Aug
	42	24 Aug
	47	Sept

Sample Site	Bk	Date
Alberni Inlet	48	Sept 1980
	65	Sept
	66	Sept
	88	10 Sept
	89	"
	90	10 Sept
Alberni Inlet	2	11 Aug 1981
	3	"
	6	14 Aug
	7	"
A.I. Rocking Pt	14	21 Aug
Area 23	15	21 Aug
Area 23, Polly		
Pt.	17	"
Area 23, Stamp		
Narrows	43	28-29 Aug
Area 23, Hocking		
Pt.	45	30 Aug
Area 23, Hocking		
Pt.	61	28 Sept

Appendix 1 (cont.'d)

Fraser R.

Sample Site	Bk	Date
Fraser R	1	15 Apr 1975
	2	" "
	3	" "
	4	" "
	6	" "
	6-2	" "
	7	" "
	8	" "
	9	" "
	10	" "
Glenrose	1	6 May
	2	" "
	3	" "
	4	" "
	5	" "
	6	" "
	7	" "
	1	27 May
	2	" "
	3	" "
	4	" "
	5	" "
	6	" "
	7	" "
	1	10 June
	2	" "
	3	" "
	4	" "
	5	" "
	6	" "
	7	" "
	1	23 July
	2	" "
	3	" "
	4	" "
	5	" "
	1	26 Aug
	2	" "
	3	" "
	4	" "
	5	" "
	1	3 Sept
	2	" "
	3	" "
	4	" "
	5	" "

Sample Site	Bk	Date
Glenrose	1	4 May 1976
	2	" "
	3	" "
	4	" "
	5	" "
	1	11 May
	2	" "
	3	" "
	4	" "
	5	" "
	1	25 May
	2	" "
	3	" "
	4	" "
	5	" "
	1	1 June 1976
	2	" "
	3	" "
	4	" "
	5	" "
	1	8 June
	2	" "
	3	" "
	4	" "
	5	" "
	1	15 June
	2	" "
	3	" "
	4	" "
	5	" "
	1	29 June
	2	" "
	3	" "
	4	" "
	5	" "
	1	6 July
	2	" "
	3	" "
	4	" "
	5	" "
	6	" "
	1	21 July
	2	" "
	3	" "
	4	" "
	5	" "
	1	28 July
	2	" "
	3	" "
	4	" "
	5	" "

Appendix 1 (cont.'d)

Fraser R.

Sample Site	Bk	Date
Glenrose	1	31 May 1977
	2	" "
	3	" "
	4	" "
	5	" "
	6	" "
	1	14 June
	2	" "
	3	" "
	4	" "
	5	" "
Steveston	1	5 July 1977
	2	" "
	3	" "
	4	" "
	5	" "
Fraser R (Steveston)	01	26 July
	02	" "
	03	" "
	04	" "
	05	" "
Fraser R	01	16 Aug 1977
	02	" "
	03	" "
	04	" "
	05	" "
	1	23 Aug
	2	" "
	3	" "
	4	" "
	5	" "
	1	20 Sept
	2	" "
(Steveston)	3	" "
Fraser R	4	" "
	5	" "
Fraser R(Bio)	1	5 Oct
	2	" "
	3	" "
	4	" "
Cottonwood Test	1	6 Oct
	2	" "
	3	" "
	4	" "

Sample Site	Bk	Date
Glenrose	1	25 April 1978
	2	" "
	3	" "
	4	" "
	5	" "
	25	2 May
	26	" "
	27	" "
	28	" "
	44	9 May
	45	" "
	46	" "
	47	16 May
	48	" "
	50	" "
	51	" "
	65	24 May
	66	" "
	67	" "
	68	" "
	82	30 May
	83	" "
	84	" "
	85	" "
	102	6 June
	103	" "
	104	" "
	105	" "
	119	13 June
	120	" "
	121	" "
	122	" "
	143	20 June
	144	" "
	145	" "
	146	" "
	159	22 Aug
	160	" "
	161	" "
	162	" "
	166	29 Aug
	167	" "
	168	" "
	170	" "
	182	6 Sept
	183	" "
	184	" "
	185	" "
	212	11 Sept
	213	" "
	214	" "
	215	" "

Appendix 1 (cont.'d)

Fraser R.

Sample Site	Bk	Date
Glenrose	216	11 Sept 1978
	217	" "
	218	" "
	219	" "
Albion	1	7 Oct 1978
	2	" "
Whonnock	4	12,13 Oct 1978
	5	13,14 Oct
	6	14 Oct
	7	14,15 Oct
	8	15,16 Oct
	9	17 Oct
Albion	10	18 Oct 1978
	11	20 Oct
	12	22,23,30,31 Oct
	13	31 Oct, 1,3,4,5,9 Nov
	14	9,10,11,18,19,21 Nov
	15	5,9,16 Dec

Appendix 1 (cont.'d)

Fraser River, 1979 and 1980

Sample Site	Bk	Date	Sample Site	Bk	Date
Glenrose	1	24 Apr 79	Glenrose	179	17 Jul 1979
	4	"		182	"
	7	"		185	"
	10	"		188	"
	13	"		191	"
	16	8 May		194	"
	19	"		Bk 1 (197)	24 Jul
	22	"		4 (200)	"
	25	"	29D	228	31 Jul
	28	"		231	"
	31	"		234	"
	34	"	Fraser R.	237	8 Aug
	37	9 May		240	"
	40	14 May		243	"
	43	"		246	"
	46	"		249	"
	49	"		253	"
	58	24 May		256	"
	61	"		259	22 Aug
	64	"		262	"
	67	"		265	"
	70	"		268	"
	73	"		271	"
	78	28 May		274	"
	81	"	Albion	10	9 Oct
	84	"		11	"
	87	"		13	10 Oct
	90	"		14	"
	93	"		15	"
	96	"		16	11 Oct
	99	5 Jun		17	11-12 Oct
	103	"		18	12-15 Oct
	106	"		19	17,19 Oct
	109	"		20	19 Oct
	112	"		21	22 Oct
	115	"		22	23,24 Oct
	118	12 Jun		23	25,29,31 Oct,
	121	"			6 Nov
	124	"		24	11 Nov
	127	"	F.R.T.F.		
	130	"	Albion	1	3 Jun 1980
	133	"		2	"
	136	"		3	5 Jun
	139	19 Jun		4	7 Jun
	142	"		7	10 Jun
	145	"		8	12 Jun
	148	"		11	14 Jun
	176	10 Jul		12	17 Jun

Appendix 1 (cont.'d)

Fraser River, 1980 and 1981

Sample Site	Bk	Date	Sample Site	Bk	Date
F.R.T.F.					
Albion	13	19 Jun 1980	Albion	20	9 Jun 1981
	16	21 Jun		22	"
	17	24 Jun		24	"
	19	26 Jun		26	11 Jun
	21	28 Jun		28	13 Jun 81?
	22	2 Jul		30	18 Jun
	24	3 Jul		32	20 Jun
	26	5 Jul		34	23 Jun
	27	8 Jul		36	25 Jun
	29	10 Jul		38	25,27 Jun
	32	12 Jul		40	27,30 Jun
	33	17 Jul		42	3 Jul
	34	15 Jul		44	
	37	19 Jul		46	Jul
	39	24 Jul		48	14 Jul
	43	26 Jul		50	18 Jul
	44	29 Jul		52	23 Jul
	45	1 Aug		54	25,28 Jul
	46	5 Aug		56	30 Jul
	47	7 Aug		58	1,3 Aug
	48	8 Aug		60	
5-7/8" mesh	1	4 Aug		62	8 Aug
	49	12 Aug		64	
	50	14 Aug		66	1981
	51	16 Aug		68	18 Aug
	53	18 Aug		70	20 Aug
	54	20 Aug		72	27,29 Aug
	55	28 Aug		74	3 Sep
	57	30 Aug		76	8,10,12,
	58	6 Sep			15 Sep
	59	6 Sep		78	
	63	13 Sep		80	17,19 Sep
	66	20 Sep		82	24 Sep
	68	23 Sep		84	26 Sep
F.R. Albion	72	25 Sep		86	29 Sep
10	04	8,9 Oct		88	
10	06	17,23 Oct		1	30 Sep
Albion	2	11,14 Apr 81		3	2 Oct
	4	23,25,28,		05	Oct
		30 Apr,		07	7,8 Oct
		2,4 May		09	14 Oct
	6	2,5 May			
	8	5 May			
	10	7,9 May			
	12	12,16,19 May			
	14	21 May			
	16	26 May			
	18	1 Jun			

Appendix 1 (cont.'d)

Quileute· R.

Sample Site	Bk	Date
Quileute	2000-2009	1977
"	2010-2019	"
"	2030-2039	"
"	2040-2049	"
"	2100-2109	"
"	2110-2119	"
"	2140-2149	"
"	2200-2209	"
"	2210-2219	"
"	2240-2249	"
"	2270-2279	"
"	2300-2309	"
"	2310-2319	"
"	2380-2389	"
"	2400-2409	"
"	2410-2419	"
"	2490-2499	"
"	2480-2489	"
"	2500-2509	"
"	2510-2519	"
Quileute	3000-3009	1978
"	3010-3019	"
"	3020-3029	"
"	3030-3039	"
"	3040-3049	"
"	3050-3059	"
"	3060-3069	"
"	3070-3079	"
"	3080-3089	"
"	3090-3099	"
"	3100-3109	"
"	3110-3119	"
"	3120-3129	"
"	3130-3139	"
"	3140-3149	"
"	3150-3159	"
"	3160-3169	"
"	3170-3179	"
"	3180-3189	"
"	3190-3199	"
"	3200-3209	"
"	3210-3219	"

Quinault R.

Sample Site	Card #	Date
Quinault R.	1	Oct 9, 1975
"	3	Oct 30 "
"		Nov 14 "
"		Nov 17 "
Quinault R.		May 1, 1976
"	1/1	May 24 "
"		May 26 "
"		June 2 "
"	1	June 9 "
"	1/2	Sept 3 "
"	2/2	" " "
"	1/1	Nov 2 "
Quinault R.	1	June 6, 1977
"	1	June 17 "
"	1	June 23 "
"	1/3	June 29 "
"	1/1	Sept 14 "
"	1/2	Sept 20 "
"	2/2	" " "
"	1	Sept 27 "
"	1	Sept 30 "
"	1/1	Oct 6 "
"	1/1	Oct 11 "
"	1/1	Oct 12 "
"	1/1	Oct 27 "
"	1/1	Nov 4 "
"	1/1	" " "
"	1/1	Nov 16 "
Quinault R.	1/1	Sept 19, 1978
"	1/2	Sept 20 "
"	2/2	" " "
"	1/2	Sept 29
"	2/2	" " "
"	1/2	Oct 16 "
"	1/1	Oct 24 "
"	1/1	Oct 25 "
"	1/1	Oct 26 "
"	1/2	Oct 30 "
"	2/2	" " "
"	1/1	Oct 31 "
"	1/1	Nov 1 "
"	1/1	Nov 3 "
"	1/1	Nov 7 "
Quinault R.	1/1	April 20, 1979
"	1/1	May 21 "
"	1/1	June 5 "
"	1/1	June 21 "
"	1/1	July 9 "
"	1/1	July 18 "
"	1/1	July 31 "
"	1/1	Aug 20 "
"	1/2	Aug 27 "
"	1/2	Sept 1 "
"	1/2	Oct 8 "
"	1/2	Oct 15 "
"	1/1	Oct 19 "

Sample Site	Card #	Date
Quinault R.	1/1	Oct 24, 1979
"	1/1	Nov 6 "
	1/2	Dec 6 "
Quinault R.	1/1	April 15, 1980
"	1/1	June 17 "
"	1/1	July 9 "
"	1/1	July 11 "
"	1/1	Aug 11 "
"	1/1	Aug 25 "
"	1/1	Sept 2 "
"	1/1	Sept 15 "
"	1/1	Sept 24 "
"	1/2	Sept 30 "
"	1/1	Oct 10 "
"	1/1	Oct 15 "
"	1/1	Oct 23 "
"	1/1	Oct 28 "
"	1/1	Nov 4 "
"	1/1	Nov 12 "
Quinault R.	1/1	May 4, 1981
"	2/2	June 3 "
"	1/1	June 18 "
"	1/1	July 8 "
"	1/1	July 24 "
"	1/1	Aug 11 "
"	1/2	Aug 17 "
"	1/2	Sept 1 "
"	1/4	Sept 8 "
"	2/4	Sept 15 "
"	1/2	Sept 25 "
"	1/3	Oct 2 "
"	1/2	Oct 8 "
"	1/2	Oct 20 "
"	1	Oct 23 "
"	1/3	Oct 28 "
"	1/1	Nov 19 "
Queets R.	1/2	1975
"	2/2	"
"	1/1	Oct 10 1975
"	1/2	Oct 20 "
"	2/2	" " "
"		Oct 29 "
Queets R.	1/6	1976
"	2/6	"
"	3/6	"
"	4/6	"
"	5/6	"
"	6/6	"
Queets R.	1/2	June, 1977
"	2/2	" "
"	1	June 23"
"	1/2	July "
"	2/2	" "
"	1/2	July 12"
"	2/2	" "
"	1/2	Aug 1 "

Appendix 1 (cont.'d)

Sample Site	Card #	Date
Queets R.	2/2	Aug 1 1977
"	1/1	Aug 26 "
"	2	undated (Aug 29?)
"	1	Sept 14 "
"	1/2	Sept 21 "
"	2/2	" " "
"	1	Sept 23 "
"	1	Oct 5 "
"	1	Oct 7 "
"	1	Oct 14 "
"	1/2	Oct 18 "
"	2/2	" " "
"	1	Oct 26 "
"	2	" " "
"	1	Nov 9-17"
"	2	" " "
Queets R.	1/1	June 7, 1978
"	1/1	July 24 "
"	1/1	Aug 2 "
"	1/1	Aug 15 "
"	1/2	Aug 16 "
"	2/2	" " "
"	1/1	Aug 29 "
"	1/1	Sept 5 "
"	1/1	Sept 6 "
"	1/2	Sept 8 "
"	1/2	" " "
"	1/1	Sept 12 "
"	1/1	Sept 13 "
"	1/1	Sept 14 "
"	1/1	Sept 15 "
"	1/1	Sept 18 "
"	1/1	Sept 22 "
"	1/2	Oct 4 "
"	2/2	" " "
Queets R.	1/1	Mar 29, 1979
"	1/2	April 24 "
"	1/1	May 10 "
"	1/1	June 6 "
"	1/2	June 21 "
"	1/2	June 28 "
"	1/2	July 31 "
"	1/1	Aug 15 "
"	1/2	Sept 21 "
"	1/1	Oct 4 "
"	1/1	Oct 11 "
"	1/1	Oct 10 "
"	1/1	Oct 24 "
"	1/1	Nov 1 "
"	1/1	Nov 7 "
Queets R.	1/1	June 8, 1980
"	1/1	June 24 "
"	1/1	July 15 "
"	1/2	Aug 8 "
"	1/1	Sept 12 "
Queets R.	1/1	Sept 30, 1980
"	1/1	Oct "
"	1/2	Oct 27 "
"	1/3	Nov 3 "
"	2/8	" " "
"	1/2	Nov 6 "
Queets R.	1/1	June 3, 1981
"	1/1	June 22 "
"	1/1	July 8 "
"	1/2	Sept 3 "
"	2/3	Sept 4 "
"	1/2	Sept 15 "
"	1/2	Sept 23 "
"	1/1	Oct 1 "
"	2/4	Oct 7 "
"	1/3	Oct 22 "
"	1/8	Oct 29 "
"	2/8	" " "
"	3/8	" " "
"	6/8	" " "
"	1/1	Nov 18 "
Humptulips R.		Oct 29, 1975
"		Nov 7 "
Humptulips R.	1	Oct 5, 1976
"	1	Oct 18 "
Humptulips R.	1	Sept 27, 1977
"	1	Sept 29 "
"	1	Sept 30 "
"	1	Oct 18 "
Humptulips R.	1	Oct 11, 1978
"	1/2	Oct 16 "
"	2/2	" " "
"	1/1	Nov 2 "
"	1/2	Nov 8 "
"	2/2	" " "
"	1	Nov 15 "
Humptulips R.	1/1	Nov 16, 1979
"		Nov 21 "
"	1/1	Nov 29 "
"	1/1	Dec 5 "
Humptulips R.	1/1	Sept 22, 1980
"	1/1	Oct 14 "
"	1/1	Oct 21 "
"	1/1	Oct 23 "
"	1/1	Nov 10 "
"	1/1	Nov 12 "
"	1/1	Nov 21 "
Humptulips R.	1/1	Sept 21, 1981
"	1/1	Sept 22 "
"	1/1	Oct 6 "
"	1/2	Oct 8 "
"	2/2	" " "
"	1/2	Oct 9 "
"	2/2	" " "
"	1/2	Oct 14 "

Sample Site	Card #	Date
Humptulips R.	2/2	Oct 14, 1981
"	1/2	Oct 26 "
"	2/2	" " "
Chehalis R.		Oct 18, 1976
Chehalis R.	1/1	Sept 30, 1977
"	1/1	Oct 5 "
"	1/1	Oct 18 "
Chehalis R.	1/2	Oct 3, 1978
"	2/2	" " "
"	1/1	Oct 5 "
"	1/1	Oct 11 "
"	1	Oct 12 "
"	1/1	Oct 15 "
"	1/1	Oct 16 "
"	1/1	Oct 17 "
Chehalis R.	1/1	Dec 6, 1979
Chehalis R.	1/2	Sept 22, 1980
"	1/1	Sept 24 "
"	1/1	Sept 29 "
"	1/1	Oct 7 "
"	1/1	Oct 10 "
"	1/1	Oct 15 "
"	1/1	Oct 21 "
Chehalis R.	1/2	Sept 22, 1981
"	1/2	Oct 6 "
"	1/2	Oct 9 "
"	1/2	Oct 13 "
"	2/2	" " "
"	1	Oct 26 "
Gray's Harbor	1	(week 39), 1975
"	2	" "
"	1	Sept 29 (Wk 40)
"	2	Oct 2 "
"	3	Oct 3 "
"	4	"
"	7	"
"	1	(wk 41)
"	3	"
"	4	"
"	5	Oct 6 "
"	6	Oct 8 "
"	8	(wk 42)
"	1	(wk 45)
West Port (Gray's Harbor)	1	Oct 27 (wk 44), 1976
2 B & C	1	Oct 18 "
2 C	1	Oct 25 "
"	.2	" " "
"	I	Nov 1 "
2 D	1	Sept 16 "
"	1	Sept 20 "
"	1	Sept 23 "
"	1	" " "
"	1	Sept 27 "
"	1	Oct 4 "

Sample Site	Card #	Date
2 D	1	Oct 7, 1976
"	1	Oct 11 "
"	1	Oct 12 "
"	2	" " "
"	1	Oct 14 "
"	I	" " "
"	1	" " "
"	1	Oct 25 "
"	1	Oct 27 "
"	2	" " "
"		Oct 28 "
"	II	Nov 1 "
"	39	Dec 12 "
2 B	3	Sept 25, 1980
"	1	Oct 3 "
2 D	1	Sept 25 "
"	2	" " "
"	1	Sept 26 "
"	1	Oct 1 "
"	1	Oct 2 "
"	1	Oct 3 "
"	2	" " "
Willapa Bay	1	(wk 36), 1975
"	2	" "
"	3	" "
"	1	(wk 37) "
"	2	" "
"	3	" "
"	1	(wk 38) "
"	2	" "
"	1	(wk 39) "
"	2	" "
"	1	(wk 40) "
"	1	(wk 41) "
"	2	" "
"	3	" "
2	29	Oct 6&7, 1976
2G	1	Sept 2 "
"	1	" " "
"	2	" " "
"	2	" " "
"	1	Sept 6 "
"	1	" " "
"	2	" " "
2 G & 2 J	1	Sept 9 "
2 G	1	Sept 13 "
"	1	Oct 18 "
"	1	Oct 20 "
2 H	30	Oct 7 "
2 J	3	Sept 2 "
"	2	Sept 6 "
2 G	3	Sept 6, 1979
"	1	Sept 10 "
"	1	Sept 17 "
"	2	" " "

Appendix (cont.'d)

Sample Site	Card #	Date
Willapa Bay		
2 G	3	Sept 20, 1979
"	1	Sept 24 "
"	2	Sept 25 "
"	2	Sept 27 "
"	1	Oct 11 "
"	1	Oct 15 "
2 G	1	Sept 1, 1980
"	5	" " "
"	1	Sept 15 "
"	2	" "
"	1	Sept 29 "
"	1	Oct 6 "
"	1	Oct 7 "
"	1	Oct 9 "
"	2	" " "
"	1	Oct 10 "
2 G	1	Sept 1, 1981
"	4	" " "
"	1	Sept 14 "
"	1	Sept 15 "
"	1	Sept 18 "
"	1	Sept 24 "
"	2	Sept 25 "
"	1	Sept 28 "
"	1	Oct 2 "
"	1	Oct 12 "
Nooksack R. & Samish R. Stocks		
7 B	2	July 23 (wk 30), 1975
"	1	Aug 7 "
"	1	Aug 11 "
"	1	Aug 13 (wk 33) "
"	4	Aug 27 (wk 35) "
7 C	1(7C-52)	Aug 8 "
"	1(7C-53)	" " "
"	1	Aug 14 "
"	2	Aug 20 "
Bellingham	3	Sept 8 (wk 37) "
7 B	4	July 22, 1976
"	1	July 26 "
"	18	Aug 17 "
"	3	Aug 24 "
"	11	Sept 16 "
7 C	2	Aug 2 "
"	4	Aug 11 "
"	1	Aug 16 "
"	4	Aug 23 "
"	1	Sept 7 "
7 B	2	July 28, 1977
"	3	" " "
"	1	Aug 2 "
"	1	Aug 12 "
"	2	" " "
"	2	Aug 15 "
"	1	Sept 1 "
"	2	" " "
7 B & C	1	Aug 22 "

Sample Site	Card #	Date
Nooksack R. & Samish R. Stocks		
7 C	1	Aug 2, 1977
7 B	1	Aug 7, 1978
"	1(102)	Aug 8 "
"	1(96)	Aug 13 "
"	118	Aug 21 "
"	112	Aug 24 "
"	I 95	Aug 31 "
"	2(155)	Sept 6 "
"	3(154)	" " "
"	1(153)	Sept 7 "
"	2(152)	" " "
7 B	1	Aug 2, 1979
"	2	" " "
"	3	" " "
"	1	Aug 8 "
"	1	Aug 9 "
"	1	Aug 10 "
"	2	" " "
"	3	" " "
"	1	Aug 16 "
"	1	Aug 17 "
"	1	Sept 17 "
"	2	" " "
7 B	2	July 15, 1980
"	2	July 31 "
"	3	Aug 7 "
"	2	Aug 18 "
"	3	Aug 26 "
"	5	" " "
"	6	" " "
"	3	Aug 27 "
"	1	Sept 1 "
"	3	Sept 3 "
7 B	2	Aug 12, 1981
"	3	" " "
"	2	Aug 13 "
"	1	Aug 14 "
"	1	Aug 17 "
"	4	Aug 18 "
"	2	Aug 19 "
"	4	Aug 26 "
"	1	Sept 2 "
"	3	Sept 9 "
Skagit R. Stock		
8	16	July 21(wk30), 1975
"	14	July 28(wk31) "
"	2	July 31 " "
"	1	Aug 8 "
"	2	Aug 9 (wk 32) "
"	1	Aug 13 (wk 33) "
"	1	Aug 25 "
"	1	Aug 28 (wk 35) "
"	1	Sept 2 (wk 36) "
"	2	Sept 10 (wk 37) "
8	6	June 18, 1976
"	1	June 21 "

Appendix 1 (cont.'d)

Sample Site	Card #	Date
Skagit R. Stock		
8	2	June 28, 1976
"	8	July 16 "
"	9	" "
"	2	July 19 "
"	5	July 22 "
"	7	" "
"	2	Aug 16 "
"	2	Aug 26 "
8	1	June 17, 1977
"	1	June 24 "
"	1	June 30 "
"	1 A	" "
"	1	July 14 "
"	2	" "
"	1	July 18 "
"	2	" "
"	1	Aug 8 "
"	2	" "
8	3	June 25, 1980
"	1	June 30 "
"	3	July 3 "
"	3	July 8 "
"	1	July 17 "
"	2	July 18 "
"	1	July 24 "
"	3	" "
"	3	Sept 16 "
"	2	Sept 24 "
8	1	July 14, 1981
"	13	July 16 "
"	3	July 22 "
"	1 of 3	" "
"	7	July 23 "
"	1	July 28 "
"	1	Aug 18 "
"	2	" "
"	3	" "
"	1	Aug 24 "
Stillaguamish R. & Snohomish R. Stock		
8 C	10	Aug 11(wk 33), 1975
"	11	" "
"	1	Aug 14 " "
"	2	" " "
"	3	Aug 15 " "
"	2	Aug 21 (wk 34) "
"	1	Aug 25 (wk 35) "
"	1	Aug 26 " "
"	1	Aug 28 " "
"	2	Sept 10(wk 37) "
8 B	1	July 19, 1976
"	1	July 26 "
"	I	Aug 31 "
"	II	Sept 3 "
8 C	2	July 21 "
"	3	July 22 "

Sample Site	Card #	Date
Stillaguamish R. & Snohomish R. Stock		
8 C	4	July 22, 1976
"	5	July 23 "
"	1	Aug 17 "
"	2	Aug 18 "
"	3	" "
"	4	Aug 20 "
"	1	Aug 30 "
"	2	Aug 31 "
8 C-1	1	Sept 20 "
8 C	1	Aug 12, 1977
"	1	Aug 18 "
"	1	Aug 31 "
"	2	" "
"	1	Sept 5 "
"	1	Sept 7 "
"	1	Sept 12 "
8 C	1(284)	July 20, 1978
"	264	Aug 2 "
"	262	Aug 7 "
"	229	Aug 14 "
"	205	Aug 22 "
"	1(104)	Aug 23 "
"	1(201)	Aug 24 "
"	200	Aug 25 "
"	1(82)	Aug 28 "
"	1(80)	Aug 29 "
8A	1	Aug 2, 1979
"	1	Aug 9 "
"	1	Aug 10 "
"	1	Aug 14 "
"	1	Aug 16 "
"	1	Aug 17 "
"	1	Aug 23 "
"	2	" "
"	1	Aug 28 "
"	1	Aug 31 "
8 A	1	July 15, 1980
"	1	July 23 "
"	3	Aug 11 "
"	1	Aug 12 "
"	1	Aug 15 "
"	1	Aug 18 "
"	1	Aug 25 "
"	2	" "
"	1	Sept 4 "
"	1	Sept 9 "
8 A	1	July 13, 1981
"	1	July 23 "
"	1	July 28 "
"	2	Aug 6 "
"	1	Aug 17 "
"	1	Aug 18 "
"	2/4	" "
"	3/4	Aug 24 "
"	1/2	Aug 25 "
"	1/2	Sept 1 "

Appendix 1 (cont.'d)

Sample Site	Card #	Date
Duwamish R.	2	Aug 1 (wk 31), 1975
"	3	" " "
"	7	Aug 4 (wk 32) "
"	6	Aug 6 " "
"	4	Aug 8 " "
"	1	Aug 11(wk 33) "
"	2	" " "
"	8	Aug 14 " "
"	3	Aug 18(wk 34) "
"	4	" "
10 A	4	July 21, 1976
"	1	July 26 "
"	5	July 27 "
"	6	July 28 "
"	8	" "
"	9	July 29 "
"	10	" "
"	1	Aug 9 "
"	2	" "
"	6	" "
10 A	2	Aug 1, 1977
"	3	" "
"	1	Aug 3 "
"	1 A	" "
"	1	Aug 8 "
"	2	" "
"	1	Aug 9 "
"	2	" "
"	1	Sept 1 "
"	2	" "
10 A	1(277)	July 17, 1978
"	1(278)	" "
"	1(279)	July 18 "
"	1(283)	July 19 "
"	1(291)	July 25 "
"	1(289)	July 26 "
"	1(266)	July 31 "
"	2(267)	" "
"	3(268)	" "
"	4(269)	" "
"	1(270)	Aug 1 "
10 A & Duwamish	1	July 18, 1979
"	2	" "
"	3	" "
10 A	1	Sept 1 "
"	2	" "
"	1	Sept 13 "
"	1	Oct 10
10 A	1	July 15, 1980
"	1A(1 of2)	July 30 "
"(Duwamish)	1	" "
"(Duwamish)	2	" "
"(Duwamish)	1	Aug 5 "
"	1	Aug 6 "
"	2	" "
"	3	" "

Sample Site	Card #	Date
10 A	1	Aug 12, 1980
"(Duwamish)	1	" "
"(Duwamish)	2	" "
"(Duwamish)	3	" "
10 A	3	July 28, 1981
"	1	Aug 4 "
"	1	Aug 5 "
"	3	" "
"	4	" "
"	1 of 4	Aug 12 "
"	3 of 4	" "
"	2/2	" "
"	2 of 5	" "
"	3 of 5	" "
Lake Washington Stocks		
Shilshole 10B	1	July 29(wk 3),1975
"	3	" " "
"	6	July 30 " "
"	2	July 31 " "
"	4	" " "
"	5	" " "
"	3	Aug 7 (wk 32) "
"	5	" " "
"	6	" " "
"	9	Aug 11(wk 33) "
"	6	Aug 12 " "
"	5	Aug 13 " "
10 B	1	Aug 3, 1976
"	4	Aug 5 "
10 B-C	2	" "
"	3	" "
10 B	1	Aug 16, 1977
"	2	" "
"	3	" "
"	4	" "
"	1	Aug 19 "
"	2	" "
"	4	" "
"	2	Aug 23 "
"	3	" "
"	5	" "
Puyallup R. Stock		
11 A	1	Sept 4, 1981
"	2	" "
"	3	" "
"	4	" "
"	5	" "
"	1	Sept 15 "
"	2	" "
"	3	" "
Hood Canal Stocks		
"	1	Aug 6(wk 32), 1975
"	8	Aug 12(wk 33) "
"	3	Aug 13 " "
"	4	" " "
"	6	Aug 15 " "
"	1	Aug 16 " "

Appendix 1 (cont.'d)

Sample Site	Card #	Date
Hood Canal Stocks		
"	2	Aug 16, 1975
Hood Canal (12 D)	1	Aug 20 "
Hood Canal	4	Aug 21 (wk 34) 1975
"	1	Aug 27 "
Hood Canal (12 D)	1	Sept 3 (wk 36) "
"	3	Sept 4 " "
Hood Canal	3	Sept 8 (wk 37) "
12 D	7	July 30, 1976
"	1	Aug 2 "
"	8	Aug 5 "
"	5	Aug 6 "
"	9	Aug 12 "
"	5	Aug 18 "
"	7	Aug 20 "
"	2	Aug 23 "
"	2	Sept 7 "
"	4	Sept 9 "
"	1	Sept 27 "
"	2	Sept 28 "
12 D	1	July 25, 1977
"	1	July 26 "
"	1	Aug 2 "
"	1	Aug 3 "
"	1	Aug 4 "
"	1	Aug 8 "
"	1	Aug 9 "
"	1	Aug 10 "
"	1	Aug 16 "
"	1	Aug 17 "
"	1	Aug 24 "
"	2	" "
"	3	" "
"	4	" "
12 D	168	July 19, 1978
"	256	Aug 2 "
"	1(254)	Aug 8 "
"	43	Aug 15 "
"	58	Aug 18 "
"	1(76)	Aug 22 "
"	1(39)	Aug 23 "
"	1(164)	" "
"	2(165)	" "
"	1(38)	Aug 24 "
"	1(186)	Aug 27 "
12 C	2	July 30, 1979
"	1	July 31 "
"	1	Aug 7 "
"	2	Aug 10 "
"	3	" "
"	2	Aug 13 "
"	2	Aug 17 "
"	3	" "
"	1	Aug 22 "
"	2	" "

Sample Site	Card #	Date
12 C	5	Aug 13, 1980
"	1	Aug 18 "
"	2	" "
"	1	Aug 19 "
"	3	Aug 20 "
"	1	Aug 27 "
"	1	Sept 2 "
"	2	" "
"	1	Sept 16 "
"	2	" "
12 B&C	1	Aug 17, 1981
"	2	" "
"	3	" "
"	4	" "
"	5	" "
12,12 B&C	1	Aug 24 "
"	4	" "
"	6	" "
Mix: 12 C	1	Aug 25 "
"	2	" "

Sample Site	Card #	Date
Klamath R.	3	Aug 9-10, 1979
"	4	Aug 10 "
"	11	Aug 15 "
"	18	Aug 16 "
"	24	Sept 6, 13 "
"	25	Sept 13 "
"	26	" "
"	27	Sept 11 "
"	30	(Sept 14 ?)"
"	34	Sept 12 "
Klamath R.	3	? 1980
"	4	May 21-26, "
"	5	May 26-31 "
"	6	May 31-June 3 "
"	7	June 4-10 "
"	8	June 10-11 "
"	1	Aug 18-Sept 3 "
"	2	Sept 3-10 "
"	3	Sept 10-19 "
"	4	Sept 19 "
Klamath R.	13	July 9-10, 1981
"	11	Aug "
"	17	Aug 24 "
"	18	Aug 24-25 "
"	22	Aug 27-28 "
"	25	Aug 31-Sept 1 "
"	28	Sept 8 "
"	30	Sept 9 "
"	32	Sept 10 "
"	35	Sept 14-15 "
"	37	Sept 15-16 "
Sacramento R.	2	Oct 20, 27, 1978
"	3	Oct 27-Nov 9 "
"	4	Nov 9 "
"	5	Dec 1 "
Sacramento R.	1	Nov 21-23, 1979
"	2	Nov 26-Dec 3 "
"	3	Dec 3-6 "
"	4	Dec 6-10 "
"	5	Dec 10-20 "
"	1	Oct - Nov "
	(one acetate imp. only)	
"	2	Nov 23 "
"	3	Nov - Dec 11 "
"	4	Dec 11 "
"	5	Dec 18 "
"	6	" "

Site	Card #	Date
Sacramento R.	1	Aug 19-Oct 16,1980
"	2	Oct 16 "
"	1	Oct 10 "
"	2	" "
"	3	" "
"	4	" "
"	5	" "
"	6	" "
"	7	" "
"	8	" "
"	9	" "
Sacramento R.		Oct 8, 1981
"		Oct 9 "
"		Oct 13 "
"		Oct 14 "
"	1	Oct 22 "
"	2	Oct 23 "
"	3	Oct 28 "
"	1	Nov 3-6 "
"	2	Nov 10,20"
"	1	Oct 19, 1981
"	2	" "
"	3	" "
"	1	Oct 22 "
"	2	" "
"	1	Oct 26 "
"	2	" "
"	1	Oct 29 "
"	2	" "
"		Nov 2 "
"	1	Nov 5 "
"	2	" "
"		Nov 9 "
"	1	Nov 12 "
"		Nov 19 "