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A summary of estimated population trends of seven most abundant
groundfish species in trawl surveys conducted by
Alaska Department of Fish and Game in the Kodiak and
Alaska Peninsula areas, 1988 through 1993.

By

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TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	i
LIST OF FIGURES	i
INTRODUCTION	1
METHODS	1
RESULTS	2

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Population estimates, in metric tons, for seven abundant fish species in the Kodiak Management Area for 1988-93	4
2. Population estimates, in metric tons, for seven abundant fish species in the Chignik Management Area for 1988-93	6
3. Population estimates, in metric tons, for seven abundant fish species in the South Peninsula Management Area for 1988-93	7
4. Estimated metric tons of cod and pollock which were in waters of the State of Alaska within stations fished in 1993. Waters of the State of Alaska that are not within the stations fished contain unsurveyed (additional) fish	9

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Location of Tanner crab management sections in the Kodiak Management district	10
2. Location of Tanner crab management sections in the Chignik and Alaska Peninsula management districts	11
3. Population size frequencies of pollock in the Kodiak management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game	12
4. Population size frequencies of pollock in the Chignik management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game	13
5. Population size frequencies of pollock in the Alaska Peninsula management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game	14

INTRODUCTION

This report presents the methods and results from bottom trawl surveys conducted annually from 1988 through 1993 (except 1988 data west of Kodiak, which was not in a usable form when this report was prepared) in the Kodiak to Dutch Harbor portion of the Gulf of Alaska by the Alaska Department of Fish and Game. The surveys are designed to estimate populations of Tanner crab and red king crab for fishery management purposes. Consequently, the survey coverage is limited to areas of historic or presumed crab habitat and survey tows are most intensely concentrated in the near shore areas and in bays.

Data on crab and fish catch has usually been recorded. Crab catch information has been reported separately. This report presents some of the fish catch information to provide data for anticipated fishery management decisions.

While the 1988-1993 survey data provide information on population trends, the population estimates of fish species presented here should be considered at best as minimum population estimates. The distribution of most fish species, especially cod and pollock, extend considerably beyond the borders of the area encompassed by these surveys; within the area of these surveys, only stations anticipated to have crab were sampled; within sampled stations the square miles of the station was set as trawlable bottom (which is approximately equal to potential crab habitat).

METHODS

The ADF&G research vessel Resolution conducted most of the work but was assisted in 1989 by the F/V Royal Baron.

The gear used was a 400-mesh eastern otter trawl net. The net had a 70 ft long headrope with 18 floats, 8 inches in diameter. The footrope was 95 feet long without roller gear or tickler chain. The footrope was weighted with 3/8 inch chain attached every 10 inches to ensure that the footrope tended bottom. The two dandyines were 25 fathoms long and consisted of a 10 fathom section of 5/8 inch cable and a pair of 15 fathom sections of 1/2 inch cable, one attached to the top and the other to the bottom of each net wing. The doors were Northeast Trawl Systems Astoria "V" type weighing 750 lbs each and measured 5 ft x 7 ft. The net was constructed with 4 inch stretch mesh at the mouth, 3 1/2 in stretch mesh in the body, and the cod end had a 1 1/4 in stretch mesh liner. The net was designed to sweep a 40 ft path.

The offshore survey areas were divided into approximately 5 nm square stations and each inshore or bay area was divided into 2.5 nm square stations. Considerable variation occurred in the size of some offshore and most bay stations based on land boundaries. The trawl net was towed on the bottom at a speed of two knots for 1.0 nautical mile at each station. Irregular bottom type occasionally caused hauls of other than 1.0 nm. Catches from these tows were standardized to 1.0 nm accordingly. Trawl placement within stations was randomly chosen except that untrawlable bottom was avoided. All tows were made during daylight hours.

Catches were brought aboard, weighed and sorted by species. Total catch weight was determined by weighing the cod end of the trawl using an electronic crane scale accurate to the nearest five pounds before and after the catch was removed. Species composition by weight was estimated for each haul. Catch sorting usually was done by first taking a complete sample of all large objects (all skates, large halibut, cod, sablefish, large debris items, etc.) until the remaining catch was fairly uniform in size range, then a two to four basket sample of the remaining catch was taken. This procedure removed types of items which were considered not to be representatively sampled by basket sampling. Crabs and important commercial fish species were measured to provide a size frequency distribution for each species.

Population estimates were derived using the "area swept" technique. In the application of this technique, the catch in each tow is expanded to the catch per tow mile by dividing by the miles towed. The result is expanded to population in the station by multiplying by the ratio of a nautical mile to the width of the net (6076 ft / 40 ft) and multiplying by the square miles in the station. The square mile area in each station is the estimated trawlable area within the station, which is considered to be approximately equal to potential crab habitat. The catch of each station sampled is then summed for the population estimate.

Stations not sampled do not contribute to the population estimate. Therefore, changes in the stations sampled among years can produce a change in the population estimate without a change in population. Prior to each year's survey, stations for trawling are selected on the basis of historic or presumed crab habitat or logistic considerations. Changes in survey area and the number of survey stations sampled have occurred between 1988 and 1993 in response to changes in crab distribution or other logistic considerations.

In 1991 there were budget restrictions which reduced staff available during the cruise so fish in catches from the later portion of the cruise were not quantified. Also, when population estimates of Tanner crab in the Westside area proved to be higher than actual, based on fishery performance, the square miles of each station in this area was reassessed, resulting in decreasing square miles in this area during the period reported here. However, the square miles at each station, as estimated in 1993, are used in this report; there is no difference in square miles of a station from year to year.

Size frequencies for graphs were expanded to population at each cm size interval in each station, using the area swept calculation described above. Corrections for the few catches not measured were applied to the total distribution.

RESULTS

The population estimates for the seven most abundant species during 1988 through 1993 are reported in Tables 1 (Kodiak Area), 2 (Chignik Area), and 3 (Alaska Peninsula Area). The population estimates for the waters of the State of Alaska, within the stations sampled, is presented in Table 4.

The Tanner crab management areas and districts, used for this presentation, are shown in Figures 1 and 2.

Since the population estimate would be altered by changes in stations sampled among years, the station by station data was examined. This resulted in the generalization that there was very little change in stations (which stations or how many) were sampled among years. Exceptions to this are obvious in the square miles column and include: Southeast and Southwest districts of Kodiak in 1992; in 1991, Westside and North Mainland districts of Kodiak and all districts of Chignik and Alaska Peninsula areas were not sampled at all.

The size distributions of pollock catch expanded to the population estimate for 1990 and 1993 is in Figures 3, 4, and 5.

The catch data includes many more species than are reported here. Size frequencies have been collected on many. This data is maintained by the Alaska Department of Fish and Game in Kodiak, currently in an R:Base database, and is available for further analysis.

Table 1. Population estimates, in metric tons, for seven abundant fish species in the Kodiak Management Area for 1988-93.

District Year	Sq Miles	Arrowtooth Flounder	Pacific Halibut	Flathead Sole	Yellowfin Sole	Rock Sole	Pacific Cod	Pollock
NORTHEAST								
1988	564.95	39325	4561	18476	3324	1972	4194	44027
1989	580.84	25255	2398	20432	3695	3200	4844	49158
1990	580.84	22226	1567	12513	2538	1278	2652	27247
1991	562.74	33919	2559	13623	1703	1457	2990	46257
1992	587.74	56219	3966	23004	1990	504	2749	33695
1993	564.95	39343	4456	14840	1257	1200	2838	6862
EASTSIDE								
1988	537.65	57034	3173	16765	784	3247	2608	68668
1989	537.65	53824	2059	22878	753	2352	5835	27709
1990	512.64	37559	2960	10759	1020	2122	2734	6427
1991	610.25	46936	2392	15280	874	2685	1341	12663
1992	581.17	54162	1723	13449	337	1513	2537	13135
1993	576.05	47584	1906	14544	684	670	2041	8632
SOUTHEAST								
1988	685.80	46437	4820	13442	1234	16475	15811	59941
1989	735.80	56278	3412	17064	1523	5026	19491	31739
1990	560.80	24431	1724	13105	905	2733	3329	12423
1991	585.80	25233	2120	12513	1051	7169	5046	10673
1992	375.80	15239	1478	10527	1496	328	3556	8222
1993	593.30	28336	2866	14125	1062	1376	3505	10219
SOUTHWEST								
1988	716.94	47386	3974	8052	535	2915	12852	5511
1989	623.24	46262	4419	12725	1926	5075	14037	8656
1990	716.74	173300	3727	12263	1319	1652	12148	12018
1991	716.74	128689	3948	10967	1328	1271	13393	10646
1992	143.34	2209	992	4037	1040	14	542	4234
1993	768.34	128437	4222	13812	1081	3553	7716	6170

-Continued-

Table 1. (page 2 of 2)

District Year	Sq Miles	Arrowtooth Flounder	Pacific Halibut	Flathead Sole	Yellowfin Sole	Rock Sole	Pacific Cod	Pollock
WESTSIDE								
1988	155.21	6970	660	5291	1347	622	984	3018
1989	114.96	3482	233	5861	1091	571	827	5498
1990	105.21	3939	512	4030	822	655	606	2968
1991	105.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	113.98	3390	287	5279	1444	493	378	2438
1993	93.54	4223	556	4307	637	391	417	1253
NORTH MAINLAND								
1988	581.32	10313	1987	5299	152	60	3996	4722
1989	606.32	25835	2644	8154	1	29	6348	5160
1990	631.32	25473	2457	6392	0	253	6367	4490
1991	631.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	608.68	17370	2919	7482	0	84	3140	8074
1993	642.16	27944	2856	7627	43	112	2691	13223
TOTAL								
1988	3241.89	207465	19175	67325	7377	25291	40444	185887
1989	3198.83	210935	15166	87115	8989	16253	51383	127920
1990	3107.59	286927	12947	59061	6605	8693	27835	65573
1991	2475.57	234777	11020	52384	4956	12581	22770	80239
1992	2410.74	148588	11365	63778	6307	2935	12902	69799
1993	3238.36	275866	16862	69256	4764	7301	19208	46358

N/A - Data concerning fish not recorded.

Note that in 1991 fish were not sampled in the Westside and North Mainland areas due to staff limitations based on budget constraints. Also note the considerable difference in square miles surveyed in the Southwest area in 1992.

Table 2. Population estimates, in metric tons, for seven abundant fish species in the Chignik Management Area for 1989-93.

District Year	Sq Miles	Arrowtooth Flounder	Pacific Halibut	Flathead Sole	Yellowfin Sole	Rock Sole	Pacific Cod	Pollock
IVANOF BAY								
1989	113.11	3419	750	4281	2190	316	391	4040
1990	110.04	3147	298	3280	1712	69	132	2597
1991	69.99	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	98.06	2822	499	3407	1855	967	349	9717
1993	96.06	3509	474	3399	1281	669	225	6008
MITROFANIA								
1989	85.97	8427	322	4155	1867	60	3222	15172
1990	97.63	1900	1221	3162	169	288	770	2584
1991	118.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	97.63	2566	1509	4131	140	373	2790	5941
1993	97.63	21709	265	8425	103	0	748	10228
CHIGNIK BAY								
1989	81.48	4592	321	4616	429	182	1156	5951
1990	95.25	3452	261	4152	325	162	644	3068
1991	103.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	67.32	1824	231	2943	321	42	260	1621
1993	88.48	3589	713	3372	199	153	1107	2061
KUJULIK BAY								
1989	32.30	2495	322	1494	126	275	447	974
1990	37.30	1123	225	1642	332	178	78	941
1991	17.98	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	10.59	192	97	833	0	0	40	97
1993	25.98	558	210	1038	99	76	173	218
TOTAL								
1989	312.88	18933	1715	14546	4611	833	5216	26138
1990	340.24	9622	2006	12236	2538	696	1623	9190
1991	309.63	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	273.62	7404	2337	11314	2317	1382	3439	17376
1993	308.16	29364	1661	16234	1682	898	2253	18515

Table 3. Population estimates, in metric tons, for seven abundant fish species in the South Peninsula Management Area for 1989-93.

District Year	Sq Miles	Arrowtooth Flounder	Pacific Halibut	Flathead Sole	Yellowfin Sole	Rock Sole	Pacific Cod	Pollock
SANAK ISLAND								
1989	119.45	2294	254	4865	0	653	2438	2670
1990	119.45	1049	268	866	0	0	477	506
1991	119.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	119.45	2779	386	2165	0	0	790	1323
1993	129.92	4387	669	2499	0	155	2525	1271
MORZHOVOI BAY								
1989	145.30	3327	1097	6080	5680	5149	3762	6531
1990	158.75	3395	1052	4880	6691	3999	1991	6192
1991	140.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	136.10	2559	691	7770	7027	1366	1675	11131
1993	119.35	2729	736	5690	4577	8086	985	2714
COLD BAY/BELKOFSKI								
1989	75.54	482	312	2254	7252	1979	768	1951
1990	107.93	234	560	3183	9415	1638	898	2902
1991	102.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	108.78	273	655	4997	8089	794	500	1906
1993	101.20	844	663	5620	10057	1671	266	2401
PAVLOF BAY/VOLCANO								
1989	261.44	5108	2241	7727	14474	4026	2838	16851
1990	247.59	5108	1257	7146	18717	2227	2247	6776
1991	253.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	248.53	3360	1234	9361	13449	1739	4023	8137
1993	244.37	6005	1562	11180	14331	1403	1239	6362
BEAVER/BALBOA BAY/UNGA								
1989	148.19	5403	1360	5822	3152	890	2169	9650
1990	115.55	3035	519	3158	3640	2545	1886	5377
1991	115.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	115.03	5028	829	3457	2368	1367	4502	5028
1993	103.57	4320	987	3824	2174	567	1731	9659

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Table 3. (page 2 of 2)

District Year	Sq Miles	Arrowtooth Flounder	Pacific Halibut	Flathead Sole	Yellowfin Sole	Rock Sole	Pacific Cod	Pollock
STEPOVAK BAY								
1989	136.11	10348	274	3940	397	171	729	8534
1990	134.58	4025	583	2805	420	10	357	7571
1991	118.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	109.78	5746	787	1886	278	0	293	6327
1993	134.58	7228	266	5714	255	0	494	34837
WEST NAGAI								
1989	103.38	6426	716	3283	516	1468	1920	14184
1990	80.88	6190	556	1351	251	317	1399	10363
1991	80.88	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	80.88	6441	507	2606	380	235	750	6332
1993	80.88	14692	559	2811	482	197	1309	10733
TOTAL								
1989	989.42	33388	6254	33970	31472	14336	14624	60371
1990	964.75	23036	4795	23389	39134	10736	9254	39688
1991	930.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	918.57	26185	5089	32243	31591	5501	12533	40184
1993	913.89	40205	5442	37338	31876	12080	8549	67976

Table 4. Estimated metric tons of cod and pollock which were in waters of the State of Alaska within stations fished in 1993. Waters of the State of Alaska that are not within the stations fished contain unsurveyed (additional) fish.

District Section	Cod	Pollock
KODIAK		
Northeast	767	1,982
Eastside	497	1,162
Southeast	1,001	2,365
Southwest	672	3,235
Westside	417	1,251
North Mainland	710	1,614
Total	4,064	11,609
CHIGNIK		
Ivanof Bay	203	5,704
Mitrofanina	703	9,668
Chignik Bay	1,107	2,060
Kujulik Bay	173	218
Total	2,213	17,650
ALASKA PENINSULA		
Sanak Island	1,394	892
Morzhovoi Bay	513	1,620
Cold Bay/Belkofski	258	2,067
Pavlof Bay/Volcano	1,103	5,445
Beaver/Balboa Bay/Unga	1,724	9,155
Stepovak Bay	490	34,780
West Nagai Strait	907	6,611
Total	6,389	60,570

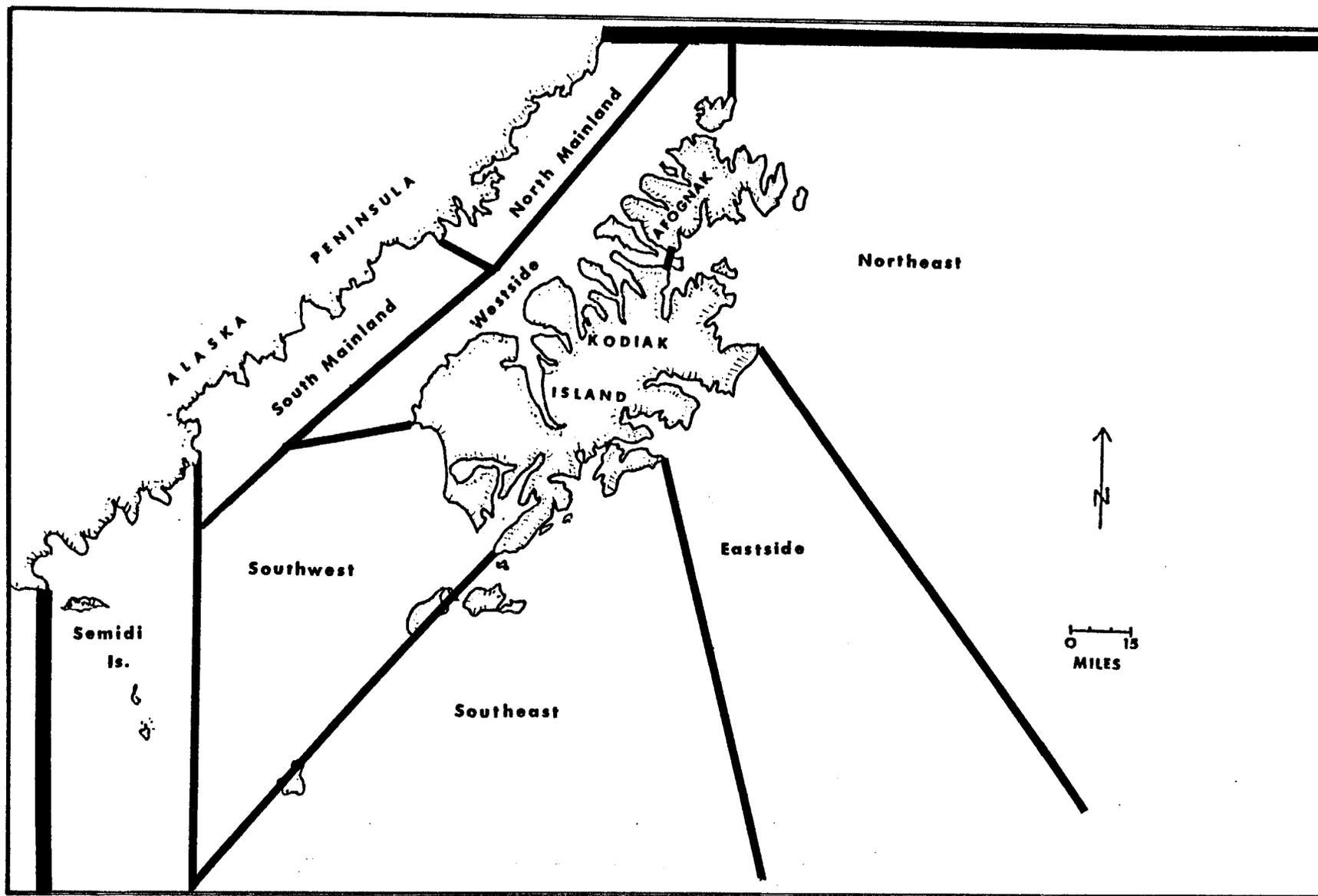


Figure 1. Location of Tanner crab management sections in the Kodiak management district.

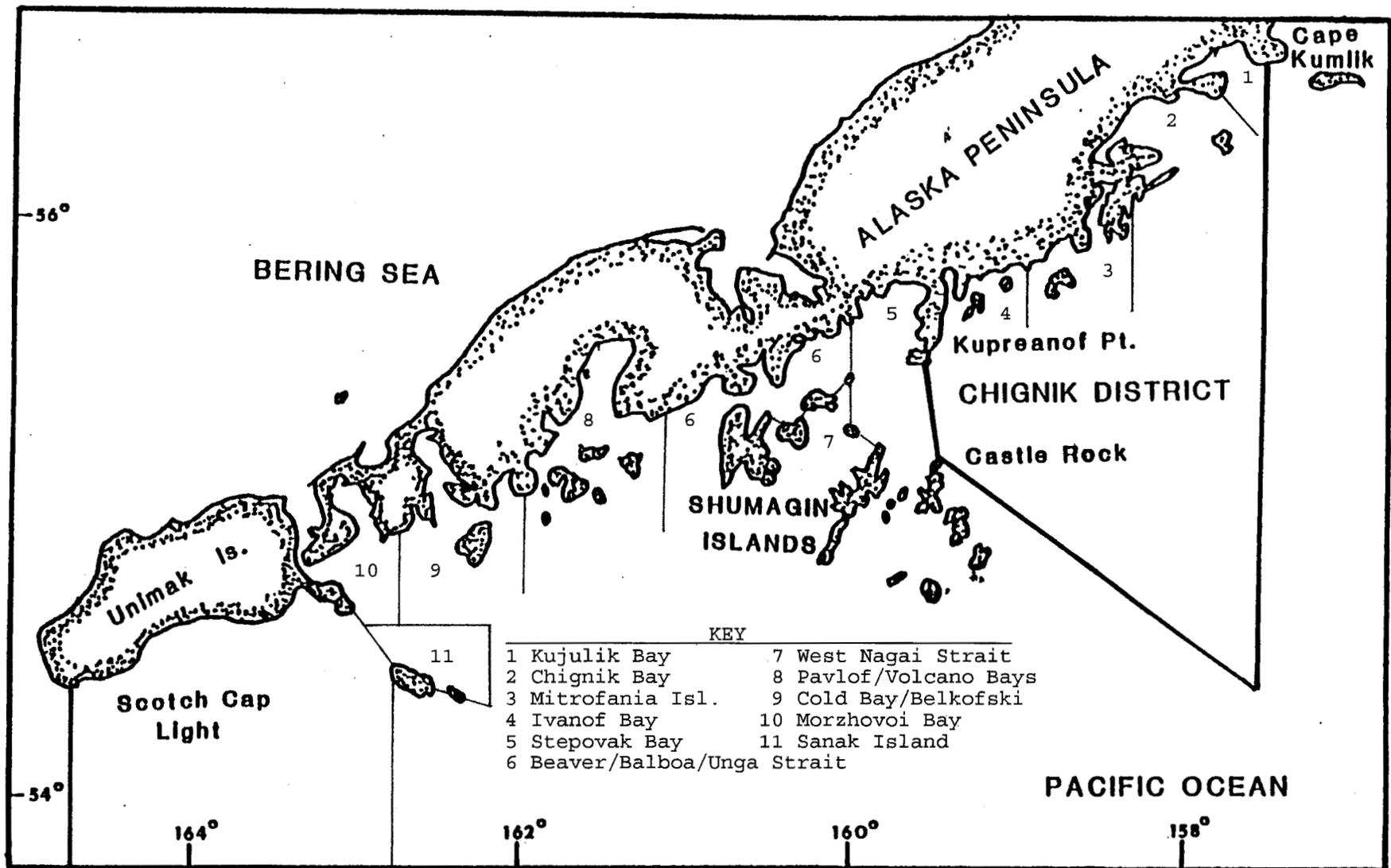
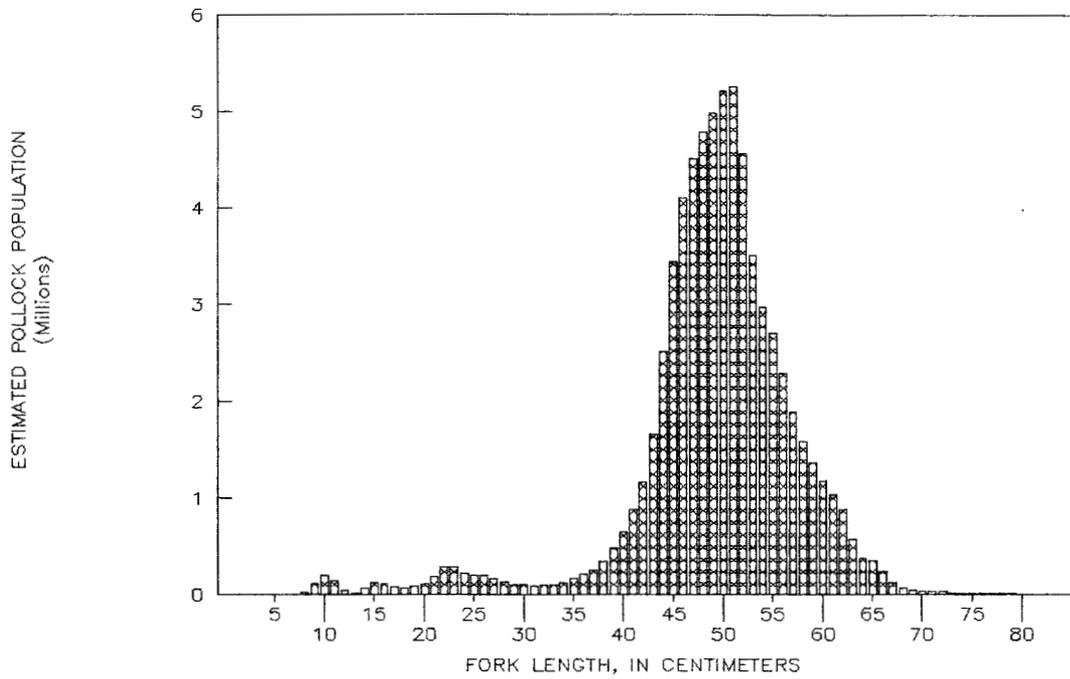


Figure 2. Location of Tanner crab management sections in the Chignik and Alaska Peninsula management districts.

KODIAK AREA 1990



KODIAK AREA 1993

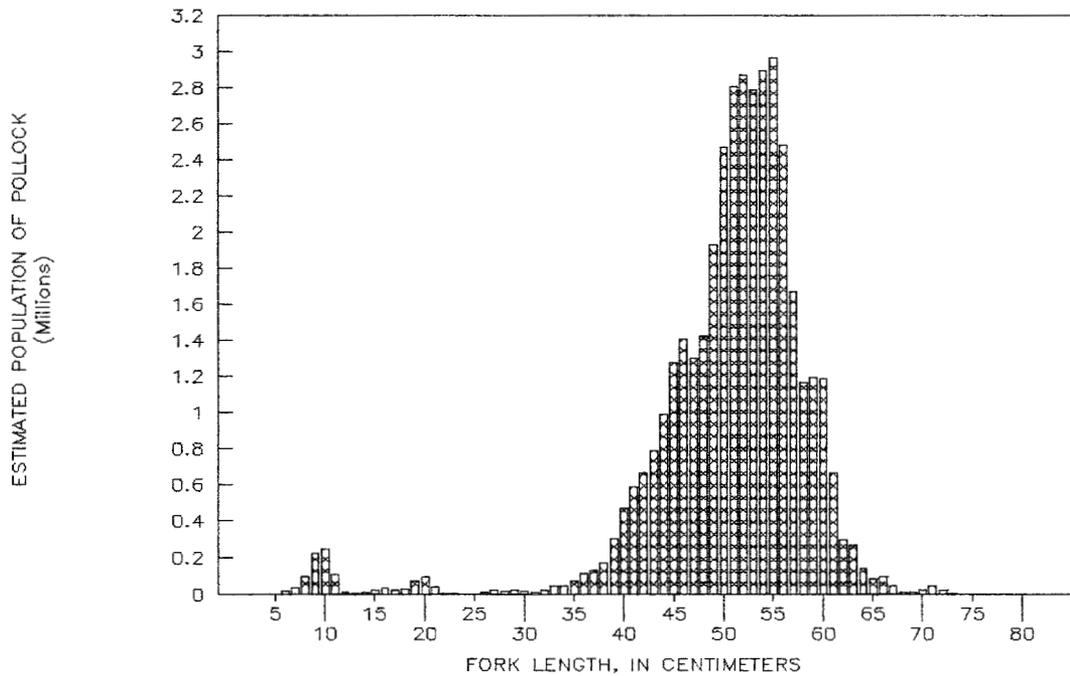
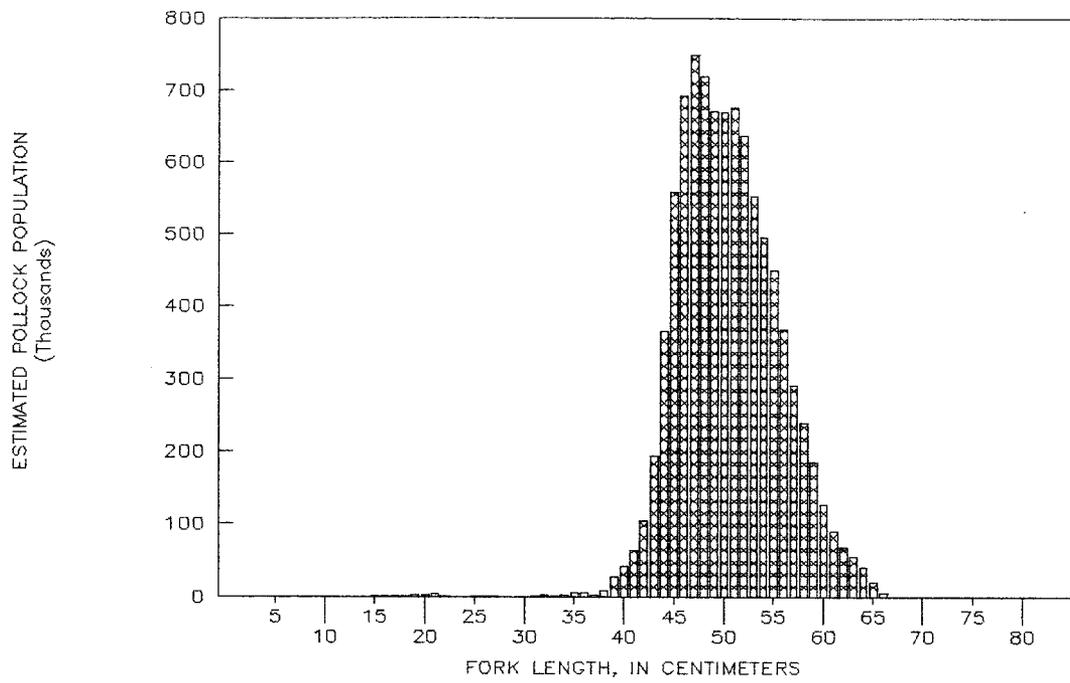


Figure 3. Population size frequencies of pollock in the Kodiak management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game.

CHIGNIK AREA 1990



CHIGNIK AREA 1993

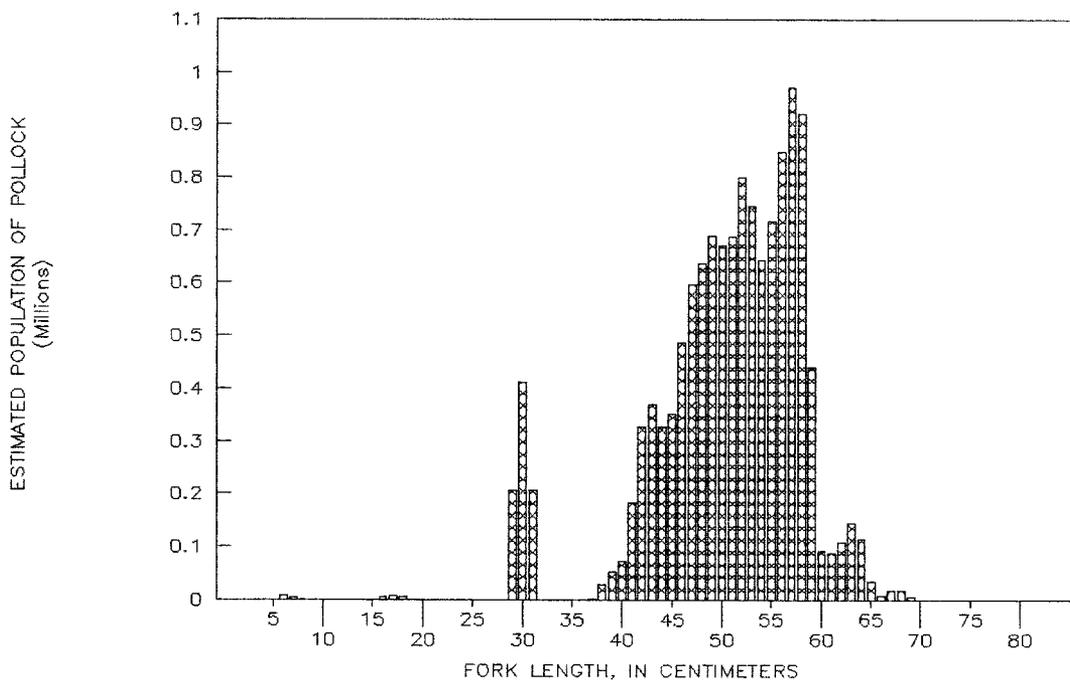
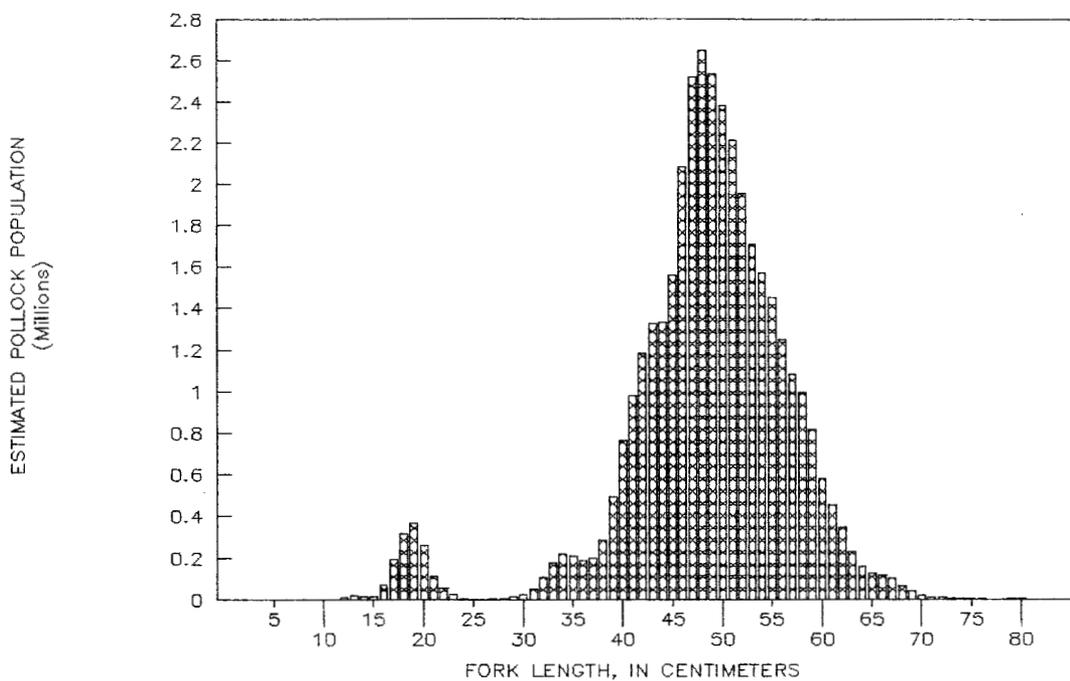


Figure 4. Population size frequencies of pollock in the Chignik management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game.

PENNINSULA AREA 1990



PENNINSULA AREA 1993

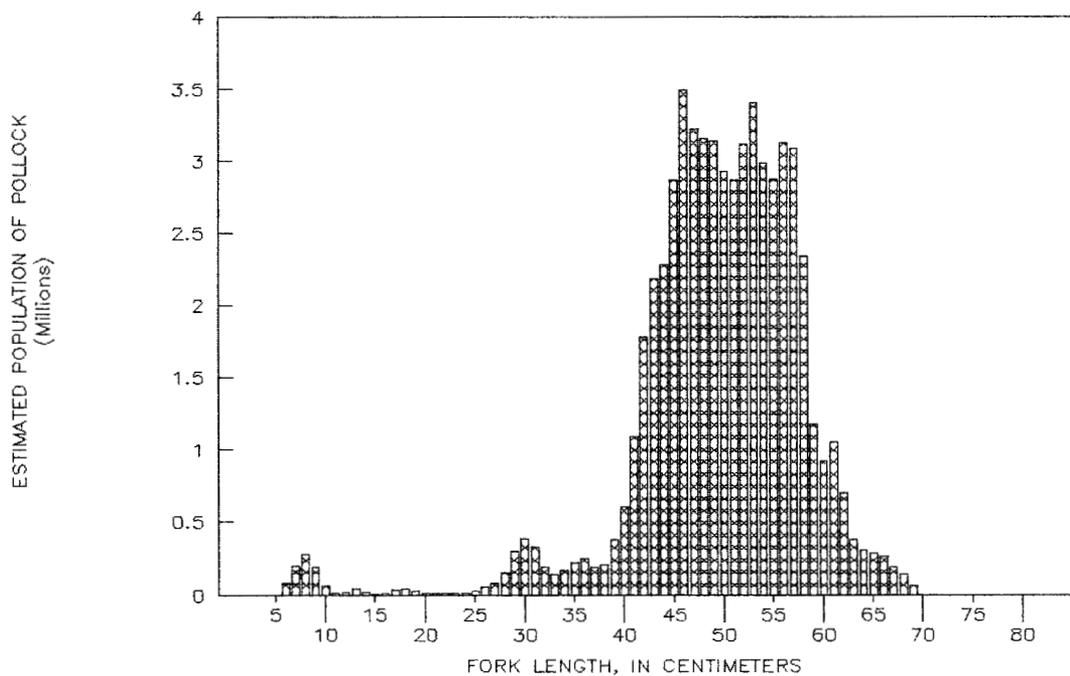


Figure 5. Population size frequencies of pollock in the Alaska Peninsula management district from 1990 and 1993 surveys by the Alaska Department of Fish and Game.

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