

**Assessment of Pollock,
Pollachius virens (L.),
in Divisions 4VWX
and Subareas 5 and 6, 1993**

R. K. Mayo¹ and B. F. Figuerido²

¹ Conservation and Utilization Division

² Program Support Staff

NOAA/National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA 02543-1097

*This document was presented to and reviewed
by the Stock Assessment Review Committee (SARC)
of the 16th Northeast Regional Stock Assessment Workshop (16th SAW)*

August 1993

Nine documents associated with the 16th Northeast Regional Stock Assessment Workshop (16th SAW) have been published as Northeast Fisheries Science Center reference documents. For copies of these documents, contact the NMFS/NEFSC, Information Services Unit, 166 Water St., Woods Hole, MA 02543-1097, (508)548-5123.

**Reports Associated with the 16th Northeast Regional
Stock Assessment Workshop (16th SAW)**

- CRD 93-13 Assessment of pollock, *Pollachius virens*, L., in Divisions 4VWX and Subareas 5 and 6, 1993
by R. K. Mayo and B. F. Figuerido
- CRD 93-14 Assessment of summer flounder (*Paralichthys dentatus*), 1993: Report of the Stock Assessment Workshop (SAW) Summer Flounder Working Group
M. Terceiro, ed.
- CRD 93-15 Analytical assessment of the Atlantic herring coastal stock complex
by D. Stevenson, D. Libby, and K. Friedland
- CRD 93-16 Report of the Workshop on Atlantic Herring Science and Assessment in the Gulf of Maine/Georges Bank Area
NOAA/NMFS/NEFSC
- CRD 93-17 Evaluation of available data for the development of overfishing definition for tilefish in the Middle Atlantic
by G. Shepherd
- CRD 93-18 Report of the 16th Northeast Regional Stock Assessment Workshop (16th SAW), Stock Assessment Review Committee (SARC) and Consensus Summary of Assessments
NOAA/NMFS/NEFSC
- CRD 93-19 Report of the 16th Northeast Regional Stock Assessment Workshop (16th SAW), The Plenary
NOAA/NMFS/NEFSC
- CRD 93-20 Calculating biological reference points for American lobsters
by J. Idoine and M. Fogarty
- CRD 93-21 Assessment of American lobster stock status off the Northeast United States, 1993
by S. Murawski, B. Estrella, J. Idoine, J. Krouse, R. Conser, T. Angell, M. Blake, K. Sosebee, P. Briggs, S. Cadrin, M. Fogarty, and A. Richards

TABLE OF CONTENTS

Introduction	1
The Fishery	1
Commercial landings	1
Discards	9
Recreational catches	9
Sampling intensity	9
Commercial catch at age	10
Commercial mean weights at age	21
Stock Abundance and Biomass Indices	21
Research vessel indices	21
Mortality	29
Total mortality	29
Natural mortality	29
Estimates of Stock Size and Fishing Mortality	29
VPA tuning	29
Fishing mortality estimates	31
Stock size and spawning stock biomass estimates	31
Recruitment estimates	31
Precision of F and SSB estimates	35
Alternative Comparative Analyses	35
Laurec-Shepherd	40
Extended survivors	40
Biological Reference Points	40
Stock-recruitment relationship	40
Yield and spawning stock biomass per recruit	40
Short-Term Projections	41
Recruitment	41
Catch and stock size projections	41
Discussion	41
Acknowledgments	47
Literature Cited	47
Appendix 1: Full listing of calibration run for Divisions 4VWX and Subareas 5 and 6 pollock	51
Appendix 2: Alternative VPA tuning methods	99

INTRODUCTION

The pollock, *Pollachius virens* (L.), constitutes a significant portion of the groundfish biomass in the Scotian Shelf and Gulf of Maine regions; its economic importance has increased considerably in recent years with declines in abundance of traditional species. Nominal catches (landings) have tripled in the last two decades from 22,800 metric tons (mt) in 1968 to 68,900 mt in 1986. Canada has accounted for 66% of the total nominal catch since 1960, followed by the United States with 26%. Distant-water fleets (DWFs), primarily from Eastern European countries, have accounted for the remainder. United States recreational fisheries have also taken minor quantities (usually <1,000 mt in recent years, much of which was released alive).

Pollock in the Scotian Shelf, Georges Bank, and Gulf of Maine region (Northwest Atlantic Fisheries Organization (NAFO) Divisions 4V, 4W, 4X, and Subarea 5) have been assessed as a unit stock since 1974 (ICNAF 1973). Pollock caught in NAFO Subarea 6 have since been included, although landings from that area have been insignificant. Canadian and U.S. scientists have cooperated closely in conducting assessments and related research on this stock for many years, and have invested considerable time and effort in developing commercial and recreational landings estimates, commercial catch rate and catch-at-age series, and research vessel survey abundance indices required for stock assessments. Much of this material has been used in prior assessments, but has recently been revised as analytical procedures and data bases have been refined (Mayo and Clark 1984; McGlade and Annand 1986; Mayo *et al.* 1989a; Annand and Beanlands 1991).

Following the 1984 decision of the International Court of Justice regarding the delimitation of the United States/Canada maritime boundary in the Gulf of Maine/Georges Bank region, stock assessments conducted by Canadian and U.S. scientists were based on the single stock hypothesis until 1989, when Canada began to assess pollock within the Canadian management zone in Divisions 4VWX and Subdivision 5Zc (Annand *et al.* 1989). The last complete assessment of pollock conducted by the United States (Mayo *et al.* 1989b) continued to assume the single stock definition. A special Pollock Working Session was convened during the Ninth Stock Assessment Workshop to review the various VPA tuning approaches for pollock and to recommend future directions. The Working Session concluded that

future U.S. assessments should continue to include the entire 4VWX-Subareas 5 and 6 stock to minimize the impact of possible immigration/emigration of pollock across the boundary on estimates of F (NEFC 1989).

Management of pollock within U.S. waters is controlled by the New England Fishery Management Council (NEFMC) through the Northeast Multispecies Fishery Management Plan. The objective of this plan is the maintenance of percent target spawning stock biomass per recruit levels through minimum fish size, mesh, and area regulations (NEFMC 1985). Landings, however, remain unrestricted in the U.S. fishery. Canadian management continues to be on a quota basis for various fleet sectors. Further details of the history of both management programs have been discussed by Mayo *et al.* (1989a).

THE FISHERY

COMMERCIAL LANDINGS

Trends in landings for this resource have been strongly influenced by technological innovations, market demand, and trends in fisheries directed towards other demersal species. Historically, pollock were of minor importance for many years and it was not until the mid-1930s that landings for the Scotian Shelf-Georges Bank-Gulf of Maine resource exceeded 20,000 mt. For Canada, landings were relatively constant during 1928-1942, averaging about 5000 mt, and then increased to an average of 29,300 mt during 1960-1964 (Table 1, Figure 1). Landings subsequently declined to only 10,800 mt in 1970, but increased to a peak of 45,300 mt in 1987. Canadian pollock landings have since declined to 33,146 mt by 1992. United States landings during 1935-1960 were relatively stable about an annual average of 13,400 mt, and then decreased to less than 4000 mt in the late 1960s. Landings increased steadily to an annual average of 18,000 mt during 1978-1987, reaching a maximum of 24,542 mt in 1986. (Table 1, Figure 1). United States pollock landings have since declined precipitously, reaching 7183 mt by 1992.

Nominal catches by other nations (primarily Eastern European countries) have fluctuated considerably, increasing from none in 1962 to 12,300 mt in 1966, and then declining sharply to only 1500 mt in 1968. The combined total averaged 9800 mt during 1970-1973, but declined to less than 1000 mt annually between 1981 and 1987 (Table 1, Figure 1). Landings by

Table 1. Commercial landings (mt) of pollock for Divisions 4VWX+5+6 for United States, Canada, and distant-water fleet (DWF)¹

Year	Canada	USA	FRG	GDR	Japan	Spain	USSR	UK	Others	Total DWF	Total
1960	29470	10132	0	0	0	783	0	0	1	784	40386
1961	26323	10265	0	0	0	982	0	0	1	983	37571
1962	31721	7391	0	0	0	0	0	0	0	0	39112
1963	28999	6650	126	0	0	0	793	28	0	947	36596
1964	30007	6006	208	0	0	0	4603	374	55	5240	41253
1965	27316	5303	71	0	0	1361	2667	11	0	4110	36729
1966	18271	3791	0	0	0	2384	9865	12	0	12261	34323
1967	17567	3312	0	0	0	1779	644	1	14	2438	23317
1968	18062	3276	0	0	0	1128	372	0	7	1507	22845
1969	15968	3943	1188	2195	0	1515	227	0	7	5132	25043
1970	10753	3976	3233	4710	40	532	527	0	0	9042	23771
1971	11757	4890	633	6849	15	912	2216	0	3	10628	27275
1972	18022	5729	475	4816	8	616	3495	4	54	9468	33219
1973	26990	6303	1124	948	1570	3113	3092	0	36	9883	43176
1974	24975	8726	149	2	40	1500	2348	48	14	4101	37802
1975	26548	9318	236	96	0	709	2004	0	124	3169	39035
1976	23568	10863	994	24	0	303	1466	0	390	3177	37608
1977	24654	13056	368	0	1	2	268	0	53	692	38402
1978	26801	17714	0	0	110	0	502	0	180	792	45307
1979	29967	15541	7	0	19	0	1025	0	73	1124	46632
1980	35986	18280	0	0	81	0	950	0	131	1162	55428
1981	40270	18171	0	0	15	0	358	0	90	463	58904
1982	38029	14357	0	0	3	0	297	0	128	428	52814
1983	32749	13967	0	0	6	0	226	0	283	515	47231
1984	33465	17903	0	1	1	0	97	0	169	268	51636
1985	43300	19457	0	0	17	0	336	0	143	496	63253
1986	43249	24542	0	0	51	0	564	0	468	1083	68874
1987	45330	20353	0	0	82	0	314	0	371	767	66450
1988	41831	14960	0	0	1	0	1054	0	225	1280	58071
1989	40976	10553	0	0	28	0	1221	0	577	1826	53355
1990	36221	9645	0	0	9	0	1052	0	264	1325	47191
1991	37936	7950	0	0	38	0	2690	0	626	3354	49240
1992	33146	7183	0	0	72	0	1006	0	1024	2102	42431

¹ 1988-1992 Canadian Data Preliminary

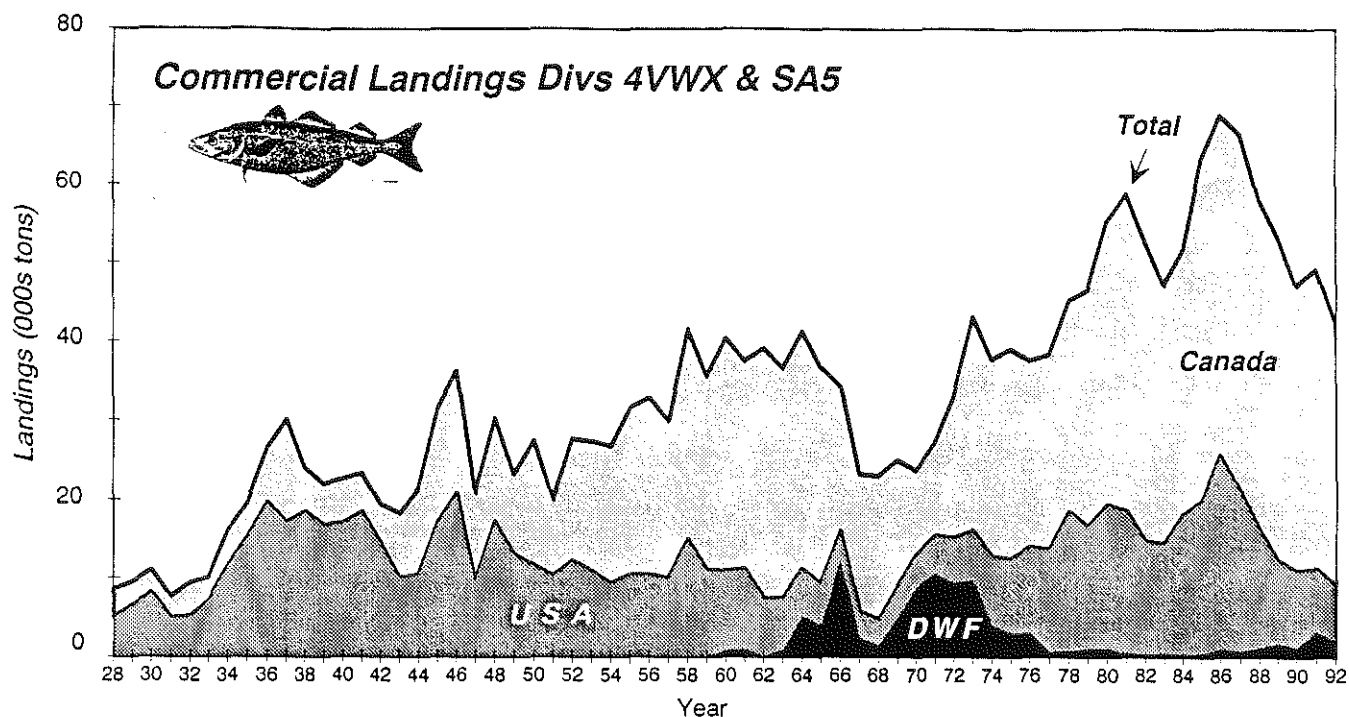


Figure 1. Commercial landings of Divisions 4VWX and Subareas 5 and 6 pollock (metric tons, live) for Canada, United States (USA), and distant-water fleets (DWF), 1928 to 1992.

DWFs have since increased to between 2000 and 3000 mt in 1991 and 1992. Historically, most of the DWF catch has been taken by the Union of Soviet Socialist Republics (USSR), the German Democratic Republic, Spain, and the Federal Republic of Germany. Japan, the United Kingdom, France, Cuba, and Poland have also taken small quantities.

Total landings for this stock have increased from about 9000 mt annually during the late-1920s to an annual average of 38,000 mt during 1960-1966. Landings then declined to an average of 24,500 mt during 1967-1971, but increased to well over 65,000 mt in 1986 and 1987; the 1986 total (68,500 mt) was the highest on record. Total pollock landings have since declined to 42,431 mt by 1992. The general increase observed through the mid-1980s appears to reflect a general increase in directed effort associated with increased Canadian and U.S. harvesting capacity and declining abundance of traditional groundfish stocks.

The distribution of nominal catch by area is given in Table 2. Since 1960, 60% of the total has been taken on the western Scotian Shelf and in the Gulf of Maine (NAFO Divisions 4X and 5Y), the apparent center of distribution of this stock.

More than 90% of the Canadian nominal catch has been taken on the Scotian Shelf (Divisions 4VWX); U.S. landings were taken primarily on Georges Bank (Division 5Z) and in the Gulf of Maine (Division 5Y) during the 1960s and early 1970s, but in more recent years have come primarily from the western Gulf of Maine.

Commercial landings of pollock by gear type and country are given in Table 3. Historically, most of the catch has been taken by bottom trawling; bottom trawls have remained the predominant gear in recent years in spite of a substantial increase in gill net effort by Canadian and U.S. fleets beginning in the mid-1970s. Since 1970, more than 70% of the nominal catch has been taken by bottom trawling, with most of the remainder (20%) being taken by gill nets. Pollock have also been taken with a variety of other gears (such as line trawls, hand lines, and purse seines). During the period since 1986, when U.S. landings declined sharply, gill net landings initially remained at relatively high levels as almost all of the decrease occurred in the trawl fishery. However, during the past three years, U.S. gill net landings have been decreasing rapidly, while the decline in trawl landings appears to have slowed considerably (Table 3).

Table 2. Commercial landings (metric tons) of pollock for Divisions 4VWX+5+6 for all countries, United States, Canada, and distant-water fleet (DWF)^{1,2}

All Countries													
Year	4V	4W	4X	Total 4VWX	5Y	5Ze	5Zw	Total 5Z	5NK	Total SA5	SA6	Total 4VWX+5	Total 4VWX+6
1960	1503	8354	20132	29989	6545	0	0	3834	18	10397	0	40386	40386
1961	1864	13167	14321	29352	5017	0	0	3177	25	8219	0	37571	37571
1962	1292	12045	19624	32961	2560	0	0	3576	15	6151	0	39112	39112
1963	674	9152	20645	30471	2168	0	0	3947	10	6125	116	36596	36712
1964	474	12488	19283	32245	1754	0	0	7250	0	9004	4	41249	41253
1965	1205	13134	13390	27729	1933	0	0	7065	0	8998	2	36727	36729
1966	788	11040	12648	24476	953	0	0	8846	0	9799	48	34275	34323
1967	657	5836	8290	14783	1728	0	0	6790	14	8532	2	23315	23317
1968	1013	5954	10656	17623	1416	3724	82	3806	0	5222	0	22845	22845
1969	300	3938	10983	15221	4635	5025	162	5187	0	9822	0	25043	25043
1970	649	2952	8194	11795	6281	5157	123	5280	0	11561	415	23356	23771
1971	531	1802	9739	12072	7016	7096	142	7238	58	14312	891	26384	27275
1972	597	3419	16190	20206	6419	6519	51	6570	0	12989	24	33195	33219
1973	1004	5871	23225	30100	5202	6235	1618	7853	0	13055	21	43155	43176
1974	307	4740	20362	25409	6106	6233	5	6238	0	12344	49	37753	37802
1975	799	5697	18668	25164	6015	7848	3	7851	0	13866	5	39030	39035
1976	1102	3424	19700	24226	6441	6915	11	6926	12	13379	3	37605	37608
1977	1347	6082	14700	22129	8278	7846	79	7925	36	16239	34	38368	38402
1978	2931	4910	15161	23002	12238	9943	17	9960	91	22289	16	45291	45307
1979	4877	4963	18340	28180	9856	8356	11	8367	221	18444	8	46624	46632
1980	3893	7511	20485	31889	11388	11883	20	11903	245	23536	3	55425	55428
1981	2316	15678	18842	36836	12475	9298	21	9319	247	22041	27	58877	58904
1982	2939	9373	21036	33348	9416	9903	15	9918	129	19463	3	52811	52814
1983	5491	5787	18137	29415	8458	9217	25	9242	113	17813	3	47228	47231
1984	5474	6043	19486	31003	12543	7819	28	7847	236	20626	7	51629	51636
1985	12085	3262	26837	42184	15615	5169	19	5188	261	21064	5	63248	63253
1986	15250	4046	23071	42367	18900	7387	14	7401	204	26505	2	68872	68874
1987	12820	4425	26858	44103	14841	7393	12	7405	101	22347	0	66450	66450
1988	11871	4240	24656	40767	11356	5942	5	5947	0	17303	1	58070	58071
1989	12074	5598	23780	41452	7143	4752	8	4760	0	11903	0	53355	53355
1990	8155	5257	22578	35990	6094	5011	9	5020	86	11200	1	47190	47191
1991	4072	9121	26447	39640	5320	4208	7	4215	64	9599	1	49239	49240
1992	2419	7336	21585	31340	4871	5213	9	5222	64	10157	6	41497	41503

¹ Totals are for all countries² 1992 data provisional

Table 2. Continued.

Canada Year	4V	4W	4X	Total 4VWX	5Y	5Zc	5Zw	Total 5Z	5NK	Total SA5	SA6	Total 4VWX+5	Total 4VWX+6
1960	906	8006	18347	27259	2211	0	0	0	0	2211	0	29470	29470
1961	973	12936	12056	25965	324	0	0	34	0	358	0	26323	26323
1962	1274	11904	17942	31120	212	0	0	389	0	601	0	31721	31721
1963	566	8369	19111	28046	53	0	0	900	0	953	0	28999	28999
1964	443	11445	16177	28065	119	0	0	1823	0	1942	0	30007	30007
1965	456	11798	13018	25272	159	0	0	1885	0	2044	0	27316	27316
1966	226	5421	8612	14259	72	0	0	3940	0	4012	0	18271	18271
1967	450	4359	7471	12280	533	0	0	4754	0	5287	0	17567	17567
1968	552	5354	10416	16322	74	1666	0	1666	0	1740	0	18062	18062
1969	161	3046	10318	13525	40	2403	0	2403	0	2443	0	15968	15968
1970	148	2003	7749	9900	28	825	0	825	0	853	0	10753	10753
1971	197	897	9027	10121	80	1556	0	1556	0	1636	0	11757	11757
1972	257	1112	15287	16656	147	1199	20	1219	0	1366	0	18022	18022
1973	205	3218	21840	25263	261	1466	0	1466	0	1727	0	26990	26990
1974	165	2612	18659	21436	680	2859	0	2859	0	3539	0	24975	24975
1975	432	3650	17730	21812	407	4329	0	4329	0	4736	0	26548	26548
1976	295	2161	18996	21452	57	2056	3	2059	0	2116	0	23568	23568
1977	1347	5760	14133	21240	237	3176	0	3176	0	3413	1	24653	24654
1978	2740	4341	14966	22047	341	4413	0	4413	0	4754	0	26801	26801
1979	4805	4005	18125	26935	573	2459	0	2459	0	3032	0	29967	29967
1980	3790	6637	19925	30352	530	5104	0	5104	0	5634	0	35986	35986
1981	2226	15322	18672	36220	713	3337	0	3337	0	4050	0	40270	40270
1982	2895	8991	20770	32656	926	4447	0	4447	0	5373	0	38029	38029
1983	5468	5304	17594	28366	1079	3304	0	3304	0	4383	0	32749	32749
1984	5427	5822	18926	30175	2091	1199	0	1199	0	3290	0	33465	33465
1985	11991	2860	26685	41536	853	911	0	911	0	1764	0	43300	43300
1986	15130	3083	22845	41058	654	1537	0	1537	0	2191	0	43249	43249
1987	12714	3764	26756	43234	0	2096	0	2096	0	2096	0	45330	45330
1988	11870	3078	24479	39427	0	2404	0	2404	0	2404	0	41831	41831
1989	12050	3840	23701	39591	0	1385	0	1385	0	1385	0	40976	40976
1990	8154	4036	22262	34452	0	1769	0	1769	0	1769	0	36221	36221
1991	4057	6705	25456	36218	0	1718	0	1718	0	1718	0	37936	37936
1992	2419	5671	20806	28896	0	3038	0	3038	0	3038	0	31934	31934

Table 2. Continued.

USA Year	4V	4W	4X	Total 4VWX	5Y	5Ze	5Zw	Total 5Z	5NK	Total SA5	SA6	Total 4VWX+5	Total 4VWX+6
1960	12	149	1785	1946	4334	0	0	3834	18	8186	0	10132	10132
1961	18	121	2265	2404	4693	0	0	3143	25	7861	0	10265	10265
1962	18	141	1682	1841	2348	0	0	3187	15	5550	0	7391	7391
1963	28	426	1526	1980	2002	0	0	2658	10	4670	3	6650	6653
1964	4	139	1095	1238	1635	0	0	3131	0	4766	2	6004	6006
1965	0	36	351	387	1774	0	0	3140	0	4914	2	5301	5303
1966	0	2	618	620	881	0	0	2242	0	3123	48	3743	3791
1967	0	3	525	528	1195	0	0	1587	0	2782	2	3310	3312
1968	149	0	146	295	1342	1586	53	1639		2981	0	3276	3276
1969	0	0	436	436	1284	2219	4	2223	0	3507	0	3943	3943
1970	0	39	345	384	1369	2221	2	2223		3592	0	3976	3976
1971	0	22	136	158	1690	3037	0	3037	0	4727	5	4885	4890
1972	2	49	435	486	3171	2067	4	2071	0	5242	1	5728	5729
1973	10	59	503	572	3567	2161	0	2161	0	5728	3	6300	6303
1974	4	41	631	676	5426	2620	4	2624	0	8050	0	8726	8726
1975	4	46	691	741	5595	2976	2	2978	0	8573	4	9314	9318
1976	0	83	536	619	6384	3842	3	3845	12	10241	3	10860	10863
1977	0	8	319	327	8041	4628	17	4645	36	12722	7	13049	13056
1978	0	5	164	169	11897	5530	17	5547	91	17535	10	17704	17714
1979	0	0	121	121	9283	5897	11	5908	221	15412	8	15533	15541
1980	0	0	375	375	10858	6779	20	6799	245	17902	3	18277	18280
1981	0	0	153	153	11762	5961	21	5982	247	17991	27	18144	18171
1982	0	0	265	265	8490	5455	15	5470	129	14089	3	14354	14357
1983	0	0	534	534	7379	5913	25	5938	113	13430	3	13964	13967
1984	0	0	560	560	10452	6620	28	6648	236	17336	7	17896	17903
1985	0	0	152	152	14762	4258	19	4277	261	19300	5	19452	19457
1986	0	0	226	226	18246	5850	14	5864	204	24314	2	24540	24542
1987	0	0	102	102	14841	5297	12	5309	101	20251	0	20353	20353
1988	0	0	60	60	11356	3538	5	3543	0	14899	1	14959	14960
1989	0	0	35	35	7143	3367	8	3375	0	10518	0	10553	10553
1990	0	0	213	213	6094	3242	9	3251	86	9431	1	9644	9645
1991	0	0	68	68	5320	2490	7	2497	64	7881	1	7949	7950
1992	0	0	56	56	4873	2176	9	2185	63	7121	6	7177	7183

Table 2. Continued.

Distant Water Fleets (DWF)													
Year	4V	4W	4X	Total 4VWX	5Y	5Zc	5Zw	Total 5Z	5NK	Total SA5	SA6	Total 4VWX+5	Total 4VWX+6
1960	585	199	0	784	0	0	0	0	0	0	0	784	784
1961	873	110	0	983	0	0	0	0	0	0	0	983	983
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	80	357	8	445	113	0	0	389	0	502	113	947	1060
1964	27	904	2011	2942	0	0	0	2296	0	2296	2	5238	5240
1965	749	1300	21	2070	0	0	0	2040	0	2040	0	4110	4110
1966	562	5617	3418	9597	0	0	0	2664	0	2664	0	12261	12261
1967	207	1474	294	1975	0	0	0	449	14	463	0	2438	2438
1968	312	600	94	1006	0	472	29	501	0	501	0	1507	1507
1969	139	892	229	1260	3311	403	158	561	0	3872	0	5132	5132
1970	501	910	100	1511	4884	2111	121	2232	0	7116	415	8627	9042
1971	334	883	576	1793	5246	2503	142	2645	58	7949	886	9742	10628
1972	338	2258	468	3064	3101	3253	27	3280	0	6381	23	9445	9468
1973	789	2594	882	4265	1374	2608	1618	4226	0	5600	18	9865	9883
1974	138	2087	1072	3297	0	754	1	755	0	755	49	4052	4101
1975	363	2001	247	2611	13	543	1	544	0	557	1	3168	3169
1976	807	1180	168	2155	0	1017	5	1022	0	1022	0	3177	3177
1977	0	314	248	562	0	42	62	104	0	104	26	666	692
1978	191	564	31	786	0	0	0	0	0	0	6	786	792
1979	72	958	94	1124	0	0	0	0	0	0	0	1124	1124
1980	103	874	185	1162	0	0	0	0	0	0	0	1162	1162
1981	90	356	17	463	0	0	0	0	0	0	0	463	463
1982	44	382	1	427	0	1	0	1	0	1	0	428	428
1983	23	483	9	515	0	0	0	0	0	0	0	515	515
1984	47	221	0	268	0	0	0	0	0	0	0	268	268
1985	94	402	0	496	0	0	0	0	0	0	0	496	496
1986	120	963	0	1083	0	0	0	0	0	0	0	1083	1083
1987	106	661	0	767	0	0	0	0	0	0	0	767	767
1988	1	1162	117	1280	0	0	0	0	0	0	0	1280	1280
1989	24	1758	44	1826	0	0	0	0	0	0	0	1826	1826
1990	1	1221	103	1325	0	0	0	0	0	0	0	1325	1325
1991	15	2416	923	3354	0	0	0	0	0	0	0	3354	3354
1992	0	1665	723	2388	0	0	0	0	0	0	0	2388	2388

Table 3. Pollock landings (metric tons, live) from Divisions 4VWX and Subareas 5 and 6 by gear, 1960-1992¹

Year	Bottom Trawls				Gill Nets			Other Gear				All Gear			
	Canada	USA	Others	Total	Canada	USA	Total	Canada	USA	Others	Total	Canada	USA	Others	Total
1970	8874	3555	N/A	12429	258	285	543	1621	136	N/A	N/A	10753	3976	9042	23771
1971	10039	4447	9464	23950	270	163	433	1448	280	1164	2892	11757	4890	10628	27275
1972	15935	4926	8761	29622	484	699	1183	1603	104	707	2414	18022	5729	9468	33219
1973	23204	4959	6754	34917	501	1033	1534	3285	311	3129	6725	26990	6303	9883	43176
1974	20449	6249	2448	29146	2211	1906	4117	2315	571	1653	4539	24975	8726	4101	37802
1975	20217	5877	2147	28241	4146	2613	6759	2185	828	1022	4035	26548	9318	3169	39035
1976	15881	6868	1975	24724	5060	3177	8237	2627	818	1202	4647	23568	10863	3177	37608
1977	19774	7483	291	27548	2866	4560	7426	2014	1013	401	3428	24654	13056	692	38402
1978	20649	9283	672	30604	4196	7227	11423	1956	1204	120	3280	26801	17714	792	45307
1979	22281	7729	1075	31085	4840	6305	11145	2846	1507	49	4402	29967	15541	1124	46632
1980	26486	10384	1107	37977	3709	6041	9750	5791	1855	55	7701	35986	18280	1162	55428
1981	30233	9685	461	40379	7684	7937	15621	2353	549	2	2904	40270	18171	463	58904
1982	26929	9793	428	37150	8029	4342	12371	3071	222	0	3293	38029	14357	428	52814
1983	24342	10630	515	35487	6149	3121	9270	2258	216	0	2474	32749	13967	515	47231
1984	26379	12871	268	39518	4974	4736	9710	2112	296	0	2408	33465	17903	268	51636
1985	31559	13658	496	45713	8680	5609	14289	3061	190	0	3251	43300	19457	496	63253
1986	28640	16531	1083	46254	8700	7762	16462	5909	249	0	6158	43249	24542	1083	68874
1987	31046	12101	767	43914	10230	8060	18290	4054	192	0	4246	45330	20353	767	66450
1988	29387	7555	1280	38222	9233	7243	16476	3211	162	0	3373	41831	14960	1280	58071
1989	27311	5356	1826	34493	10765	5072	15837	2900	125	0	3025	40976	10553	1826	53355
1990	21582	5485	1325	28392	- ²	3970	3970	14639	190	0	14829	36221	9645	1325	47191
1991	26101	4808	3354	34263	-	2972	2972	11835	170	0	12005	37936	7950	3354	49240
1992	21458	4452	2102	28012	-	2598	2598	9831	133	0	9964	33146	7183	2102	42431

¹ 1988-1992 Canadian data preliminary² 1990-92 Canadian gill net landings contained in "Other Gear" category

DISCARDS

Some discarding of pollock is likely to have occurred in U.S. fisheries due to imposition of minimum size regulations, and in Canadian fisheries due to the cod-haddock-pollock combined quota system imposed in the western Scotia-Fundy region in 1989 (Mohn *et al.* 1990). Any inclusion of discards in the catch-at-age would have to account for both of these potential sources of discarding. No analyses have yet been performed.

RECREATIONAL CATCHES

Methodology

No recreational catch data are available for Canada, and it is assumed that Canadian recreational catches are of minor significance. Recreational catch information for the United States has been collected: in a series of National Saltwater Angling Surveys for 1960, 1965, and 1970 (Clark 1962; Deuel and Clark 1968; Deuel 1973); in a regional survey of the northeastern United States in 1974 (Ridgeley and Deuel 1975); and, more recently, in a series of Marine Recreational Fishery Statistics Surveys for the Atlantic and Gulf Coasts initiated in 1979. Published data are available from these surveys for 1979-1992 (USDOC 1980, 1984, 1985a, 1985b, 1986, 1987, 1991, 1992).

These surveys differed considerably in methodology and, consequently, results are only generally comparable. The National Saltwater Angling Surveys were based on personal interviews in which participants were asked to provide data on numbers and average weights taken by species over a recall period of one year; the 1974 regional survey was based on a combination telephone and mail survey conducted at two-month intervals. The Marine Recreational Fishery Statistics Surveys have combined telephone interviews to identify fishermen and to determine effort levels over a two-month recall period with an intercept (creel) survey to determine species and size composition of the catch. This approach avoids many methodological problems of earlier surveys, *e.g.*, species misidentification and recall inaccuracies of numbers and average weights caught, and consequently results appear to be considerably more reliable (Pileggi and Thompson 1980).

Catch Trends

Recreational catch estimates obtained for 1960, 1965, and 1970 totaled 4.3 million fish (9800 mt), 3.8 million fish (4200 mt), and 2.5 million fish (2500 mt), respectively (Table 4, Figure 2). These figures are considered to be biased upward by recall inaccuracies and species identification problems, although the magnitude of this bias is unknown (USDOC 1980). The 1974 survey indicated a total recreational pollock catch of 0.5 million fish (500 mt) and may not be overestimated (USDOC 1980).

Estimates from Marine Recreational Fishery Statistics Surveys including pollock reportedly caught and released alive declined from a 1979-1980 average of 4.1 million fish to 0.6 million in 1984. Catches temporarily increased in 1985 to 2.1 million fish before declining sharply to an average of 0.6 million in 1986-1987 (USDOC 1984, 1985a, 1985b, 1986, 1987, 1991; see Table 4). Catches increased slightly in 1988 but have remained at less than 0.5 million since 1990. Total weight, however, increased from about 1,000 mt in 1979 to 2,800 mt in 1983 (Figure 2) as mean size increased. Total weights declined substantially in 1984 and have remained at less than 500 mt since 1990. Mean weights have remained in the range of 0.4 to 0.6 kg since 1984.

SAMPLING INTENSITY

Commercial Fishery Sampling Levels

A summary of commercial sampling of pollock from 1969 through 1992 is given in Table 5. Sampling of the fishery was negligible between 1969 and 1976 when 10 or less samples were taken (and 1000 or fewer fish were measured) per year. Sampling intensity increased substantially in 1977 and, since then, sampling of the catch has been adequate to derive commercial catch-at-age estimates. Between 1977 and 1981, the sampling intensity ranged from one to four samples per ton landed; since 1982, the intensity has increased to between four and nine samples per ton landed. Until 1982, sampling was limited to the unclassified market category as most landings were recorded in this manner. Beginning in 1982, sampling has been allocated among market categories, areas, and gear types in approximate proportions to the landings.

Table 4. United States catches of pollock (numbers and total weight), mean weights, and number of fish measured estimated from data collected in U.S. recreational fishery surveys, 1960-1992¹

Year	Number (thousands)	Weight (mt)	Mean Weight (kg)	Number of Fish Measured
1960	4,335	9,834	2.27	n/a
1965	3,756	4,240	1.13	n/a
1970	2,451	2,533	1.03	n/a
1974	481	496	1.03	n/a
1979	3,648	1,021	0.28	348
	<i>2,349</i> ¹	658		
1980	4,446	2,134	0.48	572
	<i>1,997</i>	959		
1981	2,724	1,226	0.45	376
	<i>1,602</i>	721		
1982	1,686	2,563	1.52	375
	<i>882</i>	1,341		
1983	1,314	2,799	2.13	146
	<i>590</i>	1,257		
1984	642	276	0.43	171
	<i>405</i>	174		
1985	2,147	862	0.40	89
	<i>1,860</i>	747		
1986	447	219	0.49	121
	<i>359</i>	176		
1987	664	269	0.40	131
	<i>264</i>	107		
1988	1,421	542	0.38	192
	<i>490</i>	198		
1989	670	696	1.04	138
	<i>306</i>	401		
1990	404	171	0.42	46
	<i>223</i>	94		
1991	458	289	0.63	42
	<i>106</i>	79		
1992	185	84	0.49	56
	<i>91</i>	40		

¹ Numbers in italics exclude data for pollock caught and released alive; weights calculated by multiplying numbers caught by mean weight of pollock available for identification in intercept (creel) survey work.

Recreational Fishery Sampling Levels

Sampling of the recreational pollock catch has been relatively poor since 1979 when intercept sampling commenced (Table 4). During 1979-1982, between 300 and 600 pollock were measured from this fishery per year, but sampling declined sharply thereafter to fewer than 100 measurements per year since 1989. A representation of the length frequency distribution of recreational pollock samples is given in Figure 3.

COMMERCIAL CATCH AT AGE

Numerous additions and revisions to the pollock catch-at-age matrix have occurred since the initial analyses were completed. Recent revisions and extensions of the matrix back to 1970 (McGlade and Annand 1986), and continuing updates forward through time have resulted in a 23-year series available for current analyses. Commercial length-frequency samples are now available from the Canadian fishery for most months since the beginning of 1970; Canadian age-length keys are also available, at least by quarter, for 1970-1975 and for most months thereafter. Length-frequency samples from the U.S. trawl fishery are generally available by quarter since 1974. Sampling of U.S. pollock landings was intensified in 1977, and length-frequencies have generally been available for U.S. trawl landings on a monthly basis, and age-length keys on a quarterly basis since that year. Sampling of the U.S. gill-net catch has been limited primarily to the period since 1977. Sampling of catches by DWFs has also been minor.

Canadian Catch at Age

The Canadian component of the catch-at-age used in the present analysis from 1988 to 1992 has been taken from the most recent Canadian assessment for Divisions 4VWX and Subdivision 5Zc (Trippel, personal communication).¹ The Canadian catch-at-age from 1970 to 1987 was taken from Mayo *et al.* (1989a); the construction of the annual catch-at-age from individual components is described in detail by Mayo *et al.* (1989a). The full matrix of Canadian catch, mean weights and estimated total weights-at-age is presented in Table 6. The 1992 Canadian age composition is dominated by the 1987 and 1988

¹ E. Trippel, Department of Fisheries and Oceans, St. Andrews, New Brunswick, May 1993.

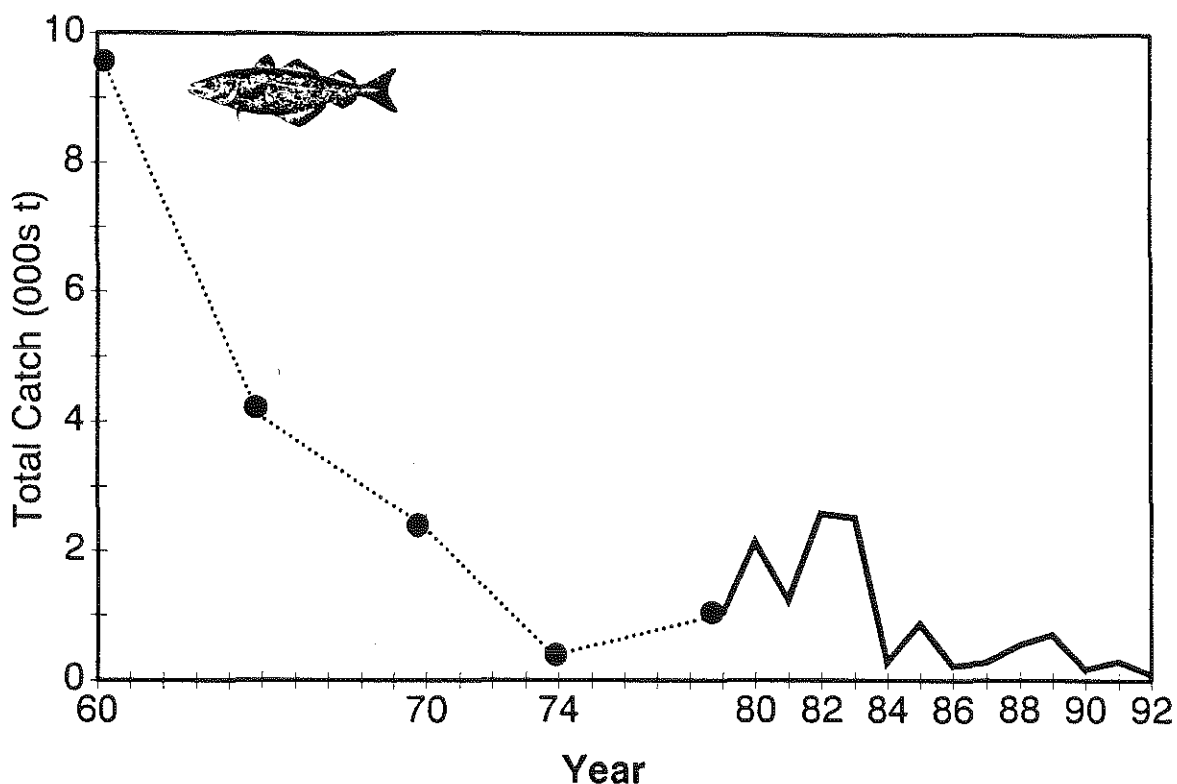


Figure 2. United States recreational landings of pollock from North and Middle Atlantic regions (metric tons, live), 1960-1992.

year classes, which together account for 61% of the total number landed.

United States Catch at Age

Sampling of U.S. catches was limited prior to 1974, and age-length keys were not available until 1977. Consequently, estimates of the U.S. component of the catch-at-age from 1970 through 1976 were based on proportions derived on an annual basis from Canadian Division 4X + Subarea 5, vessel ton class (TC) 4+ otter trawl catch-at-age compositions. Since 1977, U.S. length-frequencies and age-length keys have been applied independently to the otter trawl and gill net components, except for 1980, when Canadian gill net length-frequencies were applied to U.S. gill net landings. Further details concerning the construction of the annual U.S. catch-at-age from individual components are given by Mayo *et al.* (1989a). The full matrix of U.S. catch, mean weights and, estimated total weights-at-age is presented in Table 7. The 1992 U.S. age composition is dominated by the 1987 year class with secondary contributions from the 1985, 1986, and 1988 year classes.

Distant Water Fleet Catch at Age

The DWF component of the catch-at-age is composed of a small-mesh and a large mesh segment. The construction of these segments over time has been altered as the availability of data has increased. A description of the assumptions and methodology employed to construct this component is provided by Mayo *et al.* (1989a) for the 1970-1980 period and, more recently, by Annand and Beanlands (1991) for the 1981-present period. The full matrix of DWF catch, mean weights and estimated total weights-at-age is presented in Table 8. The 1992 DWF age composition was dominated by the 1988 and 1989 year classes, which together accounted for 86% of the total number landed.

Total Catch at Age

The combined catch, mean weight, and total weight-at-age matrices for all countries and gear types are presented in Table 9. Canadian and U.S. catches by number have been dominated by age 3 to 7 fish throughout the series, although considerable interannual variability is evident as

Table 5. Sampling levels of U.S. commercial pollock landings, 1969-1992

	Number of Samples Taken					Number of Length Measurements					Number of Age Specimens Taken				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
1969															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	0	0	6	1	7	0	0	592	42	634	0	0	0	0	0
Total	0	0	6	1	7	0	0	592	42	634	0	0	0	0	0
1970															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	0	0	4	0	4	0	0	396	0	396	0	0	0	0	0
Total	0	0	4	0	4	0	0	396	0	396	0	0	0	0	0
1971															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	1	0	0	0	1	57	0	0	0	57	0	0	0	0	0
Total	1	0	0	0	1	57	0	0	0	57	0	0	0	0	0
1972															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	0	0	2	4	6	0	0	201	432	633	0	0	20	80	100
Total	0	0	2	4	6	0	0	201	432	633	0	0	20	80	100
1973															
Large	1	0	0	0	1	117	0	0	0	117	20	0	0	0	20
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	4	1	2	2	9	344	95	203	206	848	40	20	40	40	140
Total	5	1	2	2	10	461	95	203	206	965	60	20	40	40	160
1974															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	2	3	1	4	10	210	313	101	429	1053	40	60	20	101	221
Total	2	3	1	4	10	210	313	101	429	1053	40	60	20	101	221

Table 5. Continued.

	Number of Samples Taken					Number of Length Measurements					Number of Age Specimens Taken				
	g1	g2	g3	g4	Total	g1	g2	g3	g4	Total	g1	g2	g3	g4	Total
1975															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	3	2	2	0	7	280	199	171	0	650	40	45	40	0	125
Total	3	2	2	0	7	280	199	171	0	650	40	45	40	0	125
1976															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	2	1	0	3	6	159	80	0	258	497	52	25	0	60	137
Total	2	1	0	3	6	159	80	0	258	497	52	25	0	60	137
1977															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	8	9	18	14	49	705	870	1744	1376	4695	150	190	350	315	1005
Total	8	9	18	14	49	705	870	1744	1376	4695	150	190	350	315	1005
1978															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	6	5	2	10	23	560	381	200	1018	2159	112	100	40	203	455
Total	6	5	2	10	23	560	381	200	1018	2159	112	100	40	203	455
1979															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	5	2	29	19	55	459	234	3108	1915	5716	100	58	624	479	1261
Total	5	2	29	19	55	459	234	3108	1915	5716	100	58	624	479	1261
1980															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	10	6	5	6	27	890	572	417	533	2412	193	108	88	132	521
Total	10	6	5	6	27	890	572	417	533	2412	193	108	88	132	521

Table 5. Continued.

	Number of Samples Taken					Number of Length Measurements					Number of Age Specimens Taken				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
1981															
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclass.	4	7	17	23	51	421	819	1849	2359	5448	109	10	498	559	1376
Total	4	7	17	23	51	421	819	1849	2359	5448	109	210	498	559	1376
1982															
Large	0	0	2	7	9	0	0	184	630	814	0	0	59	158	217
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	0	0	6	0	6	0	0	602	0	602	0	0	120	0	120
Unclass.	15	12	9	7	43	1553	1282	893	665	4393	303	288	242	147	980
Total	15	12	17	14	58	1553	1282	1679	1295	5809	303	288	421	305	1317
1983															
Large	8	10	17	6	41	756	931	1579	556	3822	160	263	497	161	1081
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	6	7	15	7	35	618	709	1393	761	3481	140	143	324	164	771
Unclass.	6	6	7	4	23	604	587	693	429	2313	122	134	172	141	569
Total	20	23	39	17	99	1978	2227	3665	1746	9616	422	540	993	466	2421
1984															
Large	3	4	3	10	20	310	349	315	906	1880	92	106	92	260	550
Medium	1	0	0	0	1	0	0	105	0	105	0	0	23	0	23
Small	6	4	0	0	10	625	464	0	0	1089	139	92	0	0	231
Unclass.	8	14	4	18	44	825	1517	371	1818	4531	233	339	114	445	1131
Total	18	22	7	28	75	1760	2330	791	2724	7605	464	537	229	705	1935
1985															
Large	5	6	5	12	28	569	434	456	1172	2631	122	183	166	300	771
Medium	2	4	3	2	11	207	403	248	196	1054	47	81	58	43	229
Small	0	2	7	4	13	0	110	632	377	1119	0	23	132	88	243
Unclass.	11	10	4	6	31	1179	975	378	564	3096	252	295	116	154	817
Total	18	22	19	24	83	1955	1922	1714	2309	7900	421	82	472	585	2060
1986															
Large	8	8	10	6	32	744	728	862	598	2932	218	243	289	162	912
Medium	3	3	6	5	17	364	285	618	473	1740	70	62	139	93	364
Small	2	5	6	3	16	140	502	571	255	1468	36	112	127	49	324
Unclass.	13	8	5	8	34	1362	778	501	734	3375	335	231	121	152	839
Total	26	24	27	22	99	2610	2293	2552	2060	9515	659	648	676	456	2439

Table 5. Continued.

	Number of Samples Taken					Number of Length Measurements					Number of Age Specimens Taken				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
1987															
Large	5	8	12	20	45	444	891	1077	1905	4317	132	246	359	532	1269
Medium	1	6	2	5	14	117	633	176	490	1416	20	119	46	119	304
Small	1	4	5	2	12	50	374	520	149	1093	16	86	93	46	241
Unclass.	7	2	2	2	13	706	205	204	187	1302	178	53	50	51	332
Total	14	20	21	29	84	1317	2103	1977	2731	8128	346	504	548	748	2146
1988															
Large	10	8	9	13	40	988	659	872	1285	3804	286	191	210	336	1023
Medium	14	3	3	2	22	1379	240	294	202	2115	307	74	75	50	506
Small	2	6	6	4	18	199	620	584	427	1830	41	137	150	83	411
Unclass.	3	1	4	5	13	299	100	407	512	1318	89	23	100	87	299
Total	29	18	22	24	93	2865	1619	2157	2426	9067	723	425	535	556	2239
1989															
Large	6	5	4	4	19	603	479	384	385	1851	161	145	115	108	529
Medium	8	1	4	7	20	719	121	403	711	1954	212	29	80	148	469
Small	8	6	10	9	33	747	568	938	874	3127	180	130	200	179	689
Unclass.	4	2	2	2	10	418	202	202	200	1022	97	43	42	45	227
Total	26	14	20	22	82	2487	1370	1927	2170	7954	650	347	437	480	1914
1990															
Large	11	5	1	1	18	1023	504	102	100	1729	304	137	25	25	491
Medium	1	2	1	4	8	100	208	101	375	784	25	45	23	86	179
Small	12	11	7	1	31	1195	1157	709	100	3161	269	240	145	20	674
Unclass.	0	2	1	2	5	201	101	203	0	505	0	45	25	47	117
Total	24	20	10	8	62	2519	1970	1115	575	6179	598	467	218	178	1461
1991															
Large	2	4	3	6	15	206	393	226	610	1435	74	90	60	134	358
Medium	2	4	4	2	12	201	392	401	201	1195	49	91	95	47	282
Small	6	4	7	8	25	564	393	665	758	2380	110	86	181	166	543
Unclass.	4	3	3	1	11	371	300	302	100	1073	100	80	89	26	295
Total	14	15	17	17	63	1342	1478	1594	1669	6083	333	347	425	373	1478
1992															
Large	6	5	4	9	24	594	454	428	862	2338	134	100	90	209	533
Medium	2	2	7	2	13	207	160	609	175	1151	46	53	174	58	331
Small	4	5	6	5	20	425	523	595	527	2070	80	104	323	100	607
Unclass.	2	2	1	0	5	201	211	100	0	512	51	63	25	0	139
Total	14	14	18	16	62	1427	1348	1732	1564	6071	311	320	612	367	1610

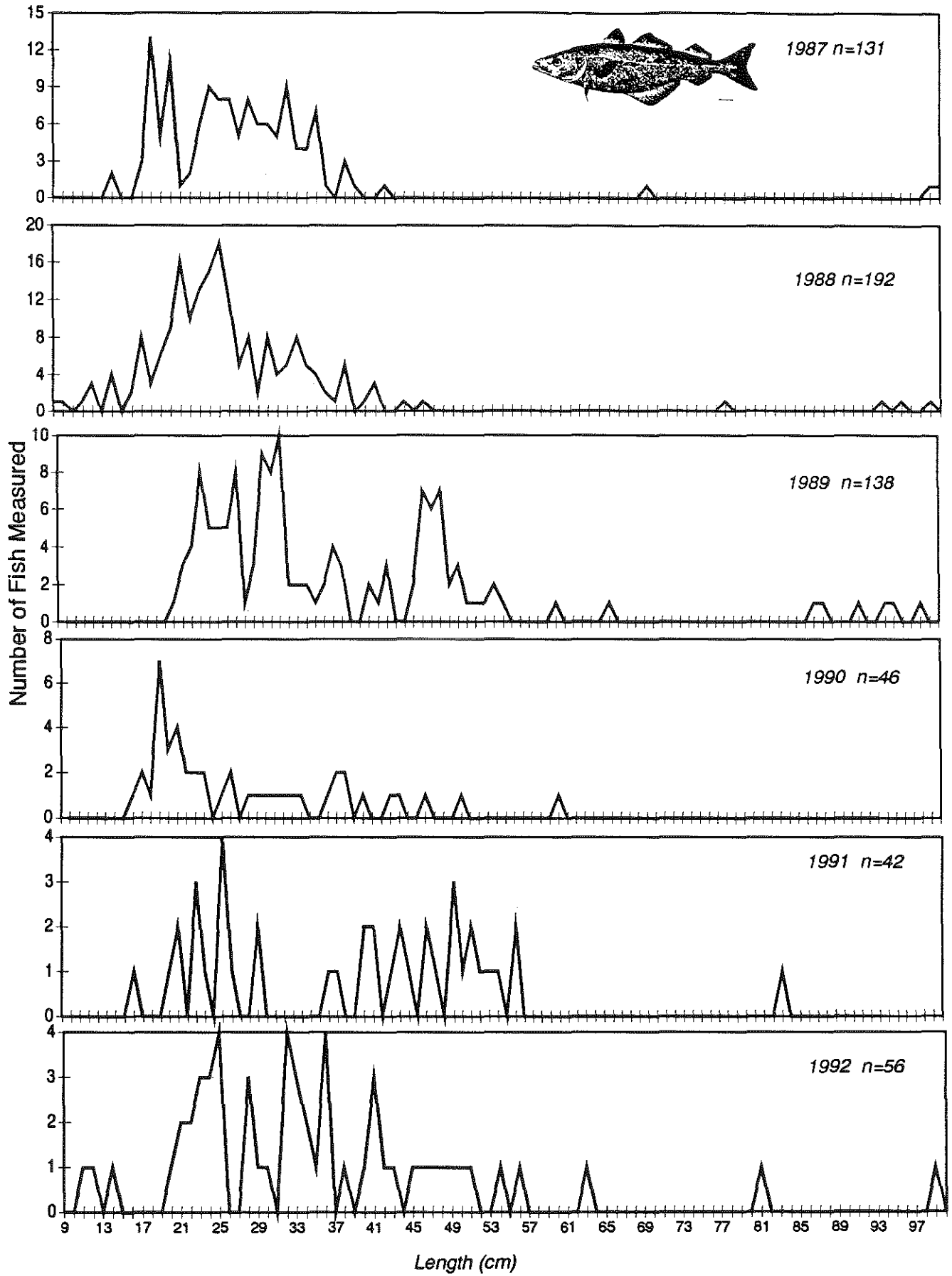


Figure 3. Sample length compositions of U.S. recreational fishery-caught pollock, 1987-1992.

Table 6. Estimated numbers landed (thousands of fish), mean weight (kilograms), and estimated total weight (metric tons) of pollock in Divisions 4VWX and Subareas 5 and 6, 1970-1992, Canada only

Year	Numbers (thousands) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	10	206	673	580	398	350	261	109	68	24	6	2685
1971	177	636	1009	924	739	249	109	1	4	0	0	3848
1972	484	1316	1491	964	560	293	67	57	16	36	52	5336
1973	191	1563	5793	3562	487	195	68	64	59	10	3	11995
1974	182	4709	2327	2092	939	269	142	63	50	32	10	10815
1975	165	973	3521	1828	1639	785	130	44	55	34	30	9204
1976	124	1189	1712	3123	925	986	191	34	12	16	41	8353
1977	36	1415	2818	1737	2101	701	390	89	19	25	79	9410
1978	23	773	3019	2971	1202	1123	242	132	17	19	18	9539
1979	97	2717	5510	3298	1624	489	245	46	15	14	0	14055
1980	126	241	1712	4975	3076	1035	266	163	32	9	2	11637
1981	41	1303	657	1997	3929	2377	696	202	145	30	23	11400
1982	129	3440	1550	551	1832	2245	1044	381	168	85	22	11447
1983	52	1786	8951	1200	228	503	801	412	157	48	56	14194
1984	21	685	3322	6805	608	87	205	197	85	17	20	12052
1985	24	477	2179	4126	6178	1102	126	134	221	78	57	14702
1986	4	317	2868	3519	3575	3291	298	82	113	165	113	14345
1987	8	428	2231	4859	3489	2372	1672	175	35	44	95	15408
1988	27	618	2493	3235	3345	1784	1146	991	43	17	93	13792
1989	44	495	3691	3772	2335	1911	847	650	382	12	10	14149
1990	6	1018	1940	3674	2484	1531	835	535	243	86	28	12380
1991	16	688	3213	3043	3885	1666	772	337	285	188	202	14295
1992	1	1136	4208	3183	1646	1061	416	232	176	81	50	12190

Year	Mean weights (kilograms) at age											Mean
	2	3	4	5	6	7	8	9	10	11	12+	
1970	0.97	1.75	2.66	3.61	4.23	5.01	5.87	7.18	7.06	9.01	8.11	4.00
1971	1.67	2.32	2.12	3.15	4.00	5.00	6.24	7.25	9.62	0.00	0.00	3.05
1972	1.06	1.86	2.93	4.44	5.29	5.95	6.52	6.84	7.60	6.81	9.56	3.37
1973	0.75	1.35	1.90	2.64	3.96	4.85	6.19	6.69	7.32	9.33	10.35	2.25
1974	0.83	1.43	1.98	3.02	4.05	5.03	6.06	6.62	7.22	8.12	9.36	2.31
1975	0.86	1.27	1.99	3.10	3.87	5.07	6.51	7.47	7.69	8.47	9.89	2.89
1976	0.63	1.23	1.94	2.80	3.73	4.65	5.62	7.04	7.71	8.67	9.19	2.82
1977	0.79	1.11	1.52	2.48	3.49	4.50	5.45	6.55	7.25	10.02	11.30	2.62
1978	1.14	1.26	1.81	2.59	3.88	4.59	6.00	6.84	7.37	8.38	10.03	2.81
1979	0.77	1.18	1.54	2.63	3.38	4.33	5.54	6.61	7.14	8.79	0.00	2.13
1980	1.12	1.77	2.10	2.80	3.47	4.14	5.56	6.51	9.07	8.40	11.64	3.09
1981	1.01	1.74	2.54	2.91	3.34	4.32	5.93	6.90	7.77	7.54	9.22	3.53
1982	0.76	1.24	2.70	3.51	4.18	4.45	5.19	6.12	7.64	8.00	8.65	3.32
1983	0.84	1.25	1.67	3.13	4.11	4.83	5.08	5.84	6.48	8.00	8.72	2.30
1984	1.46	1.68	2.36	2.67	3.84	5.41	5.97	5.90	6.34	7.69	8.76	2.76
1985	0.94	1.52	1.96	2.74	3.12	3.43	4.39	6.13	5.89	6.19	7.56	2.92
1986	0.83	1.39	2.02	2.52	3.29	3.61	4.20	5.66	6.09	6.11	6.86	2.99
1987	0.72	1.37	1.97	2.51	2.95	3.72	4.04	4.55	6.32	6.26	7.62	2.93
1988	1.17	1.46	1.92	2.64	3.22	3.51	4.23	4.41	5.26	8.03	8.52	3.02
1989	0.83	1.26	1.88	2.51	3.26	3.83	4.12	4.84	5.19	8.66	7.44	2.88
1990	0.76	1.45	2.05	2.55	2.96	3.84	4.12	4.94	5.10	5.94	7.39	2.92
1991	0.48	1.12	1.75	2.31	2.80	3.34	3.83	4.65	4.75	5.07	5.61	2.65
1992	0.84	1.30	1.77	2.55	3.39	3.75	4.27	5.00	5.64	5.96	6.34	2.57

Year	Weight (metric tons) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	10	361	1790	2094	1684	1754	1532	783	480	216	49	10751
1971	296	1476	2139	2911	2956	1245	680	7	38	0	0	11748
1972	513	2448	4369	4280	2962	1743	437	390	122	245	497	18006
1973	143	2110	11007	9404	1929	946	421	428	432	93	31	26943
1974	151	6734	4607	6318	3803	1353	861	417	361	260	94	24958
1975	142	1236	7007	5667	6343	3980	846	329	423	288	297	26557
1976	78	1462	3321	8744	3450	4585	1073	239	93	139	377	23562
1977	28	1571	4283	4308	7332	3155	2126	583	138	251	893	24667
1978	26	974	5464	7695	4664	5155	1452	903	125	159	181	26798
1979	75	3206	8485	8674	5489	2117	1357	304	107	123	0	29938
1980	141	427	3595	13930	10674	4285	1479	1061	290	76	23	35981
1981	41	2267	1669	5811	13123	10269	4127	1394	1127	226	212	40266
1982	98	4266	4185	1934	7658	9990	5418	2332	1284	680	190	38035
1983	44	2233	14948	3756	937	2429	4069	2406	1017	384	488	32712
1984	31	1151	7840	18169	2335	471	1224	1162	539	131	175	33227
1985	23	725	4271	11305	19275	3780	553	821	1302	483	431	42969
1986	3	441	5793	8868	11762	11881	1252	464	688	1008	775	42935
1987	6	586	4395	12196	10293	8824	6755	796	221	275	724	45071
1988	32	902	4787	8540	10771	6262	4848	4370	226	137	792	41667
1989	37	624	6939	9468	7612	7319	3490	3146	1983	104	74	40795
1990	5	1476	3977	9369	7353	5879	3440	2643	1239	511	207	36098
1991	8	771	5623	7029	10878	5564	2957	1567	1354	953	1133	37837
1992	1	1477	7488	8117	5580	3979	1776	1160	993	483	317	31330

Table 7. Estimated numbers landed (thousands), mean weight (kilograms), and estimated total weight (metric tons) of pollock in Divisions 4VWX and Subareas 5 and 6, 1970-1992. United States only

Year	Numbers (thousands) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	5	93	282	260	159	98	52	30	14	3	0	996
1971	74	264	420	384	307	104	45	1	2	0	0	1601
1972	154	418	474	307	178	93	21	18	5	12	16	1696
1973	16	364	1338	855	114	47	14	15	15	3	1	2782
1974	67	1804	820	711	286	91	52	17	18	8	5	3879
1975	87	390	1319	500	517	216	69	25	29	21	18	3191
1976	58	847	1136	1712	379	268	67	5	1	3	8	4484
1977	20	293	943	681	826	326	261	99	62	20	195	3726
1978	92	726	550	649	631	936	349	270	134	84	211	4632
1979	202	1359	1773	1039	500	243	285	114	47	25	112	5699
1980	192	416	1955	1556	964	542	195	168	78	36	76	6178
1981	595	1446	645	1855	762	372	258	98	123	33	125	6312
1982	105	1162	694	296	767	376	298	172	96	95	196	4257
1983	29	815	2071	659	193	364	177	128	120	83	206	4845
1984	42	510	1859	2962	641	115	161	125	105	42	115	6677
1985	198	1852	681	1652	1852	289	82	99	123	52	118	6998
1986	54	943	3107	881	1612	1176	178	57	146	88	134	8376
1987	82	957	862	2723	550	642	416	95	43	99	162	6631
1988	0	363	809	855	1627	444	264	159	26	21	77	4645
1989	1	136	1255	776	447	496	186	77	49	18	69	3510
1990	0	604	904	1135	372	200	146	67	52	37	68	3585
1991	0	143	747	595	658	162	76	69	33	13	79	2575
1992	0	32	398	753	440	347	81	27	22	14	37	2151

Year	Mean weights (kilograms) at age											Mean
	2	3	4	5	6	7	8	9	10	11	12+	
1970	0.97	1.84	2.93	3.79	4.59	5.78	6.41	7.56	6.75	9.29	0.00	3.98
1971	1.67	2.32	2.12	3.15	4.00	5.00	6.24	7.25	9.62	0.00	0.00	3.06
1972	1.06	1.86	2.93	4.44	5.29	5.95	6.52	6.84	7.60	6.81	9.56	3.37
1973	0.95	1.37	1.89	2.63	3.96	4.84	6.07	6.47	7.21	9.33	9.66	2.26
1974	0.85	1.44	2.00	3.04	4.08	4.99	6.00	6.57	7.24	7.94	9.04	2.25
1975	0.86	1.34	2.09	3.08	4.01	5.21	6.50	7.61	7.60	8.47	9.99	2.92
1976	0.63	1.27	1.89	2.67	3.62	4.33	5.26	6.86	6.70	7.24	9.99	2.42
1977	0.91	1.31	1.85	2.92	3.61	4.65	5.98	7.02	7.00	7.26	8.15	3.50
1978	0.77	1.23	1.77	3.07	4.06	4.67	5.63	6.42	6.69	7.40	7.75	3.82
1979	0.71	1.20	1.93	3.05	3.97	5.33	5.75	6.80	7.57	7.84	8.31	2.73
1980	0.88	1.19	1.83	2.83	3.68	4.39	5.75	6.45	7.17	7.74	8.77	2.96
1981	0.59	1.22	2.43	2.99	3.89	4.79	5.59	6.35	7.05	7.84	8.05	2.88
1982	0.39	0.87	2.23	3.49	4.08	4.88	5.58	6.45	6.81	7.60	8.23	3.37
1983	0.67	0.96	1.67	2.95	4.21	4.95	5.66	6.60	7.03	7.54	8.90	2.88
1984	0.83	1.18	1.78	2.55	3.20	4.95	5.48	6.13	6.68	7.46	8.52	2.66
1985	0.71	0.93	1.84	2.80	3.60	4.95	6.35	6.71	7.18	7.36	9.13	2.77
1986	0.82	1.13	1.69	2.85	3.66	4.52	6.00	7.13	7.44	7.89	9.10	2.93
1987	0.73	1.04	1.91	2.71	3.66	4.51	5.35	6.39	7.91	7.92	8.97	3.08
1988	0.00	1.19	1.74	2.75	3.41	4.04	5.15	6.20	7.13	8.37	9.19	3.22
1989	0.84	1.13	1.63	2.71	3.61	4.30	5.02	6.34	7.00	7.07	8.96	3.01
1990	0.64	0.97	1.56	2.59	3.55	4.60	5.29	5.96	6.54	7.86	9.10	2.68
1991	0.00	1.14	1.61	2.49	3.65	4.77	5.29	5.83	7.10	8.06	9.80	3.08
1992	0.00	1.27	1.66	2.64	3.61	4.67	5.86	6.03	7.35	7.66	10.35	3.34

Year	Weight (metric tons) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	5	171	826	985	730	566	333	227	95	28	0	3966
1971	124	612	890	1210	1228	520	281	7	19	0	0	4891
1972	163	777	1389	1363	942	553	137	123	38	82	153	5720
1973	15	499	2529	2249	451	227	85	97	108	28	10	6298
1974	57	2598	1640	2161	1167	454	312	112	130	64	45	8740
1975	75	523	2757	1540	2073	1125	449	190	220	178	180	9310
1976	37	1076	2147	4571	1372	1160	352	34	7	22	80	10858
1977	18	384	1745	1989	2982	1516	1561	695	434	145	1589	13057
1978	71	893	974	1992	2562	4371	1965	1733	896	622	1635	17714
1979	143	1631	3422	3169	1985	1295	1639	775	356	196	931	15542
1980	169	495	3578	4403	3548	2379	1121	1084	559	279	667	18281
1981	351	1764	1567	5546	2964	1782	1442	622	867	259	1006	18172
1982	41	1011	1548	1033	3129	1835	1663	1109	654	722	1613	14358
1983	19	782	3459	1944	813	1802	1002	845	844	626	1833	13968
1984	35	602	3309	7553	2051	569	882	766	701	313	980	17762
1985	141	1722	1253	4626	6667	1431	521	664	883	383	1077	19368
1986	44	1066	5251	2511	5900	5316	1068	406	1086	694	1219	24561
1987	60	995	1646	7379	2013	2895	2226	607	340	784	1453	20399
1988	0	432	1408	2351	5548	1794	1360	986	185	176	708	14947
1989	1	154	2039	2101	1613	2134	934	488	343	127	618	10551
1990	0	583	1408	2944	1319	921	772	400	340	291	619	9596
1991	0	163	1201	1479	2400	772	402	403	234	105	774	7933
1992	0	40	659	1990	1588	1619	475	163	162	107	383	7187

Table 8. Estimated numbers landed (thousands), mean weight (kilograms), and estimated total weight (metric tons) of pollock in Divisions 4VWX and Subareas 5 and 6, 1970-1992, distant-water fleet only

Year	Numbers (thousands) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	552	290	588	520	335	238	151	73	41	17	2	2807
1971	1267	1528	963	693	529	188	78	1	2	0	0	5249
1972	160	436	690	581	186	97	22	280	5	12	17	2486
1973	961	769	2000	862	122	47	21	177	13	2	1	4975
1974	12	819	298	231	134	44	19	16	32	41	30	1676
1975	8	73	457	238	244	40	64	11	1	1	1	1138
1976	52	154	237	479	150	88	14	2	2	2	8	1188
1977	0	43	18	25	53	22	22	18	0	0	0	201
1978	0	49	49	62	54	25	11	9	0	0	0	259
1979	0	11	204	141	60	33	1	0	0	0	0	450
1980	43	47	131	271	56	28	8	3	0	0	0	587
1981	829	1	1	1	0	0	1	1	0	0	0	834
1982	2	502	5	0	1	1	2	0	0	0	0	513
1983	2	142	205	8	1	1	2	0	0	0	0	361
1984	65	83	2	3	0	1	2	3	3	0	2	164
1985	13	16	11	34	5	3	5	5	9	7	2	110
1986	56	318	194	43	20	15	1	0	4	6	3	660
1987	2	39	28	49	49	32	64	2	4	4	3	276
1988	0	65	176	55	45	76	35	14	0	2	4	472
1989	27	90	680	180	43	66	39	25	20	3	4	1177
1990	45	208	199	322	65	20	16	10	0	2	6	893
1991	284	739	483	116	59	15	10	12	3	4	1	1726
1992	29	887	757	127	80	22	8	2	2	1	1	1916

Year	Mean weights (kilograms) at age											Mean
	2	3	4	5	6	7	8	9	10	11	12+	
1970	0.58	0.97	1.29	2.07	2.86	4.02	5.52	6.73	7.29	9.17	8.11	2.19
1971	0.61	1.34	2.13	3.17	4.00	4.98	6.24	7.25	9.62	0.00	0.00	2.02
1972	1.06	1.86	2.32	3.93	5.29	5.95	6.52	9.36	7.60	6.81	9.56	3.81
1973	0.44	1.05	2.11	2.70	3.97	4.91	6.46	6.89	8.14	8.14	8.14	2.01
1974	0.59	1.10	1.65	2.83	4.37	5.38	6.86	6.90	7.66	8.95	10.29	2.41
1975	0.84	1.13	1.71	2.78	3.40	4.88	6.55	7.48	7.00	8.43	13.00	2.71
1976	0.49	1.01	1.74	2.89	3.61	4.99	5.90	6.70	8.26	9.46	8.68	2.66
1977	0.00	0.74	1.65	2.80	3.90	4.99	5.90	6.92	0.00	0.00	0.00	3.49
1978	0.00	0.83	1.66	2.88	4.32	4.45	6.45	8.01	0.00	0.00	0.00	3.04
1979	0.00	1.23	1.81	2.49	3.93	4.48	5.98	0.00	0.00	0.00	0.00	2.50
1980	0.77	1.25	1.86	2.19	2.72	3.14	6.32	6.37	0.00	0.00	0.00	2.11
1981	0.66	1.52	1.74	2.96	0.00	0.00	5.41	7.36	0.00	0.00	0.00	0.68
1982	0.62	0.84	2.15	0.00	3.54	4.97	6.30	0.00	0.00	0.00	0.00	0.89
1983	0.43	1.15	1.28	2.52	4.38	4.62	4.35	0.00	0.00	0.00	0.00	1.29
1984	0.48	1.29	2.50	2.82	0.00	4.97	5.60	5.87	5.96	0.00	6.19	1.32
1985	0.37	0.62	1.39	2.35	2.92	3.04	4.29	5.40	5.35	5.94	6.46	2.59
1986	0.32	0.87	1.68	2.48	3.24	3.20	3.85	0.00	6.14	6.04	6.04	1.40
1987	0.32	0.79	1.40	1.92	2.65	2.94	3.61	4.78	5.74	4.84	5.96	2.50
1988	0.00	0.50	1.22	2.39	2.70	3.36	4.33	4.30	0.00	6.00	7.04	2.13
1989	0.42	1.08	1.19	2.04	2.82	3.08	3.69	3.99	4.45	4.19	7.24	1.69
1990	0.45	0.86	1.85	2.59	2.80	3.68	3.77	4.32	0.00	6.12	6.45	2.03
1991	0.47	0.79	1.29	1.85	2.69	3.40	3.89	4.54	6.02	5.86	8.25	1.11
1992	0.46	0.70	1.23	1.90	2.16	2.77	3.46	4.31	4.60	5.85	6.80	1.10

Year	Weight (metric tons) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	319	281	756	1075	958	957	834	491	299	156	16	6141
1971	771	2043	2049	2198	2116	937	487	7	19	0	0	10626
1972	170	811	1599	2285	984	577	143	2620	38	82	163	9470
1973	426	805	4229	2327	484	231	136	1219	106	16	8	9987
1974	7	899	493	653	585	237	130	110	245	367	309	4036
1975	7	82	782	661	830	195	419	82	7	8	13	3086
1976	25	156	412	1382	542	439	83	13	17	19	69	3158
1977	0	32	30	70	207	110	130	125	0	0	0	702
1978	0	41	81	179	233	111	71	72	0	0	0	788
1979	0	14	369	351	236	148	6	0	0	0	0	1123
1980	33	59	244	593	152	88	51	19	0	0	0	1239
1981	547	2	2	3	0	0	5	7	0	0	0	566
1982	1	422	11	0	4	5	13	0	0	0	0	455
1983	1	163	262	20	4	5	9	0	0	0	0	464
1984	31	107	5	8	0	5	11	18	18	0	12	216
1985	5	10	15	80	15	9	21	27	48	42	13	285
1986	18	277	326	107	65	48	4	0	25	36	18	923
1987	1	31	39	94	130	94	231	10	23	19	18	689
1988	0	33	215	131	122	255	152	60	0	12	28	1007
1989	11	97	809	367	121	203	144	100	89	13	29	1984
1990	20	179	368	834	182	74	60	43	0	12	39	1811
1991	133	584	623	215	159	51	39	54	18	23	8	1908
1992	13	621	931	241	173	61	28	9	9	6	7	2099

Table 9. Estimated numbers landed (thousands), mean weight (kilograms), and estimated total weight (metric tons) of pollock in Divisions 4VWX and Subareas 5 and 6, 1970-1992, all countries

Year	Numbers (thousands) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	567	589	1543	1360	892	686	464	212	123	44	8	6488
1971	1518	2428	2392	2001	1575	541	232	3	8	1	1	10700
1972	798	2170	2655	1852	924	483	110	355	26	60	85	9518
1973	1168	2696	9131	5279	723	289	103	256	87	15	5	19752
1974	261	7332	3445	3034	1359	404	213	96	100	81	45	16370
1975	260	1436	5297	2566	2400	1041	263	80	85	56	49	13533
1976	234	2190	3085	5314	1454	1342	272	41	15	21	57	14025
1977	56	1751	3779	2443	2980	1049	673	206	81	45	274	13337
1978	115	1548	3618	3682	1887	2084	602	411	151	103	229	14430
1979	299	4087	7487	4478	2184	765	531	160	62	39	112	20204
1980	361	704	3798	6802	4096	1605	469	334	110	45	78	18402
1981	1465	2750	1303	3853	4691	2749	955	301	268	63	148	18546
1982	236	5104	2249	847	2600	2622	1344	553	264	180	218	16217
1983	83	2743	11227	1867	422	868	980	540	277	131	262	19400
1984	128	1278	5183	9770	1249	203	368	325	193	59	137	18893
1985	235	2345	2871	5812	8035	1394	213	238	353	137	177	21810
1986	114	1578	6169	4443	5207	4482	477	139	263	259	250	23381
1987	92	1424	3121	7631	4088	3046	2152	272	82	147	260	22315
1988	27	1046	3478	4145	5017	2304	1445	1164	69	40	174	18909
1989	72	721	5626	4728	2825	2473	1072	752	451	33	83	18836
1990	51	1830	3043	5131	2921	1751	997	612	295	125	102	16858
1991	300	1570	4443	3754	4602	1843	858	418	321	205	282	18596
1992	30	2055	5363	4063	2166	1430	505	261	200	96	88	16257

Year	Mean weights (kilograms) at age											Mean
	2	3	4	5	6	7	8	9	10	11	12+	
1970	0.59	1.38	2.19	3.05	3.78	4.78	5.82	7.08	7.10	9.09	8.11	3.21
1971	0.78	1.70	2.12	3.16	4.00	4.99	6.24	7.25	9.62	0.00	0.00	2.55
1972	1.06	1.86	2.77	4.28	5.29	5.95	6.52	8.83	7.60	6.81	9.56	3.49
1973	0.50	1.27	1.95	2.65	3.96	4.86	6.23	6.81	7.42	9.17	9.77	2.19
1974	0.82	1.40	1.96	3.01	4.09	5.06	6.12	6.66	7.36	8.52	9.95	2.31
1975	0.86	1.28	1.99	3.07	3.85	5.09	6.52	7.51	7.65	8.47	9.99	2.88
1976	0.60	1.23	1.91	2.77	3.69	4.61	5.55	7.00	7.72	8.54	9.23	2.68
1977	0.83	1.13	1.60	2.61	3.53	4.56	5.67	6.81	7.06	8.79	9.06	2.88
1978	0.84	1.23	1.80	2.68	3.95	4.62	5.79	6.59	6.77	7.58	7.93	3.14
1979	0.73	1.19	1.64	2.72	3.53	4.65	5.65	6.75	7.47	8.18	8.31	2.31
1980	0.95	1.39	1.95	2.78	3.51	4.21	5.65	6.48	7.72	7.87	8.84	3.02
1981	0.64	1.47	2.48	2.95	3.43	4.38	5.84	6.72	7.44	7.70	8.23	3.18
1982	0.59	1.12	2.55	3.50	4.15	4.51	5.28	6.22	7.34	7.79	8.27	3.26
1983	0.77	1.16	1.66	3.06	4.16	4.88	5.18	6.02	6.72	7.71	8.86	2.43
1984	0.76	1.46	2.15	2.63	3.51	5.15	5.75	5.99	6.52	7.53	8.52	2.71
1985	0.71	1.05	1.93	2.75	3.23	3.74	5.14	6.36	6.33	6.62	8.59	2.87
1986	0.57	1.13	1.84	2.59	3.40	3.85	4.87	6.26	6.84	6.71	8.05	2.93
1987	0.72	1.13	1.95	2.58	3.04	3.88	4.28	5.19	7.13	7.34	8.44	2.96
1988	1.17	1.31	1.84	2.66	3.28	3.61	4.40	4.65	5.96	8.11	8.78	3.05
1989	0.68	1.21	1.74	2.52	3.31	3.90	4.26	4.96	5.35	7.39	8.69	2.83
1990	0.49	1.22	1.89	2.56	3.03	3.93	4.29	5.04	5.35	6.51	8.48	2.82
1991	0.47	0.97	1.68	2.32	2.92	3.47	3.96	4.84	5.00	5.27	6.79	2.56
1992	0.47	1.04	1.69	2.55	3.39	3.96	4.51	5.10	5.82	6.21	8.03	2.50

Year	Weight (metric tons) landed at age											Total
	2	3	4	5	6	7	8	9	10	11	12+	
1970	334	812	3373	4154	3371	3277	2699	1501	873	400	65	20859
1971	1190	4131	5078	6318	6300	2702	1448	22	77	0	0	27265
1972	846	4036	7356	7928	4888	2874	717	3133	198	409	813	33197
1973	584	3413	17764	13980	2864	1404	642	1745	646	138	49	43228
1974	215	10231	6741	9133	5555	2044	1303	639	736	690	448	37734
1975	223	1841	10545	7868	9246	5300	1714	601	650	474	490	38952
1976	140	2694	5881	14698	5364	6184	1508	287	116	179	526	37578
1977	47	1986	6058	6366	10521	4780	3816	1402	572	396	2482	38426
1978	97	1908	6519	9866	7459	9637	3488	2708	1022	781	1816	45300
1979	218	4850	12277	12194	7710	3560	3002	1079	463	319	931	46603
1980	343	980	7417	18927	14374	6752	2651	2164	850	354	690	55501
1981	940	4033	3238	11361	16087	12051	5575	2023	1994	485	1218	59004
1982	140	5698	5743	2967	10791	11830	7094	3441	1937	1402	1803	52847
1983	64	3178	18669	5720	1754	4236	5080	3251	1861	1010	2322	47144
1984	97	1860	11154	25731	4386	1045	2117	1946	1258	444	1167	51205
1985	168	2457	5539	16011	25957	5220	1095	1513	2233	907	1521	62621
1986	66	1783	11370	11485	17726	17244	2323	871	1799	1739	2013	68419
1987	66	1612	6081	19670	12435	11813	9212	1413	584	1079	2195	66160
1988	32	1367	6409	11023	16440	8311	6359	5416	412	324	1528	57621
1989	49	874	9788	11936	9346	9656	4567	3734	2414	244	721	53330
1990	25	2238	5753	13147	8853	6873	4273	3086	1580	814	865	47506
1991	141	1517	7447	8723	13436	6387	3398	2024	1606	1081	1915	47677
1992	14	2138	9039	10348	7341	5659	2279	1331	1164	596	707	40615

dominant year classes progress through the fishery. The relatively high proportion of age 2 pollock during the early years of the DWF fishery is attributable to the use of small mesh gear by the USSR fleet. Landings by Canada and the United States have been supported by the same dominant year classes (1971, 1976, 1979, 1982, and 1985, 1987), and catches of the 1969, 1974, 1980, and 1988 year classes have also been reasonably high. The lack of age 2 fish in the U.S. catch-at-age since 1988 likely reflects the imposition of a minimum landing size of 48 cm, which corresponds to the size of a pollock at the beginning of its third year (Mayo *et al.* 1989b). The total weight over all ages represents a sum of products that compares favorably with annual landings by country listed in Table 1. In most years, sums of products are within 1% of the tabulated landings.

Commercial Mean Weights at Age

Mean weights-at-age are given for each fleet component in Tables 6 to 8 and for the combined catch-at-age in Table 9. Combined mean weights-at-age represent averages taken over the three fleet components weighted by numbers landed on an annual basis. Catch biomass estimates are computed as the product of numbers-at-age times mean weights-at-age. Mean weights-at-age for Canada (Table 6) during 1977-1987 appear to be slightly lower at a given age than the U.S. weights, particularly at the intermediate ages. This is likely due to the different length-weight relationships employed in the computations and the different areas fished by each country. Canadian mean weights in 1991 and 1992 for oldest ages are extremely low relative to earlier years. Since the overall mean weight-at-age matrix (Table 9) is dominated by Canadian catches, a similar decline is evident in the oldest age groups in the last two to three years.

STOCK ABUNDANCE AND BIOMASS INDICES

Commercial CPUE

Commercial CPUE indices were calculated for U.S. TC 3 and 4 side and stern trawlers (metric tons landed per day fished), and Canadian TC 5 stern trawlers (metric tons landed per hour fished) using 1970-1992 landings and effort data from trips in which pollock constituted 50% or more of

the total landed weight or was recorded as the main species for the trip (Table 10). Indices for U.S. TC 3 and 4 vessels were computed on a seasonal basis (March through September) for trips that fished in Divisions 5Y and 5Z. The CPUE calculations for Canadian vessels (regional) were based on trips that fished from April to November by composite areas of Divisions 4V, 4W, and 4X, and Subarea 5. Logbooks have been available since 1982 from the Canadian International Observer Program (IOP) and these data have been used to compute an alternate CPUE index for pollock.

United States indices increased between 1970 and 1977, declined slightly between 1977 and 1984, then dropped sharply from 1985 through 1988 (Table 10, Figure 4). Indices have since increased slightly but the average CPUE in 1990-1992 remains at about half the level observed in 1983 and 1984 (Table 10).

The Canadian regional catch rate series reflects the same general trend, *i.e.*, an increase in CPUE from the early 1970s through the early 1980s, followed by a decline in recent years. The Canadian regional series, however, has exhibited considerable interannual variability since the early 1980s, a possible result of trip limits and other regulatory measures imposed since 1983 (Annand *et al.* 1988). The IOP CPUE series more closely matches the U.S. CPUE series indicating a steady decline since 1986 (Table 10, Figure 5).

RESEARCH VESSEL INDICES

Methodology

Bottom trawl surveys of the Gulf of Maine and western Scotian Shelf region have been conducted by the Northeast Fisheries Science Center (NEFSC) during each autumn since 1963 and each spring since 1968 using the research vessels *Albatross IV* and *Delaware II*; summer and winter cruises have been conducted occasionally (Azarovitz 1981). The Commonwealth of Massachusetts Division of Marine Fisheries (DMF) has surveyed inshore waters of the western Gulf of Maine between Cape Cod and the Merrimack River each spring and autumn since 1978. Summer surveys of the entire Scotian Shelf and Bay of Fundy have been conducted since 1970 by Canadian research vessels operated by the Department of Fisheries and Oceans (DFO) (Doubleday 1981). The 12-year *A.T. Cameron* series terminated in 1981, but was overlapped by the 1981-1983 *Lady Hammond* series. A conver-

Table 10. United States (USA)¹ and Canadian² commercial catch per unit effort (CPUE) indices for pollock based on otter trawl trips in which pollock constituted 50% or more of the total catch³

Year	USA					Canada		
	Tonnage 3		Tonnage Class 4		Tonnage Classes 3+4 Combined	Tonnage Class 5 Regional		IOP
	Mar-Sep	All Months	Mar-Sep	All Months	Mar-Sep	Jun-Aug	Apr-Nov	Apr-Nov
1970	3.02	3.56	4.44	7.64	3.76	0.74	0.86	
1971	2.88	4.13	5.03	7.80	3.95	0.78	0.64	
1972	3.58	8.70	6.79	5.88	5.63	0.81	0.75	
1973	4.35	7.52	6.50	6.65	5.35	1.07	0.75	
1974	5.04	7.25	6.05	8.82	5.30	0.58	0.66	
1975	4.43	5.47	8.17	7.45	5.99	0.61	0.70	
1976	4.42	5.63	7.39	9.57	5.19	0.52	0.57	
1977	7.19	7.89	8.89	9.14	7.71	0.69	0.78	
1978	5.95	6.77	9.11	9.58	7.26	0.84	0.89	
1979	5.23	6.18	7.04	6.16	5.62	1.16	1.09	
1980	6.28	7.28	6.82	7.88	6.41	0.97	0.94	
1981	4.58	7.30	6.02	8.03	5.02	0.89	1.01	
1982	5.29	5.64	6.37	6.75	5.62	1.58	1.32	1.95
1983	6.06	5.86	7.00	8.26	6.49	0.87	1.05	1.42
1984	5.61	6.17	6.34	5.77	5.99	1.28	1.33	2.05
1985	4.13	5.32	3.79	4.17	4.00	0.70	0.96	2.37
1986	4.54	5.26	3.40	3.36	4.13	1.38	1.26	1.75
1987	2.34	3.12	3.10	3.28	2.73	0.84	0.94	1.06
1988	1.63	2.84	2.71	2.86	2.30	n/a	0.90	1.15
1989	1.88	3.20	2.70	3.09	2.39	n/a	0.99	1.07
1990	1.67	3.03	3.04	4.66	2.63	n/a	1.50	1.10
1991	3.79	2.68	2.82	3.54	3.20	n/a	0.53	0.60
1992	2.17	2.15	3.48	3.10	3.29	n/a	n/a	0.78

¹ The U.S. CPUE is calculated as tons per 24-hour day fished.

² Canadian CPUE calculated as tons per hour fished.

³ See text for description of spatial and temporal level of resolution employed in the computations

sion factor of 1.0 between these vessels has been derived for pollock from comparative fishing power experiments. Since 1983, summer surveys have been conducted solely by the *Alfred Needler*.

Trends in Relative Abundance and Biomass

Pollock abundance and biomass indices exhibit considerable interannual variability due to schooling behavior and changes in spatial distribution patterns. Retransformed biomass indices derived from NEFSC surveys are more variable over time than retransformed abundance indices (Table 11), although results from both spring and autumn surveys indicate a gradual increase in biomass through the mid-1970s, followed by a sharp decline (Figure 6a,b). The autumn series has remained relatively low through 1992, while spring indices suggest a recent increase in biomass in 1991 and 1992.

Canadian summer survey indices suggest that abundance remained relatively stable between 1970 and 1983 except for a sharp increase in 1980 (Table 12, Figure 6c). Peak values evident in 1977 and 1980 resulted from extremely large catches in two survey strata and do not reflect overall abundance levels (McGlade *et al.* 1981). Canadian abundance and biomass indices increased in 1984, but have fluctuated considerably since then. The 1991 and 1992 indices suggest only moderate to low levels of abundance on the Scotian Shelf.

Much of the variation in U.S. and Canadian offshore survey abundance indices may be explained by differences in year class strength. Peak abundance levels evident from NEFSC spring surveys in 1972, 1976, and 1982, and from NEFSC autumn surveys in 1972-1973 and 1976-1977 were due to recruitment of strong 1970, 1971, 1975, and 1979 year classes to offshore survey areas (Table 13). Biomass indices are affected by recruitment and growth. Increases in NEFSC spring biomass indices during 1973-

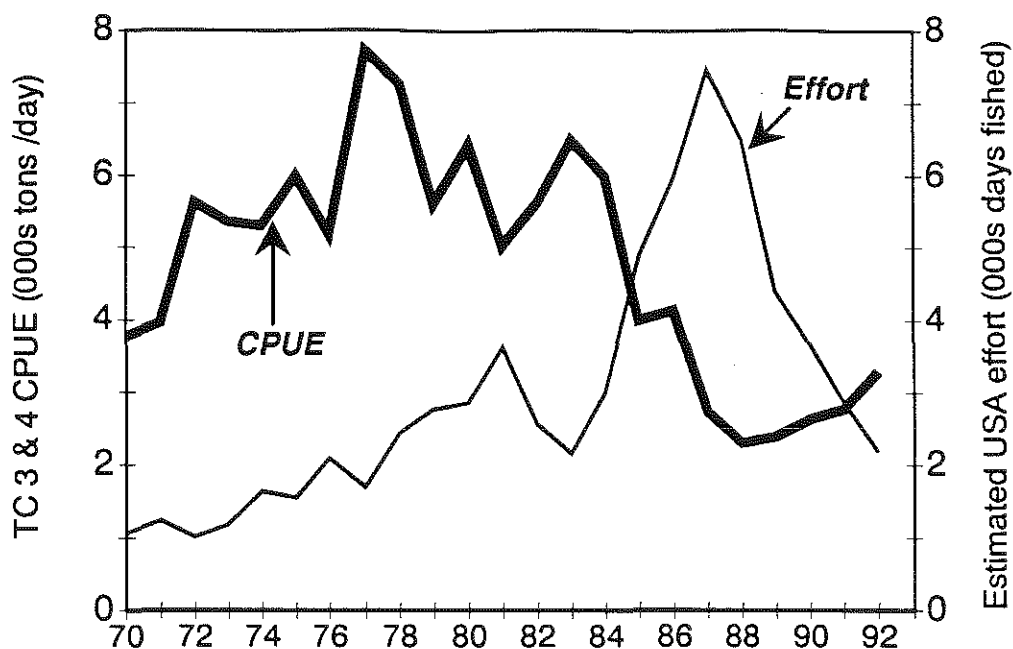


Figure 4. United States commercial pollock catch per unit effort (CPUE, landings per day fished, metric tons) and estimated fishing effort (days fished) based on otter trawl trips taking 50% or more pollock.

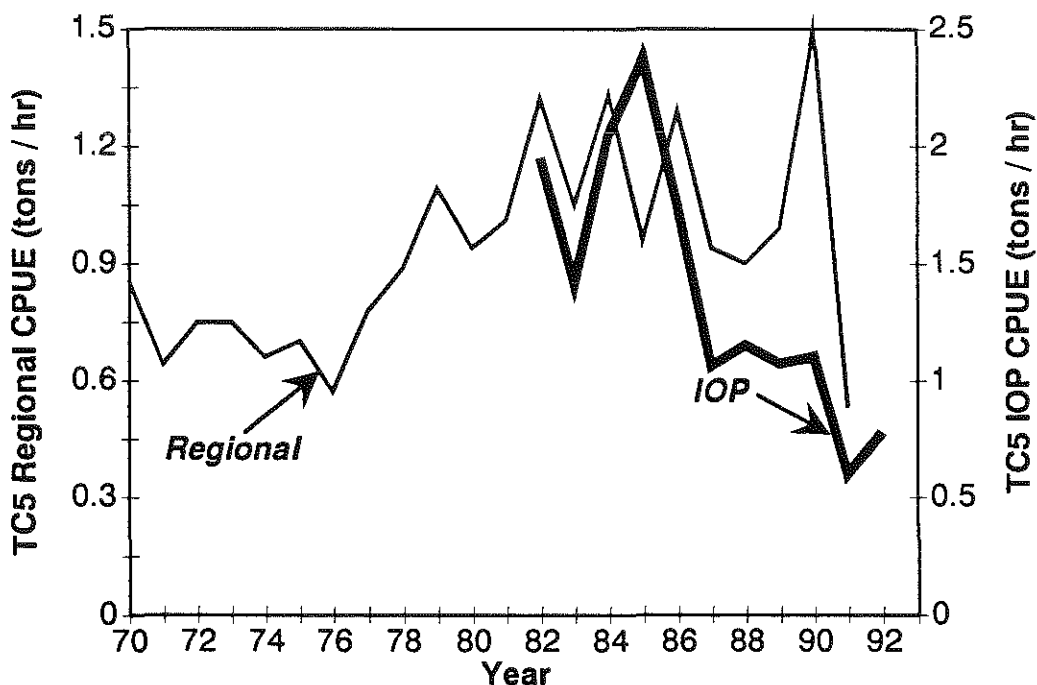


Figure 5. Canadian commercial pollock catch per unit effort (CPUE, landings per hour fished, metric tons) based on trip data and International Observer Program (IOP) logbooks.

1975 and 1977-1981 resulted from growth in weight of individual fish from the 1971 and 1975 year classes.

Relative strengths of dominant year classes derived from Canadian and U.S. bottom trawl surveys (Tables 12 and 13) are consistent with commercial catch-at-age data (Tables 6 to 9). No

relatively strong year classes are evident in the last two to three years in either survey series.

Indices from Massachusetts DMF surveys also fluctuate considerably, but results for individual year classes appear to track incoming recruitment reasonably well (Table 14). Given the limited area involved in these surveys com-

Table 11. Stratified mean catch per tow in numbers and weight (kilograms) for Scotian Shelf, Gulf of Maine, and Georges Bank pollock in NEFSC offshore spring¹, summer², and autumn¹ bottom trawl surveys, 1963-1992

Year	Spring ³				Summer				Autumn			
	Weight		Numbers		Weight		Numbers		Weight		Numbers	
	Linear	Retrans- formed	Linear	Retrans- formed	Linear	Retrans- formed	Linear	Retrans- formed	Linear	Retrans- formed	Linear	Retrans- formed
1963	-	-	-	-	10.28	3.45	2.31	1.07	5.79	4.63	1.46	1.27
1964	-	-	-	-	5.27	2.32	2.06	0.96	4.40	2.15	1.64	0.96
1965	-	-	-	-	2.56	1.05	1.72	0.63	2.74	1.85	0.83	0.72
1966	-	-	-	-	-	-	-	-	2.35	1.43	0.97	0.55
1967	-	-	-	-	-	-	-	-	1.80	1.05	0.52	0.41
1968	4.47	2.45	1.09	0.84	-	-	-	-	3.17	2.09	0.69	0.59
1969	2.66	2.22	1.12	0.94	1.75	1.19	0.70	0.47	6.58	2.67	1.31	0.79
1970	4.91	3.04	1.67	1.35	-	-	-	-	2.59	1.80	0.64	0.59
1971	4.39	2.97	1.18	0.99	-	-	-	-	3.96	1.69	1.09	0.65
1972	5.67	3.78	4.43	2.52	-	-	-	-	4.37	2.83	1.41	1.11
1973	4.82	3.33	4.00	1.47	-	-	-	-	4.71	3.59	1.64	1.17
1974	4.10	4.13	1.39	1.20	-	-	-	-	3.17	1.35	0.90	0.51
1975	5.90	4.52	1.67	1.19	-	-	-	-	2.04	1.38	0.70	0.48
1976	6.84	6.51	1.59	1.43	-	-	-	-	16.66	6.69	3.69	1.64
1977	3.44	2.80	1.63	1.18	9.98	8.35	2.07	1.67	8.78	4.81	2.14	1.19
1978	6.56	3.29	2.48	0.98	4.05	3.80	1.29	0.92	5.83	3.31	0.98	0.65
1979	4.75	3.68	1.06	0.93	17.57	4.14	2.96	1.19	5.81	4.29	1.28	0.86
1980	4.40	3.40	1.52	1.09	9.83	6.61	12.21	2.25	4.63	2.99	0.83	0.64
1981	6.30	4.87	2.00	1.34	-	-	-	-	7.75	1.37	5.24	0.57
1982	6.62	3.18	3.98	1.76	-	-	-	-	3.14	1.44	1.40	0.71
1983	1.83	1.09	0.92	0.65	-	-	-	-	3.03	1.28	0.98	0.56
1984	2.87	1.89	1.00	0.79	-	-	-	-	0.99	0.57	0.45	0.34
1985	8.36	4.75	2.81	1.82	-	-	-	-	2.43	1.79	1.12	0.72
1986	7.69	3.56	1.84	1.14	-	-	-	-	1.83	1.09	0.88	0.54
1987	13.17	2.15	6.94	0.98	-	-	-	-	2.04	1.10	0.60	0.47
1988	1.98	1.22	0.89	0.69	-	-	-	-	12.83	1.54	3.71	0.78
1989	5.17	2.00	1.98	0.94	-	-	-	-	1.20	0.56	1.86	0.70
1990	1.79	1.02	0.75	0.51	-	-	-	-	2.11	0.92	0.83	0.54
1991	5.14	2.74	2.32	1.35	-	-	-	-	1.04	0.59	0.72	0.50
1992	3.40	2.01	1.79	1.14	-	-	-	-	1.69	0.82	1.05	0.60

¹ Strata 13-40² Strata 21-28 and 37-40³ The "36 Yankee" trawl was used from 1968-1972, and 1982-1992; the "41 Yankee" trawl was used from 1973-1981. No gear conversion factors are available to adjust for differences in fishing power.

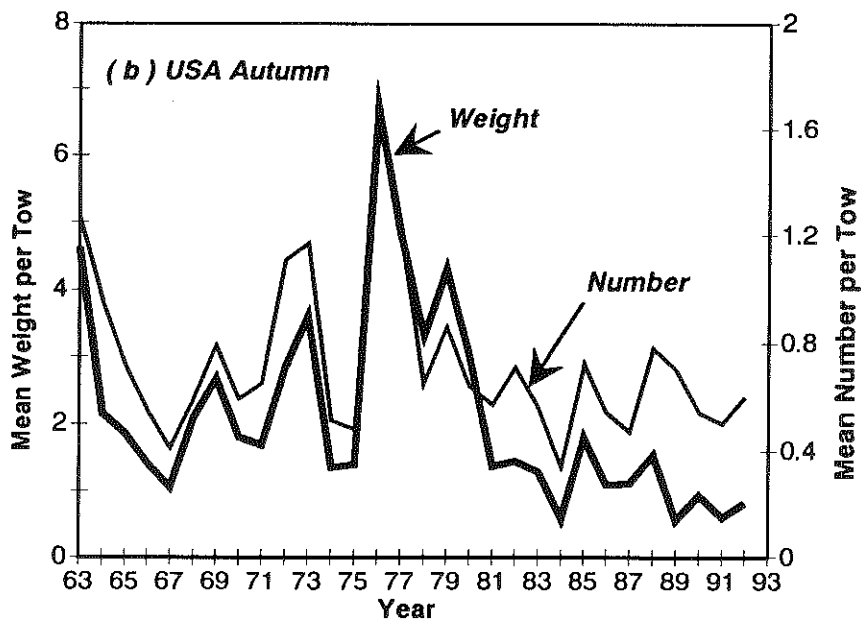
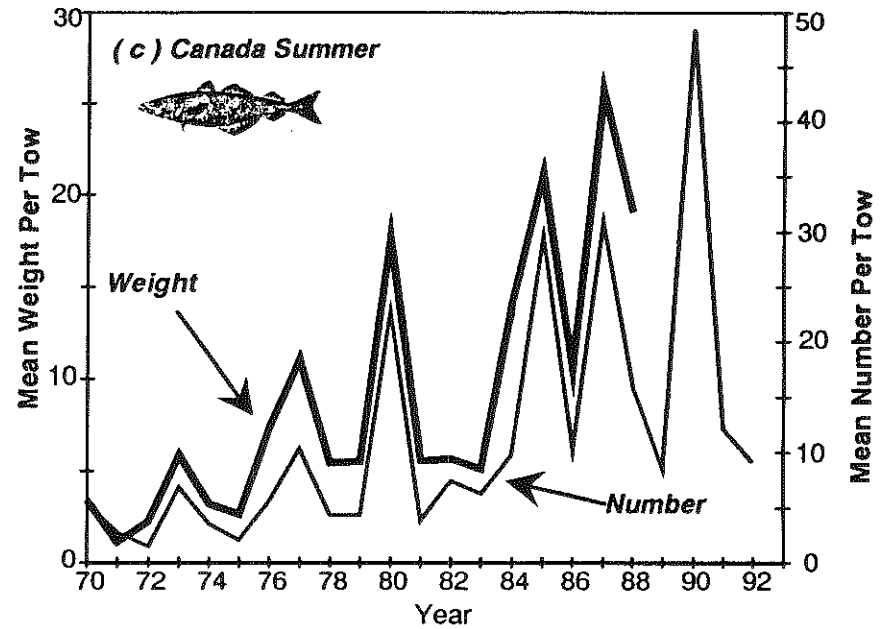
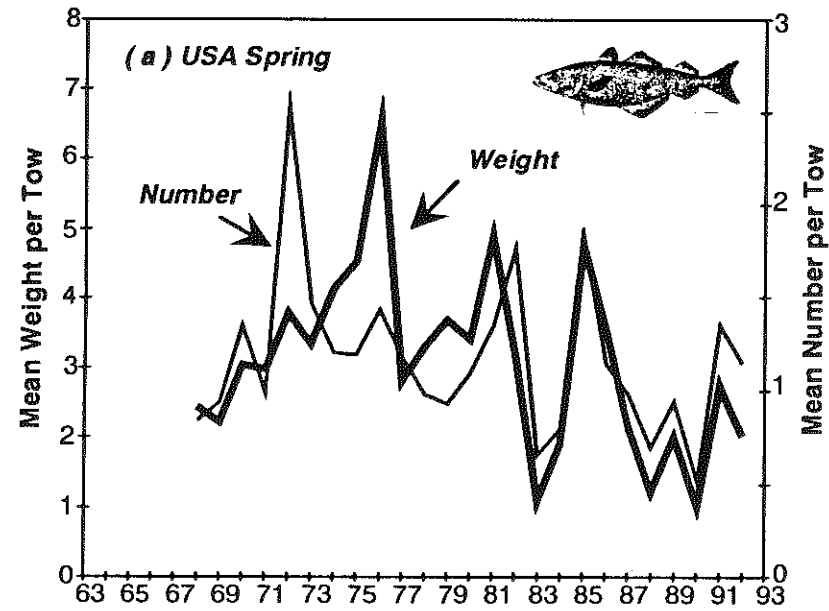


Figure 6. (a) United States (USA) spring and (b) USA autumn bottom trawl survey indices (retransformed stratified mean number and weight [kilograms] per tow), and (c) Canadian summer bottom trawl survey indices (stratified mean number and weight per tow) for Divisions 4VWX and Subareas 5 and 6 pollock.

Table 12. Stratified mean catch per tow at age in numbers and weight (kilograms) for Scotian Shelf, Gulf of Maine, and Georges Bank pollock in Canadian summer¹ bottom trawl surveys, 1970-1992

Year	Age													Totals			
	1	2	3	4	5	6	7	8	9	10	11	12+	UK	1+	2+	3+	4+
Mean number per tow																	
1970	0.007	1.815	0.445	0.270	0.197	0.179	0.120	0.066	0.025	0.000	0.036	0.007	0.000	3.167	0.900	0.630	0.433
1971	0.000	0.733	0.607	0.168	0.039	0.018	0.032	0.011	0.007	0.022	0.000	0.000	0.000	1.637	0.297	0.129	0.090
1972	0.000	0.019	0.013	0.146	0.321	0.140	0.037	0.068	0.049	0.024	0.012	0.026	0.004	0.859	0.827	0.681	0.360
1973	0.000	0.389	0.477	2.150	0.818	0.082	0.050	0.047	0.059	0.002	0.020	0.011	0.014	4.119	3.253	1.103	0.285
1974	0.007	0.042	0.941	0.230	0.279	0.130	0.152	0.086	0.066	0.037	0.087	0.031	0.000	2.088	1.098	0.868	0.589
1975	0.000	0.009	0.018	0.324	0.279	0.374	0.059	0.092	0.036	0.008	0.009	0.000	0.000	1.208	1.181	0.857	0.578
1976	0.000	0.029	0.219	0.667	1.242	0.313	0.540	0.197	0.043	0.044	0.015	0.048	0.011	3.368	3.120	2.453	1.211
1977	0.000	0.261	0.770	0.985	2.029	1.415	0.184	0.308	0.108	0.052	0.030	0.012	0.004	6.158	5.127	4.142	2.113
1978	0.000	0.007	0.147	0.607	0.941	0.351	0.330	0.102	0.048	0.022	0.000	0.023	0.017	2.595	2.441	1.834	0.893
1979	0.000	0.000	0.109	0.631	0.799	0.581	0.238	0.169	0.010	0.036	0.000	0.000	0.023	2.596	2.487	1.856	1.057
1980	0.012	1.142	1.257	3.327	5.282	1.403	0.797	0.248	0.097	0.058	0.000	0.000	0.029	13.652	11.241	7.914	2.632
1981	0.007	0.159	0.175	0.051	0.505	0.505	0.352	0.242	0.109	0.076	0.028	0.013	0.046	2.268	1.927	1.876	1.371
1982	0.000	0.196	2.787	0.266	0.118	0.368	0.252	0.148	0.130	0.072	0.012	0.049	0.034	4.432	1.449	1.183	1.065
1983	0.100	0.119	0.916	1.702	0.196	0.048	0.090	0.262	0.166	0.056	0.059	0.020	0.027	3.761	2.626	0.924	0.728
1984	0.035	0.471	0.229	0.702	2.013	0.307	0.211	0.458	0.691	0.428	0.071	0.157	0.044	5.817	5.082	4.380	2.367
1985	0.007	1.579	4.819	3.565	3.479	2.910	0.440	0.124	0.224	0.348	0.117	0.112	0.003	17.727	11.322	7.757	4.278
1986	0.051	0.606	0.653	0.965	1.008	1.383	1.015	0.073	0.011	0.103	0.136	0.089	0.007	6.100	4.790	3.825	2.817
1987	0.000	0.591	2.447	3.683	5.840	2.300	1.674	1.369	0.052	0.118	0.089	0.352	0.030	18.545	15.507	11.824	5.984
1988	0.020	0.029	0.599	1.155	2.196	1.954	1.825	1.010	0.584	0.040	0.043	0.164	0.000	9.619	8.971	7.816	5.620
1989	0.013	0.055	0.139	0.848	0.965	0.893	1.125	0.540	0.311	0.114	0.028	0.051	0.013	5.095	4.888	4.040	3.075
1990	0.152	9.763	7.494	3.161	5.230	1.963	0.524	0.344	0.215	0.066	0.031	0.122	0.000	29.065	11.656	8.495	3.265
1991	0.020	1.077	1.138	1.020	1.333	1.475	0.437	0.462	0.202	0.064	0.035	0.010	0.000	7.273	5.038	4.018	2.685
1992	0.000	0.247	1.426	1.582	1.040	0.717	0.244	0.097	0.044	0.035	0.012	0.029	0.000	5.473	3.800	2.218	1.178

¹ Strata 40-951970-1981 = data from R/V *A.T. Cameron*1982 = data from R/V *Lady Hammond*1983-1992 = data from R/V *Alfred Needler*

Table 13. Stratified mean catch per tow at age (numbers) for Scotian Shelf, Gulf of Maine, and Georges Bank pollock in NEFSC offshore spring¹, summer², and autumn¹ bottom trawl surveys, 1970-1992

Year	Age													Totals			
	0	1	2	3	4	5	6	7	8	9	10	11	12	1+	4+	5+	6+
Spring³																	
1970	0.01	0.52	0.05	0.17	0.20	0.05	0.07	0.09	0.12	0.08	0.04	0.04	0.23	1.66	0.92	0.72	0.67
1971	0.01	0.15	0.13	0.13	0.09	0.07	0.08	0.04	0.09	0.06	0.07	0.07	0.20	1.18	0.77	0.68	0.61
1972	-	1.20	1.49	0.90	0.20	0.05	0.05	0.07	0.12	0.04	0.07	0.04	0.17	4.40	0.81	0.61	0.56
1973	-	0.01	2.80	0.51	0.15	0.14	0.04	0.03	0.10	0.04	0.09	0.02	0.09	4.02	0.70	0.55	0.41
1974	-	0.01	0.10	0.53	0.14	0.08	0.16	0.07	0.03	0.00	0.01	0.10	0.16	1.39	0.75	0.61	0.53
1975	-	0.01	0.33	0.20	0.34	0.08	0.09	0.10	0.08	0.05	0.06	0.02	0.29	1.65	1.01	0.77	0.69
1976	-	0.08	0.11	0.14	0.15	0.24	0.13	0.15	0.17	0.11	0.03	0.04	0.24	1.59	1.26	1.11	0.87
1977	-	0.14	0.38	0.23	0.06	0.16	0.32	0.13	0.11	0.02	0.02	0.01	0.04	1.62	0.87	0.81	0.65
1978	-	0.00	0.22	0.42	0.65	0.63	0.15	0.11	0.08	0.07	0.05	0.04	0.07	2.49	1.85	1.20	0.51
1979	-	0.10	0.05	0.07	0.08	0.15	0.14	0.08	0.16	0.08	0.03	0.03	0.08	1.05	0.83	0.75	0.60
1980	-	0.15	0.15	0.09	0.28	0.25	0.20	0.23	0.08	0.04	0.02	0.00	0.05	1.54	1.15	0.87	0.62
1981	-	0.01	0.72	0.13	0.12	0.18	0.26	0.08	0.07	0.05	0.09	0.06	0.20	2.02	1.12	1.00	0.82
1982	-	0.13	1.63	0.84	0.55	0.11	0.33	0.11	0.14	0.05	0.01	0.02	0.07	3.99	1.39	0.84	0.73
1983	-	0.57	0.06	0.02	0.02	0.01	0.00	0.05	0.04	0.01	0.02	0.02	0.10	0.92	0.27	0.25	0.24
1984	-	0.15	0.15	0.09	0.10	0.14	0.07	0.04	0.04	0.05	0.03	0.04	0.07	1.00	0.61	0.51	0.37
1985	-	0.26	0.19	0.30	0.22	0.59	0.78	0.19	0.01	0.08	0.06	0.05	0.09	2.81	2.06	1.84	1.25
1986	-	0.11	0.14	0.07	0.17	0.17	0.38	0.37	0.09	0.05	0.04	0.08	0.17	1.84	1.52	1.35	1.18
1987	-	0.13	0.86	2.59	2.46	0.40	0.20	0.09	0.10	0.03	0.00	0.02	0.06	6.94	3.36	0.90	0.50
1988	-	0.50	0.02	0.07	0.01	0.03	0.05	0.04	0.02	0.04	0.03	0.03	0.03	0.89	0.30	0.29	0.26
1989	-	0.20	0.14	0.11	0.40	0.41	0.25	0.15	0.12	0.05	0.08	0.00	0.06	1.98	1.53	1.13	0.72
1990	-	0.01	0.09	0.27	0.11	0.02	0.07	0.04	0.02	0.03	0.02	0.03	0.05	0.75	0.38	0.27	0.25
1991	-	0.16	0.08	0.42	0.58	0.41	0.34	0.17	0.04	0.05	0.00	0.03	0.04	2.32	1.66	1.08	0.67
1992	-	0.72	0.23	0.14	0.13	0.16	0.09	0.10	0.05	0.01	0.04	0.04	0.06	1.79	0.70	0.57	0.41
Summer																	
1977	-	0.05	0.23	0.09	0.26	0.29	0.32	0.15	0.23	0.07	0.08	0.07	0.23	2.07	1.70	1.44	1.15
1978	-	0.00	0.57	0.17	0.09	0.08	0.08	0.05	0.09	0.03	0.01	0.05	0.08	1.30	0.56	0.47	0.35
1979	-	0.05	0.00	0.38	0.26	0.36	0.55	0.36	0.49	0.06	0.21	0.00	0.23	2.95	2.52	2.26	1.90
1980	-	10.67	0.11	0.06	0.29	0.25	0.30	0.22	0.03	0.02	0.07	0.05	0.13	12.20	1.36	1.07	0.82

¹ Strata 13-40

² Strata 21-28 and 37-40

³ The "36 Yankee" trawl was used from 1970-1972 and 1982-1992; the "41 Yankee" trawl was used from 1973-1981. No gear conversion factors are available to adjust for differences in fishing power.

Table 13. Continued.

Year	Age												Totals				
	0	1	2	3	4	5	6	7	8	9	10	11	12	1+	4+	5+	6+
Autumn																	
1970	0.01	0.13	0.08	0.01	0.09	0.08	0.08	0.04	0.02	0.01	0.02	0.01	0.07	0.64	0.42	0.33	0.25
1971	0.02	0.11	0.38	0.16	0.02	0.06	0.09	0.04	0.08	0.03	0.01	0.01	0.09	1.08	0.43	0.41	0.35
1972	0.00	0.38	0.27	0.20	0.08	0.07	0.08	0.07	0.05	0.04	0.03	0.03	0.10	1.40	0.55	0.47	0.40
1973	0.00	0.03	0.71	0.12	0.17	0.11	0.11	0.09	0.07	0.00	0.12	0.02	0.10	1.65	0.79	0.62	0.51
1974	0.00	0.00	0.08	0.28	0.20	0.11	0.08	0.09	0.01	0.02	0.00	0.02	0.02	0.91	0.55	0.35	0.24
1975	0.01	0.22	0.06	0.03	0.11	0.07	0.04	0.09	0.01	0.01	0.01	0.01	0.03	0.68	0.37	0.26	0.19
1976	0.00	0.03	0.03	0.15	0.55	1.63	0.50	0.31	0.14	0.05	0.01	0.01	0.29	3.70	3.49	2.94	0.31
1977	0.00	0.06	0.17	0.24	0.29	0.42	0.38	0.22	0.11	0.09	0.02	0.00	0.14	2.14	1.67	1.38	0.96
1978	0.00	0.03	0.19	0.04	0.04	0.09	0.09	0.15	0.08	0.06	0.04	0.03	0.12	0.96	0.70	0.66	0.57
1979	0.00	0.01	0.02	0.26	0.33	0.19	0.13	0.08	0.09	0.05	0.04	0.01	0.06	1.27	0.98	0.65	0.46
1980	0.01	0.13	0.01	0.01	0.05	0.11	0.06	0.07	0.13	0.08	0.06	0.04	0.07	0.82	0.67	0.62	0.51
1981	0.00	0.07	3.59	0.98	0.14	0.20	0.13	0.04	0.00	0.00	0.01	0.00	0.08	5.24	0.60	0.46	0.26
1982	0.01	0.07	0.44	0.40	0.29	0.01	0.05	0.04	0.02	0.02	0.00	0.02	0.04	1.40	0.49	0.20	0.19
1983	0.00	0.49	0.03	0.05	0.04	0.07	0.01	0.06	0.08	0.03	0.02	0.02	0.06	0.98	0.41	0.37	0.30
1984	0.00	0.12	0.18	0.02	0.01	0.01	0.03	0.00	0.00	0.02	0.02	0.02	0.02	0.45	0.13	0.12	0.11
1985	0.00	0.62	0.05	0.08	0.07	0.12	0.07	0.01	0.00	0.00	0.03	0.01	0.04	1.10	0.35	0.28	0.16
1986	0.00	0.21	0.22	0.14	0.13	0.07	0.04	0.04	0.00	0.00	0.00	0.01	0.02	0.88	0.31	0.18	0.11
1987	0.00	0.05	0.21	0.06	0.00	0.05	0.02	0.08	0.06	0.04	0.00	0.01	0.02	0.60	0.28	0.28	0.23
1988	0.00	0.13	0.13	1.06	1.14	0.33	0.57	0.07	0.15	0.08	0.02	0.01	0.02	3.71	2.39	1.25	0.92
1989	0.00	0.67	0.67	0.32	0.14	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.01	1.86	0.20	0.06	0.06
1990	0.07	0.03	0.12	0.22	0.13	0.10	0.01	0.03	0.03	0.04	0.02	0.01	0.02	0.76	0.39	0.26	0.16
1991	0.00	0.12	0.13	0.14	0.23	0.06	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.72	0.33	0.10	0.04
1992	0.02	0.32	0.22	0.12	0.14	0.16	0.04	0.02	0.02	0.00	0.00	0.00	0.00	1.03	0.37	0.23	0.07

Table 14. Stratified mean catch per tow in numbers and weight (kilograms) for pollock in Massachusetts inshore spring surveys¹, 1978-1992

Year	Stratified Mean Number Per Tow at Age				Total	Stratified Mean Weight Per Tow (kilograms)
	0	1	2	3+		
1978	2.07	0.01	0.13	0.06	2.27	0.11
1979	4.34	0.04	0.01	0.06	4.45	0.07
1980	0.30	8.37	0.20	0.02	8.89	0.72
1981	1.52	1.42	1.40	0.00	4.34	0.54
1982	1.79	0.00	0.06	0.00	1.85	0.03
1983	0.03	6.45	0.27	0.04	6.79	0.68
1984	0.04	0.00	0.02	0.00	0.06	0.01
1985	0.88	0.02	0.03	0.00	0.93	0.04
1986	0.22	0.01	0.00	0.00	0.23	< 0.01
1987	0.23	0.01	0.03	0.00	0.27	0.02
1988	0.02	0.00	0.06	0.03	0.11	0.05
1989	0.01	0.36	0.45	0.20	1.02	0.34
1990	0.01	0.00	0.10	0.01	0.12	0.05
1991	0.00	0.00	0.02	0.03	0.05	0.03
1992	0.09	0.04	0.14	0.01	0.28	0.05

¹ Regions 1-5, strata 11-21 and 25-36 (see Howe *et al.* 1979).

pared to the distribution of the stock as a whole, it is doubtful whether such indices will accurately reflect overall trends in stock abundance and biomass. But, the proximity of the inshore survey region to known western Gulf of Maine spawning grounds provides a biological basis for utilizing the results as means for predicting future pollock recruitment. Age 0 and 1 abundance estimates from the 1979 and 1980 DMF spring inshore surveys identified the strong 1979 year class, and the 1982 and 1983 surveys detected the comparatively strong 1982 year class.

MORTALITY

TOTAL MORTALITY

Research vessel catch per tow at age data available from U.S. and Canadian bottom trawl surveys have been analyzed on a cohort basis by Mayo *et al.* (1989b) to estimate total instantaneous mortality (Z). These results suggest a general increase in Z on year classes prevalent during the mid-1980s compared to those which predominated in the 1970s. No further analyses of these data have been conducted.

NATURAL MORTALITY

As in previous Canadian and U.S. pollock assessments, M is assumed to equal 0.2.

ESTIMATES OF STOCK SIZE AND FISHING MORTALITY

VPA TUNING

The ADAPT framework (Parrack 1986; Gavaris 1988; Conser and Powers 1990) was used to calibrate VPA stock sizes and derive estimates of terminal F values in 1992. The total stock catch-at-age (Table 9) was provided to the VPA with true ages 2-11 and a 12+ group represented from 1970 to 1992. Calibration of the VPA, however, was carried out only on data from 1974 to 1992 due to the poor quality of the catch-at-age estimates from 1970 to 1973 (Mayo *et al.* 1989b). The initial formulation employed 35 age-specific indices including: U.S. spring and autumn and Canadian summer bottom trawl survey indices for ages 2 to 10; Massachusetts DMF spring bottom trawl survey indices for ages 1 to 3; and U.S. commercial otter trawl CPUE for ages 4 to 8 as in

Table 15. Results of separable VPA for pollock in Divisions 4VWX and Subareas 5 and 6, down-weighting applied to years prior to 1982

Title : POLLOCK 4VWX + 5 USA+CAN+DWF VPA
 At 25/05/1993 8:00
 Separable analysis from 1974 to 1992 on ages 2 to 11
 with Terminal F of .500 on age 5 and Terminal S of 1.400
 Initial sum of squared residuals was 264.227
 Final sum of squared residuals is 32.621 after 63 iterations

Matrix of Residuals

Ages	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
2/3	1.030	.135	.800	-.410	-1.149	1.879	.768	1.382
3/4	1.363	-.169	.599	.493	-.834	1.132	.494	1.141
4/5	.416	-.302	.508	.346	-.373	.269	.193	.460
5/6	-.111	-.186	.430	.130	-.098	-.177	.127	-.043
6/7	-.370	-.461	-.083	-.047	-.008	-.230	-.127	-.145
7/8	-.388	.110	.106	-.025	.270	-.226	-.184	-.194
8/9	.234	.700	-.241	-.018	.301	-.184	-.190	-.291
9/10	-.563	.582	-1.137	-.141	.932	-.210	-.352	-.644
10/11	-.214	.191	-1.660	-.797	.281	-.372	-.122	-.487
Sum	.000	.000	.001	.001	.001	.001	.001	.000
WTS	.001	.001	.001	.001	.001	.001	.001	.001

Ages	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	SUM	WTS
2/3	-.039	-.371	.056	.850	.239	.229	-.528	-.533	-.489	.581	.000	.219
3/4	-.045	.079	.498	.119	.406	.087	-.611	-.430	.331	-.439	.000	.279
4/5	.039	.003	.344	-.223	-.011	-.196	-.135	.191	.066	-.080	.000	.628
5/6	.102	-.147	.252	-.102	-.153	.060	.104	.118	-.101	-.133	.000	1.000
6/7	.220	-.075	-.300	.108	.029	-.064	.148	-.174	-.049	.161	.000	.929
7/8	-.079	-.129	-.408	.421	.049	-.072	.027	.075	.025	.093	.000	.813
8/9	-.080	.182	.137	-.159	-.055	-.134	-.016	-.201	.255	.070	.000	.682
9/10	-.235	.174	-.318	-.622	-.027	.686	.341	.235	.088	-.322	.000	.327
10/11	-.337	.583	.005	-.319	-.079	-.076	.023	.473	-.301	.031	.000	.340
Sum	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.833	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
F-values	.4250	.4579	.3053	.3529	.4524	.3537	.3790	.4343	.4204

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
F-values	.3258	.2382	.3194	.3480	.3841	.3817	.4194	.4368	.5816	.5000

Selection-at-age (S)

	2	3	4	5	6	7	8	9	10	11
S-values	.0083	.1493	.5573	1.0000	1.3318	1.4761	1.3889	1.3710	1.4562	1.4000
S-adj	.0059	.1053	.3930	.7052	.9392	1.0000	1.0000	1.0000	1.0000	1.0000

mean = 1.418

the previous assessment (NEFC 1989). All indices received equal weight. The U.S. autumn survey was lagged by one year and age to equate autumn abundance of a given cohort with corresponding January 1 stock sizes of the following year. Canadian summer survey and U.S. commercial CPUE indices were related to corresponding mid-year stock sizes. A flat-topped partial recruitment vector was employed with full recruitment on age 7 and older as indicated from a separable VPA (Pope and Shepherd 1982) on the 1981-1992 catch-at-age data (Table 15).

The ADAPT formulation employed in the VPA calibration provided direct estimates of F on ages 2 through 8 in 1992. Since the age at full recruitment was defined as 7 years in the input partial recruitment vector, F s on ages 9 through 11 were estimated as the mean of fully recruited ages 7 and 8 in the terminal year. In all years prior to the terminal year, F on the oldest true age (11) was determined from weighted estimates of Z for ages 7 through 11. In all years, the age 11 F was applied to the 12+ group.

Several preliminary trials were attempted to estimate 1993 stock sizes at ages ranging from 2 to 10. Stock size estimates for ages 2 and 10 were in all cases nonsignificant. A subsequent calibration was performed including only ages 3 through 9 with all indices receiving equal weight. Coefficients of variation (CVs) on the stock size estimates ranged from 37% (age 5) to 52% (age 3). The CVs on the estimated q 's ranged from 26 to 30% except for the Massachusetts DMF surveys which ranged from 31 to 38%.

Additional indices were included in subsequent formulations by expanding the U.S. commercial CPUE to include ages 4 through 9, adding Canadian tonnage class 5 CPUE indices for ages 4 through 9 and adding age-aggregated commercial CPUE indices for U.S. and Canadian otter trawl fleets. The total number of indices included in final calibrations equalled 44. High residuals in the U.S. autumn age 2 and Massachusetts spring age 1 indices were reduced by eliminating the terminal year index for these ages.

Full results from the final calibration including estimates of F , stock size and spawning stock biomass as well as calibration diagnostics are included in Appendix 1.

The CVs on the age 3 to 9 stock size estimates were reduced from the original formulation, ranging from 29% (age 5) to 48% (age 9). The CVs on the estimated q 's ranged from 21-31%. Correlations among parameters and indices were generally quite low with most values between 0.05 and 0.10.

FISHING MORTALITY ESTIMATES

Fishing mortality estimates for ages 7 and 8 in the terminal year equalled 0.65 and 0.79, respectively (Table 16). The mean of these (0.72) was applied to ages 9 through 12+. The mean unweighted F for ages 7 to 11 increased during the mid-1980s and has remained essentially unchanged since 1987, fluctuating between 0.6 and 0.7, except in 1991 when the mean F increased to 0.85 (Table 16, Figure 7). This suggests that exploitable stock size has declined approximately in proportion to the steady decline in landings since 1987.

STOCK SIZE AND SPAWNING STOCK BIOMASS ESTIMATES

Total (age 2+) stock size has declined from a peak level of 172 million fish in 1982 to 121 million fish in 1988 before increasing to an estimated 152 million fish in 1990 (Table 17). In recent years, age 6+ stock size has declined from 30 million fish in 1986 to 12 million in 1992, a decline of about 60%. Mean (mid-year) age 6+ stock biomass has also declined from a maximum of 81,000 mt in 1986 to approximately 31,000 to 34,000 mt in 1991 and 1992 (Table 18), a decline of about 60%. Total catch, after peaking at 69,000 mt in 1986, has declined to about 42,000 mt in 1992, a 40% decline (Table 1, Figure 7).

Spawning stock biomass (SSB), adjusted to the spawning period (January 1 for pollock), has declined in recent years from a maximum of 204,000 mt in 1985 to 122,000 mt in 1991 (Table 18, Figure 8), a 41% decline. Compared to the mid-1980s, when the SSB was dominated by up to six moderate to strong year classes, current SSB is composed of only two to three moderate year classes.

RECRUITMENT ESTIMATES

Since 1970, recruitment at age 2 has ranged from approximately 10 million (1977 year class) to 97 million (1979 year class) fish with most estimates between 25 and 50 million fish (Table 17, Figure 8). Over the 1970-1991 period, geometric mean recruitment for the 1968-1989 year classes equalled 38.2 million fish. The 1980 and 1982 year classes, at about 59 and 56 million fish, respectively, are the strongest to have ap-

Table 16. Instantaneous fishing mortality (F) estimates for pollock in Divisions 4VWX and Subareas 5 and 6 derived from virtual population analysis (VPA) calibrated by the ADAPT method using 1974-1992 fishery independent survey indices and U.S. and Canadian commercial CPUE indices

Age	Year																				GM-F 1988-91	Partial Recruitment			
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989			1990	1991	1992
2	0.02	0.04	0.03	0.03	0.01	0.01	0.01	0.00	0.00	0.04	0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.002	0.0029
3	0.06	0.12	0.08	0.15	0.22	0.08	0.09	0.05	0.04	0.17	0.11	0.18	0.07	0.07	0.04	0.06	0.07	0.06	0.03	0.04	0.05	0.04	0.10	0.039	0.0565
4	0.25	0.34	0.19	0.53	0.30	0.24	0.24	0.21	0.15	0.25	0.24	0.32	0.22	0.23	0.17	0.13	0.21	0.18	0.20	0.26	0.21	0.17	0.16	0.209	0.3048
5	0.33	0.58	0.48	0.71	0.33	0.38	0.41	0.30	0.32	0.27	0.37	0.42	0.35	0.29	0.33	0.29	0.29	0.44	0.39	0.46	0.41	0.43	0.23	0.423	0.6160
6	0.39	0.81	0.59	0.35	0.40	0.48	0.38	0.42	0.40	0.32	0.43	0.48	0.55	0.29	0.33	0.50	0.46	0.47	0.60	0.50	0.59	0.82	0.48	0.616	0.8974
7	0.37	0.43	0.62	0.36	0.34	0.60	0.54	0.52	0.60	0.28	0.42	0.57	0.54	0.36	0.22	0.74	0.58	0.55	0.54	0.68	0.68	0.97	0.65	0.699	1.0183
8	1.52	0.21	0.14	0.26	0.50	0.38	0.31	0.58	0.66	0.29	0.28	0.48	0.62	0.40	0.25	0.38	0.62	0.61	0.55	0.52	0.65	0.87	0.79	0.636	0.9266
9	0.59	0.03	0.56	0.59	0.40	0.36	0.09	0.41	0.88	0.36	0.30	0.29	0.56	0.55	0.22	0.26	0.47	0.90	0.81	0.62	0.65	0.63	0.72	0.672	0.9793
10	3.28	0.04	0.37	0.25	0.48	0.77	0.10	0.27	0.59	0.30	0.45	0.42	0.45	0.62	0.39	0.40	0.50	0.56	0.60	0.89	0.53	0.88	0.72	0.705	1.0260
11	0.58	0.29	0.44	0.37	0.40	0.54	0.43	0.51	0.64	0.30	0.37	0.51	0.57	0.43	0.25	0.52	0.58	0.59	0.60	0.65	0.66	0.90	0.72	0.693	1.0087
12+	0.58	0.29	0.44	0.37	0.40	0.54	0.43	0.51	0.64	0.30	0.37	0.51	0.57	0.43	0.25	0.52	0.58	0.59	0.60	0.65	0.66	0.90	0.72	0.693	1.0087
6+(w)	0.57	0.54	0.51	0.36	0.39	0.50	0.41	0.45	0.53	0.31	0.40	0.49	0.56	0.40	0.29	0.50	0.52	0.53	0.59	0.58	0.62	0.85	0.58		
6+(u)	1.12	0.30	0.45	0.36	0.42	0.52	0.31	0.45	0.63	0.31	0.38	0.46	0.55	0.44	0.28	0.47	0.53	0.61	0.61	0.64	0.63	0.84	0.68		
7+(u)	1.39	0.20	0.43	0.37	0.42	0.53	0.29	0.46	0.67	0.31	0.36	0.46	0.55	0.47	0.27	0.46	0.55	0.64	0.62	0.67	0.63	0.85		0.687	1.0000

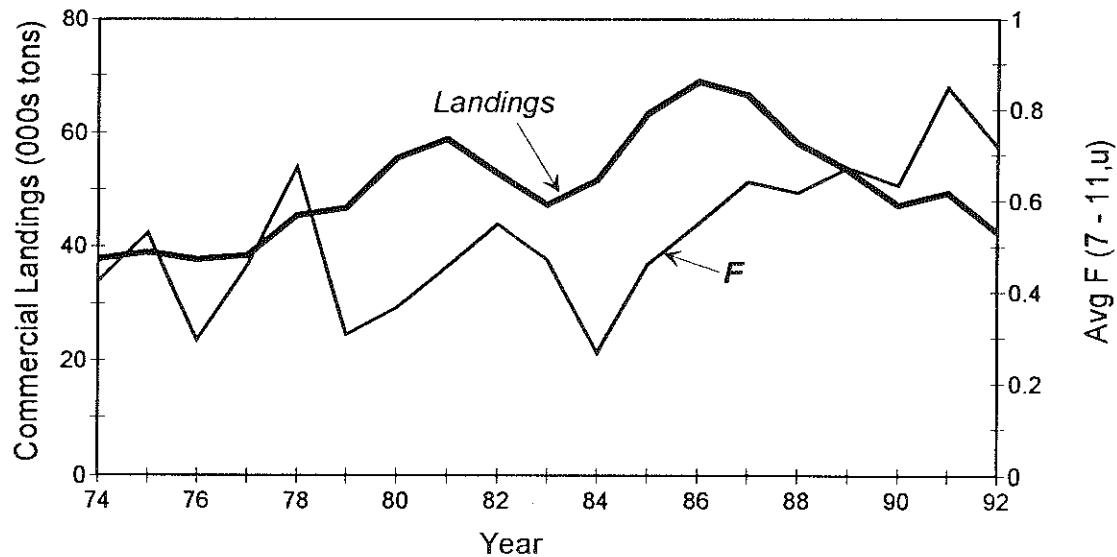


Figure 7. Trends in commercial landings (metric tons, live) and fishing mortality (f) for Divisions 4VWX and Subareas 5 and 6 pollock.

Table 17. Total stock size estimates (thousands of fish) for pollock in Divisions 4VWX and Subareas 5 and 6 derived from virtual population analysis (VPA) calibrated by the ADAPT method using 1974-1992 fishery independent survey indices and U.S. and Canadian commercial CPUE indices

Age	Year														
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	29149	41328	26676	51905	26209	36349	46595	58528	34731	9231	22647	97230	58771	41961	56279
3	11876	23352	32463	21119	41440	21222	29525	37937	47868	28331	7287	18215	78279	47904	34280
4	7835	9190	16922	24615	14851	27294	16076	22191	29476	37790	19497	5329	12425	59471	36738
5	5346	5019	5360	11452	11891	9042	17553	10370	14749	20859	24166	12527	3184	8138	38532
6	3061	3147	2298	2712	4600	6990	5081	9563	6280	8744	13026	13630	6770	1841	4973
7	2442	1699	1151	1046	1567	2536	3551	2844	5133	3434	5183	6959	6915	3190	1125
8	656	1378	902	505	595	917	1135	1693	1380	2317	2119	2791	3210	3289	1826
9	524	118	919	639	321	294	513	683	777	585	1417	1311	1421	1412	1806
10	141	237	94	431	291	176	168	383	373	265	334	858	801	663	667
11	110	4	187	53	274	148	67	124	240	168	161	174	460	417	292
12+	20	4	263	18	151	128	180	749	527	481	276	405	551	826	675
2+	61141	85472	86971	114477	102038	104967	120264	144317	141007	111725	95837	159024	172236	168286	176520
6+	6935	6584	5550	5386	7647	11061	10515	15291	14183	15513	22240	25723	19576	10811	10691

Age	Year									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	
2	33519	33429	41392	27561	48977	61603	30871	(34269)	(34675)	(Values in parentheses derived from RCT3)
3	45961	27230	27266	33806	22540	40033	50390	25003	(28040)	
4	26910	35508	20866	21035	26731	17802	31121	39835	18612	
5	25389	19434	23490	14260	14075	16795	11822	21459	27762	
6	22707	15528	11891	12327	7924	7246	9108	6282	13893	
7	2942	11321	8002	6109	5553	3932	3289	3293	3183	
8	738	1147	5213	3795	2917	2309	1635	1025	1402	
9	1162	411	508	2321	1800	1418	988	562	382	
10	1185	736	211	169	847	793	607	431	224	
11	372	651	365	98	76	285	382	207	172	
12+	475	621	638	423	190	230	517	187	157	
2+	160884	145395	139203	121481	131440	152216	140213	132367	128345	
6+	29105	29794	26189	24820	19117	15983	16009	11800	19257	

Table 18. Total (mid-year) biomass and spawning stock (Jan. 1) biomass (metric tons) for pollock in Divisions 4VWX and Subareas 5 and 6 derived from virtual population analysis (VPA) calibrated by the ADAPT method using 1974-1992 fishery independent survey indices and U.S. and Canadian commercial catch per unit effort (CPUE) indices

Age	Year														
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	22875	14766	28730	14507	20119	25791	32396	19224	5109	12535	53817	32530	23226	31151	18553
2	15425	28639	25217	23238	19375	28224	25271	44006	26395	6001	19333	55944	31360	29253	38719
3	14456	33940	52746	22608	47426	23718	31591	37888	52436	28131	8698	22250	76659	48806	44451
4	13846	15060	38807	34102	22946	43912	24859	29148	44856	49974	30724	10329	25834	80090	66037
5	12657	11007	16636	19907	27766	21098	36443	21284	30783	45251	51147	27596	8580	19665	78705
6	8746	7938	8414	8266	14177	19551	14226	25133	18623	24035	33968	33943	19743	6047	13581
7	8889	6280	4668	3883	6137	8869	11565	9232	16357	12667	16269	21221	22007	11932	4726
8	1824	7070	4972	2530	2612	4534	4938	6671	5362	10340	9508	11852	11559	12815	8449
9	2564	762	5689	3013	1605	1693	3112	3488	3136	3023	7217	6955	6185	5982	8827
10	279	2033	543	2571	1557	862	1121	2160	1741	1556	1894	4747	4317	3041	3294
11	696	31	942	370	1759	885	425	782	1230	1087	963	959	2500	2388	1770
12+	112	28	1858	130	1132	904	1235	4856	2825	3150	1860	2383	3179	5441	4623
2+	79381	112760	158634	120488	145361	153346	153550	179791	200918	182065	179721	195797	208743	220020	268559
6+	22997	24114	25228	20633	27848	36394	35387	47465	46449	52707	69820	79677	66311	42205	40647
SSB	57073	61710	87393	99964	88969	107900	112496	121151	136903	154127	156624	146838	138796	154400	182932

Age	Year								
	1985	1986	1987	1988	1989	1990	1991	1992	
2	21489	17238	26979	29211	30161	27346	13082	(14569)	(Value in parenthesis derived from RCT3)
3	42536	27015	27138	39470	24295	43176	43559	22517	
4	44331	53519	33840	31874	37201	27610	43666	56507	
5	55154	39769	44666	28685	25918	32159	20328	44378	
6	52840	38597	26391	27862	18856	15179	16690	15454	
7	7127	30324	21880	15588	14416	10286	6739	8770	
8	2871	3820	15298	11768	8853	6675	3979	2940	
9	5934	1877	1600	6800	6093	4818	3249	1874	
10	5641	3618	1052	696	2763	3012	1859	1639	
11	1752	3031	1852	550	380	1246	1223	839	
12+	2907	3471	3723	2561	1110	1308	2132	982	
2+	239674	218808	200696	192503	168936	171508	154372	169486	
6+	76165	81267	68073	63263	51361	41217	33738	31516	
SSB	203760	192095	172821	150703	136935	123813	121977	125135	



Figure 8. Trends in recruitment (R) and spawning stock biomass (SSB) for Divisions 4VWX and Subareas 5 and 6 pollock.

peared during the 1980s with the 1981 and 1985, year classes slightly above the long-term mean and the 1987 and 1988 year classes well above the mean. The 1990 year class, estimated to be about 58 million fish by the VPA is considered to be uncertain due to minimum catch-at-age data for age 2 (see "Recruitment," page 41).

PRECISION OF F AND SSB ESTIMATES

To evaluate the precision of the final estimates, a bootstrap procedure (Effron 1982) was used to generate distributions of the 1992 fishing mortality rate and spawning stock biomass. Figure 9 shows the distribution of the bootstrap estimates and a cumulative probability curve. The cumulative probability expresses the likelihood that the spawning stock biomass was less than a given level (Figure 9a) or the likelihood that fishing mortality rate was greater than a given level (Figure 9b) when measurement error is considered. The precision of the 1993 stock size, q , 1992 fishing mortality, and 1992 spawning stock biomass estimates are presented in Table 19.

Coefficients of variation (CV) for the 1993 stock size estimates ranged from 27% (age 6) to 55% (age 3), and CVs for q 's among all indices ranged from 18 to 36%. The fully recruited fishing mortality for ages 7+ was reasonably well estimated (CV = 0.22). The mean bootstrap

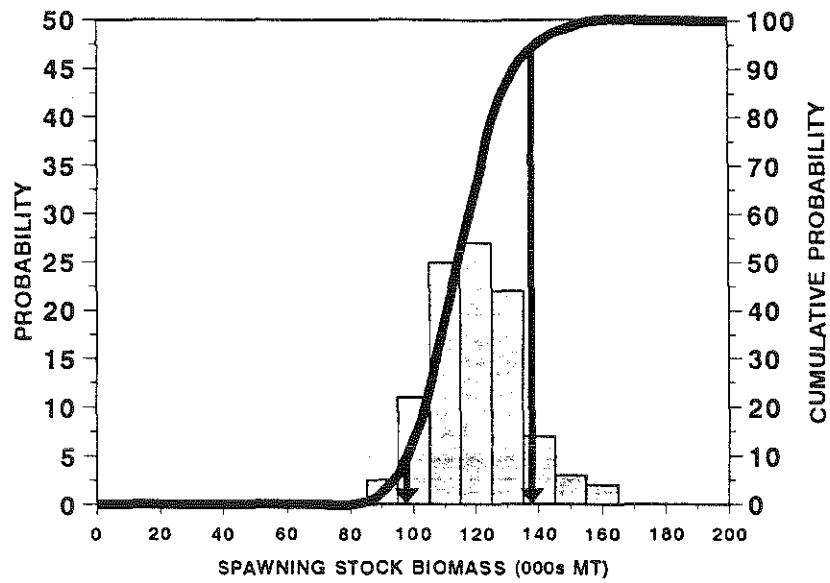
estimate of F (0.75) was slightly higher than the point estimate from the VPA (0.72) and ranged from 0.45 to 1.30 (Figure 9b). F_{med} (0.47) is about equal to the lowest bootstrap estimate, and F_{1992} is above the F_{med} level.

Although the abundance estimates of individual ages in 1993 had wider variances (CV = 0.27 to 0.55), the estimate of 1992 spawning stock biomass was robust (CV = 0.12). The bootstrap mean (128,800 mt) was slightly higher than the VPA point estimate (125,100 mt) and ranged from 96,000 to 184,000 mt. Spawning stock biomass in 1992 was at its lowest level since 1977.

ALTERNATIVE COMPARATIVE ANALYSES

Alternative VPA tuning methods were applied to the same catch-at-age data and tuning indices as applied in the ADAPT formulation. Results for both methods are given in Appendix 2. For both Laurec-Shepherd and Extended Survivors Analysis (XSA), an attempt was made to keep the "formulation" as close to that used in the final ADAPT calibration run. The F 's on ages 2 through 10 were estimated directly and the F on the oldest true age (11) was set equal to the average of the three previous age groups (8, 9, 10). The tuning employed U.S. spring and autumn and Canadian summer age 2 to 10 indices as well as U.S. and

PRECISION ESTIMATES - SSB



PRECISION ESTIMATES - FISHING MORTALITY

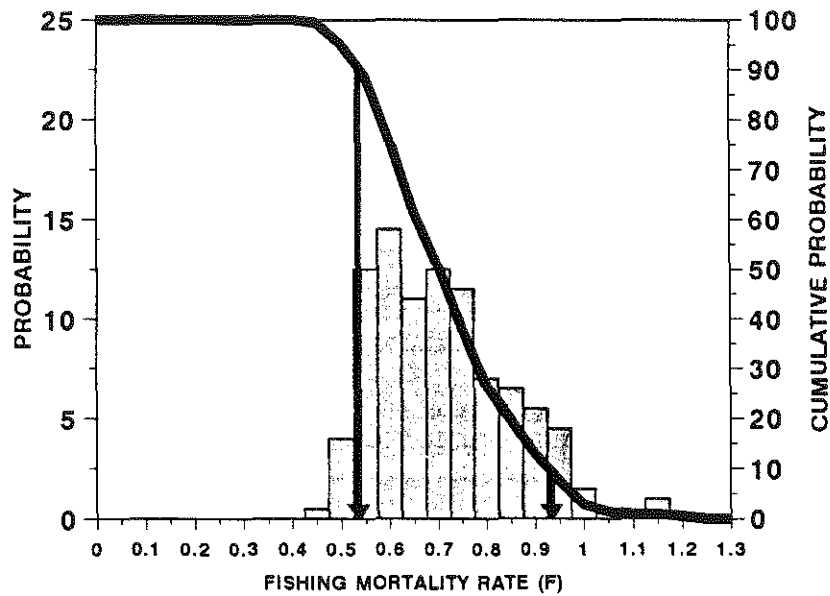


Figure 9. Precision estimates of spawning stock biomass (SSB) and fishing mortality (F) rate for Scotian Shelf-Gulf of Maine-Georges Bank pollock. The vertical bars display both the range of the estimators and the probability of individual values within the range. The solid line gives the probability that the SSB is less than any selected value on the X-axis, and the probability that F is greater than any selected value on the X-axis. The dashed lines indicate the value of the 10 to 90 percent probability levels. The precision estimates were derived from 200 bootstrap iterations of the final ADAPT formulation.

Table 19. Bootstrap results for pollock in Divisions 4VWX and Subareas 5 and 6 derived from virtual population analysis (VPA) calibrated by the ADAPT method using 1974-1992 fishery-independent survey indices and U.S. and Canadian commercial CPUE indices

 BOOTSTRAP RESULTS FOR Total Stock Timestamp 1993 6 19 14 41 41
 POLLOCK: SCOTIAN SHELF, GEORGES BANK, GULF OF MAINE STOCK

SEED FOR THE RANDOM NUMBER GENERATOR: 74747
 MAIN LOOP LIMIT IN MARQUARDT ALGORITHM: 50
 NUMBER OF BOOTSTRAP REPLICATIONS ATTEMPTED: 200
 NUMBER FOR WHICH NLLS CONVERGED: 200
 Results from the converged replications are used for computing the statistics that follow. Other replications are ignored.

BOOTSTRAP OUTPUT VARIABLE: N hat
 Age-specific stocksizes (on Jan 1, 1993) estimated by NLLS

AGE	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN
3	4.732E4	5.110E4	2.411E4	0.51
4	1.861E4	2.004E4	6.609E3	0.36
5	2.776E4	2.902E4	8.600E3	0.31
6	1.389E4	1.451E4	3.601E3	0.26
7	3.184E3	3.118E3	1.198E3	0.38
8	1.400E3	1.472E3	6.257E2	0.45
9	3.827E2	4.242E2	1.844E2	0.48

AGE	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V FOR CORRECTED ESTIMATE
3	3.777E3	1.705E3	7.98	4.354E4	0.55
4	1.433E3	4.673E2	7.70	1.718E4	0.38
5	1.254E3	6.081E2	4.52	2.651E4	0.32
6	6.157E2	2.546E2	4.43	1.328E4	0.27
7	-6.552E1	8.469E1	-2.06	3.249E3	0.37
8	7.193E1	4.425E1	5.14	1.329E3	0.47
9	4.149E1	1.304E1	10.84	3.412E2	0.54

BOOTSTRAP OUTPUT VARIABLE: q unscaled
 Catchability estimates (q) for each index of abundance used in the ADAPT run. Note that these q's have been re-scaled to original units.

INDEX	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN
USRVSP 2	4.367E-6	4.413E-6	8.609E-7	0.20
USRVSP 3	5.865E-6	5.807E-6	1.194E-6	0.20
USRVSP 4	7.253E-6	7.332E-6	1.659E-6	0.23
USRVSP 5	9.715E-6	1.007E-5	2.125E-6	0.22
USRVSP 6	2.006E-5	2.054E-5	4.255E-6	0.21
USRVSP 7	2.546E-5	2.544E-5	4.965E-6	0.19
USRVSP 8	3.334E-5	3.358E-5	7.325E-6	0.22
USRVSP 9	4.435E-5	4.571E-5	1.032E-5	0.23
USRVSP10	6.918E-5	7.069E-5	1.706E-5	0.25
CNRVSU 2	4.937E-6	5.124E-6	1.081E-6	0.22
CNRVSU 3	2.151E-5	2.140E-5	3.972E-6	0.18
CNRVSU 4	4.499E-5	4.574E-5	9.780E-6	0.22
CNRVSU 5	9.624E-5	9.782E-5	2.212E-5	0.23
CNRVSU 6	1.149E-4	1.182E-4	2.415E-5	0.21
CNRVSU 7	1.337E-4	1.383E-4	2.847E-5	0.21
CNRVSU 8	1.802E-4	1.831E-4	3.606E-5	0.20
CNRVSU 9	1.503E-4	1.539E-4	3.172E-5	0.21
CNRVSU10	1.970E-4	2.083E-4	4.501E-5	0.23
USRVFL 2	2.372E-6	2.403E-6	5.250E-7	0.22
USRVFL 3	4.018E-6	4.079E-6	8.870E-7	0.22
USRVFL 4	5.480E-6	5.623E-6	1.036E-6	0.19
USRVFL 5	8.906E-6	9.048E-6	1.781E-6	0.20
USRVFL 6	1.247E-5	1.284E-5	2.773E-6	0.22
USRVFL 7	1.699E-5	1.714E-5	3.467E-6	0.20

Table 19. Continued

INDEX	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN	
USRVFL 8	3.145E-5	3.224E-5	6.636E-6	0.21	
USRVFL 9	5.445E-5	5.519E-5	1.339E-5	0.25	
USRVFL10	8.922E-5	9.085E-5	2.212E-5	0.25	
MARVSP 1	3.054E-6	3.022E-6	9.092E-7	0.30	
MARVSP 2	2.131E-6	2.219E-6	5.579E-7	0.26	
MARVSP 3	1.123E-6	1.170E-6	3.835E-7	0.34	
USCPUE 4	1.783E-5	1.834E-5	4.181E-6	0.23	
USCPUE 5	2.839E-5	2.882E-5	5.235E-6	0.18	
USCPUE 6	3.528E-5	3.656E-5	7.478E-6	0.21	
USCPUE 7	3.891E-5	3.985E-5	9.012E-6	0.23	
USCPUE 8	4.100E-5	4.152E-5	8.049E-6	0.20	
USCPUE 9	3.823E-5	3.888E-5	8.130E-6	0.21	
CNCPUE 4	9.127E-5	9.119E-5	1.955E-5	0.21	
CNCPUE 5	1.614E-4	1.656E-4	3.658E-5	0.23	
CNCPUE 6	2.123E-4	2.216E-4	4.540E-5	0.21	
CNCPUE 7	2.411E-4	2.501E-4	4.992E-5	0.21	
CNCPUE 8	2.096E-4	2.108E-4	4.130E-5	0.20	
CNCPUE 9	1.790E-4	1.850E-4	3.609E-5	0.20	
USCPUEAG	9.075E-5	9.388E-5	2.177E-5	0.24	
CNCPUEAG	1.890E-5	1.949E-5	3.682E-6	0.19	

INDEX	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V FOR CORRECTED ESTIMATE
USRVSP 2	4.633E-8	6.088E-8	1.06	4.320E-6	0.20
USRVSP 3	-5.767E-8	8.445E-8	-0.98	5.922E-6	0.20
USRVSP 4	7.906E-8	1.173E-7	1.09	7.174E-6	0.23
USRVSP 5	3.540E-7	1.503E-7	3.64	9.361E-6	0.23
USRVSP 6	4.855E-7	3.009E-7	2.42	1.957E-5	0.22
USRVSP 7	-1.756E-8	3.510E-7	-0.07	2.548E-5	0.19
USRVSP 8	2.410E-7	5.180E-7	0.72	3.310E-5	0.22
USRVSP 9	1.361E-6	7.299E-7	3.07	4.299E-5	0.24
USRVSP10	1.511E-6	1.206E-6	2.18	6.767E-5	0.25
CNRVSU 2	1.862E-7	7.642E-8	3.77	4.751E-6	0.23
CNRVSU 3	-1.123E-7	2.809E-7	-0.52	2.163E-5	0.18
CNRVSU 4	7.499E-7	6.915E-7	1.67	4.424E-5	0.22
CNRVSU 5	1.583E-6	1.564E-6	1.64	9.466E-5	0.23
CNRVSU 6	3.278E-6	1.707E-6	2.85	1.116E-4	0.22
CNRVSU 7	4.587E-6	2.013E-6	3.43	1.291E-4	0.22
CNRVSU 8	2.856E-6	2.550E-6	1.58	1.773E-4	0.20
CNRVSU 9	3.635E-6	2.243E-6	2.42	1.467E-4	0.22
CNRVSU10	1.127E-5	3.182E-6	5.72	1.858E-4	0.24
USRVFL 2	3.082E-8	3.712E-8	1.30	2.341E-6	0.22
USRVFL 3	6.137E-8	6.272E-8	1.53	3.957E-6	0.22
USRVFL 4	1.438E-7	7.324E-8	2.62	5.336E-6	0.19
USRVFL 5	1.420E-7	1.260E-7	1.59	8.764E-6	0.20
USRVFL 6	3.742E-7	1.960E-7	3.00	1.209E-5	0.23
USRVFL 7	1.434E-7	2.451E-7	0.84	1.685E-5	0.21
USRVFL 8	7.907E-7	4.693E-7	2.51	3.066E-5	0.22
USRVFL 9	7.466E-7	9.466E-7	1.37	5.370E-5	0.25
USRVFL10	1.628E-6	1.564E-6	1.82	8.759E-5	0.25
MARVSP 1	-3.164E-8	6.429E-8	-1.04	3.086E-6	0.29
MARVSP 2	8.845E-8	3.945E-8	4.15	2.042E-6	0.27
MARVSP 3	4.646E-8	2.712E-8	4.14	1.077E-6	0.36
USCPUE 4	5.078E-7	2.956E-7	2.85	1.732E-5	0.24
USCPUE 5	4.305E-7	3.702E-7	1.52	2.796E-5	0.19
USCPUE 6	1.285E-6	5.288E-7	3.64	3.399E-5	0.22
USCPUE 7	9.405E-7	6.372E-7	2.42	3.796E-5	0.24
USCPUE 8	5.232E-7	5.691E-7	1.28	4.048E-5	0.20
USCPUE 9	6.536E-7	5.749E-7	1.71	3.758E-5	0.22
CNCPUE 4	-7.343E-8	1.383E-6	-0.08	9.134E-5	0.21
CNCPUE 5	4.180E-6	2.586E-6	2.59	1.572E-4	0.23
CNCPUE 6	9.362E-6	3.210E-6	4.41	2.029E-4	0.22
CNCPUE 7	9.004E-6	3.530E-6	3.73	2.321E-4	0.22
CNCPUE 8	1.222E-6	2.921E-6	0.58	2.084E-4	0.20
CNCPUE 9	5.983E-6	2.552E-6	3.34	1.730E-4	0.21
USCPUEAG	3.133E-6	1.540E-6	3.45	8.762E-5	0.25
USCPUEAG	5.910E-7	2.603E-7	3.13	1.831E-5	0.20

Table 19. Continued

=====					
BOOTSTRAP OUTPUT VARIABLE: F t					
Full vector of age-specific terminal F's (in 1992)					
AGE	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN	
2	5.735E-4	6.286E-4	2.509E-4	0.44	
3	9.523E-2	9.781E-2	3.124E-2	0.33	
4	1.611E-1	1.659E-1	4.467E-2	0.28	
5	2.348E-1	2.380E-1	5.789E-2	0.25	
6	4.797E-1	5.403E-1	1.877E-1	0.39	
7	6.544E-1	6.978E-1	2.282E-1	0.35	
8	7.857E-1	8.067E-1	2.543E-1	0.32	
9	7.200E-1	7.523E-1	1.497E-1	0.21	
10	7.200E-1	7.523E-1	1.497E-1	0.21	
11	7.200E-1	7.523E-1	1.497E-1	0.21	
12+	7.200E-1	7.523E-1	1.497E-1	0.21	

AGE	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V FOR CORRECTED ESTIMATE
2	5.515E-5	1.774E-5	9.62	5.183E-4	0.48
3	2.587E-3	2.209E-3	2.72	9.264E-2	0.34
4	4.817E-3	3.159E-3	2.99	1.563E-1	0.29
5	3.240E-3	4.093E-3	1.38	2.315E-1	0.25
6	6.052E-2	1.327E-2	12.62	4.192E-1	0.45
7	4.346E-2	1.614E-2	6.64	6.109E-1	0.37
8	2.105E-2	1.798E-2	2.68	7.646E-1	0.33
9	3.225E-2	1.058E-2	4.48	6.878E-1	0.22
10	3.225E-2	1.058E-2	4.48	6.878E-1	0.22
11	3.225E-2	1.058E-2	4.48	6.878E-1	0.22
12+	3.225E-2	1.058E-2	4.48	6.878E-1	0.22

BOOTSTRAP OUTPUT VARIABLE: F full t					
Fully-recruited F in the terminal year (1992)					
AGES	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN	
9-11	7.200E-1	7.523E-1	1.497E-1	0.21	
AGES	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V FOR CORRECTED ESTIMATE
9-11	3.225E-2	1.058E-2	4.48	6.878E-1	0.22

BOOTSTRAP OUTPUT VARIABLE: SSB spawn t					
SSB (males & females) at start of spawning season (1992)					
SSB	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP STD ERROR	C.V. FOR NLLS SOLN	
	1.251E5	1.288E5	1.438E4	0.11	
SSB	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V FOR CORRECTED ESTIMATE
	3.683E3	1.017E3	2.94	1.214E5	0.12

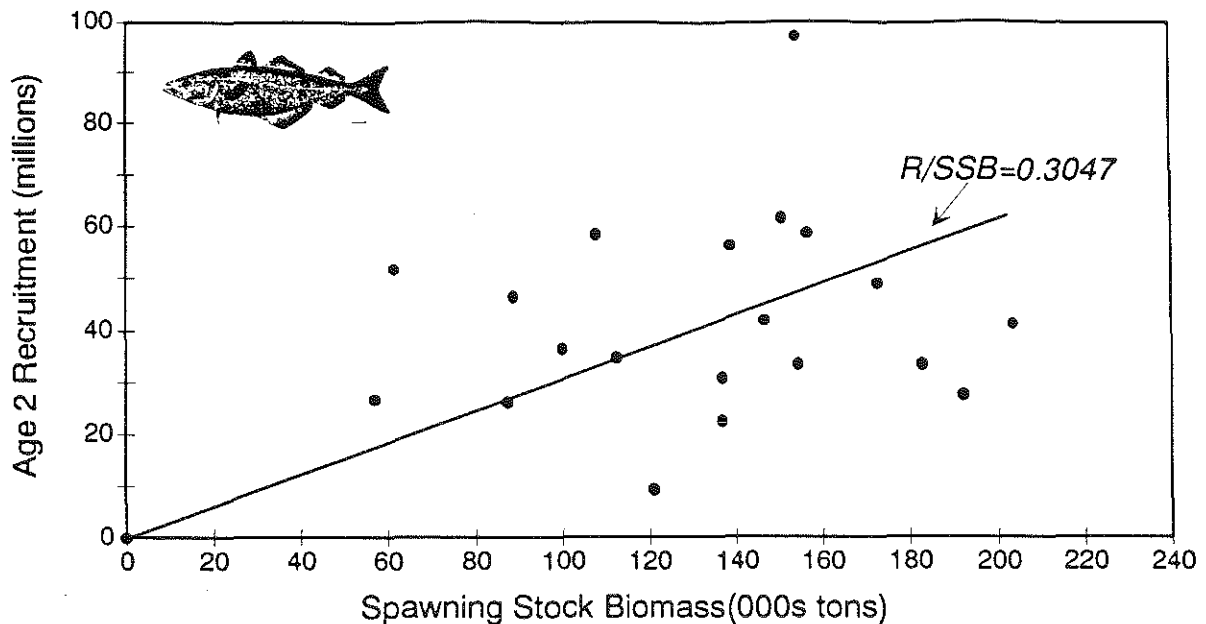


Figure 10. Spawning stock biomass-recruitment scatterplot and replacement line for Divisions 4VWX and Subareas 5 and 6 pollock.

Canadian commercial CPUE at age. There was no shrinkage to the mean or tapered time weighting applied in either tuning run. Each fleet's contribution to the overall F at age was weighted by the inverse variance of the mean q .

LAUREC-SHEPHERD

The Laurec-Shepherd method (Laurec and Shepherd 1983) indicated mean F 's on ages 7 through 11 from 1987 through 1992 ranged from 0.6 to 0.7 except in 1991 when the mean F equalled 0.77. For the critical ages 5 through 8, all five tuning data sets were estimating approximately the same terminal F as indicated by the low external (among fleets) standard errors. Variance ratios were also quite low, reflecting the relatively low internal (within fleets) standard errors. The 1992 terminal F 's at age are in line with those obtained from the final ADAPT calibration.

EXTENDED SURVIVORS

The Extended Survivors method (Shepherd unpublished MS²) indicated mean F s on ages 6 through 10 from 1988 through 1991 approximated 0.5 to 0.6; mean F in 1991 was estimated to be 0.67. The 1992 terminal F s at age are higher at younger ages and lower at older ages than those obtained from the final ADAPT calibration.

BIOLOGICAL REFERENCE POINTS

STOCK-RECRUITMENT RELATIONSHIP

An estimate of F_{med} (F_{rep} of Sissenwine and Shepherd 1987) was derived by calculating the median slope of the R/SSB plot based on 20 points from the calibrated VPA. Spawning stock biomass and recruitment (age 2 stock size) for corresponding year classes was plotted from 1972 through 1991 (Figure 10). The median slope was computed to be 0.30 R/SSB which computes to an inverse of 3.3 SSB/R .

YIELD AND SPAWNING STOCK BIOMASS PER RECRUIT

Yield per recruit and spawning stock biomass per recruit analyses were performed using the method of Thompson and Bell (1934). Mean weights at age for application to yield per recruit were computed as the arithmetic average of catch mean weights at age (Table 9) over the 1989-1992 period. Mean weights at age for application to SSB per recruit were computed as the arithmetic average of January 1 stock mean weight at age estimates (Appendix 1, page 51) over the 1989-1992 period. The maturation ogive was taken from Mayo *et al.* (1989b) since their data were

² Shepherd, J.G. Extended survivors' analysis: an improved method for the analysis of catch-at-age data & catch-per-unit-effort data. MAFF Directorate of Fisheries Research, Lowestoft, U.K.

based on both U.S. and Canadian samples collected throughout the range of the stock.

Partial recruitment for input to the yield and SSB per recruit analysis and short term projections was computed from the most recent four years of the F matrix derived from the VPA (Table 16). Geometric mean F at age was computed for the 1988-1991 period and divided by the geometric mean of the age 7+ F to derive the final partial recruitment vector. Results are similar to those obtained from the SVPA (Table 15).

The yield per recruit analyses indicate that $F_{0.1} = 0.20$ and $F_{max} = 0.76$ (Table 20, Figure 11). Mapping of the SSB/R value computed from the stock-recruitment curve indicates an F_{med} value of about 0.47 corresponding to 25% MSP (Table 20). We estimate $F_{20\%}$ to be 0.65.

SHORT-TERM PROJECTIONS

RECRUITMENT

Catches and stock sizes were projected through 1995 at various levels of fishing mortality assuming status quo landings in 1993 (Figure 12). The exploitation pattern, mean weights at age, and maturation ogive were as described above for the yield and SSB per recruit analyses. Survivors at ages 4 to 12+ in 1993 were taken from the final calibrated VPA. Age 2 recruitment in 1993 (1991 year class) was estimated from RCT3 regressions between Massachusetts spring age 1 stock sizes and VPA age 2 stock numbers for corresponding 1972-1989 year classes with shrinkage to the VPA mean applied (Table 21). Preliminary RCT3 regressions had indicated poor correspondence between NEFSC spring and autumn age 2 indices and the VPA age 2 stock sizes. The estimate of the 1990 year class from RCT3 (34.2 million) was considerably lower than the VPA-based estimate (57.8 million). NEFSC spring and autumn and Massachusetts spring surveys all predicted that this year class was slightly below average strength; the RCT3 estimate was, therefore, accepted over that derived from the VPA. Numbers at age 3 in 1993 were adjusted by Z to reflect the revised strength of this year class at age 2 in 1992. Recruitment of the 1992 and 1993 year classes (38.2 million) was computed as the geometric mean of the 1972-1989 year classes.

CATCH AND STOCK SIZE PROJECTIONS

Status Quo Landings in 1993 (43,000 mt)

If fishing mortality in 1993 remains at the 1992 level ($F_{sq}=0.72$), catches are projected to increase to approximately 60,000 tons. Because of catch restrictions imposed by Canada to meet $F_{0.1}$ management objectives, it is unlikely that the 1993 Canadian catch will exceed the 35,000 mt multi-year annual total allowable catch (TAC), and total catch is not likely to exceed 43,000 mt in 1993, assuming status quo catch for U.S. and DWF components. Under this scenario, F will decline to 0.48 in 1993 and SSB will increase to 147,000 tons in 1994 (Table 22). Continued fishing at the 1993 F level (0.48) in 1994 will result in a stabilization of SSB at about the 1974-1992 mean (143,600 mt) in 1995. If F approximates the $F_{20\%}$ level (0.65) in 1994, SSB in 1995 (131,900 mt) will again decline below the 1974-1992 mean. Reducing F to F_{med} (0.47) in 1994, will stabilize SSB at the long-term mean in 1995.

The increase in the projected catch in 1993 under the status quo F scenario is due primarily to growth in weight of the 1988 year class, which was estimated by the VPA to have been the strongest to appear since the very large 1979 year class. Thus, it is likely that F in 1993 will be considerably lower than 0.72. This suggests that the elevated levels of F estimated for 1992 and 1991 are the result of several years of below-average recruitment from the 1983, 1984, and 1986 year classes. This pattern appears to have been reversed in recent years as the 1987 and 1988 year classes are estimated to be well above average. However, the increase in stock biomass expected from growth of fish from the 1988 year class may be short-lived as the 1989, 1990, and 1991 year classes are projected to below average strength.

DISCUSSION

The Scotian Shelf-Gulf of Maine-Georges Bank pollock stock has experienced a recent decline in spawning stock biomass resulting from below-average recruitment during the mid-1980s. Age 6+ mean biomass has declined by 60% since 1986, while total landings have declined by 40%.

Table 20. Yield and spawning stock biomass per recruit results for pollock in Divisions 4VWX and Subareas 5 and 6

The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
PC Ver.1.2 [Method of Thompson and Bell (1934)] 1-Jan-1992

Run Date: 1- 7-1993; Time: 13:54:27.27

POLLOCK 4VWX + SA 5 - 1993 UPDATED AVE WTS, FPAT AND MAT VECTORS

Proportion of F before spawning: .0000
 Proportion of M before spawning: .0000
 Natural Mortality is Constant at: .200
 Initial age is: 1; Last age is: 16
 Last age is a PLUS group;
 Original age-specific PRs, Mats, and Mean Wts from file:
 ==> b:\lass\polypr.dat

Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights	
				Catch	Stock
1	.0000	1.0000	.0090	.000	.094
2	.0029	1.0000	.0750	.527	.485
3	.0565	1.0000	.3450	1.110	.969
4	.3048	1.0000	.7190	1.750	1.474
5	.6160	1.0000	.9070	2.488	2.141
6	.8974	1.0000	.9680	3.162	2.882
7	1.0000	1.0000	1.0000	3.815	3.585
8	1.0000	1.0000	1.0000	4.255	4.105
9	1.0000	1.0000	1.0000	4.985	4.700
10	1.0000	1.0000	1.0000	5.380	5.251
11	1.0000	1.0000	1.0000	6.345	5.961
12	1.0000	1.0000	1.0000	7.998	8.159
13	1.0000	1.0000	1.0000	9.025	9.025
14	1.0000	1.0000	1.0000	9.547	9.547
15	1.0000	1.0000	1.0000	10.004	10.004
16+	1.0000	1.0000	1.0000	10.403	10.403

Summary of Yield per Recruit Analysis for:
 POLLOCK 4VWX + SA 5 - 1993 UPDATED AVE WTS, FPAT AND MAT VECTORS

Slope of the Yield/Recruit Curve at F=0.00: --> 11.6919
 F level at slope=1/10 of the above slope (F0.1): -----> .199
 Yield/Recruit corresponding to F0.1: -----> .8401
 F level to produce Maximum Yield/Recruit (Fmax): -----> .763
 Yield/Recruit corresponding to Fmax: -----> .9792
 F level at 20 % of Max Spawning Potential (F20): -----> .650
 SSB/Recruit corresponding to F20: -----> 2.6694

Listing of Yield per Recruit Results for:
 POLLOCK 4VWX + SA 5 - 1993 UPDATED AVE WTS, FPAT AND MAT VECTORS

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
	.00	.00000	.00000	5.5167	14.5850	3.1215	13.3484	100.00
	.05	.08731	.40858	5.0818	11.3069	2.6884	10.0741	75.47
	.10	.14702	.62848	4.7850	9.2657	2.3933	8.0366	60.21
	.14	.19066	.75510	4.5684	7.9026	2.1784	6.6771	50.02
	.19	.22411	.83196	4.4027	6.9428	2.0143	5.7209	42.86
F0.1	.20	.22816	.84009	4.3826	6.8319	1.9945	5.6104	42.03
	.24	.25067	.88066	4.2713	6.2380	1.8846	5.0195	37.60
	.29	.27238	.91261	4.1642	5.7021	1.7791	4.4869	33.61
	.34	.29051	.93416	4.0749	5.2827	1.6913	4.0708	30.50
	.38	.30594	.94899	3.9990	4.9463	1.6170	3.7376	28.00
	.43	.31927	.95934	3.9336	4.6707	1.5531	3.4651	25.96
	.48	.33094	.96658	3.8765	4.4408	1.4974	3.2382	24.26
	.53	.34126	.97160	3.8260	4.2460	1.4483	3.0464	22.82
	.58	.35049	.97502	3.7810	4.0786	1.4047	2.8819	21.59
	.62	.35880	.97723	3.7405	3.9330	1.3656	2.7392	20.52
F20%	.65	.36298	.97803	3.7202	3.8618	1.3460	2.6694	20.00
	.67	.36634	.97852	3.7038	3.8052	1.3303	2.6141	19.58
	.72	.37323	.97911	3.6704	3.6919	1.2982	2.5035	18.75
Fmax	.76	.37896	.97916	3.6426	3.6001	1.2716	2.4141	18.09
	.77	.37956	.97914	3.6397	3.5906	1.2688	2.4048	18.02
	.82	.38540	.97874	3.6115	3.4994	1.2419	2.3162	17.35
	.86	.39082	.97800	3.5853	3.4167	1.2169	2.2361	16.75
	.91	.39586	.97698	3.5610	3.3414	1.1938	2.1633	16.21
	.96	.40058	.97575	3.5382	3.2725	1.1723	2.0967	15.71

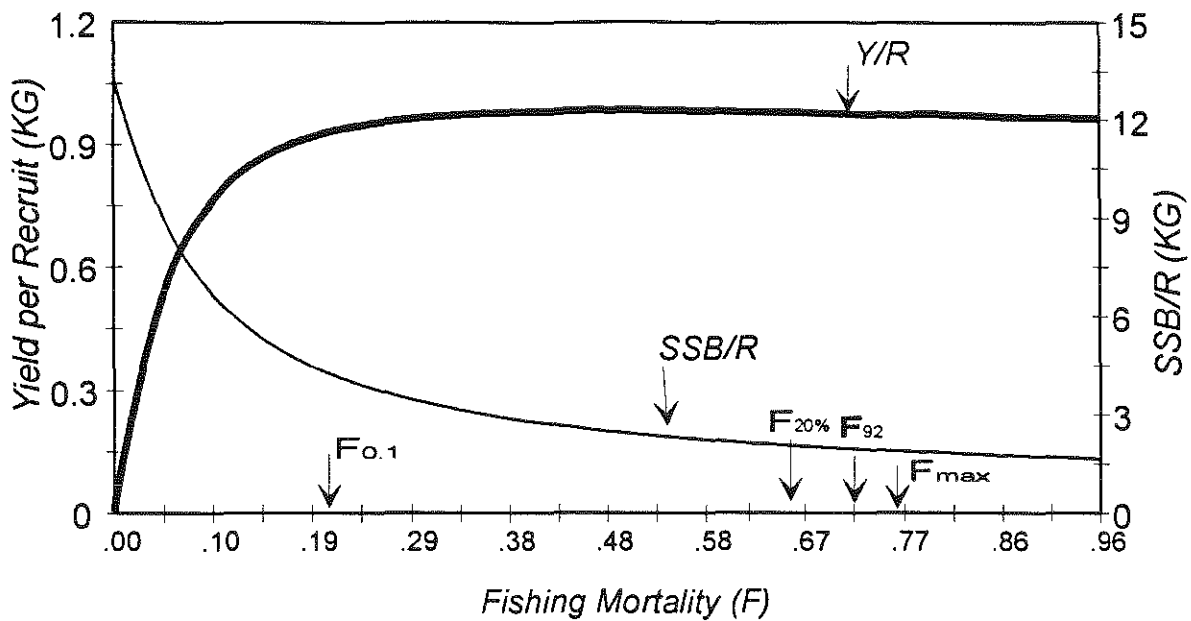


Figure 11. Yield and spawning stock biomass per recruit (SSB/R) results for Divisions 4VWX and Subareas 5 and 6 pollock.

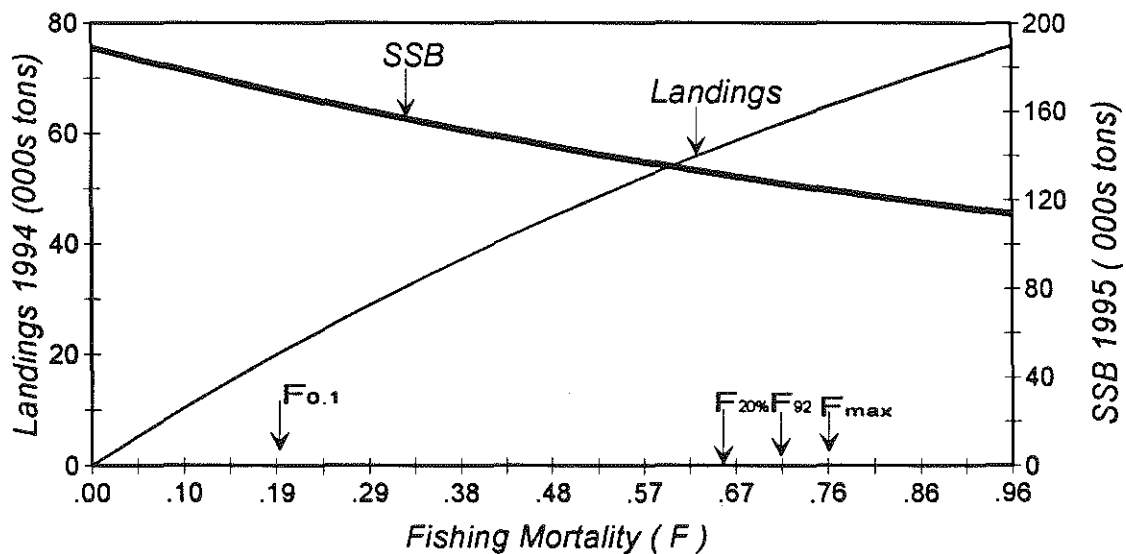


Figure 12. Short-term projections of 1994 landings and 1995 spawning stock biomass (SSB) results for Divisions 4VWX and Subareas 5 and 6 pollock.

Table 21. Estimates of age 2 recruitment for the 1989-1991 year classes of pollock in Divisions 4VWX and Subareas 5 and 6

Analysis by RCT3 ver3.1 of data from file : RPOL923.DAT
 Data for 4 surveys over 20 years : 1972 - 1991
 Regression type - C
 Tapered time weighting not applied
 Survey weighting not applied
 Final estimates shrunk towards mean
 Minimum S.E. for any survey taken as .20
 Minimum of 5 points used for regression
 Forecast/Hindcast variance correction used

Year Class = 1989

Survey/ Series	Regression					Prediction			
	Slope	Intercept	Std Error	Rsquare Pts	No. Value	Index Value	Predicted Error	Std Weights	WAP
USspr2	4.53	9.48	1.04	.209	17	.08	9.83	1.156	.070
USaut2	2.52	10.00	.77	.328	17	.12	10.31	.843	.132
CANsum	4.44	8.93	2.65	.040	17	.73	12.18	2.930	.011
MAspr1	.66	10.36	.39	.551	11	.00	10.36	.462	.439
VPA Mean =							10.56	.519	.347

Year Class = 1990

Survey/ Series	Regression					Prediction			
	Slope	Intercept	Std Error	Rsquare Pts	No. Value	Index Value	Predicted Error	Std Weights	WAP
USspr2	4.42	9.53	.99	.217	18	.21	10.45	1.081	.073
USaut2	2.52	10.00	.74	.331	18	.20	10.50	.809	.131
CANsum	4.88	8.66	2.86	.032	18	.22	9.74	3.120	.009
MAspr1	.66	10.36	.38	.565	12	.00	10.36	.433	.455
VPA Mean =							10.55	.507	.333

Yearclass = 1991

Survey/ Series	Regression					Prediction			
	Slope	Intercept	Std Error	Rsquare Pts	No. Value	Index Value	Predicted Error	Std Weights	WAP
USspr2									
USaut2									
CANsum									
MAspr1	.66	10.36	.38	.565	12	.04	10.38	.432	.579
VPA Mean =							10.55	.507	.421

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1989	33079	10.41	.31	.13	.18	30871	10.34
1990	34269	10.44	.29	.06	.04		
1991	34675	10.45	.33	.08	.06		

Table 22. Short-term projections of landings and stock size for pollock in Divisions 4VWX and Subareas 5 and 6

The NEFC/PDB Catch and Stock Size Prediction Program - PDBPRED
 Run Date: 18- 6-1993; Time: 12:33:56.41; Projection # 27
 POLLOCK 4VWX + SA 5 - 1993 UPDATED AVE WTS, FPAT AND MAT VECTORS

 Input for Projections:

Number of Years: 3; Initial Year: 1993; Final Year: 1995
 Number of Ages : 11; Age at Recruitment: 2; Last Age: 12
 Natural Mortality is assumed Constant over time at: .200
 Proportion of F before spawning: .0000
 Proportion of M before spawning: .0000
 Last age is a PLUS group;
 Original age-specific PRs, Mats, and Mean Wts from file:
 ==> b:\ass\polprd.dat

 Year-specific Input data for Projection # 27

Year	Recruits at Age 2	Reference F	Natural Mortality	Target Catch
1993	34675.	.478	.200	N/A
1994	38177.	.478	.200	N/A
1995	38177.	.478	.200	N/A

 Age-specific Input data for Projection # 27

Age	Stock Size in 1993	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights Catch	Stock
2	34675.	.0029	1.0000	.0750	.527	.485
3	28040.	.0565	1.0000	.3450	1.110	.969
4	18612.	.3048	1.0000	.7190	1.750	1.474
5	27762.	.6160	1.0000	.9070	2.488	2.141
6	13893.	.8974	1.0000	.9680	3.162	2.882
7	3183.	1.0000	1.0000	1.0000	3.815	3.585
8	1402.	1.0000	1.0000	1.0000	4.255	4.105
9	382.	1.0000	1.0000	1.0000	4.985	4.700
10	224.	1.0000	1.0000	1.0000	5.380	5.251
11	172.	1.0000	1.0000	1.0000	6.345	5.961
12+	157.	1.0000	1.0000	1.0000	7.998	8.159

 The NEFC/PDB Catch and Stock Size Prediction Program - PDBPRED
 Run Date: 18- 6-1993; Time: 12:36:34.82; Projection # 31
 POLLOCK 4VWX + SA 5 - 1993 UPDATED AVE WTS, FPAT AND MAT VECTORS

Year: 1993					Year: 1994					Year: 1995	
Fac-tor	Ref F	Stock Biomass	SpStock Biomass	Catch	Fac-tor	Ref F	Stock Biomass	SpStock Biomass	Catch	Stock Biomass	SpStock Biomass
1.00	.48	193344	145473	42999	.00	.00	195515	146955	0	239959	188742
					.10	.05		146955	5262	234580	183474
					.20	.10		146955	10330	229405	178407
					.30	.14		146955	15212	224424	173533
					.40	.19		146955	19915	219629	168844
					.50	.24		146955	24447	215014	164332
					.60	.29		146955	28814	210570	159990
					.70	.33		146955	33024	206291	155812
					.80	.38		146955	37081	202169	151789
					.90	.43		146955	40993	198199	147917
					1.00	.48		146955	44766	194375	144189
					1.10	.53		146955	48404	190690	140599
					1.20	.57		146955	51913	187139	137142
					1.30	.62		146955	55299	183716	133811
					1.40	.67		146955	58566	180417	130603
					1.50	.72		146955	61719	177236	127512
					1.60	.76		146955	64762	174168	124533
					1.70	.81		146955	67700	171210	121662
					1.80	.86		146955	70537	168356	118894
					1.90	.91		146955	73277	165602	116226
					2.00	.96		146955	75924	162946	113653

Table 22. Continued

The NEFC/PDB Catch and Stock Size Prediction Program - PDBPRED								
Run Date: 18- 6-1993; Time: 12:34:00.37;			Projection # 27			Fsq catch		
Year	F(ref)	Recruits	Total Stock		Spawning Stock		Catch	
			Number	Weight	Number	Weight	Number	Weight
1993	.478	34675.	128502.	193344.	69805.	145474.	15802.	43000.
1994	.478	38177.	129186.	195516.	67257.	146955.	15480.	44766.
1995	.478	38177.	130041.	194375.	66206.	144190.	14749.	43176.
Run Date: 18- 6-1993; Time: 12:34:53.75; Projection # 28 Fmax								
Year	F(ref)	Recruits	Total Stock		Spawning Stock		Catch	
			Number	Weight	Number	Weight	Number	Weight
1993	.478	34675.	128502.	193344.	69805.	145474.	15802.	43000.
1994	.763	38177.	129186.	195516.	67257.	146955.	22588.	64650.
1995	.763	38177.	123723.	174282.	60170.	124643.	18830.	52581.
Run Date: 18- 6-1993; Time: 12:35:23.14; Projection # 29 F20%								
Year	F(ref)	Recruits	Total Stock		Spawning Stock		Catch	
			Number	Weight	Number	Weight	Number	Weight
1993	.478	34675.	128502.	193344.	69805.	145474.	15802.	43000.
1994	.650	38177.	129186.	195516.	67257.	146955.	19928.	57268.
1995	.650	38177.	126082.	181728.	62419.	131878.	17480.	49743.
Run Date: 18- 6-1993; Time: 12:36:04.50; Projection # 30 Fmed								
Year	F(ref)	Recruits	Total Stock		Spawning Stock		Catch	
			Number	Weight	Number	Weight	Number	Weight
1993	.478	34675.	128502.	193344.	69805.	145474.	15802.	43000.
1994	.470	38177.	129186.	195516.	67257.	146955.	15261.	44144.
1995	.470	38177.	130237.	195006.	66394.	144804.	14599.	42790.
Run Date: 18- 6-1993; Time: 12:36:19.11; Projection # 31 F0.1								
Year	F(ref)	Recruits	Total Stock		Spawning Stock		Catch	
			Number	Weight	Number	Weight	Number	Weight
1993	.478	34675.	128502.	193344.	69805.	145474.	15802.	43000.
1994	.199	38177.	129186.	195516.	67257.	146955.	7073.	20667.
1995	.199	38177.	137572.	218865.	73441.	168096.	7811.	23900.

Fishing mortality (mean 7-11,u), which had fluctuated between 0.55 and 0.67 during the latter half of the 1980s, increased to more than 0.8 in 1991 and is estimated to have been 0.72 in 1992. Fishing mortality is likely to decline in 1993 and 1994 if the 1988 year class is as strong as has been estimated by the VPA and if Canada continues to impose catch restrictions. Under these conditions, the stock will remain fully exploited in the near term.

Estimates of the strength of subsequent year classes from 1989, 1990, and 1991 indicate another period of below average recruitment. However, these estimates, particularly those for the 1990 and 1991 year classes, are the least certain because little or no fishery data are yet included in the estimation process.

The decline in U.S. landings from this stock has been more severe than the decline in Canadian landings. The 1992 U.S. catch of 7182 tons is less than 30% of the peak catch of 24,542 tons taken in 1986. In contrast, Canada has been able to take between 73% and 84% of its peak 1985 catch over the past three years.

These differences in landings between the United States and Canada from what is considered a unit stock may be explained by two very different hypotheses regarding stock definition. Under one scenario, the sharp decline in U.S. landings reflects a sharp decline in available biomass resulting from extremely high exploitation during 1985-1987 when annual U.S. landings equalled or exceeded 20,000 tons. This suggests a low degree of mixing of pollock between the Scotian Shelf and U.S.-managed waters. A second scenario would explain the decline in U.S. landings (and the relative stability of 4X Canadian landings) as a result of emigration of pollock from the Gulf of Maine to Canadian waters.

If the first hypothesis holds, the inclusion of U.S. 5Y+5Zu catch-at-age data with Canadian and DWF catch-at-age from Divisions 4VWX+5Zc may introduce more variability in estimated stock sizes if recruitment is not synchronous between the two areas. If the second hypothesis is true, the inclusion of the U.S. component to the Canadian+DWF catch-at-age data should provide a more complete evaluation and yield higher estimates of F than the Canadian assessment alone would indicate. The hypotheses remain to be tested.

ACKNOWLEDGMENTS

We wish to express our appreciation to Marjorie Lambert for providing summaries of U.S. pollock recreational catches, length compositions, and sampling information, and to Ed Trippel for providing 1992 Canadian catch-at-age and summer survey indices. We thank members of the SARC Northern Demersal Subcommittee for their constructive criticism and suggestions.

LITERATURE CITED

- Annand, M.C., D. Beanlands, and J. McMillan. 1988. Assessment of Divisions 4VWX and Subarea 5 pollock (*Pollachius virens*). CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 88/71.
- Annand, M.C., D. Beanlands, and J. McMillan. 1989. Assessment of Pollock (*Pollachius virens*) in Divisions 4VWX and Subdivision 5Zc. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 89/71.
- Annand, M.C., and D. Beanlands. 1991. Assessment of pollock (*Pollachius virens*) in Divisions 4VWX and Subdivision 5Zc for 1990. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 91/35.
- Azarovitz, T. R. 1981. A brief historical review of the Woods Hole Laboratory trawl survey time series. In Doubleday, W. G., and D. Rivard, (eds.), Bottom trawl surveys. Can. Spec. Publ. Fish. Aquat. Sci. 58:62-67.
- Clark, J. R. 1962. The 1960 salt-water angling survey. U.S. Fish and Wildlife Serv. Circ. 153.
- Conser, R.J. and J.E. Powers. 1990. Extensions of the ADAPT VPA tuning method designed to facilitate assessment work on tuna and swordfish stocks. ICCAT [International Commission for the Conservation of Atlantic Tunas] Coll. Vol. Sci. Pap. 32:461-467.
- Deuel, D. G. 1973. The 1970 salt-water angling survey. NMFS [National Marine Fisheries Service] Current Fish. Stat. No. 6200.
- Deuel, D. G., and J. R. Clark. 1968. The 1965 salt-water angling survey. U.S. Fish and Wildl. Serv. Resource Publ. 67.
- Doubleday, W. G. (ed.). 1981. Manual on groundfish surveys in the Northwest Atlantic. NAFO [North Atlantic Fishery Organization] Council Studies No. 2.

- Effron, B. 1982. The jackknife, the bootstrap and other resampling plans. *Phila. Soc. for Ind. and Appl. Math.* 38.
- Gavaris, S. 1988. An adaptive framework for the estimation of population size. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 88/29, 12p.
- Howe, A.B., D. MacIassac, B.T. Estrella, and F.J. Germano, Jr. 1979. Fishery resource assessment, coastal Massachusetts. Boston, MA: Massachusetts Division of Marine Fisheries. Completion Report on Commercial Fisheries Resource Development Project No. 3-287-R-1.
- ICNAF [International Commission for the Northwest Atlantic Fisheries]. 1973. Proceedings of the 23rd Annual Meeting, June 1973. In Proceedings of the Special Commission Meeting, January 1973, and the 23rd Annual Meeting, June 1973, p. 53-214.
- Laurec, A., and J.G. Shepherd. 1983. On the analysis of catch and effort data. *J. Cons. Int. Explor. Mer* 41:81-84.
- Mayo, R. K., and S. H. Clark. 1984. An assessment of the pollock (*Pollachius virens* L.) stock in the Scotian Shelf, Gulf of Maine, and Georges Bank region, 1984. Woods Hole, MA: NOAA/NMFS. NEFC [Northeast Fisheries Science Center] Ref. Doc. 84-13.
- Mayo, R.K., S.H. Clark, and M.C. Annand. 1989a. Stock information for pollock, *Pollachius virens* (L.), in the Scotian Shelf, Georges Bank, and Gulf of Maine Regions. NOAA Tech Mem. NMFS-F/NEC-65.
- Mayo, R.K., J.M. McGlade, and S.H. Clark. 1989b. Patterns of exploitation and biological status of pollock (*Pollachius virens* L.) in the Scotian Shelf, Georges Bank, and Gulf of Maine Area. *J. Northw. Atl. Fish. Sci.* Vol. 9: 13-36.
- McGlade, J., R. Zwanenburg, and J. J. Maguire. 1981. Assessment of the Division 4VWX and SA5 pollock stock complex. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 81/31.
- McGlade, J.M., and M.C. Annand. 1986. Revision of the catch-at-age matrix for pollock (*Pollachius virens*) in Divisions 4VWX and Subarea 5. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 86/119.
- Mohn, R., Halliday, R.G., and C. Annand. 1990. A review of the cod-haddock-pollock combined quota system for the under 65' mobile gear sector in the Western Scotia-Fundy Region. CAFSAC [Canadian Atlantic Fisheries Scientific Advisory Committee] Res. Doc. 90/62
- NEFC. 1989. Report of the Fall 1989 NEFC Stock Assessment Workshop (Ninth SAW). Woods Hole, MA: NOAA/NMFS/NEFC. *NEFC Ref. Doc.* 89-08.
- NEFMC [New England Fishery Management Council]. 1985. Fishery Management Plan for the Northeast Multispecies Fishery. Saugus, MA: New England Fishery Management Council.
- Parrack, M.L. 1986. A method of analyzing catches and abundance indices from a fishery. ICCAT [International Commission for the Conservation of Atlantic Tunas] Coll. Vol. Sci. Pap. 24:209-211.
- Pileggi, J., and B. G. Thompson. 1980. Fisheries of the United States, 1979. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8000.
- Pope, J.G., and J.G. Shepherd. 1982. A simple method for the consistent interpretation of catch-at-age data. *J. Cons. Int. Explor. Mer* 40:176-184.
- Ridgely, J. E., and D. G. Deuel. 1975. Participation in marine recreational fishing, northeastern United States, 1973-1974. NMFS [National Marine Fisheries Service] Current Fish. Stat. 6236.
- Sissenwine, M.P., and J.G. Shepherd. 1987. An alternative perspective on recruitment overfishing and biological reference points. *Can. J. Fish. Aquat. Sci.* 44:913-918.
- Thompson, W.F., and F.H. Bell. 1934. Biological statistics of the Pacific halibut fishery. 2. Effects of changes in intensity upon total yield and yield per unit gear. *Rep. Int. Pacific Halibut Comm.* 8.
- USDOC [United States Department of Commerce]. 1980. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1979. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8063.
- USDOC [United States Department of Commerce]. 1984. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1979(Revised)-1980. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8322.
- USDOC [United States Department of Commerce]. 1985a. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1981-1982. NMFS [National Marine Fisheries Service] Current Fish. Stat. 324.
- USDOC [United States Department of Commerce]. 1985b. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1983-1984. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8326.

USDOC [United States Department of Commerce].
1986. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1985. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8327.

USDOC [United States Department of Commerce].
1987. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1986. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8392.

USDOC [United States Department of Commerce].
1991. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1987-1989. NMFS [National Marine Fisheries Service] Current Fish. Stat. 8904.

USDOC [United States Department of Commerce].
1992. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1990-1991. NMFS [National Marine Fisheries Service] Current Fish. Stat. 9204.

Appendix 1

**Full Listing of Calibration Run
for Divisions 4VWX and Subareas 5 and 6 Pollock**

ADAPT Run Number 74 1993 7 2 16 3 38
 FUNCTION: INITIALIZEDTOTALS
 POLLOCK: SCOTIAN SHELF, GEORGES BANK, GULF OF MAINE STOCK

Output option selected for input parameters: full
 Output option selected for results: full

INPUT PARAMETERS AND OPTIONS SELECTED

 Natural mortality is 0.2

Oldest age (not in the plus group) is 11

For all yrs prior to the terminal year (1992), backcalculated stock sizes for the following ages used to estimate total mortality (Z) for age 11: 7 8 9 10 11
 This method for estimating F on the oldest age is generally used when a flat-topped partial recruitment curve is thought to be characteristic of the stock.

F for age 12+ is then calculated from the following ratios of F[age 12+] to F[age 11]

1970	1.0000
1971	1.0000
1972	1.0000
1973	1.0000
1974	1.0000
1975	1.0000
1976	1.0000
1977	1.0000
1978	1.0000
1979	1.0000
1980	1.0000
1981	1.0000
1982	1.0000
1983	1.0000
1984	1.0000
1985	1.0000
1986	1.0000
1987	1.0000
1988	1.0000
1989	1.0000
1990	1.0000
1991	1.0000
1992	1.0000

Stock size of the 12+ group is then calculated using the following method: CATCHEQ

Partial recruitment estimate for 1992

1	0.0010
2	0.0060
3	0.1050
4	0.3930
5	0.7050
6	0.9390
7	1.0000
8	1.0000
9	1.0000
10	1.0000
11	1.0000

Objective function is $SUM w*(LOG(OBS) - LOG(PRED))^{**2}$

Indices normalized (by dividing by mean observed value) before tuning to VPA stocksizes

The residuals for years prior to the terminal year are downweighted using the following algorithm: NONE

Biomass estimates (other than SSB) reflect mean stock sizes. SSB calculated as in the NEFSC projection program (see note below SSB table for description of the algorithm).

Initial estimates of parameters for the Marquardt algorithm
and lower and upper bounds on the parameter estimates:

Par.	Initial Est	Lower Bnd	Upper Bnd
N 3	4.000000E3	1.000000E0	1.000000E6
N 4	2.000000E3	1.000000E0	1.000000E6
N 5	2.000000E4	1.000000E0	1.000000E6
N 6	2.000000E4	1.000000E0	1.000000E6
N 7	1.000000E4	1.000000E0	1.000000E6
N 8	1.000000E4	1.000000E0	1.000000E6
N 9	5.000000E3	1.000000E0	1.000000E6
qUSRVSP 2	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 3	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 4	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 5	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 6	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 7	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 8	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP 9	1.000000E-4	0.000000E0	1.000000E0
qUSRVSP10	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 2	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 3	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 4	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 5	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 6	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 7	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 8	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU 9	1.000000E-4	0.000000E0	1.000000E0
qCNRVSU10	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 2	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 3	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 4	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 5	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 6	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 7	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 8	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL 9	1.000000E-4	0.000000E0	1.000000E0
qUSRVFL10	1.000000E-4	0.000000E0	1.000000E0
qMARVSP 1	1.000000E-4	0.000000E0	1.000000E0
qMARVSP 2	1.000000E-4	0.000000E0	1.000000E0
qMARVSP 3	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 4	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 5	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 6	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 7	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 8	1.000000E-4	0.000000E0	1.000000E0
qUSCPUE 9	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 4	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 5	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 6	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 7	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 8	1.000000E-4	0.000000E0	1.000000E0
qCNCPU 9	1.000000E-4	0.000000E0	1.000000E0
qUSCPUEAG	1.000000E-4	0.000000E0	1.000000E0
qCNCPUAG	1.000000E-4	0.000000E0	1.000000E0

The following indices of abundance are available:

1	USRVSP 2
2	USRVSP 3
3	USRVSP 4
4	USRVSP 5
5	USRVSP 6
6	USRVSP 7
7	USRVSP 8
8	USRVSP 9
9	USRVSP10
10	CNRVSU 2
11	CNRVSU 3
12	CNRVSU 4
13	CNRVSU 5
14	CNRVSU 6
15	CNRVSU 7
16	CNRVSU 8
17	CNRVSU 9
18	CNRVSU10
19	USRVFL 2
20	USRVFL 3
21	USRVFL 4
22	USRVFL 5
23	USRVFL 6
24	USRVFL 7
25	USRVFL 8
26	USRVFL 9
27	USRVFL10
28	MARVSP 1
29	MARVSP 2
30	MARVSP 3
31	USCPUE 4
32	USCPUE 5
33	USCPUE 6
34	USCPUE 7
35	USCPUE 8
36	USCPUE 9
37	CNCPUE 4
38	CNCPUE 5
39	CNCPUE 6
40	CNCPUE 7
41	CNCPUE 8
42	CNCPUE 9
43	USCPUEAG
44	CNCPUEAG
45	USSP7-10
46	CNSU7-10
47	USSP7-10
48	MASP 1-3
49	
50	

Indices that will be used in this run are: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44

Obs Indices (before transformation) by index & yr; with index means

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1	-999.000	-999.000	-999.000	-999.000	0.100	0.330	0.110	0.380	0.220	0.050	0.150	0.720	1.630
2	-999.000	-999.000	-999.000	-999.000	0.530	0.200	0.140	0.230	0.420	0.070	0.090	0.130	0.840
3	-999.000	-999.000	-999.000	-999.000	0.140	0.340	0.150	0.060	0.650	0.080	0.280	0.120	0.550
4	-999.000	-999.000	-999.000	-999.000	0.080	0.080	0.240	0.160	0.630	0.150	0.250	0.180	0.110
5	-999.000	-999.000	-999.000	-999.000	0.160	0.090	0.130	0.320	0.150	0.140	0.200	0.260	0.330
6	-999.000	-999.000	-999.000	-999.000	0.070	0.100	0.150	0.130	0.110	0.080	0.230	0.080	0.110
7	-999.000	-999.000	-999.000	-999.000	0.030	0.080	0.170	0.110	0.080	0.160	0.080	0.070	0.140
8	-999.000	-999.000	-999.000	-999.000	0.000	0.050	0.110	0.020	0.070	0.080	0.040	0.050	0.050
9	-999.000	-999.000	-999.000	-999.000	0.010	0.060	0.030	0.020	0.050	0.030	0.020	0.090	0.010
10	-999.000	-999.000	-999.000	-999.000	0.042	0.009	0.029	0.261	0.007	0.000	1.142	0.159	0.196
11	-999.000	-999.000	-999.000	-999.000	0.941	0.018	0.219	0.770	0.147	0.109	1.257	0.175	2.787
12	-999.000	-999.000	-999.000	-999.000	0.230	0.324	0.667	0.985	0.607	0.631	3.327	0.051	0.266
13	-999.000	-999.000	-999.000	-999.000	0.279	0.279	1.242	2.029	0.941	0.799	5.282	0.505	0.118
14	-999.000	-999.000	-999.000	-999.000	0.130	0.374	0.313	1.415	0.351	0.581	1.403	0.505	0.368
15	-999.000	-999.000	-999.000	-999.000	0.152	0.059	0.540	0.184	0.330	0.238	0.797	0.352	0.252
16	-999.000	-999.000	-999.000	-999.000	0.086	0.092	0.197	0.308	0.102	0.169	0.248	0.242	0.148
17	-999.000	-999.000	-999.000	-999.000	0.066	0.036	0.043	0.108	0.048	0.010	0.097	0.109	0.130
18	-999.000	-999.000	-999.000	-999.000	0.037	0.008	0.044	0.052	0.022	0.036	0.058	0.076	0.072
19	-999.000	-999.000	-999.000	-999.000	0.030	0.000	0.220	0.030	0.060	0.030	0.010	0.130	0.070
20	-999.000	-999.000	-999.000	-999.000	0.710	0.080	0.060	0.030	0.170	0.190	0.020	0.010	3.590
21	-999.000	-999.000	-999.000	-999.000	0.120	0.280	0.030	0.150	0.240	0.040	0.260	0.010	0.980
22	-999.000	-999.000	-999.000	-999.000	0.170	0.200	0.110	0.550	0.290	0.040	0.330	0.050	0.140
23	-999.000	-999.000	-999.000	-999.000	0.110	0.110	0.070	1.630	0.420	0.090	0.190	0.110	0.200
24	-999.000	-999.000	-999.000	-999.000	0.110	0.080	0.040	0.500	0.380	0.090	0.130	0.060	0.130
25	-999.000	-999.000	-999.000	-999.000	0.090	0.090	0.090	0.310	0.220	0.150	0.080	0.070	0.040
26	-999.000	-999.000	-999.000	-999.000	0.070	0.010	0.010	0.140	0.110	0.080	0.090	0.130	0.000
27	-999.000	-999.000	-999.000	-999.000	-999.000	0.020	0.010	0.050	0.090	0.060	0.050	0.080	0.000
28	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	0.010	0.040	8.370	1.420	0.000
29	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	0.130	0.010	0.200	1.400	0.060
30	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	-999.000	0.060	0.060	0.020	0.000	0.000
31	-999.000	-999.000	-999.000	-999.000	0.498	0.848	0.543	0.557	0.225	0.641	0.685	0.178	0.272
32	-999.000	-999.000	-999.000	-999.000	0.432	0.321	0.818	0.402	0.266	0.376	0.546	0.512	0.116
33	-999.000	-999.000	-999.000	-999.000	0.174	0.332	0.181	0.488	0.259	0.181	0.338	0.210	0.300
34	-999.000	-999.000	-999.000	-999.000	0.055	0.139	0.128	0.193	0.384	0.088	0.190	0.103	0.147
35	-999.000	-999.000	-999.000	-999.000	0.032	0.044	0.032	0.154	0.143	0.103	0.068	0.071	0.117
36	-999.000	-999.000	-999.000	-999.000	0.010	0.016	0.002	0.058	0.111	0.041	0.059	0.027	0.067
37	-999.000	-999.000	-999.000	-999.000	1.472	2.228	0.995	2.138	2.411	4.816	1.075	0.395	1.292
38	-999.000	-999.000	-999.000	-999.000	1.323	1.157	1.816	1.318	2.373	2.883	3.125	1.200	0.459
39	-999.000	-999.000	-999.000	-999.000	0.594	1.037	0.538	1.594	0.960	1.420	1.932	2.361	1.527
40	-999.000	-999.000	-999.000	-999.000	0.170	0.497	0.573	0.532	0.897	0.427	0.650	1.428	1.871
41	-999.000	-999.000	-999.000	-999.000	0.090	0.082	0.111	0.296	0.193	0.214	0.167	0.418	0.870
42	-999.000	-999.000	-999.000	-999.000	0.040	0.028	0.020	0.068	0.105	0.040	0.102	0.121	0.318
43	-999.000	-999.000	-999.000	-999.000	5.300	5.990	5.190	7.710	7.260	5.620	6.410	5.020	5.620
44	-999.000	-999.000	-999.000	-999.000	0.660	0.700	0.570	0.780	0.890	1.090	0.940	1.010	1.320

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993*****	
1	0.060	0.150	0.190	0.140	0.860	0.020	0.140	0.090	0.080	0.230	-999.000	0.297
2	0.020	0.090	0.300	0.070	2.590	0.070	0.110	0.270	0.420	0.140	-999.000	0.354
3	0.020	0.100	0.220	0.170	2.460	0.010	0.400	0.110	0.580	0.130	-999.000	0.346
4	0.010	0.140	0.590	0.170	0.400	0.030	0.410	0.020	0.410	0.160	-999.000	0.222
5	0.000	0.070	0.780	0.380	0.200	0.050	0.250	0.070	0.340	0.090	-999.000	0.223
6	0.050	0.040	0.190	0.370	0.090	0.040	0.150	0.040	0.170	0.100	-999.000	0.121
7	0.040	0.040	0.010	0.090	0.100	0.020	0.120	0.020	0.040	0.050	-999.000	0.076
8	0.010	0.050	0.080	0.050	0.030	0.040	0.050	0.030	0.050	0.010	-999.000	0.048
9	0.020	0.030	0.060	0.040	0.000	0.030	0.080	0.020	0.000	0.040	-999.000	0.038
10	0.119	0.471	1.579	0.606	0.591	0.029	0.055	9.763	1.077	0.247	-999.000	0.910
11	0.916	0.229	4.819	0.653	2.447	0.599	0.139	7.494	1.138	1.426	-999.000	1.383
12	1.702	0.702	3.565	0.965	3.683	1.155	0.848	3.161	1.020	1.582	-999.000	1.341
13	0.196	2.013	3.479	1.008	5.840	2.196	0.965	5.230	1.333	1.040	-999.000	1.830
14	0.048	0.307	2.910	1.383	2.300	1.954	0.893	1.963	1.475	0.717	-999.000	1.021
15	0.090	0.211	0.440	1.015	1.674	1.825	1.125	0.524	0.437	0.244	-999.000	0.552
16	0.262	0.458	0.124	0.073	1.369	1.010	0.540	0.344	0.462	0.097	-999.000	0.333
17	0.166	0.691	0.224	0.011	0.052	0.584	0.311	0.215	0.202	0.044	-999.000	0.166
18	0.056	0.428	0.348	0.103	0.118	0.040	0.114	0.066	0.064	0.035	-999.000	0.094
19	0.070	0.490	0.120	0.620	0.210	0.050	0.130	0.670	0.030	0.120	-999.000	0.172
20	0.000	0.030	0.180	0.050	0.220	0.210	0.130	0.670	0.120	0.130	0.220	0.359
21	0.400	0.050	0.020	0.080	0.140	0.060	1.060	0.320	0.220	0.140	0.120	0.236
22	0.290	0.040	0.010	0.070	0.130	0.000	1.140	0.140	0.130	0.230	0.140	0.221
23	0.010	0.070	0.010	0.120	0.070	0.050	0.330	0.000	0.100	0.060	0.160	0.206
24	0.050	0.010	0.030	0.070	0.040	0.020	0.570	0.000	0.010	0.040	0.040	0.126
25	0.040	0.060	0.000	0.010	0.040	0.080	0.070	0.000	0.030	0.010	0.020	0.083
26	0.020	0.080	0.000	0.000	0.000	0.060	0.150	0.020	0.030	0.000	0.020	0.068
27	0.020	0.030	0.020	0.000	0.000	0.040	0.080	0.000	0.040	0.000	0.000	0.045
28	6.450	0.000	0.020	0.010	0.010	0.000	0.360	0.000	0.000	-999.000	-999.000	1.854
29	0.270	0.020	0.030	0.000	0.030	0.060	0.450	0.100	0.020	0.140	-999.000	0.209
30	0.040	0.000	0.000	0.000	0.000	0.030	0.200	0.010	0.030	0.010	-999.000	0.051
31	0.962	0.622	0.140	0.523	0.116	0.124	0.284	0.247	0.301	0.182	-999.000	0.418
32	0.306	0.991	0.340	0.148	0.365	0.131	0.176	0.310	0.240	0.345	-999.000	0.376
33	0.090	0.214	0.381	0.271	0.074	0.250	0.101	0.101	0.265	0.201	-999.000	0.232
34	0.169	0.038	0.059	0.198	0.086	0.068	0.112	0.055	0.065	0.159	-999.000	0.128
35	0.082	0.054	0.017	0.030	0.056	0.041	0.042	0.040	0.031	0.037	-999.000	0.063
36	0.059	0.042	0.020	0.010	0.013	0.024	0.017	0.018	0.028	0.012	-999.000	0.034
37	6.885	3.167	1.160	2.006	1.252	1.644	2.313	1.414	1.220	2.376	-999.000	2.119
38	0.923	6.487	2.196	2.461	2.727	2.134	2.363	2.678	1.155	1.797	-999.000	2.136
39	0.175	0.580	3.288	2.500	1.958	2.206	1.463	1.810	1.475	0.929	-999.000	1.492
40	0.387	0.083	0.586	2.301	1.331	1.177	1.197	1.116	0.632	0.599	-999.000	0.866
41	0.616	0.195	0.067	0.208	0.938	0.756	0.531	0.609	0.293	0.235	-999.000	0.363
42	0.317	0.188	0.071	0.057	0.098	0.654	0.407	0.390	0.128	0.131	-999.000	0.173
43	6.490	5.990	4.000	4.130	2.730	2.300	2.390	2.630	3.200	3.290	-999.000	4.804
44	1.050	1.330	0.960	1.260	1.060	1.150	1.070	1.100	0.600	0.780	-999.000	0.964

■	1985	1986	1987	1988	1989	1990	1991	1992	1993
1 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
2 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
3 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
4 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
5 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
6 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
7 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
8 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
9 ■	1.00	1.00	-99.00	1.00	1.00	1.00	-99.00	1.00	-99.00
10 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
11 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
12 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
13 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
14 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
15 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
16 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
17 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
18 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
19 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
20 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
22 ■	1.00	1.00	1.00	-99.00	1.00	1.00	1.00	1.00	1.00
23 ■	1.00	1.00	1.00	1.00	1.00	-99.00	1.00	1.00	1.00
24 ■	1.00	1.00	1.00	1.00	1.00	-99.00	1.00	1.00	1.00
25 ■	-99.00	1.00	1.00	1.00	1.00	-99.00	1.00	1.00	1.00
26 ■	-99.00	-99.00	-99.00	1.00	1.00	1.00	1.00	-99.00	1.00
27 ■	1.00	-99.00	-99.00	1.00	1.00	-99.00	1.00	-99.00	-99.00
28 ■	1.00	1.00	1.00	-99.00	1.00	-99.00	-99.00	-99.00	-99.00
29 ■	1.00	-99.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
30 ■	-99.00	-99.00	-99.00	1.00	1.00	1.00	1.00	1.00	-99.00
31 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
32 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
33 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
34 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
35 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
36 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
37 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
38 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
39 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
40 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
41 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
42 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
43 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00
44 ■	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-99.00

Negative weights in the above table indicate missing values

DOWNWEIGHTS BY YEAR (delta)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
■	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1987	1988	1989	1990	1991	1992	1993										
■	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000										

ITERATIVE RE-WEIGHTS BY INDEX (chi)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
■	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
■	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	35	36	37	38	39	40	41	42	43	44							
■	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000							

FINAL SS WEIGHTS BY INDEX NUMBER AND YR - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8 ■	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000
11 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
13 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
14 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
15 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
16 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
17 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
18 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
19 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
20 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
21 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
22 ■	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000	1.0000
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000	1.0000
26	-99.0000	1.0000	1.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000
27	-99.0000	1.0000	1.0000	1.0000	-99.0000	-99.0000	1.0000	1.0000	-99.0000	1.0000	-99.0000	-99.0000
28	-99.0000	1.0000	-99.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	-99.0000	-99.0000	-99.0000	-99.0000
29	1.0000	1.0000	1.0000	1.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
30	-99.0000	1.0000	-99.0000	-99.0000	-99.0000	-99.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
31	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
33	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
35	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
36	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
37	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
38	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
39	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
42	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
43	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000
44	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	-99.0000

Negative weights in the above table indicate missing values

CATCH AT AGE (thousands) - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	567	1518	798	1168	261	260	234	56	115	299	361	1465	236	83	128	235	114
3	589	2428	2170	2696	7332	1436	2190	1751	1548	4087	704	2750	5104	2743	1278	2345	1578
4	1543	2392	2655	9131	3445	5297	3085	3779	3618	7487	3798	1303	2249	11227	5183	2871	6169
5	1360	2001	1852	5279	3034	2566	5314	2443	3682	4478	6802	3853	847	1867	9770	5812	4443
6	892	1575	924	723	1359	2400	1454	2980	1887	2184	4096	4691	2600	422	1249	8035	5207
7	686	541	483	289	404	1041	1342	1049	2084	765	1605	2749	2622	868	203	1394	4482
8	464	232	110	103	213	263	272	673	602	531	469	955	1344	980	368	213	477
9	212	3	355	256	96	80	41	206	411	160	334	301	553	540	325	238	139
10	123	8	26	87	100	85	15	81	151	62	110	268	264	277	193	353	263
11	44	1	60	15	81	56	21	45	103	39	45	63	180	131	59	137	259
12	8	1	85	5	45	49	57	274	229	112	78	148	218	262	137	177	250
1+	6488	10700	9518	19752	16370	13533	14025	13337	14430	20204	18402	18546	16217	19400	18893	21810	23381

	1987	1988	1989	1990	1991	1992
1	0	0	0	0	0	0
2	92	27	72	51	300	30
3	1424	1046	721	1830	1570	2055
4	3121	3478	5626	3043	4443	5363
5	7631	4145	4728	5131	3754	4063
6	4008	5017	2825	2921	4602	2166
7	3046	2304	2473	1751	1843	1430
8	2152	1445	1072	997	858	505
9	272	1164	752	612	418	261
10	82	69	451	295	321	200
11	147	40	33	125	205	96
12	260	174	83	102	282	88
1+	22235	18909	18836	16858	18596	16257

CAA summary for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
2	6480	10699	9433	19747	16325	13484	13968	13063	14201	20092	18324	18398	15999	19138	18756	21633	23131
3	5913	9181	8635	18579	16064	13224	13734	13007	14086	19793	17963	16933	15763	19055	18628	21398	23017
4	5324	6753	6465	15883	8732	11788	11544	11256	12538	15706	17259	14183	10659	16312	17350	19053	21439
5	3781	4361	3810	6752	5287	6491	8459	7477	8920	8219	13461	12880	8410	5085	12167	16182	15270
6	2421	2360	1958	1473	2253	3925	3145	5034	5238	3741	6659	9027	7563	3218	2397	10370	10827
2	21975	18735	18753	16756	18314	16169											
3	21883	18708	18681	16705	18014	16139											
4	20459	17662	17960	14875	16444	14084											
5	17338	14184	12334	11832	12001	8721											
6	9707	10039	7606	6701	8247	4658											

WT AT AGE (MID-YR) in kg. - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
2	0.590	0.780	1.060	0.500	0.820	0.860	0.600	0.830	0.840	0.730	0.950	0.640	0.590	0.770	0.760	0.710	0.570
3	1.380	1.700	1.860	1.270	1.400	1.280	1.230	1.130	1.230	1.190	1.390	1.470	1.120	1.160	1.460	1.050	1.130
4	2.190	2.120	2.770	1.950	1.960	1.990	1.910	1.600	1.800	1.640	1.950	2.480	2.550	1.660	2.150	1.930	1.840
5	3.050	3.160	4.280	2.650	3.010	3.070	2.770	2.610	2.680	2.720	2.780	2.950	3.500	3.060	2.630	2.750	2.590
6	3.780	4.000	5.290	3.960	4.090	3.850	3.690	3.530	3.950	3.530	3.510	3.430	4.150	4.160	3.510	3.230	3.400
7	4.780	4.990	5.950	4.860	5.060	5.090	4.610	4.560	4.620	4.650	4.210	4.380	4.510	4.880	5.150	3.740	3.850
8	5.820	6.240	6.520	6.230	6.120	6.520	5.550	5.670	5.790	5.650	5.650	5.840	5.280	5.180	5.750	5.140	4.870
9	7.080	7.250	8.830	6.810	6.660	7.510	7.000	6.810	6.590	6.750	6.480	6.720	6.220	6.020	5.990	6.360	6.260
10	7.100	9.620	7.600	7.420	7.360	7.650	7.720	7.060	6.770	7.470	7.720	7.440	7.340	6.720	6.520	6.330	6.840
11	9.090	9.090	6.810	9.170	8.520	8.470	8.540	8.790	7.580	8.180	7.870	7.700	7.790	7.710	7.530	6.620	6.710
12	8.110	8.110	9.560	9.770	9.950	9.990	9.230	9.060	7.930	8.310	8.840	8.230	8.270	8.860	8.520	8.590	8.050
	1987	1988	1989	1990	1991	1992											
1	0.500	0.500	0.500	0.500	0.500	0.500											
2	0.720	1.170	0.680	0.490	0.470	0.470											
3	1.130	1.310	1.210	1.220	0.970	1.040											
4	1.950	1.840	1.740	1.890	1.680	1.690											
5	2.580	2.660	2.520	2.560	2.320	2.550											
6	3.040	3.280	3.310	3.030	2.920	3.390											
7	3.880	3.610	3.900	3.930	3.470	3.960											
8	4.280	4.400	4.260	4.290	3.960	4.510											
9	5.190	4.650	4.960	5.040	4.840	5.100											
10	7.130	5.960	5.350	5.350	5.000	5.820											
11	7.340	8.110	7.390	6.510	5.270	6.210											
12	8.440	8.780	8.690	8.480	6.790	8.030											

WT AT AGE (JAN 1) in kg. - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	0.400	0.343	0.500	0.390	0.381	0.456	0.388	0.386	0.414	0.363	0.442	0.460	0.403	0.406	0.420	0.468	0.417
2	0.348	0.624	0.728	0.500	0.640	0.656	0.548	0.644	0.648	0.604	0.689	0.566	0.543	0.620	0.616	0.596	0.534
3	1.113	1.001	1.204	1.160	0.837	1.024	1.028	0.823	1.010	1.000	1.007	1.182	0.847	0.827	1.060	0.893	0.896
4	1.823	1.710	2.170	1.904	1.578	1.669	1.564	1.403	1.426	1.420	1.523	1.857	1.936	1.364	1.579	1.679	1.390
5	2.663	2.631	3.012	2.709	2.423	2.453	2.348	2.233	2.071	2.213	2.135	2.398	2.946	2.793	2.089	2.432	2.236
6	3.290	3.493	4.089	4.117	3.292	3.404	3.366	3.127	3.211	3.076	3.090	3.088	3.499	3.816	3.277	2.915	3.058
7	4.184	4.343	4.879	5.070	4.476	4.563	4.213	4.102	4.038	4.286	3.855	3.921	3.933	4.500	4.629	3.623	3.526
8	5.215	5.461	5.704	6.088	5.454	5.744	5.315	5.113	5.138	5.109	5.126	4.958	4.809	4.833	5.297	5.145	4.268
9	6.074	6.496	7.423	6.663	6.441	6.779	6.756	6.148	6.113	6.252	6.051	6.162	6.027	5.638	5.570	6.047	5.672
10	6.275	8.253	7.423	8.094	7.080	7.138	7.614	7.030	6.790	7.016	7.219	6.943	7.023	6.465	6.265	6.158	6.596
11	8.034	8.034	8.094	8.348	7.951	7.896	8.083	8.238	7.315	7.442	7.667	7.710	7.613	7.523	7.113	6.570	6.517
12	8.110	8.110	9.560	9.770	9.950	9.990	9.230	9.060	7.930	8.310	8.840	8.230	8.270	8.860	8.520	8.590	8.050
	1987	1988	1989	1990	1991	1992	1993										
1	0.327	0.429	0.505	0.516	0.516	0.516	0.425										
2	0.600	0.765	0.583	0.495	0.485	0.485	0.485										
3	0.803	0.971	1.190	0.911	0.689	0.699	0.456										
4	1.484	1.442	1.510	1.512	1.432	1.280	1.547										
5	2.179	2.277	2.153	2.111	2.094	2.070	2.231										
6	2.806	2.909	2.967	2.763	2.734	2.804	3.142										
7	3.632	3.313	3.577	3.607	3.243	3.400	4.098										
8	4.059	4.132	3.922	4.090	3.945	3.956	4.612										
9	5.027	4.461	4.672	4.634	4.557	4.494	5.142										
10	6.681	5.562	4.988	5.151	5.020	5.307	5.788										
11	7.086	7.604	6.637	5.902	5.310	5.572	6.382										
12	8.440	8.780	8.690	8.480	6.790	8.030	8.030										

Weights at age at the start of the spawning season are assumed to be the same as the Jan1 weight at age estimates.

PERCENT MATURE (females) - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
4	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
5	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
6	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
7	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
11	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
12	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

SEX RATIO (Percent Female) - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
4	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
5	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
7	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
8	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
9	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
10	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
11	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
12	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

BEGIN MARQUARDT ALGORITHM

LAMBDA 1.00000E-2
 RSS 2.84309E3
 NPFI 2.84309E3

par
 4.00000E3 2.00000E3 2.00000E4 2.00000E4 1.00000E4 1.00000E4 5.00000E3 1.00000E-4 1.
 00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1
 .00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4
 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4
 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4 1.00000E-4
 1.00000E-4 1.00000E-4 1.00000E-4

LAMBDA 1.00000E-1
 RSS 2.41790E3
 NPFI 2.41790E3

par
 4.96399E3 2.57070E3 2.04942E4 1.91614E4 8.92063E3 8.51687E3 4.12918E3 8.14751E-5 8.
 26194E-5 8.49069E-5 9.22801E-5 9.95273E-5 1.07915E-4 1.15138E-4 1.22609E-4 1.29519E-4 7
 .14986E-5 8.18226E-5 8.96436E-5 9.41387E-5 1.01699E-4 1.09179E-4 1.17096E-4 1.22342E-4
 1.30827E-4 8.09041E-5 7.86972E-5 8.55927E-5 9.14129E-5 9.54399E-5 1.03287E-4 1.13288E-4
 1.20747E-4 1.30317E-4 5.96561E-5 7.79226E-5 8.55724E-5 9.20455E-5 9.77768E-5 1.04707E-4
 1.11441E-4 1.18985E-4 1.24641E-4 9.21494E-5 9.77824E-5 1.04048E-4 1.10576E-4 1.17763E-4
 1.23673E-4 8.36502E-5 8.40208E-5

.
 .
 .
 .
 .
 .
 .

LAMBDA 1.00000E-4
 RSS 6.35840E2
 NPFI 6.35840E2

par
 4.73216E4 1.86116E4 2.77616E4 1.38931E4 3.18345E3 1.40206E3 3.82485E2 1.46844E-5 1.
 65566E-5 2.09740E-5 4.37420E-5 9.00227E-5 2.10332E-4 4.36849E-4 9.17651E-4 1.83759E-3 5
 .42499E-6 1.55516E-5 3.35579E-5 5.25826E-5 1.12580E-4 2.42212E-4 5.40824E-4 9.07349E-4
 2.10664E-3 1.38176E-5 1.11939E-5 2.32188E-5 4.02898E-5 6.05872E-5 1.34518E-4 3.77419E-4
 8.00704E-4 1.96589E-3 1.64682E-6 1.02160E-5 2.19790E-5 4.26278E-5 7.55467E-5 1.51919E-4
 3.03394E-4 6.52790E-4 1.14080E-3 4.30713E-5 7.55885E-5 1.42266E-4 2.78367E-4 5.77965E-4
 1.03590E-3 1.88912E-5 1.96017E-5

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 0.00001

RESULTS

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

SUM OF SQUARES 635.839563
 ORTHOGONALITY OFFSET 0.005185
 MEAN SQUARE RESIDUALS 0.854623

	PAR. EST.	STD. ERR.	T-STATISTIC	C.V.
N 3	4.73216E4	2.03101E4	2.32995E0	0.43
N 4	1.86116E4	6.48205E3	2.87126E0	0.35
N 5	2.77616E4	8.01875E3	3.46209E0	0.29
N 6	1.38931E4	4.15063E3	3.34722E0	0.30
N 7	3.18345E3	1.19414E3	2.66589E0	0.38
N 8	1.40206E3	6.17307E2	2.27125E0	0.44
N 9	3.82485E2	1.82137E2	2.09998E0	0.48
qUSRVSP 2	1.46844E-5	3.17238E-6	4.62881E0	0.22
qUSRVSP 3	1.65566E-5	3.55447E-6	4.65795E0	0.21
qUSRVSP 4	2.09740E-5	4.48846E-6	4.67288E0	0.21
qUSRVSP 5	4.37420E-5	9.34955E-6	4.67851E0	0.21
qUSRVSP 6	9.00227E-5	1.97611E-5	4.55555E0	0.22
qUSRVSP 7	2.10332E-4	4.49489E-5	4.67935E0	0.21
qUSRVSP 8	4.36849E-4	9.34411E-5	4.67513E0	0.21
qUSRVSP 9	9.17651E-4	2.01511E-4	4.55384E0	0.22
qUSRVSP10	1.83759E-3	4.14735E-4	4.43075E0	0.23
qCNRVSU 2	5.42499E-6	1.20506E-6	4.50184E0	0.22
qCNRVSU 3	1.55516E-5	3.34030E-6	4.65574E0	0.21
qCNRVSU 4	3.35579E-5	7.18675E-6	4.66941E0	0.21
qCNRVSU 5	5.25826E-5	1.12505E-5	4.67381E0	0.21
qCNRVSU 6	1.12580E-4	2.40917E-5	4.67301E0	0.21
qCNRVSU 7	2.42212E-4	5.18990E-5	4.66698E0	0.21
qCNRVSU 8	5.40824E-4	1.16157E-4	4.65595E0	0.21
qCNRVSU 9	9.07349E-4	1.94415E-4	4.66708E0	0.21
qCNRVSU10	2.10664E-3	4.51322E-4	4.66770E0	0.21
qUSRVFL 2	1.38176E-5	3.06920E-6	4.50203E0	0.22
qUSRVFL 3	1.11939E-5	2.41850E-6	4.62844E0	0.22
qUSRVFL 4	2.32188E-5	4.86149E-6	4.77606E0	0.21
qUSRVFL 5	4.02898E-5	8.63577E-6	4.66545E0	0.21
qUSRVFL 6	6.05872E-5	1.29800E-5	4.66774E0	0.21
qUSRVFL 7	1.34518E-4	2.88572E-5	4.66152E0	0.21
qUSRVFL 8	3.77419E-4	8.34342E-5	4.52355E0	0.22
qUSRVFL 9	8.00704E-4	1.94647E-4	4.11362E0	0.24
qUSRVFL10	1.96589E-3	5.06751E-4	3.87941E0	0.26
qMARVSP 1	1.64682E-6	5.12510E-7	3.21324E0	0.31
qMARVSP 2	1.02160E-5	2.58317E-6	3.95482E0	0.25
qMARVSP 3	2.19790E-5	6.90875E-6	3.18133E0	0.31
qUSCPUE 4	4.26278E-5	9.12918E-6	4.66941E0	0.21
qUSCPUE 5	7.55467E-5	1.61638E-5	4.67381E0	0.21
qUSCPUE 6	1.51919E-4	3.25098E-5	4.67301E0	0.21
qUSCPUE 7	3.03394E-4	6.50085E-5	4.66698E0	0.21
qUSCPUE 8	6.52790E-4	1.40205E-4	4.65595E0	0.21
qUSCPUE 9	1.14080E-3	2.44435E-4	4.66708E0	0.21
qCNCPU 4	4.30713E-5	9.22416E-6	4.66941E0	0.21
qCNCPU 5	7.55885E-5	1.61728E-5	4.67381E0	0.21
qCNCPU 6	1.42266E-4	3.04441E-5	4.67301E0	0.21
qCNCPU 7	2.78367E-4	5.96460E-5	4.66698E0	0.21
qCNCPU 8	5.77965E-4	1.24135E-4	4.65595E0	0.21
qCNCPU 9	1.03590E-3	2.21960E-4	4.66708E0	0.21
qUSCPUEAG	1.88912E-5	4.04076E-6	4.67517E0	0.21
qCNCPUAG	1.96017E-5	4.19273E-6	4.67517E0	0.21

CATCHABILITY ESTIMATES IN ORIGINAL UNITS

	ESTIMATE	STD. ERR.	C.V.
	-----	-----	-----
qUSRVSP 2	4.36666E-6	9.43366E-7	0.22
qUSRVSP 3	5.86451E-6	1.25903E-6	0.21
qUSRVSP 4	7.25260E-6	1.55206E-6	0.21
qUSRVSP 5	9.71532E-6	2.07658E-6	0.21
qUSRVSP 6	2.00551E-5	4.40234E-6	0.22
qUSRVSP 7	2.54612E-5	5.44119E-6	0.21
qUSRVSP 8	3.33385E-5	7.13103E-6	0.21
qUSRVSP 9	4.43531E-5	9.73972E-6	0.22
qUSRVSP10	6.91797E-5	1.56135E-5	0.23
qCNRVSP 2	4.93734E-6	1.09674E-6	0.22
qCNRVSP 3	2.15128E-5	4.62069E-6	0.21
qCNRVSP 4	4.49869E-5	9.63441E-6	0.21
qCNRVSP 5	9.62371E-5	2.05907E-5	0.21
qCNRVSP 6	1.14891E-4	2.45862E-5	0.21
qCNRVSP 7	1.33714E-4	2.86510E-5	0.21
qCNRVSP 8	1.80208E-4	3.87049E-5	0.21
qCNRVSP 9	1.50286E-4	3.22012E-5	0.21
qCNRVSP10	1.97026E-4	4.22105E-5	0.21
qUSRVFL 2	2.37203E-6	5.26879E-7	0.22
qUSRVFL 3	4.01802E-6	8.68115E-7	0.22
qUSRVFL 4	5.47963E-6	1.14731E-6	0.21
qUSRVFL 5	8.90616E-6	1.90896E-6	0.21
qUSRVFL 6	1.24682E-5	2.67114E-6	0.21
qUSRVFL 7	1.69918E-5	3.64511E-6	0.21
qUSRVFL 8	3.14516E-5	6.95285E-6	0.22
qUSRVFL 9	5.44478E-5	1.32360E-5	0.24
qUSRVFL10	8.92214E-5	2.29987E-5	0.26
qMARVSP 1	3.05393E-6	9.50421E-7	0.31
qMARVSP 2	2.13076E-6	5.38776E-7	0.25
qMARVSP 3	1.12337E-6	3.53114E-7	0.31
qUSCPUE 4	1.78318E-5	3.81887E-6	0.21
qUSCPUE 5	2.83906E-5	6.07440E-6	0.21
qUSCPUE 6	3.52784E-5	7.54940E-6	0.21
qUSCPUE 7	3.89035E-5	8.33590E-6	0.21
qUSCPUE 8	4.10017E-5	8.80629E-6	0.21
qUSCPUE 9	3.82285E-5	8.19110E-6	0.21
qCNCPU 4	9.12655E-5	1.95454E-5	0.21
qCNCPU 5	1.61422E-4	3.45376E-5	0.21
qCNCPU 6	2.12260E-4	4.54226E-5	0.21
qCNCPU 7	2.41101E-4	5.16611E-5	0.21
qCNCPU 8	2.09600E-4	4.50176E-5	0.21
qCNCPU 9	1.79012E-4	3.83563E-5	0.21
qUSCPUEAG	9.07476E-5	1.94105E-5	0.21
qCNCPUAG	1.89002E-5	4.04267E-6	0.21

SUMMARY OF RESIDUALS

Index 1 USRVSP 2

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 2

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.0898	-0.9549	1.0000	-0.1349	-0.1460	26209.027
1975	0.1041	-0.6278	1.0000	0.7319	0.7917	36348.721
1976	-0.9945	-0.3795	1.0000	-0.6150	-0.6653	46595.211
1977	0.2452	-0.1515	1.0000	0.3967	0.4291	58528.115
1978	-0.3013	-0.6733	1.0000	0.3720	0.4024	34730.802
1979	-1.7829	-1.9984	1.0000	0.2154	0.2331	9231.081
1980	-0.6843	-1.1009	1.0000	0.4166	0.4506	22647.299
1981	0.8843	0.3561	1.0000	0.5282	0.5713	97229.724
1982	1.7014	-0.1473	1.0000	1.8487	1.9998	58770.705
1983	-1.6006	-0.4842	1.0000	-1.1164	-1.2076	41961.183
1984	-0.6843	-0.1907	1.0000	-0.4937	-0.5340	56278.771
1985	-0.4479	-0.7089	1.0000	0.2609	0.2822	33518.607
1986	-0.7533	-0.7116	1.0000	-0.0418	-0.0452	33428.692
1987	1.0620	-0.4979	1.0000	1.5598	1.6873	41391.960
1988	-2.6992	-0.9046	1.0000	-1.7947	-1.9413	27560.800
1989	-0.7533	-0.3296	1.0000	-0.4237	-0.4583	48976.576
1990	-1.1952	-0.1003	1.0000	-1.0949	-1.1844	61602.709
1991	-1.3129	-0.7912	1.0000	-0.5218	-0.5644	30870.806
1992	-0.2569	-0.1634	1.0000	-0.0935	-0.1011	57831.891

Partial variance for this index is 0.785703

Index 2 USRVSP 3

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 3

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.4030	-0.3767	1.0000	0.7797	0.8434	41439.765
1975	-0.5716	-1.0459	1.0000	0.4744	0.5131	21221.974
1976	-0.9282	-0.7158	1.0000	-0.2125	-0.2299	29524.558
1977	-0.4318	-0.4650	1.0000	0.0332	0.0359	37937.200
1978	0.1704	-0.2325	1.0000	0.4029	0.4358	47868.096
1979	-1.6214	-0.7570	1.0000	-0.8644	-0.9350	28331.119
1980	-1.3701	-2.1149	1.0000	0.7448	0.8056	7287.223
1981	-1.0024	-1.1987	1.0000	0.1963	0.2124	18215.394
1982	0.8635	0.2593	1.0000	0.6042	0.6536	78279.378
1983	-2.8742	-0.2318	1.0000	-2.6424	-2.8583	47903.842
1984	-1.3701	-0.5664	1.0000	-0.8037	-0.8693	34279.809
1985	-0.1661	-0.2732	1.0000	0.1071	0.1158	45961.342
1986	-1.6214	-0.7967	1.0000	-0.8247	-0.8921	27230.078
1987	1.9895	-0.7953	1.0000	2.7849	3.0124	27265.947
1988	-1.6214	-0.5803	1.0000	-1.0411	-1.1261	33805.625
1989	-1.1694	-0.9857	1.0000	-0.1837	-0.1988	22540.444
1990	-0.2715	-0.4113	1.0000	0.1398	0.1512	40033.480
1991	0.1704	-0.1812	1.0000	0.3515	0.3803	50389.885
1992	-0.9282	-0.8820	1.0000	-0.0463	-0.0501	25003.427

Partial variance for this index is 1.125782

Index 3 USRVSP 4

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 4

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.9042	-1.1664	1.0000	0.2622	0.2836	14851.166
1975	-0.0169	-0.5578	1.0000	0.5409	0.5851	27293.742
1976	-0.8352	-1.0872	1.0000	0.2520	0.2726	16075.736
1977	-1.7515	-0.7648	1.0000	-0.9867	-1.0673	22191.070
1978	0.6311	-0.4809	1.0000	1.1120	1.2029	29475.982
1979	-1.4638	-0.2324	1.0000	-1.2314	-1.3320	37790.394
1980	-0.2110	-0.8942	1.0000	0.6831	0.7390	19497.488
1981	-1.0583	-2.1913	1.0000	1.1329	1.2255	5329.268
1982	0.4641	-1.3447	1.0000	1.8088	1.9566	12425.200
1983	-2.8501	0.2210	1.0000	-3.0711	-3.3221	59471.444
1984	-1.2407	-0.2606	1.0000	-0.9800	-1.0601	36738.380
1985	-0.4522	-0.5720	1.0000	0.1198	0.1296	26909.552
1986	-0.7100	-0.2947	1.0000	-0.4153	-0.4493	35508.120
1987	1.9621	-0.8263	1.0000	2.7884	3.0163	20866.269
1988	-3.5432	-0.8183	1.0000	-2.7250	-2.9476	21034.981
1989	0.1456	-0.5786	1.0000	0.7243	0.7835	26731.245
1990	-1.1453	-0.9851	1.0000	-0.1602	-0.1733	17802.167
1991	0.5172	-0.4266	1.0000	0.9438	1.0209	31120.789
1992	-0.9783	-0.1797	1.0000	-0.7986	-0.8638	39835.154

Partial variance for this index is 2.075674

Index 4 USRVSP 5
 Index is tuned to the sum of Jan1 full stock sizes (in number)
 for ages: 5

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.0211	-0.6537	1.0000	-0.3674	-0.3975	11890.742
1975	-1.0211	-0.9276	1.0000	-0.0936	-0.1012	9041.941
1976	0.0775	-0.2642	1.0000	0.3417	0.3696	17553.302
1977	-0.3280	-0.7905	1.0000	0.4625	0.5003	10370.276
1978	1.0426	-0.4383	1.0000	1.4808	1.6018	14749.131
1979	-0.3925	-0.0917	1.0000	-0.3009	-0.3254	20859.191
1980	0.1183	0.0555	1.0000	0.0628	0.0680	24165.640
1981	-0.2102	-0.6016	1.0000	0.3914	0.4234	12526.620
1982	-0.7027	-1.9712	1.0000	1.2686	1.3722	3184.233
1983	-3.1006	-1.0329	1.0000	-2.0677	-2.2366	8137.914
1984	-0.4615	0.5221	1.0000	-0.9836	-1.0639	38532.490
1985	0.9770	0.1049	1.0000	0.8721	0.9434	25389.069
1986	-0.2674	-0.1624	1.0000	-0.1049	-0.1135	19433.890
1987	0.5883	0.0271	1.0000	0.5612	0.6071	23489.648
1988	-2.0020	-0.4720	1.0000	-1.5300	-1.6550	14259.858
1989	0.6130	-0.4850	1.0000	1.0981	1.1878	14074.961
1990	-2.4074	-0.3084	1.0000	-2.0991	-2.2706	16795.077
1991	0.6130	-0.6595	1.0000	1.2725	1.3765	11821.761
1992	-0.3280	-0.0633	1.0000	-0.2647	-0.2863	21459.354

Partial variance for this index is 1.148776

Index 5 USRVSP 6
 Index is tuned to the sum of Jan1 full stock sizes (in number)
 for ages: 6

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.3310	-0.8817	1.0000	0.5507	0.5957	4599.783
1975	-0.9064	-0.4632	1.0000	-0.4432	-0.4794	6990.040
1976	-0.5386	-0.7822	1.0000	0.2435	0.2634	5081.103
1977	0.3621	-0.1498	1.0000	0.5119	0.5538	9563.123
1978	-0.3955	-0.5703	1.0000	0.1748	0.1891	6279.946
1979	-0.4645	-0.2393	1.0000	-0.2252	-0.2436	8743.956
1980	-0.1079	0.1593	1.0000	-0.2671	-0.2890	13026.200
1981	0.1545	0.2046	1.0000	-0.0501	-0.0542	13630.449
1982	0.3929	-0.4953	1.0000	0.8882	0.9607	6769.591
1984	-1.1577	-0.8036	1.0000	-0.3541	-0.3830	4973.429
1985	1.2531	0.7150	1.0000	0.5381	0.5821	22707.473
1986	0.5340	0.3349	1.0000	0.1991	0.2153	15527.896
1987	-0.1079	0.0681	1.0000	-0.1759	-0.1903	11890.930
1988	-1.4942	0.1041	1.0000	-1.5982	-1.7288	12326.883
1989	0.1153	-0.3377	1.0000	0.4530	0.4900	7924.433
1990	-1.1577	-0.4273	1.0000	-0.7304	-0.7901	7245.532
1991	0.4228	-0.1985	1.0000	0.6213	0.6721	9107.925
1992	-0.9064	-0.5700	1.0000	-0.3364	-0.3639	6282.080

Partial variance for this index is 0.358815

Index 6 USRVSP 7
 Index is tuned to the sum of Jan1 full stock sizes (in number)
 for ages: 7

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.5477	-1.1102	1.0000	0.5625	0.6084	1566.532
1975	-0.1911	-0.6284	1.0000	0.4373	0.4730	2536.309
1976	0.2144	-0.2917	1.0000	0.5062	0.5475	3551.351
1977	0.0713	-0.5137	1.0000	0.5850	0.6328	2844.421
1978	-0.0957	0.0767	1.0000	-0.1724	-0.1865	5133.207
1979	-0.4142	-0.3253	1.0000	-0.0889	-0.0962	3434.157
1980	0.6419	0.0863	1.0000	0.5556	0.6010	5182.780
1981	-0.4142	0.3809	1.0000	-0.7951	-0.8601	6958.736
1982	-0.0957	0.3746	1.0000	-0.4704	-0.5088	6915.075
1983	-0.8842	-0.3991	1.0000	-0.4851	-0.5248	3189.895
1984	-1.1073	-1.4412	1.0000	0.3338	0.3611	1125.140
1985	0.4508	-0.4801	1.0000	0.9309	1.0069	2941.757
1986	1.1173	0.8676	1.0000	0.2497	0.2701	11320.938
1987	-0.2964	0.5206	1.0000	-0.8170	-0.8838	8001.678
1988	-1.1073	0.2507	1.0000	-1.3580	-1.4690	6108.882
1989	0.2144	0.1552	1.0000	0.0592	0.0640	5552.829
1990	-1.1073	-0.1900	1.0000	-0.9174	-0.9923	3931.812
1991	0.3396	-0.3685	1.0000	0.7080	0.7659	3289.110
1992	-0.1911	-0.3673	1.0000	0.1763	0.1907	3292.877

Partial variance for this index is 0.418735

Index 7 USRVSP 8

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 8

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.9337	-1.3481	1.0000	0.4145	0.4483	594.536
1975	0.0471	-0.9148	1.0000	0.9619	1.0406	917.014
1976	0.8009	-0.7019	1.0000	1.5028	1.6256	1134.619
1977	0.3656	-0.3015	1.0000	0.6671	0.7216	1693.308
1978	0.0471	-0.5063	1.0000	0.5535	0.5987	1379.641
1979	0.7403	0.0121	1.0000	0.7282	0.7877	2317.033
1980	0.0471	-0.0770	1.0000	0.1242	0.1343	2119.449
1981	-0.0864	0.1982	1.0000	-0.2846	-0.3079	2791.038
1982	0.6068	0.3381	1.0000	0.2687	0.2906	3209.933
1983	-0.6460	0.3624	1.0000	-1.0084	-1.0909	3289.101
1984	-0.6460	-0.2259	1.0000	-0.4201	-0.4544	1826.266
1985	-2.0323	-1.1326	1.0000	-0.8996	-0.9732	737.505
1986	0.1649	-0.6909	1.0000	0.8558	0.9257	1147.164
1987	0.2703	0.8230	1.0000	-0.5528	-0.5979	5213.319
1988	-1.3391	0.5055	1.0000	-1.8447	-1.9954	3795.085
1989	0.4526	0.2423	1.0000	0.2103	0.2275	2916.784
1990	-1.3391	0.0085	1.0000	-1.3476	-1.4577	2308.609
1991	-0.6460	-0.3367	1.0000	-0.3093	-0.3346	1634.725
1992	-0.4229	-0.8032	1.0000	0.3803	0.4114	1025.280

Partial variance for this index is 0.748279

Index 8 USRVSP 9

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 9

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1975	0.0339	-1.3100	1.0000	1.3439	1.4537	294.035
1976	0.8224	-0.7538	1.0000	1.5761	1.7049	512.815
1977	-0.8824	-0.4674	1.0000	-0.4149	-0.4489	682.831
1978	0.3704	-0.3377	1.0000	0.7081	0.7660	777.408
1979	0.5039	-0.6224	1.0000	1.1263	1.2183	584.842
1980	-0.1892	0.2623	1.0000	-0.4515	-0.4884	1416.558
1981	0.0339	0.1848	1.0000	-0.1509	-0.1632	1310.889
1982	0.0339	0.2654	1.0000	-0.2315	-0.2504	1420.989
1983	-1.5755	0.2590	1.0000	-1.8346	-1.9845	1411.970
1984	0.0339	0.5053	1.0000	-0.4714	-0.5099	1806.148
1985	0.5039	0.0644	1.0000	0.4395	0.4754	1162.240
1986	0.0339	-0.9749	1.0000	1.0088	1.0912	411.088
1987	-0.4769	-0.7640	1.0000	0.2871	0.3105	507.611
1988	-0.1892	0.7561	1.0000	-0.9453	-1.0226	2321.094
1989	0.0339	0.5017	1.0000	-0.4678	-0.5060	1799.663
1990	-0.4769	0.2634	1.0000	-0.7403	-0.8008	1418.075
1991	0.0339	-0.0980	1.0000	0.1319	0.1427	988.006
1992	-1.5755	-0.6621	1.0000	-0.9134	-0.9881	562.049

Partial variance for this index is 0.825721

Index 9 USRVSP10

Index is tuned to the sum of Jan1 full stock sizes (in number)

for ages: 10

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.3257	-0.6250	1.0000	-0.7006	-0.7579	291.271
1975	0.4661	-1.1307	1.0000	1.5968	1.7273	175.663
1976	-0.2271	-1.1733	1.0000	0.9462	1.0235	168.348
1977	-0.6325	-0.3519	1.0000	-0.2806	-0.3036	382.759
1978	0.2838	-0.3786	1.0000	0.6624	0.7165	372.659
1979	-0.2271	-0.7211	1.0000	0.4940	0.5344	264.600
1980	-0.6325	-0.4880	1.0000	-0.1445	-0.1563	334.054
1981	0.8716	0.4548	1.0000	0.4168	0.4508	857.564
1982	-1.3257	0.3864	1.0000	-1.7121	-1.8520	800.909
1983	-0.6325	0.1975	1.0000	-0.8300	-0.8979	663.032
1984	-0.2271	0.2041	1.0000	-0.4312	-0.4664	667.411
1985	0.4661	0.7779	1.0000	-0.3118	-0.3373	1184.676
1986	0.0606	0.3022	1.0000	-0.2416	-0.2613	736.210
1988	-0.2271	-1.1666	1.0000	0.9395	1.0163	169.481
1989	0.7538	0.4425	1.0000	0.3112	0.3367	847.121
1990	-0.6325	0.3765	1.0000	-1.0090	-1.0915	793.001
1992	0.0606	-0.2339	1.0000	0.2945	0.3186	430.689

Partial variance for this index is 0.690521

Index 10 CNRVSU 2

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 2

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-3.0759	-2.0543	1.0000	-1.0216	-1.1051	23627.848
1975	-4.6163	-1.7257	1.0000	-2.8906	-3.1268	32818.476
1976	-3.4463	-1.4763	1.0000	-1.9700	-2.1310	42117.994
1977	-1.2490	-1.2461	1.0000	-0.0030	-0.0032	53019.619
1978	-4.8677	-1.7692	1.0000	-3.0984	-3.3516	31422.419
1980	0.2270	-2.2036	1.0000	2.4306	2.6292	20350.980
1981	-1.7447	-0.7461	1.0000	-0.9986	-1.0802	87412.461
1982	-1.5355	-1.2436	1.0000	-0.2919	-0.3157	53152.260
1983	-2.0344	-1.5794	1.0000	-0.4551	-0.4922	37991.161
1984	-0.6587	-1.2860	1.0000	0.6273	0.6785	50946.054
1985	0.5510	-1.8067	1.0000	2.3577	2.5504	30265.536
1986	-0.4067	-1.8075	1.0000	1.4008	1.5153	30242.740
1987	-0.4318	-1.5932	1.0000	1.1614	1.2563	37470.886
1988	-3.4463	-1.9992	1.0000	-1.4471	-1.5653	24966.553
1989	-2.8062	-1.4245	1.0000	-1.3817	-1.4946	44354.866
1990	2.3728	-1.1948	1.0000	3.5676	3.8591	55808.688
1991	0.1684	-1.8905	1.0000	2.0588	2.2271	27834.123
1992	-1.3042	-1.2578	1.0000	-0.0464	-0.0502	52401.190

Partial variance for this index is 3.581328

Index 11 CNRVSU 3

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 3

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.3853	-0.6409	1.0000	0.2556	0.2765	33875.917
1975	-4.3419	-1.2442	1.0000	-3.0977	-3.3508	18529.904
1976	-1.8432	-0.9177	1.0000	-0.9254	-1.0010	25683.555
1977	-0.5858	-0.6512	1.0000	0.0653	0.0707	33528.843
1978	-2.2418	-0.4110	1.0000	-1.8308	-1.9804	42630.904
1979	-2.5409	-1.0007	1.0000	-1.5402	-1.6661	23639.866
1980	-0.0958	-2.3298	1.0000	2.2341	2.4167	6257.274
1981	-2.0675	-1.4465	1.0000	-0.6209	-0.6717	15136.163
1982	0.7005	0.0624	1.0000	0.6380	0.6902	68445.269
1983	-0.4122	-0.4242	1.0000	0.0119	0.0129	42074.482
1984	-1.7985	-0.7476	1.0000	-1.0509	-1.1368	30446.146
1985	1.2481	-0.4620	1.0000	1.7101	1.8499	40510.202
1986	-0.7507	-0.9894	1.0000	0.2388	0.2583	23907.176
1987	0.5704	-0.9849	1.0000	1.5553	1.6823	24015.895
1988	-0.8370	-0.7581	1.0000	-0.0789	-0.0854	30130.144
1989	-2.2978	-1.1640	1.0000	-1.1338	-1.2265	20078.210
1990	1.6896	-0.5972	1.0000	2.2868	2.4736	35390.284
1991	-0.1952	-0.3590	1.0000	0.1638	0.1772	44905.977
1992	0.0304	-1.0886	1.0000	1.1190	1.2104	21650.506

Partial variance for this index is 2.036571

Index 12 CNRVSU 4

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 4

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.7628	-0.9343	1.0000	-0.8285	-0.8962	11707.320
1975	-1.4201	-0.3004	1.0000	-1.1197	-1.2112	22066.382
1976	-0.6981	-0.8284	1.0000	0.1303	0.1409	13015.246
1977	-0.3082	-0.4921	1.0000	0.1839	0.1989	18217.463
1978	-0.7923	-0.1788	1.0000	-0.6135	-0.6636	24919.787
1979	-0.7536	0.0223	1.0000	-0.7759	-0.8393	30472.039
1980	0.9090	-0.6373	1.0000	1.5462	1.6726	15755.879
1981	-3.2690	-1.9677	1.0000	-1.3013	-1.4076	4165.096
1982	-1.6174	-1.0789	1.0000	-0.5385	-0.5825	10130.811
1983	0.2387	0.4819	1.0000	-0.2431	-0.2630	48247.051
1984	-0.6469	0.0303	1.0000	-0.6772	-0.7325	30715.050
1985	0.9781	-0.2603	1.0000	1.2384	1.3396	22969.324
1986	-0.3287	-0.0242	1.0000	-0.3045	-0.3294	29086.219
1987	1.0106	-0.5407	1.0000	1.5513	1.6781	17353.988
1988	-0.1490	-0.5425	1.0000	0.3935	0.4256	17322.557
1989	-0.4580	-0.3320	1.0000	-0.1259	-0.1362	21379.722
1990	0.8578	-0.7129	1.0000	1.5707	1.6990	14608.511
1991	-0.2733	-0.1367	1.0000	-0.1366	-0.1477	25991.483
1992	0.1656	0.1151	1.0000	0.0504	0.0546	33435.868

Partial variance for this index is 0.8157

Index 13 CNRSU 5

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 5

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.8810	-0.7235	1.0000	-1.1575	-1.2520	9224.437
1975	-1.8810	-1.0179	1.0000	-0.8631	-0.9336	6872.333
1976	-0.3877	-0.3685	1.0000	-0.0192	-0.0208	13156.289
1977	0.1031	-0.8468	1.0000	0.9499	1.0275	8154.854
1978	-0.6652	-0.5042	1.0000	-0.1610	-0.1742	11486.091
1979	-0.8288	-0.1338	1.0000	-0.6951	-0.7518	16636.490
1980	1.0599	-0.0331	1.0000	1.0930	1.1823	18398.044
1981	-1.2876	-0.7095	1.0000	-0.5781	-0.6254	9354.706
1982	-2.7415	-2.0487	1.0000	-0.6928	-0.7494	2451.368
1983	-2.2341	-1.0850	1.0000	-1.1491	-1.2430	6426.337
1984	0.0952	0.4534	1.0000	-0.3582	-0.3874	29925.845
1985	0.6423	0.0532	1.0000	0.5892	0.6373	20056.056
1986	-0.5965	-0.2139	1.0000	-0.3825	-0.4138	15354.860
1987	1.1603	-0.0939	1.0000	1.2542	1.3567	17312.589
1988	0.1822	-0.5673	1.0000	0.7495	0.8108	10783.745
1989	-0.6401	-0.6147	1.0000	-0.0254	-0.0275	10285.093
1990	1.0500	-0.4147	1.0000	1.4647	1.5844	12561.919
1991	-0.3170	-0.7749	1.0000	0.4580	0.4954	8761.979
1992	-0.5652	-0.0887	1.0000	-0.4765	-0.5154	17402.944

Partial variance for this index is 0.681854

Index 14 CNRSU 6

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 6

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-2.0605	-0.9410	1.0000	-1.1195	-1.2110	3466.280
1975	-1.0038	-0.5591	1.0000	-0.4447	-0.4810	5078.117
1976	-1.1819	-0.8347	1.0000	-0.3472	-0.3756	3855.226
1977	0.3268	-0.2212	1.0000	0.5480	0.5928	7119.948
1978	-1.0673	-0.6334	1.0000	-0.4339	-0.4694	4714.772
1979	-0.5633	-0.2659	1.0000	-0.2975	-0.3218	6808.857
1980	0.3183	0.0857	1.0000	0.2326	0.2516	9677.518
1981	-0.7035	0.1080	1.0000	-0.8115	-0.8779	9895.889
1982	-1.0200	-0.6244	1.0000	-0.3956	-0.4279	4757.370
1983	-3.0569	-1.8100	1.0000	-1.2469	-1.3488	1453.657
1984	-1.2012	-0.8311	1.0000	-0.3702	-0.4004	3869.096
1985	1.0478	0.6107	1.0000	0.4371	0.4729	16359.021
1986	0.3039	0.2453	1.0000	0.0586	0.0634	11351.986
1987	0.8126	-0.0229	1.0000	0.8355	0.9038	8681.335
1988	0.6496	-0.0447	1.0000	0.6942	0.7510	8494.378
1989	-0.1335	-0.4442	1.0000	0.3107	0.3361	5696.824
1990	0.6542	-0.5727	1.0000	1.2269	1.3271	5009.600
1991	0.3683	-0.4409	1.0000	0.8092	0.8753	5715.691
1992	-0.3530	-0.6671	1.0000	0.3141	0.3397	4558.584

Partial variance for this index is 0.473037

Index 15 CNRSU 7

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 7

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.2898	-1.2249	1.0000	-0.0649	-0.0702	1212.926
1975	-2.2361	-0.8626	1.0000	-1.3735	-1.4857	1742.501
1976	-0.0221	-0.4982	1.0000	0.4761	0.5150	2508.685
1977	-1.0987	-0.7126	1.0000	-0.3861	-0.4176	2024.474
1978	-0.5146	-0.1537	1.0000	-0.3608	-0.3903	3540.384
1979	-0.8414	-0.4158	1.0000	-0.4256	-0.4604	2724.132
1980	0.3672	-0.0662	1.0000	0.4334	0.4688	3864.330
1981	-0.4500	0.1600	1.0000	-0.6100	-0.6599	4844.994
1982	-0.7842	0.1671	1.0000	-0.9513	-1.0291	4879.592
1983	-1.8138	-0.5239	1.0000	-1.2899	-1.3954	2445.030
1984	-0.9618	-1.5038	1.0000	0.5420	0.5863	917.719
1985	-0.2269	-0.7731	1.0000	0.5462	0.5909	1905.666
1986	0.6090	0.6459	1.0000	-0.0369	-0.0399	7876.355
1987	1.1093	0.3118	1.0000	0.7975	0.8627	5639.284
1988	1.1957	0.0448	1.0000	1.1509	1.2449	4317.952
1989	0.7119	-0.1106	1.0000	0.8225	0.8897	3696.433
1990	-0.0522	-0.4558	1.0000	0.4036	0.4366	2617.388
1991	-0.2337	-0.7542	1.0000	0.5205	0.5630	1942.116
1992	-0.8165	-0.6229	1.0000	-0.1936	-0.2094	2214.542

Partial variance for this index is 0.527349

Index 16 CNRVSU 8

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 8

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.3544	-1.4661	1.0000	0.1117	0.1208	426.798
1975	-1.2870	-0.9779	1.0000	-0.3091	-0.3344	695.447
1976	-0.5256	-0.7315	1.0000	0.2060	0.2228	889.689
1977	-0.0787	-0.4521	1.0000	0.3734	0.4039	1176.533
1978	-1.1838	-0.6915	1.0000	-0.4923	-0.5326	926.084
1979	-0.6789	-0.0103	1.0000	-0.6685	-0.7232	1830.020
1980	-0.2953	-0.0941	1.0000	-0.2012	-0.2177	1682.920
1981	-0.3198	0.0931	1.0000	-0.4130	-0.4467	2029.520
1982	-0.8116	0.1689	1.0000	-0.9805	-1.0606	2189.262
1983	-0.2404	0.2912	1.0000	-0.5316	-0.5750	2473.988
1984	0.3181	-0.2299	1.0000	0.5479	0.5927	1469.330
1985	-0.9885	-1.1972	1.0000	0.2087	0.2257	558.488
1986	-1.5183	-0.8575	1.0000	-0.6608	-0.7148	784.407
1987	1.4131	0.6591	1.0000	0.7540	0.8156	3574.275
1988	1.1089	0.3691	1.0000	0.7399	0.8003	2674.443
1989	0.4828	0.1168	1.0000	0.3660	0.3959	2078.131
1990	0.0319	-0.1725	1.0000	0.2044	0.2211	1556.009
1991	0.3268	-0.6100	1.0000	0.9367	1.0133	1004.716
1992	-1.2341	-1.0425	1.0000	-0.1915	-0.2072	651.901

Partial variance for this index is 0.303821

Index 17 CNRVSU 9

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 9

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.9201	-1.5205	1.0000	0.6004	0.6494	240.930
1975	-1.5262	-1.5872	1.0000	0.0609	0.0659	225.381
1976	-1.3486	-0.9078	1.0000	-0.4408	-0.4768	444.621
1977	-0.4276	-0.7663	1.0000	0.3387	0.3663	512.187
1978	-1.2386	-0.8400	1.0000	-0.3986	-0.4312	475.815
1979	-2.8072	-0.9006	1.0000	-1.9066	-2.0623	447.805
1980	-0.5351	0.0105	1.0000	-0.5456	-0.5902	1113.779
1981	-0.4184	-0.0628	1.0000	-0.3556	-0.3847	1035.044
1982	-0.2422	-0.1029	1.0000	-0.1393	-0.1507	994.322
1983	0.0022	-0.1036	1.0000	0.1058	0.1145	993.626
1984	1.4284	0.2905	1.0000	1.1379	1.2309	1473.635
1985	0.3019	-0.1665	1.0000	0.4684	0.5067	933.071
1986	-2.7119	-1.3016	1.0000	-1.4103	-1.5255	299.877
1987	-1.1585	-1.2741	1.0000	0.1156	0.1250	308.238
1988	1.2601	0.2828	1.0000	0.9773	1.0572	1462.347
1989	0.6300	0.1084	1.0000	0.5216	0.5642	1228.340
1990	0.2609	-0.1422	1.0000	0.4031	0.4360	956.040
1991	0.1985	-0.4959	1.0000	0.6944	0.7511	671.222
1992	-1.3256	-1.0983	1.0000	-0.2272	-0.2458	367.470

Partial variance for this index is 0.580774

Index 18 CNRVSU10

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 10

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.9273	-0.8079	1.0000	-0.1194	-0.1291	211.606
1975	-2.4588	-1.4382	1.0000	-1.0206	-1.1040	112.672
1976	-0.7541	-1.1846	1.0000	0.4306	0.4658	145.190
1977	-0.5870	-0.4394	1.0000	-0.1476	-0.1596	305.897
1978	-1.4472	-0.6128	1.0000	-0.8344	-0.9026	257.200
1979	-0.9547	-0.8239	1.0000	-0.1308	-0.1415	208.252
1980	-0.4778	-0.6599	1.0000	0.1821	0.1970	245.369
1981	-0.2075	0.2957	1.0000	-0.5032	-0.5444	638.040
1982	-0.2616	0.2143	1.0000	-0.4759	-0.5147	588.128
1983	-0.5129	-0.0477	1.0000	-0.4652	-0.5032	452.577
1984	1.5209	0.0624	1.0000	1.4584	1.5776	505.272
1985	1.3140	0.6298	1.0000	0.6842	0.7401	891.075
1986	0.0965	0.1082	1.0000	-0.0117	-0.0127	528.940
1987	0.2324	-1.1687	1.0000	1.4011	1.5156	147.524
1988	-0.8494	-1.4024	1.0000	0.5531	0.5982	116.775
1989	0.1980	0.0842	1.0000	0.1138	0.1231	516.371
1990	-0.3486	0.1705	1.0000	-0.5191	-0.5615	562.916
1991	-0.3794	-0.2446	1.0000	-0.1348	-0.1458	371.708
1992	-0.9829	-0.5222	1.0000	-0.4607	-0.4983	281.586

Partial variance for this index is 0.453044

Index 19 USRVFL 2

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 2

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.7444	-1.0157	1.0000	-0.7287	-0.7882	26209.027
1976	0.2481	-0.4403	1.0000	0.6884	0.7446	46595.211
1977	-1.7444	-0.2123	1.0000	-1.5321	-1.6572	58528.115
1978	-1.0512	-0.7342	1.0000	-0.3170	-0.3429	34730.802
1979	-1.7444	-2.0592	1.0000	0.3149	0.3406	9231.081
1980	-2.8430	-1.1618	1.0000	-1.6812	-1.8186	22647.299
1981	-0.2780	0.2953	1.0000	-0.5733	-0.6201	97229.724
1982	-0.8971	-0.2082	1.0000	-0.6889	-0.7452	58770.705
1983	-0.8971	-0.5451	1.0000	-0.3520	-0.3808	41961.183
1984	1.0489	-0.2515	1.0000	1.3003	1.4066	56278.771
1985	-0.3581	-0.7697	1.0000	0.4116	0.4453	33518.607
1986	1.2842	-0.7724	1.0000	2.0566	2.2246	33428.692
1987	0.2016	-0.5587	1.0000	0.7603	0.8224	41391.960
1988	-1.2335	-0.9654	1.0000	-0.2681	-0.2900	27560.800
1989	-0.2780	-0.3905	1.0000	0.1124	0.1216	48976.576
1990	1.3617	-0.1611	1.0000	1.5228	1.6473	61602.709
1991	-1.7444	-0.8520	1.0000	-0.8924	-0.9653	30870.806
1992	-0.3581	-0.2243	1.0000	-0.1338	-0.1447	57831.891

Partial variance for this index is 1.020774

Index 20 USRVFL 3

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 3

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.6821	-0.7681	1.0000	1.4502	1.5687	41439.765
1975	-1.5011	-1.4373	1.0000	-0.0638	-0.0690	21221.974
1976	-1.7888	-1.1072	1.0000	-0.6817	-0.7374	29524.558
1977	-2.4820	-0.8565	1.0000	-1.6255	-1.7584	37937.200
1978	-0.7474	-0.6239	1.0000	-0.1234	-0.1335	47868.096
1979	-0.6362	-1.1484	1.0000	0.5123	0.5541	28331.119
1980	-2.8874	-2.5063	1.0000	-0.3812	-0.4123	7287.223
1981	-3.5806	-1.5901	1.0000	-1.9905	-2.1531	18215.394
1982	2.3027	-0.1321	1.0000	2.4348	2.6338	78279.378
1984	-2.4820	-0.9578	1.0000	-1.5241	-1.6487	34279.809
1985	-0.6902	-0.6646	1.0000	-0.0256	-0.0277	45961.342
1986	-1.9712	-1.1881	1.0000	-0.7831	-0.8471	27230.078
1987	-0.4895	-1.1867	1.0000	0.6972	0.7542	27265.947
1988	-0.5361	-0.9718	1.0000	0.4357	0.4713	33805.625
1989	-1.0156	-1.3771	1.0000	0.3614	0.3910	22540.444
1990	0.6241	-0.8027	1.0000	1.4268	1.5434	40033.480
1991	-1.0957	-0.5726	1.0000	-0.5231	-0.5658	50389.885
1992	-1.0156	-1.2734	1.0000	0.2577	0.2788	25003.427
1993	-0.4895	-0.6354	1.0000	0.1459	0.1578	47321.602

Partial variance for this index is 1.214516

Index 21 USRVFL 4

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 4

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.6763	-1.0647	1.0000	0.3884	0.4201	14851.166
1975	0.1710	-0.4561	1.0000	0.6271	0.6783	27293.742
1976	-2.0626	-0.9855	1.0000	-1.0772	-1.1652	16075.736
1977	-0.4532	-0.6631	1.0000	0.2099	0.2271	22191.070
1978	0.0168	-0.3792	1.0000	0.3960	0.4284	29475.982
1979	-1.7750	-0.1307	1.0000	-1.6442	-1.7786	37790.394
1980	0.0968	-0.7925	1.0000	0.8894	0.9620	19497.488
1981	-3.1612	-2.0896	1.0000	-1.0717	-1.1592	5329.268
1982	1.4237	-1.2431	1.0000	2.6668	2.8847	12425.200
1983	0.5276	0.3227	1.0000	0.2049	0.2217	59471.444
1984	-1.5518	-0.1590	1.0000	-1.3928	-1.5067	36738.380
1985	-2.4681	-0.4703	1.0000	-1.9978	-2.1610	26909.552
1986	-1.0818	-0.1930	1.0000	-0.8888	-0.9614	35508.120
1987	-0.5222	-0.7247	1.0000	0.2025	0.2190	20866.269
1988	-1.3695	-0.7166	1.0000	-0.6529	-0.7062	21034.981
1989	1.5022	-0.4770	1.0000	1.9792	2.1409	26731.245
1990	0.3045	-0.8835	1.0000	1.1880	1.2850	17802.167
1991	-0.0702	-0.3249	1.0000	0.2547	0.2755	31120.789
1992	-0.5222	-0.0780	1.0000	-0.4441	-0.4804	39835.154
1993	-0.6763	-0.8390	1.0000	0.1627	0.1760	18611.633

Partial variance for this index is 1.406889

Index 22 USRVFL 5
Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 5

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.2626	-0.7359	1.0000	0.4733	0.5120	11890.742
1975	-0.1001	-1.0098	1.0000	0.9097	0.9840	9041.941
1976	-0.6979	-0.3464	1.0000	-0.3515	-0.3802	17553.302
1977	0.9115	-0.8727	1.0000	1.7842	1.9300	10370.276
1978	0.2715	-0.5205	1.0000	0.7920	0.8567	14749.131
1979	-1.7095	-0.1739	1.0000	-1.5357	-1.6611	20859.191
1980	0.4007	-0.0267	1.0000	0.4274	0.4623	24165.640
1981	-1.4864	-0.6838	1.0000	-0.8026	-0.8682	12526.620
1982	-0.4568	-2.0534	1.0000	1.5967	1.7272	3184.233
1983	0.2715	-1.1151	1.0000	1.3866	1.4999	8137.914
1984	-1.7095	0.4398	1.0000	-2.1494	-2.3250	38532.490
1985	-3.0958	0.0227	1.0000	-3.1185	-3.3733	25389.069
1986	-1.1499	-0.2446	1.0000	-0.9053	-0.9792	19433.890
1987	-0.5309	-0.0551	1.0000	-0.4758	-0.5146	23489.648
1989	1.6404	-0.5673	1.0000	2.2076	2.3880	14074.961
1990	-0.4568	-0.3906	1.0000	-0.0662	-0.0716	16795.077
1991	-0.5309	-0.7417	1.0000	0.2108	0.2281	11821.761
1992	0.0397	-0.1455	1.0000	0.1852	0.2003	21459.354
1993	-0.4568	0.1120	1.0000	-0.5688	-0.6152	27761.623

Partial variance for this index is 1.867268

Index 23 USRVFL 6
Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 6

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.6264	-1.2777	1.0000	0.6513	0.7045	4599.783
1975	-0.6264	-0.8592	1.0000	0.2328	0.2518	6990.040
1976	-1.0784	-1.1781	1.0000	0.0998	0.1079	5081.103
1977	2.0695	-0.5458	1.0000	2.6152	2.8289	9563.123
1978	0.7134	-0.9663	1.0000	1.6797	1.8170	6279.946
1979	-0.8270	-0.6353	1.0000	-0.1917	-0.2074	8743.956
1980	-0.0798	-0.2367	1.0000	0.1569	0.1697	13026.200
1981	-0.6264	-0.1914	1.0000	-0.4350	-0.4706	13630.449
1982	-0.0285	-0.8912	1.0000	0.8627	0.9332	6769.591
1983	-3.0243	-2.1936	1.0000	-0.8307	-0.8986	1840.632
1984	-1.0784	-1.1996	1.0000	0.1212	0.1311	4973.429
1985	-3.0243	0.3190	1.0000	-3.3433	-3.6165	22707.473
1986	-0.5394	-0.0610	1.0000	-0.4783	-0.5174	15527.896
1987	-1.0784	-0.3279	1.0000	-0.7505	-0.8118	11890.930
1988	-1.4148	-0.2919	1.0000	-1.1229	-1.2147	12326.883
1989	0.4722	-0.7337	1.0000	1.2060	1.3045	7924.433
1991	-0.7217	-0.5945	1.0000	-0.1272	-0.1375	9107.925
1992	-1.2325	-0.9660	1.0000	-0.2665	-0.2883	6282.080
1993	-0.2517	-0.1723	1.0000	-0.0794	-0.0859	13893.079

Partial variance for this index is 1.492485

Index 24 USRVFL 7
Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 7

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.1383	-1.5572	1.0000	1.4189	1.5348	1566.532
1975	-0.4568	-1.0753	1.0000	0.6186	0.6691	2536.309
1976	-1.1499	-0.7387	1.0000	-0.4112	-0.4448	3551.351
1977	1.3758	-0.9607	1.0000	2.3365	2.5274	2844.421
1978	1.1014	-0.3703	1.0000	1.4717	1.5920	5133.207
1979	-0.3390	-0.7723	1.0000	0.4333	0.4687	3434.157
1980	0.0287	-0.3607	1.0000	0.3895	0.4213	5182.780
1981	-0.7444	-0.0661	1.0000	-0.6784	-0.7338	6958.736
1982	0.0287	-0.0724	1.0000	0.1011	0.1094	6915.075
1983	-0.9268	-0.8461	1.0000	-0.0807	-0.0873	3189.895
1984	-2.5362	-1.8881	1.0000	-0.6481	-0.7010	1125.140
1985	-1.4376	-0.9270	1.0000	-0.5105	-0.5523	2941.757
1986	-0.5903	0.4206	1.0000	-1.0109	-1.0935	11320.938
1987	-1.1499	0.0736	1.0000	-1.2235	-1.3235	8001.678
1988	-1.8431	-0.1963	1.0000	-1.6467	-1.7813	6108.882
1989	1.5069	-0.2917	1.0000	1.7986	1.9456	5552.829
1991	-2.5362	-0.8154	1.0000	-1.7208	-1.8614	3289.110
1992	-1.1499	-0.8143	1.0000	-0.3356	-0.3630	3292.877
1993	-1.1499	-0.8481	1.0000	-0.3018	-0.3265	3183.454

Partial variance for this index is 1.306969

Index 25 USRVFL 8

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 8

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.0770	-1.4944	1.0000	1.5713	1.6997	594.536
1975	0.0770	-1.0610	1.0000	1.1380	1.2310	917.014
1976	0.0770	-0.8481	1.0000	0.9251	1.0007	1134.619
1977	1.3137	-0.4477	1.0000	1.7614	1.9054	1693.308
1978	0.9708	-0.6526	1.0000	1.6234	1.7560	1379.641
1979	0.5878	-0.1341	1.0000	0.7219	0.7809	2317.033
1980	-0.0408	-0.2232	1.0000	0.1824	0.1973	2119.449
1981	-0.1744	0.0520	1.0000	-0.2264	-0.2449	2791.038
1982	-0.7340	0.1919	1.0000	-0.9258	-1.0015	3209.933
1983	-0.7340	0.2162	1.0000	-0.9502	-1.0278	3289.101
1984	-0.3285	-0.3721	1.0000	0.0436	0.0472	1826.266
1986	-2.1203	-0.8371	1.0000	-1.2832	-1.3880	1147.164
1987	-0.7340	0.6768	1.0000	-1.4108	-1.5261	5213.319
1988	-0.0408	0.3593	1.0000	-0.4001	-0.4328	3795.085
1989	-0.1744	0.0961	1.0000	-0.2704	-0.2925	2916.784
1991	-1.0217	-0.4829	1.0000	-0.5387	-0.5827	1634.725
1992	-2.1203	-0.9494	1.0000	-1.1708	-1.2665	1025.280
1993	-1.4271	-0.6365	1.0000	-0.7907	-0.8553	1402.062

Partial variance for this index is 1.121176

Index 26 USRVFL 9

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 9

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.0290	-1.3597	1.0000	1.3887	1.5021	320.652
1975	-1.9169	-1.4463	1.0000	-0.4706	-0.5091	294.035
1976	-1.9169	-0.8901	1.0000	-1.0268	-1.1107	512.815
1977	0.7221	-0.6038	1.0000	1.3259	1.4343	682.831
1978	0.4810	-0.4741	1.0000	0.9550	1.0331	777.408
1979	0.1625	-0.7587	1.0000	0.9212	0.9965	584.842
1980	0.2803	0.1260	1.0000	0.1543	0.1669	1416.558
1981	0.6480	0.0484	1.0000	0.5996	0.6486	1310.889
1983	-1.2238	0.1227	1.0000	-1.3465	-1.4565	1411.970
1984	0.1625	0.3689	1.0000	-0.2064	-0.2233	1806.148
1988	-0.1252	0.6198	1.0000	-0.7449	-0.8058	2321.094
1989	0.7911	0.3653	1.0000	0.4258	0.4606	1799.663
1990	-1.2238	0.1270	1.0000	-1.3508	-1.4612	1418.075
1991	-0.8183	-0.2343	1.0000	-0.5840	-0.6317	988.006
1993	-1.2238	-1.1833	1.0000	-0.0404	-0.0438	382.485

Partial variance for this index is 0.857274

Index 27 USRVFL10

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 10

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1975	-0.8194	-1.0632	1.0000	0.2438	0.2637	175.663
1976	-1.5126	-1.1058	1.0000	-0.4068	-0.4401	168.348
1977	0.0968	-0.2844	1.0000	0.3813	0.4124	382.759
1978	0.6846	-0.3111	1.0000	0.9958	1.0772	372.659
1979	0.2792	-0.6536	1.0000	0.9328	1.0090	264.600
1980	0.0968	-0.4205	1.0000	0.5174	0.5596	334.054
1981	0.5669	0.5223	1.0000	0.0446	0.0482	857.564
1983	-0.8194	0.2650	1.0000	-1.0845	-1.1731	663.032
1984	-0.4140	0.2716	1.0000	-0.6856	-0.7416	667.411
1985	-0.8194	0.8454	1.0000	-1.6649	-1.8009	1184.676
1988	-0.1263	-1.0991	1.0000	0.9728	1.0523	169.481
1989	0.5669	0.5100	1.0000	0.0568	0.0615	847.121
1991	-0.1263	0.1772	1.0000	-0.3034	-0.3282	607.261

Partial variance for this index is 0.672327

Index 28 MARVSP 1

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 1

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1978	-5.2228	-3.9863	1.0000	-1.2364	-1.3375	11274.868
1979	-3.8365	-3.0889	1.0000	-0.7476	-0.8087	27661.474
1980	1.5071	-1.6318	1.0000	3.1389	3.3954	118756.654
1981	-0.2669	-2.1353	1.0000	1.8683	2.0210	71782.702
1983	1.2465	-2.1786	1.0000	3.4251	3.7050	68739.048
1985	-4.5296	-2.6995	1.0000	-1.8301	-1.9797	40829.898
1986	-5.2228	-2.4858	1.0000	-2.7369	-2.9606	50556.255
1987	-5.2228	-2.8925	1.0000	-2.3302	-2.5207	33662.839
1989	-1.6392	-2.0882	1.0000	0.4490	0.4857	75241.719

Partial variance for this index is 5.56491

Index 29 MARVSP 2

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 2

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1978	-0.4727	-1.0362	1.0000	0.5634	0.6095	34730.802
1979	-3.0377	-2.3612	1.0000	-0.6765	-0.7317	9231.081
1980	-0.0420	-1.4638	1.0000	1.4218	1.5380	22647.299
1981	1.9039	-0.0067	1.0000	1.9107	2.0668	97229.724
1982	-1.2459	-0.5102	1.0000	-0.7358	-0.7959	58770.705
1983	0.2581	-0.8471	1.0000	1.1052	1.1955	41961.183
1984	-2.3445	-0.5535	1.0000	-1.7911	-1.9374	56278.771
1985	-1.9391	-1.0717	1.0000	-0.8674	-0.9383	33518.607
1987	-1.9391	-0.8607	1.0000	-1.0784	-1.1665	41391.960
1988	-1.2459	-1.2674	1.0000	0.0215	0.0232	27560.800
1989	0.7690	-0.6925	1.0000	1.4614	1.5808	48976.576
1990	-0.7351	-0.4631	1.0000	-0.2720	-0.2942	61602.709
1991	-2.3445	-1.1540	1.0000	-1.1906	-1.2878	30870.806
1992	-0.3986	-0.5263	1.0000	0.1276	0.1381	57831.891

Partial variance for this index is 1.322114

Index 30 MARVSP 3

Index is tuned to the sum of Jan1 full stock sizes (in number)
for ages: 3

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1978	0.1603	0.0508	1.0000	0.1096	0.1185	47868.096
1979	0.1603	-0.4737	1.0000	0.6341	0.6859	28331.119
1980	-0.9383	-1.8315	1.0000	0.8933	0.9663	7287.223
1983	-0.2451	0.0515	1.0000	-0.2966	-0.3209	47903.842
1988	-0.5328	-0.2970	1.0000	-0.2358	-0.2550	33805.625
1989	1.3643	-0.7024	1.0000	2.0667	2.2355	22540.444
1990	-1.6314	-0.1280	1.0000	-1.5035	-1.6263	40033.480
1991	-0.5328	0.1021	1.0000	-0.6349	-0.6868	50389.885
1992	-1.6314	-0.5987	1.0000	-1.0328	-1.1172	25003.427

Partial variance for this index is 1.193334

Index 31 USCPUE 4
Index is tuned to the sum of mean full stock sizes (in number)
for ages: 4

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.1747	-0.6950	1.0000	0.8698	0.9408	11707.320
1975	0.7063	-0.0612	1.0000	0.7675	0.8302	22066.382
1976	0.2604	-0.5891	1.0000	0.8496	0.9190	13015.246
1977	0.2863	-0.2529	1.0000	0.5392	0.5833	18217.463
1978	-0.6183	0.0604	1.0000	-0.6787	-0.7342	24919.787
1979	0.4272	0.2616	1.0000	0.1656	0.1791	30472.039
1980	0.4939	-0.3980	1.0000	0.8919	0.9648	15755.879
1981	-0.8535	-1.7285	1.0000	0.8751	0.9466	4165.096
1982	-0.4318	-0.8397	1.0000	0.4079	0.4412	10130.811
1983	0.8327	0.7211	1.0000	0.1116	0.1207	48247.051
1984	0.3966	0.2695	1.0000	0.1271	0.1375	30715.050
1985	-1.0945	-0.0211	1.0000	-1.0734	-1.1612	22969.324
1986	0.2231	0.2150	1.0000	0.0081	0.0088	29086.219
1987	-1.2859	-0.3014	1.0000	-0.9844	-1.0649	17353.988
1988	-1.2129	-0.3032	1.0000	-0.9096	-0.9839	17322.557
1989	-0.3864	-0.0928	1.0000	-0.2935	-0.3175	21379.722
1990	-0.5288	-0.4736	1.0000	-0.0551	-0.0596	14608.511
1991	-0.3300	0.1025	1.0000	-0.4326	-0.4679	25991.483
1992	-0.8314	0.3544	1.0000	-1.1858	-1.2827	33435.868

Partial variance for this index is 0.517548

Index 32 USCPUE 5
Index is tuned to the sum of mean full stock sizes (in number)
for ages: 5

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.1393	-0.3611	1.0000	0.5004	0.5413	9224.437
1975	-0.1566	-0.6555	1.0000	0.4989	0.5397	6872.333
1976	0.7778	-0.0061	1.0000	0.7839	0.8479	13156.289
1977	0.0680	-0.4844	1.0000	0.5524	0.5975	8154.854
1978	-0.3456	-0.1419	1.0000	-0.2038	-0.2204	11486.091
1979	-0.0001	0.2286	1.0000	-0.2287	-0.2474	16636.490
1980	0.3728	0.3292	1.0000	0.0436	0.0471	18398.044
1981	0.3101	-0.3471	1.0000	0.6572	0.7109	9354.706
1982	-1.1768	-1.6864	1.0000	0.5096	0.5512	2451.368
1983	-0.2052	-0.7226	1.0000	0.5174	0.5597	6426.337
1984	0.9696	0.8157	1.0000	0.1539	0.1665	29925.845
1985	-0.1012	0.4155	1.0000	-0.5167	-0.5589	20056.056
1986	-0.9300	0.1484	1.0000	-1.0785	-1.1666	15354.860
1987	-0.0285	0.2684	1.0000	-0.2969	-0.3211	17312.589
1988	-1.0504	-0.2050	1.0000	-0.8454	-0.9145	10783.745
1989	-0.7599	-0.2523	1.0000	-0.5076	-0.5491	10285.093
1990	-0.1940	-0.0523	1.0000	-0.1417	-0.1533	12561.919
1991	-0.4504	-0.4126	1.0000	-0.0378	-0.0409	8761.979
1992	-0.0866	0.2736	1.0000	-0.3602	-0.3897	17402.944

Partial variance for this index is 0.288078

Index 33 USCPUE 6
Index is tuned to the sum of mean full stock sizes (in number)
for ages: 6

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.2900	-0.6413	1.0000	0.3513	0.3800	3466.280
1975	0.3582	-0.2595	1.0000	0.6177	0.6682	5078.117
1976	-0.2487	-0.5350	1.0000	0.2862	0.3096	3855.226
1977	0.7424	0.0785	1.0000	0.6639	0.7182	7119.948
1978	0.1076	-0.3337	1.0000	0.4413	0.4774	4714.772
1979	-0.2501	0.0338	1.0000	-0.2839	-0.3071	6808.857
1980	0.3754	0.3854	1.0000	-0.0100	-0.0108	9677.518
1981	-0.0982	0.4077	1.0000	-0.5059	-0.5473	9895.889
1982	0.2568	-0.3247	1.0000	0.5815	0.6290	4757.370
1983	-0.9519	-1.5103	1.0000	0.5585	0.6041	1453.657
1984	-0.0796	-0.5314	1.0000	0.4518	0.4887	3869.096
1985	0.4945	0.9104	1.0000	-0.4159	-0.4499	16359.021
1986	0.1555	0.5450	1.0000	-0.3895	-0.4213	11351.986
1987	-1.1466	0.2768	1.0000	-1.4234	-1.5397	8681.335
1988	0.0744	0.2550	1.0000	-0.1806	-0.1954	8494.378
1989	-0.8301	-0.1445	1.0000	-0.6856	-0.7417	5696.824
1990	-0.8282	-0.2731	1.0000	-0.5551	-0.6005	5009.600
1991	0.1317	-0.1412	1.0000	0.2728	0.2951	5715.691
1992	-0.1425	-0.3674	1.0000	0.2249	0.2433	4558.584

Partial variance for this index is 0.319484

Index 34 USCPUE 7

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 7

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.8413	-0.9997	1.0000	0.1584	0.1713	1212.926
1975	0.0794	-0.6374	1.0000	0.7168	0.7753	1742.501
1976	-0.0014	-0.2730	1.0000	0.2715	0.2937	2508.685
1977	0.4066	-0.4874	1.0000	0.8940	0.9671	2024.474
1978	1.0958	0.0715	1.0000	1.0243	1.1080	3540.384
1979	-0.3778	-0.1906	1.0000	-0.1872	-0.2025	2724.132
1980	0.3934	0.1591	1.0000	0.2344	0.2535	3864.330
1981	-0.2214	0.3852	1.0000	-0.6066	-0.6562	4844.994
1982	0.1377	0.3923	1.0000	-0.2546	-0.2754	4879.592
1983	0.2765	-0.2987	1.0000	0.5751	0.6221	2445.030
1984	-1.2038	-1.2786	1.0000	0.0748	0.0809	917.719
1985	-0.7692	-0.5479	1.0000	-0.2214	-0.2394	1905.666
1986	0.4340	0.8711	1.0000	-0.4371	-0.4728	7876.355
1987	-0.3981	0.5370	1.0000	-0.9351	-1.0116	5639.284
1988	-0.6304	0.2701	1.0000	-0.9005	-0.9740	4317.952
1989	-0.1322	0.1146	1.0000	-0.2469	-0.2671	3696.433
1990	-0.8549	-0.2305	1.0000	-0.6243	-0.6753	2617.388
1991	-0.6761	-0.5289	1.0000	-0.1471	-0.1592	1942.116
1992	0.2139	-0.3977	1.0000	0.6116	0.6616	2214.542

Partial variance for this index is 0.341459

Index 35 USCPUE 8

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 8

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.6872	-1.2779	1.0000	0.5907	0.6390	426.798
1975	-0.3481	-0.7897	1.0000	0.4416	0.4777	695.447
1976	-0.6740	-0.5434	1.0000	-0.1306	-0.1413	889.689
1977	0.8979	-0.2639	1.0000	1.1618	1.2568	1176.533
1978	0.8230	-0.5033	1.0000	1.3263	1.4346	926.084
1979	0.4953	0.1778	1.0000	0.3175	0.3435	1830.020
1980	0.0849	0.0940	1.0000	-0.0092	-0.0099	1682.920
1981	0.1264	0.2813	1.0000	-0.1549	-0.1676	2029.520
1982	0.6189	0.3571	1.0000	0.2619	0.2833	2189.262
1983	0.2692	0.4793	1.0000	-0.2102	-0.2273	2473.988
1984	-0.1536	-0.0417	1.0000	-0.1120	-0.1211	1469.330
1985	-1.3153	-1.0090	1.0000	-0.3062	-0.3313	558.488
1986	-0.7404	-0.6693	1.0000	-0.0710	-0.0769	784.407
1987	-0.1183	0.8473	1.0000	-0.9656	-1.0445	3574.275
1988	-0.4366	0.5572	1.0000	-0.9938	-1.0750	2674.443
1989	-0.3994	0.3050	1.0000	-0.7043	-0.7619	2078.131
1990	-0.4559	0.0156	1.0000	-0.4715	-0.5100	1556.009
1991	-0.7193	-0.4218	1.0000	-0.2975	-0.3218	1004.716
1992	-0.5273	-0.8544	1.0000	0.3271	0.3538	651.901

Partial variance for this index is 0.384101

Index 36 USCPUE 9

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 9

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.1770	-1.2915	1.0000	0.1145	0.1239	240.930
1975	-0.7351	-1.3582	1.0000	0.6231	0.6741	225.381
1976	-2.6410	-0.6788	1.0000	-1.9622	-2.1226	444.621
1977	0.5568	-0.5373	1.0000	1.0941	1.1835	512.187
1978	1.1946	-0.6110	1.0000	1.8056	1.9531	475.815
1979	0.2073	-0.6717	1.0000	0.8790	0.9508	447.805
1980	0.5641	0.2395	1.0000	0.3246	0.3511	1113.779
1981	-0.2134	0.1662	1.0000	-0.3795	-0.4105	1035.044
1982	0.6976	0.1260	1.0000	0.5716	0.6183	994.322
1983	0.5733	0.1253	1.0000	0.4480	0.4846	993.626
1984	0.2215	0.5195	1.0000	-0.2979	-0.3223	1473.635
1985	-0.4986	0.0625	1.0000	-0.5610	-0.6069	933.071
1986	-1.2508	-1.0727	1.0000	-0.1782	-0.1928	299.877
1987	-0.9669	-1.0452	1.0000	0.0783	0.0847	308.238
1988	-0.3154	0.5118	1.0000	-0.8271	-0.8947	1462.347
1989	-0.6531	0.3374	1.0000	-0.9904	-1.0714	1228.340
1990	-0.6065	0.0868	1.0000	-0.6933	-0.7500	956.040
1991	-0.1876	-0.2669	1.0000	0.0793	0.0858	671.222
1992	-0.9976	-0.8694	1.0000	-0.1282	-0.1387	367.470

Partial variance for this index is 0.721274

Index 37 CNCPUE 4

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 4

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.3644	-0.6847	1.0000	0.3203	0.3465	11707.320
1975	0.0504	-0.0508	1.0000	0.1012	0.1095	22066.382
1976	-0.7556	-0.5788	1.0000	-0.1768	-0.1912	13015.246
1977	0.0090	-0.2425	1.0000	0.2515	0.2721	18217.463
1978	0.1293	0.0708	1.0000	0.0585	0.0633	24919.787
1979	0.8211	0.2719	1.0000	0.5492	0.5941	30472.039
1980	-0.6782	-0.3877	1.0000	-0.2906	-0.3143	15755.879
1981	-1.6802	-1.7182	1.0000	0.0379	0.0410	4165.096
1982	-0.4950	-0.8293	1.0000	0.3343	0.3617	10130.811
1983	1.1785	0.7314	1.0000	0.4470	0.4836	48247.051
1984	0.4018	0.2799	1.0000	0.1220	0.1319	30715.050
1985	-0.6028	-0.0107	1.0000	-0.5921	-0.6404	22969.324
1986	-0.0550	0.2254	1.0000	-0.2803	-0.3032	29086.219
1987	-0.5262	-0.2911	1.0000	-0.2351	-0.2543	17353.988
1988	-0.2535	-0.2929	1.0000	0.0394	0.0426	17322.557
1989	0.0875	-0.0825	1.0000	0.1699	0.1838	21379.722
1990	-0.4045	-0.4633	1.0000	0.0588	0.0636	14608.511
1991	-0.5522	0.1129	1.0000	-0.6651	-0.7194	25991.483
1992	0.1145	0.3647	1.0000	-0.2502	-0.2706	33435.868

Partial variance for this index is 0.109187

Index 38 CNCPUE 5

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 5

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.4787	-0.3606	1.0000	-0.1181	-0.1277	9224.437
1975	-0.6129	-0.6549	1.0000	0.0420	0.0455	6872.333
1976	-0.1622	-0.0056	1.0000	-0.1567	-0.1695	13156.289
1977	-0.4827	-0.4838	1.0000	0.0012	0.0013	8154.854
1978	0.1054	-0.1413	1.0000	0.2468	0.2669	11486.091
1979	0.3001	0.2291	1.0000	0.0709	0.0767	16636.490
1980	0.3807	0.3298	1.0000	0.0509	0.0551	18398.044
1981	-0.5763	-0.3466	1.0000	-0.2297	-0.2485	9354.706
1982	-1.5371	-1.6858	1.0000	0.1487	0.1609	2451.368
1983	-0.8388	-0.7220	1.0000	-0.1167	-0.1263	6426.337
1984	1.1111	0.8163	1.0000	0.2948	0.3189	29925.845
1985	0.0278	0.4161	1.0000	-0.3882	-0.4200	20056.056
1986	0.1418	0.1490	1.0000	-0.0072	-0.0078	15354.860
1987	0.2444	0.2690	1.0000	-0.0246	-0.0266	17312.589
1988	-0.0008	-0.2044	1.0000	0.2036	0.2203	10783.745
1989	0.1014	-0.2518	1.0000	0.3531	0.3820	10285.093
1990	0.2263	-0.0518	1.0000	0.2781	0.3008	12561.919
1991	-0.6144	-0.4120	1.0000	-0.2023	-0.2189	8761.979
1992	-0.1724	0.2742	1.0000	-0.4466	-0.4831	17402.944

Partial variance for this index is 0.05154

Index 39 CNCPUE 6

Index is tuned to the sum of mean full stock sizes (in number)
for ages: 6

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.9211	-0.7070	1.0000	-0.2141	-0.2316	3466.280
1975	-0.3635	-0.3251	1.0000	-0.0383	-0.0415	5078.117
1976	-1.0204	-0.6006	1.0000	-0.4198	-0.4541	3855.226
1977	0.0662	0.0128	1.0000	0.0533	0.0577	7119.948
1978	-0.4409	-0.3994	1.0000	-0.0415	-0.0449	4714.772
1979	-0.0498	-0.0318	1.0000	-0.0179	-0.0194	6808.857
1980	0.2585	0.3197	1.0000	-0.0612	-0.0662	9677.518
1981	0.4590	0.3421	1.0000	0.1170	0.1265	9895.889
1982	0.0230	-0.3904	1.0000	0.4133	0.4471	4757.370
1983	-2.1409	-1.5760	1.0000	-0.5649	-0.6111	1453.657
1984	-0.9455	-0.5970	1.0000	-0.3485	-0.3770	3869.096
1985	0.7901	0.8447	1.0000	-0.0546	-0.0590	16359.021
1986	0.5162	0.4793	1.0000	0.0368	0.0399	11351.986
1987	0.2718	0.2111	1.0000	0.0606	0.0656	8681.335
1988	0.3913	0.1893	1.0000	0.2019	0.2184	8494.378
1989	-0.0196	-0.2102	1.0000	0.1905	0.2061	5696.824
1990	0.1935	-0.3387	1.0000	0.5322	0.5757	5009.600
1991	-0.0115	-0.2068	1.0000	0.1953	0.2113	5715.691
1992	-0.4733	-0.4330	1.0000	-0.0403	-0.0436	4558.584

Partial variance for this index is 0.070926

Index 40 CNCPUE 7
 Index is tuned to the sum of mean full stock sizes (in number)
 for ages: 7

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.6274	-1.0858	1.0000	-0.5416	-0.5859	1212.926
1975	-0.5558	-0.7235	1.0000	0.1677	0.1814	1742.501
1976	-0.4127	-0.3591	1.0000	-0.0536	-0.0580	2508.685
1977	-0.4876	-0.5735	1.0000	0.0859	0.0929	2024.474
1978	0.0350	-0.0146	1.0000	0.0496	0.0536	3540.384
1979	-0.7062	-0.2767	1.0000	-0.4295	-0.4646	2724.132
1980	-0.2869	0.0730	1.0000	-0.3598	-0.3892	3864.330
1981	0.5003	0.2991	1.0000	0.2012	0.2176	4844.994
1982	0.7701	0.3062	1.0000	0.4639	0.5018	4879.592
1983	-0.8058	-0.3848	1.0000	-0.4210	-0.4555	2445.030
1984	-2.3460	-1.3647	1.0000	-0.9813	-1.0615	917.719
1985	-0.3899	-0.6340	1.0000	0.2441	0.2640	1905.666
1986	0.9772	0.7851	1.0000	0.1922	0.2079	7876.355
1987	0.4297	0.4509	1.0000	-0.0212	-0.0230	5639.284
1988	0.3065	0.1840	1.0000	0.1225	0.1326	4317.952
1989	0.3238	0.0286	1.0000	0.2953	0.3194	3696.433
1990	0.2534	-0.3166	1.0000	0.5700	0.6166	2617.388
1991	-0.3144	-0.6150	1.0000	0.3007	0.3253	1942.116
1992	-0.3686	-0.4838	1.0000	0.1152	0.1246	2214.542

Partial variance for this index is 0.149755

Index 41 CNCPUE 8
 Index is tuned to the sum of mean full stock sizes (in number)
 for ages: 8

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.3957	-1.3997	1.0000	0.0040	0.0043	426.798
1975	-1.4833	-0.9114	1.0000	-0.5719	-0.6186	695.447
1976	-1.1835	-0.6651	1.0000	-0.5184	-0.5607	889.689
1977	-0.2034	-0.3857	1.0000	0.1823	0.1972	1176.533
1978	-0.6292	-0.6250	1.0000	-0.0042	-0.0046	926.084
1979	-0.5267	0.0561	1.0000	-0.5828	-0.6304	1830.020
1980	-0.7749	-0.0277	1.0000	-0.7472	-0.8083	1682.920
1981	0.1427	0.1596	1.0000	-0.0169	-0.0183	2029.520
1982	0.8751	0.2353	1.0000	0.6397	0.6920	2189.262
1983	0.5301	0.3576	1.0000	0.1725	0.1866	2473.988
1984	-0.6183	-0.1634	1.0000	-0.4548	-0.4920	1469.330
1985	-1.6879	-1.1308	1.0000	-0.5571	-0.6027	558.488
1986	-0.5540	-0.7911	1.0000	0.2370	0.2564	784.407
1987	0.9506	0.7255	1.0000	0.2251	0.2435	3574.275
1988	0.7345	0.4355	1.0000	0.2990	0.3235	2674.443
1989	0.3808	0.1832	1.0000	0.1975	0.2137	2078.131
1990	0.5177	-0.1061	1.0000	0.6238	0.6748	1556.009
1991	-0.2130	-0.5435	1.0000	0.3306	0.3576	1004.716
1992	-0.4343	-0.9761	1.0000	0.5418	0.5861	651.901

Partial variance for this index is 0.196787

Index 42 CNCPUE 9
 Index is tuned to the sum of mean full stock sizes (in number)
 for ages: 9

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-1.4671	-1.3880	1.0000	-0.0791	-0.0856	240.930
1975	-1.8254	-1.4547	1.0000	-0.3707	-0.4010	225.381
1976	-2.1681	-0.7753	1.0000	-1.3929	-1.5067	444.621
1977	-0.9397	-0.6338	1.0000	-0.3059	-0.3309	512.187
1978	-0.4941	-0.7075	1.0000	0.2133	0.2308	475.815
1979	-1.4581	-0.7681	1.0000	-0.6899	-0.7463	447.805
1980	-0.5234	0.1430	1.0000	-0.6665	-0.7209	1113.779
1981	-0.3531	0.0697	1.0000	-0.4229	-0.4574	1035.044
1982	0.6083	0.0296	1.0000	0.5787	0.6260	994.322
1983	0.6065	0.0289	1.0000	0.5776	0.6248	993.626
1984	0.0832	0.4230	1.0000	-0.3398	-0.3676	1473.635
1985	-0.8851	-0.0340	1.0000	-0.8511	-0.9206	933.071
1986	-1.1031	-1.1691	1.0000	0.0660	0.0714	299.877
1987	-0.5651	-1.1416	1.0000	0.5765	0.6236	308.238
1988	1.3305	0.4153	1.0000	0.9151	0.9899	1462.347
1989	0.8573	0.2409	1.0000	0.6164	0.6667	1228.340
1990	0.8138	-0.0097	1.0000	0.8235	0.8908	956.040
1991	-0.3006	-0.3634	1.0000	0.0628	0.0679	671.222
1992	-0.2770	-0.9658	1.0000	0.6889	0.7451	367.470

Partial variance for this index is 0.422675

Index 43 USCPUEAG
 Index is tuned to the sum of mean full stock sizes (in weight)
 for ages: 6 7 8 9 10 11

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	0.0983	-0.6423	1.0000	0.7406	0.8011	27847.730
1975	0.2207	-0.3747	1.0000	0.5954	0.6440	36394.003
1976	0.0774	-0.4027	1.0000	0.4801	0.5193	35386.514
1977	0.4731	-0.1091	1.0000	0.5822	0.6298	47465.197
1978	0.4130	-0.1307	1.0000	0.5437	0.5881	46448.561
1979	0.1569	-0.0043	1.0000	0.1613	0.1744	52707.175
1980	0.2885	0.2769	1.0000	0.0116	0.0126	69819.641
1981	0.0440	0.4089	1.0000	-0.3649	-0.3947	79677.494
1982	0.1569	0.2253	1.0000	-0.0684	-0.0739	66311.020
1983	0.3009	-0.2265	1.0000	0.5274	0.5705	42205.212
1984	0.2207	-0.2641	1.0000	0.4848	0.5245	40646.666
1985	-0.1831	0.3638	1.0000	-0.5469	-0.5916	76164.528
1986	-0.1511	0.4287	1.0000	-0.5798	-0.6272	81267.021
1987	-0.5651	0.2515	1.0000	-0.8166	-0.8833	68072.715
1988	-0.7365	0.1782	1.0000	-0.9147	-0.9895	63262.880
1989	-0.6981	-0.0302	1.0000	-0.6679	-0.7225	51360.562
1990	-0.6024	-0.2502	1.0000	-0.3522	-0.3810	41216.522
1991	-0.4062	-0.4504	1.0000	0.0442	0.0478	33737.909
1992	-0.3785	-0.5186	1.0000	0.1401	0.1515	31515.544

Partial variance for this index is 0.290105

Index 44 CNCPUEAG
 Index is tuned to the sum of mean full stock sizes (in weight)
 for ages: 6 7 8 9 10 11

SORTED BY YEAR

Yr	Observed	Pred	Weight	Wt Res	Std Res	Pred Stocksize
1974	-0.3791	-0.6054	1.0000	0.2263	0.2448	27847.730
1975	-0.3202	-0.3377	1.0000	0.0175	0.0189	36394.003
1976	-0.5257	-0.3658	1.0000	-0.1599	-0.1729	35386.514
1977	-0.2120	-0.0721	1.0000	-0.1399	-0.1513	47465.197
1978	-0.0801	-0.0938	1.0000	0.0137	0.0148	46448.561
1979	0.1226	0.0326	1.0000	0.0900	0.0974	52707.175
1980	-0.0254	0.3138	1.0000	-0.3392	-0.3669	69819.641
1981	0.0464	0.4458	1.0000	-0.3995	-0.4321	79677.494
1982	0.3141	0.2622	1.0000	0.0519	0.0561	66311.020
1983	0.0852	-0.1896	1.0000	0.2748	0.2973	42205.212
1984	0.3216	-0.2272	1.0000	0.5488	0.5937	40646.666
1985	-0.0044	0.4008	1.0000	-0.4051	-0.4382	76164.528
1986	0.2676	0.4656	1.0000	-0.1980	-0.2142	81267.021
1987	0.0947	0.2884	1.0000	-0.1937	-0.2096	68072.715
1988	0.1762	0.2152	1.0000	-0.0390	-0.0421	63262.880
1989	0.1041	0.0067	1.0000	0.0974	0.1053	51360.562
1990	0.1318	-0.2133	1.0000	0.3451	0.3733	41216.522
1991	-0.4744	-0.4135	1.0000	-0.0609	-0.0658	33737.909
1992	-0.2120	-0.4817	1.0000	0.2696	0.2917	31515.544

Partial variance for this index is 0.067618

Standardized residuals by index & yr; with row/column/grand means

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	-99.0000	-99.0000	-99.0000	-99.0000	-0.1460	0.7917	-0.6653	0.4291	0.4024	0.2331	0.4506	0.5713
2	-99.0000	-99.0000	-99.0000	-99.0000	0.8434	0.5131	-0.2299	0.0359	0.4358	-0.9350	0.8056	0.2124
3	-99.0000	-99.0000	-99.0000	-99.0000	0.2836	0.5851	0.2726	-1.0673	1.2029	-1.3320	0.7390	1.2255
4	-99.0000	-99.0000	-99.0000	-99.0000	-0.3975	-0.1012	0.3696	0.5003	1.6018	-0.3254	0.0680	0.4234
5	-99.0000	-99.0000	-99.0000	-99.0000	0.5957	-0.4794	0.2634	0.5538	0.1891	-0.2436	-0.2890	-0.0542
6	-99.0000	-99.0000	-99.0000	-99.0000	0.6084	0.4730	0.5475	0.6328	-0.1865	-0.0962	0.6010	-0.8601
7	-99.0000	-99.0000	-99.0000	-99.0000	0.4483	1.0406	1.6256	0.7216	0.5987	0.7877	0.1343	-0.3079
8	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	1.4537	1.7049	-0.4489	0.7660	1.2183	-0.4884	-0.1632
9	-99.0000	-99.0000	-99.0000	-99.0000	-0.7579	1.7273	1.0235	-0.3036	0.7165	0.5344	-0.1563	0.4508
10	-99.0000	-99.0000	-99.0000	-99.0000	-1.1051	-3.1268	-2.1310	-0.0032	-3.3516	-99.0000	2.6292	-1.0802
11	-99.0000	-99.0000	-99.0000	-99.0000	0.2765	-3.3508	-1.0010	0.0707	-1.9804	-1.6661	2.4167	-0.6717
12	-99.0000	-99.0000	-99.0000	-99.0000	-0.8962	-1.2112	0.1409	0.1989	-0.6636	-0.8393	1.6726	-1.4076
13	-99.0000	-99.0000	-99.0000	-99.0000	-1.2520	-0.9336	-0.0208	1.0275	-0.1742	-0.7518	1.1823	-0.6254
14	-99.0000	-99.0000	-99.0000	-99.0000	-1.2110	-0.4810	-0.3756	0.5928	-0.4694	-0.3218	0.2516	-0.8779
15	-99.0000	-99.0000	-99.0000	-99.0000	-0.0702	-1.4857	0.5150	-0.4176	-0.3903	-0.4604	0.4688	-0.6599
16	-99.0000	-99.0000	-99.0000	-99.0000	0.1208	-0.3344	0.2228	0.4039	-0.5326	-0.7232	-0.2177	-0.4467
17	-99.0000	-99.0000	-99.0000	-99.0000	0.6494	0.0659	-0.4768	0.3663	-0.4312	-2.0623	-0.5902	-0.3847
18	-99.0000	-99.0000	-99.0000	-99.0000	-0.1291	-1.1040	0.4658	-0.1596	-0.9026	-0.1415	0.1970	-0.5444
19	-99.0000	-99.0000	-99.0000	-99.0000	-0.7882	-99.0000	0.7446	-1.6572	-0.3429	0.3406	-1.8186	-0.6201
20	-99.0000	-99.0000	-99.0000	-99.0000	1.5687	-0.0690	-0.7374	-1.7584	-0.1335	0.5541	-0.4123	-2.1531
21	-99.0000	-99.0000	-99.0000	-99.0000	0.4201	0.6783	-1.1652	0.2271	0.4284	-1.7786	0.9620	-1.1592
22	-99.0000	-99.0000	-99.0000	-99.0000	0.5120	0.9840	-0.3802	1.9300	0.8567	-1.6611	0.4623	-0.8682
23	-99.0000	-99.0000	-99.0000	-99.0000	0.7045	0.2518	0.1079	2.8289	1.8170	-0.2074	0.1697	-0.4706
24	-99.0000	-99.0000	-99.0000	-99.0000	1.5348	0.6691	-0.4448	2.5274	1.5920	0.4687	0.4213	-0.7338
25	-99.0000	-99.0000	-99.0000	-99.0000	1.6997	1.2310	1.0007	1.9054	1.7560	0.7809	0.1973	-0.2449
26	-99.0000	-99.0000	-99.0000	-99.0000	1.5021	-0.5091	-1.1107	1.4343	1.0331	0.9965	0.1669	0.6486
27	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	0.2637	-0.4401	0.4124	1.0772	1.0090	0.5596	0.0482
28	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-1.3375	-0.8087	3.3954	2.0210
29	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	0.6095	-0.7317	1.5380	2.0668
30	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	-99.0000	0.1185	0.6859	0.9663	-99.0000
31	-99.0000	-99.0000	-99.0000	-99.0000	0.9408	0.8302	0.9190	0.5833	-0.7342	0.1791	0.9648	0.9466
32	-99.0000	-99.0000	-99.0000	-99.0000	0.5413	0.5397	0.8479	0.5975	-0.2204	-0.2474	0.0471	0.7109
33	-99.0000	-99.0000	-99.0000	-99.0000	0.3800	0.6682	0.3096	0.7182	0.4774	-0.3071	-0.0108	-0.5473
34	-99.0000	-99.0000	-99.0000	-99.0000	0.1713	0.7753	0.2937	0.9671	1.1080	-0.2025	0.2535	-0.6562
35	-99.0000	-99.0000	-99.0000	-99.0000	0.6390	0.4777	-0.1413	1.2568	1.4346	0.3435	-0.0099	-0.1676
36	-99.0000	-99.0000	-99.0000	-99.0000	0.1239	0.6741	-2.1226	1.1835	1.9531	0.9508	0.3511	-0.4105
37	-99.0000	-99.0000	-99.0000	-99.0000	0.3465	0.1095	-0.1912	0.2721	0.0633	0.5941	-0.3143	0.0410
38	-99.0000	-99.0000	-99.0000	-99.0000	-0.1277	0.0455	-0.1695	0.0013	0.2669	0.0767	0.0551	-0.2485
39	-99.0000	-99.0000	-99.0000	-99.0000	-0.2316	-0.0415	-0.4541	0.0577	-0.0449	-0.0194	-0.0662	0.1265
40	-99.0000	-99.0000	-99.0000	-99.0000	-0.5859	0.1814	-0.0580	0.0929	0.0536	-0.4646	-0.3892	0.2176
41	-99.0000	-99.0000	-99.0000	-99.0000	0.0043	-0.6186	-0.5607	0.1972	-0.0046	-0.6304	-0.8083	-0.0183
42	-99.0000	-99.0000	-99.0000	-99.0000	-0.0856	-0.4010	-1.5067	-0.3309	0.2308	-0.7463	-0.7209	-0.4574
43	-99.0000	-99.0000	-99.0000	-99.0000	0.8011	0.6440	0.5193	0.6298	0.5881	0.1744	0.0126	-0.3947
44	-99.0000	-99.0000	-99.0000	-99.0000	0.2448	0.0189	-0.1729	-0.1513	0.0148	0.0974	-0.3669	-0.4321
**	1.0000	1.0000	1.0000	1.0000	0.2097	0.0361	-0.0649	0.4161	0.2157	-0.1786	0.3518	-0.1850

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	*****
1	1.9998	-1.2076	-0.5340	0.2822	-0.0452	1.6873	-1.9413	-0.4583	-1.1844	-0.5644	-0.1011	-99.0000	-0.0000
2	0.6536	-2.8583	-0.8693	0.1158	-0.8921	3.0124	-1.1261	-0.1988	0.1512	0.3803	-0.0501	-99.0000	-0.0000
3	1.9566	-3.3221	-1.0601	0.1296	-0.4493	3.0163	-2.9476	0.7835	-0.1733	1.0209	-0.8638	-99.0000	0.0000
4	1.3722	-2.2366	-1.0639	0.9434	-0.1135	0.6071	-1.6550	1.1878	-2.2706	1.3765	-0.2863	-99.0000	0.0000
5	0.9607	-99.0000	-0.3830	0.5821	0.2153	-0.1903	-1.7288	0.4900	-0.7901	0.6721	-0.3639	-99.0000	0.0000
6	-0.5088	-0.5248	0.3611	1.0069	0.2701	-0.8838	-1.4690	0.0640	-0.9923	0.7659	0.1907	-99.0000	0.0000
7	0.2906	-1.0909	-0.4544	-0.9732	0.9257	-0.5979	-1.9954	0.2275	-1.4577	-0.3346	0.4114	-99.0000	0.0000
8	-0.2504	-1.9845	-0.5099	0.4754	1.0912	0.3105	-1.0226	-0.5060	-0.8008	0.1427	-0.9881	-99.0000	0.0000
9	-1.8520	-0.8979	-0.4664	-0.3373	-0.2613	-99.0000	1.0163	0.3367	-1.0915	-99.0000	0.3186	-99.0000	-0.0000
10	-0.3157	-0.4922	0.6785	2.5504	1.5153	1.2563	-1.5653	-1.4946	3.8591	2.2271	-0.0502	-99.0000	-0.0000
11	0.6902	0.0129	-1.1368	1.8499	0.2583	1.6823	-0.0854	-1.2265	2.4736	0.1772	1.2104	-99.0000	-0.0000
12	-0.5825	-0.2630	-0.7325	1.3396	-0.3294	1.6781	0.4256	-0.1362	1.6990	-0.1477	0.0546	-99.0000	0.0000
13	-0.7494	-1.2430	-0.3874	0.6373	-0.4138	1.3567	0.8108	-0.0275	1.5844	0.4954	-0.5154	-99.0000	0.0000
14	-0.4279	-1.3488	-0.4004	0.4729	0.0634	0.9038	0.7510	0.3361	1.3271	0.8753	0.3397	-99.0000	0.0000
15	-1.0291	-1.3954	0.5863	0.5909	-0.0399	0.8627	1.2449	0.8897	0.4366	0.5630	-0.2094	-99.0000	0.0000
16	-1.0606	-0.5750	0.5927	0.2257	-0.7148	0.8156	0.8003	0.3959	0.2211	1.0133	-0.2072	-99.0000	0.0000
17	-0.1507	0.1145	1.2309	0.5067	-1.5255	0.1250	1.0572	0.5642	0.4360	0.7511	-0.2458	-99.0000	0.0000
18	-0.5147	-0.5032	1.5776	0.7401	-0.0127	1.5156	0.5982	0.1231	-0.5615	-0.1458	-0.4983	-99.0000	-0.0000
19	-0.7452	-0.3808	1.4066	0.4453	2.2246	0.8224	-0.2900	0.1216	1.6473	-0.9653	-0.1447	-99.0000	-0.0000
20	2.6338	-99.0000	-1.6487	-0.0277	-0.8471	0.7542	0.4713	0.3910	1.5434	-0.5658	0.2788	0.1578	-0.0000
21	2.8847	0.2217	-1.5067	-2.1610	-0.9614	0.2190	-0.7062	2.1409	1.2850	0.2755	-0.4804	0.1760	-0.0000
22	1.7272	1.4999	-2.3250	-3.3733	-0.9792	-0.5146	-99.0000	2.3880	-0.0716	0.2281	0.2003	-0.6152	0.0000
23	0.9332	-0.8986	0.1311	-3.6165	-0.5174	-0.8118	-1.2147	1.3045	-99.0000	-0.1375	-0.2883	-0.0859	0.0000
24	0.1094	-0.0873	-0.7010	-0.5523	-1.0935	-1.3235	-1.7813	1.9456	-99.0000	-1.8614	-0.3630	-0.3265	0.0000
25	-1.0015	-1.0278	0.0472	-99.0000	-1.3880	-1.5261	-0.4328	-0.2925	-99.0000	-0.5827	-1.2665	-0.8553	0.0000
26	-99.0000	-1.4565	-0.2233	-99.0000	-99.0000	-99.0000	-0.8058	0.4606	-1.4612	-0.6317	-99.0000	-0.0438	-0.0000
27	-99.0000	-1.1731	-0.7416	-1.8009	-99.0000	-99.0000	1.0523	0.0615	-99.0000	-0.3282	-99.0000	-99.0000	-0.0000
28	-99.0000	3.7050	-99.0000	-1.9797	-2.9606	-2.5207	-99.0000	0.4857	-99.0000	-99.0000	-99.0000	-99.0000	-0.0000
29	-0.7959	1.1955	-1.9374	-0.9383	-99.0000	-1.1665	0.0232	1.5808	-0.2942	-1.2878	0.1381	-99.0000	-0.0000
30	-99.0000	-0.3209	-99.0000	-99.0000	-99.0000	-99.0000	-0.2550	2.2355	-1.6263	-0.6868	-1.1172	-99.0000	-0.0000
31	0.4412	0.1207	0.1375	-1.1612	0.0088	-1.0649	-0.9839	-0.3175	-0.0596	-0.4679	-1.2827	-99.0000	0.0000
32	0.5512	0.5597	0.1665	-0.5589	-1.1666	-0.3211	-0.9145	-0.5491	-0.1533	-0.0409	-0.3897	-99.0000	0.0000
33	0.6290	0.6041	0.4887	-0.4499	-0.4213	-1.5397	-0.1954	-0.7417	-0.6005	0.2951	0.2433	-99.0000	0.0000
34	-0.2754	0.6221	0.0809	-0.2394	-0.4728	-1.0116	-0.9740	-0.2671	-0.6753	-0.1592	0.6616	-99.0000	0.0000
35	0.2833	-0.2273	-0.1211	-0.3313	-0.0769	-1.0445	-1.0750	-0.7619	-0.5100	-0.3218	0.3538	-99.0000	0.0000
36	0.6183	0.4846	-0.3223	-0.6069	-0.1928	0.0847	-0.8947	-1.0714	-0.7500	0.0858	-0.1387	-99.0000	0.0000
37	0.3617	0.4836	0.1319	-0.6404	-0.3032	-0.2543	0.0426	0.1838	0.0636	-0.7194	-0.2706	-99.0000	0.0000
38	0.1609	-0.1263	0.3189	-0.4200	-0.0078	-0.0266	0.2203	0.3820	0.3008	-0.2189	-0.4831	-99.0000	0.0000
39	0.4471	-0.6111	-0.3770	-0.0590	0.0399	0.0656	0.2184	0.2061	0.5757	0.2113	-0.0436	-99.0000	0.0000
40	0.5018	-0.4555	-1.0615	0.2640	0.2079	-0.0230	0.1326	0.3194	0.6166	0.3253	0.1246	-99.0000	0.0000
41	0.6920	0.1866	-0.4920	-0.6027	0.2564	0.2435	0.3235	0.2137	0.6748	0.3576	0.5861	-99.0000	0.0000
42	0.6260	0.6248	-0.3676	-0.9206	0.0714	0.6236	0.9899	0.6667	0.8908	0.0679	0.7451	-99.0000	0.0000
43	-0.0739	0.5705	0.5245	-0.5916	-0.6272	-0.8833	-0.9895	-0.7225	-0.3810	0.0478	0.1515	-99.0000	0.0000
44	0.0561	0.2973	0.5937	-0.4382	-0.2142	-0.2096	-0.0421	0.1053	0.3733	-0.0658	0.2917	-99.0000	0.0000
**	0.2812	-0.3668	-0.2564	-0.2347	-0.2470	0.1432	-0.4027	0.2686	0.1091	0.0505	-0.1060	-0.2276	0.0000

-99 in the above table indicates a missing value

Percent of total sum of squares by index & yr; with row/column sums

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	-99.00	-99.00	-99.00	-99.00	0.00	0.08	0.06	0.02	0.02	0.01	0.03	0.04	0.54	0.20	0.04
2	-99.00	-99.00	-99.00	-99.00	0.10	0.04	0.01	0.00	0.03	0.12	0.09	0.01	0.06	1.10	0.10
3	-99.00	-99.00	-99.00	-99.00	0.01	0.05	0.01	0.15	0.19	0.24	0.07	0.20	0.51	1.48	0.15
4	-99.00	-99.00	-99.00	-99.00	0.02	0.00	0.02	0.03	0.34	0.01	0.00	0.02	0.25	0.67	0.15
5	-99.00	-99.00	-99.00	-99.00	0.05	0.03	0.01	0.04	0.00	0.01	0.01	0.00	0.12	-99.00	0.02
6	-99.00	-99.00	-99.00	-99.00	0.05	0.03	0.04	0.05	0.00	0.00	0.05	0.10	0.03	0.04	0.02
7	-99.00	-99.00	-99.00	-99.00	0.03	0.15	0.36	0.07	0.05	0.08	0.00	0.01	0.01	0.16	0.03
8	-99.00	-99.00	-99.00	-99.00	-99.00	0.28	0.39	0.03	0.08	0.20	0.03	0.00	0.01	0.53	0.03
9	-99.00	-99.00	-99.00	-99.00	0.08	0.40	0.14	0.01	0.07	0.04	0.00	0.03	0.46	0.11	0.03
10	-99.00	-99.00	-99.00	-99.00	0.16	1.31	0.61	0.00	1.51	-99.00	0.93	0.16	0.01	0.03	0.06
11	-99.00	-99.00	-99.00	-99.00	0.01	1.51	0.13	0.00	0.53	0.37	0.78	0.06	0.06	0.00	0.17
12	-99.00	-99.00	-99.00	-99.00	0.11	0.20	0.00	0.01	0.06	0.09	0.38	0.27	0.05	0.01	0.07
13	-99.00	-99.00	-99.00	-99.00	0.21	0.12	0.00	0.14	0.00	0.08	0.19	0.05	0.08	0.21	0.02
14	-99.00	-99.00	-99.00	-99.00	0.20	0.03	0.02	0.05	0.03	0.01	0.01	0.10	0.02	0.24	0.02
15	-99.00	-99.00	-99.00	-99.00	0.00	0.30	0.04	0.02	0.02	0.03	0.03	0.06	0.14	0.26	0.05
16	-99.00	-99.00	-99.00	-99.00	0.00	0.02	0.01	0.02	0.04	0.07	0.01	0.03	0.15	0.04	0.05
17	-99.00	-99.00	-99.00	-99.00	0.06	0.00	0.03	0.02	0.02	0.57	0.05	0.02	0.00	0.00	0.20
18	-99.00	-99.00	-99.00	-99.00	0.00	0.16	0.03	0.00	0.11	0.00	0.01	0.04	0.04	0.03	0.33
19	-99.00	-99.00	-99.00	-99.00	0.08	-99.00	0.07	0.37	0.02	0.02	0.44	0.05	0.07	0.02	0.27
20	-99.00	-99.00	-99.00	-99.00	0.33	0.00	0.07	0.42	0.00	0.04	0.02	0.62	0.93	-99.00	0.37
21	-99.00	-99.00	-99.00	-99.00	0.02	0.06	0.18	0.01	0.02	0.43	0.12	0.18	1.12	0.01	0.31
22	-99.00	-99.00	-99.00	-99.00	0.04	0.13	0.02	0.50	0.10	0.37	0.03	0.10	0.40	0.30	0.73
23	-99.00	-99.00	-99.00	-99.00	0.07	0.01	0.00	1.08	0.44	0.01	0.00	0.03	0.12	0.11	0.00
24	-99.00	-99.00	-99.00	-99.00	0.32	0.06	0.03	0.86	0.34	0.03	0.02	0.07	0.00	0.00	0.07
25	-99.00	-99.00	-99.00	-99.00	0.39	0.20	0.13	0.49	0.41	0.08	0.01	0.01	0.13	0.14	0.00
26	-99.00	-99.00	-99.00	-99.00	0.30	0.03	0.17	0.28	0.14	0.13	0.00	0.06	-99.00	0.29	0.01
27	-99.00	-99.00	-99.00	-99.00	-99.00	0.01	0.03	0.02	0.16	0.14	0.04	0.00	-99.00	0.18	0.07
28	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	0.24	0.09	1.55	0.55	-99.00	1.84	-99.00
29	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	0.05	0.07	0.32	0.57	0.09	0.19	0.50
30	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	0.00	0.06	0.13	-99.00	-99.00	0.01	-99.00
31	-99.00	-99.00	-99.00	-99.00	0.12	0.09	0.11	0.05	0.07	0.00	0.13	0.12	0.03	0.00	0.00
32	-99.00	-99.00	-99.00	-99.00	0.04	0.04	0.10	0.05	0.01	0.01	0.00	0.07	0.04	0.04	0.00
33	-99.00	-99.00	-99.00	-99.00	0.02	0.06	0.01	0.07	0.03	0.01	0.00	0.04	0.05	0.05	0.03
34	-99.00	-99.00	-99.00	-99.00	0.00	0.08	0.01	0.13	0.17	0.01	0.01	0.06	0.01	0.05	0.00
35	-99.00	-99.00	-99.00	-99.00	0.05	0.03	0.00	0.21	0.28	0.02	0.00	0.00	0.01	0.01	0.00
36	-99.00	-99.00	-99.00	-99.00	0.00	0.06	0.61	0.19	0.51	0.12	0.02	0.02	0.05	0.03	0.01
37	-99.00	-99.00	-99.00	-99.00	0.02	0.00	0.00	0.01	0.00	0.05	0.01	0.00	0.02	0.03	0.00
38	-99.00	-99.00	-99.00	-99.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01
39	-99.00	-99.00	-99.00	-99.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.02
40	-99.00	-99.00	-99.00	-99.00	0.05	0.00	0.00	0.00	0.00	0.03	0.02	0.01	0.03	0.03	0.15
41	-99.00	-99.00	-99.00	-99.00	0.00	0.05	0.04	0.01	0.00	0.05	0.09	0.00	0.06	0.00	0.03
42	-99.00	-99.00	-99.00	-99.00	0.00	0.02	0.31	0.01	0.01	0.07	0.07	0.03	0.05	0.05	0.02
43	-99.00	-99.00	-99.00	-99.00	0.09	0.06	0.04	0.05	0.05	0.00	0.00	0.02	0.00	0.04	0.04
44	-99.00	-99.00	-99.00	-99.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.01	0.05
**	0.00	0.00	0.00	0.00	3.04	5.71	3.87	5.47	6.18	3.78	5.71	3.86	5.82	8.63	4.25

	1985	1986	1987	1988	1989	1990	1991	1992	1993*****	
1	0.01	0.00	0.38	0.51	0.03	0.19	0.04	0.00	-99.00	2.20
2	0.00	0.11	1.22	0.17	0.01	0.00	0.02	0.00	-99.00	3.16
3	0.00	0.03	1.22	1.17	0.08	0.00	0.14	0.10	-99.00	5.82
4	0.12	0.00	0.05	0.37	0.19	0.69	0.25	0.01	-99.00	3.22
5	0.05	0.01	0.00	0.40	0.03	0.08	0.06	0.02	-99.00	0.95
6	0.14	0.01	0.10	0.29	0.00	0.13	0.08	0.00	-99.00	1.17
7	0.13	0.12	0.05	0.54	0.01	0.29	0.02	0.02	-99.00	2.10
8	0.03	0.16	0.01	0.14	0.03	0.09	0.00	0.13	-99.00	2.19
9	0.02	0.01	-99.00	0.14	0.02	0.16	-99.00	0.01	-99.00	1.72
10	0.87	0.31	0.21	0.33	0.30	2.00	0.67	0.00	-99.00	9.49
11	0.46	0.01	0.38	0.00	0.20	0.82	0.00	0.20	-99.00	5.71
12	0.24	0.01	0.38	0.02	0.00	0.39	0.00	0.00	-99.00	2.29
13	0.05	0.02	0.25	0.09	0.00	0.34	0.03	0.04	-99.00	1.91
14	0.03	0.00	0.11	0.08	0.02	0.24	0.10	0.02	-99.00	1.33
15	0.05	0.00	0.10	0.21	0.11	0.03	0.04	0.01	-99.00	1.48
16	0.01	0.07	0.09	0.09	0.02	0.01	0.14	0.01	-99.00	0.85
17	0.03	0.31	0.00	0.15	0.04	0.03	0.08	0.01	-99.00	1.63
18	0.07	0.00	0.31	0.05	0.00	0.04	0.00	0.03	-99.00	1.27
19	0.03	0.67	0.09	0.01	0.00	0.36	0.13	0.00	-99.00	2.70
20	0.00	0.10	0.08	0.03	0.02	0.32	0.04	0.01	0.00	3.41
21	0.63	0.12	0.01	0.07	0.62	0.22	0.01	0.03	0.00	4.17
22	1.53	0.13	0.04	-99.00	0.77	0.00	0.01	0.01	0.05	5.24
23	1.76	0.04	0.09	0.20	0.23	-99.00	0.00	0.01	0.00	4.19
24	0.04	0.16	0.24	0.43	0.51	-99.00	0.47	0.02	0.01	3.67
25	-99.00	0.26	0.31	0.03	0.01	-99.00	0.05	0.22	0.10	2.97
26	-99.00	-99.00	-99.00	0.09	0.03	0.29	0.05	-99.00	0.00	1.87
27	0.44	-99.00	-99.00	0.15	0.00	-99.00	0.01	-99.00	-99.00	1.25
28	0.53	1.18	0.85	-99.00	0.03	-99.00	-99.00	-99.00	-99.00	6.86
29	0.12	-99.00	0.18	0.00	0.34	0.01	0.22	0.00	-99.00	2.67
30	-99.00	-99.00	-99.00	0.01	0.67	0.36	0.06	0.17	-99.00	1.47
31	0.18	0.00	0.15	0.13	0.01	0.00	0.03	0.22	-99.00	1.45
32	0.04	0.18	0.01	0.11	0.04	0.00	0.00	0.02	-99.00	0.81
33	0.03	0.02	0.32	0.01	0.07	0.05	0.01	0.01	-99.00	0.90
34	0.01	0.03	0.14	0.13	0.01	0.06	0.00	0.06	-99.00	0.96
35	0.01	0.00	0.15	0.16	0.08	0.03	0.01	0.02	-99.00	1.08
36	0.05	0.00	0.00	0.11	0.15	0.08	0.00	0.00	-99.00	2.02
37	0.06	0.01	0.01	0.00	0.00	0.00	0.07	0.01	-99.00	0.31
38	0.02	0.00	0.00	0.01	0.02	0.01	0.01	0.03	-99.00	0.14
39	0.00	0.00	0.00	0.01	0.01	0.04	0.01	0.00	-99.00	0.20
40	0.01	0.01	0.00	0.00	0.01	0.05	0.01	0.00	-99.00	0.42
41	0.05	0.01	0.01	0.01	0.01	0.06	0.02	0.05	-99.00	0.55
42	0.11	0.00	0.05	0.13	0.06	0.11	0.00	0.07	-99.00	1.19
43	0.05	0.05	0.10	0.13	0.07	0.02	0.00	0.00	-99.00	0.81
44	0.03	0.01	0.01	0.00	0.00	0.02	0.00	0.01	-99.00	0.19
**	8.02	4.15	7.71	6.67	4.86	7.62	2.91	1.58	0.17	100.00

-99 in the above table indicates a missing value

Partial variance (and proportion of total) by index

	1	2	3	4	5	6	7	8	9	10	
**	0.78570253	1.12578203	2.07567420	1.14877551	0.35881450	0.41873462	0.74827943	0.82572062	0.69052102	3.58132844	
**	0.01935130	0.02772722	0.05112239	0.02829353	0.00883735	0.01031314	0.01842959	0.02033692	0.01700705	0.08820559	
	11	12	13	14	15	16	17	18	19	20	
**	2.03657118	0.81570016	0.68185379	0.47303719	0.52734877	0.30382053	0.58077414	0.45304379	1.02077380	1.21451594	
**	0.05015931	0.02009012	0.01679358	0.01165057	0.01298823	0.00748289	0.01430406	0.01115815	0.02514094	0.02991267	
	21	22	23	24	25	26	27	28	29	30	
**	1.40688932	1.86726839	1.49248510	1.30696936	1.12117618	0.85727412	0.67232686	5.56490964	1.32211419	1.19333361	
**	0.03465069	0.04598950	0.03675886	0.03218973	0.02761378	0.02111406	0.01655894	0.13705980	0.03256274	0.02939097	
	31	32	33	34	35	36	37	38	39	40	41
**	0.51754784	0.28807831	0.31948430	0.34145893	0.38410080	0.72127372	0.10918744	0.05154007	0.07092582	0.14975529	0.19678683
**	0.01274684	0.00709517	0.00786867	0.00840989	0.00946013	0.01776446	0.00268921	0.00126940	0.00174685	0.00368837	0.00484672
	42	43	44*****								
**	0.42267479	0.29010468	0.06761824	40.60205602							
**	0.01041018	0.00714507	0.00166539	1.00000000							

STOCK NUMBERS (Jan 1) in thousands - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	50478	32583	63398	32012	44396	56912	71486	42420	11275	27661	118757	71783	51252	68739	40940
2	29149	41328	26676	51905	26209	36349	46595	58528	34731	9231	22647	97230	58771	41961	56279
3	11876	23352	32463	21119	41440	21222	29525	37937	47868	28331	7287	18215	78279	47904	34280
4	7835	9190	16922	24615	14851	27294	16076	22191	29476	37790	19497	5329	12425	59471	36738
5	5346	5019	5360	11452	11891	9042	17553	10370	14749	20859	24166	12527	3184	8138	38532
6	3061	3147	2298	2712	4600	6990	5081	9563	6280	8744	13026	13630	6770	1841	4973
7	2442	1699	1151	1046	1567	2536	3551	2844	5133	3434	5183	6959	6915	3190	1125
8	656	1378	902	505	595	917	1135	1693	1380	2317	2119	2791	3210	3289	1826
9	524	118	919	639	321	294	513	683	777	585	1417	1311	1421	1412	1806
10	141	237	94	431	291	176	168	383	373	265	334	858	801	663	667
11	110	4	187	53	274	148	67	124	240	168	161	174	460	417	292
12	20	4	263	18	151	128	180	749	527	481	276	405	551	826	675
1+	111639	118059	150632	146507	146585	162007	191930	187487	152809	139867	214870	231211	224038	237851	218134

	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	40830	50556	33663	59820	75242	37706	70636	2	0
2	33519	33429	41392	27561	48977	61603	30871	57832	1
3	45961	27230	27266	33806	22540	40033	50390	25003	47322
4	26910	35508	20866	21035	26731	17802	31121	39835	18612
5	25389	19434	23490	14260	14075	16795	11822	21459	27762
6	22707	15528	11891	12327	7924	7246	9108	6282	13893
7	2942	11321	8002	6109	5553	3932	3289	3293	3183
8	738	1147	5213	3795	2917	2309	1635	1025	1402
9	1162	411	508	2321	1800	1418	988	562	382
10	1185	736	211	169	847	793	607	431	224
11	372	651	365	98	76	285	382	207	172
12	475	621	638	423	190	230	517	187	157
1+	202189	196572	173504	181724	206872	190152	211366	156118	113110

Summaries for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	61141	85472	86971	114477	102038	104967	120264	144317	141007	111725	95837	159024	172236	168286	176520
3	31992	44144	60295	62572	75828	68619	73669	85789	106276	102494	73190	61794	113465	126325	120241
4	20116	20792	27832	41453	34389	47397	44144	47852	58408	74163	65903	43579	35186	78421	85961
5	12282	11602	10910	16838	19538	20103	28068	25661	28932	36372	46405	38249	22760	18949	49223
6	6935	6584	5550	5386	7647	11061	10515	15291	14183	15513	22240	25723	19576	10811	10691
2	160884	145395	139203	121481	131440	152216	140213	155930	112953						
3	127365	111966	97811	93920	82464	90613	109342	98098	112952						
4	81404	84736	70545	60115	59923	50580	58952	73094	65630						
5	54495	49228	49679	39080	33192	32778	27831	33259	47018						
6	29105	29794	26189	24820	19117	15983	16009	11800	19257						

FISHING MORTALITY - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.02	0.04	0.03	0.03	0.01	0.01	0.01	0.00	0.00	0.04	0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00
3	0.06	0.12	0.08	0.15	0.22	0.08	0.09	0.05	0.04	0.17	0.11	0.18	0.07	0.07	0.04	0.06	0.07	0.06	0.03	0.04	0.05	0.04	0.10
4	0.25	0.34	0.19	0.53	0.30	0.24	0.24	0.21	0.15	0.25	0.24	0.32	0.22	0.23	0.17	0.13	0.21	0.18	0.20	0.26	0.21	0.17	0.16
5	0.33	0.58	0.48	0.71	0.33	0.38	0.41	0.30	0.32	0.27	0.37	0.42	0.35	0.29	0.33	0.29	0.29	0.44	0.39	0.46	0.41	0.43	0.23
6	0.39	0.81	0.59	0.35	0.40	0.48	0.38	0.42	0.40	0.32	0.43	0.48	0.55	0.29	0.33	0.50	0.46	0.47	0.60	0.50	0.59	0.82	0.48
7	0.37	0.43	0.62	0.36	0.34	0.60	0.54	0.52	0.60	0.28	0.42	0.57	0.54	0.36	0.22	0.74	0.58	0.55	0.54	0.68	0.68	0.97	0.65
8	1.52	0.21	0.14	0.26	0.50	0.38	0.31	0.58	0.66	0.29	0.28	0.48	0.62	0.40	0.25	0.38	0.62	0.61	0.55	0.52	0.65	0.87	0.79
9	0.59	0.03	0.56	0.59	0.40	0.36	0.09	0.41	0.88	0.36	0.30	0.29	0.56	0.55	0.22	0.26	0.47	0.90	0.81	0.62	0.65	0.63	0.72
10	3.28	0.04	0.37	0.25	0.48	0.77	0.10	0.27	0.59	0.30	0.45	0.42	0.45	0.62	0.39	0.40	0.50	0.56	0.60	0.89	0.53	0.88	0.72
11	0.58	0.29	0.44	0.37	0.40	0.54	0.43	0.51	0.64	0.30	0.37	0.51	0.57	0.43	0.25	0.52	0.58	0.59	0.60	0.65	0.66	0.90	0.72
12	0.58	0.29	0.44	0.37	0.40	0.54	0.43	0.51	0.64	0.30	0.37	0.51	0.57	0.43	0.25	0.52	0.58	0.59	0.60	0.65	0.66	0.90	0.72

Avg F for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	0.74	0.29	0.35	0.36	0.34	0.38	0.26	0.33	0.43	0.26	0.30	0.37	0.39	0.32	0.22	0.33	0.38	0.44	0.43	0.46	0.44	0.57	0.46
3	0.82	0.32	0.39	0.40	0.37	0.42	0.29	0.36	0.48	0.28	0.33	0.41	0.44	0.36	0.24	0.36	0.42	0.48	0.48	0.51	0.49	0.63	0.51
4	0.91	0.34	0.42	0.43	0.39	0.47	0.31	0.40	0.53	0.30	0.36	0.44	0.48	0.40	0.27	0.40	0.46	0.54	0.53	0.57	0.55	0.71	0.56
5	1.01	0.34	0.46	0.41	0.41	0.50	0.32	0.43	0.58	0.30	0.37	0.45	0.52	0.42	0.28	0.44	0.50	0.59	0.58	0.62	0.60	0.78	0.62
6	1.12	0.30	0.45	0.36	0.42	0.52	0.31	0.45	0.63	0.31	0.38	0.46	0.55	0.44	0.28	0.47	0.53	0.61	0.61	0.64	0.63	0.84	0.68

Avg F (weighted by N) for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	0.15	0.17	0.14	0.24	0.20	0.17	0.15	0.12	0.13	0.22	0.25	0.15	0.12	0.14	0.13	0.18	0.21	0.21	0.21	0.20	0.15	0.19	0.13
3	0.26	0.28	0.18	0.42	0.27	0.25	0.24	0.19	0.17	0.24	0.32	0.37	0.18	0.19	0.19	0.22	0.27	0.30	0.27	0.31	0.25	0.24	0.21
4	0.38	0.46	0.31	0.56	0.33	0.33	0.35	0.31	0.28	0.27	0.34	0.45	0.42	0.26	0.26	0.31	0.34	0.40	0.41	0.41	0.41	0.41	0.25
5	0.46	0.56	0.50	0.60	0.36	0.44	0.41	0.39	0.43	0.29	0.39	0.47	0.53	0.36	0.32	0.41	0.43	0.49	0.52	0.53	0.52	0.67	0.36
6	0.57	0.54	0.51	0.36	0.39	0.50	0.41	0.45	0.53	0.31	0.40	0.49	0.56	0.40	0.29	0.50	0.52	0.53	0.59	0.58	0.62	0.85	0.58

Avg F (wt by catch) for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	0.42	0.36	0.28	0.49	0.28	0.32	0.32	0.30	0.33	0.25	0.34	0.38	0.34	0.25	0.26	0.35	0.36	0.42	0.45	0.44	0.42	0.52	0.30
3	0.46	0.42	0.31	0.51	0.28	0.33	0.32	0.30	0.33	0.25	0.35	0.41	0.34	0.25	0.26	0.35	0.36	0.42	0.45	0.44	0.42	0.52	0.30
4	0.51	0.52	0.39	0.58	0.33	0.36	0.37	0.34	0.37	0.27	0.36	0.46	0.47	0.28	0.28	0.39	0.38	0.45	0.47	0.46	0.47	0.57	0.33
5	0.61	0.62	0.52	0.64	0.36	0.46	0.42	0.41	0.46	0.29	0.39	0.47	0.54	0.37	0.32	0.44	0.45	0.50	0.54	0.55	0.53	0.72	0.43
6	0.77	0.66	0.56	0.38	0.40	0.51	0.44	0.46	0.56	0.31	0.41	0.50	0.56	0.42	0.29	0.52	0.52	0.54	0.60	0.60	0.63	0.85	0.60

BACKCALCULATED PARTIAL RECRUITMENT

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.05	0.05	0.04	0.02	0.01	0.01	0.00	0.00	0.10	0.04	0.03	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00
3	0.02	0.15	0.12	0.21	0.43	0.10	0.16	0.09	0.04	0.48	0.25	0.32	0.12	0.11	0.11	0.08	0.11	0.07	0.04	0.04	0.08	0.04	0.12
4	0.07	0.42	0.31	0.74	0.59	0.32	0.44	0.36	0.17	0.69	0.54	0.55	0.36	0.38	0.44	0.17	0.35	0.20	0.25	0.30	0.31	0.18	0.20
5	0.10	0.72	0.77	1.00	0.66	0.49	0.75	0.52	0.37	0.75	0.82	0.72	0.56	0.47	0.85	0.39	0.47	0.50	0.48	0.52	0.61	0.45	0.30
6	0.12	1.00	0.94	0.49	0.78	0.62	0.70	0.73	0.46	0.90	0.94	0.83	0.89	0.47	0.84	0.67	0.75	0.52	0.74	0.56	0.87	0.85	0.61
7	0.11	0.54	1.00	0.51	0.67	0.79	1.00	0.91	0.68	0.78	0.93	1.00	0.87	0.58	0.58	1.00	0.94	0.61	0.67	0.76	1.00	1.00	0.83
8	0.46	0.26	0.23	0.36	1.00	0.50	0.57	1.00	0.75	0.81	0.62	0.83	1.00	0.64	0.65	0.52	1.00	0.68	0.68	0.59	0.96	0.90	1.00
9	0.18	0.04	0.89	0.82	0.80	0.47	0.17	0.70	1.00	1.00	0.67	0.51	0.91	0.89	0.58	0.35	0.76	1.00	1.00	0.70	0.96	0.65	0.92
10	1.00	0.05	0.59	0.35	0.95	1.00	0.19	0.46	0.68	0.83	1.00	0.74	0.73	1.00	1.00	0.54	0.82	0.63	0.74	1.00	0.78	0.91	0.92
11	0.18	0.36	0.70	0.53	0.78	0.71	0.79	0.88	0.73	0.82	0.82	0.89	0.91	0.69	0.66	0.71	0.94	0.66	0.74	0.73	0.98	0.93	0.92
12	0.18	0.36	0.70	0.53	0.78	0.71	0.79	0.88	0.73	0.82	0.82	0.89	0.91	0.69	0.66	0.71	0.94	0.66	0.74	0.73	0.98	0.93	0.92

MEAN BIOMASS (MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	22875	14766	28730	14507	20119	25791	32396	19224	5109	12535	53817	32530	23226	31151	18553
2	15425	28639	25217	23238	19375	28224	25271	44006	26395	6001	19333	55944	31360	29253	38719
3	14456	33940	52746	22608	47426	23718	31591	37888	52436	28131	8698	22250	76659	48806	44451
4	13846	15060	38807	34102	22946	43912	24859	29148	44856	49974	30724	10329	25834	80090	66037
5	12657	11007	16636	19907	27766	21098	36443	21284	30783	45251	51147	27596	8580	19665	78705
6	8746	7938	8414	8266	14177	19551	14226	25133	18623	24035	33968	33943	19743	6047	13581
7	8889	6280	4668	3883	6137	8869	11565	9232	16357	12667	16269	21221	22007	11932	4726
8	1824	7070	4972	2530	2612	4534	4938	6671	5362	10340	9508	11852	11559	12815	8449
9	2564	762	5689	3013	1605	1693	3112	3488	3136	3023	7217	6955	6185	5982	8827
10	279	2033	543	2571	1557	862	1121	2160	1741	1556	1894	4747	4317	3041	3294
11	696	31	942	370	1759	885	425	782	1230	1087	963	959	2500	2388	1770
12	112	28	1858	130	1132	904	1235	4856	2825	3150	1860	2383	3179	5441	4623

1+ 102368 127553 189221 135126 166612 180041 187181 203871 208853 197750 235398 230710 235148 256611 291735

	1985	1986	1987	1988	1989	1990	1991	1992
1	18503	22911	15255	27109	34098	17087	32010	1
2	21489	17238	26979	29211	30161	27346	13082	24629
3	42536	27015	27138	39470	24295	43176	43559	22517
4	44331	53519	33840	31874	37201	27610	43666	56507
5	55154	39769	44666	28685	25918	32159	20328	44378
6	52840	38597	26391	27862	18856	15179	16690	15454
7	7127	30324	21880	15588	14416	10286	6739	8770
8	2871	3820	15298	11768	8853	6675	3979	2940
9	5934	1877	1600	6800	6093	4818	3249	1874
10	5641	3618	1052	696	2763	3012	1859	1639
11	1752	3031	1852	550	380	1246	1223	839
12	2907	3471	3723	2561	1110	1308	2132	982

1+ 261084 245190 219674 222172 204143 189902 188515 180527

Summaries for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	79381	112760	158634	120488	145361	153346	153550	179791	200918	182065	179721	195797	208743	220020	268559
3	63957	84120	133417	97250	125986	125122	128279	135785	174523	176064	160388	139853	177383	190766	229840
4	49501	50180	80671	74642	78560	101404	96689	97897	122087	147933	151690	117603	100724	141960	185389
5	35654	35120	41864	40541	55613	57492	71829	68749	77231	97958	120966	107274	74891	61870	119352
6	22997	24114	25228	20633	27848	36394	35387	47465	46449	52707	69820	79677	66311	42205	40647

	1985	1986	1987	1988	1989	1990	1991	1992
2	239674	218808	200696	192503	168936	171508	154372	179545
3	218185	201570	173717	163292	138774	144161	141290	154916
4	175649	174555	146579	123821	114480	100985	97731	132400
5	131319	121036	112739	91948	77279	73375	54066	75893
6	76165	81267	68073	63263	51361	41217	33738	31516

CATCH BIOMASS (MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	335	1187	848	585	214	224	141	47	97	219	344	939	139	64	97	167	65
3	815	4143	4048	3438	10319	1844	2702	1984	1908	4886	982	4062	5733	3191	1870	2469	1788
4	3399	5108	7390	17991	6797	10601	5926	6078	6539	12350	7448	3254	5766	18741	11194	5562	11410
5	4178	6395	8003	14178	9198	7940	14844	6419	9937	12255	19059	11464	2987	5750	25879	16087	11582
6	3399	6394	4944	2885	5604	9329	5408	10611	7516	7764	14503	16245	10907	1767	4415	26211	17870
7	3305	2724	2908	1415	2059	5361	6253	4833	9739	3580	6815	12176	11952	4268	1051	5286	17450
8	2771	1455	720	645	1317	1729	1520	3859	3529	3020	2667	5631	7181	5119	2128	1104	2351
9	1518	22	3169	1763	645	605	288	1415	2752	1088	2179	2036	3478	3286	1957	1523	878
10	916	77	199	649	743	660	116	575	1034	466	857	2011	1956	1884	1269	2253	1817
11	404	9	412	139	696	479	181	400	790	321	357	490	1418	1019	447	916	1758
12	65	8	813	49	448	490	526	2482	1816	931	690	1218	1803	2321	1167	1520	2013

1+ 21106 27522 33454 43738 38040 39261 37904 38702 45659 46880 55900 59525 53319 47409 51475 63098 68981

	1987	1988	1989	1990	1991	1992
1	0	0	0	0	0	0
2	66	32	49	25	141	14
3	1613	1373	874	2238	1526	2144
4	6114	6432	9849	5781	7498	9103
5	19867	11115	12026	13247	8787	10419
6	12299	16647	9444	8952	13642	7414
7	11945	8406	9769	6970	6508	5734
8	9319	6426	4614	4330	3452	2311
9	1435	5494	3775	3123	2048	1349
10	591	416	2452	1595	1631	1180
11	1091	328	247	824	1098	604
12	2194	1528	721	865	1915	707

1+ 66536 58197 53821 47951 48245 40978

Summaries for ages 2 11 3 11 4 11 5 11 6 11

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
2	21041	27514	32642	43689	37592	38771	37378	36219	43843	45949	55211	58307	51516	45088	50307	61578	66969
3	20706	26327	31794	43104	37378	38547	37238	36173	43747	45730	54867	57368	51377	45024	50210	61411	66904
4	19891	22184	27746	39666	27058	36704	34535	34189	41838	40844	53885	53306	45644	41833	48340	58942	65116
5	16492	17076	20356	21675	20262	26103	28610	28111	35299	28495	46437	50053	39878	23093	37146	53380	53705
6	12314	10681	12353	7497	11064	18162	13766	21693	25362	16239	27378	38589	36891	17342	11267	37293	42123

	1987	1988	1989	1990	1991	1992
2	64342	56669	53100	47086	46331	40271
3	64276	56637	53051	47061	46189	40257
4	62662	55264	52176	44823	44663	38113
5	56548	48832	42328	39042	37165	29010
6	36681	37717	30301	25794	28378	18592

SSB AT THE START OF THE SPAWNING SEASON - males & females (MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	811	2065	1554	2076	1343	1907	2042	3016	1801	446	1249	4400	2554	2083	2775
3	4496	7952	13294	8331	11788	7392	10324	10621	16444	9631	2496	7319	22533	13474	12358
4	10285	11318	26440	33752	16870	32801	18098	22414	30267	38645	21385	7124	17321	58385	41773
5	12958	12014	14692	28236	26215	20184	37503	21070	27793	42001	46955	27340	8537	20686	73266
6	9769	10661	9115	10832	14689	23082	16589	29007	19559	26088	39042	40827	22976	6813	15810
7	10215	7380	5616	5301	7012	11572	14961	11668	20730	14718	19980	27285	27198	14355	5208
8	3423	7528	5143	3078	3242	5267	6031	8657	7089	11838	10864	13839	15437	15898	9674
9	3184	764	6819	4256	2065	1993	3464	4198	4752	3656	8571	8077	8564	7961	10061
10	886	1959	694	3487	2062	1254	1282	2691	2530	1856	2411	5954	5625	4287	4181
11	886	35	1515	443	2179	1168	541	1024	1756	1254	1231	1341	3499	3136	2079
12	161	35	2512	171	1502	1280	1662	6786	4181	3994	2441	3330	4553	7322	5747
1+	57073	61710	87393	99964	88969	107900	112496	121151	136903	154127	156624	146838	138796	154400	182932

	1985	1986	1987	1988	1989	1990	1991	1992
1	0	0	0	0	0	0	0	0
2	1598	1428	1987	1686	2285	2439	1197	2243
3	13960	8293	7440	11163	9119	12398	11812	5944
4	32523	35536	22301	21838	29058	19383	32079	36722
5	56179	39539	46573	29554	27580	32257	22527	40419
6	64198	46056	32365	34783	22808	19421	24155	17089
7	10659	39922	29063	20237	19860	14181	10665	11197
8	3794	4896	21162	15681	11438	9443	6449	4056
9	7028	2332	2552	10355	8407	6571	4502	2526
10	7295	4856	1408	943	4225	4085	3048	2286
11	2443	4240	2585	748	507	1685	2030	1152
12	4084	4998	5384	3715	1648	1951	3513	1501
1+	203760	192095	172821	150703	136935	123813	121977	125135

The above SSBs by age (a) and year (y) are calculated following the algorithm used in the NEFSC projection program, i.e.

$$SSB(a,y) = W(a,y) \times P(a,y) \times N(a,y) \times \exp[-Z(a,y)]$$

where $Z(a,y) = 0 \times M(a,y) + 0 \times F(a,y)$
 $N(a,y)$ - Jan 1 stock size estimates (males & females)
 $P(a,y)$ - proportion mature (generally females)
 $W(a,y)$ - weight at age at the beginning of the spawning season

The $W(a,y)$ are assumed to be the same as the Jan1 weight at age estimates (see "WT AT AGE" table in input section).
Jan1 weights at age are calculated as geometric means in ADAPT from the mid-year weight at age estimates (from the catch) of the cohort in successive years.

MEAN STOCK NUMBERS (thousands) - TOTALS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	45750	29531	57460	29014	40239	51582	64791	38447	10219	25071	107635	65060	46452	62301	37106
2	26144	36717	23790	46476	23628	32818	42118	53020	31422	8221	20351	87412	53152	37991	50946
3	10475	19965	28358	17801	33876	18530	25684	33529	42631	23640	6257	15136	68445	42074	30446
4	6323	7104	14010	17488	11707	22066	13015	18217	24920	30472	15756	4165	10131	48247	30715
5	4150	3483	3887	7512	9224	6872	13156	8155	11486	16636	18398	9355	2451	6426	29926
6	2314	1984	1591	2087	3466	5078	3855	7120	4715	6809	9678	9896	4757	1454	3869
7	1860	1259	785	799	1213	1743	2509	2024	3540	2724	3864	4845	4880	2445	918
8	313	1133	763	406	427	695	890	1177	926	1830	1683	2030	2189	2474	1469
9	362	105	644	442	241	225	445	512	476	448	1114	1035	994	994	1474
10	39	211	71	347	212	113	145	306	257	208	245	638	588	453	505
11	77	3	138	40	206	104	50	89	162	133	122	124	321	310	235
12	14	3	194	13	114	90	134	536	356	379	210	290	384	614	543
1+	97820	101499	131690	122427	124553	139918	166791	163132	131111	116571	185313	199986	194745	205783	188151
	1985	1986	1987	1988	1989	1990	1991	1992							
1	37006	45821	30510	54218	68195	34174	64021	1							
2	30266	30243	37471	24967	44355	55809	27834	52401							
3	40510	23907	24016	30130	20078	35390	44906	21651							
4	22969	29086	17354	17323	21380	14609	25991	33436							
5	20056	15355	17313	10784	10285	12562	8762	17403							
6	16359	11352	8681	8494	5697	5010	5716	4559							
7	1906	7876	5639	4318	3696	2617	1942	2215							
8	558	784	3574	2674	2078	1556	1005	652							
9	933	300	308	1462	1228	956	671	367							
10	891	529	148	117	516	563	372	282							
11	265	452	252	68	51	191	232	135							
12	338	431	441	292	128	154	314	122							
1+	172058	166137	145708	154846	177688	163591	181766	133223							

Time stamp at end of run 1993 7 2 16 39 28

Appendix 2

Alternative VPA Tuning Methods:

1. Laurec-Shepherd
2. Extended Survivors

POLLOCK 4VWX + 5 USA+CAN+DWF VPA

CPUE data from file polflt92.dat

Disaggregated Qs

Log transformation

The final F is the (reciprocal variance-weighted) mean of the raised fleet F's.

No trend in Q (mean used)

Terminal Fs estimated using Laurec-Shepherd

Tuning converged after 8 iterations

Total of the absolute F residuals for all ages in the last year, between iterations 7 and 8 = .000

Regression weights

, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000

Oldest age F = 1.000*average of 3 younger ages.

Fishing mortalities

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	.011	.008	.005	.001	.004	.037	.018	.017	.004	.002	.003	.008	.004	.002	.001	.002	.001	.014	.001
3	.218	.079	.086	.052	.037	.176	.114	.183	.075	.065	.042	.058	.067	.058	.034	.036	.070	.050	.129
4	.293	.241	.242	.209	.143	.247	.246	.317	.224	.234	.169	.125	.214	.182	.196	.256	.206	.243	.242
5	.330	.371	.406	.307	.324	.265	.371	.421	.350	.294	.329	.291	.289	.444	.388	.442	.391	.422	.366
6	.396	.473	.372	.420	.413	.324	.412	.475	.564	.295	.327	.495	.459	.471	.593	.501	.543	.738	.462
7	.341	.603	.533	.504	.588	.293	.421	.540	.536	.371	.226	.741	.572	.538	.535	.668	.676	.807	.537
8	.463	.390	.308	.564	.614	.288	.294	.478	.558	.392	.265	.391	.616	.602	.532	.514	.631	.858	.540
9	.269	.316	.096	.405	.826	.324	.297	.312	.566	.458	.217	.274	.479	.893	.786	.591	.631	.599	.705
10	.373	.406	.089	.277	.591	.273	.386	.412	.496	.626	.294	.387	.550	.584	.596	.833	.489	.824	.652
11	.368	.370	.164	.415	.677	.295	.326	.400	.540	.492	.259	.351	.549	.693	.638	.646	.583	.760	.632

Log catchability residuals

Fleet : CANADA FLEET (TC 5 CPUE)

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	2.05	1.62	.98	-.20	-.07	2.80	1.82	-.81	1.16	.51	-.47	-.40	-1.95	-1.69	.11	.28	-1.73	-.78	-3.22
3	1.31	.34	.12	.28	-.50	1.45	.02	.78	.57	.31	-.11	-1.33	-.94	-.90	-.60	-.45	.18	-1.05	.52
4	.28	.07	-.20	.22	.00	.51	-.31	.01	.30	.41	.08	-.63	-.32	-.27	-.03	.10	.01	-.35	.12
5	-.14	.01	-.18	.00	.23	.03	-.23	.14	-.13	.28	-.41	-.03	-.04	-.04	.19	.29	.21	-.24	-.02
6	-.20	-.03	-.43	.06	-.01	.00	-.08	.12	.45	-.54	-.33	-.04	.04	.07	.21	.21	.47	.11	-.06
7	-.50	.19	-.04	.07	.06	-.37	-.33	.17	.47	-.36	-.95	.27	.21	-.01	.14	.31	.59	.15	-.06
8	-.05	-.52	-.49	.19	-.04	-.57	-.67	.02	.57	.19	-.38	-.51	.27	.25	.31	.22	.63	.36	.21
9	-.43	-.45	-1.32	-.26	.21	-.75	-.64	-.32	.63	.44	-.32	-.74	.14	.63	.94	.62	.85	.06	.72
10	-.19	.15	-1.24	-1.06	-.99	-.91	-.70	-.06	.61	.65	-.15	-.10	.15	-.02	.54	1.13	.72	.66	.82

Fleet : USA FLEET (TC 3+4 CPUE)

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	2.17	2.15	1.18	.12	1.81	3.81	2.82	2.25	1.36	.58	.33	1.92	.39	.36	-5.09	-3.36	-4.96	-3.95	-3.88
3	1.54	.68	.82	-.31	.00	1.11	1.21	1.34	-.04	.26	-.22	.30	-.04	-.29	-1.35	-1.52	-.10	-1.33	-2.03
4	.82	.73	.83	.51	-.73	.13	.87	.85	.38	.08	.09	-1.11	-.03	-1.02	-.98	-.36	-.11	-.12	-.82
5	.48	.47	.77	.55	-.22	-.27	.02	.66	.50	.50	.14	-.54	-1.10	-.31	-.86	-.57	-.21	-.08	-.07
6	.36	.62	.28	.67	.48	-.27	-.03	-.50	.62	.58	.47	-.40	-.38	-1.42	-.17	-.67	-.62	.19	.20
7	.20	.74	.28	.88	1.04	-.13	.26	-.64	-.24	.63	-.11	-.19	-.42	-.93	-.88	-.24	-.60	-.30	.44
8	.54	.50	-.10	1.17	1.29	.33	.07	-.12	.19	-.20	-.03	-.26	-.03	-.94	-.99	-.68	-.46	-.27	-.01
9	-.24	.54	-1.89	1.14	1.80	.82	.35	-.27	.63	.31	-.28	-.45	-.11	.13	-.80	-.99	-.67	.08	-.10
10	-.14	.64	-2.80	.98	1.52	.47	.72	.11	-.41	.99	-.13	-.52	.09	-.13	-.30	-.82	-.69	-.32	-.35

Fleet : USA SPRING SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.21	.64	-.72	.30	.29	.14	.33	.44	1.75	-1.21	-.59	.17	-.16	1.44	-1.90	-.22	-.84	-.33	.66
3	.80	.44	-.26	-.05	.33	-.86	.72	.20	.55	-2.70	-.88	.05	-.88	2.70	-1.14	-.27	.38	.64	.21
4	.25	.52	.24	-1.02	1.03	-1.25	.67	1.15	1.78	-3.10	-1.04	.04	-.45	2.74	-2.80	.68	-.21	1.23	-.45
5	-.40	-.11	.35	.44	1.45	-.38	.05	.42	1.26	-2.11	-1.01	.82	-.16	.59	-1.53	1.09	-2.14	1.27	.11
6	.69	-.28	.35	.65	.34	-.12	-.15	.12	1.11	-2.82	-.25	.72	.36	-.02	-1.38	.64	-.59	.84	-.20
7	.51	.49	.51	.56	-.14	-.15	.53	-.82	-.46	-.51	.22	1.04	.28	-.81	-1.34	.13	-.84	.74	.05
8	.36	.96	1.44	.71	.58	.65	.10	-.26	.25	-1.04	-.46	-.91	.94	-.48	-1.82	.24	-1.28	-.13	.16
9	-2.25	1.31	1.57	-.31	.97	1.11	-.41	-.03	-.04	-1.84	-.47	.54	1.17	.61	-.68	-.31	-.55	.29	-.68
10	-.61	1.42	.95	-.01	1.04	.65	.02	.70	-1.30	-.42	-.41	-.05	.19	-1.58	1.33	.76	-.73	-2.60	.64

Fleet : CANADA SUMMER SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.92	-2.80	-1.90	.08	-3.00	-3.28	2.52	-.91	-.21	-.37	.71	2.45	1.46	1.22	-1.37	-1.00	4.01	2.43	.89
3	.21	-3.13	-.97	.00	-1.88	-1.58	2.19	-.67	.59	-.04	-1.10	1.66	-.19	1.48	-.16	-1.19	2.54	.48	1.37
4	-.87	-1.16	.11	.15	-.67	-.81	1.52	-1.33	-.57	-.28	-.72	1.20	-.34	1.52	.33	-.20	1.52	.17	.42
5	-1.18	-.89	-.04	.95	-.17	-.74	1.07	-.58	-.70	-1.16	-.37	.57	-.41	1.24	.74	-.09	1.40	.42	-.05
6	-1.11	-.44	-.36	.56	-.40	-.28	.21	-.80	-.36	-1.23	-.35	.45	.06	.84	.70	.33	1.16	.73	.29
7	-.03	-1.35	.49	-.40	-.35	-.37	.46	-.65	-.94	-1.23	.58	.57	-.02	.81	1.17	.83	.43	.37	-.36
8	.06	-.25	.24	.38	-.53	-.65	-.12	-.37	-1.05	-.52	.63	.26	-.62	.78	.75	.39	.21	.96	-.53
9	.25	-.02	-.37	.38	-.41	-1.97	-.52	-.25	-.08	-.03	1.16	.58	-1.34	.16	1.00	.52	.43	.69	-.20
10	-.28	-1.56	.36	-.03	-.75	-.14	.11	-.45	-.30	-.37	1.27	.74	-.17	1.53	.64	-.14	-.51	-.11	-.47

Fleet : USA AUTUMN SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.11	-.74	-1.70	-.18	.47	-.45	-2.05	2.37	.77	-1.58	-.08	-.84	.61	.35	.29	1.67	-.22	.48	.94
3	.53	-1.09	.18	.37	-1.65	.82	-1.11	2.59	.18	-1.41	-2.01	-.90	.19	-.70	1.95	1.17	.55	-.09	.43
4	1.06	-.16	1.99	1.01	-1.31	.62	-.60	1.76	1.59	-1.95	-2.89	-.66	-.27	-3.92	2.39	.08	.41	.76	.07
5	.46	.29	2.80	1.94	.05	.40	-.23	1.06	-.60	.38	-3.11	-.23	-.51	-.95	1.41	-3.70	.01	-.11	.65
6	.93	-.15	2.63	1.76	.76	.74	-.42	.36	.17	-.27	-.16	-.75	-.96	-1.38	1.99	-3.25	-1.60	-.36	-.07
7	1.69	1.32	2.18	2.02	1.11	.78	.27	-.57	-.54	.61	-1.84	-.97	-1.01	.01	.15	-3.25	-.19	-1.16	-.62
8	.34	-.04	2.33	1.78	1.66	1.15	1.66	-2.74	-.62	.73	-2.37	-1.44	-1.79	.08	1.27	-.48	.20	-2.05	.32
9	.90	.55	1.63	2.05	1.66	1.49	1.14	-2.40	-.11	.11	-.54	-2.29	-1.20	1.75	.86	-2.68	.59	-2.08	-1.44
10	-1.34	.51	.73	.87	1.70	1.82	2.00	-.62	-2.03	.46	.06	.14	-1.92	-.70	1.80	-.44	.15	-1.72	-1.48

SUMMARY STATISTICS FOR AGE 2									
Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE	
	q		F	F		Slope	Intrcpt		
1	-14.27	1.574	.0011	.0337	-.197E+00	.458E-01	-14.269	.352	
2	-15.43	2.865	.0004	.0654	-.394E+00	.732E-01	-15.428	.641	
3	-12.14	.886	.0000	.0007	-.246E-01	.367E-01	-12.143	.198	
4	-12.30	2.097	.0000	.0006	.217E+00	.707E-01	-12.300	.469	
5	-12.47	1.136	.0000	.0005	.766E-01	.440E-01	-12.467	.254	
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)		Variance ratio		
	.001	.597	.815		.815		1.862		

SUMMARY STATISTICS FOR AGE 3									
Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE	
	q		F	F		Slope	Intrcpt		
1	-10.64	.792	.0424	.0768	-.700E-01	.286E-01	-10.639	.177	
2	-11.87	1.038	.0153	.9816	-.141E+00	.271E-01	-11.870	.232	
3	-11.86	1.100	.0000	.1042	-.251E-03	.462E-01	-11.855	.246	
4	-10.69	1.503	.0000	.0327	.131E+00	.546E-01	-10.693	.336	
5	-12.23	1.234	.0000	.0840	.370E-01	.510E-01	-12.226	.276	
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)		Variance ratio		
	.129	.474	.543		.543		1.310		

SUMMARY STATISTICS FOR AGE 4									
Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE	
	q		F	F		Slope	Intrcpt		
1	-9.26	.298	.1685	.2148	-.155E-01	.120E-01	-9.260	.067	
2	-10.89	.700	.0406	.5475	-.808E-01	.220E-01	-10.893	.157	
3	-11.59	1.480	.0000	.3812	-.910E-02	.621E-01	-11.592	.331	
4	-9.97	.929	.0000	.1590	.767E-01	.343E-01	-9.967	.208	
5	-12.05	1.688	.0000	.2250	-.459E-01	.700E-01	-12.045	.377	
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)		Variance ratio		
	.242	.256	.173		.256		.455		

SUMMARY STATISTICS FOR AGE 5									
Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE	
	q		F	F		Slope	Intrcpt		
1	-8.71	.198	.2928	.3738	.452E-02	.823E-02	-8.708	.044	
2	-10.45	.548	.0635	.3428	-.547E-01	.188E-01	-10.445	.123	
3	-11.25	1.101	.0000	.3291	-.194E-01	.460E-01	-11.254	.246	
4	-9.22	.832	.0001	.3851	.616E-01	.316E-01	-9.225	.186	
5	-11.79	1.544	.0000	.1919	-.104E+00	.597E-01	-11.793	.345	
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)		Variance ratio		
	.366	.178	.411E-01		.178		.053		

SUMMARY STATISTICS FOR AGE 6									
Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE	
	q		F	F		Slope	Intrcpt		
1	-8.46	.264	.3743	.4925	.178E-01	.102E-01	-8.462	.059	
2	-10.26	.582	.0768	.3778	-.494E-01	.213E-01	-10.257	.130	
3	-10.66	.923	.0000	.5647	-.219E-01	.384E-01	-10.660	.206	
4	-9.08	.684	.0001	.3456	.758E-01	.221E-01	-9.076	.153	
5	-11.60	1.392	.0000	.4967	-.135E+00	.485E-01	-11.599	.311	
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)		Variance ratio		
	.462	.217	.694E-01		.217		.102		

SUMMARY STATISTICS FOR AGE 7

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
	q		F	F		Slope	Intrcpt	
1	-8.34	.378	.4213	.5678	.208E-01	.151E-01	-8.344	.085
2	-10.17	.594	.0839	.3456	-.570E-01	.208E-01	-10.168	.133
3	-10.24	.661	.0000	.5092	-.335E-01	.265E-01	-10.243	.148
4	-8.93	.739	.0001	.7732	.571E-01	.278E-01	-8.933	.165
5	-11.18	1.411	.0000	.9990	-.180E+00	.401E-01	-11.178	.315
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)	Variance ratio		
	.537	.263	.133		.263	.254		

SUMMARY STATISTICS FOR AGE 8

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
	q		F	F		Slope	Intrcpt	
1	-8.49	.413	.3626	.4402	.405E-01	.143E-01	-8.494	.092
2	-10.13	.615	.0875	.5456	-.738E-01	.187E-01	-10.125	.138
3	-10.00	.866	.0000	.4592	-.849E-01	.300E-01	-9.998	.194
4	-8.64	.588	.0002	.9164	.313E-01	.235E-01	-8.645	.132
5	-11.08	1.550	.0000	.3908	-.106E+00	.598E-01	-11.076	.347
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)	Variance ratio		
	.540	.276	.147		.276	.283		

SUMMARY STATISTICS FOR AGE 9

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
	q		F	F		Slope	Intrcpt	
1	-8.67	.661	.3054	.3436	.782E-01	.203E-01	-8.665	.148
2	-10.21	.845	.0805	.7778	-.440E-01	.338E-01	-10.209	.189
3	-9.84	1.047	.0001	1.3947	-.238E-01	.436E-01	-9.837	.234
4	-8.84	.772	.0001	.8588	.423E-01	.308E-01	-8.840	.173
5	-10.69	1.617	.0000	2.9788	-.154E+00	.567E-01	-10.688	.362
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)	Variance ratio		
	.705	.387	.305		.387	.620		

SUMMARY STATISTICS FOR AGE 10

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
	q		F	F		Slope	Intrcpt	
1	-8.85	.728	.2530	.2875	.929E-01	.207E-01	-8.854	.163
2	-9.97	.945	.1022	.9292	-.362E-01	.387E-01	-9.970	.211
3	-9.58	1.079	.0001	.3445	-.625E-01	.427E-01	-9.583	.241
4	-8.61	.730	.0002	1.0424	.396E-01	.291E-01	-8.609	.163
5	-10.46	1.348	.0000	2.8581	-.855E-01	.527E-01	-10.463	.301
Fbar		SIGMA(int.)	SIGMA(ext.)		SIGMA(overall)	Variance ratio		
	.652	.399	.366		.399	.843		

VPA Version 3.0 (MSDOS)

26/05/1993 21:26

Extended Survivors Analysis

POLLOCK 4VMX + 5 USA+CAN+DWF VPA

CPUE data from file POLFLT92.DAT

Data for 5 fleets over 23 years
Age range from 2 to 11

Fleet,	Alpha,	Beta
CANADA FLEET (TC 5 C	, .000	, 1.000
USA FLEET	, .000	, 1.000
USA SPRING SURVEY	, .250	, .500
CANADA SUMMER SURVEY	, .500	, .750
USA AUTUMN SURVEY	, .750	, 1.000

Time series weights :

Tapered time weighting not applied

Catchability analysis :

Catchability independent of stock size for all ages
Catchability independent of age for ages ≥ 7

Terminal population estimation :

Final estimates not shrunk towards mean
Minimum standard error for population estimates derived from each fleet = .300
Prior weighting not applied

Tuning converged after 98 iterations

Total absolute residual between iterations
97 and 98 = .000

Regression weights

, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000

Fishing mortalities																			
Age,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992
2,	.011,	.008,	.005,	.001,	.004,	.036,	.017,	.016,	.004,	.002,	.002,	.008,	.004,	.002,	.001,	.002,	.001,	.014,	.001
3,	.204,	.076,	.081,	.051,	.036,	.169,	.111,	.174,	.073,	.065,	.042,	.057,	.065,	.056,	.032,	.036,	.070,	.057,	.123
4,	.269,	.223,	.232,	.197,	.142,	.242,	.235,	.310,	.211,	.229,	.170,	.125,	.208,	.176,	.187,	.240,	.209,	.242,	.280
5,	.293,	.330,	.366,	.291,	.299,	.261,	.361,	.398,	.340,	.272,	.319,	.292,	.289,	.429,	.375,	.418,	.360,	.430,	.366
6,	.338,	.399,	.316,	.360,	.384,	.291,	.406,	.456,	.515,	.283,	.295,	.474,	.463,	.472,	.562,	.476,	.497,	.643,	.475
7,	.304,	.472,	.407,	.396,	.463,	.264,	.361,	.528,	.502,	.321,	.214,	.629,	.534,	.546,	.536,	.605,	.618,	.685,	.419
8,	.382,	.332,	.214,	.368,	.416,	.202,	.256,	.380,	.537,	.354,	.218,	.364,	.456,	.534,	.547,	.516,	.527,	.718,	.399
9,	.243,	.240,	.078,	.249,	.403,	.183,	.189,	.260,	.396,	.429,	.189,	.214,	.431,	.515,	.627,	.620,	.637,	.438,	.494
10,	.301,	.353,	.064,	.217,	.291,	.096,	.185,	.228,	.383,	.353,	.267,	.322,	.389,	.491,	.234,	.533,	.531,	.846,	.388
11,	.205,	.275,	.137,	.278,	.473,	.113,	.094,	.154,	.236,	.333,	.117,	.308,	.416,	.392,	.474,	.167,	.272,	.902,	.665

1

XSA population numbers

YEAR ,	AGE											11, Plus GP
	2,	3,	4,	5,	6,	7,	8,	9,	10,	11,		
1974 ,	2.68E+04,	4.39E+04,	1.61E+04,	1.32E+04,	5.24E+03,	1.70E+03,	7.42E+02,	4.92E+02,	4.25E+02,	4.83E+02,	2.67E+02,	
1975 ,	3.82E+04,	2.17E+04,	2.93E+04,	1.01E+04,	8.07E+03,	3.06E+03,	1.03E+03,	4.15E+02,	3.16E+02,	2.57E+02,	2.24E+02,	
1976 ,	4.78E+04,	3.10E+04,	1.65E+04,	1.92E+04,	5.94E+03,	4.43E+03,	1.56E+03,	6.05E+02,	2.67E+02,	1.81E+02,	4.91E+02,	
1977 ,	5.97E+04,	3.89E+04,	2.34E+04,	1.07E+04,	1.09E+04,	3.55E+03,	2.42E+03,	1.03E+03,	4.59E+02,	2.05E+02,	1.24E+03,	
1978 ,	3.56E+04,	4.88E+04,	3.03E+04,	1.57E+04,	6.54E+03,	6.22E+03,	1.95E+03,	1.37E+03,	6.60E+02,	3.02E+02,	6.65E+02,	
1979 ,	9.34E+03,	2.90E+04,	3.86E+04,	2.15E+04,	9.56E+03,	3.65E+03,	3.21E+03,	1.06E+03,	7.49E+02,	4.04E+02,	1.16E+03,	
1980 ,	2.36E+04,	7.38E+03,	2.01E+04,	2.48E+04,	1.36E+04,	5.85E+03,	2.29E+03,	2.14E+03,	7.19E+02,	5.57E+02,	9.62E+02,	
1981 ,	9.90E+04,	1.90E+04,	5.41E+03,	1.30E+04,	1.41E+04,	7.40E+03,	3.34E+03,	1.45E+03,	1.45E+03,	4.89E+02,	1.14E+03,	
1982 ,	5.88E+04,	7.97E+04,	1.31E+04,	3.25E+03,	7.14E+03,	7.34E+03,	3.57E+03,	1.87E+03,	9.17E+02,	9.47E+02,	1.14E+03,	
1983 ,	4.22E+04,	4.79E+04,	6.07E+04,	8.67E+03,	1.89E+03,	3.49E+03,	3.64E+03,	1.71E+03,	1.03E+03,	5.12E+02,	1.02E+03,	
1984 ,	5.76E+04,	3.45E+04,	3.67E+04,	3.95E+04,	5.41E+03,	1.17E+03,	2.07E+03,	2.09E+03,	9.12E+02,	5.92E+02,	1.37E+03,	
1985 ,	3.42E+04,	4.70E+04,	2.71E+04,	2.54E+04,	2.35E+04,	3.30E+03,	7.72E+02,	1.37E+03,	1.42E+03,	5.72E+02,	7.34E+02,	
1986 ,	3.57E+04,	2.78E+04,	3.64E+04,	1.96E+04,	1.55E+04,	1.20E+04,	1.44E+03,	4.39E+02,	9.03E+02,	8.41E+02,	8.05E+02,	
1987 ,	4.50E+04,	2.91E+04,	2.13E+04,	2.42E+04,	1.20E+04,	8.00E+03,	5.75E+03,	7.47E+02,	2.34E+02,	5.01E+02,	8.79E+02,	
1988 ,	2.77E+04,	3.67E+04,	2.25E+04,	1.47E+04,	1.29E+04,	6.13E+03,	3.79E+03,	2.76E+03,	3.65E+02,	1.17E+02,	5.05E+02,	
1989 ,	3.66E+04,	2.26E+04,	2.91E+04,	1.53E+04,	8.25E+03,	6.02E+03,	2.94E+03,	1.80E+03,	1.21E+03,	2.36E+02,	5.92E+02,	
1990 ,	3.84E+04,	2.99E+04,	1.79E+04,	1.88E+04,	8.24E+03,	4.20E+03,	2.69E+03,	1.44E+03,	7.92E+02,	5.80E+02,	4.71E+02,	
1991 ,	2.44E+04,	3.14E+04,	2.28E+04,	1.19E+04,	1.07E+04,	4.11E+03,	1.85E+03,	1.30E+03,	6.22E+02,	3.81E+02,	5.16E+02,	
1992 ,	3.08E+04,	1.97E+04,	2.43E+04,	1.47E+04,	6.33E+03,	4.61E+03,	1.69E+03,	7.40E+02,	6.87E+02,	2.18E+02,	1.98E+02,	

Terminal population estimates.

0.00E+00, 2.52E+04, 1.43E+04, 1.50E+04, 8.33E+03, 3.22E+03, 2.48E+03, 9.31E+02, 3.69E+02, 3.82E+02, 1.75E+02,

Log catchability residuals.

Fleet : CANADA FLEET (TC 5 CPUE)

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	2.05	1.59	1.00	-.20	-.07	2.81	1.80	-.80	1.19	.53	-.47	-.40	-1.96	-1.72	.14	.30	-1.59	-.80	-3.41
3	1.26	.33	.09	.29	-.50	1.43	.02	.75	.56	.33	-.09	-1.34	-.95	-.92	-.63	-.42	.19	-.91	.49
4	.21	-.01	-.21	.18	.02	.51	-.33	.01	-.27	.41	-.11	-.61	-.32	-.27	-.05	.06	.04	-.33	.29
5	-.21	-.06	-.23	.00	.20	.07	.05	-.24	.16	-.16	.30	-.36	.02	-.03	.20	.28	.17	-.18	.03
6	-.28	-.13	-.52	-.01	.00	-.03	-.02	.16	.43	-.51	-.36	-.01	.13	.14	.23	.23	.45	.05	.04
7	-.49	.07	-.18	-.04	-.05	-.35	-.35	-.27	.54	-.38	-.87	.23	.27	.13	.27	.34	.63	.11	-.17
8	-.26	-.70	-.87	-.25	-.45	-.94	-.82	-.23	.51	.06	-.59	-.60	-.05	.11	.31	.20	.43	.16	-.12
9	-.72	-.91	-1.71	-.94	-.70	-1.51	-1.28	-.69	.09	-.19	-.65	-1.18	-.16	-.12	.52	.47	.66	-.44	.17
10	-.78	-.37	-1.94	-1.68	-2.07	-2.33	-1.82	-1.03	-.03	-.30	-.62	-.66	-.58	-.58	-.77	.30	.42	.30	-.08

Mean catchability and Standard error.

Age	2	3	4	5	6	7	8	9	10	11
Mean Q	-14.30	-10.66	-9.29	-8.76	-8.55	-8.48	-8.48	-8.48	-8.48	-8.48
S.E	1.55	.76	.29	.19	.27	.38	.63	1.06	1.57	2.02

Fleet : USA FLEET (TC 3+4 CPUE)

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.97	-.93	.01	-1.07	.61	2.62	1.60	1.06	-.19	-.59	-.86	.73	-.82	-.86	.00	-4.53	.00	.00	.00
3	1.49	.66	.79	-.31	.00	1.09	1.22	1.31	-.05	.28	-.20	.30	-.05	-.31	-1.39	-1.50	-.08	-1.19	-2.06
4	.76	.68	.81	.47	-.72	.13	.85	.85	.34	.08	.12	-1.09	-.03	-1.02	-1.00	-.40	-.07	-.10	-.65
5	.41	.40	.71	.55	-.25	-.23	.04	.64	.52	.48	.16	-.49	-1.06	-.30	-.85	-.58	-.25	-.01	-.11
6	.28	.53	.19	.60	.48	-.30	.03	-.46	.60	.62	.44	-.37	-.30	-1.34	-.15	-.65	-.64	.13	.31
7	.21	.62	.14	.77	.93	-.10	.24	-.54	-.18	.62	.19	-.23	-.36	-.78	-.75	-.21	-.56	-.33	.32
8	-.52	.51	-.29	.92	1.08	.16	.11	-.17	.32	-.13	-.05	-.16	-.16	-.89	-.79	-.51	-.47	-.28	-.14
9	-.25	.36	-2.00	.74	1.17	.34	-.01	-.36	.36	.34	-.32	-.61	-.13	-.33	-.94	-.85	-.58	-.15	-.37
10	-.02	.83	-2.80	1.07	1.15	-.24	.32	-.15	.48	.75	.37	-.38	-.08	.02	-.91	-.95	-.28	.03	-.54

Mean catchability and Standard error.

Age	2	3	4	5	6	7	8	9	10	11
Mean Q	-14.27	-11.90	-10.92	-10.50	-10.34	-10.31	-10.31	-10.31	-10.31	-10.31
S.E	1.64	1.00	.66	.51	.54	.51	.73	1.02	1.36	1.52

Fleet : USA SPRING SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.22	.62	-.71	.31	.28	.15	.31	.45	1.78	-1.19	-.58	.18	-.17	1.41	-1.86	-.20	-.69	-.35	.47
3	.74	.42	-.29	-.03	.34	-.88	.71	.16	.55	-2.68	-.85	.05	-.88	2.68	-1.17	-.23	.40	.79	.18
4	.19	.46	.22	-1.06	1.05	-1.25	.65	1.14	1.74	-3.10	-1.01	.07	-.45	2.74	-2.82	.64	-.18	1.25	-.29
5	-.47	-.18	.29	.44	1.42	-.34	-.07	.40	1.27	-2.13	-.99	.88	-.11	.59	-1.52	1.07	-2.18	1.33	-.15
6	.46	-.53	.12	.43	.19	-.29	-.24	-.01	.94	.00	-.42	.59	.28	-.10	-1.52	.50	-.76	.61	-.25
7	.54	.37	.38	.46	-.25	-.11	.51	-.72	-.40	-.51	.32	.99	.34	-.67	-1.22	.15	-.81	.68	-.06
8	.55	1.18	1.48	.66	.57	.69	.36	-.11	.57	-.76	-.25	-.60	1.01	-.24	-1.43	.61	-1.09	.05	.24
9	.00	1.59	1.94	-.24	.79	1.10	-.30	.34	.14	-1.37	-.05	.86	1.60	.59	-.39	.26	-.02	.52	-.50
10	-.02	2.09	1.45	.56	1.14	.43	.10	.92	-.76	-.19	.30	.57	.64	.00	1.20	1.10	.13	.00	.92

Mean catchability and Standard error.

Age	2	3	4	5	6	7	8	9	10	11
Mean Q	-12.20	-11.91	-11.67	-11.36	-10.65	-10.45	-10.45	-10.45	-10.45	-10.45
S.E	.84	1.07	1.44	1.08	.59	.59	.99	1.38	1.70	2.27

Fleet : CANADA SUMMER SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-1.11	-3.01	-2.06	-.09	-3.19	.00	2.32	-1.08	-.36	-.53	.54	2.27	1.27	1.01	-1.52	-1.16	3.97	2.23	.52
3	.18	-3.15	-1.01	.01	-1.89	-1.58	2.20	-.68	.59	-.02	-1.09	1.65	-.19	1.46	-.20	-1.17	2.56	.61	1.35
4	-.93	-1.21	.09	.11	-.67	-.81	1.51	-1.31	-.61	-.28	-.70	1.21	-.34	1.51	.30	-.23	1.55	.20	.60
5	-1.26	-.96	-.09	.94	-.21	-.71	1.10	-.58	-.69	-1.20	-.36	.61	-.37	1.26	.75	-.09	1.36	.50	.00
6	-1.20	-.54	-.46	.47	-.40	-.33	.27	-.76	-.36	-1.21	-.40	.49	.15	.93	.75	.36	1.16	.70	.40
7	-.04	-1.47	.34	-.52	-.46	-.38	.42	-.53	-.87	-1.27	.61	.57	.05	.96	1.31	.89	.49	.37	-.49
8	.27	-.02	.25	.36	-.50	-.63	.12	-.20	-.66	-.22	.81	.59	-.51	1.09	1.21	.82	.46	1.25	-.42
9	.33	-.11	-.41	.08	-.91	-2.36	-.79	-.24	-.23	-.12	1.20	.51	-1.23	-.15	1.03	.82	.69	.60	-.33
10	-.06	-1.27	.43	.15	-1.03	-.79	-.21	-.62	-.12	-.50	1.60	.99	-.26	1.81	.12	.16	.04	.44	-.55

Mean catchability and Standard error.

Age	2	3	4	5	6	7	8	9	10	11
Mean Q	-12.12	-10.68	-9.94	-9.20	-9.07	-8.97	-8.97	-8.97	-8.97	-8.97
S.E	1.95	1.47	.92	.83	.69	.76	1.01	1.33	1.55	1.89

Fleet : USA AUTUMN SURVEY

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2	-.12	-.76	-1.68	-.17	.46	-.43	-2.07	2.38	.80	-1.56	-.08	-.84	.60	.32	.33	1.69	-.08	.46	.75
3	.53	-1.11	.15	.36	-1.67	.84	-1.10	2.60	.18	-1.40	-2.01	-.92	.17	-.73	1.89	1.18	.56	.04	.42
4	.81	-.43	1.76	.74	-1.55	.41	-.83	1.58	1.34	-2.16	-3.10	-.89	-.49	.00	2.14	-.17	.22	.57	.05
5	.16	.01	2.55	1.71	-.21	.19	-.41	.87	-.79	-.11	-3.31	-.40	-.69	-1.11	1.23	.00	-.22	-.22	.50
6	.64	-.44	-2.32	1.48	.57	.48	-.54	.23	.01	-.47	-.41	-.88	-1.03	-1.46	1.89	.00	-1.76	-.51	-.13
7	1.35	.91	1.72	1.59	.70	.43	-.09	-.74	-.75	.24	.00	-1.23	-1.21	-.11	.02	.00	-.38	-1.40	-1.05
8	.05	-.32	1.80	1.25	1.19	.63	1.38	.00	-.69	.51	.00	.00	.00	-.07	1.27	-.52	-.01	.00	-.07
9	1.03	.51	1.60	1.80	1.25	1.13	.90	.00	-.17	-.35	-.46	.00	.00	1.55	1.03	.00	1.00	.00	.00
10	.00	.88	.79	1.08	1.47	1.18	1.70	-.76	.00	.39	.44	.45	.00	.00	1.32	-.31	.81	.00	.00

Mean catchability and Standard error.

Age	2	3	4	5	6	7	8	9	10	11
Mean Q	-12.42	-12.14	-11.69	-11.43	-11.26	-10.76	-10.76	-10.76	-10.76	-10.76
S.E	1.10	1.20	1.38	1.23	1.10	1.00	1.45	1.89	2.15	2.29