

GREENLAND HALIBUT IN SUB-AREAS V AND XIV

Landings and assessment

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Landings, Fisheries, Fleet

Total annual landings in Divisions Va, Vb and Sub-area XIV are presented for the years 1981–2001 in Tables 6.1.1–6.1.5 and from 1961 in Figure 6.1.1. Landings the decade prior to the extension of the EEZ to 200 nm by coastal nations in 1976 was in the order of 20–35 kt. From 1976, landings increased from a low of 5 kt to above 30 kt after 1982. In the years 1987–1989, landings increased to about 61 kt, followed by a decrease to about 35–40 kt during 1992–96. After 1996, landings declined to 20 kt in 1998 and 1999. Since 2000 an increase in landings has been observed, to nearly 26 kt in 2000 and about 28 kt in 2001. Landings not officially reported to ICES have been included in the assessment.

Catches in Icelandic waters have, due to quota regulations, decreased from 37 kt in 1990 to 11 kt in 1998 and 1999, but again rising to 14 kt in 2000 and about 16 kt in 2001. Faroese catches in Vb increased from 1 kt in 1981–1991 to 6.5 kt in 1996, but have been of the order of 4–5 kt in the last 5 years. Catches in division XIVb have increased from below 1 kt in 1987–1991 to 8.5 kt in 1997 followed by a decrease to 5 kt in 1999. Since then catches have increased to about 7 kt.

Most of the fishery for Greenland halibut in Divisions Va, Vb and XIVb is a directed fishery, only minor catches in Va by Iceland, and in XIVb by Germany and the UK are bycatches in redfish fisheries. A detailed description of the fishery performance and areas is given in NWWG report 1998. No major changes were observed in 2001. Table 6.1.6 describes the working group best landing estimates for the year 2001 with respect to area and gear.

Table 6.1.1. GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Sub-areas V, XII and XIV 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	-	-	6	+	-
Faroe Islands	767	1 532	1 146	2 502	1 052	853	1 096	1 378	2 319
France	8	27	236	489	845	52	19	25	-
Germany	3 007	2 581	1 142	936	863	858	565	637	493
Greenland	+	1	5	15	81	177	154	37	11
Iceland	15 457	28 300	28 360	30 080	29 231	31 044	44 780	49 040	58 330
Norway	-	-	2	2	3	+	2	1	3
Russia	-	-	-	-	-	-	-	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	19 239	32 441	30 891	34 024	32 075	32 984	46 622	51 118	61 156
Working Group estimate	-	-	-	-	-	-	-	-	61 396

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998 ¹
Denmark	-	-	-	-	-	-	1	-	-
Faroe Islands	1 803	1 566	2 128	4 405	6 241	3 763	6 148	4 971	3 817
France	-	-	3	2	-	-	29	11	8
Germany	336	303	382	415	648	811	3 368	3 342	3 056
Greenland	40	66	437	288	867	533	1 162	1 129	747
Iceland	36 557	34 883	31 955	33 987	27 778	27 383	22 055	18 569	10 728
Norway	50	34	221	846	1 173 ¹	1 810	2 164	1 986	1 367
Russia	-	-	5	-	-	10	424	37	52
UK (Engl. and Wales)	27	38	109	811	513	1 436	386	218	190
UK (Scotland)	-	-	19	26	84	232	25	26	43
United Kingdom	-	-	-	-	-	-	-	-	-
Total	38 813	36 890	35 259	40 780	37 305	36 006	35 762	30 289	20 360
Working Group estimate	39 326	37 950	35 423	40 817	36 958	36 300	35 825	30 267	-

Country	1999 ¹	2000 ¹	2001 ¹
Denmark	-	-	-
Faroe Islands	3 884	4 812	-
France	-	-	-
Germany	3 082	3 271	2 810
Greenland	200	-	-
Iceland	11 180	14 537	16 590
Norway	1 187	1 272	1 510
Russia	138	183	186
UK (Engl. and Wales)	261	370	-
UK (Scotland)	69	121	-
United Kingdom	-	-	324
Total	20 001	24 566	21 420
Working Group estimate	20 371	26 839	28 021

1) Provisional data

Table 6.1.2. GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Division Va 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	325	669	33	46			15	379	719
Germany									
Greenland									
Iceland	15 455	28 300	28 359	30 078	29 195	31 027	44 644	49 000	58 330
Norway			+	+	2				
Total	15 780	28 969	28 392	30 124	29 197	31 027	44 659	49 379	59 049
Working Group estimate									59 272 ²

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Faroe Islands	739	273	23	166	910	13	14	26	6
Germany					1	2	4		9
Greenland					1				¹
Iceland	36 557	34 883	31 955	33 968	27 696	27 376	22 055	16 766	10 580
Norway									
Total	37 296	35 156	31 978	34 134	28 608	27 391	22 073	16 792	10 595
Working Group estimate	37 308 ³	35 413 ⁴							

Country	1999	2000 ¹	2001 ¹
Faroe Islands	9		
Germany	13	22	50
Greenland	¹		
Iceland	11 087	14 507	16 590
Norway			6
UK (E/W/I)	26	73	
UK Scotland	3	5	
UK			59
Total	11 138	14 607	16 705
Working Group estimate		14 519 ⁵	16 752

1) Provisional data

2) Includes 223 t catch by Norway.

3) Includes 12 t catch by Norway.

4) Includes additional catch of 257 t by Iceland.

5) Includes additional 125 t by Iceland

Table 6.1.3. GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Division Vb 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	-	-	6	+	-
Faroe Islands	442	863	1 112	2 456	1 052	775	907	901	1 513
France	8	27	236	489	845	52	19	25	...
Germany	114	142	86	118	227	113	109	42	73
Greenland	-	-	-	-	-	-	-	-	-
Norway	2	+	2	2	2	+	2	1	3
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	566	1 032	1 436	3 065	2 126	940	1 043	969	1 589
Working Group estimate	-	-	-	-	-	-	-	-	1 606 ²

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	-	-	-
Faroe Islands	1 064	1 293	2 105	4 058	5 163	3 603	6 004	4750	3660
France ⁶	...	...	3 ¹	2	1	28	29	11	8 ¹
Germany	43	24	71	24	8	1	21	41	
Greenland	-	-	-	-	-	-	-	-	
Norway	42	16	25	335	53	142	281	42	114
UK (Engl. and Wales)	-	-	1	15	-	31	122		
UK (Scotland)	-	-	1	-	-	27	12	26	43
United Kingdom	-	-	-	-	-				
Total	1 149	1 333	2 206	4 434	5 225	3 832	6 469	4 870	3825
Working Group estimate	1 282 ³	1 662 ⁴	2 269 ⁵	-	-		-	-	3826 ⁷

Country	1999	2000 ¹	2001 ¹
Denmark			
Faroe Islands	3873	4812	
France			
Germany	22	6	7
Greenland			
Norway	87	110 ¹	53
UK (Engl. and Wales)	9	35	
UK (Scotland)	66	116	
United Kingdom			195
Total	4057	5079	255
Working Group estimate	4265 ⁸		3 951

1) Provisional data

2) Includes 17 t taken by France

3) Includes 133 t taken in Division IIa (Faroeese waters).

4) Includes 317 t taken in Division IIa (Faroeese waters) + France 12 t.

5) Includes 63 t taken in Division IIa (Faroeese waters).

6) Quantity unknown 1989-1991.

7) Includes 3661 t taken in by Faroe Islands.

8) Includes 4078 t by Faroe Islands, 3 t by France.

Table 6.1.4. GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Sub-area XIV 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	-	-	-	-	-	78	74	98	87
Germany	2 893	2 439	1 054	818	636	745	456	595	420
Greenland	+	1	5	15	81	177	154	37	11
Iceland	-	-	1	2	36	17	136	40	+
Norway	-	-	-	+	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	+
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	2 893	2 440	1 060	835	753	1 017	820	770	518
Working Group estimate	-	-	-	-	-	-	-	-	-

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	1	+	+
Faroe Islands	-	-	-	181	168	147	130	148	151
Germany	293	279	311	391	639	808	3 343	3 301	3 399
Greenland	40	66	437	288	866	533	1 162	1 129	747 ^{1,10}
Iceland	-	-	-	19	82	7	-	1 803	148
Norway	8	18	196	511	1 120	1 668	1 881	1 944	1 253
Russia	-	-	5	-	-	10	424	37	52
UK (Engl. and Wales)	27	38	108	796	513	1405	264	218	190
UK (Scotland)	-	-	18	26	84	205	13	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	368	401	1 075	2 212	3 472	4 783	7 218	8 580	5940
Working Group estimate	736 ²	875 ³	1 176 ⁴	2 249 ⁵	3 125 ⁶	5 077 ⁷	7 283 ⁸	8 558 ⁹	-

Country	1999	2000	2 001 ¹
Denmark			
Faroe Islands	2		
Germany	3047	3243	2 753
Greenland	200 ^{1,12}		
Iceland	93	30	
Norway	1100	1162 ¹	1 451
Russia	138	183	186
UK (Engl. and Wales)	226	262	
UK (Scotland)			
United Kingdom			70
Total	4806	4880	4 460
Working Group estimate	5376 ¹¹	6958 ¹³	7 216 ¹⁴

1) Provisional data

2) Includes 370 t catches taken by Japan

3) Includes 315 t catch taken by Japan and 159 t by other countries as reported to Greenland.

4) Indicates additional catches taken by Germany (96 t) and UK (17 t) as reported to Greenland.

5) Indicates additional catches taken by Germany (37 t), Norway (238 t), UK (182 t) and Japan (62 t) as reported to Greenland.

6) Total reported to Greenlandic authorities are used in assessment: 159 t trawl (Norwegian charter), 205 t gillnets (Norwegian charter). 405t from Norway not included in working group estimate.

7) Includes 273 t offshore gillnets (Greenland charter)

8) Working group estimates as in Table 6.1.5. Includes 72 t by Germany

9) Includes additional catch of 25 t as reported by Norwegian authorities (1858 t inside 200 EEZ, 64 t outside EEZ)

10) Excluding 138 t reported as area unknown.

11) Includes 125 t by Faroe Islands, 206 t by Greenland.

12) Excluding 4732t reported as area unknown.

13) Includes: 1523 t by Norway 102 t by Faroe Islands, 3343 by Germany, 1910 t by Greenland, 180 t by Russia, as reported to Greenland authorities.

14) Includes 2849 t by Greenland, 1424t by Norway, 2750t by Germany

Table 6.1.5. GREENLAND HALIBUT. Nominal catches (tonnes) by countries
in Sub-area XII, as officially reported to the ICES.

Country	1996	1997	1998	1999	2000	2001
Faroe Islands		47				
Norway	2					
Total	2	47	-	-	-	-
WG estimate						102 ¹

¹ 102 t by Faroe Islands as reported to Faroe Island authorities

Table 6.1.6. 2001 Catch statistics for Greenland halibut in V and XIV.
Working Group best estimates.

Va	Long line	Trawl	Gill Net	Unknown	SUM
Faroe Islands					0
Germany, Fed. Rep.		49		50	99
Greenland					0
Iceland	393	16 193	2		16 588
Norway				6	6
UK (E/W/NI)					0
UK (Scotland)					0
UK				59	59
Total	393	16 242	2	115	16 752

Vb	Long line	Trawl	Gill Net	Unknown	SUM
Faroe Islands	1	1 046	2 811	6	3 864
France				37	37
Germany Fed. Rep.		7			7
Norway				8	8
UK (England & Wales)					0
UK (Scotland)					0
United Kingdom				35	35
Total	1	1 053	2 811	86	3 951

XII	Long line	Trawl	Gill Net	Unknown	SUM
Faroe Islands	0			102	102
Total	0	0	0	102	102

XIV	Long line	Trawl	Gill Net	Unknown	SUM
Denmark					0
Faroe Islands					0
EU (GER)		2 750			2 750
Greenland		2 849			2 849
Iceland (outside 200 EEZ)					0
Norway (inside 200 EEZ)	983	441			1 424
Norway (outside 200 EEZ)					0
Russia				186	186
Ireland				7	7
UK (England & Wales)					0
UK (Scotland)					0
United Kingdom					0
Total	983	6 040	0	193	7 216

Summary of catch by gear	Long line	Trawl	Gill Net	Unknown	SUM
	1 377	23 335	2 813	496	28 021

ASPIC approach

G.halibut cpue 1985 to 2001

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ASPIC -- A Surplus-Production Model Including Covariates (Ver. 3.91)

FIT Mode

Author: Michael H. Prager; NOAA/NMFS/S.E. Fisheries Science Center
101 Pivers Island Road; Beaufort, North Carolina 28516 USA

ASPIC User's Manual
is available gratis
from the author.

Ref: Prager, M. H. 1994. A suite of extensions to a nonequilibrium
surplus-production model. Fishery Bulletin 92: 374-389.

CONTROL PARAMETERS USED (FROM INPUT FILE)

Number of years analyzed:	17	Number of bootstrap trials:	0
Number of data series:	2	Lower bound on MSY:	5.000E+03
Objective function computed:	in effort	Upper bound on MSY:	1.000E+09
Relative conv. criterion (simplex):	1.000E-08	Lower bound on r:	7.000E-02
Relative conv. criterion (restart):	3.000E-08	Upper bound on r:	2.500E+00
Relative conv. criterion (effort):	1.000E-04	Random number seed:	2010417
Maximum F allowed in fitting:	8.000	Monte Carlo search mode, trials:	1 10000

PROGRAM STATUS INFORMATION (NON-BOOTSTRAPPED ANALYSIS)

code 0

Normal convergence.

CORRELATION AMONG INPUT SERIES EXPRESSED AS CPUE (NUMBER OF PAIRWISE OBSERVATIONS BELOW)

1 input CPUE indices	1.000	
	17	
2 ICESURVEY indices	0.746	1.000
	6	6
	1	2

GOODNESS-OF-FIT AND WEIGHTING FOR NON-BOOTSTRAPPED ANALYSIS

Loss component number and title	Weighted SSE	N	Weighted MSE	Current weight	Suggested weight	R-squared in CPUE
Loss(-1) SSE in yield	0.000E+00					
Loss(0) Penalty for BIR > 2	0.000E+00	1	N/A	1.000E-01	N/A	
Loss(1) input CPUE indices	7.491E-01	17	4.994E-02	1.000E+00	8.683E-01	0.776
Loss(2) ICESURVEY indices	1.263E-01	6	3.158E-02	1.000E+00	1.373E+00	0.278
TOTAL OBJECTIVE FUNCTION:	8.75436634E-01					

Number of restarts required for convergence: 15
Est. B/Bmsy coverage index (0 worst, 2 best): 0.9155
Est. B/Bmsy nearness index (0 worst, 1 best): 1.0000

< These two measures are defined in Prager
< et al. (1996), Trans. A.F.S. 125:729

MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

Parameter	Estimate	Starting guess	Estimated	User guess
BIR Starting B/Bmsy, year 1985	1.364E+00	1.000E+00	1	1
MSY Maximum sustainable yield	3.700E+04	6.000E+05	1	1
r Intrinsic rate of increase	7.550E-01	8.000E-01	1	1
..... Catchability coefficients by fishery:				
q(1) input CPUE indices	7.903E-03	1.000E-02	1	1
q(2) ICESURVEY indices	7.839E-03	1.000E-02	1	1

MANAGEMENT PARAMETER ESTIMATES (NON-BOOTSTRAPPED)

Parameter	Estimate	Formula	Related quantity
MSY Maximum sustainable yield	3.700E+04	Kr/4	
K Maximum stock biomass	1.960E+05		
Bmsy Stock biomass at MSY	9.801E+04	K/2	
Fmsy Fishing mortality at MSY	3.775E-01	r/2	
F(0.1) Management benchmark	3.398E-01	0.9*Fmsy	

Y(0.1) Equilibrium yield at F(0.1) 3.663E+04 0.99*MSY

B./Bmsy Ratio of B(2002) to Bmsy 7.334E-01

F./Fmsy Ratio of F(2001) to Fmsy 1.074E+00

F01-mult Ratio of F(0.1) to F(2001) 8.383E-01

Ye./MSY Proportion of MSY avail in 2002 9.289E-01 2*Br-Br^2 Ye(2002) = 3.437E+04

..... Fishing effort at MSY in units of each fishery:

fmsy(1) input CPUE indices 4.777E+01 r/2q(1) f(0.1) = 4.299E+01

ESTIMATED POPULATION TRAJECTORY (NON-BOOTSTRAPPED)

Obs	Year or ID	Estimated total F mort	Estimated starting biomass	Estimated average biomass	Observed total yield	Model total yield	Estimated surplus production	Ratio of F mort to Fmsy	Ratio of biomass to Bmsy
1	1985	0.240	1.336E+05	1.337E+05	3.208E+04	3.208E+04	3.210E+04	6.357E-01	1.364E+00
2	1986	0.248	1.337E+05	1.332E+05	3.298E+04	3.298E+04	3.221E+04	6.557E-01	1.364E+00
3	1987	0.370	1.329E+05	1.259E+05	4.662E+04	4.662E+04	3.394E+04	9.806E-01	1.356E+00
4	1988	0.456	1.202E+05	1.120E+05	5.112E+04	5.112E+04	3.617E+04	1.209E+00	1.227E+00
5	1989	0.670	1.053E+05	9.161E+04	6.140E+04	6.140E+04	3.665E+04	1.775E+00	1.074E+00
6	1990	0.501	8.051E+04	7.851E+04	3.933E+04	3.933E+04	3.553E+04	1.327E+00	8.215E-01
7	1991	0.505	7.672E+04	7.515E+04	3.795E+04	3.795E+04	3.498E+04	1.338E+00	7.828E-01
8	1992	0.484	7.375E+04	7.331E+04	3.549E+04	3.549E+04	3.465E+04	1.282E+00	7.525E-01
9	1993	0.599	7.291E+04	6.891E+04	4.125E+04	4.125E+04	3.372E+04	1.585E+00	7.440E-01
10	1994	0.593	6.539E+04	6.276E+04	3.719E+04	3.719E+04	3.220E+04	1.570E+00	6.672E-01
11	1995	0.632	6.040E+04	5.743E+04	3.629E+04	3.629E+04	3.064E+04	1.674E+00	6.163E-01
12	1996	0.706	5.476E+04	5.081E+04	3.586E+04	3.586E+04	2.840E+04	1.869E+00	5.587E-01
13	1997	0.653	4.730E+04	4.555E+04	2.975E+04	2.975E+04	2.640E+04	1.730E+00	4.826E-01
14	1998	0.430	4.395E+04	4.733E+04	2.036E+04	2.036E+04	2.709E+04	1.139E+00	4.484E-01
15	1999	0.367	5.068E+04	5.554E+04	2.037E+04	2.037E+04	3.002E+04	9.714E-01	5.171E-01
16	2000	0.420	6.033E+04	6.330E+04	2.657E+04	2.657E+04	3.235E+04	1.112E+00	6.156E-01
17	2001	0.405	6.611E+04	6.908E+04	2.800E+04	2.800E+04	3.376E+04	1.074E+00	6.746E-01
18	2002		7.188E+04						7.334E-01

RESULTS FOR DATA SERIES # 1 (NON-BOOTSTRAPPED)

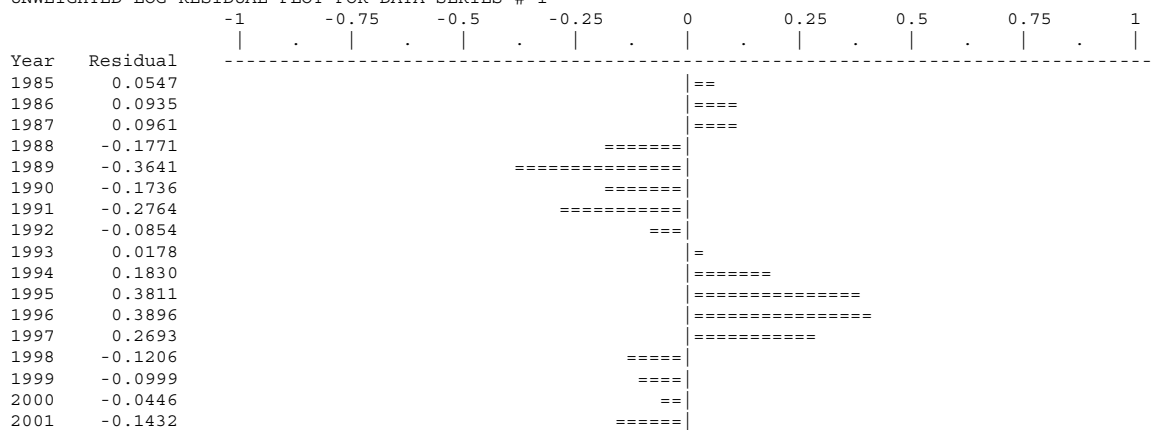
input CPUE indices

Data type CC: CPUE-catch series

Series weight: 1.000

Obs	Year	Observed CPUE	Estimated CPUE	Estim F	Observed yield	Model yield	Resid in log scale	Resid in log yield
1	1985	1.000E+03	1.056E+03	0.2400	3.208E+04	3.208E+04	0.05468	
2	1986	9.590E+02	1.053E+03	0.2475	3.298E+04	3.298E+04	0.09351	
3	1987	9.040E+02	9.952E+02	0.3702	4.662E+04	4.662E+04	0.09615	
4	1988	1.057E+03	8.854E+02	0.4563	5.112E+04	5.112E+04	-0.17715	
5	1989	1.042E+03	7.240E+02	0.6702	6.140E+04	6.140E+04	-0.36412	
6	1990	7.380E+02	6.204E+02	0.5009	3.933E+04	3.933E+04	-0.17357	
7	1991	7.830E+02	5.939E+02	0.5050	3.795E+04	3.795E+04	-0.27640	
8	1992	6.310E+02	5.794E+02	0.4841	3.549E+04	3.549E+04	-0.08538	
9	1993	5.350E+02	5.446E+02	0.5985	4.125E+04	4.125E+04	0.01778	
10	1994	4.130E+02	4.960E+02	0.5926	3.719E+04	3.719E+04	0.18303	
11	1995	3.100E+02	4.538E+02	0.6319	3.629E+04	3.629E+04	0.38112	
12	1996	2.720E+02	4.016E+02	0.7056	3.586E+04	3.586E+04	0.38958	
13	1997	2.750E+02	3.600E+02	0.6531	2.975E+04	2.975E+04	0.26929	
14	1998	4.220E+02	3.741E+02	0.4301	2.036E+04	2.036E+04	-0.12057	
15	1999	4.850E+02	4.389E+02	0.3667	2.037E+04	2.037E+04	-0.09987	
16	2000	5.230E+02	5.002E+02	0.4198	2.657E+04	2.657E+04	-0.04456	
17	2001	6.300E+02	5.459E+02	0.4053	2.800E+04	2.800E+04	-0.14323	

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 1



RESULTS FOR DATA SERIES # 2 (NON-BOOTSTRAPPED)

ICESURVEY indices

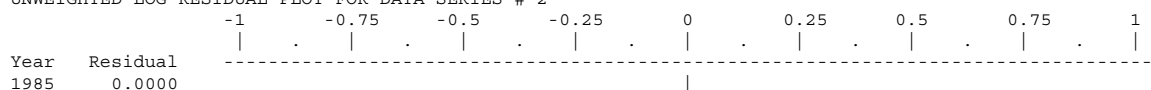
Data type I2: End-of-year biomass index

Series weight: 1.000

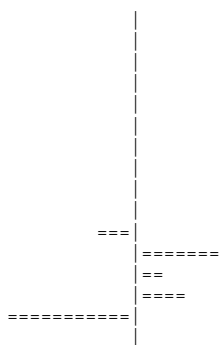
Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1985	0.000E+00	0.000E+00	0.0	*	1.048E+03	0.00000	0.0
2	1986	0.000E+00	0.000E+00	0.0	*	1.042E+03	0.00000	0.0
3	1987	0.000E+00	0.000E+00	0.0	*	9.423E+02	0.00000	0.0
4	1988	0.000E+00	0.000E+00	0.0	*	8.251E+02	0.00000	0.0
5	1989	0.000E+00	0.000E+00	0.0	*	6.311E+02	0.00000	0.0
6	1990	0.000E+00	0.000E+00	0.0	*	6.014E+02	0.00000	0.0
7	1991	0.000E+00	0.000E+00	0.0	*	5.781E+02	0.00000	0.0
8	1992	0.000E+00	0.000E+00	0.0	*	5.716E+02	0.00000	0.0
9	1993	0.000E+00	0.000E+00	0.0	*	5.125E+02	0.00000	0.0
10	1994	0.000E+00	0.000E+00	0.0	*	4.735E+02	0.00000	0.0
11	1995	0.000E+00	0.000E+00	0.0	*	4.292E+02	0.00000	0.0
12	1996	1.000E+00	1.000E+00	0.0	3.460E+02	3.708E+02	-0.06916	-2.478E+01
13	1997	1.000E+00	1.000E+00	0.0	4.140E+02	3.445E+02	0.18383	6.952E+01
14	1998	1.000E+00	1.000E+00	0.0	4.200E+02	3.973E+02	0.05566	2.274E+01
15	1999	1.000E+00	1.000E+00	0.0	5.280E+02	4.729E+02	0.11011	5.505E+01
16	2000	1.000E+00	1.000E+00	0.0	3.960E+02	5.182E+02	-0.26902	-1.222E+02
17	2001	1.000E+00	1.000E+00	0.0	5.570E+02	5.634E+02	-0.01147	-6.427E+00

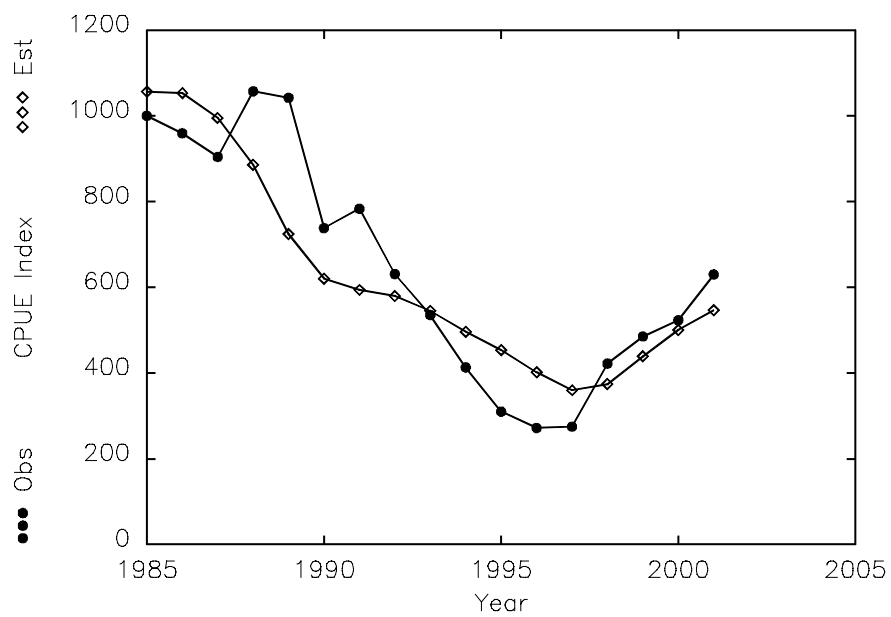
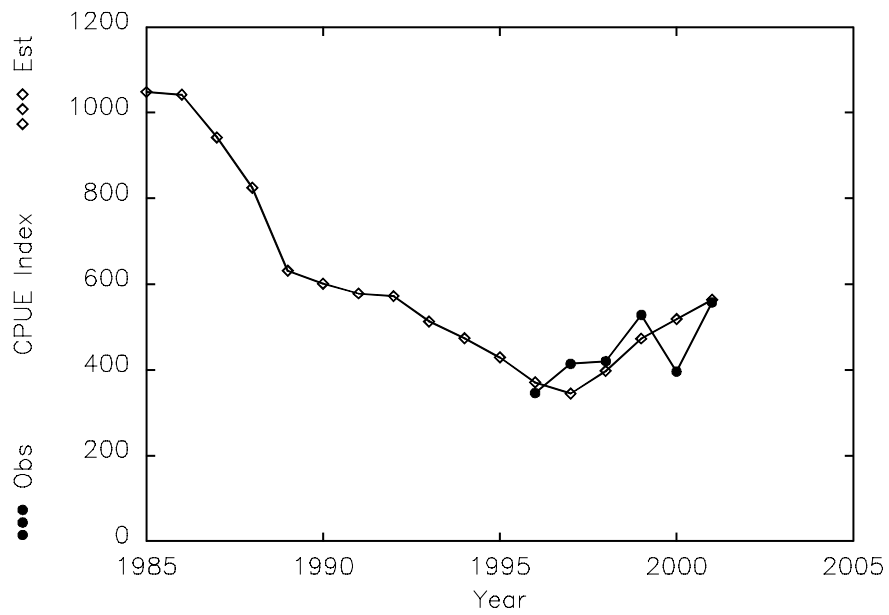
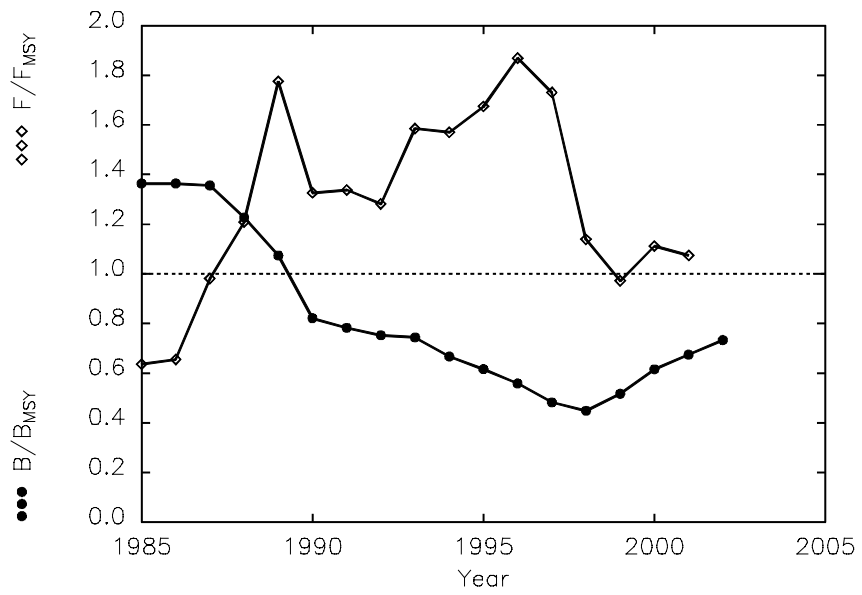
* Asterisk indicates missing value(s).

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 2

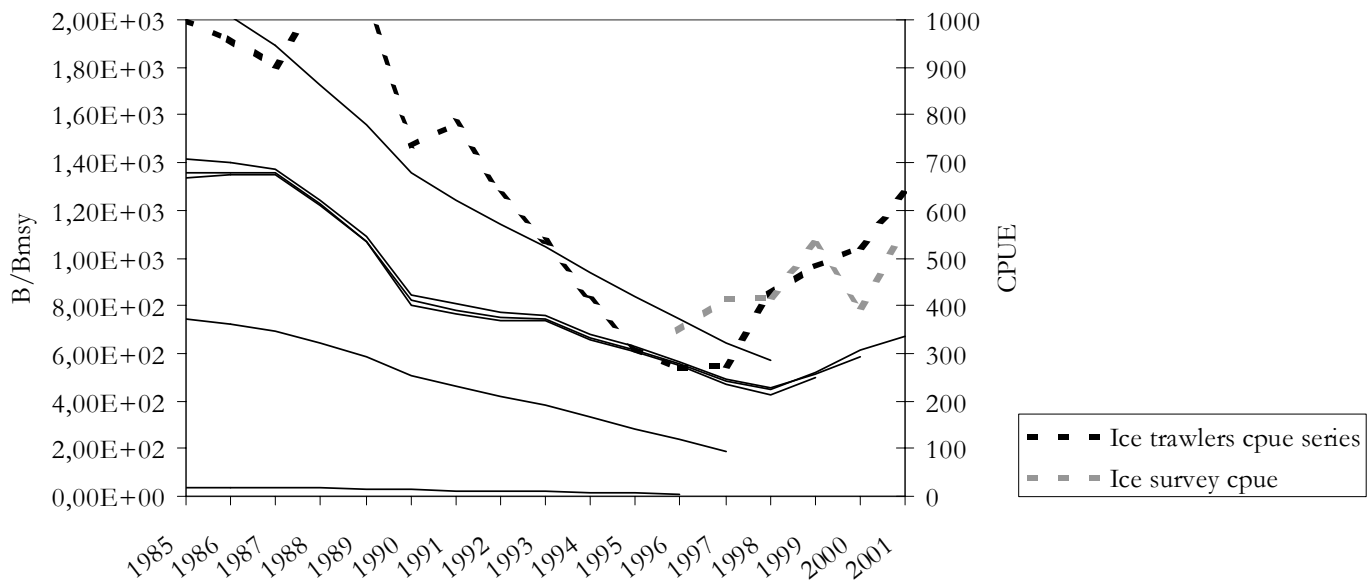


1986	0.0000
1987	0.0000
1988	0.0000
1989	0.0000
1990	0.0000
1991	0.0000
1992	0.0000
1993	0.0000
1994	0.0000
1995	0.0000
1996	-0.0692
1997	0.1838
1998	0.0557
1999	0.1101
2000	-0.2690
2001	-0.0115

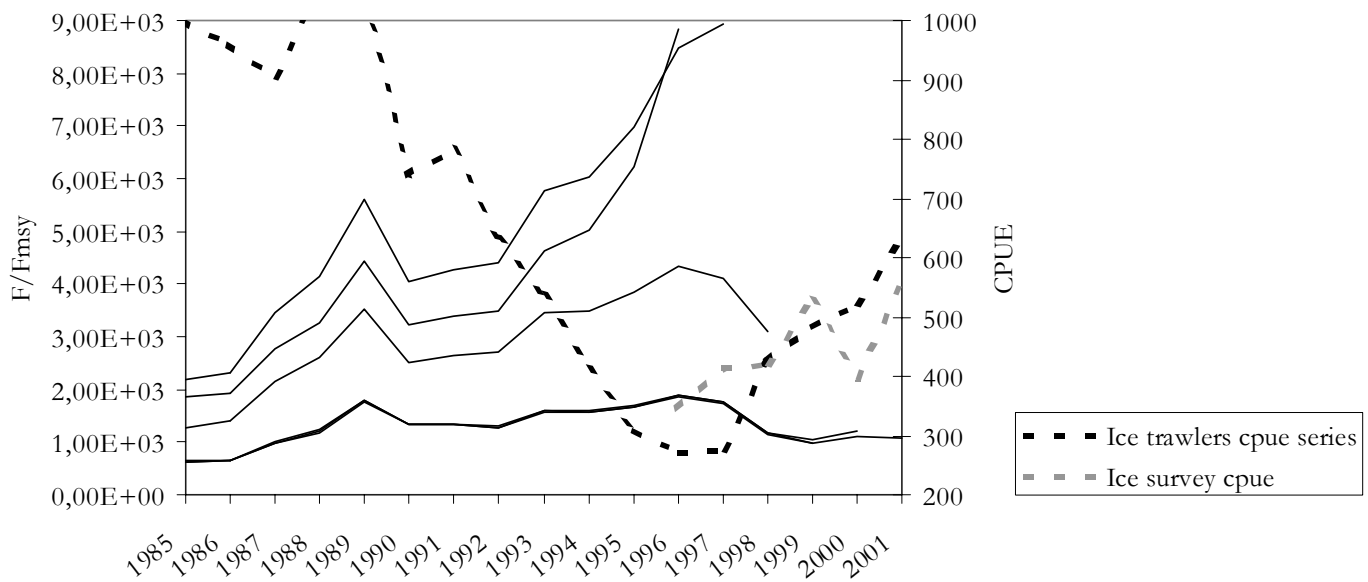




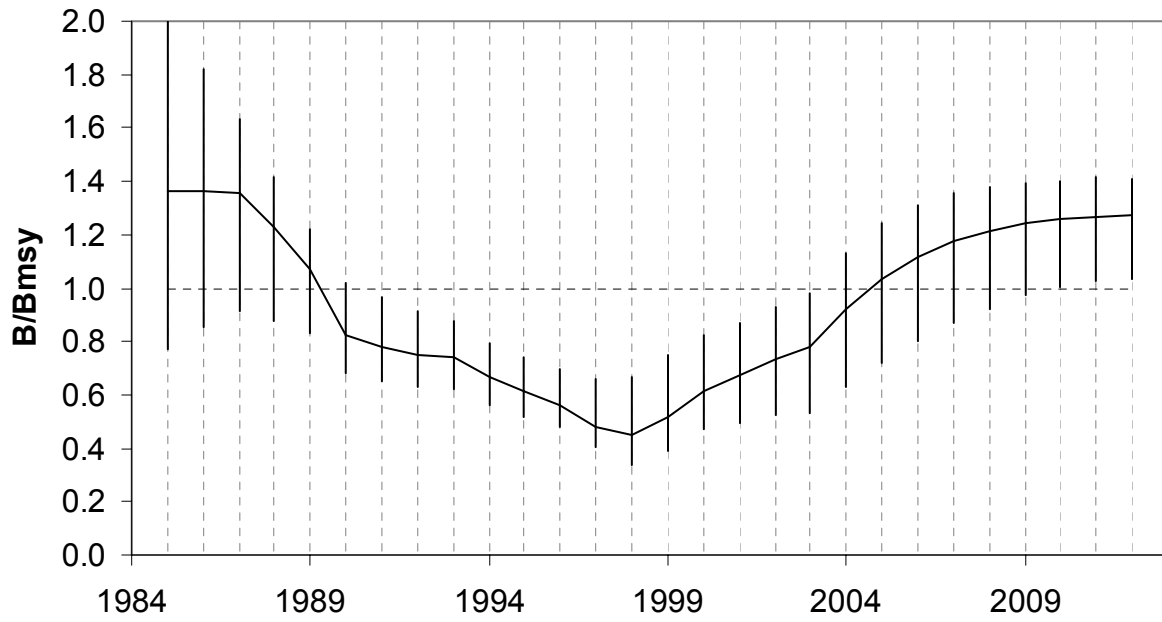
Retrospective pattern of B/B_{msy} from ASPIC



Retrospective pattern of F/F_{msy} from ASPIC



2002 catch= 30 kt; $F(2003-2011)=F_{pa} \sim 2/3 F_{msy}$



SPALY

Lowestoft VPA Version 3.1

1/05/2002 15:15

Extended Survivors Analysis

GREENLAND HALIBUT ICES V+XIV

CPUE data from file Fleet712.dat

Catch data for 27 years. 1975 to 2001. Ages 5 to 16.

Fleet,	First,	Last,	First,	Last,	Alpha,	Beta
	year,	year,	age,	age		
VA TRW CPU 1985-01 C,	1985,	2001,	7,	12,	.000,	1.000

Time series weights :

Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :

Catchability dependent on stock size for ages < 7

Regression type = C
Minimum of 5 points used for regression
Survivor estimates shrunk to the population mean for ages < 7

Catchability independent of age for ages >= 13

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 5 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = .500

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 35 iterations

1

Regression weights
, .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000

Fishing mortalities	Age,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001
5,	.001,	.001,	.003,	.016,	.007,	.003,	.002,	.005,	.002,	.002	
6,	.016,	.017,	.026,	.062,	.057,	.024,	.021,	.012,	.024,	.009	
7,	.076,	.085,	.119,	.147,	.147,	.132,	.103,	.062,	.059,	.098	
8,	.177,	.260,	.234,	.248,	.215,	.178,	.132,	.113,	.130,	.145	
9,	.206,	.355,	.288,	.235,	.237,	.228,	.157,	.158,	.138,	.186	
10,	.336,	.339,	.311,	.234,	.232,	.202,	.146,	.167,	.147,	.199	
11,	.353,	.270,	.330,	.330,	.289,	.184,	.167,	.192,	.227,	.254	
12,	.377,	.436,	.263,	.356,	.441,	.257,	.188,	.247,	.279,	.290	

13,	.334,	.274,	.210,	.264,	.346,	.424,	.140,	.182,	.403,	.352
14,	.196,	.131,	.270,	.337,	.347,	.314,	.203,	.119,	.457,	.326
15,	.313,	.269,	.225,	.265,	.287,	.285,	.189,	.203,	.419,	.448

1

XSA population numbers (Thousands)

YEAR ,	AGE									
12,	5,	6,	7,	8,	9,	10,	11,	12,	13,	14,
1992 ,	2.90E+04,	2.95E+04,	2.97E+04,	2.16E+04,	1.53E+04,	1.14E+04,	7.12E+03,	4.38E+03,	1.93E+03,	8.72E+02,
1993 ,	3.31E+04,	2.49E+04,	2.50E+04,	2.37E+04,	1.56E+04,	1.07E+04,	7.02E+03,	4.31E+03,	2.59E+03,	1.19E+03,
1994 ,	3.30E+04,	2.85E+04,	2.11E+04,	1.97E+04,	1.57E+04,	9.41E+03,	6.58E+03,	4.61E+03,	2.40E+03,	1.69E+03,
1995 ,	3.44E+04,	2.83E+04,	2.39E+04,	1.61E+04,	1.34E+04,	1.01E+04,	5.94E+03,	4.07E+03,	3.05E+03,	1.67E+03,
1996 ,	2.89E+04,	2.92E+04,	2.29E+04,	1.77E+04,	1.08E+04,	9.14E+03,	6.91E+03,	3.67E+03,	2.45E+03,	2.02E+03,
1997 ,	3.40E+04,	2.47E+04,	2.37E+04,	1.70E+04,	1.23E+04,	7.34E+03,	6.24E+03,	4.46E+03,	2.03E+03,	1.49E+03,
1998 ,	3.97E+04,	2.91E+04,	2.08E+04,	1.79E+04,	1.23E+04,	8.44E+03,	5.16E+03,	4.47E+03,	2.97E+03,	1.14E+03,
1999 ,	1.62E+04,	3.41E+04,	2.46E+04,	1.61E+04,	1.35E+04,	9.02E+03,	6.28E+03,	3.76E+03,	3.19E+03,	2.22E+03,
2000 ,	2.39E+04,	1.38E+04,	2.90E+04,	1.99E+04,	1.24E+04,	9.92E+03,	6.57E+03,	4.46E+03,	2.53E+03,	2.29E+03,
2001 ,	2.57E+04,	2.05E+04,	1.16E+04,	2.35E+04,	1.50E+04,	9.30E+03,	7.37E+03,	4.51E+03,	2.90E+03,	1.45E+03,

Estimated population abundance at 1st Jan 2002

,	0.00E+00,	2.21E+04,	1.75E+04,	9.06E+03,	1.75E+04,	1.07E+04,	6.56E+03,	4.92E+03,	2.90E+03,	1.76E+03,
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Taper weighted geometric mean of the VPA populations:

,	3.09E+04,	2.73E+04,	2.37E+04,	1.98E+04,	1.41E+04,	9.61E+03,	6.39E+03,	4.14E+03,	2.47E+03,	1.40E+03,
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Standard error of the weighted Log(VPA populations) :

,	.2686,	.2710,	.2606,	.1531,	.1468,	.1247,	.1223,	.1488,	.2514,	.4172,
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YEAR ,	AGE
	15,

1992 ,	1.44E+02,
1993 ,	6.17E+02,
1994 ,	8.99E+02,
1995 ,	1.11E+03,
1996 ,	1.03E+03,
1997 ,	1.23E+03,
1998 ,	9.40E+02,
1999 ,	8.04E+02,
2000 ,	1.70E+03,
2001 ,	1.25E+03,

Estimated population abundance at 1st Jan 2002

,	9.04E+02,
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Taper weighted geometric mean of the VPA populations:

,	7.58E+02,
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Standard error of the weighted Log(VPA populations) :

,	.7261,
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1

Log catchability residuals.

Fleet : VA TRW CPU 1985-01 C

Age	,	1985,	1986,	1987,	1988,	1989,	1990,	1991
7	,	.32,	-.15,	.56,	.38,	.48,	.12,	-.18
8	,	-1.60,	-.14,	-.02,	.27,	.49,	.40,	.05
9	,	.31,	.53,	.18,	.61,	.69,	.60,	.07
10	,	-3.72,	.68,	.56,	.64,	.80,	.55,	.04
11	,	1.46,	.54,	.49,	.57,	.47,	.15,	-.10
12	,	1.66,	.51,	.47,	.44,	.91,	.13,	.64

Age	,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001
7	,	.20,	-.11,	.13,	-.02,	-.17,	-.27,	.07,	-.32,	.01,	.01
8	,	.25,	.29,	.01,	-.14,	-.37,	-.41,	.00,	-.13,	.19,	.02
9	,	.11,	.33,	-.04,	-.40,	-.54,	-.35,	-.01,	-.25,	-.15,	.18
10	,	.30,	.16,	-.01,	-.46,	-.67,	-.51,	.14,	.12,	-.18,	.31
11	,	.06,	-.22,	-.11,	-.34,	-.60,	-.68,	.13,	.15,	.21,	.42
12	,	.11,	.01,	-.57,	-.62,	-.40,	-.60,	-.49,	.28,	.21,	.41

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

Age	,	7,	8,	9,	10,	11,	12
Mean Log q,		-6.6106,	-5.8889,	-5.6278,	-5.5377,	-5.4248,	-5.2305,
S.E(Log q),		.2260,	.3053,	.3584,	.5677,	.4080,	.5116,

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age,	Slope	,	t-value	,	Intercept,	RSquare,	No Pts,	Reg s.e,	Mean Q
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7,	.83,		.748,		7.19,		.67,	17,	.19,	-6.61,
8,	.43,		2.725,		8.15,		.70,	17,	.11,	-5.89,
9,	.34,		4.187,		8.23,		.80,	17,	.08,	-5.63,
10,	.59,		.497,		7.04,		.13,	17,	.34,	-5.54,
11,	.86,		.147,		5.88,		.10,	17,	.37,	-5.42,
12,	-6.81,		-1.042,		29.45,		.00,	17,	3.47,	-5.23,

1

Terminal year survivor and F summaries :

Age 5 Catchability dependent on age and year class strength

Year class = 1996

Fleet,		Estimated,	Int,	Ext,	Var,	N, Scaled,	Estimated	
,		Survivors,	s.e,	s.e,	Ratio,	, Weights,	F	
VA TRW CPU 1985-01 C,		1.,	.000,	.000,	.00,	0,	.000,	.000
P shrinkage mean	,	27300.,	.27,,,,			.773,	.002	
F shrinkage mean	,	10793.,	.50,,,,			.227,	.004	

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
22113.,	.24,	10.01,	2,	42.020,	.002

1
Age 6 Catchability dependent on age and year class strength

Year class = 1995

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	1.,	.000,	.000,	.00,	0,	.000,	.000
P shrinkage mean ,	23655.,	.26,,,,				.786,	.007
F shrinkage mean ,	5784.,	.50,,,,				.214,	.028

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
17509.,	.23,	9.79,	2,	42.353,	.009

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 1994

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	9165.,	.300,	.000,	.00,	1,	.716,	.097
F shrinkage mean ,	8806.,	.50,,,,				.284,	.101

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
9061.,	.26,	.02,	2,	.083,	.098

1
Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 1993

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	17765.,	.218,	.000,	.00,	2,	.815,	.143
F shrinkage mean ,	16405.,	.50,,,,				.185,	.154

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
17505.,	.20,	.02,	3,	.121,	.145

Age 9 Catchability constant w.r.t. time and dependent on age

Year class = 1992

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	10718.,	.189,	.172,	.91,	3,	.839,	.186
F shrinkage mean ,	10838.,	.50,,,,				.161,	.184

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
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at end of year,	s.e,	s.e,	,	Ratio,	
10737.,	.18,	.13,	4,	.722,	.186

1
Age 10 Catchability constant w.r.t. time and dependent on age

Year class = 1991

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	6412.,	.181,	.088,	.49,	4,	.834,	.203
F shrinkage mean ,	7361.,	.50,,,				.166,	.179

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
6561.,	.17,	.08,	5,	.437,	.199

Age 11 Catchability constant w.r.t. time and dependent on age

Year class = 1990

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	4723.,	.170,	.132,	.78,	5,	.833,	.264
F shrinkage mean ,	6018.,	.50,,,				.167,	.213

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
4918.,	.16,	.12,	6,	.708,	.254

1
Age 12 Catchability constant w.r.t. time and dependent on age

Year class = 1989

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	2885.,	.167,	.123,	.74,	6,	.812,	.291
F shrinkage mean ,	2979.,	.50,,,				.188,	.283

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
2903.,	.16,	.10,	7,	.613,	.290

Age 13 Catchability constant w.r.t. time and dependent on age

Year class = 1988

Fleet,	Estimated,	Int,	Ext,	Var,	N,	Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	,	Weights,	F
VA TRW CPU 1985-01 C,	1651.,	.170,	.108,	.64,	6,	.749,	.371
F shrinkage mean ,	2121.,	.50,,,				.251,	.300

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
1758.,	.18,	.10,	7,	.557,	.352

1

Age 14 Catchability constant w.r.t. time and age (fixed at the value for age) 13

Year class = 1987

Fleet,	Estimated,	Int,	Ext,	Var,	N, Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	, Weights,	F
VA TRW CPU 1985-01 C,	844.,	.174,	.136,	.78,	6, .669,	.345
F shrinkage mean ,	1038.,	.50,,,,			.331,	.289

Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
904.,	.20,	.11,	7,	.556,	.326

Age 15 Catchability constant w.r.t. time and age (fixed at the value for age) 13

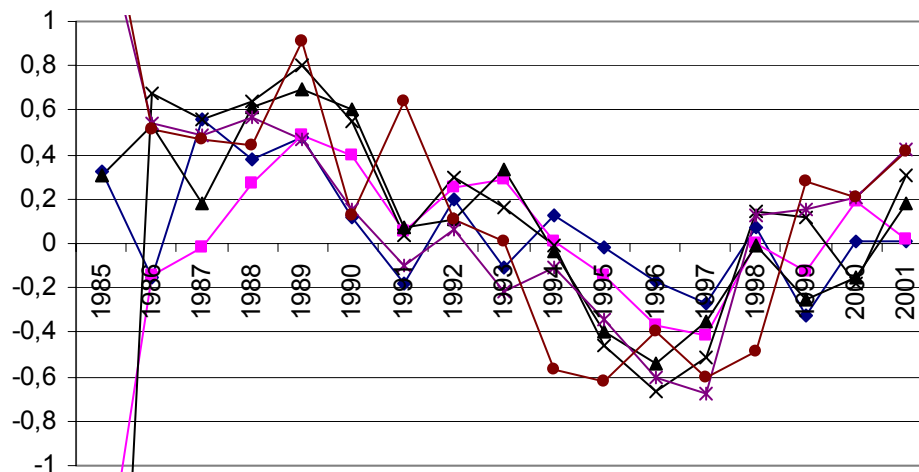
Year class = 1986

Fleet,	Estimated,	Int,	Ext,	Var,	N, Scaled,	Estimated
,	Survivors,	s.e,	s.e,	Ratio,	, Weights,	F
VA TRW CPU 1985-01 C,	469.,	.178,	.118,	.66,	6, .586,	.603
F shrinkage mean ,	1174.,	.50,,,,			.414,	.285

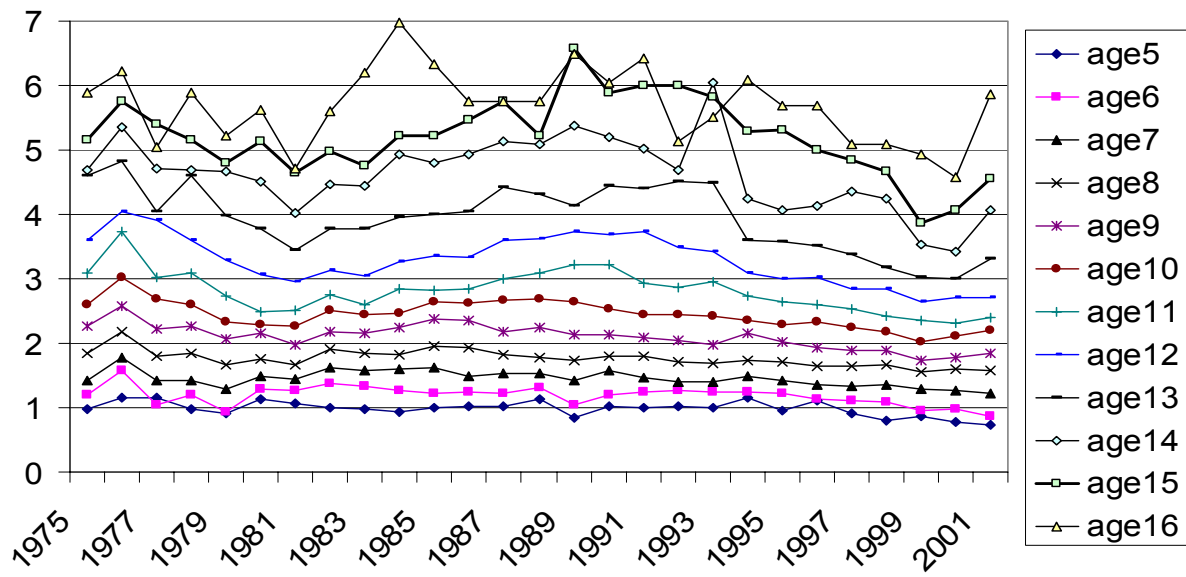
Weighted prediction :

Survivors,	Int,	Ext,	N,	Var,	F
at end of year,	s.e,	s.e,	,	Ratio,	
685.,	.23,	.25,	7,	1.101,	.448

Log q residuals G.halibut XIV+V



G.halibut wgt-at-age



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Run title : GREENLAND HALIBUT ICES V+XIV

At 1/05/2002 15:15

Table 1	Catch numbers at age							Numbers*10**-3
YEAR,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	
AGE								
5,	120,	43,	0,	23,	29,	47,	26,	
6,	800,	296,	34,	91,	197,	502,	158,	
7,	1775,	584,	671,	347,	1605,	1536,	580,	
8,	1782,	621,	1727,	1037,	2253,	2630,	1160,	
9,	1259,	431,	2289,	1214,	3090,	3126,	1430,	
10,	926,	240,	834,	848,	1693,	2324,	1764,	
11,	464,	121,	420,	567,	880,	1739,	1299,	
12,	459,	86,	423,	312,	394,	849,	664,	
13,	279,	37,	174,	232,	246,	578,	435,	
14,	193,	32,	120,	218,	189,	306,	252,	
15,	137,	14,	28,	114,	147,	143,	176,	
+gp,	39,	6,	86,	112,	101,	82,	114,	
TOTALNUM,	8233,	2511,	6806,	5115,	10824,	13862,	8058,	
TONSLAND,	23494,	6045,	16578,	14349,	23616,	31252,	19239,	
SOPCOF %,	128,	101,	102,	105,	102,	100,	102,	

0

Table 1	Catch numbers at age										Numbers*10**-3
YEAR,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	
AGE											
5,	8,	10,	83,	125,	245,	182,	129,	499,	188,	289,	
6,	300,	240,	277,	441,	612,	3123,	742,	1657,	463,	1225,	
7,	1140,	1611,	891,	1018,	1033,	4863,	2068,	4485,	1513,	1797,	
8,	2451,	2651,	2139,	2295,	1942,	2586,	2985,	5961,	3515,	2866,	
9,	2646,	3060,	3568,	3454,	2983,	2156,	3166,	5763,	4186,	2935,	
10,	2456,	2443,	2800,	2749,	3097,	3476,	2966,	3246,	3143,	2074,	
11,	1803,	1693,	1825,	1452,	1683,	1847,	1848,	1601,	1224,	1130,	
12,	963,	978,	1134,	627,	820,	1829,	1761,	1458,	959,	1072,	
13,	609,	424,	588,	423,	550,	886,	1851,	1237,	568,	924,	

	14,	331,	174,	363,	137,	202,	243,	701,	506,	358,	554,
	15,	195,	37,	92,	36,	59,	31,	216,	362,	137,	342,
	+gp,	82,	17,	13,	46,	30,	1,	246,	145,	61,	82,
0	TOTALNUM,	12984,	13338,	13773,	12803,	13256,	21223,	18679,	26920,	16315,	15290,
	TONSLAND,	32441,	30891,	34024,	32075,	32984,	46622,	51118,	61396,	39326,	37950,
	SOPCOF %,	101,	102,	100,	103,	101,	98,	101,	100,	100,	101,

1

Run title : GREENLAND HALIBUT ICES V+XIV

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Table 1	Catch numbers at age				Numbers*10**-3						
YEAR,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001,	
AGE											
5,	17,	44,	78,	503,	178,	86,	90,	82,	53,	46,	
6,	421,	397,	672,	1587,	1488,	549,	550,	366,	310,	174,	
7,	2023,	1896,	2197,	3031,	2908,	2723,	1882,	1363,	1543,	1006,	
8,	3262,	5024,	3815,	3287,	3181,	2579,	2051,	1606,	2256,	2947,	
9,	2646,	4324,	3648,	2608,	2119,	2331,	1657,	1828,	1485,	2364,	
10,	3019,	2859,	2330,	1963,	1755,	1247,	1067,	1287,	1256,	1559,	
11,	1962,	1539,	1715,	1548,	1610,	975,	737,	1018,	1235,	1536,	
12,	1278,	1412,	990,	1132,	1216,	937,	710,	762,	1006,	1052,	
13,	509,	576,	422,	657,	665,	652,	359,	492,	777,	800,	
14,	144,	136,	371,	444,	548,	374,	195,	231,	778,	375,	
15,	36,	135,	168,	240,	238,	282,	150,	137,	539,	418,	
+gp,	56,	7,	177,	211,	323,	262,	106,	119,	174,	122,	
0	TOTALNUM,	15373,	18349,	16583,	17211,	16229,	12997,	9554,	9291,	11412,	12399,
	TONSLAND,	35423,	40817,	36958,	36300,	35825,	30267,	20360,	20371,	26839,	28021,
	SOPCOF %,	100,	100,	100,	100,	103,	110,	107,	111,	108,	103,

1

Run title : GREENLAND HALIBUT ICES V+XIV

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Table 2	Catch weights at age (kg)							
YEAR,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	
AGE								
5,	.9680,	1.1570,	1.1570,	.9680,	.9110,	1.1250,	1.0710,	
6,	1.1990,	1.5850,	1.0460,	1.1990,	.9420,	1.2830,	1.2570,	
7,	1.4230,	1.7680,	1.4290,	1.4230,	1.2780,	1.4870,	1.4400,	
8,	1.8540,	2.1800,	1.7940,	1.8540,	1.6760,	1.7560,	1.6600,	
9,	2.2560,	2.5700,	2.2280,	2.2560,	2.0720,	2.1530,	1.9670,	
10,	2.6070,	3.0180,	2.6870,	2.6070,	2.3330,	2.2790,	2.2580,	
11,	3.0810,	3.7300,	3.0170,	3.0810,	2.7230,	2.4980,	2.5150,	
12,	3.5910,	4.0520,	3.9140,	3.5910,	3.2970,	3.0590,	2.9500,	
13,	4.6040,	4.8150,	4.0400,	4.6040,	3.9850,	3.7830,	3.4500,	
14,	4.6950,	5.3480,	4.7140,	4.6950,	4.6680,	4.5070,	4.0330,	
15,	5.1510,	5.7520,	5.4010,	5.1510,	4.7920,	5.1390,	4.6520,	
+gp,	5.8930,	6.2270,	5.0540,	5.8930,	5.2290,	5.6330,	4.7140,	
0	SOPCOFAC,	1.2794,	1.0068,	1.0227,	1.0471,	1.0187,	.9975,	1.0189,

Table 2	Catch weights at age (kg)									
YEAR,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,
AGE										
5,	1.0100,	.9840,	.9420,	.9950,	1.0300,	1.0300,	1.1290,	.8420,	1.0290,	1.0010,
6,	1.3680,	1.3380,	1.2750,	1.2300,	1.2380,	1.2180,	1.3040,	1.0470,	1.2100,	1.2470,
7,	1.6180,	1.5770,	1.5920,	1.6300,	1.4990,	1.5330,	1.5410,	1.4250,	1.5720,	1.4720,
8,	1.9050,	1.8480,	1.8170,	1.9510,	1.9370,	1.8240,	1.7700,	1.7270,	1.7900,	1.8100,
9,	2.1870,	2.1590,	2.2400,	2.3670,	2.3630,	2.1870,	2.2360,	2.1250,	2.1260,	2.0880,
10,	2.5160,	2.4340,	2.4610,	2.6370,	2.6310,	2.6660,	2.6830,	2.6370,	2.5360,	2.4400,
11,	2.7610,	2.6030,	2.8350,	2.8290,	2.8480,	2.9960,	3.0820,	3.2200,	3.2140,	2.9350,

	12,	3.1290,	3.0340,	3.2620,	3.3530,	3.3350,	3.5950,	3.6240,	3.7330,	3.6930,	3.7370,
	13,	3.7850,	3.7840,	3.9620,	4.0060,	4.0390,	4.4310,	4.3120,	4.1350,	4.4480,	4.4010,
	14,	4.4750,	4.4460,	4.9360,	4.7920,	4.9250,	5.1400,	5.0980,	5.3800,	5.1970,	5.0220,
	15,	4.9850,	4.7510,	5.2300,	5.2310,	5.4660,	5.7640,	5.2130,	6.5690,	5.8910,	5.9910,
	+gp,	5.6100,	6.2090,	6.9680,	6.3230,	5.7640,	5.7640,	5.7640,	6.4970,	6.0490,	6.4120,
0	SOPCOFAC,	1.0104,	1.0176,	.9953,	1.0258,	1.0069,	.9792,	1.0063,	.9999,	.9998,	1.0097,
1											

Run title : GREENLAND HALIBUT ICES V+XIV

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Table 2	Catch weights at age (kg)										
YEAR,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001,	
AGE											
5,	1.0160,	.9910,	1.1630,	.9500,	1.1010,	.9190,	.8070,	.8610,	.7700,	.7320,	
6,	1.2560,	1.2490,	1.2540,	1.2130,	1.1240,	1.1070,	1.0860,	.9530,	.9680,	.8650,	
7,	1.4010,	1.4010,	1.4880,	1.4130,	1.3460,	1.3340,	1.3630,	1.2880,	1.2720,	1.2190,	
8,	1.7180,	1.6850,	1.7360,	1.7030,	1.6490,	1.6400,	1.6580,	1.5650,	1.6070,	1.5770,	
9,	2.0490,	1.9820,	2.1500,	2.0280,	1.9250,	1.8810,	1.8860,	1.7390,	1.7690,	1.8510,	
10,	2.4360,	2.4250,	2.3520,	2.2790,	2.3420,	2.2400,	2.1670,	2.0120,	2.1220,	2.2020,	
11,	2.8680,	2.9520,	2.7360,	2.6430,	2.5950,	2.5380,	2.4150,	2.3510,	2.3140,	2.3990,	
12,	3.4780,	3.4290,	3.0820,	2.9920,	3.0130,	2.8460,	2.8440,	2.6340,	2.7220,	2.7000,	
13,	4.5100,	4.4790,	3.6070,	3.5680,	3.5150,	3.3850,	3.1730,	3.0310,	3.0100,	3.3110,	
14,	4.6810,	6.0430,	4.2420,	4.0680,	4.1230,	4.3590,	4.2370,	3.5320,	3.4230,	4.0720,	
15,	6.0100,	5.8320,	5.2930,	5.3020,	4.9960,	4.8510,	4.6560,	3.8740,	4.0660,	4.5500,	
+gp,	5.1280,	5.5120,	6.0870,	5.6860,	5.6930,	5.0910,	5.0800,	4.9370,	4.5730,	5.8670,	
0	SOPCOFAC,	1.0033,	1.0010,	1.0001,	1.0042,	1.0329,	1.1044,	1.0674,	1.1142,	1.0819,	1.0307,
1											

Run title : GREENLAND HALIBUT ICES V+XIV

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Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age							
YEAR,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	
AGE								
5,	.0053,	.0018,	.0000,	.0009,	.0009,	.0012,	.0007,	
6,	.0480,	.0153,	.0017,	.0044,	.0090,	.0183,	.0049,	
7,	.1515,	.0426,	.0415,	.0198,	.0941,	.0856,	.0251,	
8,	.2563,	.0688,	.1619,	.0791,	.1636,	.2080,	.0817,	
9,	.2989,	.0857,	.3640,	.1549,	.3352,	.3377,	.1579,	
10,	.3559,	.0803,	.2245,	.2095,	.3167,	.4277,	.3056,	
11,	.2382,	.0671,	.1864,	.2217,	.3299,	.5882,	.4256,	
12,	.3647,	.0597,	.3311,	.1946,	.2236,	.5763,	.4389,	
13,	.7896,	.0421,	.1561,	.2879,	.2191,	.5571,	.6236,	
14,	.6760,	.1746,	.1767,	.2822,	.3794,	.4369,	.4743,	
15,	.4876,	.0849,	.2157,	.2400,	.2949,	.5202,	.4560,	
+gp,	.4876,	.0849,	.2157,	.2400,	.2949,	.5202,	.4560,	
0	FBAR 7-12,	.2776,	.0674,	.2182,	.1466,	.2439,	.3706,	.2391,
1								

Table 8	Fishing mortality (F) at age									
YEAR,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,
AGE										
5,	.0003,	.0004,	.0027,	.0029,	.0055,	.0045,	.0037,	.0144,	.0049,	.0091,
6,	.0094,	.0090,	.0116,	.0169,	.0165,	.0860,	.0217,	.0577,	.0157,	.0376,
7,	.0420,	.0608,	.0397,	.0513,	.0474,	.1665,	.0716,	.1672,	.0651,	.0743,
8,	.1332,	.1231,	.1017,	.1291,	.1240,	.1522,	.1383,	.2858,	.1812,	.1601,
9,	.2557,	.2316,	.2293,	.2242,	.2332,	.1866,	.2664,	.4046,	.3146,	.2141,
10,	.4174,	.3747,	.3244,	.2623,	.3036,	.4394,	.3975,	.4520,	.3798,	.2393,
11,	.5526,	.5360,	.5018,	.2625,	.2399,	.2821,	.4168,	.3654,	.2881,	.2144,
12,	.6104,	.6253,	.8026,	.3013,	.2194,	.4191,	.4479,	.6425,	.3667,	.4152,
13,	.8846,	.5627,	.9337,	.7628,	.4437,	.3681,	.9472,	.6183,	.5241,	.6848,

14,	1.4495,	.6387,	1.3920,	.5412,	1.0074,	.3378,	.5260,	.6958,	.3393,	1.5171,
15,	.7887,	.5508,	.7968,	.4282,	.4451,	.3710,	.5362,	.5365,	.3802,	.5950,
+gp,	.7887,	.5508,	.7968,	.4282,	.4451,	.3710,	.5362,	.5365,	.3802,	.5950,
0 FBAR 7-12,	.3352,	.3253,	.3333,	.2051,	.1946,	.2743,	.2898,	.3862,	.2659,	.2196,
1										

Run title : GREENLAND HALIBUT ICES V+XIV

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Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age										
YEAR,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001,	FBAR 99-**
AGE											
5,	.0006,	.0014,	.0026,	.0159,	.0067,	.0027,	.0024,	.0055,	.0024,	.0019,	.0033,
6,	.0155,	.0173,	.0258,	.0623,	.0566,	.0242,	.0206,	.0116,	.0245,	.0092,	.0151,
7,	.0763,	.0854,	.1192,	.1471,	.1471,	.1321,	.1027,	.0616,	.0591,	.0980,	.0729,
8,	.1774,	.2596,	.2338,	.2485,	.2147,	.1783,	.1319,	.1134,	.1304,	.1451,	.1296,
9,	.2061,	.3552,	.2878,	.2347,	.2373,	.2280,	.1574,	.1579,	.1381,	.1859,	.1606,
10,	.3359,	.3388,	.3106,	.2338,	.2318,	.2023,	.1464,	.1671,	.1468,	.1992,	.1710,
11,	.3525,	.2698,	.3299,	.3301,	.2891,	.1843,	.1672,	.1921,	.2266,	.2545,	.2244,
12,	.3772,	.4360,	.2633,	.3563,	.4415,	.2570,	.1879,	.2466,	.2786,	.2899,	.2717,
13,	.3340,	.2744,	.2104,	.2642,	.3455,	.4243,	.1398,	.1820,	.4025,	.3522,	.3122,
14,	.1961,	.1314,	.2695,	.3373,	.3469,	.3143,	.2029,	.1190,	.4568,	.3256,	.3004,
15,	.3129,	.2691,	.2250,	.2646,	.2875,	.2849,	.1888,	.2029,	.4193,	.4485,	.3569,
+gp,	.3129,	.2691,	.2250,	.2646,	.2875,	.2849,	.1888,	.2029,	.4193,	.4485,	
0 FBAR 7-12,	.2542,	.2908,	.2574,	.2584,	.2602,	.1970,	.1489,	.1565,	.1633,	.1954,	
1											

Run title : GREENLAND HALIBUT ICES V+XIV

At 1/05/2002 15:15

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)						Numbers*10**-3	
YEAR,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	
AGE								
5,	24537,	25827,	26126,	27501,	34719,	40585,	40135,	
6,	18407,	21008,	22190,	22487,	23649,	29856,	34889,	
7,	13606,	15101,	17807,	19067,	19270,	20172,	25231,	
8,	8494,	10064,	12456,	14704,	16089,	15097,	15937,	
9,	5252,	5658,	8086,	9119,	11694,	11758,	10554,	
10,	3333,	3352,	4470,	4836,	6722,	7198,	7220,	
11,	2360,	2010,	2663,	3074,	3376,	4215,	4040,	
12,	1619,	1601,	1617,	1902,	2119,	2089,	2015,	
13,	551,	968,	1298,	1000,	1348,	1459,	1011,	
14,	423,	215,	798,	956,	645,	932,	719,	
15,	383,	185,	156,	576,	620,	380,	518,	
+gp,	108,	79,	476,	564,	424,	216,	333,	
0 TOTAL,	79074,	86068,	98143,	105785,	120677,	133958,	142602,	

Table 10	Stock number at age (start of year)						Numbers*10**-3			
YEAR,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,
AGE										
5,	33649,	29992,	33104,	47036,	47723,	43501,	37160,	37654,	41820,	34528,
6,	34520,	28955,	25805,	28416,	40369,	40849,	37273,	31865,	31946,	35820,
7,	29882,	29434,	24699,	21954,	24048,	34178,	32261,	31393,	25889,	27067,
8,	21179,	24662,	23839,	20432,	17951,	19740,	24906,	25849,	22859,	20879,
9,	12641,	15955,	18768,	18534,	15457,	13649,	14591,	18667,	16718,	16414,
10,	7757,	8426,	10893,	12843,	12748,	10536,	9748,	9622,	10720,	10506,
11,	4578,	4398,	4986,	6778,	8504,	8099,	5844,	5638,	5270,	6311,
12,	2272,	2267,	2215,	2598,	4487,	5758,	5257,	3315,	3368,	3400,
13,	1118,	1062,	1044,	854,	1654,	3101,	3259,	2891,	1501,	2009,
14,	466,	397,	521,	353,	343,	914,	1847,	1088,	1341,	765,
15,	385,	94,	181,	111,	177,	108,	561,	940,	467,	822,

	+gp,	160,	43,	25,	141,	89,	3,	634,	374,	207,	195,
0	TOTAL,	148609,	145686,	146079,	160052,	173552,	180437,	173342,	169295,	162105,	158716,
1											

Run title : GREENLAND HALIBUT ICES V+XIV

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Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)					Numbers*10**-3							
YEAR,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	GMST 75-99	AMST 75-99
AGE													
5,	28968,	33131,	33005,	34416,	28944,	33952,	39678,	16151,	23909,	25741,	0,	33316,	34154,
6,	29450,	24918,	28476,	28335,	29156,	24747,	29143,	34068,	13825,	20530,	22113,	28894,	29464,
7,	29694,	24958,	21078,	23886,	22916,	23714,	20790,	24573,	28983,	11612,	17509,	23539,	24107,
8,	21629,	23681,	19722,	16104,	17747,	17026,	17885,	16149,	19886,	23514,	9061,	17992,	18603,
9,	15312,	15590,	15722,	13436,	10811,	12324,	12262,	13491,	12409,	15023,	17505,	12696,	13298,
10,	11405,	10724,	9407,	10147,	9145,	7340,	8444,	9016,	9916,	9303,	10737,	8177,	8662,
11,	7118,	7015,	6578,	5935,	6913,	6243,	5160,	6278,	6567,	7369,	6561,	5009,	5335,
12,	4384,	4307,	4610,	4071,	3672,	4456,	4469,	3758,	4459,	4506,	4918,	3027,	3265,
13,	1932,	2587,	2397,	3050,	2453,	2033,	2966,	3187,	2527,	2905,	2903,	1669,	1869,
14,	872,	1191,	1693,	1671,	2015,	1495,	1145,	2220,	2287,	1455,	1758,	845,	1001,
15,	144,	617,	899,	1113,	1027,	1226,	940,	804,	1696,	1247,	904,	408,	537,
+gp,	224,	32,	943,	974,	1387,	1134,	662,	696,	544,	361,	884,		
0	TOTAL,	151133,	148751,	144529,	143138,	136185,	135689,	143544,	130392,	127010,	123566,	94854,	
1													

Run title : GREENLAND HALIBUT ICES V+XIV

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Table 16 Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR	7-12,
	Age 5						
1975,	24537,	121686,	45791,	23494,	.5131,	.2776,	
1976,	25827,	157828,	53608,	6045,	.1128,	.0674,	
1977,	26126,	157876,	63083,	16578,	.2628,	.2182,	
1978,	27501,	172835,	72685,	14349,	.1974,	.1466,	
1979,	34719,	175167,	76036,	23616,	.3106,	.2439,	
1980,	40585,	212000,	78478,	31252,	.3982,	.3706,	
1981,	40135,	213164,	72317,	19239,	.2660,	.2391,	
1982,	33649,	245955,	79394,	32441,	.4086,	.3352,	
1983,	29992,	240029,	71983,	30891,	.4291,	.3253,	
1984,	33104,	244758,	83926,	34024,	.4054,	.3333,	
1985,	47036,	269618,	96568,	32075,	.3322,	.2051,	
1986,	47723,	289055,	105577,	32984,	.3124,	.1946,	
1987,	43501,	304946,	117596,	46622,	.3965,	.2743,	
1988,	37160,	310250,	124061,	51118,	.4120,	.2898,	
1989,	37654,	276423,	115000,	61396,	.5339,	.3862,	
1990,	41820,	273053,	102841,	39326,	.3824,	.2659,	
1991,	34528,	266861,	115118,	37950,	.3297,	.2196,	
1992,	28968,	254810,	96371,	35423,	.3676,	.2542,	
1993,	33131,	253764,	103421,	40817,	.3947,	.2908,	
1994,	33005,	254154,	102180,	36958,	.3617,	.2574,	
1995,	34416,	235599,	127112,	36300,	.2856,	.2584,	
1996,	28944,	225937,	119181,	35825,	.3006,	.2602,	
1997,	33952,	211419,	103500,	30267,	.2924,	.1970,	
1998,	39678,	210253,	95925,	20360,	.2122,	.1489,	
1999,	16151,	193610,	107260,	20371,	.1899,	.1565,	
2000,	23909,	195765,	97624,	26839,	.2749,	.1633,	
2001,	25741,	189310,	95506,	28021,	.2934,	.1954,	

Arith.						
Mean	33463,	228005,	93413,	31281,	.3324,	.2435,
0 Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		
1						