REPORT OF THE

NORTH-WESTERN
WORKING GROUP

ICES, Headquarters
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PART 1 OF 2

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1.2   Terms of Reference

The North Western Working Group (Chair: J. Boje, Denmark) met at ICES Headquarters from 26 April to 4 May 1999 to:

a)   assess the status of and provide catch options for 2000 for the stocks of oceanic redfish in Sub-areas V, XII and XIV, Greenland halibut in Sub-areas V and XIV, cod in Sub-area XIV, NAFO Sub-area 1 and Divisions Va and Vb, saithe in Divisions Va and Vb and haddock in Divisions Va and Vb;

b)   for cod, haddock and saithe in Division Vb, where an effort control management system is in effect, estimate the probability profile of fishing mortalities which would be generated under the current effort control scheme and provide effort options which have a high probability (>80 %) that the realised fishing mortalities in 2000 would correspond to the fishing mortality identified as within safe biological limits;

c)   update survey and fishery information on the stocks of redfish in Sub-areas V, VI, XII and XIV;

d)   review progress in determining precautionary reference points;

e)   consider further possibilities for the incorporation of biological interactions into the assessment of capelin, herring, and cod stocks;

f)   update information on the stock composition, distribution and migration of the redfish stocks in Sub-areas V and XIV and comment on the possible relationship between pelagic "deep sea" *Sebastes mentella* and the *Sebastes mentella* fished in demersal fisheries on the continental shelf and slope;

g)   propose in consultation with WGNPBW, a Scientific Steering Group for the planned Symposium on "Capelin – What Are They Good For? Biology, Management and the Ecological Role of capelin.

The above Terms of Reference are set up to provide ACFM with the information required to respond to request for advice/information from NEAFC.

NWWG will report to ACFM at its May 1999 Meeting.

1.3 General comments

In addition to stocks assessed in previous years by NWWG, haddock in Division Va was included this year (TOR a). Regarding TOR e) on possibilities for incorporation of biological interactions into the assessment of capelin, herring, and cod stocks, the scarce information presented to the group did not allow any comprehensive considerations. TOR d) on the review progress in determining precautionary reference points is summarised below in section 1.4 and stock-specific arguments are found under the respective stocks. TOR g) on proposals for a scientific Steering Group for a capelin Symposium was discussed with WGNPBW and proposals are in the WGNPBW report for 1999.

The format of this report is similar to last year's, with tables and figures located after all text for each stock. Text, tables, and figures have all been drastically reduced in order to make the main messages more visible. Only basic input information regarded as necessary to assess stock status has been included; other relevant information is to be found in working documents and on the ICES WWW homepage.

Discrepancies were identified in calculation of biological reference points between IFAP and newly available software from Lowestoft, PASoft. The reasons for the discrepancies were partly identified, but as time proceeded, this impeded the group in finalising estimation of all the reference points available from PASoft as well as in obtaining graphic outputs.

1.4 Progress in determining precautionary reference points

The progress made was reviewed by tabulating and summarising the reference points recommended in last year's NWWG report, and updating and comparing with the recommendations made in 1999 (Table 1.4.1). The three redfish stocks we assessed were all short of data, as well as understanding of stock dynamic processes. For 9 other stocks we could, in 1988, potentially specify 36 reference points, and were able to specify 21 (58%). We were unable to specify reference points for several stocks of cod, either depleted, deficient in data, or both.

Of 18 possible reference points for SSB, we made recommendations on 12. They were usually based on B_{loss} (4) or on MBAL (4). B_{loss} was taken once as B_{pa}, otherwise it was taken as B_{lim}. MBAL was always subjectively picked, and was also used 3 of 4 times as B_{lim}. Exceptionally, the lowest *recent* SSB was used once as B_{pa}, B_{lim} in that case being set to B_{loss}. All 6 recommended values of B_{lim} were independently estimated (MBAL 3 times, B_{loss} 3 times). Of 6 recommendations for B_{pa}, 3 were independently estimated, and 2 were set by safety factors above B B_{lim}. The sixth (for Faroes Saithe) was computed from F_{pa} via a non-parametric smoothing of the relation between F and SSB.

Of 18 possible reference points on F, we were able to make recommendations on 9 (4 for F_{lim}, 5 for F_{pa}), of which 6 were independently estimated (2 for F_{lim}, 4 for F_{pa}). F_{lim} was independently estimated once by the historical maximum F and once by F_{loss}—i.e. both times as an extreme value in the historical record. F_{pa} was independently estimated twice as F_{med}, once as F_{MSY}, and once 'close to F_{med}, F_{max} and F_{MSY}'. I.e. for independent estimation of F_{lim} we favoured a historical limit; for F_{pa} we favoured a historically moderate value. Reference levels for F were derived from other reference values only three times. F_{pa} was once set 2 SDs below F_{lim}, and F_{lim} was once set 2 SDs above F_{pa}. A reference F_{lim} was also once derived from B_{lim} using a non-parametric smoother on the relation between F and SSB.

For 7 of 9 assessments, we presented in 1998 an average of 4.7 additional reference values for F. But we did not present other reference values for SSB.

Thus, where there is reasonable data to support analytical assessments, we have developed the specification of precautionary reference points as a standard component of our advice. We did not always derive them in the same way, the historical records of different stocks showing different features. In some cases we had difficulty in quantifying the uncertainty in reference points, and in saying how confident we were that, if our recommended *precautionary* reference point was observed, there could be no adverse consequences for the fishery. We did not recommend any separate target reference points to maximise yield, although we often offered a range of such reference points for consideration. We were sometimes able to specify precautionary reference points that were also approximately maximum-yield points.

We were less successful in applying the precautionary approach to fishery situations that would be considered 'data-poor', and were often unable to define biological reference points for them.

An extension of the precautionary approach was suggested in our terms of reference for cod, haddock and saithe in Division Vb in both 1998 and 1999. These fisheries are managed by limiting effort. We were asked to identify effort options that would have a high probability of resulting in a fishing mortality lower than that 'identified as within safe biological limits'. This required us to go beyond estimating stock status and dynamics, and to study how well we could

predict the fishing efficiency of the fleets. We did this by assembling the historical data on 'catchability', i.e. the ratio of estimated fishing mortality to effort, and treating the assembled data as a statistical distribution. I.e. we had no other basis for predicting next season's fishing performance than to expect that it would be another random selection from the same distribution as all the earlier years. We were able to identify the required confidence limits on the fishing mortalities that might result if a specified effort limit was allocated between fleets in different ways, and to compare them with biological reference points.

The principal development between 1998 and 1999 was in the treatment of some stocks of redfish. Following a suggestion from ACFM, we recommended limit and precautionary values for catch:effort ratios, which we set as fractions (20% and about 50%) of the historical maximum for the stock.

1.5   Recommendations

- For the stocks assessed by NWWG each country should investigate and conduct scientific work to find the best conversion factors for a particular product and fishery, and ensure that results are published/documented and made available for the assessment work.

Table 1.4.1: Precautionary-approach reference points included in the assessments presented by NWWG to ACFM in 1998 and 1999.

Stock	Limit reference points	Buffer (pa) reference points	Other values given in the assessment	Notes
1998				
Faroe Plateau Cod	$B=B_{loss}$; F=maximum observed F	$B=B_{lim}.\exp(1.645 \times 0.4)$; F 'close to F_{max}, F_{med}, possibly F_{MSY}';	$F_{0.1}$, F_{max}, F_{med}, F_{MSY}, and F_{lim} offset from F_{pa}	'reference points should be regarded as preliminary';
Faroe Bank Cod	no specific values	No specific values	None	
Faroe Haddock	$B=MBAL$; F=2 SDs above F_{pa};	B=2 SDs above B_{lim}; $F=F_{med}$;	F_{max}, $F_{0.1}$, F_{med}, F_{high},	-
Faroe Saithe	$B=MBAL$; F from B_{lim} via G_{loss}	B from F_{pa} via G_{loss}; F=2 SDs below F_{lim};	F_{max}, $F_{0.1}$, F_{med}, F_{high}	G_{loss} is a non-parametric smoother for the F-SSB relationship?
Iceland Saithe	no B; $F=F_{loss}$ (as suggested by SGPAFM)	$B=B_{loss}$ (as suggested by SGPAFM) 'seems reasonable'; $F=F_{msy}$;	F_{low}, $F_{0.1}$, F_{med}, F_{MSY}, F_{97} (i.e. most recent), F_{max}, F_{high}	SGPAFM suggested $F_{pa}=F_{med}$, but 'reference F values have been at or above F_{med} for the whole time series'
Iceland Cod	$B=B_{loss}$; no F	$B=MBAL$; F from simulating a catch rule;	F_{max}, $F_{0.1}$, F_{med}, F_{high},	
Greenland Cod Offshore	$B=MBAL$; no F	None–stock too depleted	$F_{0.1}$, F_{max}, F_{med}, F_{high}	
Inshore Greenland Cod	None	None		
Greenland halibut	$B=B_{loss}$ (preliminary); no F	B=lowest *recent* SSB; $F=F_{med}$ (from SGPAFM);	F_{low}, $F_{0.1}$, F_{med}, F_{max}, F_{high}, F_{loss}, F_{MSY}, F_{crash}	B_{pa} also equals B_{lim} $\exp(1.645 * 0.3)$
S. marinus	$U_{lim}=U_{max}/5$	$U_{pa}=U_{max}/2$		U is a catch/effort ratio, surrogate for a biomass index. 'Poor data environment'
Deep-sea *S. mentella*	Difficult to define	Difficult to define		
Oceanic *S. mentella*	Not mentioned	Not mentioned		
1999—where different from 1998				
Faroe Plateau Cod	$B=B_{loss}$; $F=F_{pa} \exp(1.645*0.4)$	$B=B_{lim}.\exp(1.645*0.4)$; F as in 1988	F_{low}, F_{med}, F_{high}	
Faroe Bank Cod	No specific values	No specific values		
Faroe Haddock	**B=MBAL**; F is 2 SDs above F_{pa}	**B set by ACFM**; $F=F_{med}$	F_{max}, F_{med}, F_{high}, $F_{0.1}$	**ACFM examined R–SSB plot to estimate a BAL for use as B_{pa}**
Faroe Saithe	**$B=B_{loss}$**; **F set by ACFM**	**B=MBAL**; **F set by ACFM**;	F_{max}, F_{med}, F_{high}, $F_{0.1}$	F_{lim} 'consistent with B_{lim}'; F_{pa} 'consistent with F_{lim} and F_{med}'
Iceland Saithe	**B set by ACFM; no F**	**B and F set by ACFM**	F_{max}, F_{med}, F_{high}, $F_{0.1}$	B_{lim} is tentative; stock is now below B_{lim}

Stock	Limit reference points	Buffer (pa) reference points	Other values given in the assessment	Notes
Iceland Cod	**None specified**	**None specified**	F_{max}, $F_{0.1}$, F_{med}, F_{high}	**F, got by simulating a catch rule, is now considered F_{target}, not F_{pa}**
Iceland Haddock	**$B=B_{loss}$;** **$F=F_{med}$;**	**$B=B_{lim}.exp(1.645*0.2)$;** **$F=F_{lim}/exp(1.645*0.2)$;**	F_{max}, F_{med}, F_{high}, $F_{0.1}$	B_{pa} is tentative pending a backward extension of population analysis;
Greenland Cod Offshore	B=MBAL; no F	None specified	F_{max}, F_{med}, F_{high}, $F_{0.1}$	
Inshore Greenland Cod	No specific values	No specific values	F_{msy}	
Greenland halibut	**$B=B_{loss}$; no F**	**$B=B_{lim}.exp(1.645*0.3)$;** **$F=F_{med}$;**	F_{max}, $F_{0.1}$	
S. marinus	**$U_{lim}=U_{max}/5$**	**$U_{pa}=0.6 * U_{max}$**		ACFM suggested $U_{pa}=U_{max}/2$
Deep-sea *S. mentella* on the shelf	**$U_{lim}=U_{max}/5$**	**$U_{pa}=U_{max}/2$**		
Oceanic *S. mentella*	No specific values	No specific values		'Catches should not be allowed to increase'

Note: several PA reference points in this report were set by ACFM at its May meeting in 1998, and reviewed (and mostly retained) by this meeting of the NWWG.

2 DEMERSAL STOCKS IN THE FAROE AREA (DIVISIONS VB AND IIA4)

2.1 General Trends in Demersal Fisheries in the Faroe Area

The fishery at the Faroes is a multi-fleet and multi-species fishery. Tables 2.1.1 - 2.1.3 show the yields of cod, haddock and saithe for Faroese fleet categories in Vb, and Figure 2.1 gives a summary of the 1999 assessments of the stocks of Faroe Plateau cod, Faroe haddock and Faroe saithe.

In 1977 an EEZ was introduced in the Faroe area. The demersal fishery by foreign nations have since decreased. The fishing mortalities on cod remained high in the first years, increased considerably during the 1980s and decreased then substantially in the first half of the 1990s. In 1995 and especially in 1996 the fishing mortalities increased again substantially, but have since declined to close the proposed F_{pa}. For saithe there has been a substantial increase in the fishing mortalities during most of the period but from 1995 it decreased generally steady. The general increase was mainly due to the introduction of pair trawlers whereas the decrease in 1995 is because of the reduction in the availability of saithe and the increased availability of cod. A slight increase in fishing mortality was noted for 1998. The fishing mortalities on haddock have been very low since the early 1980s. Catches decreased to a very low level due to poor recruitment but has in 1995 –1998 increased again because two very strong year classes have entered the fishery.

During the 1980s the Faroese authorities have attempted to regulate the fishery and the investment in fishing vessels. In 1987 a system of fishing licenses was introduced. The fishery also has been regulated by technical means such as legislation on the mesh size, closed areas, import ban on fishing vessels and a programme of buying back fishing licenses. Mesh size regulations and closed areas are still enforced.

In March 1994 the Faroese Parliament passed a law on the regulation of fisheries within the EEZ. This law introduced quotas for 5 demersal stocks including the Faroe Plateau and the Faroe Bank Cod, Faroe Haddock, Faroe Saithe and redfish. The quotas were allocated to each fleet category by percentage of the total quota and then equally divided between all vessels in each category.

The fishing year starts 1 September and ends 31 August the following year.

Revised management system

The catch quota management system introduced in the Faroese fisheries in 1994 was met with considerable criticism and it resulted in at least some fleets misreporting substantial portions of their catches. As a result of the dissatisfaction with the catch quota management system, the Faroese Parliament has adopted a law stipulating that the quota system would end as of May 31, 1996. In addition, the Faroese government has developed, in close cooperation with the fishing industry, a new system based on within fleet category individual transferable effort quotas in days. The new system entered into force on 1 June 1996.

The within fleet category individual transferable effort quotas apply to 1) the longliners less than 110 GRT, the jiggers and the single trawlers less than 400 HP, 2) the pair trawlers and 3) the longliners greater than 110 GRT. The single trawlers larger than 400 HP do not have effort limitations, but they are not allowed to fish within the 12 n. miles limit and the areas closed to them as well to the pairtrawlers have increased in area and time. Their harvest of cod and haddock is limited by maximum by-catch allocation of 5 %. The single trawlers < 400 HP are given special licenses to fish inside 12 n. miles with a by-catch allocation of 30 % cod and 10 % haddock. Holders of individual transferable effort quotas who fish outside an area where cod and haddock are normally found can fish 3 days for each day allocated within the area of normal cod and haddock distribution. One fishing days by longliners less than 100 GRT is considered equivalent to two fishing days for jiggers in the same gear category. Therefore longliners less than 100 GRT (and single trawlers < 400 HP) could double their allocation by converting to jigging. Figure 2.2 gives an overview of the different area regulations.

The effort quotas are transferable within gear categories. The allocation of number of days by gear categories was originally made such that the fixed allocation of catches in tons under the previous catch quota management regime were expected to be reduced about 20 % according to the ICES advice. However, the actual number of allocated days was set somewhat higher than that. Recently the purpose with the management scheme has been reformulated. The number of fishing days are now to be set such that together with other regulations of the fishery they result in average fishing mortalities on each of the 3 stocks of 0.45 corresponding to average annual catches of 33% of the exploitable biomasses. Built in the system is also an assumption on the day system as being self-regulatory, because the fishery will move between stocks according to the relative availability of each of them and no stock will consequently be overexploited.

The number of days fished by gear category since 1985, the averages for 1985–1997 and 1990–1997 and the number of days by category as stated in the law, are presented in Table 2.1.5.

In addition to the number of days allocated in the law, it is also stated in the law what percentage of total catches of cod, haddock, saithe and redfish, respectively, each fleet category are allowed to fish. These percentages are as follows:

Fleet category	Cod	Haddock	Saithe	Redfish
Longliners < 100GRT, jiggers, single trawl. < 400HP	51 %	58 %	17.5 %	1 %
Longliners > 100GRT	23 %	28 %		
Pairtrawlers	21 %	10.25 %	69 %	8.5 %
Single trawlers > 400 HP	4 %	1.75 %	13 %	90.5 %
Others	1 %	2 %	0.5 %	0.5 %

Technical measures such as area closures during the spawning periods, to protect juveniles and young fish and mesh size regulations are also in effect.

Table 2.1.1   Catches of COD in Vb by various faroese fleet categories. Tonnes gutted weight.

Year	Open boats	Longliners < 100 GRT	Longliners > 100 GRT	Singletrawl < 400 HP	Singletrawl 400-1000HP	Singletrawl >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000HP	Gill net	Jiggers
1985	5650	9659	3133	2506	3051	4352	5393	2223	291	1522
1986	2946	4707	1700	1643	2049	2840	10132	4793	443	919
1987	2151	3231	2586	1393	1546	1791	6361	3273	283	638
1988	591	3049	3201	1114	1660	1501	6065	3455	568	1647
1989	964	5986	3840	1102	1314	1157	2278	1729	692	1913
1990	511	4225	2440	507	517	568	863	1259	201	988
1991	342	2474	1394	439	413	371	663	1038	160	624
1992	142	1359	708	325	161	192	634	1119	1	376
1993	113	809	701	699	323	178	717	1141	0	452
1994	244	1090	1259	914	332	448	651	1950	58	1507
1995	732	3108	3328	1135	713	865	1164	2203	55	4348
1996	1345	6849	7340	1562	1317	666	3313	7253	95	7388
1997	956	8569	9571	1326	1659	983	1966	4585	191	3287
1998	483	6549	6894	1257	1397	1419	1004	2694	316	1517

Table 2.1.2   Catches of HADDOCK in Vb by various faroese fleet categories. Tonnes gutted weight.

Year	Open boats	Longliners < 100 GRT	Longliners > 100 GRT	Singletrawl < 400 HP	Singletrawl 400-1000HP	Singletrawl >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000HP	Gill net	Jiggers
1985	903	5294	1816	196	780	1055	2546	832	18	86
1986	951	5038	1535	250	354	664	2654	1313	4	62
1987	1520	5414	1796	313	639	274	2340	1251	3	47
1988	201	5219	2076	167	436	253	1205	914	2	50
1989	476	7399	2257	122	425	213	862	749	2	173
1990	278	6109	1815	63	308	192	534	800	1	132
1991	213	4206	1321	86	125	126	495	799	0	41
1992	76	1893	917	57	38	44	439	576	0	13
1993	27	783	821	217	145	37	424	713	0	6
1994	34	631	952	247	136	121	363	1046	0	4
1995	46	1010	1630	296	207	91	370	695	0	15
1996	124	2351	3068	487	572	163	562	1141	0	60
1997	231	4860	6059	447	966	405	973	1850	0	72
1998	298	5997	7871	383	1115	585	1022	2333	0	53

Table 2.1.3   Catches of SAITHE in Vb by various faroese fleet categories. Tonnes gutted weight.

Year	Open boats	Longliners < 100 GRT	Longliners > 100 GRT	Singletrawl < 400 HP	Singletrawl 400-1000HP	Singletrawl >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000HP	Gill net	Jiggers	Industrial trawlers	Others	Total
1985	89	38	28	23	2515	12923	10822	10805	13	982	60	79	38377
1986	107	67	21	31	1004	9872	9921	13173	54	1296	254	330	36132
1987	244	52	37	116	1468	7279	8134	15790	157	1985	408	1	35700
1988	173	101	31	40	2693	8224	7748	17266	113	2575	501	21	39586
1989	356	52	60	129	2148	7118	9440	16513	90	3717	504	5	40132
1990	309	131	101	84	2123	10742	13127	23442	122	4038	495	8	54721
1991	287	55	64	40	625	6791	12978	22584	281	4795	404	7	48910
1992	124	121	37	8	151	2248	7677	17486	0	3300	320	1	31472
1993	168	56	29	39	164	1879	6234	17639	0	2696	203	3	29111
1994	131	112	63	37	335	1995	5408	17243	2	3666	202	0	29194
1995	49	15	75	91	215	2406	4288	14776	5	2320	6	0	24248
1996	5	6	37	24	213	1178	4118	10173	5	1590	4	0	17353
1997	9	14	72	27	495	2098	3491	11529	3	1746	76	1	19561
1998	21	97	56	12	620	4531	3608	12610	0	1764	93	0	23421

Table 2.1.4   Number of fishing days used by various fleet groups in Vb1 1985-1995. For other fleets there are no effort limitations. Catches of cod, haddock, saithe and redfish are regulated by the by-catch percentages given in section 2.1.1. In addition there are special fisheries regulated by licenses and gear restrictions.

Year	Longliner 0-100 GRT, jiggers, trawlers < 400 HP	Longliners > 110 GRT	Pairtrawlers < 400 HP
1985	13449	2973	8582
1986	11399	2176	11006
1987	11554	2915	11860
1988	20736	3203	12060
1989	28750	3369	10302
1990	28373	3521	12935
1991	29420	3573	13703
1992	23762	2892	11228
1993	19170	2046	9186
1994	25291	2925	8347
1995	33760	3659	9346
Average	22333	3023	10778

Table 2.1.5   Number of allocated days for each fleet group since the new management scheme was adopted.

	Fleets	1996/1997	1997/1998	1998/1999
Group 1	Single trawlers > 400 HP	Regulated by area and by-catch limitations		
Group 2	Pair trawlers > 400 HP	8225	7199	6839
Group 3	Longliners > 110 GRT	3040	2660	2527
Group 4	Longliners and jiggers 15-110 GRT, single trawlers < 400 HP	9320	9328	8861
Group 5	Longliners and jiggers < 15 GRT	22000	23625	22444
Group 6	Extra days	1000	577	548
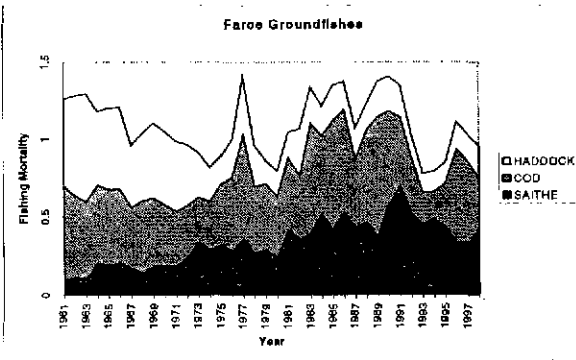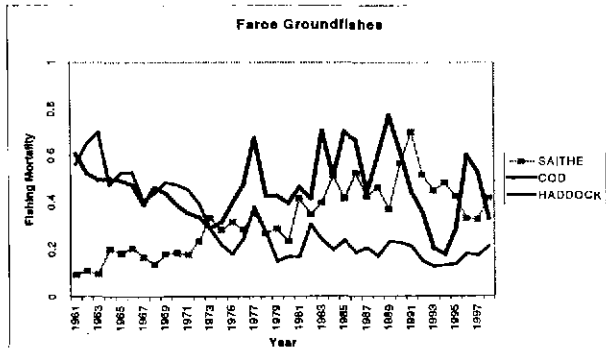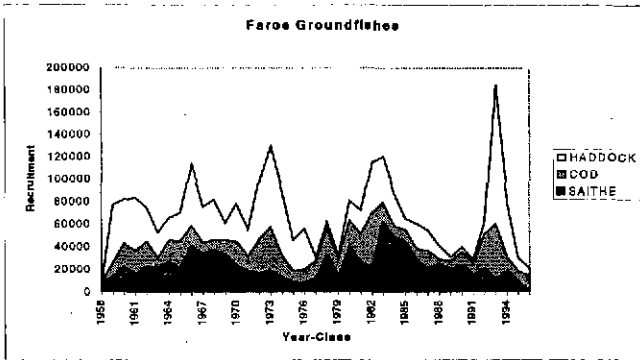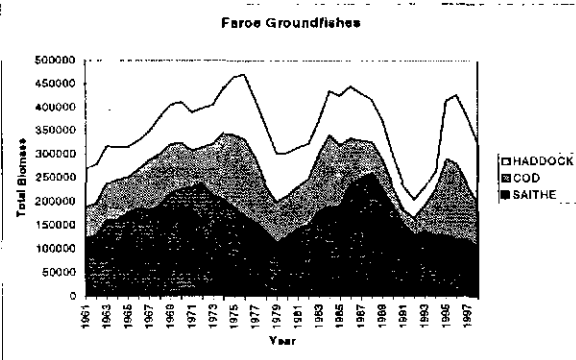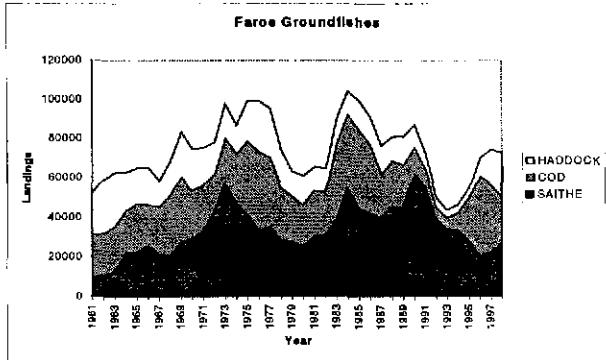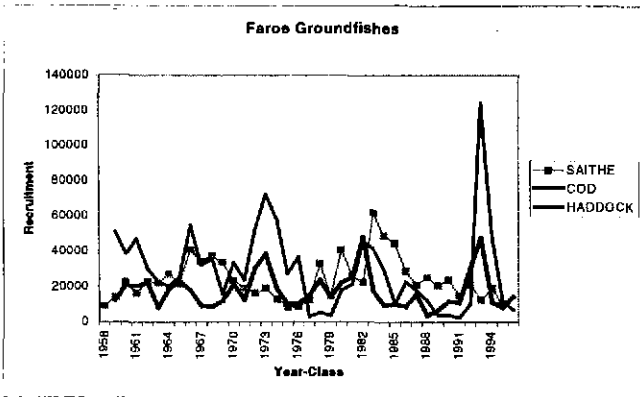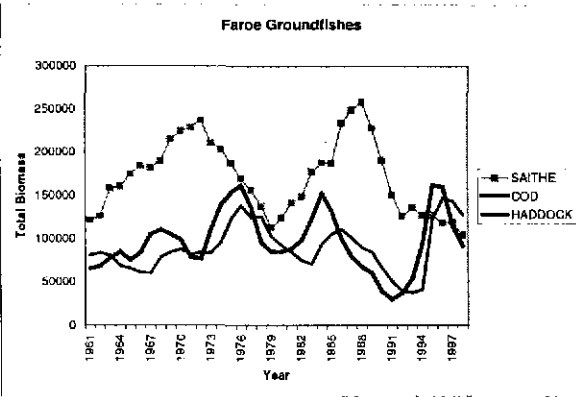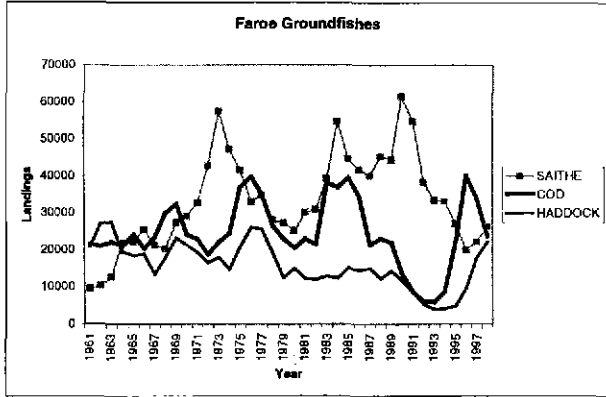
Figure 2.1   Overview of this years assessment of the stocks of Faroe Plateau cod, Faroe haddock and Faroe saithe.

2.2 Faroe Plateau Cod

2.2.1 Trends in landings

The nominal landings of cod (1986-1998) from the Faroe Plateau by nations as officially reported to ICES, are given in Table 2.2.1.1. The landings from 1961 to 1989 show an interesting pattern with minima of about 20 000t and brief increases as good year classes recruit to the fishery. This pattern ceased in the early 1990s with landings decreasing to slightly less than 6 000t in 1993. Landings increased spectacularly in 1996, to above 40 000 t., the highest value during the 1961 to 1998 time period. This increase is believed to be due to a combination of increased stock size, increased availability, and increased effective fishing effort as a result of the new management system introduced June 1, 1996. The landings decreased to 34 000t in 1997 and to 24 000 t in 1998, close to the 'normal' minimum seen in Figure 2.2.6.1.4.

In recent years, statistics for the Faroese fishery in that part of Sub-division IIa which is within the Faroese EEZ, have become available. It is expected that these catches are taken from the Faroe Plateau area so they are included in the total landings used in the assessment. This is depicted in Table 2.2.1.2 row "Total used in the assessment".

During the last 15 years, the Faroe Plateau Cod has been exploited almost solely by the Faroese fishing fleet. Table 2.2.1.3 shows the landings for the most important fleet categories. In recent years, the long liners (less than and greater than 100GRT) and the pair trawlers have reported the largest share, although the pair trawlers landings decreased markedly from 1997 to 1998. The long liners, at least those lesser than 100 GRT, have a directed fishery for cod during the entire year.

2.2.2 Catch-at-age

Catch -at-age was updated to account for a change in the nominal catches for 1992, 1996 and 1997. Catch-at-age for 1998 is provided for the Faroese fishery in Table 2.2.2.1. Faroese landings from most of the fleet categories were sampled (Table 2.2.2.2). The catch-at-age for the fleets covered by the sampling scheme were calculated from the age composition in each fleet category and raised by their respective catches. For 1998, the foreign catches were raised by the age composition of the corresponding Faroese fleets. Catch-at-age from 1961 to 1998 is shown in Table 2.2.2.3.

2.2.3 Mean weight-at-age

Mean weights-at-age were calculated using the length/weight relationship based on individual length/weight measurements of samples from the landings. The sum-of-products-check for 1998 showed a discrepancy of 3 %. The weights-at-age for 1961 to 1998 are in Table 2.2.3.1 and in Figure 2.2.3.1 for the Faroese fishery. From 1991 to 1995 weights at age appeared to have increased, they remained stable in 1996 and have decreased in the last two years. Weights-at-age for the groundfish survey are shown in Figure 2.2.3.2.

2.2.4 Maturity-at-age

The proportion of mature cod by age were obtained during the Faroese groundfish surveys carried out during the spawning period (March). The average maturity at age for 1983 to 1996 was used in years prior to 1983. They are given in Table 2.2.4.1 and shown in Figure 2.2.4.1 for 1983 to 1998.

2.2.5 Groundfish surveys

The groundfish surveys in Faroese waters with the research vessel *Magnus Heinason* were initiated in 1983. Up to 1991 three cruises each year, with approximately 50 trawl stations in each cruise, have been conducted between February and the end of March. In 1992 the period was shortened by dropping the first cruise. Random stratified sampling based on depth stratification and on general knowledge of the distribution of fish in the area has been used to select the trawl stations. In 1992 one third of the 1991-stations were used as fixed stations. Since 1993 all stations were fixed stations. The standard abundance estimates is the stratified mean catch per hour calculated using smoothed age/length keys.

The overall mean catch (kg) of cod per unit effort (trawl hour) 1983-1999 is given in Figure 2.2.5.1. The CPUE have increased substantially in 1995 and have generally declined since. In 1999, a single very large haul (28 t cod) maintains the CPUE high, otherwise the decrease would be more pronounced. On a year class basis, the stratified mean catch per trawl hour normally increases the first 4-5 years of life, and decreases afterwards (Table 2.2.6.1.1). From 1994 to 1995, however, there was an increase for all year classes (age groups 3-8 in 1994 compared to age groups 4-9 in 1995),

possibly because of increased availability. A more normal picture is observed from 1996-98 (ages 6 and 7 decrease from one year to another).

2.2.6 Stock assessment

2.2.6.1 Tuning and estimates of fishing mortality

A fishery management system based on days fished was introduced on June 1, 1996 as a result of widespread dissatisfaction with the quota management system that had been introduced in 1994 in the Faroes. Prior to 1996, practically all the fish from a given trip were landed at the same place. This practice changed in 1996-1998, with a single trip being possibly landed in several sites. The landing slips are the main source of information on landings and number of fishing days, and for those trips that have been landed at several sites, a landing slip was completed at each landing site, each one recording the actual landings, but the total number of fishing days. The number of trips/landings in 1996-97 affected by this problem is being examined in order to try to rectify the problem. An adjustment was made for 1998, but the WG believes that the data have been 'over-corrected' resulting in an underestimate of the number of days for that year. The statistical office, whose responsibility it is to produce landings and effort statistics, could not guarantee that the changes in the number of days fished would be minor. It was therefore considered unwise to proceed with using data that are expected to change, possibly significantly, in the near future.

Therefore, the two tuning series used last year (single trawlers 400-1000 HP and longliners > 100 GRT) could not be used (the effort was measured in days). This year two tuning series based on logbooks with reported effort in number of hooks for five longliners > 100 GRT and in hours fished for eight Cuba trawlers have been used. Normally, the WG would have compared the assessment results using the new series with those obtained with the series previously used. Considering that the number of days in 1998 could be severely underestimated compared with previous years, such a comparison could be seriously misleading. The WG therefore decided to present only the results from the logbook series, which in theory, reflect changes in stock size better than when 'days' is used as the effort measure to calculate CPUE.

In the longliner series records with information on cod catch, effort and fishing location where the catch of tusk and ling together was less than 20 % of the total catch were selected, in an attempt to select only cod directed sets. The longliner series was further scrutinised by looking at the CPUE for each ship. Outliers were all caused by small catch and effort information and were left in as they had no influence on the resulting average. In the Cuba trawler series records with information on cod catch, effort, and fishing location east of 7 degrees W on the Faroe Plateau were selected. In addition only "saithe hauls" were used, i.e. the catch of saithe was more than 70 %, and the sum of cod- and haddock-catch was less than 30 %. Thus the Cuba series is a by-catch series. The Cuba series was further scrutinised by looking at the CPUE for each ship. As for the longliners all ships could be used. The two CPUE series are plotted versus time in Figure 2.2.6.1.1 and the age-disaggregated values are shown in Table 2.2.6.1.1.

Preliminary XSA runs were made to compare the results using combinations of these two commercial tuning series. The diagnostics were equally good for all runs. When the longliner series was used alone, it gave a slightly higher total biomass compared to the Cuba series alone or Cuba series and longliner series together, these last two combination giving approximately the same result. The longliner and Cuba series were used in the assessment. The XSA results are shown in Table 2.2.6.1.2.

The residuals of log catchabilities are shown in Figure 2.2.6.1.2. In future assessments, age 2 for the longliners should probably be removed, but otherwise the residuals are smaller than last year, and considerably more random. The results from retrospective analyses with different shrinkages are shown in Figure 2.2.6.1.3. A shrinkage of 2.00 was used, similar to last year. The estimated fishing mortalities are shown in Table 2.2.6.1.3, Table 2.2.6.1.5 and Figure 2.2.6.1.4. The average F for age groups 3 to 7 in 1998 is estimated at 0.35, marginally higher than Fmax = 0.34.

2.2.6.2 Stock estimates and recruitment

The stock size in numbers is given in Table 2.2.6.1.4. A summary of the VPA, with recruitment set at 2 years old, and biomass estimates are given in Table 2.2.6.1.5 and in Figure 2.2.6.1.4. The stock-recruitment relationship is presented in Figure 2.2.6.2.1.

The assessment confirms the poor recruitment observed in the Faroe Plateau cod stock for the 1984 to 1991 year classes, but the 1992 and 1993 year classes to be well above the long term average. Due to the continuous poor recruitment from 1984 to 1991 and the high fishing mortalities, the spawning stock biomass declined steadily from 1983 to 1992 when it was the lowest on record at 20 300 t. SSB increased sharply since, with the increase in 1994 being partly due to a very high proportion of mature for ages 2 and 3 (Figure 2.2.4.1) to about 95 000 t. in 1996 and

1997. In 1998 the spawning stock biomass declined to 68 000 t, as the strong 1992 and 1993 year classes are passing through the fishery.

2.2.6.3   Comment on the assessment

The groundfish survey (not shifted back) was also used in XSA calibrations together with the longliner- and Cuba series. The diagnostics were considerably poorer than for the other series (SE of log catchabilities were usually more than 0.60 for the important age groups compared to less than 0.55).

Before the era of VPA calibrated with CPUE from the commercial fisheries or from surveys, VPA estimates were derived by an iterative process based on calculating the average fishing mortality in the most recent two or three years. The process was initiated by doing a first VPA run with an arbitrarily chosen terminal F, sometimes the one obtained from the previous assessment, taking the average for each age for the number of years chosen, then making another run with the average F at age as input values. The iterative process was repeated until the largest change between successive runs was smaller than a pre-agreed threshold. This iterative averaging method was applied to Faroe cod. Given the fishing days system implemented in 1996 on the Faroes, it is expected that changes in fishing mortality over the recent period would have been relatively smooth. The system was implemented in 1996, but in the calculations presented below, the fishing mortality was averaged for 1995 to 1997. An alternative would have been to take the 1996-98 average. The 1998 fishing mortality estimates are compared with those obtained from the calibrated assessment in the text table below.

Cod	2	3	4	5	6	7	8	9
Iterative	0.049	0.186	0.432	0.616	0.784	0.909	0.832	0.785
Calibrated	0.041	0.142	0.330	0.517	0.443	0.312	0.541	0.568

For Faroe Plateau cod, the iterative averaging did not detect the 35% decrease in fishing mortality estimated in the calibrated VPA.

For Faroe Plateau cod, total mortality estimates calculated from the survey (text table below) systematically show relatively high values for the older ages in the last 4 time periods. This is consistent with the assessment.

	3/4	4/5	5/6	6/7	7/8	8/9
1983/1984	0.471	1.256	1.477	1.394	2.419	3.932
1984/1985	0.345	0.958	1.355	0.740	0.781	2.565
1985/1986	-0.785	-0.539	-0.583	-1.426	-0.807	-0.578
1986/1987	-0.256	0.718	1.300	2.504	1.556	3.561
1987/1988	-0.077	0.988	1.169	0.965	0.234	1.855
1988/1989	0.229	0.702	1.154	0.770	1.427	2.079
1989/1990	-0.928	-0.315	0.637	-0.297	0.580	0.063
1990/1991	-0.650	1.575	2.218	2.146	3.816	2.778
1991/1992	-0.293	-0.393	-0.224	0.174	-0.243	-0.080
1992/1993	-0.100	1.063	1.705	1.206	1.052	1.689
1993/1994	-1.121	-1.216	-0.258	0.076	1.305	3.784
1994/1995	-1.720	-0.751	-1.258	-1.275	-1.087	-1.378
1994/1996	-1.953	-0.583	0.038	1.219	1.590	1.051
1995/1997	-0.467	0.671	2.062	2.161	2.320	1.946
1996/1998	-0.900	-0.134	0.581	1.290	1.635	0.357
1997/1999	-0.792	0.263	0.848	1.481	1.044	0.908

The results of the Magnus Heinason survey have not been used for Faroe cod because of suspected substantial changes in the catchability coefficient of the survey in the first part of the 1990s. XSA calibrations by 5 year periods, using the proposed default values, were run and the catchability coefficients calculated for each period are shown in Figure 2.2.6.3.1. While the logarithmic catchabilities for ages 3 to 7 appear to increase steadily from the beginning of the series to the 1990 to 1994 period, they subsequently decreased, at first slightly in the 1991 to 1995 period, and then drastically in the 1992 to 1996 period. (NB the word catchability is used here in the $F = q \cdot f$ context, that is that the fishing effort of the survey in the 1992 to 1996 period would have exerted a considerably smaller fishing mortality than at other

times.) This suggests that the survey results could possibly be used in future assessments, because catchabilities appear to have reverted back to the 1980s values, but that great care should be taken in doing so.

In previous assessments, there was also concern that the fishing fleets used in the calibration might also have been affected by changes in catchability. A similar retrospective analysis by five year period was also done for the fleets used in this assessment, with the same input parameters as in the assessment (Figure 2.2.6.3.2). The longliners seemed to have been more affected than the Cuba trawlers by changes in catchability, particularly the age 2, and it might be preferable not to use that age in future calibrations, as already indicated above. The catchabilities for the Cuba trawlers are remarkably stable over most of the time period, but they too have been affected by changes in catchability in the mid to late 1990s.

2.2.7 Predictions of catch and biomass

2.2.7.1 Short-term prediction

The input data for the short term prediction are given in Table 2.2.7.1.1 and Table 2.2.7.1.3. The year classes 1996-98 were estimated by the RCT3 program (output in Table 2.2.7.1.2). The initial stock size in Table 2.2.7.1.3. is obtained in this way: number of 2 year old is taken directly from RCT3 and number of 3 year old (9442) is equal to 12131 (value from RCT3) multiplied by $\exp(-0.2-0.0506)$. 0.0506 is taken from fishing mortality at age in the XSA run. The rest of the column is taken directly from stock number at age in the XSA run. The exploitation pattern was the Fbar1996-1998 rescaled to 1998 values (the high values of ages 9 and 10+ are replaced by the values for age 8). The rescaling was based on the ages 3-7. The weight at age for 1999 and 2000 was set to the 1998 values, because the decrease in weights seemed to had stopped (as observed in the groundfish survey 1999). The 2001 values were set to the average of 1996-98, implying a slight increase in weights. The proportion mature in 1999 was set to the 1999 values from the groundfish survey, and for 2000-2001 to the average values for 1983-1999.

Table 2.2.7.1.4 shows that the landings in 1999 are expected to be 19 500 tonnes if the fishing mortality stays the same as in 1998. The spawning stock biomass is expected to decrease slightly from 68 000 in 1998 to 59 000 tonnes in 1999, but to increase again in 2000 to 68 000 tonnes and to higher values at the beginning of 2001. There are indications from the O-group survey and from the catch-at-age, that the 1997 year class may be higher than the estimated 21 millions. The O-group survey indicates in addition, that the 1998 year class also is above average. If these indications prove correct, the increase in the spawning stock biomass and future landings will be greater than stated here.

2.2.7.2 Biological reference points

In 1998, ACFM set B_{lim} equal to the lowest observed SSB, about 21 000 t and proposed that B_{pa} be set at 40 000 t based on $B_{pa}=B_{lim}e^{1.645\,\sigma}$, assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment. ACFM further proposed that F_{pa} be set at 0.35, more than twice $F_{0.1}$, about equal to F_{MAX} and F_{med} and at the low end of the range of previously estimated F_{MSY}, from 0.33 (Stefansson and Bell, WD prepared for the SGPAFM) to 0.56 (NWWG, 1997). In previous years, MBAL was considered to be 52,000t. Over the period covered by the assessment, fishing mortality has been equal to or less than this F_{pa} in 6 years.

Following the logic used to set Bpa, F_{lim} could be set at $F_{lim}=F_{pa}e^{1.645\sigma}$, that is, $F_{lim}=0.68$, even though F has been estimated to exceed this value in 3 years since 1961.

The stock trajectory with respect to those reference points is illustrated in Figure 2.2.7.2.1.

The probabilities that the 1999 F will be greater than the proposed Fpa = 0.35 or that the SSB in 2001 will be less than the proposed Bpa of 40 000t have been calculated analytically using the ADAPT software (Sinclair and Gavaris 1996) for 1999 catches ranging from 15 000 to 35 000t. The results are shown in Figure 2.2.7.2.2.

2.2.7.3 Long-term prediction

The input data for the yield-per-recruit calculations (long-term predictions) are given in Table 2.2.7.3.1. The exploitation pattern and weight at age were set to the average values for 1961-1998. The proportion mature was set to the average for 1983-1999.

The output from the yield-per-recruit calculations is shown in Table 2.2.7.3.2. and in Figure 2.2.7.3.1. $F_{0.1}$ was calculated as 0.14 and F_{max} as 0.34. The present average fishing mortality in 1998 of 0.35 is close to F_{max} and $F_{med} = 0.38$ (Figure 2.2.7.3.1).

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2.2.8 Management considerations

In 1996, the Working Group estimated that the new management system proposed by the Faroese government could reduce the fishing mortality on cod in 1996 by a maximum of about 23 % if all the factors relating nominal fishing effort to fishing mortality were the same in 1996 as in 1995 except for the number of days fished. The Working Group expected that it was highly unlikely, however, that all factors would remain the same, and it speculated that the decrease in fishing mortality would probably be less than 23 %, or that perhaps fishing mortality would not decrease at all. The current assessment suggests that the fishing mortality doubled from $F = 0.28$ in 1995 to $F = 0.60$ in 1996, as did the catch.

There are many possible reasons to explain the discrepancy between the expected result of limiting the number of fishing days, and the estimated one. The fishing mortality is generally considered as being the product of the nominal fishing effort exerted multiplied by a factor, the catchability coefficient. Fishing day is an imprecise measure of the actual nominal fishing effort applied, and it leaves considerable scope for changes, for example in the number of hours fished, or the amount of gear utilized. The success of fishing is also related to atmospheric and hydrological conditions and to season. Therefore, by having the possibility to choose when to fish, one might predominantly fish during those days when the success is expected to be the greatest, and thus increase the efficiency of the fishing effort used. Thirdly, it is expected that the availability of fish varies from year to year, and therefore, a given amount of fishing effort will capture more fish when the availability is higher than normal. Evidence from the surveys suggests that cod may have been more available from 1995 to 1997, and this may have affected the commercial fishery as well, especially for longliners.

In order to evaluate the fishing mortality that could be generated in the 1999/2000 fishing year from the present number of fishing days allocated to each fishing fleets, the partial fishing mortalities by age (3 to 7) and year were calculated for each fleet from the catch at age ratios for 1985 to 1995. The partial F's were divided by each fleet's yearly fishing effort to obtain estimates of the catchability coefficient by age, year and fleet. In last year's report, the calculation was done for 1985 to 1997, but because of the problems mentioned above with the reported fishing days in 1996 to 1998, the catchabilities were only calculated for those years (1985 to 1995) where the number of days fished are considered to be more reliable. The catchability coefficients thus calculated represent the variability observed in the period covered and it is assumed that the same variability will be observed in the future. Therefore, knowing the number of fishing days allocated, it is possible to estimate the fishing mortality in a given year by multiplying the number of days allocated by each catchability, adding up the results across fleets and then calculating the frequency distribution of the resulting F.

The longliners less than 100 feet, the jiggers and the single trawlers less than 400HP have been allocated collectively 8861 fishing days, because they have the flexibility to change from one type of fishing to the other. The longliners are considered twice as efficient as the jiggers (this is supported by the catchability analysis (Figure 2.2.8.1)), and if they decide to fish as jiggers rather than longliners, they could double their number of days fished. In principle, the ST < 400 could also double their number of days allocated by changing to fish as jiggers.

The number of days allocated to each fleet category are given in the table below:

Gear	Allocation	Optional change
LL<100	8861	There are 8861 days to be shared/chosen to be fished either by longlining (<100), jigging or trawling (<400hp)
ST<400	0	There are 8861 days to be shared/chosen to be fished either by longlining (<100), jigging or trawling (<400hp)
ST400–1000	0	No effort limitation, assumed to catch less than 4 % cod.
ST>1000	0	No effort limitation, assumed to catch less than 4 % cod.
PT400–1000	1270	
PT>1000	2149	
LL>100	1264	
OPEN	11222	
JIGGERS		There are 8861 days to be shared/chosen to be fished either by longlining (<100), jigging or trawling (<400hp)

The probability density function of the potential fishing mortalities in 1999/2000 given the allocated number of days to each fleet is given in Figure 2.2.8.1. The fishing mortality referred to so far do not include the partial F exerted by the ST 400–1000 and ST > 1000 that have not been allocated cod fishing days. These two fleets should be expected to exert at least a fishing mortality of 0.04. Therefore, in examining Table 2.2.8.1 a fishing mortality of 0.04 should be added to the fishing mortality columns to reflect the activities of these two fleets. It is not presently known by what gear(s) the

8861 days allocated collectively to the LL<100, the ST<400, and the jiggers will be used, but Figure 2.2.8.1 suggests that it does not matter. With the catchabilities estimated in the current assessment, there is a 50% probability that the fishing mortality in 1999/2000 will be equal to or greater than the suggested $F_{pa} = 0.35$.

In addition to the effort control, the fleets are supposed to be constrained to a pre-agreed species composition in the catch as indicated in the table below:

Groups of fleets	Fleet	Cod %	Haddock %	Saithe %	Redfish %
Group 1	Single trawlers	4.0	1.75	13.0	90.5
Group 2	Pair trawlers	21.0	10.25	69.0	8.5
Group 3	Longliners > 100 GRT	23.0	28.0		
Group 4	Longliners and jiggers > 15 GRT	31.0	34.5	11.5	0.5
Group 5	Longliners and jiggers < 15 GRT	20.0	23.5	6.0	
Group 6	Others	1.0	2.0	0.5	0.5
		100	100	100	100

These restrictions do not take into account that several of these fleets are in fact involved in a multispecies fishery and that the actual species composition in the water is unlikely to be exactly the same as in catches under the regulation. Therefore, the regulation could result in discarding and misreporting, thus jeopardizing one of the eventual potential benefits of an effort management system, an improvement in the quality of the information collected from the fisheries.

Management systems based on effort controls are expected to lead to overcapitalisation in the fishing fleets because fishing captains will want to maximise the catch they can harvest with the fishing effort allocation they have received. In the medium to long term, this process will lead to increased fishing efficiency of the fleets and it will be necessary to decrease the total number of fishing days available to be allocated in order not to exert excessive fishing mortality. In extreme cases, effort controls can lead to the fishery being open only for a few days per year.

In order to constrain fishing mortality within reasonable limits, it will therefore be necessary to adjust the number of days periodically. For this purpose, there is a need for a mechanism to monitor changes in efficiency, and detailed information on the activities of the fleets, on the physical characteristics of the boats and their equipment should therefore be collected.

Table 2.2.1.1. Faroe Plateau (Sub-division Vb1) COD. Nominal landings (tonnes) by countries, 1986-1998, as officially reported to ICES

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 *
Denmark	8	30	10	-	-	-	-	-	-	-	-	-	-
Faroe Islands	34,492	21,303	22,272	20,535	12,232	8,203	5,938	5,744	8,724	19,079	39,406	33,556	23,064
France [1]	4	17	17	-	-	. [2]	3 [3']	1 [3']	-	2 [3']	1 [3']		
Germany	8	12	5	7	24	16	12	+	2 [3]	2	+	+	
Norway	83	21	163	285	124	89	39	57	36	38	574	410	405
UK (Engl. and Wales)	-	8	-	-	-	1	74	186	56	43	126	61 [3]	
UK (Scotland) [2)]	-	-	-	-	-	-	-	-	-	-	-		
United Kingdom	-	-	-	-	-	-	-	-	-	-			287 [3]
Total	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,107	34,027	23,756

* Preliminary
[1] Included in Vb2.
[2] Quantity unknown 1991.
[3] Reported as Vb.
[4] Reported to the Faroese Coastal Guard.

Table 2.2.1.2. Faroe Plateau (sub-division Vb1) COD. Nominal catch (tonnes) 1986-1998 , as used in the assessment.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Officially reported	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,107	34,027	23,756
Faroese catches in IIA within Faroe area jurisdiction			715	1,229	1,090	351	154						
Expected misreporting/discard										3330			
French catches as reported to Faroese authorities				12	17								
Total used in the assessmer	34,595	21,391	23,182	22,068	13,487	8,660	6,220	5,988	8,818	22,494	40,107	34,027	23,756

[1] Preliminary

Table 2.2.1.3. Faroe Plateau (sub-division Vb1) COD. The landings (gutted weight) of different faroese fleets (in percents).

Year	Open boats	Longliner < 100 GRT	Singletraw < 400 HP	Gill net	Jiggers	Singletraw 400-1000h	Singletraw >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000HP	Longliner > 100 GRT	Industrial trawlers	Others	Total Gutt.weig
1985	16.0	27.2	6.7	0.6	4.3	7.9	11.2	12.3	5.6	7.5	0.2	0.6	35413
1986	9.5	15.1	5.1	1.3	2.9	6.2	8.5	29.6	14.9	5.1	0.4	1.3	31050
1987	9.9	14.8	6.2	0.5	2.9	6.7	7.9	26.0	14.5	9.9	0.5	0.1	21697
1988	2.7	13.8	4.9	2.6	7.5	7.4	6.8	25.3	15.6	12.7	0.6	0.2	21911
1989	4.7	28.8	5.3	3.2	9.2	6.1	5.5	10.5	8.3	17.7	0.7	0.0	20730
1990	4.3	35.3	4.2	1.4	8.1	4.3	4.3	7.1	10.5	19.6	0.6	0.2	11900
1991	4.3	31.5	5.4	2.0	7.9	5.0	4.7	8.3	13.0	17.2	0.6	0.1	7844
1992	2.7	26.0	6.3	0.0	6.9	3.0	3.6	12.0	20.8	13.4	5.0	0.4	5195
1993	2.3	15.9	13.3	0.0	8.9	6.2	3.6	14.2	21.7	12.7	0.8	0.4	4957
1994	3.1	13.1	9.1	0.5	18.7	3.6	5.2	8.1	23.2	15.0	0.5	0.1	7863
1995	4.2	18.0	6.5	0.3	24.7	4.1	4.8	6.5	12.4	18.5	0.0	0.0	17157
1996	3.7	19.3	4.2	0.3	19.6	3.5	1.8	8.1	18.6	20.7	0.2	0.1	35379
1997	3.1	28.3	4.4	0.5	9.8	5.1	2.9	4.8	11.3	29.7	0.0	0.1	30019
1998	2.3	31.0	6.0	1.3	6.5	6.3	5.5	3.1	8.6	29.2	0.1	0.0	20778

Table 2.2.2.1. Faroe Plateau (sub-division Vb1) COD. Catch in numbers at age for each fleet in 1998. Numbers are in thousands and the catch is in tonnes, round weight.

Age\Fleet	Open boat	LL < 100 G	Jiggers	Gill netters	ST 0-399H	ST 400-10(	ST > 1000	PT < 1000	PT > 1000	LL > 100 G	Others	Total Far.	Foreign fle	Total
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	9	118	21	0	0	0	0	0	0	24	0	172	1	173
2	14	202	46	1	18	25	2	1	1	133	0	443	8	451
3	22	236	63	8	46	52	29	16	39	210	1	719	21	740
4	46	573	124	12	106	100	64	32	94	353	1	1506	40	1546
5	143	2001	374	27	369	311	131	83	212	1321	4	4978	123	5099
6	36	479	110	19	54	64	78	49	132	442	2	1466	53	1519
7	2	30	6	3	3	8	11	6	20	61	0	150	8	158
8	3	36	9	1	6	3	6	4	11	35	0	113	4	117
9	0	9	3	0	0	0	1	0	2	12	0	28	1	29
10	0	0	0	0	0	0	0	0	0	4	0	5	0	5
11	0	5	0	0	0	0	1	0	0	9	0	16	1	17
12	0	0	0	0	0	0	0	0	0	1	0	1	0	1
13	0	0	0	0	0	0	0	0	0	2	0	2	0	2
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Numt	275	3689	756	69	602	563	323	191	511	2607	8	9597	260	9857
Catch, t	535	7150	1507	311	1381	1455	1263	718	1985	6730	32	23063	692	23756

Others include industrial bottom trawlers and longlining for Atlantic salmon and halibut.

Table 2.2.2.2. Faroe Plateau (sub-division Vb1) COD. Samples of lengths, otoliths and individual weights in 1998.

Fleet	Size	Samples	Length	Otoliths	Weights
Longliners	<100 GRT	116	20,747	3,600	1,917
Longliners	>100 GRT	68	13,010	3,286	1,618
Jiggers		8	1,269	360	300
Sing. trawlers	<400 HP	14	2,517	480	480
Sing. trawlers	400-1000 HP	16	2,921	662	360
Sing. trawlers	>1000 HP	2	314	120	120
Pair trawlers	<1000 HP	17	2,783	719	536
Pair trawlers	>1000 HP	39	7,290	1,199	1,199
Total		280	50,851	10,426	6,530

Table 2.2.2.3. Faroe Plateau (sub-division Vb1) COD. Catch in numbers at age 1961-98.

Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

At 1-May-99 11:57:11

Table 1   Catch numbers at age
Numbers*10**-3

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	3093,	4424,	4110,	2033,	852,	1337,	1609,	1529,
3,	2686,	2500,	3958,	3021,	3230,	970,	2690,	3322,
4,	1331,	1255,	1280,	2300,	2564,	2080,	860,	2663,
5,	1066,	855,	662,	630,	1416,	1339,	1706,	945,
6,	232,	481,	284,	350,	363,	606,	847,	1226,
7,	372,	93,	204,	158,	155,	197,	309,	452,
8,	78,	94,	48,	79,	48,	104,	64,	105,
9,	29,	22,	30,	41,	63,	33,	27,	11,
+gp,	0,	0,	0,	0,	0,	0,	0,	0,
0 TOTALNUM,	8887,	9724,	10576,	8612,	8691,	6666,	8112,	10253,
TONSLAND,	21598,	20967,	22215,	21078,	24212,	20418,	23562,	29930,
SOPCOF %,	91,	94,	96,	98,	113,	109,	102,	106,

Table 1   Catch numbers at age
Numbers*10**-3

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	878,	402,	328,	875,	723,	2161,	2584,	1497,	425,	555,
3,	3106,	1163,	757,	1176,	3124,	1266,	5689,	4158,	3282,	1219,
4,	3300,	2172,	821,	810,	1590,	1811,	2157,	3799,	6844,	2643,
5,	1538,	1685,	1287,	596,	707,	934,	2211,	1380,	3718,	3216,
6,	477,	752,	1451,	1021,	384,	563,	813,	1427,	788,	1041,
7,	713,	244,	510,	596,	312,	452,	295,	617,	1160,	268,
8,	203,	300,	114,	154,	227,	149,	190,	273,	239,	201,
9,	92,	44,	179,	25,	120,	141,	118,	120,	134,	66,
+gp,	0,	0,	0,	0,	97,	91,	150,	186,	9,	56,
0 TOTALNUM,	10307,	6762,	5447,	5253,	7284,	7568,	14207,	13457,	16599,	9265,
TONSLAND,	32371,	24183,	23010,	18727,	22228,	24581,	36775,	39799,	34927,	26585,
SOPCOF %,	109,	99,	123,	125,	101,	101,	97,	97,	70,	100,

1

Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)
At 1-May-99 11:57:11

Table 1   Catch numbers at age``````````````````````````````````````
Numbers*10**-3

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	575,	1129,	646,	1139,	2149,	4396,	998,	210,	257,	509,
3,	1732,	2263,	4137,	1965,	5771,	5234,	9484,	3586,	1362,	2122,
4,	1673,	1461,	1981,	3073,	2760,	3487,	3795,	8462,	2611,	1945,
5,	1601,	895,	947,	1286,	2746,	1461,	1669,	2373,	3083,	1484,
6,	1906,	807,	582,	471,	1204,	912,	770,	907,	812,	2178,
7,	493,	832,	487,	314,	510,	314,	872,	236,	224,	492,
8,	134,	339,	527,	169,	157,	82,	309,	147,	68,	168,
9,	87,	42,	123,	254,	104,	34,	65,	47,	69,	33,
+gp,	38,	18,	55,	122,	102,	66,	80,	38,	26,	25,
0 TOTALNUM,	8239,	7786,	9485,	8793,	15503,	15986,	18042,	16006,	8512,	8956,
TONSLAND,	23112,	20513,	22963,	21489,	38133,	36979,	39484,	34595,	21391,	23182,
SOPCOF %,	98,	106,	104,	100,	97,	97,	95,	96,	96,	101,

Table 2.2.2.3 (Cont'd)

Table   1   Catch numbers at age

Numbers*10**-3

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
2,	2237,	243,	190,	199,	118,	559,	2552,	348,	198,	450,
3,	2151,	2849,	446,	442,	786,	768,	2651,	5124,	1268,	737,
4,	2187,	1481,	2130,	453,	591,	1035,	1960,	4572,	6656,	1541,
5,	1121,	852,	616,	886,	218,	519,	988,	1530,	3701,	5083,
6,	1026,	404,	300,	285,	323,	122,	454,	1514,	652,	1512,
7,	997,	294,	141,	128,	94,	172,	115,	591,	634,	157,
8,	220,	291,	92,	52,	32,	38,	171,	146,	169,	117,
9,	61,	50,	52,	29,	22,	22,	43,	344,	51,	28,
+gp,	9,	26,	24,	33,	25,	16,	48,	47,	119,	25,
0 TOTALNUM,	10009,	6490,	3991,	2507,	2209,	3251,	8982,	14216,	13448,	9650,
TONSLAND,	22068,	13487,	8660,	6220,	5988,	8818,	22494,	40107,	34027,	23756,
SOPCOF %,	98,	99,	106,	102,	102,	101,	101,	99,	101,	103,

Table 2.2.3.1. Faroe Plateau (sub-division Vb1) COD. Catch weight at age 1961-98.

Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

At 1-May-99 11:57:11

Table 2   Catch weights at age (kg)

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	1.0800,	1.0000,	1.0400,	.9700,	.9200,	.9800,	.9600,	.8800,
3,	2.2200,	2.2700,	1.9400,	1.8300,	1.4500,	1.7700,	1.9300,	1.7200,
4,	3.4500,	3.3500,	3.5100,	3.1500,	2.5700,	2.7500,	3.1300,	3.0700,
5,	4.6900,	4.5800,	4.6000,	4.3300,	3.7800,	3.5100,	4.0400,	4.1200,
6,	5.5200,	4.9300,	5.5000,	6.0800,	5.6900,	4.8000,	4.7800,	4.6500,
7,	7.0900,	9.0800,	6.7800,	7.0000,	7.3100,	6.3200,	6.2500,	5.5000,
8,	9.9100,	6.5900,	8.7100,	6.2500,	7.9300,	7.5100,	7.0000,	7.6700,
9,	8.0300,	6.6600,	11.7200,	6.1900,	8.0900,	10.3400,	11.0100,	10.9500,
+gp,	10.2700,	10.2700,	10.8200,	14.3900,	11.1100,	11.6500,	10.6900,	9.2800,
0 SOPCOFAC,	.9068,	.9444,	.9573,	.9824,	1.1262,	1.0905,	1.0224,	1.0598,

Table 2   Catch weights at age (kg)

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	1.0900,	.9600,	.8100,	.6600,	1.1100,	1.0800,	.7900,	.9400,	.8700,	1.1120,
3,	1.8000,	2.2300,	1.8000,	1.6100,	2.0000,	2.2200,	1.7900,	1.7200,	1.7900,	1.3850,
4,	2.8500,	2.6900,	2.9800,	2.5800,	3.4100,	3.4400,	2.9800,	2.8400,	2.5300,	2.1400,
5,	3.6700,	3.9400,	3.5800,	3.2600,	3.8900,	4.8000,	4.2600,	3.7000,	3.6800,	3.1250,
6,	4.8900,	5.1400,	3.9400,	4.2900,	5.1000,	5.1800,	5.4600,	5.2600,	4.6500,	4.3630,
7,	5.0500,	6.4600,	4.8700,	4.9500,	5.1000,	5.8800,	6.2500,	6.4300,	5.3400,	5.9270,
8,	7.4100,	10.3100,	6.4800,	6.4800,	6.1200,	6.1400,	7.5100,	6.3900,	6.2300,	6.3480,
9,	8.6600,	7.3900,	6.3700,	6.9000,	8.6600,	8.6300,	7.3900,	8.5500,	8.3800,	8.7150,
+gp,	14.3900,	9.3400,	10.2200,	11.5500,	7.5700,	7.6200,	8.1700,	13.6200,	10.7200,	12.3000,
0 SOPCOFAC,	1.0851,	.9943,	1.2264,	1.2481,	1.0134,	1.0134,	.9709,	.9653,	.7012,	.9964,
1

Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

At 1-May-99 11:57:11

Table 2   Catch weights at age (kg)

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	.8970,	.9270,	1.0800,	1.2300,	1.3380,	1.1950,	.9050,	1.0990,	1.0930,	1.0610,
3,	1.6820,	1.4320,	1.4700,	1.4130,	1.9500,	1.8880,	1.6580,	1.4590,	1.5170,	1.7490,
4,	2.2110,	2.2200,	2.1800,	2.1380,	2.4030,	2.9800,	2.6260,	2.0460,	2.1600,	2.3000,
5,	3.0520,	3.1050,	3.2100,	3.1070,	3.1070,	3.6790,	3.4000,	2.9360,	2.7660,	2.9140,
6,	3.6420,	3.5390,	3.7000,	4.0120,	4.1100,	4.4700,	3.7520,	3.7860,	3.9080,	3.1090,
7,	4.7190,	4.3920,	4.2400,	5.4420,	5.0200,	5.4880,	4.2200,	4.6990,	5.4610,	3.9760,
8,	7.2720,	6.1000,	4.4300,	5.5630,	5.6010,	6.4660,	4.7390,	5.8930,	6.3410,	4.8960,
9,	8.3680,	7.6030,	6.6900,	5.2160,	8.0130,	6.6280,	6.5110,	9.7000,	8.5090,	7.0870,
+gp,	13.0420,	9.6680,	10.0000,	6.7070,	8.0310,	10.9810,	10.9810,	8.8150,	9.8110,	8.2870,
0 SOPCOFAC,	.9843,	1.0584,	1.0408,	1.0030,	.9695,	.9685,	.9491,	.9625,	.9642,	1.0061,

Table 2   Catch weights at age (kg)

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
2,	1.0100,	.9450,	.7790,	.9890,	1.1550,	1.1940,	1.2180,	1.0160,	.9010,	1.0040,
3,	1.5970,	1.3000,	1.2710,	1.3640,	1.7040,	1.8430,	1.9860,	1.7370,	1.3410,	1.4170,
4,	2.2000,	1.9590,	1.5700,	1.7790,	2.4210,	2.6130,	2.6220,	2.7450,	1.9580,	1.8020,
5,	2.9340,	2.5310,	2.5240,	2.3120,	3.1320,	3.6540,	3.9250,	3.8000,	3.0120,	2.2800,
6,	3.4680,	3.2730,	3.1850,	3.4770,	3.7230,	4.5840,	5.1800,	4.4550,	4.1580,	3.4780,
7,	3.7500,	4.6520,	4.0860,	4.5450,	4.9710,	4.9760,	6.0790,	4.9780,	4.4910,	5.4330,
8,	4.6820,	4.7580,	5.6560,	6.2750,	6.1590,	7.1460,	6.2410,	5.2700,	5.3120,	5.8510,
9,	6.1400,	6.7040,	5.9730,	7.6190,	7.6140,	8.5640,	7.7820,	5.5930,	6.1720,	7.9700,
+gp,	9.1560,	8.6890,	8.1470,	9.7250,	9.5870,	8.7960,	8.6270,	7.4820,	7.0560,	7.3630,
0 SOPCOFAC,	.9774,	.9897,	1.0597,	1.0205,	1.0213,	1.0136,	1.0106,	.9940,	1.0106,	1.0299,

Table 2.2.4.1. Faroe Plateau (sub-division Vb1) COD. Proportion mature at age 1983-1999. From 1961-1982 the average from 1983-1996 is used.

YEAR AGE	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10 +
61-82	0.17	0.64	0.87	0.95	1	1	1	1	1
1983	0.63	0.71	0.93	0.94	1	1	1	1	1
1984	0.4	0.96	0.98	0.97	1	1	1	1	1
1985	0	0.5	0.96	0.96	1	1	1	1	1
1986	0	0.38	0.93	1	1	0.96	0.94	1	1
1987	0	0.67	0.91	1	1	1	1	1	1
1988	0.06	0.72	0.9	0.97	1	1	1	1	1
1989	0.05	0.54	0.98	1	1	1	1	1	1
1990	0	0.68	0.9	0.99	0.96	0.98	1	1	1
1991	0	0.72	0.86	1	1	1	1	1	1
1992	0.06	0.5	0.82	0.98	1	1	1	1	1
1993	0.25	0.73	0.78	0.91	0.99	1	1	1	1
1994	0.72	0.89	0.98	0.99	1	0.98	1	1	1
1995	0.21	0.53	0.55	0.74	0.97	1	1	1	1
1996	0.04	0.44	0.75	0.87	0.94	1	1	1	1
1997	0.07	0.75	0.95	0.98	1	1	1	1	1
1998	0	0.74	0.93	0.99	1	1	1	1	1
1999	0.02	0.43	0.88	0.98	1	1	1	1	1
Average 83-99	0.15	0.64	0.88	0.96	0.99	1.00	1.00	1.00	1.00

Table 2.2.6.1.1. Faroe Plateau (sub-division Vb1) COD. The two tuning series used in the assessment. For Cuba trawlers the effort is in number of trawling hours and for longliners in 1000 hooks.

FAROE PLATEAU COD (ICES SUBDIVISION VB1)

102

CUBA TRAWLERS

1985	1998							
1	1	0	1					
2	9							
2413	0.9	22.6	13.3	6	2.4	2.9	1	0.4
2825	0.6	9.1	34.3	13.3	5.7	1.5	0.9	0.3
5284	0.5	7.7	21	31.8	11.4	3	0.7	0.5
6351	0.5	11.9	14.4	13.6	20.7	5	1.9	0.3
5873	0.8	6.1	12.7	10	8.7	8.3	2.1	0.6
7008	0.2	17.2	18.4	11.4	5.8	3.6	3.6	0.6
7005	0.1	1.9	11.9	7.3	4	2.2	1.5	0.7
6389	0.1	2	3.8	10.8	4.4	2	0.8	0.3
6014	0.4	8.7	11.6	5.3	7	2.6	0.8	0.5
5296	2.4	7.7	10.4	12.8	3.6	4.5	1	0.7
4854	4.8	13.1	21.8	16.2	8.1	1.8	2.2	0.7
2489	0.8	24.5	24	8.3	5.1	1.2	0	0.5
2915	0.1	3.6	31.2	26.2	4.7	2.4	0.5	0
3833	0.1	3.8	9.2	20.8	12.9	2	1.1	0.2

LONGLINERS

1986	1998				
1	1	0	1		
2	6				
2071	1	70	220	94	49
827	1	5	28	50	25
1537	10	68	65	61	81
4277	236	230	218	122	144
6060	34	357	186	138	91
4561	13	45	278	94	50
3957	23	57	57	109	40
5517	10	263	256	88	158
3024	161	205	102	64	20
3069	105	268	154	106	63
9816	41	1295	1265	506	696
15602	48	551	3808	2429	544
15655	288	455	766	2865	959

Table 2.2.6.1.2. Faroe Plateau (sub-division Vb1) COD. Final XSA run.

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Lowestoft VPA Version 3.1

   1-May-99  11:54:26


Extended Survivors Analysis

Cod FaroePlateau Vb1 (run: XSAPET04/X04)

CPUE data from file /users/fish/ifad/ifapwork/nwwg/cod_farp/FLEET.X04

Catch data for  38 years. 1961 to 1998. Ages  2 to  10.

       Fleet,            .   First, Last, First, Last, Alpha,  Beta
                      ,       year, year,  age ,  age
FLT03: CUBA TRAWLERS,      1985, 1998,   2,     9,   .000,  1.000
FLT04: LONGLINERS (C,      1986, 1998,   2,     6,   .000,  1.000  .


Time series weights :

     Tapered time weighting applied
     Power =    3 over  20 years


Catchability analysis :

     Catchability dependent on stock size for ages <    3

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  3


     Catchability independent of age for ages >=    6


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 =   2.000

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

     Prior weighting not applied


Tuning converged after   26 iterations

1


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



Fishing mortalities
    Age,  1989,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998

      2,  .177,  .079,  .032,  .019,  .012,  .021,  .066,  .036,  .030,  .051
      3,  .429,  .358,  .204,  .098,  .098,  .098,  .133,  .183,  .179,  .147
      4,  .720,  .598,  .500,  .329,  .184,  .180,  .388,  .355,  .383,  .343
      5,  .766,  .696,  .537,  .399,  .260,  .245,  .262,  .602,  .547,  .571
      6,  .982,  .706,  .566,  .514,  .247,  .227,  .352,  .821,  .562,  .452
      7, 1.049,  .879,  .575,  .506,  .316,  .201,  .347, 1.109, 1.052,  .251
      8, 1.002, 1.082,  .773,  .431,  .225,  .202,  .315, 1.028, 1.236,  .545
      9,  .708,  .651,  .555,  .596,  .326,  .238,  .371, 2.396, 1.451,  .682


1
```

Table 2.2.6.1.2 (Cont'd)

XSA population numbers (Thousands)

YEAR	AGE 2,	3,	4,	5,	6,	7,	8,	9,
1989	1.52E+04,	6.82E+03,	4.71E+03,	2.32E+03,	1.81E+03,	1.70E+03,	3.84E+02,	1.33E+02,
1990	3.54E+03,	1.05E+04,	3.64E+03,	1.88E+03,	8.82E+02,	5.56E+02,	4.86E+02,	1.16E+02,
1991	6.59E+03,	2.68E+03,	5.99E+03,	1.64E+03,	7.67E+02,	3.56E+02,	1.89E+02,	1.35E+02,
1992	1.16E+04,	5.23E+03,	1.79E+03,	2.97E+03,	7.84E+02,	3.56E+02,	1.64E+02,	7.14E+01,
1993	1.12E+04,	9.34E+03,	3.88E+03,	1.05E+03,	1.63E+03,	3.84E+02,	1.76E+02,	8.74E+01,
1994	2.94E+04,	9.07E+03,	6.94E+03,	2.64E+03,	6.65E+02,	1.04E+03,	2.29E+02,	1.15E+02,
1995	4.42E+04,	2.36E+04,	6.73E+03,	4.74E+03,	1.69E+03,	4.34E+02,	7.00E+02,	1.53E+02,
1996	1.08E+04,	3.39E+04,	1.69E+04,	3.74E+03,	2.99E+03,	9.75E+02,	2.51E+02,	4.18E+02,
1997	7.49E+03,	8.56E+03,	2.31E+04,	9.70E+03,	1.68E+03,	1.08E+03,	2.63E+02,	7.36E+01,
1998	1.01E+04,	5.95E+03,	5.86E+03,	1.29E+04,	4.59E+03,	7.82E+02,	3.08E+02,	6.26E+01,

Estimated population abundance at 1st Jan 1999

, .00E+00, 7.84E+03, 4.20E+03, 3.41E+03, 5.97E+03, 2.39E+03, 4.98E+02, 1.46E+02,

Taper weighted geometric mean of the VPA populations:

, 1.23E+04, 9.89E+03, 6.81E+03, 3.68E+03, 1.65E+03, 6.97E+02, 2.89E+02, 1.19E+02,

Standard error of the weighted Log(VPA populations) :

, .6831, .7015, .7046, .7305, .6297, .5150, .4644, .5602,
1

Log catchability residuals.

Fleet : FLT03: CUBA TRAWLERS

Age	1985,	1986,	1987,	1988
2	.48,	.73,	.18,	.21
3	.59,	.50,	.20,	.44
4	.17,	.36,	.16,	.06
5	-.11,	.31,	-.06,	-.23
6	-.02,	.37,	.17,	-.06
7	.30,	.45,	-.05,	.00
8	.24,	.16,	.03,	.10
9	.07,	-.02,	-.14,	-.10

Age	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998
2	.03,	.53,	-.52,	-1.04,	-.14,	.05,	.13,	.85,	-.13,	-.58
3	.06,	.46,	-.45,	-1.02,	-.07,	-.04,	-.36,	.59,	-.11,	.02
4	.13,	.54,	-.44,	-.36,	-.02,	-.59,	.36,	.19,	.00,	-.15
5	.14,	.28,	-.10,	-.28,	.05,	.13,	-.12,	.27,	.28,	-.50
6	.14,	.17,	-.13,	.02,	-.31,	.04,	.06,	-.10,	.13,	-.19
7	.19,	.22,	.05,	.01,	.18,	-.20,	-.09,	-.31,	.10,	-.38
8	.28,	.44,	.38,	-.16,	-.26,	-.19,	-.38,	99.99,	.01,	.09
9	-.03,	-.09,	-.14,	-.24,	.01,	.16,	.02,	.11,	99.99,	.04

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

Age	3,	4,	5,	6,	7,	8,	9
Mean Log q,	-15.4608,	-14.3042,	-13.8202,	-13.6250,	-13.6250,	-13.6250,	-13.6250,
S.E(Log q),	.4624,	.3337,	.2556,	.1696,	.2256,	.2652,	.1201,

Table 2.2.6.1.2   (Cont'd)

Regression statistics :

Ages with q dependent on year class strength

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

2,	.60,	1.504,	14.90,	.60,	14,	.56,	-18.58,

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

3,	.74,	1.926,	13.84,	.86,	14,	.31,	-15.46,
4,	.90,	.733,	13.77,	.86,	14,	.31,	-14.30,
5,	1.10,	-.880,	14.40,	.88,	14,	.29,	-13.82,
6,	1.07,	-.789,	14.07,	.93,	14,	.18,	-13.62,
7,	1.08,	-.526,	14.19,	.83,	14,	.25,	-13.63,
8,	.96,	.228,	13.27,	.78,	13,	.27,	-13.60,
9,	.92,	1.289,	12.92,	.97,	13,	.10,	-13.65,

1

Fleet : FLT04: LONGLINERS (C

Age ,	1985,	1986,	1987,	1988
2 ,	99.99,	-1.86,	-1.23,	.21
3 ,	99.99,	-.41,	-1.64,	.34
4 ,	99.99,	-.33,	-.56,	.12
5 ,	99.99,	-.16,	-.49,	-.05
6 ,	99.99,	-.04,	-.06,	-.15
7 ,	No data for this fleet at this age
8 ,	No data for this fleet at this age
9 ,	No data for this fleet at this age

Age ,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998
2 ,	1.36,	1.03,	-.13,	-.16,	-1.02,	.61,	-.12,	-.33,	-.20,	.88
3 ,	.75,	.38,	-.12,	-.46,	.16,	.54,	-.15,	-.07,	-.02,	.14
4 ,	.43,	.13,	.27,	-.04,	.29,	-.61,	-.09,	-.08,	.26,	.00
5 ,	.22,	.17,	.14,	-.22,	.20,	-.44,	-.53,	.26,	.39,	.28
6 ,	.39,	.19,	-.04,	-.17,	.02,	-.56,	-.30,	.57,	.33,	-.16
7 ,	No data for this fleet at this age
8 ,	No data for this fleet at this age
9 ,	No data for this fleet at this age

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

Age ,	3,	4,	5,	6
Mean Log q,	-12.1981,	-11.4385,	-11.0799,	-10.7525,
S.E(Log q),	.5299,	.3145,	.3289,	.3239,

Regression statistics :

Ages with q dependent on year class strength

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

2,	.77,	.548,	13.07,	.38,	13,	.89,	-14.20,

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

3,	.99,	.020,	12.18,	.62,	13,	.56,	-12.20,
4,	1.07,	-.436,	11.61,	.83,	13,	.35,	-11.44,
5,	1.00,	-.016,	11.09,	.84,	13,	.35,	-11.08,
6,	.87,	.931,	10.32,	.85,	13,	.28,	-10.75,

1

Table 2.2.6.1.2   (Cont'd)

Terminal year survivor and F summaries :

Age   2   Catchability dependent on age and year class strength

Year class = 1996

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	4385.,	.605,	.000,	.00,	1,	.438,	.089
FLT04: LONGLINERS (C,	18938.,	.951,	.000,	.00,	1,	.177,	.021
P shrinkage mean ,	9893.,	.70,,,,				.343,	.040
F shrinkage mean ,	12140.,	2.00,,,,				.042,	.033

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
7840.,	.40,	.34,	4,	.830,	.051

Age   3   Catchability constant w.r.t. time and dependent on age

Year class = 1995

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	4058.,	.375,	.072,	.19,	2,	.602,	.152
FLT04: LONGLINERS (C,	4433.,	.478,	.146,	.31,	2,	.373,	.140
F shrinkage mean ,	4489.,	2.00,,,,				.025,	.139

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
4205.,	.29,	.06,	5,	.195,	.147

1
Age   4   Catchability constant w.r.t. time and dependent on age

Year class = 1994

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	3471.,	.257,	.252,	.98,	3,	.514,	.338
FLT04: LONGLINERS (C,	3324.,	.271,	.061,	.22,	3,	.473,	.350
F shrinkage mean ,	3987.,	2.00,,,,				.013,	.300

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
3407.,	.19,	.11,	7,	.579,	.343

Age   5   Catchability constant w.r.t. time and dependent on age

Year class = 1993

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	4908.,	.202,	.217,	1.07,	4,	.536,	.661
FLT04: LONGLINERS (C,	7434.,	.219,	.071,	.32,	4,	.452,	.482
F shrinkage mean ,	9770.,	2.00,,,,				.012,	.386

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
5969.,	.15,	.13,	9,	.851,	.571

Table 2.2.6.1.2 (Cont'd)

Age   6   Catchability constant w.r.t. time and dependent on age

Year class = 1992

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	2372.,	.177,	.115,	.65,	5,	.547,	.455
FLT04: LONGLINERS (C,	2420.,	.196,	.124,	.63,	5,	.444,	.448
F shrinkage mean ,	2442.,	2.00,,,,				.009,	.445

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
2394.,	.13,	.08,	11,	.571,	.452

Age   7   Catchability constant w.r.t. time and age (fixed at the value for age)   6

Year class = 1991

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	459.,	.169,	.130,	.77,	6,	.692,	.270
FLT04: LONGLINERS (C,	622.,	.198,	.121,	.61,	5,	.299,	.206
F shrinkage mean ,	169.,	2.00,,,,				.009,	.610

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
498.,	.13,	.10,	12,	.741,	.251

Age   8   Catchability constant w.r.t. time and age (fixed at the value for age)   6

Year class = 1990

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	149.,	.186,	.076,	.41,	7,	.828,	.537
FLT04: LONGLINERS (C,	135.,	.185,	.268,	1.45,	5,	.154,	.578
F shrinkage mean ,	127.,	2.00,,,,				.018,	.606

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
146.,	.16,	.08,	13,	.488,	.545

Age   9   Catchability constant w.r.t. time and age (fixed at the value for age)   6

Year class = 1989

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT03: CUBA TRAWLERS,	26.,	.202,	.051,	.25,	8,	.894,	.681
FLT04: LONGLINERS (C,	21.,	.187,	.146,	.78,	5,	.081,	.787
F shrinkage mean ,	46.,	2.00,,,,				.026,	.436

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
26.,	.19,	.05,	14,	.277,	.682

Table 2.2.6.1.3. Faroe Plateau (sub-division Vb1) COD. Results from final XSA run.

```
Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

    At   1-May-99   11:57:11
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Terminal Fs derived using XSA (With F shrinkage)

Table 8 Fishing mortality (F) at age

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	.3346,	.2701,	.2534,	.1086,	.1209,	.0829,	.0789,	.1010,
3,	.5141,	.4982,	.4138,	.2997,	.2518,	.1969,	.2389,	.2318,
4,	.4986,	.4838,	.5172,	.4523,	.4498,	.2552,	.2687,	.3949,
5,	.5737,	.7076,	.5124,	.5229,	.5622,	.4499,	.3442,	.5339,
6,	.4863,	.5569,	.5405,	.5659,	.6604,	.5016,	.5779,	.4472,
7,	.9566,	.3662,	.4879,	.6677,	.5304,	.9680,	.5203,	.7132,
8,	.8116,	.6826,	.3269,	.3531,	.4345,	.8519,	1.0438,	.3331,
9,	.6715,	.5641,	.4806,	.5164,	.5318,	.6106,	.5555,	.4882,
+gp,	.6715,	.5641,	.4806,	.5164,	.5318,	.6106,	.5555,	.4882,
0 FBAR 3- 7,	.6059,	.5226,	.4944,	.5017,	.4909,	.4743,	.3900,	.4642,

Table 8 Fishing mortality (F) at age

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	.1099,	.0530,	.0309,	.0464,	.0656,	.0815,	.0773,	.0931,	.0481,	.0575,
3,	.3063,	.2081,	.1337,	.1476,	.2321,	.1568,	.3191,	.1720,	.3030,	.1893,
4,	.3806,	.3654,	.2225,	.2070,	.3047,	.2046,	.4357,	.3661,	.4737,	.4279,
5,	.4179,	.3408,	.3845,	.2497,	.2812,	.2952,	.4132,	.5563,	.7517,	.4274,
6,	.5709,	.3708,	.5571,	.6057,	.2525,	.3795,	.4542,	.5164,	.7319,	.4832,
7,	.5118,	.6559,	.4650,	.4686,	.3721,	.5328,	.3502,	.7613,	1.1122,	.5947,
8,	.8457,	.4207,	.7527,	.2464,	.3258,	.3051,	.4483,	.6424,	.7762,	.5656,
9,	.5499,	.4338,	.4800,	.3577,	.3091,	.3456,	.4233,	.5733,	.7769,	.5037,
+gp,	.5499,	.4338,	.4800,	.3577,	.3091,	.3456,	.4233,	.5733,	.7769,	.5037,
0 FBAR 3- 7,	.4375,	.3882,	.3526,	.3357,	.2885,	.3138,	.3945,	.4744,	.6745,	.4245,

```
Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

    At   1-May-99   11:57:11
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Terminal Fs derived using XSA (With F shrinkage)

Table 8 Fishing mortality (F) at age

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	.0430,	.0548,	.0524,	.0583,	.0989,	.1072,	.0660,	.0247,	.0283,	.0653,
3,	.2556,	.2373,	.2904,	.2230,	.4647,	.3699,	.3541,	.3558,	.2213,	.3419,
4,	.4298,	.3567,	.3373,	.3649,	.5596,	.5737,	.5048,	.6219,	.4781,	.5653,
5,	.5027,	.4321,	.4144,	.3829,	.6552,	.6633,	.6032,	.6961,	.4842,	.5544,
6,	.4878,	.5143,	.5608,	.3739,	.7624,	.4707,	.9311,	.7977,	.5454,	.7710,
7,	.4453,	.4083,	.6845,	.6844,	.9153,	.4529,	1.2104,	.8568,	.4590,	.7695,
8,	.6855,	.6371,	.4945,	.5389,	.9165,	.3483,	1.1663,	.6633,	.6484,	.7628,
9,	.5143,	.4732,	.5022,	.4725,	.7694,	.5057,	.5165,	.5286,	.7757,	.7783,
+gp,	.5143,	.4732,	.5022,	.4725,	.7694,	.5057,	.5165,	.5286,	.7757,	.7783,
0 FBAR 3- 7,	.4242,	.3897,	.4575,	.4058,	.6714,	.5061,	.7207,	.6657,	.4376,	.6004,

Table 8 Fishing mortality (F) at age

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	FBAR 96-98
AGE											
2,	.1769,	.0790,	.0324,	.0191,	.0117,	.0212,	.0659,	.0361,	.0297,	.0506,	.0388,
3,	.4286,	.3581,	.2036,	.0981,	.0976,	.0982,	.1327,	.1828,	.1787,	.1472,	.1696,
4,	.7197,	.5978,	.4996,	.3288,	.1844,	.1802,	.3883,	.3551,	.3829,	.3431,	.3604,
5,	.7656,	.6959,	.5372,	.3994,	.2598,	.2449,	.2617,	.6022,	.5474,	.5713,	.5736,
6,	.9824,	.7059,	.5665,	.5139,	.2466,	.2266,	.3517,	.8208,	.5622,	.4520,	.6117,
7,	1.0489,	.8790,	.5749,	.5060,	.3156,	.2008,	.3465,	1.1091,	1.0520,	.2509,	.8040,
8,	1.0018,	1.0821,	.7730,	.4307,	.2246,	.2024,	.3147,	1.0277,	1.2364,	.5447,	.9363,
9,	.7083,	.6508,	.5548,	.5960,	.3260,	.2375,	.3712,	2.3960,	1.4509,	.6821,	1.5096,
+gp,	.7083,	.6508,	.5548,	.5960,	.3260,	.2375,	.3712,	2.3960,	1.4509,	.6821,	
0 FBAR 3- 7,	.7890,	.6473,	.4763,	.3692,	.2208,	.1902,	.2962,	.6140,	.5446,	.3529,	

Table 2.2.6.1.4. Faroe Plateau (sub-division Vb1) COD. Stock number at age.

Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

　　At　1-May-99　11:57:11

Terminal Fs derived using XSA (With F shrinkage)

Table 10　　Stock number at age (start of year)
Numbers*10**-3

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	12019,	20654,	20290,	21834,	8269,	18566,	23451	17583,
3,	7385,	7042,	12907,	12893,	16037,	5999,	13991,	17744,
4,	3747,	3616,	3503,	6986,	7823,	10207,	4034,	9021,
5,	2699,	1863,	1825,	1710,	3639,	4085,	6475,	2525,
6,	666,	1245,	752,	895,	830,	1698,	2133,	3758,
7,	668,	335,	584,	358,	416,	351,	842,	980,
8,	155,	210,	190,	294,	151,	200,	109,	410,
9,	66,	56,	87,	112,	169,	80,	70,	31,
+gp,	0,	0,	0,	0,	0,	0,	0,	0,
0　TOTAL,	27403,	35021,	40138,	45083,	37333,	41186,	51105,	52051,

Table 10　　Stock number at age (start of year)
Numbers*10**-3

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	9326,	8610,	11930,	21324,	12577,	30500,	38373,	18603,	10011,	10981,
3,	13012,	6841,	6685,	9471,	16667,	9643,	23016,	29079,	13876,	7811,
4,	11522,	7843,	4549,	4789,	6690,	10819,	6750,	13696,	20045,	8391,
5,	4976,	6448,	4456,	2981,	3188,	4038,	7219,	3575,	7776,	10219,
6,	1212,	2682,	3754,	2484,	1902,	1970,	2461,	3910,	1678,	3002,
7,	1967,	561,	1516,	1761,	1110,	1209,	1104,	1280,	1910,	661,
8,	393,	965,	238,	779,	902,	626,	581,	637,	489,	514,
9,	240,	138,	519,	92,	499,	533,	378,	304,	274,	184,
+gp,	0,	0,	0,	0,	400,	342,	476,	466,	18,	155,
0　TOTAL,	42649,	34088,	33647,	43680,	43935,	59682,	80358,	71548,	56078,	41919,

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Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)

　　At　1-May-99　11:57:11

Terminal Fs derived using XSA (With F shrinkage)

Table 10　　Stock number at age (start of year)
Numbers*10**-3

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	15098,	23404,	13985,	22218,	25227,	47788,	17271,	9497,	10176,	8893,
3,	8488,	11841,	18140,	10865,	17160,	18709,	35147,	13237,	7586,	8099,
4,	5292,	5382,	7647,	11108,	7118,	8827,	10582,	20195,	7593,	4978,
5,	4479,	2819,	3085,	4468,	6314,	3330,	4072,	5230,	8877,	3854,
6,	5457,	2218,	1498,	1669,	2494,	2685,	1405,	1824,	2235,	4479,
7,	1516,	2743,	1086,	700,	940,	953,	1373,	453,	673,	1013,
8,	298,	795,	1493,	448,	289,	308,	496,	335,	158,	348,
9,	239,	123,	344,	745,	214,	95,	178,	127,	141,	67,
+gp,	103,	52,	152,	355,	207,	182,	217,	101,	52,	50,
0　TOTAL,	40970,	49377,	47430,	52577,	59963,	82877,	70741,	50999,	37391,	31781,

Table 10　　Stock number at age (start of year)
Numbers*10**-3

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,	GMST 61-96	AMST 61-96
AGE													
2,	15249,	3536,	6592,	11628,	11209,	29413,	44232,	10844,	7486,	10073,	0,	15390,	17810,
3,	6820,	10461,	2675,	5235,	9340,	9070,	23576,	33905,	8564,	5950,	7840,	11527,	13346,
4,	4711,	3638,	5986,	1787,	3878,	6938,	6731,	16903,	23122,	5864,	4205,	6686,	7870,
5,	2716,	1878,	1638,	2974,	1053,	2640,	4742,	3738,	9702,	12908,	3407,	3612,	4089,
6,	1813,	882,	767,	784,	1633,	665,	1892,	2988,	1676,	4595,	5969,	1773,	2059,
7,	1896,	556,	356,	356,	384,	1045,	434,	975,	1077,	782,	2394,	825,	968,
8,	384,	486,	189,	164,	176,	229,	700,	251,	263,	308,	498,	352,	429,
9,	133,	116,	135,	71,	87,	115,	153,	418,	74,	63,	146,	156,	204,
+gp,	19,	59,	62,	80,	99,	83,	170,	55,	168,	55,	49,		
0　TOTAL,	33141,	21611,	18401,	23070,	27859,	50197,	82429,	70077,	52132,	40598,	24507,		

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Table 2.2.6.1.5. Faroe Plateau (sub-division Vb1) COD. Summary table from XSA.

```
Run title : Cod FaroePlateau Vb1 (run: XSAPET04/X04)
At  1-May-99  11:57:11
          Table 16     Summary     (without SOP correction)
                  Terminal Fs derived using XSA (With F shrinkage)
```

	RECRUITS, Age 2	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 7,
1961,	12019,	65428,	46439,	21598,	.4651,	.6059,
1962,	20654,	68225,	43326,	20967,	.4839,	.5226,
1963,	20290,	77602,	49054,	22215,	.4529,	.4944,
1964,	21834,	84666,	55362,	21078,	.3807,	.5017,
1965,	8269,	75044,	57057,	24212,	.4243,	.4909,
1966,	18566,	83920,	60629,	20418,	.3368,	.4743,
1967,	23451,	105291,	73935,	23562,	.3187,	.3900,
1968,	17583,	110436,	82486,	29930,	.3629,	.4642,
1969,	9326,	105542,	83490,	32371,	.3877,	.4375,
1970,	8610,	98405,	82040,	24183,	.2948,	.3882,
1971,	11930,	78226,	63314,	23010,	.3634,	.3526,
1972,	21324,	76451,	57188,	18727,	.3275,	.3357,
1973,	12577,	110738,	83564,	22228,	.2660,	.2885,
1974,	30500,	139318,	98463,	24581,	.2496,	.3138,
1975,	38373,	153765,	109620,	36775,	.3355,	.3945,
1976,	18603,	161431,	123193,	39799,	.3231,	.4744,
1977,	10011,	136420,	112226,	34927,	.3112,	.6745,
1978,	10981,	96711,	78751,	26585,	.3376,	.4245,
1979,	15098,	85737,	67153,	23112,	.3442,	.4242,
1980,	23404,	85542,	59440,	20513,	.3451,	.3897,
1981,	13985,	88930,	64132,	22963,	.3581,	.4575,
1982,	22218,	99578,	67587,	21489,	.3179,	.4058,
1983,	25227,	123906,	99339,	38133,	.3839,	.6714,
1984,	47788,	152835,	116265,	36979,	.3181,	.5061,
1985,	17271,	132494,	86062,	39484,	.4588,	.7207,
1986,	9497,	99552,	74045,	34595,	.4672,	.6657,
1987,	10176,	78316,	61921,	21391,	.3455,	.4376,
1988,	8893,	66831,	52514,	23182,	.4414,	.6004,
1989,	15249,	58889,	39041,	22068,	.5653,	.7890,
1990,	3536,	37895,	29274,	13487,	.4607,	.6473,
1991,	6592,	28343,	20940,	8660,	.4136,	.4763,
1992,	11628,	35381,	20298,	6220,	.3064,	.3692,
1993,	11209,	52231,	35801,	5988,	.1673,	.2208,
1994,	29413,	91208,	78973,	8818,	.1117,	.1902,
1995,	44232,	155385,	77774,	22494,	.2892,	.2962,
1996,	10844,	152753,	94951,	40107,	.4224,	.6140,
1997,	7486,	107564,	95572,	34027,	.3560,	.5446,
1998,	10073,	81479,	68139,	23756,	.3486,	.3529,

```
Arith.
  Mean   ,   17335,     95854,     70246,     24596,     .3590,     .4686,
0 Units,  (Thousands),  (Tonnes),  (Tonnes),  (Tonnes),
```

Table 2.2.7.1.1. Faroe Plateau (sub-division Vb1) COD. Input data to RCT3.

```
FAROE PLATEAU COD: GROUNDFISH SURVEY AND 0-GROUP SURVEY DATA
"
3 10 2
"
```

'Yrclass'	'VPA'	'Ogrpsurv'	'Suage2'	'Suage3'
1989	6592	78	2.54	2.10
1990	11628	523	1.48	4.48
1991	11209	17	0.41	3.74
1992	29413	120	4.72	9.77
1993	44232	1193	7.67	52.93
1994	10844	664	2.91	13.98
1995	7487	59	1.03	9.99
1996	-11	380	0.45	13.94
1997	-11	1196	4.96	-11
1998	-11	8138	-11	-11

Table 2.2.7.1.2. Faroe Plateau (sub-division Vb1) COD. Output from RCT3.

```
Analysis by RCT3 ver3.1 of data from file :
"
 c:\petur\codrct3.dat
"
 FAROE PLATEAU COD: GROUNDFISH SURVEY AND 0-GROUP SURVEY DATA
"
 Data for    3 surveys over   10 years :  1989 - 1998

 Regression type = C
 Tapered time weighting applied
 power =    3 over  20 years
 Survey weighting not applied

 Final estimates shrunk towards mean
 Minimum S.E. for any survey taken as     .20
 Minimum of   3 points used for regression

 Forecast/Hindcast variance correction used.

 Yearclass =   1996
```

	I-----------Regression----------I				I-----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Ogrpsu	.94	4.69	1.37	.245	7	5.94	10.28	1.773	.068
Suage2	1.49	7.72	.67	.577	7	.37	8.27	.956	.235
Suage3	1.01	7.23	.69	.559	7	2.70	9.96	.892	.269
					VPA Mean =		9.53	.708	.428

```
 Yearclass =   1997
```

	I-----------Regression----------I				I-----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Ogrpsu	.94	4.70	1.37	.246	7	7.09	11.35	1.954	.075
Suage2 Suage3	1.48	7.73	.66	.583	7	1.79	10.38	.896	.357
					VPA Mean =		9.54	.710	.568

```
 Yearclass =   1998
```

	I-----------Regression----------I				I-----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Ogrpsu Suage2 Suage3	.94	4.71	1.37	.247	7	9.00	13.14	2.497	.075
					VPA Mean =		9.54	.713	.925

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1996	12131	9.40	.46	.38	.69		
1997	21449	9.97	.54	.39	.54		
1998	18275	9.81	.69	.95	1.92		

Table 2.2.7.1.3. Faroe Plateau (sub-division Vb1) COD. Input to management option table.

Cod in the Faroe Plateau (Fishing Area Vb1)

Prediction with management option table: Input data

Year: 1999								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	21449	0.2	0.02	0	0	1.004	0.0272	1.004
3	9442	0.2	0.43	0	0	1.417	0.1188	1.417
4	4205	0.2	0.88	0	0	1.804	0.2524	1.804
5	3407	0.2	0.98	0	0	2.281	0.4018	2.281
6	5969	0.2	1	0	0	3.482	0.4284	3.482
7	2394	0.2	1	0	0	5.436	0.5631	5.436
8	498	0.2	1	0	0	5.856	0.6558	5.856
9	146	0.2	1	0	0	7.972	0.6558	7.972
10+	49	0.2	1	0	0	8.802	0.6558	8.802
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 2000								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	18275	0.2	0.15	0	0	1.004	0.0272	1.004
3	.	0.2	0.64	0	0	1.417	0.1188	1.417
4	.	0.2	0.88	0	0	1.804	0.2524	1.804
5	.	0.2	0.96	0	0	2.281	0.4018	2.281
6	.	0.2	0.99	0	0	3.482	0.4284	3.482
7	.	0.2	1	0	0	5.436	0.5631	5.436
8	.	0.2	1	0	0	5.856	0.6558	5.856
9	.	0.2	1	0	0	7.972	0.6558	7.972
10+	.	0.2	1	0	0	8.802	0.6558	8.802
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 2001								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	14933	0.2	0.15	0	0	0.974	0.0272	0.974
3	.	0.2	0.64	0	0	1.498	0.1188	1.498
4	.	0.2	0.88	0	0	2.169	0.2524	2.169
5	.	0.2	0.96	0	0	3.031	0.4018	3.031
6	.	0.2	0.99	0	0	4.032	0.4284	4.032
7	.	0.2	1	0	0	4.969	0.5631	4.969
8	.	0.2	1	0	0	5.479	0.6558	5.479
9	.	0.2	1	0	0	6.579	0.6558	6.579
10+	.	0.2	1	0	0	7.78	0.6558	7.78
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name   : MANPET01
Date and time: 02MAY99:15:37

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Table 2.2.7.1.4. Faroe Plateau (sub-division Vb1) COD. Management option table.

Prediction with management option table

Year: 1999					Year: 2000					Year: 2001	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1	0.3529	88581	58785	19496	0.0	0.0000	93809	67701	0	122936	98092
.	.	.	.	.	0.1	0.0353	.	67701	2425	120143	95385
.	.	.	.	.	0.2	0.0706	.	67701	4744	117467	92793
.	.	.	.	.	0.3	0.1059	.	67701	6964	114901	90311
.	.	.	.	.	0.4	0.1412	.	67701	9089	112442	87933
.	.	.	.	.	0.5	0.1765	.	67701	11123	110082	85654
.	.	.	.	.	0.6	0.2117	.	67701	13072	107817	83470
.	.	.	.	.	0.7	0.2470	.	67701	14940	105644	81375
.	.	.	.	.	0.8	0.2823	.	67701	16731	103556	79366
.	.	.	.	.	0.9	0.3176	.	67701	18448	101551	77437
.	.	.	.	.	1.0	0.3529	.	67701	20096	99624	75586
.	.	.	.	.	1.1	0.3882	.	67701	21677	97771	73808
.	.	.	.	.	1.2	0.4235	.	67701	23195	95989	72101
.	.	.	.	.	1.3	0.4588	.	67701	24654	94275	70459
.	.	.	.	.	1.4	0.4941	.	67701	26055	92625	68882
.	.	.	.	.	1.5	0.5294	.	67701	27402	91036	67365
.	.	Tonnes	Tonnes	Tonnes	.	.	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name   : MANPET01
       Date and time   : 02MAY99:15:37
       Computation of ref. F: Simple mean, age 3 - 7
       Basis for 1999   : F factors

Table 2.2.7.3.1. Faroe Plateau (sub-division Vb1) COD. Input data to yield per recruit calculations.

Faroe Plateau cod (Sub-division Vb1)

Yield per recruit: Input data

Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	1.000	0.2000	0.1500	0.0000	0.0000	1.067	0.0359	1.067
3	.	0.2000	0.6400	0.0000	0.0000	1.665	0.1306	1.665
4	.	0.2000	0.8800	0.0000	0.0000	2.348	0.2914	2.348
5	.	0.2000	0.9600	0.0000	0.0000	3.334	0.3935	3.334
6	.	0.2000	0.9900	0.0000	0.0000	4.372	0.4263	4.372
7	.	0.2000	1.0000	0.0000	0.0000	5.192	0.5228	5.192
8	.	0.2000	1.0000	0.0000	0.0000	5.965	0.5875	5.965
9	.	0.2000	1.0000	0.0000	0.0000	7.216	0.5875	7.216
10+	.	0.2000	1.0000	0.0000	0.0000	8.153	0.5875	8.153
Unit	Numbers	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name   : YLDPET01
       Date and time: 27MAY99:13:22

Table 2.2.7.3.2. Faroe Plateau (sub-division Vb1) COD. Output data from yield per recruit calculations.

Faroe Plateau cod (Sub-division Vb1)

Yield per recruit: Summary table

						1 January		Spawning time	
F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
0.0000	0.0000	0.000	0.000	5.517	22365.158	4.265	20685.758	4.265	20685.758
0.0500	0.0176	0.076	405.951	5.137	19593.079	3.887	17918.599	3.887	17918.599
0.1000	0.0353	0.136	694.659	4.839	17470.053	3.591	15800.408	3.591	15800.408
0.1500	0.0529	0.185	904.959	4.598	15795.370	3.352	14130.477	3.352	14130.477
0.2000	0.0706	0.225	1060.933	4.398	14442.834	3.154	12782.611	3.154	12782.611
0.2500	0.0882	0.259	1178.208	4.229	13329.190	2.987	11673.557	2.987	11673.557
0.3000	0.1059	0.288	1267.294	4.084	12397.335	2.844	10746.215	2.844	10746.215
0.3500	0.1235	0.313	1335.470	3.958	11606.836	2.719	9960.155	2.719	9960.155
0.4000	0.1412	0.336	1387.897	3.847	10928.285	2.610	9285.970	2.610	9285.970
0.4500	0.1588	0.356	1428.314	3.748	10339.804	2.513	8701.783	2.513	8701.783
0.5000	0.1765	0.374	1459.470	3.659	9824.790	2.425	8190.993	2.425	8190.993
0.5500	0.1941	0.390	1483.421	3.579	9370.430	2.347	7740.791	2.347	7740.791
0.6000	0.2118	0.405	1501.719	3.506	8966.685	2.276	7341.138	2.276	7341.138
0.6500	0.2294	0.418	1515.555	3.439	8605.586	2.210	6984.068	2.210	6984.068
0.7000	0.2470	0.431	1525.845	3.378	8280.730	2.151	6663.178	2.151	6663.178
0.7500	0.2647	0.442	1533.305	3.321	7986.918	2.095	6373.271	2.095	6373.271
0.8000	0.2823	0.453	1538.496	3.269	7719.888	2.044	6110.087	2.044	6110.087
0.8500	0.3000	0.463	1541.862	3.220	7476.113	1.997	5870.100	1.997	5870.100
0.9000	0.3176	0.473	1543.754	3.174	7252.654	1.952	5650.374	1.952	5650.374
0.9500	0.3353	0.481	1544.455	3.131	7047.043	1.911	5448.441	1.911	5448.441
1.0000	0.3529	0.490	1544.191	3.090	6857.191	1.872	5262.213	1.872	5262.213
1.0500	0.3706	0.497	1543.147	3.052	6681.322	1.835	5089.916	1.835	5089.916
1.1000	0.3882	0.505	1541.469	3.016	6517.915	1.801	4930.030	1.801	4930.030
1.1500	0.4059	0.512	1539.279	2.982	6365.660	1.768	4781.247	1.768	4781.247
1.2000	0.4235	0.518	1536.676	2.949	6223.426	1.737	4642.436	1.737	4642.436
1.2500	0.4412	0.525	1533.741	2.919	6090.227	1.707	4512.614	1.707	4512.614
1.3000	0.4588	0.531	1530.540	2.889	5965.204	1.680	4390.921	1.680	4390.921
1.3500	0.4764	0.536	1527.128	2.861	5847.604	1.653	4276.606	1.653	4276.606
1.4000	0.4941	0.542	1523.550	2.834	5736.762	1.627	4169.006	1.627	4169.006
1.4500	0.5117	0.547	1519.845	2.809	5632.093	1.603	4067.535	1.603	4067.535
1.5000	0.5294	0.552	1516.043	2.784	5533.075	1.580	3971.674	1.580	3971.674
1.5500	0.5470	0.557	1512.171	2.761	5439.247	1.558	3880.961	1.558	3880.961
1.6000	0.5647	0.562	1508.249	2.738	5350.193	1.536	3794.983	1.536	3794.983
1.6500	0.5823	0.566	1504.296	2.716	5265.545	1.516	3713.371	1.516	3713.371
1.7000	0.6000	0.571	1500.326	2.695	5184.970	1.496	3635.794	1.496	3635.794
1.7500	0.6176	0.575	1496.353	2.675	5108.167	1.477	3561.952	1.477	3561.952
1.8000	0.6353	0.579	1492.386	2.655	5034.867	1.459	3491.577	1.459	3491.577
1.8500	0.6529	0.583	1488.434	2.636	4964.824	1.441	3424.422	1.441	3424.422
1.9000	0.6705	0.586	1484.504	2.618	4897.816	1.424	3360.268	1.424	3360.268
1.9500	0.6882	0.590	1480.603	2.601	4833.640	1.408	3298.912	1.408	3298.912
2.0000	0.7058	0.594	1476.735	2.584	4772.112	1.392	3240.171	1.392	3240.171
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

(cont.)

The SAS System

13:11 Thursday, May 27, 1999
Faroe Plateau cod (Sub-division Vb1)

Yield per recruit: Summary table

(cont.)

Notes: Run name : YLDPET01
Date and time : 27MAY99:13:22
Computation of ref. F: Simple mean, age 3 - 7
F-0.1 factor : 0.3900
F-max factor : 0.9598
F-0.1 reference F : 0.1376
F-max reference F : 0.3387
Recruitment : Single recruit
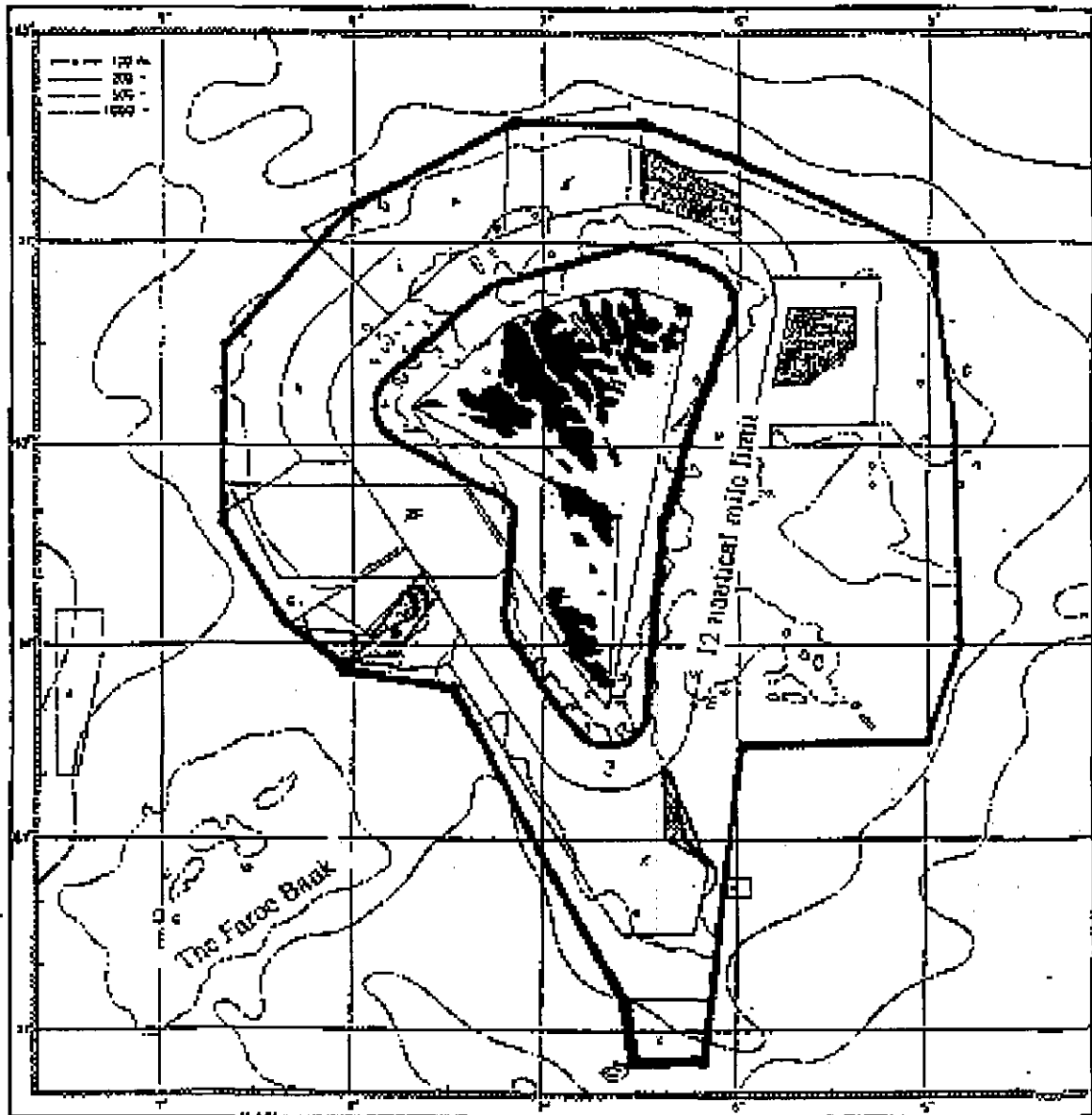
Figure 2.2 Fishing area regulations in Division Vb. Allocation of fishing days applies to the area inside the outer thick line. Holders of effort quotas who fish outside this line can triple their numbers of days. Trawlers are generally not allowed to fish inside the 12 nautical mile limit and only longliners < 100 GRT and jiggers < 100 GRT are allowed to fish inside the innermost thick line. Several areas are closed for parts of the year, to protect spawning areas, separate gears etc. The Faroe Bank (VB2) is managed separate from Vb1. The area on the bank shallower than 200 m is closed to trawling and the longline fishery is regulated by individual day quotas.

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Commercial landings
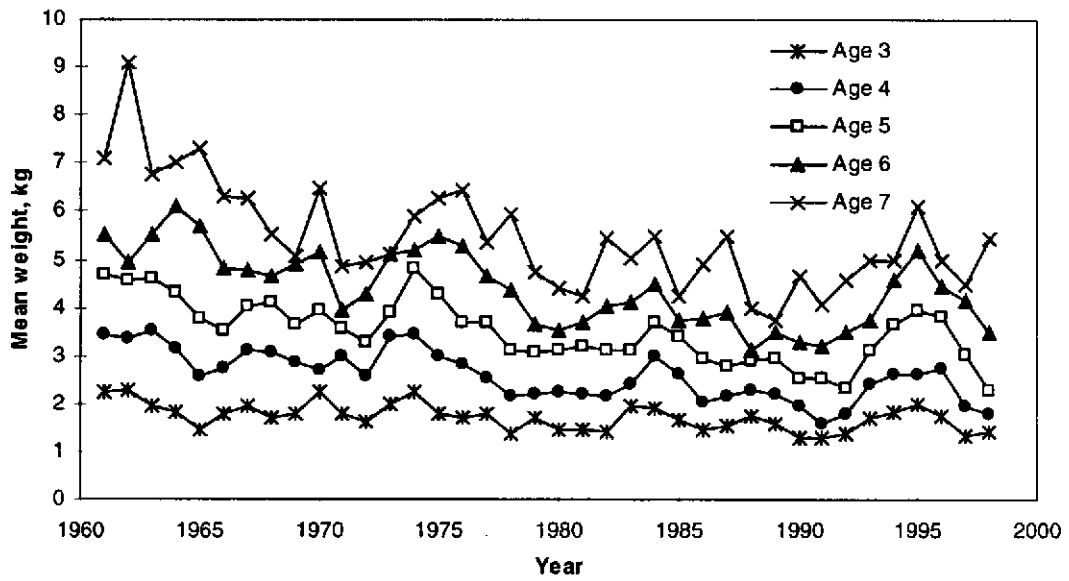
Figure 2.2.3.1. Faroe Plateau (sub-division Vb1) COD. Mean weight at age 1961-1998.

Groundfish survey
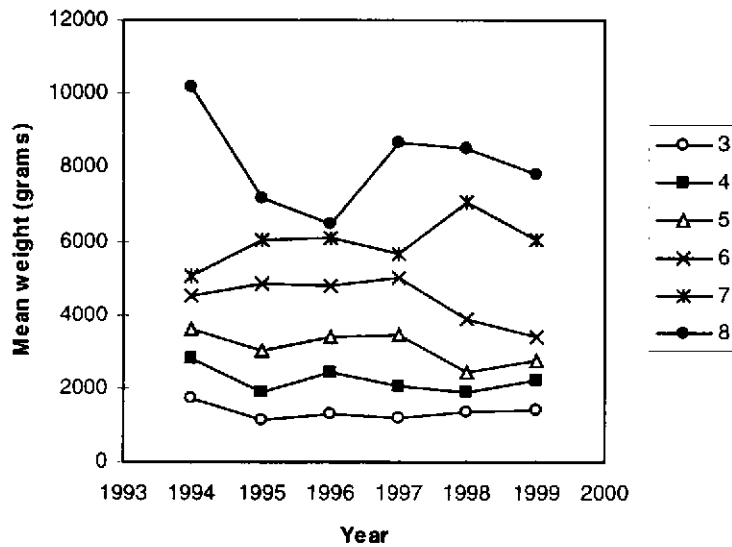
Figure 2.2.3.2. Faroe Plateau (sub-division Vb1) COD. Mean weight at age in the groundfish survey.

Observed data
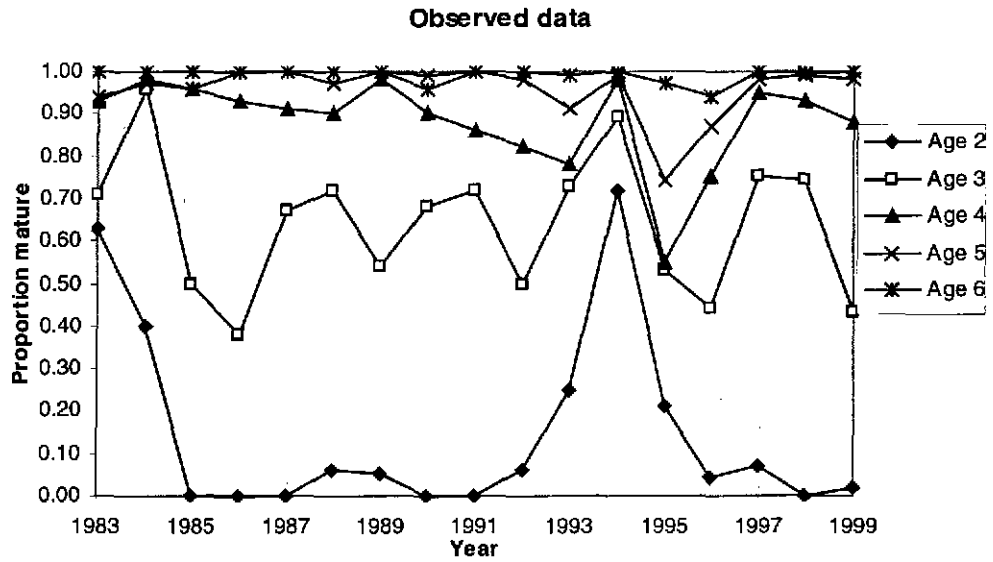
Figure 2.2.4.1. Faroe Plateau (sub-division Vb1) COD. Proportion mature at age as observed in the spring groundfish survey.

CPUE (kg/hour) in the spring survey
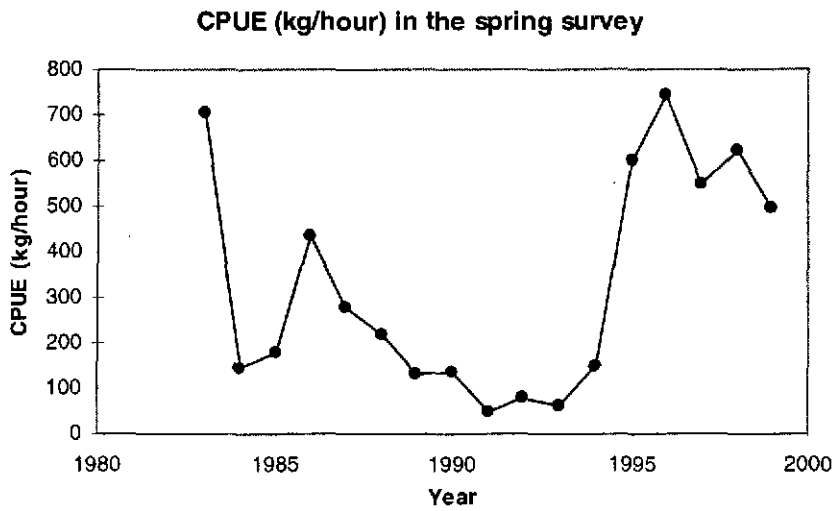
Figure 2.2.5.1. Faroe Plateau (sub-division Vb1) COD. Catch per unit effort in the groundfish survey.

CPUE for 5 longliners and 8 Cuba trawlers

···□··· Longliners   ■ Cuba trawlers
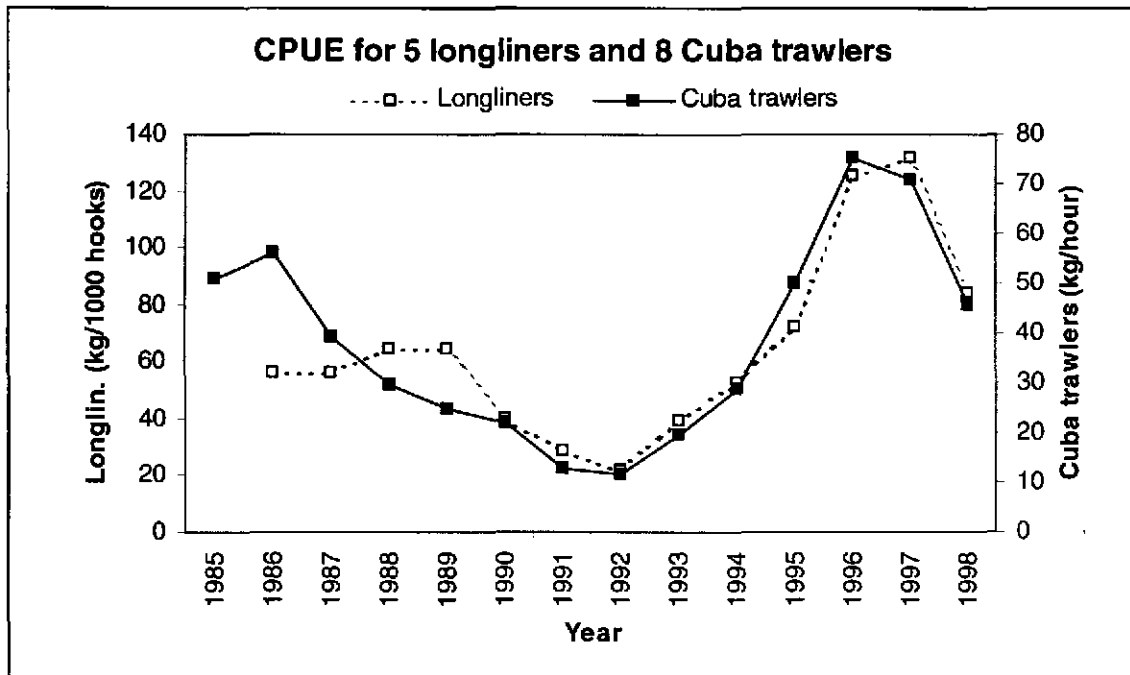
Figure 2.2.6.1.1. Faroe Plateau (sub-division Vb1) COD. CPUEs for Cuba trawlers and longliners.

Cuba trawlers
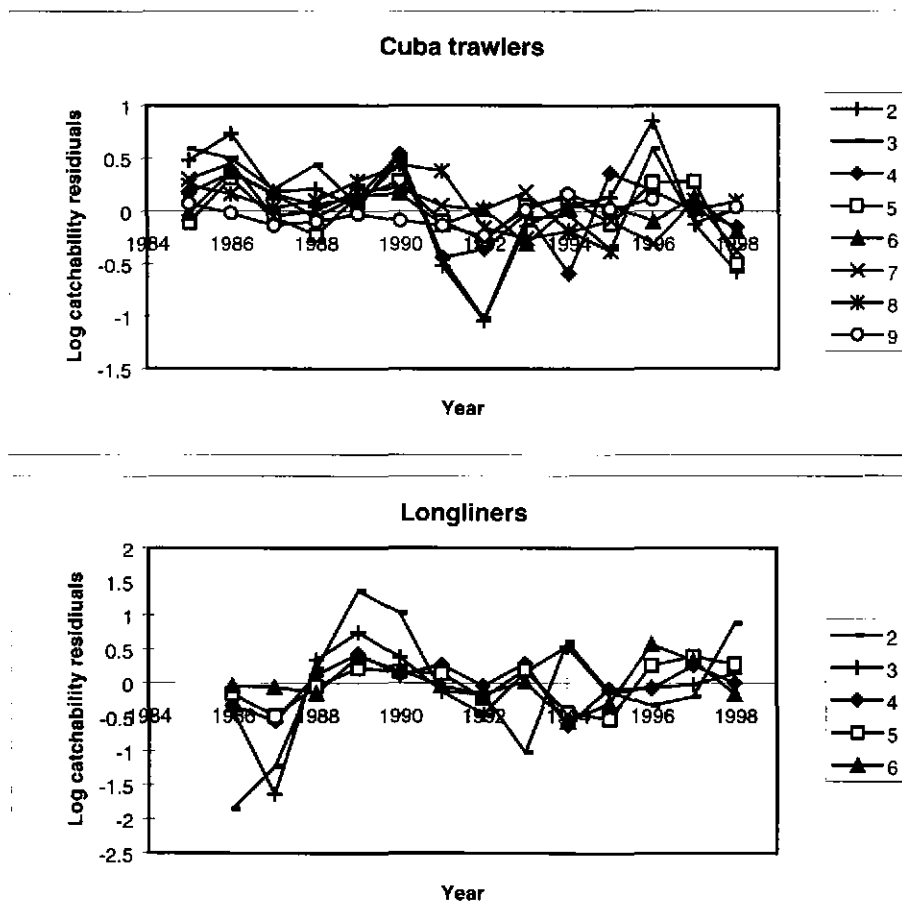
Longliners

Figure 2.2.6.1.2. Faroe Plateau (sub-division Vb1) COD. Log catchability residuals for Cuba trawlers and 5 longliners.

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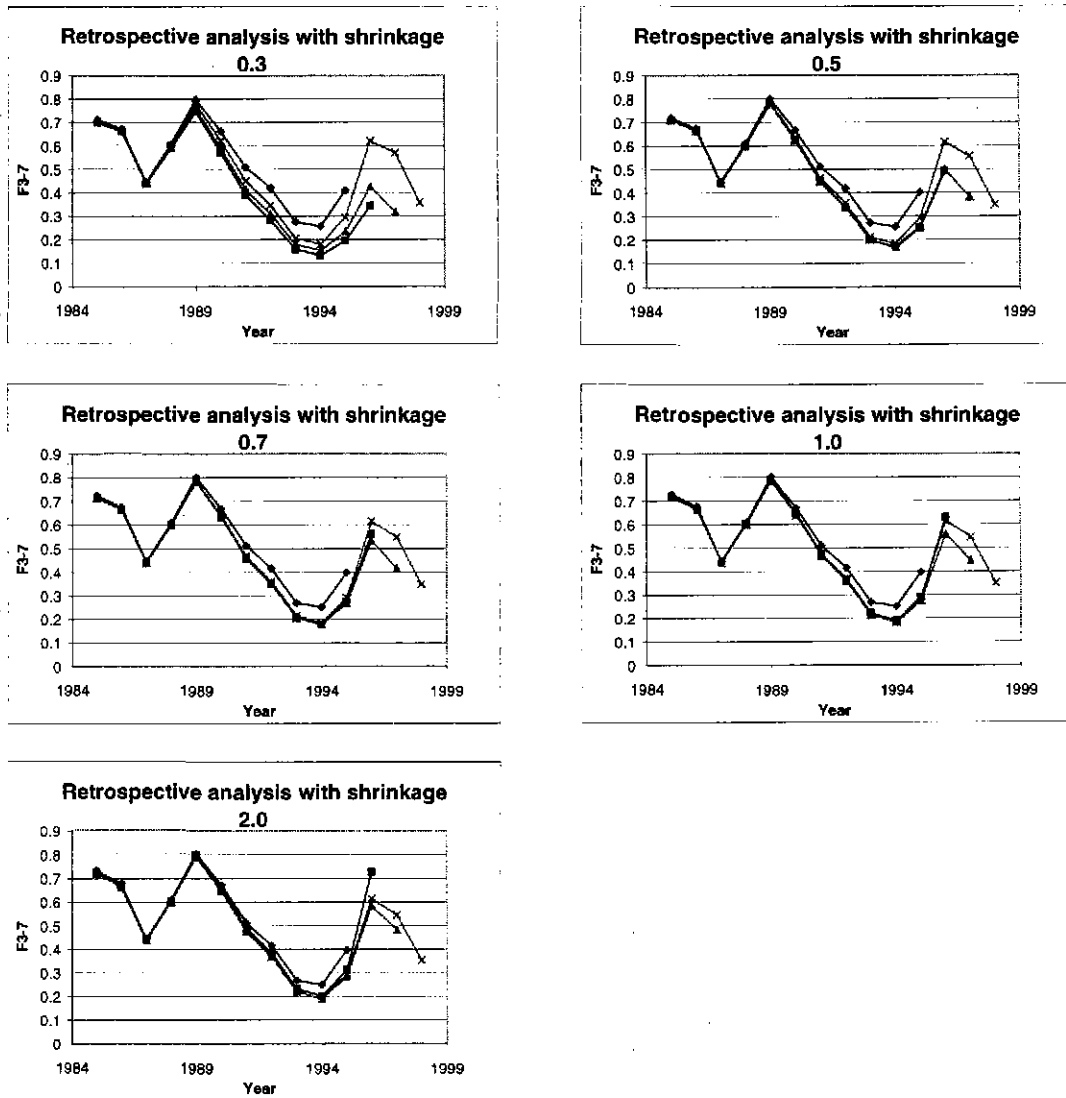
Figure 2.2.6.1.3. Faroe Plateau (sub-division Vb1) COD. Retrospective analyses with shrinkages of 0.3 to 2.0.
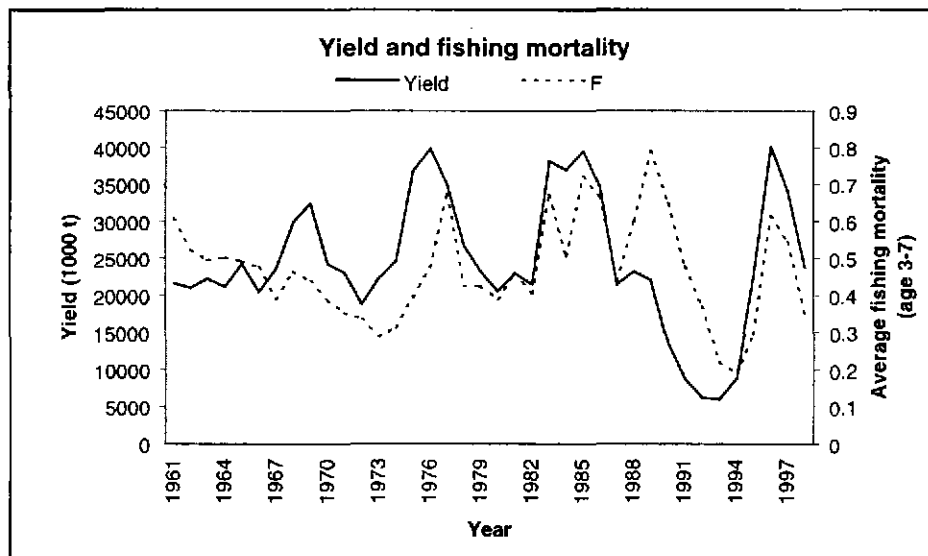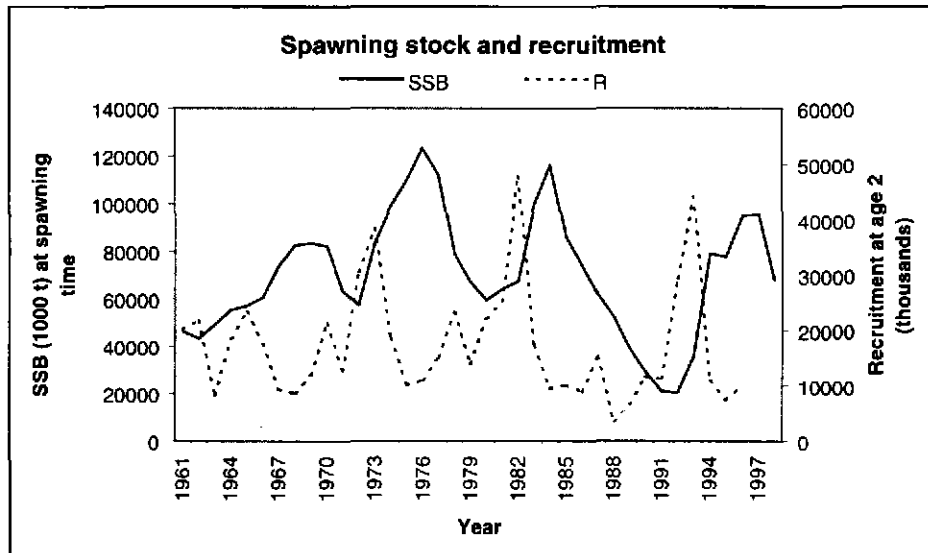
Figure 2.2.6.1.4. Faroe Plateau (sub-division Vb1) COD. Yield and fishing mortality versus year. Spawning stock biomass (SSB) and recruitment versus year.

Stock - Recruitment

$F_{high} = 1.72$

$F_{med} = 0.39$

$F_{low} = 0.1$

(run: XSAPET04)
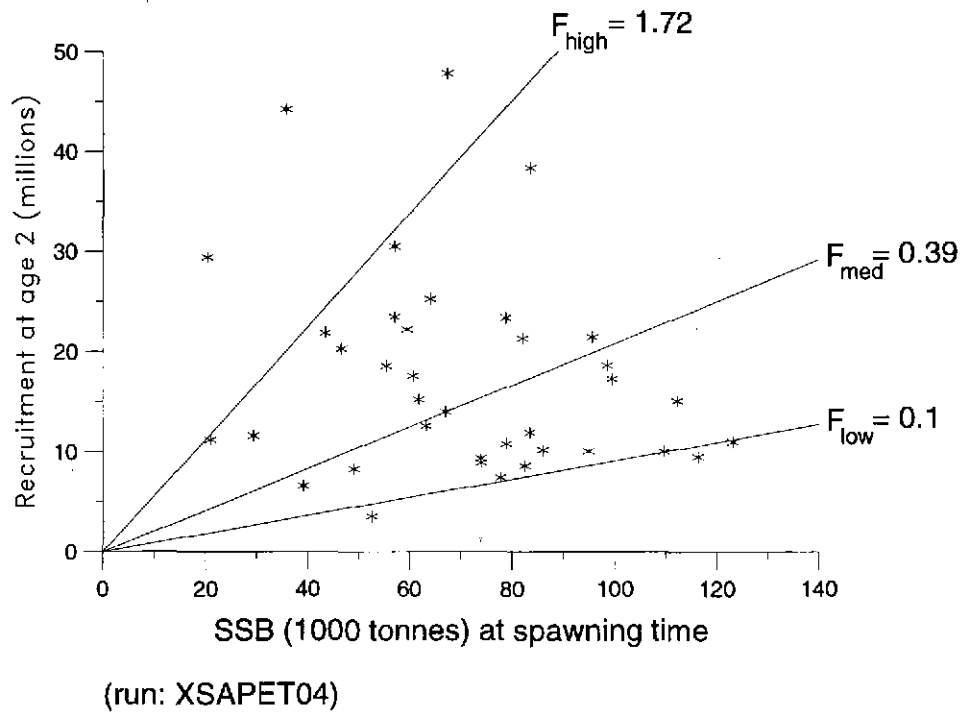
Figure 2.2.6.2.1. Faroe Plateau (sub-division Vb1) COD. Spawning stock – recruitment relationship 1961-96. Years are shown at each data point.

Faroe Cod RV Catchabilities
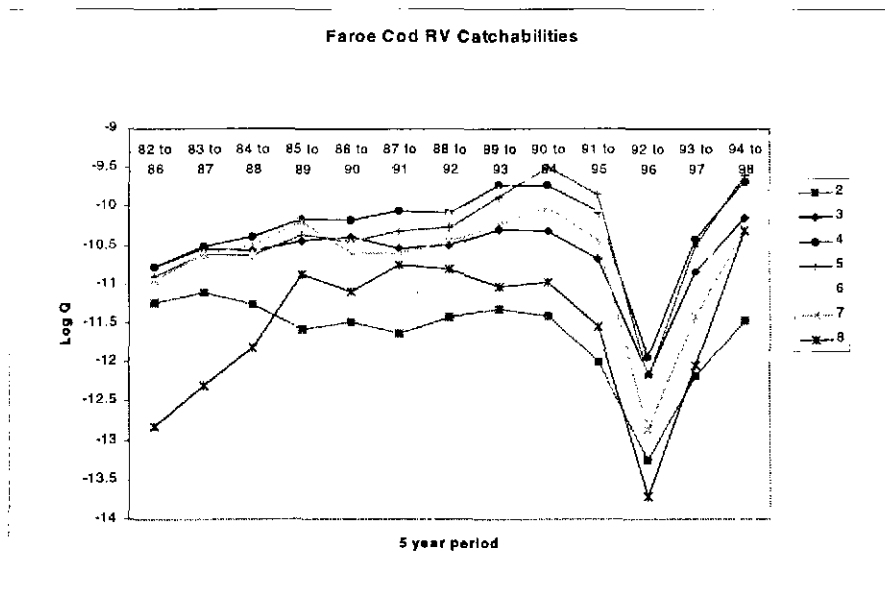
Figure 2.2.6.3.1: Faroe Plateau (sub-division Vb1) COD. Catchability coefficients calculated by XSA by 5 year periods for the research survey.

42
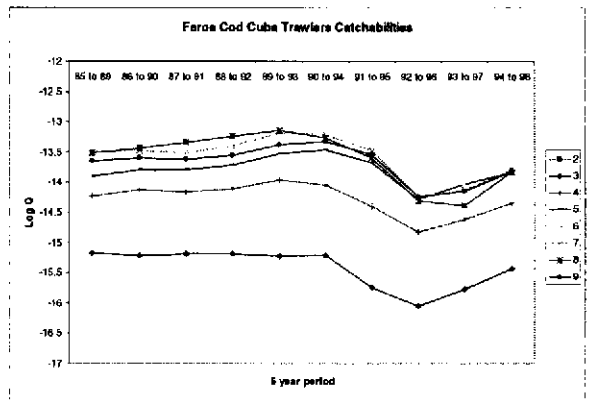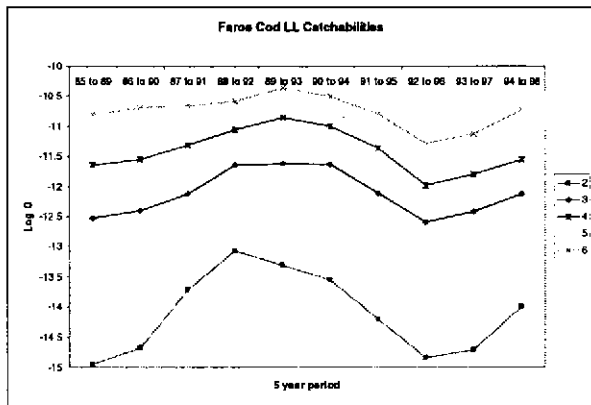
Figure 2.2.6.3.2: Faroe Plateau (sub-division Vb1) COD. Catchability coefficients calculated by XSA by 5 year periods for the longliners and the Cuba series.

Cod_farp
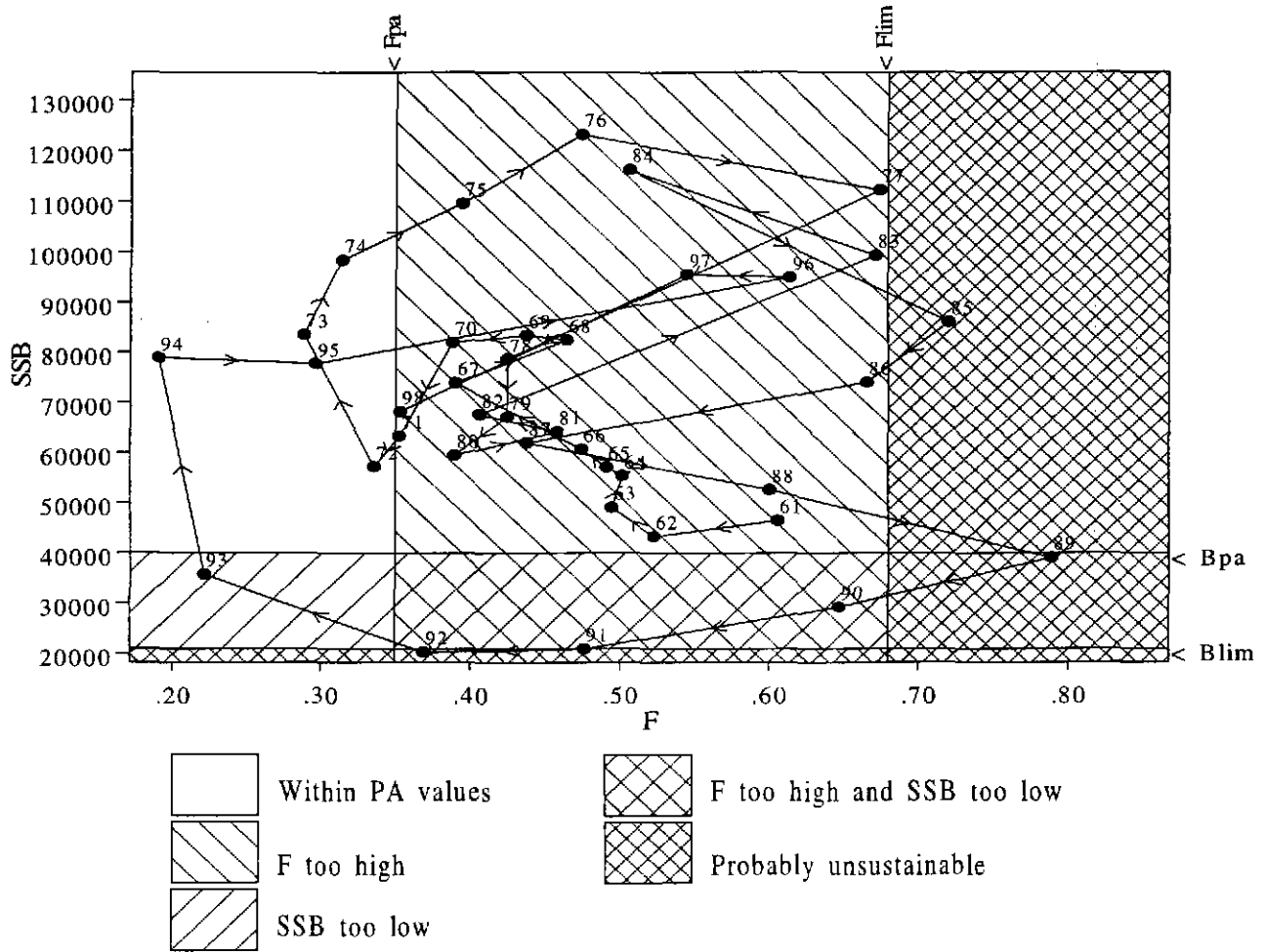
Figure 2.2.7.2.1. Faroe Plateau (ICES Subdivision Vb1) COD. Spawning stock biomass versus F. Output from the PA-software.
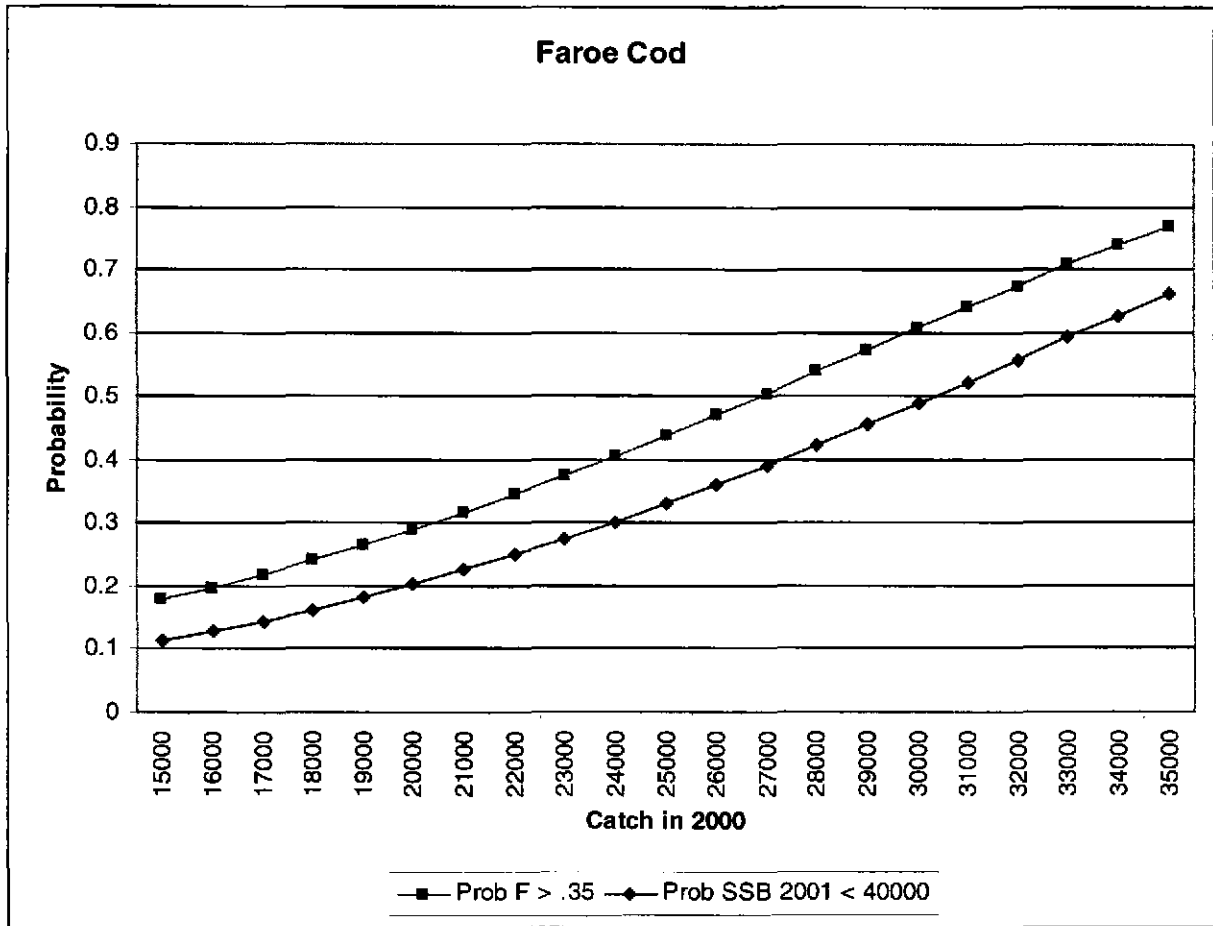
Figure 2.2.7.2.2. Faroe Plateau (sub-division Vb1). Probabilities that the 1999 F will be greater than the proposed Fpa = 0.35 or that the SSB in 2001 will be less than the proposed Bpa of 40 000t calculated analytically using the ADAPT software (Gavaris 1988, Sinclair and Gavaris 1996) for 1999 catches ranging from 15 000 to 35 000t.
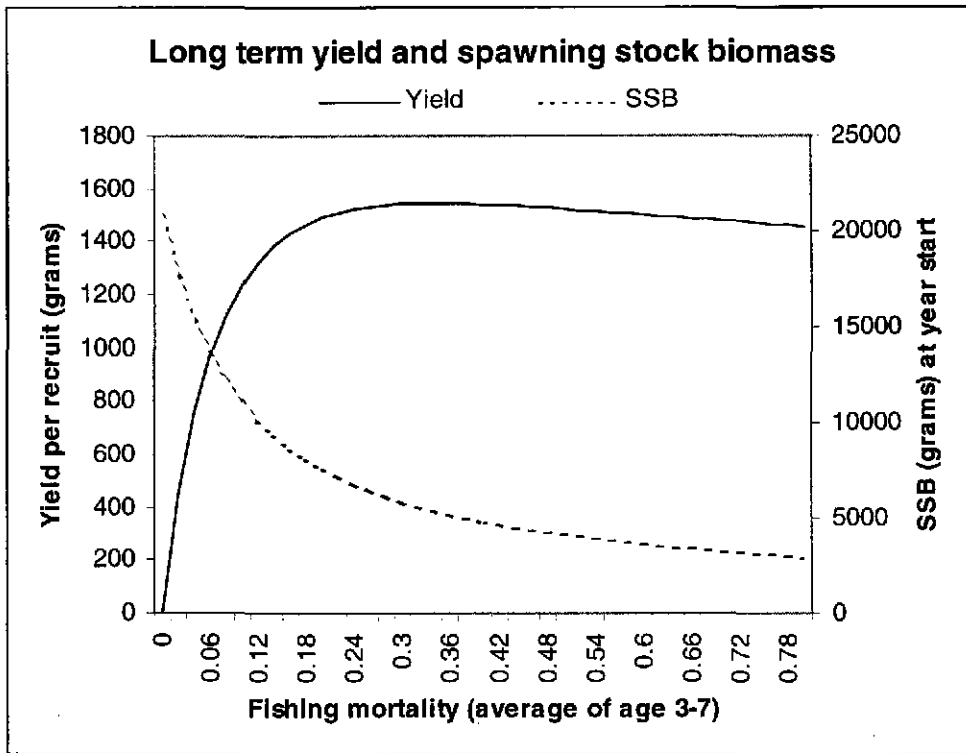
Figure 2.2.7.3.1. Faroe Plateau (sub-division Vb1) COD. Yield per recruit and spawning stock biomass as a function of fishing mortality.
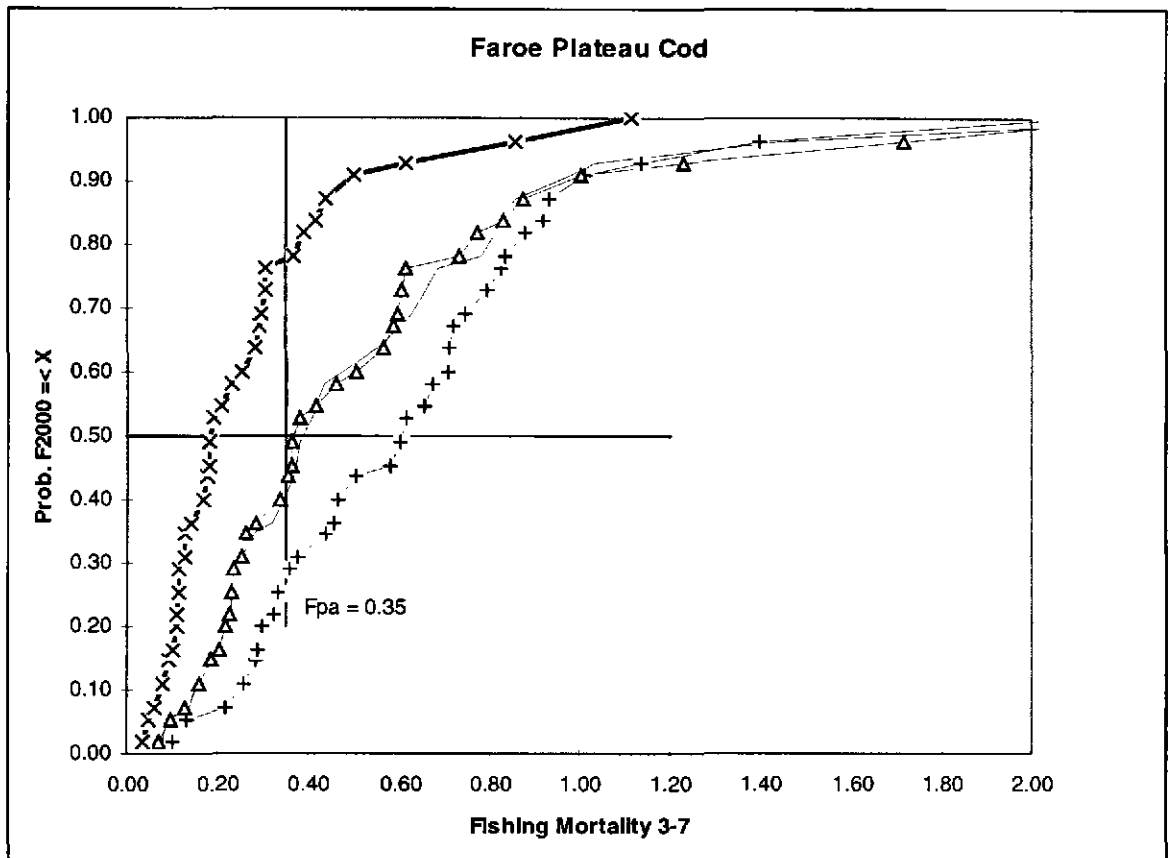
Figure 2.2.8.1: Faroe Plateau (sub-division Vb1) COD. Cumulative probability distribution of the potential fishing mortalities in 1999/2000 under the number of fishing days allocated for the LL<100, ST<400, PT>1000, LL>100, OPEN, and JIGGERS. Three options are presented where the 8861 days allocated to the LL<100, jiggers and ST<400 is either used entirely by the LL (solid line), the ST<400 (line with +) or by the jiggers (line with triangles, with 18640 days). The results confirm that the jiggers are about half as efficient as the LL. Substantially higher fishing mortalities would be exerted if the days are fished by the ST<400. There is a 50% probability that the fishing mortality will be equal to or higher than the proposed $F_{pa} = 0.35$ if the days are fished by the LL or jiggers, but the F would climb to approximately 0.60 if the days were fished by the ST<400. The leftmost line with the X shows that it would be necessary to decrease the number of days fished by half to have an 80% probability that F will be less than F_{pa}.

2.3   Faroe Bank Cod

2.3.1   Trends in landings and effort

Total nominal landings of the Faroe Bank cod from 1986 to 1998 as officially reported to ICES are given in Table 2.3.1.1 and since 1965 in Figure 2.3.1.1. Landings have been highly irregular from 1965 to the mid 1980s, reflecting the opportunistic nature of the fishery on the Bank, with a peak value exceeding slightly 5 000 t in 1973. The evolution of landings has been smoother since 1987, declining from about 3 500 t in 1987 to only 330 t in 1992 before increasing to 3 900 t in 1997. In 1998, 3 200t were reported from the Faroe Bank.

The decreasing trend in the cod landings from Faroe Bank lead ACFM in 1990 to advise the Faroese authorities to close the Bank to all fishing. This advice was followed for depths shallower than 200 meters. In 1992 and 1993 long liners and jiggers were allowed to participate in an experimental fishery inside the 200 meter depth contour. For the quota year 1 September 1995 to 31 August 1996 a fixed quota of 1 050 t was set. The new management regime with fishing days was introduced on 1 June 1996 allowing longliners and jiggers to fish inside the 200 m contour. The trawlers are allowed to fish outside the 200 contour.

2.3.2   Stock assessment

Biological samples have been taken from commercial landings since 1996 (the 1998 sampling is shown in Table 2.3.1.2) and from the groundfish survey. The available data for the Faroe Bank cod are not sufficient to permit an age-structured assessment, but as in recent years the results of general production modelling are presented.

The Faroese groundfish surveys cover the Faroe Bank and cod is mainly taken within the 200 m depth contour. The catches of cod per trawl hour in depths shallower than 200 meter are shown in Figure 2.3.2.1. The CPUE declined from 266 kg/hour in 1986 to only 23 kg/hour in 1990. The index of stock size increased to 637 kg/hour in 1998, but decreased to 369 kg/hour in 1999.

The length distributions in the 1983-1999 surveys illustrated in Figure 2.3.2.2 show substantially higher numbers in 1996-1999 compared to previous years.

As in recent years, a Schaefer general production model was fit to the Faroe Bank cod landings data using the research vessel survey CPUE for 1983 to 1999 in kg/hour as an index of stock biomass. The results are shown in Table 2.3.2.2. Parameter estimates were not stable with different set of initial values and/or constraints leading to different results.

According to the survey CPUE, the stock reached a recent peak in 1998, with the 1999 point being about 60% of the 1998. The landings are highly correlated with the ln survey CPUE in the previous year (Landings y = -3269.9 + 1148.04 x ln CPUE y-1, $r^2 = 0.84$). The observed and predicted landings shown in Figure 2.3.2.3 suggests that the landings in 1999 could be slightly higher than in 1998 (less than 10%), if the relationship continues to hold.

2.3.2.1   Comment on the assessment

The assessment was done using the same data and approaches as in previous years. There is currently no information on mortality rates, but aged information from the surveys since 1983, and for the commercial landings since 1996 could be examined in the future to estimate mortality and population sizes.

2.3.3   Reference points

There is currently little information to base the choice of reference points. Fishing mortality estimates are not available, and it is therefore not possible to compare current stock status with possible reference points such as $F=M$, $F_{0.1}$, F_{MAX}, F_{MSY}. In theory, biomass reference points could be proposed based on the survey index, but their relevance with respect to protecting cod productivity needs to be established. Although no specific values can be suggested as reference points, the currently high, albeit declining, biomass indicates that the stock is probably within safe biological limits.

2.3.4   Management considerations

The landing estimates are uncertain because since 1996 the vessels are allowed to fish both on the Plateau and on Faroe Bank during the same trip, rendering landings from both areas uncertain. Given the relative size of the two fisheries, this is a bigger problem for Faroe Bank cod than for Faroe Plateau cod, but the magnitude remains unquantified for both. The ability to provide advice depends on the reliability of input data. If the cod landings from Faroe Bank are not known, it is difficult to provide advice on landings. If the fishery management agency intends to manage the two fisheries to protect the productive capacity of each individual unit, then it is necessary to regulate the catch removed from each stock.

Table 2.3.1.1. Faroe Bank (Sub-division Vb2) COD. Nominal catches (tonnes) by countries, 1986-98. As officially reported to ICES.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Faroe Islands	1,836	3,409	2,960	1,270	289	297	122	264	717	561	2,051	3,459	3,091
Norway	6	23	94	128	72	38	32	2	8	40	57 *	135 *	148
UK (E/W/NI)	-	-	-	-	-	-	+	1	1	-	. [2]	. [2]	[3]
UK (Scotland) [1]	63	47	37	14	205	90	176	118	227	551	382	277	[3]
Total	1,905	3,479	3,091	1,412	566	425	330	385	953	1,152	2,490	3,871	3,239

*) Preliminary.
1) Includes Vb1
2) Included in Vb1
3) See cod Vb1

Table 2.3.1.2. Faroe Bank (Sub-division Vb2) COD. Samples of lengths, otoliths, and individual weights in 1998.

Fleet	Size	Samples	Length	Otoliths	Weights
Longliners	<100 GRT	1	260	0	0
Longliners	>100 GRT	16	2,721	658	478
Jiggers		6	953	119	119
Sing. trawlers	<400 HP	0	0	0	0
Sing. trawlers	400-1000 HP	0	0	0	0
Sing. trawlers	>1000 HP	0	0	0	0
Pair trawlers	<1000 HP	0	0	0	0
Pair trawlers	>1000 HP	0	0	0	0
Total		23	3,934	777	597

Table 2.3.2.2. Faroe Bank (Sub-division Vb2) COD. Results of production modelling (Schaefer).

No constraints				
r	1.27	MSY	3859.565	Catch is greater than the biomass in some years
K	12201	fMSY	11.59582	
BI	2361	FMSY	0.632649	
q	0.0546	SSQ	4.135218	
r	0.99	MSY	6627.811	r constrained to be less than or equal to .99. First stopped at r=.96, then when re-started hit the constraint, r=.99
K	26779	fMSY	11.17375	
BI	2700	FMSY	0.495	
q	0.0443	SSQ	4.20135	
r	0.96	MSY	6455.456	Additional constraint that observed catches have to be less than or equal to biomass
K	26781	fMSY	34.0192	
BI	2835	FMSY	0.482098	
q	0.0142	SSQ	23.43681	
r	0.65	MSY	3864.293	Additional constraint that BI greater than first catch
K	23644	fMSY	12.43644	Initial values r=.3, K=25000, BI=9450 (10000 lead to negative BI even with the constraint)
BI	4437	FMSY	0.326873	
q	0.0263	SSQ	7.16443	
r	0.71	MSY	2585.834	Initial r=.5, K=13000, BI=11000
K	14533	fMSY	13.03784	
BI	4843	FMSY	0.355859	
q	0.0273	SSQ	8.977429	
r	0.66	MSY	3533.049	Initial r=.3, K=18950, BI=12320
K	21309	fMSY	12.53817	
BI	4490	FMSY	0.331603	
q	0.0264	SSQ	7.411156	
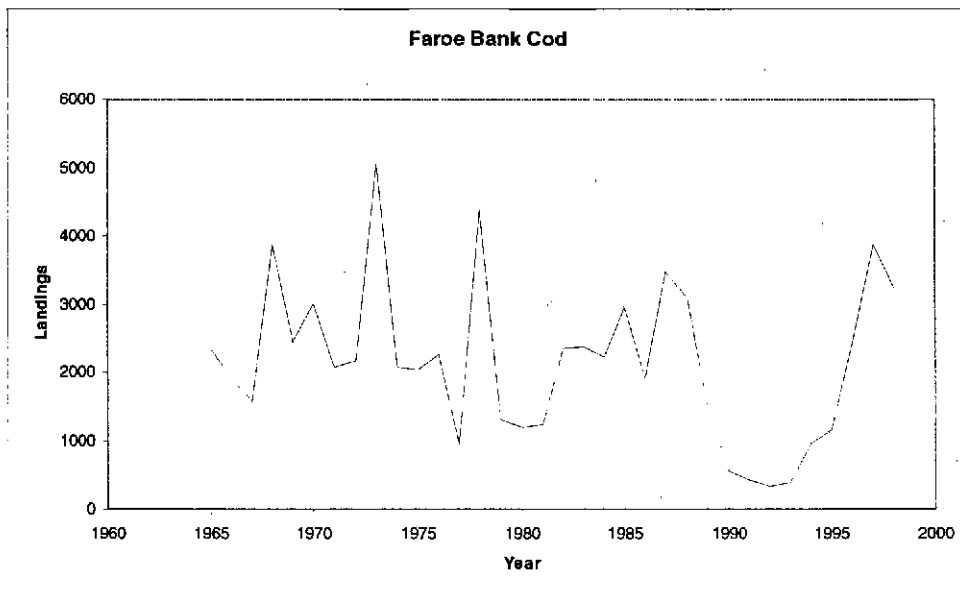
Figure 2.3.1.1. Faroe Bank (Sub-division Vb2) COD. Reported landings 1965 to 1999.
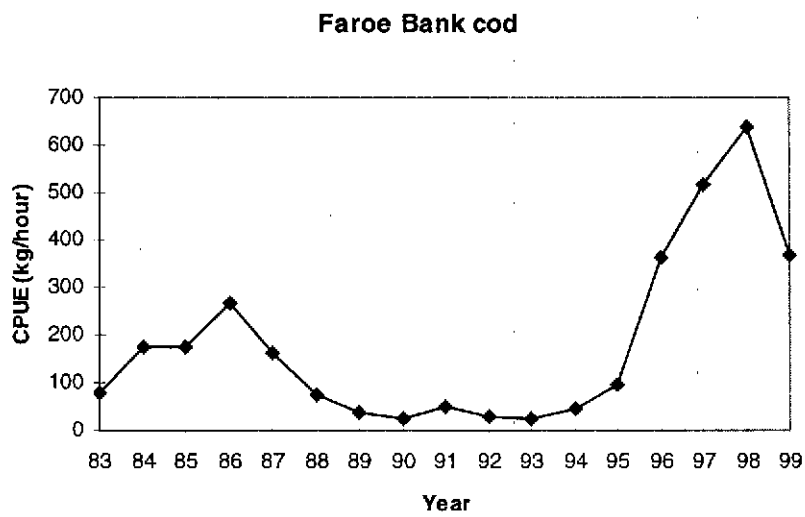
Figure 2.3.2.1. Faroe Bank (Sub-division Vb2) COD. Catch per unit effort in the spring groundfish survey.

Figure 2.3.2.2. Faroe Bank (Sub-division Vb2) COD. Length distributions in the spring survey 1983-99.
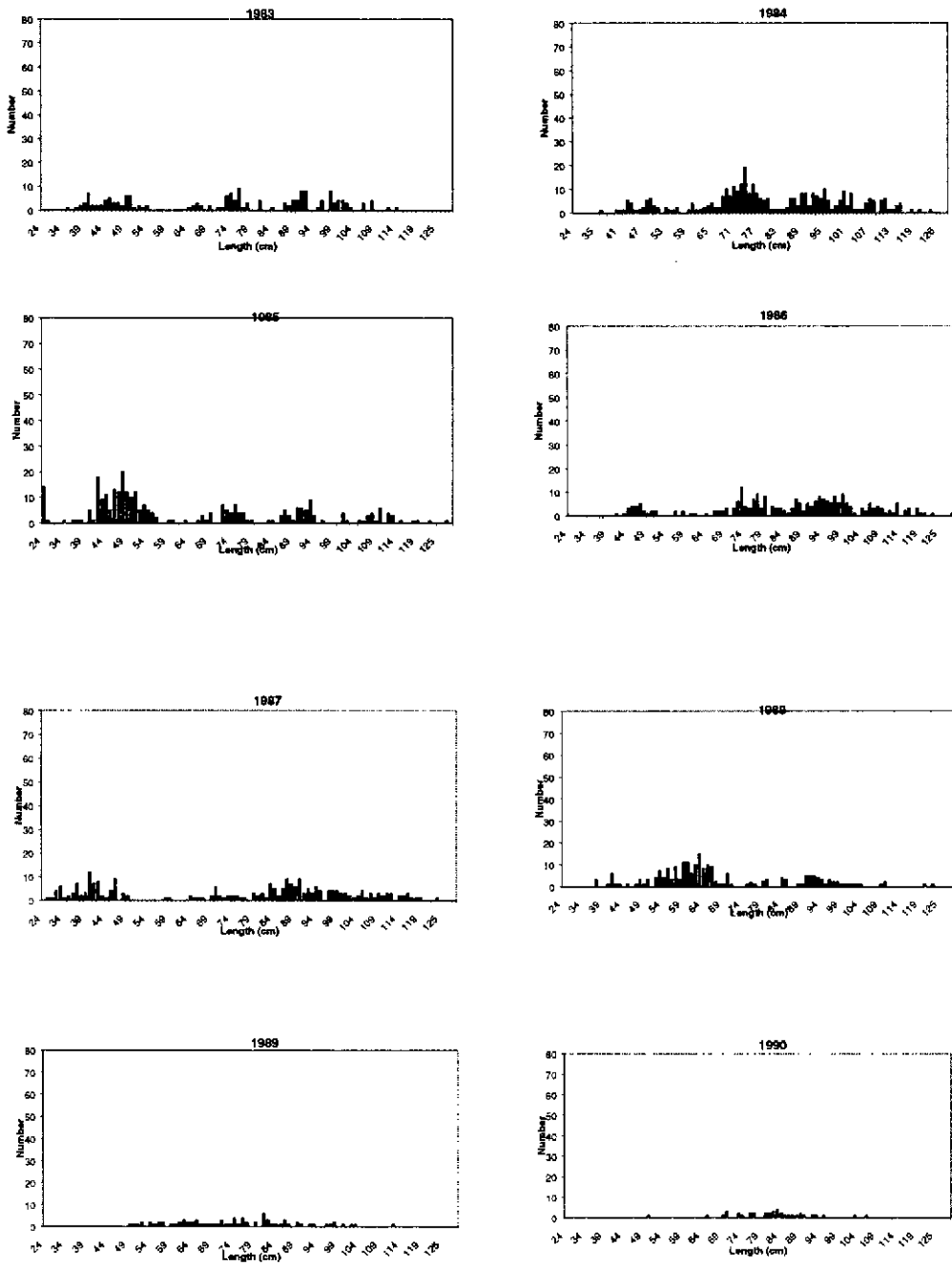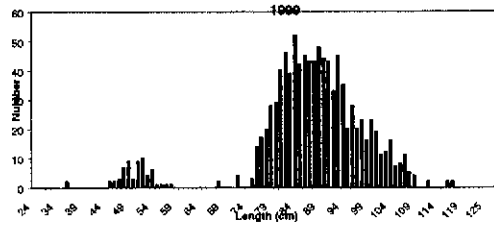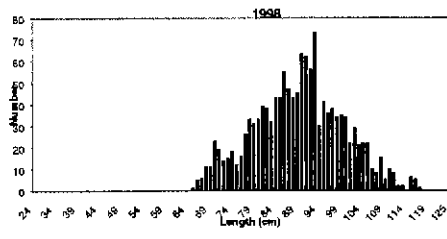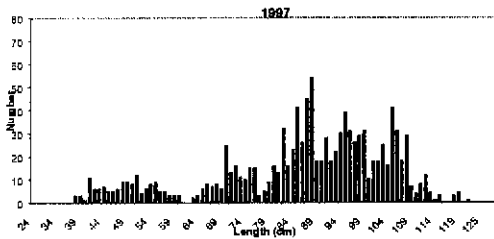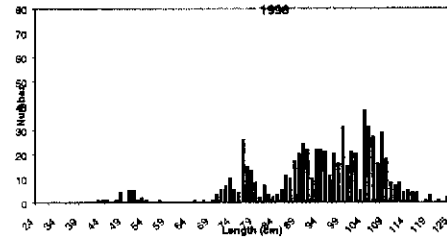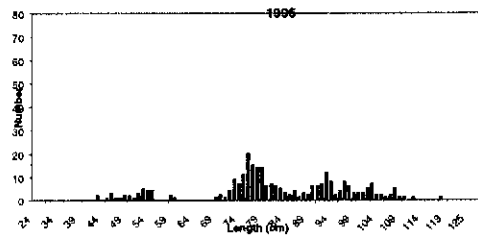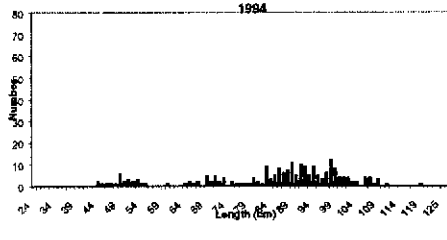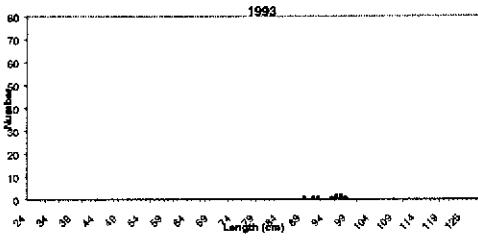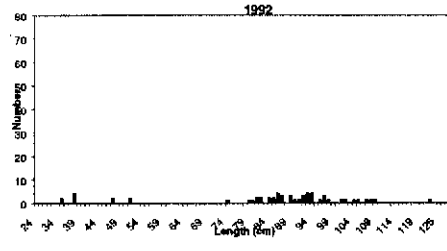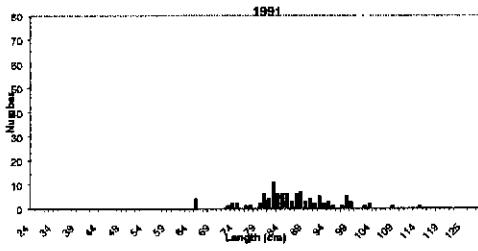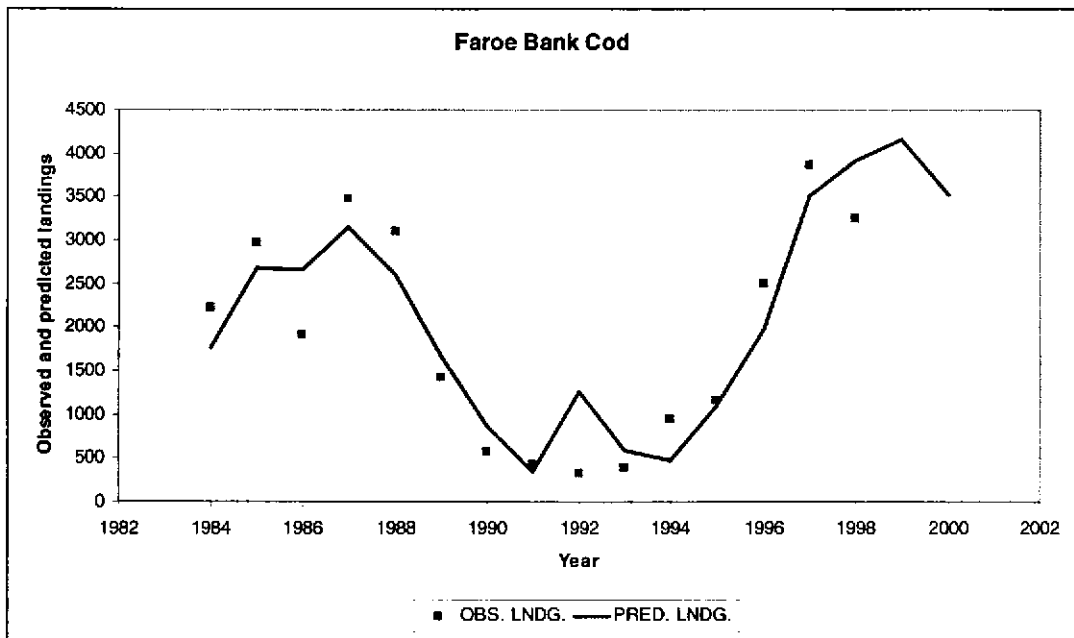
Figure 2.3.2.3. Faroe Bank (Sub-division Vb2) COD. Observed and predicted landings using the ln survey CPUE in the previous year (Landings y+1 = -3269.9 + 1148.04 x ln CPUE y, r^2 = 0.84).

2.4 Faroe Haddock

2.4.1 Landings and trends in the fishery

Nominal landings of haddock from the Faroe Plateau increased from a low level of 10 000 t in 1982 to 14 000 t in 1987, but later decreased to a very low level in 1993 and 1994 below 4 000 t; a slight increase to about 4 600 t was noted for 1995 but in 1996 and 1997 catches almost doubled each year to about 9 300 t and 16 800 t, respectively. In 1998 Landings increased further to more than 19 000 t (Table 2.4.1). Nominal landings for 1981–1992 from the Faroe Bank have varied between 500 and 1 600 t (on average 1 000 t), but dropped in 1993–1996 to 300-500 t. The closure of the fishery on the shallower parts of the Bank in 1990 and the introduction of a controlled fishery there since 1993, as described in Section 2.1, reduced the Faroese landings (Table 2.4.2) whereas Scottish landings remained relatively high in 1990-92. However, in the assessment only the fraction of the Scottish catches which have been reported to the Faroese authorities are included. In 1997 and 1998, landings on the bank increased abruptly to 1 100 and 2 900 t. Some minor Faroese catches of haddock in ICES Sub-Division IIa4 close to the boundary with Sub-Division Vb1 (see Figure 2.1.15 in ICES C.M., 1997), are used in the assessment (Table 2.4.1).

Faroese vessels have taken almost the entire catch in recent years. Table 2.4.3 shows the Faroese landings since 1985 and the proportion taken by each fleet category. Pair trawlers and longliners took most of the catches in these years and within these two groups the relative importance of the larger vessels has increased. Due to poor catches and poor economic conditions, the effort of most fleets decreased in the early 1990s but from 1995 it has increased again (Tables 2.1.4 and 2.4.8). In addition, the fishing ban on the cod spawning grounds before and during the spawning period of cod since 1992 (Section 2.1) has had a restrictive impact on the haddock fishery as well. The catch rates for most fleets has declined drastically since the late 1980s. However, from 1995 the CPUE for most fleets has increased considerably (ICES C.M 1998).

The 1998 monthly Faroese landings of haddock by fleet category from Sub-Divisions Vb1 and Vb2, are shown on Figure 2.4.1. The landings from the Plateau are high from late autumn to the end of the spawning time in late April and stay low during the summer time. On the Faroe Bank the monthly landings show a similar pattern although the landings in mid winter are small. Even if haddock is a bycatch in the pairtrawlers directed fishery for saithe, the pairtrawlers present a very large proportion of the haddock landings from the Faroe Bank; the longliners larger than 100 GRT come in second place. On the Faroe Plateau the longliner landings are substantial except during the summer months when most of the longliners fish in deeper waters and/or outside the Faroese EEZ. The longline fishery mostly targets both cod and haddock, although haddock since the late 1980s must be characterized as a by-catch only except for the most recent three years. The trawler catches of haddock must be regarded as a by-catch since the late 1980s.

2.4.2 Catch at age

For the Faroese landings, catch-at-age data were provided for fish taken from the Faroe Plateau and the Faroe Bank. Data from the two areas are combined as the fish are believed to belong to the same stock. The sampling intensity in 1998 is shown on the bottom of Table 2.4.4 and was slightly higher than in 1997.

Samples from each fleet category were disaggregated by season and then raised by the catch proportions to give the 1998 catch at age in numbers for each fleet (Table 2.4.4). Catches of some minor fleets have been included under the others heading. No catch-at-age data were available from other nations fishing in Faroese waters. Therefore, catches by UK and France trawlers were assumed to have the same age composition as Faroese otter board trawlers greater than 1000 HP. The Norwegian longliners were assumed to have the same age distribution as the Faroese longliners greater than 100 GRT. The most recent data were revised according to the final catch figures. The resulting total catch at age in numbers are given in Table 2.4.4 and Table 2.4.5.

2.4.3 Weight at age

Mean weight-at-age data are provided for the Faroese fishery (Table 2.4.6). The sum-of-products check for 1998 was 1.01. Figure 2.4.2 shows the mean weights-at-age in the landings for most age groups since 1976. After a decrease for all age groups in the most recent years, the decrease for most ages now have levelled off or even reversed. However some ages are still decreasing. No such weight information is available for 1999.

2.4.4 Maturity at age

Maturity-at-age data were available from the Faroese Groundfish Surveys 1982–1999. The surveys are carried out in February-March, so the maturity at age is determined just prior to the spawning of haddock in Faroese waters and the

determinations of the different maturity stages should be relatively easy. In order to reduce eventual year to year effects due to possible inadequate sampling and at the same time allow for trends in the series, a 3 year running average was used in the assessment. For the years prior to 1982, average maturity at age from the surveys 1982–1995 was adopted (Table 2.4.7).

2.4.5   Assessment

2.4.5.1   Tuning and estimates of fishing mortality

Several catch per unit effort series are available for tuning. They consist of two trawl groundfish surveys in February-March (from 1983) and in July-August (from 1996) and 9 commercial series. In the surveys, the estimates of catches in numbers at age per trawl hour in the surveys are used as if they represented one fleet with the same effort for all the years in the tuning process. In order to have the most recent data available for tuning, the spring survey is shifted back from February-March to the end of December the year before (Table 2.4.8). 7 of the commercial series consist of effort measured in number of fishing days and the corresponding catch at age in numbers for each fleet. It has not been possible to update these series properly because the actual number of fishing days since 1996 is not known precisely (see section 2.1). A new commercial tuning series based on logbook data since 1986 for 5 longliners larger than 100 GRT was made available last year. This series which consists of effort measured in hooks and the corresponding catch at age in numbers, has been updated and revised this year (Table 2.4.10). A new tuning series based on logbook data on effort in trawlhours and corresponding catch in numbers at age from a group of pairtrawlers larger than 1000 HP has been introduced this year.

Following numerous analyses of all available series of catch and effort data, the working group in successive recent years has decided to reduce the number of fleets and omit some years and ages from the series. Last year only 3 reduced commercial series were used for tuning and these updated series have also been used in this years tuning of the VPA, i.e., the longliners less than 100 GRT, the pairtrawlers larger than 1 000 HP, and the new longliner series consisting of the logbook data from 5 selected longliners larger than 100 GRT (Table 2.4.10). The number of fishing days for the longliners less than 100 GRT and the pairtrawlers larger than 1 000 HP has been estimated based on several data sources. Although the exact numbers might be questioned, the level of days is believed to reflect reality.

Last year it was decided to leave the spring survey (Table 2.4.8) out of the tuning because when used in tuning of the VPA they result in very unlikely low fishing mortalities and corresponding very high stock sizes. However, estimates of Z for the different yearclasses from catch curve analysis (Figure 2.4.5 and Table 2.4.9) give average total mortalities in the order of 0.6-0.8 for most age groups. When Z is calculated from the catch in numbers from the commercial landings the result is far lower values (Table 2.4.9 and Figure 2.4.6). The new summer survey is expected to be of great value as a tuning series for this stock in a few years. This year it could not be used, however, because the series is still too short. The new trawler logbook cpue series could not be used for tuning of the haddock VPA because haddock catches are too small.

The XSA was made with shrinkage of 0.7 as in last years assessment. The diagnostics from the XSA are shown in Table 2.4.11. The retrospective plot of reference fishing mortalities is shown in Figure 2.4.7.

The fishing mortalities from the final XSA run are given in Table 2.4.12 and in Figure 2.4.8A. According to this the fishing mortality has shown an overall decline since the early 1960s and it has been estimated to be below the natural mortality of 0.2 in several years of the 1990s. Since 1995 it has been increasing again and in 1998 it was estimated at 0.21. It is very difficult to explain these very low fishing mortalities given the size of the fleet and the number of fishing days used. However, one reason is that due to the very small recruitment in many years the stock declined to historical low levels and the haddock therefore has been only a by-catch in other fisheries. The large meshsizes in the codend in most trawler fisheries (145 mm) is another reason for the small trawler catches of haddock.

As seen in the retrospective plot on Figure 2.4.7, there has been a tendency to overestimate terminal fishing mortalities in recent years. This is normal when stock sizes increase abruptly. According to the survey (Figures 2.4.3 and 2.4.4) and to anecdotical information from the fishermen, the stock now seem to decline again, both in abundance and in biomass. This could imply that this years assessment of the fishing mortalities are underestimates.

2.4.5.2   Stock estimates and recruitment

The stock size in numbers is given in Table 2.4.13 and a summary of the "VPA" with the biomass estimates is given in Table 2.4.14 and Figure 2.4.8B. According to this assessment, the spawning stock biomass decreased from 79 000 t in 1987 to 33 000 t in 1994, increased to 44 000 t in 1995 but have since increased considerably to about 117 000t in 1998 and 1999. The decline in the spawning stock began in the late 1970s due to very poor recruitment in those years. The stabilization in the spawning stock biomass at a relatively high level in the mid–1980s was due to the relatively good 1982

and 1983 year classes, but the decline since then was partly due to poor year classes since the mid-1980s, as well as the pronounced decline in the mean weights at age in the stock. The mean weights at age increased for most ages from 1993-95 and after a few years decreasing weights, they now seem to increase again for most ages (Figure 2.4.2). The main reason to the very abrupt increase in the spawning stock biomass is the growth of the historical outstanding big 1993 year class and the well above the long term average 1994 year class. It should be underlined, however, that as discussed in section 2.4.5.1, this assessment might overestimate the stock size.

2.4.6 Prediction of catch and biomass

2.4.6.1 Input data

2.4.6.1.1 Short-term prediction

The input data for the short-term predictions are given in Table 2.4.17. The year classes up to 1996 inclusive are from the final VPA while the 1997-98 year classes at age 2 were predicted using the RCT3 program. As input for RCT3, stratified mean-catch-per-hour of age groups 0-3 in the Faroese groundfish survey 1986-99 were used. In order to have the most recent information in the prediction, the survey estimates from the spring were shifted back to the end of the year before (Table 2.4.15). The output from the RCT3 is given in Table 2.4.16. The large discrepancies between the XSA and the RCT3 values for the year classes, especially the 1993 and the 1994 year classes, were discussed in the 1997 report of this working group and will not be repeated here. The 1999 year class at age 2 was estimated as the geometric mean of the 2 year olds in 1986-2000, i.e., 1984-96 year classes from the final VPA, the 1997-98 year classes from the RCT3.

The exploitation pattern used in the prediction was derived from averaging the 1996–1998 fishing mortality matrices from the final VPA and then rescaling the averages to the 1998 level. The same pattern was used for all three years.

The mean weight at age for ages 2-10 in 1999 was calculated as the average weight at age in 1996-98. The 1999 mean weights at age were also applied for 2000 and 2001.

The maturity ogive for 1999-2001 is based on samples from the Faroese Groundfish Surveys and estimated as the average of the 1997-1999 values. As in the assessment, 3 years running average has been estimated in the order to reduce eventual year to year effects due to possible inadequate sampling and at the same time allow for trends in the series.

2.4.6.1.2 Long-term Prediction

The input data for the long-term yield and spawning stock biomass (yield per recruit calculations) are listed in Table 2.4.18. Mean weights-at-age are averages for the 1977–1997 period. The maturity ogives are averages for the years 1983-97. The exploitation pattern was derived from the fishing mortality matrix from the final VPA as average F-values for the long time period. Before averaging the annual fishing mortalities were scaled to let the Fbar(age3-7) equal 1.0. In the input table the values are rescaled again to the Fbar(age3-7) long term average.

2.4.6.2 Biological reference points

The yield- and spawning stock biomass per recruit (age 2) based on the long-term data are shown in Table 2.4.20 and Figure 2.4.8C. F_{max} and $F_{0.1}$ are indicated here as 0.53 and 0.19, respectively. From Figure 2.4.9, showing the recruit/spawning stock relationship, and from Table 2.4.20, F_{med} and F_{high} were calculated to be 0.25 and 0.95, respectively.

In previous assessments of this stock the Minimum Biological Acceptable Limit (MBAL) was set at 40 000 t because the probability of a good recruitment is considerably larger when the spawning stock biomass is above this value (Figure 2.4.9). Therefore, this is an appropriate value for a limit reference point and thus, B_{lim} is set at 40 000 t. In the 1998 assessment, the B_{pa} was calculated as the value lying 2 standard deviations above B_{lim} and consequently set to 65 000 t. By examining among other things the SSB-R plot, ACFM revised this value to be 55 000 t. The reference point F_{pa} was chosen as the F_{med} value 0.25. The F_{lim} is defined to be two standard deviations above F_{pa} and is calculated to 0.40.

The history of the haddock fishery in relation to the four reference points can be seen in Figure 2.4.10. In the period 1961-71 the fishing mortality was above F_{lim} and the spawning stock biomass was below B_{pa} until 1970. Except for 1977–1978 the stock/fishery was in a precautionary zone in the period 1974–1981. In 1990 the biomass went below Bpa and continued to decrease and went below B_{lim} in 1992. This decrease in SSB continued until the B_{loss} was reached in 1994. The biomass has since increased, mainly due to the outstanding high 1993 year class and the well above long

term average 1994 year class. According to this assessment, the stock has been within safe biological limits (PA values) since 1996.

2.4.6.3   Projections of catch and biomass

2.4.6.3.1   Short-term prediction

In the light of the performance of the new management system (Section 2.4.8), it is not unrealistic to assume the same level of fishing mortalities in 1999 as in 1998. The prediction was therefore run with a *status quo* reference F in 1999. The catch in 1999 is then predicted to be about 25 000 t and continuing with this fishing mortality will result in a 2000 catch of 22 000 t. The SSB will in this case decrease from 130 000 t in 1999 to 108 000 t in 2000, and 87 000 t in 2001. The results of the short-term prediction are shown in Table 2.4.19 and in Figure 2.4.8D. As discussed in section 2.4.5.1, the 1998 fishing mortality might be underestimated and this prediction should therefore be interpreted cautiously.

2.4.7   Managements considerations

In order to evaluate the fishing mortality that could be generated in 1999 and 2000 from the present number of fishing days allocated to each fishing fleet, the partial fishing mortalities by age and year were calculated for all fleets from the catch at age ratios for 1985 to 1995. It was not possible to use the whole VPA period up to include 1998 in this exercise as the actual number of days used since 1996 is not very precisely known. However, the results from this years assessment was used in the analysis, which is described in ICES C.M. 1997 and 1998.

The probability density function of the potential fishing mortality in 1998 and 1999 given the allocated number of fishing days to each fleets is given in Figure 2.4.11. Three options are presented where the 8861 days allocated to the LL < 100 (longliners below 100 GRT), ST < 400 (otterboard trawlers less than 400 HP) and Jiggers is either used entirely by the LL < 100, the ST < 400 or by the Jiggers (16404 days). The fishing mortality referred to so far do not include the partial F exerted by the ST 400–1000 HP (otterboard trawlers 400–1 000 HP) and ST > 1000 HP (otterboard trawlers larger than 1 000 HP) that have not been allocated haddock fishing days. However, these two fleets accounted for 9 % of the total haddock catch in 1998. So these two fleets should be expected to exert at least a fishing mortality of 0.02. Therefore, in examining Table 2.4.21, the 0.02 from the ST should be added to the fishing mortality column to reflect the activities of these two fleets. The results show that there is an approximately 80 % probability, when the longliners < 100 GRT are using the 8861 fishing days, that the fishing mortality in 1999 and 2000 will not exceed F = (.02+0.26) = 0.28, if the present level of fishing days is used in 1999-2000.

2.4.8   Comments on the assessment

The assessment is basically an updated version of the 1998 assessment except that the catch and effort data for one of the tuning fleet have been revised. Survey and commercial catch and effort data give different information on the mortalities and stock size. The exact number of fishing days for the different commercial fleets is not known very precisely. The number of fishing days 1996-1999 for two of the tuning series has been estimated from several data sources and although the exact numbers could be questioned, the level is believed to reflect reality. The fishing mortality in the assessment might be underestimated and the stock size correspondingly overestimated. However, the overall patterns in the assessment with very small but increasing fishing mortalities and very high stock levels are believed to reflect the status of the stock as being inside biological safe limits both regarding biomass and fishing mortality.

Table 2.4.1 Faroe Plateau (Sub-division Vb1) HADDOCK. Nominal catches (tonnes) by countries 1982-1998, as officially reported to ICES, and the total Working Group estimate in Vb.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	1	8	4	-
Faroe Islands	10,319	11,898	11,418	13,597	13,359	13,954	10,867	13,506
France[1]	2	2	20	23	8	22	14	-
Germany	1	+	+	+	1	1	-	+
Norway	12	12	10	21	22	13	54	111
UK (Engl. and Wales)	-	-	-	-	-	2	-	-
UK (Scotland)[3]	1	-	-	-	-	-	-	-
United Kingdom								
Total	10,335	11,912	11,448	13,641	13,391	14,000	10,939	13,617
Working Group estimate[4,5]	11,937	12,894	12,378	15,143	14,477	14,882	12,178	14,325

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998[2]
Denmark	-	-	-	-	-	-	-	-	-
Faroe Islands	11,106	8,074	4,655	3,622	3,675	4,549	9,152	16,585	19,023
France[1]	-	-	3[2]	-[2]	[2]	[2]	[2]	[2]	2
Germany	+	+	-	-		5	-	-	
Norway	94	125	71	28	22	28	164[2]	45[2]	71
UK (Engl. and Wales)	7	-	54	81	31	23	5	...	...
UK (Scotland)[3]	-	-	-	-	-	-	...	...	...
United Kingdom								156[6]	135[6]
Total	11,207	8,199	4,783	3,731	3,728	4,605	9,321	16,786	19,231
Working Group estimate[4,5]	11,726	8,429	5,315	4,026	4,252	4,948	9,761	17,923	22,101

1) Including catches from Sub-division Vb2.

2) Provisional data

3) From 1983 to 1996 catches included in Sub-division Vb2.

4) Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

5) Includes French catches from Division Vb, as reported to the Faroese coastal guard service

6) Reported as Division Vb.

Table 2.4.2 Faroe Bank (Sub-division Vb2) HADDOCK. Nominal catches (tonnes) by countries, 1982-1998, as officially reported to ICES.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	1,533	967	925	1,474	1,050	832	1,160	659
France[1]	-	-	-	-	-	-	-	-
Norway	1	2	5	3	10	5	43	16
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland)[3]	48	13	+	25	26	45	15	30
Total	1,582	982	930	1,502	1,086	882	1,218	705

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998[2]
Faroe Islands	325	217	338	185	353	303	338	1,133	2,810
France[1]	-	-	-	-	-	-	-	-	
Norway	97	4	23	8	1	1	40[2]	4[2]	60
UK (Engl. and Wales)	-	-	+	+	...[1]	...[1]	...[1]	...[1]	...[1]
UK (Scotland)[3]	725	287	869	102	170	39	62	...[1]	...[1]
Total	1,147	508	1,230	295	524	343	440	1,137	2,870

1) Catches included in Sub-division Vb1.

2) Provisional data

3) From 1983 to 1996 includes also catches taken in Sub-division Vb1 (see Table 2.4.1)

Table 2.4.3

Total Faroese landings of haddock from Division Vb and the contribution (%) by each fleet category (metier). In the column to the right are the average haddock percentages of the total landings of all species by each fleet category.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Haddock %
Open boats	7	7	11	2	3	2	3	2	1	1	1	2	2	2	18
Longliners < 100GRT	39	39	39	49	58	60	56	46	24	18	23	28	31	30	38
Longliners > 100GRT	13	12	13	19	18	18	18	22	25	25	38	36	38	40	21
Otterboard trawlers < 400HP	1	2	2	2	1	1	2	2	8	8	7	6	3	2	11
Otter board trawlers 400-999HP	6	3	5	4	3	3	1	1	3	2	5	7	6	6	12
Otterboard trawlers > 1000HP	8	5	2	2	2	2	2	1	1	3	2	2	3	3	1
Pairtrawlers < 1000HP	19	20	17	11	7	5	7	11	13	10	8	7	6	5	7
Pairtrawlers > 1000HP	6	10	9	9	6	8	11	14	22	29	16	13	12	12	4
Nets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jigging	1	0	0	0	1	1	1	0	0	0	0	1	1	0	1
Industry trawlers	0	1	1	2	1	1	1	1	3	3	0	0	0	0	5
Other gears	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total catch, tonnes gutted	13570	12967	13829	10697	12866	10319	7469	4103	3275	3629	4371	8535	15890	19669	

Table 2.4.4

Haddock in ICES Division Vb 1998
Catch at age in numbers by fleet category

Age	Vb1 Open Boats	Vb1 LLiners < 100GRT	Vb1 LLiners > 100GRT	Vb1 OB. trawl. < 400HP	Vb1 OB. trawl. 400-999HP	Vb1 OB. trawl. > 1000HP	Vb1 Pair trawl. < 1000HP	Vb1 Pair trawl. > 1000HP	Vb1 Others	Vb1 All Faroese Fleets	Vb2 All LLiners	Vb2 All Pair trawl.	Vb2 All Others	Vb2 All Fleets	Vb Foreign Trawlers	Vb Foreign LLiners
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	44	10	1	5	1	2	2	0	68	22	7	7	37	0	0
3	18	336	164	10	40	9	7	30	2	616	119	261	49	428	3	3
4	92	1864	1595	55	238	118	166	393	12	4531	238	331	80	649	36	27
5	144	2953	3716	194	597	229	365	913	20	9130	207	271	66	544	70	63
6	4	79	205	10	23	6	10	33	1	372	20	39	7	66	2	3
7	1	24	40	2	2	1	2	7	0	79	7	9	2	18	0	1
8	1	18	51	2	4	1	1	1	0	79	1	5	1	7	0	1
9	2	29	60	2	0	0	0	0	0	93	0	0	0	0	0	1
10	4	64	78	5	8	3	2	10	0	174	0	2	0	2	1	1
11	3	51	73	8	5	1	1	7	0	149	0	0	0	0	0	1
12	1	24	40	3	2	1	2	10	0	84	2	4	1	7	0	1
13	0	8	6	1	0	0	0	0	0	17	2	0	0	3	0	0
14	0	9	8	2	2	1	1	8	0	33	0	0	0	0	0	0
15	1	14	7	0	0	0	0	3	0	26	0	0	0	0	0	0
Total no.	274	5518	6053	296	926	372	560	1417	37	15452	618	929	213	1759	114	103
Catch, t.	300	5956	6931	353	1012	405	592	1547	42	17138	981	1224	326	2531	124	118

Notes: Numbers in 1000'

Catch, gutted weight in tonnes

Others includes netters, jiggers, other small categories and catches not otherwise accounted for

LLiners = Longliners   OB.trawl. = Otterboard trawlers   Pair Trawl. = Pair trawlers

Biological sampling of commercial catches:

No. of samples:	278
No. of length measurements:	52484
No. of individual weight measurements:	5035
No. of aged fish:	10030

Table 2.4.5

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At 4-May-99 00:21:14

Table 1   Catch numbers at age   Numbers*10**-3

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	7932,	9631,	13552,	2284,	1368,	1081,	1425,	5881,
3,	7330,	13977,	8907,	7457,	4286,	3304,	2405,	4097,
4,	5134,	5233,	7403,	3899,	5133,	4804,	2599,	2812,
5,	1937,	2361,	2242,	2360,	1443,	2710,	1785,	1524,
6,	1305,	1407,	1539,	1120,	1209,	1112,	1426,	1526,
7,	838,	868,	860,	728,	673,	740,	631,	923,
8,	236,	270,	257,	198,	1345,	180,	197,	230,
9,	59,	72,	75,	49,	43,	54,	52,	68,
+gp,	0,	0,	0,	0,	0,	0,	0,	0,
0 TOTALNUM,	24771,	33819,	34835,	18095,	15500,	13985,	10520,	17061,
TONSLAND,	20831,	27151,	27571,	19490,	18479,	18766,	13381,	17852,
SOPCOF %,	89,	90,	90,	101,	94,	109,	102,	103,

Table 1   Catch numbers at age Numbers*10**-3

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	2384,	1728,	717,	750,	3300,	5633,	7337,	4396,	255,	32,
3,	7539,	4855,	4393,	3744,	8388,	2899,	7952,	7858,	4039,	1022,
4,	4567,	6581,	4727,	4179,	1236,	3970,	2097,	6798,	5168,	4248,
5,	1565,	1624,	3267,	2706,	2786,	451,	1371,	1251,	4918,	4054,
6,	1485,	1383,	1292,	1171,	916,	976,	247,	1189,	2128,	1841,
7,	1224,	1099,	864,	696,	1051,	466,	352,	298,	946,	717,
8,	378,	326,	222,	180,	150,	535,	237,	720,	443,	635,
9,	114,	68,	147,	113,	68,	68,	419,	258,	731,	243,
+gp,	0,	0,	0,	0,	11,	147,	187,	318,	855,	312,
0 TOTALNUM,	19256,	17664,	15629,	13539,	17906,	15145,	20199,	23086,	19483,	13104,
TONSLAND,	23272,	21361,	19393,	16485,	17976,	14773,	20715,	26211,	25555,	19200,
SOPCOF %,	108,	103,	99,	98,	98,	97,	117,	107,	98,	99,

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At 4-May-99 00:21:15

Table 1   Catch numbers at age`   Numbers*10**-3

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	1,	143,	74,	539,	441,	1195,	985,	230,	283,	655,
3,	1161,	58,	455,	934,	1969,	1561,	4553,	2549,	1718,	444,
4,	1754,	3724,	202,	784,	383,	2462,	2196,	4452,	3565,	2463,
5,	3341,	2583,	2586,	298,	422,	147,	1242,	1522,	2972,	3036,
6,	1850,	2496,	1354,	2182,	93,	234,	169,	738,	1114,	2140,
7,	772,	1568,	1559,	973,	1444,	42,	91,	39,	529,	475,
8,	212,	660,	608,	1166,	740,	861,	61,	130,	83,	151,
9,	155,	99,	177,	1283,	947,	388,	503,	71,	48,	18,
+gp,	74,	86,	36,	214,	795,	968,	973,	712,	334,	128,
0 TOTALNUM,	9320,	11417,	7051,	8373,	7234,	7858,	10773,	10443,	10646,	9510,
TONSLAND,	12418,	15016,	12233,	11937,	12894,	12378,	15143,	14477,	14882,	12178,
SOPCOF %,	104,	100,	109,	92,	106,	106,	106,	101,	102,	97,

Table 1   Catch numbers at age   Numbers*10**-3

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
2,	63,	105,	77,	39,	113,	277,	804,	330,	77,	106,
3,	1518,	1275,	1044,	149,	298,	191,	452,	5298,	2913,	1049,
4,	658,	1921,	1774,	753,	274,	307,	235,	1032,	10517,	5243,
5,	2787,	768,	1248,	1087,	554,	153,	225,	181,	710,	9807,
6,	2554,	1737,	651,	931,	538,	423,	131,	165,	116,	443,
7,	1976,	1909,	1101,	325,	474,	427,	296,	163,	123,	98,
8,	541,	885,	698,	362,	131,	383,	291,	273,	93,	87,
9,	133,	270,	317,	389,	201,	125,	262,	237,	220,	94,
+gp,	81,	108,	32,	157,	185,	301,	296,	399,	517,	501,
0 TOTALNUM,	10311,	8978,	6942,	4192,	2768,	2587,	2992,	8078,	15286,	17428,
TONSLAND,	14325,	11726,	8429,	5315,	4026,	4252,	4948,	9761,	17923,	22101,
SOPCOF %,	100,	102,	106,	106,	104,	100,	103,	100,	103,	101,

Table 2.4.6

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Run title : Haddock Faroes Vb (run: XSAJAK02/X02)
At   4-May-99  00:21:15
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Table 2 Catch weights at age (kg)

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,
3,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,
4,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,
5,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,
6,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,
7,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,
8,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,
9,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,
+gp,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,
0 SOPCOFAC,	.8938,	.9011,	.8964,	1.0131,	.9401,	1.0920,	1.0166,	1.0278,

Table 2 Catch weights at age (kg)

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.3110,	.3570,
3,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.6330,	.7900,
4,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.0440,	1.0350,
5,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.4260,	1.3980,
6,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.8250,	1.8700,
7,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.2410,	2.3500,
8,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.2050,	2.5970,
9,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	2.5700,	3.0140,
+gp,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	2.5910,	2.9200,
0 SOPCOFAC,	1.0835,	1.0274,	.9874,	.9795,	.9776,	.9718,	1.1712,	1.0746,	.9784,	.9947,

```
1
Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

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Table 2 Catch weights at age (kg)

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	.3570,	.6430,	.4520,	.7000,	.4700,	.6810,	.5280,	.6080,	.6050,	.5010,
3,	.6720,	.7130,	.7250,	.8960,	.7400,	1.0110,	.8590,	.8870,	.8310,	.7810,
4,	.8940,	.9410,	.9570,	1.1500,	1.0100,	1.2550,	1.3910,	1.1750,	1.1260,	.9740,
5,	1.1560,	1.1570,	1.2370,	1.4440,	1.3200,	1.8120,	1.7770,	1.6310,	1.4620,	1.3630,
6,	1.5900,	1.4930,	1.6510,	1.4980,	1.6600,	2.0610,	2.3260,	1.9840,	1.9410,	1.6800,
7,	2.0700,	1.7390,	2.0530,	1.8290,	2.0500,	2.0590,	2.4400,	2.5190,	2.1730,	1.9750,
8,	2.5250,	2.0950,	2.4060,	1.8870,	2.2600,	2.1370,	2.4010,	2.5830,	2.3470,	2.3440,
9,	2.6960,	2.4650,	2.7250,	1.9610,	2.5400,	2.3680,	2.5320,	2.5700,	3.1180,	2.2480,
+gp,	3.5190,	3.3100,	3.2500,	2.8560,	3.0400,	2.6860,	2.6850,	2.9220,	2.9330,	3.2950,
0 SOPCOFAC,	1.0380,	1.0017,	1.0870,	.9238,	1.0554,	1.0602,	1.0559,	1.0141,	1.0197,	.9695,

Table 2 Catch weights at age (kg)

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
2,	.5800,	.4380,	.5470,	.5250,	.7550,	.7540,	.6660,	.5340,	.5190,	.6220,
3,	.7790,	.6990,	.6930,	.7240,	.9820,	1.1030,	1.0540,	.8580,	.7710,	.8460,
4,	.9230,	.9390,	.8840,	.8170,	1.0270,	1.2540,	1.4890,	1.4590,	1.0660,	1.0160,
5,	1.2070,	1.2040,	1.0860,	1.0380,	1.1920,	1.4650,	1.7790,	1.9930,	1.7990,	1.2830,
6,	1.5640,	1.3840,	1.2760,	1.2490,	1.3780,	1.5930,	1.9400,	2.3300,	2.2700,	2.0800,
7,	1.7460,	1.5640,	1.4770,	1.4300,	1.6430,	1.8040,	2.1820,	2.3510,	2.3400,	2.5560,
8,	2.0860,	1.8180,	1.5740,	1.5640,	1.7960,	2.0490,	2.3570,	2.4690,	2.4750,	2.5720,
9,	2.4240,	2.1680,	1.9300,	1.6330,	1.9710,	2.2250,	2.4900,	2.7770,	2.5010,	2.4520,
+gp,	2.5140,	2.3350,	2.1530,	2.1260,	2.2400,	2.4230,	2.6780,	2.5820,	2.6690,	2.8010,
0 SOPCOFAC,	1.0025,	1.0195,	1.0635,	1.0557,	1.0361,	.9969,	1.0323,	1.0044,	1.0250,	1.0095,

Table 2.4.7

Table 5   Proportion mature at age

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,
3,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,
4,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5   Proportion mature at age

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,
3,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,
4,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

1

Table 5   Proportion mature at age

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	.0600,	.0600,	.0600,	.0700,	.0800,	.0800,	.0300,	.0300,	.0500,	.0500,
3,	.4800,	.4800,	.4800,	.5200,	.6200,	.7600,	.6200,	.4300,	.3200,	.2400,
4,	.9100,	.9100,	.9100,	.8800,	.8900,	.9800,	.9600,	.9500,	.9100,	.8900,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	.9900,	.9800,	.9800,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5   Proportion mature at age

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
2,	.0200,	.0800,	.1600,	.1800,	.1500,	.1200,	.1000,	.0600,	.0200,	.0200,
3,	.2200,	.3700,	.5800,	.6500,	.5300,	.5000,	.5500,	.5700,	.5500,	.5600,
4,	.8700,	.9000,	.9300,	.9100,	.9000,	.9200,	.9700,	.9500,	.9300,	.9200,
5,	.9900,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	

Table 2.4.8 Catch and effort from the February-March survey moved back to the end of the previous year

HAD-FARO: Haddock in the Faroe Grounds (Fishing Area Vb)

FLT04: mhrev98 (Catch: Number)

Year	Fishing effort	Catch, age 1	Catch, age 2	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9
1982	100	25.500	16.100	2.300	1.700	0.001	6.000	2.100	2.400	0.800
1983	100	111.900	22.200	6.700	0.400	0.600	0.200	1.800	0.700	1.500
1984	100	54.700	34.700	6.500	2.100	0.001	0.300	0.200	1.000	0.200
1985	100	87.100	46.500	21.700	0.800	0.001	0.100	0.300	0.600	
1986	100	11.800	26.400	16.700	8.700	1.500	0.001	0.001	0.100	0.001
1987	100	11.800	26.400	21.200	10.700	3.800	1.100	0.200	0.100	0.001
1988	100	146.600	113.000	8.500	23.200	31.200	18.900	0.200	0.001	0.001
1989	100	43.100	64.000	23.900	2.500	1.700	7.900	3.800	0.900	0.100
1990	100	16.500	13.400	8.900	3.900	1.500	1.100	0.300	0.100	0.001
1991	100	26.900	8.500	15.500	6.800	5.100	1.600	1.200	0.600	0.200
1992	100	9.200	9.900	6.200	6.300	7.700	2.600	0.700	0.500	0.700
1993	100	21.300	21.100	4.000	2.000	3.600	4.800	3.400	0.500	0.600
1994	100	252.600	10.100	2.900	2.500	0.800	2.400	3.900	3.000	0.500
1995	100	244.200	137.100	6.100	0.900	0.700	0.500	0.800	1.100	0.900
1996	100	244.700	84.700	161.700	5.700	1.300	0.400	1.300	0.500	1.500
1997	100	3.100	43.600	96.300	111.100	3.000	0.100	0.040	0.600	0.400
1998	100	67.350	1.245	17.880	45.010	28.940	0.426	0.135	0.162	0.203

Table 2.4.9.   Z estimations from catch curve analysis

Faroe haddock
Z by age estimated from the RV

	1/2	2/3	3/4	4/5	5/6	6/7	7/8	8/9
1983/1984	-0.900	0.139	0.507	1.749	1.041	-5.298	1.204	1.099
1984/1985	0.699	1.171	1.228	1.530	5.991	0.693	0.000	0.588
1985/1986	0.761	0.162	0.469	0.437	0.965	0.000	1.099	-0.405
1986/1987	0.693	1.194	1.024	0.914	1.030	6.685	0.000	0.000
1987/1988	-0.775	0.000	0.219	0.445	0.828	0.310	-5.298	-4.605
1988/1989	-1.286	-0.249	0.328	-0.090	-1.070	-1.604	-0.780	5.298
1989/1990	0.016	0.829	1.554	1.224	1.103	1.374	1.604	0.981
1990/1991	-0.995	1.168	1.877	1.813	0.511	1.946	3.271	3.638
1991/1992	-1.906	0.663	-0.146	0.365	-0.268	-0.065	-0.087	-0.693
1992/1993	-0.395	1.000	0.316	0.900	-0.124	0.674	0.827	0.875
1993/1994	0.277	1.088	0.906	1.131	0.560	0.473	-0.268	0.336
1994/1995	-0.304	0.746	0.067	0.470	0.916	0.405	0.208	0.125
1995/1996	0.690	0.611	0.504	1.170	1.273	0.470	1.099	1.361
1996/1997	-0.256	0.412	-0.579	0.141	-0.368	0.560	-0.956	0.470
1997/1998	0.032	0.664	0.518	0.790	0.569	2.565	5.991	0.773
1998/1999	-0.729	0.912	0.891	0.761	1.345	1.952	-0.300	-5.088

Faroe Haddock
Z by age estimated from the catch at age

	0 2/3	3/4	4/5	5/6	6/7	7/8	8/9	9/10
1983/1984	-1.264	-0.223	0.958	0.590	0.795	0.517	0.646	-0.022
1984/1985	-1.338	-0.341	0.684	-0.139	0.944	-0.373	0.538	-0.919
1985/1986	-0.951	0.022	0.367	0.521	1.466	-0.357	-0.152	-0.347
1986/1987	-2.011	-0.335	0.404	0.312	0.333	-0.755	0.996	-1.548
1987/1988	-0.450	-0.360	0.161	0.328	0.852	1.254	1.528	-0.981
1988/1989	-0.841	-0.393	-0.124	0.173	0.080	-0.130	0.127	-1.504
1989/1990	-3.008	-0.235	-0.155	0.473	0.291	0.803	0.695	0.208
1990/1991	-2.297	-0.330	0.431	0.165	0.456	1.006	1.027	2.133
1991/1992	-0.660	0.327	0.490	0.293	0.695	1.112	0.585	0.703
1992/1993	-2.034	-0.609	0.307	0.703	0.675	0.909	0.588	0.743
1993/1994	-0.525	-0.030	0.583	0.270	0.231	0.213	0.047	-0.404
1994/1995	-0.490	-0.207	0.311	0.155	0.357	0.383	0.380	-0.862
1995/1996	-1.885	-0.826	0.261	0.310	-0.219	0.081	0.205	-0.421
1996/1997	-2.178	-0.686	0.374	0.445	0.294	0.561	0.216	-0.780
1997/1998	-2.612	-0.588	0.070	0.472	0.169	0.346	-0.011	-0.823

Table 2.4.10

HAD-FARO: Haddock in the Faroe Grounds (Fishing Area Vb)

FLT01: LL94A: lline<100GRT (Catch: Thousands) (Effort: 1)

Year	Fishing effort	Catch, age 2	Catch, age 3	Catch, age 4
1985	7558	613	2542	787
1986	6692	167	1435	1747
1987	6728	200	1027	1819
1988	8753	599	311	1557
1989	12804	48	1042	433
1990	14543	94	993	1141
1991	14801	53	733	1165
1992	10599	35	103	419
1993	7497	31	92	80
1994	7625	127	47	50
1995	9582	470	133	45
1996	10999	154	2169	198
1997	12050	26	1140	3501
1998	10082	44	336	1864

HAD-FARO: Haddock in the Faroe Grounds (Fishing Area Vb)

FLT03: PT97: Pair trawlers > 1000 HP (Catch: Thousands) (Effort: 1)

Year	Fishing effort	Catch, age 5	Catch, age 6
1988	6034	251	194
1989	5127	162	156
1990	7491	57	156
1991	7875	181	104
1992	7243	107	150
1993	6335	82	111
1994	6227	32	133
1995	6069	33	18
1996	6300	21	18
1997	6000	84	5
1998	5500	913	33

HAD-FARO: Haddock in the Faroe Grounds (Fishing Area Vb)

FLT08: 5 longliners revised (Catch: Thousands)

Year	Fishing effort	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9
1986	2071	51.550	17.966	10.924	0.451	2.257	0.451
1987	827	6.102	11.710	7.986	5.294	0.942	0.987
1988	1537	7.845	18.470	19.770	4.124	1.659	0.001
1989	4277	7.342	38.924	45.462	40.634	9.153	2.012
1990	6060	44.682	20.669	44.226	53.801	26.445	6.535
1991	4561	45.030	38.650	21.952	38.650	23.078	12.383
1992	3957	16.107	37.643	32.756	16.469	12.306	10.677
1993	5517	13.028	29.373	31.742	29.610	4.738	10.186
1994	3024	10.813	5.068	11.488	11.939	10.249	3.604
1995	3069	5.302	6.587	4.418	8.274	8.676	6.346
1996	9816	47.031	8.727	8.000	5.455	13.455	11.758
1997	15602	786.257	67.292	12.396	14.388	9.076	24.128
1998	15655	400.027	931.976	51.414	10.032	12.791	15.048

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Table 2.4.11

Lowestoft VPA Version 3.1

   4-May-99 00:20:06

Extended Survivors Analysis

Haddock Faroes Vb (run: XSAJAK02/X02)

CPUE data from file /users/fish/ifad/ifapwork/nwwg/had_faro/FLEET.X02

Catch data for 38 years. 1961 to 1998. Ages 2 to 10.

Fleet,	First,	Last,	First,	Last,	Alpha,	Beta
	year,	year,	age ,	age		
FLT01: LL94A: 1line<,	1985,	1998,	2,	4,	.000,	1.000
FLT03: PT97: Pair tr,	1988,	1998,	5,	6,	.000,	1.000
FLT08: 5 longliners ,	1986,	1998,	4,	9,	.000,	1.000

Time series weights :

     Tapered time weighting applied
     Power =   3 over 20 years

Catchability analysis :

     Catchability dependent on stock size for ages <   3

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages < 3

     Catchability independent of age for ages >=   6

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 =   .700

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

     Prior weighting not applied

Tuning converged after   99 iterations

1
Regression weights
    , .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000

Fishing mortalities

Age,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998
2,	.004,	.010,	.023,	.011,	.049,	.031,	.007,	.007,	.007,	.017
3,	.098,	.101,	.126,	.057,	.108,	.109,	.065,	.060,	.084,	.129
4,	.121,	.173,	.199,	.126,	.142,	.155,	.191,	.206,	.161,	.214
5,	.286,	.203,	.162,	.180,	.129,	.110,	.163,	.220,	.214,	.222
6,	.291,	.291,	.266,	.174,	.127,	.137,	.130,	.172,	.214,	.201
7,	.366,	.369,	.303,	.205,	.126,	.141,	.135,	.236,	.188,	.283
8,	.288,	.277,	.222,	.153,	.119,	.142,	.135,	.177,	.206,	.197
9,	.163,	.228,	.150,	.185,	.119,	.159,	.137,	.155,	.212,	.331

1
XSA population numbers (Thousands)

YEAR ,	2,	3,	4,	5,	6,	7,	8,	9,
1989 ,	1.80E+04,	1.80E+04,	6.36E+03,	1.24E+04,	1.12E+04,	7.12E+03,	2.39E+03,	9.77E+02,
1990 ,	1.20E+04,	1.47E+04,	1.34E+04,	4.61E+03,	7.61E+03,	6.84E+03,	4.04E+03,	1.46E+03,
1991 ,	3.69E+03,	9.72E+03,	1.09E+04,	9.23E+03,	3.08E+03,	4.66E+03,	3.87E+03,	2.51E+03,
1992 ,	3.97E+03,	2.95E+03,	7.01E+03,	7.28E+03,	6.43E+03,	1.94E+03,	2.82E+03,	2.54E+03,
1993 ,	2.61E+03,	3.21E+03,	2.28E+03,	5.06E+03,	4.98E+03,	4.42E+03,	1.29E+03,	1.98E+03,
1994 ,	1.00E+04,	2.04E+03,	2.36E+03,	1.62E+03,	3.64E+03,	3.59E+03,	3.19E+03,	9.38E+02,
1995 ,	1.25E+05,	7.97E+03,	1.50E+03,	1.65E+03,	1.19E+03,	2.60E+03,	2.55E+03,	2.26E+03,
1996 ,	4.92E+04,	1.01E+05,	6.12E+03,	1.01E+03,	1.15E+03,	8.55E+02,	1.86E+03,	1.83E+03,
1997 ,	1.18E+04,	4.00E+04,	7.81E+04,	4.07E+03,	6.65E+02,	7.93E+02,	5.53E+02,	1.27E+03,
1998 ,	6.82E+03,	9.58E+03,	3.01E+04,	5.44E+04,	2.69E+03,	4.39E+02,	5.38E+02,	3.69E+02,

Table 2.4.11 (cont'd)

Estimated population abundance at 1st Jan 1999

  , .00E+00, 5.49E+03, 6.90E+03, 1.99E+04, 3.57E+04, 1.80E+03, 2.71E+02, 3.62E+02,

Taper weighted geometric mean of the VPA populations:

  , 1.35E+04, 1.16E+04, 8.81E+03, 5.42E+03, 3.02E+03, 2.05E+03, 1.57E+03, 1.14E+03,

Standard error of the weighted Log(VPA populations) :

  , 1.1326, 1.1495, 1.1901, 1.1661, .9551, 1.0017, .9018, .9468,
1

Log catchability residuals.

Fleet : FLT01: LL94A: lline<

```
Age  , 1985, 1986, 1987, 1988
    2 , 1.82,  .53, 1.82, 2.19
    3 , 1.00,  .61,  .59,  .18
    4 ,  .49,  .71,  .75,  .66
    5 , No data for this fleet at this age
    6 , No data for this fleet at this age
    7 , No data for this fleet at this age
    8 , No data for this fleet at this age
    9 , No data for this fleet at this age
```

```
Age  , 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998
    2 , -1.60,  -.44,  -.07,  -.26,   .50,  1.06,   .01,  -.79, -1.93,  -.41
    3 ,   .25,   .28,   .38,  -.09,   .08,  -.15,  -.72,  -.61,  -.41,   .00
    4 ,   .01,   .13,   .35,   .07,  -.11,  -.63,  -.49,  -.55,  -.33,   .19
    5 , No data for this fleet at this age
    6 , No data for this fleet at this age
    7 , No data for this fleet at this age
    8 , No data for this fleet at this age
    9 , No data for this fleet at this age
```

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

```
   Age  ,        3,         4
Mean Log q, -12.4088, -11.9945,
S.E(Log q),   .4504,    .4550,
```

Regression statistics :

Ages with q dependent on year class strength

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

2, 1.38, -1.121, 15.76, .48, 14, 1.24, -14.04,

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

3, 1.02, -.155, 12.47, .87, 14, .48, -12.41,
4, .84, 1.755, 11.54, .93, 14, .35, -11.99,
1

Fleet : FLT03: PT97: Pair tr

```
Age  , 1985, 1986, 1987, 1988
    2 , No data for this fleet at this age
    3 , No data for this fleet at this age
    4 , No data for this fleet at this age
    5 , 99.99, 99.99, 99.99,  -.09
    6 , 99.99, 99.99, 99.99,   .04
    7 , No data for this fleet at this age
    8 , No data for this fleet at this age
    9 , No data for this fleet at this age
```

Table 2.4.11 (cont'd)

```
Age  ,  1989,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998
   2 ,  No data for this fleet at this age
   3 ,  No data for this fleet at this age
   4 ,  No data for this fleet at this age
   5 ,  -.01,  -.49,  -.09,  -.29,  -.08,   .12,   .18,   .21,   .25,   .14
   6 ,   .00,   .00,   .44,   .11,   .18,   .69,  -.16,  -.15,  -.81,  -.24
   7 ,  No data for this fleet at this age
   8 ,  No data for this fleet at this age
   9 ,  No data for this fleet at this age
```

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

```
   Age ,         5,          6
Mean Log q,  -12.6326,  -12.5770,
S.E(Log q),     .2283,     .4028,
```

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

   5,   1.05,   -.712,    12.83,     .96,    11,    .25,  -12.63,
   6,    .81,   1.878,    11.71,     .92,    11,    .29,  -12.58,
1
```

Fleet : FLT08: 5 longliners

```
Age ,  1985,  1986,  1987,  1988
   2 ,  No data for this fleet at this age
   3 ,  No data for this fleet at this age
   4 ,  99.99,   .35,  -.86,  -.90
   5 ,  99.99,   .08,  -.13,  -.31
   6 ,  99.99,   .28,   .46,   .02
   7 ,  99.99,  -.56,   .95,  -.41
   8 ,  99.99,   .68,  1.61,  -.41
   9 ,  99.99,  -.62,  1.24, -5.29
```

```
Age  ,  1989,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998
   2 ,  No data for this fleet at this age
   3 ,  No data for this fleet at this age
   4 ,  -.98,  -.25,   .27,  -.21,   .37,   .76,   .50,   .12,  -.09,   .21
   5 ,  -.24,  -.27,  -.08,   .29,   .05,   .02,   .27,  -.09,   .09,   .13
   6 ,  -.15,  -.15,   .33,   .10,  -.03,  -.13,   .01,  -.50,   .04,   .05
   7 ,   .22,   .19,   .50,   .62,   .01,  -.08,  -.14,  -.56,   .00,   .27
   8 ,  -.21,  -.03,   .13,  -.07,  -.59,  -.11,  -.07,  -.46,  -.09,   .27
   9 ,  -.89,  -.44,  -.09,  -.09,  -.25,   .08,  -.27,  -.59,   .05,   .87
```

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

```
   Age ,         4,          5,          6,          7,          8,          9
Mean Log q,  -13.9867,  -13.6496,  -13.4769,  -13.4769,  -13.4769,  -13.4769,
S.E(Log q),     .5401,     .1924,     .2391,     .4285,     .5025,    1.4762,
```

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

   4,   1.24,  -1.441,    15.15,     .80,    13,    .64,  -13.99,
   5,   1.02,   -.403,    13.76,     .97,    13,    .21,  -13.65,
   6,    .96,    .531,    13.24,     .94,    13,    .24,  -13.48,
   7,    .90,    .839,    12.81,     .88,    13,    .38,  -13.40,
   8,   1.46,  -1.984,    16.34,     .67,    13,    .65,  -13.49,
   9,    .61,   1.392,    11.18,     .59,    13,    .83,  -13.88,
1
```

Table 2.4.11 (cont'd)

Terminal year survivor and F summaries :

Age 2   Catchability dependent on age and year class strength

Year class = 1996

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: 1line<,	3640.,	1.320,	.000,	.00,	1,	.168,	.026
FLT03: PT97: Pair tr,	1.,	.000,	.000,	.00,	0,	.000,	.000
FLT08: 5 longliners ,	1.,	.000,	.000,	.00,	0,	.000,	.000
P shrinkage mean ,	11641.,	1.15,,,,				.225,	.008
F shrinkage mean ,	4656.,	.70,,,,				.607,	.020

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
5491.,	.54,	.41,	3,	.758,	.017

Age 3   Catchability constant w.r.t. time and dependent on age

Year class = 1995

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: 1line<,	5649.,	.445,	.588,	1.32,	2,	.685,	.155
FLT03: PT97: Pair tr,	1.,	.000,	.000,	.00,	0,	.000,	.000
FLT08: 5 longliners ,	1.,	.000,	.000,	.00,	0,	.000,	.000
F shrinkage mean ,	10646.,	.70,,,,				.315,	.085

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
6896.,	.38,	.43,	3,	1.133,	.129

1

Age 4   Catchability constant w.r.t. time and dependent on age

Year class = 1994

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: 1line<,	17346.,	.324,	.236,	.73,	3,	.617,	.242
FLT03: PT97: Pair tr,	1.,	.000,	.000,	.00,	0,	.000,	.000
FLT08: 5 longliners ,	24481.,	.564,	.000,	.00,	1,	.212,	.177
F shrinkage mean ,	25302.,	.70,,,,				.171,	.172

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
19903.,	.26,	.16,	5,	.609,	.214

Age 5   Catchability constant w.r.t. time and dependent on age

Year class = 1993

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: 1line<,	22869.,	.325,	.122,	.38,	3,	.221,	.328
FLT03: PT97: Pair tr,	40879.,	.300,	.000,	.00,	1,	.315,	.196
FLT08: 5 longliners ,	38847.,	.265,	.087,	.33,	2,	.391,	.206
F shrinkage mean ,	48534.,	.70,,,,				.072,	.168

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
35677.,	.17,	.11,	7,	.649,	.222

1

Table 2.4.11 (cont'd)

Age 6   Catchability constant w.r.t. time and dependent on age

Year class = 1992

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: lline<,	1055.,	.325,	.282,	.87,	3,	.133,	.322
FLT03: PT97: Pair tr,	1918.,	.246,	.241,	.98,	2,	.322,	.190
FLT08: 5 longliners ,	1945.,	.201,	.017,	.08,	3,	.490,	.187
F shrinkage mean ,	2360.,	.70,,,,				.055,	.157

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
1804.,	.14,	.10,	9,	.749,	.201

Age 7   Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 1991

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: lline<,	204.,	.327,	.174,	.53,	3,	.113,	.361
FLT03: PT97: Pair tr,	225.,	.246,	.499,	2.03,	2,	.279,	.332
FLT08: 5 longliners ,	294.,	.185,	.102,	.55,	4,	.544,	.263
F shrinkage mean ,	491.,	.70,,,,				.065,	.166

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
271.,	.14,	.12,	10,	.924,	.283

1

Age 8   Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 1990

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: lline<,	271.,	.331,	.244,	.74,	3,	.108,	.255
FLT03: PT97: Pair tr,	384.,	.246,	.161,	.65,	2,	.255,	.187
FLT08: 5 longliners ,	362.,	.175,	.195,	1.11,	5,	.577,	.197
F shrinkage mean ,	465.,	.70,,,,				.061,	.156

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
362.,	.13,	.11,	11,	.839,	.197

Age 9   Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 1989

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: LL94A: lline<,	196.,	.335,	.010,	.03,	3,	.109,	.360
FLT03: PT97: Pair tr,	220.,	.247,	.138,	.56,	2,	.247,	.326
FLT08: 5 longliners ,	206.,	.175,	.123,	.70,	6,	.562,	.346
F shrinkage mean ,	338.,	.70,,,,				.082,	.224

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
217.,	.13,	.08,	12,	.584,	.331

Table 2.4.12

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At 4-May-99 00:21:15

Terminal Fs derived using XSA (With F shrinkage)

Table 8   Fishing mortality (F) at age

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE
2,	.1875,	.3232,	.3801,	.0875,	.0691,	.0609,	.0641,	.1258,
3,	.4162,	.5866,	.5639,	.3722,	.2353,	.2370,	.1871,	.2645,
4,	.4209,	.5980,	.7260,	.5193,	.4767,	.4514,	.2969,	.3480,
5,	.4387,	.3480,	.5591,	.5369,	.3678,	.5006,	.2996,	.2845,
6,	.5879,	.6706,	.4026,	.6107,	.5881,	.5420,	.5405,	.4537,
7,	.9483,	1.0499,	1.2493,	.3375,	.9617,	.9127,	.6904,	.8363,
8,	.8742,	.9736,	1.1139,	1.2027,	2.3617,	.7508,	.6632,	.5848,
9,	.6600,	.7351,	.8185,	.6472,	.9618,	.6371,	.5020,	.5054,
+gp,	.6600,	.7351,	.8185,	.6472,	.9618,	.6371,	.5020,	.5054,
0 FBAR 3- 7,	.5624,	.6506,	.7002,	.4753,	.5259,	.5287,	.4029,	.4374,

Table 8   Fishing mortality (F) at age

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE
2,	.0858,	.0549,	.0523,	.0252,	.1664,	.1257,	.1190,	.0879,	.0104,	.0010,
3,	.2356,	.2523,	.1927,	.4191,	.4282,	.2159,	.2627,	.1806,	.1088,	.0524,
4,	.5314,	.3331,	.4173,	.2836,	.2356,	.3696,	.2394,	.3764,	.1732,	.1598,
5,	.3326,	.3633,	.2740,	.4496,	.3106,	.1260,	.2090,	.2196,	.5172,	.1999,
6,	.4970,	.5549,	.5545,	.1485,	.2675,	.1694,	.0941,	.2826,	.7136,	.3706,
7,	.8267,	.8722,	.8348,	.6686,	.1930,	.2114,	.0848,	.1572,	.3818,	.5595,
8,	1.0620,	.5418,	.4208,	.4033,	.2883,	.1420,	.1581,	.2500,	.3697,	.4800,
9,	.6559,	.5374,	.5042,	.3934,	.2604,	.2046,	.1577,	.2585,	.4342,	.3562,
+gp,	.6559,	.5374,	.5042,	.3934,	.2604,	.2046,	.1577,	.2585,	.4342,	.3562,
0 FBAR 3- 7,	.4847,	.4751,	.4547,	.3939,	.2870,	.2185,	.1780,	.2433,	.3789,	.2684,

1

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At 4-May-99 00:21:15

Terminal Fs derived using XSA (With F shrinkage)

Table 8   Fishing mortality (F) at age

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE
2,	.0004,	.0294,	.0232,	.0342,	.0231,	.0295,	.0266,	.0087,	.0305,	.0323,
3,	.0439,	.0261,	.1233,	.4504,	.1685,	.1064,	.1501,	.0892,	.0835,	.0612,
4,	.1195,	.1931,	.1191,	.3231,	.3354,	.3289,	.2143,	.2150,	.1737,	.1656,
5,	.1821,	.2592,	.1993,	.2587,	.2887,	.2068,	.2744,	.2260,	.2176,	.2197,
6,	.1316,	.2012,	.2101,	.2579,	.1194,	.2571,	.3895,	.2603,	.2571,	.2406,
7,	.2611,	.1574,	.1863,	.2297,	.2715,	.0725,	.1499,	.1441,	.3015,	.1656,
8,	.3158,	.3733,	.0842,	.2072,	.2742,	.2577,	.1432,	.3316,	.5158,	.1309,
9,	.2030,	.2380,	.1604,	.2566,	.2592,	.2257,	.2354,	.2470,	.1952,	.1970,
+gp,	.2030,	.2380,	.1604,	.2566,	.2592,	.2257,	.2354,	.2470,	.1952,	.1970,
0 FBAR 3- 7,	.1476,	.1674,	.1676,	.3039,	.2367,	.1943,	.2356,	.1869,	.2067,	.1705,

Table 8   Fishing mortality (F) at age

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE
2,	.0039,	.0097,	.0233,	.0109,	.0490,	.0310,	.0072,	.0074,	.0072,	.0173,
3,	.0976,	.1010,	.1264,	.0573,	.1082,	.1093,	.0647,	.0596,	.0839,	.1290,
4,	.1213,	.1726,	.1992,	.1264,	.1422,	.1552,	.1907,	.2064,	.1612,	.2138,
5,	.2861,	.2032,	.1619,	.1803,	.1290,	.1101,	.1629,	.2202,	.2139,	.2221,
6,	.2910,	.2906,	.2657,	.1745,	.1272,	.1375,	.1298,	.1725,	.2142,	.2006,
7,	.3663,	.3687,	.3026,	.2053,	.1262,	.1410,	.1346,	.2365,	.1880,	.2831,
8,	.2885,	.2771,	.2220,	.1530,	.1190,	.1424,	.1347,	.1771,	.2057,	.1969,
9,	.1631,	.2280,	.1505,	.1854,	.1189,	.1593,	.1368,	.1548,	.2116,	.3311,
+gp,	.1631,	.2280,	.1505,	.1854,	.1189,	.1593,	.1368,	.1548,	.2116,	.3311,
0 FBAR 3- 7,	.2325,	.2272,	.2112,	.1488,	.1266,	.1306,	.1365,	.1790,	.1723,	.2097,

Table 2.4.13

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At   4-May-99   00:21:15

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
2,	51279,	38538,	47364,	30115,	22652,	20216,	25371,	54975,
3,	23796,	34806,	22838,	26516,	22589,	17308,	15573,	19483,
4,	16517,	12850,	15850,	10639,	14962,	14616,	11181,	10574,
5,	6028,	8877,	5786,	6279,	5182,	7605,	7620,	6802,
6,	3245,	3182,	5132,	2708,	3005,	2937,	3774,	4624,
7,	1512,	1476,	1332,	2809,	1204,	1366,	1399,	1800,
8,	448,	480,	423,	313,	1641,	377,	449,	574,
9,	135,	153,	148,	114,	77,	127,	146,	189,
+gp,	0,	0,	0,	0,	0,	0,	0,	0,
TOTAL,	102959,	100363,	98873,	79492,	71312,	64552,	65513,	99021,

0

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
2,	32029,	35741,	15554,	33336,	23797,	52692,	72296,	57731,	27330,	36561,
3,	39688,	24066,	27699,	12086,	26615,	16498,	38043,	52552,	43288,	22145,
4,	12244,	25672,	15311,	18703,	6508,	14200,	10884,	23952,	35916,	31787,
5,	6113,	5892,	15064,	8258,	11531,	4210,	8034,	7014,	13459,	24729,
6,	4190,	3589,	3355,	9377,	4313,	6920,	3038,	5337,	4610,	6569,
7,	2405,	2087,	1687,	1578,	6618,	2702,	4783,	2264,	3294,	1849,
8,	639,	861,	714,	599,	662,	4467,	1791,	3597,	1584,	1841,
9,	262,	181,	410,	384,	328,	406,	3173,	1252,	2294,	896,
+gp,	0,	0,	0,	0,	53,	874,	1410,	1534,	2659,	1142,
TOTAL,	97570,	98090,	79794,	84322,	80424,	102969,	143453,	155232,	134434,	127520,

0
1

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At   4-May-99   00:21:15

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
2,	3045,	5454,	3559,	17734,	21368,	45409,	41400,	29188,	10406,	22755,
3,	29905,	2492,	4336,	2847,	14032,	17096,	36096,	33004,	23689,	8263,
4,	17206,	23433,	1988,	3138,	1485,	9707,	12584,	25433,	24715,	17840,
5,	22181,	12500,	15816,	1445,	1860,	870,	5719,	8316,	16795,	17009,
6,	16578,	15137,	7897,	10609,	913,	1141,	579,	3559,	5431,	11061,
7,	3713,	11899,	10135,	5240,	6712,	664,	722,	321,	2246,	3439,
8,	865,	2341,	8323,	6887,	3410,	4188,	505,	509,	228,	1360,
9,	933,	517,	1320,	6264,	4584,	2122,	2650,	359,	299,	111,
+gp,	443,	446,	267,	1039,	3825,	5266,	5098,	3575,	2071,	787,
TOTAL,	94869,	74220,	53641,	55204,	58189,	86462,	105355,	104264,	85880,	82627,

0

Table 10	Stock number at age (start of year)					Numbers*10**-3					
YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,	1999,
AGE											
2,	17983,	11983,	3694,	3966,	2614,	10041,	124525,	49205,	11789,	6824,	0,
3,	18037,	14666,	9716,	2954,	3212,	2038,	7970,	101225,	39987,	9582,	5491,
4,	6360,	13394,	10854,	7010,	2284,	2360,	1496,	6116,	78082,	30103,	6896,
5,	12378,	4615,	9228,	7281,	5058,	1622,	1655,	1012,	4074,	54412,	19903,
6,	11179,	7612,	3083,	6426,	4978,	3640,	1190,	1151,	665,	2693,	35677,
7,	7120,	6842,	4661,	1935,	4419,	3589,	2597,	855,	793,	439,	1804,
8,	2386,	4041,	3874,	2820,	1291,	3189,	2552,	1859,	553,	538,	271,
9,	977,	1464,	2508,	2540,	1981,	938,	2264,	1826,	1275,	369,	362,
+gp,	592,	582,	252,	1020,	1817,	2249,	2548,	3061,	2980,	1950,	1363,
TOTAL,	77016,	65200,	47870,	35954,	27653,	29666,	146797,	166311,	140198,	106910,	71767,

0

Table 2.4.14

Run title : Haddock Faroes Vb (run: XSAJAK02/X02)

At 4-May-99 00:21:15

Table 16   Summary   (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS, Age 2	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 7,
1961,	51279,	81164,	47797,	20831,	.4358,	.5624,
1962,	38538,	83421,	51875,	27151,	.5234,	.6506,
1963,	47364,	80755,	49548,	27571,	.5564,	.7002,
1964,	30115,	68581,	44129,	19490,	.4417,	.4753,
1965,	22652,	65663,	45559,	18479,	.4056,	.5259,
1966,	20216,	60949,	43961,	18766,	.4269,	.5287,
1967,	25371,	60231,	41974,	13381,	.3188,	.4029,
1968,	54975,	78166,	45407,	17852,	.3932,	.4374,
1969,	32030,	83954,	53493,	23272,	.4350,	.4847,
1970,	35741,	87542,	60005,	21361,	.3560,	.4751,
1971,	15554,	82087,	63143,	19393,	.3071,	.4547,
1972,	33336,	83534,	62316,	16485,	.2645,	.3939,
1973,	23797,	83306,	62028,	17976,	.2898,	.2870,
1974,	52692,	96202,	65217,	14773,	.2265,	.2185,
1975,	72296,	123706,	76217,	20715,	.2718,	.1780,
1976,	57731,	138620,	90730,	26211,	.2889,	.2433,
1977,	27330,	124787,	99174,	25555,	.2577,	.3789,
1978,	36561,	125464,	101136,	19200,	.1898,	.2684,
1979,	3045,	102510,	89653,	12418,	.1385,	.1476,
1980,	5454,	92745,	86540,	15016,	.1735,	.1674,
1981,	3559,	84555,	81237,	12233,	.1506,	.1676,
1982,	17734,	74384,	61182,	11937,	.1951,	.3039,
1983,	21368,	70635,	57284,	12894,	.2251,	.2367,
1984,	45409,	93804,	60963,	12378,	.2030,	.1943,
1985,	41400,	105260,	71574,	15143,	.2116,	.2356,
1986,	29188,	111022,	75491,	14477,	.1918,	.1869,
1987,	10406,	101329,	78966,	14882,	.1885,	.2067,
1988,	22755,	89821,	71711,	12178,	.1698,	.1705,
1989,	17983,	84044,	61950,	14325,	.2312,	.2325,
1990,	11983,	66750,	54205,	11726,	.2163,	.2272,
1991,	3694,	50670,	45473,	8429,	.1854,	.2112,
1992,	3966,	39028,	36057,	5315,	.1474,	.1488,
1993,	2614,	37914,	34519,	4026,	.1166,	.1266,
1994,	10041,	41498,	33475,	4252,	.1270,	.1306,
1995,	124525,	122957,	44470,	4948,	.1113,	.1365,
1996,	49205,	146325,	83833,	9761,	.1164,	.1790,
1997,	11789,	143389,	117693,	17923,	.1523,	.1723,
1998,	6824,	127221,	117048,	22101,	.1888,	.2097,

Arith.
| Mean , | 29487, | 89316, | 64922, | 15916, | .2587, | .3015, |

0 Units, (Thousands), (Tonnes), (Tonnes), (Tonnes),

Table 2.4.15. Input data for RCT3

Faroe Haddock: VPA and groundfish survey data

4 14 2

'Yearclass'	'VPAage2'	'Survage0'	'Survage1'	'Survage2'	'Survage3'
1985	10406	23.6	11.8	11.8	8.5
1986	22755	40.6	88.1	113.0	23.9
1987	17983	40.5	146.6	64.0	69.8
1988	11983	43.8	43.1	13.4	15.5
1989	3694	6.1	16.5	8.5	6.2
1990	3966	4.0	26.9	9.9	4.0
1991	2614	6.2	9.2	3.1	2.9
1992	10041	28.1	21.3	10.1	6.1
1993	124525	186.3	252.6	137.1	244.7
1994	49205	486.9	244.2	161.7	96.3
1995	11789	65.6	84.7	43.6	17.9
1996	-11	3.2	3.1	1.2	-11
1997	-11	32.5	67.4	-11	-11
1998	-11	43.4	-11	-11	-11

Table 2.4.16   Analysis by RCT3 ver3.1 of data from file :

rct3c97.dat
Faroe Haddock: VPA and groundfish survey data

Data for   4 surveys over   14 years :   1985 - 1998
Regression type = C
Tapered time weighting applied
power =   3 over   20 years
Survey weighting not applied
Final estimates shrunk towards mean
Minimum S.E. for any survey taken as   .20
Minimum of   3 points used for regression
Forecast/Hindcast variance correction used.
Yearclass =   1990

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	.97	6.17	.32	.869	5	1.61	7.72	.627	.322
Survag	.90	5.97	.71	.566	5	3.33	8.97	1.026	.121
Survag	.75	6.86	.52	.709	5	2.39	8.67	.788	.205
Survag	1.02	6.39	.68	.590	5	1.61	8.02	1.151	.096
					VPA Mean =		9.34	.703	.257

Yearclass =   1991

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	.82	6.69	.30	.893	6	1.97	8.31	.430	.516
Survag	1.13	4.99	.84	.510	6	2.32	7.63	1.298	.057
Survag	.86	6.48	.54	.718	6	1.41	7.69	.861	.129
Survag	.94	6.63	.55	.707	6	1.36	7.91	.843	.134
					VPA Mean =		9.16	.763	.164

Yearclass =   1992

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	.93	6.32	.35	.880	7	3.37	9.45	.450	.387
Survag	1.07	5.26	.71	.638	7	3.10	8.57	.907	.095
Survag	.82	6.61	.46	.804	7	2.41	8.58	.595	.221
Survag	.95	6.60	.50	.781	7	1.96	8.46	.644	.189
					VPA Mean =		8.96	.852	.108

Yearclass =   1993

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	.92	6.33	.33	.875	8	5.23	11.12	.544	.405
Survag	1.10	5.21	.71	.595	8	5.54	11.32	1.135	.093
Survag	.85	6.61	.50	.745	8	4.93	10.79	.763	.206
Survag	.99	6.60	.56	.704	8	5.50	12.04	1.062	.106
					VPA Mean =		8.99	.794	.190

Yearclass =   1994

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	1.06	5.94	.39	.918	9	6.19	12.51	.621	.327
Survag	1.22	4.83	.72	.760	9	5.50	11.54	1.003	.125
Survag	1.08	6.02	.65	.799	9	5.09	11.51	.898	.156
Survag	.92	6.74	.49	.875	9	4.58	10.98	.644	.304
					VPA Mean =		9.30	1.200	.088

Yearclass =   1995

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
			Regression				Prediction		
Survag	.90	6.32	.56	.850	10	4.20	10.10	.669	.224
Survag	1.13	5.08	.66	.801	10	4.45	10.13	.793	.160
Survag	1.01	6.19	.60	.830	10	3.80	10.01	.718	.195
Survag	.91	6.77	.45	.898	10	2.94	9.44	.531	.356
					VPA Mean =		9.46	1.241	.065

Table 2.4.16 (Cont'd)

Yearclass = 1996

		I----------Regression----------I				I----------Prediction----------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Survag	.90	6.23	.58	.823	11	1.44	7.53	.758	.347
Survag	1.14	4.97	.67	.782	11	1.41	6.58	.945	.224
Survag	1.01	6.10	.60	.813	11	.79	6.90	.834	.287
Survag									
					VPA Mean =		9.46	1.187	.142

Yearclass = 1997

		I----------Regression----------I				I----------Prediction----------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Survag	.90	6.22	.60	.822	11	3.51	9.40	.704	.465
Survag	1.15	4.95	.66	.789	11	4.23	9.79	.785	.375
Survag									
Survag									
					VPA Mean =		9.46	1.203	.160

Yearclass = 1998

		I----------Regression----------I				I----------Prediction----------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
Survag0	.90	6.21	.61	.821	11	3.79	9.64	.729	.738
Survag1									
Survag3									
Survag4									
					VPA Mean =		9.47	1.223	.26

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	4951	8.51	.36	.33	.85	3967	8.29
1991	3938	8.28	.31	.23	.56	2615	7.87
1992	7609	8.94	.28	.22	.59	10042	9.21
1993	47342	10.77	.35	.46	1.78	124526	11.73
1994	97133	11.48	.36	.46	1.66	49206	10.80
1995	18221	9.81	.32	.16	.24	11789	9.38
1996	1651	7.41	.45	.53	1.38		
1997	14104	9.55	.48	.13	.07		
1998	14720	9.60	.63	.07	.01		

Table 2.4.17

Haddock in the Faroe Grounds (Fishing Area Vb)

Prediction with management option table: Input data

Year: 1999								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	14104.000	0.2000	0.0200	0.0000	0.0000	0.558	0.0119	0.558
3	5491.000	0.2000	0.5200	0.0000	0.0000	0.825	0.1019	0.825
4	6896.000	0.2000	0.9100	0.0000	0.0000	1.180	0.2173	1.180
5	19903.000	0.2000	1.0000	0.0000	0.0000	1.692	0.2453	1.692
6	35677.000	0.2000	1.0000	0.0000	0.0000	2.227	0.2195	2.227
7	1804.000	0.2000	1.0000	0.0000	0.0000	2.416	0.2645	2.416
8	271.000	0.2000	1.0000	0.0000	0.0000	2.505	0.2167	2.505
9	362.000	0.2000	1.0000	0.0000	0.0000	2.577	0.2607	2.577
10+	1363.000	0.2000	1.0000	0.0000	0.0000	2.684	0.2607	2.684
Unit	Thousands	–	–	–	–	Kilograms	–	Kilograms

Year: 2000								
Age	Recruit- ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	14720.000	0.2000	0.0200	0.0000	0.0000	0.558	0.0119	0.558
3	.	0.2000	0.5200	0.0000	0.0000	0.825	0.1019	0.825
4	.	0.2000	0.9100	0.0000	0.0000	1.180	0.2173	1.180
5	.	0.2000	1.0000	0.0000	0.0000	1.692	0.2453	1.692
6	.	0.2000	1.0000	0.0000	0.0000	2.227	0.2195	2.227
7	.	0.2000	1.0000	0.0000	0.0000	2.416	0.2645	2.416
8	.	0.2000	1.0000	0.0000	0.0000	2.505	0.2167	2.505
9	.	0.2000	1.0000	0.0000	0.0000	2.577	0.2607	2.577
10+	.	0.2000	1.0000	0.0000	0.0000	2.684	0.2607	2.684
Unit	Thousands	–	–	–	–	Kilograms	–	Kilograms

Year: 2001								
Age	Recruit- ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	13509.000	0.2000	0.0200	0.0000	0.0000	0.558	0.0119	0.558
3	.	0.2000	0.5200	0.0000	0.0000	0.825	0.1019	0.825
4	.	0.2000	0.9100	0.0000	0.0000	1.180	0.2173	1.180
5	.	0.2000	1.0000	0.0000	0.0000	1.692	0.2453	1.692
6	.	0.2000	1.0000	0.0000	0.0000	2.227	0.2195	2.227
7	.	0.2000	1.0000	0.0000	0.0000	2.416	0.2645	2.416
8	.	0.2000	1.0000	0.0000	0.0000	2.505	0.2167	2.505
9	.	0.2000	1.0000	0.0000	0.0000	2.577	0.2607	2.577
10+	.	0.2000	1.0000	0.0000	0.0000	2.684	0.2607	2.684
Unit	Thousands	–	–	–	–	Kilograms	–	Kilograms

Notes: Run name   : MANJAK04
       Date and time: 03MAY99:14:40

Table 2.4.18

Faroe haddock (Division Vb)

Yield per recruit: Input data

Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
2	1.000	0.2000	0.0800	0.0000	0.0000	0.549	0.0400	0.549
3	.	0.2000	0.5000	0.0000	0.0000	0.819	0.1330	0.819
4	.	0.2000	0.9200	0.0000	0.0000	1.086	0.2060	1.086
5	.	0.2000	1.0000	0.0000	0.0000	1.426	0.2070	1.426
6	.	0.2000	1.0000	0.0000	0.0000	1.741	0.2310	1.741
7	.	0.2000	1.0000	0.0000	0.0000	2.002	0.2710	2.002
8	.	0.2000	1.0000	0.0000	0.0000	2.189	0.2970	2.189
9	.	0.2000	1.0000	0.0000	0.0000	2.425	0.2450	2.425
10+	.	0.2000	1.0000	0.0000	0.0000	2.749	0.2450	2.749
Unit	Numbers	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name   : YLDJAK03
       Date and time: 27MAY99:14:26

Table 2.4.19

Haddock in the Faroe Grounds (Fishing Area Vb)

Prediction with management option table

	Year: 1999					Year: 2000				Year: 2001	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0000	0.2097	143294	132675	24841	0.0000	0.0000	121385	108386	0	120911	107759
.	.	.	.	.	0.1000	0.0210	.	108386	2392	118539	105403
.	.	.	.	.	0.2000	0.0419	.	108386	4728	116224	103104
.	.	.	.	.	0.3000	0.0629	.	108386	7011	113964	100859
.	.	.	.	.	0.4000	0.0839	.	108386	9240	111757	98668
.	.	.	.	.	0.5000	0.1049	.	108386	11418	109603	96528
.	.	.	.	.	0.6000	0.1258	.	108386	13546	107499	94440
.	.	.	.	.	0.7000	0.1468	.	108386	15624	105445	92401
.	.	.	.	.	0.8000	0.1678	.	108386	17655	103440	90411
.	.	.	.	.	0.9000	0.1887	.	108386	19639	101482	88468
.	.	.	.	.	1.0000	0.2097	.	108386	21578	99570	86571
.	.	.	.	.	1.1000	0.2307	.	108386	23471	97703	84718
.	.	.	.	.	1.2000	0.2516	.	108386	25322	95880	82910
.	.	.	.	.	1.3000	0.2726	.	108386	27130	94100	81144
.	.	.	.	.	1.4000	0.2936	.	108386	28896	92362	79421
.	.	.	.	.	1.5000	0.3146	.	108386	30623	90664	77737
.	.	.	.	.	1.6000	0.3355	.	108386	32309	89007	76094
.	.	.	.	.	1.7000	0.3565	.	108386	33958	87388	74489
.	.	.	.	.	1.8000	0.3775	.	108386	35568	85807	72923
.	.	.	.	.	1.9000	0.3984	.	108386	37142	84263	71393
.	.	.	.	.	2.0000	0.4194	.	108386	38680	82756	69899
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name   : MANJAK04
       Date and time   : 03MAY99:14:40
       Computation of ref. F: Simple mean, age 3 - 7
       Basis for 1999   : F factors

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Table 2.4.20

Faroe haddock (Division Vb)

Yield per recruit: Summary table

F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January Sp.stock size	1 January Sp.stock biomass	Spawning time Sp.stock size	Spawning time Sp.stock biomass
0.0000	0.0000	0.000	0.000	5.517	8568.020	4.134	7669.432	4.134	7669.432
0.0500	0.0105	0.044	79.449	5.298	8031.987	3.916	7134.571	3.916	7134.571
0.1000	0.0210	0.083	147.514	5.103	7559.276	3.723	6663.026	3.723	6663.026
0.1500	0.0314	0.118	206.147	4.929	7139.757	3.549	6244.667	3.549	6244.667
0.2000	0.0419	0.150	256.902	4.771	6765.311	3.393	5871.375	3.393	5871.375
0.2500	0.0524	0.179	301.029	4.628	6429.359	3.251	5536.573	3.251	5536.573
0.3000	0.0629	0.205	339.545	4.498	6126.517	3.122	5234.874	3.122	5234.874
0.3500	0.0734	0.229	373.281	4.378	5852.336	3.004	4961.832	3.004	4961.832
0.4000	0.0838	0.251	402.927	4.268	5603.114	2.896	4713.742	2.896	4713.742
0.4500	0.0943	0.271	429.053	4.167	5375.741	2.796	4487.496	2.796	4487.496
0.5000	0.1048	0.290	452.137	4.073	5167.591	2.703	4280.468	2.703	4280.468
0.5500	0.1153	0.308	472.583	3.986	4976.432	2.617	4090.426	2.617	4090.426
0.6000	0.1258	0.324	490.731	3.905	4800.354	2.537	3915.459	2.537	3915.459
0.6500	0.1362	0.339	506.872	3.830	4637.714	2.463	3753.925	2.463	3753.925
0.7000	0.1467	0.354	521.253	3.759	4487.094	2.393	3604.406	2.393	3604.406
0.7500	0.1572	0.367	534.086	3.692	4347.262	2.328	3465.670	2.328	3465.670
0.8000	0.1677	0.380	545.554	3.630	4217.142	2.266	3336.641	2.266	3336.641
0.8500	0.1782	0.392	555.817	3.571	4095.795	2.209	3216.379	2.209	3216.379
0.9000	0.1886	0.403	565.010	3.515	3982.394	2.154	3104.058	2.154	3104.058
0.9500	0.1991	0.414	573.254	3.462	3876.209	2.102	2998.948	2.102	2998.948
1.0000	0.2096	0.424	580.653	3.412	3776.594	2.054	2900.404	2.054	2900.404
1.0500	0.2201	0.433	587.298	3.365	3682.978	2.007	2807.853	2.007	2807.853
1.1000	0.2306	0.442	593.269	3.319	3594.848	1.963	2720.785	1.963	2720.785
1.1500	0.2410	0.451	598.637	3.276	3511.751	1.921	2638.743	1.921	2638.743
1.2000	0.2515	0.460	603.464	3.235	3433.276	1.882	2561.319	1.882	2561.319
1.2500	0.2620	0.467	607.806	3.196	3359.059	1.844	2488.147	1.844	2488.147
1.3000	0.2725	0.475	611.709	3.159	3288.768	1.807	2418.898	1.807	2418.898
1.3500	0.2830	0.482	615.219	3.123	3222.106	1.773	2353.273	1.773	2353.273
1.4000	0.2934	0.489	618.373	3.088	3158.805	1.739	2291.003	1.739	2291.003
1.4500	0.3039	0.496	621.206	3.055	3098.620	1.707	2231.846	1.707	2231.846
1.5000	0.3144	0.503	623.749	3.024	3041.330	1.677	2175.578	1.677	2175.578
1.5500	0.3249	0.509	626.028	2.993	2986.733	1.648	2121.999	1.648	2121.999
1.6000	0.3354	0.515	628.068	2.964	2934.646	1.619	2070.925	1.619	2070.925
1.6500	0.3458	0.520	629.892	2.936	2884.902	1.592	2022.189	1.592	2022.189
1.7000	0.3563	0.526	631.518	2.908	2837.345	1.566	1975.637	1.566	1975.637
1.7500	0.3668	0.531	632.966	2.882	2791.837	1.541	1931.128	1.541	1931.128
1.8000	0.3773	0.537	634.250	2.857	2748.248	1.517	1888.535	1.517	1888.535
1.8500	0.3878	0.542	635.385	2.832	2706.459	1.493	1847.737	1.493	1847.737
1.9000	0.3982	0.546	636.385	2.809	2666.362	1.471	1808.625	1.471	1808.625
1.9500	0.4087	0.551	637.262	2.786	2627.855	1.449	1771.100	1.449	1771.100
2.0000	0.4192	0.556	638.025	2.763	2590.846	1.428	1735.068	1.428	1735.068
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

(cont.)

F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January Sp.stock size	1 January Sp.stock biomass	Spawning time Sp.stock size	Spawning time Sp.stock biomass
2.0500	0.4297	0.560	638.685	2.742	2555.248	1.407	1700.444	1.407	1700.444
2.1000	0.4402	0.564	639.250	2.721	2520.982	1.387	1667.147	1.387	1667.147
2.1500	0.4506	0.569	639.729	2.701	2487.974	1.368	1635.103	1.368	1635.103
2.2000	0.4611	0.573	640.129	2.681	2456.155	1.349	1604.245	1.349	1604.245
2.2500	0.4716	0.576	640.456	2.662	2425.463	1.331	1574.509	1.331	1574.509
2.3000	0.4821	0.580	640.717	2.643	2395.837	1.314	1545.835	1.314	1545.835
2.3500	0.4926	0.584	640.917	2.625	2367.222	1.297	1518.169	1.297	1518.169
2.4000	0.5030	0.588	641.061	2.608	2339.568	1.280	1491.458	1.280	1491.458
2.4500	0.5135	0.591	641.154	2.591	2312.825	1.264	1465.655	1.264	1465.655
2.5000	0.5240	0.595	641.200	2.574	2286.949	1.249	1440.715	1.249	1440.715
2.5500	0.5345	0.598	641.202	2.558	2261.899	1.233	1416.596	1.233	1416.596
2.6000	0.5450	0.601	641.166	2.542	2237.633	1.219	1393.258	1.219	1393.258
2.6500	0.5554	0.604	641.093	2.526	2214.116	1.204	1370.665	1.204	1370.665
2.7000	0.5659	0.607	640.986	2.511	2191.313	1.190	1348.781	1.190	1348.781
2.7500	0.5764	0.610	640.849	2.497	2169.192	1.177	1327.576	1.177	1327.576
2.8000	0.5869	0.613	640.684	2.482	2147.721	1.163	1307.017	1.163	1307.017
2.8500	0.5974	0.616	640.494	2.468	2126.873	1.150	1287.076	1.150	1287.076
2.9000	0.6078	0.619	640.279	2.455	2106.619	1.138	1267.726	1.138	1267.726
2.9500	0.6183	0.622	640.043	2.441	2086.934	1.125	1248.942	1.125	1248.942
3.0000	0.6288	0.625	639.788	2.428	2067.795	1.113	1230.699	1.113	1230.699
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

Notes: Run name   : YLDJAK03
       Date and time   : 27MAY99:14:26
       Computation of ref. F: Simple mean, age 3 - 7
       F-0.1 factor   : 0.9058
       F-max factor   : 2.5282
       F-0.1 reference F : 0.1898
       F-max reference F : 0.5299
       Recruitment   : Single recruit

Table 2.4.21.

If the 8861 days are allocated to the LL<100.		If the 8861 days are allocated to the ST<400.		If the 8861 X 2 days are allocated to the Jiggers.		If days are cut by half and 4430 used by LL<100	
0.054323	0.018182	0.032057	0.018182	0.028136	0.018182	0.050628	0.018182
0.070483	0.036364	0.037804	0.036364	0.030116	0.036364	0.05265	0.036364
0.078393	0.054545	0.042181	0.054545	0.034968	0.054545	0.054479	0.054545
0.082098	0.072727	0.058961	0.072727	0.042723	0.072727	0.065143	0.072727
0.082976	0.090909	0.065816	0.090909	0.051522	0.090909	0.071353	0.090909
0.083141	0.109091	0.070453	0.109091	0.05359	0.109091	0.073031	0.109091
0.085944	0.145455	0.07143	0.145455	0.055437	0.145455	0.087796	0.145455
0.094886	0.163636	0.075728	0.163636	0.055908	0.163636	0.090798	0.163636
0.095611	0.181818	0.080374	0.181818	0.056692	0.181818	0.092075	0.181818
0.097829	0.2	0.086315	0.2	0.060112	0.2	0.095691	0.2
0.10128	0.218182	0.088541	0.218182	0.061439	0.218182	0.097667	0.218182
0.105341	0.236364	0.091805	0.236364	0.062125	0.236364	0.098846	0.236364
0.107857	0.254545	0.095236	0.254545	0.062966	0.254545	0.099119	0.254545
0.110515	0.272727	0.097074	0.272727	0.065861	0.272727	0.102381	0.272727
0.114429	0.290909	0.098871	0.290909	0.068363	0.290909	0.103149	0.290909
0.115746	0.309091	0.100325	0.309091	0.069212	0.309091	0.103405	0.309091
0.116143	0.327273	0.101135	0.327273	0.070487	0.327273	0.111764	0.327273
0.117055	0.345455	0.102729	0.345455	0.073643	0.345455	0.114519	0.345455
0.11736	0.363636	0.103883	0.363636	0.078768	0.363636	0.115583	0.363636
0.117781	0.4	0.107648	0.4	0.082085	0.4	0.119144	0.4
0.12055	0.418182	0.10955	0.418182	0.082688	0.418182	0.121287	0.418182
0.121462	0.436364	0.111961	0.436364	0.08333	0.436364	0.123867	0.436364
0.122976	0.454545	0.114296	0.454545	0.083473	0.454545	0.126452	0.454545
0.1243	0.472727	0.115969	0.472727	0.08413	0.472727	0.127722	0.472727
0.127696	0.490909	0.117771	0.490909	0.084787	0.490909	0.131008	0.490909
0.134478	0.509091	0.119216	0.509091	0.085917	0.509091	0.131652	0.509091
0.144506	0.527273	0.12126	0.527273	0.086984	0.527273	0.134339	0.527273
0.149703	0.545455	0.121828	0.545455	0.087721	0.545455	0.135436	0.545455
0.155221	0.563636	0.12605	0.563636	0.091428	0.563636	0.136015	0.563636
0.157017	0.581818	0.130685	0.581818	0.093861	0.581818	0.136274	0.581818
0.157235	0.6	0.132395	0.6	0.094463	0.6	0.141061	0.6
0.181545	0.636364	0.134483	0.636364	0.095995	0.636364	0.143599	0.636364
0.186518	0.654545	0.139016	0.654545	0.114616	0.654545	0.144644	0.654545
0.198981	0.672727	0.142379	0.672727	0.116365	0.672727	0.145643	0.672727
0.20268	0.690909	0.143064	0.690909	0.122172	0.690909	0.153355	0.690909
0.215357	0.709091	0.144698	0.709091	0.130209	0.709091	0.157147	0.709091
0.221334	0.727273	0.150641	0.727273	0.132519	0.727273	0.162604	0.727273
0.227808	0.745455	0.156453	0.745455	0.13515	0.745455	0.167812	0.745455
0.235813	0.763636	0.158566	0.763636	0.13974	0.763636	0.179155	0.763636
0.250024	0.781818	0.163919	0.781818	0.146966	0.781818	0.191913	0.781818
0.26148	0.8	0.16675	0.8	0.14952	0.8	0.19553	0.8
0.269939	0.818182	0.169351	0.818182	0.156894	0.818182	0.205292	0.818182
0.273774	0.836364	0.201295	0.836364	0.187886	0.836364	0.227917	0.836364
0.295146	0.854545	0.210684	0.854545	0.191213	0.854545	0.232251	0.854545
0.302524	0.890909	0.215478	0.890909	0.204223	0.890909	0.245411	0.890909
0.339475	0.909091	0.239189	0.909091	0.226976	0.909091	0.257489	0.909091
0.341353	0.927273	0.261701	0.927273	0.231435	0.927273	0.265644	0.927273
0.34282	0.945455	0.268344	0.945455	0.242148	0.945455	0.314404	0.945455
0.353406	0.963636	0.280681	0.963636	0.252032	0.963636	0.341135	0.963636
0.407557	0.981818	0.292823	0.981818	0.273393	0.981818	0.381413	0.981818
0.457103	1	0.300282	1	0.293932	1	0.428975	1
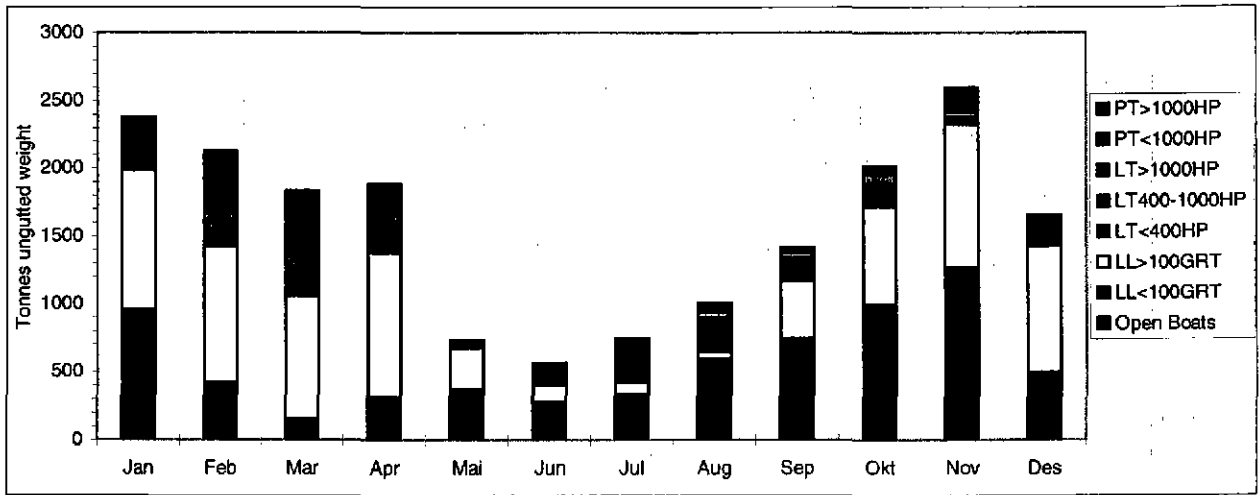
Figure A. Faroese landings of haddock from Vb1 in 1998 per fleet category. Tonnes ungutted weight.
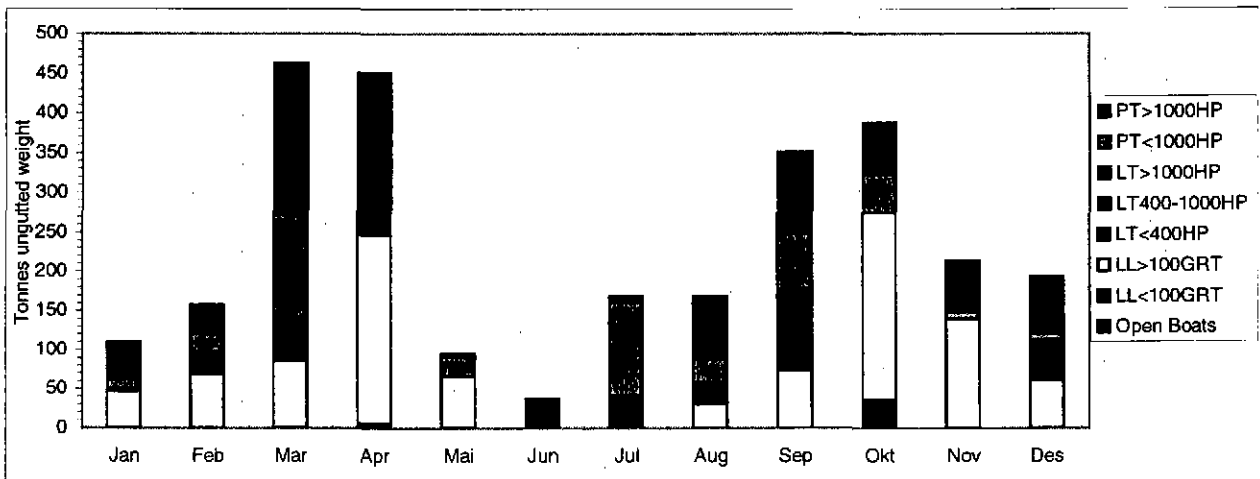
Figure B. Faroese landings of haddock from Vb2 in 1998 per fleet category. Tonnes ungutted weight.

Figure 2.4.1.

Mean weight at age of Faroe Haddock 1976-1998
Ages 2-7
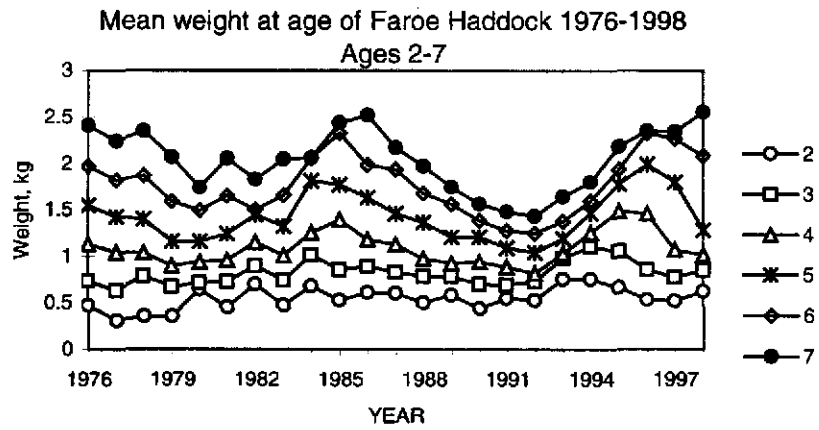
Figure 2.4.2. Mean weight at age for ages 2-7 of Faroe haddock 1976-1998.
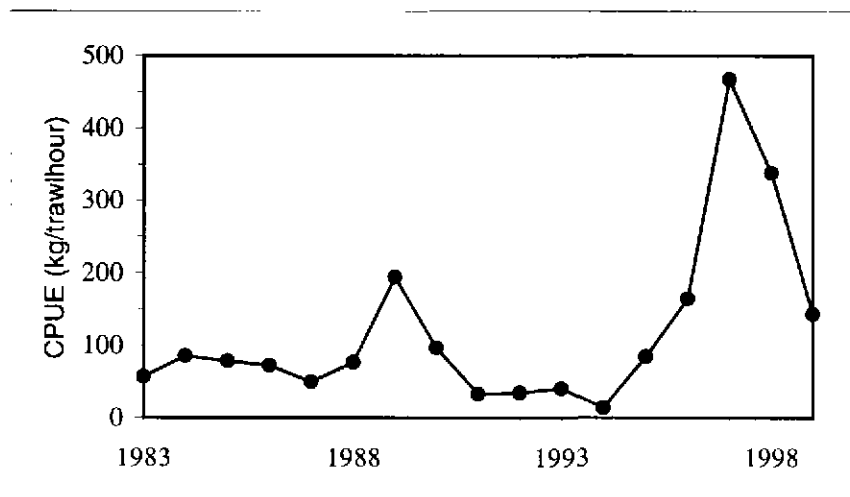
Figure 2.4.3. Faroe haddock. CPUE (kg/trawlhour) in the Faroese groundfish surveys in February-March 1983-1999.
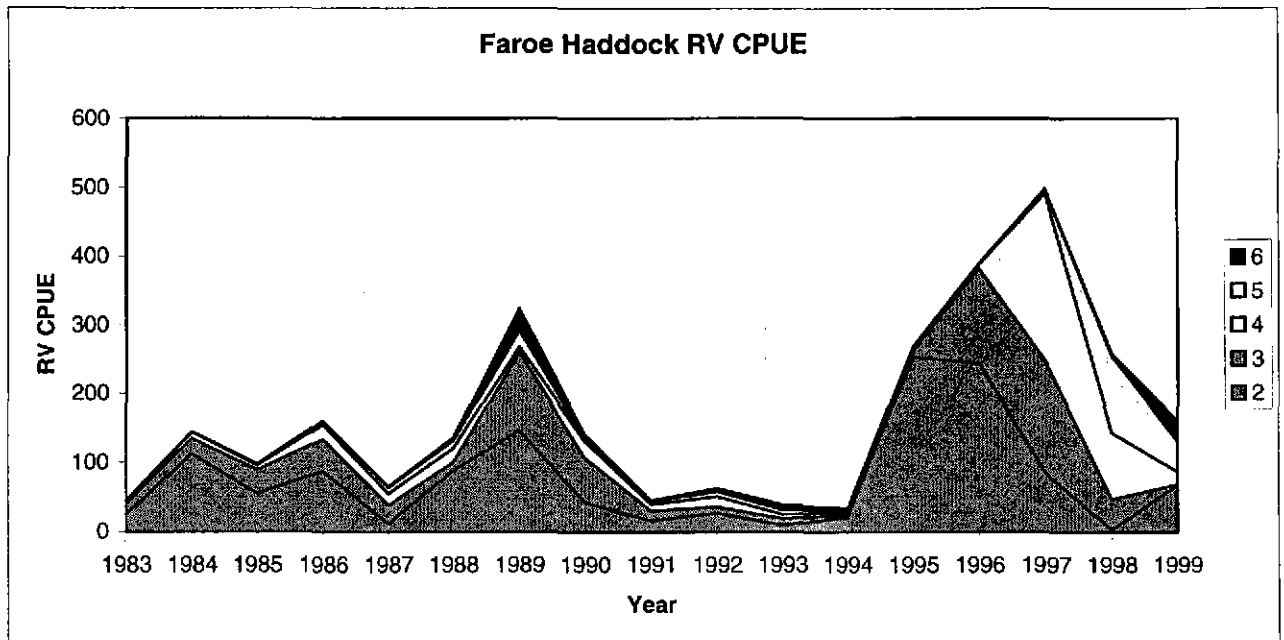
Figure 2.4.4.   Faroe haddock. Catch at age in numbers from the Faroese groundfish surveys 1983-1999.
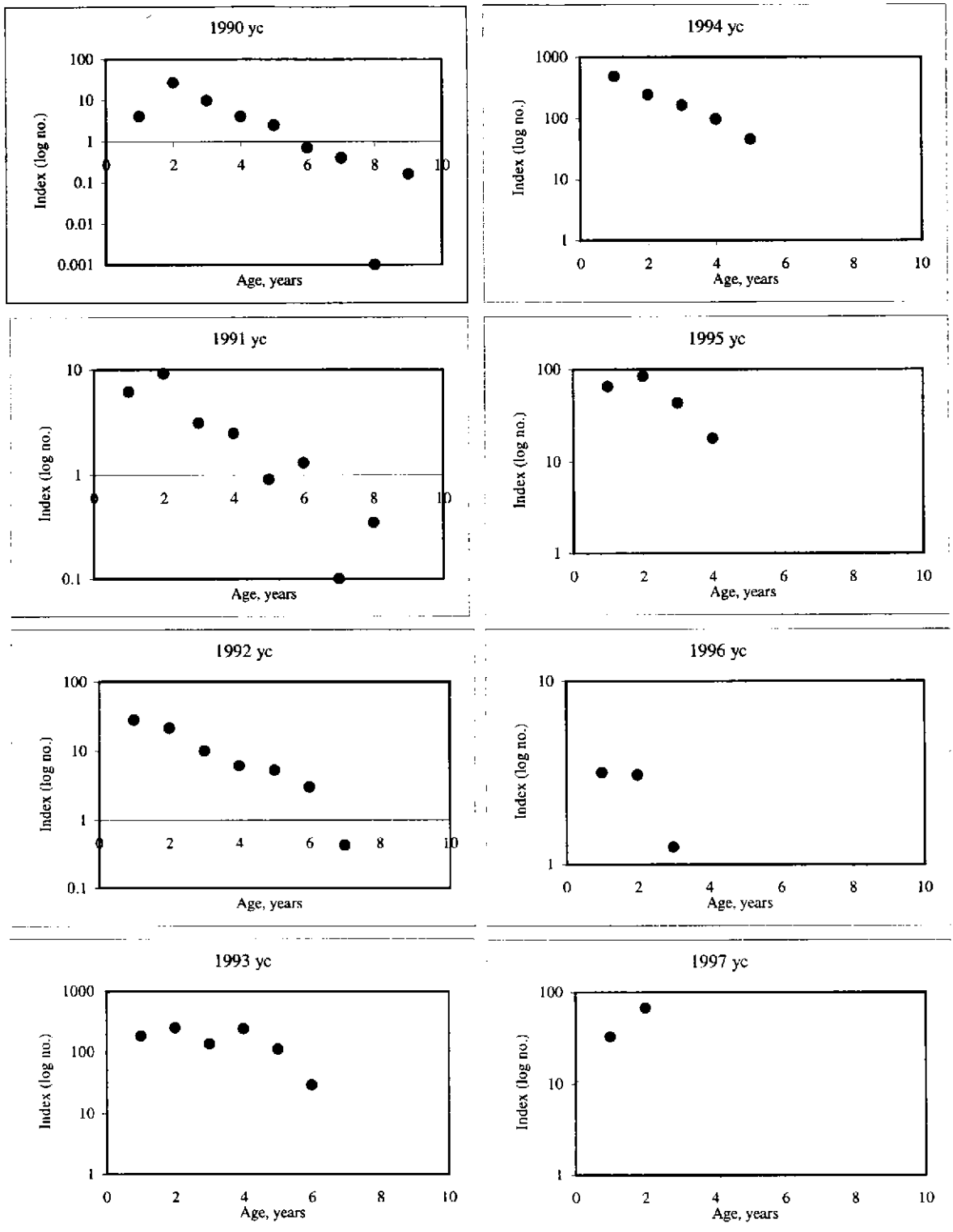
Figure 2.4.5. Faroe haddock. Stratified mean number at age from the Faroese ground fish survey in February-March.
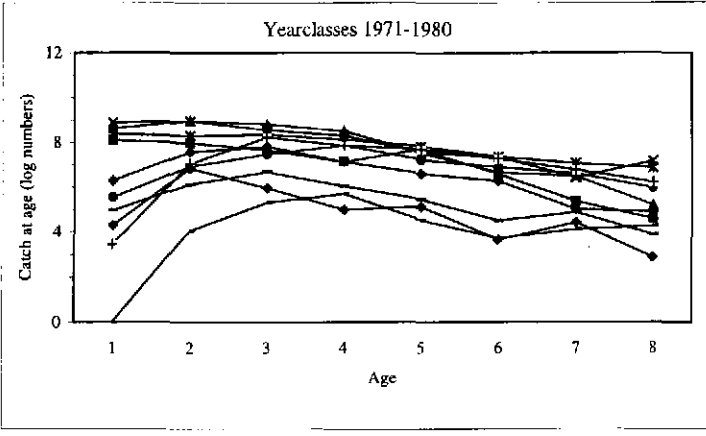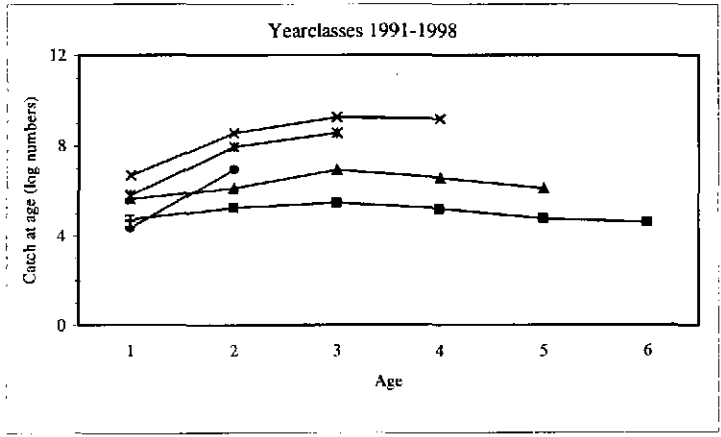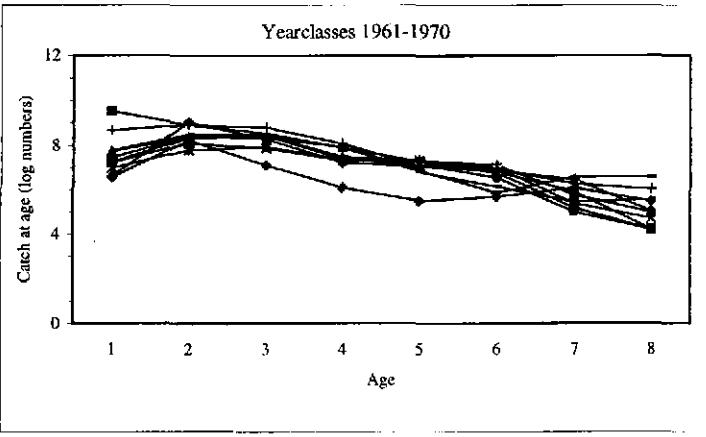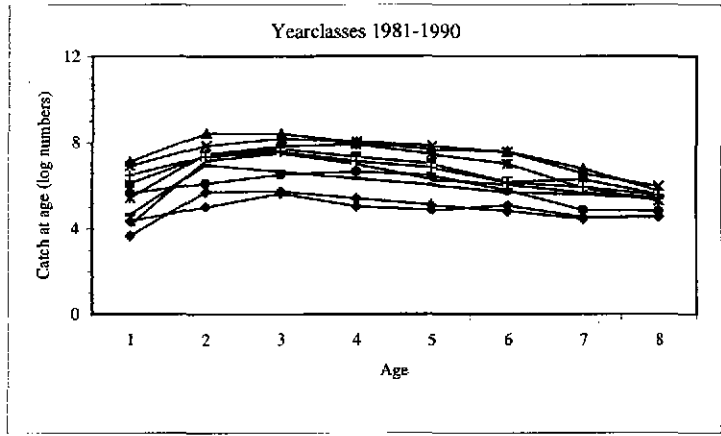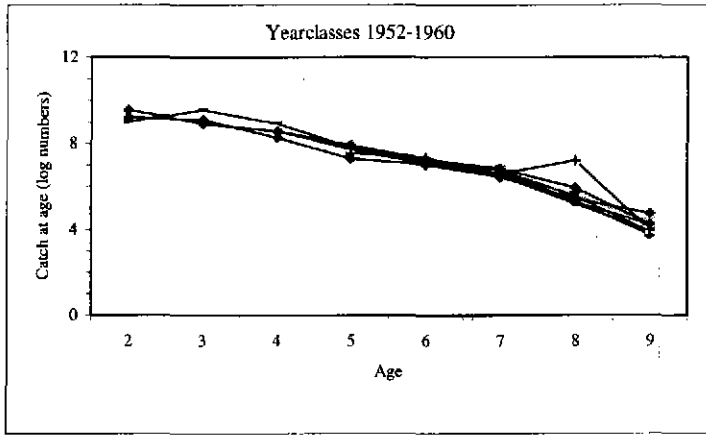
Figure 2.4.6.   Faroe haddock. Catch at age for the yearclasses 1952 onwards from the commersial landings.

Retrospective analysis Faroe Haddock XSA shrunk 0.7
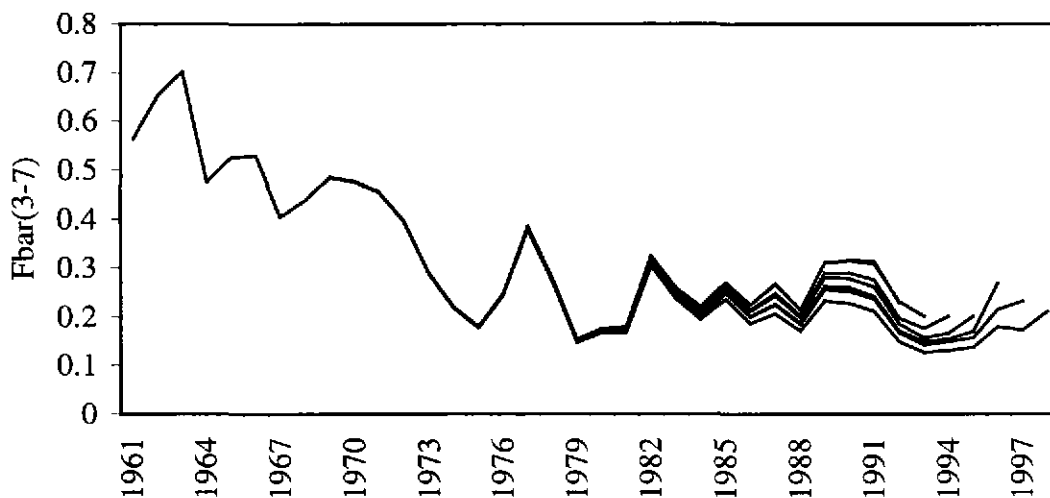
Figure 2.4.7.   Faroe haddock. Retrospective analysis of the 1999 XSA shrunk 0.7.

Figure 2.4.8 Fish Stock Summary – Haddock in the Faroe Grounds (Fishing Area Vb)

Yield and fishing mortality

(run: XSAJAK02)   **A**

Spawning stock and recruitment
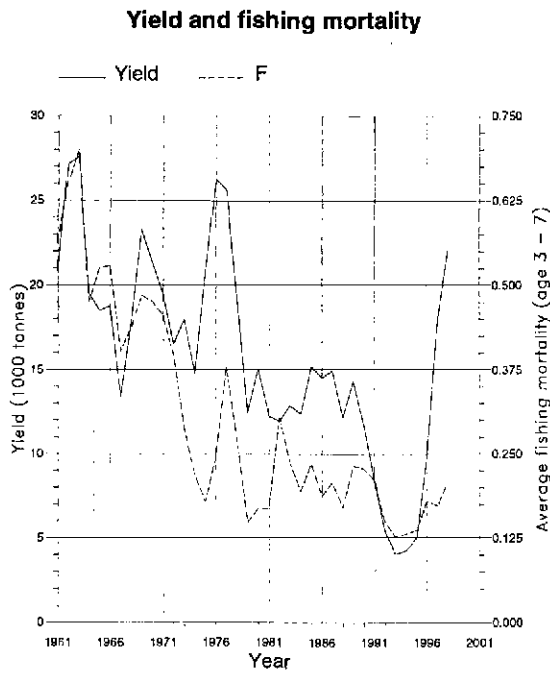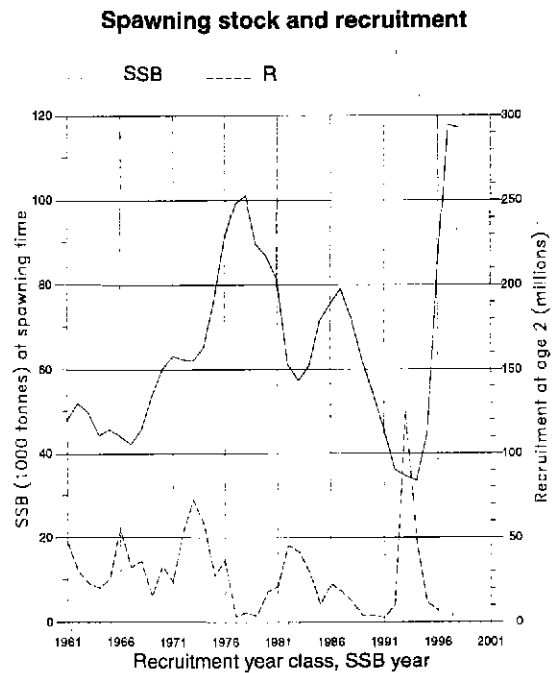
(run: XSAJAK02)   **B**

Figure 2.4.8 continued

Long term yield and spawning stock biomass
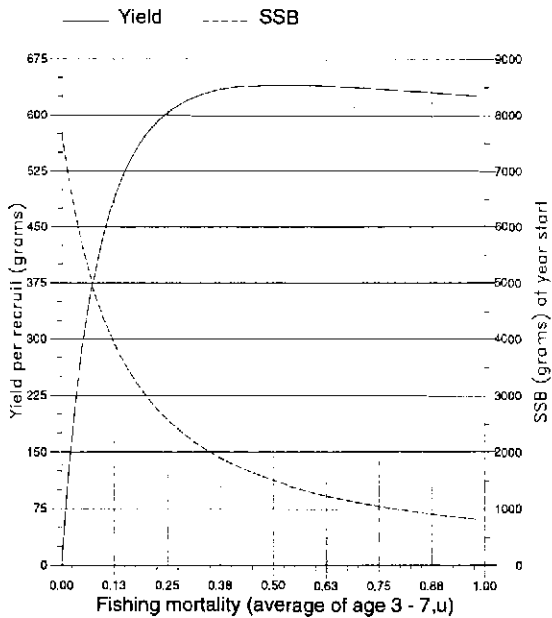
(run: YLDJAK03)   **C**

Short term yield and spawning stock biomass
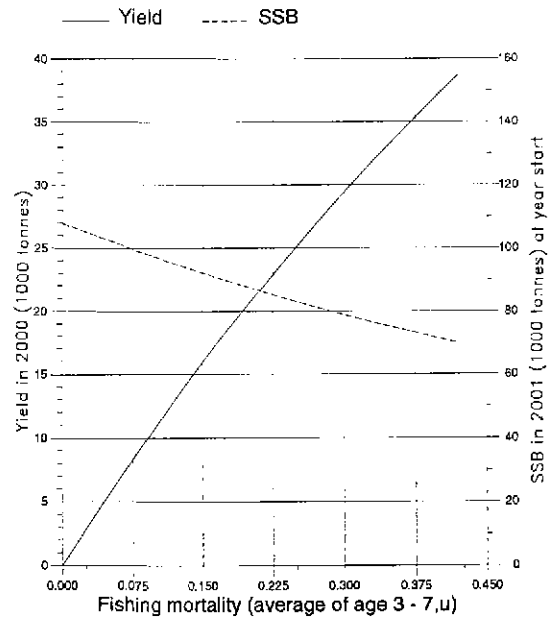
(run: MANJAK04)   **D**

Figure 2.4.9   Haddock in the Faroe Grounds (Fishing Area Vb)

Stock - Recruitment

(run: XSAJAK02)
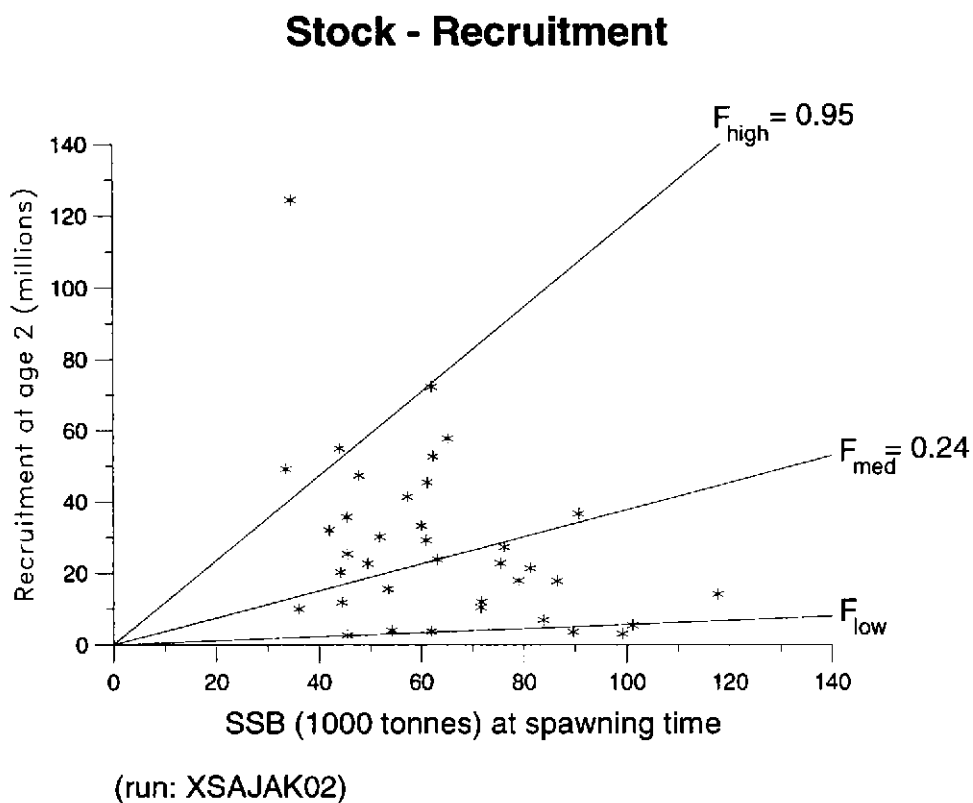
Figure 2.4.10

Figure 2.4.10. Faroe haddock. PA diagram.
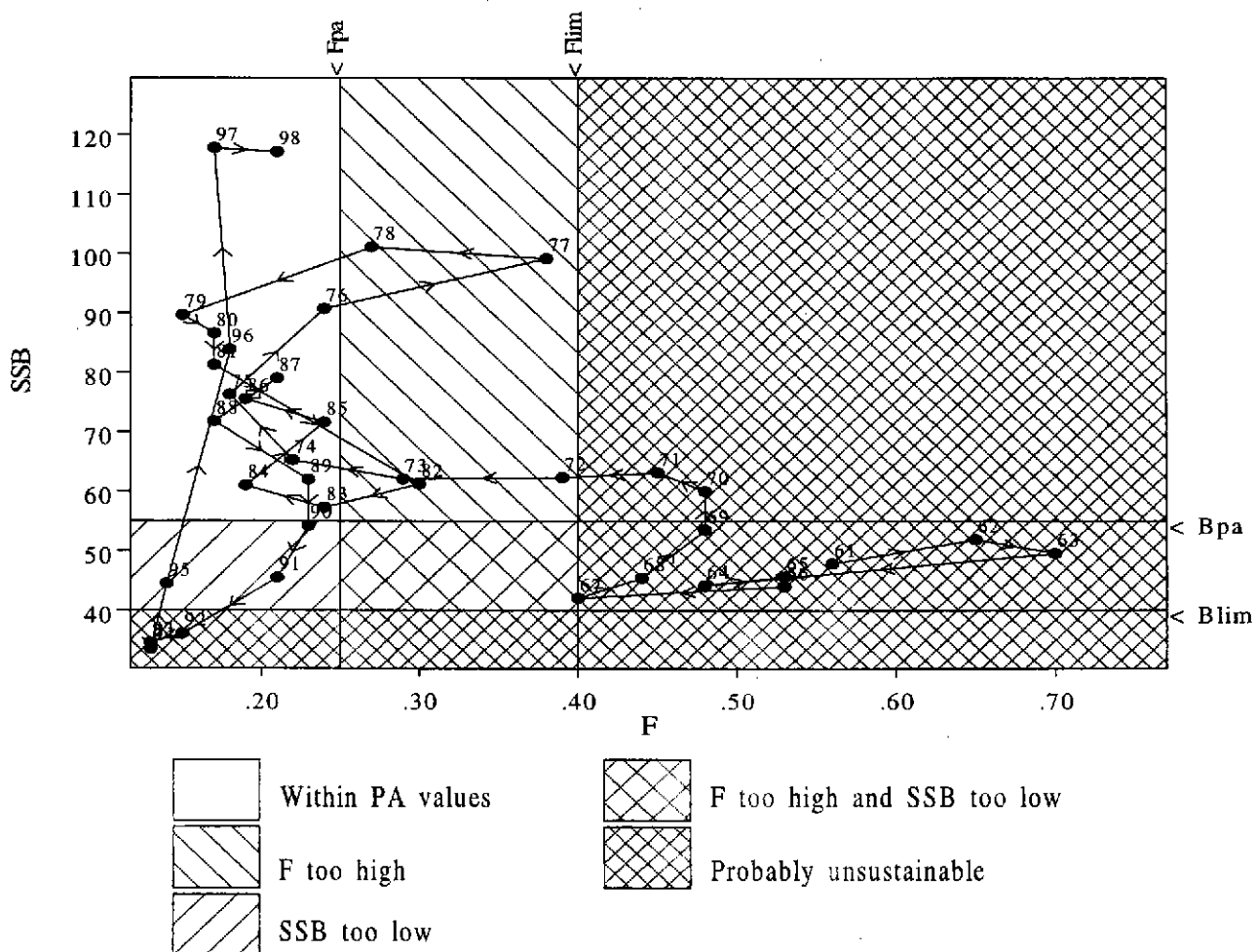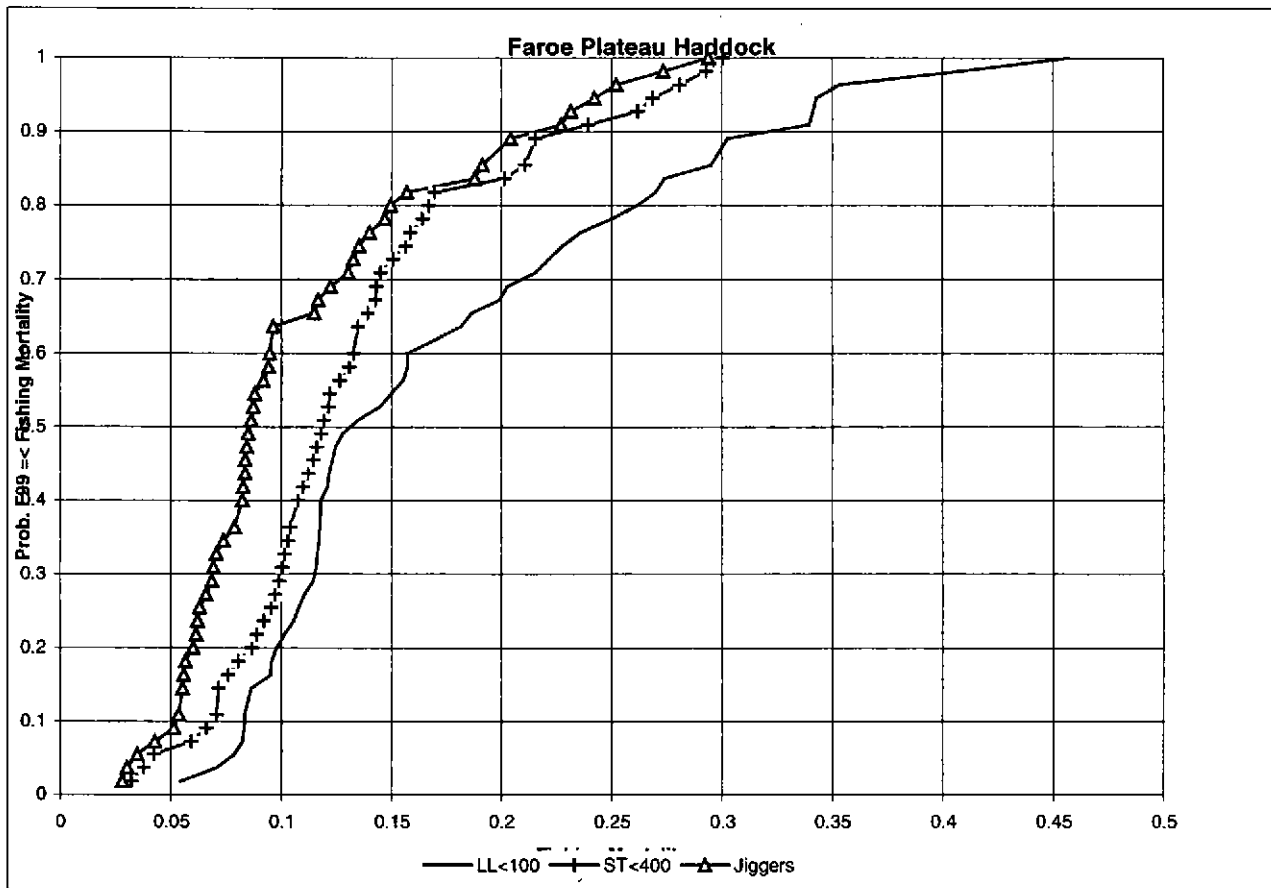
Figure   2.4.11   Faroe Plateau Haddock. Cumulative probability distribution of the 1999 fishing
mortalities under the current number of fishing days allocated for the
LL<100, ST<400, PT400-1000, PT>1000, LL>100, OPEN, and JIGGERS
Three options are presented where the 8861 days allocated to the LL < 100,
Jiggers and ST < 400 is either used entirely by the LL (solid line), the ST < 400
(line with +) or by the Jiggers (line with triangles, with 18640 days).

2.5 Faroe Saithe

2.5.1 Landings and trends in the fishery

Landings of saithe from the Faroese grounds (Division Vb) varied around 40 000 - 45 000 t in the period 1985-1989. In 1990 record landings of about 60 000 t were reached. Thereafter, landings decreased steadily to 20 000 t in 1996. Landings subsequently increased to 22 000 t in 1997 and to about 26 000 t in 1998 (Table 2.5.1.1).

With the introduction of the 200 miles EEZ in 1977 saithe has mainly been fished by Faroese vessels. The principal fleet consists of large pair trawlers (>1000 HP), which have a directed fishery for saithe, accounting for about 60% of the reported landings in 1993-98 (Tables 2.5.1.2, 2.5.1.3). The smaller pair trawlers (<1000 HP) have a more mixed fishery for saithe, and they account for about 20% of the total landings in 1993-98. During the last decade the proportion of saithe in the catches has increased for larger pair trawlers and jiggers but decreased for the smaller pair trawlers and larger single trawlers (> 1000 HP). Other vessels only have small catches of saithe as by-catch.

Total effort in terms of fishing days has increased in the period 1994-96 (Table 2.5.1.4). During the period 1985-91 the effort of the larger pair trawlers doubled. After this the effort decreased until 1994 but increased again from 1994-97. In the smaller pair trawler the effort in the period 1985-1991 was slightly fluctuated, then dropped until 1994 and increased again in 1995-96. From 1985-91 the effort of the large single trawlers declined by a third and has been relatively stable since. The effort of jiggers more than doubled in the period 1985-93 and doubled again in the period 1993-96.

A fishery management system based on days fished was introduced on June 1, 1996 as a result of widespread dissatisfaction with the quota management system that had been introduced in 1994 in the Faroes. Prior to 1996, practically all the fish from a given trip were landed at the same place. This practice changed in 1997-1998 for saithe, with a single trip being possibly landed in several sites. The landing slips are the main source of information on landings and number of fishing days, and for those trips that have been landed at several sites, a landing slip was completed at each landing site, each one recording the actual landings, but the total number of fishing days. The number of trips/landings in 1997 affected by this problem is being examined in order to try to rectify the problem. An adjustment was made for 1998, but the WG believes that the data have been 'over-corrected' resulting in an underestimate of the number of days for that year. The statistical office, whose responsibility it is to produce landings and effort statistics, could not guarantee that the changes in the number of days fished would be minor. It was therefore considered unwise to proceed with using data that are expected to change, possibly significantly, in the near future.

The CPUE derived from the Cuba trawlers, with effort either in days or in hours fished is not affected by the problem mentioned above because the effort comes from logbooks rather than from the landing slips and also because of a more direct contact with the captain of the boats involved.

Catches used in the assessment are presented in Table 2.5.1.1. These include foreign catches that have been reported to the Faroese Authorities but not officially reported to ICES. Also catches in that part of Sub-division IIa which lies immediately north of the Faroes have been included.

2.5.2 Catch at age

Catch at age are based on length and otolith samples from Faroese landings mostly in the fleet categories small and large pair trawlers and jiggers and landing statistic by fleet provided by the Faroese Authorities. Catch at age was calculated by each fleet and by each third of the year before the numbers where combined. The catch at age was raised by the foreign catches. Catch-at-age data in previous years were revised according to the final catch statistics (Table 2.5.2.1). The sampling intensity in 1998 was:

Gear	Number of otoliths	Length measurements	Weight measurements
PT > 1000 HK	2522	10905	2280
PT < 1000 HK	960	4325	779
Jiggers	1144	4453	660
Others	545	1868	479
Total	5171	21551	4198

2.5.3 Weight at age

Through the recorded period 1961-1998 mean weight at age has varied by a factor of about 2, e.g. with mean weights for age 5 between about 1.6 kg to 3.3 kg and for age 7 between 2.6 kg and 5.3 kg (Table 2.5.3.1 and Figure 2.5.3.1). In the period 1984-1986 mean weight at age values were generally high and dropped in the years 1990-1991. The mean weights increased in the period 1992-96 and have since decreased. The SOP for 1998 shows a discrepancy of 6% (Table 2.5.3.1).

2.5.4 Maturity at age

Maturity-at-age data is available from 1983 onward. Due to poor sampling in 1988 the proportion mature for this year was calculated as the average of the two adjacent years. A model was used, described in the 1993 Working Group report (ICES C.M.1993/Assess:18), for predicting maturity at age in order to alleviate some of the problems involved with the sampling data. The basic model used was a GLM with a Logit link function describing maturity at age as a function of age, year class strength, mean weight at age and a year effect. Of those factors, age and mean weight at age where significant and no other independent variables were needed. This model was applied to predict the entire maturity at age for 1982-1998 (Table 2.5.4.1 and Figure 2.5.4.1).

2.5.5 Stock assessment

2.5.5.1 Tuning and estimation of fishing mortality

Two tuning series derived from the same vessels were tried in the XSA runs. The first one was the commercial Cuba series consisting of total saithe catch at age and total effort in days, used in previous assessments, hereafter referred to as the Cuba Beta series. The series extends back to 1982 and consists of data from 8 pair trawlers greater than 1000 HP (Cuba trawlers) which specialise in fishing on saithe and account for 5 000-8 000 t of saithe each year (Table 2.5.5.1.1). The 1993 Working Group report (ICES C.M.1993/Assess:18) provides a description of how and why this particular series was chosen.

The second series was introduced in 1998, and consists of saithe catch at age and effort in hours, hereafter referred to as the Cuba Logbook series. In the Cuba Logbook series information for each haul was supplied and only those hauls where saithe consisted of more than 50% of the total catches of cod, haddock and saithe were used (Table 2.5.5.1.6).

XSA runs were made with each of the two series and the same parameters as last year. The log catchability residuals from the two series are compared age by age in Figure 2.5.5.1.1, and show very good agreement. The overall impression is that there is a trend in the data that it is similar for both series. The average fishing mortality for age groups 4-8 years for these two series are shown in Figures 2.5.5.1.2a and b. Both series give results that converge reasonably well and there are only small differences between the results of the two. It was agreed that new series should be further analysed by fitting a multivariate model to take into account factors such as year, season and area. It was thus decided to use only the Cuba Beta series in the assessment.

Catch and effort for the Cuba Beta Series is given in Fig. 2.5.5.1.1. The output from the XSA run using the Cuba Beta series is presented in Tables 2.5.5.1.2-5. The values of the S.E. log q are reasonably low for the principal year classes in both runs. XSA tuning for age groups 4-8 is presented in Figures 2.5.5.1.1a and b.

The fishing mortalities for 1961-1998 are presented in Table 2.5.5.1.3 The average fishing mortality for age groups 4-8 was 0.42 in 1998.

2.5.5.2 Stock estimates and recruitment

Recruitment in the 1980s was above or close to average (23 millions). The strongest year class since 1961 was produced in the 1980s and the average for the decade is about 33 million. Even though recruitment had been above average, the spawning stock biomass declined steeply from more than 100 000t in 1989 to about 60 000t in 1992 as a result of the two highest landings of the 1961 to 1998 period reported in 1990 and 1991. The historically low SSB persisted in 1992-1998 (Table 2.5.5.1.5 and Figure 2.5.5.2.1). The 1991-1994 year classes are all estimated to be below average.

2.5.6 Prediction of catch and biomass

2.5.6.1 Input data

Input data for prediction with management options are presented in Table 2.5.6.1.1 and input data for the yield per recruit calculations are given in Table 2.5.6.1.2.

Population numbers for the short term prediction up to the 1994 year class are from the final VPA run whereas values for the 1995-1997 year classes are the geometric mean of the three most recent years. The input for mean weight for the stock and for the catches are the same for 1999-2001. For ages 3-5 they were set equal to the average for 1996-98 and for ages 6 to 12+ they were set equal to the 1998 values. In the long term prediction (yield per recruit) mean weight for 1961-1997 was used.

In the short term prediction the fitted proportion mature values for 1998 were used for that year and for 1999 and 2000 the average of fitted values for 1983-1997 were used. This long term mean was also used in the long term prediction.

For all three years in the short term prediction the average exploitation pattern in the final VPA for 1996-98, rescaled to Fbar (age 4-8) in 1998, was used. In the long term prediction the exploitation pattern was set equal to the average of exploitation patterns for 1961-1998 rescaled to Fbar (ages 4-8) in 1998.

2.5.6.2 Biological reference points

The yield per recruit and spawning stock biomass per recruit curves are presented in Figure 2.5.6.2.1C. Compared to the 1998 average fishing mortality of 0.42 in age groups 4-8 in 1998, F_{max} is 0.43, $F_{0.1}$ is 0.17, F_{med} is 0.31 and F_{high} is 0.56 (Table 2.5.6.2.1, Figure 2.5.6.2.1C and Figure 2.5.6.2.2).

In May 1998, ACFM set B_{lim} at 85 000t, the previously defined MBAL, and correspondingly F_{lim} at 0.40. ACFM proposed that F_{pa} be set at 0.28 which is consistent with both estimates derived from F_{lim} and F_{med} and that B_{pa} be set at 110 000t.

The stock-recruitment scatter plot from the current assessment supports the conclusion that lower recruitment have been observed at SSBs below 80 000-90 000t. However, the highest recruitments have been observed at SSBs smaller than the proposed B_{pa}. It is therefore suggested that B_{lim} be reset to the lowest observed SSB, that is about 60 000t and that B_{pa} be set at the former MBAL = 85 000t. In 1998 the SSB reached a record low of 61 000 t.

The history of the stock/fishery in relation to the four reference points can be seen in Figure 2.5.6.2.3.

2.5.6.3 Projection of catch and biomass

Results from predictions with management option are presented in Table 2.5.6.3.1 and Figure 2.5.6.2.1D. With unchanged fishing mortality in 1999 and 2000 catches will be at 24 000 t and 21 000 t respectively and the spawning stock biomass will decrease from 50 000 to 48 000 t for the period 1999-2001.

Results from the yield per recruit estimates are shown in Table 2.5.6.3.2 and Figure 2.5.6.2.1C.

2.5.7 Management considerations

The spawning stock biomass is continuing its downward trend and is at a record-low which is far below B_{lim}. If the present fishing mortality is maintained the spawning stock will drop even further. Even with a drastic reduction in fishing mortality, the spawning stock will still not recover in the short term until stronger year classes are produced.

For the fishing year 1 September 1997 to 31 August 1998, 6839 days have been allocated to the pair trawlers and 22444 days to the longliners and jiggers. The cumulative probability distribution of F for these three fleet categories is presented in Figure 2.5.7.1. These fleets have accounted for 82.2% of the total catches in 1998 (Table 2.5.1.3). The single trawlers > 400 HP caught 16.5% of the total catch so the F exerted by this fleet of 0.06 should be added to the fishing mortality column to reflect the activity of this fleet. The result shows that there is an approximately 50% probability that the fishing mortality in 1999/2000 will be about 0.40 (0.35+0.06) under the present allocation of fishing days. A decrease to 60% of the allocated number of days would be required to have an 80% probability that F would be at the proposed $F_{pa} = .28$ or less.

2.5.8   Comments on the assessment

The tuning series is the same as last year, and the XSA settings are also the same.

There still is no independent recruitment index to predict recruits in the first year in the short term prediction. An attempt should be done to analyse the correlation between survey index and stock in number from VPA. A programme for echo sounding and biological sampling of age group 0-3 is in progress and might give a series that can serve this purpose in near future.

The commercial pair trawler series (Cuba trawlers) is still the series showing the lowest variation even if the unit of effort (day) is rather crude. A new Cuba series based on logbooks with the unit of effort in hours was presented. This series seems promising but needs to be analysed further with respect to the influence of season, area, etc.

The question of migration has been brought up previously but still no tangible attempt has been made to measure the rate of migration of saithe between management areas.

Table 2.5.1.1. Saithe in the Faroes. Nominal catches (t) by countries, 1985-98 as officially reported to ICES

Country	1985	1986	1987	1988	1989	1990	1991
Denmark	-	21	255	94	-	2	-
Faroe Islands	42,874	40,139	39,301	44,402	43,624	59,821	53,321
France	839	87	153	313	-	-	-
German Dem.Rep.	31	-	-	-	9		-
German Fed. Rep.	227	105	49	74	20	15	32
Netherlands	-	-	-	-	22	67	65
Norway	-	24	14	52	51	46	103
UK (Eng. & W.)	4	-	108	-	-	-	5
UK (Scotland)	630	1,340	140	92	9	33	79
USSR	-	-	-	-	-	30	-
Total	44,605	41,716	40,020	45,027	43,735	60,014	53,605
Working Group estimate[4,5]	44,605	41,716	40,020	45,285	44,477	61,628	54,858

Country	1992	1993	1994	1995	1996	1997	1998[1]
Estonia	-	-	-	-	-	16	-
Faroe Islands	35,979	32,719	32,406	26,918	19,267	21,721	25,995
France[3]	120	75	19	10	12	9	17
Germany	5	2	1	41	3	5	-
Norway	85	32	156	10	96	67	54
UK (Eng. & W.)	74	279	151	21	53	-	...
UK (Scotland)	98	425	438	200	580	460	...
United Kingdom							343
USSR/Russia[2]	12	-	-	-	18	28	-
Total	36,373	33,532	33,171	27,200	20,029	22,306	26,409
Working Group estimate[4,5]	36,487	33,554	33,193	27,222	20,029	22,320	26,409

[1] Preliminary.

[2] As from 1991.

[3] Quantity unknown 1989-91.

[4] Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

[5] Includes French catches from Division Vb, as reported to the Faroese coastal guard service.

Table 2.5.1.2. Total Faroese landings (gutted weight) of saithe in the Faroe grounds (rightmost column) and the contribution (%) by each fleet category.

Year	Open boats	Long-liners < 100 GRT	Single trawl < 400 HP	Gill	Jiggers	Single trawl 400-1000 HP	Single trawl >1000 HP	Pair trawl <1000 HP	Pair trawl >1000HP	Long-liners > 100 GRT	Indust-rial trawlers	Others	Total gutted weight
1985	0.2	0.1	0.1	0.0	2.6	6.6	33.7	28.2	28.2	0.1	0.2	0.2	38377
1986	0.3	0.2	0.1	0.1	3.6	2.8	27.3	27.5	36.5	0.1	0.7	0.9	36132
1987	0.7	0.1	0.3	0.4	5.6	4.1	20.4	22.8	44.2	0.1	1.1	0.0	35700
1988	0.4	0.3	0.1	0.3	6.5	6.8	20.8	19.6	43.6	0.1	1.3	0.1	39586
1989	0.9	0.1	0.3	0.2	9.3	5.4	17.7	23.5	41.1	0.1	1.3	0.0	40132
1990	0.6	0.2	0.2	0.2	7.4	3.9	19.6	24.0	42.8	0.2	0.9	0.0	54721
1991	0.6	0.1	0.1	0.6	9.8	1.3	13.9	26.5	46.2	0.1	0.8	0.0	48910
1992	0.4	0.4	0.0	0.0	10.5	0.5	7.1	24.4	55.6	0.1	1.0	0.0	31472
1993	0.6	0.2	0.1	0.0	9.3	0.6	6.5	21.4	60.6	0.1	0.7	0.0	29111
1994	0.4	0.4	0.1	0.0	12.6	1.1	6.8	18.5	59.1	0.2	0.7	0.0	29194
1995	0.2	0.1	0.4	0.0	9.6	0.9	9.9	17.7	60.9	0.3	0.0	0.0	24248
1996	0.0	0.0	0.1	0.0	9.2	1.2	6.8	23.7	58.6	0.2	0.0	0.0	17353
1997	0.0	0.1	0.1	0.0	8.9	2.5	10.7	17.8	58.9	0.4	0.4	0.0	19561
1998	0.1	0.4	0.1	0.0	8.1	2.8	13.8	16.5	57.6	0.3	0.4	0.0	21912

Table 2.5.1.3. Catches of saithe in the Faroe grounds in percent of total catch of each fleet 1985-98. Average percents weighted by the total catch are shown at the bottom, as well as average total catch.

Year	Open boats	Long-liners < 100 GRT	Single trawl < 400 HP	Gill	Jiggers	Single trawl 400-1000 HP	Single trawl >1000 HP	Pair trawl <1000 HP	Pair trawl >1000HP	Long-liners > 100 GRT	Indust-rial trawlers	Others	All fleets	Total gutted weight all species
1985	1.3	0.2	0.7	3.3	36.6	35.0	36.4	54.3	71.2	0.3	22.9	2.7	31.5	121995
1986	2.6	0.6	1.2	10.0	55.2	26.2	29.0	41.5	64.4	0.3	35.1	8.5	31.5	114526
1987	5.6	0.5	4.9	24.6	71.5	35.6	26.8	45.3	73.1	0.4	39.2	0.0	33.0	108094
1988	17.1	1.0	2.1	15.5	58.5	49.5	27.1	48.9	75.2	0.4	41.9	0.5	37.0	106858
1989	18.4	0.3	6.9	10.9	62.6	47.2	26.9	70.8	82.9	0.6	35.8	10.2	39.7	101111
1990	26.6	1.1	6.7	35.2	76.1	27.8	39.4	86.8	88.4	1.3	2.0	0.1	38.0	144013
1991	30.4	0.7	4.0	59.5	85.7	36.3	27.7	87.3	87.7	0.8	2.0	0.1	39.6	123638
1992	31.2	2.6	1.0	0.0	86.5	21.8	10.4	82.0	74.4	0.7	1.4	0.0	21.4	147343
1993	50.5	1.9	2.6	0.0	84.4	18.7	12.1	77.9	76.1	0.8	0.7	0.0	28.0	104119
1994	30.3	4.0	1.9	0.1	69.9	29.7	14.0	78.2	74.9	1.1	1.3	0.0	31.2	93588
1995	5.8	0.3	4.0	0.3	34.1	12.4	12.4	65.2	63.3	0.8	4.1	0.0	17.9	135670
1996	0.3	0.1	0.8	0.2	17.3	7.6	9.4	46.7	38.7	0.3	0.3	0.0	13.4	129240
1997	0.7	0.1	1.0	0.1	33.8	12.9	16.5	47.5	43.8	0.4	0.6	0.0	11.8	165893
1998	0.0	0.7	0.4	0.1	52.5	16.3	29.8	57.0	44.3	0.3	0.0	0.0	17.7	146848
Weight Mean	14.9	1.0	2.6	11.2	57.9	25.7	22.7	63.4	67.2	0.6	11.9	1.4	27.0	124496.4

Table 2.5.1.4. Effort (days) by various Faroese fleet categories in the Faroe grounds. Effort not availably for 1997 and 1998

Year	Open boats	Long-liners < 100 GRT	Single trawl < 400 HP	Gill	Jiggers	Single trawl 400-1000HP	Single trawl >1000 HP	Pair trawl <1000 HP	Pair trawl >1000 HP	Long-liners > 100 GRT	Indust-rial trawlers	Others	Total
1985	2941	7558	2171	108	3348	2077	5565	5389	3193	2973			35323
1986	2941	6692	1509	123	2745	1221	5402	6573	4433	2176			33815
1987	2941	6728	1297	201	2973	1531	4389	6314	5546	2915			34835
1988	2660	8760	1261	234	8104	2261	4907	6026	6034	3203			43450
1989	3948	12677	1345	208	10663	2093	4939	5175	5127	3369			49544
1990	3228	14321	1013	157	9510	1999	4020	5444	7491	3521			50704
1991	3204	14656	940	183	10215	1239	4005	5828	7875	3573			51718
1992	1913	10508	1032	181	10030	628	4159	3985	7243	2892			42571
1993	1611	7424	1853	561	7940	1211	3566	2851	6335	2046			35398
1994	2283	7979	1722	1883	13484	885	3828	2148	6262	2841			43315
1995	3321	9742	1985	2052	18721	1342	4317	2594	6752	3959			54785
1996	3959	12636	1475	2407	23663	1309	3780	3396	7285	4285			64195
1997													
1998													

Table 2.5.1.5. CPUE (t/day) by various Faroese fleet categories in the Faroe grounds. CPUE not avaiably for 1997 and 1998.

Year	Open boats	Long-liners < 100 GRT	Single trawl < 400 HP	Gill	Jiggers	Single trawl 400-1000 HP	Single trawl >1000 HP	Pair trawl <1000 HP	Pair trawl >1000 HP	Long-liners > 100 GRT	Indust-rial trawlers	Others
1985	0.030	0.005	0.011	0.120	0.293	1.211	2.322	2.008	3.384	0.009		
1986	0.036	0.010	0.021	0.439	0.472	0.822	1.827	1.509	2.972	0.010		
1987	0.083	0.008	0.089	0.781	0.668	0.959	1.658	1.288	2.847	0.013		
1988	0.065	0.012	0.032	0.483	0.318	1.191	1.676	1.286	2.861	0.010		
1989	0.090	0.004	0.096	0.433	0.349	1.026	1.441	1.824	3.221	0.018		
1990	0.096	0.009	0.083	0.777	0.425	1.062	2.672	2.411	3.129	0.029		
1991	0.090	0.004	0.043	1.536	0.469	0.504	1.696	2.227	2.868	0.018		
1992	0.065	0.012	0.008	0.000	0.329	0.240	0.541	1.926	2.414	0.013		
1993	0.104	0.008	0.021	0.000	0.340	0.135	0.527	2.187	2.784	0.014		
1994	0.057	0.014	0.021	0.001	0.272	0.379	0.521	2.518	2.754	0.022		
1995	0.015	0.002	0.046	0.002	0.124	0.160	0.557	1.653	2.188	0.019		
1996	0.001	0.000	0.016	0.002	0.067	0.163	0.312	1.213	1.396	0.009		
1997												
1998												

Table 2.5.2.1. Saithe in the Faroe Grounds. Catch in number (thousands).

```
Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99  17:39:41
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```
    Table   1     Catch numbers at age
Numbers*10**-3
```

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
3,	183,	562,	614,	684,	996,	488,	595,	614,
4,	379,	542,	340,	1908,	850,	1540,	796,	1689,
5,	483,	617,	340,	1506,	1708,	1201,	1364,	1116,
6,	403,	495,	415,	617,	965,	1686,	792,	1095,
7,	216,	286,	406,	572,	510,	806,	1192,	548,
8,	129,	131,	202,	424,	407,	377,	473,	655,
9,	116,	129,	174,	179,	306,	294,	217,	254,
10,	82,	113,	158,	150,	201,	205,	190,	128,
11,	45,	71,	94,	100,	156,	156,	97,	89,
+gp,	82,	105,	274,	174,	285,	225,	140,	187,
TOTALNUM,	2118,	3051,	3017,	6314,	6384,	6978,	5856,	6375,
TONSLAND,	9592,	10454,	12693,	21893,	22181,	25563,	21319,	20387,
SOPCOF %,	108,	93,	96,	99,	92,	98,	104,	102,

(Note: "0" prefix before TOTALNUM row)

```
    Table   1     Catch numbers at age
Numbers*10**-3
```

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
3,	1191,	1445,	2857,	2714,	2515,	3504,	2062,	3178,	1609,	611,
4,	2086,	6577,	3316,	1774,	6253,	4126,	3361,	3217,	2937,	1743,
5,	2294,	1558,	5585,	2588,	7075,	4011,	3801,	1720,	2034,	1736,
6,	1414,	1478,	1005,	2742,	3478,	2784,	1939,	1250,	1288,	548,
7,	1118,	899,	828,	1529,	1634,	1401,	1045,	877,	767,	373,
8,	589,	730,	469,	1305,	693,	640,	714,	641,	708,	479,
9,	580,	316,	326,	1017,	550,	368,	302,	468,	498,	466,
10,	239,	241,	164,	743,	403,	340,	192,	223,	338,	473,
11,	115,	86,	100,	330,	215,	197,	193,	141,	272,	407,
+gp,	190,	132,	100,	210,	186,	265,	298,	287,	330,	535,
TOTALNUM,	9816,	13462,	14750,	14952,	23002,	17636,	13907,	12002,	10781,	7371,
TONSLAND,	27437,	29110,	32706,	42663,	57431,	47188,	41576,	33065,	34835,	28138,
SOPCOF %,	97,	96,	109,	100,	120,	113,	116,	107,	104,	100,

(Note: "0" prefix before TOTALNUM row; "1" at bottom left)

Table 2.5.2.1 (Cont'd

Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99 17:39:42

Table   1   Catch numbers at age
Numbers*10**-3

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
3,	287,	996,	411,	387,	2483,	368,	1224,	1167,	1581,	866,
4,	933,	877,	1804,	4076,	1103,	11067,	3990,	1997,	5793,	2950,
5,	1341,	720,	769,	994,	5052,	2359,	5583,	4473,	3827,	9555,
6,	1033,	673,	932,	1114,	1343,	4093,	1182,	3730,	2785,	2784,
7,	584,	726,	908,	380,	575,	875,	1898,	953,	990,	1300,
8,	414,	284,	734,	417,	339,	273,	273,	1077,	532,	621,
9,	247,	212,	343,	296,	273,	161,	103,	245,	333,	363,
10,	473,	171,	192,	105,	98,	52,	38,	104,	81,	159,
11,	368,	196,	92,	88,	98,	65,	26,	67,	43,	27,
+gp,	691,	786,	1021,	902,	540,	253,	275,	158,	97,	60,
0 TOTALNUM,	6371,	5641,	7206,	8759,	11904,	19566,	14592,	13971,	16062,	18685,
TONSLAND,	27246,	25230,	30103,	30964,	39176,	54665,	44605,	41716,	40020,	45285,
SOPCOF %,	102,	99,	96,	96,	100,	100,	94,	94,	96,	99,

Table   1   Catch numbers at age
Numbers*10**-3

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
3,	451,	294,	1030,	521,	1316,	690,	398,	297,	343,	138,
4,	5981,	3833,	5125,	4067,	2611,	3961,	1019,	1087,	829,	1588,
5,	5300,	10120,	7452,	3667,	4689,	2663,	3469,	1146,	2432,	1854,
6,	7136,	9219,	5544,	2679,	1665,	2368,	1836,	1449,	1761,	3326,
7,	793,	5070,	3487,	1373,	858,	746,	1177,	1156,	1330,	1306,
8,	546,	477,	1630,	894,	492,	500,	345,	521,	622,	663,
9,	185,	123,	405,	613,	448,	307,	241,	132,	164,	363,
10,	83,	61,	238,	123,	245,	303,	192,	77,	71,	75,
11,	55,	60,	128,	63,	54,	150,	104,	64,	29,	32,
+gp,	39,	79,	118,	108,	52,	49,	117,	82,	100,	68,
0 TOTALNUM,	20569,	29336,	25157,	14108,	12430,	11737,	8898,	6011,	7681,	9413,
TONSLAND,	44477,	61561,	54863,	36487,	33554,	33193,	27222,	20029,	22320,	26409,
SOPCOF %,	97,	98,	99,	105,	102,	102,	102,	103,	100,	106,

1

Table 2.5.3.1. Saithe in the Faroe Grounds. Catch weights at age (kg).

```
Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99  17:39:42
```

Table 2   Catch weights at age (kg)

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
3,	1.4300,	1.2730,	1.2800,	1.1750,	1.1810,	1.3610,	1.2730,	1.3020,
4,	2.3020,	2.0450,	2.1970,	2.0550,	2.1250,	2.0260,	1.7800,	1.7370,
5,	3.3480,	3.2930,	3.2120,	3.2660,	2.9410,	3.0550,	2.5340,	2.0360,
6,	4.2870,	4.1910,	4.5680,	4.2550,	4.0960,	3.6580,	3.5720,	3.1200,
7,	5.1280,	5.1460,	5.0560,	5.0380,	4.8780,	4.5850,	4.3680,	4.0490,
8,	6.1550,	5.6550,	5.9320,	5.6940,	5.9320,	5.5200,	5.3130,	5.1830,
9,	7.0600,	6.4690,	6.2590,	6.6620,	6.3210,	6.8370,	5.8120,	6.2380,
10,	7.2650,	6.7060,	8.0000,	6.8370,	7.2880,	7.2650,	6.5540,	7.5200,
11,	7.4970,	7.1500,	7.2650,	7.6860,	8.0740,	7.6620,	7.8060,	8.0490,
+gp,	9.3400,	9.0240,	8.8590,	8.5590,	8.9040,	9.2230,	8.1490,	9.0920,
0 SOPCOFAC,	1.0779,	.9342,	.9590,	.9933,	.9220,	.9769,	1.0357,	1.0194,

Table 2   Catch weights at age (kg)

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
3,	1.1880,	1.2440,	1.1010,	1.0430,	1.0880,	1.4300,	1.1140,	1.0880,	1.2230,	1.4930,
4,	1.6670,	1.4450,	1.3160,	1.4850,	1.4610,	1.5250,	1.6580,	1.6760,	1.6410,	2.3240,
5,	2.3020,	2.2490,	1.8180,	2.0550,	1.5820,	2.2070,	2.2600,	2.8780,	2.6600,	3.0680,
6,	2.8530,	2.8530,	2.9780,	2.8290,	2.2490,	2.5000,	3.1200,	3.0810,	3.7900,	3.7460,
7,	3.6730,	3.5150,	3.7020,	3.7910,	3.6870,	3.1200,	3.5570,	4.2870,	4.2390,	4.9130,
8,	5.0020,	4.4180,	4.2710,	4.1750,	4.3850,	4.6010,	4.0960,	4.3520,	5.5970,	4.3680,
9,	5.7140,	5.4440,	5.3880,	4.8080,	5.1280,	5.5590,	5.1280,	4.7900,	5.3500,	5.2760,
10,	6.4050,	5.7330,	5.9720,	5.2940,	5.2760,	5.7140,	6.0940,	5.9120,	5.9120,	5.8320,
11,	6.5540,	6.6620,	6.4900,	6.9480,	6.7270,	6.2590,	7.1960,	6.6190,	6.8370,	6.0530,
+gp,	8.0870,	8.5840,	8.0050,	7.5150,	8.0310,	8.0100,	8.5980,	7.8940,	7.7080,	7.5760,
0 SOPCOFAC,	.9663,	.9634,	1.0935,	1.0043,	1.2006,	1.1296,	1.1607,	1.0680,	1.0442,	1.0049,
1										

```
Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99  17:39:42
```

Table 2   Catch weights at age (kg)

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
3,	1.2200,	1.2300,	1.3100,	1.3370,	1.2080,	1.4310,	1.4010,	1.7180,	1.6090,	1.5000,
4,	1.8800,	2.1200,	2.1300,	1.8510,	2.0290,	1.9530,	2.0320,	1.9860,	1.8350,	1.9750,
5,	2.6200,	3.3200,	3.0000,	2.9510,	2.9650,	2.4700,	2.9650,	2.6180,	2.3950,	1.9780,
6,	3.4000,	4.2800,	3.8100,	3.5770,	4.1430,	3.8500,	3.5960,	3.2770,	3.1820,	2.9370,
7,	4.1800,	5.1600,	4.7500,	4.9270,	4.7240,	5.1770,	5.3360,	4.1860,	4.0670,	3.7980,
8,	4.9500,	6.4200,	5.2500,	6.2430,	5.9010,	6.3470,	7.2020,	5.5890,	5.1490,	4.4190,
9,	5.6900,	6.8700,	5.9500,	7.2320,	6.8110,	7.8250,	6.9660,	6.0500,	5.5010,	5.1150,
10,	6.3800,	7.0900,	6.4300,	7.2390,	7.0510,	6.7460,	9.8620,	6.1500,	6.6260,	6.7120,
11,	7.0200,	7.9300,	7.0000,	8.3460,	7.2480,	8.6360,	10.6700,	9.5360,	6.3430,	9.0400,
+gp,	8.6260,	9.2150,	8.9620,	10.0410,	10.0550,	10.0980,	11.9500,	10.2180,	10.2440,	9.3370,
0 SOPCOFAC,	1.0248,	.9937,	.9564,	.9632,	.9997,	.9991,	.9415,	.9419,	.9620,	.9928,

Table 2   Catch weights at age (kg)

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
3,	1.3090,	1.2230,	1.2400,	1.2640,	1.4080,	1.5030,	1.4560,	1.4320,	1.4760,	1.4220,
4,	1.7350,	1.6330,	1.5680,	1.6020,	1.8600,	1.9510,	2.1770,	1.8750,	1.7830,	1.7430,
5,	1.9070,	1.8300,	1.8640,	2.0690,	2.3230,	2.2670,	2.4200,	2.4960,	2.0320,	1.9760,
6,	2.3730,	2.0520,	2.2110,	2.5540,	3.1310,	2.9360,	2.8950,	3.2290,	2.7780,	2.4270,
7,	3.8100,	2.8660,	2.6480,	3.0570,	3.7300,	4.2140,	3.6510,	3.7440,	3.5980,	3.3020,
8,	4.6670,	4.4740,	3.3800,	4.0780,	4.3940,	4.9710,	5.0640,	4.9640,	4.7660,	4.2030,
9,	5.5090,	5.4240,	4.8160,	5.0120,	5.2090,	5.6570,	5.4400,	6.3750,	5.9820,	5.0120,
10,	5.9720,	6.4690,	5.5160,	6.7680,	6.5400,	5.9500,	6.1670,	6.7450,	7.6580,	6.3500,
11,	6.9390,	6.3430,	6.4070,	7.7540,	8.4030,	6.8910,	7.0800,	7.4660,	7.8820,	6.6950,
+gp,	9.9360,	8.2870,	7.7290,	8.2300,	8.0500,	9.1090,	7.5390,	7.9810,	9.2450,	8.4300,
0 SOPCOFAC,	.9698,	.9800,	.9939,	1.0506,	1.0172,	1.0244,	1.0209,	1.0319,	1.0033,	1.0614,

Table 2.5.4.1. Saithe in the Faroes. Proportion mature at age.

Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99 17:39:42

Table 5   Proportion mature at age

YEAR,	1961,	1962,	1963,	1964,	1965,	1966,	1967,	1968,
AGE								
3,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,
4,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,
5,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,
6,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,
7,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
8,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
10,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
11,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5   Proportion mature at age

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,	1976,	1977,	1978,
AGE										
3,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,	.0400,
4,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,	.2600,
5,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,	.5700,
6,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,	.8200,
7,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
8,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,	.9800,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
10,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
11,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5   Proportion mature at age

YEAR,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,
AGE										
3,	.0400,	.0400,	.0400,	.0400,	.1000,	.1200,	.1100,	.1500,	.1300,	.1200,
4,	.2600,	.2600,	.2600,	.2600,	.3100,	.3000,	.3100,	.3000,	.2700,	.3000,
5,	.5700,	.5700,	.5700,	.5700,	.6800,	.5700,	.6800,	.6000,	.5500,	.4600,
6,	.8200,	.8200,	.8200,	.8200,	.9200,	.9000,	.8800,	.8500,	.8400,	.8000,
7,	.9100,	.9100,	.9100,	.9100,	.9800,	.9800,	.9900,	.9600,	.9600,	.9500,
8,	.9800,	.9800,	.9800,	.9800,	1.0000,	1.0000,	1.0000,	.9900,	.9900,	.9800,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
10,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
11,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5   Proportion mature at age

YEAR,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998,
AGE										
3,	.1100,	.1000,	.1000,	.1000,	.1100,	.1200,	.1200,	.1200,	.1200,	.1200,
4,	.2600,	.2400,	.2300,	.2300,	.2800,	.3000,	.3400,	.2800,	.2600,	.2800,
5,	.4400,	.4300,	.4400,	.4800,	.5400,	.5300,	.5600,	.5800,	.4700,	.5500,
6,	.7100,	.6400,	.6800,	.7400,	.8300,	.8000,	.8000,	.8400,	.7800,	.7900,
7,	.9500,	.8800,	.8600,	.9000,	.9400,	.9600,	.9400,	.9400,	.9400,	.9400,
8,	.9900,	.9800,	.9600,	.9800,	.9800,	.9900,	.9900,	.9900,	.9900,	.9800,
9,	1.0000,	1.0000,	.9900,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
10,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
11,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 2.5.5.1.1. Saithe in the Faroe Grounds. Effort (fishing days) and catch at age (thousands) for commercial Cuba Beta pair trawlers.

```
Faroe Saithe (ICES Div. Vb)
101
Cuba Beta series
1982 1998

1 1 0 1
3         14


1805    0  984  275  516  107   47   37 34 14 12   9 17
1792  225  231 1052  312  116   85   73 15 31 32   2 36
1714   77 1780  328  762  182   49   19  3  8 17   2  5
1224   93  518 1196  249  313   41   16  3  6 12   4  1
1341  170  324  891  638  177  188   45 17  9  6 16  1
1762  239  943  798  633  237  125   65 15 10  1  3  4
1705  129  539 1706  599  244  102   67 16  2  2  3  4
1473   96 1096  931 1178  133   79   26 15 10  2  0  2
1820   44  477 1442 1395  768   71   19  8  8  3  2  1
1985   72  594 1035  837  528  258   31 29 21 11  0  0
1932   19  464  488  413  207  120  104 20 10  4  6  1
1649  144  559  906  326  174  103   77 46 10  7  0  0
1638  122  906  558  524  167  117   76 70 34  4  5  0
1872   79  299  957  392  242   82   41 30 23 13  2  3
1492   44   66  236  244  298  228  109 28 15 14 10  2
1514  101  197  515  379  291  131   31 15  6 12  7  3
1288   21  293  350  608  258  129   72 14  6  6  4  2
```

Table 2.5.5.1.2. Saithe in the Faroe Grounds. Diagnostics from XSA with Cuba Beta Series.

```
Lowestoft VPA Version 3.1
  30-Apr-99  17:38:30

Extended Survivors Analysis
Saithe Faroes Vb (run: XSABJM10/X10)
CPUE data from file /users/fish/ifad/ifapwork/nwwg/sai_faro/FLEET.X10
Catch data for  38 years. 1961 to 1998. Ages  3 to  12.
```

```
      Fleet,              First, Last, First, Last, Alpha,  Beta
                     ,    year,  year,  age ,  age
FLT01: Cuba Beta ser,    1982,  1998,   3,    11,   .000,  1.000
```

Time series weights :

    Tapered time weighting applied
    Power =   3 over 20 years

Catchability analysis :

    Catchability dependent on stock size for ages <   4

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages < 4

    Catchability independent of age for ages >=   9

Terminal population estimation :

    Survivor estimates shrunk towards the mean F
    of the final   5 years or the   3 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   24 iterations
```

1
```
Regression weights
     , .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000
```

Fishing mortalities

| Age, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | 1995, | 1996, | 1997, | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| 3, | .018, | .016, | .046, | .029, | .064, | .052, | .021, | .026, | .019, | .015 |
| 4, | .204, | .203, | .412, | .260, | .199, | .278, | .101, | .072, | .093, | .117 |
| 5, | .228, | .632, | .765, | .589, | .542, | .321, | .420, | .157, | .227, | .311 |
| 6, | .491, | .786, | .891, | .703, | .588, | .586, | .384, | .310, | .384, | .556 |
| 7, | .383, | .797, | .802, | .571, | .509, | .576, | .660, | .446, | .522, | .552 |
| 8, | .551, | .419, | .652, | .487, | .411, | .639, | .580, | .705, | .461, | .541 |
| 9, | .374, | .226, | .776, | .548, | .484, | .489, | .747, | .458, | .500, | .541 |
| 10, | .375, | .202, | .913, | .571, | .441, | .723, | .658, | .568, | .481, | .450 |
| 11, | .471, | .513, | .853, | .658, | .533, | .535, | .589, | .477, | .434, | .415 |

**Table 2.5.5.1.2 (Cont'd**

1

XSA population numbers (Thousands)

| YEAR | 3 | AGE 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | 2.86E+04 | 3.58E+04 | 2.87E+04 | 2.03E+04 | 2.76E+03 | 1.43E+03 | 6.55E+02 | 2.93E+02 | 1.62E+02 |
| 1990 | 2.08E+04 | 2.30E+04 | 2.39E+04 | 1.87E+04 | 1.02E+04 | 1.54E+03 | 6.73E+02 | 3.69E+02 | 1.65E+02 |
| 1991 | 2.51E+04 | 1.68E+04 | 1.54E+04 | 1.04E+04 | 6.98E+03 | 3.76E+03 | 8.29E+02 | 4.39E+02 | 2.47E+02 |
| 1992 | 2.01E+04 | 1.96E+04 | 9.11E+03 | 5.87E+03 | 3.49E+03 | 2.56E+03 | 1.60E+03 | 3.12E+02 | 1.44E+02 |
| 1993 | 2.35E+04 | 1.60E+04 | 1.24E+04 | 4.14E+03 | 2.38E+03 | 1.61E+03 | 1.29E+03 | 7.59E+02 | 1.44E+02 |
| 1994 | 1.51E+04 | 1.80E+04 | 1.07E+04 | 5.90E+03 | 1.88E+03 | 1.17E+03 | 8.77E+02 | 6.50E+02 | 4.00E+02 |
| 1995 | 2.16E+04 | 1.18E+04 | 1.12E+04 | 6.37E+03 | 2.69E+03 | 8.66E+02 | 5.06E+02 | 4.40E+02 | 2.58E+02 |
| 1996 | 1.29E+04 | 1.73E+04 | 8.72E+03 | 6.01E+03 | 3.55E+03 | 1.14E+03 | 3.97E+02 | 1.96E+02 | 1.87E+02 |
| 1997 | 1.98E+04 | 1.03E+04 | 1.32E+04 | 6.10E+03 | 3.61E+03 | 1.86E+03 | 4.61E+02 | 2.06E+02 | 9.11E+01 |
| 1998 | 1.06E+04 | 1.59E+04 | 7.66E+03 | 8.62E+03 | 3.40E+03 | 1.75E+03 | 9.61E+02 | 2.29E+02 | 1.04E+02 |

Estimated population abundance at 1st Jan 1999

| | .00E+00 | 8.54E+03 | 1.16E+04 | 4.59E+03 | 4.05E+03 | 1.60E+03 | 8.36E+02 | 4.58E+02 | 1.19E+02 |
|---|---|---|---|---|---|---|---|---|---|

Taper weighted geometric mean of the VPA populations:

| | 2.21E+04 | 1.90E+04 | 1.31E+04 | 7.38E+03 | 3.36E+03 | 1.54E+03 | 7.13E+02 | 3.24E+02 | 1.56E+02 |
|---|---|---|---|---|---|---|---|---|---|

Standard error of the weighted Log(VPA populations) :

| | .4642 | .4333 | .4589 | .4710 | .4595 | .4106 | .4316 | .4771 | .5137 |
|---|---|---|---|---|---|---|---|---|---|

1

Log catchability residuals.

Fleet : FLT01: Cuba Beta ser

| Age | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|
| 3 | 99.99 | .41 | -.17 | .53 | -.02 | .30 | -.20 |
| 4 | .42 | -.22 | 1.05 | .44 | .04 | -.24 | -.53 |
| 5 | -.31 | -.01 | -.38 | .72 | .46 | .17 | -.15 |
| 6 | .69 | -.02 | .00 | -.14 | .45 | .19 | .27 |
| 7 | -.27 | -.17 | .18 | .16 | -.06 | -.03 | .00 |
| 8 | -.65 | .13 | -.29 | -.21 | .43 | .00 | -.10 |
| 9 | -.36 | .75 | -.52 | -.41 | .69 | .07 | .28 |
| 10 | -.07 | -.53 | -1.54 | -1.44 | .22 | .41 | -.49 |
| 11 | -.29 | .46 | -.43 | .06 | .23 | .22 | -.49 |

| Age | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .10 | -.56 | -.34 | -1.40 | .60 | .88 | -.05 | .12 | .49 | -.27 |
| 4 | .45 | -.15 | .39 | -.06 | .47 | .87 | -.03 | -1.71 | -.10 | .03 |
| 5 | -.46 | .14 | .21 | -.06 | .39 | -.05 | .36 | -.68 | -.30 | .06 |
| 6 | -.12 | .05 | .08 | -.11 | .12 | .24 | -.35 | -.57 | -.13 | .24 |
| 7 | -.41 | .00 | -.08 | -.40 | -.05 | .17 | .09 | .15 | .13 | .25 |
| 8 | -.19 | -.65 | -.23 | -.66 | -.23 | .33 | .12 | 1.15 | -.02 | .22 |
| 9 | -.54 | -1.16 | -.72 | -.24 | -.19 | .19 | .10 | 1.42 | .02 | .31 |
| 10 | -.28 | -1.43 | -.10 | -.24 | -.20 | .51 | -.11 | .82 | .09 | .06 |
| 11 | -.05 | -.49 | .14 | -.13 | -.02 | .19 | .13 | .20 | -.03 | -.01 |

**Table 2.5.5.1.2 (Cont'd**

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

| Age ,        | 4,       | 5,       | 6,      | 7,      | 8,      | 9,      | 10,     | 11      |
|--------------|----------|----------|---------|---------|---------|---------|---------|---------|
| Mean Log q,  | -11.0351,| -10.0611,| -9.6965,| -9.6348,| -9.6429,| -9.7114,| -9.7114,| -9.7114,|
| S.E(Log q),  | .6631,   | .3604,   | .2782,  | .2041,  | .4805,  | .6442,  | .6456,  | .2420,  |

Regression statistics :

Ages with q dependent on year class strength

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

| 3, | .98, | .040, | 12.94, | .38, | 16, | .62, | -12.99, |
|----|------|-------|--------|------|-----|------|---------|

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

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q   |
|-----|-------|---------|-----------|---------|--------|---------|----------|
| 4,  | .97,  | .064,   | 11.00,    | .31,    | 17,    | .67,    | -11.04,  |
| 5,  | .98,  | .075,   | 10.05,    | .62,    | 17,    | .37,    | -10.06,  |
| 6,  | .99,  | .080,   | 9.68,     | .74,    | 17,    | .29,    | -9.70,   |
| 7,  | 1.01, | -.101,  | 9.66,     | .83,    | 17,    | .22,    | -9.63,   |
| 8,  | 1.71, | -1.209, | 11.29,    | .22,    | 17,    | .81,    | -9.64,   |
| 9,  | 2.05, | -1.160, | 13.02,    | .11,    | 17,    | 1.30,   | -9.71,   |
| 10, | 1.10, | -.215,  | 10.25,    | .32,    | 17,    | .72,    | -9.85,   |
| 11, | .81,  | 1.736,  | 8.85,     | .90,    | 17,    | .18,    | -9.72,   |

1

Terminal year survivor and F summaries :

Age   3   Catchability dependent on age and year class strength

Year class = 1995

| Fleet,                | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , | Scaled, Weights, | Estimated F |
|-----------------------|-----------------------|-----------|-----------|-------------|------|------------------|-------------|
| FLT01: Cuba Beta ser, | 6497.,                | .697,     | .000,     | .00,        | 1,   | .179,            | .019        |
| P shrinkage mean ,    | 19019.,               | .43,,,,   |           |             |      | .469,            | .007        |
| F shrinkage mean ,    | 3374.,                | .50,,,,   |           |             |      | .352,            | .036        |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F    |
|----------------------------|-----------|-----------|------|-------------|------|
| 8536.,                     | .30,      | .59,      | 3,   | 1.985,      | .015 |

1

Age   4   Catchability constant w.r.t. time and dependent on age

Year class = 1994

| Fleet,                | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , | Scaled, Weights, | Estimated F |
|-----------------------|-----------------------|-----------|-----------|-------------|------|------------------|-------------|
| FLT01: Cuba Beta ser, | 15185.,               | .476,     | .227,     | .48,        | 2,   | .493,            | .090        |
| F shrinkage mean ,    | 8932.,                | .50,,,,   |           |             |      | .507,            | .149        |

**Table 2.5.5.1.2 (Cont'd**

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 11605., | .35, | .29, | 3, | .840, | .117 |

Age 5   Catchability constant w.r.t. time and dependent on age

Year class = 1993

| Fleet, , | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 4796., | .295, | .048, | .16, | 3, | .670, | .300 |
| F shrinkage mean , | 4210., | .50,,,, | | | | .330, | .335 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4593., | .26, | .05, | 4, | .210, | .311 |

1

Age 6   Catchability constant w.r.t. time and dependent on age

Year class = 1992

| Fleet, , | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 3702., | .212, | .303, | 1.43, | 4, | .742, | .595 |
| F shrinkage mean , | 5244., | .50,,,, | | | | .258, | .454 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4050., | .20, | .24, | 5, | 1.194, | .556 |

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

Year class = 1991

| Fleet, , | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 1599., | .178, | .189, | 1.06, | 5, | .783, | .553 |
| F shrinkage mean , | 1622., | .50,,,, | | | | .217, | .547 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1604., | .18, | .15, | 6, | .849, | .552 |

**Table 2.5.5.1.2 (Cont'd**

1

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

Year class = 1990

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 854., | .179, | .170, | .95, | 6, .727, | .532 |
| F shrinkage mean , | 792., | .50,,,, | | | .273, | .564 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 836., | .19, | .13, | 7, | .705, | .541 |

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

Year class = 1989

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var,, Ratio, | N, , Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 458., | .184, | .122, | .66, | 7, .674, | .541 |
| F shrinkage mean , | 459., | .50,,,, | | | .326, | .540 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 458., | .20, | .09, | 8, | .453, | .541 |

1

Age 10 Catchability constant w.r.t. time and age (fixed at the value for age)
9

Year class = 1988

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 154., | .246, | .147, | .60, | 8, .557, | .365 |
| F shrinkage mean , | 86., | .50,,,, | | | .443, | .579 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 119., | .26, | .17, | 9, | .654, | .450 |

Age 11 Catchability constant w.r.t. time and age (fixed at the value for age)
9

Year class = 1987

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, , Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT01: Cuba Beta ser, | 62., | .215, | .113, | .53, | 9, .733, | .383 |
| F shrinkage mean , | 43., | .50,,,, | | | .267, | .515 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 56., | .21, | .11, | 10, | .537, | .415 |

Table 2.5.5.1.3. Saithe in the Faroe Grounds. Fishing mortality.

Run title : Saithe Faroes Vb (run: XSABJM10/X10)
    At 30-Apr-99  17:39:42
                    Terminal Fs derived using XSA (With F shrinkage)

Table  8    Fishing mortality (F) at age

| YEAR, AGE | 1961, | 1962, | 1963, | 1964, | 1965, | 1966, | 1967, | 1968, |
|---|---|---|---|---|---|---|---|---|
| 3, | .0226, | .0465, | .0307, | .0478, | .0495, | .0250, | .0248, | .0321, |
| 4, | .0557, | .0864, | .0358, | .1261, | .0773, | .1007, | .0518, | .0911, |
| 5, | .0994, | .1208, | .0716, | .2199, | .1589, | .1493, | .1218, | .0955, |
| 6, | .1219, | .1402, | .1115, | .1798, | .2138, | .2327, | .1389, | .1358, |
| 7, | .0933, | .1192, | .1634, | .2213, | .2217, | .2785, | .2565, | .1346, |
| 8, | .0852, | .0752, | .1157, | .2567, | .2424, | .2537, | .2617, | .2185, |
| 9, | .0972, | .1150, | .1355, | .1424, | .2984, | .2771, | .2270, | .2184, |
| 10, | .0916, | .1295, | .2012, | .1658, | .2356, | .3347, | .2905, | .2028, |
| 11, | .0916, | .1069, | .1514, | .1891, | .2602, | .2902, | .2611, | .2142, |
| +gp, | .0916, | .1069, | .1514, | .1891, | .2602, | .2902, | .2611, | .2142, |
| 0 FBAR 4- 8, | .0911, | .1084, | .0996, | .2007, | .1828, | .2030, | .1661, | .1351, |

| YEAR, AGE | 1969, | 1970, | 1971, | 1972, | 1973, | 1974, | 1975, | 1976, | 1977, | 1978, |
|---|---|---|---|---|---|---|---|---|---|---|
| 3, | .0328, | .0480, | .0886, | .0936, | .1272, | .2303, | .1500, | .2071, | .1482, | .0839, |
| 4, | .1453, | .2550, | .1482, | .0729, | .3230, | .3173, | .3615, | .3687, | .3008, | .2375, |
| 5, | .1721, | .1540, | .3584, | .1652, | .4592, | .3549, | .5450, | .3177, | .4220, | .2922, |
| 6, | .1685, | .1600, | .1406, | .2990, | .3493, | .3287, | .2897, | .3440, | .4186, | .1897, |
| 7, | .2002, | .1538, | .1263, | .3292, | .2926, | .2303, | .1965, | .2054, | .3677, | .2032, |
| 8, | .2096, | .1945, | .1120, | .3001, | .2431, | .1775, | .1758, | .1775, | .2546, | .4140, |
| 9, | .3066, | .1658, | .1245, | .3766, | .1987, | .1966, | .1187, | .1671, | .2038, | .2654, |
| 10, | .3292, | .2010, | .1214, | .4608, | .2502, | .1814, | .1491, | .1207, | .1748, | .3041, |
| 11, | .2834, | .1879, | .1197, | .3817, | .2318, | .1860, | .1484, | .1557, | .2120, | .3298, |
| +gp, | .2834, | .1879, | .1197, | .3817, | .2318, | .1860, | .1484, | .1557, | .2120, | .3298, |
| 0 FBAR 4- 8, 1 | .1792, | .1834, | .1771, | .2333, | .3335, | .2817, | .3137, | .2826, | .3527, | .2673, |

| YEAR, AGE | 1979, | 1980, | 1981, | 1982, | 1983, | 1984, | 1985, | 1986, | 1987, | 1988, |
|---|---|---|---|---|---|---|---|---|---|---|
| 3, | .0375, | .0932, | .0138, | .0296, | .0695, | .0159, | .0632, | .0210, | .0366, | .0217, |
| 4, | .1781, | .1537, | .2435, | .1842, | .1106, | .4972, | .2379, | .1392, | .1381, | .0889, |
| 5, | .2903, | .2030, | .1959, | .2052, | .3654, | .3645, | .5057, | .4585, | .4300, | .3542, |
| 6, | .2832, | .2312, | .4400, | .4827, | .4715, | .5736, | .3135, | .7702, | .5840, | .6490, |
| 7, | .3172, | .3300, | .5599, | .3219, | .4961, | .6527, | .5776, | .4504, | .4718, | .6018, |
| 8, | .3645, | .2507, | .6591, | .5464, | .5340, | .4660, | .4321, | .7806, | .4908, | .6197, |
| 9, | .3901, | .3216, | .5453, | .6155, | .8707, | .5266, | .3196, | .8975, | .5918, | .7510, |
| 10, | .4729, | .5166, | .5441, | .3162, | .4215, | .3901, | .2229, | .6243, | .8842, | .6363, |
| 11, | .4120, | .3653, | .5879, | .5188, | .5517, | .5529, | .3445, | .7718, | .5759, | .8640, |
| +gp, | .4120, | .3653, | .5879, | .5188, | .5517, | .5529, | .3445, | .7718, | .5759, | .8640, |
| 0 FBAR 4- 8, | .2867, | .2337, | .4197, | .3481, | .3955, | .5108, | .4134, | .5198, | .4229, | .4627, |

| YEAR, AGE | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | 1995, | 1996, | 1997, | 1998, |
|---|---|---|---|---|---|---|---|---|---|---|
| 3, | .0176, | .0157, | .0464, | .0291, | .0639, | .0517, | .0205, | .0258, | .0193, | .0145, |
| 4, | .2043, | .2031, | .4115, | .2600, | .1992, | .2781, | .1005, | .0718, | .0934, | .1167, |
| 5, | .2281, | .6320, | .7653, | .5887, | .5415, | .3210, | .4200, | .1569, | .2273, | .3113, |
| 6, | .4905, | .7859, | .8910, | .7027, | .5880, | .5857, | .3838, | .3096, | .3841, | .5556, |
| 7, | .3825, | .7973, | .8025, | .5707, | .5087, | .5762, | .6604, | .4460, | .5224, | .5520, |
| 8, | .5507, | .4191, | .6518, | .4869, | .4106, | .6386, | .5801, | .7049, | .4611, | .5407, |
| 9, | .3744, | .2257, | .7761, | .5484, | .4845, | .4894, | .7470, | .4580, | .5002, | .5405, |
| 10, | .3748, | .2020, | .9125, | .5712, | .4409, | .7234, | .6583, | .5682, | .4806, | .4502, |
| 11, | .4712, | .5132, | .8525, | .6577, | .5329, | .5351, | .5888, | .4768, | .4337, | .4150, |
| +gp, | .4712, | .5132, | .8525, | .6577, | .5329, | .5351, | .5888, | .4768, | .4337, | .4150, |
| 0 FBAR 4- 8, 1 | .3712, | .5675, | .7044, | .5218, | .4496, | .4799, | .4290, | .3379, | .3377, | .4153, |

# Table 2.5.5.1.4

Run title : Saithe Faroes Vb (run: XSABJM10/X10)
    At 30-Apr-99  17:39:42
                        Terminal Fs derived using XSA (With F shrinkage)

Table 10    Stock number at age (start of year)                Numbers*10**-3

| YEAR, | 1961, | 1962, | 1963, | 1964, | 1965, | 1966, | 1967, | 1968, |
|---|---|---|---|---|---|---|---|---|
| **AGE** | | | | | | | | |
| 3, | 9045, | 13661, | 22424, | 16183, | 22791, | 21813, | 26854, | 21493, |
| 4, | 7738, | 7240, | 10676, | 17804, | 12631, | 17758, | 17417, | 21448, |
| 5, | 5643, | 5992, | 5437, | 8433, | 12850, | 9572, | 13146, | 13540, |
| 6, | 3880, | 4183, | 4348, | 4144, | 5542, | 8975, | 6750, | 9529, |
| 7, | 2679, | 2812, | 2977, | 3184, | 2834, | 3664, | 5823, | 4810, |
| 8, | 1746, | 1998, | 2044, | 2070, | 2089, | 1859, | 2270, | 3689, |
| 9, | 1384, | 1313, | 1518, | 1490, | 1311, | 1342, | 1181, | 1431, |
| 10, | 1036, | 1028, | 958, | 1085, | 1058, | 796, | 833, | 771, |
| 11, | 568, | 774, | 739, | 641, | 753, | 685, | 467, | 510, |
| +gp, | 1032, | 1140, | 2146, | 1111, | 1367, | 981, | 669, | 1066, |
| TOTAL, | 34751, | 40141, | 53266, | 56145, | 63226, | 67446, | 75411, | 78287, |

Table 10    Stock number at age (start of year)                Numbers*10**-3

| YEAR, | 1969, | 1970, | 1971, | 1972, | 1973, | 1974, | 1975, | 1976, | 1977, | 1978, |
|---|---|---|---|---|---|---|---|---|---|---|
| **AGE** | | | | | | | | | | |
| 3, | 40766, | 34097, | 37232, | 33577, | 23264, | 18828, | 16362, | 18773, | 12906, | 8395, |
| 4, | 17042, | 33298, | 26609, | 27898, | 25035, | 16771, | 12245, | 11531, | 12494, | 9111, |
| 5, | 16032, | 12065, | 20493, | 18785, | 21235, | 14839, | 9998, | 6984, | 6530, | 7572, |
| 6, | 10076, | 11050, | 8468, | 11724, | 13038, | 10984, | 8520, | 4746, | 4162, | 3505, |
| 7, | 6811, | 6970, | 7710, | 6024, | 7118, | 7528, | 6474, | 5221, | 2755, | 2242, |
| 8, | 3442, | 4565, | 4893, | 5563, | 3548, | 4349, | 4895, | 4355, | 3481, | 1562, |
| 9, | 2427, | 2285, | 3077, | 3582, | 3374, | 2278, | 2982, | 3362, | 2986, | 2209, |
| 10, | 942, | 1463, | 1585, | 2224, | 2012, | 2265, | 1532, | 2168, | 2329, | 1994, |
| 11, | 515, | 555, | 979, | 1149, | 1149, | 1283, | 1546, | 1081, | 1573, | 1601, |
| +gp, | 846, | 847, | 976, | 726, | 988, | 1717, | 2378, | 2191, | 1899, | 2090, |
| TOTAL, | 98898, | 106195, | 112021, | 111252, | 100762, | 80843, | 66933, | 60411, | 51115, | 40280, |

Run title : Saithe Faroes Vb (run: XSABJM10/X10)
    At 30-Apr-99  17:39:42
                        Terminal Fs derived using XSA (With F shrinkage)

Table 10    Stock number at age (start of year)                Numbers*10**-3

| YEAR, | 1979, | 1980, | 1981, | 1982, | 1983, | 1984, | 1985, | 1986, | 1987, | 1988, |
|---|---|---|---|---|---|---|---|---|---|---|
| **AGE** | | | | | | | | | | |
| 3, | 8628, | 12369, | 33167, | 14651, | 40873, | 25847, | 22101, | 61929, | 48576, | 44646, |
| 4, | 6320, | 6805, | 9226, | 26783, | 11645, | 31218, | 20829, | 16987, | 49647, | 38340, |
| 5, | 5882, | 4330, | 4778, | 5921, | 18240, | 8536, | 15545, | 13443, | 12101, | 35406, |
| 6, | 4629, | 3603, | 2894, | 3216, | 3948, | 10363, | 4854, | 7675, | 6959, | 6444, |
| 7, | 2374, | 2855, | 2341, | 1526, | 1625, | 2017, | 4781, | 2905, | 2909, | 3177, |
| 8, | 1498, | 1415, | 1681, | 1095, | 905, | 810, | 860, | 2197, | 1516, | 1486, |
| 9, | 845, | 852, | 902, | 712, | 519, | 435, | 416, | 457, | 824, | 760, |
| 10, | 1387, | 468, | 506, | 428, | 315, | 178, | 210, | 248, | 153, | 373, |
| 11, | 1204, | 708, | 229, | 240, | 255, | 169, | 99, | 138, | 109, | 52, |
| +gp, | 2242, | 2817, | 2510, | 2438, | 1392, | 651, | 1035, | 320, | 242, | 113, |
| TOTAL, | 35011, | 36221, | 58232, | 57009, | 79718, | 80223, | 70729, | 106297, | 123034, | 130797, |

Table 10    Stock number at age (start of year)                Numbers*10**-3

| YEAR, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | 1995, | 1996, | 1997, | 1998, | 1999, |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **AGE** | | | | | | | | | | | |
| 3, | 28646, | 20831, | 25117, | 20090, | 23478, | 15146, | 21628, | 12874, | 19836, | 10579, | 0, |
| 4, | 35769, | 23046, | 16789, | 19632, | 15977, | 18032, | 11776, | 17348, | 10271, | 15930, | 8536, |
| 5, | 28721, | 23874, | 15400, | 9109, | 12393, | 10718, | 11179, | 8720, | 13220, | 7659, | 11605, |
| 6, | 20342, | 18719, | 10389, | 5866, | 4139, | 5904, | 6366, | 6014, | 6102, | 8623, | 4593, |
| 7, | 2757, | 10198, | 6984, | 3489, | 2378, | 1882, | 2691, | 3551, | 3613, | 3403, | 4050, |
| 8, | 1425, | 1540, | 3762, | 2563, | 1615, | 1171, | 866, | 1138, | 1861, | 1754, | 1604, |
| 9, | 655, | 673, | 829, | 1605, | 1289, | 877, | 506, | 397, | 461, | 961, | 836, |
| 10, | 293, | 369, | 439, | 312, | 759, | 650, | 440, | 196, | 206, | 229, | 458, |
| 11, | 162, | 165, | 247, | 144, | 144, | 400, | 258, | 187, | 91, | 104, | 119, |
| +gp, | 114, | 215, | 224, | 245, | 138, | 129, | 287, | 237, | 311, | 219, | 175, |
| TOTAL, | 118884, | 99629, | 80180, | 63055, | 62312, | 54910, | 55999, | 50660, | 55971, | 49460, | 31978, |

Table 2.5.5.1.5. Saithe in the Faroe Grounds. Summary table.

Run title : Saithe Faroes Vb (run: XSABJM10/X10)

At 30-Apr-99  17:39:42

Table 16     Summary     (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

| | RECRUITS, Age 3 | TOTALBIO. | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 4- 8, |
|---|---|---|---|---|---|---|
| 1961, | 9045, | 121952, | 83785, | 9592, | .1145, | .0911, |
| 1962, | 13661, | 126439, | 85620, | 10454, | .1221, | .1084, |
| 1963, | 22424, | 158204, | 100611, | 12693, | .1262, | .0996, |
| 1964, | 16183, | 160385, | 98359, | 21893, | .2226, | .2007, |
| 1965, | 22791, | 174712, | 107182, | 22181, | .2069, | .1828, |
| 1966, | 21813, | 184058, | 108732, | 25563, | .2351, | .2030, |
| 1967, | 26854, | 181530, | 104575, | 21319, | .2039, | .1661, |
| 1968, | 21493, | 189652, | 115877, | 20387, | .1759, | .1351, |
| 1969, | 40766, | 214840, | 123686, | 27437, | .2218, | .1792, |
| 1970, | 34097, | 224210, | 129003, | 29110, | .2257, | .1834, |
| 1971, | 37232, | 228135, | 139324, | 32706, | .2347, | .1771, |
| 1972, | 33577, | 236716, | 147350, | 42663, | .2895, | .2333, |
| 1973, | 23264, | 210188, | 136426, | 57431, | .4210, | .3335, |
| 1974, | 18828, | 203599, | 137285, | 47188, | .3437, | .2817, |
| 1975, | 16362, | 186989, | 137493, | 41576, | .3024, | .3137, |
| 1976, | 18773, | 169176, | 121599, | 33065, | .2719, | .2826, |
| 1977, | 12906, | 155726, | 113652, | 34835, | .3065, | .3527, |
| 1978, | 8395, | 136712, | 95530, | 28138, | .2945, | .2673, |
| 1979, | 8628, | 112354, | 82954, | 27246, | .3284, | .2867, |
| 1980, | 12369, | 123994, | 88249, | 25230, | .2859, | .2337, |
| 1981, | 33167, | 141111, | 75534, | 30103, | .3985, | .4197, |
| 1982, | 14650, | 147219, | 81331, | 30964, | .3807, | .3481, |
| 1983, | 40873, | 178068, | 98559, | 39176, | .3975, | .3955, |
| 1984, | 25847, | 187157, | 98667, | 54665, | .5540, | .5108, |
| 1985, | 22101, | 186931, | 113072, | 44605, | .3945, | .4134, |
| 1986, | 61929, | 233782, | 101272, | 41716, | .4119, | .5198, |
| 1987, | 48576, | 248733, | 97094, | 40020, | .4122, | .4229, |
| 1988, | 44646, | 258195, | 103920, | 45285, | .4358, | .4627, |
| 1989, | 28646, | 227367, | 102807, | 44477, | .4326, | .3712, |
| 1990, | 20831, | 190192, | 96286, | 61561, | .6394, | .5675, |
| 1991, | 25117, | 150081, | 75217, | 54863, | .7294, | .7044, |
| 1992, | 20090, | 125080, | 63039, | 36487, | .5788, | .5218, |
| 1993, | 23478, | 134495, | 67557, | 33554, | .4967, | .4496, |
| 1994, | 15146, | 126093, | 66172, | 33193, | .5016, | .4799, |
| 1995, | 21628, | 126283, | 65428, | 27222, | .4161, | .4290, |
| 1996, | 12874, | 118225, | 65481, | 20029, | .3059, | .3379, |
| 1997, | 19836, | 121197, | 63046, | 22320, | .3540, | .3377, |
| 1998, | 10579, | 106292, | 61036, | 26409, | .4327, | .4153, |

Arith.
Mean     ,    23934,    171212,    98758,    33088,    .3475,    .3268,
0 Units.  (Thousands),  (Tonnes),  (Tonnes),  (Tonnes),
1

**Table 2.5.6.1.1.** Saithe in the Faroe Grounds. Prediction with management options. Input data.

Prediction with management option table: Input data

Year: 1999

| Age | Stock size | Natural mortality | Maturity ogive | Prop.of F bef.spaw. | Prop.of M bef.spaw. | Weight in stock | Exploit. pattern | Weight in catch |
|-----|-----------|-------------------|----------------|---------------------|---------------------|-----------------|------------------|-----------------|
| 3 | 13927.000 | 0.2000 | 0.0700 | 0.0000 | 0.0000 | 1.443 | 0.0300 | 1.443 |
| 4 | 8536.000 | 0.2000 | 0.2400 | 0.0000 | 0.0000 | 1.800 | 0.1410 | 1.800 |
| 5 | 11605.000 | 0.2000 | 0.4500 | 0.0000 | 0.0000 | 2.168 | 0.3350 | 2.168 |
| 6 | 4593.000 | 0.2000 | 0.6500 | 0.0000 | 0.0000 | 2.427 | 0.4920 | 2.427 |
| 7 | 4050.000 | 0.2000 | 0.7900 | 0.0000 | 0.0000 | 3.302 | 0.5440 | 3.302 |
| 8 | 1604.000 | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 4.203 | 0.5640 | 4.203 |
| 9 | 836.000 | 0.2000 | 0.9700 | 0.0000 | 0.0000 | 5.012 | 0.4540 | 5.012 |
| 10 | 458.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.350 | 0.5090 | 6.350 |
| 11 | 119.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.695 | 0.4250 | 6.695 |
| 12+ | 175.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.607 | 0.4250 | 8.607 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Year: 2000

| Age | Recruit-ment | Natural mortality | Maturity ogive | Prop.of F bef.spaw. | Prop.of M bef.spaw. | Weight in stock | Exploit. pattern | Weight in catch |
|-----|--------------|-------------------|----------------|---------------------|---------------------|-----------------|------------------|-----------------|
| 3 | 13927.000 | 0.2000 | 0.1100 | 0.0000 | 0.0000 | 1.443 | 0.0300 | 1.443 |
| 4 | . | 0.2000 | 0.2800 | 0.0000 | 0.0000 | 1.800 | 0.1410 | 1.800 |
| 5 | . | 0.2000 | 0.5200 | 0.0000 | 0.0000 | 2.168 | 0.3350 | 2.168 |
| 6 | . | 0.2000 | 0.7800 | 0.0000 | 0.0000 | 2.427 | 0.4920 | 2.427 |
| 7 | . | 0.2000 | 0.9300 | 0.0000 | 0.0000 | 3.302 | 0.5440 | 3.302 |
| 8 | . | 0.2000 | 0.9800 | 0.0000 | 0.0000 | 4.203 | 0.5640 | 4.203 |
| 9 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.012 | 0.4540 | 5.012 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.350 | 0.5090 | 6.360 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.695 | 0.4250 | 6.695 |
| 12+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.607 | 0.4250 | 8.607 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Year: 2001

| Age | Recruit-ment | Natural mortality | Maturity ogive | Prop.of F bef.spaw. | Prop.of M bef.spaw. | Weight in stock | Exploit. pattern | Weight in catch |
|-----|--------------|-------------------|----------------|---------------------|---------------------|-----------------|------------------|-----------------|
| 3 | 13927.000 | 0.2000 | 0.1100 | 0.0000 | 0.0000 | 1.443 | 0.0300 | 1.443 |
| 4 | . | 0.2000 | 0.2800 | 0.0000 | 0.0000 | 1.800 | 0.1410 | 1.800 |
| 5 | . | 0.2000 | 0.5200 | 0.0000 | 0.0000 | 2.168 | 0.3350 | 2.168 |
| 6 | . | 0.2000 | 0.7800 | 0.0000 | 0.0000 | 2.427 | 0.4920 | 2.427 |
| 7 | . | 0.2000 | 0.9300 | 0.0000 | 0.0000 | 3.302 | 0.5440 | 3.302 |
| 8 | . | 0.2000 | 0.9800 | 0.0000 | 0.0000 | 4.203 | 0.5640 | 4.203 |
| 9 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.012 | 0.4540 | 5.012 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.350 | 0.5090 | 6.350 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.695 | 0.4250 | 6.695 |
| 12+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.607 | 0.4250 | 8.607 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name      : MANBJM04
Date and time:

**Table 2.5.6.1.2.** Saithe in the Faroe Grounds. Yield per recruit: input data.

Saithe in the Faroes Grounds (Fishing Area Vb)
Yield per recruit: Input data

| Age | Recruit-ment | Natural mortality | Maturity ogive | Prop.of F bef.spaw. | Prop.of M bef.spaw. | Weight in stock | Exploit. pattern | Weight in catch |
|-----|------|-----------|---------|-----------|-----------|---------|---------|---------|
| 4 | . | 0.2000 | 0.2800 | 0.0000 | 0.0000 | 1.847 | 0.2400 | 1.847 |
| 5 | . | 0.2000 | 0.5200 | 0.0000 | 0.0000 | 2.506 | 0.4030 | 2.506 |
| 6 | . | 0.2000 | 0.7800 | 0.0000 | 0.0000 | 3.273 | 0.4850 | 3.273 |
| 7 | . | 0.2000 | 0.9300 | 0.0000 | 0.0000 | 4.149 | 0.4770 | 4.149 |
| 8 | . | 0.2000 | 0.9800 | 0.0000 | 0.0000 | 5.081 | 0.4710 | 5.081 |
| 9 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.860 | 0.4750 | 5.860 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.579 | 0.4690 | 6.579 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 7.399 | 0.4770 | 7.399 |
| 12+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.801 | 0.4770 | 8.801 |
| Unit | Numbers | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name     : YLDBJM04
Date and time: 04MAY99:21:44

**Table 2.5.6.2.1.** Saithe in the Faroe grounds. Yield per recruit: summery table.

Saithe in the Faroes Grounds (Fishing Area Vb)
Yield per recruit: Summary table

| | | | | | | 1 January | | Spawning time | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 0.0000 | 0.0000 | 0.000 | 0.000 | 5.517 | 22943.537 | 3.556 | 19315.032 | 3.556 | 19315.032 |
| 0.0500 | 0.0208 | 0.081 | 382.706 | 5.115 | 20036.592 | 3.168 | 16449.327 | 3.168 | 16449.327 |
| 0.1000 | 0.0415 | 0.146 | 661.130 | 4.790 | 17754.795 | 2.857 | 14207.380 | 2.857 | 14207.380 |
| 0.1500 | 0.0623 | 0.200 | 867.075 | 4.521 | 15926.224 | 2.601 | 12417.334 | 2.601 | 12417.334 |
| 0.2000 | 0.0830 | 0.246 | 1021.418 | 4.294 | 14435.332 | 2.387 | 10963.703 | 2.387 | 10963.703 |
| 0.2500 | 0.1038 | 0.285 | 1138.298 | 4.101 | 13201.780 | 2.206 | 9766.209 | 2.206 | 9766.209 |
| 0.3000 | 0.1246 | 0.318 | 1227.532 | 3.933 | 12168.120 | 2.050 | 8767.458 | 2.050 | 8767.458 |
| 0.3500 | 0.1453 | 0.348 | 1296.084 | 3.787 | 11292.284 | 1.916 | 7925.435 | 1.916 | 7925.435 |
| 0.4000 | 0.1661 | 0.374 | 1348.982 | 3.658 | 10542.835 | 1.798 | 7208.753 | 1.798 | 7208.753 |
| 0.4500 | 0.1868 | 0.397 | 1389.910 | 3.543 | 9895.866 | 1.694 | 6593.550 | 1.694 | 6593.550 |
| 0.5000 | 0.2076 | 0.418 | 1421.605 | 3.440 | 9332.916 | 1.602 | 6061.410 | 1.602 | 6061.410 |
| 0.5500 | 0.2284 | 0.437 | 1446.125 | 3.347 | 8839.532 | 1.520 | 5597.922 | 1.520 | 5597.922 |
| 0.6000 | 0.2491 | 0.454 | 1465.029 | 3.263 | 8404.263 | 1.446 | 5191.675 | 1.446 | 5191.675 |
| 0.6500 | 0.2699 | 0.470 | 1479.514 | 3.186 | 8017.941 | 1.380 | 4833.537 | 1.380 | 4833.537 |
| 0.7000 | 0.2906 | 0.484 | 1490.502 | 3.116 | 7673.147 | 1.319 | 4516.126 | 1.319 | 4516.126 |
| 0.7500 | 0.3114 | 0.497 | 1498.712 | 3.051 | 7363.430 | 1.264 | 4233.424 | 1.264 | 4233.424 |
| 0.8000 | 0.3322 | 0.509 | 1504.705 | 2.991 | 7085.011 | 1.214 | 3980.483 | 1.214 | 3980.483 |
| 0.8500 | 0.3529 | 0.520 | 1508.925 | 2.936 | 6832.563 | 1.168 | 3753.209 | 1.168 | 3753.209 |
| 0.9000 | 0.3737 | 0.531 | 1511.722 | 2.884 | 6603.043 | 1.125 | 3548.184 | 1.125 | 3548.184 |
| 0.9500 | 0.3944 | 0.541 | 1513.377 | 2.836 | 6393.558 | 1.086 | 3362.544 | 1.086 | 3362.544 |
| 1.0000 | 0.4152 | 0.550 | 1514.112 | 2.791 | 6201.662 | 1.050 | 3193.870 | 1.050 | 3193.870 |
| 1.0500 | 0.4360 | 0.559 | 1514.107 | 2.749 | 6025.280 | 1.016 | 3040.109 | 1.016 | 3040.109 |
| 1.1000 | 0.4567 | 0.567 | 1513.507 | 2.710 | 5862.637 | 0.985 | 2899.512 | 0.985 | 2899.512 |
| 1.1500 | 0.4775 | 0.574 | 1512.429 | 2.672 | 5712.211 | 0.956 | 2770.577 | 0.956 | 2770.577 |
| 1.2000 | 0.4982 | 0.582 | 1510.969 | 2.637 | 5572.689 | 0.928 | 2652.013 | 0.928 | 2652.013 |
| 1.2500 | 0.5190 | 0.589 | 1509.203 | 2.604 | 5442.932 | 0.903 | 2542.702 | 0.903 | 2542.702 |
| 1.3000 | 0.5398 | 0.595 | 1507.196 | 2.572 | 5321.952 | 0.879 | 2441.674 | 0.879 | 2441.674 |
| 1.3500 | 0.5605 | 0.601 | 1504.999 | 2.542 | 5208.885 | 0.856 | 2348.083 | 0.856 | 2348.083 |
| 1.4000 | 0.5813 | 0.607 | 1502.655 | 2.513 | 5102.975 | 0.835 | 2261.191 | 0.835 | 2261.191 |
| 1.4500 | 0.6020 | 0.613 | 1500.198 | 2.486 | 5003.555 | 0.815 | 2180.347 | 0.815 | 2180.347 |
| 1.5000 | 0.6228 | 0.618 | 1497.657 | 2.460 | 4910.037 | 0.796 | 2104.980 | 0.796 | 2104.980 |
| 1.5500 | 0.6436 | 0.623 | 1495.057 | 2.435 | 4821.902 | 0.778 | 2034.584 | 0.778 | 2034.584 |
| 1.6000 | 0.6643 | 0.628 | 1492.415 | 2.411 | 4738.688 | 0.761 | 1968.712 | 0.761 | 1968.712 |
| 1.6500 | 0.6851 | 0.633 | 1489.749 | 2.388 | 4659.982 | 0.745 | 1906.967 | 0.745 | 1906.967 |
| 1.7000 | 0.7058 | 0.638 | 1487.071 | 2.367 | 4585.417 | 0.729 | 1848.993 | 0.729 | 1848.993 |
| 1.7500 | 0.7266 | 0.642 | 1484.393 | 2.346 | 4514.664 | 0.715 | 1794.473 | 0.715 | 1794.473 |
| 1.8000 | 0.7474 | 0.646 | 1481.722 | 2.325 | 4447.427 | 0.701 | 1743.124 | 0.701 | 1743.124 |
| 1.8500 | 0.7681 | 0.650 | 1479.067 | 2.306 | 4383.439 | 0.687 | 1694.691 | 0.687 | 1694.691 |
| 1.9000 | 0.7889 | 0.654 | 1476.433 | 2.287 | 4322.461 | 0.675 | 1648.945 | 0.675 | 1648.945 |
| 1.9500 | 0.8096 | 0.658 | 1473.825 | 2.269 | 4264.274 | 0.663 | 1605.678 | 0.663 | 1605.678 |
| 2.0000 | 0.8304 | 0.662 | 1471.246 | 2.252 | 4208.683 | 0.651 | 1564.704 | 0.651 | 1564.704 |
| - | - | Numbers | Grams | Numbers | Grams | Numbers | Grams | Numbers | Grams |

Notes: Run name             : YLDBJM04
Date and time         : 04MAY99:21:44
Computation of ref. F: Simple mean, age 4 - 8
F-0.1 factor          : 0.4061
F-max factor          : 1.0242
F-0.1 reference F     : 0.1686
F-max reference F     : 0.4252
Recruitment           : Single recruit

**Table 2.5.6.3.1**. Saithe in the Faroe Grounds. Prediction with management option table.

Saithe in the Faroes Grounds (Fishing Area Vb)

Prediction with management option table

| Year: 1999 | | | | | Year: 2000 | | | | | Year: 2001 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F Factor | Reference F | Stock biomass | Sp.stock biomass | Catch in weight | F Factor | Reference F | Stock biomass | Sp.stock biomass | Catch in weight | Stock biomass | Sp.stock biomass |
| 1.0000 | 0.4152 | 101284 | 49974 | 23834 | 0.0000 | 0.0000 | 94718 | 51853 | 0 | 115471 | 69282 |
| | | | | | 0.0500 | 0.0208 | | 51853 | 1298 | 114020 | 67999 |
| | | | | | 0.1000 | 0.0415 | | 51853 | 2569 | 112600 | 66745 |
| | | | | | 0.1500 | 0.0623 | | 51853 | 3814 | 111212 | 65520 |
| | | | | | 0.2000 | 0.0830 | | 51853 | 5032 | 109853 | 64323 |
| | | | | | 0.2500 | 0.1038 | | 51853 | 6225 | 108524 | 63154 |
| | | | | | 0.3000 | 0.1246 | | 51853 | 7394 | 107223 | 62011 |
| | | | | | 0.3500 | 0.1453 | | 51853 | 8538 | 105951 | 60895 |
| | | | | | 0.4000 | 0.1661 | | 51853 | 9659 | 104706 | 59804 |
| | | | | | 0.4500 | 0.1868 | | 51853 | 10757 | 103488 | 58738 |
| | | | | | 0.5000 | 0.2076 | | 51853 | 11832 | 102296 | 57696 |
| | | | | | 0.5500 | 0.2284 | | 51853 | 12885 | 101129 | 56678 |
| | | | | | 0.6000 | 0.2491 | | 51853 | 13917 | 99988 | 55683 |
| | | | | | 0.6500 | 0.2699 | | 51853 | 14927 | 98870 | 54710 |
| | | | | | 0.7000 | 0.2906 | | 51853 | 15917 | 97777 | 53760 |
| | | | | | 0.7500 | 0.3114 | | 51853 | 16887 | 96706 | 52831 |
| | | | | | 0.8000 | 0.3322 | | 51853 | 17838 | 95658 | 51923 |
| | | | | | 0.8500 | 0.3529 | | 51853 | 18769 | 94632 | 51036 |
| | | | | | 0.9000 | 0.3737 | | 51853 | 19682 | 93628 | 50168 |
| | | | | | 0.9500 | 0.3944 | | 51853 | 20577 | 92645 | 49320 |
| | | | | | 1.0000 | 0.4152 | | 51853 | 21453 | 91682 | 48491 |
| | | | | | 1.0500 | 0.4360 | | 51853 | 22313 | 90740 | 47681 |
| | | | | | 1.1000 | 0.4567 | | 51853 | 23155 | 89817 | 46888 |
| | | | | | 1.1500 | 0.4775 | | 51853 | 23980 | 88913 | 46114 |
| | | | | | 1.2000 | 0.4982 | | 51853 | 24790 | 88028 | 45356 |
| | | | | | 1.2500 | 0.5190 | | 51853 | 25583 | 87161 | 44616 |
| | | | | | 1.3000 | 0.5398 | | 51853 | 26361 | 86312 | 43891 |
| | | | | | 1.3500 | 0.5605 | | 51853 | 27124 | 85480 | 43183 |
| | | | | | 1.4000 | 0.5813 | | 51853 | 27872 | 84666 | 42491 |
| | | | | | 1.4500 | 0.6020 | | 51853 | 28605 | 83868 | 41814 |
| | | | | | 1.5000 | 0.6228 | | 51853 | 29324 | 83086 | 41152 |
| | | | | | 1.5500 | 0.6436 | | 51853 | 30030 | 82320 | 40504 |
| | | | | | 1.6000 | 0.6643 | | 51853 | 30721 | 81570 | 39871 |
| | | | | | 1.6500 | 0.6851 | | 51853 | 31400 | 80834 | 39251 |
| | | | | | 1.7000 | 0.7058 | | 51853 | 32066 | 80114 | 38645 |
| | | | | | 1.7500 | 0.7266 | | 51853 | 32719 | 79408 | 38053 |
| | | | | | 1.8000 | 0.7474 | | 51853 | 33359 | 78716 | 37473 |
| | | | | | 1.8500 | 0.7681 | | 51853 | 33988 | 78038 | 36906 |
| | | | | | 1.9000 | 0.7889 | | 51853 | 34605 | 77373 | 36351 |
| | | | | | 1.9500 | 0.8096 | | 51853 | 35210 | 76722 | 35808 |
| | | | | | 2.0000 | 0.8304 | | 51853 | 35804 | 76083 | 35277 |
| — | — | Tonnes | Tonnes | Tonnes | — | — | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name           : MANBJM04
       Date and time      : 04MAY99:21:40
       Computation of ref. F: Simple mean, age 4 - 8
       Basis for 1999     : F factors

**Figure 2.5.3.1.** Saithe in the Faroe Grounds. Mean weight (kg) at age in the catches in the period 1991 – 1998.

**Figure 2.5.4.1.** Saithe in the Faroe Grounds. Observed (upper panel) and fitted values (lower panel) proportion mature for the period 1983 – 1998.

**Figure 2.5.5.1.1a**. Saithe in the Faroe Grounds. Log catchability residuals for age group 4 – 11 yrs from XSA run. Tuning data from Cuba Beta series (effort unit: days).



**Figure 2.5.5.1.1b**. Saithe in the Faroe Grounds. Log catchability residuals for age groups 4 – 11 yrs from XSA run. Tuning data from Cuba Logbiik series (effort unit: hours).

**Figure 2.5.5.1.2a.** Saithe in the Faroe Grounds. Retrospective analysis of average fishing mortality of age groups 4-8 yrs from XSA for 1993-98. Tuning data from the Cuba Beta series.



**Figure 2.5.5.1.2b.** Saithe in the Faroe Grounds. Retrospective analysis of average fishing mortality of age groups 4-8 yrs from XSA for 1993-98. Tuning data from the Cuba Logbook series.

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Figure 2.5.5.1.3. Saithe in the Faroe Grounds. Comparison of the two tuning eries CPUE indices. Cuba Beta and Cuba Logbook.

**Figure 2.5.5.2.1  Fish Stock Summary – Saithe in the Faroes Grounds (Fishing Area Vb)**



Yield and fishing mortality

(run: XSABJM10)  **A**

Spawning stock and recruitment

(run: XSABJM10)  **B**

## Long term yield and spawning stock biomass

——— Yield    - - - - - SSB

(run: YLDBJM04)    **C**

Fishing mortality (average of age 4 - 8,u)

## Short term yield and spawning stock biomass

_ Yield    - - - - - SSB

(run: MANBJM04)    **D**

Fishing mortality (average of age 4 - 8,u)

### Stock - Recruitment

$F_{high} = 0.56$

$F_{med} = 0.31$

Recruitment at age 3 (millions)

SSB (1000 tons) at spawning time

**Figure 2.5.6.2.2.** Saithe in the Faroe Grounds. Stock-recruitment relationship scatter plot with number for year class year at each point. R/SSB lines for Fmed and Fhigh are shown with their respective F-values.

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**Figure 2.5.6.2.3**

# Sai_far



Data file(s):W:\acfm\nwwg\1999\Personal\Jakup\paplot\sai_far.pa;*.sum
Plotted on 04/05/1999 at 16:33:19

**Figure 2.5.7.1.** Saithe in the Faroes. Cumulative probability distribution (squares) of the potential fishing mortalities in 1999/2000 under the number of fishing days allocated for the Pair trawlers, JIGGERS and longliners. There is a 50% probability that the fishing mortality will be about 0.35, higher than the proposed $F_{pa} = 0.28$. The left line shows that it would be necessary to decrease the number of days to 60% of those allocated to have an 80% probability that F will be less than $F_{pa}$.