Fol. 41 Assess

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International Council for the
Exploration of the Sea

C.M.1994/Assess:6

SECTION II

REPORT OF THE WORKING GROUP ON THE ASSESSMENT OF DEMERSAL STOCKS IN THE NORTH SEA AND SKAGERRAK

Copenhagen, 7-15 October 1993

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Table 4.2.1 : Nominal catch and Working Group data (in tonnes) of Cod in Division VIId 1982-1992, as officialy reported to ICES.

Year	Belgium	France	Denmark	Netherlands	UK (England & Wales)	UK (Scotland)	Total	Unreported landings	Working Group data
1982	251	2696	-	1	306	-	3254	726	3980
1983	368	2802	-	4	358	-	3532	308	3840
1984	331	2492	-	-	282	-	3105	415	3520
1985	501	2589	-	-	326	-	3416	- 86	3330
1986	650	9938	4	-	830	-	11422	1398	12820
1987	815	7541	-	-	1044	-	9400	4820	14220
1988	486	8795	+	1	867	-	10149	- 789	9360
1989	173	n/a	+	1	562	-	n/a	-	5540
1990	237	n/a	-	-	420	7	n/a	-	2730
1991	182	n/a	-	-*	340	2	n/a	-	1920
1992*	187	n/a	-	2	427	21	n/a	-	2680

* Preliminary

Table 4.2.2. : Total International Catch at Age (1000's) of COD in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	11	5840	464	292	671	57	860	125	555	14	1
2	765	4242	5717	1528	2001	2056	904	1786	1588	1210	2
3	745	209	1275	1239	673	1056	520	776	405	452	3
4	108	64	248	223	296	202	271	187	72	77	4
5	40	16	12	63	26	28	41	40	36	5	5
6	24	3	1	4	7	1	7	6	10	2	6
7	2	3			1			1		1	7

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	11133	2330	1059	729	165	126	2118	1
2	6187	8108	1922	1411	776	221	440	2
3	1477	611	2024	605	321	295	74	3
4	193	482	133	501	105	73	33	4
5	72	15	96	25	68	25	11	5
6	6	4	5	10	3	14	2	6
7	1			1		0	0	7

Table 4.2.3. : Total International Mean Weight at Age (Kg.) of COD in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.615	0.537	0.560	0.626	0.585	0.599	0.660	0.780	0.701	0.617	1
2	1.315	0.672	1.067	0.951	0.780	0.963	0.707	0.750	0.870	1.355	2
3	2.309	2.014	1.991	2.457	2.297	2.142	2.493	1.744	2.883	2.718	3
4	4.683	4.860	2.907	4.032	4.484	4.407	4.383	4.123	4.293	5.132	4
5	6.046	6.332	6.003	4.682	5.655	5.934	5.827	5.705	5.882	7.355	5
6	7.365	7.468	7.934	6.092	5.684	6.847	6.976	7.158	6.425	9.574	6
7	7.839	8.157			6.852			10.439		4.097	

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	0.547	0.681	0.761	0.656	0.952	0.750	0.759	1
2	0.589	1.230	1.149	1.194	1.208	1.603	1.112	2
3	1.403	1.996	2.668	2.153	2.587	2.836	3.745	3
4	3.193	2.788	3.785	3.760	4.102	5.011	6.017	4
5	4.955	4.711	4.343	4.939	5.342	6.541	7.981	5
6	6.101	5.779	4.795	5.894	4.656	6.959	9.561	6
7	8.164			5.730		0	0	7

Table 4.2.4. : Fleets used in catch at age analysis and effort data.

```
COD, 7d, 1976-92
102
FRATRC
 1985 1992
 1 1   .00 1.00
  1  6
  456831.000      11.000     870.000     344.000      55.000       3.000       1.000
  353839.000    9094.000    5015.000    1202.000     154.000      55.000       4.000
  309988.000    1307.000    5041.000     420.000     325.000      10.000       3.000
  260919.000     791.000    1487.000    1471.000     102.000      75.000       4.000
  329640.000     572.000     913.000     455.000     378.000      18.000       7.000
  268831.000      74.000     362.000     151.000      49.000      31.000       2.000
  361439.000      61.000     106.000     148.000      35.000      12.000       7.000
  346545.000    1426.793     267.854      33.346      12.142       3.654        .497
FRAGFS
 1988 1992
 1 1   .00 1.00
  2  3
      25.000        .052        .044
      21.000        .005        .009
      33.000        .009        .010
      37.000        .003        .002
      27.000        .003        .001
```

Table 4.2.5. : Cod in 7d. Tuning result (third run).

```
VPA, Version 3.1 (MSDOS)

   8/10/1993  12:03

Extended Survivors Analysis

COD, 7D, 1992

CPUE data from file \CAPUCINE\WG\COD7DEF.DAT


Data for    2 fleets over    8 years
Age range from    1 to    6


     Fleet,                Alpha,    Beta
FRATRC                   ,  .000   , 1.000
FRAGFS                   ,  .000   , 1.000


Time series weights :

     Tapered time weighting applied
     Power =    3 over  20 years


Catchability analysis :

     Catchability dependent on stock size for ages <    2

        Regression type = C
        Minimum of    5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  2


     Catchability independent of age for ages >=    3


Terminal population estimation :

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

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

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

     Prior weighting not applied


Tuning converged after   11 iterations


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

cont'd.

Table 4.2.4. : Fleets used in catch at age analysis and effort data.

```
COD, 7d, 1976-92
102
FRATRC
 1985 1992
 1 1   .00 1.00
  1  6
  456831.000      11.000     870.000     344.000      55.000       3.000       1.000
  353839.000    9094.000    5015.000    1202.000     154.000      55.000       4.000
  309988.000    1307.000    5041.000     420.000     325.000      10.000       3.000
  260919.000     791.000    1487.000    1471.000     102.000      75.000       4.000
  329640.000     572.000     913.000     455.000     378.000      18.000       7.000
  268831.000      74.000     362.000     151.000      49.000      31.000       2.000
  361439.000      61.000     106.000     148.000      35.000      12.000       7.000
  346545.000    1426.793     267.854      33.346      12.142       3.654        .497
FRAGFS
 1988 1992
 1 1   .00 1.00
  2  3
      25.000        .052        .044
      21.000        .005        .009
      33.000        .009        .010
      37.000        .003        .002
      27.000        .003        .001
```

Table 4.2.5. : Cod in 7d. Tuning result (third run).

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VPA, Version 3.1 (MSDOS)

  8/10/1993  12:03

Extended Survivors Analysis

COD, 7D, 1992

CPUE data from file \CAPUCINE\WG\COD7DEF.DAT


Data for    2 fleets over    8 years
Age range from    1 to    6


     Fleet,                Alpha,    Beta
FRATRC                   ,  .000   , 1.000
FRAGFS                   ,  .000   , 1.000


Time series weights :

     Tapered time weighting applied
     Power =    3 over  20 years


Catchability analysis :

     Catchability dependent on stock size for ages <    2

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  2


     Catchability independent of age for ages >=    3


Terminal population estimation :

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

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

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

     Prior weighting not applied


Tuning converged after   11 iterations


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

cont'd.

Table 4.2.5 continued

Age 1 Catchability dependent on age and year class strength

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	9392.	3.168	.000	.00	1	.021	.186
FRAGFS	1.	.000	.000	.00	0	.000	.000
P shrinkage mean	2299.	1.20				.144	.606
F shrinkage mean	4460.	.50				.835	.357

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
4118.	.46	.61	3	1.339	.382

Age 2 Catchability constant w.r.t. time, dependent on age

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	169.	1.125	.188	.17	2	.146	1.212
FRAGFS	127.	1.276	.000	.00	1	.114	1.420
F shrinkage mean	180.	.50				.740	1.167

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
171.	.43	.11	4	.257	1.201

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	13.	.652	.030	.05	3	.332	1.815
FRAGFS	16.	1.176	.008	.01	2	.102	1.664
F shrinkage mean	19.	.50				.565	1.518

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
16.	.38	.11	6	.297	1.629

cont'd.

Table 4.2.5 continued

1

Age 4 Catchability constant w.r.t. time and age (fixed at the value for age) 3

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	6.	1.030	.118	.11	4	.187	1.862
FRAGFS	3.	3.097	.307	.10	2	.021	2.274
F shrinkage mean	8.	.50				.793	1.580

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
7.	.45	.15	7	.337	1.645

Age 5 Catchability constant w.r.t. time and age (fixed at the value for age) 3

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	2.	1.326	.096	.07	5	.124	1.975
FRAGFS	3.	5.658	.377	.07	2	.007	1.473
F shrinkage mean	2.	.50				.870	1.638

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
2.	.47	.14	8	.290	1.678

1

Age 6 Catchability constant w.r.t. time and age (fixed at the value for age) 3

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	1.	.000	.000	.00	0	.000	.000
FRAGFS	1.	.000	.000	.00	0	.000	.000
F shrinkage mean	1.	.50				.874	.000

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
0.	.47	.23	9	.493	1.404

Table 4.2.6. : Total International Fishing Mortality Rate at Age of COD in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.001	0.486	0.131	0.062	0.168	0.024	0.248	0.041	0.111	0.002	1
2	0.698	1.164	1.340	0.818	0.753	1.124	0.619	1.215	1.032	0.371	2
3	2.075	0.413	1.626	1.371	1.134	1.265	1.028	2.104	1.073	0.989	3
4	1.793	1.341	1.314	2.029	1.904	1.458	1.579	1.527	1.701	0.593	4
5	2.239	2.154	1.084	1.829	2.583	1.084	1.653	1.188	1.913	0.456	5
6	1.383	1.125	1.109	1.235	1.329	1.001	1.035	1.231	1.183	0.625	6
7	1.383	1.125	1.109	1.235	1.329	1.001	1.035	1.231	1.183	0.625	7

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	0.589	0.514	0.375	0.409	0.345	0.154	0.387	1
2	1.965	1.224	1.112	1.306	1.052	1.091	1.201	2
3	1.087	1.371	1.315	1.513	1.373	1.925	1.630	3
4	2.014	1.503	1.512	1.704	1.398	1.684	1.645	4
5	2.322	0.970	1.876	1.631	1.379	2.208	1.678	5
6	1.662	1.131	1.229	1.316	1.110	1.455	1.405	6
7	1.662	1.131	1.229	1.316	1.110	1.455	1.405	7

Table 4.2.7. : Stock Numbers at Age (1000's) of COD in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	8168	16606	4146	5359	4770	2677	4301	3408	5836	9421	1
2	1661	6678	8362	2976	4123	3301	2141	2747	2677	4277	2
3	910	677	1707	1792	1075	1590	878	944	667	781	3
4	139	94	366	275	372	283	368	257	94	187	4
5	48	19	20	81	30	45	54	62	46	14	5
6	34	4	2	6	11	2	13	8	15	6	6
7	3	4			2			2		3	7

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	27337	6339	3715	2379	622	970	7236	1
2	7700	12422	3103	2091	1294	361	681	2
3	2416	884	2990	836	464	370	99	3
4	238	667	184	657	151	96	44	4
5	85	26	121	33	98	30	15	5
6	7	7	8	15	5	20	3	6
7	1			2		0	0	7

Table 4.2.8. : Mean Fishing Mortality , Biomass and Recruitment of COD in 07D between 1976 and 1992

	Mean Fishing Mortality			Biomass		Recruits	
	Ages		Ages	1000 tonnes		Age 1	
	2 to 4		0 to 0				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1976	1.522	0.000	0.000	10.52	1.21	75	8.17
1977	0.973	0.000	0.000	15.41	0.64	76	16.61
1978	1.427	0.000	0.000	15.84	1.20	77	4.15
1979	1.406	0.000	0.000	12.10	1.52	78	5.36
1980	1.264	0.000	0.000	10.38	1.91	79	4.77
1981	1.282	0.000	0.000	9.72	1.53	80	2.68
1982	1.075	0.000	0.000	8.56	2.01	81	4.30
1983	1.616	0.000	0.000	7.86	1.49	82	3.41
1984	1.269	0.000	0.000	9.11	0.77	83	5.84
1985	0.651	0.000	0.000	14.86	1.13	84	9.42
1986	1.689	0.000	0.000	24.10	1.23	85	27.34
1987	1.366	0.000	0.000	23.39	2.02	86	6.34
1988	1.313	0.000	0.000	15.63	1.26	87	3.72
1989	1.508	0.000	0.000	8.59	2.73	88	2.38
1990	1.274	0.000	0.000	4.52	1.17	89	0.62
1991	1.567	0.000	0.000	3.18	0.82	90	0.97
1992	1.492	0.000	0.000	5.34	0.41	91	5.00*
Arit-mean recruits at age 1 for period 1976 to 1992							7
Geom-mean recruits at age 1 for period 1976 to 1992							5

* Geometric mean

Table 4.2.9.: Input for catch prediction of COD in 07D

	1992 Stock and Fishing Mortality				Values used in Prediction: F at age , Mean Wt. and Propn. Retained by Consumption Fishery						
					Scaled mean F 1988 to 1992			Mean values for period 1988 to 1992 Mean Weight (Kg.)			
Age	Stock Number	Fishing Mortality H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Prop. Ret.
1	5000	0.381		0.000	0.397		0.000	0.776		0.849	0.776	1.000
2	681	1.201		0.000	1.202		0.000	1.253		1.438	1.253	1.000
3	99	1.630		0.000	1.618		0.000	2.798		3.822	2.798	1.000
4	44	1.645			1.657		0.000	4.535		4.792	4.535	1.000
5	15	1.678			1.829		0.000	5.829		5.795	5.829	1.000
6	3	1.404		0.001	1.358		0.000	6.372		8.968	6.373	1.000
7	0	1.404		0.001	1.358		0.000	8.617		7.838	8.309	1.000

Mean F	Age 2 to 4	Age 0 0	Age 2 to 4	Age 0 0
Unscaled	1.492	0.000	1.431	0.000
Scaled			1.492	0.000

Recruits at age 1 in 1993 = 5000
Recruits at age 1 in 1994 = 5000
Recruits at age 1 in 1995 = 5000
Recruits at age 1 in 1996 = 5000

M at age and proportion mature at age are as shown in Table _____

Mean F for ages 2 to 4 in 1992 for human consumption landings + discards = 1.492 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1988 to 1992
rescaled to produce a mean value of F for ages 2 to 4 equal to that for 1992

Mean F for ages 0 to 0 in 1992 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1988 to 1992 .
rescaled to produce a mean value of F for ages 0 to 0 equal to that for 1992

Values of N in 1992 from VPA have been overwritten
for the following ages .....

Age 1

Values of F for these ages in 1992 from VPA have been overwritten
with scaled mean values used for predictions for 1993 onwards

Values of Natural Mortality Rate and Proportion Mature at age

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	0.000
3	0.200	0.000
4	0.200	1.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000

Table 4.2.10. : Predicted catches and biomasses (1000's of tonnes) of COD in 07d 1993 to 1994.

	Year										
	1992	1993	1994								
Biomass 1 Jan of Year											
Total	5.3	8.0	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Spawning	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean F Ages											
Human Cons. 2 to 4	1.49	1.49	0.00	0.30	0.60	0.90	1.19	1.49	1.79	0.27	0.41
Small-mesh 0 to 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean F(Year)/Mean F(1992)										F0.1	Fmax
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.18	0.27
Catch weight											
Human Consumption	2.7	3.9	0.0	1.5	2.6	3.6	4.3	4.9	5.4	1.4	1.9
Discards	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Small-mesh Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total landings	2.7	3.9	0.0	1.5	2.6	3.6	4.3	4.9	5.4	1.4	1.9
Total catch	2.7	3.9	0.0	1.5	2.6	3.6	4.3	4.9	5.4	1.4	1.9
Biomass 1 Jan of Year+1											
Total	8.0	9.4	18.0	15.5	13.6	12.0	10.8	9.8	8.9	15.7	14.7
Spawning	0.1	0.1	2.7	2.0	1.4	1.0	0.7	0.5	0.4	2.0	1.7

Stock at start of and catch during 1993

Age	Stock No	H.Cons	Discards	By-catch	Total
1	5000	1495			1495
2	2797	1808			1808
3	168	125			125
4	16	12			12
5	7	5			5
6	2	2			2
7	1	0			0
Wt	7985	3874	0	0	3874

Stock at start of and catch during 1994
for F(1994) = F(1993)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	5000	1495			1495
2	2752	1779			1779
3	689	513			513
4	27	21			21
5	2	2			2
6	1	1			1
7	1	0			0
Wt	9403	4937	0	0	4937

Table 4.3.1 : Nominal catch and Working Group data (in tonnes) of Whiting in Division VIId 1982-1992, as officialy reported to ICES.

Year	Belgium	France	Netherlands	UK (England & Wales)	UK (Scotland)	Total	unreported landings	Working Group data
1982	93	7012	2	170	-	7277	633	7910
1983	84	5057	1	198	-	5340	1600	6940
1984	79	6914	-	88	-	7081	289	7370
1985	82	7563	-	186	-	7831	- 491	7340
1986	65	4551	-	180	-	4796	704	5500
1987	136	6730	-	287	-	7153	- 2463	4690
1988	69	7501	-	251	-	7821	- 3391	4430
1989	38	n/a	-	231	-	n/a	-	4160
1990	83	n/a	-	237	1	n/a	-	3480
1991	83	n/a	-*	292	1	n/a	-	5780
1992*	66	n/a	-	414	23	n/a	-	5760

* Preliminary

Table 4.3.2 : Total International Catch at Age (1000's) of WHITING in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	529	1351	1105	413	163	952	3199	3441	4105	491	1
2	9774	6717	6763	8072	5742	9204	10391	12546	12308	14177	2
3	6190	10329	18945	14018	16492	10274	14132	8486	13266	15972	3
4	8590	1099	9770	10512	7365	8548	3151	3537	2274	2493	4
5	1800	1301	579	2358	4806	3308	1553	1229	1075	578	5
6	430	336	650	98	776	1275	453	154	317	203	6
7	7	26	130	116	138	717	68	63	45	29	7
8	101	15	4	14	28	2	5	14	22	36	8

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	229	2160	1754	1194	237	4061	5925	1
2	3665	6133	10714	6340	8951	8753	11817	2
3	11457	1667	4058	7349	3049	5336	5666	3
4	6773	7442	572	1131	2131	3998	1489	4
5	1014	493	806	42	301	2720	893	5
6	274	246	35	129	2	525	305	6
7	61	44	10	10	4	60	48	7
8	16	11			4	40	0	8

Table 4.3.3 : Total International Mean Weight at Age (Kg.) of WHITING in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.220	0.191	0.280	0.189	0.157	0.150	0.146	0.174	0.172	0.137	1
2	0.225	0.179	0.215	0.205	0.211	0.229	0.197	0.211	0.194	0.167	2
3	0.284	0.242	0.223	0.247	0.243	0.278	0.257	0.258	0.239	0.243	3
4	0.312	0.352	0.275	0.272	0.286	0.272	0.318	0.296	0.310	0.301	4
5	0.414	0.357	0.328	0.325	0.312	0.264	0.346	0.307	0.261	0.318	5
6	0.381	0.378	0.319	0.398	0.347	0.305	0.410	0.376	0.305	0.290	6
7	0.467	0.475	0.328	0.357	0.309	0.331	0.436	0.324	0.379	0.477	7
8	0.481	0.468	0.721	0.458	0.444	1.047	0.575	0.602	0.388	0.388	8

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	0.131	0.192	0.183	0.176	0.151	0.164	0.159	1
2	0.164	0.219	0.214	0.210	0.205	0.200	0.205	2
3	0.228	0.256	0.319	0.287	0.265	0.238	0.267	3
4	0.268	0.298	0.357	0.371	0.319	0.268	0.312	4
5	0.310	0.370	0.355	0.405	0.370	0.297	0.318	5
6	0.335	0.322	0.466	0.484	0.408	0.329	0.401	6
7	0.415	0.372	0.458	0.530	0.403	0.315	0.259	7
8	0.444	0.760			0.475	0.416	0	8

Table 4.3.4. : Fleets used in catch at age analysis and effort data.

```
WHITING, 7d, 1976-92
102
FRATRC
 1985 1992
 1 1   .00 1.00
  1  6
  456831.000     474.000   13903.000   15351.000    2385.000     527.000     197.000
  353839.000     217.000    3457.000   10828.000    6419.000     960.000     258.000
  309988.000    1939.000    5352.000    1467.000    6436.000     425.000     216.000
  260919.000    1718.000   10289.000    3766.000     488.000     708.000      28.000
  329640.000    1163.000    6156.000    6885.000    1036.000      25.000      71.000
  268831.000     209.000    8351.000    2713.000    1820.000     273.000       2.000
  361439.000    3730.000    7904.000    4784.000    3640.000    2524.000     495.000
  346545.000    5796.459   10983.330    4990.140    1279.827     736.783     269.777
FRAGFS
 1988 1992
 1 1   .00 1.00
  1  4
      25.000        .603        .574        .161        .022
      21.000        .392        .109        .030        .011
      33.000        .770        .433        .032        .008
      37.000       1.319        .259        .034        .003
      27.000       1.366        .397        .041        .015
```

Table 4.3.5. : Whiting in 7d. Tuning result (third run)

```
VPA Version 3.1 (MSDOS)

   7/10/1993  18:11

Extended Survivors Analysis

WHITING, 7D, 1992

CPUE data from file \CAPUCINE\WG\WHI7DEF.DAT


Data for    2 fleets over    8 years
Age range from    1 to    7


     Fleet,                Alpha,    Beta
FRATRC                   ,  .000   , 1.000
FRAGFS                   ,  .000   , 1.000


Time series weights :

     Tapered time weighting applied
     Power =    3 over  20 years


Catchability analysis :

     Catchability dependent on stock size for ages <    2

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  2


     Catchability independent of age for ages >=    4


Terminal population estimation :

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

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

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

     Prior weighting not applied


Tuning converged after   17 iterations

1


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


cont'd.

Table 4.3.5 continued

Age 1 Catchability dependent on age and year class strength

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	53647.	.618	.000	.00	1	.130	.095
FRAGFS	45990.	.317	.000	.00	1	.494	.110
P shrinkage mean	21912.	.53				.177	.219
F shrinkage mean	85185.	.50				.198	.061

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
46497.	.22	.24	4	1.088	**.109**

Age 2 Catchability constant w.r.t. time, dependent on age

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	15361.	.347	.130	.37	2	.403	.528
FRAGFS	15945.	.348	.008	.02	2	.402	.513
F shrinkage mean	15162.	.50				.195	.534

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
15554.	.22	.04	5	.194	**.523**

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	3181.	.368	.167	.45	3	.489	.960
FRAGFS	3168.	.518	.104	.20	3	.246	.963
F shrinkage mean	4071.	.50				.264	.815

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
3392.	.26	.09	7	.351	**.921**

cont'd.

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	787.	.570	.105	.19	4	.378	.998
FRAGFS	717.	.969	.184	.19	4	.131	1.058
F shrinkage mean	617.	.50				.491	1.158

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
690.	.35	.08	9	.226	**1.083**

Age 5 Catchability constant w.r.t. time and age (fixed at the value for age) 4

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	234.	.833	.162	.20	5	.243	1.493
FRAGFS	228.	1.423	.290	.20	4	.083	1.514
F shrinkage mean	306.	.50				.674	1.291

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
280.	.41	.10	10	.254	1.357

Age 6 Catchability constant w.r.t. time and age (fixed at the value for age) 4

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	71.	1.647	.166	.10	6	.084	1.582
FRAGFS	70.	5.130	.497	.10	3	.009	1.600
F shrinkage mean	72.	.50				.908	**1.571**

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
72.	.48	.04	10	.089	**1.572**

Age 7 Catchability constant w.r.t. time and age (fixed at the value for age) 4

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FRATRC	19.	2.006	.225	.11	6	.058	1.207
FRAGFS	67.	9.412	.649	.07	2	.003	.503
F shrinkage mean	22.	.50				.939	1.104

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
22.	.48	.06	9	.123	**1.108**

Table 4.3.6. : Total International Fishing Mortality Rate at Age of WHITING in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.008	0.026	0.021	0.013	0.004	0.030	0.073	0.065	0.080	0.058	1
2	0.243	0.126	0.177	0.204	0.251	0.315	0.515	0.450	0.343	0.428	2
3	1.125	0.438	0.614	0.665	0.818	0.962	1.158	1.096	1.289	1.025	3
4	1.329	0.607	0.991	0.849	0.925	1.572	0.931	1.103	1.057	0.933	4
5	1.186	0.731	0.767	0.697	1.352	1.740	1.853	1.301	1.364	0.879	5
6	1.862	0.739	1.061	0.275	0.521	2.456	1.556	1.075	1.811	1.125	6
7	1.169	0.531	0.729	0.539	0.775	1.430	1.219	1.014	1.189	0.881	7
8	1.169	0.531	0.729	0.539	0.775	1.430	1.219	1.014	1.189	0.881	8

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	0.013	0.061	0.077	0.051	0.010	0.108	0.102	1
2	0.769	0.543	0.471	0.431	0.649	0.568	0.517	2
3	0.744	1.024	0.867	0.697	0.381	1.079	0.920	3
4	2.381	1.971	1.362	0.638	0.444	1.314	1.084	4
5	1.430	2.090	1.713	0.311	0.345	1.912	1.357	5
6	1.643	2.630	0.958	2.160	0.022	1.925	1.572	6
7	1.409	1.681	1.085	0.855	0.365	1.476	1.107	7
8	1.409	1.681	1.085	0.855	0.365	1.476	1.107	8

Table 4.3.7. : Stock Numbers at Age (1000's) of WHITING in 07D between 1976 and 1992

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	76906	57567	59996	35108	45799	35543	49830	60610	58981	9630	1
2	49721	62487	45912	48122	28371	37350	28241	37911	46518	44587	2
3	9929	31915	45106	31498	32133	18063	22309	13815	19790	27031	3
4	12615	2639	16867	19988	13264	11609	5653	5737	3780	4465	4
5	2805	2733	1177	5126	7000	4306	1974	1825	1558	1075	5
6	546	702	1077	448	2091	1483	619	253	407	326	6
7	11	69	274	305	278	1017	104	107	71	54	7
8	159	40	9	37	57	3	8	24	35	68	8

Age	1986	1987	1988	1989	1990	1991	1992	Age
1	19803	40525	26163	26326	27223	43582	67240	1
2	7441	16006	31230	19838	20476	22074	32021	2
3	23788	2823	7614	15966	10556	8764	10240	3
4	7942	9252	830	2620	6509	5906	2439	4
5	1438	601	1055	174	1134	3418	1299	5
6	365	282	61	156	104	658	414	6
7	87	58	17	19	15	84	79	7
8	22	14			15	55	0	8

Table 4.3.8 : Research vessel indices used for recent and expected recruiting year classes.

```
WHITING IN 7d - AGE 1
  2  5  2
'YEARCLASS' 'VPA'   'CGFS1 '   'CGFS2 '
1987,   26163.0,      29.7,       6.6
1988,   26326.0,      20.0,      23.6
1989,   27223.0,      33.2,       3.6
1990,      -1.0,      19.9,      25.4
1991,      -1.0,      81.4,      -1.0

WHITING IN 7d - AGE 2
  2  6  2
'YEARCLASS' 'VPA'   'CGFS1 '   'CGFS2 '
1986,   31230.0,      -1.0,      36.3
1987,   19838.0,      29.7,       6.6
1988,   20476.0,      20.0,      23.6
1989,   22074.0,      33.2,       3.6
1990,      -1.0,      19.9,      25.4
1991,      -1.0,      81.4,      -1.0
```

Table 4.3.9a : Analysis by RCT3.

Analysis by RCT3 ver3.1 of data from file :

WHI7DRE1.DAT

WHITING IN 7d - AGE 1

Data for 2 surveys over 5 years : 1987 - 1991

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

	I----------Regression----------I				I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
CGFS1	.15	9.69	.05	.310	3	3.04	10.14	.110	.011
CGFS2	-.04	10.28	.04	.390	3	3.27	10.15	.094	.011
					VPA Mean =		10.19	.021	.978

Yearclass = 1991

	I----------Regression----------I				I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
CGFS1	.15	9.69	.05	.312	3	4.41	10.35	.251	.007
CGFS2									
					VPA Mean =		10.19	.021	.993

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	26542	10.19	.02	.00	.04		
1991	26600	10.19	.02	.01	.41		

Table 4.3.9b : Analysis by RCT3.

Analysis by RCT3 ver3.1 of data from file :

WHI7DRE2.DAT

WHITING IN 7d - AGE 2

Data for 2 surveys over 6 years : 1986 - 1991

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

	I----------Regression----------I					I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
CGFS1	.50	8.28	.16	.185	3	3.04	9.80	.400	.194
CGFS2	.35	9.13	.34	.362	4	3.27	10.28	.571	.095
					VPA Mean =		10.04	.208	.712

Yearclass = 1991

	I----------Regression----------I					I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
CGFS1	.50	8.29	.16	.186	3	4.41	10.48	.907	.050
CGFS2									
					VPA Mean =		10.04	.208	.950

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	22419	10.02	.18	.09	.27		
1991	23477	10.06	.20	.09	.22		

Table 4.3.10. : Mean Fishing Mortality , Biomass and Recruitment of WHITING in 07D between 1976 and 1992

	Mean Fishing Mortality			Biomass		Recruits	
	Ages		Ages	1000 tonnes		Age 1	
	2 to 4		0 to 0				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1976	0.899	0.000	0.000	36.29	13.68	75	76.91
1977	0.390	0.000	0.000	32.11	14.62	76	57.57
1978	0.594	0.000	0.000	42.18	19.13	77	60.00
1979	0.573	0.000	0.000	31.72	19.18	78	35.11
1980	0.665	0.000	0.000	27.79	16.53	79	45.80
1981	0.950	0.000	0.000	23.98	13.84	80	35.54
1982	0.868	0.000	0.000	21.38	10.56	81	49.83
1983	0.883	0.000	0.000	24.47	9.62	82	60.61
1984	0.896	0.000	0.000	25.66	10.50	83	58.98
1985	0.795	0.000	0.000	17.17	11.30	84	9.63
1986	1.298	0.000	0.000	11.99	7.95	85	19.80
1987	1.179	0.000	0.000	15.11	5.57	86	40.52
1988	0.900	0.000	0.000	14.63	6.30	87	26.16
1989	0.589	0.000	0.000	14.52	7.18	88	26.32
1990	0.491	0.000	0.000	13.67	7.13	89	27.22
1991	0.987	0.000	0.000	14.61	6.96	90	31.85
1992	0.952	0.000	0.000	12.91	6.09	91	26.54
Arit-mean recruits at age 1 for period 1976 to 1992							40
Geom-mean recruits at age 1 for period 1976 to 1992							36

Table 4.3.11.: Input for catch prediction of WHITING in 07D

Age	1992 Stock and Fishing Mortality: Stock Number	Fishing Mortality: H.Con.	Fishing Mortality: Disc	Fishing Mortality: Ind	Values used in Prediction: Scaled mean F 1988 to 1992: H.Con.	Scaled mean F 1988 to 1992: Disc	Scaled mean F 1988 to 1992: Ind	Mean values for period 1988 to 1992: Mean Weight (Kg.): H.Con.	Mean Weight (Kg.): Disc	Mean Weight (Kg.): Ind	Mean Weight (Kg.): Stock	Prop. Ret.
1	26542	0.114		0.000	0.126		0.000	0.167		0.116	0.167	1.000
2	22419	0.594		0.000	0.656		0.000	0.207		0.260	0.207	1.000
3	10239	0.920		0.000	0.872		0.000	0.275		0.379	0.275	1.000
4	2439	1.084		0.000	1.070		0.000	0.325		0.509	0.325	1.000
5	1299	1.357			1.246		0.000	0.349		0.441	0.349	1.000
6	414	1.572			1.467			0.418			0.418	1.000
7	78	1.107			1.080			0.393			0.393	1.000
8	0	1.107			1.080			0.525			0.525	1.000

Mean F	Age 2 to 4	Age 0 0	Age 2 to 4	Age 0 0
Unscaled	0.866	0.000	0.784	0.000
Scaled			0.866	0.000

Recruits at age 1 in 1993 = 36308
Recruits at age 1 in 1994 = 36308
Recruits at age 1 in 1995 = 36308
Recruits at age 1 in 1996 = 36308

M at age and proportion mature at age are as shown in Table _____

Mean F for ages 2 to 4 in 1992 for human consumption landings + discards = 0.866 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1988 to 1992
rescaled to produce a mean value of F for ages 2 to 4 equal to that for 1992

Mean F for ages 0 to 0 in 1992 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1988 to 1992 .
rescaled to produce a mean value of F for ages 0 to 0 equal to that for 1992

Values of N in 1992 from VPA have been overwritten
for the following ages .....

Age 1
Age 2

Values of F for these ages in 1992 from VPA have been overwritten
with scaled mean values used for predictions for 1993 onwards

Values of Natural Mortality Rate and Proportion Mature at age

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	0.530
3	0.200	0.840
4	0.200	1.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000
8	0.200	1.000

Table 4.3.12. : Predicted catches and biomasses (1000's of tonnes) of WHITING in 07d 1993 to 1994

	Year										
	1992	1993	1994								
Biomass 1 Jan of Year											
Total	12.9	14.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Spawning	6.1	5.9	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Mean F Ages											
Human Cons. 2 to 4	0.87	0.87	0.00	0.17	0.35	0.52	0.69	0.87	1.04	0.30	1.10
Small-mesh 0 to 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean F(Year)/Mean F(1992)										F0.1	Fmax
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.35	1.27
Catch weight											
Human Consumption	5.8	4.8	0.0	1.4	2.5	3.6	4.4	5.2	5.9	2.2	6.1
Discards	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Small-mesh Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total landings	5.8	4.8	0.0	1.4	2.5	3.6	4.4	5.2	5.9	2.2	6.1
Total catch	5.8	4.8	0.0	1.4	2.5	3.6	4.4	5.2	5.9	2.2	6.1
Biomass 1 Jan of Year+1											
Total	14.3	15.3	21.7	20.2	18.9	17.8	16.8	15.9	15.2	19.2	14.9
Spawning	5.9	6.3	11.8	10.5	9.3	8.4	7.5	6.8	6.2	9.6	6.0

Stock at start of and catch during 1993

Age	Stock No	H.Cons	Discards	By-catch	Total
1	36308	3903			3903
2	19389	8550			8550
3	10133	5419			5419
4	3341	2024			2024
5	675	445			445
6	274	195			195
7	70	43			43
8	21	13			13
Wt	14337	4832	0	0	4832

Stock at start of and catch during 1994
for F(1994) = F(1993)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	36308	3903			3903
2	26209	11558			11558
3	8234	4403			4403
4	3470	2103			2103
5	938	618			618
6	159	114			114
7	52	31			31
8	25	16			16
Wt	15306	5223	0	0	5223

Table 4.4.1 SOLE in Division VIId. Nominal landings (tonnes) as officially reported to ICES, 1974-1992.

Year	Belgium	France	UK (E+W)	Others	Total reported	Unreported[1]	Total as used by WG
1974	159	469	309	3	940	-	940
1975	132	464	244	1	841	52	893
1976	203	599	404	-	1,206	90	1,296
1977	225	737	315	-	1,277	69	1,346
1978	241	782	366	-	1,389	75	1,464
1979	311	1,129	402	-	1,842	83	1,925
1980	302	1,075	159	-	1,536	183	1,719
1981	464	1,513	160	-	2,137	120	2,257
1982	525	1,828	317	4	2,674	145	2,819
1983	502	1,120	419	-	2,041	1,131	3,172
1984	592	1,309	505	-	2,406	880	3,286
1985	568	2,545	520	-	3,633	237	3,870
1986	858	1,528	551	-	2,937	991	3,928
1987	1,100	2,086	655	-	3,841	1,026	4,867
1988	667	2,057	578	-	3,302	644	3,946
1989	646	1,610	689	-	2,945	1,212	4,157
1990	996	1,255	742	-	2,993	964	3,957
1991	904	2,054	825	-	3,783	513	4,296
1992[2]	891	1,961	704	1	3,557	504	4,061

[1]Estimated by the Working Group.
[2]Provisional.

Table 4.4.2.- Catch numbers, catch weights and stocks weights at age.

107D SOLE 1993 WG,1-15+,80-92,SEXES COMB

At 11/09/1993 9:16

Table 1 Catch numbers at age					Numbers*10**-3					
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	0,	24,	49,	49,	9,	95,	163,	1271,	383,	106,
2,	852,	1977,	3693,	1264,	3284,	2227,	3704,	3092,	7381,	4082,
3,	3452,	3157,	5211,	5377,	3827,	7393,	3424,	6326,	3796,	8967,
4,	3930,	2610,	1646,	3273,	3417,	1648,	4842,	1257,	4316,	1886,
5,	897,	1900,	1027,	925,	2166,	1219,	1530,	1654,	585,	2065,
6,	735,	742,	1860,	790,	1064,	910,	943,	329,	1003,	295,
7,	627,	457,	144,	1087,	1110,	400,	651,	432,	256,	382,
8,	333,	317,	158,	156,	828,	268,	218,	293,	257,	140,
9,	108,	136,	156,	192,	114,	280,	181,	138,	272,	184,
+gp,	282,	337,	197,	597,	632,	368,	599,	695,	490,	335,
TOTALNUM,	11216,	11657,	14141,	13710,	16451,	14808,	16255,	15487,	18739,	18442,
TONSLAND,	3115,	3250,	3837,	3984,	4974,	3982,	4187,	4020,	4296,	4061,
SOPCOF %,	89,	90,	100,	99,	100,	100,	100,	99,	98,	98,

Table 2 Catch weights at age (kg)										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.0000,	.1000,	.0900,	.1350,	.0950,	.1020,	.1060,	.1210,	.1140,	.1030,
2,	.1730,	.1780,	.1820,	.1790,	.1760,	.1520,	.1560,	.1800,	.1610,	.1530,
3,	.2300,	.2340,	.2300,	.2120,	.2360,	.2260,	.1930,	.2400,	.2110,	.2020,
4,	.3020,	.3140,	.2810,	.3060,	.2950,	.2780,	.2740,	.2910,	.2670,	.2670,
5,	.4040,	.3800,	.3680,	.3620,	.3530,	.3580,	.2950,	.3510,	.3490,	.2910,
6,	.4360,	.4360,	.3940,	.3850,	.4070,	.4070,	.3570,	.3430,	.3900,	.3990,
7,	.4350,	.4170,	.5160,	.4350,	.4120,	.4580,	.3910,	.4690,	.4150,	.3860,
8,	.5240,	.5380,	.5430,	.5190,	.4790,	.5090,	.4690,	.4630,	.4260,	.4550,
9,	.5370,	.5290,	.5940,	.5010,	.4630,	.5510,	.5160,	.4890,	.4330,	.4450,
+gp,	.6140,	.6699,	.7285,	.5743,	.5983,	.6417,	.6296,	.5572,	.5431,	.5293,

Table 3 Stock weights at age (kg)										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.0700,	.0670,	.0650,	.0700,	.0720,	.0730,	.0600,	.0700,	.0610,	.0570,
2,	.1350,	.1310,	.1290,	.1360,	.1390,	.1410,	.1190,	.1350,	.1190,	.1130,
3,	.1970,	.1920,	.1920,	.1980,	.2030,	.2060,	.1750,	.1960,	.1750,	.1650,
4,	.2550,	.2490,	.2540,	.2560,	.2620,	.2670,	.2300,	.2530,	.2280,	.2160,
5,	.3090,	.3040,	.3150,	.3090,	.3180,	.3240,	.2830,	.3050,	.2780,	.2640,
6,	.3590,	.3550,	.3760,	.3580,	.3700,	.3770,	.3350,	.3530,	.3260,	.3100,
7,	.4060,	.4030,	.4360,	.4030,	.4170,	.4260,	.3850,	.3960,	.3710,	.3530,
8,	.4480,	.4480,	.4950,	.4430,	.4610,	.4710,	.4330,	.4350,	.4130,	.3940,
9,	.4870,	.4900,	.5540,	.4800,	.5000,	.5120,	.4790,	.4700,	.4530,	.4330,
+gp,	.5759,	.5979,	.7207,	.5529,	.5951,	.6113,	.6065,	.5401,	.5593,	.5266,

Table 4.4.3.- Tuning file input.

```
 V11D SOLE,TUNING FILE,UK,BELG,FRANCE+UK BTS  [rev: 7/10/93]
106
BELGIAN BT (HP CORRECTED EFFORT & ALL GEARS AGE COMP)
1980 1992
1 1 0 1
2 15
12.8 69.3 46.1 298.7 189.6 57.4 24.7 10.3 5.1 8.6 3.1 5.5 2.4 2.6 37.9
19.0 640.7 161.4 82.1 312.8 229.6 44.7 32.9 33.1 6.9 9.0 18.4 9.3 0.8 51.9
23.9 148.7 980.9 128.0 93.4 155.9 112.6 38.8 60.1 15.2 14.0 7.4 12.5 5.9 54.3
23.6 190.4 373.0 818.9 65.5 54.0 81.7 73.2 23.5 20.2 27.0 5.0 1.0 7.1 33.0
28.0 603.8 347.2 311.2 436.0 53.7 38.5 104.9 59.9 25.4 23.2 25.3 9.0 8.2 42.4
25.3 382.9 612.1 213.0 209.1 260.2 58.2 34.1 48.0 31.0 16.9 19.6 9.2 7.7 21.3
23.5 215.0 1522.3 675.0 233.7 170.6 194.0 30.1 53.1 64.2 32.6 12.7 2.6 43 29.3
27.1 843.6 451 739.3 724.4 344.5 232.4 152.7 25.3 86.5 56 56.1 54.5 9.3 109.0
38.5 131.6 990.4 243.3 362.9 216.7 111.8 41.8 73.8 47.0 9.8 22.3 35.8 8.6 25.3
35.7 47.5 512.6 543.6 748.0 276.6 225.0 53.1 36.4 12.7 4.7 0.0 0.0 4.7 27.0
30.3 1011.4 1375.2 218.1 366.2 85.3 198.2 65.5 39.0 22.4 22.2 25.4 2.8 24.0 18.2
24.3 320.2 1358.6 710.1 125.6 283.9 60.6 56.2 21.0 19.8 22.2 18.0 5.6 0.3 21.4
20.0 499.3 1613.7 523.3 477.7 36.9 67.9 28.2 31.7 11.2 11.4 6.0 5.7 3.2 16.7
HASTINGS TRAMMEL (FLEET EFFORT & UK TRAWL AGE COMPS)
1981 1992
1 1 0 1
2 15
2.1 8.9 18.0 19.0 58.2 27.7 8.9 10.8 6.2 0.4 0.9 1.1 0.5 0.6 7.7
5.9 33.5 301.7 24.5 13.8 50.8 11.8 8.1 10.0 16.1 6.1 0.0 1.9 1.1 12.3
3.3 24.1 109.7 325.9 3.1 5.2 14.0 9.1 2.1 0.0 0.0 0.0 0.0 6.0 3.8
4.4 23.8 128.0 168.6 262.6 7.5 4.9 9.6 6.3 4.7 2.1 1.4 2.4 1.0 6.2
3.8 2.0 396.5 94.6 50.1 160.6 1.1 1.6 12.8 0.6 1.0 0.8 1.5 0.8 0.8
3.7 17.6 184.4 267.6 73.3 74.8 113.8 3.9 5.5 14.5 4.6 4.7 2.9 4.3 10.6
4.2 48.4 113.1 203.5 182.0 38.5 37.8 72.8 5.9 1.8 4.2 3.3 2.6 1.2 2.9
6.1 3.1 241.6 50.5 95.3 128.1 32.0 26.6 72.5 0.1 6.4 14.0 0.6 0.0 0.0
5.7 31.9 104.7 345.9 38.8 65.2 52.9 12.2 11.5 36.6 1.8 1.6 4.2 4.8 12.0
9.8 78.8 645.7 84.5 121.8 17.0 21.6 23.1 4.2 6.9 28.8 2.2 0.5 2.6 7.8
14.6 300.1 280.2 610.2 25.6 104.0 16.0 25.9 34.7 8.6 4.5 27.5 0.5 0.0 12.2
7.2 51.8 421.2 104.3 322.3 18.5 46.1 15.6 29.4 10.5 3.8 4.9 8.5 0.5 5.9
UK. >40FT.BEAM TRAWL(FLEET EFFORT & ALL TRAWL AGE COMPS DE-RAISED)
1981 1992
1 1 0 1
2 15
2.27 41.5 31.2 6.7 25.7 8.5 1.9 2.3 1.6 0.3 0.4 0.8 0.1 0.0 2.8
4.17 17.2 137.2 10.1 3.3 14.1 1.8 1.8 1.9 4.5 1.1 0.0 0.1 0.1 2.3
2.66 18.5 38.4 118.6 2.0 2.8 6.9 4.4 0.3 0.0 0.0 0.0 0.0 1.7 1.3
2.88 42.6 34.8 26.1 30.1 2.6 1.1 0.7 0.6 0.4 0.1 0.1 0.1 0.3 1.5
9.11 12.8 295.0 43.8 21.9 79.8 0.3 0.1 4.9 0.0 0.1 0.5 1.8 0.5 0.5
12.92 38.4 185.4 128.7 35.9 36.9 50.5 1.5 3.1 6.7 3.3 3.6 2.0 2.2 6.8
24.27 362.0 152.3 206.4 142.6 26.8 21.0 54.1 2.1 0.6 4.8 1.5 2.2 4.7 3.5
18.98 145.2 402.6 81.8 94.4 61.4 13.4 17.6 25.6 2.6 0.4 6.7 7.1 0.0 0.3
33.29 310.0 186.9 369.7 44.0 81.7 60.5 12.7 10.8 42.6 2.5 1.1 5.0 6.8 34.5
33.39 199.8 662.3 97.2 146.7 29.1 34.2 34.7 8.7 15.0 48.6 4.1 1.1 6.8 17.7
30.38 488.9 200.3 287.8 12.3 45.9 7.5 11.0 16.3 4.1 2.7 12.7 0.4 0.0 7.4
37.10 332.3 684.6 105.6 215.2 15.0 26.1 8.2 19.0 6.6 3.0 1.9 4.2 0.1 3.3
FRENCH OFFSHORE TRAWLERS,PORT EN BESSIN,FLEET EFFORT(Kg metier/cpue metier)
1983 1992
1 1 0 1
2 15
1816.7 11.6 60.5 44.6 18.2 14.7 10.8 4.9 1.8 1.5 0.6 0.5 0.1 0.2 0.6
2801.3 32.7 75.2 58.7 26.1 21.1 12.9 6.1 2.0 2.0 0.9 0.7 0.1 0.2 1.0
6771.5 320.5 310.7 115.0 67.1 111.9 8.1 11.9 7.5 3.7 0.8 0.9 0.1 0.6 1.3
8067.3 74.5 246.1 145.5 38.0 31.6 45.5 9.5 9.9 8.9 6.4 1.2 0.4 0.6 4.6
6036.7 92.4 172.3 113.9 50.1 36.1 46.6 26.4 4.5 4.4 1.7 1.4 1.9 0.5 2.0
6065.9 64.9 194.4 43.2 18.8 14.7 8.4 5.7 2.3 1.2 1.3 0.8 0.7 0.3 1.3
5815.4 116.1 92.2 118.7 24.6 15.9 9.0 4.7 4.1 4.7 1.0 1.1 1.2 0.8 1.9
7485.7 82.3 144.8 37.9 42.8 8.4 7.1 6.5 3.9 4.0 4.2 2.5 2.4 1.5 2.4
9540.3 354.0 98.0 125.8 25.5 28.9 9.9 8.7 10.2 3.4 3.4 4.3 0.4 1.0 4.0
9261.4 139.0 262.1 48.9 31.4 9.8 9.3 3.5 3.3 2.8 3.4 0.8 0.8 0.2 1.3
FR INSHORE OT,MANCHE EST (all fleets age comp)eff=all fleet lands/metier cpue)
1985 1992
1 1 0 1
2 15
228.87 98.6 95.6 35.4 20.6 34.4 2.5 3.6 2.3 1.1 0.2 0.3 0.0 0.2 0.4
411.20 47.2 156.0 92.2 24.1 20.0 28.8 6.0 6.3 5.6 4.0 0.7 0.3 0.4 2.9
573.20 146.8 273.7 181.0 79.6 57.4 74.0 41.9 7.2 7.0 2.7 2.2 3.0 0.9 3.2
942.10 238.1 712.8 158.3 69.0 54.0 30.7 20.8 8.3 4.2 4.9 3.1 2.7 1.0 4.9
1039.00 417.9 332.0 427.1 88.7 57.4 32.3 17.1 14.8 17.0 3.6 4.1 4.4 2.8 6.9
909.10 138.9 244.4 64.1 72.3 14.3 11.9 11.0 6.6 6.8 7.1 4.2 4.0 2.5 4.0
967.00 548.3 151.8 194.9 39.5 44.7 15.4 13.4 15.8 5.2 5.3 6.7 0.6 1.5 6.2
505.22 270.6 510.5 95.1 61.1 19.1 18.1 6.8 6.5 5.5 6.5 1.6 1.6 0.5 2.5
UK BEAM TRAWL SURVEY
1988 1992
1 1 .5 .75
1 6
1.0 8.2 14.2 9.9 0.8 1.3 1.2
1.0 2.6 15.4 3.4 1.7 0.6 1.1
1.0 12.1 3.7 3.4 0.7 0.8 0.5
1.0 8.9 22.8 2.2 2.3 0.3 1.0
1.0 1.4 12.0 10.0 0.7 1.1 1.8
```

Table 4.4.4. - Tuning output.

```
VPA Version 3.1 (MSDOS)

   9/10/1993  10:03

Extended Survivors Analysis

107D SOLE 1993 WG,1-15+,80-92,SEXES COMB,MILLNER

CPUE data from file a:\sol\s7dtub92.vpa


Data for    6 fleets over   11 years
Age range from    1 to    9

     Fleet,              Alpha,    Beta
BELGIAN BT (HP CORRE    ,  .000   , 1.000
HASTINGS TRAMMEL (FL    ,  .000   , 1.000
UK. >40FT.BEAM TRAWL    ,  .000   , 1.000
FRENCH OFFSHORE TRAW    ,  .000   , 1.000
FR INSHORE OT,MANCHE    ,  .000   , 1.000
UK BEAM TRAWL SURVEY    ,  .500   ,  .750


Time series weights :

     Tapered time weighting applied
     Power =    3 over  15 years


Catchability analysis :

     Catchability dependent on stock size for ages <    2

        Regression type = C
        Minimum of    5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  2


     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 =    .500

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

     Prior weighting not applied


Tuning converged after   40 iterations

1


Regression weights
      , .482,  .610,  .725,  .820,  .893,  .944,  .976,  .993,  .999, 1.000


Age  1   Catchability dependent on age and year class strength

Fleet                   Estimated    Int        Ext      Var     N  Scaled    Estimated
                        Survivors    s.e        s.e      Ratio      Weights   F
BELGIAN BT (HP CORRE        1.      .000       .000      .00     0   .000      .000
HASTINGS TRAMMEL (FL        1.      .000       .000      .00     0   .000      .000
UK. >40FT.BEAM TRAWL        1.      .000       .000      .00     0   .000      .000
FRENCH OFFSHORE TRAW        1.      .000       .000      .00     0   .000      .000
FR INSHORE OT,MANCHE        1.      .000       .000      .00     0   .000      .000
UK BEAM TRAWL SURVEY     9923.      .301       .000      .00     1   .520      .010

  P shrinkage mean       17081.      .40                                .291      .006

  F shrinkage mean        7172.      .50                                .189      .014


Weighted prediction :

Survivors       Int       Ext       N    Var       F
at end of year  s.e       s.e           Ratio
  11080.         .22       .25      3   1.132     .009


1
Age  2   Catchability constant w.r.t. time, dependent on age

Fleet                   Estimated    Int        Ext      Var     N  Scaled    Estimated
                        Survivors    s.e        s.e      Ratio      Weights   F
BELGIAN BT (HP CORRE    29989.      1.278       .000      .00     1   .022      .122
HASTINGS TRAMMEL (FL    20039.      1.243       .000      .00     1   .024      .177
UK. >40FT.BEAM TRAWL    16240.       .776       .000      .00     1   .061      .214
FRENCH OFFSHORE TRAW    12604.       .498       .000      .00     1   .148      .269
FR INSHORE OT,MANCHE    24041.       .438       .000      .00     1   .191      .150
UK BEAM TRAWL SURVEY    17611.       .300       .122      .41     2   .407      .199

  F shrinkage mean      14424.       .50                                .147      .238


Weighted prediction :

Survivors       Int       Ext       N    Var       F
at end of year  s.e       s.e           Ratio
  17450.         .19       .09      8    .463     .201
```

Continued

Table 4.4.4. (continued).

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	15045.	.753	.310	.41	2	.047	.449
HASTINGS TRAMMEL (FL	10769.	.391	.225	.57	2	.174	.583
UK. >40FT.BEAM TRAWL	9908.	.374	.138	.37	2	.190	.621
FRENCH OFFSHORE TRAW	10054.	.424	.330	.78	2	.147	.614
FR INSHORE OT,MANCHE	14195.	.454	.142	.31	2	.129	.471
UK BEAM TRAWL SURVEY	11503.	.359	.102	.28	3	.206	.555
F shrinkage mean	10463.	.50				.106	.596

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
11161.	.16	.07	14	.405	.568

1

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	5303.	.685	.074	.11	3	.054	.288
HASTINGS TRAMMEL (FL	1565.	.484	.152	.31	3	.108	.764
UK. >40FT.BEAM TRAWL	1421.	.385	.074	.19	3	.170	.817
FRENCH OFFSHORE TRAW	1376.	.355	.082	.23	3	.200	.835
FR INSHORE OT,MANCHE	2073.	.422	.290	.69	3	.142	.623
UK BEAM TRAWL SURVEY	1629.	.335	.106	.32	4	.225	.743
F shrinkage mean	2198.	.50				.101	.597

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
1742.	.16	.09	20	.543	.708

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	3036.	.614	.336	.55	4	.059	.499
HASTINGS TRAMMEL (FL	3258.	.537	.210	.39	4	.077	.472
UK. >40FT.BEAM TRAWL	2779.	.418	.140	.34	4	.127	.535
FRENCH OFFSHORE TRAW	1585.	.366	.108	.30	4	.166	.806
FR INSHORE OT,MANCHE	2288.	.321	.171	.53	4	.216	.620
UK BEAM TRAWL SURVEY	2461.	.289	.094	.33	5	.267	.587
F shrinkage mean	2589.	.50				.089	.565

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
2377.	.15	.07	26	.454	.602

1

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	431.	.517	.059	.12	5	.091	.502
HASTINGS TRAMMEL (FL	355.	.565	.101	.32	5	.076	.583
UK. >40FT.BEAM TRAWL	315.	.361	.149	.41	5	.187	.637
FRENCH OFFSHORE TRAW	464.	.402	.101	.25	5	.151	.473
FR INSHORE OT,MANCHE	591.	.341	.159	.47	5	.209	.389
UK BEAM TRAWL SURVEY	526.	.360	.235	.65	5	.188	.428
F shrinkage mean	415.	.50				.097	.516

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
447.	.16	.07	31	.447	.487

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	791.	.459	.148	.32	6	.160	.378
HASTINGS TRAMMEL (FL	685.	.673	.161	.24	6	.074	.426
UK. >40FT.BEAM TRAWL	625.	.470	.081	.17	6	.153	.458
FRENCH OFFSHORE TRAW	517.	.472	.128	.27	6	.151	.532
FR INSHORE OT,MANCHE	622.	.413	.112	.27	6	.198	.460
UK BEAM TRAWL SURVEY	529.	.512	.076	.15	4	.129	.523
F shrinkage mean	493.	.50				.135	.552

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
601.	.18	.05	35	.272	.473

Continued

Table 4.4.4. (continued).

1
Age 8 Catchability constant w.r.t. time and age (fixed at the value for age) 6

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	299.	.316	.089	.28	7	.272	.369
HASTINGS TRAMMEL (FL	195.	.610	.237	.39	7	.073	.520
UK. >40FT.BEAM TRAWL	182.	.512	.092	.18	7	.103	.550
FRENCH OFFSHORE TRAW	165.	.408	.121	.30	7	.163	.591
FR INSHORE OT,MANCHE	263.	.357	.144	.40	7	.212	.410
UK BEAM TRAWL SURVEY	205.	.629	.148	.23	3	.068	.501
F shrinkage mean	227.	.50				.108	.461

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
230.	.16	.06	39	.362	.457

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
BELGIAN BT (HP CORRE	324.	.327	.073	.22	8	.270	.432
HASTINGS TRAMMEL (FL	339.	.587	.245	.42	8	.084	.417
UK. >40FT.BEAM TRAWL	324.	.438	.103	.24	8	.150	.432
FRENCH OFFSHORE TRAW	174.	.445	.149	.33	8	.146	.695
FR INSHORE OT,MANCHE	212.	.384	.117	.30	8	.196	.601
UK BEAM TRAWL SURVEY	306.	.855	.205	.24	2	.039	.452
F shrinkage mean	240.	.50				.115	.547

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
263.	.17	.06	43	.362	.509

1

Table 4.4.5 - VPA fishing mortality (F) and stock number at age.

107D SOLE 1993 WG,1-15+,80-92,SEXES COMB

At 11/09/1993 9:16

Terminal Fs derived using XSA (With F shrinkage)

Table 8 Fishing mortality (F) at age YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.0000,	.0011,	.0040,	.0019,	.0009,	.0039,	.0125,	.0374,	.0154,	.0092,
2,	.0812,	.1118,	.2167,	.1202,	.1559,	.2685,	.1837,	.3050,	.2807,	.2021,
3,	.3573,	.4254,	.4226,	.4932,	.5574,	.5444,	.7411,	.4791,	.6613,	.5712,
4,	.3748,	.4444,	.3645,	.4543,	.5939,	.4386,	.7417,	.5898,	.6226,	.7230,
5,	.4462,	.2783,	.2789,	.3191,	.5457,	.3853,	.8321,	.5363,	.5333,	.6102,
6,	.4448,	.7218,	.4265,	.3194,	.6496,	.4110,	.5139,	.3689,	.6455,	.4987,
7,	.4519,	.4860,	.2574,	.4209,	.8780,	.4782,	.5139,	.4157,	.4839,	.4808,
8,	.5082,	.3845,	.2732,	.4330,	.5807,	.4703,	.4609,	.4067,	.4139,	.4718,
9,	.4708,	.3551,	.2944,	.5482,	.5757,	.3485,	.5945,	.5271,	.7234,	.5202,
+gp,	.4708,	.3551,	.2944,	.5482,	.5757,	.3485,	.5945,	.5271,	.7234,	.5202,
FBAR 3- 6,	.4058,	.4675,	.3731,	.3965,	.5866,	.4448,	.7072,	.4935,	.6157,	.6008,
FBAR 3- 8,	.4305,	.4567,	.3372,	.4066,	.6342,	.4546,	.6339,	.4661,	.5601,	.5593,

Table 10 Stock number at age (start of year) Numbers*10**-3 YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,
AGE											
1,	21710,	22048,	13021,	26480,	10997,	25741,	13838,	36371,	26318,	12228,	0,
2,	11482,	19644,	19927,	11735,	23914,	9942,	23201,	12366,	31701,	23449,	10963,
3,	12080,	9579,	15894,	14518,	9416,	18514,	6877,	17470,	8248,	21663,	17335,
4,	13218,	7647,	5665,	9425,	8022,	4880,	9720,	2966,	9790,	3852,	11072,
5,	2620,	8221,	4436,	3560,	5414,	4008,	2848,	4189,	1488,	4753,	1691,
6,	2152,	1517,	5632,	3037,	2341,	2839,	2467,	1121,	2217,	790,	2336,
7,	1813,	1248,	667,	3327,	1997,	1106,	1703,	1335,	702,	1052,	434,
8,	879,	1044,	695,	467,	1976,	751,	621,	922,	797,	391,	589,
9,	302,	478,	643,	478,	274,	1000,	425,	354,	555,	477,	221,
+gp,	786,	1181,	810,	1480,	1510,	1310,	1398,	1775,	994,	864,	721,
TOTAL,	67042,	72609,	67389,	74507,	65861,	70092,	63097,	78870,	82811,	69520,	45363,
TOTALBIO,	12132,	12743,	12997,	13519,	13496,	12905,	10638,	12118,	11587,	10440,	
TOTSPBIO,	9062,	8693,	9580,	10070,	9380,	9624,	7047,	7903,	6209,	7093,	

Table 4.4.6 V I Id SOLE. Input file for RCT3

7D SOLE

7	12	2						
1981	12851	2.6	1.27	-11	-11	-11	2	0.03
1982	21734	3.31	2.04	-11	-11	-11	0.46	0.02
1983	22065	13.86	3.76	-11	-11	-11	0.38	-11
1984	13041	2.2	0.9	-11	-11	-11	-11	-11
1985	26506	4.97	1.41	-11	-11	9.9	-11	-11
1986	11021	4.2	0.96	-11	14.2	3.4	-11	0.04
1987	25809	8.23	1.8	8.2	15.4	3.4	0.36	0.08
1988	13913	2.9	0.82	2.6	3.7	2.2	0.02	0.08
1989	36492	5.3	2.29	12.1	22.8	10	7.7	0.25
1990	-11	4.47	5.4	8.9	12	8.6	0.25	0.21
1991	-11	1.6	2.2	1.4	17.8	-77	0.46	0.13
1992	-11	2.7	1.12	0.5	-11	-11	0.21	-11

eyfs0
eyfs0
ebt1
ebt2
ebt3
fyfs0
fyfs1

Table 4.4.7 - RCT3 output.

Analysis by RCT3 ver3.1 of data from file :

a:\107d\s7drc92f.dat

7D Sole

Data for 7 surveys over 12 years : 1981 - 1992

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

	I----------Regression----------I				I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.55	7.18	.68	.305	9	1.70	9.81	.819	.038
eyfs1	1.95	8.01	.48	.466	9	1.86	11.64	.823	.038
ebt1	.74	8.58	.07	.991	3	2.29	10.27	.135	.645
ebt2	1.30	6.56	.89	.364	4	2.56	9.89	1.414	.013
ebt3	1.14	7.92	.49	.584	5	2.26	10.49	.739	.047
fyfs0	.88	9.33	.68	.301	6	.22	9.52	.948	.029
fyfs1	8.43	9.16	.49	.539	6	.19	10.76	.780	.042
					VPA Mean =		9.85	.418	.148

Yearclass = 1991

	I----------Regression----------I				I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.57	7.15	.69	.304	9	.96	8.65	.953	.029
eyfs1	1.96	8.01	.48	.471	9	1.16	10.29	.602	.072
ebt1	.74	8.58	.07	.991	3	.88	9.22	.192	.653
ebt2	1.29	6.58	.89	.367	4	2.93	10.37	1.468	.012
ebt3									
fyfs0	.84	9.36	.65	.322	6	.38	9.68	.910	.032
fyfs1	8.38	9.15	.49	.546	6	.12	10.18	.688	.055
					VPA Mean =		9.86	.421	.147

Yearclass = 1992

	I----------Regression----------I				I----------Prediction---------I			
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.59	7.11	.70	.304	9	1.31	9.19	.893	.157
eyfs1									
ebt1									
ebt2									
ebt3									
fyfs0	.80	9.39	.63	.349	6	.19	9.54	.907	.152
fyfs1									
					VPA Mean =		9.86	.425	.692

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	28138	10.24	.16	.14	.75		
1991	12812	9.46	.16	.17	1.08		
1992	16430	9.71	.35	.18	.25		

Table 4.4.8.- Sole in Division VIId. VPA summary.

107D SOLE 1993 WG,1-15+,80-92,SEXES COMB

At 11/09/1993 9:16

Table 16 Summary (without SOP correction)

					Terminal Fs derived using XSA (With F shrinkage)		
YEAR	RECRUITS, (age 1)	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 6,	FBAR 3- 8,
1983,	21710,	12132,	9062,	3115,	.3437,	.4058,	.4305,
1984,	22048,	12743,	8693,	3250,	.3739,	.4675,	.4567,
1985,	13021,	12997,	9580,	3837,	.4005,	.3731,	.3372,
1986,	26480,	13519,	10070,	3984,	.3956,	.3965,	.4066,
1987,	10997,	13496,	9380,	4974,	.5303,	.5866,	.6342,
1988,	25741,	12905,	9624,	3982,	.4138,	.4448,	.4546,
1989,	13838,	10638,	7047,	4187,	.5942,	.7072,	.6339,
1990,	36371,	12118,	7903,	4020,	.5087,	.4935,	.4661,
1991,	26318,	11587,	6209,	4296,	.6919,	.6157,	.5601,
1992,	12228,	10440,	7093,	4061,	.5725,	.6008,	.5593,
1993,	19800[1],						

(1) geometric mean 1983-1990

Table 4.4.9 - Yield per recruit input table.

Sole in the Eastern English Channel (Fishing Area VIId)

Sole in the Eastern English Channel (Fishing Area VIId)

Prediction with management option table: Input data

Year: 1993								
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
1	19800.000	0.1000	0.0000	0.0000	0.0000	0.063	0.0220	0.113
2	10963.000	0.1000	0.0000	0.0000	0.0000	0.122	0.2780	0.165
3	17335.000	0.1000	1.0000	0.0000	0.0000	0.179	0.6030	0.218
4	11072.000	0.1000	1.0000	0.0000	0.0000	0.232	0.6830	0.275
5	1691.000	0.1000	1.0000	0.0000	0.0000	0.282	0.5930	0.330
6	2336.000	0.1000	1.0000	0.0000	0.0000	0.330	0.5340	0.377
7	434.000	0.1000	1.0000	0.0000	0.0000	0.373	0.4870	0.423
8	589.000	0.1000	1.0000	0.0000	0.0000	0.414	0.4560	0.448
9	221.000	0.1000	1.0000	0.0000	0.0000	0.452	0.6250	0.456
10+	721.000	0.1000	1.0000	0.0000	0.0000	0.486	0.6250	0.486
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
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
1	19800.000	0.1000	0.0000	0.0000	0.0000	0.063	0.0220	0.113
2	.	0.1000	0.0000	0.0000	0.0000	0.122	0.2780	0.165
3	.	0.1000	1.0000	0.0000	0.0000	0.179	0.6030	0.218
4	.	0.1000	1.0000	0.0000	0.0000	0.232	0.6830	0.275
5	.	0.1000	1.0000	0.0000	0.0000	0.282	0.5930	0.330
6	.	0.1000	1.0000	0.0000	0.0000	0.330	0.5340	0.377
7	.	0.1000	1.0000	0.0000	0.0000	0.373	0.4870	0.423
8	.	0.1000	1.0000	0.0000	0.0000	0.414	0.4560	0.448
9	.	0.1000	1.0000	0.0000	0.0000	0.452	0.6250	0.456
10+	.	0.1000	1.0000	0.0000	0.0000	0.486	0.6250	0.486
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
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
1	19800.000	0.1000	0.0000	0.0000	0.0000	0.063	0.0220	0.113
2	.	0.1000	0.0000	0.0000	0.0000	0.122	0.2780	0.165
3	.	0.1000	1.0000	0.0000	0.0000	0.179	0.6030	0.218
4	.	0.1000	1.0000	0.0000	0.0000	0.232	0.6830	0.275
5	.	0.1000	1.0000	0.0000	0.0000	0.282	0.5930	0.330
6	.	0.1000	1.0000	0.0000	0.0000	0.330	0.5340	0.377
7	.	0.1000	1.0000	0.0000	0.0000	0.373	0.4870	0.423
8	.	0.1000	1.0000	0.0000	0.0000	0.414	0.4560	0.448
9	.	0.1000	1.0000	0.0000	0.0000	0.452	0.6250	0.456
10+	.	0.1000	1.0000	0.0000	0.0000	0.486	0.6250	0.486
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : S7DPRED
Date and time: 11OCT93:13:49

Table 4.4.10 - Yield per recruit summary.

Sole in the Eastern English Channel (Fishing Area VIId)

Sole in the Eastern English Channel (Fishing Area VIId)

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	10.508	3572.330	8.603	3398.971	8.603	3398.971
0.2000	0.1119	0.469	157.719	5.825	1463.548	3.924	1290.676	3.924	1290.676
0.4000	0.2237	0.610	180.133	4.424	900.297	2.528	727.908	2.528	727.908
0.6000	0.3356	0.679	181.974	3.744	654.477	1.851	482.570	1.851	482.570
0.8000	0.4475	0.720	179.209	3.342	522.714	1.453	351.287	1.453	351.287
1.0000	0.5593	0.747	175.554	3.077	442.980	1.192	272.030	1.192	272.030
1.2000	0.6712	0.766	172.015	2.889	390.492	1.008	220.018	1.008	220.018
1.4000	0.7831	0.781	168.850	2.748	353.671	0.871	183.670	0.871	183.670
1.6000	0.8949	0.792	166.085	2.638	326.509	0.765	156.979	0.765	156.979
1.8000	1.0068	0.802	163.681	2.550	305.643	0.680	136.583	0.680	136.583
2.0000	1.1187	0.810	161.585	2.476	289.078	0.611	120.484	0.611	120.484
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

Notes: Run name : S7DYPR93F
Date and time : 11OCT93:14:03
Computation of ref. F: Simple mean, age 3 - 8
F-0.1 factor : 0.2175
F-max factor : 0.5383
F-0.1 reference F : 0.1217
F-max reference F : 0.3011
Recruitment : Single recruit

Table 4.4.11 - Prediction management.

Sole in the Eastern English Channel (Fishing Area VIId)

Sole in the Eastern English Channel (Fishing Area VIId)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
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	0.5593	10355	7774	4488	0.0000	0.0000	9366	5981	0	12745	9313
.	.	.	.	.	0.2000	0.1119	.	5981	928	11832	8409
.	.	.	.	.	0.4000	0.2237	.	5981	1760	11015	7602
.	.	.	.	.	0.6000	0.3356	.	5981	2507	10284	6880
.	.	.	.	.	0.8000	0.4475	.	5981	3177	9627	6233
.	.	.	.	.	1.0000	0.5593	.	5981	3780	9039	5654
.	.	.	.	.	1.2000	0.6712	.	5981	4322	8509	5134
.	.	.	.	.	1.4000	0.7831	.	5981	4811	8033	4667
.	.	.	.	.	1.6000	0.8949	.	5981	5252	7605	4248
.	.	.	.	.	1.8000	1.0068	.	5981	5650	7218	3871
.	.	.	.	.	2.0000	1.1187	.	5981	6010	6869	3531
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : S7DPRED
Date and time : 11OCT93:13:49
Computation of ref. F: Simple mean, age 3 - 8
Basis for 1993 : F factors

Table 4.4.12 Sole in Division VIId

Assessment Quality Control Diagram 1

Average F(3-8,u)						
Date of assessment	Year					
	1987	1988	1989	1990	1991	1992
1989	0.560	0.424				
1990	0.576	0.400	0.471			
1991	0.643	0.479	0.725	0.625		
1992	0.565	0.401	0.572	0.425	0.553	
1993	0.634	0.455	0.634	0.466	0.560	0.559

Remarks: XSA used in 1993, previously L-S.

Assessment Quality Control Diagram 2

Estimated total landings ('000 t) at *status quo* F							
Date of assessment	Year						
	1988	1989	1990	1991	1992	1993	1994
1989	4869	3402	3369				
1990		3310	3552	3415			
1991			4366	3214	3210		
1992				3520	3764	3500	
1993				3747	4066	4488	3780
				SQC[1]	SQC[2]	Current	Forecast

$$^1SQC = Landings(y-1) * \frac{F(y-2)}{F(y-1)} * \exp\left[-\frac{1}{2}\{F(y-2) - F(y-1)\}\right]$$

$$^2SQC = Landings(y) * \frac{F(y-1)}{F(y)} * \exp\left[-\frac{1}{2}\{F(y-1) - F(y)\}\right]$$

where $F(y)$, $F(y-1)$ *and* $F(y-2)$ *are as estimated in the assessment made in year* $(y+1)$.

Remarks: Landings in 1989 from 1988 Working Group by SHOT forecast.

Continued

Table 4.4.12 Continued

Assessment Quality Control Diagram 3

Recruitment (age 1) Unit: Thousands						
Date of assessment	Year class					
	1988	1989	1990	1991	1992	1993
1989	(14000)	(20000)				
1990	(14600)	(21000)	(17400)			
1991	(14245)	(17864)	16873	16873		
1992	13122	(19682)	(20357)	18206[1]	18206	
1993	13838	36371	26318	12228	19800[1]	19800[1]

[1]Geometric Mean 1983-1990.

Remarks: Figures in brackets are estimated from recruit surveys.

Assessment Quality Control Diagram 4

Spawning stock biomass ('000 t)								
Date of assessment	Year							
	1988	1989	1990	1991	1992	1993	1994	1995
1989	9539	8774	8968[1]	8409[1]				
1990	9111	8214	7944	7187[1]	7455[1]			
1991	7859	6645	6669	5258	5124[1]	4919[1]		
1992	8839	7767	8613	6460	6356	6093[1]	5666[1]	
1993	9624	7047	7903	6209	7093	7774	5981[1]	5654[1]

[1]Forecast.

Remarks: Not corrected for SOP.

Table 4.5.1 PLAICE in Division VIId. Nominal landings (tonnes) as officially reported to ICES, 1976-1992.

Year	Belgium	Denmark	France	UK (E+W)	Others	Total reported	Un-reported	Total as used by WG
1976	147	1[1]	1,439	376	-	1,963	-	1,963
1977	149	81[2]	1,714	302	-	2,246	-	2,246
1978	161	156[2]	1,810	349	-	2,476	-	2,476
1979	217	28[2]	2,094	278	-	2,617	-	2,617
1980	435	112[2]	2,905	304	-	3,756	-458	3,298
1981	815	-	3,431	489	-	4,735	34	4,769
1982	738	-	3,504	541	22	4,805	60	4,865
1983	1,013	-	3,119	548	-	4,680	363	5,043
1984	947	-	2,844	640	-	4,431	581	5,012
1985	1,148	-	3,943	866	-	5,957	54	6,011
1986	1,158	-	3,288	828	488[2]	5,762	1,056	6,818
1987	1,807	-	4,768	1,292	-	7,867	441	8,308
1988	2,165	-	5,688	1,250	-	9,103	1,297	10,400
1989	2,019	-	3,265[1]	1,382	-	6,666	2,091	8,757
1990	2,149	-	4,170[1]	1,404	-	7,725	1,243	8,968
1991[1]	2,265	-	3,606[1]	1,565	-	7,436	377	7,813
1992[2]	1,560	1	2,762[1]	1,541	1	5,865	472	6,337

[1]Estimated by the Working Group.
[2]Includes Division VIIe.
[3]Provisional.

Table 4.5.2.- Plaice in Division VIId. Catch numbers, catch weights and stocks weights at age.

107D PLAICE 1993 WG,1-15+,80-92,SEXES COMB,

At 9/10/1993 15:10

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

YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	92,	350,	142,	679,	25,	16,	826,	1632,	1542,	1665,
2,	3030,	1871,	5714,	4884,	8499,	5011,	3638,	2627,	5860,	6193,
3,	3199,	7310,	6195,	7034,	7508,	18813,	7227,	8746,	5445,	4450,
4,	5908,	2814,	4883,	3663,	3472,	4900,	9453,	5983,	4524,	1725,
5,	931,	1874,	413,	1458,	1257,	1118,	2672,	3603,	2437,	1187,
6,	226,	533,	612,	562,	430,	541,	588,	801,	1681,	1044,
7,	92,	236,	164,	254,	442,	439,	288,	243,	286,	698,
+gp,	227,	235,	288,	122,	336,	406,	457,	612,	358,	434,
TOTALNUM,	13705,	15223,	18411,	18656,	21969,	31244,	25149,	24247,	22133,	17396,
TONSLAND,	5043,	5161,	6022,	6834,	8366,	10420,	8758,	9047,	7813,	6337,
SOPCOF %,	90,	86,	92,	100,	98,	92,	93,	98,	96,	98,

Table 2 Catch weights at age (kg)

YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.2660,	.2330,	.2540,	.2260,	.2510,	.2920,	.2010,	.2010,	.2250,	.1820,
2,	.2960,	.2950,	.2780,	.3060,	.2820,	.2680,	.2680,	.2560,	.2770,	.2770,
3,	.3490,	.3360,	.3010,	.3310,	.3600,	.3210,	.3210,	.3260,	.3110,	.3520,
4,	.4200,	.4020,	.4270,	.4060,	.4770,	.4320,	.3700,	.3780,	.3900,	.4290,
5,	.5420,	.5080,	.5020,	.5460,	.5770,	.5600,	.4730,	.4830,	.4540,	.5090,
6,	.8220,	.6890,	.5700,	.4860,	.7830,	.6570,	.6480,	.6100,	.5560,	.5850,
7,	.9530,	.7030,	.5570,	.6290,	.7350,	.7700,	.8370,	.7810,	.7450,	.7010,
+gp,	1.3392,	1.1621,	1.0280,	1.1578,	1.2668,	1.1682,	1.2237,	1.1509,	1.2152,	.9377,

Table 3 Stock weights at age (kg)

YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.0970,	.0820,	.0840,	.1010,	.1220,	.0840,	.0790,	.0850,	.0650,	.0880,
2,	.1920,	.1640,	.1710,	.2050,	.2420,	.1680,	.1620,	.1720,	.1410,	.1770,
3,	.2860,	.2480,	.2590,	.3110,	.3610,	.2540,	.2500,	.2620,	.2270,	.2680,
4,	.3790,	.3330,	.3480,	.4200,	.4790,	.3400,	.3420,	.3550,	.3240,	.3610,
5,	.4700,	.4200,	.4400,	.5320,	.5960,	.4270,	.4390,	.4510,	.4320,	.4560,
6,	.5600,	.5070,	.5330,	.6460,	.7120,	.5140,	.5410,	.5490,	.5500,	.5520,
7,	.6480,	.5960,	.6280,	.7630,	.8260,	.6030,	.6480,	.6510,	.6790,	.6510,
+gp,	.9295,	.8693,	.8563,	1.0210,	1.0580,	.8269,	.9743,	.9257,	1.0705,	.8775,

Table 4.5.3.- Plaice in Division VIId. Tuning file input.

```
VIID PLAICE,BEL,UK+FRANCE+ UK & FR SURVEY  80-92      [rev: 07/10/93]
106
UK HASTINGS TRAMMEL, <40 trammel lands, all trammel age comps
1984 1992
1 1 0 1
2 15
7.1 71.3 106.5 25.7 18.1 5.0 2.0 0.5 0.8 0.1 0.1 0.1 0.0 0.1 0.2
5.7 145.9 99.0 52.2 4.4 0.0 0.0 0.0 4.5 0.0 0.0 0.0 0.0 0.0 0.0
5.6 88.0 111.0 49.2 19.1 2.4 1.8 1.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0
6.2 228.3 215.4 76.7 24.1 12.6 2.5 3.1 2.1 0.0 0.0 0.0 0.0 0.3 0.0
7.4 235.4 527.0 87.3 35.6 18.5 8.7 1.7 2.5 3.2 0.5 0.7 0.1 0.2 0.2
8.3 55.0 257.0 539.6 112.5 47.8 22.1 6.3 1.4 7.2 0.1 0.3 0.1 0.0 2.7
18.4 174.6 469.0 267.8 289.9 91.7 38.0 28.2 18.2 15.7 11.8 5.4 2.3 1.5 6.4
11.1 309.9 322.7 253.9 127.9 117.2 20.4 8.5 4.2 2.8 0.6 1.4 1.8 0.1 2.3
18.0 367.7 286.4 187.9 105.2 75.2 60.5 20.9 4.1 3.2 2.4 1.6 2.1 2.3 1.3
UK RYE TRAWL,<40 trawl lands,all trawl age comps  fleet effort
1984 1992
1 1 0 1
2 15
7.4 428.9 640.6 154.7 108.7 29.8 11.9 3.2 4.6 0.8 0.4 0.3 0.2 0.3 1.5
6.4 1118.4 759.1 399.9 34.0 0.0 0.0 0.0 34.4 0.0 0.0 0.0 0.0 0.0 0.0
5.9 641.5 809.4 358.4 139.0 17.4 12.8 7.8 0.0 0.0 0.0 0.0 0.0 0.0 0.0
7.4 1061.0 1001.0 356.6 111.8 58.4 11.7 14.6 9.9 0.0 0.0 0.0 0.0 1.2 0.0
4.8 661.3 1480.5 245.1 99.9 52.0 24.4 4.8 7.0 9.0 1.4 2.0 0.1 0.4 0.4
5.6 135.7 634.4 1332.0 277.8 118.1 54.5 15.6 3.5 17.8 0.1 0.8 0.3 0.0 6.7
4.3 219.7 590.2 337.0 364.8 115.4 47.9 35.4 22.9 19.7 14.8 6.7 2.8 1.9 8.1
12.0 917.2 877.1 636.2 292.4 247.8 40.9 16.3 8.0 5.0 1.2 2.7 3.6 0.2 5.4
11.8 1014.8 768.0 478.1 264.9 188.3 150.5 49.8 9.9 8.1 5.2 3.9 5.6 5.7 3.4
BELGIAN BEAM TRAWL( HP corr),all gears age comp(rev 7/10/93)
1981 1992
1 1 0 1
2 15
24.4 285.9 1126.5 593.3 67.3 21.6 8.3 7.1 13.3 14.1 3.0 11.7 1.3 13.4 10.3
29.8 147.8 1065.4 688.2 187.2 55.1 21.1 6.5 4.6 4.0 5.8 2.4 1.8 1.5 4.7
26.4 476.7 654.3 1384.5 165.0 52.2 23.0 31.6 1.3 1.4 3.6 3.1 0.4 1.4 12.2
35.4 92.0 1570.4 712.1 467.5 134.3 61.0 28.2 5.4 6.8 5.0 4.6 2.4 6.1 3.1
33.4 557.2 1125.3 1115.1 93.9 197.2 52.9 31.9 5.3 6.1 0.7 0.1 0.1 4.3 5.0
30.9 700.6 1141.8 667.8 269.9 145.9 60.3 11.3 5.6 6.4 0.1 0.1 0.1 3.6 0.1
49.3 1944.8 1639.7 889.0 343.1 92.7 154.5 41.1 28.0 14.1 1.1 10.1 0.7 0.1 2.0
48.9 773.0 4264.6 1301.8 237.1 109.9 113.2 35.8 25.4 24.0 10.4 0.3 0.1 0.1 4.8
43.8 73.6 1733.7 2950.5 973.4 212.8 113.1 61.1 21.7 0.1 9.8 14.6 9.0 0.1 0.1
38.5 372.1 2687.5 1942.8 1007.0 184.8 43.9 50.5 13.1 14.0 11.1 10.0 0.1 4.0 0.1
32.8 595.4 1689.2 1149.4 1089.5 698.4 86.9 36.0 58.9 1.7 3.3 2.4 1.5 0.0 1.5
27.9 889.8 1031.7 403.8 277.6 282.1 159.7 58.2 60.7 6.7 4.7 1.4 0.0 0.0 1.0
UK OFFSHORE BT (HP CORR),fleet lands,all trawl age comps (deraised) fleet effort
1983 1992
1 1 0 1
2 15
2.9 53.2 39.2 52.6 14.3 2.1 0.7 0.8 0.0 0.2 0.1 0.1 0.1 0.2 0.3
2.3 33.1 49.4 11.9 8.4 2.3 0.9 0.2 0.4 0.1 0.0 0.0 0.0 0.0 0.1
7.9 233.7 158.6 83.6 7.1 0.0 0.0 0.0 7.2 0.0 0.0 0.0 0.0 0.0 0.0
7.3 182.0 229.6 101.7 39.4 4.9 3.6 2.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0
24.3 376.7 355.4 126.6 39.7 20.7 4.2 5.2 3.5 0.0 0.0 0.0 0.0 0.4 0.0
19.7 126.2 282.6 46.8 19.1 9.9 4.7 0.9 1.3 1.7 0.3 0.4 0.0 0.1 0.1
24.6 61.3 286.4 601.3 125.4 53.3 24.6 7.1 1.6 8.0 0.1 0.3 0.2 0.0 3.0
32.8 152.2 408.9 233.5 252.8 79.9 33.2 24.6 15.9 13.6 10.3 4.7 2.0 1.3 5.6
29.5 449.2 429.6 311.6 143.2 121.4 20.0 8.0 3.9 2.4 0.6 1.3 1.8 0.1 2.6
35.0 452.8 342.7 213.3 118.2 84.0 67.1 22.2 4.4 3.6 2.3 1.7 2.5 2.5 1.5
UK BEAM TRAWL SURVEY
1988 1992
1 1 .5 .75
1 6
1.0 26.5 31.3 43.8 7.0 4.6 1.5
1.0 2.3 12.1 16.6 19.9 3.3 1.5
1.0 5.2 4.9 5.8 6.7 7.5 1.8
1.0 11.8 9.1 7.0 5.3 5.4 3.2
1.0 16.5 12.5 4.2 4.2 5.6 4.9
French Channel Ground fish survey
1988 1992
1 1 .75 1
1 6
1.0 8.0 17.6 9.9 1.7 0.6 0.2 0.2 0.1 0.1 0.1
1.0 3.5 7.4 2.7 1.1 0.1 0.1 0.0 0.0 0.0 0.1
1.0 3.3 0.9 2.3 1.4 1.3 0.3 0.1 0.1 0.0 0.0
1.0 1.6 0.6 0.4 0.2 0.2 0.1 0.1 0.1 0.0 0.0
1.0 37.7 3.2 0.5 0.2 0.1 0.2 0.1 0.1 0.0 0.0
```

Table 4.5.4 - Plaice in Division VIId. Separable analysis.

```
Title : 107D PLAICE 1993 WG,1-15+,80-92,SEXES COMB,MILLNER

At 13/09/1993  22:12

Separable analysis
from 1980 to 1992 on ages  1 to 14
with Terminal F of  .500 on age  4 and Terminal S of  .500

0   Initial sum of squared residuals was   496.093 and
      final sum of squared residuals is    237.941 after  58 iterations

Matrix of Residuals
```

	Years,	1980/81	1981/82
	Ages		
	1/ 2,	-.449	-1.440
	2/ 3,	.113	-.379
	3/ 4,	-.453	.312
	4/ 5,	.322	.376
	5/ 6,	.905	-.324
	6/ 7,	.310	.002
	7/ 8,	-.059	-.740
	8/ 9,	.033	.561
	9/10,	-2.519	.552
	10/11,	1.198	.471
	11/12,	-1.124	.229
	12/13,	-.057	1.146
	13/14,	-.685	-.162
0	TOT ,	.036	.037
0	WTS ,	.001	.001

	Years,	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	,TOT	,WTS
	1/ 2,	.388	.368	-.239	-.885	.671	-2.215	-2.326	1.849	1.447	1.238	-.008,	.152,
	2/ 3,	-.366	.077	-1.055	.115	.433	-.084	.315	-.330	-.440	.536	-.004,	.467,
	3/ 4,	-.458	.010	-.618	-.221	.541	.067	.265	-.413	-.221	.301	-.002,	.557,
	4/ 5,	.281	.690	.510	.085	.550	.416	-.171	.003	-.360	.109	.000,	.676,
	5/ 6,	.336	.219	-.149	-1.335	.788	.233	-.009	.391	-.348	-.265	.002,	.352,
	6/ 7,	.092	-.213	.102	.012	-.043	-.467	.155	.261	.114	-.061	.002,	1.000,
	7/ 8,	-.997	-.293	-.238	-.050	.168	.761	.392	-.294	-.234	-.622	.001,	.433,
	8/ 9,	2.402	1.479	-.993	1.156	-.346	.307	.355	-.222	.074	-.521	-.002,	.223,
	9/10,	.143	-1.756	-.271	1.185	-.750	-.277	.127	-.487	.483	.153	-.004,	.206,
	10/11,	-.316	-.603	1.413	4.367	1.695	-.452	.817	-.626	.480	-.233	-.006,	.148,
	11/12,	.385	.345	4.619	2.672	-5.322	-1.017	-.097	.019	1.024	.062	-.006,	.090,
	12/13,	-.229	-.070	3.667	-1.198	-3.598	2.493	-1.811	.339	-.343	-.682	-.004,	.111,
	13/14,	-.775	-1.434	-1.187	-5.315	-3.646	-.105	-1.507	.260	1.947	-.584	-.002,	.113,
0	,	.040	.041	.036	.031	.019	.006	-.004	-.004	-.002	.001	-4.894,	
0	WTS ,	.001	.001	.001	.001	.001	1.000	1.000	1.000	1.000	1.000		

```
0    Fishing Mortalities (F)
```

0	1980,	1981,	1982,							
F-values	.3524,	.5446,	.5945,							
0	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
F-values	.5247,	.8465,	.5750,	.4210,	.5409,	.6294,	.7580,	.8415,	.6910,	.5000,

```
0    Selection-at-age (S)
```

0	1,	2,	3,	4,						
S-values	.0133,	.3112,	.8625,	1.0000,						
0	5,	6,	7,	8,	9,	10,	11,	12,	13,	14,
S-values	.7988,	.6390,	.5620,	.4493,	.5379,	.5655,	.4713,	.6958,	.4362,	.5000,

Table 4.4.5 Plaice in Division VIId. Tuning output

```
VPA Version 3.1 (MSDOS)

   9/10/1993  15:05

Extended Survivors Analysis

107D PLAICE 1993 WG,1-15+,80-92,SEXES COMB,

CPUE data from file a:\ple\p7dtub92.vpa


Data for    6 fleets over   13 years
Age range from    1 to    7


     Fleet,                Alpha,    Beta
UK HASTINGS TRAMMEL,     ,  .000   , 1.000
UK RYE TRAWL,<40 tra     ,  .000   , 1.000
BELGIAN BEAM TRAWL(      ,  .000   , 1.000
UK OFFSHORE BT (HP C     ,  .000   , 1.000
UK BEAM TRAWL SURVEY     ,  .500   ,  .750
French Channel Groun     ,  .750   , 1.000


Time series weights :

     Tapered time weighting applied
     Power =    3 over  15 years


Catchability analysis :

     Catchability dependent on stock size for ages <    2

        Regression type = C
        Minimum of    5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  2


     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 =     .800

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

     Prior weighting not applied


Tuning had not converged after   60 iterations


Total absolute residual between iterations
59 and  60 =    .000

Final year F values

Age            ,      1,      2,      3,      4,      5,      6,      7
Iteration 59,  .0541,  .2917,  .5480,  .4375,  .4056,  .4171,  .3675
Iteration 60,  .0541,  .2919,  .5480,  .4374,  .4057,  .4171,  .3675
1


Regression weights
      ,  .482,  .610,  .725,  .820,  .893,  .944,  .976,  .993,  .999, 1.000
```

Continued

Table 4.5.5 Continued

Age 1 Catchability dependent on age and year class strength

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	1.	.000	.000	.00	0	.000	.000
UK RYE TRAWL,<40 tra	1.	.000	.000	.00	0	.000	.000
BELGIAN BEAM TRAWL(	1.	.000	.000	.00	0	.000	.000
UK OFFSHORE BT (HP C	1.	.000	.000	.00	0	.000	.000
UK BEAM TRAWL SURVEY	26323.	.308	.000	.00	1	.511	.058
French Channel Groun	51047.	.757	.000	.00	1	.085	.030
P shrinkage mean	24501.	.38				.328	.062
F shrinkage mean	42271.	.80				.076	.036

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
28189.	.22	.13	4	.596	.054

1

Age 2 Catchability constant w.r.t. time, dependent on age

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	19963.	.688	.000	.00	1	.102	.256
UK RYE TRAWL,<40 tra	18550.	.718	.000	.00	1	.094	.273
BELGIAN BEAM TRAWL(	43396.	1.155	.000	.00	1	.036	.126
UK OFFSHORE BT (HP C	20948.	1.036	.000	.00	1	.045	.246
UK BEAM TRAWL SURVEY	16186.	.297	.027	.09	2	.546	.308
French Channel Groun	10154.	.686	.300	.44	2	.103	.454
F shrinkage mean	23258.	.80				.075	.224

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
17200.	.22	.10	9	.464	.292

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	6351.	.385	.322	.84	2	.211	.507
UK RYE TRAWL,<40 tra	5368.	.367	.156	.43	2	.233	.577
BELGIAN BEAM TRAWL(	7682.	.483	.139	.29	2	.134	.435
UK OFFSHORE BT (HP C	6796.	.691	.308	.45	2	.066	.480
UK BEAM TRAWL SURVEY	5238.	.360	.128	.36	3	.242	.588
French Channel Groun	3589.	.701	.292	.42	3	.064	.774
F shrinkage mean	5345.	.80				.049	.579

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
5742.	.18	.08	15	.448	.548

1

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

Continued

Table 4.5.5 Continued

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	4120.	.391	.190	.48	3	.145	.332
UK RYE TRAWL,<40 tra	3047.	.310	.011	.04	3	.230	.427
BELGIAN BEAM TRAWL(	2728.	.322	.268	.83	3	.214	.467
UK OFFSHORE BT (HP C	3539.	.632	.178	.28	3	.056	.378
UK BEAM TRAWL SURVEY	2908.	.285	.102	.36	4	.272	.444
French Channel Groun	1912.	.676	.230	.34	4	.049	.615
F shrinkage mean	1624.	.80				.035	.693

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
2961.	.15	.07	21	.481	.437

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	2350.	.445	.226	.51	4	.127	.389
UK RYE TRAWL,<40 tra	2032.	.358	.153	.43	4	.196	.438
BELGIAN BEAM TRAWL(	2325.	.368	.199	.54	4	.185	.393
UK OFFSHORE BT (HP C	2121.	.595	.233	.39	4	.071	.423
UK BEAM TRAWL SURVEY	2546.	.272	.112	.41	5	.340	.364
French Channel Groun	1487.	.772	.282	.37	5	.042	.561
F shrinkage mean	1384.	.80				.039	.592

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
2234.	.16	.07	27	.432	.406

1

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	1794.	.469	.125	.27	5	.110	.437
UK RYE TRAWL,<40 tra	1466.	.381	.077	.20	5	.166	.513
BELGIAN BEAM TRAWL(	2156.	.364	.149	.41	5	.182	.376
UK OFFSHORE BT (HP C	1607.	.477	.110	.23	5	.106	.477
UK BEAM TRAWL SURVEY	2187.	.260	.163	.63	5	.356	.371
French Channel Groun	1884.	.757	.227	.30	5	.042	.420
F shrinkage mean	1612.	.80				.038	.476

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
1899.	.16	.06	31	.380	.417

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

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
UK HASTINGS TRAMMEL,	1716.	.461	.132	.29	6	.131	.324
UK RYE TRAWL,<40 tra	1561.	.389	.150	.39	6	.185	.351
BELGIAN BEAM TRAWL(	1569.	.381	.134	.35	6	.192	.350

Continued

Table 4.5.5 Continued

UK OFFSHORE BT (HP C	1531.	.399	.086	.21	6	.175	.357
UK BEAM TRAWL SURVEY	1309.	.338	.151	.45	4	.245	.407
French Channel Groun	1067.	.998	.532	.53	4	.028	.480
F shrinkage mean	1253.	.80				.044	.422

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
1480.	.17	.06	33	.349	.368

1

Table 4.5.6 Plaice in Division VIId. VPA fishing mortality (F) and stock number at age.

107D PLAICE 1993 WG,1-15+,80-92,SEXES COMB,

Table 8 Fishing mortality (F) at age											
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	FBAR 90-92
AGE											
1,	.0046,	.0138,	.0048,	.0111,	.0008,	.0006,	.0478,	.0784,	.0544,	.0541,	.0623,
2,	.1509,	.1112,	.2949,	.2051,	.1721,	.1882,	.1618,	.1932,	.4006,	.2919,	.2952,
3,	.4608,	.5855,	.5785,	.6464,	.5018,	.6327,	.4107,	.6464,	.6891,	.5480,	.6278,
4,	.9625,	.8687,	.9149,	.7386,	.7047,	.6530,	.6932,	.6425,	.7548,	.4374,	.6116,
5,	.5783,	.8644,	.2600,	.7007,	.5497,	.4644,	.8357,	.5617,	.5342,	.4057,	.5005,
6,	.3705,	.7041,	.7048,	.6081,	.4119,	.4394,	.4315,	.5826,	.5050,	.4171,	.5016,
7,	.4234,	.7510,	.4378,	.6518,	1.3556,	.8835,	.4022,	.2896,	.3832,	.3675,	.3468,
+gp,	.4234,	.7510,	.4378,	.6518,	1.3556,	.8835,	.4022,	.2896,	.3832,	.3675,	
FBAR 2- 6,	.5046,	.6268,	.5506,	.5798,	.4680,	.4755,	.5066,	.5253,	.5768,	.4200,	
FBAR 3- 6,	.5930,	.7557,	.6145,	.6735,	.5420,	.5473,	.5928,	.6083,	.6208,	.4521,	

Table 10 Stock number at age (start of year)						Numbers*10**-3				
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,
AGE											
1,	21376,	27156,	31685,	65064,	34991,	29172,	18782,	22986,	30926,	33556,	0,
2,	22965,	18872,	23756,	27969,	57067,	31011,	25858,	15880,	18850,	25976,	28189,
3,	9201,	17515,	14976,	15688,	20206,	42610,	22785,	19508,	11610,	11200,	17200,
4,	10150,	5147,	8650,	7448,	7290,	10851,	20074,	13402,	9065,	5170,	5742,
5,	2251,	3439,	1915,	3073,	3156,	3196,	5009,	8902,	6252,	3780,	2961,
6,	775,	1120,	1285,	1310,	1352,	1616,	1782,	1926,	4502,	3250,	2234,
7,	283,	475,	491,	563,	632,	795,	923,	1026,	954,	2410,	1899,
+gp,	695,	469,	858,	269,	474,	728,	1459,	2576,	1189,	1492,	2396,
TOTAL,	67696,	74192,	83616,	121384,	125170,	119977,	96672,	86206,	83348,	86833,	60622,
TOTALBIO	15282	14082	16184	23497	32734	25449	23417	22679	17338	18814	
TOTSPIO	8800	8760	9460	11192	14654	17788	17744	17993	12670	11263	

Table 4.5.7 Plaice in Division VIId. RCT3 files input.

```
7D PLAICE - AGE 1
9       12      2
1981    26174   1.8     0.37    5.31    0.25    -11     -11     -11     -11     -11
1982    21376   1.4     0.62    1.49    0.04    -11     -11     -11     -11     -11
1983    27156   8.2     0.58    2.42    -11     -11     -11     -11     -11     -11
1984    31685   4       0.92    -11     -11     -11     -11     -11     -11     -11
1985    65064   5.9     1.25    -11     -11     -11     -11     -11     -11     -11
1986    34991   10.8    1.61    -11     0.94    -11     31.33   -11     -11     26.46
1987    29172   15.53   1.23    4.44    0.82    26.47   12.13   -11     10.33   8.79
1988    18782   6.42    0.73    1.11    0.22    2.31    4.86    0.19    4.08    1.27
1989    22986   2.27    0.38    2.38    0.4     5.16    9.06    0.16    3.95    0.91
1990    -11     2.37    0.34    1.04    0.39    11.75   12.54   0.16    1.95    6.05
1991    -11     1.74    0.86    3.02    1.36    16.53   13.4    0.15    33.61   -11
1992    -11     1.8     -11     2.19    -11     3.22    -11     0.98    -11     -11
eyfs0
eyfs1
fyfs0
fyfs1
ebt1
ebt2
fbt0
fbt1
fbt2


7D PLAICE - AGE 2
9       12      2
1981    22965   1.8     0.37    5.31    0.25    -11     -11     -11     -11     -11
1982    18872   1.4     0.62    1.49    0.04    -11     -11     -11     -11     -11
1983    23756   8.2     0.58    2.42    -11     -11     -11     -11     -11     -11
1984    27969   4       0.92    -11     -11     -11     -11     -11     -11     -11
1985    57067   5.9     1.25    -11     -11     -11     -11     -11     -11     -11
1986    31011   10.8    1.61    -11     0.94    -11     31.33   -11     -11     26.46
1987    25858   15.53   1.23    4.44    0.82    26.47   12.13   -11     10.33   8.79
1988    15880   6.42    0.73    1.11    0.22    2.31    4.86    0.19    4.08    1.27
1989    18850   2.27    0.38    2.38    0.4     5.16    9.06    0.16    3.95    0.91
1990    -11     2.37    0.34    1.04    0.39    11.75   12.54   0.16    1.95    6.05
1991    -11     1.74    0.86    3.02    1.36    16.53   13.4    0.15    33.61   -11
1992    -11     1.8     -11     2.19    -11     3.22    -11     0.98    -11     -11
eyfs0
eyfs1
fyfs0
fyfs1
ebt1
ebt2
fbt0
fbt1
fbt2


7D PLAICE - AGE 3
9       12      2
1981    17515   1.8     0.37    5.31    0.25    -11     -11     -11     -11     -11
1982    14976   1.4     0.62    1.49    0.04    -11     -11     -11     -11     -11
1983    15688   8.2     0.58    2.42    -11     -11     -11     -11     -11     -11
1984    20206   4       0.92    -11     -11     -11     -11     -11     -11     -11
1985    42610   5.9     1.25    -11     -11     -11     -11     -11     -11     -11
1986    22785   10.8    1.61    -11     0.94    -11     31.33   -11     -11     26.46
1987    19508   15.53   1.23    4.44    0.82    26.47   12.13   -11     10.33   8.79
1988    11610   6.42    0.73    1.11    0.22    2.31    4.86    0.19    4.08    1.27
1989    11200   2.27    0.38    2.38    0.4     5.16    9.06    0.16    3.95    0.91
1990    -11     2.37    0.34    1.04    0.39    11.75   12.54   0.16    1.95    6.05
1991    -11     1.74    0.86    3.02    1.36    16.53   13.4    0.15    33.61   -11
1992    -11     1.8     -11     2.19    -11     3.22    -11     0.98    -11     -11
eyfs0
eyfs1
fyfs0
fyfs1
ebt1
ebt2
fbt0
fbt1
fbt2
```

Table 4.5.8 Plaice in Division VIId. RCT3 output

Analysis by RCT3 ver3.1 of data from file :

a:\107d\p7drec92.dat

7D PLAICE AGE 1

Data for 9 surveys over 12 years : 1981 - 1992

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 .00
Minimum of 4 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
eyfs0	1.82	6.97	1.23	.093	9	1.21	9.18	1.562	.003
eyfs1	2.61	8.70	.50	.382	9	.29	9.47	.669	.017
fyfs0	.46	9.50	.11	.737	6	.71	9.83	.176	.238
fyfs1	1.10	9.74	.16	.729	6	.33	10.10	.213	.163
ebt1									
ebt2	.40	9.15	.09	.929	4	2.61	10.19	.146	.347
fbt0									
fbt1									
fbt2	.23	9.75	.13	.871	4	1.95	10.20	.204	.178
						VPA Mean =	10.27	.367	.055

Yearclass = 1991

Survey/ Series	Slope	Inter-cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.86	6.88	1.26	.090	9	1.01	8.75	1.675	.003
eyfs1	2.61	8.69	.51	.382	9	.62	10.32	.615	.024
fyfs0	.46	9.50	.11	.745	6	1.39	10.14	.157	.373
fyfs1	1.11	9.73	.16	.734	6	.86	10.69	.288	.111
ebt1									
ebt2	.40	9.15	.09	.929	4	2.67	10.21	.148	.421
fbt0									
fbt1									
fbt2									
						VPA Mean =	10.27	.369	.067

Yearclass = 1992

Survey/ Series	Slope	Inter-cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.90	6.78	1.30	.087	9	1.03	8.74	1.742	.007
eyfs1									
fyfs0	.47	9.50	.11	.756	6	1.16	10.04	.158	.842
fyfs1									
ebt1									
ebt2									
fbt0									
fbt1									
fbt2									
						VPA Mean =	10.27	.372	.151

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	23865	10.08	.09	.07	.72		
1991	28014	10.24	.10	.08	.73		
1992	23476	10.06	.14	.10	.46		

Continued

Table 4.5.8 Continued

Analysis by RCT3 ver3.1 of data from file :

a:\107d\p7drc292.dat

7D PLAICE AGE 2

Data for 9 surveys over 12 years : 1981 - 1992

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 .00
Minimum of 4 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
eyfs0	1.80	6.86	1.22	.101	9	1.21	9.05	1.539	.004
eyfs1	2.61	8.56	.49	.407	9	.29	9.33	.656	.023
fyfs0	.52	9.28	.14	.708	6	.71	9.65	.210	.219
fyfs1	1.25	9.54	.20	.674	6	.33	9.96	.265	.138
ebt1									
ebt2	.45	8.88	.12	.903	4	2.61	10.04	.193	.261
fbt0									
fbt1									
fbt2	.25	9.56	.12	.912	4	1.95	10.05	.183	.288
					VPA Mean =		10.13	.380	.067

Yearclass = 1991

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.89	6.81	1.26	.085	10	1.01	8.72	1.600	.005
eyfs1	2.67	8.61	.56	.318	10	.62	10.27	.666	.028
fyfs0	1.04	8.75	.46	.180	7	1.39	10.19	.605	.034
fyfs1	1.40	9.52	.22	.598	7	.86	10.72	.377	.088
ebt1	.28	9.33	.11	.877	4	2.86	10.14	.188	.352
ebt2	.47	8.83	.12	.863	5	2.67	10.09	.178	.396
fbt0									
fbt1	3.50	4.07	2.36	.016	4	3.54	16.48	7.504	.000
fbt2									
					VPA Mean =		10.14	.359	.097

Yearclass = 1992

Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.93	6.72	1.29	.082	10	1.03	8.71	1.655	.010
eyfs1									
fyfs0	1.07	8.73	.48	.175	7	1.16	9.96	.622	.070
fyfs1									
ebt1	.29	9.33	.11	.877	4	1.44	9.74	.195	.712
ebt2									
fbt0									
fbt1									
fbt2									
					VPA Mean =		10.14	.361	.208

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	20573	9.93	.10	.08	.67	25976	10.16
1991	26222	10.17	.11	.08	.56		
1992	18535	9.83	.16	.11	.48		

Continued

Table 4.5.8 Continued

Analysis by RCT3 ver3.1 of data from file :

a:\107d\p7drc392.dat

7D PLAICE AGE 3

Data for 9 surveys over 12 years : 1981 - 1992

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 .00
Minimum of 4 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
eyfs0	1.97	6.22	1.33	.098	9	1.21	8.62	1.688	.003
eyfs1	2.63	8.22	.47	.467	9	.29	8.99	.626	.025
fyfs0	.72	8.68	.23	.548	6	.71	9.20	.361	.076
fyfs1	1.82	9.02	.38	.435	6	.33	9.62	.507	.039
ebt1									
ebt2	.59	8.17	.26	.746	4	2.61	9.69	.410	.059
fbt0									
fbt1									
fbt2	.29	9.14	.07	.974	4	1.95	9.70	.116	.738
						VPA Mean =	9.80	.410	.059

Yearclass = 1991

Survey/ Series	Slope	Inter-cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.98	6.19	1.34	.099	9	1.01	8.18	1.775	.012
eyfs1	2.63	8.21	.47	.472	9	.62	9.85	.572	.115
fyfs0	.73	8.67	.24	.551	6	1.39	9.69	.327	.353
fyfs1	1.82	9.01	.37	.445	6	.86	10.57	.681	.081
ebt1									
ebt2	.59	8.16	.26	.745	4	2.67	9.73	.415	.219
fbt0									
fbt1									
fbt2									
						VPA Mean =	9.80	.413	.221

Yearclass = 1992

Survey/ Series	Slope	Inter-cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
eyfs0	1.98	6.16	1.35	.101	9	1.03	8.20	1.802	.021
eyfs1									
fyfs0	.74	8.66	.24	.554	6	1.16	9.52	.337	.593
fyfs1									
ebt1									
ebt2									
fbt0									
fbt1									
fbt2									
						VPA Mean =	9.80	.417	.386

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1990	15444	9.64	.10	.08	.57		
1991	17917	9.79	.19	.13	.45		
1992	14752	9.60	.26	.17	.45		

Table 4.5.9 Plaice in Division VIId. VPA summary.

107D PLAICE 1993 WG,1-15+,80-92,SEXES COMB

At 9/10/1993 15:10

Table 16 Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

YEAR	RECRUITS, (age 1)	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 2- 6,	FBAR 3- 6,
1980,	26859,	16638,	5861,	2650,	.4522,	.4037,	.4637,
1981,	13381,	14447,	7841,	4769,	.6082,	.5166,	.6168,
1982,	26174,	15193,	9980,	4865,	.4875,	.5348,	.6351,
1983,	21376,	15282,	8800,	5043,	.5731,	.5046,	.5930,
1984,	27156,	14082,	8760,	5161,	.5892,	.6268,	.7557,
1985,	31685,	16184,	9460,	6022,	.6366,	.5506,	.6145,
1986,	65064,	23497,	11192,	6834,	.6106,	.5798,	.6735,
1987,	34991,	32734,	14654,	8366,	.5709,	.4680,	.5420,
1988,	29172,	25449,	17788,	10420,	.5858,	.4755,	.5473,
1989,	18782,	23417,	17744,	8758,	.4936,	.5066,	.5928,
1990,	22986,	22679,	17993,	9047,	.5028,	.5253,	.6083,
1991,	30926,	17338,	12670,	7813,	.6166,	.5768,	.6208,
1992,	33556,	18814,	11263,	6337,	.5626,	.4200,	.4521,
1993,	29192[1]						

(1) geometric mean 1983-1990

Table 4.5.10 Plaice in Division VIId. Yield per recruit input table.

Plaice in the English Channel, Eastern (Fishing Area VIId)

Plaice in the English Channel, Eastern (Fishing Area VIId)

Prediction with management option table: Input data

Year: 1993								
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
1	29192.000	0.1200	0.0000	0.0000	0.0000	0.079	0.0520	0.203
2	28189.000	0.1200	0.1500	0.0000	0.0000	0.163	0.2440	0.270
3	17200.000	0.1200	0.5300	0.0000	0.0000	0.252	0.5200	0.330
4	5742.000	0.1200	0.9600	0.0000	0.0000	0.347	0.5070	0.399
5	2961.000	0.1200	1.0000	0.0000	0.0000	0.446	0.4150	0.482
6	2234.000	0.1200	1.0000	0.0000	0.0000	0.550	0.4160	0.584
7	1899.000	0.1200	1.0000	0.0000	0.0000	0.660	0.2870	0.742
8+	2396.000	0.1200	1.0000	0.0000	0.0000	0.775	0.2870	0.962
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
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
1	29192.000	0.1200	0.0000	0.0000	0.0000	0.079	0.0520	0.203
2	.	0.1200	0.1500	0.0000	0.0000	0.163	0.2440	0.270
3	.	0.1200	0.5300	0.0000	0.0000	0.252	0.5200	0.330
4	.	0.1200	0.9600	0.0000	0.0000	0.347	0.5070	0.399
5	.	0.1200	1.0000	0.0000	0.0000	0.446	0.4150	0.482
6	.	0.1200	1.0000	0.0000	0.0000	0.550	0.4160	0.584
7	.	0.1200	1.0000	0.0000	0.0000	0.660	0.2870	0.742
8+	.	0.1200	1.0000	0.0000	0.0000	0.775	0.2870	0.962
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
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
1	29192.000	0.1200	0.0000	0.0000	0.0000	0.079	0.0520	0.203
2	.	0.1200	0.1500	0.0000	0.0000	0.163	0.2440	0.270
3	.	0.1200	0.5300	0.0000	0.0000	0.252	0.5200	0.330
4	.	0.1200	0.9600	0.0000	0.0000	0.347	0.5070	0.399
5	.	0.1200	1.0000	0.0000	0.0000	0.446	0.4150	0.482
6	.	0.1200	1.0000	0.0000	0.0000	0.550	0.4160	0.584
7	.	0.1200	1.0000	0.0000	0.0000	0.660	0.2870	0.742
8+	.	0.1200	1.0000	0.0000	0.0000	0.775	0.2870	0.962
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : P7DPRED
Date and time: 15OCT93:17:15

Table 4.5.11 Plaice in Division VIId. Yield per recruit in summary table.

Plaice in the English Channel, Eastern (Fishing Area VIId)

Yield per recruit: Summary table

						1 January	
F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass
0.0000	0.0000	0.000	0.000	8.843	4522.946	6.692	4217.512
0.2000	0.0841	0.339	185.984	6.021	2512.660	3.902	2215.320
0.4000	0.1682	0.500	240.789	4.692	1623.443	2.605	1333.655
0.6000	0.2522	0.590	256.057	3.947	1159.007	1.889	876.283
0.8000	0.3363	0.646	258.060	3.481	890.145	1.451	614.038
1.0000	0.4204	0.685	255.688	3.166	722.541	1.163	452.645
1.2000	0.5045	0.712	252.157	2.940	611.776	0.962	347.723
1.4000	0.5886	0.733	248.619	2.771	534.925	0.817	276.375
1.6000	0.6726	0.750	245.446	2.639	479.329	0.707	225.972
1.8000	0.7567	0.763	242.710	2.533	437.620	0.623	189.170
2.0000	0.8408	0.774	240.380	2.445	405.320	0.555	161.512
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams

Notes: Run name : P7DYPR93
Date and time : 12OCT93:13:39
Computation of ref. F: Simple mean, age 2 - 6
F-0.1 factor : 0.3730
F-max factor : 0.7556
F-0.1 reference F : 0.1568
F-max reference F : 0.3176
Recruitment : Single recruit

Table 4.5.12 Plaice in Division VIId. Prediction with managements option table.

Plaice in the English Channel, Eastern (Fishing Area VIId)

Plaice in the English Channel, Eastern (Fishing Area VIId)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
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	0.4204	18913	9511	6635	0.0000	0.0000	19820	11366	0	27035	17864
.	.	.	.	.	0.2000	0.0841	.	11177	1670	25428	16196
.	.	.	.	.	0.4000	0.1682	.	10991	3210	23951	14696
.	.	.	.	.	0.6000	0.2522	.	10809	4632	22593	13345
.	.	.	.	.	0.8000	0.3363	.	10629	5946	21342	12128
.	.	.	.	.	1.0000	0.4204	.	10453	7162	20191	11032
.	.	.	.	.	1.2000	0.5045	.	10280	8287	19130	10043
.	.	.	.	.	1.4000	0.5886	.	10110	9328	18151	9151
.	.	.	.	.	1.6000	0.6726	.	9943	10294	17248	8345
.	.	.	.	.	1.8000	0.7567	.	9778	11191	16414	7617
.	.	.	.	.	2.0000	0.8408	.	9617	12023	15643	6960
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : P7DPRED
Date and time : 12OCT93:13:27
Computation of ref. F: Simple mean, age 2 - 6
Basis for 1993 : F factors

Table 4.5.13 Plaice in Division VIId

Assessment Quality Control Diagram 1

Average F(2-6,u)						
Date of assessment	Year					
	1987	1988	1989	1990	1991	1992
1989						
1990[1]	0.384	0.344	0.299			
1991	0.500	0.548	0.564	0.514		
1992	0.512	0.566	0.607	0.580	0.531	
1993	0.468	0.476	0.507	0.525	0.577	0.420

[1]**Average F(3-6,u).**

Remarks:

Assessment Quality Control Diagram 2

Estimated total landings ('000 t) at *status quo* F							
Date of assessment	Year						
	1988	1989	1990	1991	1992	1993	1994
1989							
1990		9851	9904	9703			
1991			9597	8223	7558		
1992				8327	6594	6406	
1993				7296	8049	6635	7162
				SQC[1]	SQC[2]	Current	Forecast

$$^{1}SQC = Landings(y-1) * \frac{F(y-2)}{F(y-1)} * \exp\left[-\frac{1}{2}\{F(y-2) - F(y-1)\}\right]$$

$$^{2}SQC = Landings(y) * \frac{F(y-1)}{F(y)} * \exp\left[-\frac{1}{2}\{F(y-1) - F(y)\}\right]$$

where $F(y)$, $F(y-1)$ *and* $F(y-2)$ *are as estimated in the assessment made in year* $(y+1)$.

Remarks:

Continued

Table 4.5.13 Continued

Assessment Quality Control Diagram 3

Recruitment (age 1) Unit: Thousands						
Date of assessment	Year class					
	1988	1989	1990	1991	1992	1993
1989						
1990	(49700)	(35600)	(27500)			
1991	(22009)	(23216)	28854[1]	28854[1]		
1992	23395	(23095)	(21107)	27244[2]	27244[2]	
1993	18782	22986	30926	33556	29192[3]	29192[3]

[1]Geometric Mean 1980-1987. [2]Geometric Mean 1980-1989. [3]Geometric Mean 1983-1990.

Remarks: Figures in brackets are estimated from recruit surveys.

Assessment Quality Control Diagram 4

Spawning stock biomass ('000 t)								
Date of assessment	Year							
	1988	1989	1990	1991	1992	1993	1994	1995
1989			[1]	[1]				
1990	16528	20265	23462	24255[1]	24057[1]			
1991	11163	12025	12433	11127	9793[1]	9468[1]		
1992	10911	11627	11557	9669	10052	9541[1]	9466[1]	
1993	17788	17744	17993	12670	11263	9511	10453[1]	11032[1]

[1]Forecast.

Remarks: Not corrected for SOP.

Table 6.2.1

Comparison of estimates from the Laurec/Shepherd methods and those from the 1992 Working Group.

North Sea Cod

	F91			F92		
age	WG 92	LS	XSA	WG 92	LS	XSA
1	0.122	0.148	0.145	0.152	0.112	0.106
2	0.870	0.841	0.849	0.907	0.839	0.805
3	0.864	0.857	0.830	1.046	0.945	0.958
4	1.178	0.875	0.892	1.019	0.760	0.701
5	0.800	0.836	0.796	0.822	0.985	1.042
6	1.140	0.943	0.923	0.911	0.954	0.851
7	1.040	0.975	0.969	0.943	0.960	0.909
8	0.605	0.887	0.665	0.846	0.797	0.781
9	0.966	0.522	0.438	1.165	0.774	0.440
10	0.910	0.832	0.712	0.937	0.894	0.648
11	0.910	0.832	0.712	0.937	0.894	0.648
mean 2-8	0.928	0.888	0.846	0.928	0.891	0.864

	N91			N92		
age	WG 92	LS	XSA	WG 92	LS	XSA
1	168441	142050	149823	345000	314886	341827
2	40838	42343	43316	60188	55072	58242
3	27975	28369	29555	15954	12872	13057
4	3588	4312	4327	9187	9374	10039
5	2271	2196	2302	905	1472	1451
6	1415	1594	1643	836	779	850
7	297	311	318	371	508	534
8	282	218	269	86	96	99
9	40	62	71	126	74	113
10	6	6	7	12	30	38
11	15	16	18	2	17	21
SSB	56	58	60	51	60	64

Table 6.3.1 Haddock in the North Sea. Results from fitting the SSV model with missing catch data in 1991 and 1992.

Separable catch data

	1985	1986	1987	1988	1989	1990	1991	1992
0	140.	57.	9.	11.	11.	56.	0.	0.
1	179.	160.	277.	29.	47.	80.	0.	0.
2	526.	178.	247.	483.	34.	100.	0.	0.
3	75.	320.	47.	87.	179.	17.	0.	0.
4	37.	27.	67.	13.	18.	56.	0.	0.
5	5.	10.	5.	18.	3.	4.	0.	0.
6	7.	1.	3.	2.	4.	1.	0.	0.
7	1.	2.	1.	1.	0.	1.	0.	0.

RV data

	1985	1986	1987	1988	1989	1990	1991	1992
0	6.80	13.90	2.02	3.48	3.70	26.85	32.24	71.90
1	1.76	1.92	2.32	.30	.68	.77	1.50	3.95
2	14.99	2.54	2.86	10.26	.94	1.07	.81	4.90
3	1.07	2.35	.43	.85	2.48	.19	.14	.28
4	.42	.15	.46	.12	.14	.45	.03	.04
5	.09	.11	.03	.16	.02	.03	.13	.01
6	.09	.02	.02	.02	.05	.01	.01	.03
7	.02	.02	.00	.01	.01	.01	.00	.00

weight for effort data = 1.0000
weight for RV data = 1.0000
RV catchability constant above age = 2

Adj. Coeff. of determination = .9806

Number of observations = 120
Number of parameters = 34

Estimated populations

	1985	1986	1987	1988	1989	1990	1991	1992
0	19405.	49266.	3853.	6250.	7333.	22102.	46322.	134751.
1	1904.	2485.	6308.	494.	800.	940.	2828.	5929.
2	1592.	318.	412.	1061.	82.	135.	153.	466.
3	152.	439.	85.	120.	292.	25.	33.	39.
4	62.	33.	92.	20.	26.	72.	4.	6.
5	10.	15.	7.	23.	5.	7.	14.	1.
6	12.	3.	4.	2.	7.	2.	2.	4.
7	2.	4.	1.	1.	1.	2.	0.	1.

Total fishing mortality

	1985	1986	1987	1988	1989	1990	1991	1992
0	.005	.005	.005	.005	.005	.006	.006	.005
1	.140	.146	.132	.141	.128	.162	.153	.143
2	.888	.924	.837	.889	.807	1.026	.967	.903
3	1.264	1.315	1.191	1.266	1.148	1.460	1.376	1.285
4	1.198	1.245	1.128	1.199	1.088	1.383	1.303	1.217
5	.987	1.026	.929	.988	.896	1.140	1.073	1.003
6	.988	1.027	.931	.989	.897	1.142	1.075	1.004
7	.988	1.027	.931	.989	.897	1.142	1.075	1.004

Continued

Table 6.3.1 Continued

Fitted separable catches

	1985	1986	1987	1988	1989	1990	1991	1992
0	124.	61.	9.	11.	11.	56.	113.	306.
1	124.	168.	389.	32.	48.	70.	200.	393.
2	795.	163.	198.	530.	39.	74.	81.	235.
3	99.	292.	53.	78.	181.	17.	22.	26.
4	40.	22.	56.	13.	16.	49.	3.	4.
5	6.	9.	4.	13.	3.	4.	9.	1.
6	7.	2.	2.	1.	4.	1.	1.	2.
7	1.	2.	0.	1.	0.	1.	0.	0.

Log catch residuals

	1985	1986	1987	1988	1989	1990	1991	1992
0	.1169	-.0706	.0150	-.0257	-.0330	-.0027	.0000	.0000
1	.3653	-.0498	-.3392	-.1057	-.0106	.1327	.0000	.0000
2	-.4123	.0881	.2204	-.0941	-.1402	.3036	.0000	.0000
3	-.2702	.0939	-.1325	.1138	-.0072	-.0063	.0000	.0000
4	-.0769	.2267	.1806	.0370	.1067	.1267	.0000	.0000
5	-.0831	.0900	.1044	.3206	-.0074	-.1874	.0000	.0000
6	.0202	-.3938	.1583	.0993	.0399	-.1677	.0000	.0000
7	-.0076	-.2084	.0697	-.2698	.2113	-.1389	.0000	.0000

RMS for catch data = .1724

Year/season effect residuals

year	1
1985	.0160
1986	-.0229
1987	.0761
1988	.0149
1989	.1124
1990	-.1282
1991	-.0683
1992	.0000

RMS for effort data = .0671

Log RV residuals

	1985	1986	1987	1988	1989	1990	1991	1992
0	-.0420	-.0637	-.0017	.0043	-.0056	.0823	.0266	.0000
1	.3241	.1447	-.5967	-.0825	.2376	.2064	-.2310	-.0027
2	.1130	-.0509	-.1934	.1391	.3016	-.0618	-.4706	.2231
3	.1345	-.1408	-.1861	.1434	.3182	.2245	-.3473	.1353
4	.0777	-.3154	-.2078	-.0561	-.1363	.0171	-.0818	-.1193
5	.3379	.1676	-.3509	.1240	-.4490	-.3041	.3679	-.1109
6	.1883	.0794	-.1449	.1534	.0338	.2307	.1459	.0817
7	.0764	-.0009	-.1006	-.0204	.0684	-.0596	.0457	-.1136

RMS for RV data = .1979

Table 6.3.2 **Haddock in the North Sea. Results from XSA Analysis treating 1992 catches as missing.**

```
XSA stock analysis with input from file:
file.lst

Unknown catches have been estimated
They were estimated so that they conform the EFFORT

Catcabilities at oldest age have been shrunk towards
those of the second oldest age.
with weight of the oldest: .0

The linear funct. model used for estimating catchabilities

CPUE indexes have been weighted according to the
inverse variance of the catchability estimate


Estimates of unknown catches

 Year  Seas   Age       Catch   Init. c
1992     1     1    226521.9  500000.0
1992     1     2    195759.4  100000.0
1992     1     3     22577.3   10000.0
1992     1     4      4488.6    6000.0
1992     1     5       857.9    1000.0
1992     1     6      3038.2    5000.0
1992     1     7      1316.5     400.0

SOP in season  1 103890.9


 Survivors (Year, age, number)
1992   0  6873711.00
1992   1   616290.44
1992   2   139545.16
1992   3     9923.03
1992   4     1746.91
1992   5      403.95
1992   6     1430.61
1991   6      469.00
1990   6      465.88
1989   6     1914.19
1988   6      678.30
1987   6     1223.49
1986   6      665.39
1985   6     4142.76
1984   6     2302.92
1983   6      836.15
1982   6      459.21
```

Table 6.3.3 Estimates of the 1992 age compositions for North Sea haddock from various methods.

age	Unajusted catch	Adjusted Catch	SSV catch	XSA catch
0	262455	270731	306000	n/a
1	161245	193504	393000	226521
2	179906	248480	235000	195759
3	22621	31583	26000	22577
4	4618	6254	4000	4488
5	830	1140	1000	857
6	3412	4795	2000	3038
7	316	443		1316
8	216	293		
9	205	286		
10	97	122		
11	16	21		
12	7	8		
SOP(ages 1-6) tonnes	94551	124724	149409	109714

Table 6.5.1 Saithe in Sub-area IV. Comparison of tuning methods.

Age	F91			F92		
	W.G.92	L.S.tun	XSA	W.G.92	L.S.tun.	XSA
1	0.004	0.005	0.005	0.006	0.000	0.004
2	0.120	0.174	0.169	0.119	0.086	0.091
3	0.390	0.475	0.480	0.345	0.364	0.354
4	0.770	0.717	0.639	0.792	0.709	0.726
5	1.059	0.752	0.641	0.988	0.811	0.644
6	0.739	0.703	0.600	0.781	0.906	0.651
7	0.651	0.695	0.612	0.682	0.884	0.643
8	0.516	0.570	0.517	0.612	0.884	0.682
9	0.635	0.656	0.623	0.692	0.891	0.739
10+	0.635	0.656	0.623	0.692	0.891	0.739
F(3-6)	0.735	0.662	0.585	0.739	0.698	0.593

Age	N 91			N 92		
	W.G.92	L.S.tun.	XSA	W.G.92	L.S.tun	XSA
1	216000	0	85306	214318	0	79869
2	208739	73118	87776	174136	73118	69514
3	200145	58836	128541	124090	58836	60660
4	58100	65330	63826	110990	65330	65121
5	12211	23218	15130	22029	23218	27572
6	6061	5156	7271	3566	5156	6526
7	2848	2598	3150	2371	2598	3267
8	1930	1160	1989	121	1160	1399
9	722	846	673	943	846	971
10+	491	574	483	313	574	649
SSB	56000 t	62983 t	70000 t	68000 t	69260 t	81000 t

Table 6.6.1 North Sea sole Indices of effort and cpue

	effort						cpue					
	1 Belgium	2 UK-ot	3 UK-bt	4 Netherlands	5 France-bt	6 Denmark	7 Belgium	8 UK-ot	9 UK-bt	10 Netherlands	11 France-bt	12 Denmark
1971	24.0						60.9					
1972	29.8						39.5					
1973	29.4						33.1					
1974	32.2						23.7					
1975	39.2						26.2					
1976	44.7						24.5					
1977	47.6						27.0					
1978	50.3			44.3			25.9			375.8		
1979	40.0			44.9			38.7			423.2		
1980	35.2	166.8	36.5	45.0			30.9	2.71	12.39	282.1		
1981	31.1	160.1	35.7	46.3			35.3	2.38	10.68	267.8		
1982	34.9	156.9	35.3	57.3			44.7	2.57	11.44	309.8		
1983	35.4	160.1	24.4	65.6		3301	42.3	2.70	17.71	319.9		133
1984	42.8	146.7	34.6	70.7		1203	35.9	3.84	16.27	307.7		301
1985	51.4	170.5	65.5	70.3	12791	488	41.0	4.79	12.46	276.3	25.0	821
1986	42.5	243.6	49.2	68.1	9665	1425	38.9	2.66	13.16	213.7	18.5	174
1987	50.7	257.4	78.3	68.4	8162	1515	29.1	2.63	8.65	204.9	18.0	161
1988	53.0	250.9	87.3	76.3	9150	2539	19.4	2.95	8.48	235.9	15.4	206
1989	54.3	263.9	123.2	61.6	10485	2001	22.7	3.80	8.14	272.7	11.4	207
1990	64.7	819.4	180.4	71.2	11787	2011	24.8	2.16	9.81	379.2	12.4	759
1991	74.3	577.7	210.9	68.7	12116	2712	42.6	2.87	7.86	419.9	16.4	791
1992	67.7	644.7	195.7	71.6	10939	n.a	22.5*	1.94	6.38	305.0	14.6	n.a.

1	fishing hours in 1000 HP beam trawl units *10E3	measured
2	otter trawl units *10E2 (areas 3+4)	derived
3	beam trawl units *10E2 (areas 3+4)	derived
4	million HP days beam trawl	measured
5	hours beam trawl	measured
6	fishing days gill net 2nd quarter	measured
7	Kg/FH 1000 HP beam trawl	derived
8	otter trawl kg/FH (areas 3+4)	measured
9	beam trawl kg/FH (areas 3+4)	measured
10	kg/1000 HP day	derived
11	kg/hour	derived
12	kg/fishing day, 2nd quarter	derived

* biased by national indiviual restrictions in landings per day and per HP

Table 6.6.2 North Sea Sole
Results of the Beam Trawl Survey (BTS) in August-September in the southeastern North Sea (Isis, Belgica: number per fishing hour) and in May in the German Bight (Solea: numbers per 2 fishing hours)

	Age											
Year	0	1	2	3	4	5	6	7	8	9	10+	nos sq
R/V "ISIS" - 8 m beam trawl (daytime fishery)												
1985	-	2.34	6.43	3.58	1.68	0.74	0.21	0.00	-	-	0.02	29
1986	-	6.61	4.92	1.47	0.83	0.53	0.17	0.13	-	0.02	0.05	25
1987	0.05	6.15	11.11	1.60	0.54	0.52	0.17	0.21	0.05	-	0.02	26
1988	-	75.23	12.10	2.58	0.95	0.12	0.16	0.10	0.10	0.02	0.11	27
1989	-	8.00	60.40	3.90	3.60	0.63	0.13	0.20	0.00	0.04	0.03	29
1990	0.09	18.99	20.91	18.34	0.57	0.59	0.48	0.09	0.05	0.01	0.01	27
1991	0.95	3.23	21.15	5.14	5.22	0.11	0.12	0.07	0.02	0.01	0.03	
1992	0.18	61.01	22.19	8.73	1.89	2.47	0.05	0.12	0.07	0.01	0.06	
1993	0.03	5.10	25.14	0.83	3.59	2.29	4.01	0.03	0.05	0.06	0.05	

	Age											
Year	0	1	2	3	4	5	6	7	8	9	10+	nos sq
R/V "BELGICA" - 8 m beam trawl (daytime fishery)												
1986	-	1.9	1.7	2.7	2.0	1.0	-	0.2	-	-	0.3	8
1987	-	0.0	5.1	1.4	1.3	1.4	0.5	0.1	0.3	0.1	0.2	8
1988	1.3	4.7	2.2	14.3	3.6	2.9	0.8	-	1.7	2.1	1.0	8
1989	-	8.8	17.2	1.9	3.3	0.8	0.2	0.4	0.2	-	0.5	8
1990	-	21.8	5.8	7.5	1.7	1.8	0.8	-	0.5	0.9	1.2	8
1991	-	7.6	12.1	3.8	4.7	0.5	0.4	0.2	0.1	-	0.3	8
1992	-	76.0	23.0	14.3	1.7	1.5	-	1.7	0.1	0.8	0.6	8
1993*	-	32.0	27.5	4.0	3.0	1.0	1.0	1.0	-	1.5	3.0	8

	Age									
Year	2	3	4	5	6	7	8	9	10	11+
R/V "SOLEA" - 70 mm net (night fishery)										
1976	0.7	31.5	22.7	10.6	1.6	2.9	1.4	1.2	0.7	2.2
1977	59.8	16.3	31.0	15.9	4.6	0.5	0.4	0.2	0.1	0.4
1978	36.0	34.4	2.5	6.5	2.0	0.3	0.1	0.1	0.0	0.3
1980a	9.2	54.3	48.9	29.5	2.5	6.5	3.2	1.0	0.2	1.3
1980b	4.2	28.6	20.0	14.4	0.6	1.6	0.6	0.2	0.0	0.0
1981	42.2	1.9	10.3	6.1	2.9	0.5	0.9	1.1	0.2	0.3
1982	39.1	76.1	2.3	8.8	4.6	3.4	0.6	1.7	0.6	0.5
1983	129.7	77.1	38.4	1.4	4.0	2.2	2.1	0.4	0.5	0.7
1984	24.8	147.1	55.6	22.8	0.6	2.4	2.3	1.2	0.4	1.0
1985	10.9	77.8	87.9	18.6	6.0	0.5	0.6	0.5	0.3	0.4
1986	7.6	10.8	11.4	10.4	2.9	0.9	0.0	0.2	0.2	0.2
1987	22.0	29.8	13.5	6.8	3.6	1.0	0.2	0.0	0.1	0.0
1988	8.5	24.6	13.1	2.4	1.7	1.1	0.1	0.0	0.0	0.1
1989	17.9	20.3	16.6	3.9	1.2	1.0	0.8	0.2	0.1	0.0
1990	10.2	66.9	9.2	3.1	0.9	0.4	0.2	0.1	0.0	0.0
1991	28.4	86.4	164.3	16.9	12.3	2.0	0.8	0.3	0.7	0.1
1992	3.1	54.6	18.9	41.0	5.2	1.2	1.0	0.1	0.1	0.0
1993	not available									

* 4 meter beam trawl

Table 6.6.3 **North Sea Sole incides of recruitment.**

DFS 0-group (3-m and 6-m shrimptrawls in nurseries)

year class	nl/bel	uk	ger	comb
67				
68				
69				
70	12.18			221.00
71	7.94			144.07
72	0.29			5.26
73	4.54	27.48		90.62
74	0.83		0.2	15.56
75	8.08	42.79	3.4	167.88
76	3.38	65.30	0.4	81.91
77	1.07	24.81	2.2	32.31
78	4.36	33.58	2.5	95.38
79	20.65	46.97	1.1	391.51
80	19.83	117.89	2.6	401.63
81	15.15	50.57	1.2	293.04
82	17.61	62.73	0.9	340.58
83	4.93	64.00	0.3	109.40
84	9.17	86.91	0.7	194.20
85	15.80	46.58	0.0	300.66
86	3.50	27.03	0.3	72.36
87	28.55	38.22	1.9	534.21
88	2.07	60.72	2.4	61.73
89	2.62	116.40	0.2	83.00
90	2.60	49.70	0.2	62.56
91	19.37	53.55	0.9	369.69
92	0.82	58.08	0.2	32.80
93	n/a	52.84	0.11	n/a

DFS 1-group

nl/bel	uk	ger	comb
0.66			11.98
0.04			0.73
0.07			1.27
0.21			3.81
0.33			5.99
0.03	2.69		1.49
0.19	7.08		5.93
0.22	8.50		6.97
0.03	0.92		0.87
0.11	0.79		2.27
2.05	8.61		40.21
0.51	8.12		12.10
0.67	6.92		14.58
1.11	4.78		21.81
0.41	10.82		11.23
0.10	4.23		3.29
0.58	3.12		11.62
0.24	2.29		5.16
0.76	9.40		17.08
0.28	4.05		6.50
0.22	13.51		8.72
0.03	30.46		11.21
0.54	5.93		11.87
n/a	23.38		n/a

TRIDENS SNS surveys (6 m beam trawl continental coast)

year class	sep/oct age 0	april age 1	sep/oct age 1	april age 2	sep/oct age 2	april age3	sep/oct age3	sep/oct age 4
66						79		31
67				583		453	204	7
68		155		548	745		99	0
69		812	4938		1961	415	161	35
70	669		613	150	341	436	73	0
71	6327	294	1410	909	905	31	69	44
72	24	13	4686	310	397	8	174	70
73	847	137	1924	884	887	66	187	85
74	140	13	597	84	79	38	77	27
75	565	91	1413	846	762	365	267	60
76	475	540	3724	1311	1379	203	325	45
77	1620	271	1552	58	388	193	99	13
78	10529	183	104	99	80	14	51	7
79	3908	1027	4483	578	1411	310	231	43
80	5518	186	3739	699	1124	598	107	102
81	3194	871	5098	1242	1137	466	307	59
82	2528	515	2640	1258	1081	513	159	30
83	769	157	2359	847	709	44	67	15
84	3473	225	2151	171	465	171	59	81
85	4268	375	3791	593	955	636	284	50
86	901	159	1890	438	594	273	248	100
87	13690	235	11227	2492	5369	2367	907	607
88	523	103	3052	590	1078		527	264
89	2171	421	2900		2515		319	
90	53		1265		114		n/a	
91	3640		11081		n/a			
92	303		n/a					
93	n/a							

n/a: not available, will be made available to ACFM november 1993

Table 6.6.4 North Sea Sole
Comparison of final VPA results using various tuning methods

	XSA not shr	XSA shr (.5)	XSA shr (.3)	L-S not shr	L-S shr (.3)	Sep not shr
F2-8						
1988	0.505	0.488	0.472	0.468	0.460	0.466
1989	0.393	0.379	0.364	0.366	0.352	0.355
1990	0.449	0.430	0.406	0.404	0.385	0.395
1991	0.556	0.522	0.497	0.502	0.472	0.474
1992	0.539	0.502	0.468	0.509	0.444	0.431
SSB						
1988	40956	41871	42897	43230	43524	42974
1989	35592	37207	37665	37887	38451	38083
1990	90694	92744	93858	96172	95660	90806
1991	76527	78273	79596	81346	81140	76156
1992	63456	66203	68785	70397	71292	67968
recruits						
1988	451713	451121	456878	468922	461966	434664
1989	101624	100850	102602	96262	99056	101400
1990	132047	137489	144835	143141	150216	162359
1991	35868	37276	43400	21582	44556	64366
1992	440874	433755	426445	423023	429009	1074043

Table 6.7.1 North Sea plaice. Commercial catch rate indices.

Year	Belgium beam trawl	UK beam trawl	UK otter trawl	UK seine	Denmark Danish seine	Netherlands beam trawl
	1)	kg/hr	kg/hr	kg/hr	kg/day*10^{-1}	kg/hpd
1972	50.8	-	-	-	-	-
1973	61.8	-	-	-	-	-
1974	60.9	-	-	-	-	-
1975	43.4	-	-	-	-	-
1976	34.3	-	-	-	-	-
1977	43.8	-	-	-	-	-
1978	39.8	-	-	-	-	-
1979	45.8	-	-	-	-	1.67
1980	50.9	76.7	31.3	23.7	-	1.73
1981	58.4	81.4	29.5	29.4	-	1.85
1982	62.9	98.7	32.8	38.2	-	1.71
1983	70.1	60.4	22.6	37.3	62.6	1.44
1984	67.5	52.7	29.7	34.9	60.5	1.44
1985	60.8	42.2	25.1	29.0	59.9	1.51
1986	55.8	48.6	25.8	34.3	69.5	1.65
1987	66.0	59.0	21.1	32.3	60.3	1.44
1988	78.0	58.4	22.6	36.0	73.4	1.30
1989	74.5	53.2	23.0	43.7	76.7	1.38
1990	83.1	49.4	23.0	47.8	80.4	1.24
1991	74.6	41.5	15.0	32.0	61.7	1.18
1992	60.1	39.4	12.0	28.1	49.7	0.74

1) CPUE index based on hours fishing, corrected for HP.

Table 6.7.2 North Sea PLAICE. Results of trawl surveys in August-September in the southeastern North Sea.

Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
NETHERLANDS BTS (8 M BEAM TRAWL)										
1985	113.5	184.9	44.8	17.48	24.3	1.27	0.44	0.22	0.19	0.56
1986	596.0	121.4	52.8	14.35	6.87	0.74	0.47	0.23	0.16	0.28
1987	203.8	710.8	30.0	6.40	3.08	1.14	0.46	0.15	0.13	0.24
1988	541.7	134.4	188.0	13.38	3.58	1.67	1.05	0.47	0.20	0.42
1989	398.0	340.2	51.3	55.00	6.63	0.80	0.39	0.61	0.14	0.30
1990	123.5	112.8	68.7	32.00	8.58	0.84	0.21	0.48	0.22	0.16
1991	174.7	133.6	32.2	12.35	4.19	5.83	0.22	0.20	0.13	0.16
1992	166.33	108.69	21.64	5.23	2.97	2.79	1.44	0.22	0.07	0.09
1993	125.65	165.77	36.15	6.98	1.25	1.35	0.49	0.51	0.17	0.09
BELGIUM BTS (8 M BEAM TRAWL 1989-1992, 4 m beam trawl 1993)										
1989	3.6	3.4	6.7	6.7	0.8	0.2	0.1	0.2	-	0.1
1990	2.8	4.8	4.4	5.2	7.5	0.9	0.5	-	-	-
1991	0.5	7.0	3.5	0.8	1.0	0.2	-	-	-	-
1992	8.0	5.0	5.0	3.0	-	1.0	-	-	-	-
1993*	10.8	67.4	1.8	0.2	0.2	-	-	-	-	-

*Values corrected by a factor of 2 in order to standardize from 4 m to 8 m beam length.

Table 6.7.3 North Sea PLAICE recruitment indices.

Year class	1-group VPA	Autumn surveys				Spring survey	
		Tridens 0-group	Tridens 1-group	Tridens 2-group	Tridens 3-group	Tridens 1-group	Tridens 2-group
1967	245	-	-	-	2,813	-	-
1968	326	-	-	9,450	1,008	-	7,708
1969	369	-	8,032	23,848	4,484	8,641	-
1970	274	3,678	18,101	9,584	1,631	-	14,840
1971	234	6,708	6,437	4,191	1,261	9,799	8,738
1972	540	9,242	57,238	17,985	10,744	32,980	43,774
1973	451	5,451	15,648	9,171	791	5,835	15,583
1974	335	2,193	9,781	2,274	1,720	3,903	4,610
1975	324	1,151	9,037	2,900	435	1,739	3,424
1976	470	11,544	19,119	12,714	1,577	8,344	15,364
1977	428	4,378	13,924	9,540	456	5,054	7,041
1978	441	3,252	21,681	12,984	785	6,425	10,778
1979	657	27,835	58,049	16,106	1,146	16,567	37,468
1980	421	4,039	19,611	8,503	308	3,694	11,131
1981	1,020	31,542	70,108	14,708	2,480	20,151	45,588
1982	586	23,987	34,884	10,413	1,584	7,615	17,459
1983	605	36,722	44,667	13,788	1,155	11,869	37,339
1984	543	7,958	27,832	7,557	1,232	16,557	16,277
1985	1,355	47,385	93,573	33,021	13,140	56,559	62,290
1986	570	8,818	33,426	14,429	3,709	8,523	16,213
1987	568	21,270	36,672	14,952	3,248	12,835	34,218
1988	404	15,598	37,238	7,287	1,507	10,387	16,677
1989	-	24,198	24,903	11,149	2,257	10,235	-
1990	-	9,559	57,349	13,742	-	-	-
1991	-	17,120	48,223	-	-	-	-
1992	-	5,398	-	-	-	-	-

ctd.

Table 6.7.3 Continued

Year class	Coastal surveys					Combined	
	Netherlands/Belgium		Germany	UK			
	0-group	1-group	0-group	0-group	1-group	0-group	1-group
1969	-	2.87	-	-	-	-	-
1970	-	0.93	-	-	-	-	-
1971	4.59	2.63	-	-	-	-	-
1972	2.46	6.79	-	-	-	-	-
1973	2.58	1.96	-	43.48	-	-	-
1974	2.29	3.03	11.3	56.91	14.36	105.73	69.34
1975	2.17	4.03	6.9	21.06	4.76	68.29	77.88
1976	7.03	6.59	28.3	59.87	9.08	226.29	128.65
1977	3.70	3.00	24.7	59.02	11.82	158.38	66.25
1978	8.18	7.91	22.0	31.14	9.75	213.62	153.28
1979	17.07	10.53	17.1	17.67	6.60	355.51	197.67
1980	5.02	6.92	15.3	21.35	5.89	136.20	131.45
1981	28.87	13.83	28.0	53.19	12.64	616.99	263.58
1982	24.01	7.82	14.8	16.74	7.08	476.36	148.97
1983	18.00	5.74	13.3	62.39	9.76	398.70	113.91
1984	10.72	4.65	7.1	70.63	19.14	260.99	103.51
1985	36.98	13.41	6.0	52.61	16.68	721.87	260.00
1986	17.69	9.98	3.6	39.96	7.22	357.80	188.31
1987	23.38	4.97	12.6	33.90	7.98	473.62	98.16
1988	15.50	6.31	12.6	48.67	13.88	341.71	128.37
1989	22.35	6.25	21.2	31.71	7.90	469.64	121.31
1990	22.02	6.88	20.3	34.37	12.04	465.84	136.88
1991	24.47	5.88	20.9	17.80	7.47	497.11	151.17
1992	18.09	-	5.4	35.55	6.11	365.17	-
1993	-	-	4.2	44.91	-	-	-

Table 6.9.1 Sole in Division VIId. Catch per unit effort, 1972-1992

Year	Belgium	UK vessels < 12 m	UK vessels > 12 m		France	
	HP corr (kg/hr)	Hastings trammel (kg/day)	Beam trawl (kg/hr) GRT corr	Otter trawl (kg/hr) GRT corr	Offshore trawl (kgx10**4/Kw.hr)	Inshore trawl (kgx10**4/Kw.hr)
1972	33.0		15.2	4.8		
1973	40.0		12.1	2.1		
1974	34.5		11.6	3.3		
1975	24.1	35.0	11.5	2.6		
1976	27.3	35.2	10.5	3.7		
1977	30.0	19.9	11.0	3.2		
1978	26.3	50.4	9.1	2.2		
1979	37.4	46.5	8.3	2.1		
1980	23.3	19.0	15.2	1.1		
1981	24.5	30.3	13.7	1.0		
1982	23.6	23.0	11.2	1.6		
1983	22.4	45.1	21.4	1.9	25.5	
1984	21.6	48.7	13.3	2.1	22.5	
1985	22.9	57.4	12.8	1.7	37.9	345.3
1986	33.5	64.0	10.9	4.1	23.3	290.0
1987	36.6	56.8	11.0	3.2	28.6	478.5
1988	15.9	40.7	11.3	1.5	15.4	362.8
1989	16.8	43.0	10.6	2.4	16.5	332.0
1990	25.9	30.3	11.9	1.5	12.5	173.2
1991	22.6	27.0	8.1	2.1	16.4	250.5
1992	32.0	37.9	8.0	2.5	12.5	444.4

Note: Belgian indices revised using new HP correction

Table 6.9.2 Sole in Division VIId. Effort data, 1975-1992

Year	Belgium	UK vessels < 12 m	UK vessels > 12 m		France	
	Beam trawl ('000 hr) HP corr	Hastings trammel ('000 nets)	Beam trawl ('000 hr)	Otter trawl ('000 hr)	Offshore trawl (hr*Kw*10**-4)	Inshore trawl (hr*Kw*10**-4)
1975	5.0					
1976	6.6					
1977	6.9					
1978	8.2					
1979	7.3					
1980	12.8	2.8	6.8	96.7		
1981	19.0	2.1	6.7	96.7		
1982	23.9	5.9	16.0	110.4		
1983	23.6	3.3	12.6	143.1	1816.7	
1984	28.0	4.4	21.8	139.8	2801.3	
1985	25.3	3.8	21.5	163.2	6771.5	228.8
1986	23.5	3.7	25.8	68.8	8067.3	411.2
1987	27.1	4.2	37.8	128.0	6036.7	573.2
1988	38.5	6.1	29.0	213.6	6065.9	942.1
1989	35.7	5.7	41.4	187.2	5815.4	1039.0
1990	30.3	9.8	40.8	316.6	7485.7	909.1
1991	24.3	14.6	53.1	205.2	9540.3	967.0
1992	20.0	7.2	53.7	168.7	9261.4	505.2

Note: Belgian indices revised for new HP correction where FP= .000204 x HP**1.23

Table 6.9.3 Sole in division VIId. English beam trawl survey numbers per hr raised to 8m beam trawl equivalent (mean no/rectangle, averaged across rectangles).

Age	1	2	3	4	5	6	7	8	9	10+	1+	3+
1988	8.2	14.2	9.9	0.8	1.3	0.6	0.1	0.1	0.2	0.2	35.7	13.2
1989	2.6	15.4	3.4	1.7	0.6	0.2	0.2	0.0	0.0	0.7	25.1	6.8
1990	12.1	3.7	3.4	0.7	0.8	0.2	0.1	0.2	0.0	0.0	21.4	5.4
1991	8.9	22.8	2.2	2.3	0.3	0.5	0.1	0.2	0.1	0.1	37.6	5.8
1992	1.4	12.0	10.0	0.7	1.1	0.3	0.5	0.1	0.2	0.6	27.1	13.7
1993	0.5	17.5	8.4	7.0	0.8	1.0	0.3	0.2	0.0	0.4	36.1	18.2

Table 6.9.4 Division VIId SOLE. Survey indices of recruitment.

Year class	VPA	English YFS		English BTS			French YFS	
	('000)	0-group	1-group	1-group	2-group	3-group	0-group	1-group
1980	18128	-	4.08	-	-	-	1.07	0.77
1981	13304	2.6	1.27	-	-	-	2.00	0.03
1982	22132	3.31	2.04	-	-	-	0.46	0.02
1983	22090	13.86	3.76	-	-	-	0.38	-
1984	12844	2.2	0.9	-	-	-	-	-
1985	26709	4.97	1.41	-	-	9.9	-	-
1986	10820	4.2	0.96	-	14.2	3.4	-	0.04
1987	24308	8.23	1.8	8.2	15.4	3.4	0.36	0.08
1988	13122	2.9	0.82	2.6	3.7	2.2	0.02	0.08
1989		5.3	2.29	12.1	22.8	10.0	7.70	0.25
1990		4.47	5.4	8.9	12.0	8.6	0.25	0.21
1991		1.6	2.2	1.4	17.8	-	0.46	0.13
1992[1]		2.7	1.12[2]	0.5	-	-	0.21	-
1993		8.88[2]						

[1]Revised
[2]Provisional.

Table 6.10.1 Plaice in Division VIId. Catch per unit effort

Year	United Kingdom			Belgium	France	
	Beam trawl (kg/hr)	Hastings trammel (kg/days)	Rye trawl (kg/day)	Beam trawl (kg/hr)	Offshore trawl (kgx10**4/Kw.hr)	Inshore trawl (kgx10**4/Kw.hr)
1978		15.5		12.3		
1979		8.2		16.5		
1980		12.0		24.4		
1981		16.0		31.2		
1982		13.3		24.5		
1983	21.6	14.8		36.2	187.9	
1984	18.5	12.9	73.4	25.9	301.5	
1985	19.9	17.1	117.0	31.8	224.9	527.2
1986	27.7	17.5	121.2	34.9	221.1	701.4
1987	15.5	36.6	144.0	33.7	318.0	843.0
1988	8.9	44.2	189.9	40.6	316.8	1258.5
1989	17.6	46.9	171.7	42.8	190.5	739.5
1990	17.4	35.6	193.4	48.8	224.0	362.0
1991	18.3	41.3	91.6	45.5	173.4	382.9
1992	14.2	24.2	94.5	38.6	148.9	485.0

revised with new HP correction

Table 6.10.2 Plaice in Division VIId. Effort data

Year	United Kingdom			Belgium	France	
	Beam trawl ('000 hr)	Hastings trammel ('000 days)	Rye trawl ('000 days)	Beam trawl ('000 hr)	Offshore trawl (hrxKw x 10**-4)	Inshore trawl (hrxKw x 10**-4)
1975				6.9		
1976				7.8		
1977				9.8		
1978				11.3		
1979				9.7		
1980				16.5		
1981				24.4		
1982				29.8		
1983	2.9			26.4	1816.8	
1984	2.3	7.1	7.4	35.4	2801.7	
1985	7.9	5.7	6.4	33.4	6768.4	228.8
1986	7.3	5.6	5.9	30.9	8069.0	411.2
1987	24.3	6.2	7.4	49.3	6035.8	573.2
1988	19.7	7.4	4.8	48.9	6064.3	942.2
1989	24.6	8.3	5.6	43.8	5939.3	1044.1
1990	32.8	18.4	4.3	38.5	7485.7	909.1
1991	29.5	11.1	12.0	32.8	9537.7	967.0
1992	35.0	18.0	11.8	27.9	9260.6	505.2

Note: Belgian indices revised with new HP correction where FP = 0.000341 x HP**0.823

Table 6.10.3 Plaice in division VIId. English beam trawl survey numbers per hr raised to 8m beam trawl equivalent (mean no/rectangle, averaged across rectangles).

Age	1	2	3	4	5	6	7	8	9	10+	1+	3+
1988	26.47	31.33	43.75	6.96	4.64	1.51	0.77	0.70	0.60	1.21	117.94	60.14
1989	2.31	12.13	16.63	19.94	3.30	1.48	1.32	0.54	0.30	1.65	59.60	45.16
1990	5.16	4.86	5.76	6.70	7.53	1.76	0.65	0.97	0.75	0.37	34.51	24.49
1991	11.75	9.06	6.98	5.30	5.43	3.20	1.22	0.99	0.06	1.24	45.23	24.42
1992	16.53	12.54	4.19	4.17	5.57	4.88	3.44	0.66	0.49	0.72	53.18	24.12
1993	3.22	13.40	4.96	1.75	1.89	1.57	2.05	2.78	0.39	0.57	32.57	15.95

Table 6.10.4 Division VIId PLAICE. Survey indices of recruitment.

Year class	English YFS		English BTS		French Baie de Somme		French CGFS		
	0-group	1-group	1-group	2-group	0-group	1-group	0-group	1-group	2-group
1978	-	-	-	-	-	0.22	-	-	-
1979	-	-	-	-	3.73	0.35	-	-	-
1980	-	0.14	-	-	1.12	0.04	-	-	-
1981	1.8	0.37	-	-	5.31	0.25	-	-	-
1982	1.4	0.62	-	-	1.49	0.04	-	-	-
1983	8.2	0.58	-	-	2.42	-	-	-	-
1984	4.0	0.92	-	-	-	-	-	-	-
1985	5.9	1.25	-	-	-	-	-	-	-
1986	10.8	1.61	-	31.33	-	0.94	-	-	26.46
1987	15.53	1.23	26.47	12.13	4.44	0.82	-	10.33	8.79
1988	6.42	0.73	2.31	4.86	1.11	0.22	0.19	4.08	1.27
1989	2.27	0.38	5.16	9.06	2.38	0.40	0.16	3.95	0.91
1990	2.37	0.34	11.75	12.54	1.04	0.39	0.16	1.95	6.05
1991	1.74	0.86	16.53	13.40	3.02	1.36	0.15	33.61	-
1992[1]	1.8	0.38	3.22	-	2.19	-	0.98	-	-
1993[2]	3.51	-	-	-	-	-	-	-	-

[1]Revised.
[2]Provisional.

Table 7.1 Definition of new fleets used in predictions from the STCF database fleets.

Country=Belgium Year=91

Fleet code	Fleet description	Mesh size	New fleet
1	BEAMTRAWL > 300 HP	80	BEAM TRAWL
2	BEAMTRAWL < 300 HP	70	BEAM TRAWL
3	OTTER TRAWL		HC. TRAWL
5	PAIR TRAWL	80	HC. TRAWL

Country=Denmark Year=91

Fleet code	Fleet description	Mesh size	New fleet
A	GILL-NET	0	FIXED GEAR
B	DANISH SEINE	90	SEINE NETS
C	IND. TRAWL SIN. 0- 50 GRT	16	IND. TRAWL
D	IND. TRAWL SIN.51-100 GRT	16	IND. TRAWL
E	IND. TRAWL SIN. > 100 GRT	16	IND. TRAWL
F	CON. TRAWL SIN. 0- 50 GRT	100	HC. TRAWL
G	CON. TRAWL SIN.51-100 GRT	100	HC. TRAWL
H	CON. TRAWL SIN. > 100 GRT	100	HC. TRAWL
I	IND. TRAWL PAIR 0- 50 GRT	16	IND. TRAWL
J	IND. TRAWL PAIR51-100 GRT	16	IND. TRAWL
K	IND. TRAWL PAIR > 100 GRT	16	IND. TRAWL
L	CON. TRAWL PAIR 0- 50 GRT	100	HC. TRAWL
M	CON. TRAWL PAIR51-100 GRT	100	HC. TRAWL
N	CON. TRAWL PAIR > 100 GRT	100	HC. TRAWL
O	PURSE SEINE	35	PELAGIC
P	OTHER	0	OTHER

Country=England Year=91

Fleet code	Fleet description	Mesh size	New fleet
1	BEAM TRAWLS	80	BEAM TRAWL
2	OTTER TRAWLS	90	HC. TRAWL
3	PAIR TRAWLS	90	HC. TRAWL
4	SEINE NETS	90	SEINE NETS
5	OTHER	0	OTHER

Country=France Year=91

Fleet code	Fleet description	Mesh size	New fleet
A	VERY BIG TRAWLERS BOTTOM	90	SAITHE
B	VERY BIG TRAWLERS PELAGIC	50	PELAGIC
C	FREEZER TRAWLERS BOTTOM	90	SAITHE
D	FREEZER TRAWLERS PELAGIC	50	PELAGIC
E	HIGH SEA TRAWLERS BOTTOM	90	HC. TRAWL
F	HIGH SEA TRAWLERS PELAGIC	50	PELAGIC
G	COASTAL TRAWLERS BOTTOM	90	HC. TRAWL
H	COASTAL TRAWLERS PELAGIC	40	PELAGIC
I	COASTAL TRAWLERS BEAM	90	BEAM TRAWL
J	COASTAL VESSELS FIX	0	FIXED GEAR

Country=Netherlands Year=91

Fleet code	Fleet description	Mesh size	New fleet
A	BEAM TRAWL >300HP	80	BEAM TRAWL
B	BEAM TRAWL <300HP	75	BEAM TRAWL
O	OTTER TRAWLERS	85	HC. TRAWL
P	PAIR TRAWLERS	85	HC. TRAWL

Continued

Table 7.1 Definition of new fleets used in predictions from the STCF database fleets. (Continued)

Country=Norway Year=91

Fleet code	Fleet description	Mesh size	New fleet
F	TRAWLERS >250 GRT CONSUMP	100	SAITHE
K	TRAWLERS <250 GRT CONSUMP	100	HC. TRAWL
O	INDUSTR. TRAWL TARG. NOP	24	IND. TRAWL
P	PURSE SEINERS	0	PELAGIC
T	INDUSTR. TRAWL TARG. SAN	0	IND. TRAWL

Country=Other Year=91

Fleet code	Fleet description	Mesh size	New fleet
1	OTHER REPORTED LANDINGS	1	OTHER
2	NOT REPORTED LANDINGS	1	OTHER

Country=Scotland Year=91

Fleet code	Fleet description	Mesh size	New fleet
A	TRAWL	90	HC. TRAWL
B	LIGHT TRAWL	90	HC. TRAWL
C	NEPHROPS TRAWL	70	HC. TRAWL
D	SEINE NET	90	SEINE NETS
E	PAIR TRAWL DEMERSAL	90	HC. TRAWL
F	PAIR TRAWL HERRING	32	PELAGIC
G	PAIR TRAWL MACKEREL	32	PELAGIC
H	PAIR TRAWL SPRAT	16	PELAGIC
I	PURSE SEINE HERRING	0	PELAGIC
J	PURSE SEINE MACKEREL	0	PELAGIC
K	SINGLE TRAWL PELAGIC	32	PELAGIC
L	INDUSTRIAL TRAWL	32	IND. TRAWL
M	OTHER	0	OTHER

Table 7.2 Total international catch (tonnes) as given in the STCF North Sea data base, 1991. The fleets defined in the STCF database has been combined into 8 main fleets.

		Species					
		Cod	Haddock	Plaice	Saithe	Sole	Whiting
Fleet code	Catch category						
HC. TRAWL	Discards	.	21677	.	.	.	18705
	Human	32183	20015	13098	32943	952	26067
	Industry	*	2	.	.	.	4
	ALL	32183	41694	13098	32943	952	44778
SEINE NETS	Catch category						
	Discards	.	14104	.	.	.	11796
	Human	18032	19756	11600	2423	9	17658
	ALL	18032	33860	11600	2423	9	29455
BEAM TRAWL	Catch category						
	Discards	..	85	.	.	.	1457
	Human	5158	85	107688	7	28476	1887
	ALL	5158	171	107688	7	28476	3345
SAITHE	Catch category						
	Discards	.	573	.	.	.	60
	Human	901	644	341	19885	.	73
	ALL	901	1218	341	19885	.	133
FIXED GEAR	Catch category						
	Discards	.	143	.	.	.	26
	Human	7261	159	3855	265	1026	32
	ALL	7261	302	3855	265	1026	59
IND. TRAWL	Catch category						
	Discards	.	368	.	.	.	379
	Human	1530	445	76	10720	*	576
	Industry	544	5068	.	632	.	36118
	ALL	2075	5882	76	11352	*	37075
PELAGIC	Catch category						
	Discards	.	.	.	.	.	24
	Human	6	.	*	.	*	41
	Industry	.	94	.	.	.	145
	ALL	6	94	*	.	*	211
OTHER	Catch category						
	Discards	.	14	.	.	.	37
	Human	18597	2725	17067	20564	7571	1366
	Industry	*	1	.	.	.	2
	ALL	18597	2741	17067	20564	7571	1406
Catch category							
Discards		.	36967	.	.	.	32489
Human		83673	43832	153729	86809	38037	47703
Industry		544	5166	.	632	.	36272
ALL		84217	85966	153729	87441	38037	116464

* Less than 1 tonnes

Table 7.3 Result from the ABC-model equilibrium predictions.

F increase of 10% by fleet	Biomass change (%)					
	SPECIES					
	COD	HAD	PLE	POK	SOL	WHG
HC. TRAWL	-5.1	-2.3	-0.5	-3.0	-0.3	-2.1
SEINE NETS	-2.9	-2.1	-0.5	-0.2	-0.0	-1.3
BEAM TRAWL	-0.7	-0.0	-4.0	-0.0	-4.6	-0.2
SAITHE	-0.1	-0.1	-0.0	-1.9	0.0	-0.0
FIXED GEAR	-0.8	-0.0	-0.1	-0.0	-0.2	-0.0
IND. TRAWL	-0.3	-0.3	-0.0	-1.1	0.0	-1.8
PELAGIC	-0.0	-0.0	0.0	0.0	0.0	-0.0
OTHER	-2.7	-0.2	-0.7	-1.9	-1.3	-0.1

F increase of 10% by fleet	SSB Change (%)					
	SPECIES					
	COD	HAD	PLE	POK	SOL	WHG
HC. TRAWL	-8.9	-6.2	-0.9	-6.0	-0.4	-3.0
SEINE NETS	-5.3	-5.6	-0.8	-0.4	-0.0	-1.8
BEAM TRAWL	-1.1	-0.0	-6.3	-0.0	-6.8	-0.2
SAITHE	-0.3	-0.2	-0.0	-3.7	0.0	-0.0
FIXED GEAR	-1.6	-0.0	-0.2	-0.0	-0.3	-0.0
IND. TRAWL	-0.6	-0.5	-0.0	-2.1	0.0	-2.4
PELAGIC	-0.0	-0.0	0.0	0.0	0.0	-0.0
OTHER	-5.0	-0.6	-1.1	-3.8	-2.0	-0.1

Table 7.4 Result from the ABC-model equilibrium predictions.

YEAR=2006 SPECIES=Cod CAT=Human

F increase of 10% by fleet	Yield change (%)								
	FLEET								
	1	2	3	4	5	6	7	8	ALL
1. HC. TRAWL	4.4	-6.1	-3.9	-5.9	-7.8	-5.7	-6.6	-5.6	-1.9
2. SEINE NETS	-3.0	5.9	-2.2	-3.5	-4.6	-3.3	-3.8	-3.3	-1.3
3. BEAM TRAWL	-0.7	-0.8	9.4	-0.8	-1.0	-0.8	-0.8	-0.8	-0.1
4. SAITHE	-0.1	-0.2	-0.1	9.8	-0.2	-0.2	-0.2	-0.2	-0.1
5. FIXED GEAR	-0.7	-1.0	-0.5	-0.9	8.6	-0.8	-0.9	-0.8	0.0
6. IND. TRAWL	-0.3	-0.4	-0.2	-0.4	-0.5	9.6	-0.4	-0.4	-0.2
7. PELAGIC	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	10.0	-0.0	-0.0
8. OTHER	-2.7	-3.3	-2.0	-3.2	-4.3	-3.0	-3.5	6.7	-0.8

YEAR=2006 SPECIES=Haddock CAT=Human

F increase of 10% by fleet	Yield change (%)							
	FLEET							
	1	2	3	4	5	6	8	ALL
1. HC. TRAWL	3.2	-5.7	-7.3	-7.1	-10.0	-6.8	-5.8	-1.7
2. SEINE NETS	-5.7	4.2	-6.9	-6.6	-9.4	-6.3	-5.4	-1.2
3. BEAM TRAWL	-0.0	-0.0	10.0	-0.0	-0.0	-0.0	-0.0	-0.0
4. SAITHE	-0.2	-0.2	-0.2	9.7	-0.3	-0.2	-0.2	-0.0
5. FIXED GEAR	-0.0	-0.0	-0.0	-0.0	9.9	-0.0	-0.0	0.0
6. IND. TRAWL	-0.6	-0.5	-0.7	-0.6	-0.8	9.3	-0.6	-0.5
7. PELAGIC	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
8. OTHER	-0.6	-0.5	-0.7	-0.7	-1.0	-0.7	9.4	0.0

Continued

Table 7.4 Continued

YEAR=2006 SPECIES=Saithe CAT=Human

F increase of 10% by fleet	Yield change (%) FLEET 1	2	3	4	5	6	8	ALL
1. HC. TRAWL	4.8	-6.6	-6.5	-3.5	-9.6	-4.3	-4.4	-0.6
2. SEINE NETS	-0.4	9.3	-0.6	-0.3	-1.0	-0.3	-0.3	-0.0
3. BEAM TRAWL	-0.0	-0.0	10.0	-0.0	-0.0	-0.0	-0.0	-0.0
4. SAITHE	-2.9	-3.5	-3.6	7.5	-4.9	-2.6	-2.7	-0.7
5. FIXED GEAR	-0.0	-0.1	-0.1	-0.0	9.9	-0.0	-0.0	0.0
6. IND. TRAWL	-1.7	-2.2	-2.1	-1.3	-3.1	8.3	-1.6	-0.4
7. PELAGIC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. OTHER	-3.0	-4.0	-4.0	-2.2	-5.8	-2.7	6.9	-0.5

YEAR=2006 SPECIES=Whiting CAT=Human

F increase of 10% by fleet	Yield change (%) FLEET 1	2	3	4	5	6	7	8	ALL
1. HC. TRAWL	4.1	-5.5	-4.4	-6.4	-4.4	-4.8	-1.7	-4.1	0.0
2. SEINE NETS	-3.6	5.9	-2.9	-4.3	-2.9	-3.2	-0.9	-2.7	-0.2
3. BEAM TRAWL	-0.4	-0.4	9.6	-0.5	-0.3	-0.4	-0.1	-0.3	0.1
4. SAITHE	-0.0	-0.0	-0.0	10.0	-0.0	-0.0	-0.0	-0.0	-0.0
5. FIXED GEAR	-0.0	-0.0	-0.0	-0.0	10.0	-0.0	-0.0	-0.0	0.0
6. IND. TRAWL	-3.3	-3.6	-3.0	-3.8	-2.9	6.3	-1.6	-2.8	-3.3
7. PELAGIC	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	10.0	-0.0	-0.0
8. OTHER	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.0	9.9	0.1

Continued

Table 7.4 Continued

YEAR=2006 SPECIES=Plaice CAT=Human

F increase of 10% by fleet	Yield change (%)								
	FLEET								
	1	2	3	4	5	6	7	8	ALL
1. HC. TRAWL	8.8	-1.1	-0.9	-1.0	-1.7	-1.1	-0.1	-1.0	-0.1
2. SEINE NETS	-1.0	8.9	-0.8	-0.9	-1.6	-1.1	-0.1	-1.0	-0.2
3. BEAM TRAWL	-8.0	-7.9	2.8	-7.2	-11.7	-8.4	-1.7	-7.5	-0.3
4. SAITHE	-0.0	-0.0	-0.0	10.0	-0.0	-0.0	0.0	-0.0	-0.0
5. FIXED GEAR	-0.2	-0.2	-0.2	-0.2	9.5	-0.2	0.0	-0.2	0.0
6. IND. TRAWL	-0.0	-0.0	-0.0	-0.0	-0.0	10.0	0.0	-0.0	-0.0
7. PELAGIC	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	9.9	-0.0	0.0
8. OTHER	-1.3	-1.3	-1.1	-1.2	-2.1	-1.4	-0.3	8.6	-0.1

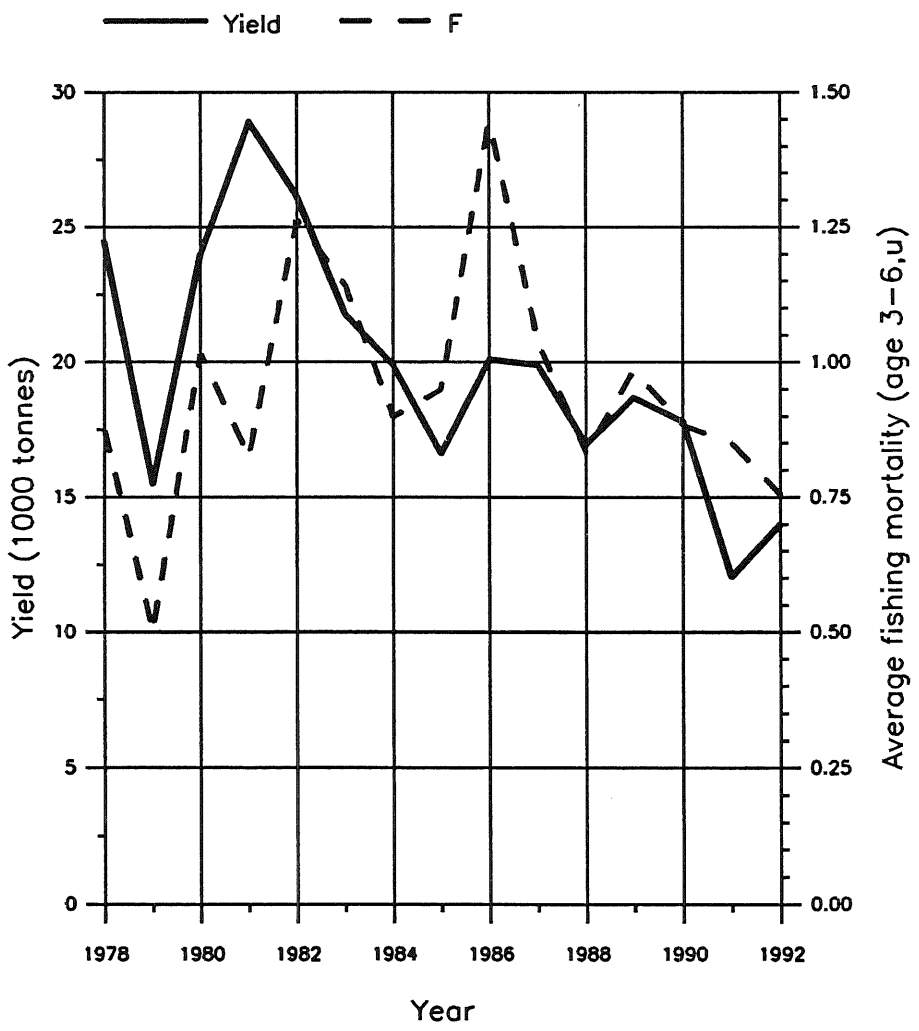
YEAR=2006 SPECIES=Sole CAT=Human

F increase of 10% by fleet	Yield change (%)							
	FLEET							
	1	2	3	5	6	7	8	ALL
1. HC. TRAWL	9.4	-0.8	-0.4	-0.6	-0.7	0.0	-0.4	-0.1
2. SEINE NETS	-0.0	10.0	-0.0	-0.0	0.0	0.0	-0.0	0.0
3. BEAM TRAWL	-8.4	-14.1	2.1	-10.8	-12.0	0.0	-7.5	-0.7
4. SAITHE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. FIXED GEAR	-0.5	-0.8	-0.3	9.3	-0.7	0.0	-0.4	0.0
6. IND. TRAWL	-0.0	0.0	-0.0	-0.0	9.9	0.0	-0.0	0.0
7. PELAGIC	0.0	0.0	-0.0	0.0	0.0	16.7	0.0	0.0
8. OTHER	-2.6	-4.3	-2.1	-3.2	-3.4	0.0	7.6	-0.2

Figure 2.2.1

FISH STOCK SUMMARY
STOCK: Cod in the Skagerrak (part of Fishing Area IIIa)
20–10–1993

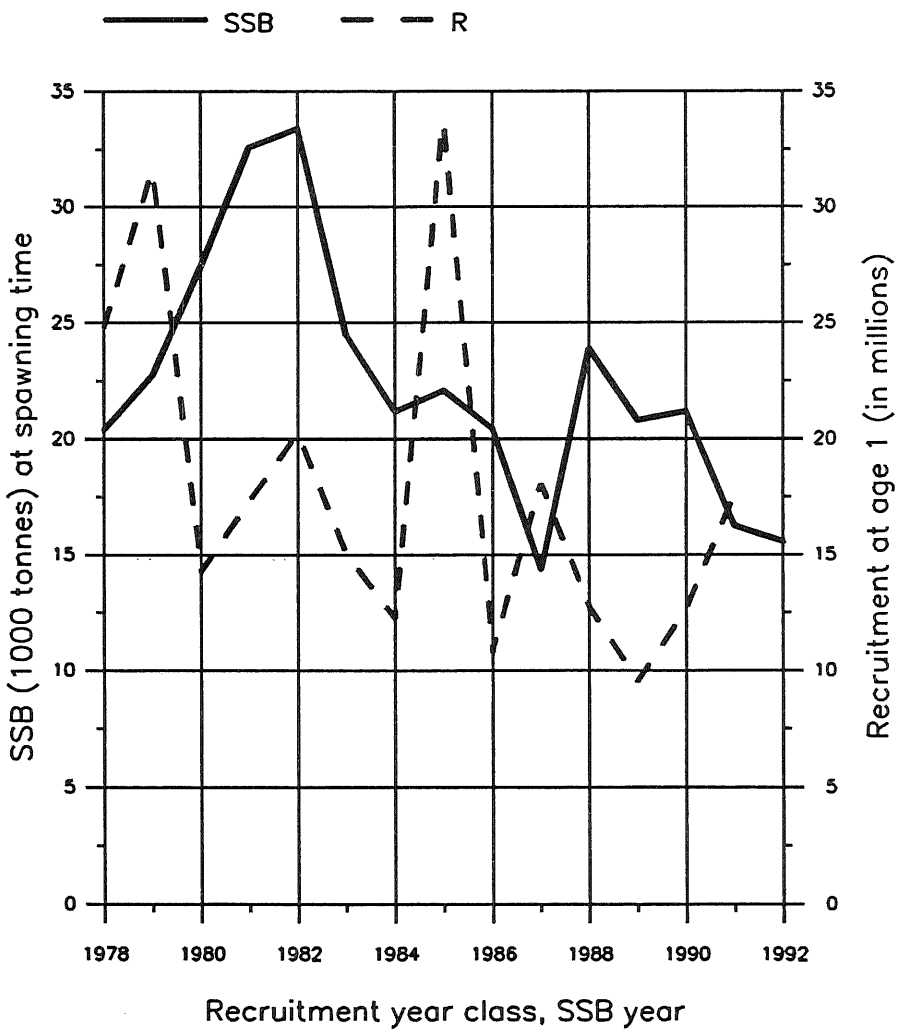
Trends in yield and fishing mortality (F)



(run: HS1)

A

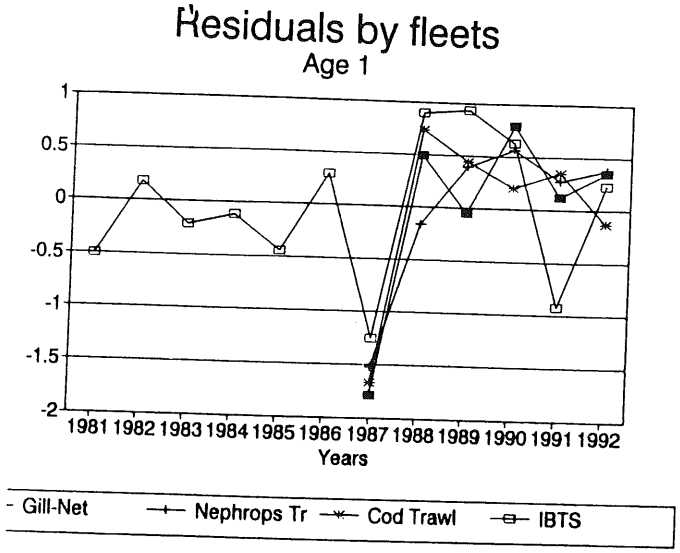
Trends in spawning stock biomass (SSB) and recruitment (R)

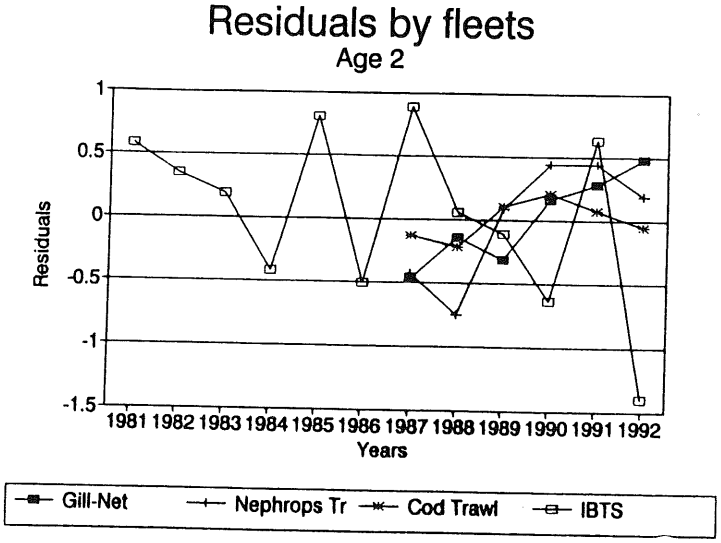


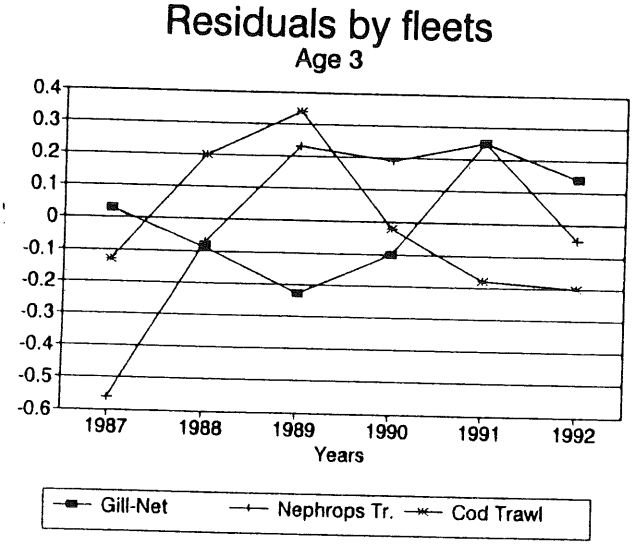
(run: HS1)

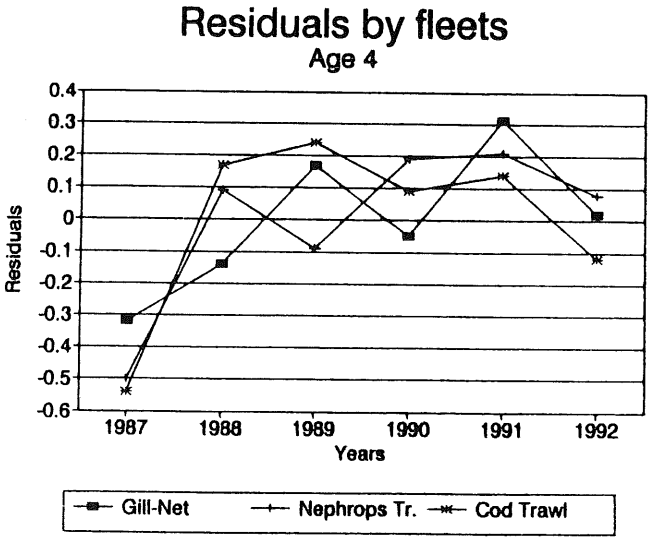
B

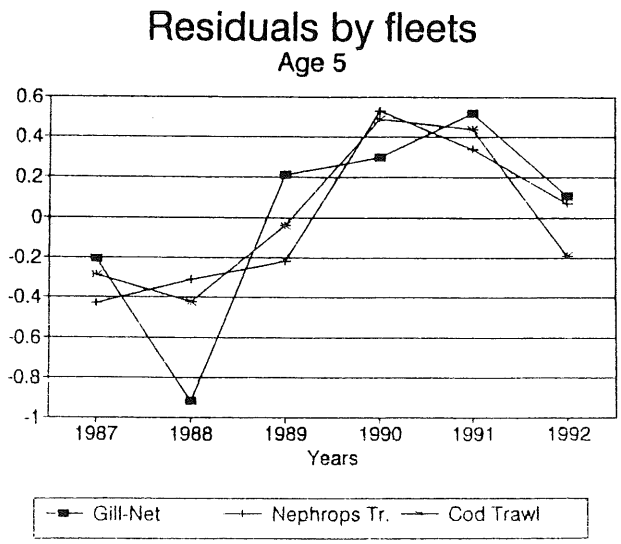
Figure 2.2.2


Residuals by fleets
Age 1
1
0.5
0
-0.5
-1
-1.5
-2
1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992
Years
Gill-Net
Nephrops Tr
Cod Trawl
IBTS


Residuals by fleets
Age 2
Residuals
1
0.5
0
-0.5
-1
-1.5
1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992
Years
Gill-Net
Nephrops Tr
Cod Trawl
IBTS


Residuals by fleets
Age 3
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
1987
1988
1989
1990
1991
1992
Years
Gill-Net
Nephrops Tr.
Cod Trawl


Residuals by fleets
Age 4
Residuals
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
1987
1988
1989
1990
1991
1992
Years
Gill-Net
Nephrops Tr.
Cod Trawl


Residuals by fleets
Age 5
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
1987
1988
1989
1990
1991
1992
Years
Gill-Net
Nephrops Tr.
Cod Trawl

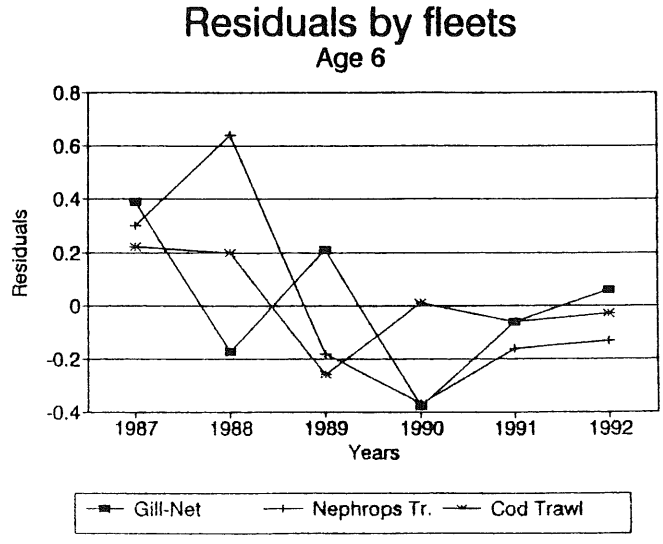
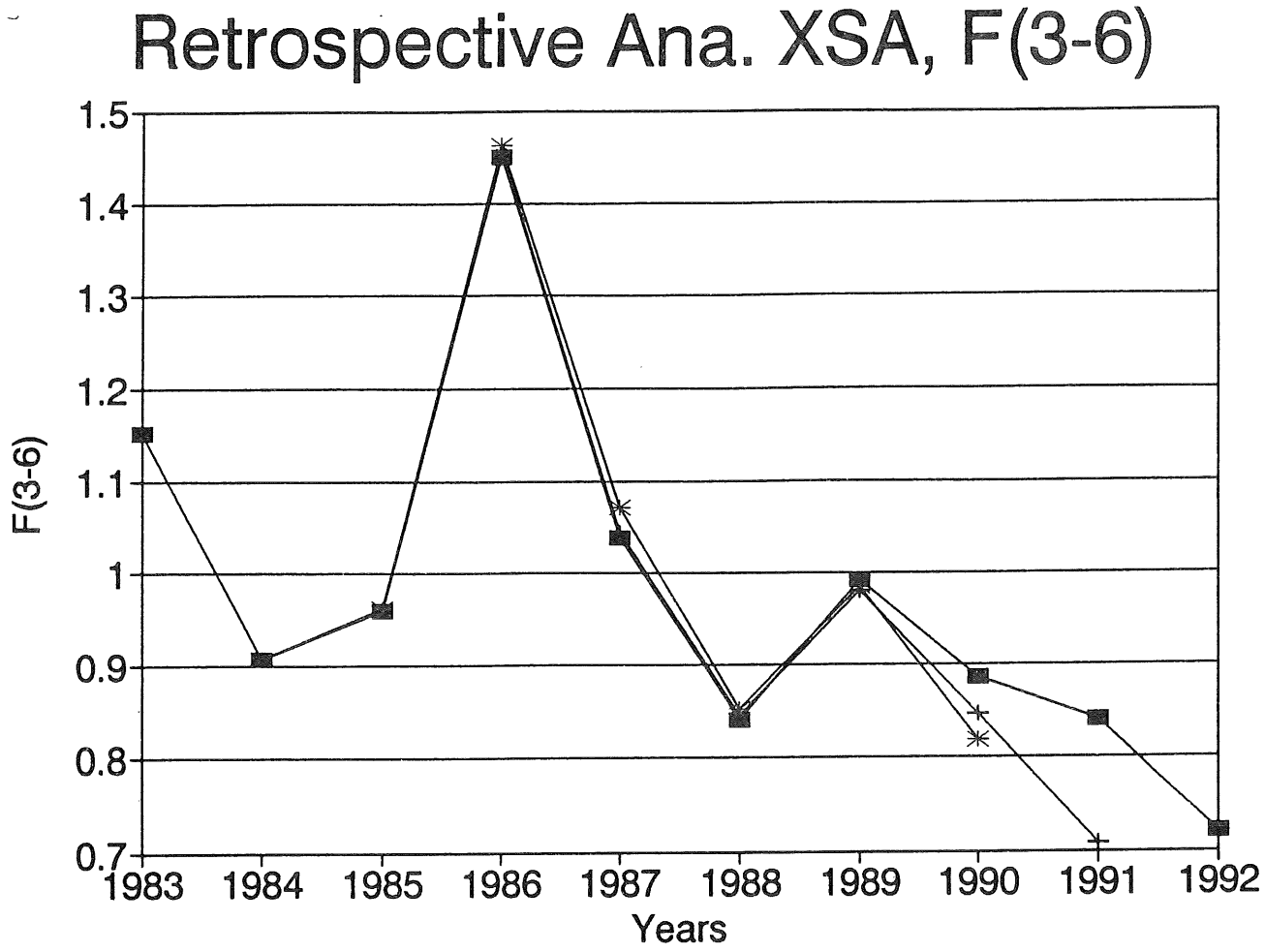

Residuals by fleets
Age 6
Residuals
0.8
0.6
0.4
0.2
0
-0.2
-0.4
1987
1988
1989
1990
1991
1992
Years
Gill-Net
Nephrops Tr.
Cod Trawl

Figure 2.2.3 Cod in the Skagerrak -retrospective analysis.



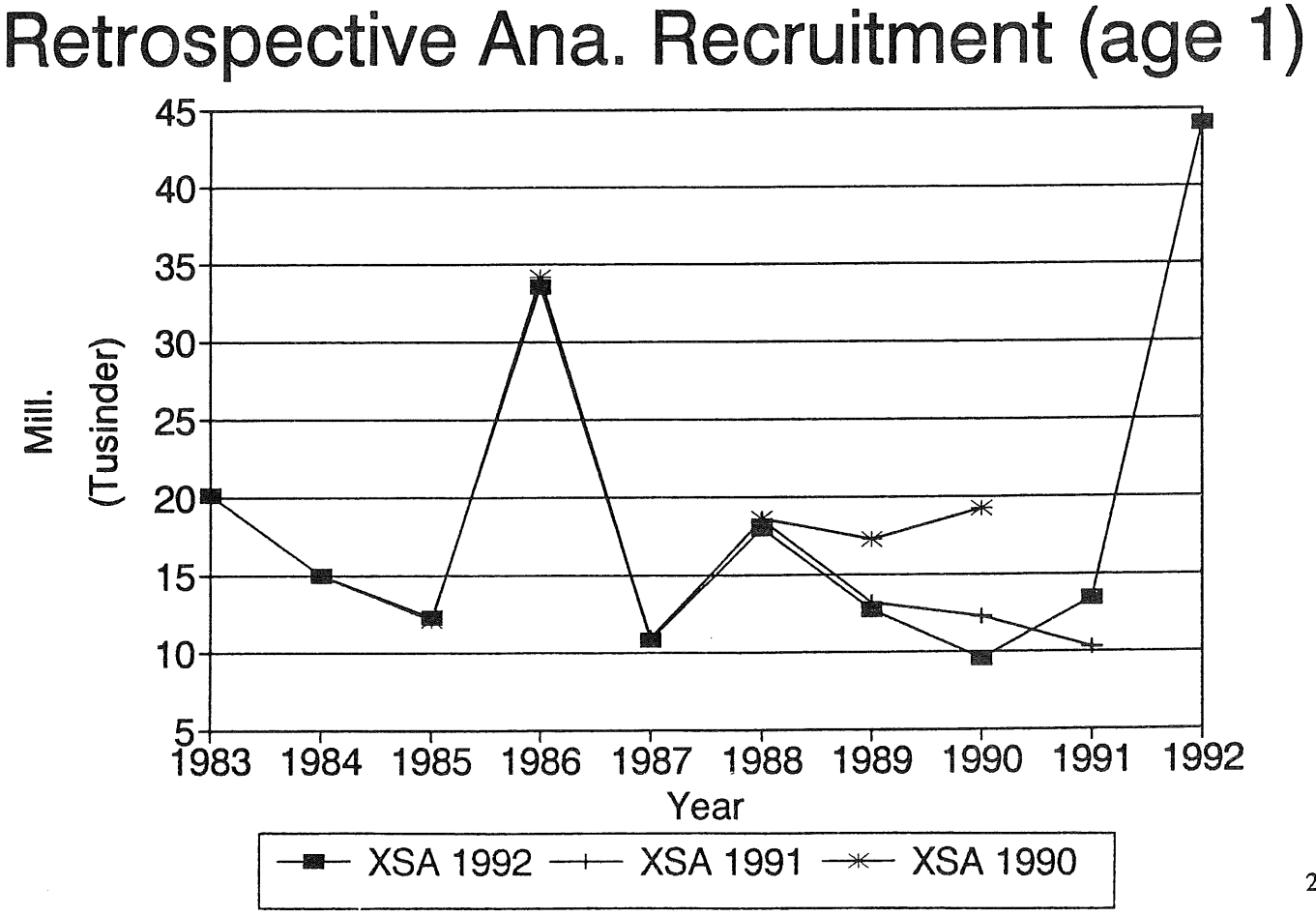


Figure 2.2.4 Cod in the Skagerrak.

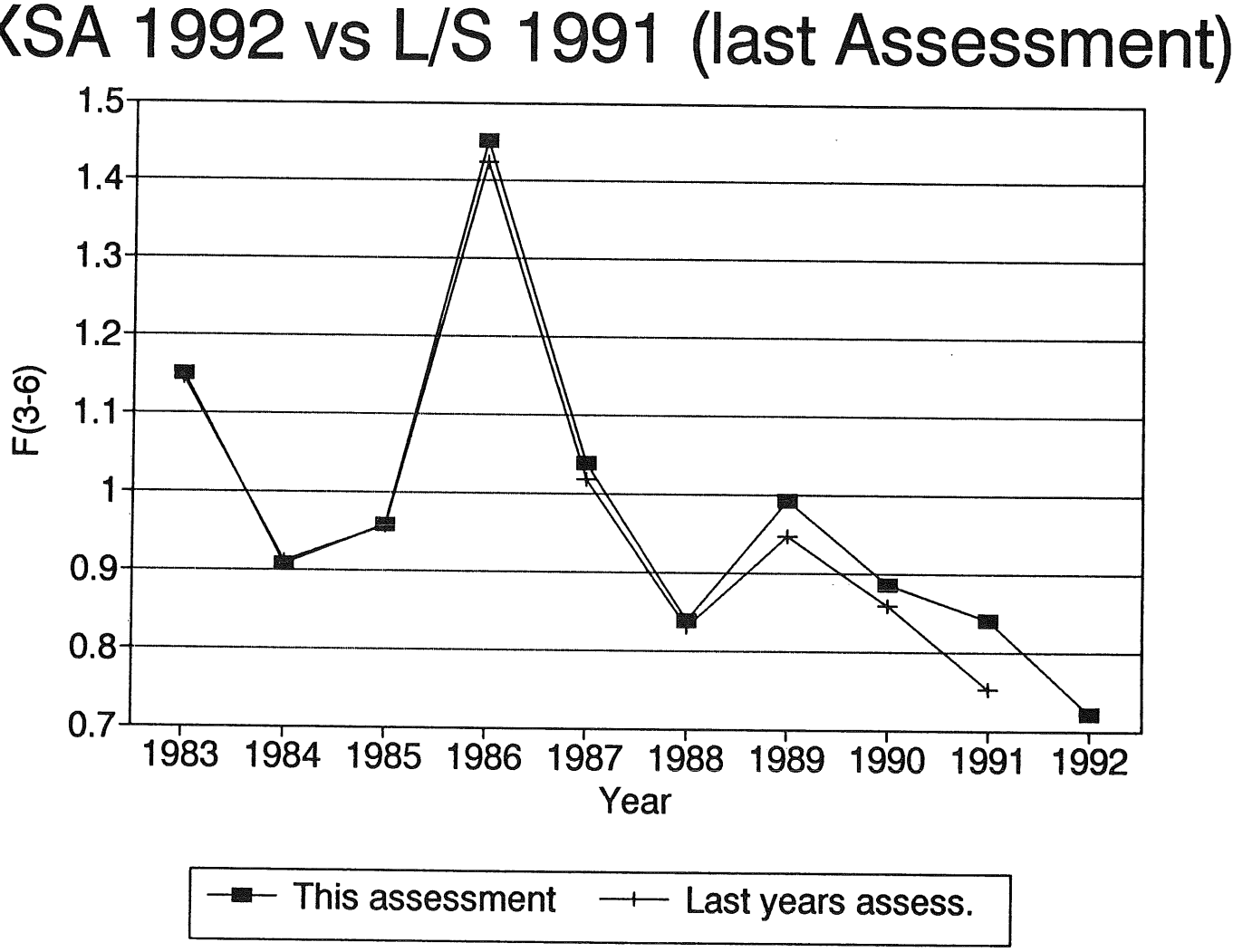
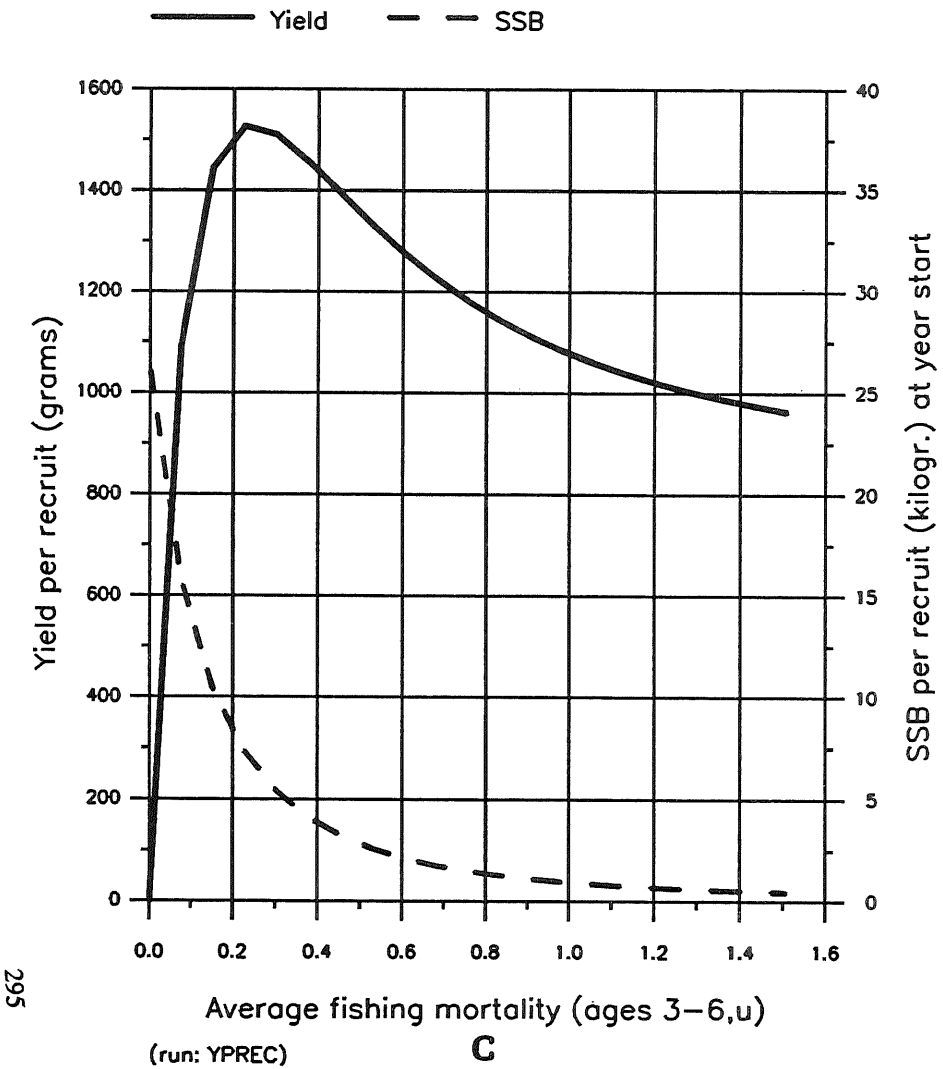


Figure 2.2.5

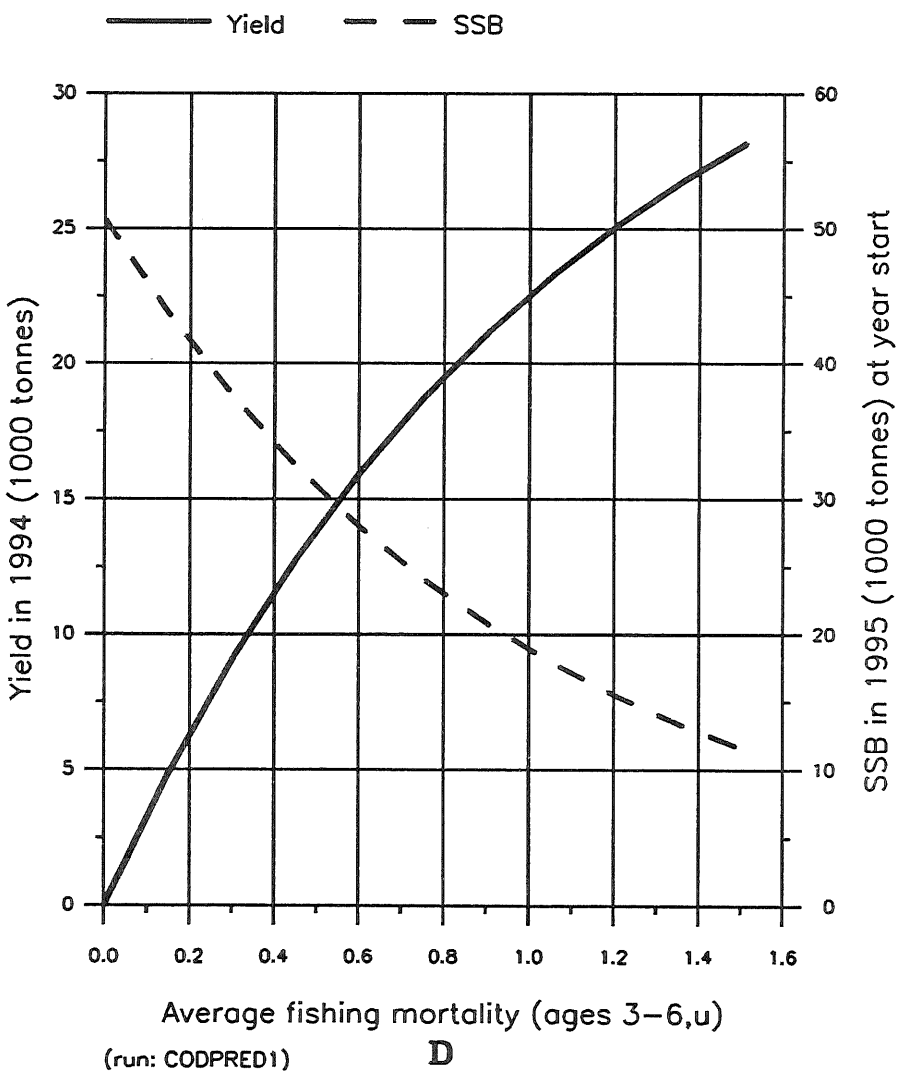
FISH STOCK SUMMARY
STOCK: Cod in the Skagerrak (part of Fishing Area IIIa)
14–10–1993

Long term yield and spawning stock biomass



(run: YPREC) **C**

Short–term yield and spawning stock biomass



(run: CODPRED1) **D**

Figure 2.2.6

COD in the Skagerrak (part of Div. IIIa). Recruitment (as I-group) vs. Spawning Stock Biomass

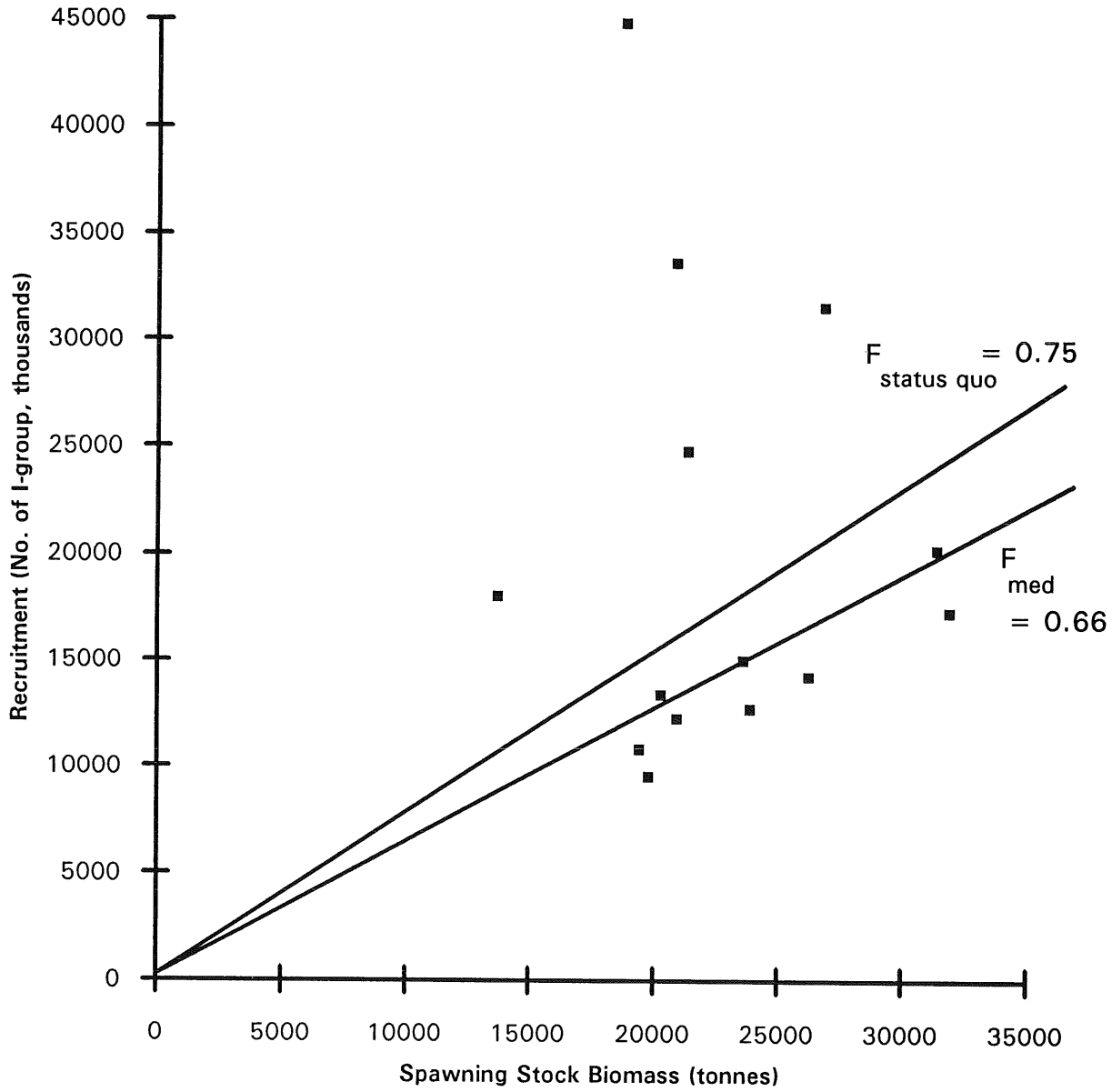


Figure 2.3.1 HADDOCK in Division IIIa. Total landings.

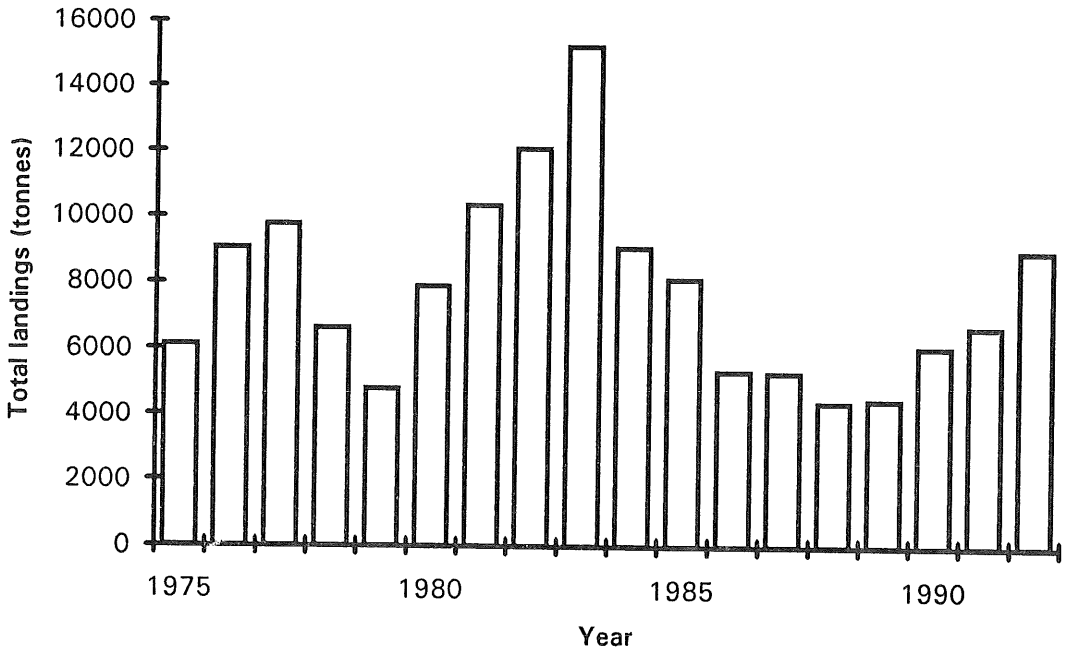


Figure 2.3.2 HADDOCK in Division IIIa. IBTS index for I-group.

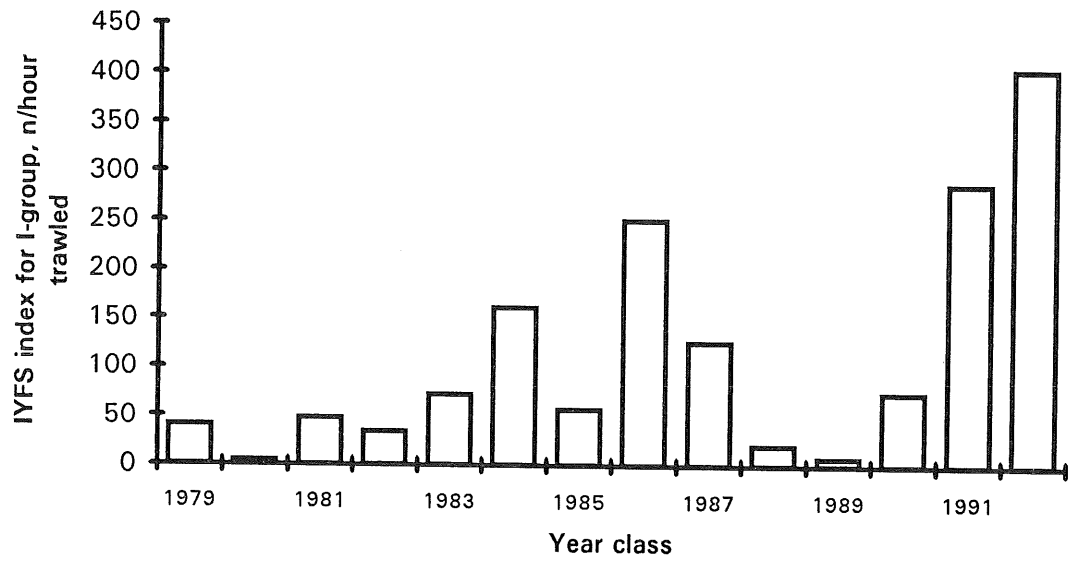


Figure 2.4.1. WHITING in Division IIIa. Total landings.

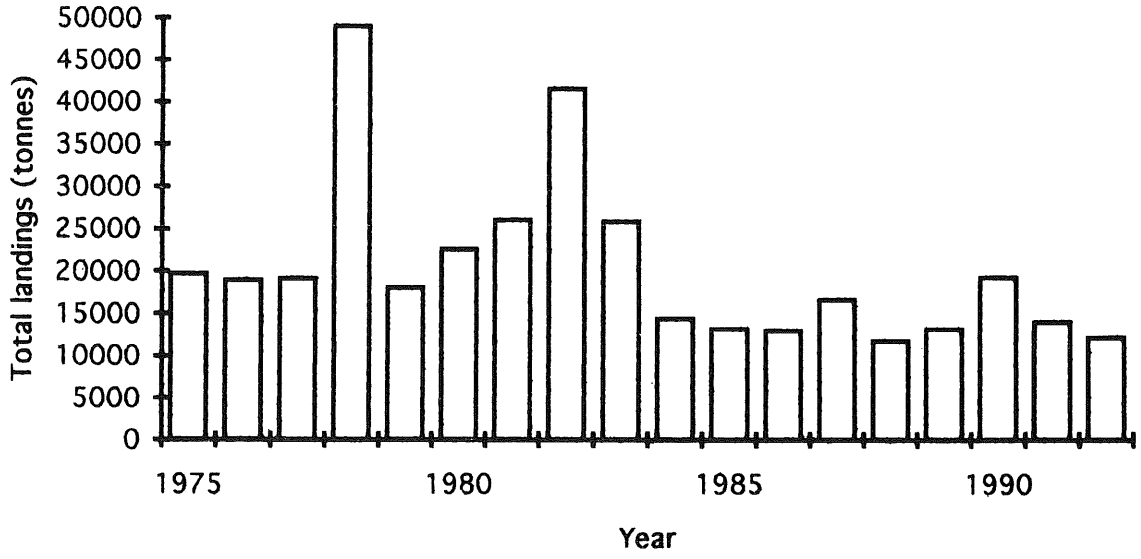


Figure 2.4.2. WHITING in Division IIIa. IYFS survey indices, 1-group, n/hour trawled

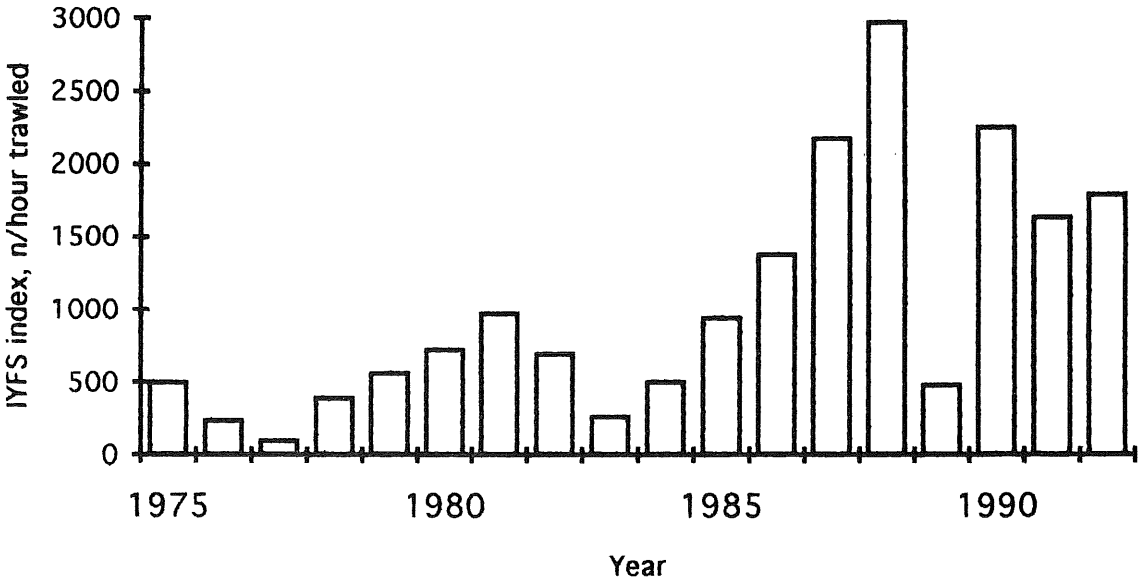


Figure 2.5.1 PLAICE in Division IIIa. CPUE in four Swedish fleets, kg/hr

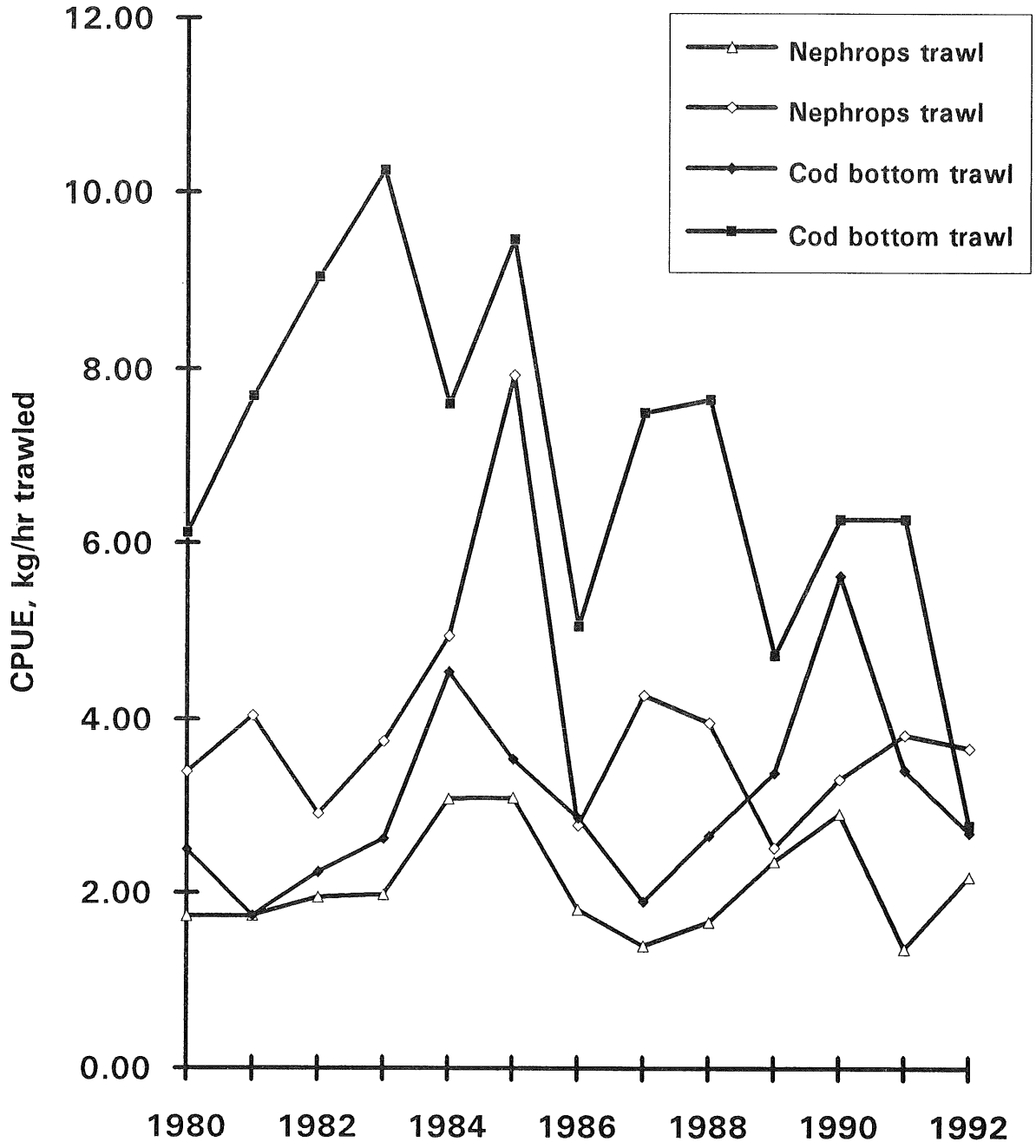


Figure 2.5.2 Log residuals from separable VPA. PLAICE in Div. IIIa.

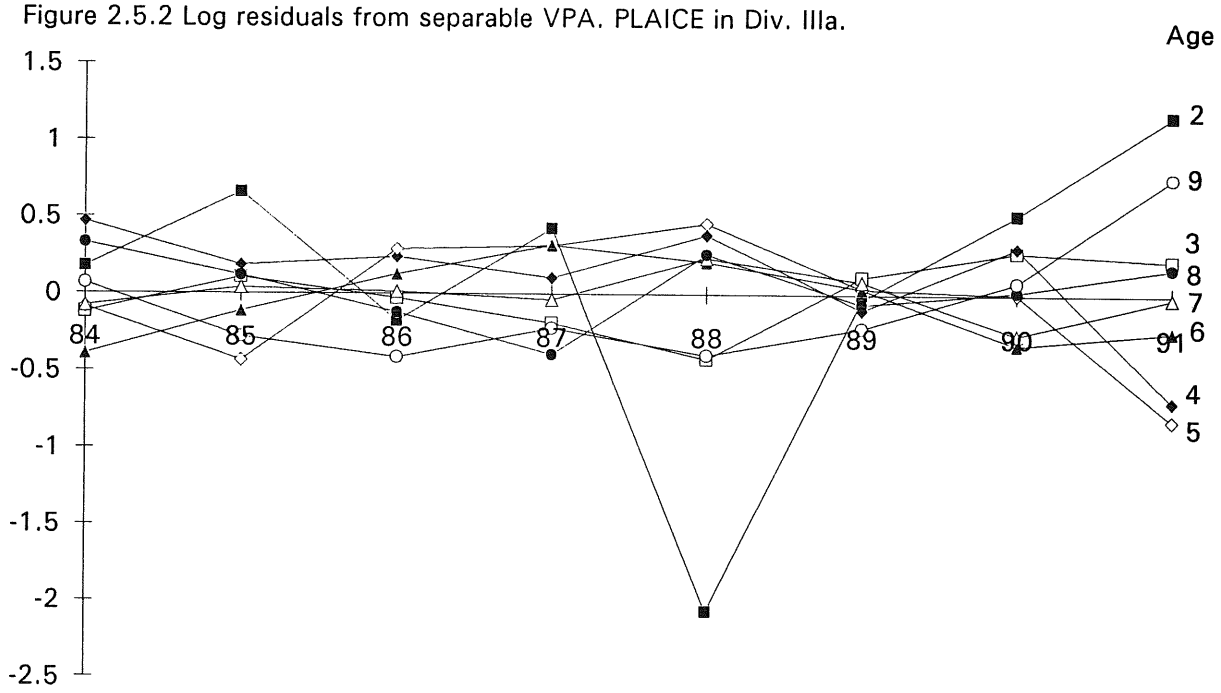
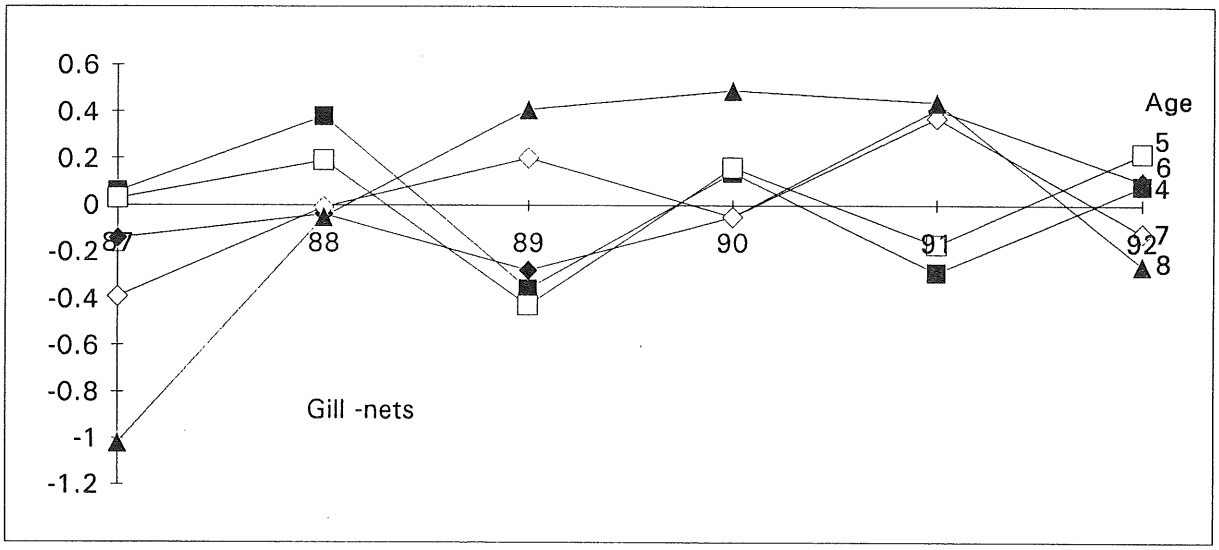
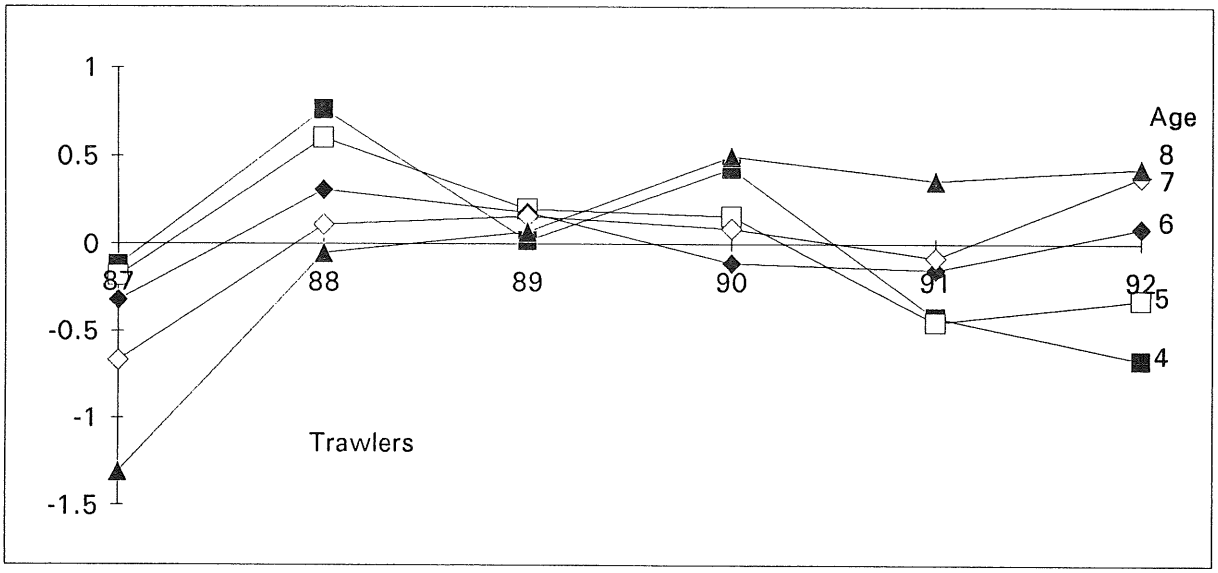


Figure 2.5.3 . Plaice in Div. IIIa. Residuals from XSA analysis for Danish fleets.
(Age-groups 4 - 8)





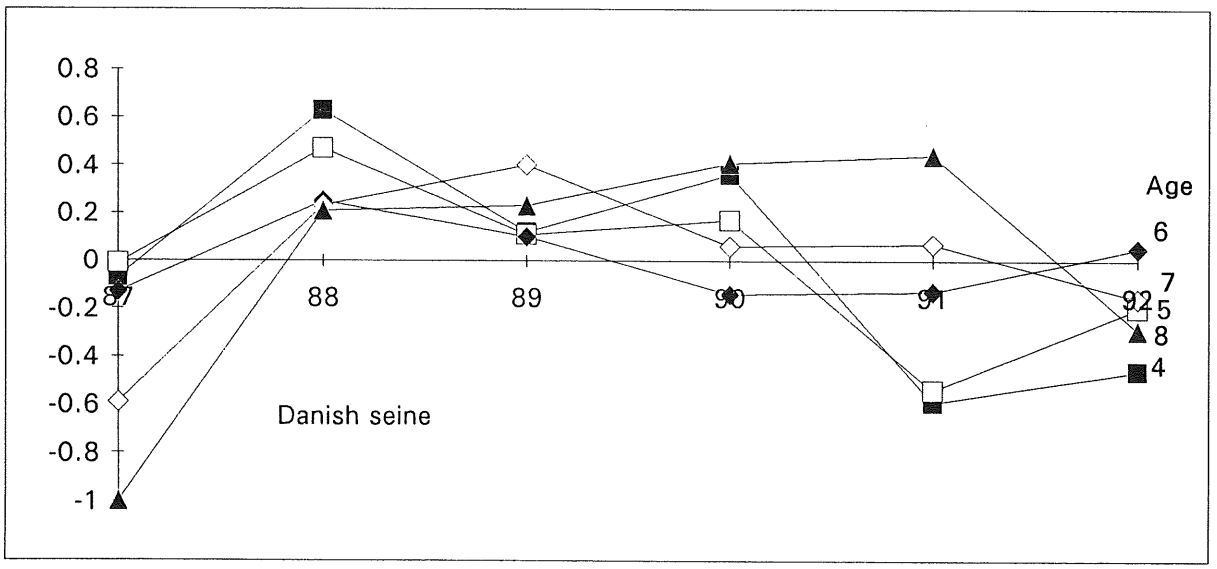
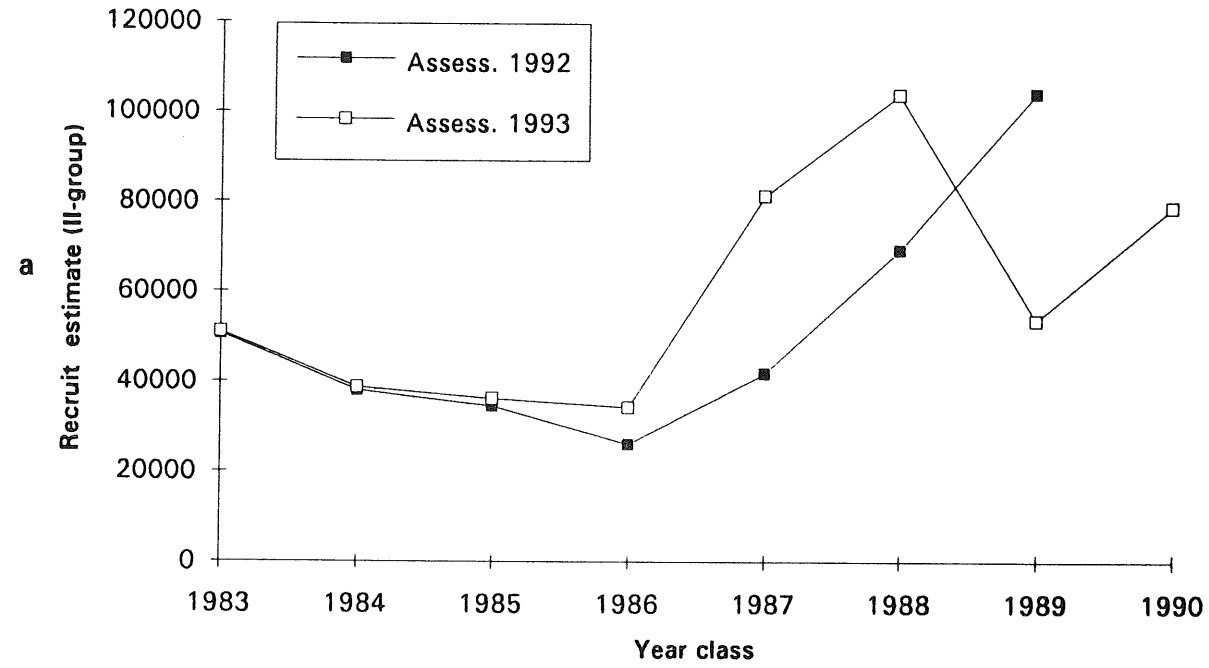


Fig. 2.5.4 Comparison between assessment in Anon (1992) and present assessment. (a) Recruitment (age group II) and (b) Average Fishing mortality (age 5-8) 1993 assessment are based on Laurec-Shepherd (L-S) and on XSA estimation.



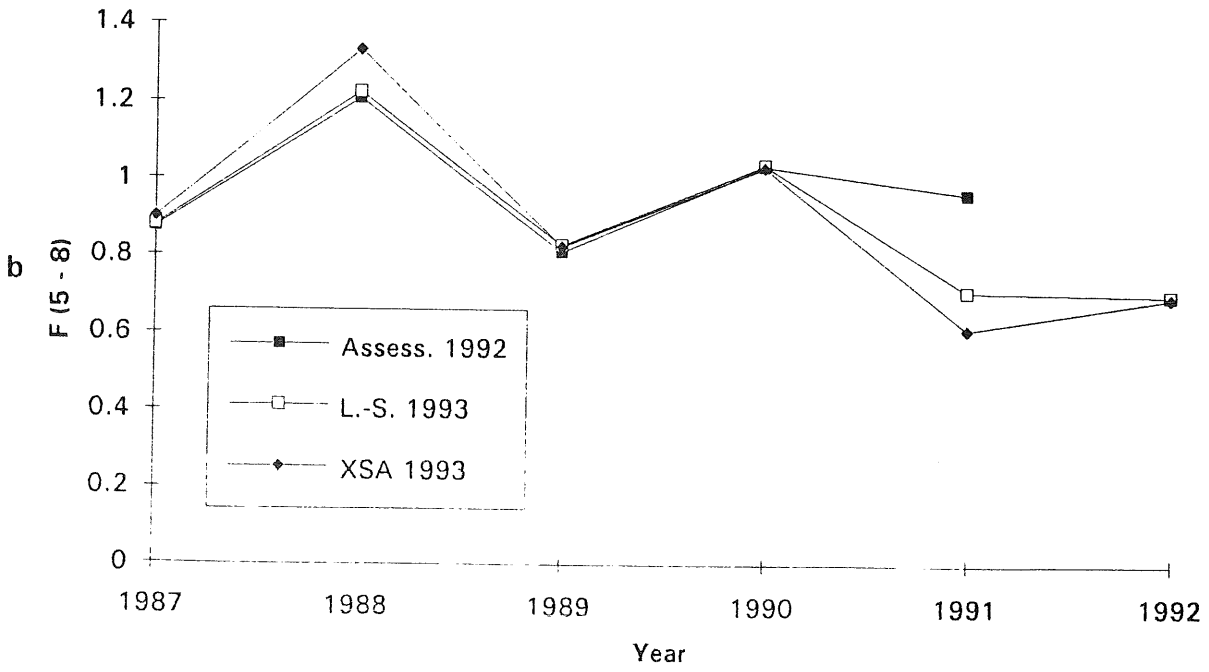
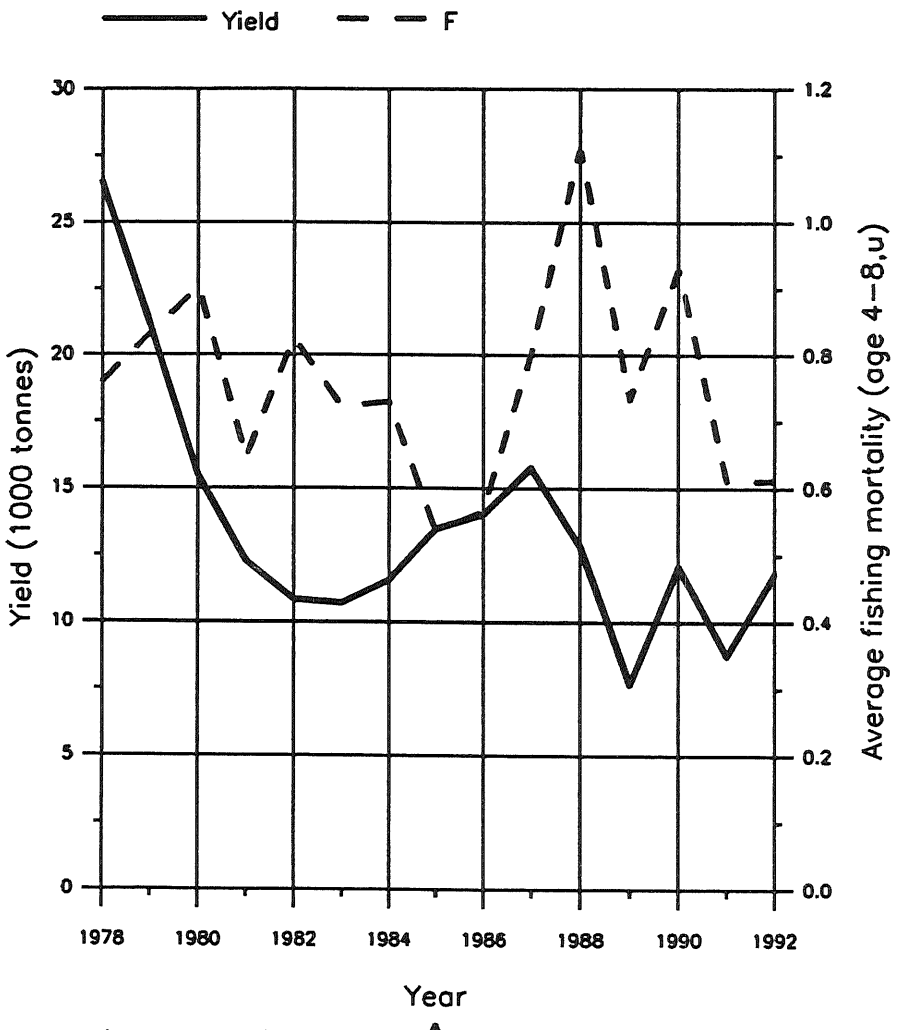


Figure 2.5.5

FISH STOCK SUMMARY
STOCK: Plaice in Skagerak and Kattegat combined
12–10–1993

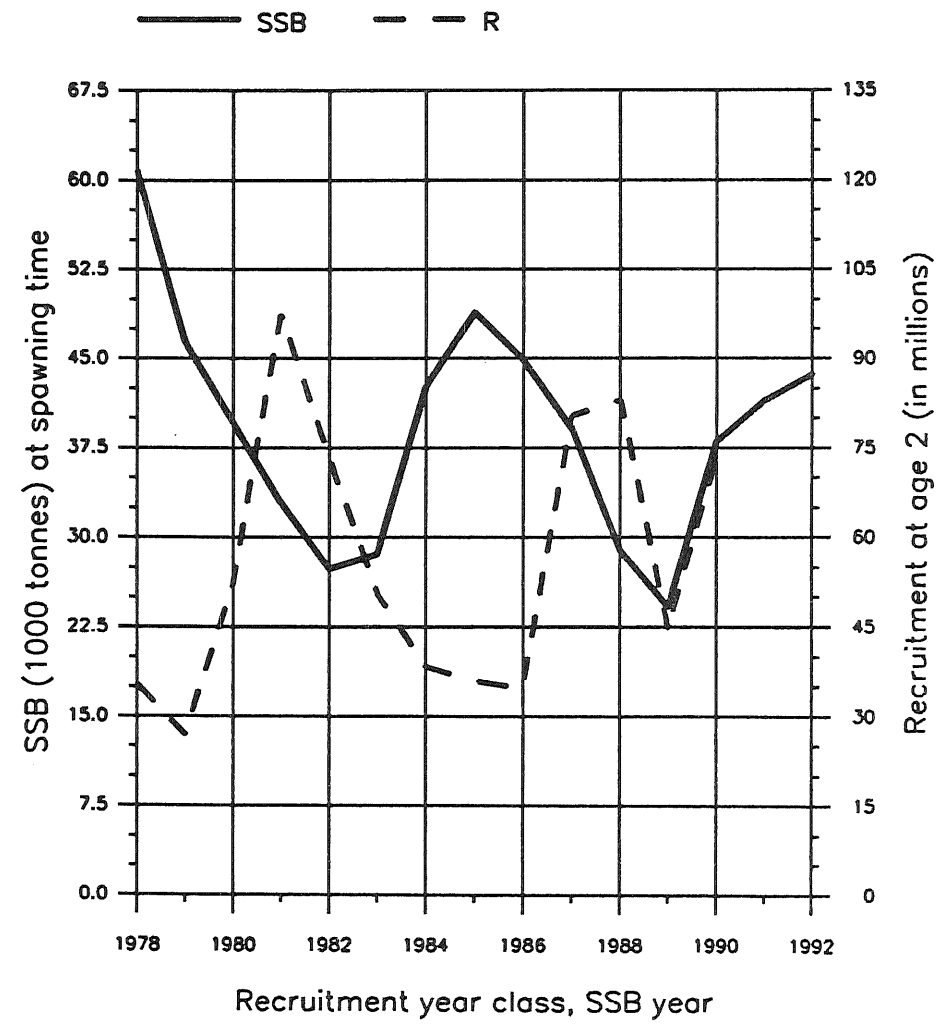
Trends in yield and fishing mortality (F)



(run: PLAICEIIIA)

A

Trends in spawning stock biomass (SSB) and recruitment (R)



(run: PLAICEIIIA)

B

Figure 2.5.6 PLAICE in Div. IIIa. Recruitment (at age 2) vs. Spawning Stock Biomass

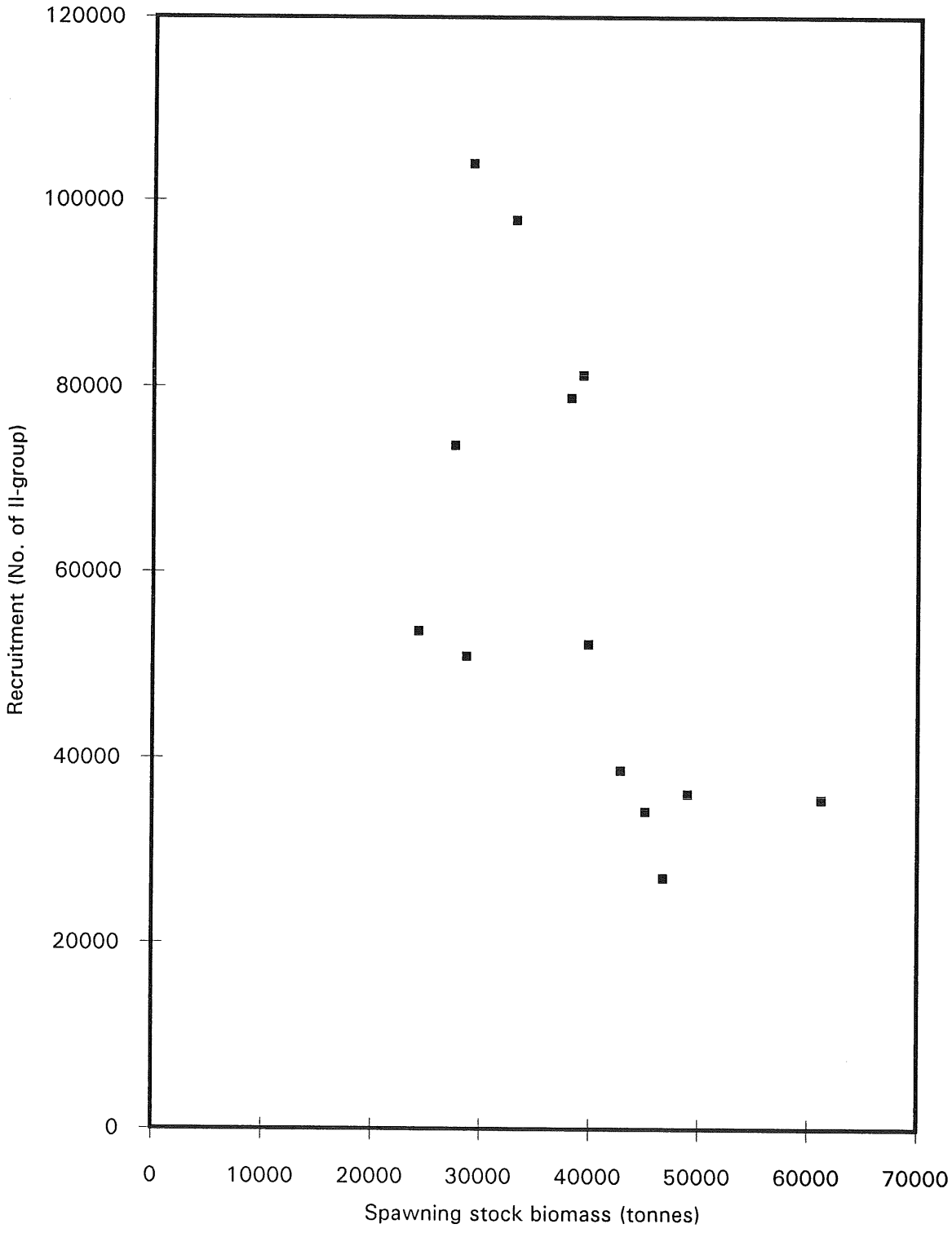
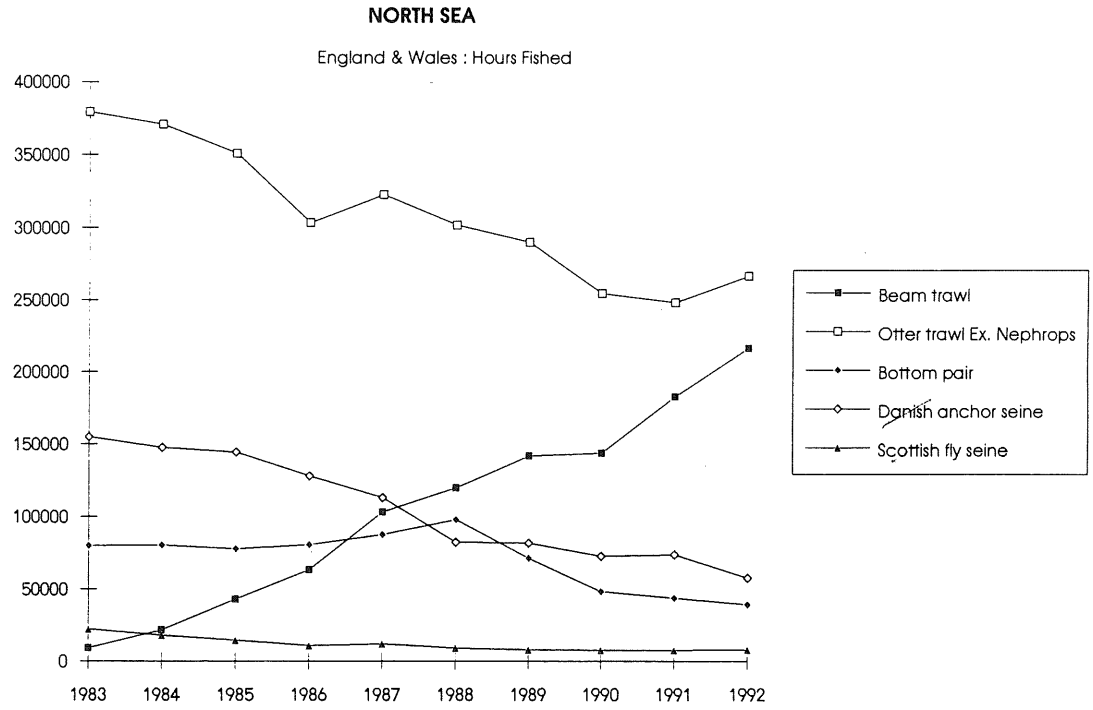
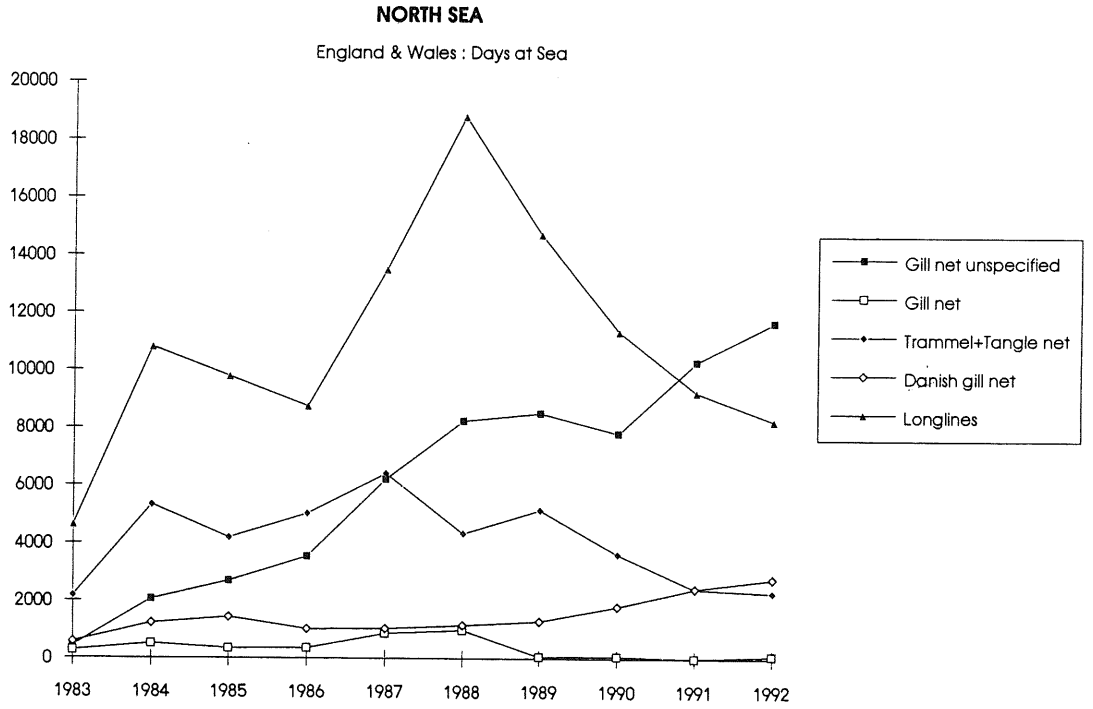


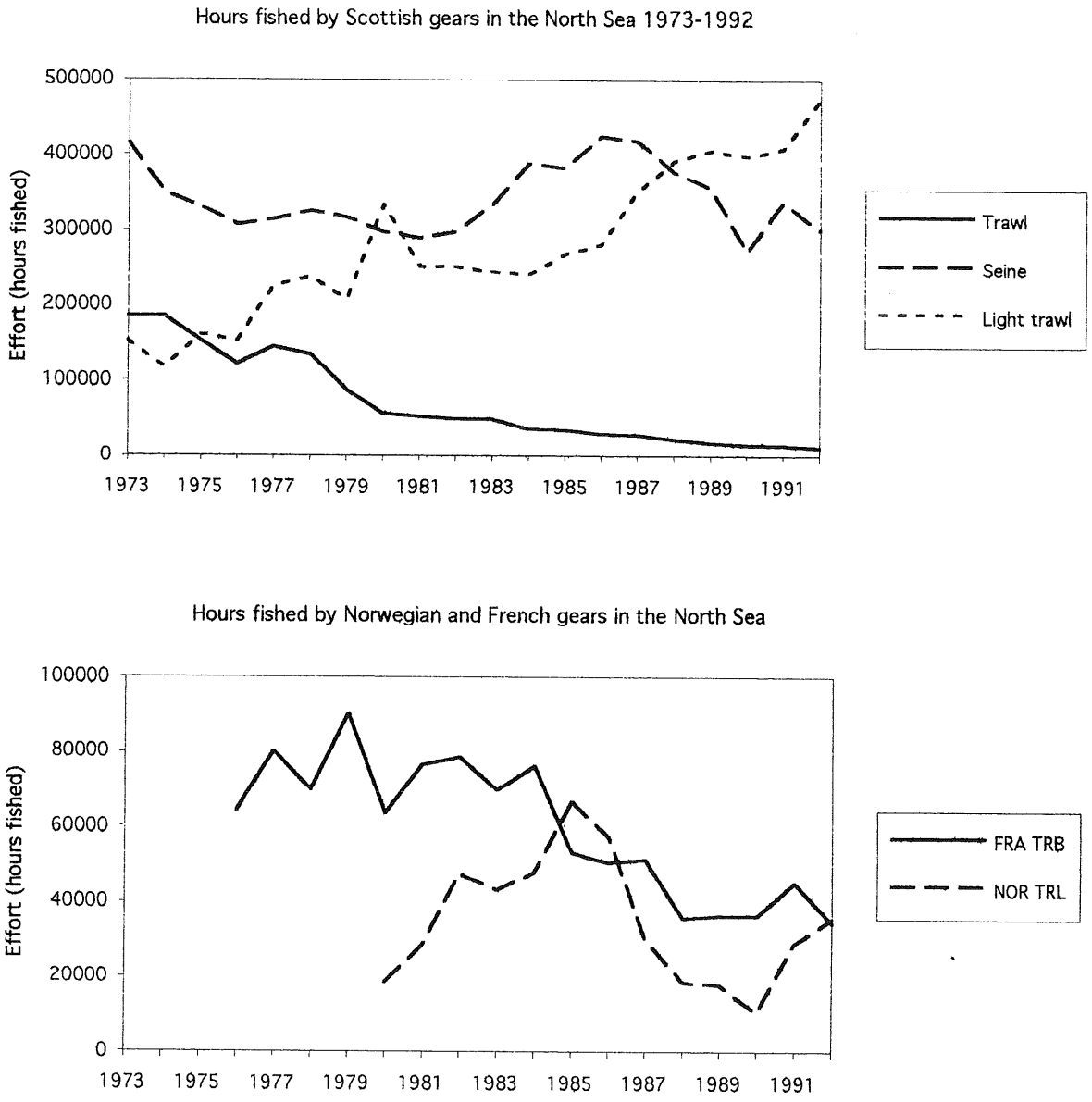
Figure 3.1 Fishing effort in the North Sea demersal fisheries.





Continued

Figure 3.1 Continued



Continued

Figure 3.1 Continued

figure effort flatfish

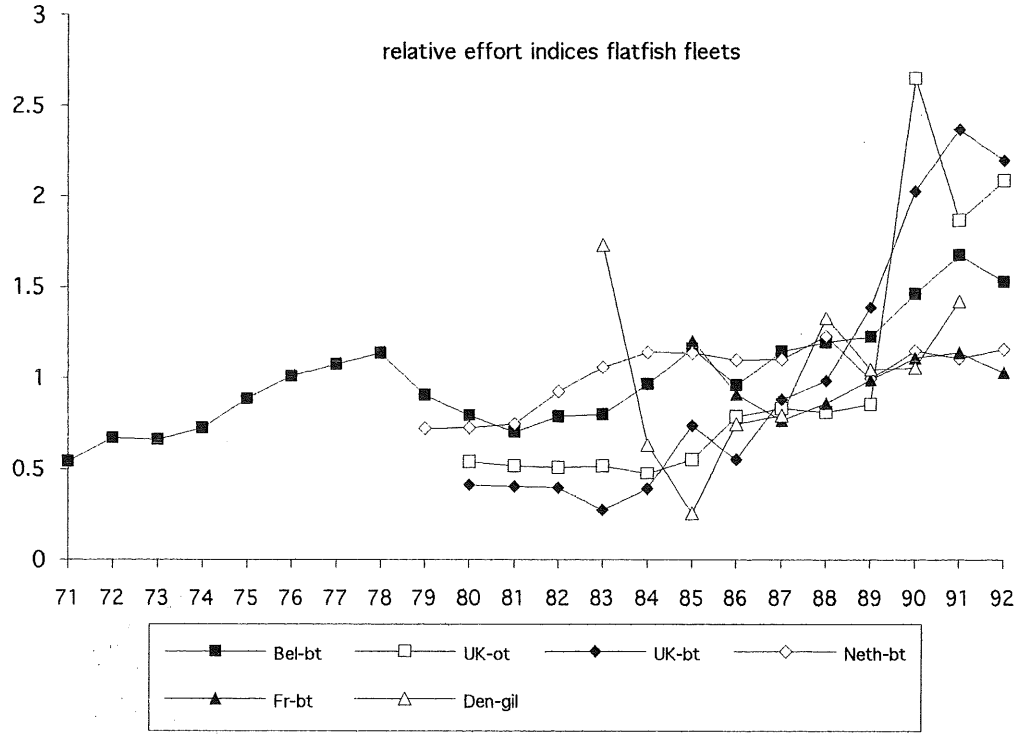


Figure 3.2.1

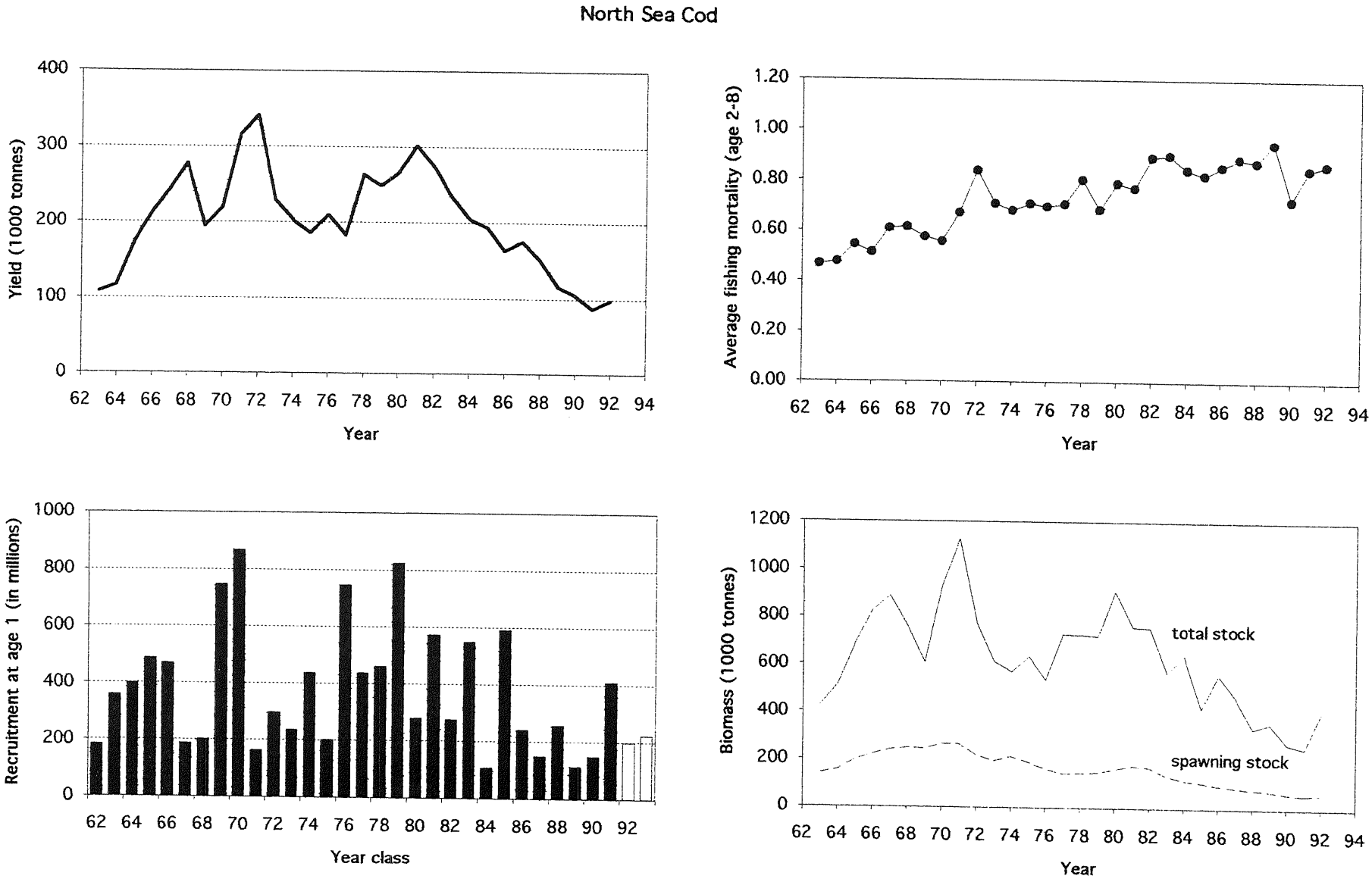
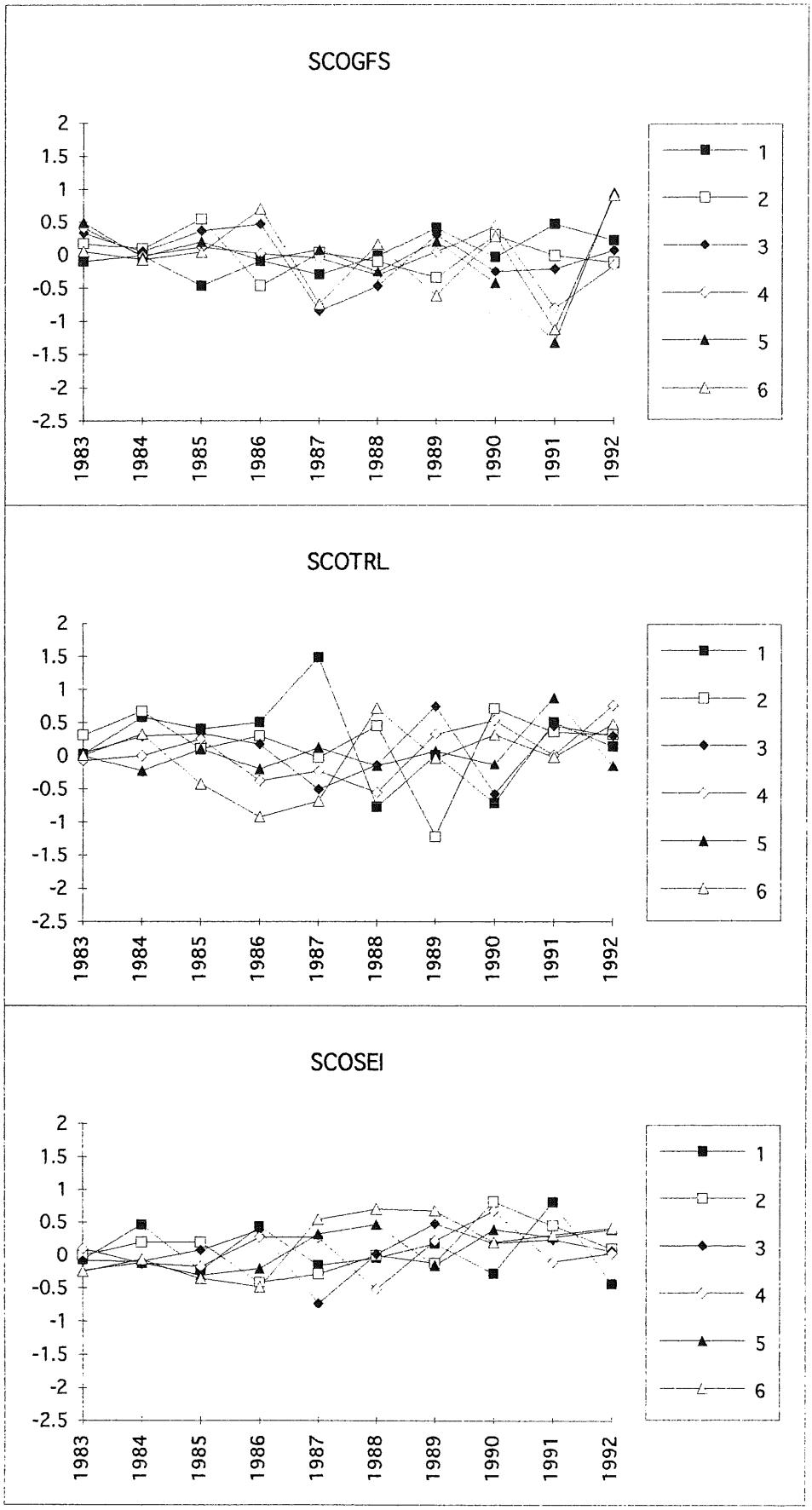
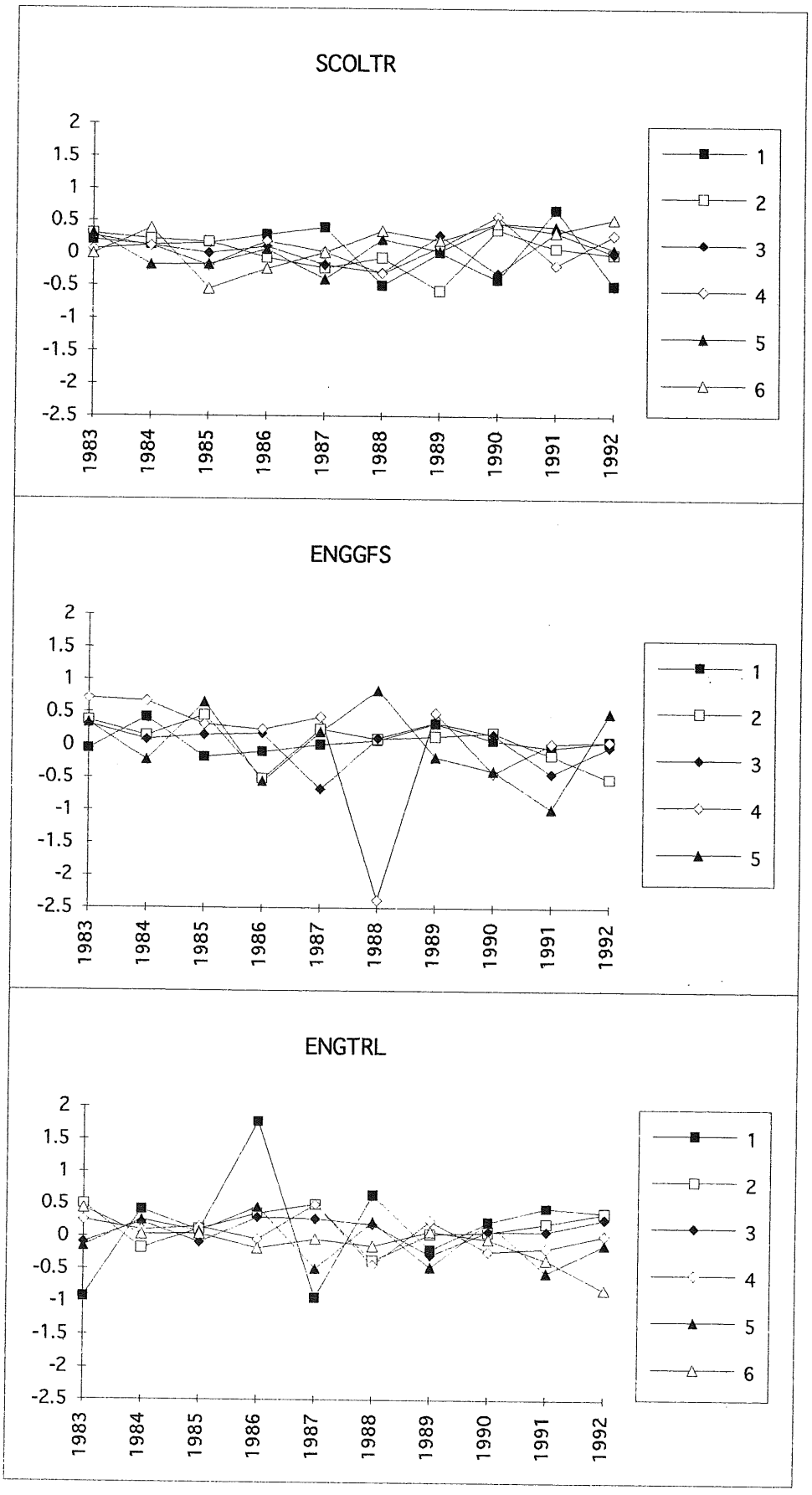

North Sea Cod
Yield (1000 tonnes)
400
300
200
100
0
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
Year
Average fishing mortality (age 2-8)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
Year
Recruitment at age 1 (in millions)
1000
800
600
400
200
0
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92
Year class
Biomass (1000 tonnes)
1200
1000
800
600
400
200
0
total stock
spawning stock
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
Year

Figure 3.2.2



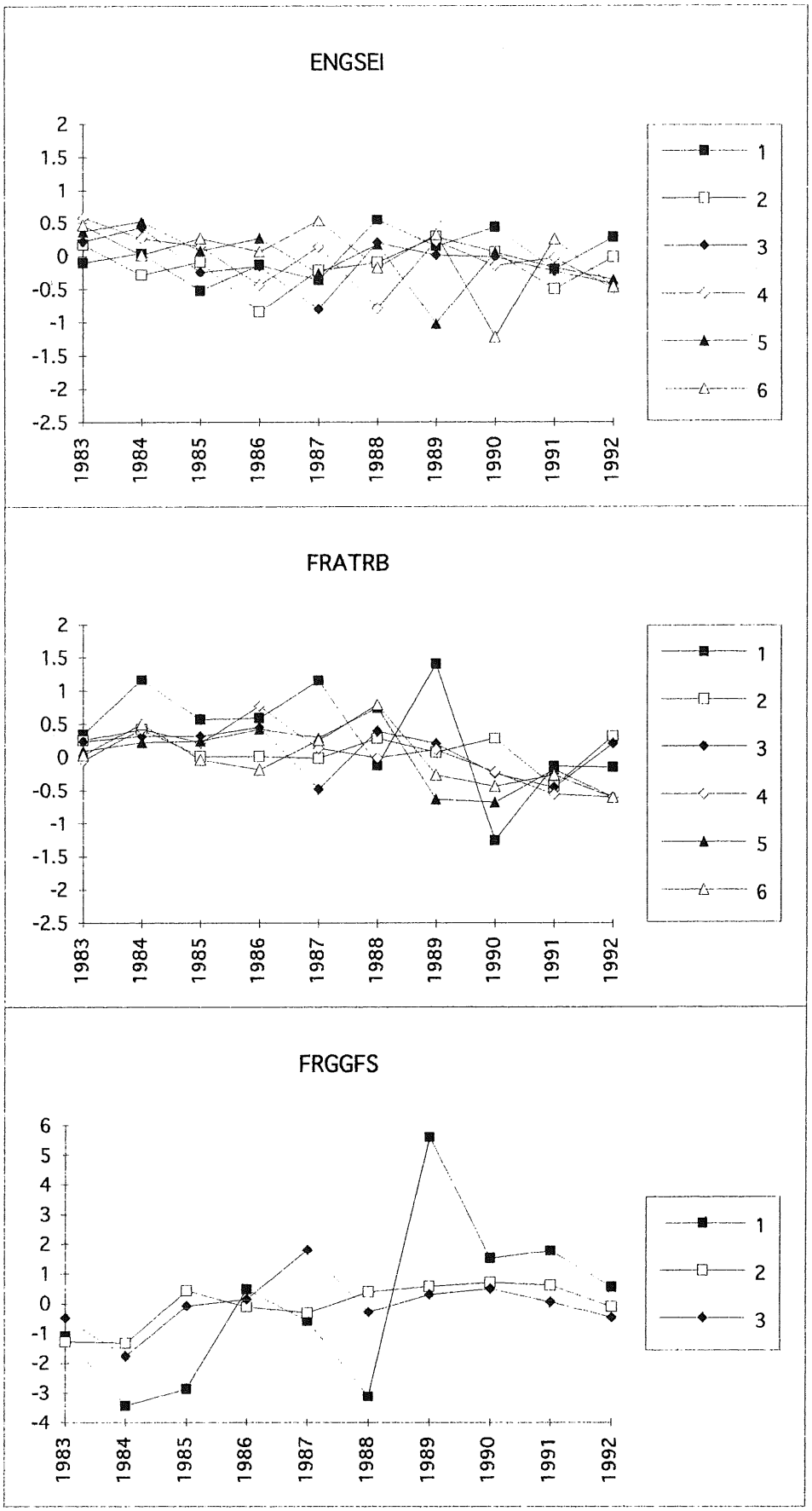
Continued

Figure 3.2.2 Continued



Continued

Figure 3.2.2 Continued



Continued

Figure 3.2.2 Continued

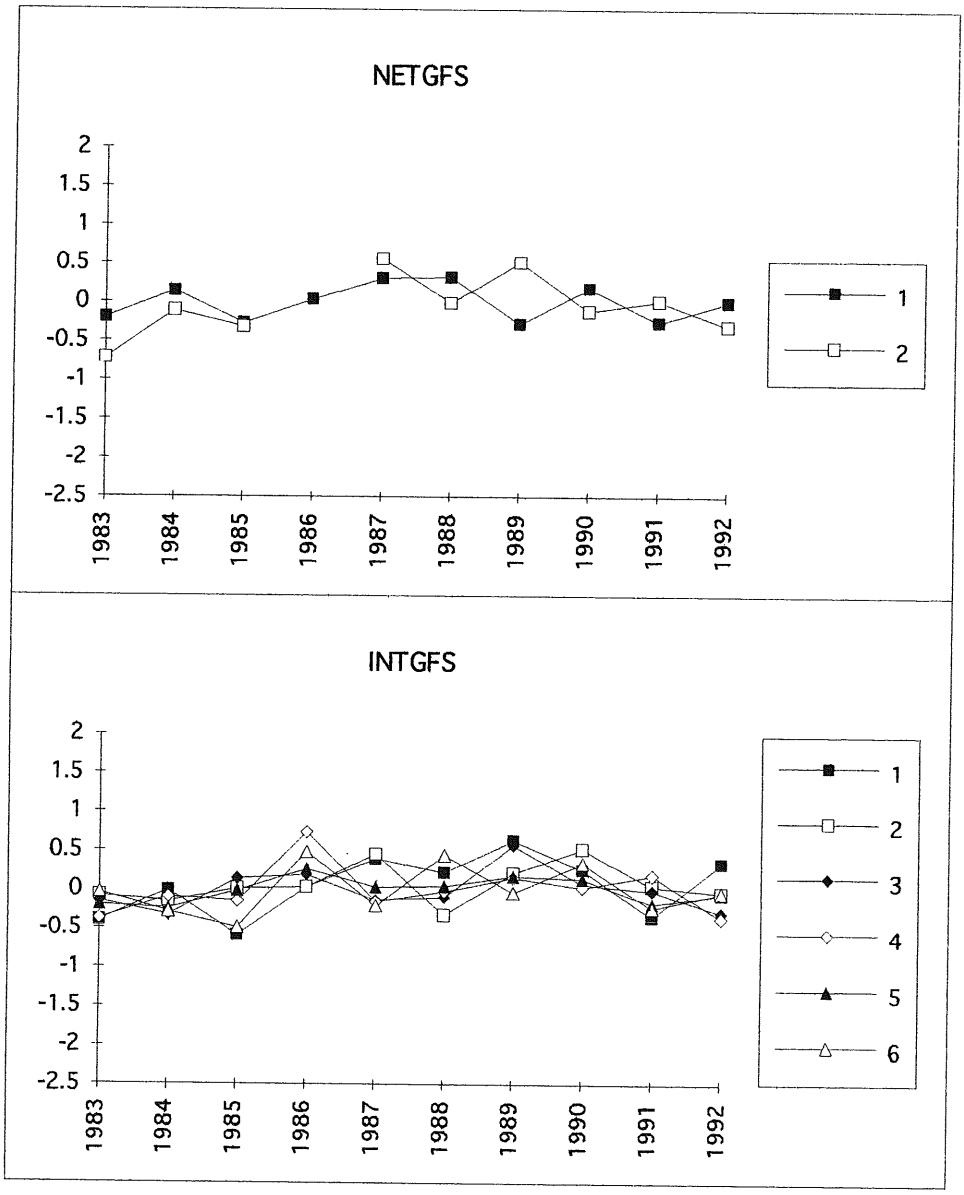


Figure 3.2.3

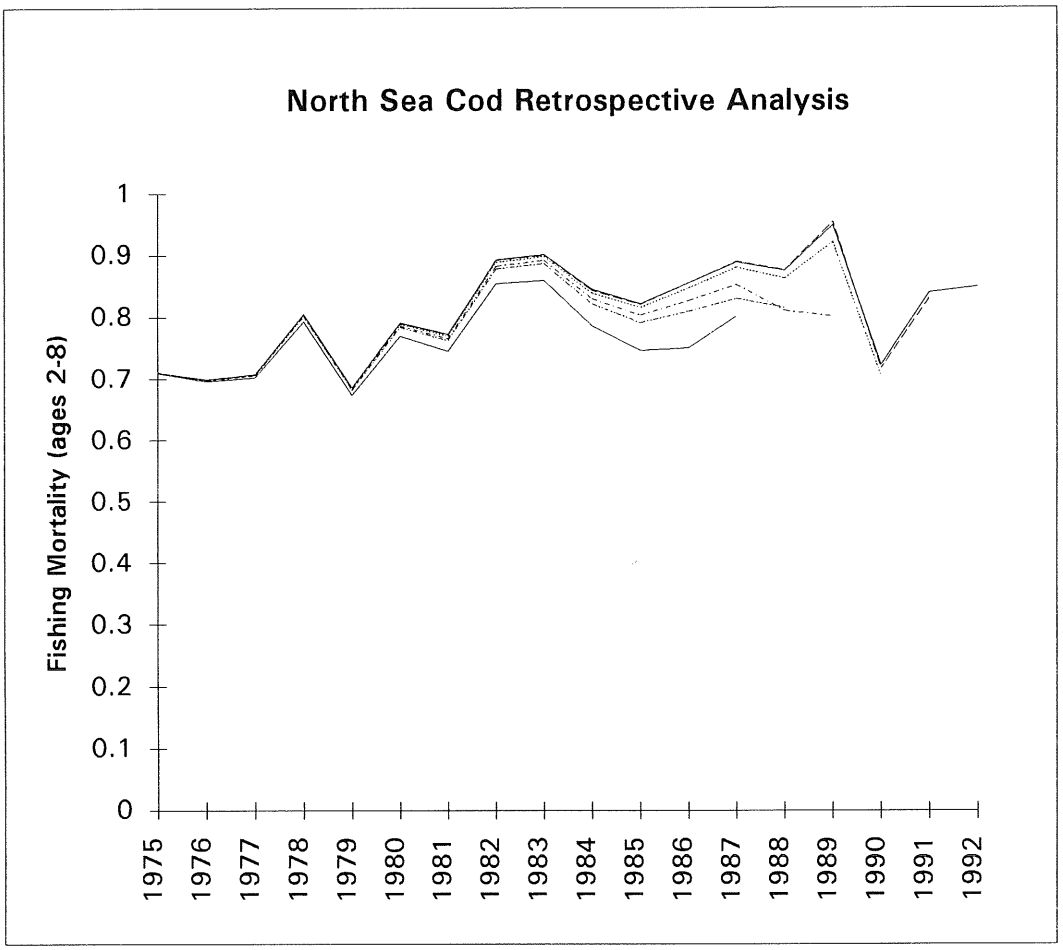

North Sea Cod Retrospective Analysis
Fishing Mortality (ages 2-8)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

Figure 3.2.4

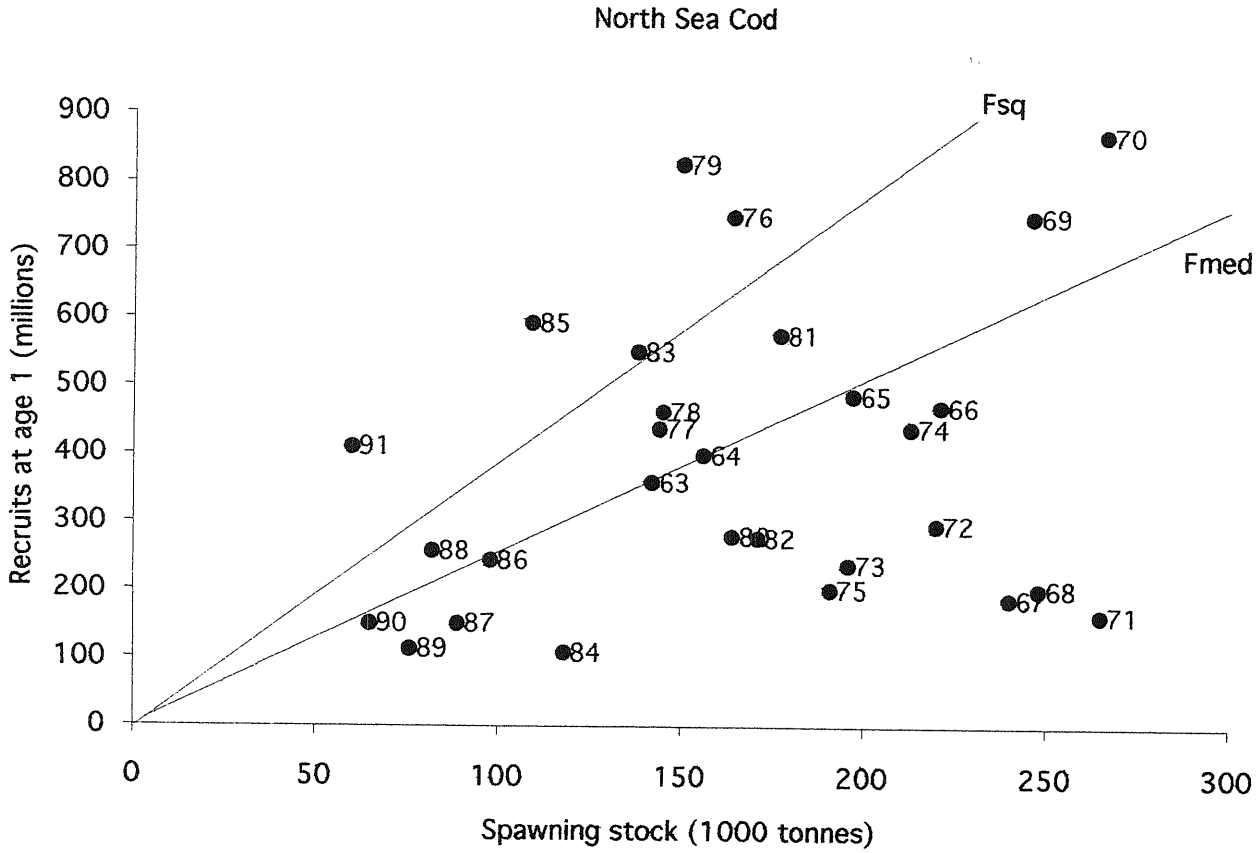
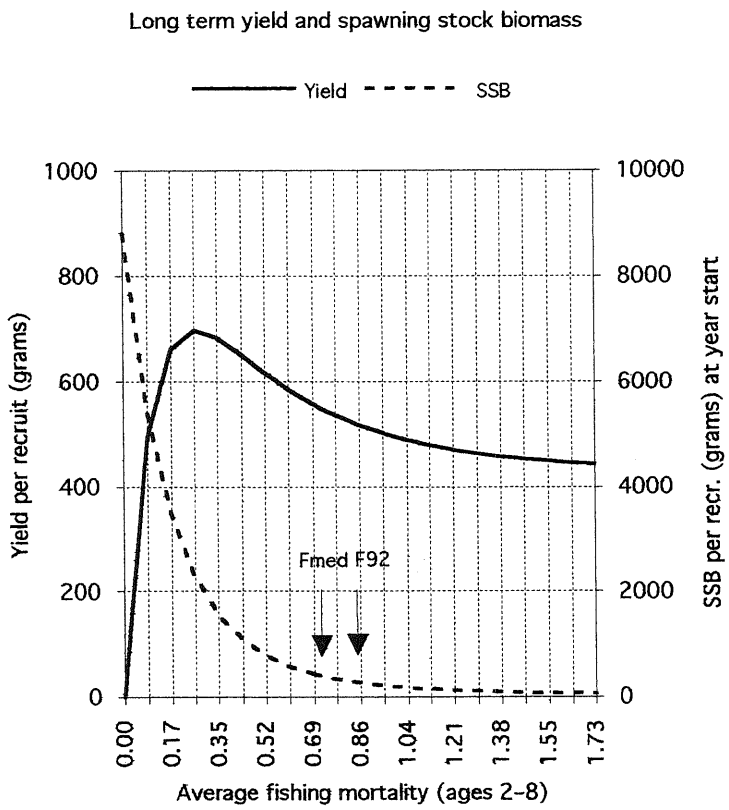

North Sea Cod
Fsq
Fmed
Recruits at age 1 (millions)
Spawning stock (1000 tonnes)
0
100
200
300
400
500
600
700
800
900
0
50
100
150
200
250
300
70
79
76
69
85
81
83
65
66
78
77
74
91
64
63
72
88
86
82
73
75
68
67
71
90
87
89
84

Figure 3.2.5

North Sea Cod



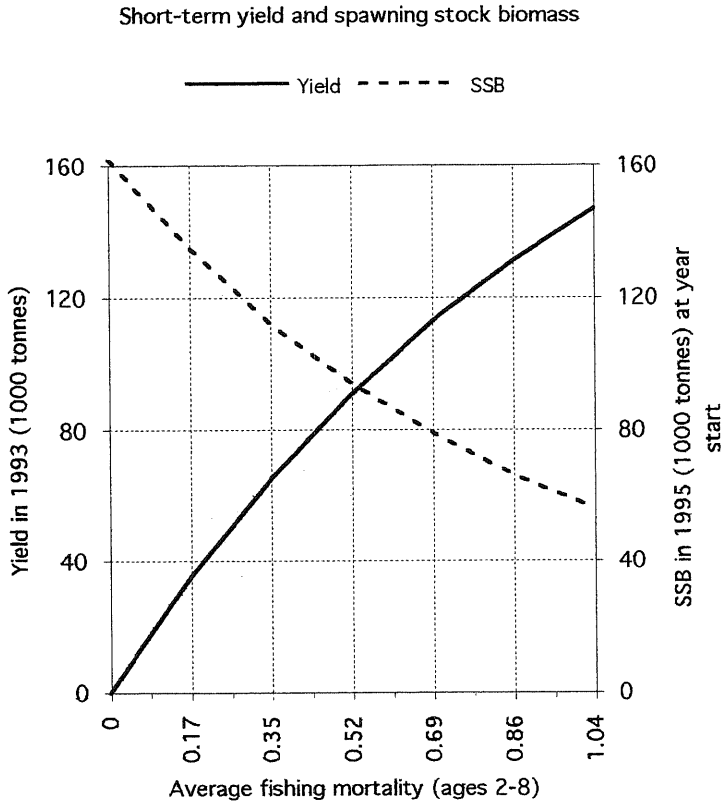
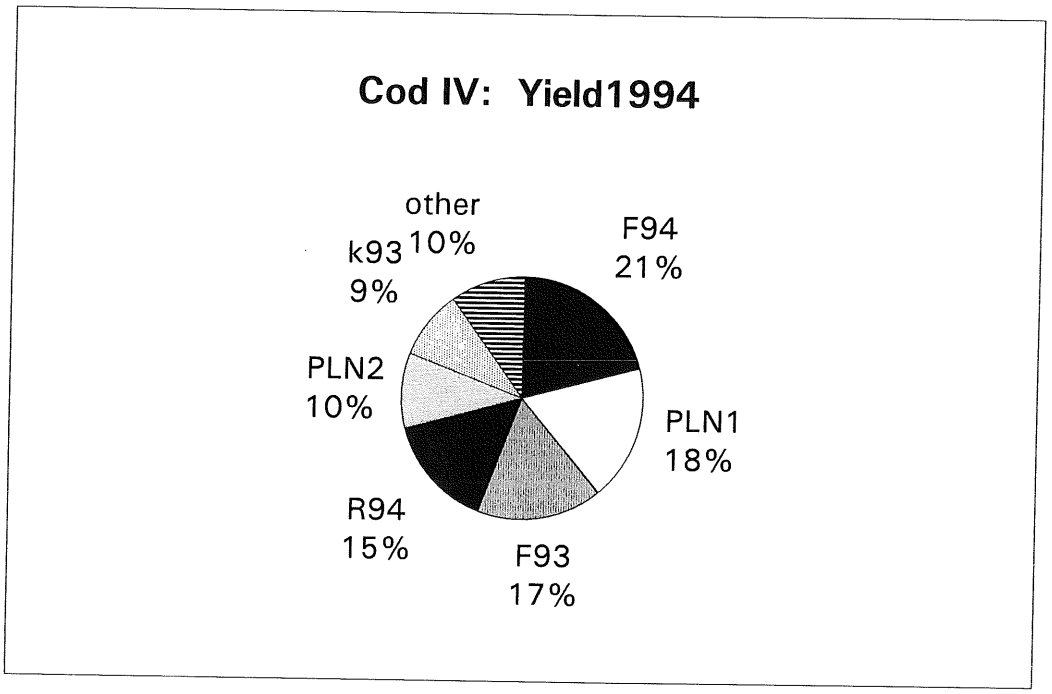


Figure 3.2.6


Cod IV: Yield1994
other
10%
F94
21%
k93
9%
PLN2
10%
PLN1
18%
R94
15%
F93
17%

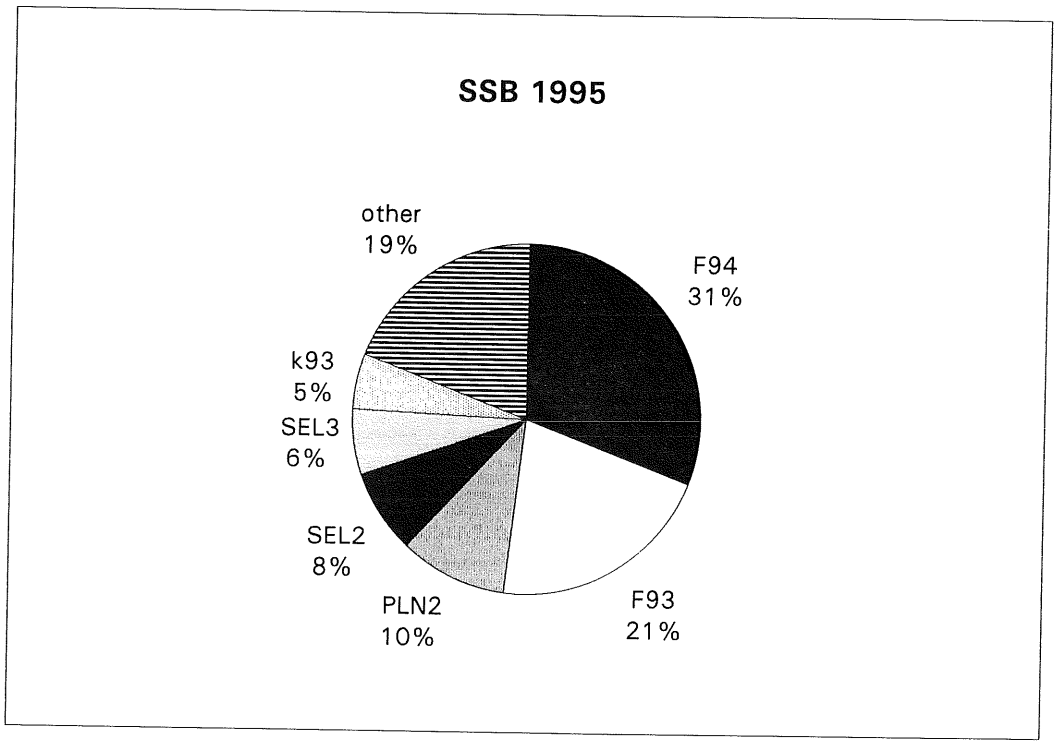
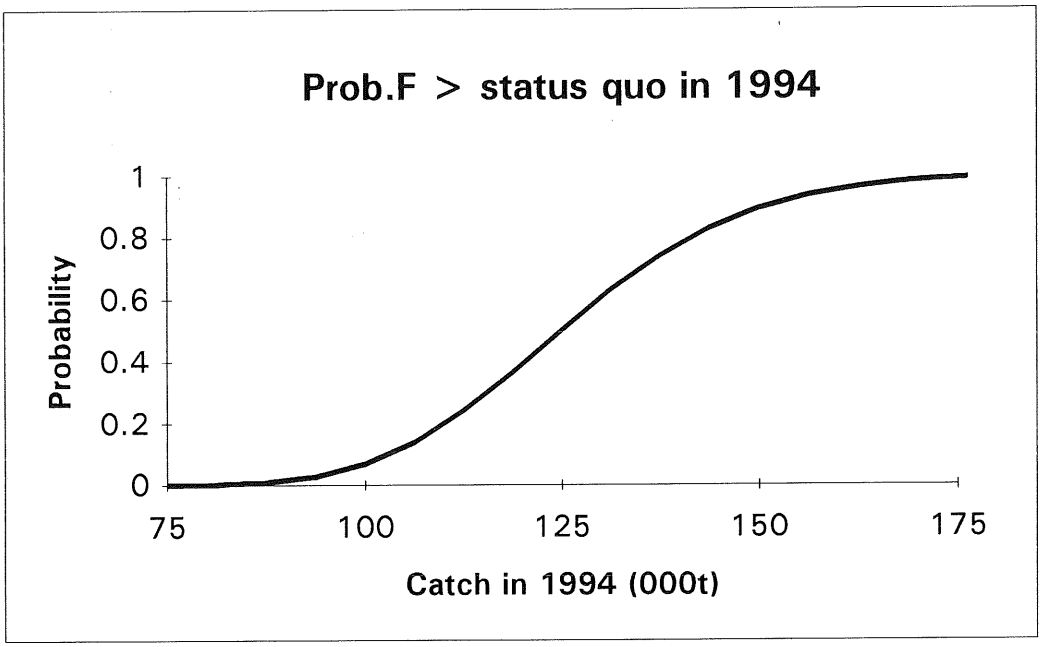
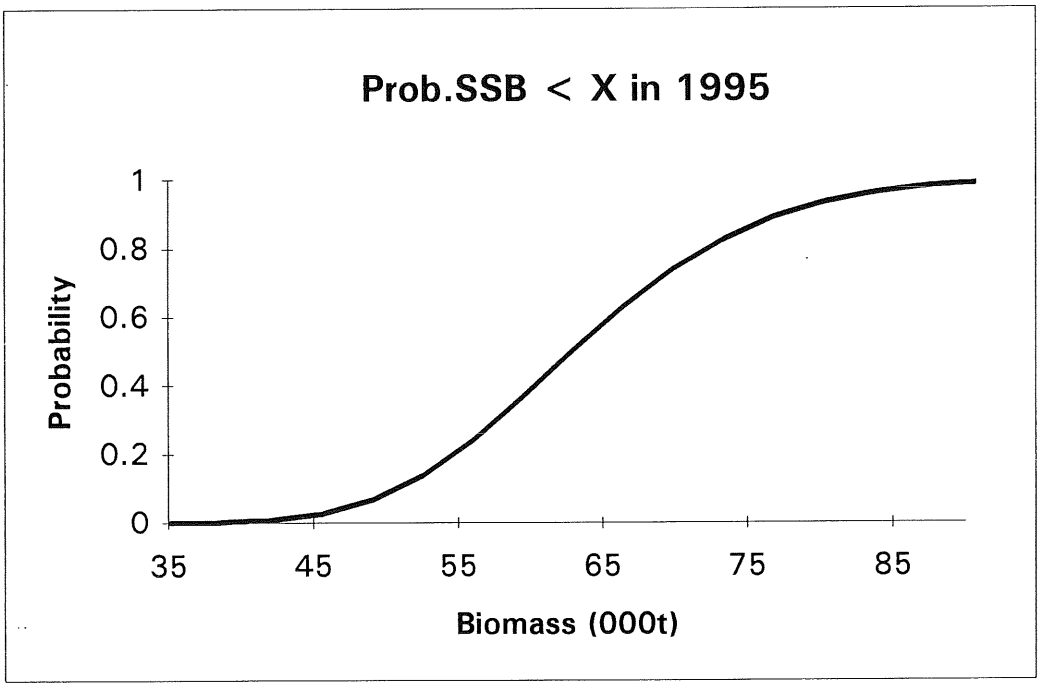

SSB 1995
other
19%
F94
31%
k93
5%
SEL3
6%
SEL2
8%
PLN2
10%
F93
21%

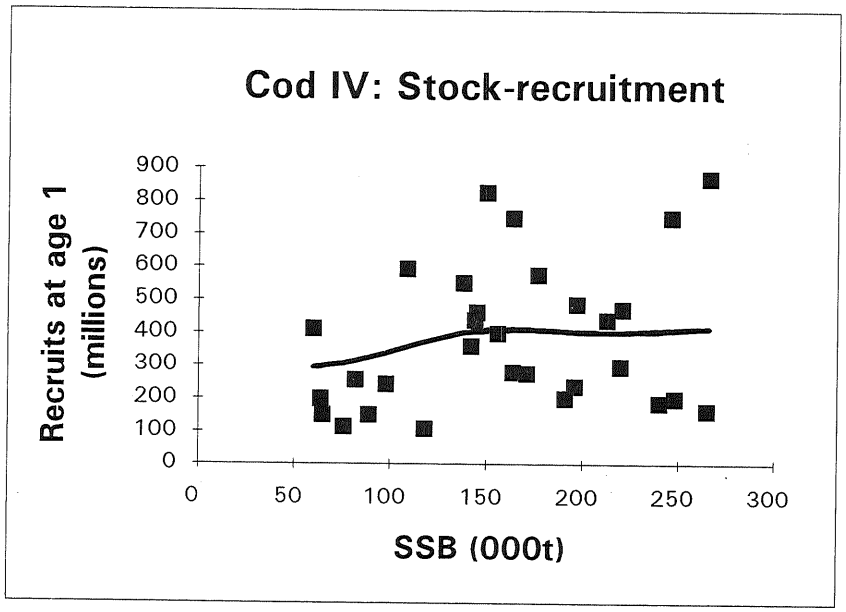
Figure 3.2.7

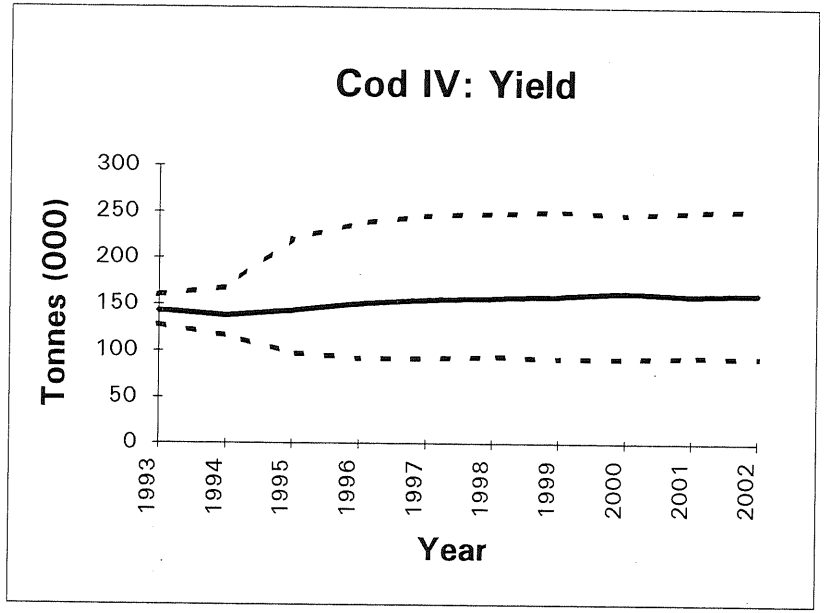

Prob.F > status quo in 1994
Probability
1
0.8
0.6
0.4
0.2
0
75
100
125
150
175
Catch in 1994 (000t)

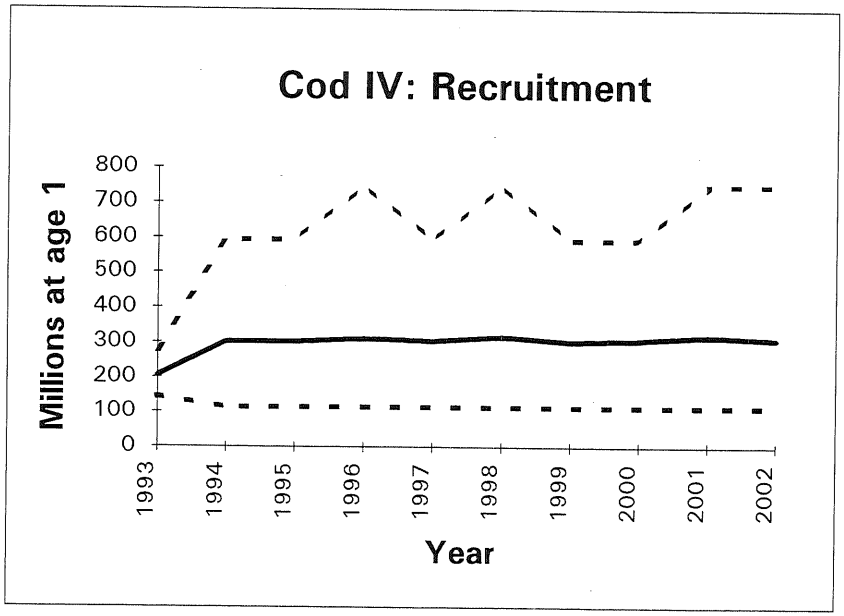

Prob.SSB < X in 1995
Probability
1
0.8
0.6
0.4
0.2
0
35
45
55
65
75
85
Biomass (000t)

MTPROJ2.XLS

Figure 3.2.8







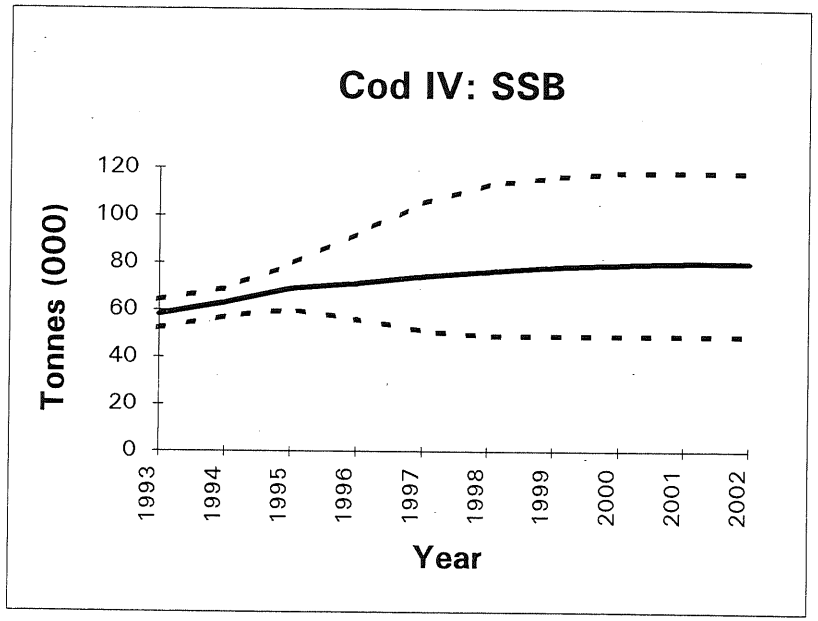


Figure 3.2.9

MTPROJ1.XLS

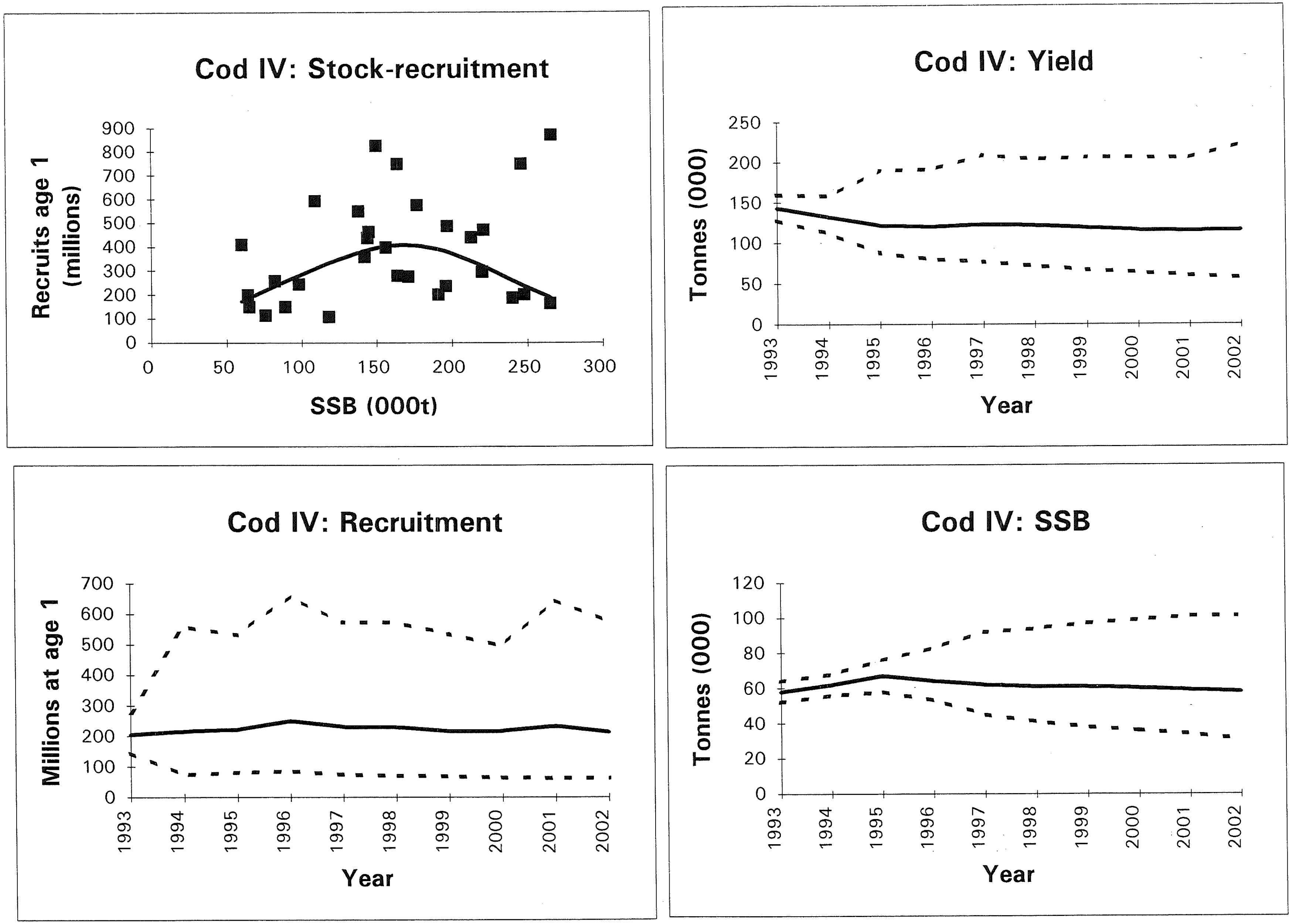


Figure 3.3.1

Haddock, North Sea

Long-term trends in yield, fishing mortality, recruitment and biomass

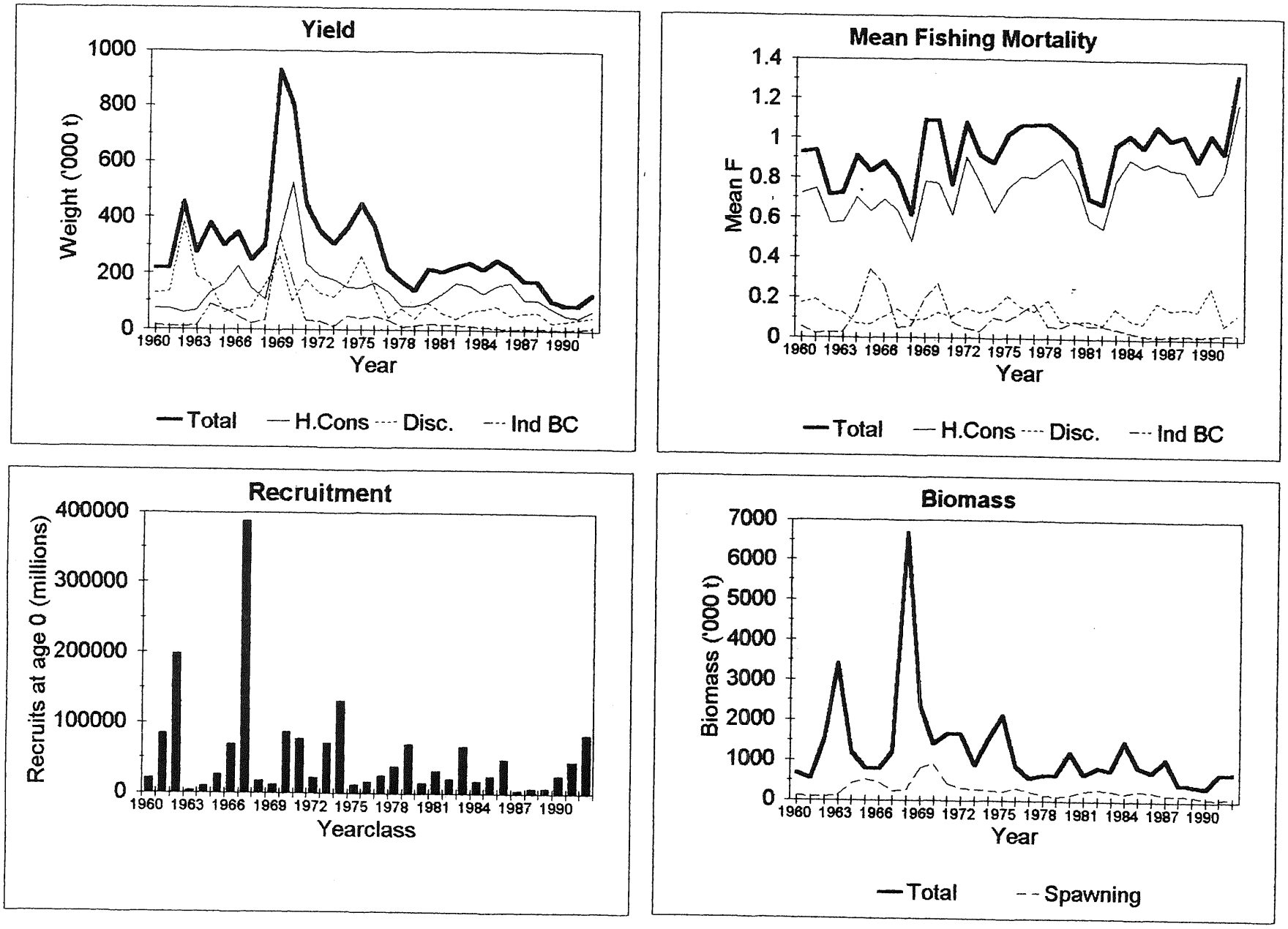
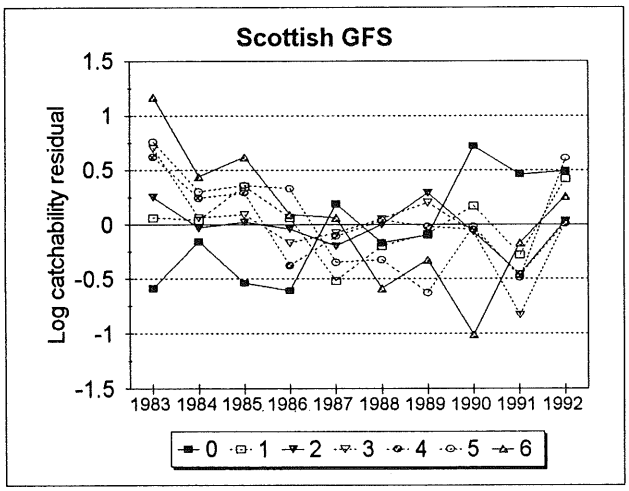
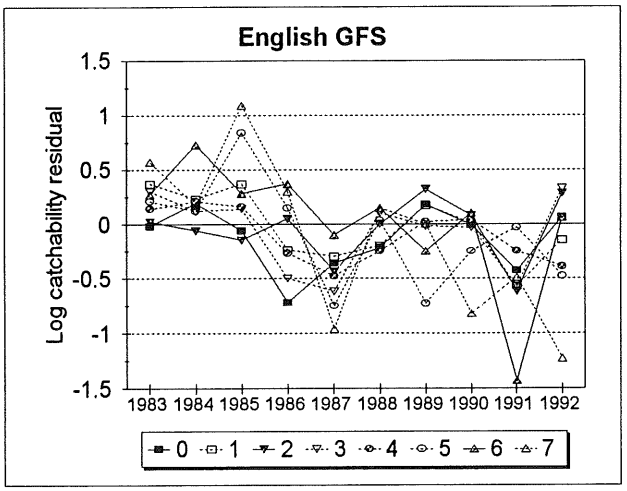


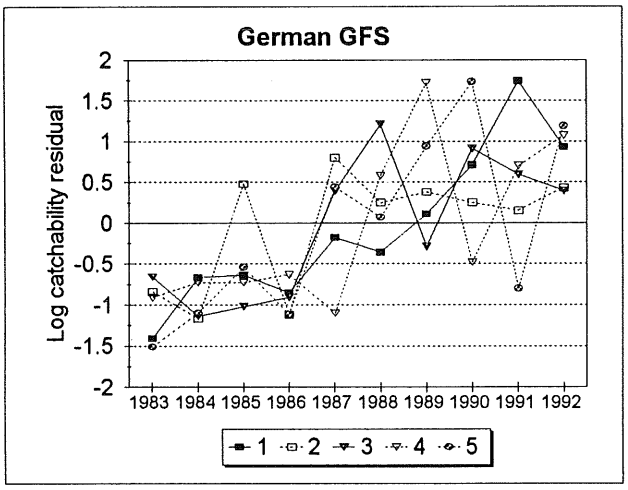
Figure 3.3.2

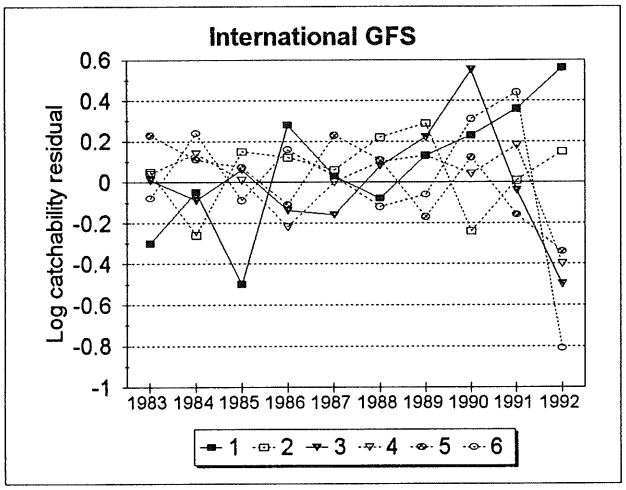
Haddock, North Sea

Log Catchability residuals at age by fleet.









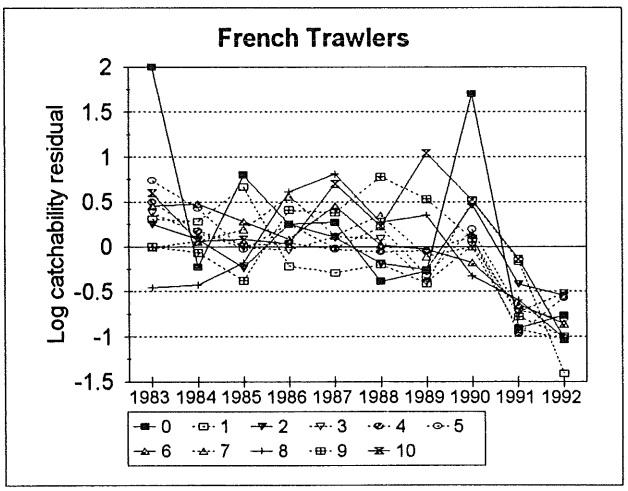


Figure 3.3.3

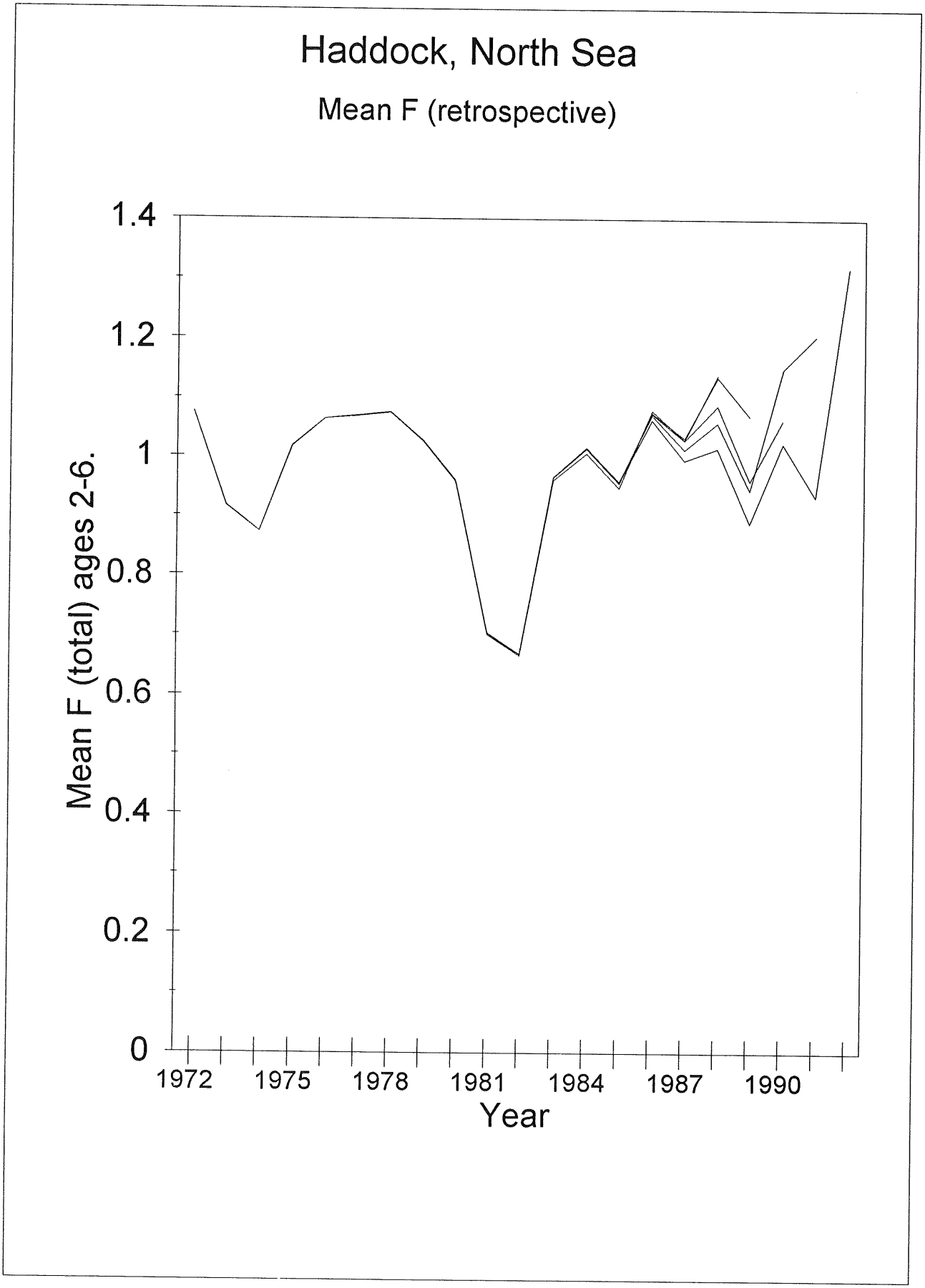

Haddock, North Sea
Mean F (retrospective)
Mean F (total) ages 2-6.
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1972
1975
1978
1981
1984
1987
1990
Year

Figure 3.3.4

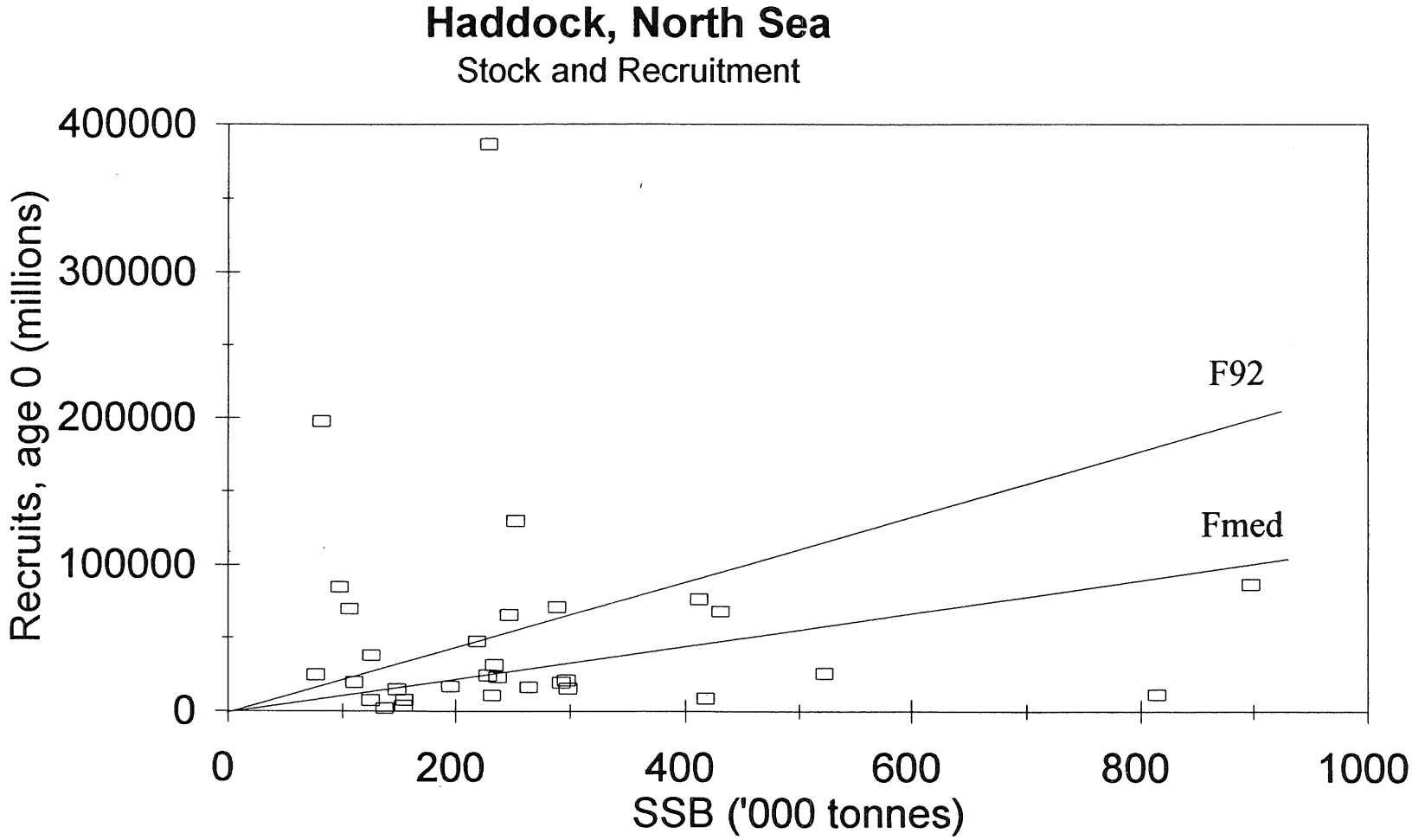

Haddock, North Sea
Stock and Recruitment
Recruits, age 0 (millions)
400000
300000
200000
100000
0
F92
Fmed
0
200
400
600
800
1000
SSB ('000 tonnes)

Figure 3.3.5

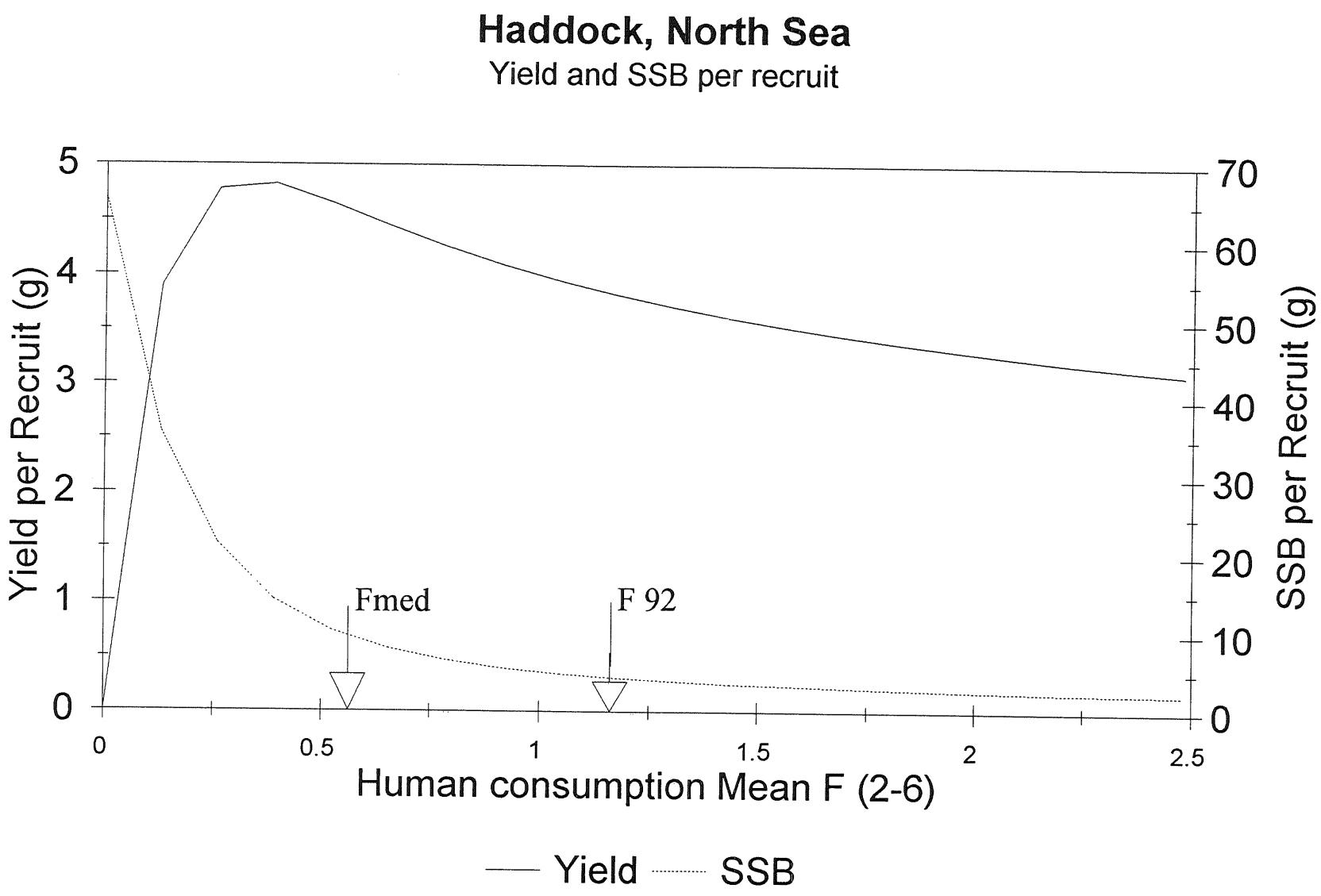

Haddock, North Sea
Yield and SSB per recruit
Yield per Recruit (g)
SSB per Recruit (g)
Fmed
F 92
Human consumption Mean F (2-6)
Yield
SSB
0
1
2
3
4
5
0
10
20
30
40
50
60
70
0
0.5
1
1.5
2
2.5

Figure 3.3.6

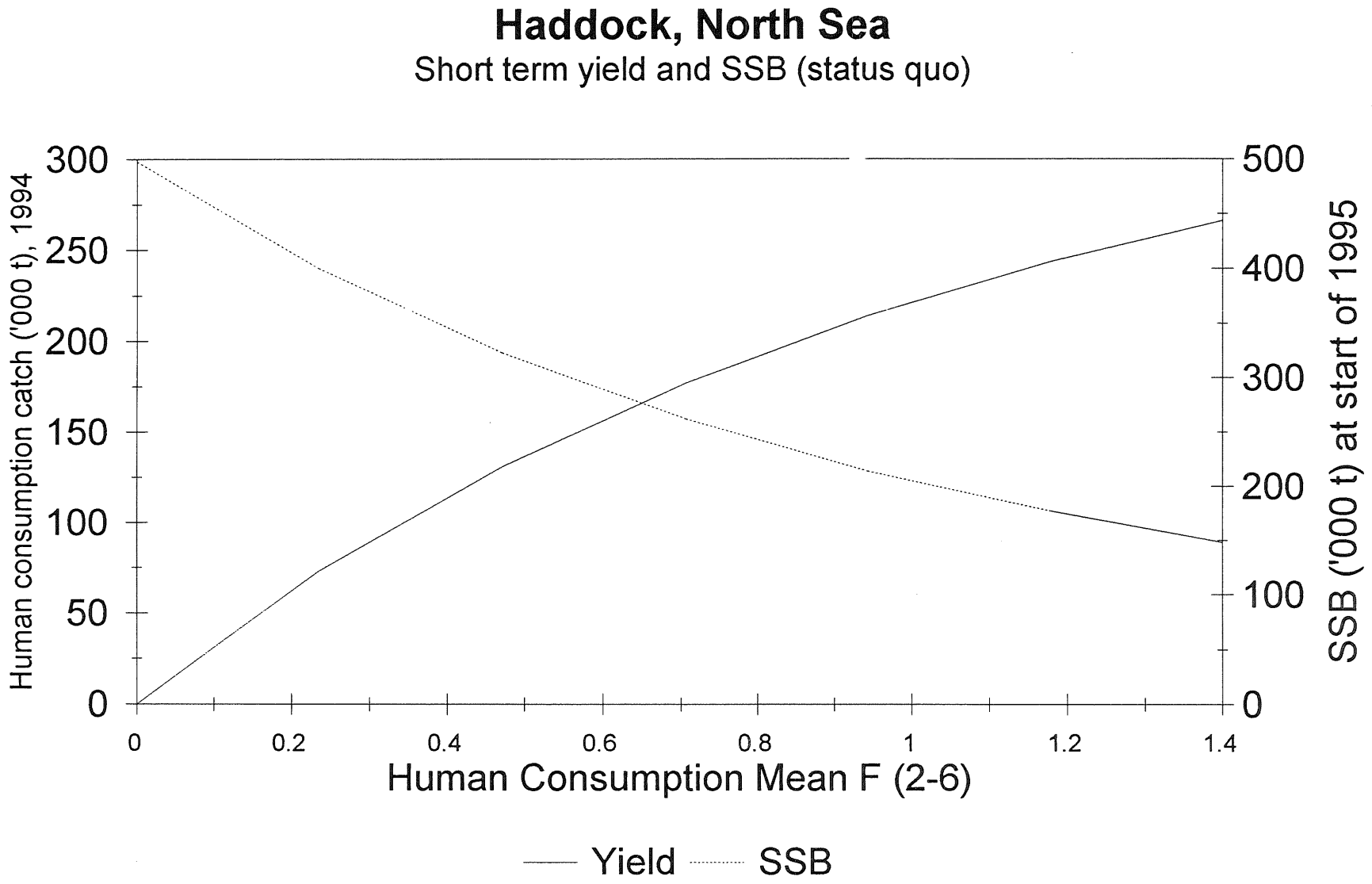
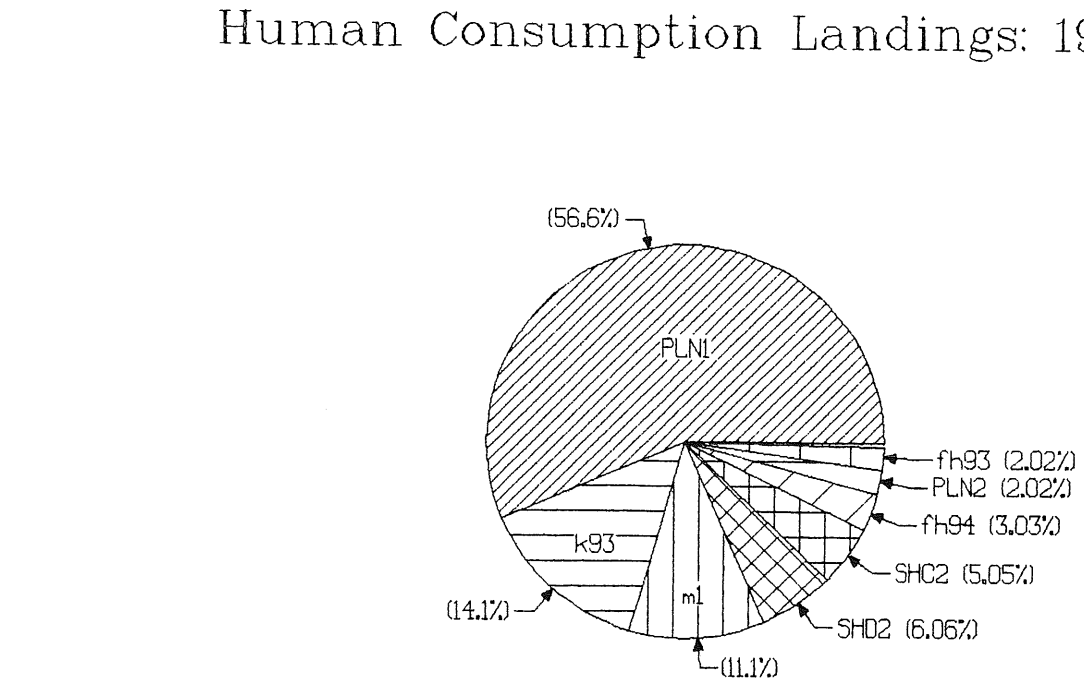

Haddock, North Sea
Short term yield and SSB (status quo)
Human consumption catch ('000 t), 1994
SSB ('000 t) at start of 1995
300
250
200
150
100
50
0
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Human Consumption Mean F (2-6)
Yield
SSB

Figure 3.3.7 **Haddock, North Sea. Results of sensitivity analysis.**



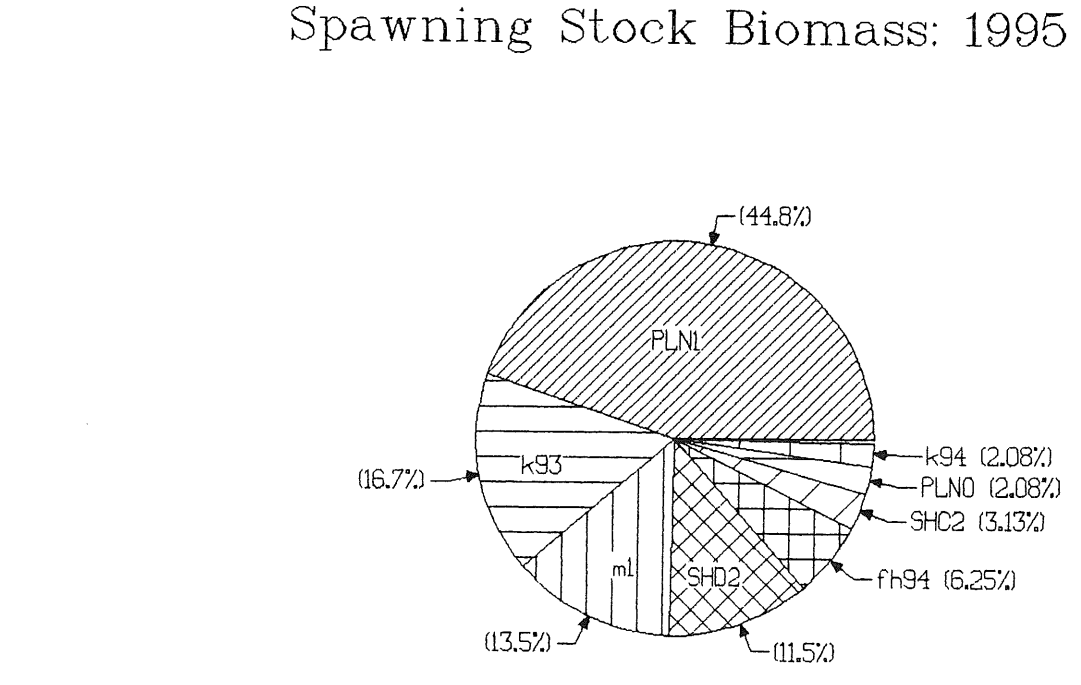
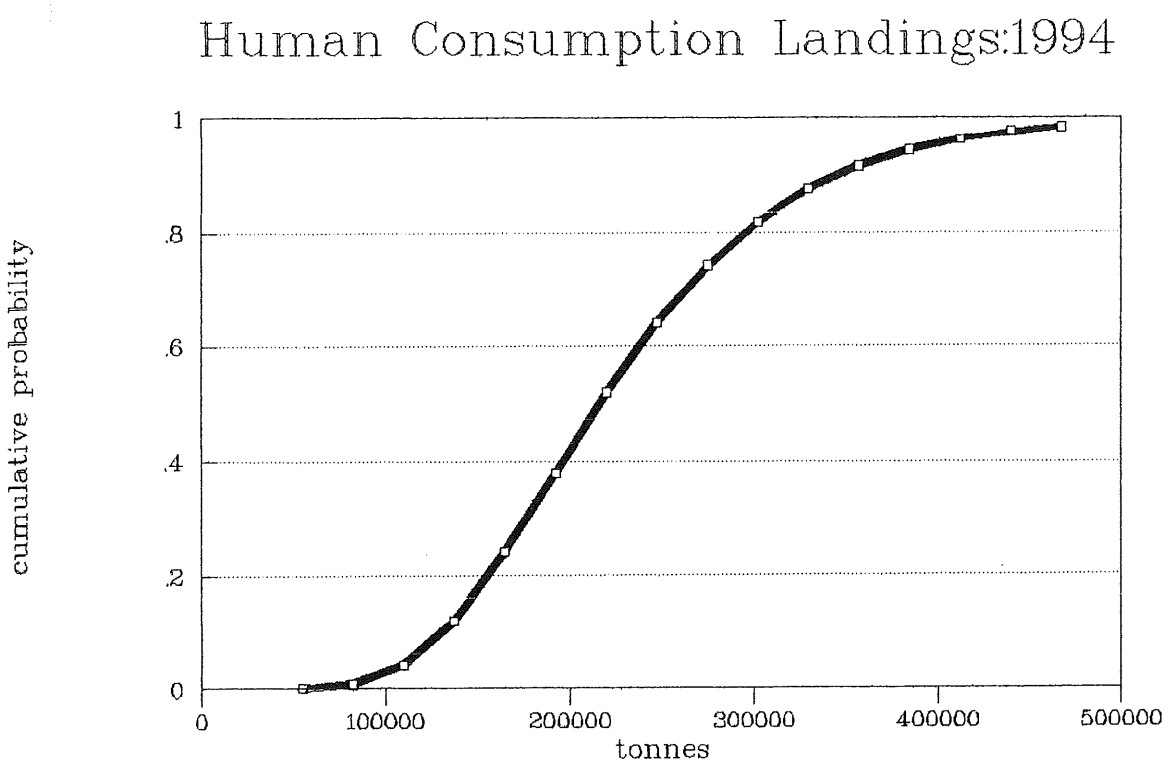


Figure 3.3.8 **Haddock, North Sea. Probability profiles for *status quo* prediction.**



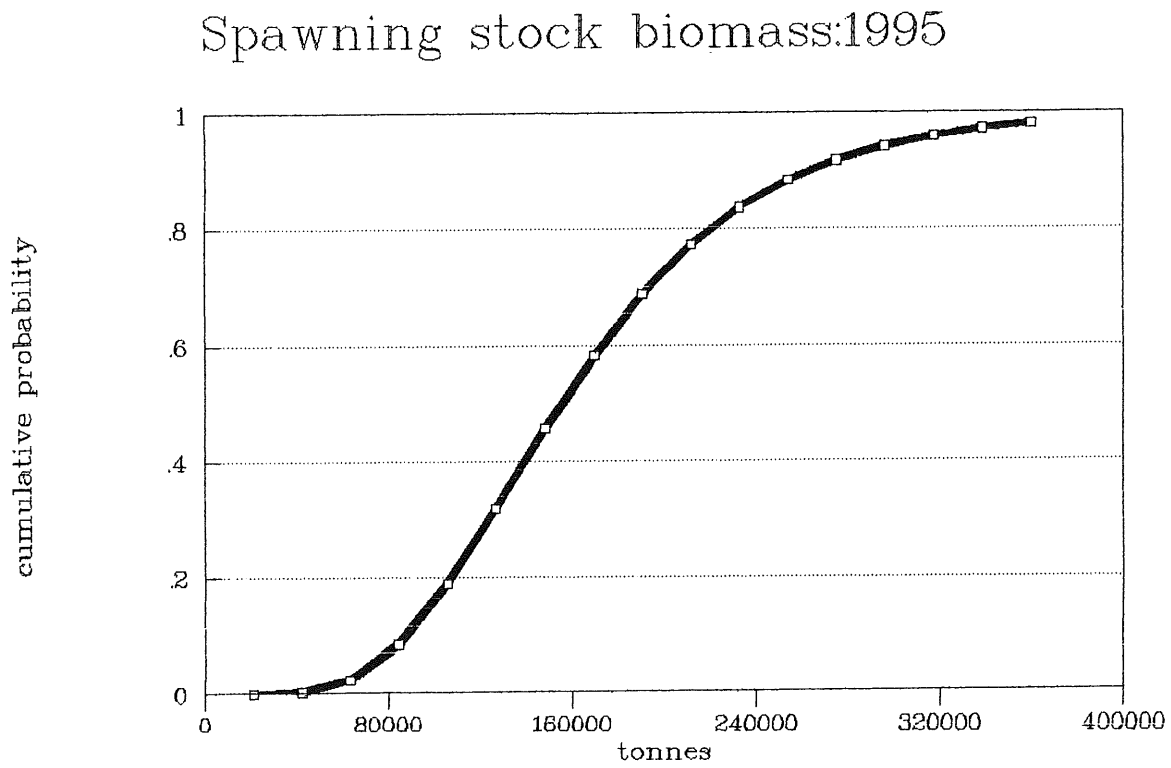
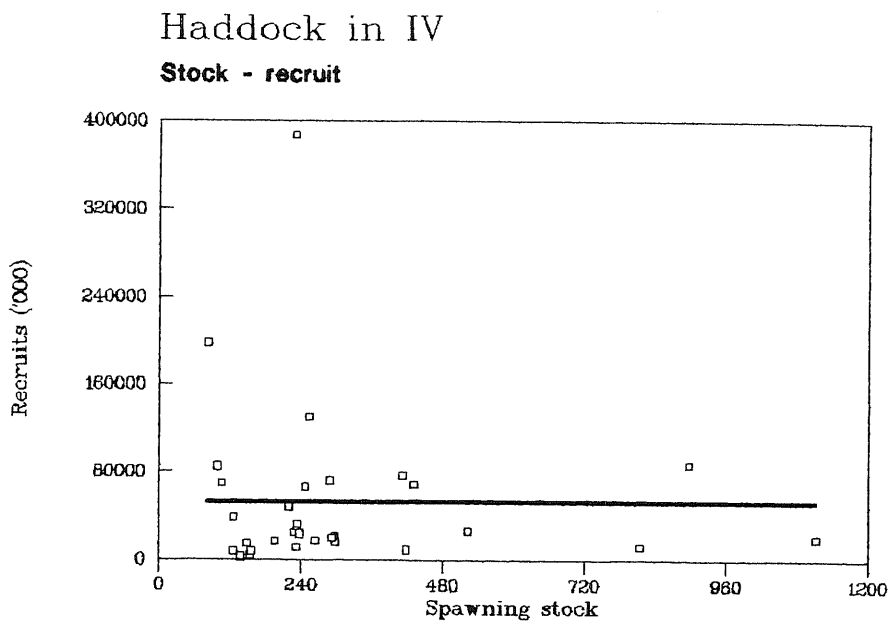
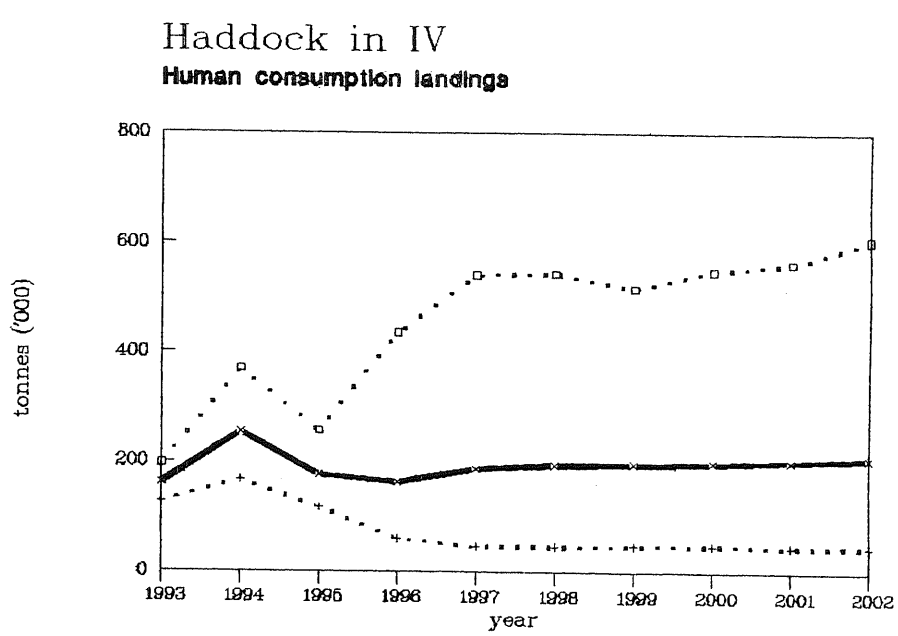
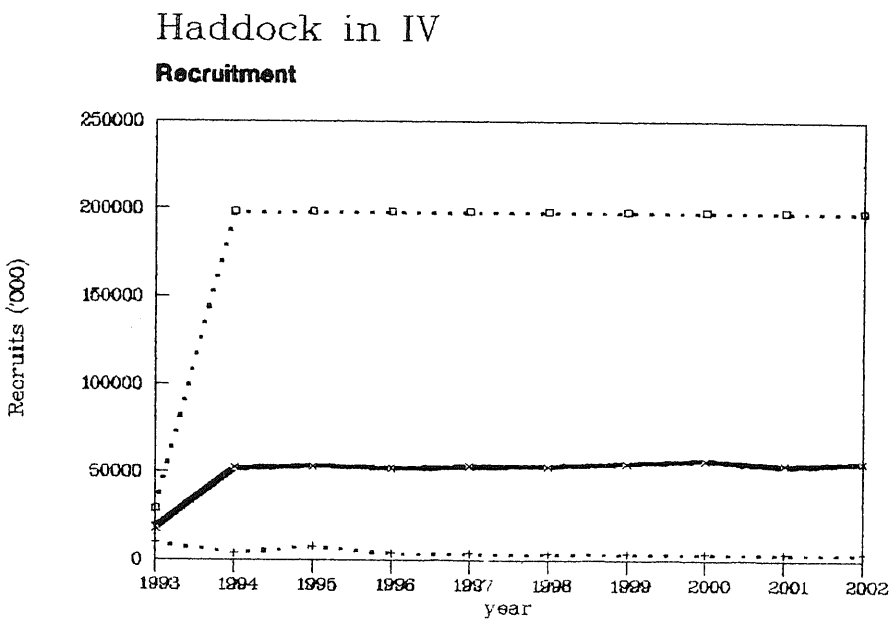


Figure 3.3.9 **Haddock, North Sea. Results of medium-term predictions.**







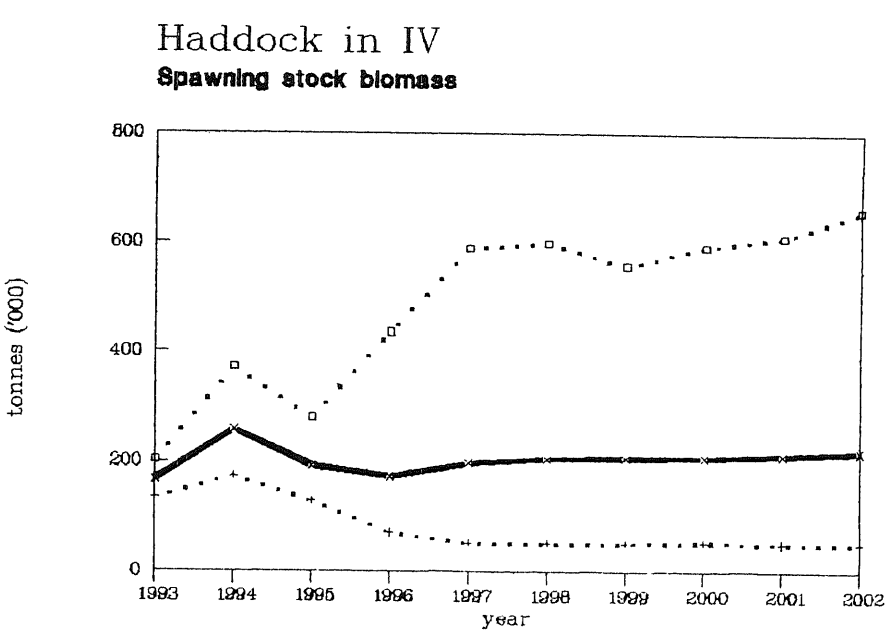
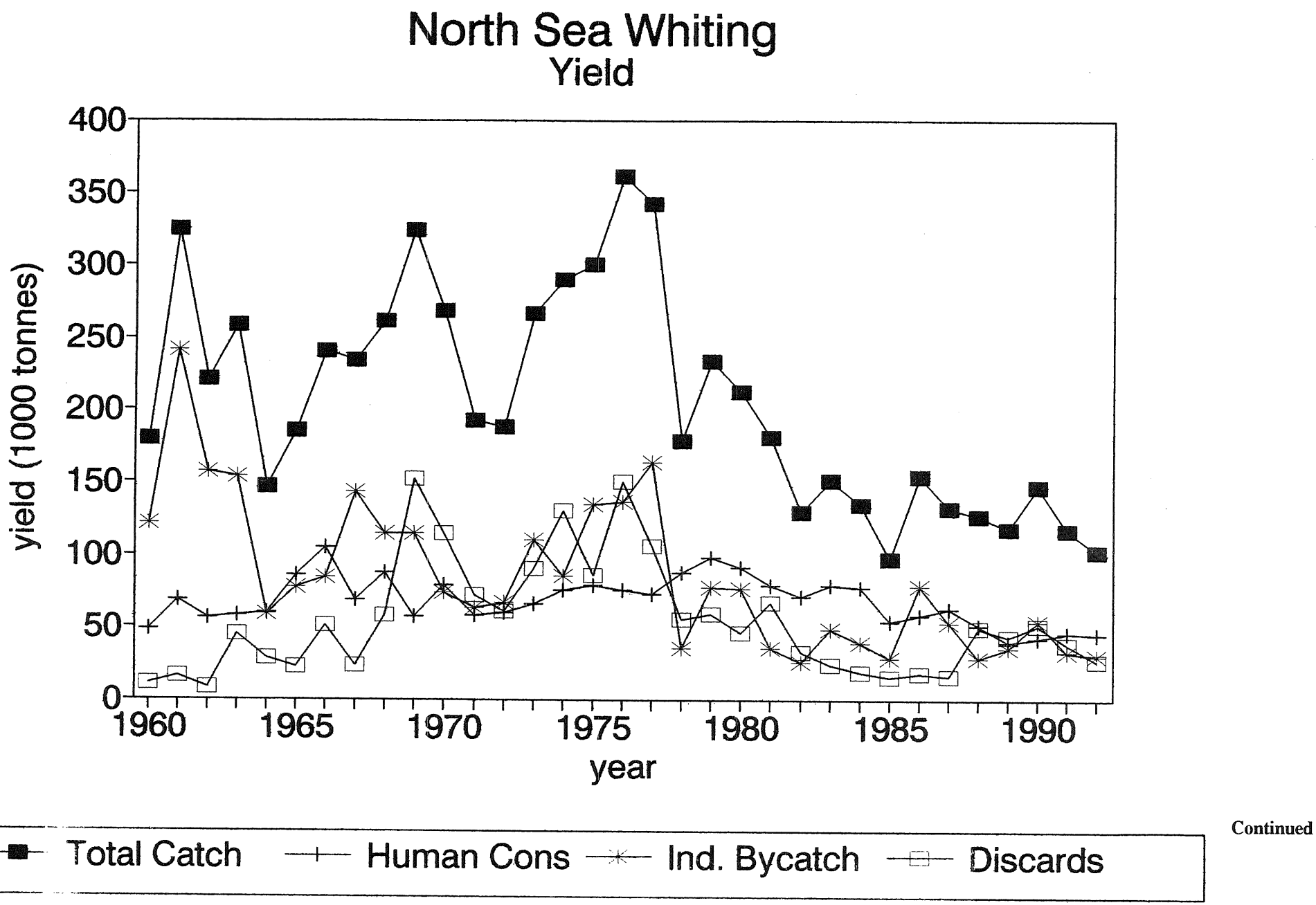


Figure 3.4.1 Whiting, North Sea. Historical trends in yield, fishing mortality, recruitment and biomasses.

A

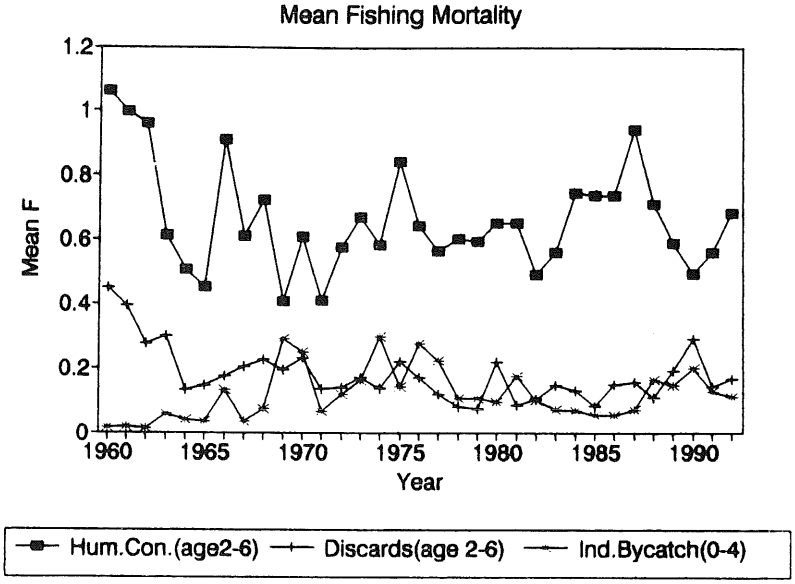


Continued

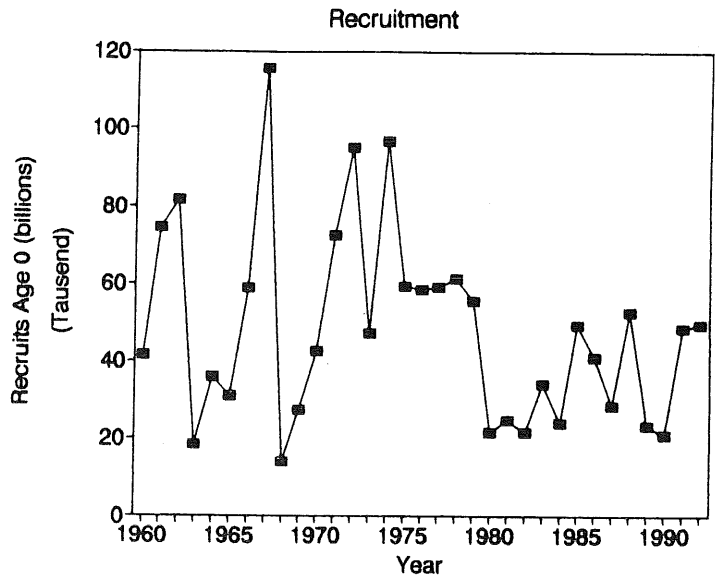
Figure 3.4.1 Continued

North Sea Whiting

B



C



D

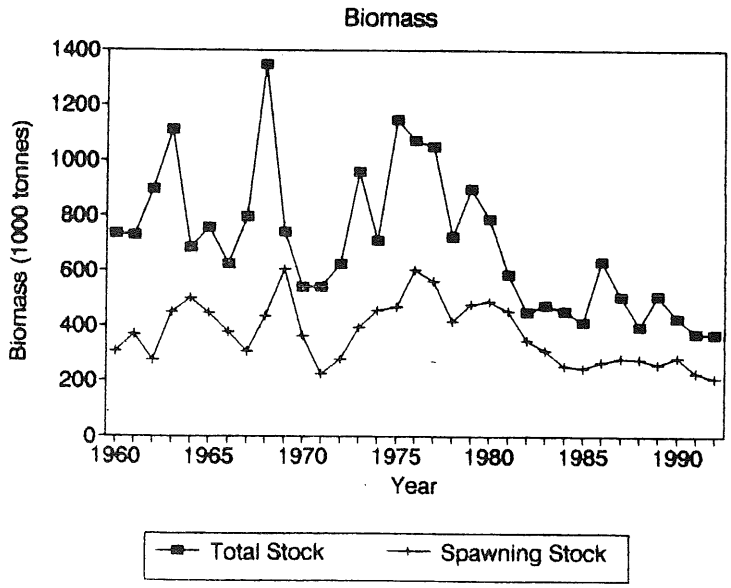
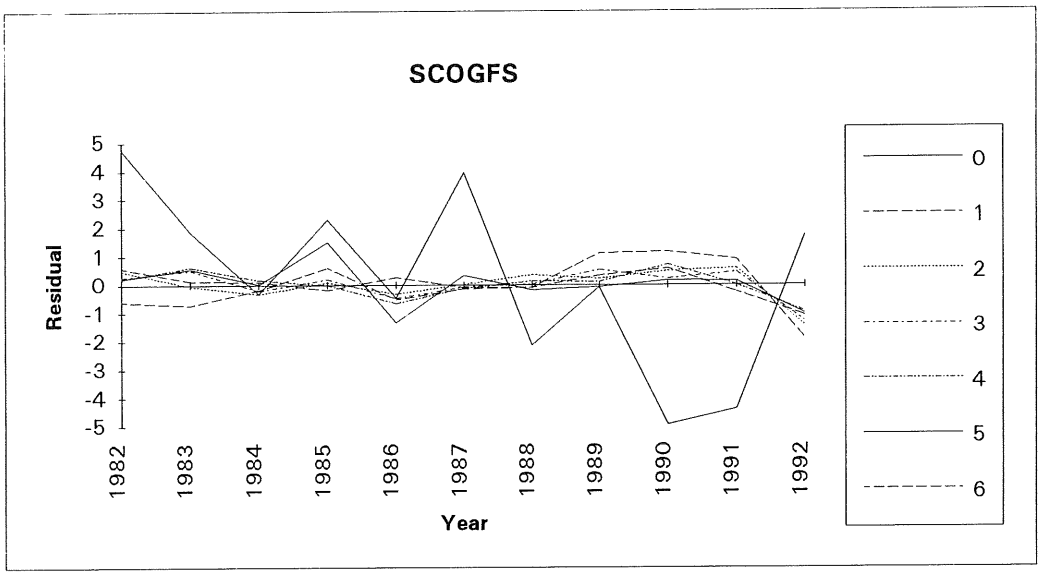
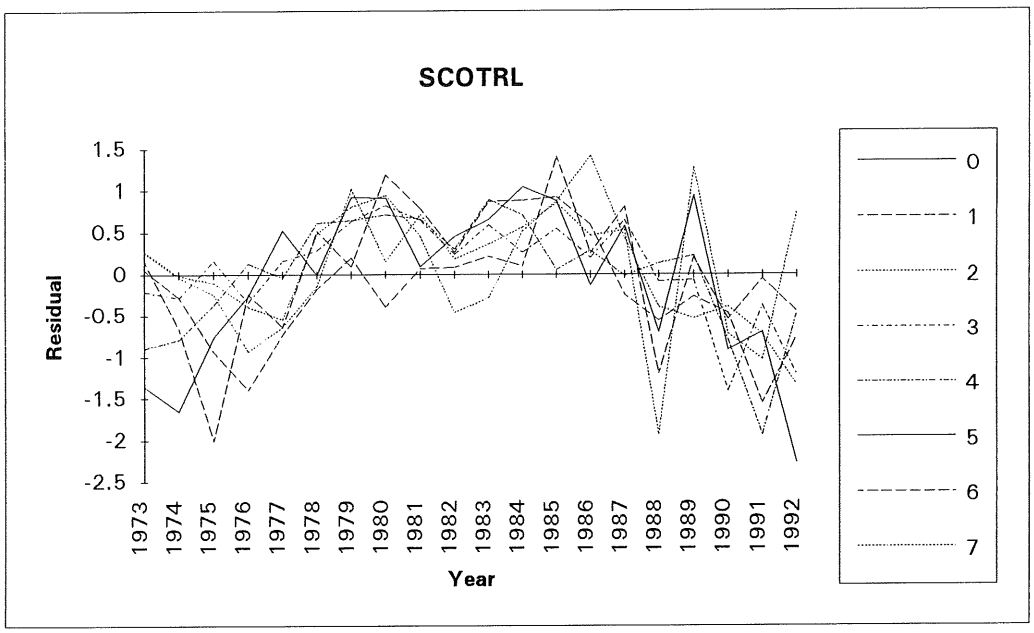


Figure 3.4.2a **Whiting, North Sea. VPA tuning, XSA : catchability residuals by fleet**





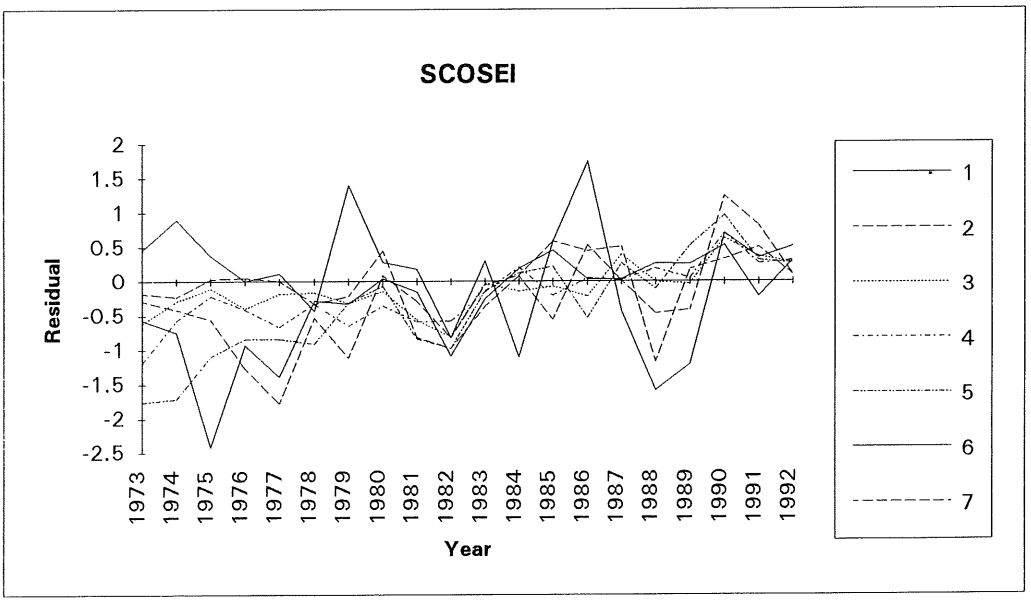
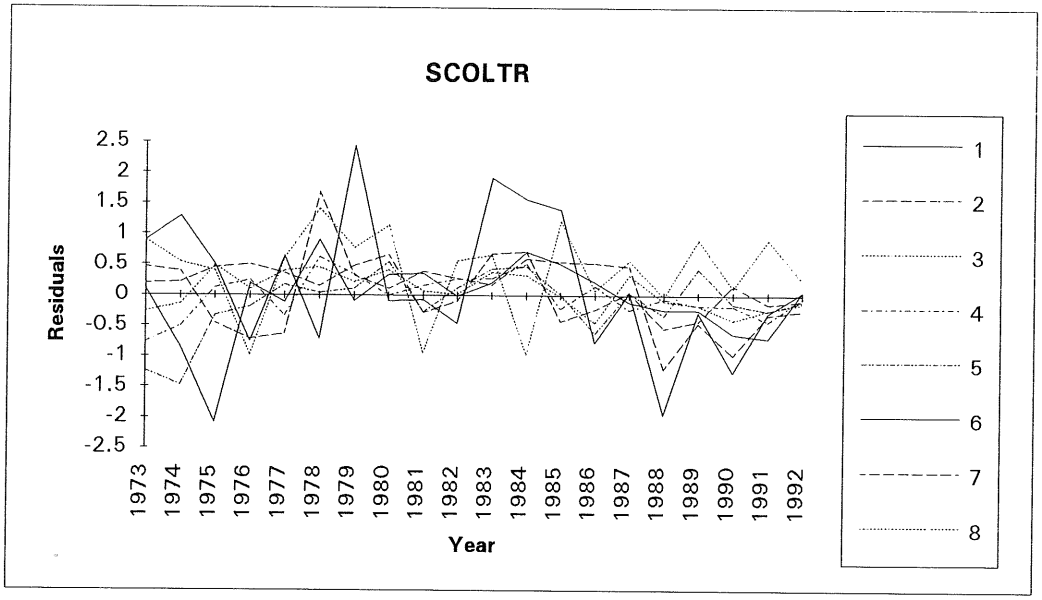
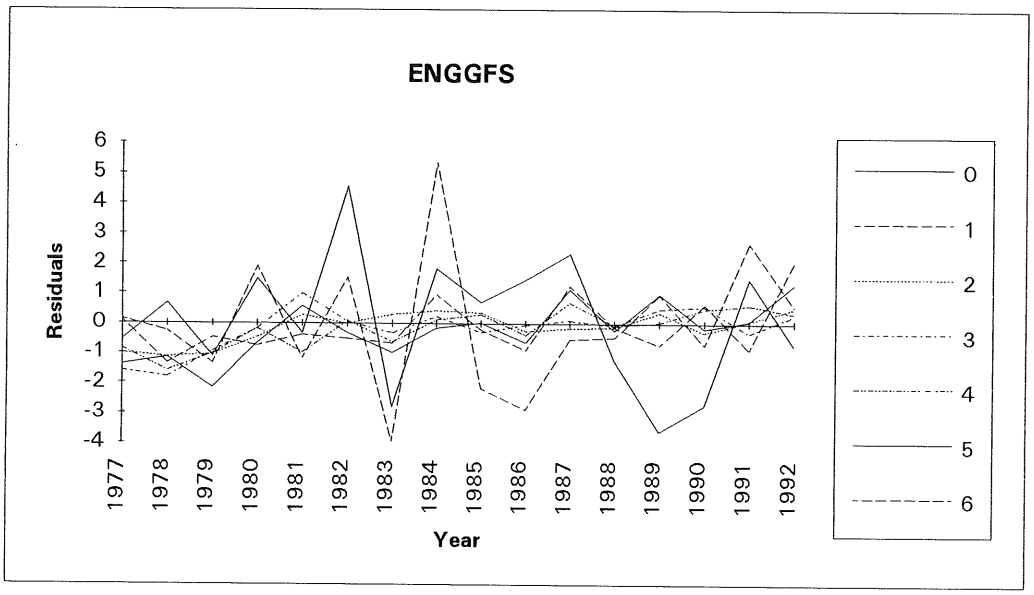


Figure 3.4.2b


SCOLTR
Residuals
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992
Year
1
2
3
4
5
6
7
8


ENGGFS
Residuals
6
5
4
3
2
1
0
-1
-2
-3
-4
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992
Year
0
1
2
3
4
5
6

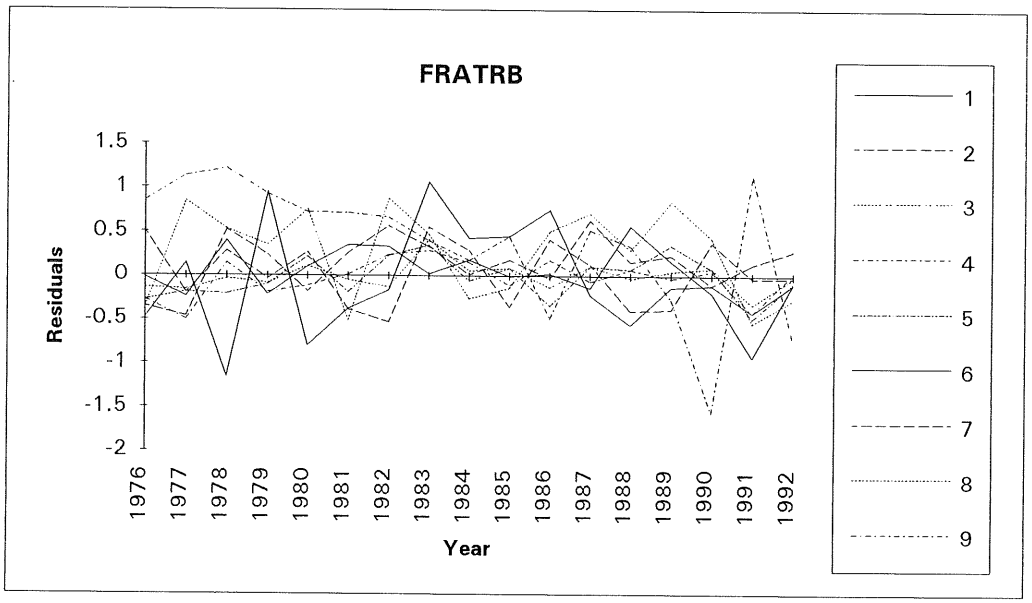
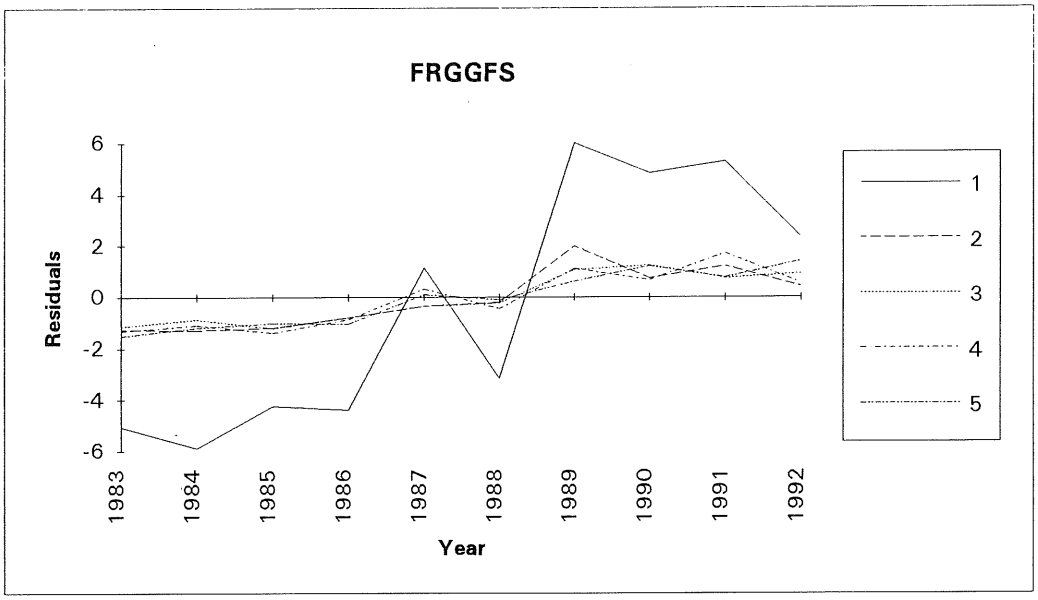
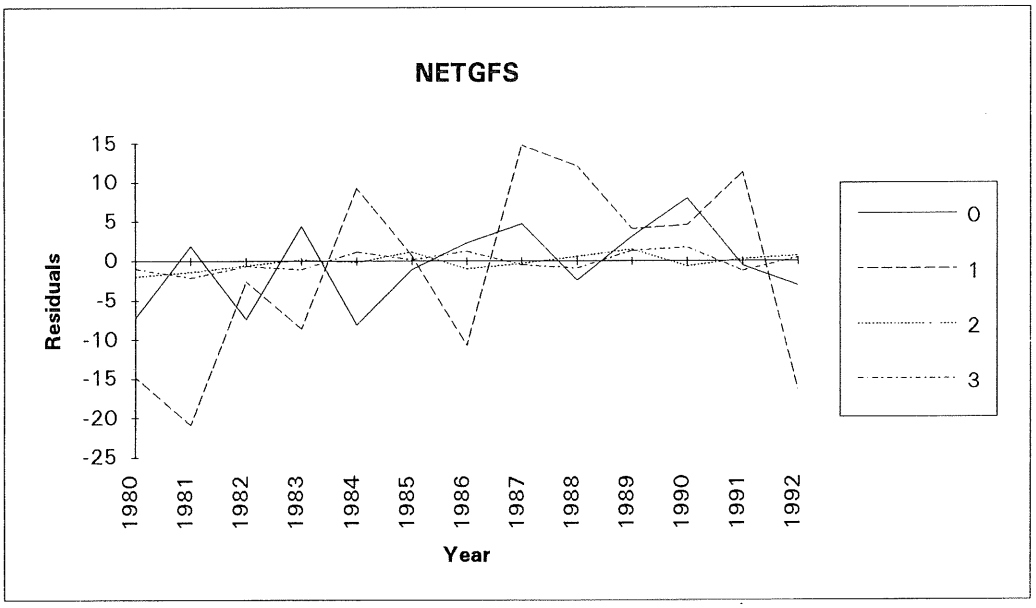

FRATRB
Residuals
1.5
1
0.5
0
-0.5
-1
-1.5
-2
1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992
Year
1
2
3
4
5
6
7
8
9

Figure 3.4.2c


FRGGFS
Residuals
6
4
2
0
-2
-4
-6
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
1
2
3
4
5


NETGFS
Residuals
15
10
5
0
-5
-10
-15
-20
-25
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
0
1
2
3

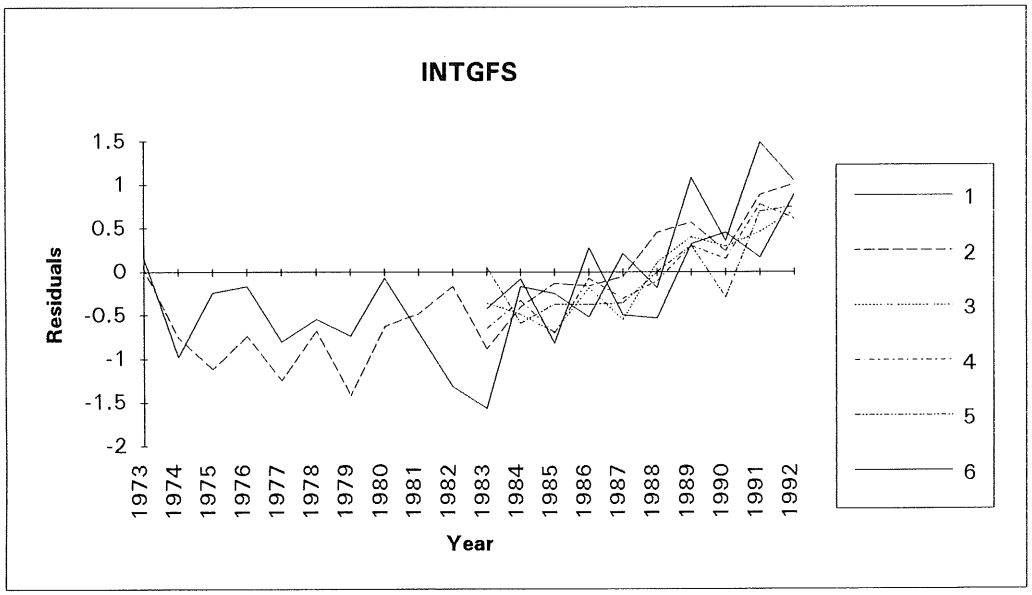

INTGFS
Residuals
1.5
1
0.5
0
-0.5
-1
-1.5
-2
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
1
2
3
4
5
6

Figure 3.4.3 Whiting, North Sea. Retrospective VPA, XSA tuning : reference F (ave. 2-6) by year.

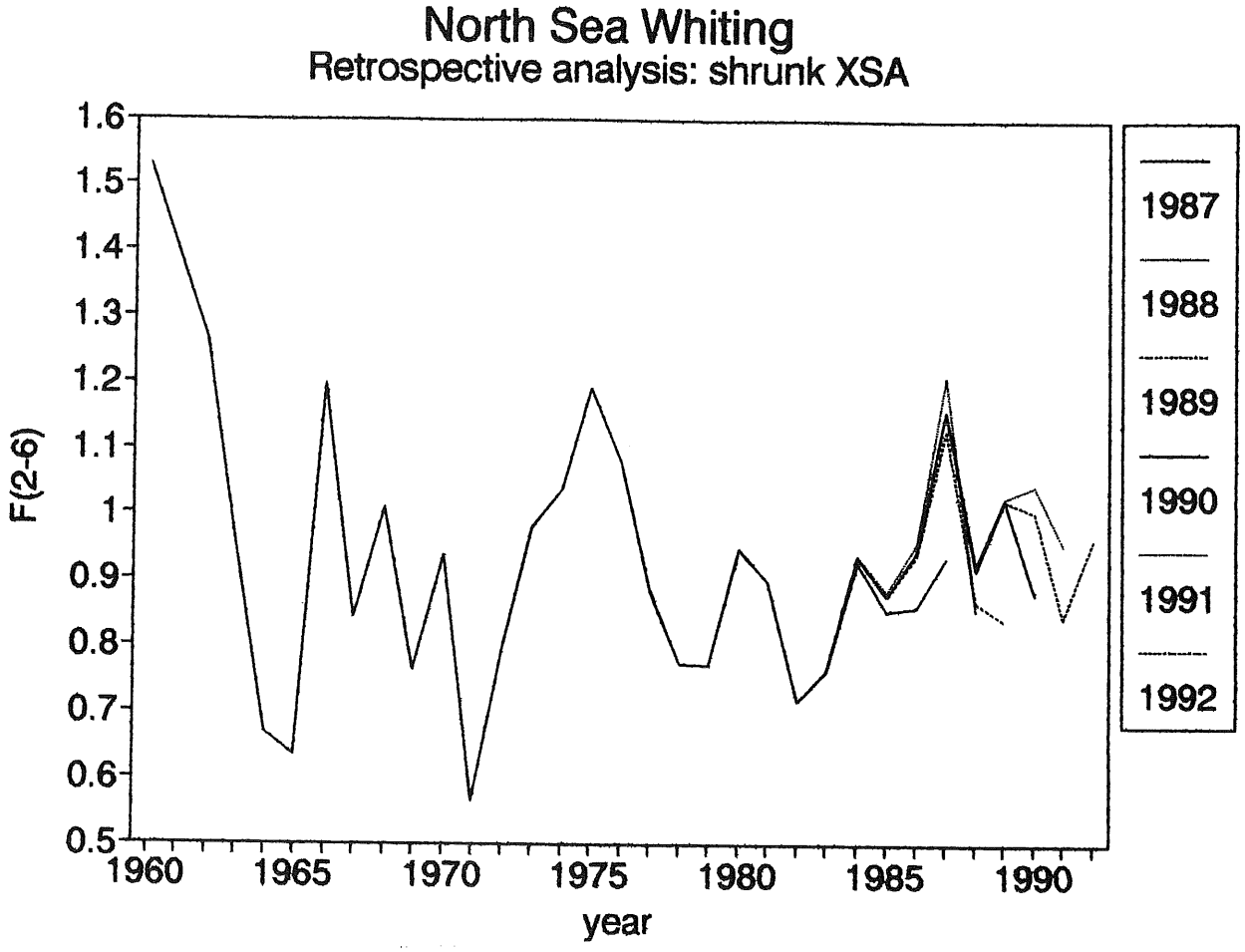


Figure 3.4.4 Whiting, North Sea. Recruitment and spawning stock biomass.

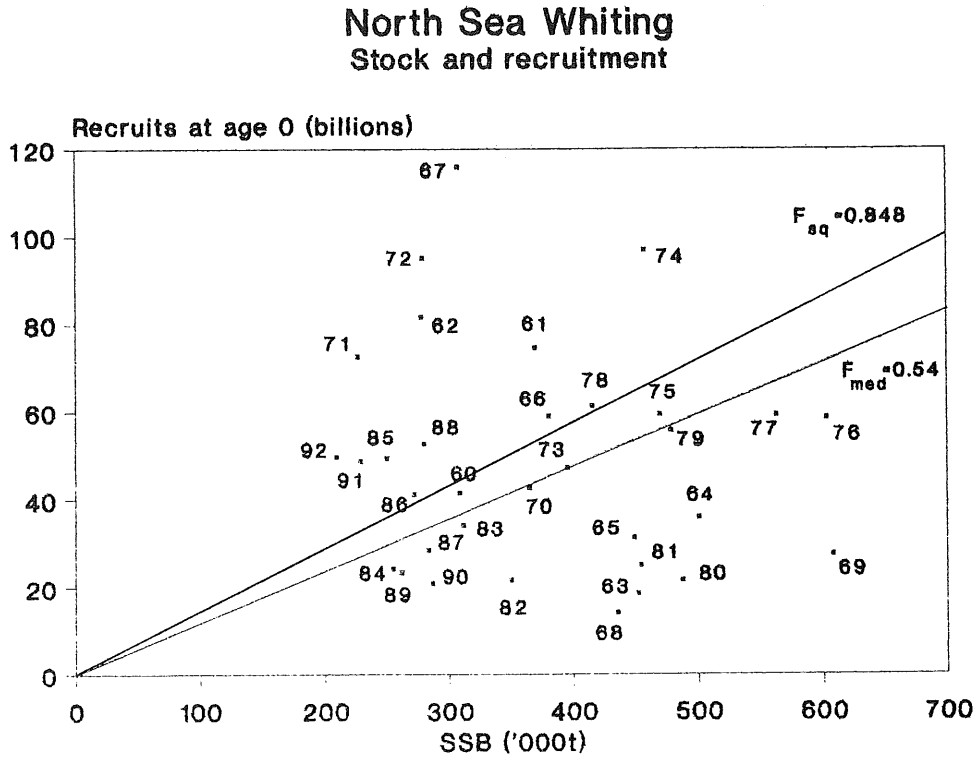


Figure 3.4.5 Whiting, North Sea. Yield per recruit.

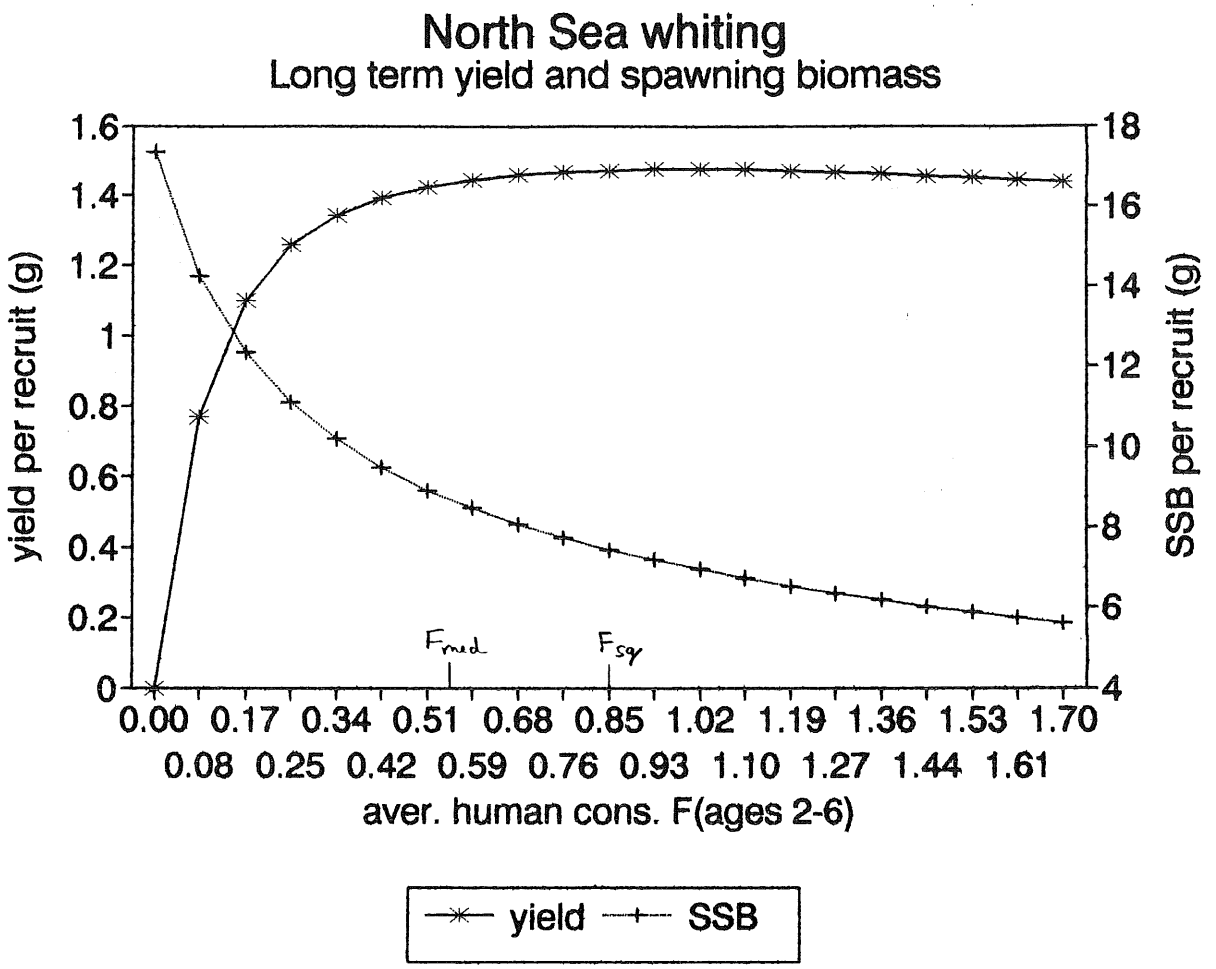


Figure 3.4.6 Whiting, North Sea. Short term forecast.

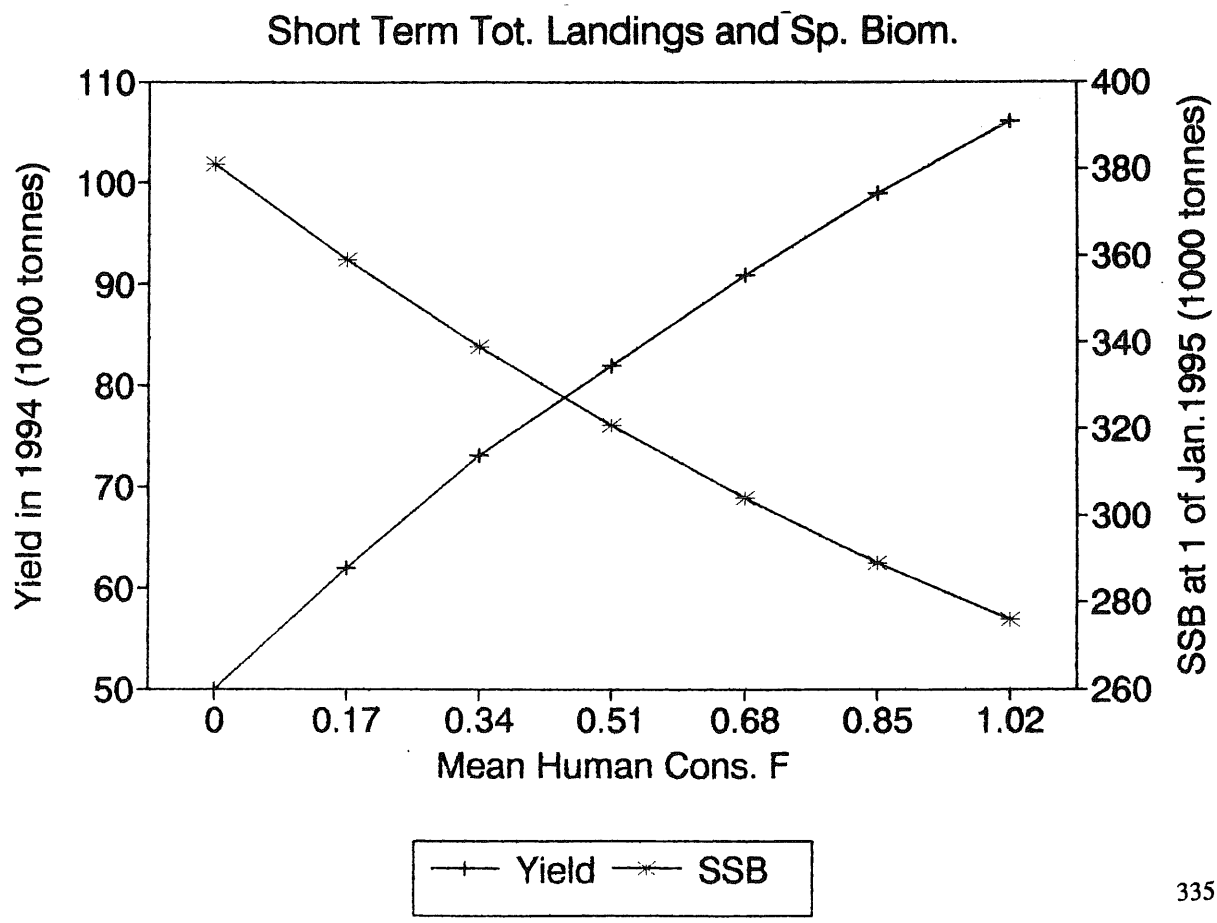
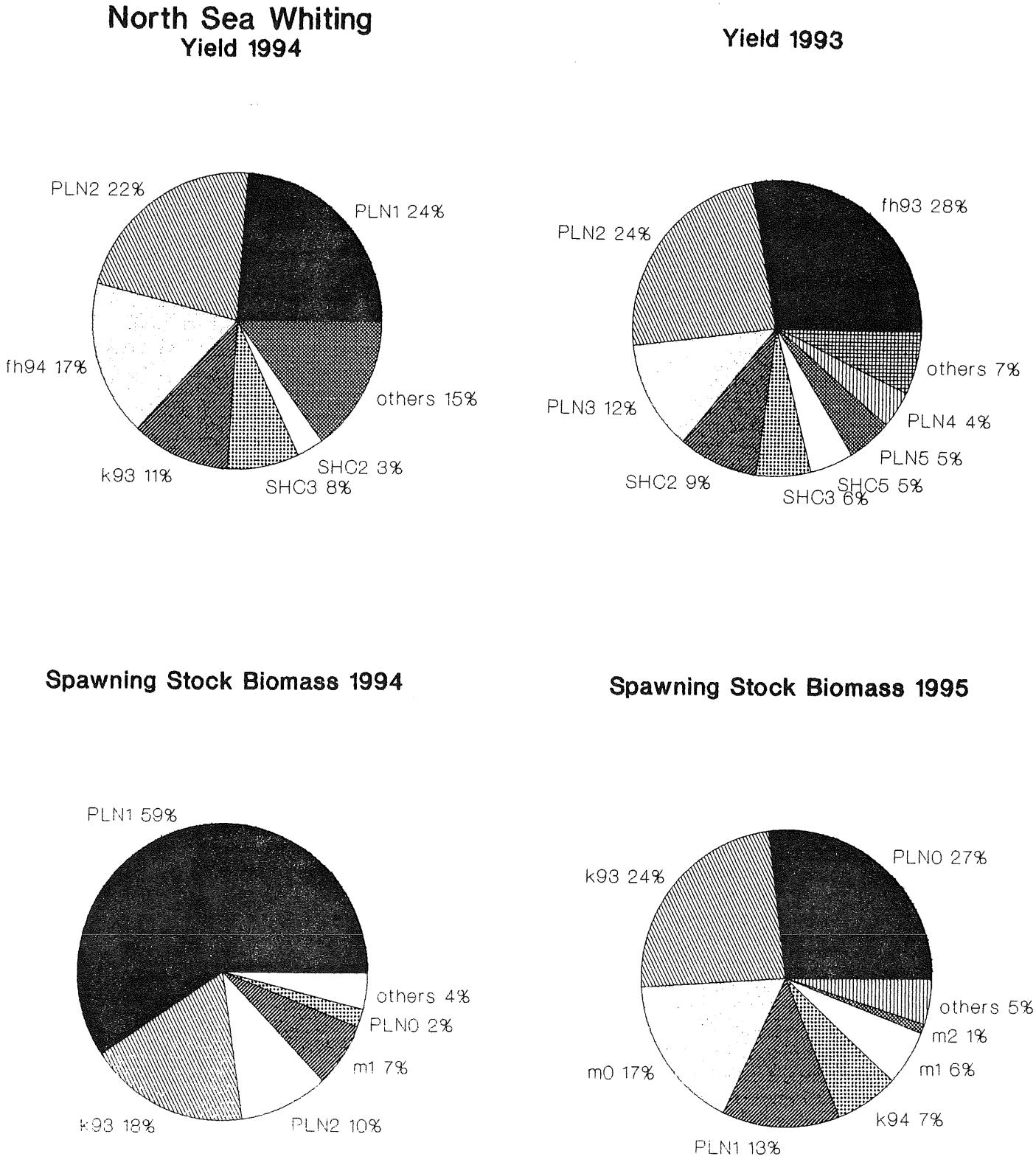


Figure 3.4.7 Whiting, North Sea. Sensitivity analysis : partial variances for yield and SSB.



List of abbreviations in Table 3.4.19.

Figure 3.4.8 Whiting, North Sea. Probability profile for 94 yield.

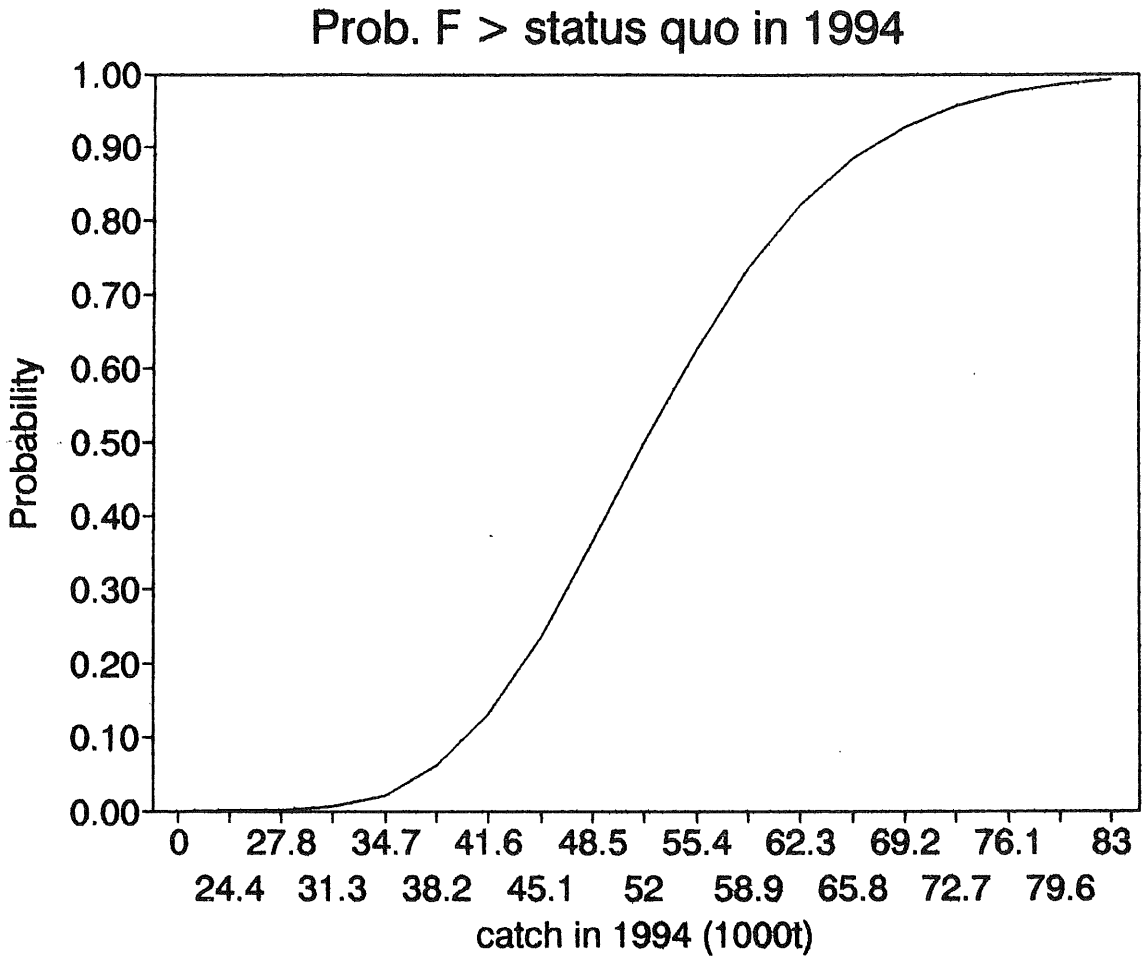


Figure 3.4.9 Whiting, North Sea. Probability profile for 95 SSB.

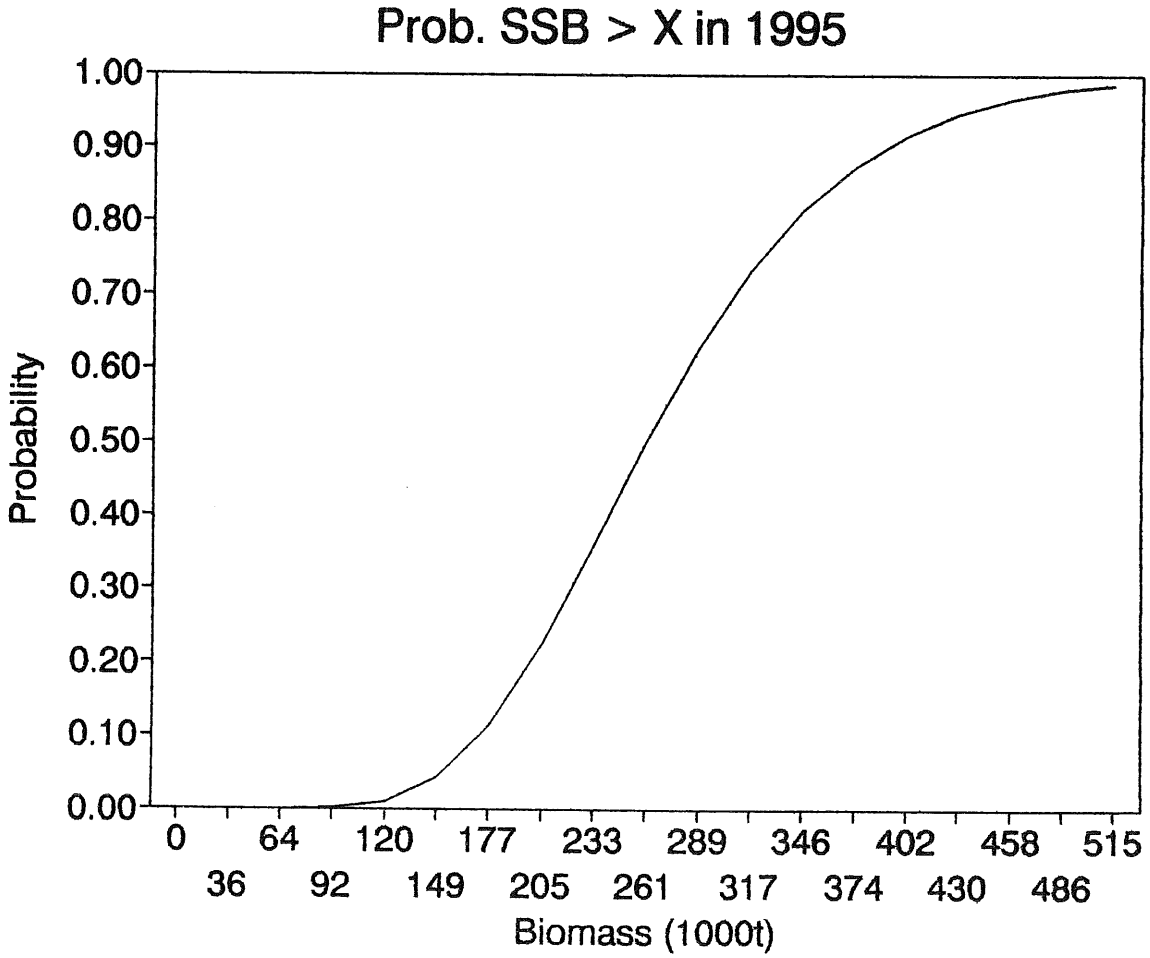
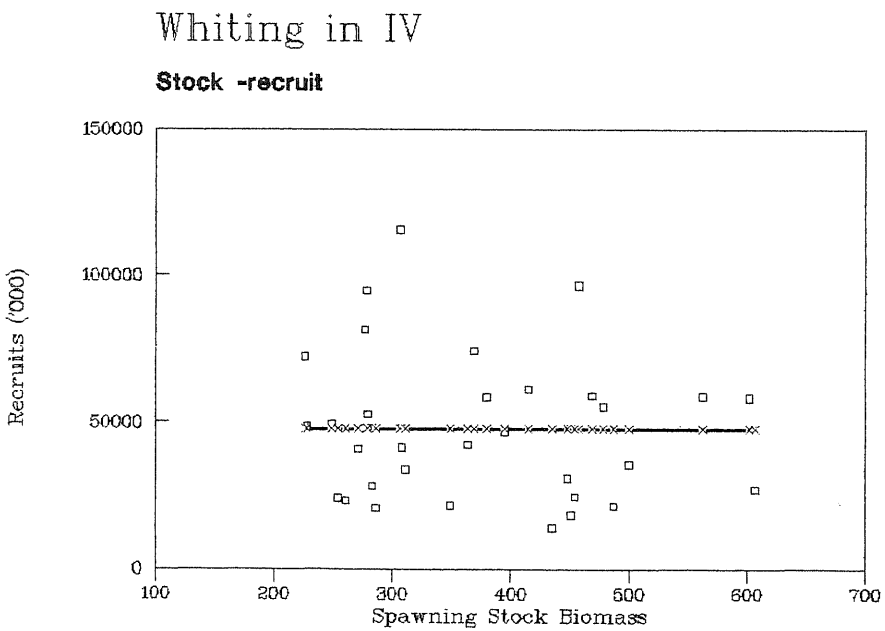
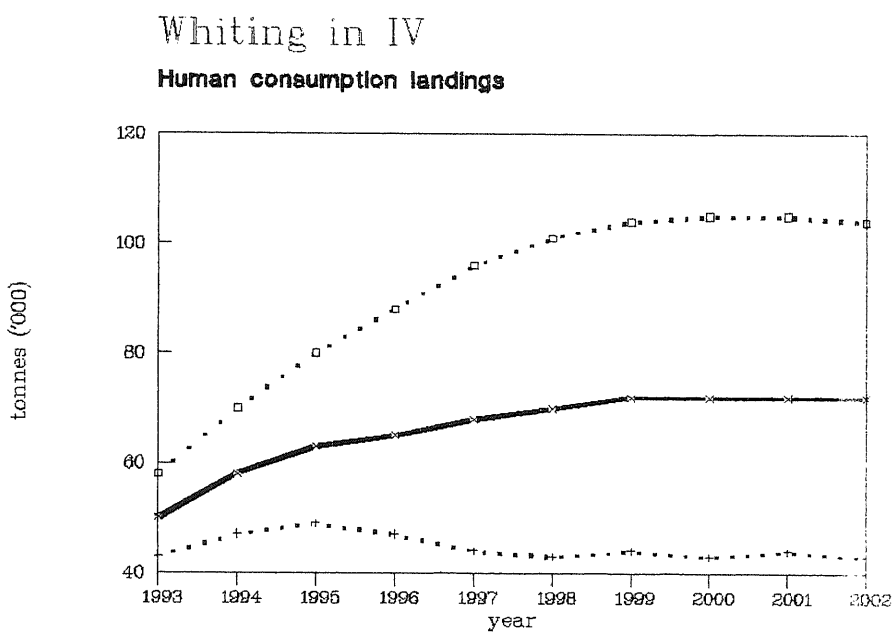
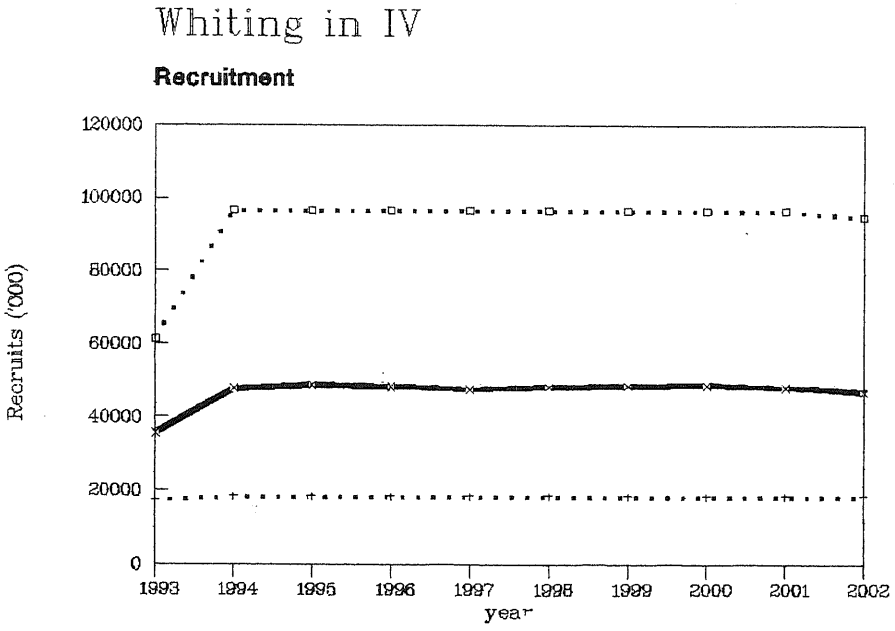


Figure 3.4.10 **Whiting, North Sea. Medium term projection of yield, recruitment and SSB.**







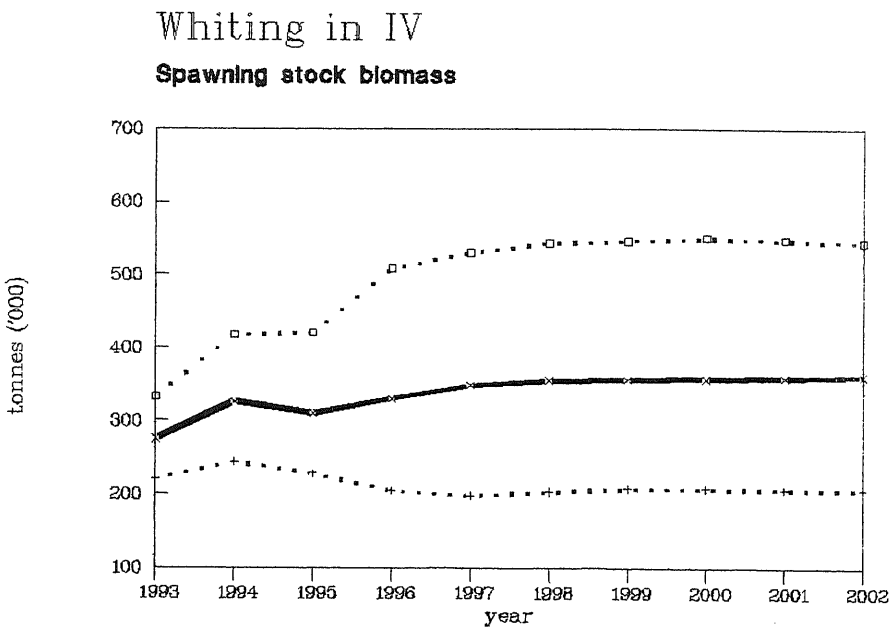


Figure 3.5.1 Saithe, North Sea and Division IIIa.

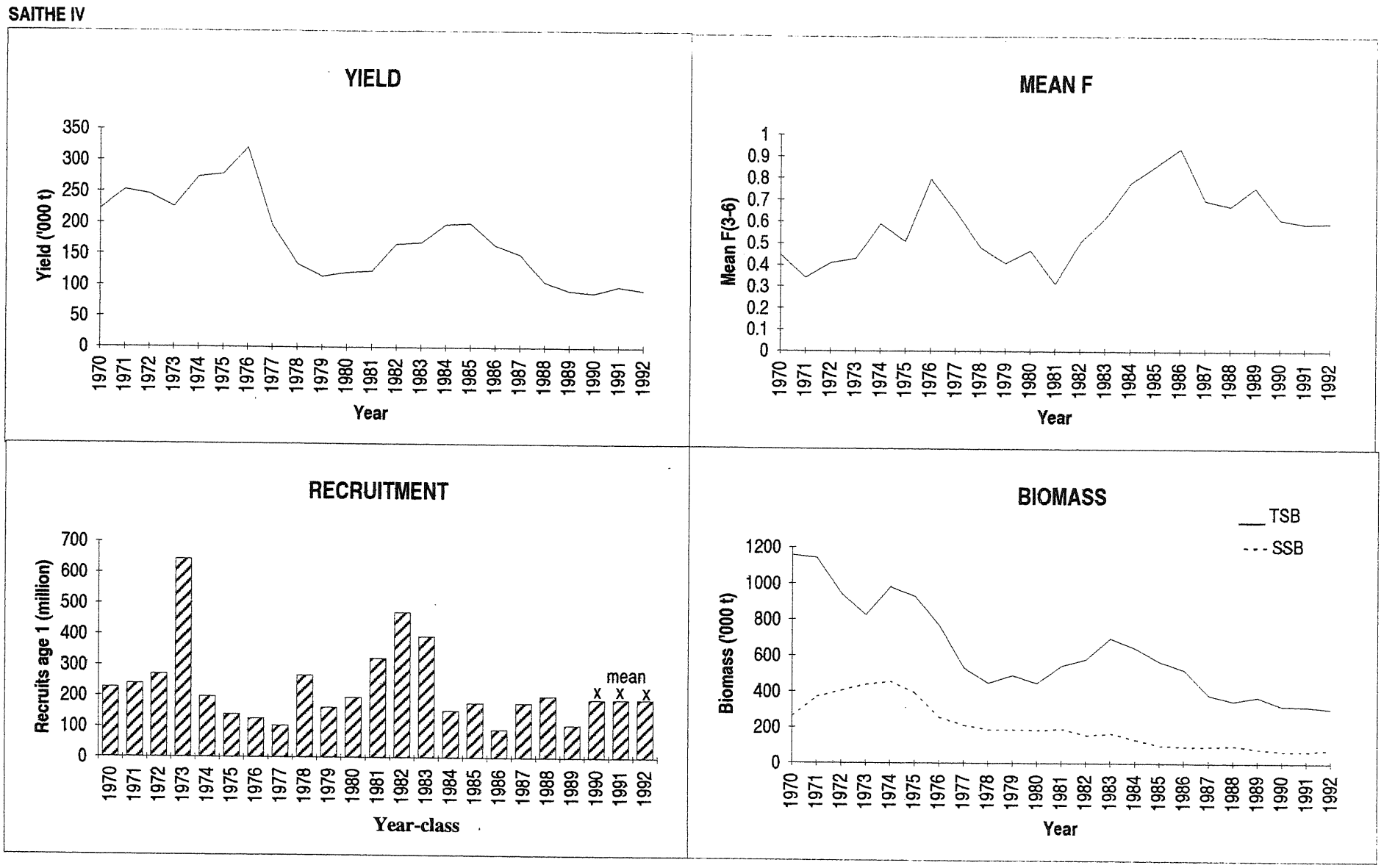
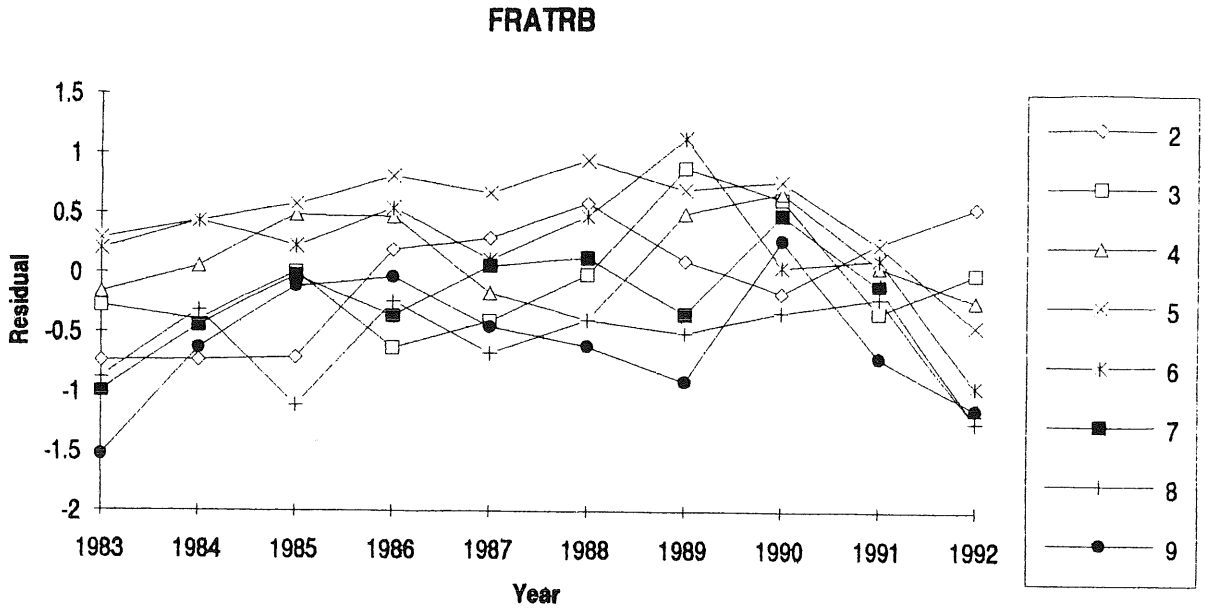


Figure 3.5.2


FRATRB
Residual
1.5
1
0.5
0
-0.5
-1
-1.5
-2
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
2
3
4
5
6
7
8
9

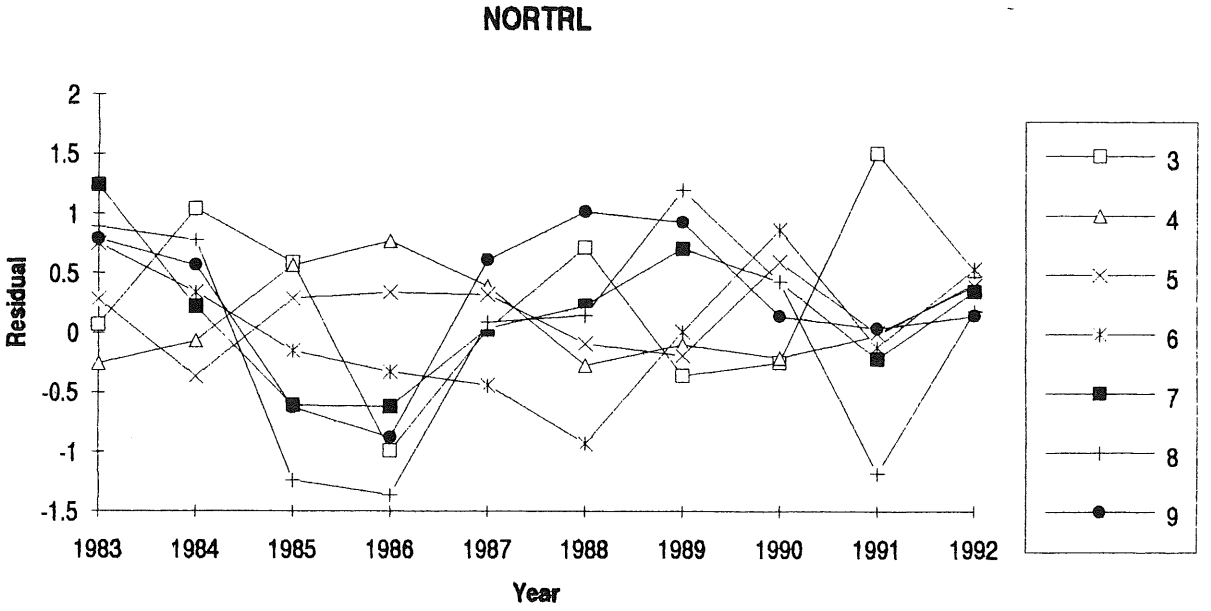

NORTRL
Residual
2
1.5
1
0.5
0
-0.5
-1
-1.5
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
3
4
5
6
7
8
9

Figure 3.5.3

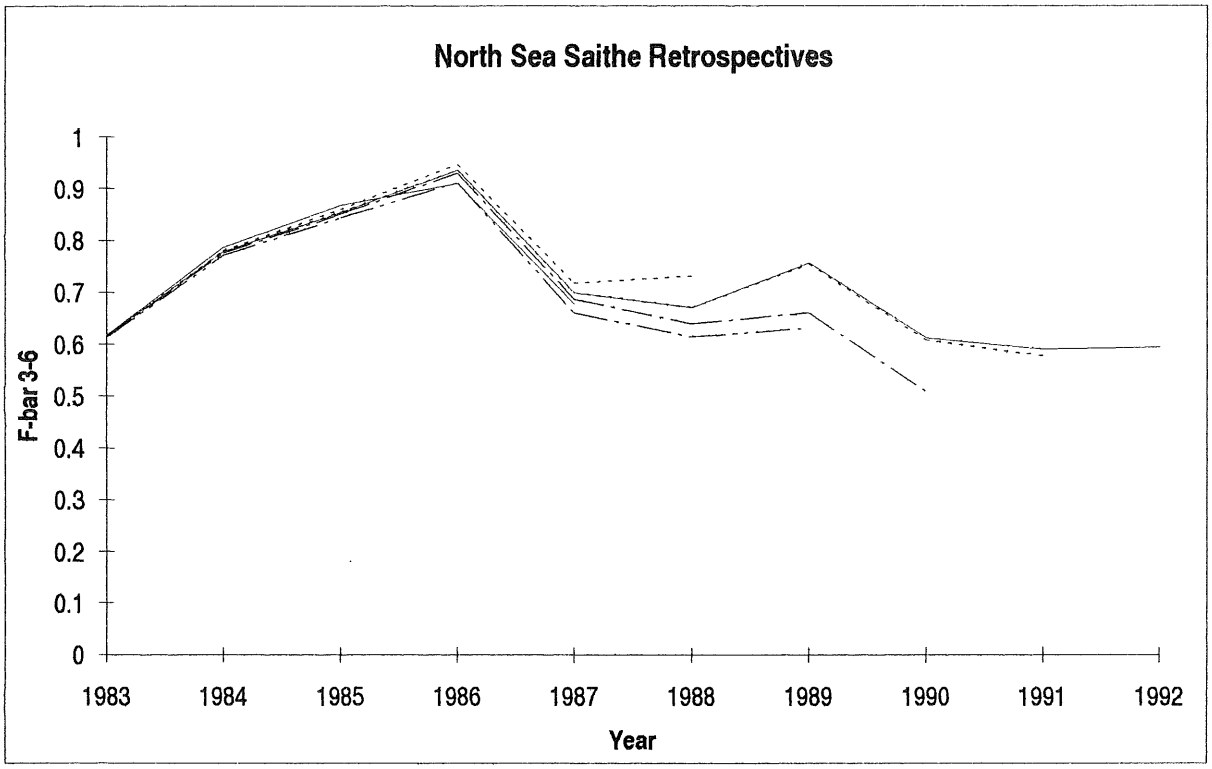

North Sea Saithe Retrospectives
F-bar 3-6
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year

Figure 3.5.4

SUMMARY2.XLS Chart 5

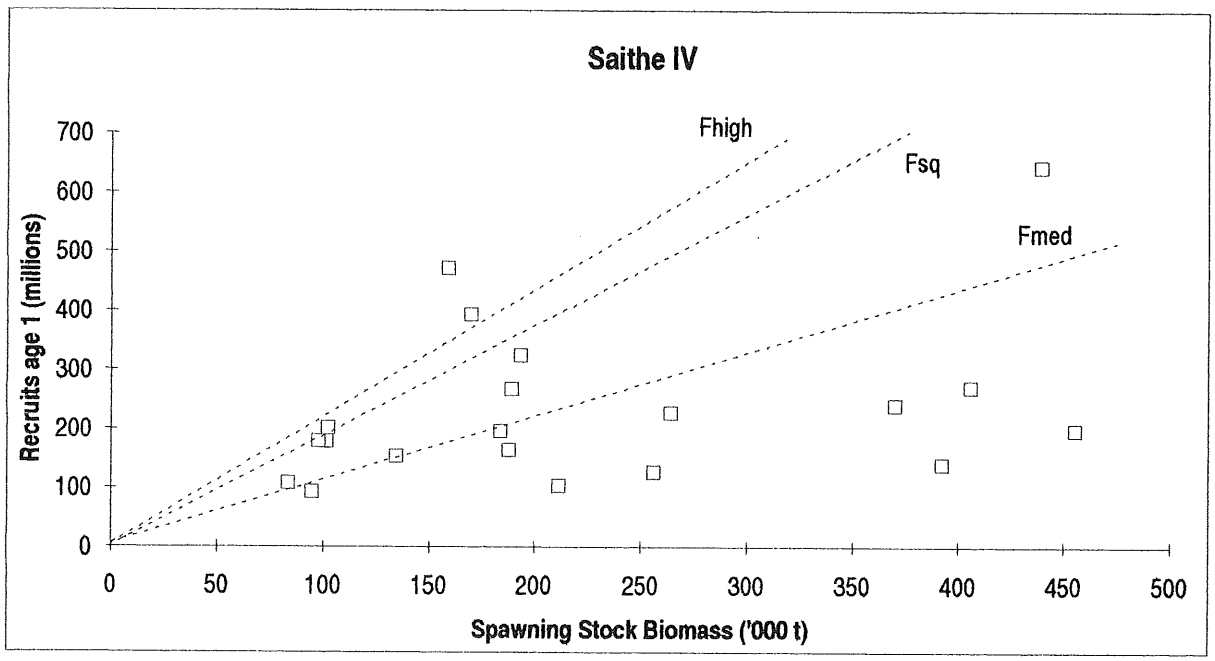
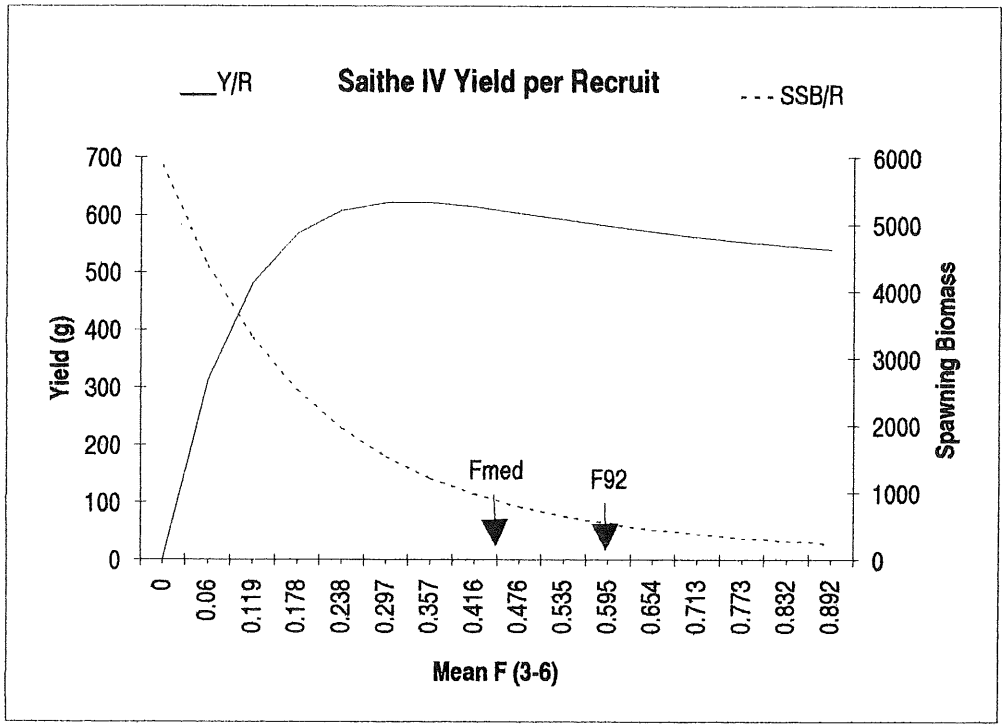


Figure 3.5.5

SUMMARY.XLS



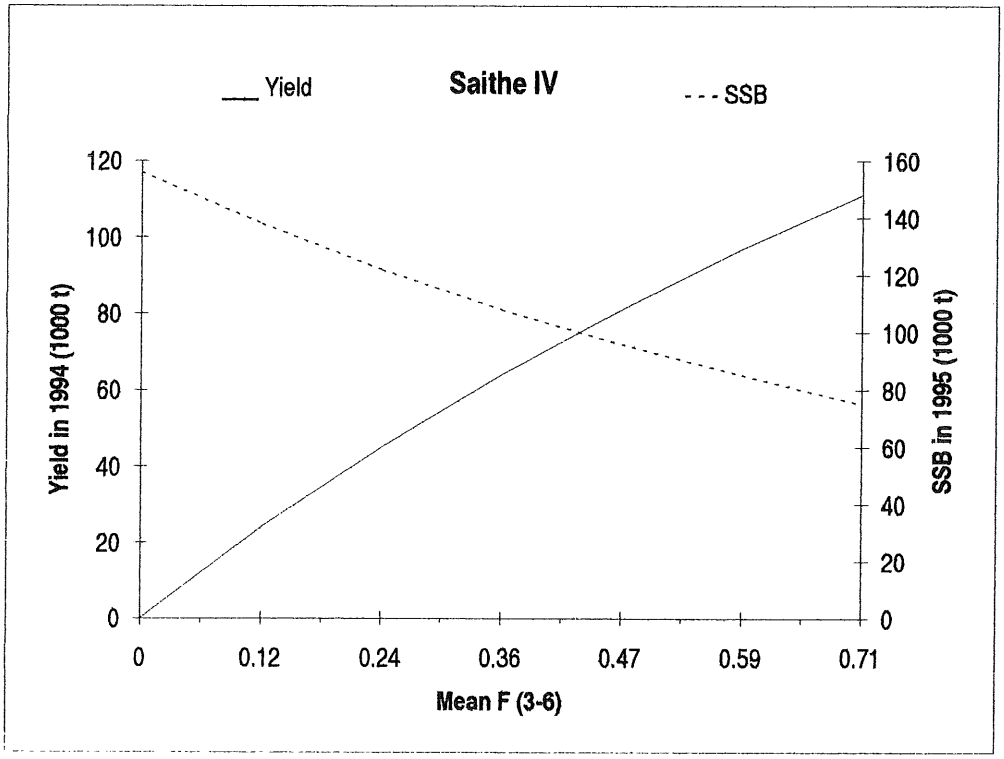
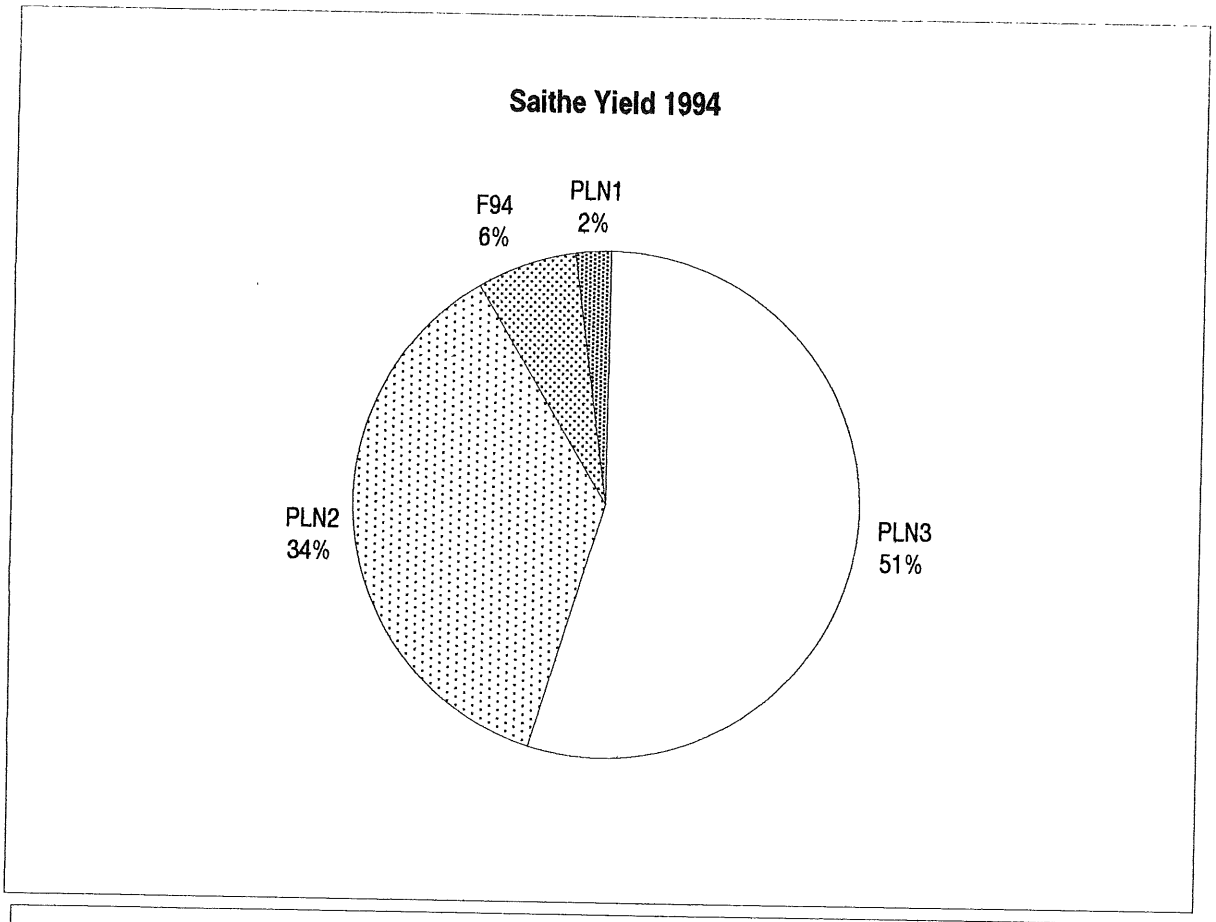


Figure 3.5.6


Saithe Yield 1994
F94
6%
PLN1
2%
PLN2
34%
PLN3
51%

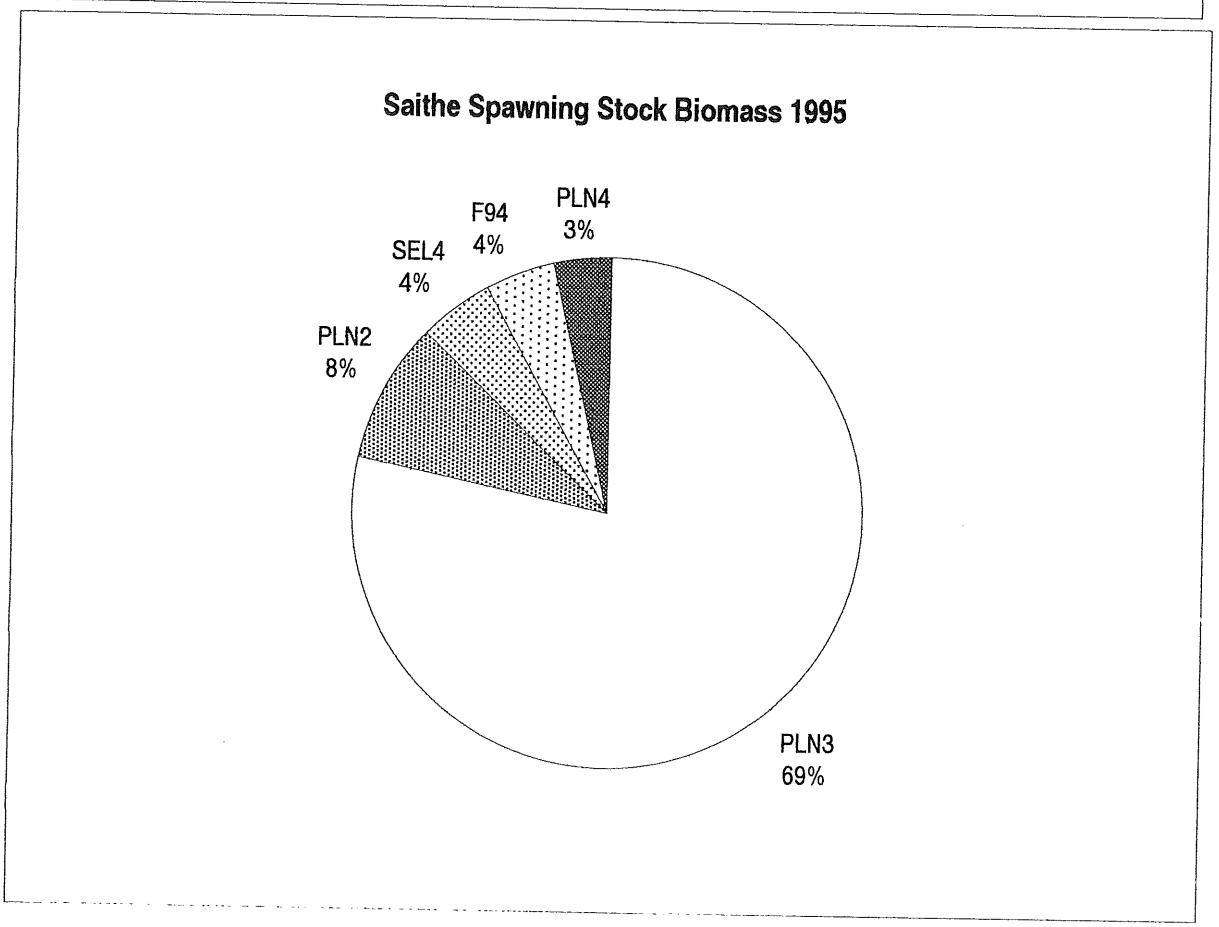

Saithe Spawning Stock Biomass 1995
F94
4%
PLN4
3%
SEL4
4%
PLN2
8%
PLN3
69%

Figure 3.5.7

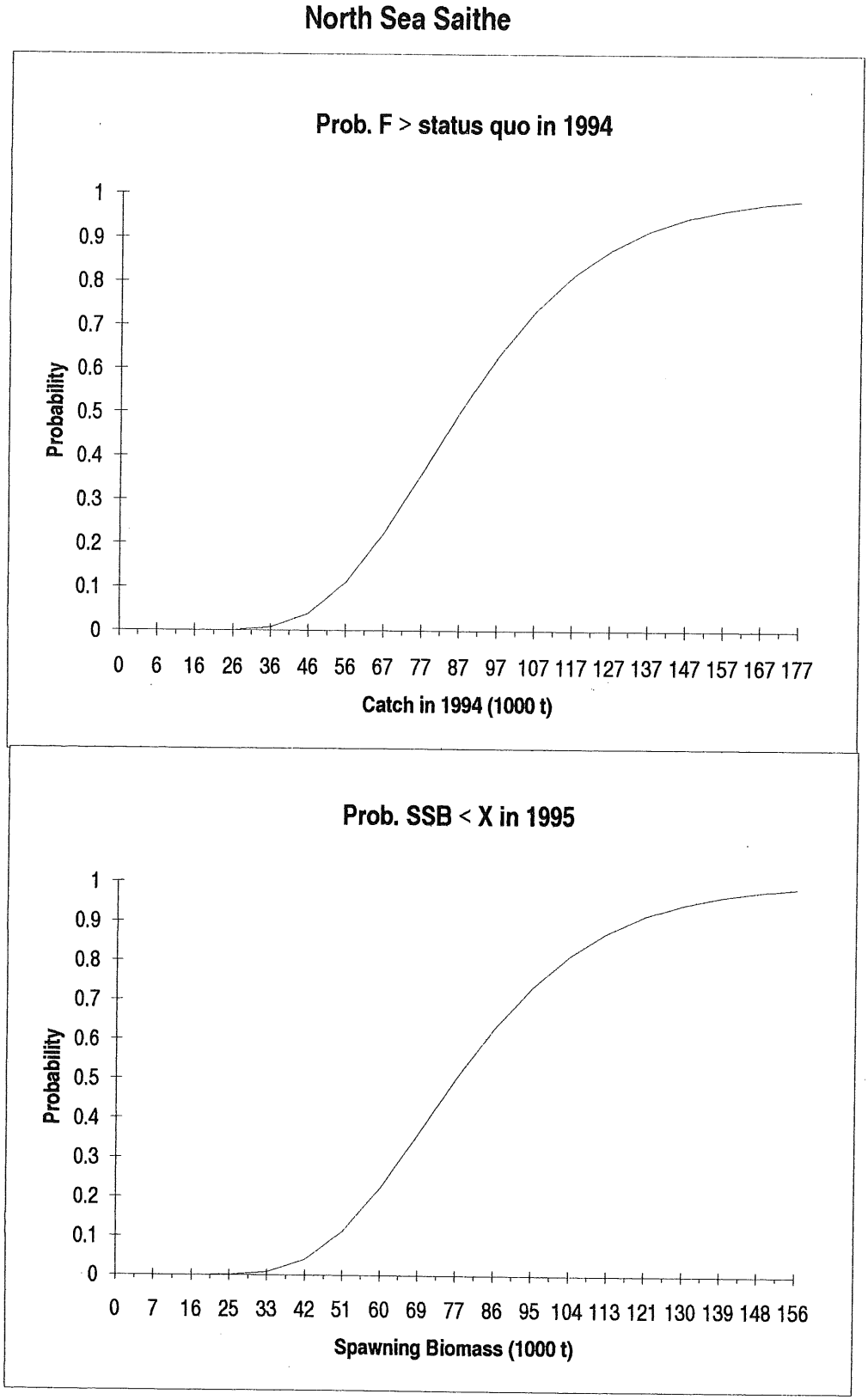

North Sea Saithe
Prob. F > status quo in 1994
Probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 6 16 26 36 46 56 67 77 87 97 107 117 127 137 147 157 167 177
Catch in 1994 (1000 t)
Prob. SSB < X in 1995
Probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 7 16 25 33 42 51 60 69 77 86 95 104 113 121 130 139 148 156
Spawning Biomass (1000 t)

Figure 3.5.8

North Sea Saithe

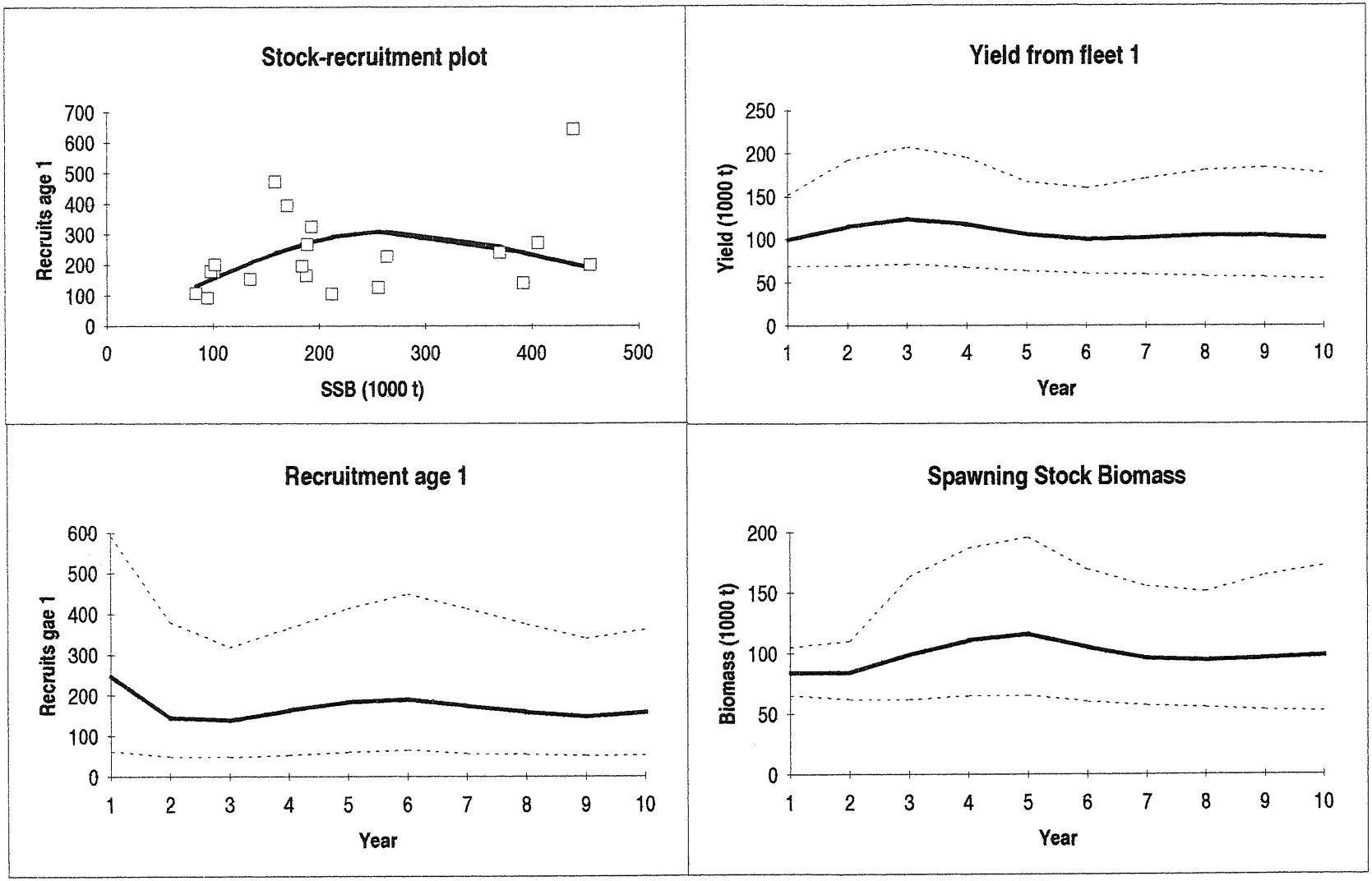


Figure 3.5.9

North Sea Saithe

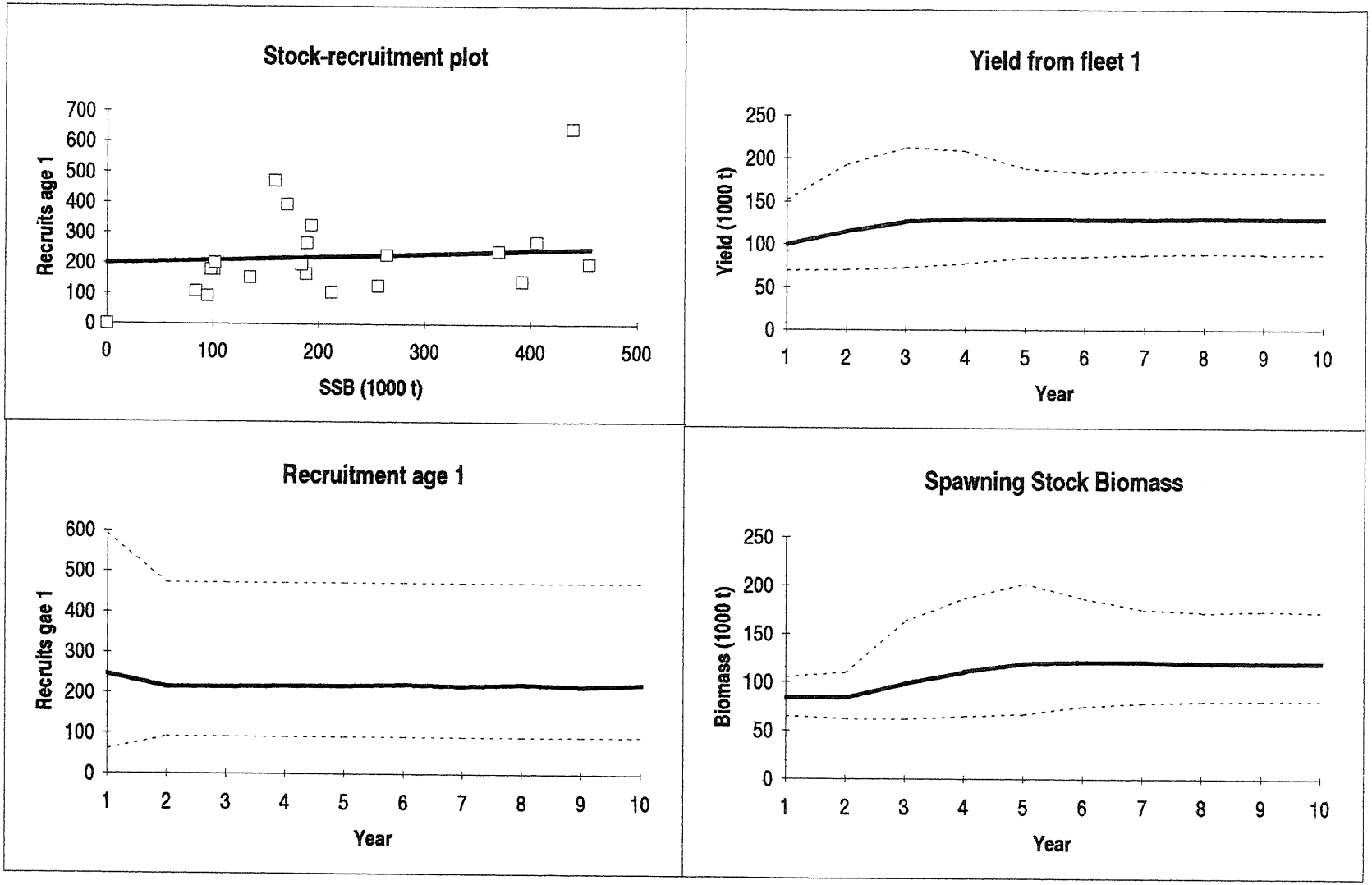


Figure 3.6.1

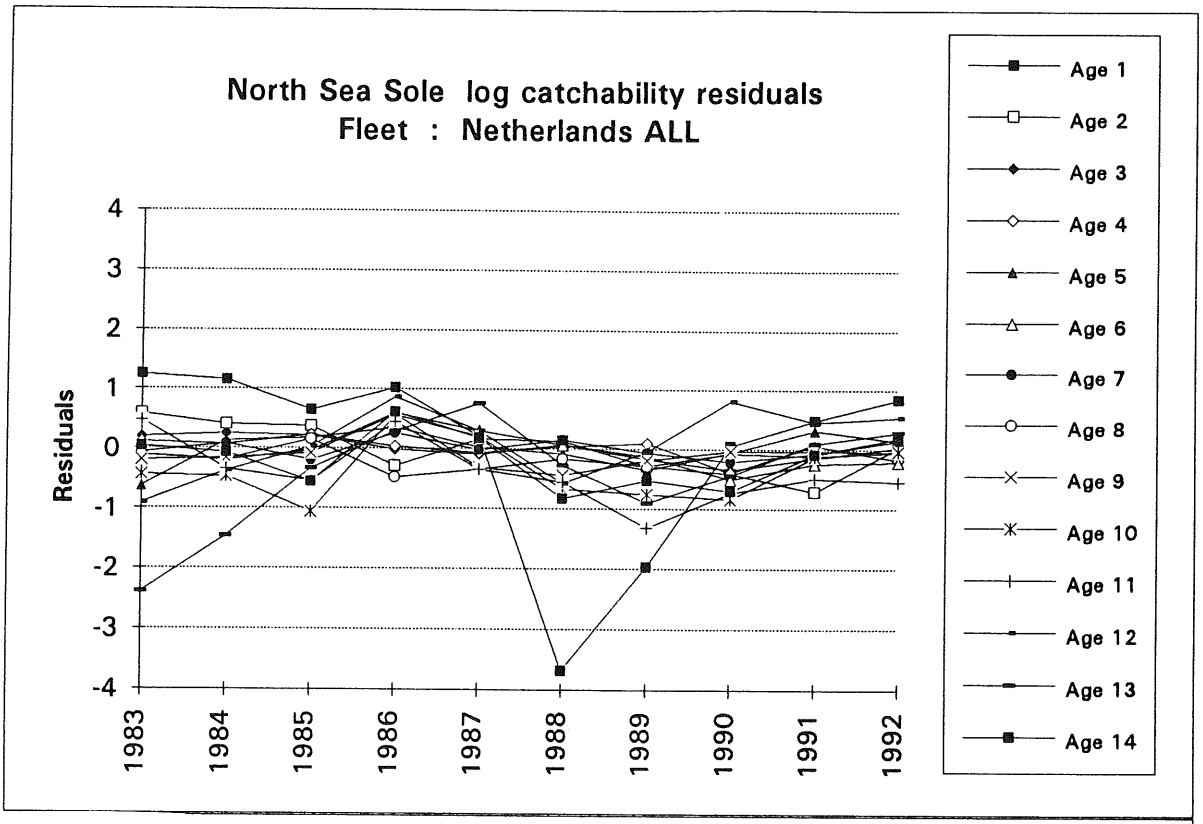


Figure 3.6.2

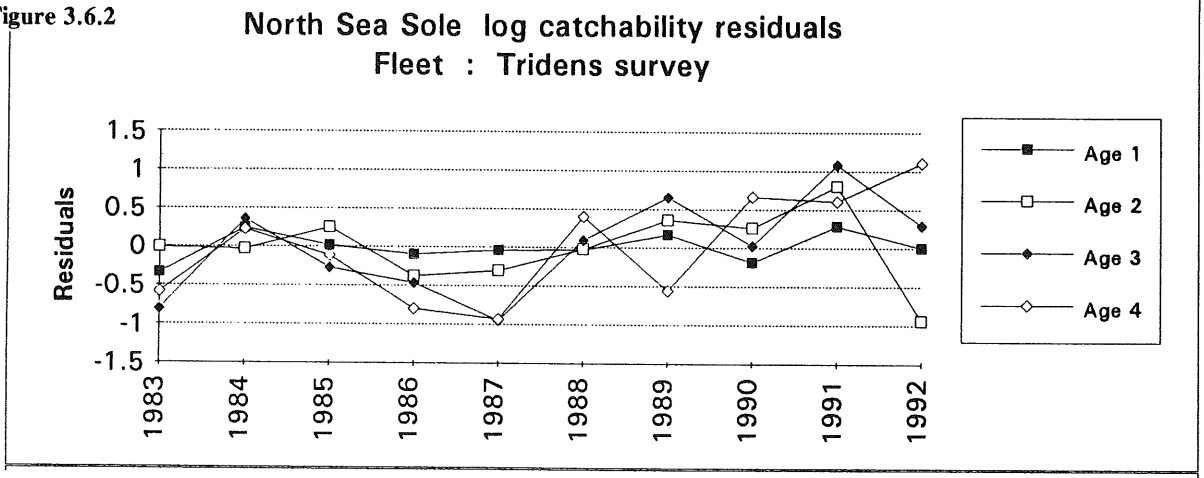


Figure 3.6.3

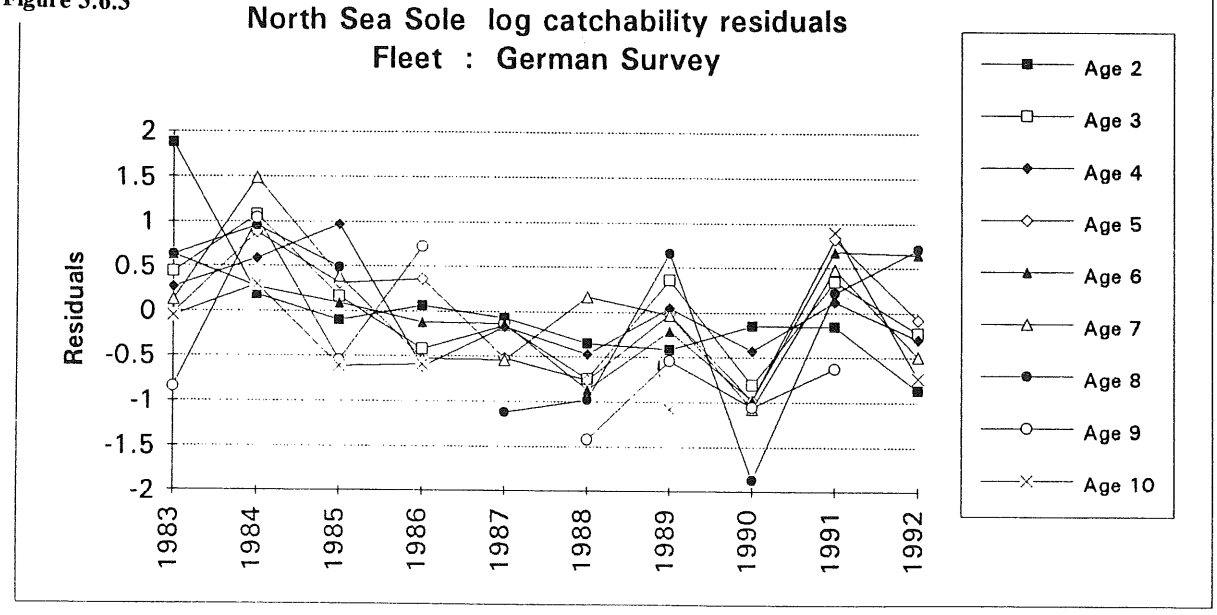


Figure 3.6.4

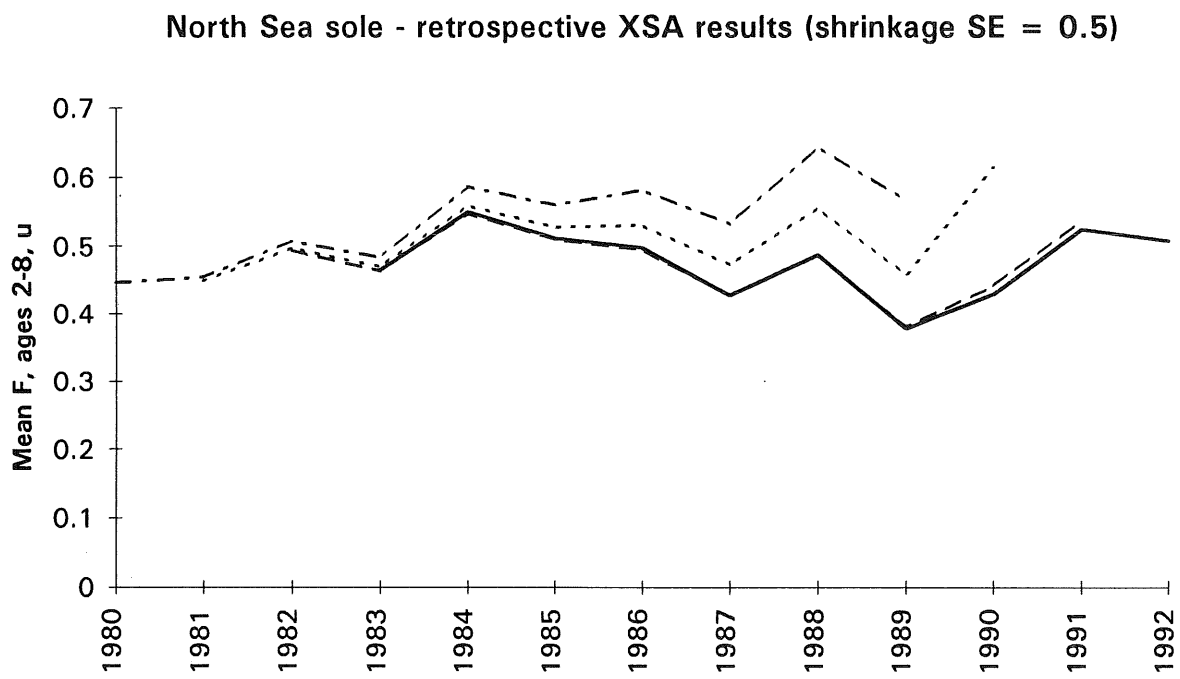

North Sea sole - retrospective XSA results (shrinkage SE = 0.5)
Mean F, ages 2-8, u
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

Figure 3.6.5 a-d

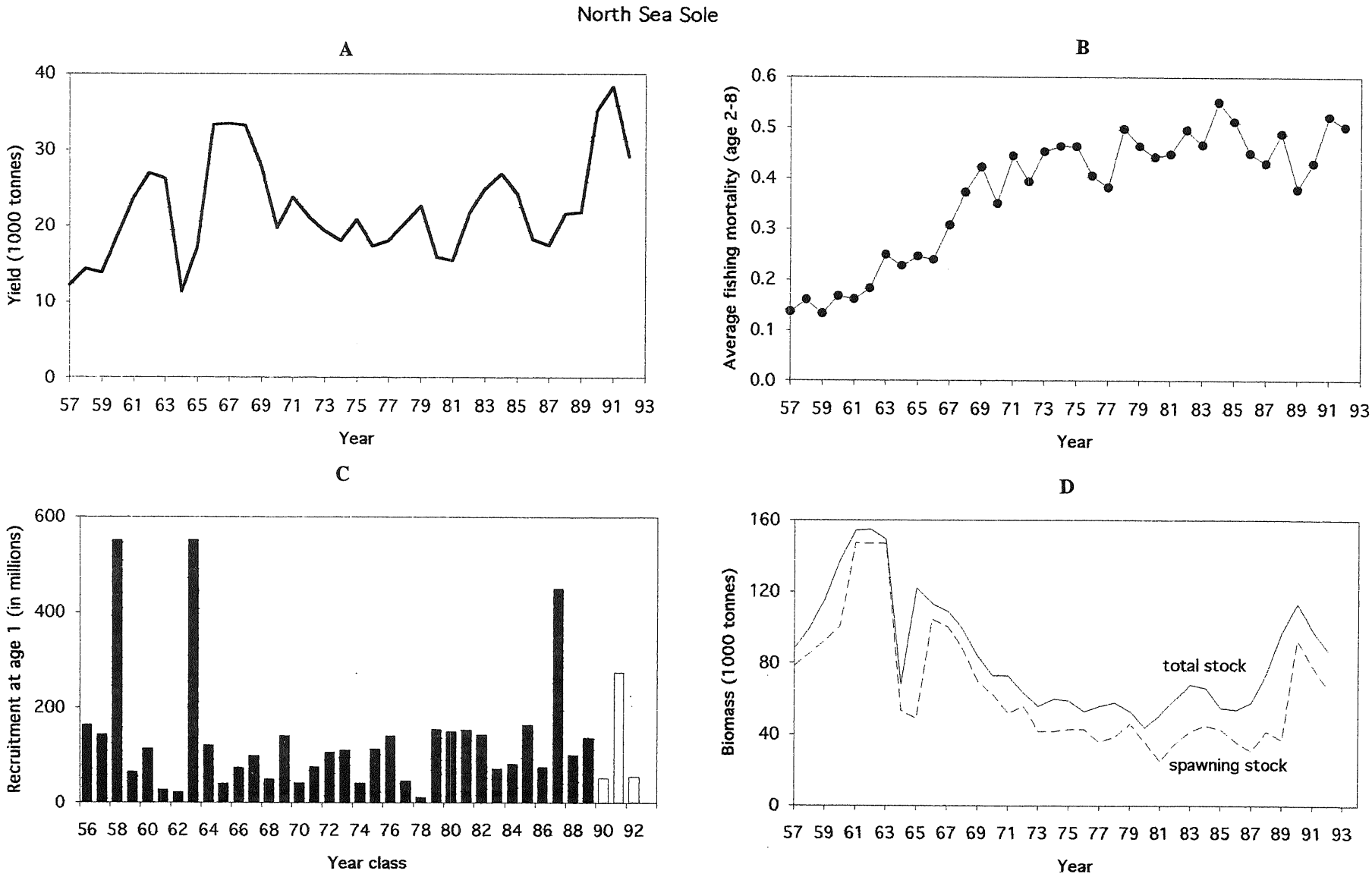


Figure 3.6.6.

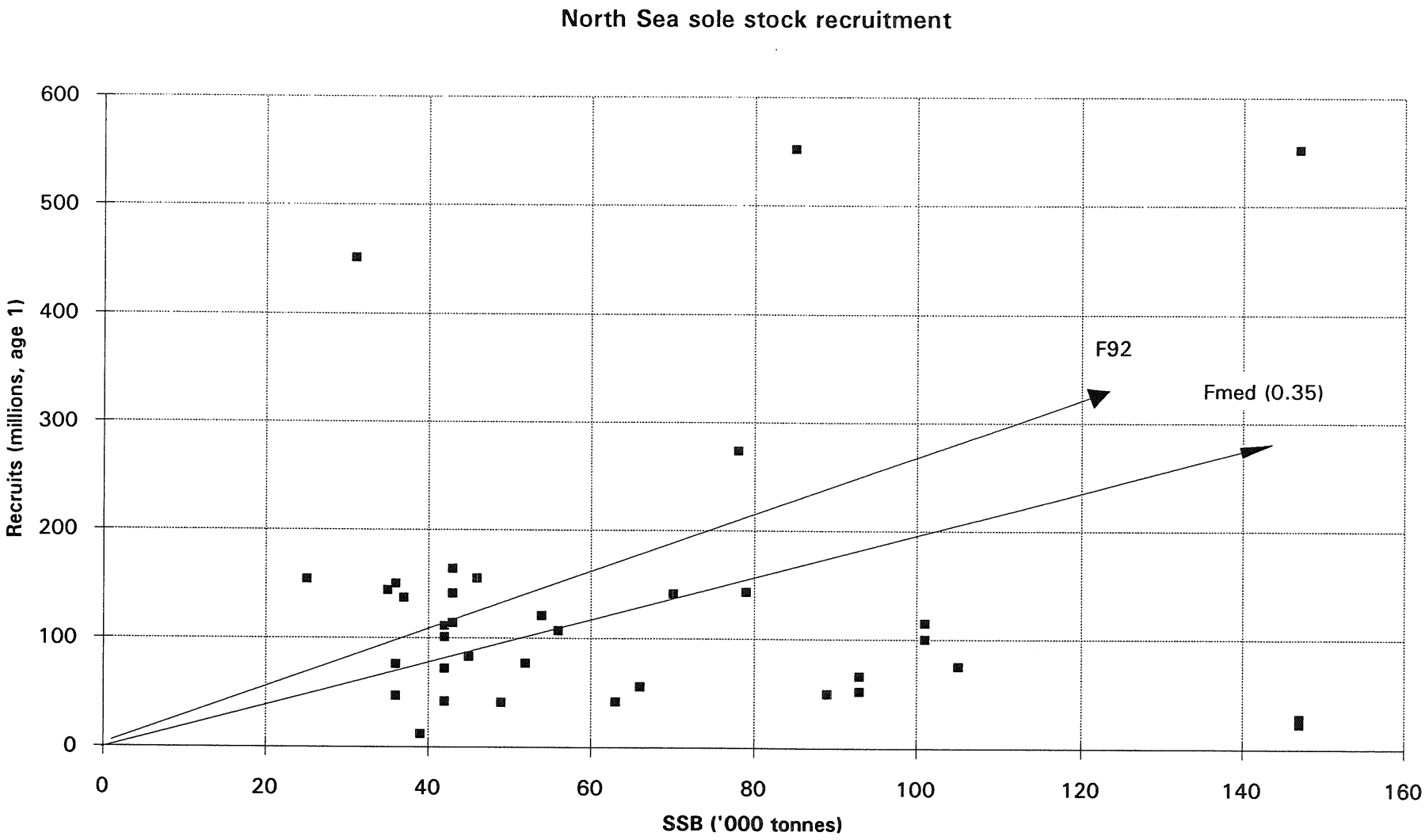
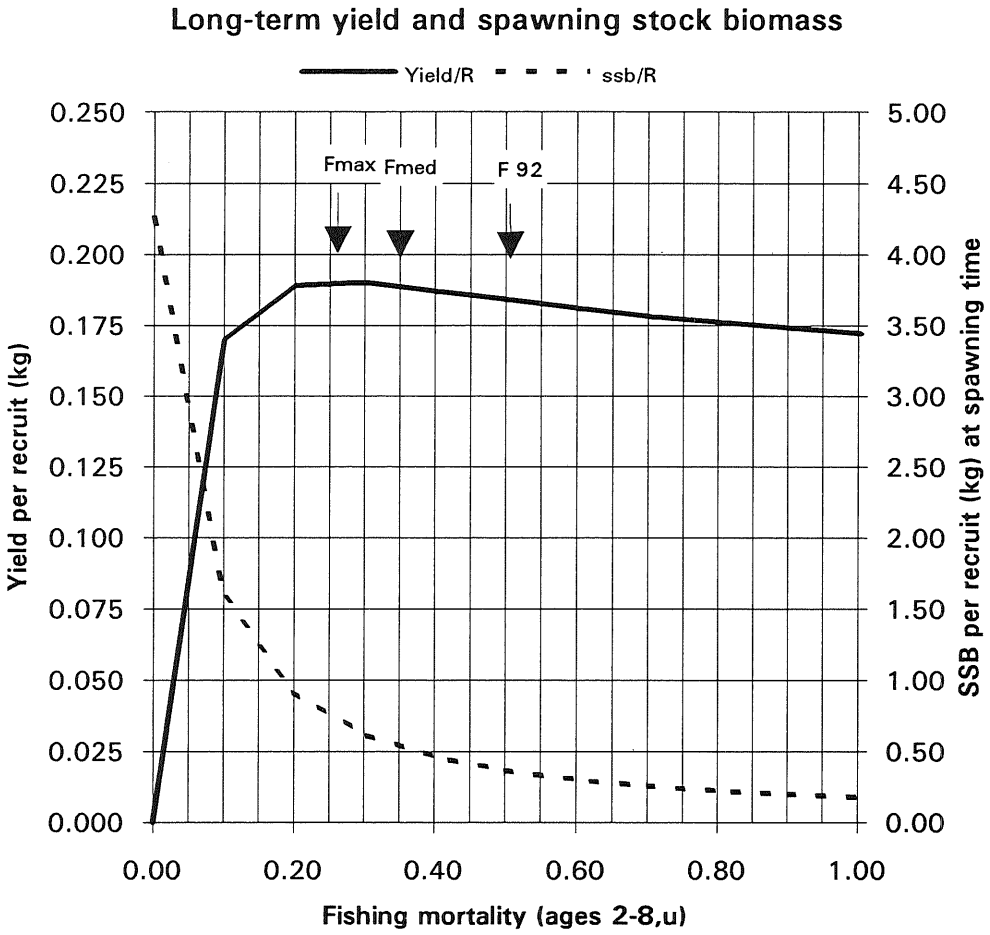

North Sea sole stock recruitment
Recruits (millions, age 1)
SSB ('000 tonnes)
F92
Fmed (0.35)
0
100
200
300
400
500
600
0
20
40
60
80
100
120
140
160

Figure 3.6.7

Figure 3.6.8

FISH STOCK SUMMARY
STOCK : North Sea sole



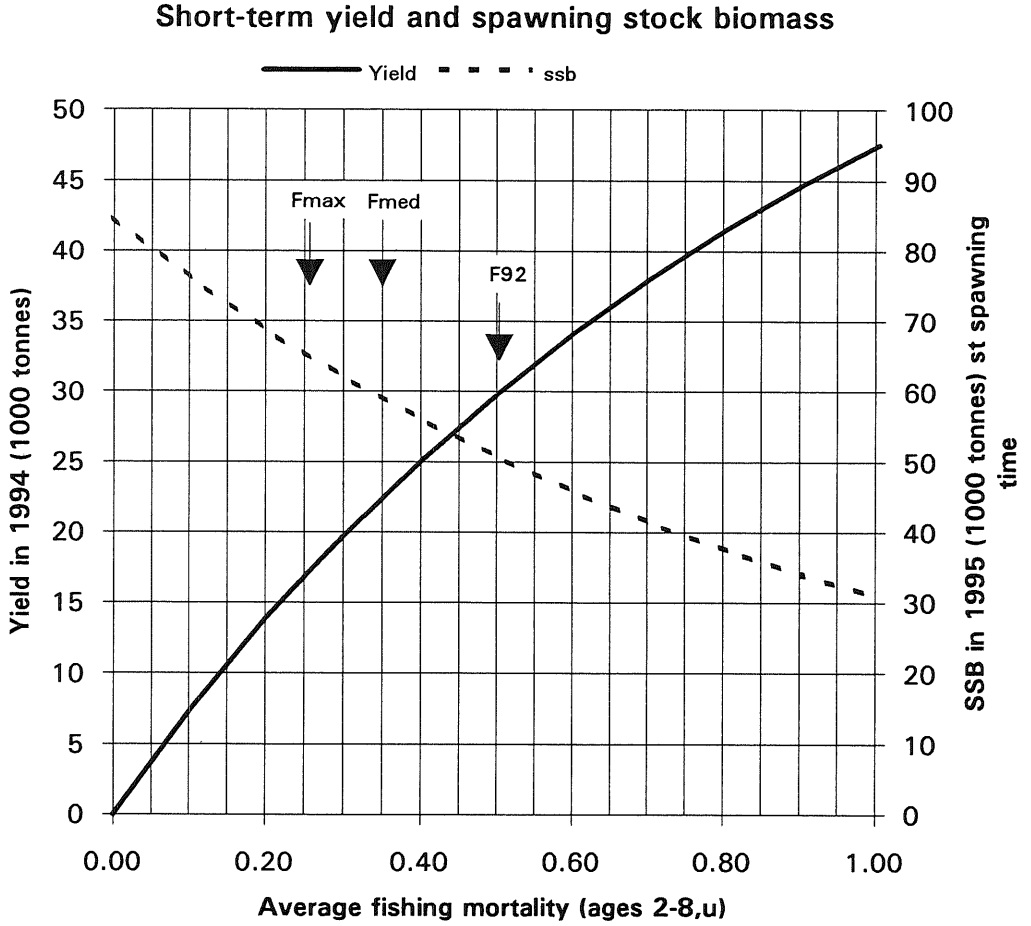


Figure 3.6.9

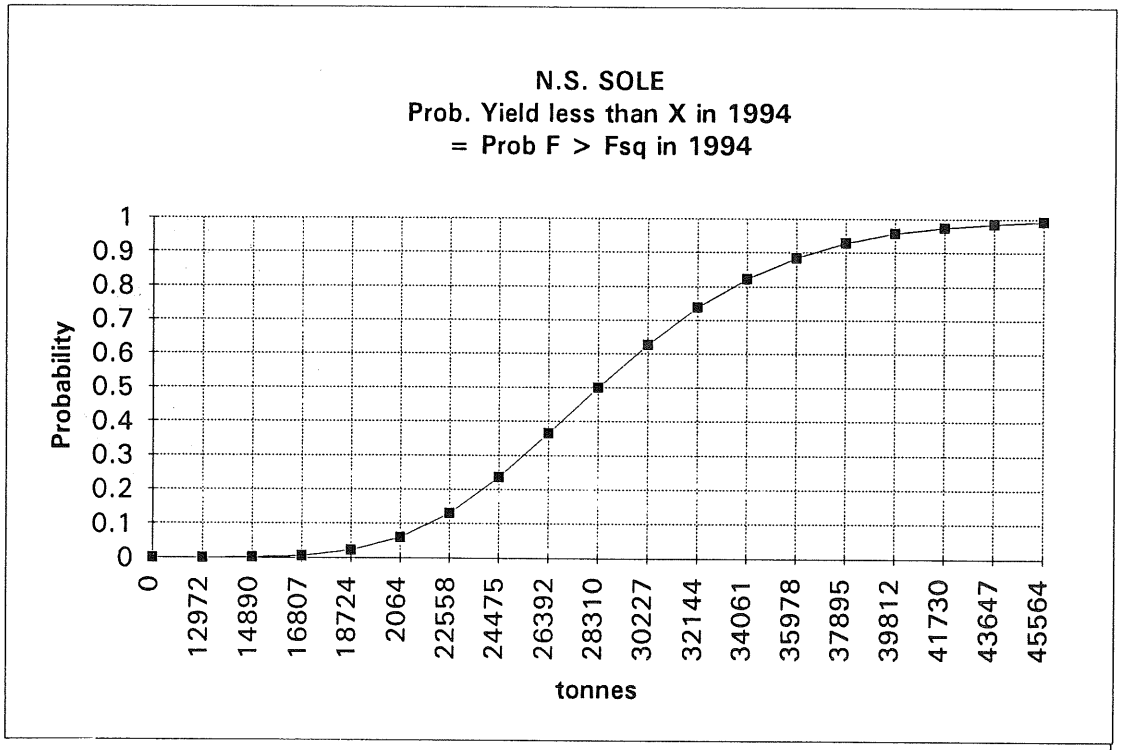


Figure 3.6.10

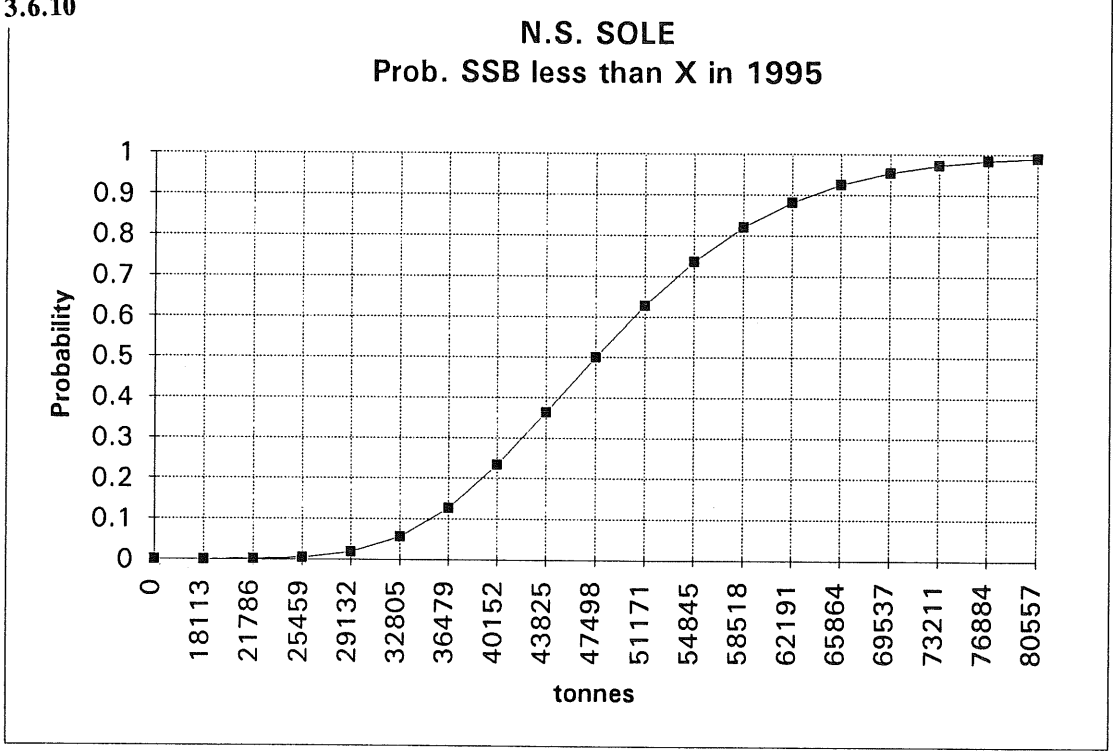
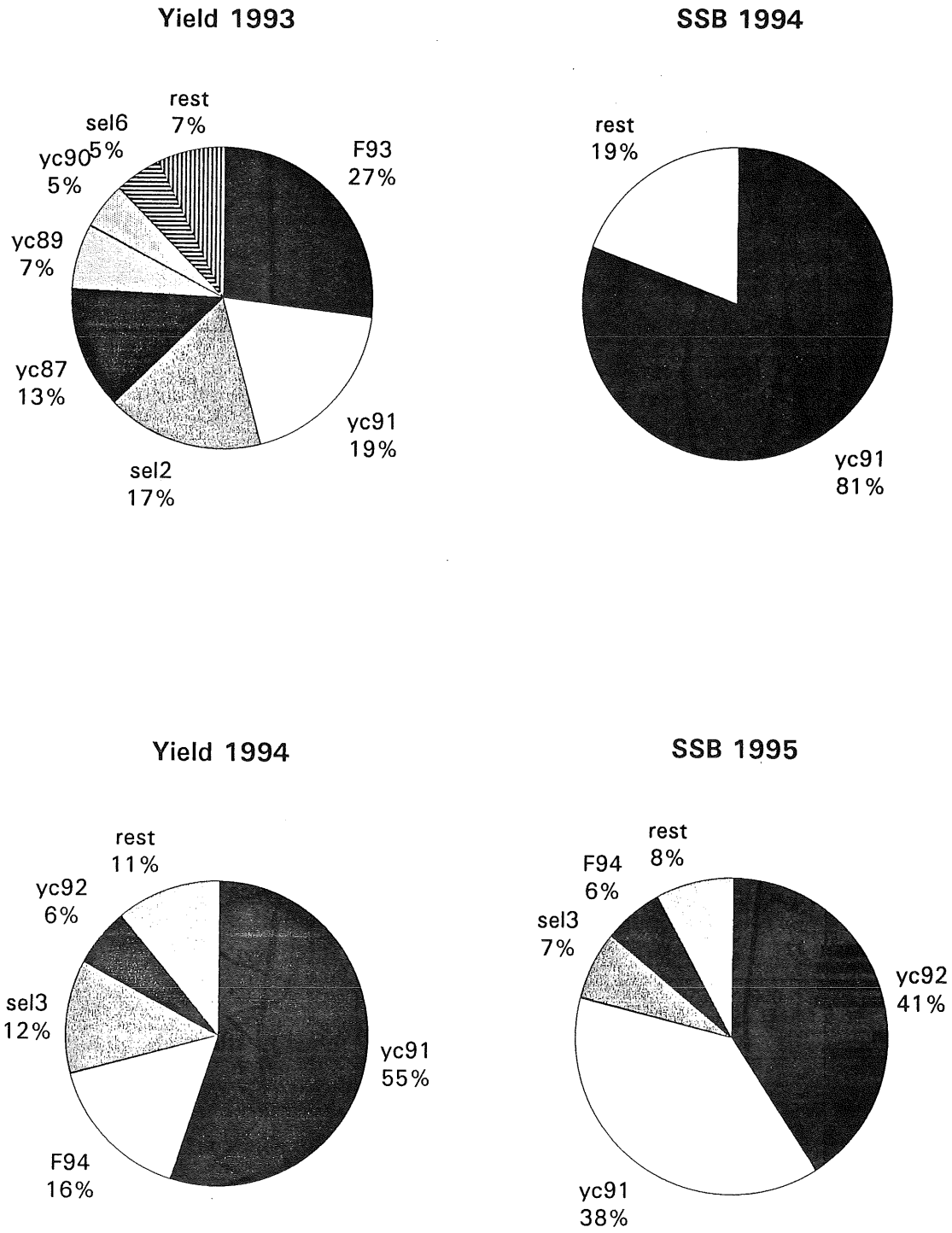


Figure 3.6.11 **North Sea sole, partial variances (proportions) of prediction.**



F: level of fishing mortality
yc: population numbers in year

sel: F at age
rest: remaining parameters combined

Figure 3.6.12

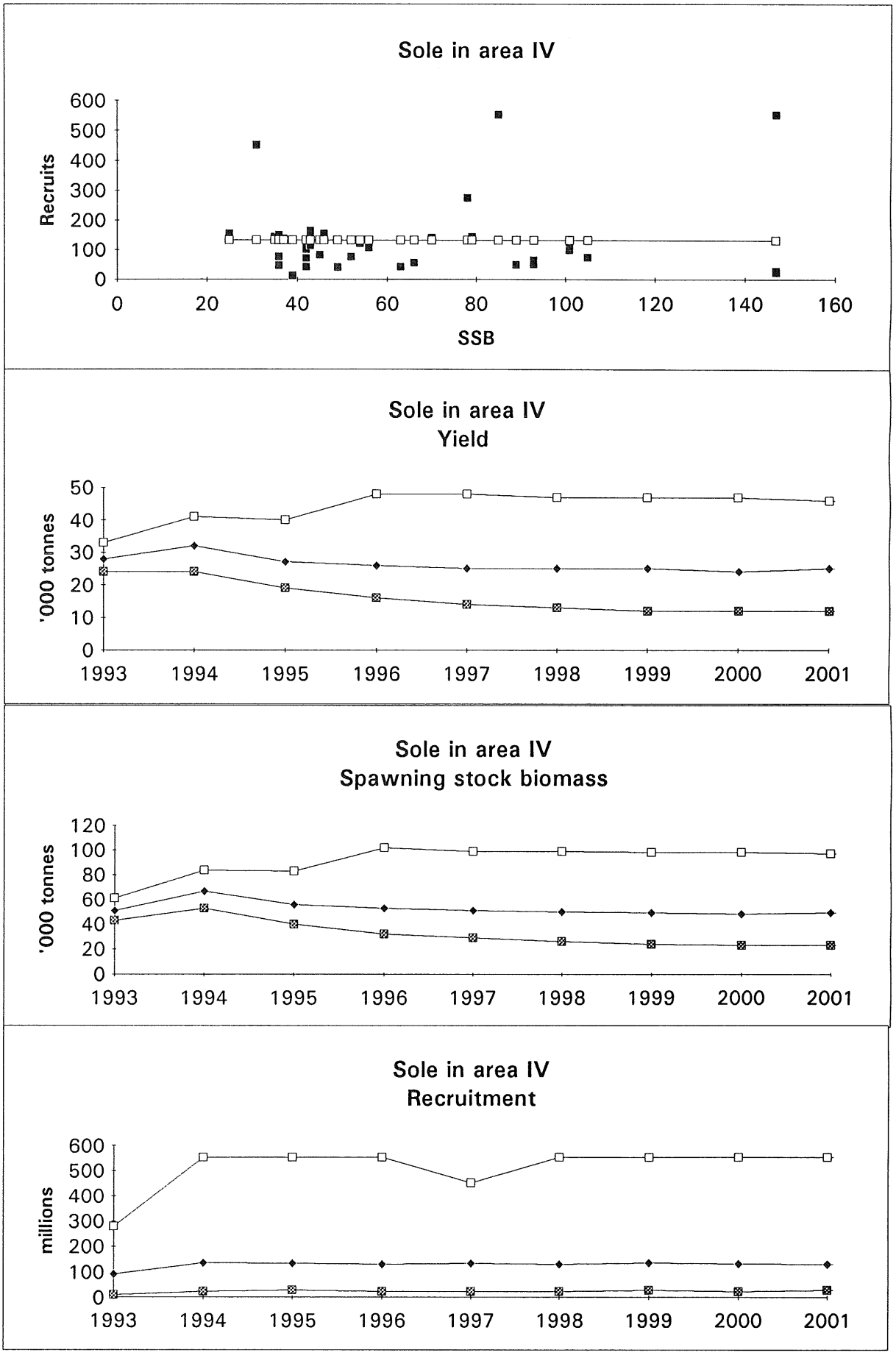

Sole in area IV
Recruits
SSB
Sole in area IV
Yield
'000 tonnes
Sole in area IV
Spawning stock biomass
'000 tonnes
Sole in area IV
Recruitment
millions

Figure 3.6.13

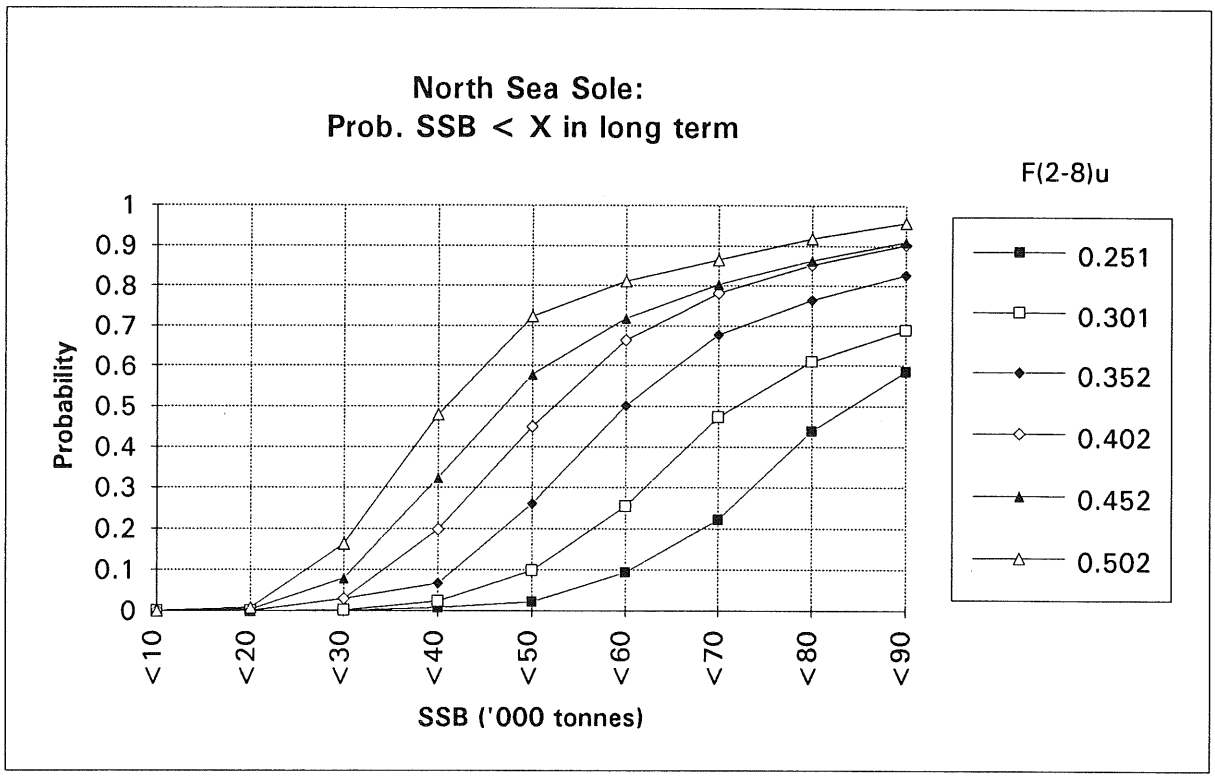


Figure 3.6.14

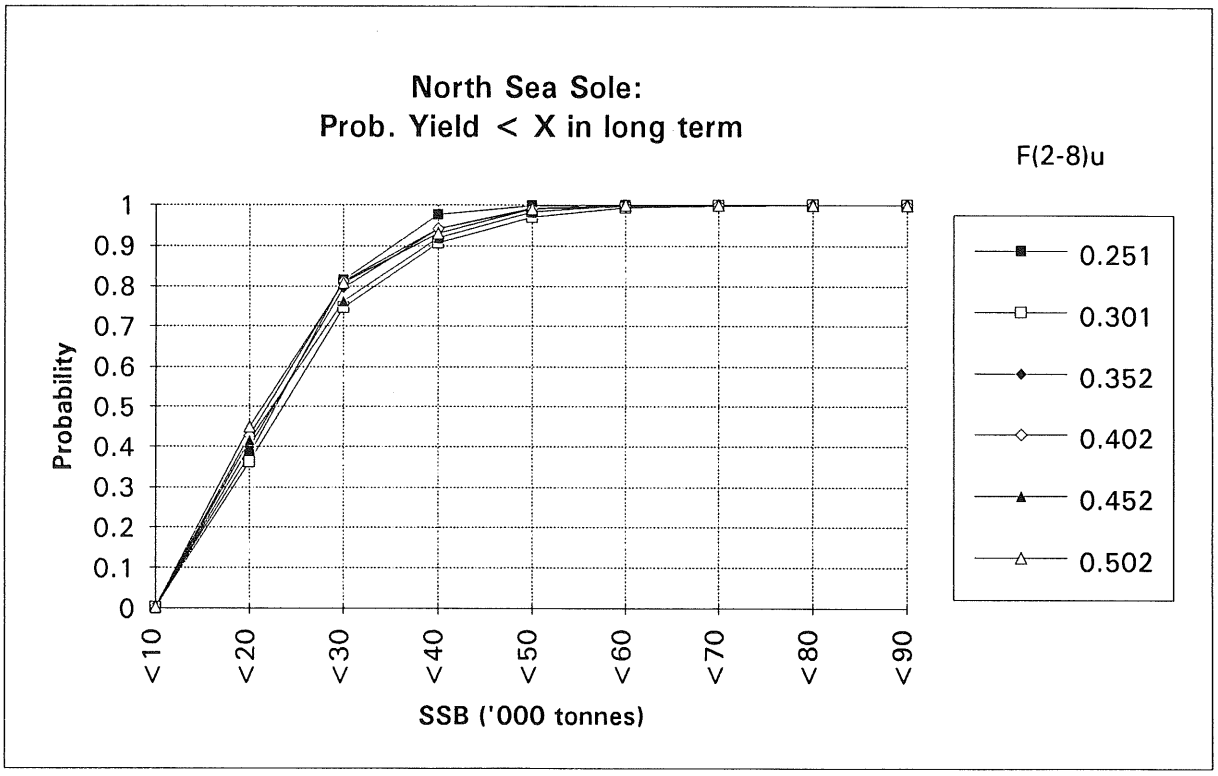


Figure 3.6.15

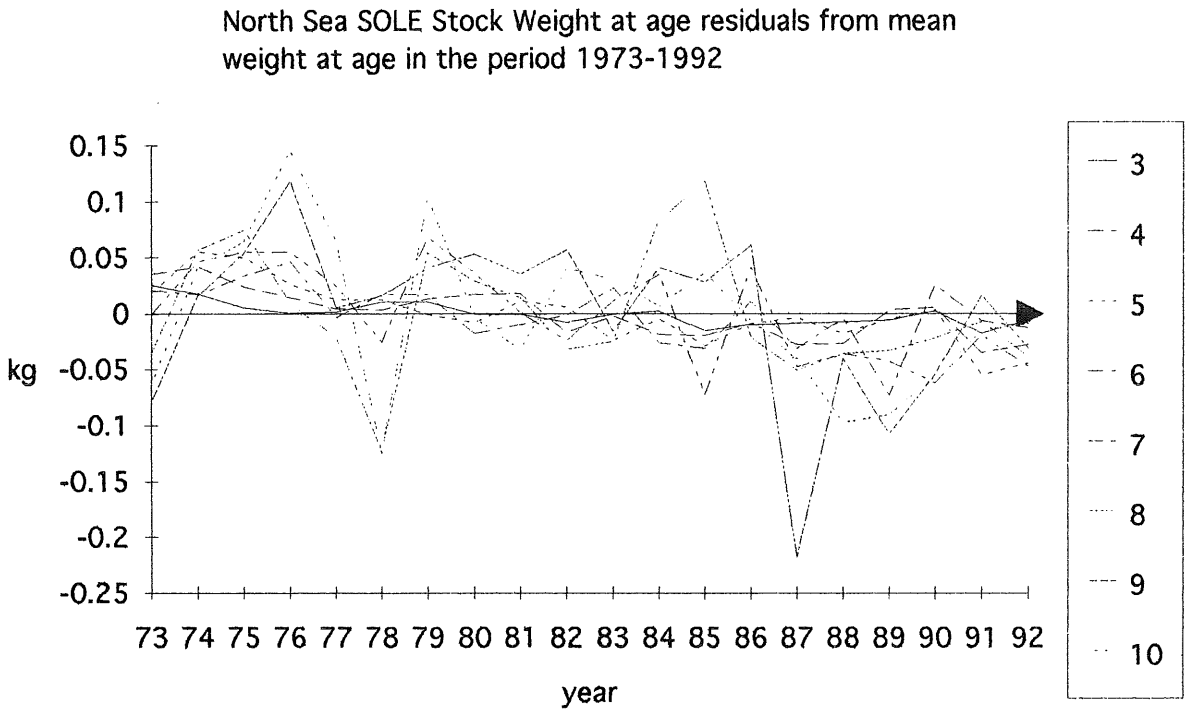
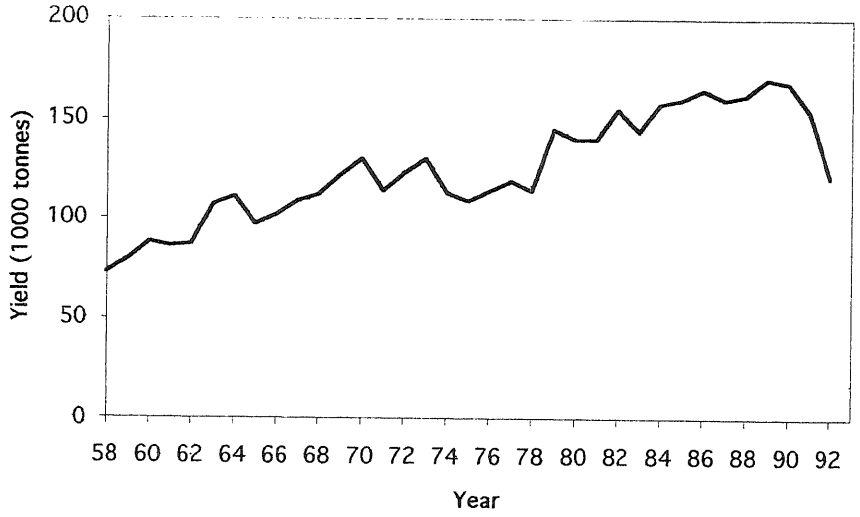
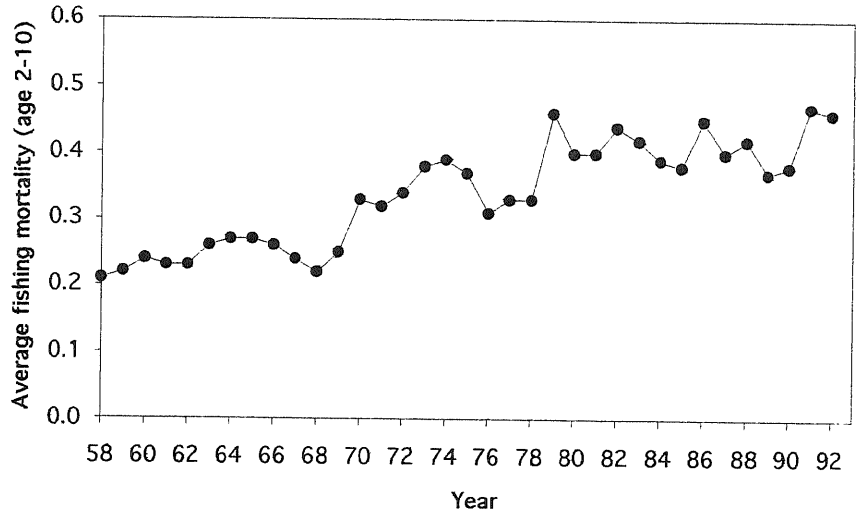
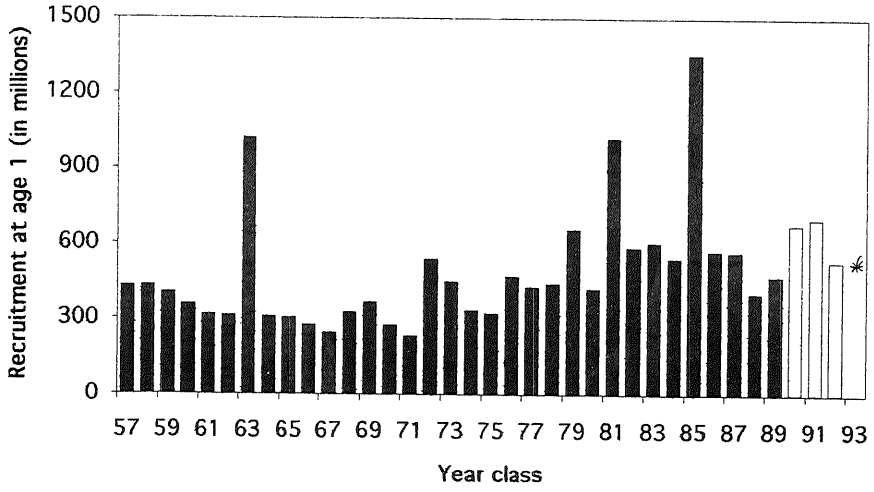

North Sea SOLE Stock Weight at age residuals from mean weight at age in the period 1973-1992
0.15
0.1
0.05
0
kg -0.05
-0.1
-0.15
-0.2
-0.25
73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
year
3
4
5
6
7
8
9
10

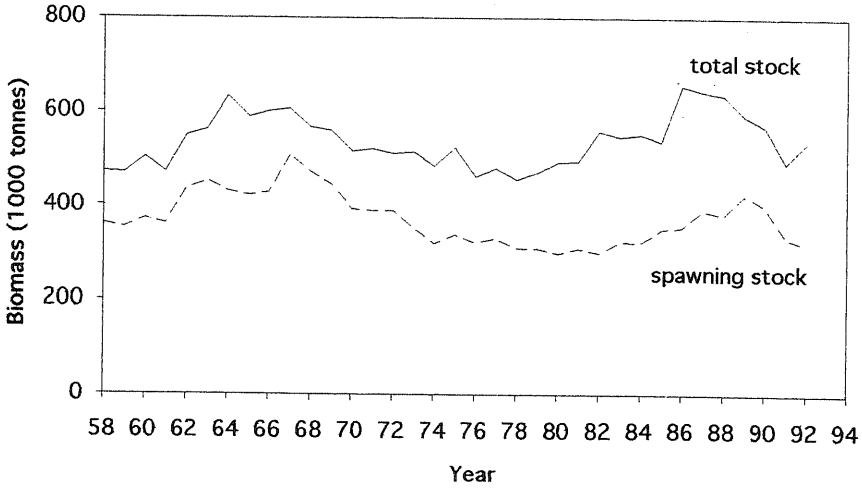
Figure 3.7.1 **Stock trends**

North Sea Plaice









*** Open bars: recruitment figures from RCT3**

Figure 3.7.2

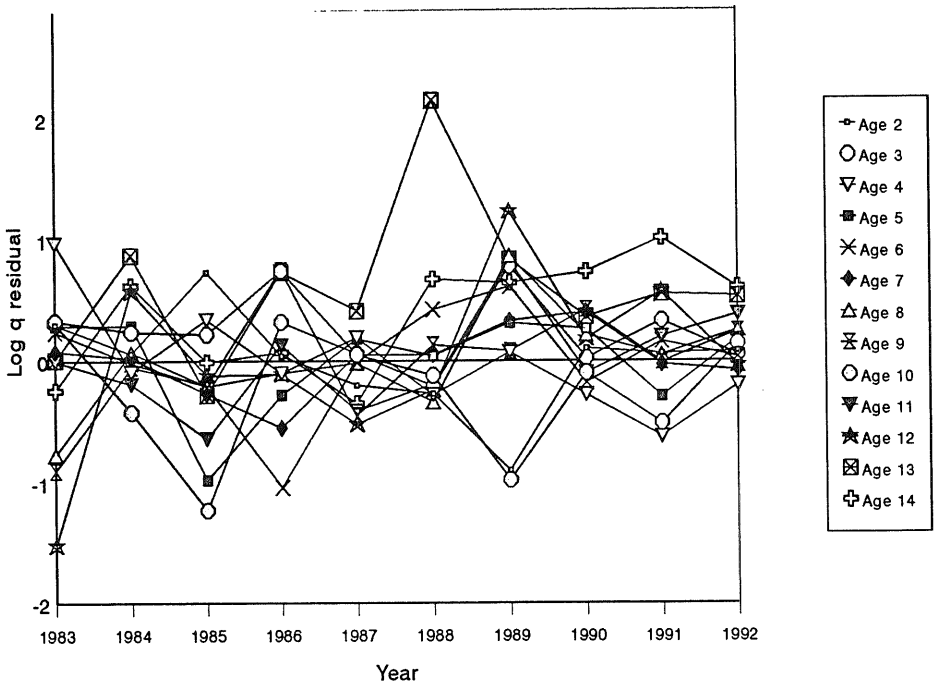


Fig North Sea plaice: Log q residuals.
(English seine fleet)

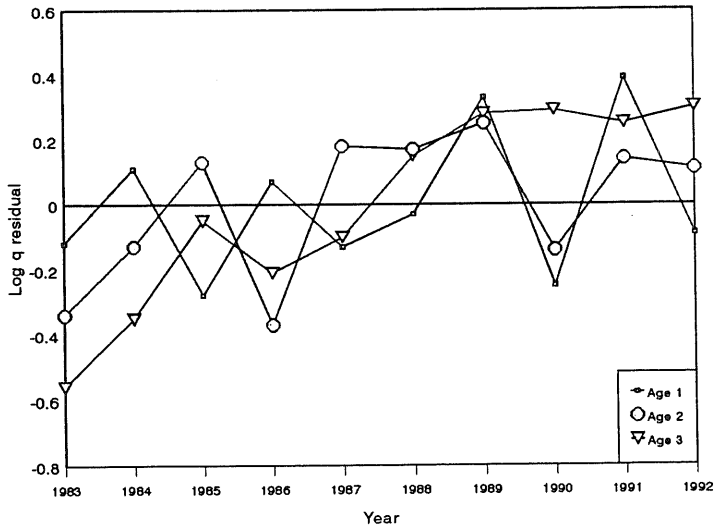


Fig North Sea plaice: Log q residuals.
(Tridens survey)

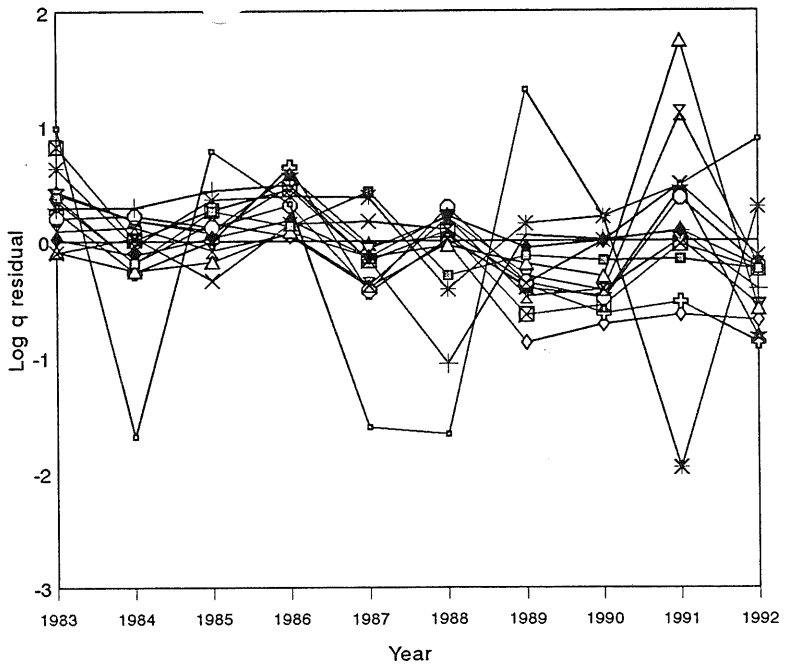


Fig North Sea plaice: Log q residuals.
(Netherlands all fleets)

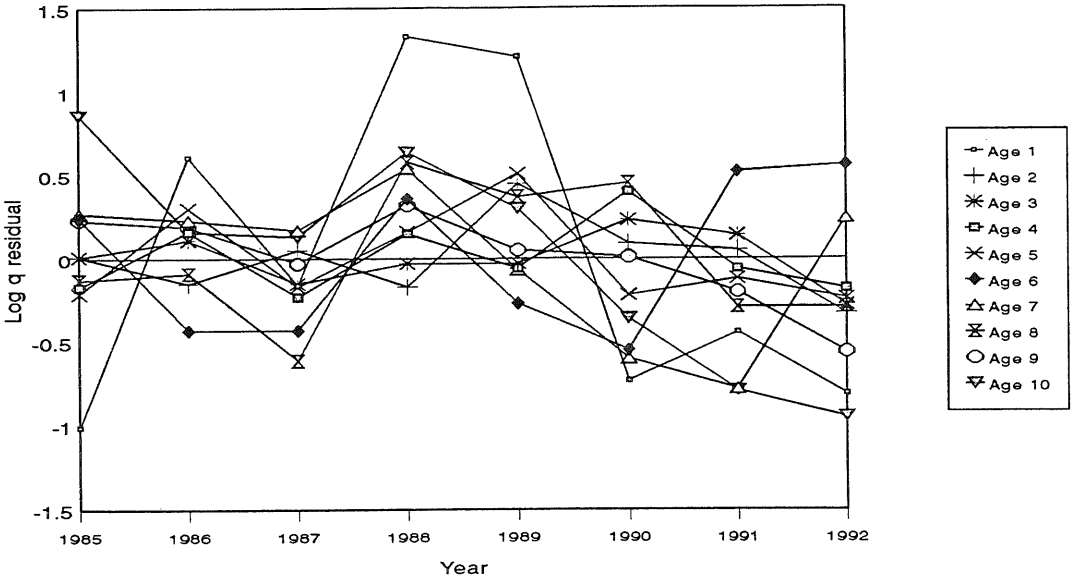


Fig North Sea plaice: Log q residuals.
(Netherlands beam trawl survey)

Figure 3.7.3 North Sea plaice: Retrospective analysis (XSA shrunk, mean F 2-10 unweighted).

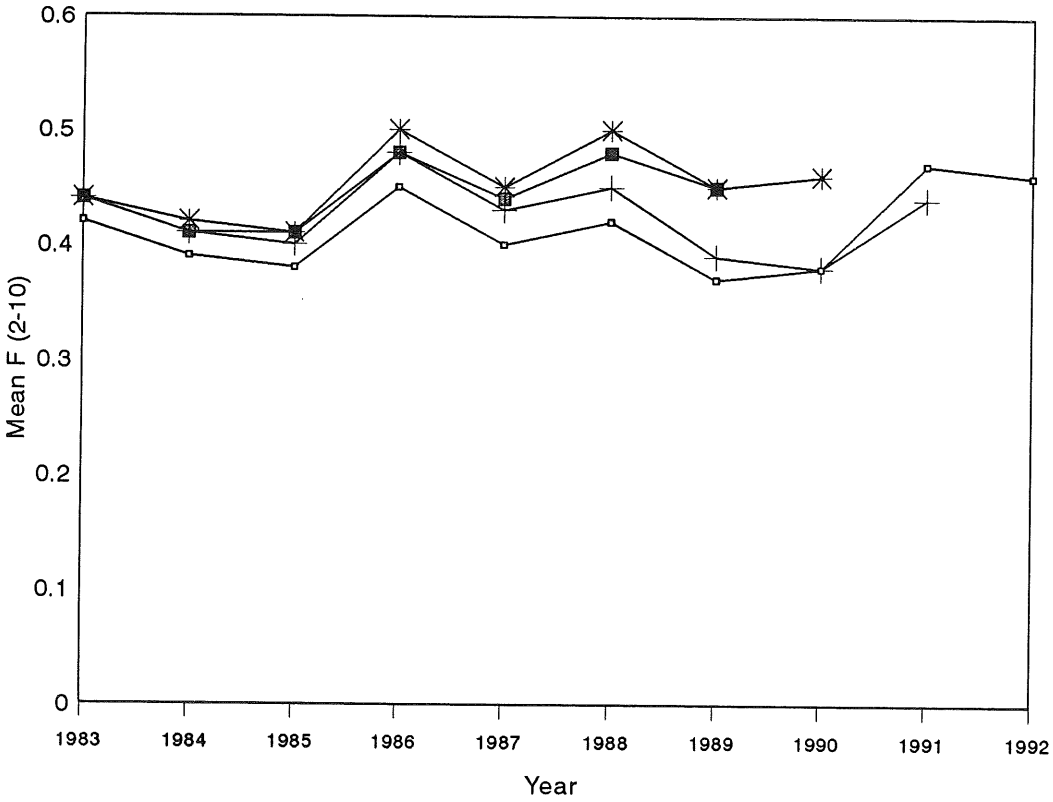


Figure 3.7.4 North Sea plaice: F at age in 1992 from XSA-shrunk tuning.

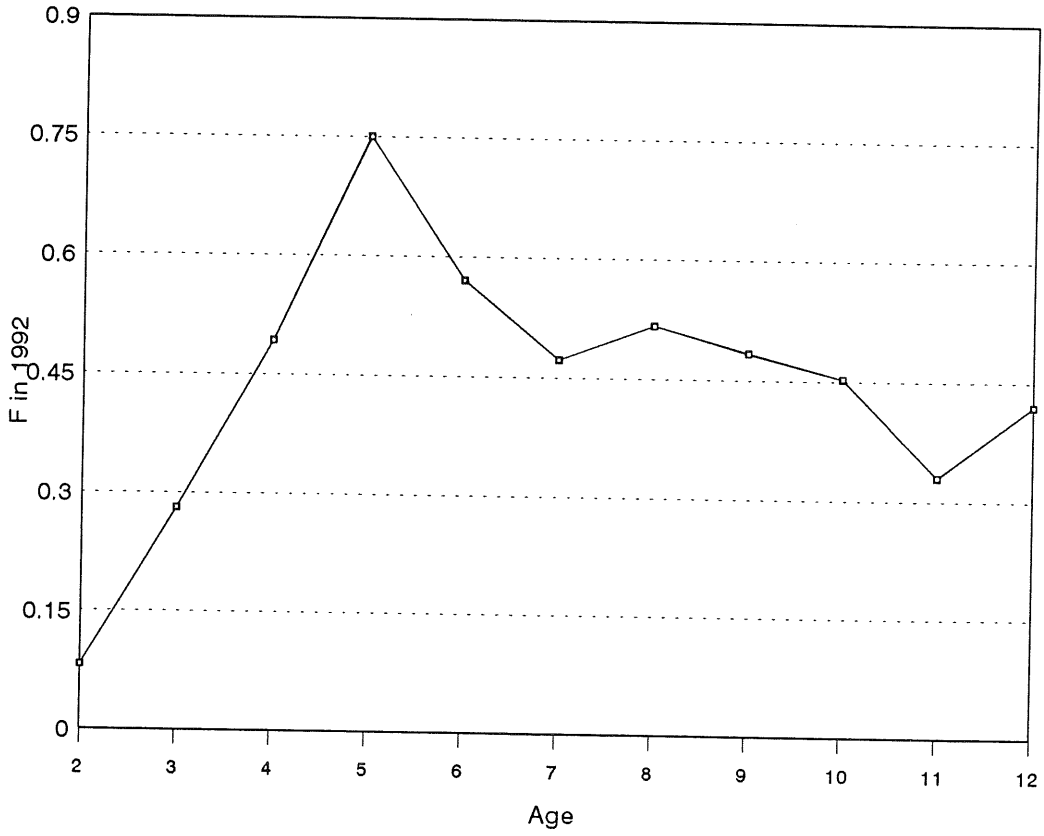


Figure 3.7.5 **North Sea plaice: stock recruitment plot with dashed lines indicating the levels of F *status quo* and Fmed.**

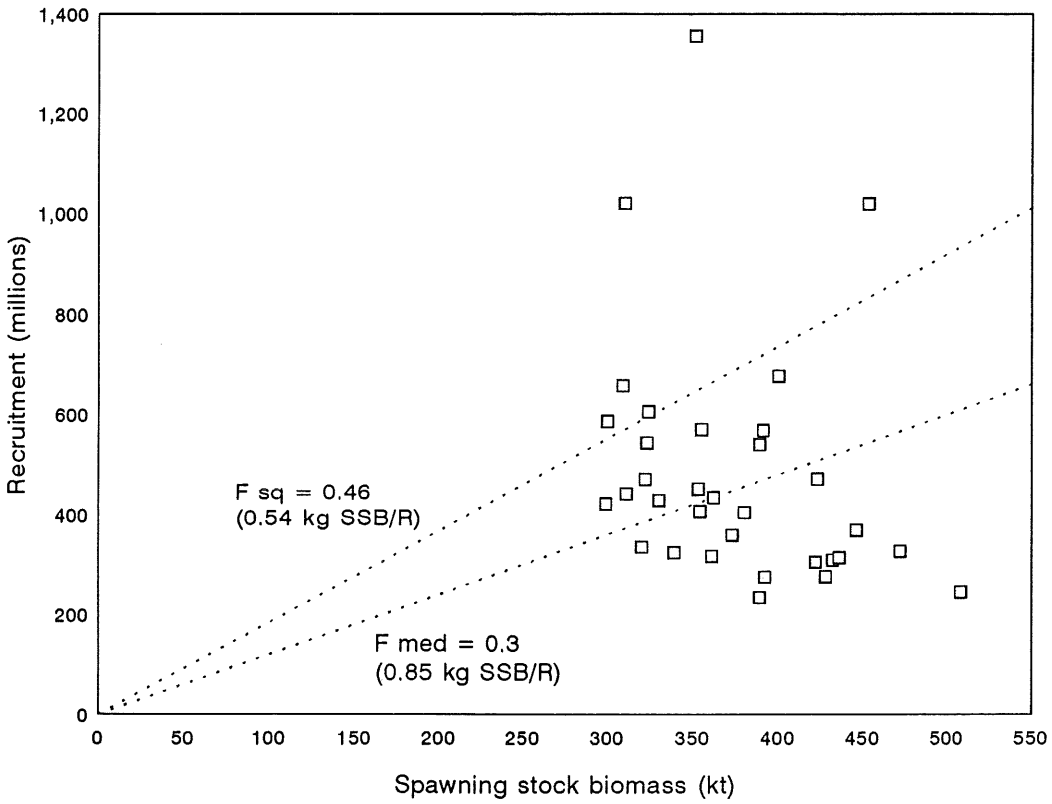
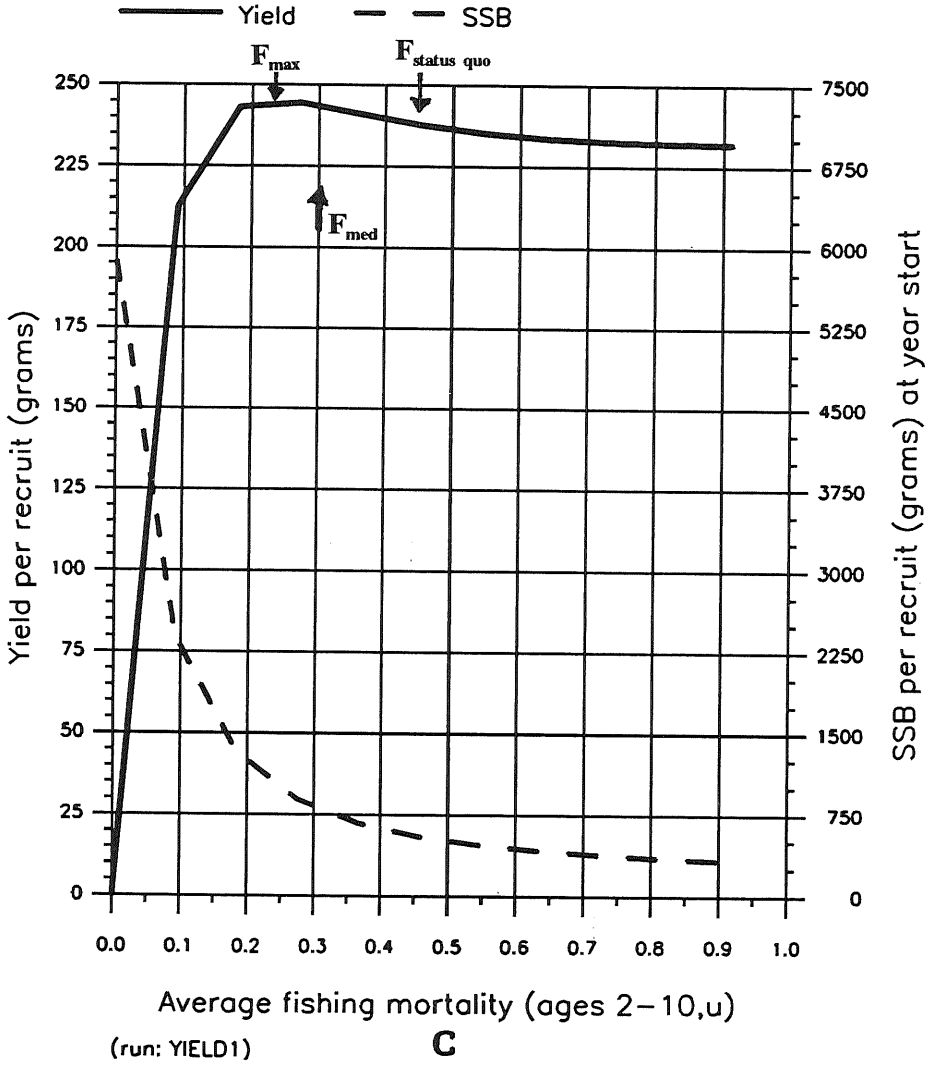


Figure 3.7.6

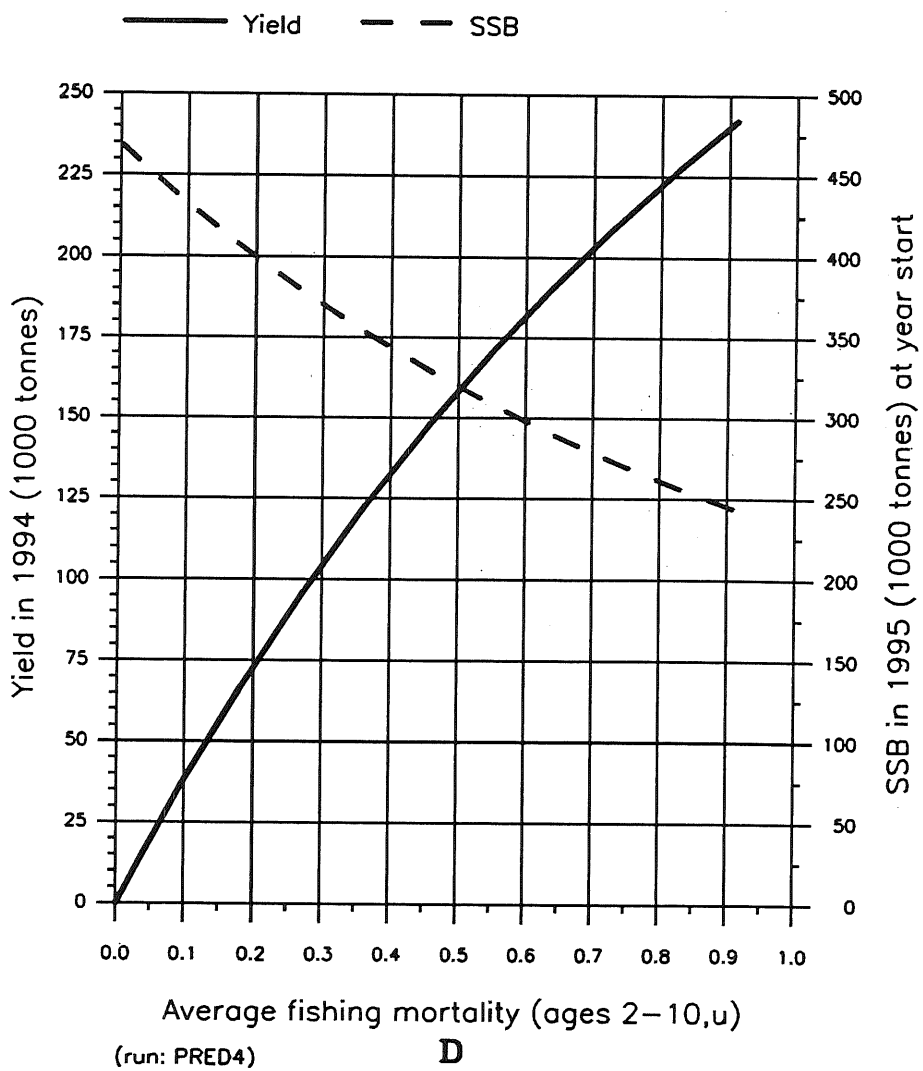
FISH STOCK SUMMARY
STOCK: Plaice in the North Sea (Fishing Area IV)
10–10–1993

Long term yield and spawning stock biomass



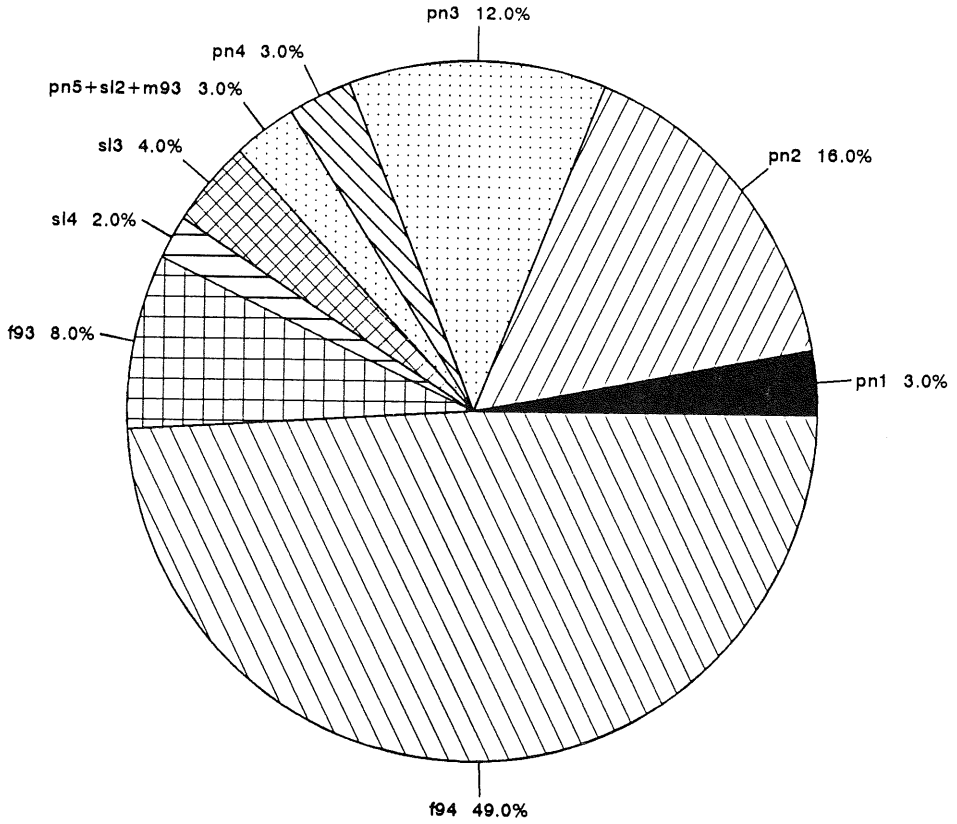
(run: YIELD1) **C**

Short–term yield and spawning stock biomass

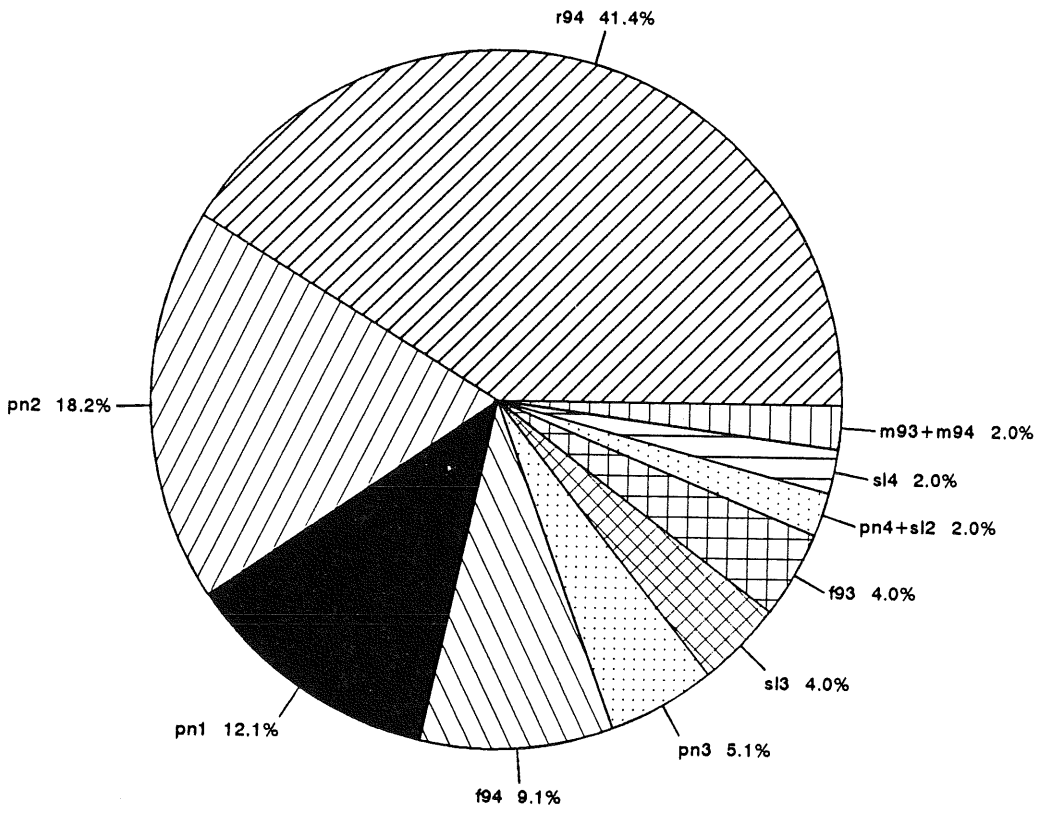


(run: PRED4) **D**

Figure 3.7.7



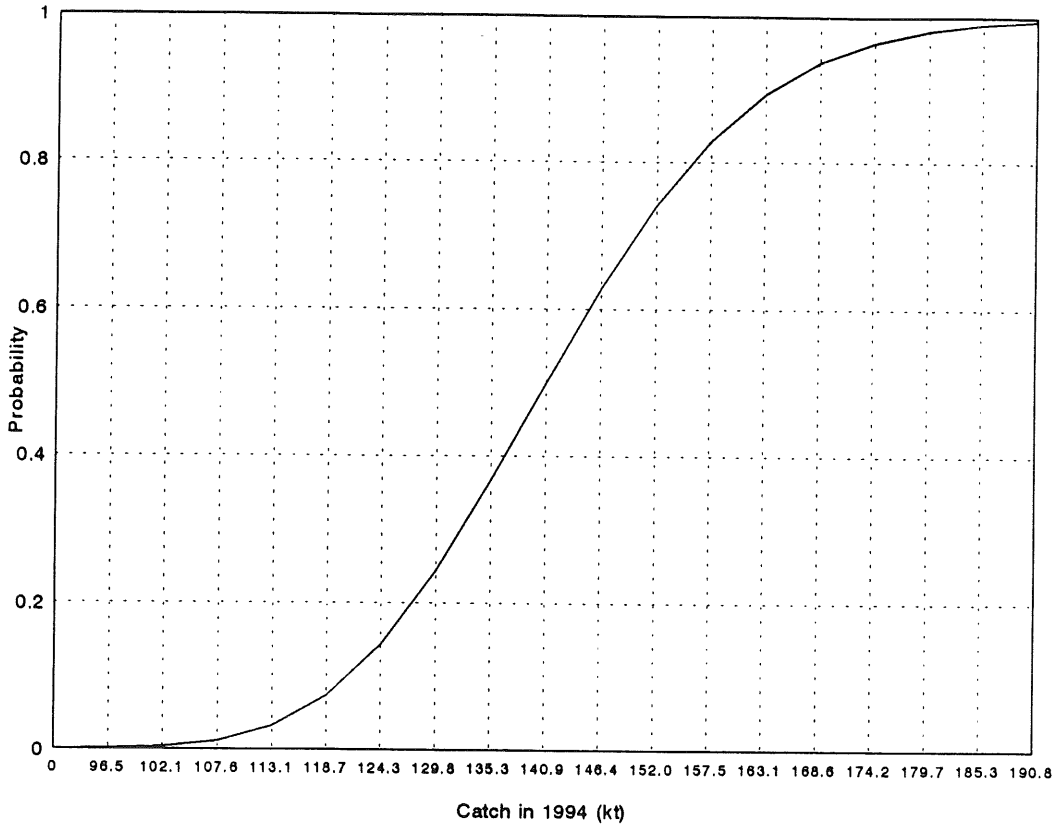
Yield 1994

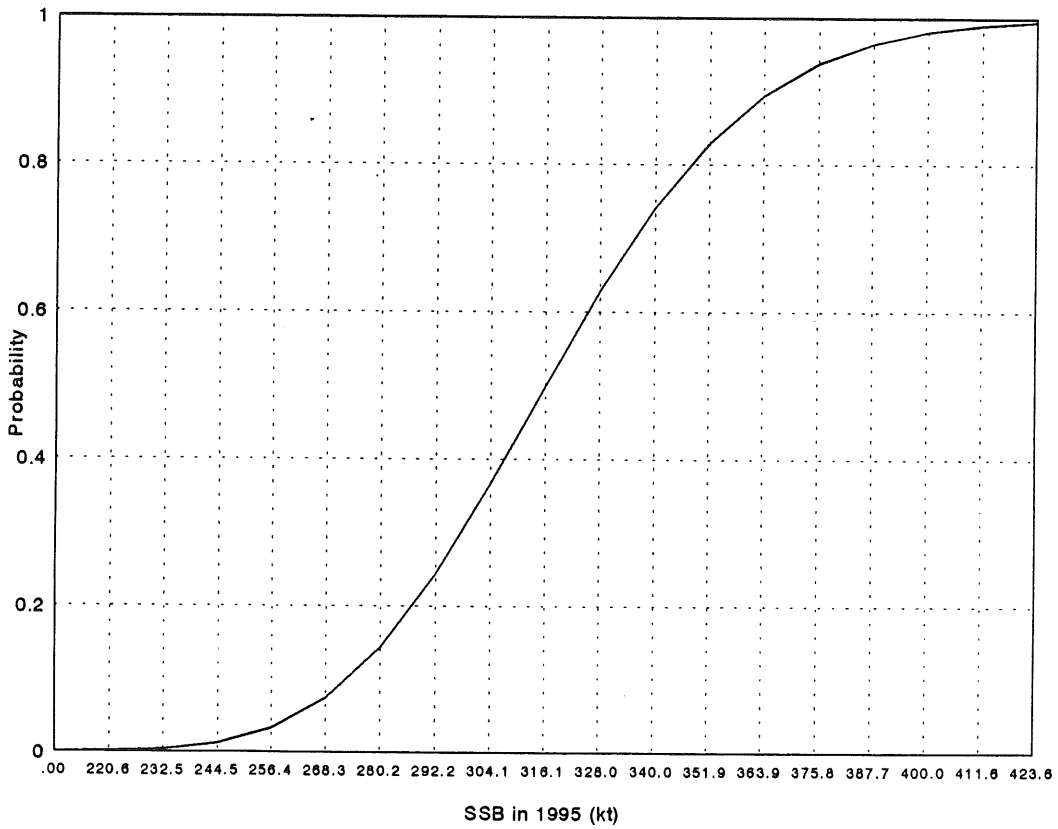


SSB 1995

NS plaice: Results of sensitivity analysis on predicted SSB 1995.

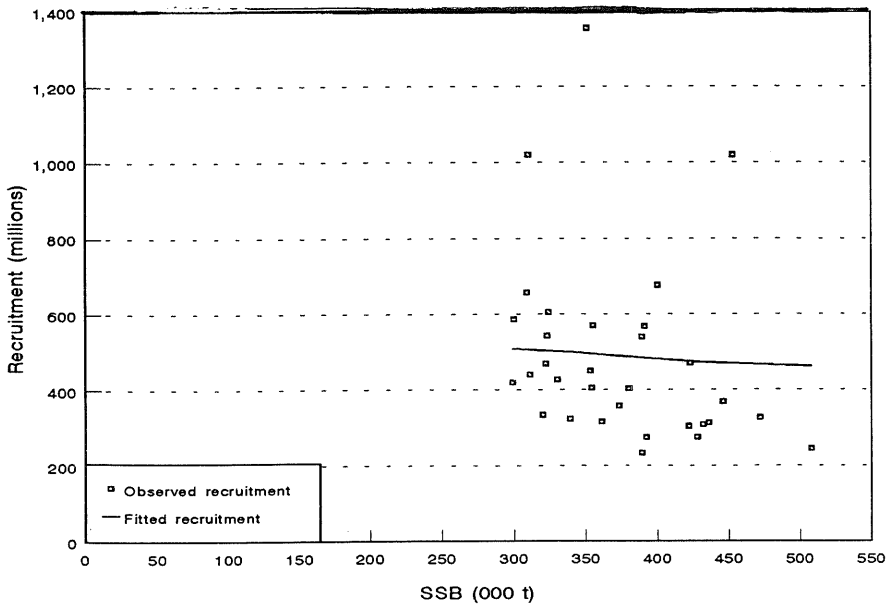
Figure 3.7.8



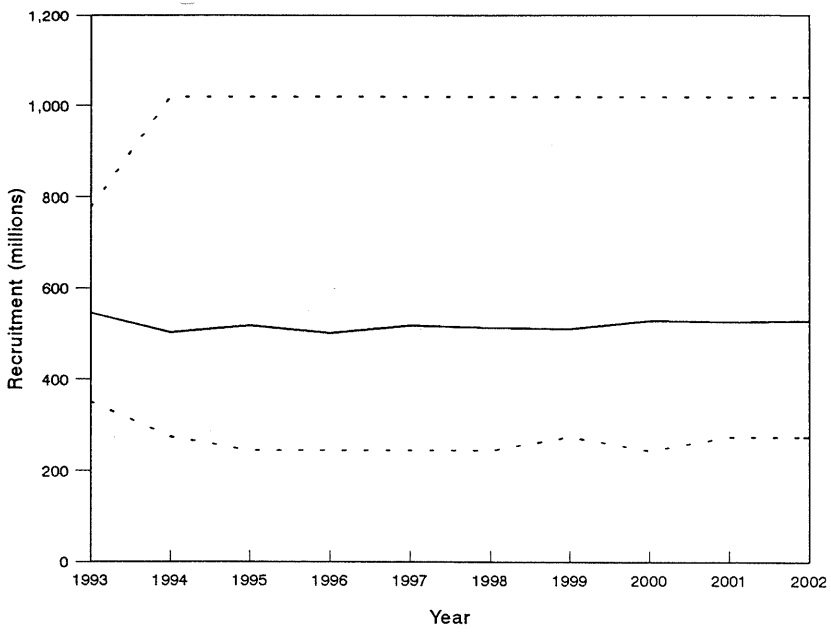


NS plaice: Probability that SSB in 1995 will be below a given value at status quo F.

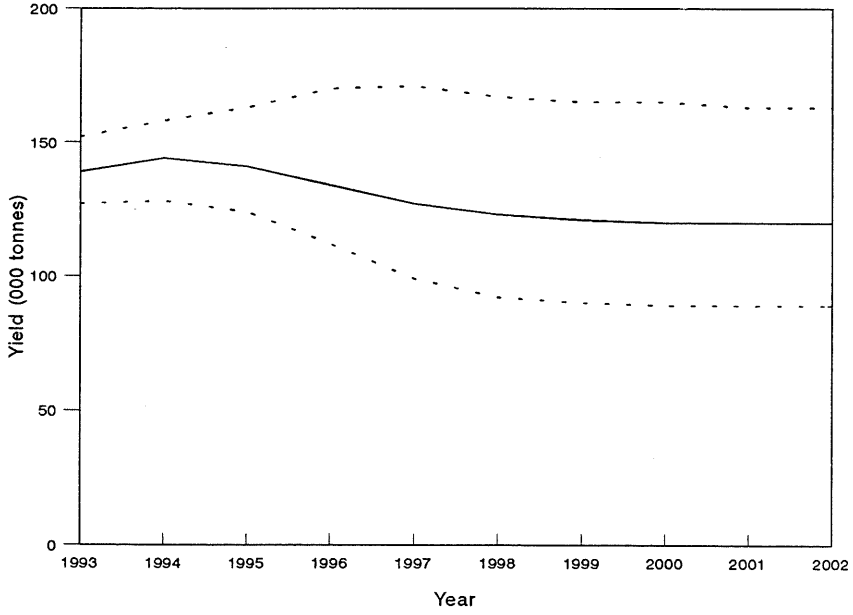
Figure 3.7.9



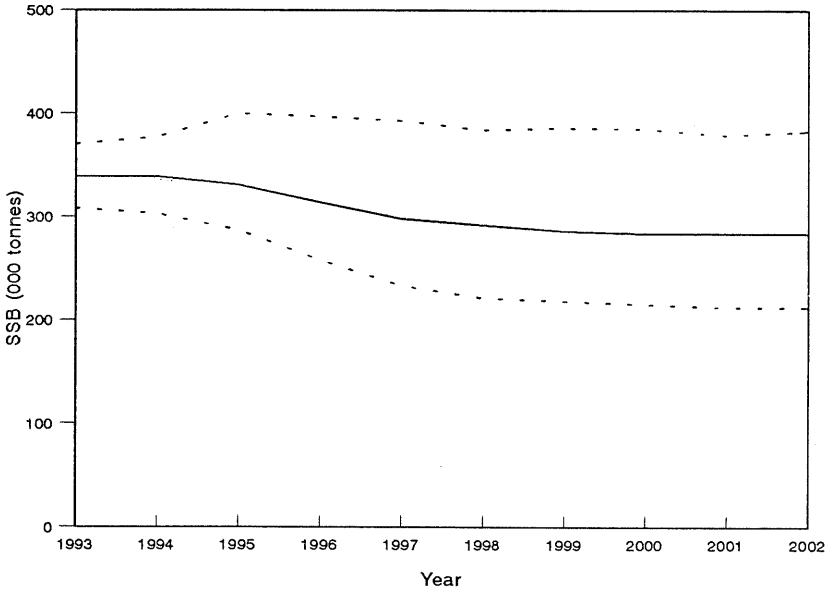
NS plaice. Recruitment vs SSB, with Cauchy fitted values.



NS plaice: Long term recruitment forecast model.
Solid line is the mean, dashed lines show 5 and 95 percentiles.

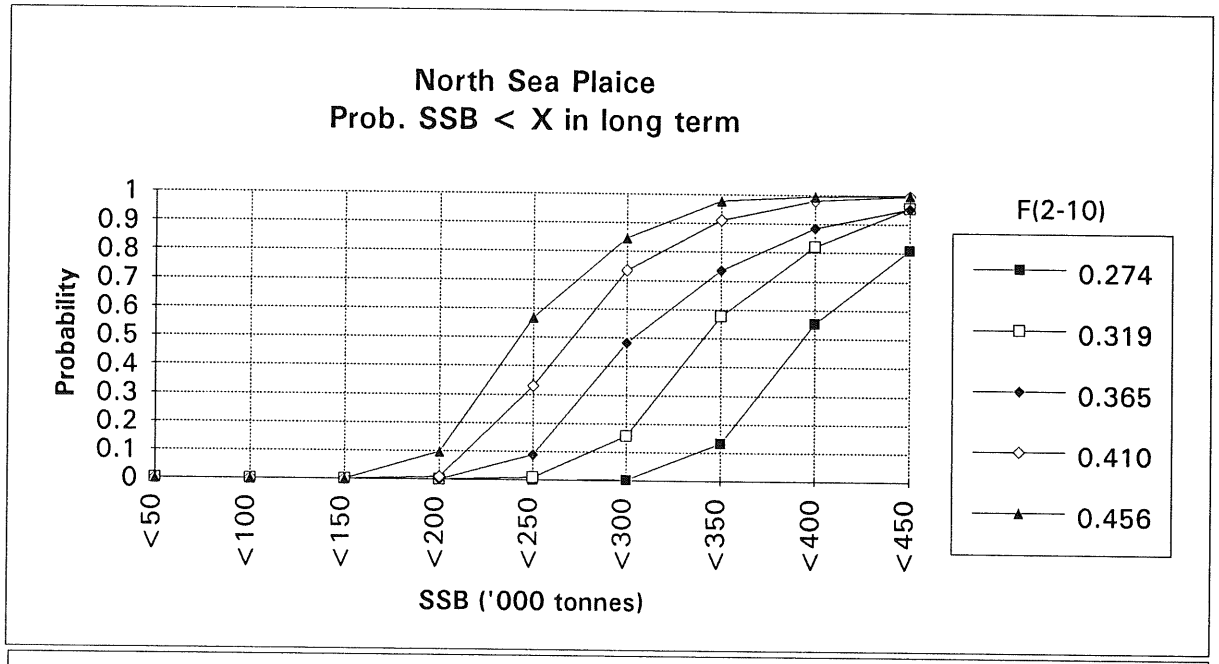


NS plaice: Long term yield forecast model.
Solid line is the mean, dashed lines show 5 and 95 percentiles.



NS plaice: Long term SSB forecast model.
Solid line is the mean, dashed lines show 5 and 95 percentiles.

Figure 3.7.10 **Results of SPLIR model.**



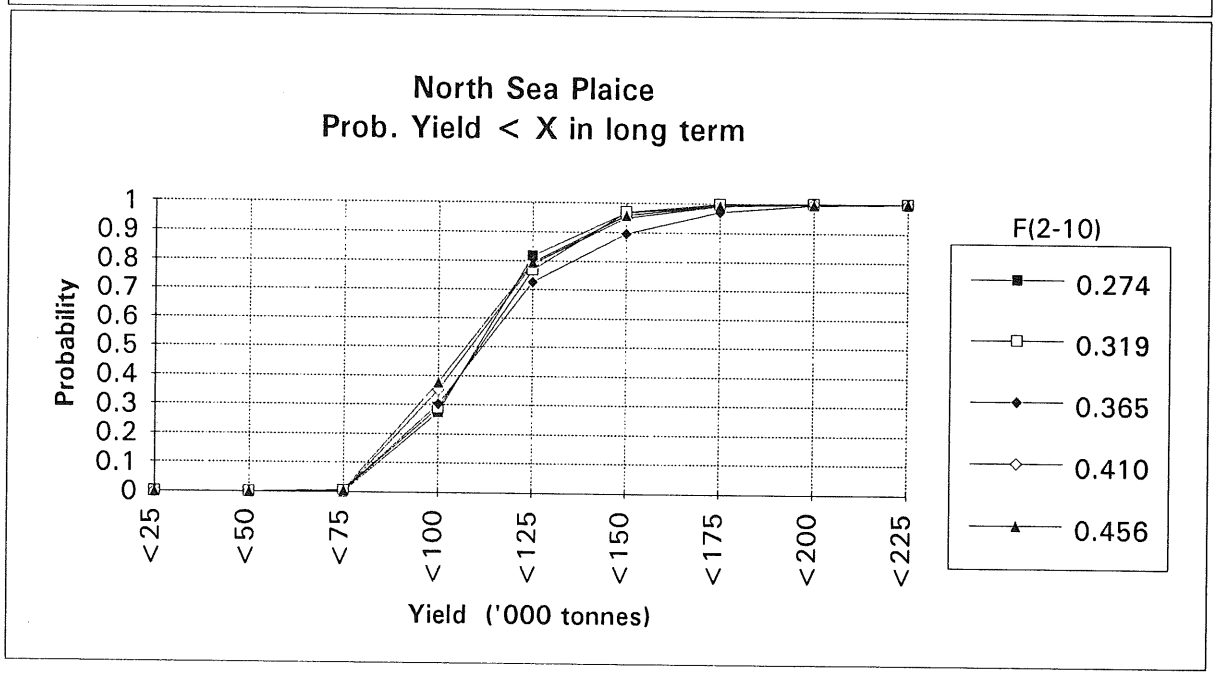


Fig. 4.2.1 : Historical trends in estimated landings, Fbar, SSB and recruitment.

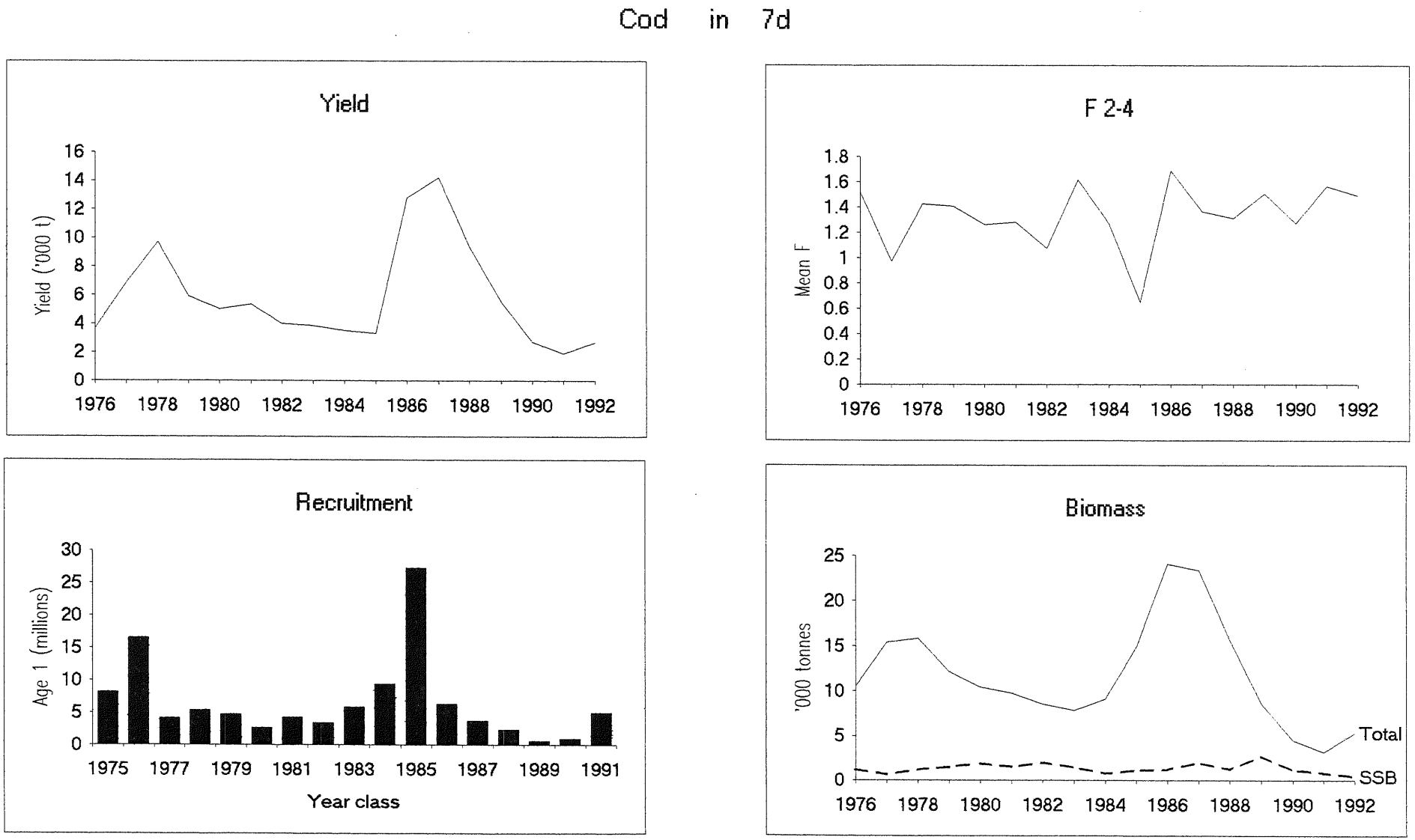
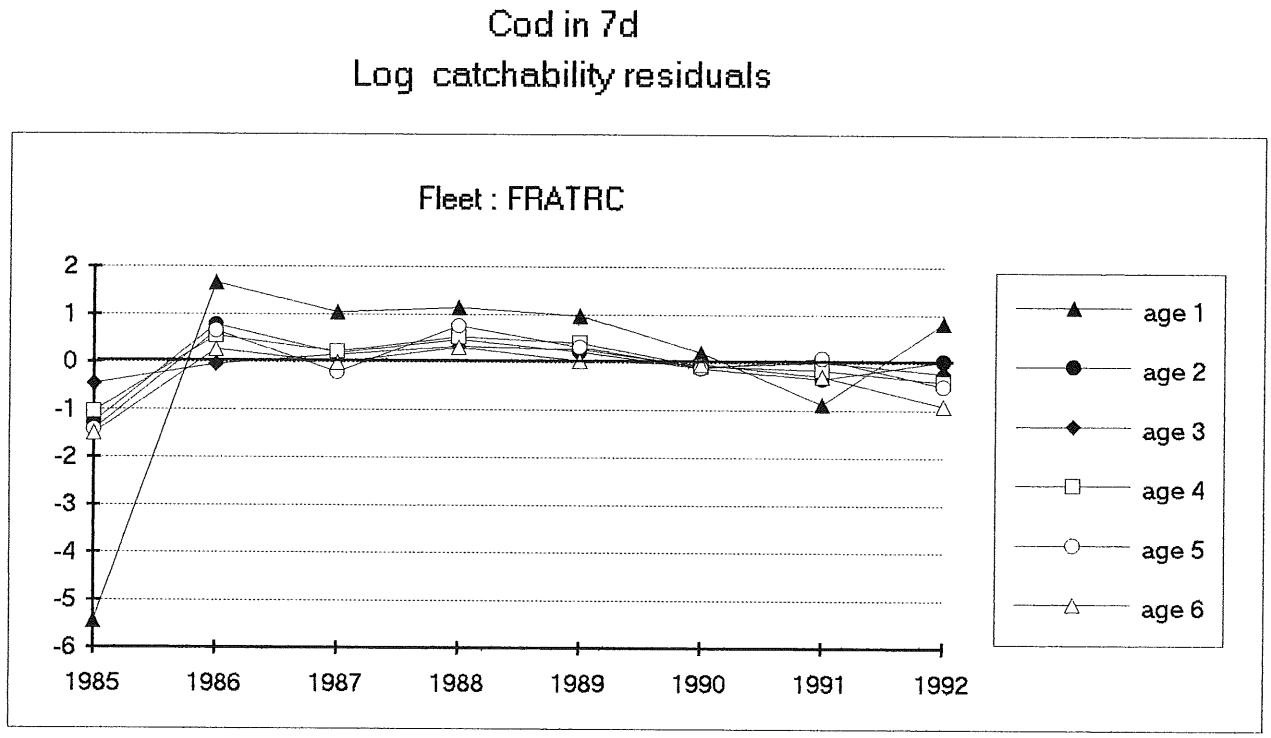


Fig 4.2.2. : Cod in 7d. Catchability residual plots.



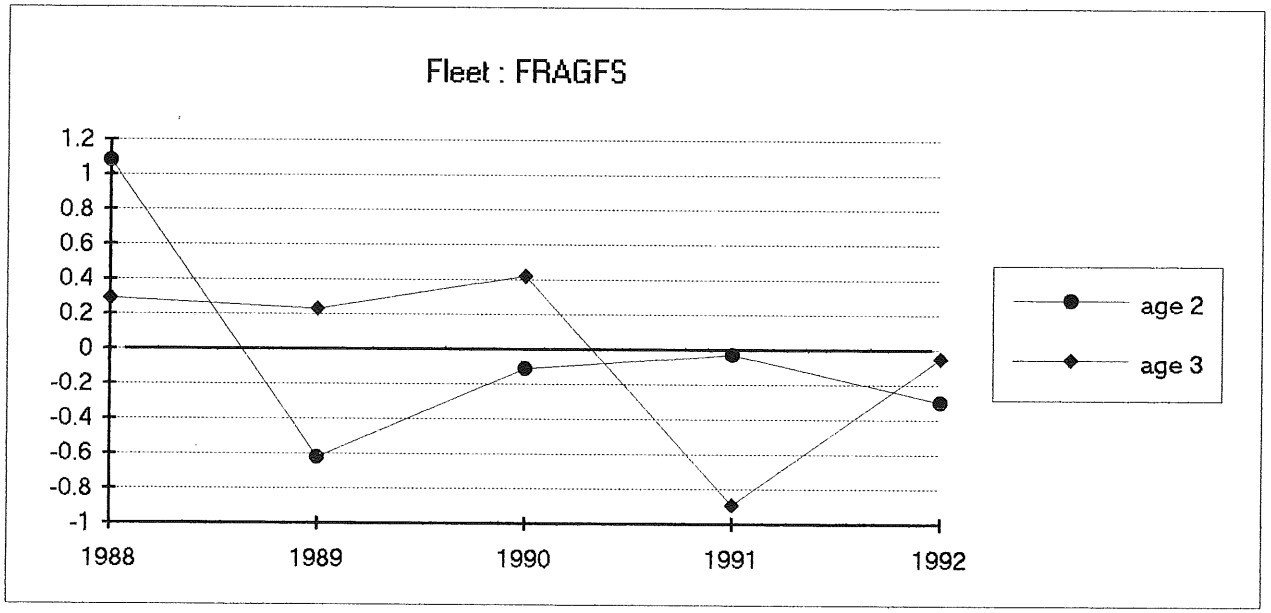


Fig 4.2.3. : Cod VIId. Retospective analysis of XSA for commercial fleet (FRATRC) in the Channel.

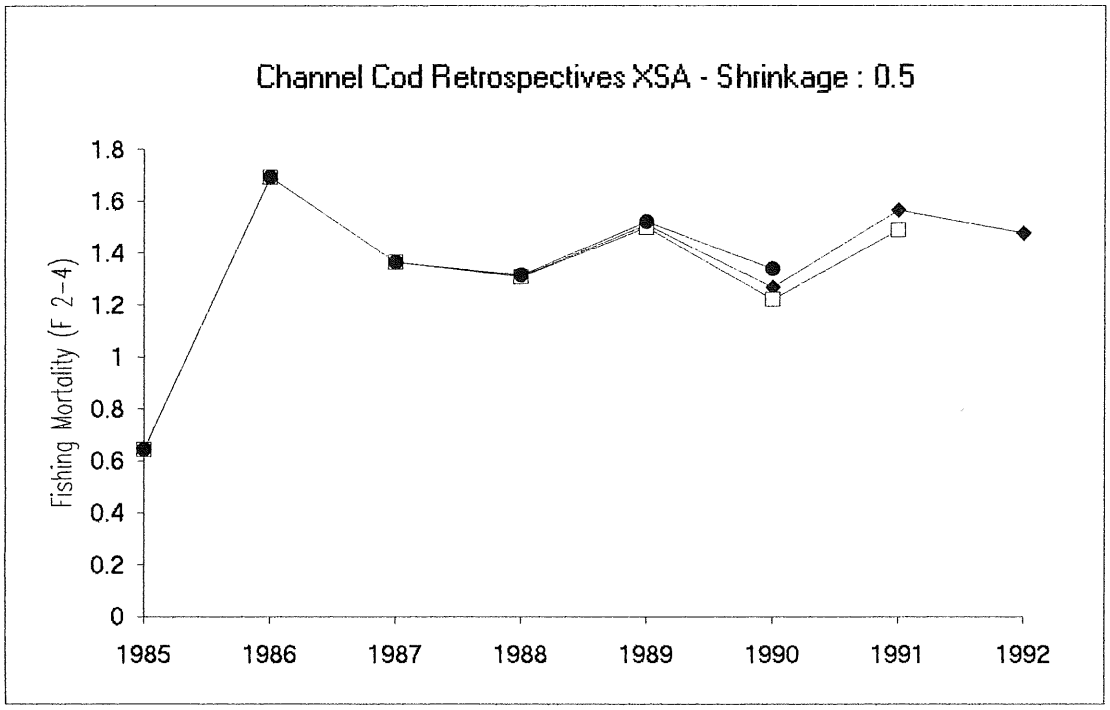
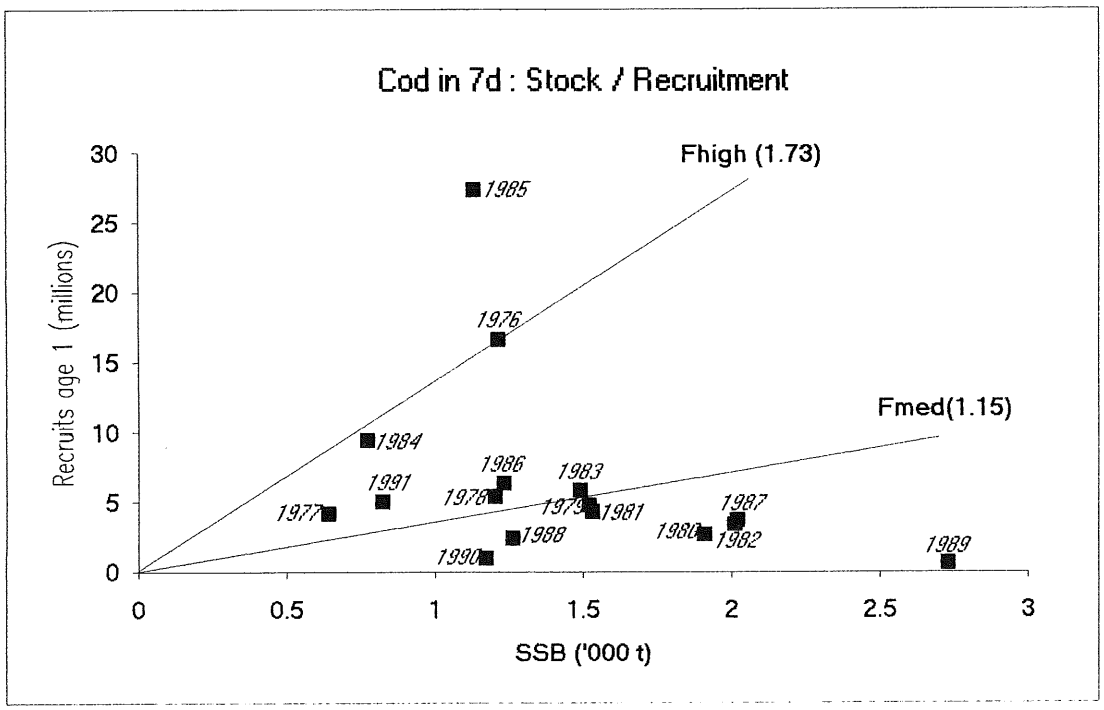
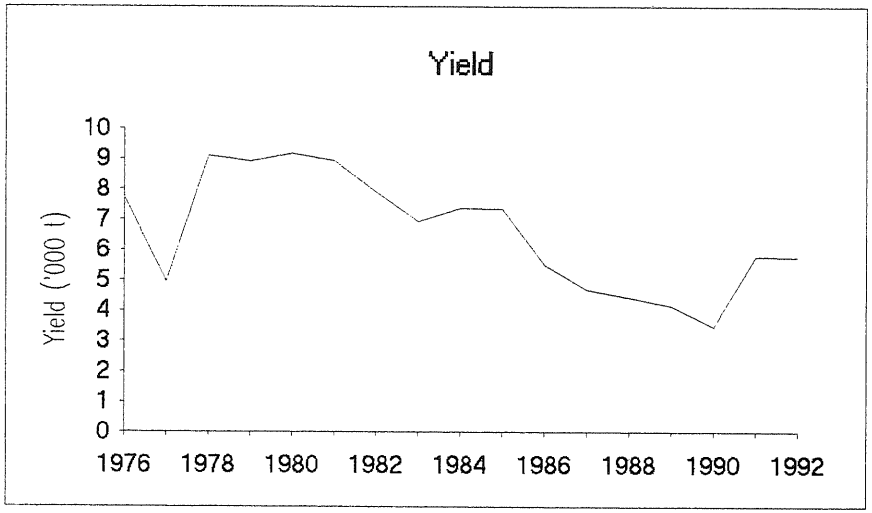


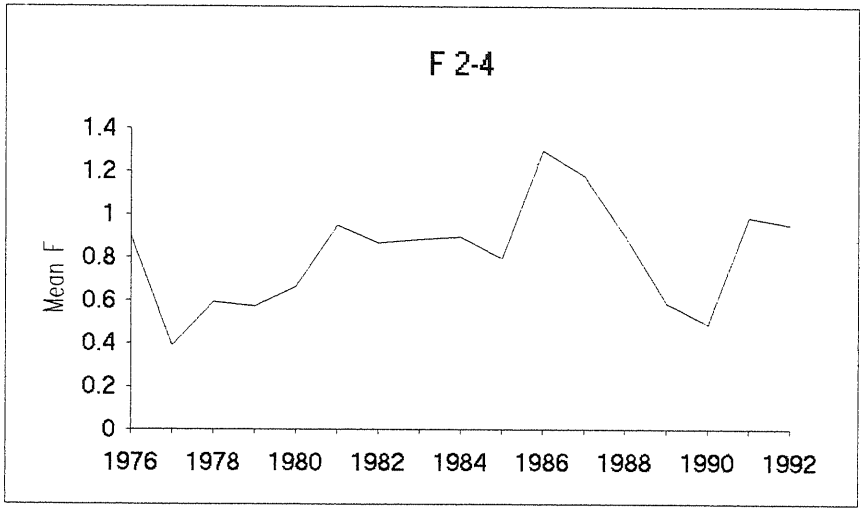
Fig. 4.2.4 : Stock / Recruitment

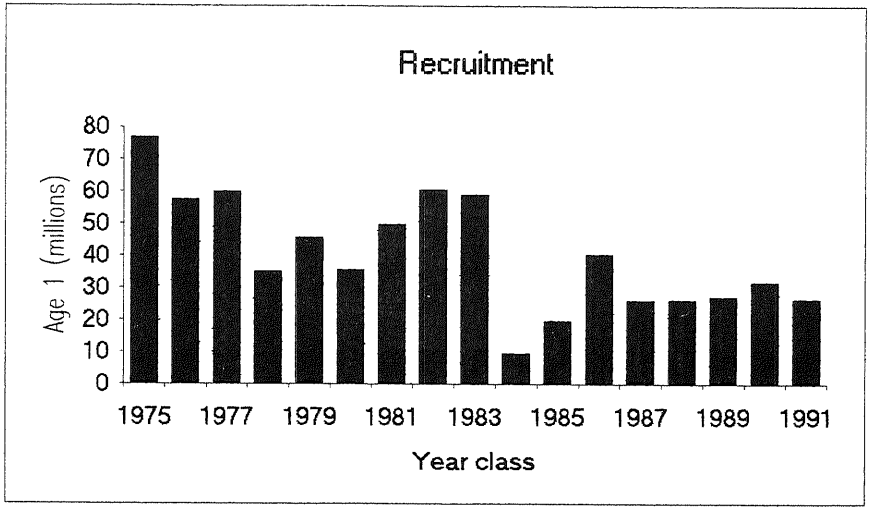


Whiting in 7d

Fig. 4.3.1. : Historical trends in estimated landings, Fbar, SSB and recruitment.







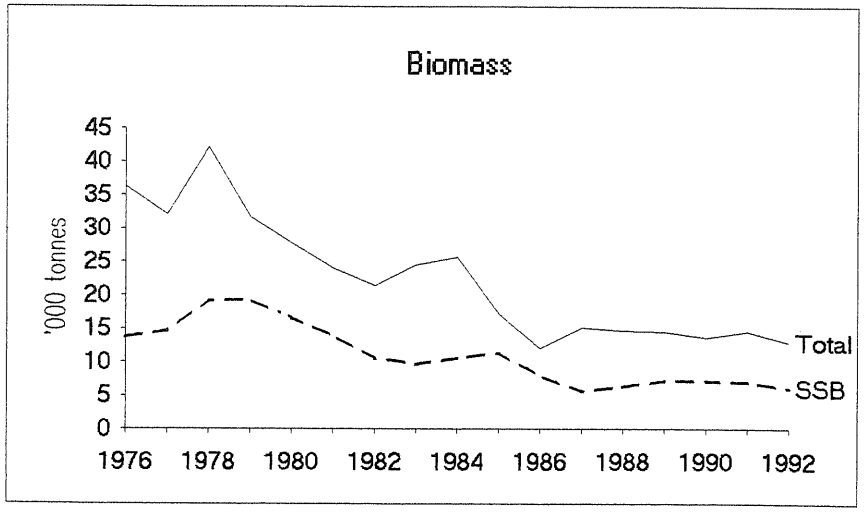


Fig 4.3.2. : Whiting in 7d. Catchability residual plots.

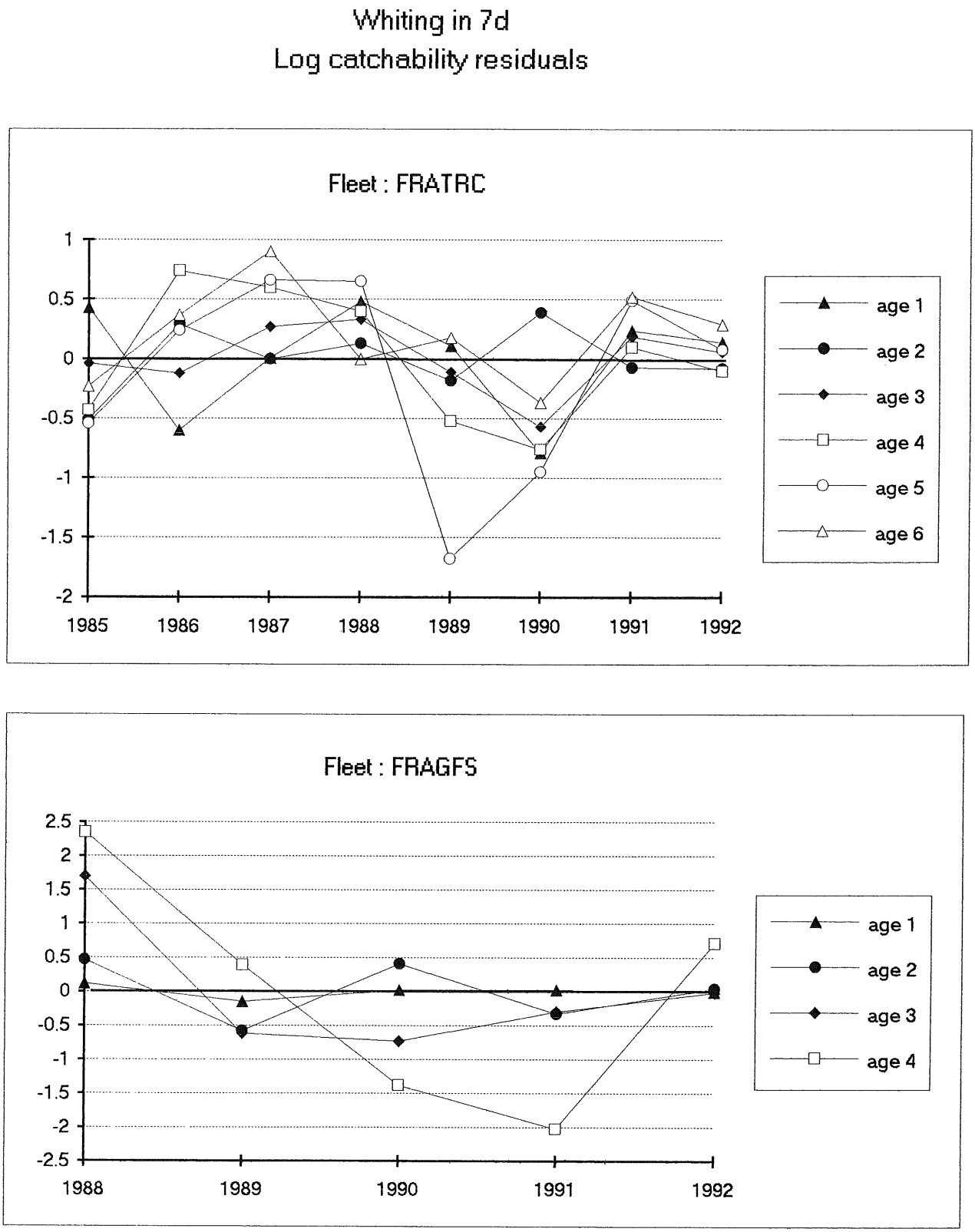


Fig 4.3.3. : Retospective analysis of XSA for commercial fleet (FRATRC) in the Channel.

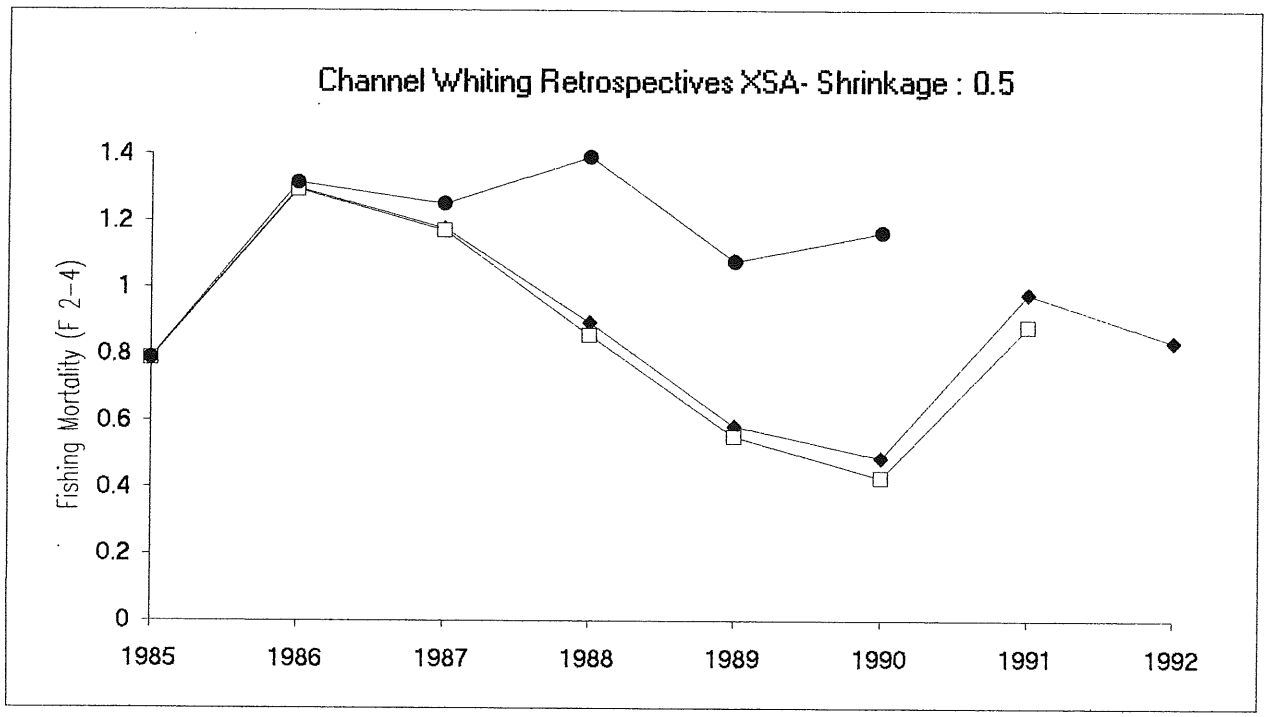


Fig. 4.3.4 : Stock / Recruitment

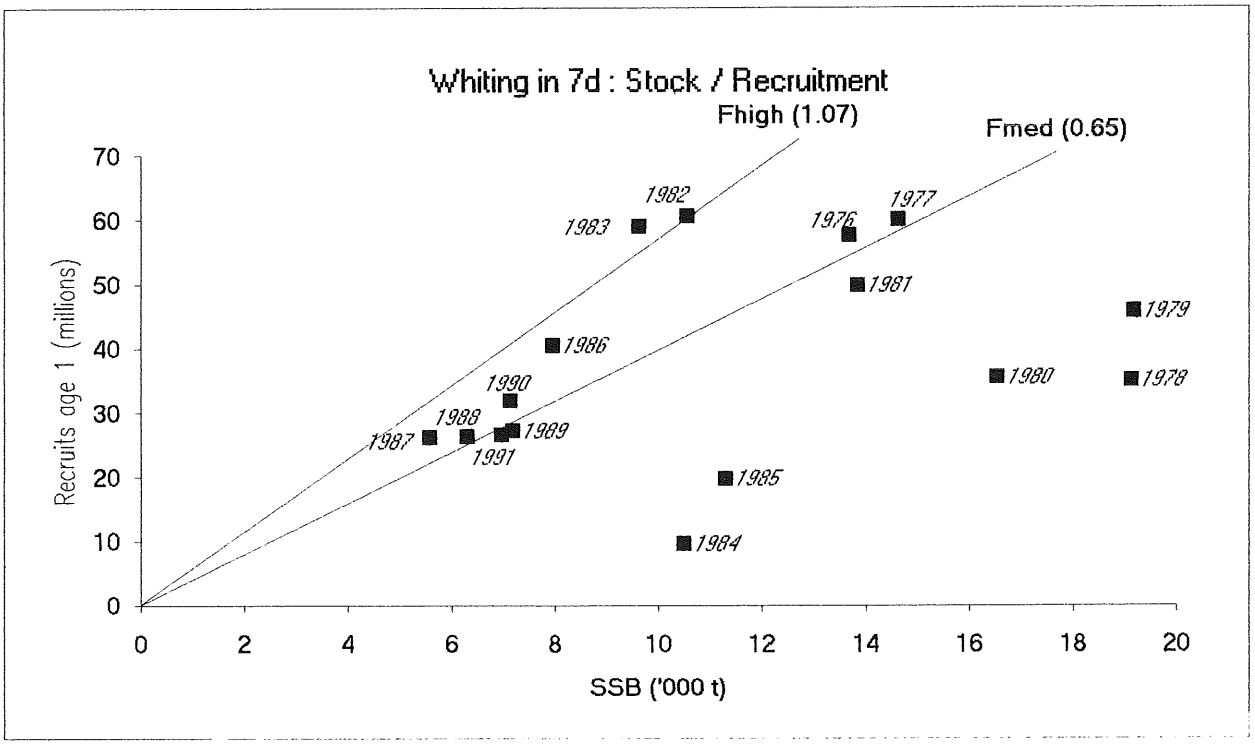
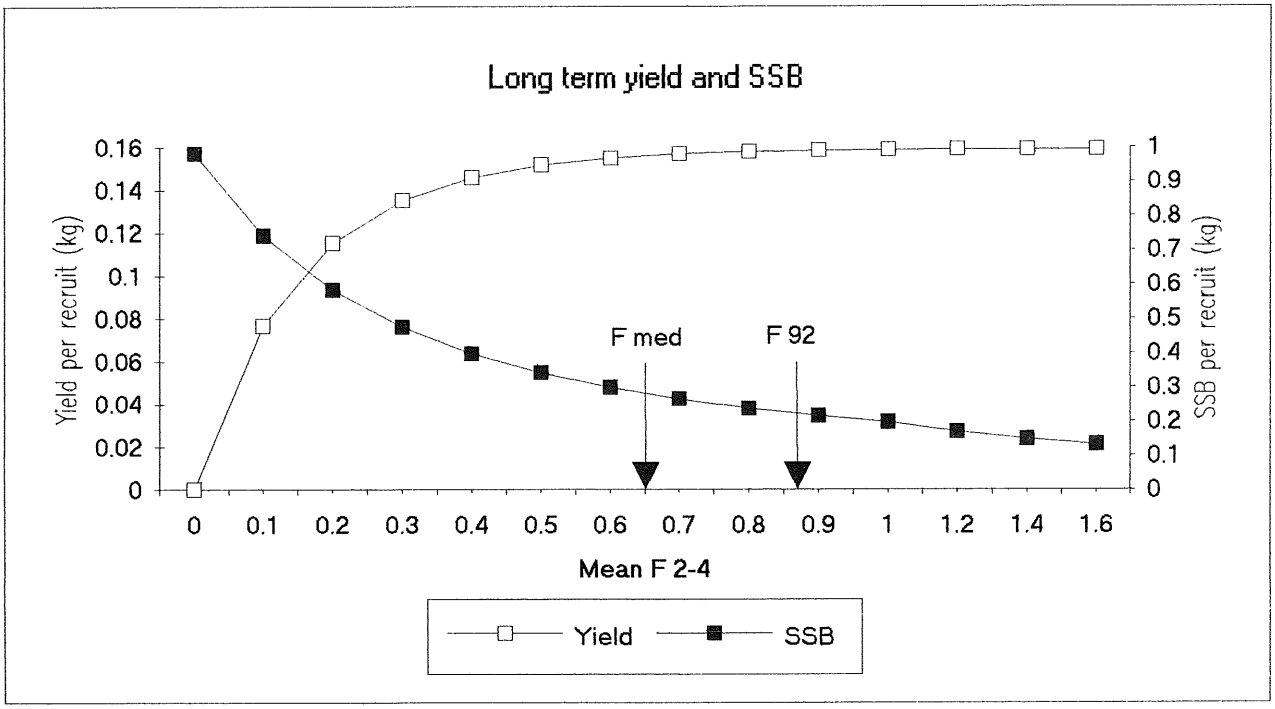
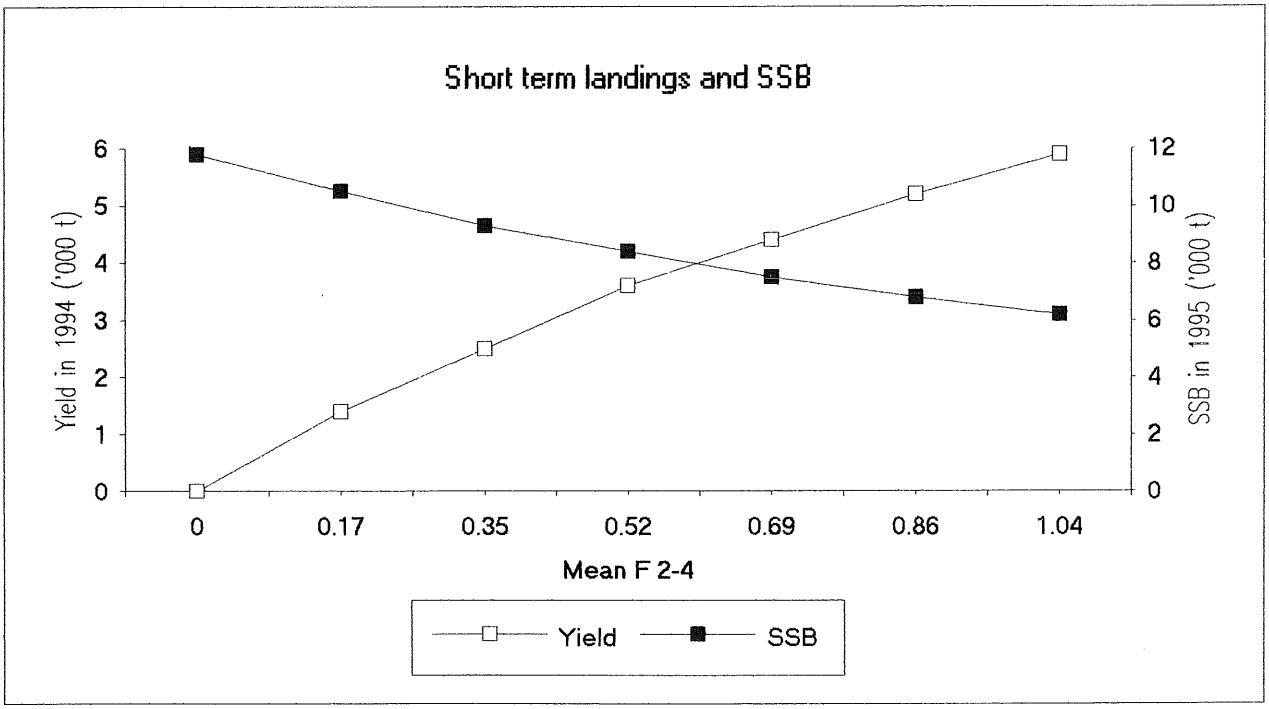


Fig. 4.3.5. : Yield per recruit - Short and long term yield - SSB

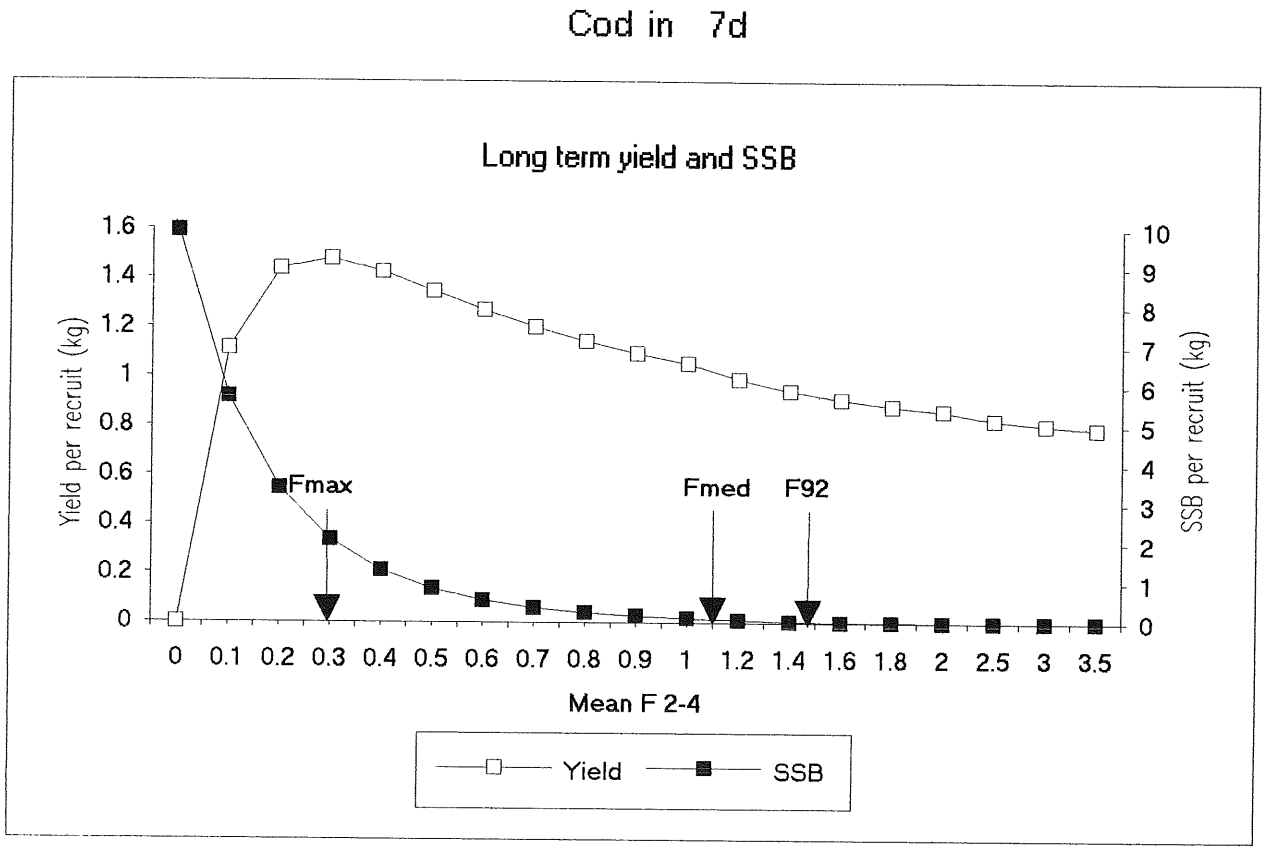
Whiting in 7d





Continued

Figure 4.3.5 Continued



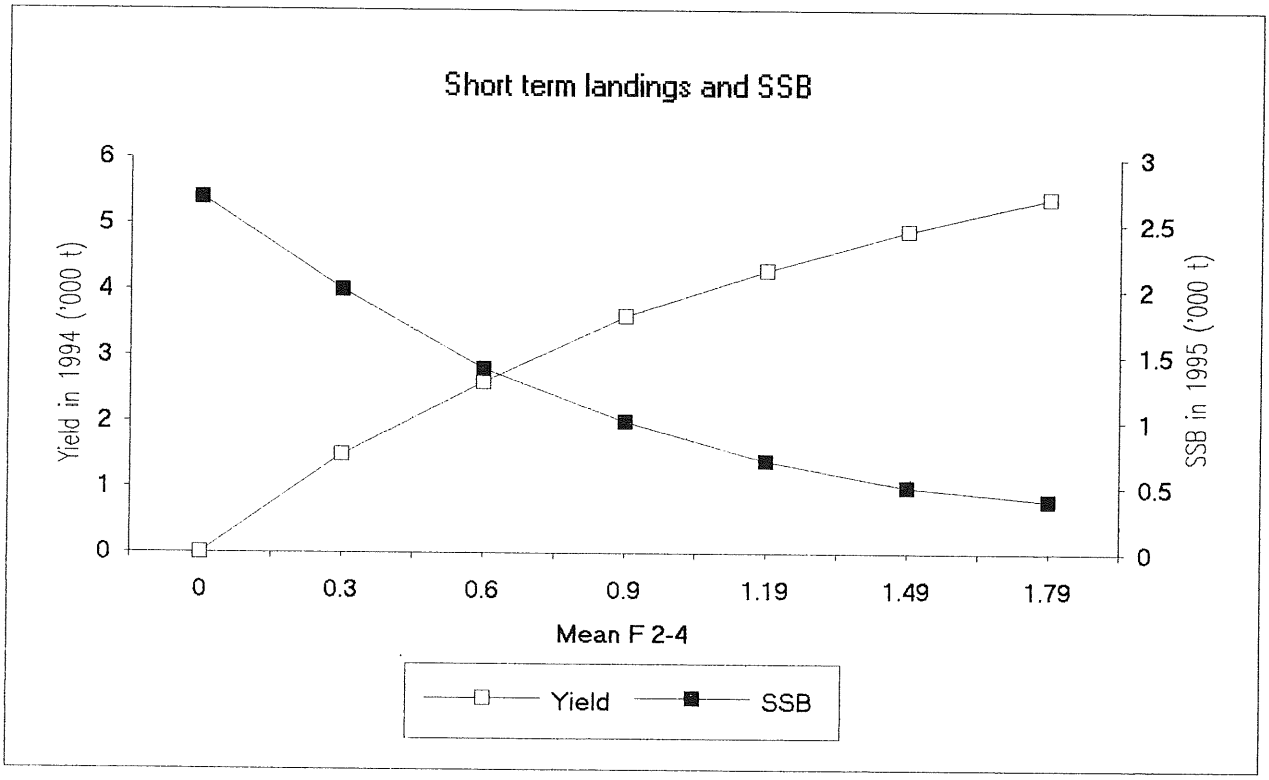
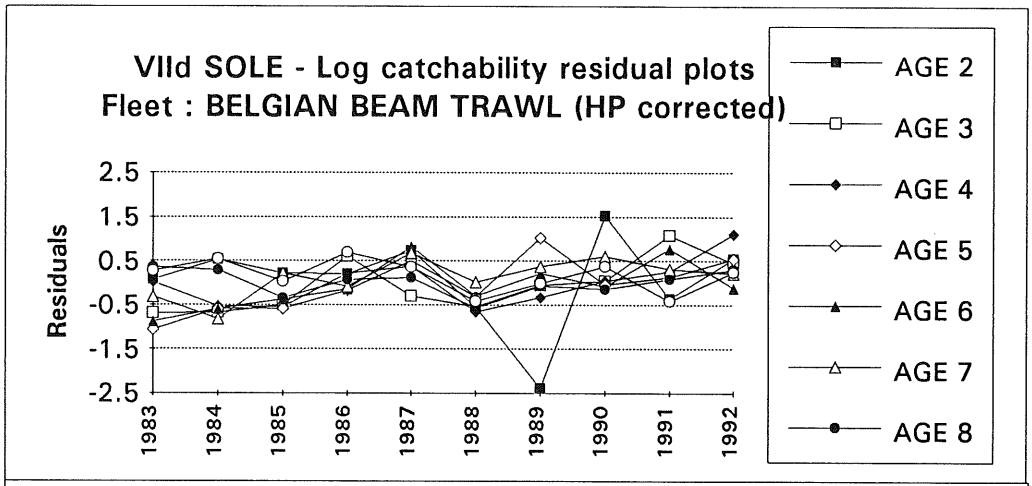
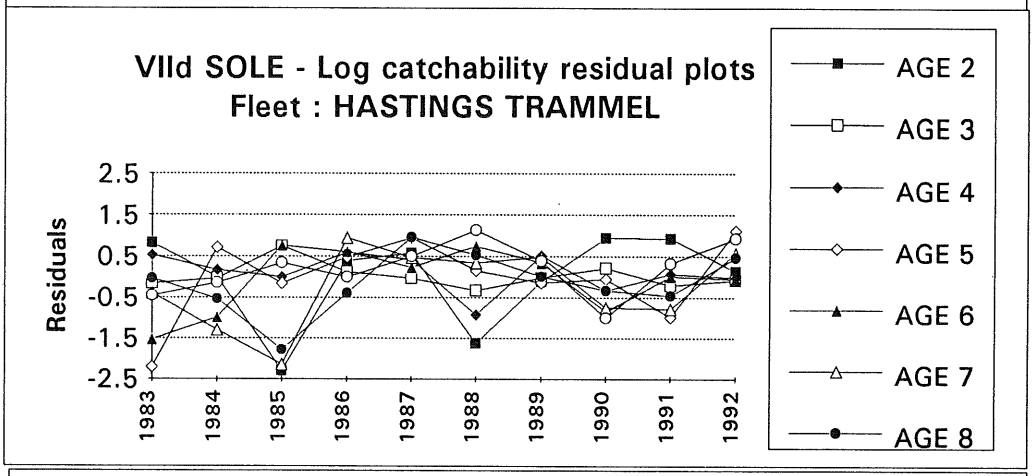
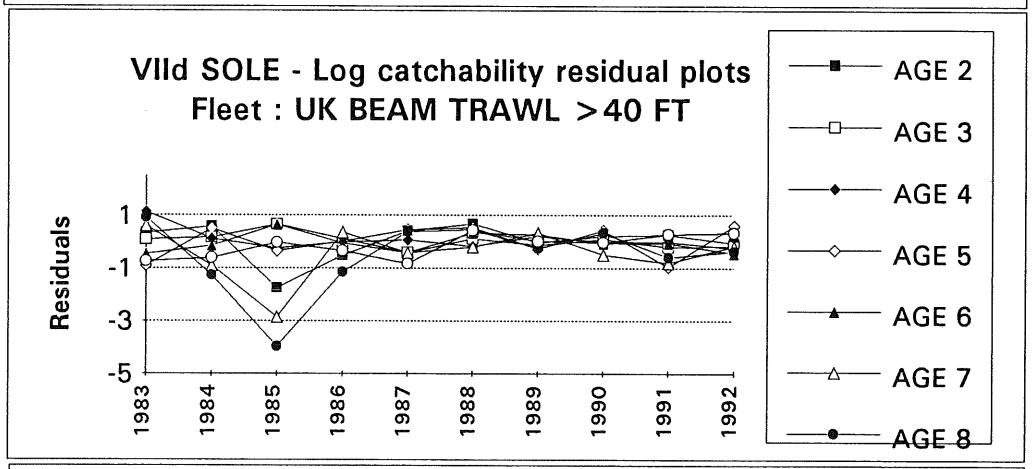
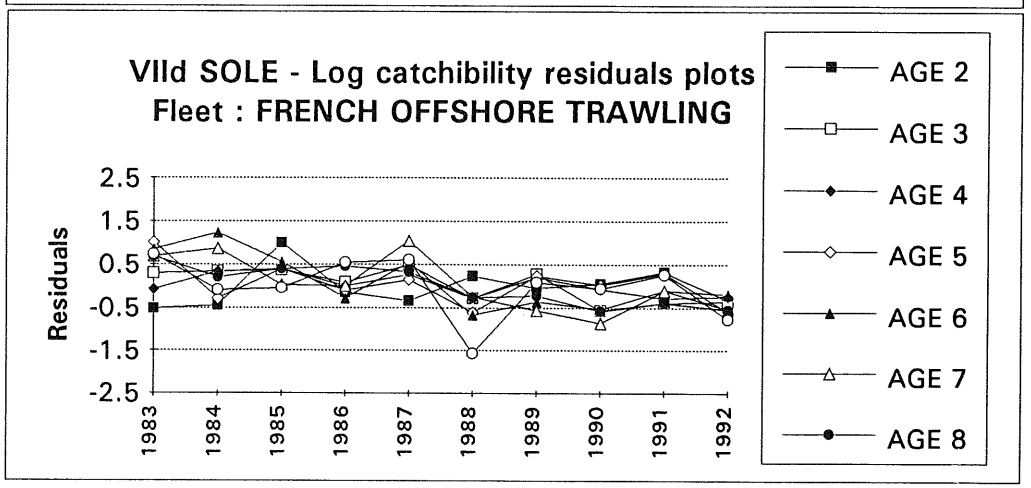


Figure 4.4.1 Sole in Division VIId. Catchability residual plots per age.









Continued

Figure 4.4.1 Continued

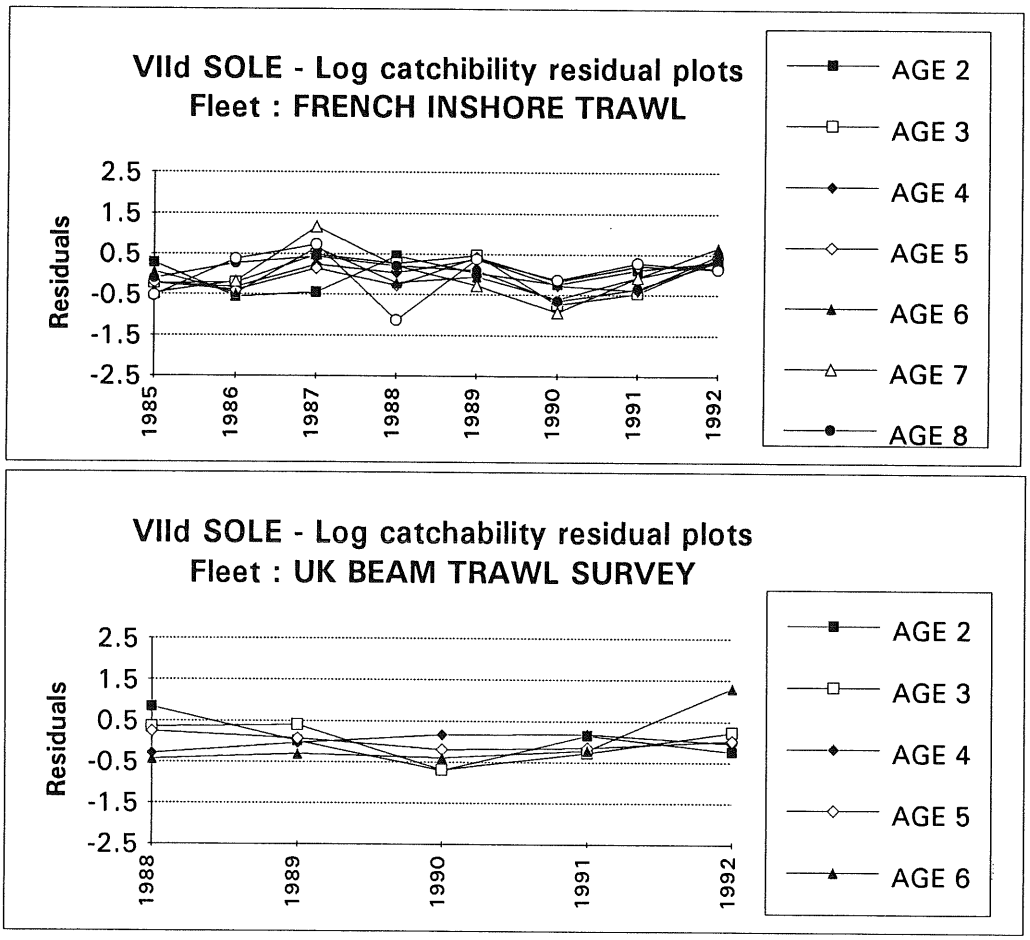


Figure 4.4.2 **Sole in Division VIId. Retrospective analysis.**

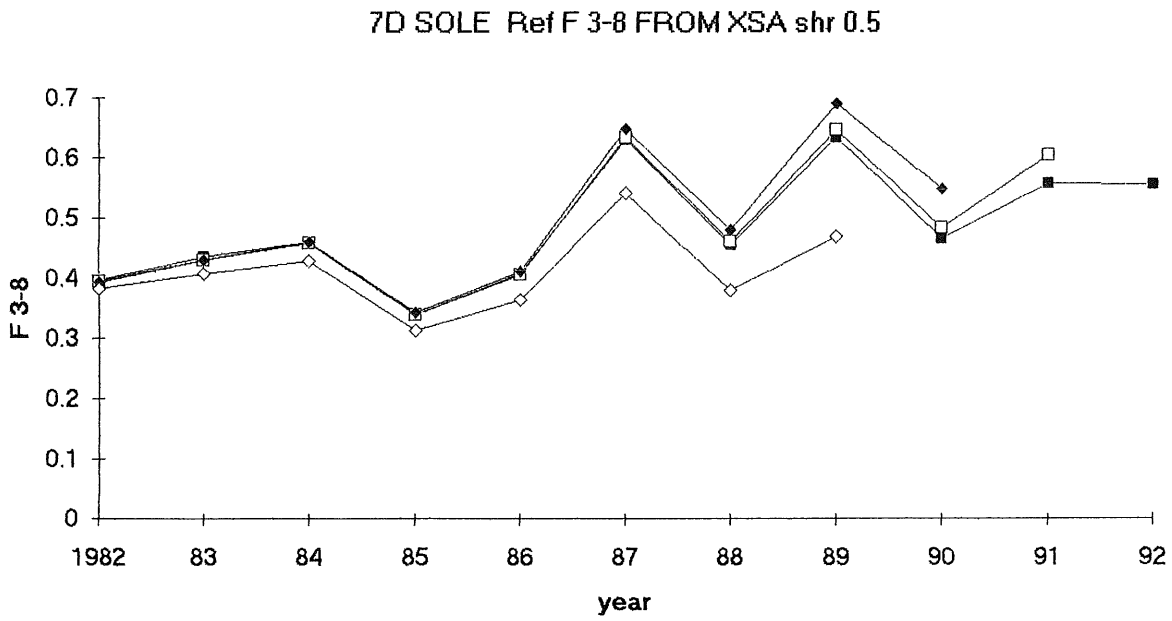


Figure 4.4.3.- Sole in Division VIId. Fish stock summary.

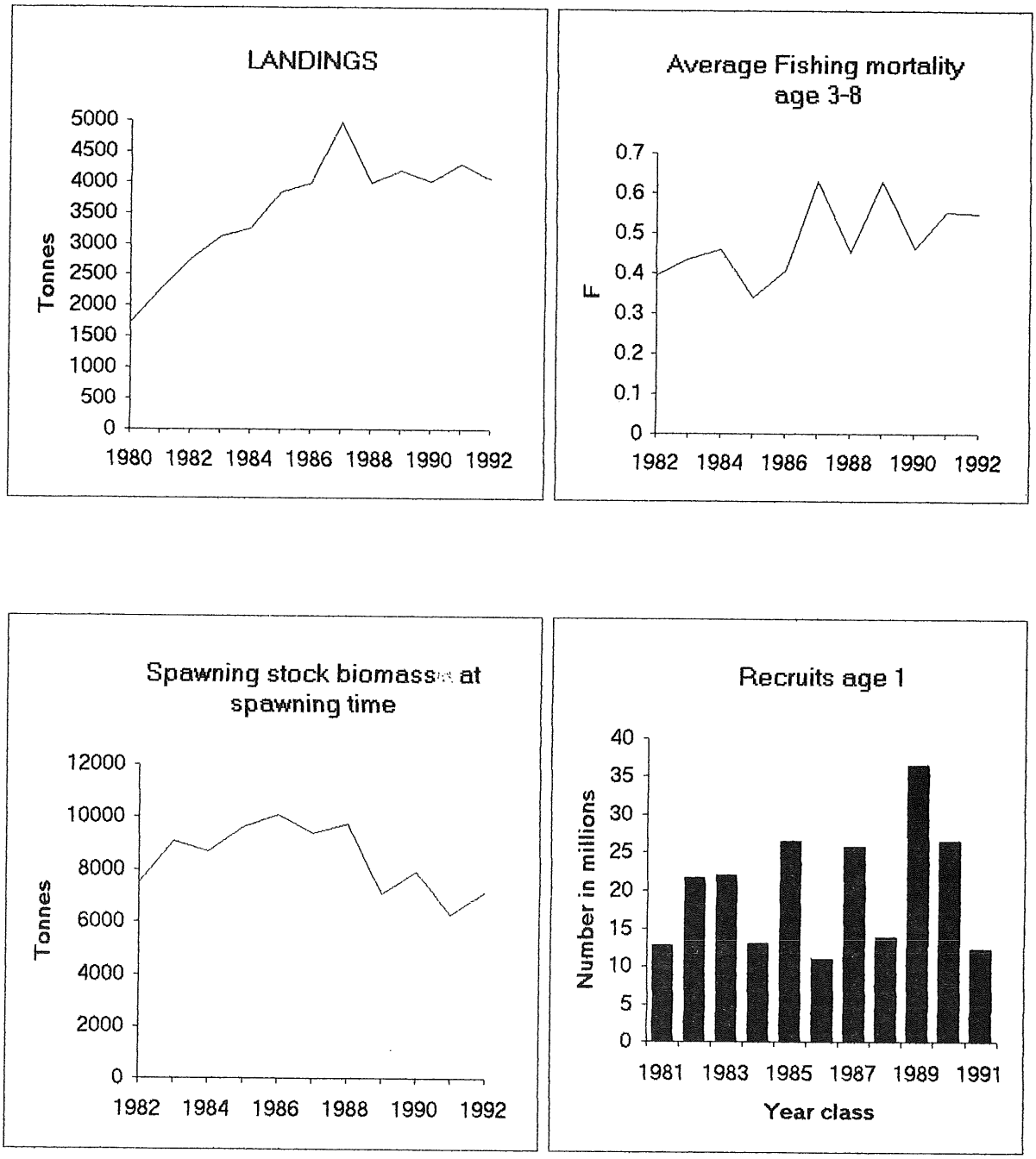


Figure 4.4.4 - Sole in Division VIId. Stock recruitement.

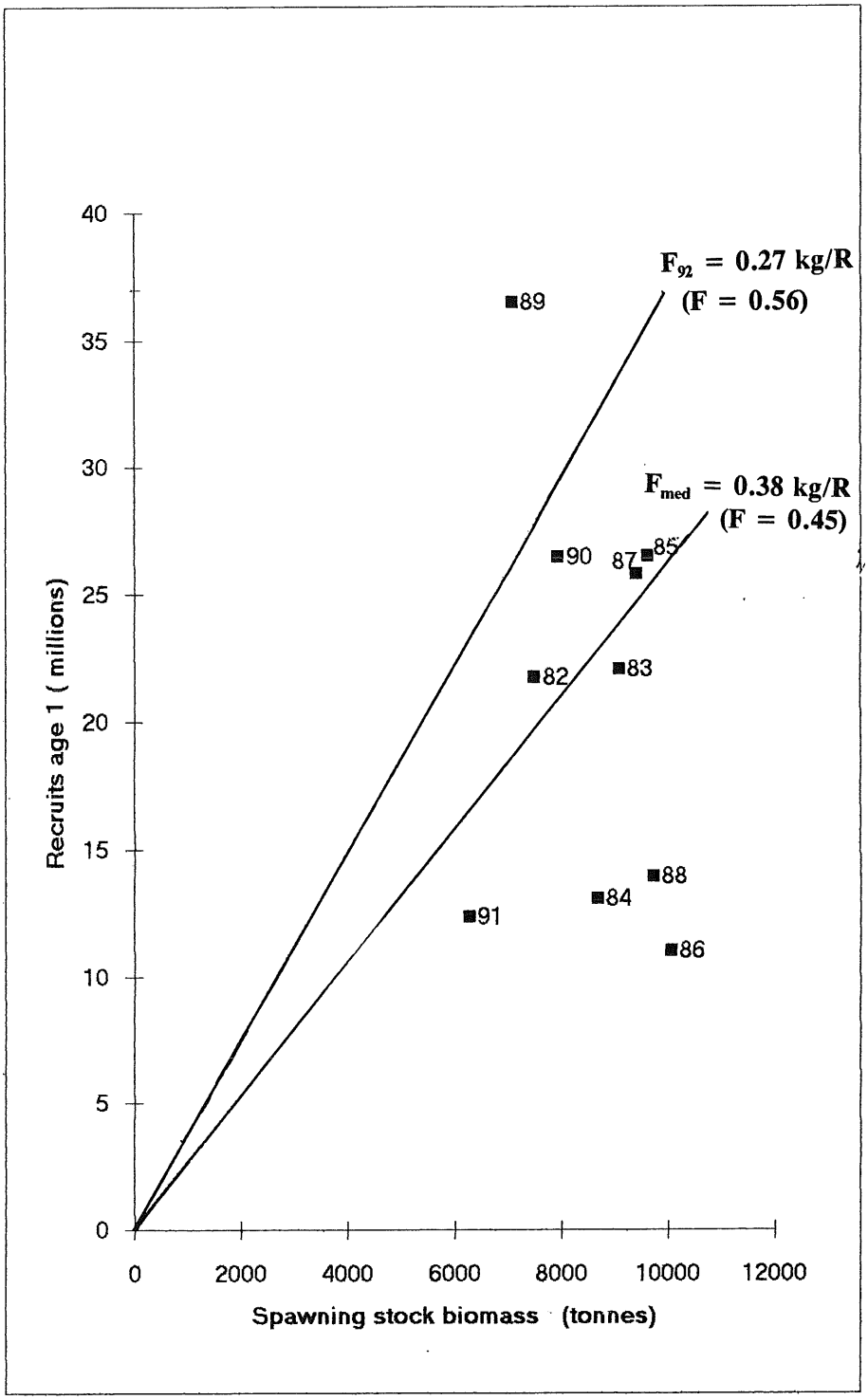
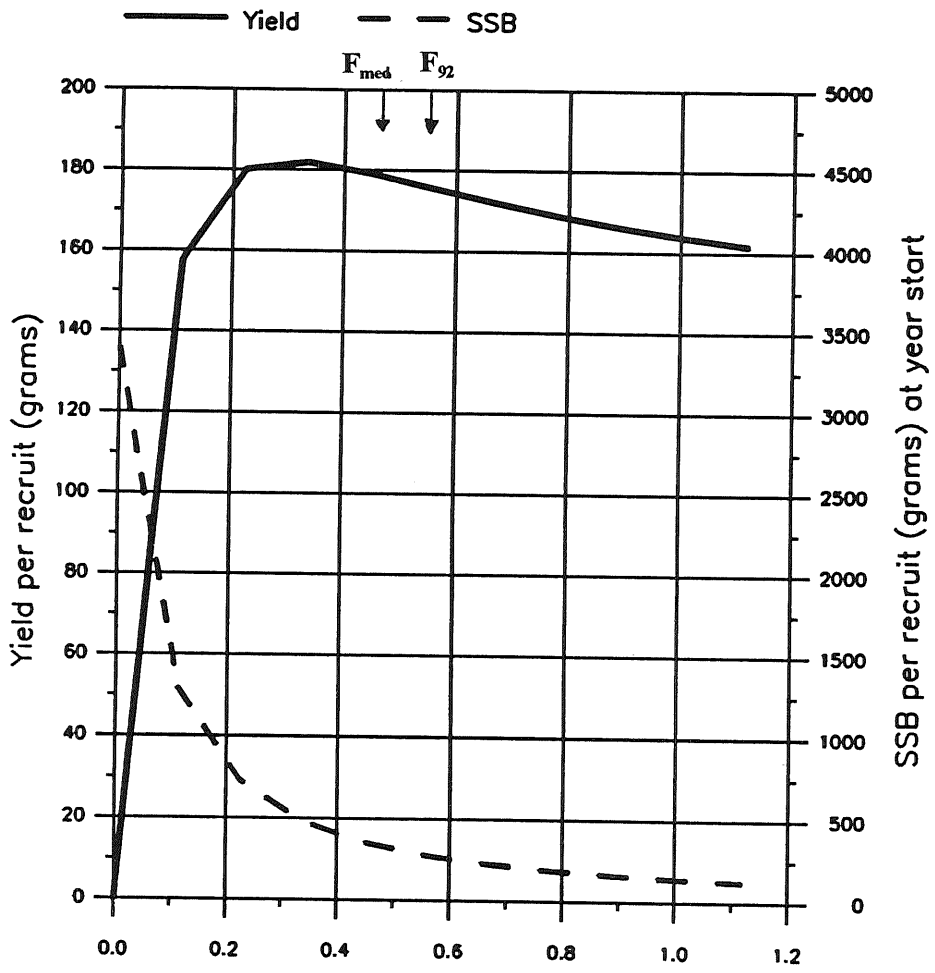


Figure 4.4.5

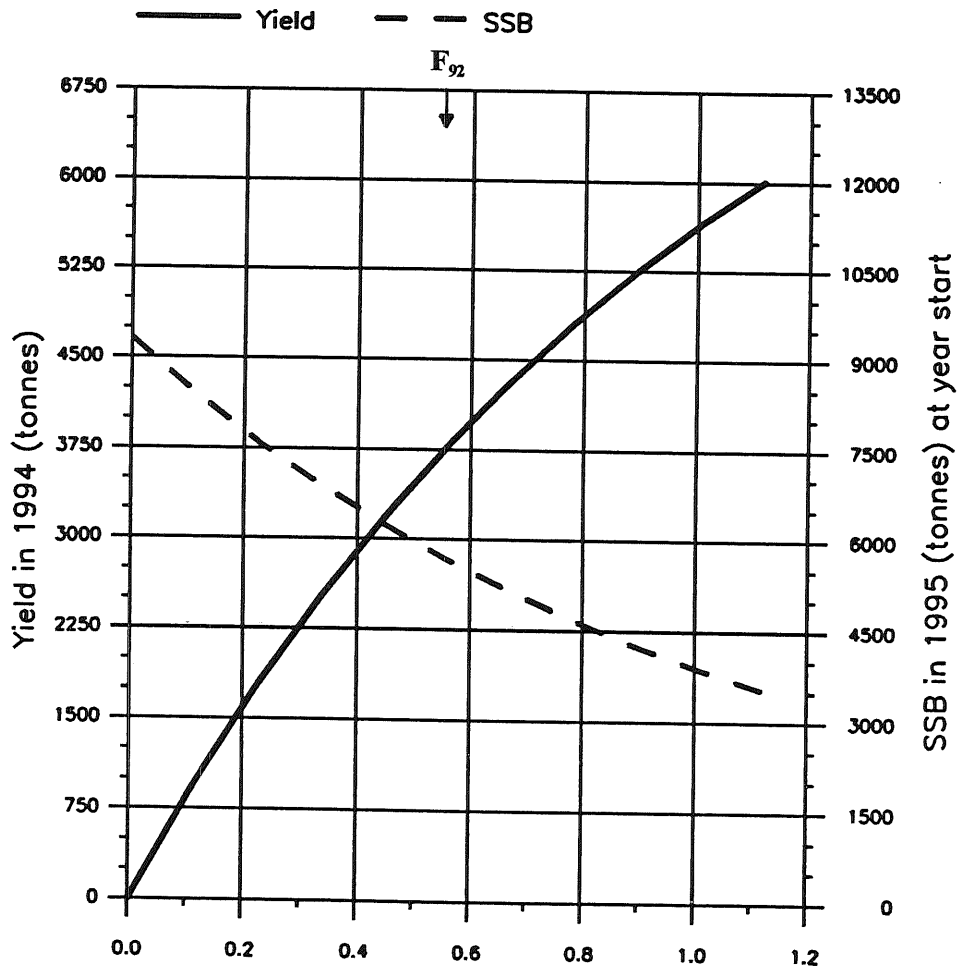
FISH STOCK SUMMARY
STOCK: Sole in the Eastern English Channel (Fishing Area VIId)
11–10–1993

Long term yield and spawning stock biomass



(run: S7DYPR93F) **C**

Short–term yield and spawning stock biomass



(run: S7DPRED) **D**

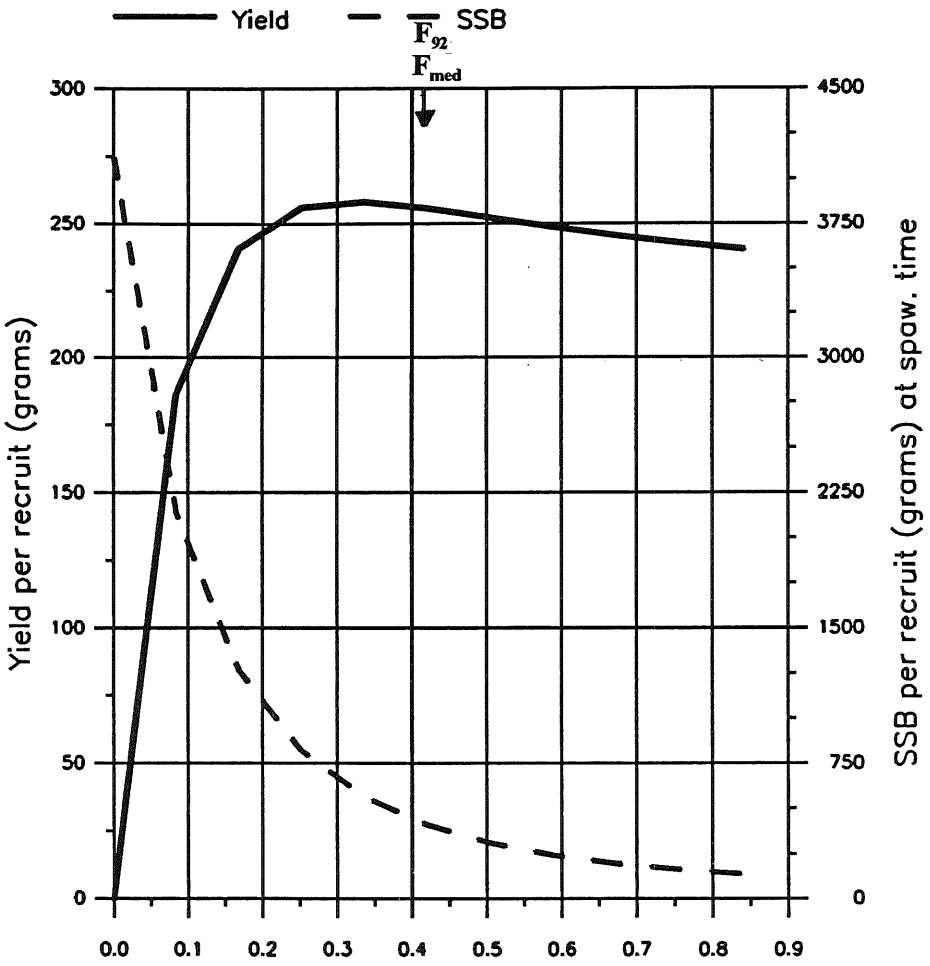
Figure 4.5.7.

FISH STOCK SUMMARY

STOCK: Plaice in the English Channel, Eastern (Fishing Area VIId)

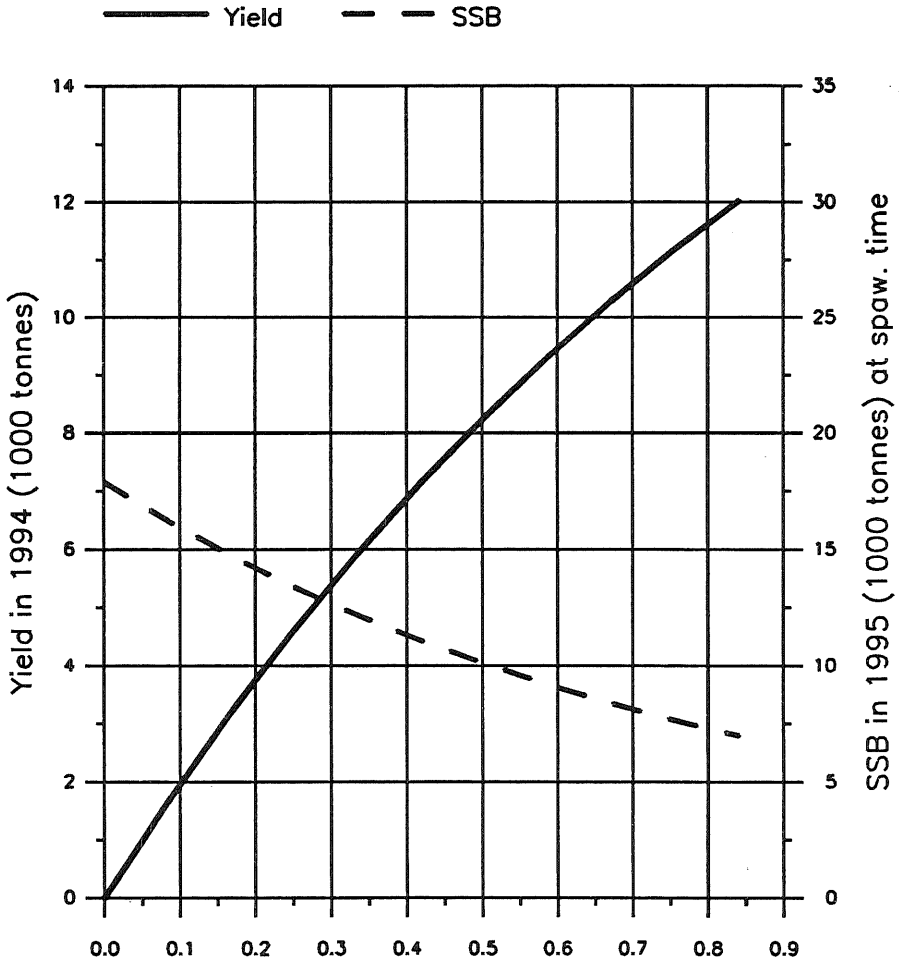
12–10–1993

Long term yield and spawning stock biomass



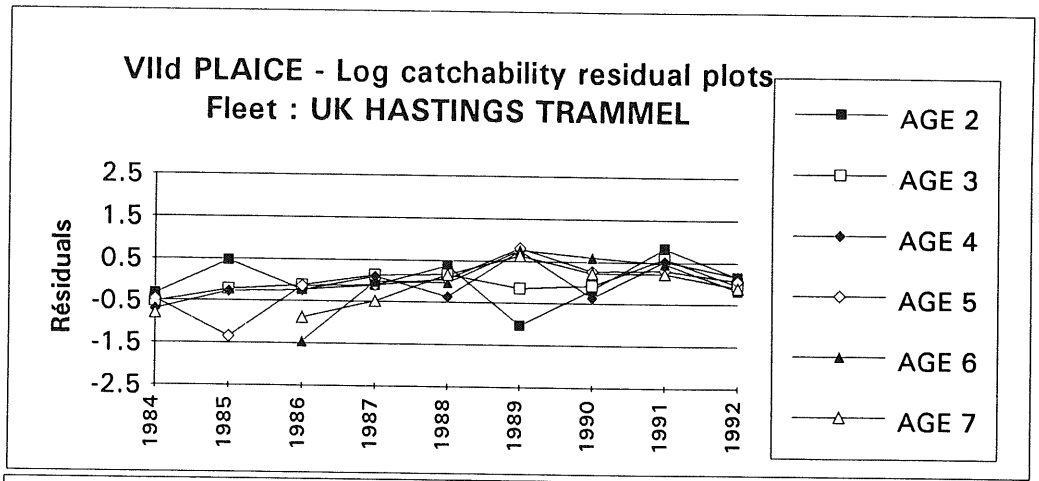
(run: P7DYPR93) **C**

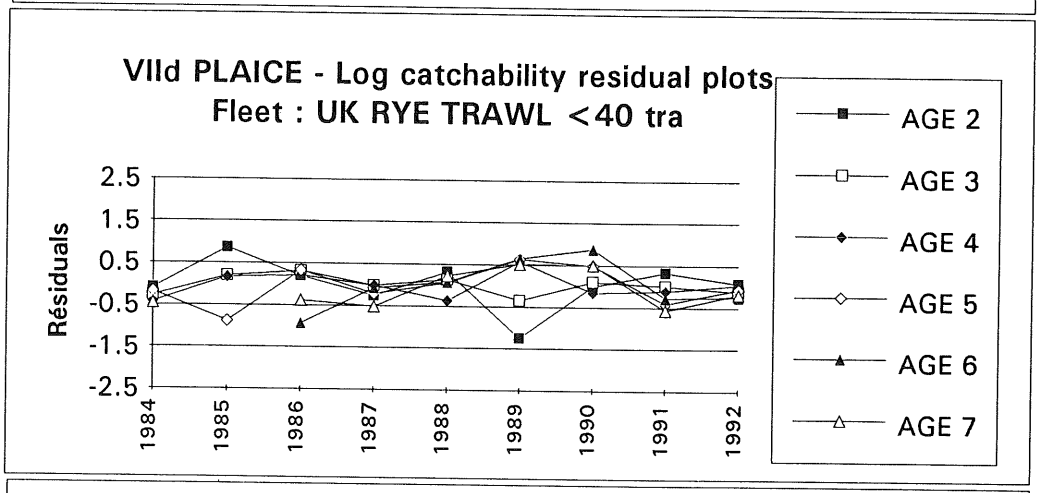
Short–term yield and spawning stock biomass

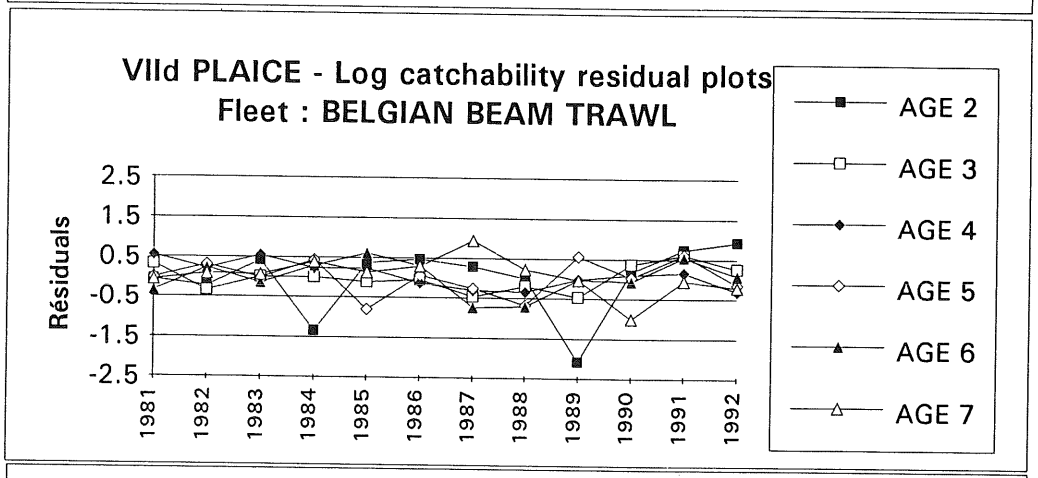


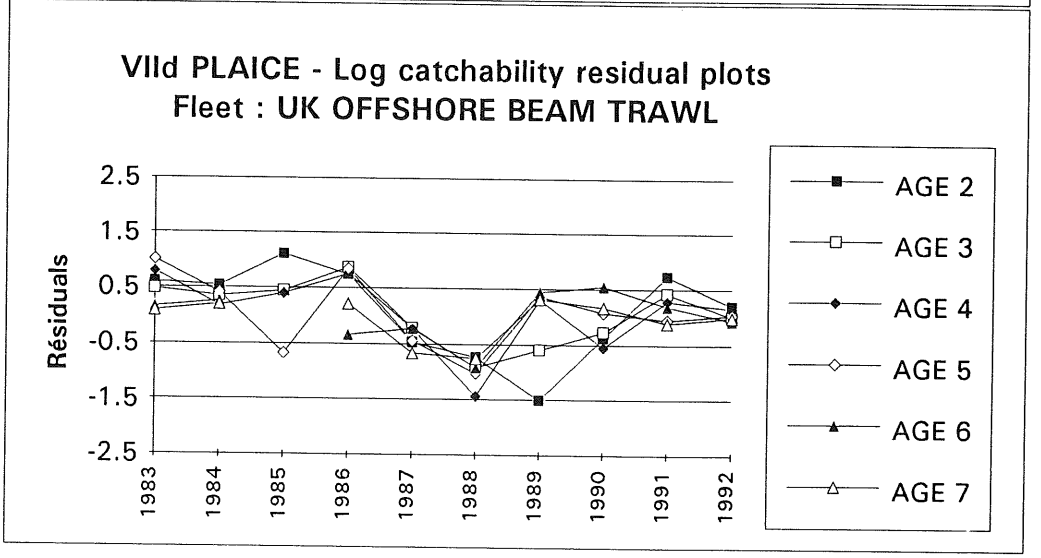
(run: P7DPRED) **D**

Figure 4.5.1 **Plaice in Division VIId. Catchability residual plots per age.**









Continued

Figure 4.5.1 Continued

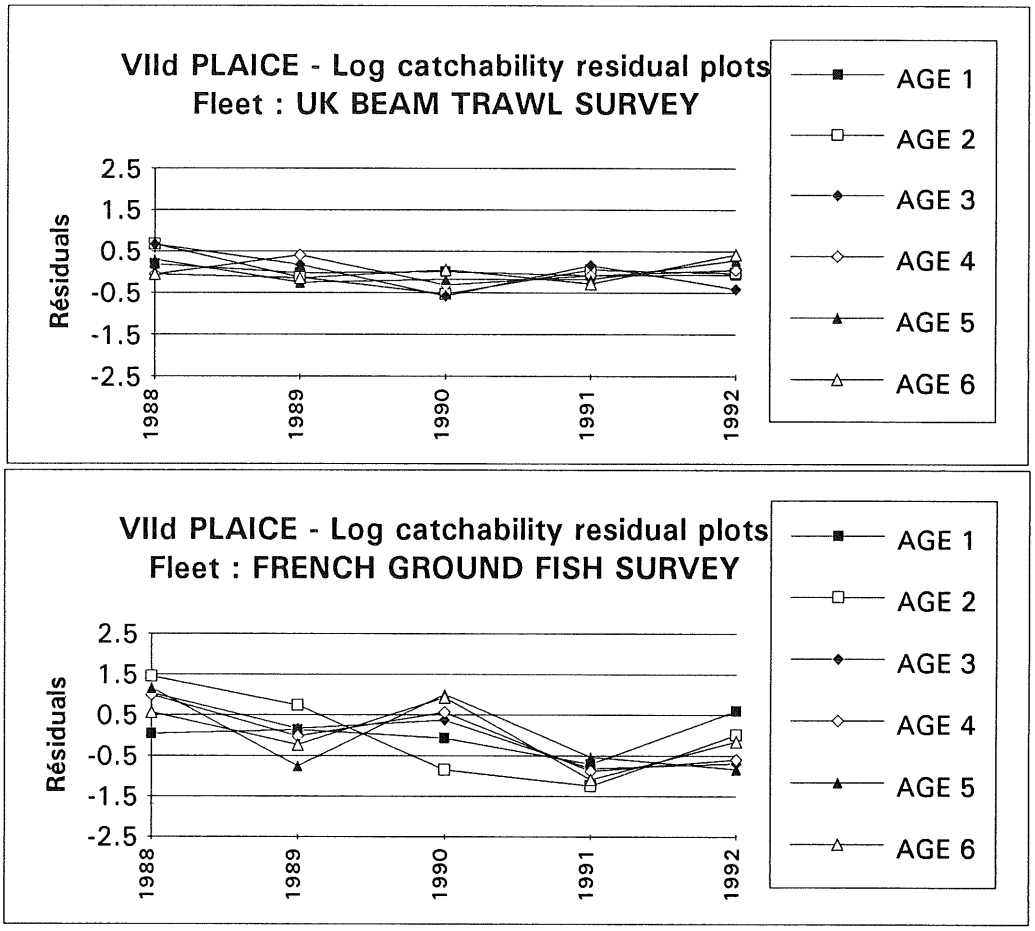


Figure 4.5.2 **Plaice in Division VIId. Retrospective analysis.**

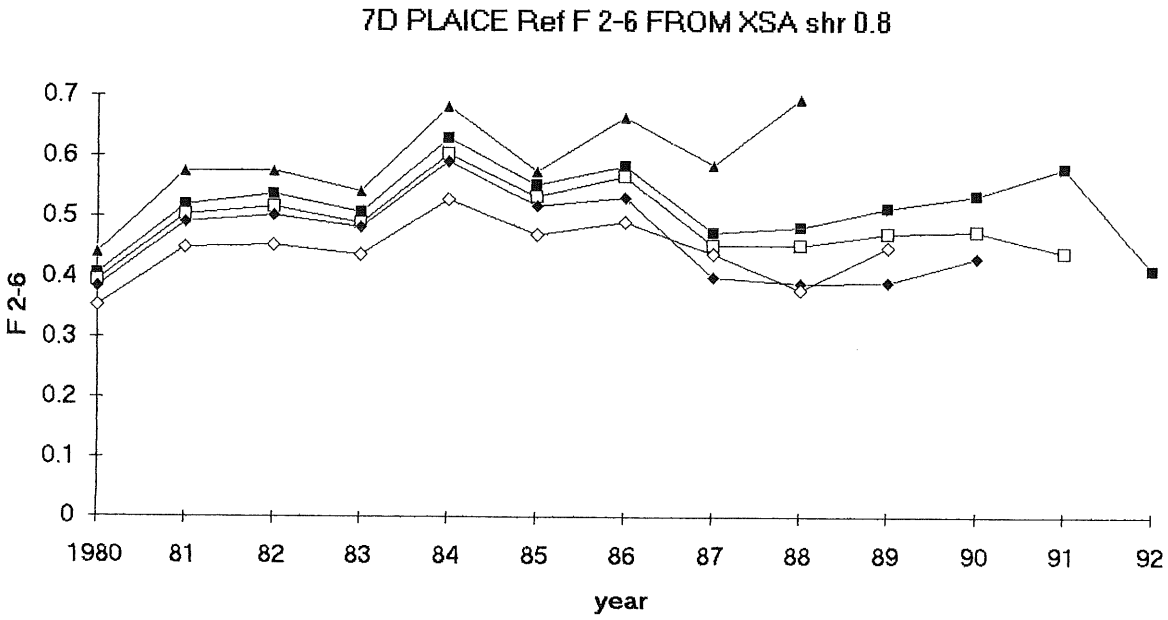


Figure 4.5.3

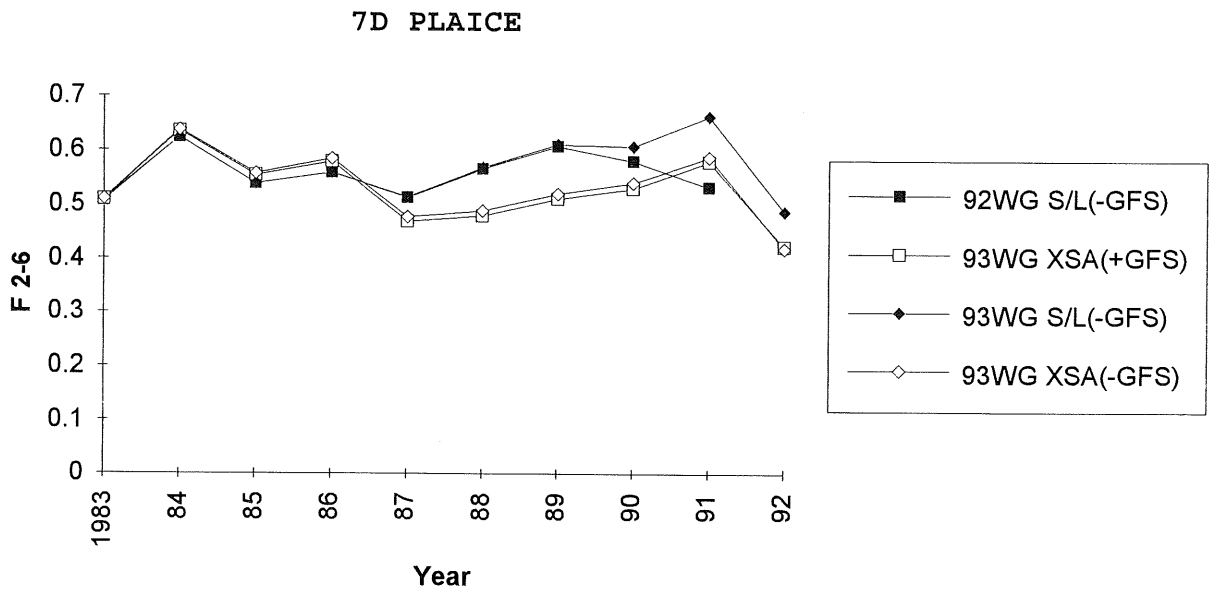


Figure 4.5.4

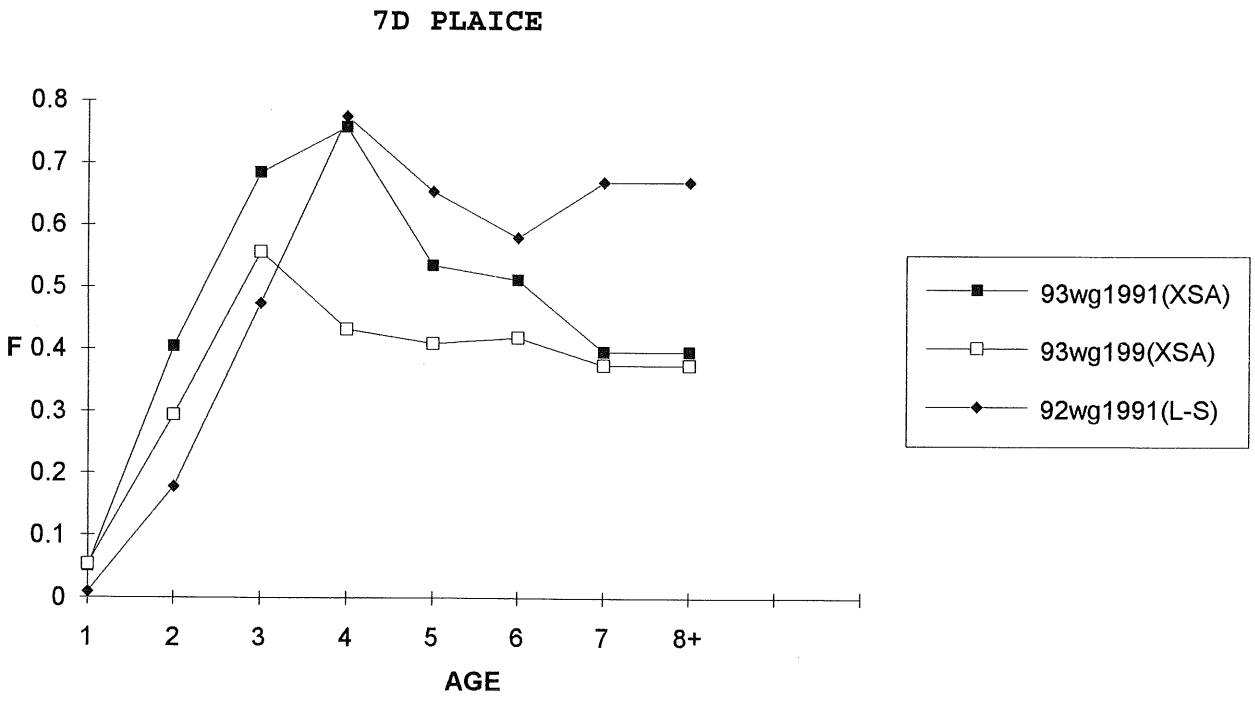


Figure 4.5.5 **Plaice in Division VIId. Fish stock summary.**

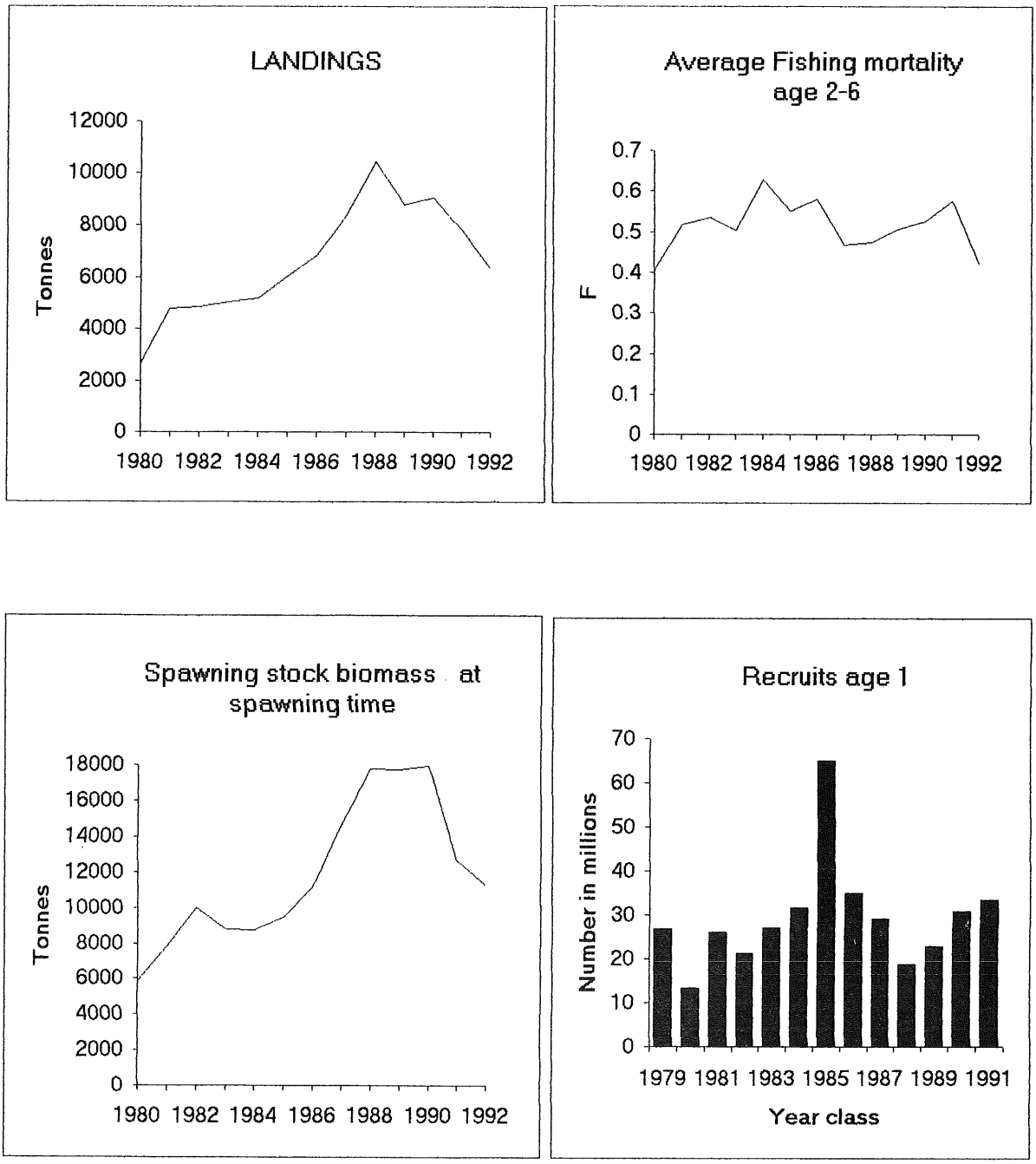


Figure 4.5.6 Plaice in Division VIId. Stock recruitment.

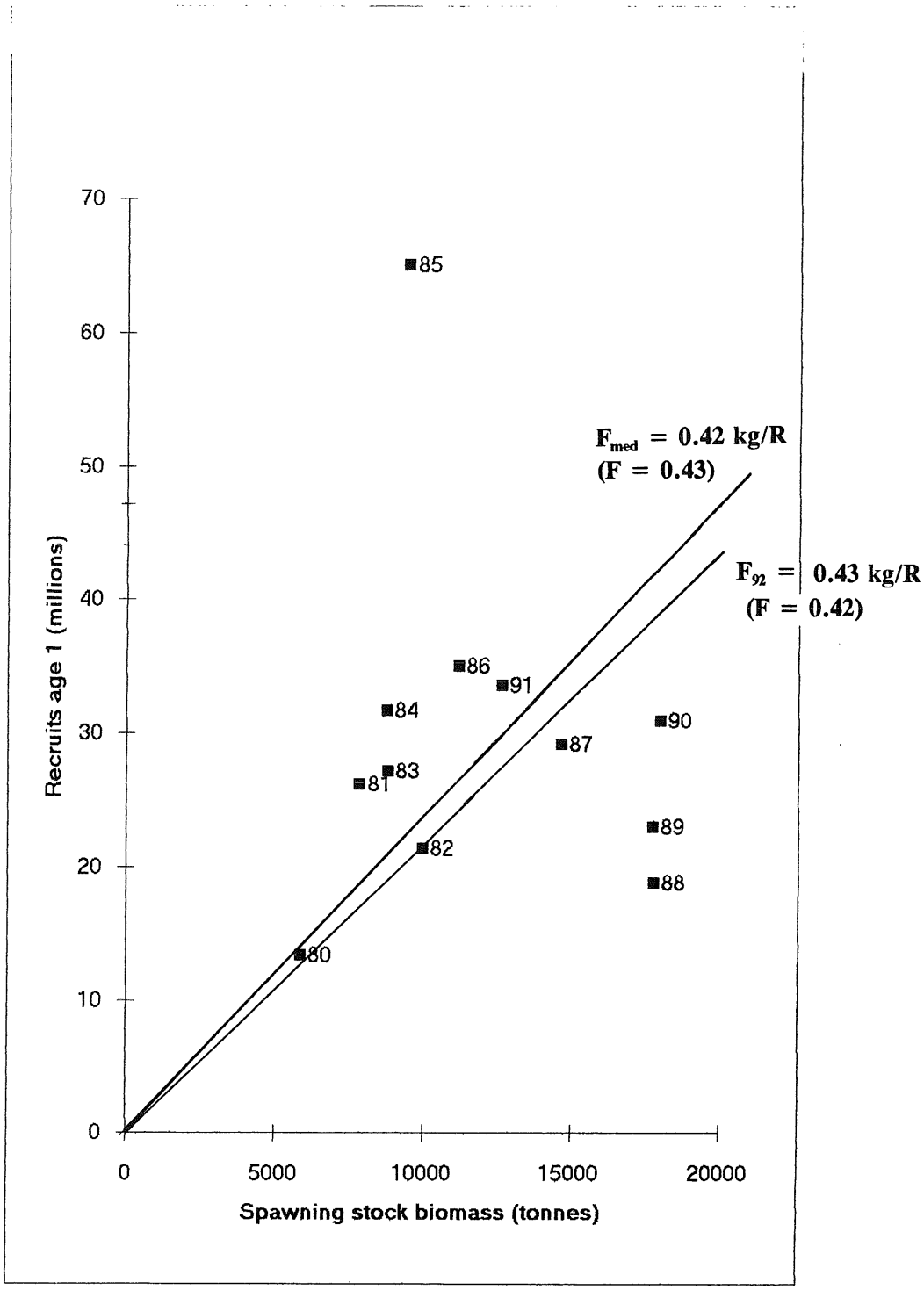


Figure 6.3.1

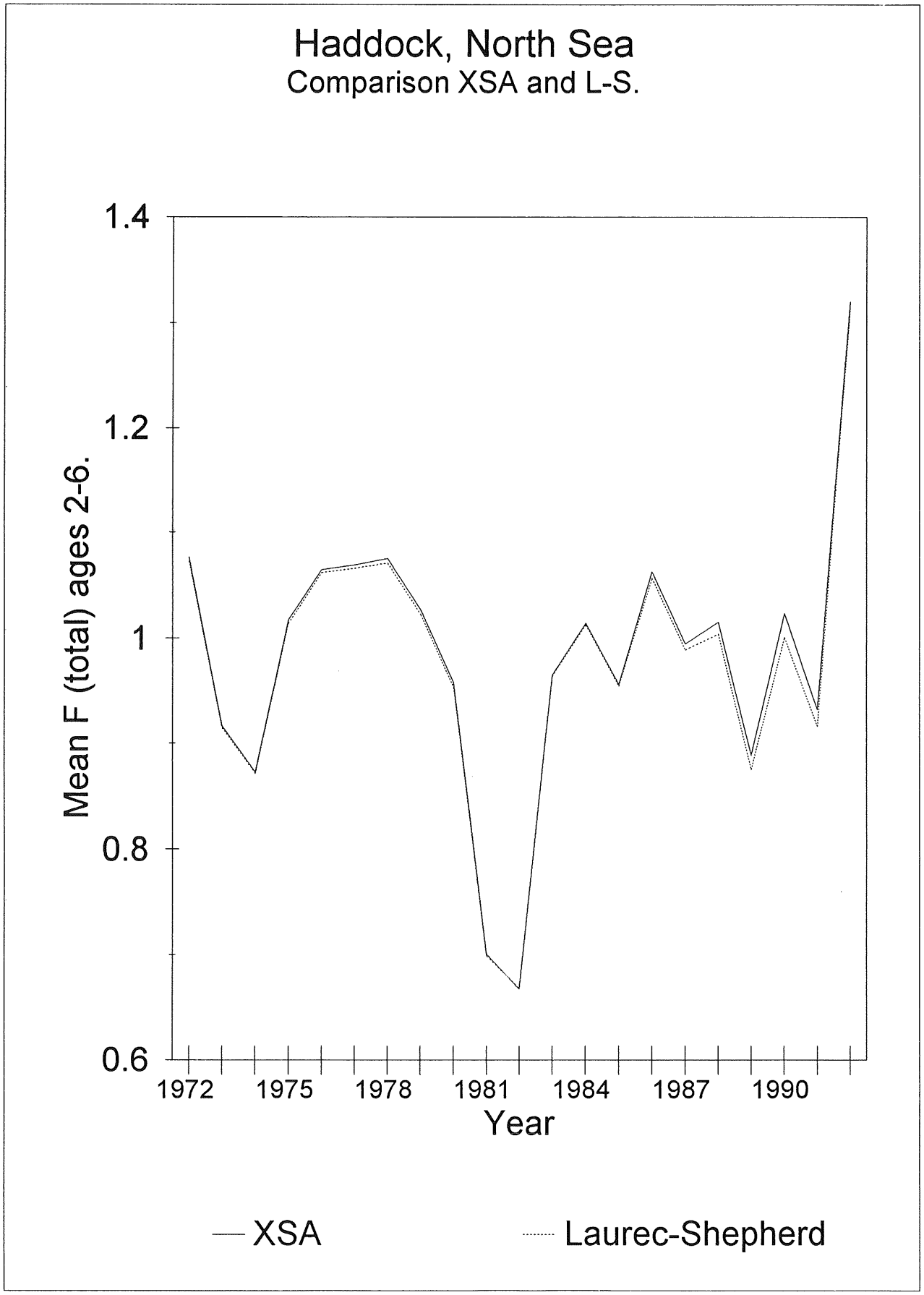

Haddock, North Sea
Comparison XSA and L-S.
Mean F (total) ages 2-6.
1.4
1.2
1
0.8
0.6
1972
1975
1978
1981
1984
1987
1990
Year
XSA
Laurec-Shepherd

Figure 6.4.1

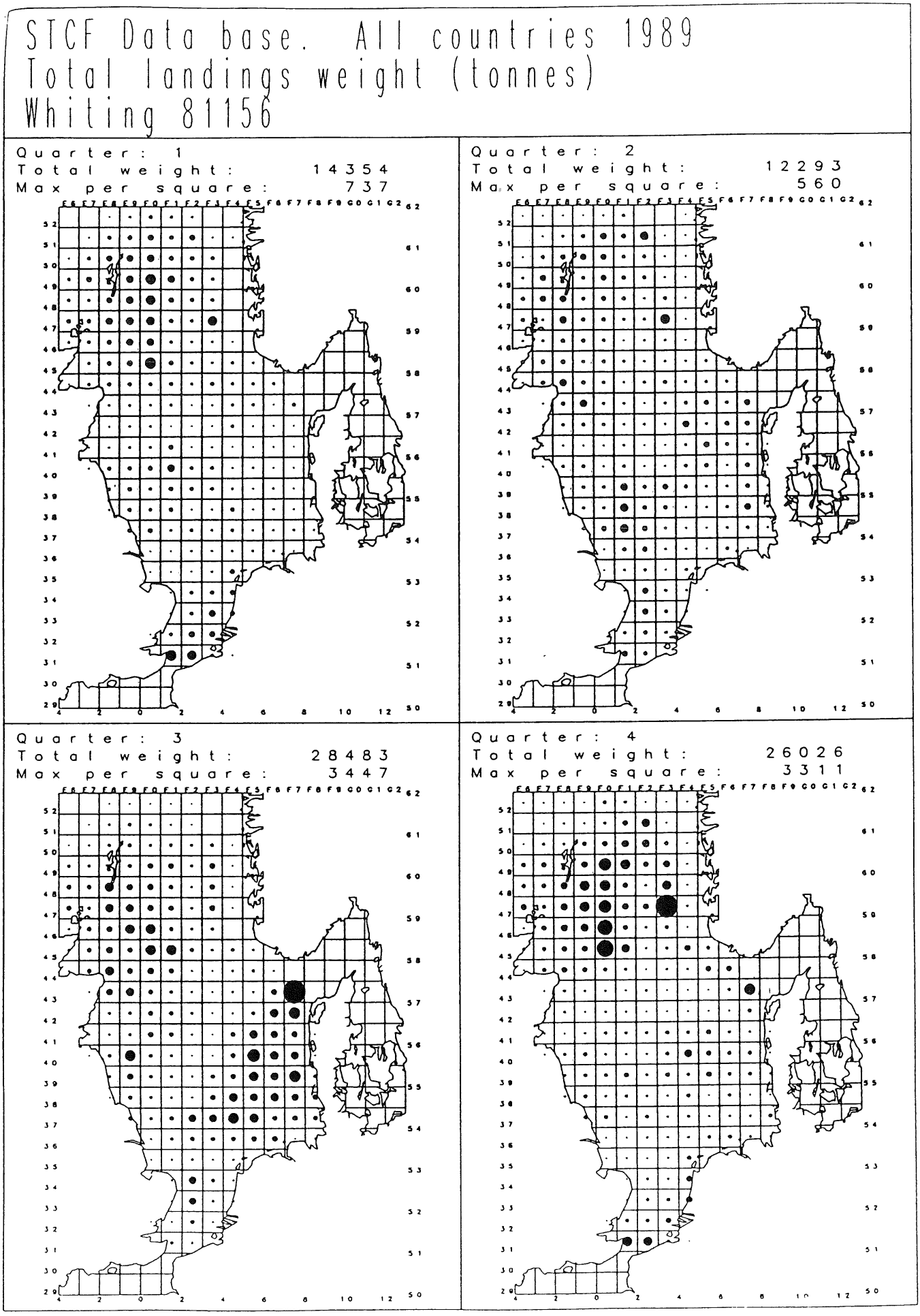

STCF Data base. All countries 1989
Total landings weight (tonnes)
Whiting 81156
Quarter: 1
Total weight: 14354
Max per square: 737
Quarter: 2
Total weight: 12293
Max per square: 560
Quarter: 3
Total weight: 28483
Max per square: 3447
Quarter: 4
Total weight: 26026
Max per square: 3311

Figure 6.6.1

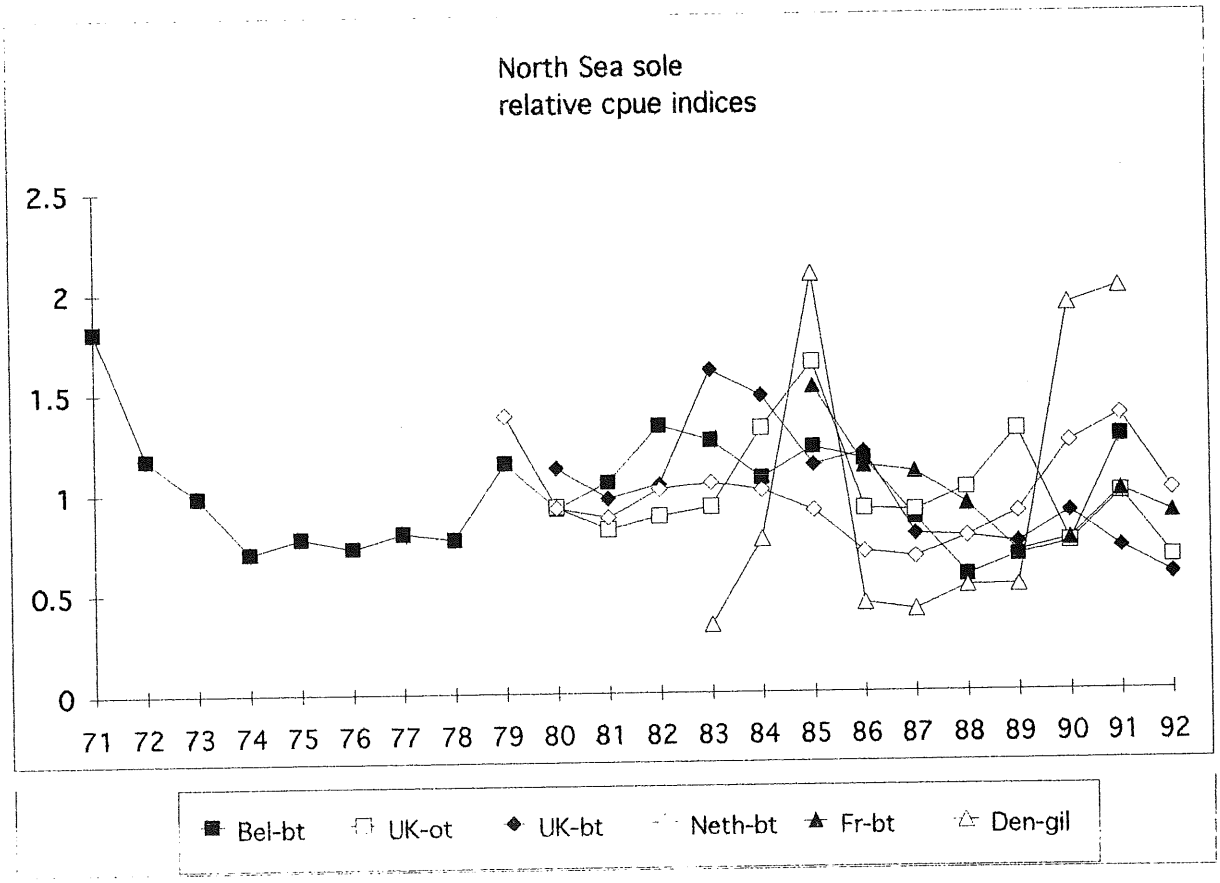


Figure 6.6.2

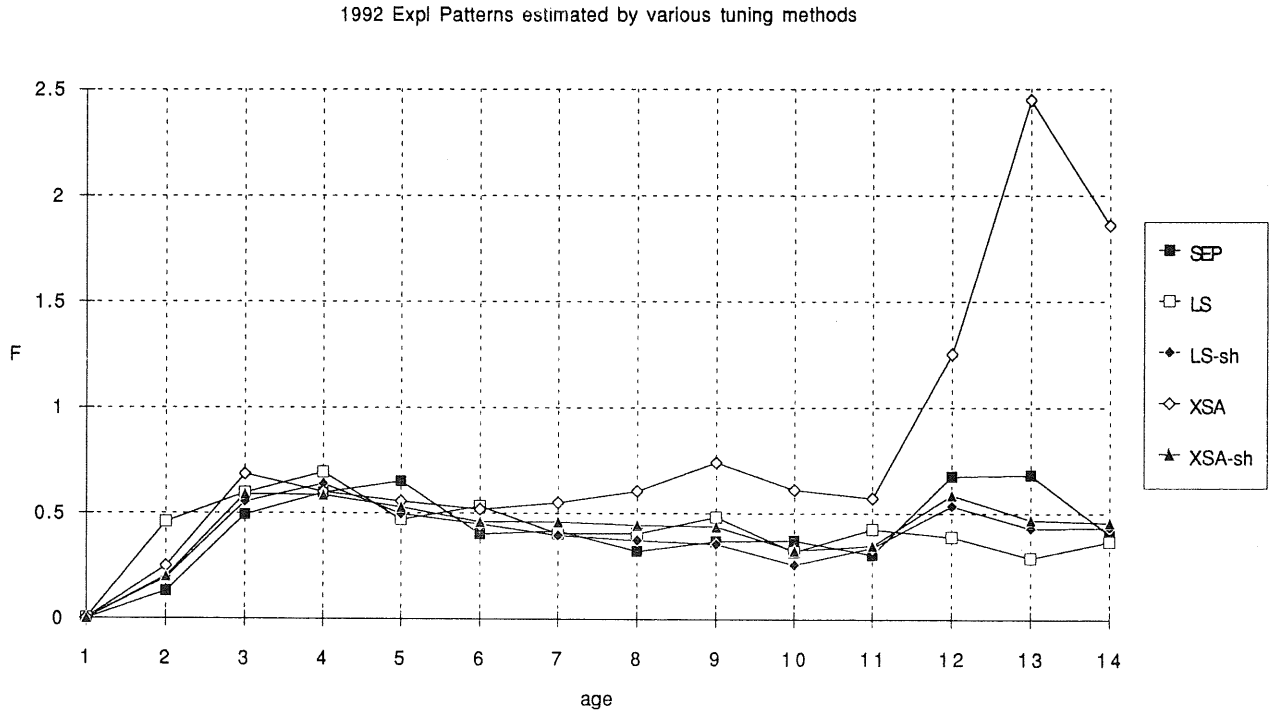


Figure 6.6.3a

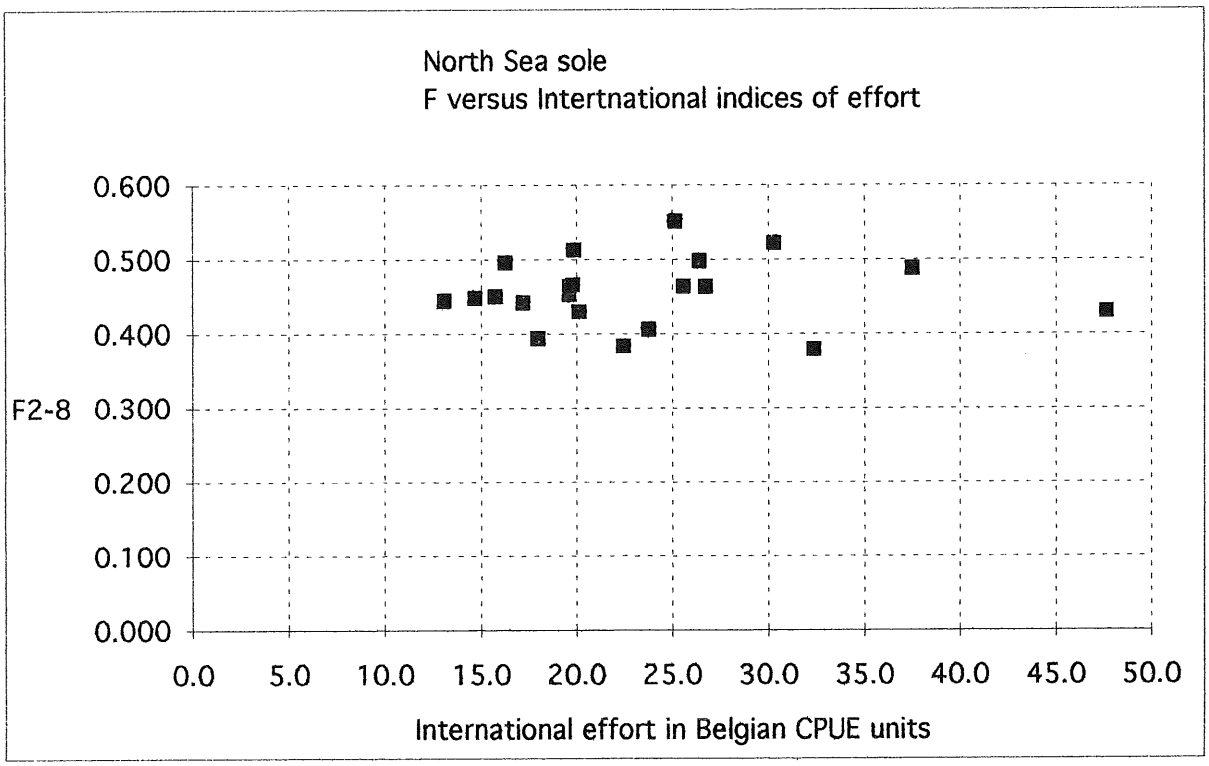


Figure 6.6.3b

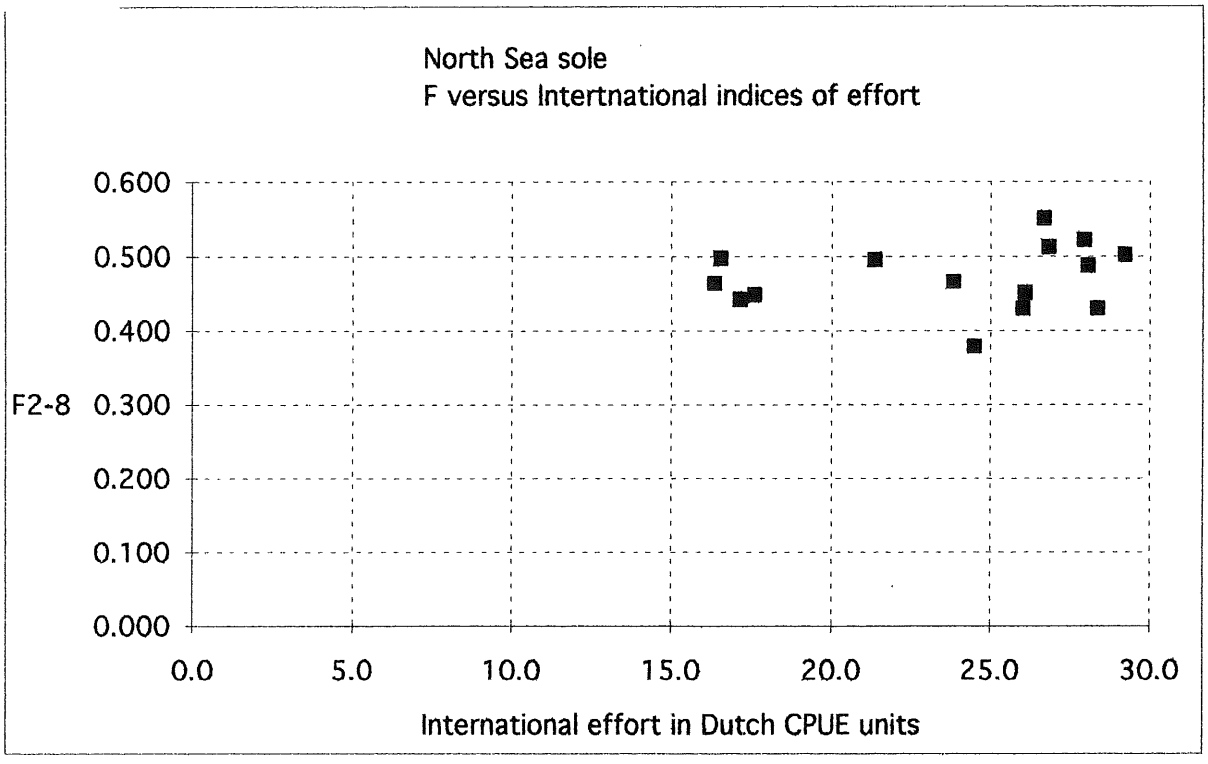


Figure 6.7.1 North Sea plaice: trends in standardized CPUE of various fleets (scaled to the mean of each series).

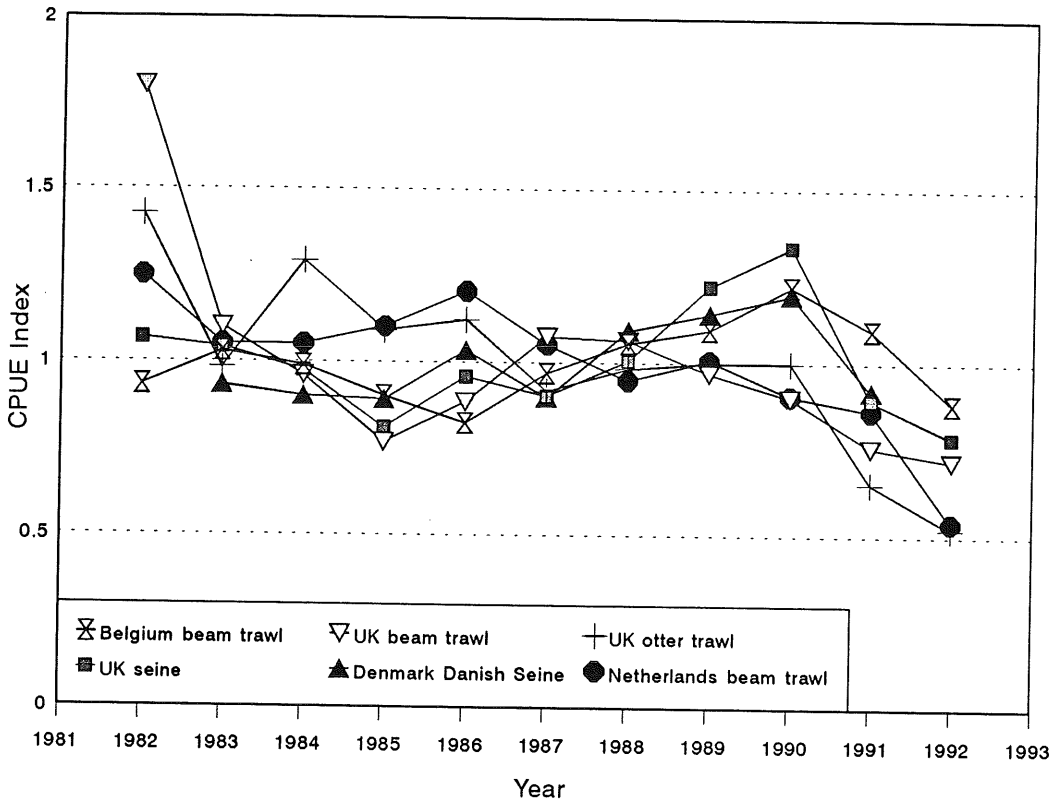


Figure 6.7.2 Trends in cumulative numbers of various age groups caught by fishing hour in the Netherlands, beam trawl survey in the sout-eastern North Sea.

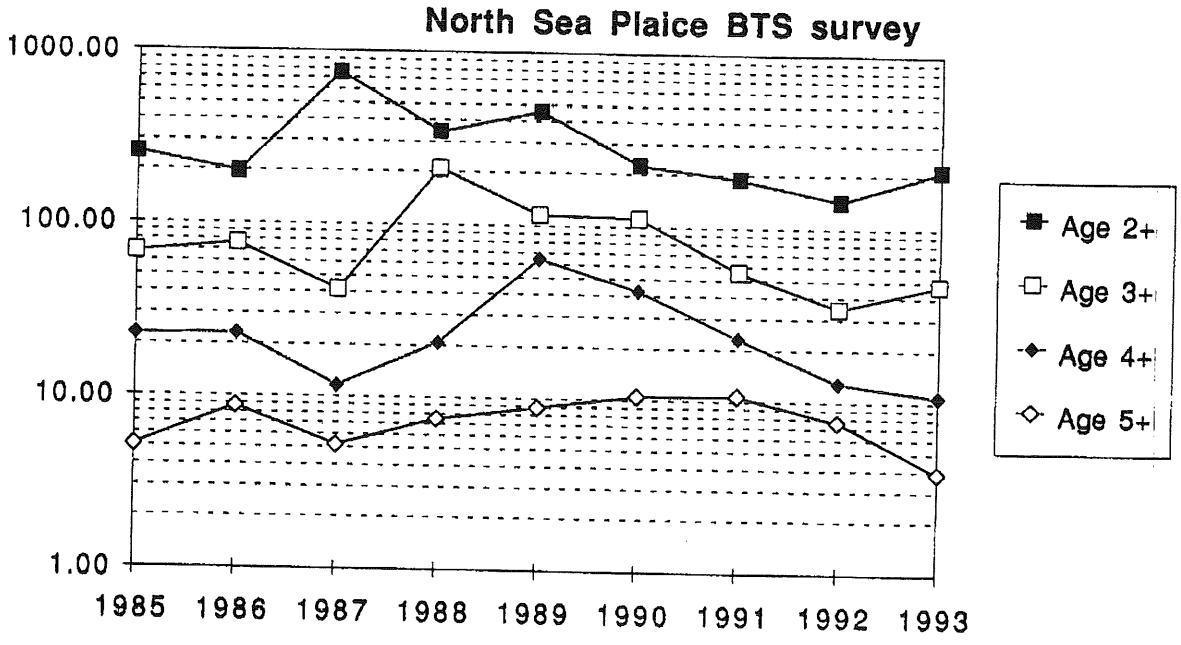


Figure 6.7.3 North Sea plaice: F at age in 1992 from 3 tuning runs.

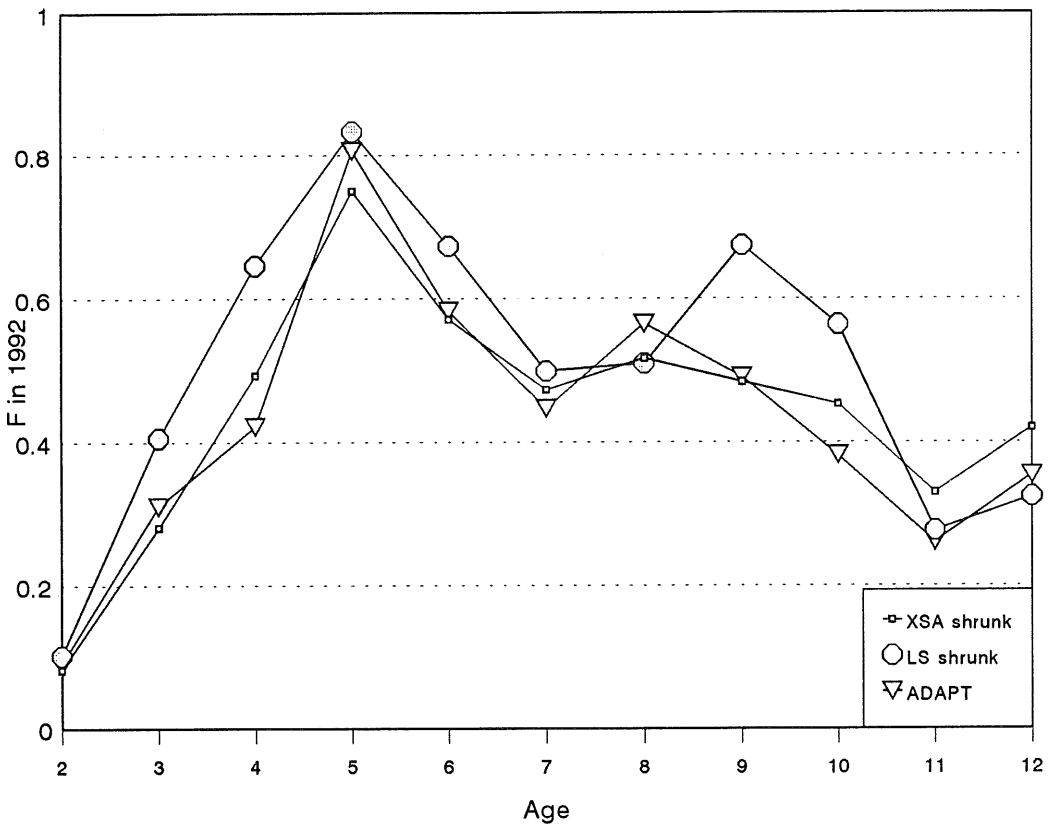


Figure 6.7.4 North Sea plaice: F at age in 1991 from 3 tuning runs in 1993 compared to F in 1991 from 1992 assessment.

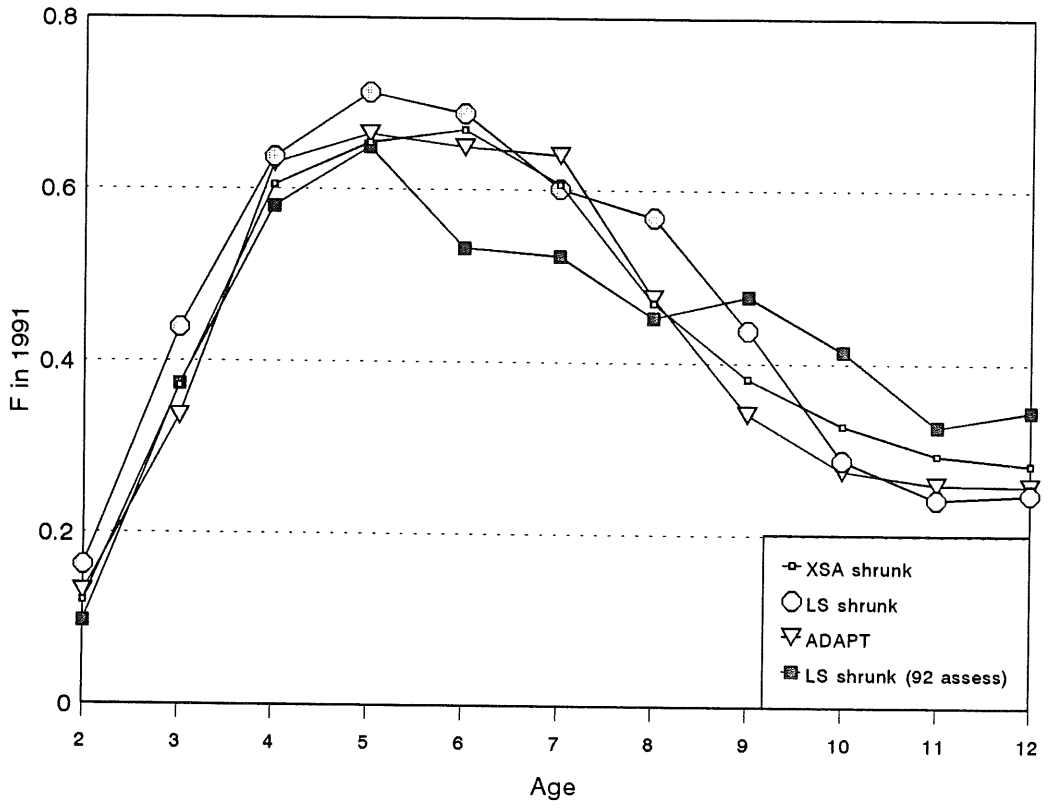


Figure 6.8.1 **Retrospective analysis of XSA for commercial fleet (FRATRC) in the Channel.**

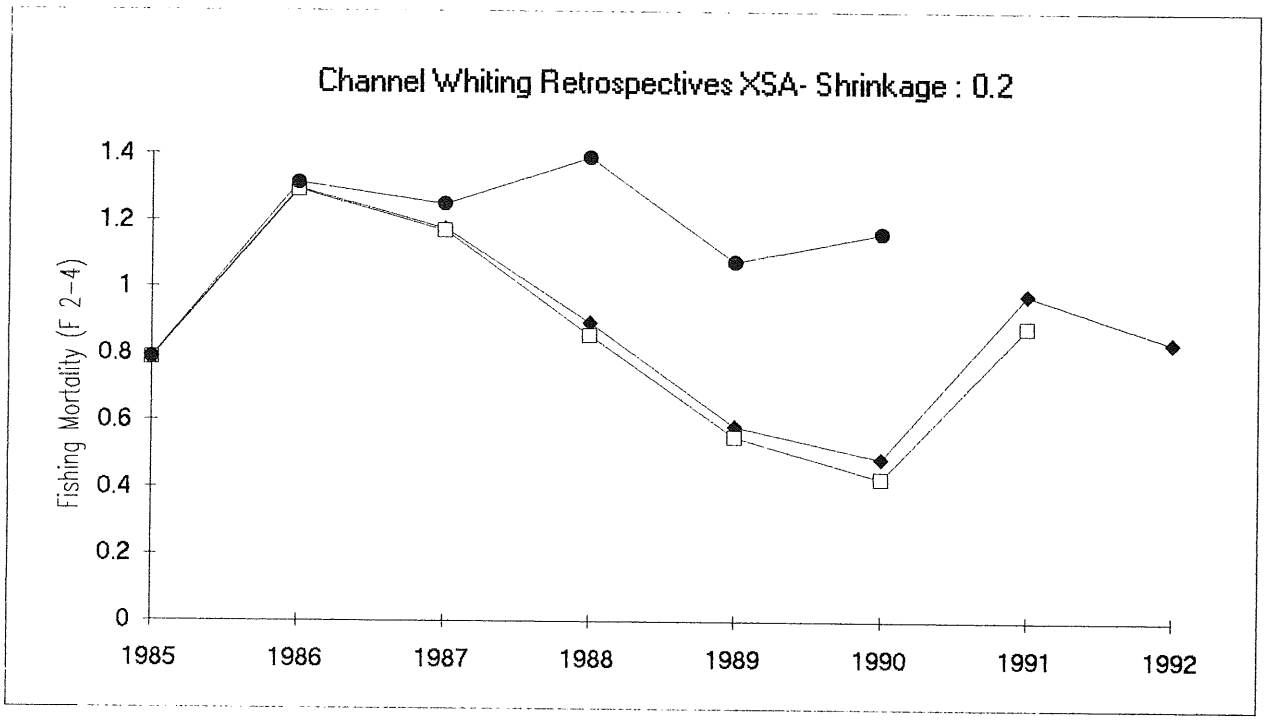
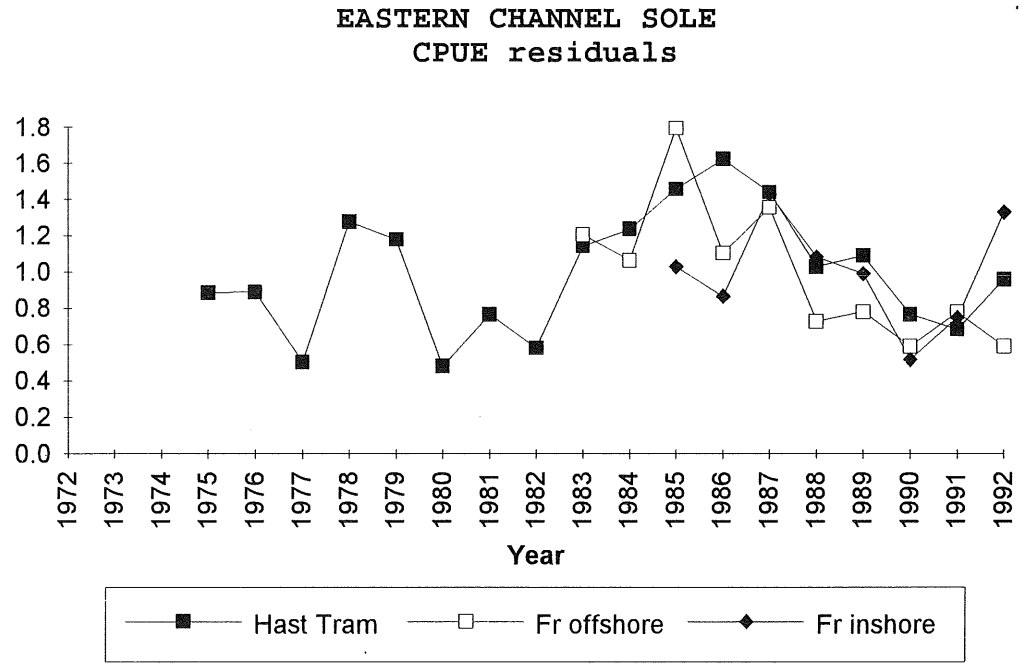


Figure 6.9.1


EASTERN CHANNEL SOLE
CPUE residuals
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
Hast Tram
Fr offshore
Fr inshore

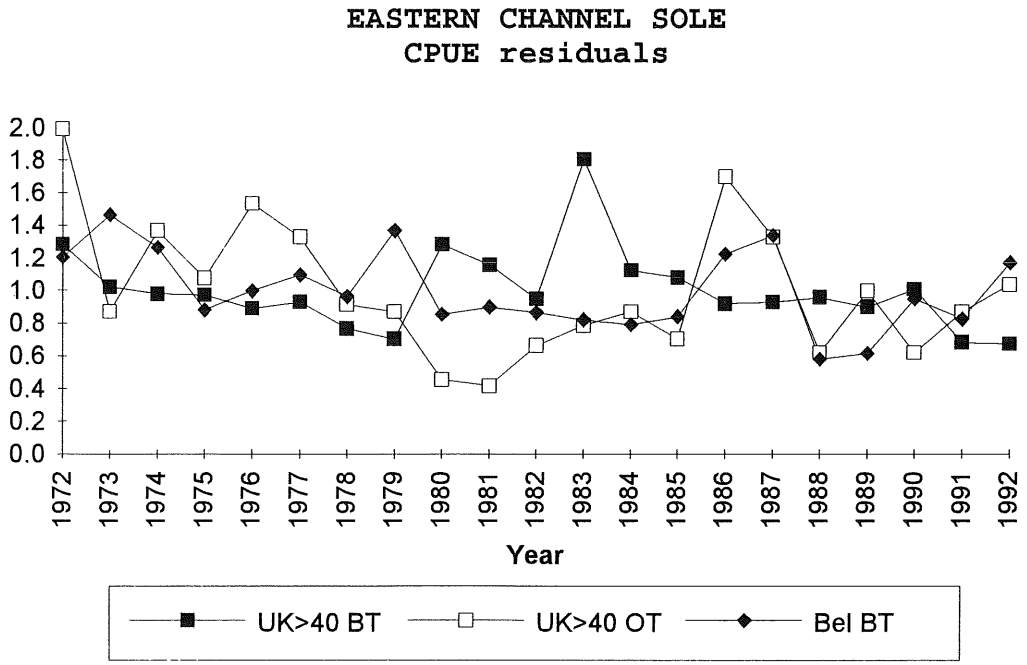
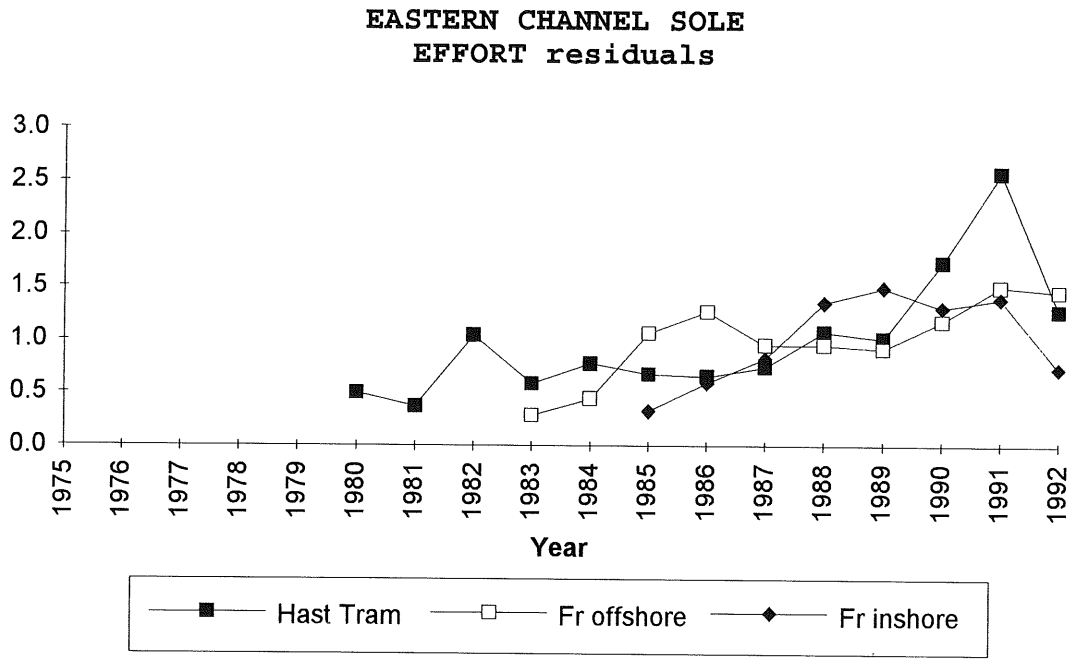

EASTERN CHANNEL SOLE
CPUE residuals
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
UK>40 BT
UK>40 OT
Bel BT

Figure 6.9.2


EASTERN CHANNEL SOLE
EFFORT residuals
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
Hast Tram
Fr offshore
Fr inshore

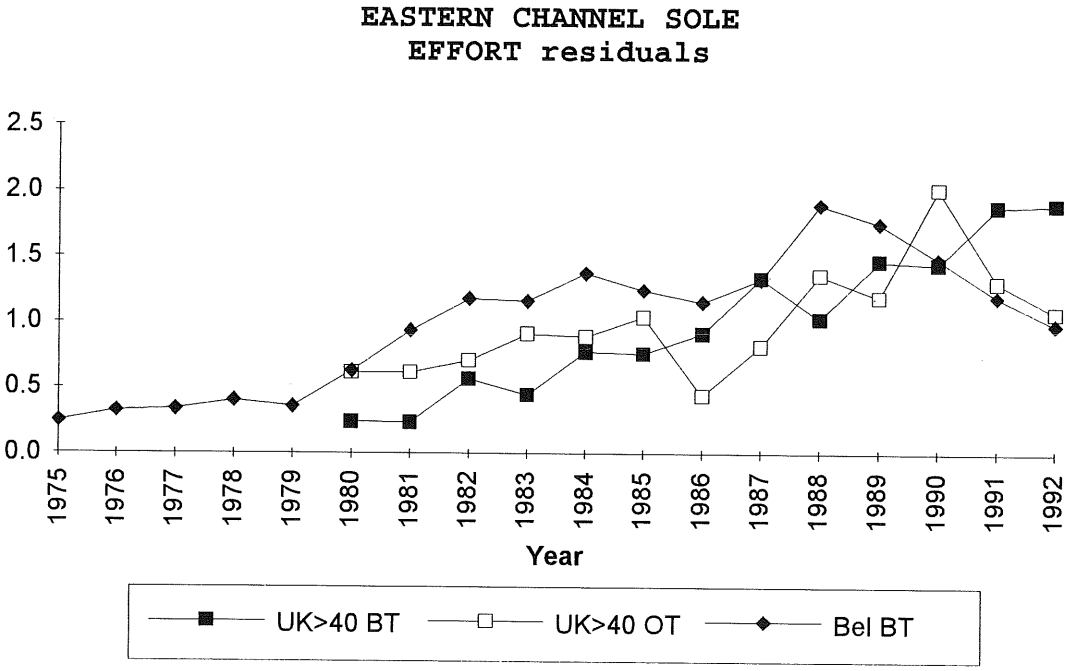

EASTERN CHANNEL SOLE
EFFORT residuals
2.5
2.0
1.5
1.0
0.5
0.0
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
Year
UK>40 BT
UK>40 OT
Bel BT

Figure 6.10.1

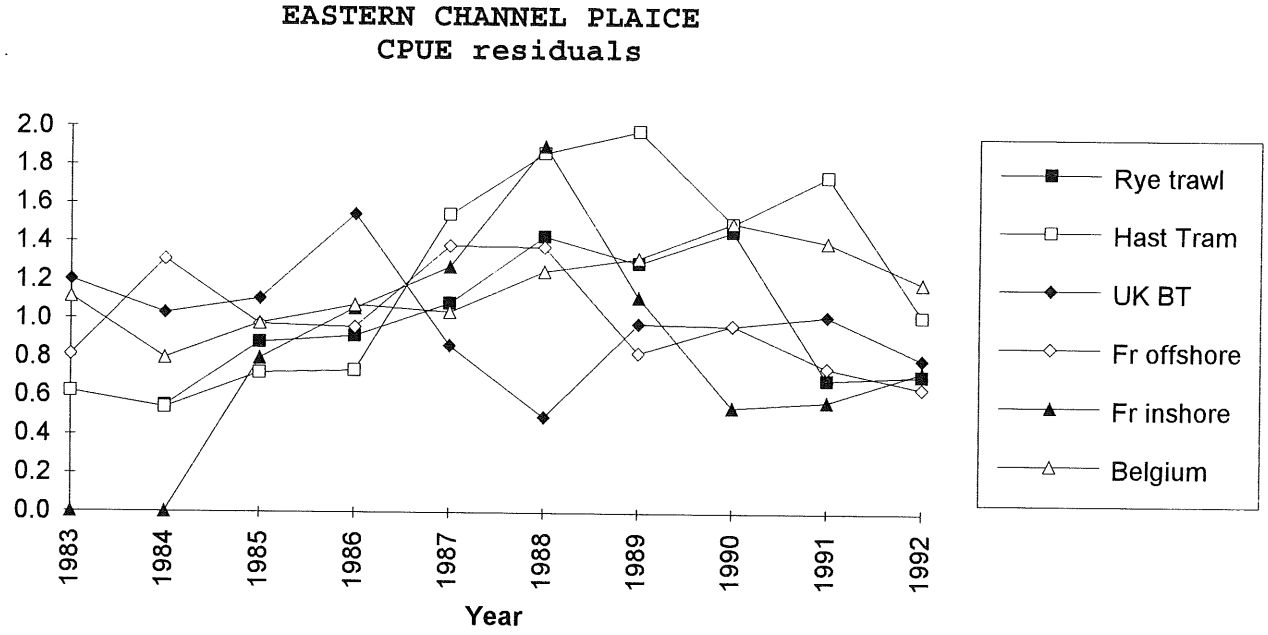


Figure 6.10.2