A SUGGESTION FOR A KEY-RUN FOR SMS APPLIED TO THE BALTIC SEA STOCKS USING CONSTRAINT UNIFORM SIZE SELECTION

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by

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Overview

Five different SMS model configurations of SMS are made and the main diagnostics and results are presented. A detailed description of both SMS diagnostics and output is given, which can be taken as a supplement to the WD describing the method (Vinther and Lewy 2012). All SMS configurations make use of the constraint uniform predator size selection. The model fit is gradually improved by estimation of seasonal predator prey overlap parameters. The final model configuration can be used as basis for a key-run, if the constraint uniform size selection is selected as basis for a key-run, however other options are also available and should be considered.

The suggested key-run is used as basis for forecast scenarios, which provides information for setting target fishing mortalities in a multispecies context. It is clearly shown that the total yield and landings value depends on the objectives for each of the individual species.

This working document is manly written to illustrate the use of the model, with limited focus on actually describing the results and the dynamic of the Baltic Sea.

1 Input data

Input data are described in details in various the reports from ICES Working Groups on multispecies models in the Baltic (e.g. ICES 1996, ICES 1997 and ICES 1998) and in reports from other multispecies related working groups (e.g. ICES WGSAM 2008, ICES WKMAMPEL 2009). Data updates of catch, mean weights, survey indices *etc.* from the period since 1998 are obtained mainly from the ICES WGBFAS.

The main input data are tabulated in Appendix 1.

2 Configuration: Options and settings

2.1 Run number 0

Run one is done (of technical reasons and for bookkeeping purposes) to produce tables of input and to produce the quantile regressions parameters used for the uniform and constraint prey size selection (see details in Vinther and Lewy 2012, section 1.3).

Given a uniform size selection, the quantile regression (Figure 2-1) is expected to produce a "cloud" of observations within two horizontal regression lines. This is not the case on the presented figure. For cod as prey the slope of lower line is close to 1, indicating that the maximum predator/prey ratio is the same for larger and smaller cod eating a cod prey. Smaller predator cod seems to prefer larger cod preys than larger predator cod, however this observation is biased as observations of cod preys smaller than 5 cm are not considered in the model. For sprat, the upper and lower line are almost parallel, however the lines are not vertical. Due to the narrow size range of sprat, cod of almost all sizes eats sprat within the same size range. Herring grow larger than sprat which gives a wider band of observations.

The constraint uniform size selection is proposed as candidate for the key-run mainly because outliers in stomach observations have a large impact for the observed predator/prey size range used for the more simple uniform size selection. For e.g. herring, the regression plot show that relatively large herring is observed eaten by small cod. This might have been the case, but by the choice of constraint uniform size selection such observations are disregarded when the model "observed size range" is determined.

The number of stomachs sampled (Table 5-12) show that a sample (all stomachs for a given predator and predator size class within a given year and quarter) includes from 10 to 1025 stomach (samples with less than 10 stomachs have been excluded). The number of samples (hauls) is probably a better indicator for sampling level and the precision of the diet data, but this information is not available for all years, such that number of stomach analysed have to be used as a proxy for "effective sample size".

SMS models the variance of the diet composition (See WD Vinther and Lewy, 2012) from

$$Var\left(STOM_{i,j,y,q}\right) = \frac{E\left(STOM_{i,j,y,q}\right)\left(1 - E\left(STOM_{i,j,y,q}\right)\right)}{V_{pred}\ U_{i,y,q}} \qquad \textbf{Eq. 1}$$

Where U is the sampling level for a given predator and size class in a given year and quarter. V is an estimated parameter common for all size classes of a predator. If the difference in sampling level between size classes is large , the difference in variance of stomach observation will be equally large, such that the information from small samples always will get a very high variance and contribute little to the fit. This is as intended, but as seen in Table 5-12, the number of stomachs from small to medium sized cod is the highest and will therefore get a lower variance. Fewer cod stomachs of larger cod are sampled, but the number of hauls they represent, might be approximately the same as for the smaller cod, such that the precision of diet data becomes more or less the same for the two groups. To compensate for the fact that number of stomachs (and not number of samples) have been used as proxy for "effective sampling size", and to give the same weight to information from small and large cod, the stomachs were divided into 4 groups (160+210+260, 310+360+410, 460+510, and 566+660+710). Within each group the number of stomachs were rescale to the maximum number of stomachs observed in each group, and multiplied by 100 (arbitrary value). The set was used in Run 01.

2.2 Run number 1

The summary diagnostic are shown in Table 2-1. The negative log likelihood for the entire model is 420.128, the number of parameters is 381 and the number of observations is 4704, of which 704 are from diet data. The maximum gradient is 8.59983e-005, where the very low number shows a clearly identified minimum. The individual sub-model contributions have, *a priory*, as input been weighted equally, except the stock recruitment relations for cod, which have been set to 0.1. Stock recruitment relationship is fitted as a "penalty function" (see Vinther and Lewy 2012) and used mainly for later use in forecast and to provide information of the recruits in the terminal years where other information often is missing. For cod, the fitted S-R has a low variance such that is get a high weight in setting the recruitment in the terminal year. Data do however exist for the 0-group in the BITS Q4 survey, and the *a priory* weight for cod S-R has been decreased to let mainly the survey information set the level of recruitment in the terminal years.

The standard deviation of the catch observation (assuming log-normal distributed errors) ~ CV (Table 2-2) show rather high CV for most ages. The Residual plots for catch observations (Figure 2-2 to Figure 2-4) show clearly clusters of positive or negative residuals.

Residual plots for survey observations (Figure 2-5) show clear clusters of positive and negative residuals, however the result are not that different from the residual plots produced by the single species assessments (WGBFAS 2011).

Cod is the only predator in the model and prey length groups are not considered in this SMS configuration, which makes it possible to present residuals for stomach observations in one figure (Figure 2-6). The residuals are standardised, i.e.

$$residual(STOM_{i,j,y,q}) = \frac{STOM_{i,j,y,q} - E(STOM_{i,j,y,q})}{\sqrt{Var(E(STOM_{i,j,y,q}))}} \qquad \text{Eq. 2}$$

Standardized residuals as defined in Eq. 2 will not be independent, as the stomach proportions sum up to one. A high residuals for one prey will therefore automatically give a low residual for other preys, however some information can be derived from the residual plot anyhow, especially when residuals between stomach samples are compared.

Some residuals are very large. These come from observation where the expected value is close to zero or one, and the observed is not. For e.g.1983, Q2, cod 21 (20-25 cm) has an expected stomach content of "Other food" at 0.9996 and observed at 0.64. The remaining observed diet was herring (0.36) where 3.8E-05 was expected. I will delete the observations (1993 Q2 size 53, 1987 Q1 size 54 and 1985 Q1 size 53) with very high residuals and few stomachs in the sample.

There are some clear clusters, e.g. the systematic model overestimate of sprat and underestimate of Other food. Figure 2-7, where the time axis is sorted by quarter shows clearly the quarter 2 bias. With limited knowledge about stock distribution of fish preys and the amount of "other food" I will let the model estimate the seasonal overlap in quarter 2 between "other food" in run 2.

Overview of Run 1

Option	Value
Size preference	Constraint uniform
Seasonal overlap	No estimated, All 1
Action from run: • Extreme outliers: Delete 3 stomach samples • Clear seasonal pattern in stomach residuals for quarter 2, and for herring quarter 4. Let the model estimate the relative seasonal "overlap" for those.	

2.3 Run number 02

The summary diagnostics (Table 2-4) show in general a better likelihood for both catch, survey and stomach observations. The seasonal overlap show a relative modest (0.175 relative to 1.0) "overlap" between cod and "other food" in quarter 2, and a high (2.36) overlap for cod-herring in quarter 4. The CVs of the overlap parameter are estimated to 6 and 9%.

Even though the quarter 2 cod-other food seasonal overlap is estimated, there is still a clear residual pattern in other food in Q2 (Figure 2-8) whit mainly positive residuals in the period 1977-1984 and negative in the remaining stomach sampling years. Given the assumption of constant "other food" over the entire model period, it is not possible to correct directly for that bias.

Figure 2-9 show a plot of the transformed Dirichlet residuals (see WD Vinther and Lewy, 2012). The difference between the standardised residual and the transformed is mainly the size of residuals where the expected value is very close to 0 or 1, (and the observed is not). The transformed residual are considered as more appropriate and are used as standard in the rest of this document.

The residual plots show a tendency for negative residual, cod-eating cod, in the first quarter. The same tendency can be seen in the box plots of residual group in various ways (Figure 2-10), where the median of cod-easting cod Q1 residuals is clearly positive. A clear positive median of the herring residuals is also seen for quarter 3, and for other food Q3.

Overview of Run 2

Option	Value
Size preference	Constraint uniform
Seasonal overlap	Predator prey overlap Other food Q2, Herring Q4
Action from run: • Clear seasonal pattern in stomach residuals Other food Q3, Cod Q1 and Herring Q3. Let the model estimate the relative seasonal "overlap" for those.	

2.4 Run number 03

The addition of two extra "overlap" parameters gave a significantly better model likelihood (Table 2-5) in total, and for both catch survey and stomach observations.

The residual plots (Figure 2-11 and Figure 2-12) show clear pattern for prat Q2.

Overview of Run 3

Option	Value
Size preference	Constraint uniform
Seasonal overlap	Predator prey overlap Other food Q2 and Q4; Cod Q1; Herring Q3 and Q4
Action from run:	

• Clear seasonal pattern in stomach residuals Sprat Q2. Let the model estimate the relative seasonal "overlap" for that combination.

2.5 Run number 04

The addition of one extra "overlap" parameters gave just a slightly better model fit (Table 2-6), and just a slightly less biased residuals for sprat as prey (Figure 2-13 and Figure 2-14).

The residual plots show tendency to overestimating the "other food" proportion for the smallest cod, which might be due to the assumption of a fixed amount and fixed suitability (1.0) of other food for all predator size classes. SMS has an (*ad hoc*) option, υ_{pred}, (default 0) to let the other food suitability be dependent on the size class, which will be estimated in Run 05.

$$S_{OF,pred,q}(l_{pred}) = \rho_{OF,pred} \quad o_{OF,pred,q} \exp\left(\upsilon_{pred} \log\left(W_{pred,l_{pred},q}/\overline{W}_{pred}\right)\right) \qquad \text{Eq. 3}$$

Overview of Run 4

Option	Value
Size preference	Constraint uniform
Seasonal overlap	Predator prey overlap Other food Q2 and Q4; Cod Q1; Herring Q3 and Q4; Sprat Q2
Action from run: • Tendency to underestimate "Other food" for smaller cod. Let the model estimate size dependent suitability for other food.	

2.5.1 Run number 05

Run 05 gave a better fit for all sub-models compared to run 04.

The residual plots (Figure 2-15 and Figure 2-16) have still clusters of positive and negative residuals. A simple plot of observed and predicted stomach contents proportion (Figure 2-18) show obviously the same picture.

A summary of the main model diagnostics show a significant improvement of the model fit from Run 01 to Run 05 (Table 2-9) for both the individual sub-models and in total.

The estimated M2 values, age 0-age 2, from the Run 01-05 are very similar (Figure 2-19), even though Run 01 has a higher M2 for cod age 0. For cod the main difference in M2 is between RUN 01-02 and Run 03-05, which is probably due to the addition of the Cod-cod, Q1 overlap factor, estimated to 3.1.

The results from Run 05 are presented in the next section .

Table 2-1 Summary diagnostics SMS, run 1

```
Date: 02/28/12  Start time:13:42:59 run time:22 seconds

objective function (negative log likelihood):  420.128
Number of parameters: 381
Number of observations used in likelihood: 4704
Maximum gradient: 8.59983e-005
Akaike information criterion (AIC):   1602.26
Number of observations used in the likelihood:
                            Catch    CPUE     S/R Stomach     Sum
Species: 1, Cod              1036     259      22     704    2021
Species: 2, Herring          1184     200      37       0    1421
Species: 3, Sprat            1036     205      21       0    1262
Sum                          3256     664      80     704    4704


objective function weight:
                          Catch  CPUE   S/R         Stom.
Species: 1, Cod           1.00  1.00  0.10          1.00
Species: 2, Herring       1.00  1.00  1.00          0.00
Species: 3, Sprat         1.00  1.00  1.00          0.00

unweighted objective function contributions (total):
               Catch    CPUE    S/R    Stom.  Penalty     Sum
Cod          -219.0   -40.1   -14.7  1496.6 0.00e+000  1222.9
Herring      -553.1   -74.3   -30.3     0.0 0.00e+000  -657.7
Sprat         -82.0   -73.8    -2.4     0.0 0.00e+000  -158.3
Sum          -854.1  -188.3   -47.4  1496.6 0.00e+000   406.9

unweighted objective function contributions (per observation):
               Catch   CPUE     S/R   Stomachs
Cod           -0.21   -0.15   -0.67    2.13
Herring       -0.47   -0.37   -0.82    0.00
Sprat         -0.08   -0.36   -0.12    0.00
```

Table 2-2 Uncertainties of catch observations

sqrt(catch variance) ~ CV:

Cod

	season			
age	1	2	3	4
2	0.855	0.764	0.730	0.729
3	0.320	0.351	0.486	0.398
4	0.320	0.351	0.486	0.398
5	0.320	0.351	0.486	0.398
6	0.320	0.351	0.486	0.398
7	0.426	0.502	0.838	0.711
8	0.426	0.502	0.838	0.711

Herring

	season			
age	1	2	3	4
1	0.691	0.613	0.483	0.378
2	0.483	0.238	0.298	0.226
3	0.403	0.316	0.404	0.361
4	0.403	0.316	0.404	0.361
5	0.403	0.316	0.404	0.361
6	0.403	0.316	0.404	0.361
7	0.403	0.316	0.404	0.361
8	0.403	0.316	0.404	0.361

Sprat

	season			
age	1	2	3	4
1	0.758	0.907	1.087	0.741
2	0.610	0.575	0.429	0.389
3	0.344	0.419	0.351	0.381
4	0.476	0.473	0.601	0.500
5	0.476	0.473	0.601	0.500
6	0.476	0.473	0.601	0.500
7	0.476	0.473	0.601	0.500

Table 2-3 Estimates survey catchability and related uncertainties

Survey catchability:

Cod	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7+
COD BITS Q1 1991-2001		1.162	4.549	4.771	2.753	2.753	2.753	
COD BITS Q1 2002-2011		1.253	10.388	12.325	9.069	9.069	9.069	
COD BITS Q4 2002-2010	0.047	0.853	1.775	1.949	1.466	1.466	1.466	
COD Danish trawlers 1997-				0.204	0.646	0.717	0.717	0.717
Herring								
HER Acoustic May		0.409	0.965	1.653	2.446	2.446	2.446	2.446
Sprat								
SPR Acoustic October		0.526	0.854	1.238	1.336	1.336	1.336	1.336
SPR Lavian Russian Acoust		1.118						
SPR Acoustic 24-28 May		0.278	0.711	0.917	1.128	1.128	1.128	1.128

sqrt(Survey variance) ~ CV:

Cod	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7+
COD BITS Q1 1991-2001		0.81	0.69	0.69	0.42	0.42	0.42	
COD BITS Q1 2002-2011		0.84	0.38	0.38	0.47	0.47	0.47	
COD BITS Q4 2002-2010	0.73	0.38	0.38	0.31	0.47	0.47	0.47	
COD Danish trawlers 1997-				0.58	0.49	0.49	0.74	0.74
Hering								
HER Acoustic May		0.41	0.40	0.37	0.44	0.44	0.44	0.44
Sprat								
SPR Acoustic October		0.53	0.38	0.40	0.40	0.40	0.40	0.40
SPR Lavian Russian Acoust		0.85						
SPR Acoustic 24-28 May		0.54	0.22	0.33	0.33	0.33	0.33	0.33

Table 2-4 RUN 02. Summary diagnostics SMS

```
objective function (negative log likelihood):  -100.215
Number of parameters: 383
Number of observations used in likelihood: 4698
Maximum gradient: 6.30866e-005
Akaike information criterion (AIC):   565.569
Number of observations used in the likelihood:
                            Catch    CPUE     S/R Stomach     Sum
Species: 1, Cod              1036     259      22     698    2015
Species: 2, Herring          1184     200      37       0    1421
Species: 3, Sprat            1036     205      21       0    1262
Sum                          3256     664      80     698    4698

unweighted objective function contributions (total):
                Catch    CPUE    S/R    Stom.  Penalty     Sum
Cod           -221.9   -40.3   -14.7  1008.3 0.00e+000   731.5
Herring       -561.1   -73.1   -28.9     0.0 0.00e+000  -663.1
Sprat         -102.4   -76.9    -2.5     0.0 0.00e+000  -181.8
Sum           -885.4  -190.3   -46.1  1008.3 0.00e+000  -113.4
```

Table 2-5 RUN 03. Summary diagnostics SMS

```
bjective function (negative log likelihood):  -155.315
Number of parameters: 386
Number of observations used in likelihood: 4698
Maximum gradient: 9.21143e-005
Akaike information criterion (AIC):   461.369
Number of observations used in the likelihood:
                            Catch    CPUE     S/R Stomach     Sum
Species: 1, Cod              1036     259      22     698    2015
Species: 2, Herring          1184     200      37       0    1421
Species: 3, Sprat            1036     205      21       0    1262
Sum                          3256     664      80     698    4698


unweighted objective function contributions (total):
                Catch    CPUE    S/R    Stom.  Penalty     Sum
Cod           -222.7   -39.9   -13.5   956.5 0.00e+000   680.3
Herring       -560.7   -74.0   -28.0     0.0 0.00e+000  -662.6
Sprat         -105.4   -77.3    -2.5     0.0 0.00e+000  -185.2
Sum           -888.8  -191.2   -44.0   956.5 0.00e+000  -167.5
```

Table 2-6 RUN 04. Summary diagnostics SMS

```
objective function (negative log likelihood):  -157.438
Number of parameters: 387
Number of observations used in likelihood: 4698
Maximum gradient: 6.29283e-005
Akaike information criterion (AIC):   459.124
Number of observations used in the likelihood:
                            Catch    CPUE     S/R Stomach     Sum
Species: 1, Cod              1036     259      22     698    2015
Species: 2, Herring          1184     200      37       0    1421
Species: 3, Sprat            1036     205      21       0    1262
Sum                          3256     664      80     698    4698


unweighted objective function contributions (total):
                Catch    CPUE    S/R    Stom.  Penalty     Sum
Cod           -222.4   -39.9   -13.6   955.1 0.00e+000   679.2
Herring       -560.2   -74.1   -28.2     0.0 0.00e+000  -662.4
Sprat         -106.5   -77.5    -2.5     0.0 0.00e+000  -186.4
Sum           -889.0  -191.5   -44.2   955.1 0.00e+000  -169.7
```

Table 2-7 RUN 05. Summary diagnostics SMS

```
objective function (negative log likelihood):  -163.306
Number of parameters: 388
Number of observations used in likelihood: 4698
Maximum gradient: 7.83735e-005
Akaike information criterion (AIC):   449.389
Number of observations used in the likelihood:
                            Catch    CPUE     S/R Stomach     Sum
Species: 1, Cod              1036     259      22     698    2015
Species: 2, Herring          1184     200      37       0    1421
Species: 3, Sprat            1036     205      21       0    1262
Sum                          3256     664      80     698    4698


unweighted objective function contributions (total):
                Catch    CPUE    S/R    Stom.  Penalty     Sum
Cod           -222.5   -40.0   -13.8   953.6 0.00e+000   677.3
Herring       -560.0   -74.1   -28.3     0.0 0.00e+000  -662.4
Sprat         -110.0   -78.0    -2.5     0.0 0.00e+000  -190.6
Sum           -892.6  -192.1   -44.6   953.6 0.00e+000  -175.7
```

Table 2-8 RUN 05 Estimate of predation related parameters

Parameter	Value	Standard deviation	CV
Vunerability Cod-cod	0.7024	0.1103	16%
Vulnerability Cod-herring	0.0987	0.0120	12%
Vulnerability Cod-sprat	0.2499	0.0253	10%
Other food size	-0.1200	0.0354	29%
Overlap Cod-cod, Q1	3.1096	0.5543	18%
Overlap Cod-Other food, Q2	0.1891	0.0192	10%
Overlap Cod-sprat Q2	1.2307	0.1270	10%
Overlap Cod-Other food, Q3	0.9164	0.1521	17%
Overlap Cod-herring, Q3	3.1022	0.5981	19%
Overlap Cod-herring, Q4	2.4786	0.2442	10%
Stomach variance (V)	1.0019	0.0011	0%

Table 2-9 RUN 01-05. Summary statistics

	Objective function, log likelihood									
label	catch	CPUE	SSB.Rec	stomachs	all	n.par	AIC	dif.like	Diference n.par	Prob likelihood.ratio
Run 01	-854.1	-188.3	-47.4	1496.6	406.9	381	1602			
Run 02	-885.4	-190.3	-46.1	1008.3	-113.4	383	565.6	520.3	2	0
Run 03	-888.8	-191.2	-44.0	956.5	-167.5	386	461.4	55.1	3	0
Run 04	-889.0	-191.5	-44.2	955.1	-169.7	387	459.1	2.1	1	0.039
Run 05	-892.6	-192.1	-44.6	953.6	-175.7	388	449.4	5.9	1	0.001

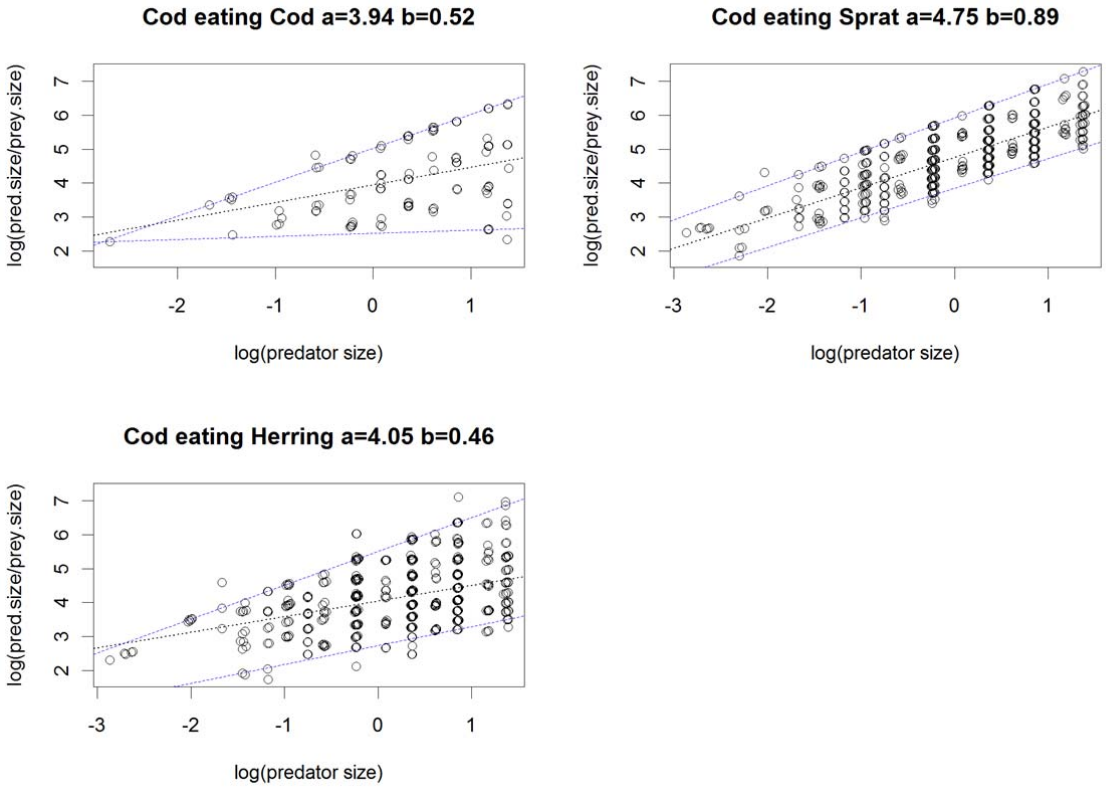

Figure 2-1 RUN 00. Quantiles regression (2.5% and 97.5%) of stomach contents observations. The a and b values in the title gives regression parameters for the 50% quantile.

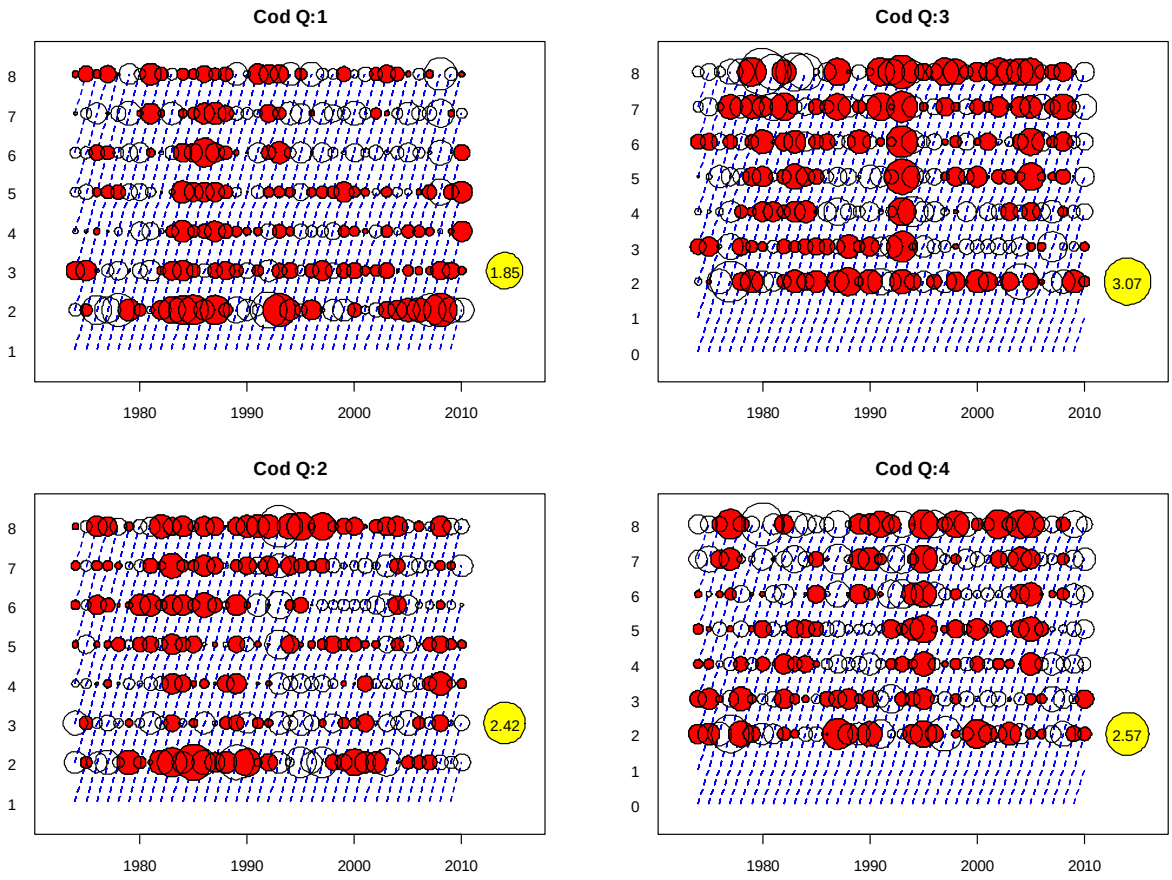

Figure 2-2 RUN 01. Catch observation residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

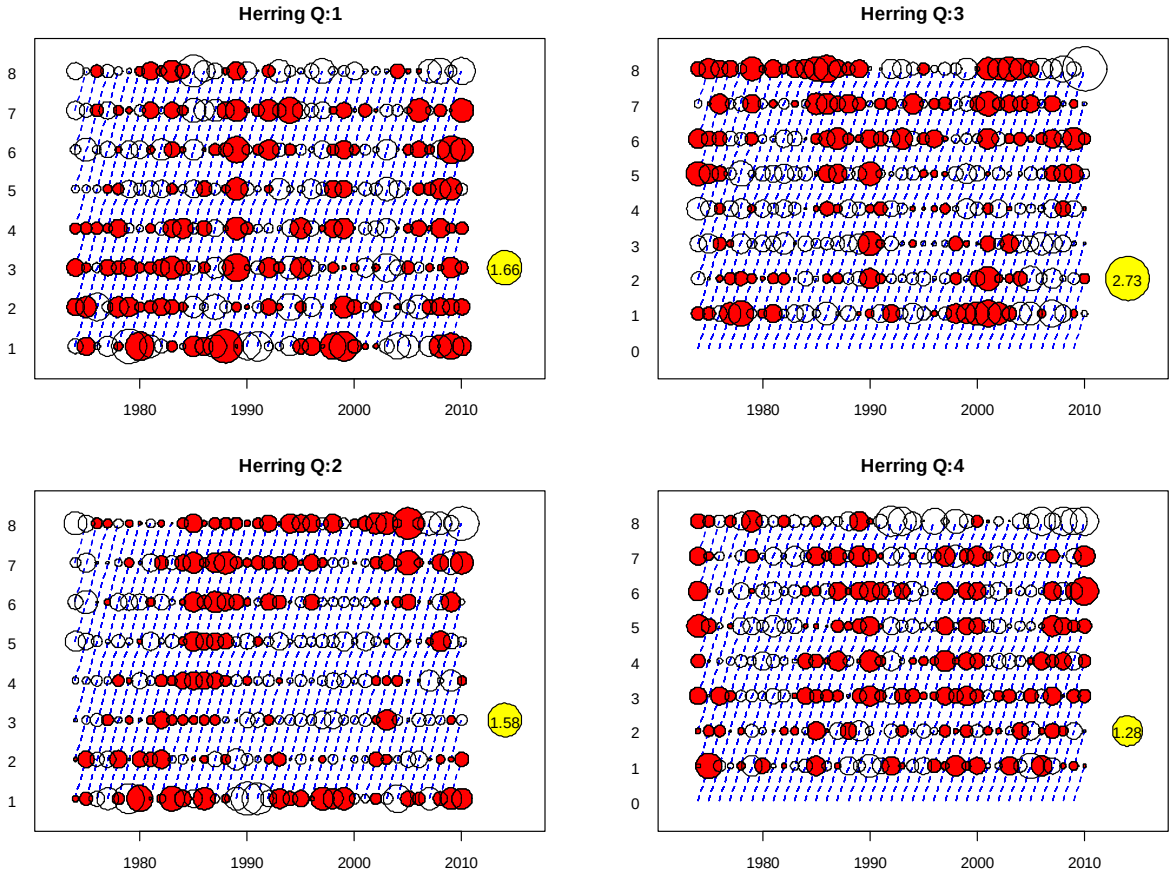

Figure 2-3 RUN 01. Catch observation residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

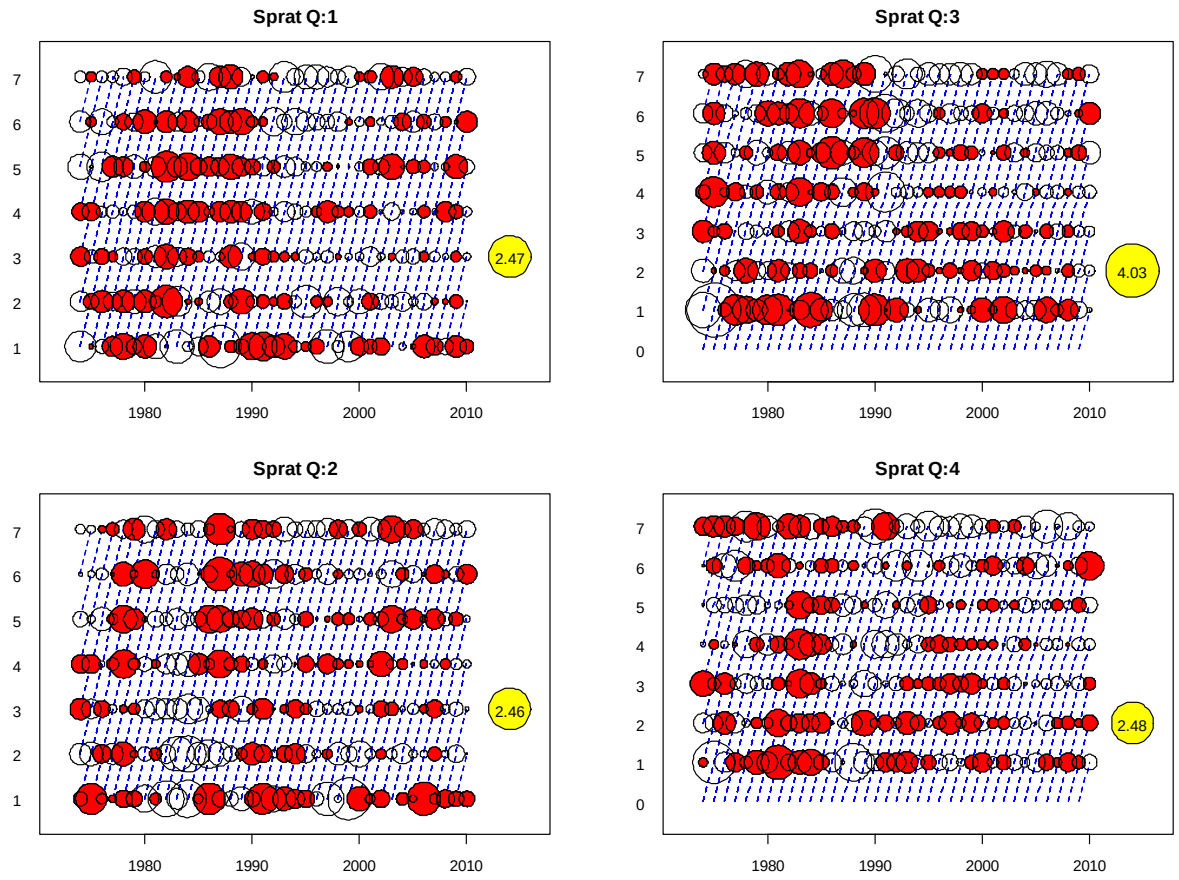

Figure 2-4 RUN 01. Catch observation residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

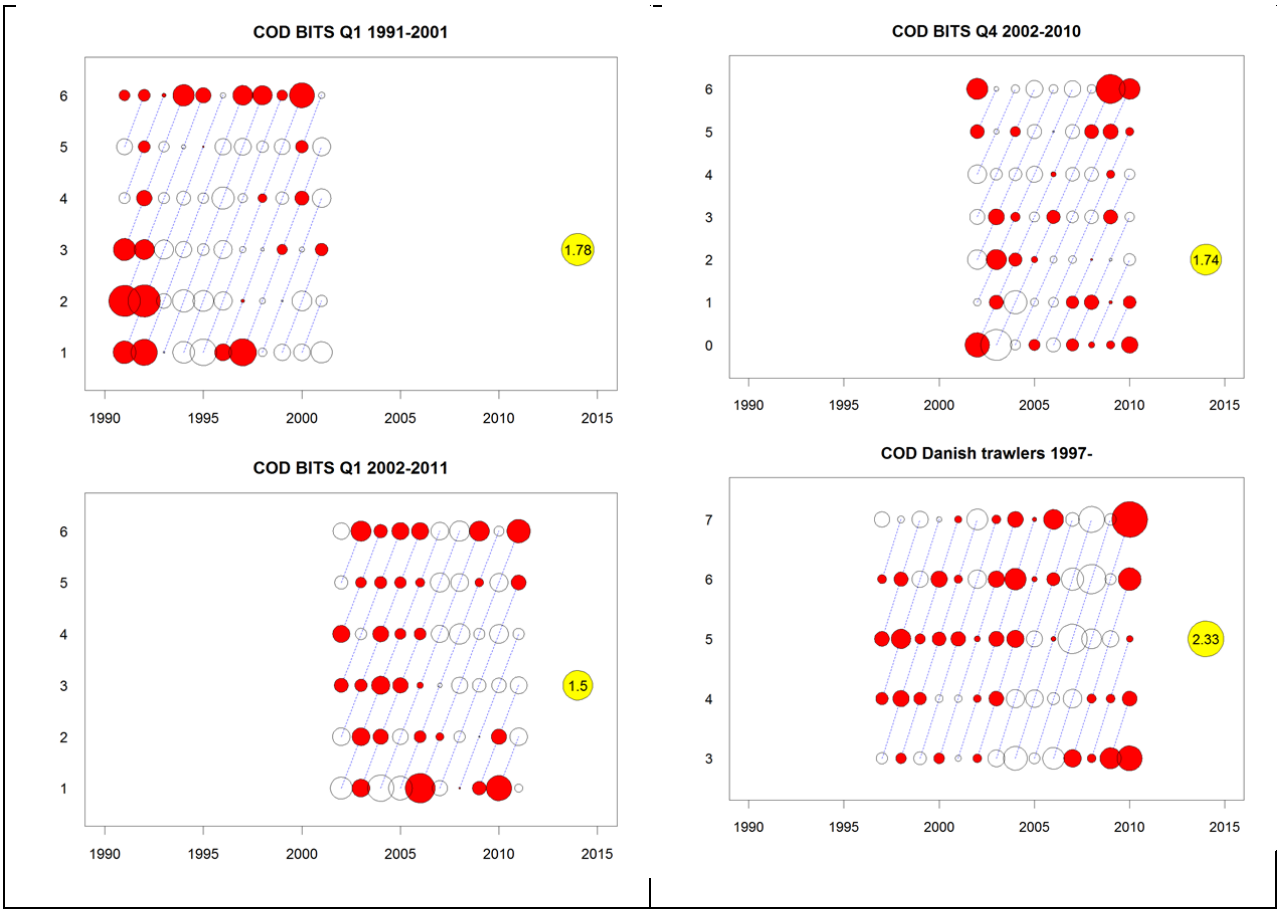

Figure 2-5 RUN 01. Survey log catchability residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

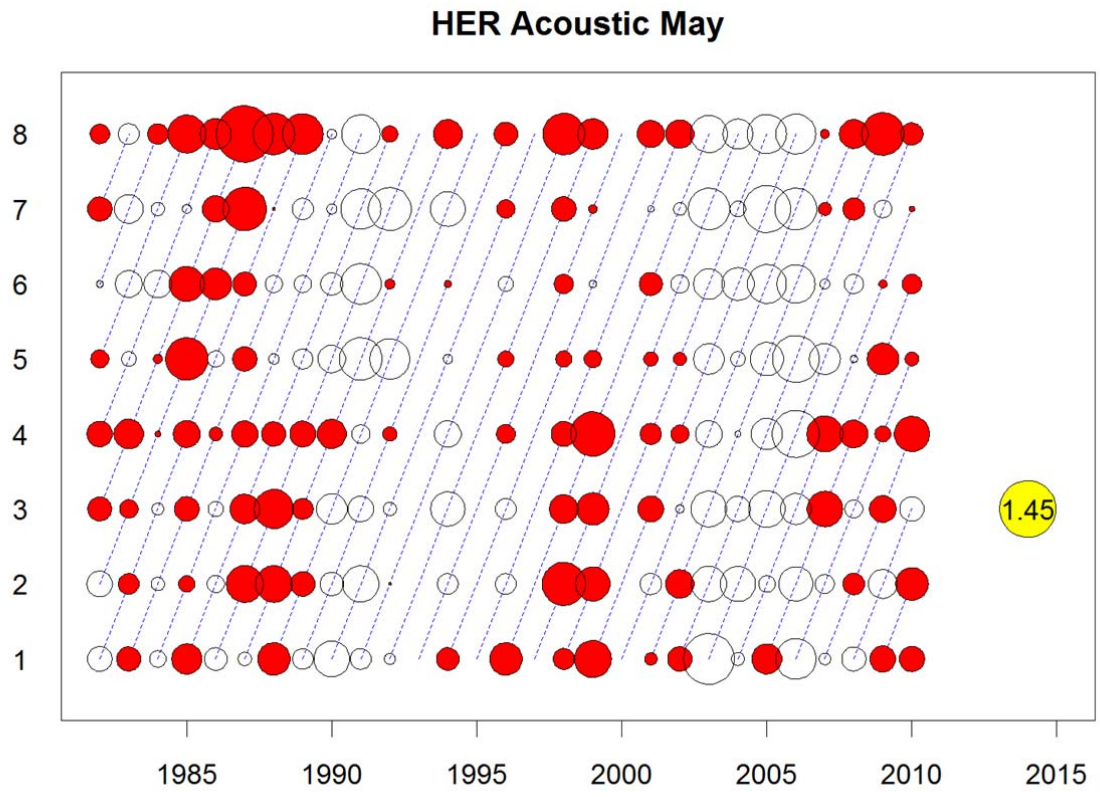

Figure 2-5 (continued) Survey log catchability residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

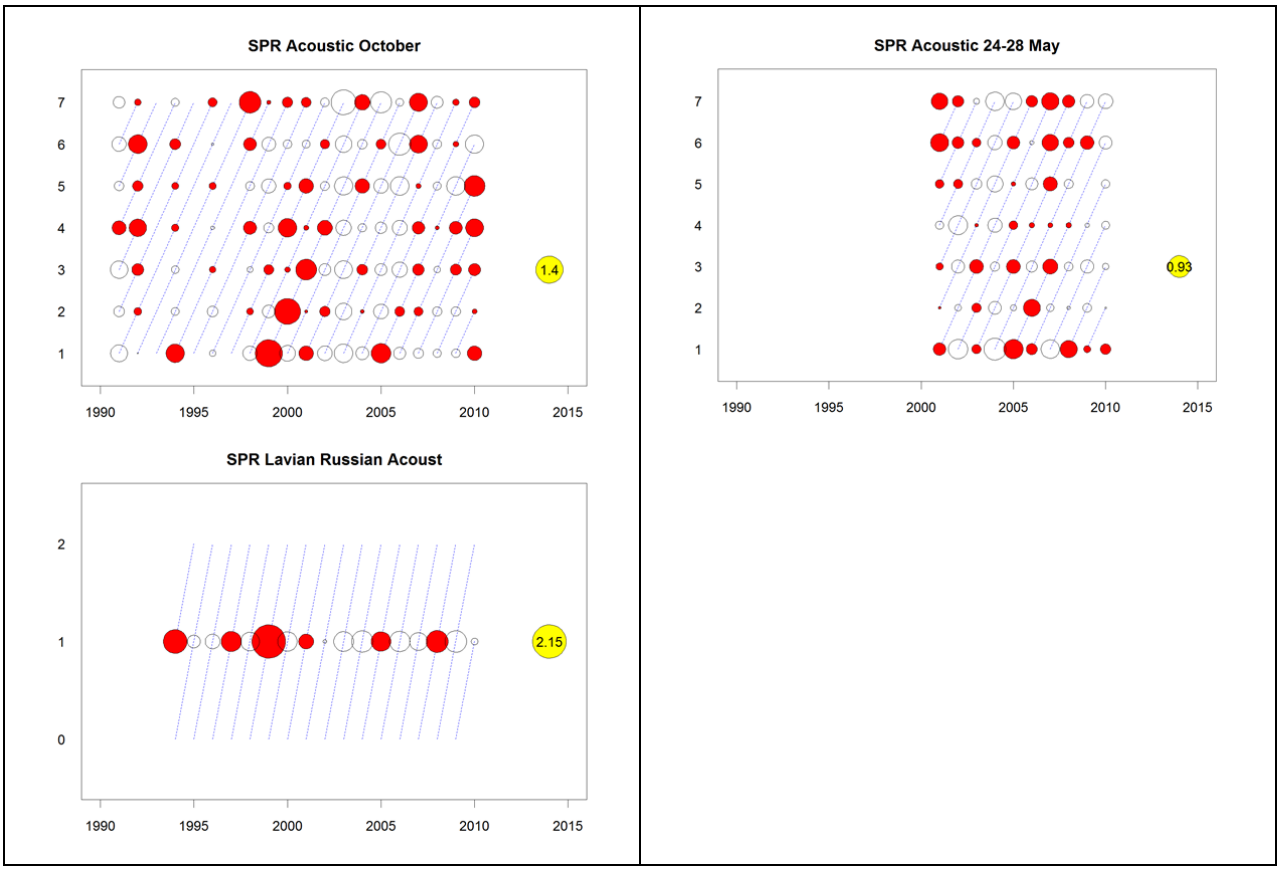

Figure 2-5 (continued) Survey log catchability residuals. The scaling of the "dots" are the same for all plots given a species. The largest dot within a plot is shown in yellow. Red dots show that the observation is smaller than the expected value.

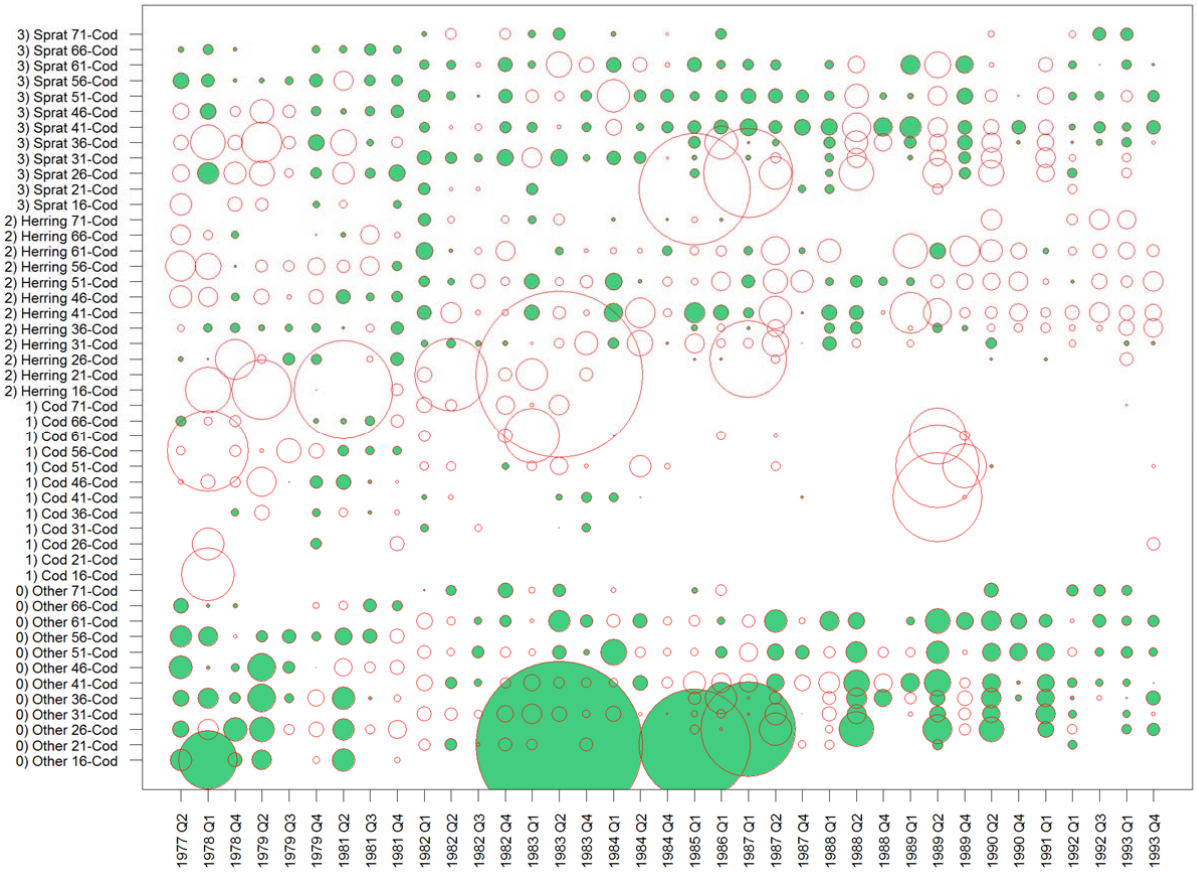

Figure 2-6 RUN 01. Standardized residual plot for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

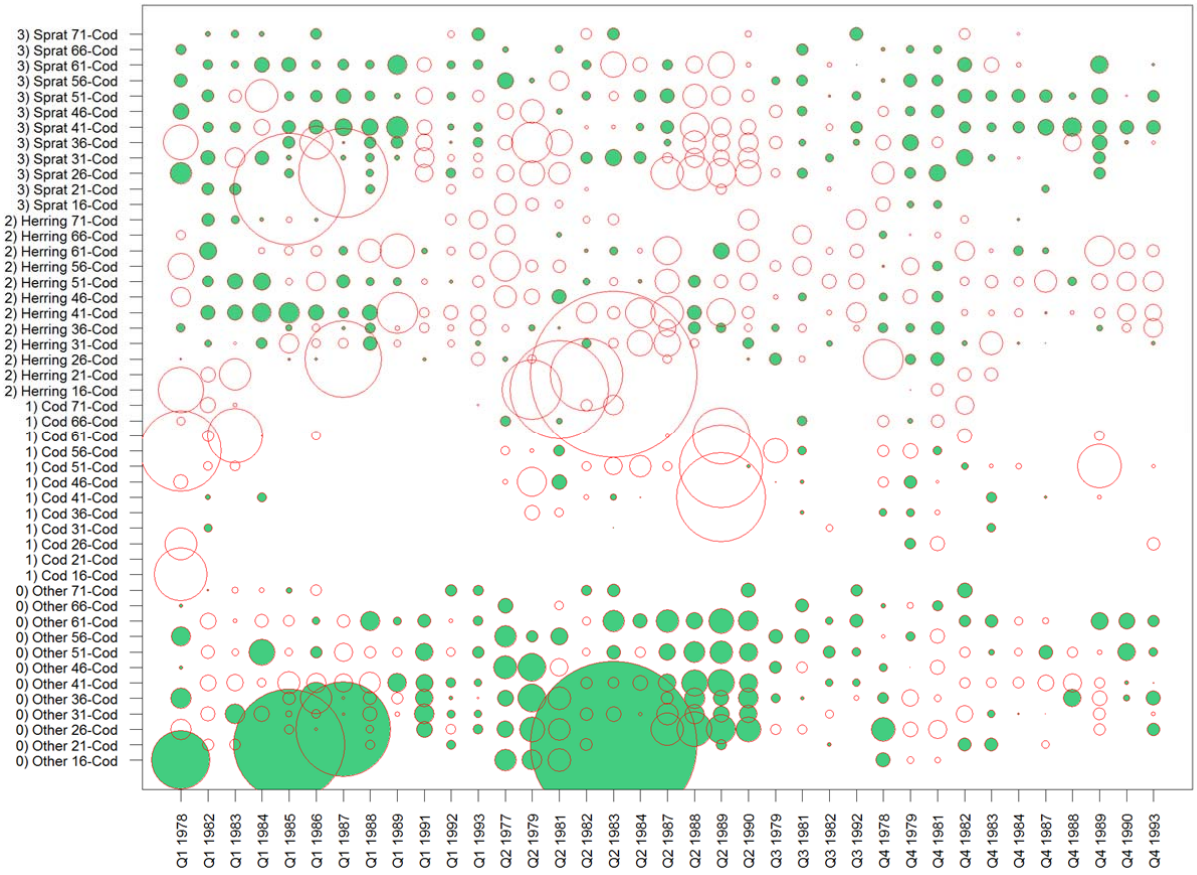

Figure 2-7 RUN 01. Standardized residual plot for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

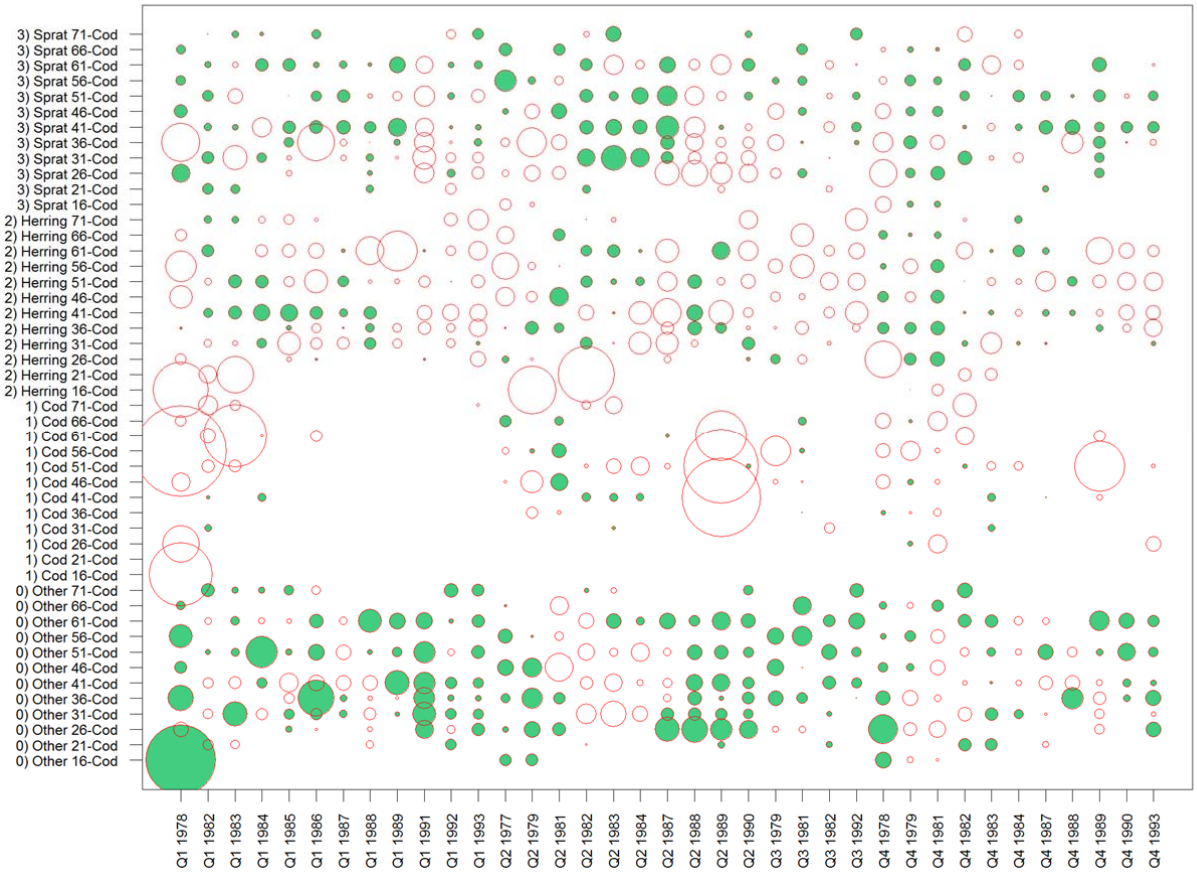

Figure 2-8 RUN 02. Standardized residual plot for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

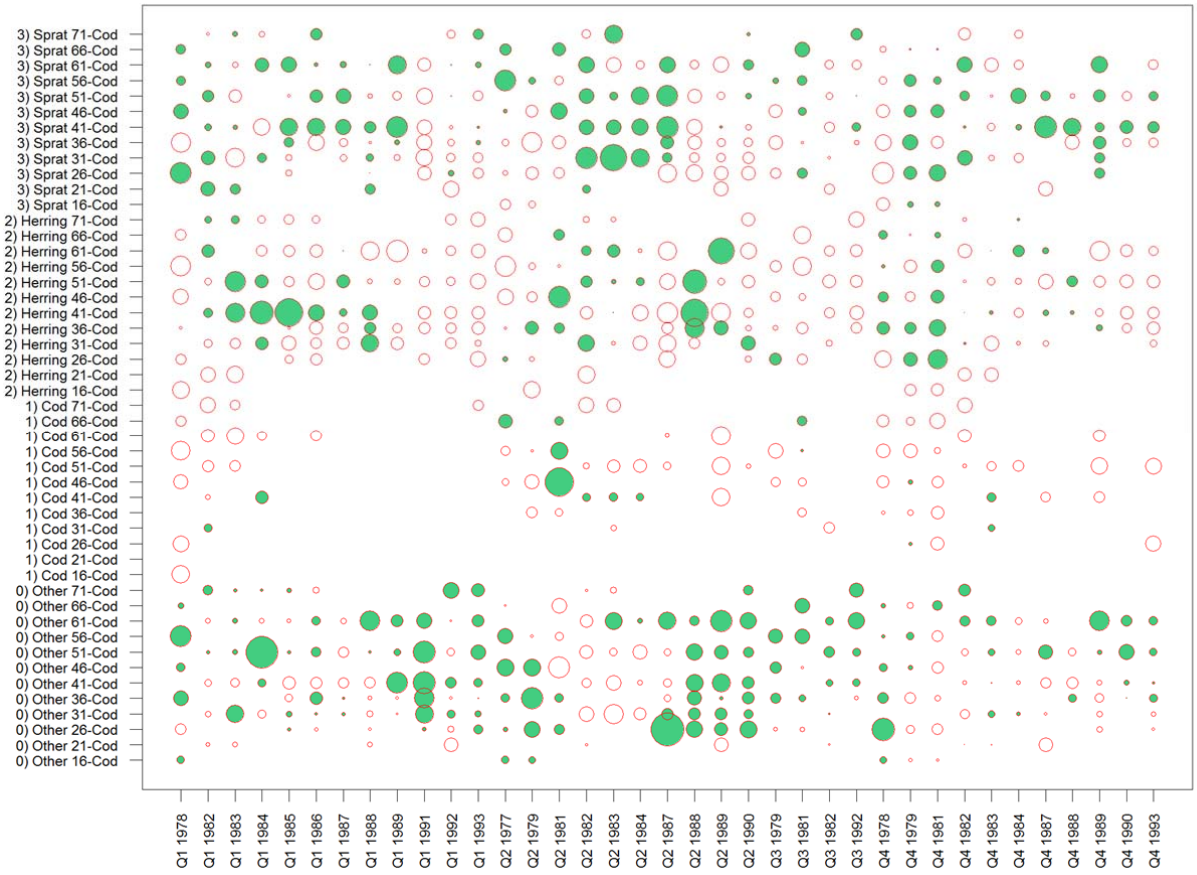

Figure 2-9 RUN 02. Transformed Dirichlet residuals plot for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

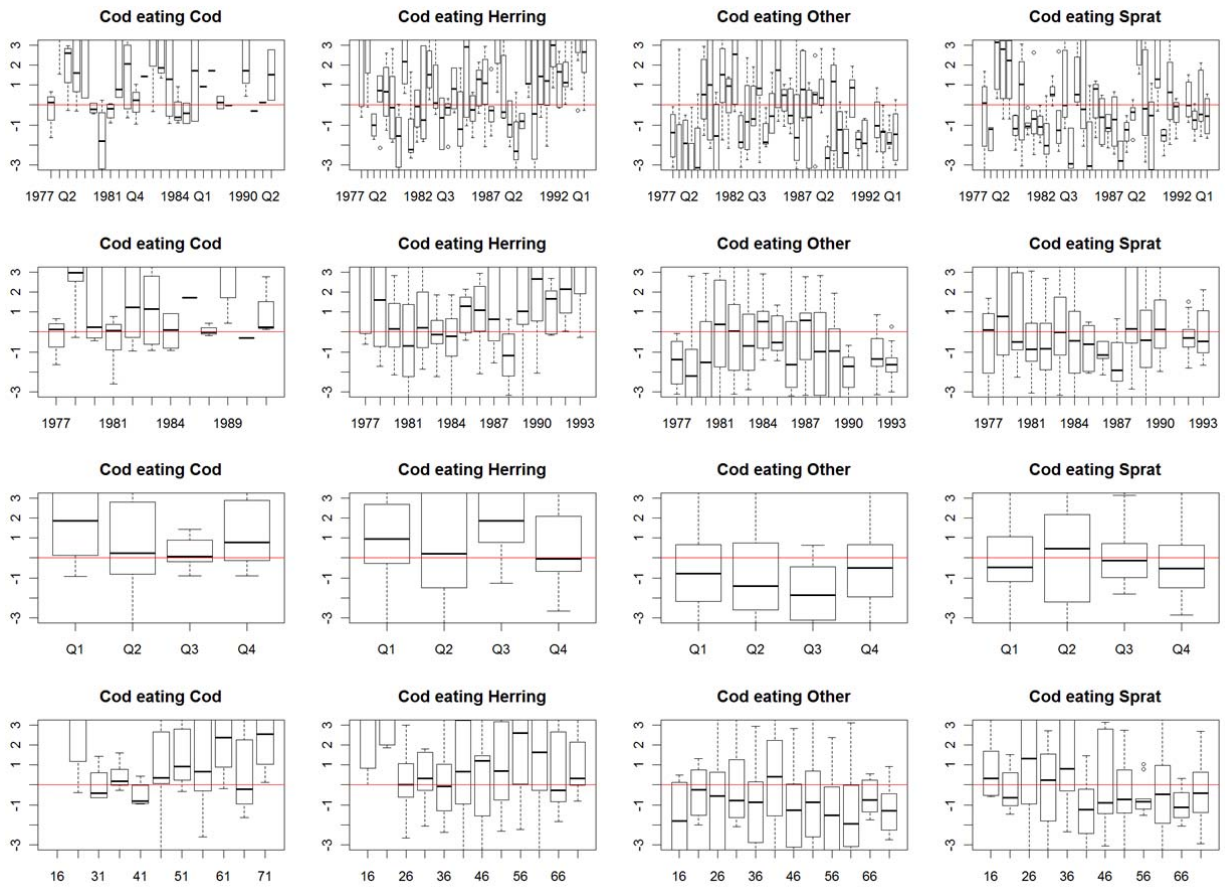

Figure 2-10 RUN 02. Box plot of residuals (standardized) for stomach contents observations. Upper row has time on the X-axis, where each box-plot represent all information within one time step (e.g. 1984, Q4). Second row includes all residuals within a year, third row all residuals within a quarter and the lower row, all residuals within individual predator size class.

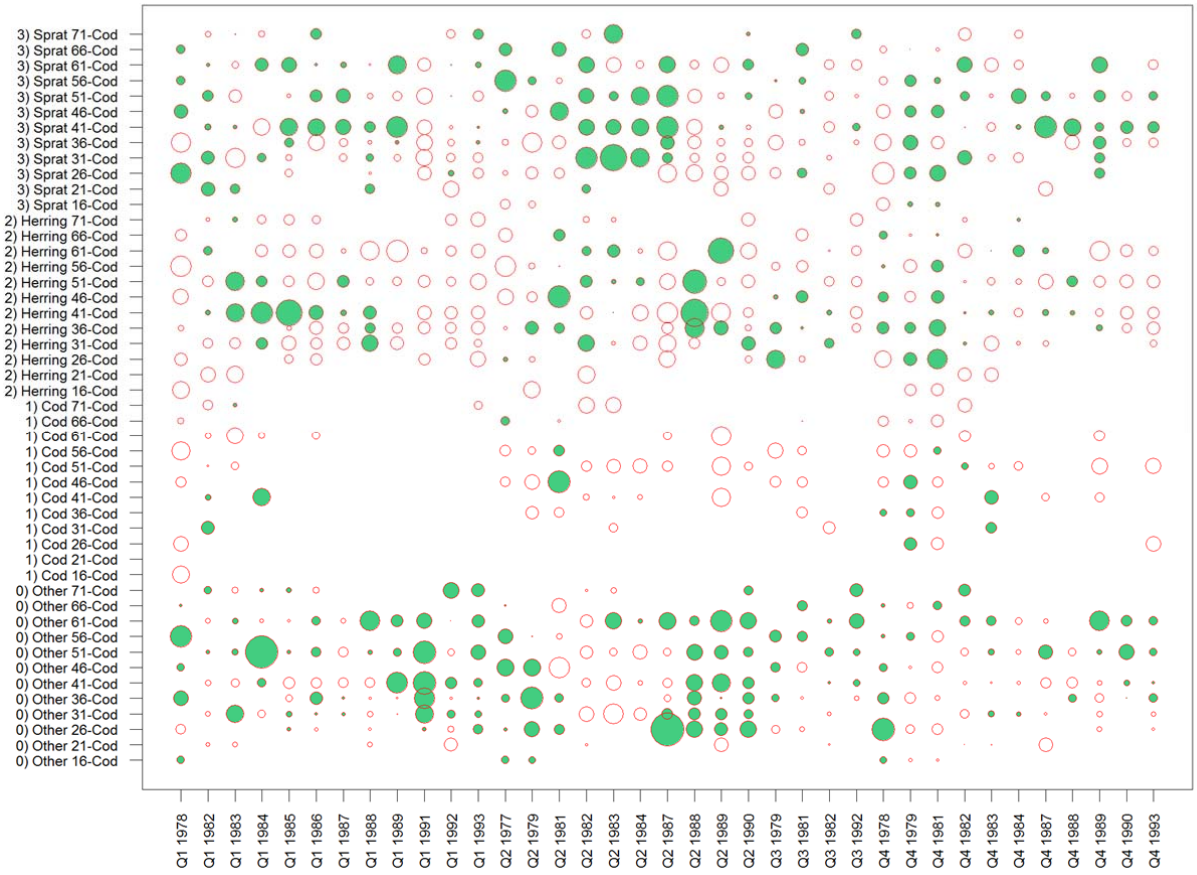

Figure 2-11 RUN 03. Residual plot (transformed Dirichlet residuals) for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

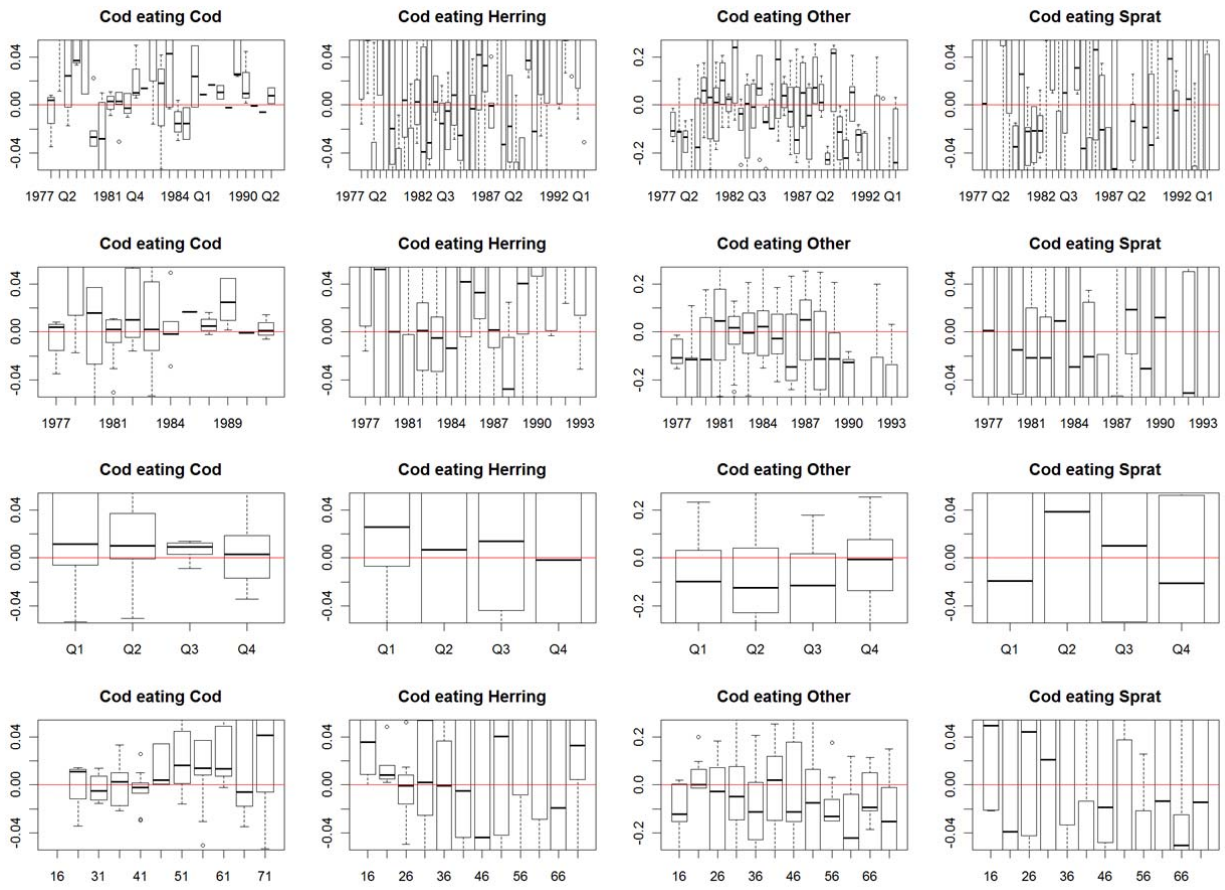

Figure 2-12 RUN 03. Box plot of residuals (Transformed Dirichlet) for stomach contents observations. Upper row has time on the X-axis, where each box-plot represent all information within one time step (e.g. 1984, Q4). Second row includes all residuals within a year, third row all residuals within a quarter and the lower row, all residuals within individual predator size class.

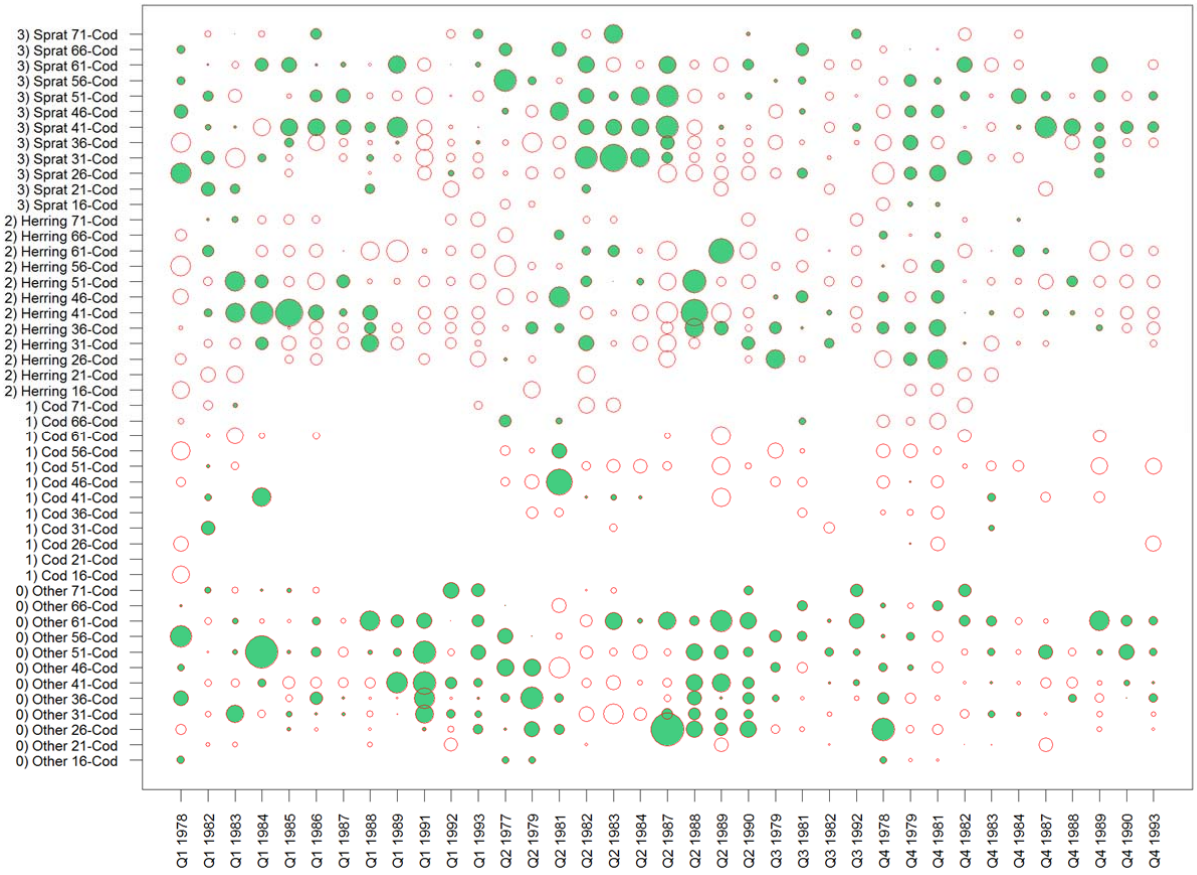

Figure 2-13 RUN 04. Residual plot (transformed Dirichlet residuals) for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator (cod). The period (year and quarter) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

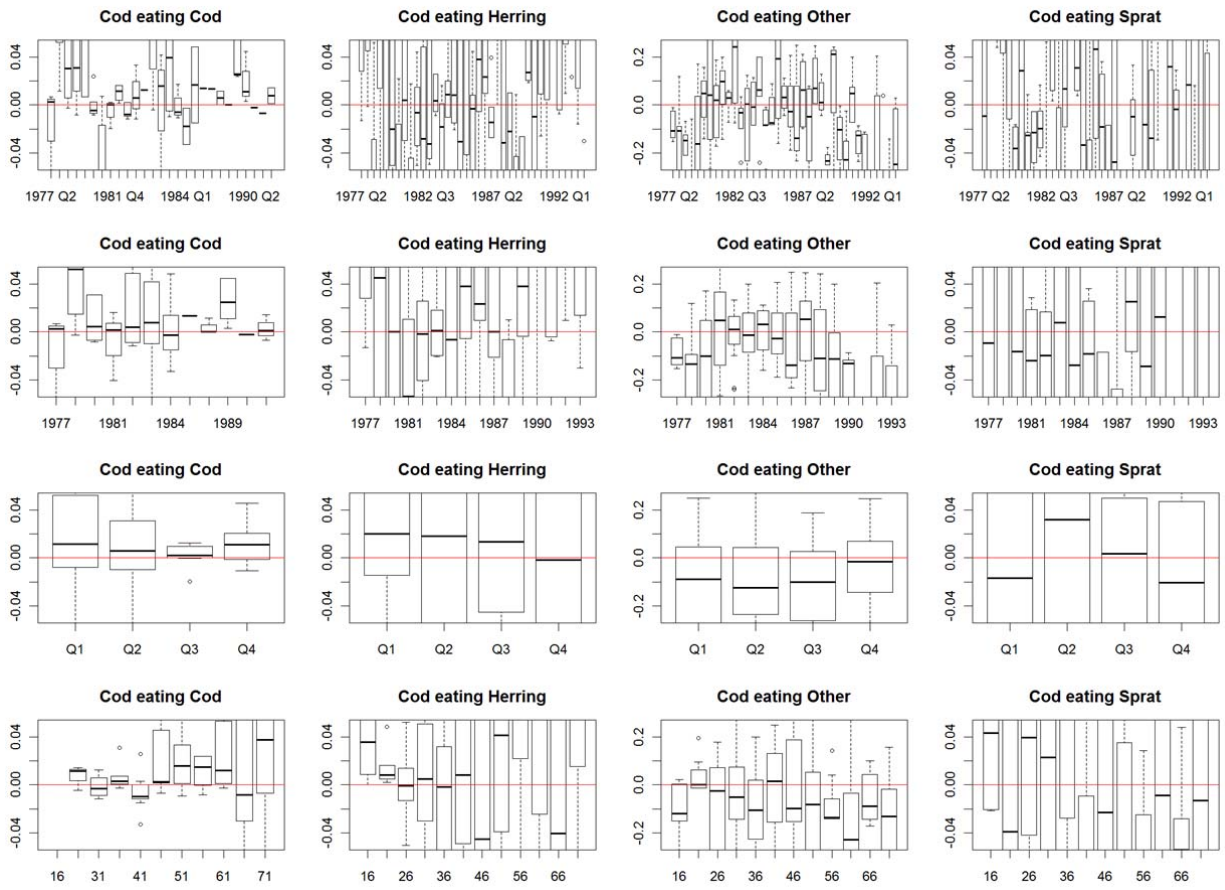

Figure 2-14 RUN 04. Box plot of residuals (Transformed Dirichlet) for stomach contents observations. Upper row has time on the X-axis, where each box-plot represent all information within one time step (e.g. 1984, Q4). Second row includes all residuals within a year, third row all residuals within a quarter and the lower row, all residuals within individual predator size class.

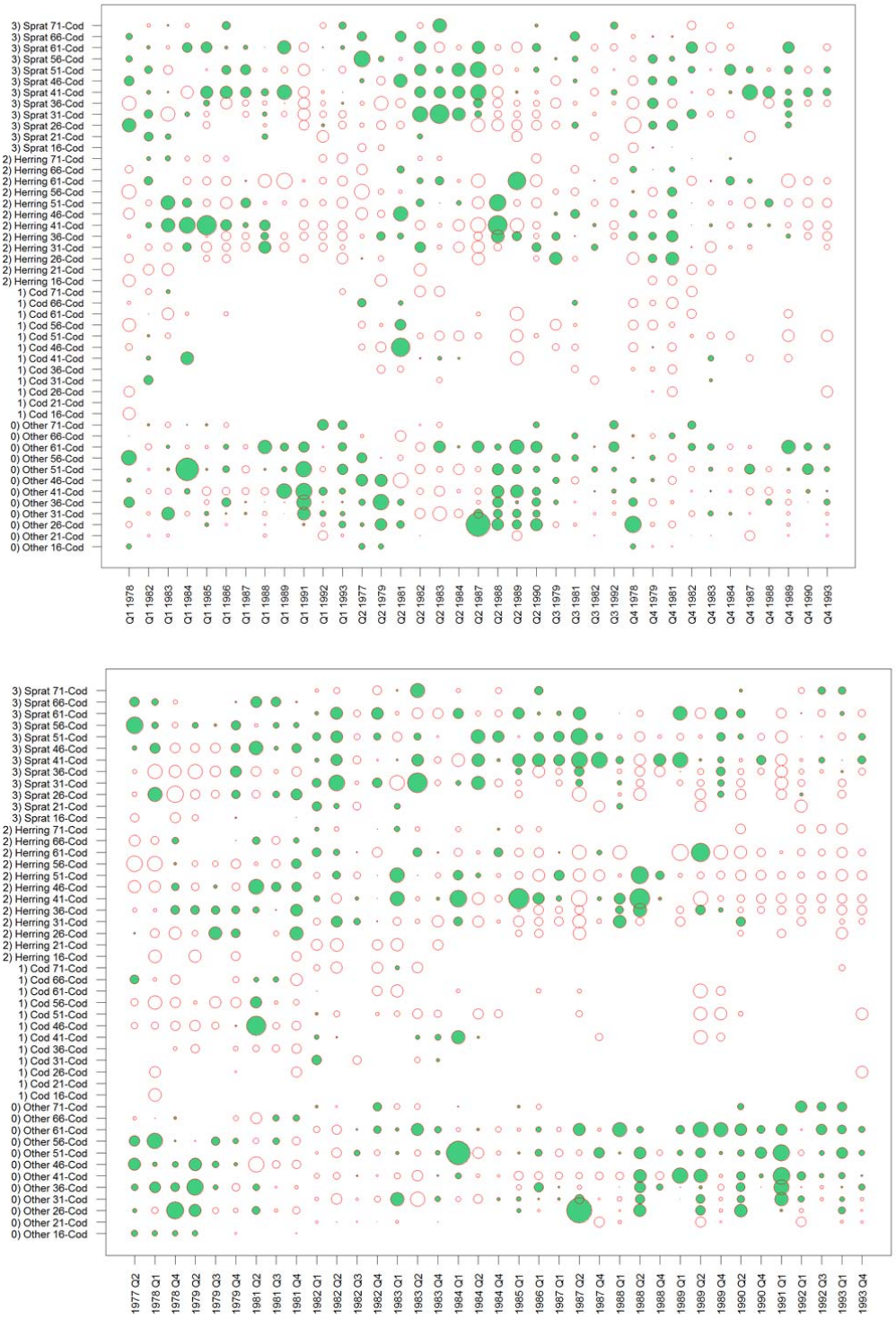

Figure 2-15 RUN 05. Residual plot (transformed Dirichlet residuals) for stomach contents observations. The Y-axis gives combinations of prey, predator size group and predator. The period (upper panel: year and quar. Lower panel: quarter and year) for the stomach sample is given on the X-axis. The green dots show that the expected value is larger than the observed value. The area of the dots is proportional to the abs value of the standardized residual.

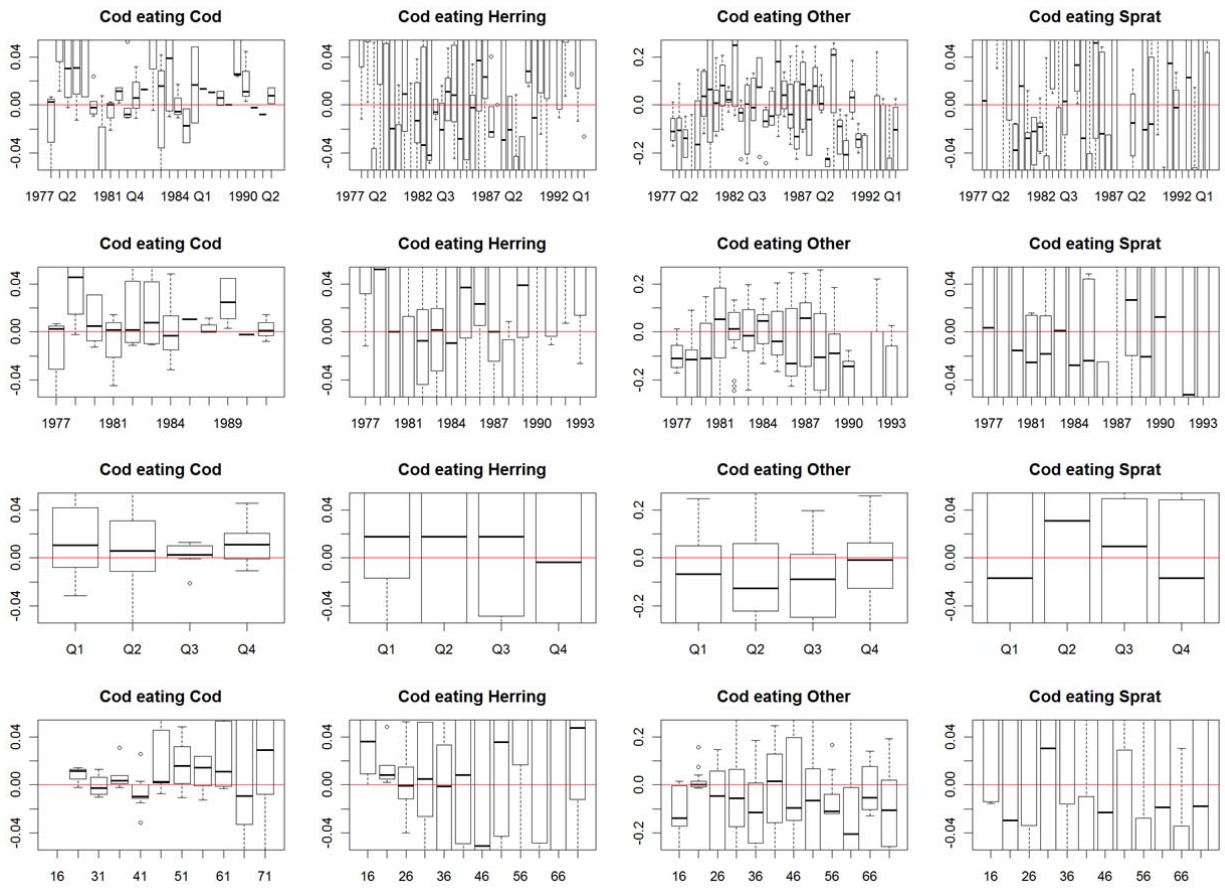

Figure 2-16 RUN 05. Box plot of residuals (Transformed Dirichlet) for stomach contents observations. Upper row has time on the X-axis, where each box-plot represent all information within one time step (e.g. 1984, Q4). Second row includes all residuals within a year, third row all residuals within a quarter and the lower row, all residuals within individual predator size class.

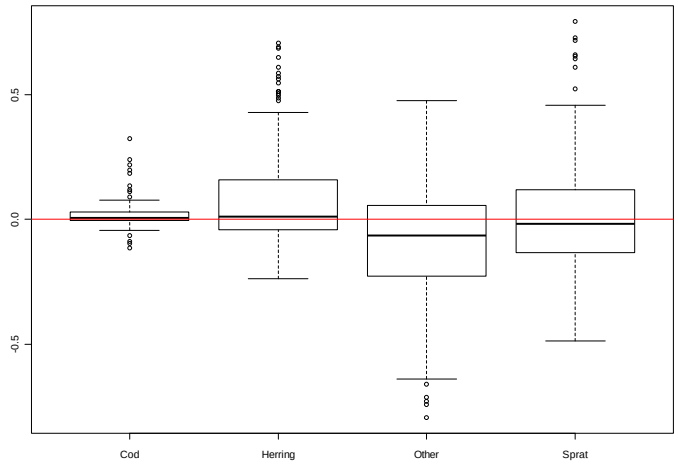

Figure 2-17 RUN 05. Box plot of residuals (Transformed Dirichlet) for stomach contents observations.

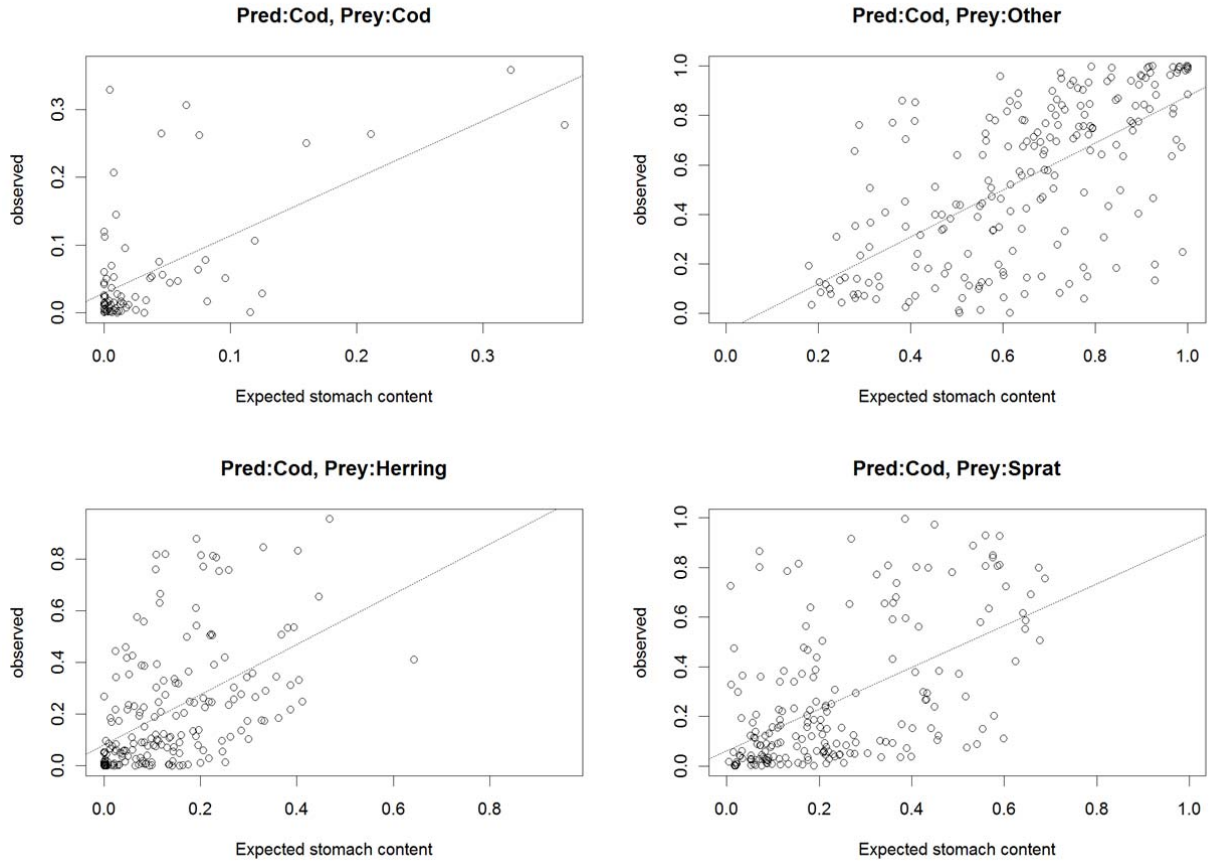

Figure 2-18 RUN 05. Observed and predicted stomach contents. The regression line shown on the plots is a simple unweighted regression.

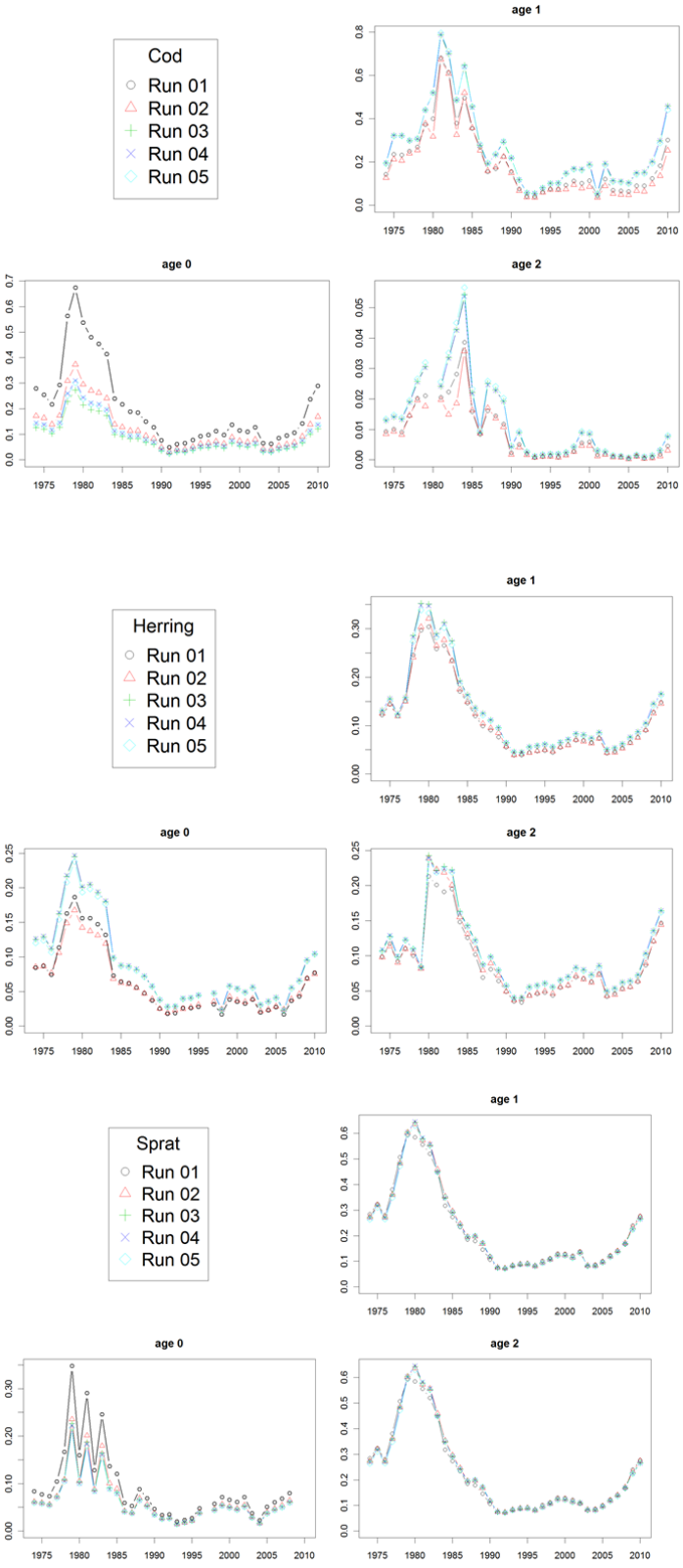

Figure 2-19 Comparison of estimated M2, Run 01 –run 05

3 Results

The main summary results of RUN 05 are presented in Figure 3-1 -Figure 3-3, uncertainties of estimated mean F, SSB and recruitments in Figure 3-4 and Figure 3-8 - Figure 3-10. The uncertainties on annual predation mortality (M2) are quite low (Figure 3-5 to Figure 3-7). The fitted stock recruitment relations (Figure 3-11) indicates the chosen relation for cod should have been adjusted (the inflection point is given as input) and that a Ricker relation might have been more appropriate for cod; however the relationships have been used as basis for the forecast scenarios presented in the next section.

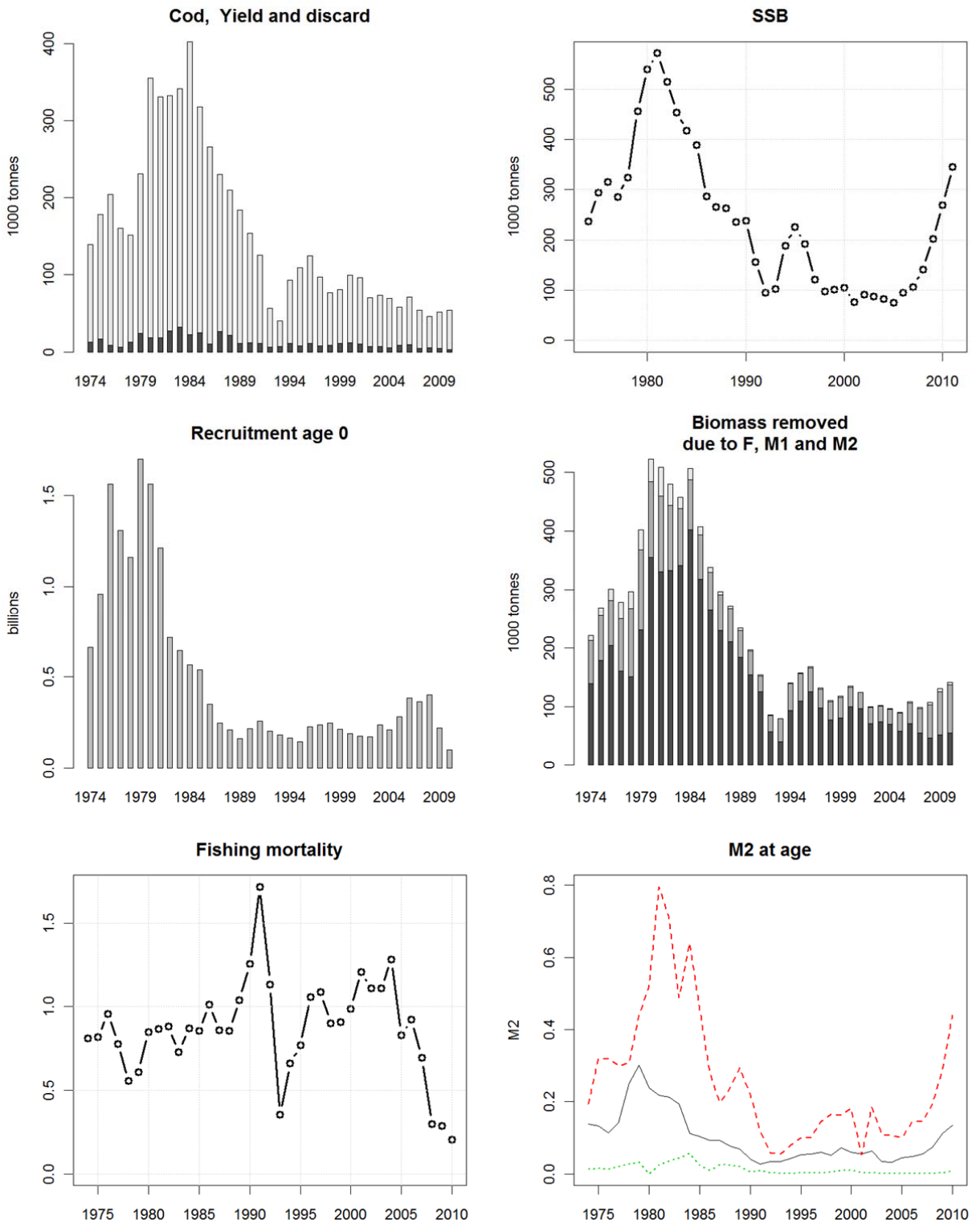

Figure 3-1 RUN 05. SMS summary output, Cod. The M2 at age plot give M2 for age 0 for the second half year (black solid line), and annual M2 values for age 1 (red) and age 2 (green).

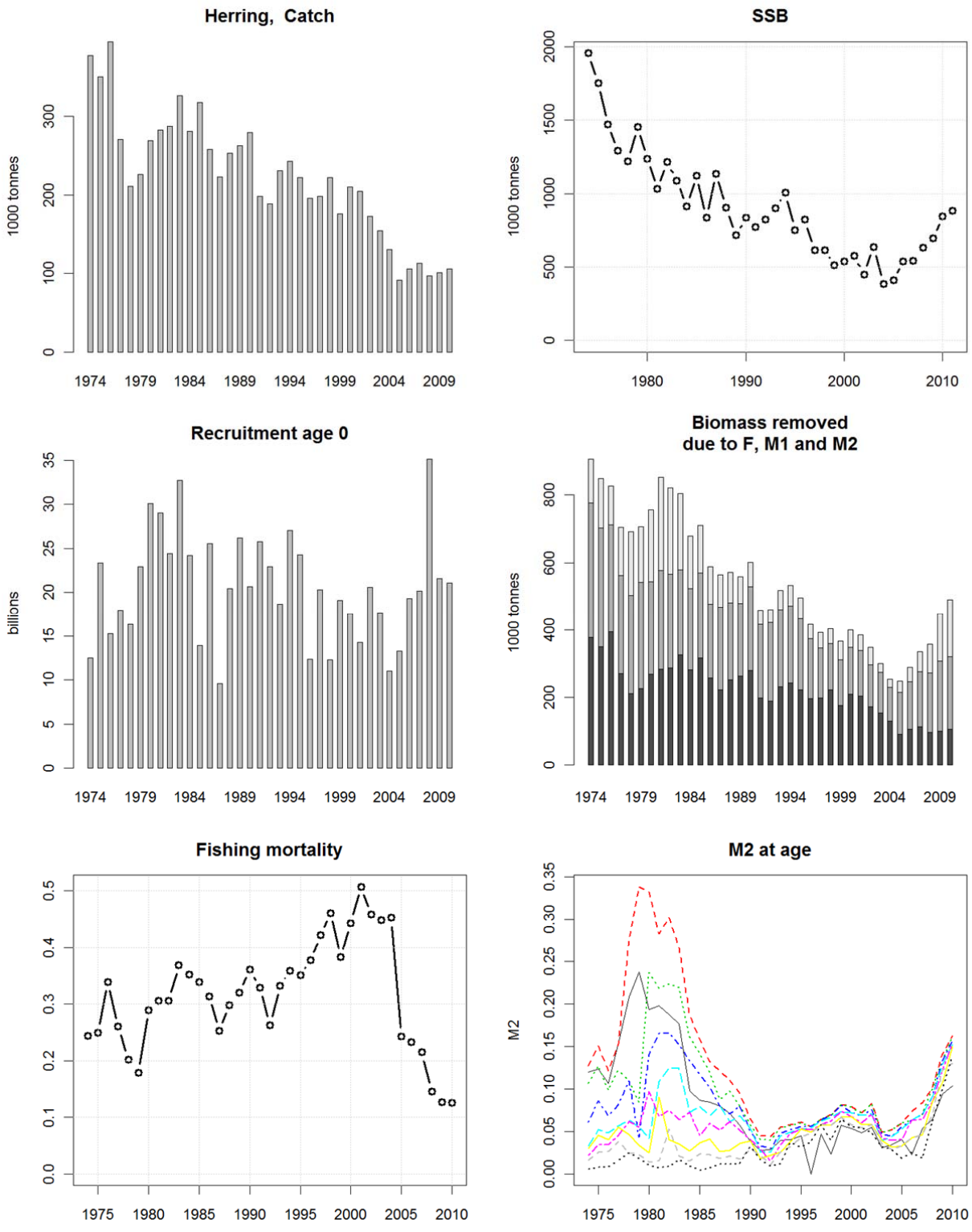

Figure 3-2 RUN 05. SMS summary output, Herring. The M2 at age plot give M2 for age 0 for the second half year (black solid line), and annual M2 values for age 1 (red), age 2 (green), age 3 (blue line) , *etc.*

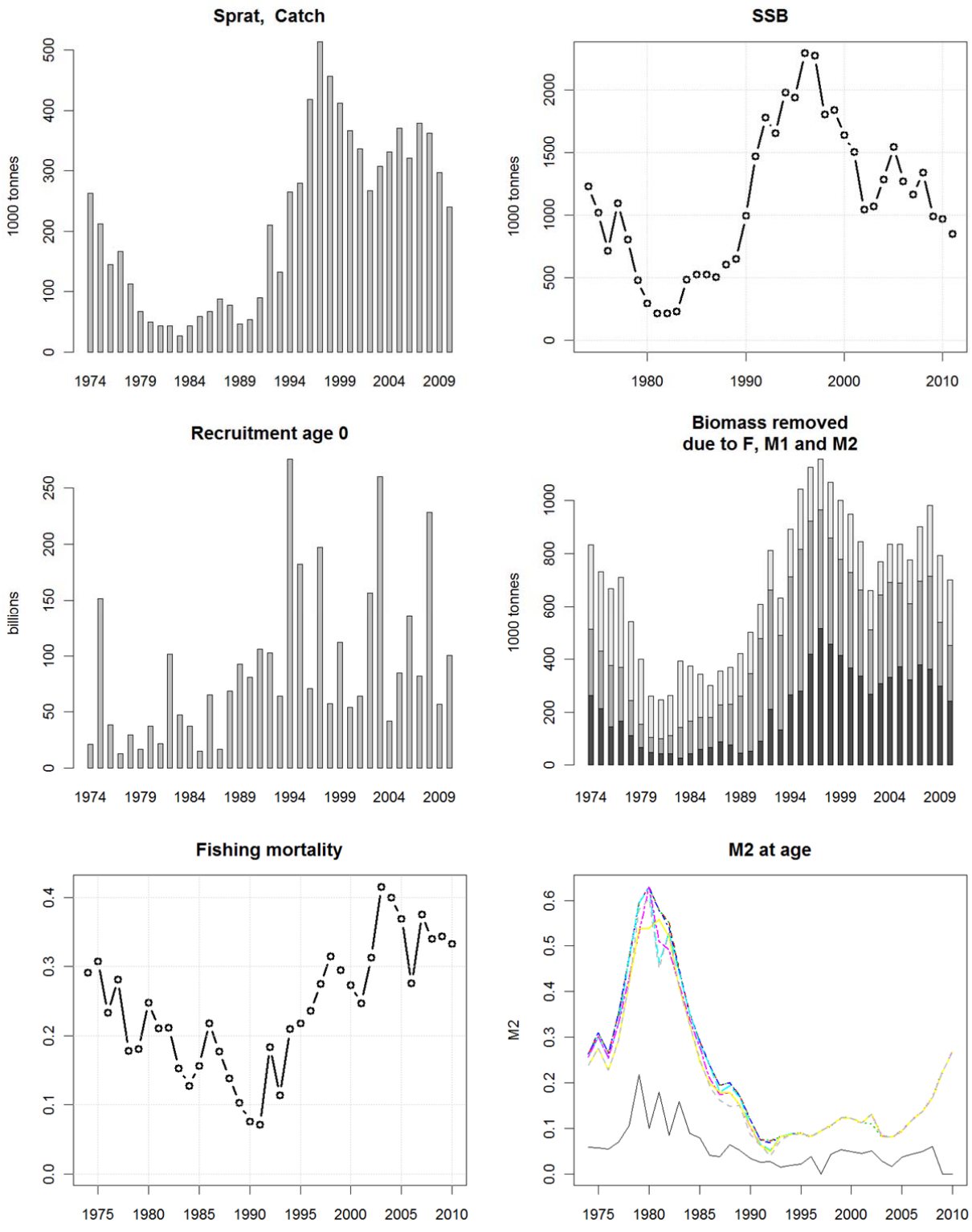

Figure 3-3 RUN 05. SMS summary output, Herring. The M2 at age plot give M2 for age 0 for the second half year (black solid line), and annual M2 values for age 1 (red), age 2 (green), age 3 (blue line) , *etc.*

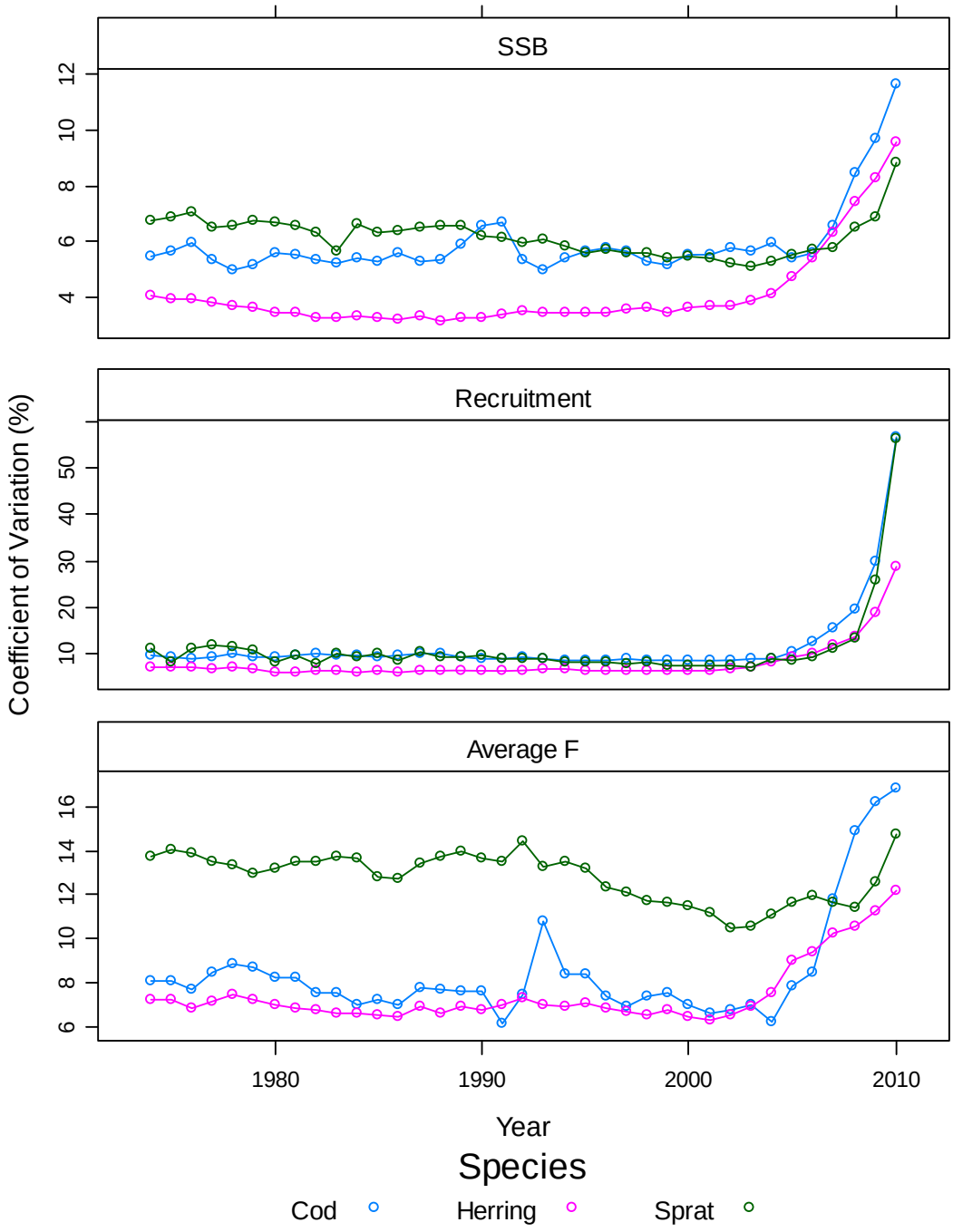

Figure 3-4 **Estimated uncertainties of SSB, Recruitment and Average F by species and year.**

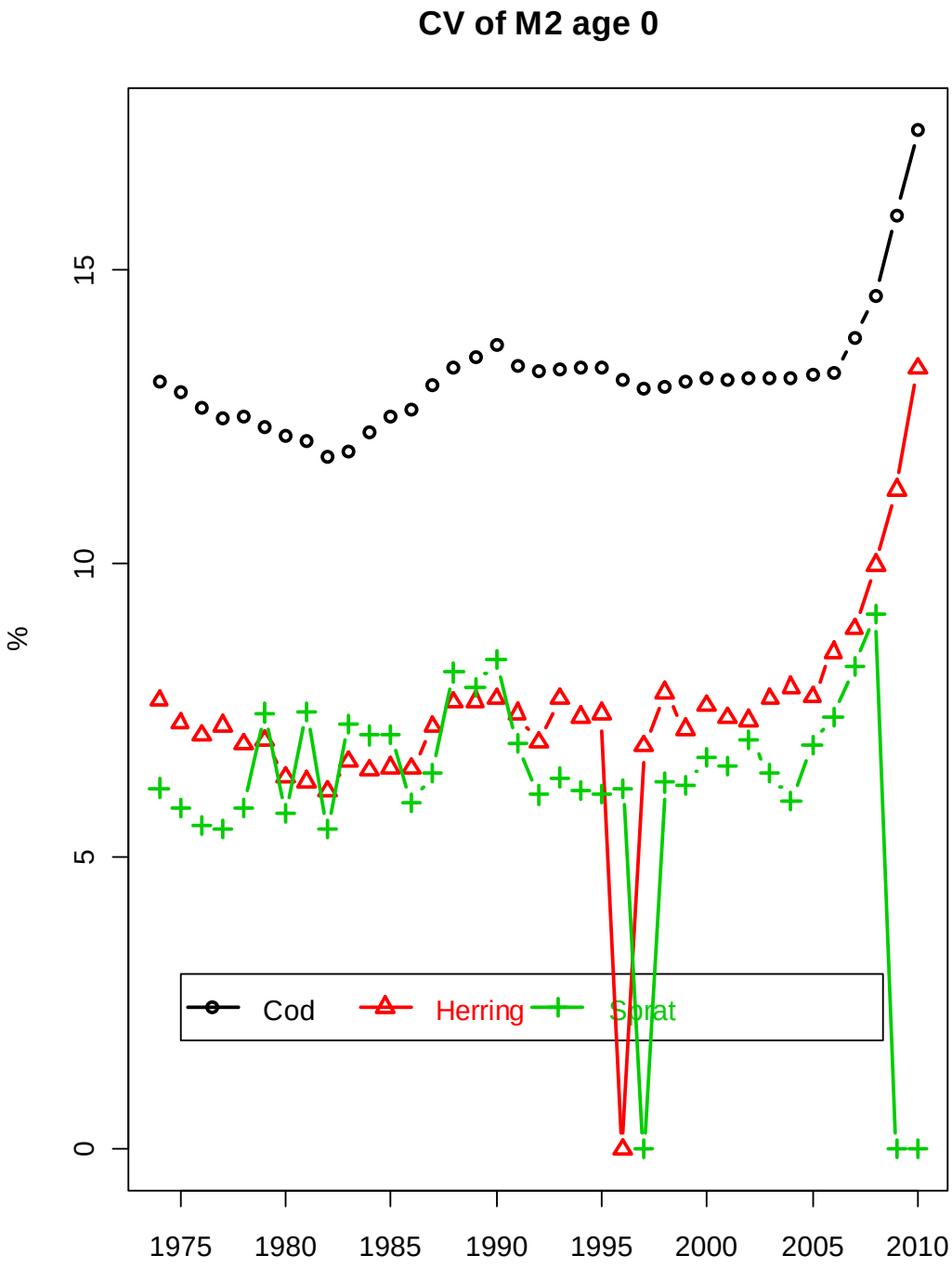

Figure 3-5 **Estimated uncertainties on annual predation mortality (M2) for age 0. Value of 0 is "no estimation possible"**

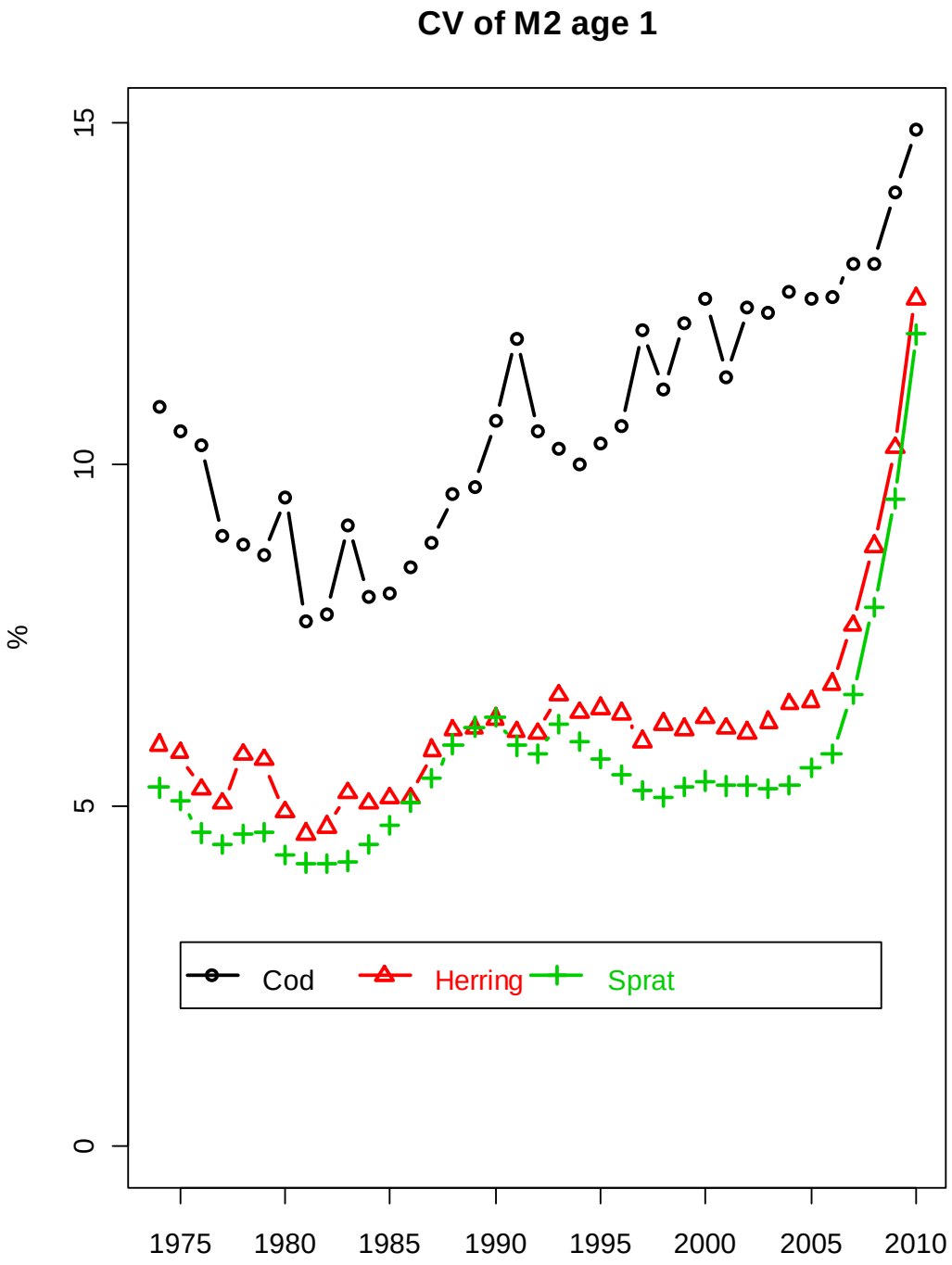

Figure 3-6 **Estimated uncertainties on annual predation mortality (M2) for age 1**

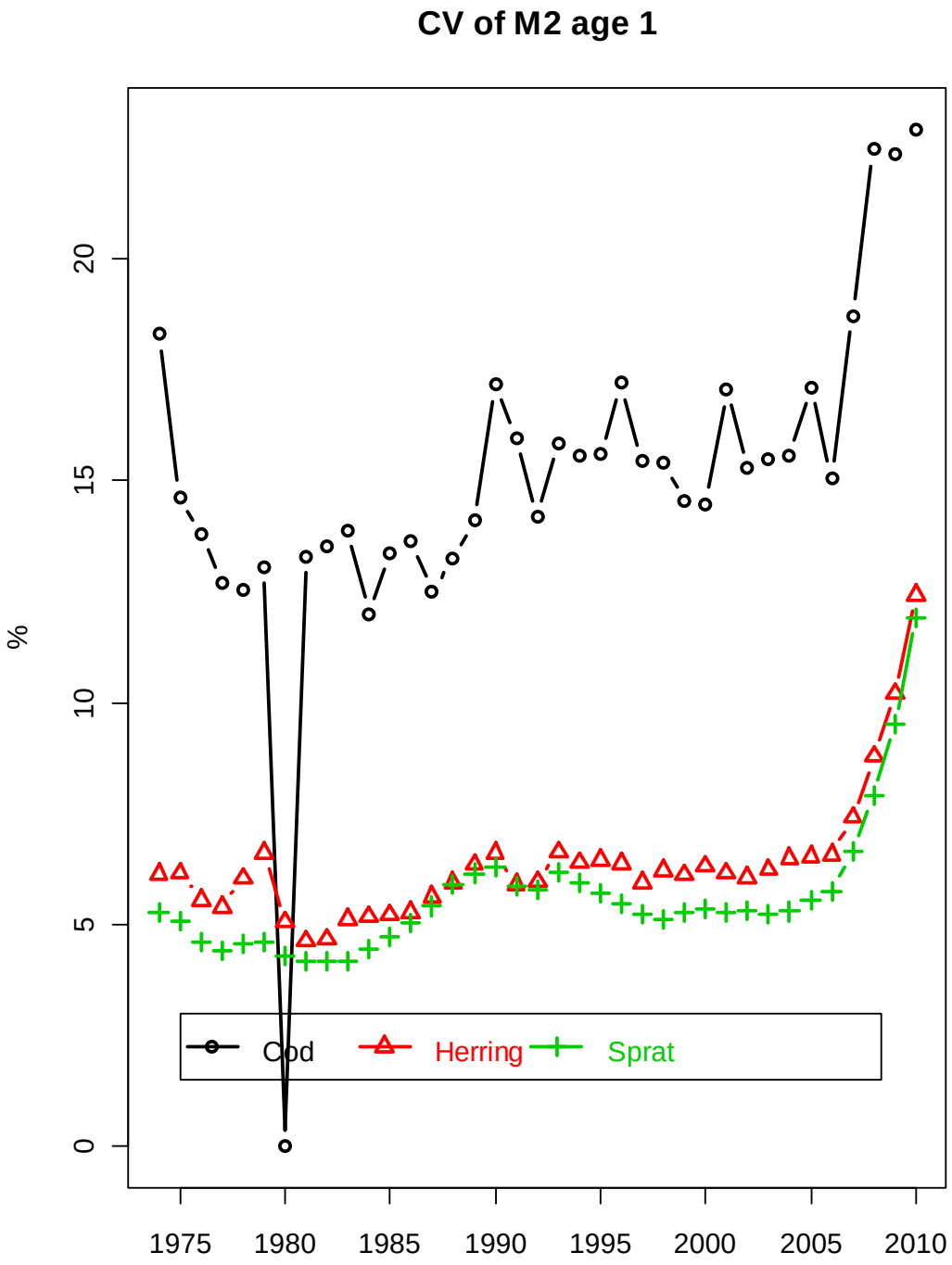

Figure 3-7 **Estimated uncertainties on annual predation mortality (M2) for age 2**

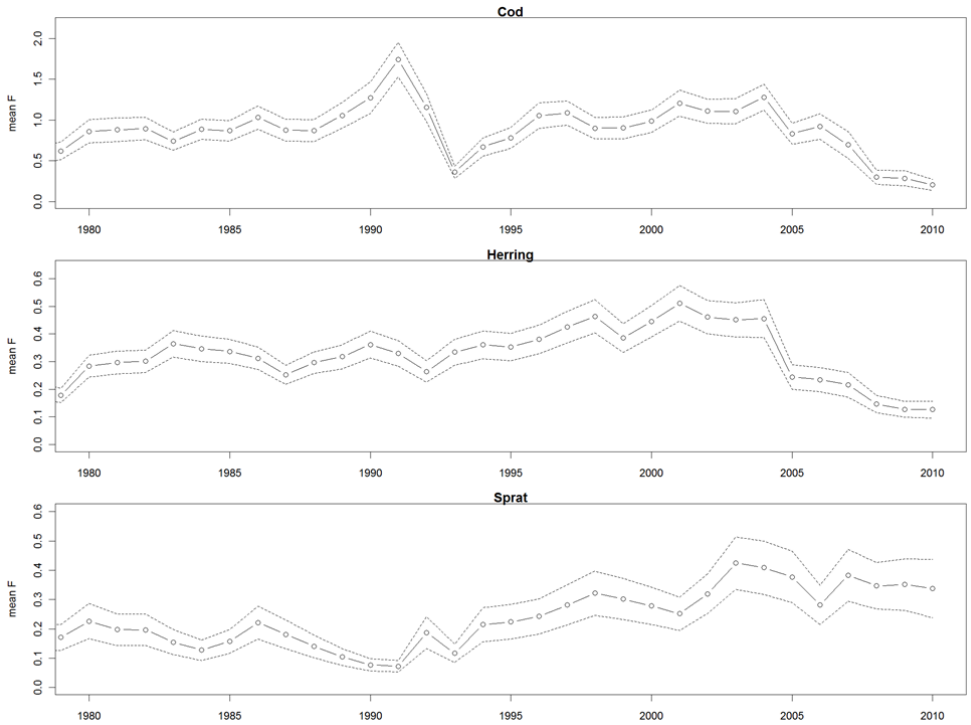

Figure 3-8 95% Confidence limits of estimated mean F by species (upper cod, herring and lower sprat) and year.

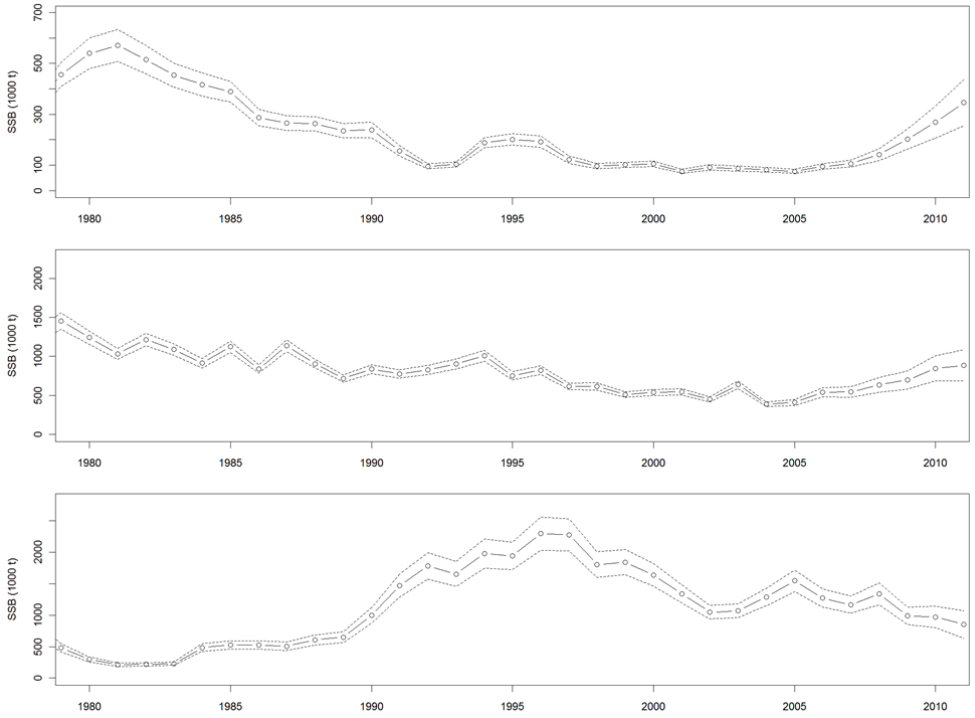

Figure 3-9 95% Confidence limits of estimated SSB by species (upper cod, herring and lower sprat) and year.

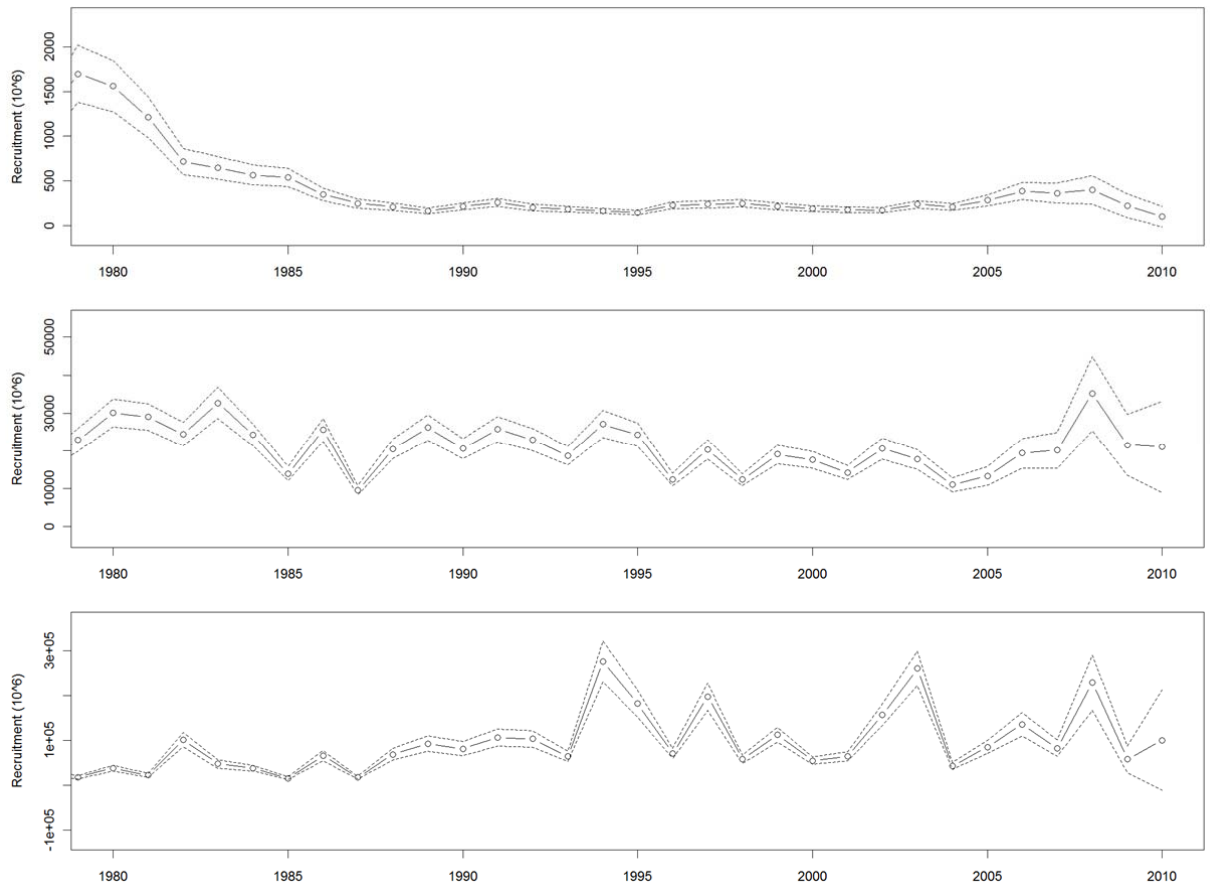

Figure 3-10 95% Confidence limits of estimated recruitment by species (upper cod, herring and lower sprat) and year.

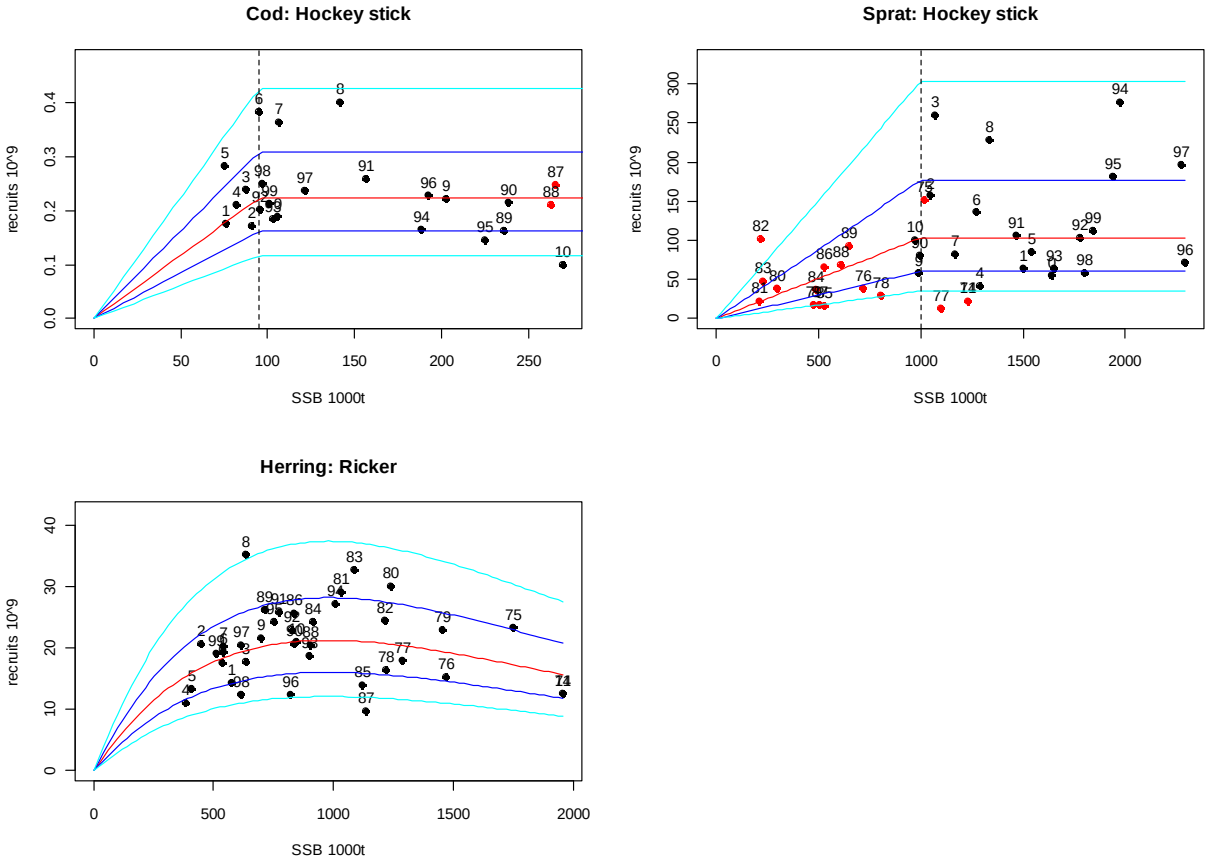

Figure 3-11 Stock recruitment relation by species. The curves give the median (blue) +- 1 std (blue) and +- 2 std (light blue). Numbers on the plots refer to year-class., numbers in black have been used in the, while year with numbers in red have been excluded

4 SMS forecast

To illustrate a simple configuration of the SMS forecast, projections were made with combinations of fixed fishing mortality for the three species. Cod mean F in the range 0 to 1 with step 0.1, Herring 0 to 0.4 with step 0.05 and sprat 0 to 0.5 with step 0.05, in total 1089 runs. On the basis of Run 05, the forecast were run until 2050, using the estimated exploitation pattern scaled to the mean F combination for the particular run. Recruitment follows the estimated stock recruitment relationship (deterministic). For each run, the average values of SSB and catch in the period 2041-2050 were calculated and saved for further analysis.

An example of a single run for cod is shown in Figure 4-1. The results from the 1089 combinations of target F runs are combined in (Figure 4-2). It is clearly shown that F on one species influences the stock sizes and yield of other species. The same data are presented using box-plots for yield (Figure 4-3) and for SSB (Figure 4-4).

The approach is useful as basis for setting multispecies targets, however "realistic" ranges of F must be applied (e.g. exclude runs with cod F=0 to 0.2). Having confined the range of Target Fs, the step size can be increased for a more detailed output. More complex HCRs than fixed F are also available.

Using the available runs, and a simple assumption that the prices of cod, herring and sprat are equivalent to 10: 1.5 : 1 the maximum value of the landings are obtained by cod F=0.9, herring F=0.3 and sprat F=0.4. Other similar optimizations can easily be calculated, given a set of input weighting factors.

As for all forecast scenarios, conclusions are very sensitive to model assumptions and in particular the stock recruitment relationships (Figure 3-11), which in this case probably need some adjustment!

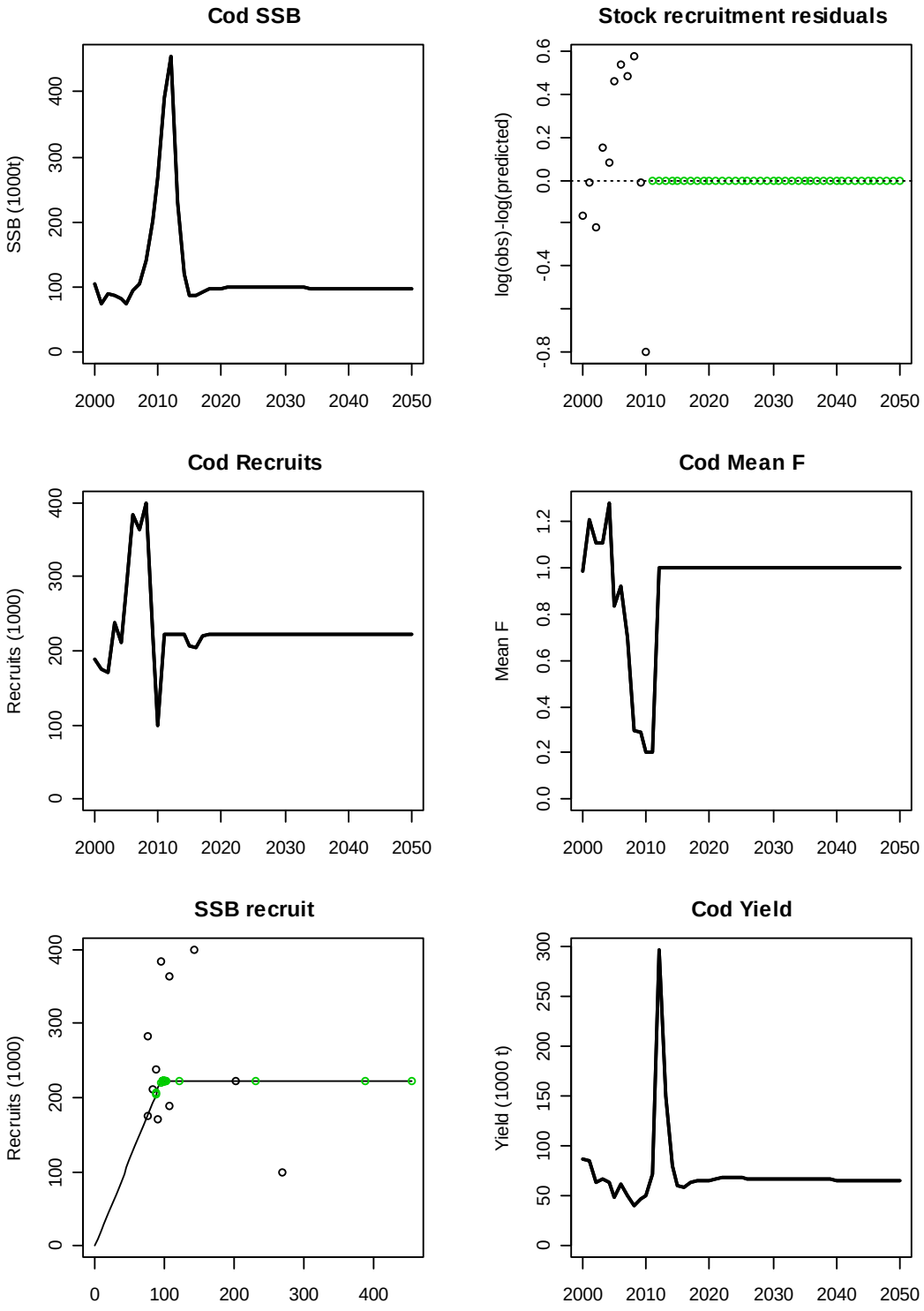

Figure 4-1 **RUN 05: example of forecast scenario for cod with fixed F at 1.0. The black dots in the recruitment plots are historical values, the green dots are forecast values.**

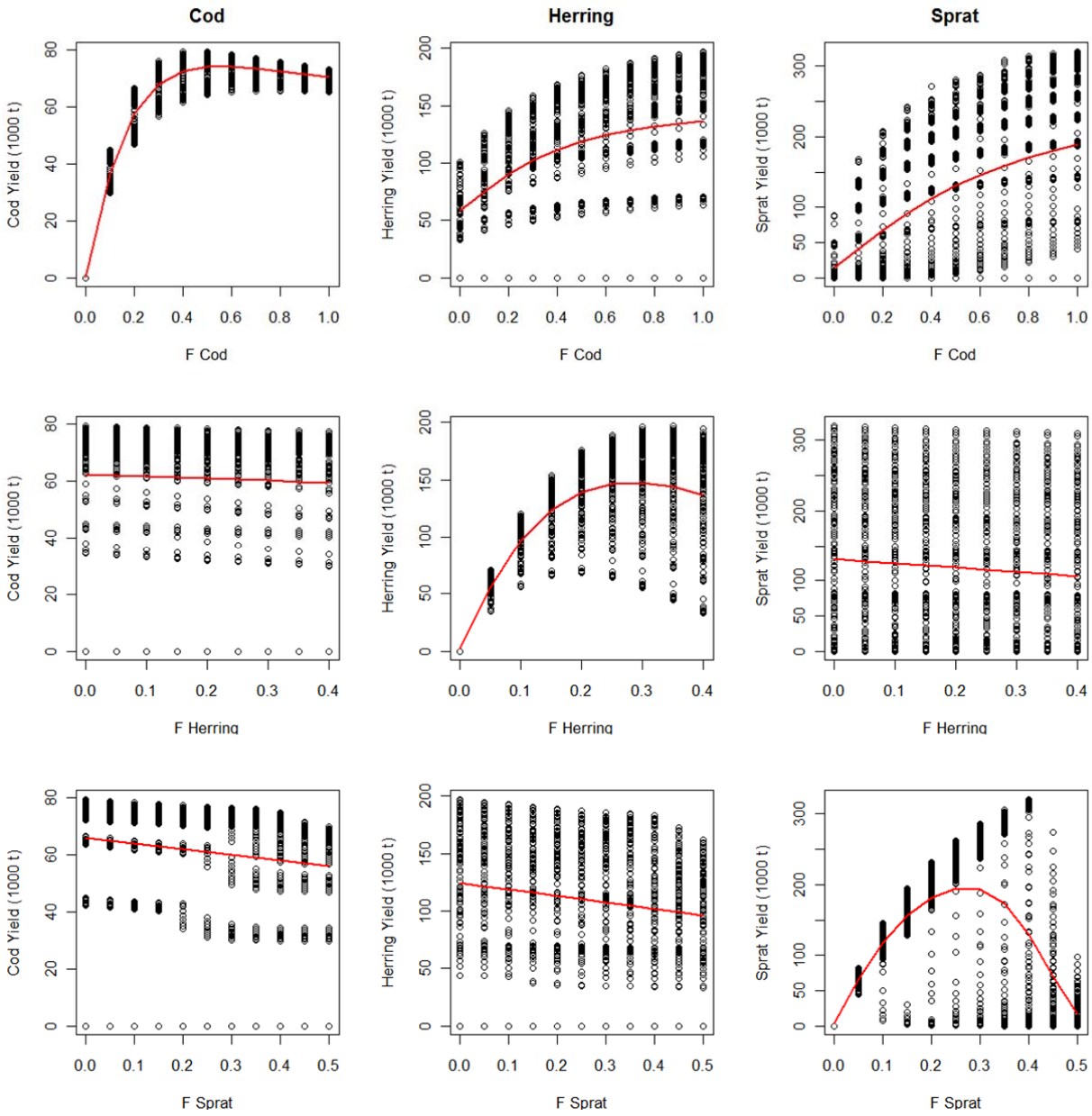

Figure 4-2 RUN 05. Summary of 1089 forecast runs using a fixed F (x-axis) HCR and deterministic recruitment. Each dot represents the result of one run given the F level on the particular species specified on the x-axis. For each F level of a particular, all combinations of the F for other species are shown as well. The red line is the result from a regression spline.

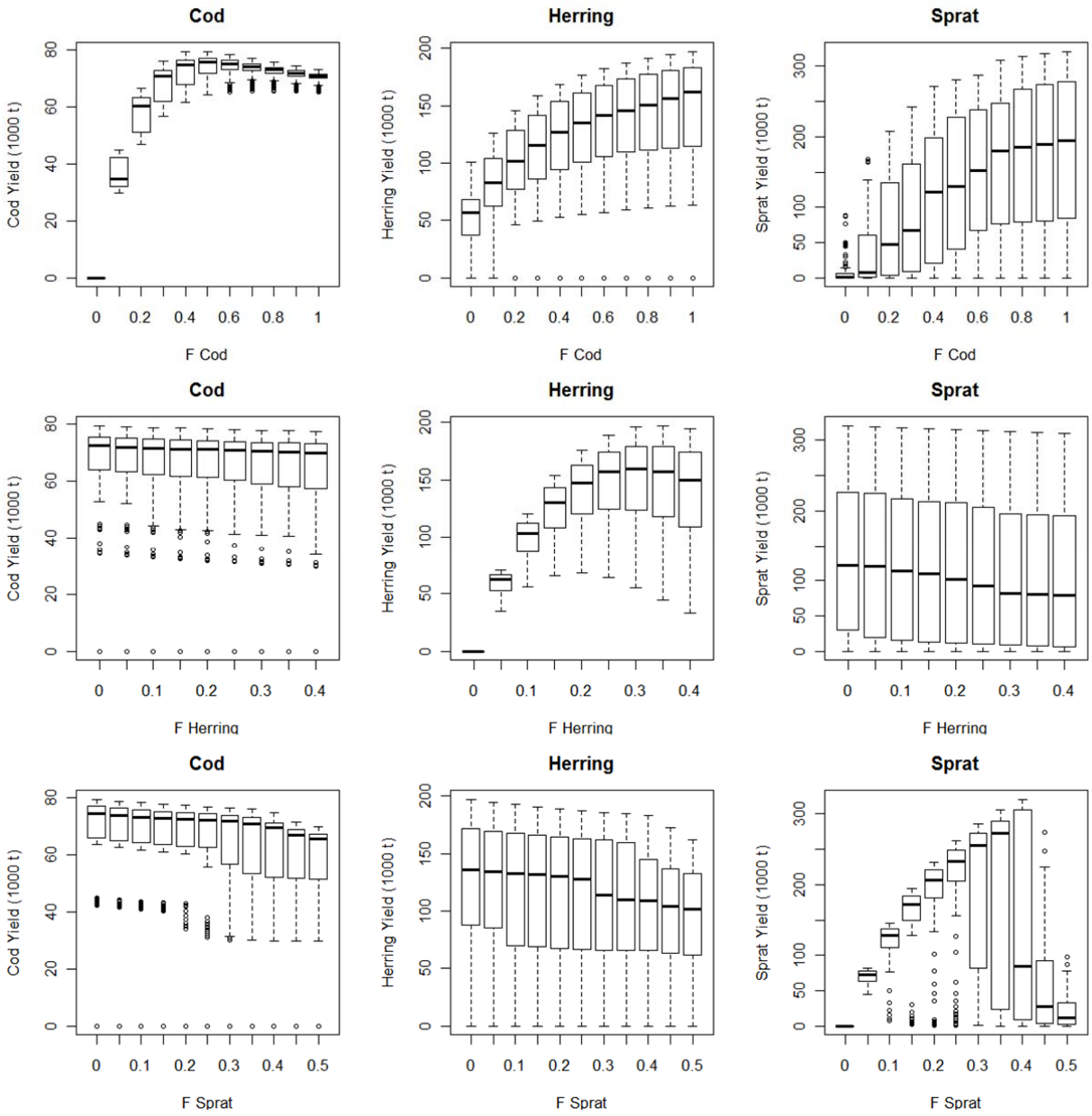

Figure 4-3 RUN 05. Yield summary of 1089 forecast runs using a fixed F (x-axis) HCR and deterministic recruitment. The box-plots show the statistics for all runs given the F level on the particular species specified on the x-axis.

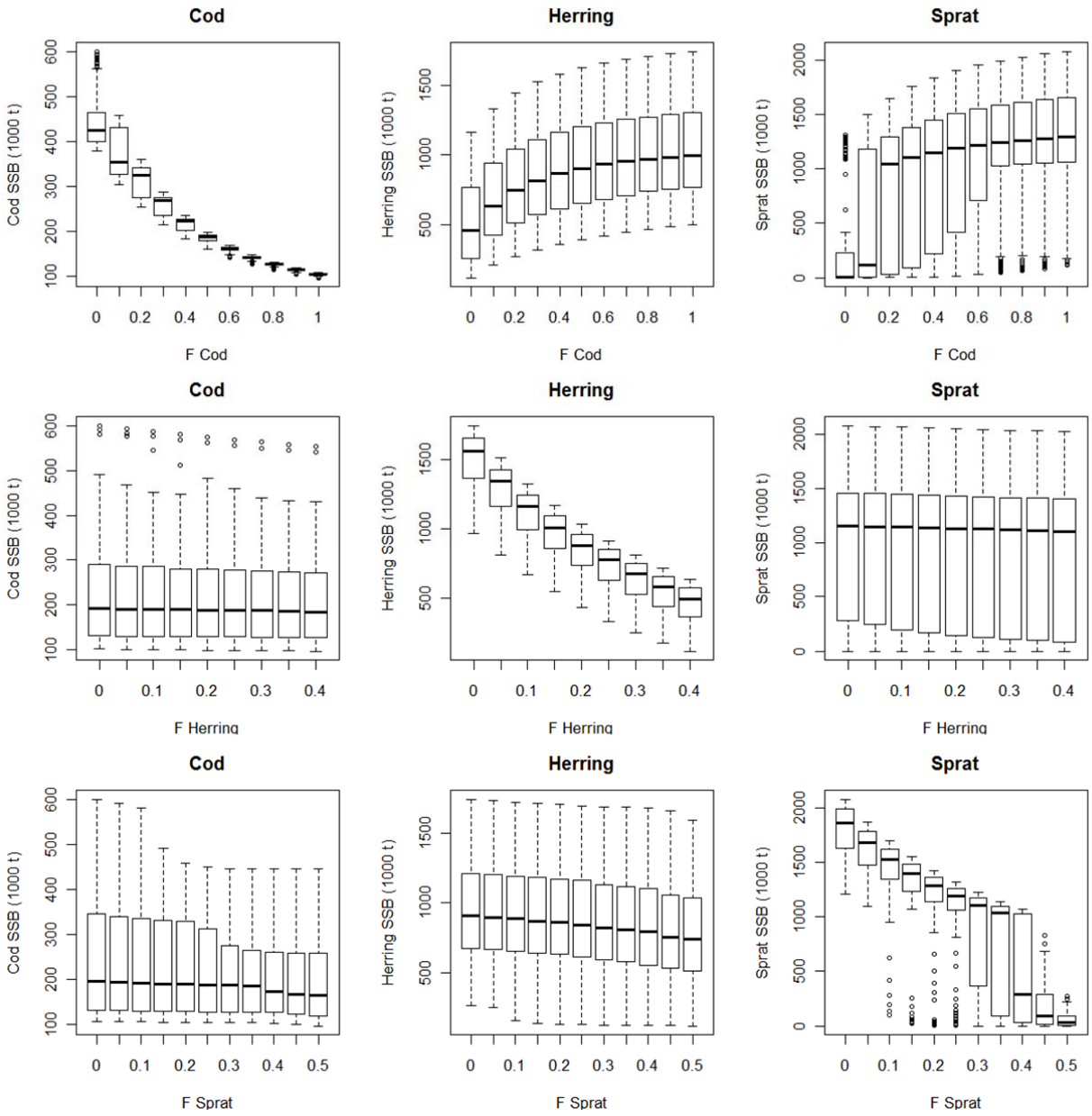

Figure 4-4 RUN 05. SSB summary of 1089 forecast runs using a fixed F (x-axis) HCR and deterministic recruitment. The box-plots show the statistics for all runs given the F level on the particular species specified on the x-axis.

References

ICES 1996. Report of the Working Groyup on multispecies assessment of Baltic fish. ICES CM 1996/Assess:2. 100 p

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ICES WKMAMPEL 2009. Report of the Workshop on Multi-annual management of Pelagic Fish Stocks in the Baltic. ICES CM 2009/ACOM:38. 120 pp.

5 Appendix 1. Input data

Table 5-1 Cod: Seasonal catch numbers (thousands)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	1	7086	59700	22639	6869	1852	723	677
	Q2	.	0	3302	12638	15239	5548	1636	546	446
	Q3	0	0	7846	14211	5189	1659	631	133	113
	Q4	0	1	17238	17451	6933	2134	545	108	89
1975	Q1	.	1	7865	70002	32822	8647	2262	652	690
	Q2	.	0	5579	39504	20190	4916	1593	432	263
	Q3	0	0	6143	17955	7643	2387	859	102	69
	Q4	0	241	13872	23380	10016	2854	614	69	74
1976	Q1	.	4	2441	30767	42434	21107	6522	590	548
	Q2	.	4	3257	20336	27260	12501	4852	793	567
	Q3	0	50	3210	8201	8035	1847	632	193	81
	Q4	0	537	4127	10576	9034	2982	1037	360	143
1977	Q1	.	17	3819	22741	21889	19118	6249	1200	600
	Q2	.	12	3047	15068	17054	10753	4217	915	439
	Q3	0	6	889	3085	2791	2038	1367	577	37
	Q4	0	710	1558	6252	4583	3776	1381	558	333
1978	Q1	.	38	2663	19219	17623	11517	3493	948	441
	Q2	.	4	7318	22311	14686	8117	3013	1014	212
	Q3	0	473	17563	14296	6434	1456	712	165	40
	Q4	0	217	34684	24492	8026	1724	763	340	174
1979	Q1	.	0	20655	61501	36072	9273	2894	914	490
	Q2	.	0	17780	52576	22334	8433	3278	1347	700
	Q3	0	1231	20489	21661	10328	5057	1341	1075	650
	Q4	0	1010	18093	23637	8561	3791	1184	520	166
1980	Q1	.	58	11899	45511	50006	18577	4253	2521	1365
	Q2	.	9	8697	42280	52680	24347	8981	1299	798
	Q3	0	21	4664	19218	31109	10103	3309	895	15
	Q4	0	643	5700	17091	27208	9357	1725	274	28
1981	Q1	.	200	10863	23334	36642	33814	10344	4415	2615
	Q2	.	300	8248	16557	29671	36211	11678	2237	532
	Q3	0	859	6551	9134	21661	7110	1940	177	49
	Q4	0	1412	7647	9591	14373	6604	1434	565	168
1982	Q1	.	139	16230	56559	35628	26887	12519	3299	1635
	Q2	.	8	15845	31291	19085	13942	6885	2221	1790
	Q3	0	424	11678	18296	10680	7257	4088	1772	567
	Q4	0	4630	13811	26922	16130	5567	1631	467	473
1983	Q1	.	26	18360	56009	45782	14266	5628	1753	998
	Q2	.	0	16365	39416	47116	18207	8920	5785	1253
	Q3	0	0	13058	11676	16419	8037	3345	590	34
	Q4	0	1467	8535	13382	13766	5769	1836	330	114
1984	Q1	.	732	18568	64940	75419	47368	10998	3757	2656
	Q2	.	0	2172	25002	38559	20626	7998	2623	2565
	Q3	0	2041	8200	13319	16646	7842	819	455	70
	Q4	0	477	4882	12117	14334	8228	1525	538	263
1985	Q1	.	179	16025	31924	37204	29695	12275	2665	2089
	Q2	.	0	20711	20829	22242	17073	6145	1684	997
	Q3	0	370	8558	9983	6785	5078	2106	619	347
	Q4	0	1496	3905	6968	8281	5472	2688	675	262
1986	Q1	.	290	3447	17624	32545	28162	21452	5236	2199
	Q2	.	217	1914	8923	18235	10008	9555	3283	1583
	Q3	0	305	5706	8490	3151	2469	1818	702	175
	Q4	0	458	6939	9612	4799	2505	1288	581	223
1987	Q1	.	22	20028	30094	29335	14981	6776	3276	1320
	Q2	.	29	7520	16485	11240	6040	3616	1562	1089
	Q3	0	229	11006	4520	1280	1137	627	893	604
	Q4	0	778	25338	10887	2598	1413	368	104	88
1988	Q1	.	0	5598	40199	25917	9882	3794	1900	1197
	Q2	.	0	6178	24168	19514	4810	1790	838	588
	Q3	0	423	11835	14811	3060	1099	473	152	183

	Q4	0	0	9093	14682	3901	1559	683	277	190
1989	Q1	.	0	1420	28386	30829	9513	3133	892	429
	Q2	.	4	479	22770	29833	9724	3365	854	820
	Q3	0	1	2989	6982	4559	2006	1188	275	121
	Q4	0	0	2020	7553	4383	1863	1017	393	308
1990	Q1	.	0	1975	12400	22622	12743	3572	808	618
	Q2	.	0	7445	6978	12825	5476	2126	858	726
	Q3	0	525	7329	7131	2363	980	439	76	98
	Q4	0	285	9157	7238	2144	1729	713	353	200
1991	Q1	.	0	3487	23132	18105	7298	2115	924	817
	Q2	.	1	2681	15034	8955	4586	835	313	467
	Q3	0	33	1404	2533	2355	609	480	354	164
	Q4	0	0	1436	3034	2126	952	424	140	139
1992	Q1	.	0	652	5534	5299	3138	1185	549	238
	Q2	.	1	4533	8379	4953	1574	528	347	181
	Q3	0	0	2202	1302	1253	620	138	64	65
	Q4	0	64	4240	986	1899	789	55	23	41
1993	Q1	.	0	7513	7550	3537	1188	464	98	70
	Q2	.	12	635	2313	1152	243	63	27	3
	Q3	0	122	3710	6586	2346	1587	266	83	59
	Q4	0	242	1739	2855	1309	395	25	8	6
1994	Q1	.	15	4479	20834	13061	4176	835	116	59
	Q2	.	14	1605	8456	6268	3990	807	264	212
	Q3	0	7	3392	4505	808	441	112	29	14
	Q4	0	83	4818	6704	3853	1880	504	74	32
1995	Q1	.	0	2039	10788	11962	5123	906	269	208
	Q2	.	0	498	4238	7065	5293	1593	423	329
	Q3	0	11	1304	1883	2209	1345	299	114	56
	Q4	0	60	7687	7606	9869	5231	1019	331	130
1996	Q1	.	70	3041	13272	10035	8580	2451	578	93
	Q2	.	48	777	7623	8654	7590	2290	580	205
	Q3	0	69	2006	3252	2300	1682	569	124	46
	Q4	0	2696	8093	7279	5513	3841	625	140	40
1997	Q1	.	117	1530	15060	7806	4754	1309	384	182
	Q2	.	0	355	10159	6025	4128	1692	905	549
	Q3	0	1324	655	3041	2840	1363	740	366	202
	Q4	1	7032	883	5237	5401	2208	933	328	159
1998	Q1	.	48	1049	4647	4490	2970	772	328	186
	Q2	.	1900	2315	4268	5721	3482	761	365	180
	Q3	0	3024	2785	2983	2473	1377	379	199	185
	Q4	1	10763	6433	6379	4989	2260	635	349	357
1999	Q1	.	238	992	13392	7667	4222	771	229	323
	Q2	.	6831	2400	12893	6475	2862	631	269	328
	Q3	0	2761	1717	3162	1348	612	183	74	64
	Q4	1	7364	4556	5893	3041	1269	398	99	63
2000	Q1	.	269	3039	15545	12181	2943	533	125	172
	Q2	.	470	5352	13480	10001	3160	683	233	273
	Q3	0	155	4000	3641	3648	1526	307	129	107
	Q4	1	3597	21430	8568	8425	2600	442	117	131
2001	Q1	.	0	2104	15794	12731	4593	798	253	126
	Q2	.	21	3571	22156	15698	4038	671	197	152
	Q3	0	21	3211	4277	2532	1274	404	108	79
	Q4	0	4019	10942	7148	5209	1817	338	136	64
2002	Q1	.	0	1627	12366	8497	2831	697	237	136
	Q2	.	389	3369	10742	8734	3018	544	168	126
	Q3	0	505	1684	2944	2573	1266	280	111	94
	Q4	0	2021	4451	5875	6974	2289	450	153	171
2003	Q1	.	0	2581	14975	11007	3675	782	256	125
	Q2	.	1675	513	7519	7276	1943	352	112	119
	Q3	91	257	2411	3507	4523	1320	228	75	59
	Q4	0	94	10845	8470	5539	1551	306	83	56
2004	Q1	.	0	3629	9875	9845	2686	758	208	131
	Q2	.	0	1774	8119	8101	3322	1319	298	151
	Q3	0	53	323	2516	2457	1010	393	124	78
	Q4	1	563	3560	5965	5075	2144	721	247	138
2005	Q1	.	13	2880	7584	6412	1741	287	74	56
	Q2	.	27	2476	3636	3998	1374	319	97	49

	Q3	0	49	1424	1718	1608	973	244	54	27
	Q4	1	1291	6541	6912	6947	2737	631	158	92
2006	Q1	.	80	3000	12023	8628	2670	581	135	64
	Q2	.	27	2478	17720	6872	2785	737	148	99
	Q3	0	36	998	2844	899	409	73	13	10
	Q4	0	179	6107	10982	3674	2009	415	84	34
2007	Q1	.	0	301	7989	8903	3125	602	128	68
	Q2	.	0	2527	8058	13095	3656	673	178	66
	Q3	0	897	509	516	845	522	148	47	17
	Q4	0	95	3504	2882	3182	1617	471	102	30
2008	Q1	.	393	3605	6829	3416	728	184	38	9
	Q2	.	7	781	8774	10406	3898	638	172	100
	Q3	0	23	254	1051	1046	648	174	70	17
	Q4	0	7	1292	2710	2623	1662	501	129	53
2009	Q1	.	0	264	8220	5486	3449	1100	257	69
	Q2	.	0	728	7637	6550	4051	1340	365	82
	Q3	0	3	952	1335	1073	634	219	49	23
	Q4	0	163	3693	5260	3246	1810	575	146	31
2010	Q1	.	15	199	3920	9455	5340	1591	416	152
	Q2	.	15	423	3723	8495	4426	1521	344	150
	Q3	0	102	380	1111	980	440	195	54	23
	Q4	0	988	2396	6295	4422	1804	794	248	107

Table 5-2 Herring: Seasonal catch numbers (thousands)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	35593	337970	261472	230434	94646	41419	20193	72120
	Q2	.	88556	715304	645533	692745	218044	131761	102765	192289
	Q3	1421	165289	214024	200429	158344	364695	125476	46668	232057
	Q4	3407	257761	355471	323913	315562	249868	96221	58187	177581
1975	Q1	.	57980	280180	217448	147575	143916	30533	22652	82430
	Q2	.	80884	685209	646759	422021	407849	111911	66896	225174
	Q3	3345	123823	181523	183685	136452	423418	136981	47597	253223
	Q4	73773	468469	269607	229112	149047	251518	74426	39071	126718
1976	Q1	.	87193	51845	146550	209488	114854	113602	64191	119412
	Q2	.	117149	346404	487038	536596	384737	460091	183352	414316
	Q3	465	180030	189977	334165	310300	258221	255841	127977	219385
	Q4	8253	390692	264061	302628	185194	128604	127333	49056	85298
1977	Q1	.	27856	183310	134771	91810	104549	35866	34069	49076
	Q2	.	42520	474425	418091	280793	339019	205083	192171	264044
	Q3	30509	246868	323278	160819	91495	119185	60220	71701	145051
	Q4	2794	235215	324193	131468	88092	113091	59454	60709	89122
1978	Q1	.	47202	202003	178342	74829	56985	45175	27136	48426
	Q2	.	87970	555119	493471	219102	141884	108343	83804	181218
	Q3	67800	262114	185295	132199	46826	32419	55037	29302	74530
	Q4	37103	217981	187897	143697	48538	38756	35462	24194	43151
1979	Q1	.	5814	171501	130146	71945	22010	16837	25020	41705
	Q2	.	14763	318779	359663	334077	118783	67261	101173	180193
	Q3	400	66755	146643	129166	151750	50980	54558	62790	156116
	Q4	27400	76582	128321	90481	95040	27194	34230	38906	102983
1980	Q1	.	207066	151567	168745	96278	90317	22806	23446	82185
	Q2	.	292032	557902	522678	266465	413790	88487	100964	272734
	Q3	23876	185781	153986	151491	110178	119288	48718	37820	120500
	Q4	140891	415807	168136	147254	75915	98112	30814	30045	66884
1981	Q1	.	48966	232765	125920	108918	57264	70808	31859	98793
	Q2	.	161685	730386	412876	307929	183718	258030	50996	206759
	Q3	2726	381380	247539	112261	120966	79374	87792	35965	149525
	Q4	145521	437872	256137	80179	81838	45692	42979	15944	59274
1982	Q1	.	67944	399145	199274	46938	42849	23209	32298	54969
	Q2	.	167905	1239380	729129	270092	226858	112285	162617	187553
	Q3	700	197843	358433	108558	60786	58477	43039	43643	82331
	Q4	100512	422597	390686	119536	60884	54616	43400	35469	65164
1983	Q1	.	109998	384861	473860	150468	58880	60835	42430	106939
	Q2	.	375500	785154	953251	396500	136938	148128	80294	200130
	Q3	3834	158988	314659	343903	113319	52766	45657	45216	123613
	Q4	241614	393004	415189	253973	98918	36882	35090	17524	46481
1984	Q1	.	111336	263854	258420	214402	52162	24914	24330	55785
	Q2	.	293850	620897	778986	629867	224621	89734	106741	177629
	Q3	4436	199787	195917	198992	181909	62064	34457	27802	100445
	Q4	184487	436648	303606	299041	182950	61193	29149	18803	39291
1985	Q1	.	172642	165638	125036	86326	50107	15137	5258	7613
	Q2	.	103081	994340	667193	581734	475461	170502	78196	185163
	Q3	7210	226170	354581	218738	164899	117267	48526	33160	106541
	Q4	60988	787938	714557	235513	150162	86325	34217	20815	41504
1986	Q1	.	82346	232337	274913	128411	93169	39420	7752	12124
	Q2	.	179352	878185	967179	516262	363447	185976	58090	85881
	Q3	7180	66059	344997	283628	193198	152713	83969	39185	94278
	Q4	115921	234267	384798	323093	111572	71878	30455	17745	22417
1987	Q1	.	38163	53462	89801	76849	44767	35684	8773	11832
	Q2	.	125476	291432	732342	619386	301406	205712	111855	75680
	Q3	1441	212313	185442	209139	209393	138456	88140	37944	41255
	Q4	16411	443966	134805	244041	231907	77579	54550	32286	17422
1988	Q1	.	172528	233565	91436	136270	111147	48623	31153	25579
	Q2	.	68697	1043980	449993	578447	516074	206781	152936	107597
	Q3	7060	70655	293184	134912	134982	122241	67293	51628	47010
	Q4	80856	116529	633598	148129	132719	122942	44367	19445	16921
1989	Q1	.	84594	139608	758460	183029	211436	159016	44865	44835
	Q2	.	71029	210609	961752	277213	334172	306036	103747	125972

	Q3	26392	240347	108615	231112	108057	116161	99817	44451	65610
	Q4	83848	370295	102980	404089	105386	151186	101716	46509	52177
1990	Q1	.	67747	433060	165432	432078	114141	112846	79225	39759
	Q2	.	30443	397520	212581	647207	168081	229924	138008	111892
	Q3	3667	229805	363267	200845	192196	147571	95590	34021	30129
	Q4	17441	294963	399392	242920	497230	166207	157378	71512	47404
1991	Q1	.	40548	408591	279060	117391	228965	79228	76075	66491
	Q2	.	26248	540230	475699	199864	444782	104157	128887	127007
	Q3	6200	97130	281558	217792	86136	104017	44188	35311	31910
	Q4	105511	312274	531999	360072	118152	177466	72720	45679	36786
1992	Q1	.	124250	459947	667799	222454	91261	180019	55420	68324
	Q2	.	71971	419256	788661	360701	123810	257200	64560	138210
	Q3	13989	236458	144230	160926	92090	41370	34680	18660	16420
	Q4	136351	733182	272860	225234	122790	42190	48980	15050	11890
1993	Q1	.	140974	559691	488765	420669	141387	46329	57680	30381
	Q2	.	201109	773236	639978	769924	282261	130888	150924	103377
	Q3	57761	143306	235249	212714	188476	103378	53956	32099	18211
	Q4	59023	533114	665782	459609	318768	155486	61870	35569	14949
1994	Q1	.	80300	176600	257100	252900	341000	181600	86800	65000
	Q2	.	134500	554900	787300	587400	571600	240900	80100	209500
	Q3	22300	82700	194200	305400	190000	133900	52800	28300	29200
	Q4	148500	352800	499700	574800	294800	191500	60200	25400	33900
1995	Q1	.	264300	453800	861100	794600	253100	152100	50700	53000
	Q2	.	208700	376400	620300	598200	356100	246300	125500	139100
	Q3	2100	164700	141200	231000	221100	140400	103500	32400	32300
	Q4	67600	415100	305700	393400	368400	173300	109500	36000	39200
1996	Q1	.	288627	359379	266099	286427	204850	141012	74027	52347
	Q2	.	142626	670134	572297	642213	499548	334720	228711	178210
	Q3	5960	213844	283681	197800	208244	175217	104505	52757	31001
	Q4	72476	769480	578236	341058	327334	209520	95516	51219	19208
1997	Q1	.	106526	589481	577995	369478	259690	126885	53476	38843
	Q2	.	170055	716110	683358	496436	407834	270786	144604	119905
	Q3	24671	95937	241829	299119	194095	153231	89892	46321	32997
	Q4	132483	380872	733578	737894	459302	326885	191692	90373	55444
1998	Q1	.	488181	355153	695147	831302	408741	200377	106457	78200
	Q2	.	245300	335800	640900	605500	333900	227900	131000	219500
	Q3	13727	345500	196000	396200	238600	87100	65000	34000	31400
	Q4	78600	1058500	356454	594714	390400	157100	104777	30450	24500
1999	Q1	.	319187	843456	259692	644743	451416	157695	86279	57900
	Q2	.	142944	498062	378075	472696	287212	132563	84995	93500
	Q3	55096	181986	203324	138590	103917	78778	38107	20790	16100
	Q4	190169	346586	561988	329983	402900	289947	95543	54553	33800
2000	Q1	.	572536	667931	765385	341719	405925	258309	72963	62993
	Q2	.	284102	363497	524052	259766	314074	156293	59307	86360
	Q3	19142	355319	152314	190986	69286	75213	49009	25025	23529
	Q4	179631	889293	308575	561136	271944	327380	187548	69102	65570
2001	Q1	.	489461	724395	274285	463792	185345	184882	147868	86307
	Q2	.	317198	586396	302988	357642	113628	144919	81281	93456
	Q3	74490	456686	392056	172638	173471	58563	93451	62137	43531
	Q4	220075	608601	688789	233304	276796	99468	88851	68001	47073
2002	Q1	.	355173	796974	618848	212595	247642	86943	85286	72048
	Q2	.	306364	695350	524031	269661	210896	79458	80006	114900
	Q3	81858	243613	160699	134631	50017	60339	17519	25651	37870
	Q4	406775	433639	542672	422871	126696	122535	32119	26998	38681
2003	Q1	.	352270	172120	169508	243097	82908	73868	31929	69748
	Q2	.	295157	487535	777785	379403	146890	107743	45241	110935
	Q3	52248	240608	131860	230566	112945	43173	38546	15197	40236
	Q4	192434	1056060	387271	432458	182405	95722	77163	17553	40086
2004	Q1	.	165900	852500	315500	397000	177500	82200	52600	71000
	Q2	.	109400	579400	326600	387200	143500	76900	46200	46500
	Q3	13100	80000	237400	79700	89700	65000	26500	21500	24800
	Q4	83400	468100	915700	258100	199900	127800	41100	32600	21200
2005	Q1	.	70800	293900	453600	210700	141600	79700	20000	31100
	Q2	.	149600	218200	312500	160000	122300	81700	40500	101400
	Q3	23000	26100	38100	77300	48600	31200	20700	9200	12300
	Q4	130300	79800	203300	343700	137800	83300	37700	12900	14500
2006	Q1	.	164700	109500	289400	437400	172100	118900	83000	30800

	Q2	.	156200	133400	228600	269300	114800	68200	37500	20900
	Q3	31500	69500	46400	50400	83200	34200	27700	10300	4400
	Q4	140900	418100	216300	185600	315100	88000	50200	23700	6600
2007	Q1	.	127300	361900	221500	286000	275600	86400	40200	18000
	Q2	.	83700	216900	148500	131300	200200	66300	37700	15400
	Q3	36700	31300	35000	35400	51200	86400	34700	18700	6500
	Q4	201700	215300	306500	224900	234700	261600	81200	39400	18100
2008	Q1	.	313707	414567	175311	203047	264916	54936	39618	13955
	Q2	.	154081	237899	130096	102389	224631	53234	40948	15132
	Q3	84316	39247	58121	34767	50739	67265	17363	9080	4094
	Q4	465809	228476	257831	121320	129624	154199	40364	22244	8244
2009	Q1	.	584286	346488	380334	151316	173347	233957	49217	31038
	Q2	.	330965	197400	208427	61903	53851	119565	20465	23699
	Q3	56600	93893	44621	62011	26898	41153	47965	15930	8306
	Q4	267532	355120	133536	194476	59450	72223	85206	24781	9671
2010	Q1	.	220920	543419	258007	230950	85531	111466	110598	20081
	Q2	.	187532	403114	156714	182800	80037	45038	90099	9724
	Q3	65057	48059	100098	61463	55345	26014	19127	14544	1032
	Q4	334747	188758	310682	185551	161133	92181	108090	63116	12419

Table 5-3 Sprat: Seasonal catch numbers (thousands)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
1974	Q1	.	128151	1695970	3297730	1378900	198132	154350	145368
	Q2	.	545350	1228680	2710810	1101410	259147	215380	115744
	Q3	6425	24528	467561	1216290	400374	99086	55751	50482
	Q4	168982	1118370	943827	2310130	441912	237629	145413	137298
1975	Q1	.	162244	2322240	2140760	1389050	451943	278105	171025
	Q2	.	509768	568985	1208580	1068720	306883	165626	98495
	Q3	0	800	558657	1012420	995002	296988	151582	87088
	Q4	0	26597	543147	1031330	482561	158657	165903	132761
1976	Q1	.	781147	763751	1537070	772778	94842	64366	71752
	Q2	.	1015330	482589	1205580	655391	111760	100884	71733
	Q3	35257	388836	151963	488306	265067	57370	35956	42110
	Q4	338740	1220960	414665	1028790	438404	115906	37348	86130
1977	Q1	.	436948	2817090	539917	529226	1141950	175779	91687
	Q2	.	227585	1824730	306409	611166	526085	159526	104152
	Q3	847	249163	837469	139697	324237	167206	62865	63649
	Q4	35864	788481	1285790	174643	320433	199619	26883	84042
1978	Q1	.	132452	955715	1525630	108002	322202	247127	39032
	Q2	.	65071	774103	1848500	272401	413912	285178	28521
	Q3	0	38542	338050	473371	27908	74251	44741	6610
	Q4	71987	113912	197819	586419	18726	45857	118134	7403
1979	Q1	.	152994	68339	268209	754723	25280	55595	105103
	Q2	.	126280	123028	337651	864568	72576	59604	113999
	Q3	39	53241	28445	88218	366849	6948	16900	52955
	Q4	43931	409434	78219	120737	536055	14922	42744	94325
1980	Q1	.	156232	738773	192166	324150	575800	63900	40061
	Q2	.	20721	191321	60052	93616	324497	63756	11682
	Q3	0	63302	65910	34495	22490	114959	20020	6734
	Q4	42913	229087	126504	45956	37026	182773	15983	10066
1981	Q1	.	73109	196247	107070	15064	31458	154858	2288
	Q2	.	167882	143512	76035	33734	28462	115998	4636
	Q3	1701	183712	90694	71822	17469	24634	88766	3537
	Q4	20653	1503960	193796	108351	27081	23117	145320	3650
1982	Q1	.	87724	1859480	247127	176422	61470	44056	70211
	Q2	.	11972	192480	41891	30677	9457	9343	76696
	Q3	0	22822	87451	16822	13066	2396	3961	36965
	Q4	29998	105674	273010	48397	27198	6616	7615	60451
1983	Q1	.	55957	74401	169995	33058	20861	5477	12996
	Q2	.	61110	22263	68204	12142	9009	3025	3776
	Q3	3267	159025	20900	35508	9109	5033	1746	2042
	Q4	135821	1128020	121041	240904	51875	30660	2671	6838
1984	Q1	.	76272	1415390	218837	313182	58092	28651	6331
	Q2	.	5444	100595	20280	27912	6921	3272	1263
	Q3	1034	169942	115822	11054	8664	1338	421	205
	Q4	71999	493512	683571	90596	98261	8860	3917	427
1985	Q1	.	55898	791885	1531450	237326	138503	11129	7491
	Q2	.	42865	165230	271656	108586	30109	5808	2927
	Q3	400	67566	45807	71436	12503	9955	613	508
	Q4	33329	281667	420315	489793	69556	47532	5548	4225
1986	Q1	.	111067	471458	671336	1120410	154802	95565	3440
	Q2	.	101952	131168	351744	500926	120907	46516	5275
	Q3	0	11771	71102	71546	111095	24766	13306	1257
	Q4	17092	79072	291963	193851	314951	40715	28874	5408
1987	Q1	.	20457	139388	533932	887191	893965	102899	57349
	Q2	.	73852	75452	428766	695892	699085	92840	58215
	Q3	0	60501	10069	36987	10043	15687	2293	6005
	Q4	4203	561113	106942	196641	91436	93312	11408	12675
1988	Q1	.	46667	1828360	479429	720045	522367	495987	40403
	Q2	.	11575	483908	167289	222164	151541	107318	7913
	Q3	25623	3343	35399	9569	27262	11422	15424	1610
	Q4	123658	12360	332885	73275	131758	48764	98036	7736
1989	Q1	.	166838	503585	328609	242694	253137	243331	65222
	Q2	.	23609	121874	179052	93723	116897	98660	36826

	Q3	14887	9197	15528	36639	14594	35540	22205	15228
	Q4	49194	153459	194888	123084	49680	60813	33105	23032
1990	Q1	.	293428	631040	169663	278813	100085	95656	46832
	Q2	.	65027	771754	90114	249885	66264	98775	41631
	Q3	7	173963	112699	9041	49053	2016	20966	521
	Q4	16202	172480	260946	46157	81760	20356	20943	3137
1991	Q1	.	276882	1097920	1111910	211297	254161	51919	63580
	Q2	.	148199	663499	688044	79893	132762	40286	40341
	Q3	51064	36376	38106	28293	1102	7468	451	3734
	Q4	661265	380468	492175	278752	19328	62081	19100	59754
1992	Q1	.	607557	2309070	2749910	1676850	327431	263561	93616
	Q2	.	55822	931997	1156470	559200	161386	116050	59780
	Q3	18830	273518	148298	174738	113481	25093	16161	4172
	Q4	187507	1299590	672851	654265	360738	103864	79380	24058
1993	Q1	.	472164	2423630	1519400	758975	417755	77538	88384
	Q2	.	183152	1246110	735266	488060	219817	88125	69561
	Q3	8700	57031	272586	111456	74060	28614	5700	6482
	Q4	52818	936986	1389020	662072	455152	215045	45499	52850
1994	Q1	.	184988	2550390	3602530	1662030	1053590	375517	91817
	Q2	.	166439	2781720	2490470	1102850	692363	275883	47184
	Q3	4997	98986	459050	399228	132320	64556	23354	6974
	Q4	220420	452301	1662160	1350830	519501	310474	90436	37436
1995	Q1	.	1175400	495700	2453600	2496800	1318800	656500	293100
	Q2	.	700300	636400	1848300	2077500	977000	674300	205500
	Q3	11600	191100	179600	374200	228000	57800	47300	20700
	Q4	518800	3589800	696900	1499100	1370600	778100	384700	63800
1996	Q1	.	4803600	14926300	2404800	3334400	1630900	634600	296600
	Q2	.	979000	5905000	947900	1460700	953200	418800	232500
	Q3	8700	411800	1139600	229700	279000	188300	93000	32800
	Q4	62500	2072200	5203200	1076200	1411700	531500	347700	124800
1997	Q1	.	308666	10549800	9984760	3678010	2228150	961215	362149
	Q2	.	119971	5459670	5463340	1631770	1047640	365628	171026
	Q3	31450	119220	1050910	1083410	185796	173290	60969	27770
	Q4	1314150	882689	5938030	6685710	803310	635697	255144	117507
1998	Q1	.	4176090	1323450	9072440	10420400	1277630	767068	626602
	Q2	.	1786120	969781	3697760	4989390	779099	725154	682573
	Q3	14714	1026950	340876	1033220	835430	142028	76162	31334
	Q4	63229	3881150	1076480	3662030	3146600	426137	183556	107380
1999	Q1	.	354982	9057150	2708890	5324250	4361070	686201	357814
	Q2	.	42147	3698240	1126180	2563240	2669120	285646	200041
	Q3	15539	277498	1510690	382301	359893	442348	36519	27954
	Q4	1432710	1403960	5530080	1572180	1646180	1291420	163309	96112
2000	Q1	.	3823050	1133480	6930160	1343920	2112380	1987780	381466
	Q2	.	2080030	543868	4176410	846632	1146970	936475	222690
	Q3	25420	1015190	159093	771159	113924	181812	294733	31430
	Q4	354090	3370030	606266	2667700	545476	830184	850708	71257
2001	Q1	.	1377150	7023180	1140790	5228880	1119030	1377260	1437460
	Q2	.	444342	2115520	893750	2225170	504801	594214	260043
	Q3	68660	220348	628039	149570	367098	66503	79361	110844
	Q4	583980	733762	1790450	486261	1431240	308461	600591	455159
2002	Q1	.	2461720	2086680	4611800	1486780	2069720	544506	328180
	Q2	.	920992	1743700	3578180	1789010	1095040	254309	249588
	Q3	251234	820456	314234	722614	101419	321058	51769	81936
	Q4	1771220	1799240	1170010	1798730	444527	797779	142990	216079
2003	Q1	.	0	3517220	3320150	2400340	2633230	1634700	831850
	Q2	.	0	1898800	1923550	1503090	1394980	371403	551999
	Q3	44296	630437	406023	184533	265905	47693	110522	26635
	Q4	7473	3064340	1168340	663661	737295	334146	391734	147941
2004	Q1	.	7890750	6338700	2533930	1536470	1724500	767767	610386
	Q2	.	3899740	2981080	1501200	898336	992793	311158	339235
	Q3	597	1001980	900403	318821	79034	150437	25308	37079
	Q4	186560	6162570	2639220	917504	549981	364215	224935	152287
2005	Q1	.	1308100	14859100	5471600	1512900	982100	446500	392300
	Q2	.	437300	7641300	3058000	775000	640800	267800	190800
	Q3	257400	137700	1643700	569400	132200	35900	29900	9400
	Q4	1452200	640800	5213300	2006500	474100	192600	92500	62000
2006	Q1	.	3853100	1382400	11301600	3878200	803800	398700	235400

	Q2	.	3290600	977400	5474900	1720400	346100	152100	137000
	Q3	14900	862200	191700	1033500	194500	38000	11100	10100
	Q4	1311200	2225100	449300	2535600	761500	172000	48300	22100
2007	Q1	.	6077900	5870500	1880600	7280800	2158300	338200	198600
	Q2	.	1749700	3596000	1633400	3316500	1959000	373500	57700
	Q3	21500	610900	427400	118100	445900	132200	28600	8300
	Q4	839600	3668500	1949200	466000	1774100	796500	136400	59800
2008	Q1	.	1521510	7894120	3477920	1828660	3169270	1254330	189489
	Q2	.	1257170	3486590	1561410	589874	1273650	558890	65205
	Q3	334515	734908	755600	341964	84545	288887	76150	19161
	Q4	2146810	2764400	2916220	994340	298712	867594	338045	20786
2009	Q1	.	11244400	5694120	6407320	2561710	1170430	1779530	629003
	Q2	.	2984060	1424330	1995870	766834	331591	612043	209400
	Q3	67151	717148	270260	338969	114190	53786	139110	49936
	Q4	1209380	5700980	1376170	1120760	399024	186881	297296	117340
2010	Q1	.	1990990	10898900	2684460	2290190	641109	436600	523793
	Q2	.	757309	5338080	1348020	1133260	384289	194534	246532
	Q3	99877	256186	698443	180014	148306	31000	33698	35336
	Q4	1665520	793244	4329400	957728	569959	159373	188918	182089

Table 5-4 Cod: Mean weigh in the catcht(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	0.006	0.237	0.386	0.839	1.375	2.229	3.562	6.045
	Q2	.	0.000	0.270	0.409	0.903	1.479	2.262	3.913	5.313
	Q3	0.000	0.000	0.217	0.320	0.761	1.288	2.075	3.576	4.955
	Q4	0.000	0.143	0.254	0.447	0.994	1.445	2.111	3.647	5.303
1975	Q1	.	0.006	0.235	0.382	0.840	1.384	2.234	3.569	6.258
	Q2	.	0.000	0.268	0.406	0.904	1.489	2.268	3.921	5.500
	Q3	0.000	0.000	0.215	0.317	0.762	1.297	2.081	3.584	5.128
	Q4	0.000	0.143	0.252	0.443	0.995	1.454	2.117	3.654	5.489
1976	Q1	.	0.006	0.236	0.382	0.843	1.376	2.210	3.536	6.409
	Q2	.	0.033	0.268	0.405	0.907	1.480	2.243	3.885	5.632
	Q3	0.000	0.088	0.215	0.317	0.765	1.289	2.058	3.550	5.252
	Q4	0.000	0.143	0.252	0.442	0.998	1.446	2.094	3.620	5.622
1977	Q1	.	0.006	0.233	0.379	0.838	1.377	2.224	3.579	6.090
	Q2	.	0.033	0.265	0.402	0.902	1.481	2.257	3.933	5.354
	Q3	0.000	0.088	0.212	0.314	0.760	1.290	2.070	3.594	4.991
	Q4	0.000	0.143	0.249	0.439	0.992	1.447	2.106	3.665	5.343
1978	Q1	.	0.009	0.161	0.384	0.837	1.448	2.304	3.666	5.965
	Q2	.	0.036	0.187	0.358	0.845	1.367	2.213	4.083	5.466
	Q3	0.000	0.064	0.211	0.371	0.860	1.276	1.950	2.733	5.977
	Q4	0.000	0.091	0.279	0.435	1.009	1.484	1.968	3.095	5.498
1979	Q1	.	0.000	0.233	0.401	0.820	1.436	2.329	4.508	6.912
	Q2	.	0.000	0.235	0.358	0.914	1.449	2.314	3.974	6.260
	Q3	0.000	0.146	0.252	0.381	0.878	1.281	1.825	2.980	3.767
	Q4	0.000	0.201	0.256	0.441	0.976	1.441	2.039	3.028	7.978
1980	Q1	.	0.070	0.232	0.408	0.914	1.503	2.379	3.564	5.594
	Q2	.	0.313	0.224	0.377	0.828	1.304	2.023	3.673	5.386
	Q3	0.000	0.151	0.246	0.346	0.806	1.391	2.192	3.907	7.290
	Q4	0.000	0.191	0.297	0.425	0.956	1.528	2.760	4.335	7.617
1981	Q1	.	0.018	0.402	0.707	0.932	1.248	2.182	2.639	5.069
	Q2	.	0.037	0.422	0.758	0.921	1.150	1.892	2.202	3.847
	Q3	0.000	0.055	0.247	0.488	0.798	1.159	1.813	2.189	3.816
	Q4	0.000	0.074	0.352	0.673	0.930	1.262	2.015	2.168	6.332
1982	Q1	.	0.010	0.277	0.593	0.958	1.426	2.013	2.944	4.613
	Q2	.	0.028	0.261	0.599	0.981	1.288	1.738	2.454	3.570
	Q3	0.000	0.066	0.384	0.575	0.798	1.106	1.578	2.364	4.186
	Q4	0.000	0.106	0.467	0.624	0.920	1.217	1.893	2.829	3.886
1983	Q1	.	0.057	0.421	0.635	0.968	1.550	2.064	3.171	5.209
	Q2	.	0.000	0.363	0.620	0.883	1.277	1.776	2.218	4.224
	Q3	0.000	0.000	0.385	0.572	0.835	1.128	1.384	1.853	4.467
	Q4	0.000	0.151	0.469	0.689	0.936	1.468	1.855	2.728	5.740
1984	Q1	.	0.012	0.299	0.526	0.893	1.374	2.057	3.014	5.123
	Q2	.	0.000	0.299	0.508	0.851	1.232	1.744	2.060	3.808
	Q3	0.000	0.073	0.320	0.643	0.872	1.314	1.816	2.098	4.158
	Q4	0.000	0.109	0.526	0.699	0.958	1.592	1.930	2.187	3.994
1985	Q1	.	0.064	0.416	0.740	1.093	1.654	2.182	2.555	4.876
	Q2	.	0.000	0.346	0.627	1.016	1.471	1.958	2.342	4.143
	Q3	0.000	0.122	0.475	0.638	1.044	1.419	2.080	2.137	3.047
	Q4	0.000	0.160	0.594	0.765	1.196	1.583	2.103	2.389	4.121
1986	Q1	.	0.087	0.313	0.562	0.954	1.435	2.028	2.192	4.820
	Q2	.	0.106	0.328	0.568	0.966	1.411	1.765	2.317	3.418
	Q3	0.000	0.143	0.469	0.775	1.256	1.559	2.211	2.775	4.204
	Q4	0.000	0.307	0.508	0.781	1.175	1.767	2.099	3.024	4.170
1987	Q1	.	0.230	0.500	0.737	1.145	1.794	2.660	3.178	4.378
	Q2	.	0.390	0.419	0.761	1.260	1.709	2.322	3.067	4.302
	Q3	0.000	0.360	0.409	0.763	1.101	1.433	2.046	2.083	3.037
	Q4	0.000	0.210	0.508	0.838	1.130	1.668	2.324	2.714	4.721
1988	Q1	.	0.000	0.454	0.691	1.197	1.851	2.690	3.632	4.668
	Q2	.	0.000	0.519	0.725	1.088	1.721	2.346	3.020	4.267
	Q3	0.000	0.584	0.460	0.600	1.027	1.592	2.104	2.845	4.235
	Q4	0.000	0.000	0.603	0.772	1.163	1.454	2.477	2.928	3.836
1989	Q1	.	0.000	0.293	0.696	1.028	1.579	2.180	2.972	4.254
	Q2	.	0.018	0.519	0.631	0.945	1.490	2.030	3.174	4.527

	Q3	0.000	0.108	0.452	0.644	1.113	1.490	2.134	2.490	3.315
	Q4	0.000	0.169	0.484	0.663	1.064	1.457	2.081	2.681	3.611
1990	Q1	.	0.000	0.421	0.599	1.182	1.638	2.317	3.209	4.829
	Q2	.	0.000	0.396	0.698	1.295	1.998	2.342	3.149	4.821
	Q3	0.000	0.437	0.556	0.737	1.199	1.843	2.750	3.370	4.071
	Q4	0.000	0.490	0.628	0.908	1.032	1.736	2.678	3.381	4.247
1991	Q1	.	0.000	0.494	0.826	1.147	1.683	2.450	3.789	4.109
	Q2	.	0.590	0.403	0.900	1.182	1.720	3.069	4.097	5.657
	Q3	0.000	0.376	0.417	0.764	1.056	1.585	2.220	3.445	4.638
	Q4	0.000	0.000	0.684	0.976	1.333	1.724	2.170	4.293	5.252
1992	Q1	.	0.000	0.440	0.825	0.995	1.556	2.512	3.359	5.122
	Q2	.	0.018	0.446	0.724	1.022	1.533	3.014	4.018	5.509
	Q3	0.000	0.000	0.609	0.902	1.070	1.377	3.692	2.970	4.616
	Q4	0.000	0.448	0.806	1.200	1.673	2.699	4.616	7.496	6.260
1993	Q1	.	0.000	0.390	0.705	1.034	1.577	2.208	3.435	5.008
	Q2	.	0.400	0.425	1.059	1.511	2.116	3.362	4.012	5.870
	Q3	0.000	0.238	0.544	0.835	1.179	1.789	2.318	3.385	4.678
	Q4	0.000	0.212	0.562	0.767	1.006	1.460	2.586	3.250	4.698
1994	Q1	.	0.022	0.567	0.824	1.116	1.439	2.029	3.244	5.504
	Q2	.	0.106	0.493	0.857	1.268	1.779	2.570	4.381	6.640
	Q3	0.000	0.157	0.520	0.731	1.108	1.562	2.304	3.389	3.224
	Q4	0.000	0.208	0.507	0.720	1.130	1.519	1.846	3.582	4.578
1995	Q1	.	0.000	0.452	0.906	1.230	1.464	2.549	3.513	6.006
	Q2	.	0.090	0.404	0.763	1.123	1.504	2.457	3.665	5.724
	Q3	0.000	0.587	0.558	0.791	1.156	1.541	2.302	3.274	5.232
	Q4	0.000	0.587	0.655	0.998	1.223	1.596	2.332	3.215	5.122
1996	Q1	.	0.154	0.569	0.933	1.171	1.444	1.914	2.621	4.524
	Q2	.	0.487	0.500	0.983	1.193	1.535	2.340	3.296	4.673
	Q3	0.000	0.434	0.687	0.958	1.260	1.706	2.542	3.544	5.670
	Q4	0.000	0.599	0.763	0.998	1.228	1.461	2.410	3.118	4.912
1997	Q1	.	0.154	0.464	0.680	1.063	1.388	2.057	3.112	4.441
	Q2	.	0.000	0.464	0.692	1.070	1.566	2.541	3.558	4.940
	Q3	0.000	0.552	0.628	0.832	1.149	1.571	2.473	3.526	5.880
	Q4	0.050	0.610	0.595	0.825	1.101	1.552	2.442	3.348	5.530
1998	Q1	.	0.154	0.436	0.784	1.149	1.316	2.020	2.970	4.609
	Q2	.	0.506	0.453	0.738	1.224	1.494	2.598	3.822	5.339
	Q3	0.000	0.767	0.495	0.644	1.067	1.499	2.470	3.605	5.629
	Q4	0.050	0.354	0.575	0.740	1.004	1.510	2.329	3.550	5.732
1999	Q1	.	0.154	0.461	0.751	1.049	1.292	2.107	4.171	6.293
	Q2	.	0.341	0.598	0.746	1.093	1.496	2.512	3.674	5.842
	Q3	0.000	0.331	0.551	0.721	1.024	1.398	2.230	3.838	5.483
	Q4	0.050	0.327	0.578	0.724	0.942	1.270	1.842	3.326	5.645
2000	Q1	.	0.265	0.341	0.629	0.934	1.296	2.309	3.787	6.305
	Q2	.	0.323	0.295	0.668	0.964	1.414	2.392	3.711	6.450
	Q3	0.000	0.374	0.404	0.656	0.960	1.438	2.371	3.260	6.510
	Q4	0.005	0.462	0.435	0.647	0.924	1.341	1.947	2.805	5.522
2001	Q1	.	0.000	0.314	0.504	0.737	1.031	1.708	3.009	6.154
	Q2	.	0.034	0.334	0.683	0.996	1.300	2.390	3.813	6.513
	Q3	0.000	0.033	0.448	0.690	1.083	1.873	2.407	3.124	5.225
	Q4	0.000	0.245	0.460	0.564	0.856	1.423	2.071	3.601	5.321
2002	Q1	.	0.000	0.321	0.596	0.942	1.319	1.892	2.845	4.619
	Q2	.	0.152	0.364	0.581	0.932	1.351	2.149	3.487	5.937
	Q3	0.000	0.357	0.435	0.633	0.909	1.393	2.333	3.489	6.015
	Q4	0.000	0.365	0.451	0.567	0.828	1.359	2.349	3.667	6.439
2003	Q1	.	0.000	0.171	0.652	0.921	1.301	2.032	3.392	5.918
	Q2	.	0.000	0.351	0.708	0.911	1.321	2.161	3.929	5.849
	Q3	0.000	0.062	0.431	0.759	0.825	1.349	2.534	4.018	6.078
	Q4	0.000	0.110	0.322	0.762	0.844	1.351	2.414	4.034	5.609
2004	Q1	.	0.000	0.250	0.624	0.962	1.346	1.876	3.059	5.393
	Q2	.	0.000	0.458	0.666	1.011	1.363	1.742	3.270	5.521
	Q3	0.000	0.079	0.518	0.692	0.996	1.386	1.925	3.134	5.219
	Q4	0.011	0.169	0.436	0.680	0.953	1.379	1.877	3.026	4.821
2005	Q1	.	0.541	0.681	0.766	0.970	1.293	2.089	3.394	5.239
	Q2	.	0.572	0.734	0.765	0.967	1.309	2.191	3.078	4.193
	Q3	0.000	0.379	0.808	0.768	0.900	1.286	2.347	3.625	5.543
	Q4	0.005	0.818	0.727	0.781	0.936	1.294	1.970	2.737	4.442
2006	Q1	.	0.407	0.486	0.728	0.879	1.250	1.843	3.379	5.955

	Q2	.	0.135	0.477	0.681	0.913	1.194	1.814	3.441	6.197
	Q3	0.000	0.128	0.548	0.703	0.905	1.316	1.978	2.943	8.357
	Q4	0.000	0.135	0.531	0.719	0.946	1.258	2.110	2.415	4.694
2007	Q1	.	0.000	0.315	0.703	0.866	1.053	1.645	2.937	4.916
	Q2	.	0.000	0.401	0.713	0.918	1.101	1.592	2.272	4.879
	Q3	0.000	0.150	0.345	0.632	0.829	1.061	2.282	4.090	4.101
	Q4	0.000	0.189	0.426	0.730	0.818	1.081	1.430	1.988	3.385
2008	Q1	.	0.000	0.474	0.639	0.857	1.428	2.131	2.648	4.182
	Q2	.	0.552	0.604	0.706	0.904	1.353	2.083	3.284	4.397
	Q3	0.000	0.176	0.537	0.735	0.966	1.359	1.561	1.996	3.256
	Q4	0.000	0.193	0.556	0.813	0.914	1.218	1.432	1.890	2.594
2009	Q1	.	0.000	0.362	0.707	0.857	0.950	1.342	2.049	4.440
	Q2	.	0.000	0.510	0.750	0.897	1.005	1.466	1.979	3.917
	Q3	0.000	0.130	0.596	0.812	0.884	1.037	1.476	2.501	4.714
	Q4	0.000	0.225	0.559	0.798	0.915	1.092	1.700	2.783	3.530
2010	Q1	.	0.168	0.456	0.632	0.791	0.975	1.240	2.393	4.527
	Q2	.	0.210	0.349	0.685	0.889	1.060	1.302	2.325	3.723
	Q3	0.000	0.254	0.490	0.737	0.955	1.210	1.399	2.149	3.306
	Q4	0.000	0.542	0.655	0.740	0.878	1.023	1.176	1.791	2.946

Table 5-5 Herring: Mean weigh in the catcht(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.101
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.077
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.092
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.088
1975	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.101
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.077
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.092
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.086
1976	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.100
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.078
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.094
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.090
1977	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.101
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.078
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.093
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.089
1978	Q1	.	0.019	0.033	0.048	0.060	0.071	0.073	0.080	0.091
	Q2	.	0.007	0.045	0.047	0.052	0.055	0.058	0.065	0.073
	Q3	0.005	0.033	0.063	0.061	0.057	0.057	0.075	0.075	0.094
	Q4	0.016	0.033	0.047	0.050	0.055	0.060	0.065	0.071	0.089
1979	Q1	.	0.014	0.043	0.059	0.069	0.076	0.076	0.100	0.140
	Q2	.	0.007	0.052	0.064	0.056	0.058	0.065	0.072	0.082
	Q3	0.006	0.035	0.067	0.070	0.067	0.071	0.078	0.082	0.108
	Q4	0.007	0.028	0.056	0.068	0.073	0.073	0.072	0.085	0.109
1980	Q1	.	0.016	0.041	0.052	0.061	0.061	0.075	0.087	0.101
	Q2	.	0.010	0.033	0.047	0.057	0.049	0.064	0.074	0.087
	Q3	0.007	0.027	0.052	0.068	0.069	0.075	0.083	0.086	0.107
	Q4	0.009	0.021	0.039	0.056	0.071	0.069	0.080	0.087	0.105
1981	Q1	.	0.014	0.031	0.046	0.059	0.073	0.068	0.091	0.106
	Q2	.	0.019	0.029	0.044	0.055	0.060	0.058	0.074	0.092
	Q3	0.007	0.045	0.061	0.070	0.076	0.081	0.085	0.090	0.111
	Q4	0.007	0.029	0.041	0.054	0.068	0.075	0.079	0.085	0.116
1982	Q1	.	0.012	0.036	0.057	0.075	0.087	0.090	0.096	0.112
	Q2	.	0.008	0.029	0.037	0.048	0.064	0.070	0.065	0.101
	Q3	0.009	0.028	0.057	0.063	0.073	0.075	0.086	0.086	0.115
	Q4	0.008	0.022	0.044	0.049	0.061	0.072	0.079	0.085	0.111
1983	Q1	.	0.009	0.028	0.051	0.062	0.075	0.087	0.090	0.112
	Q2	.	0.006	0.025	0.048	0.045	0.059	0.070	0.078	0.097
	Q3	0.008	0.023	0.041	0.065	0.069	0.075	0.086	0.100	0.122
	Q4	0.011	0.023	0.031	0.046	0.051	0.063	0.072	0.081	0.090
1984	Q1	.	0.013	0.026	0.040	0.059	0.063	0.075	0.089	0.102
	Q2	.	0.007	0.022	0.035	0.058	0.057	0.073	0.080	0.095
	Q3	0.008	0.021	0.042	0.058	0.074	0.072	0.076	0.094	0.110
	Q4	0.009	0.019	0.029	0.044	0.061	0.059	0.068	0.079	0.106
1985	Q1	.	0.011	0.029	0.051	0.060	0.074	0.082	0.079	0.099
	Q2	.	0.010	0.027	0.053	0.060	0.075	0.066	0.077	0.097
	Q3	0.009	0.020	0.031	0.043	0.065	0.074	0.079	0.091	0.103
	Q4	0.014	0.021	0.022	0.034	0.049	0.061	0.066	0.078	0.098
1986	Q1	.	0.011	0.023	0.029	0.043	0.051	0.062	0.069	0.090
	Q2	.	0.009	0.020	0.029	0.044	0.055	0.060	0.074	0.090
	Q3	0.007	0.023	0.036	0.045	0.063	0.073	0.078	0.082	0.108
	Q4	0.008	0.025	0.031	0.035	0.053	0.060	0.071	0.077	0.101
1987	Q1	.	0.019	0.034	0.047	0.056	0.069	0.078	0.086	0.099
	Q2	.	0.010	0.028	0.038	0.042	0.055	0.061	0.068	0.091
	Q3	0.006	0.016	0.041	0.048	0.051	0.066	0.075	0.078	0.094
	Q4	0.007	0.018	0.035	0.037	0.041	0.053	0.062	0.069	0.093
1988	Q1	.	0.009	0.022	0.039	0.038	0.049	0.058	0.069	0.088
	Q2	.	0.012	0.019	0.041	0.048	0.047	0.061	0.066	0.090
	Q3	0.006	0.030	0.040	0.061	0.066	0.066	0.083	0.089	0.105
	Q4	0.009	0.027	0.029	0.040	0.048	0.055	0.063	0.074	0.092
1989	Q1	.	0.011	0.024	0.025	0.034	0.045	0.050	0.060	0.082
	Q2	.	0.010	0.028	0.031	0.050	0.054	0.057	0.071	0.081

	Q3	0.005	0.024	0.045	0.041	0.053	0.061	0.074	0.088	0.099
	Q4	0.008	0.024	0.036	0.033	0.047	0.059	0.062	0.074	0.094
1990	Q1	.	0.008	0.026	0.035	0.034	0.052	0.066	0.069	0.087
	Q2	.	0.008	0.028	0.042	0.040	0.062	0.067	0.065	0.077
	Q3	0.011	0.032	0.044	0.051	0.046	0.054	0.058	0.065	0.074
	Q4	0.010	0.021	0.036	0.043	0.036	0.054	0.055	0.068	0.069
1991	Q1	.	0.007	0.020	0.031	0.040	0.034	0.054	0.048	0.061
	Q2	.	0.008	0.019	0.029	0.042	0.034	0.050	0.048	0.056
	Q3	0.006	0.020	0.028	0.042	0.056	0.045	0.063	0.064	0.082
	Q4	0.010	0.021	0.025	0.035	0.046	0.037	0.053	0.045	0.064
1992	Q1	.	0.008	0.017	0.024	0.040	0.053	0.040	0.063	0.062
	Q2	.	0.008	0.018	0.026	0.038	0.046	0.042	0.061	0.061
	Q3	0.005	0.014	0.033	0.039	0.052	0.058	0.047	0.066	0.078
	Q4	0.007	0.015	0.024	0.033	0.048	0.061	0.049	0.056	0.063
1993	Q1	.	0.008	0.018	0.027	0.030	0.039	0.047	0.037	0.051
	Q2	.	0.006	0.019	0.028	0.032	0.040	0.045	0.043	0.060
	Q3	0.006	0.015	0.025	0.034	0.041	0.047	0.052	0.049	0.066
	Q4	0.008	0.016	0.020	0.029	0.037	0.044	0.054	0.052	0.075
1994	Q1	.	0.009	0.017	0.024	0.036	0.044	0.057	0.066	0.066
	Q2	.	0.008	0.018	0.023	0.031	0.037	0.046	0.057	0.055
	Q3	0.007	0.018	0.024	0.033	0.039	0.042	0.046	0.057	0.063
	Q4	0.007	0.017	0.022	0.027	0.037	0.037	0.043	0.057	0.057
1995	Q1	.	0.010	0.017	0.020	0.027	0.031	0.034	0.042	0.042
	Q2	.	0.006	0.018	0.024	0.028	0.033	0.036	0.043	0.051
	Q3	0.010	0.013	0.023	0.028	0.035	0.039	0.041	0.051	0.057
	Q4	0.008	0.014	0.021	0.027	0.032	0.039	0.042	0.049	0.051
1996	Q1	.	0.015	0.019	0.024	0.027	0.032	0.036	0.038	0.047
	Q2	.	0.005	0.014	0.020	0.024	0.027	0.031	0.035	0.045
	Q3	0.003	0.011	0.017	0.024	0.027	0.031	0.037	0.039	0.049
	Q4	0.004	0.011	0.016	0.022	0.027	0.029	0.033	0.038	0.051
1997	Q1	.	0.007	0.012	0.018	0.021	0.028	0.028	0.031	0.037
	Q2	.	0.006	0.012	0.018	0.026	0.028	0.033	0.039	0.041
	Q3	0.005	0.014	0.019	0.022	0.025	0.030	0.034	0.039	0.045
	Q4	0.006	0.013	0.018	0.021	0.024	0.026	0.030	0.030	0.030
1998	Q1	.	0.008	0.016	0.019	0.026	0.032	0.032	0.033	0.035
	Q2	.	0.006	0.015	0.020	0.027	0.030	0.036	0.038	0.044
	Q3	0.004	0.012	0.017	0.021	0.027	0.030	0.035	0.039	0.052
	Q4	0.006	0.012	0.019	0.022	0.026	0.029	0.034	0.033	0.050
1999	Q1	.	0.009	0.013	0.020	0.023	0.026	0.032	0.033	0.038
	Q2	.	0.007	0.014	0.021	0.024	0.028	0.033	0.036	0.042
	Q3	0.008	0.017	0.022	0.023	0.028	0.034	0.038	0.038	0.045
	Q4	0.007	0.017	0.021	0.024	0.026	0.031	0.036	0.038	0.056
2000	Q1	.	0.010	0.020	0.023	0.027	0.029	0.034	0.036	0.038
	Q2	.	0.009	0.018	0.024	0.026	0.028	0.033	0.035	0.033
	Q3	0.005	0.014	0.025	0.028	0.031	0.036	0.043	0.049	0.049
	Q4	0.008	0.015	0.025	0.026	0.028	0.032	0.036	0.042	0.043
2001	Q1	.	0.009	0.020	0.030	0.031	0.034	0.040	0.039	0.043
	Q2	.	0.009	0.018	0.028	0.032	0.036	0.038	0.042	0.038
	Q3	0.006	0.016	0.020	0.024	0.026	0.029	0.029	0.038	0.036
	Q4	0.007	0.020	0.025	0.029	0.030	0.035	0.036	0.038	0.039
2002	Q1	.	0.006	0.014	0.023	0.028	0.032	0.037	0.041	0.035
	Q2	.	0.009	0.016	0.022	0.027	0.031	0.034	0.037	0.043
	Q3	0.005	0.016	0.025	0.033	0.040	0.043	0.046	0.047	0.053
	Q4	0.006	0.018	0.024	0.030	0.036	0.041	0.042	0.042	0.047
2003	Q1	.	0.007	0.029	0.036	0.039	0.044	0.046	0.053	0.052
	Q2	.	0.005	0.018	0.023	0.027	0.031	0.036	0.042	0.049
	Q3	0.004	0.009	0.025	0.022	0.034	0.035	0.040	0.043	0.048
	Q4	0.006	0.011	0.020	0.023	0.032	0.032	0.040	0.047	0.044
2004	Q1	.	0.005	0.010	0.021	0.025	0.033	0.037	0.043	0.043
	Q2	.	0.007	0.011	0.024	0.024	0.034	0.034	0.042	0.046
	Q3	0.004	0.012	0.015	0.028	0.032	0.041	0.045	0.049	0.054
	Q4	0.005	0.010	0.014	0.024	0.029	0.037	0.040	0.042	0.046
2005	Q1	.	0.008	0.012	0.016	0.028	0.035	0.040	0.050	0.057
	Q2	.	0.011	0.014	0.020	0.030	0.034	0.043	0.045	0.055
	Q3	0.007	0.022	0.025	0.029	0.039	0.046	0.054	0.059	0.065
	Q4	0.005	0.016	0.018	0.022	0.028	0.034	0.045	0.048	0.057
2006	Q1	.	0.008	0.026	0.022	0.025	0.032	0.041	0.047	0.050

	Q2	.	0.013	0.029	0.024	0.026	0.038	0.045	0.051	0.057
	Q3	0.004	0.018	0.032	0.034	0.037	0.042	0.054	0.057	0.068
	Q4	0.005	0.012	0.017	0.022	0.026	0.030	0.042	0.048	0.054
2007	Q1	.	0.007	0.017	0.025	0.026	0.032	0.047	0.051	0.063
	Q2	.	0.009	0.026	0.028	0.033	0.032	0.041	0.049	0.059
	Q3	0.005	0.022	0.039	0.035	0.041	0.042	0.049	0.051	0.061
	Q4	0.006	0.016	0.021	0.022	0.031	0.032	0.037	0.048	0.052
2008	Q1	.	0.007	0.020	0.026	0.031	0.036	0.033	0.048	0.051
	Q2	.	0.007	0.021	0.023	0.027	0.036	0.031	0.040	0.043
	Q3	0.005	0.013	0.027	0.031	0.035	0.042	0.037	0.047	0.052
	Q4	0.006	0.016	0.025	0.027	0.030	0.037	0.036	0.041	0.045
2009	Q1	.	0.009	0.018	0.026	0.031	0.035	0.040	0.035	0.047
	Q2	.	0.007	0.018	0.022	0.024	0.031	0.036	0.031	0.042
	Q3	0.005	0.017	0.028	0.032	0.036	0.042	0.052	0.044	0.049
	Q4	0.006	0.014	0.022	0.030	0.029	0.037	0.045	0.038	0.042
2010	Q1	.	0.011	0.017	0.025	0.032	0.033	0.039	0.044	0.044
	Q2	.	0.007	0.016	0.023	0.030	0.029	0.032	0.043	0.038
	Q3	0.005	0.014	0.027	0.035	0.037	0.039	0.043	0.050	0.049
	Q4	0.006	0.013	0.020	0.027	0.032	0.036	0.043	0.046	0.041

Table 5-6 Sprat: Mean weigh in the catcht(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
1974	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1975	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.000	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.000	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1976	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1977	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1978	Q1	.	0.005	0.010	0.012	0.015	0.015	0.016	0.014
	Q2	.	0.005	0.010	0.012	0.014	0.016	0.016	0.016
	Q3	0.000	0.008	0.011	0.014	0.015	0.015	0.015	0.016
	Q4	0.004	0.013	0.013	0.012	0.014	0.013	0.014	0.015
1979	Q1	.	0.004	0.011	0.013	0.014	0.016	0.016	0.015
	Q2	.	0.004	0.013	0.014	0.013	0.016	0.016	0.015
	Q3	0.003	0.007	0.011	0.015	0.015	0.016	0.017	0.017
	Q4	0.005	0.011	0.014	0.015	0.015	0.017	0.015	0.015
1980	Q1	.	0.004	0.010	0.014	0.015	0.015	0.017	0.016
	Q2	.	0.004	0.011	0.014	0.015	0.014	0.016	0.015
	Q3	0.000	0.008	0.012	0.015	0.015	0.015	0.017	0.016
	Q4	0.003	0.009	0.013	0.016	0.016	0.016	0.016	0.016
1981	Q1	.	0.004	0.014	0.015	0.016	0.016	0.015	0.017
	Q2	.	0.004	0.013	0.014	0.018	0.017	0.014	0.018
	Q3	0.003	0.009	0.012	0.015	0.016	0.016	0.016	0.018
	Q4	0.004	0.010	0.014	0.016	0.016	0.017	0.017	0.018
1982	Q1	.	0.004	0.010	0.014	0.016	0.017	0.017	0.016
	Q2	.	0.004	0.012	0.014	0.015	0.017	0.014	0.014
	Q3	0.000	0.007	0.014	0.016	0.016	0.017	0.016	0.016
	Q4	0.004	0.011	0.014	0.016	0.016	0.017	0.017	0.016
1983	Q1	.	0.004	0.010	0.013	0.015	0.016	0.017	0.017
	Q2	.	0.006	0.011	0.014	0.014	0.016	0.016	0.016
	Q3	0.003	0.006	0.011	0.014	0.016	0.015	0.017	0.017
	Q4	0.004	0.010	0.013	0.015	0.016	0.017	0.018	0.019
1984	Q1	.	0.004	0.009	0.013	0.015	0.016	0.017	0.017
	Q2	.	0.005	0.010	0.015	0.014	0.015	0.016	0.017
	Q3	0.003	0.008	0.011	0.014	0.015	0.017	0.016	0.016
	Q4	0.004	0.009	0.012	0.015	0.015	0.017	0.018	0.017
1985	Q1	.	0.004	0.009	0.012	0.014	0.016	0.017	0.017
	Q2	.	0.004	0.010	0.012	0.012	0.015	0.017	0.016
	Q3	0.004	0.009	0.012	0.014	0.016	0.015	0.019	0.017
	Q4	0.004	0.010	0.013	0.015	0.016	0.016	0.016	0.015
1986	Q1	.	0.004	0.010	0.012	0.014	0.015	0.016	0.017
	Q2	.	0.004	0.010	0.012	0.013	0.016	0.016	0.016
	Q3	0.000	0.010	0.013	0.014	0.015	0.015	0.018	0.017
	Q4	0.004	0.011	0.014	0.015	0.016	0.017	0.016	0.018
1987	Q1	.	0.005	0.012	0.014	0.016	0.016	0.017	0.018
	Q2	.	0.005	0.011	0.014	0.016	0.016	0.017	0.017
	Q3	0.000	0.009	0.012	0.014	0.015	0.016	0.015	0.017
	Q4	0.004	0.011	0.012	0.014	0.015	0.016	0.015	0.017
1988	Q1	.	0.004	0.010	0.011	0.013	0.015	0.015	0.016
	Q2	.	0.004	0.011	0.012	0.014	0.016	0.017	0.018
	Q3	0.003	0.010	0.013	0.014	0.016	0.017	0.017	0.019
	Q4	0.005	0.012	0.014	0.015	0.017	0.017	0.017	0.018
1989	Q1	.	0.005	0.011	0.014	0.014	0.016	0.017	0.018
	Q2	.	0.005	0.011	0.014	0.015	0.016	0.017	0.017

	Q3	0.003	0.010	0.013	0.015	0.016	0.017	0.017	0.018
	Q4	0.005	0.014	0.015	0.017	0.018	0.019	0.018	0.019
1990	Q1	.	0.007	0.013	0.014	0.016	0.017	0.017	0.019
	Q2	.	0.005	0.013	0.014	0.016	0.018	0.018	0.019
	Q3	0.003	0.009	0.013	0.014	0.015	0.018	0.016	0.019
	Q4	0.004	0.012	0.015	0.016	0.017	0.017	0.017	0.019
1991	Q1	.	0.006	0.013	0.015	0.016	0.017	0.018	0.018
	Q2	.	0.005	0.013	0.014	0.016	0.017	0.018	0.017
	Q3	0.004	0.010	0.014	0.014	0.016	0.017	0.017	0.017
	Q4	0.004	0.012	0.014	0.016	0.017	0.017	0.017	0.017
1992	Q1	.	0.004	0.012	0.015	0.015	0.017	0.018	0.018
	Q2	.	0.005	0.012	0.015	0.016	0.017	0.018	0.019
	Q3	0.003	0.009	0.013	0.014	0.016	0.017	0.017	0.019
	Q4	0.005	0.012	0.015	0.017	0.018	0.019	0.019	0.019
1993	Q1	.	0.003	0.009	0.012	0.012	0.012	0.014	0.015
	Q2	.	0.004	0.010	0.012	0.013	0.014	0.015	0.016
	Q3	0.003	0.005	0.008	0.010	0.012	0.013	0.012	0.014
	Q4	0.003	0.007	0.009	0.010	0.012	0.012	0.013	0.013
1994	Q1	.	0.004	0.009	0.012	0.014	0.015	0.015	0.016
	Q2	.	0.005	0.009	0.012	0.014	0.014	0.015	0.015
	Q3	0.002	0.009	0.010	0.012	0.013	0.014	0.015	0.015
	Q4	0.003	0.010	0.011	0.012	0.014	0.014	0.016	0.015
1995	Q1	.	0.004	0.011	0.011	0.013	0.014	0.014	0.014
	Q2	.	0.004	0.010	0.010	0.012	0.013	0.014	0.015
	Q3	0.002	0.006	0.009	0.010	0.011	0.012	0.012	0.012
	Q4	0.003	0.008	0.011	0.012	0.013	0.013	0.014	0.014
1996	Q1	.	0.003	0.007	0.010	0.011	0.013	0.014	0.013
	Q2	.	0.003	0.007	0.010	0.011	0.012	0.013	0.013
	Q3	0.003	0.006	0.007	0.010	0.010	0.011	0.011	0.011
	Q4	0.003	0.007	0.008	0.011	0.011	0.013	0.012	0.012
1997	Q1	.	0.003	0.007	0.008	0.010	0.012	0.013	0.013
	Q2	.	0.005	0.007	0.008	0.010	0.012	0.012	0.012
	Q3	0.002	0.006	0.008	0.009	0.011	0.012	0.012	0.013
	Q4	0.002	0.007	0.008	0.009	0.011	0.011	0.011	0.012
1998	Q1	.	0.003	0.007	0.008	0.009	0.011	0.011	0.011
	Q2	.	0.003	0.007	0.008	0.009	0.010	0.010	0.010
	Q3	0.004	0.006	0.008	0.009	0.009	0.011	0.012	0.012
	Q4	0.004	0.006	0.008	0.008	0.009	0.010	0.010	0.010
1999	Q1	.	0.005	0.007	0.008	0.009	0.009	0.011	0.011
	Q2	.	0.005	0.007	0.009	0.009	0.009	0.010	0.011
	Q3	0.004	0.005	0.009	0.010	0.010	0.010	0.011	0.012
	Q4	0.003	0.004	0.009	0.011	0.010	0.010	0.011	0.012
2000	Q1	.	0.004	0.009	0.009	0.010	0.011	0.011	0.013
	Q2	.	0.005	0.009	0.010	0.011	0.012	0.012	0.013
	Q3	0.003	0.008	0.010	0.010	0.011	0.011	0.012	0.011
	Q4	0.004	0.008	0.010	0.011	0.011	0.011	0.012	0.013
2001	Q1	.	0.004	0.009	0.011	0.010	0.011	0.010	0.010
	Q2	.	0.007	0.010	0.011	0.012	0.013	0.012	0.011
	Q3	0.005	0.008	0.010	0.011	0.011	0.012	0.012	0.012
	Q4	0.004	0.009	0.010	0.012	0.012	0.012	0.012	0.012
2002	Q1	.	0.004	0.009	0.010	0.006	0.008	0.009	0.009
	Q2	.	0.005	0.009	0.007	0.010	0.009	0.009	0.009
	Q3	0.003	0.009	0.002	0.005	0.010	0.007	0.012	0.012
	Q4	0.003	0.010	0.003	0.009	0.012	0.012	0.012	0.012
2003	Q1	.	0.000	0.010	0.011	0.011	0.011	0.011	0.011
	Q2	.	0.000	0.009	0.011	0.011	0.012	0.011	0.011
	Q3	0.003	0.007	0.010	0.011	0.011	0.012	0.011	0.011
	Q4	0.040	0.007	0.010	0.011	0.011	0.011	0.011	0.011
2004	Q1	.	0.003	0.007	0.011	0.011	0.011	0.011	0.011
	Q2	.	0.004	0.008	0.011	0.012	0.011	0.011	0.011
	Q3	0.002	0.006	0.007	0.010	0.011	0.011	0.011	0.010
	Q4	0.004	0.006	0.007	0.010	0.011	0.010	0.011	0.011
2005	Q1	.	0.003	0.006	0.008	0.011	0.011	0.011	0.011
	Q2	.	0.004	0.007	0.008	0.011	0.011	0.011	0.011
	Q3	0.004	0.007	0.008	0.009	0.011	0.012	0.012	0.012
	Q4	0.004	0.007	0.008	0.009	0.011	0.011	0.012	0.012
2006	Q1	.	0.004	0.007	0.008	0.009	0.011	0.011	0.011

	Q2	.	0.004	0.007	0.008	0.009	0.011	0.012	0.011
	Q3	0.003	0.006	0.008	0.008	0.009	0.010	0.013	0.011
	Q4	0.004	0.006	0.008	0.008	0.009	0.011	0.011	0.012
2007	Q1	.	0.004	0.007	0.009	0.009	0.009	0.011	0.011
	Q2	.	0.004	0.007	0.009	0.009	0.010	0.012	0.012
	Q3	0.003	0.009	0.010	0.011	0.011	0.011	0.012	0.014
	Q4	0.004	0.009	0.010	0.011	0.011	0.011	0.010	0.010
2008	Q1	.	0.004	0.009	0.009	0.010	0.010	0.010	0.011
	Q2	.	0.004	0.008	0.009	0.010	0.010	0.009	0.010
	Q3	0.004	0.009	0.010	0.011	0.012	0.011	0.011	0.012
	Q4	0.004	0.009	0.010	0.011	0.011	0.011	0.012	0.012
2009	Q1	.	0.003	0.004	0.009	0.010	0.011	0.011	0.011
	Q2	.	0.003	0.004	0.009	0.010	0.011	0.011	0.011
	Q3	0.002	0.003	0.009	0.011	0.011	0.012	0.012	0.012
	Q4	0.002	0.003	0.008	0.010	0.011	0.011	0.011	0.011
2010	Q1	.	0.003	0.004	0.008	0.009	0.011	0.011	0.011
	Q2	.	0.003	0.005	0.007	0.009	0.010	0.011	0.011
	Q3	0.002	0.004	0.008	0.010	0.011	0.012	0.012	0.011
	Q4	0.002	0.004	0.008	0.010	0.010	0.011	0.011	0.011

Table 5-7 Cod: Mean weight in the sea(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	0.065	0.206	0.541	0.884	1.457	2.405	3.141	5.531
	Q2	.	0.073	0.242	0.574	0.951	1.567	2.441	3.451	4.861
	Q3	0.005	0.089	0.310	0.449	0.802	1.365	2.239	3.154	4.533
	Q4	0.028	0.125	0.460	0.627	1.047	1.531	2.278	3.216	4.852
1975	Q1	.	0.065	0.206	0.541	0.884	1.457	2.404	3.141	5.531
	Q2	.	0.073	0.242	0.574	0.951	1.567	2.441	3.451	4.861
	Q3	0.005	0.089	0.310	0.449	0.802	1.365	2.239	3.154	4.533
	Q4	0.028	0.125	0.460	0.627	1.047	1.531	2.278	3.216	4.852
1976	Q1	.	0.065	0.206	0.541	0.884	1.457	2.405	3.141	5.531
	Q2	.	0.073	0.242	0.574	0.951	1.567	2.441	3.451	4.861
	Q3	0.005	0.089	0.310	0.449	0.802	1.365	2.239	3.154	4.533
	Q4	0.028	0.125	0.460	0.627	1.047	1.531	2.278	3.216	4.852
1977	Q1	.	0.065	0.206	0.541	0.884	1.457	2.405	3.141	5.531
	Q2	.	0.073	0.242	0.574	0.951	1.567	2.441	3.451	4.861
	Q3	0.005	0.089	0.310	0.449	0.802	1.365	2.239	3.154	4.533
	Q4	0.028	0.125	0.460	0.627	1.047	1.531	2.278	3.216	4.852
1978	Q1	.	0.065	0.206	0.530	0.898	1.536	2.273	3.234	4.890
	Q2	.	0.073	0.242	0.495	0.907	1.450	2.184	3.602	4.481
	Q3	0.005	0.089	0.310	0.512	0.923	1.354	1.924	2.411	4.400
	Q4	0.028	0.125	0.460	0.600	1.083	1.574	1.942	2.730	4.508
1979	Q1	.	0.065	0.206	0.543	0.804	1.408	2.189	3.231	4.632
	Q2	.	0.073	0.242	0.486	0.896	1.421	2.175	2.848	4.195
	Q3	0.005	0.089	0.310	0.516	0.861	1.256	1.716	2.136	2.477
	Q4	0.028	0.125	0.460	0.598	0.957	1.413	1.917	2.170	5.346
1980	Q1	.	0.065	0.206	0.599	0.800	1.193	1.757	2.224	2.797
	Q2	.	0.073	0.242	0.554	0.725	1.035	1.494	2.292	2.694
	Q3	0.005	0.089	0.310	0.508	0.706	1.104	1.619	2.438	3.645
	Q4	0.028	0.125	0.460	0.625	0.837	1.213	2.038	2.705	3.809
1981	Q1	.	0.065	0.206	0.720	0.976	1.308	1.841	2.570	4.417
	Q2	.	0.073	0.242	0.772	0.965	1.206	1.596	2.144	3.352
	Q3	0.005	0.089	0.310	0.497	0.836	1.215	1.530	2.132	4.728
	Q4	0.028	0.125	0.460	0.685	0.975	1.323	1.700	2.111	5.517
1982	Q1	.	0.065	0.206	0.567	0.996	1.501	2.078	2.867	4.043
	Q2	.	0.073	0.242	0.573	1.019	1.356	1.794	2.390	3.129
	Q3	0.005	0.089	0.310	0.550	0.829	1.164	1.629	2.302	3.668
	Q4	0.028	0.125	0.460	0.597	0.956	1.281	1.954	2.755	3.406
1983	Q1	.	0.065	0.206	0.578	0.923	1.521	2.058	3.092	3.999
	Q2	.	0.073	0.242	0.565	0.842	1.253	1.770	2.163	3.244
	Q3	0.005	0.089	0.310	0.521	0.796	1.107	1.380	1.807	3.430
	Q4	0.028	0.125	0.460	0.627	0.893	1.440	1.849	2.660	4.408
1984	Q1	.	0.065	0.206	0.567	0.938	1.274	1.893	3.004	4.576
	Q2	.	0.073	0.242	0.547	0.894	1.142	1.605	2.053	3.401
	Q3	0.005	0.089	0.310	0.693	0.916	1.218	1.672	2.091	3.714
	Q4	0.028	0.125	0.460	0.753	1.006	1.476	1.776	2.179	3.567
1985	Q1	.	0.065	0.206	0.765	1.058	1.563	2.098	2.652	5.155
	Q2	.	0.073	0.242	0.649	0.983	1.390	1.883	2.431	4.380
	Q3	0.005	0.089	0.310	0.660	1.010	1.341	2.000	2.218	3.220
	Q4	0.028	0.125	0.460	0.791	1.157	1.496	2.023	2.480	4.358
1986	Q1	.	0.065	0.206	0.619	1.004	1.444	2.106	2.304	5.127
	Q2	.	0.073	0.242	0.626	1.016	1.419	1.833	2.436	3.636
	Q3	0.005	0.089	0.310	0.854	1.321	1.568	2.296	2.917	4.472
	Q4	0.028	0.125	0.460	0.860	1.236	1.778	2.179	3.179	4.435
1987	Q1	.	0.065	0.206	0.722	1.122	1.807	2.752	3.555	4.391
	Q2	.	0.073	0.242	0.745	1.235	1.722	2.403	3.431	4.316
	Q3	0.005	0.089	0.310	0.747	1.079	1.444	2.117	2.330	3.047
	Q4	0.028	0.125	0.460	0.821	1.107	1.680	2.405	3.036	4.736
1988	Q1	.	0.065	0.206	0.733	1.190	1.815	2.461	3.416	4.412
	Q2	.	0.073	0.242	0.769	1.082	1.687	2.146	2.840	4.033
	Q3	0.005	0.089	0.310	0.637	1.021	1.561	1.925	2.676	4.002
	Q4	0.028	0.125	0.460	0.819	1.156	1.425	2.266	2.754	3.627
1989	Q1	.	0.065	0.206	0.789	1.055	1.619	2.317	2.853	4.045

	Q2	.	0.073	0.242	0.716	0.970	1.527	2.158	3.047	4.305
	Q3	0.005	0.089	0.310	0.730	1.143	1.527	2.268	2.391	3.116
	Q4	0.028	0.125	0.460	0.752	1.093	1.493	2.212	2.574	3.434
1990	Q1	.	0.052	0.262	0.687	1.436	1.818	2.436	3.381	4.804
	Q2	.	0.090	0.339	0.801	1.574	2.218	2.463	3.318	4.796
	Q3	0.006	0.138	0.425	0.846	1.457	2.046	2.892	3.551	4.050
	Q4	0.024	0.195	0.520	1.042	1.254	1.927	2.816	3.562	4.225
1991	Q1	.	0.052	0.262	0.868	1.216	1.739	2.587	3.973	4.522
	Q2	.	0.090	0.339	0.946	1.253	1.777	3.240	4.296	6.226
	Q3	0.006	0.138	0.425	0.803	1.119	1.638	2.344	3.613	5.104
	Q4	0.024	0.195	0.520	1.026	1.413	1.781	2.291	4.502	5.780
1992	Q1	.	0.052	0.262	0.804	1.187	1.978	2.900	3.971	5.221
	Q2	.	0.090	0.339	0.706	1.219	1.949	3.480	4.750	5.617
	Q3	0.006	0.138	0.425	0.879	1.277	1.751	4.262	3.511	4.706
	Q4	0.024	0.195	0.520	1.170	1.996	3.432	5.329	8.861	6.383
1993	Q1	.	0.052	0.262	0.748	1.043	1.577	2.202	3.453	4.805
	Q2	.	0.090	0.339	1.123	1.524	2.116	3.352	4.033	5.632
	Q3	0.006	0.138	0.425	0.886	1.189	1.789	2.311	3.403	4.488
	Q4	0.024	0.195	0.520	0.814	1.015	1.460	2.578	3.267	4.507
1994	Q1	.	0.052	0.262	0.872	1.118	1.442	2.031	3.280	5.531
	Q2	.	0.090	0.339	0.907	1.270	1.783	2.573	4.429	6.672
	Q3	0.006	0.138	0.425	0.774	1.110	1.565	2.307	3.426	3.240
	Q4	0.024	0.195	0.520	0.762	1.132	1.522	1.848	3.621	4.600
1995	Q1	.	0.052	0.262	0.966	1.234	1.465	2.524	3.436	5.862
	Q2	.	0.090	0.339	0.814	1.127	1.505	2.433	3.585	5.587
	Q3	0.006	0.138	0.425	0.844	1.160	1.542	2.280	3.202	5.107
	Q4	0.024	0.195	0.520	1.065	1.227	1.597	2.309	3.145	4.999
1996	Q1	.	0.052	0.262	0.950	1.178	1.449	1.914	2.621	4.523
	Q2	.	0.090	0.339	1.001	1.200	1.540	2.340	3.296	4.672
	Q3	0.006	0.138	0.425	0.975	1.267	1.712	2.542	3.544	5.669
	Q4	0.024	0.195	0.520	1.016	1.235	1.466	2.410	3.118	4.911
1997	Q1	.	0.052	0.262	0.785	1.063	1.394	2.060	3.112	4.454
	Q2	.	0.090	0.339	0.800	1.070	1.572	2.545	3.558	4.955
	Q3	0.006	0.138	0.425	0.961	1.149	1.577	2.477	3.526	5.898
	Q4	0.024	0.195	0.520	0.953	1.101	1.558	2.446	3.348	5.546
1998	Q1	.	0.052	0.262	0.825	1.154	1.318	2.021	2.970	4.666
	Q2	.	0.090	0.339	0.776	1.230	1.497	2.599	3.822	5.334
	Q3	0.006	0.138	0.425	0.677	1.072	1.502	2.471	3.605	5.624
	Q4	0.024	0.195	0.520	0.778	1.009	1.513	2.330	3.550	5.727
1999	Q1	.	0.052	0.262	0.793	1.048	1.291	2.100	4.172	6.291
	Q2	.	0.090	0.339	0.788	1.092	1.495	2.504	3.675	5.841
	Q3	0.006	0.138	0.425	0.761	1.024	1.397	2.223	3.839	5.481
	Q4	0.024	0.195	0.520	0.765	0.941	1.269	1.836	3.327	5.643
2000	Q1	.	0.052	0.262	0.643	0.936	1.301	2.310	3.775	6.290
	Q2	.	0.090	0.339	0.683	0.966	1.420	2.392	3.699	6.434
	Q3	0.006	0.138	0.425	0.670	0.962	1.444	2.371	3.249	6.494
	Q4	0.024	0.195	0.520	0.661	0.926	1.346	1.947	2.796	5.509
2001	Q1	.	0.052	0.262	0.434	0.606	1.015	1.793	2.502	4.022
	Q2	.	0.090	0.339	0.587	0.820	1.280	2.508	3.170	3.920
	Q3	0.006	0.138	0.425	0.594	0.891	1.844	2.527	2.597	3.516
	Q4	0.024	0.195	0.520	0.485	0.705	1.401	2.173	2.994	3.966
2002	Q1	.	0.052	0.262	0.617	0.943	1.321	1.892	2.845	3.941
	Q2	.	0.090	0.339	0.602	0.933	1.353	2.149	3.487	5.299
	Q3	0.006	0.138	0.425	0.655	0.910	1.395	2.333	3.489	5.717
	Q4	0.024	0.195	0.520	0.587	0.829	1.362	2.349	3.667	6.202
2003	Q1	.	0.052	0.262	0.672	0.924	1.303	2.037	3.400	5.777
	Q2	.	0.090	0.339	0.730	0.914	1.323	2.166	3.938	5.442
	Q3	0.006	0.138	0.425	0.783	0.828	1.351	2.540	4.028	5.400
	Q4	0.024	0.195	0.520	0.786	0.847	1.353	2.419	4.044	4.707
2004	Q1	.	0.052	0.262	0.647	0.967	1.356	1.884	3.063	4.893
	Q2	.	0.090	0.339	0.691	1.016	1.373	1.749	3.275	4.913
	Q3	0.006	0.138	0.425	0.718	1.001	1.397	1.933	3.138	4.458
	Q4	0.024	0.195	0.520	0.706	0.958	1.389	1.885	3.030	4.191
2005	Q1	.	0.052	0.262	0.798	0.982	1.296	2.092	3.399	4.253
	Q2	.	0.090	0.339	0.797	0.979	1.312	2.194	3.082	3.503
	Q3	0.006	0.138	0.425	0.800	0.911	1.289	2.350	3.630	5.068
	Q4	0.024	0.195	0.520	0.814	0.947	1.297	1.973	2.741	3.884

2006	Q1	.	0.052	0.262	0.773	0.885	1.251	1.835	3.350	5.082
	Q2	.	0.090	0.339	0.723	0.919	1.195	1.807	3.411	5.289
	Q3	0.006	0.138	0.425	0.746	0.911	1.317	1.970	2.918	7.132
	Q4	0.024	0.195	0.520	0.763	0.952	1.259	2.101	2.394	4.006
2007	Q1	.	0.052	0.262	0.757	0.871	1.055	1.705	3.181	4.872
	Q2	.	0.090	0.339	0.768	0.924	1.103	1.650	2.461	4.835
	Q3	0.006	0.138	0.425	0.681	0.834	1.063	2.366	4.430	4.064
	Q4	0.024	0.195	0.520	0.786	0.823	1.083	1.482	2.153	3.354
2008	Q1	.	0.052	0.262	0.692	0.880	1.415	2.073	2.644	3.794
	Q2	.	0.090	0.339	0.765	0.928	1.340	2.026	3.279	3.989
	Q3	0.006	0.138	0.425	0.796	0.992	1.346	1.519	1.993	2.954
	Q4	0.024	0.195	0.520	0.881	0.939	1.207	1.393	1.887	2.353
2009	Q1	.	0.052	0.262	0.769	0.903	1.015	1.418	2.184	3.945
	Q2	.	0.090	0.339	0.816	0.945	1.074	1.549	2.109	3.481
	Q3	0.006	0.138	0.425	0.883	0.932	1.108	1.560	2.665	4.189
	Q4	0.024	0.195	0.520	0.868	0.964	1.167	1.797	2.966	3.137
2010	Q1	.	0.052	0.262	0.719	0.852	1.035	1.289	2.416	4.327
	Q2	.	0.090	0.339	0.779	0.957	1.125	1.353	2.348	3.559
	Q3	0.006	0.138	0.425	0.839	1.028	1.284	1.454	2.170	3.160
	Q4	0.024	0.195	0.520	0.842	0.946	1.086	1.223	1.808	2.816

Table 5-8 Herring: Mean weight in the sea(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1974	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.103
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.075
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.086
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.081
1975	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.103
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.075
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.086
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.081
1976	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.103
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.075
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.086
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.081
1977	Q1	.	0.012	0.030	0.048	0.060	0.065	0.066	0.072	0.103
	Q2	.	0.008	0.035	0.047	0.054	0.059	0.051	0.057	0.075
	Q3	0.011	0.041	0.045	0.049	0.052	0.063	0.068	0.068	0.086
	Q4	0.010	0.031	0.040	0.052	0.059	0.061	0.060	0.068	0.081
1978	Q1	.	0.019	0.033	0.048	0.060	0.071	0.073	0.080	0.081
	Q2	.	0.007	0.045	0.047	0.052	0.055	0.058	0.065	0.063
	Q3	0.005	0.033	0.063	0.061	0.057	0.057	0.075	0.075	0.085
	Q4	0.016	0.033	0.047	0.050	0.055	0.060	0.065	0.071	0.075
1979	Q1	.	0.014	0.043	0.059	0.069	0.076	0.076	0.100	0.121
	Q2	.	0.007	0.052	0.064	0.056	0.058	0.065	0.072	0.072
	Q3	0.006	0.035	0.067	0.070	0.067	0.071	0.078	0.082	0.094
	Q4	0.007	0.028	0.056	0.068	0.073	0.073	0.072	0.085	0.085
1980	Q1	.	0.016	0.041	0.052	0.061	0.061	0.075	0.087	0.102
	Q2	.	0.010	0.033	0.047	0.057	0.049	0.064	0.074	0.083
	Q3	0.007	0.027	0.052	0.068	0.069	0.075	0.083	0.086	0.093
	Q4	0.009	0.021	0.039	0.056	0.071	0.069	0.080	0.087	0.089
1981	Q1	.	0.014	0.031	0.046	0.059	0.073	0.068	0.091	0.096
	Q2	.	0.019	0.029	0.044	0.055	0.060	0.058	0.074	0.081
	Q3	0.007	0.045	0.061	0.070	0.076	0.081	0.085	0.090	0.100
	Q4	0.007	0.029	0.041	0.054	0.068	0.075	0.079	0.085	0.093
1982	Q1	.	0.012	0.036	0.057	0.075	0.087	0.090	0.096	0.099
	Q2	.	0.008	0.029	0.037	0.048	0.064	0.070	0.065	0.092
	Q3	0.009	0.028	0.057	0.063	0.073	0.075	0.086	0.086	0.103
	Q4	0.008	0.022	0.044	0.049	0.061	0.072	0.079	0.085	0.100
1983	Q1	.	0.009	0.028	0.051	0.062	0.075	0.087	0.090	0.100
	Q2	.	0.006	0.025	0.048	0.045	0.059	0.070	0.078	0.081
	Q3	0.008	0.023	0.041	0.065	0.069	0.075	0.086	0.100	0.114
	Q4	0.011	0.023	0.031	0.046	0.051	0.063	0.072	0.081	0.078
1984	Q1	.	0.013	0.026	0.040	0.059	0.063	0.075	0.089	0.088
	Q2	.	0.007	0.022	0.035	0.058	0.057	0.073	0.080	0.081
	Q3	0.008	0.021	0.042	0.058	0.074	0.072	0.076	0.094	0.107
	Q4	0.009	0.019	0.029	0.044	0.061	0.059	0.068	0.079	0.091
1985	Q1	.	0.011	0.029	0.051	0.060	0.074	0.082	0.079	0.096
	Q2	.	0.010	0.027	0.053	0.060	0.075	0.066	0.077	0.102
	Q3	0.009	0.020	0.031	0.043	0.065	0.074	0.079	0.091	0.100
	Q4	0.014	0.021	0.022	0.034	0.049	0.061	0.066	0.078	0.099
1986	Q1	.	0.011	0.023	0.029	0.043	0.051	0.062	0.069	0.079
	Q2	.	0.009	0.020	0.029	0.044	0.055	0.060	0.074	0.086
	Q3	0.007	0.023	0.036	0.045	0.063	0.073	0.078	0.082	0.103
	Q4	0.008	0.025	0.031	0.035	0.053	0.060	0.071	0.077	0.096
1987	Q1	.	0.019	0.034	0.047	0.056	0.069	0.078	0.086	0.095
	Q2	.	0.010	0.028	0.038	0.042	0.055	0.061	0.068	0.079
	Q3	0.006	0.016	0.041	0.048	0.051	0.066	0.075	0.078	0.090
	Q4	0.007	0.018	0.035	0.037	0.041	0.053	0.062	0.069	0.089
1988	Q1	.	0.009	0.022	0.039	0.038	0.049	0.058	0.069	0.073
	Q2	.	0.012	0.019	0.041	0.048	0.047	0.061	0.066	0.078
	Q3	0.006	0.030	0.040	0.061	0.066	0.066	0.083	0.089	0.102
	Q4	0.009	0.027	0.029	0.040	0.048	0.055	0.063	0.074	0.091
1989	Q1	.	0.011	0.024	0.025	0.034	0.045	0.050	0.060	0.076
	Q2	.	0.010	0.028	0.031	0.050	0.054	0.057	0.071	0.078

	Q3	0.005	0.024	0.045	0.041	0.053	0.061	0.074	0.088	0.093
	Q4	0.008	0.024	0.036	0.033	0.047	0.059	0.062	0.074	0.092
1990	Q1	.	0.008	0.026	0.035	0.034	0.052	0.066	0.069	0.085
	Q2	.	0.008	0.028	0.042	0.040	0.062	0.067	0.065	0.074
	Q3	0.011	0.032	0.044	0.051	0.046	0.054	0.058	0.065	0.073
	Q4	0.010	0.021	0.036	0.043	0.036	0.054	0.055	0.068	0.066
1991	Q1	.	0.007	0.020	0.031	0.040	0.034	0.054	0.048	0.058
	Q2	.	0.008	0.019	0.029	0.042	0.034	0.050	0.048	0.055
	Q3	0.006	0.020	0.028	0.042	0.056	0.045	0.063	0.064	0.071
	Q4	0.010	0.021	0.025	0.035	0.046	0.037	0.053	0.045	0.059
1992	Q1	.	0.008	0.017	0.024	0.040	0.053	0.040	0.063	0.069
	Q2	.	0.008	0.018	0.026	0.038	0.046	0.042	0.061	0.059
	Q3	0.005	0.014	0.033	0.039	0.052	0.058	0.047	0.066	0.078
	Q4	0.007	0.015	0.024	0.033	0.048	0.061	0.049	0.056	0.064
1993	Q1	.	0.008	0.018	0.027	0.030	0.039	0.047	0.037	0.054
	Q2	.	0.006	0.019	0.028	0.032	0.040	0.045	0.043	0.056
	Q3	0.006	0.015	0.025	0.034	0.041	0.047	0.052	0.049	0.065
	Q4	0.008	0.016	0.020	0.029	0.037	0.044	0.054	0.052	0.071
1994	Q1	.	0.009	0.017	0.024	0.036	0.044	0.057	0.066	0.065
	Q2	.	0.008	0.018	0.023	0.031	0.037	0.046	0.057	0.051
	Q3	0.007	0.018	0.024	0.033	0.039	0.042	0.046	0.057	0.056
	Q4	0.006	0.017	0.022	0.027	0.037	0.037	0.043	0.057	0.048
1995	Q1	.	0.010	0.017	0.020	0.027	0.031	0.034	0.042	0.046
	Q2	.	0.006	0.018	0.024	0.028	0.033	0.036	0.043	0.049
	Q3	0.010	0.013	0.023	0.028	0.035	0.039	0.041	0.051	0.062
	Q4	0.008	0.014	0.021	0.027	0.032	0.039	0.042	0.049	0.058
1996	Q1	.	0.015	0.019	0.024	0.027	0.032	0.036	0.038	0.043
	Q2	.	0.005	0.014	0.020	0.024	0.027	0.031	0.035	0.040
	Q3	0.003	0.011	0.017	0.024	0.027	0.031	0.037	0.039	0.047
	Q4	0.004	0.011	0.016	0.022	0.027	0.029	0.033	0.038	0.052
1997	Q1	.	0.007	0.012	0.018	0.021	0.028	0.028	0.031	0.033
	Q2	.	0.006	0.012	0.018	0.026	0.028	0.033	0.039	0.038
	Q3	0.005	0.014	0.019	0.022	0.025	0.030	0.034	0.039	0.044
	Q4	0.006	0.013	0.018	0.021	0.024	0.026	0.030	0.030	0.028
1998	Q1	.	0.008	0.016	0.019	0.026	0.032	0.033	0.033	0.033
	Q2	.	0.006	0.015	0.020	0.027	0.030	0.036	0.038	0.039
	Q3	0.004	0.012	0.017	0.021	0.027	0.030	0.035	0.039	0.050
	Q4	0.006	0.012	0.019	0.022	0.026	0.029	0.033	0.033	0.051
1999	Q1	.	0.009	0.013	0.020	0.023	0.026	0.032	0.033	0.038
	Q2	.	0.007	0.014	0.021	0.024	0.028	0.033	0.036	0.036
	Q3	0.008	0.017	0.021	0.023	0.028	0.034	0.038	0.038	0.041
	Q4	0.007	0.017	0.021	0.024	0.025	0.031	0.036	0.038	0.048
2000	Q1	.	0.010	0.020	0.023	0.027	0.029	0.034	0.036	0.039
	Q2	.	0.009	0.018	0.024	0.026	0.028	0.033	0.035	0.041
	Q3	0.005	0.014	0.025	0.028	0.031	0.036	0.043	0.049	0.046
	Q4	0.008	0.015	0.025	0.026	0.028	0.032	0.036	0.042	0.044
2001	Q1	.	0.009	0.020	0.030	0.031	0.034	0.040	0.039	0.044
	Q2	.	0.009	0.018	0.028	0.032	0.036	0.038	0.042	0.041
	Q3	0.006	0.016	0.020	0.024	0.026	0.029	0.029	0.038	0.040
	Q4	0.007	0.020	0.025	0.029	0.030	0.035	0.036	0.038	0.043
2002	Q1	.	0.007	0.015	0.024	0.029	0.032	0.038	0.042	0.034
	Q2	.	0.009	0.017	0.023	0.028	0.033	0.034	0.038	0.042
	Q3	0.005	0.016	0.025	0.033	0.041	0.044	0.046	0.048	0.054
	Q4	0.006	0.018	0.025	0.030	0.036	0.042	0.042	0.043	0.044
2003	Q1	.	0.007	0.029	0.036	0.039	0.044	0.046	0.053	0.050
	Q2	.	0.005	0.018	0.023	0.027	0.031	0.036	0.042	0.046
	Q3	0.004	0.009	0.025	0.022	0.034	0.035	0.040	0.043	0.047
	Q4	0.006	0.011	0.020	0.023	0.032	0.032	0.040	0.047	0.044
2004	Q1	.	0.005	0.010	0.021	0.025	0.033	0.037	0.043	0.054
	Q2	.	0.007	0.011	0.024	0.024	0.034	0.034	0.042	0.051
	Q3	0.004	0.012	0.015	0.028	0.032	0.041	0.045	0.049	0.053
	Q4	0.005	0.010	0.014	0.024	0.029	0.037	0.040	0.042	0.048
2005	Q1	.	0.008	0.012	0.016	0.028	0.035	0.040	0.050	0.056
	Q2	.	0.011	0.014	0.020	0.030	0.034	0.043	0.045	0.051
	Q3	0.007	0.022	0.025	0.029	0.039	0.046	0.054	0.059	0.066
	Q4	0.005	0.016	0.018	0.022	0.028	0.034	0.045	0.048	0.056
2006	Q1	.	0.008	0.026	0.022	0.025	0.032	0.041	0.047	0.050

	Q2	.	0.013	0.029	0.024	0.026	0.038	0.045	0.051	0.057
	Q3	0.004	0.018	0.032	0.034	0.037	0.042	0.054	0.057	0.068
	Q4	0.005	0.012	0.017	0.022	0.026	0.030	0.042	0.048	0.054
2007	Q1	.	0.007	0.017	0.025	0.026	0.032	0.047	0.051	0.063
	Q2	.	0.009	0.026	0.028	0.033	0.032	0.041	0.049	0.059
	Q3	0.005	0.022	0.039	0.035	0.041	0.042	0.049	0.051	0.061
	Q4	0.006	0.016	0.021	0.022	0.031	0.032	0.037	0.048	0.052
2008	Q1	.	0.007	0.020	0.026	0.031	0.036	0.033	0.048	0.051
	Q2	.	0.007	0.021	0.023	0.027	0.036	0.031	0.040	0.043
	Q3	0.005	0.013	0.027	0.031	0.035	0.042	0.037	0.047	0.052
	Q4	0.006	0.016	0.025	0.027	0.030	0.037	0.036	0.041	0.045
2009	Q1	.	0.009	0.018	0.026	0.031	0.035	0.040	0.035	0.047
	Q2	.	0.007	0.018	0.022	0.024	0.031	0.036	0.031	0.042
	Q3	0.005	0.017	0.028	0.032	0.036	0.042	0.052	0.044	0.049
	Q4	0.006	0.014	0.022	0.030	0.029	0.037	0.045	0.038	0.042
2010	Q1	.	0.011	0.017	0.025	0.032	0.033	0.039	0.044	0.044
	Q2	.	0.007	0.016	0.023	0.030	0.029	0.032	0.043	0.038
	Q3	0.005	0.014	0.027	0.035	0.037	0.039	0.043	0.050	0.049
	Q4	0.006	0.013	0.020	0.027	0.032	0.036	0.043	0.046	0.041

Table 5-9 Sprat: Mean weight in the sea(kg)

		Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
1974	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1975	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1976	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1977	Q1	.	0.004	0.010	0.012	0.014	0.014	0.015	0.014
	Q2	.	0.005	0.010	0.013	0.015	0.015	0.017	0.016
	Q3	0.002	0.006	0.011	0.015	0.016	0.016	0.017	0.016
	Q4	0.005	0.010	0.012	0.014	0.015	0.015	0.015	0.015
1978	Q1	.	0.005	0.010	0.012	0.015	0.015	0.016	0.014
	Q2	.	0.005	0.010	0.012	0.014	0.016	0.016	0.016
	Q3	0.001	0.008	0.011	0.014	0.015	0.015	0.015	0.016
	Q4	0.004	0.013	0.013	0.012	0.014	0.013	0.014	0.015
1979	Q1	.	0.004	0.011	0.013	0.014	0.016	0.016	0.015
	Q2	.	0.004	0.013	0.014	0.013	0.016	0.016	0.015
	Q3	0.003	0.007	0.011	0.015	0.015	0.016	0.017	0.017
	Q4	0.005	0.011	0.014	0.015	0.015	0.017	0.015	0.015
1980	Q1	.	0.004	0.010	0.014	0.015	0.015	0.017	0.016
	Q2	.	0.004	0.011	0.014	0.015	0.014	0.016	0.015
	Q3	0.002	0.008	0.012	0.015	0.015	0.015	0.017	0.016
	Q4	0.003	0.009	0.013	0.016	0.016	0.016	0.016	0.016
1981	Q1	.	0.004	0.014	0.015	0.016	0.016	0.015	0.017
	Q2	.	0.004	0.013	0.014	0.018	0.017	0.014	0.018
	Q3	0.003	0.009	0.012	0.015	0.016	0.016	0.016	0.018
	Q4	0.004	0.010	0.014	0.016	0.016	0.017	0.017	0.018
1982	Q1	.	0.004	0.010	0.014	0.016	0.017	0.017	0.016
	Q2	.	0.004	0.012	0.014	0.015	0.017	0.014	0.014
	Q3	0.001	0.007	0.014	0.016	0.016	0.017	0.016	0.016
	Q4	0.004	0.011	0.014	0.016	0.016	0.017	0.017	0.016
1983	Q1	.	0.004	0.010	0.013	0.015	0.016	0.017	0.017
	Q2	.	0.006	0.011	0.014	0.014	0.016	0.016	0.016
	Q3	0.003	0.006	0.011	0.014	0.016	0.015	0.017	0.017
	Q4	0.004	0.010	0.013	0.015	0.016	0.017	0.018	0.019
1984	Q1	.	0.004	0.009	0.013	0.015	0.016	0.017	0.017
	Q2	.	0.005	0.010	0.015	0.014	0.015	0.016	0.017
	Q3	0.003	0.008	0.011	0.014	0.015	0.017	0.016	0.016
	Q4	0.004	0.009	0.012	0.015	0.015	0.017	0.018	0.017
1985	Q1	.	0.004	0.009	0.012	0.014	0.016	0.017	0.017
	Q2	.	0.004	0.010	0.012	0.012	0.015	0.017	0.016
	Q3	0.004	0.009	0.012	0.014	0.016	0.015	0.019	0.017
	Q4	0.004	0.010	0.013	0.015	0.016	0.016	0.016	0.015
1986	Q1	.	0.004	0.010	0.012	0.014	0.015	0.016	0.017
	Q2	.	0.004	0.010	0.012	0.013	0.016	0.016	0.016
	Q3	0.001	0.010	0.013	0.014	0.015	0.015	0.018	0.017
	Q4	0.004	0.011	0.014	0.015	0.016	0.017	0.016	0.018
1987	Q1	.	0.005	0.012	0.014	0.016	0.016	0.017	0.018
	Q2	.	0.005	0.011	0.014	0.016	0.016	0.017	0.017
	Q3	0.001	0.009	0.012	0.014	0.015	0.016	0.015	0.017
	Q4	0.004	0.011	0.012	0.014	0.015	0.016	0.015	0.017
1988	Q1	.	0.004	0.010	0.011	0.013	0.015	0.015	0.016
	Q2	.	0.004	0.011	0.012	0.014	0.016	0.017	0.018
	Q3	0.003	0.010	0.013	0.014	0.016	0.017	0.017	0.019
	Q4	0.005	0.012	0.014	0.015	0.017	0.017	0.017	0.018
1989	Q1	.	0.005	0.011	0.014	0.014	0.016	0.017	0.018
	Q2	.	0.005	0.011	0.014	0.015	0.016	0.017	0.017

	Q3	0.003	0.010	0.013	0.015	0.016	0.017	0.017	0.018
	Q4	0.005	0.014	0.015	0.017	0.018	0.019	0.018	0.019
1990	Q1	.	0.007	0.013	0.014	0.016	0.017	0.017	0.019
	Q2	.	0.005	0.013	0.014	0.016	0.018	0.018	0.019
	Q3	0.003	0.009	0.013	0.014	0.015	0.018	0.016	0.019
	Q4	0.004	0.012	0.015	0.016	0.017	0.017	0.017	0.019
1991	Q1	.	0.006	0.013	0.015	0.016	0.017	0.018	0.018
	Q2	.	0.005	0.013	0.014	0.016	0.017	0.018	0.017
	Q3	0.004	0.010	0.014	0.014	0.016	0.017	0.017	0.017
	Q4	0.004	0.012	0.014	0.016	0.017	0.017	0.017	0.017
1992	Q1	.	0.004	0.012	0.015	0.015	0.017	0.018	0.018
	Q2	.	0.005	0.012	0.015	0.016	0.017	0.018	0.019
	Q3	0.003	0.009	0.013	0.014	0.016	0.017	0.017	0.019
	Q4	0.005	0.012	0.015	0.017	0.018	0.019	0.019	0.019
1993	Q1	.	0.003	0.009	0.012	0.012	0.012	0.014	0.015
	Q2	.	0.004	0.010	0.012	0.013	0.014	0.015	0.016
	Q3	0.002	0.005	0.008	0.010	0.012	0.013	0.012	0.014
	Q4	0.003	0.007	0.009	0.010	0.012	0.012	0.013	0.013
1994	Q1	.	0.004	0.009	0.012	0.014	0.015	0.015	0.016
	Q2	.	0.005	0.009	0.012	0.014	0.014	0.015	0.015
	Q3	0.002	0.009	0.010	0.012	0.013	0.014	0.015	0.015
	Q4	0.003	0.010	0.011	0.012	0.014	0.014	0.016	0.015
1995	Q1	.	0.004	0.011	0.011	0.013	0.014	0.014	0.014
	Q2	.	0.004	0.010	0.010	0.012	0.013	0.014	0.015
	Q3	0.002	0.006	0.009	0.010	0.011	0.012	0.012	0.012
	Q4	0.003	0.008	0.011	0.012	0.013	0.013	0.014	0.014
1996	Q1	.	0.003	0.007	0.010	0.011	0.013	0.014	0.013
	Q2	.	0.003	0.007	0.010	0.011	0.012	0.013	0.013
	Q3	0.003	0.006	0.007	0.010	0.010	0.011	0.011	0.011
	Q4	0.003	0.007	0.008	0.011	0.011	0.013	0.012	0.012
1997	Q1	.	0.003	0.007	0.008	0.010	0.012	0.013	0.013
	Q2	.	0.005	0.007	0.008	0.010	0.012	0.012	0.012
	Q3	0.002	0.006	0.008	0.009	0.011	0.012	0.012	0.012
	Q4	0.002	0.007	0.008	0.009	0.011	0.011	0.011	0.011
1998	Q1	.	0.003	0.007	0.008	0.009	0.011	0.011	0.011
	Q2	.	0.003	0.007	0.008	0.009	0.010	0.010	0.010
	Q3	0.004	0.006	0.008	0.009	0.009	0.011	0.012	0.012
	Q4	0.003	0.006	0.008	0.008	0.009	0.010	0.010	0.010
1999	Q1	.	0.005	0.007	0.009	0.009	0.009	0.011	0.011
	Q2	.	0.005	0.007	0.009	0.009	0.009	0.010	0.011
	Q3	0.004	0.005	0.009	0.010	0.010	0.010	0.011	0.012
	Q4	0.003	0.004	0.009	0.011	0.010	0.010	0.011	0.012
2000	Q1	.	0.004	0.009	0.009	0.010	0.011	0.011	0.013
	Q2	.	0.005	0.009	0.010	0.011	0.012	0.012	0.013
	Q3	0.003	0.008	0.010	0.010	0.011	0.011	0.012	0.011
	Q4	0.004	0.008	0.010	0.011	0.011	0.011	0.012	0.013
2001	Q1	.	0.004	0.009	0.011	0.010	0.011	0.010	0.010
	Q2	.	0.007	0.010	0.011	0.012	0.013	0.012	0.011
	Q3	0.005	0.008	0.010	0.011	0.011	0.012	0.012	0.012
	Q4	0.004	0.009	0.010	0.012	0.012	0.012	0.012	0.012
2002	Q1	.	0.004	0.009	0.010	0.006	0.008	0.009	0.009
	Q2	.	0.005	0.009	0.007	0.010	0.009	0.009	0.009
	Q3	0.003	0.009	0.002	0.005	0.010	0.007	0.012	0.012
	Q4	0.003	0.010	0.003	0.009	0.012	0.012	0.012	0.012
2003	Q1	.	0.003	0.010	0.011	0.011	0.011	0.011	0.011
	Q2	.	0.004	0.009	0.011	0.011	0.012	0.011	0.011
	Q3	0.003	0.007	0.010	0.011	0.011	0.012	0.011	0.011
	Q4	0.004	0.007	0.010	0.011	0.011	0.011	0.011	0.011
2004	Q1	.	0.003	0.007	0.011	0.011	0.011	0.011	0.011
	Q2	.	0.004	0.008	0.011	0.012	0.011	0.011	0.011
	Q3	0.002	0.006	0.007	0.010	0.011	0.011	0.011	0.010
	Q4	0.004	0.006	0.007	0.010	0.011	0.010	0.011	0.011
2005	Q1	.	0.003	0.006	0.008	0.011	0.011	0.011	0.011
	Q2	.	0.004	0.007	0.008	0.011	0.011	0.011	0.011
	Q3	0.004	0.007	0.008	0.009	0.011	0.012	0.012	0.012
	Q4	0.004	0.007	0.008	0.009	0.011	0.011	0.012	0.012
2006	Q1	.	0.004	0.007	0.008	0.009	0.011	0.011	0.011

	Q2	.	0.004	0.007	0.008	0.009	0.011	0.012	0.011
	Q3	0.003	0.006	0.008	0.008	0.009	0.010	0.013	0.011
	Q4	0.004	0.006	0.008	0.008	0.009	0.011	0.011	0.012
2007	Q1	.	0.004	0.007	0.009	0.009	0.009	0.011	0.011
	Q2	.	0.004	0.007	0.009	0.009	0.010	0.012	0.012
	Q3	0.003	0.009	0.010	0.011	0.011	0.011	0.012	0.014
	Q4	0.004	0.009	0.010	0.011	0.011	0.011	0.010	0.010
2008	Q1	.	0.004	0.009	0.009	0.010	0.010	0.010	0.011
	Q2	.	0.004	0.008	0.009	0.010	0.010	0.009	0.010
	Q3	0.004	0.009	0.010	0.011	0.012	0.011	0.011	0.012
	Q4	0.004	0.009	0.010	0.011	0.011	0.011	0.012	0.012
2009	Q1	.	0.003	0.004	0.009	0.010	0.011	0.011	0.011
	Q2	.	0.003	0.004	0.009	0.010	0.011	0.011	0.011
	Q3	0.002	0.003	0.009	0.011	0.011	0.012	0.012	0.012
	Q4	0.002	0.003	0.008	0.010	0.011	0.011	0.011	0.011
2010	Q1	.	0.003	0.004	0.008	0.009	0.011	0.011	0.011
	Q2	.	0.003	0.005	0.007	0.009	0.010	0.011	0.011
	Q3	0.002	0.004	0.008	0.010	0.011	0.012	0.012	0.011
	Q4	0.002	0.004	0.008	0.010	0.010	0.011	0.011	0.011

Table 5-10 Survey indices

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#  Fleet catch for CPUE data
#####################################################################
# Species no. 01 COD
#####################################################################
# Fleet01: COD BITSQ1
# First and last year: 1991 2001
# First and last age: 1-6
#
1E-4  8.73   7.65  15.16  13.84  8.22  1.74       #1991
1E-4  8.00  10.33  14.12   4.77  1.72  0.57       #1992
1E-4 20.26 113.65  85.07   9.41  2.73  0.53       #1993
1E-4 41.20 143.15 100.96  24.99  4.78  0.58       #1994
1E-4 54.60 113.64  61.22  26.54  8.45  1.26       #1995
1E-4  8.75  83.69  74.54  36.59 14.93  3.27       #1996
1E-4  6.15  41.00  39.08  13.81  7.67  1.37       #1997
1E-4 25.76  66.26  32.51   8.88  4.37  0.68       #1998
1E-4 37.91  63.83  40.57  12.68  5.32  0.95       #1999
1E-4 31.95 130.97  51.21  10.47  2.55  0.39       #2000
1E-4 39.55  68.87  39.40  25.66  8.18  1.07       #2001
# Fleet02: COD BITSQ1
# First and last year: 2002 2011
# First and last age: 1-6
#
1E-4 41.52 219.10  76.81  26.68 16.18  5.84       #2002
1E-4 10.27  61.75  85.11  46.74 10.33  1.59       #2003
1E-4 83.27  74.01  51.78  25.05  8.28  2.46       #2004
1E-4 58.98 238.90  62.38  23.95  7.37  1.44       #2005
1E-4  6.56 110.84 133.25  30.05 10.13  1.94       #2006
1E-4 58.48 160.56 129.97  92.91 25.78  6.15       #2007
1E-4 36.44 297.52 254.62 111.35 42.21 10.91       #2008
1E-4 28.15 213.62 308.09 105.35 30.30  7.38       #2009
1E-4  6.86 140.78 288.86 217.89 94.80 24.39       #2010
1E-4 10.19 163.00 326.64 135.81 55.18 13.72       #2011
#Fleet03: COD BITSQ4
#2002 2010
# ages 0 6
1E-3  2.48  98.66 333.86 135.90  46.68  4.50  0.86     #2002
1E-3 57.67  64.87  66.70  58.02  26.99  6.99  1.77     #2003
1E-3 10.84 353.05 103.96  61.26  25.25  4.05  1.73     #2004
1E-3  9.51 133.16 200.17 107.56  34.88  8.82  2.65     #2005
1E-3 22.91 178.53 208.26  94.99  25.15  7.10  2.23     #2006
1E-3 11.39 150.66 272.38 163.00  63.23 14.60  4.35     #2007
1E-3 15.25 121.95 333.71 267.14  83.93 17.91  6.53     #2008
1E-3  8.11 174.51 303.85 185.81  82.76 23.74  3.29     #2009
1E-3  2.57  60.51 382.93 287.03 168.45 53.80 10.61     #2010
############################
# Fleet03: COD Den_Trawl_>
# First and last year: 1997 2010
# First and last age: 3-7
1E-4  1.255  1.000  0.373  0.272  0.158  #1997
1E-4  0.752  0.764  0.230  0.118  0.105  #1998
1E-4  1.877  0.888  0.380  0.246  0.091  #1999
1E-4  1.116  1.903  0.292  0.088  0.049  #2000
1E-4  1.446  1.609  0.345  0.096  0.034  #2001
1E-4  0.985  1.311  0.398  0.239  0.061  #2002
1E-4  1.941  0.827  0.290  0.069  0.030  #2003
1E-4  2.559  2.098  0.195  0.045  0.017  #2004
1E-4  1.327  2.030  0.595  0.091  0.029  #2005
1E-4  3.744  1.861  0.421  0.088  0.015  #2006
1E-4  0.844  4.429  2.941  0.391  0.061  #2007
1E-4  1.901  2.491  2.872  1.468  0.275  #2008
1E-4  1.332  3.961  3.199  1.054  0.238  #2009
1E-4  0.877  4.426  3.025  0.487  0.052  #2010
```

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#################################################################
# Fleet01: HER_ACU_29_32_ex_Riga
# First and last year: 1982 2008
# First and last age: 1-8
1E-3    7398  10609  3863  2219    2178    1690    983 1582    #1982
1E-3    3583   5854  5939  2605    1682    1829   1275 2063    #1983
1E-3    7522   6769  6841  5413    1871    1150    769 1148    #1984
1E-3    3649   8240  4466  3764    1289     593    454  603    #1985
1E-3    4065   9199 10088  4589    3206    1020    420  587    #1986
1E-3    6945   2677  5692  5914    2237    1305    407  210    #1987
1E-3    1537   5210  2531  5638    4725    1912    965  498    #1988
1E-3    6046   2840  7835  3202    4812    2815   1147  544    #1989
1E-3   11954  10075  6016  5433    3176    2611   1341 1136    #1990
1E-3    6739  19731 11477  4029    9728    2508   2295 2474    #1991
1E-3    7445   9217 13327  7256    4217    2346   1595 1214    #1992
1E-3     -11    -11   -11   -11     -11     -11    -11  -11    #1993
1E-3    3939  11992 20607 11770    5804    2158   965   858    #1994
1E-3     -11    -11   -11   -11     -11     -11    -11  -11    #1995
1E-3    4000  13914 10105  7435    4613    2419  1213   803    #1996
1E-3     -11    -11   -11   -11     -11     -11    -11  -11    #1997
1E-3    4312   2199  6717  6643    2651    1558   816   443    #1998
1E-3    1762   4772  3233  3233    3740    1461   852   643    #1999
1E-3     -11    -11   -11   -11     -11     -11    -11  -11    #2000
1E-3    4053   8242  3308  4708    1583    1251   869   473    #2001
1E-3    2699   4298  6581  2883    2386     895   763   471    #2002
1E-3   16868   9204 10887  6819    2378    1812   778  1193    #2003
1E-3    4942  13388  6905  4774    2539    1163   613   694    #2004
1E-3    1929   8302 15543  7243    4455    2604  1121  1156    #2005
1E-3    7346   8107 12793 21290    7386    3095  1712  1219    #2006
1E-3    5424   6657  3025  4276    7205    1724   892   816    #2007
1E-3    6756   6776  7615  3677    4989    3478   843   798    #2008
1E-3    6429  12300  6958  5658    2107    3026  2138   627    #2009
1E-3    3855   8479 12339  5139    3600    1721  1939  1634    #2010
#################################################################
# Fleet01: InternationalAcoustic Survey in October (SD 24-29)
# First and last year: 1991 2010
# First and last age: 1-7
1E-3  46989  40690  43970   2637   8953  1806  1936           #1991
1E-3  37345  27356  24438   9433   1945  2452   717           #1992
1E-3    -11    -11    -11    -11    -11   -11   -11           #1993
1E-3  12557  45137  43656  17478  12051  5149  1034           #1994
1E-3    -11    -11    -11    -11    -11   -11   -11           #1995
1E-3  71379 133914  21098  23648  12968  6493  3770           #1996
1E-3    -11    -11    -11    -11    -11   -11   -11           #1997
1E-3 102572  22213  56369  37065   8201  4856  1675           #1998
1E-3   4904  91316  16083  36201  39247  5296  3364           #1999
1E-3  59895   5321  51166   5753  14282 16174  1599           #2000
1E-3  12224  36403   6973  30796   4064  9749  6477           #2001
1E-3  31811  14641  37845   5831  19258  2656  5167           #2002
1E-3 100928  32803  24306  23675   8099 13435  4867           #2003
1E-3 121935  47843  11895   8053   4995  2472  2454           #2004
1E-3   7200 126586  49268  10179   5197  3051  2392           #2005
1E-3  37280  12054 105751  33052   8168  4692  2167           #2006
1E-3  52489  22128   8331  26627   9980  1105   479           #2007
1E-3  29422  45772  20500   5407  19177  5765  1267           #2008
1E-3  78186  25771  21329   6728   4751  7197  2070           #2009
1E-3  11769  52258  10916   6781   1737  1995  2621           #2010
#################################################################
# Fleet02: SPR_Lavian_Russian_Acou on age 0 shifted to represent age 1
# First and last year: 1994 2010
# First and last age: 1-1
1E-4    2221   #1994
1E-4   38555   #1995
1E-4   27810   #1996
1E-4    3285   #1997
1E-4   39334   #1998
1E-4     682   #1999
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1E-4   22249   #2000
1E-4    3466   #2001
1E-4    6410   #2002
1E-4   31780   #2003
1E-4   61462   #2004
1E-4    2074   #2005
1E-4   18202   #2006
1E-4   23831   #2007
1E-4    3144   #2008
1E-4   53263   #2009
1E-4    6363   #2010
#########################################################################
#FLT03: Intenational acoustic in May corrected by surveyed area
# 2001  2010
# ages 1  7
1E-3   8322  36412  13010  37889  5449  4804  4717   #2001
1E-3  27439  19133  37184  19104 14974  2547  3711   #2002
1E-3  27313  16662   8514  15855  5668  7364  1720   #2003
1E-3 139812  68118  16020  11115 13050  3296  8068   #2004
1E-3   4402  91314  23823   7313  3593  2827  1873   #2005
1E-3  13783   8242  78851  21526  5847  2008  1570   #2006
1E-3  53027  29438   6506  36976  7692  1292   540   #2007
1E-3   9163  41157  20519   5706 21703  4320   777   #2008
1E-3  40705  27209  36819  10775   -11  6012  3586   #2009
1E-3   9432  59855  15427  16098  5129  1682  5628   #2010
```

Table 5-11 **Cod : Eaten biomass (kg) (food ration) by age and year for one individual**

Year/Age	0	1	2	3	4	5	6	7	8
1974	0.000	0.445	1.061	1.268	1.952	2.862	3.722	4.757	5.681
1975	0.000	0.467	1.112	1.338	2.058	3.020	3.933	5.028	6.007
1976	0.000	0.397	0.984	1.162	1.746	2.727	4.060	4.675	5.404
1977	0.000	0.356	0.857	1.327	2.079	3.478	4.771	5.887	6.955
1978	0.000	0.288	0.793	1.298	1.923	3.040	4.057	5.022	5.950
1979	0.000	0.296	0.734	1.106	1.752	2.854	3.577	4.069	4.613
1980	0.000	0.325	0.778	1.009	1.475	2.492	3.372	4.096	4.749
1981	0.000	0.284	0.693	1.219	1.867	3.030	3.993	5.030	6.161
1982	0.000	0.315	0.719	1.304	2.054	3.356	4.597	5.680	6.698
1983	0.000	0.320	0.982	1.473	2.142	3.290	4.118	4.962	6.148
1984	0.000	0.272	0.706	1.183	1.736	2.909	3.676	4.234	4.871
1985	0.000	0.396	0.789	1.317	1.782	2.566	3.152	3.644	4.316
1986	0.000	0.397	0.800	1.355	1.811	2.398	2.835	3.485	3.849
1987	0.000	0.314	0.784	1.328	1.676	2.258	2.797	3.193	3.243
1988	0.000	0.393	0.774	1.331	1.799	2.557	3.206	3.776	4.390
1989	0.000	0.421	0.832	1.511	2.097	3.181	4.253	4.842	5.386
1990	0.000	0.442	0.922	1.582	2.561	3.521	5.037	5.589	6.915
1991	0.000	0.490	1.114	1.634	2.040	2.837	4.041	5.969	7.731
1992	0.000	0.486	0.997	1.553	2.292	3.532	5.050	6.509	6.028
1993	0.000	0.399	0.806	1.310	1.631	2.447	3.464	4.739	5.902
1994	0.000	0.448	0.981	1.166	1.532	2.340	2.908	5.518	6.435
1995	0.000	0.523	1.164	1.578	1.859	2.662	3.669	4.843	6.556
1996	0.000	0.482	1.096	1.706	1.912	2.661	3.647	4.662	6.574
1997	0.000	0.555	1.283	2.223	2.487	3.074	4.281	5.733	7.012
1998	0.000	0.555	1.302	2.070	2.743	3.522	4.784	6.268	7.765
1999	0.000	0.571	1.335	2.139	2.613	3.384	5.299	7.048	8.901
2000	0.000	0.544	1.289	1.939	2.435	3.413	5.157	7.106	8.446
2001	0.000	0.542	1.254	1.791	2.195	3.103	4.782	6.539	8.970
2002	0.000	0.606	1.415	1.906	2.459	3.373	5.308	7.300	10.151
2003	0.000	0.448	1.024	1.364	1.561	2.226	3.394	4.827	5.976
2004	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2005	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2006	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2007	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2008	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2009	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806
2010	0.000	0.470	1.062	1.495	1.913	2.389	3.042	4.520	5.806

Table 5-12 **Number of stomachs sampled**

Lower limit(mm) of size range

			160	210	260	310	360	410	460	510	560	610	660	710	
Cod	1977	Q2	219	.	270	.	233	.	519	.	218	.	117	.	
	1978	Q1	369	.	763	.	260	.	217	.	111	.	22	.	
		Q4	175	.	659	.	403	.	242	.	60	.	29	.	
	1979	Q2	40	.	271	.	268	.	83	.	23	.	.	.	
		Q3	.	.	193	.	321	.	141	.	20	.	.	.	
		Q4	104	.	753	.	631	.	509	.	102	.	20	.	
	1981	Q2	.	.	120	.	345	.	618	.	185	.	88	.	
		Q3	73	.	113	.	250	.	257	.	167	.	96	.	
		Q4	160	.	747	.	251	.	314	.	185	.	164	.	
	1982	Q1	.	843	.	1025	.	764	.	623	.	340	.	164	
		Q2	.	197	.	409	.	456	.	146	.	49	.	13	
		Q3	.	89	.	431	.	265	.	80	.	33	.	.	
		Q4	.	355	.	477	.	463	.	263	.	80	.	79	
	1983	Q1	.	162	.	637	.	465	.	188	.	116	.	59	
		Q2	.	111	.	737	.	764	.	239	.	107	.	72	
		Q4	.	162	.	623	.	741	.	308	.	43	.	.	
	1984	Q1	.	.	14	495	.	724	.	746	.	141	.	37	
		Q2	.	.	.	191	.	307	.	134	.	20	.	.	
		Q4	.	10	51	549	.	410	.	161	.	57	.	10	
	1985	Q1	.	15	744	161	143	738	.	242	.	72	.	22	
	1986	Q1	.	.	43	51	50	331	.	179	.	99	.	21	
	1987	Q1	.	.	15	107	78	394	.	221	.	70	.	.	
		Q2	.	32	339	417	215	795	.	437	.	138	.	.	
		Q4	.	10	43	92	124	226	.	87	.	20	.	.	
	1988	Q1	.	45	205	331	460	817	.	324	.	63	.	.	
		Q2	.	.	82	194	305	850	.	217	.	31	.	.	
		Q4	.	.	22	20	122	380	.	41	.	12	.	.	
	1989	Q1	.	.	.	58	264	697	.	348	.	153	.	.	
		Q2	.	11	35	69	275	983	.	553	.	222	.	.	
		Q4	.	80	218	261	167	303	.	194	.	101	.	.	
	1990	Q2	.	.	72	349	374	320	.	313	.	126	.	22	
		Q4	.	35	49	61	45	121	.	35	.	13	.	.	
	1991	Q1	.	.	24	167	330	447	.	334	.	43	.	.	
	1992	Q1	.	10	32	47	24	37	.	18	.	13	.	18	
		Q3	.	30	18	21	28	46	.	17	.	10	.	27	
	1993	Q1	.	29	57	63	37	59	.	27	.	23	.	20	
		Q4	.	44	38	35	36	64	.	25	.	11	.	.	
	All	all	1140	2270	5990	8078	6039	12967	2900	6500	1071	2206	536	564	
	All														50261