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Some exploratory XSA runs for NEA-saithe (using FLR)

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There are presently 2 fleets used to tune the NEA saithe XSA assessment;

FLT12: Norwegian new trawl revised 2006; age span 4-8, time span 1994-2006
FLT13: Norway Acoustic Survey extended 2000; age span 3-7, time span 1994-2008

The Norwegian purse seine fleet was used until the last benchmark in 2005. The quality and performance of the purse seine tuning fleet had been discussed several times in the WG. The effort, measured as number of vessels participating, had been highly variable from year to year. This had been partly taken care of by only including vessels with total catch > 100 tonnes. However, with a restricting and changing TAC and transfer of quota, the CPUE may change much from year to year without really reflecting trends in the saithe availability. Analysis showed rather large and variable log q residuals and large S.E. log q for all age groups except age 4, which was the dominant age group in the purse seine landings in many years. And even the S.E. log q for age 4 was higher than in Norwegian trawl CPUE and acoustic survey indices single fleet tuning runs. There were strong year effects, and in the combined tuning the purse seine series got low scaled weights. The 2005 WG therefore decided to not include the purse seine tuning fleet in the further analysis.

However, in later years with lower availability of young saithe the TAC has perhaps been less restricting, and we therefore decided to update the purse seine tuning series for a few exploratory runs (FLT08: Norway Purse Seine revised 2000).

The different exploratory XSA runs are tabled below. All XSA parameter settings are as in the standard (SPALY) run. The tuning fleet data is listed in appendix A.

Run No.	1	2	3	4	5	6	7	8	9	10
Ass. type	SPALY	SFT	SFT	SFT	SFT	SFT	SFT	SFT	SFT	CFT
Flt12 Norwegian trawl	1994-06 age 4-8 Q2-4	1994-08 age 3-10 20% Q2-4 All vessels	1994-08 age 3-10 20% Q2-4 7 vessels	1994-08 age 3-10 20-80% Q2-4 7 vessels	1994-08 age 3-10 20-80% Q1-4 7 vessels	1994-08 age 3-10 20-80% Q2-4 All vessels	1994-08 age 3-10 20-80% Q1-4 All vessels			1994-08 age 3-10 20-80% Q1-4 All vessels
Flt13 Norwegian ac. survey	1994-08 age 3-7							1994-08 age 3-10		1994-08 age 3-10
Flt08 Purse seine									1989-08 age 3-7	1989-08 age 3-7

Figure 1 shows S.E_Log q residuals in the diagnostics from six runs (runs 2-7) with different CPUE data (days with >20% or >20% and <80% saithe, averaged over Q2-4 or Q1-Q4, all vessels above median length or 7 vessels proposed by the industry). Note that the time period is 1994-2008 and age span is 3-10 in all runs. The trends are similar for all runs, but runs 3 and 7 seem to perform best regarding all over lowest S.E_Log q residuals.

Figure 1. S.E_Log q residuals from different trawl CPUE single fleet tuning runs.

Figure 2 presents S.E_Log q residuals from the two CPUE single fleet tuning runs with all over lowest S.E_Log q residuals (runs 3 and 7) together with single fleet tuning runs with the acoustic tuning series, age span 3-10 (Run 8) and the updated purse seine series, age span 3-7 (run 9). The purse seine does not seem to perform any better than during the previous analysis in 2005. For age groups 3 and 4 the acoustic survey has the lowest S.E_Log q residuals, for ages 5-9 both the acoustic series and CPUE series have similar large S.E_Log q residuals but with different patterns, perhaps with the all over best results for the CPUE fleets. For age 10 the two alternative CPUE fleets perform best.

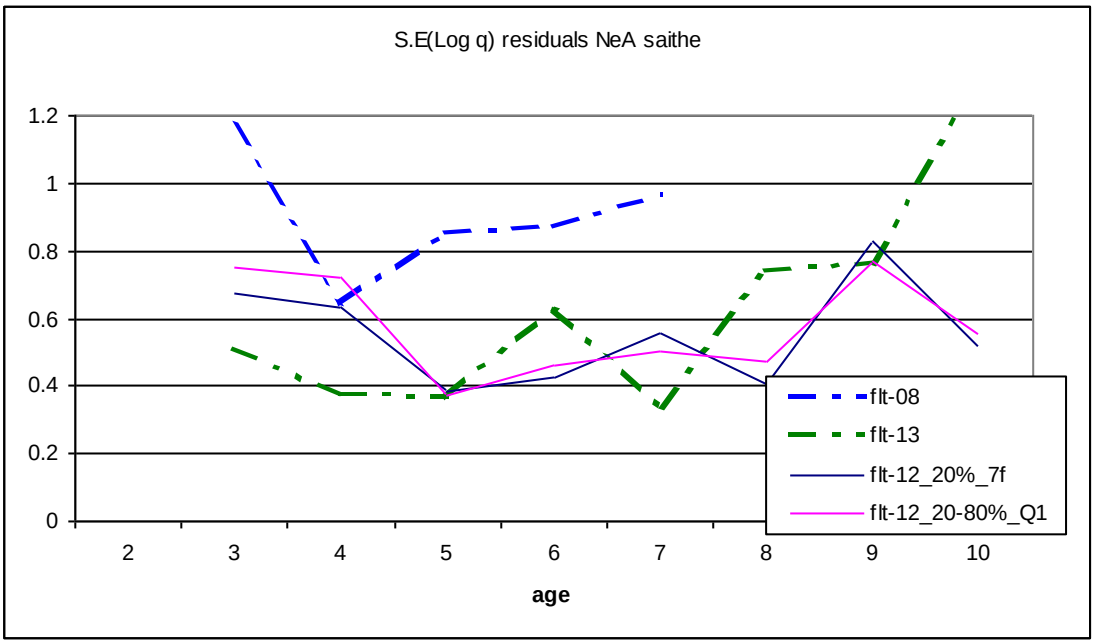

Figure 2. S.E_Log q residuals from four different single fleet tuning runs (runs 3,7, 8 and 9).

Figure 3 presents scaled weights from diagnostics for a XSA run (run 10) with three tuning fleets; trawl CPUE from days with >20% and <80% saithe, averaged over Q1-Q4, including all vessels above mean length, acoustic survey indices and the updated purse seine series, the latter only for age groups 3-7. The purse seine series get lowest scaled weights for most cohorts, the survey series get highest weights for the two youngest cohorts (age groups 3 and 4), while the trawl CPUE series have highest scaled weights for older fish, except age group 9 where the survey and trawl CPUE have similar scaled weights.

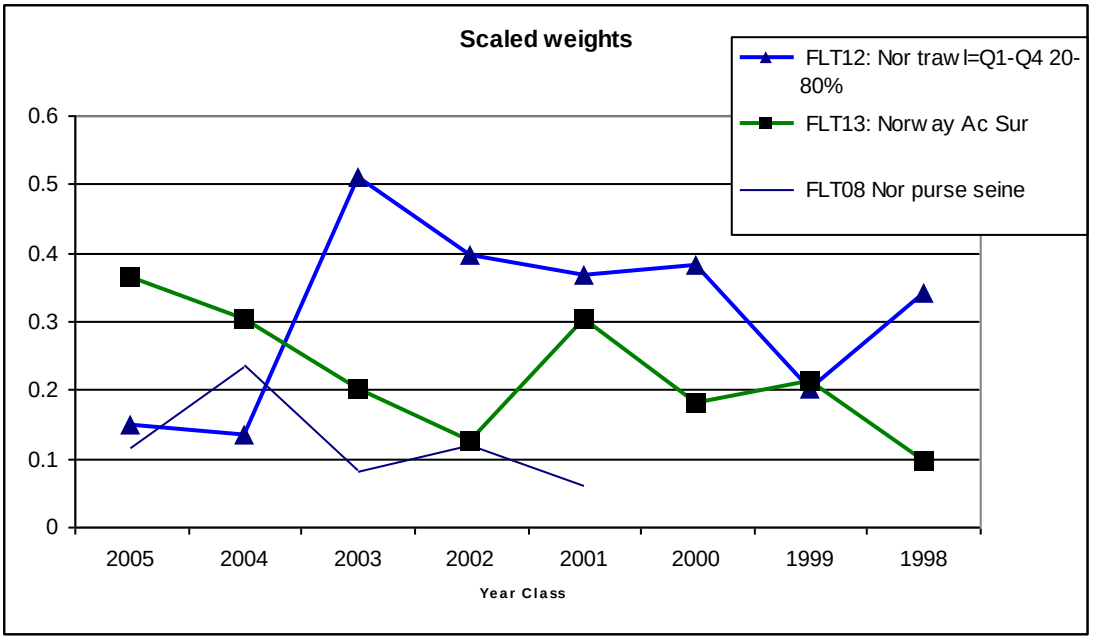

Figure 3 Scaled weights at age from combined XSA run with 3 fleets.

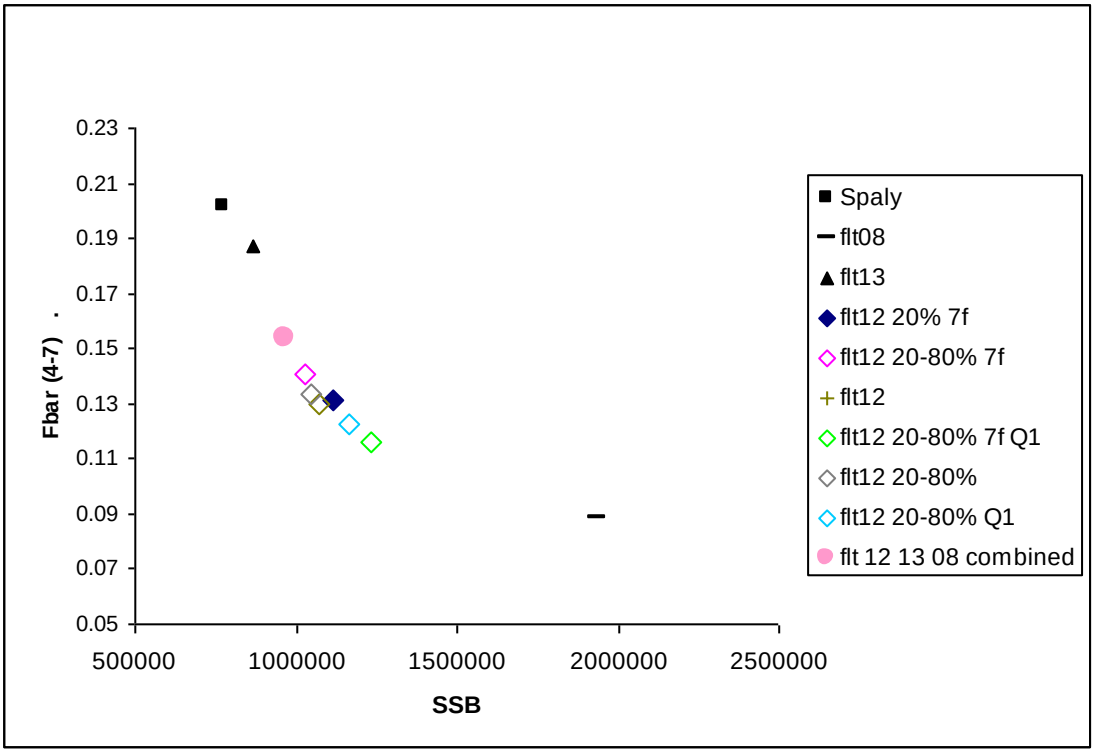

Figure 4 Comparison of SSB and F_{4-7} in the last assessment year (2008) from single fleet and combined fleet XSA runs.

Estimates of SSB and F_{4-7} in the final assessment year (2008) from the different single and multi fleet runs given in the table above are presented in Figure 4. Note that except for the SPALY run, all trawl CPUE fleets include data from 1994-2008 and age groups 3-10. The acoustic series also includes age groups 3-10, while the purse seine fleet includes ages 3-7. The standard (SPALY) multi fleet run and the acoustic fleet run give the highest F and lowest SSB, while the purse seine run results in extremely low F and high SSB. The results of the different trawl CPUE single fleet runs are clustered more or less together. CPUE series excluding some of the direct saithe fishery seems to give highest Fs and lowest SSBs.

Summary

S.E_Log q residuals and scaled weights from XSA diagnostics are presented together with estimates of F_{bar} and SSB in the final assessment year for 10 different single and multi fleet runs. The purse seine tuning series showed the highest S.E_Log q residuals and lowest scaled weights and did not seem to perform any better than in previous analysis. It is therefore doubtful if there are any strong reasons to reintroduce this tuning series in the assessment.

The acoustic survey indices got best results for the youngest age groups, but seem to perform reasonably well for older ones also, and it could be considered to extend the age span to age group 9.

When it comes to the six different trawl CPUE tuning fleets, the one including all vessels above the median length, days with >20% and <80% saithe and averaging over Q1-4 seems to give the best and most stable results, though there are only minor differences between some of the series. One of the series based on the 7 vessels proposed by the industry also performs reasonably well. However, as pointed out in another WD, there are both holes and outliers in the data basis from the 7 vessels, and for the time being it is perhaps best to use time series based on more vessels.

The CPUE indices got higher scaled weights in the XSA for older ages, while for age-groups 3-4 this tuning fleet is down-weighted. Age group 3 is rarely represented in landings for the later part of the time period 1994-2008 and should not be included in the tuning series, and perhaps age group 4 also should be excluded. S.E_Log q residuals and scaled weights for age group 9 are in the same range as for age group 9 from the survey, while age group 10 indices from the CPUE series got higher scaled weight in the XSA. However, regarding the high S.E_Log q residuals for age group 9, both age groups could be left out in the CPUE tuning series.

Appendix A

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North-East Arctic saithe (Sub-areas I and II)
101
FLT08: Norway Purse Seine reviced 2000 (Catch: Unknown) (Effort: Unknown)
1989 2008
1 1 0.00 1.00
3 7
  119.2     5041     7952    18484     2892       15
   56.4    10896     6275     2662     2462      663
   98.5    35281     2285     1027      763      786
   88.8    27263     6211      228      112       51
   71.9     7869    24630     1314       40       29
   79.3     5604    14963     9208     1587      132
   52.2     6317    13778     4952      727      110
   81.9     5237    37806     5404     2456      515
   92.0     9277     6738    18355     1870     1349
  130.1     1988     9487     5131    10178     1224
  133.0     6420     5990    10422     2275     2749
  125.6     8039    13692     1304     1211      269
  104.6     2407     4322    11515      653      279
   77.8     4823     9965     3211     3081      308
  116.3     1728    36994     2172      496      738
   76.3      580     4337    19643     2072      623
   83.3    23842     8723     2402     3701      844
  115.1     1897    61687     4438     3722     3357
   73.4     1042     1589    15091     2943      970
   48.7     6750     3779     1726     7614     3128


North-East Arctic saithe (Sub-areas I and II)
101
FLT13: Norway Ac Survey extended 2000 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.75 0.85
3  10
   1    87.1   108.9    41.4     8.1     0.7    1.0    0.5    1.0
   1   166.1    86.5    46.5    16.5     2.4    0.0    0.0    1.0
   1   122.6   207.4    31.7    15.1     4.0    0.5    0.0    0.0
   1    38.0   184.8    79.8    50.6     9.6    1.2    0.0    0.3
   1    96.7   202.6    69.3    84.3     6.6    3.8    0.7    0.1
   1   233.8    72.9    62.2    21.0    19.2    5.9    1.4    0.4
   1   142.5   176.3    11.6    11.5     8.0    4.0    1.0    2.0
   1   275.9    45.9    53.8     5.6     6.1    3.2    3.4    1.9
   1   230.2    92.6    18.9    10.6     2.2    0.9    0.8    1.2
   1    87.5   151.7    26.1     6.2     6.4    1.2    0.7    1.3
   1   212.4   118.7    49.1    19.2     4.7    3.0    3.1    3.1
   1   228.1    67.2    20.3    16.5     7.7    2.2    1.7    0.9
   1    42.6   142.9    19.4     4.6     8.5    5.6    2.1    3.5
   1   111.0    27.1    61.1     7.9     5.8    4.1    4.3    1.1
   1    97.2    29.2    13.8    11.9     4.0    1.0    1.0    1.6


North-East Arctic saithe (Sub-areas I and II) flt 12 20% 7 vessels
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3  10
   1     6.3   155.6   524.2   325.6    45.0    10.0     3.2     6.2
   1    33.6   179.6   249.3   270.9    43.0     7.1     0.2     1.8
   1    29.2   145.0   193.8   281.8   371.6    42.6     9.2     0.9
   1    14.0    37.2   193.8   197.4   253.9   159.8    16.9     1.7
   1     4.5    45.7    76.7   338.3   128.9    78.3    22.6    10.6
   1    32.6    78.8   222.0   168.3   389.9    89.3    65.5    18.7
   1     6.6    72.5    77.5   145.3   112.5   151.1    57.2    64.6
   1     7.7    45.9   251.2   180.9   170.8    72.4   103.1    49.4
   1    14.4   108.2   176.1   548.2   123.5   126.9    58.1   108.0
   1     6.3   166.4   253.9   168.5   243.0   156.8   129.7    80.3
   1     5.8    14.2   349.1   259.5   333.1   417.6   134.1   184.2
   1    21.3    61.5   164.4   486.3   232.1   130.5   231.9    78.0
   1    19.2    77.3   111.5   346.8   182.0   105.1   155.4    69.5
   1     5.6    19.3   351.2   269.8   172.6   240.4   160.4    81.5
   1    27.9   111.4    69.4   431.6   214.1   143.0   199.8   125.4
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North-East Arctic saithe (Sub-areas I and II) flt 12 20-80% 7 vessels
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3 10

1	8.4	206.6	696.0	432.3	59.7	13.3	4.2	8.2
1	19.6	105.0	145.7	158.3	25.1	4.2	0.1	1.1
1	22.6	112.6	150.5	218.8	288.5	33.1	7.1	0.7
1	9.9	26.4	137.5	140.0	180.2	113.4	12.0	1.2
1	3.1	31.6	53.0	233.8	89.1	54.2	15.6	7.3
1	18.5	44.7	126.0	95.5	221.2	50.7	37.2	10.6
1	5.2	57.0	60.9	114.2	88.4	118.8	44.9	50.8
1	5.6	33.2	182.1	131.1	123.8	52.4	74.7	35.8
1	8.2	61.4	99.8	310.8	70.0	71.9	32.9	61.2
1	4.2	110.6	168.9	112.1	161.6	104.3	86.3	53.4
1	2.9	7.0	171.5	127.5	163.7	205.2	65.9	90.5
1	15.1	43.7	116.7	345.2	164.8	92.7	164.6	55.4
1	13.4	54.0	77.8	242.1	127.1	73.4	108.5	48.5
1	3.7	12.7	231.5	177.8	113.7	158.5	105.7	53.7
1	17.7	70.6	44.0	273.6	135.7	90.7	126.7	79.5

North-East Arctic saithe (Sub-areas I and II)
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3 10

1	5.1	126.0	424.3	263.6	36.4	8.1	2.6	5.0
1	39.5	211.0	292.9	318.3	50.5	8.3	0.3	2.1
1	21.3	105.9	141.5	205.7	271.3	31.1	6.7	0.6
1	15.2	40.4	210.1	214.0	275.3	173.3	18.3	1.8
1	3.2	32.4	54.3	239.5	91.2	55.5	16.0	7.5
1	16.1	39.0	109.8	83.2	192.8	44.2	32.4	9.3
1	7.3	80.3	85.8	160.9	124.6	167.3	63.3	71.5
1	8.3	49.6	271.9	195.7	184.9	78.3	111.6	53.5
1	9.9	74.8	121.7	378.9	85.4	87.7	40.1	74.6
1	5.0	130.8	199.7	132.5	191.1	123.3	102.0	63.1
1	3.1	7.7	189.0	140.4	180.3	226.0	72.6	99.7
1	12.8	36.9	98.7	291.9	139.4	78.4	139.2	46.8
1	17.5	70.5	101.7	316.5	166.1	95.9	141.8	63.4
1	4.9	17.1	309.8	238.0	152.2	212.1	141.4	71.9
1	24.3	96.9	60.3	375.2	186.2	124.3	173.7	109.1

North-East Arctic saithe (Sub-areas I and II) flt 12 20-80% 7 vessels Q1-Q4
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3 10

1	7.2	176.1	593.3	368.6	50.9	11.3	3.6	7.0
1	25.6	137.0	190.2	206.7	32.8	5.4	0.2	1.4
1	22.6	112.6	150.5	218.8	288.5	33.1	7.1	0.7
1	11.7	31.1	162.0	165.0	212.3	133.6	14.1	1.4
1	3.3	33.9	56.9	250.9	95.6	58.1	16.8	7.8
1	17.9	43.4	122.3	92.7	214.7	49.2	36.1	10.3
1	4.3	47.0	50.2	94.1	72.9	97.9	37.1	41.8
1	5.6	33.5	183.5	132.1	124.8	52.9	75.3	36.1
1	7.7	57.9	94.3	293.5	66.1	67.9	31.1	57.8
1	5.1	133.4	203.6	135.1	194.8	125.7	104.0	64.4
1	3.2	7.9	193.5	143.8	184.6	231.4	74.3	102.1
1	19.4	56.1	149.9	443.4	211.7	119.0	211.4	71.2
1	16.2	65.2	94.0	292.5	153.5	88.6	131.0	58.6
1	4.1	14.2	257.7	198.0	126.7	176.5	117.7	59.8
1	24.2	96.3	60.0	373.2	185.1	123.7	172.8	108.5

North-East Arctic saithe (Sub-areas I and II) flt 12 20-80%
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3 10

1	3.3	82.0	276.2	171.6	23.7	5.3	1.7	3.3
1	26.5	141.5	196.4	213.4	33.9	5.6	0.2	1.4
1	15.5	77.3	103.3	150.2	198.0	22.7	4.9	0.5
1	9.4	24.9	129.6	132.0	169.8	106.9	11.3	1.1
1	2.2	22.6	38.0	167.5	63.8	38.8	11.2	5.2
1	10.3	25.0	70.3	53.3	123.5	28.3	20.7	5.9
1	6.2	68.1	72.8	136.5	105.7	142.0	53.7	60.7
1	5.5	33.0	181.0	130.3	123.1	52.2	74.3	35.6
1	6.6	50.0	81.3	253.0	57.0	58.6	26.8	49.9
1	3.5	92.0	140.4	93.2	134.4	86.7	71.7	44.4
1	2.0	5.0	122.3	90.9	116.7	146.3	47.0	64.5
1	9.1	26.2	70.0	207.0	98.8	55.6	98.7	33.2
1	11.4	45.8	66.0	205.4	107.8	62.3	92.0	41.1
1	3.2	11.2	204.0	156.7	100.2	139.6	93.1	47.3
1	16.3	65.1	40.5	252.2	125.1	83.6	116.8	73.3

North-East Arctic saithe (Sub-areas I and II) flt 12 20-80% Q1-Q4
101
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3 10

1	3.3	82.1	276.6	171.8	23.7	5.3	1.7	3.3
1	27.8	148.5	206.1	223.9	35.6	5.9	0.2	1.5
1	16.5	82.2	109.8	159.7	210.6	24.1	5.2	0.5
1	10.3	27.5	142.9	145.6	187.3	117.9	12.5	1.2
1	2.4	24.0	40.2	177.6	67.7	41.1	11.9	5.6
1	10.7	25.9	73.0	55.3	128.2	29.4	21.5	6.2
1	5.3	57.8	61.8	115.9	89.7	120.5	45.6	51.5
1	5.3	31.3	171.4	123.4	116.6	49.4	70.3	33.7
1	6.7	50.5	82.1	255.7	57.6	59.2	27.1	50.4
1	4.0	104.3	159.3	105.7	152.4	98.3	81.4	50.4
1	2.3	5.7	141.3	105.0	134.8	169.0	54.3	74.6
1	13.2	38.3	102.3	302.6	144.4	81.2	144.3	48.5
1	13.5	54.1	78.0	242.7	127.3	73.6	108.7	48.6
1	3.5	12.1	220.4	169.3	108.3	150.9	100.6	51.1
1	18.2	72.6	45.2	281.3	139.6	93.2	130.3	81.8

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North-East Arctic saithe (Sub-areas I and II) flt 12 13 08 combined
103
FLT12: Nor new trawl revised 2006 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.00 1.00
3  10
   1      3.3   82.1   276.6   171.8    23.7     5.3    1.7    3.3
   1     27.8  148.5   206.1   223.9    35.6     5.9    0.2    1.5
   1     16.5   82.2   109.8   159.7   210.6    24.1    5.2    0.5
   1     10.3   27.5   142.9   145.6   187.3   117.9   12.5    1.2
   1      2.4   24.0    40.2   177.6    67.7    41.1   11.9    5.6
   1     10.7   25.9    73.0    55.3   128.2    29.4   21.5    6.2
   1      5.3   57.8    61.8   115.9    89.7   120.5   45.6   51.5
   1      5.3   31.3   171.4   123.4   116.6    49.4   70.3   33.7
   1      6.7   50.5    82.1   255.7    57.6    59.2   27.1   50.4
   1      4.0  104.3   159.3   105.7   152.4    98.3   81.4   50.4
   1      2.3    5.7   141.3   105.0   134.8   169.0   54.3   74.6
   1     13.2   38.3   102.3   302.6   144.4    81.2  144.3   48.5
   1     13.5   54.1    78.0   242.7   127.3    73.6  108.7   48.6
   1      3.5   12.1   220.4   169.3   108.3   150.9  100.6   51.1
   1     18.2   72.6    45.2   281.3   139.6    93.2  130.3   81.8
FLT13: Norway Ac Survey extended 2000 (Catch: Unknown) (Effort: Unknown)
1994 2008
1 1 0.75 0.85
3  10
   1    87.1   108.9    41.4     8.1     0.7    1.0    0.5    1.0
   1   166.1    86.5    46.5    16.5     2.4    0.0    0.0    1.0
   1   122.6   207.4    31.7    15.1     4.0    0.5    0.0    0.0
   1    38.0   184.8    79.8    50.6     9.6    1.2    0.0    0.3
   1    96.7   202.6    69.3    84.3     6.6    3.8    0.7    0.1
   1   233.8    72.9    62.2    21.0    19.2    5.9    1.4    0.4
   1   142.5   176.3    11.6    11.5     8.0    4.0    1.0    2.0
   1   275.9    45.9    53.8     5.6     6.1    3.2    3.4    1.9
   1   230.2    92.6    18.9    10.6     2.2    0.9    0.8    1.2
   1    87.5   151.7    26.1     6.2     6.4    1.2    0.7    1.3
   1   212.4   118.7    49.1    19.2     4.7    3.0    3.1    3.1
   1   228.1    67.2    20.3    16.5     7.7    2.2    1.7    0.9
   1    42.6   142.9    19.4     4.6     8.5    5.6    2.1    3.5
   1   111.0    27.1    61.1     7.9     5.8    4.1    4.3    1.1
   1    97.2    29.2    13.8    11.9     4.0    1.0    1.0    1.6
FLT08: Norway Purse Seine reviced 2000 (Catch: Unknown) (Effort: Unknown)
1989 2008
1 1 0.00 1.00
3 7
  119.2     5041     7952    18484     2892       15
   56.4    10896     6275     2662     2462      663
   98.5    35281     2285     1027      763      786
   88.8    27263     6211      228      112       51
   71.9     7869    24630     1314       40       29
   79.3     5604    14963     9208     1587      132
   52.2     6317    13778     4952      727      110
   81.9     5237    37806     5404     2456      515
   92.0     9277     6738    18355     1870     1349
  130.1     1988     9487     5131    10178     1224
  133.0     6420     5990    10422     2275     2749
  125.6     8039    13692     1304     1211      269
  104.6     2407     4322    11515      653      279
   77.8     4823     9965     3211     3081      308
  116.3     1728    36994     2172      496      738
   76.3      580     4337    19643     2072      623
   83.3    23842     8723     2402     3701      844
  115.1     1897    61687     4438     3722     3357
   73.4     1042     1589    15091     2943      970
   48.7     6750     3779     1726     7614     3128
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