Year	Area/Age	2	3	4	5	6	7	8	9	10+
2012	0	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
2012	6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2012	7	1.00	1.00	1.00	1.00	1.00	1.00	0.50		
2013	3	0.87	0.79	0.58	0.54	0.73	0.59	057	0.58	1.00
2013	4	0.98	0.94	0.90	0.87	0.77	0.76	0.89	0.80	1.00
2013	5	1.00	1.00	1.00	1.00	0.95	1.00	0.94	1.00	1.00
2013	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2013	6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2013	7	1.00		1.00	1.00	1.00	1.00	0.50		
2014	3	0.99	0.98	0.92	0.84	0.76	0.85	0.68	0.73	0.70
2014	4	0.99	1.00	1.00	0.99	0.99	0.98	0.96	0.94	1.00
2014	5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
2014	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00
2014	6	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
2014	7	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2015	3	0.90	0.84	0.80	0.68	0.56	0.46	0.66	0.85	0.69
2015	4	0.93	0.89	0.89	0.77	0.81	0.68	0.68	0.71	0.86
2015	5	0.97	1.00	0.93	1.00	0.91	0.93	1.00	1.00	1.00
2015	0	1.00	1.00	1.00	1.00	1.00	0.92	0.75	1.00	1.00
2015	6	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	
2015	7	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
2016	3	0.95	0.97	0.85	0.74	0.47	0.53	0.50	0.32	0.19
2016	4	0.99	0.98	0.89	0.84	0.71	0.72	0.64	0.59	0.16
2016	5	0.92	0.90	0.89	0.86	0.75	0.71	0.62	0.21	0.25
2016	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
2016	6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2016	7	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2017	3	0.97	0.92	0.9	0.81	0.70	0.64	0.50	0.86	0.83
2017	4	0.98	0.97	0.94	0.82	0.64	0.76	0.87	0.75	0.88
2017	5	1.00	1.00	1.00	1.00	0.94	1.00	0.92	1.00	0.94
2017	0	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	
2017	6	1.00	1.00	0.94	0.94	1.00	1.00	1.00	1.00	
2017	7	1.00	1.00	1.00	1.00	1.00	1.00	1.00		

Table 2.13. Norwegian Coastal Cod. Stock weight (SWT), catch weights (CWT) and proportion mature (MAT). Input data to all the VPA-analysis. Proportions of F and M before time of spawning was set to 0 for all ages and years.

SWT	2	3	4	5	6	7	8	9	10+
1984	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1985	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1986	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1987	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1988	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1989	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1990	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1991	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1992	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1993	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723

1994	0.321	0.758	1.479	2.137	2.814	4.722	6.685	6.980	9.723
1995	0.298	0.700	1.338	1.973	2.649	4.164	7.051	6.413	14.326
1996	0.270	0.717	1.435	2.044	2.694	4.817	6.280	11.365	15.670
1997	0.232	0.677	1.363	1.903	2.816	3.833	5.849	9.600	13.037
1998	0.323	0.834	1.366	2.075	3.013	4.255	5.305	8.350	18.016
1999	0.318	0.804	1.559	2.042	2.798	4.678	7.151	8.959	18.340
2000	0.346	0.777	1.458	2.296	2.735	4.048	7.011	9.224	12.277
2001	0.347	0.878	1.543	2.213	2.862	3.321	4.849	7.339	11.542
2002	0.430	0.880	1.698	2.452	3.538	4.397	4.191	7.046	15.619
2003	0.308	0.686	1.299	2.149	3.135	4.048	5.008	5.789	10.069
2004	0.339	0.834	1.614	2.269	3.290	4.124	4.718	4.976	6.358
2005	0.407	0.846	1.748	2.200	2.693	3.817	3.797	5.344	14.829
2006	0.490	1.125	1.812	2.559	3.579	3.964	4.822	7.332	14.650
2007	0.518	1.185	2.011	2.500	3.160	4.241	6.806	11.051	14.931
2008	0.508	1.208	2.095	2.987	3.671	3.976	4.387	5.415	11.558
2009	0.434	1.116	2.003	2.894	3.632	4.875	5.400	6.125	4.719
2010	0.419	1.026	1.996	2.839	3.665	4.868	4.895	5.685	6.504
2011	0.343	1.062	2.119	2.882	3.761	5.505	6.336	6.309	6.570
2012	0.336	1.038	2.006	2.998	3.727	4.783	5.071	5.851	7.446
2013	0.365	0.851	1.815	2.856	3.561	4.122	6.435	5.974	7.670
2014	0.423	1.071	1.845	2.886	3.905	4.495	5.249	5.871	8.762
2015	0.370	1.045	1.940	2.910	3.518	4.927	4.753	5.864	7.277
2016	0.344	1.121	2.033	3.081	3.734	4.286	5.895	7.556	6.984
2017	0.421	1.026	1.868	2.687	3.746	4.419	6.05	6.887	7.637
CWT	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10+**
1984	0.248	0.619	1.149	1.734	2.325	3.486	4.845	5.608	8.84
1985	0.214	0.712	1.415	2.036	2.737	4.012	6.116	6.46	10.755
1986	0.227	0.525	1.08	1.706	2.256	3.353	4.838	5.838	7.053
1987	0.331	0.673	1.12	1.693	2.359	3.743	5.326	6.129	11.623
1988	0.246	0.634	1.17	1.727	2.328	3.256	4.7	5.45	8.202
1989	0.3	0.661	1.836	2.17	2.448	4.391	4.899	6.661	11.608
1990	0.345	1.174	1.515	1.678	2.708	3.898	6.515	7.299	13.924
1991	0.164	0.922	1.608	2.108	2.507	3.469	4.976	5.734	11.059
1992	0.168	0.556	1.359	2.267	2.957	3.903	5.317	4.558	7.032
1993	0.241	0.645	1.71	2.591	3.588	4.366	5.899	6.494	7.509
1994	0.254	0.805	1.476	2.097	3.287	4.095	5.592	7.217	8.331
1995	0.302	0.71	1.335	1.842	2.467	4.191	5.778	6.376	9.903
1996	0.274	0.921	1.464	1.979	2.516	3.461	4.866	5.391	8.854
1997	0.277	0.97	1.554	1.97	2.897	3.716	4.829	6.349	9.267
1998	0.376	0.978	1.518	2.281	3.125	3.9	5.52	6.333	9.337
1999	0.467	1.155	1.633	2.171	3.249	4.095	5.013	6.018	6.255
2000	0.515	1.305	2.272	2.555	3.283	4.504	5.4	6.379	6.42
2001	0.164	0.952	1.637	2.881	3.424	4.038	5.397	7.208	6.881
2002	0.491	1.179	1.8	2.485	3.86	4.76	5.195	5.507	9.183
2003	0.944	1.552	2.146	3.082	3.594	4.953	5.736	6.477	9.686
2004	0.824	1.374	1.877	2.679	3.365	4.013	4.847	5.554	6.343

2005	0.82	1.317	2.094	2.795	3.493	4.087	4.836	6.264	5.115
2006	1.274	1.599	1.894	2.687	3.562	4.029	5.182	5.905	6.213
2007	1.241	1.744	2.143	2.718	4.098	4.884	5.939	6.89	8.098
2008	0.977	1.882	2.444	3.747	4.165	4.989	5.992	6.143	8.229
2009	1.219	1.47	2.348	3.331	4.251	4.824	5.807	6.776	8.571
2010	0.813	1.576	2.344	3.114	4	5.025	4.911	5.873	6.809
2011	0.575	1.5	2.238	3.165	4.05	4.878	5.533	5.898	6.277
2012	0.727	1.518	2.267	3.415	4.287	5.029	5.781	7.968	8.404
2013	1.018	1.596	2.228	3.02	4.071	4.931	5.645	6.143	8.499
2014	0.86	1.496	2.632	3.229	4.162	5.029	5.424	6.193	6.569
2015	0.435	1.326	2.246	3.193	3.985	4.987	5.953	6.418	7.677
2016	0.437	1.424	2.201	3.268	4.208	5.027	6.058	6.841	7.583
2017	0.472	1.286	2.138	3.138	4.176	5.131	5.858	7.015	8.083

MAT	2	3	4	5	6	7	8	9	10+
1984	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1985	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1986	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1987	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1988	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1989	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1990	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1991	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1992	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1993	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1994	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1995	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1996	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1997	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1998	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
1999	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2000	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2001	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2002	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2003	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2004	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2005	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2006	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2007	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2008	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2009	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2010	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2011	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2012	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2013	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2014	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2015	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1

2016	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1
2017	0	0.02	0.16	0.46	0.69	0.87	0.91	0.96	1

Table 2.14. Norwegian Coastal Cod. Diagnostic output from XSA trial run based on commercial catch-at-age and survey index at age (ages 2–8 in Table 2.6). Proportions of F and M before time of spawning has been set to 0 for all years and ages.

Lowestoft VPA Version 3.1

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Extended Survivors Analysis

Norwegian Coastal Cod COMBSEX PLUSGROUP

CPUE data from file coast-9.txt

Catch data for 34 years. 1984 to 2017. Ages 2 to 10.

Fleet	First year	Last year	First age	Last age	Alpha	Beta
Norw. Coast. survey	1995	2017	0	8	0.75	0.85

Time-series weights :

Tapered time weighting applied

Power = 3 over 20 years

Catchability analysis :

Catchability dependent on stock size for ages < 4

Regression type = C

Minimum of 5 points used for regression

Survivor estimates shrunk to the population mean for ages < 4

Catchability independent of age for ages >= 7

Terminal population estimation :

Survivor estimates shrunk towards the mean F

of the final 2 years or the 4 oldest ages.

S.E. of the mean to which the estimates are shrunk = 1.000

Minimum standard error for population

estimates derived from each fleet = .300