

7 Golden redfish (*Sebastes norvegicus*) in subareas 1 and 2

Multiyear advice

Following a three-year advice cycle, this stock was assessed in 2016 with advice nominally covering 2017–2019. Following the WKREDFISH 2018 benchmark, there is a new assessment and advice in 2018. The AFWG recommended that the stock follows a two-year assessment cycle, with the next assessment and advice being issued in 2020. The present report updates the catch tables but does not update the assessment or give advice.

7.1 Status of the Fisheries

7.1.1 Recent regulations of the fishery

A description of the historical development of the fishery and regulations is found in the Stock Annex for this stock. The Stock Annex was last updated in February 2018.

Prior to 1 January 2003 there were no regulations particularly for the *S. norvegicus* fishery, and the regulations aimed at *S. mentella* had only marginal effects on the *S. norvegicus* stock. After this date, all directed trawl fishery for redfish (both *S. norvegicus* and *S. mentella*) outside the permanently closed areas were forbidden in the Norwegian Economic Zone north of 62°N and in the Svalbard area. When fishing for other species it was legal to have up to 15% redfish (both species together) in round weight as bycatch per haul and on board at any time. Until 14 April 2004 there were no regulations of the other gears/fleets fishing for *S. norvegicus*. After this date, a minimum legal catch size of 32 cm has been set for all fisheries, with the allowance to have up to 10% undersized (i.e. less than 32 cm) specimens of *S. norvegicus* (in numbers) per haul. In addition, a time-limited moratorium (up to 8 months) was enforced in the conventional fisheries (gillnet, longline, handline, Danish seine) except for handline vessels less than 11 metres. From 2016, when trawling outside 12 nm, vessels can have up to 20% by weight of redfish in each catch and upon landing. When trawling inside 12 nm, it is permitted to have up to 10% bycatch. Since 2015 it has been prohibited to fish for redfish with conventional gears north of 62°N. The ban does not, however, apply to vessels less than 15 metres fishing with handline during 1 June - 31 August. When fishing with conventional gears for other species, it is permitted to have up to 10% by weight of redfish. Vessels less than 21 metres can still have up to 30% by weight of redfish in the period 1 August to 31 December. Bycatch of redfish is calculated in live weight per week.

7.1.2 Landings prior to 2019 (Tables 7.1–7.4, D1 and D2, figures 7.1–7.2)

Nominal catches of *S. norvegicus* by country for subareas 1 and 2 combined, and for each subarea and division are presented in tables 7.1–7.4. The total landings for both *S. norvegicus* and *S. mentella* are presented in section 6 (Tables 6.12 and 6.13). The sources of information used are catches reported to ICES, NEAFC, Norwegian authorities (foreign vessels fishing in the Norwegian economic zone) or direct reporting to the AFWG. Where catches are reported as *Sebastes* sp., they are split into *S. norvegicus* and *S. mentella* by AFWG experts based on available information and prior knowledge. Landings of *S. norvegicus* showed a decrease from a level of 23 000–30 000 t in 1984–1990 to a stable level of about 16 000–19 000 t in the years 1991–1999. Since then the landings have decreased further, and the total landings figures for *S. norvegicus* in 2003–2013 have

been low but remarkably stable, between 5500–8000 t. In 2014 the landings decreased to 4436 t, followed by a further decrease in 2015 with landings of 3629 t, mainly due to stronger regulations. This has since reversed with 6647 tonnes in 2018 (provisional). The time-series of *S. norvegicus* landings is given in Figure 7.1. A map of *Sebastes norvegicus* catches from Norwegian vessels' logbooks in 2017 is shown in Figure 7.2. Note that species identification from landings and logbooks is not always trusted when the Norwegian final landings data are prepared (see Stock Annex).

The Norwegian landings are presented by gear and month/year in figures 7.3a,b. Reported landings continued to decrease in 2015 and were then at the lowest level since World War II. Since 2015 only bycatches of *S. norvegicus* are allowed except for a limited amount caught by vessels less than 15 meters fishing with handline during 1 June to 31 August.

The reported Russian catches of *S. norvegicus* have been around 600–900 t since 2001, but increased in 2018 to 1834 tonnes. Twelve other countries together usually report catches of about or less than 300–600 t per year (Table 7.1).

The bycatch of redfish (*Sebastes* spp.) in the Norwegian Barents Sea shrimp fisheries during 1983–2017 were dominated by *S. mentella*, and hence influenced the *S. norvegicus* to a much lesser extent. However, these bycatches probably inflicted an extra mortality on *S. norvegicus* in the coastal areas before the sorting grid was enforced in 1990. From 1 January 2006, the maximum legal bycatch of redfish juveniles in the international shrimp fisheries in the northeast Arctic has been reduced from ten to three redfish per 10 kg shrimp.

Information describing the splitting of the redfish landings by species and area is given in the Stock Annex.

7.1.3 Expected landings in 2019

New regulations were designed and implemented in the Norwegian coastal fisheries with conventional gears in 2016. No directed fishery is allowed, but the bycatch-regulations are currently rather liberal with vessels less than 21 meters being allowed to have up to 30% by weight of redfish in the period 1. August – 31. December and calculated in live weight per week. An observed increase of *S. norvegicus* in the trawl catches in 2016–2018 should lead to a careful monitoring of the trawl fishery in 2019 to see if this continues and hence be a sign of new recruitment to the trawl fishery. For the time being, however, the total landings in 2019 are expected to increase due to the raised quota for *S. mentella*, and thus an increase in bycatch of *S. norvegicus*.

7.2 Data Used in the Assessment (Table 0.1 and Figure E2)

An overview of the sampling levels (by season, area and gear) of the data used in the assessment is presented in Figure E2 for 2013. Although Table 0.1 (see Section 0) shows a reasonably good total sampling level for this stock, the number of different boats sampled, and the gear and area coverage should be improved.

7.2.1 Catch-at-length and age (Table 7.5)

Age composition data for 2017 were only provided by Norway, accounting for 60% of the total landings. Norwegian data for 2009–2016 were also revised. Other countries were assumed to have the same relative age distribution and mean weight as Norway. The updated catch in numbers-at-age matrix is shown in Table 7.5. Catch at length data were also only available from Norway in 2017 (Figure 7.4). Norwegian data on age and length were revised for 2009–2016.

7.2.2 Catch weight-at-Age (Table 7.6)

Weight-at-age data for ages 7–24+ were available from the Norwegian landings in 2017, and revised for 2009–2016. Variations in the weight-at-age of young individuals (<10 years) must be considered with caution as these numbers are derived from only a small number of aged individuals.

7.2.3 Maturity-at-age (Table E4, Figure 7.9a-b)

A maturity ogive has previously not been available for *S. norvegicus*, and knife-edge maturity-at-age 15 (age 15 as 100% mature) had hence been assumed. Maturity-at-age and length is available from Norwegian surveys and landings, as reported in Table E4 and presented in Figure 7.9a. The maturity ogive modelled by Gadget is presented (Figure 7.9b). This analysis shows that 50% of the fish are mature at age 12.

7.2.4 Survey results (Tables E1a,b-E2a,b-E3, figures 7.5a,b–7.7)

The results from the following research vessel survey series were evaluated by the Working Group:

Winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)) from 1986 to 2018 (joint with Russia some of the years since 2000) in fishing depths of 100–500 m. Length compositions for the years 1986–2017 are shown in Table E1a and Figure 7.5a. Age compositions for the years 1992–2016 are shown in Table E1b and Figure 7.5b. This survey covers important nursery areas for the stock. As described in the stock annex, this survey is used in model tuning.

Norwegian Svalbard (Division 2.b) bottom-trawl survey (August–September) from 1985 to 2017 in fishing depths of 100–500 m (depths down to 800 m incl. in the swept-area). Since 2005 this is part of the Ecosystem survey (Eco-NoRu-Q3 (BTr)). Length compositions for the years 1985–2016 and age compositions for the years 1992–2008, 2012, 2013 and 2016 are shown in Table E2a and E2b, respectively. Data for 2017 were not available in time for AFWG 2018. This survey covers the northernmost part of the species' distribution. Insufficient number of age readings in 2009 and 2011, and no age samples collected in 2010 did not allow for updating the age composition in these years. This survey is not currently included in the model tuning.

Data on length and age from both these surveys have been combined and are shown in figures 7.6a,b.

Norwegian Coastal and Fjord survey in 1998–2016 from Finnmark to Møre (NOcoast-Aco-Q4). Length composition from catch rates (numbers/nm² averaged for all stations within subareas and finally averaged, weighted by subarea, for the total surveyed area) are shown in Figure 7.7 and Table E3. The survey is an acoustic survey designed to obtain indices of abundance and estimates of length and weight-at-age of saithe and cod north of 62°N. The index for golden redfish was previously used in the assessment, but was considered unreliable and stopped in 2010. A new index series was recalculated for the benchmark in 2018 (WKREDFISH 2018). The aggregated survey index varied too much year-to-year to be driven by the population dynamics, but the length distribution was included in the assessment.

The bottom-trawl surveys covering the Barents Sea and the Svalbard areas show that the abundance indices over the commercial size range (>25 cm) were relatively stable up to 1998 but declined to lower levels afterwards. Abundance of prerecruits (<25 cm) has steadily decreased since 1991 and has dropped to very low levels after 2000 (Figure 7.5a). An increase in the number of

prerecruits is visible from 2008 onwards. Although this could originally partly result from taxonomic misidentification, the confirmation of increased numbers for individuals of size 15 cm and greater gives some confidence that at least some of the increasing numbers are *S. norvegicus*.

7.3 Assessment with the GADGET model

7.3.1 Description of the model

Since AFWG2005, the GADGET model has been used for this stock, first with experimental runs, and then as analytical assessments following its adoption by WKRED (2012) benchmark (ICES CM 2012/ACOM:48). The model was then approved again at WKREDFISH (2018). Although the stock has a three-year advice cycle, and advice was updated in 2016, we update the advice this year following the benchmark. A number of changes have been made to the model at the benchmark; the model is moved to a one-year time-step; The fleet structure has been revised to better reflect recent fishing patterns; age-length data are used for tuning in 5 cm (rather than the previous 1 cm) bins to reduce the extensive noise in this series; proportions (but not absolute abundance) by length in the coastal survey is used for tuning; the model weights have been re-calculated; a number of minor errors in the model and data were fixed. Full details are in the WKREDFISH benchmark report (ICES 2018).

The GADGET model used for the assessment of *S. norvegicus* in subareas 1 and 2 is closely related to the GADGET model that currently is used by the ICES Northwestern WG on *S. norvegicus* (Björnsson and Sigurdsson, 2003). The functioning of a Gadget model, including parameter estimation and data used for tuning, is described in Bogstad *et al.* (2004) and in the stock annex for *S. norvegicus*. In brief, the model is a single species forward simulation age-length structured model, split into mature and immature components. There are three commercial fleets (a gillnet, a trawl and a combined longline and handline fleet). Prior to 2009 the trawl and longline fleets are combined into one, due to difficulties in obtaining data on a finer resolution. The gillfleet has different selectivity from 2009 compared to 2008 and earlier. There are two surveys used in the model, the winter survey and coastal survey. The winter survey tunes to total survey index, length distributions (only). Growth and fishing selectivity within each fleet and survey are assumed constant over time (with the exception of the gillfleet), and recruitment is estimated on annual basis (no SSB-recruit relationship).

The weighting scheme for combining the different datasets into a single likelihood score is a method where weights are selected so that the catch and survey data have approximately equal contribution to the overall likelihood score in the optimized model, and that each dataset within each group gives approximately equal contributions to each other. This ensures that both noise and bias (actually divergence from the consensus) are taken account of in the weighting of datasets. The parameters in the model are estimated using a combination of Simulated Annealing (wide area search) and Hooke and Jeeves (local search) repeated in sequence until a converged solution is found.

7.3.2 Data used for tuning

- Annual catch in tonnes from the commercial fishing fleets, i.e. Norwegian gillnet, and trawl fleet, longline since 2009 and “combined trawl and longline” prior to 2009.
- Annual length distribution of total international commercial landings from the commercial fishing fleets to 2017. Due to late data submissions, there is one-year time-lag in the inclusion of length distributions from other countries than Norway.
- Annual age-length data (1 year by 5 cm resolution) from the same fishing fleets, up to 2017

- Length disaggregated frequencies from the Barents Sea (Division 2.a) bottom-trawl survey (February) from 1990–2017 (Table E1a)
- Age–length data and aggregated survey indices from the same survey up to 2017 (Table E1b)
- Length disaggregated frequencies from the Barents Sea (Division 2.a) coastal survey (February) from 1998–2017 (Table E3, Figure 7.7)

7.3.3 Assessment results using the Gadget model

The general patterns in the stock dynamics of *S. norvegicus* are similar to those modelled for the past several years (Figure 7.12), and have not been altered by the benchmark, but the recruitment event in 2003 is now beginning to have a noticeable positive effect on the overall stock. The overall stock numbers and biomass have shown a decline over a number of years, but the recent recruitment means that immature numbers and biomass are now starting to improve. Some of the 2003 year class are now starting to mature, and the mature stock numbers are therefore stabilizing. The mature biomass is responding more slowly, since the maturing fish are still relatively small.

As in previous years we note that there has been a tendency for some recruitment signal to be reduced in subsequent years, possibly due to misidentification of small *S. mentella* (which is a larger stock and has had good recent recruitment) as *S. Norvegicus*, and the model has repeatedly revised down the estimates of this recruitment, although not to zero. The largest fish from the 2003 year class are now entering the mature stock and the fishery, and this is providing multiple sources of information that this was a genuinely good recruitment. The WG stresses that the subsequent recruitment signals (for example the high estimated 2009 year class) should be treated with extreme caution until they enter the fishery (c. 12–15 years after recruiting).

The most important conclusions to be drawn from the current assessment using the Gadget model are:

- The recruitment to the stock has been very poor for a long period, and especially prior to 2005 (Figure 7.11)
- There has been somewhat better estimated recruitment in recent years, with a reasonably good recruitment in 2003. There may also be a second pulse of good recruitment in 2009, however this is still highly uncertain, and will need to be tracked for some years to reduce this uncertainty.
- The estimated fishing mortality (F_{15+}) declined between 1990 and 2005 and remained stable until around 2010, but has slowly increased since then (Table 7.7). The current mortality is estimated to $F = 0.3$ (Figure 7.10), well above a sustainable level for a redfish species, and above the $F_{MSY} = 0.05$ estimated at WKRED 2018. Note that the F estimate is based on the 2003 year class being a good one, and the estimate would be higher if this is not the case.

According to the model the total-stock biomass (3+) of *S. norvegicus* has decreased from about 151 000 tonnes in 1992–1993 just under 40 000 tonnes in 2015 (Figure 7.12, Table 7.8). Due to the improved recruitment from the 2003 year class the total biomass is beginning to stabilize, although the SSB is continuing to decline. This reduction is primarily the result of prolonged low recruitment, combined with excessively high fishing pressure.

7.1 State of the stock

Survey observations and Gadget assessment update confirm previous diagnostics that this stock is currently in a very poor situation. This is confirmed by the production model run as a check at WKRED, which produced similar trends. Indications are that the SSB is continuing to fall. This

has led to an upwards trend resulting in a level of F which may place an increasing burden on an already poorly performing stock. Furthermore, in the absence of a substantial population of fish in the 10–18 age range, the fishery has become increasingly concentrated on the oldest (18 years and older) individuals, reducing the reproductive capacity of the stock.

There are indications that new recruits from the 2003 year class may have entered the population in recent years as noted in previous AFWG reports. The estimated immature biomass is now beginning to increase, and the rate of decline of SSB is reducing. However, the total level of this recruitment is still uncertain, and although the 2003 is estimated to have been the best since the late 1990s, it is not the largest year class seen in the time-series. Consequently, any rebuilding from this year class is likely to be slow. Rebuilding of this stock is therefore dependent on protecting both the existing SSB and any fish recruiting to the SSB. Note that there are significant uncertainties from misidentification between the redfish species in the Barents Sea, and thus the exact values of both stock and F are uncertain, although the trends are clearly defined.

Sebastes norvegicus is currently on the Norwegian Redlist as a threatened (EN) species according to the criteria given by the International Union for Conservation of Nature (IUCN).

Red-listing is understood to mean that a species (or stock) is at risk of extinction. ICES convened two workshops in 2009. The first Workshop WKPOOR1 (ICES CM 2009/ACOM:29) addressed methods for evaluating extinction risk and outlined approaches that could support advice on how to avoid potential extinction. The second Workshop WKPOOR2 (ICES CM 2009/ACOM:49) applied the results of the first workshop to four stocks selected as being of interest to Norway and ICES.

There are three general methods for evaluating extinction risk: (1) screening methods, such as the IUCN redlisting criteria; (2) simple population viability analysis (PVA) based on time-trends; and (3) age structured population viability analysis. None of the methods are considered reliable for accurately estimating the absolute probability of extinction, but they may be useful to evaluate the relative probability of extinction between species or between management options.

The fishery is largely concentrated on the mature individuals. With a currently estimated SSB of around 23 000 tonnes, and a F_{MSY} of 0.05, one would expect a sustainable catch to be in the order of 1000 to 1500 tonnes. The current catches are well above this level.

7.3.4 Biological reference points

Reference point calculations were conducted at WKRED benchmark (2018), based on a BLOSS with reasonable recruitment, and a forecast with constant recruitment to produce a F_{MSY} candidate. Note that the benchmark used preliminary data, and that the results presented here are slightly changed from those at WKRED (2018). We therefore follow the methodology presented at WKRED (2018), but adjust the B_{lim} based on the revised SSB estimate for 2002. This has the effect of raising the proposed B_{lim} from 44 000 tonnes to 49 000 tonnes. The F_{MSY} calculations are unaffected, as these are based on steady state forecasts.

No stock recruitment relationship is presented for this stock. Within the model, recruitment is modelled as an annual recruitment value with no relationship with the SSB.

- B_{lim} : B_{lim} is based on the Lowest Observed Stock Size at which reasonable recruitment was observed. This is assumed to be the 2003 year class, at which time the SSB is estimated to be 49 000 tonnes (or 44 000 tonnes using the benchmark values)
- B_{pa} : Using the ICES default multiplier of 1.4 for B_{pa} gives a B_{pa} value of 68 600 tonnes (61 000 tonnes using the benchmark values)

The stock is currently well below the biomass limit reference point, and thus F_{MSY} is not recommended as the current fishing level. However, it was considered useful to try to estimate a candidate F_{MSY} reference point, which can be used to compare against management performance. Using yield-per-recruit analysis WKREDFISH_2018 proposes $F_{0.1(15+)}$, estimated to be 0.0525, as a candidate F_{MSY} .

Given the poor state of this stock, management should be based on the need to protect and recover the stock, not on F_{MSY} .

7.3.5 Management advice

AFWG considers that the stock is severely depleted. There are signs that recruitment in 2003 is now beginning to stabilize and, for the immature fish, improve the stock status. However, the stock remains in a poor state, and there are no indications that the mature stock is yet improving. AFWG therefore recommends that current area closures and low bycatch limits should be maintained. No directed fishery should be conducted on this stock at the moment, and the percent legal bycatch should be set as low as possible for other fisheries to continue. There will be no directed fishery for *S. norvegicus* in 2019. It is critical that the bycatch regulations do not allow the catch to increase, as this would impair prospects for recovery.

7.3.6 Implementing the ICES F_{MSY} framework

As a long-lived species, *S. norvegicus* has many year classes contributing to the population, and consequently a relatively stable stock level from year-to-year. This makes it relatively simple to manage to some proxy of MSY (e.g. $F_{0.1}$) once the biomass has reached close to B_{MSY} , provided adequate measures can be implemented to reduce fishing pressure to an appropriate level. It should be noted that the current fishery is well above the preliminary F_{MSY} for the stock (Section 7.6). The main focus should therefore be on reducing total F . The current priority is to stabilize the stock and prevent further decline, and allow the recruiting 2003 year class to grow and reproduce. Only then could a recovery strategy and eventually an MSY fishery be implemented. The recent upturn in immature biomass gives some hope that such recovery may be possible, given light fishing pressure.

Table 7.1 *Sebastes norvegicus* in subareas 1 and 2. Nominal catch (t) by countries in Subarea 1 and divisions 2.a and 2.b combined.

Year	Denmark	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Lithuania	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Total
1998	-	78	494	131	33	-	19	-	-	16 540	-	6	1 632	51	171	19 155
1999	-	35	35	228	47	14	7	-	-	16 750	-	3	1 691	7	169	18 986
2000	-	17	13	160	22	16	-	-	-	13 032	-	16	1 112	-	73	14 461
2001	-	37	30	238	17	-	1	-	-	9 134	-	7	963	1	119	10 547
2002	-	60	31	42	31	3	-	-	-	8 561	-	34	832	3	46	9 643
2003	-	109	8	122	36	4	-	-	89	6 853	-	6	479	-	134	7 840
2004	-	19	4	68	20	30	-	-	33	6 233	-	5	722	3	69	7 206
2005	-	47	10	72	36	8	-	-	48	6 085	-	56	614	8	52	7 037
2006	-	111	8	35	44	31	3	-	21	6 305	-	69	713	9	39	7 388
2007	-	146	15	67	84	68	13	-	20	5 784	-	225	890	5	55	7 372
2008	-	274	63	30	71	27	6	-	2	5 216	-	72	749	4	85	6 599
2009	-	70	1	58	81	66	-	-	1	5 451	-	30	698	-	31	6 487
2010	-	171	51	31	72	22	-	-	-	5 994	1	28	565	3	44	6 981
2011	-	24	53	9	51	22	-	-	1	4 681	48	25	919	6	13	5 852
2012	-	87	182	71	58	23	12	-	5	4 247	34	17	681	-	100	5 517
2013	-	83	353	1	45	8	1	-	-	3 771	19	36	797	-	493	5 609

Year	Denmark	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Lithuania	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Total
2014	-	67	219	6	20	29	-	-	1	3 053	21	5	806	-	211	4 436
2015	1	76	53	24	211	35	-	-	-	2 488	17	-	664	2	57	3 629
2016	7	183	30	4	87	55	-	-	-	3 239	26	-	864	-	76	4 572
2017	-	123	17	19	61	65	-	-	2	3 353	27	90	1 297	44	160	5 258
2018 ¹	1	146	37	52	77	67	-	5	-	4 276	36	67	1 834	12	37	6 647

¹ Provisional figures.

Table 7.2 *Sebastes norvegicus* in subareas 1 and 2. Nominal catch (t) by countries in Subarea 1.

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Norway	Poland	Portugal	Russia	Spain	UK	Total
1998	78	-	5	-	-	-	2109	-	-	308	-	30	2530
1999	35	-	18	9	14	-	2114	-	-	360	-	11	2561
2000	-	-	1	-	16	-	1983	-	-	146	-	12	2159
2001	4	-	11	-	-	-	1053	-	-	128	-	16	1212
2002	15	1	5	-	-	-	693	-	-	220	-	9	943
2003	15	-	-	1	-	-	815	-	-	140	-	4	975
2004	7	-	-	-	-	-	1237	-	-	213	-	12	1469
2005	10	1	-	-	-	-	1002	-	-	61	-	4	1078
2006	46	-	-	-	-	-	690	-	-	136	-	-	872
2007	15	-	12	15	-	-	1034	-	-	49	2	20	1147
2008	45	7	2	-	-	-	634	-	3	49	-	15	755
2009	-	-	3	2	6	-	701	-	30	19	-	24	768
2010	58	-	-	-	-	-	497	-	-	21	1	6	583
2011	24	-	-	2	1	-	674	-	-	7	-	-	708
2012	17	-	3	1	9	2	546	-	-	27	-	18	623
2013	28	2	1	-	+	-	574	-	-	41	-	4	651
2014	59	10	6	17	4	-	403	2	-	27	-	17	542
2015	57	4	9	211	13	-	514	2	-	51	2	10	871
2016	161	7	4	74	-	51	782	4	-	136	-	60	1275
2017	81	5	-	8	4	-	844	2	2	211	2	23	1180
2018 ¹	146	28	21	29	-	-	926	5	3	302	5	25	1 485

¹ Provisional figures.

+ Less than 1 t

Table 7.3 *Sebastes norvegicus* in subareas 1 and 2. Nominal catch (t) by countries in Division 2.a.

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherland	Norway	Poland	Portugal	Russia	Spain	UK	Total
1998	-	494	116	33		19	-	14 326	-	6	1 078	51	137	16 260
1999	-	35	210	38		7	-	14 598	-	3	976	7	156	16 030
2000	17	13	159	22		-	-	11 038	-	16	658	-	61	11 984
2001	33	30	227	17		1	-	8 002	-	6	612	1	103	9 031
2002	45	30	37	31	3	-	-	7 761	-	18	192	2	32	8 151
2003	94	9	122	35	4	-	89	5 970	-	6	264		130	6 722
2004	12	4	68	20	30	-	33	4 872	-	5	396	3	58	5 500
2005	37	9	60	36	8	-	48	4 855	-	56	265	8	48	5 430
2006	60	8	35	44	31	3	21	4 404	-	59	293	9	39	5 006
2007	119	15	55	69	68	13	20	4 101	-	70	599	3	35	5 168
2008	229	56	28	71	27	6	2	4 456	-	68	450	4	70	5 467
2009	70	1	55	79	60	-	1	4 543	-	17	500	-	7	5 333
2010	113	51	31	72	22	-	-	5 414	1	26	287	2	38	6 056
2011	-	51	9	49	20	-	1	3 942	-	-	695	2	13	4 782

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherland	Norway	Poland	Portugal	Russia	Spain	UK		Total
2012	49	182	33	57	13	2	2	3 599	-	1	427	-	33		4 398
2013	55	343	-	45	8	-	-	3 076	-	9	475	-	466	Denmark - 1	4 478
2014	8	209	-	3	25	-	1	2 465	-	2	559	-	178		3 449
2015	18	49	15	-	22	-	-	1 946	12	-	439	-	47		2 548
2016	22	23	-	13	4	-	-	2 417	8	-	545	-	15		3 047
2017	41	12	19	36	61	-	2	2 455	22	88	680	38	137		3 591
2018 ¹	-	9	17	43	67	-	-	3 275	12	64	489	7	12	Lithuania - 5	4 000

¹Provisional figures.

Table 7.4 *Sebastes norvegicus* in subareas 1 and 2. Nominal catch (t) by countries in Division 2.b.

Year	Denmark	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Total
1998	-	-	-	10	-				105	-	-	246	-	3	364
1999	-	-	-	-	-				38	-	-	355	-	2	395
2000	-	-	-	-	-				10	-	-	308	-	-	318
2001	-	-	-	-	-				79	-	1	223	-	-	303
2002	-	-	-	-	-				107	-	16	420	1	5	549
2003	-	-	-	-	-				68	-	-	75	-	-	143
2004	-	-	-	-	-				124	-	-	113	-	-	237
2005	-	-	-	13	-				2281	-	-	288	-	-	529
2006	-	5	-	-	-				1211	-	10	284	-	-	1510
2007	-	12	-	-	-				649	-	155	242	-	-	1057
2008	-	-	-	-	-				126	-	1	250	-	-	377
2009	-	-	-	-	-				207	-	-	179	-	-	386
2010	-	-	-	-	-				83	-	22	257	-	-	342
2011	-	-	2	-	-	1	-	-	65	48	25	217	4	-	362
2012	-	21	-	35	-	1	8	3	102	34	16	227	-	49	496
2013	-	-	9	-	-	-	1	-	120	19	27	281	-	23	480
2014	-	-	-	-	-	-	-	-	185	19	3	221	-	16	444
2015	1	-	-	-	-	-	-	-	28	3	-	175	-	-	207
2016	7	-	-	-	-	-	-	-	40	14	-	183	-	-	244
2017	-	-	-	-	18	-	-	-	54	2	-	405	4	-	483
2018 ¹	1	-	-	14	6	-	-	-	75	19	-	1043	-	-	1158

¹ Provisional figures.

Table 7.5. *Sebastes norvegicus* in subareas 1 and 2. Catch numbers-at-age (in thousands).

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp	Total Num.	Tonnes Land.
1992	5	22	78	114	394	549	783	1718	3102	2495	2104	1837	998	858	688	547	268	3110	19670	16185
1993	0	24	193	359	406	1036	1022	1523	2353	1410	1655	1678	745	716	534	528	576	3482	18240	16651
1994	46	7	292	640	816	1930	2096	2030	1601	2725	2668	1409	617	733	514	256	177	1508	20065	18120
1995	60	85	230	672	908	1610	2038	2295	1783	1406	785	563	670	593	419	368	250	3232	17967	15616
1996	9	119	313	361	879	1234	1638	2134	1675	1614	1390	952	679	439	560	334	490	3135	17955	18043
1997	9	98	156	321	686	1065	1781	2276	2172	1848	1421	851	804	608	511	205	334	2131	17277	17511
1998	28	51	206	470	721	968	1512	1736	1582	1045	1277	970	1018	846	443	764	486	3389	17512	19155
1999	78	593	855	572	1006	1230	1618	1480	1612	1239	1407	1558	1019	394	197	459	174	2131	17622	18986
2000	4	13	70	245	902	958	1782	1409	2121	2203	1715	753	483	458	132	230	224	895	14597	14460
2001	23	23	44	199	347	482	1120	1342	1674	1653	1243	568	119	183	154	112	135	254	9675	10547
2002	14	36	71	143	414	686	1199	1943	1377	1274	1196	388	313	99	104	117	113	253	9740	9643
2003	22	25	30	44	204	359	705	1687	1338	1071	937	481	367	146	84	51	18	69	7637	7841
2004	19	47	46	65	198	277	504	590	677	963	1059	787	436	169	183	108	79	186	6390	7320
2005	40	55	94	80	165	173	393	779	741	916	926	743	376	210	189	129	111	220	6338	7037
2006	45	32	56	70	245	204	201	809	549	779	794	747	496	332	310	188	165	397	6419	7348

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp	Total Num.	Tonnes Land.
2007	15	21	31	68	138	306	448	495	523	637	892	616	510	396	225	322	170	630	6443	7306
2008	1	4	14	12	49	139	265	366	361	443	442	538	547	479	281	223	144	1032	5342	6557
2009	0	11	2	4	9	23	144	277	315	248	406	374	509	404	331	323	253	911	4544	6487
2010	1	0	10	7	4	20	75	261	291	529	359	311	531	502	385	295	247	776	4605	6982
2011	2	1	3	0	2	5	64	304	466	266	312	223	378	289	247	229	253	985	4028	5852
2012	15	10	5	12	0	2	228	226	322	295	191	169	184	283	266	268	262	1152	3891	5517
2013	31	88	138	57	10	44	58	202	241	437	321	205	213	270	258	196	322	1216	4309	5608
2014	5	4	8	8	8	15	26	49	67	204	197	148	167	184	165	156	213	1197	2821	4438
2015	15	16	14	17	26	43	29	96	113	128	170	147	159	115	99	96	220	1156	2661	3628
2016	53	59	60	88	88	147	293	217	266	81	178	176	110	162	110	182	191	1103	3563	4674
2017 ¹	40	34	108	56	188	411	484	651	286	139	109	92	88	116	127	116	148	996	4187	5340

¹Provisional figures.

Table 7.6. *Sebastes norvegicus* in subareas 1 and 2. Catch weights at age (kg).

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp
1992	0.18	0.29	0.48	0.42	0.50	0.59	0.58	0.65	0.65	0.71	0.82	0.84	0.94	1.02	1.03	1.15	1.27	1.27
1993	0.2	0.33	0.36	0.43	0.51	0.51	0.64	0.64	0.76	0.86	0.89	0.98	1	1.03	1.21	1.03	1.2	1.14
1994	0.25	0.37	0.38	0.49	0.51	0.64	0.74	0.76	0.86	0.95	1.03	1.07	1.11	1.16	1.15	1.13	1.02	1.36
1995	0.33	0.43	0.64	0.61	0.59	0.65	0.74	0.79	0.84	0.92	1.12	1.01	1.01	1.21	1.14	1.09	1.3	1.01
1996	0.22	0.49	0.56	0.65	0.71	0.81	0.84	0.88	0.96	1	1.02	1.01	1	1.03	1.04	1.14	1.09	1.16
1997	0.23	0.51	0.53	0.74	0.72	0.78	0.8	0.86	0.91	0.99	1.16	1.18	1.21	1.34	1.28	1.54	1.19	1.29
1998	0.37	0.21	0.47	0.62	0.67	0.77	0.77	0.85	1.05	0.96	1.25	1.28	1.3	1.23	1.87	1.46	1.73	1.29
1999	0.14	0.26	0.44	0.57	0.69	0.78	0.86	1.04	1.07	1.12	1.18	1.71	1.09	1.18	1.04	1.34	1.18	1.34
2000	0.19	0.24	0.32	0.44	0.53	0.64	0.73	0.84	0.96	1.11	1.25	1.32	1.53	1.06	1.29	1.32	1.12	1.2
2001	0.15	0.26	0.45	0.55	0.58	0.67	0.8	0.89	1.01	1.14	1.33	1.43	1.62	1.6	1.47	2	2.7	2.31
2002	0.17	0.25	0.33	0.42	0.54	0.67	0.72	0.84	0.98	1.09	1.2	1.3	1.44	1.78	1.68	1.88	2.12	1.84
2003	0.19	0.22	0.31	0.39	0.49	0.58	0.69	0.84	0.96	1.05	1.29	1.36	1.65	1.74	2.09	1.85	2.3	2.38
2004	0.21	0.26	0.36	0.45	0.51	0.59	0.68	0.8	0.96	1.07	1.22	1.34	1.57	1.67	1.75	2.09	1.9	2.04
2005	0.16	0.21	0.36	0.45	0.52	0.58	0.68	0.82	0.94	1.03	1.16	1.36	1.46	1.51	1.67	1.91	2.23	2.27
2006	0.13	0.15	0.28	0.41	0.51	0.58	0.66	0.74	0.83	1	1.14	1.27	1.39	1.46	1.37	1.47	1.64	2.03
2007	0.15	0.21	0.33	0.39	0.5	0.59	0.65	0.77	0.9	1	1.09	1.27	1.42	1.32	1.53	1.47	1.69	1.81

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp
2008	0.41	0.55	0.55	0.57	0.52	0.58	0.65	0.81	0.9	1.07	1.14	1.36	1.51	1.81	1.99	2.01	2.26	1.93
2009	0.00	1.01	0.34	0.59	0.61	0.66	0.82	0.92	0.94	1.09	1.22	1.35	1.40	1.57	1.68	1.74	1.73	2.25
2010	0.15	0.00	0.10	0.32	0.52	0.73	0.77	0.89	0.98	1.09	1.25	1.40	1.48	1.64	1.77	1.99	1.82	1.86
2011	0.16	0.20	0.21	0.00	0.54	0.52	0.72	0.91	1.08	1.14	1.20	1.45	1.40	1.43	1.54	1.60	1.74	1.93
2012	0.19	0.25	0.33	0.72	0.61	0.88	0.70	0.86	0.95	1.02	1.13	1.18	1.33	1.48	1.31	1.55	1.50	2.59
2013	0.20	0.27	0.32	0.44	0.47	0.55	0.63	0.88	0.96	1.08	1.08	1.19	1.21	1.39	1.38	1.62	1.41	1.81
2014	0.20	0.26	0.39	0.41	0.56	0.61	0.71	0.87	0.95	1.07	1.14	1.28	1.46	1.35	1.51	1.62	1.69	1.84
2015	0.16	0.22	0.30	0.50	0.51	0.60	0.66	0.88	0.93	1.04	1.15	1.18	1.23	1.34	1.51	1.50	1.48	1.62
2016	0.17	0.21	0.34	0.62	0.53	0.66	0.68	0.86	0.94	1.03	1.11	1.32	1.43	1.29	1.42	1.43	1.48	2.67
2017 ¹	0.18	0.23	0.29	0.38	0.55	0.59	0.70	0.80	0.92	1.06	1.15	1.35	1.40	1.56	1.37	1.74	1.83	2.92

¹Provisional figures.

Table 7.7. *Sebastes norvegicus* in subareas 1 and 2. Fishing mortalities as estimated by Gadget.

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.05	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10	0.08	0.06	0.05	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02
11	0.11	0.09	0.08	0.08	0.05	0.04	0.05	0.04	0.05	0.05	0.04	0.03	0.03
12	0.15	0.11	0.10	0.11	0.12	0.07	0.07	0.07	0.08	0.08	0.07	0.05	0.05
13	0.19	0.15	0.13	0.14	0.15	0.13	0.11	0.10	0.12	0.12	0.10	0.08	0.07
14	0.24	0.18	0.16	0.16	0.18	0.15	0.17	0.14	0.15	0.16	0.13	0.10	0.10
15	0.30	0.22	0.19	0.19	0.20	0.17	0.20	0.20	0.19	0.20	0.17	0.13	0.12
16	0.36	0.26	0.22	0.22	0.23	0.19	0.22	0.22	0.25	0.25	0.20	0.16	0.15
17	0.43	0.31	0.25	0.25	0.26	0.22	0.24	0.24	0.28	0.30	0.24	0.18	0.17
18	0.46	0.35	0.29	0.28	0.29	0.24	0.26	0.26	0.29	0.32	0.28	0.20	0.18
19	0.50	0.37	0.32	0.30	0.31	0.25	0.28	0.27	0.31	0.34	0.29	0.22	0.20

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
20	0.53	0.39	0.33	0.32	0.33	0.27	0.30	0.29	0.33	0.35	0.30	0.22	0.21
21	0.56	0.41	0.34	0.33	0.35	0.28	0.31	0.30	0.34	0.37	0.30	0.23	0.21
22	0.58	0.42	0.35	0.34	0.36	0.29	0.32	0.31	0.35	0.37	0.31	0.23	0.21
23	0.60	0.43	0.36	0.34	0.36	0.29	0.32	0.31	0.35	0.38	0.31	0.23	0.21
24	0.61	0.44	0.36	0.34	0.36	0.29	0.32	0.31	0.35	0.37	0.30	0.22	0.20
25	0.61	0.44	0.35	0.34	0.35	0.28	0.32	0.31	0.34	0.36	0.29	0.22	0.20
26	0.61	0.43	0.34	0.33	0.34	0.28	0.31	0.30	0.33	0.35	0.28	0.21	0.19
27	0.60	0.41	0.32	0.31	0.33	0.26	0.30	0.29	0.32	0.33	0.25	0.19	0.18
28	0.58	0.39	0.30	0.30	0.31	0.25	0.29	0.28	0.31	0.32	0.24	0.18	0.17
29	0.56	0.37	0.29	0.28	0.29	0.23	0.27	0.26	0.29	0.30	0.23	0.17	0.15
30	0.52	0.33	0.26	0.26	0.27	0.21	0.25	0.23	0.25	0.28	0.19	0.15	0.14
This year													
15+	0.526	0.373	0.304	0.296	0.309	0.251	0.282	0.273	0.306	0.325	0.260	0.196	0.179

[illegible]

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.03
0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.06
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.05	0.07	0.09
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.08	0.07	0.08	0.09	0.08	0.07	0.11	0.14
0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.11	0.10	0.11	0.12	0.12	0.10	0.15	0.19
0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.14	0.12	0.13	0.16	0.15	0.13	0.18	0.24
0.13	0.12	0.11	0.12	0.12	0.12	0.13	0.17	0.15	0.16	0.19	0.18	0.15	0.22	0.29
0.14	0.13	0.13	0.13	0.14	0.14	0.14	0.19	0.17	0.19	0.22	0.21	0.18	0.25	0.34
0.16	0.15	0.14	0.15	0.15	0.15	0.16	0.21	0.19	0.20	0.24	0.23	0.20	0.28	0.37
0.17	0.15	0.15	0.16	0.16	0.16	0.17	0.23	0.20	0.22	0.26	0.24	0.21	0.29	0.40
0.17	0.16	0.15	0.16	0.17	0.16	0.17	0.23	0.20	0.22	0.27	0.25	0.22	0.30	0.41
0.17	0.16	0.16	0.16	0.17	0.16	0.17	0.23	0.20	0.22	0.26	0.25	0.22	0.30	0.41
0.17	0.16	0.16	0.16	0.17	0.16	0.17	0.22	0.20	0.21	0.25	0.24	0.21	0.29	0.39

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
0.17	0.15	0.15	0.16	0.17	0.16	0.16	0.22	0.19	0.20	0.24	0.22	0.20	0.27	0.37
0.16	0.15	0.14	0.15	0.16	0.15	0.15	0.20	0.18	0.19	0.22	0.20	0.18	0.25	0.33
0.15	0.14	0.14	0.15	0.15	0.14	0.15	0.19	0.17	0.18	0.21	0.18	0.16	0.23	0.30
0.14	0.14	0.13	0.14	0.15	0.13	0.13	0.18	0.15	0.16	0.19	0.17	0.15	0.21	0.26
0.13	0.13	0.13	0.14	0.14	0.12	0.12	0.16	0.14	0.15	0.17	0.15	0.14	0.19	0.23
0.12	0.12	0.12	0.13	0.14	0.12	0.11	0.14	0.13	0.14	0.16	0.14	0.12	0.17	0.21
0.11	0.11	0.12	0.13	0.13	0.11	0.10	0.13	0.11	0.13	0.15	0.13	0.12	0.16	0.19
0.09	0.09	0.10	0.11	0.11	0.09	0.08	0.10	0.09	0.10	0.12	0.10	0.09	0.12	0.13
0.144	0.136	0.132	0.142	0.146	0.136	0.138	0.184	0.162	0.176	0.207	0.189	0.166	0.232	0.305

Table 7.8. *Sebastes norvegicus* in subareas 1 and 2. Stock numbers, biomass, mean weight and maturity ogives as estimated by GADGET.

year	total stock			mature			immature			recruit	
	number	mean wt	biomass	number	mean wt	biomass	number	mean wt	biomass	F(15+)	age 3
	(millions)	(kg)	(1000t)	(millions)	(kg)		(millions)	(kg)	(1000t)		(millions)
1986	383	0.37	139.85	101	0.69	69.7	282	0.25	70.13		6.53
1987	376	0.36	136.94	102	0.68	68.9	274	0.25	68.09		3.52
1988	350	0.37	131.22	100	0.65	65.1	250	0.26	66.15		1.74
1989	325	0.39	127.41	99	0.63	62.4	226	0.29	64.99		1.44
1990	296	0.40	117.53	93	0.60	55.7	203	0.30	61.88	0.53	1.47
1991	277	0.42	115.95	94	0.60	55.8	183	0.33	60.14	0.37	1.42
1992	261	0.45	116.52	95	0.61	58.6	166	0.35	57.93	0.30	1.36
1993	245	0.47	115.76	96	0.64	61.4	149	0.37	54.35	0.30	1.29
1994	229	0.49	112.54	94	0.67	63.0	135	0.37	49.53	0.31	1.44
1995	216	0.51	110.92	93	0.71	65.8	123	0.37	45.08	0.25	1.31
1996	197	0.54	105.64	89	0.74	65.9	108	0.37	39.75	0.28	0.86
1997	180	0.56	99.78	84	0.77	64.9	96	0.36	34.87	0.27	0.89
1998	158	0.58	90.90	77	0.80	60.9	81	0.37	30.00	0.31	0.43
1999	137	0.59	80.89	68	0.81	55.2	68	0.38	25.72	0.32	0.35

year	total stock				mature		immature			recruit	
	number	mean wt	biomass	number	mean wt	biomass	number	mean wt	biomass	F(15+)	age 3
	(millions)	(kg)	(1000t)	(millions)	(kg)		(millions)	(kg)	(1000t)		(millions)
2000	120	0.62	74.39	62	0.83	51.7	58	0.39	22.68	0.26	0.27
2001	108	0.66	71.05	58	0.87	50.6	50	0.41	20.46	0.20	0.30
2002	97	0.70	68.04	54	0.91	49.7	43	0.43	18.37	0.18	0.25
2003	87	0.76	66.03	51	0.97	49.6	36	0.46	16.43	0.14	0.13
2004	80	0.80	64.01	48	1.02	49.4	32	0.46	14.57	0.14	0.32
2005	73	0.85	61.68	45	1.08	49.0	28	0.46	12.73	0.13	0.22
2006	78	0.76	58.91	42	1.14	47.6	36	0.32	11.35	0.14	1.40
2007	72	0.77	55.64	39	1.18	45.6	34	0.30	10.07	0.15	0.38
2008	66	0.80	52.72	36	1.22	43.6	30	0.30	9.09	0.14	0.21
2009	61	0.82	49.78	33	1.26	41.4	28	0.30	8.38	0.14	0.24
2010	55	0.83	45.23	29	1.29	37.5	26	0.30	7.76	0.18	0.21
2011	60	0.71	42.46	27	1.31	34.7	33	0.24	7.78	0.16	1.14
2012	75	0.54	40.38	25	1.30	31.9	51	0.17	8.50	0.18	2.23
2013	69	0.55	37.86	23	1.23	28.9	45	0.20	8.96	0.21	0.06
2014	62	0.58	36.48	23	1.18	27.0	39	0.24	9.44	0.19	0.03

year	total stock			mature			immature			recruit	
	number	mean wt	biomass	number	mean wt	biomass	number	mean wt	biomass	F(15+)	age 3
	(millions)	(kg)	(1000t)	(millions)	(kg)		(millions)	(kg)	(1000t)		(millions)
2015	58	0.62	35.87	23	1.13	26.0	35	0.28	9.84	0.17	0.05
2016	77	0.46	34.96	22	1.09	24.2	54	0.20	10.72	0.23	2.52
2017	110	0.31	34.45	22	1.00	22.0	88	0.14	12.41	0.30	4.11

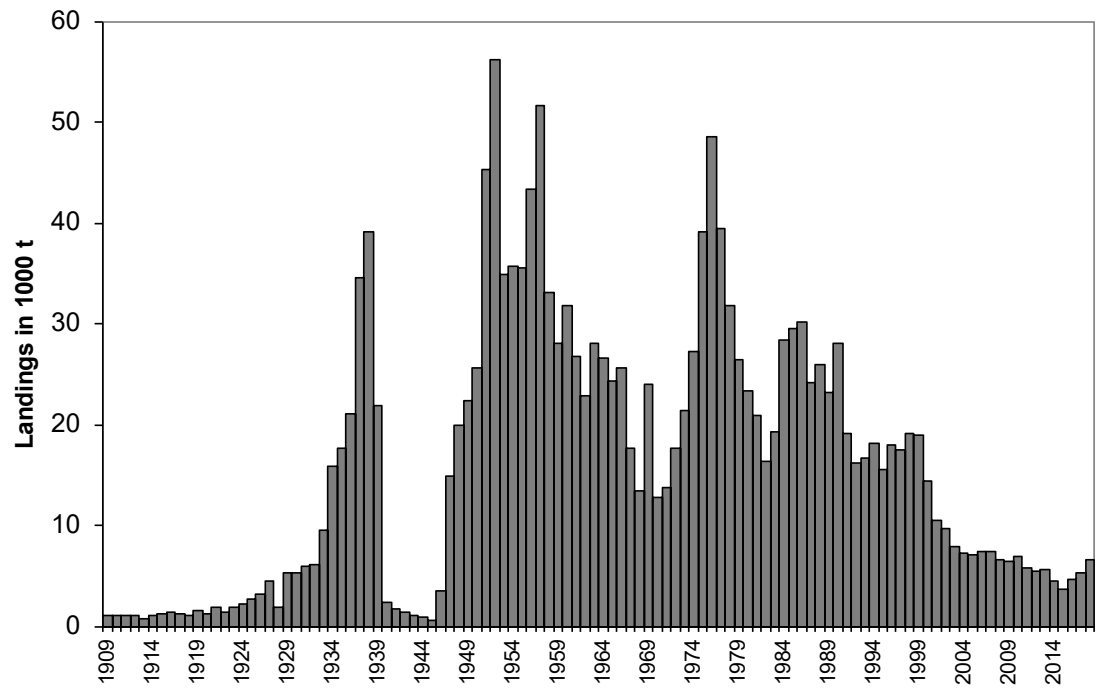


Figure 7.1. *Sebastes norvegicus* in subareas 1 and 2. Total international landings 1908–2018 (in thousand tonnes).

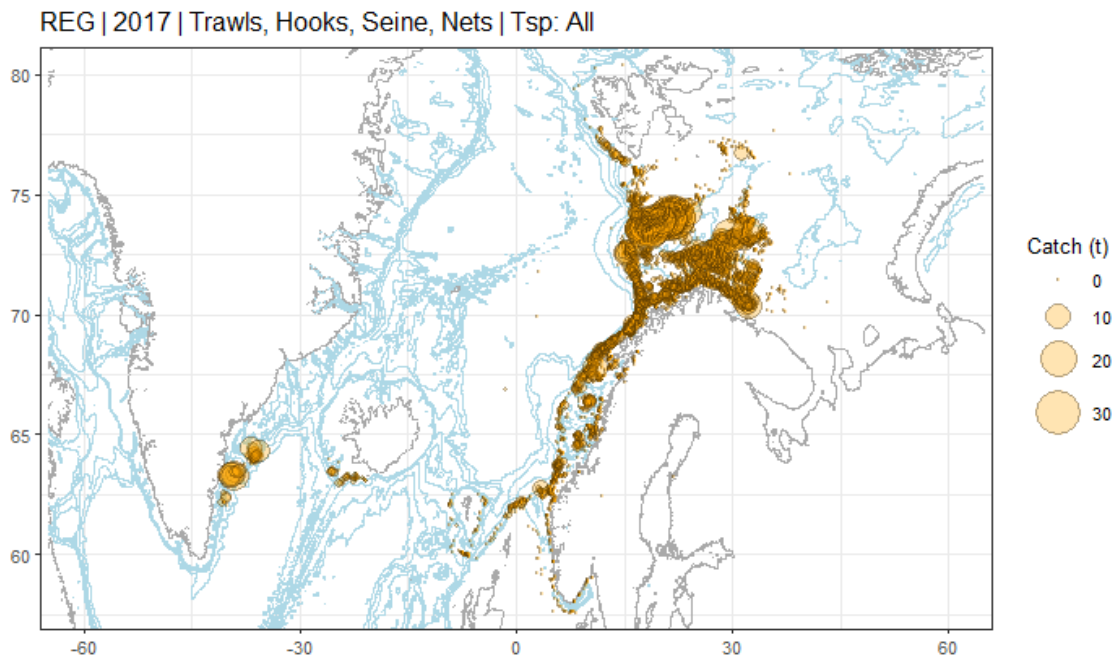


Figure 7.2. *Sebastes norvegicus* in subareas 1 and 2. Catches (including bycatch) of *Sebastes norvegicus* in 2017 from Norwegian logbooks.

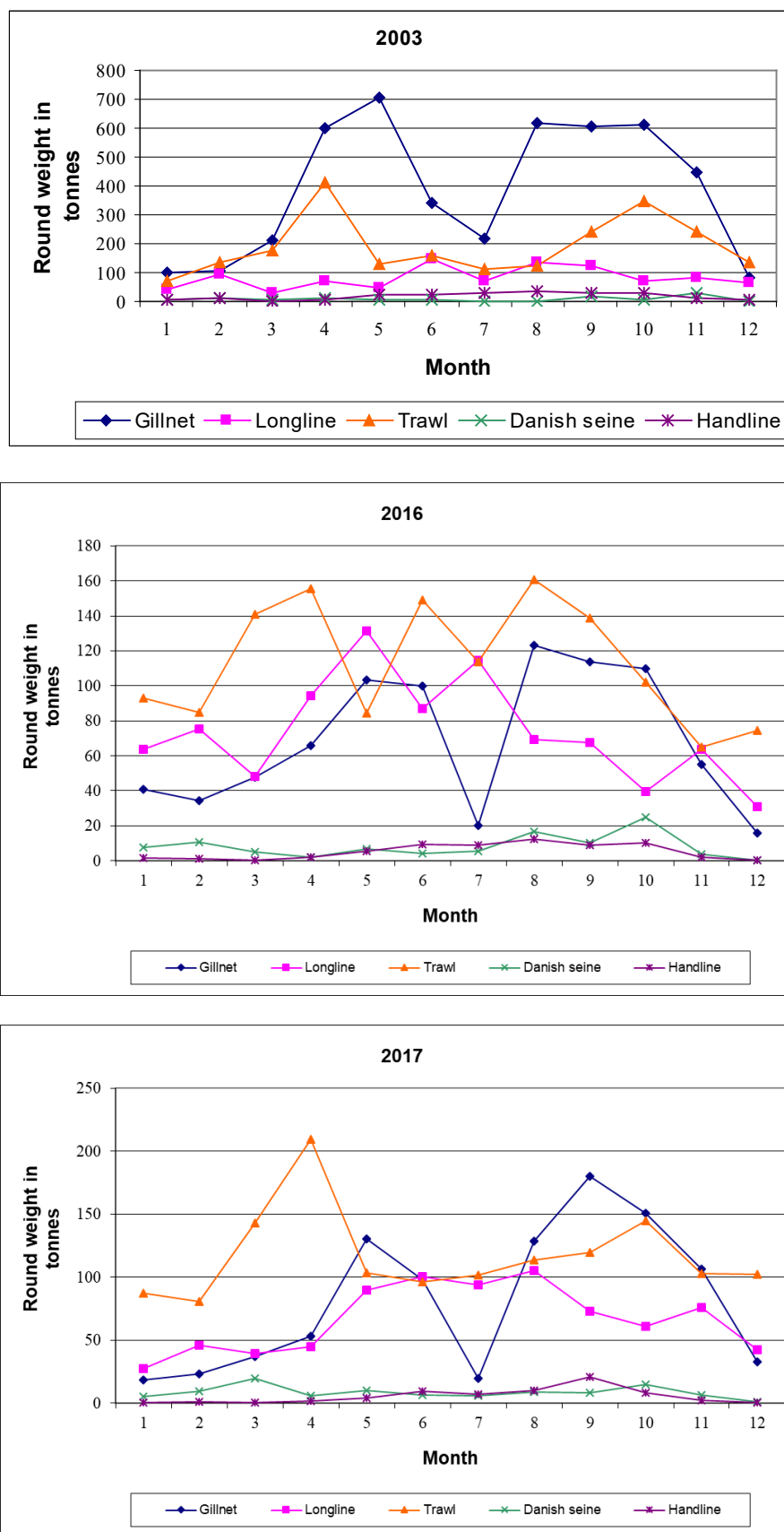


Figure 7.3a. Illustration of the seasonality in the different Norwegian *S. norvegicus* fisheries in 2003, 2016 and 2017, also illustrating how the current regulations are working.

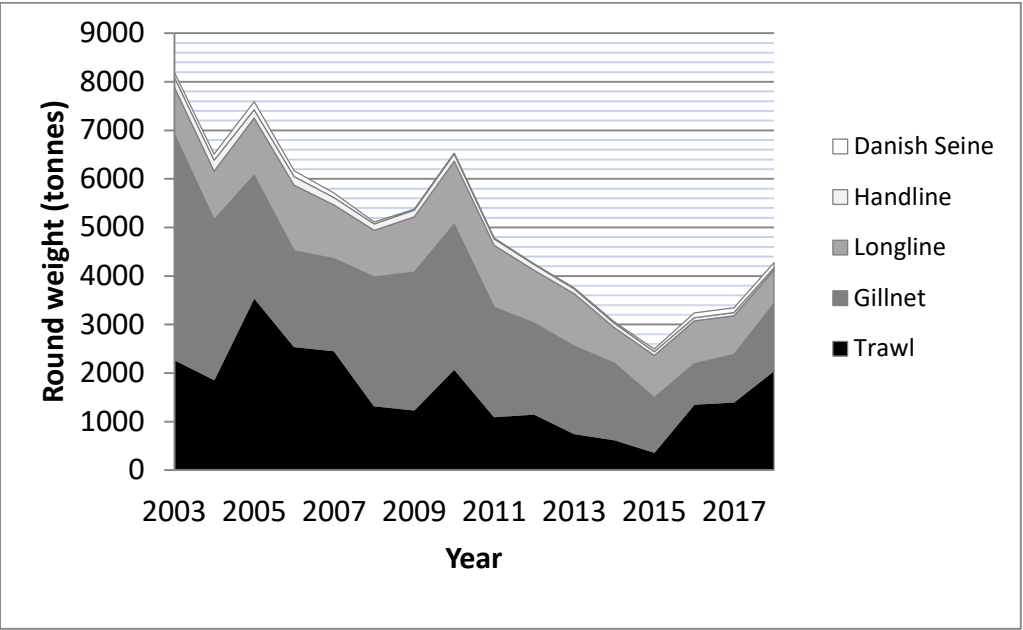


Figure 7.3b. Interannual changes in the Norwegian catches by fleet of *S. norvegicus* fisheries (2003–2018).

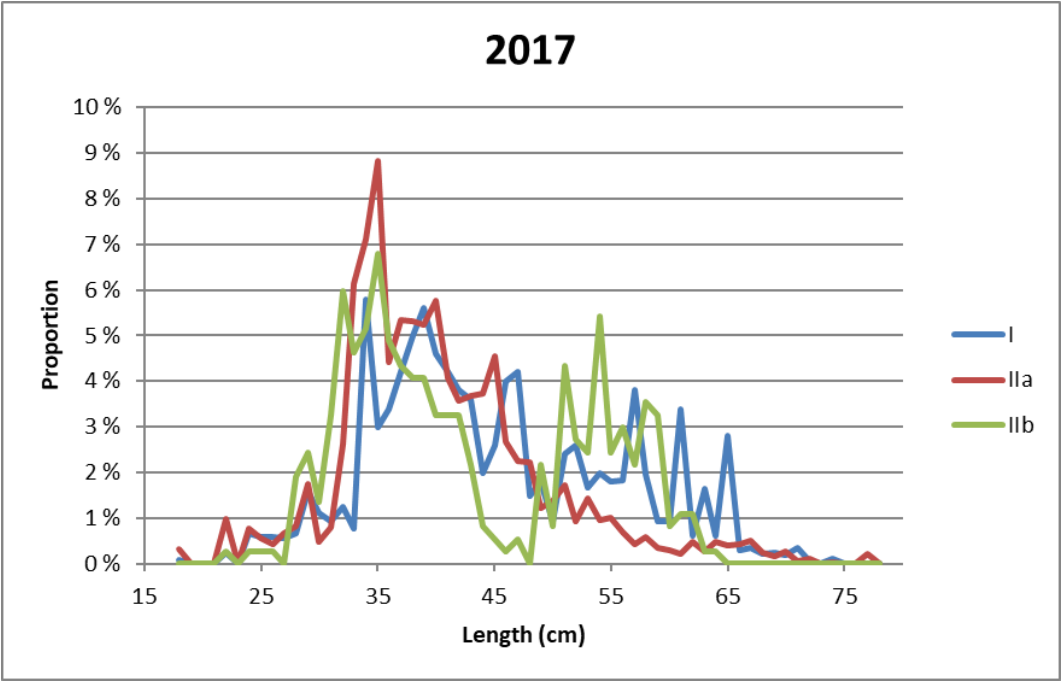


Figure 7.4. *Sebastes norvegicus*. Length frequency of *S. norvegicus* reported from Norwegian catches in Subarea 1, 2.a and 2.b in 2017, all gears combined.

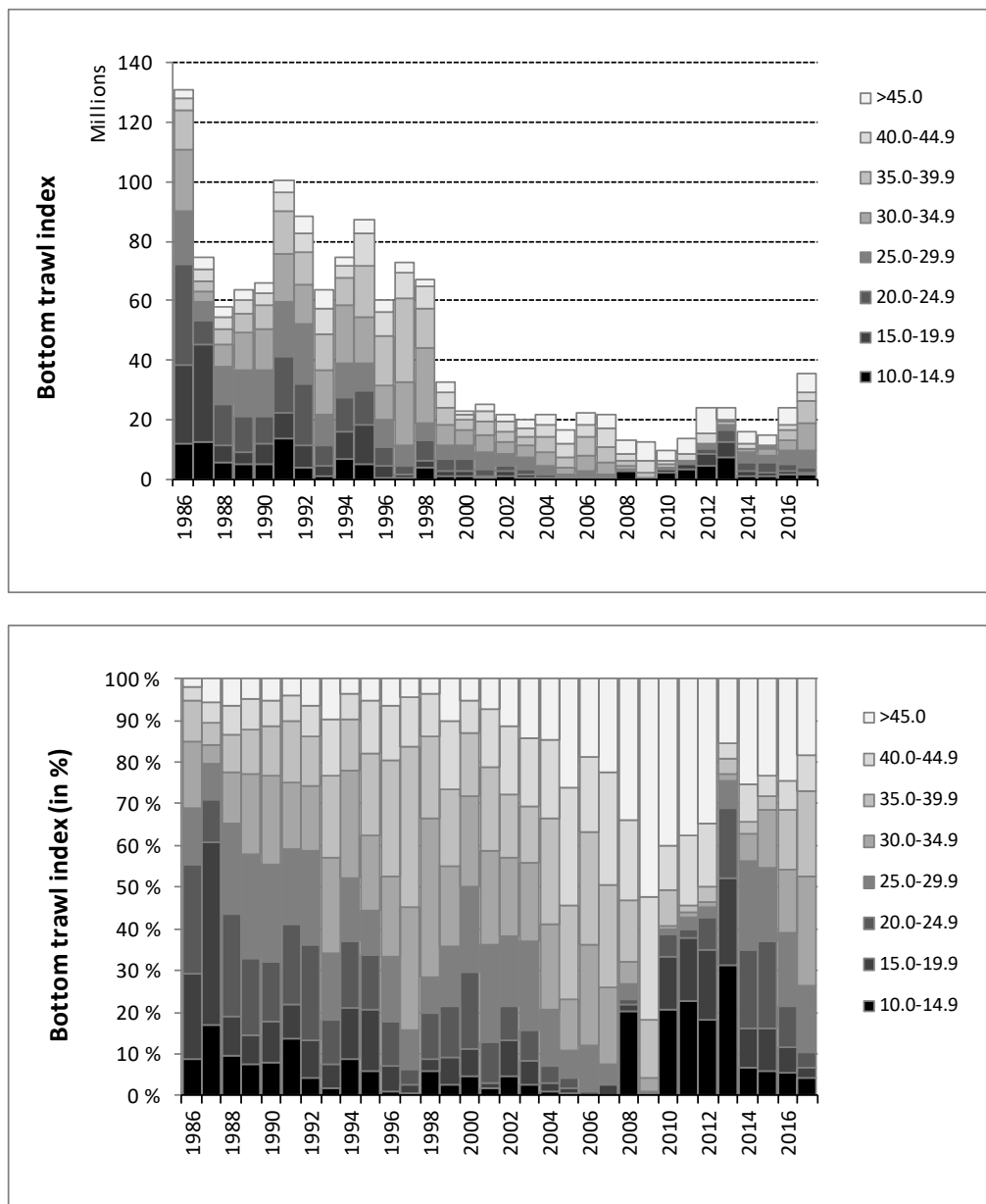


Figure 7.5a. *Sebastes norvegicus*. Abundance indices disaggregated by length for the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)) (joint with Russia some of the years since 2000), for 1986–2017 (ref. Table E1a). Top: absolute index values, bottom: relative frequencies.

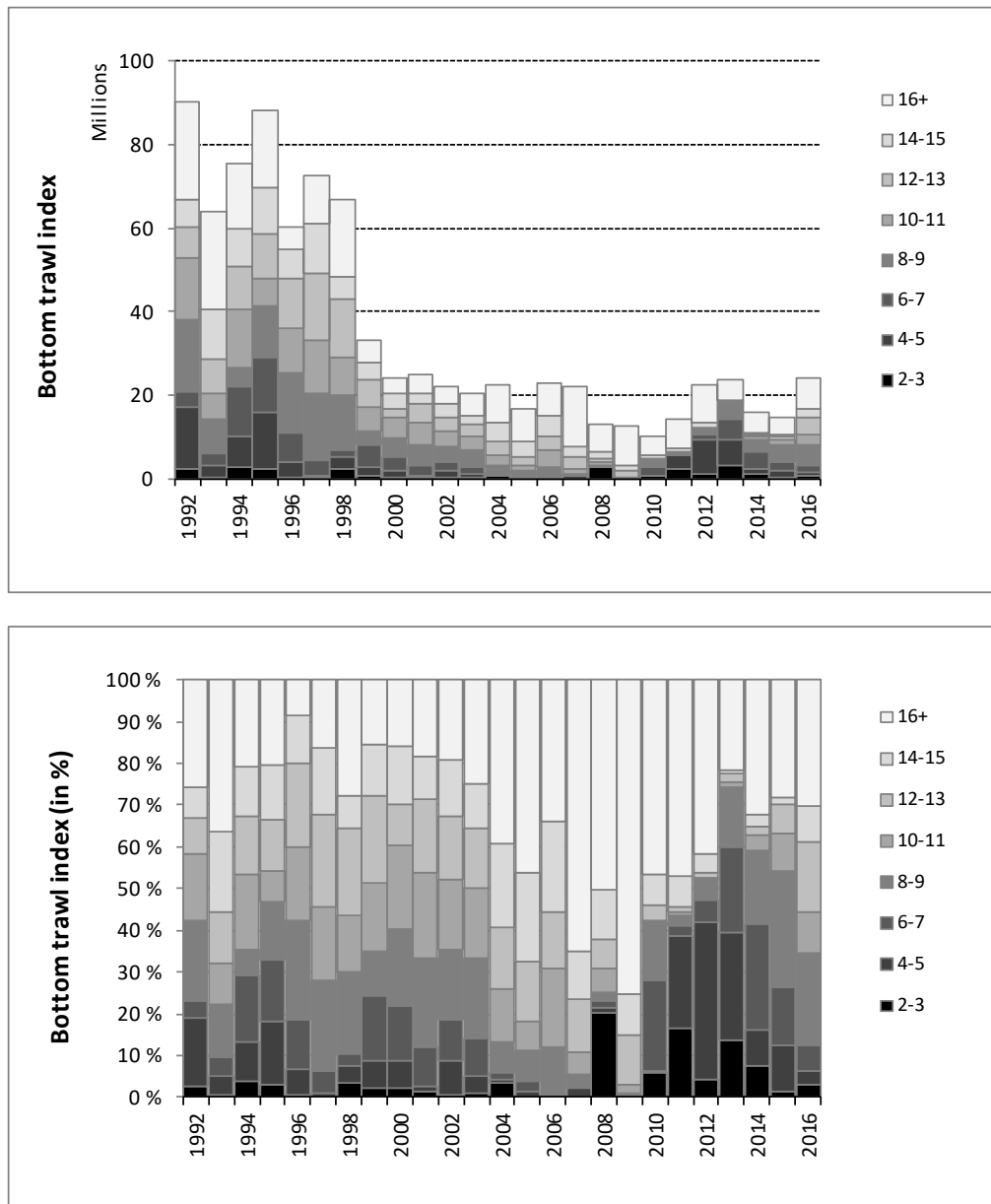


Figure 7.5b. *Sebastes norvegicus*. Abundance indices (by age) from the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)) (joint with Russia some of the years since 2000), for 1992-2016 (ref. Table E1b). Top: absolute index, bottom: relative frequencies. Horizontal line indicates the median age of the surveyed population.

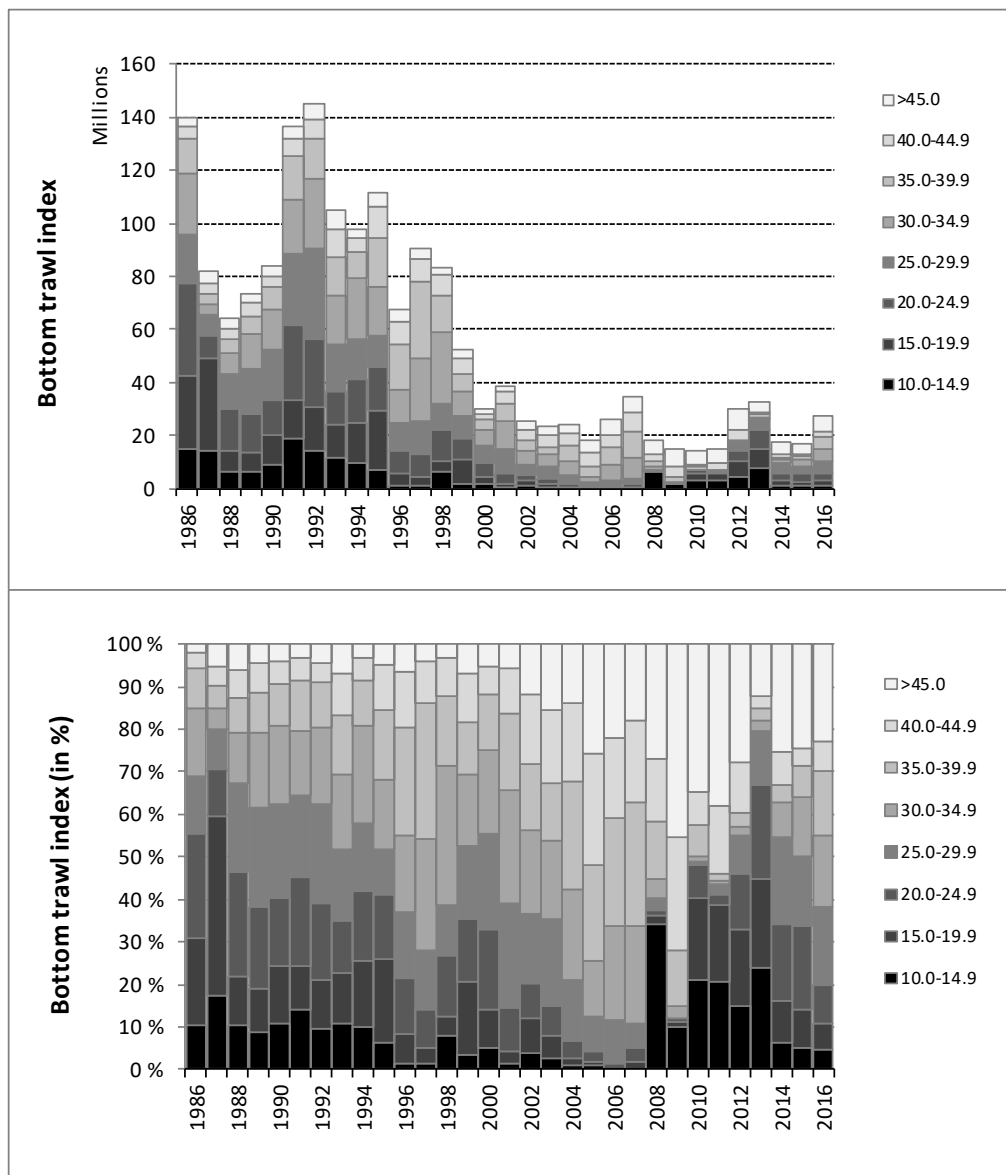


Figure 7.6a. *Sebastes norvegicus*. Abundance indices disaggregated by length when combining the Norwegian bottom-trawl surveys 1986–2016 in the Barents Sea (winter) and at Svalbard (summer/fall). Top: absolute index values. Bottom: relative frequencies. Horizontal line indicates the median length in the surveyed population.

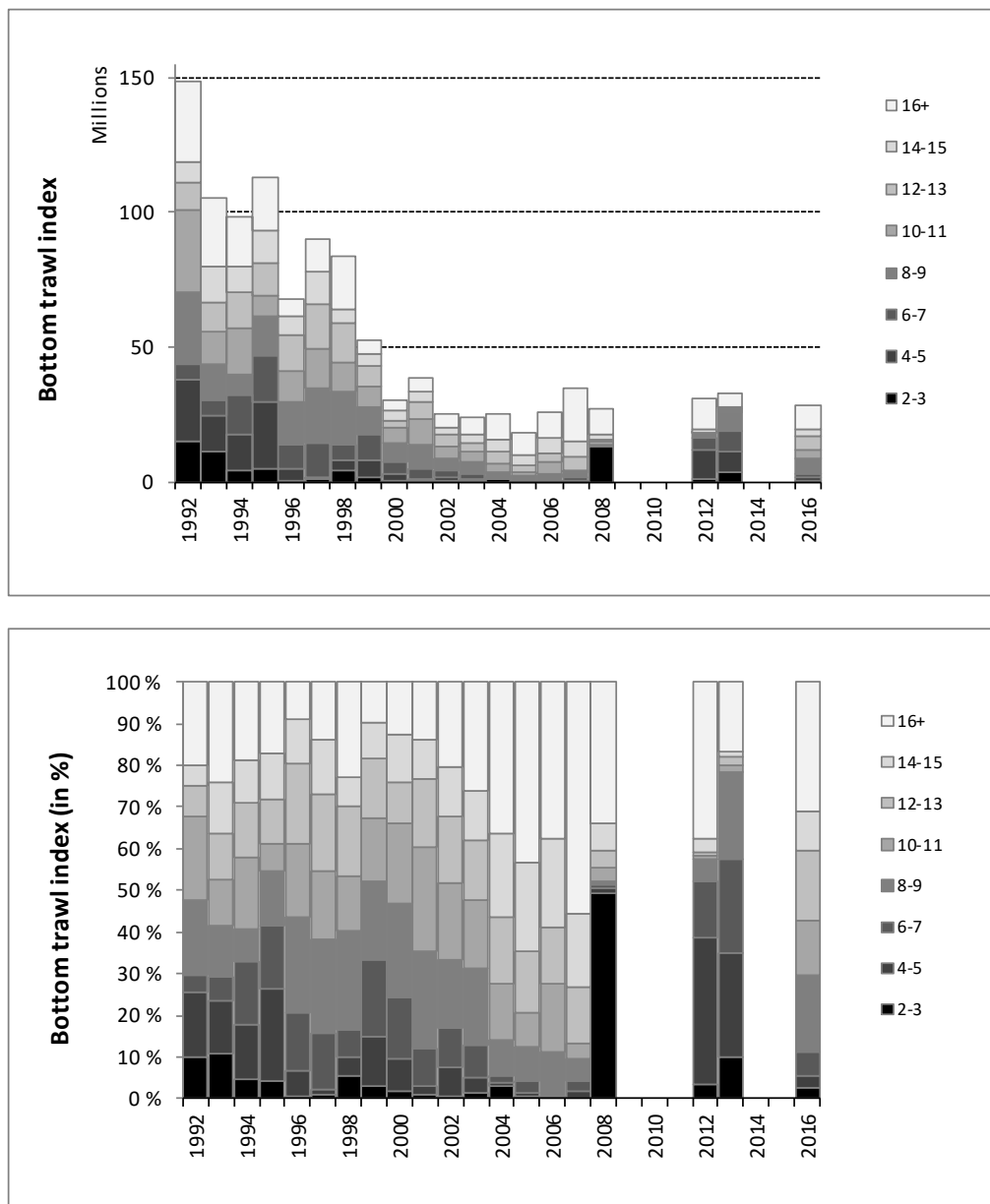


Figure 7.6b. *Sebastes norvegicus*. Abundance indices disaggregated by age. Combined Norwegian bottom-trawl surveys 1992–2016 in the Barents Sea (winter) and Svalbard survey (summer/fall). Top: absolute index values, bottom: relative frequencies. Horizontal line indicates median age of the surveyed population. In 2009–2011 and 2014–2015, there was insufficient number of age readings to derive numbers-at-age.

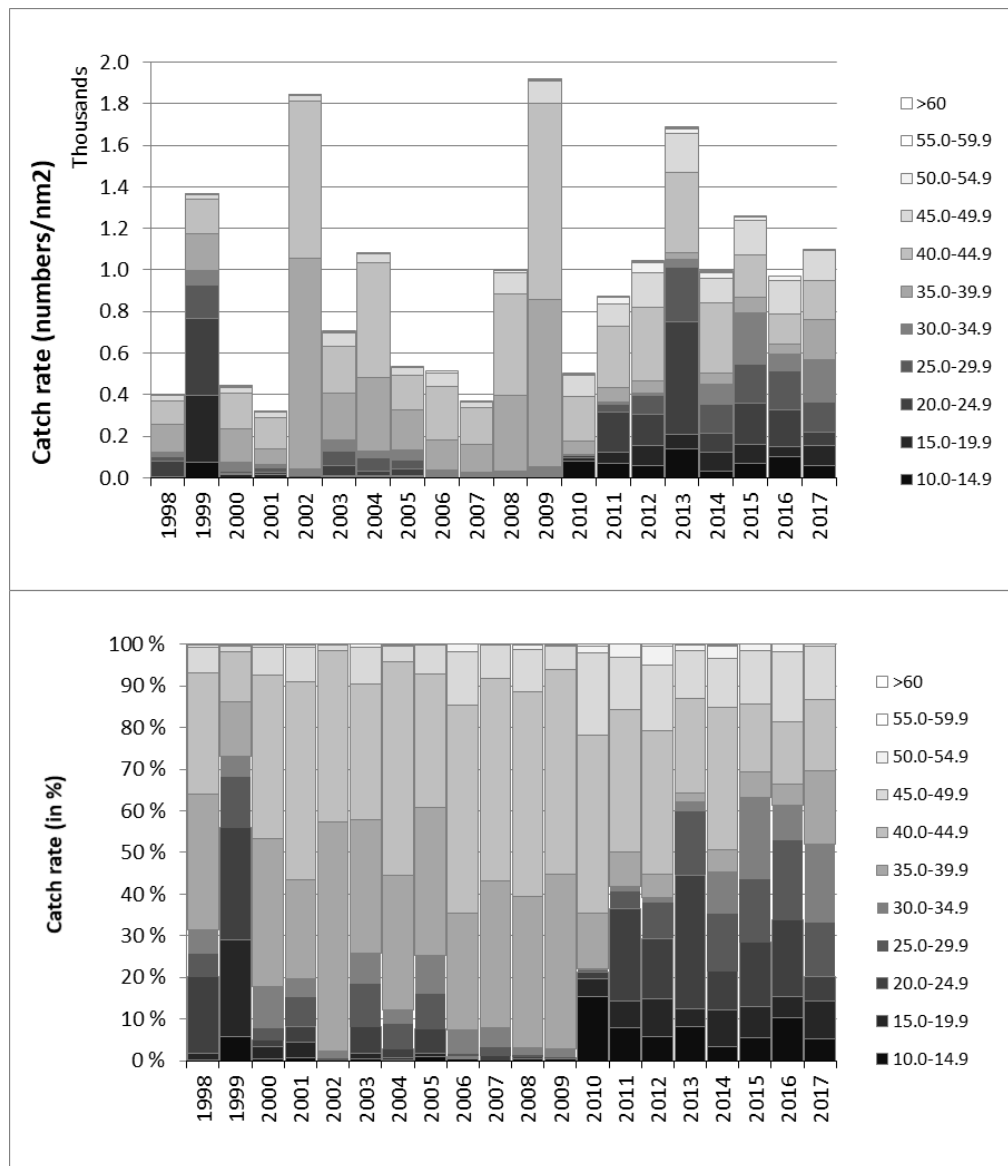


Figure 7.7. *Sebastes norvegicus*. Catch rates (numbers/nm) disaggregated by length for the Barents Sea coastal survey 1998–2017. Top: absolute catch rates. Bottom: relative values.

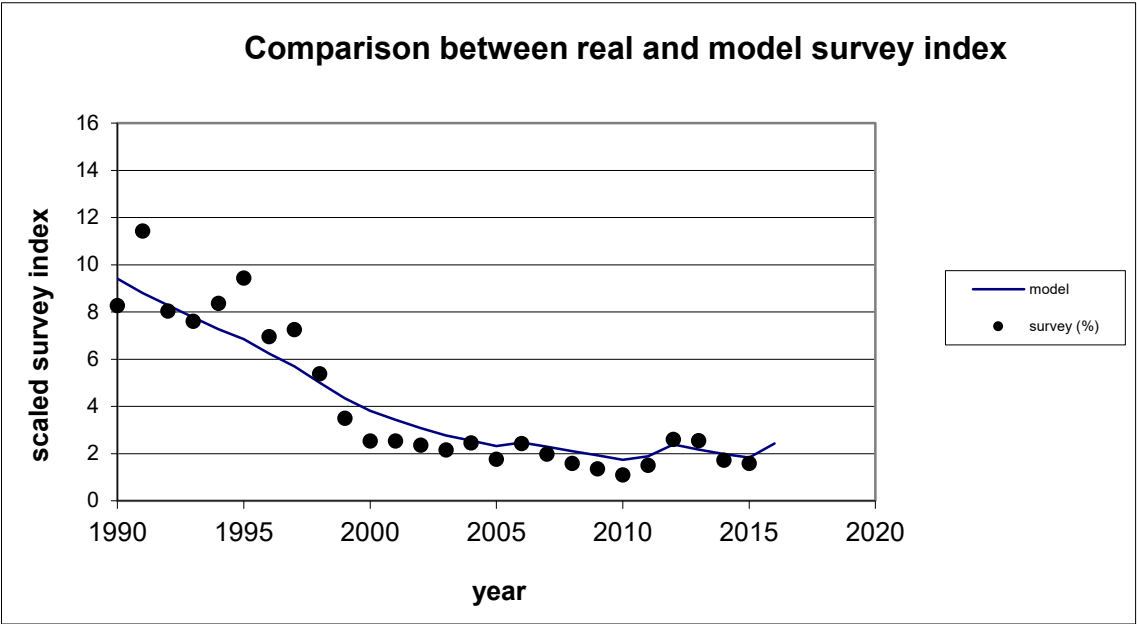


Figure 7.8. *Sebastes norvegicus* in subareas 1 and 2. Results from the Gadget assessment compared to the scientific survey. The Figure shows comparison of observed and modelled survey indices (total number scaled to sum=100 during the period) – the traditional Barents Sea February survey Dots: survey indices. Plain lines: survey indices estimated by the model.

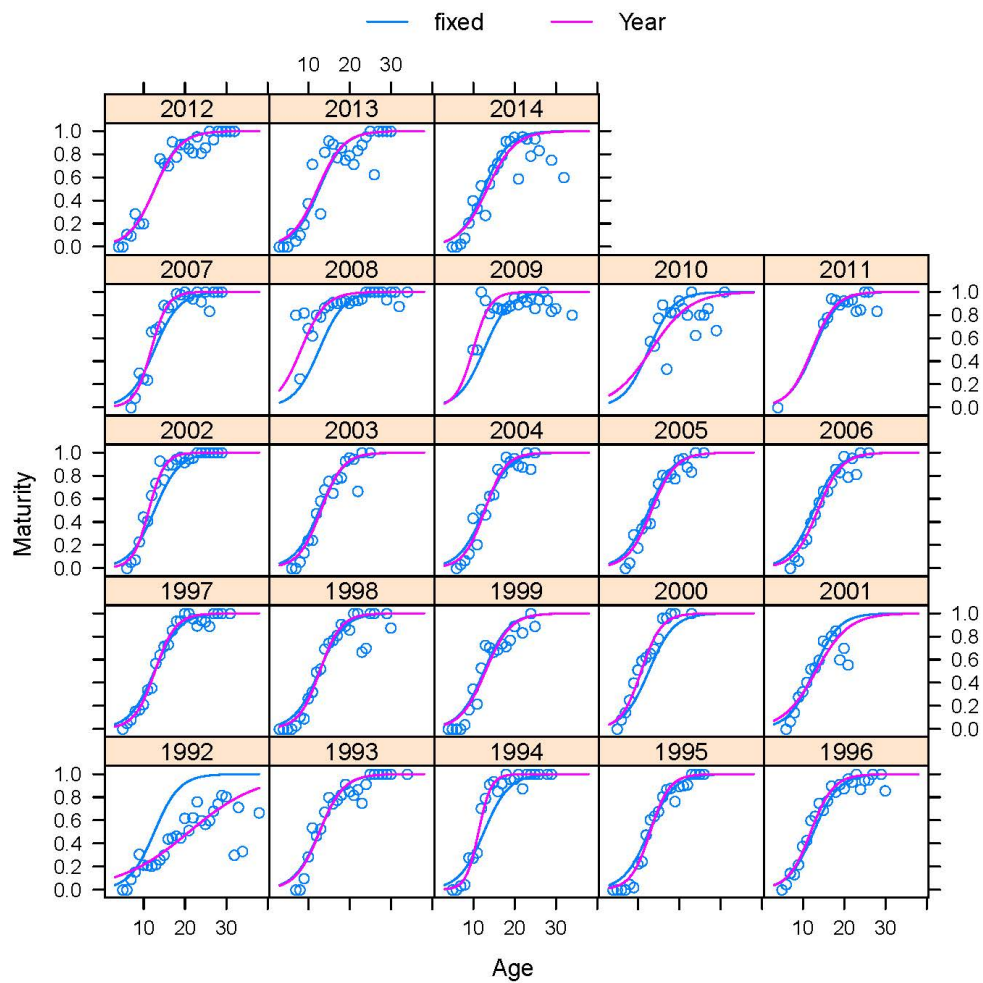


Figure 7.9a. Proportion maturity-at-age of *S. norvegicus* in subareas 1 and 2 derived from Norwegian commercial and survey data (Table E4). The proportions were derived from samples with at least five individuals. Note that due to time constraints this was not updated for the 2018 assessment and will be updated for the 2020 assessment.

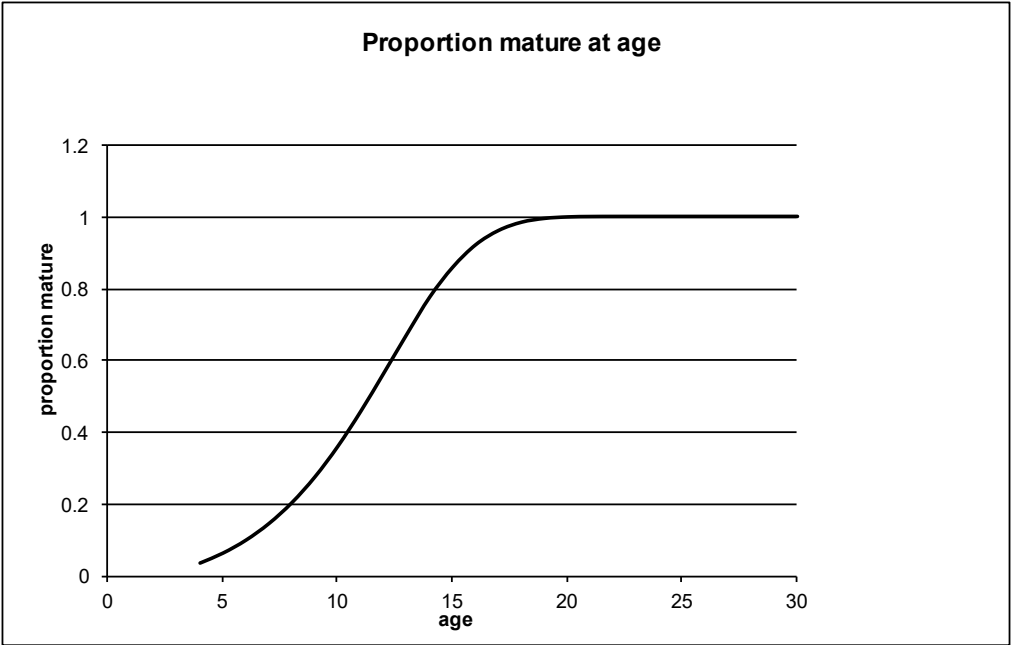


Figure 7.9b. *Sebastes norvegicus* in subareas 1 and 2. Estimates of maturity-at-age by Gadget. Input data have been proportions of *S. norvegicus* mature both at age and length as collected and classified from Norwegian commercial landings and surveys.

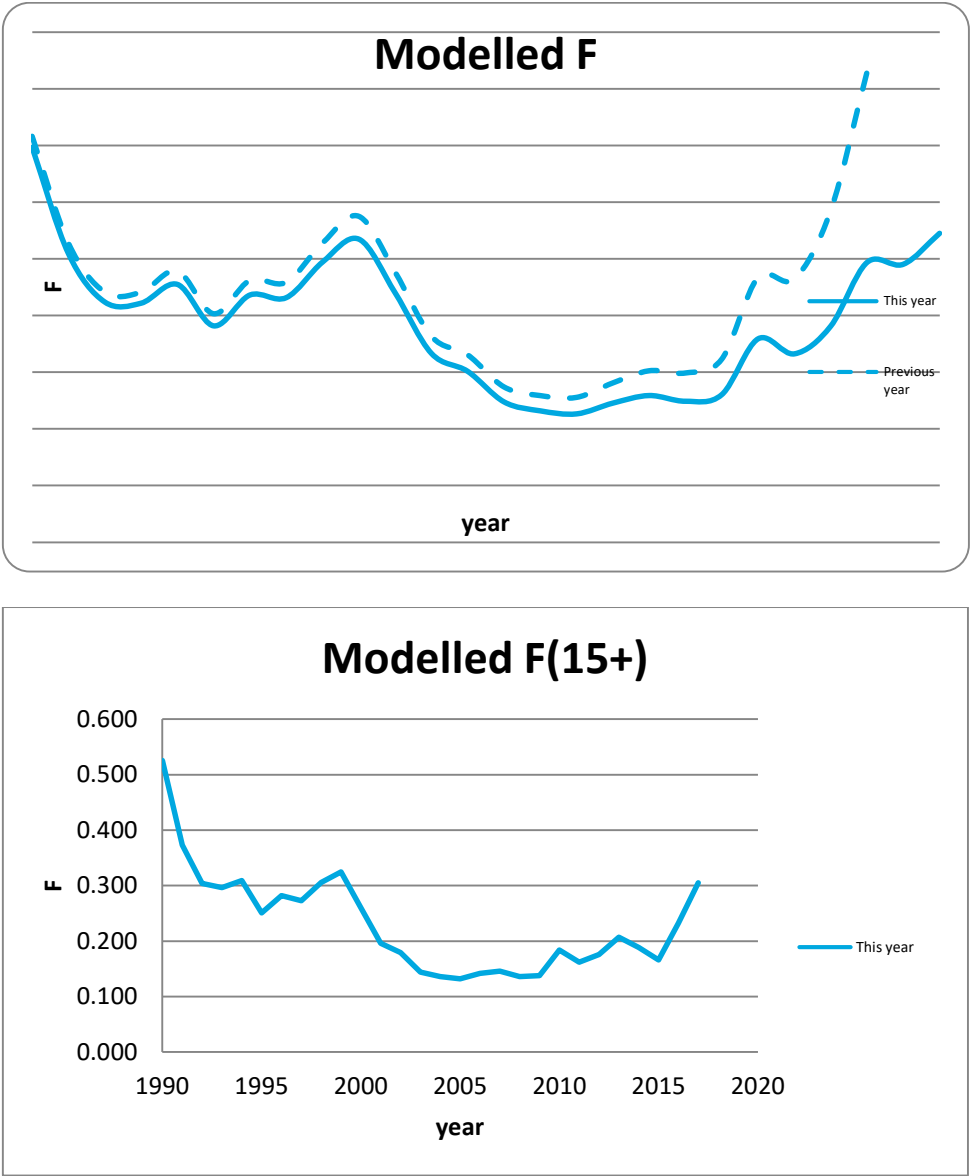


Figure 7.10. *Sebastes norvegicus* in subareas 1 and 2. Unweighted average fishing mortality of ages 15+

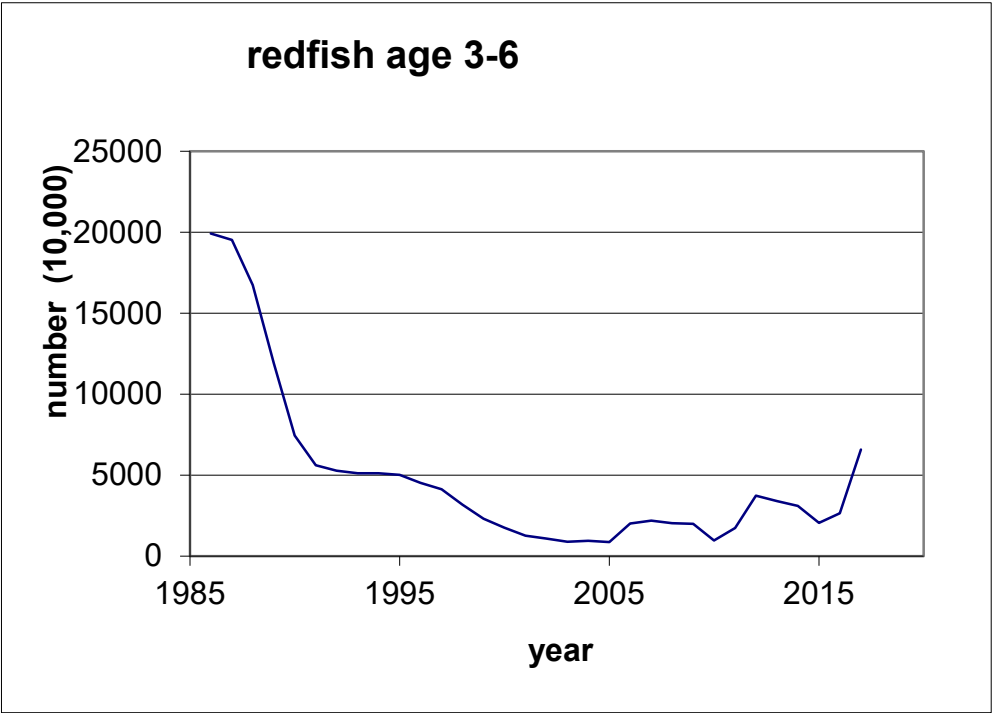


Figure 7.11. *Sebastes norvegicus* in subareas 1 and 2. Estimates of abundance at age 3–6 by Gadget. Note that recent year (since 2015) have very little tuning data behind them.

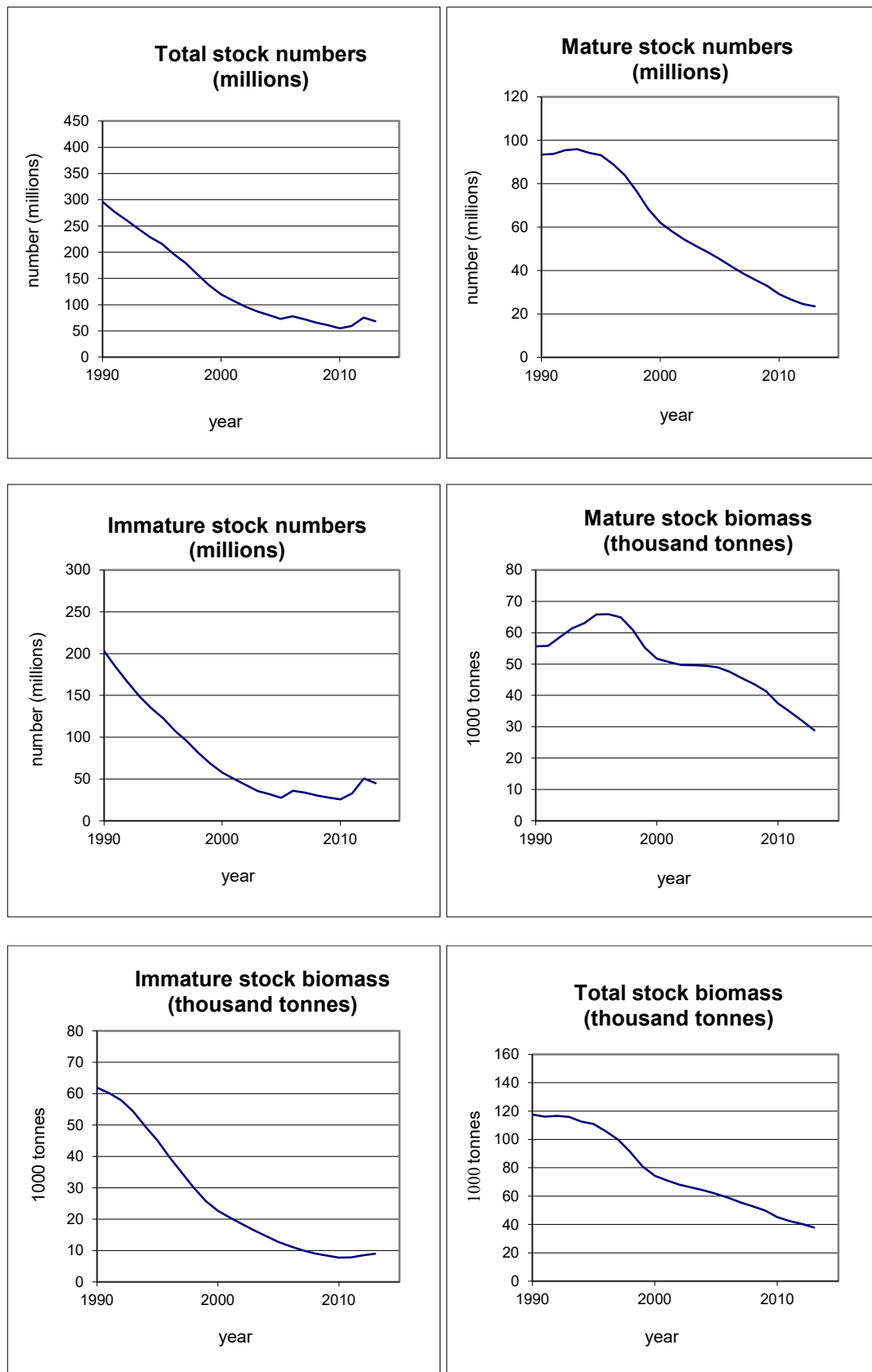
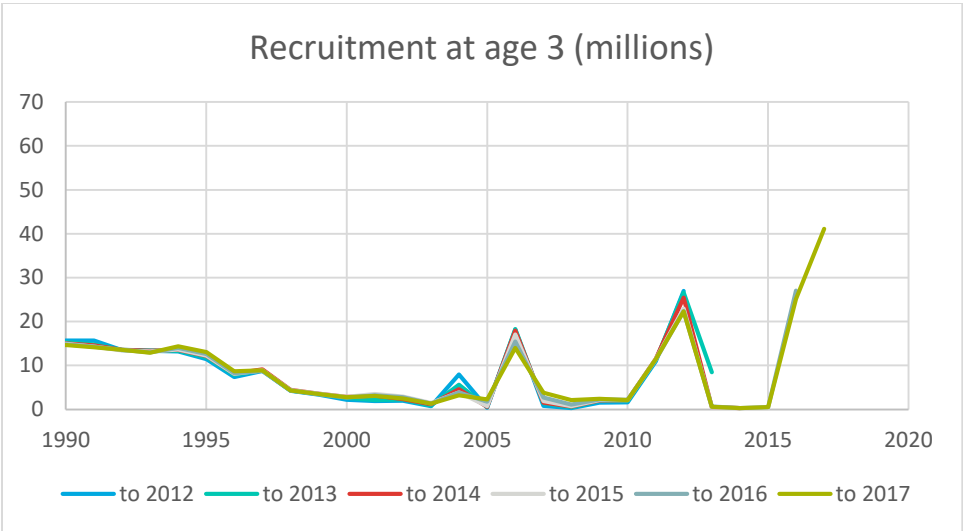
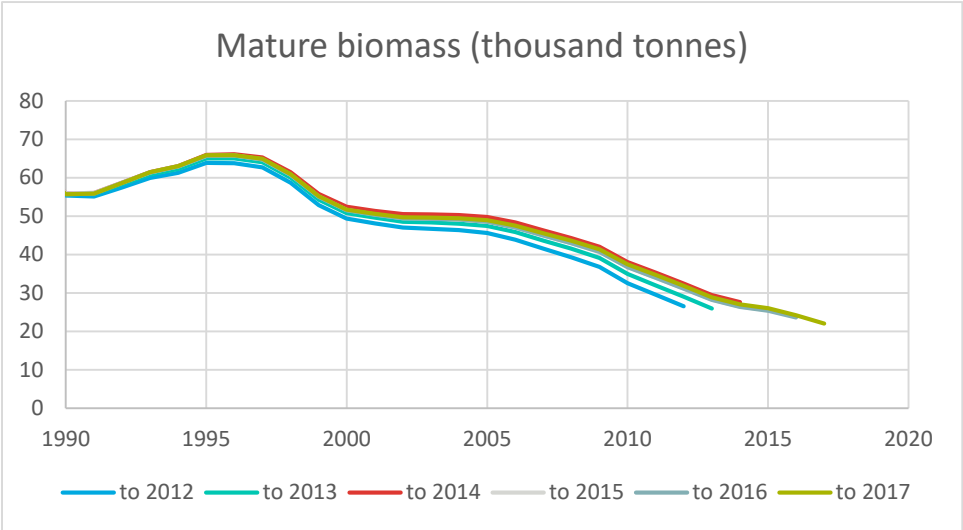
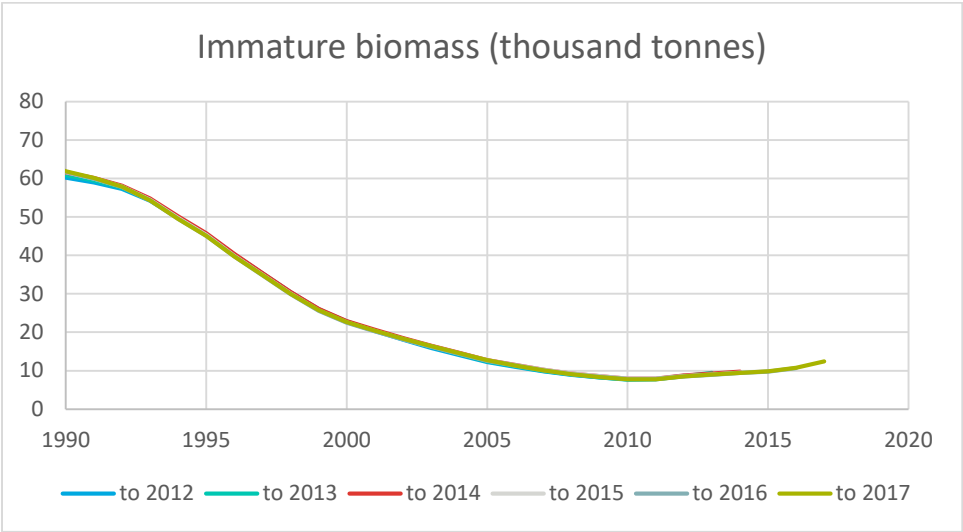


Figure 7.12. *Sebastes norvegicus* in subareas 1 and 2. Stock numbers (in thousands) and biomass (in tonnes) for the total stock (3+) (upper panel), and the fishable and mature stock (middle panel), and the immature stock (lower panel), as estimated by Gadget using two surveys as input.



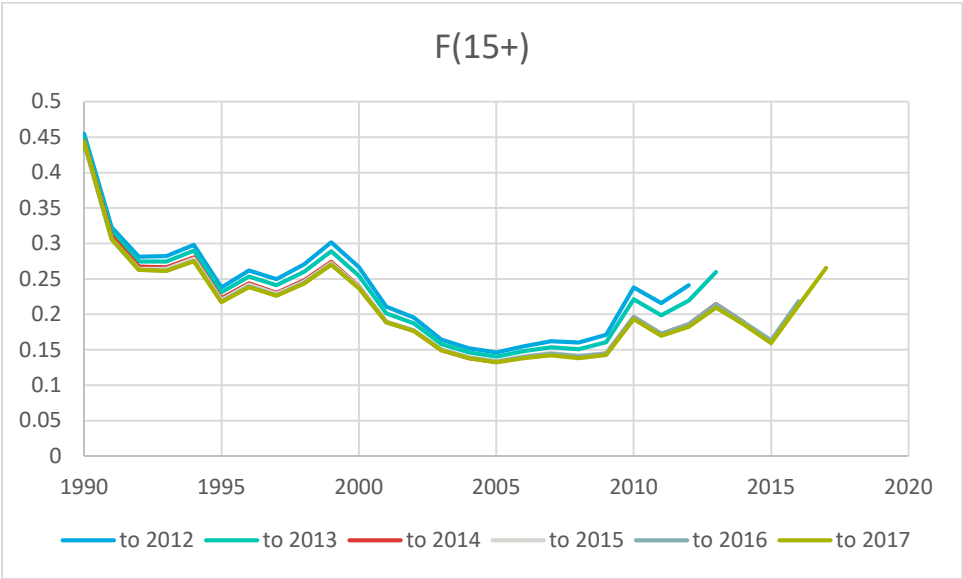


Figure 7.13. Gadget retrospective trends 2012 to 2017, immature biomass, mature biomass, recruitment-at-age 3, F(15+).

Table E1a. *Sebastes norvegicus* in subareas 1 and 2. Abundance indices (numbers in millions) - on length - from the Winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)) from 1986 to 2017. The area coverage was extended from 1993.

Year	Length group (cm)									Total
	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	>45.0	
1986	3.0	11.7	26.4	34.3	17.7	21.0	12.8	4.4	2.6	133.9
1987	7.7	12.7	32.8	7.7	6.4	3.4	3.8	3.8	4.2	82.5
1988	1.0	5.6	5.5	14.2	12.6	7.3	5.2	4.1	3.7	59.2
1989	48.7	4.9	4.3	11.8	15.9	12.2	6.6	4.8	3.0	112.2
1990	9.2	5.3	6.5	9.4	15.5	14.0	8.0	4.0	3.4	75.3
1991	4.2	13.6	8.4	19.4	18.0	16.1	14.8	6.0	4.0	104.5
1992	1.8	3.9	7.7	20.6	19.7	13.7	10.5	6.6	5.8	90.3
1993	0.1	1.2	3.5	6.9	10.3	14.5	12.5	8.6	6.3	63.9
1994	0.7	6.5	9.3	11.7	11.5	19.4	9.1	4.4	2.8	75.4
1995	0.6	5.0	13.1	11.5	9.1	15.9	17.2	10.9	4.7	88.0
1996	+	0.7	3.5	6.4	9.4	11.7	16.6	7.9	3.9	60.1
1997 ¹	-	0.5	1.3	2.7	6.9	21.4	28.2	8.5	3.3	72.7
1998 ¹	0.1	3.9	2.0	7.4	5.8	25.3	13.2	7.0	2.3	67.0
1999	0.2	0.9	2.1	4.0	4.6	6.4	6.0	5.3	3.5	33.0
2000	0.5	1.1	1.5	4.2	4.7	5.0	3.5	1.8	1.2	24.0
2001	0.1	0.4	0.4	2.4	5.8	5.6	5.0	3.5	1.8	25.0
2002	0.1	1.0	1.9	1.7	3.7	4.1	3.3	3.6	2.5	22.0
2003	0.0	0.5	1.2	1.5	4.3	3.8	2.7	3.3	2.9	20.2
2004	0.7	0.2	0.4	1.0	2.9	4.4	5.5	4.0	3.2	22.3
2005	+	0.1	0.2	0.4	1.1	2.0	3.7	4.6	4.3	16.4
2006	0.0	0.0	0.0	0.2	2.5	5.4	6.1	4.1	4.2	22.5
2007	0.0	0.1	0.5	0.1	1.0	4.0	5.4	5.9	4.9	21.9
2008	1.8	2.6	0.2	0.2	0.4	0.7	1.9	2.5	4.4	14.8
2009	0.0	0.0	0.1	0.0	0.0	0.4	1.7	3.7	6.6	12.7
2010	0.4	2.0	1.2	0.6	0.1	0.1	0.8	1.1	3.9	10.3
2011	0.3	3.1	2.1	0.3	0.4	0.1	0.3	2.3	5.2	14.1
2012	0.8	4.4	4.0	1.9	0.6	0.3	0.9	3.6	8.3	24.8

Year	Length group (cm)									Total
	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	>45.0	
2013	0.0	7.4	4.9	4.0	1.6	0.4	0.9	0.8	3.7	23.8
2014	0.1	1.1	1.5	3.0	3.4	1.0	0.5	1.4	4.0	16.0
2015	0.1	0.9	1.5	3.1	2.6	2.0	0.5	0.7	3.4	14.8
2016	0.8	1.3	1.5	2.4	4.2	3.6	3.4	1.7	5.9	24.7
2017	0.4	1.4	1.0	1.4	5.7	9.3	7.3	3.1	6.5	36.1

1 - Adjusted indices to account for not covering the Russian EEZ in Subarea 1

Table E1b. *Sebastes norvegicus* in subareas 1 and 2. Norwegian bottom-trawl indices (numbers in thousands) - on age - from the annual Winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)) from 1986 to 2016. The area coverage was extended from 1993 onwards.

Year/AGE	3	4	5	6	7	8	9	10	11	12	13	14	15	Total 1-15	16+
1992	2 295	4 261	10 760	2 043	1 474	13 178	4 230	6 302	8 251	3 751	3 865	3 064	3 568	67 042	23 300
1993	468	1 218	1 424	2 020	979	5 048	2 968	4 230	2 142	4 634	3 338	2 951	9 148	40 568	23 300
1994	2 951	4 485	2 573	3 801	8 338	3 254	1 297	7 231	6 443	248	10 192	6 341	2 612	59 766	15 600
1995	2 540	7 450	6 090	7 150	5 820	6 590	5 670	2 000	4 440	6 500	4 320	5 330	6 030	69 930	18 100
1996	310	1 300	2 340	3 520	3 660	8 720	5 650	3 960	6 590	5 730	6 230	4 070	2 950	55 030	5 100
1997	190	80	360	1 320	2 530	5 370	10 570	6 840	5 810	7 390	8 790	9 740	1 980	60 980	11 700
1998	2 380	1 930	850	660	1 140	7 090	6 124	4 962	4 091	5 190	8 790	2 730	2 560	48 487	18 500
1999	737	916	1 246	3 469	1 650	1 826	1 679	3 084	2 371	2 953	3 837	2 132	1 979	27 879	5 100
2000	490	720	900	1 310	1 800	2 440	2 020	2 710	2 090	940	1 440	2 940	430	20 230	3 800
2001	320	170	190	940	1 360	2 220	3 110	2 400	2 690	2 230	2 180	1 200	1 370	20 380	4 600
2002	130	910	902	1 590	544	1 546	2 153	1 822	1 900	2 220	1 073	1 294	1 730	17 814	4 200
2003	220	250	590	1 080	680	1 020	2 910	1 180	2 250	1 370	1 530	840	1 310	15 230	5 000
2004	780	100	100	90	240	540	1 130	1 260	1 590	1 740	1 490	2 570	1 890	13 520	8 800

Year/AGE	3	4	5	6	7	8	9	10	11	12	13	14	15	Total 1-15	16+
2005	39	85	107	110	321	524	669	497	697	820	1 517	1 905	1 653	8 944	7 652
2006	0	0	0	24	52	1 011	1 641	1 999	2 246	1 578	1 550	3 487	1 444	15 030	7 666
2007	58	202	248	50	51	185	422	582	592	1 747	1 030	1 127	1 359	7 652	14 248
2008	2 637	0	0	0	203	72	175	272	476	369	553	850	700	6 306	6 543
2009	0	0	0	0	85	0	14	77	192	358	1 146	532	737	3 141	9 539
2010	0	0	16	1 966	267	0	1 450	35	0	117	268	285	494	5 510	4 779
2011	1 832	1 621	1 529	163	148	0	343	0	122	0	204	107	903	7 459	6 624
2012	973	3 187	5 362	923	293	501	556	116	27	212	0	350	758	13 256	9 405
2013	1 432	929	5 194	2 183	2 757	2 346	1 031	250	0	378	117	250	0	18 684	5 112
2014	1 108	215	1 163	1 188	2 923	1 812	992	559	69	0	297	67	402	10 861	5 163
2015	143	526	1 106	954	1 111	1 955	2 126	300	1 043	487	537	143	51	10 554	4 173
2016	247	627	106	1 123	428	1 870	3 365	1 378	948	1 255	2 827	1 536	479	16 682	7 268
2017	Age data not available during AFWG 2018.														

16+ group is considered in the calculation since 2005. Values prior to this date were derived by subtracting the sum of abundance in groups 1-15 to the total abundance, available in Table E1a.

Table E2a. *Sebastes norvegicus* in subareas 1 and 2. Abundance indices (numbers in thousands) - on length – from the Norwegian Svalbard (Division 2.b) bottom-trawl survey (August-September) from 1985 to 2016. Since 2005 this is part of the Ecosystem survey (Eco-NoRu-Q3 (BTr)).

Year	Length group (cm)									Total
	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	>45.0	
1985 ¹	-	1 307	795	1 728	2 273	1 417	311	142	194	8 325
1986 ¹	200	2 961	1 768	547	643	1 520	639	467	196	8 941
1987 ¹	100	1 343	1 964	1 185	1 367	652	352	29	44	7 060
1988 ¹	500	1 001	1 953	1 609	684	358	158	68	95	6 450
1989	200	1 629	2 963	2 374	1 320	846	337	323	104	10 100
1990	1 700	3 886	4 478	4 047	2 972	1 509	365	140	122	19 185
1991	100	5 371	5 821	9 171	8 523	4 499	1 531	982	395	36 420
1992	1 700	10 228	8 858	5 330	13 960	12 720	4 547	494	346	58 172
1993	200	10 160	9 078	5 855	7 071	4 327	2 088	1 552	948	41 284
1994	100	3 340	5 883	4 185	3 922	3 315	1 021	845	423	22 985
1995	470	2 000	9 100	5 070	3 060	2 400	1 040	920	780	24 840
1996	80	130	1 260	2 480	1 030	480	550	990	400	7 400
1997	0	810	1 980	5 470	5 560	2 340	590	190	450	17 430

Year	Length group (cm)									Total
	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	>45.0	
1998	180	2 698	1 741	4 620	4 053	1 761	535	545	241	16 403
1999	0	794	7 057	3 698	4 563	2 449	467	619	369	20 017
2000	40	360	1 240	1 390	2 010	760	400	160	390	6 750
2001	10	110	790	1 470	3 710	4 600	1 880	680	370	13 660
2002	0	0	64	415	459	880	620	565	519	3 522
2003	90	90	108	83	525	565	447	760	769	3 437
2004	0	0	10	50	650	740	670	430	190	2 740
2005	0	45	0	30	315	384	307	159	274	1 513
2006	0	0	70	64	167	376	473	735	1 514	3 398
2007	0	32	58	1 003	1 049	3 875	4 656	811	1 267	12 751
2008	7 009	3 573	175	21	42	142	475	162	529	12 130
2009	227	1 476	114	114	0	0	185	213	193	2 522
2010	666	917	1 506	522	0	117	172	0	985	4 885
2011	0	0	681	33	0	0	0	131	568	1 413
2012	0	85	1 512	2 138	2 145	327	32	0	133	6 372

Year	Length group (cm)									Total
	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	>45.0	
2013	48	437	1 971	3 239	2 564	412	152	33	392	9 248
2014	47	0	316	130	223	443	208	0	452	1819
2015	0	0	0	206	193	276	768	0	651	2094
2016	0	0	136	128	916	944	756	234	417	3531

1 - Old trawl equipment (bobbins gear and 80 m sweep length)

Table E2b. *Sebastes norvegicus* in subareas 1 and 2. Norwegian bottom-trawl survey indices - on age - from the Norwegian Svalbard (Division 2.b) bottom-trawl survey (August-September) from 1985 to 2016. Since 2005 this is part of the Ecosystem survey (Eco-NoRu-Q3 (BTr)). In 2009–2011 and 2014–2015, there was insufficient number of age readings to derive numbers-at-age.

Year	Age														Total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1992	284	12378	5576	2279	371	2064	3687	5704	9215	6413	1454	1387	696	22	51530
1993	32	10704	5710	5142	1855	1052	1314	3520	2847	2757	2074	1245	844	119	39215
1994	429	1150	3418	2393	1723	1106	1714	1256	1938	1596	2039	484	550	319	20155
1995	600	1600	6400	5100	1800	2200	1800	700	700	400	700	500	400	500	23400
1996	40	110	+	560	1050	940	930	400	1050	280	320	590	160	70	6500
1997	320	490	+	480	1500	6950	2720	1680	800	1310	550	30	+	120	16950
1998	210	1817	881	202	1555	2187	4551	1913	1010	797	49	264	73	187	15696
1999	0	760	2893	1339	3534	1037	3905	2603	762	1663	481	361	258	152	19748
2000	40	20	400	350	840	480	730	1670	620	340	510	100	80	70	6250
2001	0	40	50	450	330	790	1760	1970	3300	1200	1810	150	660	430	12940
2002	0	0	+	+	65	160	204	326	364	614	442	328	15	0	2518
2003	30	30	30	+	108	+	219	263	126	259	306	199	248	411	2229
2004	0	0	0	+	+	20	360	120	430	160	410	360	370	200	2430

Year	Age														Total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
2005	0	45	0	0	0	30	48	228	138	187	194	93	105	109	1177
2006	0	0	23	23	23	21	22	21	84	0	84	279	194	376	1148
2007	0	33	19	19	19	764	764	525	0	0	21	1927	1927	1683	7702
2008	10583	44	88	44	11	11	0	42	88	13	13	118	63	174	11292
2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	0	28	121	2353	1836	1183	577	79	30	32	0	0	0	0	6239
2013	48	44	738	1298	1433	1097	2746	806	183	91	185	0	0	180	8849
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	0	0	0	68	68	0	0	0	916	403	442	227	466	145	2734

Table E3. *Sebastes norvegicus* in Sub-area 1 and 2. Mean catch rates (numbers/nm) of *Sebastes norvegicus* from the Norwegian Coastal Surveys (NOcoast-Aco-Q4) (Division 2.a) in 1998-2017.

Length range (cm)	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	# Hauls	Total Distance (nm)	# Fish Caught	# Fish Sampled	Area (nm ²)
1998	0	0	692	6 632	73 075	22 255	22 430	130 161	116 216	23 519	2 547	880	0	89	139	778	NA	43 574
1999	0	7 587	77 067	317 802	369 258	165 769	67 222	178 802	163 919	20 445	3 642	1 520	0	103	138	2 144	NA	43 574
2000	0	0	1 856	13 048	6 459	13 065	42 990	156 418	171 407	29 117	3 036	331	191	99	144	756	503	43 574
2001	0	295	2 031	11 787	12 305	22 408	14 127	74 790	150 763	26 573	1 787	345	191	81	113	460	325	43 574
2002	0	0	0	0	2 321	7 588	34 283	1 011 273	754 947	26 769	3 195	513	0	109	172	3 289	332	43 574
2003	0	0	2 579	10 118	44 506	72 473	52 479	224 734	228 374	62 121	5 536	481	0	123	160	1 367	1 053	43 574
2004	0	937	3 139	5 591	21 042	66 182	34 613	351 154	552 183	41 851	2 666	1 345	0	104	130	1 290	950	43 574
2005	0	554	5 209	4 627	30 272	46 072	48 379	189 993	170 639	37 468	1 450	0	0	99	132	833	780	43 574
2006	0	0	2 884	496	1 738	3 065	29 933	144 743	256 394	65 959	9 272	0	0	112	112	771	680	43 574
2007	0	0	0	0	4 335	7 308	17 338	129 412	177 332	29 042	1 182	0	0	131	140	637	637	43 574
2008	0	3644	4 555	955	3 957	4 679	17 440	362 633	490 611	99 469	11 772	1 630	0	110	139	1 156	850	43 574
2009	0	0	6 976	2 285	2 984	4 530	39 275	800 208	945 004	106 479	6 244	663	1 122	114	136	2 947	598	43 574
2010	0	39 758	77 542	20 364	8 814	1 378	2 582	66 948	214 182	99 061	7 417	2 454	0	117	136	833	690	43 574
2011	0	3 654	67 407	55 725	193 640	35 323	10 043	72 244	296 697	107 318	27 832	286	0	113	104	998	571	43 574
2012	0	39 530	59 337	95 227	150 260	89 534	12 686	58 890	356 556	163 645	46 792	4 640	263	98	96	1 191	778	43 574
2013	0	5 176	137 751	72 253	540 679	260 689	38 079	34 628	384 207	190 595	21 534	3 528	2 091	93	95	2 231	1 105	43 574

Length range (cm)	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	# Hauls	Total Dist- ance (nm)	# Fish Caught	# Fish Sampled	Area (nm^2)
2014	0	949	33 978	87 279	91 651	138 732	99 402	52 335	338 428	118 890	27 270	2 343	3 361	107	108	1 717	777	43 574
2015	399	32 520	69 615	93 690	193 721	189 891	246 181	77 869	202 366	163 442	17 169	565	0	97	103	1 886	984	43 574
2016	620	25 016	100 428	49 233	177 926	186 202	81 997	48 577	143 802	163 426	18 716	0	0	99	101	1 648	1 153	43 574
2017	0	24 275	56 939	100 863	64 461	140 908	205 950	194 298	187 502	141 478	4 160	0	0	108	144	3 054	1 888	43 574

Table E4. Proportion of maturity-at-age 5 – 30 in *S. norvegicus* in subareas 1 and 2 derived from Norwegian commercial and survey data. The proportions were derived from samples with at least five individuals.

Year/Age	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1992	0.00	0.00	0.09	0.15	0.31	0.22	0.21	0.20	0.22	0.26	0.30	0.44	0.45	0.47
1993	-	-	0.00	0.00	0.10	0.29	0.54	0.47	0.53	0.67	0.80	0.75	0.78	0.82
1994	0.00	0.00	0.03	0.05	0.28	0.28	0.32	0.70	0.79	0.91	0.94	0.85	0.92	1.00
1995	0.00	0.00	0.00	0.05	0.02	0.22	0.25	0.48	0.61	0.64	0.68	0.80	0.87	0.88
1996	0.00	0.05	0.14	0.13	0.22	0.38	0.43	0.60	0.64	0.75	0.69	0.77	0.90	0.85
1997	0.00	0.05	0.08	0.15	0.17	0.21	0.34	0.35	0.57	0.64	0.72	0.73	0.85	0.93
1998	0.00	0.00	0.03	0.11	0.09	0.26	0.32	0.49	0.52	0.69	0.74	0.77	0.81	0.91
1999	0.00	0.00	0.00	0.04	0.17	0.35	0.22	0.53	0.73	0.71	0.67	0.69	0.74	0.71
2000	0.00	0.08	0.14	0.25	0.40	0.51	0.59	0.62	0.65	0.69	0.78	0.96	0.96	1.00
2001	-	0.00	0.06	0.14	0.28	0.32	0.40	0.52	0.53	0.60	0.76	0.74	0.81	0.85
2002	-	0.00	0.05	0.07	0.23	0.44	0.41	0.63	0.74	0.93	0.77	0.89	0.90	0.94
2003	-	0.00	0.00	0.05	0.13	0.24	0.24	0.47	0.58	0.68	0.75	0.65	0.77	0.78
2004	-	0.00	0.03	0.07	0.13	0.43	0.21	0.51	0.46	0.63	0.64	0.86	0.82	0.96
2005	-	-	0.00	0.05	0.29	0.18	0.34	0.39	0.39	0.56	0.73	0.81	0.79	0.82
2006	-	-	0.00	0.10	0.06	0.22	0.25	0.39	0.47	0.57	0.67	0.67	0.74	0.86
2007	-	-	0.00	0.08	0.30	0.25	0.24	0.66	0.68	0.70	0.88	0.86	0.89	0.99
2008	-	-	0.80	0.25	0.82	0.68	0.62	0.80	0.79	0.86	0.88	0.91	0.90	0.92
2009	-	-	-	-	-	0.50	0.50	1.00	0.93	0.81	0.86	0.86	0.84	0.86
2010	-	-	-	-	-	-	-	-	0.57	0.53	0.77	0.89	0.33	0.82
2011	-	-	-	-	-	-	-	-	-	-	0.73	0.78	0.94	0.93
2012	0.00	0.11	0.10	0.29	0.20	0.20	-	-	-	0.75	0.72	0.70	0.91	0.78
2013	0.00	0.12	0.05	0.10	0.19	0.38	0.71	-	0.29	0.82	0.92	0.89	0.77	0.86

Year/Age	19	20	21	22	23	24	25	26	27	28	29	30
1992	0.45	0.62	0.51	0.63	0.76	0.60	0.57	0.60	0.68	0.74	0.82	0.80
1993	0.91	0.85	0.82	0.87	0.75	0.91	1.00	1.00	1.00	1.00	1.00	1.00
1994	0.96	0.96	1.00	0.88	1.00	1.00	1.00	1.00	-	1.00	1.00	-
1995	0.76	0.89	0.90	0.91	1.00	1.00	1.00	1.00	-	-	-	-
1996	0.91	0.88	0.96	0.93	1.00	0.87	0.95	0.95	1.00	-	1.00	0.86
1997	0.94	1.00	1.00	0.95	0.89	0.94	0.93	0.89	1.00	1.00	1.00	-
1998	0.89	0.86	1.00	1.00	0.67	0.70	1.00	1.00	-	-	1.00	0.88
1999	0.77	0.89	-	0.83	-	1.00	0.89	-	-	-	-	-
2000	1.00	-	-	-	1.00	-	-	-	-	-	-	-
2001	0.60	0.70	0.56	-	-	-	-	-	-	-	-	-
2002	0.96	0.92	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-
2003	0.93	0.96	0.94	0.67	1.00	-	1.00	-	-	-	-	-
2004	0.92	0.95	0.89	0.88	1.00	0.86	1.00	-	-	-	-	-
2005	0.77	0.94	0.95	0.88	0.83	1.00	-	1.00	-	-	-	-
2006	0.83	0.97	0.79	0.95	0.81	1.00	-	1.00	-	-	-	-
2007	0.98	1.00	0.96	0.94	1.00	0.92	1.00	0.83	1.00	1.00	1.00	-
2008	0.92	0.90	0.93	0.93	0.94	1.00	1.00	1.00	1.00	1.00	0.93	1.00
2009	0.88	0.95	0.89	0.95	0.92	0.95	0.86	0.93	1.00	0.93	0.83	0.86
2010	0.82	0.92	0.86	0.80	1.00	0.63	0.80	0.80	0.86	-	0.67	-
2011	0.89	0.92	0.92	0.93	0.83	0.85	1.00	1.00	-	0.83	-	-
2012	0.88	0.89	0.85	0.81	0.95	0.81	0.86	1.00	0.93	1.00	1.00	1.00
2013	0.75	0.79	0.71	0.83	0.88	0.95	1.00	0.63	1.00	1.00	1.00	1.00

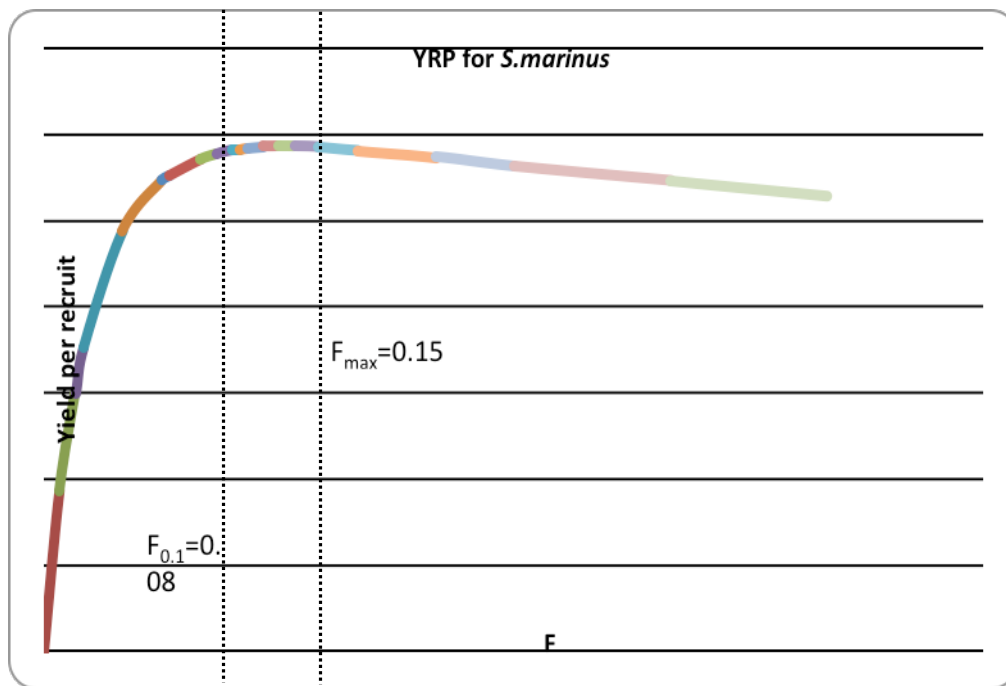


Figure E1. *Sebastes norvegicus* in subareas 1 and 2. Yield-per-recruit for *S. norvegicus*, computed from the base case GADGET model presented at the benchmark assessment in February 2012 (WKRED).

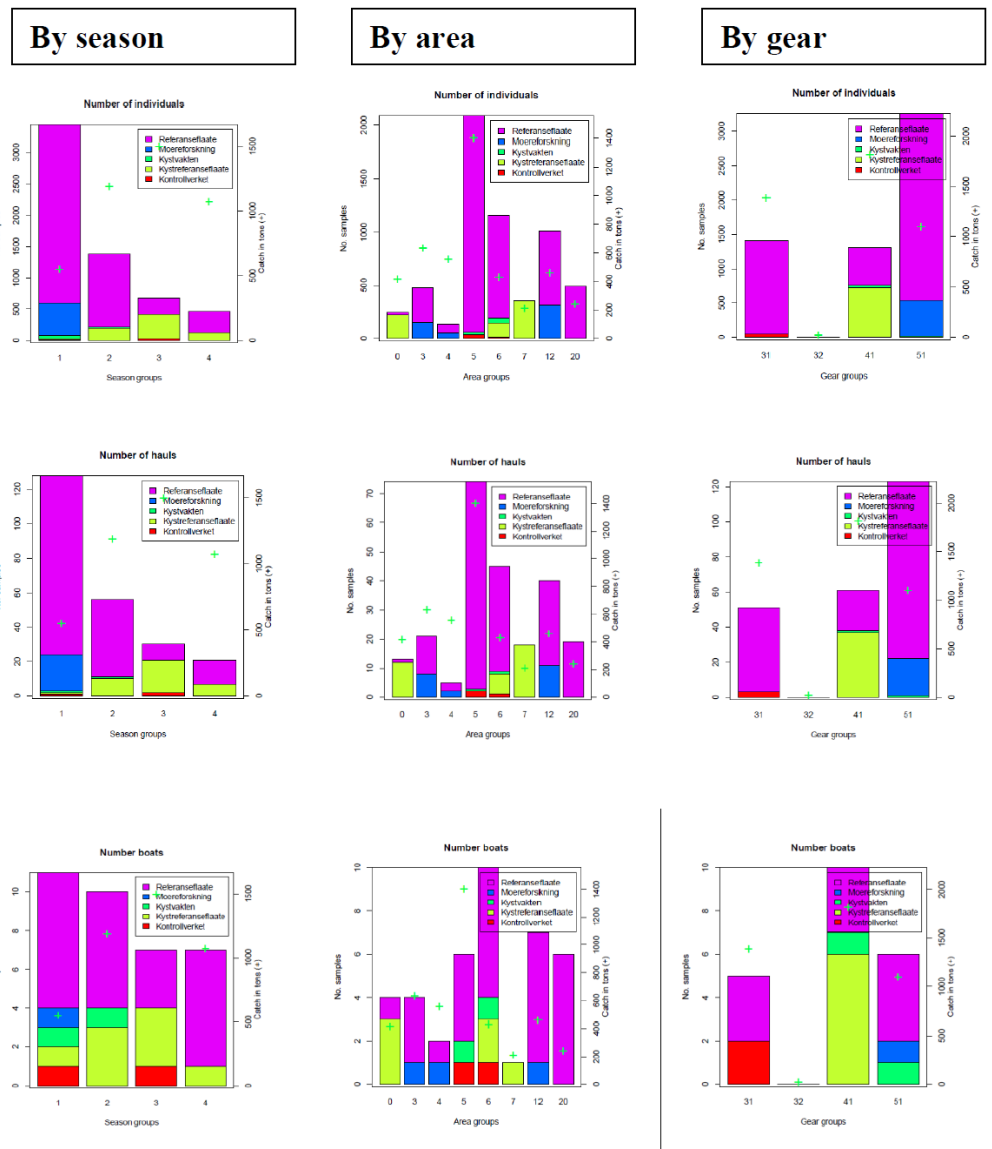


Figure E2. Overview of the Norwegian biological age samples (number individuals, number hauls/sets, number of boats) from the commercial fisheries for *S. norvegicus* in 2013 representing more than 80% of the catches and which the input data to the Gadget model are based upon. The colours denote which sampling platform has been used: High Seas Reference fleet, port sampling, Coast guard, Coastal Reference Fleet, or inspectors/observers at sea. The green crosses show the catch in tonnes for the different seasons, areas and gears.