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## International Council for the Exploration of the Sea Conseil International pour l'Exploration de la Mer

H.C. Andersens Boulevard 44–46  
DK–1553 Copenhagen V  
Denmark  
Telephone (+45) 33 38 67 00  
Telefax (+45) 33 93 42 15  
[www.ices.dk](http://www.ices.dk)  
[info@ices.dk](mailto:info@ices.dk)

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### Editors

Daniel Howell

### Authors

Jane Aanestad Godiksen • Erik Berg • Matthias Bernreuther • Bjarte Bogstad • José Miguel Casas  
Thomas de Lange Wenneck • Elena Eriksen • Johanna Fall • Anatoly Filin • Harald Gjøsæter • Elvar  
Hallfredsson • Hannes Höffle • Daniel Howell • Edda Johannesen • Yuri Kovalev • Kjell Nedreaas • Holly  
Ann Perryman • Dmitri Prozorkevich • Alexey Russkikh • Silje Elizabeth Seim • Arved Staby • Ross  
Tallman • Mikko Juhani Vihtakari • Tone Vollen • Kristin Windsland • Natalia Yaragina



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## Section contents

7	Golden redfish in subareas 1 and 2 (Northeast Arctic) .....	371
7.1.1	Recent regulations of the fishery.....	371
7.1.2	Landings prior to 2021 (Tables 7.1–7.4 and Figures 7.1–7.2) .....	371
7.1.3	Expected landings in 2021 .....	372
7.2	Data used in the assessment (Table 0.1 and Figure E1).....	372
7.2.1	Catch–at–length and age (Table 7.5 and Figure 7.4) .....	372
7.2.2	Catch weight–at–Age (Table 7.6).....	373
7.2.3	Maturity–at–age (Table E4, Figure 7.5a–b) .....	373
7.2.4	Survey results (Tables E1a,b–E2a,b–E3, Figures 7.6a,b–7.8) .....	373
7.3	Assessment with the Gadget model .....	374
7.3.1	Description of the model .....	374
7.3.2	Data used for tuning .....	374
7.3.3	Assessment results using the Gadget model (Figures 7.9–7.13) .....	375
7.3.4	State of the stock .....	376
7.3.5	Biological reference points .....	376
7.3.6	Management advice .....	377
7.3.7	Implementing the ICES $F_{MSY}$ framework.....	377
7.4	Tables and figures .....	378

## 7 Golden redfish in subareas 1 and 2 (Northeast Arctic)

### *Sebastes norvegicus* – reg.27.1–2

#### 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 onboard 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* (s) 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 from 1 June to 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 2021 (Tables 7.1–7.4 and Figures 7.1–7.2)

Nominal catches of *S. norvegicus* for the years 1998–2020 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 6.6 and 6.7). The sources of information used are catches reported to ICES, NEAFC, Norwegian and Russian authorities (foreign vessels fishing in these countries' 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 correlation between official catches of these two species in the considered areas. 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. Then the landings decreased further, and the total landings figures for *S. norvegicus* in 2003–2013 were 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 6656 tonnes in 2018, 8274 tonnes in 2019 and 9033 tonnes in 2020 (provisional). This increase is likely due to the increased quota for beaked redfish and thereby increased bycatch of golden redfish. The time-series of *S. norvegicus* landings is given in Figure 7.1. A map of *Sebastes norvegicus* catches from Norwegian vessels' logbooks in 2020 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 were at the lowest level since World War II in 2015. Since 2015 only bycatches of *S. norvegicus* are allowed except for a limited amount caught by vessels less than 15 metres fishing with handline from 1 June to 31 August. The increase in landings since 2015 is due to increased bycatch in trawl.

The reported Russian catches of *S. norvegicus* have been around 600–900 t since 2001, but increased to 1834 tonnes in 2018, 1929 tonnes in 2019 and 2615 tonnes in 2020. Twelve other countries together usually report catches in the 300–600 t range or less (Table 7.1).

The bycatch of redfish (*Sebastes* spp.) in the Norwegian Barents Sea shrimp fisheries during the period 1983–2017 were dominated by *S. mentella*, and hence influenced the *S. norvegicus* to a much lesser extent. However, these bycatches probably inflicted 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 2021

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 metres being allowed to have up to 30% by weight of redfish in the period 1 August–31 December. The bycatch is calculated in live weight per week.

As expected, total landings in 2020 increased due to the raised quota for *S. mentella*, and thus an increase in bycatch of *S. norvegicus*. The quota for *S. mentella* in 2020 was not reached but catches increased considerably. With an even higher *S. mentella* quota for 2021, the increase in bycatch of *S. norvegicus* is expected to continue in 2021.

## 7.2 Data used in the assessment (Table 0.1 and Figure E1)

An example of the sampling levels (by season, area and gear) of the data used in the assessment is presented in Figure E1 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 and Figure 7.4)

The current method used for calculating catch-at-length and age of Norwegian catches is outdated, and there seemed to be issues with the results. Therefore, catch-at-length and catch-at-age were not updated this year. New methods will be implemented and reviewed by the group before AFWG 2022.

Age composition data were only provided by Norway in the latest years. Other countries were assumed to have the same relative age distribution and mean weight as Norway. The catch numbers-at-age matrix is shown in Table 7.5. Catch at length data were also only available from Norway (Figure 7.4).

### 7.2.2 Catch weight-at-age (Table 7.6)

Weight-at-age data for ages 7–24+ were not available from the Norwegian landings in 2018–2020 during the working group (Table 7.6). 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 7.5a–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 up to 2019, as reported in Table E4 and presented in Figure 7.5a. Only the data up to 2016 was considered in the model, due to insufficient age readings in the later years. The maturity ogive modelled by Gadget is presented (Figure 7.5b). This analysis shows that 50% of the fish at age 12 are mature.

### 7.2.4 Survey results (Tables E1a,b–E2a,b–E3, Figures 7.6a,b–7.8)

Results from the following research vessel survey series are available for *S. norvegicus*:

Joint Norwegian–Russian Barents Sea winter bottom-trawl survey (A6996 BS–NoRu–Q1 BTr) from 1986 to 2021 in fishing depths of 100–500 m. Length compositions for the years 1986–2021 are shown in Table E1a and Figure 7.6a. Age compositions for the years 1992–2016 and 2018 are shown in Table E1b and Figure 7.6b. 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 2020 in fishing depths of 100–500 m (depths down to 800 m incl. in the swept-area). Since 2005 this is part of the Joint Norwegian–Russian Barents Sea Ecosystem survey (A6996 Eco–NoRu–Q3 BTr). Length compositions for the years 1985–2020 and age compositions for the years 1992–2008, 2012, 2013, 2016 and 2018 are shown in Table E2a and E2b, respectively. This survey covers the northernmost part of the species' distribution. Missing age compositions are due to insufficient number of age readings or too few age samples. This survey is not currently included in the model tuning.

Data on length and age from winter and ecosystem surveys have been combined and are shown in Figures 7.7a–b.

Norwegian Coastal and Fjord survey in 1998–2020 from Finnmark to Møre (NOcoast–Aco–Q4). Length composition from catch rates (numbers/nm<sup>2</sup> averaged for all stations within subareas and finally averaged, weighted by subarea, for the total surveyed area) are shown in Figure 7.8 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 2018a). 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.

SToX versions of winter and ecosystem surveys are used since AFWG 2020. The group recommended that work continues to investigate redfish-specific strata systems for the survey. The coastal survey for *S. norvegicus* should be converted to SToX in a similar manner, with special attention to the strata system to see if a coherent index of abundance and/or biomass can be obtained for this survey (which is currently only used for annual length distributions).

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 pre-recruits ( $< 25$  cm) has steadily decreased since 1991 and has dropped to very low levels after 2000 (Figure 7.6a). An increase in the number of pre-recruits 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 (2018a), where it was also recommended to switch to a two-year advice cycle. A number of changes have been made to the model at the benchmark WKREDFISH (2018a); 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 recalculated; a number of minor errors in the model and data were fixed. Full details are in the WKREDFISH benchmark report (ICES 2018a).

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, winter survey and coastal survey. Winter survey tunes to total survey index, the coastal survey to length distributions only. Growth and fishing selectivity within each fleet and survey are assumed constant over time (except for 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 into account 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 2019. 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 2018.
- Length disaggregated frequencies from the Barents Sea (Division 2.a) bottom-trawl survey (February) from 1990–2019 (Table E1a).
- Age-length data and aggregated survey indices from the same survey up to 2018, excluding 2017 (Table E1b).
- Length disaggregated frequencies from the Barents Sea (Division 2.a) coastal survey (February) from 1998–2019 (Table E3, Figure 7.8).

### 7.3.3 Assessment results using the Gadget model (Figures 7.9–7.13)

The general patterns in the stock dynamics of *S. norvegicus* are similar to those modelled for the past several years, 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 not responding yet, 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 7.10).
- There has been somewhat better-estimated recruitment in recent years, with a reasonably good recruitment in 2003 (Figure 7.13). Indications of a second pulse of good recruitment in 2009 have strengthened in the current assessment, but are still highly uncertain, and will need to be tracked for some years to come, to reduce this uncertainty.
- The estimated fishing mortality ( $F_{15+}$ ) declined between 1990 and 2005 but remained relatively stable until around 2015, (Figure 7.11, Table 7.7). The current mortality is estimated to  $F = 0.46$  (Figure 7.11), well above a sustainable level for a redfish species, and above the  $F_{MSY} = 0.05$  estimated at WKREDFISH (ICES 2018a). 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 119 000 tonnes in the early 1990s to just under 40 000 tonnes in 2019 (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.

The average assessment bias (Mohn's Rho) over the last 5 assessments was 1% for recruitment, 56% for  $F(15+)$  and -29% for SSB. The retrospective plots (Figure 7.13) exhibit a sharp rise in the estimate of mature biomass compared to earlier assessments and a corresponding decline in  $F(15+)$ , the reason for which is unclear. Whether these changes persist or are eliminated by updated input data in future assessments will have to be monitored.

### 7.3.4 State of the stock

Survey observations and the 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 (ICES 2012) and for the 2020 red list evaluation, which produced similar trends. Indications are that the SSB is continuing to fall. This has led to an upwards trend in  $F$  to a level that may place an increasing burden on an already poorly performing stock. Furthermore, in the absence of a substantial population of fish in the 10 to 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, but SSB still declines. However, the total level of this recruitment is still uncertain, and although the 2003 year class 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 it. 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 mature individuals. With a currently estimated SSB of around 24 000 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.

### 7.3.5 Biological reference points

Reference point calculations were conducted at WKREDFISH benchmark (2018a), based on a  $B_{LOSS}$  with reasonable recruitment, and a forecast with constant recruitment to produce an  $F_{MSY}$  candidate. Note that the benchmark used preliminary data and that the results presented here are slightly changed from those at WKREDFISH (2018). We, therefore, follow the methodology presented at WKREDFISH (2018a) 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 (2018a) proposes  $F_{0.1(15+)}$ , estimated to be 0.0525, as a candidate  $F_{MSY}$  (Figure E2).

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

### 7.3.6 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 as of now, there are only weak indications that the mature stock is 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 2021. It is critical that the bycatch regulations do not allow the catch to increase, as this would impair prospects for recovery.

### 7.3.7 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. 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 low fishing pressure.

## 7.4 Tables and figures

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	1632	51	171	<b>19 155</b>
1999	–	35	35	228	47	14	7	–	–	16 750	–	3	1691	7	169	<b>18 986</b>
2000	–	17	13	160	22	16	–	–	–	13 032	–	16	1112	–	73	<b>14 461</b>
2001	–	37	30	238	17	–	1	–	–	9134	–	7	963	1	119	<b>10 547</b>
2002	–	60	31	42	31	3	–	–	–	8561	–	34	832	3	46	<b>9643</b>
2003	–	109	8	122	36	4	–	–	89	6853	–	6	479	–	134	<b>7840</b>
2004	–	19	4	68	20	30	–	–	33	6233	–	5	722	3	69	<b>7206</b>
2005	–	47	10	72	36	8	–	–	48	6085	–	56	614	8	52	<b>7036</b>
2006	–	111	8	35	44	31	3	–	21	6305	–	69	713	9	39	<b>7388</b>
2007	–	146	15	67	84	68	13	–	20	5784	–	225	890	5	55	<b>7372</b>
2008	–	274	63	30	71	27	6	–	2	5216	–	72	749	4	85	<b>6599</b>
2009	–	70	1	58	81	66	–	–	1	5451	–	30	698	–	31	<b>6487</b>
2010	–	171	51	31	72	22	–	–	–	5994	1	28	565	3	44	<b>6981</b>
2011	–	24	53	9	51	22	–	–	1	4681	48	25	919	6	13	<b>5852</b>

Year	Denmark	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Lithuania	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Total
2012	–	87	182	71	58	23	12	–	5	4247	34	17	681	–	100	<b>5517</b>
2013	–	83	353	1	45	8	1	–	–	3771	19	36	797	–	493	<b>5609</b>
2014	–	67	219	6	20	29	–	–	1	3053	21	5	806	–	211	<b>4436</b>
2015	1	76	53	24	211	35	–	–	–	2488	17	–	664	2	57	<b>3629</b>
2016	7	183	30	4	87	55	–	–	–	3239	26	–	864	–	76	<b>4572</b>
2017	–	123	17	19	61	65	–	–	2	3353	27	90	1297	44	160	<b>5258</b>
2018	1	146	37	66	77	67	–	–	–	4276	36	67	1834	12	37	<b>6656</b>
2019	–	244	24	93	56	83	–	3	–	5667	20	69	1929	61	25	<b>8274</b>
2020 <sup>1</sup>	–	166	1	85	99	52	–	–	–	5902	9	80	2615	6	18	<b>9033</b>

**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	Lithuania	Norway	Poland	Portugal	Russia	Spain	UK	Total
1998	78	–	5	–	–	–	–	2109	–	–	308	–	30	<b>2530</b>
1999	35	–	18	9	14	–	–	2114	–	–	360	–	11	<b>2561</b>
2000	–	–	1	–	16	–	–	1983	–	–	146	–	12	<b>2158</b>
2001	4	–	11	–	–	–	–	1053	–	–	128	–	16	<b>1212</b>
2002	15	1	5	–	–	–	–	693	–	–	220	–	9	<b>943</b>
2003	15	–	–	1	–	–	–	815	–	–	140	–	4	<b>975</b>
2004	7	–	–	–	–	–	–	1237	–	–	213	–	12	<b>1469</b>
2005	10	1	–	–	–	–	–	1002	–	–	61	–	4	<b>1078</b>
2006	46	–	–	–	–	–	–	690	–	–	136	–	–	<b>872</b>
2007	15	–	12	15	–	–	–	1034	–	–	49	2	20	<b>1147</b>
2008	45	7	2	–	–	–	–	634	–	3	49	–	15	<b>755</b>
2009	–	–	3	2	6	–	–	701	–	30	19	–	24	<b>768</b>
2010	58	–	–	–	–	–	–	497	–	–	21	1	6	<b>583</b>
2011	24	–	–	2	1	–	–	674	–	–	7	–	–	<b>708</b>
2012	17	–	3	1	9	2	–	546	–	–	27	–	18	<b>623</b>
2013	28	2	1	–	+	–	–	574	–	–	41	–	4	<b>651</b>
2014	59	10	6	17	4	–	–	403	2	–	27	–	17	<b>542</b>
2015	57	4	9	211	13	–	–	514	2	–	51	2	10	<b>871</b>
2016	161	7	4	74	–	51	–	782	4	–	136	–	60	<b>1275</b>
2017	81	5	–	8	4	–	–	8 44	2	2	211	2	23	<b>1182</b>
2018	146	28	35	29	–	–	–	926	5	3	302	5	25	<b>1504</b>
2019	228	11	32	22	30	–	2	1052	4	2	422	3	11	<b>1819</b>
2020 <sup>1</sup>	145	–	14	18	33	–	–	1158	2	8	708	6	1	<b>2093</b>

**1 – Provisional figures.**

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	9 032
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	6 723
2004	12	4	68	20	30	–	33	4 872	–	5	396	3	58	5 501
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	5 167
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	6 057
2011	–	51	9	49	20	–	1	3 942	–	–	695	2	13	4 782
2012	49	182	33	57	13	2	2	3 599	–	1	427	–	33	4 398

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherland	Norway	Poland	Portugal	Russia	Spain	UK		Total
2013	55	343	–	45	8	–	–	3 076	–	9	475	–	466	<b>Denmark – 1</b>	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	–	9	17	43	67	–	–	3 275	12	64	489	7	12	–	3 995
2019	15	14	61	34	53	–	–	4 493	16	68	794	57	13	<b>Lithuania – 1</b>	5 619
2020 <sup>1</sup>	21	1	58	81	19	–	–	4520	–	72	946	–	15	–	5733

1 – Provisional 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	–				228	–	–	288	–	–	529
2006	–	5	–	–	–				1211	–	10	284	–	–	1510
2007	–	12	–	–	–				649	–	155	242	–	–	1058
2008	–	–	–	–	–				126	–	1	250	–	–	377
2009	–	–	–	–	–				207	–	–	179	–	–	386
2010	–	–	–	–	–				83	–	2	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	–	–	14	6	–	–	–	75	19	–	1043	–	–	1158
2019	–	–	–	–	–	–	–	–	122	–	–	712	1	1	836
2020 <sup>1</sup>	–	–	–	13	–	–	–	–	224	7	–	961	–	2	1207

<sup>1</sup> -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
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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp	Total Num.	Tonnes Land.
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 <sup>1</sup>	106	82	132	69	132	165	311	455	225	132	105	83	85	102	88	138	182	1169	3760	5257
2018	Data not available during AFWG 2021.																			
2019	Data not available during AFWG 2021.																			
2020	Data not available during AFWG 2021.																			

<sup>1</sup> – Provisional figures. Weight-at-age in the catches was not available for 2018–2020.

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
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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp
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 <sup>1</sup>	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
2018	Data not available during AFWG 2021.																	
2019	Data not available during AFWG 2021.																	
2020	Data not available during AFWG 2021.																	

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<sup>1</sup> – Provisional 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	2003	2004
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	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	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	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	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	0.00	0.00
9	0.05	0.04	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
10	0.08	0.07	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.01	0.01
11	0.11	0.09	0.08	0.08	0.05	0.04	0.04	0.04	0.05	0.05	0.04	0.03	0.03	0.02	0.02
12	0.15	0.12	0.11	0.11	0.11	0.06	0.07	0.07	0.08	0.08	0.06	0.05	0.05	0.04	0.04
13	0.20	0.15	0.13	0.13	0.14	0.12	0.10	0.10	0.11	0.11	0.09	0.07	0.07	0.06	0.06
14	0.25	0.19	0.16	0.16	0.17	0.14	0.16	0.13	0.15	0.15	0.13	0.10	0.09	0.08	0.07
15	0.31	0.23	0.19	0.19	0.19	0.16	0.19	0.18	0.18	0.19	0.16	0.12	0.12	0.10	0.09
16	0.38	0.27	0.22	0.21	0.22	0.18	0.21	0.21	0.24	0.23	0.19	0.15	0.14	0.12	0.11
17	0.44	0.32	0.26	0.24	0.25	0.20	0.23	0.22	0.26	0.28	0.22	0.17	0.16	0.13	0.12
18	0.48	0.36	0.29	0.27	0.27	0.22	0.25	0.24	0.27	0.30	0.25	0.19	0.17	0.15	0.13
19	0.51	0.38	0.32	0.29	0.30	0.24	0.26	0.25	0.29	0.32	0.26	0.20	0.18	0.15	0.14
20	0.54	0.40	0.33	0.31	0.31	0.25	0.28	0.27	0.30	0.33	0.27	0.21	0.19	0.16	0.15
21	0.56	0.42	0.34	0.32	0.33	0.26	0.29	0.28	0.31	0.34	0.28	0.21	0.19	0.16	0.15

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
22	0.58	0.43	0.34	0.32	0.33	0.26	0.29	0.28	0.32	0.34	0.28	0.21	0.19	0.15	0.14
23	0.59	0.43	0.34	0.32	0.33	0.26	0.29	0.28	0.32	0.34	0.28	0.20	0.18	0.15	0.14
24	0.58	0.42	0.33	0.31	0.32	0.25	0.28	0.27	0.31	0.33	0.27	0.20	0.18	0.14	0.13
25	0.57	0.41	0.32	0.30	0.30	0.24	0.27	0.26	0.29	0.31	0.25	0.19	0.17	0.13	0.12
26	0.55	0.38	0.30	0.28	0.28	0.23	0.26	0.25	0.28	0.29	0.23	0.17	0.16	0.12	0.12
27	0.52	0.36	0.27	0.26	0.26	0.21	0.24	0.23	0.26	0.27	0.20	0.16	0.15	0.11	0.11
28	0.50	0.34	0.25	0.24	0.24	0.19	0.22	0.21	0.24	0.24	0.19	0.14	0.13	0.10	0.10
29	0.47	0.31	0.23	0.22	0.22	0.17	0.20	0.19	0.22	0.22	0.17	0.12	0.11	0.09	0.09
30	0.43	0.27	0.19	0.17	0.17	0.13	0.14	0.13	0.14	0.14	0.10	0.10	0.09	0.06	0.06
15+	0.500	0.358	0.283	0.266	0.270	0.217	0.242	0.235	0.264	0.280	0.225	0.171	0.156	0.126	0.118

Age	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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	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	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	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	0.00	0.00
8	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
9	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.02
10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.03	0.05

Age	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
11	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.06	0.09
12	0.04	0.04	0.04	0.04	0.03	0.05	0.04	0.04	0.05	0.04	0.04	0.06	0.07	0.10	0.14
13	0.05	0.06	0.06	0.06	0.05	0.07	0.06	0.06	0.07	0.06	0.05	0.08	0.10	0.14	0.20
14	0.07	0.08	0.08	0.08	0.07	0.09	0.08	0.09	0.10	0.09	0.07	0.11	0.13	0.19	0.27
15	0.09	0.09	0.10	0.10	0.09	0.12	0.10	0.11	0.12	0.11	0.09	0.13	0.16	0.24	0.35
16	0.11	0.11	0.12	0.11	0.11	0.14	0.12	0.13	0.15	0.13	0.11	0.15	0.19	0.28	0.42
17	0.12	0.13	0.13	0.13	0.12	0.16	0.14	0.15	0.17	0.15	0.12	0.17	0.22	0.32	0.49
18	0.13	0.14	0.14	0.14	0.13	0.18	0.15	0.16	0.18	0.16	0.14	0.19	0.24	0.36	0.55
19	0.14	0.14	0.15	0.15	0.14	0.19	0.16	0.17	0.19	0.17	0.14	0.20	0.25	0.38	0.59
20	0.14	0.15	0.15	0.15	0.15	0.19	0.17	0.17	0.20	0.18	0.15	0.20	0.26	0.39	0.62
21	0.14	0.15	0.15	0.15	0.15	0.20	0.17	0.18	0.20	0.18	0.15	0.21	0.26	0.39	0.62
22	0.14	0.15	0.15	0.15	0.15	0.19	0.16	0.17	0.20	0.17	0.15	0.20	0.25	0.38	0.60
23	0.13	0.14	0.15	0.14	0.14	0.19	0.16	0.17	0.19	0.17	0.14	0.19	0.24	0.36	0.56
24	0.12	0.13	0.14	0.13	0.14	0.18	0.15	0.16	0.18	0.16	0.13	0.18	0.23	0.33	0.52
25	0.12	0.13	0.13	0.12	0.13	0.17	0.15	0.15	0.17	0.15	0.13	0.17	0.21	0.31	0.47
26	0.11	0.12	0.12	0.11	0.12	0.16	0.14	0.14	0.16	0.14	0.12	0.16	0.19	0.28	0.42
27	0.11	0.11	0.12	0.10	0.11	0.15	0.13	0.13	0.15	0.13	0.11	0.15	0.18	0.25	0.37
28	0.10	0.11	0.11	0.09	0.10	0.13	0.12	0.12	0.14	0.12	0.10	0.14	0.16	0.23	0.33



Age	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
29	0.09	0.10	0.10	0.09	0.10	0.12	0.10	0.11	0.13	0.11	0.09	0.13	0.15	0.21	0.30
30	0.06	0.07	0.07	0.06	0.07	0.09	0.08	0.09	0.10	0.08	0.07	0.09	0.10	0.13	0.18
15+	0.115	0.123	0.127	0.120	0.122	0.160	0.137	0.144	0.163	0.142	0.122	0.167	0.207	0.302	0.462

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	384	0.37	141.98	112	0.67	75.09	271	0.25	66.88		3.79
1987	372	0.37	138.88	111	0.66	73.16	261	0.25	65.72		2.97
1988	347	0.38	133.09	108	0.63	68.34	239	0.27	64.75		1.67
1989	324	0.40	129.33	105	0.62	64.98	219	0.29	64.34		1.57
1990	299	0.40	119.60	100	0.58	57.94	199	0.31	61.65	0.50	1.66
1991	281	0.42	118.20	100	0.59	58.40	182	0.33	59.80	0.36	1.58
1992	266	0.45	119.00	101	0.61	61.70	165	0.35	57.30	0.28	1.46
1993	250	0.47	118.50	101	0.64	65.03	149	0.36	53.47	0.27	1.39
1994	237	0.49	115.64	99	0.68	66.98	138	0.35	48.65	0.27	1.69
1995	221	0.52	114.30	97	0.72	69.98	124	0.36	44.31	0.22	1.09
1996	201	0.54	109.31	93	0.75	70.05	108	0.36	39.26	0.24	0.75
1997	182	0.57	103.72	88	0.79	69.03	95	0.37	34.69	0.24	0.76
1998	160	0.59	95.12	80	0.81	65.00	80	0.37	30.12	0.26	0.40
1999	140	0.61	85.40	71	0.83	59.33	69	0.38	26.07	0.28	0.41
2000	124	0.64	79.18	65	0.86	56.08	58	0.40	23.10	0.23	0.31

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)
2001	112	0.68	76.15	61	0.90	55.28	51	0.41	20.87	0.17	0.40
2002	102	0.72	73.44	57	0.95	54.70	45	0.42	18.74	0.16	0.32
2003	93	0.78	71.76	55	1.01	54.99	38	0.44	16.77	0.13	0.19
2004	86	0.81	70.10	52	1.07	55.18	35	0.43	14.92	0.12	0.44
2005	80	0.85	68.16	49	1.13	55.01	31	0.42	13.15	0.11	0.31
2006	82	0.80	65.69	45	1.19	53.90	37	0.32	11.79	0.12	1.16
2007	75	0.83	62.67	42	1.24	52.16	33	0.32	10.51	0.13	0.24
2008	70	0.85	60.06	39	1.30	50.48	32	0.30	9.57	0.12	0.38
2009	65	0.88	57.39	36	1.34	48.48	29	0.31	8.91	0.12	0.27
2010	59	0.90	53.11	33	1.37	44.81	27	0.31	8.30	0.16	0.21
2011	65	0.78	50.65	30	1.40	42.32	35	0.24	8.33	0.14	1.27
2012	81	0.60	48.88	28	1.40	39.83	53	0.17	9.05	0.14	2.27
2013	75	0.62	46.64	27	1.35	37.15	47	0.20	9.49	0.16	0.10
2014	69	0.66	45.51	27	1.31	35.54	42	0.24	9.97	0.14	0.03
2015	63	0.71	45.14	27	1.28	34.75	36	0.29	10.39	0.12	0.04
2016	84	0.53	44.56	27	1.25	33.13	58	0.20	11.43	0.17	2.68

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)
2017	103	0.43	43.91	26	1.18	31.13	76	0.17	12.78	0.21	2.64
2018	99	0.42	41.73	26	1.06	28.11	73	0.19	13.62	0.30	0.61
2019	136	0.29	39.49	26	0.94	23.89	110	0.14	15.60	0.46	4.73

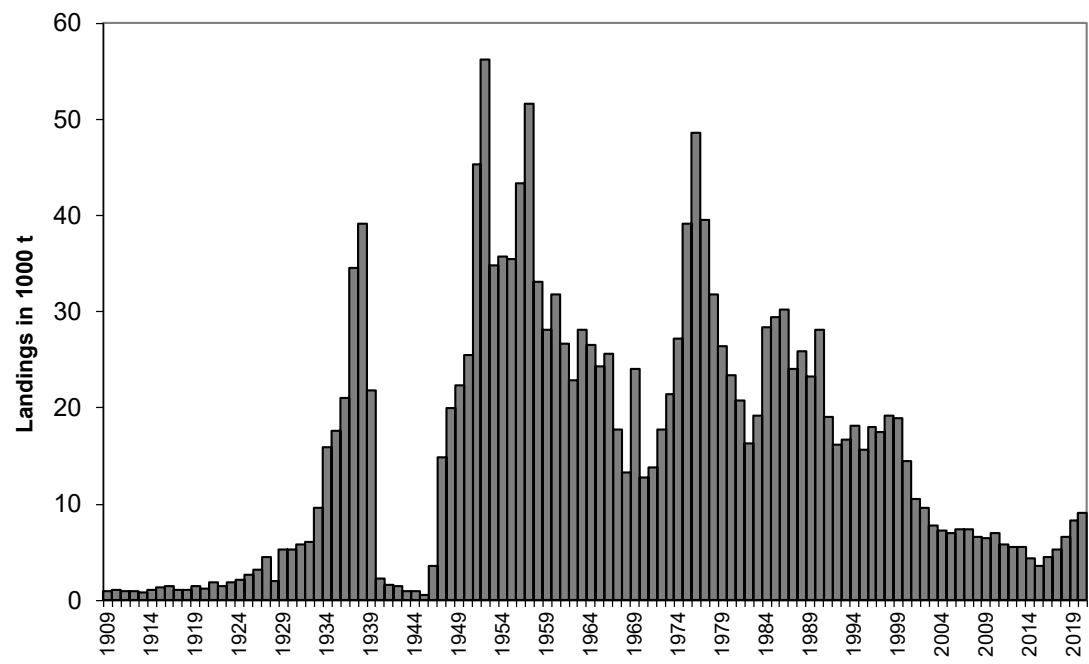


Figure 7.1. *Sebastes norvegicus* in subareas 1 and 2. Total international landings 1908–2020 (in thousand tonnes).

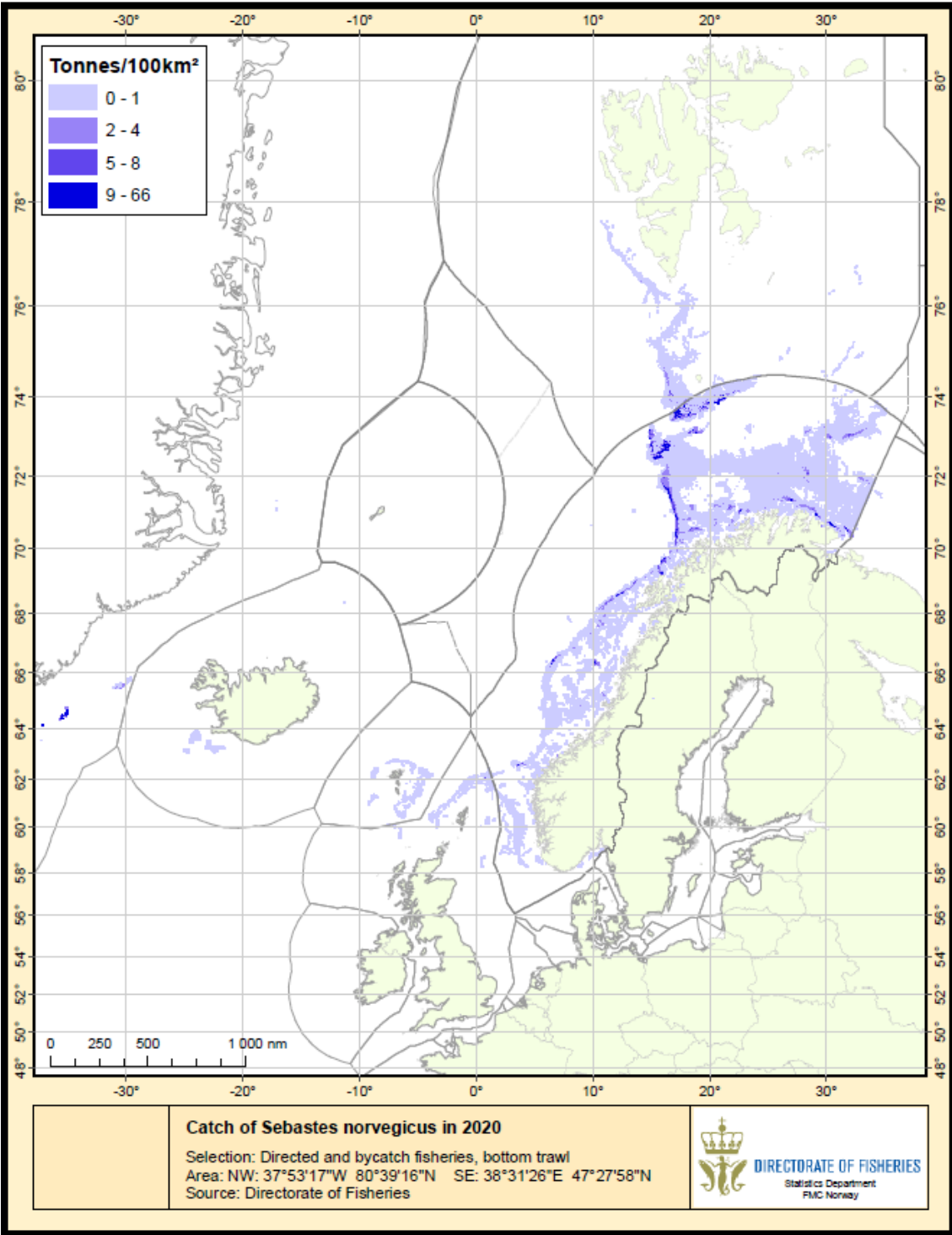


Figure 7.2. *Sebastes norvegicus* in subareas 1 and 2. Catches (including bycatch) of *Sebastes norvegicus* in 2020 from Norwegian logbooks. Due to reporting on the genus level these catches may contain a considerable amount of *Sebastes mentella*.

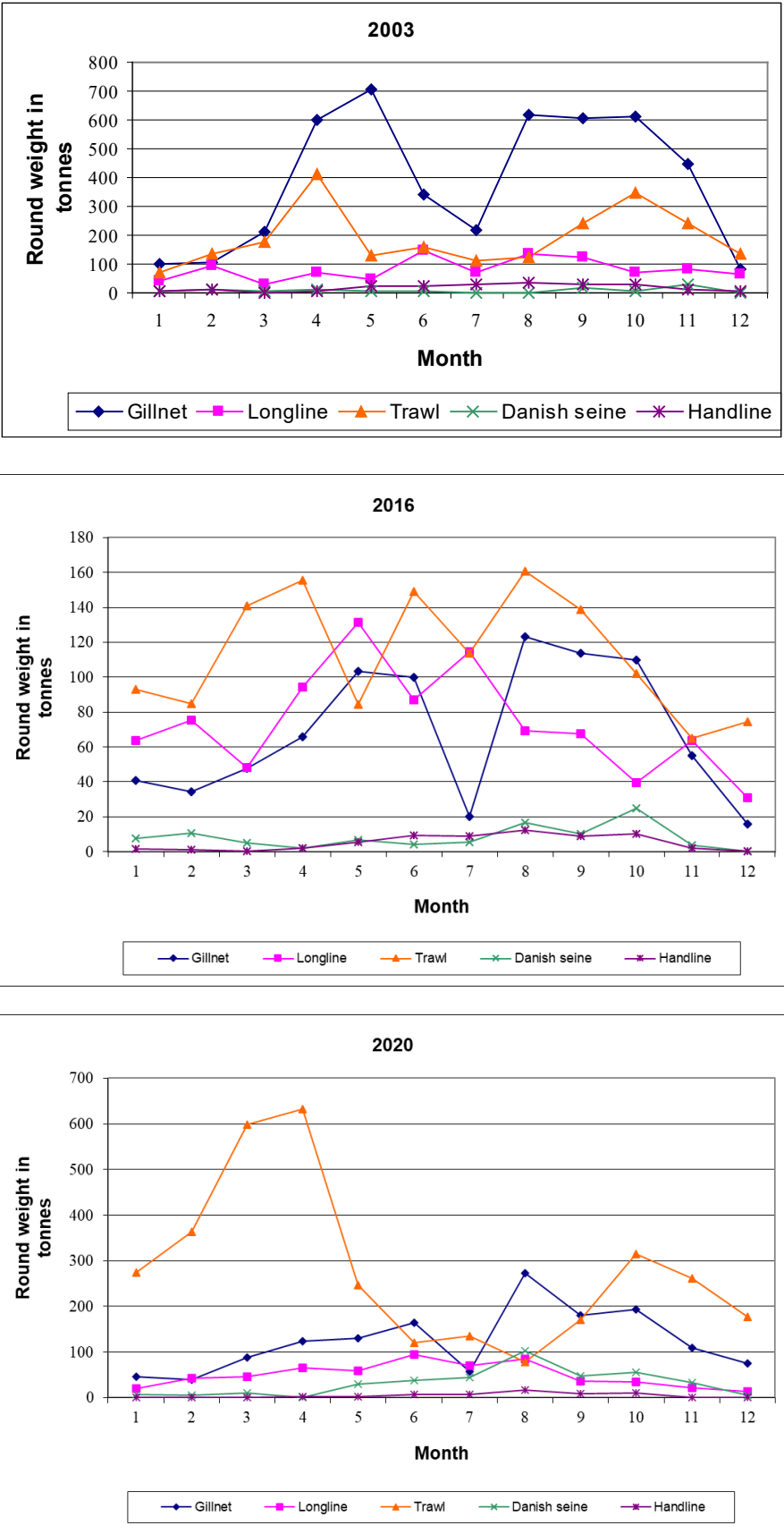


Figure 7.3a. Illustration of the seasonality in the different Norwegian *S. norvegicus* fisheries in 2003, 2016 and 2020, also illustrating how the current regulations are working.

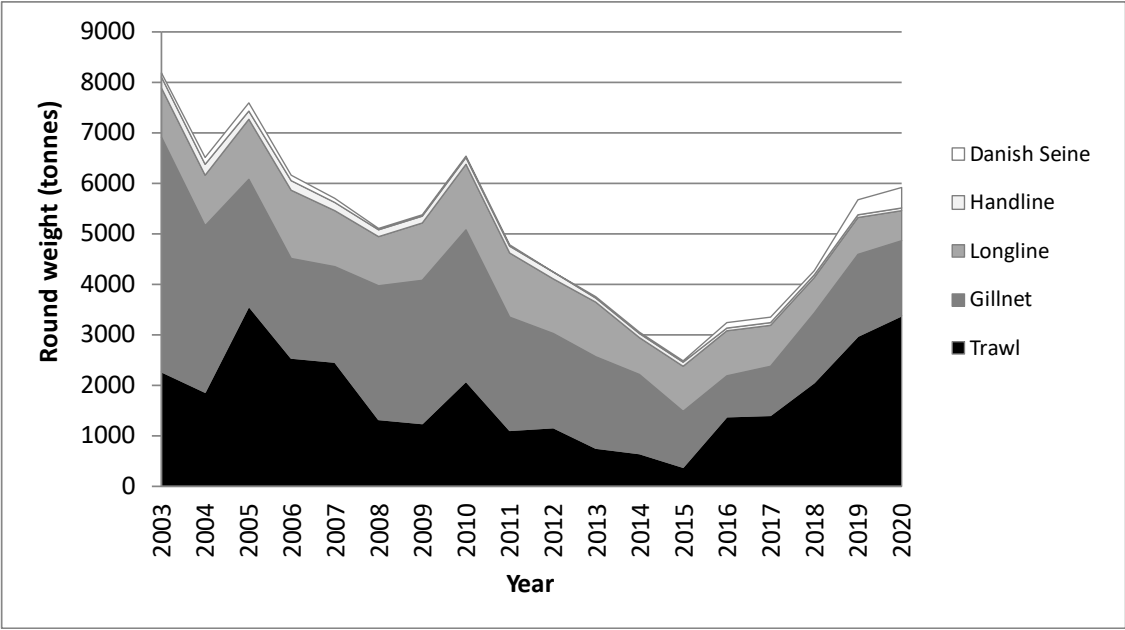


Figure 7.3b. Interannual changes in the Norwegian catches by fleet of *S. norvegicus* fisheries (2003–2020).

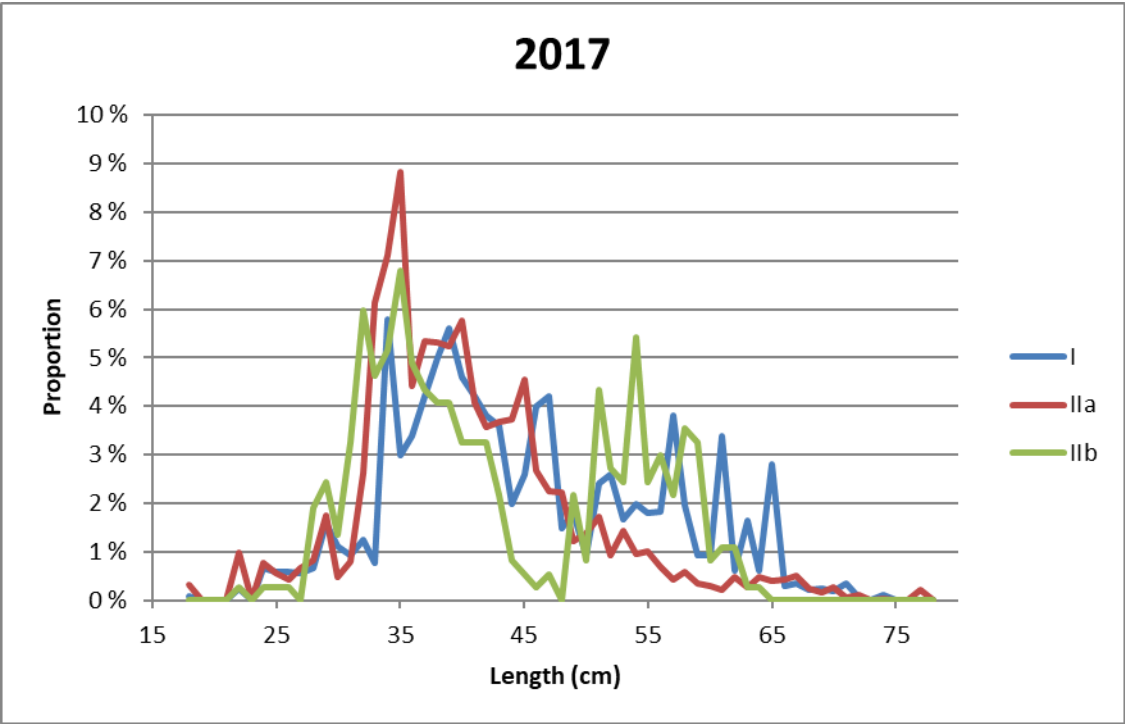
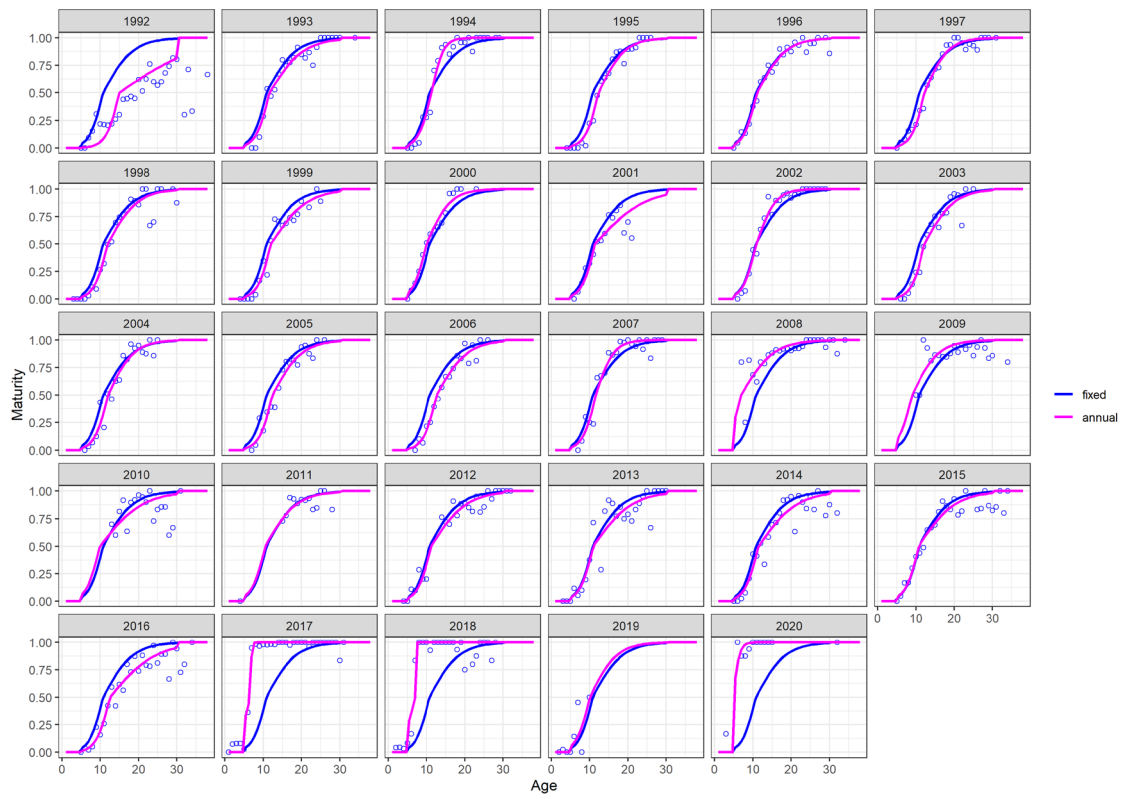


Figure 7.4. *Sebastes norvegicus*. Length frequency of *S. norvegicus* reported from Norwegian catches in Subarea 1, 2.a and 2.b in 2017, all gears combined. Data separated by gears and areas was not available for 2018–2020 during AFWG 2021.





**Figure 7.5a.** 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. Updated for the 2020 assessment, but due to a lack of data in later years only the data up to 2016 was used in the model.

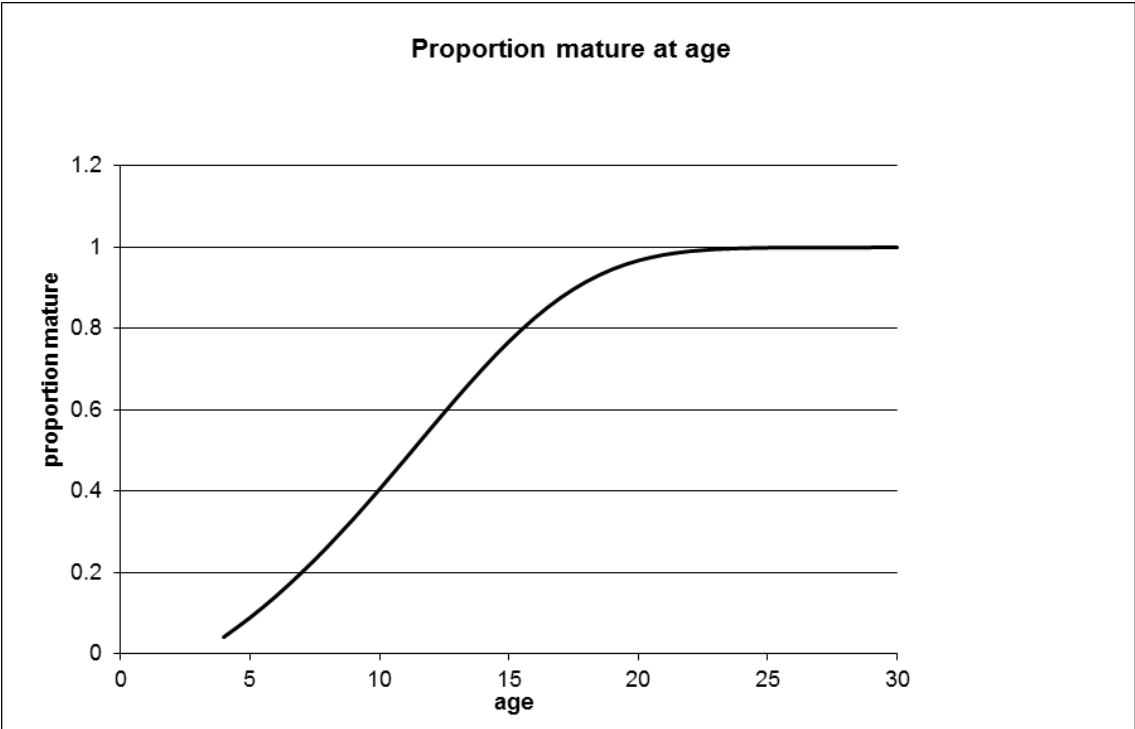


Figure 7.5b. *Sebastes norvegicus* in subareas 1 and 2. Estimates of maturity-at-age by Gadget. Input data have been proportions of *S. norvegicus* mature both at age and length as collected and classified from Norwegian commercial landings and surveys.

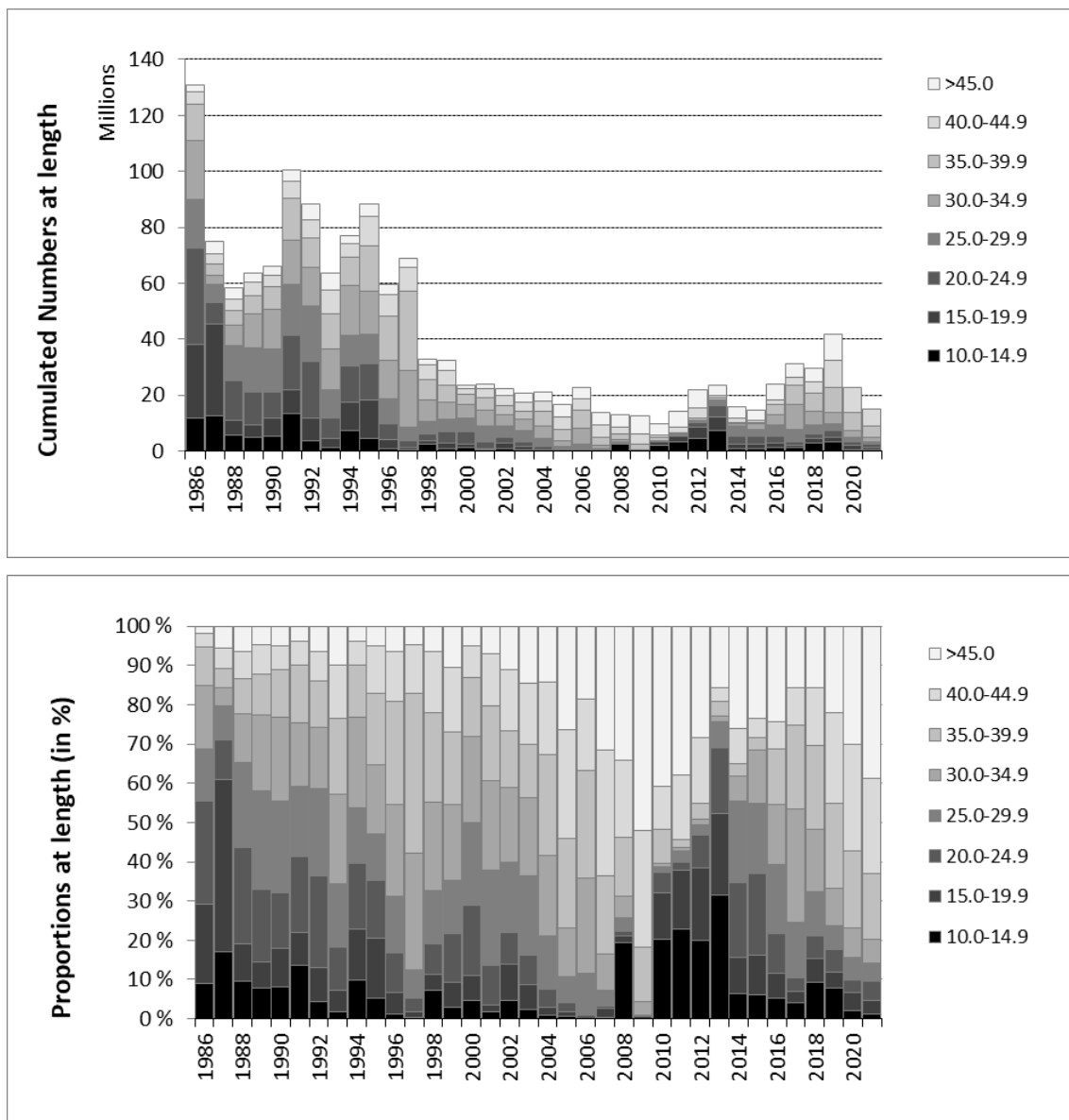


Figure 7.6a. *Sebastes norvegicus*. Abundance indices disaggregated by length for the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)); joint with Russia some of the years since 2000), for 1986–2021 (ref. Table E1a). Top: absolute index values, bottom: relative frequencies.

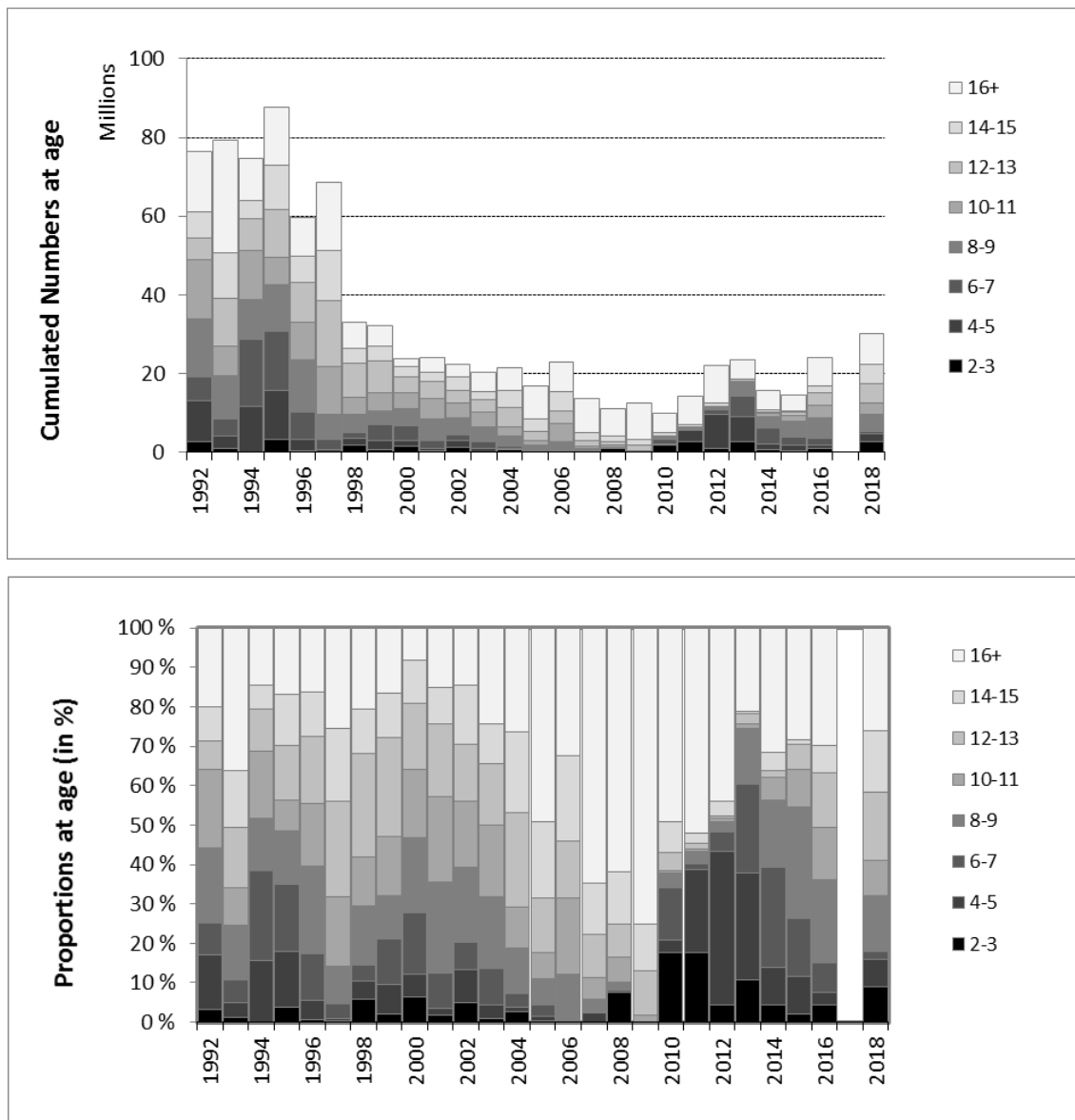


Figure 7.6b. *Sebastes norvegicus*. Abundance indices by age from the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS–NoRu–Q1 (BTr); joint with Russia some of the years since 2000), for 1992–2018 (ref. Table E1b). Age readings for 2017, 2019 and 2020 not available during AFWG 2021. Top: absolute index, bottom: relative frequencies.

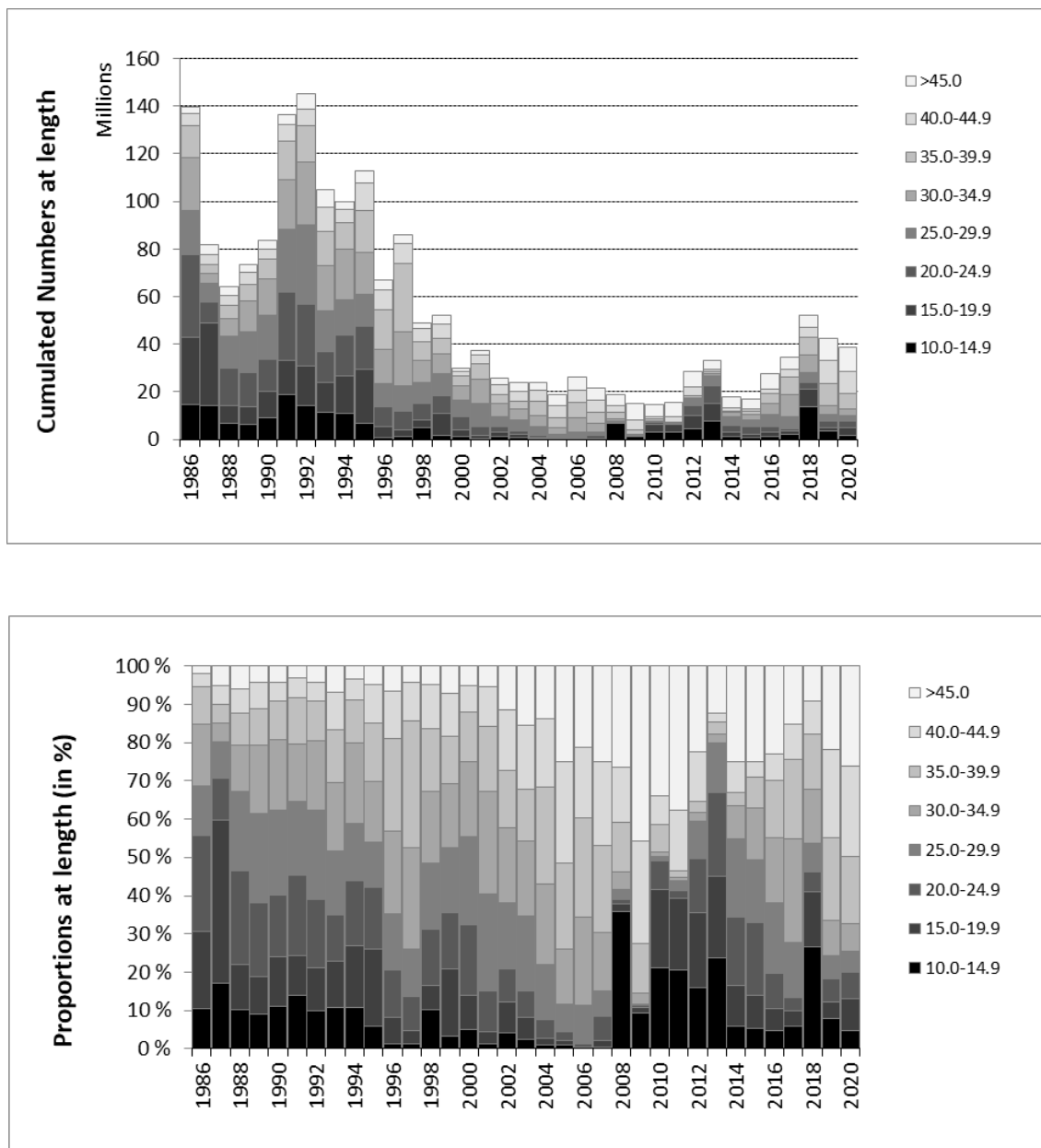


Figure 7.7a. *Sebastes norvegicus*. Abundance indices disaggregated by length when combining the Norwegian bottom-trawl surveys 1986–2020 in the Barents Sea (winter) and at Svalbard (summer/fall). Top: absolute index values. Bottom: relative frequencies. Horizontal line indicates the median length in the surveyed population.

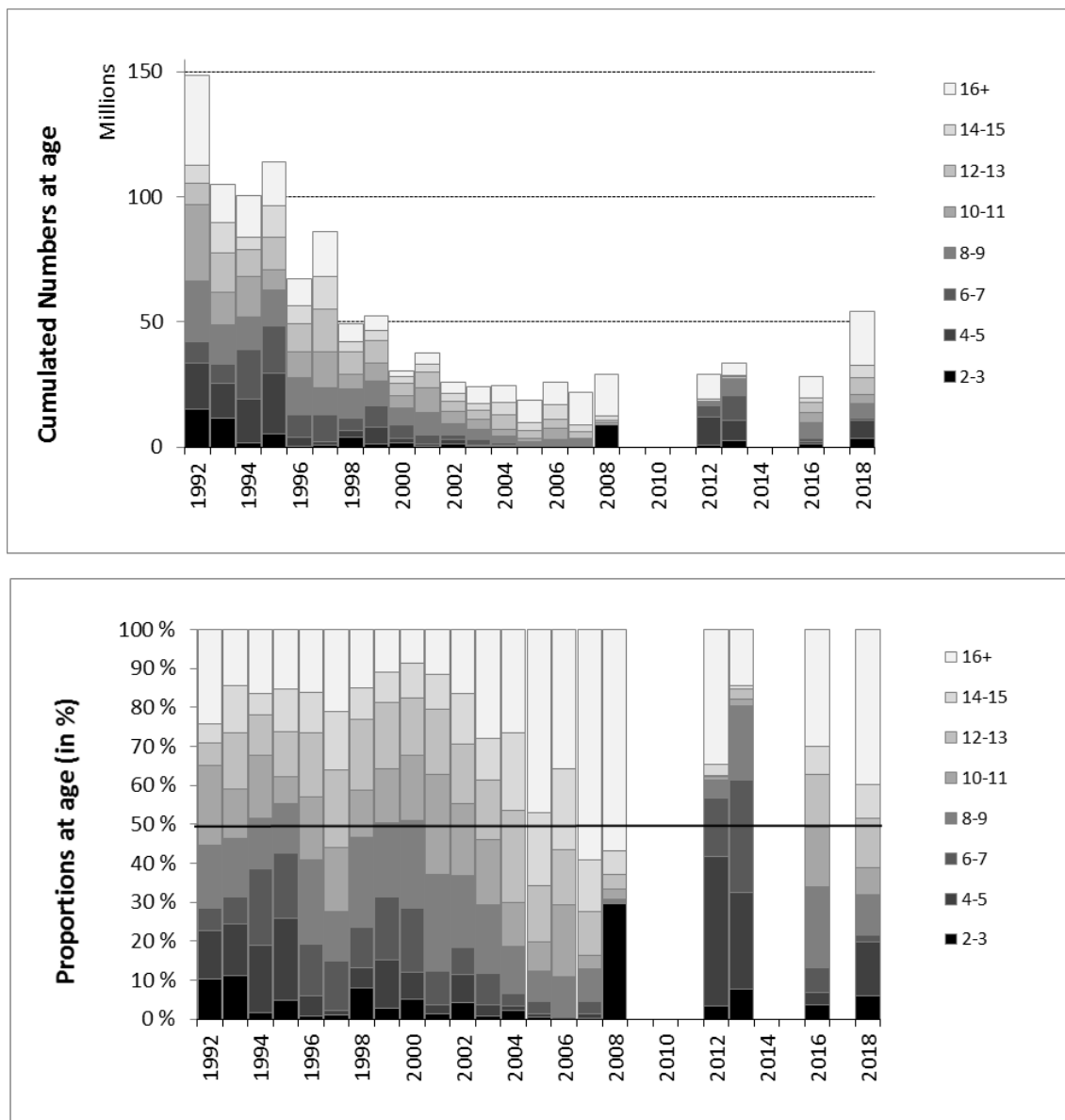


Figure 7.7b. *Sebastes norvegicus*. Abundance indices disaggregated by age. Combined Norwegian bottom-trawl surveys 1992–2018 in the Barents Sea (winter) and Svalbard survey (summer/fall). Top: absolute index values, bottom: relative frequencies. Horizontal line indicates median age of the surveyed population. In 2009–2011, 2014–2015, 2017, 2019 and 2021 there was insufficient number of age readings to derive numbers-at-age.

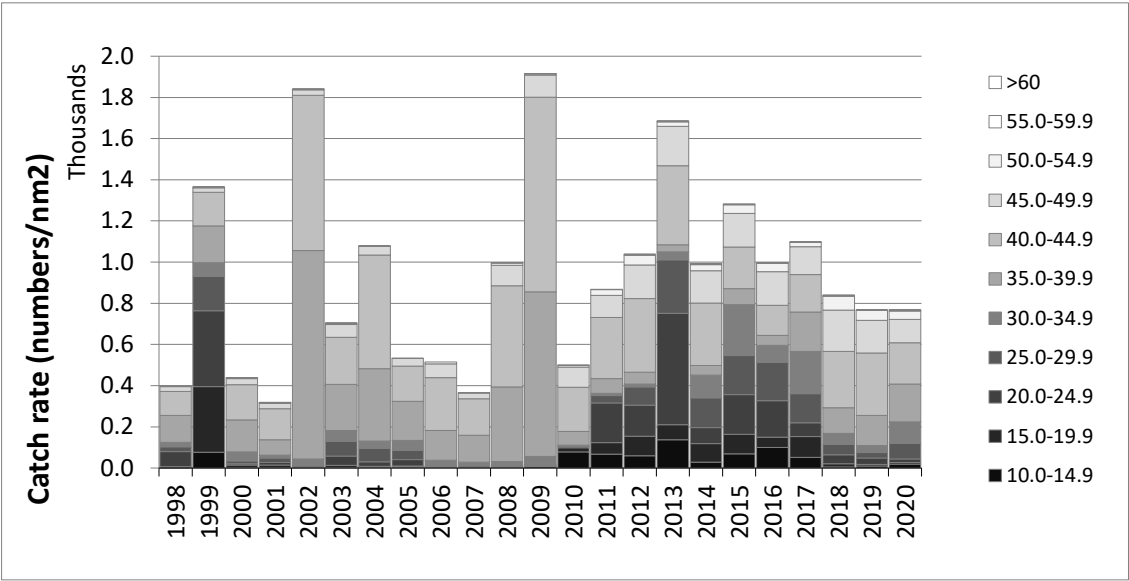


Figure 7.8. *Sebastes norvegicus*. Catch rates (numbers/nm) disaggregated by length for the Barents Sea coastal survey 1998–2020. Top: absolute catch rates. Bottom: relative values.

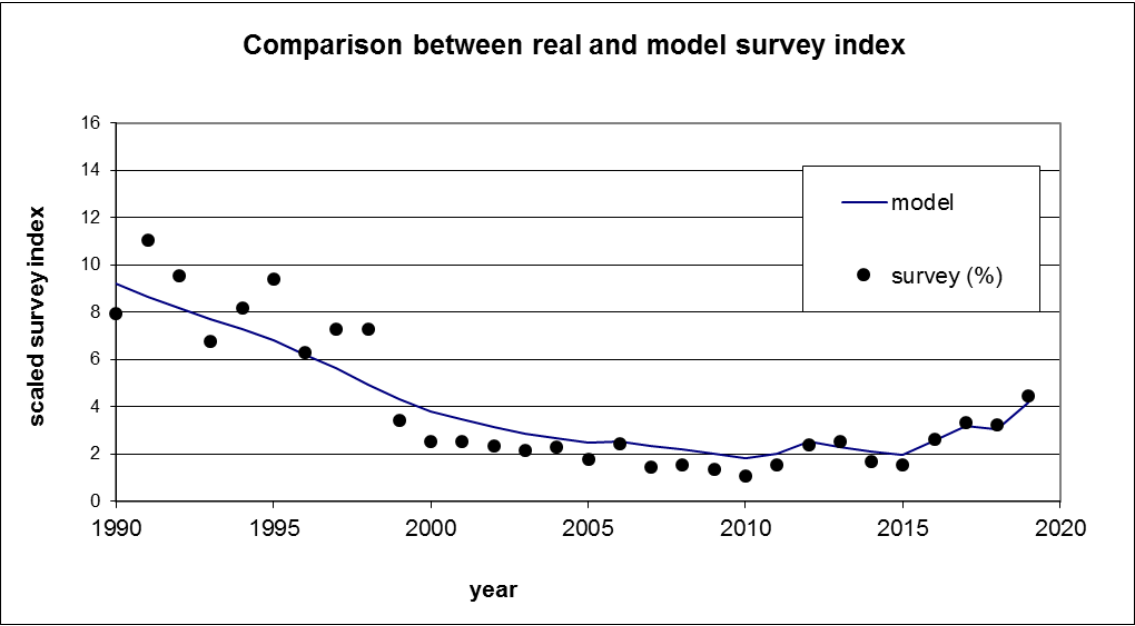


Figure 7.9. *Sebastes norvegicus* in subareas 1 and 2. Comparison of observed and modelled survey indices (total number scaled to sum=100 during the period) for the Barents Sea winter survey in February. Dots: survey indices. Plain lines: survey indices estimated by the model.

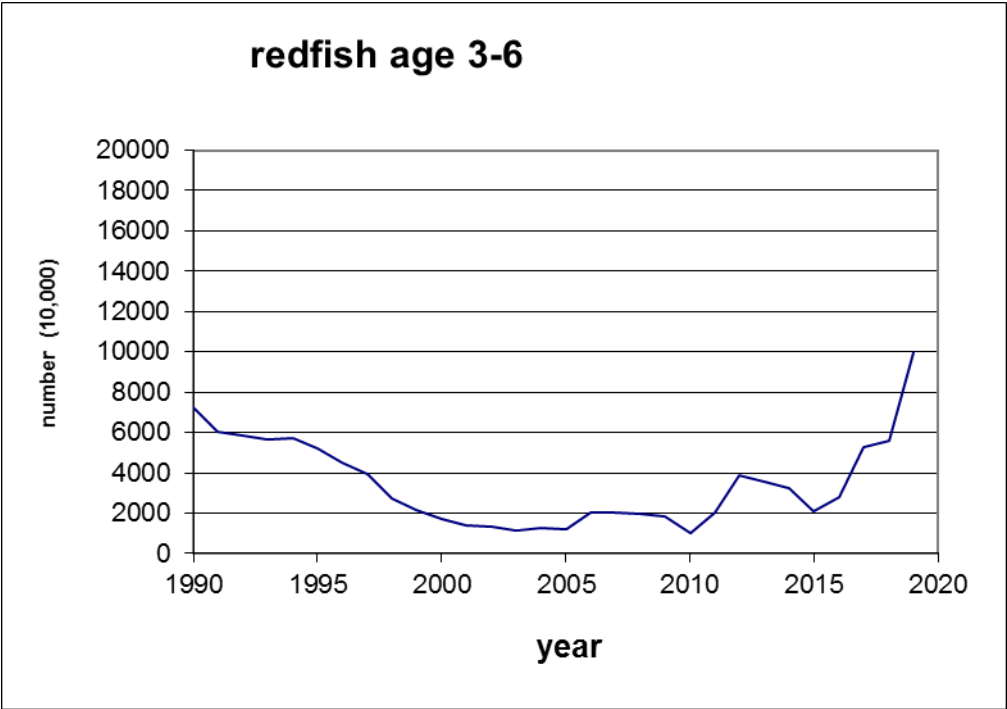


Figure 7.10. *Sebastes norvegicus* in subareas 1 and 2. Estimates of abundance-at-age 3–6 by Gadget. Note that recent year (since 2015) have very little tuning data behind them.

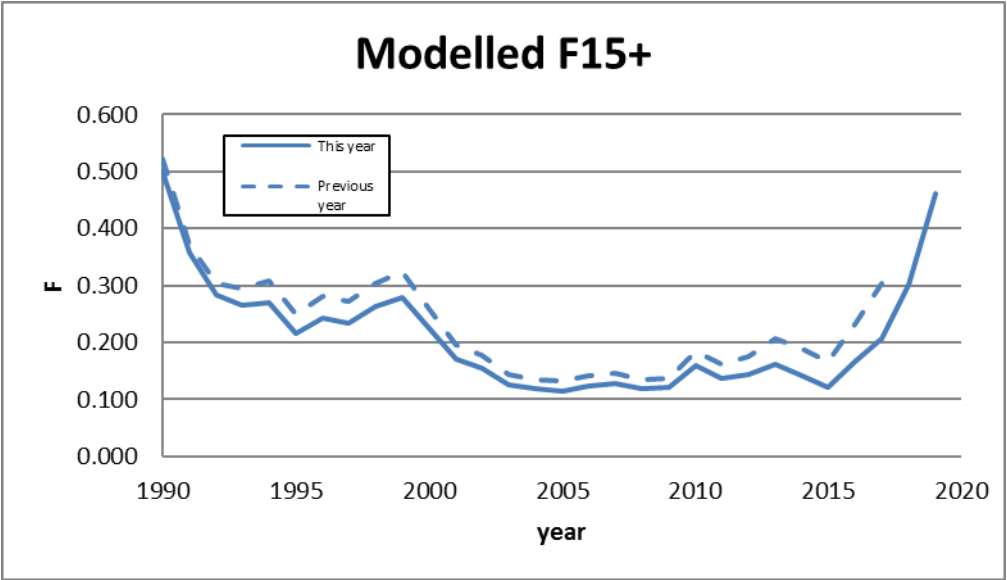


Figure 7.11. *Sebastes norvegicus* in subareas 1 and 2. Unweighted average fishing mortality of ages 15+. Solid line shows this years assessment and the dashed line shows last assessment.



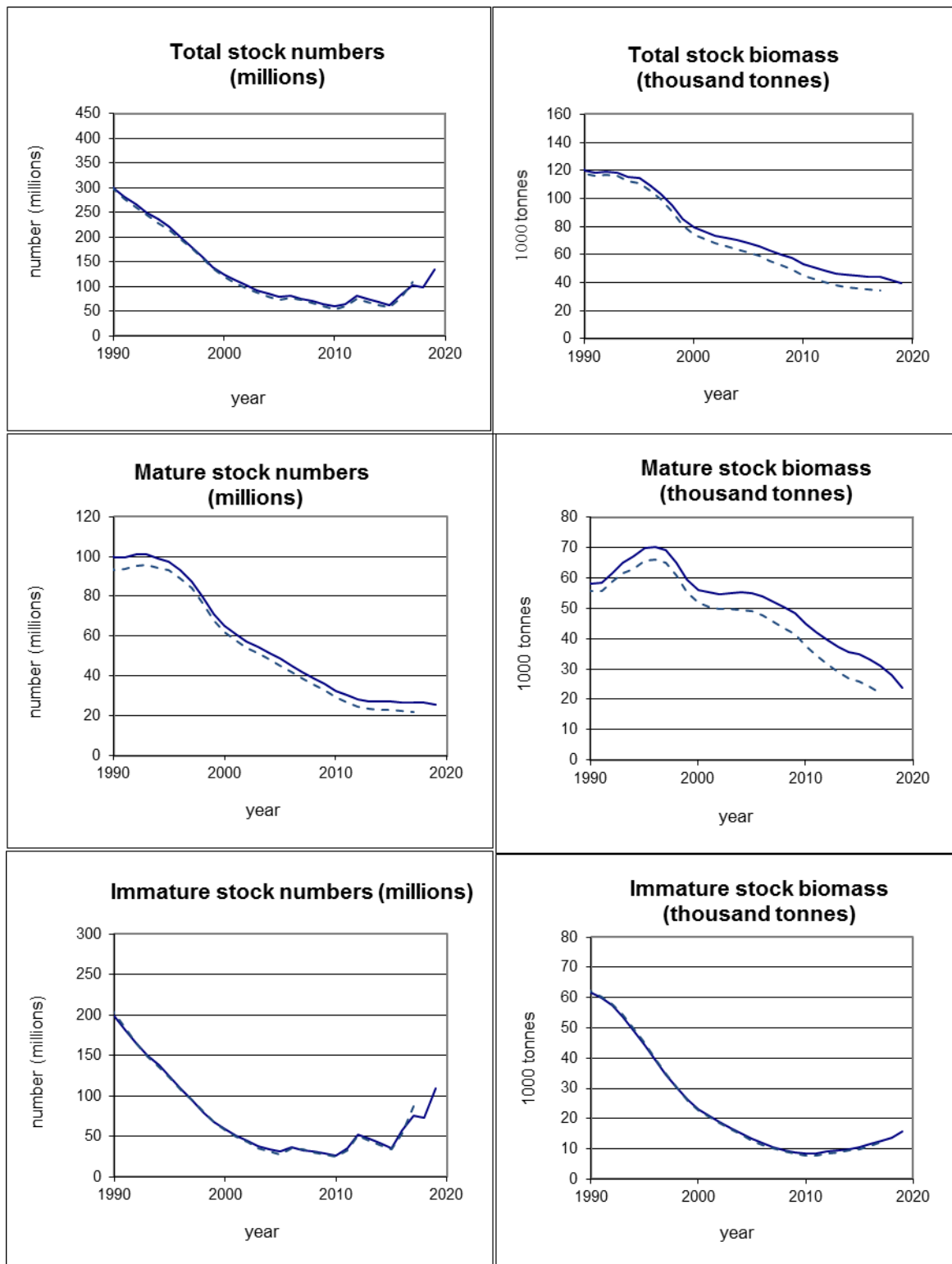
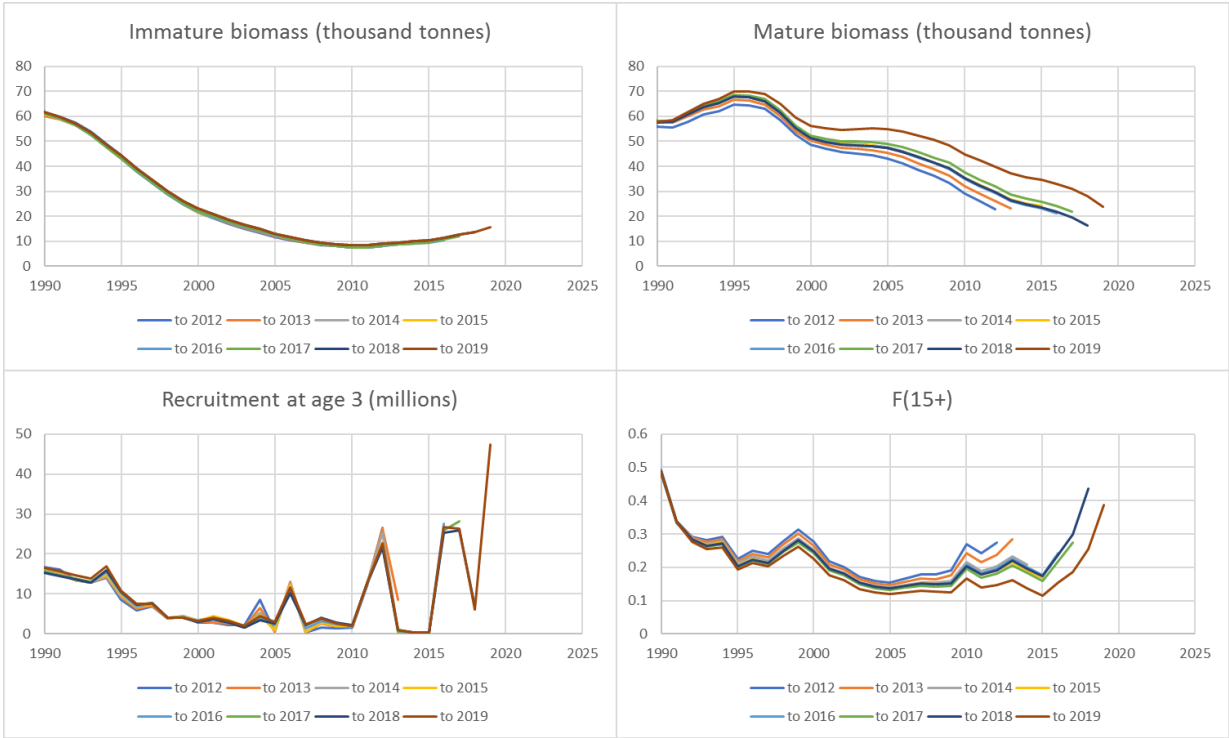


Figure 7.12. *Sebastes norvegicus* in subareas 1 and 2. Stock numbers (in thousands) and biomass (in tonnes) for the total stock (3+; upper panel), and the fishable and mature stock (middle panel), and the immature stock (lower panel), as estimated by Gadget using two surveys as input. Solid line shows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



**Figure 7.13. Gadget retrospective trends 2012 to 2019, immature biomass, mature biomass, recruitment-at-age 3, and 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 2021. The area coverage was extended from 1993.**

Length group (cm)										
Year	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	Total
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	7.5	10.1	12.8	10.9	17.8	10.1	4.8	2.9	77.6
1995	0.4	4.7	13.5	13.1	10.4	15.4	16.2	10.6	4.6	88.9
1996	0.0	0.7	3.3	5.9	8.7	14.0	15.7	7.5	3.9	59.8
1997	0.0	0.5	1.3	2.7	6.9	21.4	28.2	8.5	3.3	72.7
1998	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	4.3	6.2	6.0	5.3	3.4	32.4
2000	0.5	1.1	1.5	4.2	4.9	5.1	3.6	1.9	1.2	23.9
2001	0.1	0.4	0.4	2.5	5.8	5.5	4.5	3.2	1.7	24.0
2002	0.1	1.0	2.0	1.8	3.9	4.2	3.2	3.5	2.4	22.3
2003	0.0	0.5	1.3	1.5	4.2	4.1	2.8	3.2	3.0	20.5
2004	0.7	0.2	0.4	1.0	2.8	4.4	5.4	3.9	3.0	21.8
2005	0.0	0.1	0.2	0.4	1.1	2.1	3.8	4.7	4.4	16.8
2006	0.0	0.0	0.0	0.2	2.5	5.5	6.3	4.2	4.3	22.9
2007	0.0	0.1	0.3	0.1	0.5	1.3	2.7	4.4	4.3	13.7
2008	1.7	2.5	0.2	0.2	0.4	0.7	2.0	2.5	4.5	14.7
2009	0.0	0.0	0.1	0.0	0.0	0.4	1.7	3.8	6.6	12.7
2010	0.4	2.0	1.1	0.5	0.1	0.1	0.9	1.1	4.0	10.2
2011	0.3	3.2	2.1	0.3	0.4	0.1	0.3	2.3	5.3	14.4

Length group (cm)										
Year	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	Total
2012	0.8	4.4	4.0	1.8	0.5	0.3	0.9	3.6	6.2	22.6
2013	0.1	7.4	4.9	4.0	1.6	0.4	0.9	0.8	3.7	23.8
2014	0.1	1.0	1.5	3.0	3.3	1.0	0.5	1.4	4.1	16.0
2015	0.1	0.9	1.5	3.0	2.6	2.0	0.5	0.7	3.4	14.6
2016	0.7	1.3	1.5	2.4	4.3	3.7	3.4	1.7	5.8	24.7
2017	0.3	1.3	0.9	1.1	4.5	9.1	6.7	3.0	5.0	31.7
2018	1.1	2.7	1.8	1.7	3.3	4.7	6.3	4.3	4.7	30.6
2019	0.7	3.2	1.7	2.4	2.5	3.9	9.0	9.7	9.1	42.3
2020	1.0	0.7	1.5	1.0	1.9	2.4	6.5	8.8	9.9	33.6
2021 <sup>1</sup>	0.0	0.3	0.9	1.2	1.1	1.5	4.1	5.9	9.5	24.5

1 – Provisional figures.

**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 2018. Age readings not available for 2019–2021 at the time of AFWG 2021. The area coverage was extended from 1993 onwards.**

Year/AGE	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
1992	2 509	4 070	6 395	2 375	3 757	10 392	4 299	3 567	11 526	2 276	3 239	3 070	3 666	15 183	76 324
1993	996	1 308	1 661	3 005	1 559	7 689	3 346	4 801	2 712	5 480	6 568	2 735	8 801	28 737	79 398
1994	0	9 311	2 441	5 722	11 251	6 422	3 609	7 824	4 775	2 032	6 095	1 825	2 651	10 838	74 796
1995	3 222	4 925	7 594	9 150	5 735	8 496	3 529	2 029	4 800	8 077	3 967	5 353	6 072	14 877	87 826
1996	336	689	2 157	2 902	4 158	7 448	5 816	3 082	6 290	4 122	6 158	3 136	3 518	9 656	59 468
1997	154	37	512	832	1 670	2 893	3 614	3 063	9 084	5 669	10 848	10 393	2 351	17 500	68 620
1998	1 658	859	664	392	1 032	2 323	2 567	2 256	1 897	3 595	5 099	999	2 703	6 804	32 848
1999	552	1 036	1 300	2 557	1 241	1 577	1 938	2 966	1 848	3 407	4 704	1 786	1 884	5 306	32 102
2000	376	545	814	1 567	2 129	2 621	1 902	2 228	1 907	1 506	2 448	2 096	484	1 957	22 580
2001	350	117	241	611	1 589	2 634	2 885	2 686	2 514	2 529	1 853	1 214	1 000	3 630	23 853
2002	904	1 182	685	972	592	1 706	2 549	2 032	1 742	2 286	919	1 053	2 308	3 235	22 165
2003	165	157	539	1 340	533	1 204	2 469	1 610	2 071	1 350	1 796	825	1 204	4 935	20 198
2004	0	181	91	219	536	1 039	1 426	1 093	1 145	2 060	3 066	1 780	2 606	5 668	20 910
2005	57	96	74	114	394	483	636	435	689	1 131	1 166	1 592	1 661	8 287	16 815
2006	0	0	0	0	48	955	1 766	2 516	1 918	1 343	1 984	3 163	1 822	7 403	22 918
2007	19	39	256	39	0	297	154	411	324	823	709	866	909	8 881	13 727
2008	826	0	0	0	76	69	144	217	476	340	575	881	606	6 800	11 010

Year/AGE	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
2009	0	0	0	0	0	0	12	53	156	220	1 189	469	1 013	9 429	12 541
2010	0	0	290	1 051	250	0	364	62	0	140	325	278	467	4 793	8 020
2011	1 873	1 635	1 391	134	64	0	439	0	103	0	213	119	249	7 421	13 641
2012	939	3 726	4 933	620	442	267	291	113	102	86	0	465	382	9 715	22 081
2013	1 806	1 633	4 722	2 784	2 570	2 139	1 208	275	0	483	99	166	0	4 970	22 855
2014	676	887	604	1 255	2 735	1 774	943	446	455	53	228	94	621	4 970	15 741
2015	125	441	946	898	1 267	1 585	2 515	349	1 062	442	471	104	53	4 136	14 394
2016	511	487	302	533	1 213	2 366	2 722	2 018	1 178	883	2 425	1 101	555	7 169	23 463
2017	Age data not available during AFWG 2020														
2018	1 624	1 044	998	259	318	1 759	2 501	1 042	1 707	2 467	2 690	3 495	1 202	7 892	28 998

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 2020. 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 <sup>1</sup>	–	1 307	795	1 728	2 273	1 417	311	142	194	8 167
1986 <sup>1</sup>	200	2 961	1 768	547	643	1 520	639	467	196	8 941
1987 <sup>1</sup>	100	1 343	1 964	1 185	1 367	652	352	29	44	7 036
1988 <sup>1</sup>	500	1 001	1 953	1 609	684	358	158	68	95	6 426

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	
1989	200	1 629	2 963	2 374	1 320	846	337	323	104	10 096
1990	1 700	3 886	4 478	4 047	2 972	1 509	365	140	122	19 219
1991	100	5 371	5 821	9 171	8 523	4 499	1 531	982	395	36 393
1992	1 700	10 228	8 858	5 330	13 960	12 720	4 547	494	346	58 183
1993	200	10 160	9 078	5 855	7 071	4 327	2 088	1 552	948	41 279
1994	100	3 340	5 883	4 185	3 922	3 315	1 021	845	423	23 034
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	17 390
1998	180	2 698	1 741	4 620	4 053	1 761	535	545	241	16 374
1999	0	794	7 057	3 698	4 563	2 449	467	619	369	20 016
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	13 620
2002	0	0	65	415	459	880	621	565	521	3 526
2003	87	87	104	84	534	635	459	759	738	3 487
2004	0	8	9	192	581	667	607	395	213	2 672
2005	0	52	0	84	267	608	411	274	283	1 979

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	
2006	0	0	75	74	138	437	470	668	1 264	3 126
2007	0	47	83	1 251	938	2 012	2 254	373	1 135	8 093
2008	8 603	4 255	211	25	50	169	525	180	536	14 554
2009	216	1 403	108	108	0	0	197	214	220	2 466
2010	868	1 117	1 845	607	0	123	189	0	996	5 745
2011	0	0	850	50	0	0	0	159	578	1 637
2012	0	111	1 565	2 242	2 217	285	0	0	154	6 574
2013	56	489	2 155	3 307	2 738	433	136	34	349	9 697
2014	64	0	425	167	296	531	74	0	312	1 869
2015	0	0	0	216	198	303	877	18	810	2 422
2016	0	0	121	119	813	1 007	754	300	498	3 612
2017	838	675	577	93	585	291	476	288	262	4 085
2018	826	11 129	5 619	1 000	677	2 741	1 134	127	110	23 363
2019	78	90	104	219	68	0	115	131	182	987
2020	527	1 193	1 728	1 597	290	368	318	365	264	6 644

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, 2014–2015, 2019 and 2020, there was insufficient number of age readings to derive numbers-at-age, or age readings were not available at the time of the AFWG 2021.**

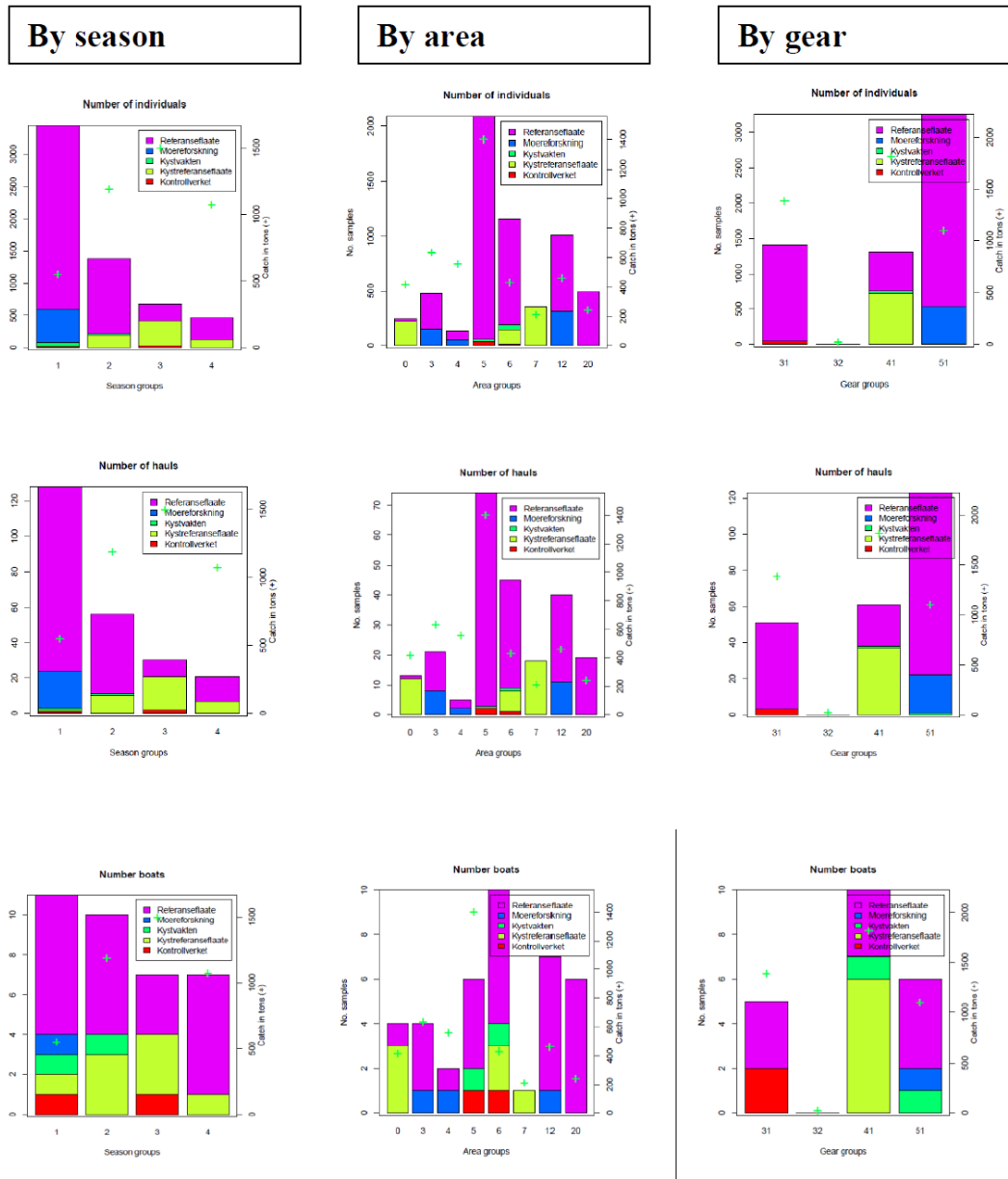
Year	Age														Total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1992	284	12 378	5 576	2 279	371	2 064	3 687	5 704	9 215	6 413	1 454	1 387	696	22	51 530
1993	32	10 704	5 710	5 142	1 855	1 052	1 314	3 520	2 847	2 757	2 074	1 245	844	119	39 215
1994	429	1 150	3 418	2 393	1 723	1 106	1 714	1 256	1 938	1 596	2 039	484	550	319	20 115
1995	600	1 600	6 400	5 100	1 800	2 200	1 800	700	700	400	700	500	400	500	23 400
1996	40	110	–	560	1 050	940	930	400	1 050	280	320	590	160	70	6 500
1997	320	490	–	480	1 500	6 950	2 720	1 680	800	1 310	550	30	–	120	16 950
1998	210	1 817	881	202	1 555	2 187	4 551	1 913	1 010	797	49	264	73	187	15 696
1999	0	760	2 893	1 339	3 534	1 037	3 905	2 603	762	1 663	481	361	258	152	19 748
2000	40	20	400	350	840	480	730	1 670	620	340	510	100	80	70	6 250
2001	0	40	50	450	330	790	1 760	1 970	3 300	1 200	1 810	150	660	430	12 940
2002	0	0	–	–	65	160	204	326	364	614	442	328	15	0	2 518
2003	0	0	0	0	95	0	283	227	93	296	285	189	228	341	2 035
2004	0	0	0	0	0	0	359	144	362	152	343	315	316	220	2 209
2005	0	50	0	0	0	73	25	286	106	191	271	167	125	152	1 447
2006	0	0	0	0	0	71	0	0	233	106	174	194	305	179	1 261
2007	0	0	0	0	0	617	1 006	398	0	0	155	799	799	303	4 078

Year	Age														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
2008	7 844	0	0	0	0	0	0	37	98	16	18	148	86	164	8 412
2009	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2010	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2011	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2012	0	40	123	2445	2105	1205	642	92	35	0	0	0	0	0	6 687
2013	0	56	383	1532	3963	377	1910	1029	214	121	250	0	0	166	10 000
2014	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2015	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2016	0	0	124	0	0	0	0	813	455	739	0	483	136	263	3 015
2017	356	187	322	97	145	130	193	205	79	292	205	176	278	0	2 667
2018	543	0	1 363	4 066	0	367	885	422	0	970	1 625	0	0	0	10 239

**Table E4. Observed proportion of maturity-at-age 5 through 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. Data for years after 2016 was considered insufficient until further age reading and is not presented.**

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	0.85	0.85
2010	–	–	–	–	–	–	–	–	0.70	0.60	0.81	0.92	0.64	0.90
2011	–	–	–	–	–	–	–	–	–	–	0.73	0.78	0.94	0.93
2012	0.00	0.11	0.10	0.29	0.20	0.20	–	–	–	0.76	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
2014	0.00	0.00	0.02	0.08	0.21	0.43	0.41	0.53	0.33	0.58	0.69	0.71	0.80	0.92
2015	0.00	0.05	0.17	0.17	0.30	0.41	0.44	0.49	0.65	0.67	0.69	0.81	0.91	0.86
2016	0.00	0.04	0.02	0.05	0.23	0.16	0.26	0.43	0.59	0.42	0.62	0.57	0.80	0.73

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	0.94	1.00	0.93	0.83	0.86
2010	0.92	0.96	0.95	0.90	1.00	0.73	0.83	0.86	0.86	0.60	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	0.73	0.83	0.89	0.95	1.00	0.67	1.00	1.00	1.00	1.00
2014	0.92	0.95	0.63	0.96	0.90	0.84	0.95	0.83	1.00	–	0.78	0.88
2015	0.83	0.93	0.78	0.82	1.00	0.95	0.96	0.83	0.84	1.00	0.87	0.82
2016	0.87	0.74	0.88	0.79	0.78	0.97	0.81	0.89	0.89	0.67	1.00	0.94



**Figure E1. 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.**

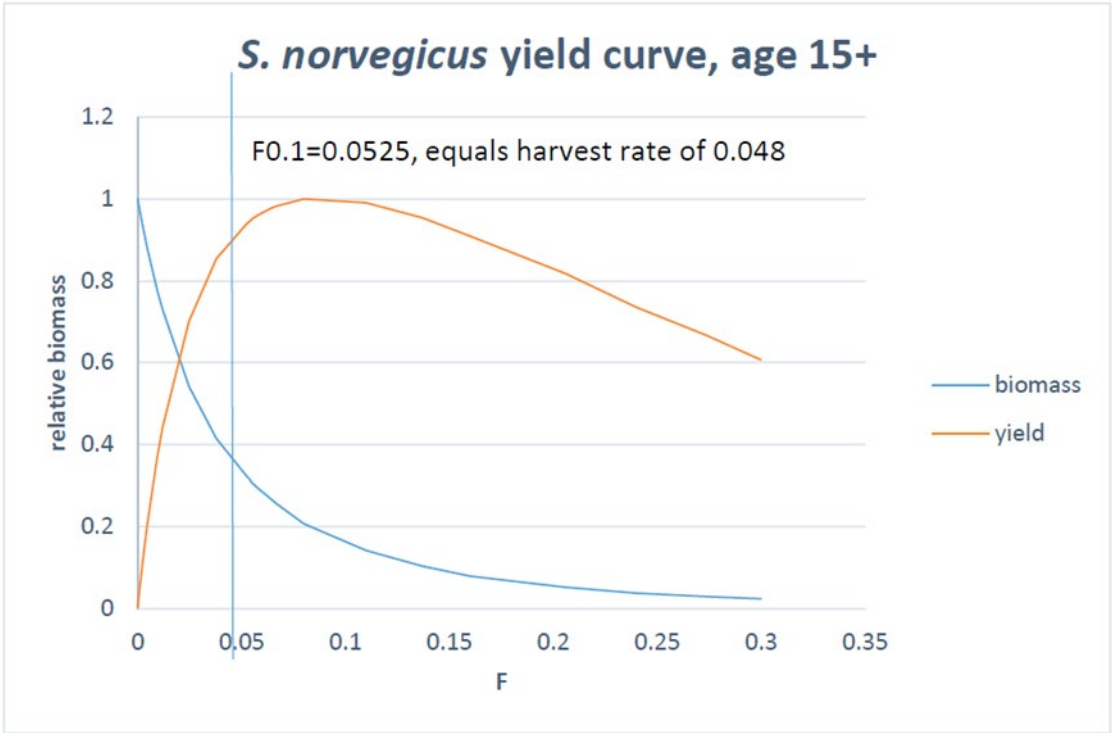


Figure E2. *Sebastes norvegicus* in subareas 1 and 2. Yield-per-recruit for *S. norvegicus*, computed from the GADGET assessment model presented at the benchmark assessment in January 2018 (WKREDFISH, ICES 2018a).