

7 Northeast Arctic golden redfish

reg.27.1-2 – *Sebastes norvegicus* in subareas 1 and 2

The advice cycle for golden redfish in subareas 1 and 2 is biennial, following the recommendation of the benchmark assessment for redfish stocks in January 2018 (WKREDFISH, ICES 2018a). Advice was last given in 2022. The age-based GADGET model was then run for the period 1990–2021, in the configuration approved during the benchmark. The present report updates the tables and figures, but the group did not re-run the assessment model and does not 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 some permanently closed areas were forbidden in the Norwegian Exclusive 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 15% (in numbers) undersized (i.e. less than 32 cm) specimens of *S. norvegicus* 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 meters. From 2016, when trawling outside 12 nm, vessels can only 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. However, vessels less than 21 metres can 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 2022 (Tables 7.1–7.4 and Figures 7.1–7.3)

Nominal catches of *S. norvegicus* for the years 1998–2022 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 4825 t, followed by a further decrease in 2015 with landings of 3873 t, mainly due to stronger regulations. This has since reversed with 9639 tonnes in 2020, 10 195 tonnes in 2021 and 8407 tonnes in 2022 (provisional). Landings in 2022 do not include Russian landings. 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 *S. norvegicus* catches from Norwegian vessels' logbooks in 2022 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 from 2017 onwards the catches increased steadily to a maximum of 2615 tonnes in 2020 and then decreasing again to 1737 tonnes in 2021. No data on Russian catches is available for 2022. Twelve other countries together usually report catches in the 300–500 t range or less (Table 7.1).

The bycatch of redfish (*Sebastes* spp.) in the Norwegian Barents Sea shrimp fisheries during the period 1994–2022 was dominated by *S. mentella*, and hence influenced the *S. norvegicus* to a much lesser extent (Figure 0.1). 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 north-east 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 2023

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. The bycatch is calculated in live weight per week.

As expected, total landings in 2021 increased due to the raised quota for *S. mentella*, and thus an increase in bycatch of *S. norvegicus*. Although total landings cannot be compared in 2022, it is notable that Norwegian landings decreased by 150 tonnes. The Norwegian quota for *S. mentella* in 2022 was not fully exhausted and catches decreased by about 3000 t compared to the previous year. With a slight reduction in the total quota for *S. mentella* in 2023, bycatch of *S. norvegicus* is expected to stagnate on that high level.

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 method previously used for calculating catch-at-length and age of Norwegian catches can no longer be used and the procedure was intended to use the new StoX-Reca software. However, this ran into problems with the bimodal growth pattern exhibited by golden redfish and the large number of length-samples compared with age-samples. Therefore, it was decided to fall back onto the workaround used in the 2020 assessment for catch-at-length and to use the age data from StoX-Reca for 2018 onwards with ages 30+, at which most of the differences occurred, set to missing. Work on the StoX-Reca method will continue towards the benchmark in 2025.

Except for 2021 and 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+ from Norwegian catches were estimated using StoX-Reca starting with the 2018-catches (Table 7.6). For 2021 and 2022 weight-at-age-data were not available during the working group, due to a lack of age data from those year. 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 E1, 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 2020, as reported in Table E1 and presented in Figure 7.5a. Only the data up to 2018 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 E2a,b–E3a,b–E4, 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 2023 in fishing depths of 100–500 m. Length compositions for the years 1986–2023 are shown in Table E2a and Figure 7.6a. Age compositions for the years 1992–2019 are shown in Table E2b 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 2022 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 1985–2022 and age compositions for the years 1992–2008, 2012, 2013, 2016, 2017 and 2018 are shown in Table E3a and E3b, 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 1998–2022 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 7.8 and Table E4. The survey is an acoustic survey designed to obtain indices of abundance and estimates of length and weight-at-age of saithe and coastal 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 winter survey and continued monitoring whether the distribution of redfish shifts outside the strata system used for the ecosystem survey. The coastal survey for *S. norvegicus* is in the process of conversion to StoX and adoption of a species-specific strata system, aiming to establish a coherent index of abundance and/or biomass 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 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 the 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 is currently 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 gillnet), and recruitment is estimated on an 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 2021. 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 2020. In the last three years (2018–2020) ages above 29 were excluded due to changes in age reading which particularly affected the proportion of fish aged 30+.
- Length disaggregated frequencies from the Barents Sea (Division 2.a) bottom–trawl survey (February) from 1990–2022 (Table E1a).
- Age–length data and aggregated survey indices from the same survey up to 2019, excluding 2017 (Table E1b).
- Length disaggregated frequencies from the Barents Sea (Division 2.a) coastal survey (February) from 1998–2021 (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 and total numbers as well as immature biomass are improving. By now some of the 2003 year class are 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 still 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 $F = 0.41$ (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 50 000 tonnes in 2021 (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 15% for recruitment, 121% for F_{15+} and -43% 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+} . This can partially be explained by a change in the method of splitting the catch between beaked and golden redfish. However, also years before this change in method exhibited a rise in mature biomass for which the reason is unclear and 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 2021 red list evaluation, which produced similar trends (Hesthagen et al. 2021). 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.

S. norvegicus is currently on the Norwegian Redlist as an endangered (EN) species (Hesthagen et al. 2021), 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 below 30 000 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 about ten times as much.

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 the population 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 2023. 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. *S. 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	–	–	16540	–	6	1632	51	171	19155
1999	–	35	35	228	47	14	7	–	–	16750	–	3	1691	7	169	18986
2000	–	17	13	160	22	16	–	–	–	13032	–	16	1112	–	73	14461
2001	–	37	30	238	17	–	1	–	–	9134	–	7	963	1	119	10547
2002	–	60	31	42	31	3	–	–	–	8561	–	34	832	3	46	9643
2003	–	109	8	122	36	4	–	–	89	6853	–	6	479	–	134	7840
2004	–	19	4	68	20	30	–	–	33	6233	–	5	722	3	69	7206
2005	–	47	10	72	36	8	–	–	48	6085	–	56	614	8	52	7036
2006	–	111	8	35	44	31	3	–	21	6305	–	69	713	9	39	7388
2007	–	146	15	67	84	68	13	–	20	5784	–	225	890	5	55	7372
2008	–	274	63	30	71	27	6	–	2	5216	–	72	749	4	85	6599
2009	–	70	1	58	81	66	–	–	1	5451	–	30	698	–	31	6487
2010	–	171	51	31	72	22	–	–	–	5994	1	28	565	3	44	6981
2011	–	24	53	9	51	22	–	–	1	4681	48	25	919	6	13	5852

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	5517
2013	1	83	353	1	45	8	1	–	–	3836	19	36	797	–	493	5673
2014	–	67	219	6	20	29	–	–	1	3440	21	5	806	–	211	4825
2015	1	76	53	24	211	35	–	–	–	2733	17	–	664	2	57	3873
2016	7	183	30	4	87	55	–	–	–	4131	26	–	864	–	76	5463
2017	–	123	17	19	61	65	–	–	2	3567	27	90	1297	44	160	5472
2018	1	146	37	66	77	67	–	–	–	4961	36	67	1834	12	37	7341
2019	–	236	25	93	56	83	–	3	–	5951	20	73	1929	65	25	8559
2020	–	166	1	88	99	53	–	–	–	6503	9	80	2615	6	19	9639
2021 ¹	2	323	6	76	92	72	–	–	–	7703	20	60	1737	8	96	10195
2022 ¹	–	311	12	60	161	220	–	–	–	7553	0	75	N. a.	4	11	8407 ²

1 – Provisional figures.

2 – Excluding Russian data

Table 7.2. *S. 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	2530
1999	35	–	18	9	14	–	–	2114	–	–	360	–	11	2561
2000	–	–	1	–	16	–	–	1983	–	–	146	–	12	2158
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

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Lithuania	Norway	Poland	Portugal	Russia	Spain	UK	Total
2013	28	2	1	–	+	–	–	563	–	–	41	–	4	639
2014	59	10	6	17	4	–	–	573	2	–	26	–	17	714
2015	57	4	9	211	13	–	–	624	2	–	51	2	10	983
2016	161	7	4	74	51	–	–	1152	4	–	136	–	60	1649
2017	81	5	–	8	4	–	–	970	2	2	211	2	23	1308
2018	146	28	35	29	–	–	–	1151	5	3	302	5	25	1729
2019	220	10	32	22	30	–	2	1104	4	1	422	3	10	1860
2020	143	–	14	18	34	–	–	1284	2	0	708	6	1	2210
2021 ¹	296	–	–	54	15	–	–	1445	–	12	305	–	–	2127
2022 ¹	288	6	5	48	–	–	–	1632	–	2	N. a.	–	–	1981²

1 – Provisional figures.

2 – Excluding Russian data

+ denotes less than 0.5 tonnes.

Table 7.3 *S. 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	–	14326	–	6	1078	51	137	16260
1999	–	35	210	38		7	–	14598	–	3	976	7	156	16030
2000	17	13	159	22		–	–	11038	–	16	658	–	61	11984
2001	33	30	227	17		1	–	8002	–	6	612	1	103	9032
2002	45	30	37	31	3	–	–	7761	–	18	192	2	32	8151
2003	94	9	122	35	4	–	89	5970	–	6	264		130	6723
2004	12	4	68	20	30	–	33	4872	–	5	396	3	58	5501
2005	37	9	60	36	8	–	48	4855	–	56	265	8	48	5430
2006	60	8	35	44	31	3	21	4404	–	59	293	9	39	5006
2007	119	15	55	69	68	13	20	4101	–	70	599	3	35	5167
2008	229	56	28	71	27	6	2	4456	–	68	450	4	70	5467
2009	70	1	55	79	60	–	1	4543	–	17	500	–	7	5333
2010	113	51	31	72	22	–	–	5414	1	26	287	2	38	6057
2011	–	51	9	49	20	–	1	3942	–	–	695	2	13	4782
2012	49	182	33	57	13	2	2	3599	–	1	427	–	33	4398

Year	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherland	Norway	Poland	Portugal	Russia	Spain	UK		Total
2013	55	343	–	45	8	–	–	3170	–	9	475	–	466	Denmark – 1	4572
2014	8	209	–	3	25	–	1	2732	–	2	559	–	178		3717
2015	18	49	15	–	22	–	–	2081	12	–	439	–	47		2683
2016	22	23	–	13	4	–	–	2946	8	–	545	–	15		3576
2017	41	12	19	36	61	–	2	2549	22	88	680	38	137		3685
2018	–	9	17	43	67	–	–	3746	12	64	489	7	12	–	4466
2019	16	14	61	34	53	–	–	4744	16	72	794	61	14	Lithuania – 1	5880
2020	23	1	61	81	20	–	–	4838	–	80	946	–	16		6066
2021 ¹	24	5	21	36	57	–	–	5682	–	48	1073	2	90		7038
2022 ¹	22	5	53	112	220	-	-	5490	-	72	N. a.	1	7		5982 ²

1 – Provisional figures.

2 – Excluding Russian data

Table 7.4 *S. 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

Year	Denmark	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Total
2013	–	–	9	–	–	–	1	–	102	19	27	281	–	23	462
2014	–	–	–	–	–	–	–	–	135	19	3	221	–	16	394
2015	1	–	–	–	–	–	–	–	28	3	–	175	–	–	207
2016	7	–	–	–	–	–	–	–	34	14	–	183	–	–	238
2017	–	–	–	–	18	–	–	–	48	2	–	405	4	–	477
2018	1	–	–	14	6	–	–	–	64	19	–	1043	–	–	1147
2019	–	–	–	–	–	–	–	–	103	–	–	712	1	1	817
2020	–	–	–	13	–	–	–	–	381	7	–	961	–	3	1365
2021 ¹	2	3	–	55	2	–	–	–	576	20	–	359	6	6	1029
2022 ¹	–	1	1	2	1	–	–	–	431	–	1	N. a.	4	4	445 ²

1 – Provisional figures.

2- Excluding Russian data

Table 7.5. *S. norvegicus* in subareas 1 and 2. Catch numbers-at-age (in thousands). Since 2018, numbers are from StoX-Reca.

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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp	Total Num.	Tonnes Land.
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
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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp	Total Num.	Tonnes Land.
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	106	82	132	69	132	165	311	455	225	132	105	83	85	102	88	138	182	1169	3760	5257
2018	129	65	230	443	246	496	158	170	236	171	145	183	194	232	233	229	249	2425	6235	7341
2019	52	141	243	187	458	913	513	405	138	177	101	143	97	83	209	185	133	3105	7283	8559
2020 ¹	39	20	161	652	700	861	965	481	282	227	82	92	187	73	166	145	133	2596	7862	9644

1 – Provisional figures.

Table 7.6. *S. norvegicus* in subareas 1 and 2. Catch weights at age (kg). Since 2018, numbers are from StoX-Reca.

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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp
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
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

Year/Age	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	+gp
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	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	0.75	0.76	0.80	0.86	0.92	1.00	1.04	1.06	1.15	1.23	1.24	1.27	1.35	1.40	1.43	1.50	1.48	2.34
2019	0.93	0.98	1.07	1.12	1.20	1.26	1.28	1.34	1.38	1.33	1.36	1.43	1.44	1.45	1.43	1.50	1.48	1.95
2020 ¹	1.71	1.13	1.28	1.14	1.31	1.28	1.39	1.49	1.56	1.59	1.52	1.59	1.64	1.68	1.67	1.69	1.64	2.09

1 – Provisional figures.

Table 7.7. *S. 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	0.01	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	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
9	0.07	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
10	0.10	0.08	0.07	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02
11	0.13	0.11	0.10	0.09	0.07	0.05	0.06	0.06	0.06	0.06	0.05	0.04	0.04	0.03	0.03
12	0.17	0.13	0.12	0.12	0.12	0.08	0.09	0.08	0.09	0.09	0.07	0.06	0.05	0.04	0.04

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
13	0.22	0.17	0.14	0.14	0.15	0.12	0.11	0.11	0.12	0.12	0.10	0.08	0.07	0.06	0.06
14	0.28	0.20	0.17	0.16	0.17	0.14	0.16	0.13	0.15	0.16	0.13	0.10	0.09	0.07	0.07
15	0.34	0.24	0.19	0.18	0.19	0.16	0.18	0.17	0.18	0.19	0.15	0.11	0.10	0.09	0.08
16	0.41	0.29	0.22	0.21	0.21	0.17	0.20	0.19	0.22	0.21	0.17	0.13	0.12	0.10	0.09
17	0.48	0.33	0.25	0.23	0.24	0.19	0.21	0.21	0.24	0.25	0.19	0.15	0.13	0.11	0.10
18	0.52	0.38	0.29	0.26	0.26	0.21	0.23	0.22	0.25	0.27	0.22	0.16	0.14	0.12	0.11
19	0.55	0.40	0.31	0.28	0.28	0.22	0.25	0.24	0.27	0.28	0.23	0.17	0.15	0.13	0.12
20	0.58	0.42	0.32	0.30	0.30	0.24	0.26	0.25	0.28	0.29	0.24	0.17	0.16	0.13	0.12
21	0.61	0.43	0.33	0.31	0.31	0.25	0.27	0.26	0.29	0.30	0.24	0.18	0.16	0.13	0.12
22	0.62	0.44	0.33	0.31	0.31	0.25	0.27	0.26	0.29	0.31	0.25	0.18	0.16	0.13	0.12
23	0.62	0.43	0.33	0.30	0.30	0.24	0.27	0.26	0.29	0.31	0.25	0.18	0.16	0.12	0.11
24	0.61	0.42	0.32	0.29	0.29	0.23	0.26	0.25	0.29	0.30	0.24	0.17	0.15	0.12	0.11
25	0.58	0.40	0.29	0.27	0.27	0.22	0.25	0.24	0.27	0.29	0.23	0.17	0.15	0.12	0.11
26	0.55	0.36	0.26	0.24	0.24	0.20	0.22	0.22	0.25	0.26	0.21	0.16	0.14	0.11	0.10
27	0.50	0.33	0.23	0.21	0.22	0.17	0.20	0.20	0.22	0.23	0.18	0.14	0.13	0.10	0.09
28	0.46	0.30	0.21	0.19	0.19	0.15	0.17	0.17	0.20	0.20	0.16	0.12	0.11	0.09	0.09
29	0.42	0.27	0.19	0.16	0.16	0.13	0.15	0.15	0.17	0.17	0.14	0.10	0.09	0.08	0.08
30	0.34	0.20	0.13	0.11	0.13	0.11	0.12	0.11	0.13	0.14	0.10	0.08	0.07	0.04	0.04

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
15+	0.513	0.351	0.264	0.241	0.243	0.196	0.219	0.212	0.239	0.251	0.199	0.147	0.132	0.107	0.099

Age	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
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	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	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	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	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	0.01	0.01	0.01	0.01
9	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	0.02	0.03
10	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06
11	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.05	0.06	0.07	0.10
12	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.05	0.05	0.07	0.09	0.11	0.14
13	0.05	0.06	0.06	0.06	0.04	0.06	0.05	0.05	0.05	0.05	0.04	0.06	0.06	0.09	0.12	0.15	0.19
14	0.07	0.07	0.07	0.07	0.06	0.07	0.06	0.06	0.07	0.06	0.05	0.08	0.08	0.12	0.15	0.18	0.24
15	0.08	0.08	0.09	0.08	0.07	0.09	0.07	0.07	0.08	0.07	0.06	0.09	0.10	0.14	0.18	0.22	0.29
16	0.09	0.10	0.10	0.10	0.08	0.10	0.08	0.08	0.09	0.09	0.07	0.11	0.11	0.16	0.21	0.26	0.34
17	0.10	0.11	0.11	0.11	0.09	0.11	0.09	0.09	0.10	0.09	0.08	0.12	0.12	0.18	0.23	0.29	0.38
18	0.11	0.11	0.12	0.11	0.10	0.12	0.10	0.10	0.11	0.10	0.08	0.13	0.13	0.19	0.25	0.32	0.43
19	0.11	0.12	0.12	0.12	0.10	0.13	0.11	0.11	0.12	0.11	0.09	0.13	0.14	0.21	0.27	0.34	0.46

Age	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
20	0.11	0.12	0.12	0.12	0.11	0.14	0.11	0.11	0.12	0.11	0.09	0.14	0.14	0.21	0.28	0.36	0.48
21	0.11	0.12	0.12	0.12	0.11	0.14	0.11	0.11	0.13	0.11	0.09	0.14	0.15	0.22	0.28	0.36	0.50
22	0.11	0.12	0.12	0.12	0.11	0.14	0.11	0.12	0.13	0.11	0.09	0.14	0.15	0.21	0.28	0.36	0.50
23	0.11	0.12	0.12	0.11	0.11	0.14	0.11	0.11	0.12	0.11	0.09	0.14	0.15	0.21	0.28	0.36	0.49
24	0.10	0.11	0.12	0.11	0.11	0.14	0.11	0.11	0.12	0.11	0.09	0.13	0.14	0.21	0.27	0.35	0.47
25	0.10	0.10	0.11	0.10	0.11	0.13	0.11	0.11	0.12	0.11	0.09	0.13	0.14	0.20	0.26	0.33	0.45
26	0.09	0.10	0.10	0.09	0.10	0.13	0.11	0.11	0.12	0.10	0.09	0.13	0.13	0.19	0.25	0.32	0.43
27	0.09	0.09	0.10	0.08	0.10	0.13	0.10	0.10	0.11	0.10	0.08	0.12	0.13	0.18	0.23	0.30	0.40
28	0.08	0.09	0.09	0.08	0.09	0.12	0.10	0.10	0.11	0.10	0.08	0.12	0.12	0.17	0.22	0.28	0.37
29	0.08	0.08	0.08	0.07	0.09	0.11	0.09	0.10	0.10	0.09	0.08	0.11	0.12	0.16	0.21	0.26	0.35
30	0.04	0.04	0.04	0.04	0.07	0.09	0.08	0.08	0.09	0.08	0.06	0.09	0.09	0.13	0.16	0.19	0.25
15+	0.095	0.101	0.104	0.098	0.096	0.123	0.101	0.102	0.111	0.101	0.083	0.122	0.129	0.186	0.240	0.307	0.411

Table 7.8. *S. 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	375	0.35	132.28	103	0.67	69.06	271	0.23	63.22		4.25
1987	370	0.35	129.94	101	0.65	65.92	268	0.24	64.01		3.54

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)
1988	348	0.36	125.06	98	0.61	60.02	250	0.26	65.04		1.98
1989	328	0.37	122.35	96	0.58	56.21	231	0.29	66.14		1.84
1990	305	0.37	113.79	92	0.54	49.82	213	0.30	63.97	0.51	1.98
1991	289	0.39	113.64	94	0.55	51.17	195	0.32	62.47	0.35	1.83
1992	275	0.42	115.73	96	0.57	55.39	178	0.34	60.34	0.26	1.65
1993	260	0.45	116.56	98	0.61	59.71	162	0.35	56.85	0.24	1.56
1994	248	0.46	115.09	97	0.64	62.75	151	0.35	52.33	0.24	1.91
1995	233	0.49	115.17	97	0.69	66.78	136	0.36	48.38	0.20	1.24
1996	213	0.52	111.60	94	0.72	68.08	119	0.37	43.52	0.22	0.85
1997	195	0.55	107.39	90	0.76	68.37	105	0.37	39.02	0.21	0.85
1998	173	0.58	100.10	84	0.79	65.81	89	0.39	34.29	0.24	0.42
1999	151	0.60	91.59	76	0.81	61.68	75	0.40	29.91	0.25	0.42
2000	135	0.64	86.51	71	0.85	59.87	64	0.41	26.64	0.20	0.35
2001	124	0.68	84.51	67	0.90	60.37	56	0.43	24.14	0.15	0.44
2002	113	0.73	82.75	64	0.95	61.03	49	0.44	21.72	0.13	0.35
2003	104	0.79	81.95	61	1.02	62.45	43	0.46	19.51	0.11	0.32

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)
2004	98	0.83	81.10	59	1.09	63.66	40	0.44	17.44	0.10	0.52
2005	92	0.87	79.89	56	1.15	64.41	36	0.43	15.48	0.09	0.38
2006	92	0.84	78.05	52	1.22	64.13	40	0.35	13.91	0.10	1.08
2007	86	0.88	75.63	49	1.28	63.13	37	0.34	12.50	0.10	0.33
2008	82	0.90	73.58	46	1.34	62.08	35	0.33	11.50	0.10	0.49
2009	77	0.93	71.48	44	1.39	60.63	33	0.32	10.85	0.10	0.36
2010	74	0.92	67.86	41	1.42	57.50	33	0.31	10.36	0.12	0.51
2011	80	0.82	66.07	38	1.45	55.56	42	0.25	10.51	0.10	1.36
2012	93	0.70	64.94	37	1.46	53.64	56	0.20	11.29	0.10	2.03
2013	89	0.71	63.43	36	1.43	51.47	53	0.22	11.96	0.11	0.39
2014	82	0.76	62.65	36	1.41	50.07	47	0.27	12.57	0.10	0.03
2015	76	0.82	62.73	36	1.39	49.63	41	0.32	13.10	0.08	0.04
2016	95	0.65	62.00	35	1.37	47.86	60	0.23	14.14	0.12	2.58
2017	117	0.53	61.98	35	1.32	46.26	82	0.19	15.72	0.13	2.95
2018	114	0.53	60.04	35	1.24	43.26	79	0.21	16.78	0.19	0.77
2019	130	0.44	57.79	35	1.14	39.45	96	0.19	18.35	0.24	2.70

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)
2020	118	0.46	54.15	34	1.02	35.03	83	0.23	19.12	0.31	0.03
2021	104	0.47	49.18	33	0.90	29.89	71	0.27	19.29	0.41	0.03

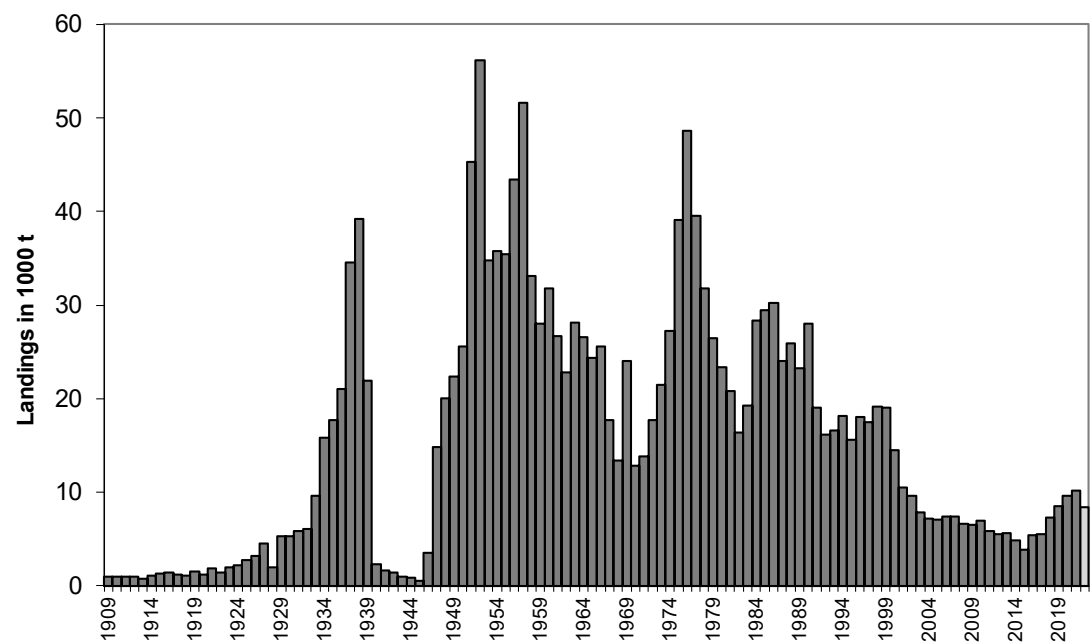


Figure 7.1. *S. norvegicus* in subareas 1 and 2. Total international landings 1908–2022 (in thousand tonnes), excluding Russian landings in 2022.

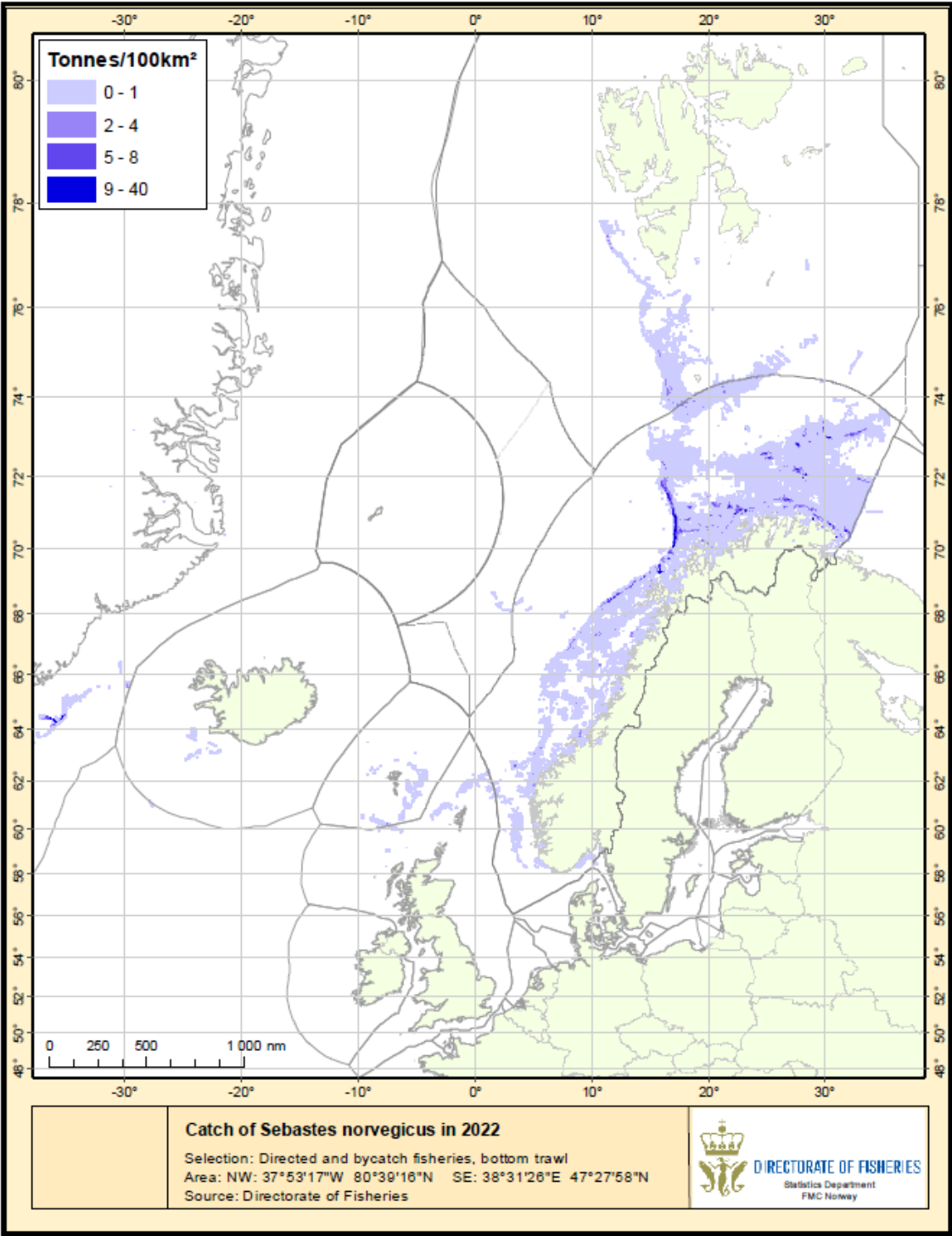


Figure 7.2. *S. norvegicus* in subareas 1 and 2. Catches (including bycatch) of *S. norvegicus* in 2022 from Norwegian log-books. Due to some reporting on the genus level some catches may contain *S. mentella*.

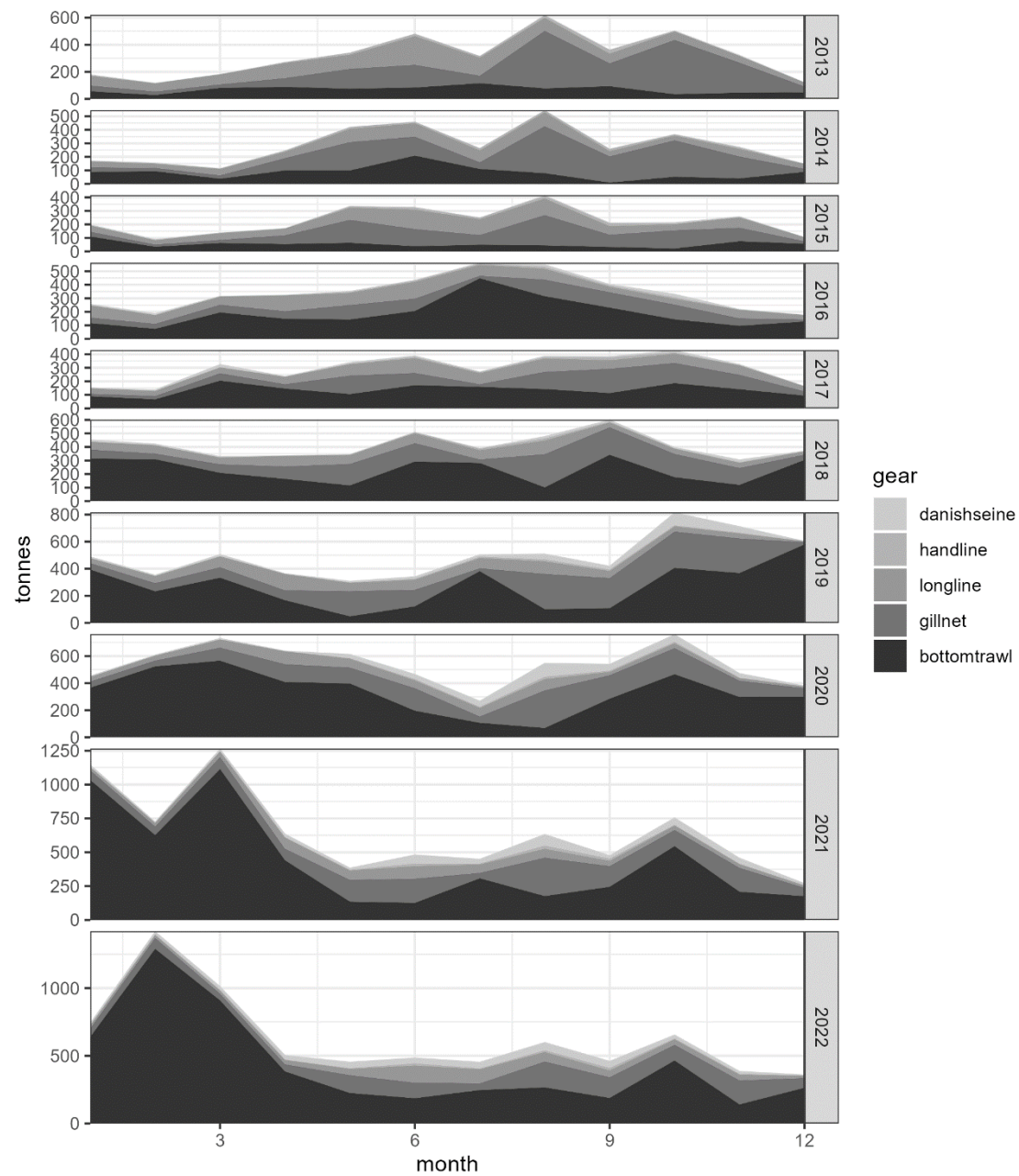


Figure 7.3a. Illustration of the seasonality in the different Norwegian *S. norvegicus* fisheries in 2013–2022, also illustrating how the current regulations are working.

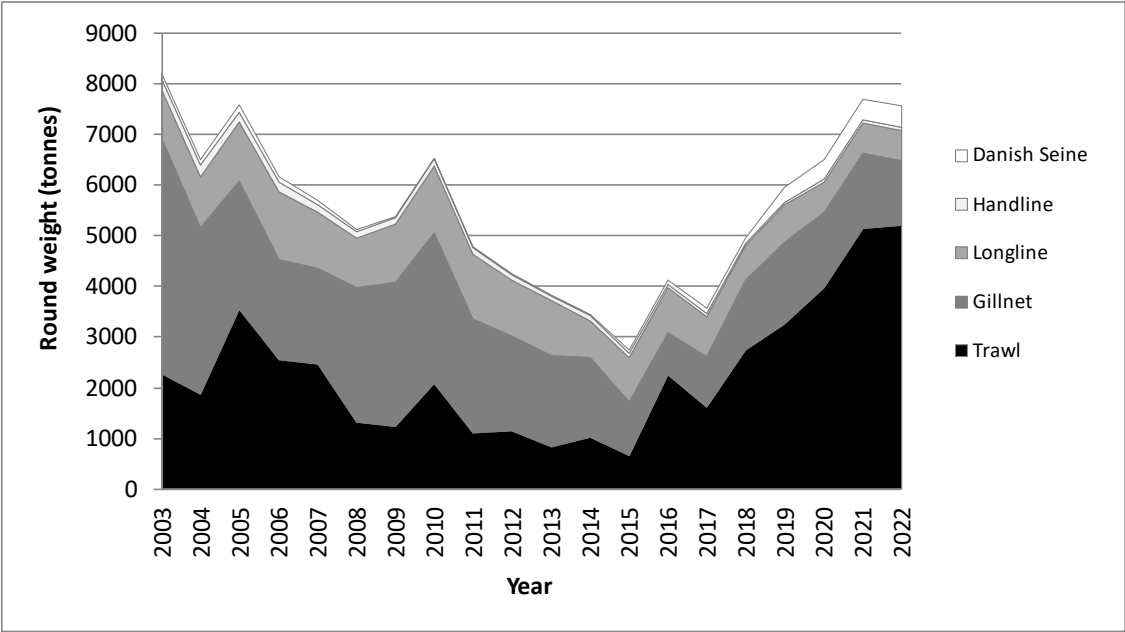


Figure 7.3b. Interannual changes in the Norwegian catches by fleet of *S. norvegicus* fisheries (2003–2022).

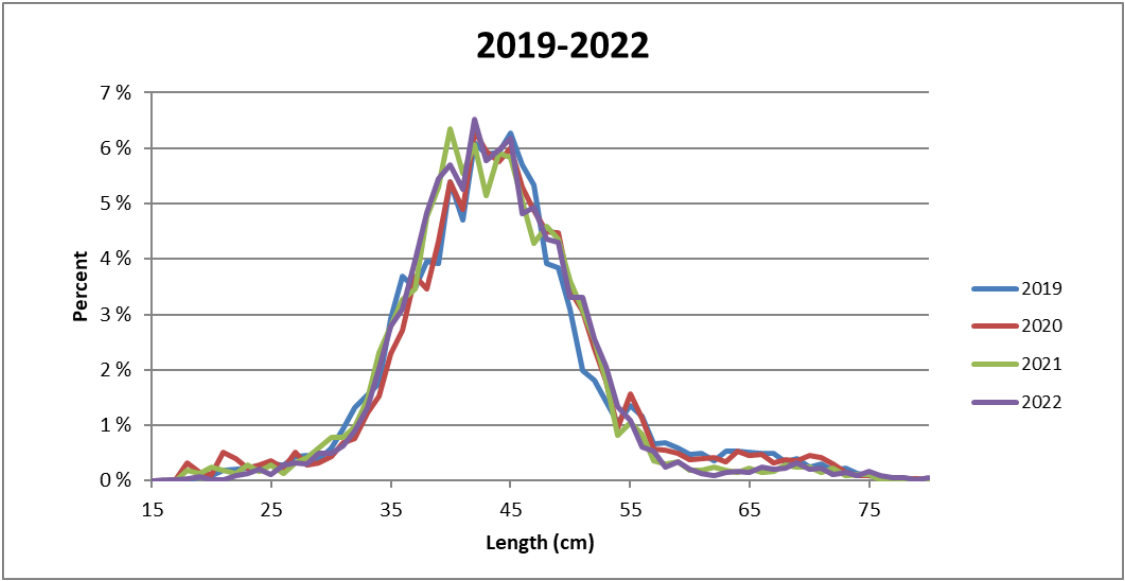


Figure 7.4. *S. norvegicus*. Length frequency of *S. norvegicus* reported from Norwegian catches in 2019–2022, all gears combined.

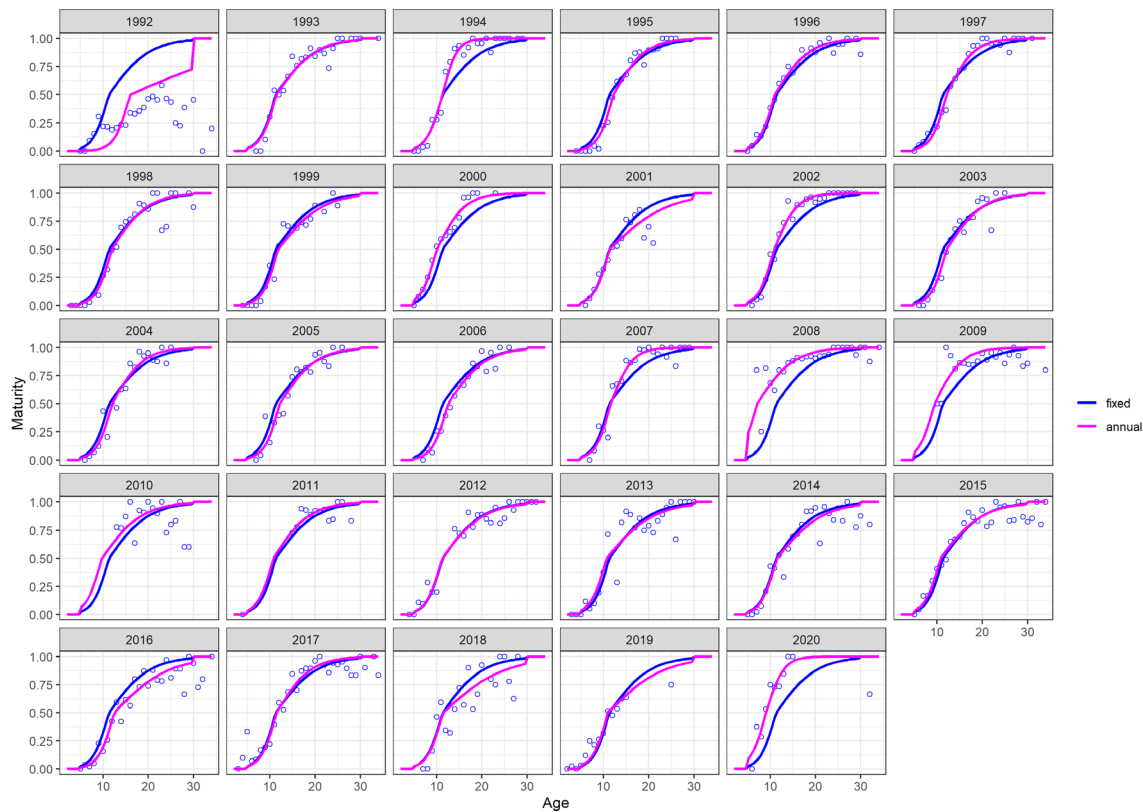


Figure 7.5a. Proportion maturity-at-age of *S. norvegicus* in subareas 1 and 2 derived from Norwegian commercial and survey data (Table E4). The proportions were derived from samples with at least five individuals. Updated for the 2023 report. Due to a lack of data in later years only the data up to 2018 was used in the 2022 assessment model. The blue line depicts the fixed-effects model across all years and pink line depicts the annual models, including random-effects.

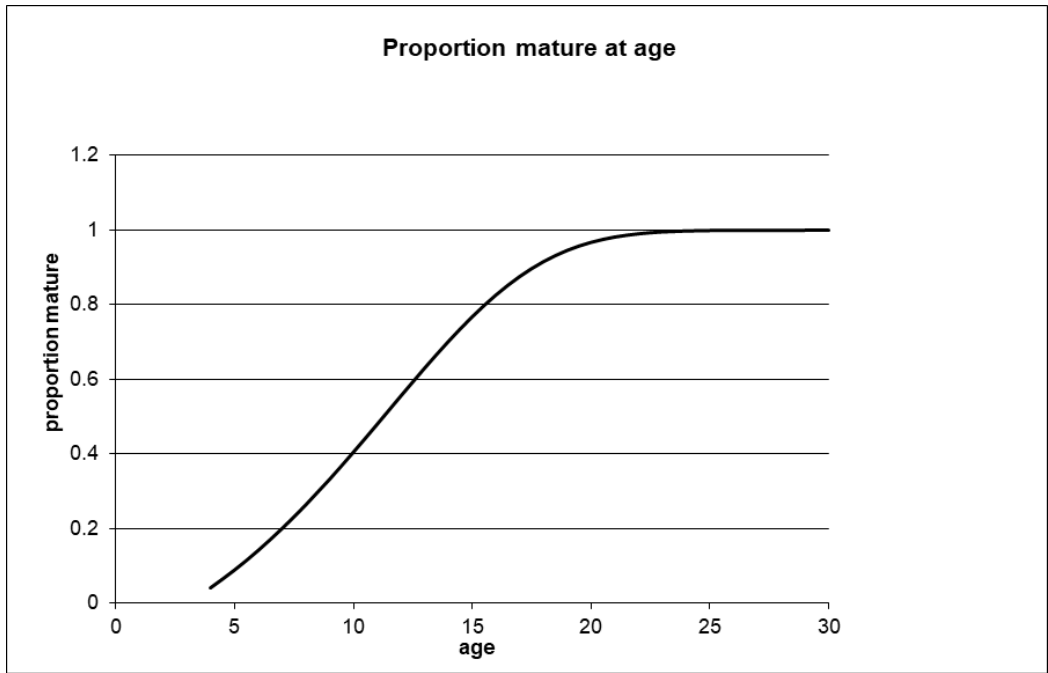


Figure 7.5b. *S. norvegicus* in subareas 1 and 2. Estimates of maturity-at-age by Gadget. Input data have been proportions of *S. norvegicus* mature both at age and length as collected and classified from Norwegian commercial landings and surveys.

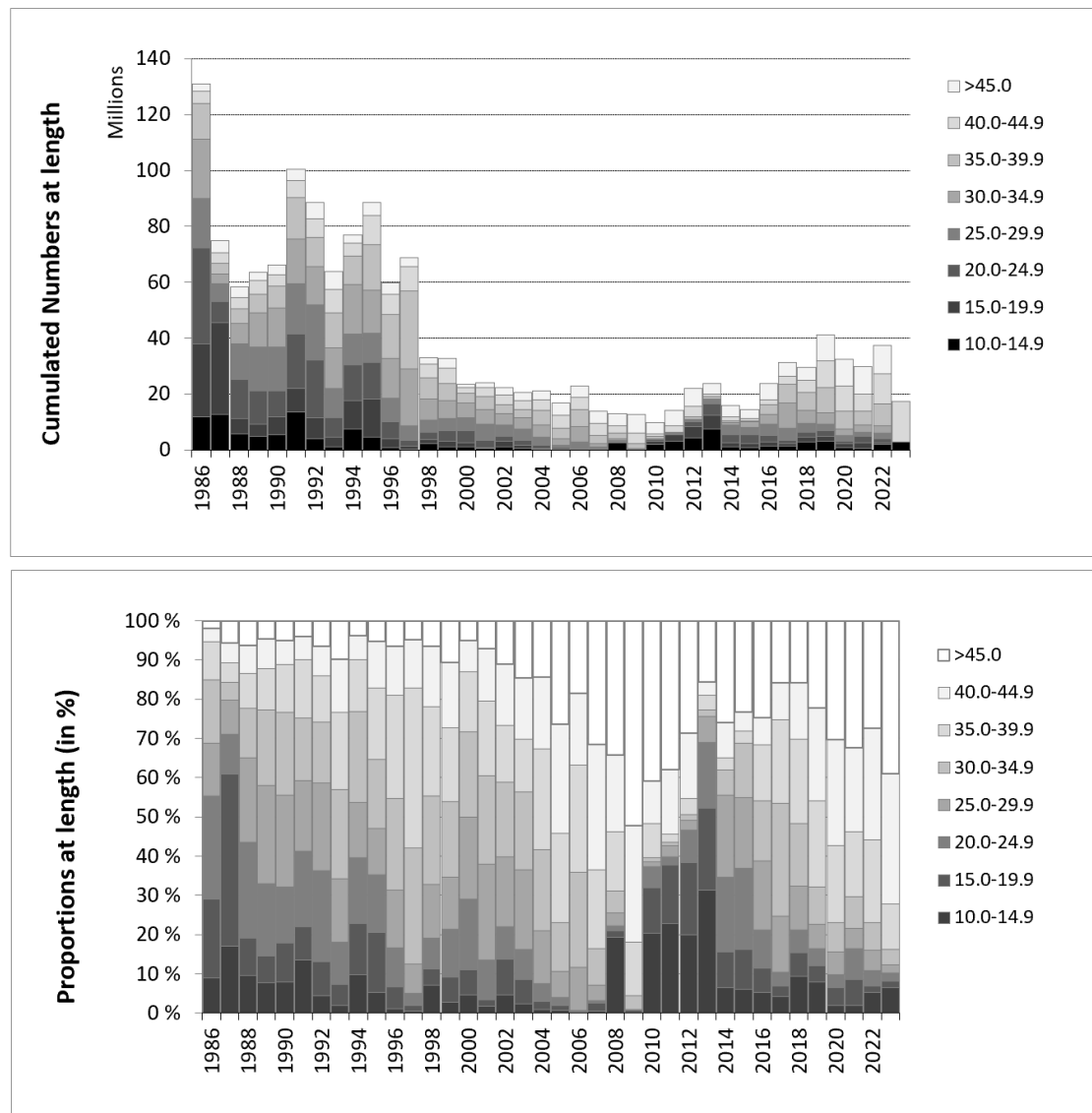


Figure 7.6a. *S. norvegicus*. Abundance indices disaggregated by length for the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr); joint with Russia some of the years since 2000), for 1986–2023 (ref. Table E2a). Numbers for 2023 are preliminary as Russian data were not available during AFWG 2023. Top: absolute index values, bottom: relative frequencies.

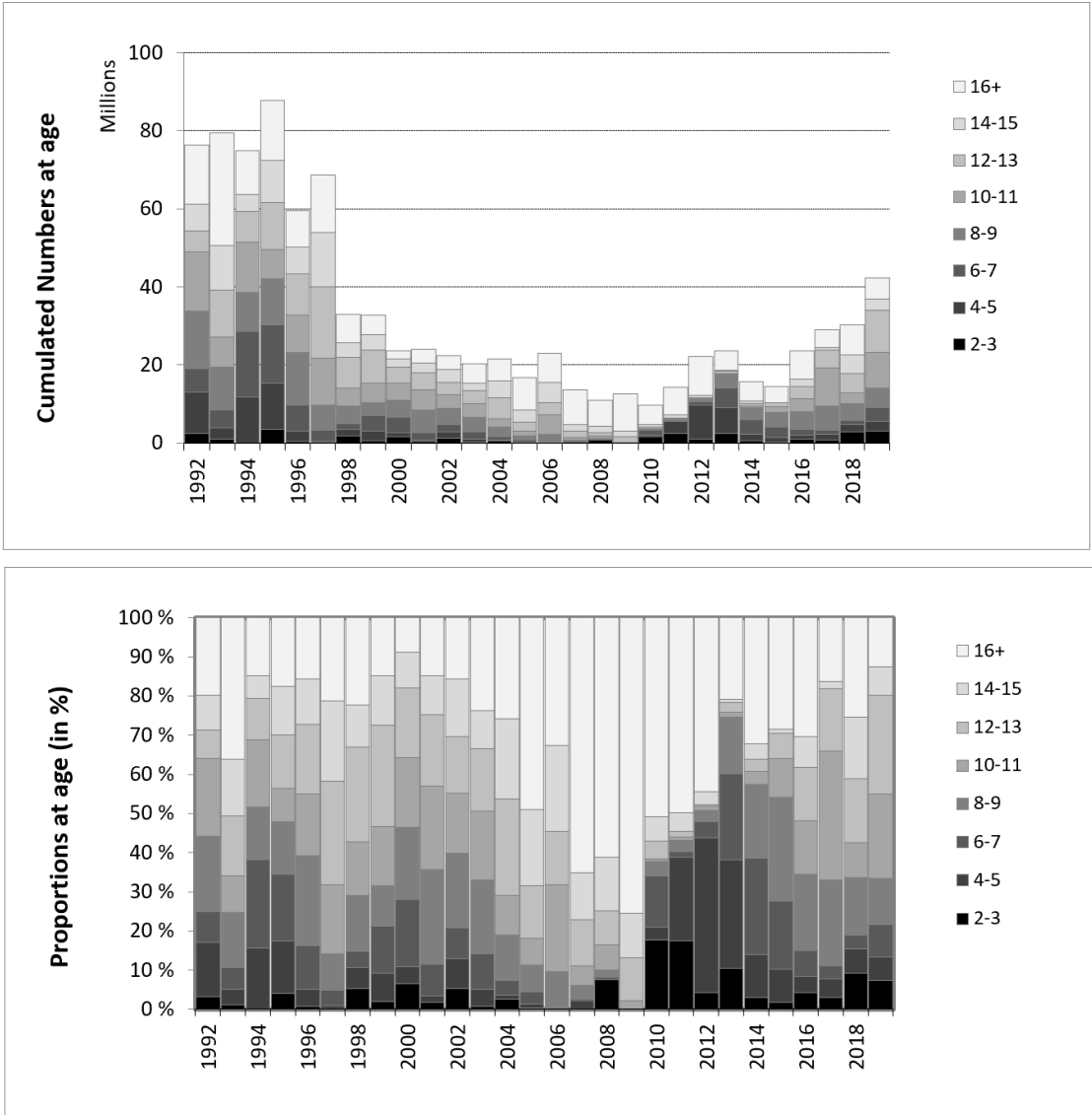


Figure 7.6b. *S. norvegicus*. Abundance indices by age from the winter Norwegian Barents Sea (Division 2.a) bottom-trawl survey (BS-NoRu-Q1 (BTr)); joint with Russia some of the years since 2000), for 1992–2019 (ref. Table E2b). Age readings for 2020–2022 not available during AFWG 2023. Top: absolute index, bottom: relative frequencies.

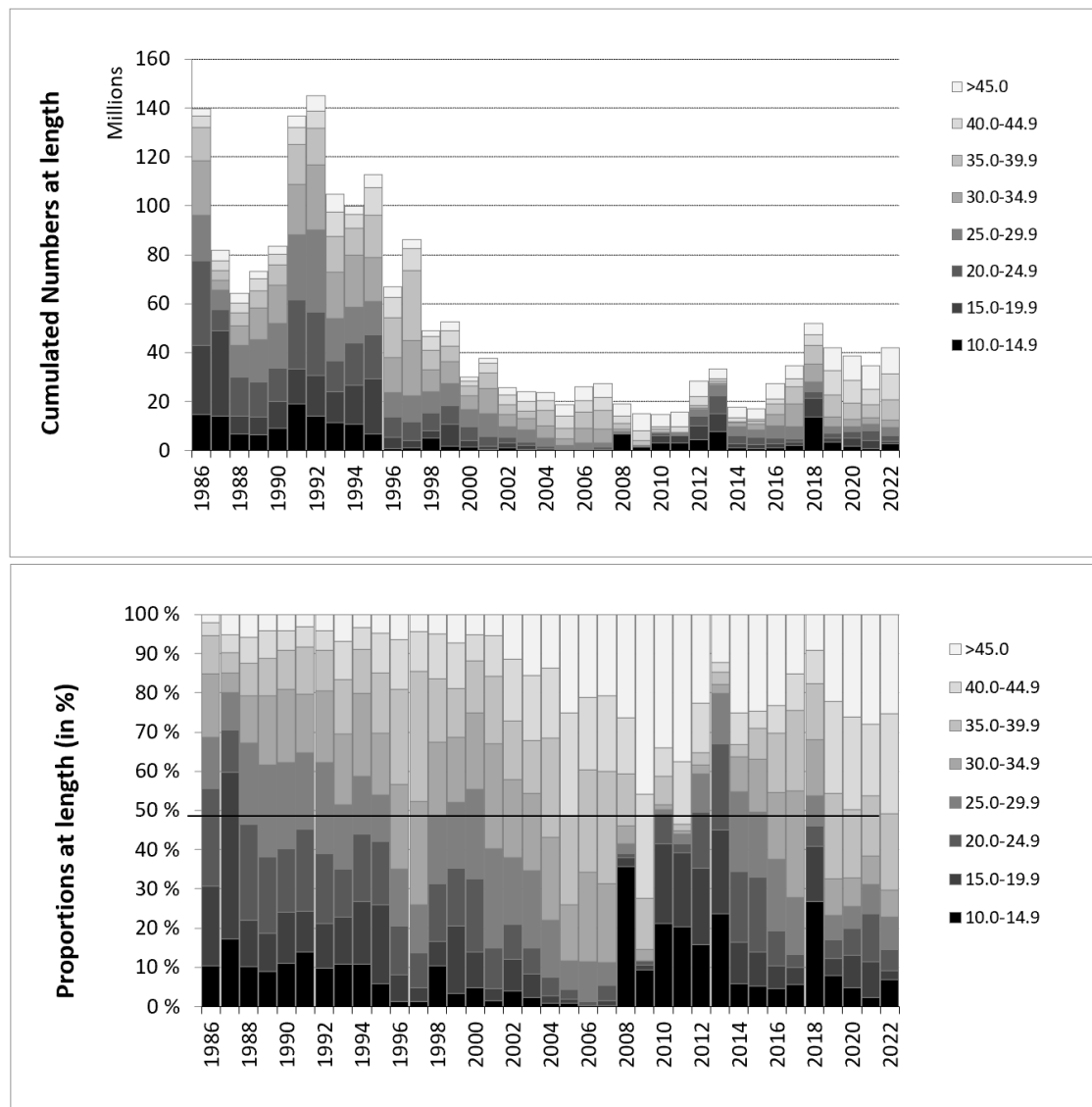


Figure 7.7a. *S. norvegicus*. Abundance indices disaggregated by length when combining the Norwegian bottom-trawl surveys 1986–2022 in the Barents Sea (winter) and at Svalbard (summer/autumn). Top: absolute index values. Bottom: relative frequencies. Horizontal line indicates the median length in the surveyed population.

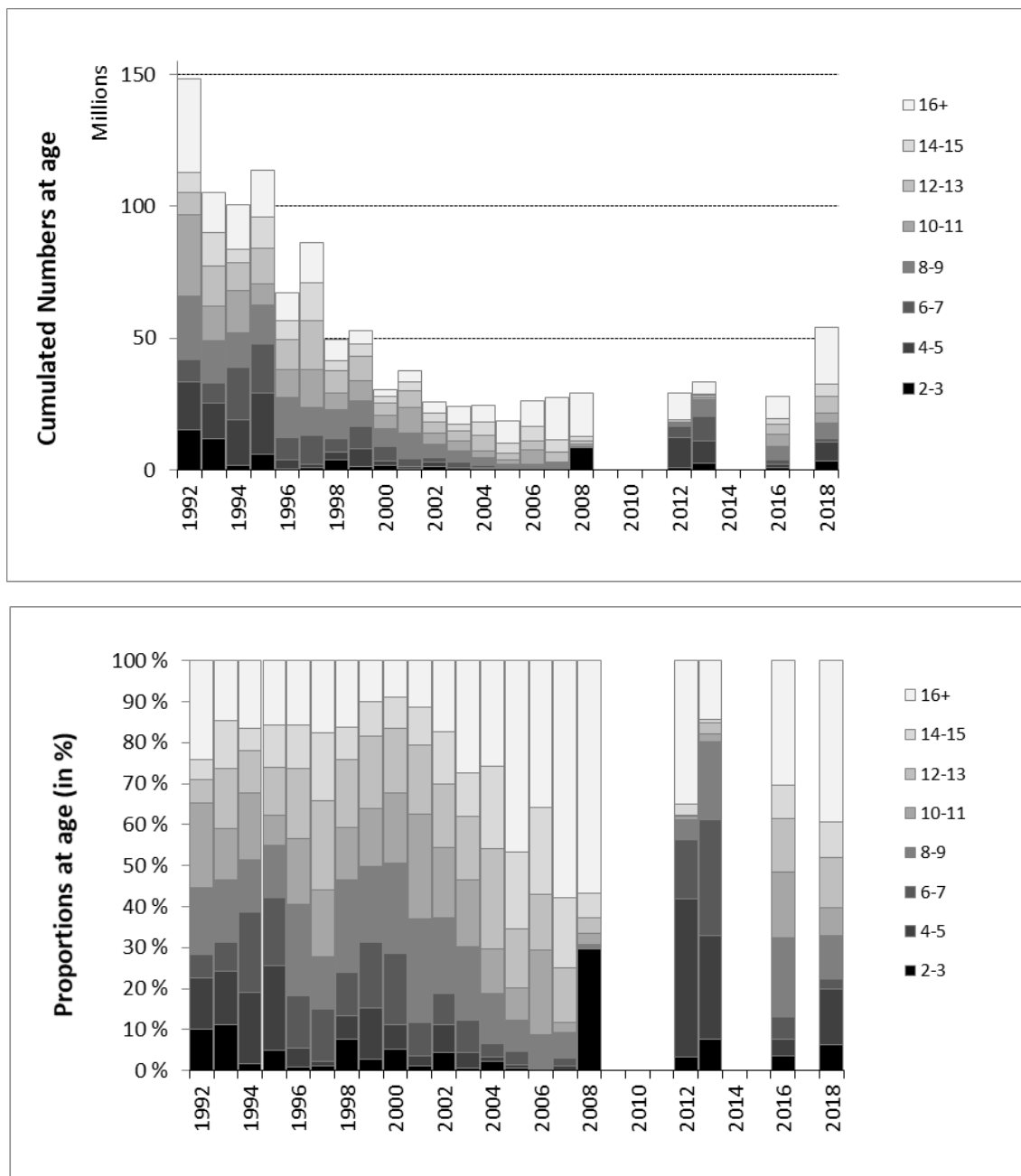


Figure 7.7b. *S. norvegicus*. Abundance indices disaggregated by age. Combined Norwegian bottom-trawl surveys 1992–2018 in the Barents Sea (winter) and Svalbard survey (summer/autumn). Top: absolute index values, bottom: relative frequencies. Horizontal line indicates median age of the surveyed population. In 2009–2011, 2014–2015, 2017, 2019–2022 there was insufficient number of age readings to derive numbers-at-age.

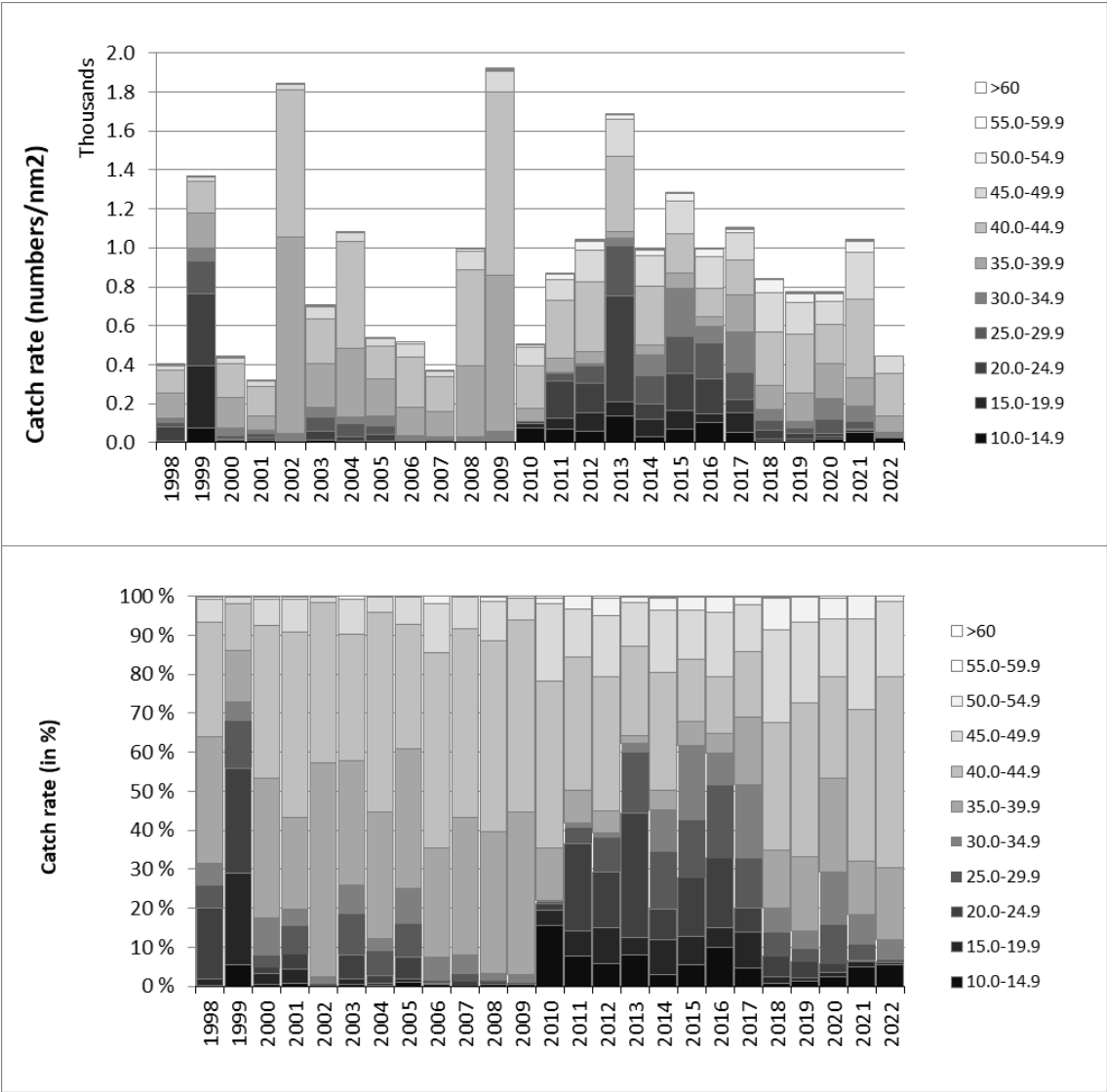


Figure 7.8. *S. norvegicus*. Catch rates (numbers/nm) disaggregated by length for the Norwegian coastal survey 1998–2022. Top: absolute catch rates. Bottom: relative values.

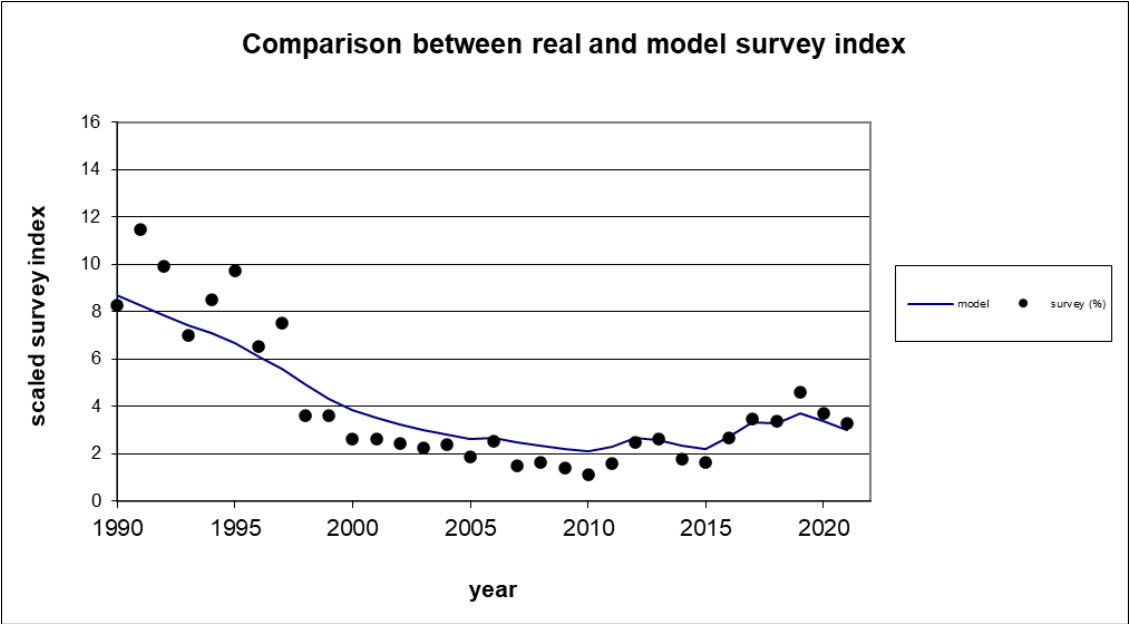


Figure 7.9. *S. norvegicus* in subareas 1 and 2. Comparison of observed and modelled survey indices (total number scaled to sum=100 during the period) for the Barents Sea winter survey in February. Dots: survey indices. Plain lines: survey indices estimated by the model.

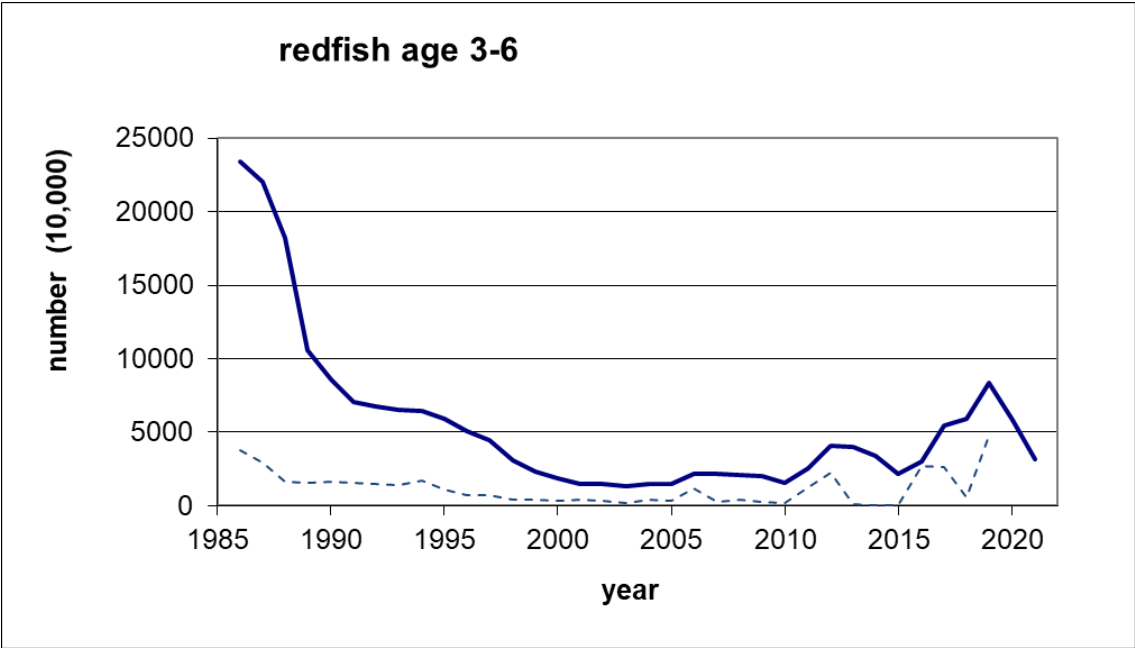


Figure 7.10. *S. norvegicus* in subareas 1 and 2. Estimates of abundance-at-age 3-6 by Gadget for this year's assessment (solid line) and the last assessment (broken line), with data up to 2019 and 2021, respectively. Note that recent year (since 2015) have very little tuning data behind them.

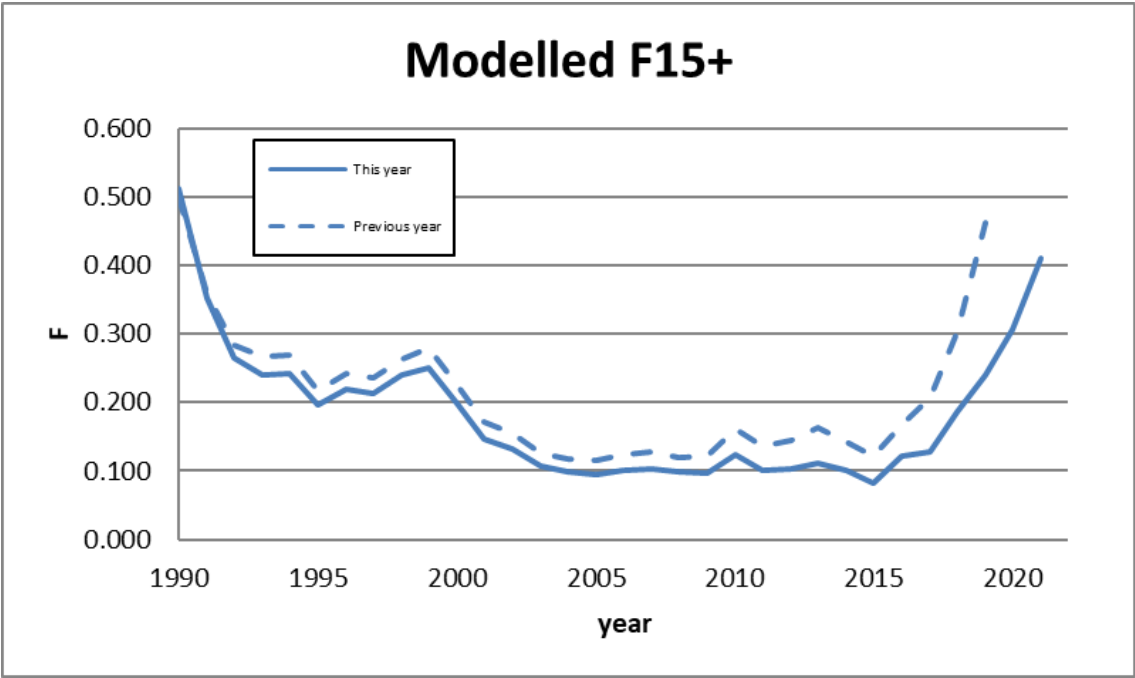


Figure 7.11. *S. norvegicus* in subareas 1 and 2. Unweighted average fishing mortality of ages 15+. Solid line shows this year's assessment (data up to 2021) and the dashed line shows last assessment (data up to 2019).

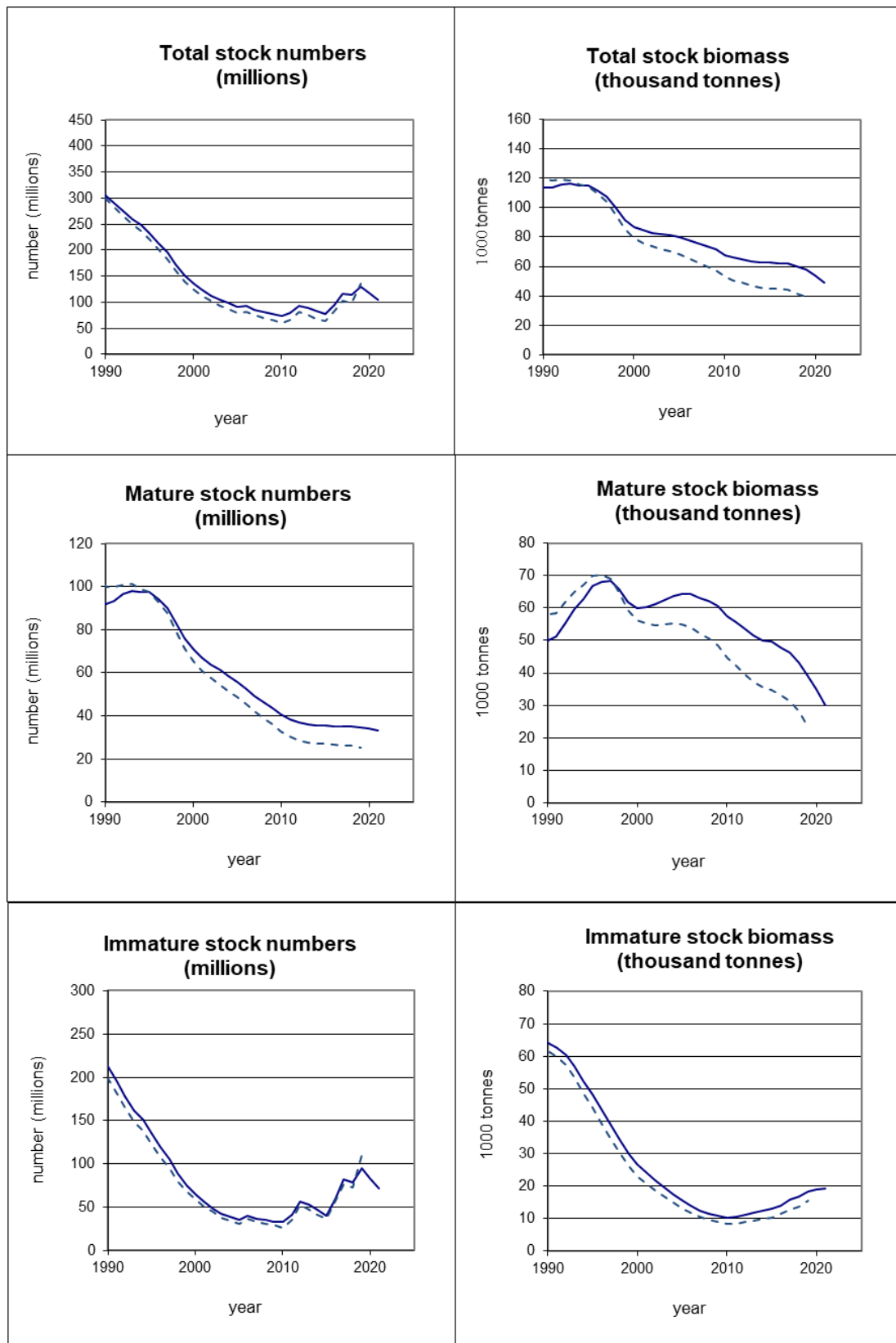


Figure 7.12. *S. norvegicus* in subareas 1 and 2. Stock numbers (in millions) and biomass (in 1000 tonnes) for the total stock (3+; upper panel), and the fishable and mature stock (middle panel), and the immature stock (lower panel), as estimated by Gadget using two surveys as input. Solid line shows this year's assessment (data up to 2021), and the dashed line shows last assessment (data up to 2019).

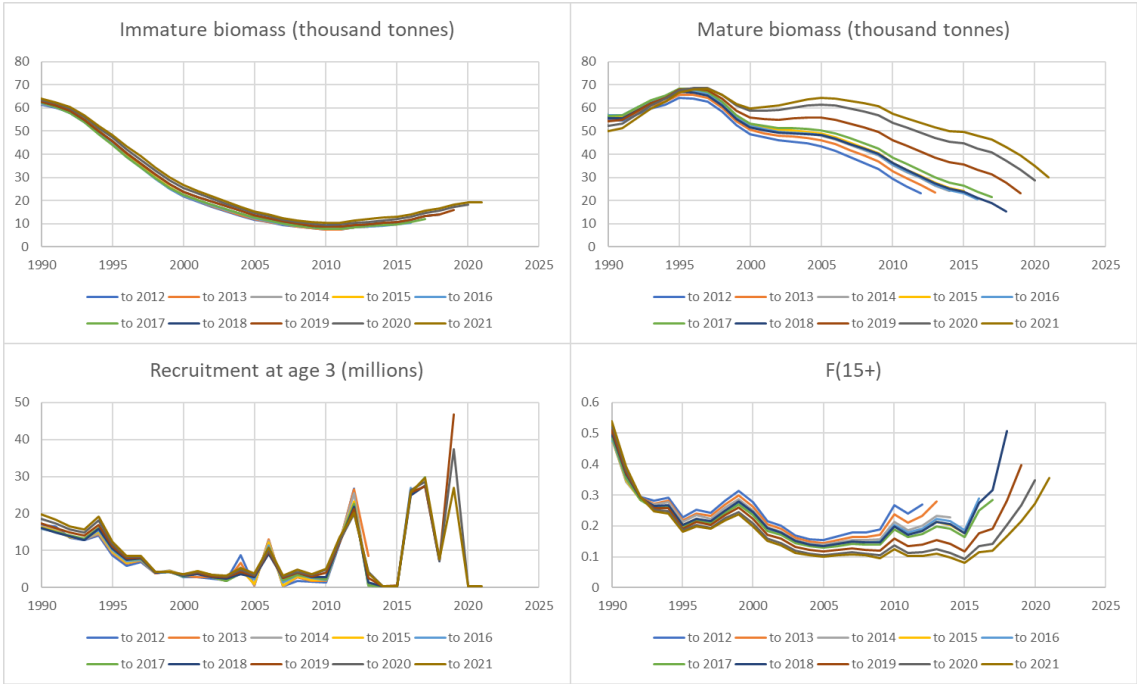


Figure 7.13. Gadget retrospective trends 2012 to 2021, immature biomass, mature biomass, recruitment-at-age 3, and F(15+).

7.5 Additional tables and figures

Table E1. 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 2018 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	19	20	21	22	23	24	25	26	27	28	29	30
1992	0	0	0.09	0.15	0.31	0.22	0.21	0.19	0.21	0.23	0.23	0.34	0.33	0.36	0.38	0.46	0.48	0.45	0.58	0.47	0.43	0.25	0.22	0.38	-	0.45
1993	-	-	0	0	0.1	0.31	0.54	0.5	0.54	0.66	0.84	0.76	0.82	0.83	0.91	0.84	0.9	0.87	0.74	0.91	1	1	-	1	1	1
1994	0	0	0.03	0.05	0.28	0.28	0.34	0.7	0.79	0.91	0.94	0.85	0.92	1	0.96	0.96	1	0.88	1	1	1	1	-	1	1	-
1995	0	0	0	0.05	0.02	0.22	0.25	0.48	0.62	0.64	0.68	0.8	0.87	0.88	0.76	0.89	0.9	0.91	1	1	1	1	-	-	-	-
1996	0	0.05	0.14	0.13	0.22	0.38	0.45	0.6	0.65	0.75	0.69	0.77	0.9	0.85	0.91	0.88	0.96	0.93	1	0.87	0.95	0.95	1	-	1	0.86
1997	0	0.05	0.08	0.15	0.17	0.21	0.34	0.36	0.58	0.64	0.72	0.74	0.86	0.93	0.94	1	1	0.95	0.96	0.94	1	0.88	1	1	1	-
1998	0	0	0.03	0.11	0.09	0.26	0.32	0.49	0.52	0.69	0.74	0.77	0.81	0.91	0.89	0.86	1	1	0.67	0.7	1	1	-	-	1	0.88
1999	0	0	0	0.04	0.17	0.35	0.23	0.53	0.73	0.71	0.67	0.69	0.74	0.71	0.77	0.89	-	0.83	-	1	0.89	-	-	-	-	-
2000	0	0.08	0.14	0.25	0.4	0.53	0.59	0.62	0.65	0.69	0.78	0.96	0.96	1	1	-	-	-	1	-	-	-	-	-	-	-
2001	-	0	0.06	0.14	0.28	0.32	0.4	0.52	0.53	0.6	0.76	0.74	0.81	0.85	0.6	0.7	0.56	-	-	-	-	-	-	-	-	-
2002	-	0	0.05	0.07	0.23	0.46	0.41	0.63	0.74	0.93	0.77	0.89	0.9	0.94	0.96	0.92	0.95	0.95	1	1	1	1	1	1	1	-
2003	-	0	0	0.05	0.13	0.24	0.24	0.47	0.58	0.68	0.75	0.65	0.77	0.78	0.93	0.96	0.94	0.67	1	-	1	-	-	-	-	-
2004	-	0	0.03	0.07	0.13	0.43	0.21	0.51	0.46	0.63	0.64	0.86	0.82	0.96	0.92	0.95	0.89	0.88	1	0.86	1	-	-	-	-	-
2005	-	-	0	0.04	0.39	0.16	0.33	0.4	0.41	0.57	0.74	0.81	0.78	0.82	0.78	0.94	0.95	0.88	0.83	1	-	1	-	-	-	-
2006	-	-	0	0.1	0.07	0.26	0.26	0.39	0.47	0.57	0.67	0.67	0.74	0.86	0.83	0.97	0.79	0.95	0.81	1	-	1	-	-	-	-

Year/Age	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2007	-	-	0	0.08	0.3	0.26	0.2	0.66	0.68	0.7	0.88	0.86	0.89	0.99	0.98	1	0.96	0.94	1	0.92	1	0.83	1	1	1	-
2008	-	-	0.8	0.25	0.82	0.68	0.62	0.8	0.79	0.86	0.88	0.91	0.9	0.92	0.92	0.9	0.93	0.93	0.94	1	1	1	1	1	0.93	1
2009	-	-	-	-	-	0.5	0.5	1	0.93	0.81	0.86	0.86	0.85	0.85	0.88	0.95	0.89	0.95	0.92	0.95	0.86	0.94	1	0.93	0.83	0.86
2010	-	-	-	-	-	-	-	-	0.78	0.77	0.87	1	0.64	0.93	0.91	1	0.95	0.9	1	0.73	0.8	0.83	1	0.6	0.6	-
2011	-	-	-	-	-	-	-	-	-	-	0.73	0.78	0.94	0.93	0.89	0.92	0.92	0.93	0.83	0.85	1	1	-	0.83	-	-
2012	0	0.11	0.1	0.29	0.2	0.2	-	-	-	0.76	0.72	0.7	0.91	0.78	0.88	0.89	0.85	0.81	0.95	0.81	0.86	1	0.93	1	1	1
2013	0	0.12	0.05	0.1	0.19	0.38	0.71	-	0.29	0.82	0.92	0.89	0.77	0.86	0.75	0.79	0.73	0.83	0.89	0.95	1	0.67	1	1	1	1
2014	0	0	0.02	0.08	0.21	0.43	0.41	0.53	0.33	0.58	0.69	0.71	0.8	0.92	0.92	0.95	0.63	0.96	0.9	0.84	0.95	0.83	1	-	0.78	0.88
2015	0	0.05	0.17	0.17	0.3	0.41	0.44	0.49	0.65	0.67	0.69	0.81	0.91	0.86	0.83	0.93	0.78	0.82	1	0.95	0.96	0.83	0.84	1	0.87	0.82
2016	0	0.04	0.02	0.05	0.23	0.16	0.26	0.43	0.59	0.42	0.62	0.57	0.8	0.73	0.87	0.74	0.88	0.79	0.78	0.97	0.81	0.89	0.89	0.67	1	0.94
2017	0.33	0.07	0.09	0.17	0.19	0.22	0.4	0.59	0.53	0.68	0.85	0.7	0.87	0.89	0.9	0.96	1	0.92	0.86	0.94	0.93	0.95	0.9	0.83	0.83	1
2018	-	-	0	0	0.16	0.46	0.59	0.34	0.32	0.53	0.72	0.57	0.9	0.53	0.67	0.92	-	0.8	0.75	1	1	0.78	0.63	1	-	-
2019 ¹	0.03	0.12	0.25	0.22	0.26	0.32	0.51	0.48	0.53	0.63	0.64	-	-	-	-	-	-	-	-	-	0.75	-	-	-	-	-
2020 ¹	-	0	0.38	0.29	0.53	0.75	0.73	0.74	0.85	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 – Provisional figures.

Table E2a. *S. 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 2023. The area coverage was extended from 1993. Indices recalculated from 1994 onwards.

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	59.7
1997	0.0	0.3	1.0	2.2	5.1	20.3	28.0	8.5	3.3	68.8
1998	0.1	2.4	1.3	2.6	4.5	7.4	7.5	5.1	2.2	33.0
1999	0.2	0.9	2.1	4.0	4.4	6.3	6.1	5.5	3.5	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	5.4	4.5	3.2	1.7	24.1

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
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
2012	0.8	4.4	4.0	1.8	0.5	0.3	0.9	3.6	6.3	22.7
2013	0.1	7.4	4.9	4.0	1.6	0.4	0.9	0.8	3.7	23.7
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	14.7
2016	0.7	1.3	1.5	2.3	4.2	3.6	3.4	1.7	5.8	24.3
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

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
2019	0.7	3.2	1.7	1.8	2.5	3.9	9.0	9.7	9.1	41.7
2020	1.0	0.6	1.5	1.0	1.9	2.4	6.5	8.8	9.9	33.6
2021	0.1	0.6	1.9	2.3	1.5	2.4	4.9	6.3	9.6	29.8
2022	1.8	1.9	0.6	1.5	2.0	2.6	8.0	10.6	39.4	68.4
2023 ¹	1.7	2.8	0.7	0.9	0.9	1.7	5.1	14.4	16.9	45.1

1 – Provisional figures. Russian data not provided in time for AFWG 2023.

Table E2b. *S. 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 2019. Age readings not available for 2020–2023 at the time of AFWG 2023. The area coverage was extended from 1993 onwards. Indices recalculated from 1994 and onwards.

Year/age	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
1992	2509	4070	6395	2375	3757	10392	4299	3567	11526	2276	3239	3070	3666	15183	76324
1993	996	1308	1661	3005	1559	7689	3346	4801	2712	5480	6568	2735	8801	28737	79398
1994	0	9249	2475	5998	10871	6530	3523	8189	4566	1639	6285	1486	2964	11035	74809
1995	3544	4554	7203	9362	5598	8583	3308	2305	5004	7512	4602	4848	5948	15455	87826
1996	365	800	1825	2917	3715	8299	5343	3038	6373	4653	5945	3113	3720	9357	59462
1997	154	37	489	1012	1588	2717	3764	2925	9098	6036	12131	11643	2430	14607	68629
1998	1604	1118	607	550	858	2233	2470	2310	2157	3345	4618	827	2785	7320	32803
1999	489	1079	1289	2708	1220	1315	2060	3177	1766	3129	5342	2053	2085	4828	32537
2000	437	427	588	1774	2274	2559	1814	2378	1850	1817	2396	1838	336	2089	22577

Year/age	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
2001	322	105	280	583	1346	2759	3072	2603	2488	2511	1886	1377	1016	3552	23903
2002	973	919	796	1126	640	1511	2744	1694	1754	2144	1090	1102	2172	3492	22157
2003	165	88	773	1329	523	1154	2638	1391	2140	1330	1890	801	1165	4809	20197
2004	0	163	68	250	544	978	1513	1069	1110	2135	3150	1559	2832	5541	20911
2005	57	85	86	114	393	532	627	460	689	1095	1178	1713	1545	8244	16818
2006	0	0	0	0	26	1025	1157	2641	2424	1244	1888	3242	1795	7480	22922
2007	19	39	256	39	0	320	173	369	293	868	751	809	847	8941	13724
2008	826	0	0	0	76	97	116	224	477	320	623	885	621	6744	11010
2009	0	0	0	0	0	0	12	80	176	220	1168	417	1018	9507	12598
2010	0	0	328	1012	250	0	364	62	0	96	343	264	345	4955	8018
2011	2001	1750	1283	135	64	0	440	0	103	0	214	119	560	7110	13776
2012	938	3955	4777	547	342	267	391	112	102	86	0	247	506	9811	22083
2013	1594	1773	4772	2651	2504	2050	1386	275	0	483	143	166	0	4925	22721
2014	485	985	724	1030	2856	1906	1048	532	0	262	228	113	513	5056	15737
2015	223	438	814	1034	1481	1909	1947	483	943	484	471	104	53	4130	14514
2016	338	557	408	390	1163	2022	2567	2214	1027	805	2392	1324	555	7162	22925
2017	402	737	648	953	0	2522	3842	7964	1661	787	3806	352	204	4747	28625
2018	1597	1016	892	354	696	1784	2627	1086	1596	2558	2358	3478	1311	7647	28999

Year/age	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
2019	939	1725	780	2080	1464	2136	2821	3349	5696	7266	3475	2071	942	5334	40076

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 E3a. *S. 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 2022. 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	–	1307	795	1728	2273	1417	311	142	194	8167
1986 ¹	200	2961	1768	547	643	1520	639	467	196	8941
1987 ¹	100	1343	1964	1185	1367	652	352	29	44	7036
1988 ¹	500	1001	1953	1609	684	358	158	68	95	6426
1989	200	1629	2963	2374	1320	846	337	323	104	10096
1990	1700	3886	4478	4047	2972	1509	365	140	122	19219
1991	100	5371	5821	9171	8523	4499	1531	982	395	36393
1992	1700	10228	8858	5330	13960	12720	4547	494	346	58183
1993	200	10160	9078	5855	7071	4327	2088	1552	948	41279
1994	100	3340	5883	4185	3922	3315	1021	845	423	23034
1995	470	2000	9100	5070	3060	2400	1040	920	780	24840
1996	80	130	1260	2480	1030	480	550	990	400	7400
1997	0	810	1980	5470	5560	2340	590	190	450	17390

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	2698	1741	4620	4053	1761	535	545	241	16374
1999	0	794	7057	3698	4563	2449	467	619	369	20016
2000	40	360	1240	1390	2010	760	400	160	390	6750
2001	10	110	790	1470	3710	4600	1880	680	370	13620
2002	0	0	65	415	459	880	621	565	521	3526
2003	87	87	104	84	534	635	459	759	738	3487
2004	0	8	9	192	581	667	607	395	213	2672
2005	0	52	0	84	267	608	411	274	283	1979
2006	0	0	75	74	138	437	470	668	1264	3126
2007	0	29	52	938	1069	4268	5154	892	1390	13792
2008	8603	4255	211	25	50	169	525	180	536	14554
2009	216	1403	108	108	0	0	197	214	220	2466
2010	868	1117	1845	607	0	123	189	0	996	5745
2011	0	0	850	50	0	0	0	159	578	1637
2012	0	111	1565	2242	2217	285	0	0	146	6566
2013	56	489	2155	3307	2738	433	136	34	349	9697
2014	64	0	425	167	296	531	74	0	312	1869

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	
2015	0	0	0	216	198	303	877	18	810	2422
2016	0	0	121	119	813	1007	754	300	498	3612
2017	838	675	577	93	585	291	476	288	262	4085
2018	826	11129	5619	1000	677	2741	1134	127	110	23363
2019	78	90	104	219	68	0	115	131	182	987
2020	527	1193	1728	1591	290	368	318	365	264	6644
2021	0	184	1277	1849	1074	95	407	20	69	4975
2022	958	913	376	811	1449	342	189	104	422	5564

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

Table E3b. *S. 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 2018. Since 2005 this is part of the Ecosystem survey (Eco-NoRu-Q3 (BTr)). In 2009–2011, 2014–2015 and 2019–2022, there was insufficient number of age readings to derive numbers-at-age, or age readings were not available at the time of the AFWG 2023.

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	20115
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

Year	Age														Total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
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	0	0	0	0	95	0	283	227	93	296	285	189	228	341	2035
2004	0	0	0	0	0	0	359	144	362	152	343	315	316	220	2209
2005	0	50	0	0	0	73	25	286	106	191	271	167	125	152	1447
2006	0	0	0	0	0	71	0	0	233	106	174	194	305	179	1261
2007	0	0	0	0	0	513	776	399	0	0	292	1752	1759	1349	6841
2008	7844	0	0	0	0	0	0	37	98	16	18	148	86	164	8412
2009	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2010	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2011	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2012	0	40	123	2445	2105	1205	642	92	35	0	0	0	0	0	6687
2013	0	56	383	1532	3963	377	1910	1029	214	121	250	0	0	166	10000

Year	Age														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
2014	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2015	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2016	0	0	124	0	0	0	0	813	455	739	0	483	136	263	3015
2017	356	187	322	97	145	130	193	205	79	292	205	176	278	0	2667
2018	543	0	1363	4066	0	367	885	422	0	970	1625	0	0	0	10239

Table E4. *S. norvegicus* in Sub-area 1 and 2. Mean catch rates (numbers/nm²) of *S. norvegicus* from the Norwegian Coastal Survey (NOcoast-Aco-Q4; Division 2.a) in 1998–2022.

Length range (cm)														# Hauls	Total.Dist- ance (nm)	# Fish Caught	# Fish Sampled	Area (nm^2)
	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					
1998	0	0	692	6632	73075	22255	22430	130161	116216	23519	2547	880	0	89	139	778	NA	43574
1999	0	7587	77067	317802	369258	165769	67222	178802	163919	20445	3642	1520	0	103	138	2144	NA	43574
2000	0	0	1856	13048	6459	13065	42990	156418	171407	29117	3036	331	191	99	144	756	503	43574
2001	0	295	2031	11787	12305	22408	14127	74790	150763	26573	1787	345	191	81	113	460	325	43574
2002	0	0	0	0	2321	7588	34283	1011 273	754947	26769	3195	513	0	109	172	3289	332	43574
2003	0	0	2579	10118	44506	72473	52479	224734	228374	62121	5536	481	0	123	160	1367	1053	43574
2004	0	937	3139	5591	21042	66182	34613	351154	552183	41851	2666	1345	0	104	130	1290	950	43574
2005	0	554	5209	4627	30272	46072	48379	189993	170639	37468	1450	0	0	99	132	833	780	43574

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	# Hauls	Total.Dist- ance (nm)	# Fish Caught	# Fish Sampled	Area (nm^2)
2006	0	0	2884	496	1738	3065	29933	144743	256394	65959	9272	0	0	112	112	771	680	43574
2007	0	0	0	0	4335	7308	17338	129412	177332	29042	1182	0	0	131	140	637	637	43574
2008	0	3644	4555	955	3957	4679	17440	362633	490611	99469	11772	1630	0	110	139	1156	850	43574
2009	0	0	6976	2285	2984	4530	39275	800208	945004	106479	6244	663	1122	114	136	2947	598	43574
2010	0	39758	77542	20364	8814	1378	2582	66948	214182	99061	7417	2454	0	117	136	833	690	43574
2011	0	3654	67407	55725	193640	35323	10043	72244	296697	107318	27832	286	0	113	104	998	571	43574
2012	0	39530	59337	95227	150260	89534	12686	58890	356556	163645	46792	4640	263	98	96	1191	778	43574
2013	0	5176	137751	72253	540679	260689	38079	34628	384207	190595	21534	3528	2091	93	95	2231	1105	43574
2014	0	524	28653	89876	78267	144543	109523	47736	302185	157358	30251	2343	3361	107	108	1717	777	43574
2015	0	5081	69615	93690	193721	189891	246181	77869	202765	163442	41838	3335	0	97	103	1886	984	43574
2016	0	0	100206	49233	177926	186202	81997	49197	145043	163426	41278	869	567	99	101	1648	1153	43574
2017	0	1789	51611	101305	67426	140564	205389	191361	182391	134508	21507	1130	515	110	147	2996	1866	43574
2018	0	509	5230	16112	43173	50831	52728	124778	273489	200310	67433	4181	988	154	220	2182	1837	43574
2019	0	646	10371	6780	31170	26133	34875	145733	303319	158832	48546	1234	635	159	182	1856	1363	43574
2020	0	8763	19753	7782	16762	75324	104097	184328	200398	113592	40320	4186	475	136	201	3338	1703	43574
2021	2786	28669	51554	12878	4767	41451	78399	142549	404448	238166	60729	530	470	127	160	2482	1484	43574
2022	0	12281	24472	2385	751	2481	23120	83750	219794	87298	5834	0	0	97	130	839	839	43574

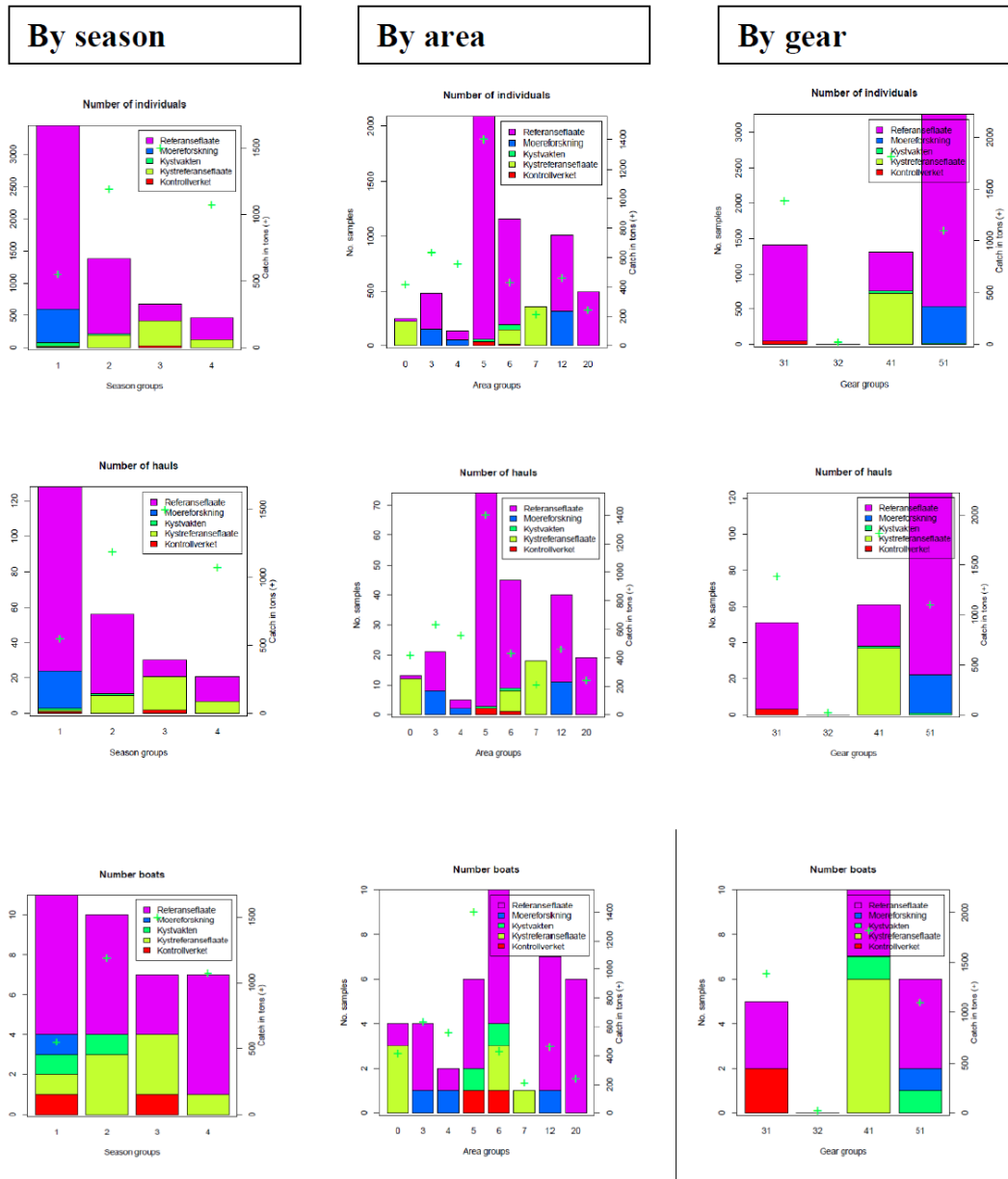


Figure E1. Overview of the Norwegian biological age samples (number individuals, number hauls/sets, number of boats) from the commercial fisheries for *S. norvegicus* in 2013 representing more than 80% of the catches and which the input data to the Gadget model are based upon. The colours denote which 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.

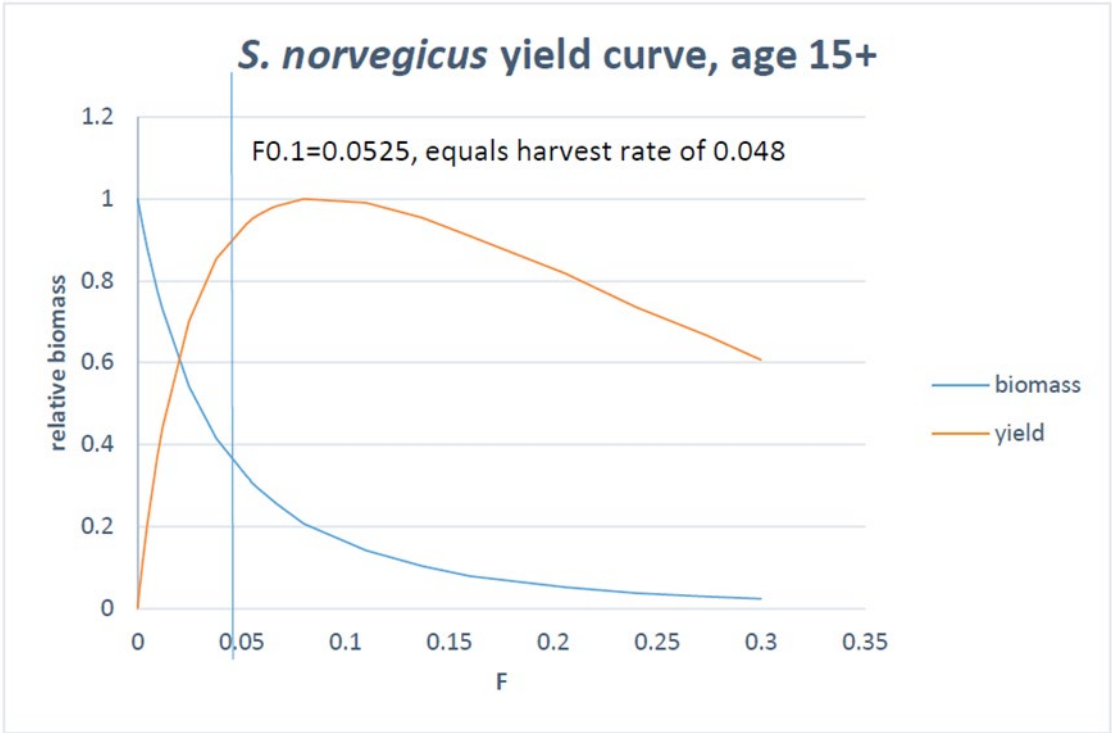


Figure E2. *S. norvegicus* in subareas 1 and 2. Yield-per-recruit for *S. norvegicus*, computed from the GADGET assessment model presented at the benchmark assessment in January 2018 (WKREDFISH, ICES 2018a).

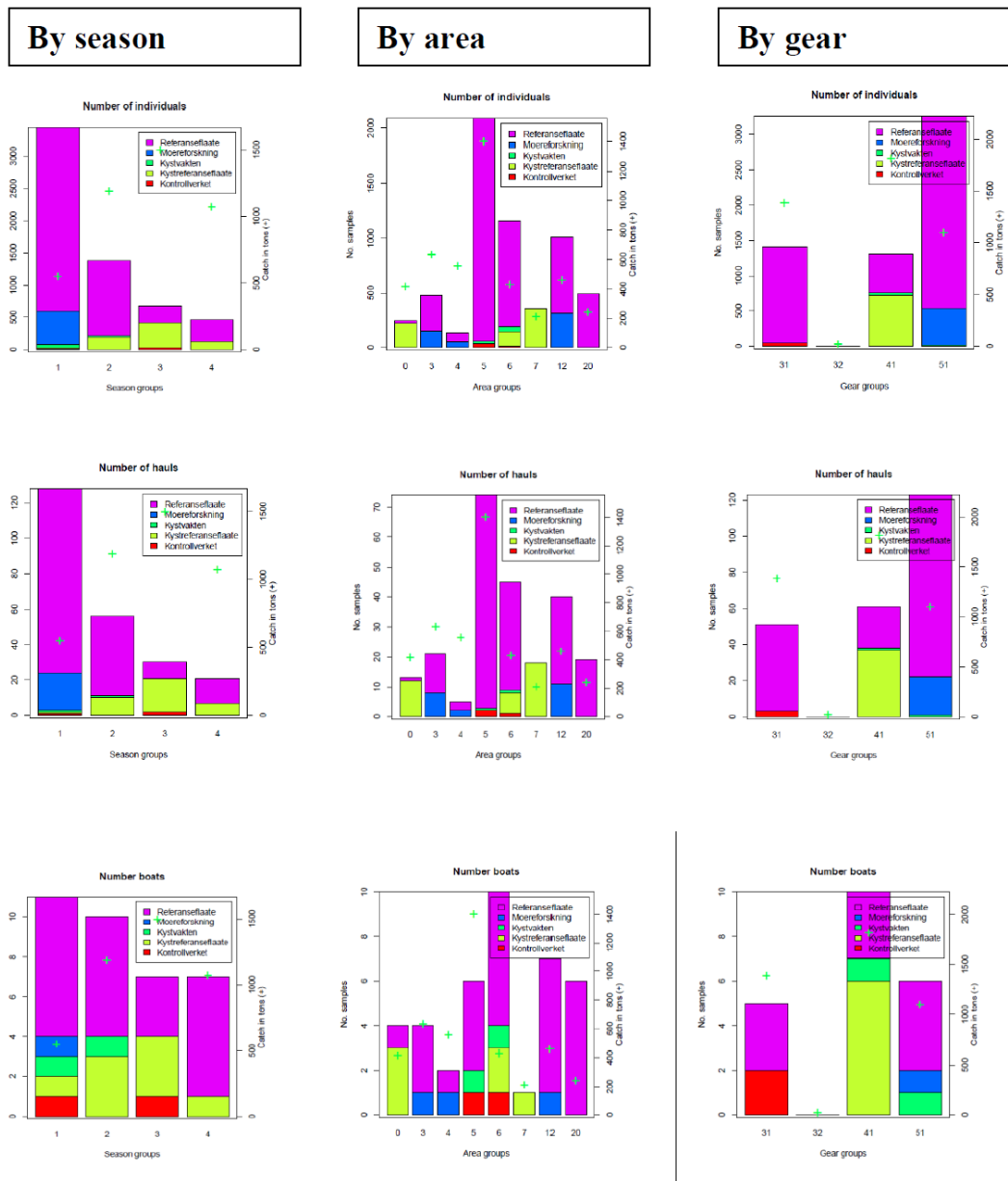


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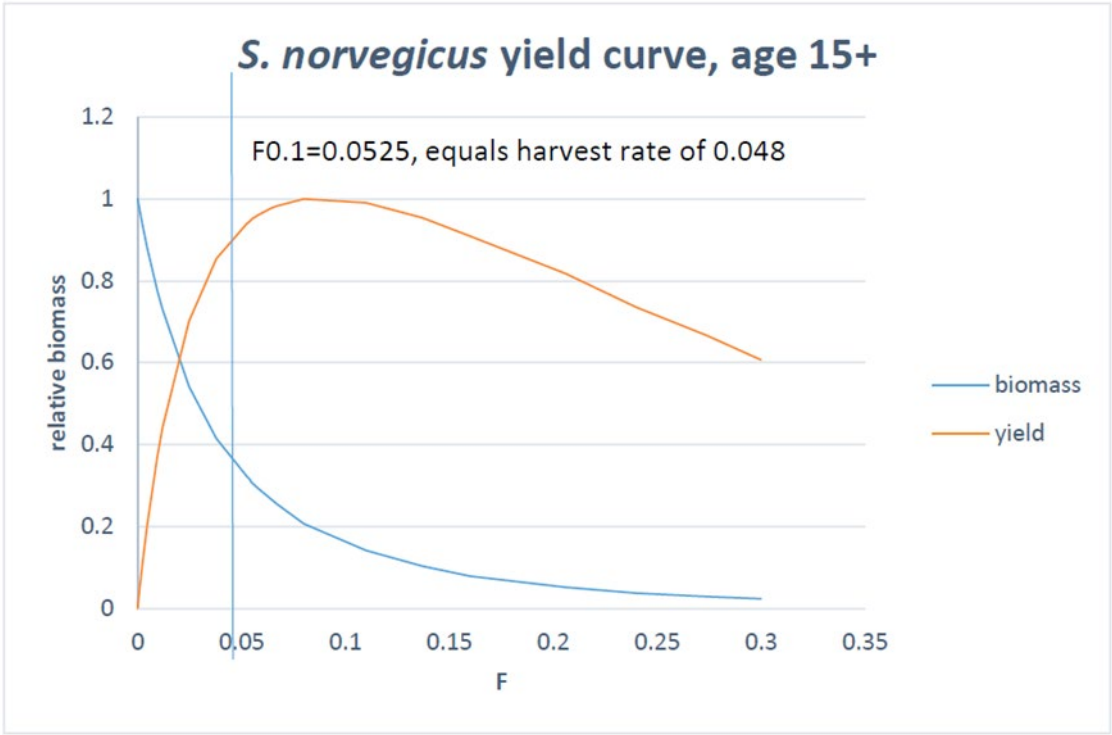


Figure E2. *S. norvegicus* in subareas 1 and 2. Yield-per-recruit for *S. norvegicus*, computed from the GADGET assessment model presented at the benchmark assessment in January 2018 (WKREDFISH, ICES 2018a).

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