

8 Roundnose grenadier (*Coryphaenoides rupestris*)

8.1 Stock description and management units

ICES WGDEEP has in the past proposed four assessment units of roundnose grenadier in the NE Atlantic:

- Skagerrak (Division 3.a);
- The Faroe-Hatton area, Celtic sea (Divisions 5.b and 12.b, Subareas 5, 7);
- the Mid-Atlantic Ridge 'MAR' (Divisions 5.b, 12.c, Subdivisions 5.a1, 12.a.1, 14.b.1);
- All other areas (Subareas 1, 2, 4, 8, 9, Division 14.a, Subdivisions 5.a.2, 14.b.2).

This current perception is based on what are believed to be natural restrictions to the dispersal of all life stages. The Wyville-Thomson Ridge may separate populations further south on the banks and slopes off the British Isles and Europe from those distributed to the north along Norway and in the Skagerrak. Considering the general water circulation in the North Atlantic, populations from the Icelandic slope may be separated from those distributed to the west of the British Isles. It has been postulated that a single population occurs in all the areas south of the Faroese slopes, including also the slopes around the Rockall Trough and the Rockall and Hatton Banks but the biological basis for this remains hypothetical.

In 2007, WGDEEP examined the available evidence of stock discrimination in this species but, on the available evidence, was not able to make further progress in discriminating stocks. On this basis WGDEEP concluded there was no basis on which to change current practice.

In the 2010s, genetic analyses have brought forward information regarding the stock discrimination in the roundnose grenadier. White *et al.* (2010), investigating a limited geographic area in the central and eastern North Atlantic, found evidence of population substructure and local adaptation to depth. Knutsen *et al.* (2012) covered a larger geographic range including East and West Atlantic as well as Arctic areas and found significant genetic structure. Parts of this structure, notably in peripheral (Canada) and bathymetrically isolated basins (Skagerrak and Trondheimsleia (off Norway)), was found to represent distinct biological populations with limited present connectivity with central Atlantic and West European slope. Off the British Isles (Irish slope, Rockall, and Rosemary Bank), the magnitude of genetic structure was found weak. This lack of definition could reflect that samples from this area represent a single, widespread population. On the other hand, a study of coastal Atlantic cod (Knutsen *et al.*, 2011) reported highly restricted connectivity (less than 0.5% adult fish exchanged per year) among two populations that were only weakly differentiated at microsatellite loci. This level is similar to that found between Greenland, Mid-Atlantic Ridge, Rockall, and Rosemary Bank for grenadier. These sites may therefore represent distinct demographical populations, where there is a sufficient gene flow to maintain genetic similarity in terms of allele frequency but the demography is driven by local/regional recruitment and growth with a minor contribution of large scale migrations of juveniles and adults or transport of larvae.

The current stock units are consistent with the study from Knutsen *et al.* (2012) except that the unit covering subareas 1, 2, 4, 8, and 9, Division 14.a, and subdivisions 14.b.2 and 5.a.2, should not be considered as a demographic stock or a genetic population because it includes Arctic and Atlantic areas in which roundnose grenadier was found to be genetically different. This unit might be only considered as an aggregations of areas where roundnose grenadier occurs at low to moderate density and is not subject to significant continuous exploitation.

8.2 Roundnose Grenadier (*Coryphaenoides rupestris*) in Division 5.b and 12.b, Subareas 6 and 7

8.2.1 The fishery

The majority of landings of roundnose grenadier from this area are taken by bottom trawlers. To the west of the British Isles, in Divisions 5.b, 6.a, 5.b.2 and Subareas 7, French trawlers catch roundnose grenadier in a multispecies deep-water fishery. The Spanish trawling fleet operates further offshore along the western slope of the Hatton Bank in ICES Divisions 6.b.1 and 12.b.

8.2.2 Landings trends

Over the past two decades, landings from Division 5.b, reached more than 3800 t in 1991 and more than 2000 t in 2001. Between these two periods, the landings were low (less than 700 t in 1994). After 2001, landings decreased to about 1000 t in 2002 but increased further to about 1840 t in 2005 and then decreased to 74 t in 2011. Since then, landings have continued to gradually decreased. In the period 2011–2021, landings in 5.b were exclusively from French and Faroese trawlers (Table 8.2.0a), with 33 t in 2020 and 22 t in 2021.

In Subarea 6, the highest landings were observed in 2001 (close to 15 000 t) and then decreased progressively to around 513 t in 2018, 202t in 2019 and 318t in 2020. Most of these landings were traditionally caught by French and Spanish trawlers (Table 8.2.0b), with small amounts from Scotland. Provisional landings in 2021 are 116t almost exclusively from French trawlers.

In Subarea 7, landings close to 2000 t were recorded in 1993–1994, although recent annual landings are much lower (from 200–400 t/year in 2005–2007, to around 10 t in 2014–15). Only 2 t were reported in 2018 and less than 1t in 2019, increasing slightly to 5 in 2020. Provisional landings for 2021 are 2.5t from France (Table 8.2.0c).

In ICES Division 12.b, the recent landings are exclusively from Spanish trawlers. After a peak to more than 12 700 t in 2004, reported landings have decreased to about 5300 t in 2009, 2900 t in 2011 and 992 t in 2014. In 2015 the landings went down to 363 t and then increased again slightly until the 632 t in 2016 and around 1000 in 2017 and 2018. In 2019, the landings decreased again to around 50% of the previous year (460t), and have been continue to decrease drastically since then, with 268t in 2020 and 0t in 2021 (Table 8.2.0d).

In the mid-1990s Faroese landings were significant, but this fishery ended in the 2000s and now only few tonnes were landed. In 2004 French fisheries have landed up to 1700 t but since 2007 almost no landings were registered.

Official landings have been revised for 2020 and are preliminary for 2021.

8.2.3 ICES Advice

ICES advises that when the precautionary approach is applied, catches should be no more than 3177 tonnes in each of the years 2023 and 2024. All catches are assumed to be landed.

8.2.4 Management

TACs for EU vessels for deep-water species have been set since year 2003. These TACs are revised every second year. The EU TAC and national quotas from member countries apply to all vessels in EU EEZ and to EU vessels in international waters.

For Division 5.b and Subareas 6 and 7, a TAC was set at 639 t for 2021 and 639 t for 2022. The TAC since EC regulation 1367/2014 was a combined value for roundnose grenadier and roughhead grenadier (*Macrourus berglax*). Since 2019, this TAC set by EC regulation 2018/2025 is only for roundnose grenadier but with the following rule that "any bycatches for roughhead grenadier should be limited to 1% of each Member State's quota of roundnose grenadier and counted against that quota, in line with the scientific advice".

The rationale for this change is explained in the EC regulation: "According to the advice provided by ICES, limited on-board observations show that the percentage of roughhead grenadier has been less than 1% of the reported catches of roundnose grenadier. Based on those considerations, ICES advises that there should be no directed fisheries for roughhead grenadier and that bycatches should be counted against the TAC for roundnose grenadier in order to minimise the potential for species misreporting. ICES indicates that there are considerable differences, of more than an order of magnitude (more than ten times), between the relative proportions of roundnose and roughhead grenadier reported in the official landings and the observed catches and scientific surveys in the areas where the fishery for roughhead grenadier currently occurs. There are very limited data available for this species, and some of the reported landing data are considered by ICES to be species misreporting. As a consequence, it is not possible to establish an accurate historical record of catches of roughhead grenadier".

In Subareas 8, 9, 10, 12 and 14 the TAC for 2021 was set at 572 t and 572 t for 2022. This TAC covers areas with minor roundnose grenadier catches (8, 9 and 10), part of this assessment area (Division 12.b, the western slope of the Hatton bank) and the Mid-Atlantic Ridge (Divisions 12.a,c and Subarea 14). The main countries having quotas allocations under this TAC are Spain and Poland. Therefore these quota allocations are based upon historical landings in 12.b for Spain and in 12.a,c (Mid-Atlantic Ridge) for Poland.

The table below summarizes the TACs in the two management areas and landings in the assessment area.

5.b, 6, 7			7, 9, 10, 12, 14		Total international Landings 5.b, 6, 7, 12.b		ICES predicted
esti- mates	EU TAC	EU Land- ings	EU TAC	EU Landings 12.b			catch corresp. to advice
2005	5253	5777	7190	8782	14558		-
2006	5253	4535	7190	4361	8896		-
2007	4600	3880	6114	4258	8138		< 6000
2008	4600	2980	6114	2432	5412		< 6000
2009	3910	2566	5197	6377	8943		< 6000
2010	3324	1421	5197	2910	4332		< 6000
2011	2924	790	4573	2905	3695		< 6000
2012	2546	546	3979	1343	1889		< 6000
2013	4297	760	3581	991	1752		< 6000
2014	4297	558	3223	988	1546		< 6000
2015**	4010	744	3644	363	707		< 5433

5.b, 6, 7		7, 9, 10, 12, 14		Total international Landings 5.b, 6, 7, 12.b		ICES predicted
esti- mates	EU TAC	EU Land- ings	EU TAC	EU Landings 12.b		catch corresp. to advice
2016**	4078	732	3279	623	1005	< 5511
2017**	3052	633	2623	1001	1634	≤ 3897
2018**	3120	521	2099	998	1519	≤ 3971
2019	2558	232	2281	457	689	≤ 3971
2020	2558	356	2281	268	624	≤ 3971
2021*	639	140	572	0	140	≤ 3177
2022	639		572			≤ 3177

* provisional.

** combined TAC for roundnose grenadier and roughhead grenadier.

After the introduction of TACs in 2003 and 2005, the reported landings have decreased.

In addition to TACs, further management measures applicable to EU fleets are a licensing system, fishing effort limits, the obligation to land the fish in designated harbours and a regulation for on-board observations according to Council Regulation (EC) No 2347/2002 of 16 December 2002. In Faroese waters, the catch of roundnose grenadier is subject to a minimum size of 40 cm total length.

The fishery of this species was affected by the EU regulation 2016/2336 establishing specific conditions for fishing for deep-sea stocks, namely a ban for bottom trawling at depths > 800 m.

8.2.5 Data available

Landings and discards

Landings time-series data per ICES areas are presented in Tables 8.2.0a-e.

Landings data by ICES area were available for France, Norway and UK (England, Wales and Scotland) since 2005 and for Spain since 2010. Catch in Subarea 12 were allocated to Division 12.b (western Hatton bank) or 12.a,c (Mid-Atlantic Ridge) according to knowledge of the fisheries from WG members in years prior to 2010.

Catch and discards by haul were available from observer programmes from France and Spain.

French observer programme: Discards data are available routinely from France since 2004 through the Obsmer (observers at sea) program. The length distributions of discards from all these observations has been consistent and stable for the period 2004–2010 with about 30% of the weight and 50% of the number of roundnose grenadier caught being discarded, because of small size. This figure is higher than from previous sampling programme where the discarding rate in the French fisheries was estimated slightly above 20% in 1997–1998 (Allain *et al.*, 2003). These differences may have come from a combination of changes in the depth distribution of the fishing effort and a decrease in the abundance of larger fish as visible in the landings. Since then, the discard rate has been reduced to 12% of the weight of the catch (29% in number of individuals) in 2011 and 6% in weight in 2012 (24% in numbers). In 2013, discards accounts for 15% of the

catch in weight and 32% in number. In 2014, discards accounts for 6% of the catch in weight and 16% in number. In 2015 and 2016, discards accounted for 5% of the catch in weight and 15 to 17% in number. In 2017, discards were 6% in weight and 15% in number. In 2018, discards accounted for 3% in weight and 8% in number. In 2019 and 2020, reported discard rates were almost negligible, with around 0.7% and 0.6% in weight respectively, and in 2021 the reported discard rate is almost 0.

The reduction of discards is related to:

1. a change of depth of the French fleet towards shallower waters
2. attempts to avoid areas where discards are high.

Spanish Observer programme (Hatton Bank): discard data are available from the Spanish Observer Programme. For the period 2004–2015, observers have covered on average $15 \pm 10\%$ (range 3–39%) of the fleet fishing days in Division 6.b, and $12 \pm 8\%$ (range 2–33%) in Division 12.b. Discards data for 2011 were not presented as they are considered to be inaccurate but provided again for 2012 and onwards. Although occasionally the discards reached 26% of the total observed weight catch in the period 1996–2015, they are negligible in most sampled months. Annual average discards were around 7% (range 0–21%) in weight in both Divisions 6.b and 12.b (range 0–26%) for that period. These discards, however, correspond to undersized individuals.

In 2017, in area 6.b and 12.b, the discard rate is around 4.7% in weight (5.05% in 6.b and 4.6% in 12.b). In 2018, the discard rate is estimated to be around 2.5% (1.6% in 6.b and 3% in 12.b), and around 0.32% in 2019 (0.39% in 6.b.1 and 0.26% in 12.b). The sampling programs were suspended in most of 2020, due notably to administrative problems and to a lesser extend to covid-19, so there is no new discard information for 2020. In 2021 there is no fishing effort in the area by the Spanish fleet.

Length composition of the landings and discards

Length composition of landings and discards were available for France and Spain covering different periods and areas (Figures 8.2.1–8.2.5).

8.2.5.1 Age composition

No new data.

8.2.5.2 Weight-at-age

No new data.

8.2.5.3 Maturity and natural mortality

No new data.

8.2.5.4 Research vessel survey and cpue

Research vessel survey

Data were available from the Marine Scotland deep-water survey since the years 1998 and from stats squares 41E0 through 45E0. This survey operates now on a biannual basis therefore no survey was carried out in 2020. Last survey occurred in 2021.

LPUE from the French trawl fishery to the west of the British Isles

In 2022 no new information was presented as the fishing effort has been greatly reduced. Historical standardized LPUE information based haul by haul data from French skipper's personal tallybooks is included in the Stock annex.

LPUE from the Faroese commercial fleet

In 2022 no new information was presented as the fishing effort has been greatly reduced and more recent landings are at about 1t. Historical standardized LPUE information can be consulted in the stock annex.

CPUE from the Spanish commercial fleet.

CPUE series were calculated from commercial trawlers operating in 6.b.1 and 12.b areas, with effort being the total applied in each area in Kw-day, and the catches only those with any presence of roundnose grenadier in the total catch.

An updated revision of the available data for the period 2010-2020 was included for analysis. A general linear model (GLM) was used to standardize all the CPUE (kg/effort unit) series for the Spanish commercial fleet where the independent variables were the following: year, vessel and fishing area (6.b.1, 12.b). The dependent variable was the log-transformed kg per day measure for variable, which was back-transformed prior to use.

The standardized CPUE time series aims to serve as an approximation for the evolution of the stock in this period, but should be taken with caution, due to the limited number of years currently available and the fact that it only represents the area where the Spanish fleet has a higher presence, and not the whole stock area. In addition, the continuous reduction of the effort applied to this stock by all the commercial fleets, could pose an added difficulty to improving the quality of this series in coming years.

8.2.6 Data analyses

Trends from length distribution and individual weight

For France, the modal discarded length has remained constant (Figure 8.2.1) at around 11 cm while the average pre-anal length of the individuals in the landings has decreased from 20.8 cm in 1990 to around 15.5 cm since 2011. There is an increasing trend in the landings since then. The mean pre-anal length for landings was around 15 cm in 2018-2019, 16.3 cm in 2020 reaching 17.3 in 2021 (Figure 8.2.4).

Modal length for landings in 12.b and 6.b1 shows some differences, being in general those from 12.b smaller (Figures 8.2.2 and 8.2.3). Size–frequency data provided by Spain for the period 2001–2019 in 6.b.1 and 12.b shows the modal length (PAFL) of landings to be closely similar between divisions with female being larger than male by around 2 cm (Figure 8.2.5). The modal length of discards is around 9.5 cm. Over the period 2001–2019, there is no apparent trend in size of discards. However, for landed individuals, both the average size for male and female have decreased by 1 cm (from 15.5 cm to 14cm for females and 13.5 to 12.4 cm for males) until 2009. Over the period 2009–2020, in both 6.b.1 and 12.b, the mean length in landings has increased by two centimetres for both males and females in 2010–2014, with a tendency to decrease after 2015. The difference of modes of the length distributions of landed catch between the Spanish fleet in Divisions 6 and 12.b and the French fleet is possibly because of different sorting habits in relation to different markets.

It is therefore important that length distribution of the landings and discards are provided to the working group by all fleets exploiting the stock.

Time-series of mean individual weight from the Marine Scotland Deepwater Science survey shows no clear trends because of big confidence intervals. Average weight is around 0.75 kg in 2017, 0.5 kg in 2019 and 0.6 in 2021, but with very wide confidence intervals in most of the cases (Figure 8.2.6).

Trends in abundance indices

Marine Scotland Deep-water Science survey (MSDSS)

Data on Marine Scotland Deep-water Science survey was available for WGDEEP2022. There is an increasing trend of abundance over the period 2011–2013. Since 2015, there is however, a decrease and the index were close to the long term average of the series. (Figure 8.2.7).

Lpue from the Faroese commercial fleet

In 2021 no new information was presented and the CPUE series available for the Faroese commercial fleet ended in 2014. The historical CPUE time series can be found in the stock annex.

CPUE from the Spanish commercial fleet in 12.b

CPUE indices based on revised catches for the period 2010–2020 were estimated for the Spanish fleet in order to include the 12.b landings into the assessment. The CPUE has declined from 2010 to 2014 with a peak in 2017 followed by a decline in 2018. Preliminary data shows and a slight increase in 2019 (Figure 8.2.8). The general tendency of the total catches has been variable previous to 2010, with a general tendency to decrease since 2004, since there seems to be a change in the fishing habits, with a growing tendency for vessels to use this area as a stopover, either on the way out or on the way back, of other fishing grounds, mainly to the NAFO area.

LPUE from the French tallybooks

In 2021 no new information was presented. Stock annex includes the historical CPUE time series, which was available from 2010 to 2015.

Stock assessment

The advice on this stock is based on the framework for advice for ICES category 5 stocks for the entire stock since 2018.

In 2016, it was possible to provide advice on stock as category 1 advice for the part of the stock in subareas 6 and 7 and Division 5.b, but while the advice for the part of the stock occurring in Division 12.b was a catch-only assessment (category 5).

LPUE data from haul-by-haul data provided by French trawlers were used in previous assessments for subareas 6 and 7 and Division 5.b. The decrease in activity and number of boats now prevents the use of those indices in the assessment.

In 2020, an exploratory model using a new index available up to 2019 (Marine Scotland Deep-water Survey) was examined. However, this model formulation and the use of this survey as a biomass indicator was not benchmarked yet.

Discard data are available back to 1996. Discards have not been included in the assessment as it was considered that sorting patterns of discards and landings in earlier years may have been different.

The ICES framework for category 5 stocks was applied for the 2018–2022 advice. ICES considers that a precautionary reduction of catches should be implemented unless there is sufficient data to access the current level of exploitation of the stock.

The precautionary buffer (20% reduction in landings) was applied in 2016 and later in 2020 advice so it was not applied in 2022. Therefore, ICES advises that when the precautionary approach is applied, catches should be no more than 3177 tonnes in each of the years 2023 and 2024. All catches are assumed to be landed.

ICES cannot assess the stock and exploitation status relative to MSY and PA reference points because the reference points are undefined.

This stock is classified as Category 1 in the [NEAFC categorization of deep-sea species/stocks](#) which implies that NEAFC requires stock-specific management measures since the entire or a significant proportion of the catch is taken in the NEAFC regulatory area.

Previous stock assessment issues

This stock was benchmarked in 2010 and the assessment methodology based on the surplus production model has not been revised since then. At that time it was considered the assessment was considered to be of category 3. In 2012, this stock assessment was classified as category 1 due to development of short-term forecast.

Yet, some issues have not been resolved since the 2010 benchmark.

Discard time-series is available since 1996 and properly quantified since then. It is supposed from various exploratory runs that discard rates might have been higher at the beginning of the fishery. Because of this, discards have not been included in the past assessments and the impact of this is unknown. The reconstruction of a time-series of discard rates is required for the whole time-series. No new information has been available since then. Prior estimates of discards can only be addressed at the moment through assumptions to be tested.

Additionally, some issues regarding model requires more studies

- Estimates of r (intrinsic growth rates of the surplus production model) was possibly too high in regards of stock dynamics. This should be explored from modelling and data exploration. The lack of contrast between indices from observation and those predicted using estimates of r is a concern as trends from the model seem to increasingly differ over the years.
- A workaround to the problem above would be to use another model taking account additional information that are not currently taken account by the model such as length distributions and giving more value to recent information from survey indices.
- The French tallybooks, due to the decrease of effort and number of vessels in the deep-water French fisheries are no longer representative to derive abundance indices. The Marine Scotland Science Deep-water survey is available on a biannual basis in line with advisory years and a sufficient time-series has been integrated into the assessment over the last years. However, comparisons with the French tallybooks showed some strong differences of biomass, which leaves some doubt on biomass estimates. The reason for those differences have to be investigated.
- Spanish CPUE based on data from commercial fleet has been also calculated and tested as input for the assessment, combined with French and Scottish indices. The model shows discrepancies between the indices, with strong negative correlations between all of them.
- Multi Year Catch Curves are no longer available. Other indicator of stock status may be considered using for example, length or individual weight.

8.2.7 Management considerations

Previous simulations suggest that fishing mortality is below F_{MSY} .

8.2.8 Benchmark preparation

At this moment, there is no planned benchmark for this stock. In the current state, more work is needed to investigate what is the most appropriate approach to try to integrate the available information and develop a model that represents the dynamics of the stock.

Table 8.2.0a. Working Group estimates of landings (t) of roundnose grenadier from Division 5.b.

Year	Faroes	France	Nor way	Germ any	Russia/ USSR	UK (E+W)	UK (Scot)	TOTAL
1988	0	0	0	1	0	0	0	1
1989	20	181	0	5	52	0	0	258
1990	75	1470	0	4	0	0	0	1549
1991	22	2281	7	1	0	0	0	2311
1992	551	3259	1	6	0	0	0	3817
1993	339	1328	0	14	0	0	0	1681
1994	286	381	0	1	0	0	0	668
1995	405	818	0	0	0	0	0	1223
1996	93	983	0	2	0	0	0	1078
1997	53	1059	0	0	0	0	0	1112
1998	50	1617	0	0	0	0	0	1667
1999	104	1861	2	0	0	29	0	1996
2000	48	1699	0	1	0	43	0	1791
2001	84	1932	0	0	0	0	0	2016
2002	176	774	0	0	0	81	0	1031
2003	490	1032	0	0	0	10	0	1532
2004	508	985	0	0	6	0	76	1575
2005	903	884	1	0	1	0	48	1837
2006	900	875	0	0	0	0	0	1775
2007	838	862	0	0	0	0	0	1700
2008	665	447	0	0	0	0	0	1112
2009	322	122	0	0	0	0	2	446
2010	229	381	0	0	0	0	1	611
2011	63	11	0	0	0	0	0	74

Year	Faroës	France	Norway	Germany	Russia/USSR	UK (E+W)	UK (Scot)	TOTAL
2012	16	28	0	0	0	0	0	44
2013	24	36	0	0	0	0	0	60
2014	33	44	0	0	0	0	0	77
2015	24	28	0	0	0	0	0	52
2016	30	7	0	0	0	0	0	38
2017	9	21	0	0	0	0	0	30
2018	0	6	0	0	0	0	0	6
2019	19	11	0	0	0	0	0	30
2020	20	13	0	0	0	0	0	33
2021	12	10	0	0	0	0	0	22

*Provisional.

Table 8.2.0b. Working Group estimates of landings (t) of roundnose grenadier from Subarea 6.

Year	Estonia	Faroës	France	Germany	Ireland	Lithuania	Norway	Poland	Russia	Spain	UK (E+W)	UK (Scot)	TOTAL
1988	0	27	0	4	0	0	0	0	0	0	1	0	32
1989	0	2	2211	3	0	0	0	0	0	0	0	2	2218
1990	0	29	5484	2	0	0	0	0	0	0	0	0	5515
1991	0	0	7297	7	0	0	0	0	0	0	0	0	7304
1992	0	99	6422	142	0	0	5	0	0	0	2	112	6782
1993	0	263	7940	1	0	0	0	0	0	0	0	1	8205
1994	0	0	5898	15	14	0	0	0	0	0	0	11	5938
1995	0	0	6329	2	59	0	0	0	0	0	0	82	6472
1996	0	0	5888	0	0	0	0	0	0	0	0	156	6044
1997	0	15	5795	0	4	0	0	0	0	0	0	218	6032
1998	0	13	5170	0	0	0	21	0	0	3	0	0	5207
1999	0	0	5637	3	1	0	0	0	0	1	0	0	5642
2000	0	0	7478	0	41	0	1	0	0	1002	1	433	8956
2001	680	11	5897	6	31	137	32	58	3	6942	21	955	14773

Year	Estonia	Faroes	France	Germany	Ireland	Lithuania	Norway	Poland	Russia	Spain	UK (E+W)	UK (Scot)	TOTAL
2002	821	0	7209		12	1817		932			6	741	11538
2003	52	32	4924		11	939		452	3			185	6598
2004	26	12	4574	0	8	961	0	13	72	1991	0	72	7729
2005	80	24	2897	0	17	92	1	0	71	468	0	44	3694
2006	34	25	1931	0	5	112	0	0	0	252	0	15	2374
2007	0	10	1552	0	2	31	0	0	0	354	0	4	1953
2008	0	6	1433	0	0	23	0	0	16	336	0	27	1841
2009	0	6	1090	0	0	0	0	0	0	279	0.3	15	1391
2010	0	13	1271	0	0	0	2	0	0	769	1.2	23	2079
2011	0	4	1112	0	0	0	0	0	0	682	0	8	1806
2012	0	0	1088	0	0	0	0	0	0	454	2	0	1544
2013	0	0	934	0	0	0	0	0	0	661	6	0	1601
2014	0	0	630	0	0	0	0	0	0	471	0	0	1101
2015	0	0	364	0	0	0	0	0	0	282	0	0	646
2016	0	0	422	0	0	0	0	0	0	330	0	5.5	757
2017	0	0	99	0	0.5	0	0	0	0	496	0	8	602
2018	0	0	184	0	0	0	0	0	0	323	0	6	513
2019	0	0	128	0	0	0	0	0	0	68	0	6	202
2020	0	0	204	0	0	0	0	0	0	108	0	5.5	318
2021*	0	1	106	0	0	0	0	0	0	0	0	9	116

* Provisional.

Table 8.2.0c. Working Group estimates of landings (t) of roundnose grenadier from Subarea 7.

Year	Faroes	France	Ireland	Spain	UK (Scot)	TOTAL
1988	0	0	0	0	0	0
1989	0	222	0	0	0	222
1990	0	215	0	0	0	215
1991	0	489	0	0	0	489
1992	0	1556	0	0	0	1556

Year	Faroes	France	Ireland	Spain	UK (Scot)	TOTAL
1993	0	1916	0	0	0	1916
1994	0	1922	0	0	0	1922
1995	0	1295	0	0	0	1295
1996	0	1051	0	0	0	1051
1997	0	1033	0	5	0	1038
1998	0	1146	0	11	0	1157
1999	0	892	0	4	0	896
2000	0	859	0	0	0	859
2001	0	938	416	0	0	1354
2002	1	449	605	0	3	1058
2003	0	373	213	0	1	587
2004	0	248	320	0	0	568
2005	0	191	55	0	0	246
2006	0	248	138	0	0	386
2007	0	207	20	0	0	227
2008	0	27	0	0	0	27
2009	0	59	0	0	0	59
2010	0	41	0	0	0	41
2011	0	34	0	0	0	34
2012	0	48	0	0.18	0	48
2013	0	40	0	0	0	40
2014	0	11	0	0	0	11
2015	0	10	0	0	0	10
2016	0	4	0	0	0	4
2017	0	0	0	0	0	0
2018	0	2	0	0	0	2
2019	0	0.8	0	0	0	0.8
2020	0	5	0	0	0	5
2021*	0	2.5	0	0	0	2.5

* provisional.

Table 8.2.0d. Working Group estimates of landings (t) of roundnose grenadier from Subarea 12.b

Year	Estonia	Fa-roes	France ***	Germany	Iceland	Ireland	Lithuania	Spain	USSR/Russia	UK (E+W)	UK (Scotland)	Norway	Total
1988													0
1989			0						52				52
1990			0										0
1991			14						158				172
1992			13										13
1993		263	26	39									328
1994		457	20	9									486
1995		359	285										644
1996		136	179		77			1136					1528
1997		138	111					1800					2049
1998		19	116					4262					4397
1999		29	287					8251	6				8573
2000		6	374	9				5791		9	6		6195
2001		2	159			3		5922			7	1	6094
2002			14				18	10045		1	2		10080
2003			539			1	31	11663			1		12235
2004		8	1 693				120	10880	91		4		12796
2005	20	5	508				13	7804	81		350		8782
2006	27	1	85				6	4242					4361
2007	140	2	0				8	4108					4258
2008		0	0				3	2416	13				2432
2009								5335					5335
2010			1					2910					2911
2011		3						2905					2908
2012		9						1343					1352
2013								991					991
2014		3.6						988					992

Year	Estonia	Faroes	France***	Germany	Iceland	Ireland	Lithuania	Spain	USSR/Russia	UK (E+W)	UK (Scotland)	Norway	Total
2015								363					363
2016								632					632
2017								1001					1001
2018								998.53					999
2019		3						454					457
2020	0	0	0	0	0	0	0	268	0	0	0	0	268
2021*	0	0	0	0	0	0	0	0	0	0	0	0	0

* Preliminary.

Table 8.2.0e. Working Group estimates of landings (t) of roundnose grenadier unallocated landings in 5.b, 6 and 12.

Year	Unallocated
1988	0
1989	0
1990	0
1991	0
1992	0
1993	0
1994	0
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0
2001	208
2002	504
2003	952
2004	0
2005	0

Year	Unallocated
2006	0
2007	0
2008	0
2009	0
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2108	0
2019	0
2020	0
2021*	0

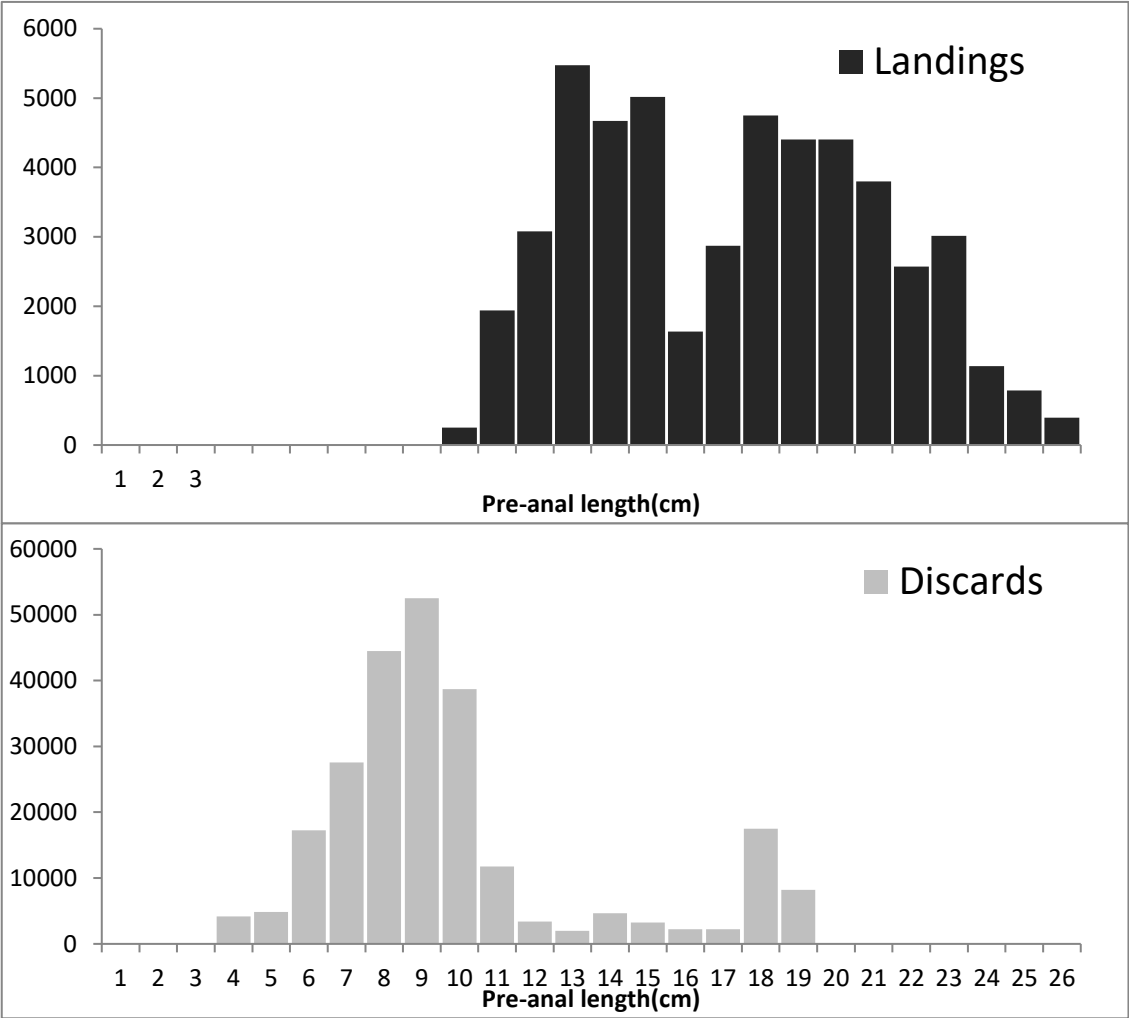
* Provisional.

Table 8.2.0f. Working Group estimates of landings (t) of roundnose grenadier 5.b, 6, 7 and 12.b.

Year	5.b	6	7	12.b	Unallocated	5.b,6,7	Overall total
1988	1	32	0	0	0	33	33
1989	258	2218	222	52	0	2698	2750
1990	1549	5515	215	0	0	7279	7279
1991	2311	7304	489	172	0	10104	10276
1992	3817	6782	1556	13	0	12155	12168
1993	1681	8205	1916	328	0	11802	12130
1994	668	5938	1922	486	0	8528	9014
1995	1223	6472	1295	644	0	8990	9634
1996	1078	6044	1051	1528	0	8173	9701
1997	1112	6032	1038	2049	0	8182	10231

Year	5.b	6	7	12.b	Unallocated	5.b,6,7	Overall total
1998	1667	5207	1157	4397	0	8031	12428
1999	1996	5642	896	8573	0	8534	17107
2000	1791	8956	859	6195	0	11606	17801
2001	2016	14773	1354	6094	208	18143	24445
2002	1031	11538	1058	10080	504	13627	24210
2003	1532	6598	587	12235	952	8717	21904
2004	1575	7729	568	12796	0	9872	22668
2005	1837	3694	246	8782	0	5777	14559
2006	1775	2374	386	4361	0	4535	8896
2007	1700	1953	227	4258	0	3880	8138
2008	1112	1841	27	2432	0	2980	5411
2009	446	1391	59	5335	0	4046	9381
2010	611	2079**	41	2911**	0	2731**	5643**
2011	74	1805**	34	2907**	0	1914**	4822**
2012	44	1542**	48	1352**	0**	1634**	2986**
2013	60	1601**	40	991**	0**	1701**	2692**
2014	77	1100**	11	992**	0**	1188**	2180**
2015	52	646**	10	363**	0	708**	1071**
2016	38	777**	4	632**	0	819**	1452**
2017	30	603**	0	1001	0	633**	1634**
2018	6	513	2	998	0	521	1519
2019	30	202	1	457	0	233	689
2020	33	318	5	268	0	356	624
2021*	22	116	2	0	0	140	140

* Preliminary. ** Revised catches, updated in 2020.



Figures 8.2.1. Length distribution of the landings and discards of the French fleet in Division 5.b, 6, 7 based from on-board observations. Landings were updated to 2021, while no new information about discards was available. The “discards” graphic above correspond to 2020.

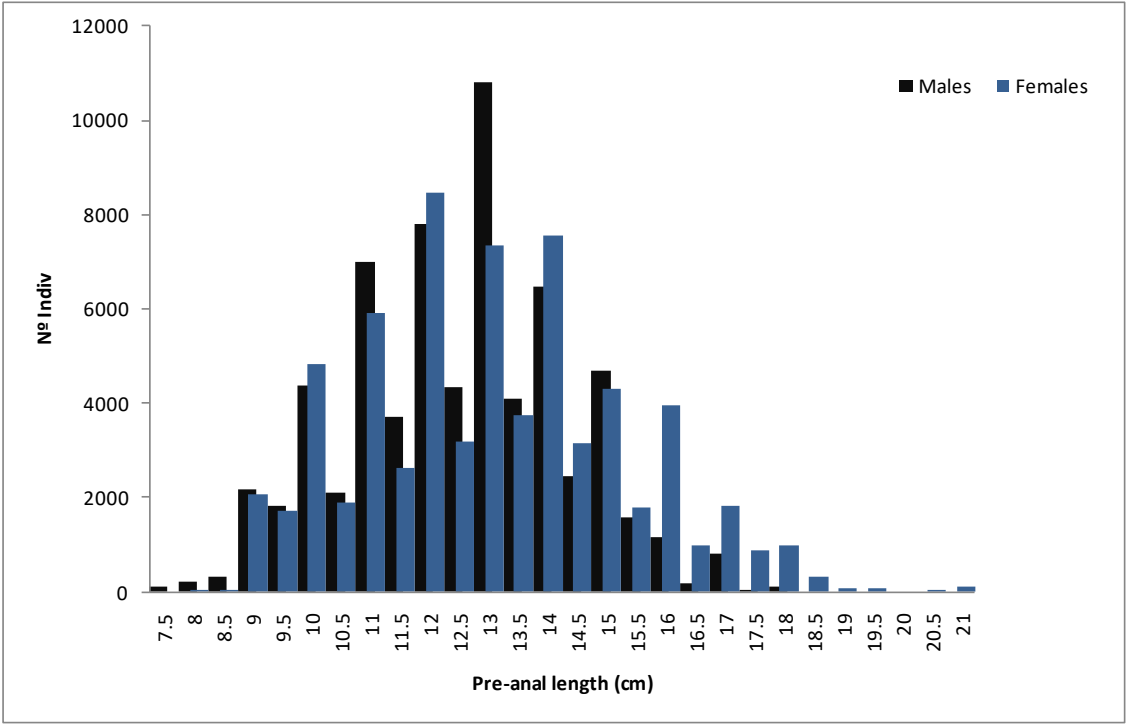


Figure 8.2.2. Length distribution of the landings of the Spanish fleet in Division 6.b.1 based from on-board observations in 2019. No new information was available in 2020-2021.

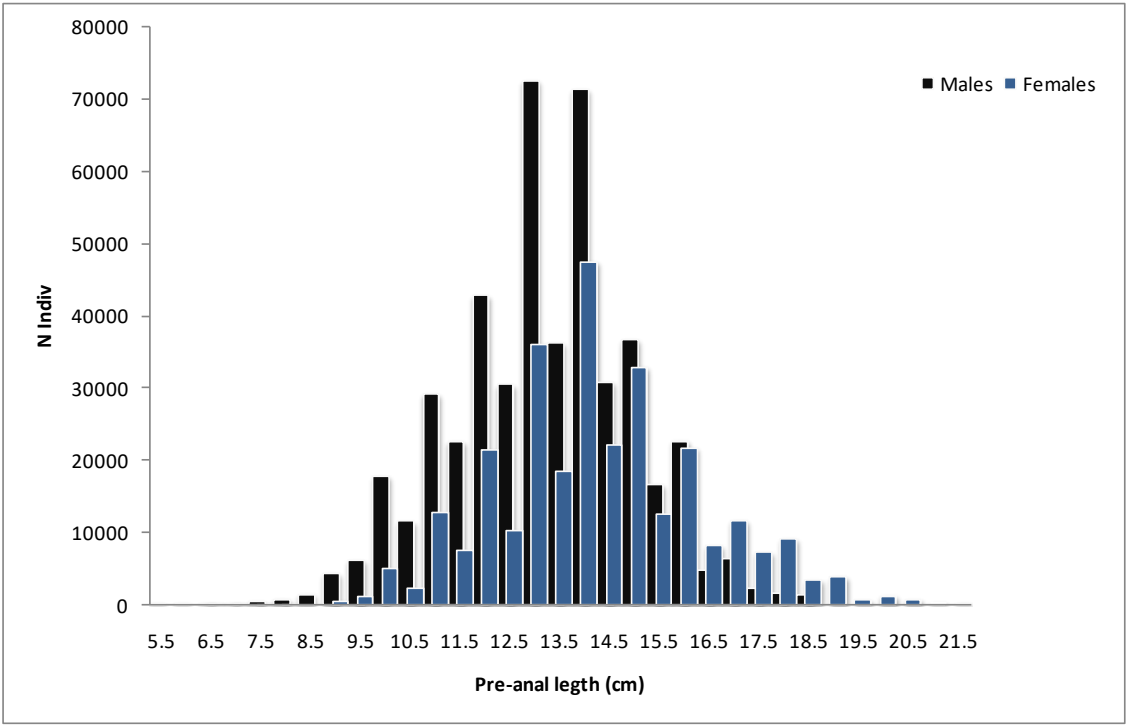


Figure 8.2.3. Length distribution of the landings of the Spanish fleet in Division 12.b based from on-board observations in 2019. No new information was available in 2020-2021.

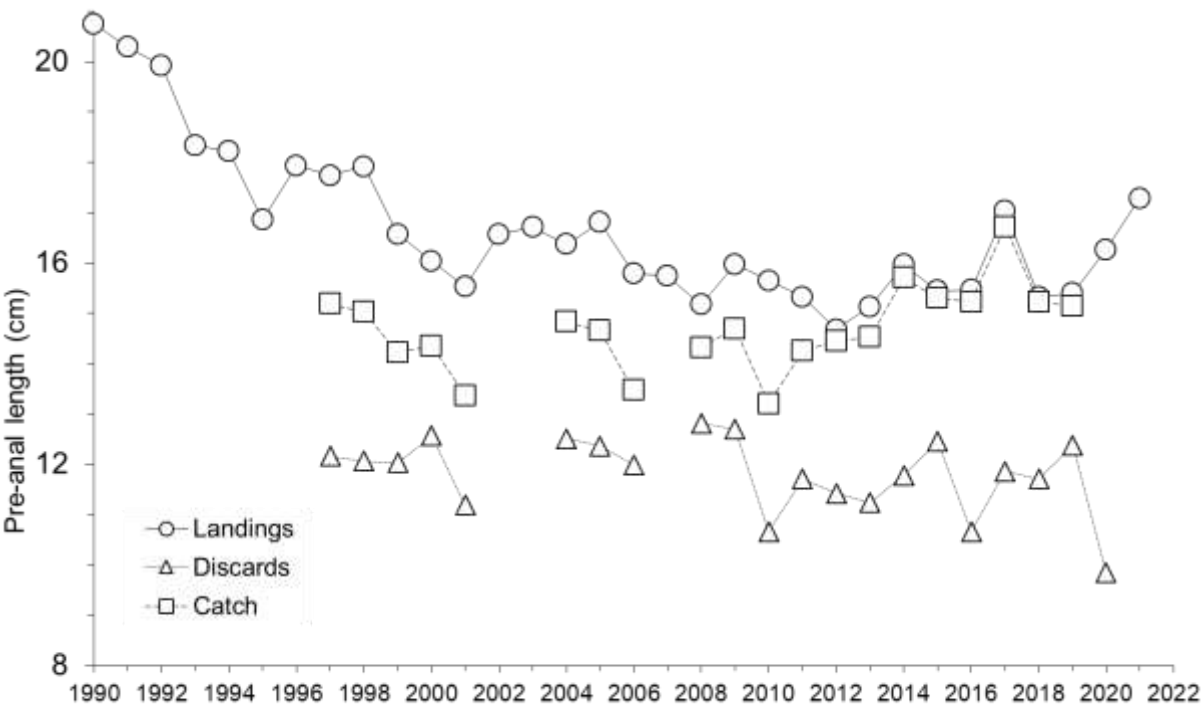


Figure 8.2.4. Evolution of the pre-anal length of roundnose grenadier in the French landings, catch and discards, 1990–2020. No new information was available on discards for 2021.

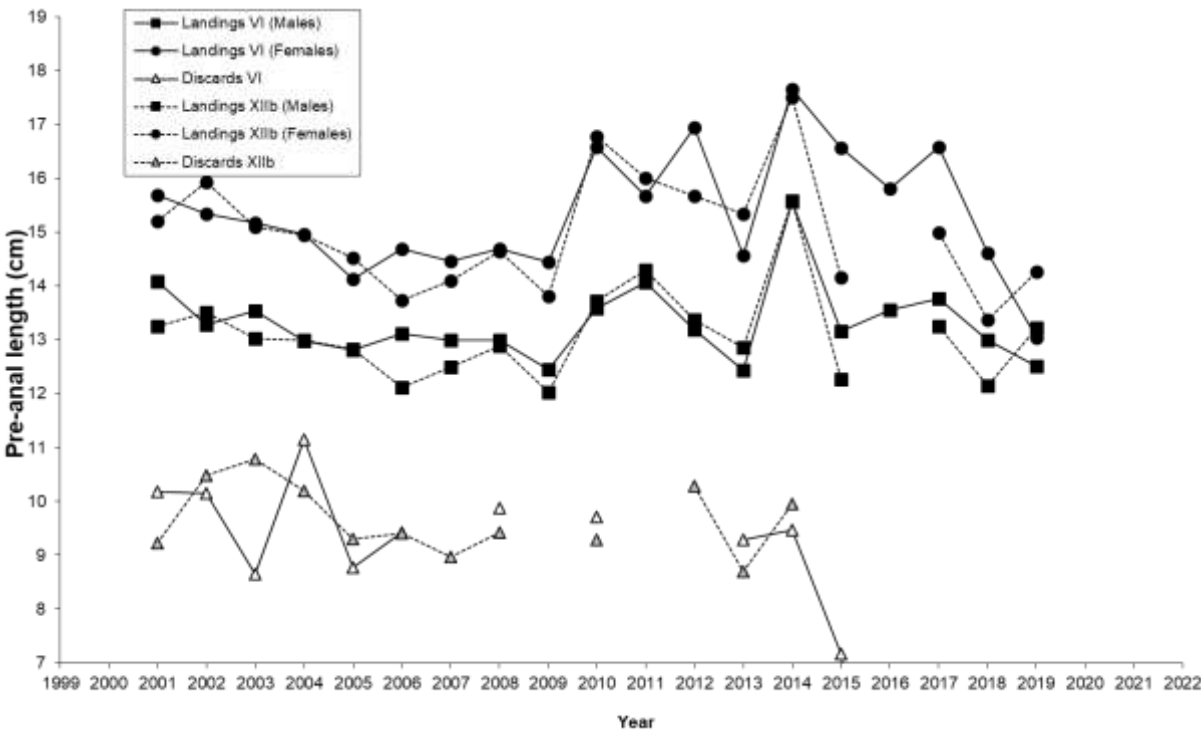


Figure 8.2.5. Evolution of the pre-anal length of roundnose grenadier in the Spanish landings and discards in Divisions 6.b and 12.b, 2001–2019. No new discard or landings length distribution information in 2020–21.

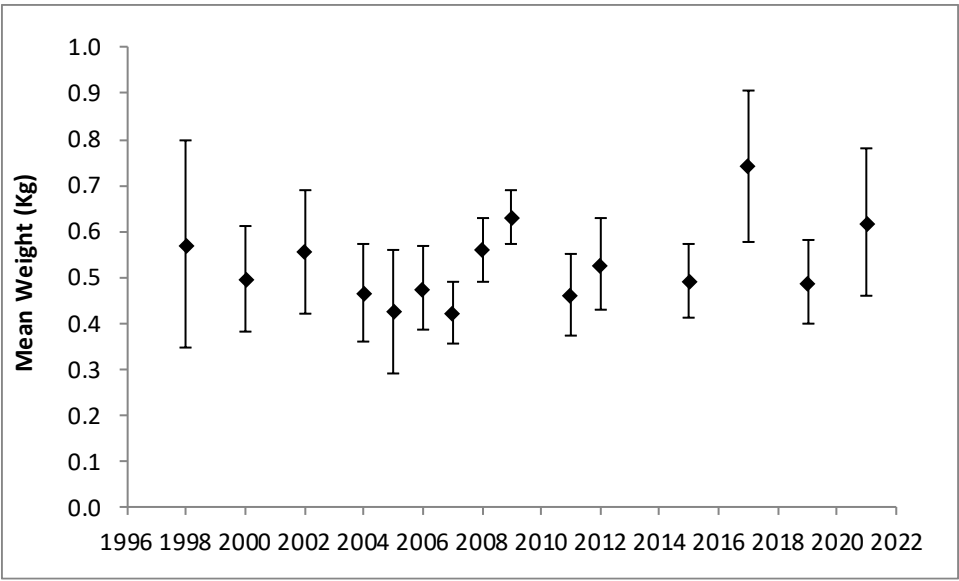


Figure 8.2.6. Mean individual weight of roundnose grenadier according to Marine Scotland deep-water science survey in 6.a.

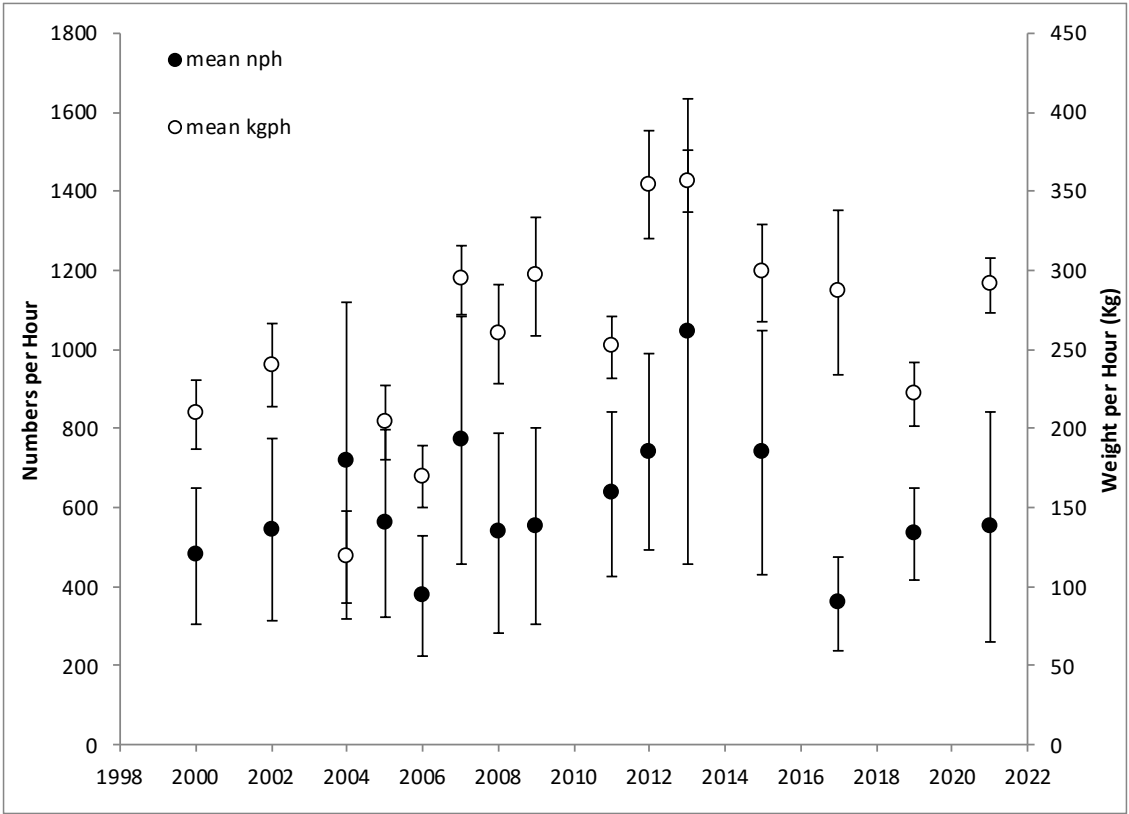


Figure 8.2.7. Abundance indices of roundnose grenadier according to Marine Scotland deep-water science survey in 6.a.

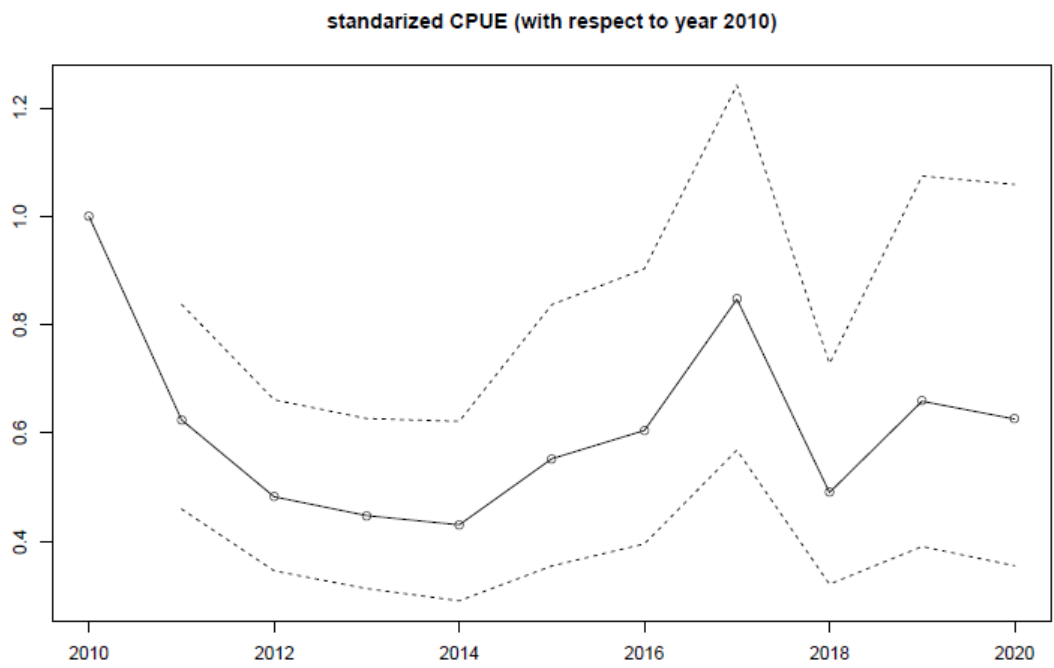


Figure 8.2.8. CPUE from the Spanish commercial fleet operating in 6.b.1 and 12.b. Dotted lines represent the confidence intervals.

8.3 Roundnose grenadier (*Coryphaenoides rupestris*) in Division 3.a

8.3.1 The fishery

From the late 1980s until 2006 a Danish directed fishery for roundnose grenadier was conducted in the deeper part of Division 3.a. Until 2003 landings increased gradually, from around 1000 t to 4000 t with fluctuations. In 2004 and 2005 exceptionally high catches were reported; reaching almost 12 000 tonnes in 2005. This directed fishery stopped in 2006 due to implementation of new agreed regulations between EU and Norway.

At present, there are no directed fisheries for roundnose grenadier in Division 3.a.

8.3.2 Landing trends

The total landings by all countries from 1988–2021 are shown in Table 8.3.0 and Figure 8.3.0.

The landings from the directed Danish fishery ceased in 2007 and the total landings have since been minor (<2 tonnes). The landings are now by-catches from other fisheries.

8.3.3 ICES Advice

The 2021 and 2022 advice for rng.3a was: “ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2021 and 2022”.

8.3.4 Management

The directed fishery for roundnose grenadier was stopped in April 2006 based on agreements between Norway and the EU. The directed fishery has then been prohibited since 2006. Norway and the EU has introduced a mandatory use of sorting grids in shrimp fisheries in order to minimize the bycatch of fish.

In Council Regulation (EU) No 2021/91 of 28 January 2021, fixing for 2021 and 2022 the fishing opportunities for EU vessels for fish stocks of certain deep-sea fish species, a precautionary TAC was set to 5 tons for each year, for EU vessels in EU waters and international waters of Subarea 3. Since there is no area outside national jurisdiction (international waters) in 3.a, this regulation applies to EU waters unless other agreements are negotiated with Norway. There is no TAC for Norwegian vessels in Norwegian waters but the agreed regulation between EU and Norway apply for this area.

8.3.5 Data available

8.3.5.1 Landings and discards

Landings data from 1988–2021 are presented in Table 8.3.0. Discards have been reported from both the Swedish and Danish fishery since 2014 (Table 8.3.2).

8.3.5.2 Length compositions

Since the Danish directed fishery has stopped there is no new information on size compositions from commercial catches other than the data given for the period 1996–2006 (see stock annex for further details).

Updated information on size distribution from the Norwegian shrimp survey is provided in Figure 8.3.1.

8.3.5.3 Age composition

Age data are available from a deep-sea species survey in 1987 and from the Norwegian shrimp survey in 2007-2021 (Table 8.3.3).

These age data are presented in Bergstad *et al.*, 2014.

8.3.5.4 Bycatch effort and cpue

Data from the Norwegian reference fleet have been analysed from 2013-2019 to estimate the catch of roundnose grenadier in the shrimp fishery (Table 8.3.5).

8.3.5.5 Survey indices

The Norwegian annual shrimp survey conducted since 1984 samples deeper parts of the Skagerrak and north-eastern North Sea (3.a and 4.a), including the depth range where the roundnose grenadier occurs (mainly 300–600 m) (Bergstad, 1990b). The minor area >600 m is an ammunition and warship dumping ground with warning against fishing. The survey is considered to adequately sample the main distribution area of roundnose grenadier, and the sample sizes by year (no. of tows at depths >300 m and >400 m) are presented in Table 8.3.1. The survey indices from the shrimp survey were updated with new information from 2022 (Table 8.3.4 and Figure 8.3.2). The indices are given as biomass (kg/h) and abundance (number/h).

For the years 2018-2021, an index from a Swedish bottom trawl survey was available to add information to the survey trends (Table 8.3.6).

8.3.6 Data analyses

An earlier study analysed the time-series of abundance of roundnose grenadier through the time-series (Bergstad *et al.*, 2014). Catch rates in terms of biomass (kg/h) and abundance (nos/h) were calculated for stations 300 m and deeper (Figure 8.3.2). Stations with zero catches were included, and the catches at non-zero stations were standardized by tow duration. The published analysis also includes a time-series of small grenadier, i.e. <5 cm pre anal fin length (PAFL), illustrating variation in recruitment.

8.3.6.1 Trends in landings, effort and estimated bycatches

Collated information on landings and estimates of bycatch from the Norwegian Reference fleet suggest that the removals of roundnose grenadier are now at low levels in Division 3.a. Discard has been reported since 2014. For 2021, there was no discard and all catches were landings. Although the discards from the fishery in this area from recent years was reported to be at the same level as the landings for some years, the level on reported total catch was still low and in the range of what it has been since 2007.

There is no longer a directed fishery for grenadier in this area and data on effort and CPUE is therefore not available from the commercial catches. The earlier evaluation of the Danish CPUE data were presented in ICES (2007) but these CPUE data do not provide any clear indications of stock status nor stock development for the time of the directed fishery, which ceased in mid-2006.

Landings and discards are now insignificant and have been represented as bycatches from other fisheries. Data from the Norwegian reference fleet show that catches of roundnose grenadier in the Norwegian shrimp fishery is low (Table 8.3.5). Discards from Danish and Swedish fishery is zero for 2021.

8.3.6.2 Size compositions

The recent length distributions from the Norwegian shrimp survey data contrasts with the 1991–2004 distributions by not having a distinct mode of small fish as seen in the early 1990s (Bergstad *et al.*, 2014). The pulse of juveniles appearing in the early 1990s appears to have represented the only major recruitment event through the time-series 1984–present. Recently some small juveniles appear every year in the survey, but there is no indication of a pronounced recruitment pulse as observed in the early 1990s.

The Danish and Norwegian length distributions, sampled from commercial landings and survey catches, respectively, agree well for those years covered by samples from both countries (1987 and 2004–2006) (See stock annex for information on the Danish length distributions from the directed fishery). Note that both in 1987 and 2004 there appear to be two clearly distinguishable components in the Danish length compositions. In the Norwegian data, several years show two modes and it is possible to follow the more abundant occurrence of juveniles <5 cm (PAFL) through several years.

8.3.6.3 Biomass and abundances indices from survey

The survey catch rate in terms of biomass (kg/h) and abundance (nos/h) varied strongly through the time-series, but elevated levels were observed from 1998 to 2005. The indices have declined since 2004 with both biomass and abundance being lowest on record in 2017. The index for 2022 show a small increase since the lowest record in 2017. Since the directed fishery is stopped and the bycatches from other fisheries are expected to be low, it is uncertain why the survey catches still are very low compared to the levels before 2000.

The Swedish bottom trawl survey was area and depth stratified covering the same area as the Norwegian shrimp survey. The trend in the Swedish survey index 2018–2021 follow the trend from the Norwegian shrimp survey well for the same period.

8.3.6.4 Age data

The age frequency distributions from recent years contrast with distributions from the 1980s (Bergstad, 1990b) in terms of proportions of old fish (e.g. >20 years) (Table 8.3.3). After the exploitation pulse in 2003–2005, the proportion of old fish has declined to very low levels (Bergstad *et al.*, 2014). In recent years, i.e. after 2006 the mean age in the catches has increased somewhat, but the proportion of fish >20 years remains low.

Analyses of size distributions and the time-series of survey abundance of small juveniles by Bergstad *et al.* (2014) suggested that only a single very abundant recruitment event occurred during the period 1984–2022, perhaps only a single major year class. This event rejuvenated the stock and enhanced abundance in subsequent years.

8.3.7 Comments on assessment

In 2022, the rb-rule was used for the assessment. This rule was chosen when lacking a SPiCT assessment and length measurements from the fisheries.

Itrigger is calculated as $I_{loss} \times 1.4$ and I_{loss} was defined as the lowest value in the Norwegian shrimp survey value in the period before the collapse (1990), giving $I_{trigger} = 69.73$ kg/h. The r would be the “2 over 3 rule” giving 1.25, the multiplier $m = 0.5$

In 2018, the stock was upgraded to a 3.2 category stock using the biomass index from the Norwegian shrimp survey, derived from the relevant depth range of the species in this area.

8.3.8 Management considerations

The decline in abundance after 2005–2006 suggested by the Norwegian shrimp survey catch rates probably reflect the combined effect of the enhanced targeted exploitation in 2003–2005 and low recruitment in the years following the single recruitment pulse in the early 1990s. The percentage of fish >15 cm is at a lower level as in the late 1980s and early 1990s, and there is no suggestion of a new recruitment pulse as seen in the 1990s. Recent age distributions almost lack the >20 years old component which was prominent in the 1980s.

Since the targeted fishery has stopped and the bycatch in the shrimp fishery seems low, the potential for recovery of the roundnose grenadier in Skagerrak may be good. Abundance levels has declined since 2004 and in 2017 it was the lowest recorded during the survey period 1984–2022. However, there has been a small increase in the index since 2017 but still at very low levels. Rejuvenation and growth of the population would at present seem unlikely due to low recruitment during the recent decade.

8.3.9 References

- Bergstad, O.A. 1990b. Distribution, population structure, growth and reproduction of the roundnose grenadier *Coryphaenoides rupestris* (Pisces:Macrouridae) in the deep waters of the Skagerrak. *Marine Biology* 107: 25–39.
- Bergstad, O.A., H.Ø. Hansen and T. Jørgensen. 2014. Intermittent recruitment and exploitation pulse underlying temporal variability in a demersal deep-water fish population. *ICES Journal of Marine Science*, 71: 2088–2100.

8.3.10 Tables and Figures

Table 8.3.0. Roundnose grenadier in Division 3.a. WG estimates of landings.

Year	Denmark	Norway	Sweden	TOTAL
1988	612		5	617
1989	884		1	885
1990	785	280	2	1067
1991	1214	304	10	1528
1992	1362	211	755	2328
1993	1455	55		1510
1994	1591		42	1633
1995	2080		1	2081
1996	2213			2213
1997	1356	124	42	1522
1998	1490	329		1819
1999	3113	13		3126
2000	2400	4		2404
2001	3067	35		3102
2002	4196	24		4220
2003	4302			4302
2004	9874	16		9890
2005	11 922			11 922
2006	2261	4		2265
2007	+	1		1
2008	+	+		+
2009	2	+	+	2
2010	1	+	+	1
2011		0		0
2012	1	0		1
2013	1	0		1
2014	0.6	0	0.4	1

Year	Denmark	Norway	Sweden	TOTAL
2015	0.6	+	+	0.6
2016	1.1	0.3	0.01	1.4
2017	0.7	0.03	0.03	0.76
2018	0.3	0.06		0.36
2019	0.9	0.09	+	1
2020	0.4	0.8	+	1.2
2021*	0.4	0.5	+	0.9

* Preliminary data.

Table 8.3.1. Summary of data on bottom-trawl survey series from the Norwegian shrimp survey, 1984-2022. Rg- rock-hopper groundgear. 'Strapping' maximum width of trawl constrained by rope connecting warps in front of otter doors. MS-RV Michael Sars, HM-RV Håkon Mosby. Data from 2022 survey are included. All trawls were fitted with a 6mm mesh codend liner.

YEAR	Survey month	Vessel	IMR Gear code	Additional gear info.	No. trawls >300m	No. trawls >400m	No. trawls survey
1984	OCT	MS	3230	Shrimp trawl	10	1	67
1985	OCT	MS	3230	"	21	5	107
1986	OCT/NOV	MS	3230	"	24	9	74
1987	OCT/NOV	MS	3230	"	35	14	120
1988	OCT/NOV	MS	3230	"	31	11	122
1989	OCT	MS	3236	Campelen 1800 35mm/40, Rg	31	7	106
1990	OCT	MS	3236	"	26	5	89
1991	OCT	MS	3236	"	28	9	123
1992	OCT	MS	3236	"	27	10	101
1993	OCT	MS	3236	"	30	10	125
1994	OCT/NOV	MS	3236	"	27	10	109
1995	OCT	MS	3236	"	29	12	103
1996	OCT	MS	3236	"	27	11	105
1997	OCT	MS	3236	"	25	6	97
1998	OCT	MS	3270	Campelen 1800 20mm/40, Rg	23	6	97
1999	OCT	MS	3270	"	27	8	99
2000	OCT	MS	3270	"	25	10	109

YEAR	Survey month	Vessel	IMR Gear code	Additional gear info.	No. trawls >300m	No. trawls >400m	No. trawls survey
2001	OCT	MS	3270	"	18	4	87
2002	OCT	MS	3270	"	24	6	82
2003	OCT/NOV	HM	3230	Shrimp trawl (as in 1984–1988)	13	0	68
2004	MAY	HM	3270	Campelen 1800 20mm/40, Rg	17	6	65
2005	MAY	HM	3270	"	23	8	98
2006	FEB	HM	3270	"	10	0	45
2007	FEB	HM	3270	"	11	1	66
2008	FEB	HM	3271	Campelen 1800 20mm/40, Rg and strapping*	18	5	73
2009	JAN/FEB	HM	3271	"	25	7	91
2010	JAN	HM	3271	"	24	7	98
2011	JAN	HM	3271	"	22	7	93
2012	JAN	HM	3271	"	20	5	65
2013	JAN	HM	3271	"	28	8	101
2014	JAN	HM	3271	"	16	7	69
2015	JAN	HM	3271	"	28	9	92
2016	JAN	HM	3271	"	28	9	108
2017	JAN	KB	3271	"	30	9	128
2018	JAN	KB	3271	Campelen 1800 20mm/40, Rg and strapping**	27	8	111
2019	JAN	KB	3296	Campelen 1800 20mm/40, Rg and strapping***	27	8	119
2020	JAN	KB	3296	""	26	7	106
2021	JAN	KB	3296	""	27	8	113
2022	JAN	KB	3296	""	28	8	119

* Path width of the tow constrained by a 10 m rope connecting the warps, 200 m in front of otter boards. ** Path width of the tow constrained to a 15 m rope connecting the warps, 100 m in front of the otter boards. *** Same trawl and strapping but from 2019 there are inserted several floaters on the trawl to lighten the trawl (Nordsjørigging).

Table 8.3.2. Discards (tons) reported for roundnose grenadier in 3a from 2014-2021.

Year	Denmark	Sweden	Norway	TOTAL
2014		0.4		0.4

2015	1		1
2016	0.1	0.9	1
2017		1.6	1.6
2018	2.9	0.01	2.9
2019	0.5	0.08	0.6
2020	0	0	0
2021	0	0	0

Table 8.3.3. Cumulative percentages (%) for selected ages from the deep-sea species survey in 1987 and from the Norwegian shrimp survey in 2007-2021

Year	Age				
	5	10	20	30	50
1987	9	21	45	75	96
2007	10	23	83	94	96
2008	22	40	92	99	100
2009	14	30	88	93	100
2010	12	29	71	96	99
2011	6	23	65	94	99
2012	10	28	48	96	100
2013	14	28	56	92	99
2014					
2015	7	17	48	95	100
2016					
2017	14	52	81	94	99
2018	23	50	77	99	100
2019	8	37	64	92	100
2020	40	64	83	97	100
2021	20	55	83	97	100

Table 8.3.4. Mean biomass index and mean abundance index from the Norwegian shrimp survey 1984-2022. Missing data are from surveys that are not representable according to roundnose grenadier catches (less stations > 300 m). Data from 2016 are considered unreliable according to gear inconsistencies.

Number stations>300m (n) Mean biomass (kg/h), Mean abundance (n/h), Number (n) and Standard error (SE)					
Year	n	(kg/h)	SE(kg/h)	(n/h)	SE(n/h)
1984	10				
1985	21	108.12	38.32	149.95	49.43
1986	24	83.75	32.16	117.83	46.99
1987	35	76.15	13.56	125.80	24.60
1988	31	72.14	13.92	105.19	21.22
1989	31	122.69	43.48	195.94	73.07
1990	26	49.81	18.20	72.66	27.55
1991	28	107.14	22.27	176.86	38.75
1992	27	188.54	67.53	698.52	337.67
1993	30	58.59	19.42	190.33	74.15
1994	27	87.19	21.21	372.96	143.56
1995	29	118.30	32.36	440.62	144.41
1996	27	99.63	31.68	268.01	116.92
1997	25	113.86	66.47	362.72	222.08
1998	23	255.54	87.80	812.82	336.85
1999	27	149.30	42.85	388.83	122.54
2000	25	129.27	30.39	389.06	107.71
2001	18	105.33	51.84	272.99	151.99
2002	24	174.77	66.27	371.70	129.97
2003	13				
2004	17	324.38	125.48	1143.35	487.33
2005	23	193.65	93.81	550.42	260.94
2006	10				
2007	11				
2008	18	95.58	65.81	259.10	208.53
2009	25	72.72	39.81	207.41	121.84
2010	24	33.24	21.47	77.21	54.81

Number stations>300m (n) Mean biomass (kg/h), Mean abundance (n/h), Number (n) and Standard error (SE)					
Year	n	(kg/h)	SE(kg/h)	(n/h)	SE(n/h)
2011	22	26.84	12.61	54.76	27.05
2012	20	16.69	11.97	34.40	23.83
2013	28	11.48	4.92	35.06	16.90
2014	16	25.62	15.76	49.56	28.69
2015	28	7.28	4.59	21.19	12.14
2016	28				
2017	30	6.64	2.41	15.74	6.73
2018	27	12.88	6.60	41.91	26.13
2019	27	14.59	5.77	40.09	18.05
2020	26	18.72	11.48	63.02	38.07
2021	27	9.59	5.03	26.14	14.19
2022	28	23.87	10.94	75.20	35.61

Table 8.3.5. Proportion of tows with shrimp trawl that caught roundnose grenadier. Data from Norwegian Reference fleet

Year	Total number of shrimp trawl	Number of trawl hauls that caught roundnose grenadier	Catch of roundnose grenadier (kg)	% of the total catch
2013	243	0		0
2014	288	2		0.69
2015	1489	14		0.94
2016	4811	23		0.48
2017	3798	20	29	0.53
2018	2849	19		0.67
2019	1233	4	80	0.32

Table 8.3.6. Mean average catch (kg/km²) from the Swedish bottom trawl survey 2018-2021.

Year	nHauls>=300 m	nHauls with catch	mean	var	sd	se
2018	15	11	114.6	24921.9	157.9	40.8
2019	10	4	128.2	157271.1	396.6	125.4
2020	14	11	381.3	223687.7	473.0	126.4

2021	7	2	272.6	114841.2	338.9	128.1
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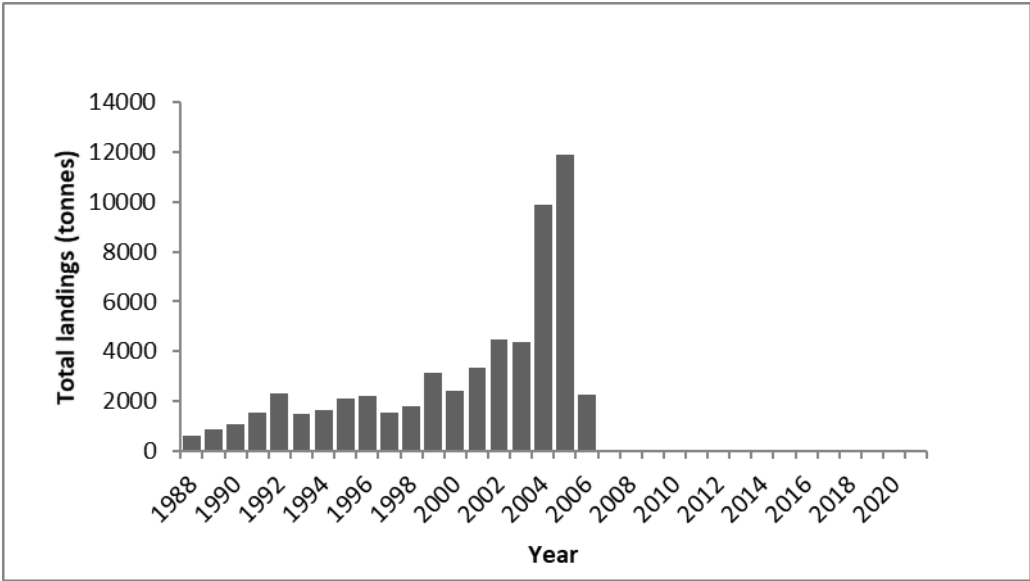


Figure 8.3.0. Landings of roundnose grenadier from Division 3.a. Landings from 2007–2021 are insignificant.

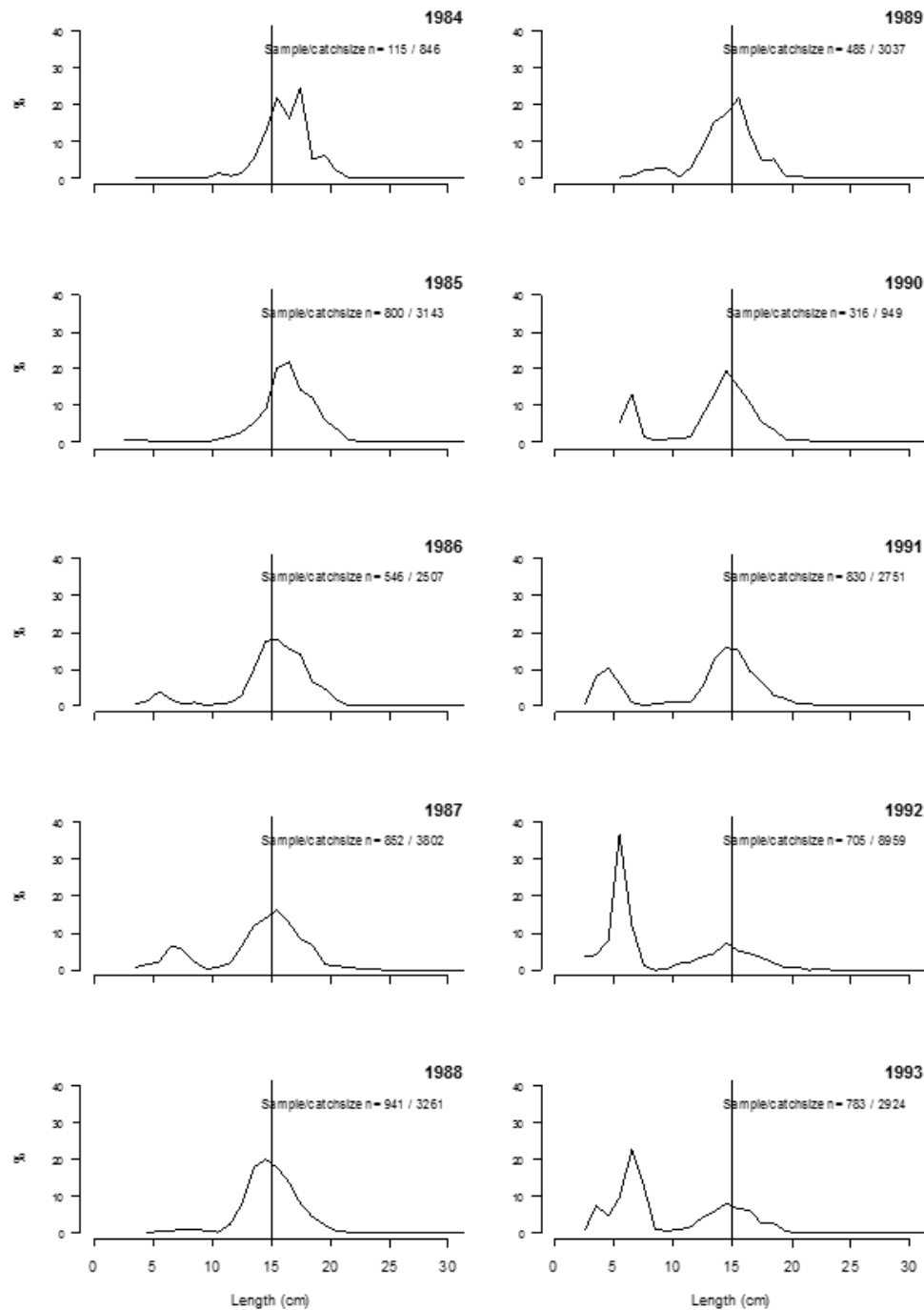


Figure 8.3.1. Length–frequency distributions for roundnose grenadier, 1984–2022. Data from Norwegian shrimp survey, all catches deeper than 300 m. Length is measured as pre-anal fin length in cm. The distributions are calculated as percent number of fish in each cm length interval standardized to total catch number and trawling distance for each station each year.

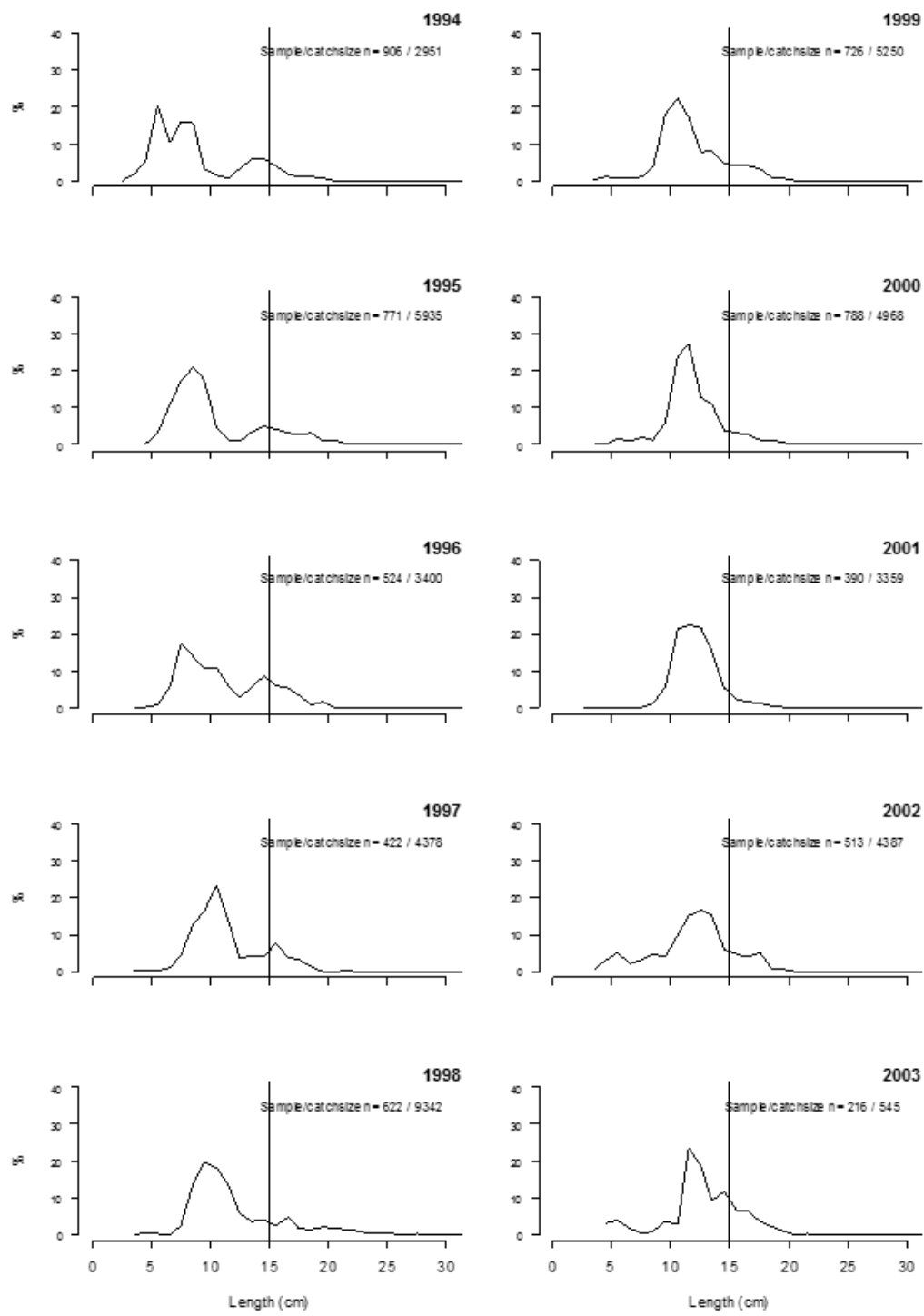


Figure 8.3.1. (Con't).

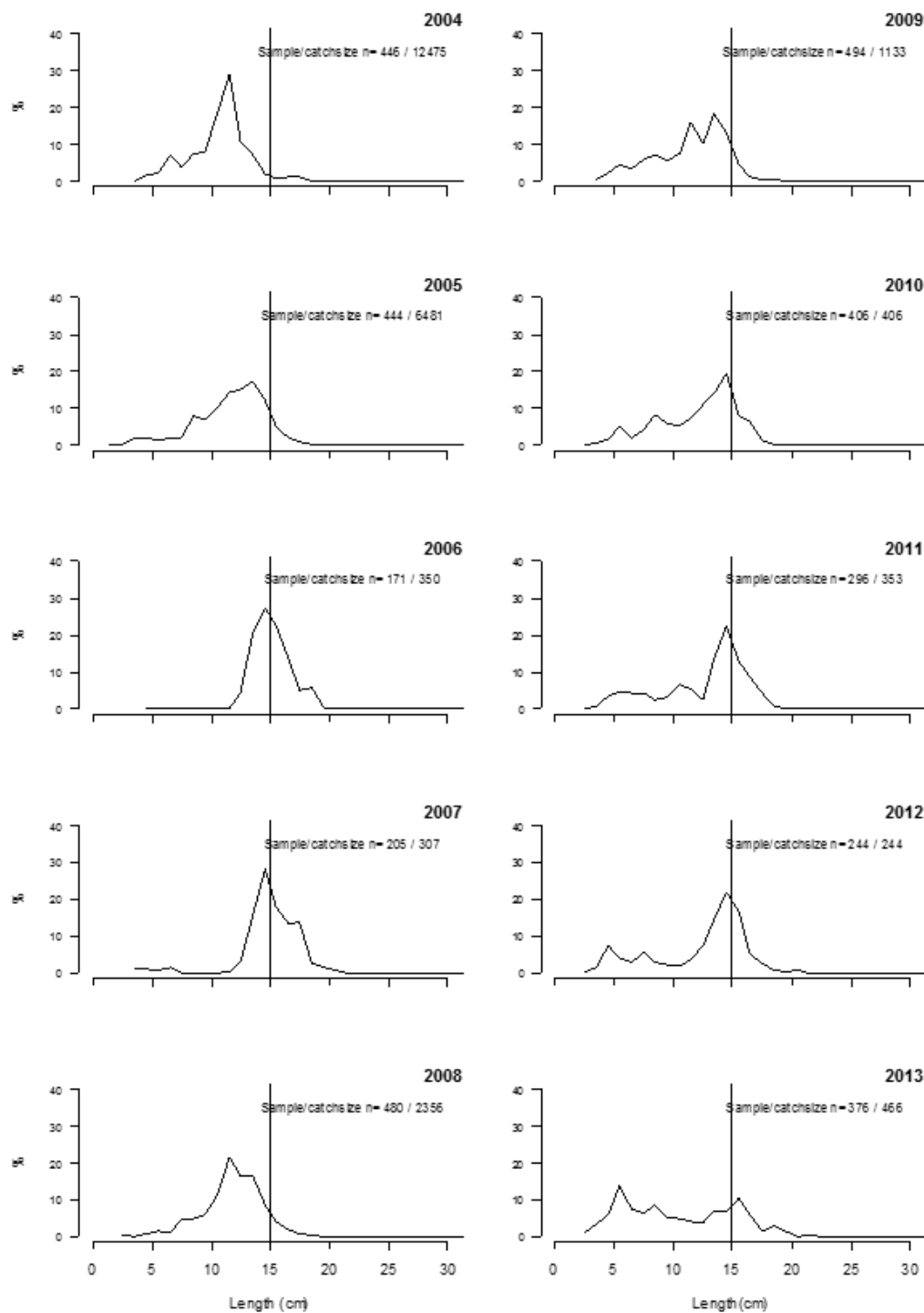


Figure 8.3.1. (Con't).

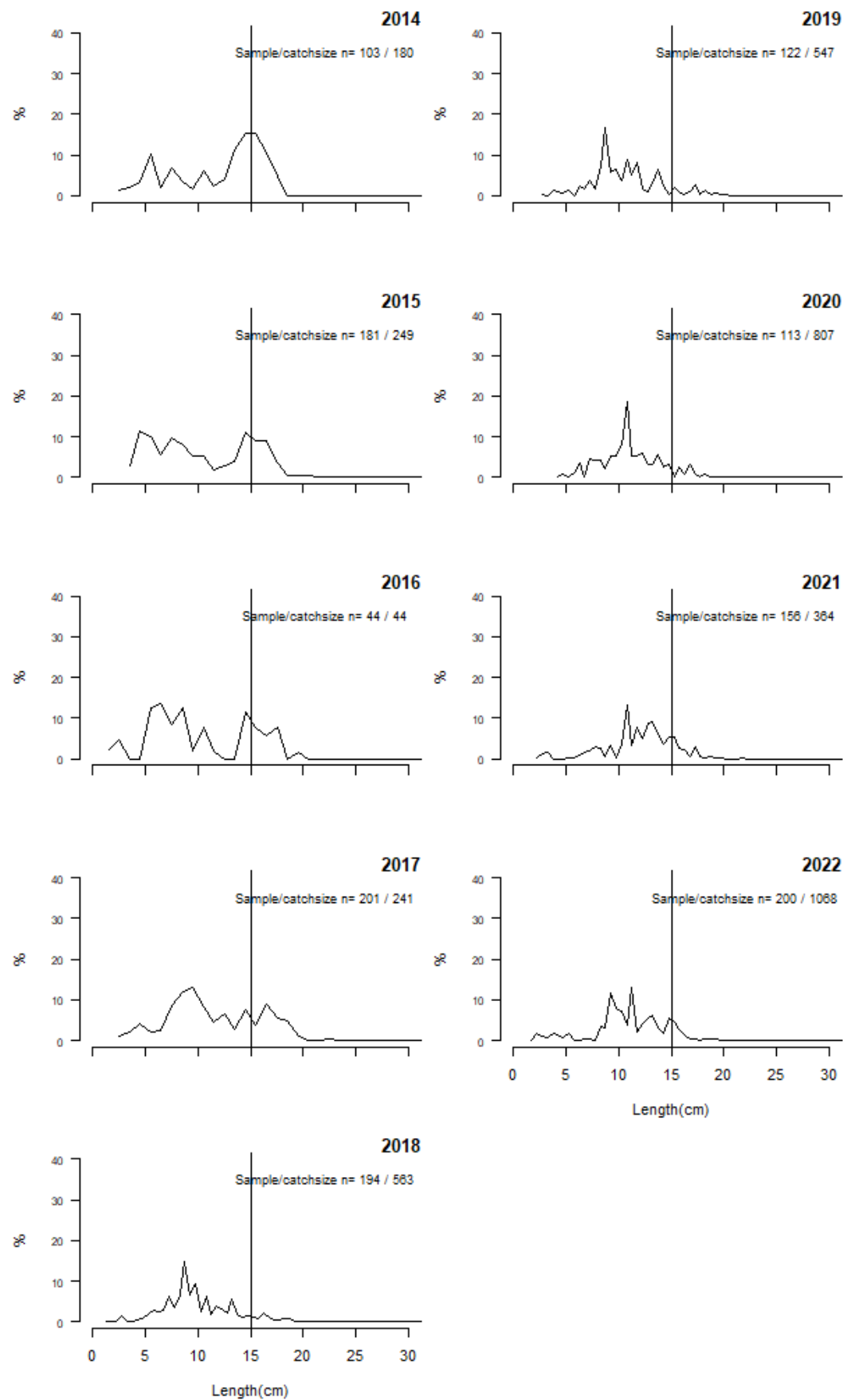


Figure 8.3.1. (Con't).

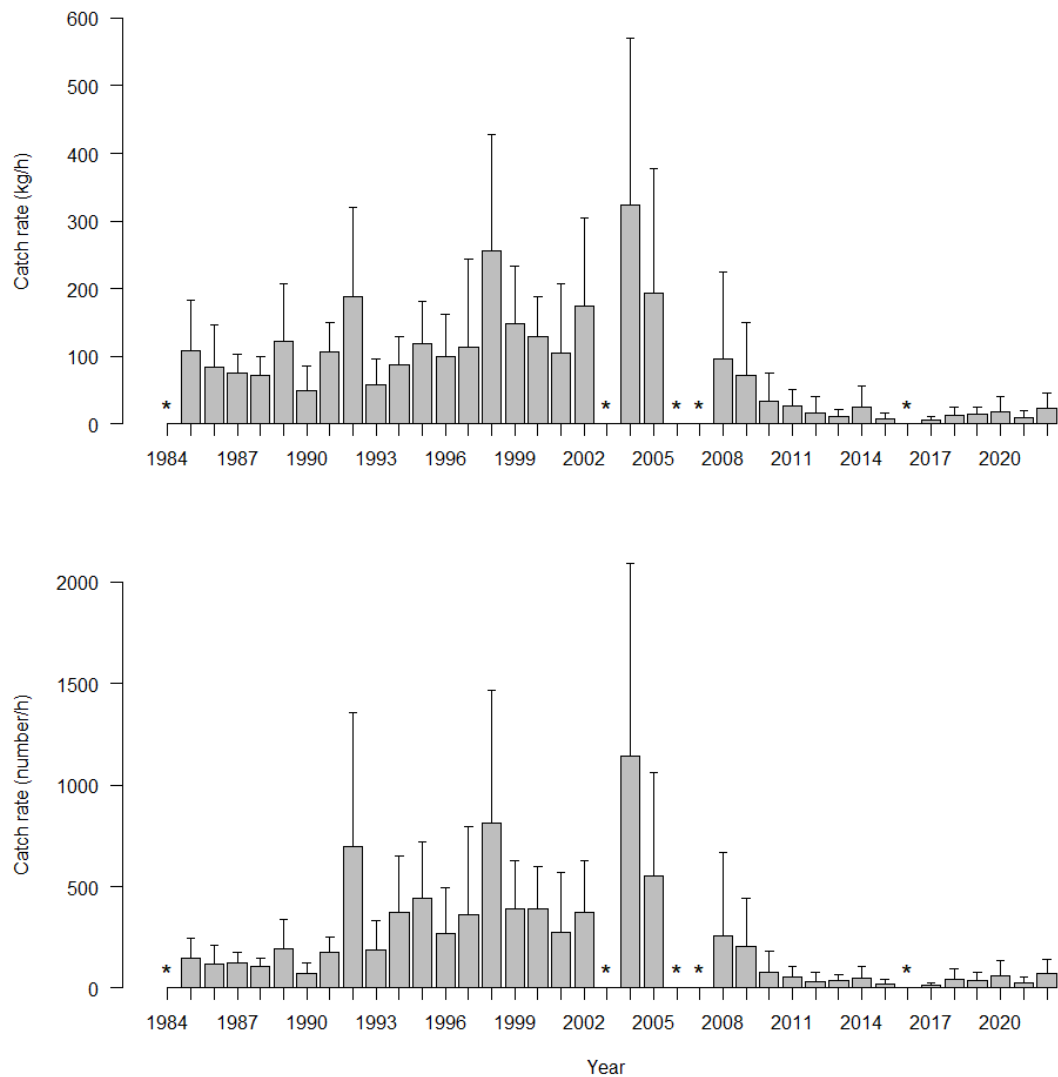


Figure 8.3.2. Survey catch rates in biomass (kg/h) and abundance (nos/h) of grenadier 1984–2022 in the Norwegian shrimp survey. Note: in 1984, 2003, 2006, and 2007 only a single or no trawls were made deeper than 400 m, thus the primary grenadier habitat was not sampled for those years. For 2016 data from the shrimp survey is regarded as unreliable due to inconsistencies with trawling gear and data from that year should be excluded. For the other years the survey is thought to cover the distribution area of roundnose grenadier Lines indicate estimates of 2SE (Updated from Bergstad *et al.*, 2014).

8.4 Roundnose Grenadier (*Coryphaenoides rupestris*) in Divisions 10.b, 12.c and Subdivisions 5.a.1, 12.a.1, 14.b.1 (Oceanic Northeast Atlantic and northern Reykjanes Ridge)

8.4.1 The fishery

The fishery on the Northern Mid-Atlantic Ridge (MAR) started in 1973, when dense concentrations of roundnose grenadier were discovered by USSR exploratory trawlers. Roundnose grenadier aggregations may have occurred on 70 seamount peaks between 46–62°N, but only 30 of them were commercially important and subsequently exploited. Since the early 1990s, fisheries on MAR have been sporadic and much smaller in scale. USSR/Russian fleet has the maximum length of the history of fishery and took the greatest volume of landings. Since 2010, Russian fleets abandoned the fishery, which is almost exclusively exploited by Spain in recent years.

8.4.1.1 Landings trends

The highest annual catch (almost 30 000 t) was taken by the Soviet Union in 1975 (Figure 9.4.1, see Stock Annex for detailed information) and in subsequent years the Soviet catch varied from 2800 to 22 800 tonnes. The fishery for grenadier declined after the dissolution of the Soviet Union in 1992. In the last 15 years, there has been a sporadic fishery by vessels from Russia (annual catch estimated at 200–3200 t), Poland (500–6700 t), Latvia (700–4300 t) and Lithuania (data on catch are not available). Grenadier has also been taken as bycatch in the Faroese orange roughy fishery and Spanish demersal multispecies fishery.

There is no information about target fishery of roundnose grenadier on the MAR in 2006 and 2007. In 2008 and 2009 Russian trawlers made attempts at fishing with pelagic and bottom trawls in the southern part of the Division 12.c. Total catches were 30 t and 12 t respectively including 13 t and 5 t of roundnose grenadier. In 2010, Russian trawler caught 73 t roundnose grenadier during a short-term fishery (two days) in the southern part of the Division 10.b.

In 2008, the Spanish fleet targeting redfish on the MAR reported landings of roundnose grenadier in 14.b.1 totalling 1722 tonnes. Since 2010, roundnose grenadier became a target species. In 2011 official landings in 14.b.1 increased to 2239 tonnes. In subsequent years total estimated landings amounted to of 1860, 1790 and 2065 t in 2012, 2013 and 2014 respectively (Table 9.4.2). To these figures an unallocated catch in 14.b.1 of 1098 and 1015 t must be added in 2012 and 2014, respectively. The total estimated preliminary catch in 2014 consists of 3466 t including Spanish catch in 14.b.1, negligible Faroese and French bycatches in 10.a, 12.a and 14.b.1 and discards. Catches have been reported only by Spain since 2015. In 2015 total Spanish catch was declared as 862 t (533 and 329 tonnes in 14.b.1 and 12.a.1 respectively; Table 9.4.3). In 2016 the landings were estimated as 660 tonnes. In 2017 and 2018, preliminary official landings were considerably low, not exceeding 84 tonnes. In 2019 the landings increased to 215 tonnes and in 2020 decreased to 131 tonnes, all in Division 12.a.1. (Table 9.4.1 and 9.4.3). In 2021, zero tonnes were reported.

There has been uncertainty in the number of Spanish landings in 2015–2016, and previous report include different figures. Additionally, most landings of roundnose grenadier from the NEAFC Regulatory Area are caught in Division 12.b and 6.b.1, which are part of another stock (rng.27.5b6712b). The current report only includes data for 2021 based on preliminary official landings from InterCatch.

8.4.1.2 ICES Advice

ICES advice applicable to 2020–2023

“ICES advises that when the precautionary approach is applied, landings should be no more than 574 tonnes in each of the years 2020 and 2023. ICES cannot quantify the corresponding catches.”

8.4.1.3 Management

There is a TAC for the roundnose grenadier in Subareas 8, 9, 10, 12 and 14. It applies to European Union (EU) waters and EU vessels in international waters (See Section 9.1.2). The EU TAC combined ICES advices on catch for 2 stocks: the roundnose grenadier in divisions 10.b and 12.c, and in subdivisions 12.a.1, 14.b.1, and 5.a.1 and the roundnose grenadier in subareas 6 and 7, and divisions 5.b and 12.b. This allows for the realization of the full amount of TAC in any of these areas. For 2021, NEAFC recommendation (Rec. 5:2021) on the conservation and management of roundnose grenadier (*Coryphaenoides rupestris*) and other grenadiers in the NEAFC Regulatory Area (Divisions 10.b and 12.c, and Subdivisions 12.a.1 and 14.b.1) specifies:

1. A total allowable catch limitation of 574 tonnes of roundnose grenadier is established.
2. No direct fisheries for roughhead grenadier and roughsnout grenadier should be authorised, and bycatches of these grenadiers as well as other grenadiers (Macrouridae) should be counted against the total allowable catch of roundnose grenadier specified in Point 1.
3. Contracting Parties shall submit all data on the relevant fishery to ICES, including catches, bycatches, discards and activity information. Catches should be reported by species. Unidentified grenadiers should be recorded as Macrouridae.

8.4.2 Data available

8.4.2.1 Landings and discards

From earlier years data are WGDEEP estimates based on national submissions to ICES which are not fully included in InterCatch. Landings are given in Tables 9.4.1–9.4.3. The information on landings have been variable and at a considerably lower level down to insignificant in 2017 and 2018 but have increased to about 215 tonnes in 2019 and reached 131 tonnes in 2020. In 2021, zero tonnes were reported. Landings from the 1970s to the 1990s were reported to be mostly from pelagic trawling. In the 2000s there has been pelagic trawling in Division 14 and bottom trawling in Division 12. There were no discards of roundnose grenadier on Russian trawlers where smallest fish and waste were used for fishmeal processing. The information on discards is very limited. An assessment of discards was conducted in 2014, when the discards on Spanish target fishery estimated by scientific observers was at level of 386 tonnes (Tables 9.4.2). No discards have been reported from 2015–2021. Discards of roundnose grenadier in other fisheries have declined and this can be attributed to the decline of the deep-water fishery overall.

8.4.2.2 Length compositions

No new data on length compositions were presented.

8.4.2.3 Age compositions

No new data on age compositions were presented.

8.4.2.4 Weight-at-age

No new weight-at-age data are available.

8.4.2.5 Maturity and natural mortality

No new data on natural mortality are available.

8.4.2.6 Catch, effort and research vessel data

Catch and CPUE data are given in the Stock Annex. There are gaps in the CPUE time-series due to lack of catch statistics for 1973 and 1982 and absence of target fishery in 1994–1995 and 2006–2009 (data for some years cannot be used owing to short fishing periods). Effort data for each subareas and divisions are available for Russian fleet in 2003–2009. Effort data for Spanish fleet is available for 2010–2020, but information remains very uncertain.

8.4.3 Data analyses

Substantial landings were recorded in the 1970s and 1980s. Since then, landings have been variable and have decreased considerably to around 27 tonnes in 2018. In 2019, landings reached 215 tonnes, all in Subdivision 27.12.a.1. Provisional landings are 131 tonnes in 2020 and zero tonnes in 2021. ICES cannot quantify the corresponding catches.

Since 2010 the official Spanish CPUE and effort data are available (see Stock Annex). The current effort is low compared to the effort developed by USSR vessels in the 1970s and the CPUE seems also low. Long-term comparison is debilitated by the lack of standardisation of fleet and vessel type. The Spanish CPUE in Subdivisions 14.b.1 were on maximum historical levels in 2011. In 2012–2013 the CPUE declined and was stable in 2014–2015. The time-series of the CPUE for Subdivisions 12.a.1 is very limited.

8.4.4 Stock assessment

The ICES framework for category 5 stocks was applied for the 2020–2023 advice (ICES, 2019). ICES considers that a precautionary reduction of catches should be implemented unless there is sufficient data to access the current level of exploitation of the stock.

The precautionary buffer (20% reduction in landings) was applied in the 2015 advice and the available new data (catch statistics) do not change the assessment of the stock. There is no data on abundance trends but in the absence of fishing, the stock is expected to rebuild from the past depletion state caused by exploitation before the 2000s. Therefore, ICES advises that when the precautionary approach is applied, landings should be no more than 717 tonnes in each of the years 2020 to 2023. ICES cannot assess the stock and exploitation status relative to MSY and PA reference points because the reference points are undefined.

This stock is classified as Category 4 in the NEAFC categorization of deep-sea species/stocks which implies that fisheries are primarily restricted to Coastal State exclusive economic zones (EEZs) and therefore management measures are not taken by NEAFC unless complementary to coastal state conservation and management measures.

8.4.5 Biological reference points

No attempt was made to propose reference points for this stock.

8.4.6 Comments on the assessment

No analytical assessments were carried out.

8.4.7 Management considerations

Active roundnose grenadier fishery was resumed in 2010, but the current status is unknown due to insufficient data. The landings series is very limited and the CPUE data are very uncertain. The CPUE can be used as an indicator of the state of stock in the future.

8.4.8 References

- ICES. 2019. Advice basis. In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, section 1.2. <https://doi.org/10.17895/ices.advice.5757>
- Vinnichenko V., Khlivnoy V. 2008. New data on distribution of young roundnose grenadier (*Coryphaenoides rupestris*) in the North Atlantic. Grenadiers of the world oceans: Biology, stock assessment and fisheries. American Fisheries Society, 2008. 119–124 pp.

8.4.9 Tables and Figures

Table 9.4.1. Working group estimates of catch for roundnose grenadier from Subareas 12.a.1 and 12.c, between 2012 and 2021 (data from 1973-2011 is shown in the Stock Annex)

Year	USSR/Russia	Poland	Latvia	Faroës	Spain	Lithuanian	Total
2012					864	4	868
2013					118		118
2014				4			4
2015					329		329
2016					289		289
2017					16*		16
2018					27*		27
2019					215*		215
2020 ¹					131*		131
2021 ¹					0		0

¹—preliminary statistics. * Subareas 12.a.1 only

Table 9.4.2. Working group estimates of catch for roundnose grenadier from Subdivision 14.b.1.

Year	USSR/Russia	Spain	Unallocated	Discards	Total
1976	11				11

1982	153				153

1997	3361				3361
1998					
1999					
2000	5				5
2001	69				69
2002	4	235			239
2003		272			272
2004	201				201

Year	USSR/Russia	Spain	Unallocated	Discards	Total
2005					
2006					
2007		57			57
2008		1722			1722
2009					
2010		753			753
2011		2239			2239
2012		1860	1098		2958
2013		1790			1790
2014		2065	1015	386	3466
2015		533			533
2016		371			371
2017		68			68
2018	0	0	0	0	0
2019	0	0	0	0	0
2020 ¹	0	0	0	0	0
2021 ¹	0	0	0	0	0

¹—preliminary statistics.

Table 9.4.3. Working group estimates of catch of roundnose grenadier in Divisions 10.b, 12.c and Subdivisions 5.a.1, 12.a.1, 14.b.1, by area.

Year	5.a.1	10.b	12.a.1 and 12.c	14.b.1	Total
1973	820	0	226	0	1046
1974	12561	0	5874	0	18435
1975	0	0	29894	0	29894
1976	0	170	4545	11	4726
1977	0	0	9347	0	9347
1978	0	0	12310	0	12310
1979	0	0	6145	0	6145
1980	0	0	17419	0	17419
1981	0	0	2954	0	2954

Year	5.a.1	10.b	12.a.1 and 12.c	14.b.1	Total
1982	0	0	12472	153	12625
1983	0	0	10300	0	10300
1984	0	0	6637	0	6637
1985	0	0	5793	0	5793
1986	0	0	22842	0	22842
1987	0	0	10893	0	10893
1988	0	0	10606	0	10606
1989	0	0	9495	0	9495
1990	0	0	2838	0	2838
1991	0	0	7510	0	7510
1992	0	0	1979	0	1979
1993	0	249	2912	0	3161
1994	0	0	1132	0	1132
1995	0	0	359	0	359
1996	0	3	344	0	347
1997	0	1	6710	3361	10072
1998	0	1	7600	0	7601
1999	0	3	1151	0	1154
2000	0	0	2325	5	2330
2001	0	0	1716	69	1785
2002	0	0	737	239	976
2003	0	0	510	272	782
2004	0	1	444	201	646
2005	0	799	600	0	1399
2006	0	0	1	0	1
2007	0	0	2	57	59
2008	0	0	13	1722	1735
2009	0	0	5	0	5
2010	0	73	0	753	826

Year	5.a.1	10.b	12.a.1 and 12.c	14.b.1	Total
2011	0	0	0	2239	2239
2012	0	0	868	2958	3826
2013	0	0	118	1790	1908
2014	0	0	4	3466	3470
2015	0	0	329	533	862
2016	0	0	289	371	660
2017	0	0	16*	68	84
2018	0	0	27*	0	27
2019	0	0	215*	0	215
2020 ¹	0	0	131*	0	131
2021 ¹	0	0	0	0	0

¹—preliminary statistics. * Subareas 12.a.1 only.

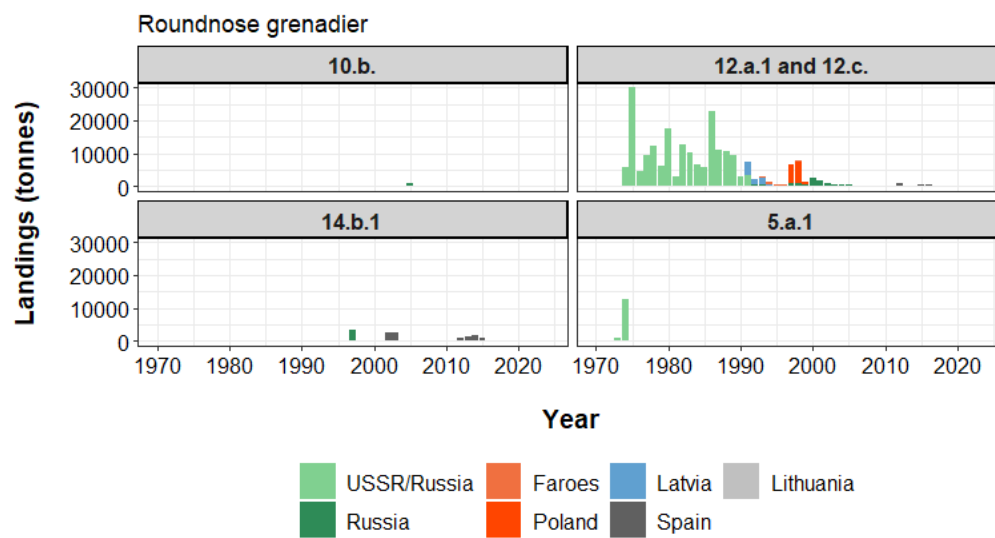


Figure 9.4.1. Landings of roundnose grenadier in ICES Divisions 10.b, 12.c and Subdivisions 5.a.1, 12.a.1, 14.b.1 in 1973–2021.

8.5 Roundnose grenadier (*Coryphaenoides rupestris*) in subareas 1, 2, 4, 8, and 9, Division 14.a, and in subdivisions 14.b.2 and 5.a.2 (Northeast Atlantic and Arctic Ocean)

8.5.1 The fishery

Areas of the main fisheries for roundnose grenadier are covered in the other sections of this chapter. Landings of roundnose grenadier in subareas 1, 2, 4, 8, and 9, Division 14.a, and in subdivisions 14.b.2 and 5.a.2 are mostly small bycatch of trawl fisheries for other species.

8.5.1.1 Landings trends

Landing statistics by countries in the period 1990–2021 are presented in Tables 9.5.1–9.5.5.

In the subareas 1 and 2 the catch of roundnose grenadier in 2021 was 45 t. Since 1990, landings ranged from 0 t to 101 t in 1997, showing a significant decline since 1998 (Table 9.5.1). In subareas 1 and 2, the major contribution to the total catch was made by Norway. Roundnose grenadier was partly taken as bycatch in the mixed deep-water fisheries; directed local fisheries in Norwegian fjords for this species also exist. Earlier French landings, that reached 41 t, were assigned to this species however a recent revision of the data indicates that previous landings are more likely to correspond to roughhead grenadier. Therefore, it is assumed that there are no French landings for roundnose grenadier from subareas 1 and 2.

In Subarea 4, the catch of roundnose grenadier in 2021 was mainly taken by the French fleet and comprised < 0.5 t. Negligible catches were also reported by Norway. During 1990–2021 total landings in this area ranged between 0 and 372 t (Table 9.5.2). Unusually high landings were reported by the Danish fleet in 2004. Similar to French landings in Subareas 1 and 2, earlier landings of roundnose grenadier in Subarea 4 likely correspond to roughhead grenadier but since 2014 landings are correctly assigned. Four tonnes reported in 2014 may correspond to catch of roundnose grenadier close to the Norwegian deep or to misreported roughhead along the slope of the northern North Sea.

For the period 1990–2021, landings of roundnose grenadier within Icelandic waters (Division 5.a) varied 2 to 398 t, mostly by Iceland (Table 9.5.3). Maximum landings were recorded in 1992–1999 when 120–398 t were caught annually as bycatch in mixed deep-water fisheries. However, it should be noted that catches may include other grenadier species until 1990. In recent years (2010–2021), landings of roundnose grenadier ranged between 3 to 81 t were taken in Icelandic waters as bycatch in trawl fisheries for Greenland halibut and redfish.

Between 1990 and 2021, landings of roundnose grenadier from subareas 8 and 9 ranged between 0 to 28 t annually. Since 2009, landings from this area are negligible (Table 9.5.4).

Landings from Division 14.a and Subdivision 14.b.2 (Greenland and Icelandic waters) in 1990–2021 varied from 15 to 262 t (Table 9.5.5). There is no directed fishery for roundnose grenadier in these areas. Most of the landings is taken as bycatch of the Greenland halibut bottom-trawl fisheries by Greenland and Germany. In 2021 landings were 175 t mostly by Greenland. In 2020, bycatch of roundnose grenadier reported by Greenland reached the lowest levels in more than 10 years, 42.2 t.

Between 2001 and 2003 unallocated landings were assigned to subareas 1, 2, 4, 8, 9 and Division 5.a.2 and 14.b.2 (Table 9.5.6).

8.5.1.2 ICES advice

ICES advice applicable to 2015

“The 2012 advice for this stock is biennial and valid for 2013 and 2014 (ICES, 2012). New data available do not change the perception of the stock. Therefore, the advice for this fishery in 2015 is the same as the advice for 2013: Based on the ICES approach for data-limited stocks, ICES advises that fisheries should not be allowed to expand from 120 t until there is evidence that this is sustainable.”

ICES advice applicable to 2016 and 2017

“ICES advises that when the precautionary approach is applied, landings should be no more than 65 tonnes in each of the years 2016–2017. ICES cannot quantify the corresponding catches.”

ICES advice applicable to 2018 and 2019

“ICES advises that when the precautionary approach is applied, landings should be no more than 65 tonnes in each of the years 2018 and 2019. ICES cannot quantify the corresponding catches.”

ICES advice applicable to 2020 and 2023

“ICES advises that when the precautionary approach is applied, landings should be no more than 131 tonnes in each of the years from 2020 to 2023. ICES cannot quantify the corresponding catches.”

8.5.1.3 Management

This stock is classified as Category 4 in the NEAFC categorization of deep-sea species/stocks which implies that fisheries are primarily restricted to Coastal State exclusive economic zones (EEZs) and therefore management measures are not taken by NEAFC unless complementary to coastal state conservation and management measures (NEAFC, 2016).

Management measures adopted by NEAFC established a total allowable catch limitation of 574 tonnes of roundnose grenadier in 2021 and no direct fisheries for roughhead grenadier and roughsnout grenadier should be authorised in NEAFC Regulatory Area. Any bycatches of these grenadiers as well as other grenadiers (Macrouridae) should be counted against the total allowable catch of roundnose grenadier.

There is a TAC management of the roundnose grenadier fisheries in Subareas 1, 2, 4, 8, 9, Division 5.a and Subdivision 14.b.1 for European Community vessels. In eastern Greenland, main fishing operations are in Subdivision 14.b.2 and here, TAC of roundnose and roughhead grenadiers combined has been 1000 tonnes between 2010 and 2020.

8.5.2 Data available

8.5.2.1 Landings and discards

From earlier years data are WG estimates based on national submissions to ICES, which are not fully included in InterCatch.

Landings are given in Table 9.5.1–9.5.5. Estimated discards owing to bycatch in Spanish fisheries for demersal fish in 8 and 9 did not exceed 2 t in 2012, and 1 t in subsequent years. In 2020, discards data is available from Spain in Subarea 8.c (3 t) and Subarea 9.a (1 t). No discards were reported from the Portuguese bottom otter trawl fisheries in division 27.9.a in 2020 and 2021 (ICES, 2021; WD14).

National catch statistics of Greenland were used to update catches in subarea 14.b.2 from 1999 to 2021. These may include both landings from Greenland and other countries vessels, wherefore it was unclear whether this implies double count with landings reported by other countries. A potential misreporting is suspected for roundnose grenadier, as fisheries-independent data have revealed that roughhead grenadier is much more common than roundnose grenadier in ICES Subarea 14.b.2. – while roundnose grenadier is more abundant in reported catches from the same area (WGDEEP 2022: WD12). Furthermore, the proportion of the catch from the longline fishery is very unlikely to be roundnose grenadier, since this species is unlikely to be caught by hooks (Hareide, 1995).

There remains some uncertainty on historical landings and discards, which have not been always accurate or provided by all countries. Additionally, there is a discrepancy between reported catches in Greenland waters between 1999 and 2018, the origin of which had not been resolved at the time of preparing this report. Therefore, available data needs to be reviewed to provide robust estimations.

Landings of roundnose grenadier inside and outside the NEAFC Regulatory Area are provided in table 9.5.7.

8.5.2.2 Length compositions

No new data.

8.5.2.3 Age compositions

No new data.

8.5.2.4 Weight-at-age

No new data.

8.5.2.5 Maturity and natural mortality

No new data.

8.5.2.6 Catch, effort and research vessel data

Greenland's annual bottom trawl survey is the main source for fishery-independent data for roundnose grenadier in subarea 14.b.2 (Greenland waters). This survey is depth stratified covering depths from 400-1500 m using Alfredo trawl towed at a speed between 2.5-3.0 knots with a 30-min bottom time (tows of at least 15 min are accepted). Fisheries-independent surveys have been carried out since 1998 (except in 2001). Due to the lack of survey in East Greenland since 2017, no survey data is available to ICES WGDEEP.

8.5.3 Data analyses

Commercial catches of roundnose grenadier in Subarea 14.b.2 have been relatively stable between 1999 and 2021, ranging from 31 tonnes (2008) to 156 tonnes (2019). The majority of this is caught as bycatch by trawlers, whereas longlines contribute to a smaller proportion.

Length distribution data from fishery-independent surveys in Subarea 14.b.2 show varying modes between years. Typically, sizes between 3 cm to 10 cm dominates but no clear temporal pattern is evident (Fig. 9.5.1). In 2016, the highest indices of biomass and abundance were found at depths between 1001-1500 m (Table 9.5.8). The biomass index shows that for 1998 to 2016, the biomass generally decreased (from 3039 t in 1998 to 170 t in 2016) yet higher indices were estimated in some year, e.g. 2003 and 2012 (Fig. 9.5.2).

Biological reference points

There are no reference points for this stock.

WKLIFE has not yet suggested methods to estimate biological reference points for stocks, which have only landings data or are bycatch species in other fisheries.

8.5.4 Comments on the assessment

No assessment was carried out for this stock.

8.5.5 Management considerations

This is a bycatch fishery and advice for other stocks and fisheries should take into account advice on this stock. Trends in landings may reflect changes in activity in other fisheries rather than in stock abundance. Most landings since 2000 are from subdivisions 5.a.2 and 14.b.2, and have been relatively stable. Since 2016, it is noticeable a decrease in landings from Subdivision 5.a.2 and increase from subareas 1 and 2. Landings from other areas were negligible since 2016. There are no reported catches inside the NEAFC regulatory area.

The current stock units are consistent with the study from Knutsen et al. (2012) except that the unit covering subareas 1, 2, 4, 8, and 9, Division 14.a, and subdivisions 14.b.2 and 5.a.2, should not be considered as a demographic stock or a genetic population because it includes areas of the Arctic and Atlantic oceans in which roundnose grenadier was found to be genetically distinct. This unit might be only considered as an aggregation of areas where roundnose grenadier occurs at low to moderate density and is not subject to significant continuous exploitation.

8.5.6 References

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8.5.7 Tables and Figures

Table 9.5.1. Working group estimates of landings of roundnose grenadier from Subareas 1 and 2.

Year	Faroes	Denmark	Germany	Norway	Russia/USSR	Germany	UK (E+W)	France	TOTAL
1990			2		12	3			17
1991			3	28					31
1992		1		29					30
1993				2					2
1994			12						12
1995									0
1996									0
1997	1			100					101
1998				87	13				100
1999				44	2				46
2000									0
2001							2		2
2002				11	1				12
2003				4					4
2004				27					27
2005				12					12
2006				6	2				8
2007				11	1				12
2008				10					10
2009				8					8
2010				17	6				23
2011				16					16
2012				5					5
2013				17					17
2014				4					4
2015				11					11
2016				2				0	2

Year	Faroes	Denmark	Germany	Norway	Russia/USSR	Germany	UK (E+W)	France	TOTAL
2017				4				< 1	4
2018				21				< 1	21
2019*				35					35
2020*	< 0.5	< 0.5		25					26
2021*	< 0.1	0	0	45	0	0	0	< 0.1	45

* Preliminary data.

Table 9.5.2. Working group estimates of landings of roundnose grenadier from Subarea 4.

Year	Germany	Norway	UK (Scot)	Denmark	France	TOTAL
1990	2					2
1991	4					4
1992			4	1		5
1993	4					4
1994	2			25		27
1995	1		15			16
1996			5	7		12
1997			10			10
1998						0
1999		5				5
2000						0
2001				17		17
2002		1	26			27
2003		1	11			12
2004			1	371		372
2005		2				2
2006		4				4
2007		1				1
2008						0
2009						0
2010		2	0			2

Year	Germany	Norway	UK (Scot)	Denmark	France	TOTAL
2011		0	0			0
2012		1				1
2013						0
2014					3	3
2015		1	< 1		1	2
2016		0	0		1	1
2017		< 1			< 1	< 1
2018		< 0.5			< 1	< 1
2019*		< 0.5				< 0.5
2020*		< 0.5			2	2
2021*	0	< 0.5	0	0	< 0.5	< 1

*Preliminary data.

Table 9.5.3. Working group estimates of landings of roundnose grenadier from Division 5.a.2.

Year	Faroese	Iceland**	Norway	UK (E+W)	Denmark	Greenland	TOTAL
1990		7					7
1991		48					48
1992		210					210
1993		276					276
1994		210					210
1995		398					398
1996	1	139					140
1997		198					198
1998		120					120
1999		129					129
2000		54					54
2001		40					40
2002		60					60
2003		57					57
2004		181					181

Year	Faroese	Iceland**	Norway	UK (E+W)	Denmark	Greenland	TOTAL
2005		76					76
2006		62					62
2007	1	13	2				16
2008		29					29
2009		46					46
2010		59					59
2011		62					62
2012	0	80					80
2013		84					84
2014		36					36
2015		22			2		24
2016		52					52
2017						2	2
2018		28					28
2019*		15					15
2020*		6				3	9
2021*	0	6	0	0	0	0	6

* Preliminary data. ** includes other grenadiers from 1990 to 1996.

Table 9.5.4. Working group estimates of landings of roundnose grenadier from Subareas 8 and 9.

Year	France	Spain	TOTAL
1990	5		5
1991	1		1
1992	12		12
1993	18		18
1994	5		5
1995			0
1996	1		1
1997			0
1998	1	19	20

Year	France	Spain	TOTAL
1999	9	7	16
2000	4		4
2001	7		7
2002	3		3
2003	2		2
2004	2		2
2005	8		8
2006	27	1	28
2007	10		10
2008	8		8
2009	1		1
2010	1		1
2011	1		1
2012	0		0
2013	0		0
2014	0		0
2015	1		1
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019*		0	0
2020*	< 0.5	0	< 0.5
2021*	< 0.1	0	< 0.1

* Preliminary data.

Table 9.5.5. Working group estimates of landings of roundnose grenadier from Division 14.a and Subdivision 14.b.2.

Year	Faroes	Germany	Greenland***	Iceland	Norway	UK (E+ W)	UK (Scot)	Russia	Es- to- nia	TOTAL
1990	45	1				1				47
1991	23	4				2				29

Year	Faroes	Germany	Greenland***	Iceland	Norway	UK (E+ W)	UK (Scot)	Russia	Es- to- nia	TOTAL
1992		19	1	4	6		1			31
1993		4	18	4						26
1994		10	5							15
1995		13	14							27
1996		6	19							25
1997	6	34	12		7					59
1998	1	116	3		6					126
1999		105	138		19					262
2000		41	96		5					153
2001		11	75		7	2	72			172
2002		25	56		15	1	1			103
2003			55		5	1				76
2004		27	107							137
2005			62		6	1				76
2006		35	79		17					131
2007	1		43		1					45
2008			31					12		43
2009			45		2					47
2010		33	61		7					101
2011		32	138		4					174
2012			126		1					127
2013			129		2					131
2014	0		100		7				4**	111
2015			141							179
2016			64							79
2017			93							119
2018		59	127		1					217
2019*			156		1					157

Year	Faroes	Germany	Greenland***	Iceland	Norway	UK (E+ W)	UK (Scot)	Russia	Es- to- nia	TOTAL
2020*		26	43					4		73
2021	< 0.1	28	143	0	3	0	0	0	0	175

* Preliminary data. ** Estonian landings in 2014 not reflected in ICES catch statistics. ***Official landings from the National catch statistics of Greenland (1999-2021) (WGDEEP 2022, WD12).

Table 9.5.6. Working group estimates of landings of roundnose grenadier from 1, 2, 4, 5.a.2, 8, 9, 14.a and 14.b.2.

Year	1+2	4	5.a.2	8+9	14.b.2	14.a	Unallocated	Total
1990	17	2	7	5	47		0	78
1991	31	4	48	1	29		0	113
1992	30	5	210	12	31		0	288
1993	2	4	276	18	26		0	326
1994	12	27	210	5	15		0	269
1995	0	16	398	0	27		0	441
1996	0	12	140	1	25		0	178
1997	101	10	198	0	57		0	366
1998	100	0	120	20	126		0	366
1999	46	5	129	16	262		0	458
2000	0	0	54	4	153		0	211
2001	2	17	40	7	172		208	238
2002	12	27	60	3	103		504	205
2003	4	12	57	2	76		952	151
2004	27	372	181	2	137		0	719
2005	12	2	76	7	76		0	173
2006	8	4	62	28	131		0	233
2007	12	1	16	10	45		0	84
2008	10	0	29	8	43		0	90
2009	8	0	46	1	47			102
2010	23	2	59	1	101			186
2011	16	0	62	1	174			253

Year	1+2	4	5.a.2	8+9	14.b.2	14.a	Unallocated	Total
2012	5	1	80	0	127			213
2013	17	0	84	0	131			232
2014	4	3	36	0	111			154
2015	11	2	22	1	179			216
2016	2	1	0	0	79	2		84
2017	4	< 1	2		119			125
2018	21	< 1	28	0	217	2		268
2019*	35	< 0.5	0	0	157			192
2020*	26	2	9	< 0.5	68	5		110
2021*	45	< 1	6	< 0.1	174	1	0	226

* Preliminary data.

Table 9.5.7. Roundnose grenadier in the Northeast Atlantic. Landings inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES. Landings in tonnes.

Year	Inside the NEAFC RA	Outside the NEAFC RA	Total landings	Proportion inside the NEAFC RA (%)
2017	0	125	125	0
2018	0	268	268	0
2019	0	192	192	0
2020*	0	110	110	0
2021*	0	226	226	0

* Preliminary data.

Table 9.5.8 Biomass (t) and abundance (in numbers) with SE of roundnose grenadier expressed as mean catch per km² and total biomass by Q-subarea and depth stratum in ICES subarea 14.b.2 in 2016. Q-subareas encompass Q1-Q5 (see Nielsen et al. 2019) for which area and number of survey hauls in 2016 are listed.

Subarea	Depth strata	Area	Hauls	<i>Biomass</i>			<i>Abundance</i>		
				Mean/km ²	Biomass	SE	Mean/km ²	Abundance	SE
Q1	401-600	6975	12	0.0000	0.0	0.0	0.0	0	0
Q2	401-600	1246	5	0.0000	0.0	0.0	0.0	0	0
	601-800	1475	7	0.0000	0.0	0.0	0.0	0	0
	801-1000	1988	10	0.0015	3.1	2.2	4.9	9839	6566
	1001-1500	6689	7	0.0193	128.9	43.2	45.8	306453	107017
Q3	401-600	9830	11	0.0000	0.0	0.0	0.0	0	0
	601-800	3788	14	0.0000	0.0	0.0	0.0	0	0
	801-1000	755	6	0.0000	0.0	0.0	0.0	0	0
Q5	401-600	1819	3	0.0000	0.0	0.0	0.0	0	0
	601-800	257	6	0.0000	0.0	0.0	0.0	0	0
	801-1200	256	5	0.0214	5.5	2.1	384.2	98206	41556
	1201-1400	986	9	0.0311	30.6	15.7	109.0	107419	55057
	1401-1500	615	5	0.0035	2.1	1.3	13.2	8132	5020
All		36679	100	0.0046	170.2	46.0	14.5	530050	128000

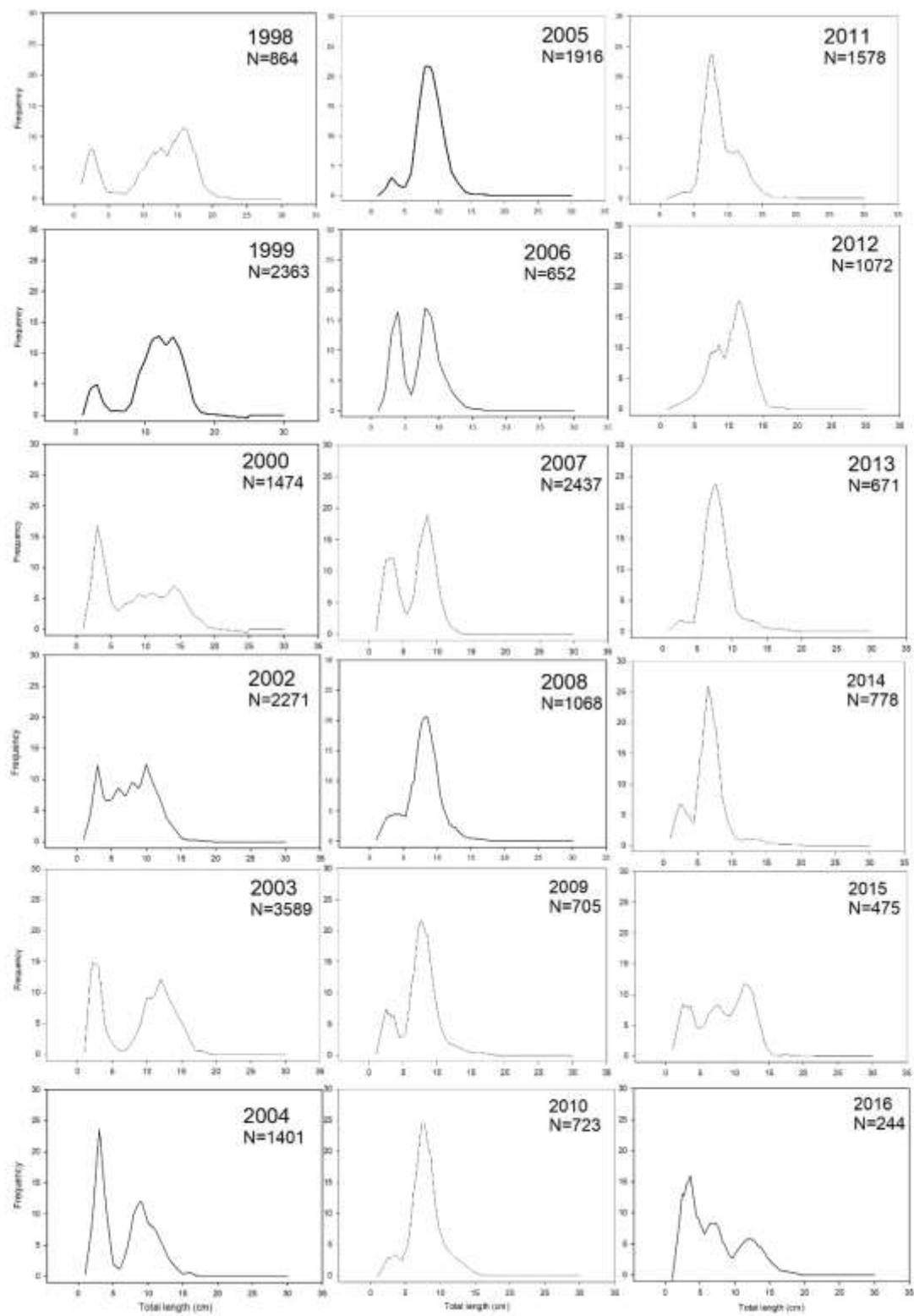


Figure 9.5.1. Length frequency distribution of roundnose grenadier for years 1998-2016 in ICES subarea 14b2. No survey in 2001, and since 2017.

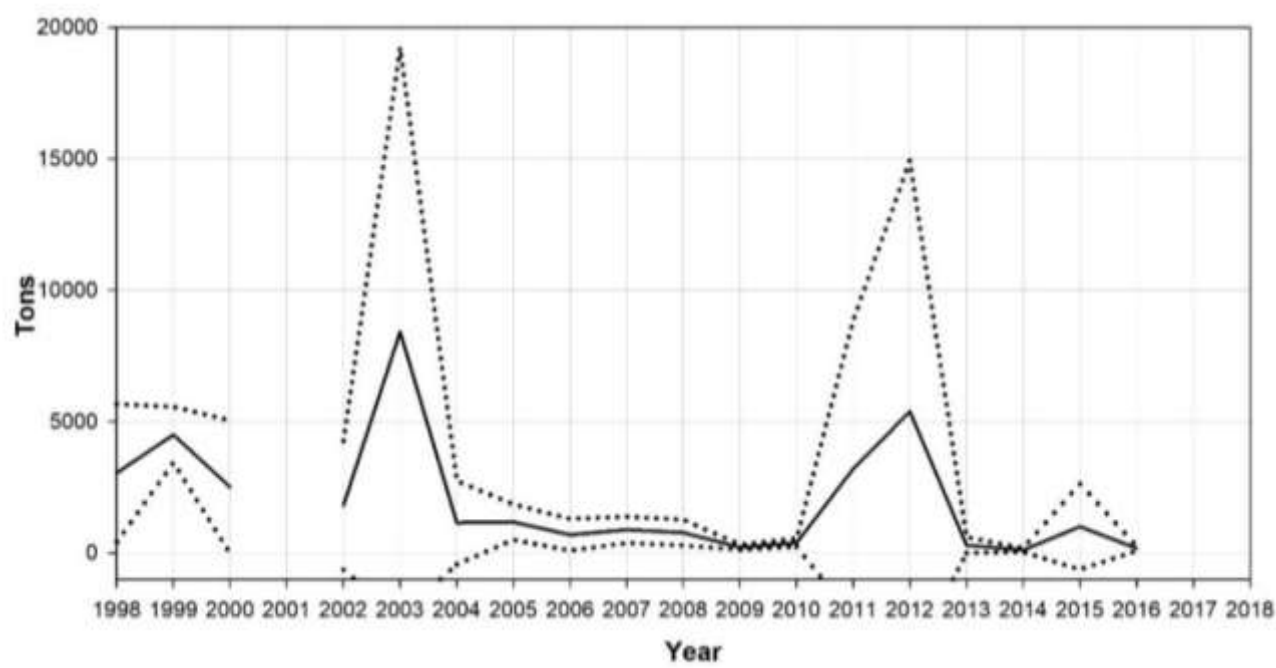


Figure 9.5.2. Total biomass of roundnose grenadier (solid line) in ICES subarea 14b2 plotted with ± 2 SE. No survey in 2001, and since 2017.