

## 4 Blue Ling (*Molva dypterygia*) in the Northeast Atlantic

### 4.1 Stock description and management units

Biological investigations in the early 1980s suggested that at least two adult stock components were found within the area, a northern stock in Subarea 14 and Division 5.a with a small component in 5.b, and a southern stock in Subarea 6 and adjacent waters in Division 5.b. This was supported by differences in length and age structures between areas as well as in growth and maturity. Egg and larvae data from early studies also suggested the existence of many spawning grounds in each of areas of the northern and southern stocks and this was considered as indications of stock separation. However, in most areas small blue ling below 60 cm do not occur and fish appear in survey and commercial catch at 60–80 cm suggesting large spatial migrations and therefore limited population structuring. The conclusion is that stock structure of blue ling in the ICES area is uncertain.

As in previous years, in addition to one stock in Division 5.b and subareas 6 and 7 and one in Division 5.a and Subarea 14. All remaining areas (subareas 1, 2, 8, 9 and 12 and divisions 4.a and 3.a) are grouped as in a single stock unit, labelled "Northeast Atlantic" for advice purposes". Historical landing in subareas 1 and 2 and Division 4.a and 3.a have been significant. Whilst landings reported in 8 and 9, where the species does not occur, are now ascribed to the related Spanish ling (*Molva macrophtalma*).

The situation in Subarea 12 is different as this subarea includes part of the Mid-Atlantic Ridge (ICES Divisions 12.a1, 12.a2, 12.a4 and 12.c) and the western slope of the Hatton Bank (ICES Division 12.b). Since 2014, landings from Subarea 12 have been decreasing from 80 to 5 tonnes in 2021, an insignificant level. However, based upon the continuity of bathymetric features and lesser abundance, blue ling from the western Hatton Bank (Division 12.b) is likely to be related to those from the northern Hatton Bank (ICES Division 6.b) and blue ling from other divisions of Subarea 12 is likely to be related to those from Icelandic and east Greenland waters. Following this, the stock Division 12.b would be added to the stock unit bli.27.5b67 and other divisions of 12 would be added to the stock unit bli.5a14. These revised stocks units would be more consistent than currently where the "Northeast Atlantic" unit (bli.27.nea) covers two areas: Subarea 12 (Mid-Atlantic Ridge and Western Hatton Bank), and Subareas 1–4 separated by the two other stock units. Because of the minor landings from Subarea 12 in recent years, current assessments would not be significantly impacted.

Historical total international landings show that blue ling have been exploited for long. Before the start of the time-series considered by WGDEEP, Norway landed 1000–2000t per year in the 1950s and 1960s. These landings might have been mainly from subareas 1 and 2. German landings starting in the 1950s were mainly reported in Statlant from ICES Division 5.a and 5.b. Since 1966, the main fishing countries have been the Faroe Islands, France, Germany, Iceland and Norway (Figure 4.1.1). Except in a few recent years where large amount were caught in Division 5.a, the stock unit of Division 5.b and subareas 6 and 7 have had the main contribution to total landings (Figure 4.1.2).

Blue ling forms spawning aggregations, i.e., blue ling is an aggregating species at spawning time. From 1970 to 1990, the bulk of the fisheries for blue ling were seasonal and targeted those aggregations which were thus subject to sequential depletion. Known spawning areas are shown in Figure 4.1.3. In Iceland, the depletion of one spawning aggregation in a few years was

documented (Magnússon, 1995). To prevent depletion of adult populations temporal closures have been set in the Icelandic and EU EEZs as well as in the NEAFC RA.

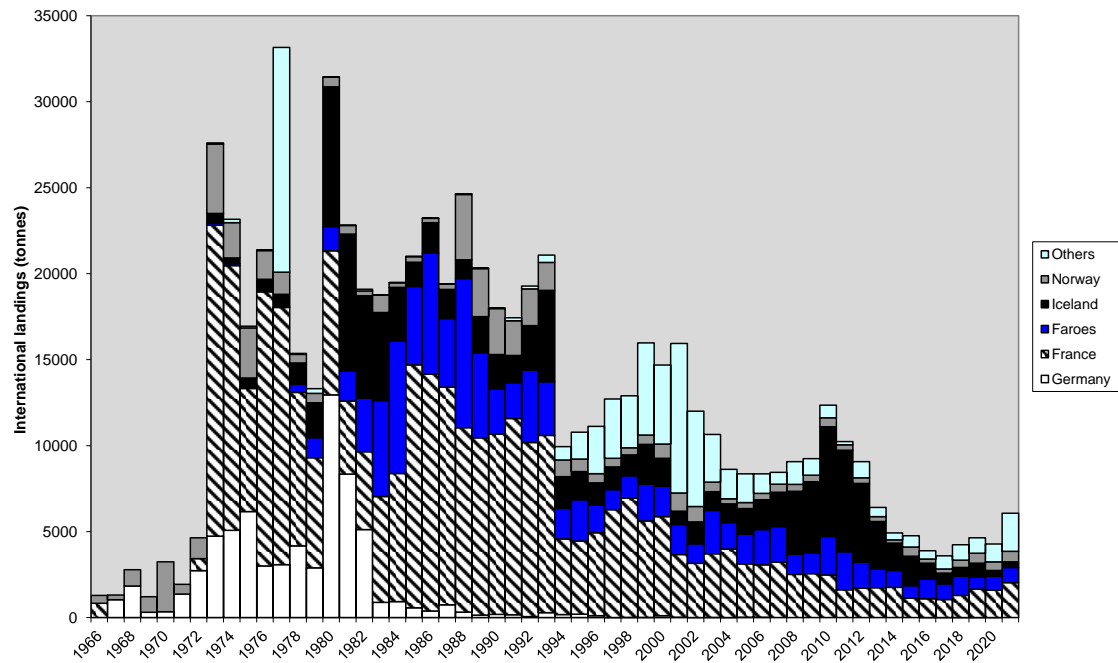


Figure 4.1.1. Total international landings of blue ling in the Northeast Atlantic, by country, 1966–2021.

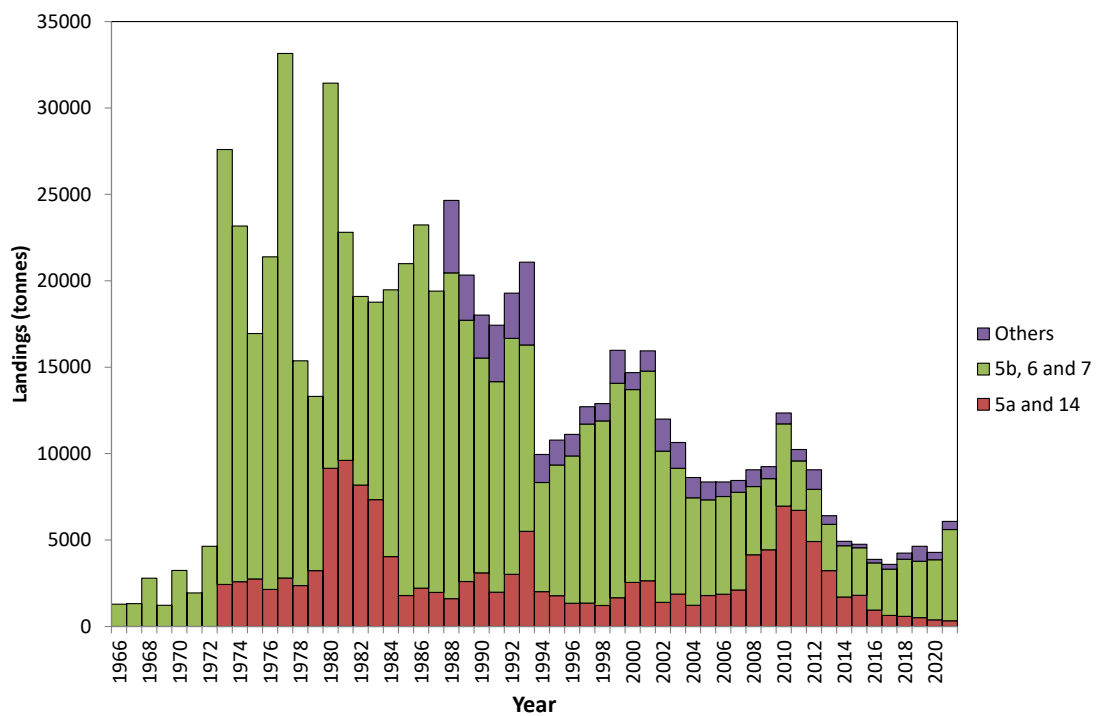


Figure 4.1.2. Total international landings of blue ling in the Northeast Atlantic, by stock unit, 1966–2021.

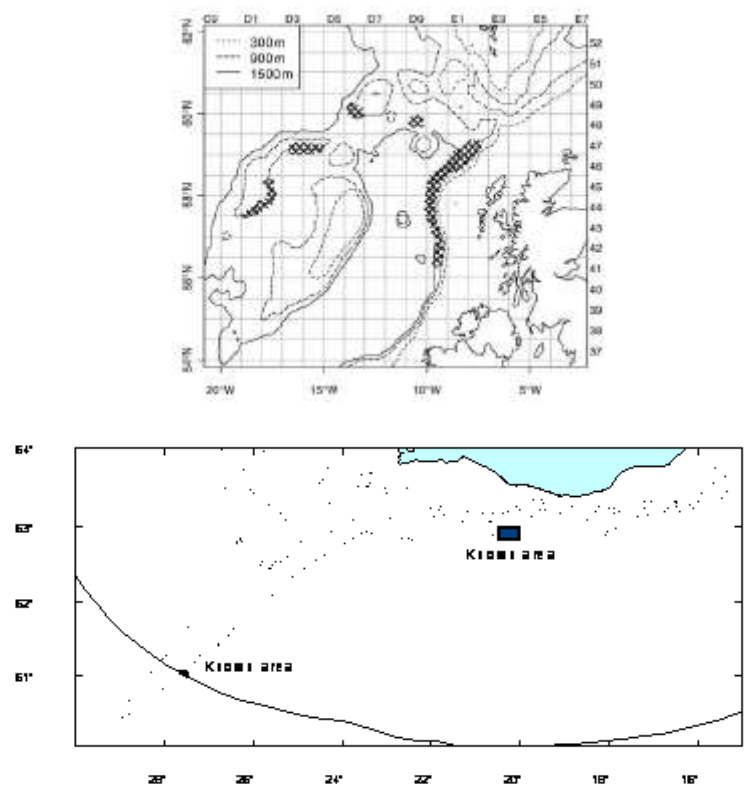
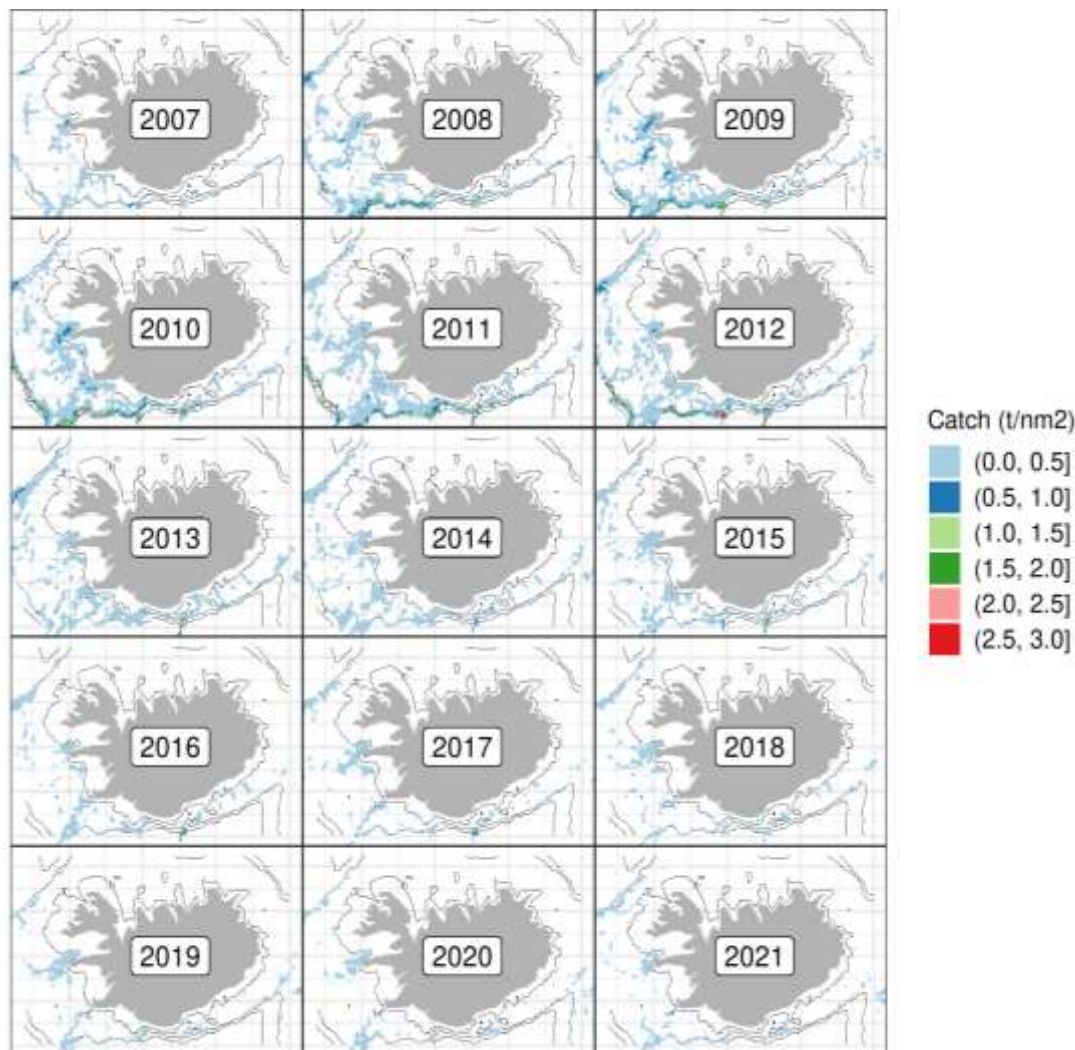


Figure 4.1.3. Known spawning areas of blue ling in Icelandic water (lower panel) and to the West of Scotland (upper panel, from Large *et al.*, 2010).

## 4.2 Blue ling (*Molva dypterygia*) in 5a and 14

### 4.2.1 Fishery

The geographical distribution of the Icelandic blue ling fisheries from 2007 to 2021 (Figure 4.2.1 and Figure 4.2.2), indicates an expansion of the fishery of blue ling to north-western waters. This increase may partly be the result of increased availability of blue ling in the north-western area.



**Figure 4.2.1. Blue ling in 5.a and 14. Geographical distribution of the Icelandic blue line fishery since 2007 as reported in logbooks. All gear types combined.**

Before 2008, most blue ling catches were by trawlers, as bycatch in fisheries targeting Greenland halibut, redfish, cod and other demersal species (Table 4.2.3). Most of the catches by trawlers are taken in waters shallower than 700 m and by longliners until 2008 mostly at depths shallower than 600 m.

After 2008 there was a substantial change in the fishery for blue ling (Table 4.2.3 and Figure 4.2.3). The proportion of catches taken by longliners increased from 7–20% in 2001–2007 to around 70% in 2011 as longliners started targeting blue ling.

In 2015–2021, the trend has reversed; the proportion of longline catches decreased to 20–30% and longliners started fishing in shallower waters. From 2008–2014, longline catches were mostly

taken at depths greater than 500 m. Now, the depth distribution resembles the one observed before 2008, or at depths less than 400 m. (Figure 4.2.4).

Historically the fisheries in Subarea 14 have been relatively small but highly variable.

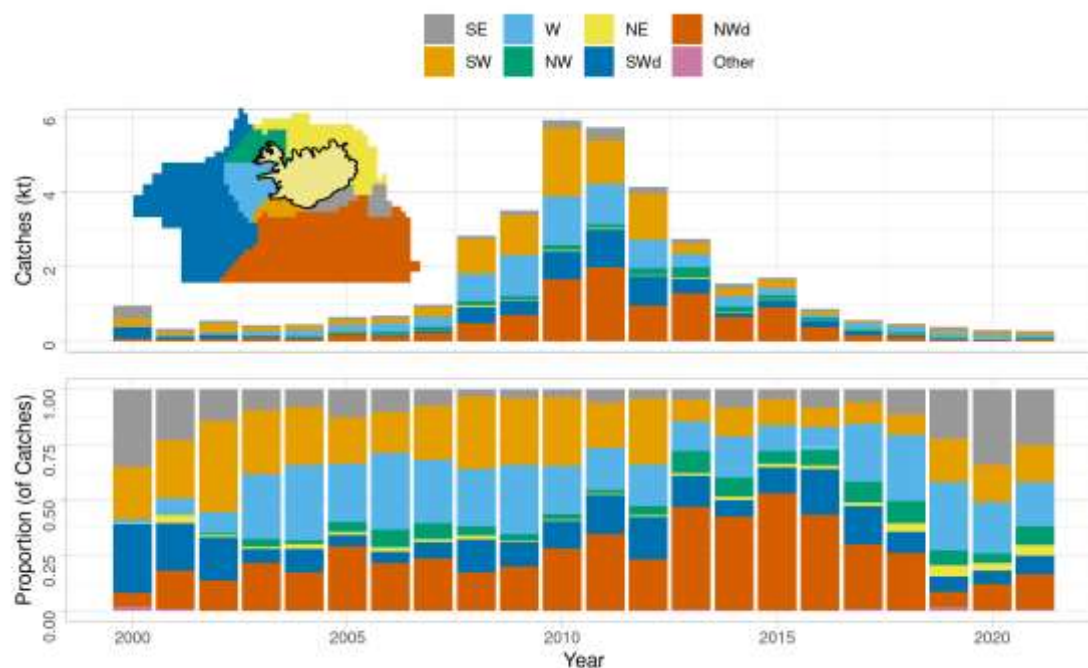


Figure 4.2.2: Blue ling in 5.a and 14. Catch distribution and proportions by area according to logbooks. All gears combined.

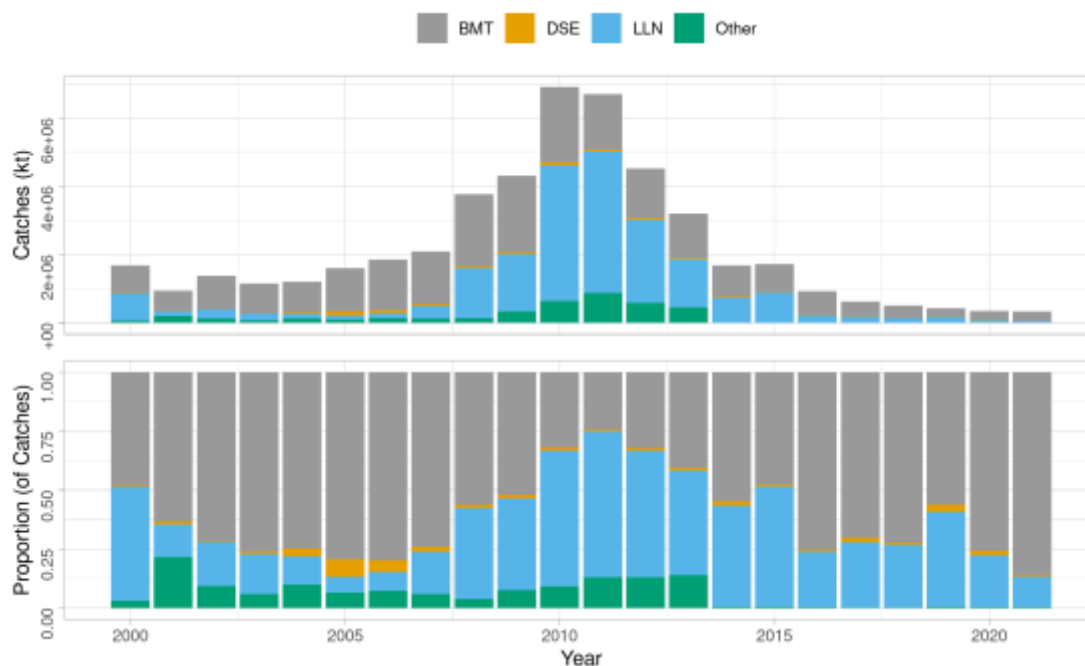


Figure 4.2.3: Blue ling in 5.a and 14. Total catch (landings) and proportion by fishing gear since 2000. according to log-books.

In 2021, the total landings of the Icelandic fleet were 323 t (Table 4.2.3). Between 2006 and 2010, the catches of blue ling increased by more than 370%; the main part of this increase can be attributed to increased targeting of blue ling by the longline fleet. Since then, catches decreased

substantially due to increased management procedures. Now, blue ling is mainly caught as by-catch in the redfish and Greenland halibut fisheries (Table 4.2.3).

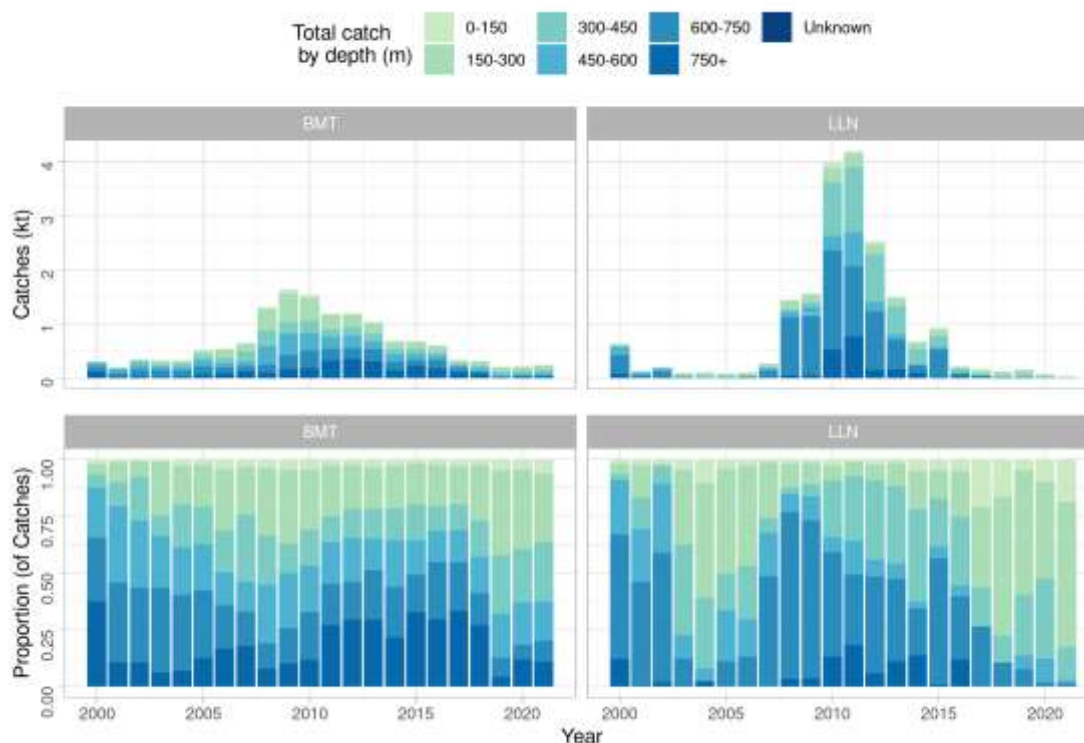


Figure 4.2.4: Blue ling in 5.a and 14. Depth distribution and proportion of longlines (LLN) (right) and trawls (BMT) (left) catches according to logbook entries.

## 4.2.2 Landings trend

The preliminary total landings in 5.a. in 2021 were 332 t of which the Icelandic fleet caught 323 t. (Table 4.2.3 and Figure 4.2.5). Catches of blue ling in ICES Division 5.a increased by more than 370% between 2006 and 2010, the main part of this increases can be attributed to increased targeting of blue ling by the longline fleet. Since then, catches in ICES Division 5.a decreased compared substantially due to increased management procedures (Table 4.2.3).

Total international landings from Subarea 14 (Table 4.2.4) have been highly variable over the years, ranging from a few tonnes in some years to around 3700 t in 1993 and 950 t in 2003. Most of the landings in 2003 were taken by Spanish trawlers (390 t). Since then, no further information is available on this fishery. The high landing values in Subarea are very occasional, and in most years, total international landings have been between 50 and 200 t. Preliminary landings in 2021 were 16 t.

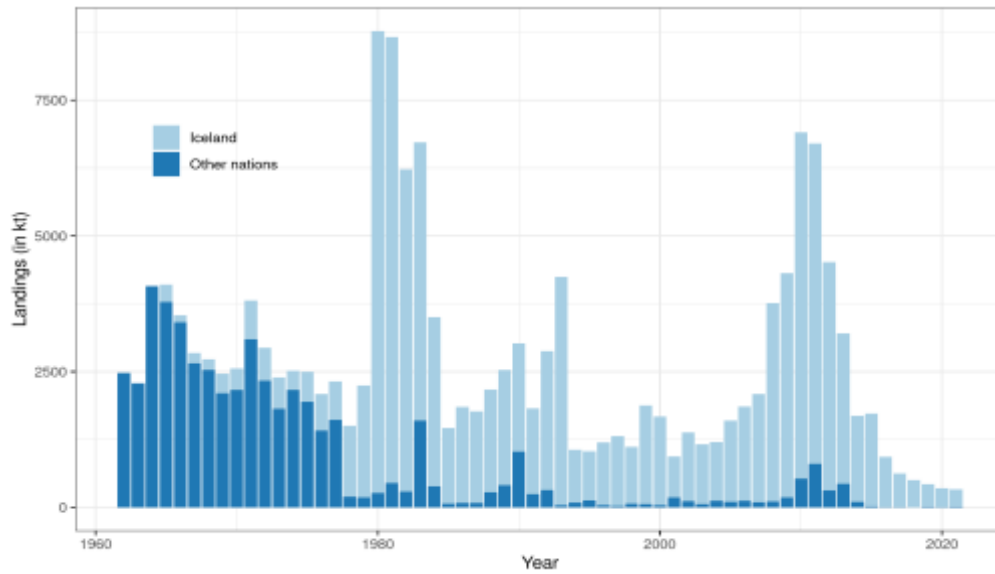


Figure 4.2.5: Blue ling in 5.a and 14. Nominal landings

### 4.2.3 ICES advice

The assessment is based on ICES *rfb*-rule for data limited stocks for the first time in 2021, where life history traits, exploitation characteristics and other relevant parameters for data-limited stocks are considered (ICES 2021). The *rfb*-rule has the following form:

$$A_{y+1} = A_{y-1} r f b m$$

where  $A_{y+1}$  is the advised catch,  $A_{y-1}$  is last years advice,  $r$  corresponds to the trend in biomass index (as in the current ICES “2 over 3” rule),  $f$  is a proxy for the exploitation (mean catch length divided by an MSY reference length) and  $b$  a biomass safeguard (reducing the catch when biomass index drops below a trigger value).

Last year’s advice was 334 t.

$r$  is the ratio of the mean of the last two survey indices and the mean of the three preceding values or:

$$r = \frac{\sum_{i=y-2}^{y-1} I_1 / 2}{\sum_{i=y-3}^{y-5} I_1 / 3}$$

$f$  is the length-ratio component where:

$$f = \frac{\bar{L}_{y-1}}{L_{F=M}}$$

where  $\bar{L}$  is the mean catch length above  $L_{F=M}$ .  $L_{F=M}$  is calculated as:

$$L_{F=M} = 0.75L_c + 0.25L_\infty$$

where  $L_c$  is length at first capture and  $L_\infty$  is von Bertalanffy  $L_\infty$ .

$b$  is the biomass safeguard and is used to reduce catch advice when index falls below trigger,

$$b = \min(1, I_y - 1/I_{trigger})$$

where  $I_{trigger} = i_{loss\omega}$

$m$  is a multiplier based on stock growth.  $K$  for blue ling is  $< 0.2$  and therefore  $m$  is 0.95.

## 4.2.4 Management

Before the 2013/2014 fishing year the Icelandic fishery was not regulated by a national TAC or ITQs. The only restrictions on the Icelandic fleet regarding the blue ling fishery were the introduction of closed areas in 2003 to protect known spawning locations of blue ling, which are in effect. As of the 2013/2014 fishing year, blue ling is regulated by the ITQ system (regulation 662/2013) used for many other Icelandic stocks such as cod, haddock, tusk and ling.

The TAC for the 2018/2019 fishing year was set at 1520t based on the recommendations of MFRI using the same advisory procedure as for ICES category 3 stocks. The difference between national TAC and landed catch in Icelandic waters can be attributed to species transformation which for blue ling is only from blue ling to other species and not vice versa as for other species in the ITQ system (Figure 4.2.6).

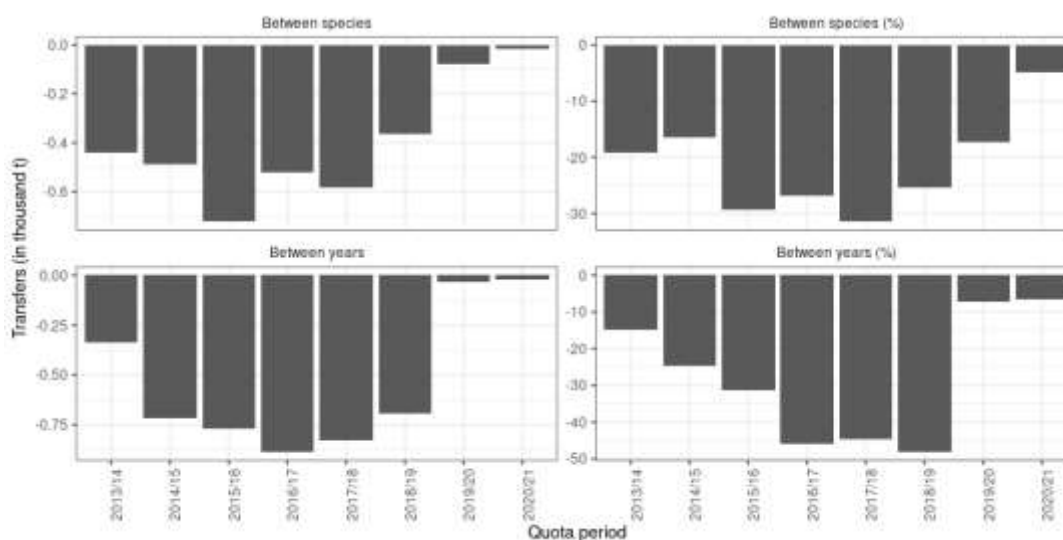


Figure 4.2.6: Blue ling in 5.a and 14. Net transfer of quota, from blue ling to other species and between years, in the Icelandic ITQ system by fishing year.

## 4.2.5 Data available

In general sampling is considered adequate from commercial catches from the main gears (long-lines and trawls). The sampling does seem to cover the spatial distribution of catches for long-lines and trawls. Similarly, sampling does seem to follow the temporal distribution of catches (WGDEEP 2012).

### 4.2.5.1 Landings and discards

Landings data are given in Table 4.2.3 and Table 4.2.4. Discarding is banned in the Icelandic fishery. There is no available information on discarding of blue ling. Being a relatively valuable species and not being subjected to TAC constraints prior to 2013/2014 fishing year nor minimum landing size there should be little incentive to discard blue ling.

### 4.2.5.2 Length composition

Length distributions from the Icelandic trawl and longline catches for the period 2005–2021 are shown in Figure 4.2.8. No length measures were called for from commercial catches in 2017. In 2021, seven sample were collected from commercial catch and all from bottom trawls (Figure 4.2.7).



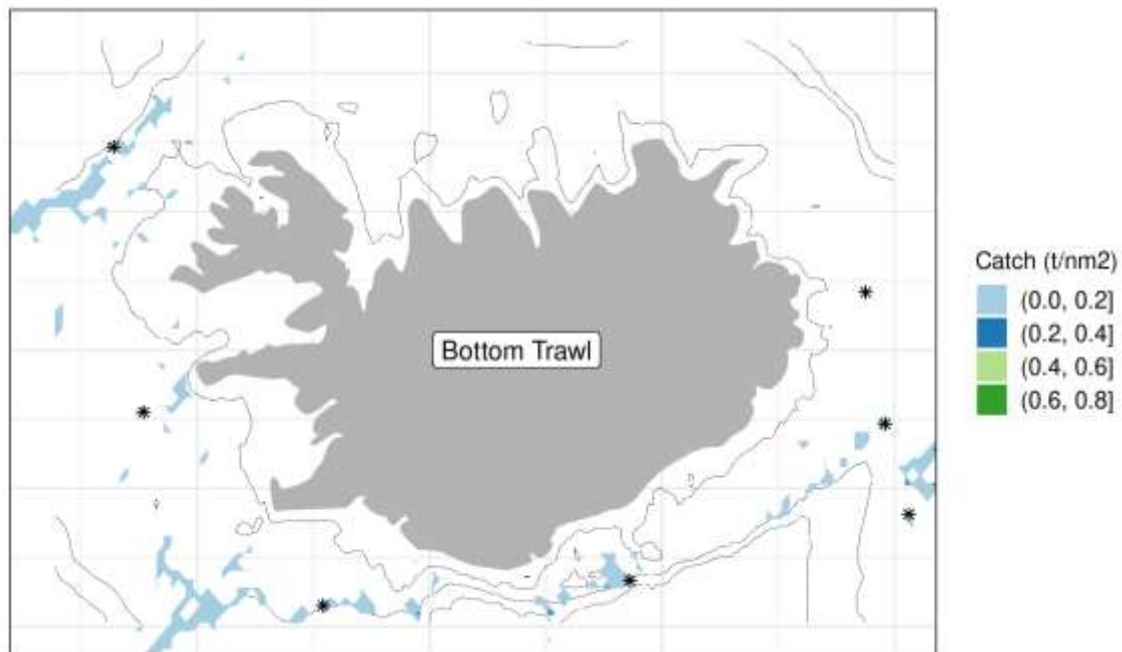


Figure 4.2.7: Blue ling in 5a. Distribution of catches in 2021 and location of samples.

Mean length from catches increased from 86 cm in 2005 to 103 cm in 2018. On average mean length from longlines is higher than from trawls.

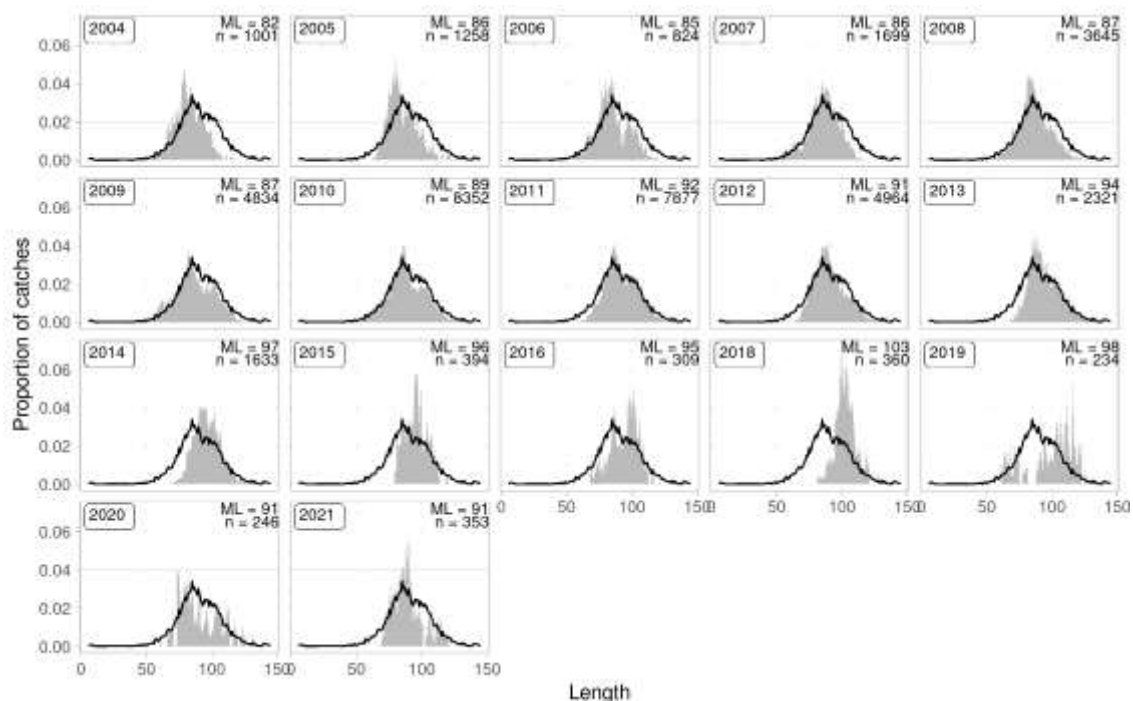


Figure 4.2.8: Blue ling in 5a. Length distribution of blue ling from catch (grey area). Black line is the mean for the period. No data available in 2017.

#### 4.2.5.3 Age composition

No new data were available. Existing data are not presented due to the difficulties in the ageing of this species.

#### 4.2.5.4 Weight-at-age

No new data were available. Existing data are not presented because of difficulty in ageing.

#### 4.2.5.5 Maturity and natural mortality

Length at 50% maturity is estimated at roughly 77 cm and the range for 10–90% maturity is 65–90 cm. No information is available on natural mortality (M)

#### 4.2.5.6 Catch, effort and survey data

Catch per unit effort from the Icelandic trawl and longline fleet are given in Figure 4.2.9. Due to changes in the fishery (expansion into new areas, fleet behaviour, etc.) and technical innovations CPUE is not considered a reliable index of biomass abundance of blue ling and therefore no attempt has been made to standardize the series.

However, looking at fluctuations in CPUE may be informative regarding the development of the fishery. CPUE from longlines was high from 2008 to 2013 but has decreased markedly since then. CPUE from trawls has been gradually decreasing in the period.

Effort from longlines peaked in 2009 but has since then decreased sharply. Effort from trawls peaked in 2011 but has remained relatively stable since. Non-standardised estimates of CPUE and fishing effort from longlines (right) and trawls (left), based on logbook data where blue ling was recorded in catches.

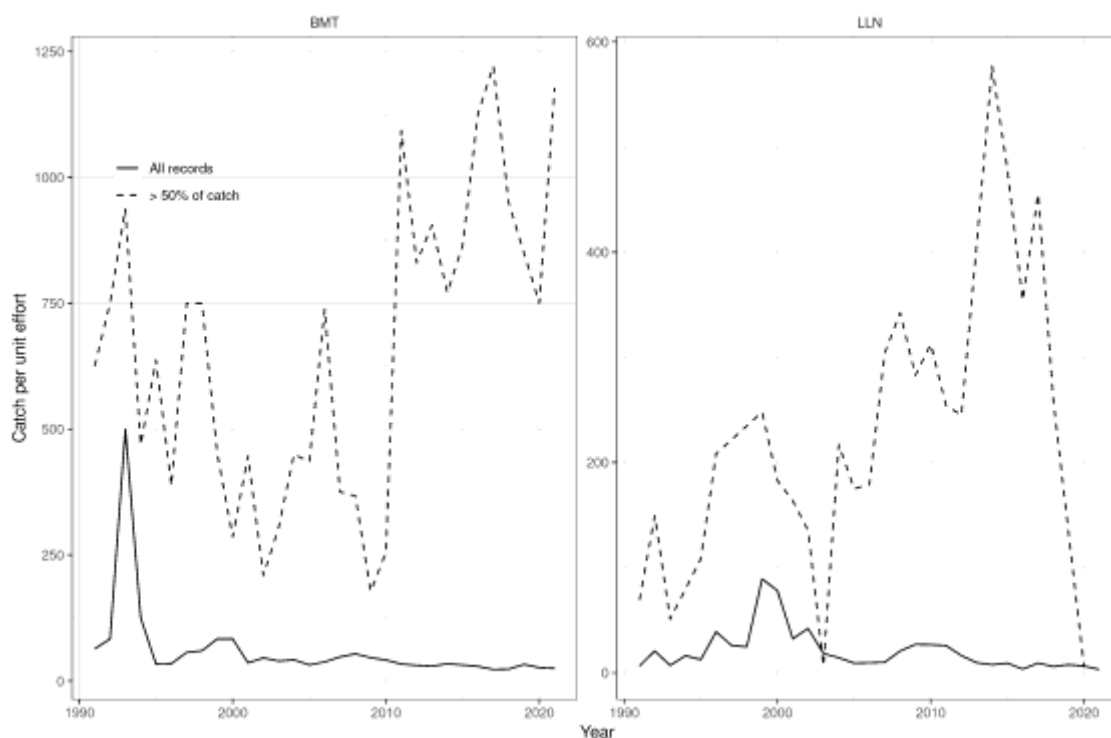


Figure 4.2.9: Blue ling in 5.a and 14. Catch per unit effort from longlines (right) and trawls (left) in 5.a based on logbook data where blue ling was either recorded in catches or above certain level.

Time-series stratified abundance and biomass indices from the spring (G3239) and autumn (G4493) trawl surveys are shown in Figure 4.2.10.

The length distributions from the autumn survey and its spatial distribution are presented in Figure 4.2.11 and Figure 4.2.12. Due to industrial action in 2011 the autumn survey was cancelled after about one week of survey time. Therefore, no estimates are presented for 2011.

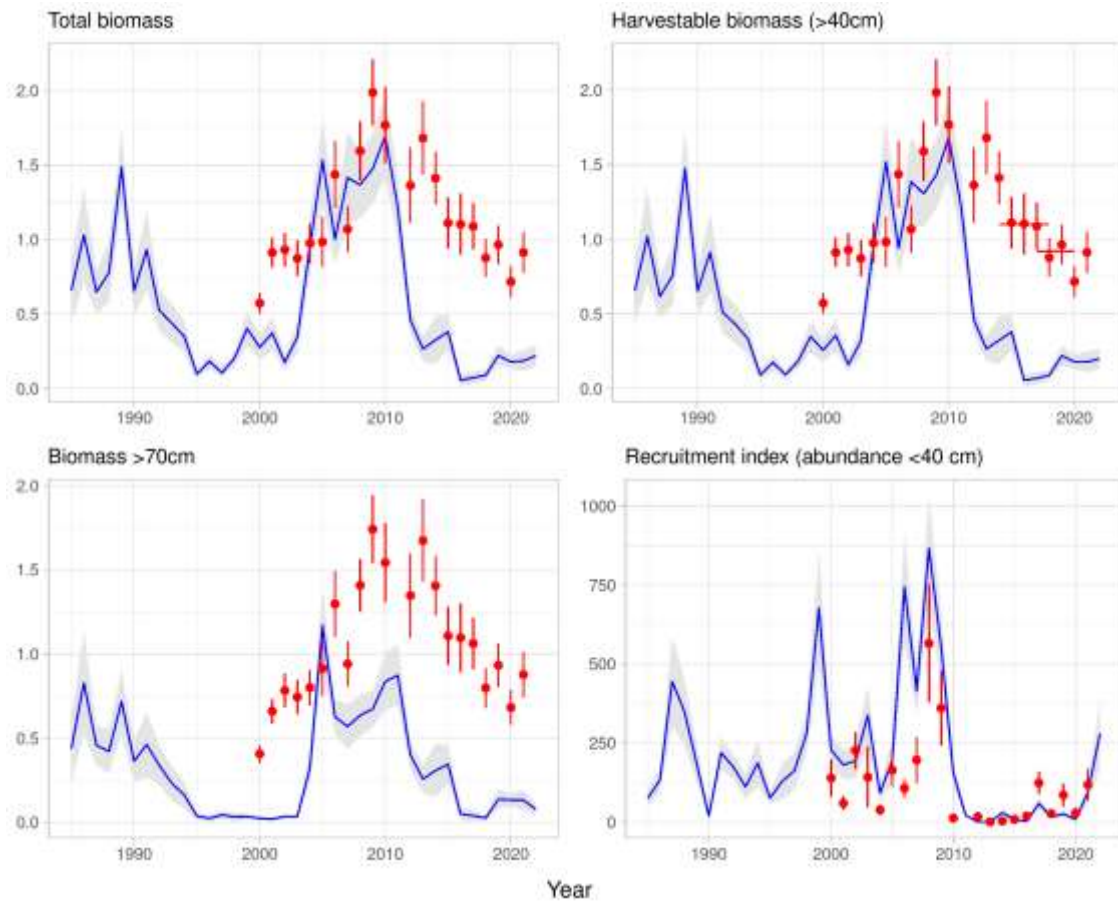


Figure 4.2.10: Blue ling in 5.a and 14. Survey abundance indices for blue ling in the Icelandic autumn survey since 2000 (red points and vertical lines) and the spring survey since 1985 (faded lines and shaded area). Total biomass index (top-left), biomass of 40 cm and larger (top-right), biomass of 70 cm and larger (bottom-left) and abundance - standard error of the estimate. Biomass in thousand tonnes.

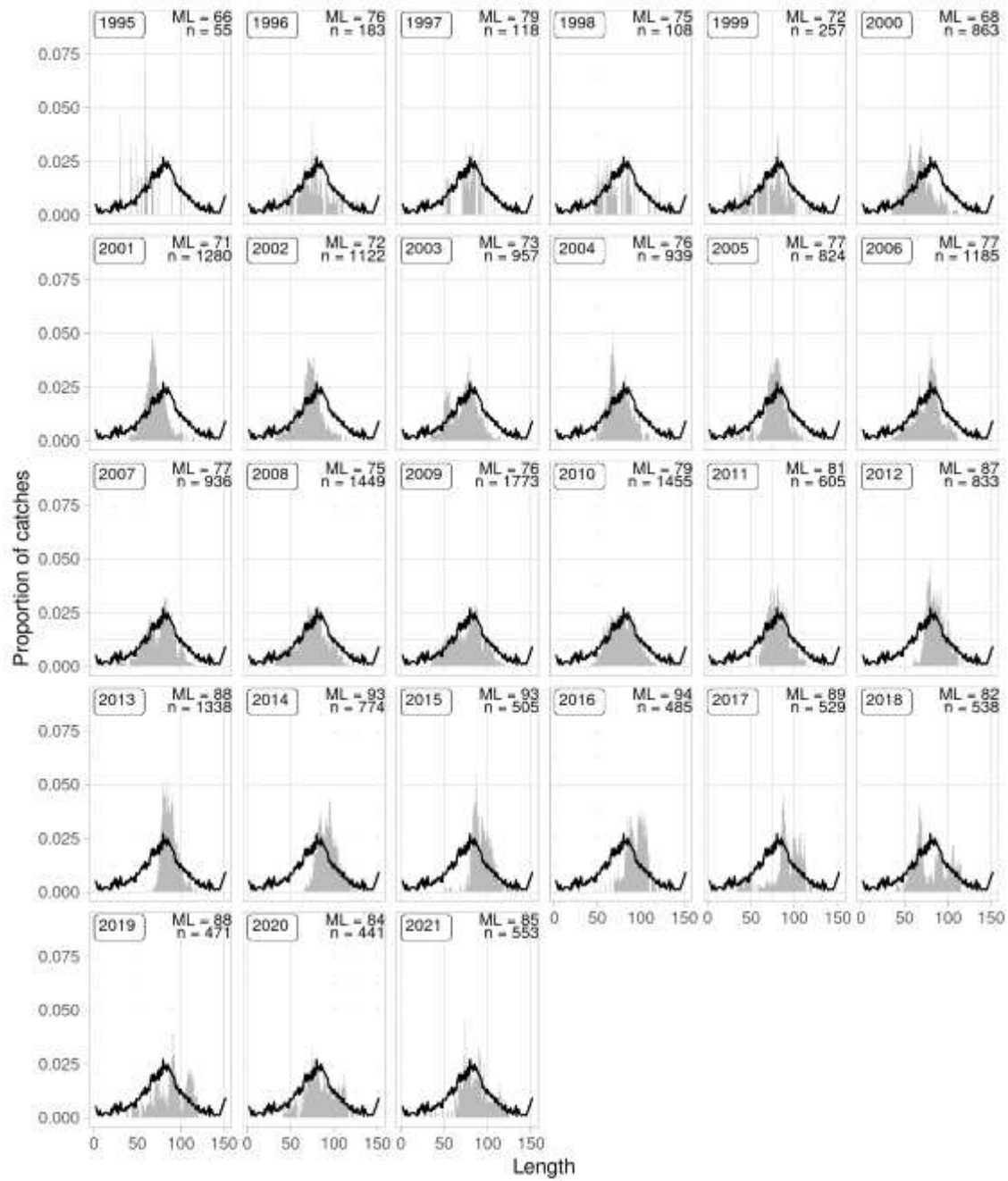


Figure 4.2.11: Blue ling in 5.a and 14. Length distribution from the Icelandic autumn survey since 1995. Black line is the average by length over the displayed period.

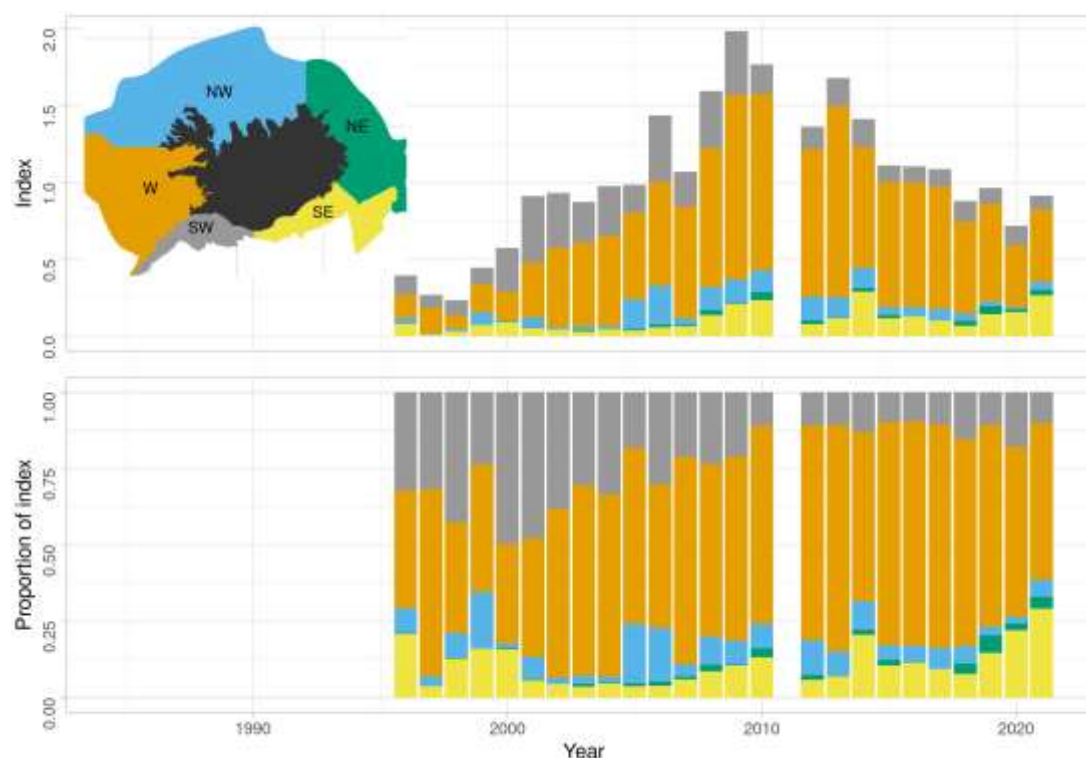


Figure 4.2.12: Blue ling in 5.a and 14. Spatial distribution of biomass index from the Icelandic autumn survey in 1996-2020.

## 4.2.6 Data analysis

### Landings and sampling

Catches from the Icelandic longline fleet increased rapidly from 2007–2010 resulting in a rapid expansion of the fishing area and change in the selectivity of the fishery although there are now strong indications since 2012 that this may have reversed (Table 4.2.3).

In 2005 longliners caught 108 tonnes of blue ling when trawlers caught 1261 tonnes or 84% of the total catches (1496 tonnes). In 2011 trawlers caught 1630 tonnes, out of 5904 tonnes or 28%, but longliners 4140 tonnes or 70%. Since then, the proportion taken by longliners has decreased and in 2021 longliners caught 33t or 10% of the catches, trawls 286t or 88.5% and other gear 4t, or 1.5%. As longliners take on average larger specimens of blue ling, this will have resulted in an overall change in the selection pattern in 2006–2015.

Total catches by the Icelandic fleet decreased between 2010 and 2013 and this decrease is mainly the result of decrease in trawls fishing activity in 2011 and longlines in 2012 and 2013. The expansion of the longline fleet to deeper waters (Figure 4.2.4) may be the result of decreased catch rates in shallower areas.

**CPUE and effort:** CPUE indices from commercial catches are not considered a reliable index of stock abundance. The rapid CPUE increase from longlines should not be viewed as an increase in stock biomass but rather as the result of increased interest by the longline fleet and its expansion into deeper waters (Figure 4.2.4). In 2011 to 2012 there was a slight decrease in CPUE from longline but the CPUE increased again in 2013 to its highest value in the time-series. CPUE from trawling has remained at low levels while effort increased until about 2009 after which it has decreased (Figure 4.2.9).

**Surveys** The spring survey covers only the shallower part of the depth distributional range of blue ling and shows high interannual variance (Figure 4.2.12). It is thus unknown to what extent the spring indices reflect actual changes in total blue ling biomass, given that it does not cover the depths where largest abundance of blue ling occur. It is however not driven by isolated large catches at a few survey stations. The shorter autumn survey, which goes to greater depths and is therefore more likely to reflect the true biomass dynamics, does indicate that there was an increase in blue ling biomass 2007-2009 (Figure 4.2.12). Since 2010 the biomass index has decreased to similar levels as observed in 2002–2005. A large increase of more than 200% in the recruitment index was observed in 2008 but in the 2010 it had decreased again to its lowest observed value and has not increased again for nine years, with the exception of 2017 and 2021, when an increase was observed (Figure 4.2.11 and Figure 4.2.12). As a result, mean length measured in the autumn survey has been higher after 2009 than it was before. Due to industrial action, only part of the autumn survey was conducted in 2011.

#### **Analytical assessment *Exploratory stock assessment on blue ling using gadget***

An exploratory stock assessment of blue ling using the Gadget model was presented at WGDEEP 2012. Updated results of the model were not presented at WGDEEP 2022.

#### **4.2.6.1 Comments on the assessment and advice**

The assessment is based on the new *rfb*-rule for ICES category 3 data-limited stocks and is applied for blue ling for the first time this year. The Icelandic autumn trawl survey (IS-SMH) was used as the index for the stock development. The advice is in accordance to  $A_{y+1} = A_{y-1} \cdot r \cdot f \cdot b \cdot m$  or  $334 \text{ t} \cdot 0.833 \cdot 0.977 \cdot 1 \cdot 0.95$  which result is advice for 2022/2023 set at 258 t (23% reduction from last year's advice). From 2019-2021, the advice was based on the ICES framework for data limited stocks (Category 3.2) where the ratio of the mean of the last two survey indices (Index A) to the mean of the three preceding values (Index B) is multiplied by the last years advice. In 2019, the precautionary buffer was applied and thus, it would have been applied this year, resulting in advice for 223 tonnes (33% reduction) (Table 4.2.1).

**Table 4.2.1. Blue ling. Comparison between the *rfb*-rule and the "2 over 3" rule.**

Component	Rfb-rule	Old 2 over 3 rule
Previous advice	334	334
Index A	817	817
Index B	980	980
Ratio	0.833	0.833
Length ratio	0.977	-
Biomass safeguard	1	-
Multiplier	0.95	-
Initial advice	258	-
Stability clause applied	0	
Precautionary buffer*	-	0.8
Final advice	258	223

Component	Rfb-rule	Old 2 over 3 rule
Advice change	-23	-33

\*Last applied in 2019.

4.2.6.3 The application of rfb-rule

- $r$  is calculated as the average of last two years values, divided by average of three preceding years values which results in  $r=0.833$  (Figure 4.2.13, Table 4.2.6)

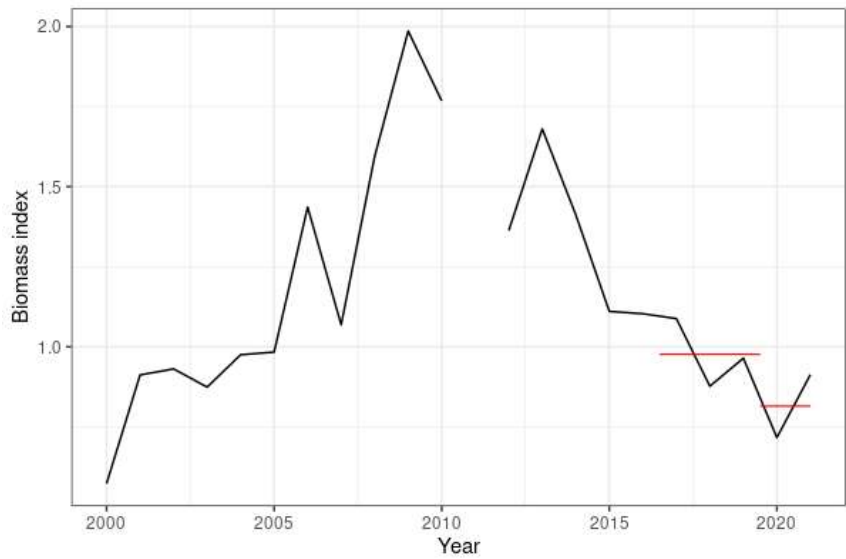


Figure 4.2.13: Blue ling in 5.a and 14. Biomass index since 2000. No index is in the year 2011 (No survey). The red lines show the average of last two years values and the three preceding years.

- $f$  is the length-ratio component. The mean length of last years' catch was 93 cm and the target reference length ( $L_c$  or length at first capture  $\times 0.75 + \text{length} \infty \times 0.25$ ) is 95.25 (figure 4.2.14).

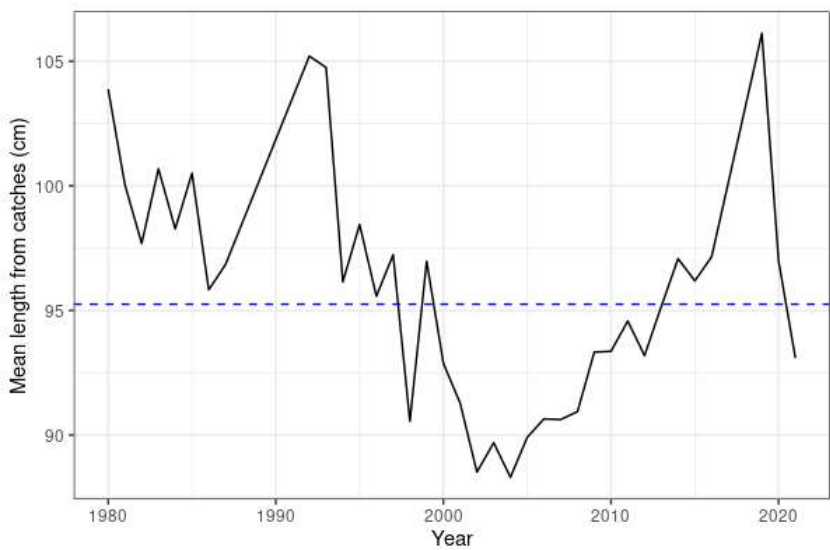


Figure 4.2.14: Blue ling in 5.a and 14. Mean length of blue ling from catches since 1980. The blue dashed line shows the target reference length.

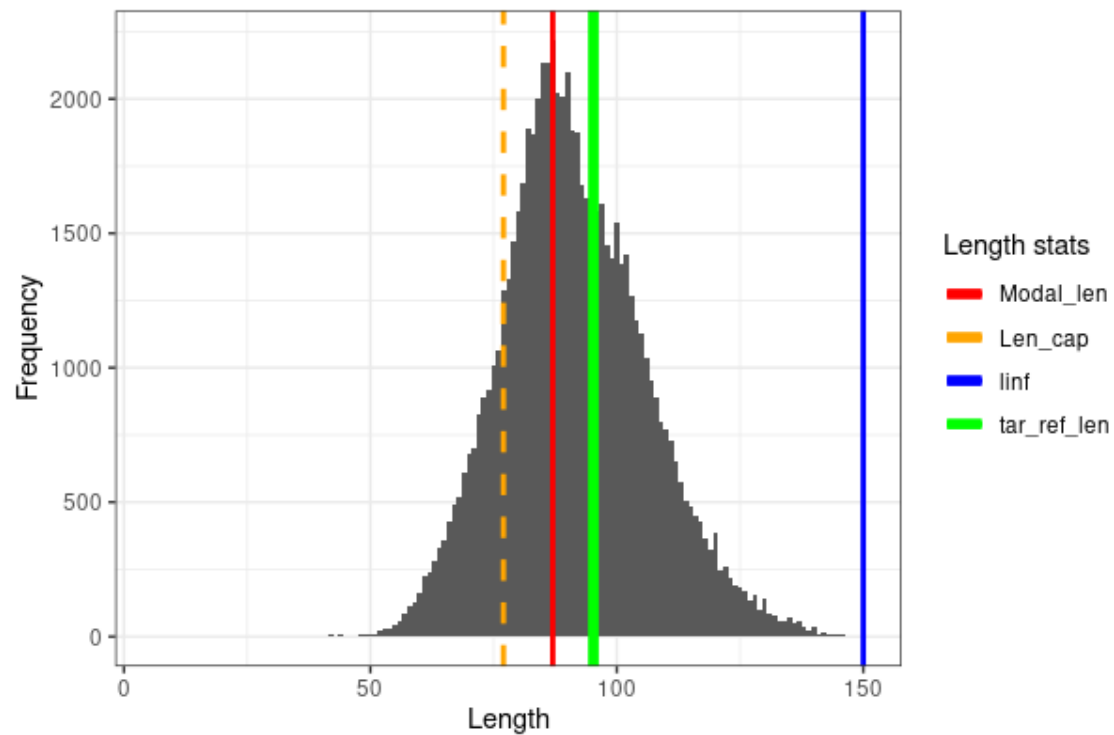


Figure 4.2.15: Blue ling in 5.a and 14. Length frequency distribution from catches. Red line is the length of modal abundance, the orange line is the length at first capture, green line is the target reference length, and the blue line is the  $L_{\infty}$ .

- $b$  is the biomass safeguard and is used to reduce catch advice when index falls below trigger. The lowest index or the  $I_{loss}$  for blue ling is 574 and was recorded in the year 2000.  $I_{trigger}$  is  $I_{loss} * 1.4$  or 803.75 (Figure 4.2.15). Biomass index this year is 915 and above  $I_{trigger}$  and  $b$  is therefore 1.

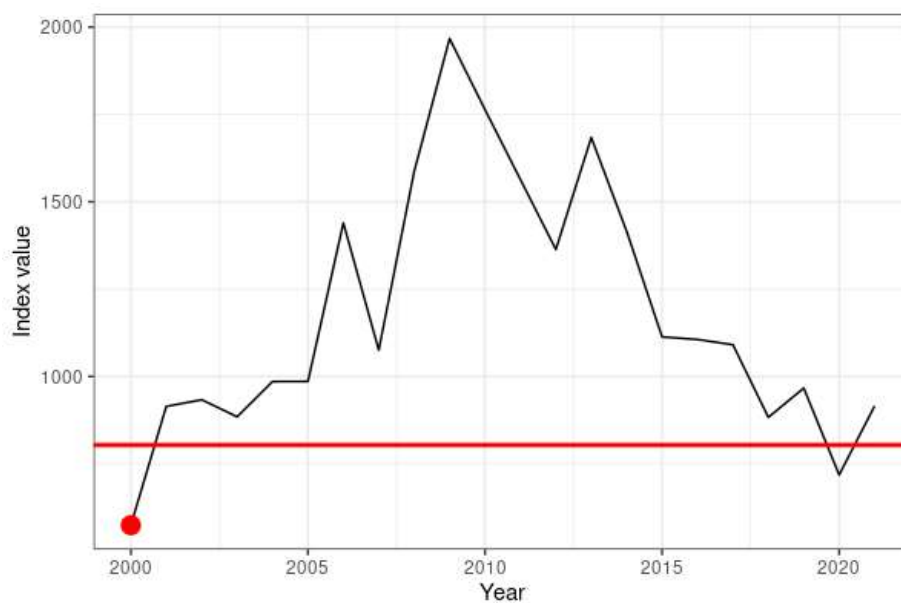


Figure 4.2.16: Blue ling in 5.a and 14. Biomass index values since 2000. The red line is the  $I_{trigger}$  and the red dot is the lowest observed value ( $I_{loss}$ ).

- $m$  is the tuning parameter and for slow growing species (with von Bertalanffy  $K < 0.2$ ),  $m$  equals to 0.95.



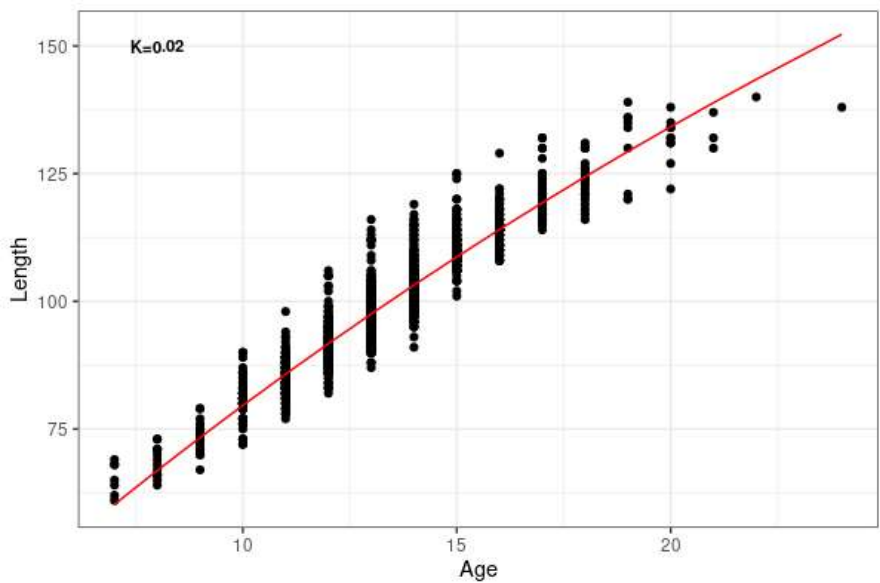


Figure 4.2.17: Blue ling in 5.a and 14. The von Bertalanffy growth curve (red line) fitted to age and length data for blue ling.

4.2.6.4 Exploring sensitivity of  $f$  with other  $L_{\infty}$  values.

The  $f$  and TAC are sensitive to different  $L_{\infty}$  values (Figure 4.2.18, Table 4.2.2). The  $L_{\infty}$  used in the assessment is the maximum length from Icelandic catches. The 99<sup>th</sup> and 95<sup>th</sup> percentiles were tested for sensitivity, as well as the  $L_{\infty}$  from fishbase.org. Table 4.2.1 shows how higher  $L_{\infty}$  values decrease  $f$  by increasing the target reference length. Increased  $L_{\infty}$  values result in lower TAC as it decreases  $f$ .

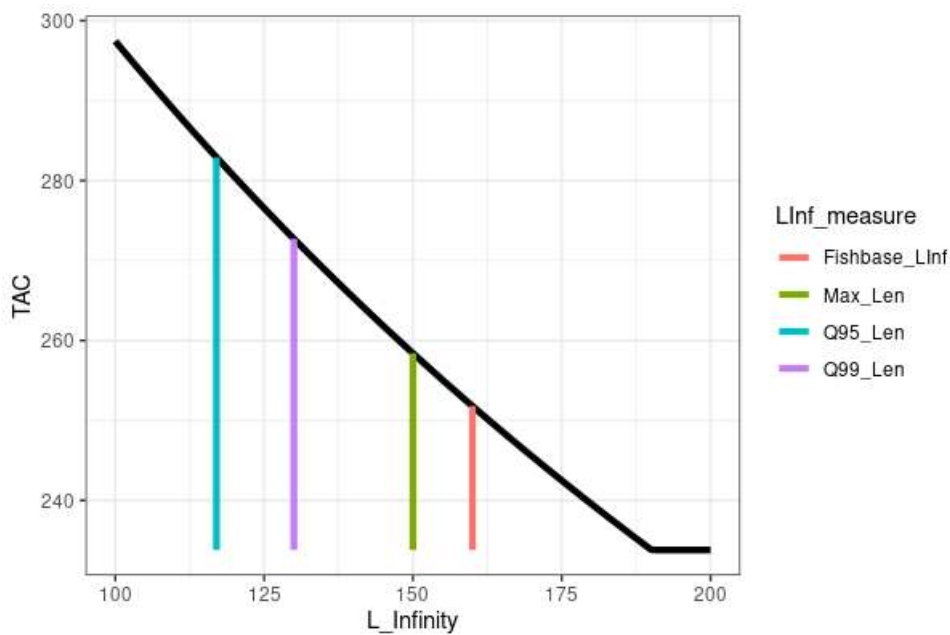


Figure 4.2.18: Blue ling in 5.a and 14. TAC sensitivity to different  $L_{\infty}$  values. Blue line shows the 95<sup>th</sup> percentile to the maximum length value (117 cm), purple line is the 99<sup>th</sup> percentile to the maximum value (130 cm), green line is the maximum length value (150 cm) and the red line shows the fishbase.org value (160 cm).

**Table 4.2.2: Blue ling in 5.a and 14. Parameter sensitivity to different  $L_{\infty}$  values. The max length value is 150 cm, the 99<sup>th</sup> percentile of maximum length value is 130 cm, the 95<sup>th</sup> percentile is 117 cm and the fishbase.org value is 160 cm.**

Component	$L_{\infty}$ (max length)	$L_{\infty}$ (99 <sup>th</sup> percentile)	$L_{\infty}$ (95 <sup>th</sup> percentile)	$L_{\infty}$ (fishbase.org)
Previous advice	334	334	334	334
Index A	817	817	817	817
Index B	980	980	980	980
Ratio	0.833	0.833	0.833	0.833
$L_{F=M}$ (target reference length)	95.25	90.25	87	97.75
$f$ (length ratio)	0.977	1.03	1.07	0.952
Biomass safeguard	0.910	0.91	0.91	0.91
Multiplier	0.95	0.95	0.95	0.95
$I_{loss}$	574	574	574	574
$I_{trigger}$	804	804	804	804
Initial advice	258	273	283	252
Stability clause applied	0	0	0	0
Final advice	258	273	283	252
Advice change	-23	-18	-15	-25

## 4.2.7 Management considerations

Landings have decreased considerably in the last year and as blue ling is now part of the ITQ system such a rapid increase in landings as observed between 2006 and 2011 is unlikely. Blue ling is caught in mixed fisheries by the trawler fleet, mainly targeting redfish and Greenland halibut. After the inclusion of blue ling in the ITQ system the longliners have shifted from a directed fishery to a more mixed fishery for the species. Because of the restrictions of the TAC the implications of low blue ling TAC for the trawlers can be considerable, although the species is a low percentage in their catches. Recruitment index from the autumn survey indicates very little recruitment to the stock since 2010, resulting in a truncated length distribution from both the survey and commercial catches. Closure of known spawning areas should be maintained and expanded where appropriate.

**Table 4.2.3: Blue ling in 5.a and 14. Number of Icelandic boats with blue ling landings and their total landings in 5a.**

Year	Bottom trawl (tonnes)	Gill nets (tonnes)	Longlines (tonnes)	Other (tonnes)	Bottom trawl (n boats)	Gill nets (n boats)	Longlines (n boats)	Total catch (tonnes)
2000	801	13	808	13	108	18	44	1634
2001	597	24	131	10	110	28	39	762
2002	986	15	256	8	105	14	41	1264

Year	Bottom trawl (tonnes)	Gill nets (tonnes)	Longlines (tonnes)	Other (tonnes)	Bottom trawl (n boats)	Gill nets (n boats)	Longlines (n boats)	Total catch (tonnes)
2003	883	6	197	11	105	14	47	1098
2004	894	5	145	39	112	19	53	1083
2005	1261	8	108	119	106	16	60	1496
2006	1477	13	151	94	105	16	69	1734
2007	1544	22	374	54	97	24	90	1995
2008	2111	28	1454	60	95	25	92	3653
2009	2242	136	1677	75	89	31	87	4129
2010	2201	91	3978	107	85	31	96	6378
2011	1630	76	4140	59	81	24	97	5904
2012	1449	274	2425	58	79	22	78	4207
2013	1300	14	1420	34	75	20	71	2769
2014	923	11	622	32	72	15	73	1588
2015	821	9	868	13	67	18	77	1712
2016	701	3	213	7	66	11	53	925
2017	436	1	169	12	57	8	52	619
2018	363	2	132	5	65	6	59	502
2019	238	3	161	13	58	11	53	415
2020	264	1	70	7	58	9	46	343
2021	286	2	33	2	59	10	40	323

**Table 4.2.4: Blue ling in 5.a and 14. Landing in ICES Division 14. Source: STATLANT database and WD02 (Annex 2).**

YEAR	FAROE	GERMANY	GREENLAND	ICELAND	NORWAY	RUSSIA	SPAIN	UK	DENMARK	TOTAL
1983	0	621	0	0	0	0	0	0	0	621
1984	0	537	0	0	0	0	0	0	0	537
1985	0	315	0	0	0	0	0	0	0	315
1986	214	149	0	0	0	0	0	0	0	363
1987	0	199	0	0	0	0	0	0	0	199
1988	21	218	3	0	0	0	0	0	0	242
1989	13	58	0	0	0	0	0	0	0	71
1990	0	64	5	0	0	0	0	10	0	79

YEAR	FAROE	GERMANY	GREENLAND	ICELAND	NORWAY	RUSSIA	SPAIN	UK	DENMARK	TOTAL
1991	0	105	5	0	0	0	0	45	0	155
1992	0	27	2	0	50	0	0	32	0	111
1993	0	16	0	3124	103	0	0	22	0	3265
1994	1	15	0	300	11	0	0	57	0	384
1995	0	5	0	117	0	0	0	19	0	141
1996	0	12	0	0	0	0	0	2	0	14
1997	1	1	0	0	0	0	0	2	0	4
1998	48	1	0	0	1	0	0	6	0	56
1999	0	0	0	0	1	0	66	7	0	74
2000	0	1	2	4	0	0	889	2	0	898
2001	1	0	1	11	61	0	1631	6	0	1711
2002	0	0	0	11	1	0	0	0	0	12
2003	0	0	3	0	36	0	670	5	0	714
2004	0	0	7	0	1	0	0	7	0	15
2005	2	0	6	0	1	0	176	8	0	193
2006	0	0	6	0	3	1	0	0	0	10
2007	19	0	1	0	1	0	0	0	0	21
2008	1	0	5	0	2	0	381	0	1	390
2009	1	0	5	0	3	0	111	4	0	124
2010	1	0	8	0	9	0	34	0	3	55
2011	0	0	8	0	2	0	0	1	6	17
2012	0	0	13	367	9	0	0	0	3	392
2013	0	0	16	0	0	0	0	3	9	28
2014	0	0	14	0	3	0	0	0	0	17
2015	0	0	66	0	1	0	0	0	5	72
2016	0	0	9	0	0	0	0	0	7	16
2017	0	0	12	0	4	0	0	0	3	19
2018	0	0	34	0	12	0	0	0	5	51
2019	0	7	20	0	36	0	0	0	0	62

YEAR	FAROE	GERMANY	GREENLAND	ICELAND	NORWAY	RUSSIA	SPAIN	UK	DENMARK	TOTAL
2020	0	7	18	0	2	0	0	0	0	27
2021	0	6	1	0	9	0	0	0	0	16

Table 4.2.5: Blue ling in 5.a and 14. Advised TAC, national TAC and total landings since the quota year 2013/2014.

Fishing Year	MFRI Advice	National TAC	Iceland	Others	Landings
2013/14	2400	2400	1653	101	1754
2014/15	3100	3100	1898	41	1939
2015/16	2550	2550	1734	90	1828
2016/17	2032	2032	932	23	955
2017/18	1956	1956	554	79	592
2018/19	1520	1520	424	62	424
2019/20	483	483	371	5	376
2020/21	406	406	365	12	377
2021/22	349	349			
2022/23	235				

Table 4.2.6: Blue ling in 5.a and 14.: Landings from Icelandic fishing grounds (5a)

Year	Faroe	Germany	Iceland	Norway	UK
2002	28	4	1264	74	10
2003	16	16	1098	6	24
2004	38	9	1083	49	27
2005	24	31	1496	20	26
2006	63	22	1734	27	11
2007	78	0	1995	4	13
2008	88	0	3653	21	0
2009	178	0	4129	5	0
2010	515	0	6378	13	0
2011	797	0	5904	2	0
2012	312	0	4207	2	0
2013	435	0	2769	2	0
2014	70	0	1588	30	0

Year	Faroe	Germany	Iceland	Norway	UK
2015	12	0	1712	4	0
2016	6	0	925	0	0
2017	4	0	619	0	0
2018	28	0	502	0	0
2019	28	0	415	4	0
2020	6	0	343	0.1	0
2021	1	0	323	7	0

**Table 4.2.7: Blue ling in 5.a and 14. Catches along with survey biomass index (larger than 40 cm) from the Icelandic Autumn survey and the calculated Fproxy (Catches in Iceland and Greenland)/Index)**

Year	Iceland	Greenland	Index	Fproxy
2000	1635.876	896	574.1	4.41
2001	761.809	1710	914.3	2.70
2002	1264.674	12	933.2	1.37
2003	1098.029	711	884.4	2.04
2004	1089.908	8	985.4	1.11
2005	1502.326	187	985.7	1.71
2006	1736.037	4	1439.2	1.20
2007	1998.092	20	1075.5	1.87
2008	3653.183	385	1586.6	2.54
2009	4129.245	119	1967.2	2.16
2010	6377.866	47	1763.5	3.64
2012	4206.665	379	1363.3	3.36
2013	2769.869	28	1683.9	1.66
2014	1687.642	17	1415.2	1.20
2015	1727.363	72	1113.2	1.62
2016	930.790	16	1105.7	0.89
2017	622.257	19	1090.7	0.59
2018	502.955	17	883.0	0.59
2019	423.983	62	966.7	0.50
2020	349.307	27	718.1	0.52

Year	Iceland	Greenland	Index	Fproxy
2021	331.856	16	915.3	0.38

**4.2.9      References**

ICES. 2012. “Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP), 28 March–5 April, 2012, Copenhagen, Denmark. ICES Cm 2012/Acom:17.” International Council for the Exploration of the Seas; ICES publishing.

ICES. 2021. Tenth Workshop on the Development of Quantitative Assessment Methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks (WKLIFE X). ICES Scientific Reports. Report. <https://doi.org/10.17895/ices.pub.5985>

### 4.3 Blue Ling (*Molva dypterygia*) in Division 5.b and subareas 6 and 7

#### 4.3.1 The fishery

In the last decade, the main fisheries have been from French, Faroese and Scottish trawlers. Faroese vessels have been fishing almost exclusively in ICES Division 5.b, French and Scottish vessels have been mostly fishing in in ICES Division 6.a, with a smaller catch in in ICES Division 5.b from French trawlers. Scottish vessels have been catching an increasing proportion of annual international landings. The two other countries, which contribute notably to the total catch are Norway and Spain. Total international landings from Subarea 7 are small and are mostly by-catches in other fisheries. There used to be more fishing in divisions 7.bc, but these have declined to very small bycatch in recent years.

Landings by Faroese trawlers are mostly taken in the spawning season. Historically, this was also the case for French trawlers fishing in in ICES Division 5.b and 6.a. However, since the 2000s blue ling has been taken round the year together with roundnose grenadier and black scabbardfish, as well as deep-water sharks until 2009. Since 2016 trawling is banned deeper than 800 m, whilst blue ling is abundant down to at least 1200 m.

In 2019, 94.2 % of the landings were from bottom trawlers and 5.8% from longliners. The contribution of longliners increased to 9% and .20% in 2020 and 2021. As in previous years, all Norwegian catch were from longliners. The Spanish fleet has a component of longliners, which represented one quarter of Spanish catches in 2019 and increased to 90% in 2021. Scottish landings increased from about 720 tonnes in 2018-2020 to 1807 t in 2021 with 10% from longlines.

#### 4.3.2 Landings trends

See the stock annex for the time-series of landings from 1966 to 1999. Total international landings from Division 5.b (Tables 4.3.1a–f, Figure 4.3.1 and stock annex) peaked in the late 1970s at around 21 000 t and then declined until 2010. Thereafter landings have oscillated between 1000 and 1700 tonnes per year.

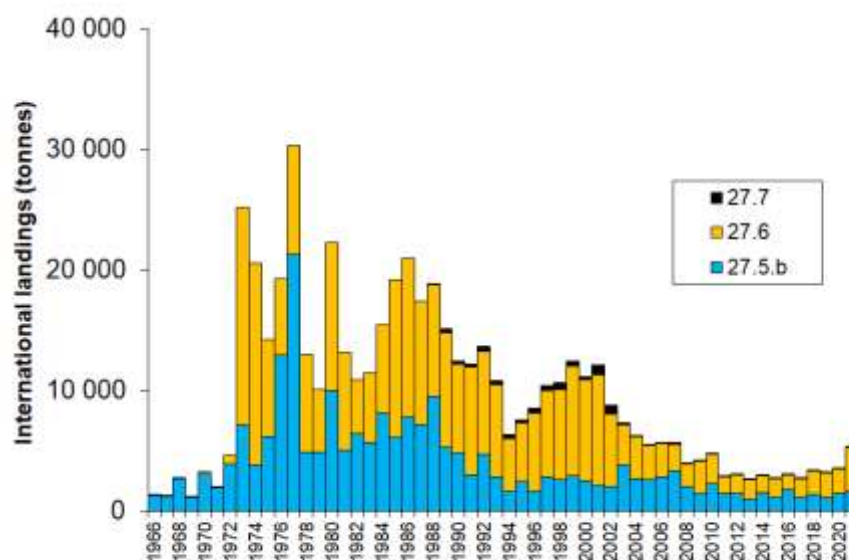


Figure 4.3.1. International landings for bli.27.5b67 in ICES subareas 6 and 7 and Division 5b.



The landings from Subarea 27.6 peaked at about 18 000 t in 1973 and fluctuated throughout the 1980s within the range of 5000–10 000 t and have since gradually declined. In the 2000s reducing EU TACs have been the main driver of the catch level. In the 2010s, the landings declined to an historical low level of less than 1300 tonnes in 2016 but have increased since to more than 2000 tonnes in 2019 and increased again to more than 3600 tonnes in 2021 (Table 4.3.1c). Although significant in the past, landings in Division 6b were minor in the last 10 years and none were reported in 2021 (Table 4.3.1d).

Landings from Subarea 7 are comparatively small, mostly less than 500 t per year in the whole time-series and less than 50 t during the last ten years, except in 2015 when 78 t were landed (Table 4.3.1e).

Landings in 2021 at 5285 tonnes were 58% higher than the mean of 2019 and 2020, the increase coming mostly from Division 6.a, where French and Scottish landings increased strongly (Tables 4.3.1.f-g). Despite this increase, landings in 2021 were only about half the maximum level advised by ICES. Some EU fleets, in particular the French fleet of large trawlers, appear to be in a situation of under capacity. Although fishing opportunities for blue ling have increased from 2015, vessels kept fishing mostly for saithe. This under capacity is the result of the reduction of the number of French trawlers  $\geq 30$  m, based in harbours where deep-water species are landed, from 35 in 2005 to 16 in 2016 (Common Fleet Register data). Further the EU regulation limiting fishing at spawning time no longer allows for large targeted catch during the spawning season as in the 1980s and 1990s.

Like in recent years, landings data by country and ICES Division were extracted from InterCatch for all countries, except for the Faroe Islands for which official Faroese landings were provided separately.

### 4.3.3 ICES Advice

The ICES advice for 2021 and 2022 is "when the MSY approach is applied, catches should be no more than 11522 tonnes in 2021 and no more than 10859 tonnes in 2022."

### 4.3.4 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.

Prior to 2009, EU deep-water TACs were set on a biennial basis; however from 2009 onwards, annual TACs were applied for the components of this stock in EU waters of in ICES Division 5.b, and Subareas 6 and 7. TACs are fixed according to bilateral agreements between EU and Faroe Islands and EU and Norway. The EU TAC includes quotas for Norway and the Faroe Islands and the EU has a quota for ling and blue ling in Faroese waters (1885 t in 2019 and 2020). This EU quota in Faroese waters is divided in national quotas between Germany, France and UK.

The table below provides the EU TAC the quota allocated to EU vessel in Faroese waters and the ICES estimate of international landings in recent years.

Agreement about TAC between Faroe Islands the United Kingdom of Great Britain and Northern Ireland for 2022: UK stocks for transfer to Faroes ICES area 6, 7 of 500 tonnes blue ling (western) and Faroe stocks for transfer to UK ICES area 5b of 225 tonnes blue ling and ling (Agreed record of fisheries consultations between the Faroe Islands and the United Kingdom of Great Britain

and Northern Ireland for 2022, <https://lms.cdn.fo/media/16241/semja-millum-f%C3%B8royar-og-bretland-um-s%C3%ADnamillum-fiskir%C3%A6ttindi-fyri-2022.pdf?s=sJM9VkNVqiTh-gFIq6Q2NuMDoaZg>).

Year	Area	ICES advice	QUOTA INCLUDED IN EU TAC				EU QUOTA IN FAROESE WATERS OF 5.b(1)	INTERNATIONAL landings
			EU TAC	EU	Norway	Faroe		
2006	67	Biennial		3037	200	400	3065	5650
2007	67	No direct fisheries		2510	160	200	3065	5648
2008	67	Biennial		2009	150	200	3065	3940
2009	5b67	No direct fisheries	2309	2009	150	150	3065	4121
2010	5b67	Biennial	2032	1732	150	150	2700	4759
2011	5b67	No direct fisheries	2032	1717	150	0	0	2861
2012	5b67	Same as 2011	2031	1882	150	0	0	3031
2013	5b67	3900	2540	23905	150	0	0	2588
2014	5b67	3900	2540	2210	150(2)	150(3)	1500	2949
2015	5b67	5046	5046	4746	150(2)	150(3)	1500	2748
2016	5b67	5046	5046	4746	150(2)	150(3)	2100	3043
2017	5b67	11314	11314	11014	150(2)	150(3)	2000	2669
2018	5b67	10763	10763	11463	150(2)	150(3)	2000	3322
2019	5b67	11778	11778	11378	250(2)	150(3)	1885	3218
2020	5b67	11150	11150	10750	250(2)	150(3)	1885	

- (1) TAC for ling and blue ling, against which a bycatch roundnose grenadier and black scabbard fish may be counted, up to a limit of 665 t in 2018.
- (2) To be fished in Union waters of 27.2.a and 27.4-7 (BLI/\*24X7C).
- (3) Including bycatch of roundnose grenadier and black scabbardfish.
- (4) preliminary TAC from 01.01.2021 to 07.31.2021, according to agreement between EU and UK
- (5) status of this quota unknown

From 2021, following the Brexit, the jurisdiction of most of the area have change. The EU TAC for 2021 is labelled " 6 and 7; United Kingdom and international waters of 5". The EU quota in Faroese waters of 5.b was set to 0 in 2021 and 2022, and therefore is no longer mentioned in the table below.

Year	Area	ICES	EU		Quotas included in the TAC				International
		Advice	TAC	EU	UK	Norway	Faroe Islands	Other	landings
2021	5b67	11522	11 522	8902	2614	0	0	32	5285
2022	5b67	10859	10859	8332	2527	0	0	30	

In Faroese waters, Faroese vessels are encouraged to land all fish, which is thought to be done for blue ling, owing to the species value and the absence of fish of unmarketable size. Faroese vessels in Faroese waters are regulated by licences and fishing days but no quota.

From 2015 to 2020, the EU TAC in EU and international waters was set to the level of the ICES catch advice. As a significant fraction of the catch comes from Faroese waters, setting the EU TAC at the level of the ICES advice implied that the ICES advice could have been overrun without any illegal catch, so creating a risk of exploiting the stock beyond the recommended level.

In 2009, the EU introduced protection areas of spawning aggregations of blue ling on the edge of the Scottish continental shelf (6.a) and at the edge of Rosemary Bank (6.a). Fishing for blue ling is restricted in known spawning areas during 3 months corresponding to the spawning season. Entry/exit regulations apply and vessels cannot retain >6 t of blue ling from these areas per trip. On retaining 6 t vessels must exit and cannot re-enter these areas before landing. This regulation and the coordinate of the prohibited area are included in regulation 2019/1241 of the European parliament and of the Council. Since 2021 and the Brexit, these spawning areas are no longer in EU but in UK waters. In 2013, NEAFC introduced a protection of the spawning area located near the southwest boundary of the Icelandic EEZ, this area is banned to bottom fishing gears from 15 February to 15 April (rec 7:2017, [https://www.neafc.org/managing\\_fisheries/measures/current](https://www.neafc.org/managing_fisheries/measures/current)).

In ICES Division 27.6.b, areas closed to bottom fishing gears have been extended and these include some of the spawning areas identified by Large *et al.* (2009), see Figure 4.1.3b.

Blue ling has been subject to a minimum conservation reference (MCRS) of 70 cm in EU North-western and South-Western waters (EU regulation 2019/124). This regulation also apply to the NEAFC RA. The impact of this MCRS regulation is minor as the proportion of blue ling smaller than 70 cm has always been minor.

### 4.3.5 Data availability

#### 4.3.5.1 Landings and discards

The time-series of landings was updated (Tables 4.3.1a-f).

As in previous years, landings from the Faroe Islands in 2020 were not uploaded to InterCatch but provided to the expert group. From all countries, except the Faroe Islands, landings estimates submitted to InterCatch were used. In InterCatch, official landings where available for a subset of fleets only, in these case official landings and estimates were similar. For the Faroe Islands, official landings from Statland were used.

Data submitted to InterCatch showed that international discards in 2018-20 were less than 1% of landings for country reporting through InterCatch. Faroese vessels are considered making no

discards. This low discarding proportion comes from the absence of catch of small blue ling on most of the fishing grounds. Overall, discarding is well below the maximum level of 5% for considering it negligible in ICES advice. No catch in international waters were reported in 2020 and 2021.

#### **4.3.5.2 No catch in international waters were reported in 2020.Length compositions**

Length composition times-series previously used were all updated (see below section 5.3.6 data analyses). The length composition of the landings used for the stock assessment was taken from InterCatch.

#### **4.3.5.3 Age compositions**

Age estimations have been carried out by France since 2009, using a consistent protocol (see stock annex) so even though ageing is not validated for this species, comparable data are now available for 11 years. The MYCC model uses not only the age composition but also the variability of age-at-length, so that in addition to the catch in number at age, the age-length key is necessary to this model. The age length key from France is applied to the international length distribution of the landings.

#### **4.3.5.4 Weight-at-age**

Blue ling is landed gutted in France, the only EU country where age estimation of this species is carried out. Weight-at-age is calculated using the length-at-age and length-weight relationship. Since the stock was benchmarked in 2014, the length-weight relationship used comes from the Faroese surveys, which cover a wide range of size (see stock annex).

#### **4.3.5.5 Maturity and natural mortality**

No new data.

#### **4.3.5.6 Catch, effort and RV data**

Catch data were updated, discards data reported to InterCatch were negligible (less than 5% of total catch). Effort data are not used for modelling the dynamics of the stock.

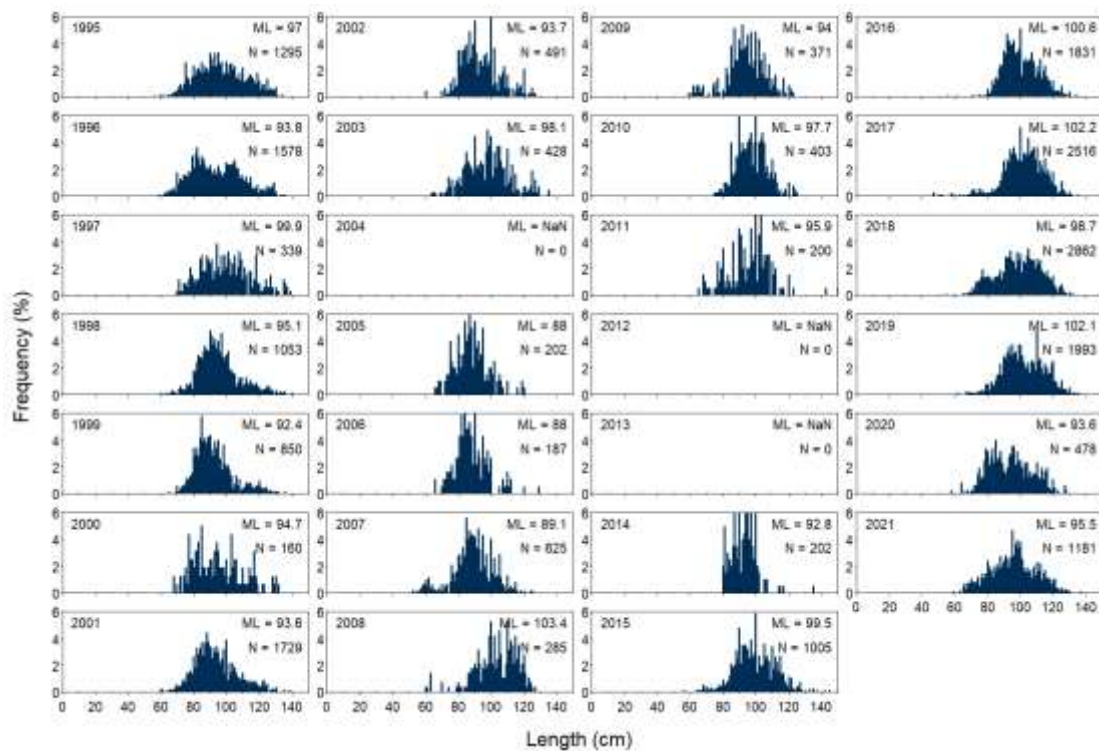
Abundance and biomass indices from surveys were all available. Blue ling is sampled in three Faroese surveys and one Scottish survey. The commercial CPUE series from the Norwegian long-liner fleet was updated (Table 4.3.3).

### **4.3.6 Data analyses**

#### **4.3.6.1 Length compositions**

Possible recruitment inputs are visible in length compositions of Faroese commercial catches in some years, e.g. 2007–2009 and again in 2018 (Figure 4.3.2).

In the sampling of Faroese landings, large numbers of fish have been measured in the last five years, making this data set useful to appraise change in the stock. On the contrary, in years 2000 to 2014, the number of fish measured seemed low. Despite the good data quality in recent years, these length distributions were not included in the assessment because quarterly length distribution was not available.



**Figure 4.3.2.** Length composition of blue ling landings from Faroese otter-board trawlers >1000 HP in Division 5.b from 1995 to 2021.

Small blue ling (between 40 and 60 cm total length) were caught in higher number during both surveys in the three last years than during most of the time series (Figures 4.3.3 and 4.3.4). The length distribution of the Faroese deep-water survey initiated in 2014 is shifted to the right compared to the other survey, which is expected as blue ling move to deeper areas with age. Nevertheless, in 2019 the deep-water survey also shows a higher proportion of smaller (60-80 cm) individuals (Figure 4.3.5).

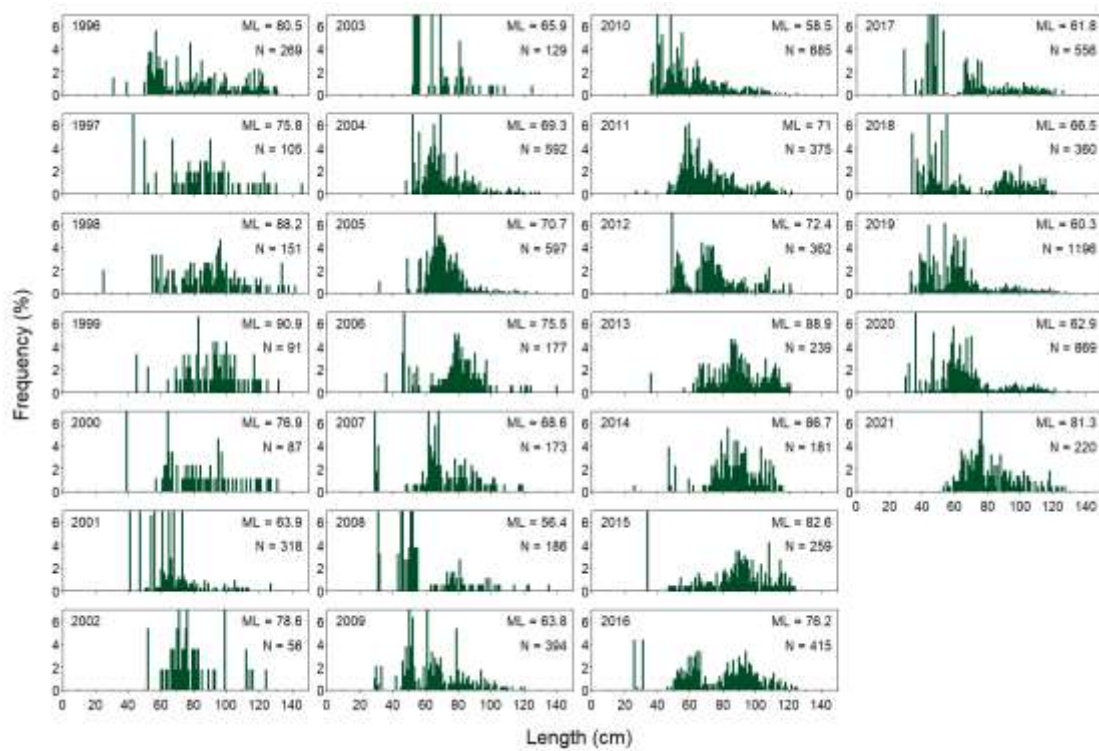


Figure 4.3.3. Length composition of blue ling in the Faroese summer groundfish survey on the Faroe Plateau (1996-2020).

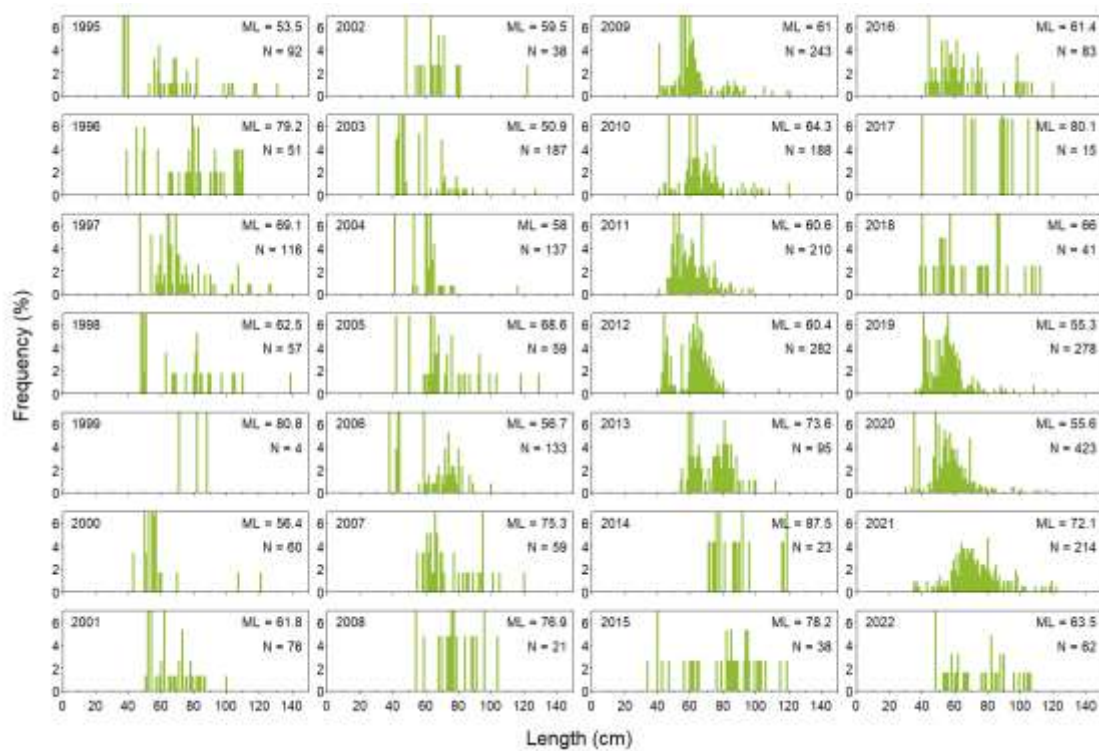
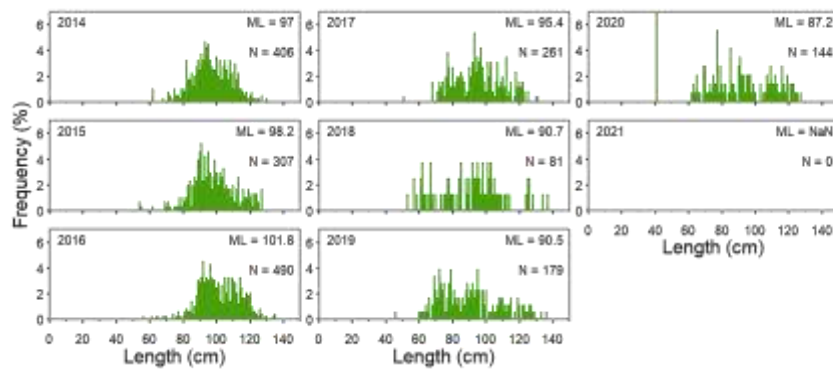


Figure 4.3.4. Length composition of blue ling in the Faroese spring groundfish survey on the Faroe Plateau (1995-2021).



**Figure 4.3.5. Length composition of blue ling in the Faroese deep-water survey in Faroese waters (2014-2021). No deep-water survey in 2021**

The length composition in French commercial data show an increasing proportion of larger fish over the past decade with an increasing proportion of fish on size larger than 1 m in the catch compared to the late 1990s to 2010 (Figure 4.3.6). The mean length was lower in years 1995-2006 and increased to a peak in 2014, then decreased further. This decreasing reflects a large income of small fish (recruitment) as in 2014-2018 the stock biomass increased and the fishing mortality was low. On the contrary, the large increase in mean length in 2019 probably reflects a lesser recruitment (Figure 4.3.7).



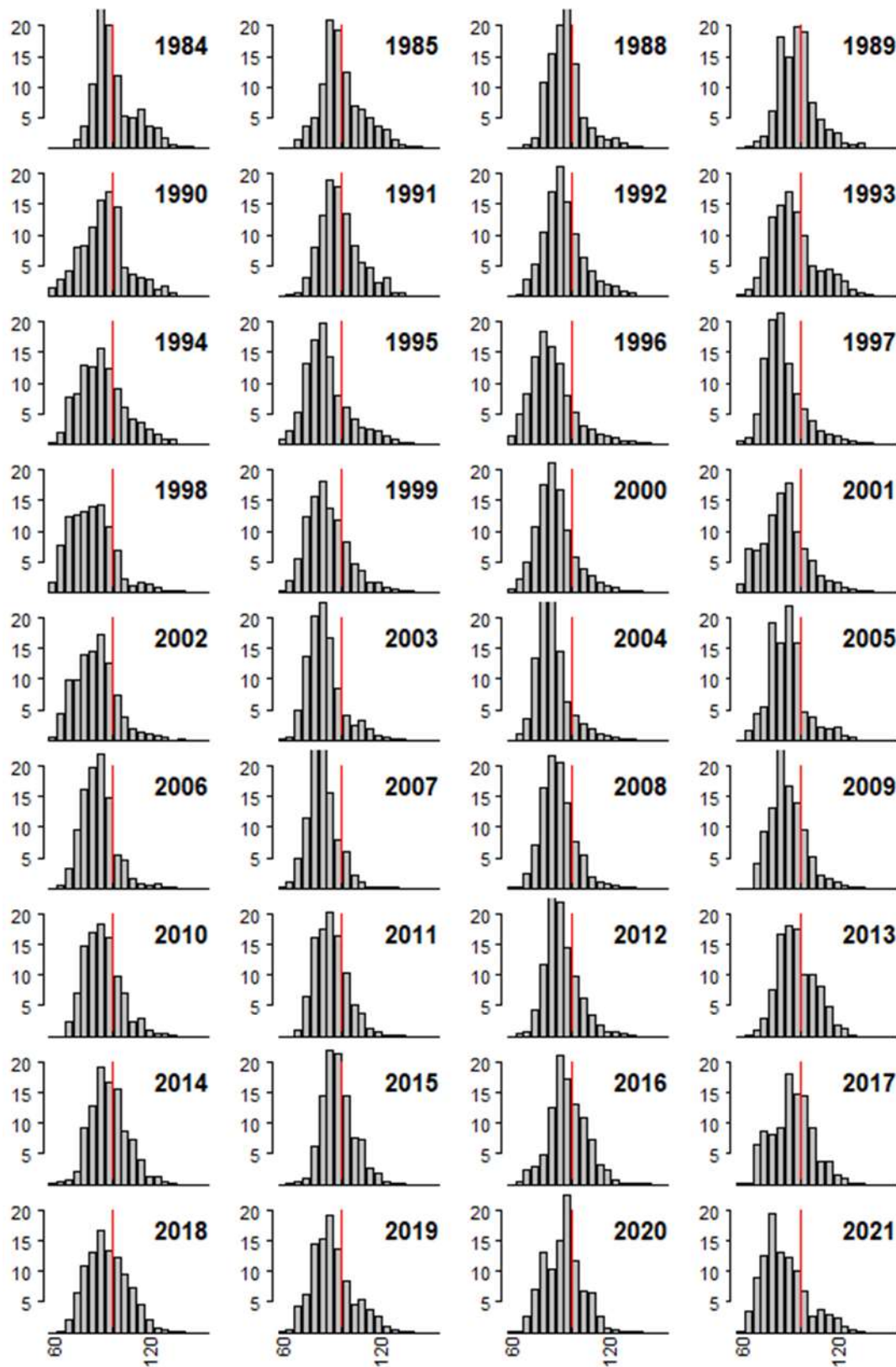


Figure 4.3.6. Length distribution of landings from 1984 to 2021 (no data in 1986-87) by 5 cm intervals. The red line represent the 100 cm size class. Length distribution based upon French landings only in 1984-2011 and combining French and Faroese length distribution in 2012-2021.



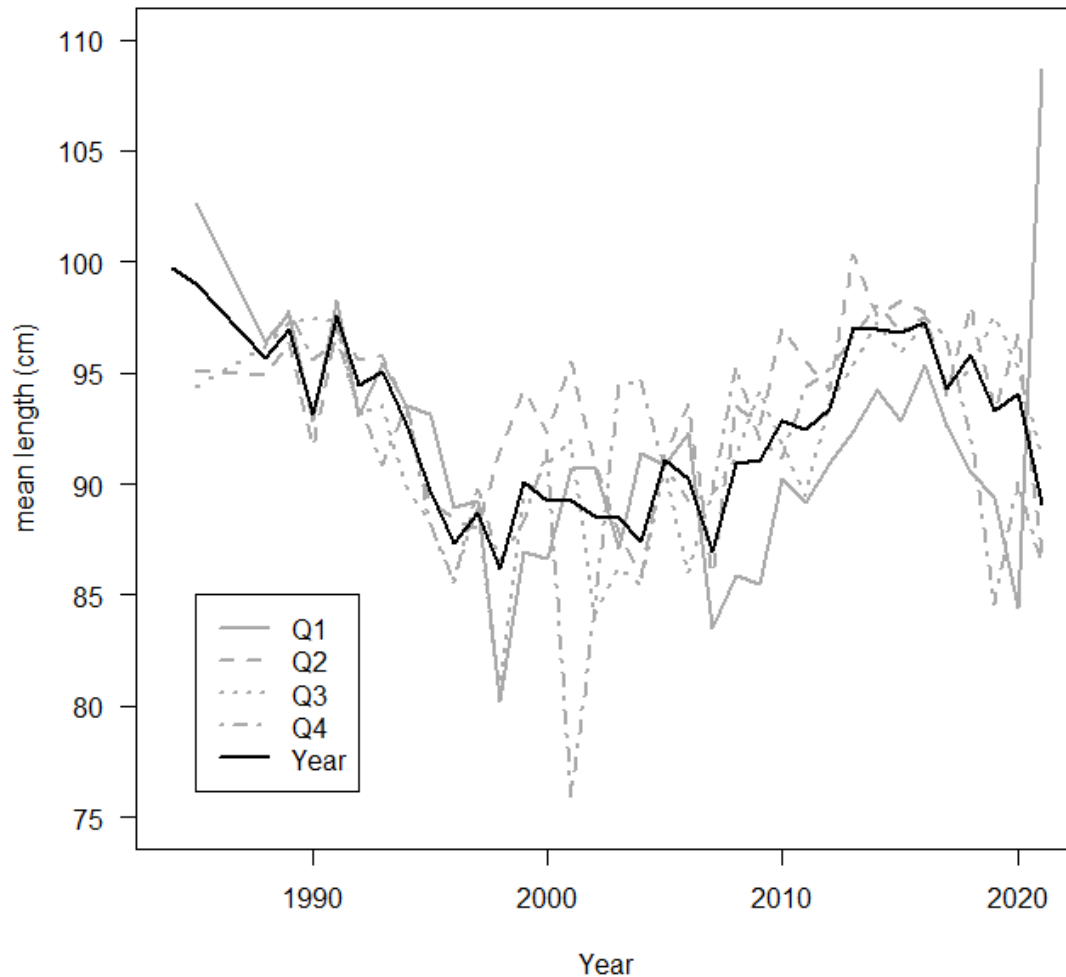


Figure 4.3.7. Quarterly mean length estimated by combining French and Faroese samples, 1984–2021 (no data in 1986–87, some years with French data only).

#### 4.3.6.2 Abundance and biomass indices

The previously used indicators of abundance and occurrence of blue ling smaller than 80 cm, also reflect this higher abundance of juveniles in Faroese surveys (Figure 4.3.8). The numbers per hour and occurrence of blue ling smaller than 80 cm caught in the last survey of both series (summer 2019 and spring 2020) are the highest since the start of these time-series. Number and occurrence of juveniles (< 80 cm) have decreased in 2021 and spring 2022.

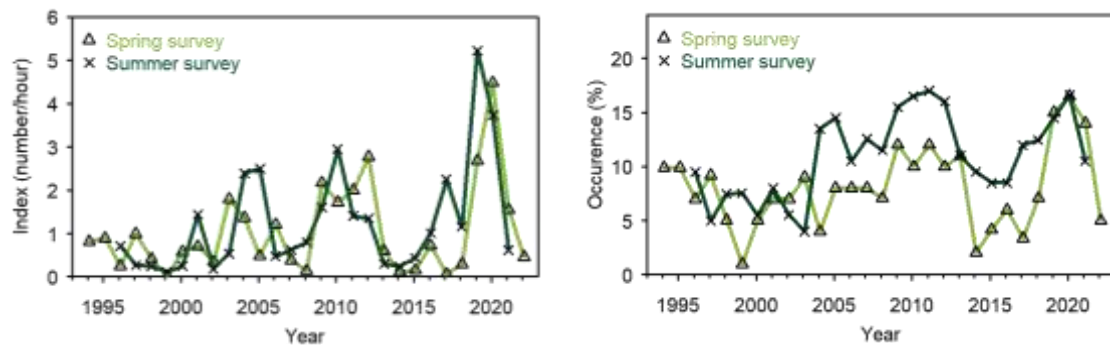


Figure 4.3.8. Juvenile (<80 cm) blue ling caught in groundfish surveys on the Faroe Plateau (left) number per hour and (right) occurrence.

The indices of total biomass from Faroese are uncertain with high values in 2004, 2005 and since 2009 for the summer survey. The spring summer shows a sharp increase since a low level in 2017. The two last points of the two surveys are amongst the highest from the whole time-series (Figure 4.3.9, Table 4.3.2). Over the last decade the indices from the two surveys did not track each other. The depth range (mostly <500 m) of these surveys do not extend down to the core depth distribution of blue ling. The indices include all hauls and are calculated using a design-based stratification.

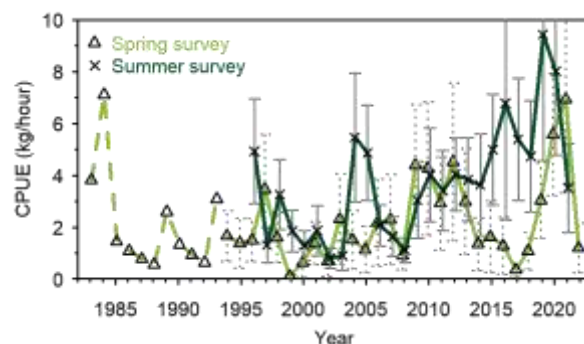


Figure 4.3.9. Biomass indices ( $\text{kg}\cdot\text{hour}^{-1}$ ) of blue ling in Faroese surveys.

Indices from the Marine Scotland trawl deepwater survey carried out on the fisheries research survey SCOTIA are uncertain (Figure 4.3.10, Table 4.3.4) probably owing to the small number of hauls per year and the aggregating distribution of blue ling. The indices are averaged numbers and weights caught per haul carried out in the depth range 400 to 1600 m ( $n = 394$  hauls for the whole time-series), which is the core range of the species along the Scottish slope. Only hauls from the Scottish slope are included, excluding data from Rockall and seamounts. The survey was performed biennially since 2013 and annually before (with no surveys in 1999, 2001, 2003 and 2010). The last survey in 2021 was carried out in October/November instead of mostly September in previous years, but the availability of blue ling is not known to change at this late summer/autumn season.

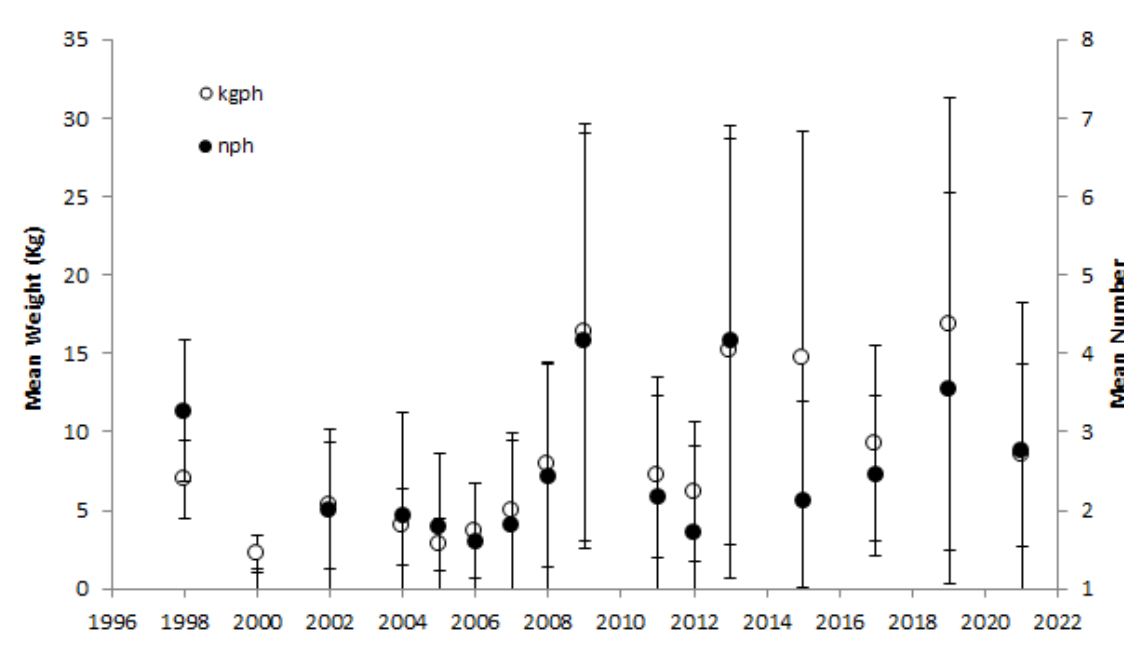


Figure 4.3.10. Biomass and abundance indices of blue ling from the Marin Scotland deep-water survey.

#### Multiyear catch curve (MYCC) model

The fit of the model reflects a sustained increase of the stock biomass since 2003. The stock biomass in 2003 is estimated to 53 000 tonnes and is the historic low, the biomass has almost doubled since at 100 000 t.

Results of the Multiyear catch curve (MYCC, see stock annex) model are presented in Figures 5.3.9 and 5.3.10. The fit of the model to the landings, considered equivalent to total catch as discards are negligible was good for recent years. The model shows erratic variation for years 1995-2003 where the quality of catch data was probably poorer and age data to fit the model start only in 2009 and do not inform much on early years (Figure 5.3.9a). The fit to proportion-at-age is generally correct, age 9 in the two last years was not well fitted, but there are few data points to fit these value at the moment (Figure 5.3.9b). Age 9 in the two early years were also not well fitted which come from a low proportion of this age groups in these years, while larger numbers of the same cohorts were caught in subsequent years. Importantly, the plot shows that there is no cohort effect.

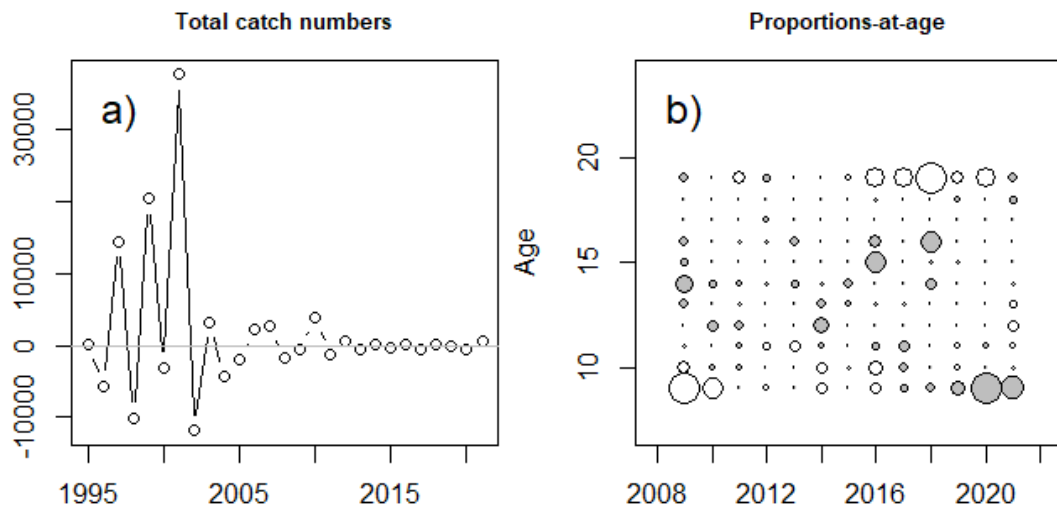


Figure 5.3.11. Diagnostic plot of the fit to the MYCC, a) residuals and b) proportion-at-age.

The total mortality was estimated to have decreased from 2001 and stabilized at 0.14-0.16 since 2013 (Figure 5.3.10). As in previous assessment, the fishing mortality has been smaller than the  $F_{MSY}=0.12$  reference point for the stock since 2004. It has been smaller than 0.07 ( $MSY F_{lower}$ ) since 2011. The total number of individuals of age 9 and over was estimated to 217 million at the start of 2022. The fishing mortality was estimated to have slightly increase in the last year (2021), remaining at a low level (below 0.06). However, because of the overall low fishing mortality and low sampling levels estimates are uncertain. The assessment presented this year is more uncertain than previously. Several effect contribute to this uncertainty. The reduction of the mean length in the landings in 2020 suggest a recruitment pulse. Landings increased strongly in 2021 with a lesser contribution of large individuals to the catch. Length distributions are uncertain because of the overall low level of sampling, less number of fish were measured in 2020 and 2021, possibly as a consequence of the pandemic situation.

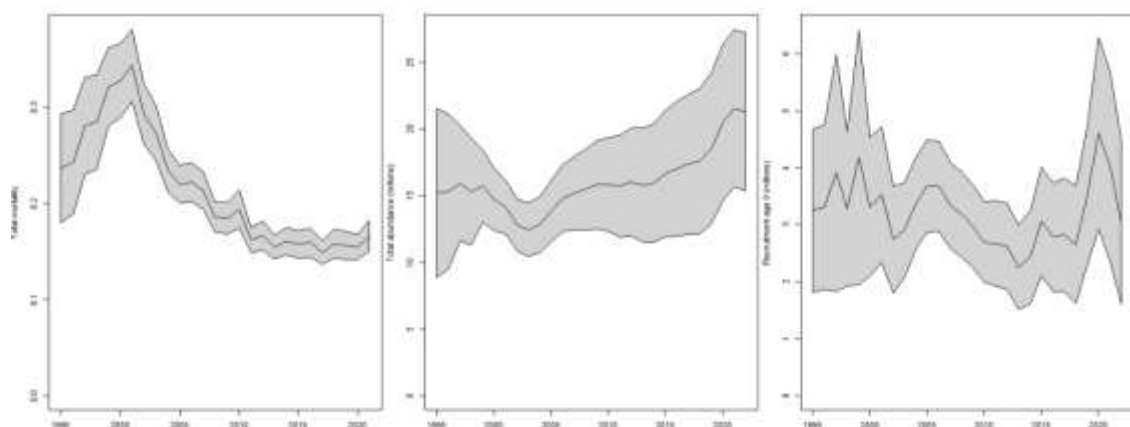


Figure 5.3.12. Model estimates 1995-2022, (left) total mortality  $Z$ , (centre) total abundance of fully recruited age groups (9 and older), (right) recruitment.

The recruitment estimate is more uncertain than previously, probably as a consequence of the recent larger estimate and low consistency of numbers caught by cohort over time. However, the average recruitment is estimated at the same level between 3 and 4 million fish. Remember that the recruitment is at age 9, younger age groups are not fully recruited as they occur in smaller abundance than age 9, only small numbers of ages 6 and younger are observed.

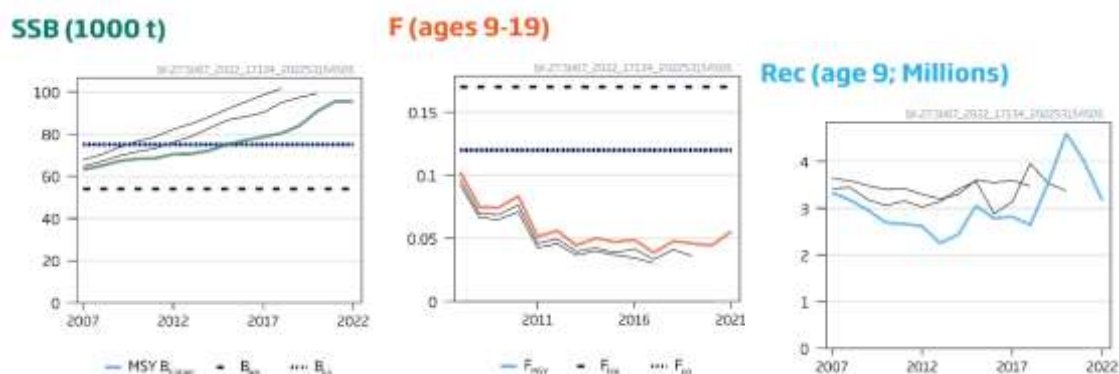
**Table 10** Blue ling in subareas 6–7 and Division 5.b. Assessment summary. Weights are in tonnes, recruitment in thousands. High and Low indicate 95% confidence intervals.

Year	Recruitment			Stock size: SSB			Landings	Fishing pressure: F		
	R <sub>age 9</sub>	High	Low	SSB	High	Low		F <sub>ages 9–18</sub>	High	Low
	thousands			tonnes						
1995	3247	4683	1811	65099	108649	21549	7570	0.126	0.183	0.069
1996	3305	4749	1861	65466	108320	22613	8531	0.132	0.19	0.078
1997	3914	6003	1824	67431	111369	23492	10367	0.170	0.22	0.120
1998	3276	4635	1918	64960	105565	24355	10682	0.174	0.22	0.124
1999	4192	6430	1953	65763	106341	25185	12406	0.21	0.25	0.170
2000	3314	4525	2103	61685	97264	26107	11160	0.22	0.26	0.178
2001	3533	4731	2336	58983	90439	27527	12127	0.23	0.27	0.20
2002	2742	3680	1803	53590	80573	26608	8753	0.183	0.21	0.152
2003	2908	3738	2078	52134	76398	27869	7275	0.162	0.190	0.133
2004	3381	4189	2574	53377	75819	30935	6222	0.124	0.146	0.101
2005	3683	4493	2873	57156	78817	35494	5540	0.109	0.129	0.090
2006	3677	4468	2887	61041	82187	39895	5650	0.112	0.132	0.091
2007	3334	4090	2578	63150	83416	42883	5648	0.103	0.123	0.083
2008	3182	3932	2431	64838	85000	44677	3940	0.075	0.090	0.059
2009	2961	3690	2231	67147	86972	47321	4121	0.074	0.091	0.058
2010	2694	3405	1983	68237	88378	48097	4759	0.084	0.103	0.064
2011	2669	3413	1925	68501	88996	48006	2861	0.051	0.064	0.038
2012	2621	3377	1865	70444	91737	49151	3016	0.056	0.071	0.041
2013	2251	2990	1512	70649	92693	48605	2675	0.044	0.057	0.032
2014	2438	3256	1619	72117	95232	49002	2963	0.050	0.065	0.036
2015	3056	4013	2099	75028	99593	50462	2748	0.047	0.061	0.033
2016	2783	3735	1831	76983	102957	51009	2734	0.049	0.064	0.034
2017	2824	3816	1831	78684	106120	51249	2673	0.039	0.051	0.027
2018	2644	3673	1614	80265	109248	51283	3310	0.048	0.063	0.033
2019	3543	4762	2325	83902	114871	52933	3268	0.046	0.060	0.032
2020	4609	6296	2922	90852	125170	56533	3478	0.044	0.058	0.031

Year	Recruitment			Stock size: SSB			Landings	Fishing pressure: F		
	$R_{age\ 9}$	High	Low	SSB	High	Low		$F_{ages\ 9-18}$	High	Low
	thousands			tonnes						
2021	4004	5668	2340	95478	132781	58174	5285	0.056	0.072	0.040
2022	3168*			95515	134560	56470				

\*Geometric mean from 1995 to 2021.

The retrospective pattern of the assessment shows a tendency of the assessment to over-estimate SSB and under-estimate fishing mortality (Figure 5.3.11). The Mohn's  $q$  was -0.038 for  $F$ , 0.078 for biomass and 0.10 for recruitment.



#### Reference points

Reference points the stock were defined as  $F_{MSY}=0.12$ ,  $MSY\ F_{lower}=0.08$  and  $MSY\ F_{upper}=0.17$ .  $MSY\ B_{trigger}$  was set as  $B_{pa}=1.4*B_{lim}$  (table below), because the variability of the stock dynamics was not fully captured by the analysis (ICES 2016). This is because the only input available, at the time was the Stock reduction analysis (SRA) as the MYCC did not cover a sufficient time-series to estimate a stock–recruitment relationship. SRA does not allow for significant variability of recruitment. In these circumstances a  $MSY\ B_{trigger}$  based on 5% of  $B_{MSY}$  is not meaningful and was not recommended.  $B_{lim}$  was set as  $B_{loss}$ , the lowest biomass estimate in the time-series (here the time-series of biomass from the SRA estimated in 2014).

Reference points for bli-5b67 estimated by WKMSYref4.

$MSY\ F_{lower}$	$F_{MSY}$	$MSY\ F_{upper}$ with AR	$MSY\ B_{trigger}$ (tonnes)	$MSY\ F_{upper}$ with no AR
0.08	0.12	0.17	75 000	0.14

Further,  $F_{lim}$  was estimated to 0.17 based on simulated fishing mortality to  $B_{lim}$  and  $F_{pa}$  was estimated to 0.12 as  $F_{lim}*\exp(-1.645*0.2)$ . Therefore,  $F_{pa}$  is estimated to be equal to  $F_{MSY}$  and  $F_{lim}$  to  $MSY\ F_{upper}$ . This comes from setting  $B_{lim}$  at  $B_{loss}\approx 20\%$  of the unexploited biomass, which is in all circumstances much more than 5%  $B_{MSY}$ , again, a level not used here because the long-term mean of  $B_{MSY}$  could not be projected in a projection taking account of recruitment variability.

### 4.3.7 Comments on assessment

The assessment became more uncertain than previously. Uncertainties may arise from several reasons including (1) age estimation of blue ling is difficult and keeping the reading scheme of otolith consistent over years is challenging, (2) the level of sampling of length distribution of landings is insufficient, which implies that because of small samples the estimated length distribution may not be representative. Erratic variations from year-to-year impact on the age composition and the fit of the model. The level of fishing mortality is low for more than 10 years, it is overall about half that of the natural mortality, this low level contributes also to the uncertainty.

In previous years, the length distribution used was estimated from French sampling only. This year, French and Faroese samples were combined starting from 2012. This implied minor changes in the estimated length distribution in 2012-2019.

#### 4.3.7.1 Management considerations

International landings have been well below the ICES advice for several years. This is the consequence of several factors including:

- in Faroese waters, fleets have other resources available and do not target particularly blue ling,
- in EU waters the major fishing country has been France since the 1970s, the French fleets of large trawlers has reduced and the remaining vessels fish primarily for saithe and hake,
- historically most of the landings were caught in quarter 2 during the spawning season, the fishing for spawning blue ling is now restricted in particular in Division 6a (EU regulation 2019/1241), this regulation was transcribed to the UK regulation and therefore continued to apply in 2021,
- the ban of trawling deeper than 800 m for EU fleets since 2016, reduced the access to the stock which depth distribution extends deeper., this regulation was transcribed to the UK regulation and therefore continued to apply in 2021.

### 4.3.8 Recommendation

The number of length samples in recent years has been small. Data for the Faroe Islands include more than 1000 blue ling measured from commercial landings in most years. These data are not provided through InterCatch, which would ease the assessment. They were however integrated in the current assessment. Further, although the MYCC model uses data aggregated by year, length distribution by quarter would be useful to help detecting e.g. the recruitment season. Numbers of fish measured from other countries have been too small. In 2020 and 2021, the two main fishing countries were France and Scotland, with close to 2000 tonnes landed from each in 2021. These countries provided data through InterCatch. Nonetheless, there was overall less than 500 fish length measurements in InterCatch for 2021. Landings from longline fisheries increased in 2021 and those were not or little sampled. These lack of sampling compromise the reliability of the assessment. Much larger numbers of blue ling were measured in 2010-2018. The increase in landings in 2021 makes it necessary that sufficient data is collected in future years to reliably assess the stock.

### 4.3.9 References

ICES. 2016. Report of the Workshop to consider  $F_{MSY}$  ranges for stocks in ICES categories 1 and 2 in Western Waters (WKMSYREF4), 13–16 October 2015, Brest, France. ICES CM 2015/ACOM:58. 187 pp.

Large, P. A., G. Diez, J. Drewery, M. Laurans, G. M. Pilling, D. G. Reid, J. Reinert, A. B. South, and V. I. Vinnichenko. 2010. Spatial and temporal distribution of spawning aggregations of blue ling (*Molva dypterygia*) west and northwest of the British Isles. ICES Journal of Marine Science 67:494–501.



### 4.3.10 Tables

Table 4.3.1a. Landings of blue ling in Subdivision 5.b.1 (see stock annex for years before 2000).

YEAR	FAROEES	FRANCE(1)	GERMANY(1)	NORWAY	UK (E & W) (1)	UK (Scot.)	IRELAND	RUSSIA(1)	TOTAL
2000	1677	575	1	163	33			1	2450
2001	1193	430	4	130	11		2		1770
2002	685	578		274	8				1545
2003	1079	1133		12	1				2225
2004	751	1132		20				13	1916
2005	1028	781		74	1				1884
2006	1276	839		21	1			16	2153
2007	1220	1166		212	8			36	2642
2008	642	865		35				110	1652
2009	523	325						0	848
2010	840	464		49			0	0	1353
2011	838	312		0			0	0	1150
2012	799	401		8			0	5	1213
2013	440	543		0			0	3	986
2014	730	606		29					1365
2015	621	142	0	140	0		0	0	903
2016	1100	302	0	74	0		0	0	1476
2017	766	267	0	21	0	3	0	0	1057
2018	818	220	0	150	0	0	0	0	1188
2019	573	385		29					987
2020	697	580	0	87		5	0		1369
2021	651	477	0	212		10			1350

(1) Includes 5.b.2.

**Table 4.3.1b. Landings of Blue ling in Subdivision 5.b.2 (see stock annex for years before 2000).**

YEAR	FAROEES	NORWAY	SCOTLAND	France	TOTAL
2000	0	37	37		74
2001	212	69	63		344
2002	318	21	140		479
2003	1386	84	120		1590
2004	710	6	68		784
2005	609	14	68		691
2006	647	34	16		697
2007	632	6	16		654
2008	317	0	91		408
2009	444	8	161		613
2010	656	10	225		891
2011	319	0	0		319
2012	211	0			211
2013	133	0	2		135
2014	150	6	2		158
2015	82	97		46	225
2016	13	0	7		20
2017	88	9	0	0	97
2018	151	0	0	0	151
2019	64	56	0	0	120
2020	102	0	4	0	106
2021	196	0	88	0	284

**Table 4.3.1c. Landings of blue ling in Division 6.a (see stock annex for years before 2000).**

YEAR	FAROEES	FRANCE	GERMANY	IRELAND	NORWAY	SPAIN(1)	E & W	SCOTLAND	LITHUANIA	TOTAL
2000		4544	94	9	102	108	24	1300		6181
2001		2877	6	179	117	797	116	2136	16	6244
2002		2172		125	61	285	16	2027	28	4714
2003	7	2010		2	106	3	3	428	29	2588
2004	10	2264		1	24	4	1	482	38	2824
2005	17	2019		2	33	88		390	1	2550
2006	13	1794		1	49	87	3	433	2	2382
2007	13	1814			31	47		113	1	2019
2008	14	1579			73	10		112	2	1790
2009	11	2202			74	165		178		2630
2010	43	1937			86	223		134		2423
2011	10	1136			93	10		74		1323
2012	5	1185			86	6		47		1329
2013	2	1128			132	11		203		1476
2014		1109			18			278		1405
2015	0	920	0	0	127	83	8	371	0	1509
2016	0	776			37	124	0	273	0	1210
2017	0	777	0	0	29	44	0	641	0	1491
2018		1066			87	72		735		1970
2019		1235			67	92		718		2112
2020		985			28	244		710		1967
2021	1	1472	0	0	0	0	367	1797	0	3637

**Table 4.3.1d. Landings of blue ling in Division 6.b (see stock annex for years before 2000).**

[illegible]

YEAR	POLAND	RUSSIA	FAROEES	FRANCE	GERMANY	NORWAY	E & W	SCOTLAND	ICELAND	IRELAND	ESTONIA	SPAIN	TOTAL
2017	0			0	0	1						21	22
2018				0				1				6	7
2019						3		1				5	9
2020	0		0	0	0	0	2	0	0	6	0		8
2021	0	0	0	0	0	0	0	0	0	0	0	0	0

<sup>(1)</sup> Includes unallocated catch.

Table 4.3.1e. Landings of blue ling in Subarea 7 (see stock annex for years before 2000).

YEAR	FRANCE	GERMANY	SPAIN	NORWAY	E & W	SCOTLAND	IRELAND	TOTAL
2000	91	2	65	5	31	17	73	284
2001	84	2	64	5	29	17	634	835
2002	45	4	42	0	77	55	453	676
2003	27	1	42	0	8	16	28	122
2004	23	1	15	0	4	1	19	63
2005	37	0	25	0	1	0	11	74
2006	30	0	31	0	2	0	4	67
2007	121	0	38	0	2	1	2	164
2008	28	0	6	0	0	0	0	34
2009	10	0	1	0	0	0	0	11
2010	13	0	24	0	0	0	0	37
2011	23	0	26	0	0	0	0	49
2012	18	0	21	5	0	0	0	44
2013	35	0	0	0	0	0	0	35
2014	26				3	2		31
2015	11	0	63	0	3	1	0	78
2016	8	0	0	0	0	1	1	10
2017	'	1	0	0	1	0	0	6
2018	4	0	0	0	0	0	0	4
2019	4	0	35	0	0	0	0	39
2020	4	0	0	0	24	0	0	28
2021	6	0		0	8		0	14

Year	Estonia	Faroes	France(1)	Germany(1)	Iceland	Ireland	Lithuania(2)	Norway(2)	Poland	Russia (1)	Spain	UK (E & W)	UK (Sco)	Total
2000	0	1677	5724	97		89	0	491	0	1	173	588	2320	11160
2001	85	1643	3601	13		819	16	577	0	0	861	493	4019	12127
2002	0	1082	3140	4	0	579	28	629	0	3	327	242	2719	8753
2003	5	2472	3680	1	0	30	29	304	4	2	45	26	677	7275
2004	3	1475	3933	1	0	20	38	52	1	18	19	15	647	6222
2005	0	1655	3072	0	0	13	1	122	0	15	113	11	538	5540
2006	0	1939	2976	0	0	5	2	106	0	16	118	10	478	5650
2007	0	1880	3213	0	0	2	1	253	0	37	85	17	160	5648
2008	0	975	2501	0	0	0	2	110	0	122	16	2	212	3940
2009	0	978	2547	0	0	0	0	83	0	1	166	0	346	4121
2010	0	1539	2453	0	0	0	0	160	0	0	247	0	360	4759
2011	0	1167	1480	0	0	0	0	104	0	0	36	0	74	2861
2012	0	1015	1609	0	0	0	0	102	0	5	238	0	47	3016
2013	0	575	1715	0	0	0	0	132	0	3	45	0	205	2675
2014	0	880	1741	0	0	0	0	53	0	0	1	3	285	2963
2015	0	703	1119	0	0	0	0	366	0	0	177	11	372	2748
2016	0	1113	1086	0	0	1	0	111	0	0	142	0	281	2734
2017	0	854	1048	1	0	0	0	60	0	0	65	1	644	2673

Year	Estonia	Faroes	France(1)	Ger-many(1)	Iceland	Ireland	Lithua-nia(2)	Nor-way(2)	Poland	Russia (1)	Spain	UK (E & W)	UK (Sco)	Total
2018	0	969	1290	0	0	0	0	237	0	0	78	0	736	3310
2019	0	638	1624	0	0	0	0	155	0	0	132	0	719	3268
2020	0	799	1569	0	0	0	0	121	0	0	274	0	715	3478
2021	0	848	1955	0	0	0	0	300	0	0	375	0	1807	5285



**Table 4.3.1f. Blue ling landings in Division 5.b and subareas 6 and 7 (see stock annex for years before 2000).**

YEAR	5.b	6	7	TOTAL
2000	2524	8352	284	11 160
2001	2114	9178	835	12 127
2002	2024	6053	676	8753
2003	3815	3338	122	7275
2004	2700	3459	63	6222
2005	2575	2891	74	5540
2006	2850	2733	67	5650
2007	3296	2188	164	5648
2008	2060	1846	34	3940
2009	1461	2649	11	4121
2010	2244	2478	37	4759
2011	1469	1343	49	2861
2012	1424	1548	44	3016
2013	1121	1519	35	2675
2014	1523	1409	31	2963
2015	1128	1542	78	2748
2016	1496	1228	10	2734
2017	1154	1513	6	2673
2018	1339	1967	4	3310
2019	1108	2121	39	3268
2020	1475	1975	28	3478
2021	1634	3637	14	5285

**Table 4.3.2. Standardized biomass indices (kg/h) of blue ling in the annual demersal trawl spring and summer survey on the Faroe Plateau.**

YEAR	SPRING SURVEY		SUMMER SURVEY	
	Index	SE	Index	SE
1994	1.66	0.98		
1995	1.38	0.95		
1996	1.39	0.78	4.93	2.03
1997	3.46	2.10	1.31	0.67
1998	1.60	0.97	3.26	1.34
1999	0.10	0.06	1.85	0.81
2000	0.63	0.58	1.28	0.57
2001	1.38	0.83	1.87	0.96
2002	0.68	0.58	0.80	0.40
2003	2.31	1.76	0.90	0.57
2004	1.51	1.12	5.46	2.47
2005	1.13	0.90	4.87	1.84
2006	2.18	1.68	2.06	0.80
2007	2.30	1.74	1.64	0.76
2008	0.90	0.55	1.11	0.48
2009	4.39	2.35	3.04	1.48
2010	4.27	2.58	4.01	1.80
2011	2.92	1.79	3.41	1.55
2012	4.52	3.05	4.04	1.41
2013	2.99	2.04	3.84	1.61
2014	1.36	1.01	3.63	1.97
2015	1.63	1.38	5.00	2.14
2016	1.28	1.1	6.78	4.50
2017	0.35	0.3	5.38	2.36
2018	1.08	0.72	4.73	2.14
2019	3.03	1.47	9.44	4.88
2020	5.59	2.36	8.02	3.23

YEAR	SPRING SURVEY		SUMMER SURVEY	
	Index	SE	Index	SE
2021	6.93	3.60	3.52	1.72
2022	1.20	0.96		

**Table 4.3.3. Standardized cpue index (kg/1000 hooks) from the Norwegian longliners in ICES Division 6.a.**

YEAR	LOWER LIMIT	MEAN INDEX	UPPER LIMIT
2000	8.07787	11.5548	15.0318
2001	4.60621	8.82401	13.0418
2002	8.40796	13.3235	18.2389
2003	4.54772	7.89182	11.2359
2004	1.55956	5.33972	9.11989
2005	5.68665	8.7668	11.847
2006	10.7495	13.8033	16.8571
2007	7.18068	10.7865	14.3923
2008	14.6099	18.4694	22.3289
2009	11.7957	16.2868	20.778
2010			
2011	14.141	16.7851	19.4292
2012	16.9459	19.8301	22.7144
2013	19.1724	21.7229	24.2733
2014	8.23313	11.3728	14.5126
2015	21.8908	24.7353	27.5797
2016	8.60406	11.761	14.918
2017	8.91193	11.9361	14.9602
2018	12.3624	15.0228	17.6833
2019	12.2703	15.1831	18.096

**Table 4.3.4. Abundance (nb.hour<sup>-1</sup>) and biomass (kg.h<sup>-1</sup>) indices from the Scottish deep-water survey in ICES Division 6.a. Lower in upper bounds of 95% confidence intervals of the mean are estimated assuming a normal distribution.**

Year	Number per hour			Weight per hour (kg)			Number of hauls
	Lower bound	Mean	Upper bound	Lower bound	Mean	Upper bound	
1998	2.366	3.263	4.160	4.47	7.0	9.48	19
1999							
2000	0.462	0.857	1.252	1.04	2.2	3.45	35
2001							
2002	0.964	2.000	3.036	1.22	5.3	9.39	27
2003							
2004	0.599	1.929	3.258	1.55	4.0	6.43	28
2005	0.820	1.778	2.536	1.16	2.8	4.48	18
2006	0.864	1.607	2.350	0.65	3.7	6.67	28
2007	0.739	1.810	2.880	-0.08	4.9	9.94	21
2008	0.994	2.429	3.863	1.42	7.9	14.39	28
2009	1.524	4.167	6.809	3.07	16.4	29.64	24
2010							
2011	0.641	2.172	3.703	1.96	7.1	12.32	20
2012	0.596	1.711	2.826	1.74	6.2	10.63	27
2013	1.571	4.154	6.738	0.70	15.1	29.51	23
2014							
2015	0.875	2.130	3.386	0.12	14.6	29.14	24
2016							
2017	1.423	2.447	3.471	3.04	9.2	15.46	29
2018							
2019	1.058	3.554	6.049	2.47	16.9	31.23	18
2020							
2021		2.753	4.674	2.692	8.512	14.331	17

## 4.4 Blue ling (*Molva dypterygia*) in 1, 2, 3.a, 4, and 12

### 4.4.1 The fishery

The directed fisheries on spawning aggregations for blue ling on Hatton Bank (ICES Division 12.b) and ICES Division 2.a (Storegga) are no longer conducted. Blue ling is now only taken as bycatch of other fisheries taking place in these areas.

In Hatton Bank (Division 12.b) blue ling has represented a significant bycatch of trawl fisheries for mixed deep-water species; especially from Spanish freezer trawlers. In Division 2.a there is a bycatch from the longline and gillnet fisheries on ling, tusk and saithe.

In other ICES subareas blue ling is taken in minor quantities. Small reported landings in Subareas 8 and 9 are now ascribed to the closely related Spanish ling (*Molva macrophthalma*) since the species is not known to occur in any significant numbers in these subareas.

### 4.4.2 Landing trends

Landing data are presented in Tables 4.4.0a–f. There are also historical landings from the Norwegian fishery, mainly from Division 2.a, back from 1896 (Figure 4.4.1). During the whole time-series, around 90% or more of the total landings were taken in Subareas 2, 4 and 12 combined. Landings from Subarea 12 which primarily are from the western slope of Hatton Bank (ICES Division 12.b) are now very low. Landings are now reported mostly from ICES Divisions 2a and 4a. In 2021, 98% of the landings came from Subarea 2 and 4 and this was mainly Norwegian landings. In 2019 and from Subarea 1, Iceland has landed 45% of total landings from the whole stock area but there are some uncertainties about this number. In 2020, Iceland had no landings from this area.

For all areas, a continuous decline on landings has been observed after the higher landing levels in the 1988–1993 period and total landings are now 13% of that level. However, the total landings have increased since 2015 which was the lowest level recorded since 1988. As a result of the Icelandic landings from Subarea 1, the total landings from 2018–2019 more than doubled (348–862 tons). For 2020, the total landings are at recent levels.

### 4.4.3 ICES Advice

The ICES advice for 2020 to 2023 is:

*“ICES advise that when precautionary approach is applied, there should be zero catches in each of the years 2020 to 2023. Closed areas to protect spawning should be maintained.”*

### 4.4.4 Management

A 2022 precautionary TAC for EU vessels in international waters of ICES Subarea 12 was set to 76 tonnes and only applicable to bycatches; no directed fishery for blue ling was allowed in this area. TACs for vessels in EU waters, United Kingdom and international waters of ICES Division 5, and Subareas 6 and 7 were set to 10859 tons; of this a quota for UK vessels was set to 2527 tonnes; for Norway and Faroe Islands, each to be fished in Union waters of ICES Subareas 4, 6 and 7. In United Kingdom and international waters of Subareas 2 and United Kingdom and Union waters of 4, a precautionary TAC for EU vessels was set to 20 tonnes and United Kingdom vessels to 7 tonnes. In European Union and international waters of ICES Division 3.a, a precautionary TAC for EU vessels was set to 4 tonnes.

## **4.4.5 Data availability**

### **4.4.5.1 Landings and discards**

Landings and discards data are presented in Table 4.4.0a–f and 4.4.1 respectively. The discards data from Scotland were revised in 2021 and the Scottish discards were updated in the table for 2015–2020 (Table 4.4.1).

### **4.4.5.2 Length compositions**

Length compositions from the Norwegian longline and gill net fishery from 2002–2021 are available (Figure 4.4.2). Length compositions from the Spanish fishery from 2017 in Stock Annex.

### **4.4.5.3 Age compositions**

No age data are available.

### **4.4.5.4 Weight-at-age**

No weight-at-age data are available.

### **4.4.5.5 Maturity and natural mortality**

No data were available.

### **4.4.5.6 Catch, effort and research vessel data**

For the Norwegian catches there was presented a CPUE from Subareas 1, 2 and 4 and ICES Division 3.a combined (Figure 4.4.3). The CPUE series was calculated for the time period 2000–2021 and is based on longline data from the Norwegian fishery.

## **4.4.6 Data analyses**

The assessment for this stock is based on landing trends (Figures 4.4.4–4.4.6). This is followed by some uncertainties because the trends in landings can be a consequence of changes in effort rather than changes in the stock. However, it is regarded that the situation for the stock is reflected by the landings and it is also thought that discards are minimal since the fishery is exclusively done on larger individuals.

The landings have declined for all areas and the mean landings are now only 13% of the mean landings from the years 1988–1993 (the period with stable landings). There has been however, some fluctuations in landings for some areas.

Landings from Subarea 1 has always been low (less than 5 t for the whole time series). However, for 2019 Iceland landed 389 tons (45% of total landings for the whole stock area) which were assigned to in Subarea 1. For 2020–21 and for Subarea 1, there were no Icelandic landings and the total landings are back on recent, low levels.

The historical Norwegian landings, mainly in ICES Division 2.a reached almost 6000 tonnes in 1980. Since then, landings have decreased. In 2010, there was an increase in landings from Subarea 2 as a result of an increase in Faroese landings. From 2013 onwards, landings are at the same low levels as seen in the early 2000s. Landings in 2015 were lowest on record but have increased since then.

The increase of landings in Division 3a in 2005 (2.5 times increase from 2004–2005) is likely to be associated to the increase of the Danish roundnose grenadier fishery. This fishery stopped in 2006 and the landings of blue ling have since been insignificant.

The landings in Subarea 4 increased from 2019-2021. This increase came from Norwegian and French landings. French landings for 2021 is 78 t; other landings are low.

An increase on French and Norwegian landings from Subarea 4 was also registered in 2010-2012. The landings then decreased to less than 100 tons and the landings have been stable around this level since 2015. The 2020 level of landings was back to the increased level in 2010-12. The landings for 2021 are again around 100 t. An analyse of the French 2021 landing data by gear type revealed that 60% of the blue ling was taken with bottom trawl and 30% with longlines.

In Subarea 12 and after relative high levels for the period 2001–2005 landings have declined. Spain has for many years been the only country reporting landings from this area; for 2021 there are no Spanish landings from Subarea 12. The reported landings from this Subarea have always been from Division 12b; however, from 2019-20 there was also some landings from Division 12a. For 2021, the landings are from 12.a.4 (Norwegian landings).

Denmark and Scotland report discards from Division 4a. A revision of the Scottish discard data for 2015-2020 was done. The revised values for Scottish discards increased, especially in 2019. Total discards are now less than 3 tonnes.

The Norwegian length compositions from the longline and gill net fishery from 2002-2021 show some years inclusions of smaller fish. It is also possible to follow a dominant group of ages from year to year in some periods (from 2009-2014 and 2015-2021). The mean length varies from 77-100 cm.

The length compositions from Spanish landings from 2017 show lengths from 69-129 cm (See Stock Annex). This is in the same range as seen in length compositions from Faroese catches from areas 5.b, 6 and 7.

The Norwegian CPUE series shows a low level and varies without any trend for the years 2000–2021. Although there is no directed fishery from this area there seems to be no recovery for this part of the stock.

#### **4.4.6.1 Biological reference points**

There are not yet suggested methods to estimate biological reference points for category 5 and 6 stocks.

#### **4.4.7 Comments on assessment**

Assessment is based on landing trends. Landings have declined since the 90's (Figure 4.4.7) and are thought to represent stock status. However, there was some concern about the 2020 year increase in Norwegian landings in Subarea 4. In this subarea, blue ling is bycatch in ling and tusk fishery and these bycatch landings may come from a shift to larger proportion of gill nett landings in the fishery for ling. The Norwegian landings from 2021 is now low.

#### **4.4.8 Management considerations**

Trends in landings suggest serious depletion in Subarea 2 and perhaps also for the other Subareas. Landings have also declined strongly in Subarea 12 from 2002 onwards. Landings in other subareas and divisions are minor but there is some evidence of a persistent decline.

The advice given in 2019 remains appropriate.

Blue ling specimens caught in Division 12.b probably belong to the same stock that is exploited in Subarea 6. Management of Division 12.b should be consistent with the Advice for ICES Division 5.b and for Subareas 6 and 7.

The bulk of current bycatches of blue ling from subareas and divisions treated in this section are taken within EE (Table 4.4.2).



### 4.4.9 Tables

Table 4.4.0a. Blue ling (*Molva dypterygia*). Working group estimates of landings (tonnes) in Subarea 1. (\* preliminary).

Year	Iceland	Norway	France	Faroes	Greenland	Total
1988		10				10
1989		8				8
1990		4				4
1991		3				3
1992		5				5
1993		1				1
1994		3				3
1995		5				5
1996		2				2
1997		1				1
1998		1				1
1999		1				1
2000		3				3
2001		1				1
2002		1				1
2003						0
2004		1				1
2005		1				1
2006						0
2007						0
2008						0
2009		1				1
2010		1				1
2011			3			3
2012			1			1
2013						0
2014				4		4

Year	Iceland	Norway	France	Faroes	Greenland	Total
2015						0
2016		1				1
2017						0
2018	6				16	22
2019	389					389
2020		1				1
2021*		1		+		1

**Table 4.4.0b. Blue ling (*Molva dypterygia*). Working group estimates of landings (tonnes) in divisions 2.a, b. (\* preliminary).**

Year	Faroes	France	Germany	Greenland	Norway	E & W	Scotland	Sweden	Russia	Total
1988	77	37	5		3416	2				3537
1989	126	42	5		1883	2				2058
1990	228	48	4		1128	4				1412
1991	47	23	1		1408					1479
1992	28	19		3	987	2				1039
1993		12	2	3	1003					1020
1994		9	2		399	9				419
1995	0	12	2	2	342	1				359
1996	0	8	1		254	2	2			267
1997	0	10	1		280					291
1998	0	3			272		3			278
1999	0	1	1		287		2			291
2000		2	4		240	1	2			249
2001	8	7			190	1	2			208
2002	1	1			129	1	17			149
2003	30				115		1	1		147
2004	28	1			144				1	174
2005	47	3			144	1			2	197
2006	49	4			149					202
2007	102	3			154		3			262

Year	Faroes	France	Germany	Greenland	Norway	E & W	Scotland	Sweden	Russia	Total
2008	105	9			208		11			333
2009	56	1			219		9			285
2010	183	1			234		4			422
2011	312	7			167					486
2012	188	7			142		1			338
2013	79	16			107					202
2014	29	16			73		9			127
2015	16	6			91					113
2016	22	7	0.059		57		1			87
2017	57	5			112		3			177
2018	112	4			124	0,105	0,69			241
2019	48	7			321					376
2020		2			237					239
2021*	29	4			289		2			324

**Table 4.4.0c. Blue ling (*Molva dypterygia*). Working group estimates of landings (tonnes) in Division 3a. (\* preliminary).**

Year	Denmark	Norway	Sweden	FRANCE	Total
1988	10	11	1		22
1989	7	15	1		23
1990	8	12	1		21
1991	9	9	3		21
1992	29	8	1		38
1993	16	6	1		23
1994	14	4			18
1995	16	4			20
1996	9	3			12
1997	14	5	2		21
1998	4	2			6
1999	5	1			6
2000	13	1			14

Year	Denmark	Norway	Sweden	FRANCE	Total
2001	20	4			24
2002	8	1			9
2003	18	1			19
2004	18	1			19
2005	48	1			49
2006	42				42
2007					0
2008		2			2
2009		+			0
2010		+			0
2011					0
2012					0
2013		1			1
2014		+	+		0
2015	+	+			0
2016	0.154	0.64	0.005	0.307	1
2017		0.775			1
2018	0.286	0.97	0.085		1
2019	0.885	0.63	0.047		2
2020	0.775	0.948	0.070		2
2021*	1.360	1.259	0.128		3

Table 4.4.0d. Blue ling (*Molva dypterygia*). Working group estimates of landings (tonnes) in Subarea 4. (\* preliminary).

Year	Denmark	Faroes	France	Germany	Norway	E & W	Scotland	Ireland	Swe- den	Neth- er- lands	Total
1988	1	13	223	6	116	2	2				363
1989	1		244	4	196	12					457
1990			321	8	162	4					495
1991	1	31	369	7	178	2	32				620
1992	1		236	9	263	8	36				553

Year	Denmark	Faroes	France	Germany	Norway	E & W	Scotland	Ireland	Swe- den	Neth- er- lands	Total
1993	2	101	76	2	186	1	44				412
1994			144	3	241	14	19				421
1995		2	73		201	8	193				477
1996		0	52	4	67	4	52				179
1997		0	36		61	0	172				269
1998		1	31		55	2	191				280
1999	2		21		94	25	120	2			264
2000	2		15	1	53	10	46	2			129
2001	7		9		75	7	145	9			252
2002	6		11		58	4	292	5			376
2003	8		8		49	2	25				92
2004	7		17		45		14				83
2005	6		7		51		2				66
2006	6		6		82						94
2007	5		2		55						62
2008	2		9		63		+				74
2009	1		12		69		7				89
2010	1		24		109		21				155
2011			129		46		1				176
2012			96		70						166
2013			5		38						43
2014			4		34		12				50
2015	+		6		74	+	3				83
2016	+		6	+	74		6				87
2017	+		3		65	+	5				73
2018	3		3	+	50	+	3				60
2019	3		12		66	+	4				85
2020	7		21	+	138		10				176



Year	Fa- roes	France	Ger- many	Spain	E & W	Scot- land	Nor- way	Ice- land	Po- land	Lithua- nia	Rus- sia	unallo- cated	To- tal
2012				205								427	632
2013				178								76	254
2014				80									80
2015				12									12
2016				29									29
2017				28									28
2018				24									24
2019				10									10
2020				13									13
2021*							5						5

**Table 4.4.0f. Blue ling (*Molva dypterygia*). Total landings by Subarea (past reported landings from subareas 8 and 9 are ascribed to *Molva macrophthalmus* and not included). (\* preliminary data).**

Year	1	2	3	4	12	Total
1988	10	3537	22	363	263	4195
1989	8	2058	23	457	70	2616
1990	4	1412	21	495	552	2484
1991	3	1479	21	620	1147	3270
1992	5	1039	38	553	971	2606
1993	1	1020	23	412	3336	4792
1994	3	419	18	421	752	1613
1995	5	359	20	477	573	1434
1996	2	267	12	179	788	1248
1997	1	291	21	269	417	999
1998	1	278	6	280	438	1003
1999	1	291	6	264	1353	1915
2000	3	249	14	129	594	989
2001	1	208	24	252	675	1160
2002	1	149	9	376	1318	1853
2003	0	147	19	92	1192	1450

Year	1	2	3	4	12	Total
2004	1	174	19	83	905	1182
2005	1	197	49	66	710	1023
2006	0	202	42	94	501	839
2007	0	262	0	62	354	678
2008	0	333	2	74	564	973
2009	1	285	0	89	312	687
2010	1	422	0	155	50	628
2011	3	486	0	176	55	720
2012	1	338	0	166	632	1137
2013	0	202	1	43	254	500
2014	4	127	0	50	80	261
2015	0	113	0	83	12	208
2016	1	87	1	87	29	205
2017	0	177	1	73	28	279
2018	22	241	1	60	24	348
2019	389	376	2	85	10	862
2020	1	239	2	176	13	431
2021*	1	295	3	98	5	402

**Table 4.4.1** Blue ling in Subarea 27.nea. Discards from 2015-2021. Discards from Denmark are taken from Inter-Catch. Discards from Scotland are estimated in 2021.

Year	Denmark	Scotland	Sweden	Total discards	Scotland old <sup>1</sup>
2015		0			
2016		0			
2017	0.808	2.403		3.211	0.117
2018	0.300	0.774		1.074	0.002
2019	0.750	14.110		14.860	0,023
2020	1.448	0		1.448	0
2021	0.051	2.887	0.487	3.425	



<sup>1</sup> The old InterCatch values for discards from Scotland; revised in 2021. The new values are estimated from 2015-2020.

**Table 4.4.2** Blue ling in Subarea 27.nea. Landings inside and outside the NEAFC Regulatory Area (RA). Landings inside NEAFC area are from 12a and 12b. Weights are in tonnes.

Year	Inside the NEAFC RA	Outside the NEAFC RA	Total landings
2014	80	181	261
2015	12	196	208
2016	29	176	205
2017	28	251	279
2018	24	324	348
2019	10	852	862
2020	13	418	431
2021*	0	402	402

4.4.10 Figures

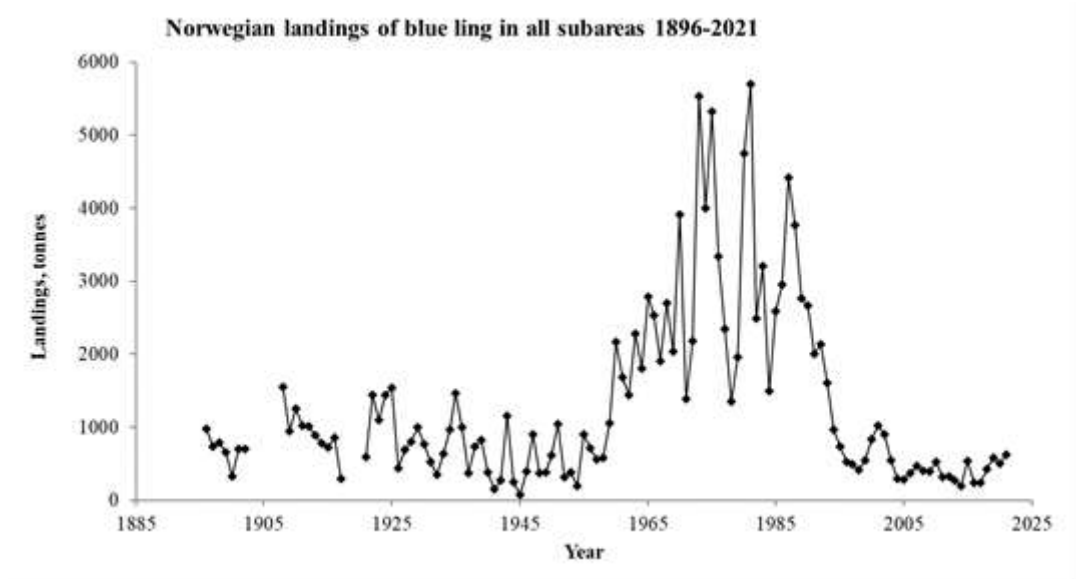


Figure 4.4.1. Reported Norwegian landings on blue ling from 1896–2021.

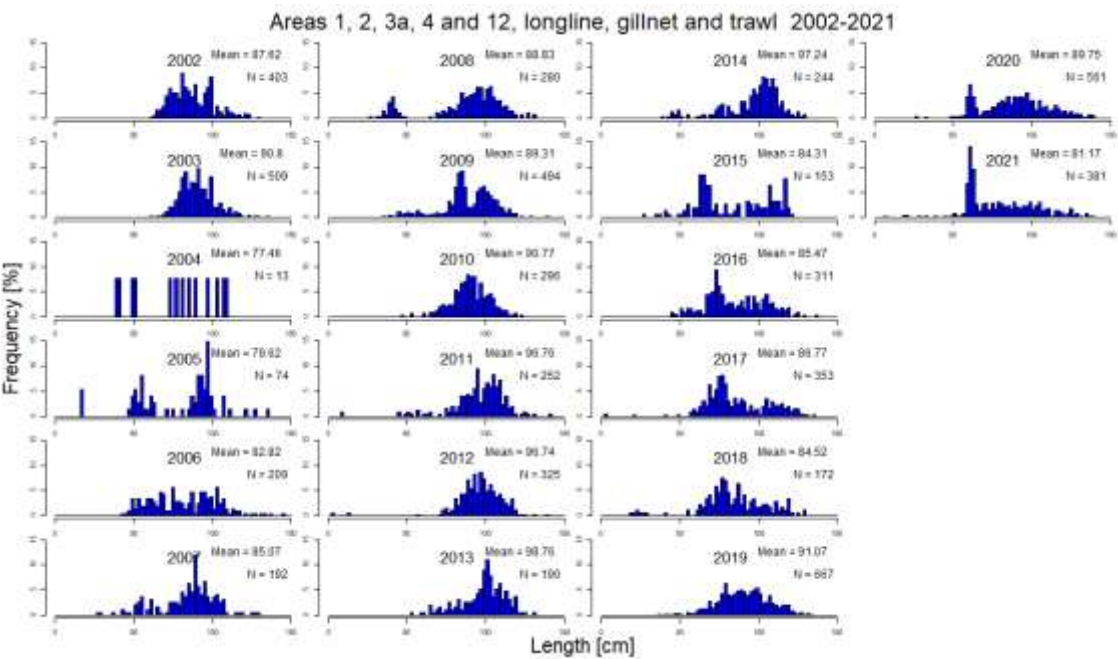


Figure 4.4.2. Length compositions from Norwegian longline and gill net fishery from 2002-2021.

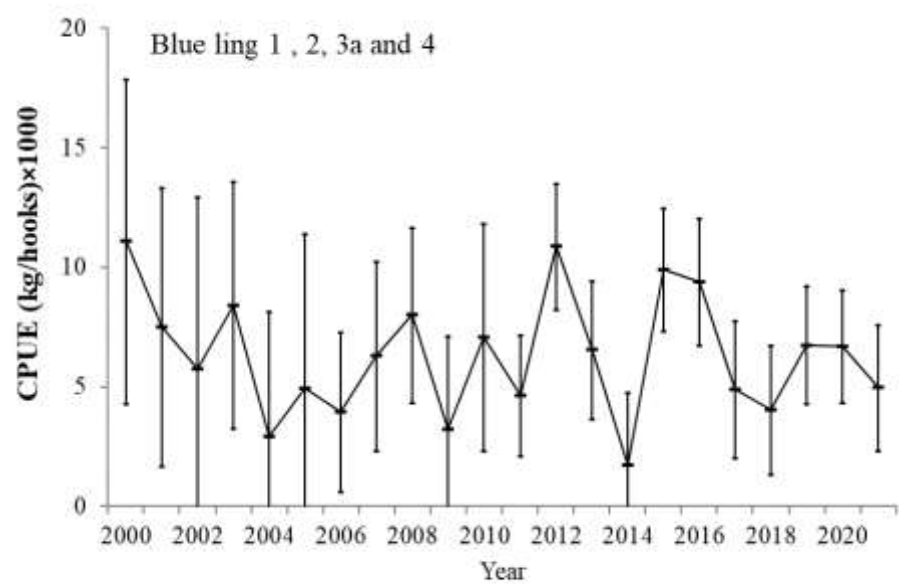


Figure 4.4.3. Norwegian cpue (kg/1000 hooks) from longlines catches in areas 1, 2, 3.a and 4 from 2000–2021.

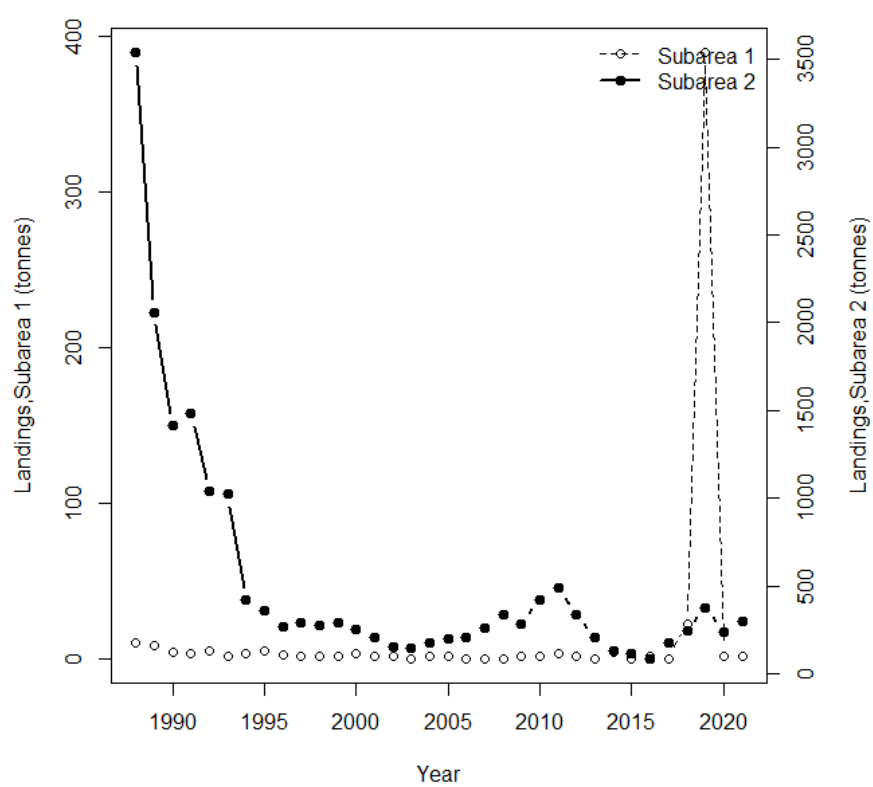


Figure 4.4.4. Landings of blue ling in Subareas 1 and 2 from 1988-2021. Subarea 1: open circles, left axis. Subarea 2: filled circles, right axis.

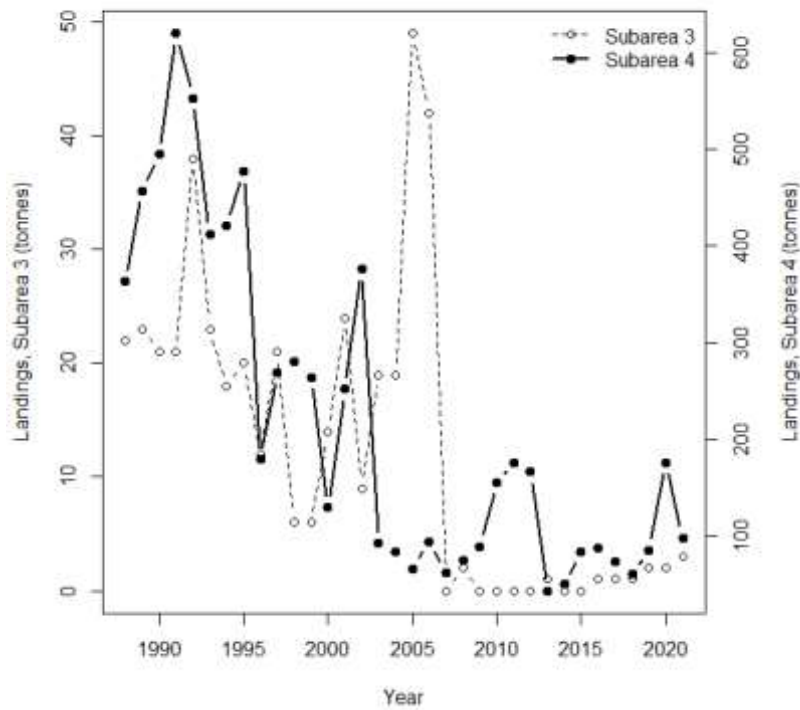


Figure 4.4.5. Landings of blue ling in Subareas 3 and 4 from 1988-2021. Subarea 3: open circles, left axis. Subarea 4: filled circles, right axis.

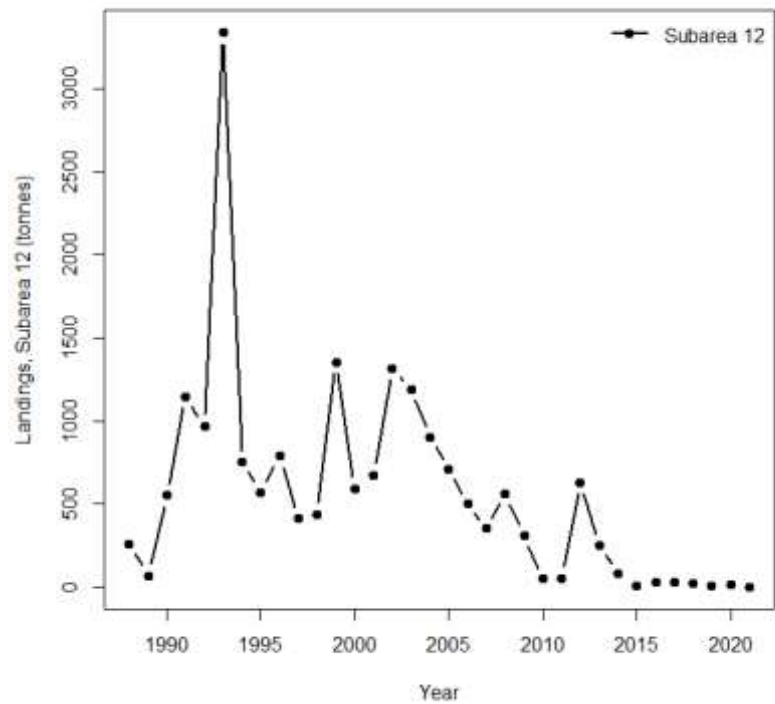


Figure 4.4.6. Landings of blue ling in Subarea 12 from 1988-2021.

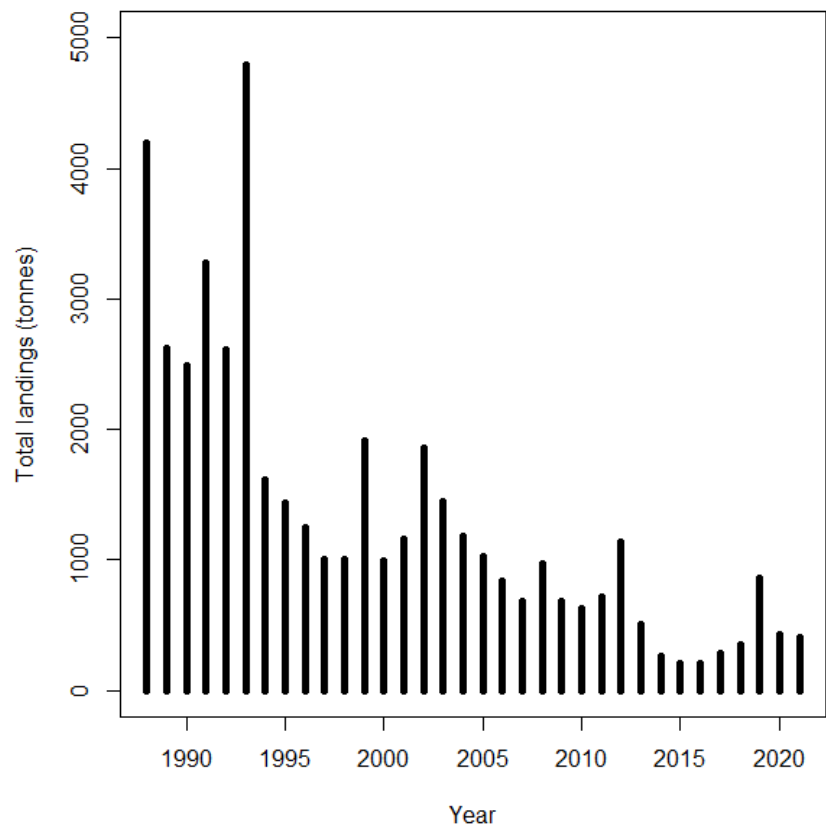


Figure 4.4.7. Total landings of blue ling from stock area 1,2,3a,4 and 12 from 1988-2021.