

## Stock Annex: Blue ling (*Molva dypterygia*) in Subarea 14 and Division 5.a (East Greenland and Iceland grounds)

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Stock specific documentation of standard assessment procedures used by ICES.

<b>Stock:</b>	Blue ling
<b>Working Group:</b>	Working Group on Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP)
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### A. General

#### A.1. Stock definition

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. However, the observations of spawning aggregations in each of these areas and elsewhere suggest further stock separation. This is supported by differences in length and age structures between areas as well as in growth and maturity. Egg and larval data from early studies also suggest the existence of many spawning grounds. The conclusion is that stock structure is uncertain within the areas under consideration.

However, as in previous years, on the basis of similar trends in the cpue series from Division 5.b and Subareas 6 and 7, blue ling from these areas has been treated for assessment purposes as a single southern stock. Blue ling in 5.a and 14 has been treated as a single northern stock. All remaining areas are grouped together as “other areas”.

#### A.2. Fishery

The change in geographical distribution of the Icelandic blue ling fisheries from 1996 indicates that there has been an expansion of the fishery of blue ling to north-western waters. This increase is likely to be the result of increased availability of blue ling in the north-western area, rather than being the result of an increase in effort or reporting.

The fishery for blue ling in 5.a changed substantially in nature and extent in the early 1980s. At the start of this period catches were high, in part because of fisheries on spawning aggregations. These aggregations diminished relatively quickly and since the mid-1980s blue ling has largely been a bycatch in the redfish and Greenland halibut fishery. In 1993, the Icelandic fleet fished on aggregations of spawning blue ling in a small area on the Reykjanes Ridge at the border between Subareas 5.a and 14. This was a transient fishery that declined rapidly in the years thereafter.

Before 2008 the majority of the catches of blue ling in 5.a were caught by trawlers, as bycatch where the main target species are cod, haddock and other demersal species. 50% of the bottom trawl catches in 2007 were taken within the depth range of 300–700 and 50% of the longline catches was taken at depths greater than 400 m. After 2008

there has been a substantial change in the fishery for blue ling in 5.a as longliners started targeting blue ling.

The gross fluctuation in catches in the late seventies, early eighties and again in the early nineties is most likely a reflection transient fisheries on spawning grounds. As a result of depletion of fish on spawning grounds, total international landings in 5.a declined from around 8500 t in 1980 to a level of between 2000 and 3000 t in the late 1980s. Landings were at a historical low in the late 1990s, but have increased in recent years.

Historically the fisheries in Subarea 14 have been relatively small.

### **A.3. Ecosystem aspects**

Blue ling in Icelandic waters is mainly found on the continental shelf and slopes of southeast, south, and west of Iceland at depths of 0–1000 m, but is mainly caught in the fisheries at depths greater than 500 meters. Warming of sea temperature, have been documented in 5.a and an expansion of distributional area of warm-water species such as anglerfish. The significance and reliability of such metrics is considered at the moment insufficient for their consideration in the provision of management advice of blue ling in 5.a.

### **A.4. Management**

The Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The Ministry issues regulations for commercial fishing for each fishing year, including an allocation of the TAC for each of the stocks subject to such limitations. Below is a short account of the main feature of the management system and where applicable emphasis will be put on blue ling.

A system of transferable boat quotas was introduced in 1984. The agreed quotas were based on the Marine Research Institute's TAC recommendations, taking some socio-economic effects into account, as a rule to increase the quotas. Until 1990, the quota year corresponded to the calendar year but since then the quota, or fishing year, starts on September 1 and ends on August 31 the following year. This was done to meet the needs of the fishing industry. In 1990, an individual transferable quota (ITQ) system was established for the fisheries and they were subject to vessel catch quotas. The ITQ system allows free transferability of quota between boats. This transferability can either be on a temporary (one year leasing) or a permanent (permanent selling) basis. This system has resulted in boats having quite diverse species portfolios, with companies often concentrating/specializing on particular group of species. The system allows for some but limited flexibility with regards converting a quota share of one species into another within a boat, allowance of landings of fish under a certain size without it counting fully in weight to the quota, and allowance of transfer of unfished quota between management years. The objective of these measures is to minimize discarding, which is effectively banned. Since 2006/2007 fishing season, all boats operate under the TAC system.

In the beginning, only few commercial exploited fish species were included in the ITQ system, but many other species have gradually been included. Blue ling in 5.a is one of the few species in the Icelandic fisheries that is not included in the ITQ-system and as such not subjected to annual TAC.

Landings in Iceland are restricted to particular licensed landing sites, with information being collected on a daily basis time by the Directorate of Fisheries in Iceland (the enforcement body). All fish landed has to be weighted, either at harbour or inside the fish

processing factory. The information on each landing is stored in a centralized database maintained by the Directorate and is available in real time on the internet ([www.fiskistofa.is](http://www.fiskistofa.is)). The accuracy of the landings statistics are considered reasonable.

All boats operating in Icelandic waters have to maintain a logbook record of catches in each haul/set. The records are available to the staff of the Directorate for inspection purposes as well as to the stock assessors at the Marine and Freshwater Research Institute.

With some minor exceptions it is required by law to land all catches. Consequently, no minimum landing size is in force. To prevent fishing of small fish various measures such as mesh size regulation and closure of fishing areas are in place.

A system of instant area closure is in place for many species. The aim of the system is to minimize fishing on juveniles. An area is closed temporarily (for two weeks) for fishing if on-board inspections (not 100% coverage) reveal that more than a certain percentage of the catch is composed of fish less than the defined minimum length. The only restrictions on the Icelandic fleet regarding the blue ling fishery was the introduction of closed areas in 2003 to protect known spawning locations of blue ling, which are in effect during the spawning period of blue ling in 5.a from 15th of February until 30th of April.

## B. Data

### B.1. Commercial catch

The text table below shows which data from landings are supplied from ICES Division 5.a.

ICES DIVISION 5.A			KIND OF DATA		
Country	Caton (Catch in weight)	Canum (catch-at-age in numbers)	Weca (weight-at-age in the catch)	Matprop (proportion mature-by-age)	Length composition in catch
Iceland	x				x
The Faroe Islands	x				
Norway	x				

Icelandic blue ling catch in tonnes by month, area and gear are obtained from Statistical Iceland and Directorate of Fisheries. Catches are only landed in authorized ports where all catches are weighed and recorded. The distribution of catches is obtained from logbook statistic where location of each haul, effort, depth of trawling and total catch of blue ling is given. Logbook statistics are available since 1991. Landings of Norwegian and Faroese vessels are given by the Icelandic Coast Guard and reported to the Directorate of Fisheries.

Discard is banned in the Icelandic demersal fishery and there is no information available on possible discard of blue ling. Being a relatively valuable species and not subjected to TAC constraints nor minimum landing size there should be little incentive to discard blue ling in 5.a.

## **B.2. Biological**

Biological data from the commercial longline and trawl fleet catches are collected from landings by scientists and technicians of the Marine and Freshwater Research Institute (MFRI) in Iceland. The biological data collected are length (to the nearest cm), sex and maturity stage (if possible since most blue ling is landed gutted), and otoliths for age reading. Most of the fish that otoliths were collected from were also weighted (to the nearest gram). Biological sampling is also collected directly on board on the commercial vessels during trips by personnel of the Directorate of Fisheries in Iceland or from landings (at harbour). These are only length samples.

The general process of the sampling strategy is to take one sample of blue ling for every 180 tonnes landed. Each sample consists of 150 fishes. Otoliths are extracted from 50 fish which are also length measured and weighed gutted. In most cases blue ling is landed gutted so it not possible to determine sex and maturity. If blue ling is landed ungutted, the ungutted weight is measured and the fish is sex and maturity determined. The remaining 100 in the sample are only length measured. Age reading of blue ling from commercial catches ended in 1998. The reason was great uncertainty in ageing and cost saving.

Earlier observations indicates that blue ling becomes mature at-age of about 8–13 years or at around the length of 90 cm. The mean length-at-maturity is close to the mean length of blue ling in the commercial catches. This means that a large proportion of the blue ling is caught as immature.

No estimates of natural mortality are available for blue ling in 5.a and 14.

The biological data from the fishery are stored in a database at the Marine and Freshwater Research Institute. The data are used for description of the fishery.

## **B.3. Surveys**

For detailed description of the surveys relevant for blue ling in 5.a, please refer to the stock annex for tusk in 5.a and 14.

The Icelandic Spring survey (March) commenced in 1985 and covers the Icelandic shelf down to 500 meters. As such the survey is not considered descriptive of biomass trends. However smaller blue ling is found at shallower depths and therefore the spring survey may contain valuable information on smaller and younger blue ling. This has at present not been explored.

The Icelandic autumn survey (October) commences in 1996 and after its expansion in 2000 the survey is considered to cover the distributional range of blue ling in 5.a and therefore to be representative of stock biomass.

## **B.4. Commercial cpue**

Data used to estimate cpue for blue ling in Division 5.a since 1991 are obtained from logbooks of the Icelandic trawl and longline fleet. Non-standardized cpue and effort is calculated for each year which is simply the sum of all catch divided by the sum of number of hooks.

## **B.5. Other relevant data**

## **C. Assessment: data and method**

2012-2018 advice of blue ling in 5.a and 14.b was based on  $F_{\text{proxy}}$  (Cat 3.3). The method was as following:

Relative fishing mortality ( $F_{\text{proxy}} = \text{Yield}/\text{Survey biomass}$ ) was derived from the autumn survey biomass index (+40 cm) and the combined catches from 5.a and 14. In the 2012 advice the target  $F_{\text{proxy}}$  was set at 1.7 or the average  $F_{\text{proxy}}$  in 2002 to 2009, however the landings from 14 were not correct and using the revised landings the target should be 1.75. The reference period (2002 to 2009) was selected as during that time the  $F_{\text{proxy}}$  was relatively stable (and low) and the stock seemed to increase according to the biomass indicator.

In 2019 it was decided to base the advice of blue ling in 5.a and 14.b on the ICES framework for category 3 stocks using survey trends as a precautionary approach due to lack of recruitment since 2010.

The method is as following:

The Icelandic autumn trawl survey (IS-SMH) was used as the index for the stock development. The advice is based on the mean of the previous two index values (index A) divided by the mean of the three preceding values (index B) multiplied by the mean catches in the last three years.

## **D. Short-term projection**

## **E. Medium-term projections**

## **F. Long-term projections**

## **G. Biological reference points**

## **H. Other issues**

At WGDEEP-2004, exploratory runs of Delury, surplus production and stock reduction models were carried out using total international catch data for Division 5.a and Sub-areas 14 combined (1966–2003) and cpue data from Icelandic spring groundfish trawl survey (1985–2003). Although the survey data are fisheries-independent and are considered to be a better indicator of changes in stock abundance than longline and trawl data from Icelandic commercial vessels, the fits from the models were generally poor reflecting a high variability in the survey series, particularly in the early years.

## **I. References**