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COD IN THE BARENTS SEA (NORTH-EAST ARCTIC COD)

a review of the biology and the history of fishery and management

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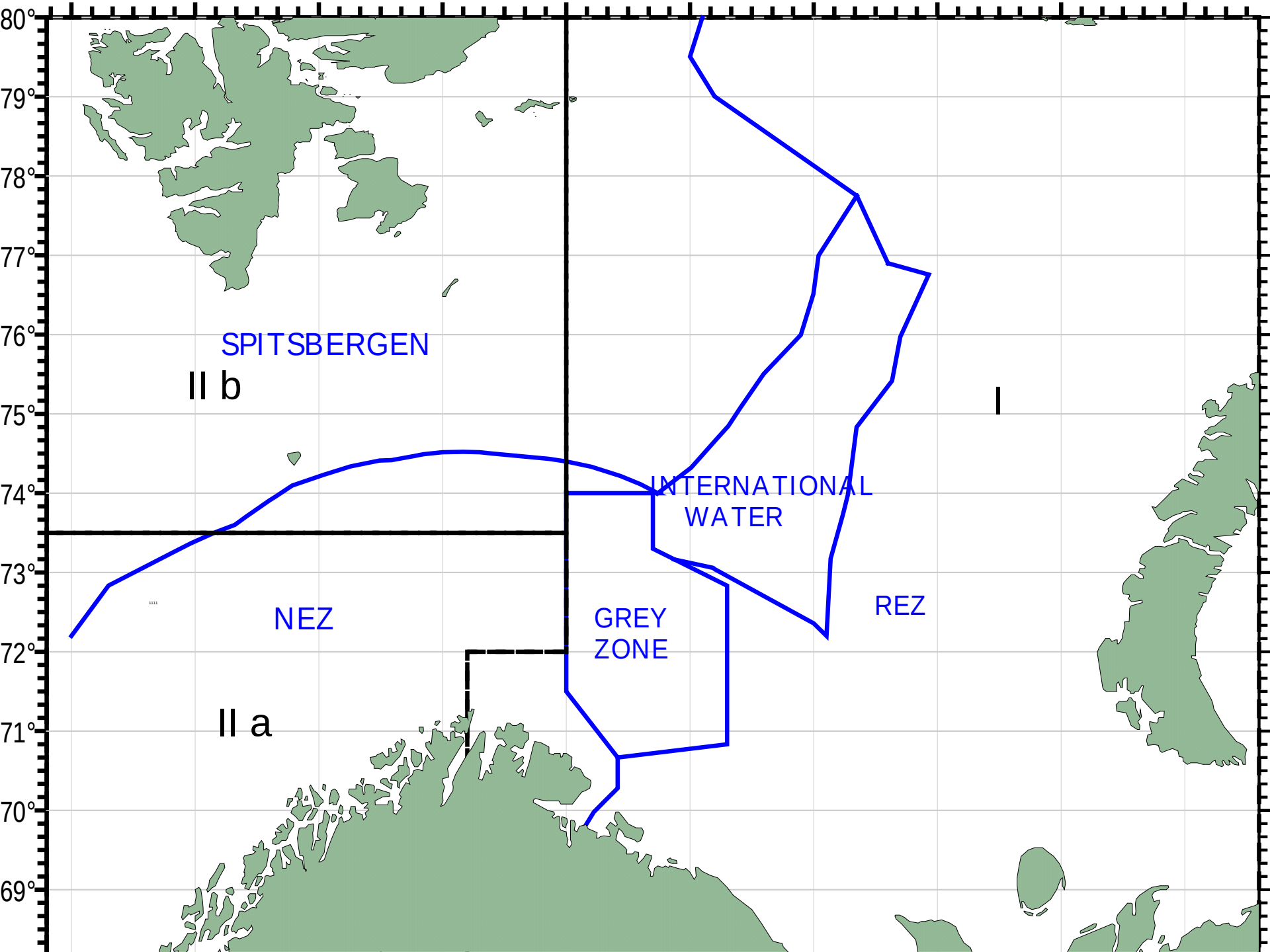
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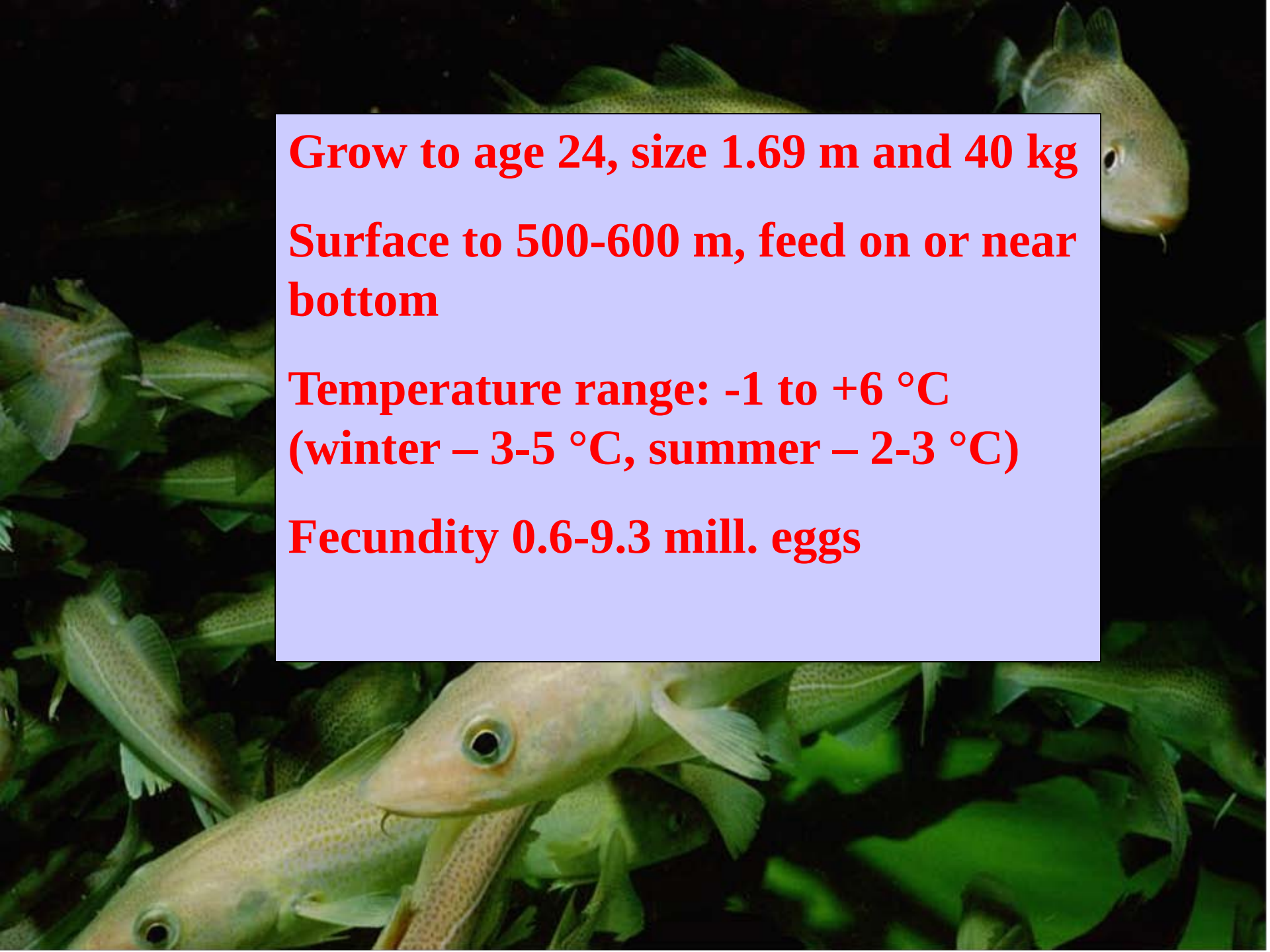


Grow to age 24, size 1.69 m and 40 kg

Surface to 500-600 m, feed on or near bottom

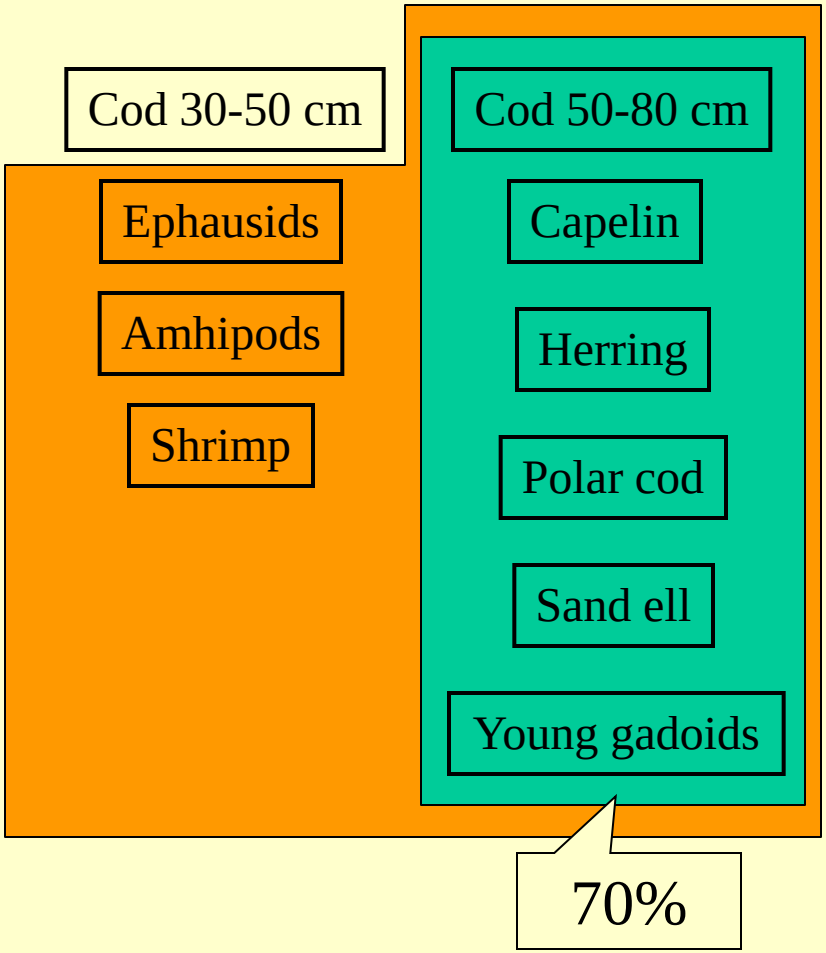
Temperature range: -1 to +6 °C (winter – 3-5 °C, summer – 2-3 °C)

Fecundity 0.6-9.3 mill. eggs

FOOD WEB

Cod larvae

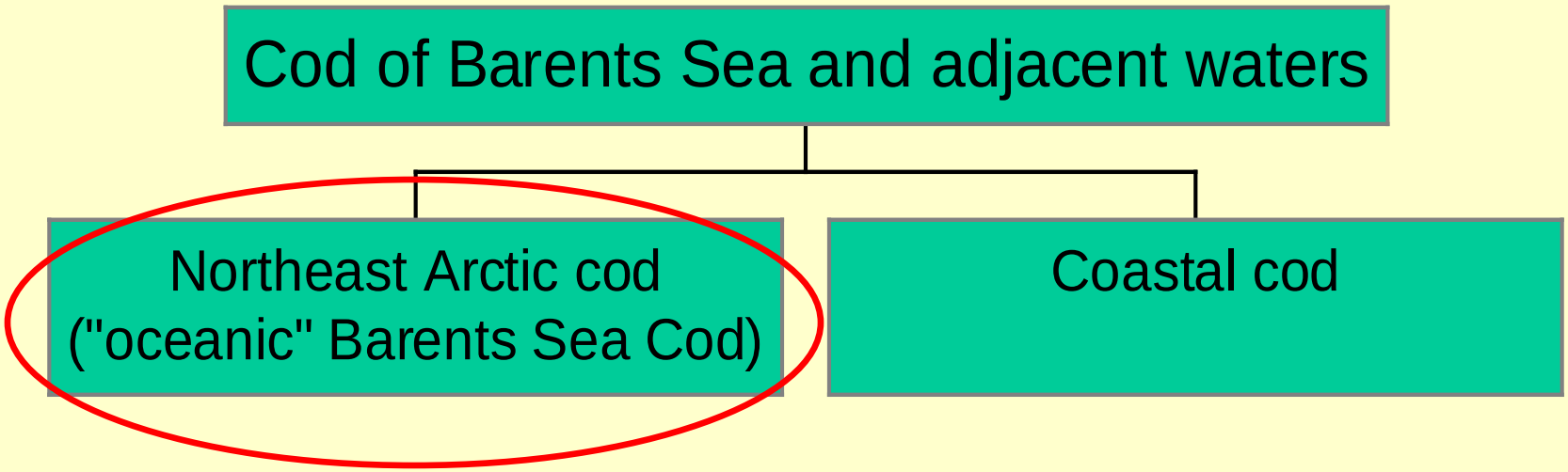
Calanus various stages

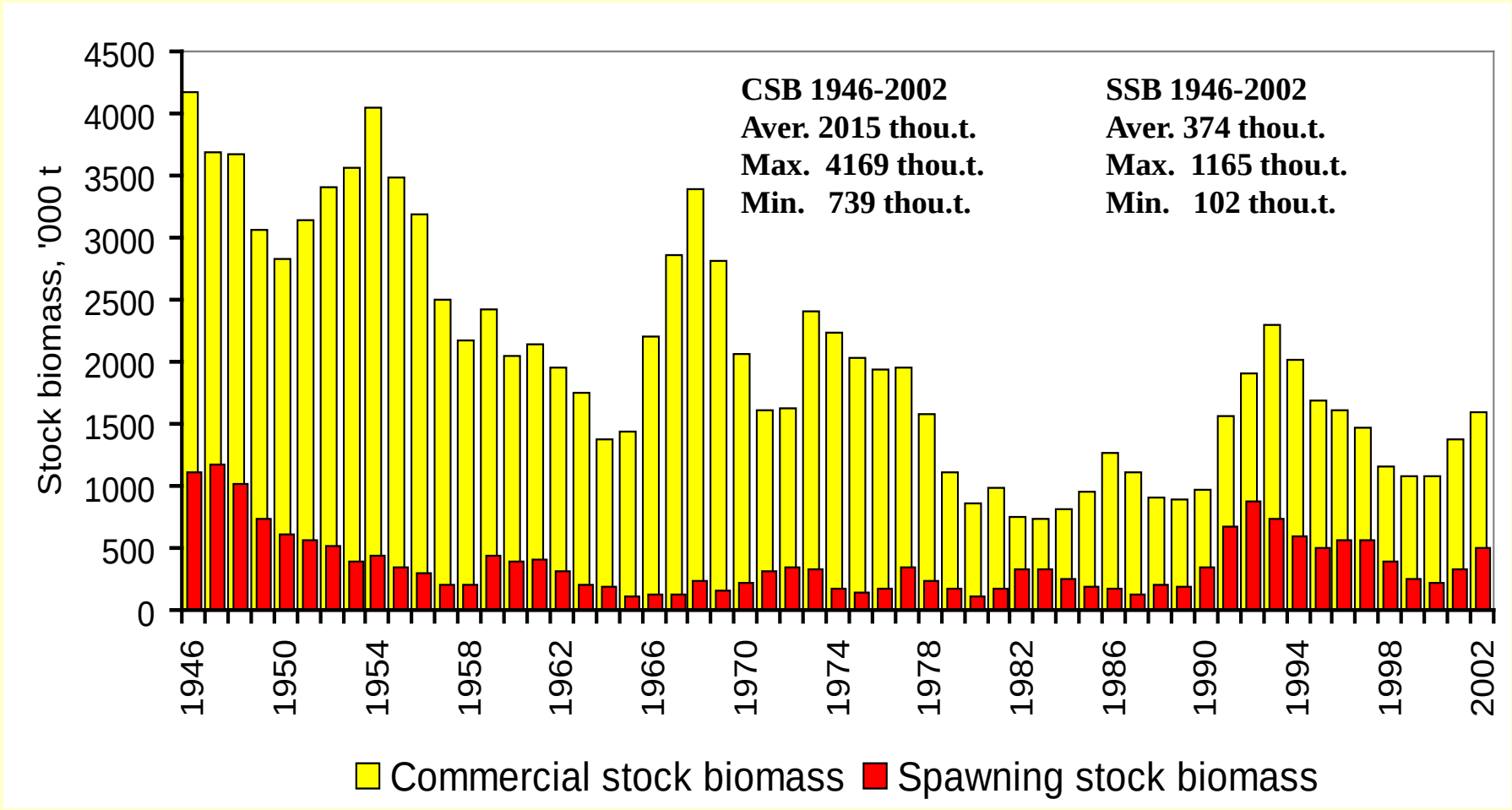


Cod >80 cm

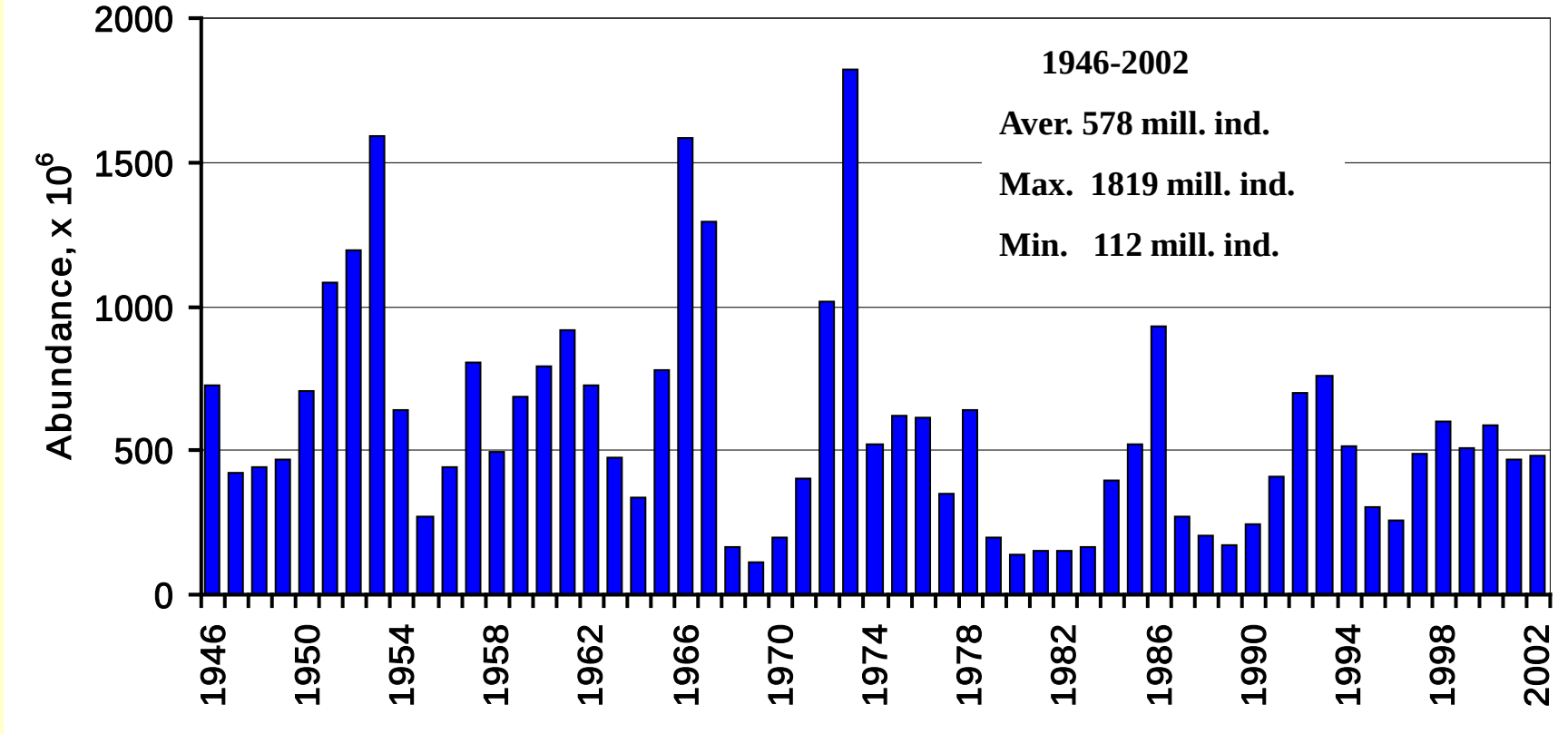
FISH

Stock as a management unit

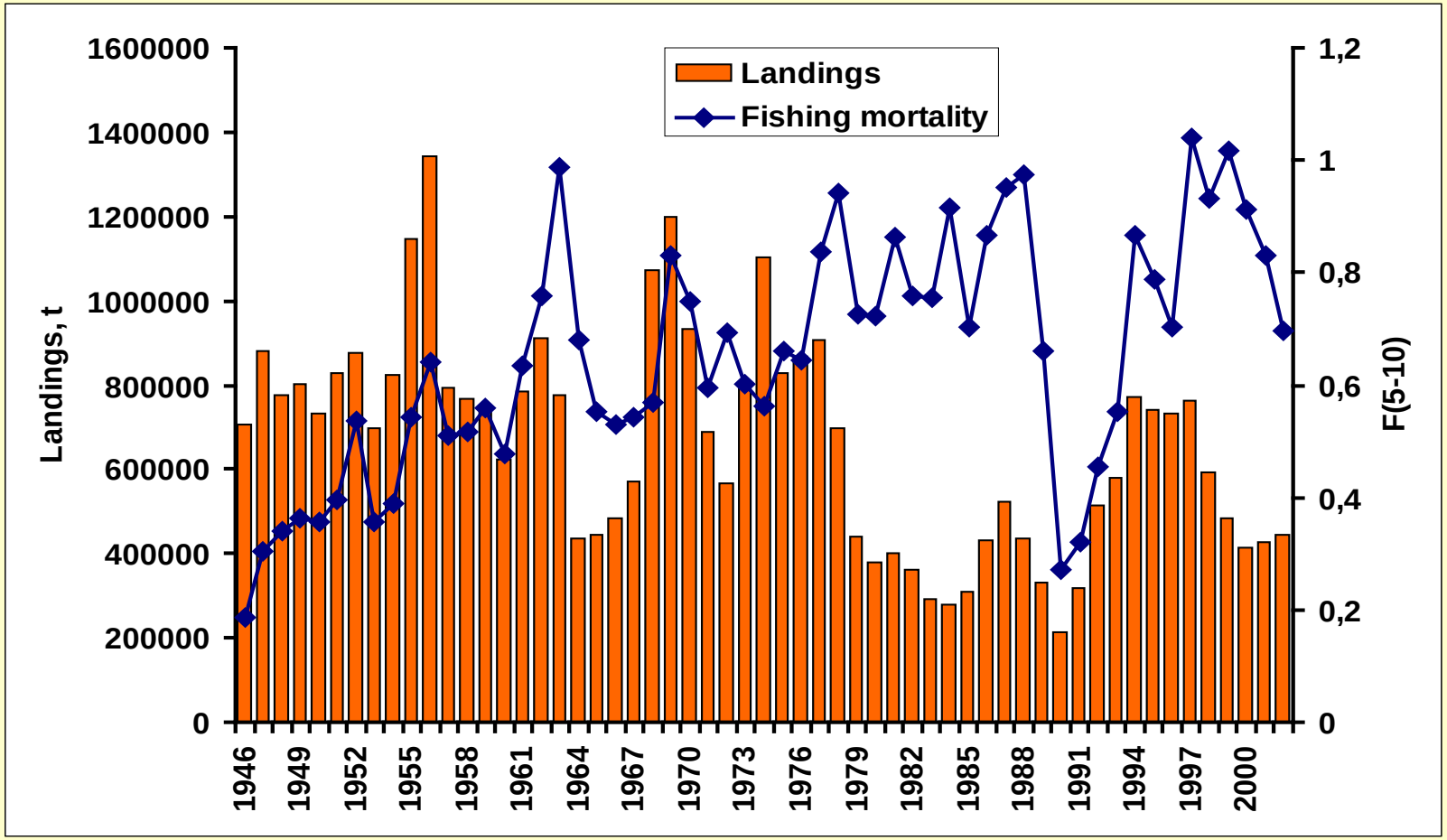




Commercial stock biomass and spawning stock biomass of NEA Cod in 1946-2002



Year-class abundance of Northeast Arctic cod at age 3, x 10^6 individuals.



1946-2002

Aver. 663 thous.t., Min. 212 thous.t., Max. 1343 thous.t.

Landings of NEA cod and fishing mortality (F_{5-10}) in 1946-2002, in tonnes.

The cod catch dynamics by countries (thous.t / per cent)

Year	Russia	Norway	UK	Germany	Others	Total
1961-1970	3551 47	2407 31	1390 18	74 1	188 2	7612 100
1971-1980	2714 37	3274 45	650 9	227 3	406 6	7271 100
1981-1990	962 27	2212 62	62 2	42 1	267 8	3546 100
1991-2002	2742 42	2923 45	140 2	63 1	662 10	6529 100
1961-2002	9969 40	10817 43	2242 9	406 2	1523 6	24957 100

Stock assessment and advice

- ✓ **The first meeting of the ICES Working Group on Arctic Fisheries was in 1959.** (AFWG reported the status of research and described recent trends in catches and stock condition.)
- ✓ **The first "Virtual Population analysis" was made in 1965.** (This led to recommendations on measures to improve the selection pattern and limit the fishing mortality).
- ✓ **Quantified advise on next year's catch has been provided by ICES since 1975** (This period fishing mortality (F) reference points based on theoretical yield-F relationships were often used to advice for F-levels maximising long-term yield. It was also recognised that several stocks could be in danger of recruitment overfishing, and rebuilding of spawning stock biomass (SSB) was recommended when SSB was observed to approach historic low levels).

!!! In the late 80s the SSB of the Barents Sea cod was estimated to decline to very low levels and severe reductions in catches were recommended to rebuild the stock.

Stock assessment and advice

✓ In 1991 ICES introduced the term "minimum biological acceptable level" (MBAL)

MBAL was defined as the spawning stock biomass below which the recruitment is decreasing. For stocks assessed to be below MBAL the advice from ICES was then to restrict the fishery to allow rebuilding above MBAL.

The 1991 Form of Advice can be summarised as:

SSB>MBAL: No specific advice

SSB<MBAL: Sufficient reduction in fishing to allow rebuilding SSB

!!!This Form of Advice was for the first time applied for the advice on the catches in 1992.

Stock assessment and advice

Since 1998 precautionary approach has been used by ICES for advising on TACs.

The 1998 Form of Advice can be summarised as:

SSB>B_{pa}: Restrict TAC so that F<F_{pa}

SSB<B_{pa}: Sufficient reduction in fishing to allow rebuilding SSB

The most important reference points used for the ICES advice on North-East Arctic cod

Advice for catch in year	Main reference points for advice	Add. reference points used
1978-1991	F_{low}=0.32 (for rebuilding)	F_{max}(~0.25), $F_{0.1}$(~0.15)
1992-1998	MBAL=500,000 tonnes	F_{med}=0.46
1999-2003	F_{pa}=0.42 B_{pa}=500,000 t.	F_{lim}=0.70 B_{lim}=112,000 t.
2004-	F_{pa}=0.40 B_{pa}=460,000 t.	F_{lim}=0.74 B_{lim}=220,000 t.

Management and regulations

! There were no effective management measures in operation for demersal fish in the area prior to the establishment of the national economic zones in 1977.

! ! For the years 1975 and 1976 a TAC for cod was set by NEAFC

! ! ! After the introduction of the 200 nautical mile Economic zones in 1977 TAC for cod has been established by the Joint Russian-Norwegian Fisheries Commission.

Minimum mesh size* in trawl fishery for cod in the Barents Sea by Norwegian and Russian (Soviet) trawlers

Year of entry into force	Minimum mesh size (mm)	
	Norwegian trawlers	Russian (Soviet) trawlers
1946	80	90
1954	110	
1961		110
1963	130	120
1967		120
1981		125
1982	135**	
1997	135 plus sorting grid, 55 mm bar spacing**	
1998		125 plus sorting grid, 55 mm bar spacing

* mesh sizes applied to manila before 1966 and to nylon since 1967

** applied to all vessels in Norwegian economic zone

Minimum landing size of cod

1967-34 cm
1981-39 cm
1982-42 cm
1990-47 cm (applied to all vessels in Norwegian economic zone)

15% undersized fish has been allowed in the catches

Discarding of cod has been prohibited since 1977

A closed area system was introduced in the trawl fisheries in the early 1980s to protect young cod and haddock.

In 2002 at the 31st session the Joint Norwegian-Russian Fishery Commission decided to develop a new harvesting strategy for Northeast Arctic cod and haddock, which should incorporate the following considerations:

1. to attain **high sustainable catches** from exploited stocks in the ecosystems of the Barents and Norwegian seas without decreasing their productivity;

2. **to keep exploited stocks within safe biological limits** while maintaining the biodiversity and productivity of marine ecosystems;

3. to ensure **sustainable development of fishing industry** while exploiting the stocks within safe biological limits;

4. to attain **sustainable social development** of maritime regions.