

TERMS OF REFERENCE

NWWAC Webinar on climate change impacts on cod in the Celtic Sea

12 June 2024

Rationale

Since 2018, ICES has adopted a 0 catch advice for cod in the Celtic Sea, as none catch option scenarios would allow this stock to recover above the B_{lim} for the next year. Therefore, this stock is ever since managed under a bycatch TAC provision with additional technical measures.

The recovery of this stock is still a political objective, as for instance clearly stated in the UK/EU Written Record regarding fishing opportunities, with some further technical measures and/or seasonal closures under reflection.

As mentioned in the [2022 ICES Celtic Seas ecoregion – Ecosystem Overview](#), climate change is already observable within some parts of the Celtic Seas ecoregion, with a mean annual sea surface temperature showing an overall upward trend of about +0.5°C since 1975. In addition, it is very well known (Drinkwater, 2005) that Celtic Sea cod stock will be one the very first affected by the warming of the seas, with a collapse/disappearance from this sea basin predicted, depending on how fast the waters would warm.

For proportionality purpose, it is necessary to better monitor and inform on the effects of climate change and the warming of Celtic Sea waters regarding the management of this stock. It is then of the utmost importance for NWWAC Members to take note and share the latest information regarding the scientific knowledge, in order to propose the best way to monitor and organize the management of this stock.

Cod preservation in the Celtic Sea is critically threatened, as the species' temperature optimum is outside of the range of temperature values occurring in the Celtic Sea ecosystem¹. This is especially true for cod reproduction and larval survival, as the spawning cycle of this species is extremely fine-tuned, sophisticated and easily disturbed.

The recent study "*Latitudinally distinct stocks of Atlantic cod face fundamentally different biophysical challenges under on-going climate change*"², published in the Journal Fish and Fisheries in January 2023 by Kjesbu et al., identified a water temperature threshold around 9.6 (± 0.25) °C where cod spawning frequency becomes unpredictable.

¹ Hervann, P. Y., Gascuel, D., Grüss, A., Druon, J. N., Kopp, D., Perez, I., ... & Robert, M. (2020). The Celtic Sea through time and space: Ecosystem modeling to unravel fishing and climate change impacts on food-web structure and dynamics. *Frontiers in Marine Science*, 1018.

² Kjesbu, O. S., Alix, M., Sandø, A. B., Strand, E., Wright, P. J., Johns, D. G., ... & Sundby, S. (2023). Latitudinally distinct stocks of Atlantic cod face fundamentally different biophysical challenges under on-going climate change. *Fish and Fisheries*.

Moreover, cod spawning times are also temperature dependent. This was detected for cod in both the North Sea and in the Irish Sea, as reported in a study published in 2017³, where there was a shift to early spawning times. Earlier spawning has the potential to create a mismatch with larval prey, and as the mismatch index increases, the recruitment rates will decrease through food limitation impacting survival. Therefore, temperature dependency of spawning times have the potential for decreasing productivity as waters warm.

The NWWAC has noted that the ICES assessment for cod stock in the Celtic Sea does not take enough into account the implications of rising sea temperatures. As advised in two letters addressed to DG MARE from [July 2022](#) and [June 2023](#), the NWWAC believes that an operational understanding of ocean warming implications in cod survivability in the Celtic Sea is needed to address the future viability of cod fisheries in the Celtic Seas and allow for the suitable and adaptive alignment of fisheries management measures.

Purpose

To bring together representatives from the international scientific community, the Advisory Council, the European Commission and the NWW Member States to discuss and progress on the following issues:

- Overview of state of play of stock status
- Overview of state of play of currently available scientific information on climate change impacts on cod biology
- Identification of additional research needs and data collection, and monitoring
- Identification of potential additional considerations for the management of this stock

Proposed outcomes

- Webinar report
- Advice to DG MARE on operational understanding of climate change effects on cod survivability in the Celtic Sea
- Advice to DG MARE on ad hoc request to ICES regarding monitoring/research needs on cod in the Celtic Sea

Workshop participants

- Members of NWWAC Working Group 2 Celtic Sea & West of Scotland
- DG MARE
- NWW Member States Group

³ McQueen, K., & Marshall, C. T. (2017). Shifts in spawning phenology of cod linked to rising sea temperatures. *ICES Journal of Marine Science*, 74(6), 1561-1573.

- ICES
- Representatives from national research and development institutes, including for example Ifremer, AZTI, Marine Institute, ILVO
- Former NWWAC members from the UK

Working languages

- English, French, Spanish

Location

- Half day online workshop via Zoom
- Distribution of information and documents electronically

Resources, inputs and external sources

- Presentations from researchers on results from recent studies as identified above and in addition:
 - Kaja H Skjærven, Maud Alix, Lene Kleppe, Jorge M O Fernandes, Paul Whatmore, Artem Nedoluzhko, Eva Andersson, Olav Sigurd Kjesbu, Ocean warming shapes embryonic developmental prospects of the next generation in Atlantic cod, *ICES Journal of Marine Science*, 2024;, fsae025, <https://doi.org/10.1093/icesjms/fsae025>
- Input from ICES as identified above