Contribution of the United Kingdom to 17th round of the Informal Consultations of the State Parties to the UN Fish Stocks Agreement (ISP-17): Sustainable fisheries management in the context of climate change – Discussion paper

1. Introduction

Climate change is one of the biggest challenges of our time. Its effects are increasingly apparent, with 2023 the warmest year on record and ocean heat content also reaching the highest-level recorded[1]. Climate change has already begun to cause irreversible damage to the planet and our way of life[2]. There is clear evidence demonstrating the accelerating pace of warming in the oceans in recent decades and the impacts that will need to be faced should this continue.

Many climate change impacts have a long-term, slow-onset nature, resulting in multi-dimensional cascading effects with substantial environmental, social, and economic consequences[3]. But there is growing research to suggest that climate events such as heatwaves can sometimes have more dramatic and immediate consequences, such as coral bleaching events, harmful algal blooms and fish die-offs. This presents a particular challenge for fisheries management, as it is difficult to predict exact consequences and build these into either short or long-term planning.

This paper sets out the UK's perspective on the potential substantial impacts of climate change on fisheries and fisheries industries, on the marine environment, the seafood supply-chain, and the on-shore industries reliant on the sector. It references some of our key evidence sources, describes the climate change impacts already felt in the UK, and some of the actions we have taken, and plan to take, in response. We hope sharing some of our experiences and learning is a useful contribution to this crucial discussion.

2. Impacts and Challenges for Fisheries Managers

The varied and wide-reaching direct and indirect impacts of climate change pose complex challenges for sustainable fisheries management.

2.1 Environmental Impacts

Increases in atmospheric carbon dioxide (CO_2) and other greenhouse gas emissions have resulted in warming of both the atmosphere and the ocean, a reduction in sea ice and has increased global sea levels[4,5]. The rise in ocean temperatures has also had additional indirect effects, through increasing water column stratification, disrupting ocean circulation, primary productivity, and nutrient cycling. Increased water column temperatures and CO_2 levels can result in reduced oxygen concentrations, the prevalence of which are predicted to occur more frequently and over greater geographic areas in the near future[6].

[1] State of the Global Climate 2023 (wmo.int)
[2] ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf
[3] Slow-onset events (SOEs) and future sustainability - ScienceDirect
[4] https://www.fao.org/3/i9705en/i9705en.pdf
[5] report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf
[6] 20_fisheries_2020.pdf (mccip.org.uk)

Climate change has notably increased the frequency of marine heatwaves, with approximately double the number of events occurring today in comparison to the 1980s. The frequency and duration of marine heat waves are projected to continue to increase.

As well as directly impacting the atmosphere and the ocean, physical changes brought about by climate change can cause significant health and safety, social, and economic impacts to fisheries. For example, increased extreme weather events and changes to the magnitude or frequency of storms as a result of climate change pose a direct risk to fisheries, disrupting fishing effort and posing a physical danger to fishers, vessels and gear, fishing communities and infrastructure[7].

2.2 Movement of fish stocks and implications for managers

The physical and/or chemical changes to our seas give rise to impacts upon the habitats and species within them. In the North-east Atlantic commercial fish species have altered their distribution and abundance and are expected to continue to move under current climate predictions[8] . Increasing temperatures and ocean acidification have been linked to changes in species life history, changing spawning and migration timings, growth rates and mismatched predator-prey seasons, especially the overlap between hatching of fish larvae and their zooplankton food resource[9]. Climate change is also increasing the prevalence of warmer water organisms and species into more northern waters some of which may be considered harmful (algal blooms, pathogens, jellyfish and non-endemic species) due to their ability to out-compete endemic populations and spread disease.

Future changes in temperature and salinity are expected to result in shifts to distributions of marine organisms, usually northwards in the northern hemisphere, including commercial fish and shellfish. As far back as 2011 an analysis of 50 abundant species in the waters around the United Kingdom and Ireland demonstrated that 72% of the fish species were shown to have responded to warming in the region already, by changing distribution and abundance[10]. Warm-water species appear to have increased in abundance while cold-water species have decreased, with these trends expected to continue in the future[11]. Similar changes are anticipated everywhere, including for species in the Exclusive Economic Zones of many fishing nations. Species turnover will in-turn result in a range of implications that will affect fishers. Fish populations may move towards or away from traditionally utilised fishing grounds, or shift across management boundaries, with implications for quotas of different nations, or fishing communities[12,13]. Furthermore, climate change can alter the catch potential, expected sustainable yield and quality of landings for fishing sectors. Such changes must be considered by fisheries managers in order to ensure that fisheries remain sustainable and able to adapt in the face of these changes.

[7] Climate change adaptation in the UK (wild capture) seafood industry - watching brief 2020-21 — Seafish
[8] https://www.researchgate.net/publication/371991330_Climate_change_projections_of_commercial_fish_distribution_and_suitable_habitat_around_north_western_Europe
[9] https://academic.oup.com/plankt/article/32/5/699/1542348
[10] https://pubmed.ncbi.nlm.nih.gov/21924906/
[11] https://pure.aber.ac.uk/ws/portalfiles/portal/9854739/fmars_03_00062.pdf
[12] https://www.researchgate.net/publication/263154777_Guidelines_for_incorporating_fish_distribution_shifts_into_a_fisheries_management_context
[13] https://collaborate.princeton.edu/en/publications/fish-and-fisheries-in-hot-water-what-is-happening-and-how-do-we-a

2.3 Effects of emission reduction through renewable energy

In the UK we have learned that measures which seek to mitigate the effects of climate change can also pose challenges for fisheries management owing to a competing use of the marine space. In the UK Offshore wind rollout is a major component of delivering our net zero commitment. The British Energy Security Strategy[14] sets out our ambition to deliver 50GW of offshore wind by 2030, with 5GW through floating offshore wind. The UK is not alone in this ambition, with the Global Wind Energy Council anticipating over 380GW of offshore wind capacity to be added over the next decade globally[15].

The development of the offshore wind sector is already affecting fishing activity. Where it has not been possible to avoid fishing grounds, fishing activities have been displaced, with fishing effort being redistributed to other fishing grounds. In the future it could conceivably be lost entirely if fishers leave the sector. This is anticipated to have associated social, economic, and environmental effects especially for coastal communities[16]. The challenge for fisheries management to take account of these effects is even greater in the context of other measures taken to support the recovery and resilience of marine ecosystems which may affect the distribution of fishing, such as MPA designation.

3. UK Action to Understand and Monitor Impacts

A comprehensive climate change risk assessment in 2021 attempted to rank European fisheries and fishery-dependent coastal communities in terms of the threat posed by future climate change. Scores for Hazard, Exposure and Vulnerability were combined to assess the relative climate 'Risk' to 380 fishing fleets and 105 coastal regions. Fisheries in the UK were highlighted as having a particularly high risk-profile. Climate risk was greatest in the north of England, while fisheries in northern Scotland and the south of England exhibited much lower risk. Indeed, six of the ten regions with the highest climate risk in Europe, including the overall top region (Tees Valley and Durham), were in the UK.

Through the UK's Marine Climate Change Impacts Partnership (MCCIP) we are improving our understanding of the impact of climate change in our waters. MCCIP engages with a wide range of scientific authors to supply policy makers and the public with updates on the current and predicted impacts of climate change.

MCCIP is undertaking work to develop understanding of marine ecosystem impacts under projected future climate scenarios, helping to address risks identified in the UK's third Climate Change Risk Assessment, current National Adaptation Programme and beyond.

Information on real time changes in catch abundance from fishers is an invaluable source of intel that can support, shape, and validate scientific models and projections. For example, in recent years, both commercial and recreational fishers have reported seeing large numbers of Atlantic bluefin tuna, especially off Devon and Cornwall, but also in the North Sea. Throughout 2020 and 2021, scientific investigations into bluefin tuna migrations and movements have been conducted (in particular, tagging experiments) under the Defra-

[14] British energy security strategy - GOV.UK (www.gov.uk)
[15] https://gwec.net/gwecs-global-offshore-wind-report-2023/#:~:text=A%20total%20of%2064.3%20GW,of%20global%20wind%20power%20installation.&text=Nearly%20half%20of%20that%20growth,%25)%20and%20LATAM%20(%201%25).
[16] https://cfpo.org.uk/true-value-of-seafood-report/

funded THUNNUS UK and CHART programmes[17]. Information from the fishing industry on the impacts of climate change across species distribution in the UK is integral to support adaptive and flexible management.

Large-scale and long-term changes in fish abundance and distribution in response to climate change have also been simulated through modelling. Habitat suitability modelling indicates conditions around the UK are likely to become more favourable for species such as pilchards, anchovy, sprat, European seabass, squid, and Atlantic horse mackerel over the course of this century[18]. Conversely, results indicate significant decline in suitability for other species including saithe, Atlantic wolffish, halibut, ling, megrim, and lemon sole. Such projected changes in fish distribution are likely to require proactive management which takes account of anticipated changes and seeks to improve the resilience of stocks and subsequently the resilience and longevity of the fishing sectors and our collective food security.

4. UK Action to address impacts

In the UK we are committed to ensuring that climate change adaptation, resilience and mitigation are fully considered and integrated in our marine and fisheries policies.

Under the United Kingdom Climate Change Act 2008, the Government was given powers to direct 'reporting authorities' to prepare an assessment on what they are doing to adapt to climate change. Such reports are required every five years, to coincide with the government's own Climate Change Risk Assessment (CCRA) and National Adaptation Programme (NAP).

In January 2016 the UK Sea Fish Industry Authority (Seafish), together with MCCIP, drafted its first report[19] on behalf of the 'wild-capture' fisheries sector. In early 2024 this report was substantially updated and expanded to include greater emphasis on vessel safety, onshore facilities as well as wider seafood supply chains, both domestic and international. Climate change risks have been systematically reviewed, in consultation with fishers, processors, importers and port operators.

From a seafood industry perspective, climate change is now a more important consideration compared to the lower priority it was accorded only a decade ago (during the previous assessment); this shift primarily reflects a changing policy context, but also actual impacts experienced during fishing operations. Over the last decade, independent stakeholder action has supported adaptation. Action has focussed on developing new, emerging fisheries; enhancing fisheries science; ensuring flexibility in fisheries management regimes and governance; building port resilience; assessing the vulnerability of fleets; and keeping a 'watching brief' on industry perceptions of climate change impacts both domestically and overseas. Much has been learnt from a recent exploration of seafood industry resilience in the light of the COVID-19 pandemic.

The Climate Change Objective in our Fisheries Act[20] provides for future fisheries management policy that can mitigate against the effects of climate change, where

[17] https://www.seafish.org/document/?id=0f08da6f-54be-4d38-a788-fee919778f59
[18] https://research-information.bris.ac.uk/en/publications/climate-change-projections-of-commercial-fish-distribution-and-su
[19] https://www.seafish.org/insight-and-research/current-and-future-trends-impacting-the-uk-seafood-industry/climate-change-impacts-and-adaptation/
[20] Fisheries Act 2020 (legislation.gov.uk)

appropriate, as well as adapting to any future impacts of climate change. In November 2022 the UK's four national fisheries authorities published a Joint Fisheries Statement (JFS) that included commitments that "*policy authorities will work in partnership with the seafood sector to support their adaptation to the impacts of climate change and co-develop climate-adaptive management techniques to support sustainable fishing of stocks and aquaculture impacted by climate change, thereby contributing to meeting the climate change objective"*. This objective is put into practice in the UK's Fisheries Management Plans (FMPs). These are designed to streamline the management process for different fish stocks, with each plan containing climate change goals and commitments. Our first five FMPs were published on 14 December 2023; we are now turning attention to their implementation.

The UK's third National Adaptation Programme[21] (NAP3) was published on 17 July 2023 and showcases our plans to adapt to and mitigate the risks of a warming climate on the marine environment, including to manage the risks and opportunities to marine species, habitats, and fisheries.

Further research commissioned by the UK Government to support fisheries climate adaptation in preparation, will highlight climate change adaptation measures being used in fisheries management in the UK and internationally. This study will also examine fisheries management measures that directly or indirectly support or hinder climate-adaptive fisheries management.

5. Reducing the Impact of the Fishing Sector on Climate Change

The UK Government is committed to working with and helping our fishing industry adapt to climate change and achieve our vision of clean, healthy, safe, productive and biologically diverse ocean and seas.

5.1 Net Zero Emissions

The UK recognises the urgency to reduce emissions across the economy with the fishing sector being no exception. Government is working in partnership with industry to identify feasible technological, behavioural, and managerial changes to mitigate and reduce emissions across the fisheries supply-chain to support the transition towards net zero carbon emissions by 2050. We are exploring the potential carbon savings from engine upgrades, gear choices and green technology, as well as identifying opportunities for vessel emission reductions through alternative fuels.

Our Fisheries and Seafood Scheme (FaSS) funds projects in areas such as energy efficiency audits, and propulsion systems. The FaSS also provides support to enable businesses to adapt to new conditions as a result of climate change, for example through vessel modification to undertake new forms of work, new equipment and training. The FaSS includes safeguards which exclude any projects that would:

- negatively affect fish stocks that are in an overfished condition.
- negatively affect or increase the exploitation of fish stocks.

[21] Third National Adaptation Programme (NAP3) - GOV.UK (www.gov.uk)

- increase the fishing capacity of a fishing vessel, except where they meet legitimate public policy goals such as improved safety or sustainability.

The UK Seafood Fund is also supporting the movement to net zero, by providing grants for newer, greener engines and for projects that improve energy efficiency and reduce emissions on vessels.

5.2 Blue Carbon

UK fisheries managers are working with the scientific community to identify and address gaps in the UK's blue carbon evidence base and will conduct research into the impact of different fishing activities and aquaculture on blue carbon habitats to inform future management. Specifically, we have instigated research looking at how trawling disturbance can impact stock and fluxes of carbon in offshore sediments[22], and the merits (or otherwise) of preventing trawling in certain marine protected areas or offshore windfarms on net carbon fluxes, versus the risks of fishery displacement to more sensitive areas.

In addition, species like whales and plankton, are keystones of the ocean's biological pump, the system constantly at work producing energy and capturing and storing excess carbon from the atmosphere. Effective fisheries management can help to conserve that system and in turn contribute towards combatting climate change and protect biodiversity. As the understanding of the role of fish in carbon sequestration improves, fisheries managers may need take this into account in setting sustainable fishing quotas.

6. Conclusion

Climate change will continue to alter the marine environment, changing the species composition of marine ecosystems and their use. Future fisheries management must secure outcomes that are both environmentally sustainable, and resilient to future change, which requires a collaborative and cohesive approach to climate change and fisheries policy.

In the UK we are taking steps to adapt the management of our marine resources to ensure they remain as resilient as possible to climate change enabling our seas to continue to deliver a full range of goods and services.

Recognising that species are mobile and marine environments inter-connected, we must continue to learn from experience at local, regional and global scales, ensuring we take active measures to conserve marine ecosystems and associated stocks as they come under increased pressure. We must also act to ensure that the management of new or re-emerging stocks is sustainable from the outset.

[22] SSB Legacy – Blue Carbon stocks and accumulation analysis for Secretary of State (SoS) region - ME5439 (defra.gov.uk)