BLUE ACTION

www.blue-action.eu

Advances in climate modelling have paved the way for fish forecasts

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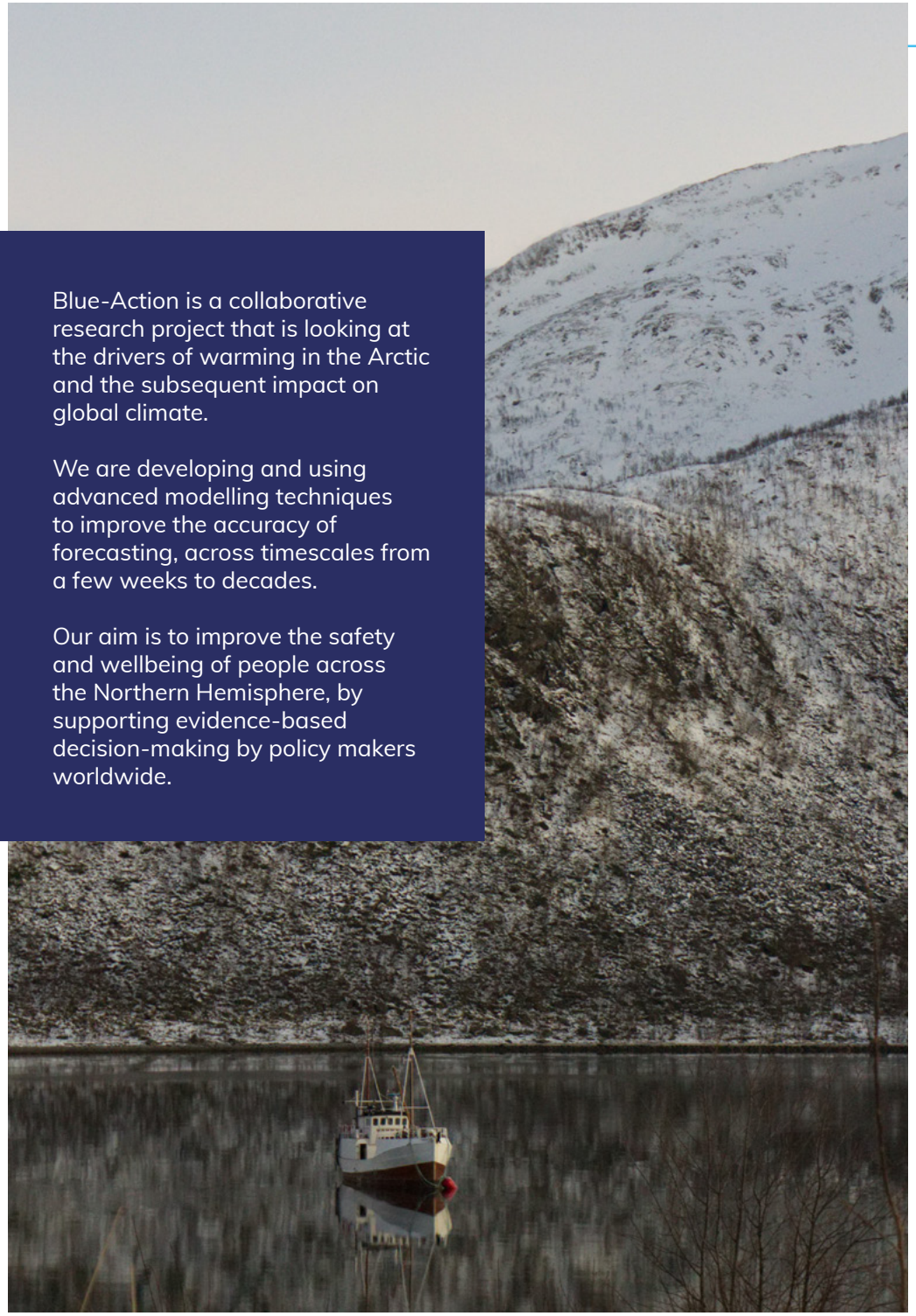

Blue-Action is a collaborative research project that is looking at the drivers of warming in the Arctic and the subsequent impact on global climate.

We are developing and using advanced modelling techniques to improve the accuracy of forecasting, across timescales from a few weeks to decades.

Our aim is to improve the safety and wellbeing of people across the Northern Hemisphere, by supporting evidence-based decision-making by policy makers worldwide.

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Climate predictions are important for climate adaptation

Projections of global mean temperature are powerful tools for discussions about future climate scenarios, but are less useful in aiding day-to-day decisions for most people. We are familiar with using weather forecasts that provide information a few days to weeks ahead. But in a rapidly changing climate, there is a growing need for robust information that allows longer-term planning. Climate predictions from months to up to a decade ahead are required to support individuals, businesses and policy makers in adapting to the challenges of a changing and variable climate.

Understanding the ocean is key to predictions

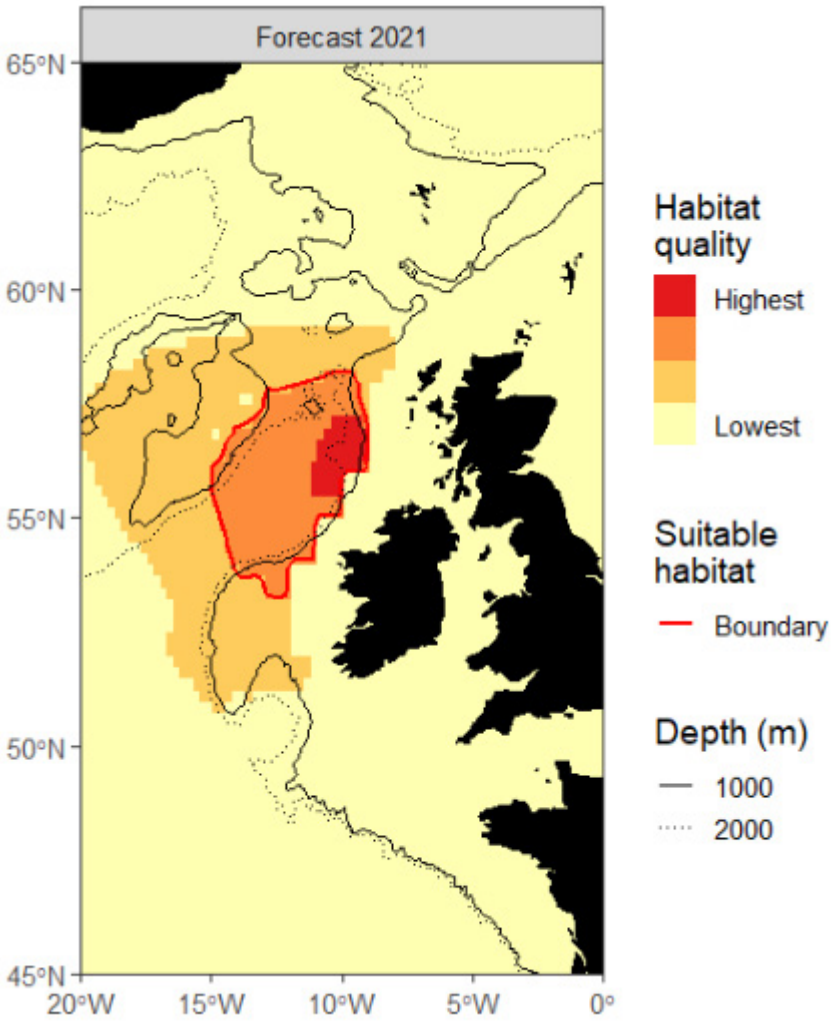
Our skill in making these meaningful predictions comes from understanding the role of the ocean. We refer to the “memory” of the ocean, which - slow to move and slow to change - is a great source of long-term predictability. Recent research shows promising results in predicting ocean temperature, and in some ocean regions, such as the Subpolar North Atlantic, it is possible to predict ocean temperatures several years ahead. Climate models are therefore moving towards robust, reliable predictions of the physical state of the ocean.

Biological systems respond to physical environments

Many mobile species across the world's oceans have been shown to respond directly to the physical state of the marine environment. Variability in where fish are found, behaviour and abundance can be related to changes in factors such salinity or temperature. These include economically important fish species such as blue whiting or cod, and species of high conservation importance, such as Bluefin tuna. However, our knowledge of the response to changes in the environment for many important species is limited, and much more research is required to understand the complexity of interactions.

Fish forecasts are the future

By bringing together our predictions of future ocean states with our understanding of biological responses to the environment, we can begin to forecast variability in key marine species. Development of these forecasts would allow the fishing industry to adapt to challenges several years ahead, improving the economic viability of the sector, avoiding conflicts over fishing rights and increasing the sustainability of fish stock management.



Case study: blue whiting

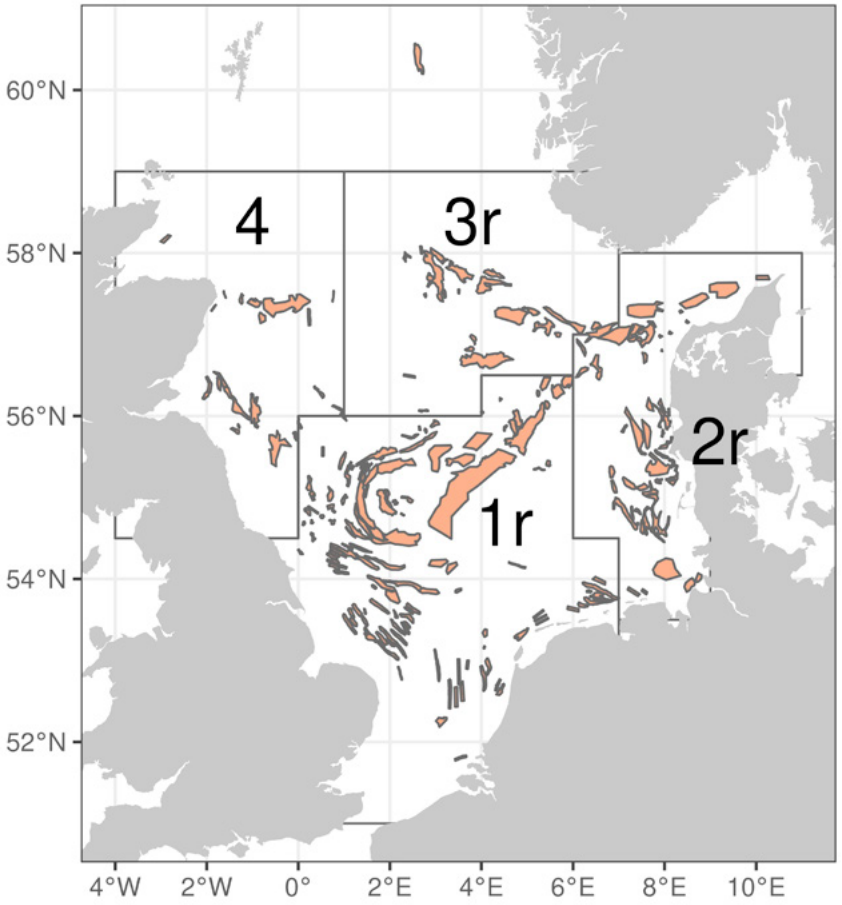
Blue-Action has produced a case study that demonstrates how climate models can forecast the abundance and distribution of certain fish species in the North Atlantic.

One example is for blue whiting, an economically important species. The North Atlantic population overwinters in the Norwegian sea and migrates to the west of Great Britain and Ireland to spawn. The location of spawning varies widely between years, making it difficult to predict for both the fishers trying to catch the species and the scientists monitoring it alike.

Blue-Action has linked these shifts in where blue whiting spawn to oceanographic conditions in the North Atlantic, and in particular to salinity.

Salinity in this region is strongly driven by the dynamics of the North Atlantic Ocean. The slow nature of oceanographic properties can be used to provide reliable estimates of future distributions of water masses and thereby spawning habitat for blue whiting.

The distribution of blue whiting can therefore be forecast up to ten years into the future. Surveys for blue whiting show a good match with these predicted distributions, suggesting that the forecasts from climate models are robust and can support long-term planning by industries and policy makers.



Sandeel areas and banks in the North Sea. Sandeel management areas outlined, with the habitat banks coloured within each area.

Case study: sandeels

A second case study demonstrates how predictions of abundance are also possible. Lesser sandeel (Ammodytes marinus) are a North sea species that live on sandy banks, and are site-faithful as adults.

They are a fundamentally important prey species for many seabird populations, particularly during the breeding season. They are also the basis for a commercially important fishery, where they are used in the production of fish oil.

Understanding and predicting the changing abundance each year is therefore important to maintain a sustainable population, vital for for both industry and conservation.

The abundance of sandeel can be linked to several environmental and population factors. In particular, the numbers of new sandeels each year is affected by competition, the amount of food available and the sea temperatures. By using these factors in a model, it is possible to predict the abundance of sandeel in future years.

The forecast indicates the expected abundance of the next year in terms of high, medium or low productivity. Assessment of the success of the models suggests that in some geographical areas, (Area 1r) the predictions are skilful at predicting abundance a year ahead. However, the skill is much less in other areas, suggesting that other factors may influence abundance, and more understanding of the links between the environment and the population are required.

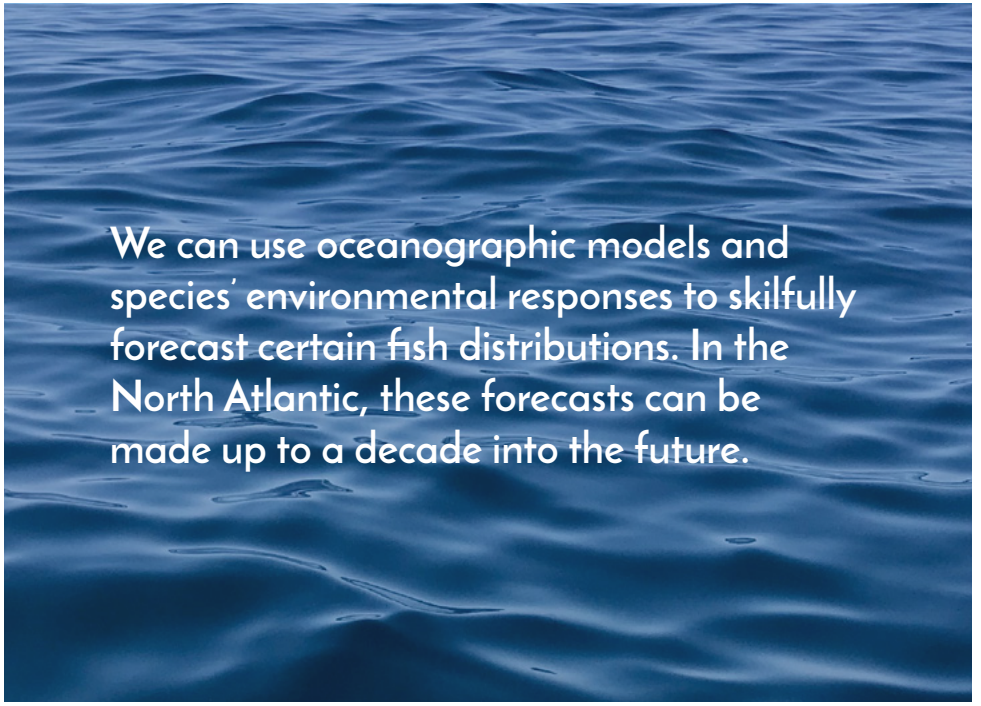
Fish forecasts in action

Recent work and case studies demonstrate that fish forecasts are possible, and are beginning to be effectively developed. However, at the moment there is limited evidence of how these can be translated in real-world action for stakeholders in the marine environment. Predictive outputs are necessarily complex, and translating these data into a form that is relevant and useful for end-users will require consultation and co-design.

Up to date forecasts for blue whiting and other species such as sandeel and Bluefin tuna are freely available at www.fishforecasts.dtu.dk

For more information on Blue-Action and the case studies:

Twitter: @BG10BlueAction
Web: www.blue-action.eu



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DTU

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PFA Pelagic Freezer-trawler Association

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