

Fish in the sea are affected by climate changes – now researchers want to know how

There's no doubt that changes in the climate affect fish, but how will life in the sea be changed and what will happen? Western Nordic marine researchers are joining forces to find the answers.

Research scientists have documented how climate changes affect certain fish stocks. But how are other stocks affected when a stock either expands or becomes smaller? This is a question that Icelandic, Faroese and Norwegian marine researchers have determined to find the answer to. They are investigating the distribution of pelagic stocks in the Nordic seas.

With support from (among others) the Nordic Council of Ministers, research scientists from the Institute of Marine Research (IMR) in Bergen, Hafrannsóknarstofnunin in Reykjavik and Fiskirannsóknarstofnanin in Tórshavn have initiated a joint project where they will take

a closer look at pelagic stocks. The project has the working title *"Effects of future climate change on distribution of pelagic species in the Nordic seas."*

The visible changes

Rapports from both fishermen and researchers indicate major changes are taking place in the Nordic seas. Despite it being difficult at present to determine the cause of the various changes, there is much to indicate that climate changes play a large and important role. This winter we have received several indications that major stocks are changing their behavioural patterns. Capelins in the Barents Sea are behaving dif-

ferently. Now they are spawning in the west of the Barents Sea, whereas a few years ago they were spawning in the east of the sea. This was confirmed by IMR's Director of Research, Ole Arve Misund, to the Norwegian fisheries newspaper Fiskaren on March 13 this year. Capelins have for several decades headed westwards when the sea is cold, and eastwards when it is warm. But with global warming and a sea temperature that is 1.5 degrees warmer than the long-term average, the capelin have over the last two years swum against the current and are spawning in the west, reported Fiskaren. Meanwhile, the Icelanders have had problems finding capelin this winter. Neither are cod spawning where they previously had their core areas. New species are also being registered far up towards the north, species that are moving northwards with the increase in sea temperatures.

More documentation needed

Air temperatures are rising, and it is becoming warmer in the North Atlantic. Changes in the marine environment, as a result of climate changes, are steadily gaining tremendous significance for fish stock distribution, growth and immigration patterns. Even though there is good, solid research documentation available on a number of changes in the seas, an ultimate review is still needed that can provide us with several answers as to the cause of these.

Through the research project *"Effects of future climate change on distribution of pelagic species in the Nordic seas"*, researchers are now eager to gather the knowledge that exists, and through this carry out an analysis of the changes that occur.



Kings Cross during the blue whiting fishing season off Ireland's west coast in 2007. Blue whiting is one of the stocks that is spread over large stretches of the North Atlantic. Researchers will now investigate how climate changes affect various fish stocks. Photo: scanfishphoto

In their project description the researchers said that until now the effects of climate changes on fish stocks is normally based on a single-stock perspective. Researchers made reference to documentation being based on the effect on one single species, without taking into consideration how these changes would affect other species.

"This can lead to incorrect conclusions. In order to obtain the most accurate picture possible you have to assess the stocks in a multi-stock perspective. This means that changes for one species must be viewed in the light of changes for species that have significant interactions with this species," the researchers wrote in their project description. They intend to use existing data to look at changes in their stock parameters in order to make any statement on the stocks in a multi-stock perspective.

The focus is particularly on examining which species are benefiting from the changes, and which species are most likely to decline as a consequence of these changes. Two stocks that affect each other as for example with predator and prey can from an isolated perspective both develop further as a result of temperatures rising in the sea. But the chances are just as likely that the relationship between the two stocks can change, if for example a growing predator stock needs more food than the prey stock manages to produce through its own growth. This means that the increase in temperature can be positive for one stock, but negative for another.

On the move

Traditionally, we talk about stationary fish stocks and migratory fish stocks. With the first group we mean the stocks that are found within the individual country's sea territory. In the other groups we find the stocks that in the course of a year migrate between several countries' zones. In the Nordic seas this concerns particularly pelagic species such as blue whiting, mackerel and herring.

The United Nations' (UN) international climate panel issued a report in February 2007 where they stated with greater conviction than previously that we are in a period with climate changes as a result of CO2 emissions. The report issued by Arctic Climate Impact Assessment (ACIA) in 2005 shows that temperature changes we will face, will impact the Arctic regions in particular. The Arctic Zone will most likely be subjected to changes in the short and long term. That is why researchers are keen to obtain better data that reveals how the Atlantic sea currents are affected in the Nordic seas.

Previously, the Atlantic mackerel and blue whiting had their core areas off the British Isles. Both species now concentrate their summer feeding far away within the western stretches of the Barents Sea.

Many species inhabit limited areas, among other reasons because the temperature is decisive for them. When the temperature rises, the areas previously inhabited by a number of species will be extended to become much bigger areas. For the species' part this means major changes in their way of life and their normal habitat in regard to fixed spawning sites, larva drift patterns, areas where the fish 'grows up' and feeding areas.

These changes have already been registered by researchers and fishermen for the Norwegian Arctic cod. From the seventies the spawning grounds off the Western Norwegian coast have gradually diminished in size while the spawning grounds on the Troms and Finnmark coast in North Norway have become more important. From 2004 the Norwegian Arctic cod has for the first time since the thirties spawned off the coast of East Finnmark, not far from the Russian border.

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Fisheries management and climate changes

April 17 – 18 are the dates for a conference dealing with challenges, brought about by changes in the climate, that fisheries management could be facing in the future. The Institute of Marine Research is organising the conference on behalf of the Norwegian Ministry of Fisheries and Coastal Affairs, the Nordic Council of Ministers and the European Commission.

Fisheries administrators from the Nordic countries and the European Commission, and a number of interest organisations are invited. The addresses will focus on how climatic changes affect the sea environment in the North Atlantic, North Sea, Barents Sea and the Baltic Sea, how this will have an effect on the basis of production, distribution and migration of the major fish stocks, and the social and political consequences that changes in fish stocks could have for the countries in the Nordic region and the EU.

The Norwegian Minister of Fisheries and Coastal Affairs Helga Pedersen and the Secretary General of the Nordic Council of Ministers, Halldor Ásgrímsson, will open the conference which is due to take place in Bergen, Norway, on April 17–18.

www.imr.no/climatechange2008



Photo: Jógvan H. Gardar



Bogi Hansen. Photo: norden.org

Committed to understanding the processes of change

Fish, marine environment and climate will be the main themes of the climate conference to be held in Bergen, Norway, this April. Among the keynote speakers we find the Faroese professor and author Bogi Hansen, winner of the Nordic Council Nature and Environment Prize 2006 for his long-standing and respected work in climate research.

Bogi Hansen has worked for a number of years with analysing the knowledge that research scientists gather on sea currents. He is also a keen diver, and has gathered knowledge first-hand on all that moves on the bottom of the sea off the Faroe Islands, and elsewhere in Nordic waters.

Ongoing development

He has also accrued data on the changes in sea currents, which today are outstanding in enabling comprehension of the effect climate changes has on circulation in the seas. Sea currents in the depths of the ocean are a highly important factor for the climate system. It caused quite a stir when Bogi Hansen suggested that the flow of deep, cold water from the Arctic strokes into the Atlantic and thereby into the seas of the world, has been reduced by up to 20 percent over the last 50 years.

– Our latest measurements and calculations don't however support this, Bogi Hansen said. There has been registered a decline for deep water development in the Labrador Sea between Greenland and Canada; but for the time being it would appear as though the outward flow from the Arctic strokes has been appropriately stable. This is in agreement with the forecasts from the United Nations' climate panel IPCC.

New knowledge

Bogi Hansen will be appearing at the conference in April to present the latest he and other researchers have of knowledge on climate changes and the effect they have on the seas.

– I will be raising attention especially to

changes that have happened, are happening and that in all likelihood will take place in the Nordic and North Atlantic sea areas, Bogi Hansen said.

He intends to speak principally about changes in currents and temperatures, but will most likely also touch on changes for fish in the sea, even though this is a topic that will be dealt with by other speakers.

– It is particularly the temperature and changes in sea current conditions that are my field, but one of the main reasons we research in this area, is out of consideration for fish stocks.

– We don't know which changes might emerge, or how they might affect the sea environment. We have changes occurring in sea temperatures over the past ten-fifteen years. Changes that most likely originate from changes occurring with the Labrador Sea.

– Areas in the Arctic zone are now undergoing one of the most comprehensive climatic changes ever on this planet. Naturally, this is first and foremost of enormous significance for the peoples and nature in the Arctic areas. But the Arctic Council's report, Arctic Climate Impact Assessment, documents in an extensive manner how a warmer climate in the Arctic will impact the global climate, among other things through sea levels rising, changes in sea currents.

– For life in the sea this will most probably mean that we will see new species entering our waters, at the same time as species we have had in our waters will disappear due to changes in the temperature, access to food and other changes.

New research project

Bogi Hansen is employed at the marine research institute in Torshavn. From his base in Torshavn he is engaged in researching activity in the sea. He works in closely with researchers from a number of countries. This spring he participated in starting up a new, long-term research project. The project has been dubbed THOR, and is administrated from Germany. But there are numerous research environments from all over Europe involved in the project, which is an EU investment and is expected to be completed within three-four years. Among the countries participating we find most of the Nordic countries, France, the United Kingdom and Germany.

– We will be carrying out further research on, among others, the research I've taken part in before. There's such a lot we are eager to investigate, and this will be a good opportunity to accumulate results from many researchers, Bogi Hansen said.

He won't be presenting any surprising conclusions at the conference in Bergen. His prime message will be that the man-made climate changes are already underway, and that they will intensify in this century.

– They will have an impact on the sea in our areas, fish and other living organisms. We can be certain that massive changes lie ahead; we just do not know which ones.

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Photo: Jógvan H. Gardar

Faroe Islands – ready to become transatlantic climate centre

The Faroe Islands are set to become a centre for marine research, which will also document the climate changes that the sea is exposed to. April is the month that marks the start for establishment of a transatlantic research centre.



Former Vice President of the United States, Al Gore, was the draw card and main keynote speaker at the "Trans Atlantic Climate Conference" which was held on the Faroe Islands April 7 and 8. The climate conference was organised as a cooperation project between several local groups on the Faroe Islands. NORA (Nordic Atlantsamarbeid) has also been a contributor.

Among the conference's keynote speakers was Professor Bogi Hansen, who among other things has been awarded the Nordic Council's Nature and Environment Prize, for his research on sea currents. A third interesting speaker was the Icelander Orri Vigfusson, who almost single-handedly stopped the Faroese fishing of wild salmon, when through donations from sports fishermen he managed to buy off the Faroese commercial fishermen from their traditional sea fishing. The reason for this was anxiety that the Faroese fishing would affect the Icelandic rivers so that they would become less attractive to rich tourists travelling to the volcanic island to relax and fish for salmon.

Ólavur Gregersen, director of Bitland and one of the conference's organisers, said that with this conference they are eager to initiate what they hope will be a crucial contributor to climate research that is related to what is

happening in the sea. One concrete result of this conference is that an international research, development and education park in marine research is to be established on the Faroe Islands. This park will link up progress happening in research in this field on both sides of the Atlantic.

– On the Faroe Islands we have researchers with specialised expertise that is at the forefront on a global basis in regard to research on sea currents in the North Atlantic. As a fisheries nation the Faroe Islands is also widely knowledgeable on weather and resources in the sea. We would also mention that we are now also underway with several stimulating research projects that will ensure less usage of oil, savings in energy and new types of energy, Ólavur Gregersen said.

Gregersen said they are now preparing the groundwork for the Trans Atlantic Climate Institute, so that international research scientists, students and others can travel to the Faroe Islands to work with climate research and on climate changes that occur in the Nordic sea areas. He added that this research and education park will be at university level.

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