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Fisheries and aquaculture in Europe

Climate change: what impact on fisheries?

Turbot:
the future lies in farming

Romania:
a sector in the making

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Calendar

Shows and exhibitions

- **Interpescas, Aveiro (Portugal), 20-23 September 2007**
  The organizers of Portugal's first large-scale national fisheries and seafood exhibition hope to make it an annual event drawing in operators from throughout the sector.
  > For more information:
  Tel: +351 916 63 87 57
  E-mail: comercial@exposan.pt
  Website: http://www.interpescas.com

- **NAFO, annual meeting, Lisbon (Portugal), 24-28 September 2007**
  This meeting will draw up stock management guidelines for species exploited in the North- West Atlantic, based on the recommendations of the association's Scientific Council.
  > For more information:
  Tel: +1 902 468 55 90
  E-mail: info@nafo.int
  Website: www.nafo.int

- **World Seafood Congress, Dublin (Ireland), 25-27 September 2007**
  Ireland is hosting the annual travelling event this year. The exhibitions and conferences will focus on innovation, particularly new technologies, new products, new methods, quality assurance and ecological labelling.
  > For more information:
  Website: www.worldseafoodcongress07.com

- **SEAFO, Annual Commission Meeting, Windhoek (Namibia), 8-12 October 2007**
  This annual meeting brings together the states involved in management of deep-sea resources in the South-East Atlantic (off the coast of Southern Africa). It will follow the meeting of the Scientific Committee, which will draw up management recommendations.
  > For more information:
  Tel: +264 64 22 03 87
  E-mail: info@seafo.org
  Website: www.seafo.org

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Note to readers
We welcome your comments or suggestions at the following address: European Commission – Directorate-General for Fisheries and Maritime Affairs – Communication and Information Unit – Rue de la Loi/Wetstraat 200 – B-1049 Brussels or by fax to: (+ 32) 2 299 30 40 with reference to *Fisheries and aquaculture in Europe*. E-mail: fisheries-magazine@ec.europa.eu

For further information on fisheries and maritime affairs, please consult the following sites:

http://ec.europa.eu/commission_barroso/borg/index_en.htm

http://ec.europa.eu/fisheries

http://ec.europa.eu/maritimeaffairs

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Climate change and fisheries: the need to combat global warming and strengthen stocks

Scientists have all recognised the reality of the climate change we are now experiencing. The earth's atmosphere has warmed by 0.74 °C in the past century. This may not seem like much, but the impacts of this "slight" warming on ecosystems are already significant and they suggest what might lie ahead if the climate changes further, as projected in all the expert scenarios.

The impact on the marine environment is already apparent: the sea level is rising, currents are changing course, the oceans are becoming more acidic, species' natural ranges are shifting, and so on.

The scientists of the Intergovernmental Panel on Climate Change (IPCC) have confirmed the reality of climate change and its consequences. There are signs that the trend is accelerating. The 10 warmest years on record have all occurred since 1990. Concentrations of methane and CO_2 in the air have reached levels never equalled over 650 000 years…

For these experts, global warming is inevitable. The goal now is to limit its scope. A rise of more than 1.5-2.5 °C in the earth's average temperature would bring changes that would obviously be disastrous for biodiversity, but for human civilisation as well. Hence the need to limit the temperature increase: an objective of 2 °C was set by the 27 European Union countries early this year. Ambitious target figures, going well beyond the EU's current international commitments, have therefore been set: cutting greenhouse gas emissions by 20% by 2020 and increasing the share of renewable energy to 20%.

Achieving those targets means that combating climate change must become a priority in all European Union policies. The fisheries sector is no exception. Like all energy-consuming economic activities, it has a negative impact on the climate. If the sector already starts analysing the energy performances of its fishing methods and gears, it can help reduce consumption of fossil fuels, which produce greenhouse gases.

It is also important to realise that fishing is one of the economic activities that suffers the most from climate change. The marine ecosystems on which fishing depends are changing and are likely to undergo considerably more changes as the climate evolves. The migration of marine species is already a reality. So it is essential to strengthen stocks to cope with these changes. Now more than ever it is more important to stop weakening resources through overfishing…

The Editor

Climate change
What impact on fisheries?

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Climate change is already affecting marine ecosystems. Its impact can be seen in the acidification of the oceans, rising sea levels, an increase in storms and higher water temperatures.

The earth's climate is heating up, primarily as a result of human activity. This reality is today widely recognised by the scientific community and most political authorities. The facts are unequivocal: ecosystems are already being affected by global warming. If we fail to react rapidly now, we open the door to major upheavals which will have serious consequences both for the environment and for all human activities. Sectors which depend on the exploitation of natural resources, such as fisheries, are particularly at risk.

The Intergovernmental Panel on Climate Change (IPCC), made up of scientists throughout the world, has assessed the current and future impact of climate change. The experts have released a synthesis report on their work. Although this paper does not give details on marine ecosystems or fisheries the full report, to be published later this year, is expected to confirm the many studies showing that climate change has already had repercussions on marine ecosystems, fish stocks and fisheries.

The general observations made in the conclusions of the synthesis report are alarming. The IPCC asserts that numerous ecosystems are threatened by an unprecedented combination of disruptions associated with climate change, such as acidification of the oceans, and other factors such as pollution and over-exploitation of resources. Some 20 to 30% of plant and animal species will in all likelihood face a greater threat of extinction if the rise in the average temperature of the atmosphere exceeds an estimated range of 1.5-2.5 °C, while all the scenarios drawn up predict temperature increases of 1.5 °C or more by the end of the century. These developments will obviously not spare marine ecosystems, which are already experiencing certain impacts of climate change[1]. The following are some of the most important:

- **Marine warming** – The increase in atmospheric temperature has repercussions on bodies of water. The temperature of surface waters has risen by around 1.5 °C since the 1960s. Recent research shows a warming of the seas up to a depth of 3 000 metres. The temperature of the North Sea, for example, has risen by 1.1 °C over the last 30 years.

- **Acidification of surface waters** – The seas and oceans have the capacity to absorb CO_2 from the atmosphere. As concentrations of this gas continue to rise, the quantity absorbed has also increased, leading to an acidification of their waters. The pH of oceans has changed from 8.2 to 8.1 since the middle of the 19th century[2].

(1) See SEC(2007) 8, impact study of Communication COM(2007) 2 "Limiting global climate change to 2 degrees Celsius – The way ahead for 2020 and beyond."
(2) pH is a measure of acidity, with neutral solutions having a pH of 7.

- **Rise in sea level** – Climate change is causing ice sheets – both polar caps and mountain glaciers – to melt. All that water stored in solid form is now pouring into the oceans, whose level inevitably rises. Sea level has risen by 19.5 cm since 1870, with serious impacts on coastal regions.

- **An increasing number of extreme weather events** – Climate change is being seen in increasingly frequent periods of drought, heavy precipitation and storms. In the northwest Atlantic, events of extreme winds and high waves are on the rise.

Weakened resources in jeopardy

These impacts, which have already been widely established, have observable consequences on certain species. Climate change plays a role, for example, in the decline in North Sea and Baltic cod stocks. And this occurs for different reasons, given the extreme complexity of the climate's interaction with ecosystems.

In the North Sea, this decline seems to be caused by shifts in the geographical ranges of plankton. The dominant species, *Calanus finmarchicus,* on which cod larvae feed, have shifted from the North Sea to the Arctic Ocean in search of colder waters. Its biomass in the North Sea has dropped by 70% since the 1960s. Species of plankton from the south, which are replacing it, are less abundant and do not seem suited to the larval stage of cod. So the decline in the favourite prey of cod larvae partially explains the problems of cod stocks in the North Sea.

In the Baltic, mild winters, a reduced inflow of water from the Skagerrak and higher rainfall and river flows have resulted in gradual desalination. Salt water, which is heavier than fresh water, is now found at deeper levels. Cod eggs sink before reaching a certain salt density, which enables them to remain in suspension. Therefore they now sink further towards the sea bed, to depths where the lack of oxygen makes their survival much more difficult. On top of that phenomenon come pollution, shifts in plankton ranges and overfishing, creating tremendous pressure on these stocks.

Species displacement

As described above with plankton, the most visible expression of climate change today is species displacement. Fish, molluscs and crustaceans are moving further north in search of colder waters, either because their organism requires a specific temperature range no longer provided by their natural habitat, which has become too warm, or because they are following vegetation, plankton and other marine organisms on which they feed, and which are migrating north.

Red mullet, for example, which used to be rare north of the English Channel, has become a commercial species in the North Sea since the start of this century: catches have risen from 10 tonnes in 1985 to 700 tonnes in 2005. The same trend is occurring with seabass: in 20 years, catches have risen from 31 to 558 tonnes in the North Sea and from 694 to 2 429 tonnes west of the British Isles. Without showing such a spectacular evolution, other species previously known to live at lower latitudes are spreading beyond the 50th parallel, including anchovies, sardines, bluefin tuna, grey triggerfish, stingrays, thresher sharks, and blue sharks.

A similar phenomenon can be seen to the south. Species that habitually live along the African coasts are moving northwards. Tropical species of black codling *(Physiculus dalwigki),* rockling *(Gaidropsarus granti)* and snake eel *(Pisodonophis semicinctus)* are now being spotted in Galician waters. The CIESM[3] Atlas of exotic species is continually adding to its list of tropical fish that have moved into the Mediterranean via the Suez Canal or the Straits of Gibraltar, including sharks and sole from Senegal, two species with considerable commercial potential.

These changes are not negative as such, since they sometimes create new fishing activities. However, their indirect effects on the fragile balance of marine ecosystems and on the species currently making up part of such ecosystems are not yet well known. Permanent vigilance thus remains vital.

Multiple effects

In addition to species displacement, climate change puts other types of pressure on aquatic ecosystems. Here are a few examples:

Feeding on agricultural pollution and untreated wastewater, aquatic vegetation develops excessively, depleting water of its oxygen. This phenomenon, known as eutrophication, is a type of pollution that has long been present in all European coastal waters. For the last 30 years or so, however, eutrophication has become more intense because of higher water temperatures and the release into aquatic environments of eroded earth due to rising sea levels. The phenomenon results in an increasing number of green, red and brown tides and excessive growth of plankton on European coasts. These imperil marine life by depleting the water of oxygen and occasionally by releasing toxic substances. In addition to the problems they create for aquaculture, they lead to high mortality among young marine organisms living in coastal waters.

For a number of decades, a process of coral bleaching has been occurring on a worldwide basis. This phenomenon is one of the first signs of acidification of sea water, which affects these particularly vulnerable organisms. The experts are concerned about the effects of acidification on the respiratory systems of aquatic animals and on the development of those with calcareous skeletons or shells, like most molluscs. Shellfish farmers will have to take this factor into account.

As seen with species displacement, the sea is a complex ecosystem whose full ramifications are not yet fully understood. In the long and winding food chain, phenomena as local as green tides and coral mortality will inevitably have consequences on the ecosystem as a whole.

(3) Mediterranean Science Commission – www.ciesm.org

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The decline of cod stocks is partly due to the impact of climate change on plankton in the North Sea and on the salinity of the waters of the Baltic. In both cases, though, the main cause is overfishing.

Pressure on the environment from all sides

Of course, today's climate change is not the first the Earth has seen. Successive periods of warming and glaciation have marked the history of our planet and have even played a decisive role in the evolution of the earth's flora and fauna.

The present evolution, however, is of a different in nature. Present-day climate change is driven by human activity, with its artificial greenhouse gas emissions. This trend is occurring at an unprecedented speed: since the mid-19th century, the earth's temperature has risen by 0.76 °C, and the last 10 years have been the warmest ever since meteorological record-keeping began. During previous climate changes, nature has always had the possibility to adapt to the new conditions, to strike a new balance (animals migrate or change feeding habits; vegetation develops to absorb CO_2, etc.). That is not the case today, though, because human activity has weakened nature and prevented it from evolving and adapting to a change that is occurring at a speed never before seen.

For marine environments, the different forms of water pollution and over-exploitation of certain fish stocks are creating a situation that makes it difficult if not impossible for species to adapt to the new conditions. The simultaneous observation within a single habitat of non-exploited and commercial species tends to show that the former adapt better and more quickly than the latter to the new conditions imposed by the climate.

How should we react?

Fishing activity has a dual interaction with the climate: on the one hand, it contributes to climate change by burning fuel and producing greenhouse gas emissions; on the other, it is affected by climate change because it alters marine ecosystems, which form the basis of fisheries resources. The action to be taken has to take on board both aspects of the problem.

Regarding the first, the fisheries sector can help attenuate climate change by reducing its use of fossil fuel, which would also mean contributing at its own level to the general action decided by the European Union to cut greenhouse gas emissions (see article, page 8).

As for fisheries management, maintaining sustainable fisheries means helping ecosystems cope with climate change. Limiting pressure on weakened species and implementing ecosystem-based fisheries management, based on the principle of "maximum sustainable yield" (MSY)[4], are the most appropriate actions to enable marine ecosystems to adapt to climate change.

(4) Maximum sustainable yield is an approach that determines the maximum amount of fish (referred to as maximum balanced catch) that can be taken from a stock over the years without endangering its reproductive potential. See: Fisheries and aquaculture in Europe No 32.

So many uncertainties

The impact of climate change on marine ecosystems is already being felt and already causing major changes. The question is knowing what the future holds...

"That is an extremely difficult question," notes Keith Brander, coordinator of the GLOBEC international programme at the International Council for Exploration of the Sea (ICES). *"The ICES expects to see a global temperature increase of 0.2° per decade. So we can suppose that the temperature of the oceans will continue to rise and that we will see more species displacement... It is easier to migrate in the sea than on land! But there are still a lot of uncertainties, because along with global warming, other parameters intervene in the evolution of ecosystems and add to the complexity of the situation."*

It is therefore difficult to imagine species displacement and replacement patterns. *"It is hard to say whether cod will be replaced in the North Sea, for example, because as a species with very general feeding habits, it occupies a very specific niche,"* continues Keith Brander. *"Red mullet and hake could take its place, but mullet is a much smaller fish and hake has a more specific diet."*

For the longer term, other effects of climate change could become more extensive. *"Acidification is a big problem,"* explains the scientist. *"It is a major change, because the projections announce a level of acidity in the oceans that has not been seen for thousands of years. The phenomenon has only been studied for two or three years and its consequences are still very poorly known. Animals with a calcareous skeleton will suffer the consequences. We also know that squid are sensitive to high acidity and present a limited capacity to adapt. The consequences should not begin to be felt for a few decades."*

Keith Brander, researcher at the International Council for the Exploration of the Sea, explains that it is hard to know what the future holds: *"In addition to global warming, other parameters come into play in the evolution of ecosystems, making things very complex."*

"For increases in global average temperature exceeding 1.5-2.5° C and in concomitant atmospheric carbon dioxide concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions and species' geographic ranges, with predominantly negative consequences for biodiversity , and ecosystem goods and services e.g., water and food supply." – Intergovernmental Panel on Climate Change, *Climate Change 2007: Impacts, Adaptation and Vulnerability – Summary for Policymakers,* Brussels, 6 April 2007.

The most spectacular effect of climate change on fisheries is the shift in the geographical range of certain species. Red mullet and seabass, for example, are now being fished commercially in the North Sea and west of the British Iles.

Europe's commitment: cutting greenhouse gas emissions by 20%

The European Union is firmly committed to combating climate change. Last February, the 27 Member States, acting on a Commission recommendation, set out an ambitious programme: to reduce our greenhouse gas emissions by 20% by the year 2020 and to increase the share of renewable energy to 20%. These targets go well beyond the Kyoto objective, exemplifying Europe's intention to create a strong dynamic which can mobilize the rest of the world. Achieving this objective will mean that economic sectors as well as citizens will have to rethink their energy consumption patterns. And fisheries will be part of this process.

At the Earth Summit in June 1992 in Rio de Janeiro, some hundred Heads of State or Government adopted the *United Nations Convention on Climate Change*[1], in which they agreed to reduce their greenhouse gas emissions. That commitment in principle became concrete in 1997, in Kyoto, when the industrialised nations set an objective for 2012: to reduce emissions of carbon dioxide (CO_2) by 5% from 1990 levels. The European Union, which accounts for 15% of global emissions, undertook to reduce its emissions by 8%.

The EU's first combat was to save the Kyoto Protocol, which barely escaped becoming a dead letter due to the defection of the United States and Australia in 2002. At the price of a considerable diplomatic effort, the European Commission succeeded in maintaining the accession of all the other partners, which enabled the Protocol to enter into force on 16 February 2005. The EU thus became the de factor leader of the struggle to save the climate.

Most importantly, though, the EU matched its words with actions, taking measures to reduce the use of fossil fuels. Those measures today concern society as a whole. Here are a few examples:

- In 1998, the Commission reached an agreement with **vehicle manufacturers** to decrease average CO_2 emissions from new vehicles by 25%. Manufacturers must clearly display the fuel consumption and emissions of their models.
- A directive adopted in 2001 sets targets for the use of **renewable energy:** 12% of energy and 22% of electricity consumed in 2010 must be generated from renewable sources.
- Since 2003, all new and renovated buildings must comply with minimum **energy efficiency** standards.
- The **European emissions trading scheme** came into force in 2005, imposing CO_2 emissions quotas on 12 000 companies in the sectors of energy, steel, petroleum, cement, paper, glass and ceramics.
- Also since 2005, the directive on the promotion and use of **biofuels** imposes the use of 5.75% biofuel for transport by 2010.

With this policy, the EU looks set to meet its Kyoto targets, in spite of the difficulty of controlling emissions from transport, which have risen by 22% in the EU from 1990 levels (40% for trucks).

Strong commitments

The fact remains that the Kyoto Protocol will not be enough to keep climate change under control. The Intergovernmental Panel on Climate Change (IPCC) has drawn up a number of scenarios detailing the climate's evolution during the 21st century[2]. It is now known that global warming must be kept within the limit of 1.5-2.5 °C to prevent irreversible or even catastrophic upheavals. Doing so requires a 30% reduction in greenhouse gas emissions from 1990 levels.

At the start of 2007, the EU sets its objective of limiting the increase in the planet's average temperatures to 2 °C from pre-industrial age levels. Obviously, achieving that objective will not depend on Europe alone, but will require efforts from every country in the world. Yet by placing itself in that perspective and setting an example to prove that the objective can be reached, the EU intends to bring a good many governments along in this dynamic.

Concretely, European leaders have agreed to reduce the Union's greenhouse gas emissions by 20% by 2020 and to generate 20% of its energy from renewable sources. The drive to decrease greenhouse gas emissions will even have to be raised to a 30% target for all developed countries if a global-level agreement is reached for the post-2012 period.

And what about fisheries?

As an industry that consumes diesel fuel, fishing is naturally concerned by this action. The catching sector accounts for 1.2% of total consumption of petroleum products and requires 640 litres of fuel per tonne landed. This is an average figure, because it is easy to imagine that the energy needs for bottom trawling are considerably higher than those for fixed net fishing. A European analysis of the life cycle of fishery products[3] points out that in the production chain that culminates with these products, it is the catch sector that contributes the most to global warming.

Yet the sector has high energy savings potential. Economies of up to 20% are possible by improving the design and use of vessels and equipment. Such investments can, moreover, receive financial backing from the European Fisheries Fund (EFF).

The Commission recently launched a study on this important question, with the aim of identifying all possible changes and analysing their profitability over time. Upon its conclusion, online information will be made available to operators via a regularly updated website.

It is also important to note that measures taken to protect resources and maintain stocks at their optimal level also help reduce energy consumption. Improved management will make stocks more abundant and lessen the fishing effort needed to exploit them.

The fisheries sector, like many others, is on the frontline in the battle against climate change. The serious harm that climate change can cause to fishing activity provides the best motivation for getting seriously involved.

(1) See http://unfccc.int
(2) See http://www.ipcc.ch/SPM2feb07.pdf
(3) M. Thrane, *LCA of Danish fish products – New methods and insights,* in *The International Journal of Life Cycle Assessment,* 11, 2006, pp 66-74; http://ec.europa.eu/environment/integration/research/newsalert/pdf/8na1.pdf

Romania's fleet is mostly composed of small craft that fish with a fixed net in coastal waters.

Romania: a sector on ice

Following the enlargement of 1 January 2007, the European Union's borders now stretch to the Black Sea on the shores of Romania and Bulgaria. Two new sets of fishermen have joined the Common Fisheries Policy. In Romania, the sector has to cope with both environmental and economic problems.

The 1970s and 1980s in Romania saw intensive production in maritime and inland fisheries, as well as in aquaculture. Consumption peaked at 12 kg a year per inhabitant, one of the highest in Central Europe. The Romanian fleet operated in the East Atlantic all the way to South Africa. Aquaculture production was six times higher than it is today. From 1989, privatisation of the sector in a context of economic recession resulted in radical changes.

Maritime fishing activity has refocused on the Black Sea for the last 15 years. From 14 000 tonnes in 1988, production dropped to 6 000 tonnes in 1990 and has plummeted to 2 000 tonnes today. Landings are composed mainly of small pelagic species (85%), essentially sprats (75%). Other catches (20 to 50 tonnes a year) include anchovies, whiting, Black Sea shad (a type of herring that swims back up the Danube, as far as 80 km from the mouth of the river), Black Sea turbot, different types of mullet and, depending on the year, Atlantic bonito.

Given the scarcity of scientific data on Black Sea fish resources, it is hard to identify the causes of the decline of the Romanian fishing sector other than a lack of economic investments. It is well established that the Black Sea suffers from environmental problems that are now being addressed (see box), but in the lack of systematic stock evaluation, it is difficult to know their real impact on fisheries. At the initiative of the European Commission, Romania is gearing up for discussions with the other states bordering the Black Sea (Turkey, Ukraine, Russia and Georgia) to lay the bases for shared stock management.

The Romanian fleet is made up of around 450 vessels, mostly small craft that fish with a fixed net in coastal waters. Ten or so trawlers still fish for small pelagic species in the 12-mile coastal zone.

Inland fisheries

Inland fisheries, primarily in the Danube and its delta, have always been more productive than fishing activity in the Black Sea. The communities of the Danube delta depend heavily on this activity, which has also suffered from the decline of the sector. Production slipped from 26 000 tonnes in 1988 to 13 000 tonnes in 1990 and dropped to 4 000 tonnes in 2005.

This small-scale fishing is practiced in boats operated by one or two fishermen (3 000 operators are registered). They fish for fresh water species like allis shad, common bream, zander, pike, wels catfish and different species of carp. The Danube and the brackish waters close to the delta are home to several species of sturgeons, including the famous beluga, all of which are in danger of extinction. Romania has just adopted a 10-year moratorium on sturgeon fishing to encourage stock recovery.

Aquaculture production has gradually dropped from 35 000 tonnes in 1990 to 7 000 tonnes in 2005. Providing work for 1 800 people, it is practised exclusively in fresh water, in natural or artificial ponds, and produces different kinds of carp, in the Eastern European tradition. The Romanian authorities plan to develop aquaculture with support from the European Fisheries Fund: a large part of the € 230 million allocated to Romania for the period up to 2013 is earmarked for aquaculture products.

With consumption currently totalling only 4.4 kg per person per year, the Romanian market is not currently ready for the development of a processing industry. There is only one big plant for fish smoking and salting in the Danube delta, which has some 200 employees.

A sea plagued by eutrophication and invaders

The Black Sea concentrates all the pollution carried by the three huge river basins that flow into it: the Danube, the Dniepr and the Don. The biggest problem is eutrophication[1], caused by agricultural fertilisers and untreated waste water. It leads to the decline of the sea bed, excessive plankton growth and loss of biodiversity. In the past few years, some improvement has been observed thanks to the work of international bodies such as the Black Sea Commission[2], for environmental recovery, and the ICPDR[3], for improvement of the quality of the waters of the Danube.

The other problem is the proliferation of a species of jellyfish, the American Ctenophore, or comb jelly, *(Mnemiopsis leidyi)*, which was accidentally introduced around 1980 via the ballast water of ships. Feeding on plankton, eggs and larvae, it caused a collapse in stocks of small native pelagic species. It is now falling victim to another West Atlantic ctenophore *(Beroe ovata),* which feeds exclusively on other jellyfish and is currently decimating the American comb jelly.

(1) Depletion of oxygen in the water due to the excessive development of aquatic vegetation.
(2) Commission on the Protection of the Black Sea Against Pollution – www.blacksea-commission.org
(3) International Commission for the Protection of the Danube River – www.icpdr.org

Out and about

Turbot farming: a luxury product nurtures a growing industry

Turbot *(Psetta maxima)* is a large flat fish prized by gourmets for its refined flesh. While catches of the wild fish are constantly declining, turbot farming is experiencing rapid expansion, with new economic prospects opening up for the 20-year old industry, in both Eastern and Western Europe.

Catches of turbot, like those of many other species, have dropped sharply in all the seas where it is caught. On the European Union's Atlantic shoreline, catches now total only 5 000 tonnes, having declined by one third over the last decade[1]. In the absence of existing scientific studies on this species, the European Commission has asked scientific bodies to evaluate the stock to determine whether protection measures are needed. Meanwhile, turbot in the North Sea is subject to a shared quota with brill of 4 323 tonnes for 2007.

Some 85% of catches come from the North Sea, the Channel and the Celtic Sea. The Netherlands has an outstanding fleet for catching flat fish and is far and away the top producer (1 915 tonnes in 2005).

However, a sub-species of turbot is also exploited in Eastern Europe, in the Black Sea. As with its cousin from the west, the high culinary value and refined flavour of its flesh make it a highly sought after and very profitable luxury product, particularly in Turkey, which is the principal operator (650 tonnes in 2005). Only 50 tonnes are caught by small-scale operators from Bulgaria and Romania. A large part of those 50 tonnes is exported to the Turkish market.

Catches of Black Sea turbot also continue to decline. As recently as a decade ago, they stood at between 2 000 and 3 000 tonnes, as compared to only some 700 tonnes today. Overfishing is the cause, together with environmental problems (see article, p.9). Since the end of the 1990s, Turkey has been implementing catch restriction measures (minimum sizes, closures, etc.). In Bulgaria, the Fisheries Ministry sets annual quotas, based on recommendations of the Fisheries Resources Institute, to ease pressure on this resource.

A future for farming

Since there is high demand for turbot on all markets, aquaculture clearly offers development prospects. In the Western part of the European Union, turbot farming began in Galicia in the early 1980s. Annual production in the EU currently stands at around 7 000 tonnes.

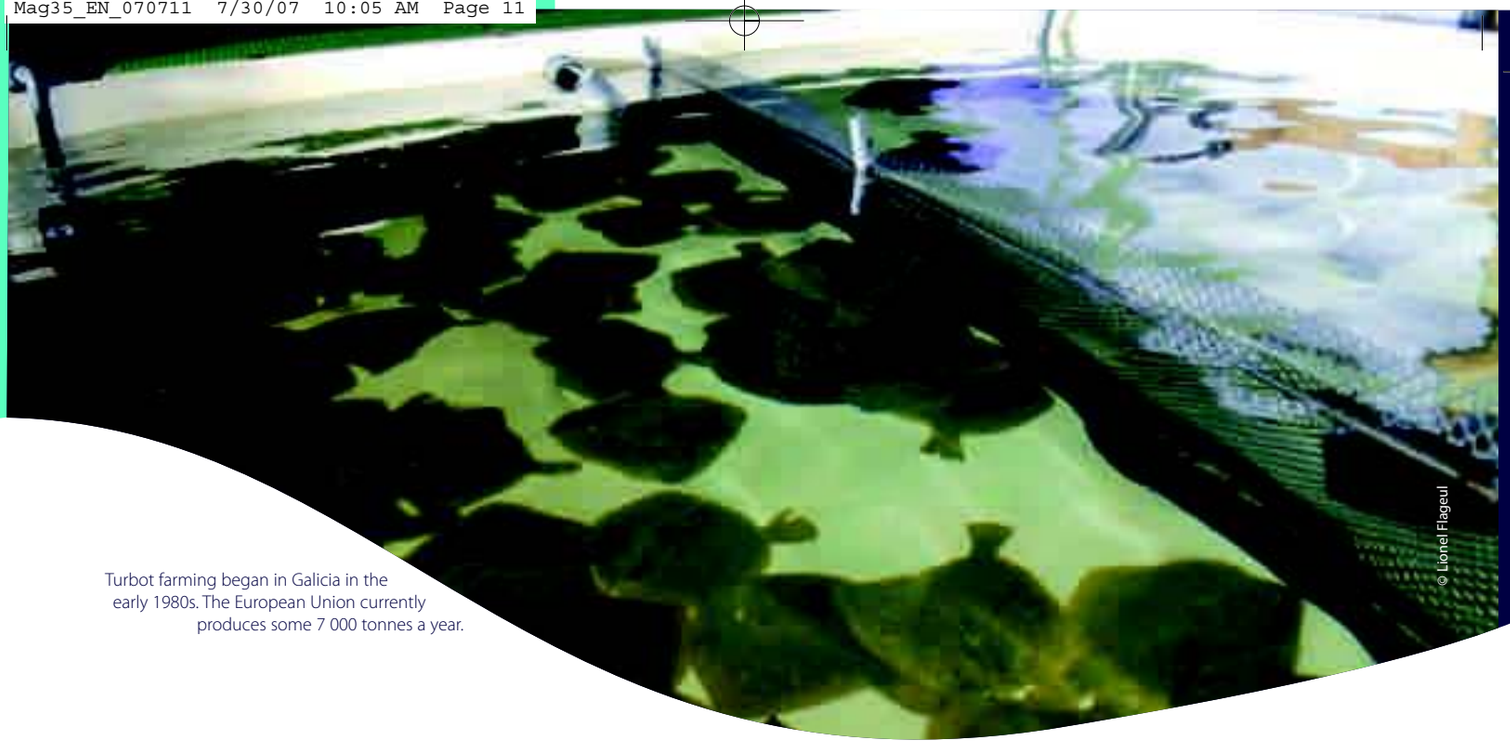
The European market has developed primarily in Spain and France, with production from other states accounting for barely 3%. With 5 500 tonnes in 2005, Spain, and more precisely, Galicia, dominates the market. Stolt Sea Farm is the leading EU producer (4 000 tonnes). It has six hatcheries and six farms in Galicia, a farm in Centro (Portugal), another in Aquitaine (France) and still another in Sørlandet (Norway). Ranking second is Pescanova, a Spanish agri-business multinational that is also active in preserves and frozen foods. It runs a hatchery and two farms in Galicia.

Galicia's dominance of the sector stems from the quality of its sea waters, whose temperature is ideal for turbot (around 17° C). As a result, fish farmers can work in an open circuit, i.e. continually renewing tank water with water from the sea. Further north, the water is too cold in winter (and sometimes too warm in summer), obliging farmers to use a recirculation system, with which the tank water is largely recycled, reoxygenated and reheated (or recooled) in an internal circuit. This system not only requires much more complex and costly installations, but also has a negative effect on the growth of turbots, slowing their development significantly during the second year of fattening. This phenomenon is being studied by scientific research.

France has the second highest farmed turbot production (800 tonnes). The main operator is France Turbot (600 tonnes), a subsidiary of Groupe Adrien, which runs a hatchery and a farm on the island of Noirmoutier (Pays de la Loire) and another farm in

The refined taste and culinary value of turbot makes this flat fish a highly sought after luxury product.

(1) Eurostat source for data in the first four paragraphs.



Turbot farming began in Galicia in the early 1980s. The European Union currently produces some 7 000 tonnes a year.

Brittany. The group also supplies fry to the other major French operator, Société aquacole de l'île de Ré, which operates two farms on the islands of Noirmoutier and Ré (Poitou-Charentes).

An expanding market

There is a flourishing market for farmed turbot. *"There is no problem marketing turbot,"* explains Dominique Duval, manager of Société aquacole de l'île de Ré. *"Demand far exceeds supply. The problem is mostly one of production. To produce more, we need to expand. And to have a supply of sea water, we need to place our tanks on the shoreline. That is where we run into problems of space limitations. There have been attempts to raise turbot offshore, in cages with a trampoline-style bottom, but they haven't worked very well."*

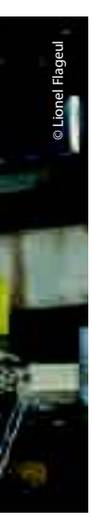
The problem of space limitations recently gave rise to much debate in Galicia, where Pescanova failed to obtain a permit to build new facilities, for reasons of protection of the coastal environment. The company therefore chose to implement its expansion projects in Portugal. Last May, the group announced the construction in Mira, on the Centro coast, of the world's biggest turbot farm, with capacity of 7 000 tonnes. It is expected to reach cruising speed by 2009.

Capacity capable of doubling European farmed turbot production may seem surprising at first sight. At its current production rate, however, turbot farming primarily supplies the restaurant business. Stolt Sea Farm sells only 20% of its production to supermarkets, and France Turbot only 5 to 7%. So there is plenty of room to seek new buyers.

What is more, the hotel and restaurant market is not showing any signs of saturation. For example, when the two French operators launched Label Rouge[2] production in 2002, the impact on demand was spectacular. *"French operators are extremely confident in this quality label and our sales have risen significantly on the domestic market,"* explains Christian Cloutour, manager of France Turbot. *"We are now starting to return to the export market, which is also expanding."*

Offer will soon become more plentiful with a new production centre opening up in Eastern Europe. Turkish scientists have just worked out a system for Black Sea turbot farming and a commercial application will be launched this autumn. Black Sea turbot is thus becoming a farmed product, opening up new development prospects on the shores of this sea, where little aquaculture activity exists to date.

Fish farmers' ongoing work to enhance the quality and quantity of their production should have a positive effect on the restaurant market, retail sales and exports. Especially when one considers the rising standard of living in the Central European countries.



Two years of fattening

Turbot, a flat fish, spends most of its time on the seabed, half buried in the sand, where it feeds. That represents a major constraint for breeding, since the shelter in which it is raised must necessarily have a hard and flat bottom covered with sand. It is out of the question to use offshore floating cages, as with salmon or seabass. The only workable system that currently exists is the use of land-based tanks, set up not too far from the sea to facilitate water supply.

By regulating the water temperature and light artificially, fish farmers can now alter the turbot's reproductive cycle and obtain 'off-season' laying, allowing for regular production throughout the year.

From the egg stage to marketing size, the farming process takes two to two and a half years. During the first month after hatching, the larvae are fed marine micro-organisms. At one month, the turbot already has all the morphological characteristics of an adult (apart from size) and its feed includes fish meal and other elements. At three to four months, the fry are transportable and are moved to installations where they are fattened for around two years before being slaughtered.

(2) French agricultural label created in 1960 certifying that a food product has certain predetermined characteristics that give it superior quality to that of a standard product.

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[In brief

> Agreement with Guinea-Bissau

The European Union and Guinea-Bissau concluded in May a new fisheries partnership agreement that will enter into force once ratified by both parties' decision-making institutions.
The agreement will run for a renewable period of four years.
In exchange for a European financial contribution of € 7 million a year, Guinea-Bissau opens up its exclusive economic zone to European fishermen. The mixed agreement authorises the exploitation of stocks of tunas (23 seiners and surface long liners, and 14 pole and line vessels), shrimp (4 400 gross registered tonnes) and fish and cephalopods (4 400 gross registered tonnes). This accord, which replaces the framework agreement concluded back in 1980, is the first to include important support for the local sector, as do all the fisheries agreements concluded following the reform of the Common Fisheries Policy. It will invest € 2.45 million a year in projects for the development of sustainable and responsible fisheries in Guinea-Bissau. The agreement also provides for payment of a yearly amount of € 500 000 to that country to improve sanitary conditions and the monitoring of fishing activity. An additional € 1 million a year at most will also be provided under the agreement, subject to optimal use of fishing rights.

> Consultation on aquaculture in the EU

The aquaculture sector has a huge economic potential due to rising demand for fishery products. Technological developments and scientific research also make it feasible to consider investments with the aim of increasing and diversifying supply. The sector nevertheless has to take up a number of challenges such as environmental problems, sanitary requirements, new species, technological advances, space limitations and research. To help European operators make the most of development opportunities, the Commission has kicked off a wide consultation that will sound out the entire sector. Stakeholders will have the chance to voice their expectations and needs on the basis of a consultation document addressing different themes. The result of the exercise will serve as a basis for proposals for aquaculture.
For more information, see:
http://ec.europa.eu/fisheries/cfp/governance/consultations/consultation_100507_en.htm

> North-East Atlantic: new control scheme

From 1 May, the states whose fleets are active in the zone of the North-East Atlantic Fisheries Commission (NEAFC) are obliged to comply with a new control system aimed at curbing illegal fishing. The principle is as follows: a foreign fishing vessel[1] is only authorised to land its frozen catches in NEAFC ports if its flag state has cleared the landing with the port state. For each landing, the flag state must exercise its responsibilities by checking that: the fishing vessel had sufficient quotas to allow for the catch; the catches in question are registered in the national quota monitoring system; the vessel was authorised to fish; and the declared area of catch was checked by a satellite-based vessel monitoring system. The NEAFC decision has been transposed into EU legislation as part of the regulation on catch possibilities for 2007.

(1) Namely, a fishing vessel flying the flag of another NEAFC Contracting Party.

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