FinE

Fisheries-induced evolution

FinE is an international research project investigating the prevalence and consequence of evolutionary changes caused by fishing in European waters. FinE is developing new scientific tools required for monitoring and forecasting evolutionary changes to manage Europe's fisheries. This three-year project, funded by the European Commission, has a consortium of 18 different partners.

www.iiasa.ac.at/Research/EEP/FinE

The Evolutionary Dimension of Modern Fishing

Worldwide, commercial fishing maximally exploits or overexploits three-quarters of fish stocks. Wasteful practices and ineffective enforcement of fishing quotas are contributing to this. But commercial fishing not only reduces the number of fish, it also changes their heritable features. This previously overlooked evolutionary dimension of modern fishing has unexpected consequences for economic yields and for the ecological stability and recovery potential of exploited fish stocks.

Fisheries-induced Evolution Can Be Fast

Evolutionary processes have long been thought of as being too slow to impinge on the management of fish populations. Not so. Commercial fishing practices strongly advantage certain features, such as slower growth and earlier maturation, so that the speed of the fish's evolution is greatly accelerated. Smaller fish avoid being caught by staying under nets' mesh size for longer. Fish that reproduce when they are smaller and younger will reproduce more often than fish that mature later, as chances of surviving until maturation age are so low. Under such pressures, many commercially exploited fish stocks have shown changes suggestive of rapid evolution.

Consequences of Fisheries-induced Evolution

Fish maturing earlier in life can have serious implications for sustainable yield, stock stability, and recovery potential. Early-maturing fish divert much energy to relatively inefficient reproduction. Consequently, they grow less, which is detrimental to the yield extractable from a stock. They also contribute far less eggs than older and larger individuals would and so render a stock more vulnerable to environmental fluctuations and less capable of recovering from over-exploitation. In 1992 the northern cod stock collapsed in one of the worst disasters of modern fishing. A negative trend in the size of cod at maturation could have been detected seven years before the collapse with a confidence of more than 80%.

An Evolutionary Approach to Fisheries Management

To avoid further undesired fisheries-induced evolution, a new generation of fisheries scientists and managers will need to adopt an evolutionarily sound management approach. FinE is developing the needed tools.

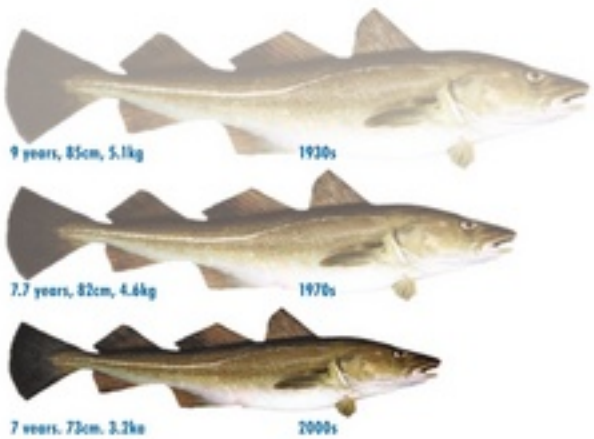

Figure 1: Illustrating the effects of fisheries-induced evolution, the age, size, and weight of first-time spawners have fallen dramatically in Northeast Arctic cod.

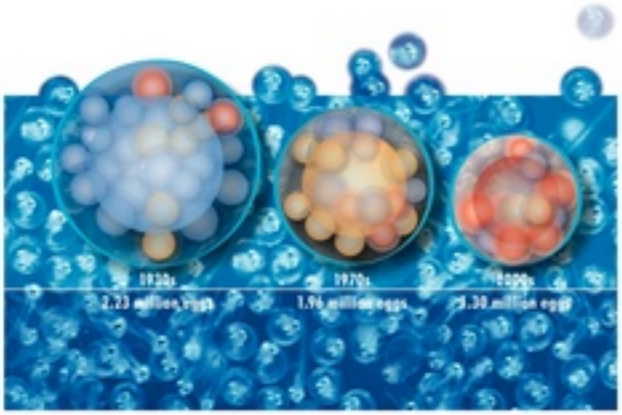

Figure 2: First-time spawners produce fewer offspring. When females of Northeast Arctic cod spawn for the first time, they produce far fewer eggs today than they did decades ago.

Participating Countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom

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Moving forward together

Joe Borg believes now is the time to harness Europe's maritime potential

Europe, a continent located between two oceans and four seas, has nearly 70,000 kilometres of coastline. Europeans have always been among the world's leading seafarers, and they remain so today. Nowadays, over 40 per cent of the EU's internal trade is carried out by sea, and nigh on 4.8 million Europeans now work in the maritime sector.

Hitherto, the EU has tended to see itself primarily as a continental bloc rather than a peninsula. Maritime matters have traditionally been addressed as part of sector-specific concerns immune to the lure of shared interest. The governance of the seas and oceans remains very much anchored in sectoral management methods. Treating every domain as a separate entity remains the order of the day for most European governments, whether at national or local level. This is quite surprising, given the potential synergies between such sectors as transport, energy, environment, spatial planning and research.

With its recent maritime action plan, Europe is proposing a radical change of tack away from the sector-specific to an all-embracing, integrated approach to our maritime heritage. The European commission cannot, of course, impose this new approach without the support of EU member states. However, it has recently launched promising initiatives to encourage ambitious forms of cooperation between the various policies with a bearing on the sea.

The rational exploitation of the oceans and seas should enable Europe to benefit from new opportunities in terms of transport and economic development, while conserving marine resources. Europe is under pressure from globalisation, climate change and energy issues. In facing up to climate change, coastal regions must prepare to deal with rising sea levels. Turning to energy, the exploitation of the seabed can offset the forthcoming scarcity of fossil fuels on land. Also, the development of renewable marine energies can contribute to the diversification of energy supplies and the efforts to combat climate change.

The commission is encouraging member states to adopt this integrated approach. Issues often hinge around the maritime sector and transcend borders. It is more cost effective to organise maritime surveillance or planning in marine and coastal areas with cross-border partners than in isolation. Accordingly, coordination between the different member states' services makes it possible to improve surveillance at sea, thereby making it more effective in terms of monitoring, safety and fisheries management. Maritime spatial planning such as the eco-friendly development of wind farms or ports is also more rational and sustainable when coordinated in conjunction with neighbouring countries. By taking action at European level we can be better equipped to take on common challenges.

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We are counting on EU member states to make this all-embracing, integrated view their own. This will entail a change in maritime governance methods, as suggested in the commission's guidelines. The financial crisis is at present pushing us to invest in the industries of the future and to create jobs. Maritime matters can be an intrinsic part of this general stimulus. Offshore energy, port expansion, new energy transmission systems and the development of cost efficient coastal infrastructure will ensure a return on Europe's investment. The time for action has come. ★

Joe Borg is fisheries and maritime affairs commissioner