

BACK TO THE FUTURE

Returning to a tried and true method, ICES adopts maximum sustainable yield to guide its advice

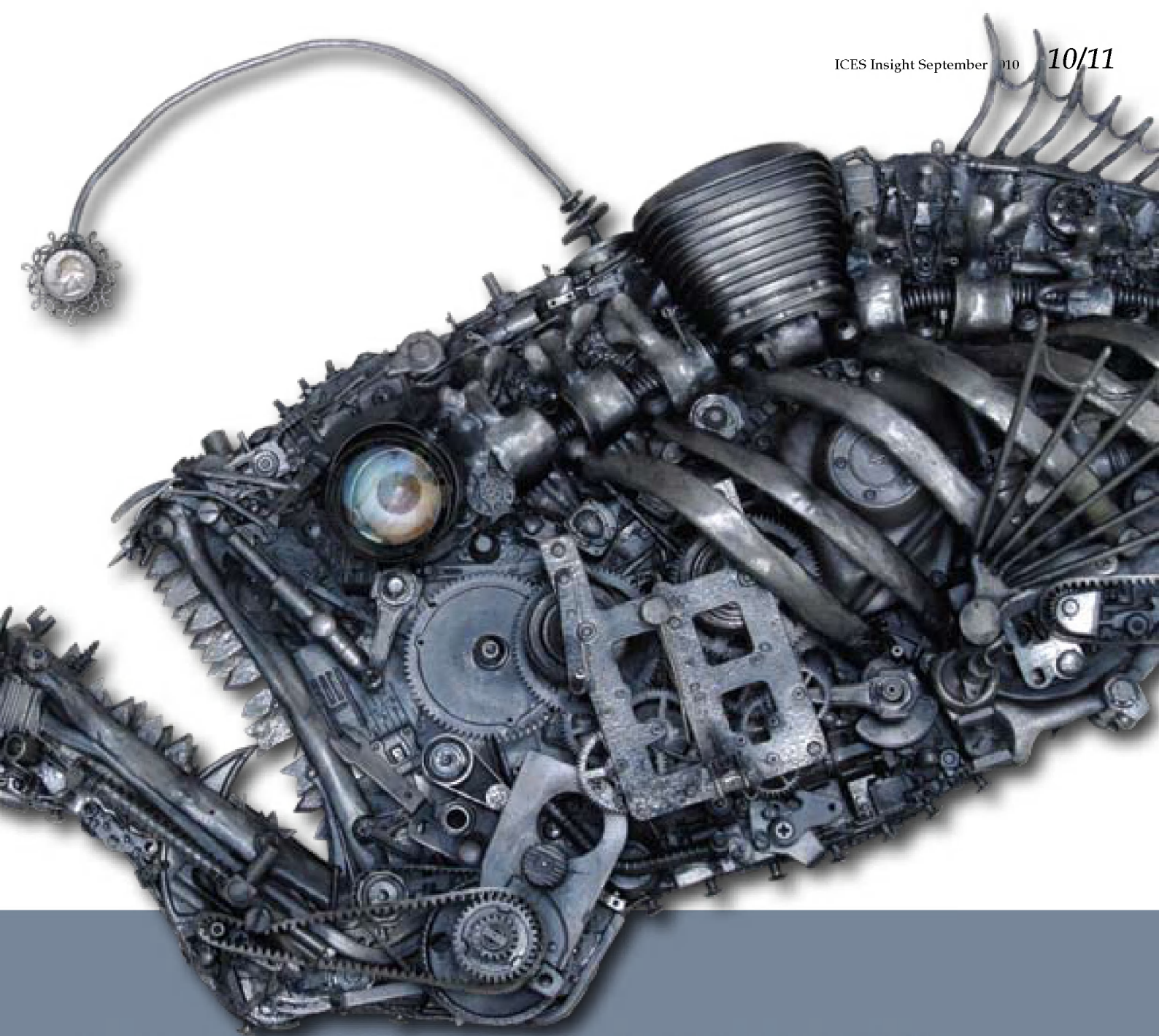
Maximum sustainable yield, a concept nearly as old as fishery science itself, has regained its role in the language of the conventions and agreements that govern fisheries at the international level. Ellen Johannesen explains that ICES has begun to implement the renewed concept by moving toward MSY in its advice for fisheries beginning this year.

Maximum sustainable yield (MSY) is based on the observation that any population attains maximum productivity at an intermediate exploitation level (or fishing pressure in the case of fish stocks). Unharvested fish stocks are thought to be limited to a certain size by density dependence and predation. If by fishing, or natural events, a stock is reduced from its maximum size, production is enhanced and the fishery can take this extra production as sustainable catch. When the population is reduced beyond a certain level, the growth potential of the population will not be fully realized. MSY aims to achieve the long-term maximum production and avoid overfishing resulting in endangered stocks.

The concept of MSY is closely associated with the problem of overfishing. If a stock is fished too intensely, its potential is not fully realized in two ways: the growth potential of individual fish is not fully realized (growth overfishing) and there are too few mature fish to produce enough juveniles (recruitment overfishing).

Growth overfishing occurs when the individual fish are caught too small, before they are past the initial rapid growth phase where growth in weight adds more to the weight of the population than what is lost owing to natural mortality. Recruitment overfishing occurs when the stock is depleted, and the remaining fish cannot produce enough offspring to maintain full productivity. The ICES precautionary approach focused on avoiding recruitment overfishing. ICES interpretation of MSY takes both growth overfishing and recruitment overfishing into account. In this way, ICES approach to MSY embeds the precautionary approach, which from the mid-1990s was the basis for the advice.

The ICES MSY framework aims to inform policy-makers on how they can achieve the goals set out in the various international agreements by advising on how to attain the maximum long-term average catch.



Conventions such as the United Nations Convention on the Law of the Sea (UNCLOS, 1982), the United Nations Conference on Environment and Development (UNCED, 1992), and the Johannesburg Declaration of the World Summit of Sustainable Development (WSSD, 2002) have called for signatories to maintain or restore fish stocks to MSY; the WSSD set a deadline of 2015 for implementation.

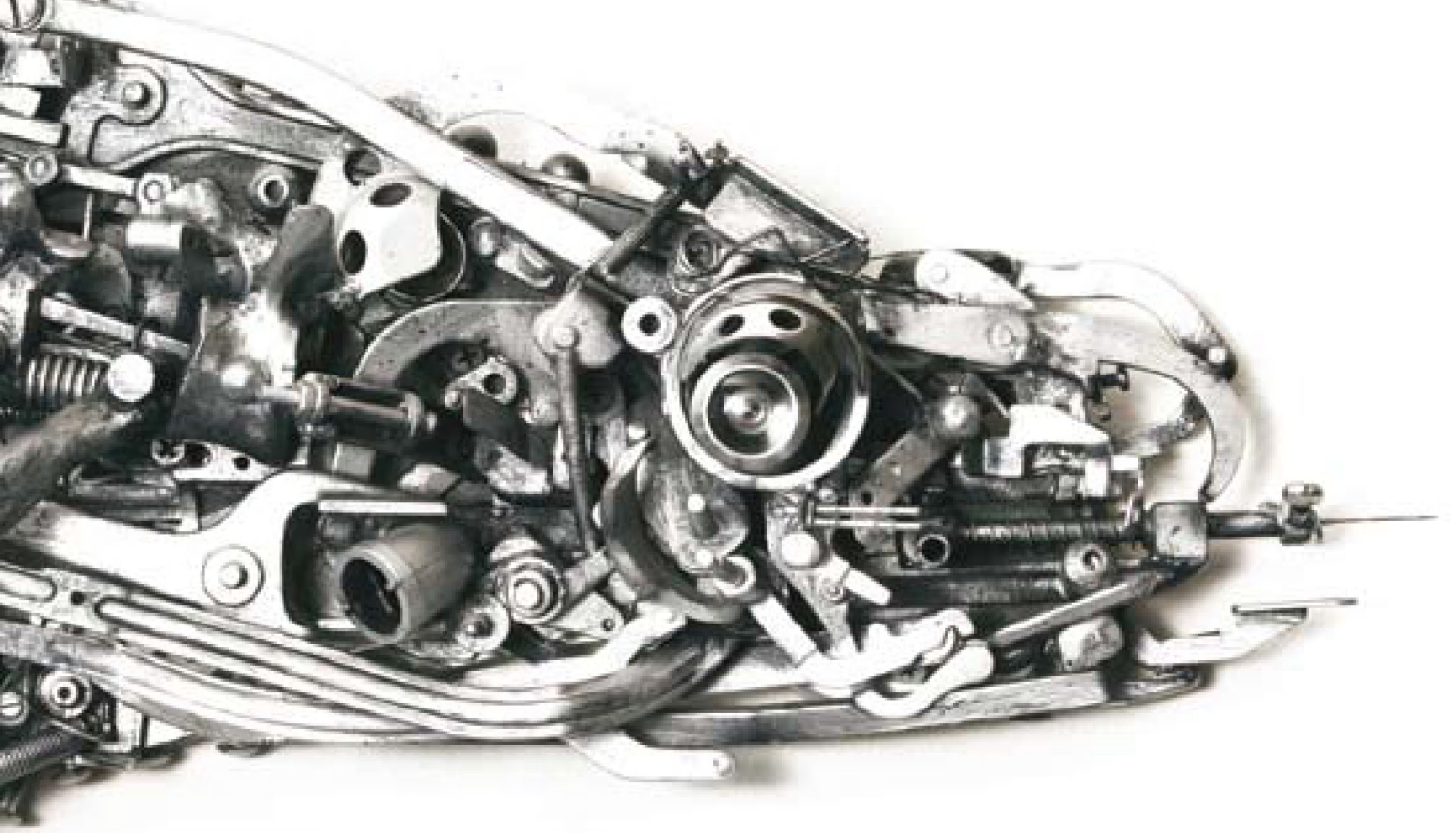
Timeline of implementation at ICES

ICES has begun to implement this new approach in response to the objectives of the above agreements and policies that set the context for advice, as well as to provide advice that allows clients to fulfil their international policy obligations.

Hans Lassen, retired Head of the Advisory Programme explains, "One of our main clients, the European Commission, decided how they will interpret these broad political agreements in 2006. During our 2008

annual meeting with all of the clients for fishery advice, we agreed that ICES should operationalize MSY-based advice. In short, we are reflecting general political agreements, which, from an ICES perspective, is nothing new in concept. But the precise way you operationalize the framework differs a bit, of course. It depends on the data you have available: What can you calculate? Implementation of the concept will determine the legal frameworks and political environments under which various management authorities operate".

After the ICES Advisory Committee (ACOM) agreed on an MSY framework in 2009, work on defining how the concept would be implemented began in ICES expert groups. In 2010, ICES hosted a meeting between clients, scientists, and stakeholders to provide some technical guidelines to the expert groups. The Workshop on the Application of Advisory Framework to Data-Poor Stocks (WKFRAME) met in March 2010 to discuss how MSY would be defined in operational advisory terms.



According to WKFRAME's 2010 report, "The concept of MSY is widely interpreted as the maximum long-term average catch that can be achieved under prevailing conditions (including both the state of the ecosystem and size selectivity of the fishery). MSY is considered to be achieved by a fishing mortality (F_{MSY}) that produces a high, long-term average yield, while the stock fluctuates around the stock size where production is at or close to the maximum. A strategy for achieving MSY can be expressed as a harvest control rule where F is a fixed target, which may also be a function of stock size. This is the form of the ICES MSY Framework".

The precautionary approach

ICES advice has been based on the precautionary approach since 1998. Advice based on the precautionary approach aims at keeping enough fish in the sea to maintain the full reproductive capacity of the stock. Unfortunately, this goal has not been achieved for all stocks. Implementation of MSY is a more ambitious objective. Maintaining full recruitment potential is necessary for MSY, but it is not sufficient.

Lassen explains, "The point is that the emphasis differs depending on whether recruitment overfishing is the primary issue or both growth overfishing and recruitment overfishing are to be prevented. In general, recruitment overfishing for a fish stock occurs at a higher exploitation rate than growth overfishing. Of course, there are examples where this is not the case, but it is generally the case.

"From the point of view of a fishery biologist, if you have a heavily overfished stock, the first step is to get fishing pressure below recruitment overfishing bounds, and then to balance growth with mortality. You could see

this as a shift from the precautionary approach, which is recruitment overfishing, to MSY, which puts more emphasis on growth overfishing".

ICES advice using the MSY approach aims at attaining the objective by controlling fishing mortality. The precautionary approach will continue to be part of ICES advice.

Poul Degnbol, Head of Advisory Programme, notes, "Conservationist stakeholders remind us that MSY is only part of the story. MSY only considers one aspect of fishery management and needs to be framed within an ecosystem approach. When you build a house, you need a roof. A roof won't protect you from the wind, so you need walls, but you still need a roof. MSY does not protect all aspects of the ecosystem but is only one part of management in an ecosystem context. In order to implement an ecosystem approach you must implement MSY but you must also supplement this with specific measures to protect sensitive habitats and species for instance".

How to reach MSY by 2015 is another question, because there are multiple ways of getting there. In general, precautionary approach limits allow higher exploitation limits than the MSY target. Therefore, the general trend where MSY has been implemented is towards lower fishing mortality than has been advised by the precautionary approach. ICES discussed options for changing to the lower fishing mortality rates associated with MSY with the users of fishery advice. Although there was no formal agreement among all the parties, it was generally understood that there should be a gradual transition. "The Johannesburg declaration talks about MSY in 2015, and we are taking five equal steps towards MSY where we have not achieved it", says Lassen.

Model predictions of stock increases may not be realistic, but practical experience indicates that some beneficial increases will usually occur

According to Degnbol, “Some might say that the advice has become more complicated because now there is more than one piece of scientific advice. In the past, there was only one piece of advice, and now the advice presents decision-makers with more options. Each alternative provides them with the choice of how they want to manage the information about what the implications will then be”. This apparent complexity in the advice simply reflects the reality that management decisions are complex.

From theory to practice

In spring 2010, many fish stock assessment advisory working groups began to make the transition to MSY, although not all advice for 150 stocks could be given using MSY in the first year. According to Lassen, “For perhaps a third of fish stocks, we were at or near MSY. For another third, we need some sort of transition plan. For the final third, the information on precisely where we are is rather thin, and we will have to look at those stocks a bit more carefully”.

Degnbol recalls, “It was a tough advisory year because it is always difficult to implement something new. Working groups that already work with sharp time constraints worked under pressure, unforeseen issues arose, and many special cases presented themselves. But in the end, it got done”.

Lassen says, “We have recorded all these issues, and the Advisory Committee will take a closer look when they meet in November, but we managed to get through, and we are completely convinced that the system can be made operational”.

Challenges remain for MSY implementation. Fishery scientists have limited data to work with. Some stocks have been chronically overfished, and no previous data exist from times when they were not overfished, so we do not know what will happen when fishing mortality is reduced. Model predictions of stock increases may not be realistic, but practical experience indicates that some beneficial increases will usually occur. Says Degnbol, “The technical basis is still being developed and, in some cases, the models being used are predicting increases that are hard to believe. So, for some stocks, only observations over time will really reveal how the stocks will react”.

Degnbol concludes, “Industry stakeholders will be concerned with the transition because they are interested in surviving economically in the short term. However, as a concept, MSY is widely accepted because it implies managing at an optimum level over the long term, allowing SSB to reach a certain level, and thus allowing more fish to be harvested”.

North Sea herring is a typical example of a stock that was fished down in the 1970s. After initial closure of the fishery, restricting fishing mortality has resulted in less interannual variability in landings. In recent years, where recruitment was low (probably as a result of environmental factors), restricting fishing mortality to around F_{MSY} through management plans has resulted in a sharp decrease in landings, but stock biomass has remained around levels prior to the collapse in the 1970s. (See “The story of SGRECVAP” starting on page 18.)

About the artist

The sculptures illustrating this article are by sculptor Jud Turner. Working with found objects and welded steel, he creates artworks that are immediately visually engaging, using elements of symmetry, repetition, and intricate detail to balance some of the darker contemporary themes they address. His work has been exhibited all over the world and featured in numerous publications.

About his artistic motivations, Turner says, “Our culture mass produces more consumer goods and pop culture flotsam than any society has at any time in history. I hope to use this abundance created by our culture to provide an artistic critique of that very culture”.

For more information about the artist and his work, visit <http://judturner.com/>.