

## An Ecosystem Approach to Fisheries should imply a shift in EU policy targets used for single-species management

by *Didier Gascuel\**

Since 1998, according to the "Code of Conduct for Responsible Fisheries" (FAO 1995), the European procedure for the production of scientific advice is largely based on a standard method called the "precautionary approach". This uses single-species assessment models and is the basis for the adoption by politicians of annual Total Allowable Catches (TACs) for the main target stocks. Such an approach is supposed to ensure long term sustainability of exploited stocks and marine ecosystems. Undoubtedly, it has had positive effects for some severely depleted stocks, usually leading to more restrictive access to allow stock recovery. Nevertheless, the overall state of European fishes stocks remains grim, with the situation deteriorating for some species. More generally, the current procedure should be considered inappropriate

from an Ecosystem Approach to Fisheries (EAF) perspective.

Indeed, the current approach has consisted of assessing stocks close to the edge of the abyss by determining the minimal spawning biomass (and the maximal fishing effort) that can be applied to ensure, theoretically, stock regeneration and bringing stocks back within safe biological limits. Even with safety margins, this approach tends to maintain low abundances, with stocks above critical limits. Conversely, EAF should imply a major change regarding conservation measures for resources management: single-species policy targets should be changed to provide the maximal stock biomass that allows sustainable high catches. In other words, an ecosystem approach must deal with the minimization of fishing impacts on the major exploited stocks. This would

be the first step to reducing ecosystems impacts and preserving ecosystem integrity, biodiversity and function and should lead to higher catches in the longer term and to economic profitability.

The shift from a minimum stock biomass target to a maximum target would have huge consequences. From that perspective, the 2002 Johannesburg decision (endorsed by the European Commission) to restore stocks to levels that permit the maximum sustainable yield (MSY) "as much as possible not later than 2015" is a step in the right direction. Its main purpose is not to maximize catches but to enforce the idea that further biomass reductions, due to increasing fishing pressures, are unacceptable when they lead to decreasing catches. Such a decision should imply enormous changes, as current levels of overcapacity are over 50% for the majority of

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major European stocks. It would also lead to a re-definition of management measures, by combining TACs and fishing effort limitations. However, MSY targets usually lead to a 2.5 to 3-fold reduction in fish abundance compared to the unexploited state. This is probably not sufficient from the EAF perspective, as the same amount of catch could result from more conservative exploitation patterns if larger mesh size was used. Therefore, managing not only fishing effort but fishing patterns as well would lead to the same increases in catch but to stronger reductions of impact on marine ecosystems, according to the new suggested target.

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## Ecopath with Ecosim one of NOAA's top 10 breakthroughs

by Ussif Rashid Sumaila

The US National Oceanic and Atmospheric Administration (NOAA) has during its history charted the seas, forecast the weather, launched satellites into space, modeled the climate, managed fisheries and much more. As part of the organization's 200<sup>th</sup> anniversary, it reflected on the outstanding individuals, inspiring achievements, and defining moments that shaped the NOAA of today, selecting the most deserving to be honoured as the NOAA 'Top Ten Breakthroughs' (<http://celebrating200years.noaa.gov/toptens.html#categories>). Ecopath modeling was one of the top ten – a significant achievement given the numerous outstanding contributions of NOAA and its predecessors during their history. For anybody studying marine ecosystems, however, this recognition is not a surprise. Back in 1993, the renowned ecosystem modeler R.E. Ulanowicz hinted at the potential of Ecopath when he wrote "The heavens were opened to us by Galileo and his telescope, the world of microbes by Pasteur and his microscope. It may not be much of an exaggeration to say that the realm of ecosystems is being opened to us by Polovina, Pauly, and Christensen." This was before Ecopath, which is static, was extended by Carl Walters by the addition of Ecosim and Ecospace - dynamic and spatial versions of the

modeling software, respectively. The Ecopath approach was initiated by NOAA scientist Dr Jeffrey Polovina in the early 1980s, and modified into its current form by Pauly, Christensen and Walters. Ecopath has the ability to represent complex ecosystems using novel equations, smaller data sets and limited computing power – advantages that most other ecosystem modeling approaches lack. This quality of the Ecopath suite along with numerous courses and lectures given by its authors have resulted in its widespread use. A recent addition is the optimal policy search module, which uses nonlinear optimization to improve an objective function by iteratively changing relative fishing rates. This module connects the functioning of an ecosystem to human behaviour, allowing different policy and management objectives to be analyzed. This new development has brought the Ecopath approach into full cycle, with implications for our ability to impact positively on policies for the sustainable use and management of marine ecosystems worldwide.

I wish to conclude by congratulating Drs Jeffrey Polovina, Daniel Pauly, Villy Christensen and Carl Walters, and of course NOAA, for this significant contribution to the world of marine ecosystem science, policy and management.

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