A recent article in Science, authored by leading fisheries scientists, called for a shift from management of single fish stocks under Ecosystem-based Fishery Management (EBFM). While nobody will argue against the need to "sustain healthy marine ecosystems and the fisheries they support," fear that complicated new analytical models and management tools (that will be needed) in this context will further remove fishers from management, fish consumers, who as citizens own the fish in their national waters and as consumers, should finance management costs.

"MOST FISH THAT YOU HAVE EATEN WERE CHILDREN" C

Here I argue that it is the remoteness and obscurity of current fishery management practice that has allowed fish resources to be devastated, on land, in contrast, the sleeping giant of public pressure has drastically reduced terrestrial pollution, thus halting the demise of our forests and reviving our drier rivers. Eating too many young fish?

It is now common knowledge that most fish stocks are overfished because too many fishers are hunting too few fish. It is less known that most fish that you have eaten were children. This is because fishing removes large fish first and foremost, and typical fishery management does not only allow more fish to be caught than has been recommended by science-anecdotal advisory bodies, it also sets the minimum size for landings well below the size of first reproduction, well below the size where maximum number of eggs would be produced. One does not have to be a scientist to realize that this is a recipe for destroying stocks. To remedy this situation I propose Common-Sense Fishery Management (CSFM) consisting of three simple measures:

1. Let them spawn! All fish are allowed to reproduce at least once before being caught. It is obvious that if every fish is allowed to produce at least one replacement spawner it is impossible to overfish the stock, because the size at which fish are able to spawn when first time—that is, for all commercial fish stocks, this measure can be put into practice by raising the existing minimum size limits above this size.

2. Let them grow! Fish are only caught around a target size where the maximum biomass per year-class (the fish hatched or born in a given year) can be obtained. This size is known for all commercial fish stocks and is typically a lot larger than size at first maturity. Catching fish at this size makes biological and economic sense and thus "pays for itself" in the mid-term.

3. Let the mega-spawners live! Old, large, successfully surviving fish typically produce many more eggs of a better quality, with higher survival chances and larger size, than first-time spawners. A certain percentage of each year-class is therefore allowed to survive to old age, thus acting as "spreader of good genes" and in insurance against natural recruitment failures in cases where unfavourable environmental conditions cause the loss of an entire year-class. This percentage will typi- cally be 50% or more of first-time spawners, depending on the productivity of the species and on other management goals such as those derived from the Ecosystem-Based Fishery Management mentioned above.

If fishery management can be so easy, why is it not done that way? The answer is complex, but I want to highlight three components here:

1. In healthy fish stocks there are normally more than enough spawning fish for the stock to be able to cope with the removal of a surplus by fishers. But when the stock fails to a low level that this potential is lost, not only does this allow for drastic changes in direction, while I welcome Ecosystem-Based Fishery Management I do not see it as a huge change, rather as a logical next step in applying state-of-the-art science to fisheries. However, it is not the science that failed but the institutions that were supposed to apply scientific advice in real-world circumstances.

I suggest Common-Sense Fishery Management as explained above as a drastic change in direction with the potential to recover healthy stocks and fisheries. As the first and most important measure I suggest making sizes at first maturity widely known, e.g. in form of posters showing fish at the respective length. These posters can be placed in fishing boats, ports, super markets, restaurants, schools, billboards, Internet and meeting rooms. Fishers, traders, supermarket managers, oil companies, insurers, politicians could all then easily determine whether a fish in front of them had been given a chance to reproduce, and thus actively participate in fishery management. The European Community could decide to only import fish beyond size of first maturity, thus sending a very strong signal to fishery managers worldwide.

And there is already precedence: The Convention on International Trade in Endangered Species (CITES) is about to adopt a minimum size limit of 60 cm for the trade in seahorses, which is beyond the size of first maturity for most of these species. Minimum size limits are often enforced, and so we may ask why can't we do the same for the management of the Great Barrier Reef to deal more effectively with multi-species fisheries. The National Oceanic and Atmospheric Administration (NOAA) of the United States states that "it is now more important than ever to protect small [Atlantic] swordfish in order to rebuild the population." Senegal has adopted size at

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1 Ecosystem-based fishery management. Science 309: 540-547

By Rainer Froese

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Photo by Paul Kay (www.marinefishlife.co.uk)

**“ONE DOES NOT HAVE TO BE A SCIENTIST TO REALIZE THAT THIS IS A RECIPE FOR DESTROYING C FISH STOCKS” C **

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Photo courtesy of Norwegian Seafood Export Council

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**“THE EUROPEAN COMMUNITY SHOULD CHARGE FOR C FISHERY MANAGER TO CONTINUE WITH THE C FISHING SYSTEM Risking the collapse of additional stocks, rather than risking conflict with special interest groups and the politicians who support them. I propose the term ‘Convenience overfishing’ for this situation which is common in the developed world, in contrast to ‘Massive swordfishing’ which is poverty-driven and predominant in developing countries.”**
first maturity as minimum landing size for most commercial species. Hawaii has done the same and is considering implementing additional maximum size limits for certain species to protect mega-spawners. Florida applies minimum size limits to imported reef fishes. And the Bureau of Fisheries and Aquaculture Research in the Philippines, distributes a ‘fish ruler’ and encourages consumers to assess how mature/nimmature the fish being sold are—thus, the process of bringing common sense to fishery management has already begun.

Note that Common Sense Fishery Management is not meant as a replacement for Ecosystem-Based Fishery Management or for additional measures such as marine protected areas. The latter will be crucial in protecting juveniles or mega-spawners and spawning habitats as well as the many non-commercial species affected by fishing. Also note that ‘let all fish spawn’ will not work for species such as eels and salmon which die shortly after spawning. These species need dedicated management plans.

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Or see:

FishBase (www.fishbase.org) contains size at first maturity and size with maximum biomass for all commercial fishes.

Often, managers do not follow scientific advice exactly, but seldom has the gap between the advice and the actual catches been so yawning as for blue whiting over the last few years. In 2009, catches of blue whiting reached a record high of 2.3 million tonnes—making the blue whiting fishery the biggest one in the Atlantic—whereas the advice from ICES was not to exceed 600 thousand tonnes. As attempts to reach an international agreement on exploitation have failed, and despite the warnings by the scientists that a collapse may be imminent unless fishing pressure is decreased, the gap between the advice and the actual catch has only been widening. Yet the stock appears to have sustained the heavy exploitation and is estimated to be at a historically high level.

“The result is ever-increasing C exploitation that will eventually ruin the resource”

Why have the managers chosen to neglect the scientific advice? How is this possible during the era of the precautionary approach? Have the scientific advice and the underlying stock estimates been faulty? And finally, how can blue whiting show such remarkable resilience? These are simple questions, but there are no simple answers. However, it is important to appreciate three basic aspects of blue whiting fisheries:

1. Blue whiting is a straddling stock

Blue whiting has a very wide distribution area covering the EEZs (Exclusive Economic Zones) of several coastal states as well as international waters (see the information box). There are no obvious stock units within the main distribution area, and blue whiting need to visit several EEZs to complete their life cycle: spawning areas are mostly in the BC and international waters, spawning migrations bring them through the Passerby waters twice a year, and feeding areas cover most of the northeast Atlantic.

As for any straddling stock, rational management of blue whiting calls for international co-operation, and, in particular, an agreement on how the total catch is to be divided among the players. Because this agreement is not in place, we witness the “tragedy of the commons” individually, each player gains by exploiting the common resource harder, whereas the resulting cost is shared by everybody. The result is ever-increasing exploitation that will eventually ruin the resource. However, the situation is not unique to blue whiting and cannot alone explain why attempts to reach a political agreement have failed.

2. Blue whiting boom

The most likely reason for the resilience of blue whiting to ever-increasing catch levels is very good recruitment of young fish to the stock in the recent years. In fact, all year classes during the period 1995-2001 have been either strong or extremely strong in comparison to those that were born in the period 1988-1994 (prior estimates do not exist). Although part of this increase may only be apparent and may be caused by geographical changes in fishing exploitation and reporting of catches, it appears that the recruitment dynamics of blue whiting have changed in a positive way. The cause of this change is one of the main questions for us to solve. Further more, will the unprecedented recruitment continue?

3. Difficulties in assessing the stock

Blue whiting is a challenging stock to give advice on. One reason is that stock assessment of a widely distributed species with poorly known population structure is inherently difficult. Fishery-independent surveys estimates are hard to come by, although international co-operation on the spawning grounds shows promise.

Another aspect is that the blue whiting fishery is increasingly dependent on recruiting year classes. In practice it has been impossible to satisfactorily estimate the number of new fish joining the stock until after a year class has recruited to the fishery.

Yet the advice is based on population estimates projected into the future and relies heavily on current catch rates and assumptions about future recruitment (which appears to have changed in comparison to the earlier years).