Bachelorthesis

How do marine target animals benefit from the new Common Fisheries Policy adopted by the European Union?

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Introduction

30 October 2011. According to the United Nations the world reached the number of 7 billion inhabitants. Expected is that in 2050 approximately 9,2 billion people will live on this planet. With the growth of the population on our planet the strain on our food sources will increase. Something to cherish then are the seemingly unlimited food sources in our oceans, but as proven by the collapse of numerous fisheries worldwide these are not unlimited at all. Examples of collapsing fisheries are the crab and shrimp fisheries in the Greater Gulf of Alaska (Armstrong *et al.* 2001) and the collapse of Peruvian anchovy fisheries in the 1970's (Pauly *et al.* 1998). Since World War II the fishing pressure has increased tremendously, and fisheries have become totally industrialized. Fisheries provide 19 % of animal protein consumed by human beings and work for more than 200 million people all over the world (Zabel *et al.* 2003). But as we became better at fishing, global catches have started declining since the late 1980's (see figure 1, from FAO, 2010).

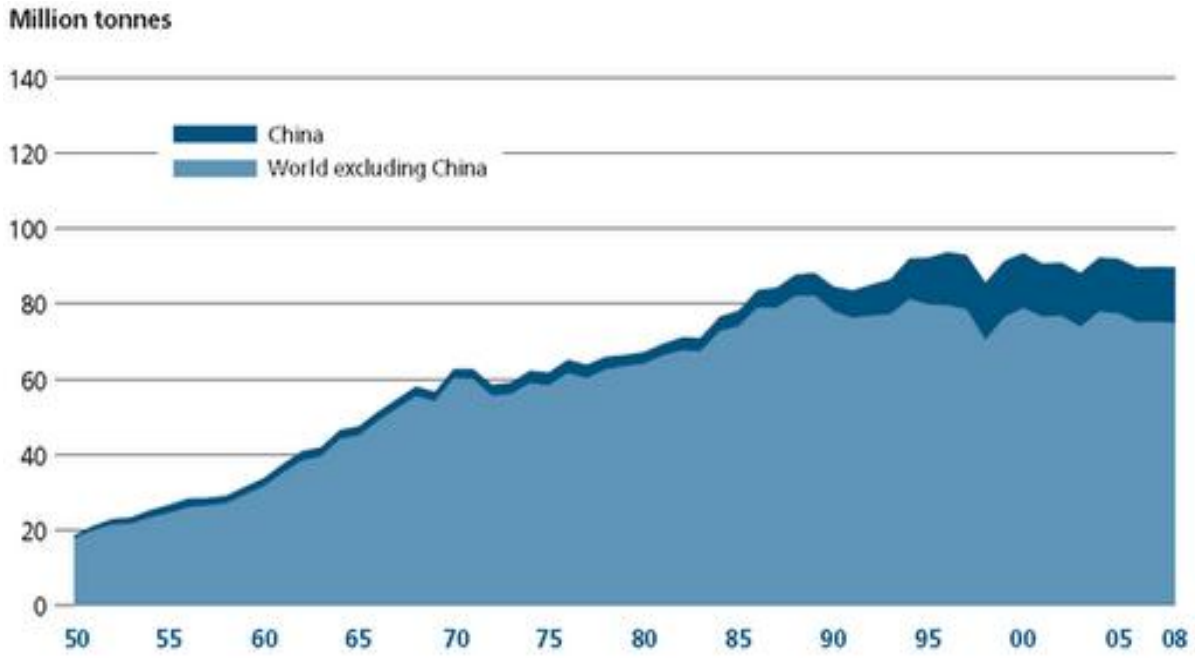

Figure 1 World capture fisheries according to FAO, 2010, light-blue world catch excluding China

In European waters the same trend is also clear. At the moment approximately 80 % of EU fishing stocks are at levels below Maximum Sustainable Yield level (MSY) (ICES, 2009). MSY is the maximum harvestable amount of a target species you can catch over an indefinite period. This yield is maximal when population size is intermediate (Zabel *et al.* 2003). MSY is used to get from assessed fish stocks to catch quotas per target species. Despite scientific advice on quotas, the average quota is 48% higher than the advice given. 30 % of the fishing stocks are even threatened in their direct survival (Casey *et al.* 2011). If we go on in this manner in 2022 eight of a total of 136 fish stocks will be sustainable (COM, 2006). To get to a sustainable future for the European fishing fleet and fishing stocks, the member states of the European Union (EU) implemented a Common Fisheries Policy (CFP) in 1983. Since then there have been two revisions (1992 and 2002) of this policy (COM, 2006). The CFP gives a ground base of rules and laws for all concerned groups to work in. To prevent overfishing three types of fishery rules are used by the EU in the CFP (W1, 2011). First there are catch-limiting rules for which Total Allowable Catch per species (TAC) are calculated. Each year

stocks of fish are assessed by the International Council for the Exploration of the Sea (ICES) and TAC is calculated using the MSY mentioned before (ICES, 2009). This TAC is then divided between the different member states as catch quota.

Second the EU tries to decrease fishing pressure. At the moment the fishing fleet is too large for the available amount of fish. The size of the fishing fleet has to be decreased and this is done in a number of ways. For example to decrease the number of fishing vessels on the sea fishers get a maximum amount of sea days (number of days allowed to fish at sea).

Finally technological measures are implemented (W1, 2011). These measures tell fishers how and where to fish. An example is the plaice box to protect plaice. The plaice box is an area in the North Sea along the coast of the Netherlands, Germany and Denmark (see figure 2, from Van Keeken *et al.* 2006). This area was closed for all large trawl fisheries in 1989. The area was not closed for smaller trawlers and prawn fishers. The plaice box was made to protect undersized plaice from discarding, because this area is the main nursing area of North Sea plaice (Beare *et al.* 2010). This example immediately shows how difficult management of marine ecosystems is. Despite closing of the box the yield and biomass only decreased further. Maybe due to other factors counteracting decreased fishing effort (Pastoors *et al.* 2000).

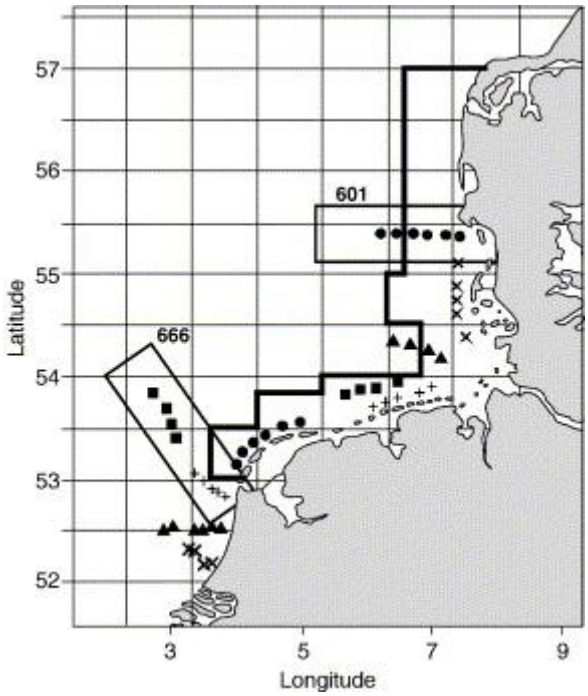

Figure 2 Location of plaice box along the coast of the Netherlands, Germany and Denmark. The bold line gives location of the box. From Van Keeken *et al.* 2006.

The member states themselves decide how these three types of rules are maintained. In this bachelor thesis I am going to look at the upcoming changes of the third revision of the Common Fisheries Policy of the European Union, and what effects these changes will have on marine target animals and marine ecosystems in general.

Common fisheries policy

To provide a sustainable future for fish stocks and fisheries in the European Union the Common Fisheries Policy has to be adjusted. This will be the third revision in the history of the Common Fisheries Policy, but it is the first time that the European Parliament has a voice in it. That is why now fisheries, consumers and non-governmental organisations let themselves be heard. The revision planned for 2013 will be for a period of ten years (COM, 2009).

The main aims of the revised CFP are to prevent further overfishing and make the whole sector sustainable for the future. At this moment the fishing fleet is too large in comparison to the available fish stocks. More than 2/3th of the EU fish stocks are below safe levels (Casey *et al.* 2011). Another important aim is to make all involved groups more responsible for the state of fishing stocks. And last but not least an important aim is to let fisheries scientists have more data about fish stocks. When science has more data it can provide better advice on quotas, management of stocks and marine ecosystems. At this moment the state of 62 % of fishing stocks is unknown (ICES, 2009), either because of a lack of money or in other cases because of deliberately withholding information by some countries. In recent history Spain and France did withhold catch information to increase their own quotas (ICES, 2009). From the stocks of which there are data only a small percentage is sustainable at the moment (see figure 3, from COM, 2009).

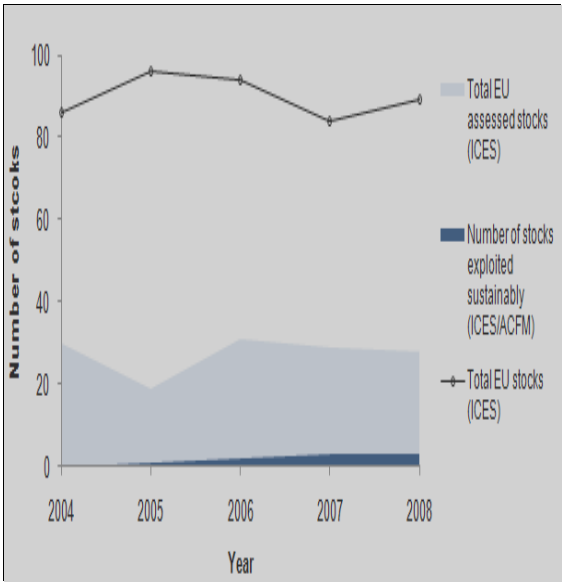

Figure 3 Total number of EU stocks (Mediterranean not included), assessed stocks by ICES, sustainable assessed stocks (data source ICES/ACFM 2009)

The upcoming revision of the CFP will lead to changes in conservation, regionalisation, discard reduction, aquaculture and economic policies.

1) Conservation policy

The first policy adressed will be conservation policy. Important aims of the changes in this field are to get fish stocks back to sustainable levels with the eventual aim to maximize long term profits. In relation to this aim it is important to understand how fish stocks are assessed and how quotas are calculated. Fish stocks are assessed by the International Council for the Exploration of the Sea (ICES). ICES is a network of scientists from over 20 organisations linked by the ICES-convention (W4, 2011). Stock assessment is done using four parameters: total international landings, market sampling, data from commercial fishing vessels and data from surveys of research vessels (W4, 2011). All these data are then pooled and models such as Virtual Population Analysis (VPA) and Maximum Sustainable Yield are used to back-calculate the size of the entire population through age and size of animals caught (W4, 2011). ICES then

gives their advice to the EU who then calculate the quotas for the different target species and member states.

In 1954 Milner Schaefer came up with a model that connected population dynamics and harvesting by fishing. This model is called Maximum Sustainable Yield (Schaefer M.B, 1954). Important in this model is the notion that population size determines growth rate, and that intermediate-sized populations have the largest growth rate and highest possible harvest (see figure 3, from Zabel *et al* 2003).

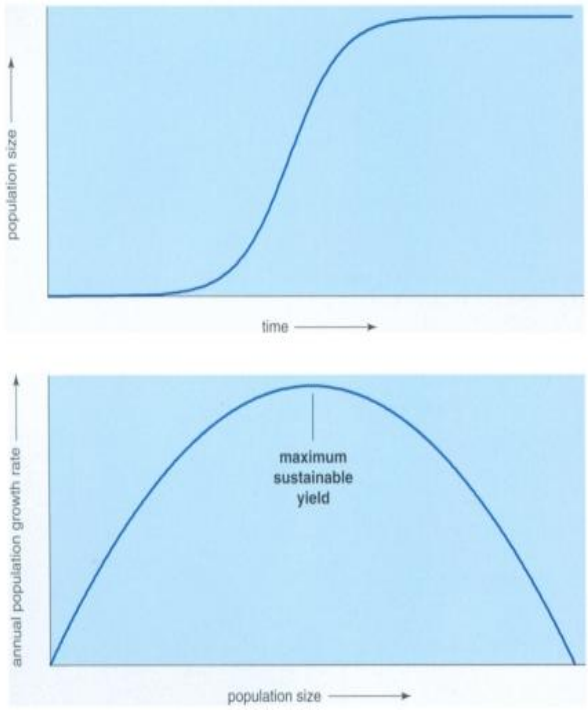

Figure 4 Population growth based on logistic population growth model, maximum yield and growth rate (bottom) occurs when population size is intermediate (top)

The risk with fishing under Maximum Sustainable Yield is that it focuses on one or a few target species instead of focusing on entire ecosystems. Catching one or a few target species can cause disturbances in ecosystems, and over different trophic levels. The most important example of this is found in Jamaica. In a period of 40 years the ecosystem there changed from a flourishing coral reef system with large predatory fish like sharks and groupers, to an ecosystem with a 97 % cover of algae and hardly any fish left. This dramatic shift was mainly due to overfishing (Hughes *et al*, 1994). Another example seems to be happening at the moment in Canada. Lobsters seem to be a key species there, controlling the sea urchin population which feeds on kelp. After intensive lobster fishing the population of sea urchins exploded overgrazing their own food supply and degrading the whole ecosystem (Mann *et al.* 2011). The new CFP will increase the protection of endangered species using ecosystem-based multiple-year quotas, like was done successfully for sole and plaice in the North-Sea (Hoff *et al.* 2008).

Fishing has a bigger influence on ecosystems than just the removal of target species, it alters community structure often in indirect ways. In some cases, like for example in North Sea plaice, it even seems to evoke fisheries-induced selection (Grift *et al.* 2003). So fishing might even alter behaviour in marine animals due to increased predation risk leading to fisheries-induced selection pressures. For example lobster escape behaviour might be altered when escaping leads to being caught in beam trawler nets, in a bachelorproject of lobster escape behaviour it already became clear that lobsters change their behaviour after repeated evoking of this escape behaviour (Bachelorproject: Havermans *et al.* 2010). Because MSY only aims at sustaining harvest of economically interesting species, in an ideal world Ecologically Sustainable Yield (ESY) would be used. ESY is the yield an ecosystem can bear without changing ecosystem communities or relations in these communities (Zabel *et al.* 2003).

2) Regionalisation policy

The second important change in policy regards regionalisation. More regionalisation means that the EU will only

provide a ground base of rules and that the member states themselves have to fill these in according to local situations. The local governments of the member states have to do this together with the fishing industry, marine biologists, food-distributing sector and also other member states. This will lead to an increased responsibility for the sustainability of the fish stocks for all parties. So higher support from the fishing industry is to be expected, and this is something that previous revisions of the CFP missed (COM, 2009). At this moment the fishing fleet is too large for the available amount of fish (COM, 2009). This overcapacity was not handled in previous revisions because of the need to save jobs. But during the last period the number of fishermen working in the EU dropped with 30 % (COM, 2010). To decrease the fishing fleet a system of transferable fishing quotas will be introduced. This system of transferable quotas will only be for ships of at least 12 m to protect small scale coastal fisheries (COM, 2009). This system of transferable quotas will at least lead to a decreased amount of vessels on the sea. Together with the ban on discards this should result in more sustainable fisheries and a lowered pressure on fishing stocks (COM, 2010).

3) Discard reduction policy

Discarding of unwanted or low-quality fish is a big problem for conserving fish stocks. Studies show that discarding is found in highest quantities in beam-trawl fisheries (Van Beek *et al.* 1990) followed by Nephrops fisheries (Catchpole *et al.* 2007; Stratoudakis *et al.* 2001). Actual discard rates are unknown, but average discard rates are estimated around 40 % (COM, 2006). An aim in the new CFP is to gradually ban discarding. This will hopefully lead to three major improvements. Because all caught animals are brought in catch data will improve. Fisheries will also become more selective in the use of their fishing gear. Several studies have showed that using more selective fishing gear reduces bycatch of sea birds,sea turtles, marine mammals (Cox *et al.* 2007) and also of other marine organisms like fish (Isaksen *et al.* 1992).

The formal definition of discards is: ‘Discards, or discarded catch is that portion of the total organic material of animal origin in the catch, which is thrown away or dumped at sea for whatever reason. It does not include plant materials and post-harvest waste such as offal. The discards may be dead or alive’ (FAO, 1996). Discards consist of two types namely unwanted bycatch (without economical value) or target species (COM, 2006). Target species get discarded for several reasons: poor quality, small size (also called high-grading), being outside a particular size range or because the specified quota for a species is already reached (COM, 2006). Highgrading is especially harmful for the stock because undersized or poor quality target species then get discarded, these individuals do not get caught for food and they do not reproduce for the population. When maximum quota has been reached target species sometimes get discarded and this is called regulatory discard (COM, 2006)

Discarding is not always a bad thing, for example in pot fisheries for crab and lobsters pregnant females are discarded (Bennet *et al.* 1974). Discarding only becomes an issue when the mortality of discards is very high, and this is the case in most EU fisheries. Average mortality of discards is 60 %, especially in trawl-fisheries for finfish (COM, 2006). The new CFP wants to put an end on discarding in two ways: reduce total bycatch (and with this the need for discarding) by using more selective fishing gear, and by banning discarding (like highgrading) via direct measures. This ban on discards will be implemented as a catch quota system for all species already managed by catch quotas. This quota system will be

implemented gradually with pelagic species in 2012 and demersal species in 2013 (COM, 2011). The first years of the ban extra quotas depending on current discard rates of the specific fisheries will be used. Total Allowable Catch will get a landings and a discards component (COM, 2011). This should act as an incentive for the fisheries sector to gradually stop discarding. On the short term this will not have an effect on sustaining the fish stocks. But when discarding is eventually eleminated Total Allowable Catch will only have a landings-component and then a positive effect on fish stocks will occur (COM, 2011). Then there still is the problem of undersized fish caught during the banning-period of discarding. Two options are still under debate here: the first one is to bring in all fish for human consumption, the second option is to set a minimum marketable size in which the fish below this size goes to non-human consumption for example as fish meal in aquaculture.

4) Aquaculture

Stimulation of aquaculture will be an important part of the new CFP. Stimulating aquaculture will lead to increased production and to a decrease in importing of marine animals caught in non-sustainable fisheries outside the EU. At this moment aquaculture provides for about 20 % of fish production (COM, 2009). The most important aquaculture projects in the European Union are salmon in Scotland and Ireland, sea bass and sea bream in the Mediterranean and the culture of mussels in the Netherlands, Ireland, Greece, Spain and France (COM, 2010). Cultured carnivorous species bring about a couple of problems mainly regarding the diet which consists of fish-meal, to grow 1 kg of cod 10 kg of meal from wild fish is needed (Tuominen *et al.* 2003). But a more efficient way of culturing carnivorous finfish is at hand. Integrated multi-trophic aquaculture makes use of different trophic levels in proximity of each other (Troell *et al.* 2009). In this type of aquaculture fish-meal fed finfish are held together with an inorganic (seaweed) and an organic (shellfish) extractive species. In this way waste of the highest trophic level (finfish) is ‘recycled’ by the lower tropic levels (seaweeds and shellfish) (Troell *et al.* 2009). A recent study showed that this system works in blue mussels which lived of particulate salmon culture waste (Reid *et al.* 2010). Another problem arising from aquaculture is eutrophication of ecosystems. Eutrophication is the process in which by adding large amounts of food into an ecosystem the system moves to a state of increased phytoplankton biomass. This can lead to harmful algal blooms or hypoxia (depletion of oxygen in the water body). A strict demand to fish diet composition maybe a solution to the problem of eutrophication (Talbot *et al.* 2007). The final major problem is that the genetic integrity of wild stocks is being challenged by escaped farmed fish. Escaped farmed fish are not yet caught regularly by fishing vessels (P.A.R.M. *et al.* 2006). But farmed fish only are 1-2 % as fit as wild fish so when they reproduce in wild stocks their impact can be very large (Mcginnity *et al.* 2003).

5) Economic policy

The last changes in the CFP will not be in a marine biology perspective, but in an economic and market-related perspective. To let the third revision of the CFP become the most succesfull it will be integrated in overall marine policy. To make consumers more aware and responsible changes on the market will be implemented. Labeling will give costumers a better view and understanding of what they are eating. Differences between wild and cultured fish will become required on labels. To improve sustainable fishing the EU will change the bases on which grants are

given, these grants will only go to sustainable plans.

Discussion & Conclusion

With the worldwide collapse of fisheries (Armstrong *et al.* 2001, Pauly *et al.* 1998), we have to start taking better care of our fish stocks. Global catches have been declining since the late 1980's (Pauly *et al.* 2003). In the EU about 80 % of fishing stocks are below safe levels. To improve the situation of fisheries in the EU a revision of the CFP is needed. These revisions will affect five fields of policies.

In conservation policies the changes made will be aimed at sustaining fishing stocks for the future. At this moment average quotas are 48 % higher than advised by ICES (ICES, 2009), but assessing fish stocks is far from perfect. MSY is used to calculate quotas but this only involves catch of target species. Fishing on one or a few target species can have detrimental effects on ecosystems (Hughes *et al.* 1994, Mann *et al.* 2011). Also scientific data of fishing stocks are far from complete so it would be better not to use a maximum yield but to use a safer method. An ideal method would be ESY (Zabel *et al.* 2003), but ESY-levels of fishing will not be compatible with sustaining the fisheries sector itself . So from an overall point of view it would be better to use a 60%MSY or a 75%MSY, if the data then proves not to be correct effects do not have to be disastrous. But important to remember is that it is easier to revive a fishery than it is to revive an ecosystem. Another point in the conservation policies is the implementation of ecosystem-based multiple-year plans. To get to an ecosystem-based approach something has to change in the calculation of quota which only accounts for catch of target species.

In the new policy the EU will only provide a ground base of rules leading to larger responsibility and hopefully cooperation of the fishing sector and member states governments (COM, 2009). At this moment the fishing fleet is to large for the available fish stocks. To decrease the size of the fishing fleet transferable quotas will be implemented for large-scale fisheries (COM, 2009). This will lead to a decrease in the size of the fleet but it will also make the fleet more effective in fishing. So whether the net result will be good or bad for fishing stocks remains unclear. But the regionalisation policy will lead to decisions being made closer to the people concerned, instead of decisions coming from the distant EU. This will make it easier to maintain rules and to do something about parties not complying with the new rules.

Discarding is one of the biggest problems regarding fishing at the moment. Average amounts of discarding in the EU seem to be around 40 % (COM, 2006), found in highest intensities in beam-trawl fisheries (Van Beek *et al.* 2009) and *Nephrops*-fisheries (Catchpole *et al.* 2007, Stratoudakis *et al.* 2001). The revision of the CFP will lead to a gradual ban on discarding (COM, 2011). From a marine biological point of view this is the most important change in the new CFP. Banning discarding will hopefully lead to three major improvements: better protection of fish stocks, increased use of selective fishing gear, improved catch data. The use of selective fishing gear has shown to reduce bycatch of all kinds of marine animals (Cox *et al.* 2007, Isaksen *et al.* 1992). Improvements of catch data will lead to better assessment of fishing stocks and better advice on quotas. In the short term the ban will not yet lead to better protection of fish stocks because of the adding of an discarding component to quotas. Fishing vessels will bring everything they catch that has a

economical value to shore. This will lead to the creation of a market for discards, but several options are still under debate to prevent this. The best way would be to only give a certain period (for example two years) to stop discarding after which it becomes illegal. During this period the discards should go to the fish-meal industry. Quota for the fish-meal industry can then be lowered in this period. In the long term discarding will cease to exist and this extra quota-component can be removed again (COM, 2011). This is a major improvement in the CFP as long as the fisheries sector does comply with these rules and does not abuse them.

To decrease the import of non-sustainable fish and increase the production of fish aquaculture will be stimulated. At this moment aquaculture provides for 20 % of fish production (COM, 2009). Aquaculture gives rise to several problems. The first problem is the food resource of cultured species (especially carnivorous species). Cultured carnivorous species feed on fish meal, and worldwide about 30 % of wild catch is used for fish meal and fish oil (Tuominen *et al.* 2003). Waste products and food of cultured species also come into ecosystems leading to the second problem of aquaculture: eutrophication. The final solution for these problems would be to only farm vegetarian fish and molluscs not needing fish meal. For these species amounts of fish meal needed are 80-100 % lower than for carnivorous species (Naylor *et al.* 2000), but the market rather wants a salmon then a carp irrespective of the influence on the environment. A partial solution is integrated multi-trophic aquaculture. In this type of aquaculture waste of the highest trophic level (finfish) is ‘recycled’ by the lower tropic levels (seaweeds and shellfish) (Troell *et al.* 2009, Reid *et al.* 2010). So when aquaculture is stimulated these problems have to be kept in mind. Close attention should be paid on what is actually stimulated. Legislation should be very strict and more money should be given to research improving and assessing aquaculture.

Changes in economic policy will lead to a better understanding and higher awareness of consumers. Overall leading to a higher social support of the CFP. The changes in the granting system of the EU will act as another incentive for fisheries to become sustainable.

The first two revisions showed that a couple of circumstances need to be met to make the revision a success. First everybody involved needs to cooperate with the new plans. Plans should not get stuck on the drawing table, but make it into actual policy. If these circumstances are met this revision can be a valuable starting point for a sustainable future. But if not the future for fishing stocks in the EU looks very grim.

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