Report evaluating strategy options in terms of expectations of compliance and cooperation

Delaney, Alyne; Bezabih, Mintewab

Publication date:
2009

Document Version
Early version, also known as pre-print

UNCOVER report

Report evaluating strategy options in terms of expectations of compliance and cooperation

November 2009

Project no. 022717 (SSP 8)

UNCOVER

UNderstanding the Mechanisms of Stock Re**COVER**y

SIXTH FRAMEWORK PROGRAMME
PRIORITY TP 8.1
Integrating and Strengthening the European Research Area – Scientific Support to Policies
SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECT

Deliverable 29
Report evaluating strategy options in terms of expectations of compliance and cooperation

Due date of deliverable: Project month 36
Actual submission date: Project month 45

Start date of project: 01.03.2006 Duration: 4 years

Organisation name of lead contractor for this deliverable:

Innovative Fisheries Management – An Aalborg University Research Centre (IFM)

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

UNCOVER
Understanding the mechanisms of stock recovery

WP5, Deliverable 29

Strategy Options Evaluation Report, with Expectations of Compliance and Cooperation

FINAL Report

Alyne Delaney

IFM

Innovative Fisheries Management
- an Aalborg University Research Centre

&

Mintewab Bezabih
CEMARE
Centre for the Economics and Management of Aquatic Resources,
University of Portsmouth
United Kingdom

This study has been carried out with financial support from the European Commission (Contract No. 022717, "Understanding the mechanisms of stock recovery"). It does not necessarily reflect its views and in no ways anticipates the Commission's future policy in this area.

Table of contents

1. Introduction 4
2. Synopsis 6
3. North Sea Cod (*Gadus morhua*) 7
4. Northen Hake (*Merluccius merluccius*) Emergency and Recovery Plans 8
5. Expectations on Compliance and Cooperation 9
   5.1. Compliance in the bio-economic studies 10
   5.2. Compliance in Social Impact Assessments 11
6. Similarities in the Case Studies 11
7. Final Take Home Lessons 13
8. References 16

1. INTRODUCTION

This report was written as a synthesis paper, fulfilling the requirements for Deliverable 29, under work package 5 of UNCOVER, UNderstanding the mechanisms of stock reCOVERy. The main task of which is to provide a "Strategy Options Evaluation Report," to work package 6. The focus of this report centres on expectations of compliance and cooperation.

The primary goal of UNCOVER was to define optimal strategies for recovery plans for the future in European waters. This came about due to the number of exploited fish stocks in European waters at historically low levels and in danger of collapse. For many of these stocks, management advice from ICES has been a closure of the fishery. In light of this situation, the purpose of UNCOVER was to develop recovery strategies for EU fish stocks which are outside of safe biological limits. In order to develop these recovery strategies, the principle objectives of UNCOVER were to 1) identify changes experienced during stock decline and their consequences for the prospects of stock recovery; 2) enhance the understanding of mechanisms of fish stock recovery; and 3) provide recommendations for the recovery of EU fish stocks, which are outside of safe biological limits.

For this report, data from the UNCOVER report on SIAs and Community Profiles (D.28) have been synthesized with data from the Report on the application of bio-economic and compliance theory to three case studies (D.27) both of which were a part of work package 5, Task 5.4.

Social impact assessments (e.g., as seen in D.28) are a key component for evaluating stock recovery plans, especially given the Community Fisheries Policy (CFP) mandate of the social and economic stability of communities along with the environmental sustainability of the stocks. For UNCOVER, social impact assessments were undertaken in 6 communities, using two stock recovery plans as the basis: Northern Hake and North Sea Cod. Social impact assessments are most successful when used in concert with community profiles.

Community Profiling is a methodology for understanding how impacts that are primarily economic can be evaluated in a broader context. Generally-speaking, an SIA is a methodical assessment of the quality of life of persons and communities whose social, cultural, and natural environment is affected by policy changes, such as through the fisheries management and recovery plans. Social impacts refer to changes to individuals and communities due to management actions which alters the day-to-day way in which people live, work, relate to one another, organize to meet their needs, and generally cope as members of a fisheries society. Social impact assessment provides an appraisal of possible social ramifications and proposals for management alternatives, often with possible mitigation measures.

A bio-economic modelling approach was applied to fleet level data, associated with the North Sea Cod, Plaice and Herring, and Anchovy and Hake at the Bay of Biscay, in order to quantitatively measure expected fishers' response to alternative recovery plans. This was done specifically in terms of fishers' decisions such as effort

allocation, discards, as well as the resulting outcomes such as profit and fishing mortality. A combination of fisheries was evaluated against the different management strategies.

Combined, the assessment of the impacts of management measures on society, culture, and institutions, and the bio-economic modelling of management strategies, are methods which complement one another, though admittedly combining such methods remains challenging, and needs further work. Similar findings, such as with the compliance issue in the case of Northern Hake in Spain, were also supported with the same results uncovered using different methods.

As suggested in D.27, The effectiveness of any regulation in place depends on the manner of its enforcement, and the impact it has on the stakeholders. While the primary aim of fisheries regulations is to safeguard and regenerate the resource for sustainable use, the effect of the regulations on the short term objectives of stakeholders (e.g. maintaining profit) needs to be factored in an economic analysis for effective enforcement of the regulation.

Currently, many important commercial European stocks are below their safe biological levels. Consequently, the long run sustainability of many European fisheries is highly questionable. Accordingly, a number of initiatives, such as closed areas, quantity restrictions, and gear restrictions have been implemented to facilitate the recovery of fisheries where there is risk of collapse. As these measures have involved restrictions on fishing activity, they will have had direct impacts on the livelihoods of fishers and regional communities.

The bio-economic methods employed in the analysis included TEMAS, Fcube and ISIS-FISH models in the respective case studies. TEMAS is a multispecies, multi-fleet, multi-country bio-economic model. TEMAS models the link between technical management measures and fishing mortality. The resulting analytical tool was flexible enough to accommodate the salient biological, fleet and economic features of the fisheries in the North Sea case study. An additional important feature of the model included the explicit and detailed fleet component enabling the depiction of the relationship between management measures and fleet dynamics. These features enabled researchers to see how aspects of the fleets are changed as a response to the regulatory schemes, their influence on fishers' behaviour, and subsequently, their impact on measures like effort allocation and profit, discarding. (CEMARE, et al. 2009:1)

The Bio-economic report focused on evaluating fishers' responses to major recovery plans with regard to their effectiveness in reducing fishing mortality and their associated socioeconomic impacts. Within this task, analysis focused on decommissioning (capacity management), days at sea reduction, and mesh size restrictions. (CEMARE, et al. 2008, UNCOVER D.27:1)

Decommissioning was shown to have a strong overall effect in reducing fishing mortality across fleets and fisheries. At the same time, it was found that overlapping restrictions may be more effective than a single regulation in reducing fishing mortality. However, and unfortunately, when looking in terms of the socio-cultural

impacts, overlapping regulations can potentially serve to increase frustration and confusion, and with it, *anomie* and negative impacts on quality of life.

Analyses using the Fcube model on Hake at the Bay of Biscay indicate that gradual decreases in effort certain fleets do not affect the effort of other fleets, probably because of shifts in target species and tendency not to use all vessel capacity.

The results from the ISIS FISH model for Anchovy in the Bay of Biscay show that more than the implemented MPA, given the structure of the dynamic model developed, fisher's behaviour and spatial fish distribution have a strong impact on the performances of management strategies.

The socio-cultural and community analysis focused on two stocks: North Sea Cod and Northern Hake in the Bay of Biscay. Consequently, the comparative analysis and this synthesis focus on these two stock recovery plans, communities, and fleets.

2. SYNOPSIS

As would be expected, the situations found in both the communities and fleets researched vary considerably; as did the methods underlying the results between the two reports; yet in some instances, these complemented one another. They also strengthened the results by providing similar results despite different methods.

In general, in order for effects of the recovery plans to be felt, there must be compliance: fleets and fishers must actually change their behaviour. If the short term costs are viewed as being too high and if the plan does not have "buy-in" than fleets and fishers may not alter their actions and "comply" as desired by scientists and managers for rebuilding. After all, incentives exist to "cheat" when catches are lower due to their need to operate as businesses; they must compensate for revenue losses.

The Bay of Biscay Northern Hake fishery is a specialized fishery whereby boats cannot easily switch to alternative species (e.g., to cover such revenue losses). There was no stakeholder public comment period on the plan, as there were no real forums for input available; the Northwestern and Southwestern Waters RACs had not yet been formed at the time of the implementation of the Recovery Plan. It is assumed that when a plan is not adjusted for the needs of stakeholders, they may move away from adherence to avoid the increased costs of the plan. Careful consideration of the drafting of the legislation - as well as enforcement, of course - can decrease costs and therefore increase compliance. Some costs include fixed (sunk) investment and labour (fixed contracts and thus can not be easily dismissed). Both the bio-economic modelling and the social impact assessment showed limited impacts due to limited levels of compliance.

The bio-economic TEMAS model focusing on North Sea Cod found that in response to decommissioning management measures, effort, profitability, and discards (in most cases) decreased. Decommissioning had a strong overall effect in reducing fishing mortality across fleets and fisheries, though effort reduction was uneven across the fisheries. It was found that reducing the number of vessels by 10% reduces the profit

within 5-20%. The impact is stronger for smaller vessels. Days at sea (DAS) reductions also reduced profits by similar percentages (except Norwegian vessels).

At the community level, qualitative interviews uncovered continued stress among certain levels of society, though these varied temporally and sectorally.

In Urk, the Netherlands, continued restrictions decreased firms' profitability, as well as increase stress in the society: particularly along the lines of recruitment issue and health. Retail consumption patterns have also shifted. Certain segments of the sector are also particularly at risk, such as those in their 40s and 50s, less able to switch over, and families with the cultural tradition of wives remaining as homemakers. Ancillary industries are limited. Lesser-known groups are potentially at risk with the decrease in landings, such as the self-employed fish graders working in the fish market.

In Peterhead, The fishing industry is impacted by low profitability - prices had been good, overall, for whitefish in the two years previous to fieldwork (November 2007). However, in spring of 2008, fuel prices greatly increased. If prices decline, however, the industry will face increased difficulty. This comes as no surprise to anyone familiar with fisheries. Specific support industries, such as net repairers, are particularly vulnerable while generalized firms, such as engineers, have made transitions. The port has managed to diversify - the port is expanding into more pelagics and the shellfish landings have doubled in the last two years. This is good for the Port Authority and those connected to servicing them. Limited impact on the community overall, especially shops, though these are in great decline, as in many other small towns throughout the Northeast of Scotland. As with Urk (NL) and Thorsminde (DK), low recruitment of crew and staff continues to be an important issue in fishing and processing sectors. Currently the catching sector seems to have stabilized, while the processing sector has been hit hard by the combination of the CRP and the Registry of Buyers and Sellers introduced in 2005, and came into full force in January 2006); currently there are only 4 main processing firms remaining in Peterhead.

Thorsminde, Denmark, is a particularly small port with limited opportunities to diversify within and without the fishing industry. They have been hit by the change in quota allocation in Denmark, the Cod Recovery Plan, as well as the Plaice and Sole management plan. Though designated as a port for cod landings, the Thorsminde auction did not receiver increased landings from boats from other ports as expected. Facing severe recruitment problems, some fishers prefer to retire than to work with foreign crew.

3. NORTH SEA COD (*GADUS MORHUA*)

Social impacts of the Cod Recovery Plan were undertaken in three North Sea communities, for a minimum of two weeks each. In the North Sea, all stocks of roundfish and flatfish have been exposed to high levels of fishing mortality over the past century. For most of these stocks their lowest observed spawning stock biomass has been seen in recent years (ICES 2004). North Sea cod in particular has been outside of 'safe biological limits' since the late 1980s and North Sea plaice since 1994 (ICES 2005). Over the past 2-3 years a number of different management measures

(e.g. area closure, effort reduction, drastic TAC cuts) have been applied in an attempt to rebuild the cod stock, yet it is still only at 20-25 % of the level it was in 1990. Similarly, the establishment of a partially closed area in 1989 ('plaice box') has not prevented the plaice stock from continuing to decline (Pastoors et. al. 2000).

In 1999 the EU and Norway agreed to implement a long-term management plan for the North Sea cod stock. This was intended to constrain harvesting within 'safe biological limits' and to provide for sustainable fisheries and greater potential yield in the future (a 'cod-recovery plan'). The latest proposal from the European Commission (Reg 2003/0090 (SNS)) includes both effort reduction/control and Harvest Control Rules (HCR) for setting TACs. In 2003 scientists recommended complete closure of fisheries catching cod in the North Sea, including severe restrictions on vessels targeting other species (e.g. haddock), but which catch cod as accidental by catch (ICES 2004).

In 1999, the EU and Norway agreed to implement a long-term management plan for the North Sea plaice stock (ICES 2004), and a plaice (sub-area IV) 'recovery plan' is now under consideration. Increased mortality as a result discarding practices appears to be a particular threat to plaice recovery.

Given the mixed fisheries nature of harvesting commercial stocks in the North Sea, impact assessments were not only conducted in the whitefish (cod) extraction communities of Peterhead (Scotland) and Thorsminde (Denmark), but also in the plaice and sole extraction community of Urk (the Netherlands). This is due to the impact the quota restrictions on Plaice, Sole, and Turbot in the Cod Recovery Plan.

4. NORTHEN HAKE (*MERLUCCIUS MERLUCCIUS*) EMERGENCY AND RECOVERY PLANS

Three social impact assessments were conducted seeking to address the socio-cultural impacts of the Northern hake (*Merluccius merluccius)* emergency and recovery plans of 2000 and 2004, respectively, in the Basque region of Spain and the Guilvinec region of France. In Spain, the selection of two community profiles was based on high level of dependence on the Northern hake fishery. The communities of Ondarroa and Pasajes (*Pasaia)* were investigated for two weeks each using rapid assessment protocol, a standard method for conducting Social Impact Assessments (SIAs). This method incorporates ethnographic investigation along with archival research to produce a community profile based on the effects of significantly altered regulations, typically in communities with a high level of dependence on an extractive natural resource.

In France, given the nature of the fishery today, a regional approach was taken to "community" and work was concentrated in the region of Guilvinec, using the same methods. The maritime district of Guilvinec constitutes a particular territory with a specific cultural characteristic and it is called *Bigouden* Country. There are 4 harbours in this district: Guilvinec, Lesconil, Loctudy and Saint Guenolé. Guilvinec district is divided in two types of fisheries: small scale fisheries and offshore fisheries. Like Urk in the Netherlands, the main concern was not of the primary catching sector, but rather those which catch hake as "bycatch", in this instance, juvenile langoustines. In

Guilvinec, fishing strategies have adjusted to fit the new regulations; fishmongers who supply the Spanish market have been impacted.

5. EXPECTATIONS ON COMPLIANCE AND COOPERATION

Based upon the bio-economic modelling and the social impact assessments, some views on the expectations on compliance and cooperation are provided in this section. First, however, some intellectual underpinnings to the issue of compliance will be presented. This is necessary to set the stage in order to understand behaviour.

It should be noted in considering the issue of compliance that compliance behaviour partly depends on the understanding and belief that changes are inevitable (Bressers and Bruijn 2005). Without such belief, behaviour may not be likely to adjust to changing circumstances. In the past, as Raakjær and Mathiesen (2003) point out, compliance to management measures was often understood from an economic perspective, assuming that fishers act in economically rational terms, and assumes that fishers calculate the economic gain to be made from by-passing regulations compared to the risk of detection and facing fines (Raakjær and Mathiesen 2003). This idea has influenced fisheries managers where increased enforcement is seen to the way to go. However, as Kuperan and Sutinen (1998) argue, "even in situations where the investment in enforcement is considerable, it can be questioned whether an increased effort will actually reduce the number of violations" (in Raakjær and Mathiesen:1). In fact, fishers were often found to be creative in finding ways to avoid getting caught in breaking the rules. Why would they, for example, report to their otherwise competitive peers, the activities and movements of enforcement agents on sea and in the ports (ibid: 1)? Some studies (e.g. Sutinen et al. 1990) have shown that low economic sanctions can partly explain the levels of non-compliance. Other empirical studies have shown that this issue may be a bit more complicated (e.g. Hatcher et. al., 2000; Hønneland, 1998). In addition to the

> *"influence of regulation, enforcement, economic benefits and the accessibility of fish in the sea, the compliance behaviour may be influenced by the behaviour of others and the moral values of the individual fisher." … The influence of norms and what the fisher considers as fair and morally correct are important aspects of the normative analysis. Although fishing is a commercial and highly competitive business, a variety of non-monetary incentives is in place, such as: social pressure, tradition, moral, knowledge about fishing (experience and skill) (Jentoft, 1998; Maurstad, 1998; Raakjær and Mathiesen 2003: 2).*

Norms are defined as the typical actions and attitudes, and the expectations regarding the behaviour and attitude of peers; they may work as social pressure, which creates both positive and negative sanctions (Giddens 1984), for examples the Dutch Biesheuvel system.

Of course, lack of compliance in the fisheries, despite increased enforcement activities, brings attention to the importance of legitimacy of fisheries management. "Legitimacy is considered as a normative phenomenon, and differs from moral in the

sense that legitimacy is linked to a political authority (system), while moral may or may not be" (Raakjær and Mathiesen 2003).

"Legitimacy exists when the members of a society see adequate reason for feeling that they should voluntarily obey the command of authorities" (Easton 1958). In thinking of the issue of legitimacy, Jentoft (1989:139) emphasizes that four factors have important influence on the existence of legitimacy:

1. content of the regulations;
2. distributional effects;
3. making of the regulations; and finally
4. implementation of the regulations, where the hypothesis is, that *"the more directly involved the fishermen are in installing and enforcing the regulation, the more the regulation will be accepted as legitimate."*

Ideas of equity also play an important role in compliance. Is it viewed as fair to themselves? And more importantly, do the fishers believe that other fleets will also follow suit? As qualitative interviews showed, they may be less likely to comply if they do not feel the system is equitable.

5.1. Compliance in the bio-economic studies

An empirical analysis of compliance was not provided by any of the case studies conducted for the bio-economic and compliance theory case studies, though there are some studies currently underway in other EU projects, such as COBECOS (CEMARE, AZTI, and IFREMER 2009: iv). Studies incorporating compliance behaviour have been limited to either full compliance, or none at all (Tidd, Hutton and Hillary 2009). Consequently, such models have difficulty in accounting for real-world behaviour, whereby compliance often falls between such all-or-none compliance levels. Furthermore, the bio-economic modelling shows that it is important to show the probability of detection of violators an essential component of understanding compliance behaviour as related to the status of the stock.

Detection, and the related compliance, also impacts the status of communities and subsectors at the social and cultural levels. For the North Sea Cod, the introduction of the Registry of Buyers and Sellers in the UK (2005) had a significant impact upon the numbers of processors operating in Peterhead, for example. Processors now operating in Peterhead have fallen to four, which is a significant decline from previously.

The reduction in the number of vessels over all the fleet groups resulted in a total increase in the number of discards. For both 10% and 20% simulations, the impact of decommissioning on discards is larger for cod than the other two fisheries. The 10% increase show that the increase in discards is smooth and shows a steady rise with larger sized vessels on average. In contrast, the change in discards due to a 20% change in the number of boats shows a more fluctuating pattern across all sizes.

Reduction of days at sea shows that the percentage change in discards is slightly less than 10% for a small change in days at sea, but reaches almost 20% for when effort is reduced by a larger margin. Comparison with the simulation across fisheries shows that, discard patterns are similar but lower for herring and plaice than for cod.

Analysis of the effects of increases in minimum mesh size shows that the amount of discards increases on average by 3 percent and 6 percent (10% and 20% levels, respectively). The effect of increased mesh size on discards is smoother for Belgian and UK fleets. When minimum mesh size is increased to 20%, the percentage increase in discards increases for all the fleets, but with increased fluctuation across fleets. Although differences in magnitude are observed, the impacts of the regulatory measures- reduced days at sea, increased mesh size exhibit similar patterns across the three fisheries.

5.2. Compliance in Social Impact Assessments

If alternatives exist, and there is support for technological changes, compliance can be seen in some segments of the fisheries. For example, in France's Guilvinec district, fishing strategies have adjusted in the face of management measures. For most of the fleet targeting hake, the strong impact that would have this regulation on the main fishing activity, the langoustines catching, of the vessels from Guilvinec has been a major incentive to develop more selective fishing practices. Due to the strong interaction between the two fishing activities, fishers from Guilvinec have tried to find new ways to maintain their fishing activity in the future.

In the other cases, interviewed fishers spoke of a desire to comply, but also grappled with the difficulty of obtaining enough quota to run their operations, as well as their inability to switch gears and species.

6. SIMILARITIES IN THE CASE STUDIES

There are a number of similarities found between the between the cases of North Sea Cod and Northern Hake in regards to social and economic impacts of the stock recovery plans.

- Specialization makes it difficult to switch (species; gears) in time of crisis.

Many of the fleets analyzed practice a specialized harvesting strategy. Historically, fleets and fishers often practiced a broad-spectrum subsistence/harvesting strategy in which they often shifted among species and gear depending upon the season and local conditions. In the current situation with strict quota and management limits, fleets and fishers find it difficult to switch species and gears as they would have traditionally done. The inability to switch negatively impacts both the economy and potentially, the society. Such difficulties in switching gears were shown in the bio-economic analysis report as well as in qualitative interviews, in both the Northern Hake and Cod Recovery Plan fleets. For example, for the parajes in Spain, they have no ability to reduce their effort by switching gears. The Northern hake fishery cannot switch to alternative species due to high technical specialization and low mobility. Fleet equipment fixed costs can be considered almost as sunk costs of the gear. This is due to the high cost of the gear that includes not only the large nets, but the machinery to haul them and the electronic equipment and software to control both. In addition to this, the second hand market for the gear is only very residual and is reduced to individual operations taking place only very seldom between fishing companies. More often, gear is only sold together with the vessel or as a consequence of scrapping. This is closely related to the longer term behaviour of this fleet, where very few changes of métier occur (less than ten baka-pareja switches from 1995 to 2005) and the time and

resources needed to switch from one métier to the other (and therefore the opportunity cost incurred) are considerable.

- A real desire for long-term management plans

Fishers in all cases (Hake, NS cod) voiced a desire and need for stability and ease of planning purposes. Qualitative interviews uncovered a high degree of consensus in the desire for long term management plans among fleets from the case studies. Most interviewed discussed the business nature of the industry and their need to plan for investments. Some examples cited included improvements to ships, as well as the purchase of additional quota. One skipper, for example, spoke of buying quota, only to have it taken away the next month. When skipper and firm owners are able to plan for the future with some sense of reliability and assurance, they can potentially make long-terms decisions, in theory, increasing the likelihood of sustainable decision-making.

- Impacts will only be seen if fishers/fleets are compliant (e.g., Northern Hake).

It is common sense that economic and social impacts of stock recovery plans will only be seen if fishers and fleets are compliant. Compliance can potentially increase with buy-in, long-term planning, and avenues for stakeholder input into the process. However, in the case of the Northern hake in the Bay of Biscay, the recovery plan was never agreed upon by stakeholders. Consequently, it was assumed in the bio-economic modelling that compliance will have costs which affect fishers' behaviour and choice of adhering to the plan. One example of costs include fixed investment and labour: most have fixed contracts and consequently, skippers can not dismiss part of the crew in order to adapt to the Plan's impact on their profitability.

- Incorporating compliance indicators into the bio-economic modelling has potential, especially if these include a realistic view of compliance; specifically, in the range between full or non-compliance.

Incorporating compliance indicators into the bio-economic modeling has potential, especially if these include a realistic view of compliance; specifically, in the range between full or non- compliance. Attempts at incorporating compliance behaviour into fisheries bio-economic models have been very limited. This has mainly got to do with the implicit assumption in bio-economic analyses that there is full compliance or where there is no compliance at all (Hutton *et al*., 2001). Given this, bio-economic analyses that incorporate compliance levels that fall between the full- and no-compliance extremes will contribute to a better understanding of fisheries compliance behaviour. One area where bio-economic analyses could contribute to better understanding of compliance behaviour is how fishers' behaviour is adjusted to the dynamics of the fishery biomass as well as to the corresponding evolution of the regulatory mechanisms (dynamic parameters corresponding to the regulations), and when even the probability of detection is endogenous in the bio-economic model.

- Combining the bio-economic analysis with the socio-cultural analysis has great potential.

Bio-economic analysis can provide quantitative data which support explanatory, qualitative data and descriptions. Provided, of course, the parameters for the bio-economic modelling are set appropriately and the necessary data are available. When an individual fishing firm, for example, speaks of investment costs with changing mesh sizes, the bio-economic modelling can show both the economic impact along with the estimated stock increase along fleet lines. The bio-economic analyses provide a macro level view on the situation, while the micro-level analysis provides insight into the behaviour of individuals and firms which make up the fleets. The qualitative and quantitative methods can complement and support one another with varying methods, thereby potentially strengthening the results.

7. FINAL TAKE HOME LESSONS

This final section presents some concluding thoughts on social and economic impacts which warrant particular emphasis.

- Keep in mind that social and economic impacts can be cumulative, consequently other legislation, policies, and recovery plans should be included in analyses.

Social and economic impacts do not take place in a vacuum, away from other management activities and social and economic occurrences. A small change in management or legislation may, in fact, be "the straw which breaks the camel's back" so-to-speak in economic and social terms. Cumulative impacts in society are loosely similar to the cumulative impacts seen in the environment whereby "Many processes and changes … take place below the surface, silently, on large scales and over long time periods" and on the "the natural …. their capacity to act as natural buffers, is likely to diminish in [the] future" (UNEP 2009: Chapter 5: 1). Economies and societies which are continually hit will have a more difficult time responding; they are not as healthy and robust as other communities faced with restrictions by policies and management measures.

For example, among the Dutch beamtrawl fleet (Annex 5), The Cod Recovery Plan severely limited fleet activities through DAS schemes and reduced mesh sizes. Though this may not explain by itself why 40% of the Urk fishing firms were technically bankrupt in 2007, it could be said the combination of the Cod Recovery Plan, the Long-term Plaice and Sole Management Plan, high fuel costs, reduced quotas, increased imports of competing species like *pangasius*, with low prices for have all combined to place the fleet in a precarious position. Once one combines the state of the fleet with the cultural and societal parameters of quality of life issues (preferences for being with family and going to church on weekends), limited education levels and employment opportunities, especially for women of a certain generation, unwillingness to move away from Urk, to name some boundaries – all place Urk households and the Urk community in a vulnerable and less resilient position. The community of Thorsminde, Denmark is also in a precarious position, in their case, aggravated by their small size, remote location, and limited alternative opportunities.

- Impacts affect subsectors at different times and to varying degrees, and this includes divisions along gender and demographic lines, as well as the expected subsectors.

Communities and economic sectors are heterogeneous. Consequently, impacts affect subsectors at different times and to varying degrees, and this includes gender and demographics. For example, in Urk, there is a generational difference in education levels. While in Peterhead, Scotland, wives may leave the home to find employment, in Urk, most girls leave school at 16 and work in processing firms. Consequently, they are limited in the types of employment they are qualified for. And this assumes there is a cultural expectation that they may work away from the home; there may be cultural preferences that they do not. Additionally, men in their late 30s, 40s and 50s, also have a more limited education which impacts where they may be able to find employment, if even they have a cultural preference for it (e.g., on any kind of boat, such as barges or dredgers rather than land-based work).

As far as subsectors are concerned, the catching sector is often affected first with any change in regulation. And this has a trickle-down effect on fish agents (Peterhead), auction houses (Urk), support firms such as engineers, painters, grocers and net makers (Thorsminde, Peterhead, Urk). Particularly with support firms, it should be understood that often there is a minimum number of boats necessary to support the industry. Too few boats, and support industry closes down. And once support industry leaves, they may not be able to return. This is particularly true in North America and ports which have switched over to high end housing in port areas, and to tourism as the main replacement industry.

- Increased regulation without the perception of a say in the process can increase *anomie* and stress in communities and fleets

As Jentoft (2000) has pointed out, "Fishermen are born, raised and live in local communities. They are enmeshed in cultural and social systems that give meaning to their lives and directions for their behaviour. Their fishing practices are guided by values, norms and knowledge that are shared within their community" (2000: 54). Jentoft then argues, following Emile Durkheim, that "overfishing/the Tragedy of the Commons may well be a consequence of anomie, that is normative confusion, which occurs when social ties are weak and moral standards unclear." Consequently, following this reasoning, there could result a continuing vicious cycle of threat to stocks in communities which are under threat with management plans. "Overfishing results when the norms of self-restraint, prudence and community solidarity have eroded. It occurs when fishermen do not care about their resource, their community and about each other. Then, their ability to communicate among themselves, to agree and to cooperate is lost. Instead, their social relations are featured with opportunism, strife and conflict. Hence, their capacity for collective action becomes severely weakened" (2000: 54). With this in mind, it stands to reason that managers include the community into the process.

- Feeling of fairness imperative

Tied into this feeling of needing a say in the process, is a feeling of fairness. Interviews, particularly in the North Sea Case Studies, uncovered this feeling of

unfairness. Fishers and industry members feel a need for fairness across members States, as well as among fleets in the same country.

Keeping in mind the social and economic nature of fisheries and fishing communities, it is prudent to not only investigate social impacts in order to mitigate negative impacts which may result from new management measures, but also to include the community into the process for the health and improvement of the fish stocks themselves.

8. REFERENCES

Bressers, H. and Bruijn, T. d.

2005 Conditions for the Success of Negotiated Agreements: Partnerships for Environmental Improvement in the Netherlands. *Business Strategy and the Environment* 14: 241-254.

CEMARE, AZTI, and IFREMER

2009 Report on the application of bio-economic and compliance theory to three case studies. Work package 5.4.1 of the UNCOVER project. May 2009.

Easton, David

1958 The Perception of Authority and Political Change. In C.J. Friedrich (ed.), *Authority*. Cambrigde: Harward University Press.

Hatcher, A., S. Jaffry, O. Thébaud, and E. Bennet

2000 Normative and social influences affecting compliance with fisheries regulations. *Land Economics,* 76(3):448–61.

Hønneland, Geir

1998 Enforcement and Legitimacy in the Barents Sea Fisheries. In: David Symes (ed.), *Northern Waters, Management Issues and Practice*. Fishing News Books. Pp. 116–129.

Tidd, A., T. Hutton and R. Hillary

2009 Modelling fishing effort in the North Sea demersal fisheries using general linear mixed models. CEFAS. Mimeo.

ICES

2004 Report of the ICES Advisory Committee on Fishery Management and Advisory Committee on Ecosystems, 2004. ICES Advice. Volume 1, Number 2. 1544 pp.

2005 Report on the Assessment of Demersal Stocks in the North Sea and Skagerrak. ICES CM 2005/ACFM: 07, 783pp.

Jentoft, S.

1989 Fisheries co-management. Delegating government responsibility to fishermen's organizations. *Marine Policy*, 1989, 137-154.

1998 (ed.) *Commons in a Cold Climate*. Carnforth: Parthenon Publishing, Paris: UNESCO.

2000 The community: a missing link of Fisheries management. *Marine Policy* 24: 53-59.

Kuperan, K. and J. Sutinen
1998 Blue water crime: deterrence, legitimacy, and compliance in fisheries. *Law and Society Review,* 32:309–37.

McCay, B.J. and S. Jentoft
1998 Market or community failure? Critical perspectives on common property research. *Human Organization*, 57(1):21-39.

Pastoors, M.A., A.D. Rijnsdorp, and F.A. Van Beek
2000 Effects of a partially closed area in the North Sea ("plaice box") on stock development of plaice. ICES Journal of Marine Science, 57: 1014-1022.

Sutinen, J, A. Rieser, and J. R. Gauvin
1990 Measuring and Explaining Noncompliance in Federally Managed Fisheries. *Ocean Development and International Law,* 21:335-372.

UNEP
2009 Rapid Response Assessments. Chapter 5 in *Dead Water: The Cumulative Impacts*. http://www.grida.no/publications/rr/in-dead-water/page/1254.aspx.

Maurstad, A. and J.H. Sundet
1998 The invisible cod - fishermen's and scientists' knowledge. In: S. Jentoft (ed.) *Commons in a Cold Climate*. Carnforth: Parthenon Publishing, Paris: UNESCO.

Raakjær and Mathiesen
2003 Important factors influencing rule compliance in fisheries: lessons from Denmark. *Marine Policy*, 27:409–416.

UNCOVER:
Understanding the
Mechanisms of
Stock Re**cover**y

www.uncover.eu

An EU 6th Framework Programme (FP6)
Specific Targeted Research Project
Project No. 022717
March 2006 - February 2010