



Project no. 022717 (SSP 8)

UNCOVER

UNderstanding the Mechanisms of Stock ReCOVERy

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 30

Stakeholder Participation in Recovery Plans

Due date of deliverable: Project month 47

Actual submission date: Project month 47

Start date of project: 01.03.2006

Duration: 4 years

Organisation name of lead contractor for this deliverable:

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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)	

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1 Introduction

In 2002 the European Council set as a priority the creation and implementation of recovery plans for depleted fish stocks. This is an EU expression of the requirement of the Johannesburg World Summit on Sustainable Development for signatories to restore depleted fish stocks by 2015. The UNCOVER project, as part of its analysis of ways to meet this priority, has committed itself to considering the social, economic and governance implications of the implementation of existing and alternative recovery plans. This has two major parts. The first is an analysis of the socio-economic incentives for compliance with the recovery plans by the fishing industry. The second is an analysis of the governance of recovery plans. This involves an investigation on the acceptance of the plans by stakeholders in terms of both their content and the processes by which they are created and implemented.

The present report is Deliverable 30 of the UNCOVER project, the analysis of stakeholder positions on the governance of recovery plans. It is based on a number of sociological field research activities¹. The field activities and related documents that were reviewed in the preparation of this report include: 24 individual interviews and four focused group interviews with various fisheries experts, managers, RAC leaders, fishers, fisher representatives and members of conservation NGOs; the observation of 15 fisheries management related meetings; and, 13 public and semi-public documents used by stakeholders to communicate positions. Many of these documents are quoted directly, and most others contributed in some way to the background information in the report. As is appropriate in social science research, the documents produced by the field research activities are presented in a way that keeps the identities of individuals confidential. All other sources used in the preparation of the report are cited separately.

The first major focus of the report is the links between recovery plans and the Regional Advisory Councils (RACs). These are the major current EU initiative for improving fisheries governance. RACs comprise a wide group of recovery plan stakeholders, the two most important being the fishing industry and the conservation NGOs. The second focus is the links between recovery plans and mechanisms for developing scientific advice. The key insight is perhaps the central importance that recovery plans have taken in governance reform by reflecting a general agreement on goals among stakeholders and the way they have created focal points for cooperative action, in spite of considerable disagreement on details and objectives.

After this introduction, the report contains four substantive sections and a conclusion. The first section addresses the different ways that stakeholders define recovery plans in the EU. The second section outlines two major challenges for recovery plans: the ecosystem approach to fisheries management (EAFM) and the problem of mixed fisheries. Both of these raise questions about the degree to which recovery plans focus on single species. The third section

¹ Many of these were supported directly by the UNCOVER project. However, many others were interviews and participant-observer research opportunities supported in other ways. The subject of recovery plans is one of general importance in European fisheries and it comes up in many discussions at meetings or with stakeholders. As the author has stored textual information, i.e. meeting notes, interview transcripts, and documents, generated by several large research projects in a single textual database any discussion of recovery plans was recoverable for analysis. In these cases the UNCOVER project supported the reanalysis of data that was gathered in other field activities.

evaluates science policy issues around recovery plans. The fourth substantive section looks at the ways in which recovery plans are acting as catalysts for governance reform in EU fisheries.

2 Defining recovery plans in an EU context

The need for the European recovery plans arises in the first instance from the depleted condition of the stocks in question. This reality has led to a general consensus that, “yes, recovery plans should be done”. However this shared ideal of seeking the recovery of a stock leaves many issues of disagreement in the details. Every management agency and stakeholder group seeks to define the essence of a recovery plan as an effort to achieve their priorities. Nevertheless, in spite of the differences in details and emphasis, even this broad, symbolic consensus has proven important because it has allowed stakeholders with conflicting interests to set the parameters of a cooperative effort.

The European Commission

What the European Commission saw as the scientific requirements of recovery plans reveals some of what they were after when they first began to develop the plans. The following is from a public talk by the Director of Conservation Policy at the then Commission’s Directorate General for Fisheries (now DG MARE) early in the process of recovery plan development:

Q1. What do we need for such recovery plans? As they will normally contain targets for recovery or long-term management, usually expressed in terms of biomass, we need clear precautionary and limit reference levels for the stocks concerned. They will also contain harvest rules, i.e. rules for the fixing of TAC's over several years. We will need to have an evaluation by scientists of the relevance and usefulness of such rules... [later in the document]. It means a concentration of resources, at least in the short term, on the analysis of the most depleted fish stocks (Farnell 2003).

For DGMARE recovery plans are strategic mechanisms that are used to concentrate fisheries management capacity on a sub-set of the most serious problems with depleted stocks. There is an emphasis on biomass targets and the precautionary approach (PA). The speaker’s understanding of the PA reflects the ICES-style operationalization of the PA as target reference points.

Two central questions about recovery plans are their relationship to long-term management plans (LTMPs) and effort management. This quote presupposes a rather smooth movement from recovery plans to LTMPs based on harvest control rules (HCRs). These are rules in a form “for Y condition X change in harvesting pressure is required”, and are one of the aspects of LTMP that all stakeholders see as useful. The following quote outlines some of the challenges that DG MARE sees in working towards LTMPs. Clearly the idea is to use recovery plans strategically in the move to LTMPs, but the overall concept requires further development. HCRs are just the beginning of an effective LTMP:

Q2. Commission Scientist: There is also a possibility, which should start now, to develop management plans for stocks which are not in the recovery phase, multi-annual management plans similar to what we have with the bilateral agreement with Norway for example, the herring stock in the North Sea, although this management plan is just a harvest rule it should consist of more than harvest rule. A management plan for me should be more integrated, complete and also recover for example technical measures, clear targets, not only harvest rules.

The following is short and unequivocal about LTMPs while being more circumspect about effort management:

Q3. Interviewer: So, you see the recovery plans as sort of a starting point for a general reform, a general move towards effort management and long-term management? Commission Administrator: Certainly to long-term management. To effort management in justified cases. I think it's clear there won't be a general signing up to effort management as the normal, or as a normal instrument for fisheries management, but I think there is recognition that we will need to manage effort in order to make particular efforts to stop the serious degradation of the stock collapses.

Perhaps the most difficult set of issues are raised by recovery plans in mixed fishery context. As discussed in the next section, it is this mixed fisheries problem that links recovery plans to the question of effort management.

Perhaps the greatest challenge the Commission faces as it tries to develop recovery plans is that, particularly in their long-term aspects, these plans are not a clean fit with official EU fisheries decision-making. First, for many recovery plans the European Commission is negotiating both internally with stakeholders and externally with other countries with which it shares recovery plan stocks. Because some recovery stocks are shared they have an inevitable effect on the negotiations between Norway and the EU over shared stocks. This has led to ongoing joint working groups between these two parties seeking to find ways that recovery plans and LTMPs can fit into annual negotiation processes. An even greater problem of decision-making fit stems directly from how fisheries decisions are made in the EU. The next quote describes the problem:

Q4. Interviewer: Can you explain what the procedure is for implementing the recovery plan? Commission Scientist: In principle, when we come to the 2004 December and 2005 we will look at the latest scientific advice for cod. We will look at the commitments in the recovery plan. So given the advice in order to reach the commitments in the recovery plan, then the TAC should be this and the effort should be this. And that's what we propose to the council. The Council has bound its own hands to accept that. It's not legally constraining.

Recovery plans, while products of a government regulatory effort are not a legal entity in and of themselves over the long term. The actual legal decisions are made year-by-year by the Council of Ministers, who have been reluctant to bind themselves to the details of long-term plans. This includes the kinds of if "X condition then Y action" HCRs that would avoid short-term political decision-making.

Recovery plans emerge out of various kinds of proposals and measures that have different kinds of legal statuses. This legal ambiguity, of course, increases the degree to which different stakeholders are able to construct the recovery plan concept to reflect particular concerns. While individual measures are well defined, the loose overall understanding of recovery plans and their objectives plays a helpful political role by allowing stakeholders with different interests to articulate a common long-term objective and focus their collaborative efforts.

The Fishing Industry

Members of the fishing industry are the most directly affected by the recovery plans. They are also the most complicated set of stakeholders because they are so varied and the impacts of recovery plans are so different. Spokesmen for the fishing industry are increasingly professional lobbyists more than fishers. Many of them have been fishermen, and are still active in various respects in fishing, but many others are scientists of various disciplines.

Some members of the industry see positive outcomes from recovery plans because they provide a way of contributing their knowledge to the process and to benefitting from responsible fishing:

Q5. RAC Staff Member: The more subtle techniques, like technical conservation measures, changing the nets, the idea of closed areas, came forward, and it was actually volunteered subsequently by some fishermen as a consequence of all this, when they realised that they would get more days at sea if they actually adopted methods that promoted the conservation of cod.

The movement from recovery plans to more general long-term planning is a priority for the fishing industry. The following is from a member of a RAC who represents an industry group:

Q6. Interviewer: What would you say are the most important lessons from past experience with recovery plans in Europe? Industry RAC member: The most important lesson is that it removes political interference in the process of setting allowable catches by removing the ability of Member States to question the output given that the plan would have been agreed through Council. The output is clinical and precautionary thus affording greater security to the stocks in the medium to long term.

Here we see strong support for the idea of a recovery plan in general, with the emphasis being placed on HCRs and the reduction of “political interference”. Recovery plans are to be driven by technical considerations through HCRs. For the industry an important aspect of this is reducing uncertainty in business planning. Other stakeholders, however, believe that a good deal of this “political interference”, itself a strange term for government decision-making, is driven by the industry. The industry desires to shield itself from sudden drops in catches and hence revenue loss and market destabilization. An historical comparison of scientific recommendations for TACs with actual TACs has shown that that is exactly the pattern that emerges from the “political interference”. The analysis showed that the Council of Ministers generally moves its TAC decisions in the direction of scientific advice, but not as far as the scientists are recommending. The overall effect is one of smoothing the impact of the advice (Patterson and Résimont 2007). Reflecting this same general desire for smoothing the impact of changes in TACs, many HCRs used in LTMPs involve limits on how much quotas can be increased or decreased in a given year. These characteristics can greatly increase industry support for LTMPs. This interest is illustrated in the following quote where another industry representative places emphasis on long-term plans as involving gradual change:

Q7. Industry RAC Member: A multiannual plan allows one to go forward in steps. By setting in-between/midway goals it is easier for the fishermen to adapt themselves and to change their fishing behaviour.

In respect to the current set of recovery plans, many in the industry feel that they were engaged late in the process. The need for involving stakeholders early in these sorts of processes is well documented, their participation is often most helpful at the stage of problem definition (Renn 2008). Recovery plans were developed by DG MARE in Brussels and ICES in Copenhagen and presented to the fishers as a *fait accompli*.

Q8. RAC Staff Member in an interview: I'm not sure where it came from this idea of recovery plans, I guess it was a kind of ICES philosophy of some kind, but when it was introduced it was kind of sprung upon the fishing industry that had no real warning about it.

This failure to involve the industry early left them in a defensive stance, resisting the recovery plans. Of course, such resistance would have been present anyway so this process weakness only increased its intensity. Many fishermen simply do not agree with the need for recovery plans. They are especially hostile to the cod recovery plans in mixed fisheries, focussing on a single stock that they do not even see as particularly threatened:

Q9. Industry RAC Representative: What is the main challenge for recovery plans in a mixed fisheries context? A concern is that opportunities to take other species in a mixed fishery are lost when a so called recovery stock is taken. The abundance of cod makes it almost impossible for cod to be avoided and thereby additional days to catch other species are lost.

Because of this early exclusion and ongoing questions about the need for recovery among some members, parts of the industry have been challenging the objectives of recovery plans. This has been done mainly through quite reasonable demands that the plans, and their defining objectives, be systematically evaluated. The following exchange at a forum for interaction between the industry and scientists illuminates how the industry sees the process. They see both scientists and managers as interpreting the precautionary approach too narrowly.

Q10. Industry Representative: Fishers don't disagree that the cod are sub optimal, we disagree about the need for speed in rebuilding, that would be, to me, a management objective. They might say half power for four years instead of zero for two years, but they will get the precautionary approach put on them. Scientist: There is nothing in the PA that dictates rebuilding times. The idea behind defining objectives is to put things on the table in a forum that matters. These are management decisions, not really science decisions (*Observer's notes ICES NSC Study Group on the Incorporation of Additional Information from the Fishing Industry into Fish Stock Assessments, Newcastle, 2003*).

An interesting thing about the quote is that in the scientists' formulation of the precautionary approach it is placed within the domain of science while the rebuilding times are placed within the realm of management. European fisheries scientists often think of the precautionary approach as a technical requirement. While they justify this quite reasonably by citing public commitments by both scientific organizations and their clients, this treatment of the precautionary approach tends both to obscure its essentially political nature and limit the kinds of uncertainty it is actually addressing to its most measurable aspects (Wilson 2009). This ultimately reduces the legitimacy of the PA as seen in Q10.

Many in the industry feel that if they had been included earlier in the process then the objectives would have been more realistic. The major fishing organizations publically agree on the need for recovery plans. Demands for evaluations are their key mechanism for ensuring their own participation in the recovery plan process.

Conservation NGOs

Conservation NGOs are the "other" critical stakeholder in fisheries management apart from the various kinds of fishers. They have proved historically very important. Their exclusion in the early development of the co-management system in the United States led to both irresponsible fisheries decisions and a series of law suits that paralyzed the management system during the 1990s. This error was avoided by the European Commission when they insisted on their inclusion in the Regional Advisory Councils. However their role in the RACs has been ambiguous and difficult:

Q11. Interviewer: What about the increased demands on the conservation NGOs for participation in RACs? Respondent: [Respondent's own NGO] is fortunate that they have considerable funding and our programme is funded by a foundation and is solely focused on the CFP. With respect to the RACS I foresee a lot of problems because there are going to be 7 RACs and God knows how many working groups. The NGOs have not been welcome in participating in the initial moves; it has been the industry who has written the proposals. Now we are invited to the Baltic RAC, but not in the beginning. Even though we would have liked more seats allocated to the greens, but we have the problem that there are not many NGOs working on fisheries. ... So we are worried that we are just green stamping, a waste of time and of money, the person we have in the UK is doing nothing but RACs. Interviewer: You see a caveat on RAC advice as green stamping? You are not

going to get a consensus in RACs? Respondent: No, I don't think we are, but it can't always be the NGOs that are compromising all the time. It has to go both ways. We can't agree about everything because we have different objectives. We have to work on the issues we can agree on. ... What is the point of sitting there if you agree with the industry or you become a footnote?

Not only are conservationists a minority on the RACs, they do not have a clear way to support their participation. Most other stakeholders, particularly the fishing industry, have a related revenue stream to support their RAC work. The NGOs are dependent on grants. Furthermore, these grants are given to achieve particular conservation objectives, not to work in stakeholder processes *per se*. Hence the NGOs have to decide that the RAC participation is the best way to use their limited resources to achieve these objectives and then demonstrate this to their funders, and to their own boards.

These tensions have emerged strongly in respect to the cod recovery plans where mixed fisheries complicate matters. This was underlined during and after the Cod Symposium, discussed below. At the symposium the WWF, which is a key NGO on the North Sea RAC, publically committed themselves to cooperating with the fishing industry to achieve cod recovery through the RAC process. Shortly thereafter they announced a law suit to force their position on certain cod recovery measures. The legitimacy of the RACs is dependent on NGO participation and, in the long run, on the possibility of the NGOs and the fishing industry to come to consensus positions on many, if not most, fisheries management issues. They may not decide that the RACs are the best way to reach their goals with their limited resources. On the other hand should they begin to fund this participation through government sources then they would no longer be an independent stakeholder voice.

Conservationists active in fisheries management are supportive of recovery plans, especially as a move towards a longer term approach to management:

Q12. Interviewer: What would you say are the most important lessons from past experience with recovery plans in Europe? Conservationist RAC Member: They are not perfect but are improving under adaptive management, and we would be worse off without them. There are still far too few Long-Term Management Plans, the Commission should proceed as quickly as possible towards LTMPs for all stocks, and CFP reform 2012 should give a stronger mandate for that.

Conservationists are an ongoing voice advocating an ecosystem approach to fisheries management (EAFM) to which they also link the recovery plans.

Q13. Conservationist RAC Member: It appears that a requirement to protect/restore ecosystem functioning is missing from the current application, and this must be incorporated into processes in the future, if recovery is to be successful.

Movement towards an EAFM is critical for many reasons. It is certainly required for a scientifically rational approach to fisheries management. It is also important as a way to bring various important stakeholders into the process so that a balance of views and values can be maintained. Many of the benefits of stakeholder processes depend on this balance of views, because it is in the ensuing debate that the full range of issues are brought to the table and discussed in a communicatively rational fashion (Wilson 2009).

The Regional Advisory Councils

The staff members who work within RACs often see recovery plans as process issues. In the following quote a RAC staff member reflects on how the creation of the RACs had an impact on the plans because they created a direct way for the industry to be involved in shaping the plans:

Q14. Interviewer: What would you see as the RAC's role in the future in terms of recovery for depleted stocks? RAC Staff Member: I think, now we've got the RACs, you can't really go back, and what is brought to the process is that there is recognition, that it is a good thing to discuss these things with fishermen right from the start... It is a good idea when you first think of something to actually start discussing it, because then it will, the concept will change and evolve as you get comment back from fishermen, and it would be better than it was before.

The implementation of the first recovery plan took place in February 2001. Initially the recovery plan took the form of a set of emergency measures, and then in December of 2004 the European Council elaborated some guidelines for developing longer term plans. It was during this same period that the Regional Advisory Councils came into existence through a process that was authorized in December 2002 and led to the first RAC being created in November of 2004. This timing meant that recovery plans started out with a central place on the RAC's agendas, bringing together two important reform agendas within European fisheries. The cod recovery plans were adopted by the RACs, particularly the North Sea RAC, as an opportunity to help define their emerging role.

In March of 2007 the North Sea RAC and the North Western Waters RAC held a joint symposium on cod recovery in Edinburgh to which they invited representatives of management agencies, stakeholders and scientists. The symposium was well attended and proved to be something of a defining moment for the RACs. RACs had been formally created as purely advisory bodies to DG MARE. The forms these advisory activities are going to take, beyond giving responses to specific questions from DG MARE, were, and indeed still are, an open question. The Cod Symposium was a RAC initiative that demonstrated that the RACs could take a proactive role in helping to shape the direction of management discussions.

One focus of the symposium, and indeed of ongoing statements by RACs about recovery plans, is the nature of plan objectives. A key part of this objective setting is the timing, i.e., what needs to be accomplished in what time frame. RAC members are pushing for "trend management" where objectives are defined more in terms of a direction than in terms of specific targets. While targets remain important they are seen as more long term and the emphasis is on changing fishing behaviour to move in the right direction.

Q15. RAC Staff Member: The other thing that came out of the cod recovery symposium and also about discussion of plans, was the idea that the biomass is not really very important as an index of the state of stock, and that fishing mortality was a much better one, but that in addition one needed a number of other parallel alternative and complementary targets to bring forth, and the other thing that we discussed was this idea that rather than have a very strict target that you meet in one leap, the idea that the important thing was to move in the right direction, and that should be the main emphasis of any fishery management, but it should improve year on year, not necessarily reach particular targets.

The fishing industry makes up 2/3 of RAC membership. It is reasonable to expect that the industry's concern with objective setting in recovery plans would play an important part in their public statements on the matter. Where they have been able to come to agreement has been in arguing that objectives should be set in terms of fishing pressure rather than biomass goals.

Q16. Based on the experience in the North West Atlantic and elsewhere, it would be very naive to expect a 30% increase in mature biomass year after year. Recruitment may very well be driven by environmental conditions which we cannot influence. The proposal to manage human activities plays an important part, i.e. we can try to reduce fishing mortality, but it is important to recognise that recruitment is not under our control. In other words, recovery plans must establish the milestones in fishing mortality terms rather than in biomass terms, but accept that these actions

will not necessarily result in an increase in biomass (NS RAC position on Cod Recovery Measures, p. 3).

Their basic position is that a recovery plan should be something that is based on trends rather than on targets. This is a paper that a conservation RAC member told me represents in his mind the NSRAC's first real "consensus position". A recovery plan should be based on a stock moving in the direction of recovery, rather than on a stock reaching some predetermined recovery level. To do otherwise would ignore the importance of other ecological factors.

When it comes to recovery plans the NSRAC also sees itself as needing to be involved in negotiations on an international level:

Q17. It is axiomatic that the Review will have to take into account that North Sea cod is a stock shared and jointly managed with Norway. It is important that the NS RAC is not excluded from discussions with Norway on the future of cod recovery measures (NS RAC position on Cod Recovery Measures).

In an interview with a staff member from another RAC, however, the role of the RAC in setting objectives was qualified. His response was based on the recognition noted in the last two quotes that stakeholders have an important role to play. However, this recognition was combined with the related concern that recovery plans are responding to an urgent problem and cannot wait for an extended period of negotiations.

Q18. Interviewer: What would you say are the most important lessons from past experience with recovery plans in Europe? RAC Staff Member: Too much time lost in unhelpful discussions and delaying arguments. When the principle of a plan is decided, it would be much better to start with a broad-brush set of measures, and then let stakeholders negotiate to refine them. At least, during those talks, something is being done towards recovery.

It is important in stakeholder processes to begin widely with defining questions of "scoping" the issues (Renn 2008), but the insight here is that government must still move quickly to name general directions for fisheries goals if the stakeholder negotiation processes are to avoid long delays. Ongoing stakeholder processes are then needed to negotiate the "operational definitions", i.e. how particular goals are going to be defined, measured and met in particular instances. In the case of recovery plans the recovery of the stocks become the goal which they should be operationalized, following the RAC, as limits of fishing mortality that move the stock in the direction of recovery.

3 Critiques of the single species approach

3.1 *The ecosystem approach to fisheries management*

The terms "ecosystem management" and "ecosystem approach" have been used in natural resource management for a generation. The term was widespread in the late 1980s and 1990s in terrestrial environments in the western part of the United States where a large number of management agencies at both the Federal and local level adopted a version of the approach (Haeuber 1996). For marine ecosystems Turrell (2004) traces the roots of the idea back to the 1950s, but tells us that the actual term 'ecosystem approach' first appeared in the form 'ecosystem process-oriented approach' (Turrell 2004, p. 16) in 1995. The most widely cited source for the EAFM in fisheries is the FAO Technical Paper (Garcia et al. 2003). They discuss the definition of their preferred term, ecosystem approach to fisheries as follows:

Q19. The Reykjavik FAO Expert Consultation (FAO 2003) agreed that the “purpose of an ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems”. Therefore, “an ecosystem approach to fisheries strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries” (2003, p. 6).

However, the EAFM is a classical “essentially contested concept” (Gallie 1955), meaning that the definition will always reflect the speaker’s interest. It is a hard thing to define operationally, even harder than recovery plans, so everyone includes their concern as an essential component. The point of the EAFM is to involve a larger set of issues within fisheries management, and that means that in practice the EAFM is often invoked in reference to a particular set of issues that a particular stakeholder group wants to see considered. These different approaches can be quite different in how they see the role of a reduction in fishing pressure. From one perspective, the European Commission’s Biodiversity Action Plan for Fisheries conceives of the EAFM in terms of biodiversity. They are arguing that while the EAFM may initially bring higher catches, the consideration of the state of other species or habitats ‘will lead to less exploitation, less fishing opportunities and lower employment in the fishing sector’ (CEC 2001, p. 6). The fishing industry, as seen in quotes below, tends to focus on non-fishing related causes of stock decline.

One area most stakeholders agree upon is that the EAFM raises a serious question about the emphasis of recovery plans on a single species. However the EAFM is defined, it is going to involve wider considerations than single-species fisheries management. In this sense a species recovery plan is an uneasy fit with the EAFM. Quote 20 comes from an interview with a RAC member that represents a conservation NGO:

Q20. What would you say are the most important lessons from past experience with recovery plans in Europe? Conservationist RAC Member: I think it has yet to be shown that the current way of implementing stock recovery is through the current system of recovery plans. To use a single species approach, given our understanding of how species operate within an ecosystem context, is probably at best naive.

Quote 21 comes from a RAC staff member. A subtle difference that emerges between his perspective and that of the conservation RAC member is that the emphasis on the EAFM falls on the question of conservation plans within mixed fisheries, rather than the multi-species emphasis above:

Q21. Interviewer: When it is decided that something has to be done about a depleted stock, is a recovery plan a good way to approach that problem? RAC Staff Member: No, the big thing with recovery plans of course is, as you mentioned it, that the focus is on a particular species or stock. Because the fisheries are mixed that inevitably limits its value ... and I think this is the problem with the cod recovery plan, that the Commission thought in terms of simply stopping fishing on cod without realising that that would actually jeopardize some fisheries on quite sustainable stocks.

In official documents the NSRAC emphasizes another aspect of the EAFM. This is the degree to which depleted stocks are under pressure from non-fishing sources. In this quote they discuss the impacts of climate change on cod recovery:

Q22. ICES scientists have emphasised the possibility of cod recovery in the long term if fishing effort is suppressed. Other ICES scientists have suggested that the projected impact of climate change will mean cod, which in Community waters exists at the southern extremity of its range, has no long-term future in the North Sea. The Review should situate its recommendations for cod

recovery within long-term environmental changes and their impact on species composition in the North Sea (*NS RAC position on Cod Recovery Measures*, pp. 4).

In an accompanying quote from the same document they raise the same type of question about seal predation:

Q23. Continued increases in grey seal population abundance has led to increased predation and therefore increased natural mortality. The last time this was quantified, it was the equivalent of one fishing fleet, steadily increasing its fishing effort. It would be necessary to take this source of mortality fully into account in any cod recovery programme. In fact, changing predation patterns, including increased seal and seabird populations and decreased abundance of zooplankton and sandeel, are potentially central to the prospects of cod recovery and as such should be fully taken into account (*NS RAC position on Cod Recovery Measures*, pp. 3).

The EAFM is a similar concept to a recovery plan in that it is essentially unclear and an opportunity for different stakeholder groups to write into it what they would like to see. Even among experts the EAFM can be described as a broad but shallow consensus: nearly everyone agrees that fisheries cannot be considered apart from the broader marine ecosystem but there are many different ideas about how this approach would work in practice. The EAFM is a way to justify the inclusion within fisheries management policy of a sub-set of important related issues, e.g. the impacts of fishing on the sea bottom, bycatch of marine mammals and birds, and many others that are outside the traditional fish stock focus of management. The EAFM is a tremendous challenge for governance because while democracies use firm legal definitions and calculable rules and hold both industries and bureaucracies accountable, ecosystems don't cooperate. They are difficult to understand, measure or predict. Scientists constantly ask for "clear objectives" to aid their analysis, but changing objectives is implicit in adaptive management in a democracy, so stated objectives vacillate between being either inoperable or so abstract as to give little guidance in particular situations (Wilson 2009).

3.2 Recovery in a mixed fisheries context

Perhaps the most difficult challenge in the recovery of depleted fish stocks happens when they are caught in mixed fisheries. The term mixed fisheries refers to fisheries where more than one species are present in the area being fished and are vulnerable to being caught in the fishing gear. In most cases this also means that more than one kind of fishing gear is also being used. For many reasons mixed fisheries present an immensely more difficult challenge for fisheries management than single species fisheries do. Mixed fisheries are a critical topic here because most of the European recovery plans in this century have been attempts to recover depleted stocks caught in mixed fisheries. The basic problem for cod recovery was laid out for us most directly by this scientist:

Q24. Interviewer: You haven't actually been involved in anything to do with the cod recovery plan? Fisheries Scientist: No, thankfully. Interviewer: Why do you say that? Fisheries Scientist: Well, because it's so political. And the real problem with cod is that people are catching it when they're fishing for haddock or whiting. And they're catching the cod before it has had a chance to breed ... And in the case of cod, if they can solve that one, I think they might solve the cod stock problem.

From a technical perspective, one can produce advice for mixed fisheries by making assumptions about the relative effort of different fishery units and the catch compositions of the different fleets. The data requirements, such as catch composition data, discards, and possibly catch-at-age for all species and fleets, however, are extremely daunting (Reeves

2005). The models are very sensitive to changes in fisher behaviour, including changes in response to these same management measures (Reeves 2005).

Mixed fisheries are “so political” as the scientist in Q24 put it because questions of fairness to different groups of fishers arise more quickly than in any other set of fisheries management problems. Perceptions of fairness play an important role in fisheries governance. Social psychologists have shown that these perceptions of fairness depend mainly on three things: people having their needs taken into account; being treated equally; and, getting out something that is proportional to what they put in (Loomis and Ditton 1993). Even more critical for our purposes here, people's judgements about fairness are not related to some abstract ideal of what should be, but come rather from comparisons of their situation with the situation of other groups they see as similar (Loomis and Ditton 1993). Mixed fisheries provide many opportunities for such comparisons. One senior manager from the European Commission described the problem this way:

Q25. When ICES advises a closure for cod, haddock and whiting and not for plaice, sole and nephrops there is a perception in the whitefish sector that the flatfish sector is not taking up its share of the conservation burden.

It is important to note here that there are very good reasons for treating one species differently from another. The reality of the situation may explain the differences, but perceptions of fairness have their own independent impact on the governance situation, and hence on support for the recovery effort. Within the scientific advisory system many different types of demands for consistency have arisen. These demands often involve the idea that scientific analysis should treat two similar advisory questions, for example the assessment of different stocks, in the same way. Even when all the scientific requirements for consistency have been met, scientists are still asked to demonstrate that they are treating the similar advisory questions in similar ways (Wilson 2009).

When stakeholders, particularly from the fishing industry, talk about EU recovery plans, the mixed fishery problem is almost always the first thing they bring up:

Q26. RAC Industry Representative: A recovery plan for a species should be aware of the fact that the species can be targeted by some vessels and caught as bycatch by others. It is therefore important to adapt the measures to the métiers concerned.

The problem the industry sees is not so much about the depleted stock. If a stock is truly depleted it is probably not making up very much of their product anyway. The problem is that the recovery plan is restricting them from catching the more abundant stocks that they are dependent on. These restrictions are usually seen in some way as unfair.

Q27. RAC Industry Representative: What is the main challenge for recovery plans in a mixed fisheries context? The main challenge in mixed fisheries relates to defending the plan against pressures which come as a result of recovery plans for associated stocks in the mixed fishery; these would most possibly limit exploitation to a limit below that of the plan.

Fishermen are, albeit sometimes reluctantly, willing to cut back on catching depleted stocks, but asking them to catch less than their allocated quotas is not acceptable.

An important aspect is whether or not the recovery plan is seen to incorporate fishermen's knowledge, which becomes particularly important in mixed fisheries because of the complex interactions between fish species, the physical features of the ocean, and fishing gear.

Q28. Interviewer: What is the main challenge for recovery plans in a mixed-fisheries context?
Industry RAC Member: Developing avoidance and discard reduction plans on the basis of industry knowledge about selective gear, and spatial and temporal patterns of fish distribution.

Indeed, well-designed recovery plans, emerging in part from fishermen's detailed knowledge of the fisheries, would be supported in general as a part of the solution to the problem of sustainable fisheries in a complex environment. Several examples of this have happened around existing recovery plans, such as the real time closures and other examples of cooperation of fishermen and scientists described below in Section 4.3. Some of the experiences with cod recovery have led to the observation that the conservation of one species has had positive impacts on the conservation of other species:

Q29. Although cod continues to make a significant contribution to landings and earnings of the fishing fleets in the North Sea, other stocks such as haddock, sole, plaice, nephrops, saithe, monkfish and whiting are the principal mainstays of the fishing economy in the North Sea. Measures taken for cod recovery reasons appear to have had significant positive consequences for these stocks. The Review should address the question of how cod recovery measures can be effective for cod without resulting in adverse economic consequences for the non-cod fisheries in the North Sea (*NS RAC position on Cod Recovery Measures, p. 7*).

However, the more common response is the complaint (Qs 9 and 27) that recovery plans caused cuts in catches of healthy stocks while yielding uncertain benefits for depleted stocks. A RAC staff member offered us an interpretation of the mixed fisheries governance problem as a general problem faced by the entire governance system when dealing with depleted stocks and recovery plans:

Q30. RAC Staff Member: So far, many of the mixed-fishery problems could not be resolved because no one was able to decide what was the priority among species; more precisely, no one could say whether some key species, e.g. cod up north, or hake in the Bay of Biscay, had to be saved even at the price of foregoing some yield on other species.

The underlying contradiction in recovery plans in mixed fisheries might be articulated as whether or not one species is more important than another and, if so, by whom and on what basis is such a decision made. Developing political legitimacy for recovery plans in mixed fisheries is a multi-faceted problem, as the remainder of this section seeks to describe.

3.2.1 Legitimacy problems of recovery plans in mixed fisheries

3.2.1.1 The early stages of recovery and regulatory discards

On perhaps the most basic level fishermen object to recovery plans when they feel that the stock does not need to recover, either because it was never a problem, or because it has recovered. The second perception is actually both the more common and the greater challenge for governance. Different perceptions of what it means to have "recovered" are very common in recovery situations both inside and outside Europe. Fishermen usually associate a depleted stock with a lack of fish as such. If they encounter a great many, e.g. cod, when they are fishing they deduce that there are plenty of cod and hence no need for a recovery plan. Conservationists, scientists, and many managers, on the other hand, tend to define recovery not simply in terms of abundance but also in terms of the age structure of the stock. For them if a stock has recovered from depletion then older and larger fish can be found, in numbers that at least to some degree resemble the distribution of ages that would be found in an unfished stock.

The big problem, one that is particularly acute in mixed fisheries, comes when a recovery plan is beginning to have an impact, the stock begins to recover in numbers, but all the fish that represent the recovery plan effort are young. Because of the increased numbers, fishermen are catching, and with mobile gear this means killing, many more recovery plan fish while fishing for other species. So their simultaneous perceptions are: 1) there are a lot of

fish so there is no need for the recovery plan and 2) all these fish that are under strict recovery regulations are interfering with their fishing for other fish. Furthermore this interference leads to what may be the most legitimacy destroying factor in fisheries management discourse. This is the “regulatory discard”, i.e., the managers are making fishermen throw perfectly good fish back in the water, dead:

Q31. What is the main challenge for recovery plans in a mixed fisheries context? Scientist who has been working with a RAC: Recently many fishers complained that on traditional grounds where for days clean pelagic fisheries was performed they were getting substantial quantities of cod. As these boats do not have quotas for cod, this by-catch had to be discarded. It is clear that for real fishers discarding 2-3 tonnes of high quality cod is simply a crime.

3.2.2 The legitimacy cost of a single species focus in a mixed fishery

Recovery plans in mixed fisheries can result in exceptionally great anger at fisheries authorities. The following reflection from a RAC staff member points at the importance of mixed fisheries, while at the same time suggesting that the fact that the recovery plans were taking place in mixed fisheries was not addressed by the Commission.

Q32. Interviewer: When we decide something has to be done about a depleting stock, is there one particularly good way to approach that problem. RAC Staff Member: No, the big problem with recovery plans, of course, is as you mentioned it, the focus is on a particular species or stock, and because the fisheries are mixed that inevitably limits its value...one mustn't forget ...this stock is in mixed fisheries, and the recovery plan would have an impact upon a much wider range of fisheries than originally envisaged, and I think this is the problem with the cod recovery plan, that the Commission sort of thought in terms of simply stopping fishing on cod without realising that that would actually jeopardize some fisheries on quite sustainable stocks.

Indeed, this respondent is not the only one to suggest that DG MARE did not realize that the recovery plans were taking place in mixed fisheries. We heard this idea repeatedly when talking to fishermen. Making DG MARE recognize the importance of mixed fisheries for recovery plans was even considered to be a critical outcome of the Cod Symposium:

Q33. RAC Staff Member: The other thing that came forward [at the symposium] was the idea that cod were caught in mixed fisheries, it seems to me that up until that point the Commission thought that there was a cod-fishery as such, whereas in fact lots of different fisheries pursuing different fishing patterns were landing significant amounts of cod.

This interpretation is hard to credit at face value, it is probably not meant to be taken literally, the DG MARE scientists are fisheries professionals as well. It does, however, point out the degree to which people in the industry or working closely with them believe that the DG MARE ignored the mixed fishery problem in the development of the plan.

3.2.3 Legitimacy and effort control

The two most basic approaches to fisheries management are often termed “input control” and “output control”. In the first the amount and type of fishing activities are controlled. In the second the amount of fish that can be taken is controlled. In Europe the two main systems for implementing them are referred to as respectively “effort management” and “quota management”. Both approaches have their strengths and weaknesses, but the mixed fishery situation increases the attraction of effort over quota. The strength of quota management is that the fish can be allocated according to easily measureable quantities. This makes an easier political problem out of dividing the fish, for example between Member States or fishers. But quota management makes the science more challenging because it requires the calculation of a total allowable catch while tending to bias the information used in these calculations by increasing incentives for discarding and illegal landings. Fishing effort, however, is much

more difficult to define and allocate than fish quotas. However effort management can be carried out using a simpler scientific advice system, and best of all for our purposes, it does not require the separate allocation of quotas for species in a mixed fishery. Here a scientist explains in simple terms the attraction of an effort system in a mixed-fishery context:

Q34. Interviewer: But anyway, the problem of mixed fisheries needs to be dealt with in some way or another. And if this won't work, do you have an idea of what will work? Fisheries Scientist: Well, the only idea I have that could work would be an appropriate form of effort regulation. And I was very careful to say "an appropriate form of effort regulation" because I am not really sure what that is yet. [laughs] Conceptually, that should solve all the problems. But practically implementing and getting people to agree what that should be is a huge political problem, I think. Interviewer: Why does it solve everything conceptually? Fisheries Scientist: Well, if you don't fish, you don't catch any fish, so there's no fishing mortality. And if you have a low level of fishing, then you can't blame fishing mortality for the change in stocks.

Allocating fish among Member States is of central political importance in European fisheries, and this has meant that quota management has always been the approach of choice. This has been strongly reinforced in the last 20 years by the increasing influence of economic theories about using transferable quotas to mimic property rights in fisheries in order to achieve greater economic efficiency. However, when the recovery plans began to be introduced, for the reasons discussed above, effort-based management measures were introduced as well. This was a very major change for much of the European fishing industry.

Q35. RAC Staff Member: I think the cod recovery plan was probably the first one to come in, wasn't it? And with it went this concept of effort control, and in a way effort control was identified with the cod recovery plan because it had such far reaching implications for fishermen. So, it was really the effort control aspect of it that had most, received most debate within the RAC.

Effort control has been widely used elsewhere in the world, but was experienced in Europe as unfamiliar and threatening.

Q36. RAC Staff Member: It was clear from the start that nobody quite knew how [effort] control was going to work, or how effective it was going to be, and even after a year or so operating, first of all the stock assessments weren't able to provide any feedback on whether it could be successful or not, and, because of that the Commission kind of concluded that it wasn't working and that stronger [effort] controls were needed, so, I think that was what prompted the [RAC] to start questioning the cod recovery plan.

The critical problems of measuring effort quickly became evident:

Q37. Commission Administrator: Managing outputs has not stopped the decline of fish stocks. The implementation of reform and recovery plans has been about moving from managing outputs to managing inputs. Problems with catch controls lead to the need to monitor all catches and take discards into account. Effort is a very complex notion because so many different kinds of measurement and terminologies are used. A tonne is always a tonne, but a kilowatt is not always a kilowatt! To make this work we have to move towards a consensus on instruments. We will not necessarily apply effort to all fisheries. You want to go to effort where you have multispecies fisheries and catches and where control over the definition of gear types and time spent fishing are possible. We do not want a competition between each unless each system is considered as compulsory. We are condemned to live with TACs and quotas because they are the measuring stick for allocations, and effort is less easy and transparent for finding an objective and verifiable indicator of allotment. To take historical effort may mean legitimizing a lot of illegal fishing.

To compound the problem the introduction of the recovery plans did not shift the system from output control to input control, it created hybrid schemes using both effort (defined as days-at-sea) and quota limitations. This hybrid has also not proven very satisfactory.

Q38. Member State Fisheries Manager in an interview: If you have this philosophy in a clean, purified version then if you have one stock in trouble, then you have to reduce fishing on all stocks taken together with that species. In a way probably the politicians have said 'that's the way we want to do it because that's the way the Commission told us was a good way to do it'. But I don't think the Ministers are prepared to take the consequences of this approach. ... One of the big challenges that we have now, that is to elaborate the system where we have TAC quotas, but also limit the fishing effort. I think that is important. I don't think my minister agrees with me. He is not very fond of days-at-sea. It is a new signal from my minister. We have to see how far he will go here, but he actually agrees with the fishermen, that it is not reasonable to have two management systems, quotas and days-at-sea, at the same time.

It is this hybrid management rather than the effort control as such that has created the most problems for the legitimacy of the recovery plans. The piling of measure on measure, and the cumulative effects and growing complexity, that result, finally led to problems in the political support for recovery plans in mixed fisheries.

4 Recovery plans and scientific advice

Fisheries management is science-based policy. This means that we try to base decisions on the best available science. It also means that scientific advice is the key means for demonstrating the legitimacy of the management decisions. When managers are faced with difficult problems for legitimacy they often turn to scientists to find technical reasons to justify the decisions they see need to be made. So the scientific establishment also comes in for criticism when it is faced by the daunting problems of developing scientific advice for a recovery plan in a mixed-fishery context. DGMARE sees the scientific advice needed for developing a recovery plan in a mixed fishery context as encompassing two things. Advice is needed that is based on the biology and condition of the individual stocks and how they interact; this advice can be used to set a total allowable catch for the recovery plan species. Advice is also needed on how different fisheries using different fishing gear catch different species; in other words if a certain fleet is fishing for haddock how much cod will it catch as well. This advice is needed to determine the degree to which fisheries on other species should be limited, for example by limiting overall fishing effort. A scientist at DG MARE put it this way:

Q39. We want to reduce fishing mortality for cod. What effect is it going to have, a change in TAC on cod by itself, if a large part of the cod is being caught in mixed fishing with other species? It's a problem which ICES has not addressed, and we try to address it within the STECF mixed fisheries group. The approach is break down of the data from each of the fleets and to separate out catches of each of the species. Look at the activity of the fleet, and then use a sort of optimization technique where you put a score on the outcome that you want to have: So what fishing mortality do you want to have for cod, haddock and all the others?

A central idea in this quote is that ICES has not addressed this problem, and therefore DG MARE's own Scientific, Technical and Economic Committee for Fisheries (STECF) needs to take the lead. ICES is external to DG MARE and therefore a stronger source of scientific legitimacy for fisheries decisions. ICES did take up the challenge of producing multi-species advice. An instructive interchange over scientific advice needed for a recovery plan in a mixed fishery happened in 2003 as the need to create a long-term recovery plan for cod was reaching a peak (Wilson 2009). Related demands for advice from DG MARE were very strong. A multi-species section was created in the report in which ICES tried to produce scientific advice in respect to both mixed fisheries and the implications of multi-species

interaction. However, they simply did not have enough accurate and well-organized data as the data available applied to fleets. The official advice that they produced read as follows:

Q40. It is not currently possible to provide analytical forecasts for input into mixed fishery evaluation models. The main obstacle is that ICES does not have access to discard data for most fisheries. Development of such capability furthermore requires better catch monitoring, fishery analyses, and management decisions. The lack of such mixed fishery forecasts necessitates the development of complementary processes that do not require analytical short-term forecasts. ICES has in this report taken a first step towards the formulation of advice in a mixed fisheries context ... ICES acknowledges that defining relevant allocation scenarios places difficult demands on managers and that mixed fishery advice in particular will require interactive communication between scientists and managers. DG Fish has indicated to ICES some scenarios that would be of interest for managers. However, mainly because discard data for most fleets are not available, ICES is unable to provide the required scenarios at this time (ICES 2003, pp. 5-6).

The data was insufficient for forecasting the impacts of various combinations of fleet effort. This response was not good enough because it meant that DG MARE now had a very difficult time moving the decision process forward. A Commission scientist describes the issue:

Q41. ICES just said do not fish cod. There should be a recovery plan for plaice without cod bycatch or discards. For cod there should be a zero catch until the SSB is within safe biological limits. So this means no cod catch and would require closing the demersal fisheries. So basically the advice is no fishing [for all demersal fisheries in the North Sea]. They gave us some defined biological limits but have refused to give forecasts for cod, haddock and some others. This is the advice I have received. What will you do, I ask you? No fishing is not an option. Scientists don't tell you the elements of a recovery plan, they don't guide you.

DG MARE then gave the problem to STECF. STECF recognised the validity of ICES' position but also believed that 'despite its numerous limitations, it would be more appropriate to provide advice based on evidence for the mixed-species nature of the different fisheries than advice that completely ignores the effects of technical interactions on the implementation success of TAC-based management' (STECF 2003, p. 56). Basically STECF agreed that the data problems would be fatal for mixed-fishery advice but not for multi-species advice. They then performed the analysis and produced some, but not all, of the advice that ICES had declined to produce.

These actions had a direct impact on scientific legitimacy in respect to the cod recovery plane. A story circulated in ICES that DG MARE employees had said that this outcome demonstrated that ICES should have been able to do the analysis in the first place. The ICES scientists were not at all pleased by this. We observed one scientist getting a laugh at an ICES meeting by suggesting that 'DG MARE is better than ICES because they are able to do more work with less data' (Wilson 2009).

The science boundary is the line between which claims are or are not science, and between who is and who is not qualified to make such claims. Maintaining boundaries around science is critical to the functioning of both science and policy. It allows scientists and policymakers to bring a clear accounting of knowledge into policy. Boundary maintenance cannot be treated naively; neither by assuming that the distinction between what is science and what is policy, advocacy or values is easily made in concrete situations, nor by assuming that it does not really exist (Wilson 2009). One view of the science boundary is articulated as follows by DG MARE:

Q42. Visibly free of political influence: Scientists in most national administrations are generally placed at a distance from administrative and political pressures by the national fisheries laboratories. Those who are not so distanced quickly lose credibility and influence (CEC 2003a, p. 15).

This is the mainstream view of the role of science in policy in general, and in fisheries in particular. Science must stand off to the side so that the other players in the policy debate have a common set of facts to debate about. The most concrete expression of this role is when DG MARE is able to point to scientific conclusions to justify particular management measures. This need is only intensified by the move towards the use of harvest control rules which, in the final analysis, uses the scientific finding as a mechanism to shortcut the policy debate, hence adding predictability and continuity to the policies to everyone's benefit. Providers of scientific advice usually do seek to play just such a "distanced" role in supporting recovery plans by seeking to analyze the implications of the objectives of the plans developed by political processes. This neutrality can be difficult to maintain, however, and trying too hard to do so can attach a heavy price in irrelevant science with low legitimacy. These challenges commonly arise from two different directions.

The first challenge comes from trying to respond to the advisory needs of governance. The governance system for fisheries management is trying to reach an agreement among a fairly wide set of stakeholders while still translating this agreement into meaningful legal language. Because recovery plans are being defined by sometimes contentious processes and such processes often find that a rather loosely defined outcome expedites decision-making, scientists find themselves being asked to respond to objectives that are difficult to operationalise. The following quote is from an oral report to an ICES expert group plenary that had been given as a term of reference to "evaluate the effects of the existing recovery plan for North Sea cod":

Q43. The working group did not find a way to define recovery plan. The current proposal is not accepted by the Commission (*Observer's notes WGNSSK Oct. 2003*).

These scientists are caught in the bind that the term "recovery plan" does not point so much to a set of long-term objectives and measures to achieve them as it does to a shared intention. Specific sets of measures are suggested by the European Commission and passed by the European Council for a particular year. These may be referred to as the "recovery plan" during that year, or later if they are being evaluated. A recovery plan may also be, as in Q43, a set of proposals being developed. The term "recovery" also points to efforts by many different fisheries to recover depleted stocks, and very different sets of measures may be called "recovery plans" for purposes of comparison and analysis. The scientist in the next quote wants to avoid the management aspects of stock recovery altogether. He wants to focus on what is known about stock recovery and have his advice used as the basis of long-term decision-making.

Q44. Scientist: We should state about the recovery plan that all our evaluation of last year was long term. Eight years was the shortest. All the evidence from around the world is that we estimate these recoveries too short; managers can try to aim for recovery in [a shorter] period, but we should not be advising that (*Observer's notes ACFM Oct. 2003*).

The second challenge to maintaining scientific neutrality on governance plans is scientific uncertainty. This uncertainty arises from several sources. The stock dynamics of heavily depleted stocks are both more volatile and not as well understood. The scientific information on depleted stocks coming from fisheries dependent sources are unreliable, particularly under quota management and in mixed fisheries contexts. ICES scientists, as well as fisheries

scientists in general, give more conservative estimates of stock health when uncertainty is high because of their commitment to the precautionary principle.

Q45. Scientist One: The current text is that ICES advises closure, not a rebuilding plan. Scientist Two: This confusion comes from our evaluation of the rebuilding plan. We said that the reproduction dynamics are unknown at this stock level, we have to see recovery starting, so 0 [catch] until it starts and then a rebuilding plan. Scientist One: That sounds good and consistent with what we have said. [The text you are proposing] is advice for when a rebuilding plan is formed. But we stick with the fact that we don't know the stock dynamics [for such depleted stocks] and that our advice is 0 F. Is that still our advice? (*Observer's notes ACFM Oct. 2003*).

This is illustrated in this quote as the scientists debate how to frame their advice on the North Sea cod recovery plan. They are unsure if their advice should be based on the recovery plan being in place or if they should simply stick to what they see as the requirements of the precautionary principle: If they cannot evaluate stocks that are this badly depleted, they should advise that no fishing takes place at all. The second option is more in line with the precautionary approach, but it is unrealistic to expect all fishing on cod to stop in the North Sea, which is a mixed fishery where cod are caught as bycatch in fishing on healthy stocks. Giving advice in respect to a rebuilding plan is, hence, more realistic.

It is very difficult for scientists to remain neutral providers of facts and not be sucked into all the various definitions, debates, and objectives that surround the development and implementation of stock recovery plans. The mainstream role of scientists expresses a naive view of what science actually is. This does not mean that science playing the role of “objective other” is not needed, the issue is not to replace it but to supplement it in ways that help address rather than avoid the implications of legal complexity and scientific uncertainty.

5 Recovery plans as catalysts of broader reforms

Recovery plans for depleted species provide an opportunity for real reform. Indeed, very few meaningful changes in fisheries management have not been preceded by some sort of crisis. That the global crisis in fisheries may be changing this attitude, and leading towards greater stakeholder consensus, is suggested by the recent unanimous decision by the North Pacific Fishery Management Council to close 150,000 square nautical miles in the US EEZ of the Arctic sea to commercial fishing. However, Alaskan fisheries are particularly well managed, both biologically and economically, and such proactive actions remain rare, most substantial changes in fisheries are a response to a crisis. In an interview, one European scientist reflected on recovery plans this way:

Q46. It's a pity, but we live in a system where it is always impossible to have a serious reform without a crisis. And the poorest state of a number of stocks has made it possible to have a basic negotiation suggesting that 'I will close the fishery right now or you'll agree about a five years recovery plan'. And this is the deal and people will say, oh yes we better have the recovery plan. It's a matter of negotiation. And anyway this is an achievement.

This achievement and its related negotiations are helping with reforms in various ways. Both the EAFM and the development of the RAC system, each in their own ways, are providing opportunities for more effective communication and reflection, and hence both better science and better governance. Evidence for this assertion is outlined in this section.

5.1 Recovery plans helping to build EAFM institutions

One area where stakeholders see European recovery plans as potentially helping to focus and move reform forward is in developing institutions for the ecosystem approach to fisheries management (EAFM). This is the main priority of the conservation NGOs beyond simply the rebuilding of the stocks involved. The EAFM is a major governance challenge. The FAO 2003 technical paper mentioned above (Garcia et al. 2003) contains an early discussion of the governance needs of the EAFM. The EAFM requires strong legislation with effective implementation and enforcement, and co-ordinated decision-making among agencies.

Q47. Intersectoral planning and coordination must be improved, on an ecosystem basis, particularly when resources are shared (e.g. space shared among aquaculture, transportation and fisheries) or nuisances are transboundary. This requires developing collaboration between institutions in charge of the different economic sectors as well as of research, environment, etc. Such collaboration will not be very effective without explicit allocation of natural resources and space and improved coherence between sectoral legislative frameworks. A requirement in this respect is to improve coordination between regional fishery and environmental commissions (Garcia et al. 2003, p. 37).

In addition the overall governance requirements include:

Q48. Decentralisation of decision-making and management responsibility to lower-than-central national level (e.g. to coastal communities), building the necessary capacity at that level.

Higher participation of stakeholders in decision-making through opening of institutions, broader public debates, development of representation of the sector, etc. Various forms of partnership management (co-management, community-based management, etc) are available.

Improved transparency, diffusing more information and instating oversight mechanisms.

Establishment (or confirmation) of user rights, communal or individual, free or against payment, exchangeable or not, depending on the circumstances.

Bilateral and international agreements are required to optimise management of shared and straddling fish stocks. This implies agreeing on resource allocation and, in the ambit of regional fisheries commissions, with the issue of new entrants and illegal fishing. Agreements may also be needed to deal with transboundary pollution.

Cooperation between regional fishery bodies and environmental commissions ... need to be significantly upgraded in many areas.

Oversight mechanisms by institutions and individuals independent from sectoral interested pressures would help build objectivity and public confidence in fisheries governance (2003, p. 39).

Here we see a critical tension. Strong legislation and a comprehensive, inter-agency, decision-making does not fit easily with cooperation from more groups in society operating at multiple scales. The latter requires de-centralised decision-making, greater participation, and increased transparency. This is a major governance challenge, and recovery plans moving towards LTMPS are one place where it is being recognized. One way of moving forward here is to pitch fisheries management at appropriate scales:

Q49. Interviewer: What is the main challenge for recovery plans in a mixed fisheries context?
Conservationist RAC Member: Ideally, recovery plans should be incorporated into a strategic approach which looks at recovery of stocks within regional seas, or at larger scales if this is more appropriate.

This is reflected in the advances made at the Cod Symposium:

Q50. RAC Staff Member: The idea that one size didn't fit all certainly occurred to people, and I think it got through to the Commission at last that you couldn't treat West of Scotland cod the

same way as Irish Sea cod and the same way that you treated North Sea cod, that they were different, that the fisheries were different.

Another way is to develop more responsive and flexible management systems. The urgency of recovery plans may provide an opportunity for moving in this direction:

Q51. RAC Staff Member: The problem at the moment is that the EU decision system is much too "heavy" and lacks responsiveness to decide quickly on the most effective technical measures (e.g. restrict access temporarily to places where the mix of species or sizes is inadequate). Potentially, RACs might take this sort of responsibility, but they also should be structured to make decisions very quickly, close to real-time.

A good example of this is the fishing industry's implementation of voluntary "real time closures". The basic idea here is that when fishing boats encounter spawning events, cod concentrations, or other areas where there is a high danger of bycatch, they call for a temporary closure of that area. For the current cod recovery plan, the system in Scotland is the most advanced. Implementation is being facilitated by the Scottish Government and the Fisheries Research Service. A real time closure of an area of not more than 50 square miles that will last for 21 days is triggered when 40 or more cod are caught in one hour of fishing effort.

Q52. Industry RAC Member: We need flexibility in the effort control regime to facilitate vessels fishing on non-recovery stocks. The Commission should be encouraged by the RAC to keep vessels in low cod-intensive areas without using a sledge hammer to crack the nut. This is a dimension of spatial distribution we should be thinking about (*Observer's notes from RAC spatial planning working group, London, 2005*).

The real time closures system is an adaptive boundary object that represents knowledge cooperation between fishers and scientists. As this quote shows it is also an example of the flexible way that the fishing industry would like to approach the emerging issues with spatial planning. According to an oral report given at the RAC demersal working group in 2009, Scottish fishers closed 14 areas to fishing for 21 days in 2008, and this reduced cod landings by 61 tonnes. Meeting their targets in 2009 would mean closing 140 areas. To help increase the number of real time closures they have begun to use satellite information linked to the vessels' fishing logs. The number of simultaneous closures is limited to 9, and there are some special restrictions on the closures in areas of particular commercial importance. This system has now moved on to become more formal, and has even become part of the negotiations with Norway over the North Sea cod.

5.2 Recovery plans and development of RACs

The interaction between the two reform trends of recovery plans and the Regional Advisory Council has been an important force for change in European fisheries governance. Inter-RAC conferences and symposia were not something that was originally envisioned when the RAC idea was being developed. Indeed, the idea of RACs was precisely to move away from the European level and get systematic input at the regional level. Nevertheless, these events have proven important in focussing a reform agenda. The NSRAC in particular put itself on the map through the key role they played in the cod symposium. Regardless of what particular impacts that the symposium had on policy, and that is impossible to trace, the symposium created a story of the RACs as a focal point for reform. This is evident, for example, in the following quote from a RAC staff member:

Q53. RAC Staff Member: Well I think [the cod symposium] had far reaching effects in many ways, the questioning of the efficacy of the [effort] controls was raised and didn't go away and has occupied people ever since. The whole question of how good the stock assessments were was

focused on, and the role of the fishermen in improving that was really put firmly on the agenda. The idea that cod could recover in an area like the North Sea or in parts of an area like the North Sea, became prevalent, and it was accepted I think by both sides, that if the right controls were put into place the cod could recover.

The RACs have created an important role for themselves and recovery plans have been an important part of this story. This is not to suggest that the RACs have been free of conflict, or that their current structure is what is needed in the long run. As a fisheries management institution RACs take an atrophied form. Their budgets are strictly limited. How representative they really are of stakeholders is questionable and unexamined. They are purely advisory forums, and DG MARE, which they formally advise, has no requirement, and often seemingly no incentive, to take their advice. Indeed RAC advice seems most likely to be taken when it finds existing previous agreement within DG MARE. As one DG MARE representative responded when asked about not taking RAC advice “the Commission could not guarantee that every opinion of the RAC would be accepted, as only measures in line with the objectives of the CFP could be taken on board” (DG MARE 2005, p. 4). That DG MARE will make use of this rather loose criterion in deciding whether or not to listen to RACs is clear from the context.

Perhaps most debilitating of all, the RACs are commonly treated within fisheries discourse as if they were just one more stakeholder rather than a stakeholder forum. They are commonly referred to, even now, by ICES scientists, as “industry bodies”. At a recent meeting between the NSRAC and the Swedish minister responsible for fisheries, for example, the Minister assured them that their input would be considered during the Swedish presidency, along with that of other fisheries stakeholders. This response reduces the only forum we currently have for allowing stakeholder negotiations to produce balanced approaches to fisheries management to one more “stakeholder” in the process.

Even in this limited form the task the RACs have taken on is a challenging one. They have shown a great deal of willingness to take on these challenges, in spite of the fact, that RACs are made up of many people who have not been socialized into a bureaucratic culture. They experience a great deal of frustration with the process. For many of them stakeholder negotiations in fisheries management are far from abstractions:

Q54. Interviewer: What is the main challenge for recovery plans in a mixed fisheries context?
RAC Staff Member: Both terms in the question just mean loads of problems! An important point is the recognition that solving the problems implies winners and losers. Given this, stakeholders should negotiate to (sort of) designate the potential winners, and the various compensations that should be afforded to losers (perhaps out of gains made by winners).

Everyone sitting around a RAC table has passionate beliefs and sees the stakes as high. They are also seeing progress:

Q55. Industry RAC member addressing a RAC meeting: ICES and STECF had a meeting in January to discuss integrated long-term management plans. This was a ground breaker. Now we are seeing discussions of long-term plans and taking an inclusive attitude towards stakeholder involvement. The RAC representatives felt that the lessons from Edinburgh [The Cod Symposium] and Nantes [joint RAC meeting on LTMPs] have been taken on board. One issue is the evaluation of the existing recovery plans, moving to long-term management and away from the simple HCRs that are currently used. Two important words were that this needed to be an iterative process and the other was feedback (*Observer's notes RAC demersal working group, Berlin, 2009*).

RACs, seen as part of the ongoing history of European fisheries management, are playing the critical role of what Niels Röling has called “learning platforms” (Leeuwis and Pyburn 2002).

This applies to the NSRAC in particular as it is both the oldest RAC and one of the few RACs that has, at this early point, developed the organizational capacity to work together effectively. Its history reaches back to the North Sea Commission Fisheries Partnership in which fishermen and ICES scientists met on a regular basis. As a learning platform this group has constantly expanded. Becoming a RAC meant bringing in other stakeholders, notably the conservation NGOs and recreational fishers. In recent years marine spatial planning has meant the further expansion of the stakeholder group (Degnbol and Wilson 2008). The existence of these fora, organized in a way that they can develop their own identity and agendas, has focussed the fisheries management reform discussion. Recovery plans, especially understood as precursors to LTMPs, have emerged as a key agenda for that stakeholder-based learning process. They have been the key content of the growth of inter-RAC cooperation.

5.3 Recovery plans as boundary objects

Cash et al. (2002) studied a large number of science/policy experiences, and they found that science-based policy is most effective when the science boundary is approached in part using ‘boundary objects’. Examples of such objects would be models, indicators, collaborative research designs and data collection efforts that are used to provide a way to structure discussions between different stakeholders. A recovery plan is a classic boundary object, and if the science-stakeholder interactions are approached carefully, several benefits can be extracted from this. The most effective science policy efforts were found where boundaries were recognised and respected but not used as a rigid barrier to interaction. Through structured interactions around the boundary objects, participation was allowed across a recognised and selectively permeable science boundary. This made possible both good policy and good science.

The ways in which a recovery plan acts as a boundary object is illuminated in the following quote which comes from an early discussion at ICES about how to produce advice for the cod recovery plan. This particular discussion takes place between a representative of DG MARE and the ICES scientists.

Q56. DGMARE Observer: This is, of course, a management decision, but you need to decide if you are giving stock advice or fisheries advice, this is the mixed fisheries issue, you state in evaluation of the recovery plan that you said it would work, so why say zero here? Scientist One: We are saying that you give advice contingent on recovery plan. We need input from managers on priorities... [sometime later].... We are mixing our philosophy of the advice, what we want, and with what words do we want to say it. As I understand it we are saying closure, then rebuilding plan, we are saying all rebuilding will take a long time, and it will be difficult to detect changes in the stock. I wonder if it is realistic to advise a closure until you see something happens, that would not be helpful to managers because they cannot close all the demersal fisheries. DGMARE Observer: The proposed rebuilding plan says that when the stock is below Blim, it should be recovered as quickly as possible, even within a year, so this closure is not inconsistent. Scientist One: But if it is not possible in one year, or five years I can't imagine then closing it (*Observer's notes ACMF Oct. 2003*).

The scientists are, in effect, being asked to interpret the objectives of the rebuilding plan which at this point was a proposal and which stated its objective as rebuilding “as quickly as possible”. Scientists will often complain in interviews about such “objectives” because it makes their lives difficult, and does not conform to what from a purely technical perspective would make for effective fisheries management. However within the political system such objectives are very often necessary to get any movement at all towards shared goals.

One thing that really complicates addressing a recovery plan as a boundary object is that the European fisheries management system is such a tightly coupled bureaucratic system tied to a yearly rhythm. Science for recovery plans in Europe is under two kinds of pressure. One is simple time pressure. In the words of one DG MARE Administrator:

Q57. What do we need for such recovery plans? It means the delivery of advice within a shorter time than normal, certainly within a year, perhaps within weeks in some cases. It means setting priorities in order to get the most urgent jobs done and to leave less pressing concerns until later, perhaps choosing to abandon some of these concerns altogether (Farnell 2003).

It also means in the midst of this time pressure, developing new practices of science that can respond to the opportunities that recovery plans represent. One of these new practices is developing ways to communicate uncertainty. As discussed above, uncertainty is a particularly important issue in recovery plans because of the unknown dynamics of depleted stocks and, especially in mixed fisheries under quota regimes, difficulties with fisheries-dependent data. The following interchange between DG MARE and ICES illustrates how the standard practice of offering tables of model results surrounded by complex textual discussions of uncertainty is inadequate for a multi-stakeholder environment where there is a constant need to maintain political momentum for stock recovery.

Q58. DG MARE question: ICES advice on cod included a short-term catch option table that was interpreted by the industry as saying that a moderate reduction in TAC would result in significant increase in biomass. So the forecasts did not seem to fit the need for a cod moratorium. ICES response: It was clearly stated that even if the indicated improvement could be realized it was insufficient to rebuild the stock in a short time. At the present low level the biological dynamics of the stock are unknown. The stock needs maximum protection to bring it into known territory. Recent experience is that redevelopment of biomass is slower than predicted. This is thought to be due to changing fishing patterns, discards and discards from mixed fisheries after quotas are reached (*Communication between DG MARE and ICES*).

This raising of questions about how to “communicate” uncertainty raises a much deeper set of questions about how to deal with uncertainty in the first place. Both fisheries scientists and scholars interested in science for policy have been examining the question of uncertainty from a theoretical perspective for some time. Harwood and Stokes (2003) suggest that uncertainty is really four different things. There is, of course, the stochasticity that is usually associated with reports of errors, which they call process uncertainty. They also point to uncertainty rising from faulty input data, from errors in the design of the model, and from implementation errors, meaning that the modelled measures are not translated into actual behaviour in the way the models had foreseen. To this list Kell et al. (2005) add error related to the estimation of parameters as a form of model error, as distinct from that related to accurately reflecting system dynamics. These descriptions by fisheries scientists point to kinds of uncertainty which, apart from “process uncertainty” are not systematically addressed by the management system, and their classifications reflect the steps of fish stock assessment estimation.

It is also helpful to think of different kinds of uncertainty in terms of their degree. Wynne (1992), examining the more general case of science for policy, suggests that “risk” be used when behaviour is known and that outcomes can be assigned probabilities, and that we reserve “uncertainty” for those situations where the system parameters are known, but not their probability distributions. He also thinks it is important to consider the “ignorance” that arises where what is not known is not known, and the “indeterminacy” that arises when nature itself defies prediction. The implications of uncertainty for policy have perhaps been most closely examined by Funtowicz and Ravetz (Funtowicz and Ravetz 1990, 1992, Ravetz

1999) who are interested in what happens in policy areas characterised by both high uncertainty and high stakes. In these conditions it is very difficult to keep facts, especially as they are usually expressed as probabilities, separate from the interests and value positions. Where stakes are high, interests and values determine how participants perceive the associated risks. Their basic argument is that such conditions require a more participatory decision-making process. To deal with new problems in a high uncertainty/high stakes area an open dialogue is required because the quality of the science depends on an 'extended peer review'. The extended peer community is a new kind of quality control needed for science in these very difficult environments. It involves other kinds of expertise, such as lay expertise, who are able to help locate the uncertainties within the policy choices.

Hence the second change that fisheries reform is demanding of science, the movement towards more interactive advice, is perhaps most directly related to the changes in communicating risk and uncertainty. A scientific role is developing that is supplementary to the traditional scientific role of providing objective knowledge. This kind of interactive science is beginning to require scientists, in addition to their role of fact providers, to facilitate and guide knowledge processes and help them maintain a focus on dealing with uncertainty.

This new form of practice means scientists, in a reversal of roles, are also making demands for information on managers. As particularly salient boundary objects within European fisheries management, recovery plans have been a key area where a demand for such approaches has emerged. This is illustrated in the following quote. Here one of the scientists in an advisory committee addressing a species within a mixed fishery wants a guarantee that the client will implement a mixed fishery recovery plan if he is to agree to a particular piece of advice.

Q59. Scientist One: We could have an opening statement saying the catch should be 0 and all fisheries close, and then continue with this text. Scientist Two: I agree to a large extent, but it should be made conditional on the implementation of the recovery plan as that would take account of the mixed fisheries. Scientist Three: The evaluations or recovery plan last year shows that that would take 8 years. Scientist Two: That may be acceptable to managers. Scientist Four: Yes, but to the stock? (*Observer's notes ACFM Oct. 2003*).

Fishers see a real need for their participation in fact finding as well as management decisions. It is one of the interesting things about fishing that, compared to other areas of science for policy, there is much less of a gap between scientific expertise and lay ignorance. Fishers have a great deal of experience-based knowledge of the marine environment that is available to supplement, or to contradict, the scientists' research-based knowledge. They want that knowledge used in recovery plans:

Q60. Fisher in a focus group: In terms of good science I think the example is that of the cod recovery programme in Greencastle. And it was good science because it was a bottom-up approach, the fishermen's views were taken into account, a plan was developed and it worked very well. It was inclusive and if you don't do that, then it is bad science, and you are asking people to buy into something they know nothing about. Otherwise it's a take-it-or-leave-it scenario when people are told that's the science, which may or may not be factual, and you are asked to buy into it. If people know about the science and what's going on, then they are much more likely to buy into it (*Catching Sector Focus Group in Ireland 2005*).

The need for this more interactive approach to science in implementing recovery plans, as it has expanded scientists' roles, has also opened up a place for local knowledge. This has taken place while maintaining quality control. One example of fishers' knowledge being mobilized in support of a recovery plan in concert with scientists is the advent of real time closures in

Scotland described above (Section 4.1). Other examples have emerged in rapid succession over the past few years, especially in respect to recovery plan stocks. Many of the projects of the Fisheries Science Partnership in the UK deal with recovery plans including several instances of fishermen helping with cod surveys (Horwood 2005) and two projects on cod avoidance in flatfish (Armstrong and Dann 2006) in England and selectivity studies of mesh sizes in nephrops and whitefish trawls in Scotland (Ferro 2008). Cooperative planning between scientists, managers and the fishing industry has also led to the development of the Scottish Conservation Credits scheme under which the Scottish Government exempts participating vessels from the cuts in effort and allows them to operate using hours, rather than days-at-sea. These vessels must implement a series of measures using spatial, gear and selectivity techniques to reduce impact on the cod stock. Ninety-four percent of eligible vessels have decided to participate (STECF 2008). The real time closures are among the ways to earn conservation credits.

6 Conclusion: Recovery plans in boundary-spanning networks

A number of interesting points emerged in these discussions with and observations of fisheries stakeholders in respect to recovery plans. The first is the importance that recovery plans have had for broader areas of reform for the CFP. Recovery plans represent a loose consensus that a focus on the most depleted stocks is justified, particularly if this focus leads to a long-term management plan. The basic approach taken by stakeholders to these long-term plans also represents a compromise position: the industry is willing to accept a lower quota over the long term if it means that catches at that lower level can remain stable with a degree of insulation from both biological and political sources of instability.

The most difficult areas of stakeholder consensus are found when recovery plans take place in mixed fisheries. In this situation the contradiction between the single-species nature of recovery plans and the need for broader approaches creates the most direct problem. Severe disagreements emerge as stock recovery begins because of different perspectives on when a stock is recovered, problems that are exacerbated by the issues of juvenile fish and regulatory discarding. Mixed fisheries also make effort-based approaches more attractive. This has led to hybrids of input-control and output-control management systems that are confusing, extremely intrusive into fishing operations, and which intensify the problem of cumulative impacts of management measures on the fishing industry and fishing communities.

One way to take advantage of what is working well in governance for recovery plans is to think of these plans as potential foci for plan implementation networks that treat the recovery plans as science-policy boundary objects. A network-style organization form has the advantage of being able to mobilize scientists, stakeholders and managers from both Member States and the European Union to address the various aspects of a recovery plan on the scale where they occur. Networks can be organized around targets, such as a definition of species recovery, but they can also avoid being caught up in definitional games that result from approaches depending on top-down mandates. As has already been demonstrated recovery plans can be supported by different kinds of initiatives, including changes in fishing behaviour and fishing gears, that can contribute to stock recovery, but without any formal relationship to an overall plan.

The recovery plan understood as a boundary object helps the focus of the network remain on addressing uncertainty. What this means in practice is evaluating the different areas of

science and policy in terms of levels of uncertainty. If the depleted stock dynamics are unknown then directed fishing should be avoided while collaborative research is aimed at increasing understanding. Such research can have an important educational impact as well because stakeholders would work together to give operational meaning to the idea of “recovery” and come to better understand the depth of the differences among stakeholders about what comprises a healthy fish stock. Considerable progress has already been made on developing collaborative research around recovery plan issues.

The government role in governance networks is critical, but different from the usual assumption that government agencies should manage the fishery directly. Rather its role is fourfold:

1. Government need to set the recovery targets and high level limits on ecosystem impacts.
2. Government needs to ensure that participation in governance networks is balanced as far as the various interests and values are concerned. This means that participants should reflect concern with both use and non-use eco-system values, both present and future use values, and all the relevant sources of knowledge, i.e., research-based knowledge, experience-based knowledge, social, economic and natural science disciplines.
3. Government needs to make resources available to ensure broad participation and the development of an adequate knowledge base for decision-making, within an appropriate cost-recovery programme.
4. Government needs to stand behind the network, providing it with legitimacy in its decision-making and holding the industry accountable to the publicly articulated targets and limits.

Such networks link people in many different kinds of activities that all share the goal of stock recovery and the eventual implementation of sustainable LTMPs. There is a process of recovery that begins with setting recovery targets, then designing various measures and fishing behaviours that move towards the targets, and then implementing them in ways that consider uncertainty and find ways to reduce those uncertainties over time. Each stage represents a different kind of activity and different stakeholders have different roles at different times.

Treating recovery plans as a boundary object means that scientists have roles to play throughout the recovery process. These roles involve both setting high level targets and limits based on the best available knowledge and working with stakeholders to design and implement measures. Experience with current recovery plans has shown the importance of involving a wide group of stakeholders at the very beginning in scoping out the basic objectives and identifying the key uncertainties around these objectives. Then the government has its most direct role in the next step with the statement of simple and achievable targets and the basic limits that have to be placed on human impacts on the species and their habitats. Then broad stakeholder involvement is again required in the development of operational limits for particular fleets and métiers and in the design of recovery measures. Finally, scientists and fishers work together to design specific implementation strategies. Results-based management is an effective way to organize this process and specify the shifting roles.

One of the most important benefits of approaching recovery governance through a network structure is that it can respond to different kinds of problem at different scale levels.

Recovery plans need some decisions, for example in respect to multi-species interactions, to be made at the level of regional seas. They need other decisions, for example, understanding stock dynamics and their implications for measures, at the level of a stock. Many decisions then have to be made at the level of fleets or métiers. These different problems and scales mean mobilizing different kinds of expertise. One important caution in this approach is that current experience suggests that care and attention need to be paid to the problem of cumulative impacts on the fishing industry and fishing communities. Broad industry participation in the development of measures should mitigate this difficulty.

Broad support can be seen among stakeholders for the idea that setting limits on human activities is more important than setting management targets. This was a clear consensus, for example, among the stakeholders represented on the NSRAC in the document on cod recovery. This does not mean that targets are not important, especially the conservation NGOs believe they have a role to play, but the main focus of the scientific and management effort needs to be on how to reach those targets – meaning the setting of limits – rather than on the precision of inevitably imprecise and uncertain targets. The first job of the management system is to make sure it is moving in the right direction, i.e. getting the trends right. The NSRAC position is based on an agreement that the causes of both decline and recovery is very uncertain, particularly the relative weight of all the different causal mechanisms that apply in any given situation. What the NSRAC is saying is that this uncertainty can neither be ignored nor used to block progress.

A network approach is also feasible. In fact it is a way to turn the great weakness of European fisheries management – its plethora of jurisdictions – into a strength. ICES is already a network structure as a result of having to deal with organizing marine science as a multi-lateral effort. The European Union has also meant the development of international networks of governments, for example the North Sea Commission. These networks are much less developed than ICES, and even more plagued by international rivalries, but they exist, and the advent of the Marine Strategy Directive and its international marine spatial planning initiatives suggests that they will be strengthened. Organizing international implementation networks in respect to recovery plans and long-term management is well within the Commissions ability and is a strategy that they should consider. In some important ways it is a legitimation, and extension, of what already exists.

Recovery plans provide new opportunities for European fisheries management as we re-evaluate the Common Fisheries Policy. In combination with the emerging learning platforms that the RACs have become, recovery plans and long-term management plans have created a focus on reform efforts that should not be squandered.

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