“PAINTING THE FLOOR WITH A HAMMER” Technical fixes in fisheries management

Poul Degnbol[a], Henrik Gislason[b], Susan Hanna[c], Svein Jentoft[d], Jesper Raakjær Nielsen[a], Sten Sverdrup-Jensen[a] and Douglas Clyde Wilson[a].

[a]*Institute for Fisheries Management and Coastal Community Development (IFM), The North Sea Centre, 9850 Hirtshals, Denmark. Phone +45 98942855, fax +45 98944268.*
[b]*Copenhagen University and the Danish Institute for Fisheries Research, Charlottenlund, Denmark. Board of Directors at IFM. Phone +45 33963361, fax +45 33963333.*
[c]*Department of Agricultural and Resource Economics, Oregon State University, USA. Board of Directors at IFM. Phone +1 541 7371437, fax +1 541 7372563.*
[d]*The Norwegian College of Fishery Science, University of Tromsø, Norway. Board of Directors at IFM. +47 77644000.*

Abstract

Fisheries management benefits from the contribution of several academic disciplines, each with their own perspectives, concerns and solutions. In this essay we argue that the contribution of biology, economics, sociology and other relevant disciplines to fisheries would be improved if they originated from broader, more integrated analytical perspectives that are attuned to the empirical realities of fisheries management. Today, disciplinary boundaries narrow the perspectives of fisheries management, creating tunnel vision and standardized technical fixes to complex and diverse management problems. Having worked separately and together for a number of years in fisheries research and consultancy in many parts of the world we, as a group of biologists, economists and sociologists, feel that the time to rid ourselves from disciplinary dogmatism is long overdue. We claim that improvements in fisheries management will be realized not through the promotion of technical fixes but instead by embracing and responding to the complexity of the management problem.

Keywords: Fisheries management, technical fix, ITQ, MPA, CBM

1. Introduction

Fisheries management incorporates a wide array of concerns, issues and subjects. Addressing these in a coherent manner requires knowledge of the biological, economic, social and cultural aspects of fisheries. Many academic disciplines have therefore been attracted to fisheries management, each with a focus on issues and implications relating to their specific area of expertise. Biology, economics, sociology and other disciplines have all provided valuable insights that have improved our understanding of the complexity of fisheries management.

Yet fishery management remains a challenging exercise. Most of the world's fisheries are suffering from the effects of over-investment and declining resources (FAO 2004) [1]. Fishery managers are under increasing pressure to find more effective solutions to the biological, economic and social problems of the fisheries they manage. The combination of complexity and urgency has created a market for quick and technical solutions to management problems. These technical solutions fall into the category of "fixes" when they are used as wholesale solutions to specialized problems. While a fix might appear to be a welcome solution to a difficult management problem, its application may solve only a part of the problem while exacerbating others. Examples of such technical measures that have been promoted as fishery management fixes include individual transferable quotas (ITQs), marine protected areas (MPAs) and community based management (CBM). In this essay we address the transformation of these three tools into fixes.

Each of these three management tools typically originate in, and are heralded by, representatives of a single discipline, and as fixes they address fisheries problems as seen through the lens of a particular disciplinary paradigm. ITQs, often promoted by economists, derive from that discipline’s focus on economic efficiency. MPAs, which are sponsored primarily by biologists and ecologists, target ecosystem health. CBM, promoted by social anthropologists, are deemed essential for the necessary empowerment of fishing people. Although, undoubtedly, each discipline’s perspective and problem definition is relevant, taken alone each cannot fully address the complex problems of fisheries management. Their singular application would, we argue, be concomitant to using a hammer to paint the floor. Hammers are effective on nails but completely inappropriate to paint. Yet both are needed to complete a house.

Our objective in this essay is to create awareness of the negative consequences of tunnel visions that lead to the promotion of specialized tools as fixes to complex fisheries management problems. Given the dynamics, diversity and complexity of fisheries, and the risks of fisheries management, we need to ask how and why tunnel visions emerge and why technical fixes are seen as universal solutions. Why are hammers thought to be sufficient even for tasks where brushes would be more pertinent to the job?

We begin our consideration of this question by looking at the social context of scientific discourse. We then discuss the ways tunnel vision is promoted by the specialization of individual disciplines and the theoretical assumptions and paradigms from which they derive. Next, we consider the transformation of tunnel visions into technical fixes, evaluating fixes as a function of both supply and demand. We assess the weaknesses of technical fixes in promoting effective management, critiquing ITQs, MPAs and CBM. We conclude that a more trans-disciplinary and calibrated approach to fisheries management, rooted in empirical research, has a far greater potential to promote effective solutions to challenging fishery management problems.

2. The Factors that Produce Tunnel Vision

Scholars of the sociology of science have long examined the processes by which conceptual barriers between disciplines are erected. Their key argument has been that different disciplines have different perceptions – or paradigms - of how the world works, and that there are conceptual and institutional reasons why cross-disciplinary cooperation and even communication is difficult.

The notion of viewing science as a set of paradigms is generally attributed to Kuhn (1970) [2]. His basic argument is that science does not simply progress in a step-by-step fashion linking one fact to the next in a continuous process of knowledge accumulation. Instead, scientific progress consists of periods of "normal science" punctuated by discontinuities that bring about entirely new ways of asking and answering questions. Each of these discontinuities is followed by a new period of normal science, which continues until the next discontinuity. Kuhn terms these discontinuities 'paradigm shifts,' and the different ways of asking and answering questions 'paradigms'.

The social sciences quickly adopted the notion of paradigm. The speed of adoption can be partly attributed to social sciences having been structured around various traditions of thought. The idea that natural science was equally structured around differing worldviews lent a new legitimacy to this traditional structure, which the previous, linear notion of scientific progress had attributed to the social sciences' infancy relative to the natural sciences.

In the 1970s sociologists began to associate these various scientific worldviews with non-scientific interests in the prediction and control of natural and social processes. Barnes and MacKenzie, for example, set out to show “that opposed paradigms and hence opposed evaluations may be sustained, and probably are in general sustained, by divergent sets of instrumental interests usually related in turn to divergent social interests" (Barnes and MacKenzie 1979:54) [3]. Trying to demonstrate such direct relationships empirically, however, was not very successful because the incentive structure of scientists is oriented not so much around material interests as around a reward system that focuses on the importance and validity of contributions to knowledge. Through a number of empirical studies of scientists and work, sociologists of science began to revise their understanding of scientific paradigms. Rather than scientific paradigms serving specific material interests, particular scientific communities define what constitutes valid science and, hence, how scientific contributions will be recognized. The concrete form of the scientific paradigm is a reflection not of larger material interests but rather of scientific communities with shared assumptions about what constitutes valid science (Barnes et al. 1996) [4].

These paradigms, in the concrete form of scientific communities, are the beginning of the sociological understanding of the difficulties of cross-disciplinary discussion that this essay examines. It is important to note that these communities are not a result of a failure to adhere to the scientific method. To the contrary, scientific inference is made possible by the trust that a scientific community provides (Barnes et al. 1996) [4]. The application of the scientific method nearly always involves complex research skills and the use of non-replicable judgements (Collins and Pinch 1998) [5], hence the interpretation of results depends on such cultural factors as the legitimacy of approach and reputation of the researcher. Such factors are institutionalized in processes such as peer review, the training of graduate students, the organisation of research departments and professional reward systems.

Different results will be interpreted according to how well they fit previous expectations. The community will see some results as more plausible than others and use this to make judgements about which outcomes point to new contributions and which are anomalies (Collins and Pinch 1998) [5]. These realities are not a particular problem. As Merton (1968) [6] recognized long ago, scepticism is one of the normative pillars of science. The realities do, however, explain how science can be made up of different scientific communities equally committed to valid science. The scientific method itself draws on background assumptions about what is and is not an interesting question as well as what is and is not a valid answer.

These scientific communities are dynamic structures and are related to, but not synonymous with disciplines. Disciplines are often divided into a number of different communities that interact little with one another. Furthermore, cross-disciplinary scientific communities do sometimes arise. Social scientists interested in resource management, for example, may be part of a community based on a common theoretical interest in institutions. Some economists, sociologists, political scientists, and anthropologists concerned with institutions may have more shared understandings in common than they do with their "non-institutionalist" colleagues within their disciplines.

Such differentiation penetrates even to the most micro levels. Scientists need to specialize if they are to develop in-depth knowledge. But as a professional strategy, choosing to be a generalist or a specialist depends not only on the drive to develop in-depth knowledge but also on the nature of the work environment. In work environments, (for example contract research institutes) in which funding is highly variable, it is generally more efficient to diversify professional capital and become a generalist. In more stable work environments (for example in universities) it is often more efficient to develop unique professional capital through specialization. This specialization leads to conceptual sophistication and analytical depth in a particular area, but it also frames perceptions and limits knowledge about tools outside the area of specialization.

Professional specialization begins with the graduate education that trains thinking within a particular disciplinary frame. The concepts, theories and values transmitted in graduate school exert a strong influence on how scientists later frame the world. Specialization continues with the development of a disciplinary focus that allows the development of sophisticated concepts and analytical depth. Eventually, identity with a discipline reinforces the acceptance and promotion of its dogma, leading to what Thorstein Veblen labelled “trained incapacity” – a professional’s inability to understand and solve problems outside his narrow field of specialization (Merton 1968:19) [6].

Tunnel vision is short and narrow, as when in a tunnel you only see what is ahead and behind you and not to the side. In science it means staying within the discourses within your own scientific community and not making the attempt to draw from other communities. Barriers of understanding exist between scientific communities within single disciplines, many based on differences in areas of research focus. Barriers also arise across disciplines from differences in disciplinary language, theoretical frameworks and worldview, including definitions of what constitutes valid scientific methods and process.

The socialization process of living within a scientific community leads to vesting in identification with the collective. Scientists' investments in training and skill development, their careers and perhaps even their deepest beliefs and self-valuations are strongly tied to their particular scientific community, so they are very committed to their continued success. Although recognizing disciplines are productive as they generate the conditions for accumulation of knowledge and deepening our understanding of the natural and social world, Harriss (2002:488) [7] argues that disciplines also impose constraints that are repressive rather than productive: "Academic disciplines, too, like other kinds of sects, may be characterized by religiosity, when particular practices of ways of acting come to be venerated in themselves, and others treated as quite unacceptable for no other reason than the do not conform to the currently accepted canon - or fashion."

Scientific communities, like other human organizations, compete for resources and power. Solidarity within a scientific community is one way to generate the kind of power that sustains it. Solidarity is based in part on shared definitions of group boundaries. In scientific communities, 'boundary maintenance' involves the identification of 'real' science by answering two critical and related questions: which claims are and are not scientific, and who is and is not a scientist (Jasanoff 1990) [8].

Where boundary maintenance becomes particularly difficult is in the conjunction of scientific uncertainty with the application of science to policy problems. In this situation scientists must represent uncertainty in a way that assures their audience that the risks are tractable and manageable, and hence that their science is of practical value, while at the same time acknowledging the uncertainty enough to satisfy other scientists that the findings are still scientific (Shackley and Wynne 1996) [9]. This means constant engagement in the broader social arena to make sure that ones own scientific community, and its contributions, are recognized as ‘inside’ the science boundary.

However, sustaining a community is not ensured by only defining boundaries. It also requires defining the essence and relevance of the community. Maintaining a scientific community requires that issues be defined in ways that make community’s knowledge and skills the appropriate remedy (Dietz et al. 1989) [10]. Hence, certain facts, techniques and ideas take on a symbolic function that is directly linked to community solidarity. To concede limitations is to lessen this power, and such concessions will be resisted. Authority and resources flow to those scientific communities that wear the mantel of ‘experts.’

Tunnel vision can be intensified by the demands of managing large amounts of complex information. As fisheries develop the information base correspondingly expands. The choice of fisheries management techniques has direct implications for the information required for decision-making. For example, the common approach of managing stocks for MSY while allocating fishing opportunities among competing user groups requires substantial information about stock levels, fishing effort, and the characteristics of different fleet segments. Under these conditions specialization in the use of information becomes a matter of time management and the cost-effective use of limited human capital. Thus, tunnel vision becomes a way to reduce complexity.

Tunnel vision should not be confused with focus. Focus involves developing well defined management objectives and identifying specific problem areas. Indeed, fishery management is often criticized (Hennemuth and Rockwell 1987 [11]; Holden 1994 [12]; Hanna 1998 [13]) for being unfocused in its approach, operating with vague lists of objectives that inhibit measuring, monitoring and evaluating performance and limit accountability. Requirements for standard definitions, metadata and reference points are all attempts to ensure more focus and accountability in management (Caddy and Mahon 1995 [14]; Rosenberg and Restrepo 1996 [15]; FAO 1999 [16]; Sinclair and Valdimarsson 2003) [17].

Tunnel vision is a major cause of fishery management underperformance. Some management alternatives never get serious consideration because they are invisible or perceived irrelevant from a particular perspective. Thus, the boundaries between scientific communities and disciplines provide barriers to free exchange of perspectives that could validate other management tools. At any given time, the set of possible management actions is constrained by incomplete information about available management tools.

3. Technical Fixes

The history of fisheries management is rich in examples of technical fixes that have achieved prominence for a period within a research community and among managers. Some of these, in particular ITQs, MPAs, and CBM, have emerged as a result of tunnel vision of specific disciplines. Each of the fixes may alone, or in combination with other management tools, be perfectly adequate and justified in specific situations where the context and management concerns match the assumptions and properties of these tools. But when they are promoted as universal remedies, they cease to be useful tools and enter the category of technical fixes, diverting attention away from the full range of potential solutions to a particular management problem.

Fixes are not likely to adequately represent the complexity of a problem nor are they likely to solve a range of problems simultaneously.

Fixes become hammers looking for nails, i.e. solutions looking for problems in the hands of their promoters (March and Olsen 1976) [18]. In these cases problems become diagnosed through the lens of the preferred fix. They focus on a specific element although the problem may require a multifaceted approach. Fix proposals have been offered to fishery managers, often in an advocatory manner and as global solutions, leading managers to grasp such solutions as the technical fixes to their complex problems. After implementation, when the fix does not deliver as promised or produce unanticipated negative side effects, it may already be too late to turn back. For instance, when common property fish resources are turned into private property – a solution endorsed by resource economists as a solution to the Tragedy of the Commons - reversing the situation may be impossible for political and other reasons.

Fixes derived from tunnel vision gather proponents over time because of the benefits they seem to offer in limiting the required scope of information and in reaffirming the importance of particular scientific perspectives (Latour 1987)) [19]. Not only do fixes provide relatively simple solutions to complex problems. They also concentrate the attention of scientific discourse.

Both in the U.S. and Europe, specific management tools have been stipulated in the law, respectively MSY and TAC. These instruments require a specific type of advice and create a path for the type of advice requested, and in practice exclude other management tools. Therefore the fix is strongly influenced by statutory mandates. Also, the supply is structured by portioned management advisory channels, in which some disciplines are part of a highly institutionalised management system, while other disciplines are sidelined. Biologists are the discipline that was always integrated into the management system, more so than economists and social scientists.

The fact that managers often request advice on very specific issues from specific disciplines prevents cross-disciplinary advice and maintains tunnel thinking. Specific management tools and targets, such as TACs and MSY, create demand for a specific type of advice, create a path for the type of advice requested, and in practice exclude other tools from consideration. Thus the tunnel vision and the particular fix that is derived from it, is largely pre-determined by choice of management targets and the basic tools used to achieve them.

In the interest of time efficiency, fishery managers will prefer fixes that are simple to use and explain to constituents. Complex and ambiguous messages from the scientific community do not simplify management tasks, and so are not in demand. President Truman's famous request for a "one handed economist" alludes to this situation. In fisheries worldwide there is an increasing public expectation to understand the management tools used. Fixes are useful in being easier to communicate to a broader audience than more complex, diffuse approaches. The legitimacy of fishery management rests to an increasing extent on effective public participation. Public participation creates an incentive for managers to focus on a tool that is easier to characterize, such as an MPA , ITQ or CBM and to concentrate management time to its adoption and implementation. Fishery managers are often under extreme time pressure to implement regulations and political pressure to satisfy diverse constituents. The workload of routine management does not allow time for strategic thinking or the luxury of exploring new solutions and tools. Learning about new or complicated approaches is time consuming and may even seem intimidating. Managers often choose the safety of the well-known path rather than taking on the political risk of experimentation. Management will be able to accommodate marginal changes better than radical overhaul.

The demand for fixes also derives from the intuitive sense they make within the broader perceptions and discourses of fishery management problems. For instance, if one sees the major management problem as time-consuming allocation decisions that try to meet the needs of overcapitalised fleets, then ITQs make immediate sense. If one sees the major management problem as the cost of making decisions, CBM will appeal to the idea of leaner management through devolving and outsourcing management responsibilities to communities. If one sees the major management problem as one of maintaining effective conservation of fish populations, the idea of MPAs as sanctuaries outside the bounds of human use is appealing.

When certain fixes are in larger demand than others, it is not necessarily because the manager has made an extensive and thorough comparison of the costs and benefits of all alternatives, but may be because it “sounds right” based on some gut feeling, some preconceived perceptions or some shared meanings with the suppliers. As in consumer markets, buyers are susceptible to fashions and creative marketing. Finally, managers demand for fixes may be connected with their interest in moving the burden of management to other groups, for instance from national agencies to user-groups, where the community will bear some of the costs, or as with ITQs, because cost-recovery in many cases are an integrated part of ITQ programmes. A fix that is externally proposed also allows spreading the blame in the event of failure.

To use a metaphor from economics, with a supply and a demand for technical fixes in fisheries management, a ”market” inevitably exists. The market is not necessarily a competitive one. Market imperfections such as incomplete information and market imbalances such as differential power are usual. In fishery management the market for fixes will also be influenced by exogenous shocks from natural, social, economic or institutional changes that shift demand or supply.

It is possible for the supply of fixes to generate its own demand through effective marketing, as when academics advocate a particular approach. Supply and demand of technical fixes may also emerge in isolation, resulting from the individual concerns and agendas of the suppliers and demanders. For example, science communities may develop and promote a particular fix as a result of intra-disciplinary discourse rather than in response to a particular management need. When a situation occurs, scientists may happen to have some insights into a matter of interest that managers may find useful to their immediate problems.

5. Examples

In fisheries, it is rarely possible "to kill many birds with one stone" because fisheries are diverse and embedded in larger contexts. There are simply no blanket solutions to all fisheries management problems. ITQs may be effective in reducing excess capacity, but do not address distributional equity or ecosystem protection. MPAs may be suited to ecosystem protection but contribute little to economic efficiency or equity. CBM may enhance equity but provide no assurance that resources will be harvested efficiently or conservatively. Despite their promised benefits, none of the three fixes is guaranteed to solve the specific problems they are meant to solve. Each has weaknesses as well as strengths, as we summarize below.

Individual Transferable Quotas

ITQs are the economist's fix to fishery problems. ITQs allocate shares of the TAC among fishermen who subsequently are allowed to buy, sell or lease quota shares among themselves. Because ITQs create some degree of ownership over a quota share, and hence the control of fishing practice, the race for fish is ended and fishermen have an incentive to minimize costs and maximize revenues. Consequently, efficiency is promoted through the pursuit of economic self-interest. Allocation, formerly an expensive component of fishery management, becomes the function of the quota share market. Less efficient producers tend to sell their quota share and leave the fishery, reducing the level of fishing capacity in the fleet. Thus, ITQs are perceived primarily as a measure of avoiding over-investment and generating resource rent.

ITQ programmes have been operative for some years now in Iceland, New Zealand, Australia, Canada and the US. ITQs cannot deal with nature conservation objectives such as maintenance of biodiversity and ITQs seem more feasible in temperate waters, where stock diversity is less, than in tropical waters. As Hannesson (cited by Kurien, 2002 [20]) argues, ITQs are better adapted to single species fisheries in the north rather than in the multi-species and extremely labor intensive fisheries in the south. The 'Q' in ITQs links management to quotas as the main management instrument, which is a questionable proposition in multispecies fisheries or when considerations beyond single stock harvest are addressed.

On the grounds of equity and distributional effects some also contests the merits of ITQ's for fisheries in single stock fisheries in temperate waters. Copes (1997:65) [21] remarks that the "theoretical case for superiority is highly dependent on gross simplifications imbedded in the implicit or explicit assumptions, which remove the ITQ mode for the real world of fisheries." He is troubled by social inequities that ITQs tend to create, for instance between generations of fishers. In the case of Iceland, Helgason and Pálsson (1998) [22] document that quota rights tend to become geographically concentrated, thus removing from a number of coastal communities an important part of their economic base. For these researchers, the alternative to ITQs is a management practice more firmly rooted in empirical reality, a model reflecting the social and cultural context within which the fishery operates.

For others, however, ITQs remain the solution. As Davis (1996:97) [23] writes in a special journal issue on ITQs: "Herein and elsewhere, ITQs have received positive endorsement and, in some instances, enthusiastic championship. They are associated with the achievement of long sought fisheries management goals, goals such as resource conservation, economic efficiency, fisheries sustainability, and, even, harvester co-participation in fisheries management. As a result, the ITQ system, in the minds of some, has received panacea status with respect to the endemic problems of fisheries economics, ecologies and management."

For reasons such as these ITQs remain a contested issue in fisheries management in most countries where the systems have been introduced. ITQ systems do address some important issues – such as the prevalent excess harvesting capacity that pose pressure on stocks and profits - but they are largely insensitive to the social and cultural impacts on communities and are inadequate to ensure sustainable harvest in multispecies fisheries. They also tend to make the barriers of access for young newcomers insurmountable, thus impeding on the long term efficiency of markets and the survival of communities. In isolation, ITQs are thus inadequate to address ecological and social concerns.

Marine Protected Areas

MPAs are the ecologist's fix to fishery problems. As areas where fishing and other human activities are restricted or prohibited, MPAs range from highly protected nature reserves to large multi-use areas with modest limitations on specific types of human activities. As a fisheries management tool MPAs have gained increasing popularity over the last couple of decades and some consider their establishment as a necessary condition for successful fisheries management. To quote Gell and Roberts (2003:453) [24]: "Nature conservation in the oceans cannot be achieved without marine reserves, neither, we would contend, can the world's fisheries be made sustainable."

MPAs are expected to reduce fishing on spawning stocks and recruits, to increase fish abundance within the protected area and to promote spillover of the increased fish abundance into neighbouring areas where it may lead to improved catches. By reducing fishing effort MPAs can contribute to ecosystem conservation and may enhance or preserve local biodiversity. Their introduction is therefore often supported by conservation organisations (Halpern and Warner 2003) [25]. The increase in fish abundance and diversity has the potential to increase non-consumptive use such as tourism and recreation. If they are sited in locations that are relatively easy to observe, MPAs may also have advantages relative to other management tools in the effectiveness with which they can be monitored and enforced. Once they are established MPAs typically require less biological information than other management tools and they may therefore be a more cost-effective way to conserve fish stocks than either TACs or effort control.

Despite these advantages, MPAs have been met with criticism both within and outside the discipline of ecology. One criticism is that their protection is limited to relatively stationary species and that they do little to protect migratory species. Typically a lack of information on migration and transport rates of species and life-stages across boundaries makes it difficult to determine the biologically optimal size and number of protected areas needed to achieve objectives (Halpern and Warner 2003) [25]. Poor design may lead to loss of within-species genetic diversity if stock components inside and outside the protected areas differ in genetic composition (Leis 2002) [26]. MPAs may trigger redistribution and concentration of fishing effort in adjacent areas, potentially leading to overexploitation. As a consequence, MPAs may need to be supplemented with additional measures outside their boundaries (Murray et al. 1999) [27]. The socio-economic benefits of MPAs are difficult to predict in advance due to the limited predictability of the biological responses (Farrow 1996) [28], and because non-market values, such as biodiversity, are difficult to assess (Carter 2003) [29].

The previous experience with MPAs shows that few have fulfilled expectations. In an assessment of MPAs around the world Kelleher et al. (1995) [30] thus found that less than 31% of the MPA's surveyed could be classified as achieving their management objectives. The lack of success has been suggested to be caused by inappropriate MPA size and design, by a lack of economic and social science input in their establishment, by insufficient stakeholder participation and involvement, and by inadequate institutional capacity for monitoring and enforcement (e.g. Jones 2002 [31], Jameson et al. 2002 [32], Defeo and Pérez-Castañeda 2003 [33], Christie et al. 2003 [34], Halpern and Warner 2003 [25], Rudd et al. 2003 [35], Coleman et al. 2004 [36]). However, despite the apparent lack of success and the complexity of the underlying biological, sociological and economic problems they are supposed to tackle, MPAs are rapidly becoming a mainstream management tool for fisheries management and for conservation of marine biodiversity in many parts of the world. This has recently led some of their supporters to warn against the enthusiasm with which they are currently prescribed (Agardy et al. 2003) [37].

Community-Based Management

Community-based management is the sociologist's fix to fishery problems. CBM grants local communities a formal role in fisheries management. Sociologists and social anthropologists, CBMs main sponsors, see it as a means of empowerment. They argue that managers must recognize the traditions, capacities and natural rights of communities in managing access to, and extraction of, the marine resources they depend on. Management also needs the support of communities to be effective. Without community support, legitimacy will be low and enforcement costly. Therefore, proponents conclude that management authority should be devolved while allowing greater participation of resource users.

One criticism of CBM is that community and ecosystem boundaries seldom coincide. A community is often too small to manage an entire ecosystem, and is therefore hindered from managing effectively. To encompass all ecosystem processes, management must be exercised at a higher level than the community. A second criticism regards the concept of community. What is a community - do we think of it in geographic terms or in sociological terms? In many instances, communities have no distinct geographic boundaries, and have a shifting membership. Fishing communities also vary greatly in scale, from the small fishing "outport" to the urban, heavily congested settlement. Involving communities in fisheries would therefore be easier said than done. It sounds good in principle but difficult to accomplish in practice, as it would somehow have to take these differences into account when setting up the management system.

Their management capacity would also be reduced internally and/or among themselves, if communities are socially divided, for example according to ethnicity, religion and class, and if they are ridden with conflict and strife. As Agrawal and Gibson (2001:7) [38] point out: “The vision of a small, integrated communities using locally evolved norms and rules to manage resources sustainably and equitably is powerful. But because it views community as a unified, organic whole, this vision fails to attend to the differences within communities, and ignores how these differences affect resource management outcomes.”

Thus, even though communities would provide significant input that could improve the efficacy and legitimacy of fisheries management, they also add complexity and risk (Jentoft 2004) [39]. Some fisheries and fish resources obviously are better suited for constructive community involvement than others. Some communities are also better equipped to play a role in management than others. But much could be done to improve their management capacities. For instance integrative institutions within the community could be formed. The build up of management competence could be enhanced. Cooperative links between communities to address their interdependencies and to pool their resources could be established. For communities to become more effective as managers of fisheries resources, they would need government financial and legislative support. In many instances, it would therefore require a reorientation of state policies and practices. Without such constructive frameworks CBM is much less likely to succeed.

6. Cross-disciplinary fertilisation

Tunnel visions and the technical fixes generated from them, dealt with in this essay, can be cast as three separate and competing conceptual models:

Model 1: The Fishery as an Economic Enterprise

Efficiency is all, allocation is expensive, and markets are efficient allocation mechanisms. Self-interest is the best motivator, therefore ITQs.

Model 2: The Fishery as a Biological System

"Whatever you do, keep all the parts": humans are uncontrollable influences, recent experience shows they are not to be trusted, we don't know which are the key ecological processes or core species, preserves are the best protection, therefore MPAs.

Model 3: The Fishery as a Social System

Social networks are important, communities have their own integrity, community failure contributes to management failure, and the social fabric is threatened by individualism, therefore CBM.

These conceptual models are promoted through their corresponding fixes. Although the criticisms of fishery management fixes are pertinent, their shortcomings are not necessarily inherent but are more a question of design fit. Fixes can never be one-size fits-all solutions, but rather only be effective if tailored to the contexts of particular fishery management problems. Fixes may also be combined as they are not necessarily in contradiction. MPAs may include the identification of stakeholders and securing their involvement in design, establishment and enforcement (combining MPA's and CBM's), and economic evaluation. Also there are ways of counteracting the tendency of ITQs to concentrate quotas on a few major stakeholders, solving problems of by-catches and high grading. Building integrative institutions within and between communities may compensate CBM's problem of scale.

Because they are limited in scope, fixes cannot address more than one concern, while fisheries management must routinely address many. Fishery management has multiple goals, some of which may well be in conflict. These multiple goals pose dilemmas and hard choices that are inherently political. It is because of the complexity of fisheries that fisheries management legislation is typically rich in context-specific rules and regulations (Jentoft and Mikalsen 2004) [40]. However appealing quick fixes are to academics and managers, when fixes are confronted with real world fisheries situations they tend to encounter resistance among user-groups.

Technical fixes serve some important functions in the decision process of fishery management that are welcomed by managers. The context-specific solution is not always well designed. The costs of decision-making are reduced when they can pick from a "menu" of fisheries management fixes legitimised by science. Fishery managers cannot be expected to invent the wheel every time they are faced with a problem and fixes are also often marketed extremely effectively.

Managers will also prefer fixes that are simple to use and explain to people. There is an increasing expectation that the public will be able to understand the management tools that affect them. The more complicated the tool, the more likely is it that it will stir suspicion among those who have to live with it, and people tend to trust a simple message over a complex one.

While managers may need tailor-made solutions to their problems, what is on offer is often mass-produced, undifferentiated fixes. Scientists are themselves victims of their tunnel visions, stemming from their own disciplinary background. As mentioned before, when scientists leap from disciplinary tunnel vision to the advocacy of a particular technical fix they do so not only from a certain analytical perceptive but also from a profound conviction about the "nature of things." Managers may also share this conviction. Thus, theoretical assumptions are treated as if they are true representation of reality. They even become blueprint for real life solutions that are not in any fundamental way challenged by experience.

The answer to ideological fixes is not to ignore the value perspectives of different fishery interests. The management of publicly owned resources necessarily must acknowledge the diverse points of view. The answer to the narrowness of scientific specialization is not to undermine particular scientific disciplines or to build management systems based on scientific generalists. Fishery management needs the technical depth and sophistication of specialists in order to address the complexity of the problems it faces. The answer to both ideology and scientific specialization is instead to recognize that fishery management problems and fishery regulatory design have multiple attributes and to establish institutional processes that promote integration among technical specialists, interest groups and management authorities. For this, we need management specialists who are people trained in management disciplines, who have the skills of recognizing appropriate areas of specialized knowledge, and who can bring them to bear in a coordinated manner to the multidimensional problems at hand. As Visser (2004: 23) [41] argues, "the analytical strength of the natural sciences in the study of ecosystem change has to be coupled with the social science study of social transformation". The challenge, according to Visser, "lies in translating the insights that arise from the oscillation between disciplinary domains into disciplinary lessons" (p.

27). What more is, she holds that cross-disciplinary research “only works if the partners from the different disciplines are strong ” (p.28).

7. Conclusion

We believe that it is crucial to adopt a broader vision of fisheries management, one that is sensitive to the multiple concerns and specific contexts of fisheries management. Hammers should be used for what they are meant, not more, and if the specific problem is a floor needing paint the hammer should be swapped with a paintbrush. In other words, fisheries science must be pragmatic and open to perspectives, assumptions, insights and methodologies of all disciplines as required in the specific case. In our view, Harriss has a point when he contends that ”academic disciplines are saved from themselves by cross-disciplinary work, whether through multidisciplinary, when arguments from within different disciplines are set side-by-side, or through more rigorous cross-disciplinary exercises that attempt to integrate the theoretical and methodological frameworks of different disciplines” (Harriss 2002: 488) [7]. He believes that disrespect for the particular systems of rules when they stand in the way of the pursuit of knowledge, can only be healthy. For this reason, he claims that ”good scholarship must involve a tension between ”discipline” and ”anti-discipline”” (p.488), and that ””disciplines need to be saved from themselves” as they can be through the encouragement of dialogues between them.” (p. 494).

On their part, managers must become more conscious of the limitations of particular scientific communities and perspectives, of how tunnel vision arises and is given expression in technical fixes. Researchers of the relevant natural and social science disciplines must find ways to work out their differences and disagreements in order to convey a more coherent message than the ones managers and users receive today. Fisheries scientists of various disciplines cannot just leave it to the managers and the user-groups to figure out the conflicting scientific perspectives and recommendations.

The question, however, is how to make cross-disciplinary work happen. There is obviously something about the science culture that needs to be changed. People would need to rethink their assumptions, values, and ambitions, and the way they speak to each other. The arrogance that often prevail among sciences, and which is nurtured through their disciplinary blinders, is a factor to be reckoned with.

However, cross-discplinary work processes need institutional restructuring as well. Wallersteins recommendations in the report of the Gulbenkian Commision of the Social Sciences (1996) [42] are of relevance. He wants to reorganize the institutional structure of universities and research institutes and how faculty and graduate students work together. More concretely he suggests four changes: (1) the establishment of thematically organized, one-year research groups of scholars; (2) the funding of five-year cross-disciplinary research programmes; (3) the compulsory joint appointment of professors; and (4) the requirement of cross-disciplinary work for graduate students. Although Wallerstein has only the social sciences in mind, his suggestions should be equally relevant across the social and natural science divide. We would add the need for more cross-disciplinary research conferences, for requirements for interdisciplinarity in research programmes, a de-portioning of the advisory systems for fisheries management allowing for a broader disciplinary input, and the need to open up some of the institutions where social science is basically excluded through inclusion or cooperation between institutions with different disciplinary competencies. The International Council for the Exploration of the Sea (ICES) is for instance a central player in coordinating marine science in the Northern Atlantic and providing fisheries management advice from a natural science perspective, but the ICES community is increasingly aware of the need for social science inputs which need to be provided through cooperation with similar international social science professional communities or by co-opting social scientists to contribute to the advisory process.

As there is no one fix that will solve the multifaceted problem of fisheries management, there is no single fix that will make cross-disciplinary fertilisation and integration happen. Since it involves institutions, material structures, and cultures, it is expected to take time, to be a learning process of trial and error that needs to start simple and gradually expand. It may even require external help from experts in organizational development. Before cross-disciplinary interaction works on an informal basis, we cannot assume that it will work on a formal basis. Colleagues need to know each other well and respect each other before they can be expected to be creative together and to take on shared responsibilities, for instance a joint research grant.

If the fisheries management problem is an urgent one, the need to launch more cross-disciplinary fisheries management research is equally pressing. Thus, the responsibility for starting the process not only rests with the individual researchers but also with the institutions they work in, the agencies that ask for their advice, and the foundations that finance their work. Fisheries scientists are probably for the most part comfortable with the present situation and the safety that their disciplines and institutions provide them (Pitcher et al. 1998) [43]. Also, bold initiatives suffer from the classical collective goods stalemate as described by Olson (1977) [44] and others. Therefore, for cross-disciplinary work to start, there must be some incentives, both internally and externally. Cross-disciplinary work must be rewarded not punished as is typical of today. One cannot expect that people would freely and knowingly risk their careers. If fisheries scientists – be they biologists, economists, or sociologists/anthropologists – are forced to make such a choice, cross-disciplinary cooperation will continue to be something that we talk about but never realize.

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