ROLE OF RESEARCHERS IN SUPPORT OF FISHERIES CO-MANAGEMENT

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ABSTRACT

Increased attention is being given to the promise of co-management as a means of achieving sustainable fish stocks while at the same time providing benefits to those dependent on the fishery. At the same time, the view that co-management represents a continuum between state or user control is being replaced by the view that co-management is better represented by more complex networks comprised of a variety of stakeholders who may each assume different roles, responsibilities and levels of authority. Experiences from research funded through the UK Department for International Development's Fisheries Management Science Programme (FMSP) have highlighted the potential role of researchers, a stakeholder group not traditionally given an active role in management, within such networks. Often in fisheries management the approach taken has been to separate research from management decision-making or to research and then manage, with scientific advice being provided to government agencies. However, in co-managed fisheries there is a danger that this can lead to advice that does not reflect the needs and constraints of those dependent on the fishery and/or advice that is not available to all the stakeholder groups involved in making decisions. The FMSP experiences suggest that there are many benefits from involving researchers more actively in the management process. This not only makes information generation (the traditional role of the researcher) more relevant but can also lead to improvements in the sharing of information so that decisions are made on the basis of a common understanding amongst stakeholder groups. Management uncertainties can be reduced and, at the same time, management strategies can be developed that better meet the objectives of those dependent upon, or affected by, the fishery.

Keywords: research, fisheries co-management, adaptive learning, generating information, decision-support, learning alliances

INTRODUCTION

Small-scale fisheries in developing countries are dynamic systems characterized by diversity and complexity. This diversity, complexity and dynamism is not limited to the biological aspects of the system but includes economic, social, technological, cultural and political dimensions [1]. The approach to managing such fisheries has most often been a centralised arrangement with a focus on the inter-relationship between the bio-physical characteristics of the resource system and the technical intervention of fishing. This approach has tended to encourage a view that the outcomes of fishing are predictable and can be optimised, something that has been referred to as the "illusion of certainty" [2]. In many small-scale fisheries it remains an illusion because it is not possible to exert such control or to predict peoples' actions. People therefore become a major determinant of the management outcomes and management decisions cannot be made on the basis of technical information alone [e.g. 3]. The increasing recognition of the difficulties that a narrow focus, together with diversity, complexity and dynamic processes across scales, can present to the centralised management of small-scale fisheries has led to increased interest in fisheries as broader socio-ecological systems and to the potential of more participatory co-management that might provide more locally relevant management arrangements and strategies.

Co-management has been defined in many ways. What has been found to be common to the definitions of co-management is that it is a form of partnership between public and private actors, it is explicitly associated with natural resources management and is not a fixed state but a dynamic process [4]. In addition there appears to be a trend from considering co-management as a linear continuum in the sharing of authority and responsibility extending between the extremes of government centralized management and community self-governance and management [e.g. 5] to more multi-modal stakeholder networks that are inclusive of a wider range of stakeholders and between whom authority and responsibility may be shared [e.g. 1, 6].

A major issue in multi-stakeholder decision-making is asymmetrical availability of information and differing objectives and influence. Experiences have indicated that while fishers often have a wealth of time and place knowledge (itself interdisciplinary), they often have less understanding about the dynamics and biological limits of the fishery [e.g. 6, 7, 8]. On the other hand external agencies and researchers often have an understanding of some of the larger scale bio-physical, political, economic and social processes and factors affecting the fishery but often lack knowledge of the specifics [9]. Addressing the information imbalances, in order that management and policy decisions and the identification of future information needs is built upon a common understanding, is best achieved by combining existing knowledge from different sources. While increasing the range of knowledge types and perspectives can provide more informed decision-making, it is acknowledged that this can also pose problems where consensus is required to address issues.

The UK Department for International Development (DFID) funded Fisheries Management Science Programme (FMSP) has commissioned a number of projects that have focused on information generation and supply to decision-makers within co-managed fisheries [10]. These projects have involved facilitating two types of learning[a]: the experiential 'learning from doing'; and the experimental 'learning as an objective of doing' and, in the process of doing so, have generated some useful insights into the issues around the role of researchers in co-managed fisheries. In particular it has led us to believe that there is an important role for researchers in fisheries co-management based on, yet beyond, their traditional role as information generators. In this paper we will describe the particular benefits that we have observed from scientists working closely with other stakeholders, what they bring to the management process and some of the challenges of working in this way that need to be overcome.

The type of research required

We have only to think of a river basin to recognise that processes in natural resource systems occur across a range of scales. As a result, not all researchable constraints can be identified at the local level (the so-called 'demand driven' research). There is still a need for 'supply driven' basic research that can increase our understanding of socio-ecological dynamics and interactions, particularly at the larger scales. Within a single co-managed fishery the requirement for better management is likely to be a mixture of need for new knowledge together with an awareness and understanding of how to make use of what is already known in that particular context. This is where applied research can potentially be highly effective.

Research in support of co-management funded through the FMSP has focused on how local management units can access, generate and make use of information in management decision-making. A fundamental requirement is a good understanding of the characteristics of the socio-ecological system (i.e. the management context), both to identify information that already exists and to help ensure that future information generation, i.e. research questions, are relevant and unanswered. This theme is echoed elsewhere where it is pointed out that, in many cases, the answers that are being provided address the wrong question [11].

A series of FMSP funded projects provide a good illustration of what this means in practice. Research on village-managed small water body fisheries in Southeast Asia started in 1995. To begin with a traditional approach was taken where the focus was on establishing and understanding bio-physical limits and potential of the system interactions between technical interventions and the bio-physical system. It was felt that doing so could generate information for management decision-makers that could help to improve local stocking strategies [12]. However, the results of subsequent stocking initiatives were not as expected and it became clear that this was because the technical intervention of stocking was leading to changes in institutional arrangements and changes in utilization of the resource that had not been expected [3]. The conclusion was that a social science perspective is required to understand the outcomes of technical interventions in common pool resources, in which human action is difficult to control and/or predict [3, 9].

Subsequent research sought to take a multi-disciplinary approach, examining the system from different disciplinary perspectives to provide a fuller picture. However, it quickly became clear that even this was not enough [9]. The need for greater understanding of how humans interact with the bio-physical system requires an integrated, inter-disciplinary rather than multi-disciplinary approach. In an inter-disciplinary approach natural and social science disciplines are harnessed in both the formulation of research questions and the subsequent undertaking of the research itself. Disciplinary integration, where researchers are prepared to cross traditional disciplinary boundaries in order to gain a basic understanding of other disciplines and the language they use is required [9]. Only by doing so can researchers learn to communicate with each other and appreciate how different disciplinary perspectives can enhance understanding of the system as a whole. This then forms the basis for a considering the entire socio-ecological system, defining the research questions and interpreting findings. This interdisciplinary approach was developed in further research between 1999 and 2002 and proved successful in allowing the identification of a number of locally relevant researchable constraints [9, 13, 14, 15).

Our experience has been that including resource users and other local stakeholders in the identification and prioritisation of appropriate management strategies and information needs can increase the relevance of information generating activities and, in turn of the resulting management recommendations, increasing the likelihood of uptake and positive outcomes [16]. Without the basis of a common understanding there is a danger that decisions made on the basis of incomplete information or assumptions that can lead to irrelevant information generation or unintended management outcomes. As an example, research on stocking strategies in India identified the potential benefits (increased yields with no increase in inputs or financial cost) from alternative strategies but did not consider the costs (more fish is more work to harvest). As a result, resource managers were not prepared to adopt suggested changes in stocking practices [17].

In summary, our experience has been that in complex, diverse systems, developing an understanding of the socio-ecological system and identifying knowledge gaps and uncertainties can best be achieved through an interdisciplinary approach that makes use of a wide range of available knowledge types and perspectives. Methods have been identified that can help frame and undertake such enquiry [e.g. 6, 16, 18].

The role of research

Helping to identify appropriate policies and management strategies and ensuring that management and policy-making are learning processes is a key role for researchers. These processes should, at the same time as generating benefits, increase knowledge about the nature and dynamics of the fishery. In terms of applied research our experience is that this can be achieved in two ways, discussed in turn.

<u>Learning by doing</u>

This can be described as an approach characterised by a process of Research → Manage → Adapt. Information about the system and from other sources, for example from similar systems, trials or meta analyses, is used to identify an appropriate management strategy [e.g. 19]. This strategy is then implemented along with an appropriate monitoring system. The monitoring and evaluation system, if effective, generates information on the resource system response, providing a feedback loop. This new information can potentially provide new insights into the resource system dynamics and the management strategy can be adapted in the light of it.

This approach can be effective. However, we would argue that it is less appropriate where uncertainties are large and the systems are complex and diverse. In the first place it is likely that in such systems it will be difficult to identify the most appropriate management strategy because of the high level of uncertainty surrounding the fishery and its dynamics. Some uncertainties, can potentially be addressed prior to identification of the management strategy but dynamic uncertainties, i.e. the response of key variables to change, can only be reduced by actually observing them, either through time, or space.. Secondly, this type of experiential learning can be slow, particularly within a single system. This is because if only small changes are made to the management strategy each time then the contrast between management actions may not be enough to explain the causal link between change and the response in the variable.

Learning as an objective of doing

Where the management uncertainties are high we suggest that the use of experimental learning through a process of adaptive co-management can provide greater benefits by making learning more systematic. This type of learning can be described as Research **and** manage → Adapt. In this approach management is treated as an experimental process and the principles of experimental design are used to design management (learning) strategies that can yield significant information about the fishery and its dynamics, in addition to more immediate benefits to those dependent on the resource [13, 14, 16, 20].

Experimentation in such cases may be of two types, both based on examining contrast in management actions, either temporally or, where possible, spatially. The contrast in management actions may be due either to naturally occurring variation in the systems (passive experimentation), e.g. differences in the existing levels of fishing effort in different locations, or come about through management actions explicitly designed to deliberately create the necessary variation (active experimentation). In either case it is important that the experimental designs are assessed to ensure that they are robust and likely to generate the required information. This can be done using fairly simple modelling techniques allied to statistical power analysis. In terms of learning, active experimentation, where the variation and contrast between treatments can potentially be controlled more easily, can potentially produce results more quickly [21, 22, 23].

The drawback of the approach is that during a period of experimentation fewer benefits may be generated and stakeholders will need to be prepared to accept short term costs. However, in our experience resource users are prepared to experiment so long as the experiments ensure that no one group is likely to lose out more than any other and the designs have sufficient rigour to generate the required information. Collaboration with stakeholders and the provision of a forum for discussion and negotiation with affected stakeholders has been a vital part of the planning process when developing explicitly experimental management strategies. In our research in South and Southeast Asia using this type of learning, a key aspect of the process of negotiating the experimental design to produce village or management unit specific ‘action plans’ has been to ensure that the negotiation process was transparent and fair. Each of the participating management units is aware of the agreed roles for each of the participating stakeholder groups as well as the treatment that will be applied within each management unit [13]. This is perhaps more straightforward in the design of stocking experiments, where the costs were likely to be low, than in a capture fishery but was effective even when the management unit was responsible for over 60% of the direct cost of the treatment (i.e. fish fingerlings, fingerling transport) as well as 100% of the costs of monitoring on-growing and harvesting [17]. Even so, this process can also lead to compromises to the experimental design as participants may prefer a particular treatment or not be prepared to accept the proposed short term costs. Researchers need to be flexible and able to accommodate such compromises and be able to alter or re-design the experiments quite quickly. As such, these factors remain the major constraints in the design of experiments and with this approach.

In describing these approaches we do not seek to suggest that one of these approaches is inherently ‘better’ than the other, merely that they may be more suited to different circumstances, depending upon a combination of the level of uncertainty, stakeholders attitude to risk and the costs and estimated value of the benefits from experimentation. Indeed it should be possible to combine the two approaches in a given management situation.

The role of the researcher

Whichever form of learning is applied it is important to consider who should be learning. Traditionally it has been the role of the trained scientist to undertake the information generating activities as a ‘scientific expert’. However, we believe that unless other stakeholders, in particular decision-makers, become researchers there will be little opportunity for increased understanding and improved outcomes. We have already explained that our experiences have indicated that it is important to involve resource users and other stakeholders (or their legitimate and effective representatives) in developing a common understanding and identifying the knowledge gaps and information priorities because they are involved in management decision-making. There is a powerful argument that in addition to their role in developing an understanding of the research and management context, other stakeholders (from resource users to policy makers), should be involved throughout the research process because they are the users of the information.

To some extent the shift in emphasis over the lifetime of the FMSP as it attempted to address the issue of uptake promotion and developmental impact helped to place more focus on moving beyond presenting information in peer-reviewed papers and technical reports within FMSP funded research [see 10]. Our experience showed that there is much to be gained if stakeholders are involved in assessing or evaluating information or collaborate in undertaking the research. In the first place it can help to improve the monitoring and evaluation systems, improving the efficiency and effectiveness of data collection [16, 18]. This will not be the case if participation is limited to a role in data collection. In such cases the primary motivation behind increased participation may actually be the opportunity to reduce the data collection costs or to obtain data that would otherwise be too difficult or to costly to collect. In such cases we feel that this does little to empower the group involved or to create any sense of ownership of the research process. People are more likely both to believe the results when they know where the information came from and had a hand in producing the answers and are also more likely to collect data effectively if they know what will be done with it and that the information that it will be used to create will be important to them. Thus participation also raises some important issues around the credibility of the information generated by the research process.

Increasing participation and involving people in the research process can be a challenge. Not only is it time consuming and involves undertaking unfamiliar activities, but, at least in a developing country context, there may be cultural barriers and the simple problem of low levels of education and analytical capacity. In Lao PDR, where the adaptive learning approach was developed, local stakeholder groups were involved in the design and implementation of experimental management strategies aimed at determining appropriate multi-species stocking strategies under different environmental conditions. Time was invested to discuss the experimental design with extension staff and the representatives from the 38 participating villages. Action plans were then negotiated and agreed setting out the roles and responsibilities of each stakeholder group within the plans. At this stage, the village representatives were invited to comment and to indicate their desire to be involved in the process, including the monitoring of their own management process, its successes and problems. These stakeholder groups were then involved in designing monitoring systems that they would use themselves to collect data relating to the experiment. Researchers then facilitated learning by these stakeholder groups, analysing for themselves the data that they had helped to collect. This not only proved effective in allowing them to reach their own conclusions and enabling them to contextualise the findings and incorporate them into their knowledge base, but was also quite a new role for the researcher. An additional benefit of this facilitated learning was that the information was obtained by all stakeholder groups almost simultaneously so that information imbalances were reduced and all stakeholders were effectively equal in the process and had access to the same information on which to base decisions. [13, 16, 24]. Involving people in the research process makes additional demands of the scientist and it is important to develop communications, facilitation and conciliation skills in order to translate often complex ideas into relatively simple messages and to foster active participation.

Discussion

Interdisciplinary enquiry that could access and utilize knowledge from a range of sources was important for understanding co-managed fisheries. Yet developing participatory and interdisciplinary research approaches remains a far from trivial issue. In the first place, while scientists may recognise the practical need for broader approaches and the potential of including other stakeholder groups in the process of finding solutions to the problems facing society, they also find that for career advancement they need to be specialising and producing cutting-edge disciplinary research [25]. This can make it difficult for the scientist to summon up the courage to step out of the ivory tower, or at least open the door. Secondly, the peer review process, and requirement in many scientific institutions to produce peer-reviewed outputs can also provide a disincentive to interdisciplinary research. While peer-review provides quality assurance, and is therefore desirable, journals are traditionally set up along disciplinary lines so that scientists undertaking such work may find that it is more difficult to get the results of research published. Peer-pressure can provide an important further disincentive with concerns amongst natural scientists that they are 'going soft' or amongst social scientists that they are turning in to 'nerds' should they engage in interdisciplinary approaches.

We have presented a case for increased participation in the research process and feel that it is worth pausing to consider the implications this as we have earlier alluded to issues of credibility. In the first instance there does appear to be a trade-off between the quality of science and the use of participatory methodologies. This appears in two ways. Firstly increased participation means that the research agenda is determined to a greater extent by stakeholders, who perhaps have less incentive to be involved in cutting-edge science and are instead more interested in practical solutions to current problems. Indeed increased participation may result in a diversity of opinions that makes it difficult to gain consensus on what to do. Secondly, and this applies to experimental learning in particular, proposed experimental treatments need to balance the requirement for fair allocation and acceptable risk against the experiment being robust and able to generate the required information. While active participation in the research process is difficult to achieve, it is worth also considering what we feel is the more important trade off. This is the one that exists between the quality of science and **not** using participatory methodologies. In developing countries where research and management are taking place in resource poor and educationally limited situations there is a very real risk that methods will be unfamiliar and that key words, questions and concepts may be irrelevant or misinterpreted. The likely result is poorly understood and executed designs that will not get data collected with great accuracy or reliability. This is a concern as poor data well analysed still results in poor information. More attention should perhaps be given to critically assessing the value of participation in research.

From the point of view of the scientist, participatory research, as we have described it here, can also be time consuming and this can be a further disincentive to scientists where a steady stream of peer reviewed outputs are required, or an institution views activities supporting the sharing and utilisation of information as outside its information generating remit. Scientists, particularly from more technical disciplines, may also feel that interdisciplinary and participatory research devalues their knowledge or that their influence will be lessened [e.g. 26]. This may be especially the case in places where there has been a traditional hierarchy of disciplines and academic elitism.

For the type of applied research in support of management, broadening participation in research can bring real benefits and present just as real challenges. Given the disincentives that face the academic researcher, we are left asking whether a new type of interdisciplinary applied scientist is required, one who can work with a variety of stakeholders in broad 'learning alliances' and interact with the more discipline based academics?

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ENDNOTES

a Where learning is defined as the generation, sharing and utilisation of information.

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