CHAPTER 14
THE ROLE OF MARINE SCIENCE IN PARTICIPATORY FISHERIES GOVERNANCE

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Abstract

In the North Atlantic, formal international agreements to provide a co-ordinated response to the requirement for marine science to underpin fisheries governance have been in place for over 100 years. In this chapter, I consider how marine science has been used during that period, and the extent to which failures in fisheries management result from deficiencies or misuse of the science. My analysis of our failures in the past leads me to a consideration of ways to avoid such failures in the future, including an account of the possible role for marine science in an objective-based management regime, such as the 'ecosystem-based approach to fisheries management'. This role will include a significant element of prediction of the ecosystem effects of management scenarios, and also much greater dialogue with industry stakeholders and society to allow the informed selection of management objectives. The traditional fisheries science sector is inadequately prepared for this task, and much greater use of the wider marine science community will be required. In addition to the scientific challenges, the development of effective communication mechanisms between marine scientists and fisheries scientists, and between the science sector and society, must be acknowledged as necessary conditions for the success of these initiatives.

14.1 Introduction

Marine science as a discipline is often traced back to the oceanic voyages of exploration in the late nineteenth century. However, 'science' has been involved in fisheries governance for probably as long as there has been fisheries governance. In early times, this input came from 'advisors' who included stakeholders, such as fishers, resource 'owners' such as the Crown, and learned men. With the development of what we would now describe as the 'scientific approach', there was scope for its application to fisheries problems. This was seen most in freshwaters where scientific investigation led to great advances in our understanding of, for example, salmon lifecycles. However, the continued increase year on year in marine catches, and the extent and richness of life in the oceans as revealed by the early research surveys, meant that most people, including many early scientists, believed that the oceans' bounty was so vast that it could not be impacted by anything man could do. As late as 1884, Thomas Henry Huxley, President of the Royal Society, stated "The cod fishery, the herring fishery, the pilchard fishery, the mackerel fishery, and probably all the great sea fisheries, are inexhaustible". However, by the turn of the last century this view was being challenged and it was recognised that a coordinated international programme of research was required. It was this that led to the establishment of the International Council for the Exploration of the

T. S. Gray (ed.), Participation in Fisheries Governance, 231–247.

Sea (ICES) in 1901, which brought together marine science in the North Atlantic. Similar agreements were established subsequently, covering the Baltic, Mediterranean, North Pacific and other regions.

The aim of this chapter is to provide an analysis of the role of science in current governance, using the NE Atlantic as a case study, and to consider the science needs of an alternative governance framework – that of ecosystem management.

14.2 The role of science in fisheries governance

Science is defined by the Oxford English Dictionary as the "systematic study of the structure and behaviour of the physical and natural world through observation and experiment". It therefore provides a body of knowledge and a mechanism for answering questions posed by society. In the context of fisheries, these questions are likely to concern the possible configurations of the exploited system and how to manage the system in order to arrive at the condition desired by society and expressed by their democratic choices. This leads us to answer questions such as:

- How many fish are in the sea?
- How many fish can be removed without compromising the stock (i.e. what is the Total Allowable Catch (TAC))?
- What impact will this removal have on the habitat and other parts of the ecosystem?
- What is the level of annual recruitment, and how does it relate to size/age and number of adults?
- What should be the minimum size/age of the fish we catch?
- What are the options for technical measures to limit exploitation (such as restrictions on fishing methods or the imposition of marine protected areas (MPAs))?
- What impact will these options have on fishers?
- What impact will the measures have on the exploited stocks?

It is immediately apparent, then, that the central question for fisheries science is 'how many fish can we harvest without impacting on the ability of those that remain to maintain the population'? Population models would seem to offer a solution, as they can allow us to predict future population size, based on a limited number of measures of the current situation and some knowledge of the biology of the organisms. Fish, like all living organisms, have the capacity to produce an excess of offspring. That is to say, each pair of parents can produce more than one pair of offspring. In a stable population, disease, predation and other natural processes, mean that within a generation each pair of parents replaces itself. However, if we remove a proportion of the offspring produced, we reduce the amount of competition for food, and the size of the population may show no effect of the harvesting. In other words, the number of individuals we took as a harvest would have died later of natural causes anyway. Given that an adult fish like a cod can produce in excess of two million eggs each year, and may have a reproductive life of ten or more years, there would seem to be a massive scope for the harvesting of the excess production.