How Science Serves Fisheries Management

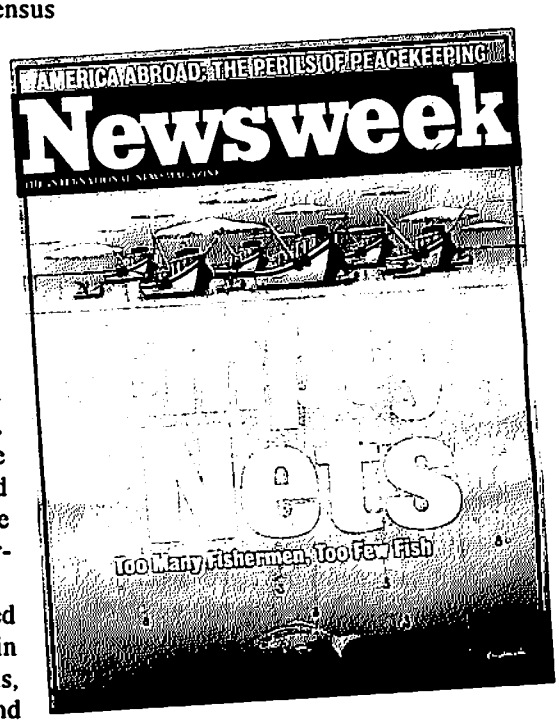
MERYL J. WILLIAMS
ICLARM

Fisheries recently captured rare world attention. In less than a month, *The Economist* front cover proclaimed 'The tragedy of the oceans', *Time* featured 'Too few fish in the sea' and *Newsweek* pictured many fishing nets and hooks seeking a lone fish. The focus was on the developed world industries but similar articles could have been written for much of the developing world fisheries. In the scientific literature, scientists debated the contribution of science to fisheries and natural resource management.

Ludwig et al. (1993) started the scientific debate when they argued that sustainable management is unattainable without a new approach, as demonstrated by many failures to prevent overuse. They challenged the prospects for achieving scientific consensus over sustainable levels of fisheries resource use and pointed out that even if achieved, scientific consensus advice was often not acted on, leading thus to overuse. They doubted that science and technology could provide answers to resource or conservation problems although adaptive management approaches were promoted.

In reply, Rosenberg et al. (1993) argued that sustainable resource use was a legitimate concept and although challenging, is achievable. They illustrated their arguments with examples of successes and failures, many of which occurred despite scientific consensus. They described new developments in which science assesses risks in the face of uncertainty.

Ehrlich and Dailey (1993) described and supported the use of science in perceiving natural resource problems, understanding their mechanisms, and strategically assessing options for their solution. They suggested, however, that lessons from the application of fisheries science to management of fisheries resources might not be relevant to other (sic) 'resources more relevant to sustaining of human civilization...soil, freshwater, forests, atmospheric composition, and some level of biodiversity'.



Setting aside the debate on the importance of fisheries resources to humans and the environment, I contend that biophysical and social science is more important than ever to achieving better fisheries management, and that the roles of science are expanding to meet the needs of management. That fish stocks have declined and some have collapsed despite scientific warnings shows

that science well may not be applied in time to conserve the resources if the social, political and economic circumstances are ignored. If social science, including policy, research is added to research on the status of stocks, we could understand how to implement more timely conservation actions.

Science has at least four roles in assisting natural resource management. Science:

(1) produces basic knowledge on which strategic and applied studies draw. Thus, fish taxonomy, the fundamentals of biodiversity research, economic market theory and the sociology of village systems may be relevant to fisheries management research.

(2) identifies issues for action. Thus, scientific studies may assess the status of an exploited stock; social science research may reveal problems in the distribution of benefits from the catch.

(3) helps resolve conflict. What is the risk of stock collapse if catches are increased? How will limited entry affect coastal communities? Will larger mesh sizes protect the small fish? Research can help resolve these questions or concentrate the disagreements on issues where value judgements have to be made.

(4) produces new solutions and options. Fisheries production has become more efficient with new gears, vessels and postharvest technologies. Aquaculture production is now entering a period of technical development including new selectively bred strains of species, such as the GIFT Nile tilapia. In the future, scientific studies will suggest new fisheries management policy instruments, forms of aquatic environment protection and remediation, and ways of integrating fish and other resource production systems.

Will science be as successful in assisting sustainable fisheries management as it has been in increasing production and recommending sustainable catch levels? The answer should be yes, provided all four roles are used, sufficient research is well targeted to needs through close interaction between researchers and the users of their work, and the appropriate mix of social and biophysical science applies.

Fisheries have large research needs relative to the available research resources, especially in the developing world. The right mix and sequence of fisheries research therefore must be selected carefully if we are to speed management applications to beat further degradation of the resource base and to begin to rebuild our fisheries. Ideally, early stage and even precautionary management actions are preferred.

The world recognises now that fisheries have severe problems and resource managers are responding. Most national objectives for fisheries are in transition to balancing resource, environmental and economic considerations, recognizing their interdependencies in achieving sustainability.

The scientific debate is a healthy sign at this critical stage. The results should be a clearer understanding of how science can best serve fisheries and natural resource management objectives. ICLARM will participate and learn from the debate as one means of better directing its research for developing world partners and stakeholders.

Further Reading

Ehrlich, P. and G.C. Dailey. 1993. Science and the management of natural resources. Ecological Applications 3: 558-560.

Ludwig, D, R. Hilborn and C. Walters. 1993. Uncertainty, resource exploitation, and conservation: lessons from history. Science 260: 17-18.

Rosenberg, A.A., M.J. Fogarty, M.P. Sissenwine, J.R. Beddington and J.G. Shepherd. 1993. Achieving sustainable use of renewable resources. Science 262: 828-829.

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M.J. WILLIAMS *is Director General of ICLARM.*