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Fisheries Management: Putting Our Future in Places

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The crisis of fisheries is real, and global.¹ It is an ecological crisis in that fisheries production systems worldwide are losing their productive capacity. It is a socioeconomic crisis in that industrial fisheries now rely globally on U.S.\$50 billion worth of subsidy per year (Garcia and Newton 1997), while simultaneously undermining the livelihood of millions of small-scale fishers (Pauly 1997).

It is also an intellectual crisis in that fisheries science has recently lost much of its hard-won credibility, partly because of its continued perception, in spite of several fisheries-induced collapses, of narrow industry interests as the only legitimate 'clients' for its services (see, for example, Charles 1995), and of the apparent unwillingness of many fisheries scientists to rely on the broad ecological knowledge so far accumulated to support management approaches based on precautionary principles (see McGuire 1991, for a tropical, and Hutchings and Myers 1994, for a cold-water example; see also Hutchings, Neis et al., this volume).

It is finally an ethical crisis, and certainly one of alienation as well, as much of the fisheries sector has discarded, along with an estimated 27 million tonnes of by-catch per year (Alverson et al. 1994), all notions of guardianship of the resources on which its survival depends. In effect, the fisheries sector has abdicated this role to conservationist organizations, which industry representatives, from the CEOs of fishing corporations to lobbyists for sport fishing, too often criticize for their lack of 'realism.'

Canada's fisheries provide examples of all the above-mentioned ills. Indeed, Canada offers one of the few instances of a major stock's being driven into collapse by a fishery that largely followed mainstream scientific advice (Finlayson 1994; Hutchings, this volume). Also, Canadian fisheries reproduce numerous aspects of the global fisheries crisis, as they pit a corporate fishing fleet against

owner-operated craft, both against sport fishers, all against the First Nations, all of these users against the Canadian Department of Fisheries and Oceans (DFO), and the entire sector against the taxpaying public at large – the ultimate sovereign. Walters (1994) provides a detailed analysis of this buck-passing exercise on the Pacific coast of Canada. Thus Canada can serve as a microcosm of the world's fisheries, and in this chapter¹ I alternate between Canadian and other examples, as when discussing solutions proposed to address these problems.

Dealing with Real People

The main theme of this chapter, written from the perspective of a fisheries biologist, is my contention that to be successful future management schemes, whether based on market incentives, on co-management, or on governance arrangements, must involve local communities living in real places and exploiting stocks that have places as well. However, before we look at the places of fish, we should discuss at least one of the half-truths that pollute such discussion.

The cliché often used by fisheries scientists to counter conservationist arguments is that 'management is not about fish, but about people.' This is a statement that may resonate nicely in empty heads but which implies that we, fisheries scientists, are or should be equipped to deal with 'people issues.' Our collective inability, nay unwillingness, to engage in collaborative work with social scientists (sociologists, anthropologists, historians) and our tendency to reduce what they commonly use as fact or evidence to the status of anecdote (Pauly 1995) show our discipline to be conceptually ill-equipped to deal with people issues. Moreover, and perhaps more important, applied sciences dealing with real people (as opposed to our nominal fishers and hypothetical managers), such as medicine or psychology, have by necessity developed strong codes of conducts to regulate the ethical aspects of their interactions with people (see, for example, contributions in Roy, Wynne, and Old 1991). Thus, psychologists must obtain informed consent, usually in writing, before performing even seemingly harmless teaching experiments on graduate students, while complex protocols regulate the conduct of medical experiments, with both animals and people. When human beings are involved, experiments on the efficacy of a potentially life-saving drug must be interrupted when the subjects receiving placebos can be shown to suffer from not being included in the treatment group. This and similar ethical issues, in many medical schools, are part of the curriculum and taught by faculty specialized in medical ethics.

How about fisheries scientists? Do we really want to be dealing with real people and become personally responsible (as medical doctors are) for what we do, for the advice that we give, and for the consequences of such advice?

Types of Solutions

Three classes of approaches have been proposed to address the global fisheries crisis and/or its local manifestations, usually as a complement or as an alternative to national and/or international 'top-down' regulatory approaches. These are market-based approaches, community-based approaches, and ecology-based approaches.

Market-Based Approaches

The open-access nature of most fishing grounds, in Canada and elsewhere, has long been identified as the major cause of the 'race for fish' and its attendant ills, such as overcapitalization, rent dissipation, and stock collapses. Consequently, there are numerous accounts by economists attributing these problems to 'market failures' – i.e., to the market's being unable to properly account for, or 'internalize,' the social and environmental costs of fishing (review in Clark 1990). There are, in contrast, far fewer accounts by economists of the active collusion (what other word is there?) between governments and large fishing enterprises, as made manifest in the boat-building and other subsidies that have enabled large fishing enterprises to exploit coastal resources far from their home ports (Garcia and Newton 1997) and, in the process, to marginalize otherwise efficient, localized, small-scale or artisanal fisheries (Pauly 1997). Thus it is not surprising that the market-based mechanism recently proposed to overcome market failures – individual transferable quotas (ITQs) – is often perceived to be not a tool for resource management per se but a ploy for transferring more public assets from public to corporate ownership (see, for example, Davis 1996). When firmly implemented, however, ITQs seem to achieve much of what is expected of them, reintroducing rationality – albeit in its narrowest, economic sense – into an industry that had gone irrational several decades ago (Arneson 1996; McCay, this volume).

Community-Based Approaches

To emphasize community-based approaches is to imply that they are something new – yet we know that in earlier times, and for obvious reasons, local commu-

nities were the only entities required for and capable of managing fisheries (see, for example, contributions in McCay and Acheson 1987; Ruddle and Johannes 1985; and Gallagher and Vodden, Newell, Pinkerton, Thoms, this volume). The reason why community-based management is not a trivially obvious thing to do is that, in parallel with the development of large fishing boats (typically bottom trawlers, but also purse seiners and other type of industrial craft), national governments in recent decades have created centralized agencies to regulate fisheries, with an internal culture, and often an explicit mandate, that favoured industrial (and distant-water) fleets over smaller, locally based artisanal fleets (see Pauly 1988 for examples pertaining to tropical fisheries, and Finlayson 1994 and Charles 1995, for the case of northern cod).

The resulting inequities and alienation, in both developed and developing countries, are well documented in the literature and have spawned the concept of co-management, a sharing of responsibility between national governments (usually represented through a regulatory agency) and fisher communities (see contributions in Pinkerton 1989; Pinkerton and Weinstein 1995; and Pinkerton, this volume). Co-management, as currently conceived, may range from the right of communities to be consulted during a decision-forming process to their nearly full autonomy (with respect to fishing). Usually these arrangements assume that owners of fishing vessels have legitimate interest in co-managing a fishery, but not their salaried crew or their wives, who are often involved in processing (Neis, this volume) – additional sources of inequity and alienation.

Moreover, and perhaps even more important, these arrangements all imply the resource users to be the only group that governments need to consider – i.e., the concept usually does not lead to the perception of non-user groups as legitimate ‘stakeholders’ in the management and resource-allocation process. This assumption contrasts with the concept of ‘governance’ (see contributions in Kooiman 1992), wherein governments unwilling to accommodate all demands by particular user groups involve groups with different or even opposing interests in the decision-making process, thus forcing the user groups – here, fishers – to justify their privileged access to public resources. In the case of coral-reef fisheries, this might imply, for example, the creation of local management councils in which fishers must negotiate with the operators of SCUBA dive resorts, and perhaps conservationist groups, and where government representatives only set and enforce rules for intergroup negotiations.

The outcome of governance arrangements of this sort, which would always be local in nature, may be not only levels of exploitation that are sustainable and compatible with the interests of different stakeholder groups, but also reduced transaction and enforcement costs for the central government.

Ecology-Based Approaches

Nature is complex, particularly the oceans, and we know very little about the processes that produce and maintain the biomass that we harvest – another set of clichés, part of the smokescreen behind which disciplinary irresponsibility can be hidden. Actually we do know – and have known since the beginning of the twentieth century, when F.I. Baranov developed the principles of quantitative fisheries science (see Baranov 1977), or a least since The Second World War and the giant fishery closure that it entailed (Beverton and Holt 1957) – that excessive fishing reduces stocks and eventually causes them to collapse and that reducing fishing is sufficient, in most cases, for natural stocks to recover (given time).

What has enabled our historic fisheries to last for centuries is that catches were limited relative to stock size; part of the stock was not susceptible to fishing, because it had access to natural refuges. The refuge in the case of northern cod was depth: the historic fishery was an inshore one, and the old, large females whose reproductive output maintained recruitment to the stock were largely inaccessible to the inshore gear dominating the fishery (see Cadigan, this volume). Similarly, most tuna could be caught only if part of their stock strayed inshore, the rest of the stock remaining safe in oceanic waters. In the last decades, technological developments – powerful echo-locating devices, extremely precise satellite positioning, and new gear – have made it possible to locate almost any fish, anywhere, and to exploit what initially were refuges. It is beyond the scope of this chapter to document this change. However, the well-documented recent stock collapses throughout the world would provide much of the evidence, were it to be presented here.

Countering this creeping invasion of natural refuges is possible, and this possibility is probably what lies behind the growing scientific consensus about the efficacy of marine protected areas (MPAs), particularly in their most effective form, as ‘no-take’ MPAs (Bohnsack 1994; Roberts et al. 1995). Essentially, MPAs work as artificial refuges, by reconciling nature’s time scales with those of fishers and markets as required, because even very low fish mortality can drastically reduce the numbers of the large, old, and highly fecund females that contribute most to a stock’s recruitment. Thus within a (suitably located and sized) no-take zone, the numbers, and eventually the biomass, of one (or several) previously decimated stocks can recover, even as (regulated) fishing continues outside that zone. Gradually, as stock density and mean ages increase within the zone, it starts exporting eggs and/or later juveniles and adults that contribute to the adjacent fishery, soon offsetting through this export the fishing lost because of the no-take zone itself. A tropical example, documenting the

reality of these processes, is found in Russ and Alcala (1994); while Ballantine (1991) provides similar examples from colder waters. The conference proceedings edited by Shackell and Willison (1995) provide a comprehensive overview, including many Canadian examples.

The most important aspect of MPAs, however, may be their feature of simultaneously reducing risk and accommodating imperfect knowledge (Clark 1996) – an intractable problem – using quota-based or other, traditional forms of management (Ludwig, Hillborn, and Walters 1993). Contrary to much of what one may hear about it, lack of knowledge about the dynamics of exploited stocks, as expressed in the above cliché, speaks not against but for the establishment of MPAs. Consider the question whether lack of knowledge about average weights in *Homo sapiens* is used by engineers (who also deal with real people) as a reason for or against building elevators that can accommodate more than their stated maximum number of passengers.

Our Future Is in Places

The text above should have made my sympathies clear: I believe that fisheries management, if it is to lead to anything sustainable, must take into account the places of people in its logic. It must consider, far more than has hitherto been the case, the places of small-scale fisher communities, but also of other stakeholders, and the places of fish, especially places where their populations can recover from fishing. Taking places into account will not, and indeed could not, be done by 'fisheries managers' alone. Rather the public at large, which ultimately owns the resource and whose taxes have so far been misused to subsidize the carnage, must become involved. There are scattered signs of this happening, throughout the world, as a result of the recent massive coverage of global fisheries issues in science and/or nature-oriented magazines (Parfit and Kendrick 1995; Safina, 1995; see Gallagher and Vodden, this volume), in the general press, and as a result of the trend towards greater accountability of government agencies. The public will not do this en masse, obviously. Rather it will support those people who best express the needs of the time – as happened in the 1970s, when public support swelled for the non-governmental organizations and politicians who advocated an end to whaling. Here again, the conservation movement can be expected to heed the call. It would be good if fisheries scientists put their hearts in the right place as well.

NOTE

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WORKS CITED

- Alverson, D.L., M.H. Freeberg, S.A. Murawski, and J.G. Pope. 1994. 'A Global Assessment of Fisheries Bycatch and Discards.' *FAO Fisheries Technical Paper no. 339*. Rome.
- Arneson, R. 1996. 'On the ITQ Fisheries Management System in Iceland.' *Reviews in Fish Biology and Fisheries* 6, no. 1: 63–90.
- Ballantine, W.J. 1991. *Marine Reserves for New Zealand*. Leigh Laboratory Bulletin no. 25. University of Auckland.
- Baranov, F.I. 1977. *Selected Works on Fishing Gears*. Vol. 3. *Theory of Fishing*. Jerusalem: Israel Program for Scientific Translations.
- Beverton, R.J.H., and S.J. Holt. 1957. *On the Dynamics of Exploited Fish Populations*. Fisheries Investigations. Series II. London: Ministry of Agriculture, Fisheries, and Food.
- Bohnsack. 1994. 'Marine Reserves: They Enhance Fisheries, Reduce Conflicts, and Protect Resources.' *Naga: The ICLARM Quarterly* 17, no. 3: 4–7.
- Charles, A.T. 1995. 'The Atlantic Canadian Ground Fishery: Roots of a Collapse.' *Dalhousie Law Journal* 18, no. 1: 65–83.
- Clark, A.T. 1996. 'Refugia.' Paper presented at the National Academy of Sciences International Conference on Ecosystem Management for Sustainable Marine Fisheries, 19–24 Feb. Monterey, Calif.
- Clark, C.W. 1990. *Mathematical Bioeconomics: The Optimal Management of Renewable Resources*. 2nd ed. New York: Wiley Interscience.
- Davis, A. 1996. 'Barbed Wire and Bandwagons: A Comment on ITQ Fisheries Management.' *Reviews in Fish Biology and Fisheries* 6, no. 1: 97–197.
- Finlayson, A.C. 1994. *Fishing for Truth: A Sociological Analysis of Northern Cod Assessments for 1977 to 1990*. St John's: ISER, Memorial University.
- Garcia, S., and C. Newton. 1997. 'Current Situation, Trends, and Prospects in World Capture Fisheries.' In E. Pikitch, D.D. Hubert, and M. Sissenwine, eds., *Global Trends in Fisheries Management*, 3–27. American Fisheries Society Symposium 20. Bethesda, Md.: American Fisheries Society.
- Hutchings, J.A., and R.A. Myers. 1994. 'What Can Be Learned from the Collapse of a Renewable Resource? Atlantic Cod, *Gadus morhua*, for Newfoundland and Labrador.' *Canadian Journal of Fisheries and Aquatic Sciences* 51: 2126–46.
- Kooiman, J., ed. 1992. *Modern Governance—Society Interactions*. London: Sage Publications.
- Ludwig, D.R., R. Hilborn, and C. Walters. 1993. 'Uncertainty, Resource Exploitation, and Conservation: Lessons from History.' *Science* 260 (2 April): 17, 36.
- McCay, B.J., and J.M. Acheson, eds. 1987. *The Question of the Commons: The Culture and Ecology of Communal Resources*. Tucson: University of Arizona Press.

- McGuire, T. 1991. 'Science and the Destruction of a Shrimp Fleet.' *Maritime Anthropological Studies* 4, no. 1: 32–55.
- Parfit, M., and R. Kendrick. 1995. 'Diminishing Returns.' *National Geographic* 188, no. 5: 2–37.
- Pauly, D. 1988. 'Fisheries Research and the Demersal Fisheries of Southeast Asia.' In J.A. Gulland, ed., *Fish Population Dynamics*, 2nd ed., 329–48. ed. Chichester: Wiley Interscience.
- 1995. 'Anecdotes and the Shifting Baseline Syndrome of Fisheries.' *Trends in Ecology and Evolution* 10, no. 10: 430.
- 1997. 'Small Scale Fisheries in the Tropics: Marginality, Marginalization and Some Implications for Fisheries Management.' In E. Pikitch, D.D. Hubert, and M. Sissenwine, eds., *Global Trends in Fisheries Management*, 40–9. American Fisheries Society Symposium 20. Bethesda, Md.
- Pinkerton, Evelyn, ed. 1989. *Co-operative Management of Local Fisheries: New Directions of Improved Management and Community Development*. Vancouver: University of British Columbia Press.
- Pinkerton, E., and M. Weinstein, eds. 1995. *Fisheries That Work: Sustainability through Community-Based Management*. Vancouver: David Suzuki Foundation.
- Roberts, C., W.J. Ballantine, C.D. Buxton, P. Dayton, L.B. Crowder, W. Milon, M.K. Orbach, D. Pauly, and J. Trexler. 1995. 'Review of the Use of Marine Fishery Reserves in the U.S. Southeastern Atlantic.' NOAA Technical Memorandum NMFS-SEFSC-376. Miami: National Marine Fisheries Service.
- Roy, D.J., B.E. Wynne, and R.W. Old, eds. 1991. *Bioscience Society*. Chichester: John Wiley and Sons.
- Ruddle, K., and R.E. Johannes, eds. 1985. *The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific*. Jakarta: UNESCO Regional Office for Science and Technology.
- Russ, G., and A. Alcala. 1994. 'Sumilon Island Reserve: Twenty Years of Hopes and Frustrations.' *Naga: The ICLARM Quarterly* 17, no. 3: 8–12.
- Safina, C. 1995. 'The World's Imperiled Fish.' *Scientific American* 273, no. 5: 46–53
- Shackell, Nancy L., and J.H. Willison. 1995. *Marine Protected Areas and Sustainable Fisheries*. Wolfville, NS: Science and Management of Protected Areas Association.
- Walters, Carl. 1994. *Fish on the Line: The Future of Canada's Pacific Fisheries*. Vancouver: David Suzuki Foundation.