

## Report on the ICES/SCOR Symposium on Ecosystem Effects of Fishing



In 1996, the Scientific Committee on Oceanic Research (SCOR) initiated a Working Group on the Impact of World Fisheries Harvests on the Stability and Diversity of Marine Ecosystems. At the PICES Fifth Annual Meeting (October 1996), the Governing Council named myself, then the Chairman-elect of the Fishery Science Committee, to officially represent PICES in this Working Group. The SCOR WG 105 activities compliment work being carried out in the North Atlantic under the auspices of the International Council for the Exploration of the Sea (ICES) by the Working Group on the Ecosystem Effects of Fishing, which has been active since 1990. A summary of the first meeting of the SCOR WG 105, held in November 1996 in Halifax, Canada, was published in PICES Press Vol. 6, No. 1. At this meeting, ICES and SCOR agreed to plan a joint symposium in order to facilitate a global synthesis of what is known about the impacts of fishing on marine ecosystem, and to provide a forum for discussions on how this information can be used for formulations of management strategy and tactic.

The ICES/SCOR Symposium on “Ecosystem Effect of Fishing” was held in France, March 15-19, 1999. About 350 scientists and managers attended the meeting. “PICES participants” include Anne B. Hollowed (U.S.A), Warren S. Wooster (U.S.A), Patricia Livingston (U.S.A), Chang-Ik Zhang (Korea) and Qi-Sheng Tang (China) (*see photo*).

A major part of the meeting was taken up with invited keynote papers covering three topics:

The first topic “*Fisheries impacts in different ecosystems*” provided a global overview of the effects of fishing on different marine ecosystems and on specific species groups. The focus was on differences and similarities in the responses in various parts of the world. The ecosystems addressed

included coastal and estuarine system, semi-enclosed seas, continental shelves, upwelling systems, boreal ecosystems, the deep seas and the Antarctic. The species groups involved benthos, demersal fish, large pelagics, sharks and rays, seabirds, marine mammals and turtles. The evidence for cascading effects on primary production and zooplankton was also reviewed.

The second topic “*Quantification of ecosystem impacts*” presented methods for quantifying fisheries impacts at the species and ecosystem levels. The definition of overfishing in an ecosystem perspective, the quantification of the vulnerability of individual species to fishing, selection and phenotypic evolution caused by fishing, and the risk of species extinction were discussed. At the community and ecosystem level, the usefulness of trophodynamic models, multispecies models, and indices of community structure were summarized. Experience in the use of sustainability indicators and measures of ecosystem health was reviewed.

The development of integrated approach to fisheries and environmental management requires a selection of indices of ecosystem change, which are perceived to be scientifically sound, important to society and operational in a management context. The third topic “*Integrating fisheries and environmental management*” reviewed management objectives and expectations from the respective points of view of representatives of the fishing industry, NGOs, and fisheries and environmental managers. This was followed by the presentation of a framework for designing operational ecosystem management strategies, after which some of the legal, economic, and technical tools that might be used to achieve the objectives were described. The current experience with integrating environmental and fisheries objectives was summarized by reviewing the approaches developed within ICES, CCAMLR, US fisheries management, Philippine coastal zone management, and Australian multiple-use management. The future trends and constraints in the development of an integrated approach to fisheries management were outlined.

Additional contributions were as posters presenting specific case studies. A total of 140 posters were displayed throughout the symposium and presented at three special afternoon sessions.

All invited papers and a limited number of papers based on poster presentations will be considered for publication, following peer review, in a special issue of the ICES Journal of Marine Science, produced by Academic Press in March 2000.

The final summary report on the ICES/SCOR symposium, drafted by Dr. M. Sinclair (Chairman of SCOR WG 105), will be available within a few months. The SCOR WG 105 will close its activity after the final summary report with a concluding paper presented at the coming SCOR annual meeting.

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*Kerim Y. Aydin received his B.Sc. (1992) in Mathematical Biology from Harvey Mudd College, Claremont, California. Now he is completing his Ph.D. in Fisheries Ecology and Modeling at the School of Fisheries, University of Washington, Seattle, with major advisor Dr. Robert Francis. His dissertation, to be finished in summer 1999, is entitled "Trophic feedback and variation in carrying capacity of Pacific salmon (*Oncorhynchus* spp.) on the high seas of the Gulf of Alaska". More of his research is available at: (<http://www.fish.washington.edu/research/highseas>).*



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The symposium showed clear evidence that some ecosystems have been altered by fishing. In other cases, the evidence was not so clear because of lack of data at the appropriate time and space scales, inadequate knowledge of pristine conditions, and insufficient data on certain ecosystem components. The scientific community is now challenged to develop and apply ecosystem indicators of the effects of fishing for their regions and to establish standards that can be related to ecosystem management objectives. The whole PICES scientific community can certainly play a role in these activities. PICES, which has focused primarily on the climate-related changes on ecosystems, needs to begin investigations and comparative studies that can help separate human- and climate-related impacts. We have the interdisciplinary scientific expertise that is necessary to take such an ecosystem perspective, which might be lacking in other intergovernmental organizations that may focus on only one species or group of species. The ways in which we can begin this work could include:

- starting a working group that develops and compares ecosystem change indicators among PICES regions,
- promoting ecosystem monitoring programs that would allow the detection of change in presently unmonitored ecosystem components,
- conducting symposia that summarize present knowledge of community structure and diversity changes in North Pacific ecosystems, and
- promoting data exchange on climate factors, fishing removals, and ecosystem components that could assist in comparative studies.

All PICES committees and the PICES Climate Change and Carrying Capacity Program can have a role in making progress in this area.

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