The fisheries of the northeastern Pacific are, for the most part, healthy because of conservative management. Scientists' advice has been heeded and has been conservative in the face of the uncertainty noted by Ludwig *et al.* Management regimes are enforcing strict quotas in heavily overcapitalized fisheries and result in significant constraints on a multibillion-dollar industry. Seasonal and area restrictions are imposed for the protection of marine mammals and to account for uncertainties associated with species interactions and overall ecosystem health.

Specific examples illustrate this success. In the Bering Sea, the weight of total acceptable biological catch is about 2.5 million tons, but the fishery is restricted to no more than 2 million tons. Professionals in the fields of population dynamics, marine mammals, oceanography, economics, anthropology, and ecology participate in setting the level of harvest. Political pressures on management derive largely from economic pressures related to the allocation of quotas and not in quota setting.

Cooperative Canadian and U.S. research and management since 1937 have restored the sockeye and pink salmon stocks of the Fraser River in British Columbia. These fisheries were decimated by rockslides that blocked fish passage early in this century. Construction of fishways eliminated the major obstacles to rebuilding fish runs. Harvests have risen from about 1.5 million sockeye (1918–1921) to 12.9 million (1987–1990). This occurred despite tremendous pressure from an overcapitalized fishery to harvest more. The task of restoring runs of salmon in Washington, Oregon, and California demands serious scientific attention. The roles of habitat destruction, overfishing, hatchery production, and interdecadal shifts in ocean environment (*1*) present daunting challenges.

When halibut stocks were reduced by fishing in the 1920s, the West Coast halibut fishing industry called on Canada and the United States to initiate scientific studies of the causes and to recommend measures for conservation. Over the course of 70 years as a managed fishery, stocks of halibut have fluctuated with environmental changes and the effects of direct or indirect fishing, but they have never been in a state of distress or in danger of irreversible overexploitation. The highest yield ever from that fishery occurred in 1989 after 100 years of commercial harvests.

We may never know the precise relationships between environmental conditions and fishing pressure that led to the collapse of the Peruvian anchovy fishery or the California sardine fishery. However, there is broad scientific agreement that stocks of small pelagics fluctuate massively through time independent of fishing pressure. These fisheries pose complex problems of prediction, and management strategies have been designed and implemented that attempt to take these characteristics into account.

There is much more to learn about the management of these and other fisheries in the North Pacific, and funding for research is hardly lavish. Better databases are needed, and annual fisheries cannot wait for scientific consensus to be achieved. However, current fisheries management in this area contradicts the conclusions of Ludwig *et al.* that fisheries scientists cannot determine harvest levels to sustain stocks at abundant levels and that management institutions are incapable of resisting industry pressures.

William Aron
Director,
Alaska Fisheries Science Center,
7600 Sand Point Way NE,
Seattle, WA 98115–0070
David Fluharty
School of Marine Affairs,
University of Washington,
Seattle, WA 98195
Donald McCaughran
Director,
International Pacific Halibut Commission,
University of Washington, Seattle
John F. Roos
Former Director,
International Pacific Salmon Fisheries Commission,
Pacific Seafood Processors,
4019 21st Avenue West, Suite 201,
Seattle, WA 98199

References

1. D. E. Rogers, in *The Influence of Ocean Conditions on the Production of Salmonids in the North Pacific*, W. G. Pearcy, Ed. (Oregon State University Sea Grant Program, Corvallis, OR, 1984), pp. 100–127; A. B. Hollowed and W. S. Wooster, *ICES Mar. Sci. Symp.* **195**, 433 (1992).
2. T. R. Baumgartner, A. Soutar, V. Ferreira-Bartrina, *CalCOFI Rep.* **33**, 24 (1992); T. Kawasaki, in *Climate Variability, Climate Change and Fisheries*, M. R. Glantz, Ed. (Cambridge Univ. Press, Cambridge, UK, 1992), pp. 325–354; J. Csirke, in *Fish Population Dynamics*, J. Gulland, Ed. (Wiley, New York, ed. 2, 1988), pp. 271–302.

■

Determining Carcinogenicity

We write in reference to the letter "Pesticides and the Delaney amendment" by Philippe Shubik (4 June, p. 1409). For those who may be unfamiliar with the International Agency for Research on Cancer (IARC) Monographs on the Evaluation

of Carcinogenic Risks to Humans, we would like to make the following points.

1) The IARC does not "certify" that agents are (or are not) carcinogenic. It reviews all the evidence relevant to carcinogenicity and classifies agents according to the strength of the evidence for (or against) their carcinogenicity. The IARC monographs are composed in a way that expressly permits the reader to follow the reasoning of the IARC working groups that made the evaluations. Readers may therefore make their own decisions to accept or reject them.

2) The IARC monographs and their associated evaluations and classifications are prepared by scientists actively working in the different areas of cancer research, spanning human and experimental pathology, epidemiology, genetics, molecular biology, and toxicology. These scientists are invited to participate on the basis of their expertise and their ability to make objective evaluations of evidence relevant to carcinogenicity. The scientists who participate in the preparation of any particular monographs are listed in the front of the relevant volume of monographs so that anyone can see who has done the work.

3) For the sake of consistency in evaluation and classification, comprehensive descriptions are given of the approach used by each IARC working group in both evaluating the evidence and arriving at a classification. These descriptions, prepared by a working group of scientists expert in the study of carcinogenesis, are not rigid rules, but rather guidelines for use by each working group. The evaluations as well as the assignment of an agent or exposure to one of the IARC classification groups is, and will remain, a matter of scientific judgment.

4) As of this date, no agent has been described in an IARC monograph as "carcinogenic to humans" without there being sufficient evidence of its carcinogenicity in epidemiological studies in exposed humans.

5) Since October 1991, the IARC monographs have presented data on the possible mechanisms of action of potentially carcinogenic agents. Where this evidence is of itself adequate, it may be used to either strengthen or weaken inferences about the carcinogenicity of the agent to humans.

H. Vainio
B. Armstrong
L. Tomatis
International Agency for Research on Cancer, 69372 Lyon Cedex, France

■

Choose Your Poison

Philip H. Abelson recently provided an insightful response (Letters, 4 June, p. 1410) to criticism of his 26 February edito-