Foreword

This publication by PICES Working Group 15 brings together reviews of the state of knowledge of harmful algal blooms (HABs) in the six PICES member countries of the North Pacific (Canada, Japan, People's Republic of China, the Republic of Korea, Russia and the United States of America) plus Mexico, up to 2001. Both HABs harming humans due to the consumption of contaminated marine products and those harming marine life are involved; both have major economic and social impacts. The reports summarize the impacts and provide insights into the understanding of the ecology of HABs in northern Pacific countries. All nations report severe HAB problems, often due to the same species of algae. These problems appear to be chronic in some countries, and worsening in others; the severity of HABs will likely continue into the foreseeable future. The need and potential value of co-operation in this and other similarly-affected regions is emphasized in this report.

Background and objectives

This report constitutes the first publication of PICES Working Group 15 (WG 15) on Ecology of harmful algal blooms (HABs) in the North Pacific. PICES, the intergovernmental North Pacific Marine Science Organization, derives its nickname from "Pacific ICES", the 10-year-old North Pacific counterpart to the 100 year-old ICES (International Council for the Exploration of the Sea) in the North Atlantic. The current member countries of PICES are Canada, Japan, People's Republic of China, Republic of Korea, Russia and the United States.

HAB is the internationally preferred collective name for harmful phenomena, also known variously as "red tides", "brown tides", and by similar names which may, confusingly, include harmless blooms or blooms without visible manifestations. They have freshwater counterparts but only the marine forms are considered here. The subjects harmed by HABs are either humans or marine fauna. WG 15 was formed as an initiative of both the Marine Environmental Quality (MEQ) and Biological Oceanography (BIO) Committees at the Eighth Annual Meeting of PICES in Vladivostok in 1998. It was established in recognition of dramatically increasing reports of HABs, not only in the North Pacific but also in the coastal regions of the world as a whole. Its goals are to promote the exchange of information and cooperation between the PICES member countries to assist in coping with HABs. A similar working group has been in existence under various guises in ICES for more than a decade, the North Atlantic being similarly afflicted with various types of HABs, including most of those mentioned here.

The membership and terms of reference for WG 15 are shown in Appendices A and B. As a first priority, the Working Group agreed that the state of knowledge on HABs and their impacts in each of the member countries needed to be reviewed to serve as a baseline for determination of regional needs. Other goals were to encourage regional communications, collaborative studies, standardization of methodologies, data sharing and, possibly, training initiatives. The interim activities of WG 15 are summarized in 2000-2001 Annual reports (Appendix C) and in Workshop report on Taxonomy and identification of HAB species and data management (Appendix D).

This is the first group to establish linkages among HAB studies in the six PICES member countries but it is not the first Pacific-based international organization to investigate HABs. In Southeast Asia, a HAB component was a significant part of a seven-year Cooperative Program in Marine Science, a project sponsored by ASEAN-Canada. The program included within-country training workshops for all the ASEAN countries: Malaysia (including Sabah and Sarawak), Indonesia, Brunei, the Philippines, Singapore, Thailand and Vietnam (which joined shortly before the program concluded). A communication network, based in the Philippines, was left in place after the program ended. WESTPAC, another regional scientific organization under IOC, has sponsored meetings and training courses on HABs in the western Pacific, and DANIDA and APEC have also focused on Pacific HABs mostly in Southeast Asia. IOC has a semi-permanent office dealing with global HABs that is located in Denmark. Most recently IOC-UNESCO has established an international program concerned with promoting the study of the ecology of HABs on a global scale, termed GEOHAB. At present most of the activity has been at the national level, most notably ECOHAB in the United States, but with national programs formed or forming in several other PICES member countries.

Our goal in preparing this report has been to provide a useful and practical guide to HAB-related problems, literature and related research/monitoring efforts in northern Pacific nations. For example, the literature relating to each country deliberately includes obscure local literature that might otherwise be missed by outsiders. The national reports provide a basis for future annual incident updates similar to those of the ICES working group. The activities of WG 15 have also brought to light discrepancies in approach and methodologies in the reporting and study of HAB data by the member countries (see

Summary and conclusions). Although there are some differences in detail among PICES member countries, this work has emphasized that all PICES countries suffer from common problems and challenges due to HABs. In many ways, HABs have created a bridge of understanding among nations that share bodies of water and coastlines. These nations are, in fact, more similar to one another than a single nation with multi-ocean coastlines such as Canada, Russia or the United States.

This commonality should help to unite HAB researchers in PICES nations in the future, motivating many international collaborative efforts that strive to better understand the ecology and oceanography of North Pacific and global HABs.

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