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Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters

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MACROINVERTEBRATE FIELD AND LABORATORY METHODS FOR EVALUATING THE BIOLOGICAL INTEGRITY OF SURFACE WATERS

by

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FOREWORD

Environmental measurements are required to determine the chemical and biological quality of drinking water, surface waters, ground waters, waste waters, sediments, sludges, and solid waste. The Environmental Monitoring Systems Laboratory - Cincinnati (EMSL-Cincinnati) conducts research to:

- Develop and evaluate methods to identify and measure the concentration of chemical pollutants.
- Identify and quantitate the occurrence of viruses, bacteria, other human pathogens and indicator organisms.
- Perform ecological assessments and measure the toxicity of pollutants to representative species of aquatic organisms and determine the effects of pollution on communities of indigenous freshwater, estuarine, and marine organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish.
- Develop and operate a quality assurance program to support achievement of data quality objectives for environmental measurements.

This manual describes guidelines and standardized procedures for the use of macroinvertebrates in evaluating the biological integrity of surface waters. It was developed to provide biomonitoring programs with the most recent benthic invertebrate methods for measuring the status and trends of environmental pollution on freshwater, estuarine, and marine macroinvertebrates in field and laboratory studies. These studies are carried out to assess water quality criteria for the recognized beneficial uses of water and to monitor surface water quality.

Thomas A. Clark
Director
Environmental Monitoring Systems
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PREFACE

The Aquatic Biology Branch, Quality Assurance Research Division, Environmental Monitoring Systems Laboratory - Cincinnati is responsible for the development, evaluation and standardization of methods for the collection of biological field and laboratory data by EPA regional, enforcement, and research programs engaged in inland, estuarine, and marine water quality and permit compliance monitoring, and other studies of the effects of impacts on aquatic organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish. The program addresses methods for sample collection; sample preparation; organism identification and enumeration; the measurement of biomass and metabolic rates; the bioaccumulation and pathology of toxic substances; bioassay; biomarkers; the computerization, analysis, and interpretation of biological data; and ecological assessments. Biological methods recommended for use in the U.S. Environmental Protection Agency are included in this manual: "Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters."

This document provides macroinvertebrate methods for evaluating the biological integrity of fresh, estuarine, and marine waters. The subjects covered include selection of sample sites, qualitative and quantitative sampling methods, sample processing, data analysis techniques, quality assurance and quality control procedures, safety and health recommendations, taxonomic bibliography, and the pollution tolerance of selected macroinvertebrate species.

The manual is a revision and enlargement of the chapter on macroinvertebrate methods originally published in the document, "Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents," Environmental Monitoring Series, USEPA, 1973, EPA-670/4-73-001, and was developed in the Aquatic Biology Branch, Environmental Monitoring Systems Laboratory - Cincinnati to provide biomonitoring programs with current methods for assessing point and non-point sources of impacts, status and trends water quality monitoring.

ABSTRACT

This manual describes guidelines and standardized procedures for using benthic macroinvertebrates in evaluating the biological integrity of surface waters. Included are sections on quality assurance and quality control procedures, safety and health recommendations, selection of sampling stations, sampling methods, sample processing, data evaluation, and an extensive taxonomic bibliography of the benthic macroinvertebrate groups. Supplementary information on the pollution tolerance of selected species, examples of macroinvertebrate bench sheets and macroinvertebrate data summary sheets, and a list of equipment and supplies for conducting biomonitoring studies are provided in the Appendices.

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