



Standard Guide for Behavioral Testing in Aquatic Toxicology¹

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1. Scope

1.1 This guide covers some general information on the selection and application of behavioral methods useful for determining the sublethal effects of chemicals to fish, amphibians, and macroinvertebrates.

1.2 Behavioral toxicity occurs when chemical or other stressful conditions, such as changes in water quality or temperature, induce a behavioral change that exceeds the normal range of variability (1).² Behavior includes all observable, recordable, or measurable activities of a living organism and reflects genetic, neurobiological, physiological, and environmental determinants (2).

1.3 Behavioral methods can be used in biomonitoring, the determination of no-observed-effect and lowest-observed-effect concentrations, and the prediction of hazardous chemical impacts on natural populations (3).

1.4 Behavioral methods can be applied to fish, amphibians, and macroinvertebrates in standard laboratory toxicity tests, tests of effluents, and sediment toxicity tests.

1.5 The various behavioral methods included in this guide are categorized with respect to seven interdependent, functional responses that fish, amphibians, and macroinvertebrates must perform in order to survive. These functional responses include respiration, locomotion, habitat selection, feeding, predator avoidance, competition, and reproduction (4). These responses can be documented visually or through video or acoustic imagery. Electronically recorded information can be derived through manual techniques or through the use of digital image analysis software. (5, 6, 7)

1.5.1 The functional responses are not necessarily mutually exclusive categories. For instance, locomotion, of some form of movement, is important to all behavioral functions.

1.6 Additional behavioral methods for any category may be added when new tests are developed as well as when methods are adapted to different species or different life stages of an organism.

1.7 This guide is arranged as follows:

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1.8 The values stated in SI units are to be regarded as the standard.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 9.

2. Referenced Documents

2.1 ASTM Standards:³

E729 Guide for Conducting Acute Toxicity Tests on Test Materials with Fishes, Macroinvertebrates, and Amphibians

E1241 Guide for Conducting Early Life-Stage Toxicity Tests with Fishes

E1383 Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates (Withdrawn 1995)⁴

¹ This guide is under the jurisdiction of ASTM Committee E50 on Environmental Assessment, Risk Management and Corrective Action and is the direct responsibility of Subcommittee E50.47 on Biological Effects and Environmental Fate.

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ The last approved version of this historical standard is referenced on www.astm.org.