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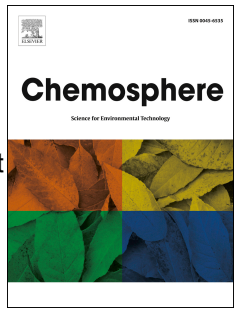

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In situ embryo toxicity test with sea urchin: development of exposure chamber for test execution

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Abstract

In situ toxicity tests represent a technique rarely performed owing to the lack of standard methodologies or to technical or economic problems. Nevertheless, its application would allow for a more realistic interpretation of pollution effects than those obtained by standard laboratory tests. The goal of this study is to develop and validate a specific exposure chamber for *in situ* exposition of *Paracentrotus lividus* embryos to obtain a defined methodology to perform the sea urchin embryo toxicity test in field conditions. After a first part of the study to verify the feasibility of the test chamber and the methodology, this approach was used as a tool to investigate whether the cruise ship "Costa Concordia" shipwrecked on Giglio Island (Tuscany, Italy), could have acted as a source of pollution. The results obtained for *in situ* tests showed, on average, percentages of normal embryos lower than those obtained in laboratory conditions and a greater sensitivity than for those obtained in the laboratory owing to the time-integration of results. Thus the exposure chamber and the i*n situ* methodology so far developed would appear to be suitable tools for future application in the environmental quality evaluation of marine waters.

Keywords: *in situ* bioassay; sea urchin; embryo; water quality; standardization

1. Introduction

Standard toxicity tests are often used in the evaluation of water contamination. A growing body of literature suggests they are useful tools when used correctly and in a multicomponent assessment approach. Nevertheless, procedures for the obtaining, conservation and manipulation of samples are highly heterogeneous and can greatly affect the results of the test (Rosen et al., 2012). In fact, the traditional laboratory tests increase the risk of losing representativeness because of sample manipulation and absence of the natural conditions (Chappie and Burton, 1997; Tucker and Burton, 1999; Adams et al., 2005; Burton et al., 2012). An alternative is to adopt *in situ* toxicity tests, carrying out the exposure of test species directly in the field and thus accurately reflecting the state of the environment. This technique allow for a more realistic scenario by integrating major natural fluctuating environmental variables, which could influence the bioavailability and the potential for toxic effect (Borgmann, 2000). On the other hand, *in situ* toxicity test also present the disadvantages