

**METHODS FOR AQUATIC ECOTOXICOLOGICAL EFFECTS ASSESSMENT:
DEVELOPING AN INTEGRATED APPROACH**

by

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Tangible

I have strayed from the traditional scheme of documents such as theses by opting to call this first section a tangible rather than the usual abstract. Abstracts are often just that. For the reader uninitiated in the field they can be very difficult to grasp. I have written this paper for a wide audience and I don't want to scare off any casually curious minds who have never heard of ecotoxicology, *Ampelisca abdita* (or any amphipod for that matter), BCFs, section 5a of the Toxic Substances Control Act (better known as ToSCA to its friends, foes, and admirers), or the safety factor concept. Yet I discuss all of this and more in these pages. To summarize concisely in a few paragraphs over 100 pages of research into which I have put so much time, thought, and energy is a task I don't feel particularly up to right now. So instead, I will try to give the curious reader pondering whether or not this paper is worth reading, the essence of why I pursued this topic so fervently.

Within the past twenty years a growing awareness for environmental issues triggered the proclamation of a wide range of legislation aimed at protecting the natural environment from excessive human impact. In addition to the numerous value questions raised concerning the "worth" of an unimpaired environment, this shift in focus also brought about the need for new scientific disciplines. People started asking questions of science which scientists had not begun to address. New experimental methods had to be developed to seek the answers. In this manner, the field of ecotoxicology was created from an amalgam of other disciplines, foremost among them classical toxicology and ecology.

A number of imposing difficulties face scientists in this field including our very limited understanding of natural ecosystems, the almost overwhelming complexity of the interactions and processes contained within an ecosystem, and the regulatory need for predictive assessments. Grappling with these obstacles can be both immensely frustrating and an exciting challenge. Through some "hands-on" research I did at the EPA Laboratory in Narragansett, R.I., I was able to immerse myself in the field and find out what is really

involved in doing environmental science. In Chapter 2, I try to convey to the reader the additional insight I gained from this experiential learning process.

While pursuing my specific scientific research on a tiny crustacean very few people have even heard of, many questions about its larger significance kept tugging at me. So I changed my focus from evaluating dredging policy (the organism I studied was being developed as a test species in a program to regulate the ocean dumping of dredged material) to evaluating how well ecotoxicological research of the kind I was doing was fulfilling its perceived purpose. Therefore this paper also evaluates the present state of the science in light of the political framework and societal goals out of which it was created.

We hear so much about what the environmental effects of a certain project will be, but often little thought is given to how we are actually determining what those effects will be. Before spending a great deal of effort debating whether a project with certain adverse impacts should be regulated or restricted, it is wise to take a close look at the risk assessment process. Just how certain are the estimates? Where do those figures with cryptic names such as LC(50)s and MATCs come from and what relevance do they have to the actual effects on the natural environment? Are the ecotoxicological methods being used the most appropriate for informing decisions on environmental issues? How have regulatory demands and other external pressures constrained the development of more suitable methods?

This paper is addressed towards answering questions such as these. A great deal of energy, time, and expense is spent in debating, weighing, and challenging decisions based on risk estimates. I propose that not enough attention has been given to developing the scientific methods by which we obtain them. So for those of you interested in learning a bit more about the science which lies behind all the environmental policy decisions which we read about in newspapers everyday, I invite you to read on.