Woods Hole Sea Grant: 1994-1996 Projects

Molecular Probes for Cytochrome P4501A: Provision and Use in Chemical Effects in Research and Monitoring

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Detecting and interpreting the significance of chemical effects on marine biota continues to be an important environmental and scientific issue. These studies involve the use of highly specific molecular probes for establishing the degree, sites of action, and significance of effects of critical environmental contaminants. Continuing Sea Grant support for studies of a family of enzymes, cytochrome P4501A, yield important clues about contaminant detection. This project will produce, evaluate and provide highly specific molecular probes for establishing details about marine environmental contaminants and their effects. The assessment and interpretation of chemical effects in resident biota in estuarine and marine resource species will be greatly enhanced by methods for examining cytochrome P4501A regulation in specific cells. The approaches and probes may be applied in biomarker analysis of commercial, endangered and rare species, to conclusively address questions of chemical effects in the marine environment.

Detection and Quantification of Harmful Species Using Molecular Probes: Phase II

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Over the last two decades, the economic and public health impacts from harmful algal blooms ("red tides") have increased dramatically in the United States and throughout the world. One result of this expansion is that regulatory officials and the fishing industry now face a broad array of affected species spanning all levels of the food chain, many of which can be contaminated by several different toxins. These changes have forced a major reevaluation of strategies to monitor seafood products for marine biotoxins, now a time-intensive and costly process. This project--a collaboration between academia, commercial interests, and a federal marine biotoxins and seafood safety program--will investigate two promising approaches to the rapid and accurate detection and enumeration of harmful algal species, with the goal of developing molecular probe-based assays that can be used in the laboratory and the field by personnel with varied levels of technical expertise.

Development of Species-Specific Immunofluorescent Markers for Larvae of Benthic Invertebrates

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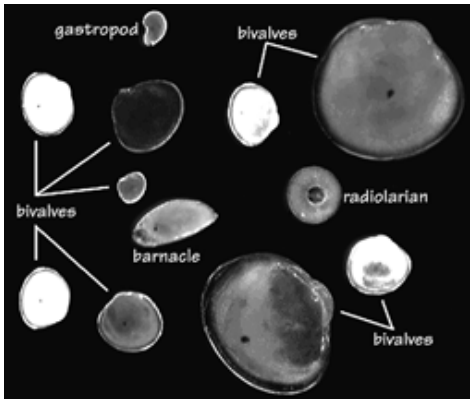
The need for easy, rapid, reliable identification of benthic invertebrates and other small, morphologically indistinguishable marine organisms at the larval stage is undisputed. The recent addition of molecular methods to the arsenal of techniques for use in species identification is revolutionizing sytematics, ecology and applied science; such methods are sure to improve the state of larval taxonomy. This project will develop species-specific immunofluorescent markers for broad-scale applications in processing large numbers of field samples for planktonic larval distributions. Proving the concept and application of immunofluorescent, species-specific markers for the identification of planktonic larvae would be invaluable for monitoring environmental quality (as "biosensors" for early detection of environmental deterioration or other biological hazards); for in situ aquaculture (identification of potential food items, predators and competitors or the targeted culture species); for ecosystems research (providing information on the biggest black box in the system, larval supply); for fisheries management (providing critical information for analyses of food-web relationships); and for early detection of invasions of exotic species that may displace local dominate endemics.

During the planktonic larval phase, different species of bivalves -- several of which are shown to the right -- are extremely difficult to identify, due to subtle differences in shell shape and hinge structure. With Sea Grant support, researchers are working to develop species-specific fluorescent probes that would enable biologists to quickly identify organisms beyond the level of major taxonomic group, to a level that has greater ecological significance and impact.



Last updated: June 24, 2014

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