

Marine Genetic Resources: Experiences in Commercialization

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Genetic material from marine microbes, plants, and animals hold great potential for mankind as medicine, food and bioremediation products. This is because the oceans represent over 90% of the planet's biosphere, encompassing extremes of temperature, pressure, light and nutrients. These selective pressures have resulted in unusual proteins and biochemicals within this genetic diversity. While biotechnologies based on marine genetic resources are relatively new, there are good examples of marine-based pharmaceuticals, enzymes, nutritional supplements, and biochemical probes used in cell biology. In addition, important biomaterial, agrochemical, and antifoulant leads are currently in development.

The commercialization of marine genetic resources is time-consuming and costly; requiring strong partnerships between the public and private sectors, as well as stable regulatory systems. The process of commercialization can be long (up to 20 yrs for some pharmaceuticals), and costly (current estimates suggest as much as 1 Billion USD for a drug to reach the marketplace). Most commercial applications will find their inspiration from wild-collected marine organisms, but due to issues of sustainability, phytosanitation, and production needs, most products will be ultimately developed through aquaculture, laboratory cell culture, total synthesis of biochemical products, and heterologous gene expression. Basic understanding of the biology of these organisms can often lead to approaches to enhance product yield while protecting rare species and/or endangered habitats.

One of the most promising sources of marine genetic diversity are microbes. Currently only about 1% of marine microbes can be cultured in the laboratory allowing fermentation products to be collected. Recent work with community profiling via molecular techniques has started to unlock some of the resources from "unculturable" microbes.

Marine genetic resources offer direct compensatory benefits to parts of the public and private sectors for developed intellectual property. However, there are many diffuse benefits to society as a whole with respect to the use of novel biotechnologies (e.g., new drugs, nutritional supplements, etc), as well as training opportunities, capacity building, basic scientific knowledge and its application to ecosystem health, etc. As we move forward in the commercialization of marine genetic resources, several recommendations are germane: (1) we need to support research that provides a more complete understanding of marine biodiversity down to the microscopic level; (2) we must develop techniques and technologies that foster sustainability and ecosystem health; and (3) we must accelerate moving our growing knowledge about marine biodiversity and genetic resources into the development of new products for the health and well-being of people, our environment, and our economies.