

Marine Biotechnology: Milestone Events and Perspectives with Particular Emphasis on Genetic Tailoring of Fish

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Biotechnology using marine genetic resources will be one of key activities addressing the numerous issues facing mankind in this century especially with respect to sustainable human welfare. Land-based production (output per hectare) has reached maximal levels and there are numerous bottleneck issues that is further aggravated by environmental conditions in future. Thereby, marine and aquatic resources offer the best hope and has been given much attention as a target of a new wave of researches. Research of marine genetic resources based on platform technologies including genomics, bioinformatics, transgenics and molecular breedings can offer new opportunities to provide valuable information, biomolecules and desired phenotypes of an organism. This technology should be consisted of three major sub-parts: (1) discovery of desirable genes followed by the molecular genetic manipulation, (2) *in vivo* and/or *in vitro* transgenesis of target genes to generate novel geno- and phenotypes, and (3) molecular genetics and breeding of transgenics for maximizing the usefulness of the transgenics. Recent advances in high throughput screening techniques have readily extended the 'wish list' of target traits in genetic improvement of domestic animals. Also the direct acquisition of desired function in an organism by gene transfer has made it possible to overcome the weakness of probability-based approach in traditional breedings. Research activity in a well-organized fashion will play significant roles in (1) addressing food security by dramatic enhancement of productivity in aquatic or marine farms, (2) providing biological system for the illumination of gene expression in the genomes of aquatic and/or marine organisms, and (3) generating the transgenic bioreactor allowing the mass-production of useful biomolecules. This powerful new technology will not only revolutionize the efficiency and capability of aquaculture but also enable us to understand and answer the numerous biological questions arising from sea.

The potential application of these new biotechnological approaches in marine bio-industry could bring us closer to achieving the growing demands of marine bioresources. Molecular biological technologies including transgenic manipulation have, for the past two decades, made a major contribution in all disciplines. Furthermore, the recent advance in genomics and proteomics allows us to perform high throughput screening of geno and phenotyps by networking with many other biological databases. Transgenic application assisted by such modern technologies will be potentially important as means to bridge gaps in our knowledge for understanding the marine genomes and consequently developing valuable marine bioresources.