

Services Provided by Marine Genetic Resources

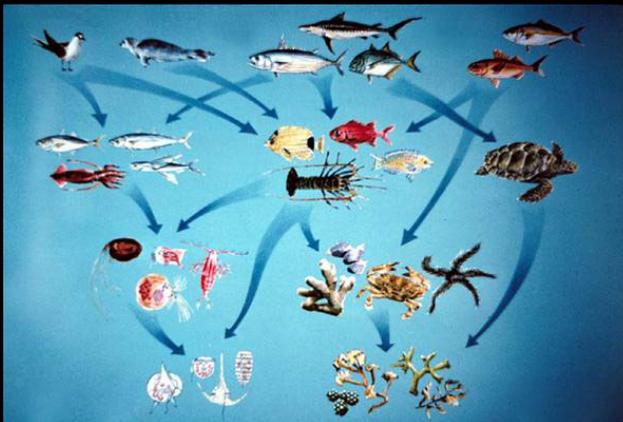


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UN Open-Ended Informal Consultative Process on Oceans and the Law of
the Sea

June 25, 2007

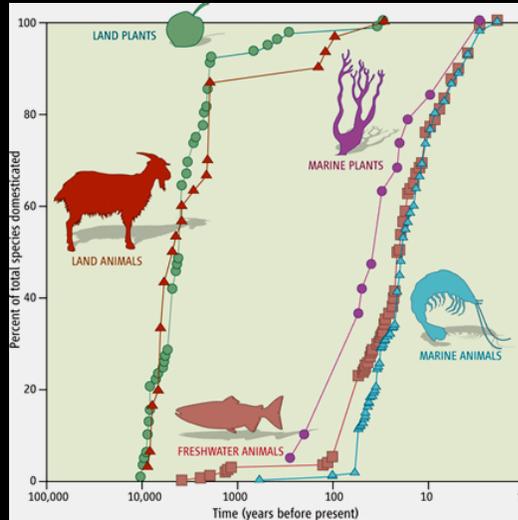
Services Provided by Marine Genetic Resources



Oxygen production
Carbon cycling
Ecosystem stability
Food

http://celebrating200years.noaa.gov/breakthroughs/ecopath/food_web_600.html

Rapid Increase in Marine Aquaculture



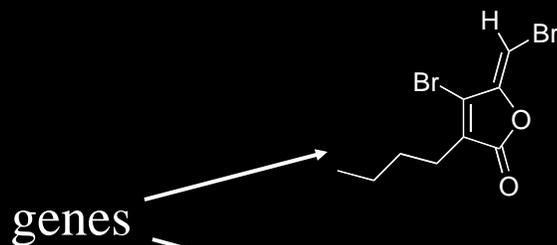
106 aquatic species domesticated in the past decade

>3000 marine species used as food

Genetic improvement of marine species is often facilitated by short generation times and huge reproductive output

Duarte, Marba, and Holmer (2007) Science 316: 382-383.

Services Provided by Marine Genetic Resources



Organic metabolites for drug discovery, personal care products, and industrial applications



Proteins, enzymes and biopolymers for biotechnology and industry

Conotoxins: Agents for Pain

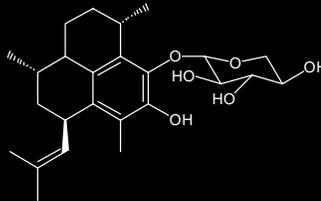


The predatory cone snail *Conus magnus* kills its prey using an array of paralyzing peptides.

ω -conotoxin MVIIA (ziconatide, Prialt) is a potent calcium channel blocker that has been developed as a treatment for intractable pain.



Pseudopterins: Anti-inflammatory Agents



Pseudopterogorgia elisabethae

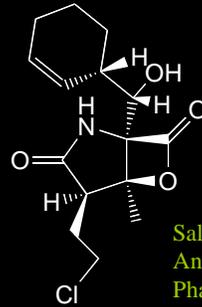
Anti-fouling Agents



Delisea pulchra

Givskov et al. (1996) J. Bacteriol. 178:6618

Marine Microorganisms: The Next Frontier



Salinosporamide A
Anticancer agent
Phase I Clinical Trials

New genera of actinomycetes are now being reported that reside exclusively in the marine environment.

These bacteria are chemically prolific and produce structurally unique molecules with significant biomedical potential.

Feling et al. (2003) *Angew. Chem.* 42:355-357.

Mincer et al. (2001) *Appl. Environ. Microbiol.* 68: 5005-5011

Examples of Marine Proteins and Biopolymers

Polymerases used by biotechnology researchers to replicate DNA.

Fluorescent proteins from jellyfish have been developed into reporter systems to study cell regulation.

Numerous possible applications for marine enzymes in industry and biotechnology (future development area).

Other marine biopolymers, such as seaweed carrageenans, are used as food additives, in personal care products, and for biotechnology.



Additional Current and Future Applications for Marine Microorganisms

Bioremediation of hazardous waste and polluted environments.

“Probiotic” agents to protect cultured finfish and shellfish against marine diseases.

Some cyanobacteria are used as nutritional supplements (e.g. spirulina).

Development of microbial fuel cells to power ocean instrumentation in remote locations.

Further Development and Understanding of Services Provided by Marine Genetic Resources

Conservation of marine ecosystems.

Access to remote environments.

Cross-disciplinary collaboration among scientists and engineers.

Knowledge sharing through open-access databases.