

International cooperation and coordination on
issues related to
Marine Genetic Resources
Current and future challenges
Social and Economic Aspects

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United Nations Open-ended Informal Consultative Process
on Oceans and the Law of the Sea – 8th Meeting

Marine Biodiversity

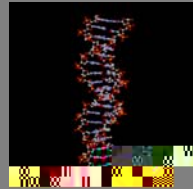
- High diversity in the marine environment (coral reefs, hydrothermal vents, deep water corals)
- Largely unknown
 - Weddell Sea (CML)* - 674 isopod species (90% new spp.)
 - Deep Sea Corals – under threat, more than half are already gone
 - Genomic and bioinformatics** – 1.2 million genes - 1,800 bacterial species in the Sargasso Sea
- Difficult access
 - Shallow waters are most studied - about 5% of the world's oceans
 - Scientific research in the high seas
 - Special technology
 - High costs
 - International cooperation

* Nature 447, 2007

**PLoS Biology 5(3), 2007

Genetic Diversity

- We know less about genetic diversity than we do about species diversity
- The sea
 - Cradle of life
 - Marine organisms
 - Key to our evolutionary history
 - Main components of the Earth's phyletic biodiversity



Sequenced Marine Metazoans

- Five species from three groups *

Vertebrates - Puffer fishes

Takifugu rubripes



Tetraodon nigroviridis

International Fugu Genome Consortium (four institutions)

* Wilson *et al.* 2005. *Marine Ecology* 26, 3-16.

Sequenced Marine Metazoans

Urochordates – Sea squirts and larvacea

Ciona intestinalis

-International (26 institutions)

Ciona savignyi

- National (four institutions)



Appendicularian

Oikopleura dioica

-International two institutions

Sequenced Marine Metazoans

Echinoderm - sea urchin

Strongylocentrotus purpuratus

- International several institutions

Marine Genetic Resources

- New set of tools
 - Genomics, bioinformatics and proteomics
 - Small microorganisms
- Promise for understanding
 - Species physiological responses to the environment
 - Gene-environment interactions that determine biodiversity at multiple scales
- Biotechnology
 - Aquaculture (disease control)
 - Pharmaceuticals
 - Cosmetics
 - Environmentally friendly technology

Biotechnology and Genetic Resources in Brazil

- National Policy on Biotechnology
 - Develop innovative biotechnological products and processes and build capacity within research institutions
- Approximately 1,700 biotechnology research groups
 - Human genome project – consortia institutes
 - Genetic vaccine against the dengue virus
- Very few working with MGRs

Biotechnology and Genetic Resources in Brazil

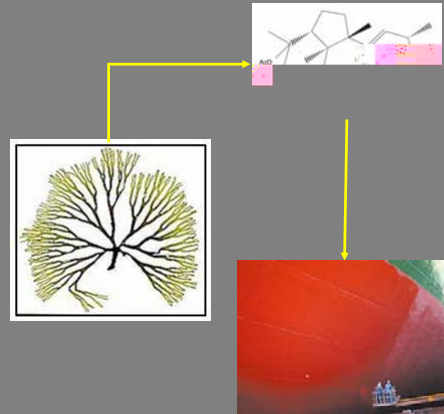
- International Cooperation
 - 12 countries
 - Argentina, France, Germany, United Kingdom, USA
 - Limited regional cooperation

Experiences from UFF

- Microbe-killing gel from a type of algae found at the “Atol das Rocas Biological Reserve” may be used to block HIV infection.
 - Preliminary lab tests - 95% efficient against HIV virus with low cytotoxicity.
 - Final product – more than 50% efficiency.
 - A product with at least 30% efficiency would help to reduce 40% of the number of new HIV cases each year in Africa.

Experiences from UFF

- A secondary metabolite from a seaweed collected at the “Atol das Rocas Biological Reserve” showed antifouling activity.
- Further studies – potential use as an environmentally friendly antifouling paint



Extremophiles from the Deep Sea

- Organism which thrives in 'extreme' conditions
- Found on the deep ocean floor, hydrothermal vents
- Genes that help the adaptation of the organism to extreme conditions
- Potential industrial application
 - Lipases – catalyze the hydrolysis of long chain triglycerides
 - Biotechnological applications
 - fat and oleochemical industry
 - biodegradable polymers
 - detergent industry
 - Cosmetics
 - production of biodiesel
 - *Oceanobacillus iheyensis* - Proteolytic enzymes, detergents.

Marine Genetic Resources Legal Framework

- United Nations Convention on the Law of the Sea (UNCLOS)
 - Living resources + Marine Scientific Research
 - Benefit of mankind as a whole
- Convention on Biological Diversity (CBD)
 - Jurisdictional Scope

Marine Genetic Resources Conclusions

- Ad Hoc Working Group, established by the UNGA, to be convened in 2008.
- MGRs uses beyond national jurisdiction should aim to provide benefits to all populations.

THANK YOU