

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 – 8<sup>th</sup> Meeting

## Marine Biodiversity

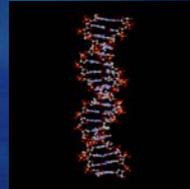
- High diversity in the marine environment (coral reefs, hydrothermal vents, deep water corals)
- Largely unknown
  - Weddell Sea (CML)\* - 674 isopod species (90% new spp.)
  - Deep Sea Corals – under threat, more than half are already gone
  - Genomic and bioinformatics\*\* – 1.2 million genes - 1,800 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

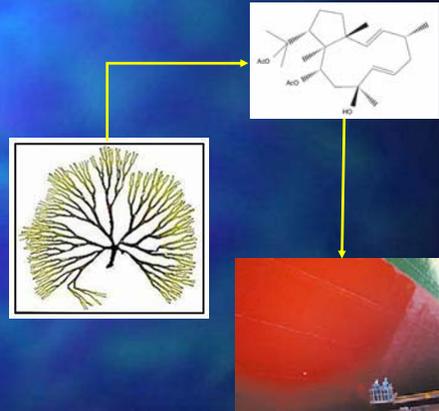
- International Cooperation
  - 12 countries
    - Argentina, France, Germany, United Kingdom, USA
  - Limited regional cooperation

## 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
- TRIPS Agreement

## Marine Genetic Resources Legal Framework

- Marine Scientific Research
- High Seas versus International Seabed
- ABS Regime
- IPRs
- Ex-situ conservation
- Biopiracy

## **Marine Genetic Resources Legal Framework BRAZIL**

- National Council for Management of Genetic Resources (CGEN)
  - Collection permits
  - Prior consent
  - Access permits
  - Contracts
- IP/C/W/474 – Doha Work Programme
  - Outstanding implementation issue on the relationship between the TRIPS Agreement and the Convention on Biological Diversity –
    - disclosure of origin of biological resources

## **Marine Genetic Resources Conclusions**

- Current regimes: MSR, Marine living resources, ABS, IPRs and Common Heritage of Mankind.
- Fill the knowledge gap (enormous hole of knowledge absence) to understand oceans
- Increase international cooperation (IOC)
- Build capacity in developing States
- Resources conservation in the HS/Area

## 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