



Bioactive compounds from marine organisms: How to prospect and preserve this potential?

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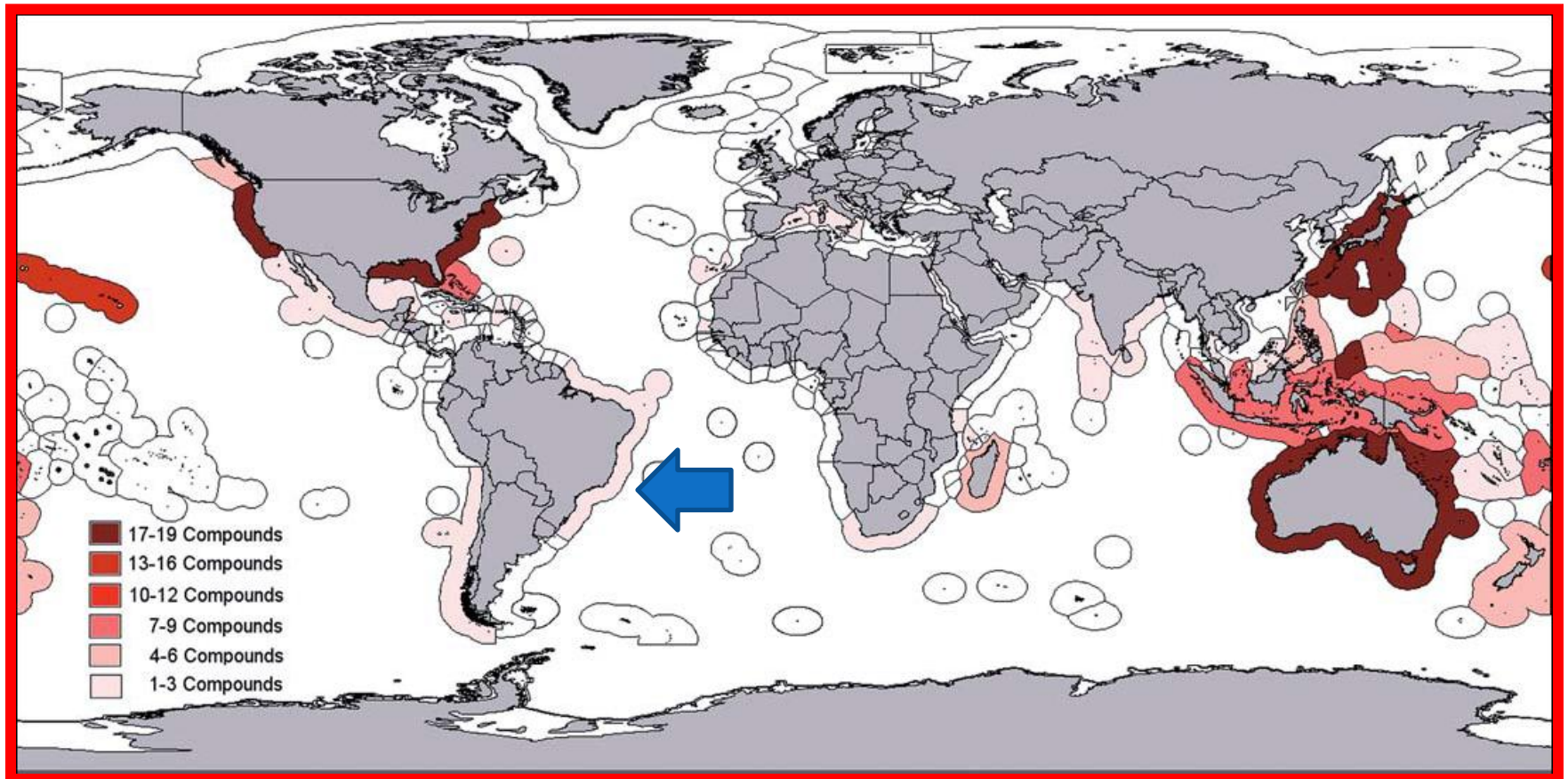
Definition

Bioprospecting is the exploration of biodiversity
for new biological resources of social and
economic value

Why this talk?

- The bioprospecting is beginning in Brazil.
- This is an opportunity to evaluate if the strategies are appropriate.
- Approach other than bioprospecting probably are important and pertinent.

Quantitative distribution - number of new marine natural products



Case studies

Marine bioprospecting=

Secondary metabolites are resources
of great interest



Why this great interest?

Structural variability

Broad biological activity

Why this structural variability?

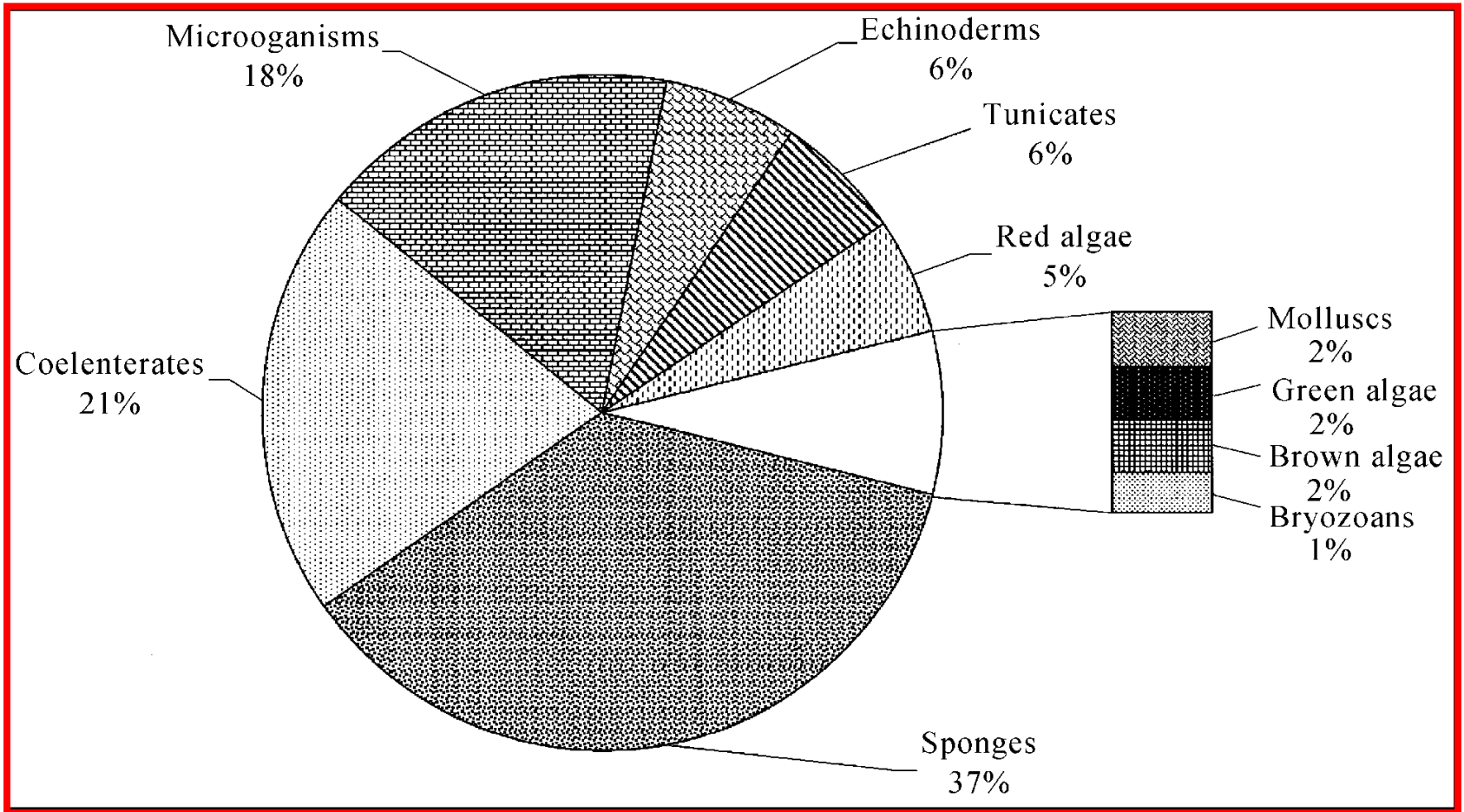
- Broad variation of temperature (Antartic to 350 °C)
- Variation of pressure (1 to 1000 atm)
- Oligotrophic to eutrophic areas
- Afotic to disfotic areas

Importance of ecological investigations

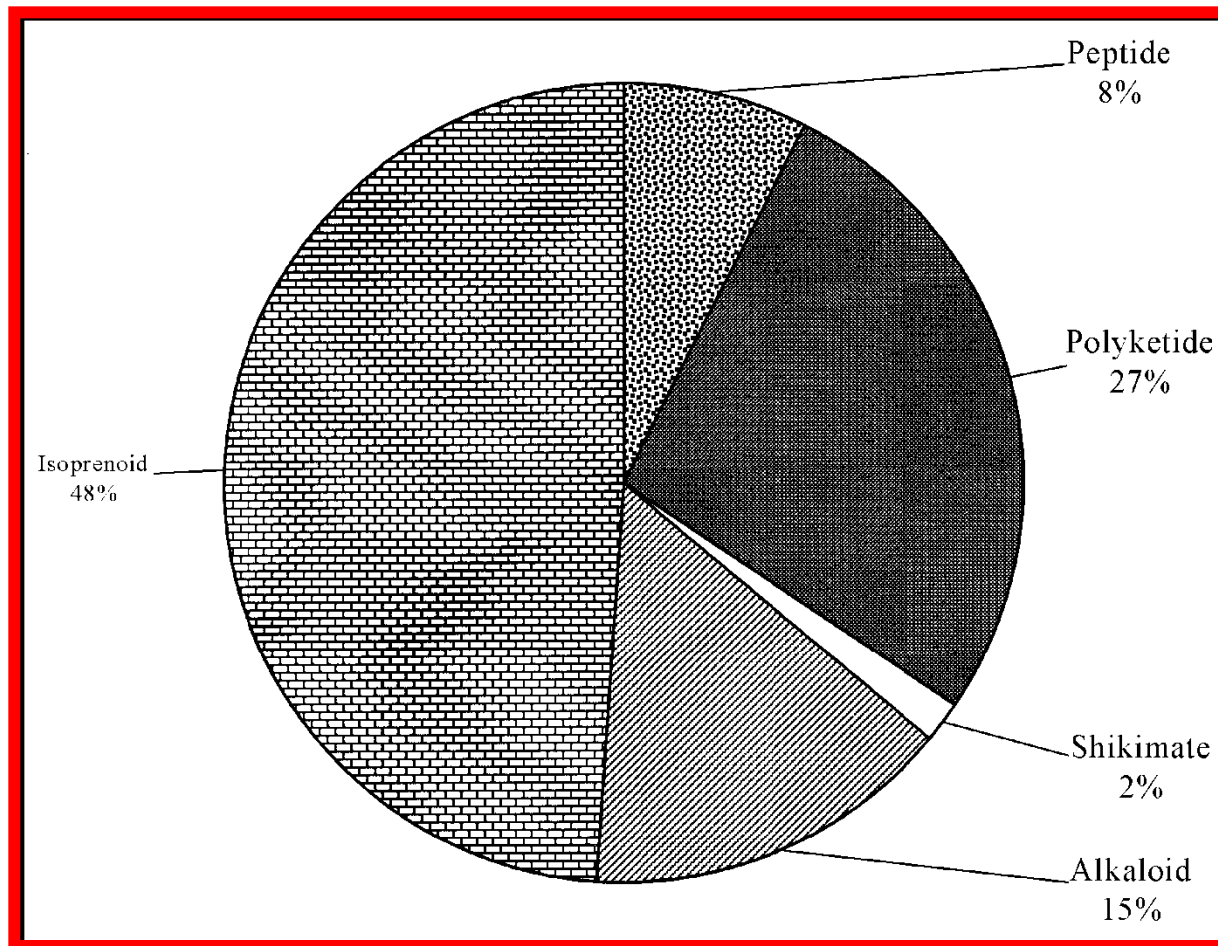
Biological activities

- **antimitotic**
- **antibacteria**
- **antifungic**
- **anti-inflammatory, etc**

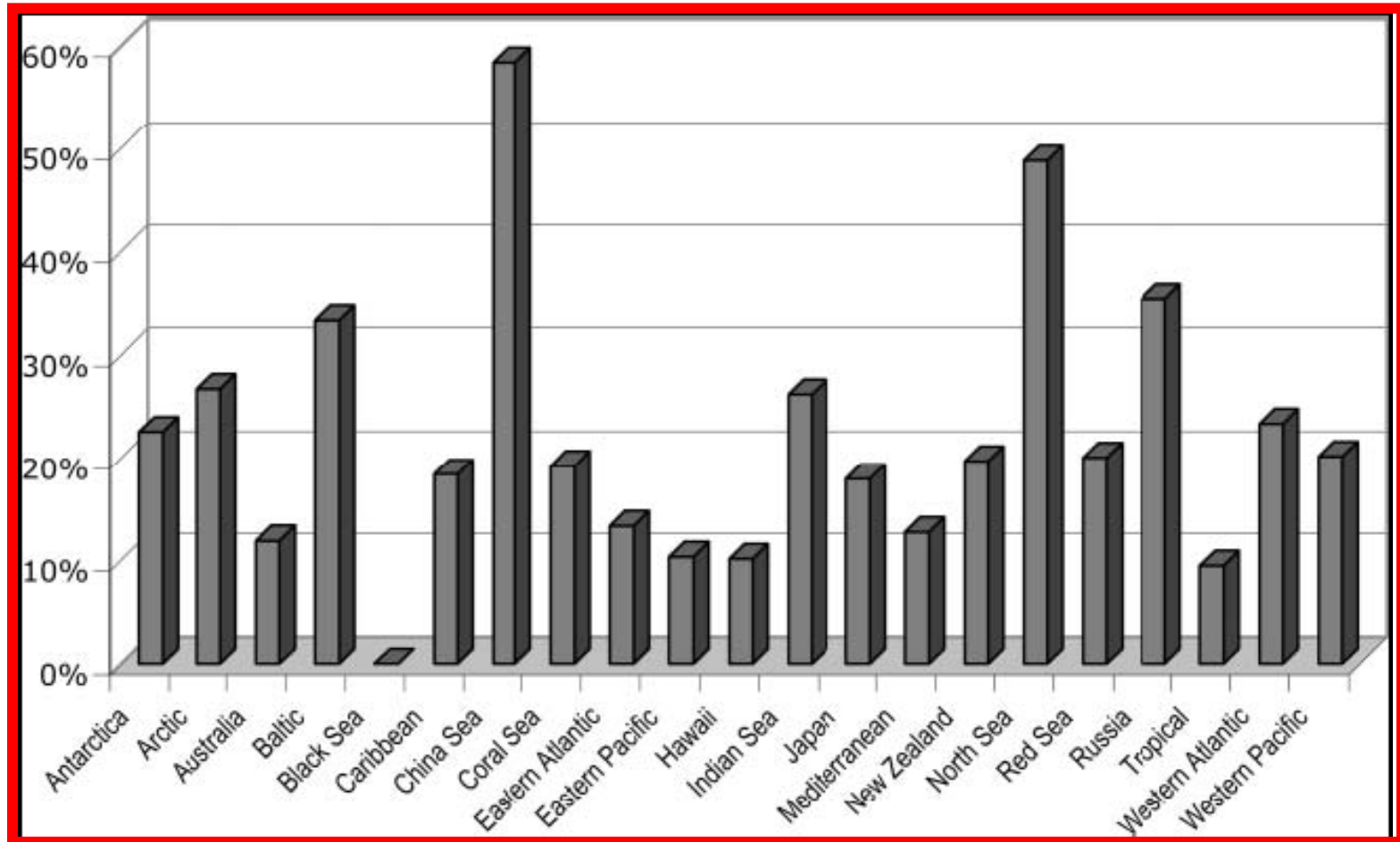
Distribution of natural products by marine Phylum



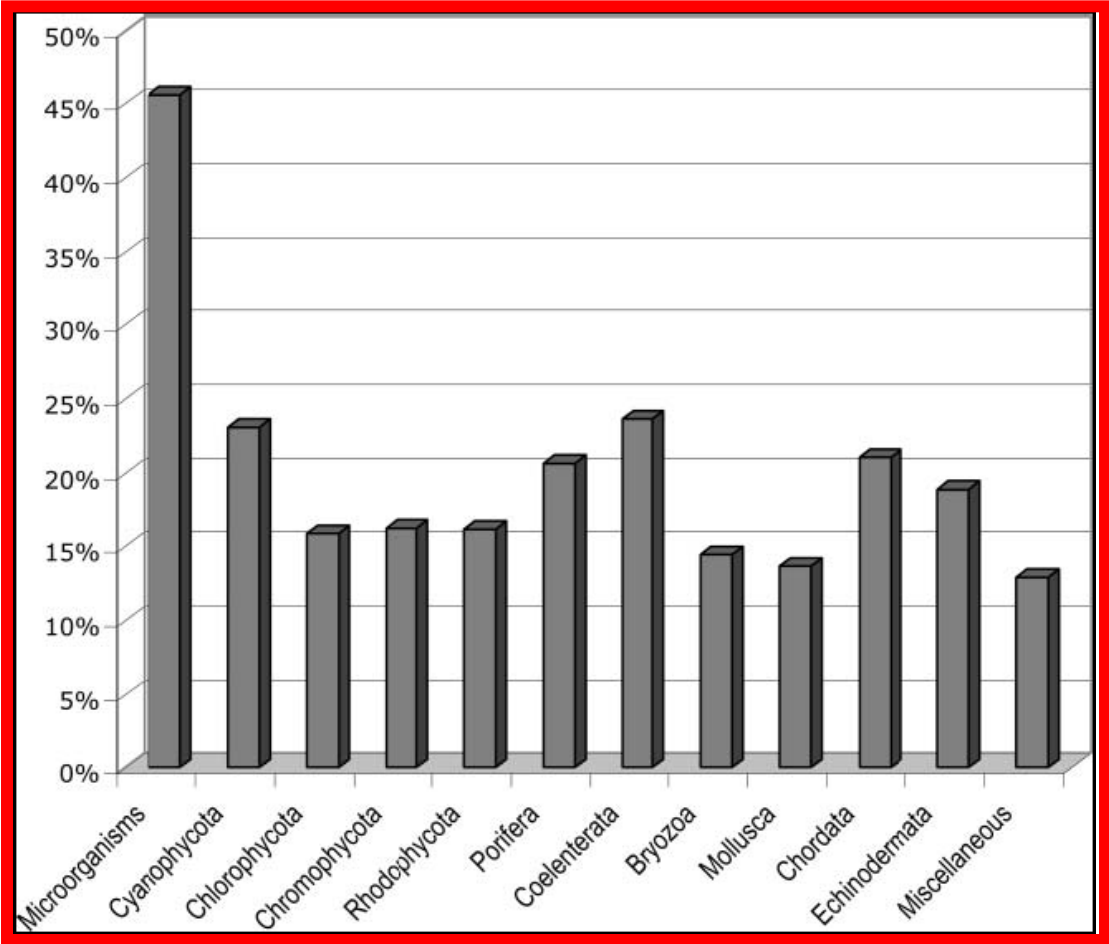
Biogenetic origin of MNP



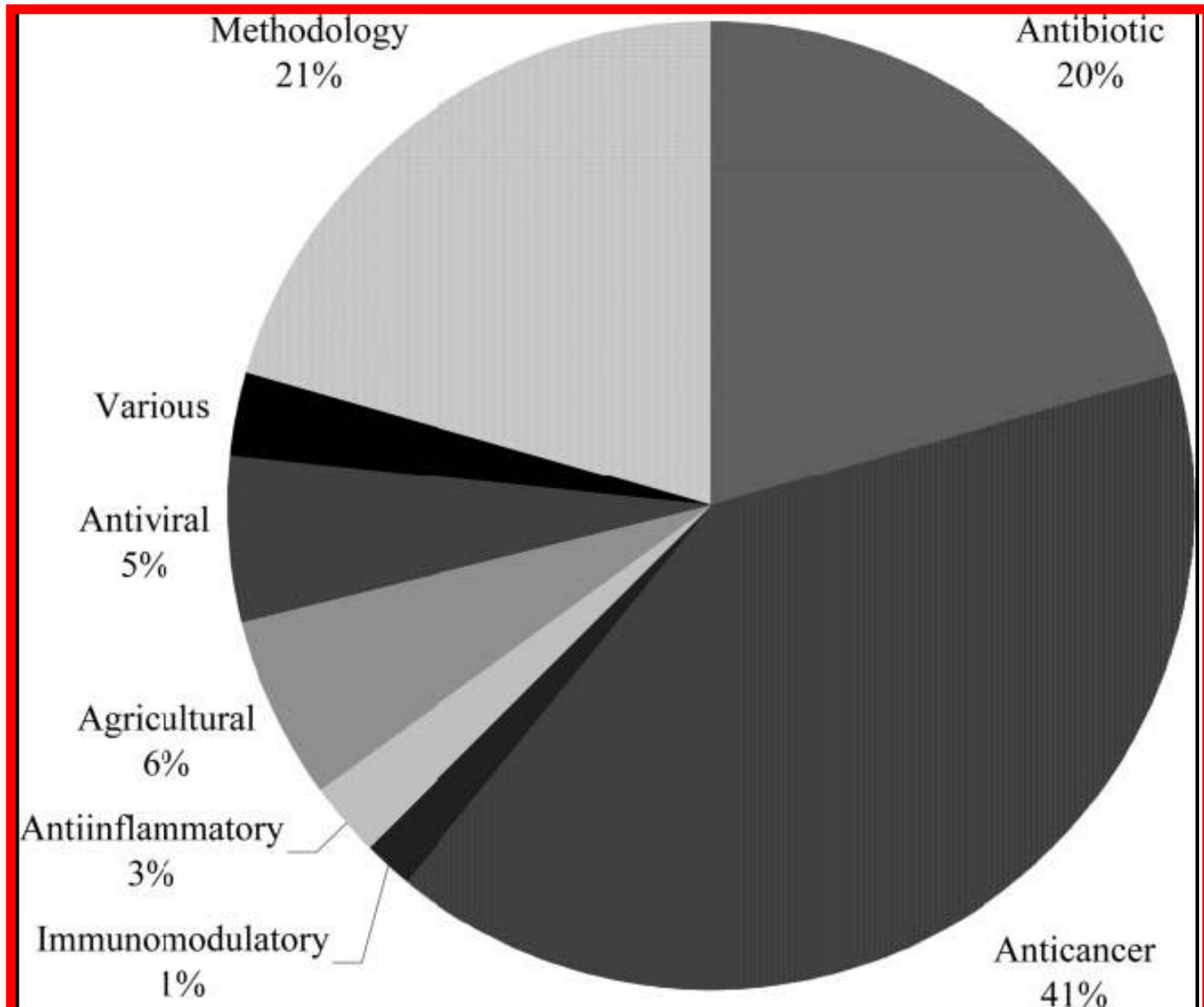
Citation by region (2001-2005) as percentual of the total (1965-2005)



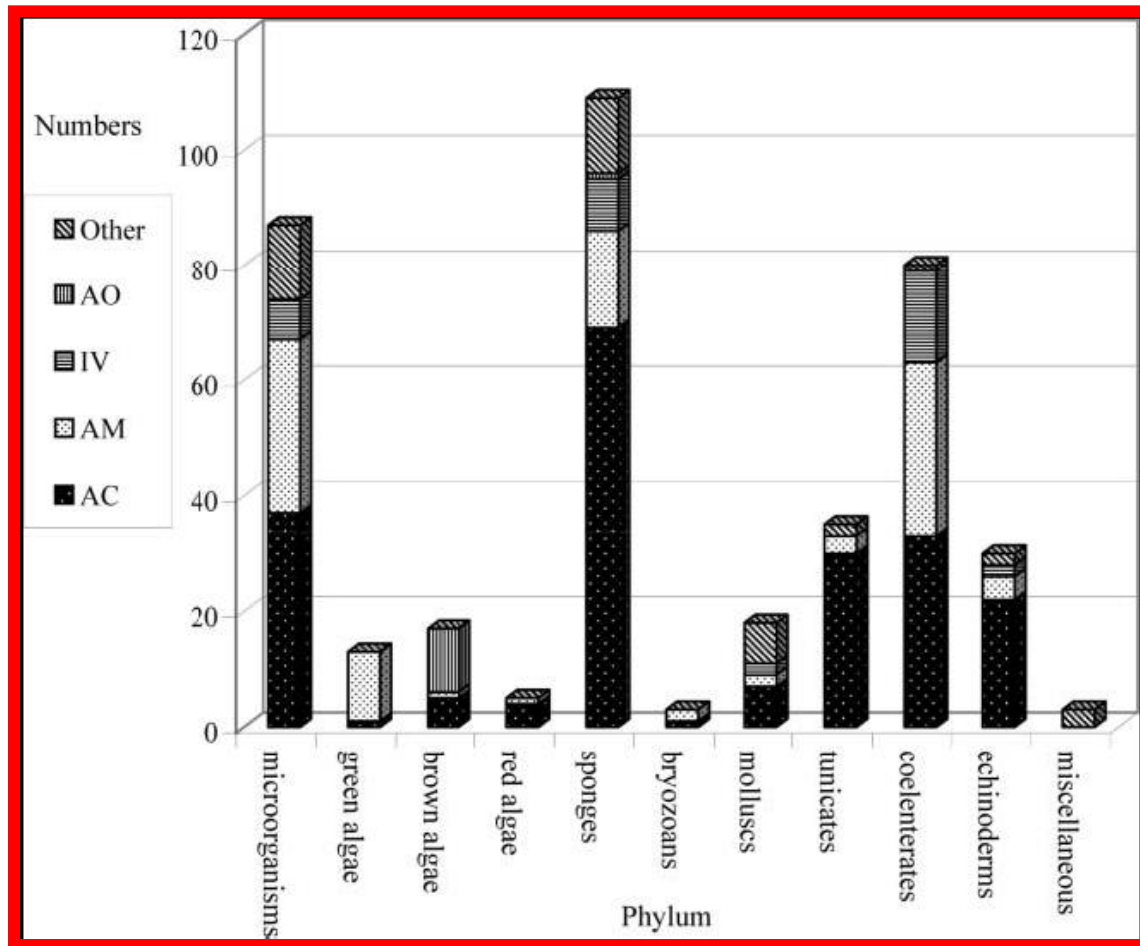
Citation by Phylum (2001-2005) as percentual of the total (1965-2005)



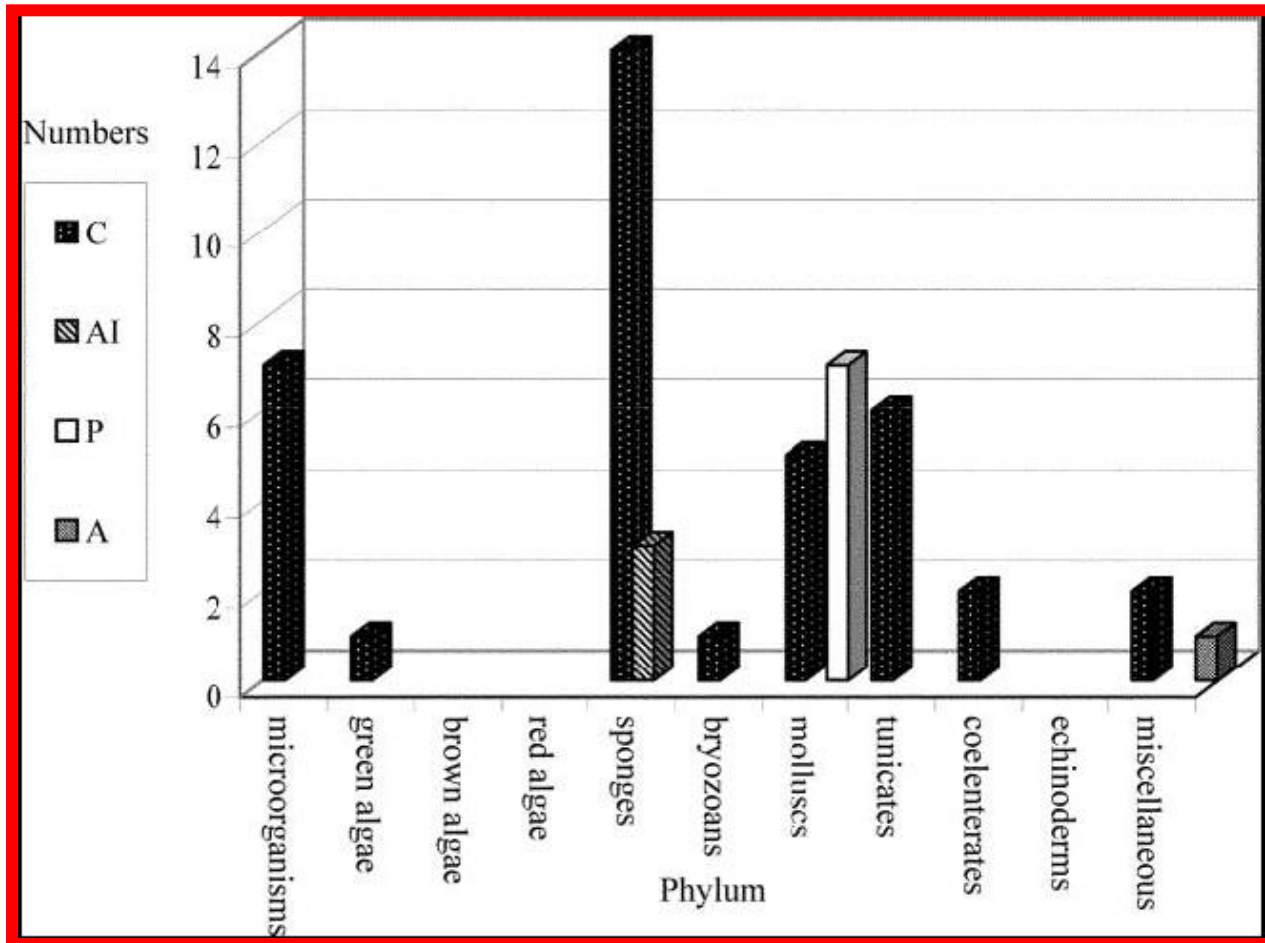
Biological tests



Biological activity by Phylum



Number of metabolites in clinic and pre-clinic stages





**Why this potential is not a
commercial reality?**



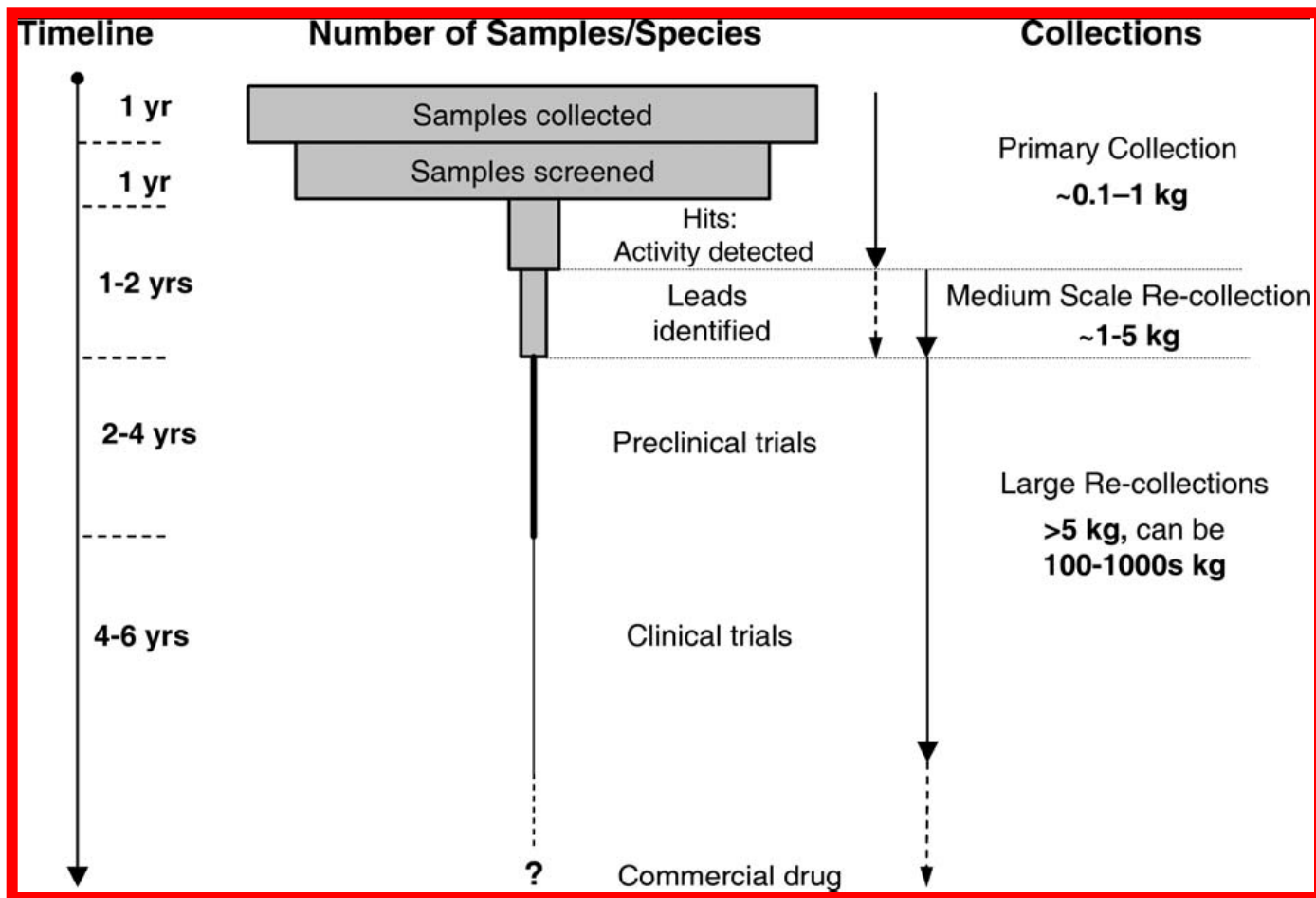
If selection is true, who selected?

**The enemies of the marine organisms are distinct
from human diseases.**



Limitation

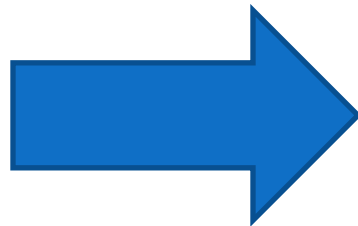
Discovery and development of drugs



...is complicated, lengthy, and expensive.

Diversity of tests

- antimitotic
- antibacteria
- antifungic



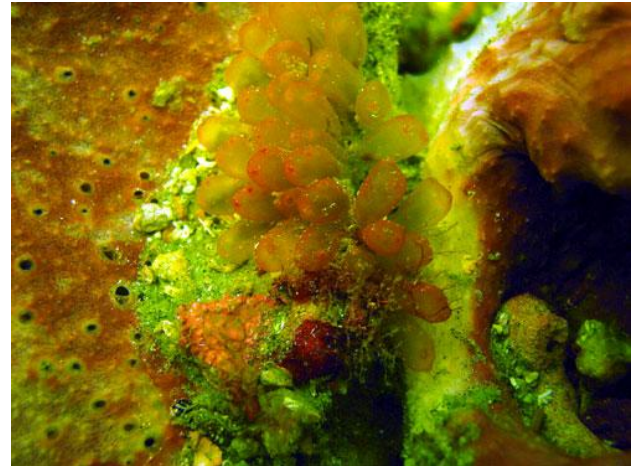
Drug?



**Drug development from the sea
is often hampered by the
difficulty of obtaining sufficient
supply**

Supply of material

**ET-743 from *Ecteinascidia turbinata*
anticancer**



For obtention of 1g, 1 ton of ascidia

Supply of material

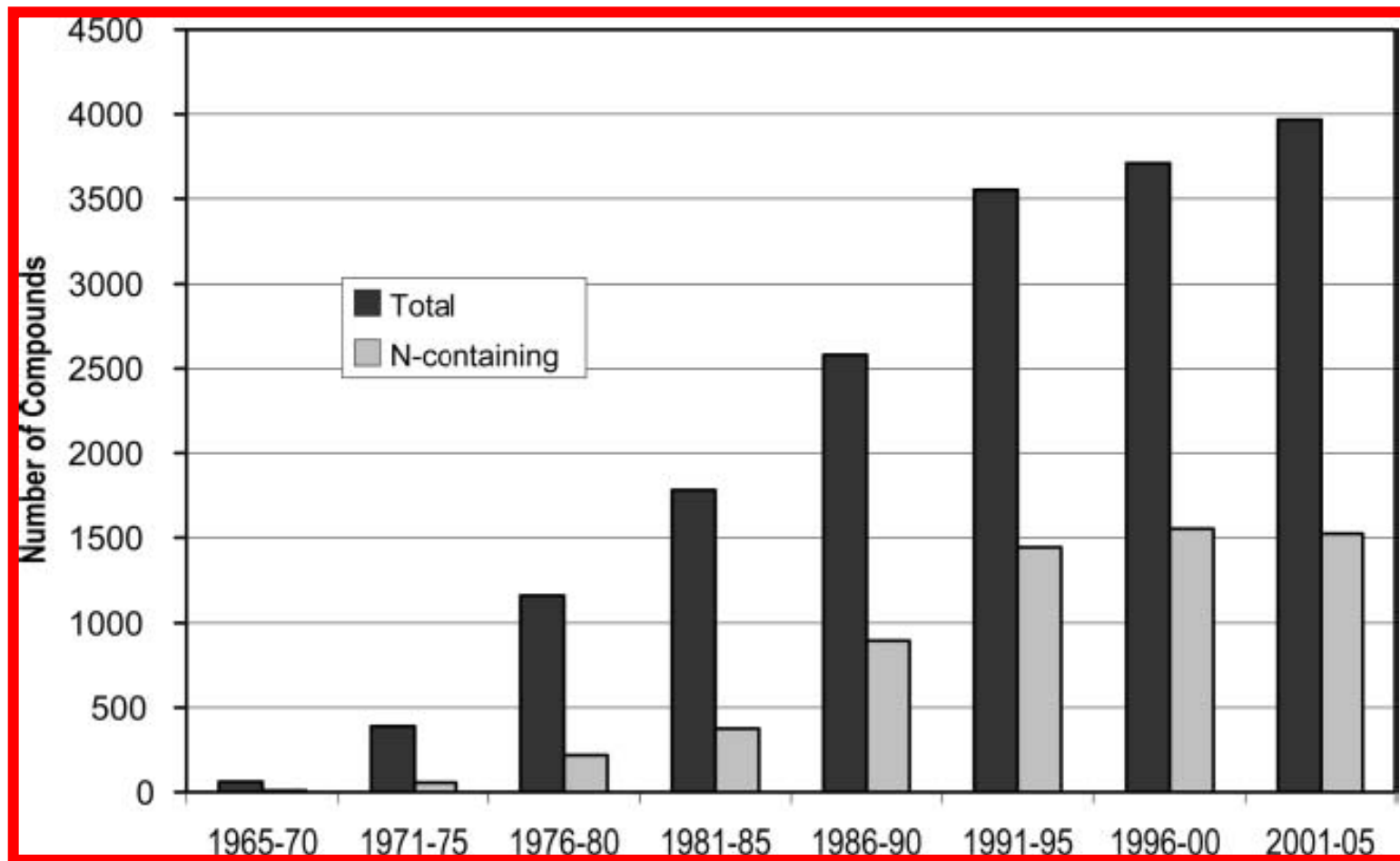
Halichondrina B from *Lissodendoryx*



To obtention of 300mg → 1 ton of sponge

To supply demand 1 a 5 Kg/year → 3 to 16 tons

Number of MNP – 1965-2005

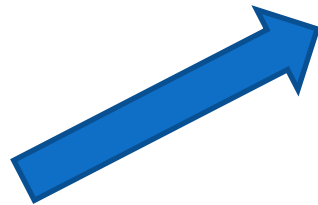




ALTERNATIVES

Synthesis

Difficulties



High complexity

Intellectual work

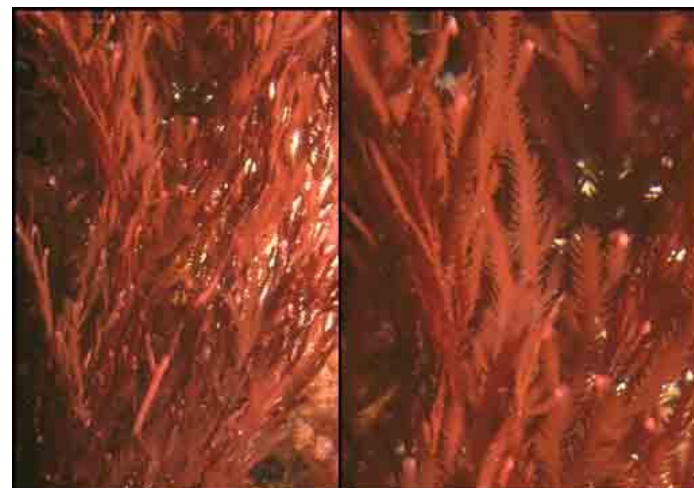
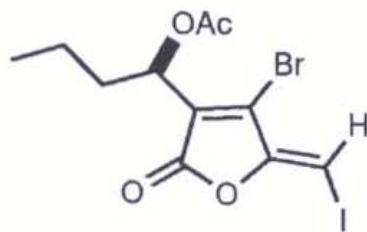
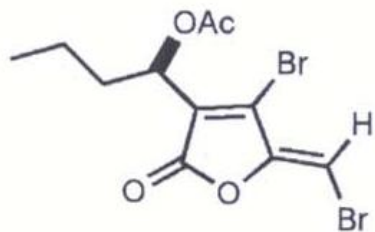
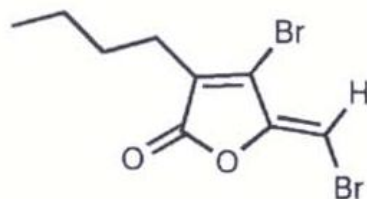
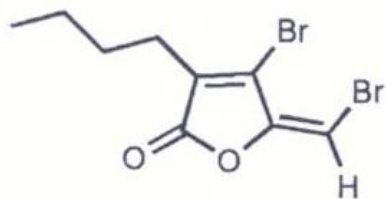
High cost

Low yield

Library of molecules

- Guarantee of supply.

Furanones from *Delisea pulchra* inhibit the bacteria *Staphylococcus epidermidis*.



Delisea pulchra

Photos: J.M. Huisman

Cultivation of microorganisms

Bugula neritina bryostatins

Actual

Ecteinascidia turbinata

ET-743

Supply is insufficient to world demand!



Cultivation of seaweeds

- **Results only for seaweed phycocolloids.**
- **Few studies about optimal conditions for production of secondary metabolites.**

Alternatives

- **Investigation on cultivation conditions**
- **Isolation of gen responsible by production of the compounds**



Cultivation of microorganisms

Production of secondary metabolites

Case studies – exploring variation

- Large scale: chemical defenses are more potent in tropical than temperate populations;
- Smaller scales: variance among local population, among different life stages or portions of a single individual;
- Damage from natural enemies or physical stresses result in great levels or types of chemicals.

Case studies – exploring variation

- Induction and activation of chemical defense after attack appear to be common;
- The frequency of activation among seaweeds appear greater;
- Similar prey responses to cues emitted by nearby predators also occur.

Knowledge of this variance can exploited for the discovery of novel pharmaceuticals

Contemporary bioprospecting has multiple goals

- conservation of biodiversity;
- sustainable management of natural resources;
- biodiversity as economic resources



Ecological ways

- applying ecological principles to discovery new drugs;
- sustainable management of natural resources;
- economic resources

Perspectives for Brazil

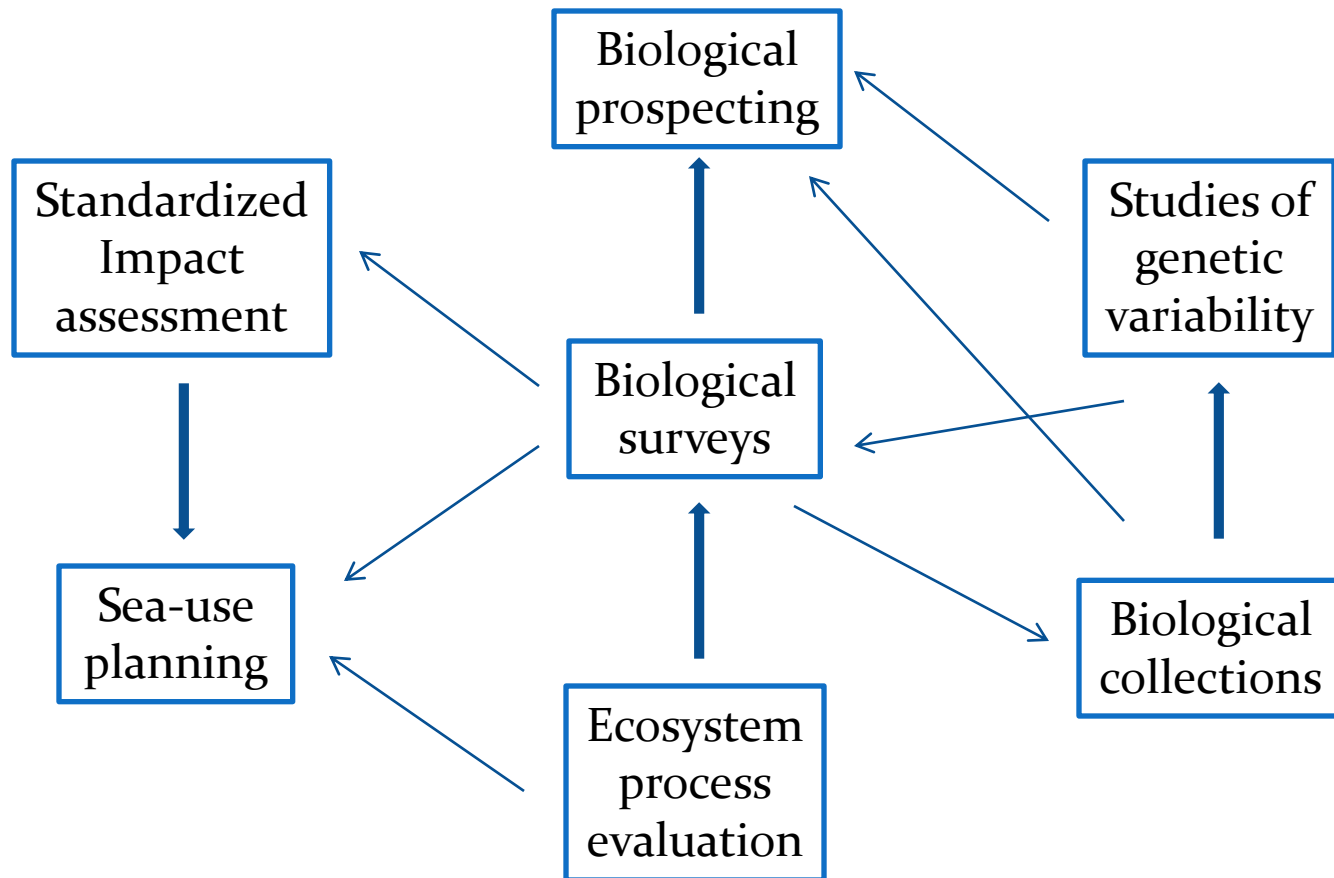
- Continue screening?
- Deepen the preliminary research without guarantee of supply?
- Search synthesis of active metabolites?

Perspectives for Brazil

Search sustainable alternatives:

- Cultivation of microorganisms?
- Genomic and proteomic approach?
- All alternatives at the same time?

Interactions among biodiversity studies - importance of integration





Perspectives for Brazil

**Establish politics of integrating ecology and
bioprospecting for supply material**

Thanks

