About OMICS Group

OMICS Group International is an amalgamation of Open Access publications and worldwide international science conferences and events. Established in the year 2007 with the sole aim of making the information on Sciences and technology 'Open Access', OMICS Group publishes 500 online open access scholarly journals in all aspects of Science, Engineering, Management and Technology journals. OMICS Group has been instrumental in taking the knowledge on Science & technology to the doorsteps of ordinary men and women. Research Scholars, Students, Libraries, Educational Institutions, Research centers and the industry are main stakeholders that benefitted greatly from this knowledge dissemination. OMICS International also organizes 500 International conferences annually across the globe, where knowledge transfer takes place through debates, round table discussions, poster presentations, workshops, symposia and exhibitions.

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OMICS International is a pioneer and leading science event organizer, which publishes around 500 open access journals and conducts over 300 Medical, Clinical, Engineering, Life Sciences, Pharma scientific conferences all over the globe annually with the support of more than 1000 scientific associations and 30,000 editorial board members and 3.5 million followers to its credit.

OMICS International has organized 500 conferences, workshops and national symposiums across the major cities including San Francisco, Las Vegas, San Antonio, Omaha, Orlando, Raleigh, Santa Clara, Chicago, Philadelphia, Baltimore, United Kingdom, Valencia, Dubai, Beijing, Hyderabad, Bengaluru and Mumbai.

UNIVERSITA' degli STUDI di NAPOLI
"Federico II" - Napoli

Frontiers in Comparative Endocrinology: challenges and opportunities of the "Program of Relevant National Interest", PRIN 2010-2011, prot. 2010 ARBLT7, UniNA operative unit

Giulia Guerriero

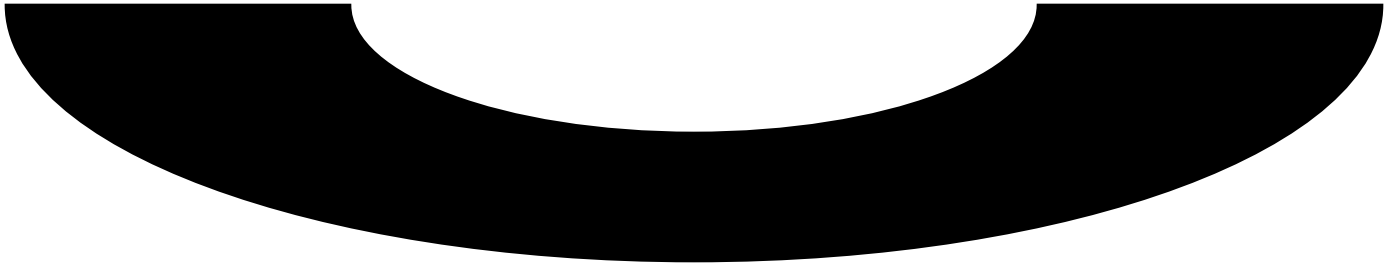
4th International Conference and Exhibition on
Metabolomics & Systems Biology
April 27-29, 2015 Philadelphia, USA

- **Environmental Sustainability and Territorial Biomonitoring**

- **The italian "Program of Relevant National Interest", PRIN 2010-2011, prot. 2010 ARBLT7, UniNA operative unit**

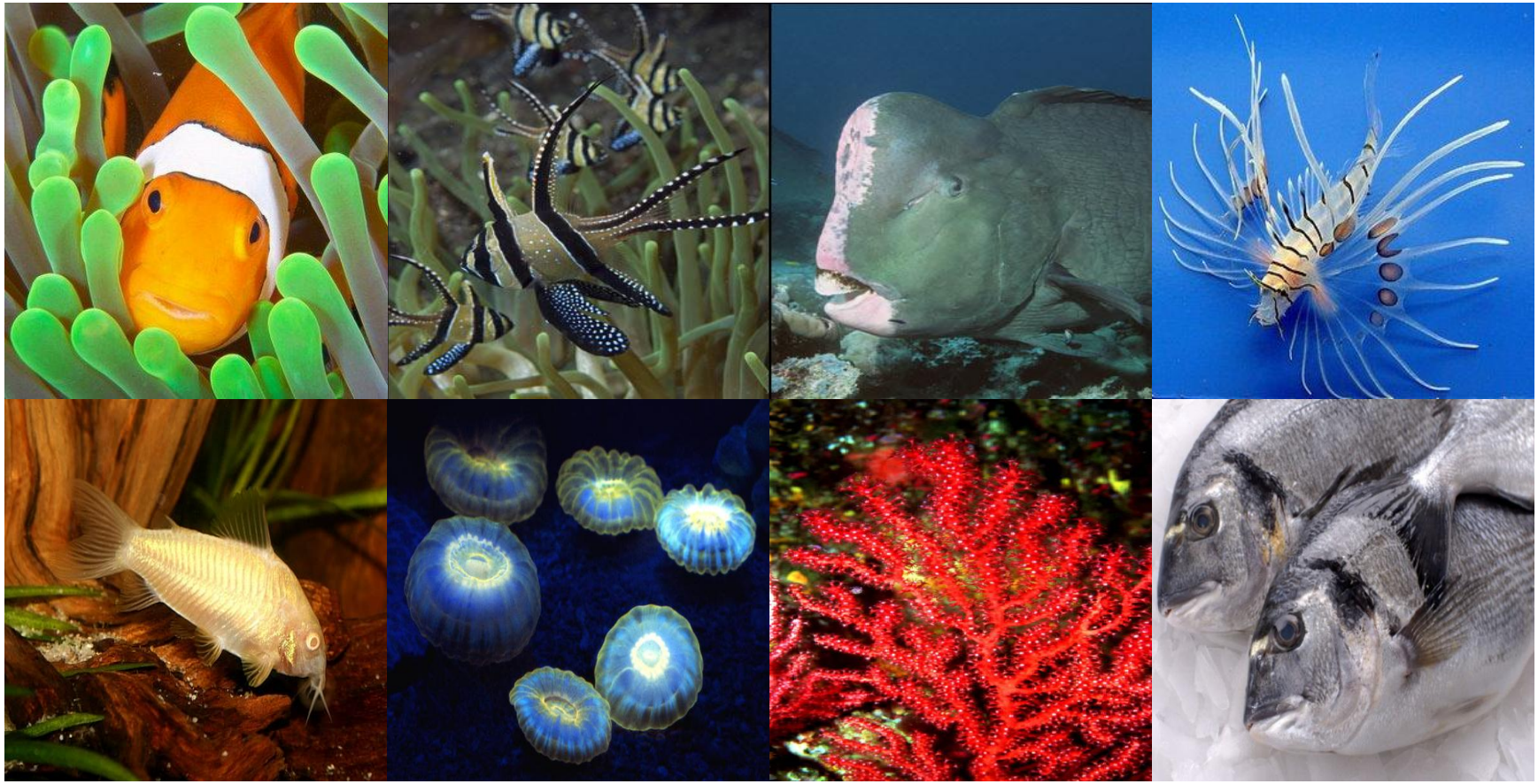
Environmental Resources

Cheap Goods



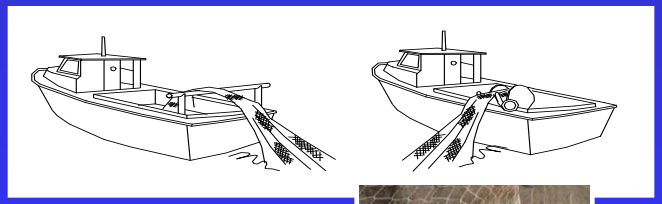
...freshwater and marine systems offer and sustain important habitats

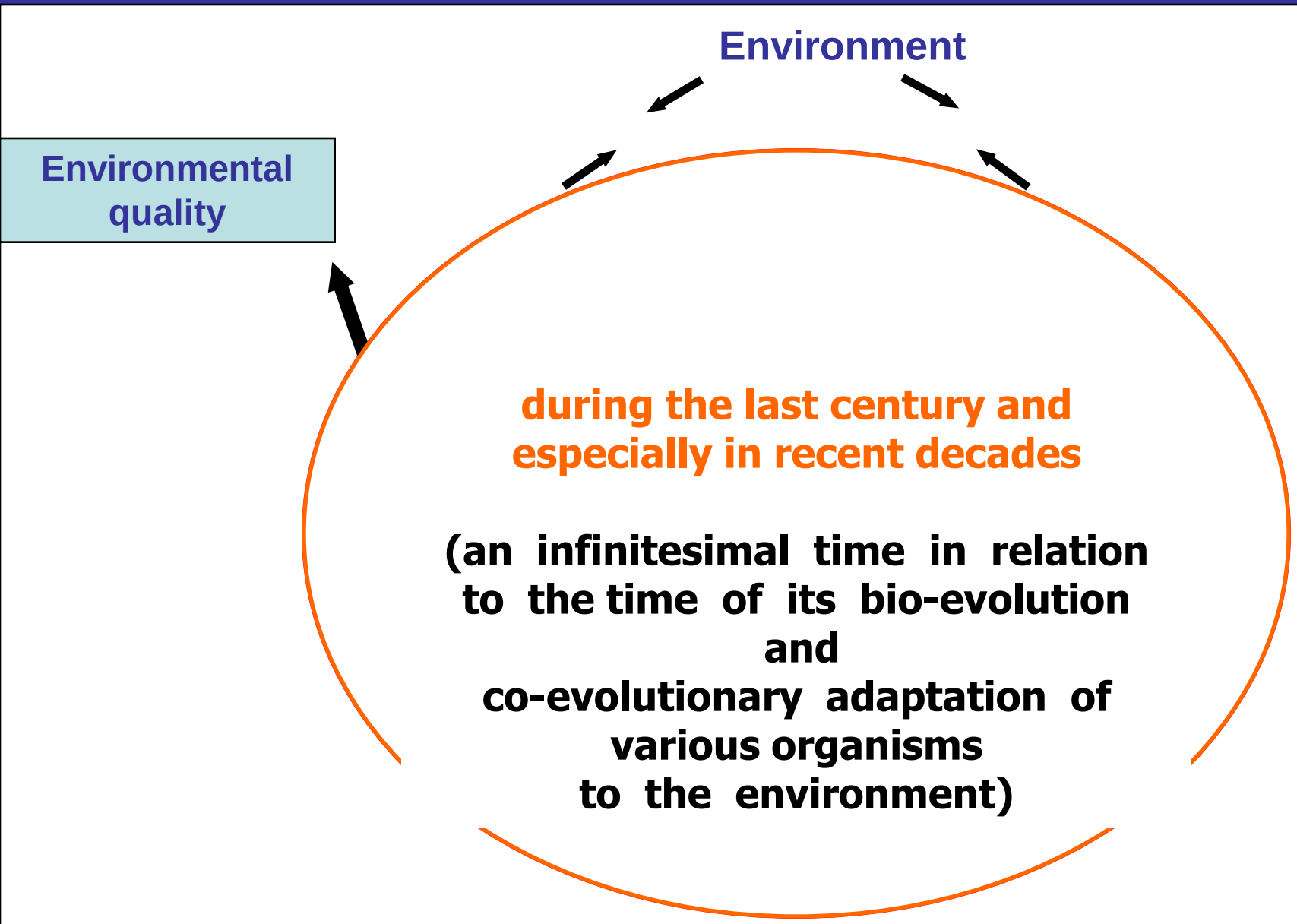
Freshwater and marine systems and aquatic species

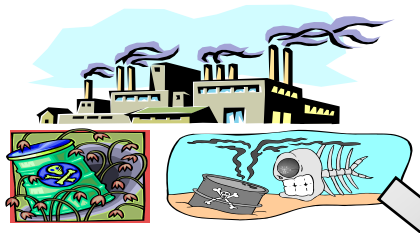


- resources & environmental damage -

Freshwater and marine systems and human activity




Environment
Environmental quality
during the last century and especially in recent decades
(an infinitesimal time in relation to the time of its bio-evolution and co-evolutionary adaptation of various organisms to the environment)

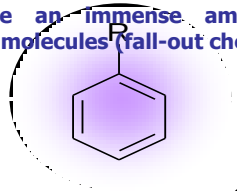


INDUSTRY

DOMESTIC WASTE

ORGANIZATIONS LIVING

-produced and released into the biosphere an immense amount of artificial molecules (fall-out chemical)



solvents

drugs

Benzine

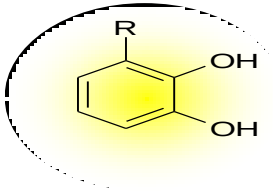
Explosives

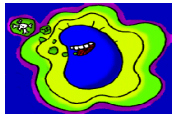
Polymers

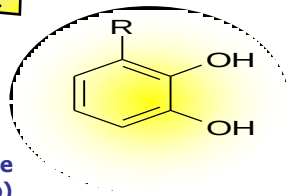
Adhesives

agrochemicals

Food



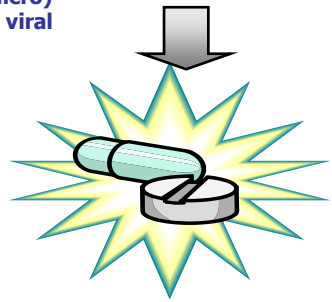




-transformed entire ecosystems (micro) biological and viral infections

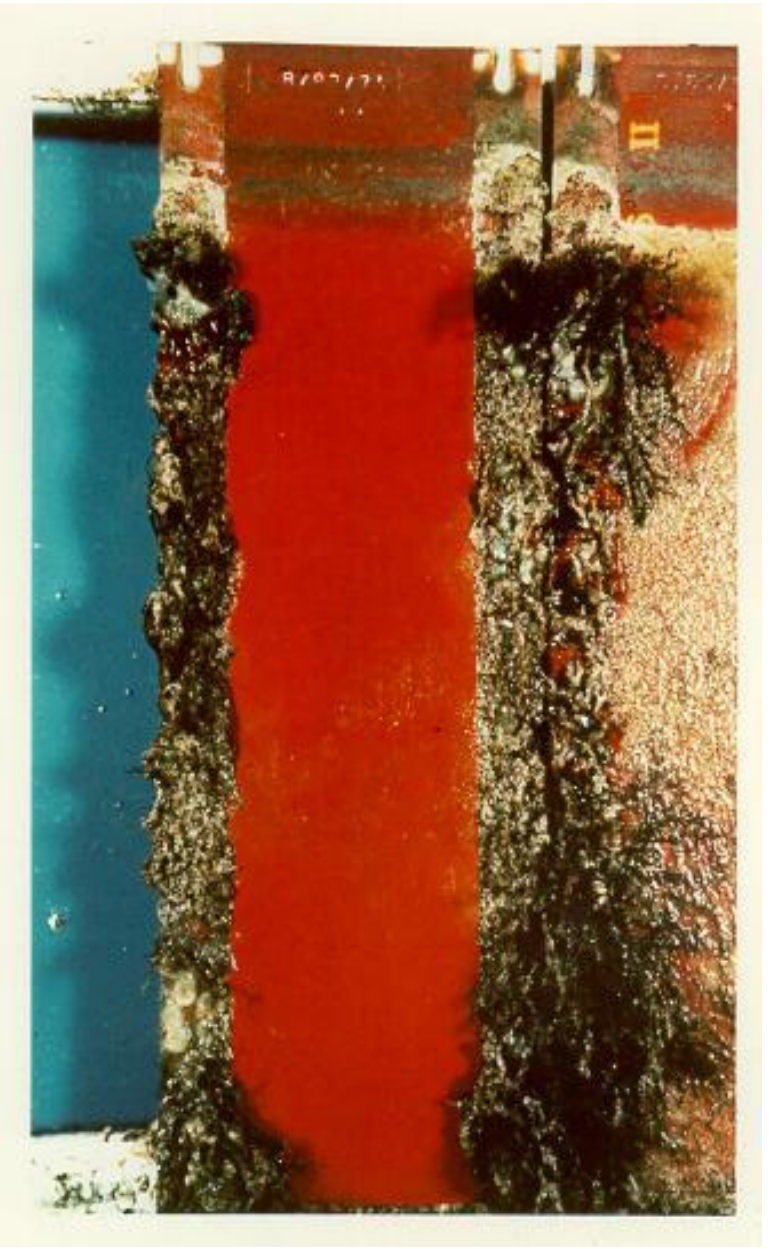
increased the range of sources and forms of radiant energy

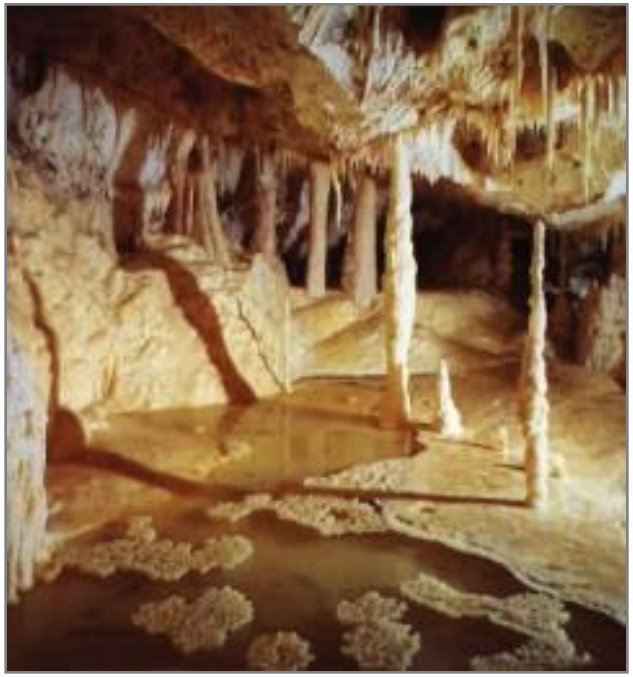
-



anthropogenic pressure

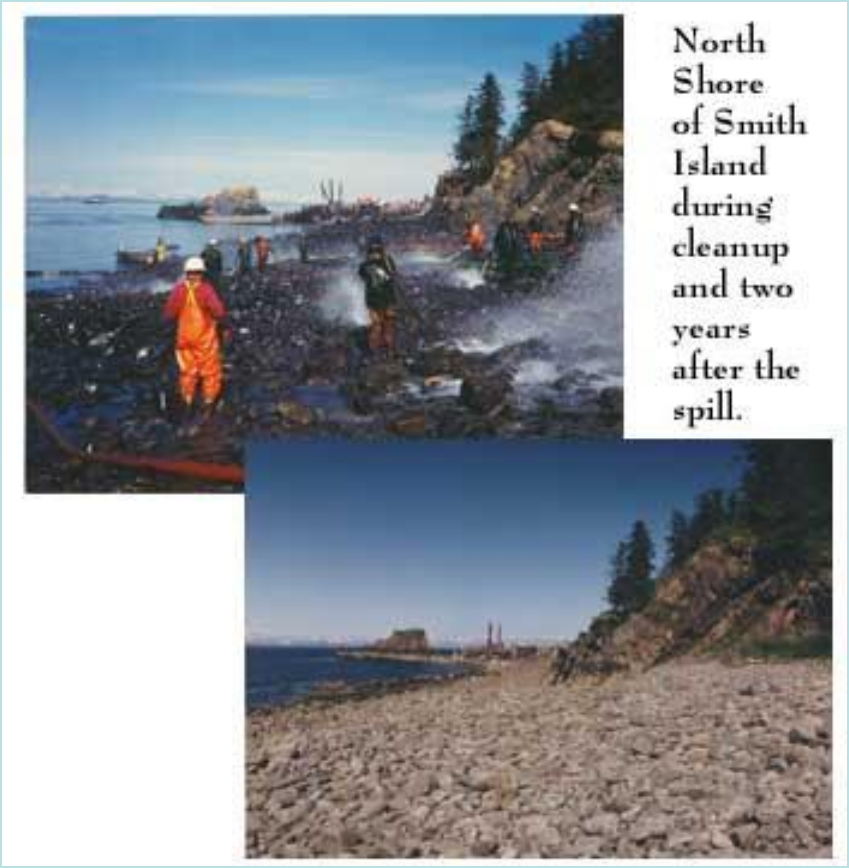
anti-fouling TBT paint effect





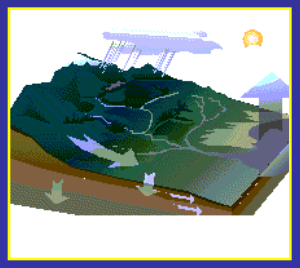
Water pollution is caused by the emission into surface waters and / or groundwater of hazardous substances and toxic

CASE STUDY 89'– Exxon Valdez - Treatment of oil spills



North Shore of Smith Island during cleanup and two years after the spill.

There are still small residues of Exxon Valdez in sediments in the area between the tide lines, in the form of asphaltenes, the most recalcitrant component of crude oil.

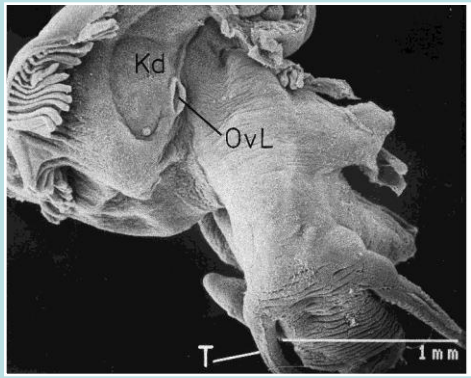


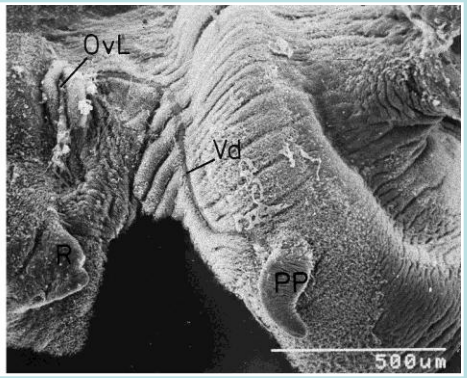
Acid rain, besides being harmful to agriculture and vegetation in general have a major impact on surface water closed basins or water networks in direct communication with the surface

Lagoon of Cabras (June, 1999)

Anti-fouling paint and endocrine disruptor

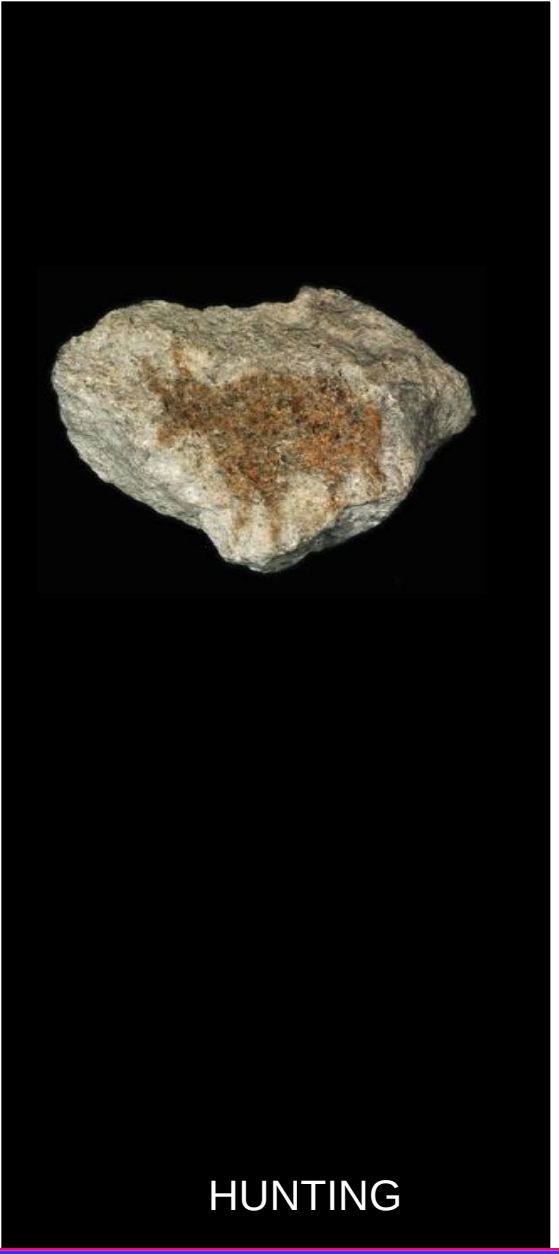
IMPOSEX



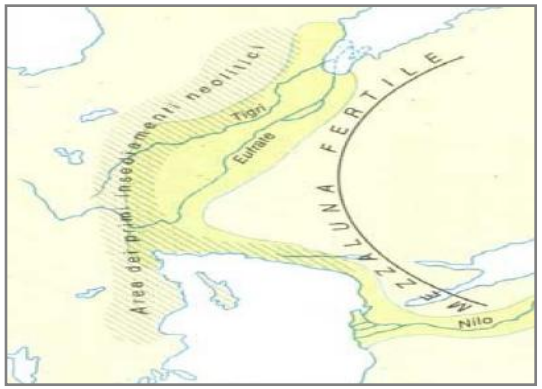


Pollutants: Key categories

- Physical
- Chemical
- Organic
- Bacteriological

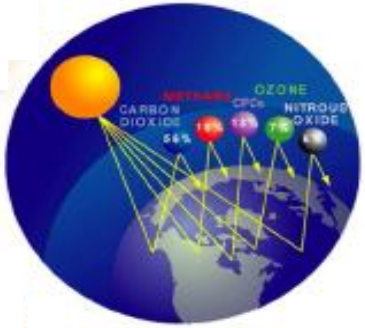


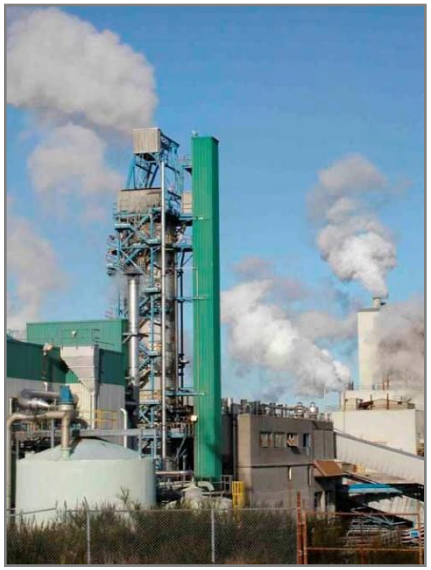
HUNTING



AGRICULTURE

INDUSTRY





The unmistakable signs of global change
are everywhere
and the world is rapidly changing around us

Coordinated of long-term

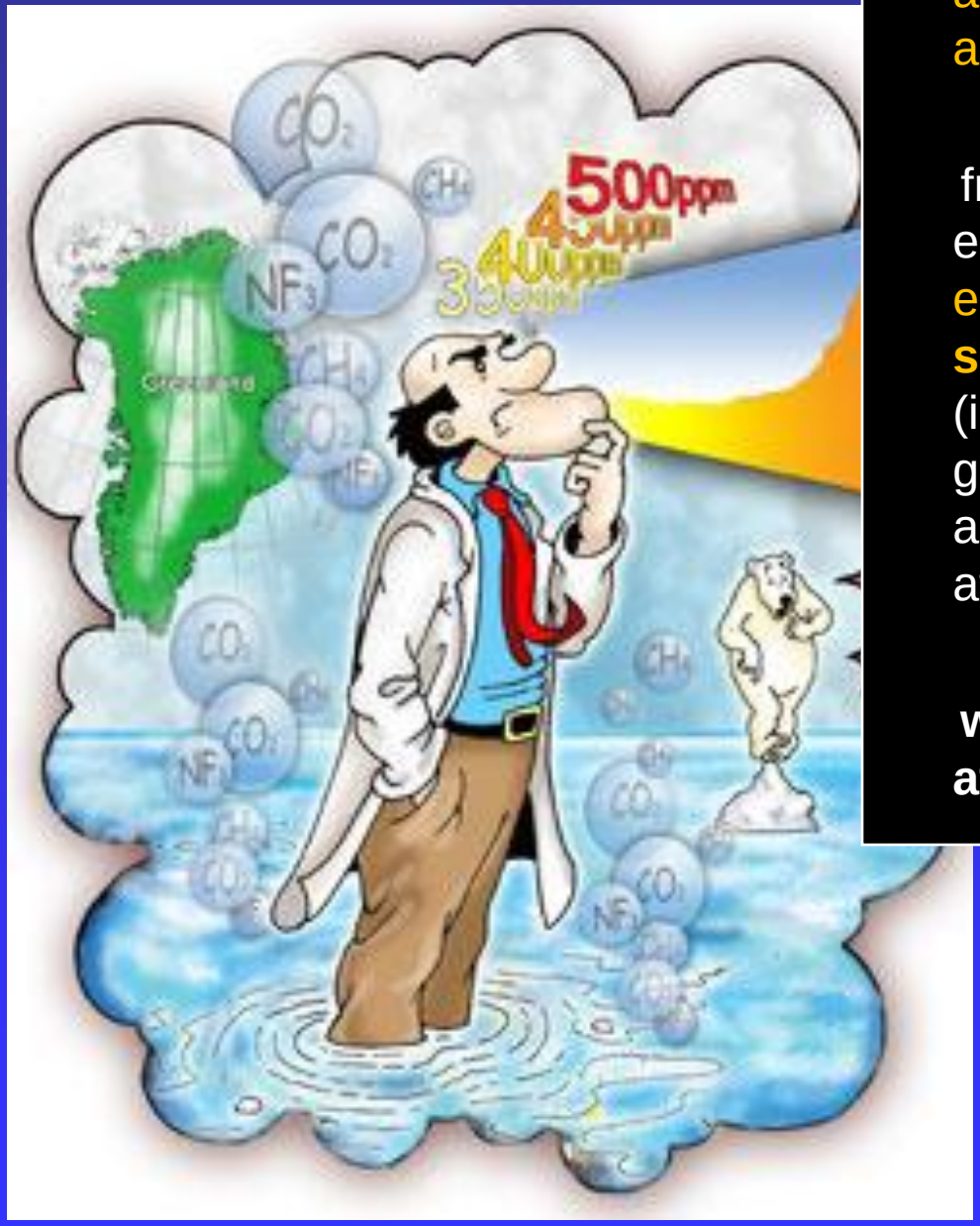
If we want to understand what is really happening on the world not only on environmental and climate-but also on the biological (bio-gene-sphere) aspects can not overlook the use of coordinate of long-term

We must remember that

the current structure of the biosphere - a network extremely complex, consisting of billions of organisms and genomes in intimate and continuous relationship - is the result of billions of years of adaptive co-evolution

and

in the last 10 thousand years particularly over the past 150 years , *Homo sapiens sapiens* has changed the very rules of the life game escaping the fundamental co-adaptive evolution law



- If alarmed and alarming (sometimes apocalyptic) predictions of scientists about the future of the planet

from a chemical/ physical and environmental/ climate point are essentially related to the **reading of some signs** of global change in place (in particular the exponential increase of green house gases and the consequent alteration of chemical and physical atmospheric and ocean)

which symptoms of a disorder affecting the global system,

Warming has hit polar species hardest. Shrinking sea ice in particular spells trouble for polar bears, wich depend on it to hunt, rest, and travel. As their numbers fall, the reality hits home.

We cannot restore their habitat.
We cannot go back.

Climate change has already caused arid areas to become drier and may be intensifying *droughts* in different parts of the globe.

African countries like Ethiopia are among the most at risk, since they remain heavily dependent on rain-fed agriculture and often can't afford technology that would help them adapt.

Impact of temperature anomalies on the marine ecosystem

Low pH and bi-carbonate ions

damage

- the marine ecosystem (chain food)
- the skeleton of numerous marine organisms

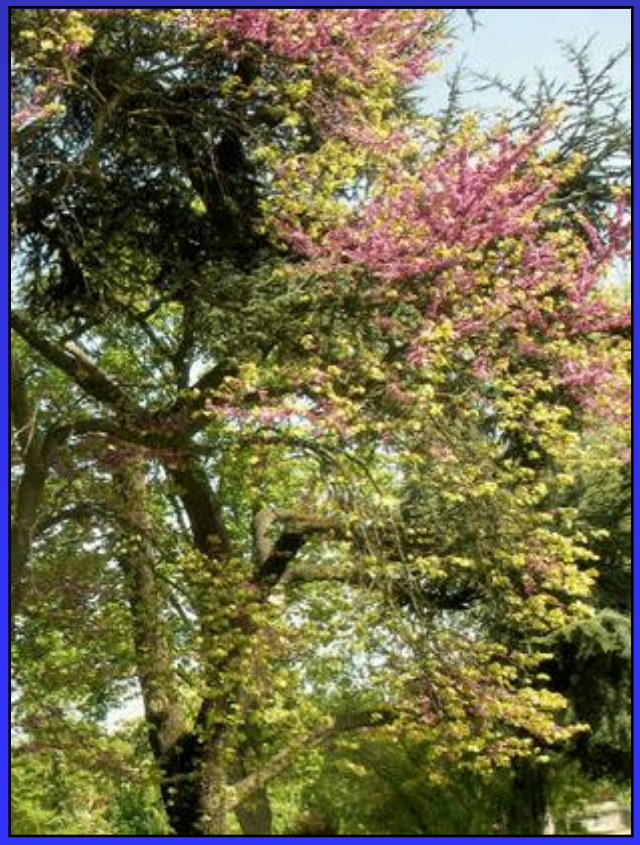
Signs

Heat waves…hurricanes, landslides, storms, inundations, cyclones, floods

Signs

It’s here.

Migratory birds delaying their flights south…



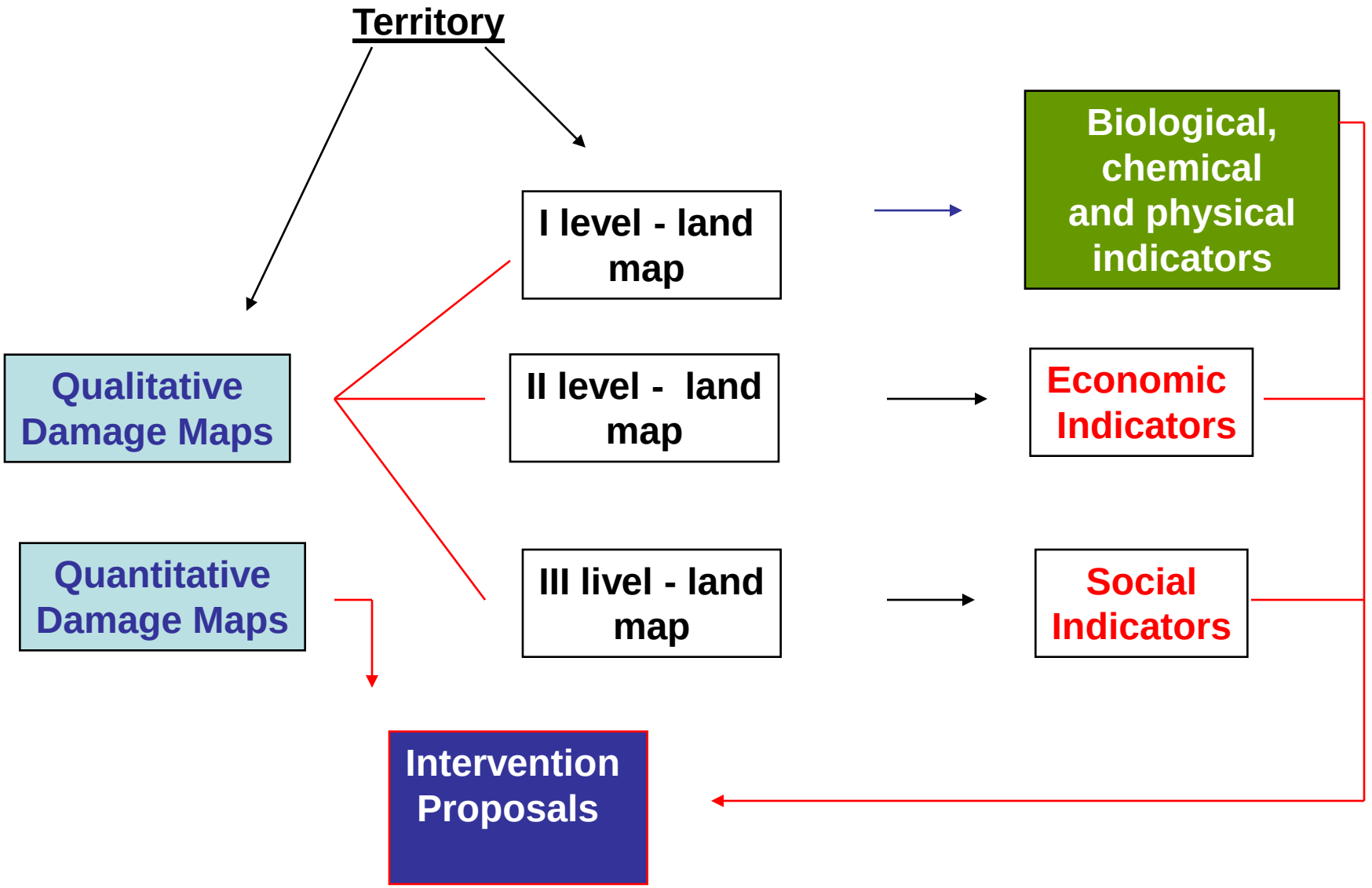
Signs

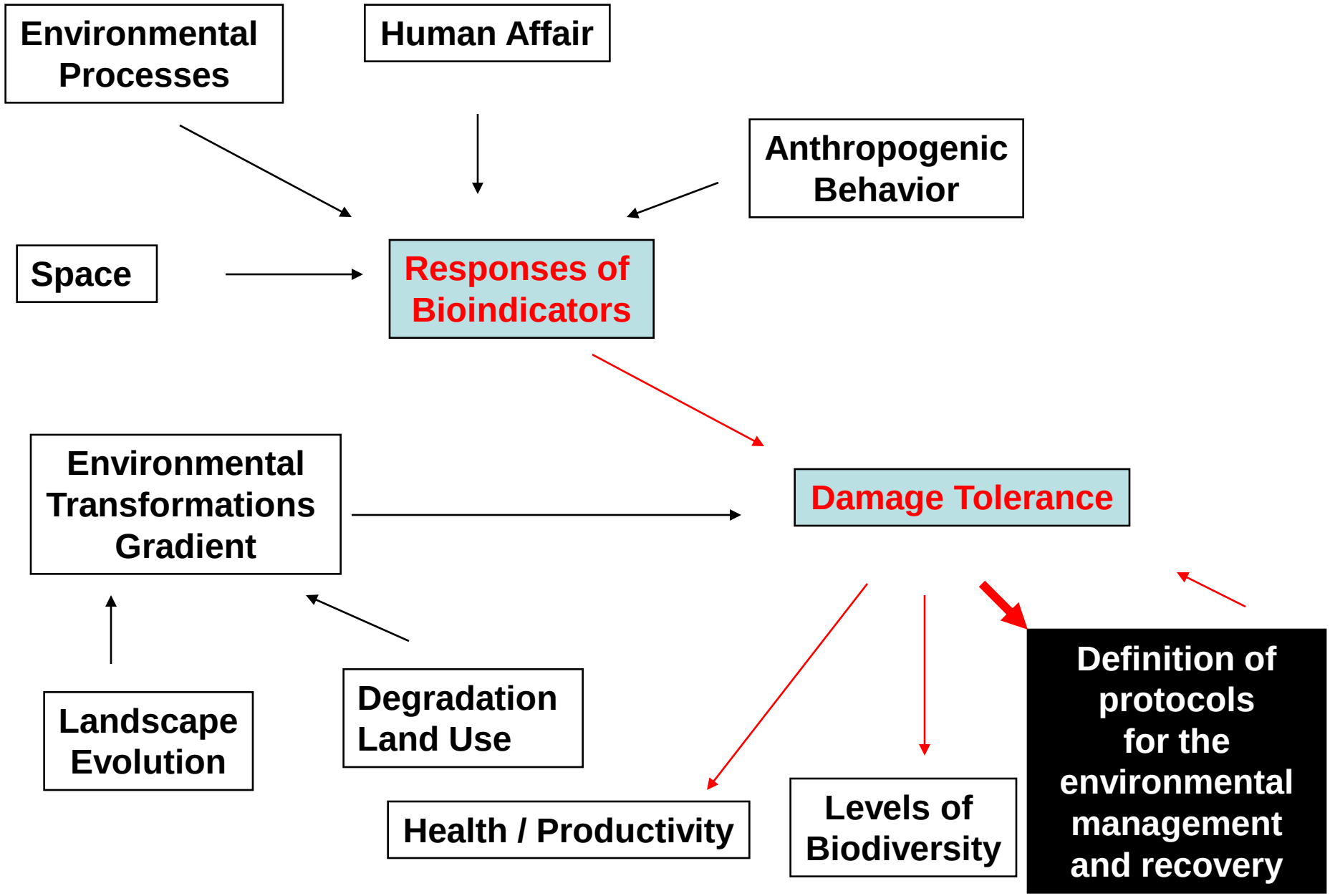
It’s here.

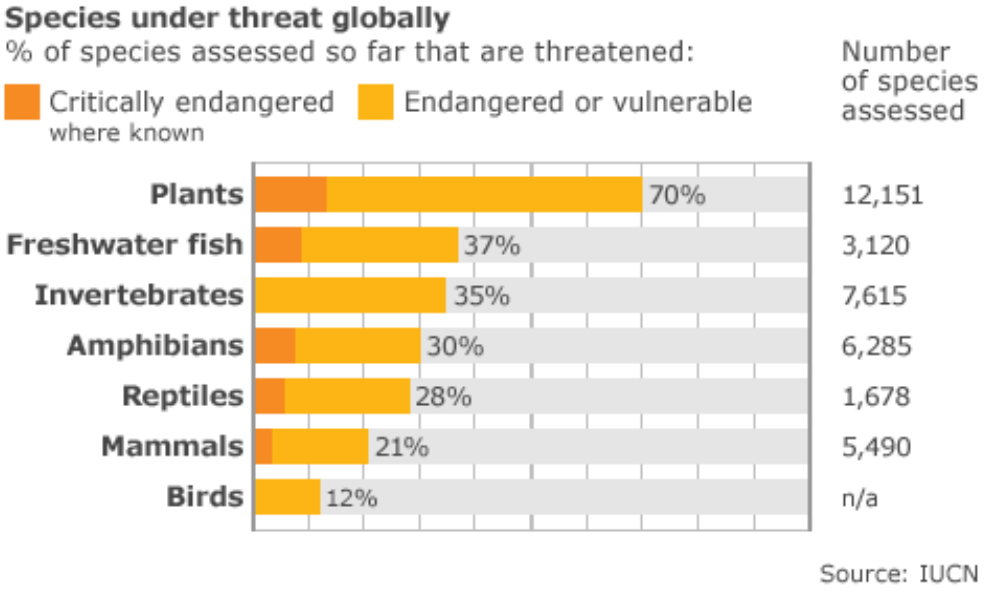
Trees flowering earlier….

- **there is clearly a need to apply a similar criterion of evaluation systems for the infinitely more complex fluids such as biological (genomic in particular) aspect.**

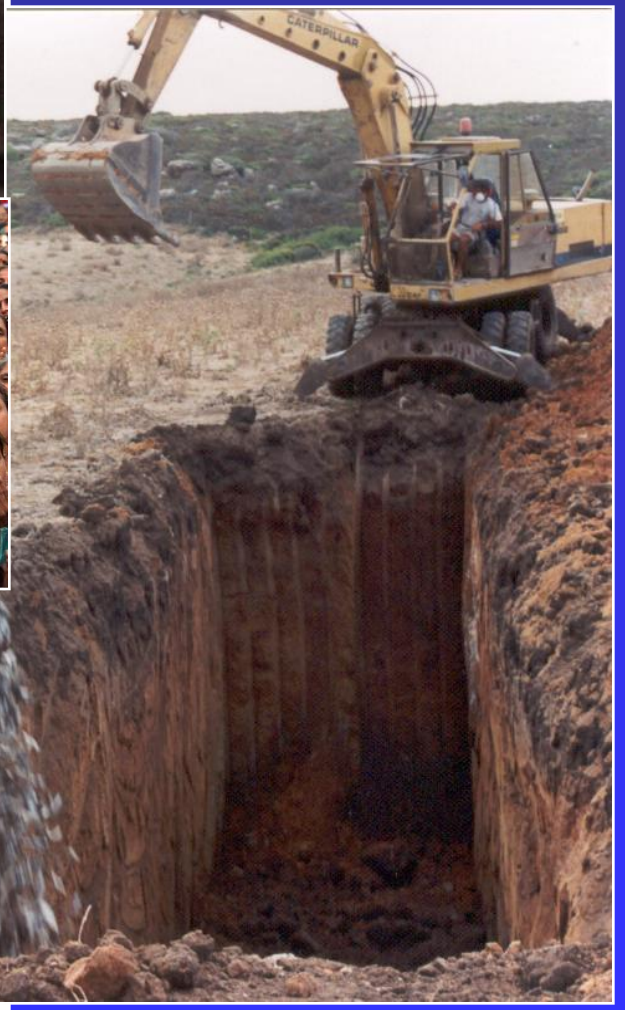
Environmental Sustainability and Biomonitoring




Environmental Processes
Human Affair
Anthropogenic Behavior
Space
Responses of Bioindicators
Environmental Transformations Gradient
Damage Tolerance
Landscape Evolution
Degradation Land Use
Health / Productivity
Levels of Biodiversity
Definition of protocols for the environmental management and recovery



The concept of biodiversity includes
genetic diversity within a population,
the number and distribution of species in one area,
diversity of functional groups (**producers, consumers, decomposers**)
within an ecosystem,
differentiation of ecosystems within a territory


CATERPILLAR

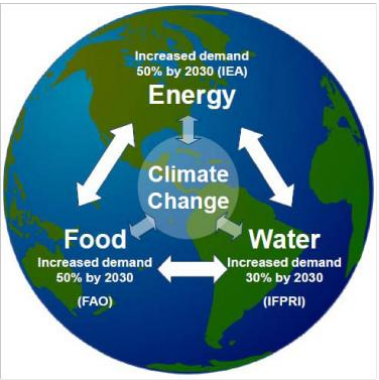

Increased demand
50% by 2030 (IEA)
Energy
Climate
Change
Food
Increased demand
50% by 2030
(FAO)
Water
Increased demand
30% by 2030
(IFPRI)


Foto gentilmente offerta da uno studente del Corso di
Laurea in Biologia delle Produzioni Marine


AMBIENTE È
SALUTE:
Il progetto "PREVIENI"
Interferenti endocrini, ambiente
e salute riproduttiva
Roma, 25 ottobre 2011
Aula Magna Rettorato Sapienza
Università di Roma

IMPORTANT EVENTS in THE LIFE's EVOLUTION

14 miliard of years ago: the BIG BANG

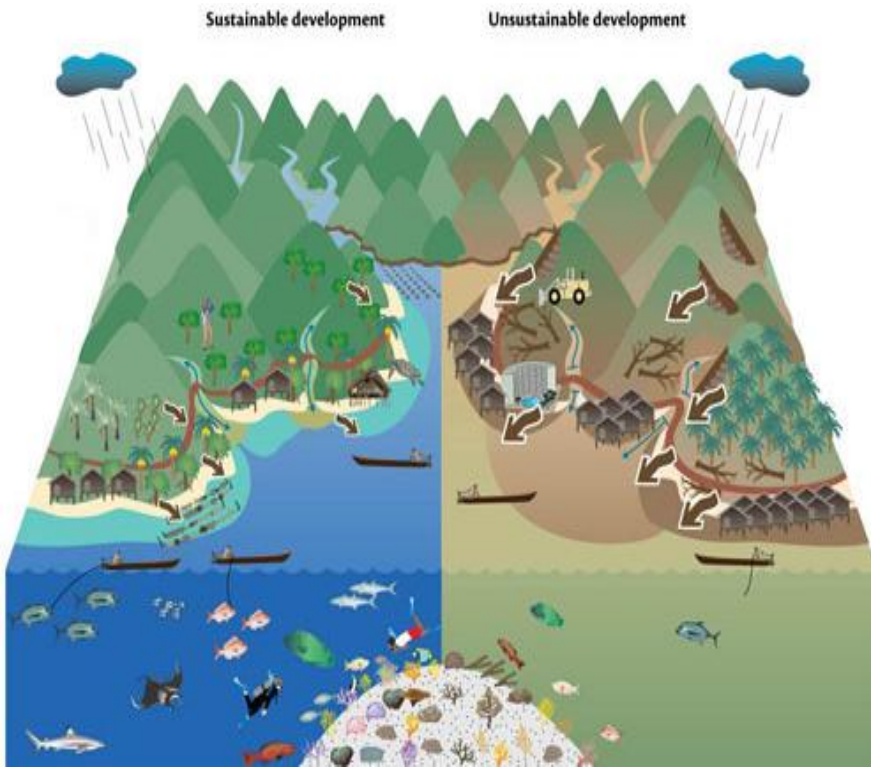
	BIGHEST ESTINTION	DISAPPEARANCE (%)
1°	at the end of **Ordovician** – 450 million years ago	85%
2°	at the end of **Devonian** – 365 million years ago	82%
3°	at the end of **Permian** – 250 million years ago	90-95%
4°	at the end of **Triassic** – 205 million years ago (especially marin species)	75%
5°	at the end of **Cretaceous** – 65 million years ago (dinosaur)	80%

- **Environmental Sustainability and Territorial Biomonitoring**

- **The italian "Program of Relevant National Interest", PRIN 2010-2011, prot. 2010 ARBLT7, UniNA operative unit**

degradation issues …

Marine and coastal resources are used more intensively and thus, are degraded.



Environmental monitoring and bioremediation of disturbed sites, are amongst the **focus keys of the international strategies for territory management**

(see Horizon 2020, the new European Program for Research and Innovation, etc.)

not only for the environmental and health consequences, but also for the strong social and economic impacts

“Program of Relevant National Interest”
(PRIN 2010-2011 prot. 2010ARBLT7)
Operativity 2013-2016

Recently, the Italian Ministry of Education, University and Research funded the project

SYSTEMS BIOLOGY IN THE STUDY OF XENOBIOTIC EFFECTS ON MARINE ORGANISMS FOR EVALUATION OF THE ENVIRONMENTAL HEALTH STATUS: *BIOTECHNOLOGICAL APPLICATIONS FOR POTENTIAL RECOVERY STRATEGIES*

SYSTEM BIOLOGY as the coordinated study of biological systems by

1. Investigating the components of cellular networks and their interactions

2. Applying experimental high-throughput and whole-genome techniques

3. Integrating computational methods with experimental efforts

…often, such in the case of chemical and petrochemical productions, the areas subjected to the most intensive industrialization are located along the coastline, being a severe threat to the marine environment

We see the origin and the methodological foundations of system biology:

1. in the accumulation of detailed biological knowledge with the prospect of utilization in biotechnology
2. in the emergence of new experimental techniques in genomics and proteomics

3. in the tradition of mathematical modeling of biological processes

4. in the developing computer power as a prerequisite for databases and for the calculation of large systems and

5. in the internet as the medium for quick and comprehensive exchange of information

Background

Despite the recent technological advances in the field of recovery of marine environments, the impact of different strategies of intervention on natural ecosystems are still largely unknown.

Indeed, chemical investigations on pollutants occurring in environmental matrices may be not adequate to correctly evaluate the potential risks for ecosystem and human health, since several environmental conditions may affect the pollutant bioavailability and, consequently, toxicity.

In addition, numerous chemicals can simultaneously appear in aquatic habitats, and their chemical interactions may cause complex and substantial changes in the overall toxicity.

Goals of this research

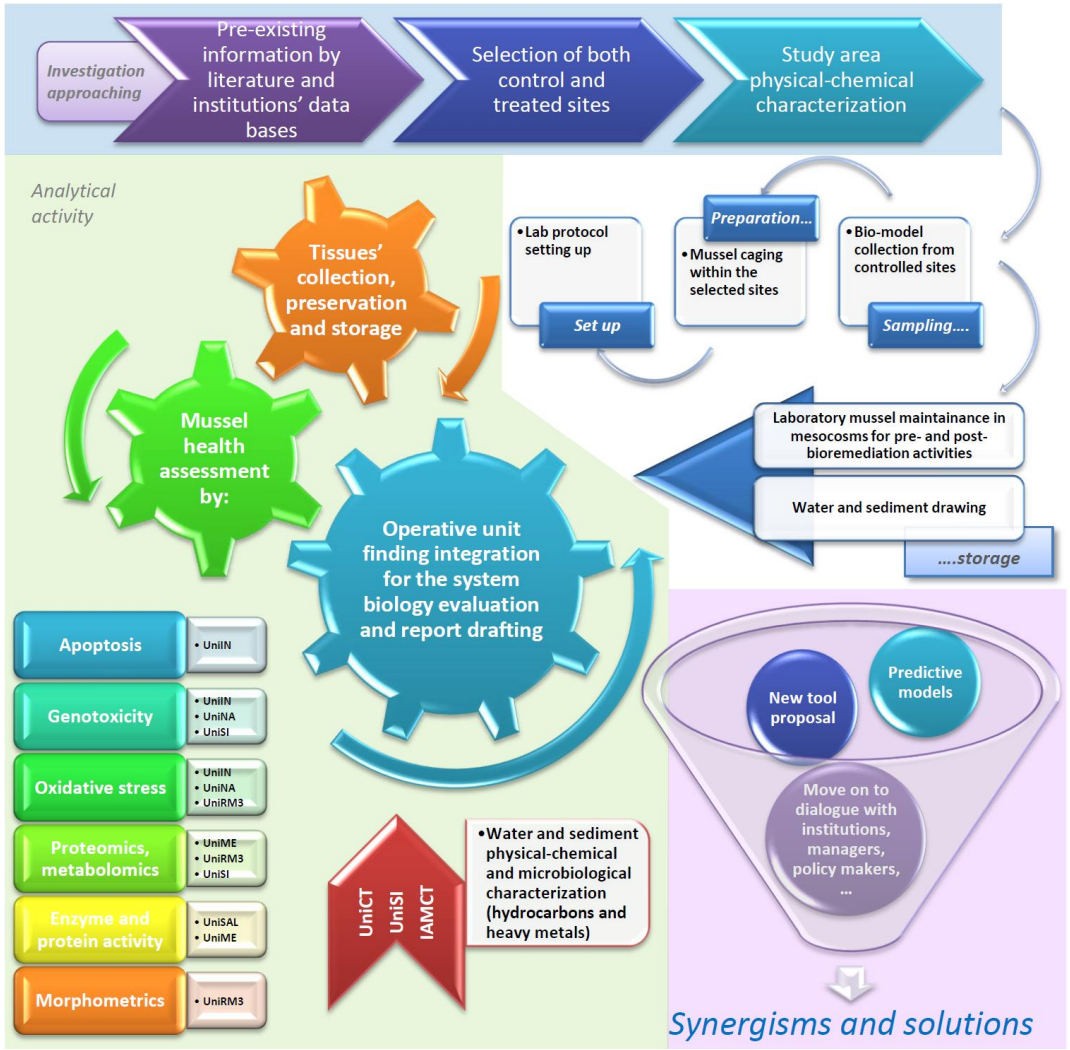
Amongst several approaches to evaluate environmental state and damages, benthic organisms provide a reliable tool to collect data on pollutants destiny within the ecosystem food chain.

Indeed **benthic invertebrates, acting as bio-filters, can accumulate toxic substances in their tissues so bio-magnifying contaminants up to the highest level of the food chain, and causing potentially dangerous humans exposition**

Mytilus galloprovincialis

The aim of the presentation is to describe the expected research activities of an Italian National research project (http://www.systemsbiologyprin.unime.it) which is investigating the modifications of biological processes in the aquatic species subjected to different levels of contamination obtained through technically reliable and cost-effective water and sediment management strategies and highlight the importance of reproductive health studies to ensure sustainability of our resources.

The "SYSTEMS BIOLOGY" Consortium



The project is articulated into seven phases within **two main WPs**, the first referred to the analysis to be performed in natural environments, and the second in laboratory experiments.

Each phase will be developed through the synergic collaboration among the 8 research units involved in the project.

SYSTEMS BIOLOGY

Associated Partners

University of Buenos Aires CONICET,
PRALIB-School of Pharmacy and Biochemistry (**Argentina**)

University of Victoria
Dep. of Biochemistry and Microbiology, Victoria (**Canada**)

University of Conception
Faculty of Biological Sciences, Conception (**Chile**)

University of Cyprus (**Cyprus**)
National Research Center of Egypt (**Egypt**)

National University of Mexico
Unidad Multidisciplinaria de Docencia e Investigation Sisal (**Mexico**)

University of Algarve
Center of Marine and Environmental Research (**Portugal**)

Oceanographic Center of Baleares,
Spanish National Oceanographic Institute (**Spain**)

University of Manouba
Higher Institute for Biotechnology (**Tunisia**)

Namik Kemal University, Tekirdag (**Turkey**)

University of Illinois at Chicago (**USA**)

Oregon Health & Science University (**USA**)

Veneto Nanotech S.C.p.A, Padova (**Italy**)

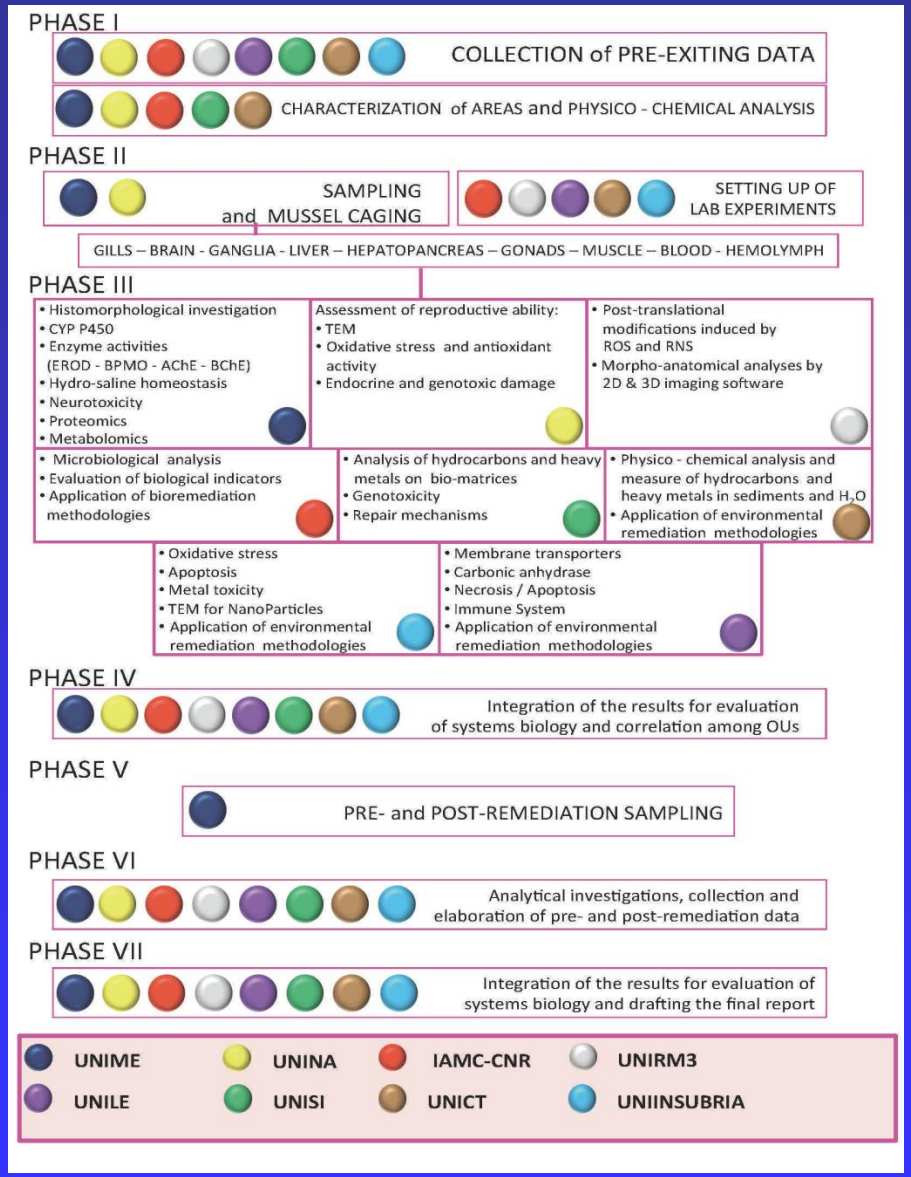
Istituto Cooperativo di Ricerca Soc. Coop., Napoli (**Italy**)

The associated partners of the operative units, coming from 14 Research Institutes of different continents and countries, and 2 Italian industries

The Project is articulated into two main points:

1. a field monitoring program to evaluate the effects of toxic contaminants (e.g. heavy metals and hydrocarbons) on "sea sentinels" (organisms representing early living warning systems) purposely placed in different contaminated areas

2. a series of controlled mesocosms-scale experiments to measure the effects, on the same sea sentinels, of different remediation actions on waters and sediments collected from the contaminated areas under inspection



The project is aimed to understand

- **how the xenobiotic contamination induces or modifies the biological processes in aquatic species**

and to evaluate

- **the potential effectiveness of different biotechnological strategies in controlling and reducing the impact of marine pollution on the biological compartment.**

Expertise and contribution of each Italian operative unit within the research project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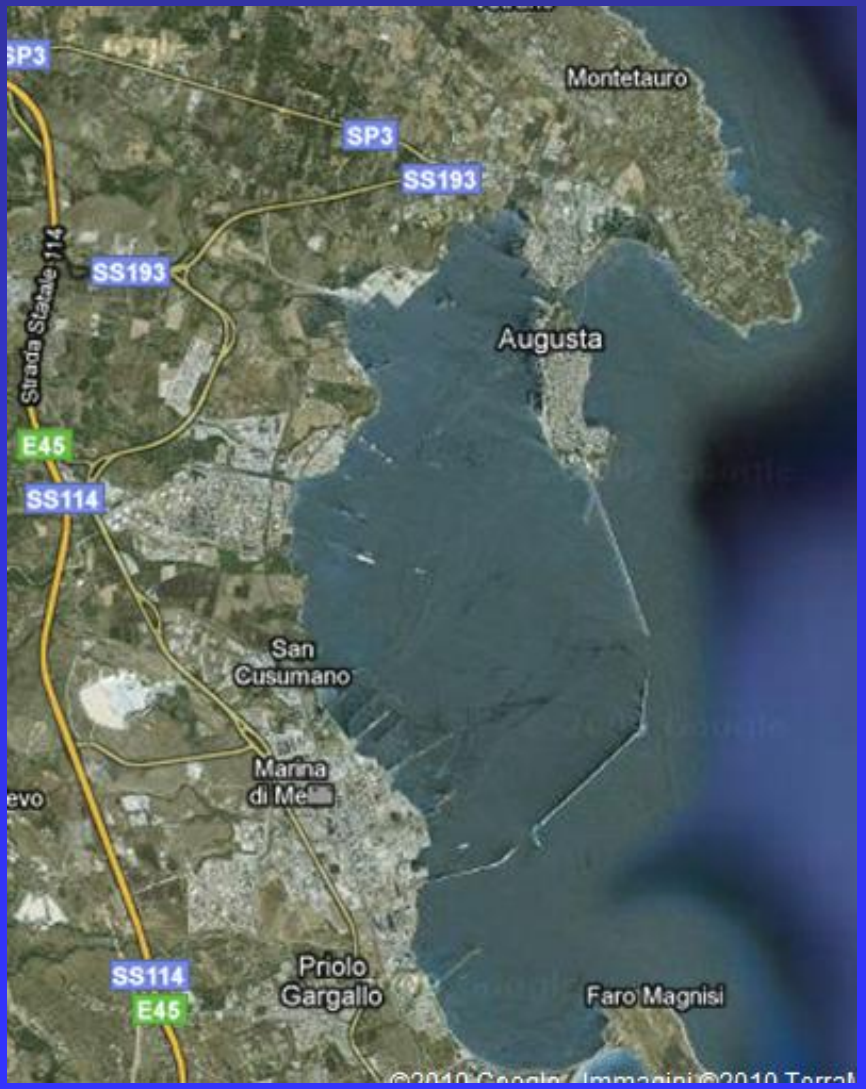
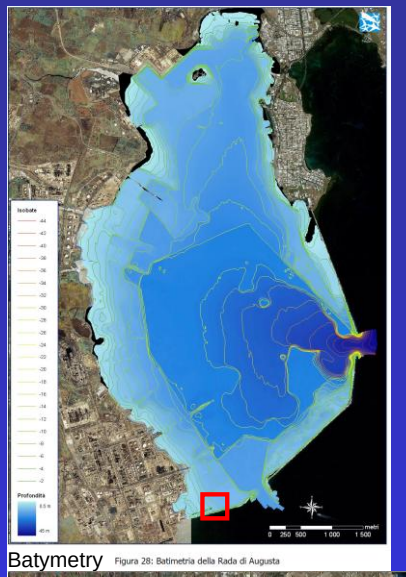
© 2010 Tele Atlas


B2
B1
M1
Bagnoli
Golfo di
Pozzuoli
Miseno

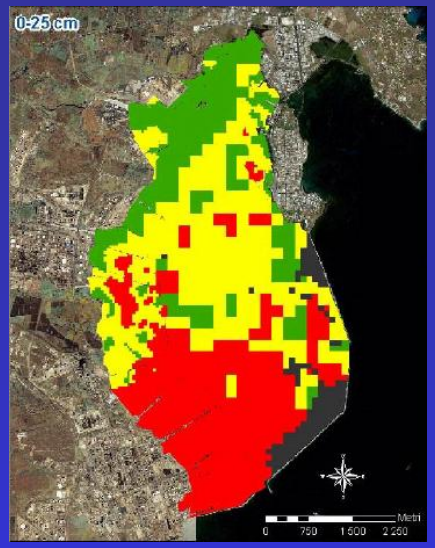
WP1: analysis in "natural" environments



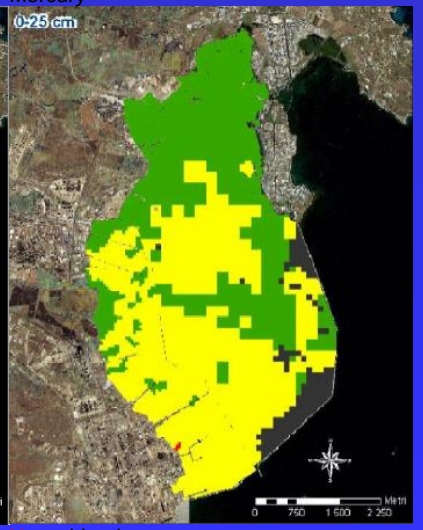
WP1: analysis in "natural" environments



Batymetry Figura 28: Batimetria della Rada di Augusta



Mercury



arbons C > 12

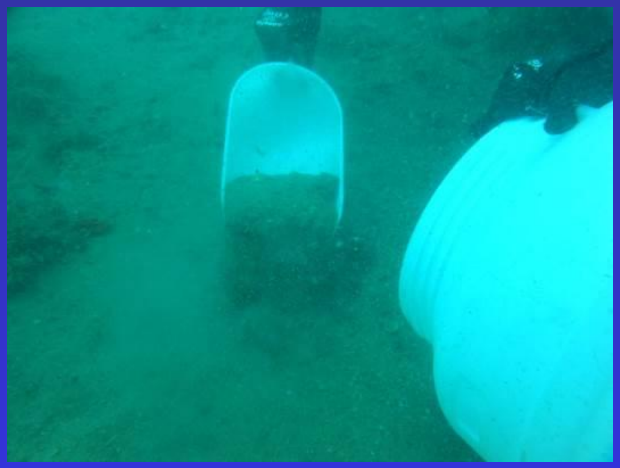
Hexachlorobenzene

Concentration less the intervention limit (ICRAM)

Intervention limit (ICRAM) < concentrations< limits of Col. B Tab.1 All.5 Law 152/06

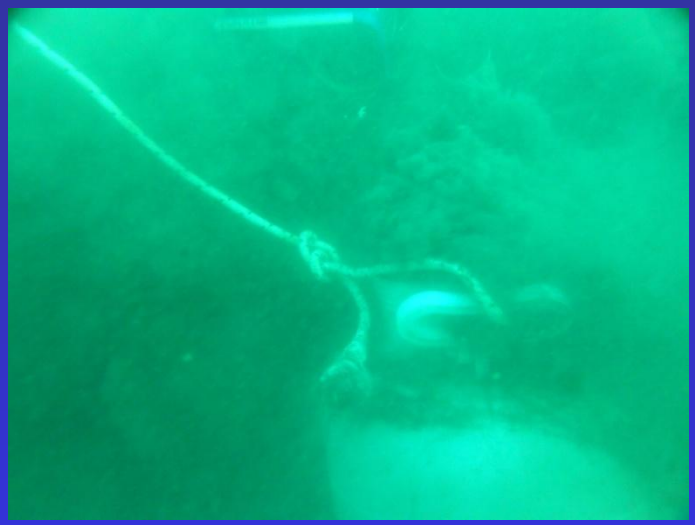
Concentrations > limits of Col. B Tab.1 All.5 Law 152/06

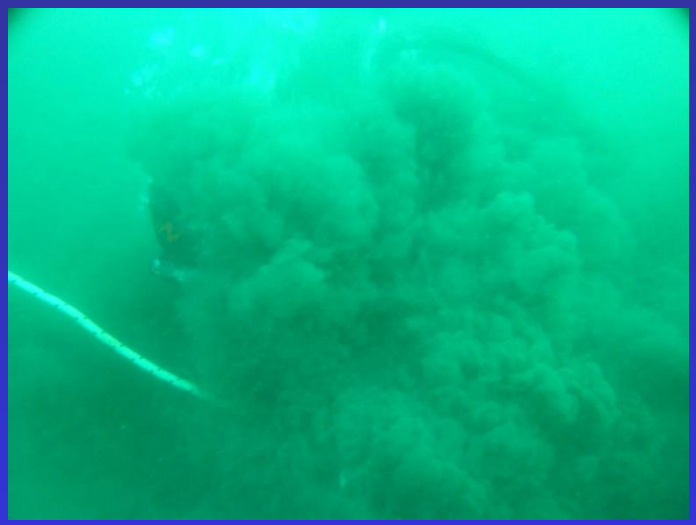
WP1: analysis in "natural" environments

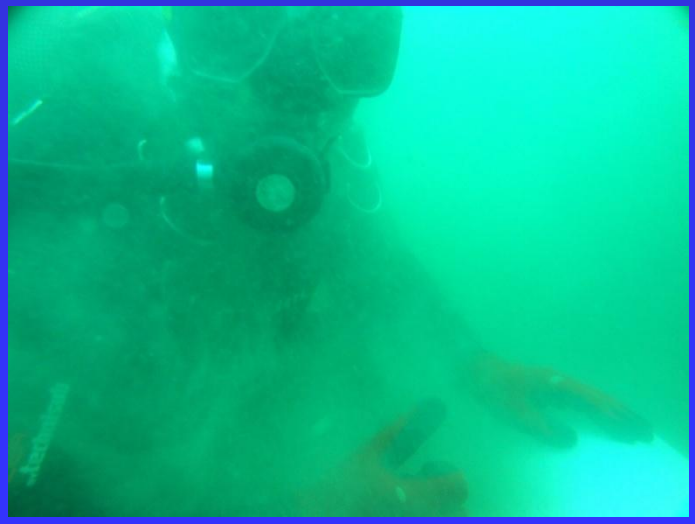


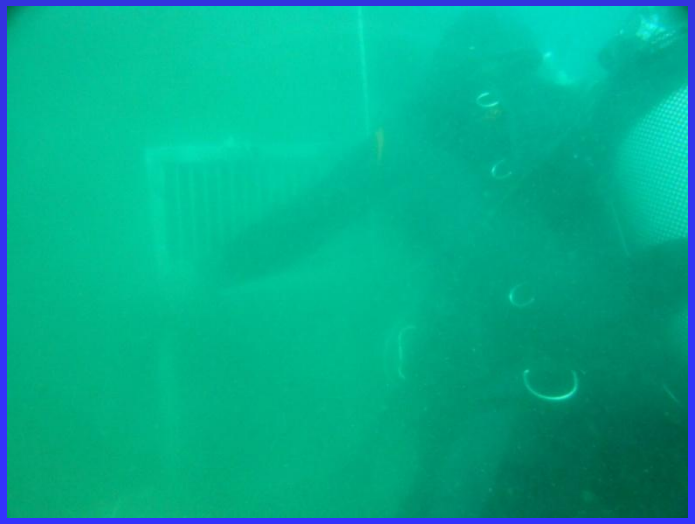
Contaminated site

WP1: analysis in "natural" environments









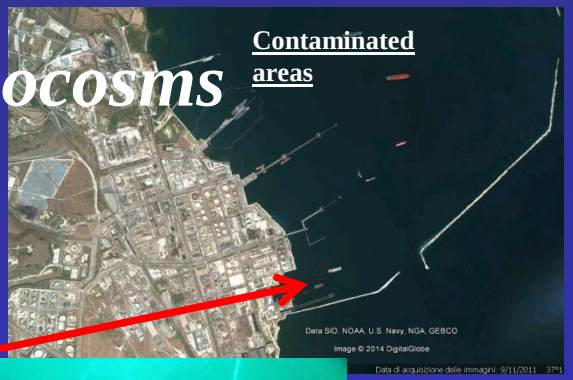
Contaminated site

WP1: analysis in "natural" environments

Contaminated site

WP1: analysis in "natural" environments

WP2: analysis in mesocosms



1) Reference mesocosm

- Clean water
- Clean Sediment

SAMPLING

2) Black mesocosm

- Clean water
- Contaminated Sediment

3) Black mesocosm

- Pollutted waters
- Clean Sediment

- Pollutted waters
- Contaminated Sediment
- Treatment/Remediation

4) Grey 1 mesocosm

- Treated water
- Clean Sediment

5) Grey 2 mesocosm

- Clean water
- Treated Sediment

6) "In situ" treatment mesocosm

- Clean water
- Contaminated Sediment

CNR IAMC mesocosms

Messina Research Unit

Coordinator: Salvatore Fasulo

UNIVERSITY OF MESSINA
Department of Animal Biology and Marine Ecology
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Investigation of morphological and functional damages on selected target tissues in order to individuate different responses on the bioindicator species induced by environmental pollutants.

1) use of histochemical, immunohistochemical and molecular approaches in order to investigate alteration in the expression of proteins and neurotransmitters selected as biomarkers;

2) application of environmental metabolomics to asses the health status of organisms and their interactions with the environment, by simultaneously characterizing a pool of metabolites involved in different metabolic pathways;

3) proteomics study, as well as the evaluation of the resurgence of oxidative stress, allowing to highlight the physiological response of the organisms to anthropogenic stress.

Insubria Research Unit

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Rosalba Gornati

Evaluation, by quali/quantitative PCR and ultrastructure analysis, of samples coming from the natural marine environment and samples exposed to pollutants in laboratory.

1) ascertains on target tissues (gills, and digestive gland) the presence of transcripts of the genes involved in oxidative stress, heavy metal toxicity and apoptosis, such as metallothionein (MT), heat shock protein 70 (HSP70), superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione reductase (GR), caspase-3, p53). ;

2) quantitative evaluation of the expression of these key genes, together with TEM (Transmission Electron Microscopy) analysis, to understand the type of environment pollution (presence of metallic nanoparticles), and adaptive responses triggered by these animal models;

Salento Research Unit

Trifone Schettino

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Department of Science, Biological and Environmental Technologies

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standardization and validation of a multiple set of molecular and cytological biomarkers and field validation of an innovative bioassay

1) to study the effects of exposure to multiple chemical contaminants in bioindicator species and to develop new cytological and molecular biomarkers of chemical stress;

2) Validating a new cytological and molecular biomarkers before and after the application to bioremediation techniques;

3) Applying a new in vitro biossay, recently patented by the research group at the University of Salento, to environmental remediation techniques.

Rome Research Unit

Marco Colasanti

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Identification of proteins susceptible to post-translational modifications (PTM) caused by the oxidative stress.

1) assess the fluctuating asymmetry degree and eventual directional asymmetry by analyzing macro-and microscopic images of both total-body and dissected specimens

2) Investigating the loss of symmetry and the formation of anomalies and malformations at the external morphology by measuring the dispersion of points of homology from a standard condition symmetry.

3) performing morphological, morphometric, histological, molecular, and cellular analyses on samples collected from other Research Units

Siena Research Unit

Claudio Leonzio

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Application of an integrated methodology on bioindicator organisms in order to evaluate the multiple impact of mixtures of environmental contaminants.

1) the comet assay and the diffusion assay give insights in the actual damage caused by genotoxic agents;

2) the estimation of the concentrations of 8-Oxo-2'-deoxyguanosine (8-oxo-dG) assesses the efficiency of repair mechanisms;

3) Development of a multiple set of biomarkers for predicting the actual genotoxic damage caused by the action of multiple environmental contaminants.

CNR Research Unit

NATIONAL RESEARCH COUNCIL
Institute for Coastal Marine Environment
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Simone Cappello

Microbiological investigation on water and sediment samples, collected from the impacted environments, for the isolation and establishment of a HCB culture collection.

1) selection and validation of HCB as bioindicators in marine environments polluted by hydrocarbons;

2) identification of specific functional gene of biodegradation as specific biomarkers of hydrocarbon contamination;

3) test of methodologies for environmental recovery (bioremediation) by performing small-scale lab experiments and experimental activities at a larger scale (mesocosms).

Among bacteria, Alcanivorax borkumensis, showed to play a pivotal role in the oil-spill bioremediation (Schneiker et al., 2006), presumably for its capacity to grow on many saturated petroleum fraction constituents and biogenic hydrocarbons such as straight-chain and branched alkanes, isoprenoids, phytane, pristine and long sidechain alkyl compounds (Schneiker et al., 2006).

Catania Research Unit

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Identification of effective and provable solutions to control and reduce marine pollution through biotechnological applications.

1) individuation of a possible treatment of oily wastewaters from marine transportation and shipyard, (high salinity level);

2) verifying the potential of enhancing the natural biodegradation of pollutants (mostly hydrocarbons) through introduction of nano bubbles directly “in situ” (water and sediment);

3) investigating the chance to “ex situ” treat the metal and hydrocarbons contaminated sediments and the resulting washing solution. In particular, flushing sediment treatments is carried out in a pulse-mode using different chelating agents and surfactants

Napoli Research Unit

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Giulia Guerriero

Assessing of environmental health status through the ecotoxicological impact on tissues involved in the reproductive events.

1) Define the levels of reactive oxygen species and the antioxidant response in animal models, in order to evaluate their physiological status and provide optimal environmental conditions for the reproductive function;

2) checking for morpho-functional correlations between oxidants and reproductive health status;

3) estimation of xenobiotics effects on histones, sperm nuclear basic proteins, DNA damage and repair as well as qualitative and quantitative responses to stress of genes and proteins involved in spermatogenesis is performed in order to achieve information relevant to fertility.

ENDOCRINE DISRUPTING CHEMICALS

(EDCs)

WHAT ARE EDCs?

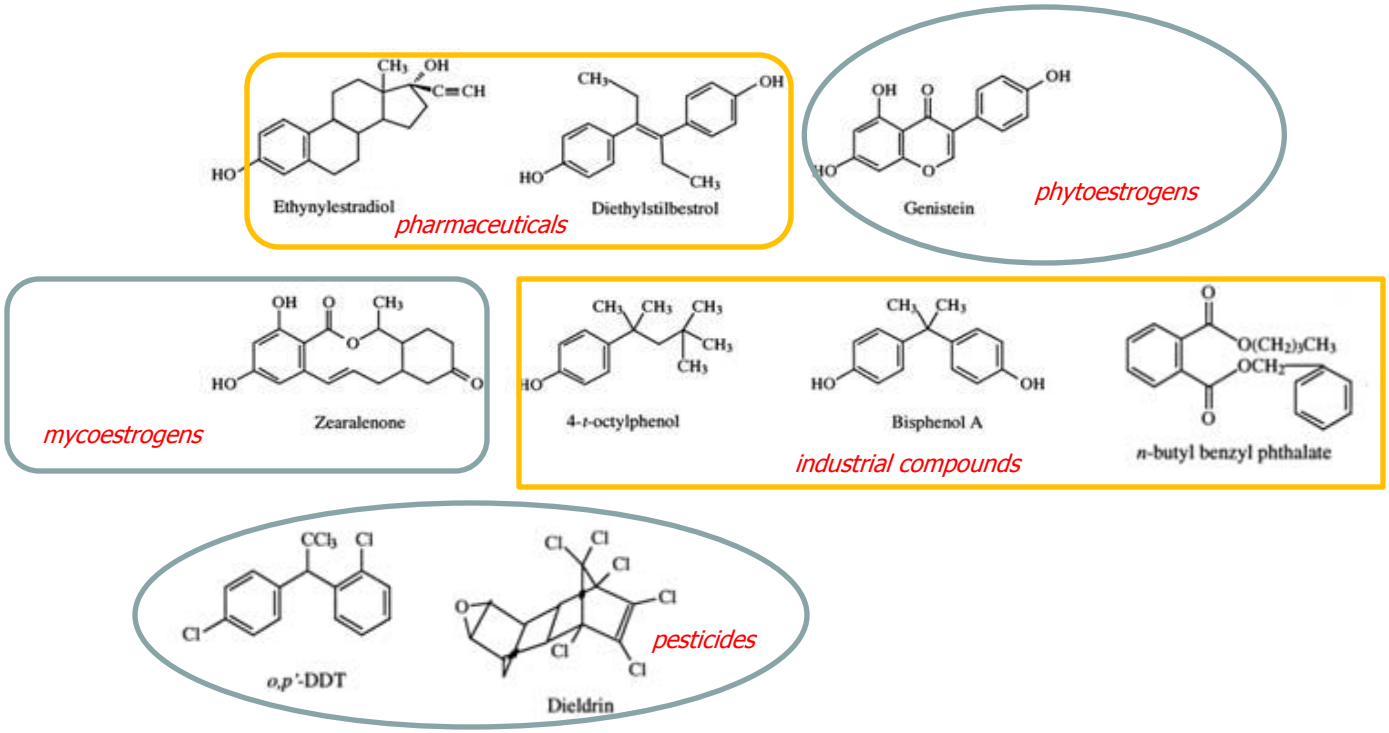
• Exogenous substances that cause adverse effects in an intact organism, or its progeny consequent to changes in endocrine functions (European Commission, 1996)

WHERE WE FIND EDCs?

• EDCs can have different origins
– environmental contaminants, food, water

• They can bind to hormone receptors:
– those binding gonadal hormones' receptors are named xenoestrogens or xenoandrogens

• They may interfere with all processes that are organized and /or activated by gonadal hormones in the living beings, including brain and behavior differentiation

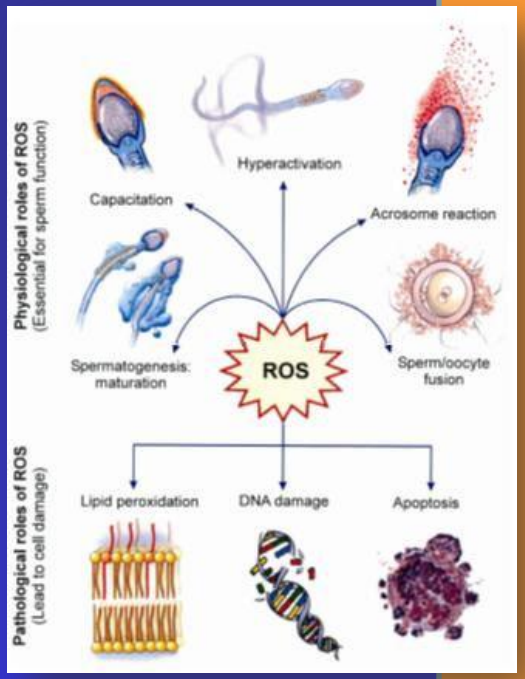


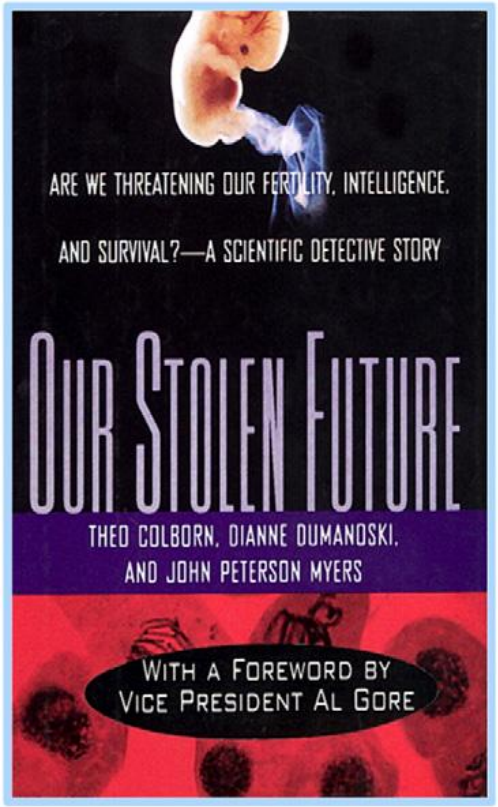
Exposure to environmental

synthetic hormones, industrial chemicals, pesticides

which specifically target and interact with the normal endocrine hormonal system could be very harm


TRUE STORY*—THE ESTROGEN, STEROIDS, PROZAC AND OTHER DRUGS WE TAKE...
PAXIL
ZOLOFT
...ARE NOT BEING FILTERED OUT OF OUR WASTE BY SEWAGE TREATMENT PLANTS OR SEPTIC SYSTEMS
AND THEY'RE TURNING UP IN INCREASING CONCENTRATIONS IN RIVERS AND LAKES, ...AND IN THE FISH THAT INHABIT THEM.
*11|14|03 CNN.COM
THAT WAS DELICIOUS TROUT! SUDDENLY, I FEEL LESS DEPRESSED ABOUT MY ERECTILE DYSFUNCTION
SINGER





Endocrine Disruptor Targets

Estrogens
Androgens
Progestins
Thyroid
Hypothalamic
Pituitary

Endocrine Disrupting Chemicals

Chemicals that interfere with the biological actions of hormones by blocking, mimicking, displacing, or acting through a variety of other mechanisms to subvert their natural roles.

Maintaining endocrine functions
involve many signal transduction pathways

- **Many alternative pathways**
- **Many enzymes**
- **Rate limiting steps unknown**

NEW PROMISING TOOLS FOR THE REPRODUCTIVE HEALTH ASSESSMENT IN *Mytilus galloprovincialis* from uniNA

e.g.

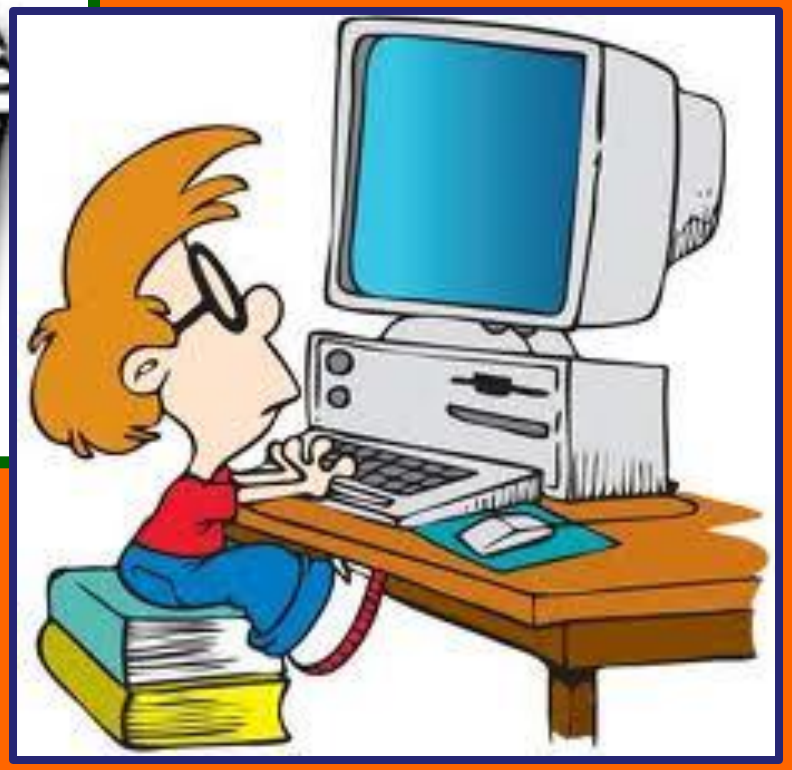
Our studies present the first use of ESR spectroscopy (CW measurements in X band at room temperature) to assess the level of reactive oxygen species (ROS), the Tunel assay for DNA damage and the quantitative espression of steroid receptors and their isoforms in *Mytilus galloprovincialis* gamete, exposed at different levels of pollution.

Radicals have been trapped by phenylbutylnitrone (PBN) according to a protocol which has been previously optimized to stabilize the radical with well-defined and predictable decay kinetics in whole body, gonads and gametes.

Gametes genomic DNA fragmentation into low molecular weight double-stranded DNA and high molecular weight single stranded DNA have been detected using terminal deoxynucleotidyl transferase (TdT)-mediated dUTP-biotin nick end labeling staining using confocal microscope.

Espression of steroid receptors and their isoforms u qRT.

Statistical analyses show gamete ROS concentration, DNA fragmentation critically depends on the habitat pollution. Evidence is also presented by glutathione S-transferase level variation in the *Mytilus galloprovincialis* gametes of different polluted areas. The oxygen consumption rates, the DNA integrity and the gene espressione of specic steroid receptors could be utilized to provide a non-invasive biological marker of gametes competence and as a quantitative assessment of the pollution impact on marine specie-specific reproduction.



The system biology in our project

- integration of traditional techniques of investigation with biological methodologies
- new approach to select the best site-specific technologies
- evaluation of a wide set of biological endpoints
- identification of provable solutions to reduce marine pollution
- validation of a multiple set of molecular and cytological biomarkers

Treat the Earth well:

It was not given to you by your parents.

It was loaned to you by your children.

Kenyan Proverb

Let Us Meet Again

We welcome you all to our future conferences of OMICS International

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