



Erasmus+ "Climate Change is here"

# Marine Ecosystems & Biodiversity

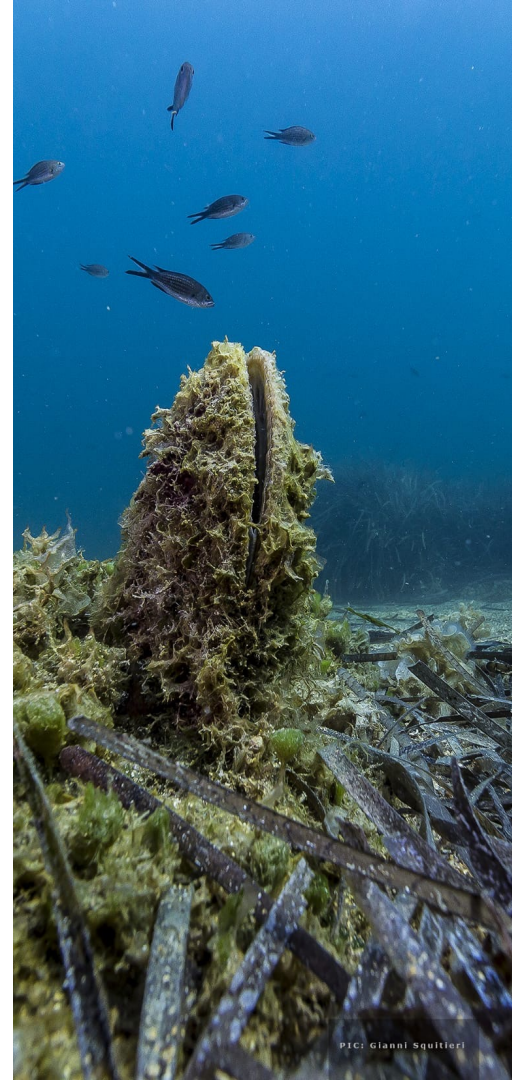
*evidences  
and some signals of climate change*

**Fernando RUBINO**

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Consiglio Nazionale delle Ricerche  
**Istituto di Ricerca sulle Acque**  
Sede Talassografico Taranto



PIG: Gianni Squitieri



Regione Puglia



Lega Navale Italiana  
Sez. di Campomarino



Comune di  
Maruggio

# Agenda



Ecology



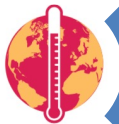
Anthropocene



Climate Change



*Pinna nobilis*



Conclusions



## Ecosystem

complex combination  
between organisms, microorganisms  
and habitat,  
strictly interdependent each other





# Ecology

## Ecosystem



## Goods & services



the **multiple** benefits provided by ecosystems to mankind



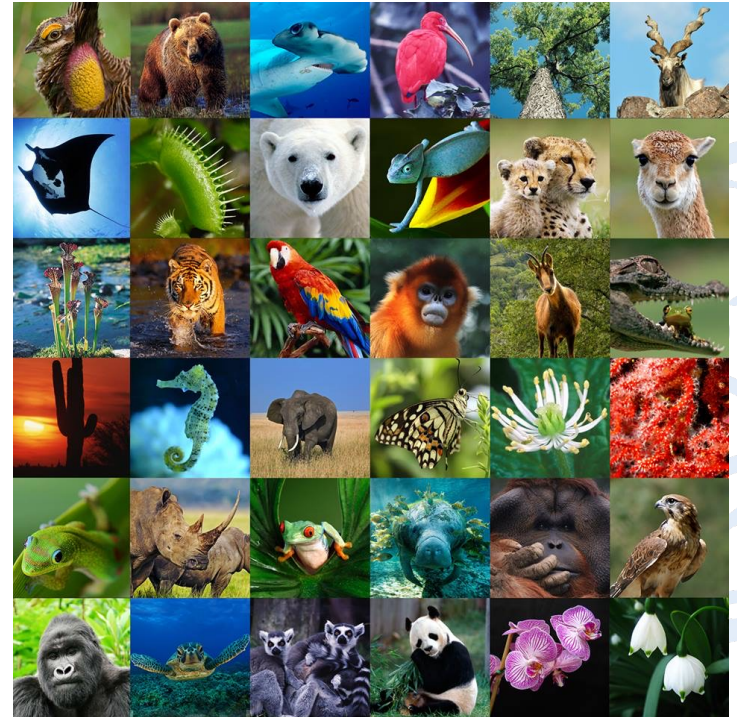
## Welfare



# Ecology

## The Biodiversity

the **wealth of life on Earth:**  
the **number, variety** and  
**variability** of the living beings and  
the complex ecosystems they build in  
the biosphere





## The Biodiversity

strengthens  
the **stability**  
of the ecosystems





## The Biodiversity

its **loss** increases  
the **vulnerability**  
of the ecosystems  
to natural disasters





## The Biodiversity

is a source of  
**goods and services**







## The Biodiversity

provides **nourishment**  
**raw materials**

is the basis for many  
**medicines**



# Agenda



Ecology



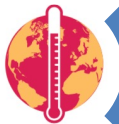
**Anthropocene**



Climate Change



*Pinna nobilis*



Conclusions



# Anthropocene

## the Great Acceleration

### an·thro·po·cene

(n) The proposed current geological epoch, in which humans are the primary cause of permanent planetary change.

- We have reached an unprecedented moment in planetary history. Humans now arguably change the Earth and its processes more than all other natural forces combined. Climate change, extinctions, invasive species, technofossils, anthroturbation, terraforming of land, and redirection of water are all part of the indelible human signature.

<https://theanthropocene.org>



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# Anthropocene

nature

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[nature](#) > [concepts](#) > article

[Published: 03 January 2002](#)

## Geology of mankind

[Paul J. Crutzen](#)

[Nature](#) **415**, 23 (2002) | [Cite this article](#)

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## The Anthropocene

*The Anthropocene could be said to have started in the late eighteenth century, when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane.*



# Anthropocene



**Micronesia, 25<sup>th</sup> July 1946**

**The Baker explosion**

A nuclear weapon test by the US. Water released was highly radioactive, and some researchers think this material could be a marker for the beginning of the Anthropocene

## Geology of mankind

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# Anthropocene

last 300 years

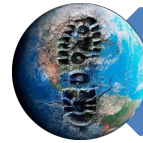


high emissions of CO<sub>2</sub>



climate alterations  
for the next millennia





# Anthropocene

## the Great Acceleration







# Anthropocene



## the Great Acceleration



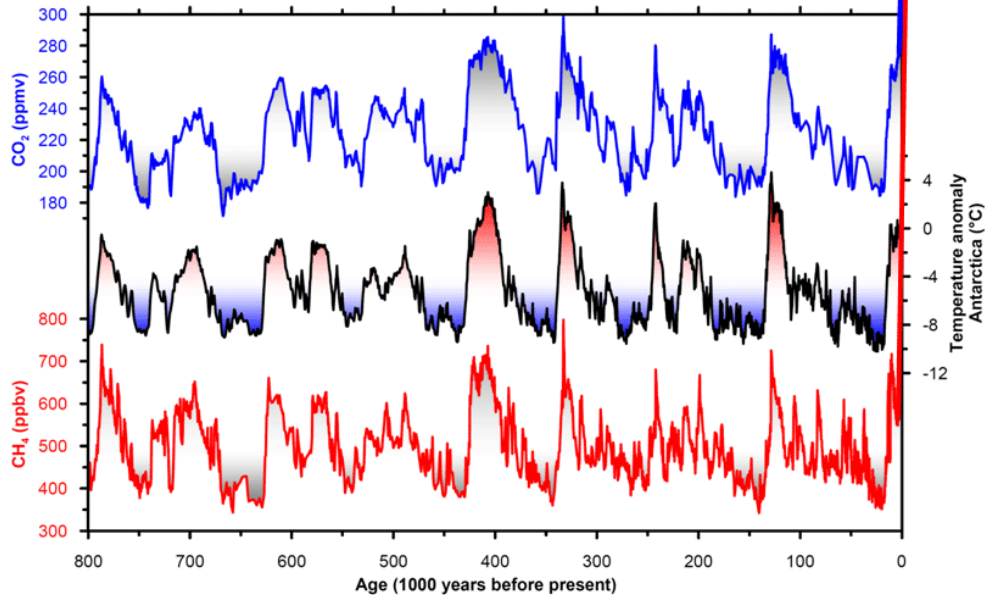


# Anthropocene

800,000 year ice core record

390  
parts per million  
Carbon  
dioxide  
(2010)

1800  
parts per billion  
Methane  
(2010)



the  
Great  
Acceleration

Adapted from:

Loulergue L., *et al.* Orbital and millennial-scale features of atmospheric CH<sub>4</sub> over the past 800,000 years, *Nature*, 2008.

Lüthi D., *et al.* High-resolution carbon dioxide concentration record 650,000-800,000 years before present *Nature*, 2008.

# Agenda



Ecology



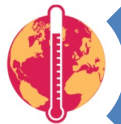
Anthropocene



Climate Change



*Pinna nobilis*



Conclusions



# Climate Change

**extreme events**

**climate extremes**

**climate change**

**global change**

**sea level rise**

**glacial retreat**

**global warming**

**heat waves**

**tropicalization**

**ocean acidification**





# Climate Change

## What are the **CAUSES**?

- fossil fuel
- industry
- vehicular traffic
- household heating
- agriculture
- deforestation



linked to **human activities**



increase in  
greenhouse gases

$\text{CO}_2 - \text{CH}_4 - \text{N}_2\text{O}$



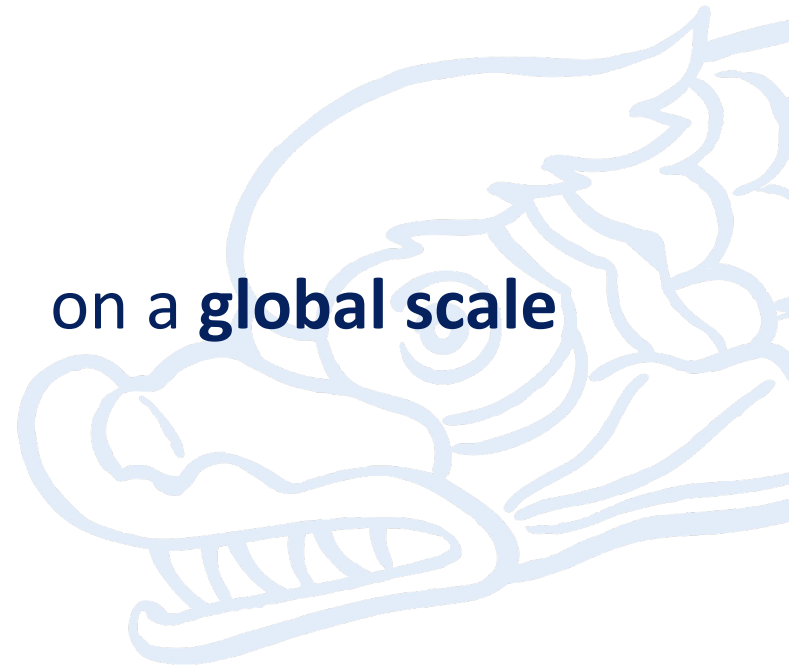
# Climate Change

## What are the **CONSEQUENCES?**

- floods
- drought
- wildfires
- ocean acidification
- invasive species spreading
- deforestation



on a **global scale**





## What are the **CONSEQUENCES?**

abnormal distribution of T



- water masses circulation
- sea level rise
- repetitiveness of exceptional weather



in the sea



productivity  
biodiversity

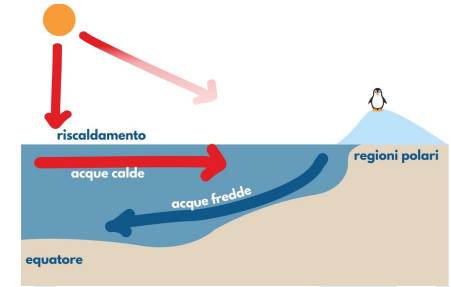
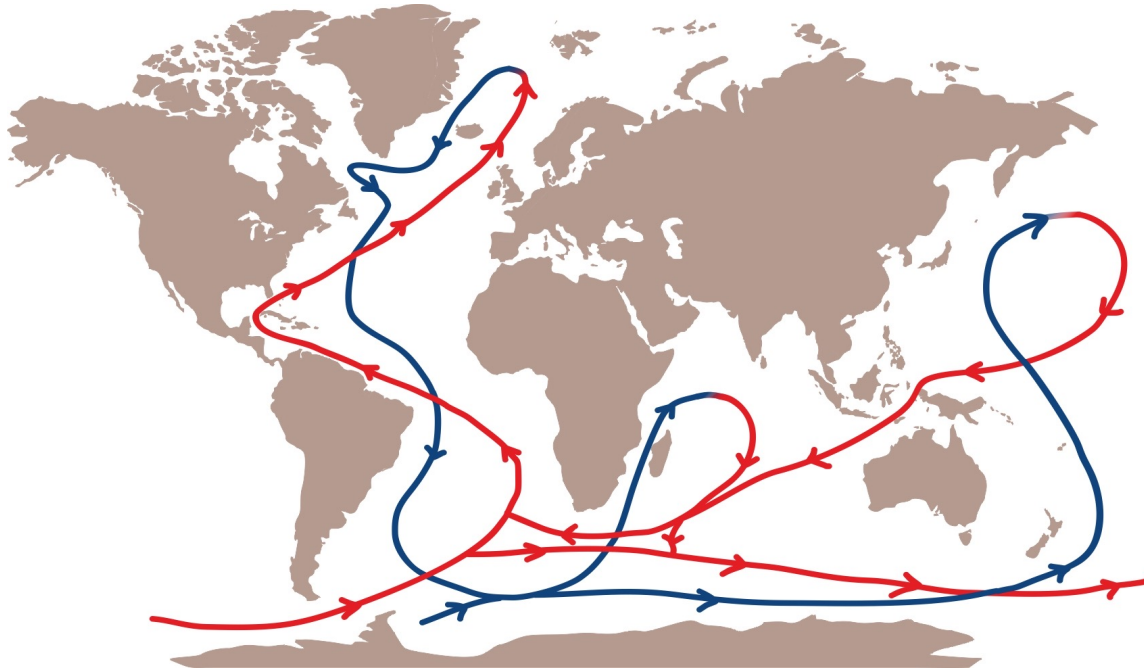


social, economic and, cultural aspects



# Climate Change

## What are the **CONSEQUENCES?**



the climate  
conveyor belt





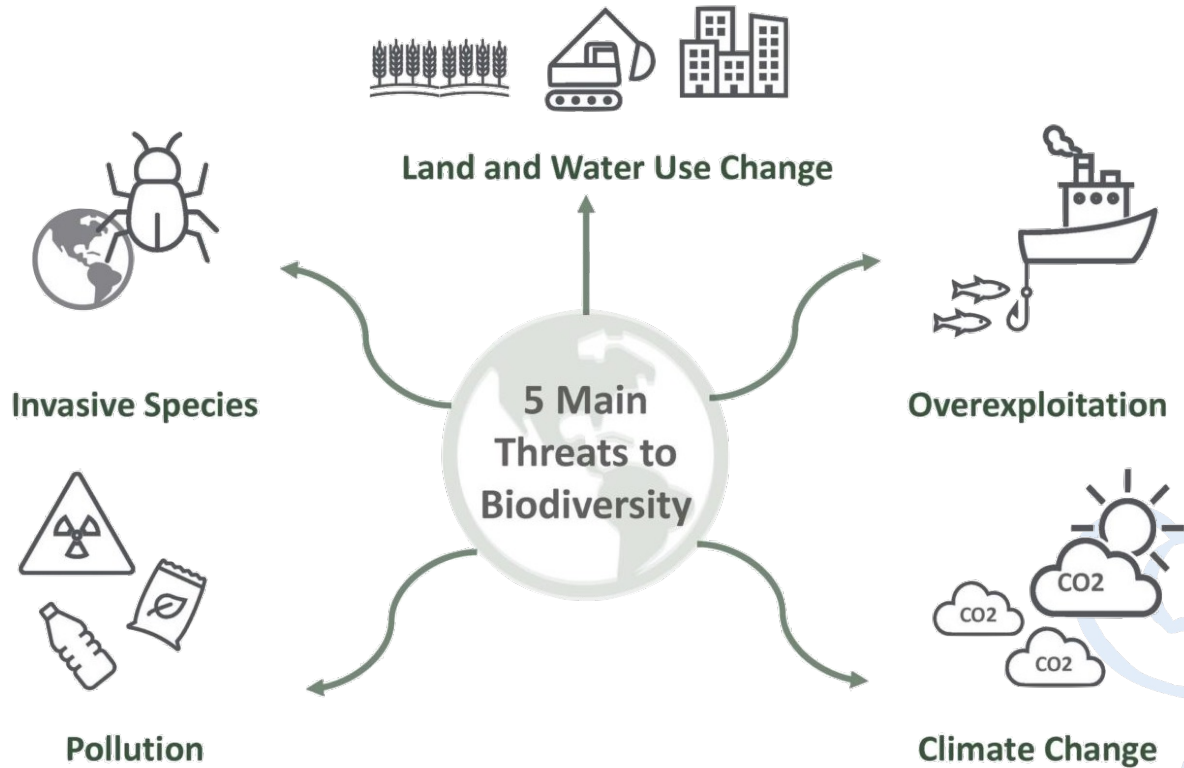
the relationship?

**biodiversity** ↔ **climate change**



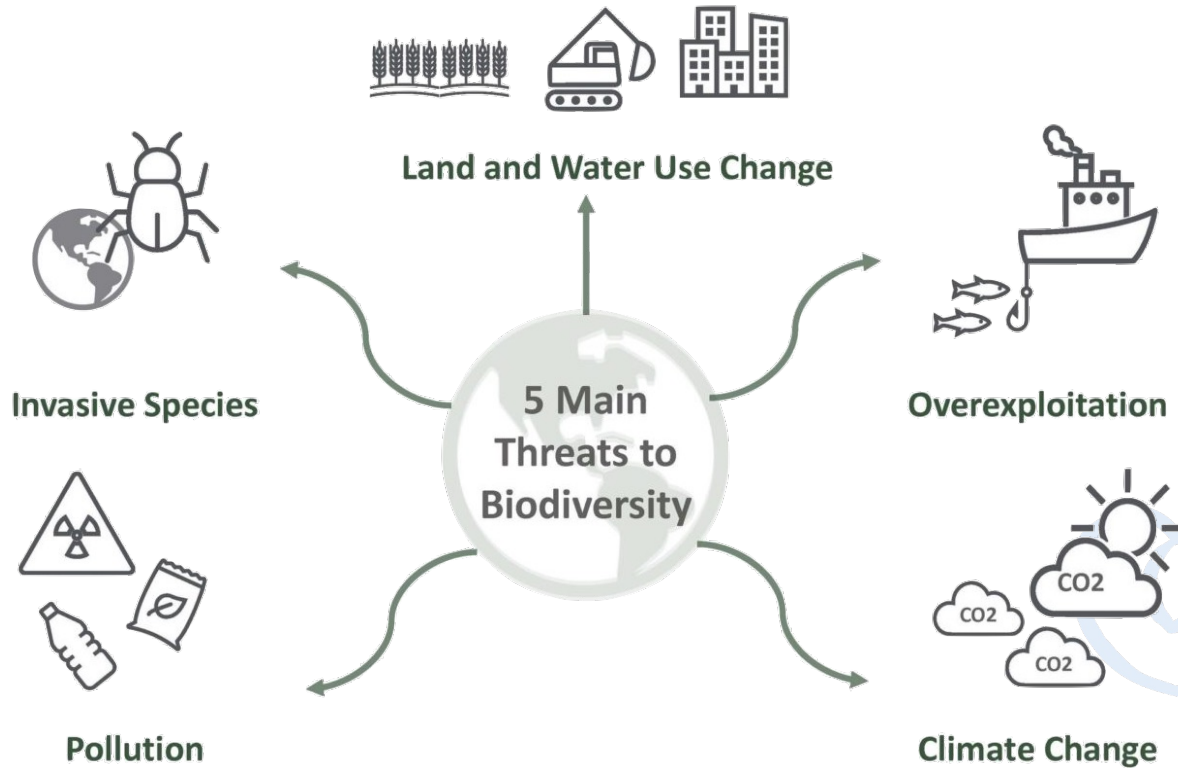


# Climate Change





# Climate Change



**not only  
climate change**



# Climate Change

## THE LIVING PLANET INDEX

The population sizes of mammals, birds, fish, amphibians and reptiles have seen an alarming average drop of 68% since 1970.





# Climate Change

*changes*

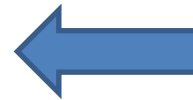


**average T**

**regional and local climate systems**

**rainfall regime**

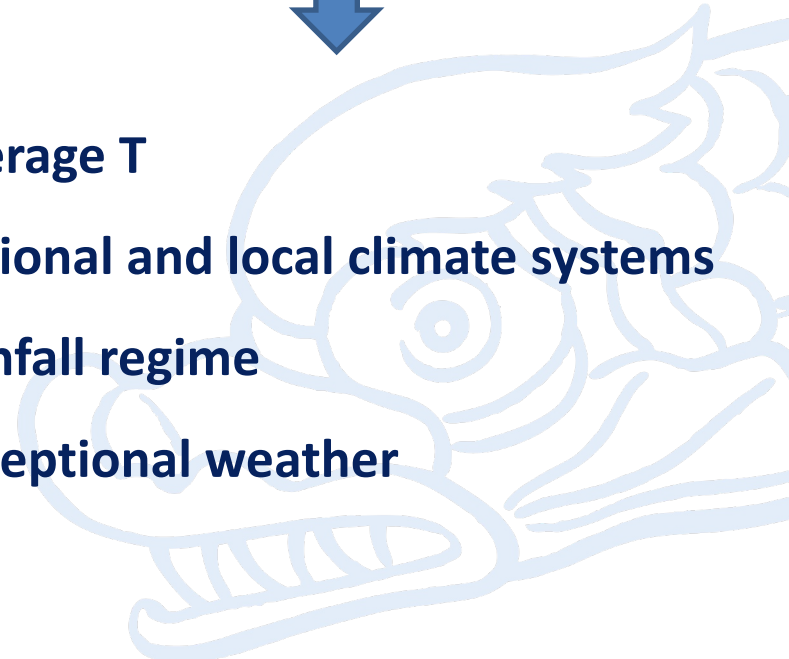
**exceptional weather**



plant and animal communities

biodiversity

ecosystem services





# Climate Change

the **demanding** questions

what are the causes?

what is really happening and at what speed?

how the species will be affected?

can we predict the fate of individual species?

there will be a natural adaptation?

there will be an «answer» by the *Nature*?

conservation strategies are effective?

are there species we cannot save?





# Climate Change

## the Mediterranean?

*a semi-closed sea*

heavily anthropized



**vulnerable**





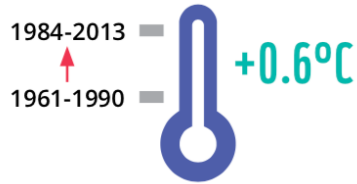
## the Mediterranean?

a semiclosed sea

heavily anthropized



## vulnerable



the mean increase of T  
at regional scale

groups	global scenario of climate change					
	2°C		3.2°C		4.5°C	
	no dispersal	dispersal	no dispersal	dispersal	no dispersal	dispersal
plants	36	36	55	55	69	69
birds	21	10	35	22	49	36
mammals	29	16	45	30	60	45
amphibians	26	26	43	43	57	57
reptiles	16	16	30	30	43	43



# Agenda



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Climate Change



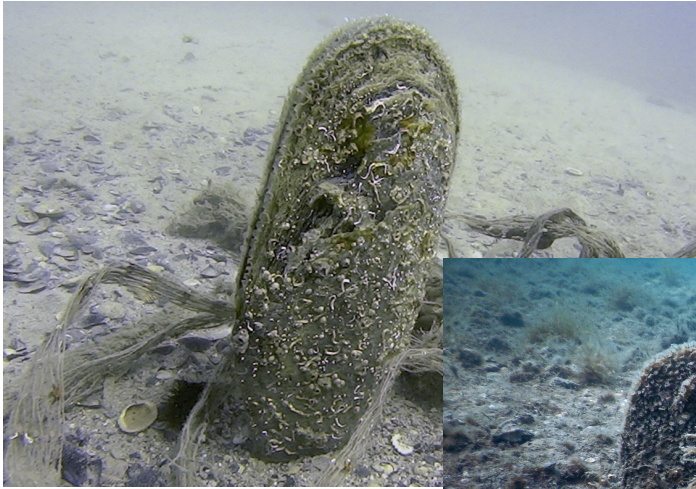
*Pinna nobilis*



Conclusions



# *Pinna nobilis*





## *Pinna nobilis*

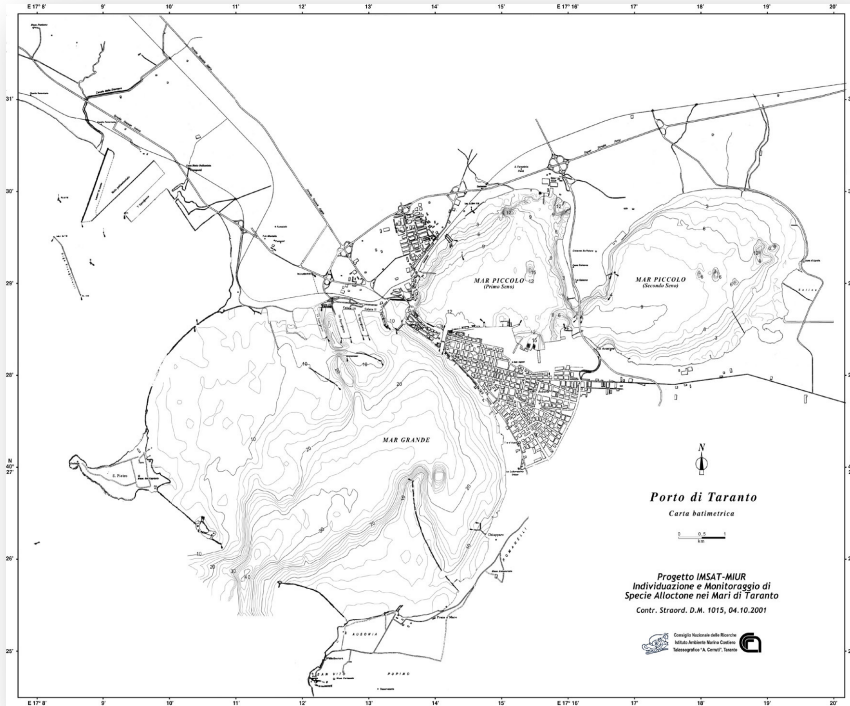
- the largest bivalve mollusc in the Mediterranean
- endemic
- up to 120 cm long
- up to 30 years
- from 0 to 60 m depth
- under a strict protection



Gianni Squitieri



# *Pinna nobilis*



a  
mass mortality  
event





# *Pinna nobilis*



september 2019



# *Pinna nobilis*



at Taranto



*Pinna nobilis*

very high  
densities



at Taranto



*Pinna nobilis*

ecological role





## POR Puglia 2021-2023 – action 6.5 monitoring actions of Rete Natura 2000



# next steps



Regione: Puglia

Codice sito: IT9130008

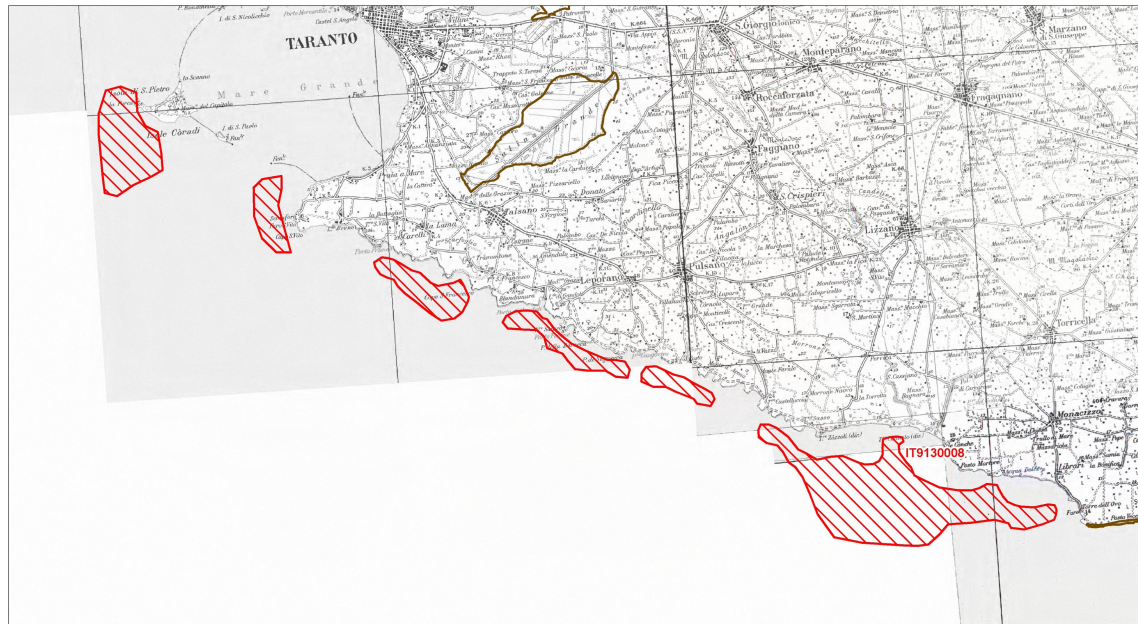
Superficie (ha): 3148

Denominazione: Posidonieto Isola di San Pietro - Torre Canneto

### Action:

State of health of *Pinna nobilis*  
(species of EC interest 1028) along the  
apulian coastline

coastline from Secca dell'Armeleia  
to Torre Ovo



Data di stampa: 07/12/2010



Scala 1:100'000

# Agenda



Ecology



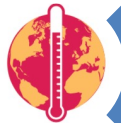
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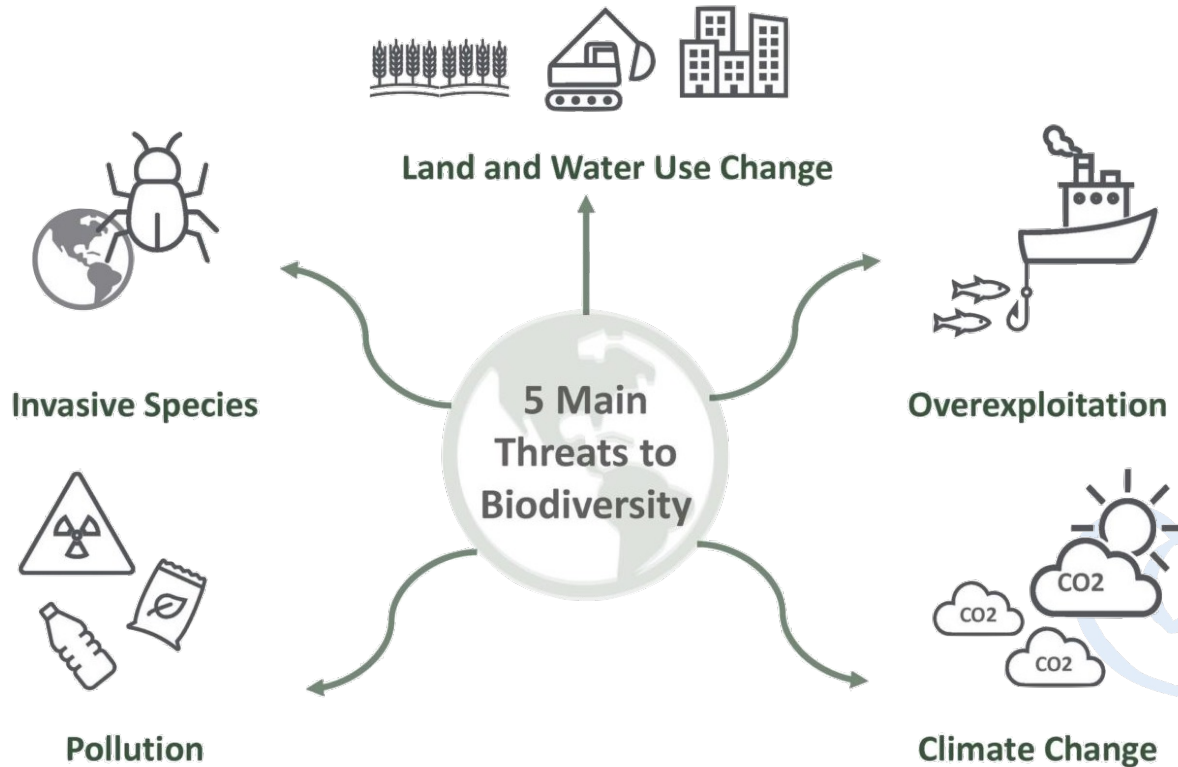
# Conclusions

- need to solve problems of **non-climatic origin**





# Conclusions



**not only  
climate change**



# Conclusions

- need to solve problems of **non-climatic origin**
- increase the resistance of the natural environment:  
**minimize the damage**
- increase the resilience of the natural environment:  
**facilitate the recovery**  
(e.g., MAP networks)





what about us?

## *the 4 commandments*

reduce

switch off

recycle

walk





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