Mediterranean marine biodiversity: an endangered treasure

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CSIC Consejo Superior de Investigaciones Científicas

MedRecover Marine Biodiversity Conservation Group

April 26th, 2017 @GIFT EGU Vienna

Results from a team effort

From research institutions in Spain and France







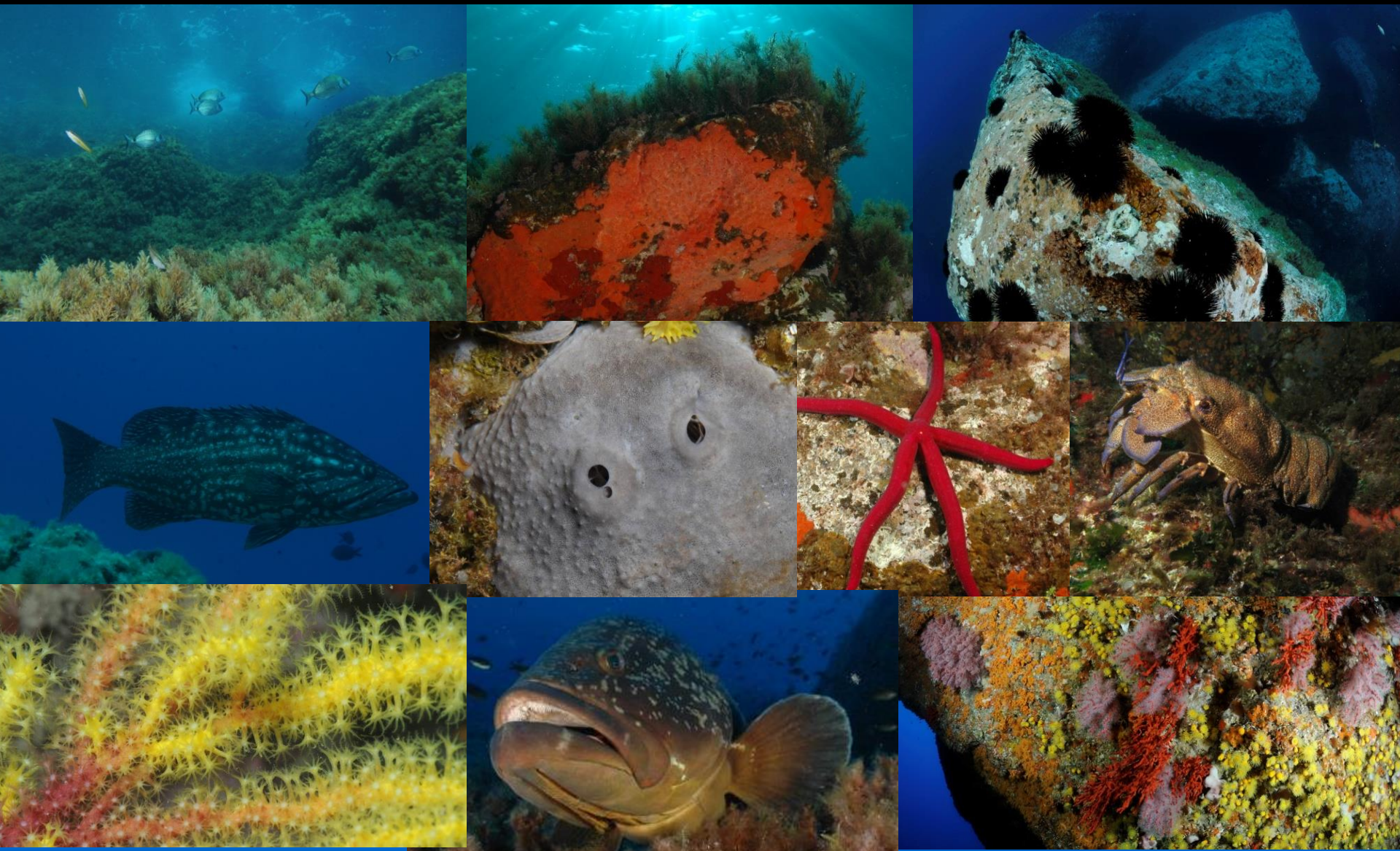


Cristina Linares, J.B. Ledoux, Ignasi Montero, Pierre Drap
E. Cebrian, Mikel Zabala……. and many more

Researchers, MPA managers, Postdocs, Technicians,
PhD students, master students

Mediterranean Biodiversity hot-spot:

>17000 species



Mediterranean Biodiversity hot-spot:
>17000 species

Foraminifera >600
Macrophyta > 800
Mollusca > 2000
Crustacea > 2000
Fishes > 600 species

Coll et al. 2010 PLoS ONE

Mediterranean Biodiversity hot-spot:
>17000 species

10% marine species in less than

0,1 % ocean's surface

Why?

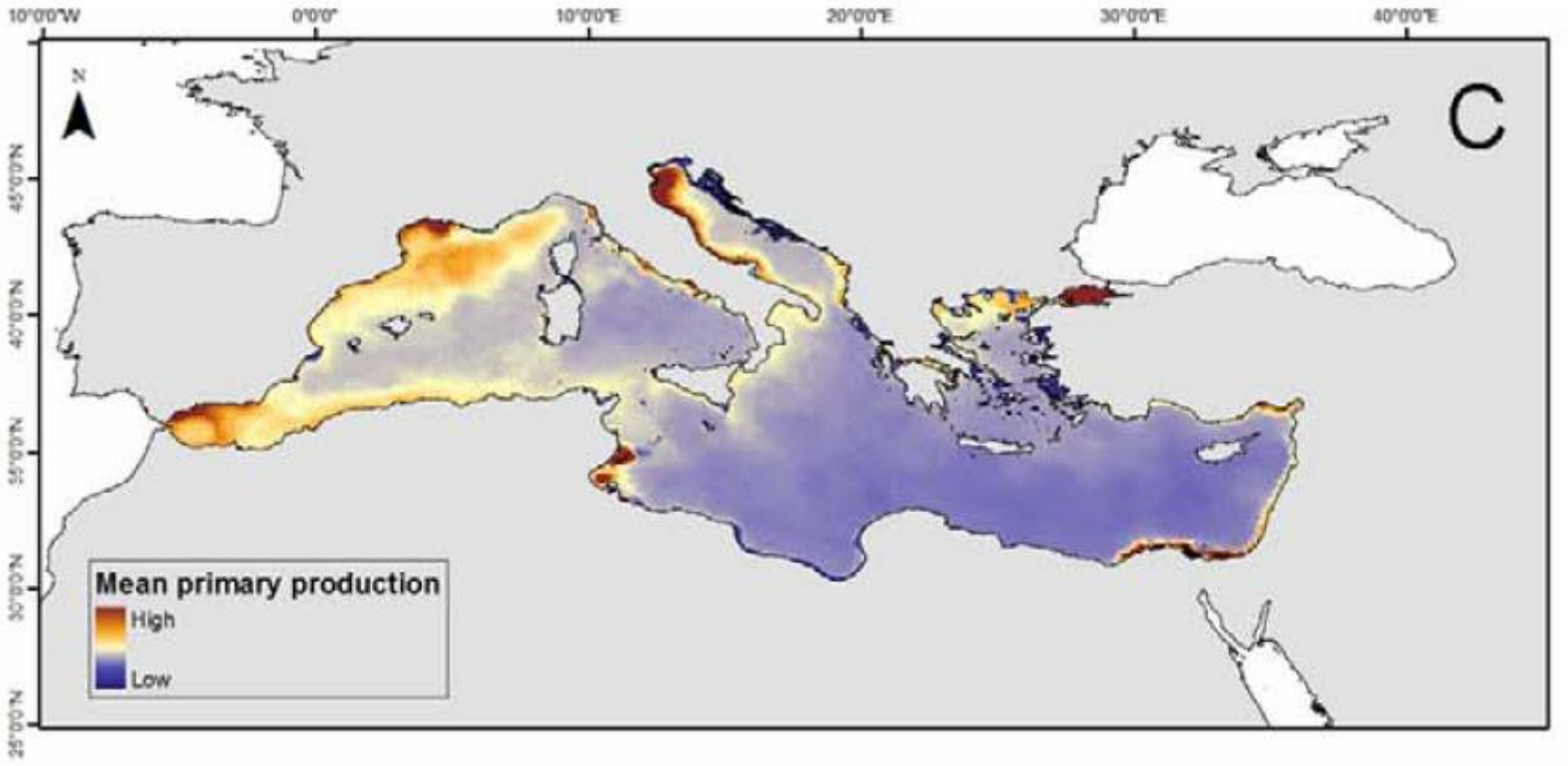
Historical/Geological factors

Geomorphology

Environmental gradients

Mediterranean environmental gradients:

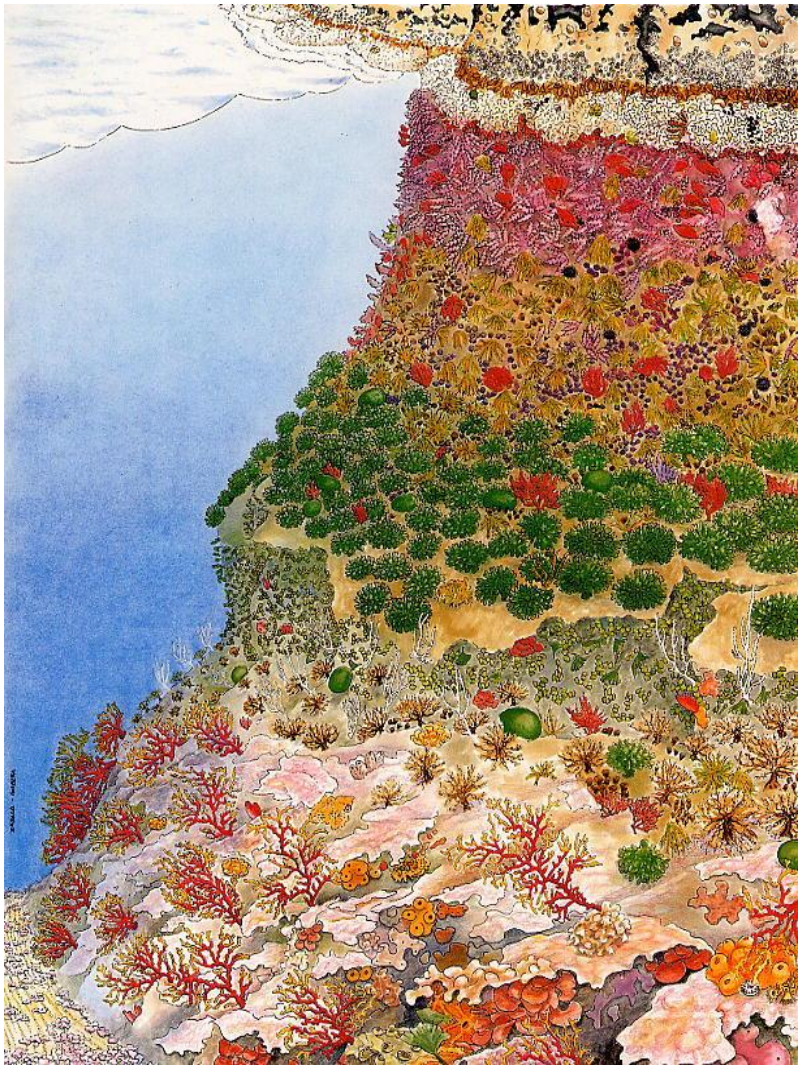
Primary production



Coll et al. 2010 PLoS ONE

Coastal areas high biodiversity:

Examples from rocky coasts



Coastal areas high biodiversity:
Small-scale forests

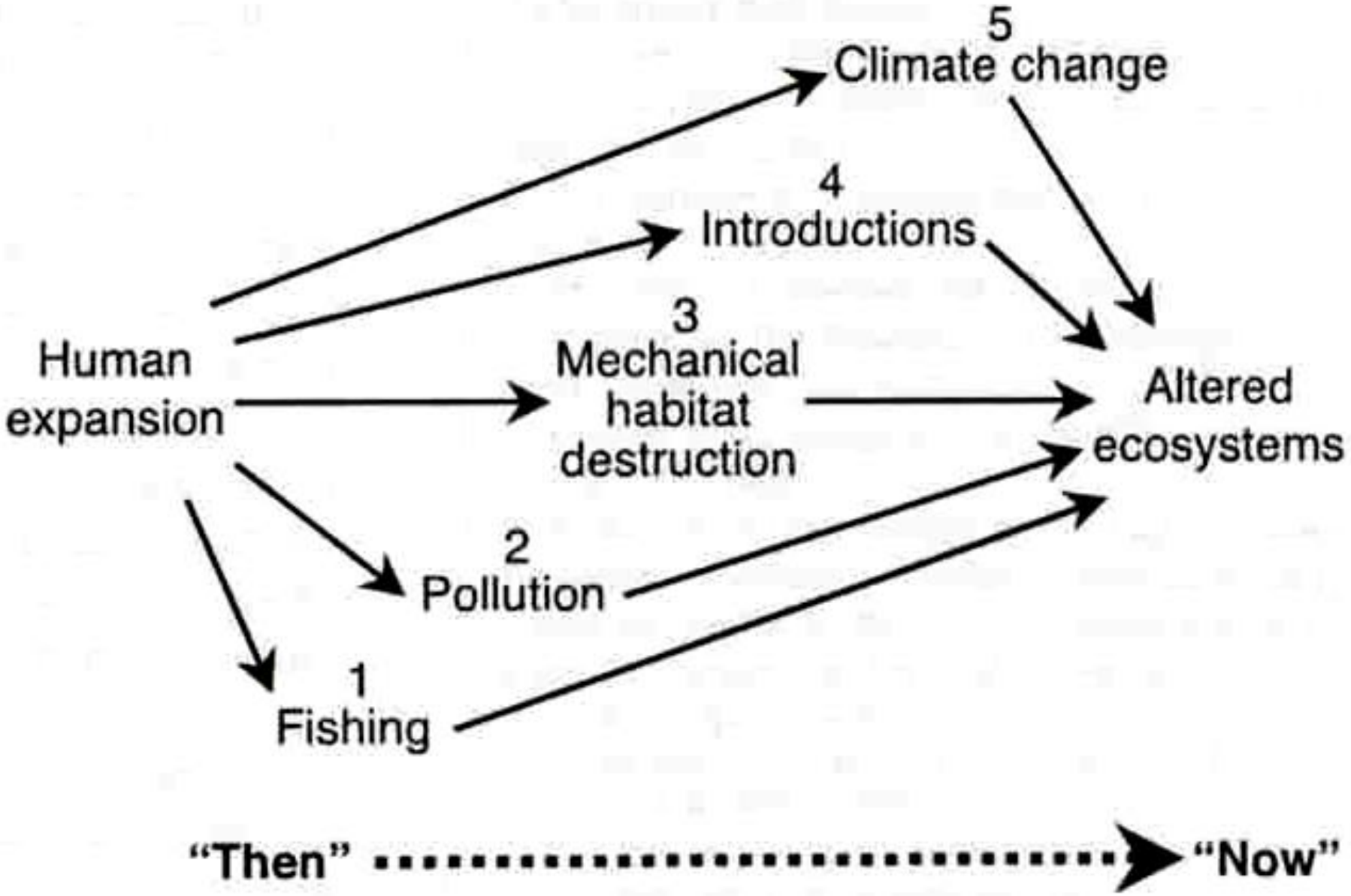
MEDITERRANEAN MONK SEAL
Monachus monachus

Foto: Zafer Kızılkaya

DRIVERS OF CHANGE

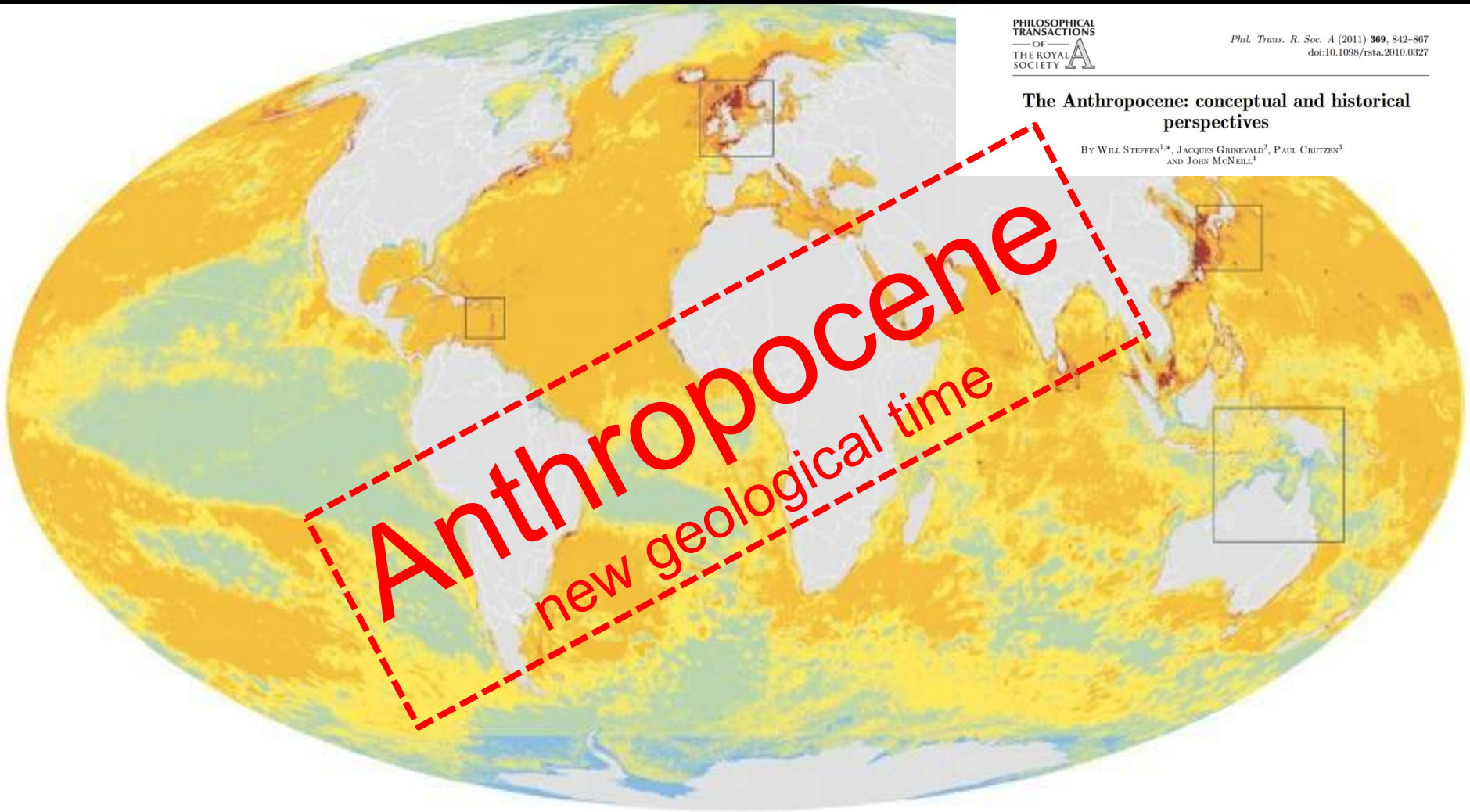
Sequence of human disturbances

Jackson et al. 2001 Science



ERA OF CHANGE

Human disturbances impacts



PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A

Phil. Trans. R. Soc. A (2011) **369**, 842–867
doi:10.1098/rsta.2010.0327

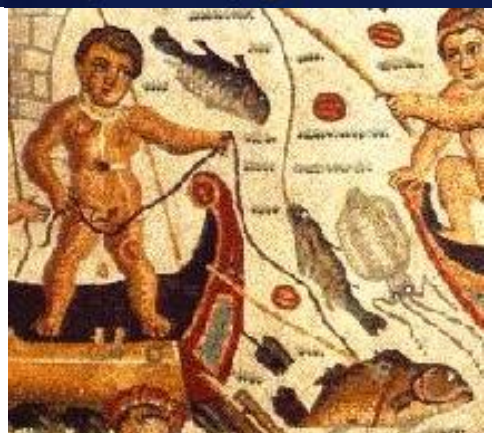
The Anthropocene: conceptual and historical perspectives

By Will Steffen[1,*], Jacques Grinevald[2], Paul Crutzen[3] and John McNeill[4]

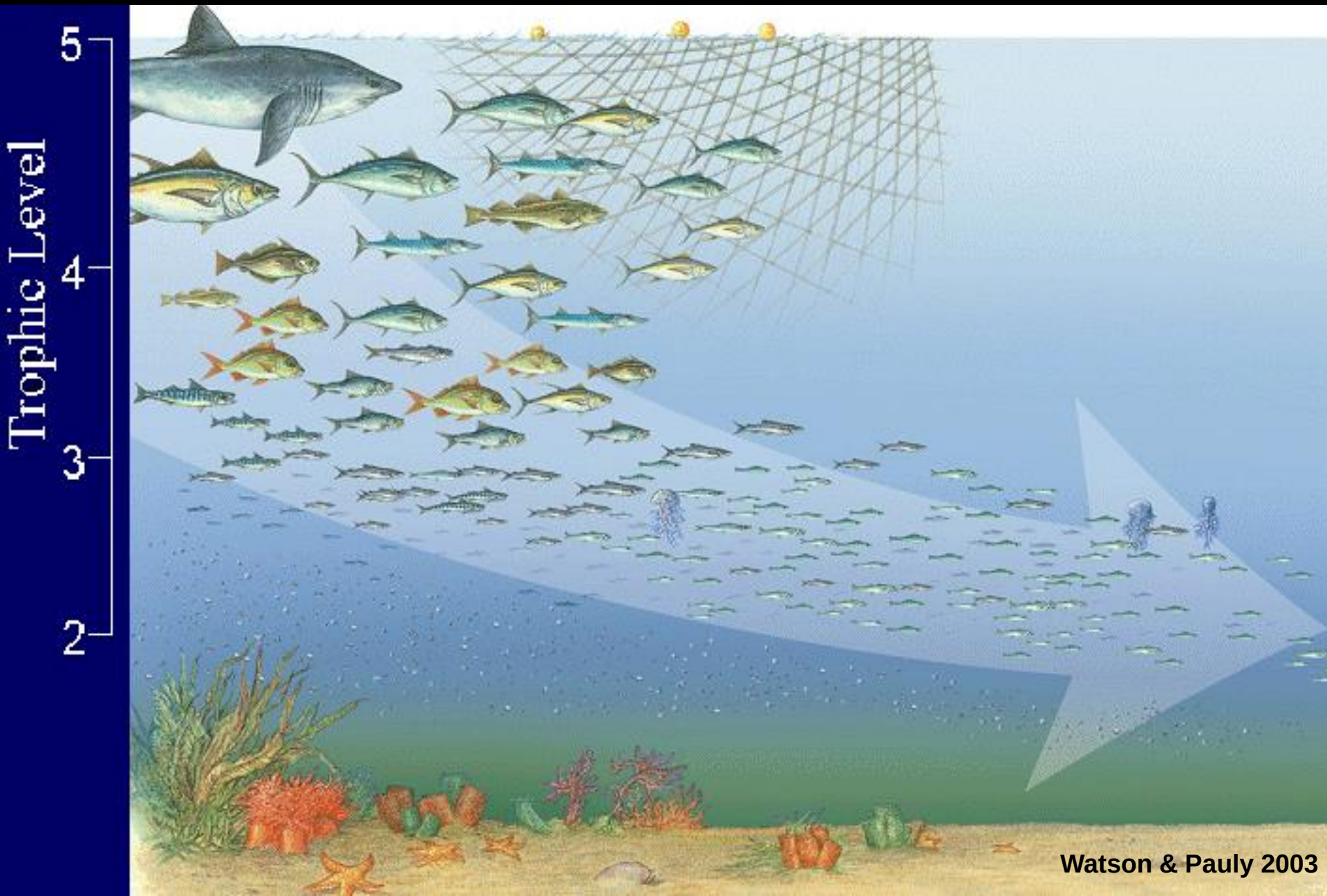
Halpern et al. 2008 Science

Mediterranean a threatened sea

E Trainito/Bardo Museum

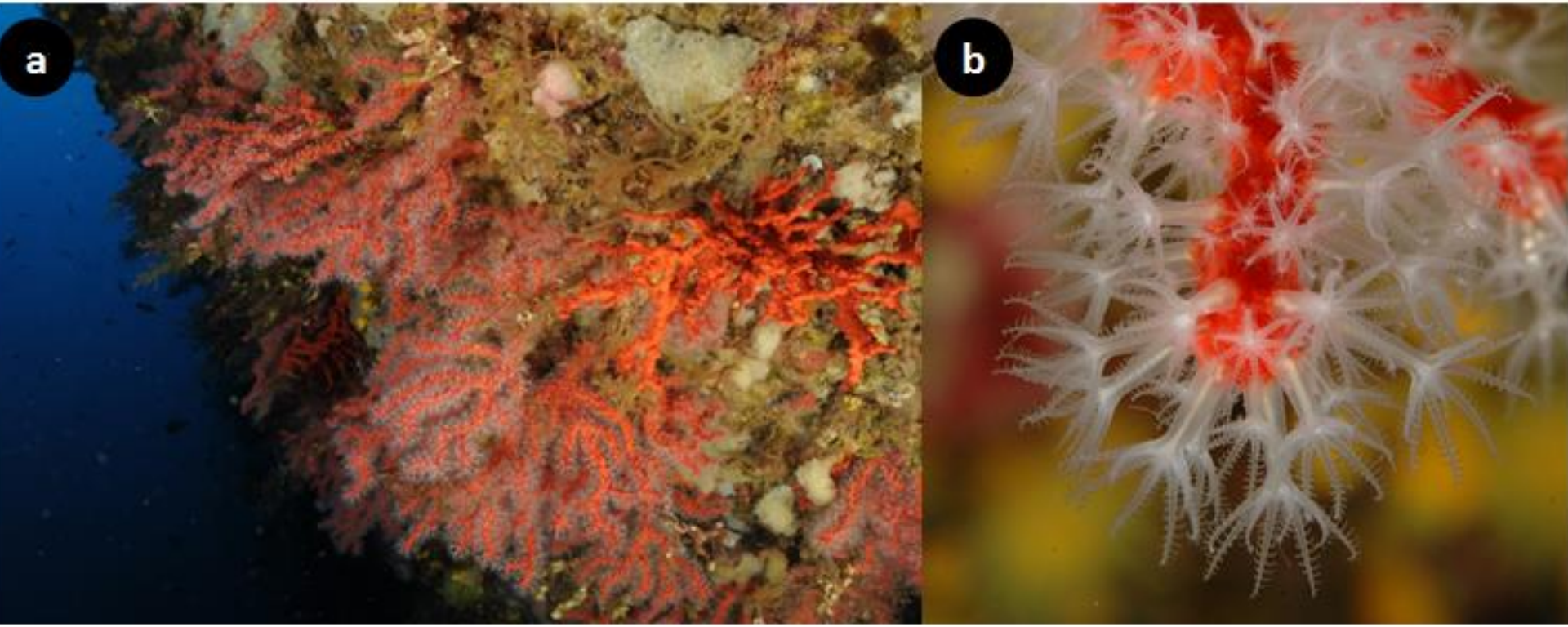


Simplification of ecosystems



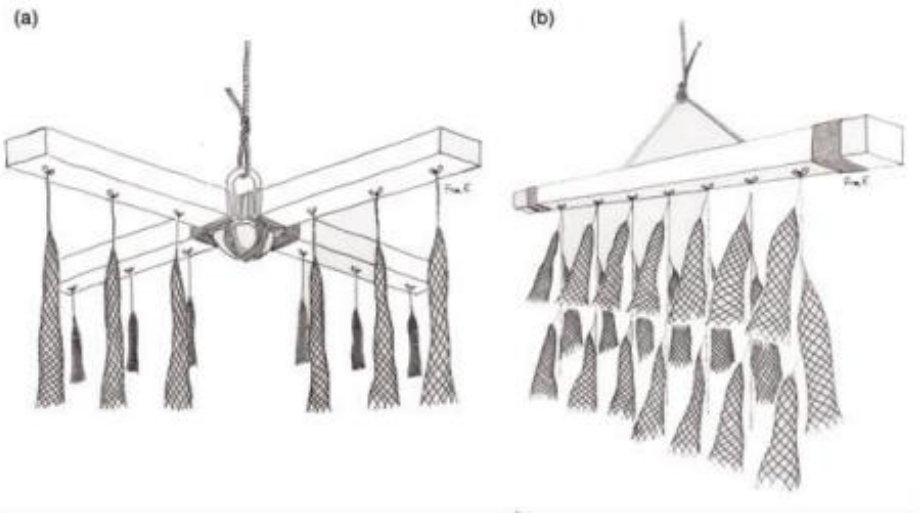
IMPACTS

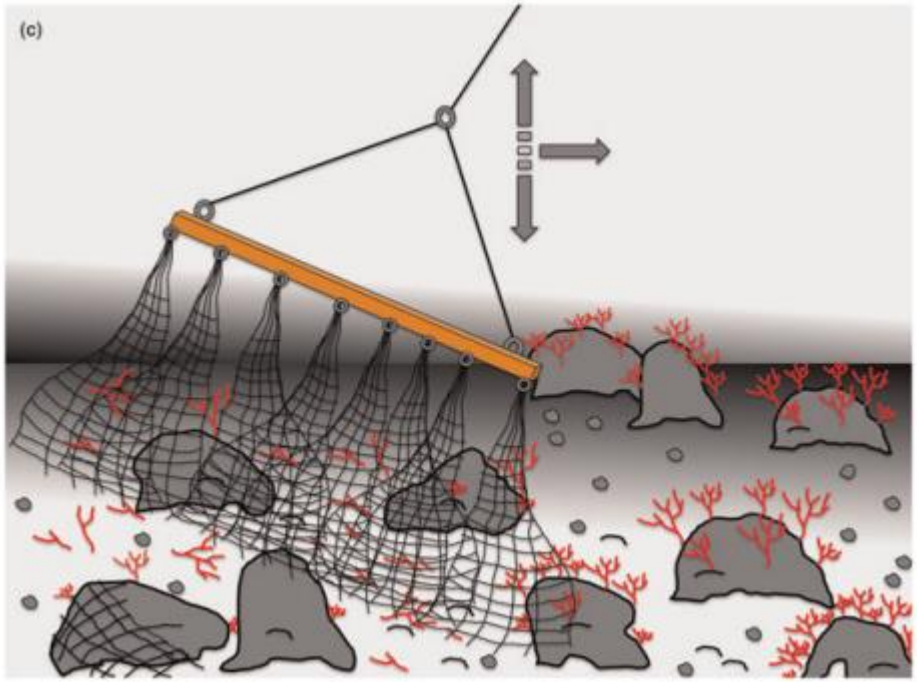
Red coral *Corallium rubrum*



Red coral *Corallium rubrum*: Exploitation for use for jewelry

Fishing gears
St. Andrews cross

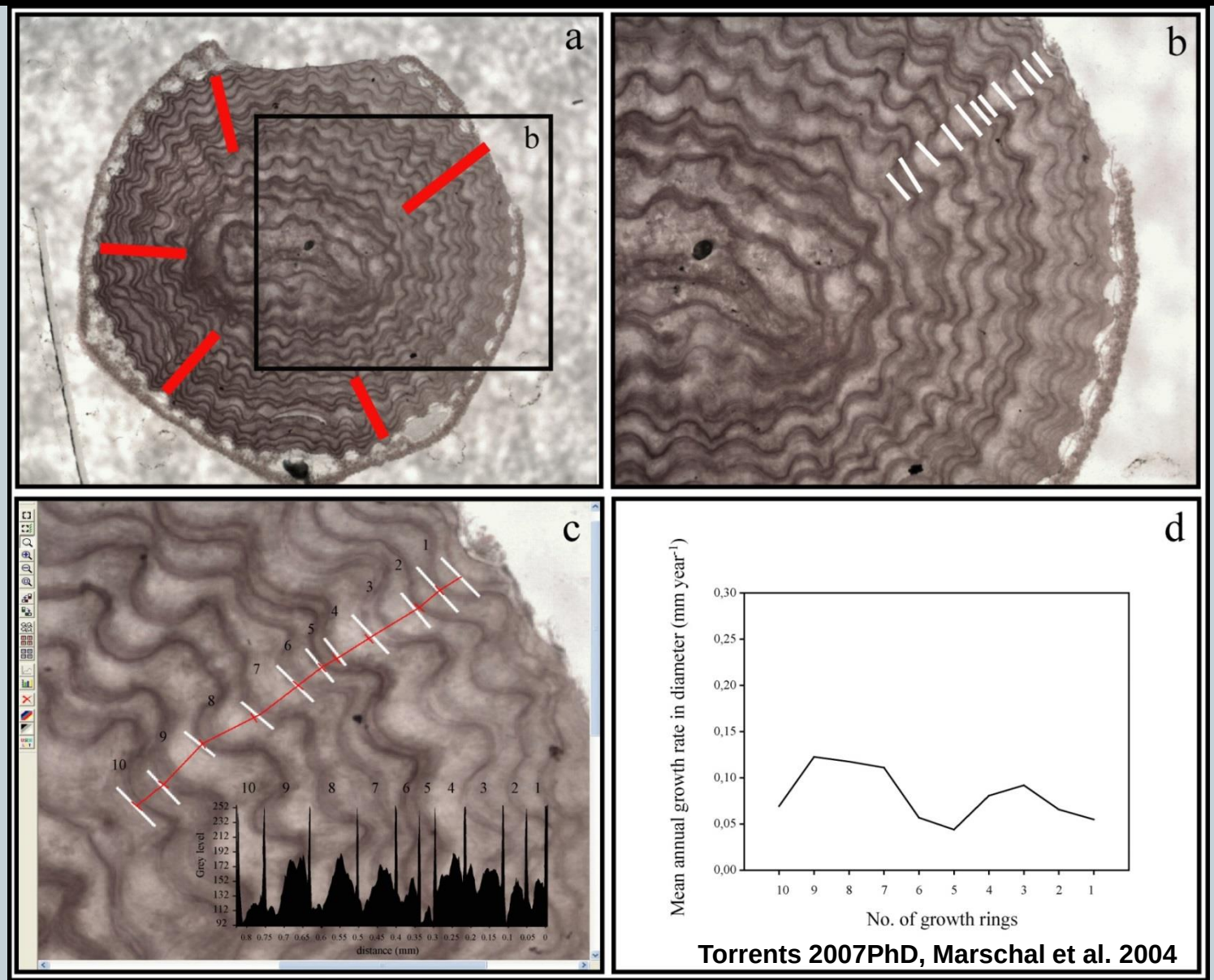




Cattaneo-Vietti et al. 2016

Aging methods for red coral

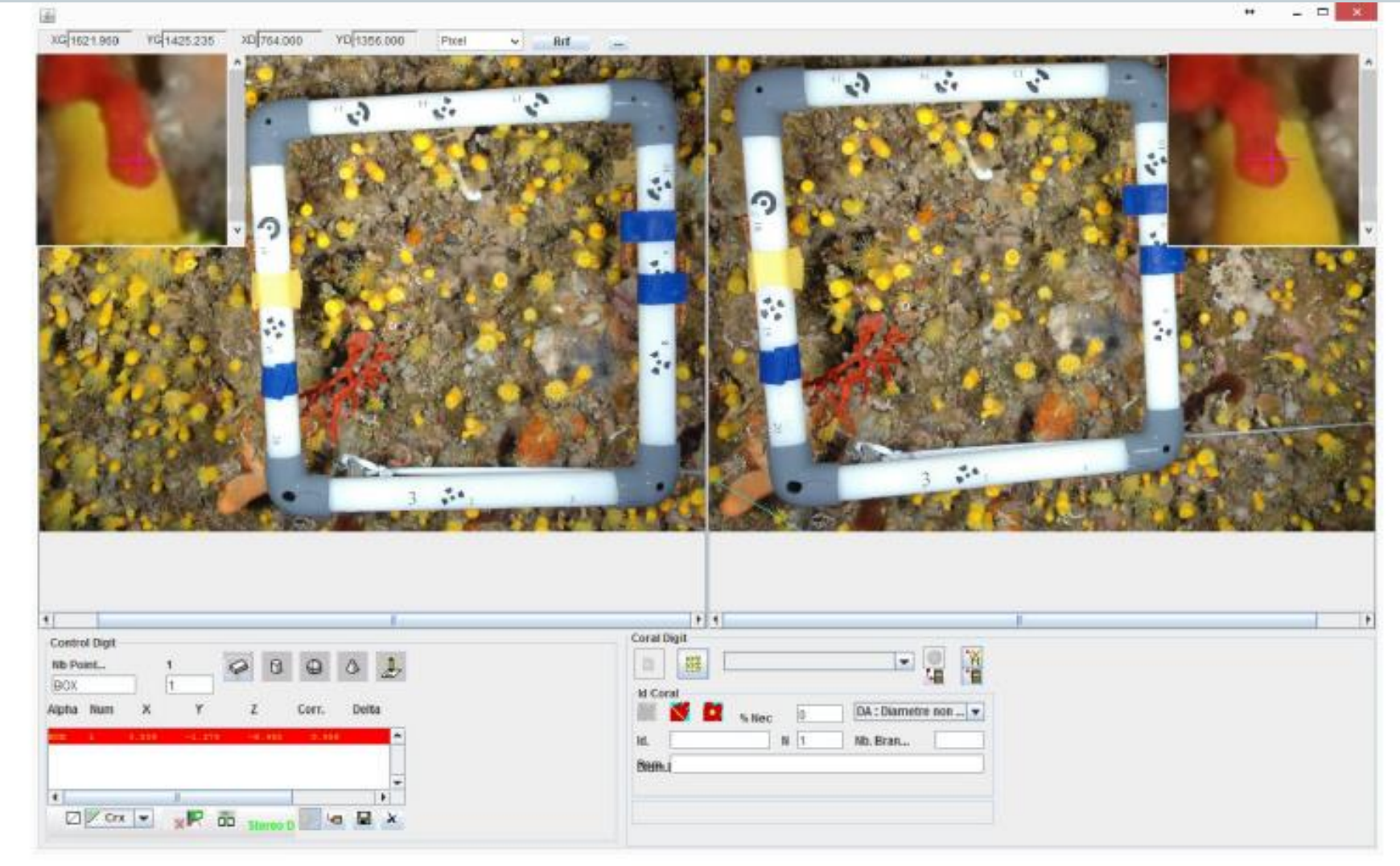
Annual growth rings. Growth rate 0,25 mm year^{-1}



Torrents 2007PhD, Marschal et al. 2004

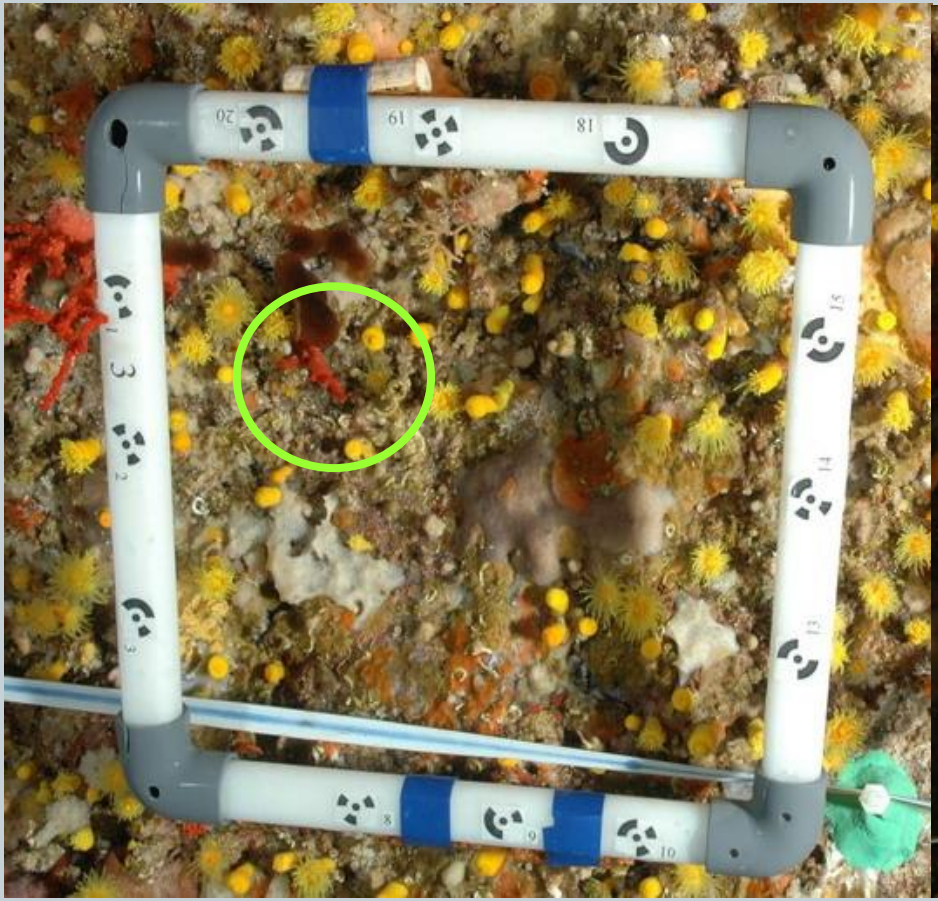
Monitoring permanent plots
Photogrammetric methods

Monitoring permanent plots
Photogrammetric methods

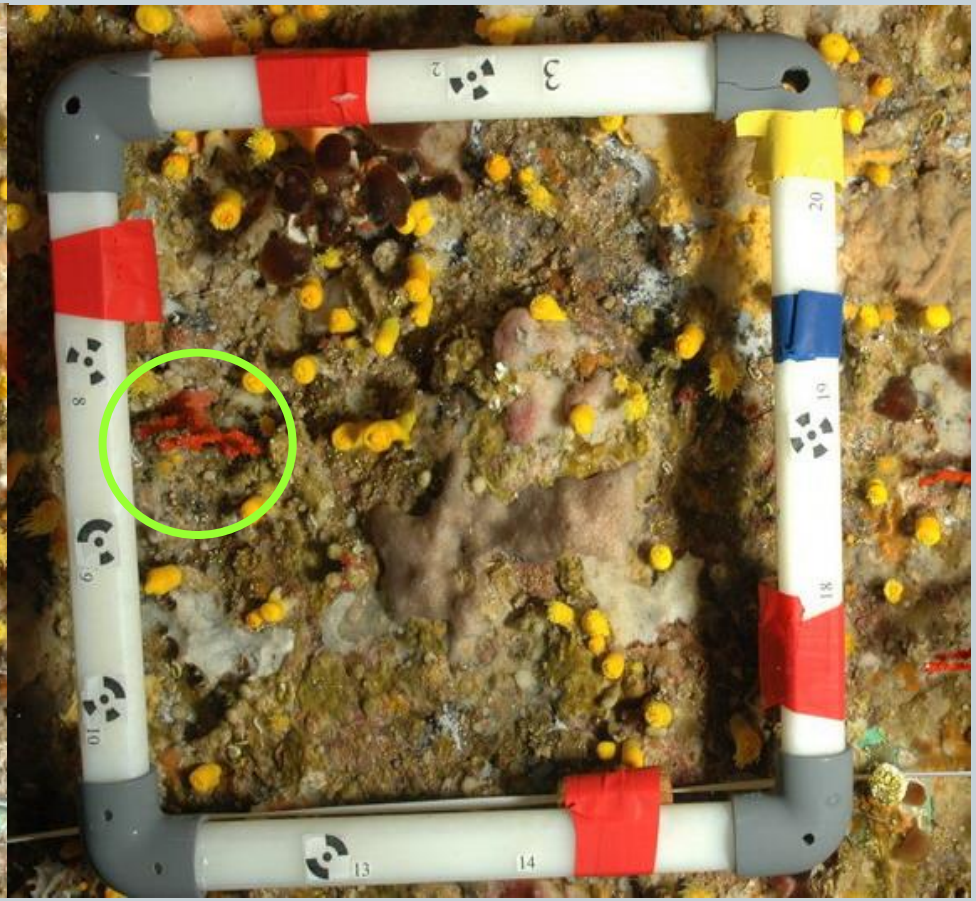


Growth rates:
Height 1 mm year^{-1}

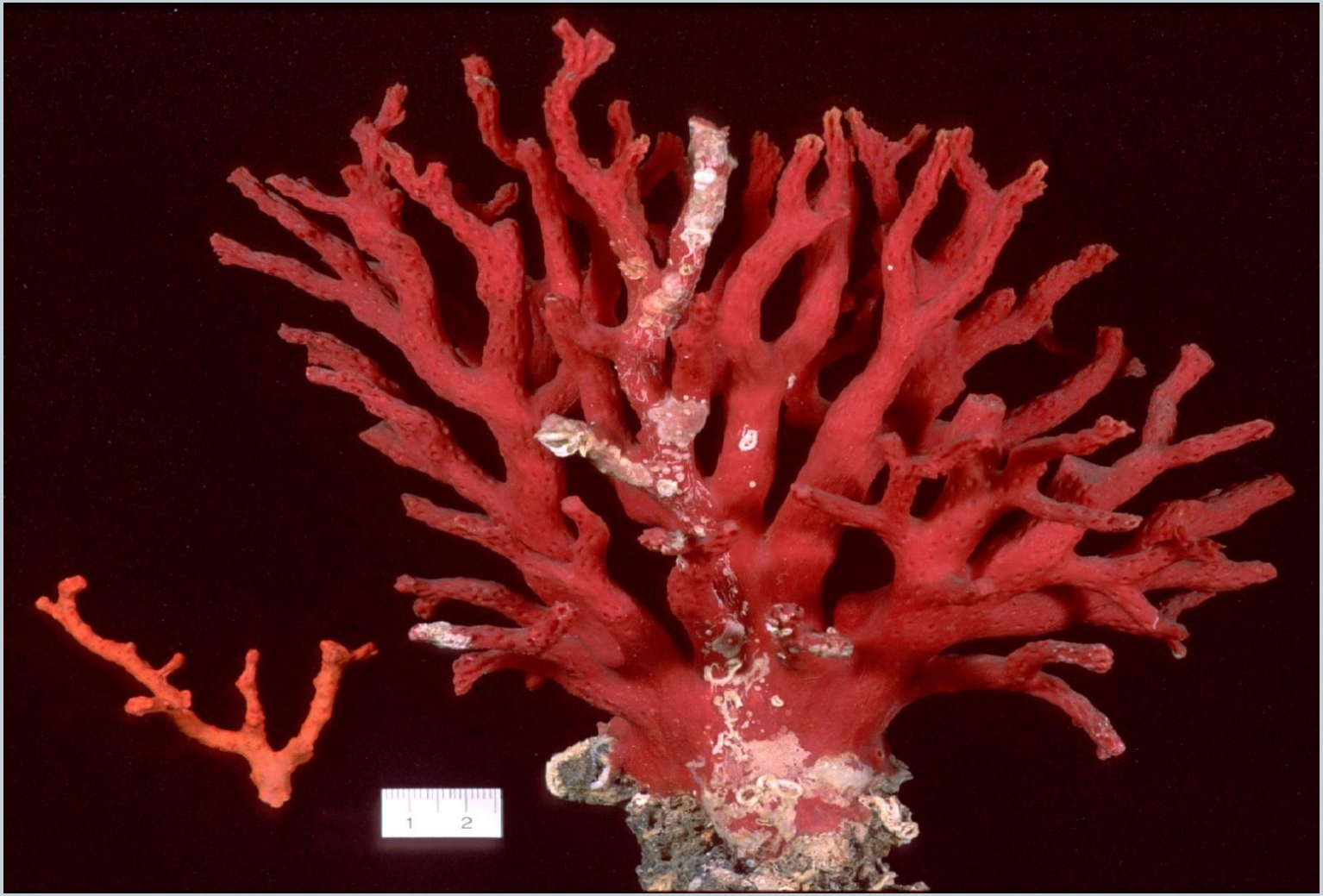
2006



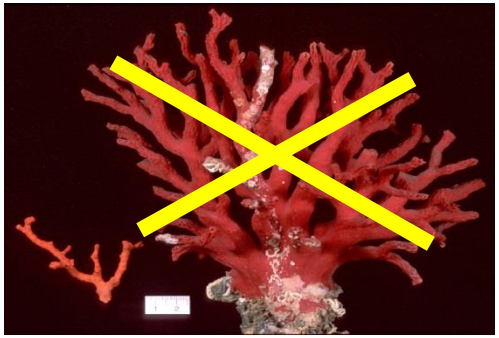
2010

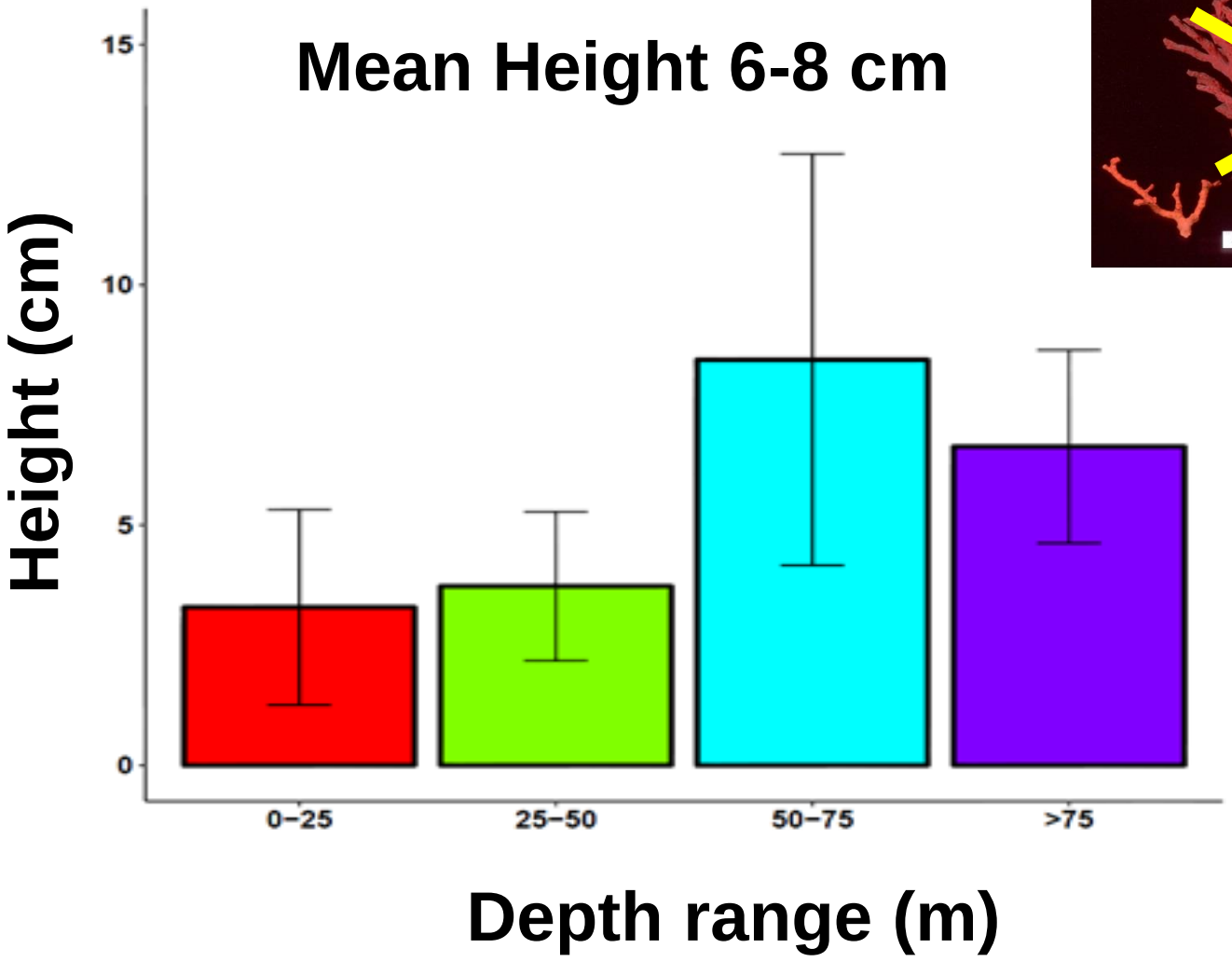


Life span:
Colonies > 200 years

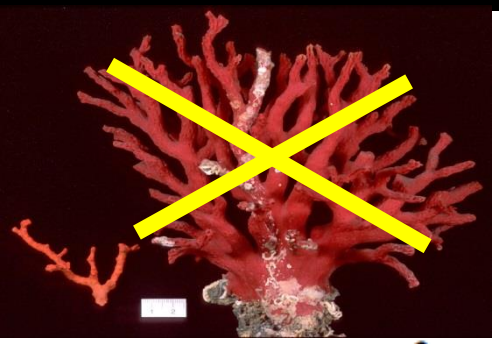


Studied red coral populations:
Colony size along depth

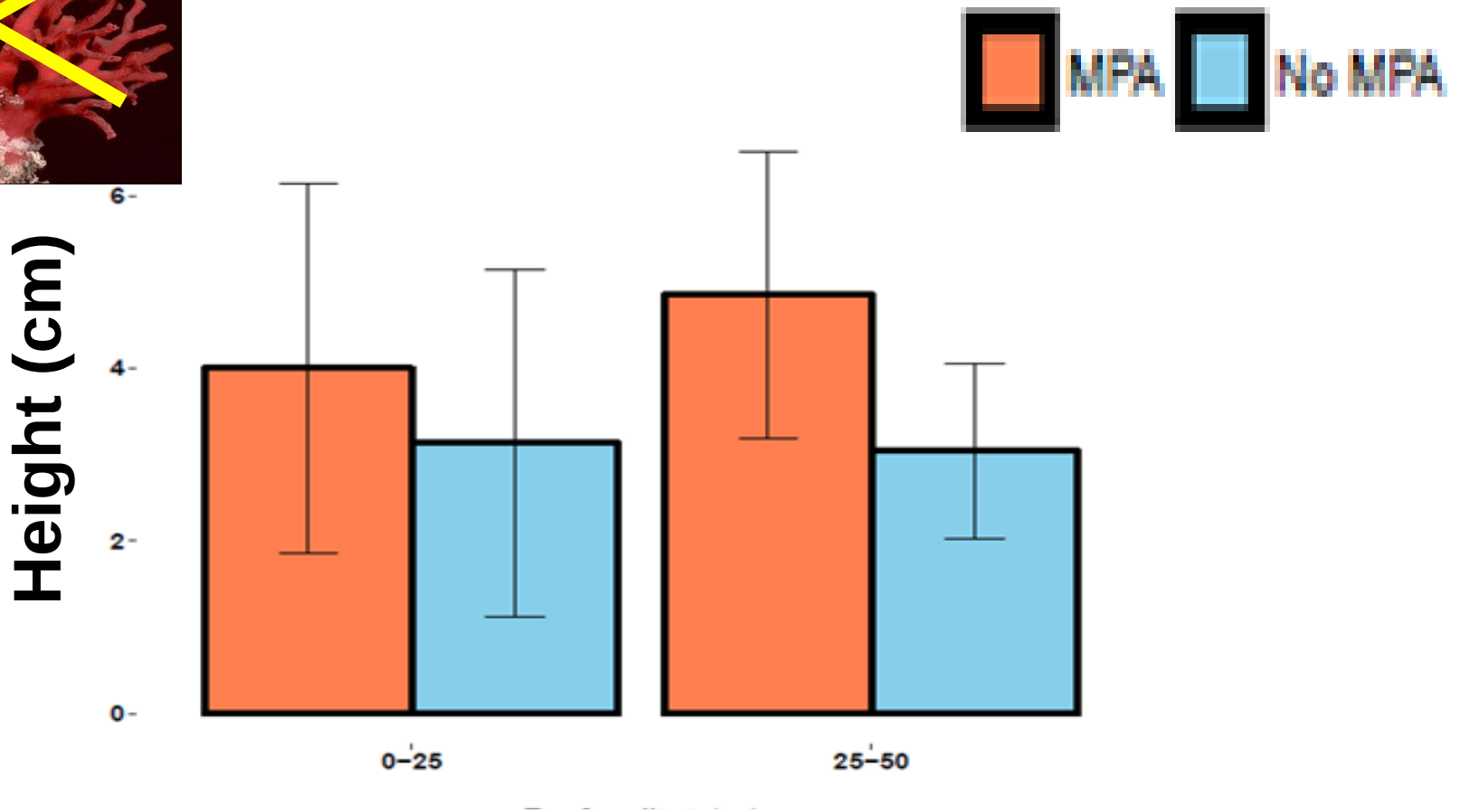




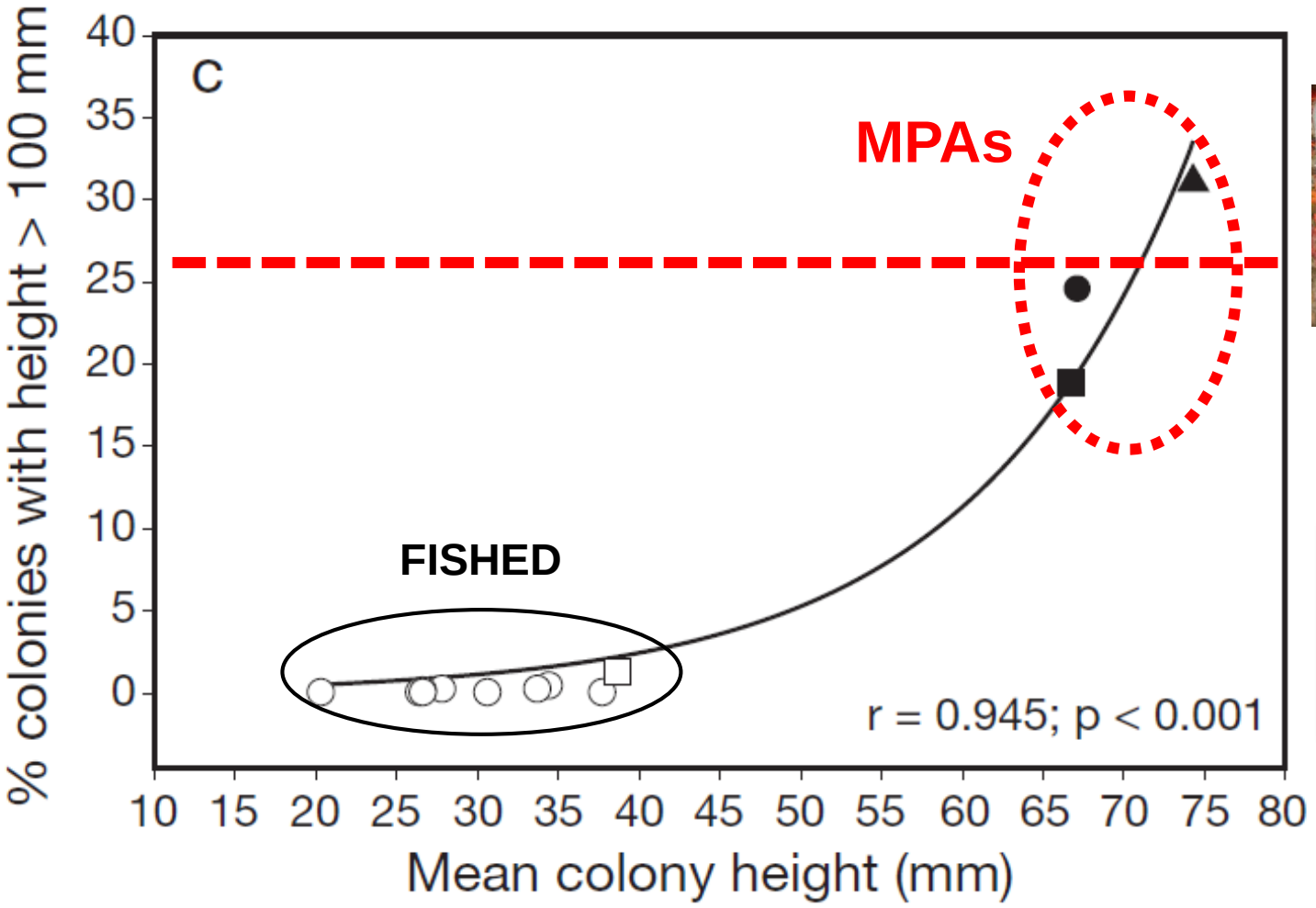
Studied red coral populations:
Effect of protection

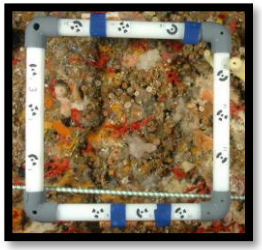


MPA = MARINE PROTECTED AREA



Conservation status populations:
% large colonies

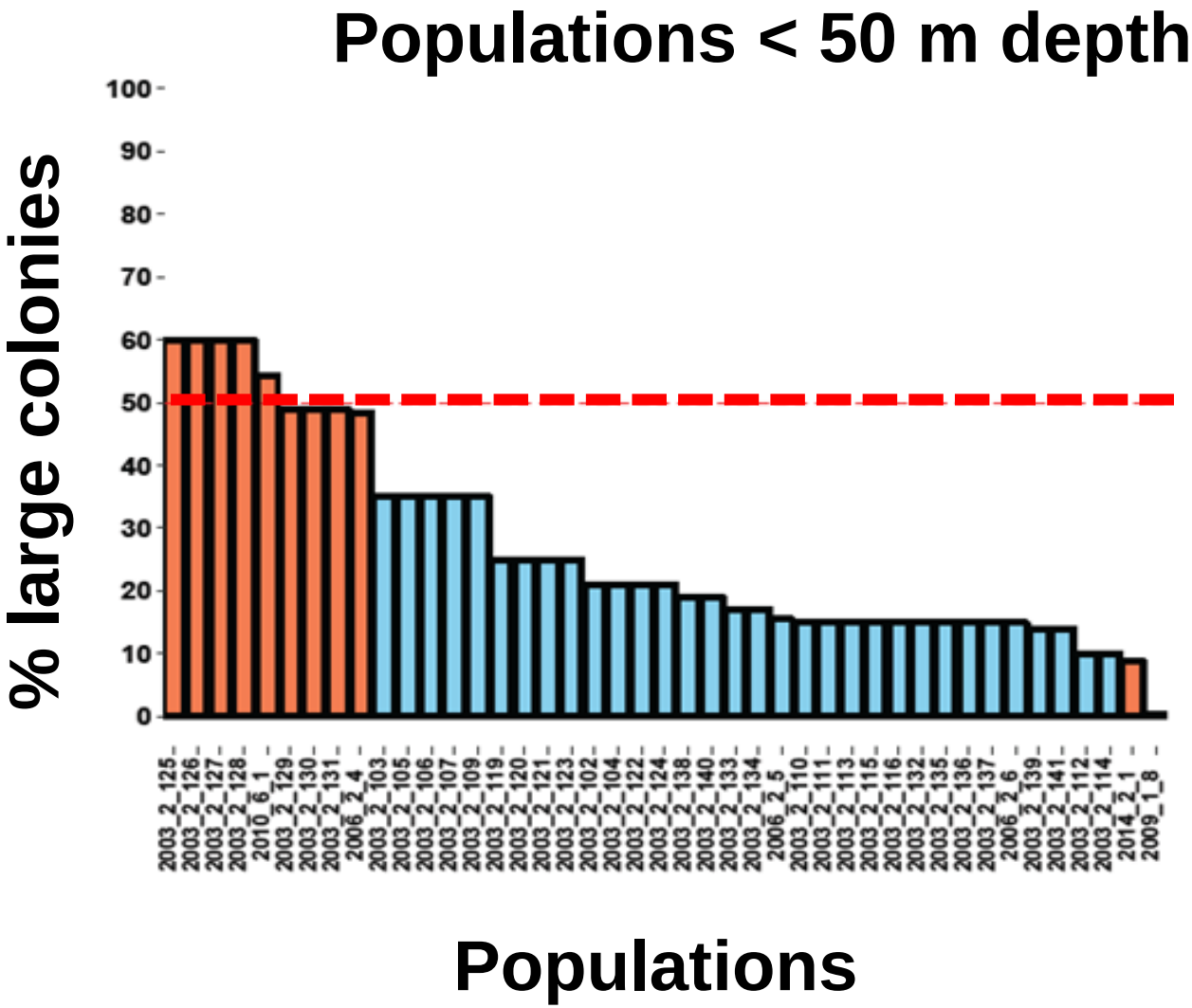




MPA = MARINE PROTECTED AREA

Linares et al. 2010 MEPS

Conservation status populations:
Only 10% good status



Overfishing effects

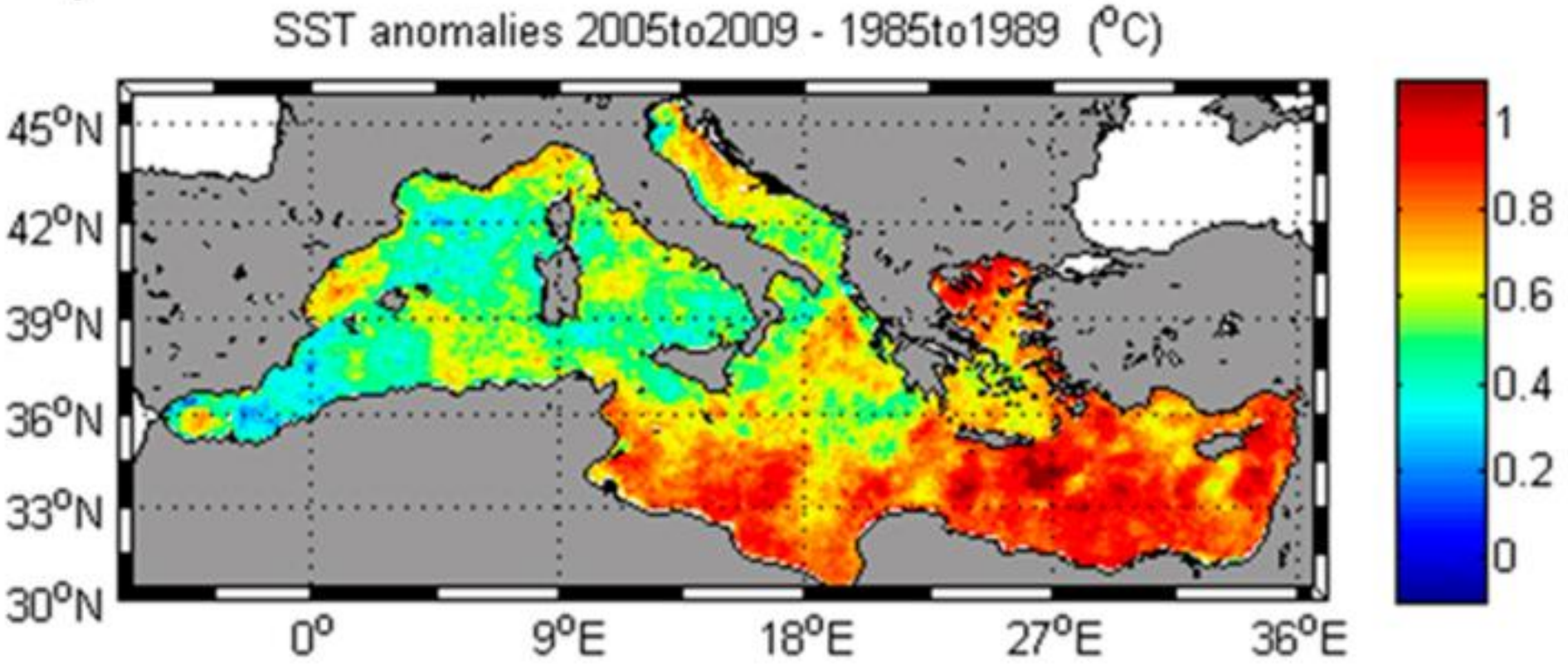
Changes in size and abundance of species

Fotos: E. Ballesteros

Fishing in Catalan Coast (Spain)

Climate Change hot-spot

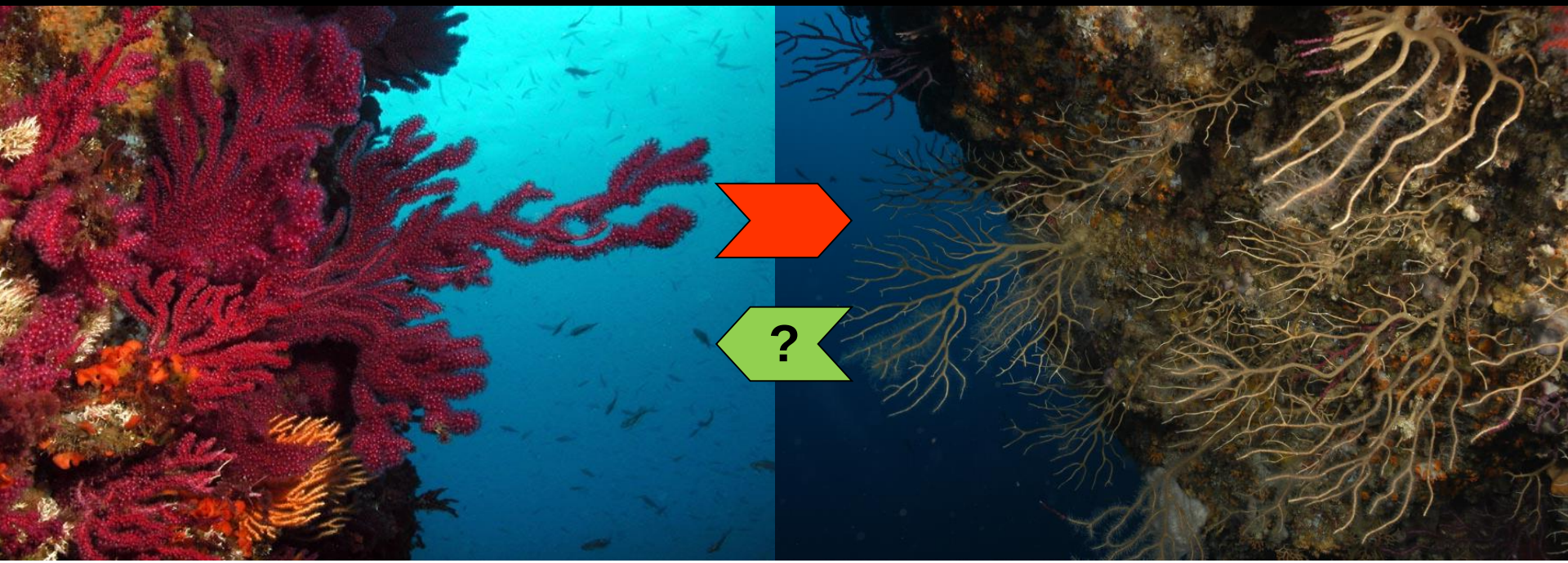
Warming SST in the Mediterranean



Overall = +0.37 °C / decade
Western = +0.26 °C / decade
Eastern = +0.42 °C / decade

Macias et al 2013 PLoSONE
Skliris et al. 2012 Oce. Dyna.

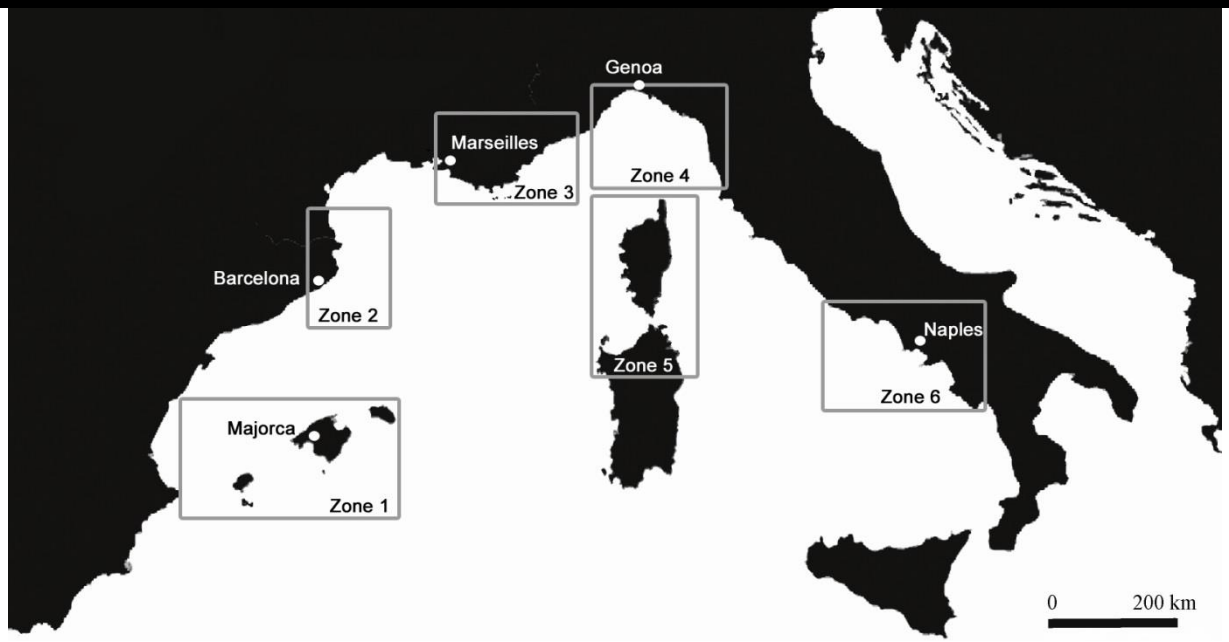
Warming is related with unprecedented mass mortality events

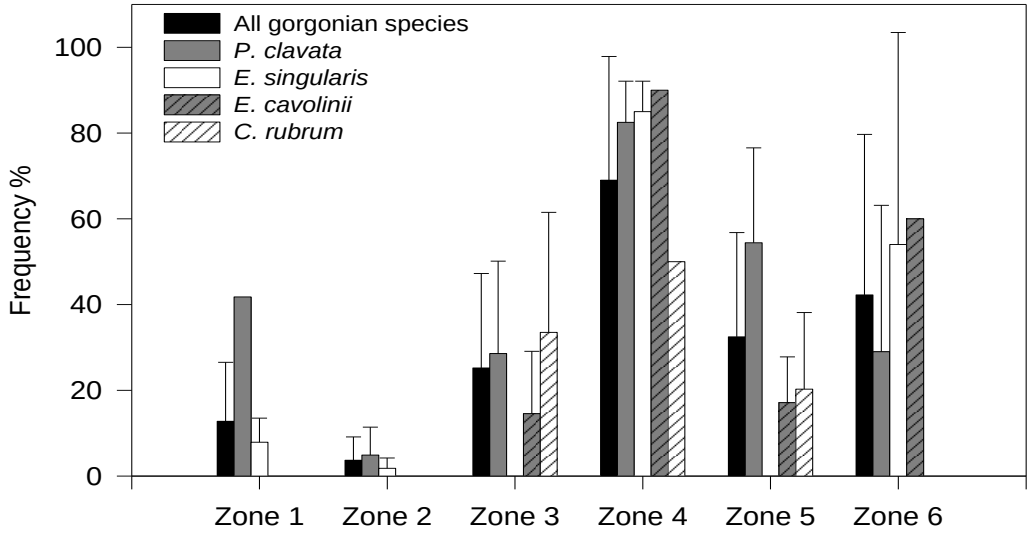


- **Large scale events (>1000 km)**
- **About 30 affected species, 6 phyllums**
- **Concomitant with high temperatures**

Large scale events (> 1000km)

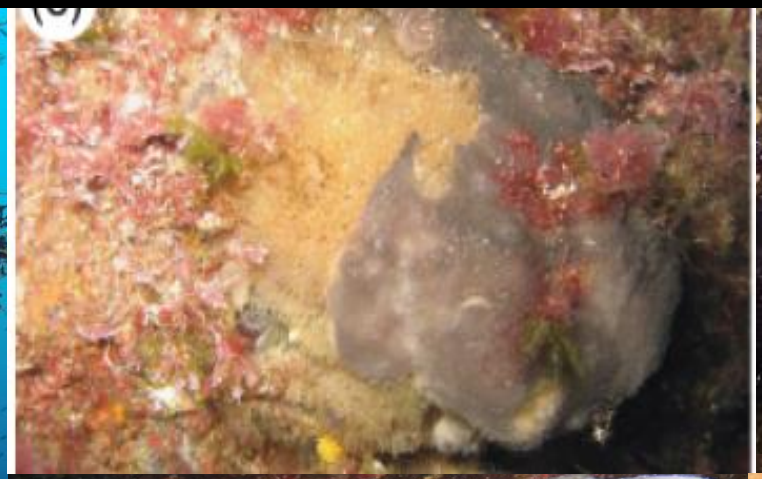
Mass mortalities in the Mediterranean

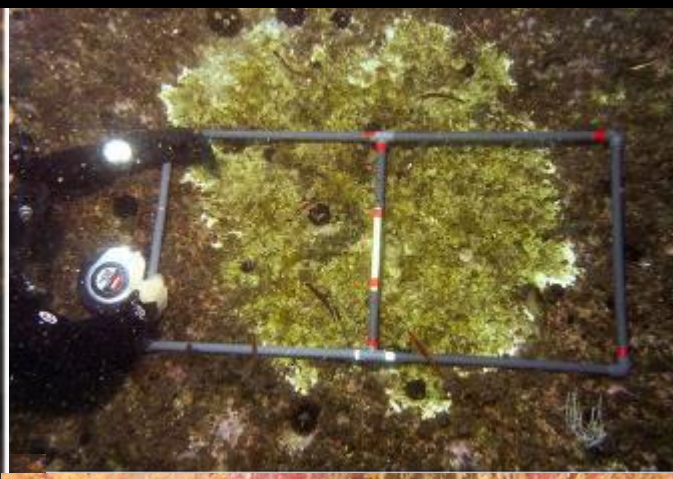


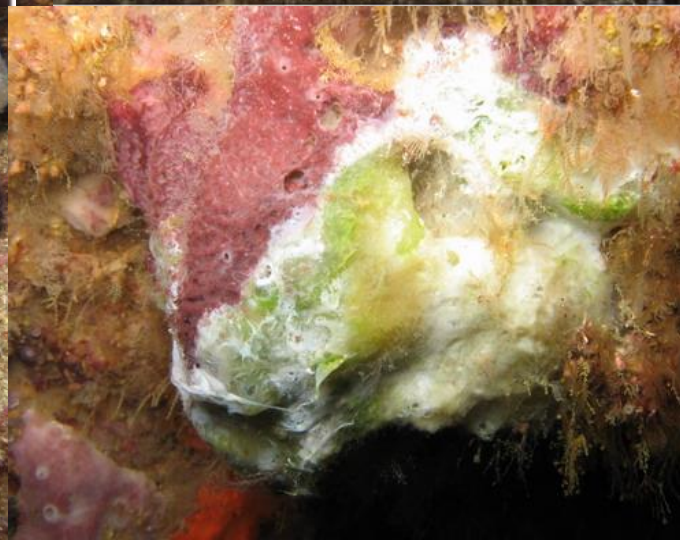


Large number of affected species

Mass mortalities in the Mediterranean





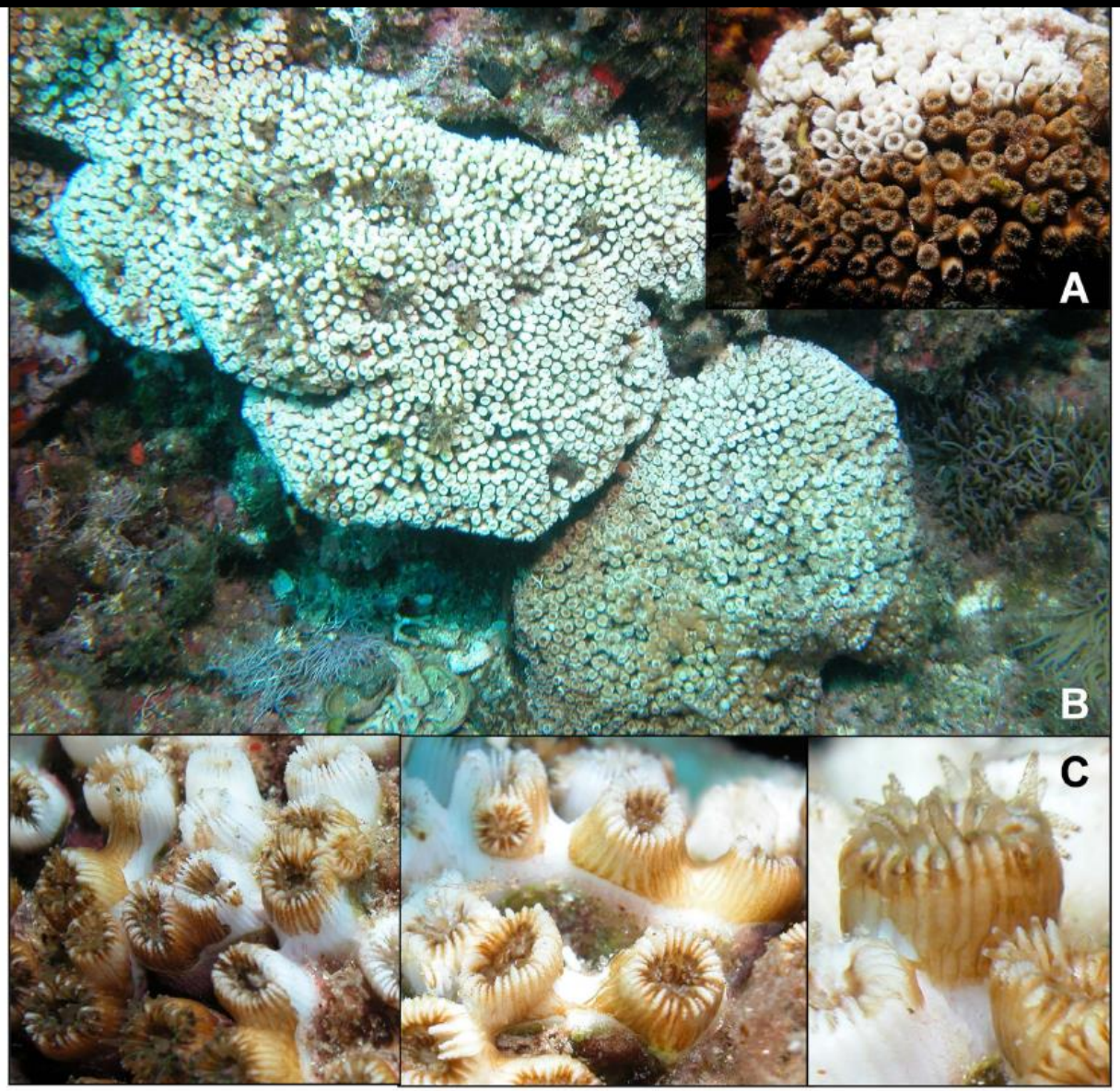


+30 species affected, 6 phyllums

Garrabou et al. 2009, Cebrian et al. 2011, Hereu & Kersting 2016

Large number of affected species

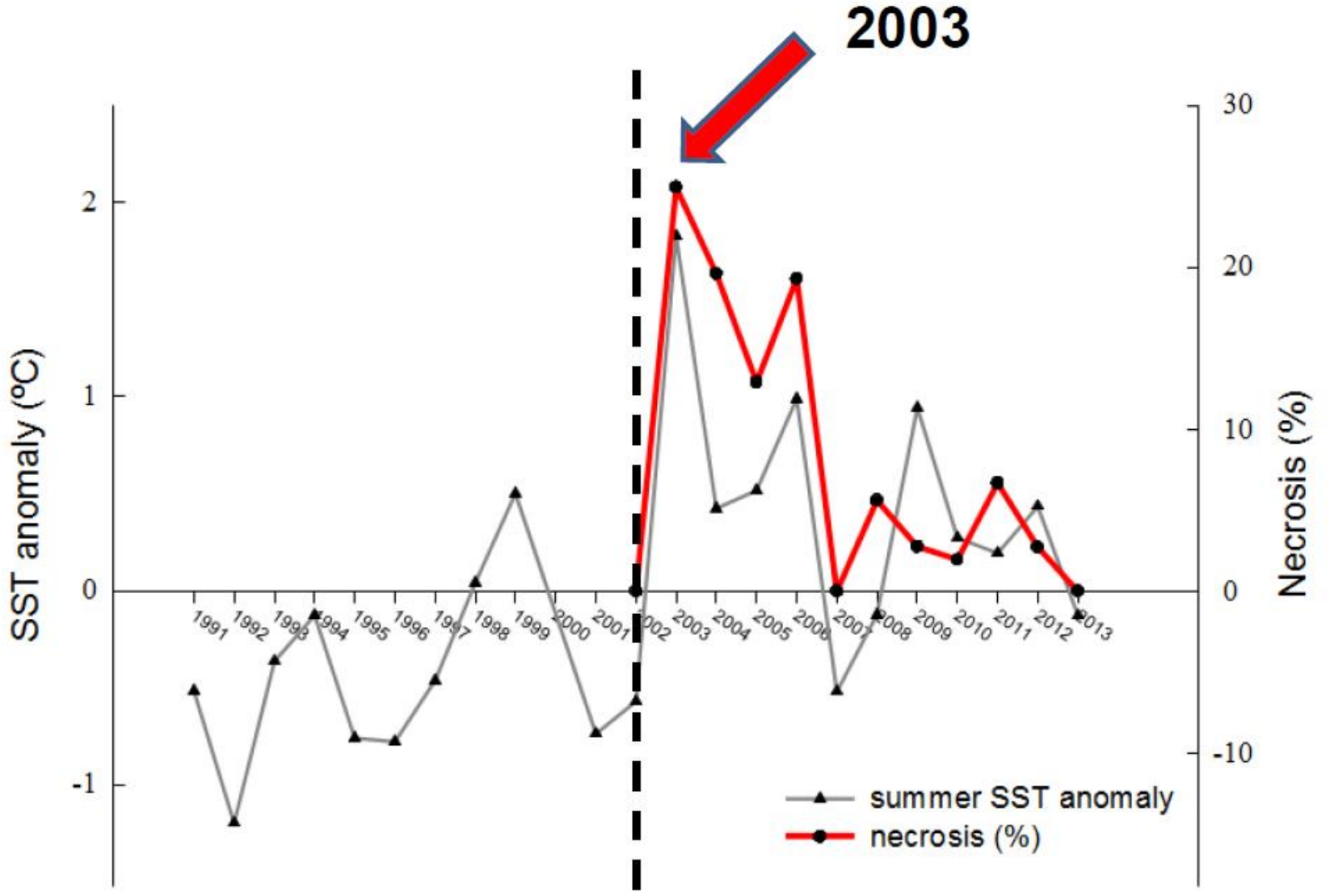
Mass mortalities in the Mediterranean



Kersting et al. 2013 PLoS ONE

Relatioship with high temperatures

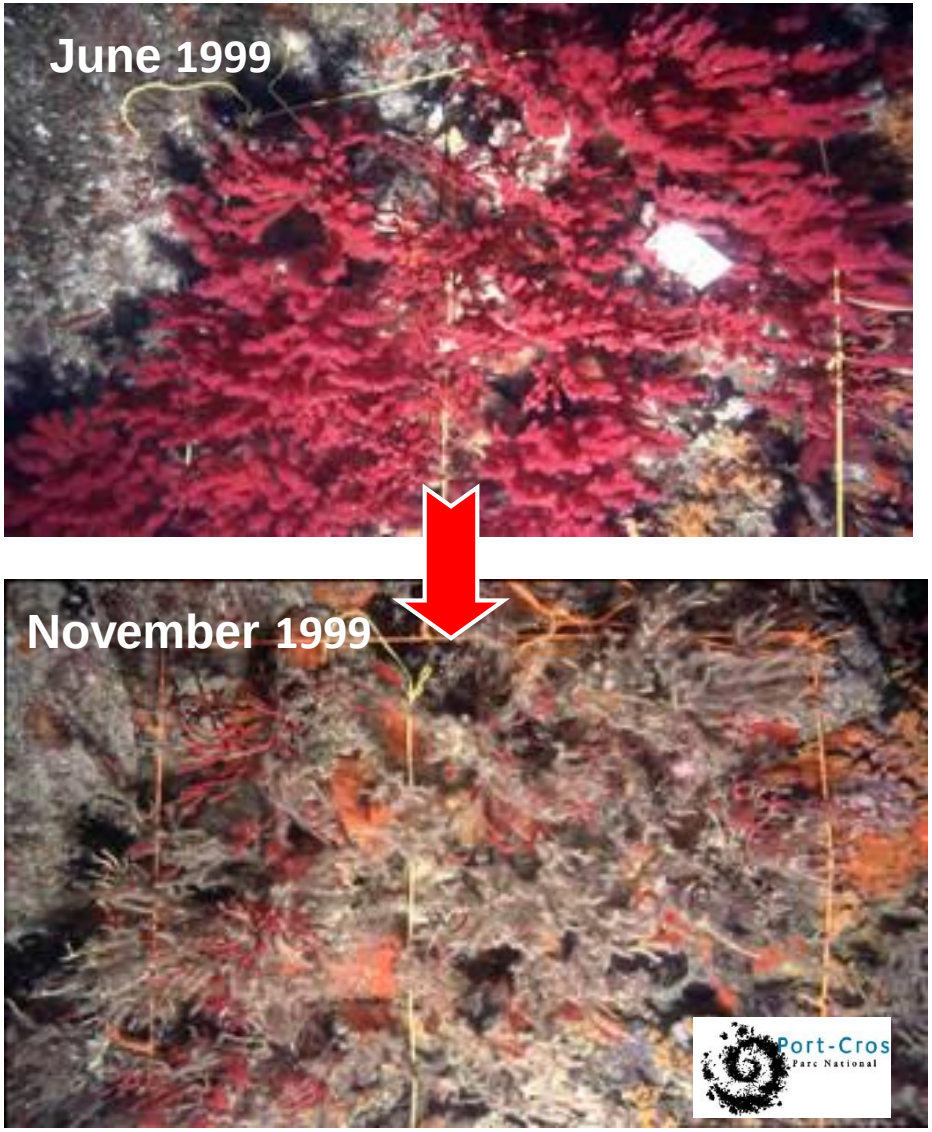
Mass mortalities of *Cladocora caespitosa* populations



Kersting et al. 2013 PLoS ONE

Long lasting effects

Mass mortalities in the Mediterranean



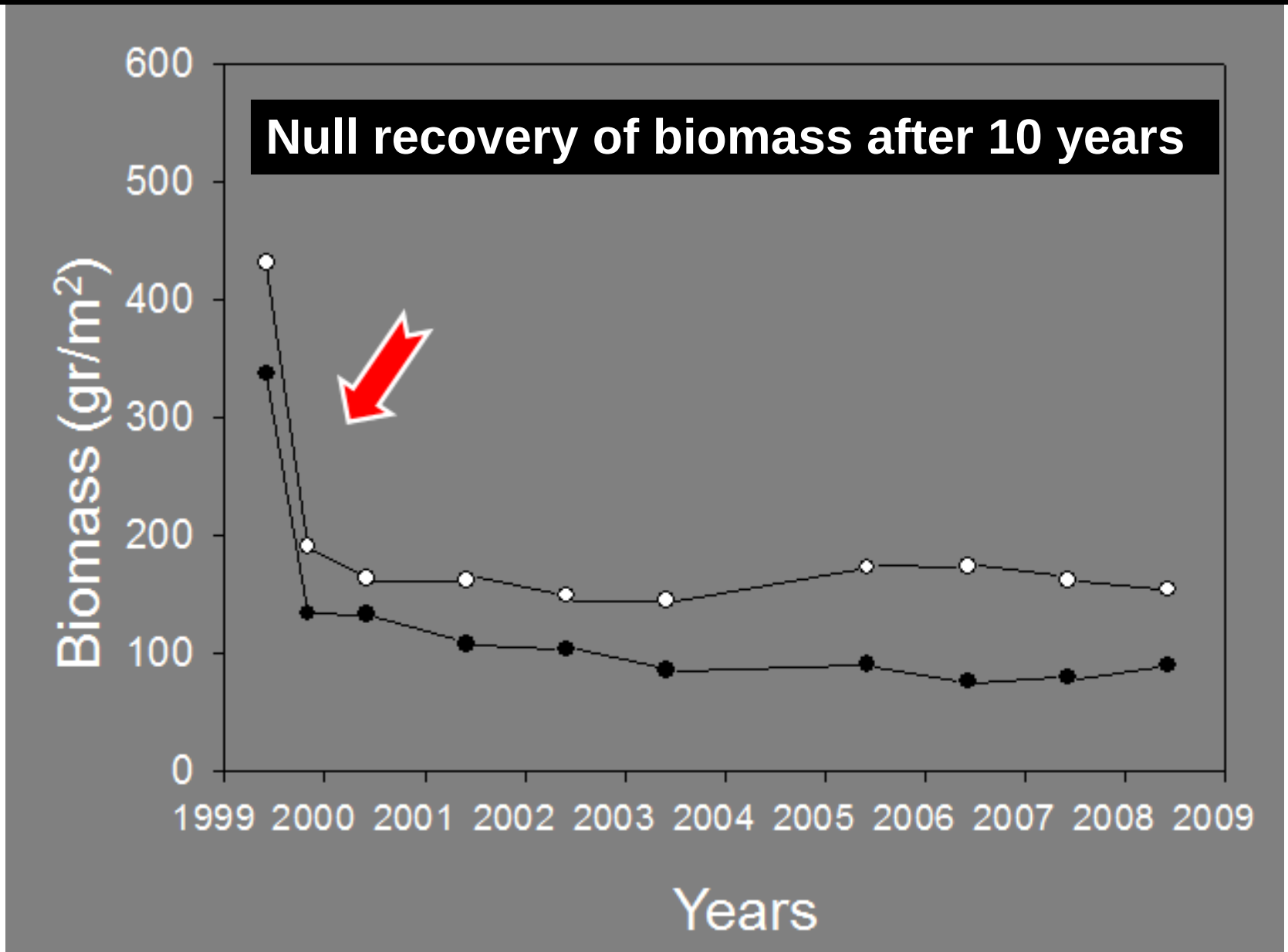
High impact

Slow dynamics

Long recovery

Long lasting effects

Mass mortalities in the Mediterranean



Warming facilitate colonization invasive species *Siganus spp.* from the Red Sea

SOLUTIONS

Conservation biology:
reverse the negative trend

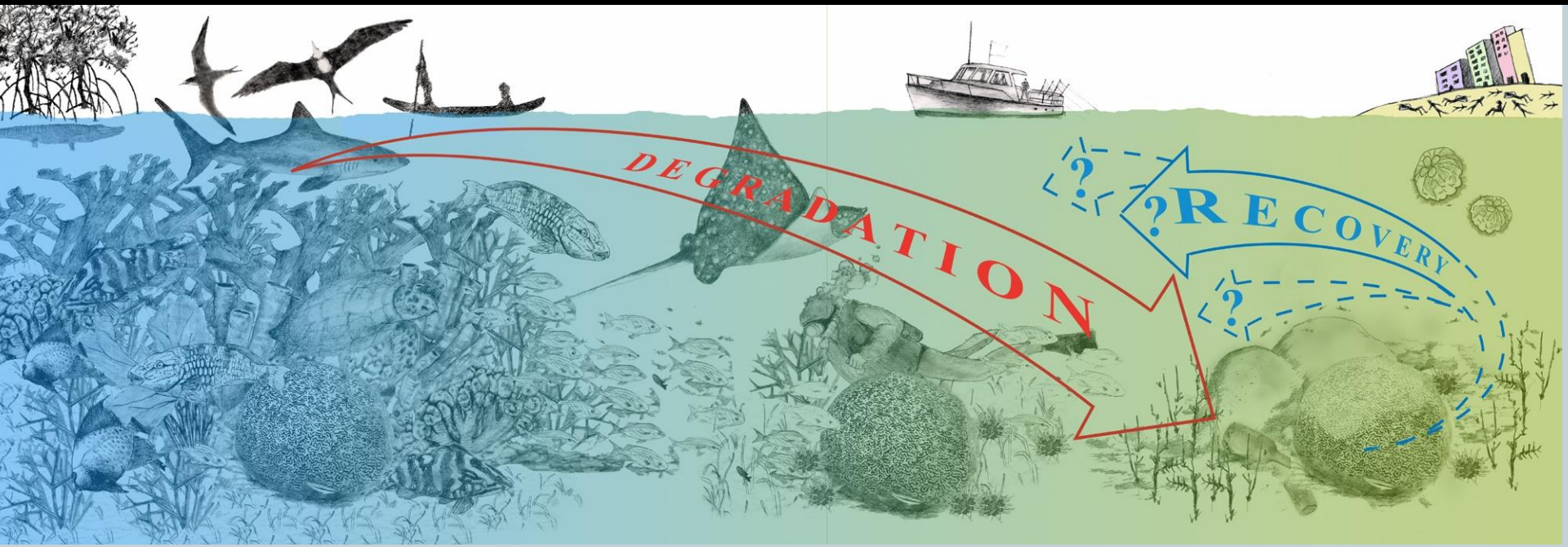
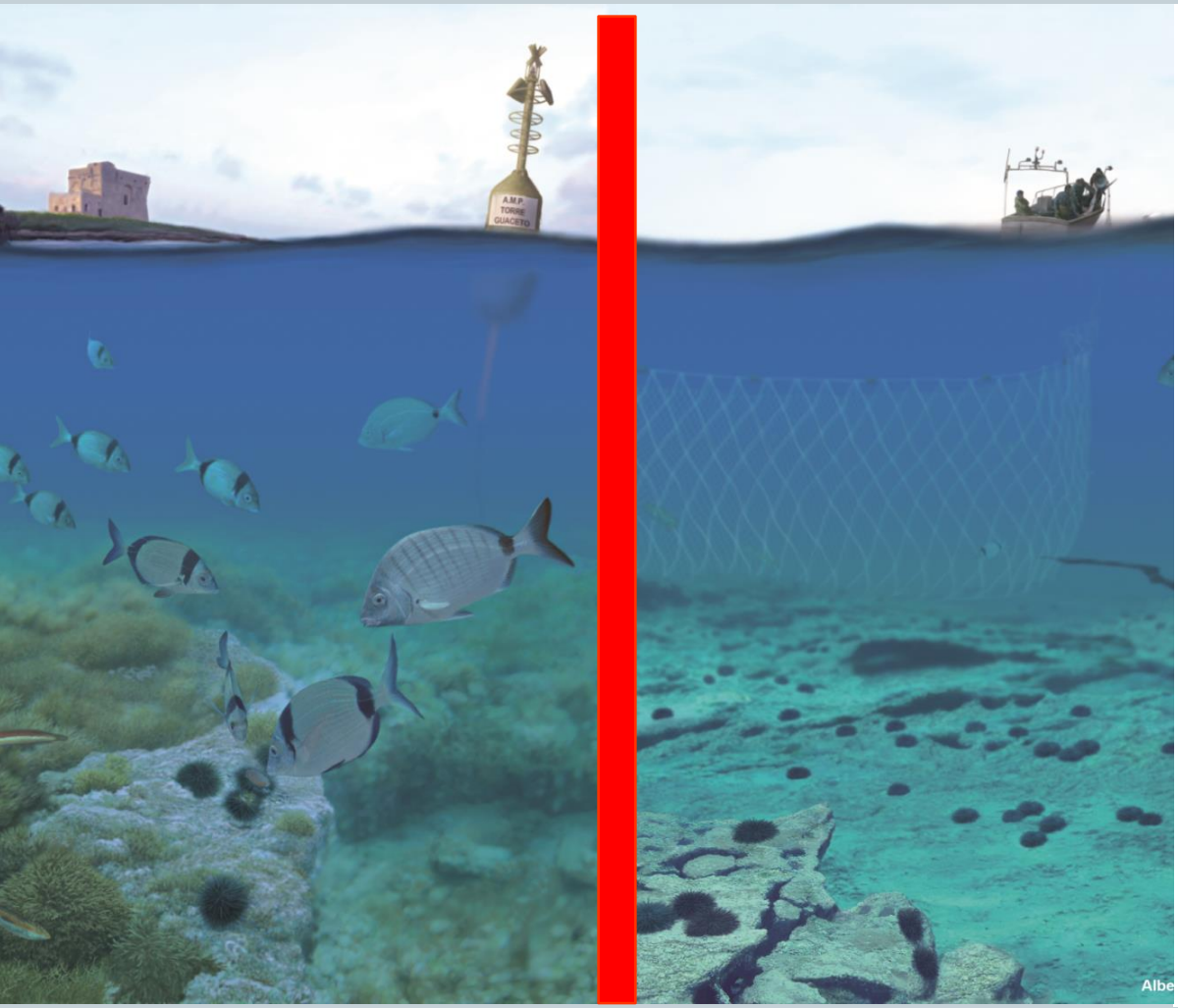
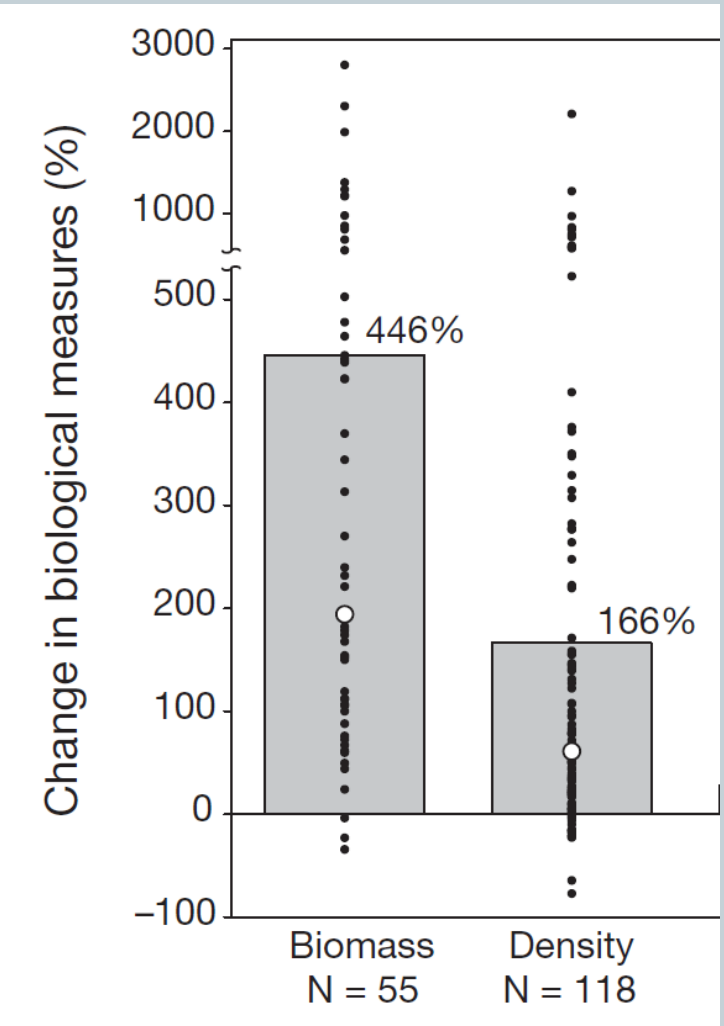


Image courtesy of the Smithsonian Institution.

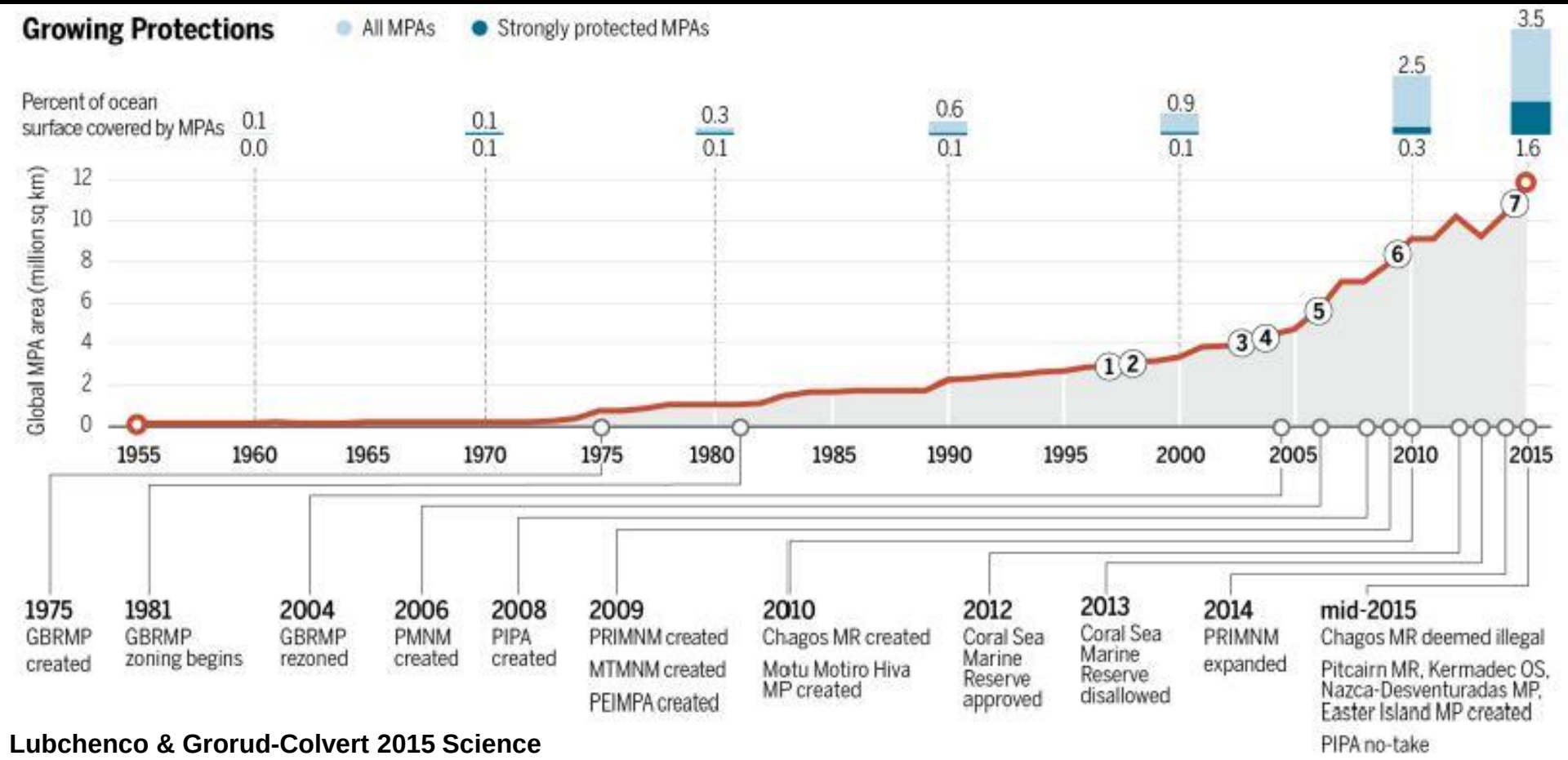
Marine Protected Areas work!





Lester et al. 2009

Increase in global MPAs coverage over time



Lubchenco & Grorud-Colvert 2015 Science

~3,5% Total

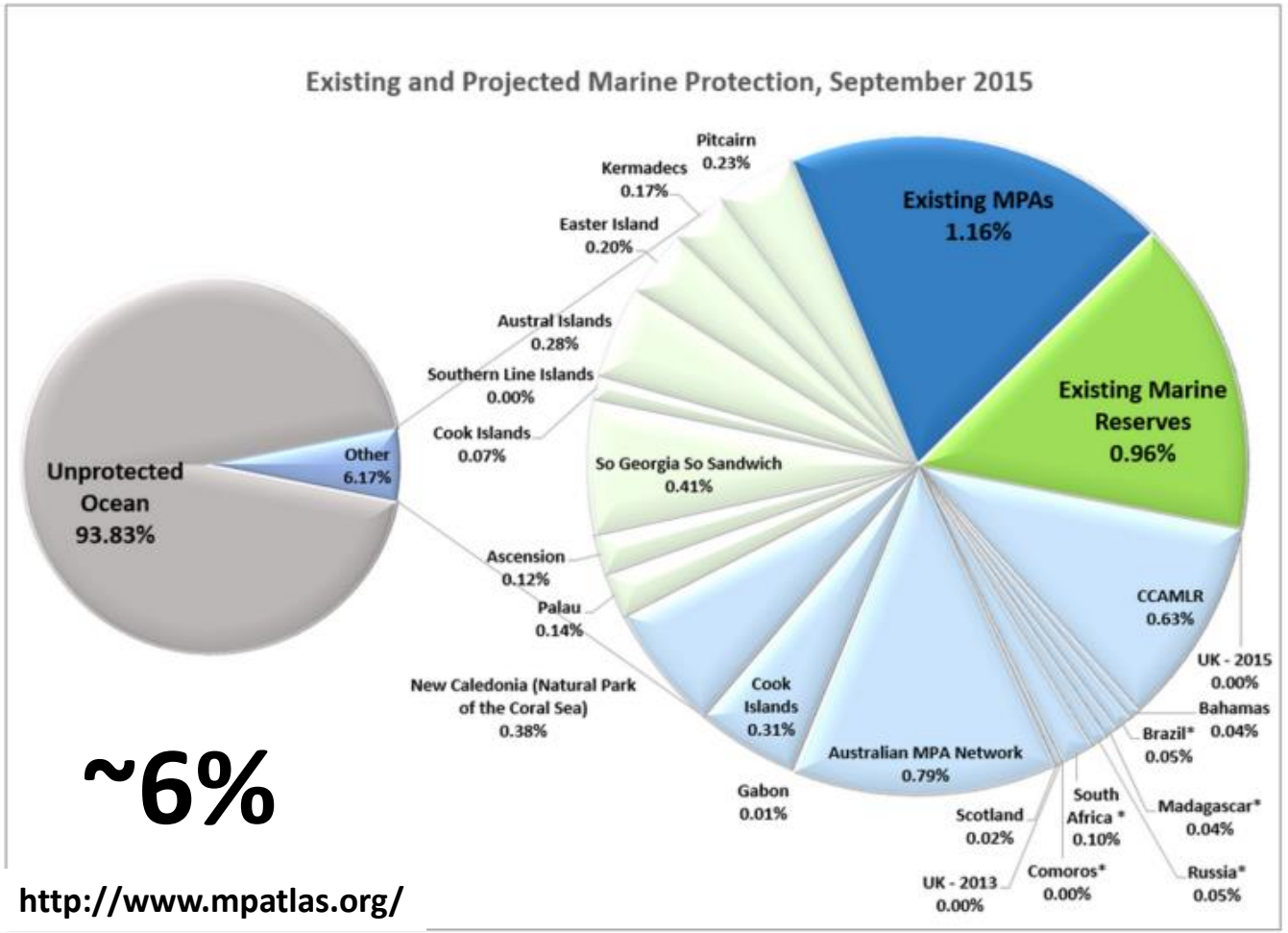
1,6% No take

MPAs in the Mediterranean

7.14 - (3,6) % Total

AND 0.04% No take zone

MPAs projected



~6%

http://www.mpatlas.org/

Goal by 2020 at least 10% MPAs

Making progress but still a lot of work ahead

Sea Watchers

A citizen science platform to involve society in marine research

Coordinated by:

Instituto de Ciencias del Mar ICM CSIC

Supported by:

FECYT

Sea Watchers

WHAT IS SEA WATCHERS?

Explore the current state of the sea and detect environmental changes!

The Sea Watchers platform is a site to connect citizens and scientists in order to **investigate together** the current state of our seas and oceans

It is a **citizen science platform** coordinated by the Institute of Marine Science (ICM-CSIC)

Sea Watchers

WEB PLATFORM

www.seawatchers.org

Citizens and scientist explore together the conservation status of the sea and detect environmental changes

Sea Watchers

#CITIZEN SCIENCE

CITIZEN SCIENCE
Growing discipline

Citizen collaboration in research is essential!

- Provides a **global vision** in time and space, essential to knowledge advance.
- Improves **comunication** between society, science and administration.
- Represents the opportunity to **share** results obtained by seawatchers network with society.

Sea Watchers

HOW IT WORKS?

PLASTIC 0

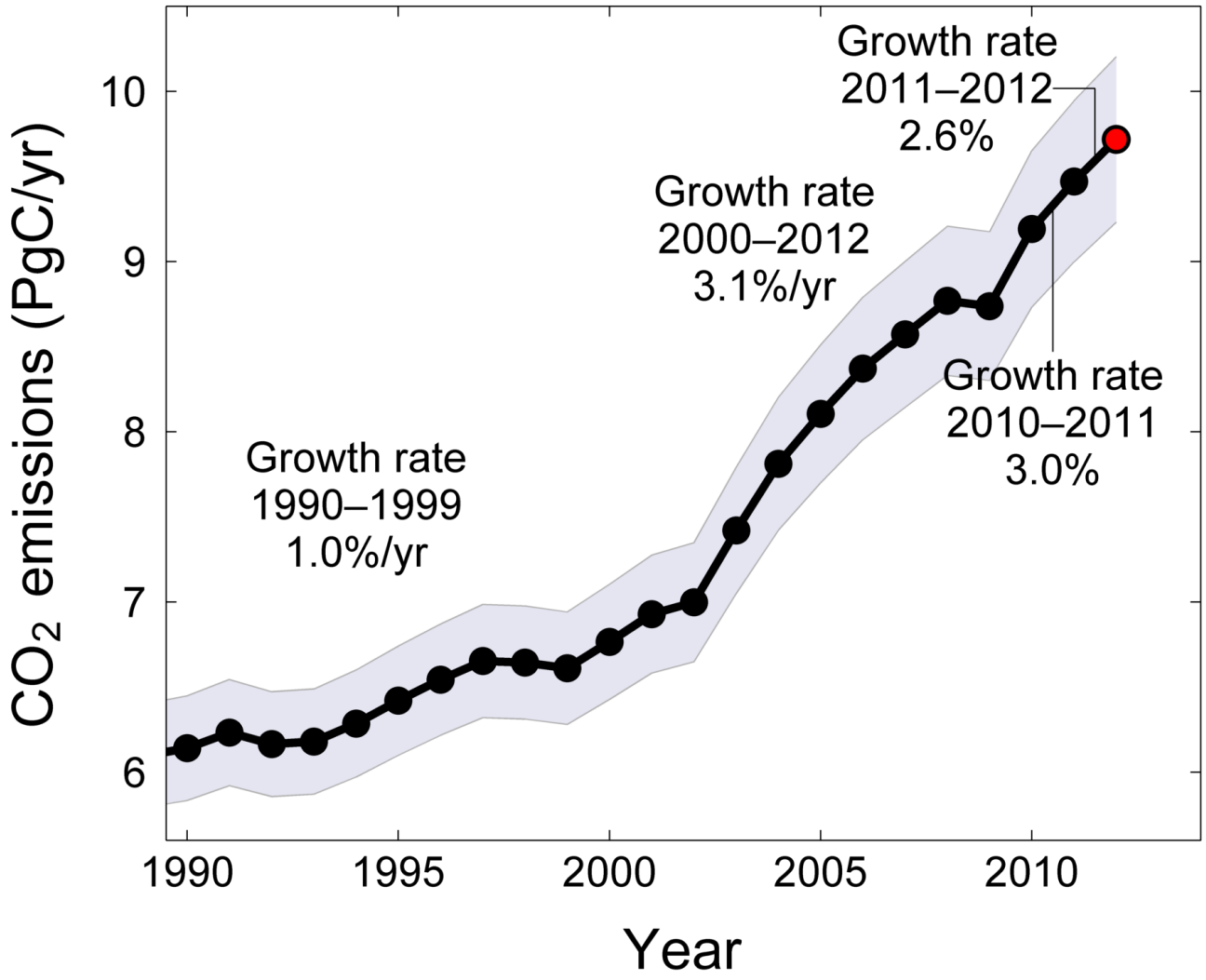
Sea Watchers

- Cuantify plastics found in beaches or floating in the sea.
- Localize and classify plastics in two cathegories: macro and micro plastics (smaller than 5mm).

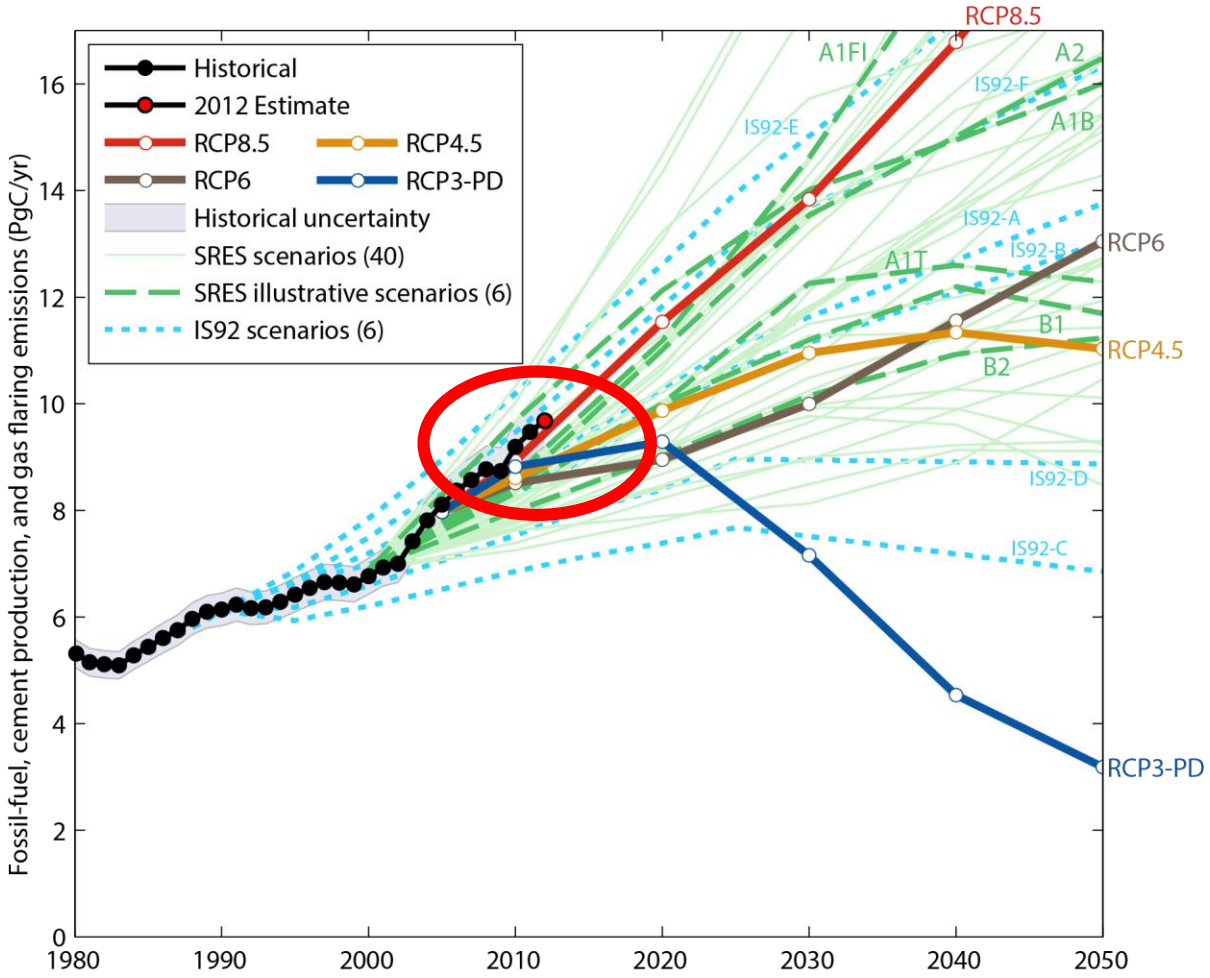
Learn more about the Plàstic 0 project

FINAL MESSAGE

CO_2 emissions



CO_2 emissions scenarios




Thank you for your attention
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