

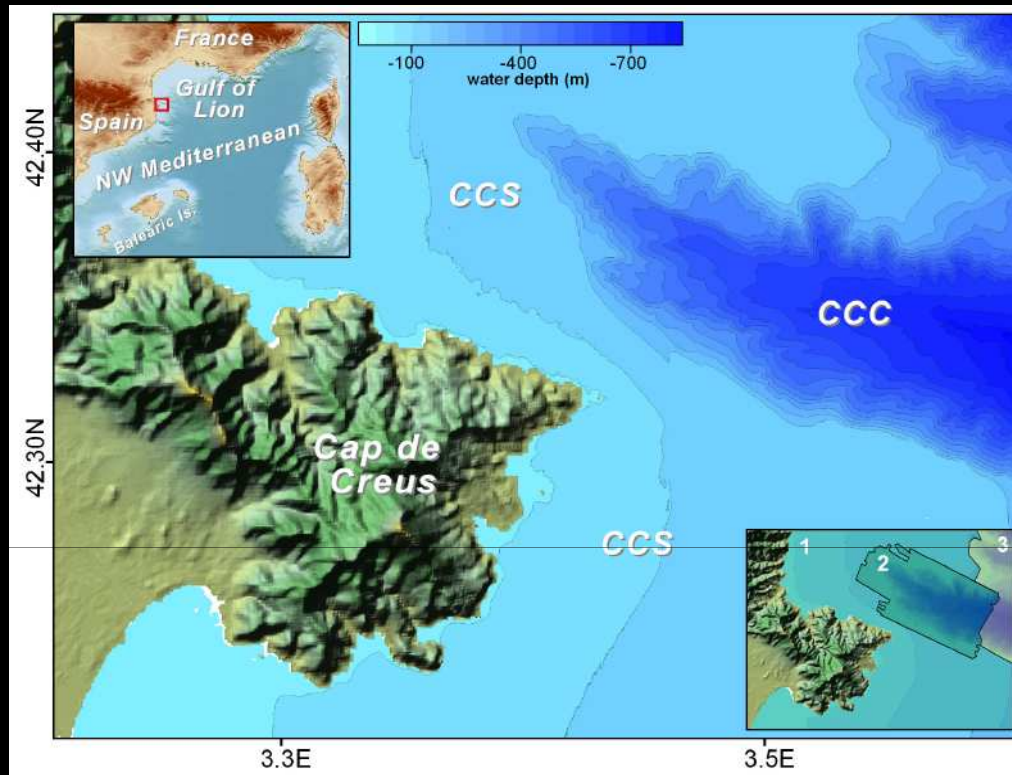


Cold-water coral ecology in the Cap de Creus submarine canyon (Northwestern Mediterranean): 7 years of multidisciplinary research

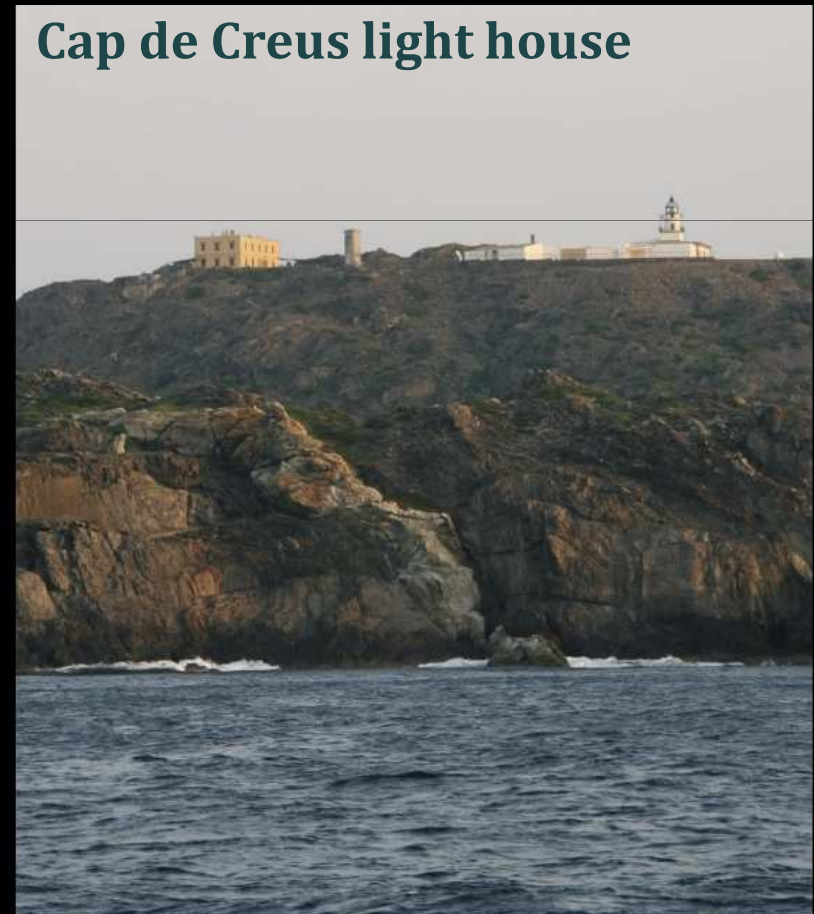
C Orejas, A Gori, C Ferrier-Pagès, C Lo Iacono, P Puig, MS Naumann,
J Movilla, G Tsounis, S Reynaud, A Olariaga, T Madurell & JM Gili



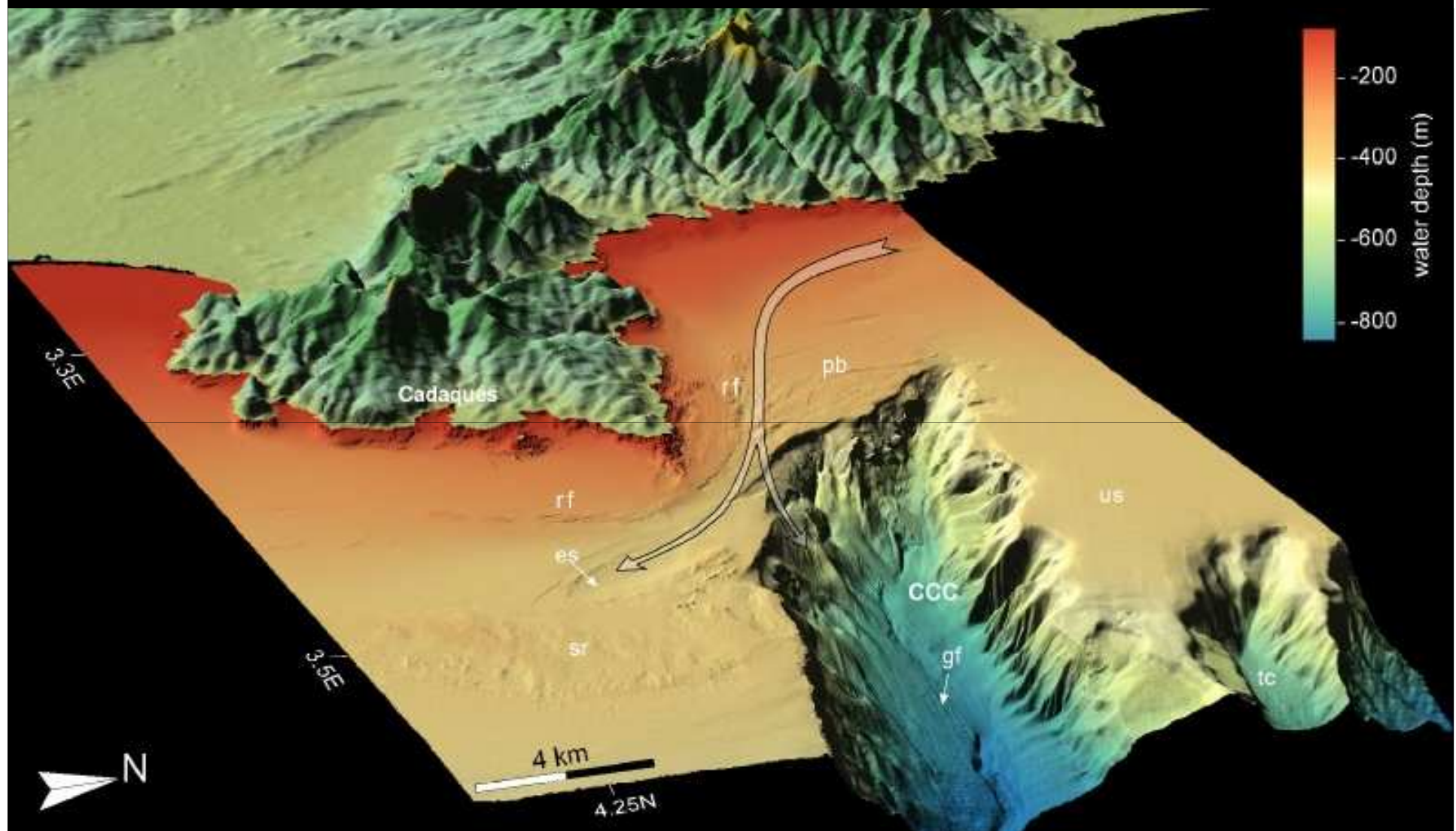
The Cap de Creus: the eastern most point of the Iberian peninsula



Cap de Creus light house



The Cap de Creus: from the shallow to the deep

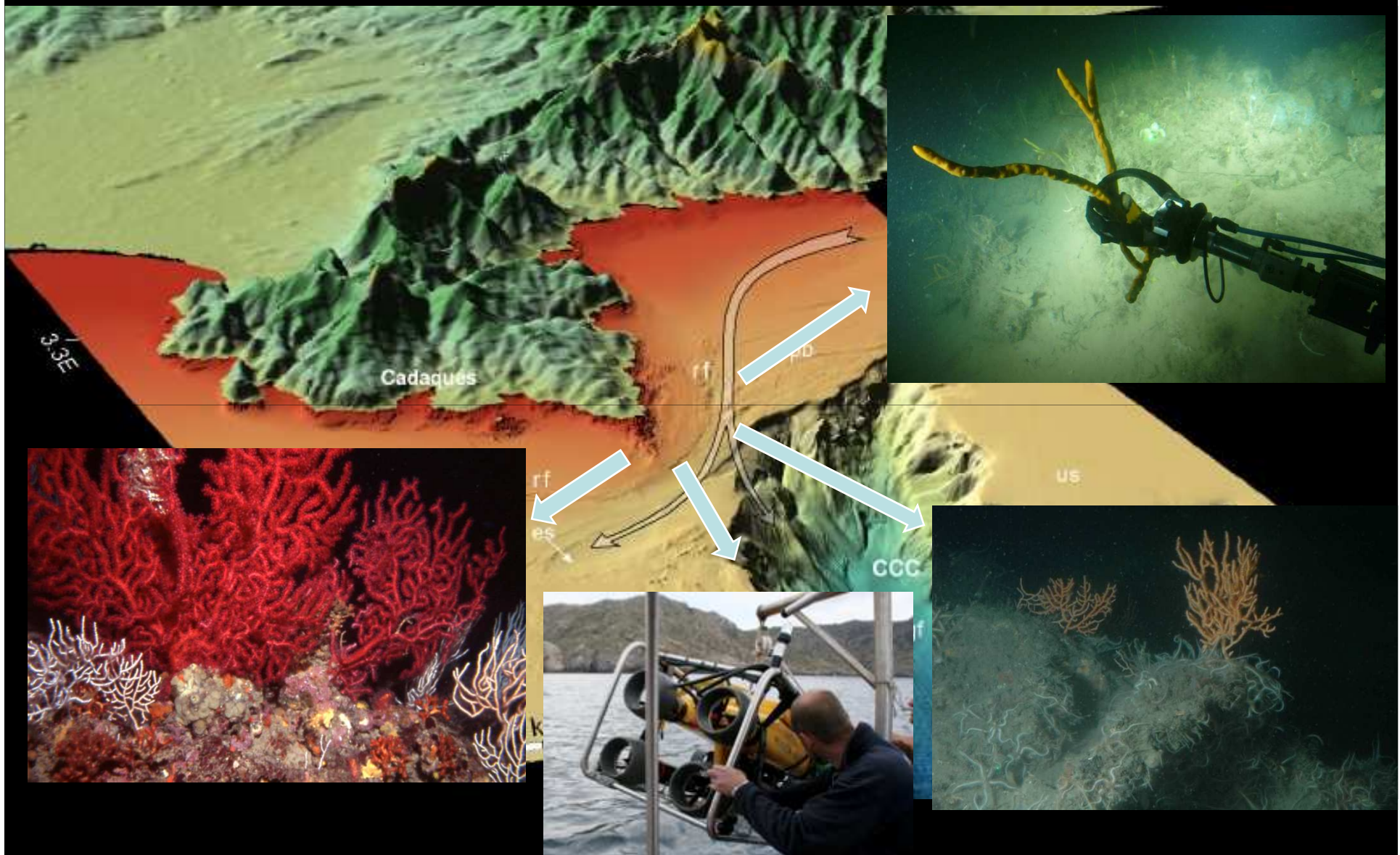


The Cap de Creus: from the shallow to the deep



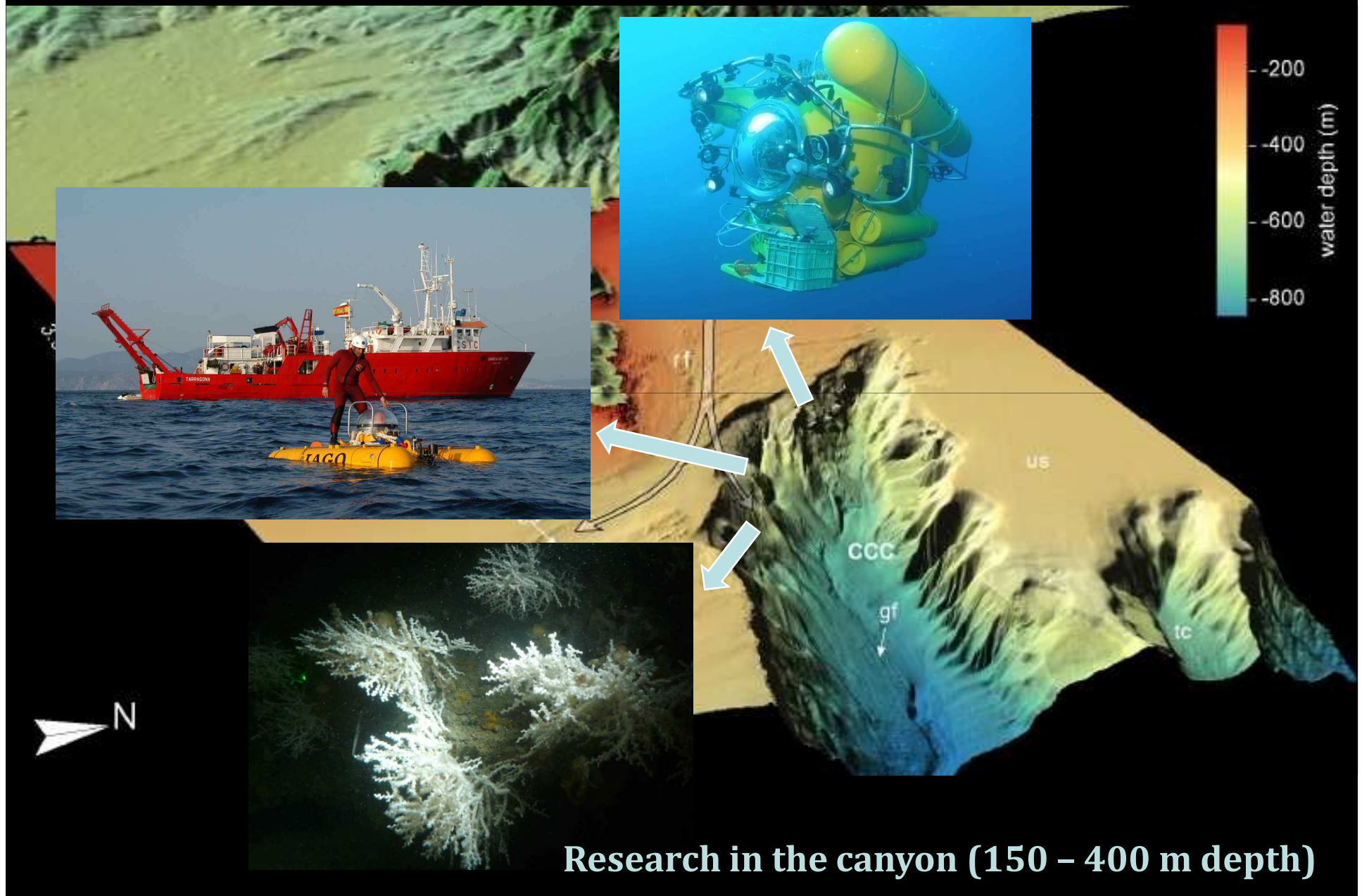
Research in shallow waters (0 – 40 m depth)

The Cap de Creus: from the shallow to the deep



Research at intermediate depths (40 - 150 m depth)

The Cap de Creus: from the shallow to the deep



Research in the canyon (150 – 400 m depth)

We have not been the first ones ...



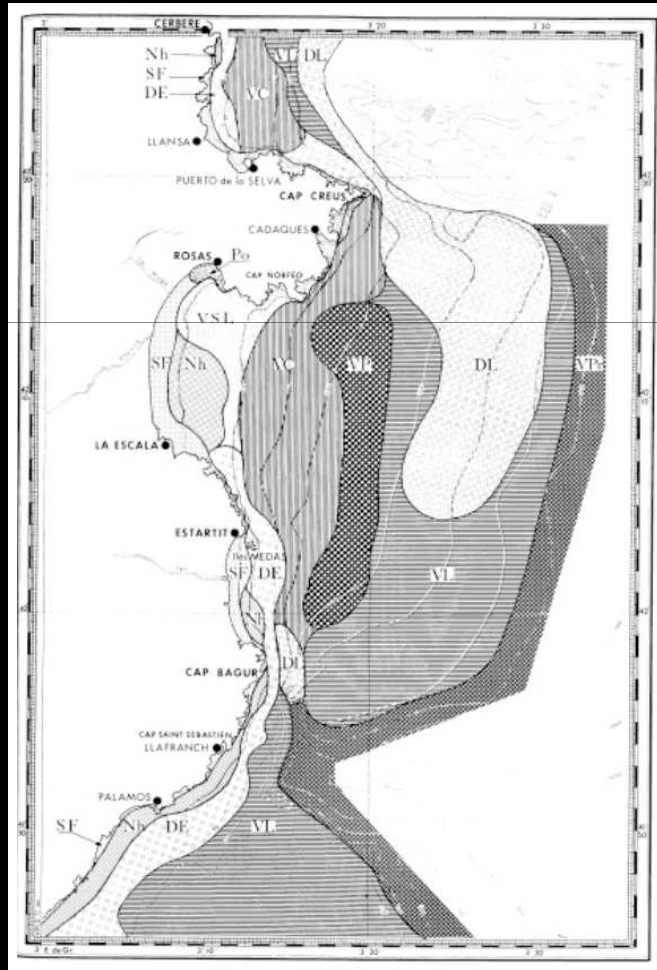
**Jacques Piccard
(1922-2008)**



**Jean Marie
Pérès
(1915 - 1988)**

We have not been the first ones ...

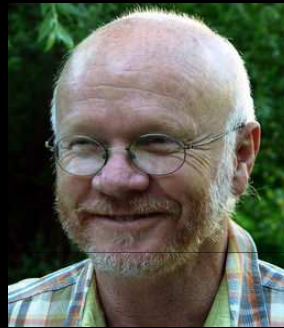
Bionomie benthique du plateau continental de la côte catalane espagnole



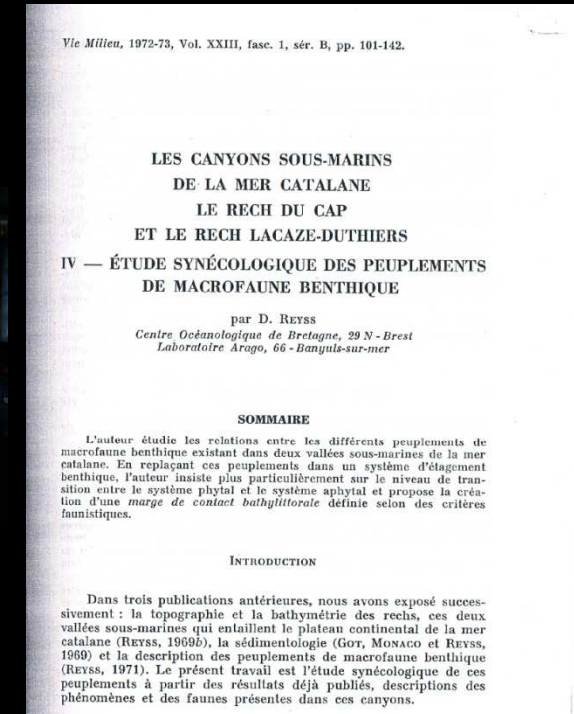
Desbruyères et al. 1972-73

Reyss 1972-73

Daniel
Reyss



Daniel
Desbruyères



Les canyons sous-marins de la mer catalane. Le rech du Cap et le rech Lacaze-Duthiers

Our 7 years research in the Cap de Creus canyon

Technical advances

TT

Team work

Oceanographers

Geologist

Plankton taxonomists
and ecologists

ROVs

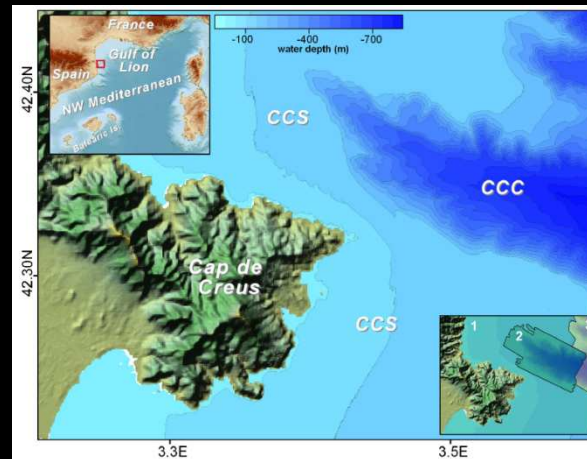
Benthos
ecologists

Technicians

New sampling
devices

Submersibles

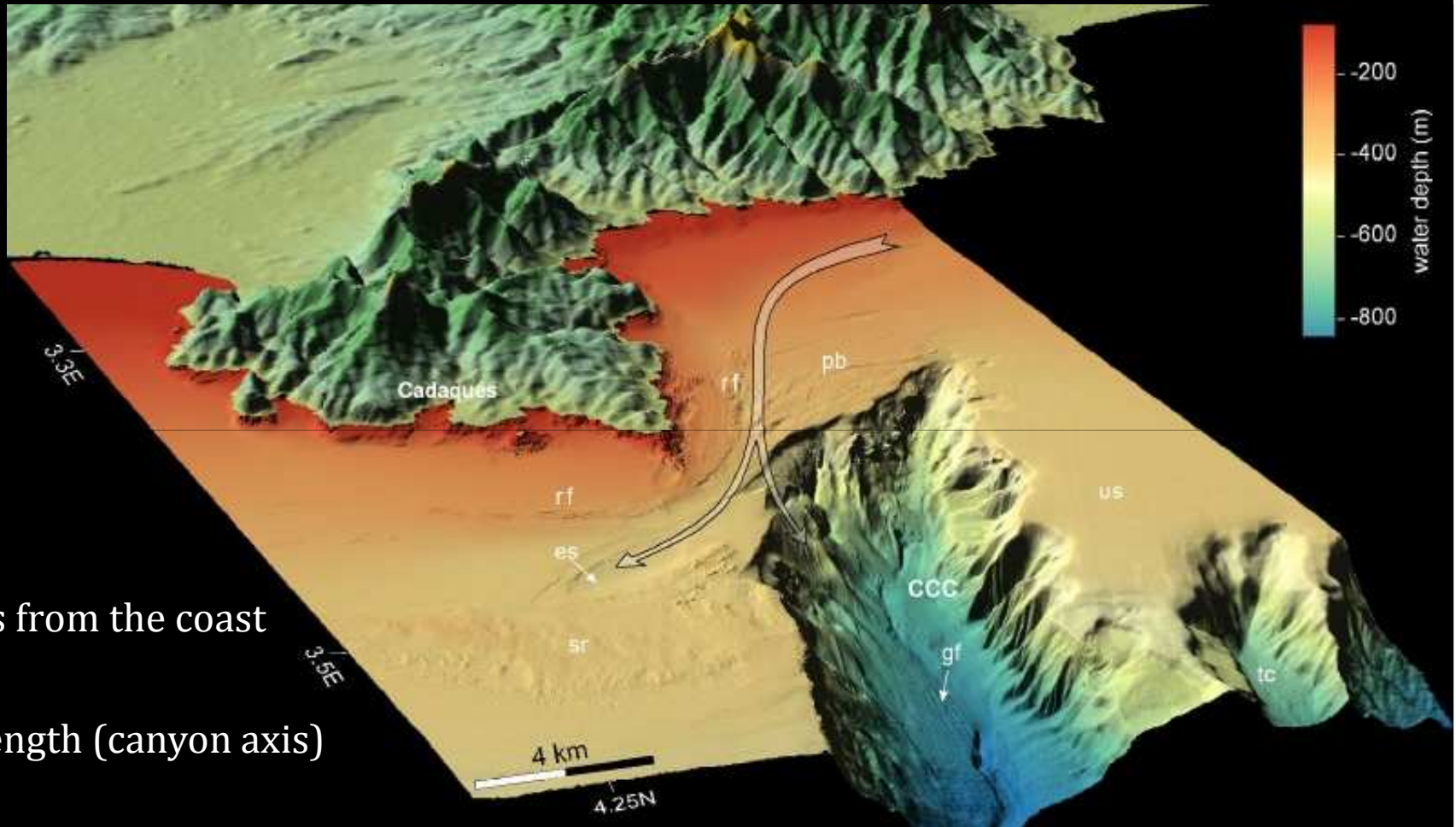
Benthos
taxonomists



First observations of Cold-Water corals in the shelf edge



The Cap de creus submarine canyon : main current direction and features



2.7 miles from the coast

95 km length (canyon axis)

Max Depth: 2150 m

Oceanography

Mooring deployment in Cap de Creus canyon

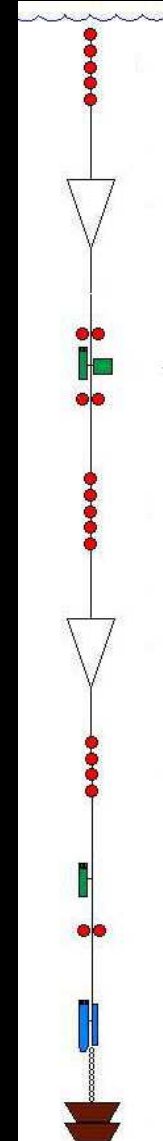


EuroSTRATAFORM, HERMES, HERMIONE

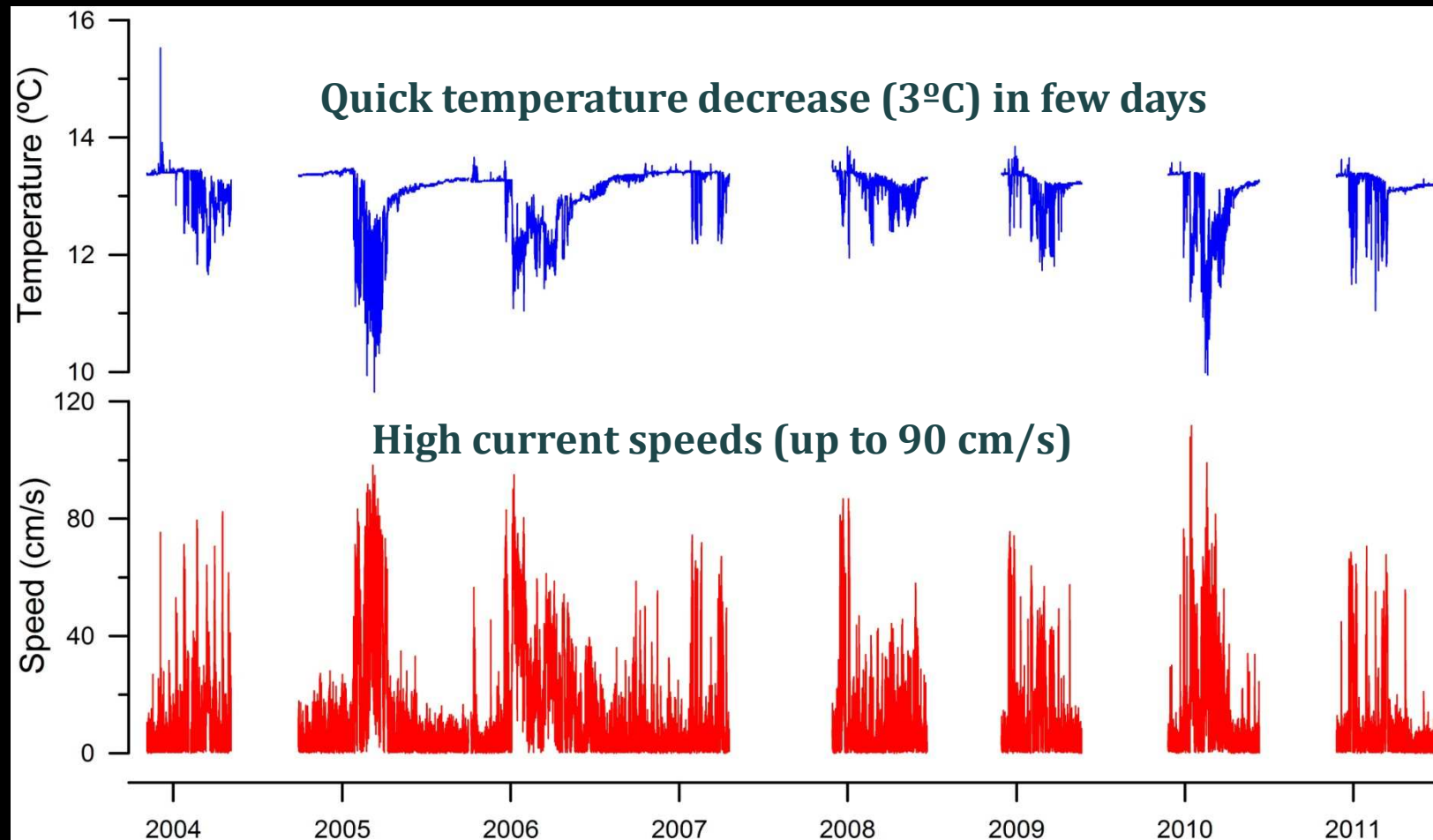
Sediment traps

Temperature

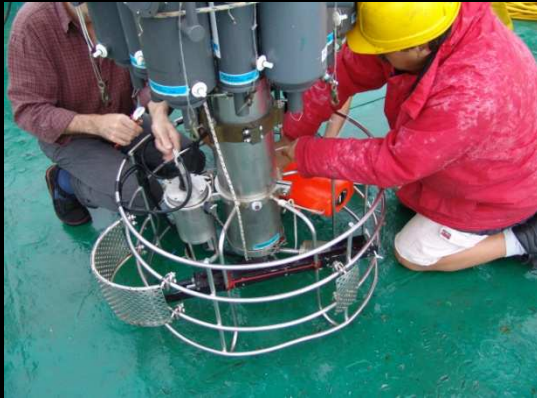
Current meters



Cascading episodes in Cap de Creus canyon registered from 2004 to 2011



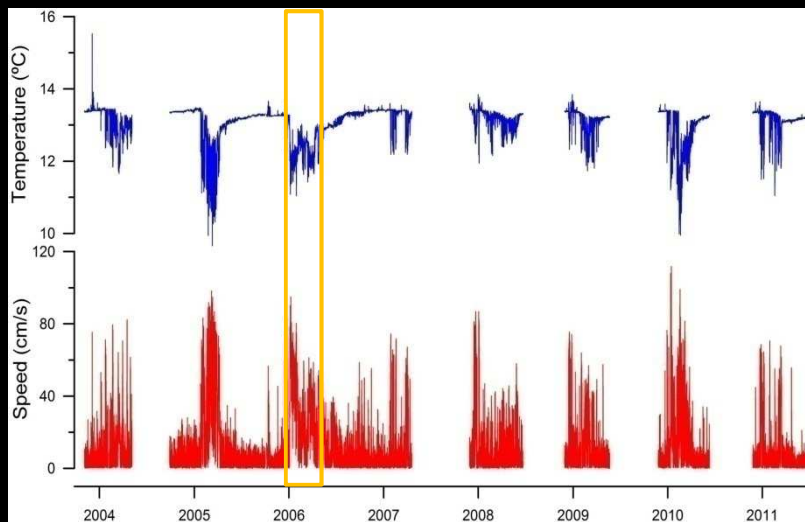
Water column analyses



Water column
characterization:
nutrients, POC, PON,
temperature, salinity,
Chla ...

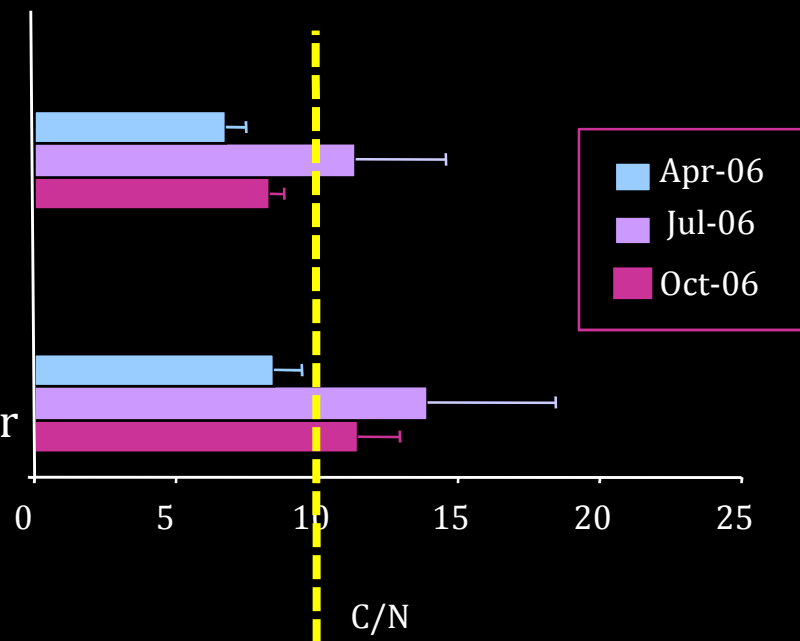
C/N ratio as indicative of
the “quality” of the suspended
matter

C/N < 10 → “Fresh material”

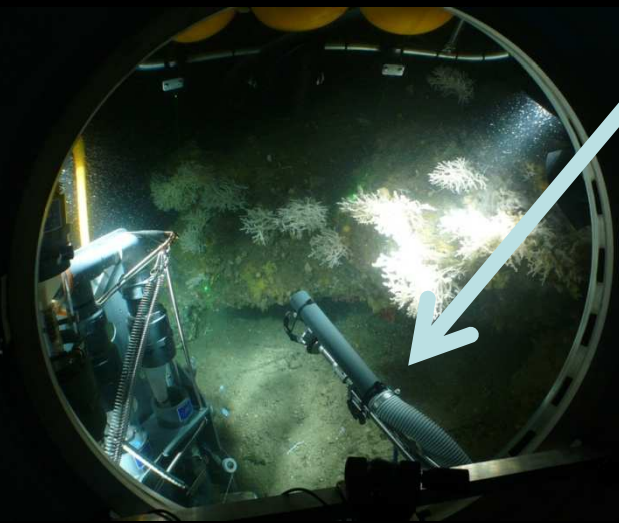


Surface

Near
Seafloor

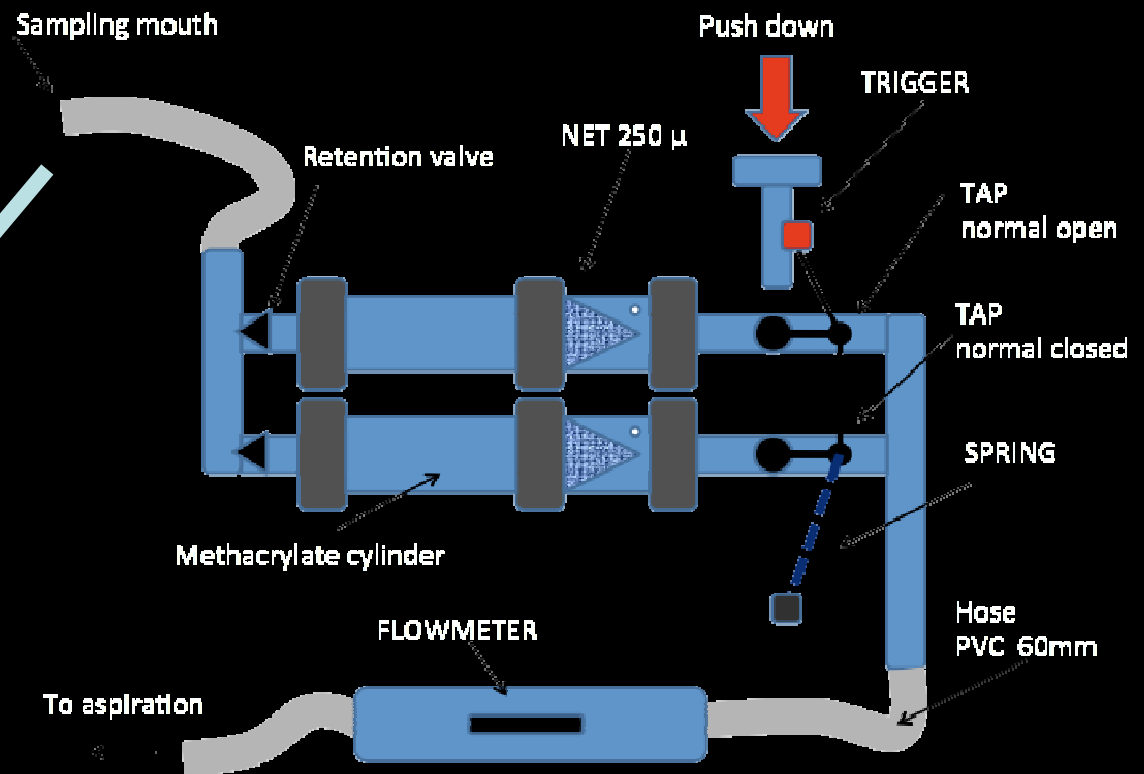


Plankton community near the sea floor

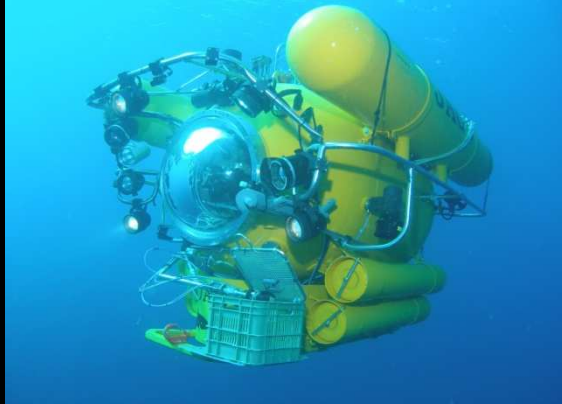


Plankton near the sea floor,
community composition

Submarine Associated Multi Filtration Pump (SAMFP)



Video surveys (ROVs and JAGO)



**Benthic communities:
occurrence, composition,
abundances...**

**Focus on Cold-Water coral
communities**

...the never ending possibilities of underwater video images



IFM-GEOMAR



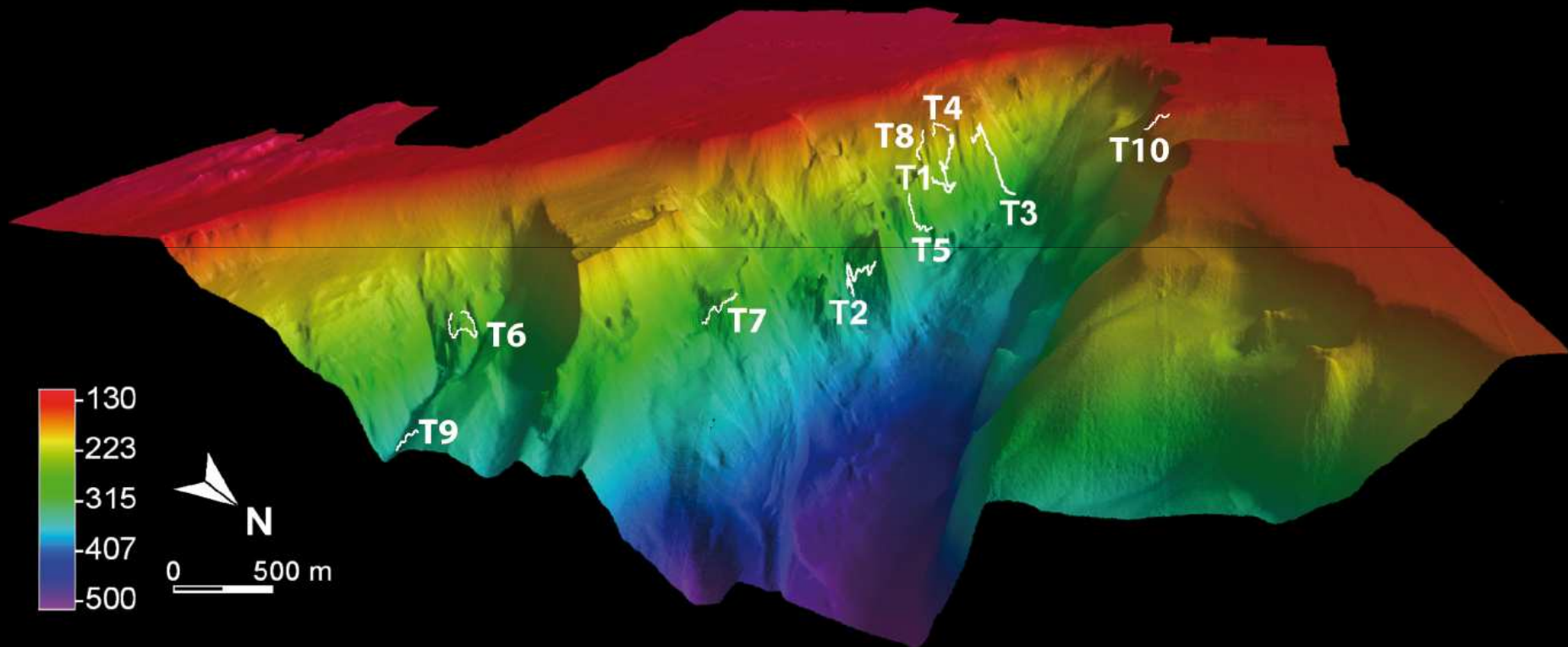
IFM-GEOMAR



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Coral occurrence, distribution and abundance

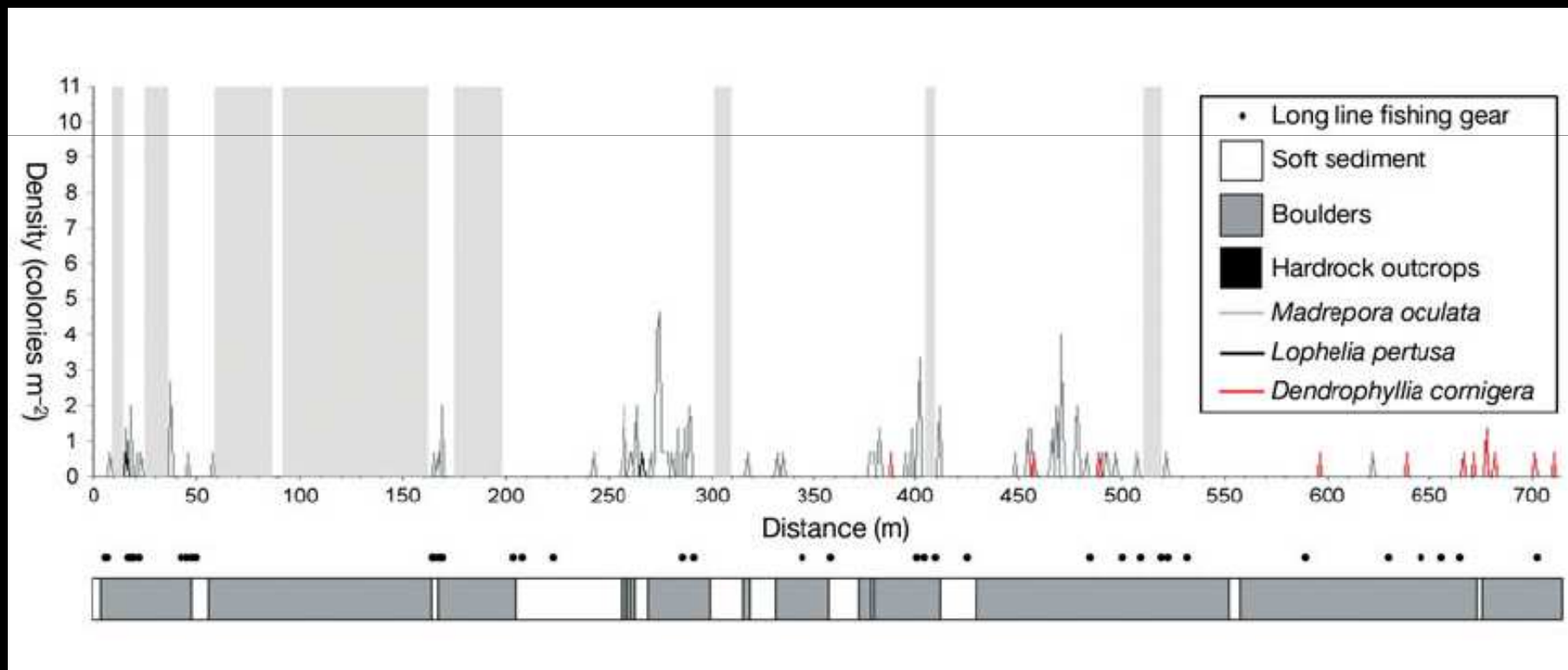
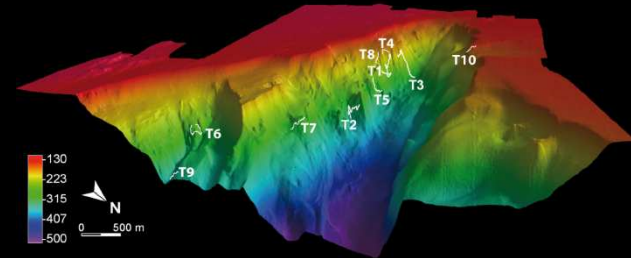
HERMES, DEEP CORAL (2005 - 2007)



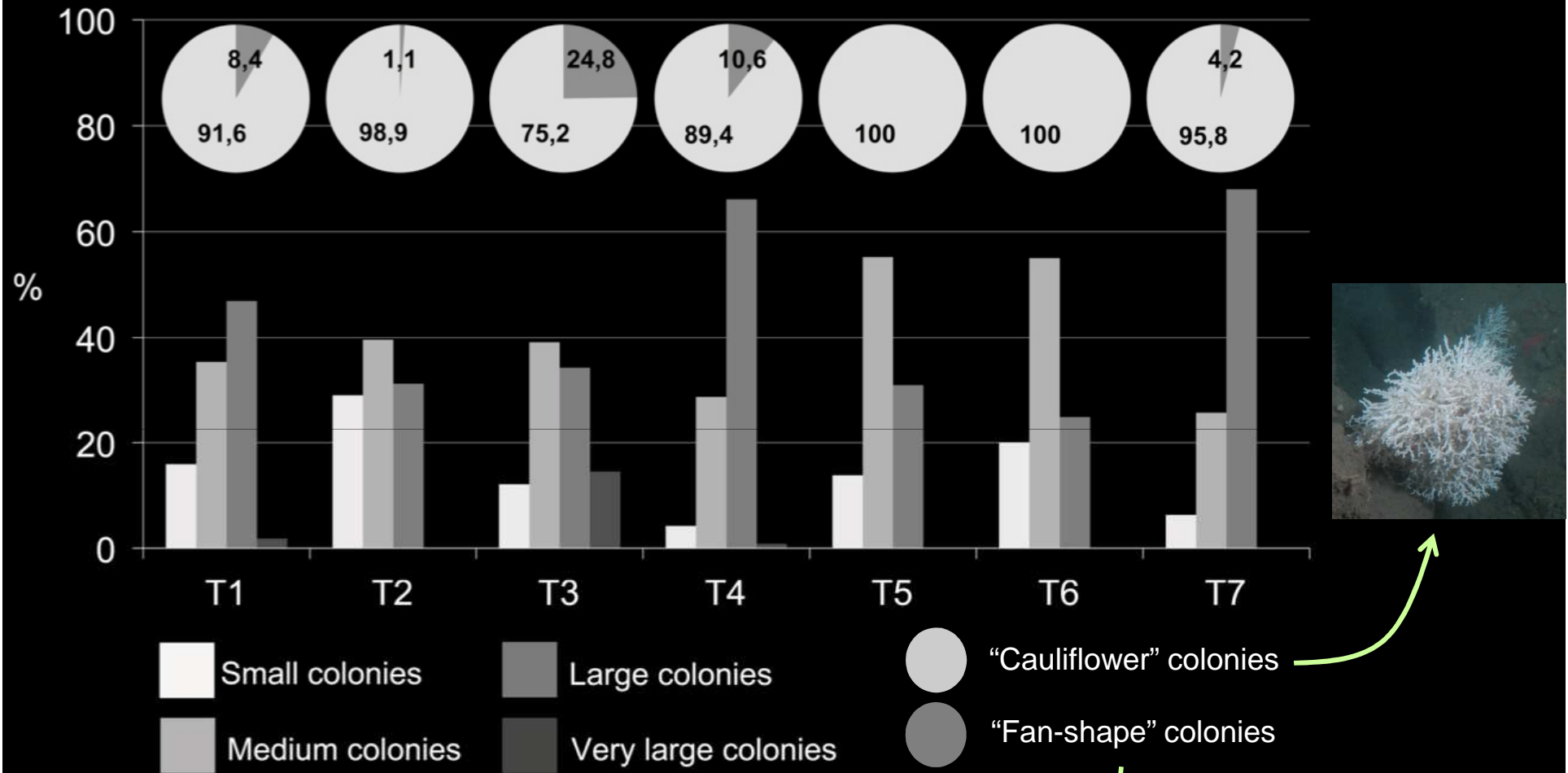
Coral occurrence, distribution and abundance

HERMES, DEEP CORAL (2005 – 2007)

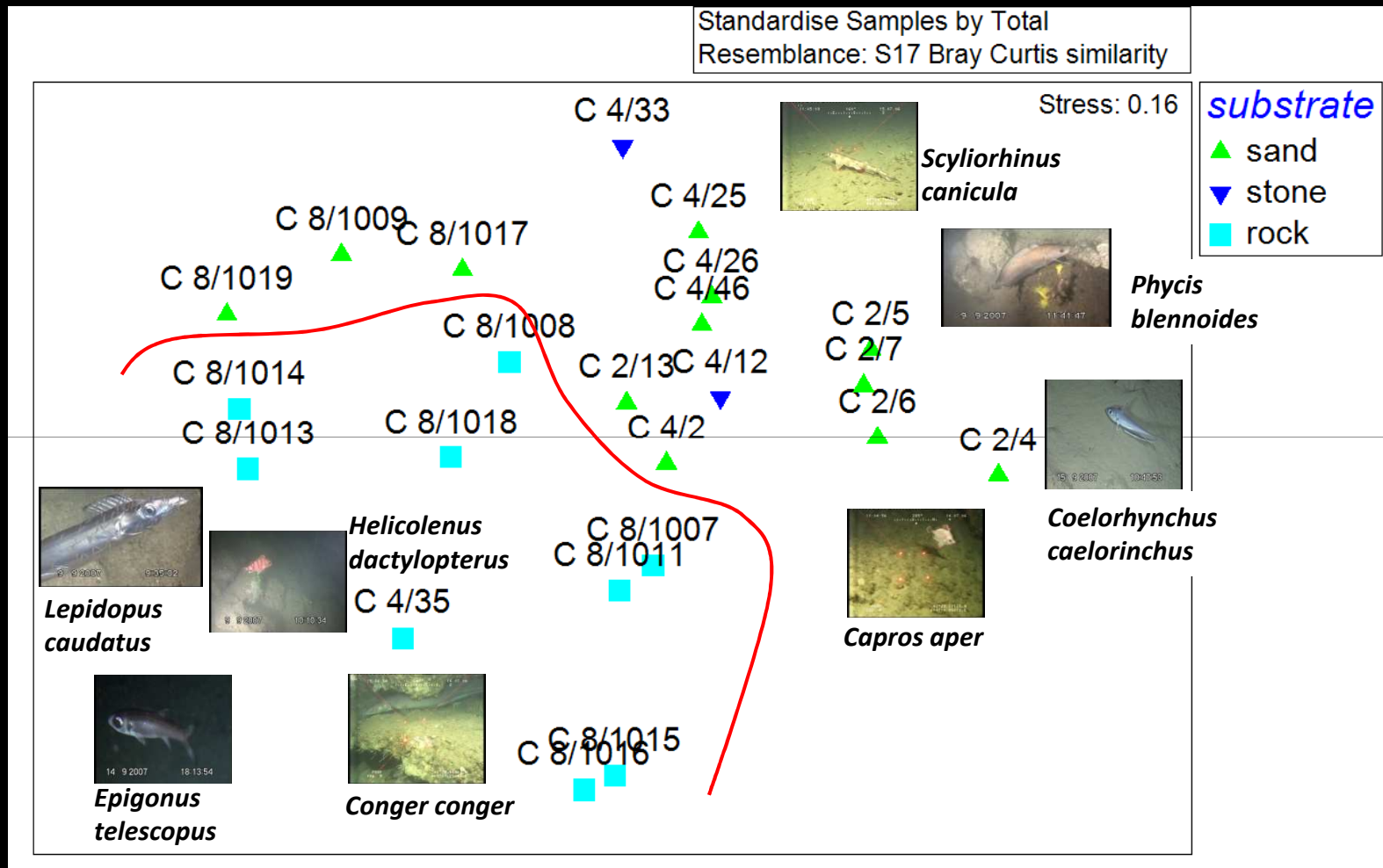
Where?
How many?
Distribution pattern?
Substrate?



Coral size structure and morphology

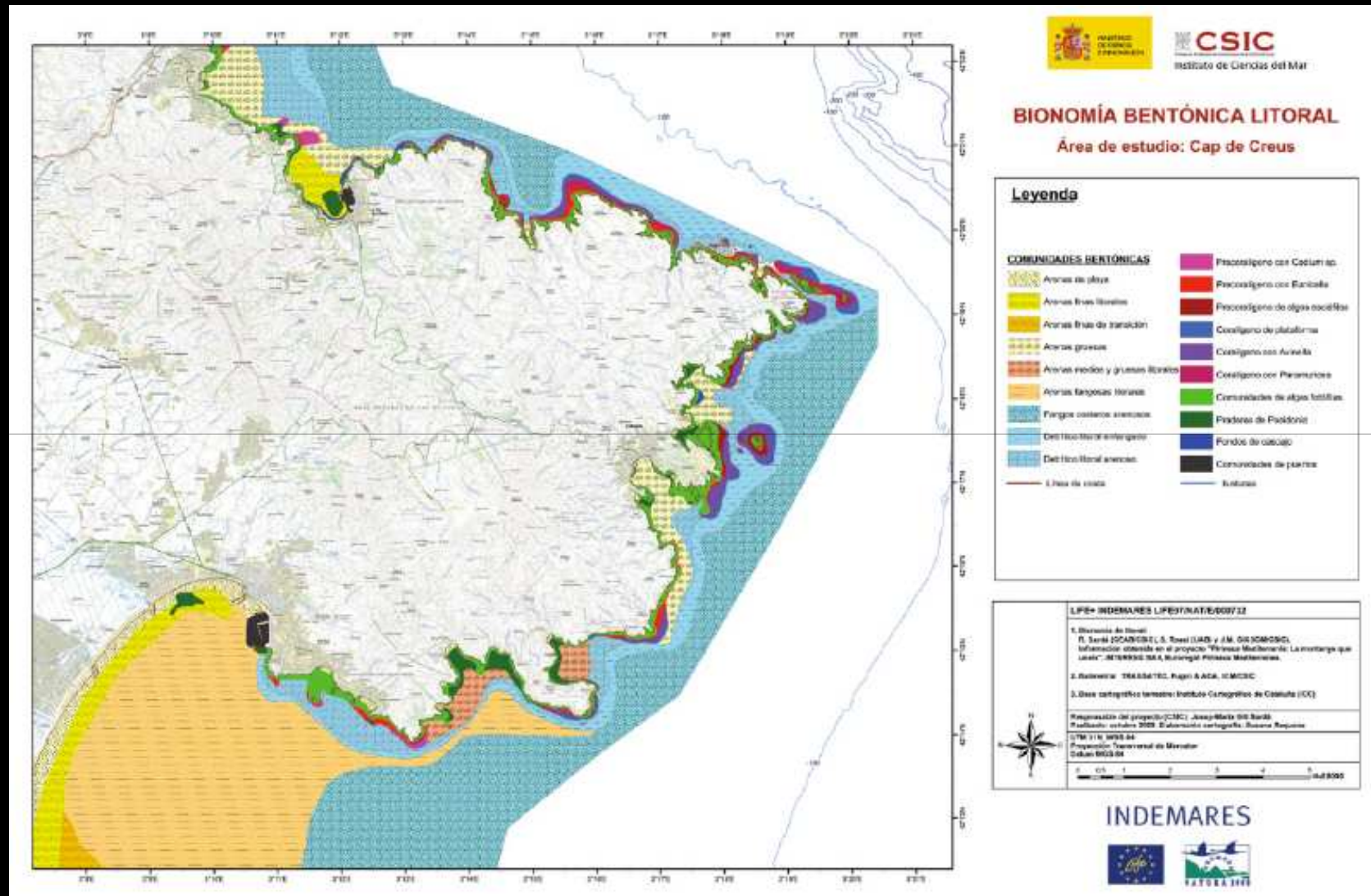


Fish community associated to CWCs



Different fish community in rocky and sandy substrates in the canyon

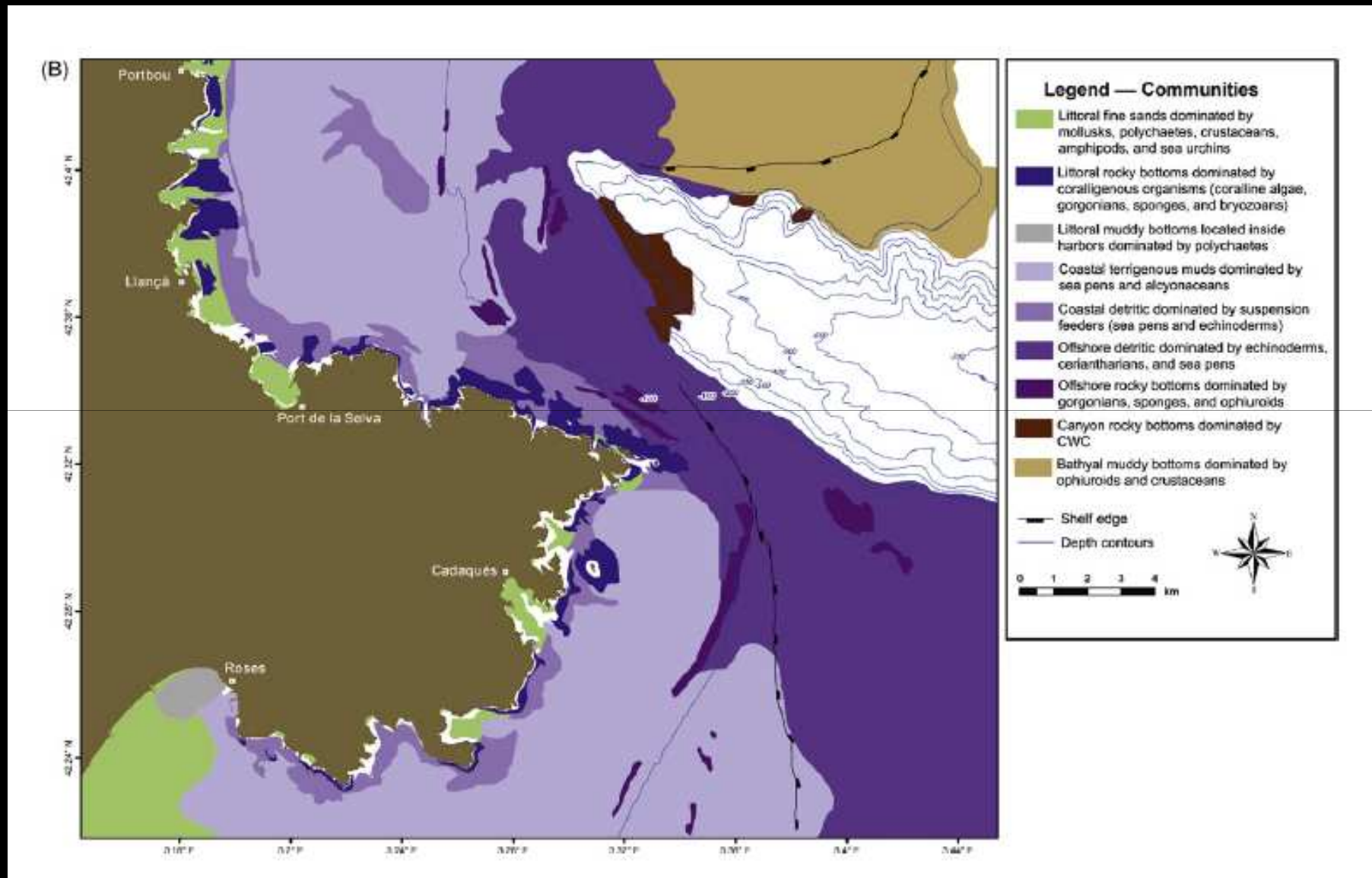
Habitat mapping (shallow benthic habitats)



Litoral benthic bionomie for the 0-60 m zone in Cap de Creus

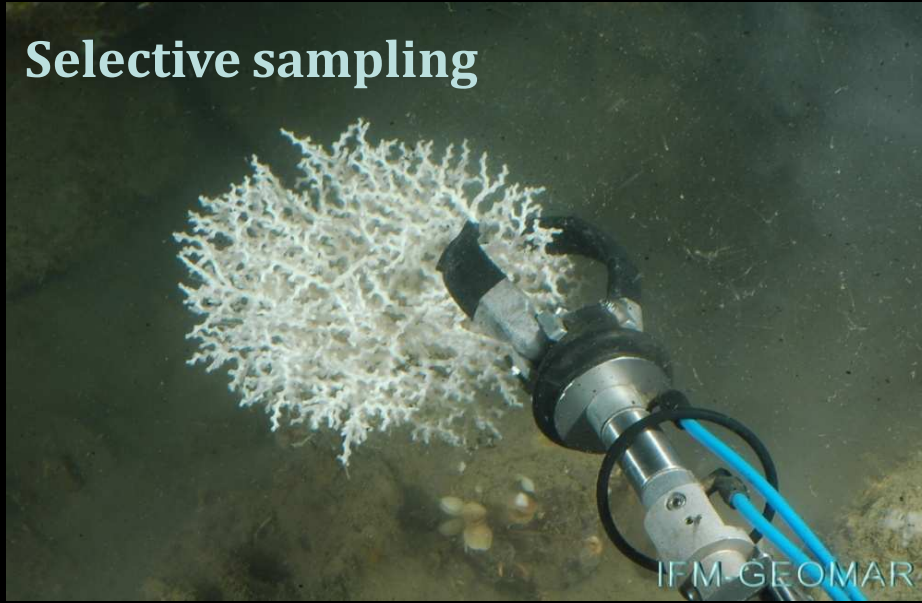
Sardá et al. 2012

Habitat mapping (continental shelf)



Cold-Water Coral sampling and maintenance

Selective sampling



Lophelia pertusa, *Madrepora oculata*,
Dendrophyllia cornigera and
Desmophyllum dianthus in aquaria
since 2006!



Aquaria facilities
for CWCs

Cold-Water Coral ecophysiology

HERMES, DEEP CORAL , HERMIONE (2005 - 2012)

*Madrepora
oculata*



*Lophelia
pertusa*

*Desmophyllum
dianthus*



*Dendrophyllia
cornigera*

Cold-Water Coral ecophysiology

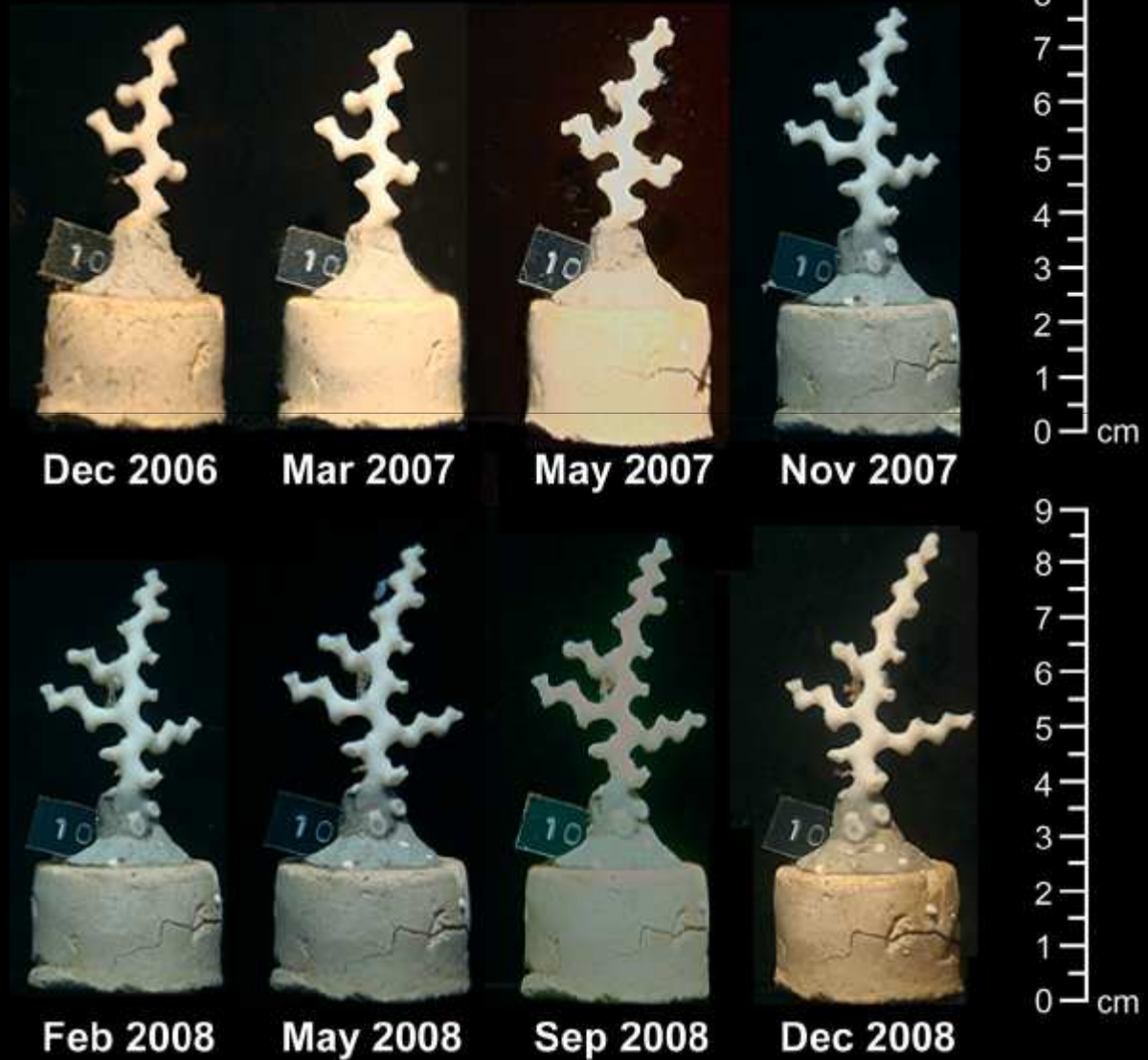
(growth)

M. oculata (n= 17)

$0.014 \pm 0.007 \text{ mm d}^{-1}$

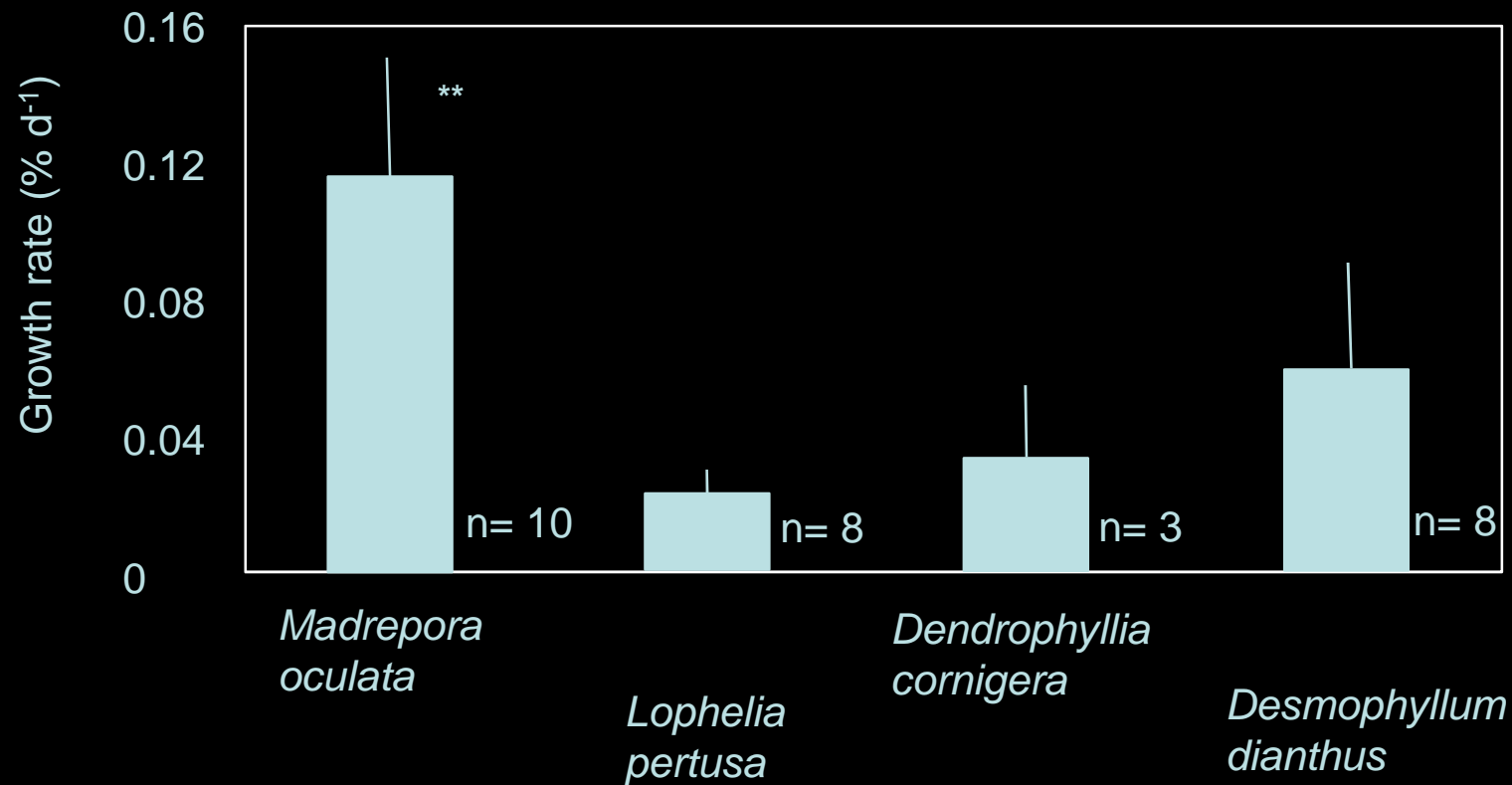
L. pertusa (n=10)

$0.024 \pm 0.018 \text{ mm d}^{-1}$



Cold-Water Coral ecophysiology

(growth)

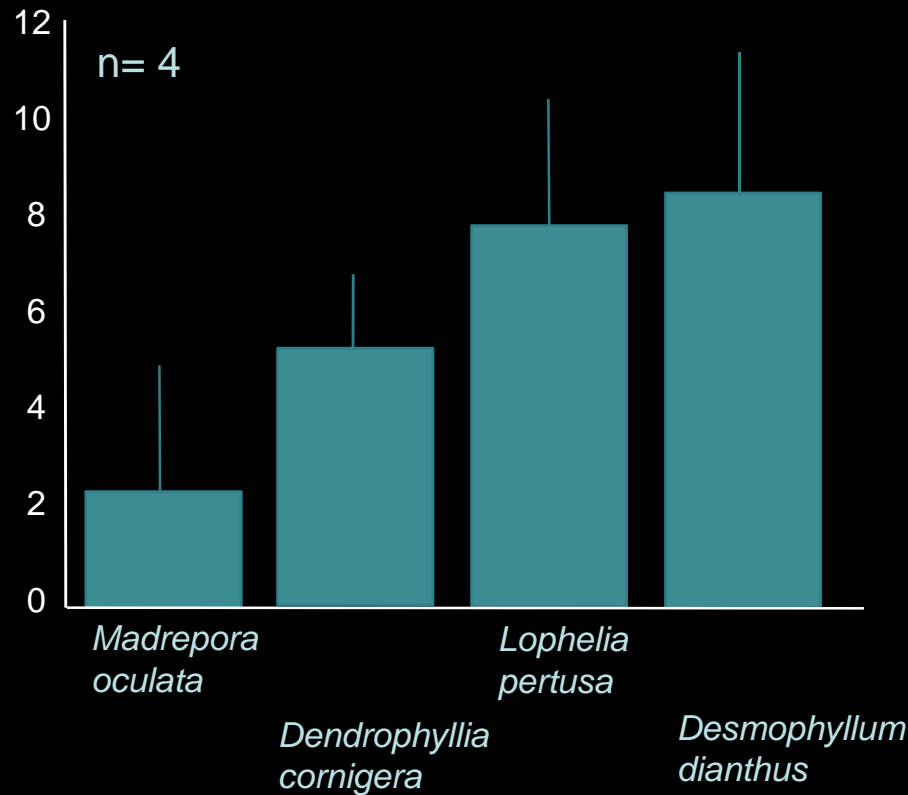


***M. oculata* growth rate significantly higher than for the other 3 CWC species.**

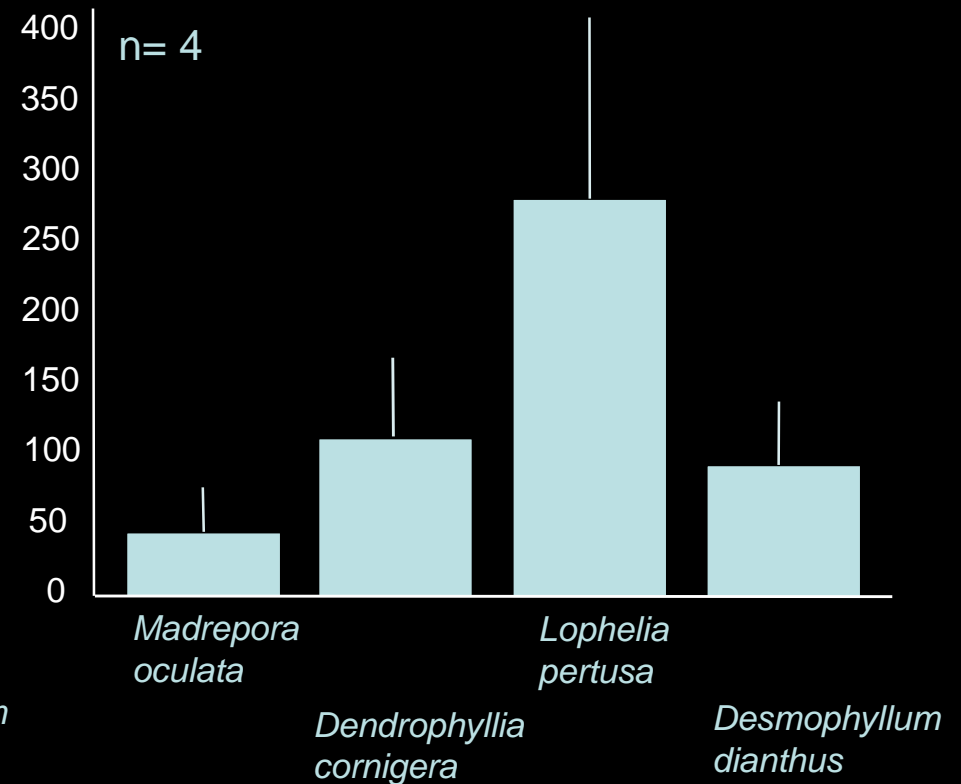
Cold-Water Coral ecophysiology

(feeding)

N° *Artemia* polyp⁻¹ h⁻¹

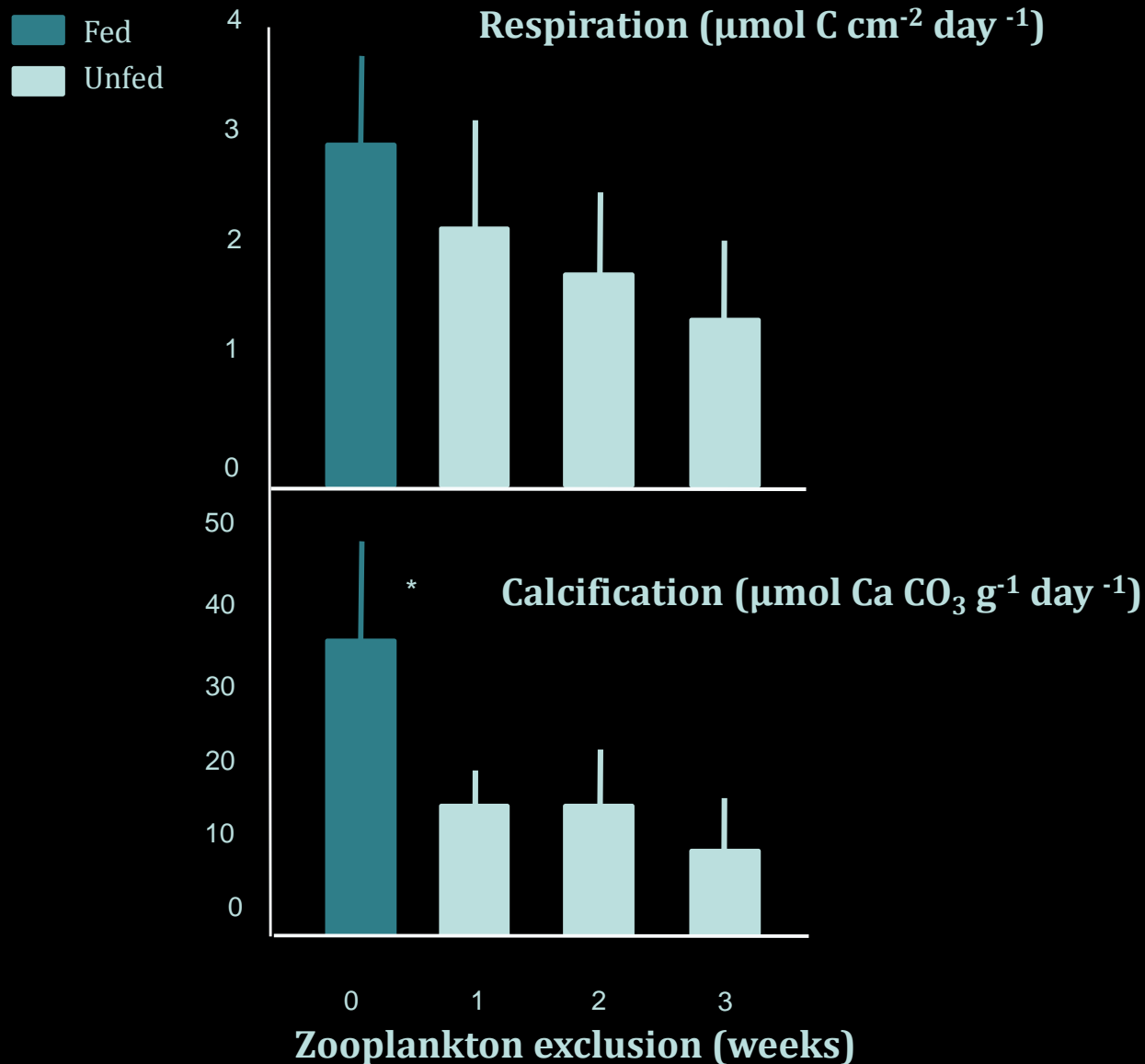


N° *Artemia* nauplii polyp⁻¹ h⁻¹



Different capture rates for different prey size among the four species

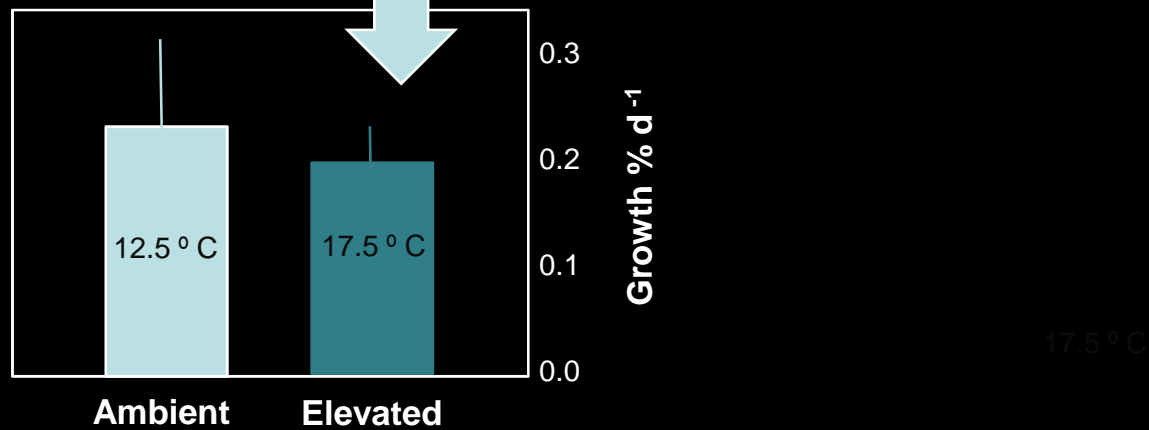
Cold-Water Coral ecophysiology (feeding)



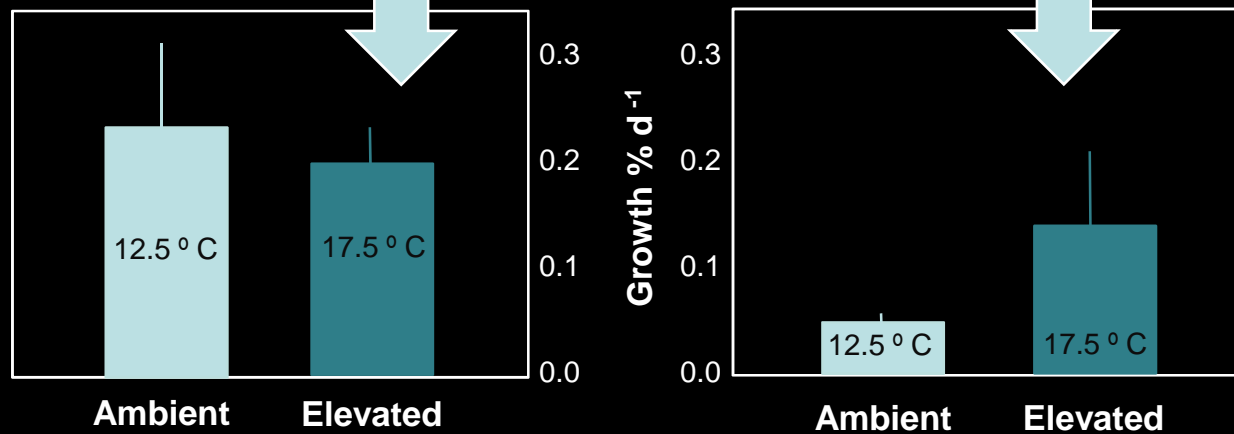
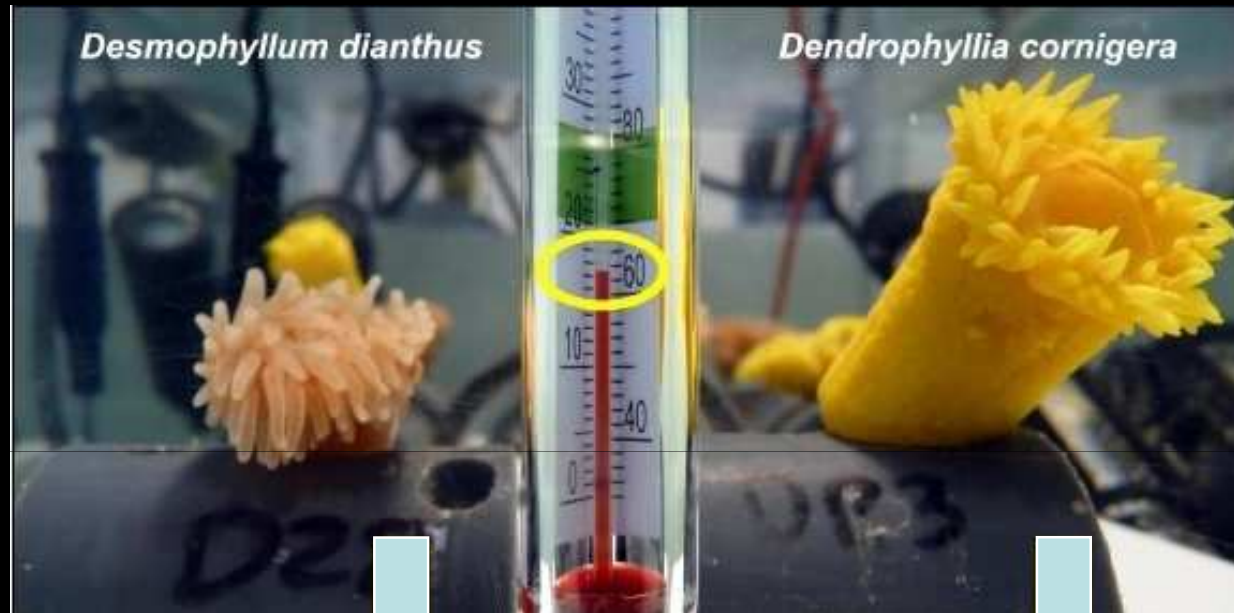
Desmophyllum dianthus

Evidence for the principal trophic significance of zooplankton feeding in fuelling and sustaining levels of CWC key physiological processes

Cold-Water Coral ecophysiology (response to environmental conditions)

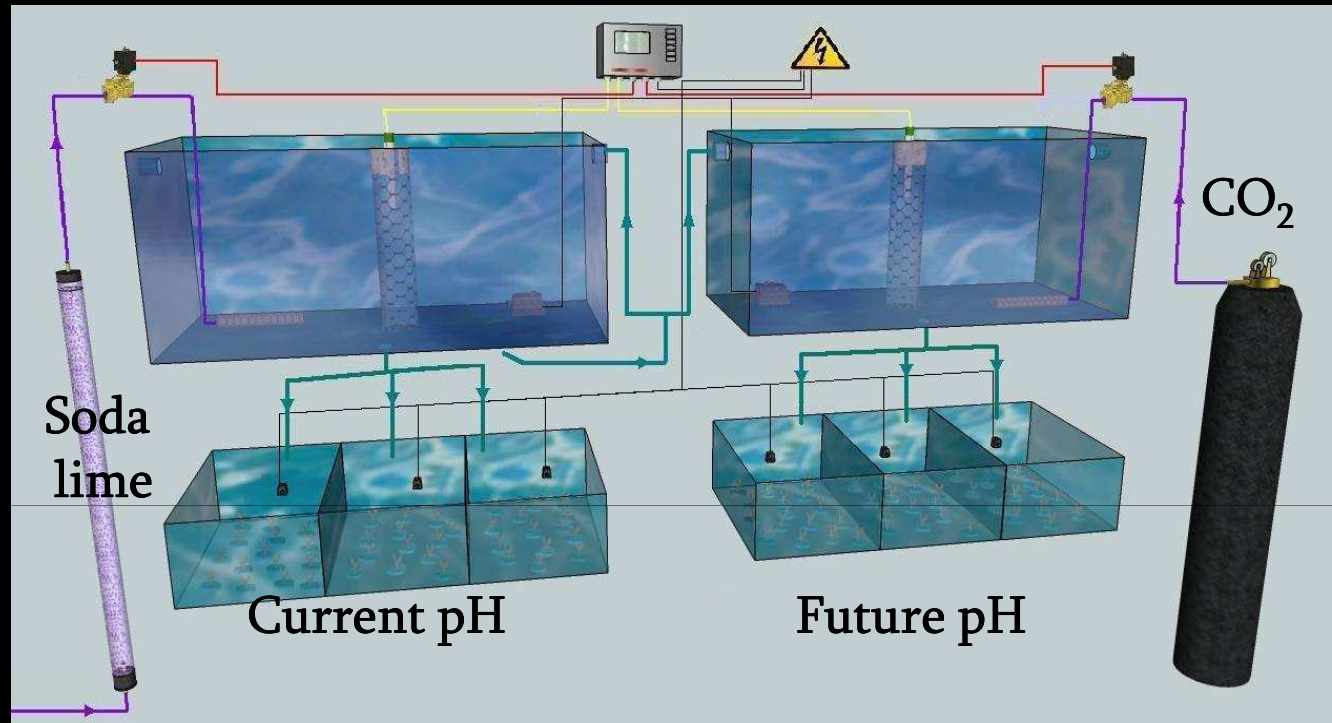


Cold-Water Coral ecophysiology (response to environmental conditions)



Cold-Water Coral ecophysiology

(effects of acidification)



Experimental set-up

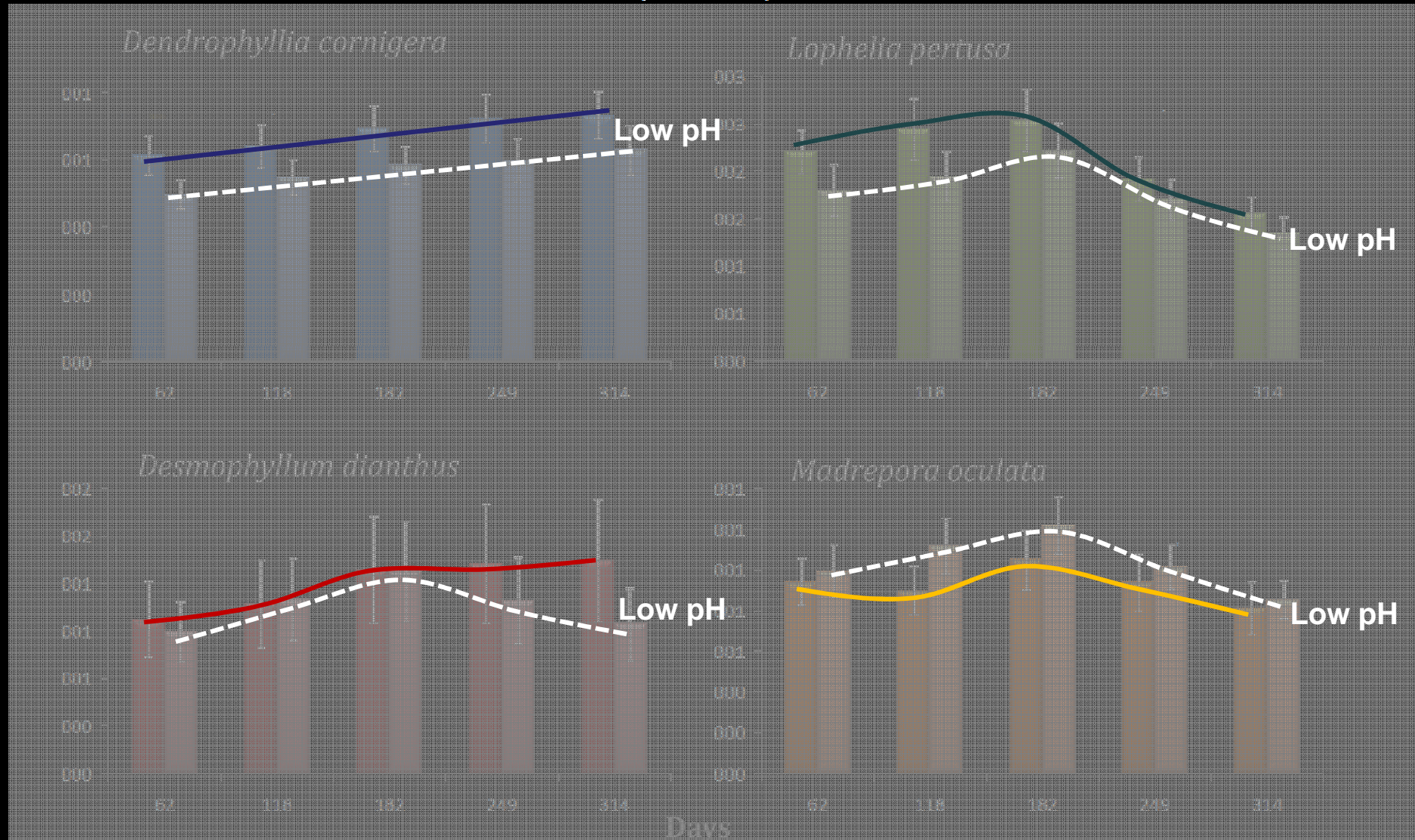
- Aquaria control (current pH = 8.12)
- Aquaria treatment (future pH scenario = 7.84)
- Temperature: 12° C / No Light / Same feeding

Cold-Water Coral ecophysiology

(effects of acidification)

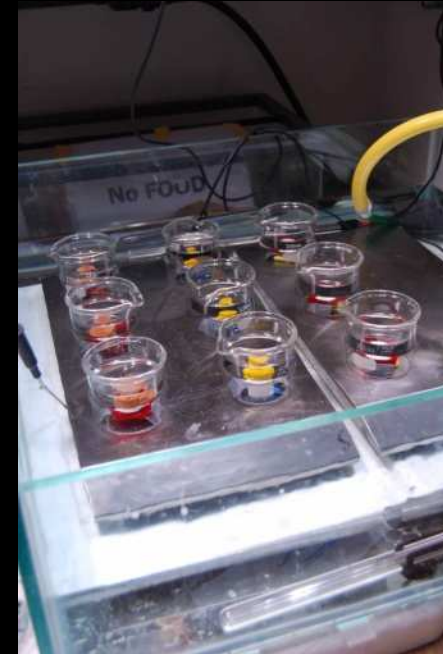
Calcification rates (mg CaCO₃ / g day)

(Mean ± SE)



Whats going on ...

- **Ecophysiological responses of CWC to different seawater temperatures (Andrea Gori et al.)**



- **Development of a geospatial analysis for predictive mapping (Claudio Lo Iacono et al.)**

This work has been and is being possible thanks to a **great** and very large **team!**



Ale



Jürgen, Karen & JAGO



Andrea



Àngel



Jordi



Lorenzo



Teresa



Malik



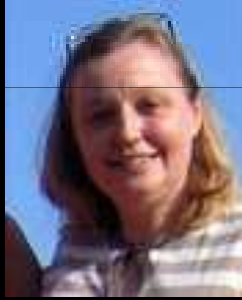
Eva



Carles



Juancho



Christine



Cécile



Cova Josep Maria



Many students



Claudio



Pere



Pablo



Arturo & all UTM guys



García del Cid cap, officers and crew

ETC,

ETC...

Thanks also to...

People from different Institutions who generously share knowledge,
experience and friendship with us during all these years :

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Helmuth Zibrowius

Andrea de Lucia

Autun Purser

Carlos Jiménez

Inken Suck

Norbert Frank

Christian Dullo

Julian Gutt

André Freiwald

Francesc Pagès

JAGO IFM-GEOMAR

Pål Mortensen

Bego Vendrell

FIELAX

Thomas Lundälv

Werner Dimmler

INSTALSUB

Claudia Wienberg

Armin Form

DIVING CENTER

Jan Helge Fosså

Pedro Siles

CADAQUÉS

Marina Carreiro

Sergio Rossi

Nuria Viladrich

Mikael Dahl

...and more !!

Thanks to many research Institutes, Institutions, and projects which support our work



SAMS

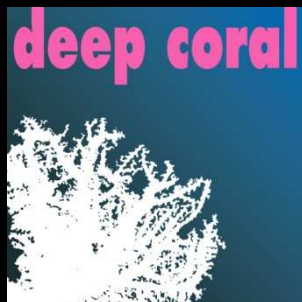


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