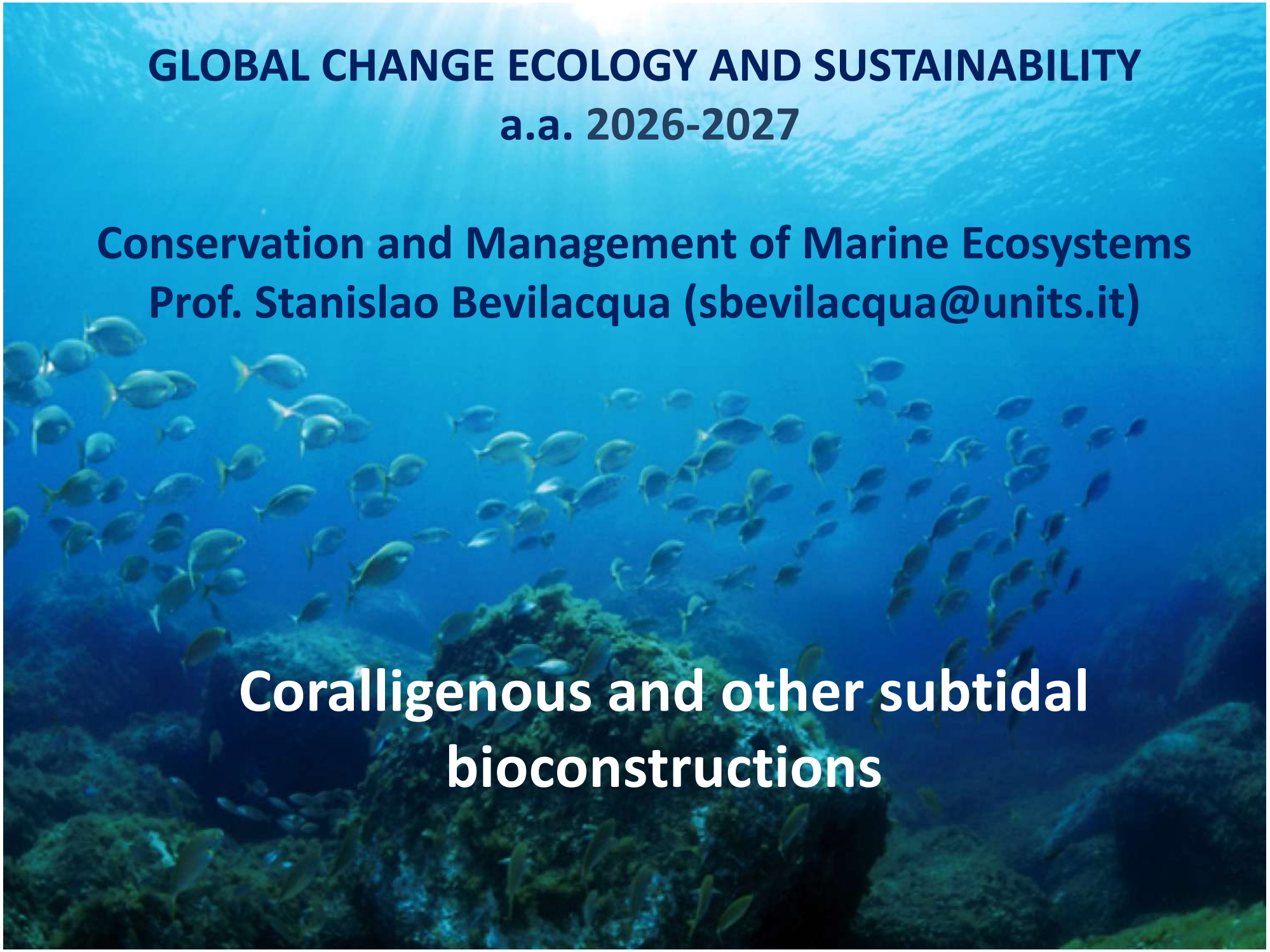


# GLOBAL CHANGE ECOLOGY AND SUSTAINABILITY

a.a. 2026-2027

## Conservation and Management of Marine Ecosystems

Prof. Stanislao Bevilacqua (sbevilacqua@units.it)

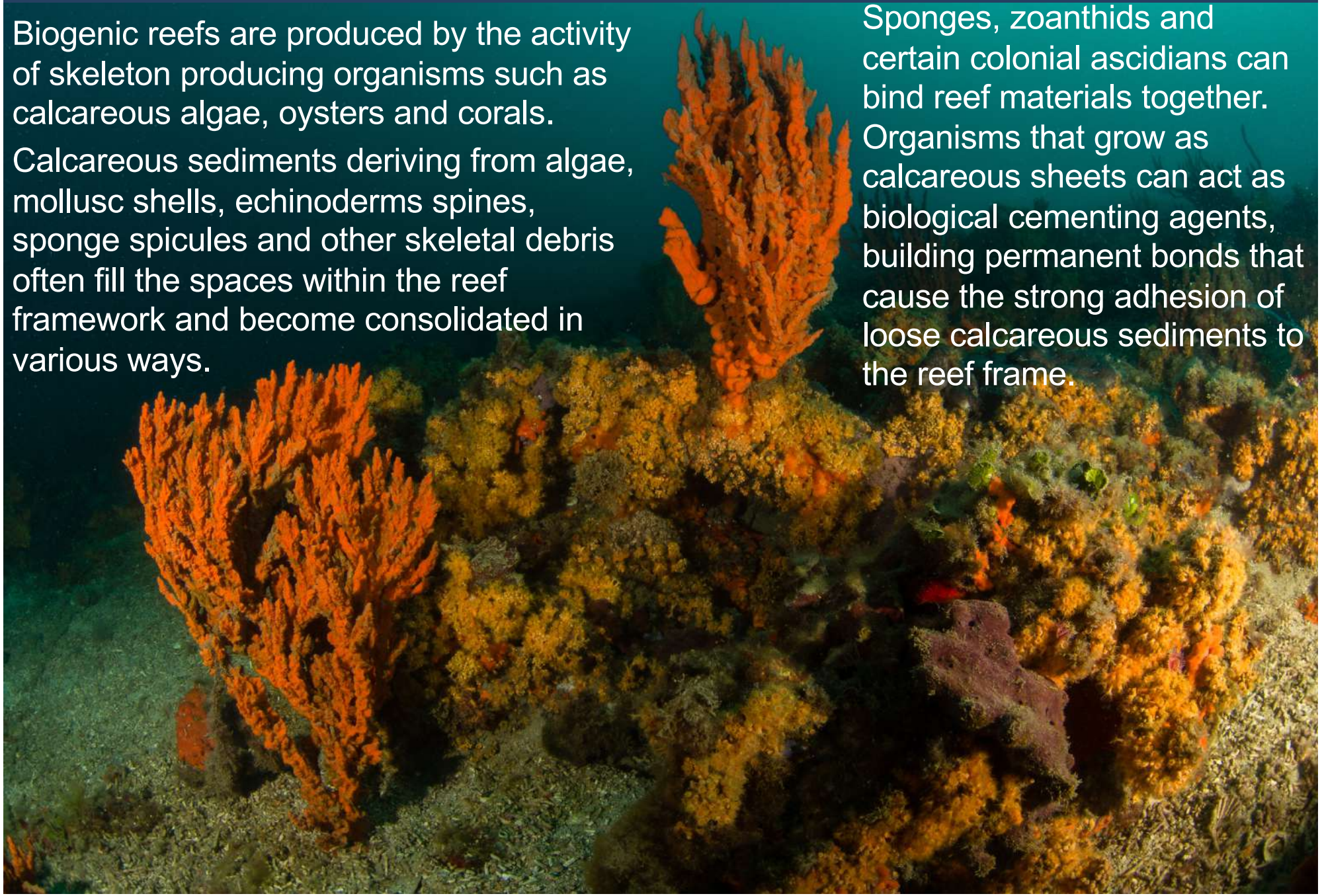
# Coralligenous and other subtidal bioconstructions

# Bioconstructions

Biogenic reefs are produced by the activity of skeleton producing organisms such as calcareous algae, oysters and corals.

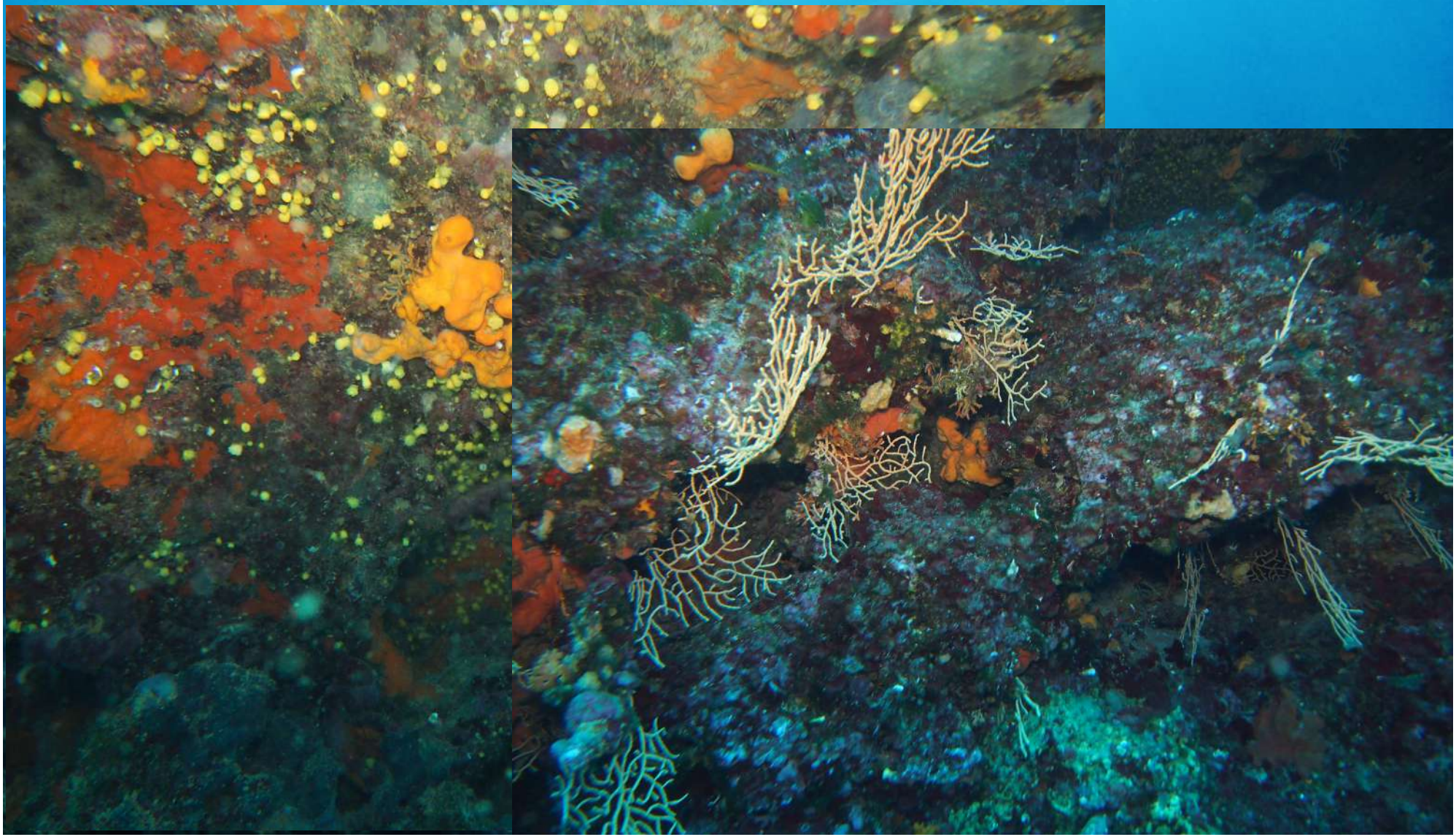
Calcareous sediments deriving from algae, mollusc shells, echinoderms spines, sponge spicules and other skeletal debris often fill the spaces within the reef framework and become consolidated in various ways.

Sponges, zoanthids and certain colonial ascidians can bind reef materials together. Organisms that grow as calcareous sheets can act as biological cementing agents, building permanent bonds that cause the strong adhesion of loose calcareous sediments to the reef frame.



# Bioconstructions

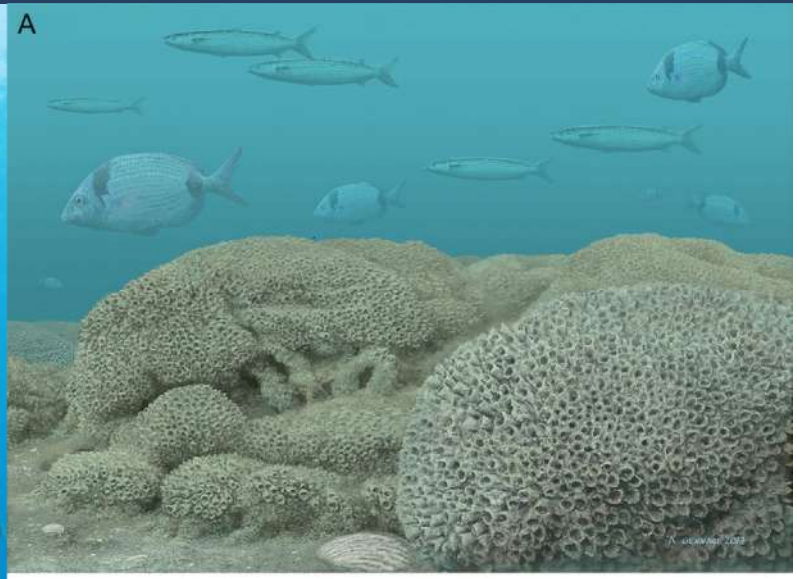
Bioconstructors modify primary (i.e. geological) substrates and provide secondary (i.e. biogenic) substrates for new bioconstructors and for nonbioconstructors who simply inhabit them

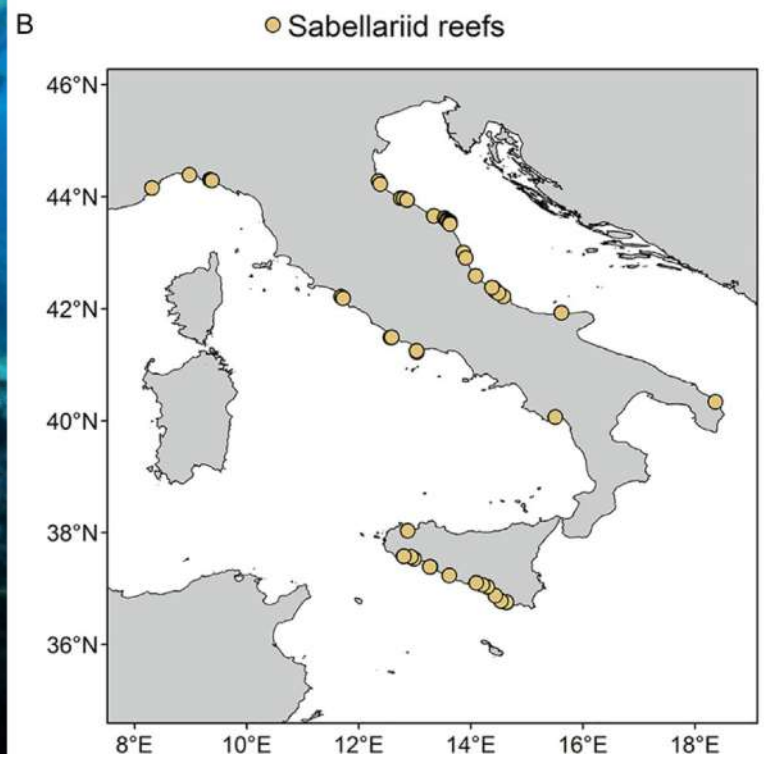


# Bioconstructions of the Mediterranean Sea

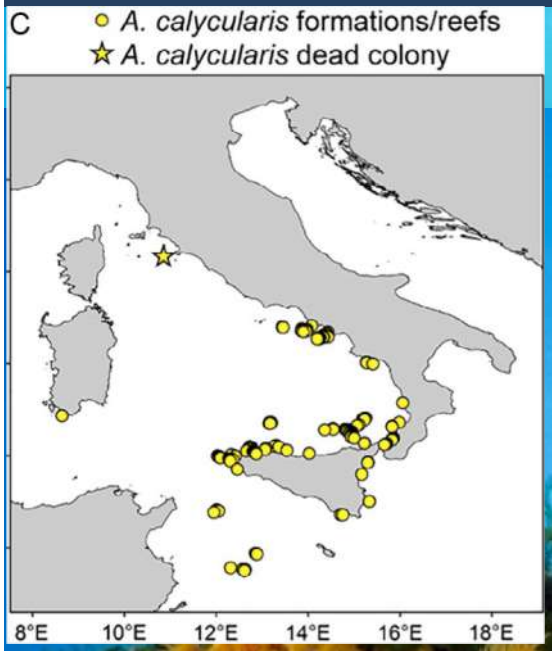
- ***Lithophyllum byssoides*** **concretions/trottoirs**
- **Vermetid reefs**
- **Sabellariid reefs**
- ***Astroides calycularis*** **formations/reefs**
- ***Cladocora caespitosa*** **formations/reefs**
- **Cold-water corals**
- **Serpulid reefs, including biostalactites**
- **Coralligenous assemblages**

Sabellariid reefs are compact bioconstructions resulting from the aggregation of tubes made up of sand grains and bioclasts, cemented with mucus, which develop on both solid and soft bottoms. The worms construct these tubes around themselves, in close proximity



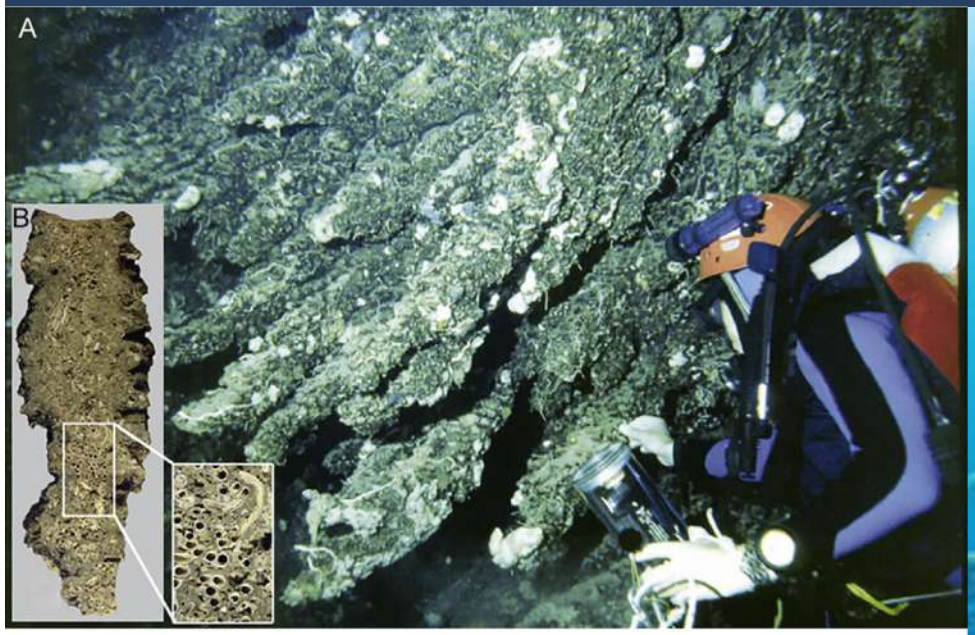



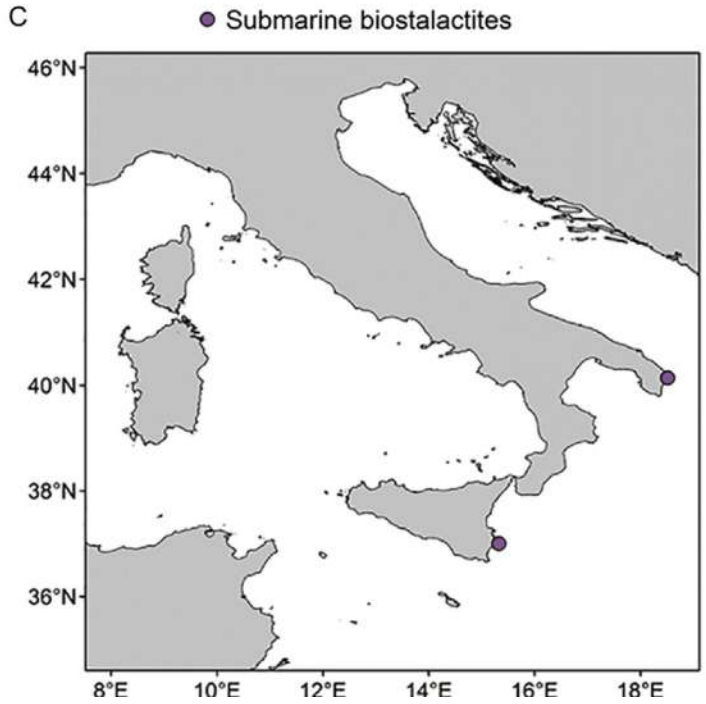
# Bioconstructions of the Mediterranean Sea




*Astroides calycularis* scleractinians not zooxanthelate

# Biostalactites



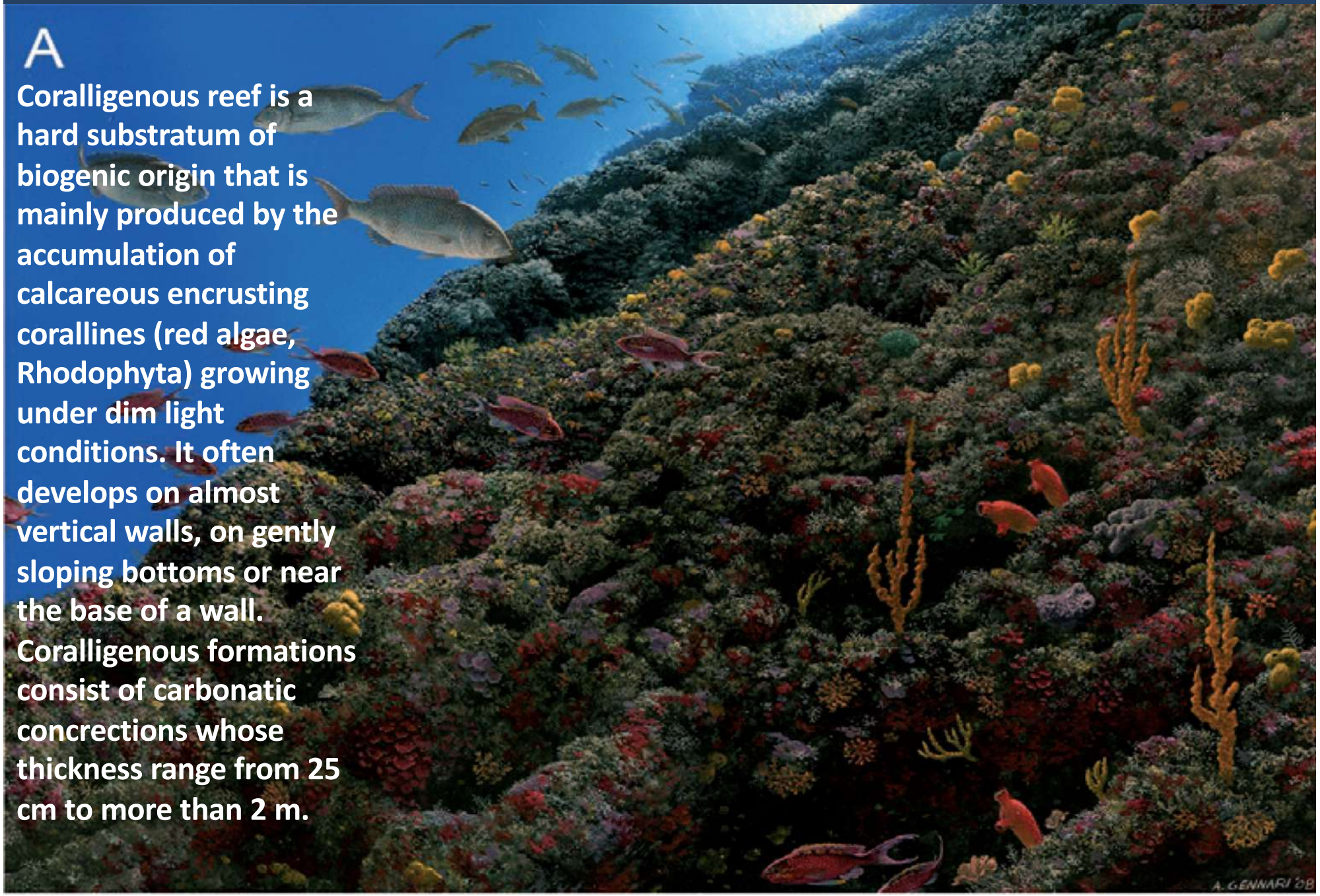




Particular serpulid structures in submarine caves are the so called biostalactites.

They are formed by single or few serpulid species (mostly *Protula* spp.) whose aggregations become substrate for smaller invertebrates and bacteria.

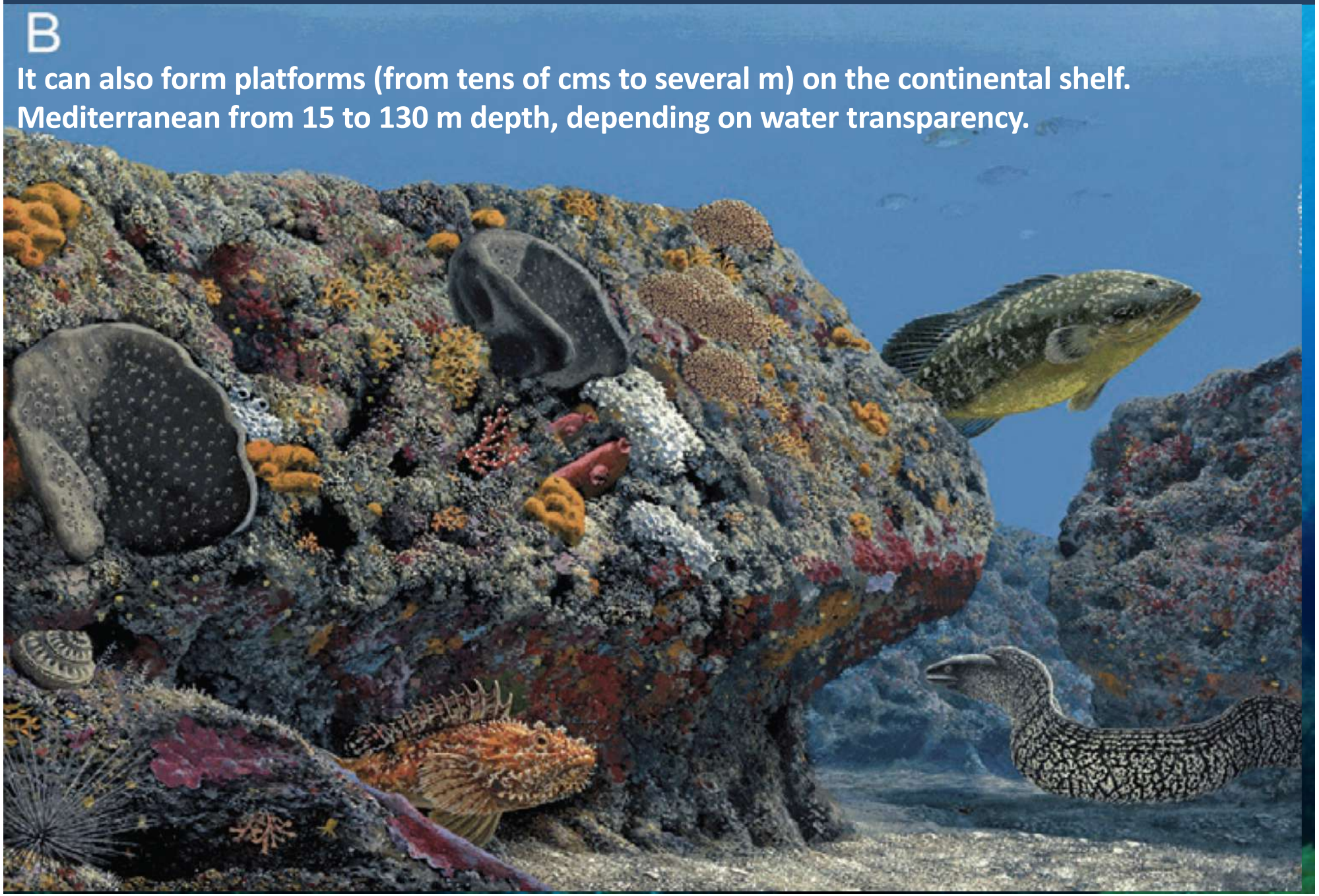
Biostalactites can protrude a few cm up to 2 m.

# Coralligenous assemblages



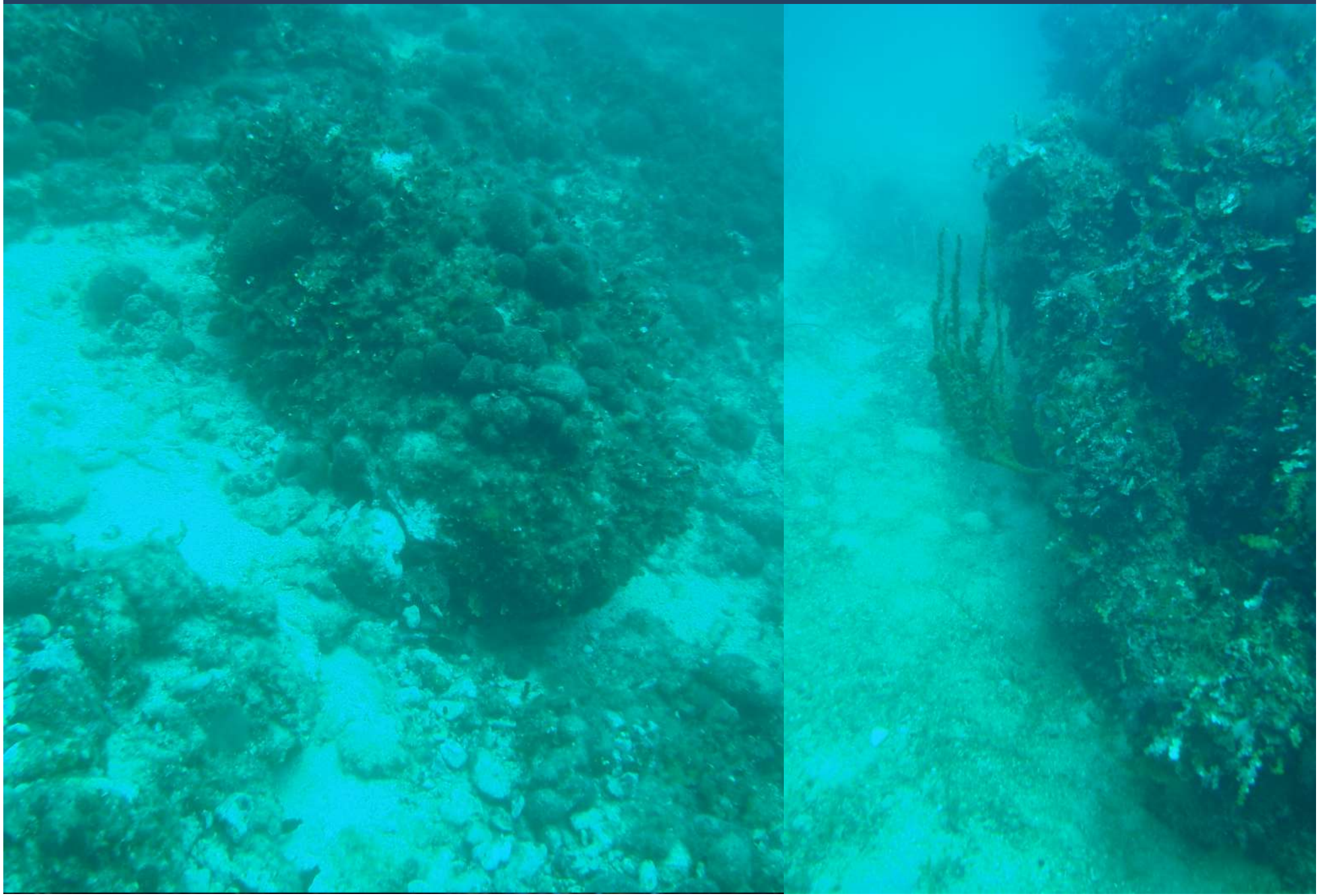

Coralligenous reef is a hard substratum of biogenic origin that is mainly produced by the accumulation of calcareous encrusting corallines (red algae, Rhodophyta) growing under dim light conditions. It often develops on almost vertical walls, on gently sloping bottoms or near the base of a wall. Coralligenous formations consist of carbonatic concrections whose thickness range from 25 cm to more than 2 m.

# Coralligenous assemblages

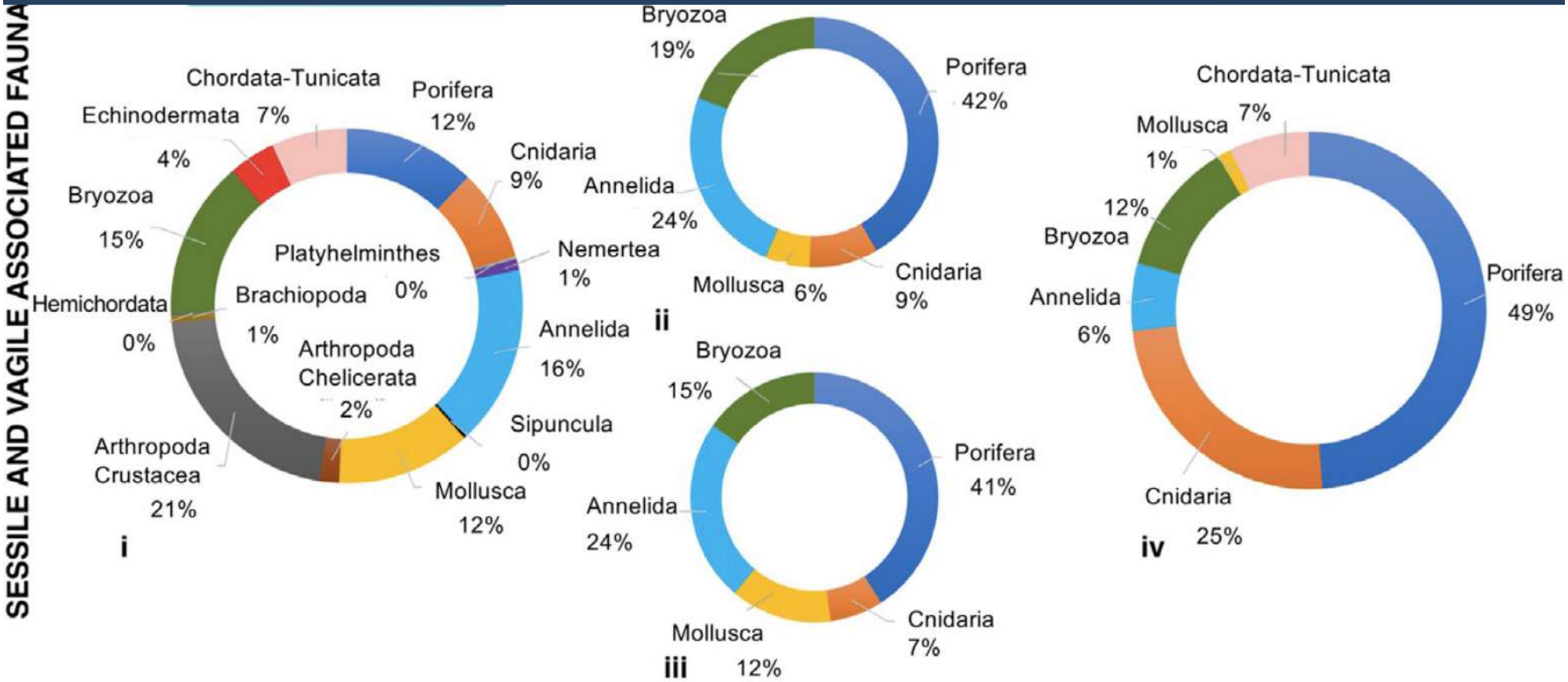



**It can also form platforms (from tens of cms to several m) on the continental shelf. Mediterranean from 15 to 130 m depth, depending on water transparency.**

# Coralligenous assemblages



# Coralligenous assemblages

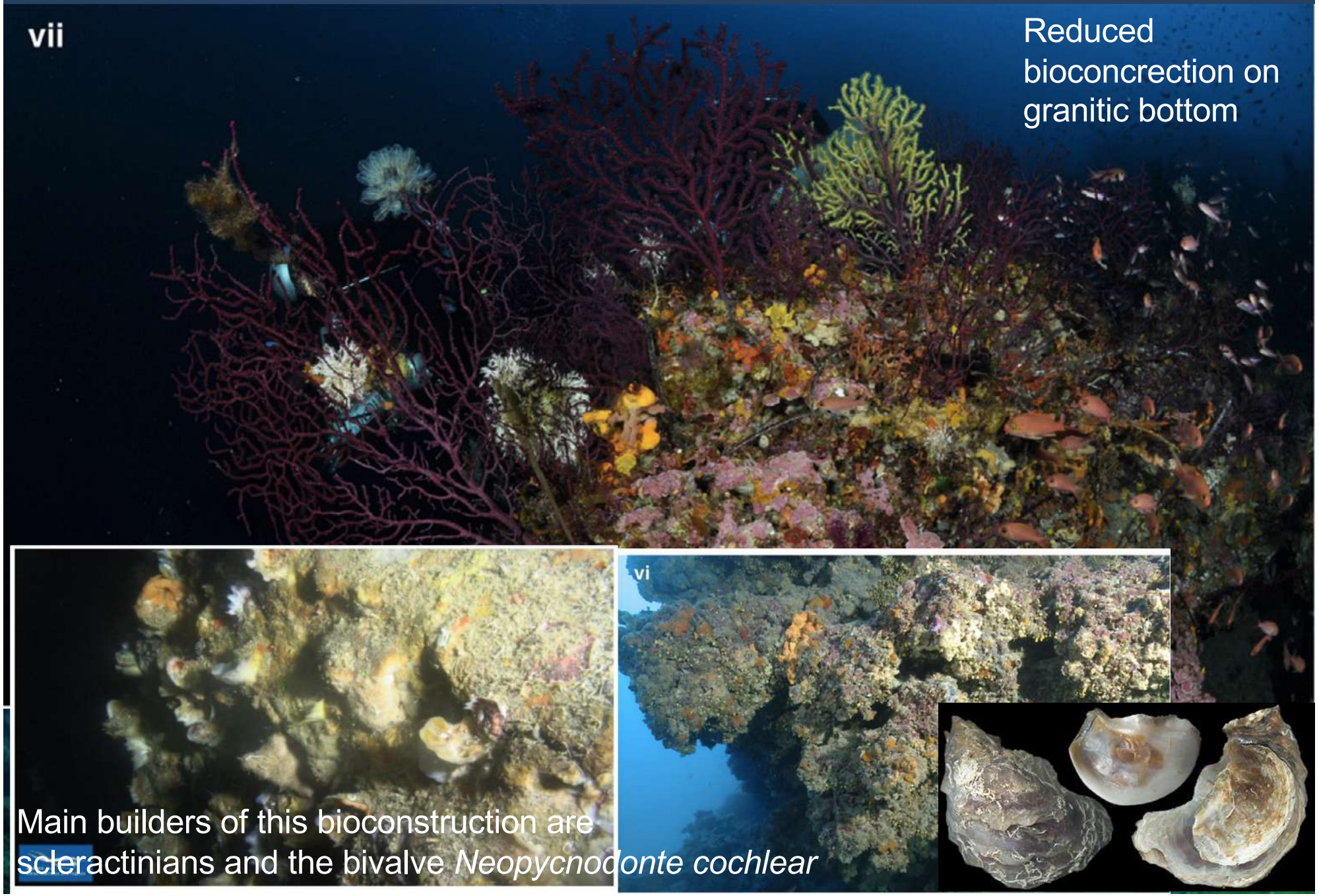



Algal bioconstruction
(coralligenous *sensu stricto*)
Built by coralline algae
Depth range 20-120 m

Animal bioconstruction
Built by animal remains
Depth range 30-70 m

Thin bioconstruction
Built by animal on granitic rocks
Depth range 30-70 m

# Coralligenous assemblages

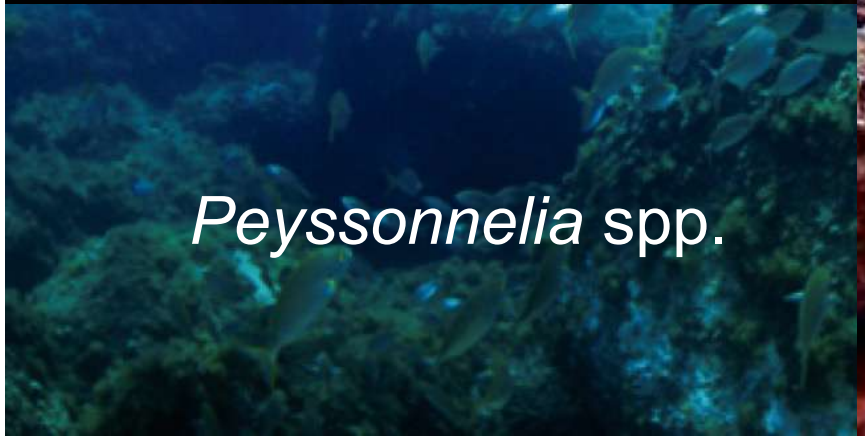


# Typical species



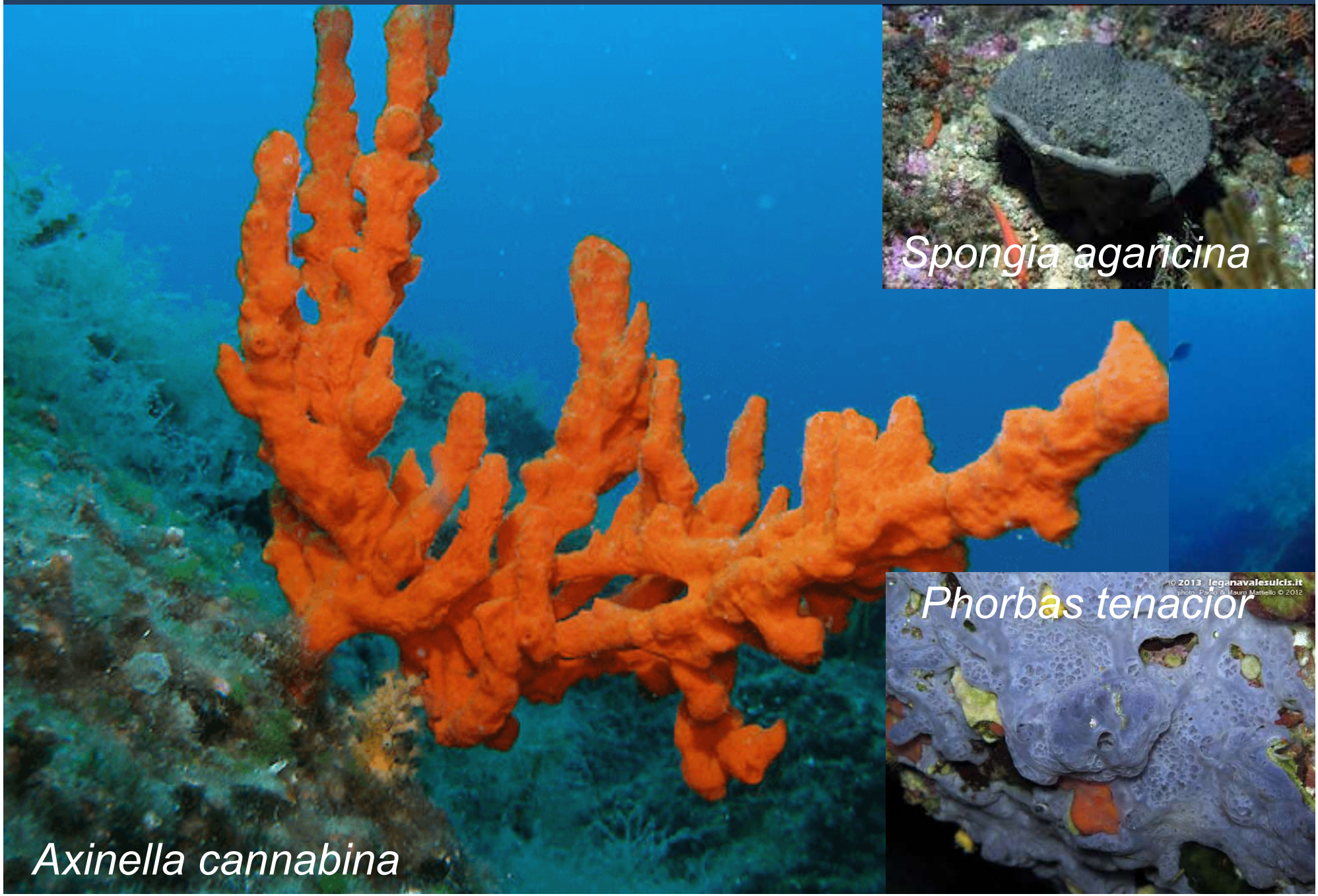




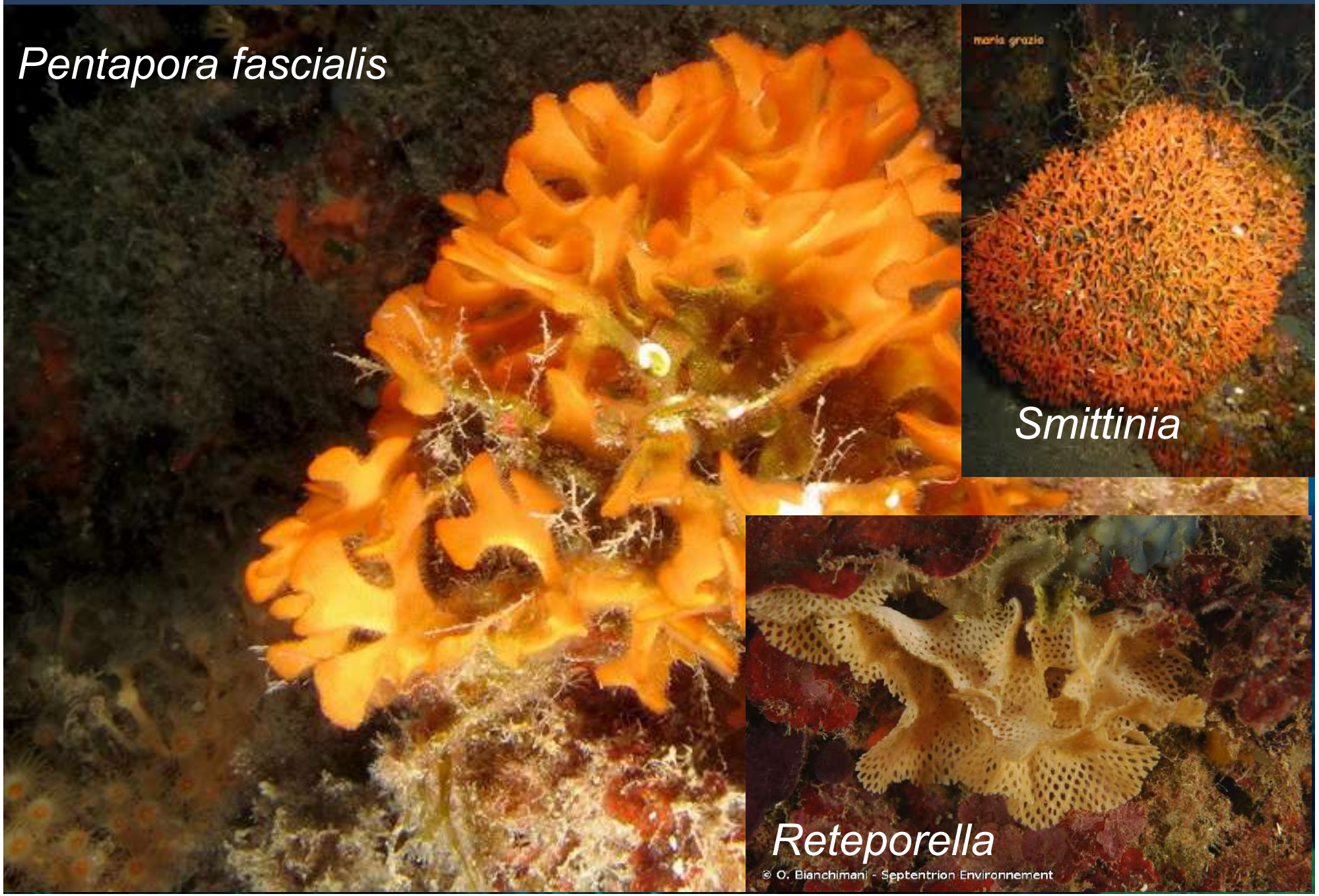





# Typical species



# Typical species



# Typical species


Parazoanthus axinellae



Scyllarides latus


Halocynthia papillosa


Palinurus elephas



Centrostephanus longispinus


Sphaerechinus granularis

# Typical species




*Conger conger*



*Dentex dentex*



*Epinephelus marginatus*



*Muraena helena*

# Trezze or tegnue



*turf*
encrusting sponges
bioeroders
sediment

massive sponges
*Peyssonnelia* spp.
ascidians

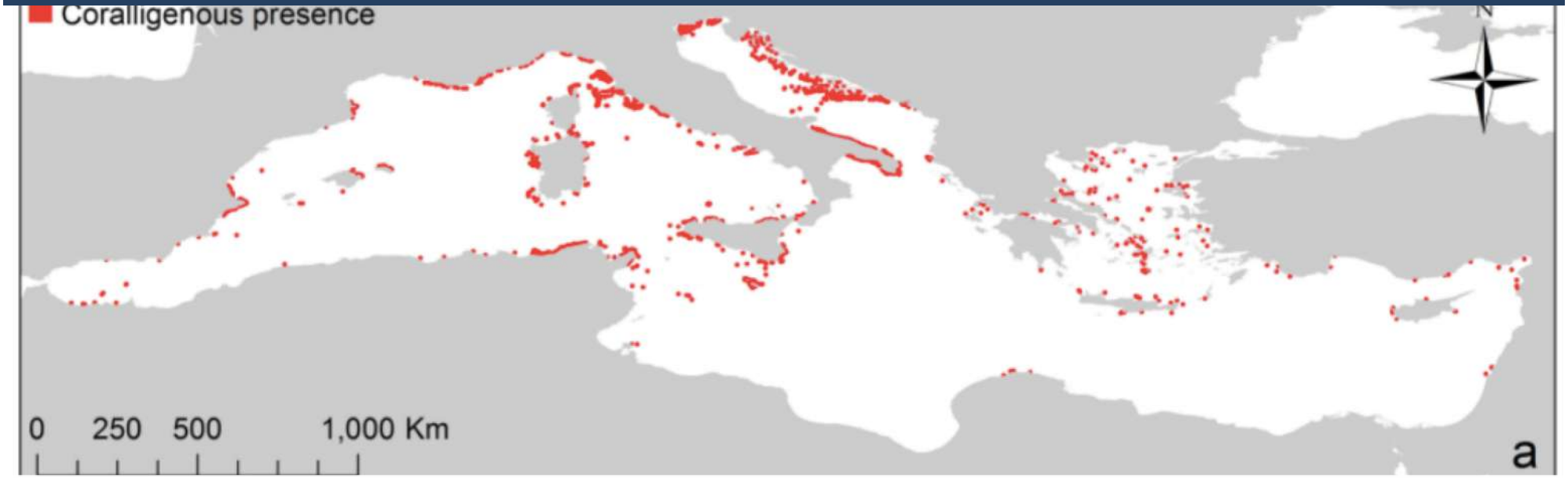
reef builders
*Polycitor adriaticus*

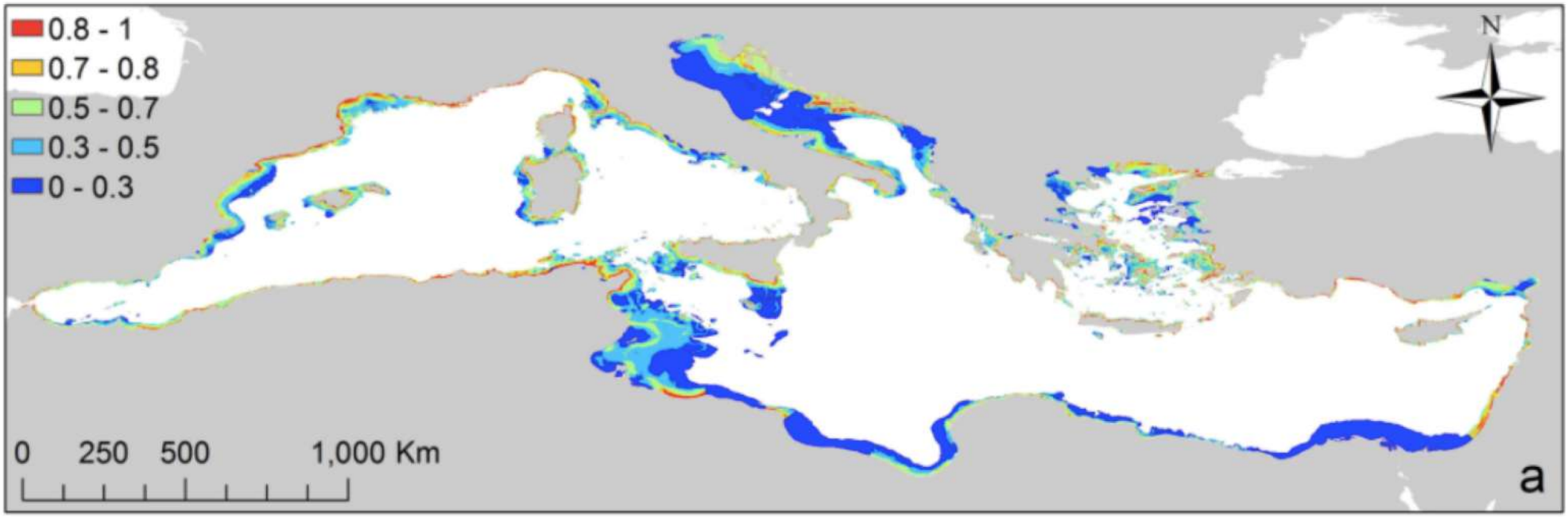
Different types of bioconcrections are present depending on the main components, which in turn, depends on environmental features such as distance from the coasts and human influence

Falace et al., 2015

In the northern Adriatic continental shelf, biogenic frameworks are generally superimposed on hard bottoms. Marine sediments may be consolidated by methane-related calcium carbonate cementation, thanks to seepage of $CH_4$-rich fluids, observable near many offshore reefs. Pleistocenic rivers, Holocene tidal channels and beach bars which are initial substrate for current coralligenous build-ups.

# Distribution




Surface areas reported here for coralligenous outcrops (2,763 km$^2$) based on data resulting from *in situ* observations limited to the 0 to 200 m depth band. Martin et al. 2014

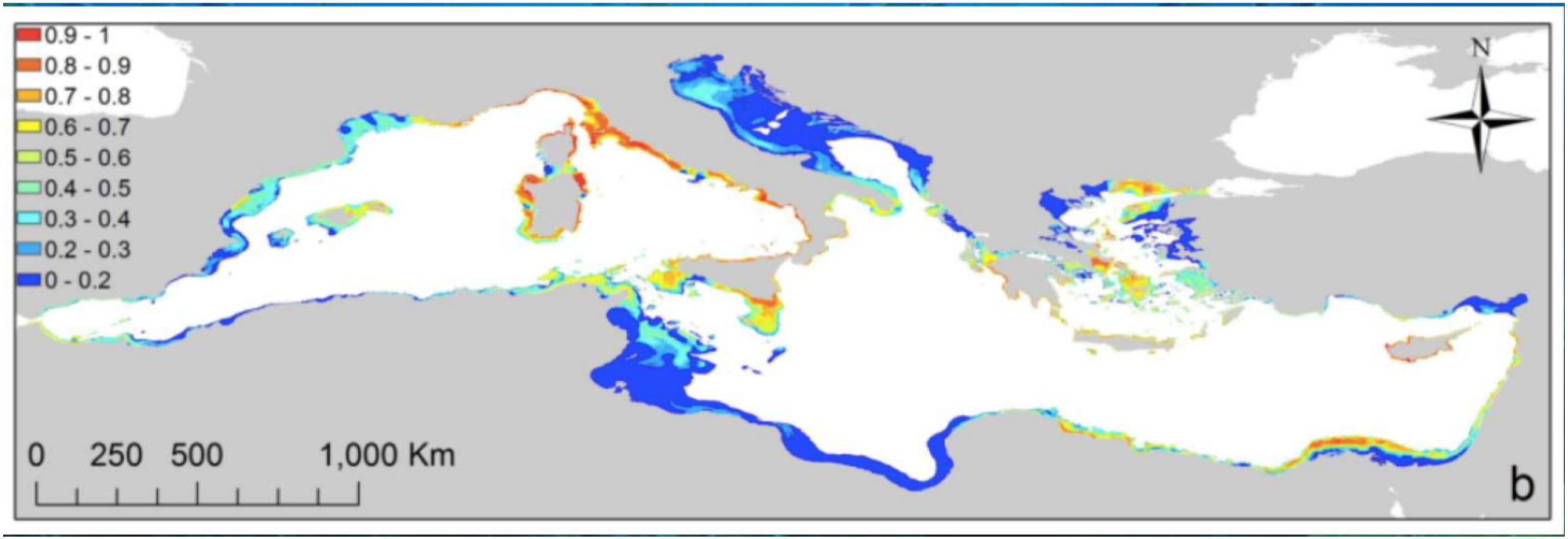
# Maërl

Biogenic structure formed by several coralline algae growing and accumulating (dead and alive) on soft bottom, living unattached to the substrate with thalli as nodules of ramified shapes.
Algae can live >100 y.
*Phymatolithon calcareum*

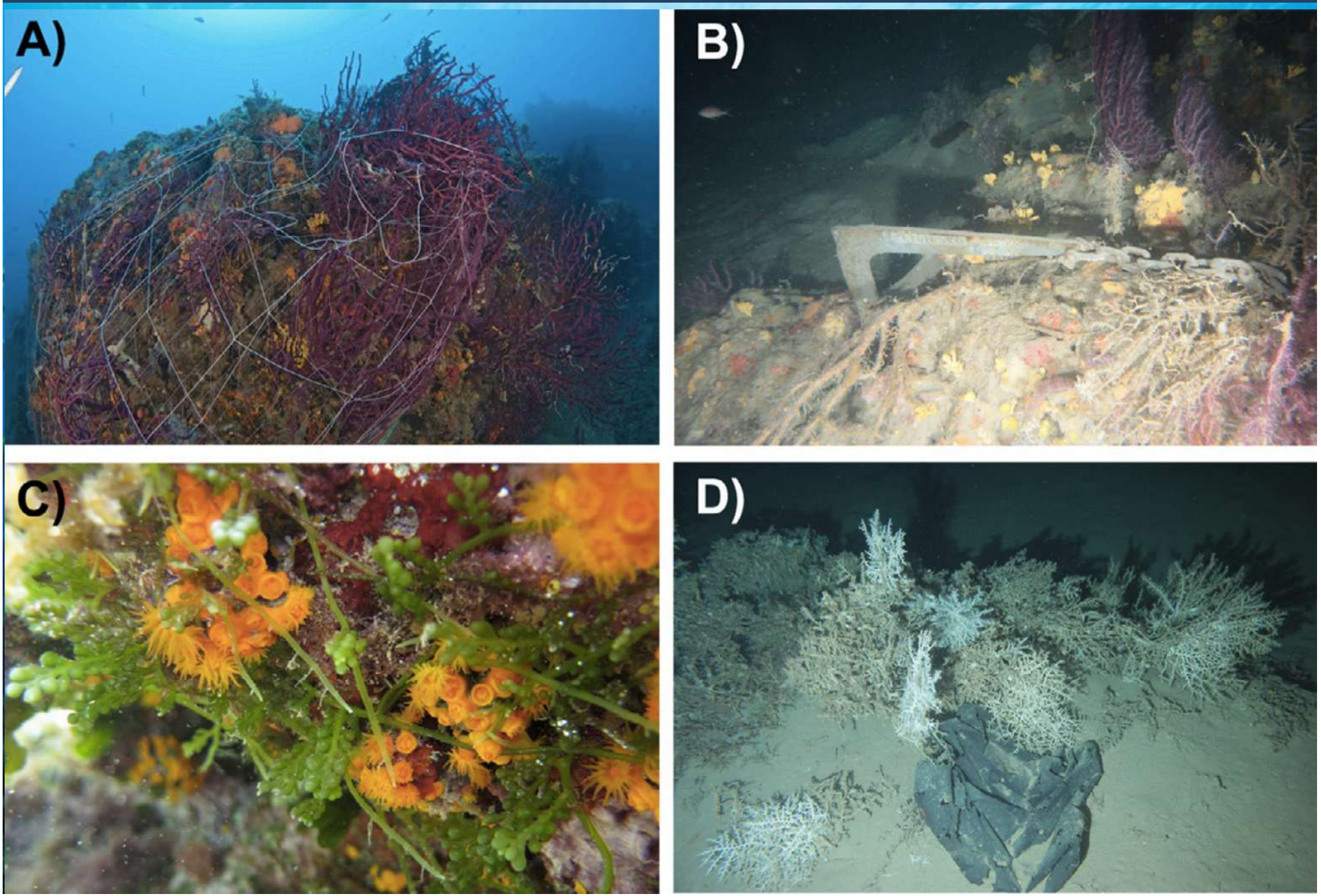


# Distribution



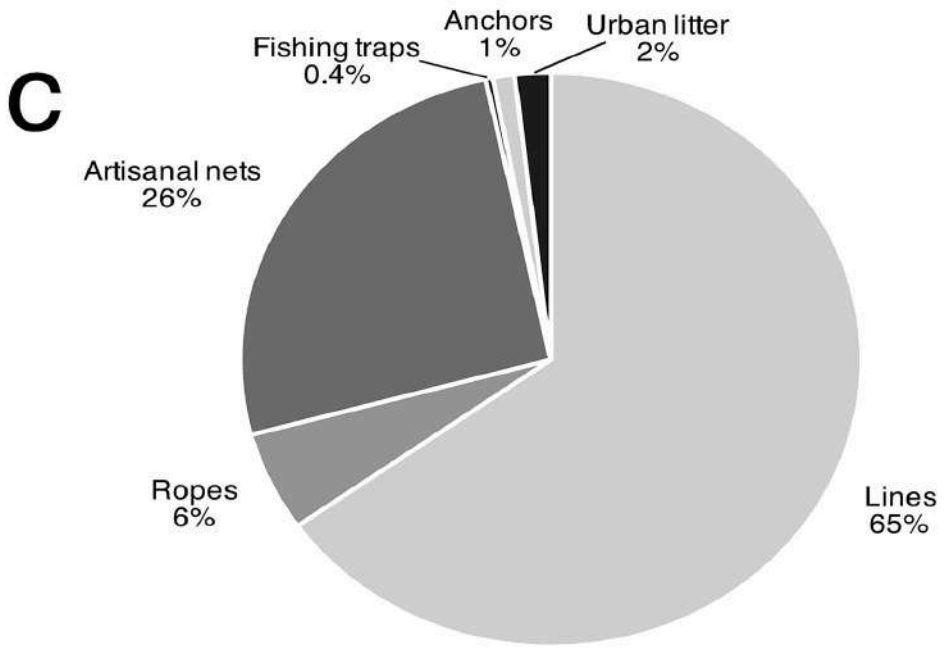
# Threats

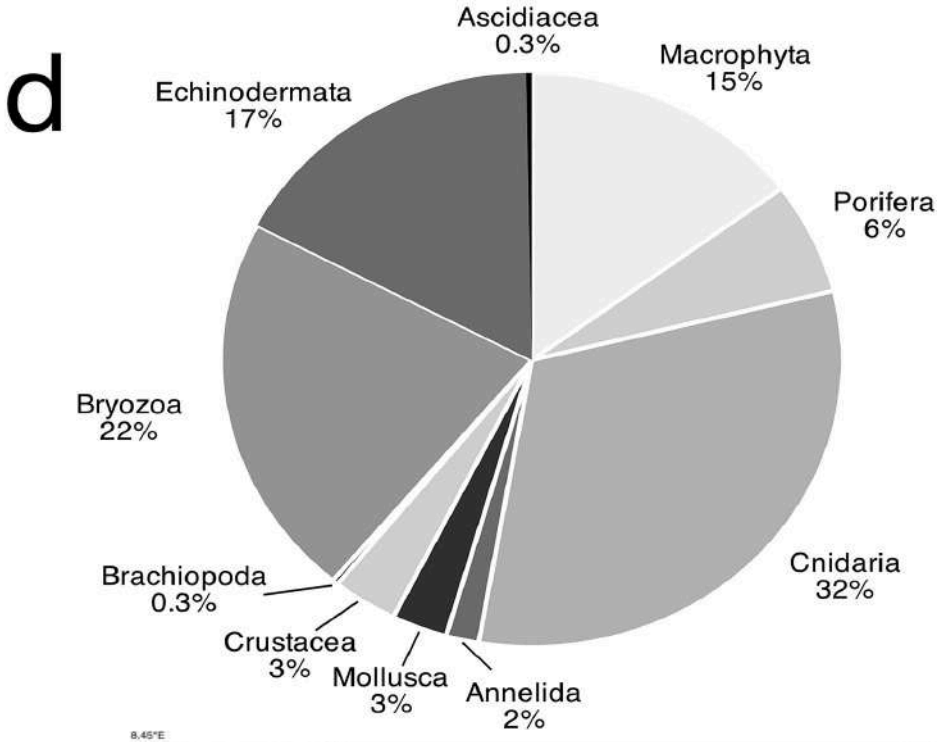


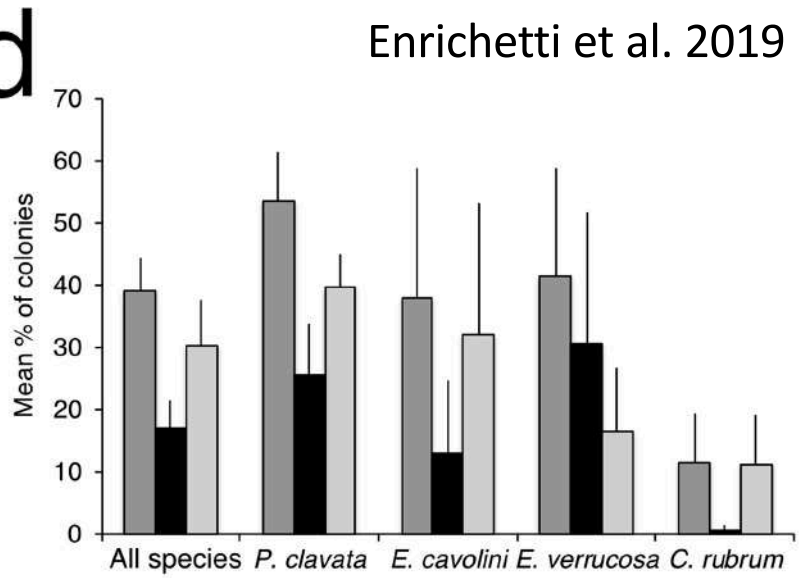
# Threats: trawling



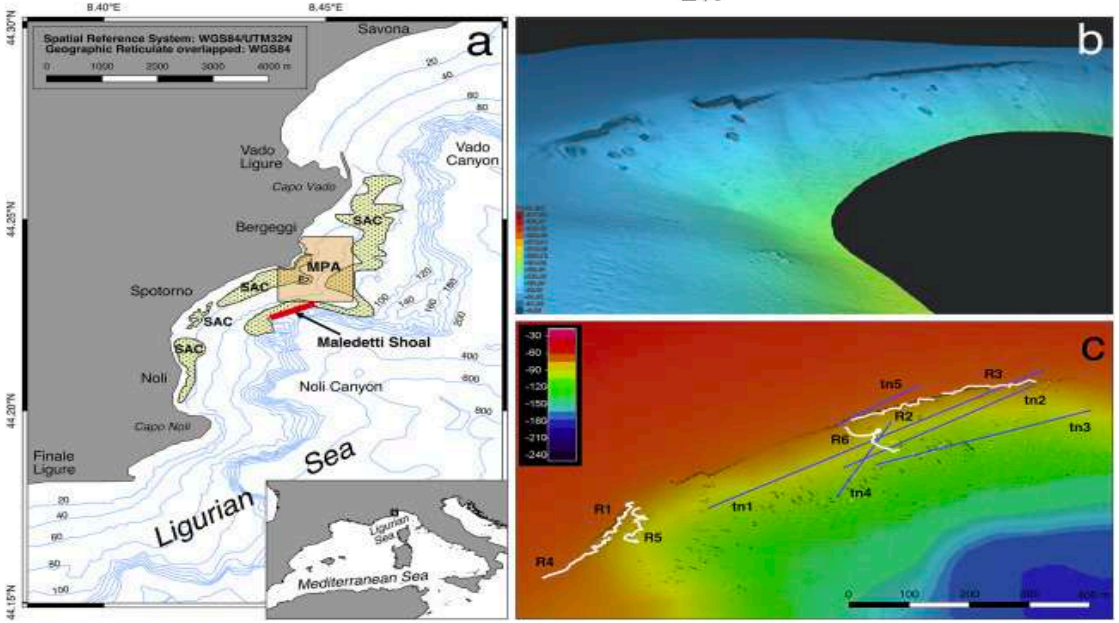
# Threats: fishing



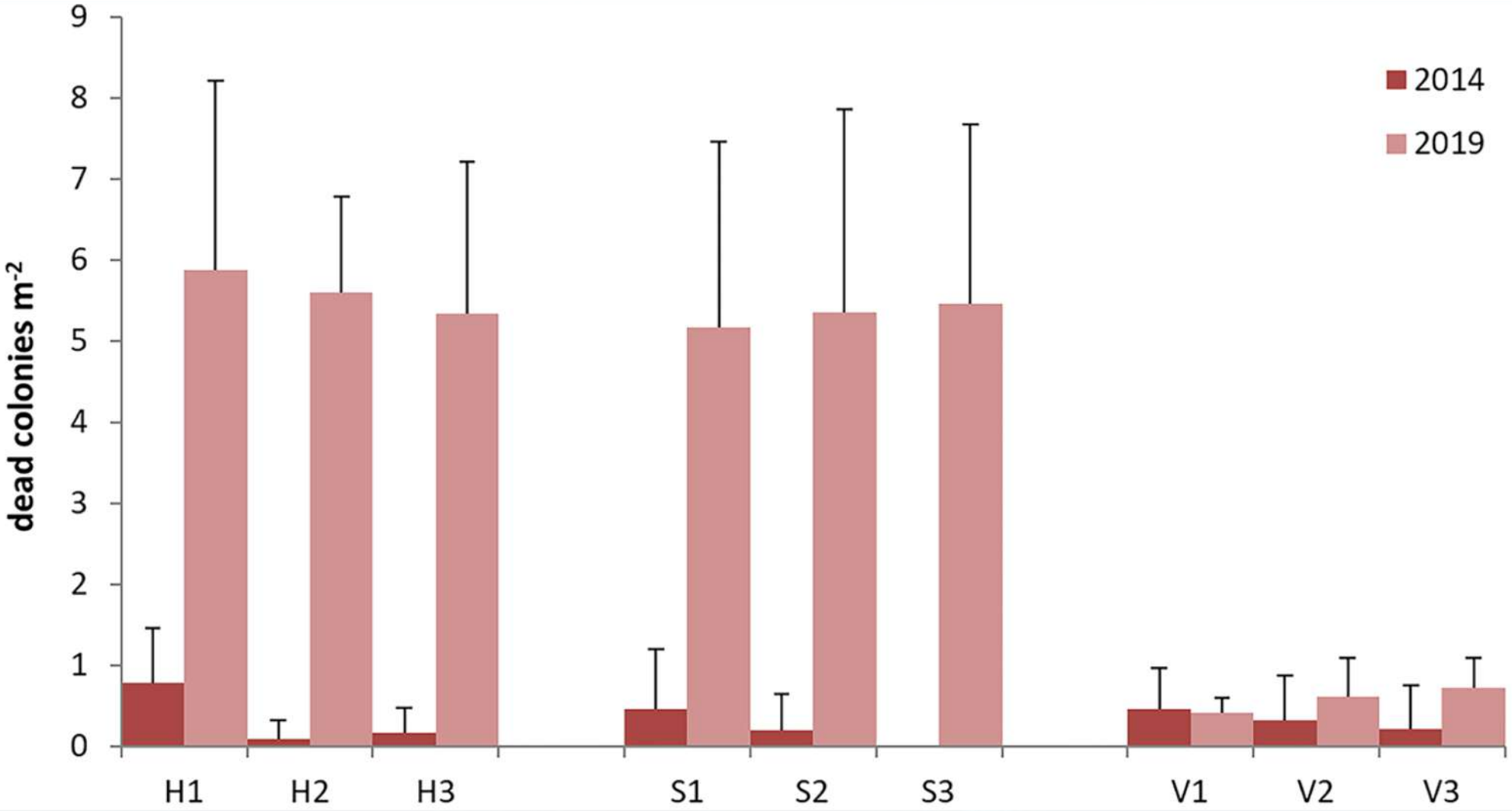



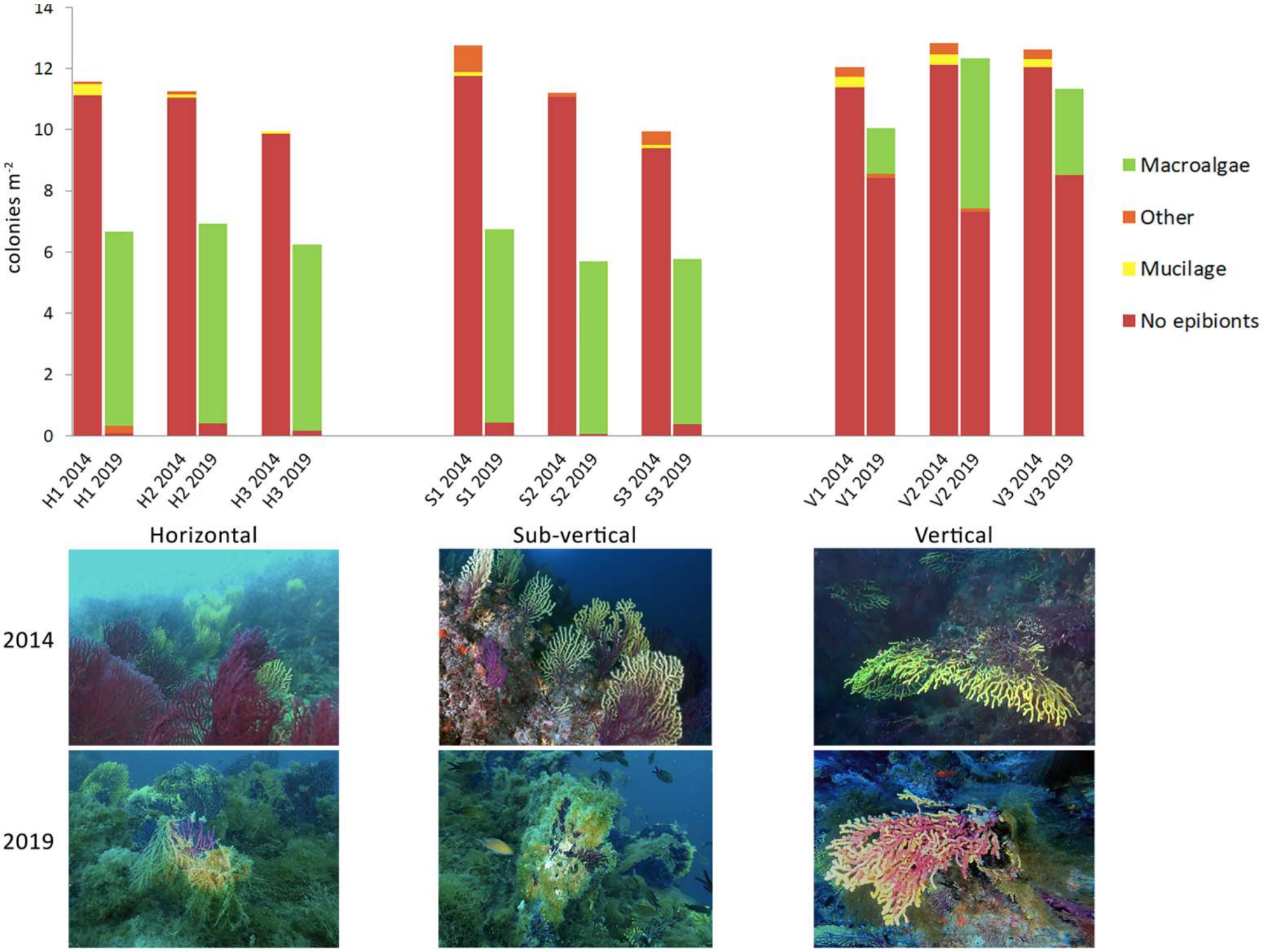

Enrichetti et al. 2019



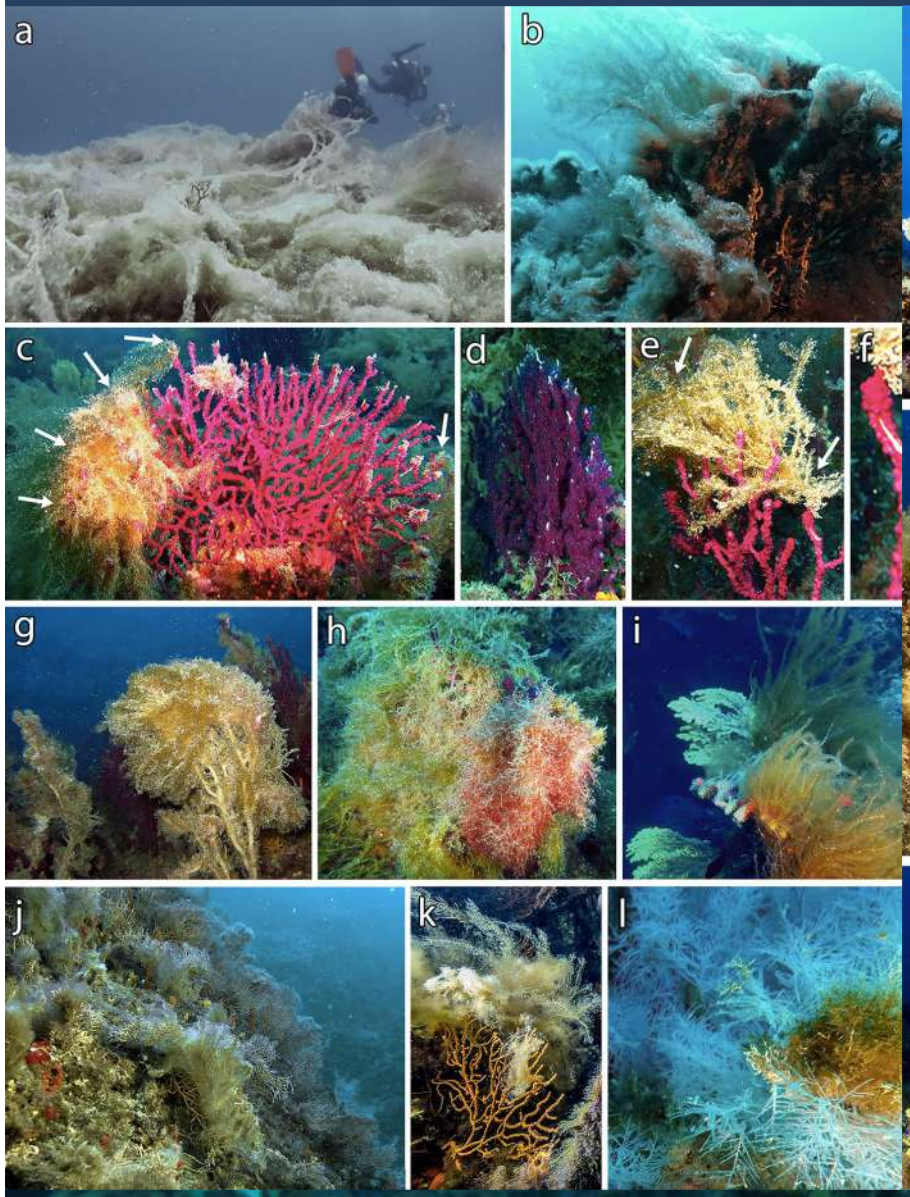
# MMEs

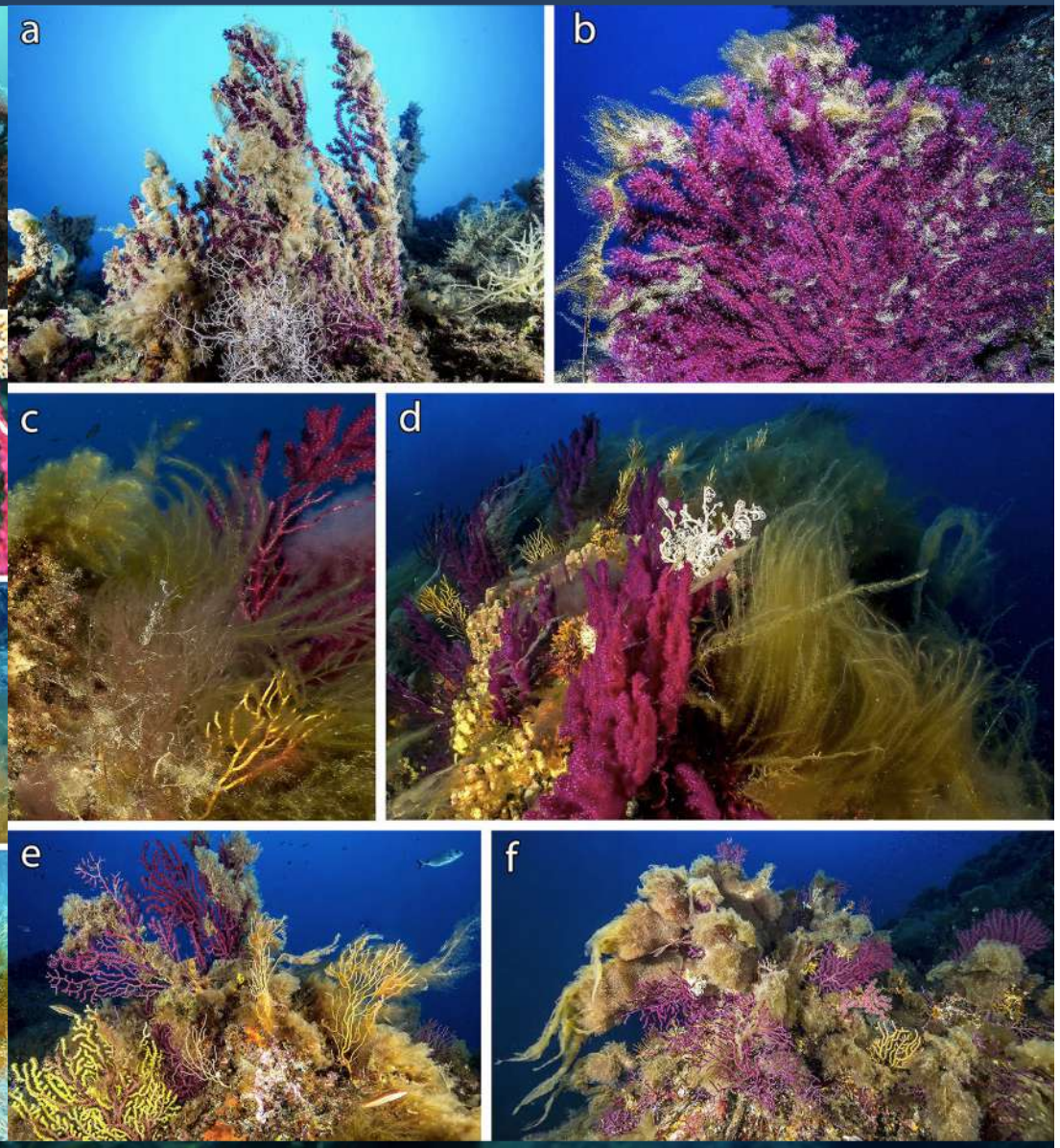



*Paramuricea clavata* monitored during five years (2014–2019, Tremiti Islands). Massive mucilagenous blooms occurred from 2015 until 2018. The gorgonians at 30-40 m were entirely covered with mucilage. Below 40 m colonies were almost unaffected.
Chimienti et al. 2021


colonies m-2
0
2
4
6
8
10
12
14
H1 2014
H1 2019
H2 2014
H2 2019
H3 2014
H3 2019
S1 2014
S1 2019
S2 2014
S2 2019
S3 2014
S3 2019
V1 2014
V1 2019
V2 2014
V2 2019
V3 2014
V3 2019
Macroalgae
Other
Mucilage
No epibionts
Horizontal
Sub-vertical
Vertical
2014
2019

# MMEs




Tremiti Islands

Tuscan Archipelago