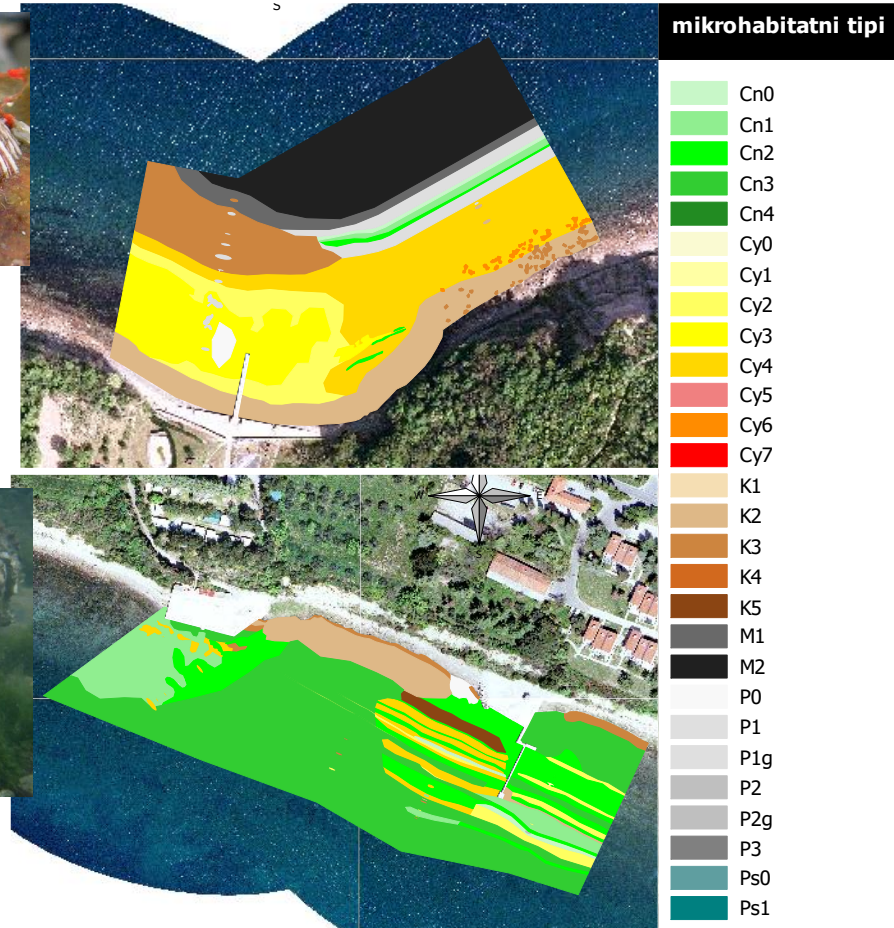


Changes in Marine Biodiversity in Slovenia

Our research areas:

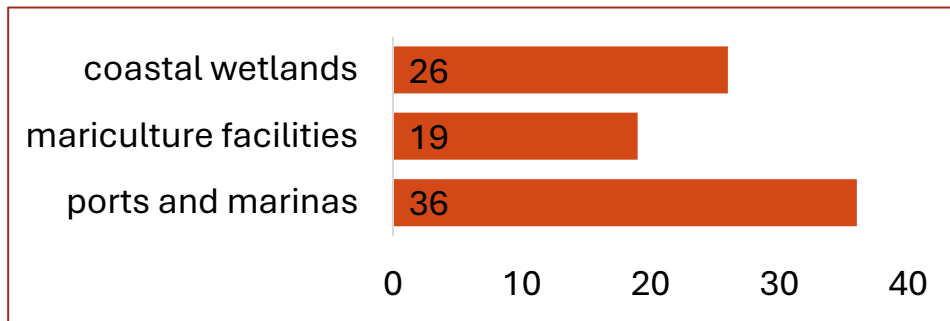
- diversity of benthic flora and fauna
- fish assemblage
- mapping of benthic habitat types
- assessment of bioindicators status → national monitoring for EU directives (WFD, MSFD)
- non-indigenous species → increasing trend
- conservation of endangered marine species
- development of restoration methodologies



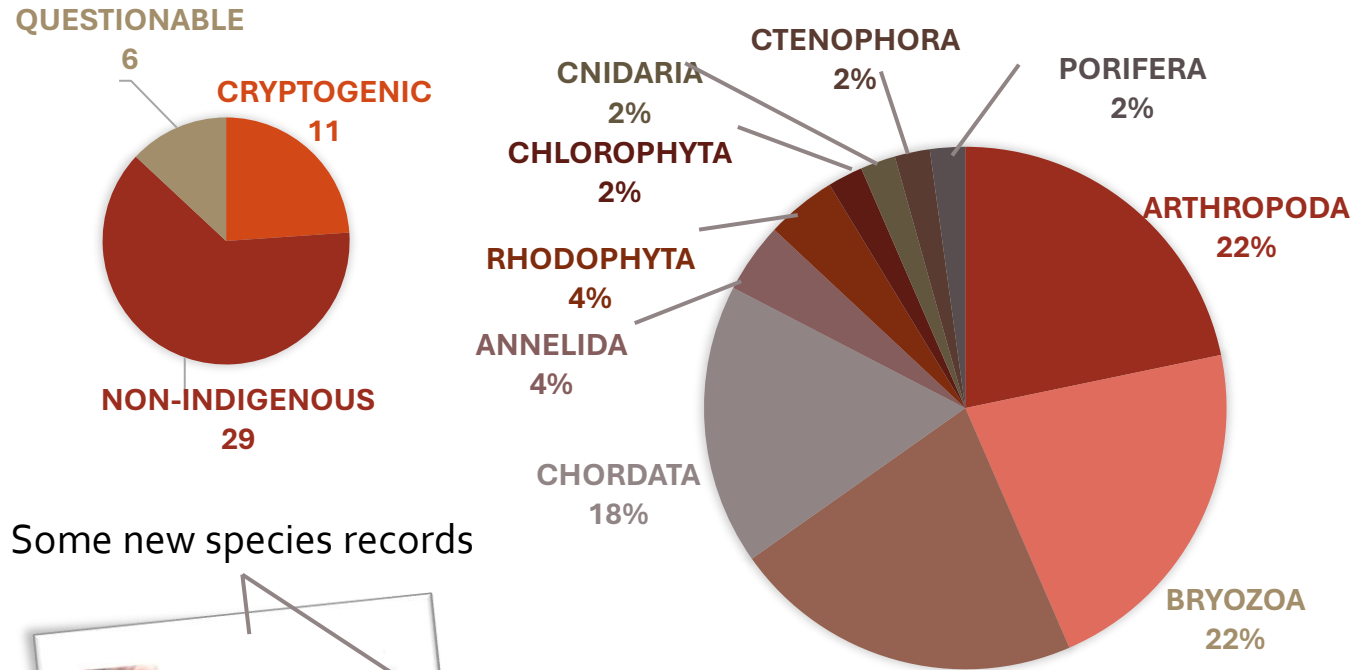
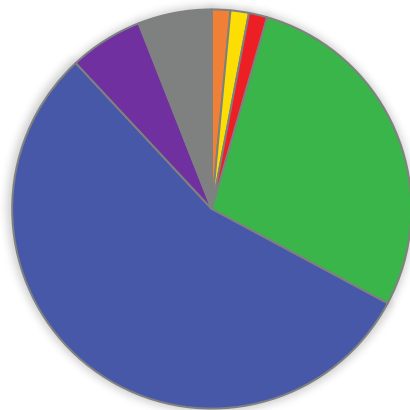
Martina ORLANDO-BONACA, Ana FORTIČ, Domen TRKOV,
 Ana LOKOVŠEK, Borut MAVRIČ, Valentina PITACCO,
 Milijan ŠIŠKO, Tihomir MAKOVEC, Simone SPINELLI &
 LOVRENC LIPEJ

Monitoring marine non-indigenous species (NIS) with rapid assessment methods

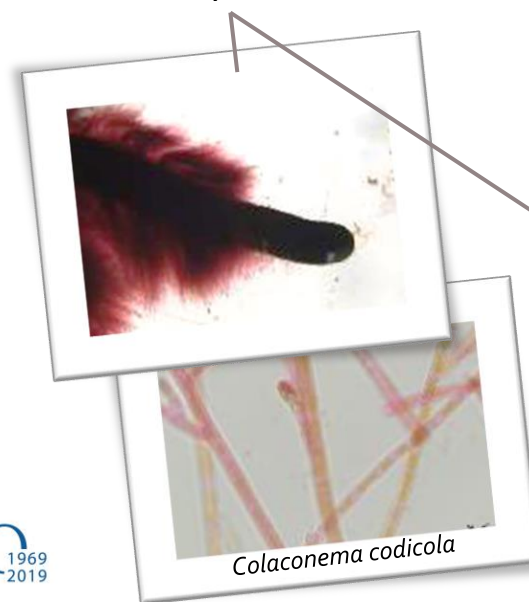
- Rapid assessments in **donor** (ports and marinas, mariculture facilities) and **recipient** areas (coastal wetlands) in 2022-2023
- Number of NIS → the highest in ports and marinas



- Two most common pathways of marine NIS in Slovenia → maritime transport (blue) and mariculture (green)



Some new species records



Fan mussel (*Pinna nobilis*) importance for fish community and negative influence of anchoring

- largest mussel in Mediterranean → important habitat builder → provides surface, shelters and hiding places for organisms
- highest densities → the Gulf of Trieste (up to 38 sp./100m²)
- critically endangered → mass mortality in Slovenia in 2020

Fish fauna related to shells of *Pinna nobilis*

106 fish specimens → 17 fish species

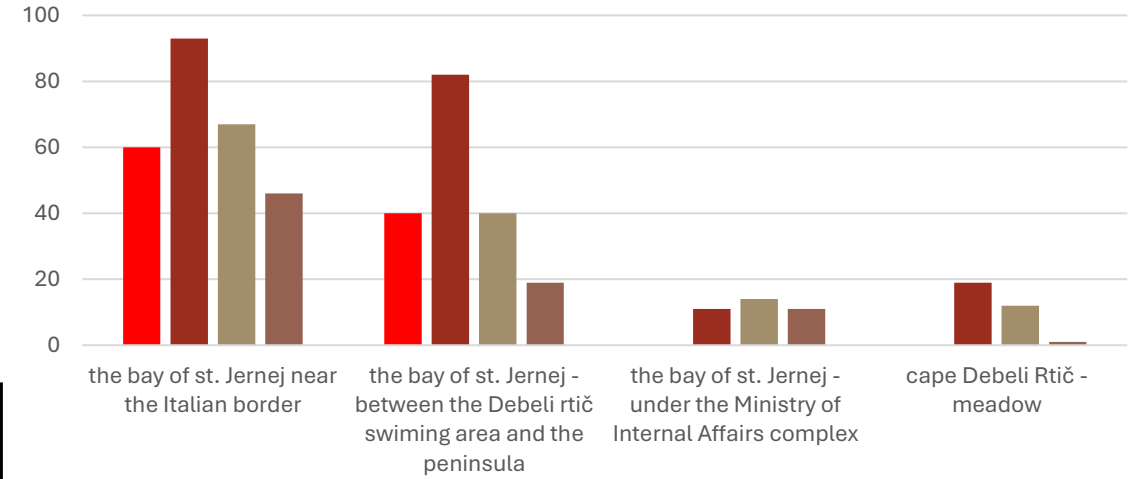
142 quadrats (50 cm x 50 cm)	Quadrats with shell	Quadrats without shell
Share of quadrats contained fish	63 %	41 %
average fish density	3.5 fishes/m ²	2.7 fishes/m ²



Life Pinna



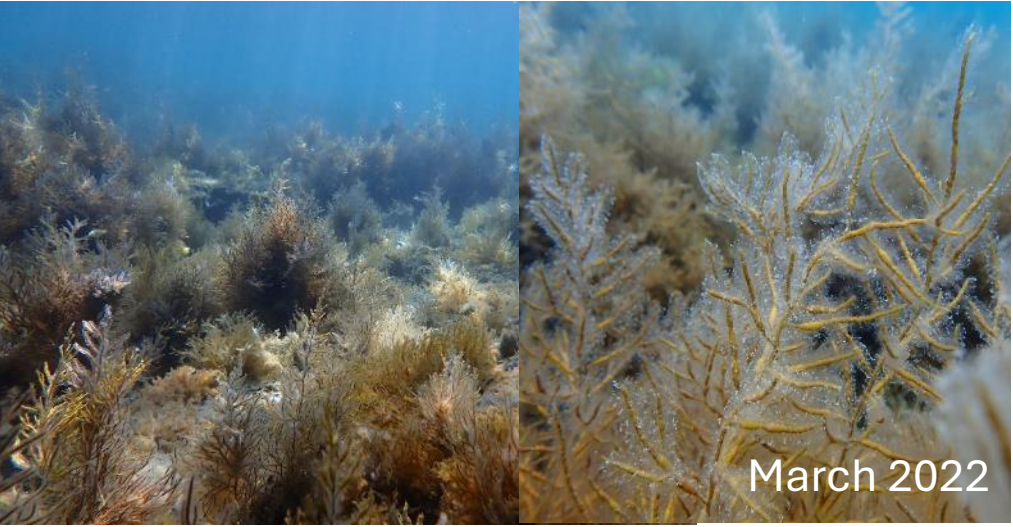
Cofinanziato dall'Unione europea
Sofinanciata
Evropska unija



■ the proportion of anchor injuries ■ lying shells (%) ■ damaged shells (%) ■ crushed shells (%)



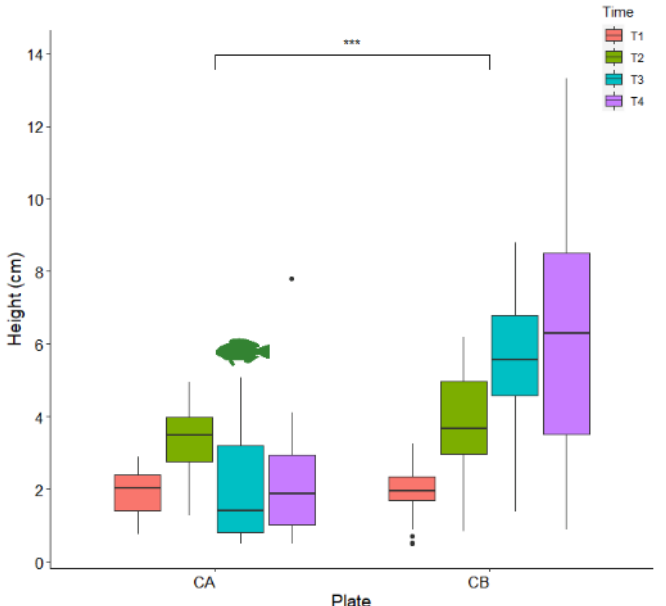
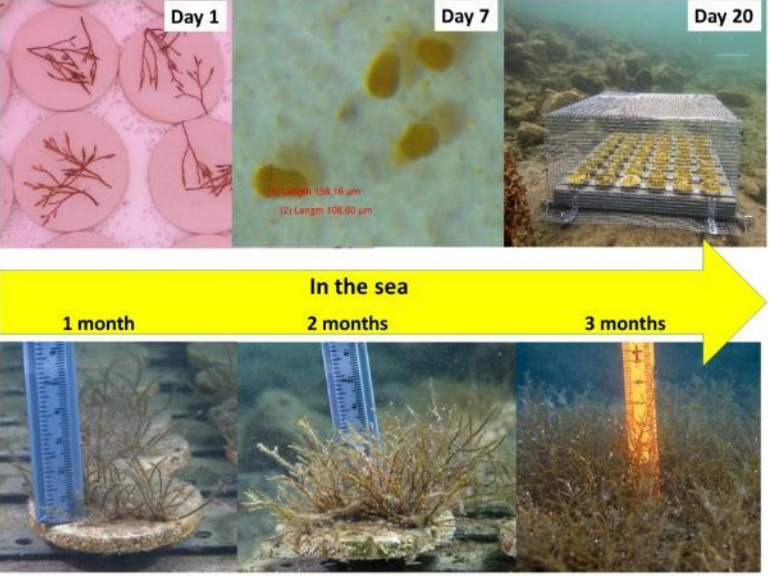
Restoration activities for brown algal forests



Cystoseira s.l. species
 Habitat builders – shelter,
 food, nursery
**Regression in the whole
 Mediterranean**

Ex-situ restoration

- Donor population → apical parts
- Culture in controlled rooms
- Transplantation of juveniles

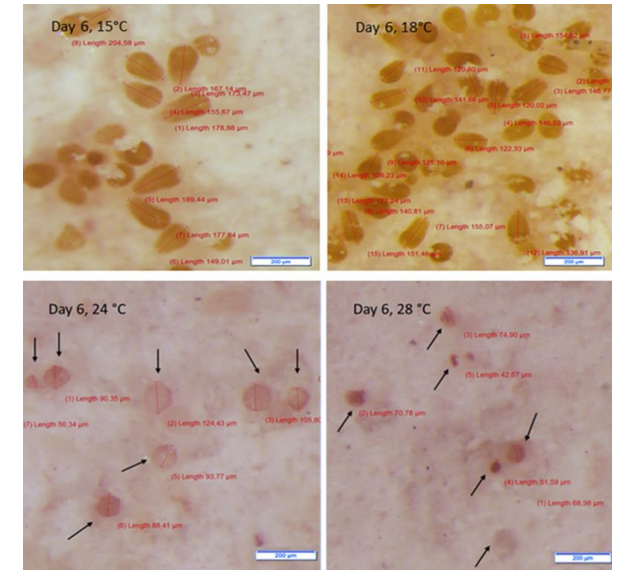
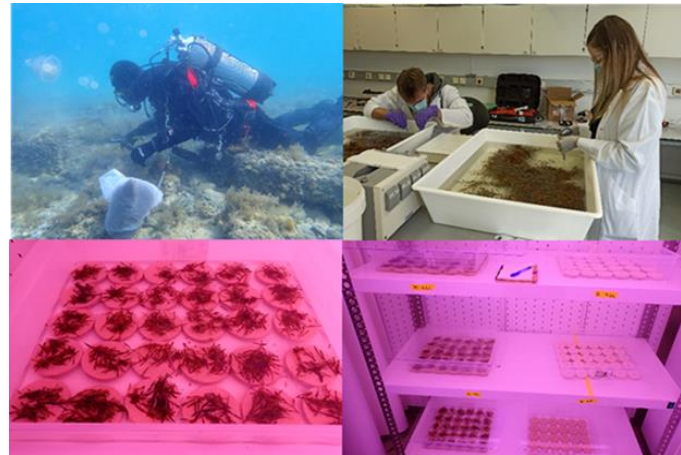


Without protection → grazing from herbivorous fish!

intend to develop acoustic deterrents

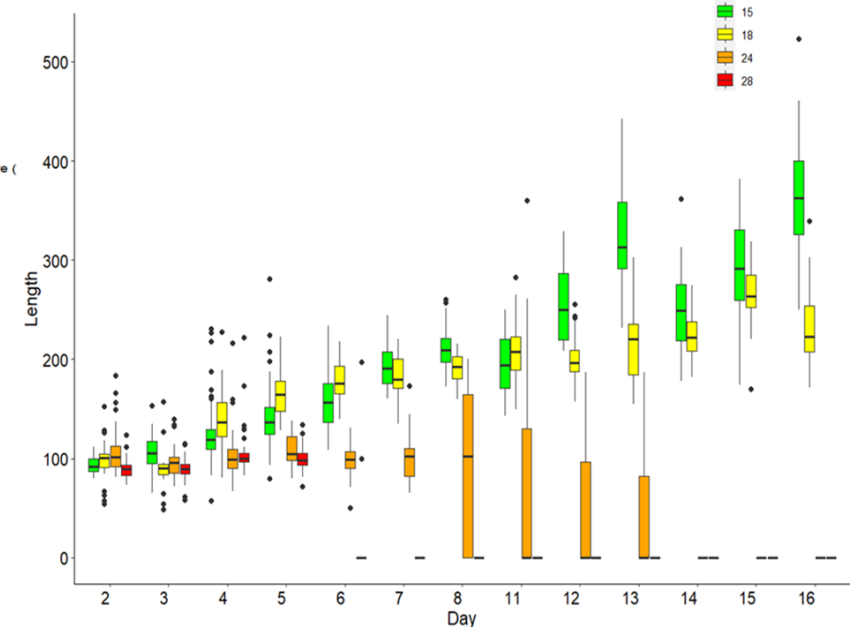
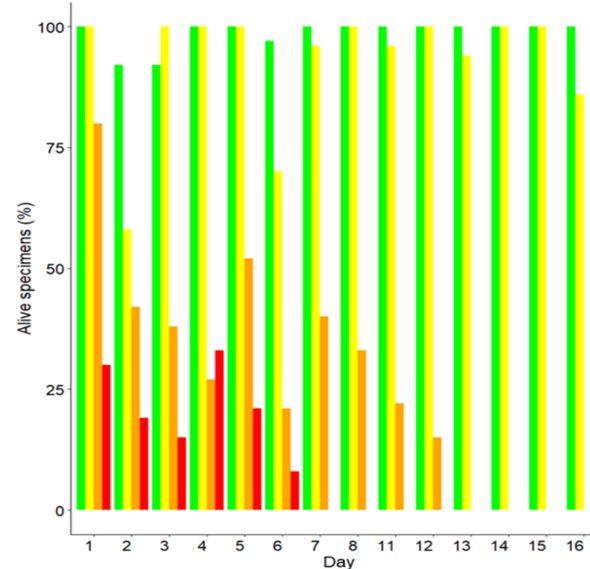
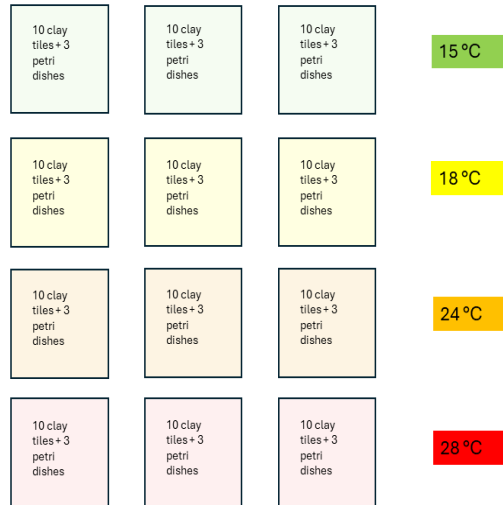
Effects of increased water temperature on the early life stages of *Gongolaria barbata* (Fucales)

- Temperatures 15-18 °C allow normal development of germlings
- Best growth at 15 °C
- 28°C: All germlings died within the first week.
- 24°C: Survival until the second week, significant deformities before death



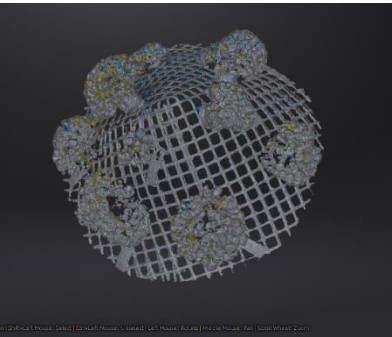
Experiment set-up in environmentally controlled room (growth chamber)

Incubation length: 16 days
 Water treatment: UVC sterilised water
 Light conditions: 125 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$
 Light/dark cycle: 15:9 h
 Donor site: Izola



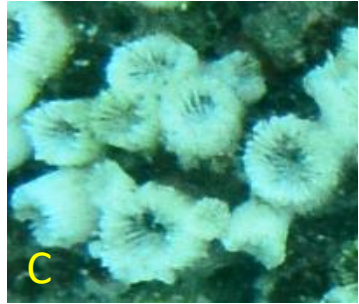
Development of techniques to repopulate the Mediterranean stony coral (*Cladocora caespitosa*)

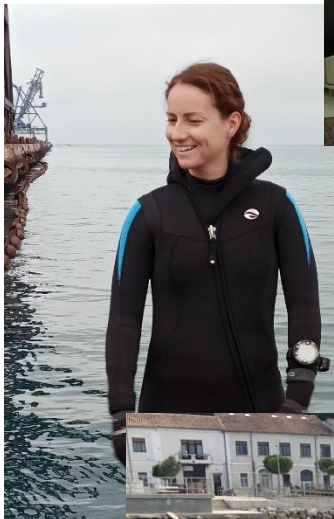
- higher average summer temperatures → symbionts: zooxanthellae leave polyps → coral bleaching
- if this period (> 25 °C) extends for 2-3 weeks in September → zooxanthellae do not return, and corals die
- laboratory experiments → evaluate colony growth in relation to food availability
- preparation of a transplantation protocol – also for Italian waters



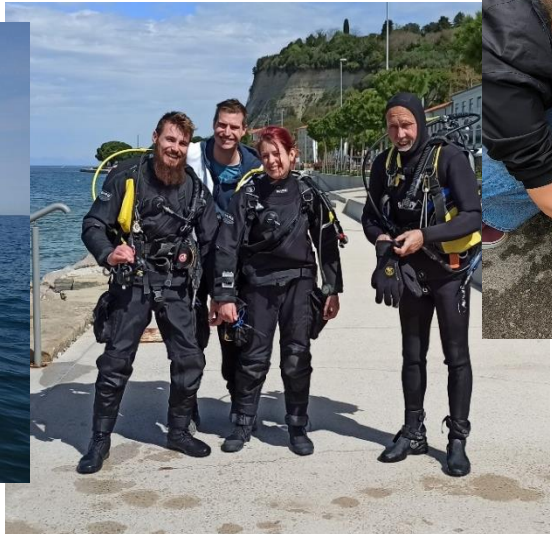
← dead colony

- A → normal
- B → bleaching
- C → dead polyps





Thank you for your attention



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