Sveučilište u Zadru
Universitas Studiorum
Jadertina | 1396 | 2002 |

AQUARIUMPULA

Morski obrazovni centar Pula

Institut
Ruđer
Bošković

Praćenje širenja invazivne alge *Caulerpa cylindracea* u uvali Sakarun (Dugi otok, Hrvatska)

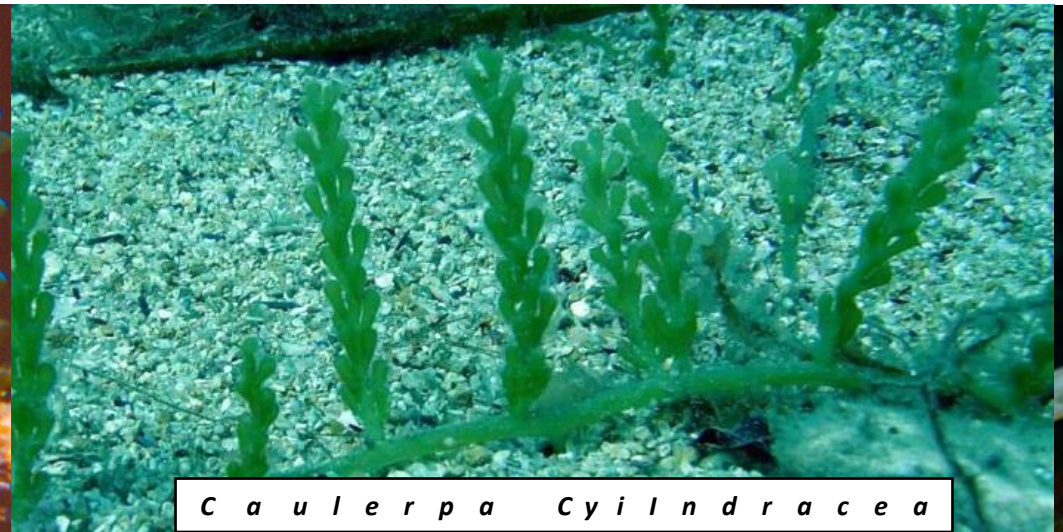
Rina Milošević, Tomislav Šarić, Ivan Župan
Department of Ecology, Agronomy and Acquaculture

University of Zadar

Climate change and preservation of marine ecosystems in the Adriatic Sea

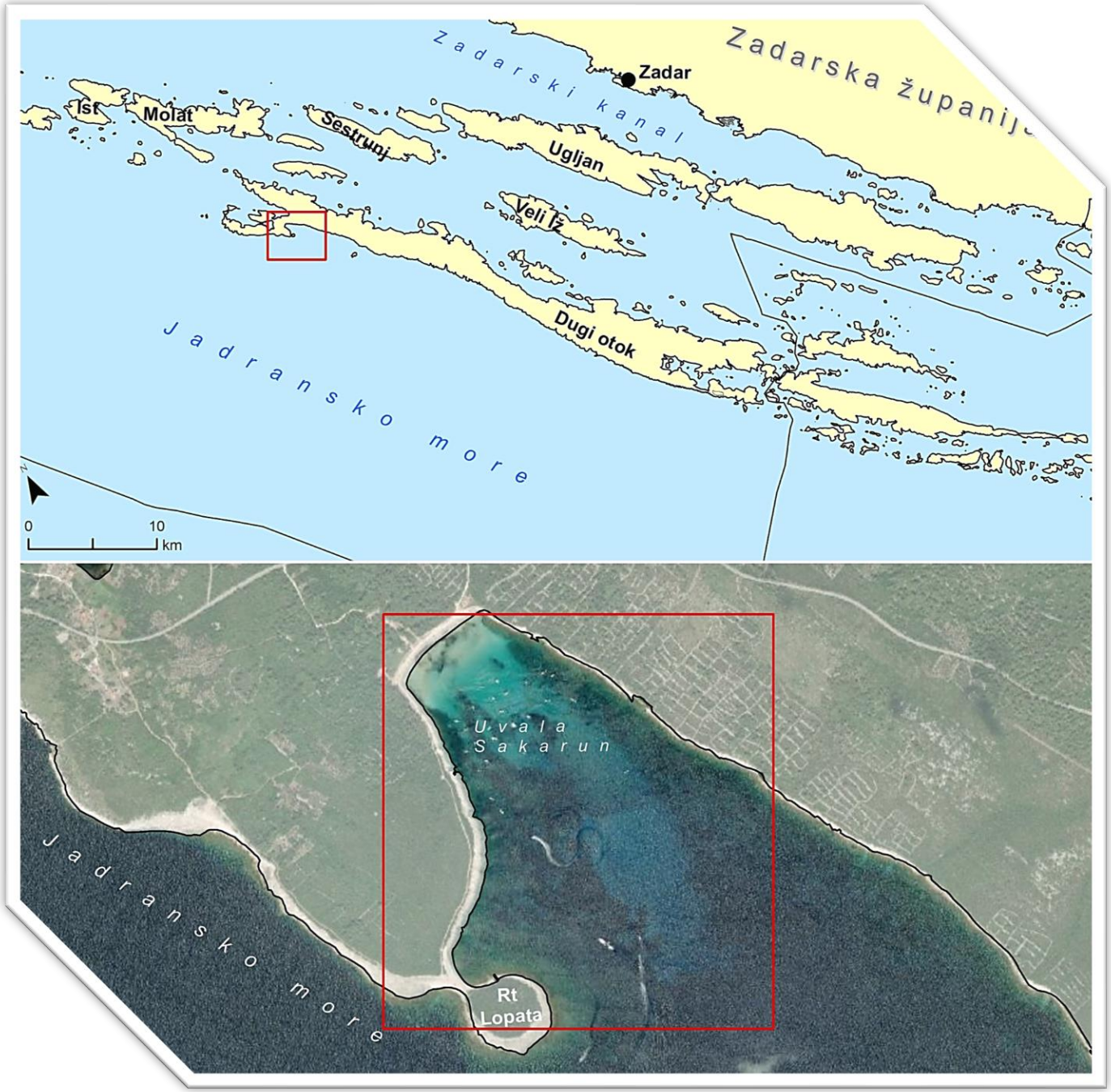
1. Introduction

- **Invasive species** are among the major threats to marine ecosystems
- One such species is ***Caulerpa cylindracea***, a tropical green macroalga alga from Australia that has rapidly spread throughout the Mediterranean Sea.
- It has ability to cause **ecological changes** and **reduce biodiversity**. It aggressively colonizes rocky substrates and areas near seagrass meadows of ***Posidonia oceanica***, disrupting the balance of benthic communities.
- Caulerpa in Croatia is first time detected in 2000 around Pakleni islands . To 2005 is found at additonal 40 locations and in 2012 at 100 locations.
- It is also found in NP Kornati, Mljet and Nature Park Lastovsko otočje.



2. Study area

- Sakarun Bay (60 ha) is located in the SW part of Dugi Otok (**Natura 2000**)
- Geomorphological characteristics: alignment of orographic structure with underlying geological formations and a **karst landscape**
- The bay is susceptible to intensive abrasion due to winds from the open sea
- Sakarun **Beach** is a gravel beach formed in tectonically weakened and fragmented carbonate rocks. Despite this, **sand** predominates in the bay.

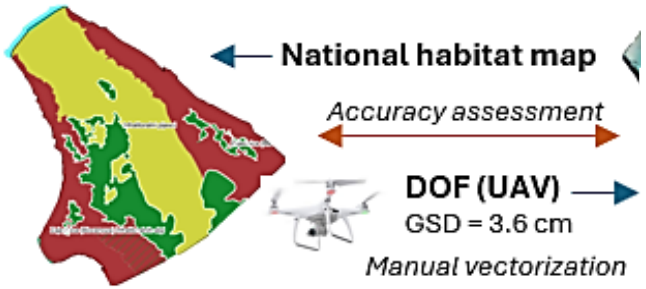


3. Materials and methods

This study, focuses on monitoring the spread of ***C. cylindracea*** and dynamics and distribution of ***P. oceanica*** in Sakarun Bay

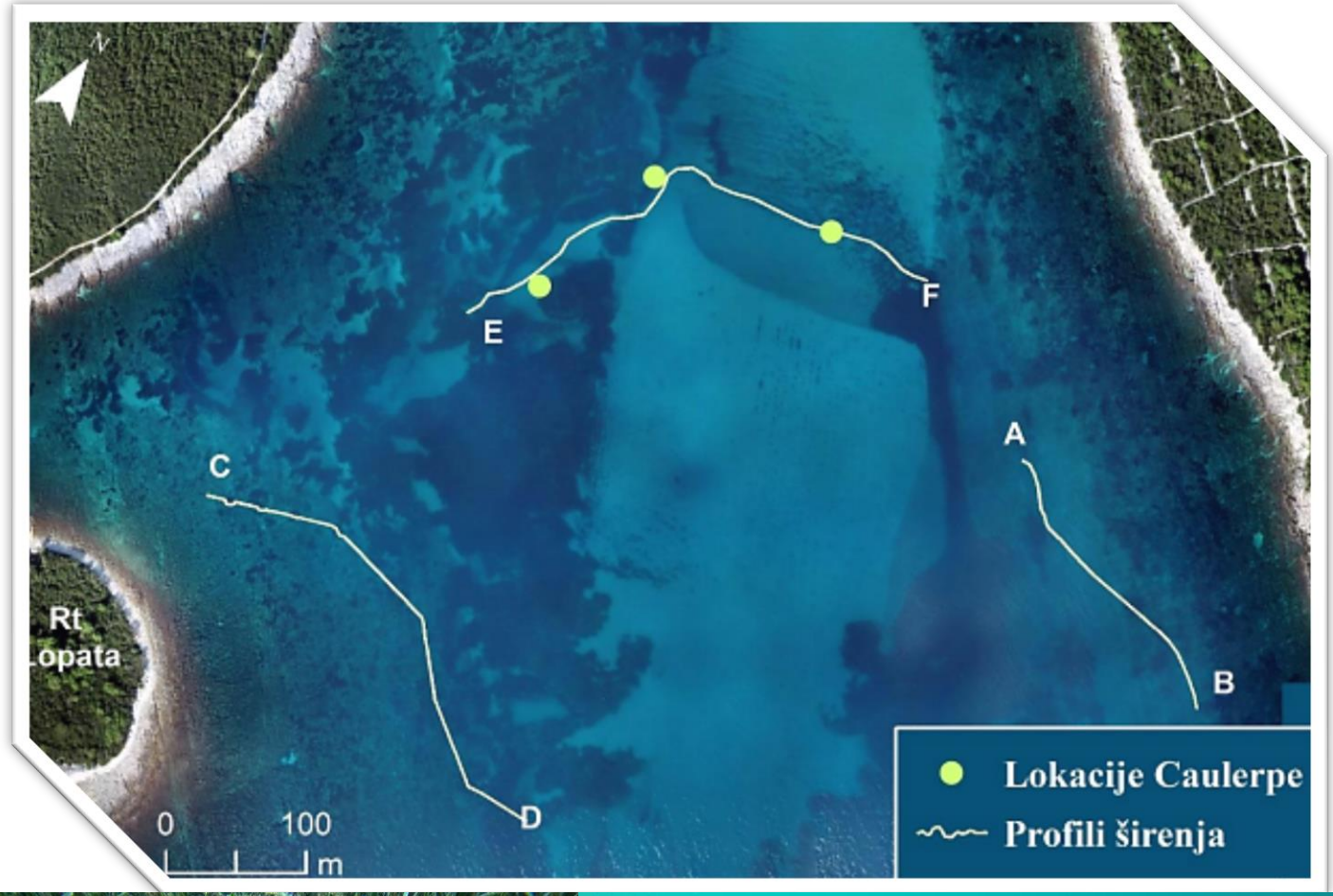
- 1. **Monitoring the spread of Caulerpa in Sakarun Bay (2021–2023)**
  - Conducted a **diving survey** and collected **coordinates** of *C. cylindracea* locations
  - 12 profiles were recorded using digital cameras *(Canon G16 and GoPro Hero 5).*
  - **Transect** with dimensions: **5 m wide** and **200 m long**

- 2. **Posidionia state from 2016 to 2023**
  - Is assessed based on open-source satellite **multispectral imagery** from the ***PlanetScope*** with a **spatial resolution of 3 m**
  - Additionally, a **DOF (Digital Orthophoto)** was created*, t*he supervised classification techniques were applied to **classify the seabed**, and **the bathymetric model** was created (from *Navionics*)



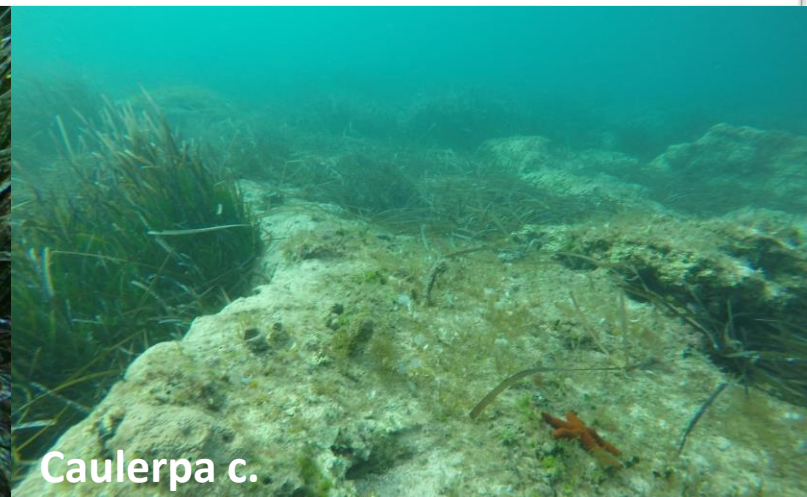
4. a) Results: *Caulerpa monitoring*

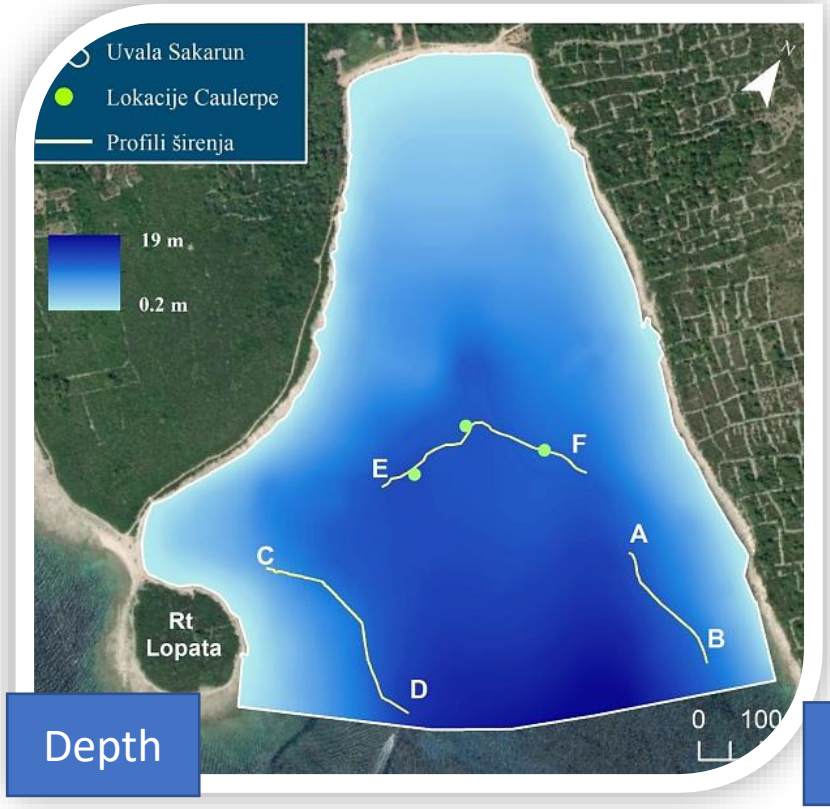
- *Caulerpa* spread is detected along **three dominant lines (1050 m)**
- In Sakarun *bay Caulerpa c.* grows on **rocky substrates** along the edge of *P. oceanica* meadows
- It also grows on the mats of intertwined rhizomes of dead *P. oceanica*.




Caulerpa c.

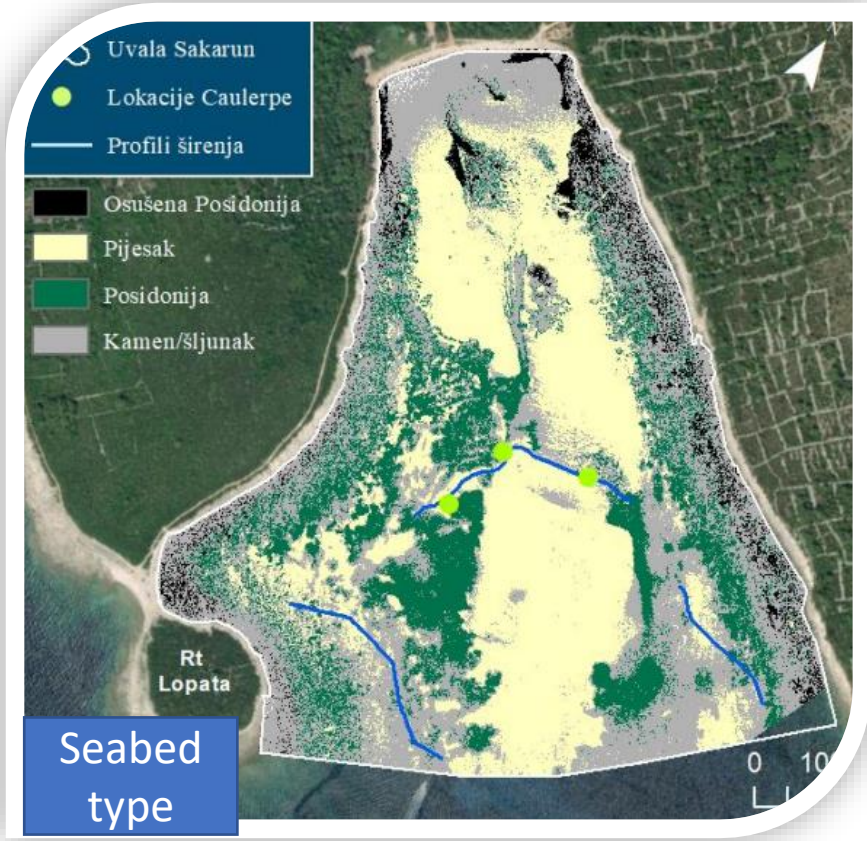

Caulerpa c.


Caulerpa c.



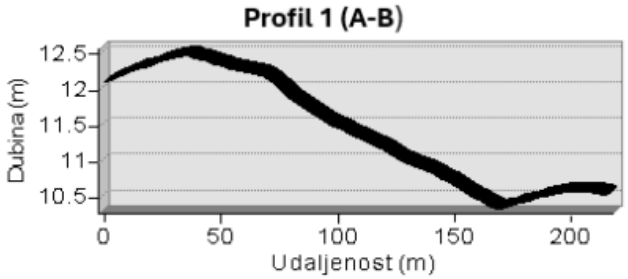
Depth

Slope

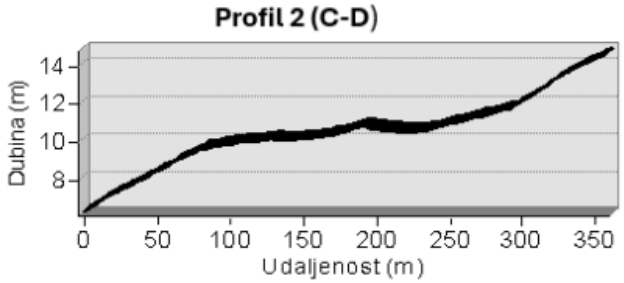


Seabed type

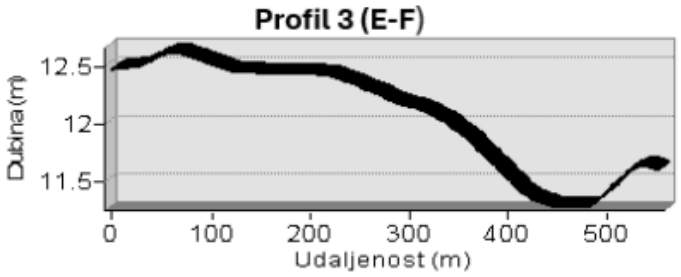
- **Profile A-B (2021)**
  - Length 200 m
  - Depth 0.2 to 14 m
  - Slope (2°- 5°)



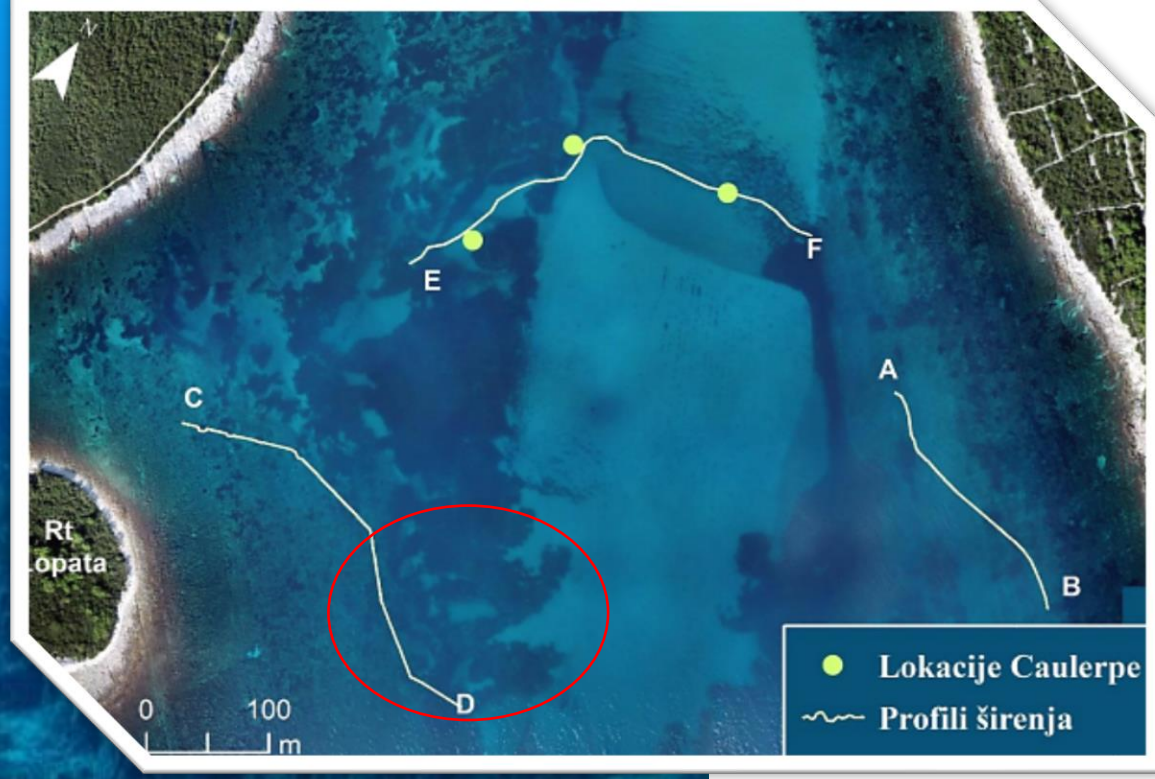
- **Profile C-D (2022)**
  - Length 350 m
  - Depth 0.1 to 13 m
  - Slope (2°- 5°)



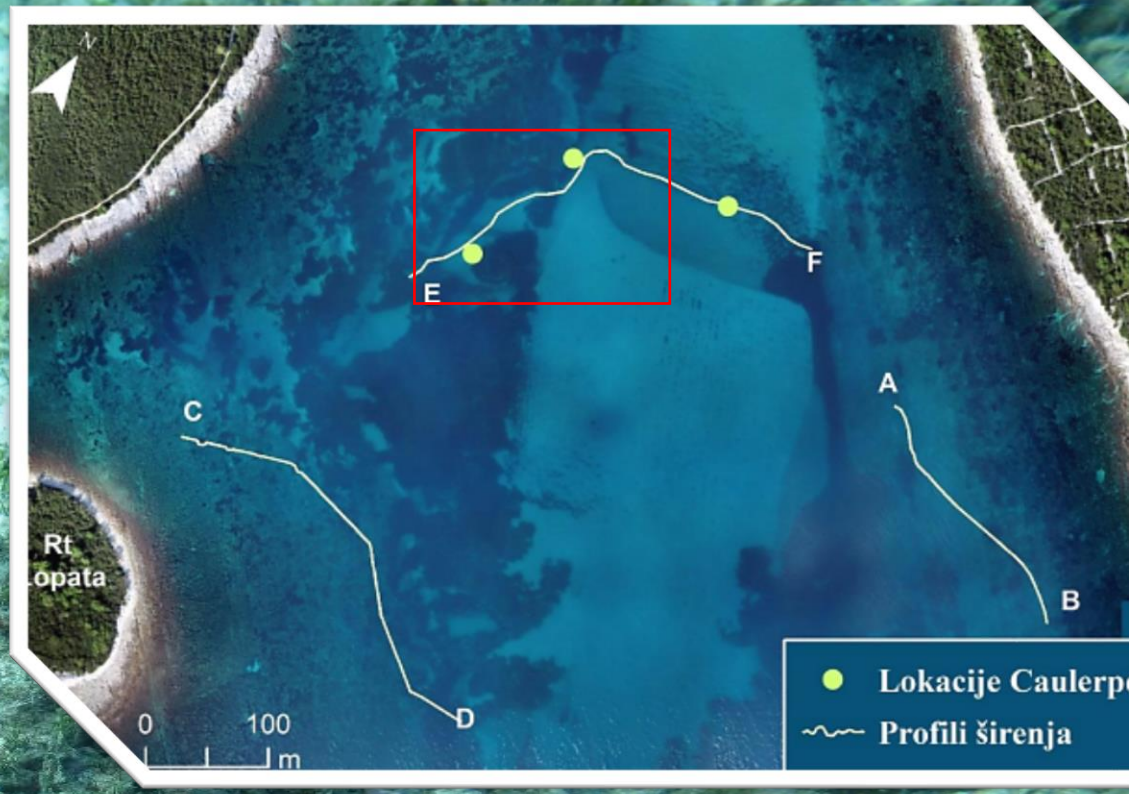
- **Profile (E-F) (2023)**
  - Length 500 m
  - Depth 0.2 to 13 m
  - Slope (<2°)

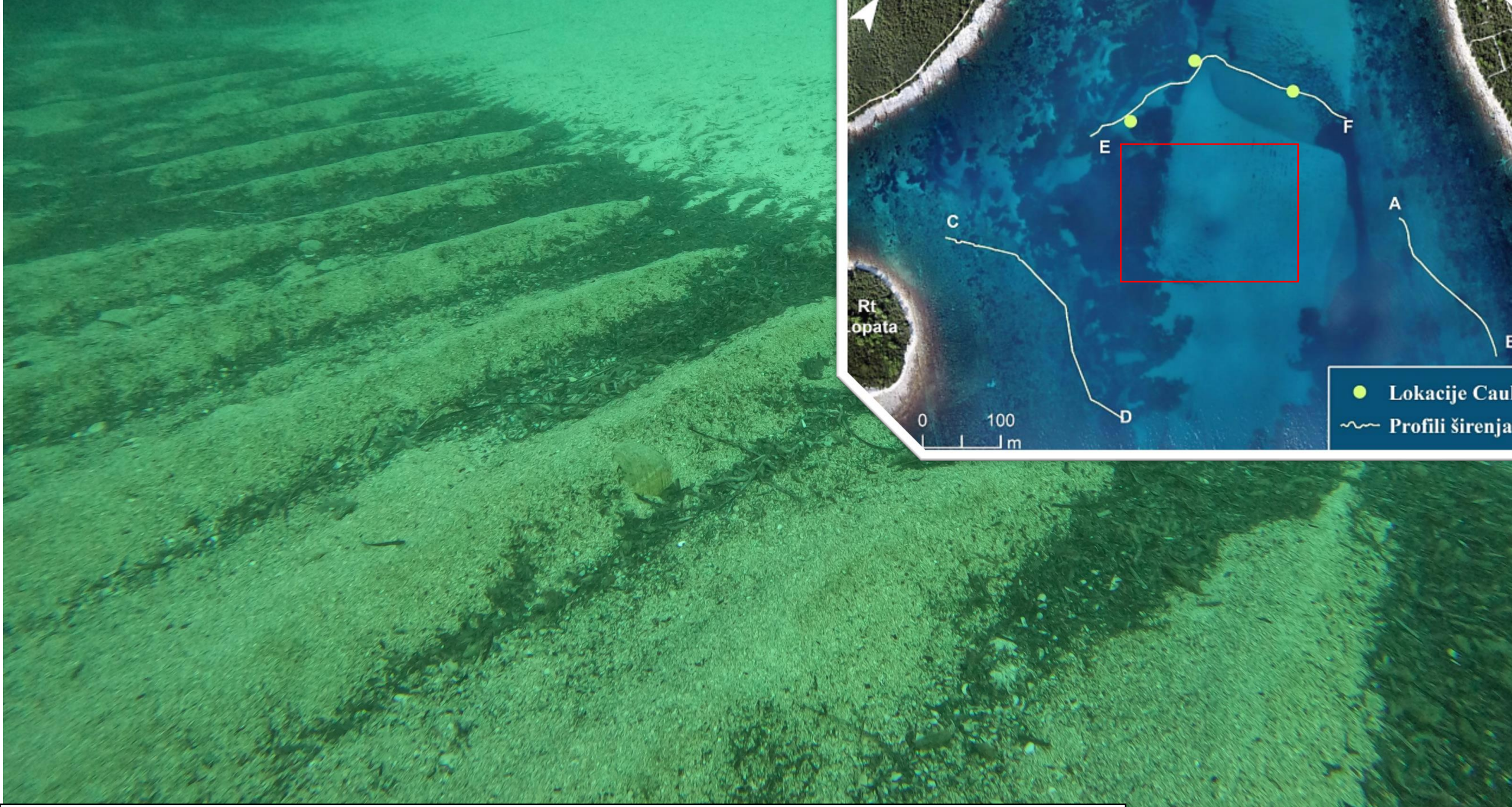


Rubna linija Posidonije / *Edge of P. oceanica*



Caulerpa c. na naslagama rizoma Posidonije /
Caulerpa c. on deposits of rhizomes (mattes) of Posidonia

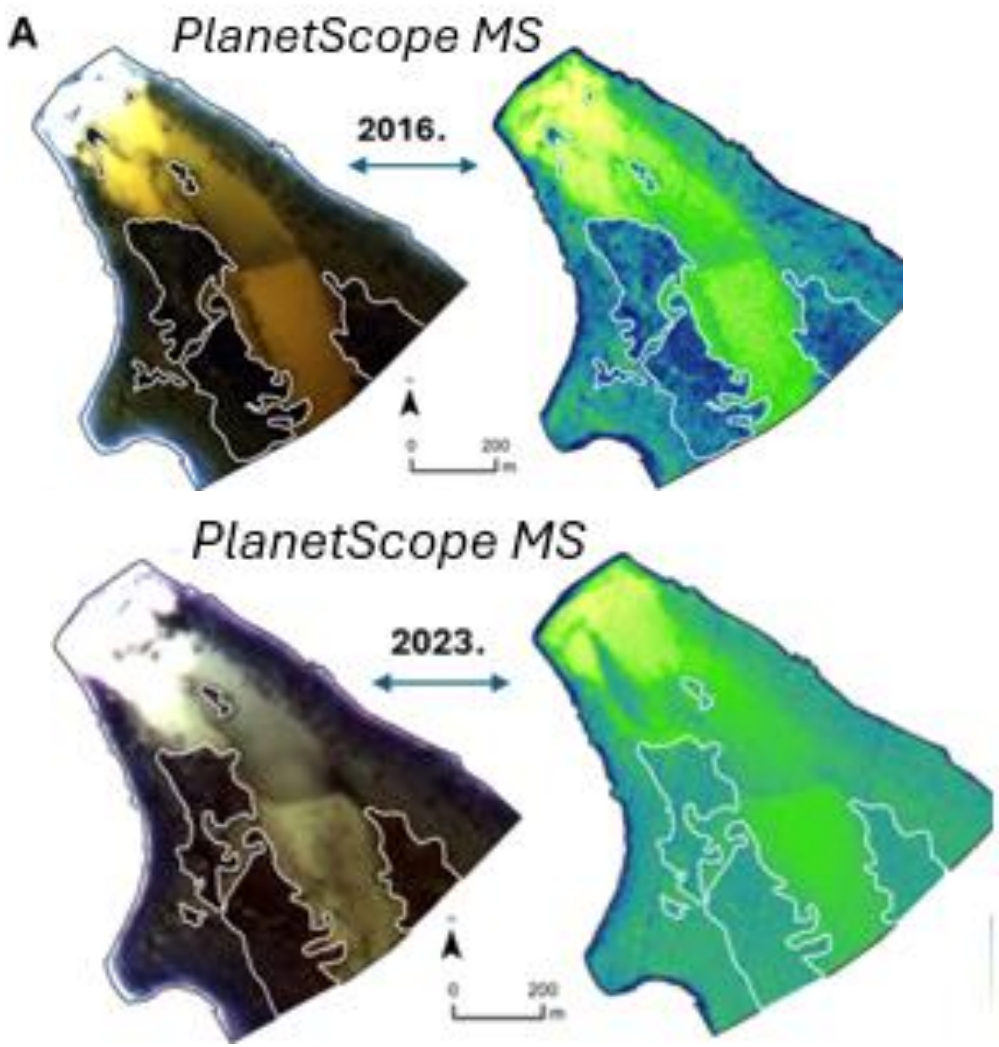




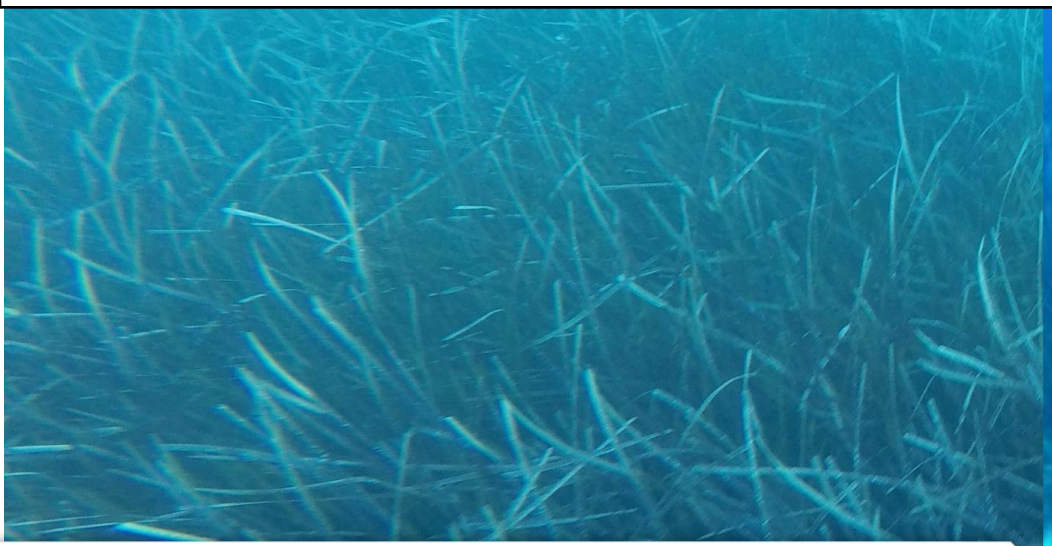
Pješćani dio uvale pod utjecajem valova / **Sandy part of the Bay under the influence of waves**

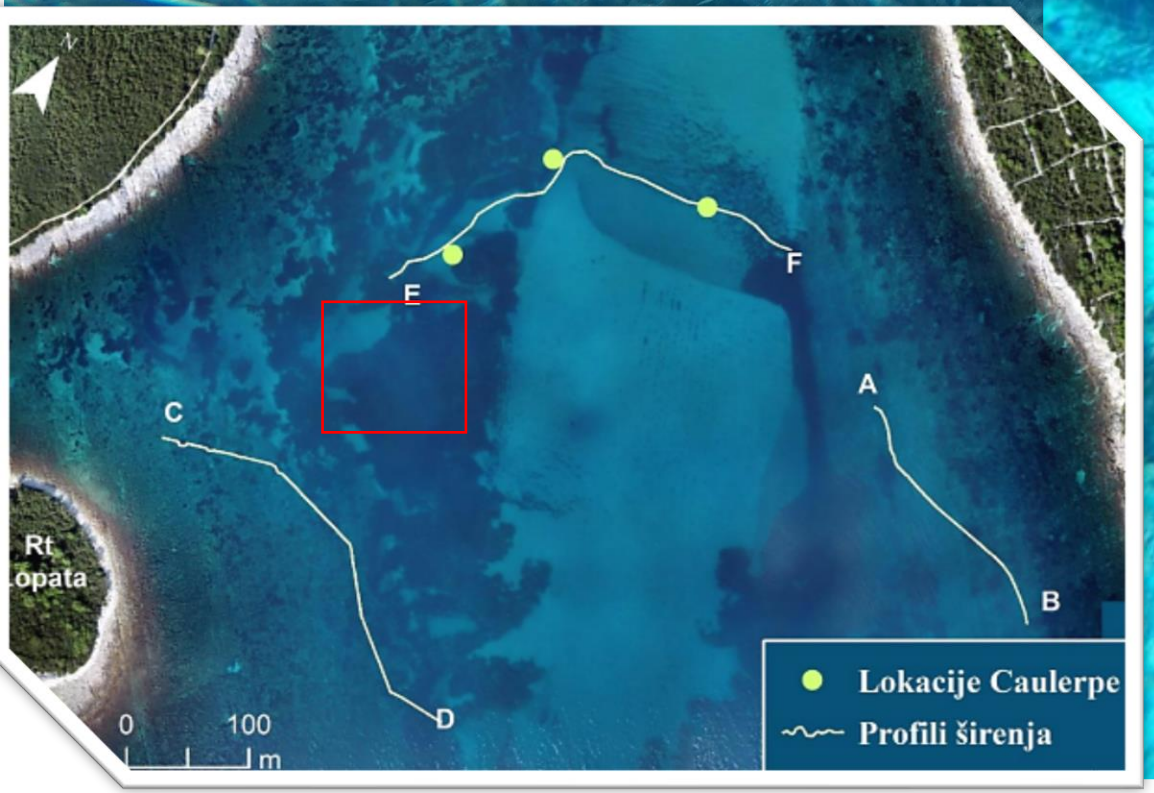
4. b) Results: *Posidonia status 2016 - 2023*

- ***P. oceanica*** cover an area of **131,460 m²**, primarily at depths ranging from 6 to 16 meters **on gentle slopes**



Infralitoralna zona s kombinacijom stijena i biocenoze morske cvjetnice Posidonia /
The infralittoral zone with a combination of rocks and biocenosis of Posidonia marine flowering plants





Conclusion

- It is visible that Caulerpa is moving towards the interior part of the bay
- The density is not yet so high that it crosses over *P. oceanica*
- Early removal strategies could be applied in the bay to mitigate the potential environmental disruptions caused by algae proliferation.


Thanks for your attention!