Innovation in Climate Change Education

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HOW DO PUBLIC CONSTRUCTIONS AFFECT ZOSTERA BIOCENOSES WITHIN MARINE ECOSYSTEMS?

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Zostera sp. is a higher plant (angiosperm) with a fully submerged body, known as sea grass. It has a foliated stem and narrow linear leaves and rounded at the tip, with 3-9 longitudinal ribs. The rhizome is creeping, thick, compressed with adventitious roots. The flowers are arranged in spikes. The fruit is longitudinally furrowed. It reaches a length of 60-150 cm and a width of 3-9 mm. It grows in seawater and coastal lakes, in the warm season, on sandy-muddy bottom, at shallow depths near the shore.

Classification: Kingdom Plantae, Order Tracheophyta, Order Alismatales, Family Zosteraceae, Genus *Zostera*, Subgenus *Zostera* (*Zostera*), Species *Zostera* (*Zostera*) noltei (Horneman, 1832). Marine ecosystems and especially fields with *Zostera*, are very fragile from an ecological point of view and respond very quickly to changes in the environment.

Zostera meadows are important habitats for many species, including hydrozoans, bryozoans, crustaceans, polychaete worms, gastropod molluscs and fish. Therefore, they are considered a valuable component of coastal ecosystems, due to the identification of various ecological functions, services and resources, and are increasingly protected by law in many countries. In the Black Sea, *Zostera noltei and Zostera marina* are abundant seagrasses, but little is known about their sensitivity to coastal development.

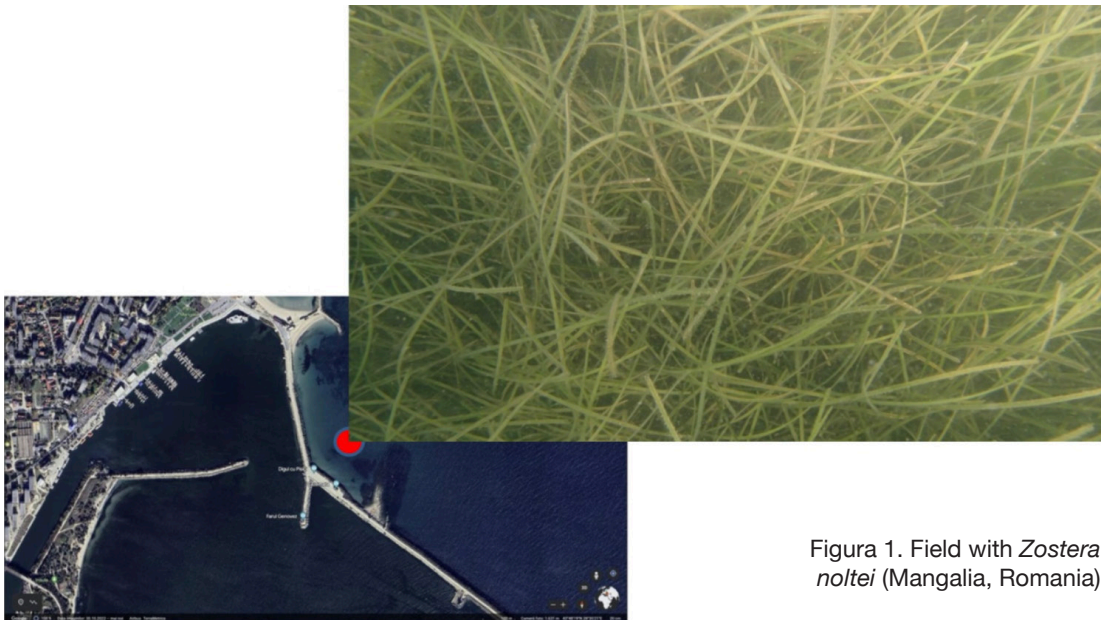

Figura 1. Field with *Zostera noltei* (Mangalia, Romania)

Zostera noltei was observed in Mangalia in the sheltered bay located between the Municipal Hospital and Hotel Paradiso, and at the dike that delimits the Port of Mangalia. The habitat of fine, clean or slightly silty sands with meadows of *Zostera noltei* covers a very small area and is always associated with *Treptacantha* / *Cystoseira barbata.*

Field analysis reveals an average percentage coverage of 32% in the area populated by this phanerogam. In some areas the coverage reaches 70%, while in others the minimum value of 15% is observed. The number of shoots per m2 is also highly variable, with values ranging from 175 to 502 shoots per square meter (mean value 381.8 shoots x m^{-2}).

Considering the percent cover values and the number of shoots per unit area, the *Zoostera noltei* meadow appears to be in an unfavourable state of conservation.

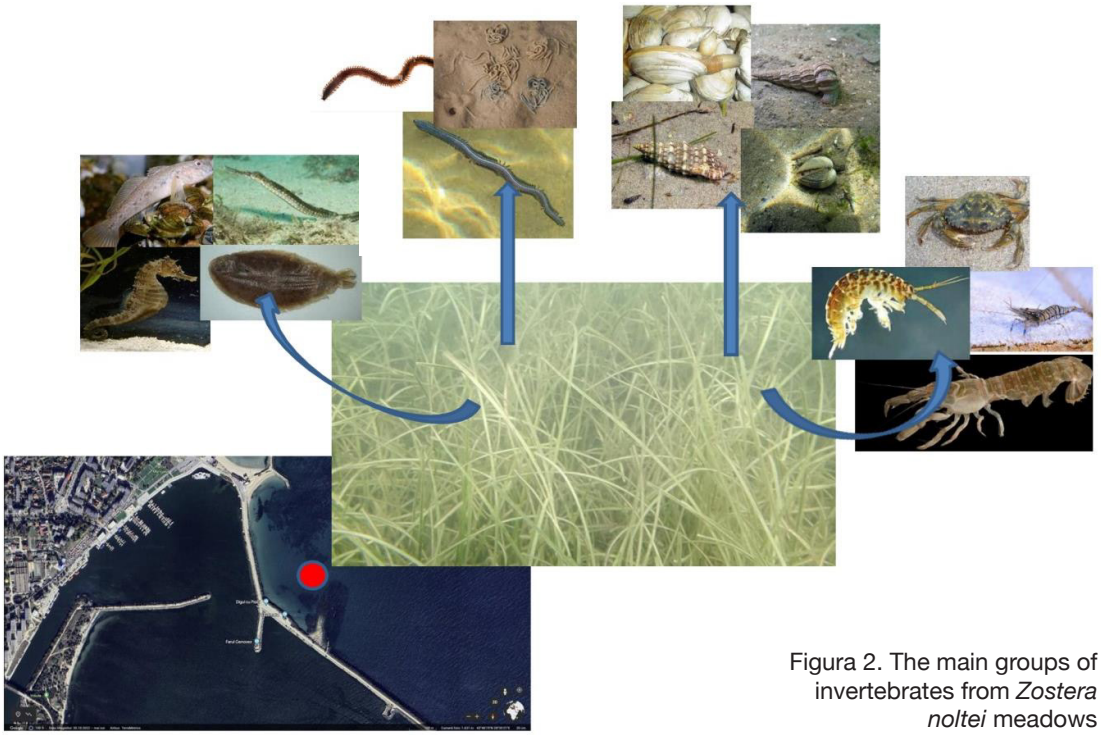

Figura 2. The main groups of invertebrates from *Zostera noltei* meadows

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EXERCISE

IDENTIFY THE MAIN GROUPS OF ORGANISMS ASSOCIATED WITH ZOSTERA NOLTEI MEADOW

A *Zostera noltei* was observed in a protected area of limited extent. Zostera noltei, with the status of a critically endangered species (according to O.M.M.A.P. 488 of 24.03.2020), was also observed in front of the Banat - Olimp Hotel, in the sheltered entrance next to the coastal defence structure.

Figura 3. *Zostera noltei* distribution map in the Mangalia-Saturn area

Figura 4. *Zostera noltei* meadows in front of Banat Hotel - Olimp

The planned works to restore the dikes and build artificial beaches in the Mangalia area constitute a major threat, both for the survival of the sea grass (*Zostera noltei*) and for most of the Natura 2000 habitats present in the site.

At Mangalia-Saturn, *Zostera noltei* was observed in small sheltered areas near coastal defense structures or close to shore.

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EXERCISE

USING A FIELD GUID (DETERMINATION KEYS), WITH A LINE, ASSOCIATE THE IMAGE WITH THE CORRESPONDING ORGANISM

- Mya arenaria (Linnaeus, 1758)
- Aidablennius sphynx (Valenciennes, 1836)
- Rapana venosa (Valenciennes, 1846)
- Dikerogammarus villosus (Sowinsky, 1894)
- Hippocampus guttulatus (G. Cuvier, 1829)
- Mytilus galloprovincialis (Lamarck, 1819)
- Alitta virens (Sars, 186)

It is no secret that the construction industry has grown in recent years. Along with it and the demands of the market. Statistically, more is built and, compared to other years, it is built more sustainably and with better quality, thanks to the latest innovations in the field.

Creativity and technology come together perfectly so that all types of civil construction fulfill their purpose: providing perfect conditions for the habitat.

Whether we refer to residential constructions, agricultural or socio-cultural constructions, the quality standards are the same: durability and aesthetics; functionality and resistance.

Figura 5. Civil constructions in the coastal area of Mangalia municipality

Constructions are divided into two broad categories: buildings or civil constructions and engineering constructions. Civil, industrial and agricultural buildings or constructions shelter people and other living things, human activity, from the atmospheric weather (blizzard, frost, wind, rain, heat of the sun, etc.) making it possible to adapt to the geographical environment so varied and with such different climates. In short, buildings are those constructions that house a human activity.

Engineering constructions are all other constructions, land and water communication ways, hydrotechnical and underground constructions, electricity transmission lines, etc. Civil constructions fulfil various functional processes, such as: housing, education, culture, health, social protection, sports, trade and similar. Their differentiation criteria are, among others: the number of people using the created space, the structure of the functional space, the internal compartments (which result according to the function or destination), etc.

In short, the human factor, the human activity factor and the nature factor directly influence the conception of civil constructions. Residential buildings belong to the category of civil constructions. They are created to meet the needs of the private sector. Civil type constructions must be well individualized and, at the same time, easily repairable. Civil buildings require medium-sized or small functional spaces and are used by a small number of people.

When we talk about civil constructions, we are talking about achieving optimal comfort conditions for human activity, including: temperature conditions, lighting, humidity, noise, etc.

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EXERCISE

IDENTIFY TYPES OF CIVIL STRUCTURES IN THE COASTAL AREA OF MANGALIA MUNICIPALITY AND TRY TO HIGHLIGHT THEIR ROLE ON THE MARINE ECOSYSTEM IN GENERAL AND THE FIELD WITH ZOSTERA IN PARTICULAR.

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