

## The EcoDaLLi project

EcoDaLLi (2023-2026) stands for 'ECOsysteM-based governance with Danube lighthouse Living Lab for sustainable Innovation processes'. Coordinated by Steinbeis Europa Zentrum (SEZ) in Germany, the project brings together 17 partners and one associated partner from eleven countries. Through a network of Living Labs, EcoDaLLi strengthens collaboration between stakeholders, driving the development and implementation of innovative, sustainable solutions for the Danube and its delta. The project aims to build a robust innovation ecosystem, supporting the ecological restoration, protection and conservation of the Danube basin and its delta.

## EcoDaLLi's concept and achievements

EcoDaLLi is built around four key objectives that guide its mission to support sustainable innovation in the Danube basin. These goals, illustrated in figure 2, focus on promoting collaboration, integrating nature-based solutions, and strengthening the region's governance and innovation ecosystem. Through these efforts, EcoDaLLi aims to enhance ecological restoration and support the long-term health of the Danube basin.

Key achievements of the project so far include the development of a nature-based solutions methodology and a

best-practice catalog, which is designed to support the implementation of sustainable approaches across the Danube region. EcoDaLLi has also launched a Danube Innovation Community through stakeholder engagement workshops and Living Labs (*fig. 3*), facilitating collaboration among various stakeholders. Additionally, the project has established the EcoDaLLi portal, which serves as a repository for all project results (<https://portal.ecodalli.eu/>). A Danube & Black Sea Lighthouse Roadmap provides the framework for close cooperation between the Lighthouse projects to ensure effectiveness in working towards the shared goal: reaching the targets set by the Mission for the Danube & Black Sea Lighthouse.

Looking ahead to the project's completion in June 2026, EcoDaLLi will focus on capacity-building activities for stakeholders, offering targeted trainings to help scale up innovations demonstrated in the Danube & Black Sea Lighthouse. The project will also develop a Danube Innovation Action Plan, which will integrate its key outputs to ensure they are reflected in long-term governance policies. This plan will not only support entrepreneurship in the Danube basin but also foster cross-border cooperation, contribute to a healthier environment, and further strengthen the innovation ecosystem. Through these efforts, EcoDaLLi will facilitate shape strategies and policies that drive progress towards the overarching goals of the Mission Ocean & Waters.

## Hands-On Science: IAD Summer School in the Danube Delta, 2024

Katrin Teubner<sup>1</sup>, Dragos Balaican<sup>2</sup>

<sup>1</sup> Department of Functional and Evolutionary Ecology, Faculty of Life Sciences, University of Vienna, Austria, e-mail: [katrin.teubner@univie.ac.at](mailto:katrin.teubner@univie.ac.at)

<sup>2</sup> Danube Delta National Institute, 165 Babadag Street, 820112 Tulcea, Romania

### Abstract

By the end of August 2024, more than 20 student applicants nominated by IAD national representatives and 13 IAD expert group leaders and lecturers attended a one-week IAD Summer School in the Danube Delta. Ten students were from Romania and Austria, while another twelve came from Bulgaria, Hungary, Serbia, Ukraine and Slovakia. The summer school focused on microplastics, along with wetland biodiversity and nature conservation, reed management, and landscape development in the context of climate warming mitigation. Lecturers, who volunteered their time, represented many IAD countries and shared their expertise in diverse scientific fields, including microbiology, biota field surveys, reed management, wetland landscape planning, nature conservation, and climate research, as well as environmental education. This project was financed by the 'Executive Agency for Higher Education, Research, Development and Innovation Funding' Romania and IAD.

### Excursion Details

Danube Delta Scientific Summer School aimed to create a friendly and open atmosphere for students and lecturers, sharing scientific practice in the floodplain and scientific discussions at 'round tables'. This was in line with the mission statement of IAD, to foster space for scientific collaboration and mutual exchange. IAD, as vital scientific network, is dedicated to a better understanding and protection of the Danube River and its catchment. By connecting with fellow participants and experts during IAD scientific summer school, we aimed to strengthen a better understanding of the many vital Danube Delta ecosystems, a unique area of 6,264.03 km<sup>2</sup> biosphere reserve established in 1998 under UNESCO's Programme on Man and the Biosphere and shared by Romania and Ukraine.

The lecturers have brought in their broad and deep expertise in aquatic sciences, while the students, many of whom are PhD candidates, also offered specialized knowledge backgrounds. This diverse mix of participants from various Danubian countries promises a rich learning experience. Thus, we had meaningful and stimulating discussions about former collaboration and joint projects and shared discoveries as we explored the fascinating world of the Danube Delta together. The photo figure 1 A shows the whole group of participants of this summer school in front of the small



**Figure 1.** Group photo of the summer school participants, B-C: Students identifying biota, B: European green toad, *Bufo viridis*, C: Salt marsh plant, *Salicornia*; D: Insect Mantis. (Photo A: Dragos Balaican; B-D: Polina K. Nikova)



**Figure 2.** A: The five-to-ten-minute stimulating talk and discussion at round tables after dinner. B-C: Thematic excursion to the study areas of the project DaWetRest (Caraorman and Seaside Cordon). B: The floating reed islands, some as large as entire cities, impressed the participants of the summer school. C: Dr. Alexandru Cătălin Doroşencu, as IAD summer school lecturer, presented his extensive lexical knowledge of the ecological background and the specifics of the sites, landscapes, and biota in the delta. D: Zonation of riparian vegetation of floating aquatic plants (*Nymphaea alba*) and reed beds (*Typha*). (Photo A, D: Polina K. Nikova; B, C: Katrin Teubner)





**Figure 3.** Thematic excursion to the Periprava area and Letea Forest. **A:** Pelicans in the sky above the sand dune area. **B:** Abandoned traditional houses in the village Letea, **C:** Endangered plant species of sand dunes, *Ephedra distachya*, **D:** Visiting saline vegetation (Photo A, B: Polina K. Nikova; C,D: Katrin Teubner)



**Figure 4.** 'BeachCleanUp', collecting macroplastics and other waste on a natural beach section of the Black Sea near Sulina. **A:** Sand dunes and coastal vegetation by the sea. **B:** Searching for waste on the beach. **C, D:** The amount of waste collected by two groups within three hours each. (Photo A, B: Katrin Teubner, C, D: Dragos Balaican)

harbor in Sulina, furthermore, figures 1-4 document main activities during this summer school.

The expertise of the IAD lecturers ranged from terrestrial observations in floodplains to aquatic microbiology and plastic pollution. When lecturers introduced themselves, they focused on one of three main topics during IAD summer school, terrestrial or aquatic issues or plastics as follows:

### 1. Terrestrial issues:

#### Diversity of floodplain habitats in the Danube Delta, with focus on terrestrial systems

Prof. Bernd Cyffka (Germany) presented online a welcome speech for this summer school, and also about the mission and history of IAD

Dr. Eng. Iulian Nichersu (Romania) introduced to the IAD summer school at Danube Delta National Institute (DDNI) and referred, among others to 'Floodplain Reconnection & Delta Wetland Conservation'.

Dr. Thomas Zechmeister (Austria) contributed to 'Wetland monitoring & conservation, Reed management, Saline lakes and soda pans, Biodiversity of Moths and Butterflies'.

Dr. Alexandru Cătălin Doroșencu (Romania) introduced to the Delta ecosystems in general, with focus on 'Bird Monitoring & Conservation Strategies in the Danube Delta' (*fig. 2 C*).

Prof. Dr. Dušanka Cvijanović (Serbia) provided scientific background of 'Wetland monitoring and conservation'.

Dr. Werner Lazowski (Austria) introduced to aspects of 'Botanical surveys, Floodplain vegetation, wetland conservation'.

Mag. Dragos Balaican (Romania) did an introduction on utilizing Chorematic Focus Maps for 'Water Energy Food Nexus in urbanizing wetlands in Danube Delta'.

### 2. Water issues:

#### Diversity of floodplain habitats in the Danube Delta, focusing on channels and lakes

Prof. Martin Dokulil (Austria) with focus on Phytoplankton, Freshwater Ecology, Impact of global warming on aquatic systems contributed to the topic 'Global warming & Delta Ecosystems'.

Prof. Vera Istvánovics (Hungary) outlined about 'Eutrophication & Delta Ecosystems', which was most stimulating for discussions about the future of the Danube Delta ecosystems.

Dr. Adrian Burada (Romania) provided insights to his research field of 'Environmental Impact Assessments and Water Quality in the Danube Delta'.

Eng. Matei Simionov outlined to 'Hydraulic parameters measurements & Hydraulic Modeling in the Danube Delta'.

PD Dr. Katrin Teubner focused on 'Water quality and macrophytes in Delta Ecosystems'.

Dr. Markus Weinbauer emphasized the many facets of microbiology in coastal areas with focus on 'Viruses und microorganisms & Delta Ecosystems'.

### 3. Macroplastic and microplastic issues:

#### Detecting plastic and effective strategies to prevent and mitigate this pollution.

Dr. Eng. Cristina Despina presented a comprehensive outline about 'Microplastic Pollution in the Danube Delta'.

In addition to this, as mentioned before, advanced students contributed to issues, as Polina K. Nikova (Bulgaria) to the identification of invasive species, Gergely Tikász (Hungary) by a detailed presentation using AI methods for detecting macroplastics to reduce waste degrading ecosystems, and Nikola Bobchev to methods analysing microplastics.

After the Visit and welcome speech at the Danube Delta National Institute in Tulcea we traveled by boat to Sulina. It was, all in all, a dense program with limited time in the Delta identifying biota diversity of ecosystems among other Delta issues (*fig. 1 B-D*). The two whole-day excursions were the boat trip to the Periprava area and Letea Forest (*fig. 2*) and visiting the study areas of the project DaWetRest (Caraorman and Seaside Cordon, *fig. 3*). Another day was dedicated to plastic collection at a natural coastal area near Sulina, focusing on identifying the types and quantities of macroplastics and other waste (*fig. 4 A, B*). The participants were divided into two groups for this activity. The volume of waste collected by late morning is shown in figure 4 C, D.

The four 'round table' discussions after dinner (*fig. 2 A*) were about 1: scientific publishing – presenting research results in scientific journals, at conferences, and using other science platforms, 2: 'terrestrial issues', 3: 'water issues' and 4: 'macro and microplastics'. Most stimulating for students, for example, was the discussion about the validity and the limits of using artificial intelligence in research, especially in the context of scientific publishing.

Outlook: Several participants of the summer school are still in contact. Some are exchanging ideas about potential publications arising from practical work during summer school excursions, comparing sampling results from the Delta with other wetland areas. The potential topics preparing publications are 'The Danube Delta and Its Ecosystem Diversity and Threats to the Ecosystem Diversity in the Danube Delta (Review)', 'Modern Monitoring of Floodplain Forests Vegetation in the Danube: NDMI and Conservation Efforts', 'Tracing Pollution Pathways: Industrial, Agricultural, and Urban Impacts on the Coastal Area between Sulina and Sf. Gheorghe', 'Sustainable Food Systems: Addressing Microplastic Pollution in the Danube Delta's Aquatic Food Chain' and 'Structural Diversity of underwater vegetation habitats: Bio-Mass vs Bio-Surface Ratios of macrophyte species'. Furthermore, several lecturers from this summer school will continue their collaboration in approved joint research projects along the Danube River starting in 2025.