

Project Title

Metagenomic Profiling of Plastic- and Hydrocarbon-Degrading Enzymes in the War-Affected Marine Ecosystem of Odesa Bay

Project Data

Duration	Funding	Project location/ Region
16 February 2026 – 15 February 2027	19 600 €	Odesa Bay, north-western Black Sea, Ukraine

Project Partners

Who are the project partners?

Explogen LLC, Lviv, Ukraine

What does each partner specifically contribute to the project?

Metagenomic library preparation and shotgun sequencing of Odesa Bay sediment DNA, with methodological support and training related to sequencing workflows.

About the Project

What is the problem – and what do you want to change about it?

What are you doing specifically to achieve this goal?

Odesa Bay is exposed to long-standing urban and maritime pollution, including plastics, petroleum hydrocarbons and metals. The ongoing war adds further environmental pressures from damaged infrastructure, vessels, fuel releases and debris. The project combines environmental analyses with shotgun metagenomics to investigate coastal microbial communities and their potential to transform plastics and hydrocarbons. Water and sediments are sampled at four coastal locations, with two distances from shore, and analyzed for environmental parameters and contaminants. Sediment DNA is sequenced to identify microorganisms and environmentally relevant genes and enzymes.

What is special or new about your approach?

The project links chemical characterization with metagenomic data from the same coastal system. This makes it possible to examine microbial taxonomic and functional potential in relation to measured environmental conditions. Because sampling is taking place during the ongoing war, the project also creates a time-specific environmental and genomic record of Odesa Bay that cannot be reconstructed retrospectively.

The figure: What does the project actually do?

The project investigates coastal areas of Odesa Bay that differ in the intensity and nature of anthropogenic and infrastructure-related pressures, as well as in their proximity to the open sea. Sediment and near-bottom water samples are collected at four coastal locations, at two distances from the shore (20 and 50 m), providing eight sampling sites and allowing spatial differences in environmental conditions and microbial communities to be assessed. The samples are characterised using a combination of physicochemical and chemical analyses, including environmental water and sediment parameters, heavy metals, petroleum-related contaminants, microplastics and phthalates. In parallel, shotgun metagenomic sequencing is used to characterise the composition and functional potential of sediment microbial communities, with particular attention to genes and enzymes potentially involved in the degradation of plastics and hydrocarbons. By integrating chemical, physical and metagenomic data from the same sites, the project will establish a multidimensional environmental and microbial baseline for Odesa Bay during the ongoing war. The resulting dataset will provide a reference for future comparisons and long-term environmental monitoring, help identify spatial and temporal changes in pollution and microbial communities, reveal potential microbial indicators of ecosystem disturbance, resilience and recovery, and contribute to the scientific basis for assessing and supporting the long-term restoration of the Odesa Bay coastal ecosystem.

What remains? What concrete results are achieved, and who can use them in the future?

The project will generate a reusable metagenomic and environmental dataset for Odesa Bay and a bioinformatic workflow for analyzing microbial communities and pollutant-degradation potential. The data can be reanalyzed as databases and analytical tools evolve and can support Ukrainian researchers, future Black Sea monitoring, comparative studies and longer-term assessment of ecosystem change and post-war recovery.



The project will generate a reusable metagenomic and environmental dataset for Odesa Bay and establish a reproducible bioinformatic pipeline for the analysis of microbial communities and pollutant-degradation potential. The workflow will be further developed and documented during the project so that it can be reused for future environmental metagenomic studies and monitoring. The data can be reanalyzed as databases and analytical tools evolve and can support Ukrainian researchers, future Black Sea monitoring, comparative studies and longer-term assessment of ecosystem change and post-war recovery. In addition, the methodological and bioinformatic approaches developed within the project are being integrated into teaching at Odesa I. I. Mechnikov National University, particularly into the Master's course "Omics Technologies in Microbiological Research" within the Microbiology and Virology programme. This integration has already begun, including a lecture on marine metagenomics based partly on the project approach and experience. In this way, the project contributes not only to environmental research, but also to strengthening practical metagenomics and bioinformatics skills among the next generation of Ukrainian microbiologists.

See the project images
on the following pages



Project images

Image 1 of 3

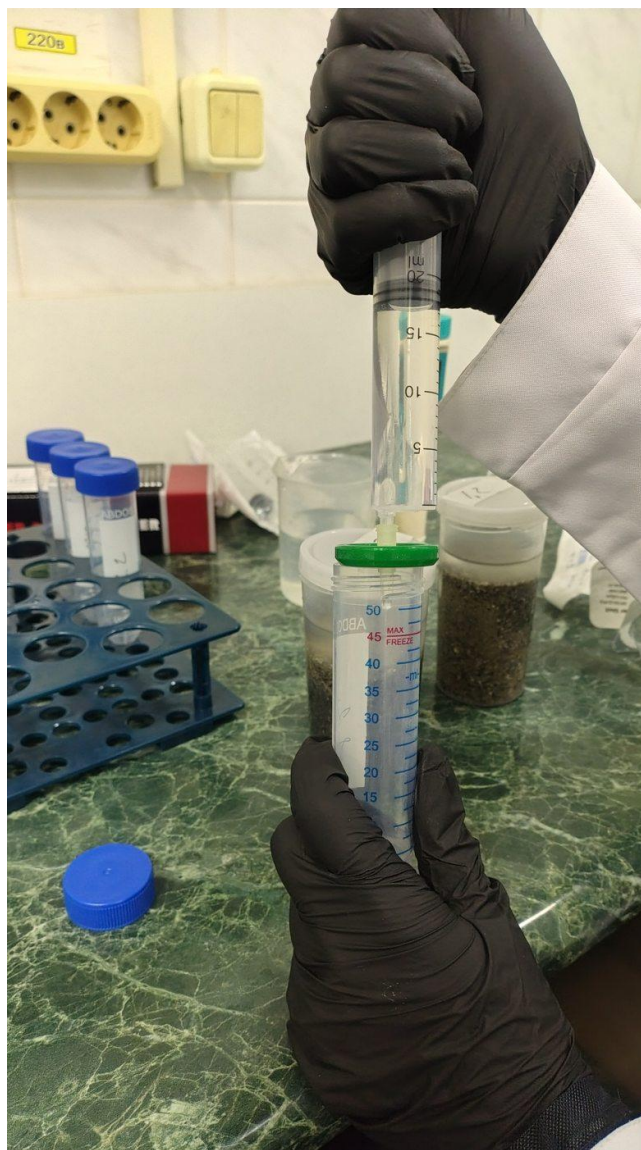


Sampling of sediment and near-bottom water at a coastal site in Odesa Bay within the DBU-funded project, June 2026.

Photo: © Oksana Zinchenko

Project images

Image 2 of 3

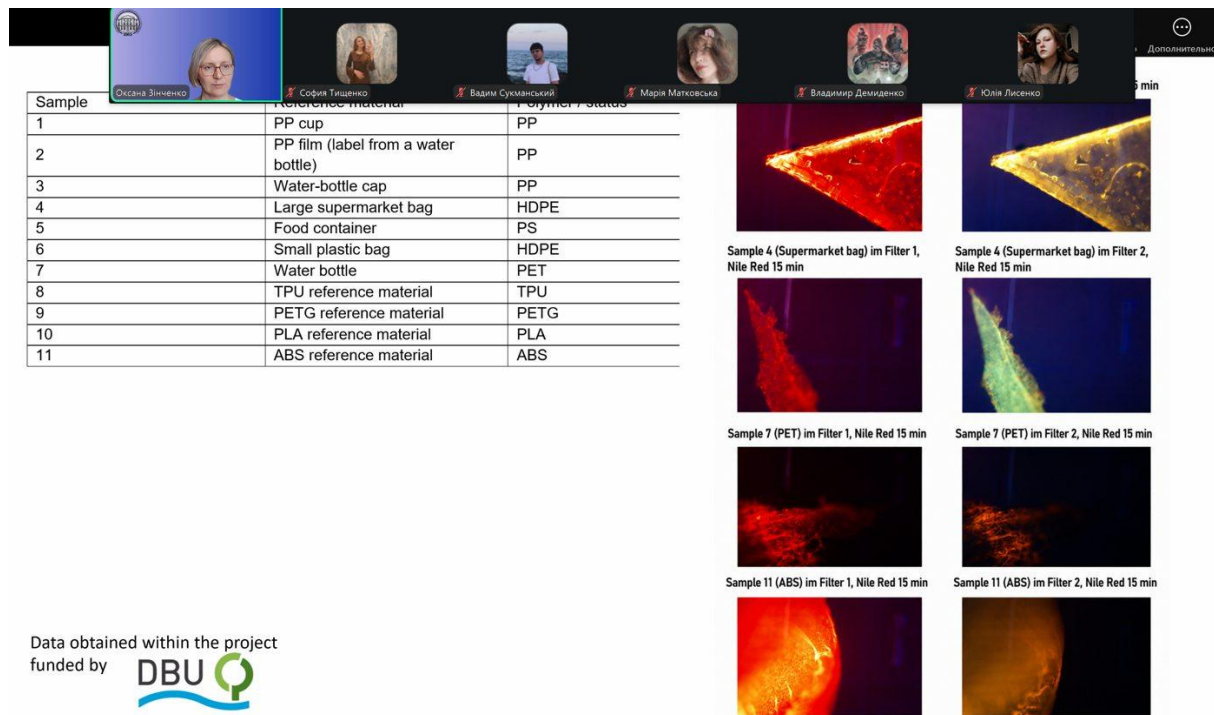


Laboratory processing and physicochemical analysis of environmental samples collected in Odesa Bay as part of the DBU-funded project.

Photo: © Oksana Zinchenko

Project images

Image 3 of 3



Sample	Reference material	Reference material
1	PP cup	PP
2	PP film (label from a water bottle)	PP
3	Water-bottle cap	PP
4	Large supermarket bag	HDPE
5	Food container	PS
6	Small plastic bag	HDPE
7	Water bottle	PET
8	TPU reference material	TPU
9	PETG reference material	PETG
10	PLA reference material	PLA
11	ABS reference material	ABS

Sample 4 (Supermarket bag) im Filter 1, Nile Red 15 min

Sample 4 (Supermarket bag) im Filter 2, Nile Red 15 min

Sample 7 (PET) im Filter 1, Nile Red 15 min

Sample 7 (PET) im Filter 2, Nile Red 15 min

Sample 11 (ABS) im Filter 1, Nile Red 15 min

Sample 11 (ABS) im Filter 2, Nile Red 15 min

Data obtained within the project funded by 

Integration of the DBU-funded project into teaching: a lecture on marine metagenomics for Master's students in the "Microbiology and Virology" programme at Odesa I. I. Mechnikov National University, using project-generated data and methodological approaches developed within the Odesa Bay project (microplastic detection), September 2026.

Photo: © Oksana Zinchenko