MEDNARODNA KONFERENCA
PROGRAMA EKOŠOLA

GRADIMO TRAJNOSTNO DRUŽBO - VLOGA MENTORJEV V PROGRAMU EKOŠOLA

ZRINKA KLARIN, ANITA MUSTAĆ, OŠ ŠIME BUDNIĆA ZADAR

31. maj 2025 | OŠ Jožeta Gorjupa, Kostanjevica na Krki, Slovenia

Tragovi koje ostavljamo u moru

Osnovna škola Šime Budinića Zadar

31.svibnja 2025.

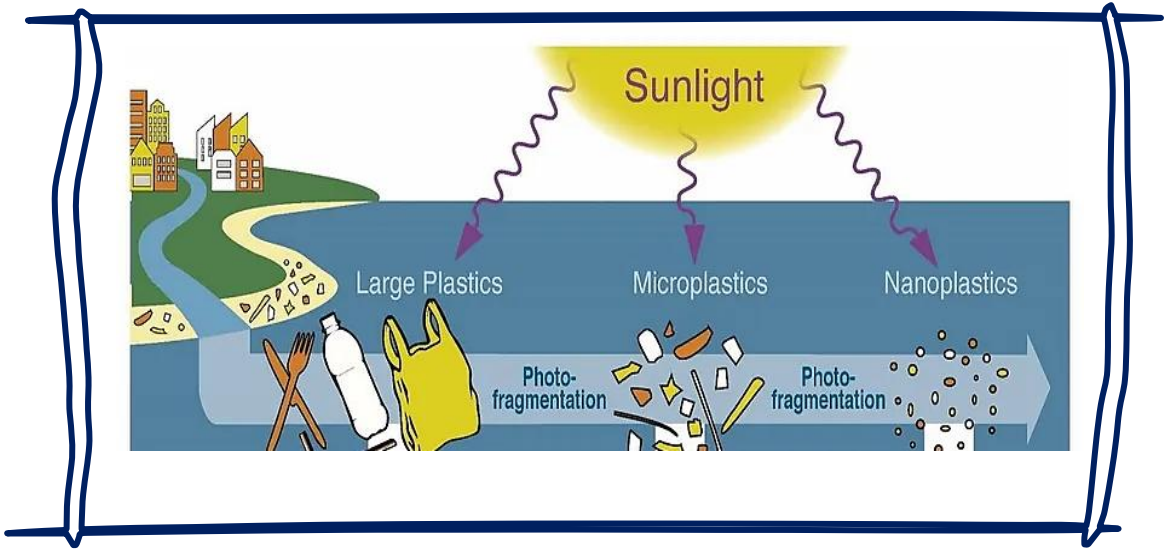
Osnovna škola Šime Budinića Zadar, Republika Hrvatska

Zrinka Klarin, prof. geografije i sociologije, savjetnik
Anita Mustać, dipl. ing. biologije, izvrsni savjetnik





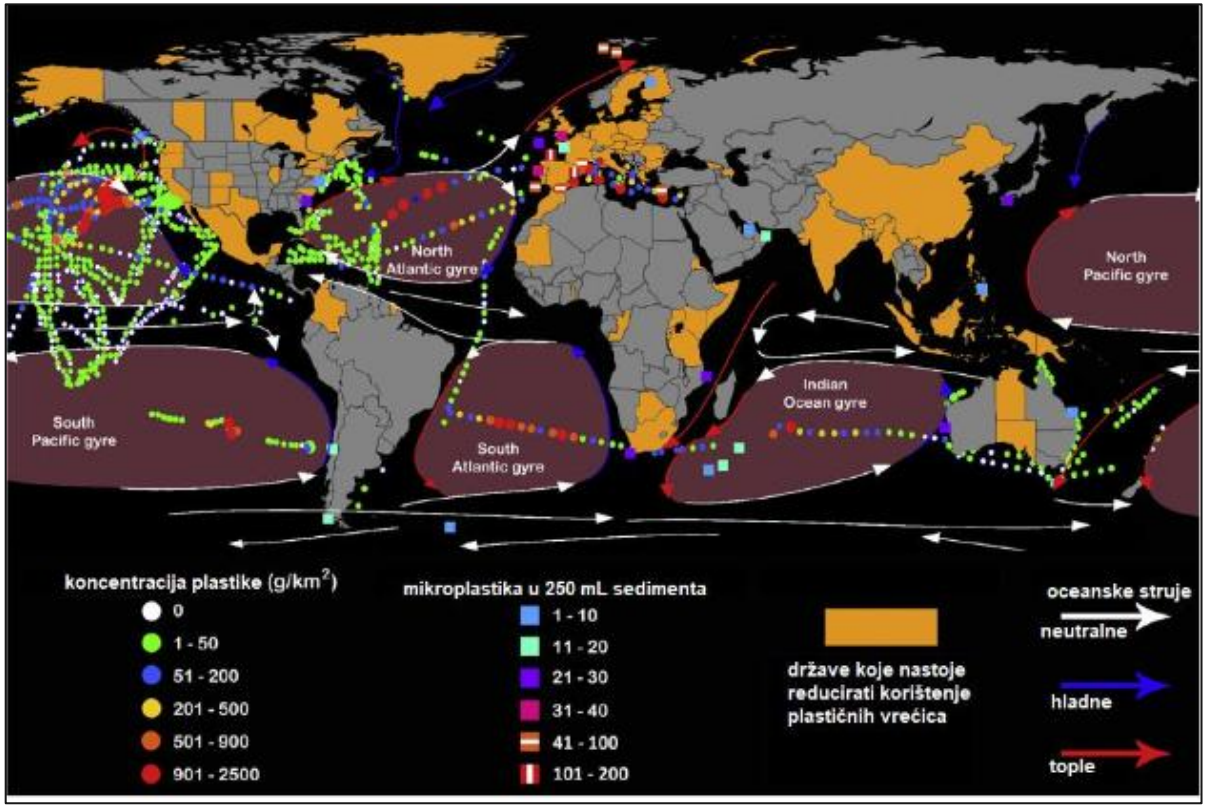

PLASTIKA → MIKROPLASTIKA



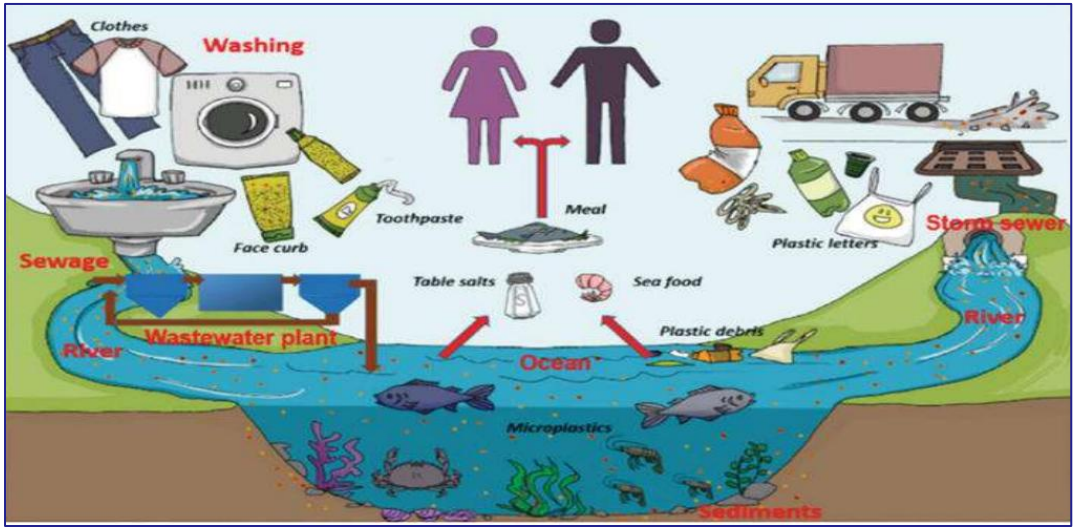
Cilj projekta:

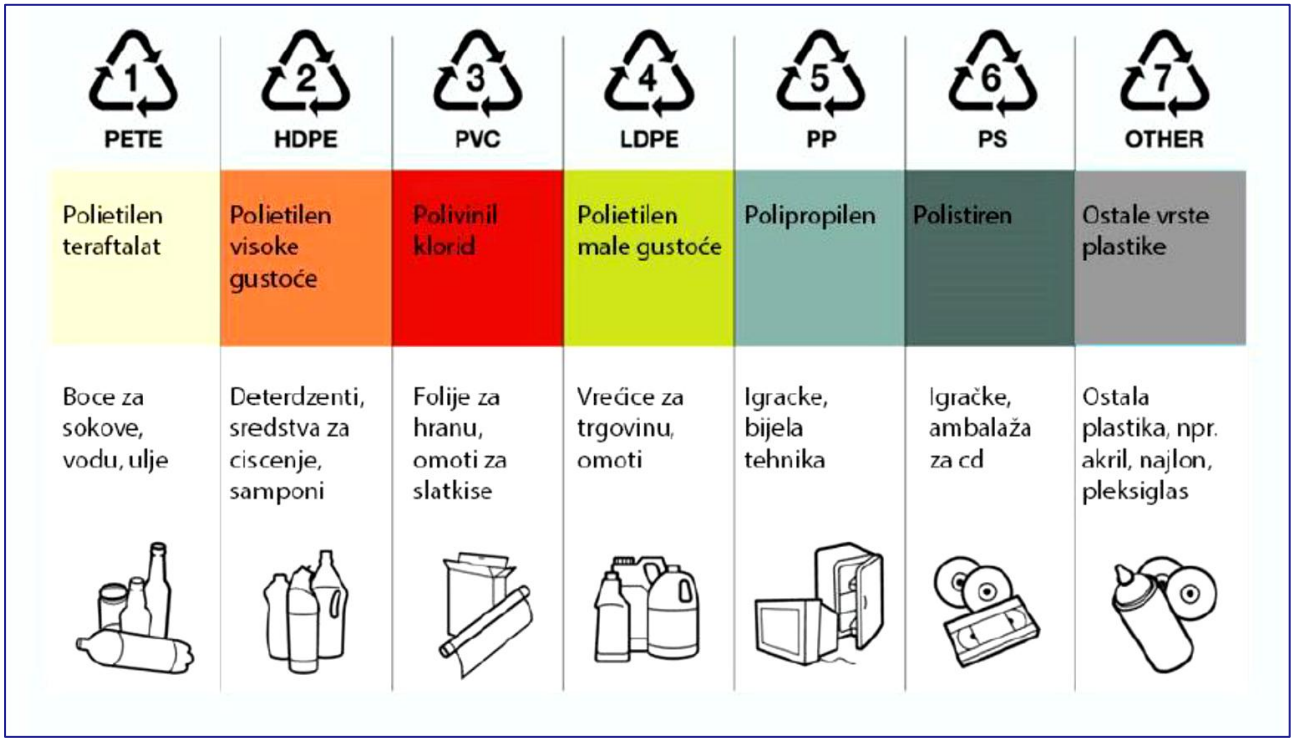
istražiti prisutnost mikroplastike u zadarskom kanalu u Jadranskom moru.

Onečišćenje oceana mikroplastikom



Izvori onečišćenja vode mikroplastikom



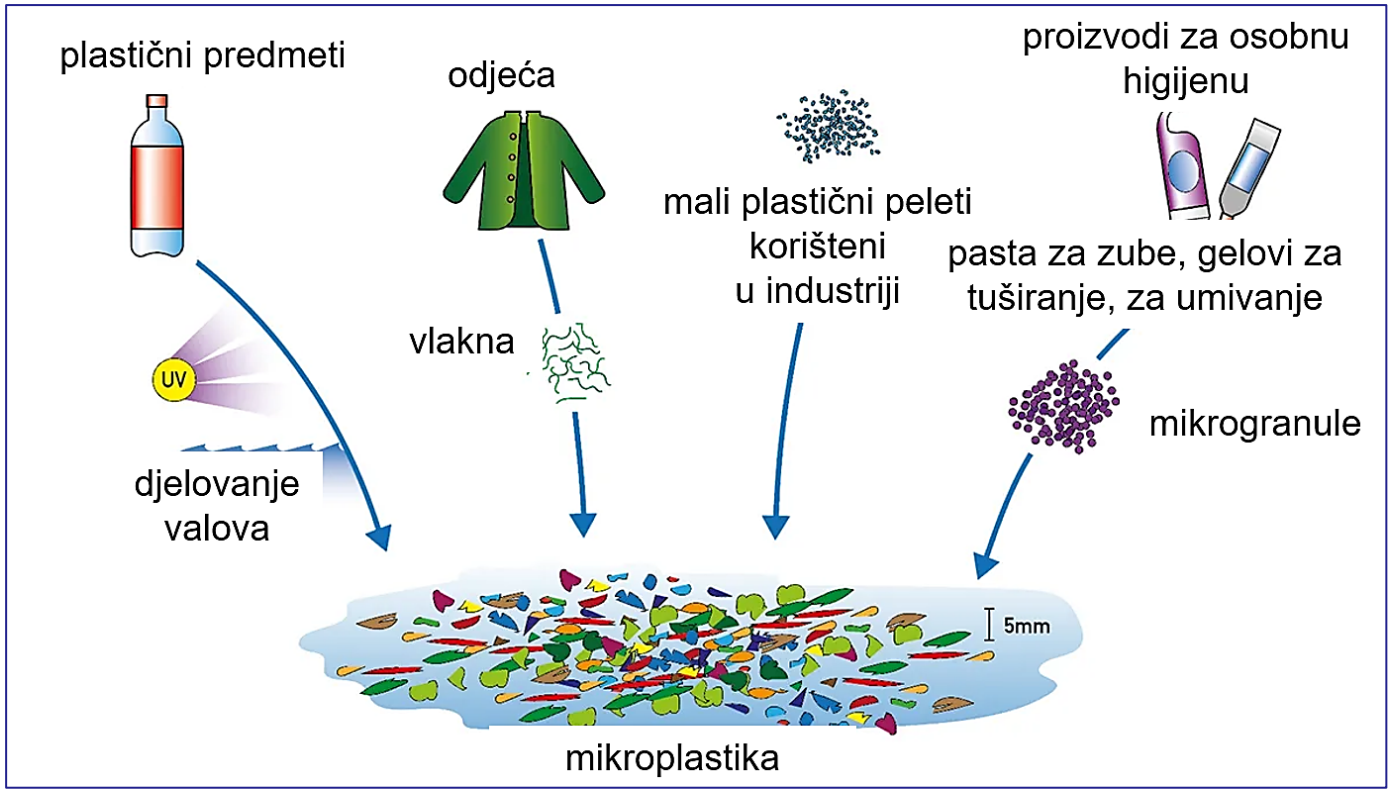


Prikaz najznačajnih vrsta polimernih materijala, njihovi simboli i upotreba

https://www.arocha.org/en/plastics-toolbox/

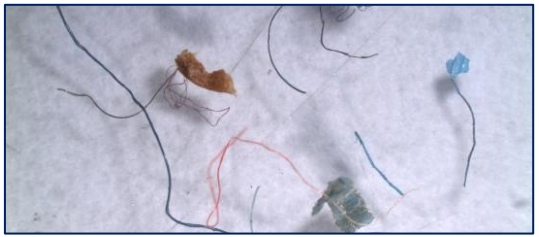
Podjela mikroplastike prema nastanku:

- primarna
- sekundarna



OBLICI MIKROPLASTIKE

vlakna



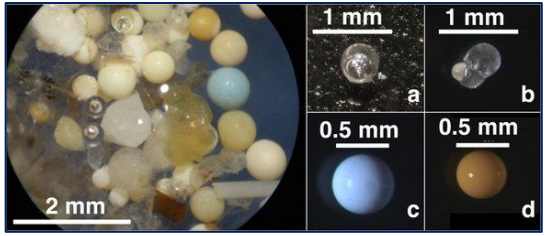
peleti

filmovi

fragmenti

pjena

mikrozrna



PRIMARNA MIKROPLASTIKA
- ulaze u okoliš u mikro veličini
- nastaju od većih plastičnih predmeta tijekom proizvodnje ili uporabe

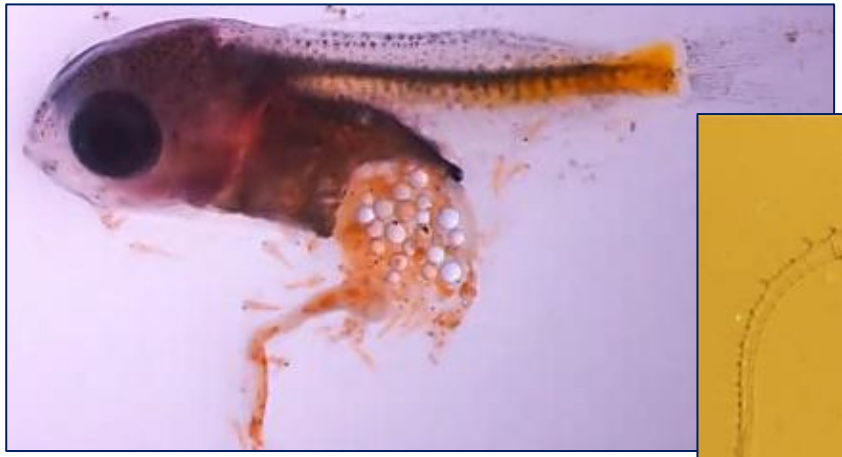
SEKUNDARNA MIKROPLASTIKA
- potječe od većih plastičnih predmeta koji se razgrađuju u morskom okolišu

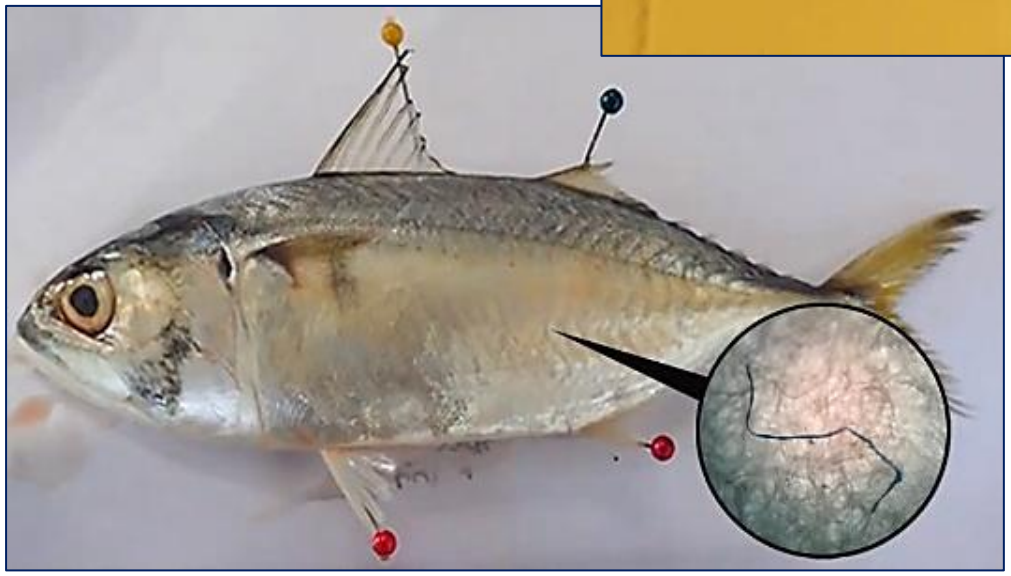
Podjela plastike prema veličini

https://www.arocha.org/en/plastics-toolbox/

Macro	Meso	Micro	Mini-micro
			
≥25mm	<25 - 5mm	<5 - 1mm	<1mm - 1μm

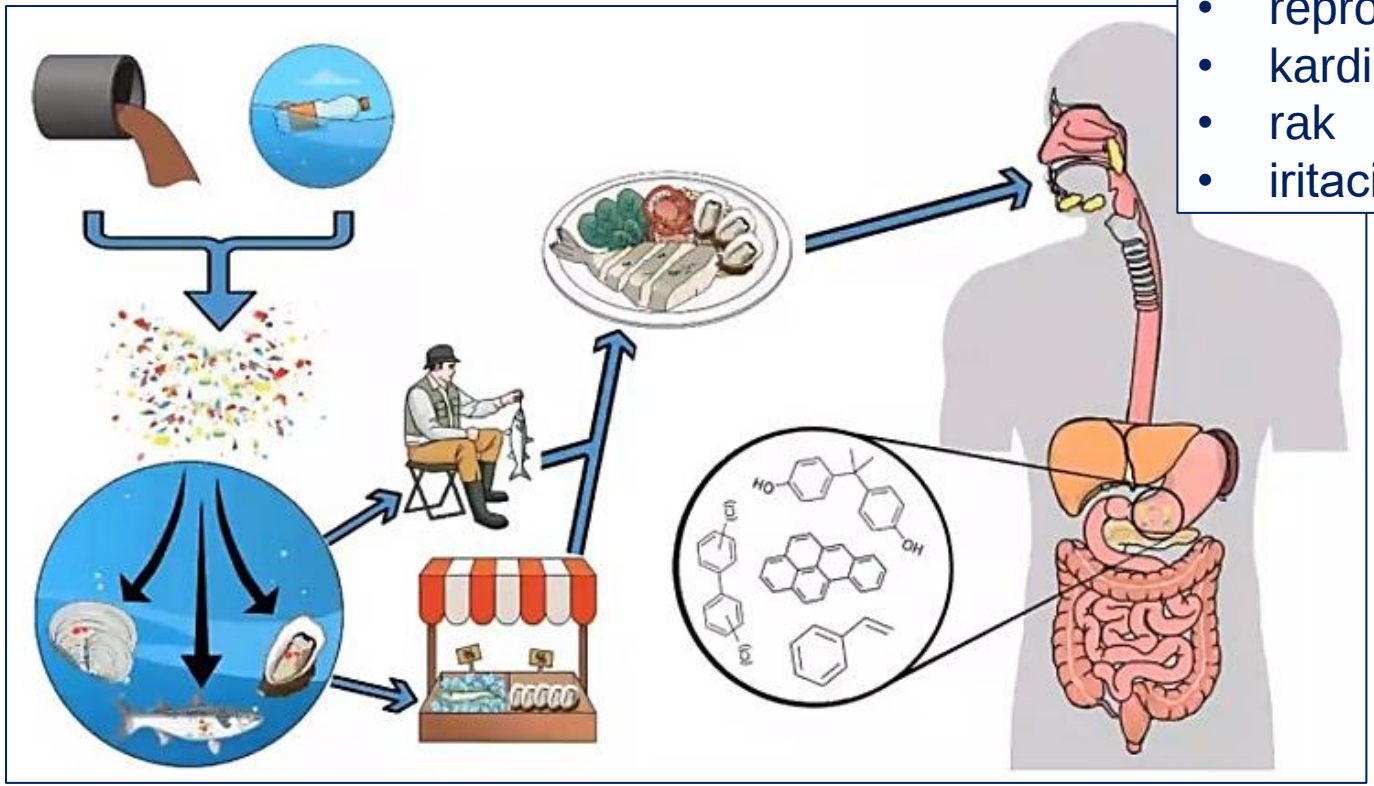
THE MICROPLASTICS TOOLBOX
A Rocha International





Utjecaj mikroplastike na čovjeka:

- respiratorne bolesti
- probavne bolesti
- reproduktivne bolesti
- kardiovaskularne bolesti
- rak
- iritacija kože



ISTRAŽIVAČKA PITANJA

Je li mikroplastika prisutna u moru u zadarskoj uvali Jazine?

Postoji li razlika u udjelu mikroplastike u uzorcima mora s iste mjerne postaje u različitim vremenskim razdobljima?

U MORU ĆE BITI VIŠE MIKROPLASTIKE TIJEKOM LJETA U ODNOSU NA JESEN I ZIMU ZBOG VEĆEG BROJA PLOVILA I POVEĆANOG PROMETA U ZADARSKOJ LUCI.

MJERNA POSTAJA

OŠ Šime Budinića Zadar, uvala Jazine u Zadar

VRIJEME ISTRAŽIVANJA

2024.

1. LIPANJ

2. RUJAN

3. PROSINAC

GLOBE PROTOKOL ZA VODU/MIKROPLASTIKU

ARC Research Hub for FUTURE FIBRES · Globe Italia · LABTER-CREA Rete di Scuole · IFM INSTITUTE FOR FRONTIER MATERIALS · DEAKIN UNIVERSITY

A MICROPLASTICS RECOGNITION GUIDE

This guide is aimed at helping you recognise microplastics of interest under the microscope.

Site Definition Sheet

* Required Field

School Name: ______________________ Site Name: ______________________
Choose a unique name based on location, e.g. "Grassy area - Front of School"

Names of students completing Site Definition Sheet: ______________________

Date: Year_____ Month______ Day____ Check one: ❑ New Site ❑ Metadata Update

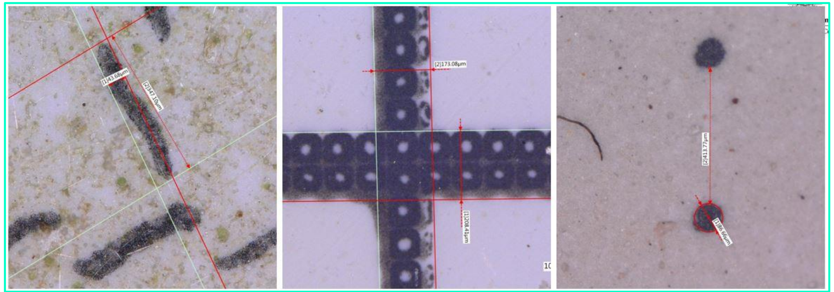
***Coordinates:** Latitude: __________ ° ❑ N or ❑ S Longitude: __________ ° ❑ E or ❑ W
Elevation: __________ meters

***Source of Location Data** (check one): ❑ GPS ❑ Other ______________________

Comments: ______________________

Site Type (select all that apply based on intended measurements, then complete the necessary fields below): ❑ Atmosphere ❑ Surface Temperature ❑ Hydrosphere
❑ Biosphere Land Cover ❑ Biosphere Greening ❑ Biosphere Phenological Gardens
❑ Biosphere Lilacs ❑ Soil (Pedosphere) Characteristics
❑ Soil (Pedosphere) Moisture and Temperature ❑ Soil (Pedosphere) Frost Tube

Cover type (Select one): ❑ Short grass (< 0.5m) ❑ Tall grass (> 0.5m) ❑ Barren land
❑ Sand ❑ Closed Forest (Trees interlocking) ❑ Woodland (Trees not interlocking)
❑ Shrubs ❑ Dwarf Shrubs ❑ Flowering Plants ❑ Wetland ❑ Cultivated Agricultural
❑ Cultivated Recreational ❑ Open Water ❑ Bare Rock ❑ Urban Residential
❑ Urban Commercial ❑ Asphalt ❑ Concrete ❑ Other ❑ Land Cover site



ONLYOFFICE File Plugins mcrplstcs-material-list-of-the-costs_NEW.xlsx

C4 Info

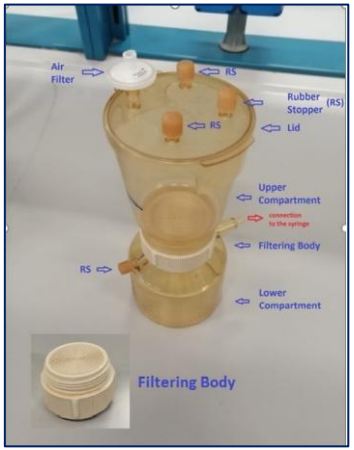
	A	B	C	D
1				
2			Search keywords:	filter membrane, gridded, 47 mm, hydrophilic
3				
4		Brand	Info	Link to website
5		Membrane solutions	MCE Gridded Membrane Filter, Membrane Solutions Mixed Cellulose Esters Membrane Filter, Sterile Individual Pack Membrane Disc Filter, Diameter: 47 mm, Pore Size: 0.45 um, 100/Pk	https://www.amazon.com/Membrane-Solutions-La Diameter/dp/B075XJ96RJ/ref=sr_1_1_sspa?dchild=1 id=1632458194&sr=8-1-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWV EwNzAzMzk4M1NGQURZM0UxMFNSTSZlbmNyeXB 4QyZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2x WU=
6		SimPure	SimPure MCE Micro Disc Membrane Filter, Sterile Gridded Individual Pack, 47mm Diameter and 0.45um Pore Size Hydrophilic Filter Paper, Pack of 100	https://www.amazon.com/Sterile-Hydrophilic-Mem Diameter/dp/B07DK85P6S/ref=sr_1_2_sspa?dchild= qid=1632458194&sr=8-2-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWV EwNzAzMzk4M1NGQURZM0UxMFNSTSZlbmNyeXB wVyZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2x dWU=
7		Biomed Scientific	MCE Membrane Filter,Mixed Cellulose Esters Membrane Disc Filters,Sterile,Black Gridded,Hydrophilic,Diameter 47mm,Pore Size 0.45um,Individually Packed (Pack of 100)	https://www.amazon.com/Membrane-Cellulose-Hy Packed%EF%BC%88pack/dp/B07CVFNQ7F/ref=sr_1 ne+mce&qid=1632458194&sr=8-5
8		Foxx Life Sciences	Foxx Life Sciences 36E-3613-OEM EZBio Gridded Membrane Disc Filter, MCE Sterile, 47 mm.45 µm Pore Size (Pack of 100)	https://www.amazon.com/Foxx-Life-Sciences-36E-Membrane/dp/B01BHNGMJ6/ref=sr_1_9?dchild=1 d=1632458194&sr=8-9
9		Millipore via Hach	Filter Membrane, EZ-Pak, 0.45 micron, 47 mm, white, gridded, 600/pk (Millipore)	https://www.hach.com/filter-membrane-ez-pak-0-millipore/product?id=7640246077&callback=qs
10		Millipore via Hach	Sterile Membrane Filters, 47-mm, 0.45-µm, gridded, pk/150	https://www.hach.com/sterile-membrane-filters-47 150/product?id=7640246052&callback=qs
		Whatman via Sigma	Whatman® Mixed Cellulose Ester filters white gridded, pore size 0.45 µm, diam. 47	

Oprema

teleskopski štap

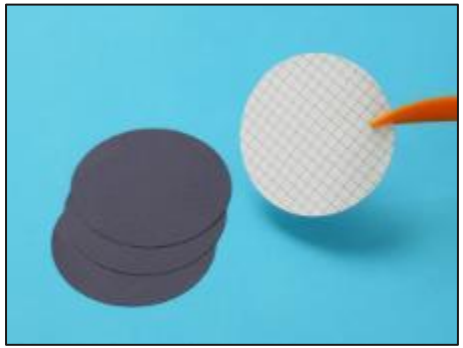
500 ml boca

petrijeve posude



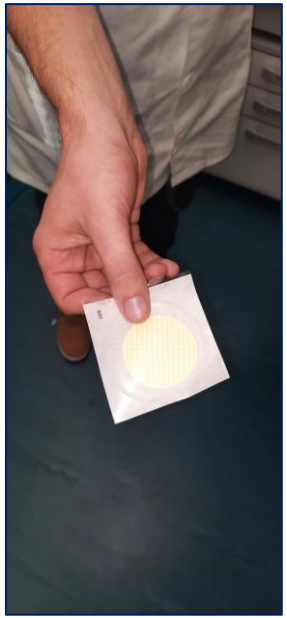
uređaj za filtraciju

šprica

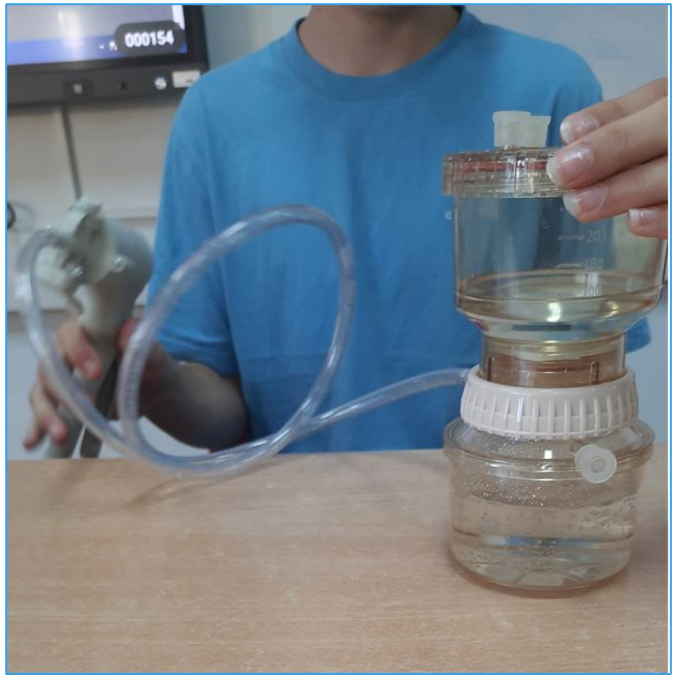


filter papir promjera 47 mm, veličina pora 0,45 µm

Zavod za javno zdravstvo Zadar,
Odjel za zdravstvenu ekologiju i zaštitu okoliša

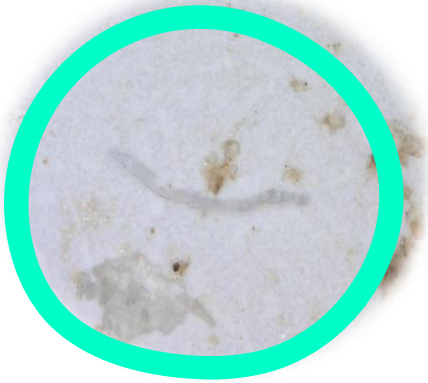


Filtracija mora

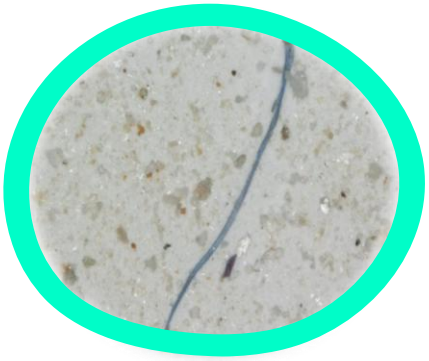


Mikroskopiranje uzoraka

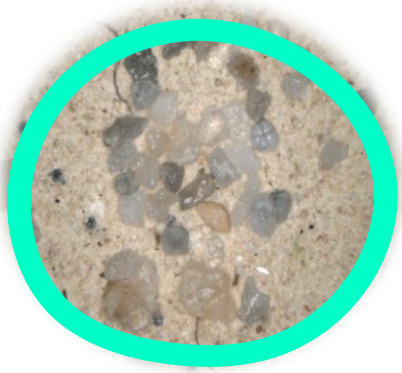
Kategorije u identifikaciji uzoraka



PAMUK I CELULOZA



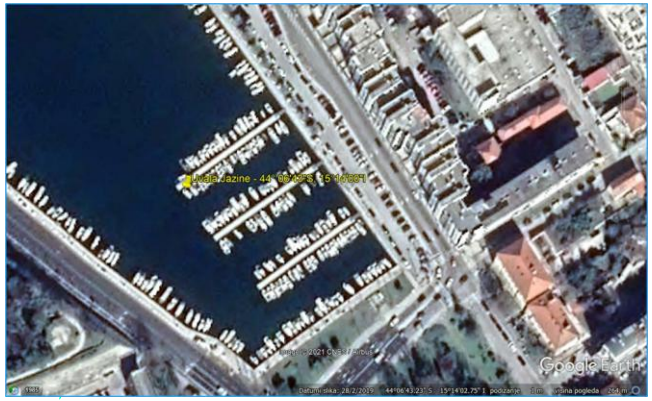
TEKSTILNA VLAKNA



PRIRODNE TVARI

PLASTIKA

ŽIVOTINJSKO PODRIJETLO



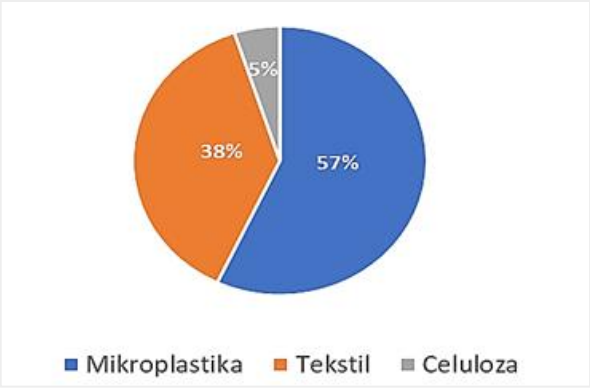
PRIKAZ I ANALIZA PODATAKA

OŠ Šime Budinića Zadar

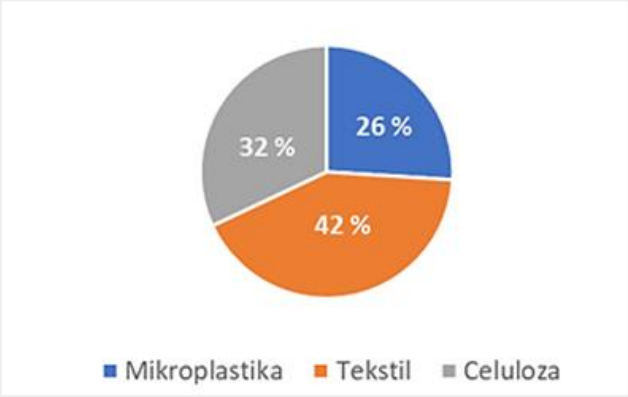
- Uvala Jazine

Analiza uzoraka mora - Uvala Jazine

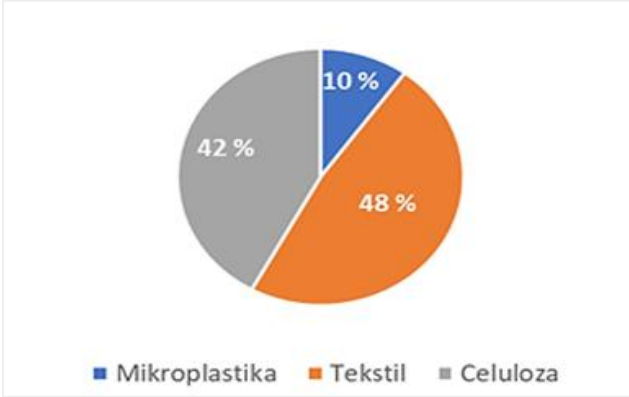
2024.



Slika 4 Analiza uzorka mora u uvali Jazine u Zadru, lipanj 2024. godine

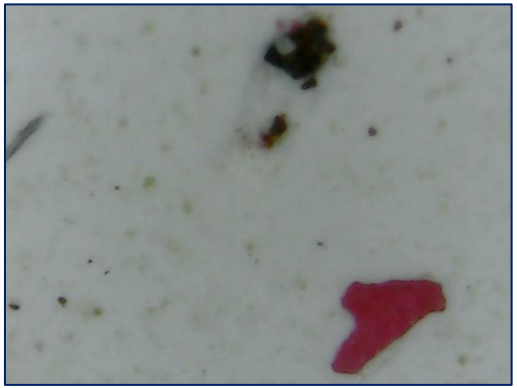


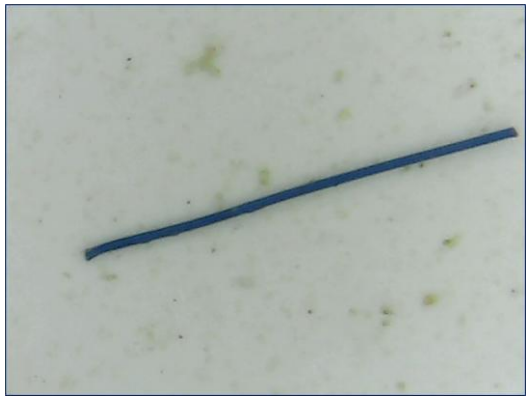
Slika 5 Analiza uzorka mora u uvali Jazine u Zadru, rujan 2024. godine



Slika 6 Analiza uzorka mora u uvali Jazine u Zadru, prosinac 2024. godine

MIKROSKOPIRANJE UZORAKA MORA

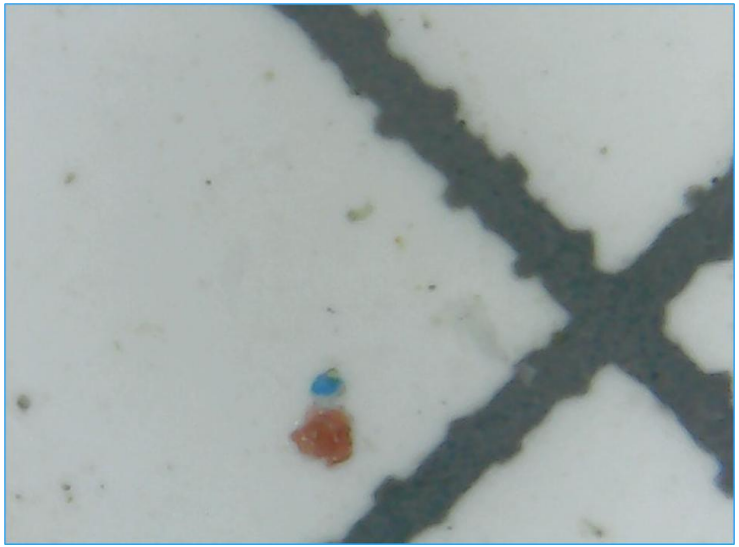




Rasprava i zaključci

- ✓ Analiza rezultata s mjerne postaje uvala Jazine pokazale su različite udjele mikroplastike, celuloze i tekstila u različitim uzorcima.
- ✓ U svakom uzorku pronađena je mikroplastika.
- ✓ Najniži udio tekstila prisutan je u uzorku mora iz rujna.
- ✓ Najviši udio celuloze prisutan je u uzorku mora iz prosinca.

Za potpunu i točnu analizu potrebno je analizirati uzorke mora na mjernoj postaji i tijekom ostalih mjeseci kako bi se bolje uočile promjene u sastavu filtrata.



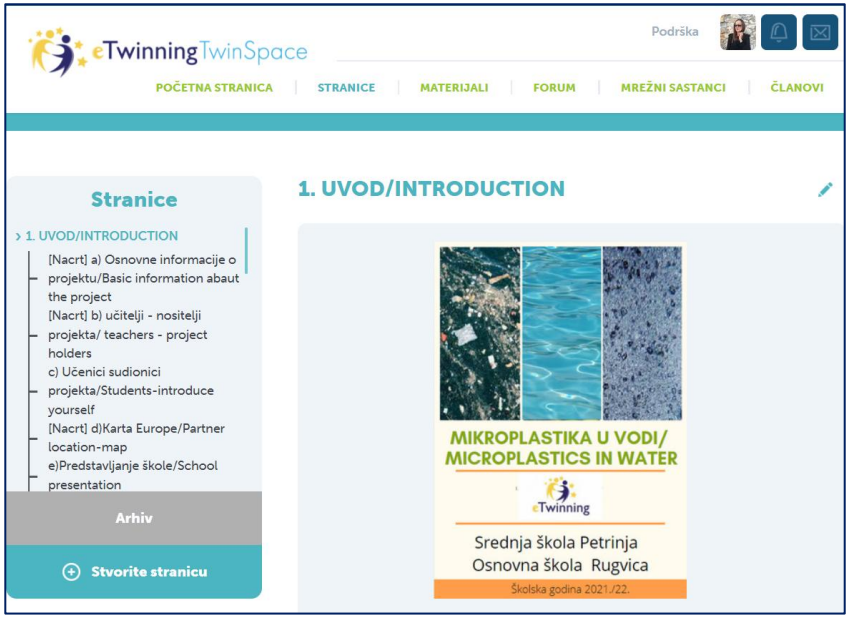
Rasprava i zaključci

Protokol za praćenje mikroplastike u površinskoj vodi

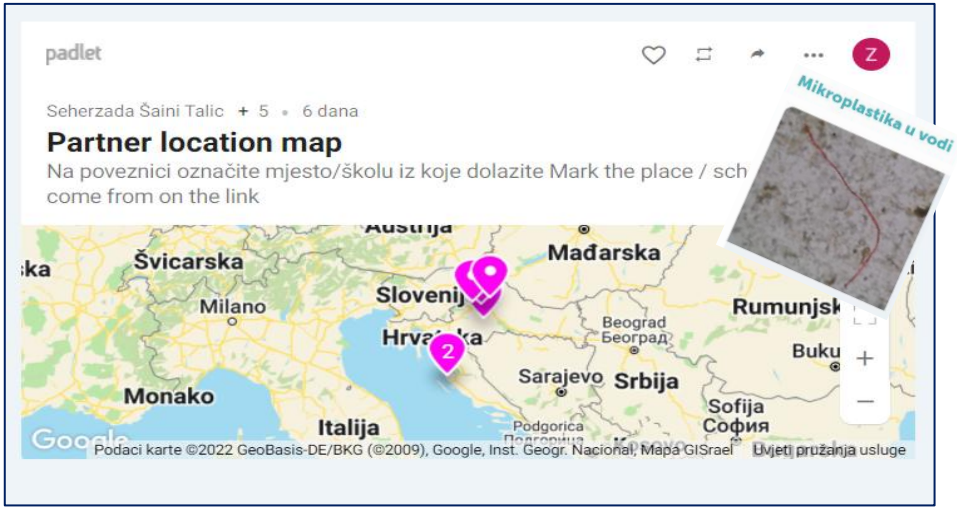
A/Prof. Alessandra Sutti and
Environmental Engineer Stuart Robottom
of Deakin University in Geelong, Victoria,
Australia

WEBINARI ZA PRIMJENU PROTOKOLA

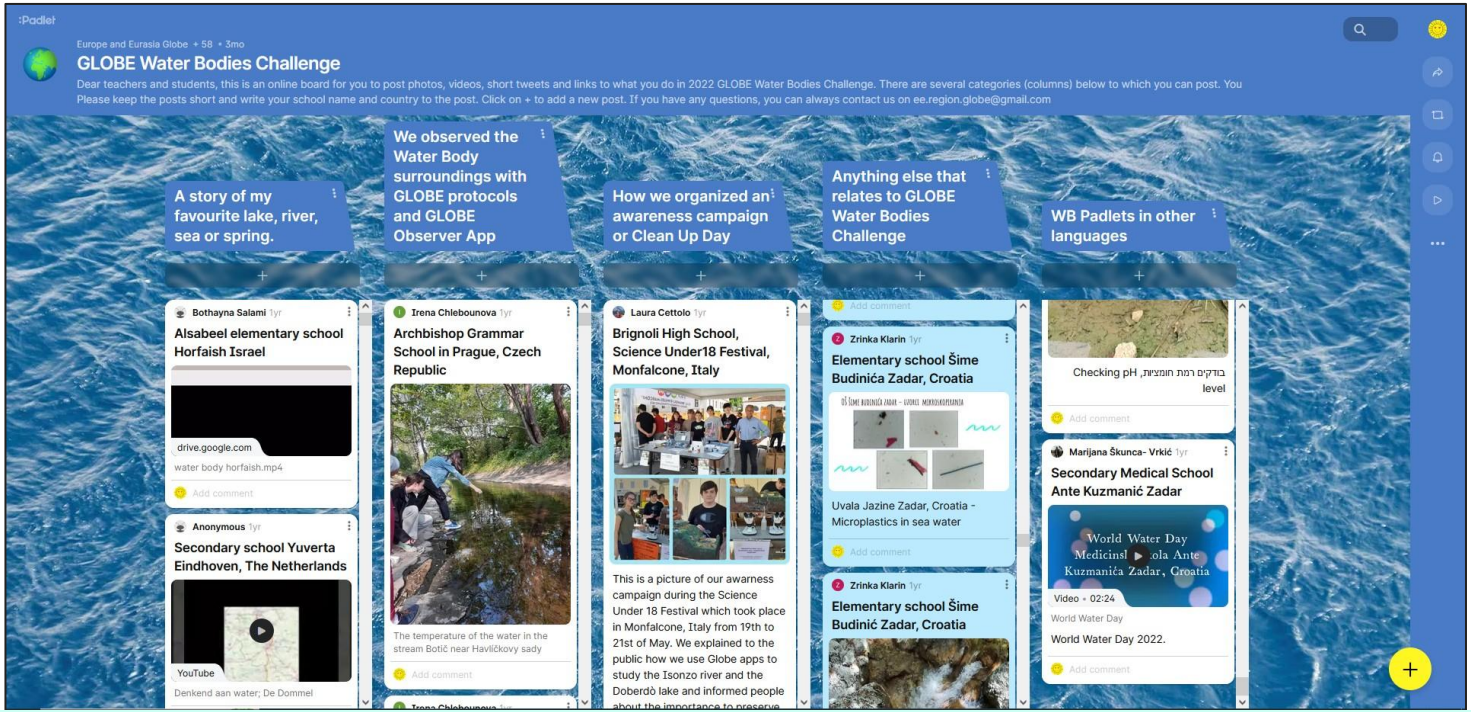
MICROPLASTICS MONITORING PROTOCOL



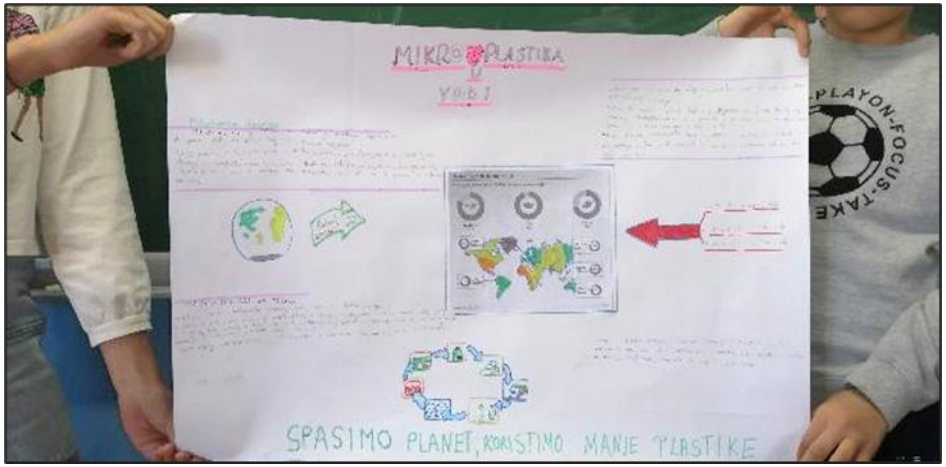
eTwinningTwinSpace

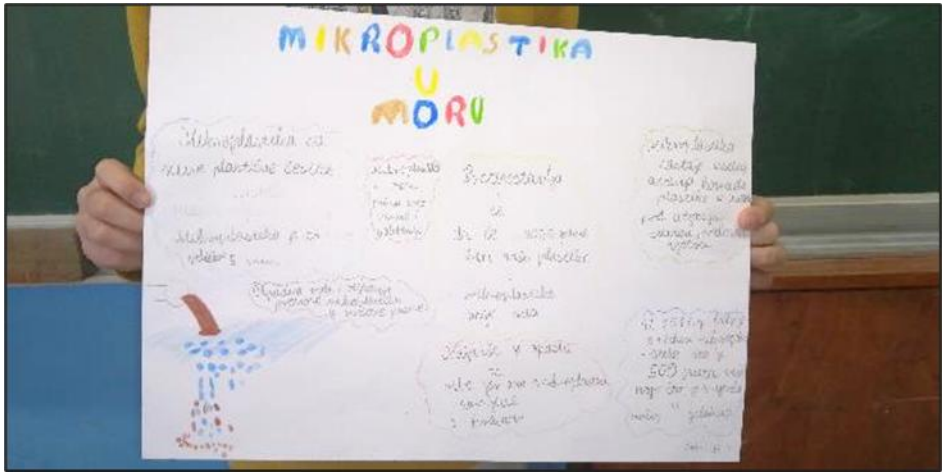


eTWINNING PROJEKT – MIKROPLASTIKA U VODI



WATER BODIES CHALLENGE – GLOBE





MIKROPLASTIKA – UČENIČKI POSTERI

RADOVI UČENIKA U RAZLIČITIM AKTIVNOSTIMA

EVALUACIJA

MEDNARODNA KONFERENCA
PROGRAMA EKOŠOLA,31.5.2025

https://forms.office.com/e/Bfiq3hL0fC

HVALA !

ZRINKA I ANITA

OSNOVNA ŠKOLA ŠIME BUDINIĆA ZADAR