COEXISTENCE OF ICHTHYONEUSTON AND MICROPLASTIC IN THE NORTHWEST BLACK SEA

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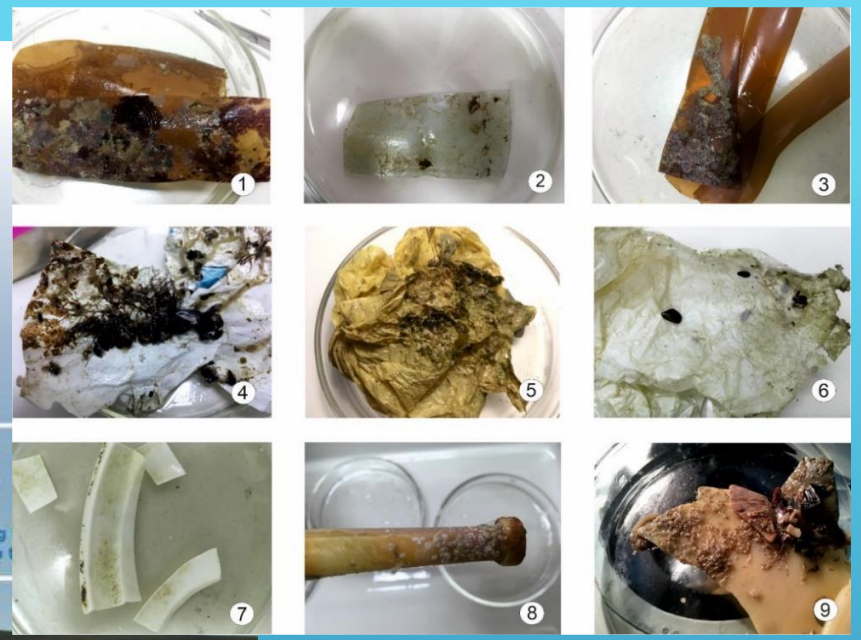
Environmental Monitoring in the Black Sea

WHAT'S FLOATING IN THE BLACK SEA?



During 1 hour rivers bring
of floating litter to t

TOP 5 types of litter flowing from rivers

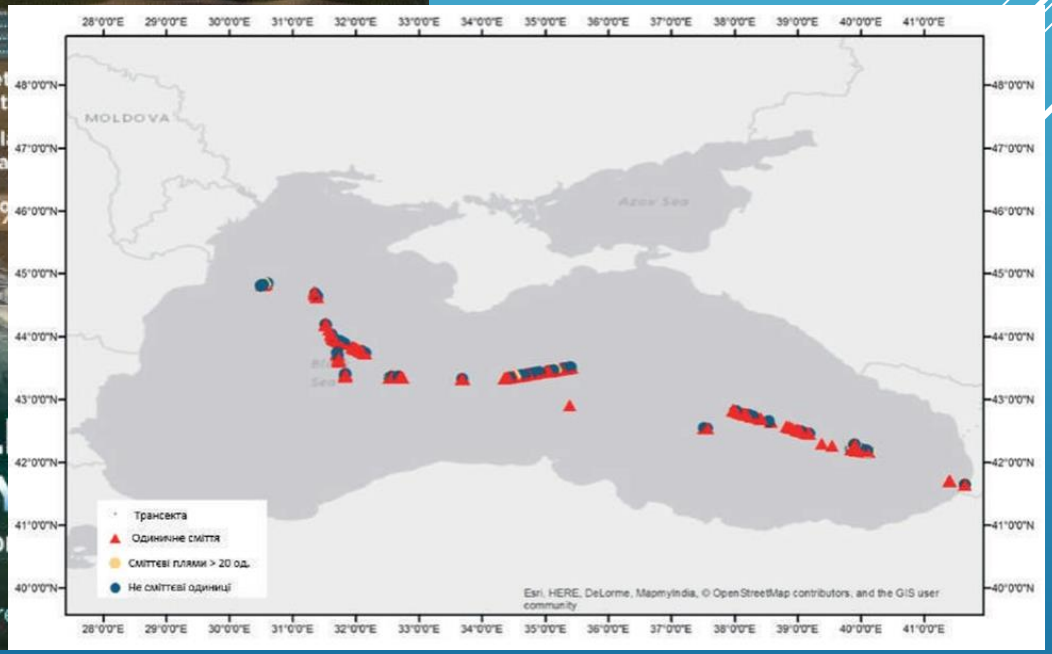
Bottles 20%
Pieces of plastic 14%
14% Packaging
10% Plastic bags
9% Plastic containers
18% Cigaret and filt
14% Pl ca
6%

TOP 5 of litter found on the beach

85% Pieces of plastic
9% Packaging
8% Plastic bags
3% Foam
3% Bottles

TOP 5 types of litter found in the Sea

AVOIDING SINGL
PLASTIC SAVES Y
https://plastics-strategy.prezly.co



(source: data of the EU/UNDP Project "Improving Environmental Monitoring in the Black Sea - Selected Measur

- The aim of present study is to represent new information on microplastic (MP) and inchthyoneuston (IN) distribution in the North-western part of the Black Sea (NWBS) in order to prioritize future investigations

Contents lists available at ScienceDirect

Marine Environmental Research

journal homepage: www.elsevier.com/locate/marenvrev

First evaluation of neustonic microplastics in Black Sea waters

Ulgen Aytan [a, *], Andre Valente [b], Yasemen Senturk [a], Riza Usta [a], Fatma Basak Esensoy Sahin [a], Rahsan Evren Mazlum [a], Ertugrul Agirbas [a]

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[b] Marine and Environmental Sciences Centre, (MARE), Faculty of Sciences, University of Lisbon, Campo Grande, 1749-016 Lisbon, Portugal

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Baseline

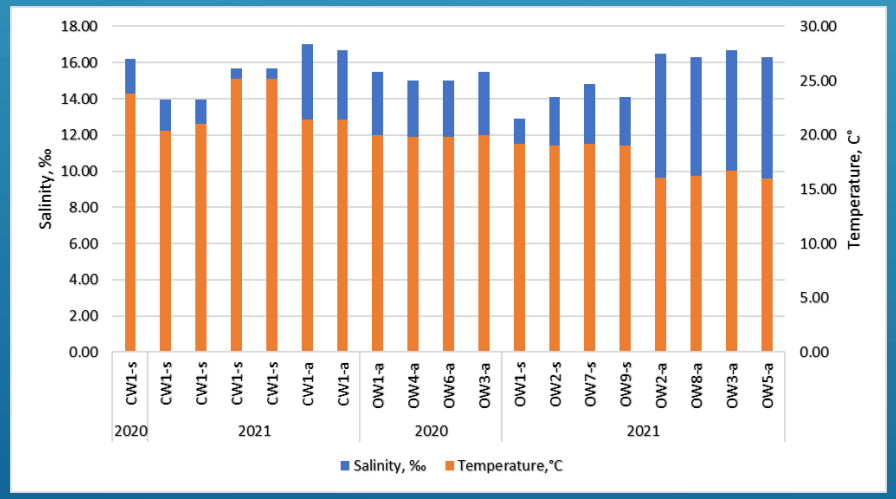
Characteristics and temporal trends of microplastics in the coastal area the Southern Black Sea over the past decade

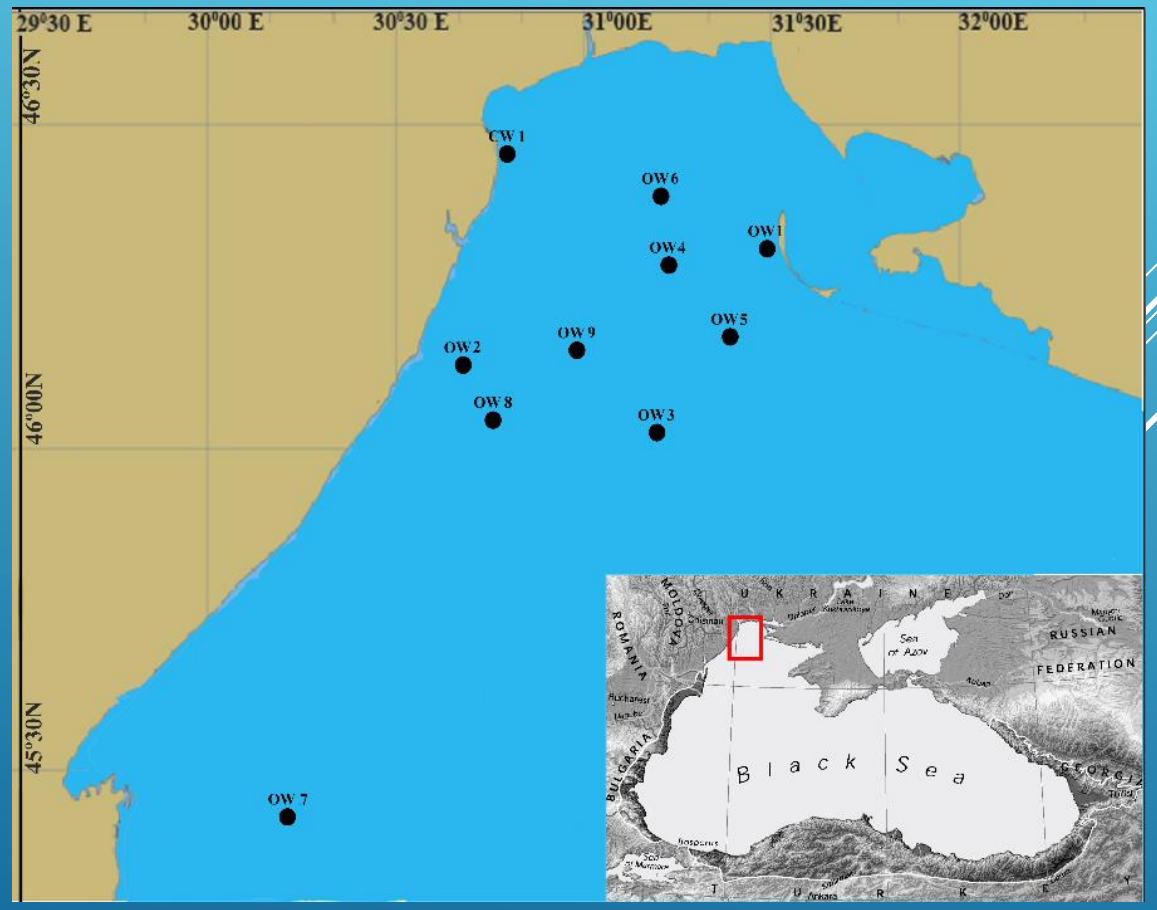
Ahmet Raif Eryaşar [a,1], Kenan Gedik [a,*,1], Ahmet Şahin [b], Rafet Çağrı Öztürk [b], Fatih Yılmaz

[a] Recep Tayyip Erdogan University, Vocational School of Technical Sciences, Rize, Turkey
[b] Karadeniz Technical University, Faculty of Marine Science, Trabzon, Turkey

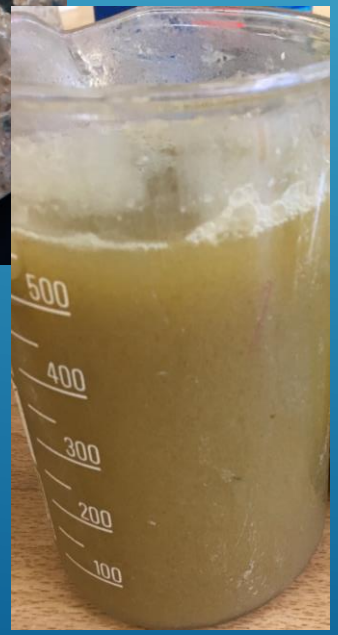
MATERIALS AND METHODS

- Autumn and summer seasons in 2020-2021
- Sites: transects on 1 coastal site in the area of Cape Malyi Fontan (CW) and 9 sites in open waters (OW)
- surface double-layered net (100 μm mesh)
- neuston (0-5 cm) and hyponeuston (5-20 cm)





MICROPLASTIC AND ICHTHYONEUSTON IDENTIFICATION



Microplastic processing:

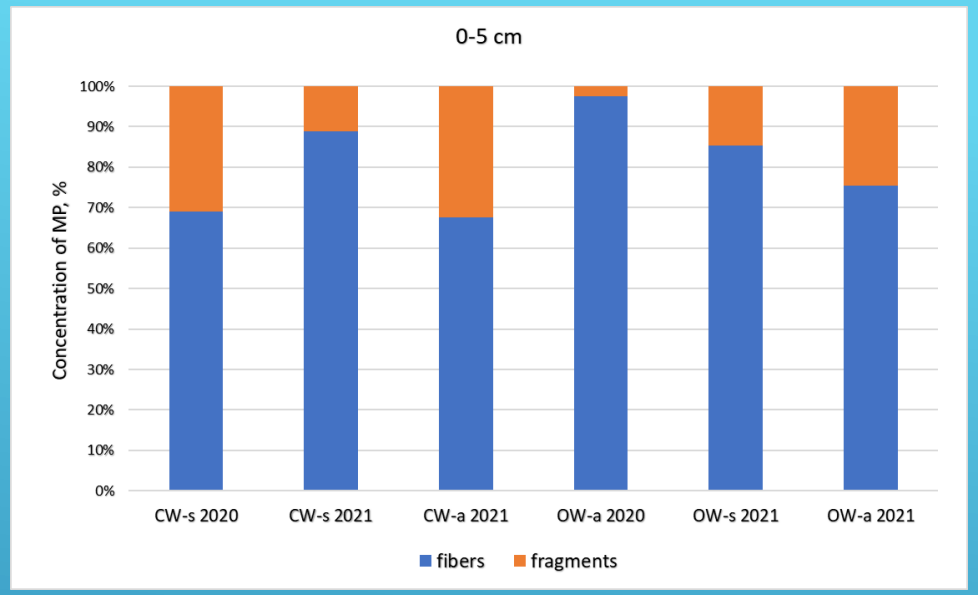
- Filtering (0,1– 5 mm)
- Stereomicroscope Micromed SM-6420 (20x and 40x)
- Counting in Bogorov chamber
- Hot needle test

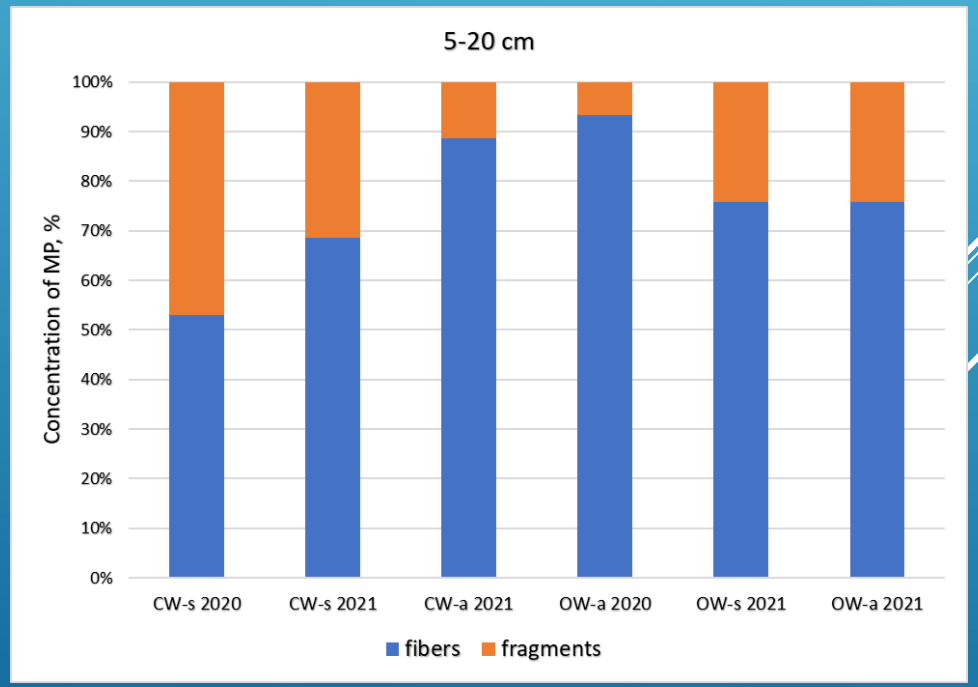
Ichthyoplankton processing:

- Species identification of eggs and larvae
- Direct counting under the stereomicroscope

RESULTS

Microscopic photos of microplastic in the surface layer of the NWBS

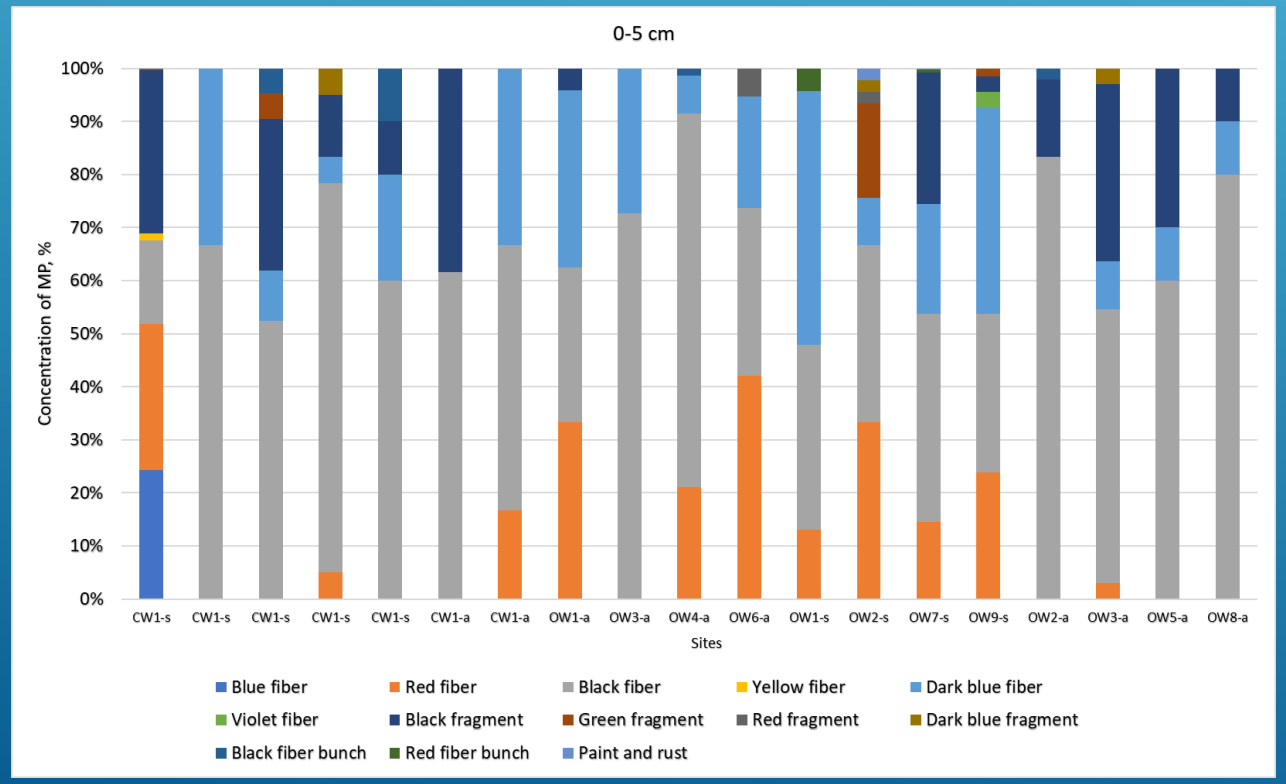


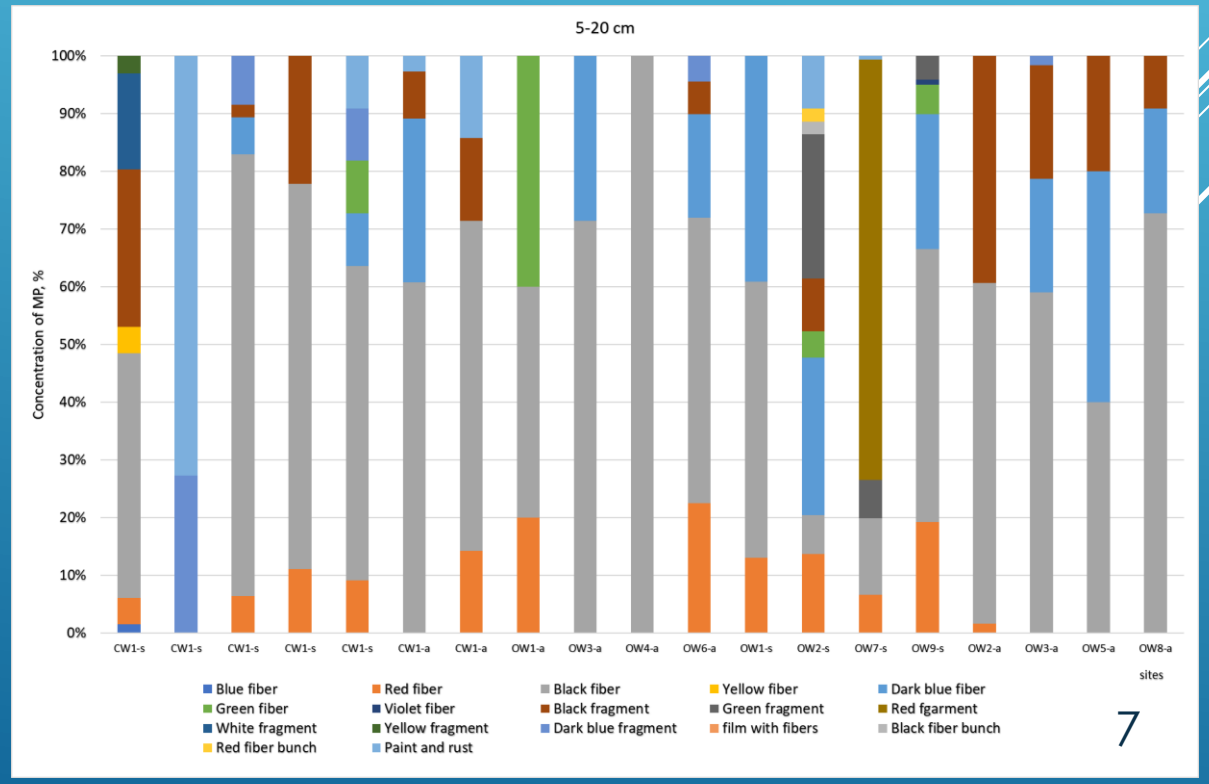


F-test for 0-5 cm p=0,0578; for 5-20 cm p=0,0046

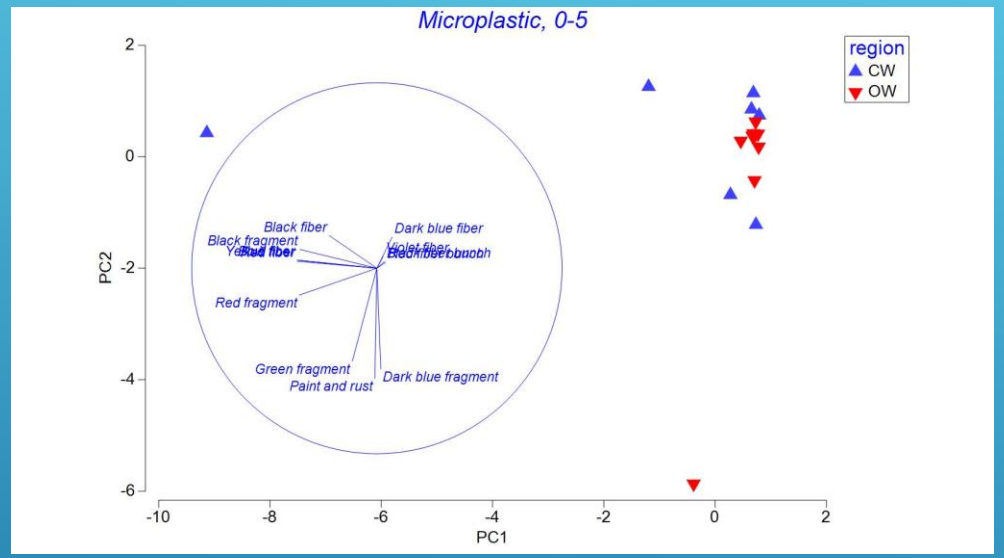
TYPES OF MP

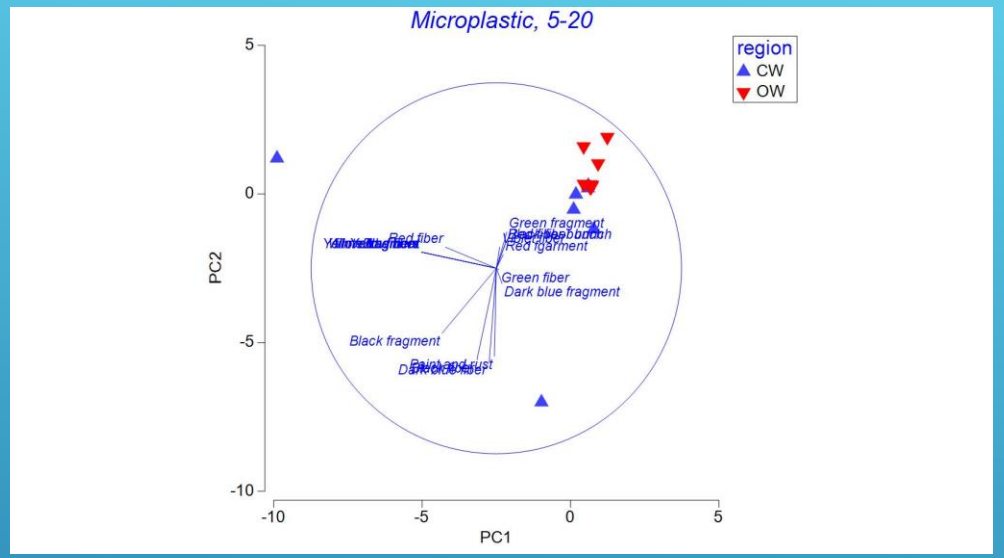
- 17 types of MP: 14 types of MP in neuston (0-5 cm) and 17 types in hyponeuston (5-20 cm).
- Neuston (0-5 cm): black, red, blue fibers and black particles Black fibers were present at most stations; other types – on 11-21% of stations.
- Hyponeuston (5-20 cm): black fibers are registered at 95% of stations; red, blue fibers and black particles – at 58-63% of stations.





CONCENTRATION OF MP



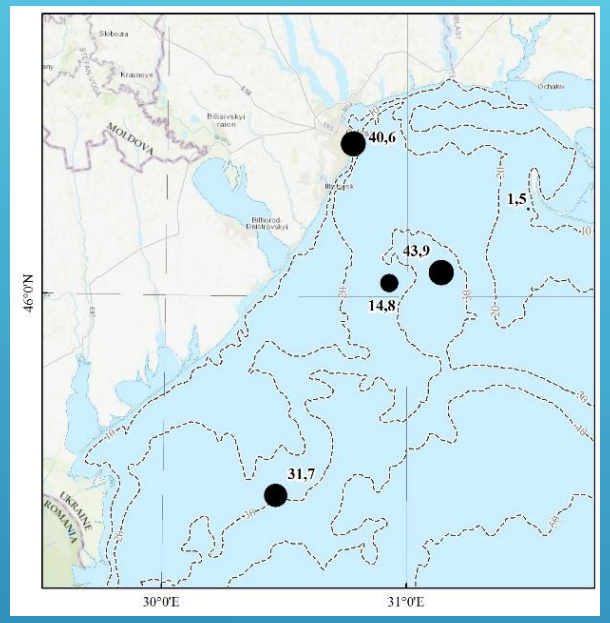


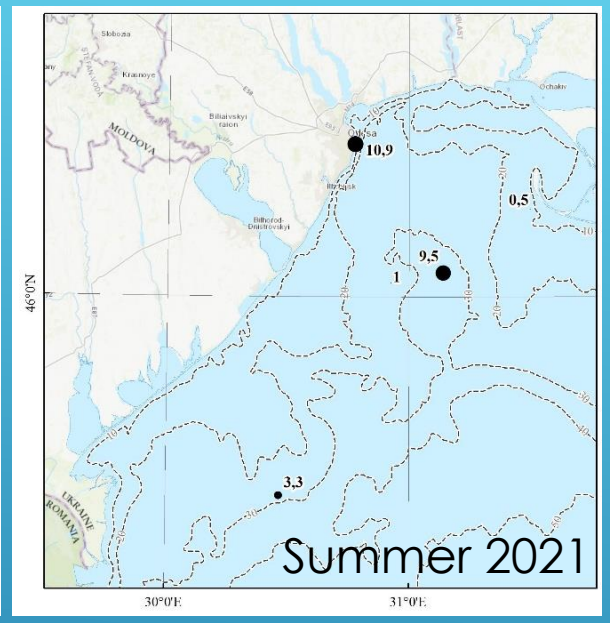
Region	Season	Concentration of MP, particles ·м$^{-3}$	
		0-5 cm	5-20 cm
Coastal waters (CW)	summer	356,82±115,93	38,45±10,73
	autumn	171,11±118,13	142,22±132,24
Open waters (OW)	summer	22,98±9,33	3,57±2,08
	autumn	4,19±0,85	1,71±0,53

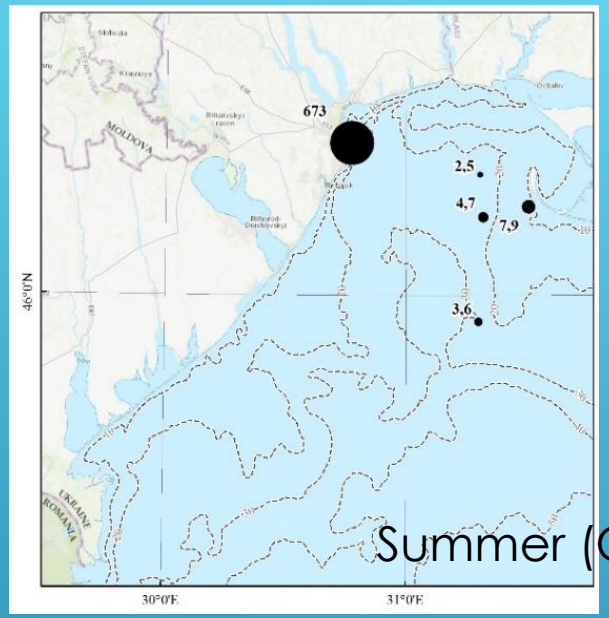
Results of the two-way ANOVA

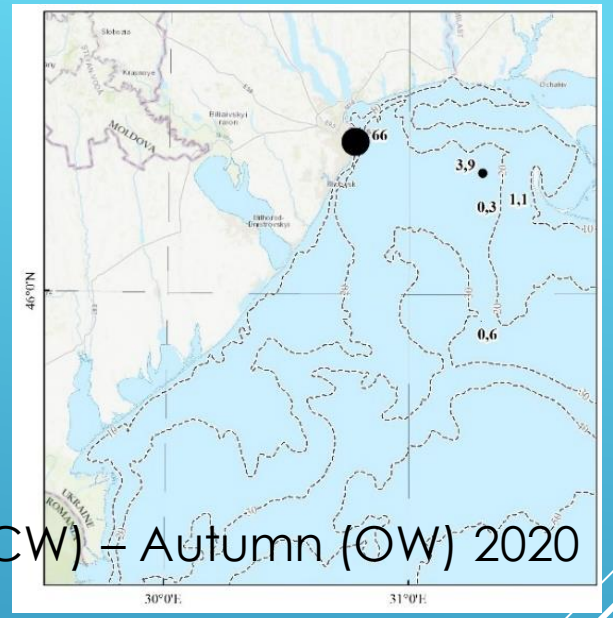
	0-5 cm		5-20 cm	
Region	CW	OW	CW	OW
Types of MP	0,0134	0,0000	0,0530	0,0000
Distribution on sites	0,0032	0,0001	0,0439	0,0062

CONCENTRATION OF MP



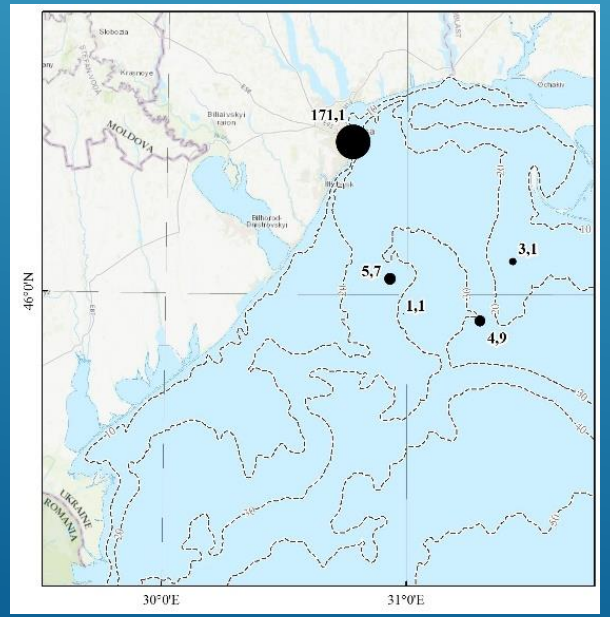


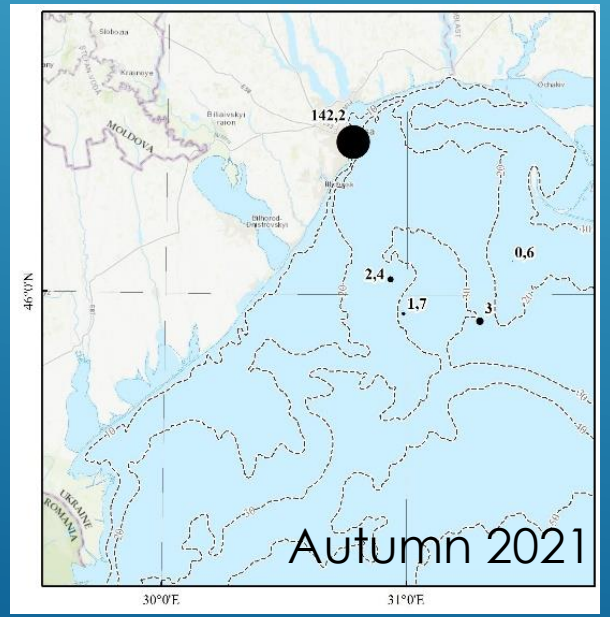




neuston

hyponeuston

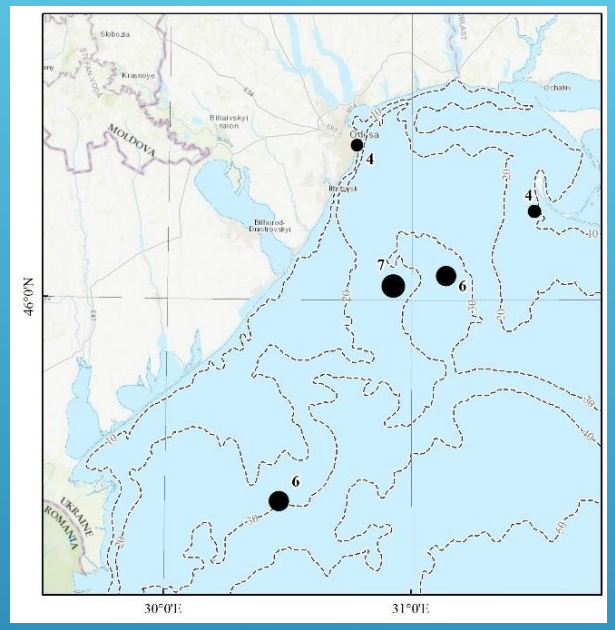


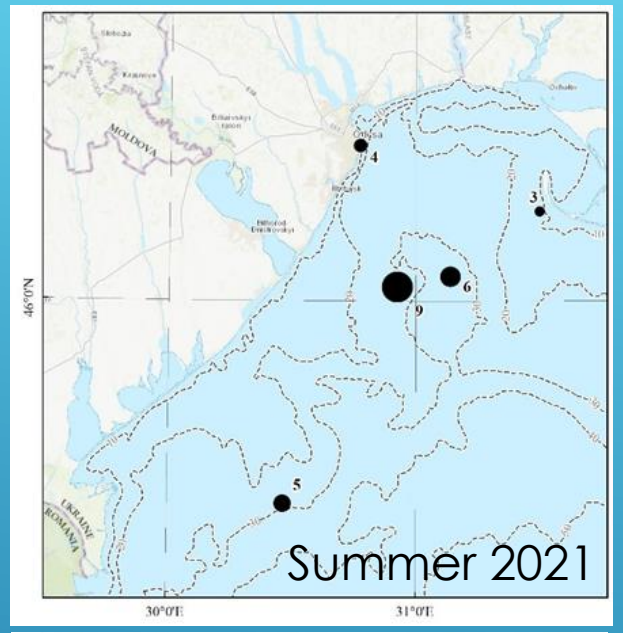


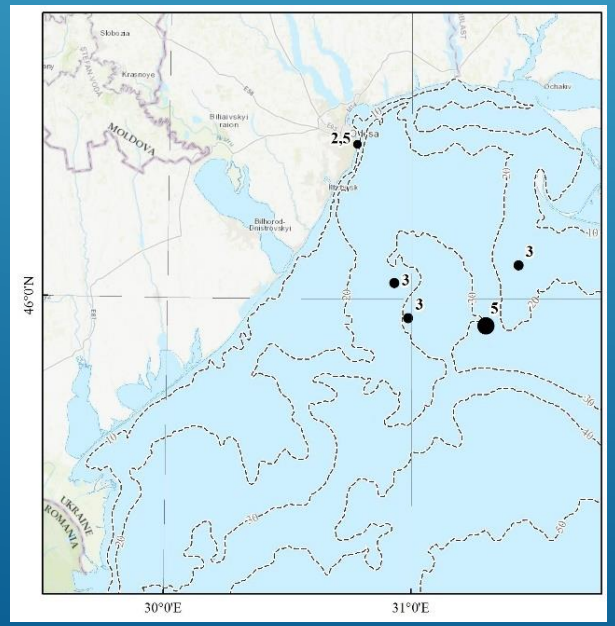
neuston

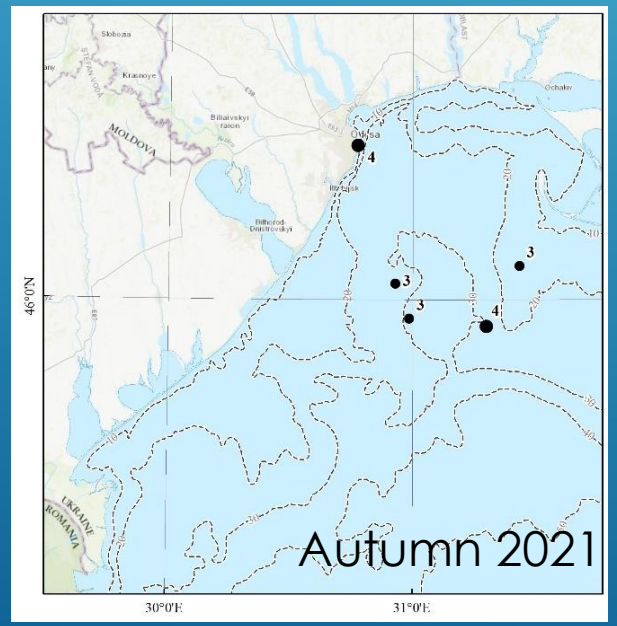
hyponeuston

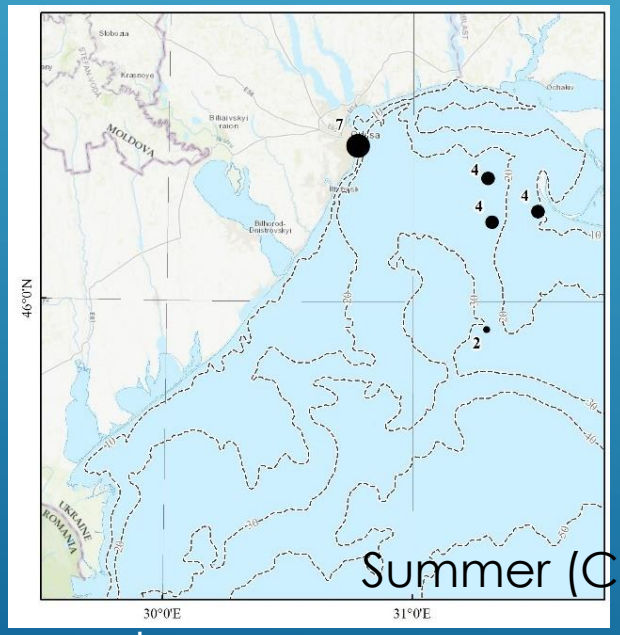
TYPES OF MP

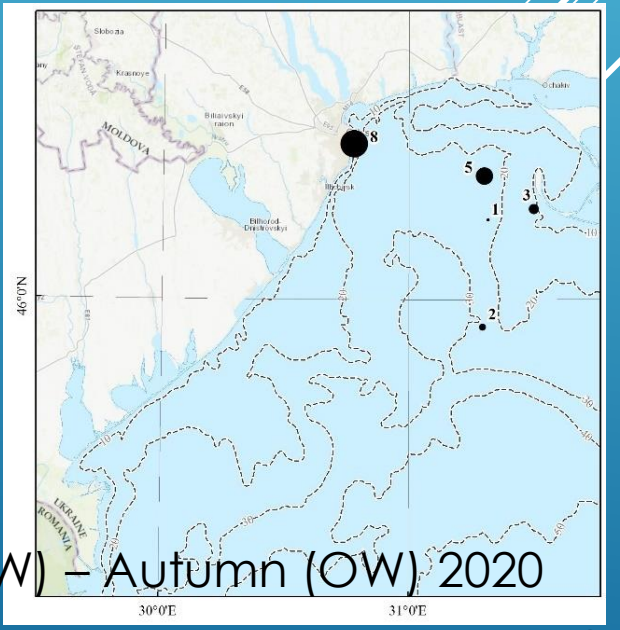








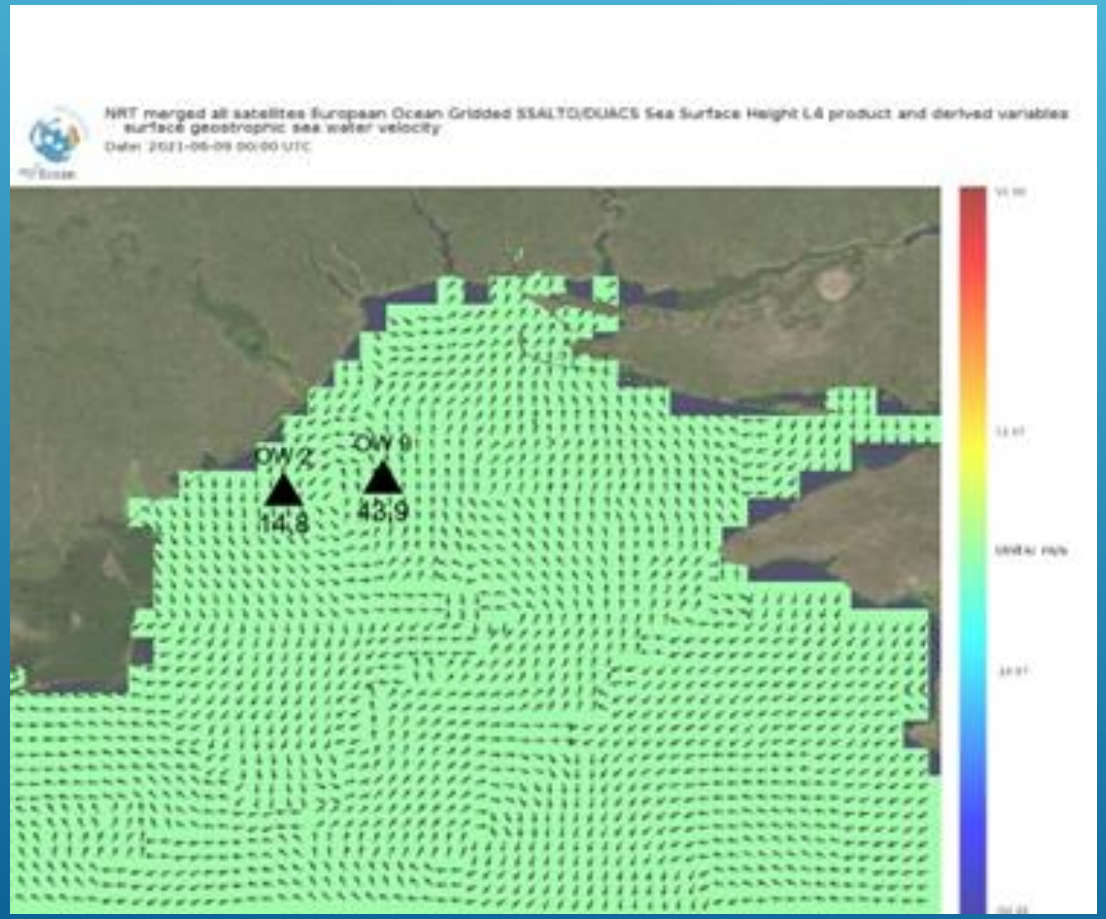




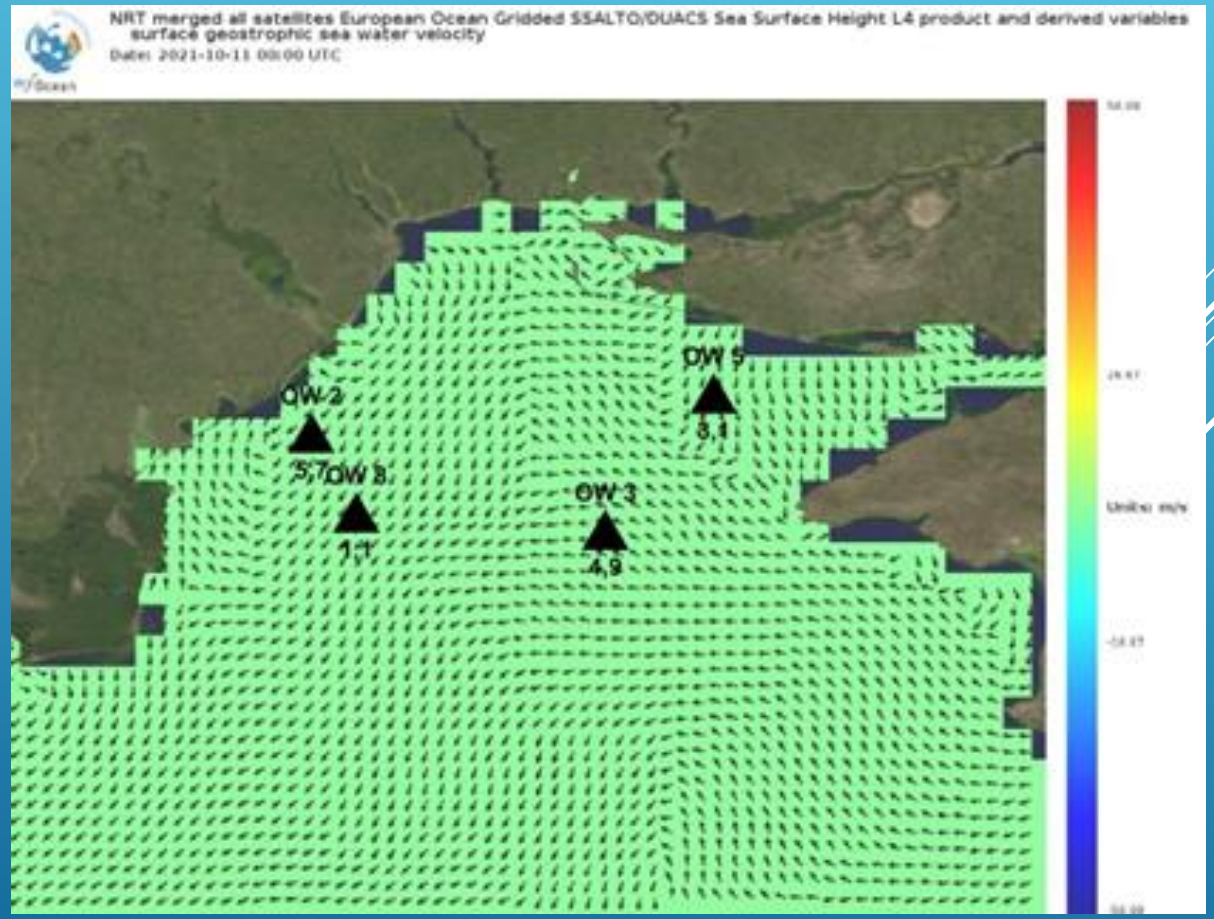
neuston hyponeuston neuston hyponeuston

DISTRIBUTION OF MP

Satellite data on surface geostrophic currents in neuston area



Summer 2021



Autumn 2021

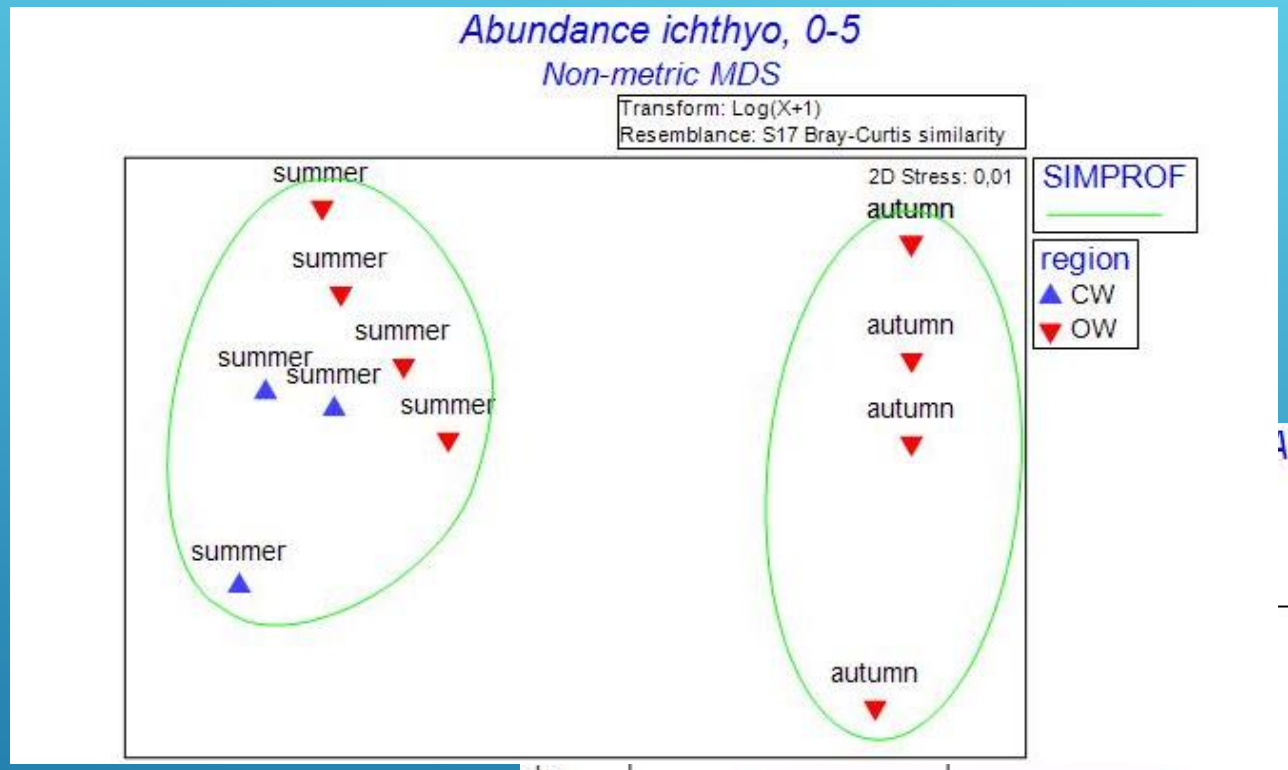
ICHTHYONEUSTON STRUCTURE

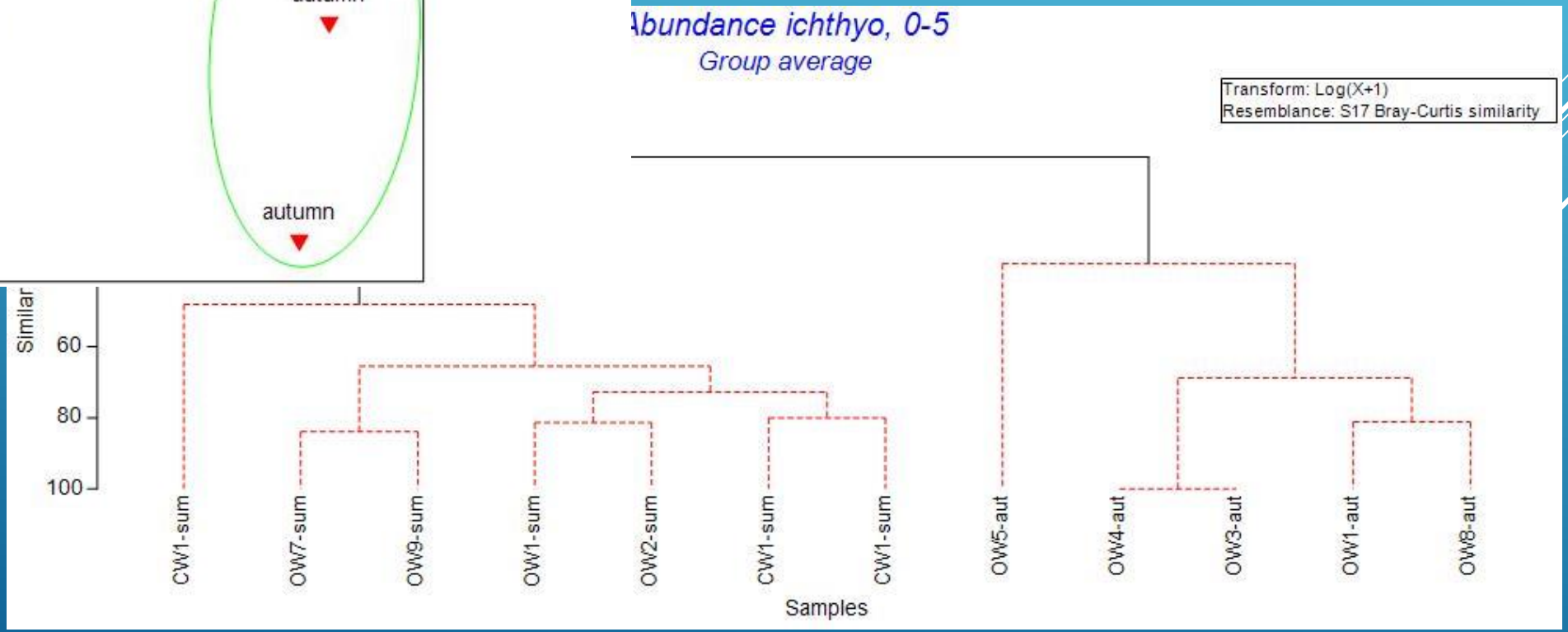
- Six numerous Black Sea fish species were noted:
- **European anchovy *Engraulis encrasicolus* (Linnaeus, 1758)** max abundance **374,6 ind.m^{-3}** (in CW) and **116 ind.m^{-3}** (in OW)
- Golden gray mullet *Chelon auratus* (Risso, 1810)
- Greater weever *Trachinus draco* Linnaeus, 1758
- Blackhand sole *Pegusa nasuta* (Pallas, 1814)
- Mediterranean horse mackerel *Trachurus mediterraneus* (Steindachner, 1868)
- Garfish *Belone belone* (Linnaeus, 1760)

Average abundance of IN

Species	CW		OW	
	0-5 cm	5-20 cm	0-5 cm	5-20 cm
Engraulis encrasicolus (egg)	191,13	73,23	39,67	33,00
Engraulis encrasicolus (larv)	-	-	13,71	31,50
Chelon auratus (egg)	21,60	2,90	-	-
Chelon auratus (larv)	-	-		4,00
Trachinus draco (egg)	4,05	-	-	-
Pegusa nasuta (egg)	1,50	0,50	-	-
Trachurus mediterraneus (egg)	-	-	3,00	20,00
Trachurus mediterraneus (larv)	-	-	-	-
Belone belone (egg)	0,30	-	-	-

ICHTHYONEUSTON STRUCTURE





MP:IN RATIOS

MP:IN ratio in the north-western part of the Black Sea on studied sites

Horizon	Average per region		Average per season				In total
	CW	OW	CW-s	CW-a	OW-s	OW-a	
0-5 cm	0,83	0,42	0,20	-	0,69	0,23	0,47
5-20 cm	0,76	0,06	0,21	13,17	0,09	0,04	2,39

Region	MP:neuston	Source
Portuguese west coast	0,0009	Rodrigues et al., 2020
Bay of Calvi	0,002	Collignon et al., 2014
Ligurian Sea	0,2	Pedrotti et al., 2014

Data on MP in surface waters in the Black Sea

source	MP, part.m-3
Aytan et al., 2016	969,09
Muchanov, 2019	0,6-7,0
Pojar, Stock, 2019	9,00

CONCLUSIONS

- From 17 types of MP the most frequent were black and red fibers, and black particles were among the fragments
- The **average MP concentration** in the coastal zone (**CW**) reached **264.0 particles ·m^{-3}** (horizon 0-5 cm) and **90.3 particles ·m^{-3}** (horizon 5-20 cm).
- The concentration of MP in open waters (**OW**) was **13.6 particles ·m^{-3}** (horizon 0-5 cm) and **2.6 particles ·m^{-3}** (horizon 5-20 cm).
- On average, the difference in MP concentrations on two horizons in the coastal area was 5.0 times, and in open waters – 3.8 times.
- The lower densities of the MP compared to IN in the neuston (**0,47**); and higher ratios of **MP:IN** in hyponeuston (**2,39**).
- Taking into account that the IN is the temporary component of the neustonic community, whereas MP is constant, we may consider that comparable densities of MP:IN favour their interrelation, negative effect and transport through the food web.

Thank you very much for your attention!

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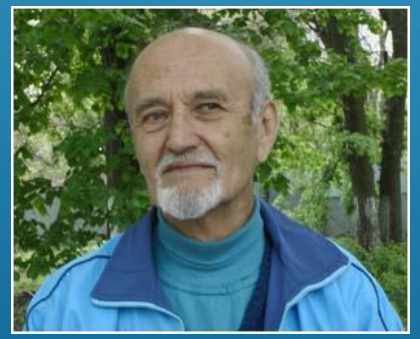
Serhii Snigirov

Sergiy Hutornoi

Ruslana Migas



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