Investigation by Bulgarian National Television and Televiziunea Română: Plastic Invasion in the Danube River (PART I)

By Milen Atanasov, Biliana Boneva

How microplastics affect life in the river

Microplastics in the Danube have turned into a kind of invasive species that aggressively attacks and takes over life in the river. This is the conclusion of the investigation carried out by the journalists from BNT - Milen Atanasov and Biliana Boneva, together with their colleagues from the Romanian public television TVR, Alina Salanți and Ana-Maria Stancu. From fishing nets to laboratories - they searched for answers to the question of what is happening to the fish in the Danube, while the surface waters of the lower course of the river pour more than 4 tons of floating plastic into the Black Sea every day.

The first part of the investigation takes the journalists to the labs of Konstantin Preslavsky University of Shumen, to the area of the Romanian city of Galați at the beginning of the Danube Delta, and to the National Institute for Marine Research and Development “Grigore Antipa” on the Black Sea coast. With the help of scientists and people who know well different sections of the lower Danube, the journalistic narrative reveals how the visible and especially microscopic plastic particles sneak into the food chain of aquatic organisms, how they reach their offspring, and how they threaten even humans - those who are responsible for plastic waste ending up in the river and from there - in the sea.

PHOTO: The bank of the Danube River at the beginning of the delta near the Romanian city of Galați.

THE JOURNEY OF A COMMON BARBEL FROM THE DANUBE TO THE UNIVERSITY OF SHUMEN

The belly of the barbel has turned upward under the rays of the sun, which blend with the lighting in one of the labs of the Department of Biology at the Faculty of Natural Sciences of the University of Shumen. The fish is an excellent representative of its species *barbus barbus* -

a large specimen weighing about 2 kilograms. It was caught in the Danube River near Belene and hardly ever imagined that it would be frozen and transported 200 kilometers east, all the way to the university in the city of Shumen.

"Here we have equipment, know-how and developed technology for studying microplastics in the environment and in organisms. And so the idea quite naturally arose to see the load of Danube inhabitants with microplastics," explains Prof. Nikolay Nachev, who teaches "Ecology and Environmental Monitoring" at the University of Shumen.

It is impressive how the professor speaks about plastic particle pollution as an "infection". He admits that the problem depresses and worries him. But it also fuels his scientific curiosity.

PHOTO: Prof. Nikolay Nachev records the process of examining tissues from the barbel.

"Since the topic of microplastic contamination is extremely trending and important at the moment, the so-called primary accumulation of data is just beginning. The Danube and its lower course, part of which is our coastline, are very important and essential from an ecological point of view, because apparently waste from Central and Eastern Europe accumulates here," the professor says.

While we reflect on his words about the grim ecological fate of the Danube River, we watch with some discomfort the barbel, which will soon become a donor of tissues in the name of science. This sacrifice will add valuable data to the knowledge of the interaction of floating plastic with river inhabitants. And this contact is constant and increasingly intensive. Every year, the Danube pours hundreds of tons of plastic into the Black Sea. And these are only the estimated visible quantities, based on not very comprehensive monitoring. The microplastic which is almost invisible to the human eye travels with the current, settles, accumulates, and leaves its mark.

PHOTO: Prof. Tsveteslava Ivanova and the BNT team observe the sampling process of tissues from the barbel.

"Three samples are taken from each part of the fish. Three from the skin, three from the gills, three from the intestinal tract, and three from the roe," explains Prof. Tsveteslava Ivanova, Dean of the Faculty of Natural Sciences.

A team of three young assistants skillfully moves between the tables with glassware and test tubes, while our TV crew observes and films the process from a respectful distance. The reasons are two - not to clumsily get in the way of science and not to contaminate the samples. Tiny fibers from our clothes could rise into the air and fall into the dishes or filters through which the tested material passes. Knowledge, a steady hand, and patience are needed to reach the final results of lab tests. The process takes days, and we do not want it to be repeated because of some thread introduced by us. Therefore, we follow sterility requirements and watch the processing of the collected tissues and the return of the fish to the refrigeration chamber. Two days will pass before the dried material on the filter reveals to us the miniature picture of a major problem - the penetration of plastic into the organism of river fish.

PHOTO: Besides filming, scientific rules also require making sketches during laboratory research.

THE MOMENT OF TRUTH – THE STEREOMICROSCOPE DOES NOT LIE

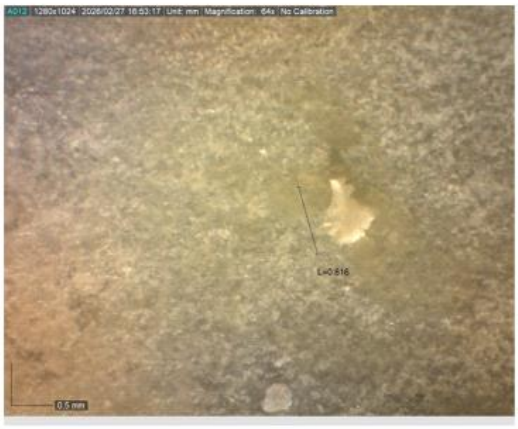
"Right now you see fibers with irregular shape. Now Associate Professor Ibryamova will measure them and show us their size. This software allows us to do this in real time," explains Prof. Ivanova.

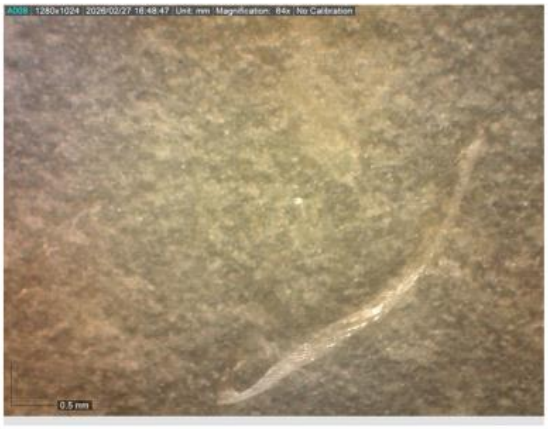
We lean over the laptop screen, which transmits an image from a stereomicroscope of each part of the sample taken from the flesh of the barbel two days earlier. Associate Professor Ibryamova carefully examines different areas of the filter with the tissue. Unfortunately, there is no pleasant surprise. With every movement, the microscope lens shows the presence of plastic particles. It really looks like contamination with something resembling viruses and bacteria. Something that does not belong there.

PHOTO: The BNT team, Prof. Ivanova and Assoc. Prof. Ibryamova observe images from the stereomicroscope of a sample from the barbel tissue.

Prof. Ivanova is used to this sight. She tells us that in studies in her department of marine mussels and fish from the Black Sea and inland water bodies, samples without plastic particles are almost never found. They are everywhere - in the gills, in the skin, even in the roe of female fish. The largest accumulation is in the intestinal tract. There is less in the flesh. But our observation shows that they are there too. In this case, those on the screen before us are of different shapes and sizes. The filamentous ones reach a length of 0.978 millimeters, while those with irregular contours require a different approach - measuring width and length. Every particle under one millimeter down to 20 micrometers is classified as microplastic, explains Prof. Ivanova. Particles under 20 micrometers are nanoplastics, which also enter living organisms.

Хриле, Мряна (р. Дунав) – 24.02.2026 г.





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PHOTOS: Images from the stereomicroscope of microplastic particles in the gills, skin, and roe of Danube barbel

The Dean of the Faculty of Natural Sciences summarizes the grim picture: *"Look how much there actually is on this filter. If we go through it carefully, which takes about half an hour, to average it, from each place, from the three samples, a considerable number of particles will come out per three grams of meat that we took two days ago. Which is not little at all. And extrapolated to one fish that we dissected, about 2 kg, it will turn out to be quite a large amount of plastic."*

Scientists, of course, are not satisfied only with establishing one big problem. The presence of worrying amounts of plastic in fish logically leads to the next question: how does it get there?

FLOATING PLASTIC "BITES"

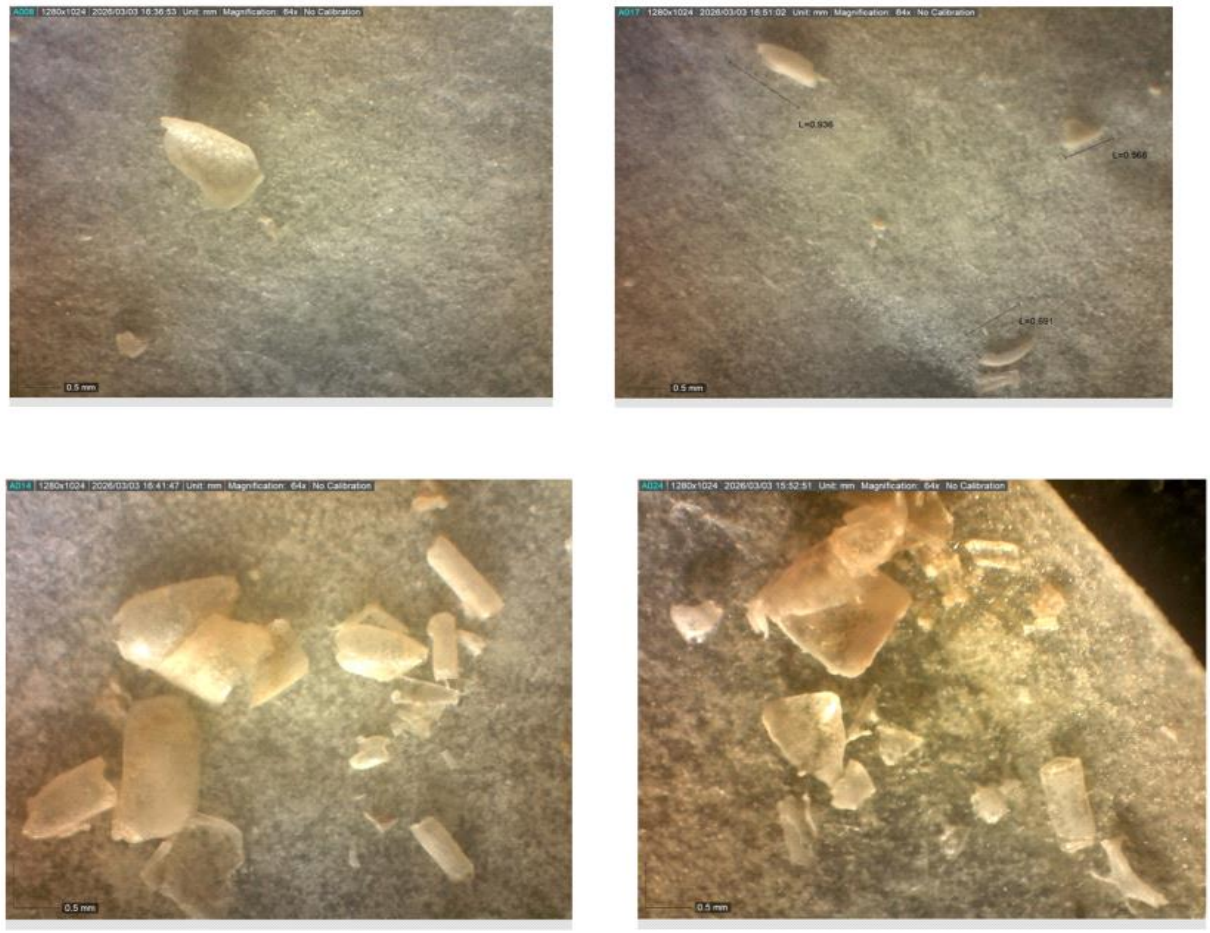
Fish have excellent vision, no worse than that of humans - Prof. Nachev explained to us on the first day of the study. We recall this fact when Prof. Ivanova mentions the description of plastic particles in aquatic organisms by type and color.

“If the fish can distinguish colors well, it means it will feed on plastic particles that have color. Because they resemble prey. It does not distinguish that it is plastic. To it, it resembles an invertebrate and moves like one - so it is prey and it feeds on it. So the color of the plastics we produce is not good for fish at all, because it confuses their behavior. In other words, we deceive them that this is food.”

Just like artificial lures in fishing, resembling small fish or flies. Only people hardly realize that fragmented plastic of different colors can also make fish “bite”. When entering the water, different types of microplastics undergo chemical modifications under the influence of acidity and temperature. Some of them begin to emit aromas, which is another way to stimulate fish appetite. The very surface of microplastics provides space for aquatic microorganisms to attach. Floating “bites” are formed that attract fish even more - by color, smell, and taste.

Ingested plastic particles accumulate in the intestinal tract and from there, through the bloodstream, reach the flesh and organs of the fish. In the gills, they enter through water filtration. Plastic particles, especially fibers, pass through even the finest systems of the fish to reach the roe of females.

Чревен тракт, Мряна (р. Дунав) – 24.02.2026 г.



PHOTOS: Images from the stereomicroscope of microplastic particles in the intestinal tract of Danube barbel

Depending on its type and the tissues it has entered, microplastic can affect in various ways. Regarding feeding and reproduction, Prof. Ivanova specifies:

"Irregularly shaped particles can indeed, if they are too many, clog the intestines of fish and lead to their death. There are many assumptions, besides intestinal blockage, about what the accumulation of these plastics could lead to. One is that it will increase satiety - the fish will think it is fed, but in fact it will not be, which will lead to weight loss and reduction of its flesh. There are hypotheses that the accumulation of microplastics in roe can lead to delayed growth of offspring and delayed hatching of fish. It could also disrupt the development of the fish itself. Changes and mutations are also induced at the DNA level. This was proven by colleagues from the Institute of Molecular Biology at the Bulgarian Academy of Sciences. In this direction, science is just beginning to develop."

A BIG PROBLEM, NOT ENOUGH DATA

It is impossible to avoid thinking about the continuation of the food chain and the effect of microplastics accumulating in the human body. Establishing this effect requires the

accumulation of more and more scientific data. In its typical evolutionary zeal, humanity notices most slowly the very large-scale problems that threaten its life and health. Prof. Nachev is firm that the relatively young science of ecology can only raise the alarm about plastic "contamination" and its consequences:

"Our organism as mammals, especially humans, has portal veins of the liver. These filtering organs are overcome by plastics. They have passed through them and have begun to accumulate. They accumulate in the organisms we use for food. They accumulate in domestic animals. They accumulate in wild animals we eat. They accumulate in marine resources we use for food. They are everywhere. I am afraid that we will have to communicate with clinical sciences in the next stage. At the moment we are at the stage of accumulating data on how much microplastic accumulates in the body (where and in which part of the body in particular), and the next very important answer must be given by medicine - to say what the physiological impact of these particles on the body is and what the clinical picture is of organisms literally contaminated with microplastics, including humans. Because the interconnections between the state of the environment and health may turn out to be very frightening. We will have to talk with physiologists and medical specialists," explained Prof. Nachev.

The water in the Danube recognizes no borders. The same applies to river organisms and, of course, to floating plastic, different in type and size. Active data accumulation on microplastics in river organisms and the potential risks for ecosystems and human health is also underway in neighboring Romania. Many questions are also raised by the impact of plastic pollution in the unique Danube Delta - an area with rich biodiversity, river branches and lakes.

GALAȚI – AT THE BEGINNING OF THE DANUBE DELTA

There is nothing accidental in the name of the university in the southeastern Romanian city of Galați. The higher education institution is called “Dunărea de Jos” - translated as “Lower Danube”. The city is located at the beginning of the Danube Delta. Here the river slows down, becomes wider, splits into branches, and begins to accumulate sediments. Along with them, the delta retains more plastic particles. This is one of the reasons for the latest study titled: *“Assessment of the risk to human health from accumulation of potentially toxic elements and microplastics in fish market products in the Danube River basin”*. Scientists from three departments of “Dunărea de Jos” University have joined forces in this study. Specialists in biotechnology, aquaculture, chemistry, physics, biology, and environment took part.

The study covers 23 species of fish and aquatic organisms, including marine ones. Its goal is not only to establish microplastic accumulation in these organisms from the river delta and the area where it meets the Black Sea, but also to analyze how safe they are for consumption. The results largely coincide with the observations of scientists from the University of Shumen. Plastic particles were found in over 90% of samples. The focus is on edible tissues. In addition to heavy metals, scientists also found microplastics in them. In many cases, the type of particles is identified as “polystyrene polymer”. The conclusion sounds like a warning: “*Microplastics represent an additional risk, as they can act as carriers of toxic substances and accumulate and transport potentially toxic elements.*”

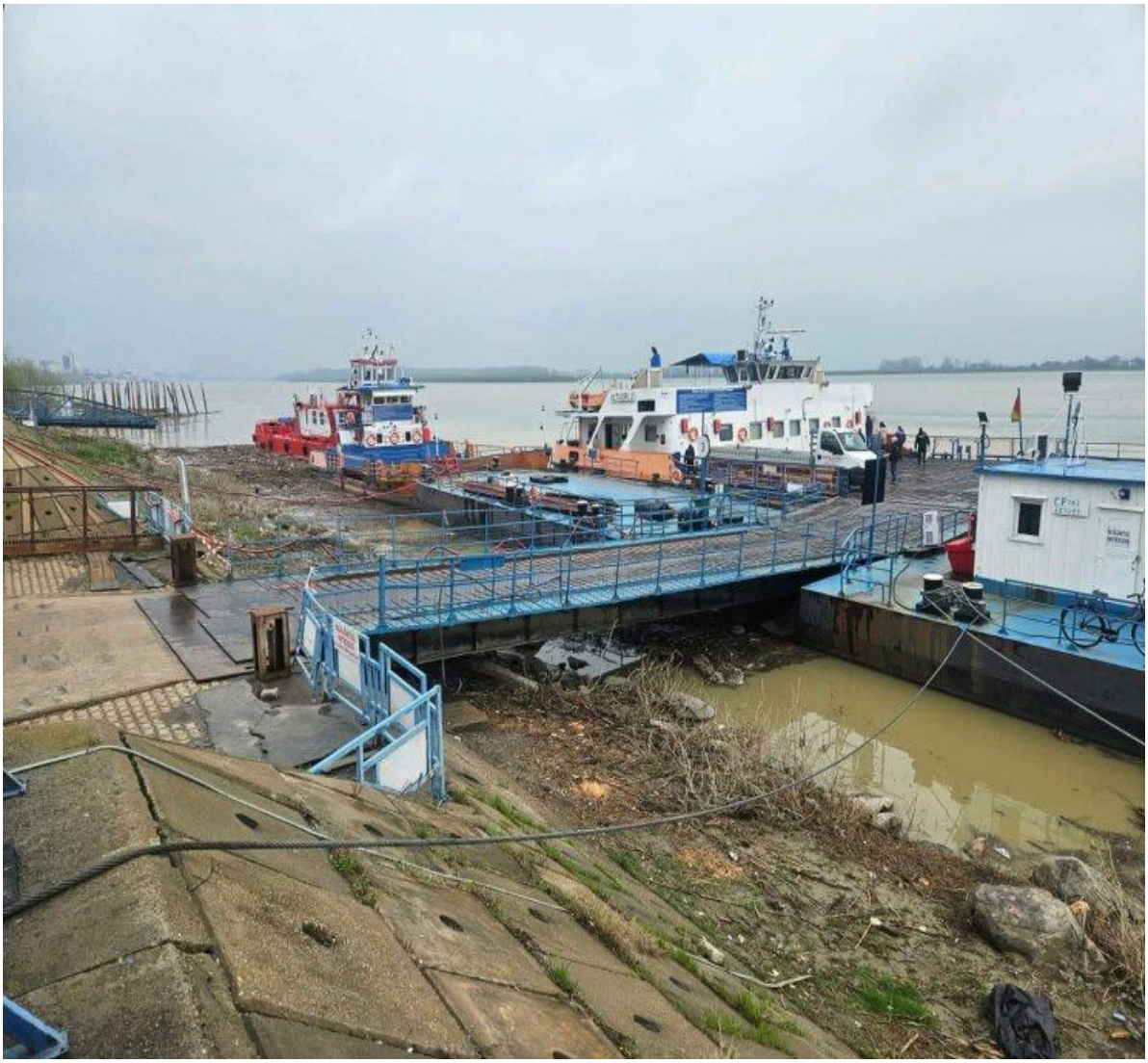


PHOTO: The Danube bank near the city of Galați after heavy rainfall in the spring of 2026.

The study also highlights another conclusion: *"Fish raised in a controlled environment contain fewer toxic elements compared to wild ones".* The reason is that wild species are exposed to a polluted environment in the Danube River and the Black Sea. For now, however, people can breathe a sigh of relief. Despite the presence of pollutants, Romanian scientists reach a reassuring conclusion, supported by numerous measurements and evidence: *"Consumption of fish from the Danube region does not pose a significant health risk, but pollution remains a real problem that must be monitored."*

The study highlights the need for regular and detailed monitoring, as well as better control of pollution, particularly in view of the river's role as a source of pollutants for the Black Sea.

REEDS – FILTER OR WASTE DEPOT

The interaction between floating plastic waste and reed systems in the Danube Delta has been the subject of several environmental studies conducted by the "Dunărea de Jos" University in recent years. Scientists have found that areas with denser reed growth retain more

microplastics and contribute to their sedimentation. On the one hand, they act as a filter that stops plastic on its way to the Black Sea. On the other, they turn into a kind of “depot” for long-term pollution, where microplastics remain trapped in the mud around the root systems of the plants and gradually extend their impact on the ecosystem both in and out of the water.

PHOTO: Plastic waste near the beginning of the Danube Delta along the Romanian bank

This impact is observed along the entire food chain. Small invertebrates that ingest microplastics are eaten by fish, creating risks for larger predators and birds, abundant in the delta. Mussels show clogged filtering structures and reduced filtration capacity. The composition of microorganisms around roots itself changes, and the risk of pathogenic bacteria increases. Consequences include disrupted processes related to the decomposition of organic substance and deterioration of water quality. It is no surprise that in heavily polluted reed areas, the Romanian scientists have recorded a decrease in biodiversity. Despite these “depots”, much of the floating plastic still passes through the delta into the Black Sea.

CONSTANȚA – BETWEEN THE RIVER AND THE SEA

Constanța has specific geographical advantages. As the largest port city in Romania, it provides proximity to the coastline, where the waters of the Danube River flow into the Black Sea through a system of canals. What could be a more suitable place to study the impact of floating plastic that has traveled for hundreds, and in some cases thousands of kilometers, in order to come into contact with organisms in both fresh and salt water? Moreover, this is where one of the most interesting scientific and educational centers in the region is located – the "Grigore Antipa" Institute. It is named after the great Romanian biologist, zoologist and ichthyologist who studied the fauna of the Black Sea, the Danube Delta and the riverside lakes.

PHOTO: The port city of Constanța.

In the spirit of this same tradition, but with the support of modern technologies, the scientists at the institute focus their activities on the preservation of biodiversity, climate change, and the sustainable use of marine resources. A new study by the institute reports serious pollution of the Romanian Black Sea coast with microplastics, affecting the marine ecosystem.

In the study, plastic particles were found in 93.3% of the examined samples of sprat and rapa whelk, and in 66.7% of the mussels collected in the area. The analyses compare the collected data with those from similar studies conducted in the regions of the Bulgarian Black Sea cities of Varna and Burgas. The conclusion shows a higher frequency of microplastics in marine organisms collected from Romanian waters. It turns out that near the Danube Delta, pollution with plastic particles is increasing.

PHOTO: Journalist Alina Salanti from TVR covering the issue with plastic pollution near Galati

It is difficult to say exactly how many tons of floating plastic are discharged through the Danube into the Black Sea every day. Certainly, the quantities vary depending on the seasons, the river level, and the currents. The large plastic waste visible on the surface is only part of this polymer flow. Submerged plastic, in the process of fragmentation and sedimentation, also moves along the riverbed. How is it formed and where does it come from? What is its composition and, most importantly – who are the main polluters? These questions prompt us to once again follow the lower course of the Danube in order to better understand the contact between the river, its banks and tributaries, which triggers the plastic “contamination” of Europe’s most significant waterway.

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