Investigation by BNT and TVR: IS THE DANUBE TURNING INTO A PLASTIC SOUP? (PART II)

By Milen Atanasov

The large floating waste on the surface is only part of the plastic invasion along the lower course of the Danube River. Plastic hides in bushes and roots, breaks down, settles, and continues to move along the bottom of the riverbed. Where does it actually come from and who are the biggest polluters?

Plastic Invasion in the Danube River (PART I)

The journalists from BNT Milen Atanasov and Bilyana Boneva and their colleagues from the Romanian public television TVR Alina Salanți and Ana-Maria Stancu set off on a hunt for plastic along the Danube. The second part of their investigation takes them to the Persina Nature Park, aboard the research vessel Rexdan, to the beaches in Romania and near the port of Ruse.

THE CRACKLING OF POLLUTION

Spring fills the air of the protected area “Kaikusha” with fluttering, buzzing, birdsong, and the rustling of grass. A strange crackling spoils the effect of this natural idyll. The sinister sound comes from sacks of plastic bottles collected by volunteers during the latest cleaning campaign in the swampy area five kilometers southwest of the Danube town of Belene. The same sound also spreads from the nearby reeds. At the base of their stems more discarded plastic bottles are piled up, expanding, shrinking and crackling under the sun’s rays.

PHOTO: Plastic waste on the beach in the town of Belene, opposite Magarets Island.

"Kaikusha" is a wetland reminiscent of the former floodplains along the Danube. It is located 5 km southeast of the town of Belene and is part of the impressive Persina Nature Park – one of the wildest places along the lower course of the river, home to 1,100 animal species. We completely understand why 25 years ago the ecologist Stoyan Mihov chose to settle in Belene. The protection and restoration of the Danube wetlands has turned into his life mission. During the last several years, Stoyan and employees of the nature park have also been researching the reproduction of the Danube shad. The fish enter from the Black Sea in order to lay their eggs along the lower course of the Danube. Searching for their roe is equivalent to searching for a drop of water inside the river, Stoyan explains.

Stoyan Mihov, ecologist: *"Their eggs are very light. They float in the water and are absolutely transparent. The little fish that forms inside the egg is transparent. Its eyes are transparent. Everything is transparent. This is a characteristic meant to protect it from predators. We use plankton and ichthyoplankton nets, very fine ones, with which we catch these eggs and count them. Despite the fact that the net has a small diameter, we catch in it all kinds of natural and unnatural materials. Unfortunately, in recent years more and more often, there are also many plastic particles and all sorts of other polluting results of human activity inside the net, together with the eggs. And sometimes we have no eggs, but we have more plastics inside the sample."*

PHOTO: Searching for Danube shad roe near the Belene Archipelago.

We have lost track of time while observing the herons and cormorants from the deck of the research boat with which Stoyan and biodiversity expert Veselin Koev study the river zone near Magarets Island - part of the local Danube archipelago. We also lose our sense of scale while the words of the ecologist immerse us in the microscopic world of the great plastic invasion.

Stoyan Mihov, ecologist: *"We can see the container floating on the surface, but these little pieces that are in the water, close to the bottom, are difficult to notice. Very often even living organisms break down the plastic purely mechanically when it passes through the stomach of the fish. One piece of 5 mm will become 1 mm. Then it will be taken in by the little crustaceans that live on the bottom. They will break it down even more, trying to extract some food from it, because the plastic becomes covered with algae. The crustacean cannot understand that this is plastic covered with algae and tries to eat them, while additionally crushing it. And all of this comes into the river. It will seem to us that the water is transparent, but in fact it carries with it a lot of the plastic that was once thrown away in some meadow or ravine."*

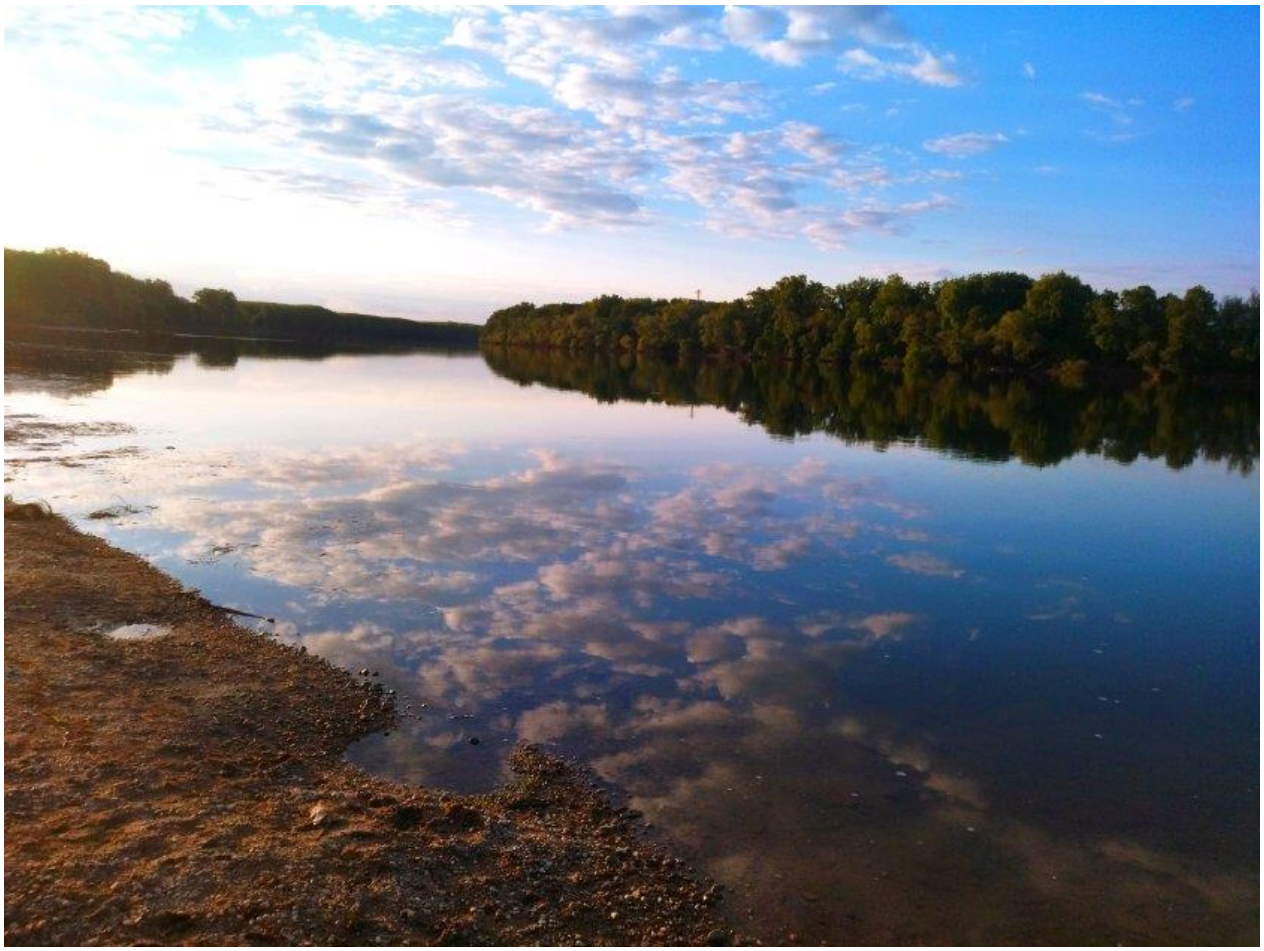

PHOTO: View toward part of the Belene Archipelago in the Danube River

This is only one of the many polluting scenarios in which the crackling large plastic from the coastal zones of the Danube turns into a stream of microparticles along the lower course of the river. New information about these particles is also added by the Romanian scientists from Rexdan – the largest and most modern ship for comprehensive monitoring of the Danube River.

ABOARD THE FLOATING LABORATORY

The TVR journalist Alina Salanți is allowed aboard Rexdan at a moment when the scientists are "capturing" plastic particles beneath the surface near the Romanian city of Galați. The mesh of the water sampling device is much finer than the one for catching roe during the fish breeding period. It retains all particles larger than 50 microns. After collecting and processing the samples under laboratory conditions, the separated plastic particles form a colorful kaleidoscope upon the white filter. It is difficult to determine exactly how much, but certainly large quantities of this microplastic accumulate in the Danube Delta – an area with unique nature and biodiversity.

PHOTO: The research vessel Rexdan near the Romanian city of Galați

"The Danube Delta is part of the UNESCO World Heritage. We are talking about exceptionally rich biodiversity, and microplastic has a serious impact on aquatic organisms, animals and birds. There are studies proving the presence of microplastic even in birds," ***explains Madalina Calmuc,*** *researcher from the Faculty of Sciences and Environment at the Lower Danube University.*

In all water and sediment samples taken aboard Rexdan, the scientists discover microplastics. But in the natural environment these plastics are not found in pure form, reminds Professor Lucian Georgescu, who is coordinator of the Rexdan research complex.

PHOTO: Research of the Danube current near Galați for microplastic particles

Professor Dr. Lucian Puiu Georgescu, Lower Danube University: *"When a microplastic particle enters an organism, it does not enter alone. Together with it also enter the substances stuck to its surface - heavy metals, pharmaceutical residues, pesticides, as well as pathogens, viruses and bacteria."*

A small polymer time bomb. This is what the fragmented plastic particles turn into. They become carriers of biological and chemical content, ready to activate and trigger all kinds of reactions upon contact, attachment or entry into living organisms. All this is happening while we are afraid that someone will implant chips into us in order to change our habits, perceptions or DNA...

PHOTO: This is what the plastic particles from the river current along the lower course of the Danube River look like

We no longer consider the definition "plastic soup" exaggerated when speaking about the tons of macro and microplastic along the lower course of the Danube. However, Bulgaria and Romania hardly bear the entire responsibility for this pollution. In fact, Professor Georgescu is aware what share of it is caused by the two countries.

Professor Dr. Lucian Puiu Georgescu, Lower Danube University: *"The Danube basin covers around 33 percent of the territory of the European Union. Our research ship reaches Vienna and performs analyses along the entire course of the river. The data show that Romania and Bulgaria contribute less than 15 percent to the microplastic pollution. The remaining 85 percent come from the sections upstream, before the Iron Gates."*

Only that the floating plastic slips through the gigantic hydropower complex between Serbia and Romania, finds its way along the Bulgarian and Romanian shore, fills the Danube Delta and inevitably reaches the Black Sea.

LET'S GO TO THE SEA – WITH A TASTE OF SALT AND PLASTIC

"If you come to the seaside and do not eat a portion of anchovies, it is as if the vacation is not real. But recently we established the presence of microplastic in the digestive tract of some fish traditionally consumed in Romania, Bulgaria and Turkey." ***This is shared by Elena Stoica****, senior scientific researcher at the Grigore Antipa Institute for Marine Research and Development.*

PHOTO: Plastic waste near the Danube-Black Sea canal near the city of Constanța

The Romanian journalist from the city of Constanța Ana-Maria Stancu meets with scientists from the institute in order to check the results and conclusions from their latest research related to the invasion of microplastic in the coastal zone. In the story of Ana-Maria and the scientists there seems to be a little bit of everything: gastronomy, predatory and not-so-predatory organisms, consumers, textiles, washing, wastewater, treatment plants and polluted marine environment.

Elena Stoica, senior scientific researcher at the Grigore Antipa Institute for Marine Research and Development: *"Besides anchovies, in Romania mussels and rapana snails are increasingly consumed. We studied both species. Rapana snails are predators and feed on mussels, so we wanted to understand whether the concentration of microplastic in them was even higher."*

PHOTO: Research of mussels in a laboratory at the Grigore Antipa Institute in the city of Constanța

In the mussels from the port area of Constanța the scientists discover an average of 40 microplastic particles in each of the examined specimens. There is a logical explanation for this worrying result. Ports are enclosed spaces in which microplastic accumulates more easily. The data of the Romanian scientists about the type and shape of the plastic particles in organisms are similar to those of their Bulgarian colleagues. They point toward the tiny fibers.

Elena Stoica, senior scientific researcher at the Grigore Antipa Institute for Marine Research and Development: *"Microfibers are one of the most widespread forms of microplastic in the world ocean and in the Black Sea. Their main source is human activity. They are released during the washing of synthetic clothes. These plastic textile fibers enter the sewage system, and wastewater treatment plants still do not have sufficiently effective technologies to retain them. Thus the microfibers reach the marine environment."*

PHOTO: Most of the microplastic in mussels and fish examined at the Grigore Antipa Institute is in the form of fibers

Huge quantities of microplastic have already accumulated in the Black Sea, while the pollution on its surface is twice as high as that in the Mediterranean Sea, the scientists from the Grigore Antipa

Institute categorically state. They remind that the sediments constantly release particles back into the water that the polymer structure of plastic does not allow it to decompose completely in the natural environment, but only to fragment more and more. This process may continue between one hundred and five hundred years.

A PLASTIC SAFARI NEAR RUSE

The BNT team decides to personally attack the problem. The irony is that it does it using plastic gloves and a plastic bag, but in the name of the experimental hunt for large and small plastic in the area of the Prista hut – shortly before the Danube enters the port zone of the city of Ruse. Marine biologist Nikola Bobchev is also drawn into the short plastic safari. Although quite young, he has rich experience in the study of plastic in different water basins.

The area of the sandy strip near the Danube looks relatively unpolluted, but within a few minutes we manage to overfill the bag with all kinds of plastic waste: large and small, in different stages of fragmentation and merging with the river landscape. Plastic bottles from water and beer predominate, but there is also no shortage of pieces of styrofoam, polyamide remains from fishing nets and ropes, labels with blurred inscriptions in Cyrillic and Latin script. Among the other trophies are a punctured ball, a child's flip-flop and a rubber boot, about which we learn that it is as much rubber as it is content of plastic fibers. Nikola patiently explains what happens to the waste in the zone between the shallows and the vegetation along the wet shore from which the river has recently retreated.

Nikola Bobchev, marine biologist: *"When the large plastic objects accumulate near the shore during the dry period, the ultraviolet rays, no matter how much we think plastic is resistant, destroy them severely. One plastic cup, believe me, does not remain in the same condition for more than one summer. It falls apart into small pieces. But this is only part of the problem. Industry also produces plastic in small sizes. These small particles are incorporated into cosmetics, as an abrasive product in toothpaste or in cleaning creams."*

PHOTO: Plastic from packaging along the sandy strip in the area of the Prista hut near the city of Ruse

And it is not only cosmetics. Nikola presents the air and the roads as a huge generator of microplastic, which is released from the traction of car tires with the asphalt and mixes with the fine dust particles. Wind and rain gradually push them toward the water basins. The polymer pellets produced by industry for manufacturing different plastic objects often fly into the air during transportation by ships and barges and thus end up in the river. Even after the death of crustaceans, mussels, fish or birds, the plastic in their bodies does not decompose, but is once again carried in the water or settles and sticks to the bottom. Scientists manage to detect it in the sand by using special instruments made of metal and glass. A logical question arises: since we can detect and separate microplastic in laboratories, can we not also sieve and capture it outside them? Nikola has an answer.

Nikola Bobchev, marine biologist: *"Older wastewater treatment plants do not capture microplastic particles so well, but modern wastewater treatment plants capture over 90% of them, which is quite a great success. There are such plants in Bulgaria as well. The problem in Bulgaria is that there are still places where a wastewater treatment plant is missing."*

PHOTO: With the help of instruments made of metal and glass the concentration of plastic particles in the river sediments is established

The sad admission of the scientists is that for now there is no effective way to remove the microplastic that has spread through the rivers and seas. But there are ways to limit its invasion. Among them are the introduction of a deposit system for packaging, the European requirement for collecting 90% of plastic bottles, the ban on products with intentionally added plastic particles, the installation of microplastic filters in washing machines for capturing the fibers released from artificial fabrics during washing. But the most important thing, it seems, is to admit that there is not a single or several big polluters whom we can point at admonishingly with a finger. The bitter truth is that the biggest polluter... is all of us, the people, with our habits that have become fused with plastic. How and to what extent we allow plastic into our lives determines whether it ends up in the air, in rivers, in the sea, in food chains, and ultimately in our own bodies.

PHOTO: Studies of the coastal river layers in depth reveal the presence of plastic from decades ago

After so much collected data, conversations and filmed footage along the Romanian and Bulgarian shore of the Danube, we ourselves – the journalists from BNT and TVR – began to perceive plastic differently. We realize that it literally accumulates in all layers of contemporary life. The process began a century and a half ago. But today it has reached shocking dimensions. And it is more than high time to stop it. So that after centuries they will not call the times in which we live "the plastic era".

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