STUDY OF PLASTIC LITTER ACCUMULATION IN THE WESTERN PART OF THE RUSSIAN ARCTIC IN 2019-2021.

Alexandra Ershova, Tatyana Eremina, Irina Makeeva

Laboratory for Plastic Pollution Research (PlasticLab), Russian State Hydrometeorological University (RSHU), St. Petersburg, Russia

ershova@rshu.ru

Abstract: The results of the study in the seas of the Russian Arctic in 2019 and 2021 show that the seas of the western Arctic are significantly polluted by plastic waste - both large litter and microplastics, including both the busy traffic routes, and the coasts of the most remote and uninhabited islands.

Key words: marine pollution, marine debris, microplastics, Russian Arctic, Barents Sea.

In 2019 and 2021 RSHU team conducted the study in the seas of the Russian Arctic in order to study the pollution of the marine environment with plastic particles – large litter and microplastics. Two stages of research included the water and sediment sampling in 2019 carried out in frames of the TRANSARCTICA-2019 program, and a complex survey held in 2021 as part of the Arctic Floating University - AFU-2021 cruise, when marine field works (water sampling and visual observations of the sea surface) were complemented by the coastal landings on the beaches of Arctic remote archipelagos. The water sampling was done by the sub-surface water pumping system HydroPuMP, developed by PlasticLab and patented in 2021.

The studies in 2019 showed that, in general, along the Northern Sea Route (NSR), the maximum accumulation of microplastics in surface waters occurs in the Barents Sea, which confirms the data of studies carried out earlier in this region by other scientific groups, while the lowest and negligible amounts were found in the East Siberian Sea. The average concentration in the Barents Sea was 30 pcs / m3. Microplastic particles of various shapes, sizes and colors were found, with the most common - transparent fibers. Particles of indefinite shapes in vivid colors have been generally found in the seas with

heavy traffic load, namely the Barents and the Kara seas. Most of the microparticles were synthetic polymers such as PET, PP and PE.

In 2021 a complex survey of water in the Barents Sea showed in general high level of pollution of the surface with both large marine litter items, and microplastic particles, that can mainly be explained by the intensive traffic in this area. Additional surveys were carried out on the coasts of Western Arctic during the landings in 2021 that showed significant pollution of the coasts with plastic litter on Novaya Zemlya (at Cape Zhelaniya) and on Bell Island of Franz Josef Land. A large amount of man-made litter was found on the Barents Sea coast of Cape Zhelaniya (6 large bags in volume, more than 1000 fragments and plastic items per 100 meters of the beach), which is about 8 times more than the amount of litter on the Kara coast of the same cape. At the same time, the composition of the litter on the coasts of the two expositions was significantly different: in the Barents Sea area, the litter was consisting of the remains of fishing gear and bottles of various cosmetic products and non-food of European origin, while in the Kara area the litter was predominantly metal, most likely of local origin (the remnants of economic activity on N.Zemyla from Soviet times). At the same time the survey of the 100 m strip of the beach on Bell Island (the completely uninhabited part of the Franz Jozef Land archipelago) showed over 100 fragments of plastic products only and the complete absence of other materials (metal, wood, textiles), which indicates a difference in the sources of litter on this coast and on the coast of Novaya Zemlya and the ways of its distribution.

Once again, the theory of the transfer of plastic waste to the western Arctic from the North Atlantic from the more densely populated regions and its accumulation in the Barents Sea off the shores of Novaya Zemlya and the uninhabited islands of Franz Josef Land has been confirmed. However, the high (and rapidly growing) traffic load in this area is another very important source of litter pollution.

The research was carried out within the framework of the State Assignment of the Ministry of Science and Higher Education of the Russian Federation, project No. FSZU-2020-0009, as well as with the support of the Arctic Floating University project - AFU-2021.