INNOVATIVE APPROACH TO SAMPLING OF MICROPLASTICS IN THE MARINE ENVIRONMENT

Filip Radunović[1], Špiro Ivošević[1], Neven Cukrov[2]

[1]University of Montenegro, Faculty of Maritime Studies Kotor, Put I Bokeljske brigade 44, 85330 Kotor, Montenegro, fradunovic02@gmail.com, spiroi@ucg.ac.me,
[2]Ruđer Bošković Institute, Bijenička 55, 10000 Zagreb, Croatia, spiroi@ucg.ac.me

ABSTRACT

MARPOL recognises various types of marine pollution, including oil, garbage, sewage, and greenhouse gases pollutions. Garbage-sourced microplastics (MP), due to their small size and high resistance coupled with their chronic biological effects, pose a serious omnipresent environmental threat. This paper's research was motivated by the lack of methodology innovations in the field of sea environment monitoring and sampling of MPs.

Traditionally, microplastic sampling was conducted using big manta-ray nets, requiring deployment from motor-propelled vessels. Driving the question of possible usage of manta-ray net in combination with unmanned vehicles for a more economical, eco-friendly, flexible and precise approach. The innovative contribution of this research is highlighted through the design of a mini manta-ray net, successfully integrated on Remotely Operated Underwater Vehicles (ROV). Mini manta-ray was constructed in accordance with all relevant technical specifications using a special 300 micron net. First, the prototype was constructed for preliminary testing of structural integrity and stability. Based on experience and the results of preliminary prototype testing, the construction of the final product was used for our first MP sampling using an ROV. Sample of 1.5 liters of seawater obtained from the filtration of 5000 liters of seawater was then sent for laboratory analysis to evaluate system functionality under realistic operational conditions.

Practical testing confirmed stable and functional operational integration of mini manta-ray with ROV. From good water worthiness to positive results from laboratory analysis, indicating reliable sampling performance. The results show realistic functionality and potential for further improvements and optimization of the sampling of microplastics by ROV.

Keywords: Microplastics (MP), Innovative, Mini manta-ray net, Remotely Operated Underwater Vehicles (ROV).