Keeping a sharp Weka eye on tiny plastics – the usability and perspective of Fiji image analysis tool for microplastics identification in environmental samples

Alena Sakovich* , Emma Labis , Carolin Müller[1], and Tim Dudeck[1]

[1]Leibniz Centre for Tropical Marine Research – Fahrenheitstraße 6, 28359 Bremen, Germany

Abstract

The ubiquitous distribution of microplastics (MPs) in the environment is of rising scientific and civil concern. As a consequence, the number of studies on MPs has been growing rapidly in the last decades. One particularly important area of these research initiatives implies developing fast, relatively simple, and effective techniques for MPs detection as an alternative to costly and complex spectroscopic methods. One potential option based on image analysis is the Trainable Weka Segmentation (TWS). This Fiji software plugin uses machine learning algorithms to compute segmentation based on pixel classification. The primary advantage of TWS for MPs identification lies in the ability to divide the image into two or more groups by using the differences in pixel contrast, intensity, and texture of the selected regions of interest. Thereby, it is possible to detect specific shapes and structures (e.g., fibers, fragments) based on selected areas. TWS has been tested on images of zooplankton samples from regions potentially contaminated by MPs, and an image stack of biota samples spiked with MPs was used as a referential source for a model. Used primarily to compensate for inefficient digestion of organic material, TWS allowed removing regions of zooplankton remains from the image. Moreover, TWS aided in the identification and counting of potential MP particles. However, given the "automated" nature of such a tool, the applicability of TWS for large-scale MPs analysis should be repeatedly tested on artificial samples spiked with MPs. Complementary cross-checking using spectroscopic methods will further minimize the risk of false-positive results when applied on environmental samples. On the basis of further experiments, TWS has the potential to allow for quick and automated analysis of i) the presence of MPs in samples; ii) their numerical abundance; iii) MPs shapes and sizes.

Keywords: microplastic litter, computer methods, image segmentation, machine learning

*Speaker