First evidence of MPs in remote high mountain lakes of Sierra Nevada, Spain

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Abstract

The presence of microplastics (MPs) has been studied so far in almost every Earth water ecosystem, with increasing attention paid to rivers and lakes, including some remote places. However, differences in MPs concentration and characterization among nearby lakes has rarely been examined. This work was carried out in the framework of the "74 High Mountain Glacial-Lake Oases" Citizen Science initiative. The main objective was to analyze the abundance of MPs in the surface of 35 glacial lakes of Sierra Nevada National Park in Southern Spain. After the sampling, MPs were extracted and qualitative parameters as the shape, size, color and nature of MPs were determined by using a stereomicroscope. In addition, the number and concentration of these particles were quantified and statistically related to some characteristics of the lakes and environmental variables. The main results showed that MPs were present in all lakes, with a maximum abundance of 21.3 particles/L. Fragments were the predominant shape (59.7%) followed by fibers (38.8%) and very scarce spheres. MPs 0.05), but the concentrations were related to the presence of meadows surrounding the lakes (p-value = 0.035). This result indicates a main anthropic origin of MPs in these lakes caused by outdoor and leisure activities of mountaineers, in addition to atmospheric transport which may provides a relevant source of MPs to all lakes. The great abundance of MPs in these remote lakes is a major concern that deserves further investigation and can serve as a base to improve regulations about waste management and to adopt stricter objectives to avoid the microplastic contamination in natural preserve areas.

Keywords: Citizen Science, glacial lakes, plastic, Sierra Nevada National Park

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