First insights into leachate toxicity of field collected plastics towards marine zooplankton

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Abstract

Plastic pollution represents a global threat to marine ecosystems. Plastic litter can leach a variety of substances into marine environments; however, few studies are available on leachate toxicity on marine biota. In the frame of the JPI-O Response and the PRIN project, we investigated the ecotoxicological effects of plastic leachates exposure on four marine zooplankton species. Four typology of plastics - fishing ropes, hard plastics, plastic bottles, pellets - were collected in different geographic areas, including the Adriatic and Ligurian Sea and the Biscay Bay. They were cut into small fragments and ground into a fraction $<$ 250 μm. A concentration of 1 g/L of plastics was used to obtain leachates in seawater after 1 day. Besides undiluted leachate (1 g/L), serial dilutions (0.33-0.1-0.033%) were prepared to assess plastic ecotoxicity towards *Amphibalanus amphitrite* crustacean nauplii, *Paracentrotus lividus* sea urchin larvae, *Brachionus plicatilis* rotifers and *Aurelia* sp. jellyfish ephyrae. Mortality, immobility, development and behavior (swimming speed or frequency of pulsations) were investigated up to 48 h exposure. No mortality or immobility were detected in any species at any exposure time for all leachates; however, a toxic effect in term of EC50 was observed in behavior and development of barnacles, ephyrae and sea urchins exposed to fishing ropes' leachate. These findings indicate an ecotoxicological risk associated to fishing ropes leachates collected in the Adriatic Sea. However, they need to be confirmed by chemical characterization, to clarify if the toxicity may be ascribed to specific additives or sorbed chemicals released during leaching process.

Keywords: Plastic leachate, ecotoxicology, Immobility, Swimming behavior, marine invertebrates, zooplankton

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