MANUELA PICCARDO

Biosketch

Graduated in Environmental Sciences in 2016 with an experimental thesis in Zoology applied to the conservation and management of natural systems focused on quantifying microplastics in the sentinel species *Mullus barbatus*. He worked as a fellow at CoNISMA, where he contributed to the project CLEAN SEA LIFE (GIE / IT / 000999). In 2021 she obtained a PhD in Environment and Life (XXXIII cycle, MD / 4 grant co-funded by the University of Trieste and the Anton Dohrn Zoological Station) with a thesis entitled "Toxicological effects of Micro- and nanoplastics in different marine model organisms". She received a HORIZON2020 grant (N 730984) under the AssemblePlus project, which allowed her to conduct research at the *Observatoire Océanologique de Banyuls sur mer* (France). Currently, she is a research fellow at the Department of Life Sciences within the project "Evaluation of pollution of water and marine sediments in Natura 2000 sites" as part of the project "MITigation and monitoring of the interaction between artisanal fishing and fish fauna, protected species of aquatic avifauna and benthic habitats in Natura 2000 sites", funded by the OP EMFF (2014-2020) measure 1.40 - project code 071 / RBC / 20" - CUP D48D2000073000

Research

Her doctoral activity focused on the effects of the two fractions of marine debris that have attracted the attention of the scientific community in recent years: Microplastics (1 um-5mm) and Nanoplastics (< 1 um). With respect to microplastics, the central theme was to evaluate the potential effects of the toxicity of polyethylene terephthalate microparticles (PET) on various marine organisms, with particular attention to *Vibrio fischeri* bioluminescence, *Phaeodactylum tricornutum* growth, and *Paracentrotus lividus* larval development in relation to changes in factors related to global change (e.g., changes in pH and food resource availability). The results of this study have been published and have shown that i) unlike *Paracentrotus lividus* larvae, *V. fischeri* and *P. tricornutum* do not appear to show significant effects; ii) the pluei of *P. lividus* have shown negative effects due to anomalous development and, in the case of non-anomalous individuals, to a general reduction in their biomass; iii) the different sizes of the microplastics tested have shown effects that are not always related to their size; (iv) differences were found between the standard pH scenario and the acidic pH scenario; (v) the food availability factor significantly affected the ecotoxicological responses of echinoderms; (iv) the complexity of microplastic toxicity mechanisms, which depend on several factors (e.g. e.g. pH and food availability) was confirmed, suggesting that they need to be taken into account if a more complete picture of their actual dynamics in natural systems is to be obtained.

In addition to a careful bibliographic analysis on the subject of nanoplastics, which led to a review paper published in *Marine Pollution Bulletin*, she has had the opportunity in recent years to conduct some experiments on *Amphiprion ocellaris* juveniles exposed to micro- and nanoplastics in the laboratory of the *Observatoire Océanologique de Banyuls sur mer*. The potential adverse effects were assessed using a large battery of molecular and cellular biomarkers, focusing on the catalytic activity of some enzymes involved in the response to oxidative stress (CAT, GST, GR), on the total capacity of antioxidant scavengers (TOSC) and on the possible changes in gene expression using RNA sequencing techniques.

Other work published in the last two years has focused on assessing the ecotoxicological risk of elutriates from cigarette butts (conventional and electronic) and food packaging exposed to different environmental conditions (light/dark, rain/no rain). The most recent research activity then concerned a particular type of primary microplastic, namely glitter (submillimeter particles with a multimaterial character composed of plastic polymers and metals that give it its characteristic shine) and the development of protocols for the extraction of microplastics from different environmental matrices (sediment, water and biota), evaluating the potential impact of operator experience.

Publications

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1. Piccardo, M., Provenza, F., Anselmi, S., Broccoli, A. & Terlizzi, A. Use of Sediqualsoft ® to Determine the Toxicity of Cigarette Butts to Marine Species: A Weather Simulation Test. *J. Mar. Sci. Eng.* **9**, 734 (**2021**).

2. Piccardo, M., Priami, G. S., Anselmi, S., Bevilacqua, S. & Renzi, M. Intra-Laboratory Calibration Exercise for Quantification of Microplastic Particles in Fine-Grained Sediment Samples : Special Focus on the Influence of User Experience. *Microplastics* 440–455 (**2022**).

3. Piccardo, M., Renzi, M. & Terlizzi, A. Nanoplastics in the oceans: Theory, experimental evidence and real world. *Mar. Pollut. Bull.* **157**, 111317 (**2020**).

4. Piccardo, M. *et al.* Impacts of Plastic-Made Packaging on Marine Key Species: Effects Following Water Acidification and Ecological Implications. *J. Mar. Sci. Eng.* **9**, 432 (**2021**).

5. Piccardo, M. *et al.* PET microplastics toxicity on marine key species is influenced by pH, particle size and food variations. *Sci. Total Environ.* **715**, 136947 (**2020**).

6. Pignattelli, S. *et al.* Short-term physiological and biometrical responses of *Lepidium sativum* seedlings exposed to PET-made microplastics and acid rain. *Ecotoxicol. Environ. Saf.* **208**, 111718 (**2021**).

7. Pignattelli, S., Broccoli, A., Piccardo, M., Terlizzi, A. & Renzi, M. Effects of polyethylene terephthalate (PET) microplastics and acid rain on physiology and growth of *Lepidium sativum*. *Environ. Pollut.* **282**, 116997 (**2021**).

8. Felline, S., Piccardo, M., De Benedetto, G. E., Malitesta, C. & Terlizzi, A. Microplastics' Occurrence in Edible Fish Species (*Mullus barbatus* and *M. surmuletus*) from an Italian Marine Protected Area. Microplastics 1, 291–302 (**2022**).