EXPERIMENTAL EVIDENCE OF PHYSIOLOGICAL AND BEHAVIORAL EFFECTS OF MICROPLASTICS INGESTION IN *SPARUS AURATA*

Beatriz Rios-Fuster*[1], Pablo Arechavala-Lopez[2,3], Karlos García-Marcos[1], Carme Alomar[1], Montserrat Compa[1], Elvira Álvarez[1] and Salud Deudero[1]

[1] Instituto Español de Oceanografía, Centro Oceanográfico de Baleares, Muelle de Poniente s/n, 07015 Mallorca, SPAIN
[2] Fish Ecology Group. Instituto Mediterráneo de Estudios Avanzados (IMEDEA-CSIC/UIB), Mallorca, SPAIN
[3] Fish Ethology and Welfare Group. Centro de Ciencias do Mar (CCMAR), Faro, PORTUGAL

*Corresponding author. E-mail address: beatriz.rios@ieo.es

Abstract

Increasing global research has identified microplastics to be impacting marine organisms. Here, we investigate the physiological and behavioral effects of thirty-six juvenile *Sparus aurata* exposed to microplastic enriched diets during a 21-day period. Physiological effects were assessed in liver and brain using the following biomarkers: activities of the antioxidant enzymes catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione reductase (GRd), the detoxifying enzyme glutathione S-transferase (GST) and malondialdehyde (MDA) as indicative of lipid peroxidation. Individuals were recorded for behavior analysis (i.e. social interactions and feeding behavior). Results revealed an increased cellular stress from control to marinated-microplastic group, with virgin-microplastic group showing intermediate levels in all quantified biomarkers. Significant differences were found in liver for all biomarkers except for MDA, which suggests that the time of exposure to enriched plastic diets of this experiment is long enough to trigger the activation of antioxidant enzymes but not to produce cell damage by lipid peroxidation. In brain samples, the marinated-microplastic group presented significantly higher values for CAT and SOD, highlighting its function as primary antioxidants. Regarding behavioral effects, virgin and marinated groups displayed significantly more aggressive actions, such as biting and avoiding than control groups. In conclusion, a short period of microplastic exposure causes biomarker responses along with behavioral changes in fish. Nevertheless, further research is needed to assess long-term effects of microplastic ingestion and its potential consequences on fish populations.

Keywords: ecotoxicology, biomarkers, social interactions, feeding behavior, plastic pollution

Acknowledgments: Acknowledgments to the research project "Plásticos derivados de la acuicultura: impactos y efectos en las redes tróficas marinas" (ACUIPLASTIC), with reference number CTM2017-88332-R and funded by the Programa Estatal de Investigación, Desarrollo e Innovación Orientada a los Retos de la Sociedad, en el marco del Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016, from the Spanish Government.