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Sea snail (*Hexaplex trunculus*) and sea cucumber (*Holothuria polii*) as potential sentinel species for organic pollutants and trace metals in coastal ecosystems

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ABSTRACT

The seasonal bioaccumulation of trace metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorinated pesticides (OCPs) in sea snail (*Hexaplex trunculus*) and sea cucumber (*Holothuria polii*) from Mar Menor lagoon were characterised. The highest concentrations of p,p'-DDE were detected in the central and south part of Mar Menor lagoon. However, the highest concentrations of metals in sea snail and holothurians were detected in the influence area of El Beal wadi. Biomagnification factors (BMF) in sea snail from cockle (sea snail-cockle concentration ratio) were higher than 5 for metal and organochlorinated compounds. However, similar concentrations were observed in both species for PAHs due to gastropods capability of metabolising these pollutants. Consequently, sea snail is proposed as a sentinel for trace metals, PCBs and OCPs in the coastal lagoons, not only due to its bioaccumulation and biomagnification capacity but also the easy sampling and amply distribution in many coastal areas.

1. Introduction

The use of sediments or sentinel organisms for environmental assessment is particularly relevant for contaminants with a clear tendency to be transferred to particulate matter (inert of alive). Bivalves are commonly used in international monitoring programmes (UNEP, 1993; OSPAR Commission, 2018) as integrative indicators of the pollution of chemical pollutants in the water column, mainly mussels and oysters. However, these species are not always present or the populations are not useful for monitoring due to their scarcity in some coastal areas and protection, for this reason, alternative invertebrates, such as gastropods (sea snails, limpets, etc.) or echinoderms (sea cucumbers), could be used as potential bioindicators. Gastropods are commonly used as biomonitors species for organotins through imposex effects, because of its high specificity and its sensitivity in relation to other species and endpoints (Alzieu, 1996; Garaventa et al., 2007; Rial et al., 2018). Other studies have considered the use of gastropods as potential metal biomonitors because they have limited mobility (sedentary), they are available all year and easy to sample (Cubadda et al., 2001; María-Cervantes et al., 2008; Reis et al., 2011; Ragi et al., 2017; Pérez et al., 2019), and they take metals from all compartments (i.e. aqueous medium and through ingestion –from food or inorganic particulate material and heavily concentrate them (Phillips, 1977). Particularly, molluscs have limited ability to metabolise PAHs, so it is frequent to detect concentrations of PAHs and persistent organic contaminants (POPs) in different organ tissues (Oehlmann and Schulte-Oehlmann, 2003). However, fewer studies have evaluated the potential use of gastropods as sentinel organisms for the assessment of organic pollution (Storelli et al., 2014; Pérez et al., 2019).

On the other hand, holothurians have been also evaluated as marine bio-indicators, because they also exhibit local-scale migratory movements, they can easily come in contact with all the pollutants of the marine waters as a consequence of these compounds they tend to accumulate in the sediments, place from where the animals extract their food (Parra-Luna et al., 2020). However, these studies were mainly centred in metal contamination (Xin and Chia, 1997; Laboy-Nieves and Conde, 2001; Warnau et al., 2006; Jiang et al., 2014; Mohammadizadeh et al., 2016; Mohsen et al., 2019). Some studies have confirmed the

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