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Multi-element profiles as a fingerprint to discriminate estuarine *R. philippinarum* populations

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Abstract

Filter-feeder bivalves such as non-indigenous *Ruditapes philippinarum* absorb and accumulate metals, resulting in multi-element signatures. The goal of this study was to analyse if multi-element profiles of *R. philippinarum* can discriminate between spatial and temporal patterns of estuarine bivalves' populations.

Spatial and temporal variability patterns of chemical profiles were assessed by collecting samples of *R. philippinarum* and sediment at i) three sites with different environmental and physiological conditions of clams, ii) located within two Portuguese estuaries (Tagus and Sado estuaries) and iii) sampled at three different occasions (May 2018, January 2019, May 2019). This sampling design hypothesized that there are significant differences in the bivalves' chemical profiles between estuaries, among sampling sites and among sampling occasions. The chemical elements were categorized according to the estuarine geomorphology sources (Se,Co, Ni and Cu), elements with function in metabolic processes of the clams (Mn, Fe, Zn and Cr) and elements derived from the anthropogenic inputs (As, Pb and Cd). The multi-element concentrations of clams' soft tissues and sediments were obtained using a powerful analytical technique, ICP-MS (inductively coupled plasma mass spectrometry). Multivariate differences were tested in multi-element concentrations of bivalves' soft tissues and sediments. Results revealed that Zn, Co, Ni and Pb were the main contributors for the chemical signatures of Tagus estuary populations, whilst for the Sado estuary populations were Cu, Fe, Cr, As and Cd. These elements were representative of all elemental categories and proved to be spatial and temporal habitat discriminators of bivalves' estuarine populations. The multi-element signatures of *R. philippinarum* as a natural tag derived from the physical and chemical conditions of its habitat can be considered as a potential rapid tool for ecological biomonitoring and habitat assessment, accounting for spatial and temporal habitat differences of estuarine populations.

Keywords

Multi-element signatures, Traceability, spatial and temporal elemental discriminators, habitat bioassessment