# THE EFFECTS OF ANTHROPOGENIC STRESSORS ON THE FOOD QUALITY IN ESTUARINE SYSTEMS

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## Introduction

Contaminants' discharges are one of the themes that concerned the scientific community and received special attention by media because of the threat and adverse effects that may cause in aquatic ecosystems (McKnight et al., 2012).

Pollutants that cause most damage to the ecosystem originated from industry and mining include toxic substances such as metals and organic contaminants.

Little is known about the response of ecosystems to chronic exposure to these contaminants and the effects of these stressors on biochemical composition (Gonçalves et al., 2012; Holliday et al., 2009).

The use of biomarkers stands for a fundamental approach in the assessment of ecosystem health and allows the early detection of biological changes due to exposure to chemical pollutants (Mussaki-Galante et al., 2013)

A more functional approach to trace changes in food webs due to the modified biochemical composition of interacting species is lacking so far.

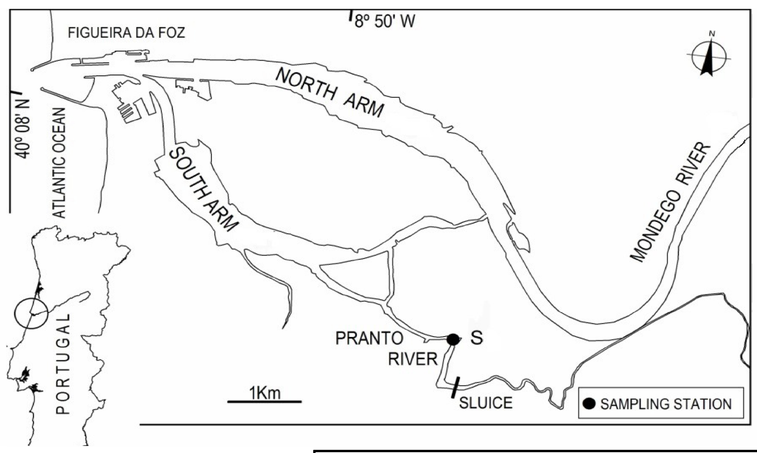
## Objectives

- To assess **individual effects** of chemical stressors on biochemical composition of two estuarine species from different trophic levels
- To assess **multiple-stressor scenarios** on biochemical composition of estuarine species
- To develop an **ecotoxicological model** about the influence of chemical stressors on food webs and thus on food quality

This Mares PhD study (2014-2016) aims to address the influence of human-induced environmental changes on biochemical composition of two main estuarine planktonic species in a southern European estuary (Mondego estuary, Portugal) by means of (trophic) biomarkers.

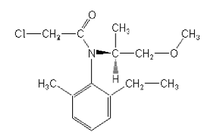
## Sampling Site

Fig. 1 Mondego Estuary (Figueira da Foz, Portugal)




## Anthropogenic Stressors

1. Copper
2. Herbicide Primextra® Gold TZ : S-metolachlor (30.2 % W/W)



Terbuthylazine (17.75 % W/W)

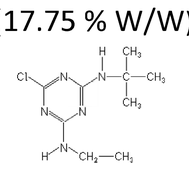


Fig. 4 Mondego valley:

Primextra® Gold TZ is the most used herbicide in Corn crops fields.

Copper is the main component of pesticides.

## Investigated species

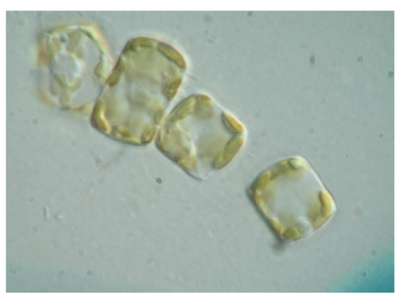


Fig. 2 Primary producer diatom *Thalassiosira weissflogii*

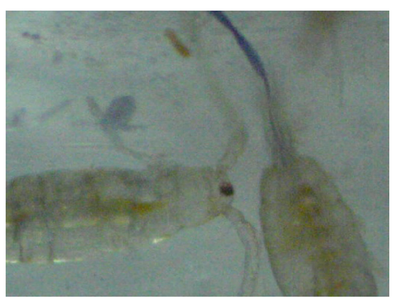


Fig. 3 Primary consumer copepod *Acartia tonsa*

1. Key role at the basis of marine food webs.
2. Copepods transfer biomass and energy between primary producers and higher trophic levels.

**Task 1**

Maintenance of stock cultures in the laboratory.

**Task 2**

Laboratory bioassays and biochemical analysis of planktonic species exposed to individual and mixture of toxicants.

**Task 3**

Development of an ecotoxicological model of the effects of anthropogenic stressors on aquatic food webs.

## Trophic biomarkers

Fatty acid (FA) profiles

Protein content quantification and protein expression

Enzymatic activity

1. Involved in many vital functions.
2. "Essential nutrients".
3. Proved to be useful trophic markers.

Determination the level and type of pollution in estuarine systems susceptible of causing changes in species biochemical composition.

Prediction of potential changes in aquatic food web, and thus in food quality, caused by anthropogenic activities.

## Main hypothesis

The two estuarine species show different biochemical responses to stressors, being more severe for the copepod species at the highest concentrations of mixture of contaminants.

## Expected results

At the highest concentrations of copper and pesticide, concentrations of fatty acids and the enzymatic activity are decreased. The protein expression is affected even at lowest concentrations.

A mixture of contaminants is much more detrimental to key species than individual contaminants.

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