

# Can Opisthobranchs be a useful bioindicator of cadmium pollution?

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## Introduction

A biological indicator can be defined as an organism which may be used to quantify relative levels of pollution.

Cadmium is produced by human activities (however it is also produced by nature processes), and it is a very toxic metal, even at low concentrations can inhibit physiological processes like reproduction. Due to the bioaccumulation of cadmium of many species it can enter to the alimentary chain and it can arrive to people causing diseases such as cancer.

The highest levels of cadmium have been found in the river mouths, and they are also the entry of this contaminant on the marine ecosystem.

Molluscan gastropods are one of the best biological indicators due to the high bioaccumulation in their tissues and they have been widely used. Opisthobranchs are a very diverse group in the Mediterranean (205 sp). These animals are really sensible to the environment characteristics, therefore they could be very useful to detect cadmium contamination rapidly, and that's very important for a rapid action.

## Methodology

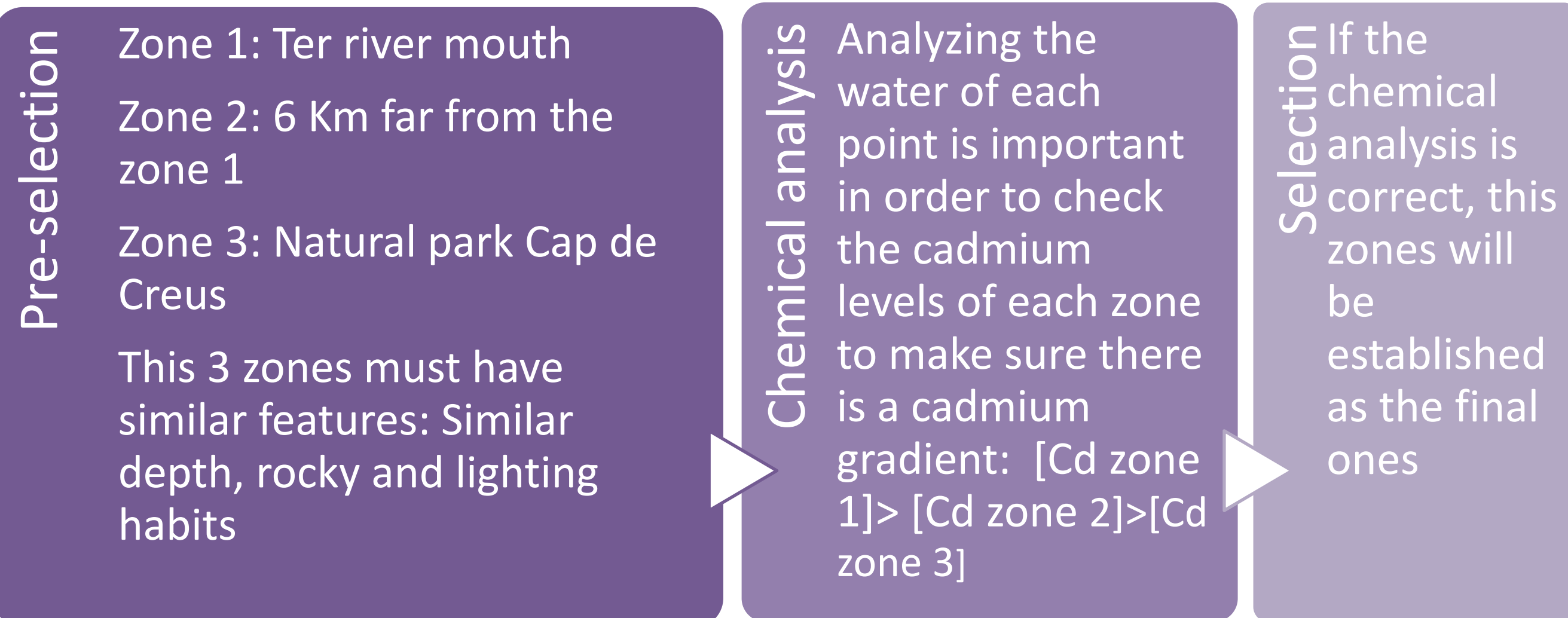
### Part 1: Opisthobranchs selection

We need 3 different pattern of reaction to cadmium of different species (which will be used for the rest of the study):

	ZONA1: High Contaminated	ZONA2: Low contaminated	ZONA3: Not contaminated
Type 1: High tolerance	+	+	+
Type 2: Low tolerance	-	+	+
Type 3: Not tolerant	-	-	+

Different points in GROC database were analyzed, river mouths, natural parks and other random points were checked in order to found this 3 types of pattern.

### Part 2: Zones selection



### Part 3: Cadmium concentration in selected species

To ensure that those species were accumulating cadmium in their tissues, 5 individuals of each specie should be analyzed to find out the concentration by digestion and AAS.

### Part 4: Bioassay

This is the main bioassay to test the capability of Opisthobranchs to react to different concentrations of cadmium so it would be possible to use them to control the water quality. For this experiment it would be needed:

	Control	50µl/l	100 µl/l	200 µl/l	400 µl/l	800 µl/l
Type 1						
Type 2						
Type 3						

### Part 5: Cadmium in tissues

During 4 weeks the aquariums would be checked (and the parameters controlled). Those individuals that have died would be picked up and dissected, separating the hepatopancreas, gills and the rest of the body, they would be analyzed separately in order to study where the highest bioaccumulation of cadmium is.

## Conclusions

This study could be very useful because changes in the presence/absence of some species in an ecosystem could indicate a change of the concentration of cadmium in the water. Swift actions against the increase of cadmium could be taken, so lot of damages to the ecosystem could be avoided.

## Objectives

The main objective of this research project is to assess if the use of Opisthobranchs is suitable or not in the fast detection of cadmium contamination.

1. Select some Opisthobranchs which seem to have relation with the cadmium level in the environment
2. Study how does the exposure to different concentrations of cadmium affect to different kind of Opisthobranchs.
3. Determinate which tissues are the ones with the highest bioaccumulation of cadmium.

## Expected results

Type 1	<i>Cratena peregrina</i>	Observed at all the river mouths.
Type 2	<i>Elysa timida</i>	Observed at some km of the river mouths, but not there.
Type 3	<i>Felimida krohni</i>	Observed only at natural parks, very far from the river mouths.

