

## Using WIZ portable module to analyse Eutrophication Risk levels in the NW Iberian coast

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**Abstract** – A portable module has been used to measure inorganic nutrients on the NW coast of the Iberian Peninsula during summer of 2019. The results allow us to know the variability of nutrient concentration and study the potential risk of eutrophication.

**Keywords** - Eutrophication, WIZ probe, nitrate, phosphate, inorganic nutrients

### I. INTRODUCTION

Marine eutrophication is a process that results from the increase of nutrients, mainly nitrate and phosphate in seawater. Eutrophication damages marine ecosystems by promoting blooms of microbial communities (some of them toxic) that lead to an increase in total organic matter and in oxygen demand. In marine environment, nitrate and phosphate come from subsurface nutrient-rich waters, and also from agriculture via river runoff and wastewater [1].

The NW coast and adjacent shelf of the Iberian Peninsula constitute the most important upwelling region in Europe [2]. In the Northern Hemisphere, upwelling processes occur mainly during summer, when northerly winds blow over the shelf. These winds push away surface water close to the coast and cause subsurface water to rise. As it rises, this deeper nutrient-rich water reinforces primary production [3]. If the primary producers are not effective enough, high concentration of nutrients could stay in surface layers, causing a potential risk of eutrophication. In this study, surface concentrations of nitrate and phosphate were measured during summer months on the NW Iberian coast (shelf and inner bays). The main goals are to analyse nutrient concentration variability and perform an assessment of the potential risk of eutrophication.

### II. METHODS

Surface seawater samples were collected on different days in August and September 2019 (Fig. 1A) and analysed on board the opportunity vessel Tyba III (BDRI, O Grove). Nitrate and phosphate concentrations were measured using a portable WIZ nutrient probe (Bastero et al 2021, MarTECH workshop). To consider the effect of upwelling events on nutrient concentration, we

used data of the Upwelling Index (UI) obtained from the INTECMAR database.

### III. RESULTS

Surface nutrient concentrations along the NW Iberian coast increase from offshore to the shelf and from the shelf to the inner bays (Fig. 1a). The time variability of the nutrient concentrations followed UI variability, with higher concentrations observed during upwelling events (Fig. 1a, b). The highest concentrations in the sampling period were measured in September, and result from the persistent upwelling events that occurred during this month (Fig. 1b). Considering the eutrophication level ranges proposed by the Environmental European Agency (EEA, [4]), the nutrient concentrations observed show that the study area was in low risk of eutrophication during the sampling period. Nevertheless, some local sites with high vulnerability (medium and high levels of eutrophication) were detected (Fig. 1c, d).

### REFERENCES

- [1] Malone TC, Newton A, "The Globalization of Cultural Eutrophication in the Coastal Ocean: Causes and Consequences", *Frontiers Marine Science*, vol. 7, Article 670, 2020.
- [2] Fraga F, *Upwelling off the Galician Coast, Northwest Spain*. In: Richardson FA (ed). Coastal upwelling. American Geophysical Union, Washington DC, pp. 176-182, 1981.
- [3] Castro CG, Perez FF, Alvarez-Salgado XA, Fraga F, "Coupling between the thermohaline, chemical and biological fields during two contrasting upwelling events off the NW Iberian Peninsula", *Continental Shelf Research*, vol. 20, pp.189-210, 2020.
- [4] EEA, *Nutrient enrichment and eutrophication in Europe's seas. Moving towards a healthy marine environment*. European Environment Agency, 14/2019.

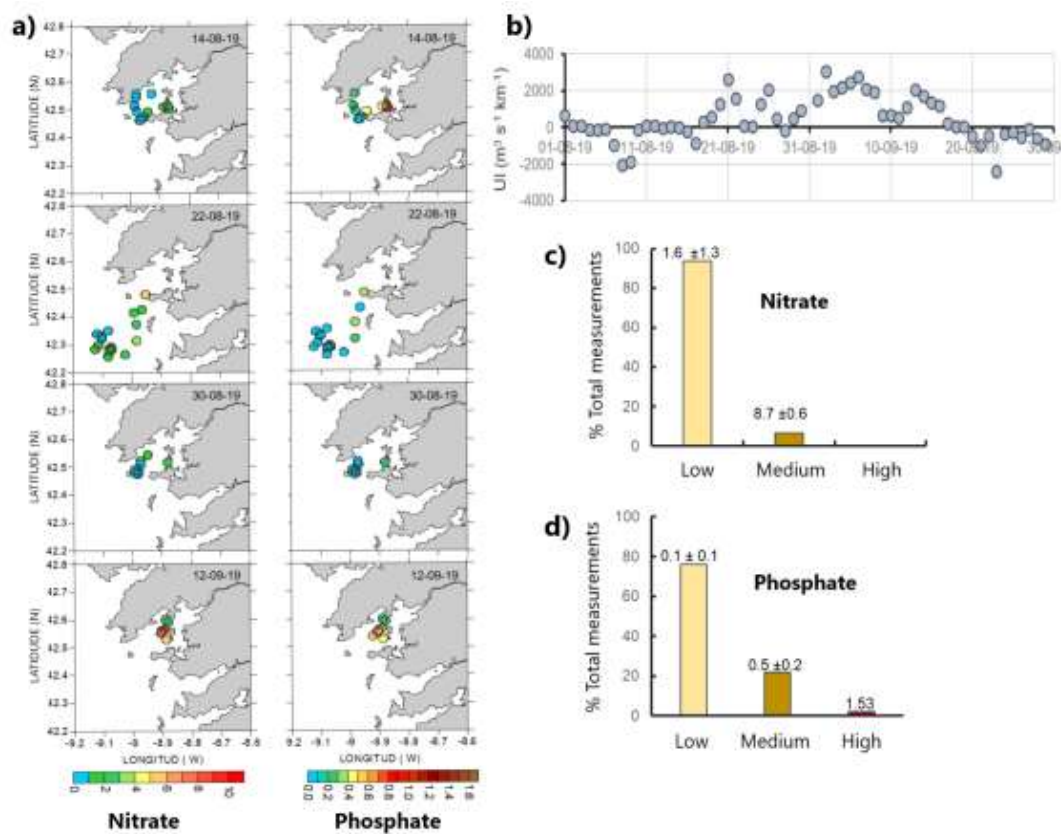


Figure 1. a) Nitrate and phosphate concentrations, b) Upwelling Index (UI), and Eutrophication risk levels for c) nitrate and d) phosphate.