

What seaweeds can tell us about coastal pollution? From landscapes to elemental composition.

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Marine ecosystems are increasingly subjected to a variety of anthropogenic pressures, which can alter environmental conditions (e.g., acidification, climate change, eutrophication, biological invasions, emergent contaminants, metal and organic contamination) giving rise to different levels of contaminative and pollution status. In order to monitor the contaminative status of coastal ecosystems many international initiatives are being developed, especially focused on the assessment of nutrients, turbidity and metal contamination. The analysis of water and sediment samples might give accurate information about the presence of contaminants, but not about its bioavailability and biological effects. Bioindicators and biomonitors provide a direct measurement of pollution and may indicate long-term effects yielding a more time-integrated response than physico-chemical indicators alone. To obtain a more comprehensive and complete assessment of the ecological status of European water bodies in order to develop more efficient management strategies, the European Commission (EC) implemented the Water Framework Directive (WFD, 2000/60/EC). This directive supports the combined use of physico-chemical and biological indicators to assess the ecological status of European waters, with particular focus on eutrophication. In the case of transitional (e.g., estuaries, lagoons, saltmarshes) and coastal waters (i.e., fully marine environments), seaweed is one of the biological quality elements proposed for the assessment of the ecological status. Different indices have been proposed following WFD requirements. Here, the main indices proposed for the assessment of the ecological status of coastal and transitional waters for North East Atlantic and Mediterranean eco-regions will be described, analysed and discussed (i.e., RSL, CFR, CARLIT, EEIc and Opportunistic macroalgal blooms tool). Furthermore, other scenarios pertaining to the use of seaweeds as bioindicators, biomonitors or bio-remediation tools that are usually overlooked due to the requirements of the WFD will be explored.