LIFE ON THE EDGE: HOW INTERTIDAL BENTHIC DIATOMS THRIVE IN COASTAL ENVIRONMENTS AND WHY WE SHOULD CARE'

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Golden brown patches of colour on the surface of intertidal mudflats and sand flats are the signs of abundant populations of microphytobenthic diatoms. Species-rich and physiologically versatile, these intertidal assemblages nicely illustrate some of the key advantages of living in biofilms. Biofilms are three dimensional structures, with cells held within a matrix of sediment particles and extracellular polymeric substances (EPS). Irradiance levels at the biofilm's surface can be extremely high, and different species of microphytobenthic diatom show distinct migratory behaviour, in response to light gradients, and use vertical migration within the biofilm as a mechanism of photoacclimation, combined with physiological responses to deal with light stress and desiccation. Changing light and nutrient conditions also mediate patterns of production of different EPS fractions within biofilms,and EPS serves both a protective and nutritional function for benthic diatoms. Diatom species composition is also influence by nutrients, spatial distribution and environmental factors such as anoxia and disturbance, and has the potential to feedback to effect biofilm properties. All these factors result in an interplay between species richness, abundance and ecosystem functioning. High rates of production, nutrient uptake and oxygen production mean that estuarine biofilms playing an important role in the biogeochemistry and ecology of shallow estuarine and coastal waters. Quantifying and understanding diatom biofilm processes is a necessary component for good management of important coastal ecosystems.