

The use of lipid and PAH biomarkers in establishing temporal environmental trends within a coastal lagoon.

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The ecological sustainability of the Ancão Basin of the Ria Formosa Lagoon in Portugal is essential for the local region to maintain both its shellfish and tourist industries. Evidence for temporal environmental, anthropogenic and biological trends within an area of reduced circulation and flushing was examined. Biomarker compounds were quantified within sediment depth profiles and GC-MS was used to analyse a range of specific lipid compounds and Polycyclic Aromatic hydrocarbons (PAHs). Biomarker trends were established using multivariate statistical techniques (PLS and PCA).

Specific fatty alcohol and sterol ratios and lipid group multivariate analysis indicate changes have occurred in the biological production and environmental conditions within the Basin. Fatty alcohols and sterols within the upper sediments were mostly of a marine origin; with greater depth, these were found to be terrestrial in origin; this indicated a temporal change from freshwater conditions to marine. Discussion is given as to whether this was the result of specific degradation of marine markers or the construction of a new inlet into the lagoon causing large tidal influx into the Ancão Basin, thus increasing the seawater flushing of the lagoon.

Two forms of terrestrial input were revealed: sewage and vascular plants. Evidence that sewage originates in other areas of the lagoon is discussed, together with the hypothesis that the freshwater (vascular plant) source indicates seasonal flow of the Ribeira de S.Lourenço and direct land run off from the surrounding golf courses. Sewage contamination and primary production were shown to reduce over time. Specifically there is a reduction in diatoms and dinoflagellates appearing to be a result of decreased sewage, the likely cause being increased seawater flushing.

Overall, the lipid results indicate an improvement of water quality in the Ancão Basin because of increased seawater flushing from the new Barra Nova inlet. However, a change in PAH distribution also occurs with depth, and concentrations of PAHs attributed to anthropogenic combustion origin are higher in recent times. This may be of concern to the shellfish and tourist industries of the Ria Formosa, if subsequent work were to show a conclusive increase in those PAHs classified as probably carcinogenic.