

# Assessing species diversity of estuarine microphytobenthos: short-term variability and limitations of the 'lens tissue' method

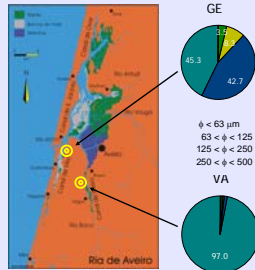
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## Introduction & Objectives

- The 'lens tissue' method has been routinely used to collect microalgae from microphytobenthic biofilms and to assess its taxonomic composition;
- This study evaluates the selectivity of the technique, by comparing the diatom species composition of samples collected by using lens tissues with the original composition of the natural communities, and its ability to quantify short-term changes in species composition associated with vertical migrations.

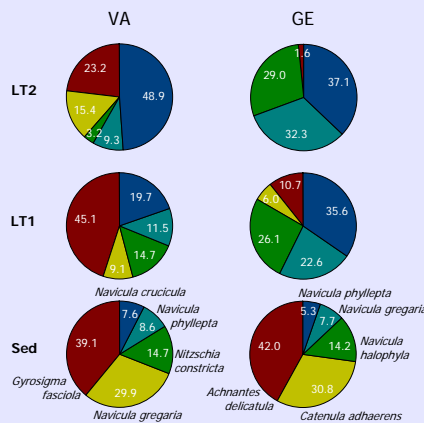
## Sampling sites and methods



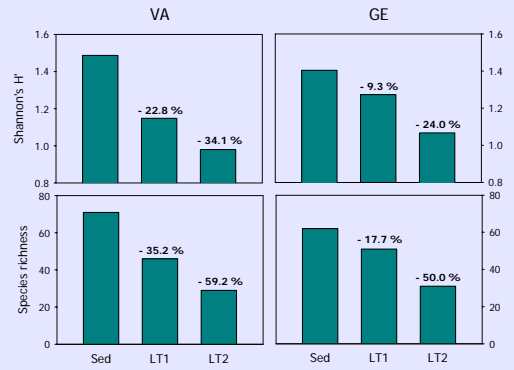
- Two intertidal sites with different granulometry were sampled: a sandy mud sediment (Gafanha da Encarnação, GE), and a fine muddy sediment (Vista Alegre, VA);
- Two pieces of lens tissue (Leica) were placed on undisturbed sediment cores during low tide exposure, for 3 h: LT1, in direct contact with the sediment, and LT2, on top of LT1;
- The taxonomic composition of the assemblages collected on the lens tissues were compared with the composition of the sediment (upper 2 mm).

## Differences in vertical migratory behaviour

- The changes in relative abundance between the sediment (SED) and the lens tissues (LT1, LT2) varied considerably from species to species;
- These differences allow to classify the diatom species with respect to their migratory behaviour:
  - Migratory species, for which the relative abundance increases from SED to LT2: *Navicula crucicula*, *N. phyllepta*, *N. Gregaria*;
  - Non-migratory species, for which the relative abundance is much higher in SED than in either of the lens tissues: *Achnantes delicatula*, *Catenula adhaerens*.



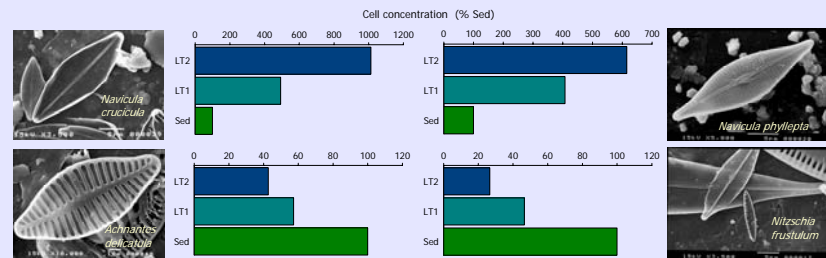
## Underestimation of diversity



- Diversity (Shannon H' index) and species richness was substantially lower in the lens tissues than in the original sediment community, gradually decreasing from SED to LT2, the underestimation of the number of species being more accentuated than in the diversity index;
- The underestimation of diversity and species richness was higher in the muddy sediment (VA), where diversity was higher and where migratory species are expected to be more abundant;
- The 'lens tissue' method thus appears to be a highly selective sampling method, its selectivity being higher for finer sediments, where the epipellic diatom population is more represented.

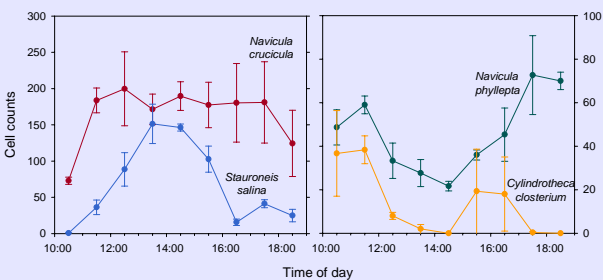
## Species list: commonest taxa

Sampling site VA (%)	Sampling site GE (%)
<i>Gyrosigma fasciola</i> (16.9)	<i>Achnantes delicatula</i> (15.6)
<i>Navicula gregaria</i> (12.9)	<i>Catenula adhaerens</i> (11.4)
<i>Nitzschia constricta</i> (6.4)	<i>Navicula sp.</i> (11.4)
<i>Navicula phyllepta</i> (3.7)	<i>Amphora coffeaeformis</i> (6.6)
<i>Navicula cohnii</i> (3.5)	<i>Opephora olsenii</i> (5.5)
<i>Navicula crucicula</i> (3.3)	<i>Navicula halophila</i> (5.3)
<i>Navicula salinicola</i> (3.1)	<i>Cocconeis placentula</i> (4.0)
<i>Navicula halophila</i> (2.9)	<i>Nitzschia frustulum</i> (3.3)
<i>Nitzschia calcicola</i> (2.6)	<i>Navicula gregaria</i> (2.9)
<i>Nitzschia capitellata</i> (2.6)	<i>Navicula duerrenbergiana</i> (2.9)
<i>Nitzschia frustulum</i> (2.6)	<i>Nitzschia constricta</i> (2.6)
<i>Opephora olsenii</i> (2.4)	<i>Cocconeis peltoides</i> (2.2)
<i>Nitzschia liebetruithii</i> (2.0)	<i>Navicula phyllepta</i> (2.0)
<i>Cocconeis scutellum</i> (1.8)	(75.4% total abundance)
<i>Navicula perminuta</i> (1.8)	
<i>Nitzschia sigma</i> (1.8)	
<i>Achnantes delicatula</i> (1.5)	
<i>Diploneis didyma</i> (1.5)	
<i>Nitzschia hungarica</i> (1.5)	
(74.8% total abundance)	



- Species like *Navicula crucicula* and *N. phyllepta* accumulate in the upper lens tissue (LT2), revealing a strong upward migratory behaviour during low tide exposure;
- On the other hand, species like *Achnantes delicatula* and *Nitzschia frustulum* appear in very small numbers in the lens tissues (LT1 and LT2), comparatively to their abundance in the sediment, revealing a less accentuated migratory behaviour.

## Short-term variability during low tide exposure



- The method's selectivity for motile taxa is advantageous for detecting short-term changes in the surface composition associated to migrations;
- The method enables to characterize the different migratory patterns of each taxa, as the composition on the lens tissue varies strongly along the exposure period;

- Example of two contrasting migratory behaviour: some species migrate upwards during the middle of the exposure period (left), while others display two abundance peaks, reflecting two upward migration events (right).

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