

Phytoplankton biomass and composition in the Benguela Ecosystem

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Introduction

The phytoplankton is a basic component of the ecosystem and determines its productivity. Data on phytoplankton biomass and composition are a prerequisite for understanding the food web, whose analysis is one main aim of the GENUS project.

A specific question to solve was the possible occurrence of nitrogen fixation in the upwelling region. Low DIN:DIP ratios in the upwelling water may support the growth of nitrogen fixing cyanobacteria.

The distribution and composition of phytoplankton is closely connected to the hydrographic and nutrient characteristics of the water bodies. Therefore it is of special interest how the history and character of the water bodies influences their phytoplankton content.

Results

1.) Nitrogen fixation

Measurements of nitrogen fixation by the ^{15}N isotope measurement, did not show any significant nitrogen fixation in the investigated area. This was expected after we did not find any nitrogen-fixing species (*Trichodesmium* sp.) in the coastal waters. Obviously, even no nitrogen-fixing picocyanobacteria are present. As nitrogen-fixing organisms could not be stimulated in mesocosm experiments by neither phosphate, trace metals, vitamins and warming, we conclude that they are not present in upwelling water. At the most off-shore stations, however, *Trichodesmium* was found in low quantities (data not shown).

2.) Phytoplankton development in dependency of the hydrological characteristics of the water

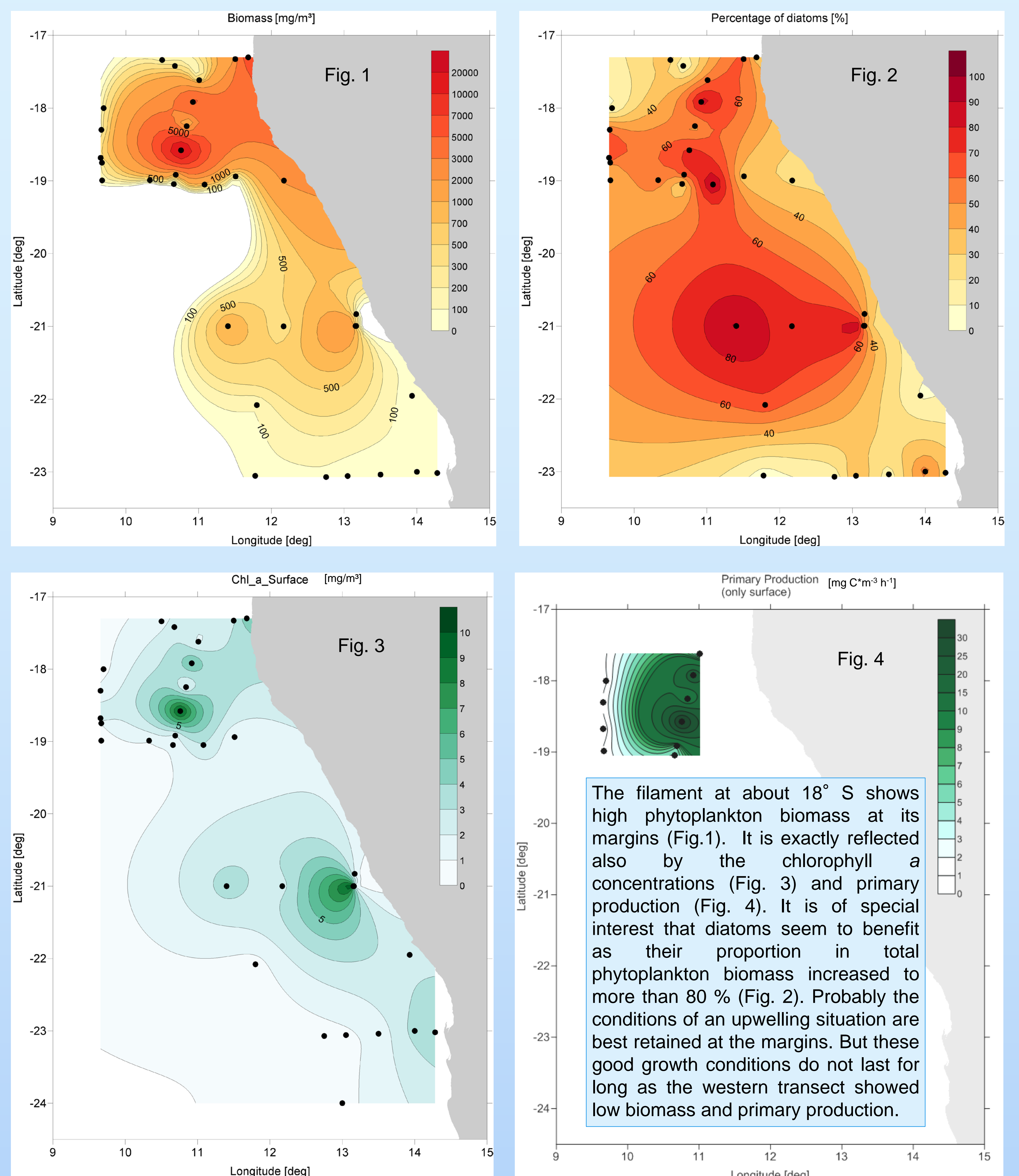
a) Investigation in a filament:

An example for the dependence of phytoplankton biomass and composition on the hydrographical (incl. nutrients) situation is shown in Figures 1-4. During the Discovery cruise in September/October 2010, a filament stretching at about 18° S westwards was specifically investigated. High phytoplankton biomass and activity occurs especially at the margins of that filament.

b) General distribution:

The highest phytoplankton biomasses occurred near the coast and within the offshore moving filament. The species composition differed in the coastal and offshore regions due to the different hydrographical and nutrient situation.

Summarizing the results of three cruises (DISCOVERY cruise D356, AFRICANA cruise Afr258 and MERIAN cruise MSM17/3) in Fig. 5, it appears that diatoms (red points) are dominating north of Walvis Bay while dinoflagellates (blue points) are dominating south of Walvis Bay. This may cause different trophic links in these two regions.



Figs. 1-4: Distribution of different phytoplankton parameters during the Discovery cruise in September/October 2010. Specific explanation inserted into Fig. 4

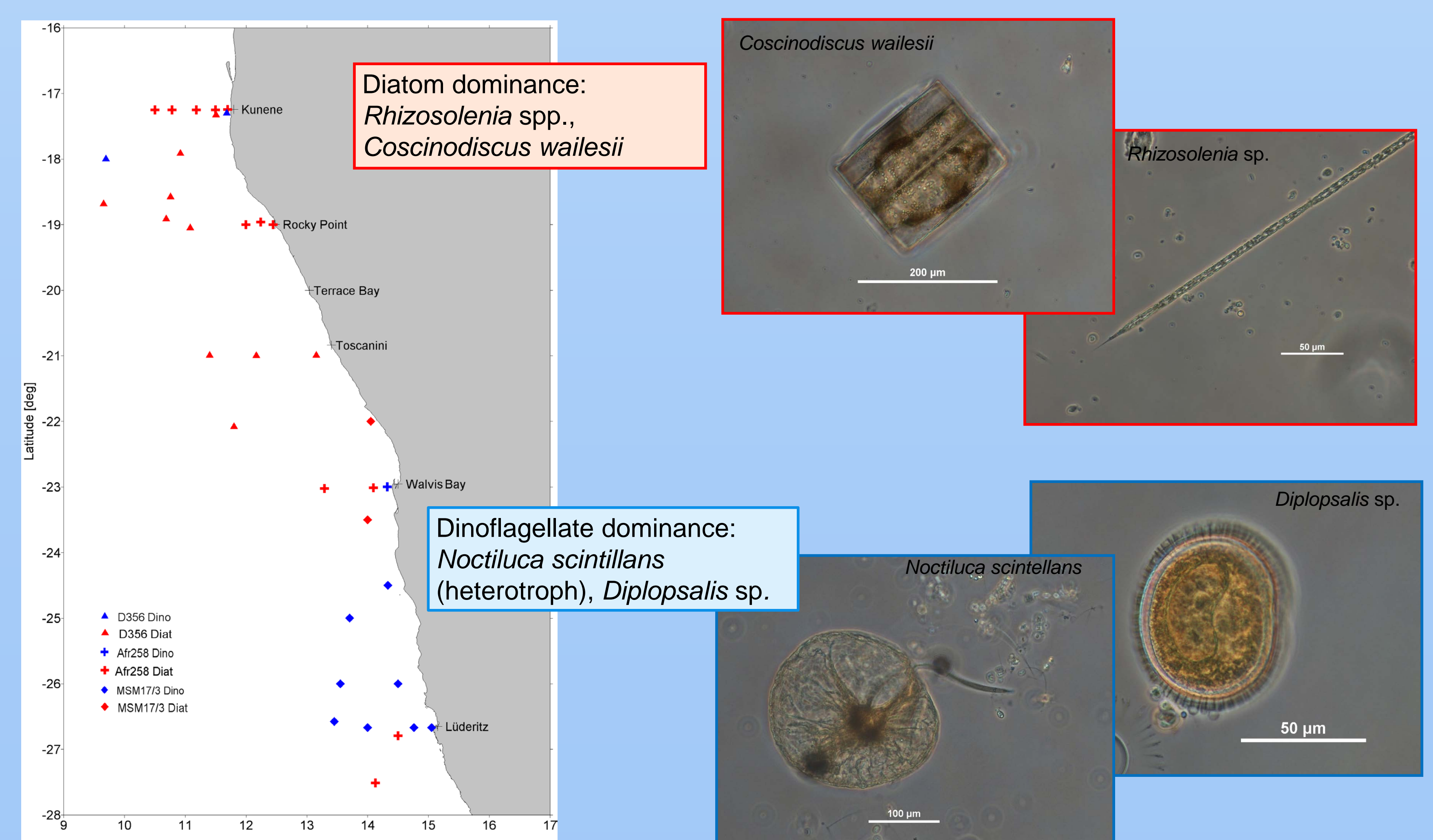


Fig. 5: Spatial differences in phytoplankton composition off Namibia.