ABSTRACT

A large number of processes and physical, chemical and biological factors, interact in a complex way in benthic metabolism of shallow coastal areas. Traditionally, benthic respiration and nutrient regeneration in infralittoral permeable sands have not been widely studied, although these sands can have a direct and transcendental impact in coastal ecosystems. The overall purpose of this dissertation is to determine oxygen and nutrient fluxes at the sediment-water interface. Moreover, the study of possible interactions among environmental variables and the identification of those ones more influential on benthic metabolism in sorted fine sands it is considered.

In this study, eight sampling campaigns were carried out in a sampling station placed over well sorted fine sand bottoms, in which microphytobenthos biofilms are also developed in these surfaces. At each sampling campaign, water column and surface sediment were sampled, apart from dark and light benthic chambers, and sediment traps were deployed. Additionally, two experiments were performed under controlled conditions in laboratory, where the same granulometric matrix of the sampling station was incubated with different levels of organic matter and *Spisula subtruncata* respectively.

In dark conditions, the benthic respiration in these infralittoral fine sands were regulated by a very small fraction of organic matter at the sediment, composed of biopolymeric carbon and chloroplastic pigments. This resulted in an oxygen uptake by the sediment and a dissolved inorganic nitrogen and orthosilicic acid release into the water column. In light conditions, the strong correlation between the net primary production and the average of incident irradiance on the sediment surface indicated that microphytobenthos played a major role in the oxygen production and in the metabolism of these bottoms. According to daily fluxes, in which it was assumed that the exchange during daylight period corresponds to light chamber fluxes and nighttime exchange with the dark chamber fluxes, these well sorted fine sands, placed in an oligotrophic environment, were heterotrophic throughout the year. This meant that oxygen was consumed by sediments and dissolved inorganic nitrogen and orthosilicic acid were released to water column over an annual cycle. Only during the spring, these bottoms were autotrophic due to a higher incident irradiance over sediments that promoted primary production by microphytobentos. In these shallow bottoms, the benthic primary production was higher than the planktonic primary production in all sampling campaigns, carried out under hydrodynamic stability circumstances.

Ex situ experiments showed that benthic respiration responded more markedly in oligotrophic conditions, which also lead to a greater increase in dissolved inorganic nitrogen release, than eutrophic or hypereutrophic situations. The presence of *S. subtruncata*, one of the most abundant species in the sampling station, involved an increase in both oxygen uptake, in 60-75 %, and dissolved inorganic nitrogen release, in 65-100 %, at densities between 400 and 850 ind m^{-2}, because of its metabolism and activity.