Phytoplankton is the primary source of Dissolved Organic Matter (DOM) to the oceans. DOM is mainly released by extracellular exudation and used by heterotrophic prokaryotes to synthesise biomass and recycle inorganic nutrients. DOM released by phytoplankton is mainly composed by carbohydrates, proteins and lipids that are thought to be labile and by humic substances that are thought to be recalcitrant and thus resistant to bacterial degradation. There are a lot of uncertainties regarding the biological lability of exudates and the role of DOM released by phytoplankton in the marine carbon cycle. In this study, cultures of the diatom *P. tricornutum* were produced under axenic conditions and Dissolved Organic Carbon (DOC) concentration, Excitation-Emission matrices (EEMs) and cell density were measured with time in order to follow the release of DOM during the different growth phases. Exudates were then inoculated with a marine microbial community for 24 days, DOC removal and FDOM transformation were followed with time in the exudates and in the permeate (< 3k Da; Low Molecular Weight, LMW) and retentate (> 3k Da; High Molecular Weight, HMW) fractions. Heterotrophic prokaryotes abundance was also followed during the incubations. Our results show that ~75% of the total DOC pool was LMW. After 24 days, 28% of the initial DOC pool was removed. Fluorescence indicate high lability of protein-like molecules and degradation of bigger proteins into smaller peptides before their removal. The production of humic-like and flavin-like substances was also observed.