

Primary Productivity and heterotrophic activity (Puyuhuapi channel; 44° S, 73° W)

G. Daneri et al.

Primary Productivity and heterotrophic activity in an enclosed marine area of central Patagonia (Puyuhuapi channel; 44° S, 73° W)

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Abstract

We assessed temporal variability in phytoplankton biomass, Chlorophyll *a*, nutrient availability, Gross Primary Production (GPP), community respiration (CR), and bacterial secondary production (BSP) over a year of monthly observations (October 2007 to October 2008) at a fixed station in the Puyuhuapi fjord, Chilean Patagonia (44° S, 73° W). A set of in situ observations gathered over two consecutive spring-summer seasons, and one autumn-winter season in the middle, has made it possible to connect the two-phase (i.e. productive season/non-productive season) pattern of Chlorophyll *a* (Chl *a*) variability shown by satellite data with a two-phase cycle in GPP, CR, and the composition of phytoplankton assemblages. Estimates of annual GPP and CR, integrated over the top 20 meters of the water column, were 533 and 537 g C m⁻² yr⁻¹, respectively. Low values of *p*CO₂ were measured in mixed layer autotrophic waters (GPP/CR > 1) while high *p*CO₂ levels were measured in mixed layer heterotrophic waters (GPP/CR < 1). Bacterial Secondary Production (BSP) was significantly and positively correlated with GPP ($r = 0.6$, $p < 0.05$, $n = 24$) and Chl *a* ($r = 0.4$, $p < 0.05$, $n = 24$) on an annual cycle basis. The winter drop in bacterioplankton (both bacteria and archaea) activity (from 0.9 ± 0.6 g C m⁻² d⁻¹ to 0.6 ± 0.3 g C m⁻² d⁻¹) was not as pronounced as the winter drop in phytoplankton activity (from 1.1 ± 1.12 g C m⁻² d⁻¹ to 0.1 ± 0.09 g C m⁻² d⁻¹). It is hypothesized that dissolved organic matter (DOM) of terrestrial origin plays an important role (especially in winter) supporting bacterial activity in the Puyuhuapi fjord.

1 Introduction

Fjords and estuaries play an important role in biological productivity and carbon cycles in aquatic ecosystems (González et al., 2010). The Chilean fjords region (41–55° S) spans more than 1600 km of (straight) coastline and over 240 000 km² of highly complex geomorphologic and hydrographic conditions. Oceanographic conditions in this

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