

# Primary production and plankton dynamics in the Reloncaví Fjord and the Interior Sea of Chiloé, Northern Patagonia, Chile

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**ABSTRACT:** Seasonal variability in freshwater discharge and solar radiation directly affects the structure and functioning of the pelagic community in Chile's northern Patagonian fjords. The input of fresh water loaded with silicate from the top and marine water enriched with nitrate and orthophosphate from the bottom results in overlapping limnetic and marine characteristics. Two research cruises (CIMAR 12) were conducted in the area of Reloncaví Fjord and the Interior Sea of Chiloé (42 to 44° S) during austral winter and spring 2006, in order to assess the spatial/temporal variability in biological, physical, and chemical oceanographic characteristics, and to quantify the carbon budget of the pelagic trophic webs in Reloncaví Fjord. Vertical flux of particulate organic carbon (POC) and primary production (PP) increased 2-fold (334 vs. 725 mgC m<sup>-2</sup> d<sup>-1</sup>) and 2 orders of magnitude (42 vs. 1893 mgC m<sup>-2</sup> d<sup>-1</sup>), respectively, from winter to spring. In addition, the bacterial secondary production to primary production (BSP:PP) ratio decreased from 3.7 to 0.2 in Reloncaví Fjord, suggesting a transition from microbial to classical pelagic food webs. The higher solar radiation and extended photoperiod of springtime promoted the growth of diatoms in a nutrient-replete water column. Allochthonous (river discharge) and autochthonous (phytoplankton exudates) organic matter maintained high year-round bacteria biomass and secondary production. In spring, grazing pressure from zooplankton on the microplankton (largely diatoms) resulted in the relative dominance of the classical food web, with increased export production of zooplankton faecal pellets and ungrazed diatoms. Conversely, in winter, zooplankton grazing, mainly on nanoplankton, resulted in a relative dominance of the microbial loop with lower export production than found in spring. Carbon fluxes and fjord-system functioning are highly variable on a seasonal basis, and both the multivorous trophic webs and the carbon export were more uncoupled from local PP than coastal areas.

**KEY WORDS:** Interior Sea of Chiloé · Patagonia marine ecosystem · Carbon budget

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## INTRODUCTION

Fjords and estuaries play an important role in biological productivity and carbon cycles in aquatic ecosystems worldwide. The productivity of Chilean

fjords is influenced by oligotrophic freshwater discharge (rich in Si) from river runoff and glacial melting, as well as the vertical entrainment of Sub-Antarctic Water (SAAW) loaded with macronutrients from the adjacent oceanic area (Silva et al. 1997, 1998). The

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