

Oceanographic processes that favor the zooplankton distribution and aggregation in Puyuhuapi fjord and Jacaf channel (44.7° S)

Authors: Iván Ernesto Pérez Santos¹, Leonardo Castro^{1,2}, Lauren Ross³, Luis Cubillos^{1,2}, Mariano Gutierrez⁴, Nicolas Mayorga¹ and Cristian Parra²

¹ Programa COPAS Sur-Austral, Universidad de Concepción, Campus Concepción, Víctor Lamas 1290, Casilla 160-C, código postal: 4070043, Concepción, Chile

²Departamento de Oceanografía, Universidad de Concepción, Campus Concepción, Víctor Lamas 1290, Casilla 160-C, código postal: 4070043, Concepción, Chile

³EPOC Laboratory, University of Bordeaux, Avenue des Facultés, 33405 Talence, France

⁴Universidad Nacional Federico Villareal, Facultad de Oceanografía, Pesquerías y Ciencias Alimentarias, Calle Francia 726, Miraflores, Lima, Perú

Abstract

This study aimed to better understand zooplankton abundance and migration patterns in Puyuhuapi fjord and Jacaf Channel. To accomplish this, multiple Acoustic Doppler Current Profiler (307.7 kHz) moorings were installed in central Puyuhuapi in May, 2013 and from November, 2013 to January, 2014. A scientific echosounder (SIMRAD 38 and 120 KHz) was used in the summer and winter of 2014 to study plankton distributions along the fjord. In order to validate the acoustic data, in-situ zooplankton sampling was carried out with the aid of a Tucker trawl. A strong diurnal vertical migration of zooplankton was registered by the ADCP, with high/low backscatter signal during night/day. Zooplankton aggregated between the surface and ~50 m depth at night, while during the day the aggregation was observed close to 100 m depth, indicating a downward migration during daylight hours to avoid predation. Along fjord acoustic echosounder sampling at both 38 and 120 kHz confirmed that zooplankton biomass concentrated during the daytime around 100 m depth in Puyuhuapi fjord. Oxygen data obtained from CTD showed that from 100 m to ~300 m depth the oxygen concentration decreased from 3 to 1 ml/l, confining the zooplankton to the first 100 m. High concentrations of zooplankton were also observed around the sill in Jacaf channel, evidencing that zooplankton tend to aggregate in regions of increased mixing. Microprofiler measurements using VMP-250 detected a high dissipation rate of turbulent kinetic energy (~100 m depth) in the zooplankton layer.

Keywords: Acoustic measurements, ADCP, zooplankton, turbulent kinetic energy, Patagonia, Chile.

Contact author: Iván Ernesto Pérez Santos· Programa COPAS Sur-Austral, Universidad de Concepción, Campus Concepción, Víctor Lamas 1290, Casilla 160-C, código postal: 4070043, Concepción, Chile.

Email: ivanperez@udec.cl