Benthic trophic structure of a glacial fjord (Central Patagonia, Chile): spatial variability of isotopic niche

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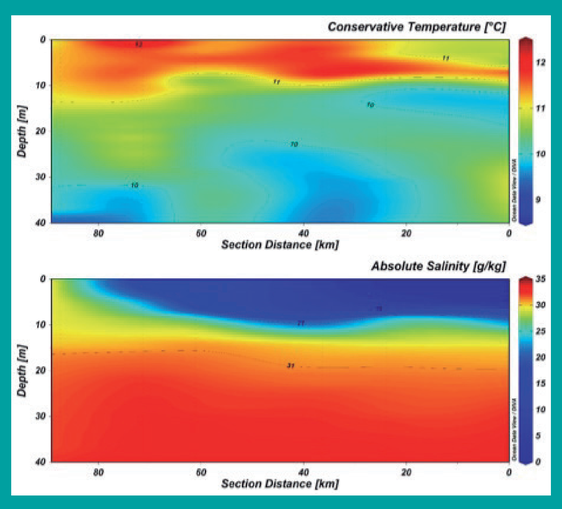
Introduction

The Martínez-Baker Fjord System (47° S), is almost entirely fed by three major rivers (the Baker, Bravo, and Pascua), delivering a total supply of 5.1 x 10^4 km^3 yr^{-1} of freshwater to the Baker Basin, influencing the hydrographic conditions and exchange of organic matter in this estuarine ecosystem (Quiroga *et al.*, 2012; 2016) which constitute one of the main environmental forcing.

Analysis of the information

Lipid correction was performed according to Kiliunen et al. 2006 on muscle tissue of fish. The TEF was calculated using the formula of Post (2002) and Vander Zanden *et al*. 2010. To estimate the isotope niche width, we used the SIBER package in R (Jackson *et al*., 2011).

Martínez Channel



Baker Channel

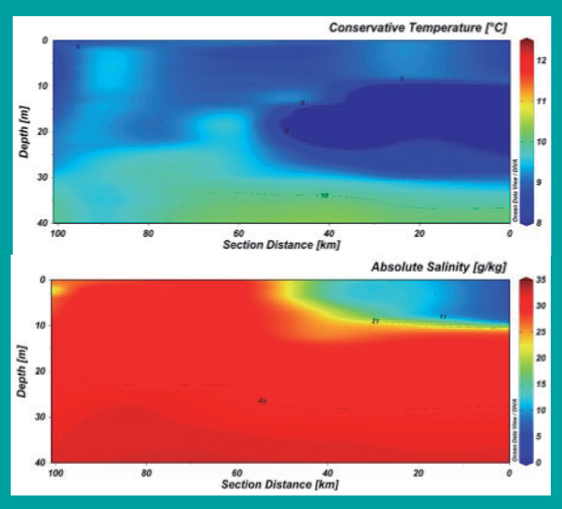


Figure 2.
The cross-sections of temperature and salinity (from top to bottom) represented for the Martínez Channel (Left) with distances from the station closest to the Baker River mouth towards the open shelf, and Baker Channel (right), with distances from the station closest to the Pascua River mouth towards the open shelf. CTD data were plotted using Ocean Data View (Schlitzer, 2012).

Remarks

- The contribution of organic and inorganic material from the discharge of the Baker River is capable of producing local disturbances, such as low primary productivity (~1 mg Chla $^{-3}$) and high turbidity (~14 NTU) limiting the flow of organic carbon to the sediment (Figure 2).
- The basal resources (surface sediment, SPOM and river POM) were statistically differentiated between the head and mouth of the fjord (Kruskal-Wallis $p < 0.05$).
- The fjord was dominated by carnivorous predator, in particular, crustaceans decapods and bony fishes in the inner section, and omnivorous detritivores and suspension feeders organisms (echinoderms and cnidariasn) in the middle section.
- Echinoderms exhibited a isotopic niche width wider because they have more food items in their diet. In contrasting, cnidarians appear to be feeding on different type of allochthonous organic matter, which is reflected in the stable isotopes of nitrogen values ranged from 8 to16 ‰ ($\delta^{15}N$).
- Our research provide evidence that the River Baker is influencing the trophic structure of the benthic communities along then fjord, and therefore the functioning of the ecosystem.

Acknowledgements
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Materials and Methods

In general, five oceanographic samplers, *i*.e. gravity corer, van Veen grab, a modified trawl net Agassiz (AGT), crab traps and a bongo plankton net were used to collect benthic organisms, plankton and possible basal resources to characterize the trophic structure by means of isotope analysis of stable carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$). The samples were processed at Pontificia Universidad Católica de Valparaíso and analyzed at LABASI of the Pontificia Universidad Católica de Chile.

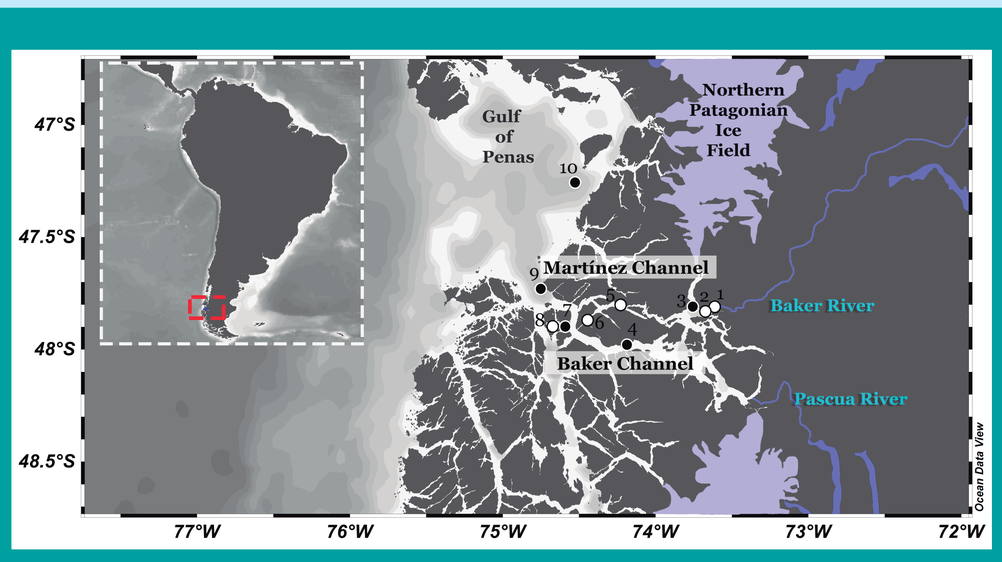

Figure 1.
Location of the Martinez-Baker fjord system in Chilean Patagonia, with indication of the main glaciers and rivers influencing the system. Sampling stations are represented by white dots (sampling stations for March 2014 and December 2015) and black dots (sampling stations for October 2014) along the Inner, Middle and Outer section from the Fjord.

a) Inner section

b) Middle section

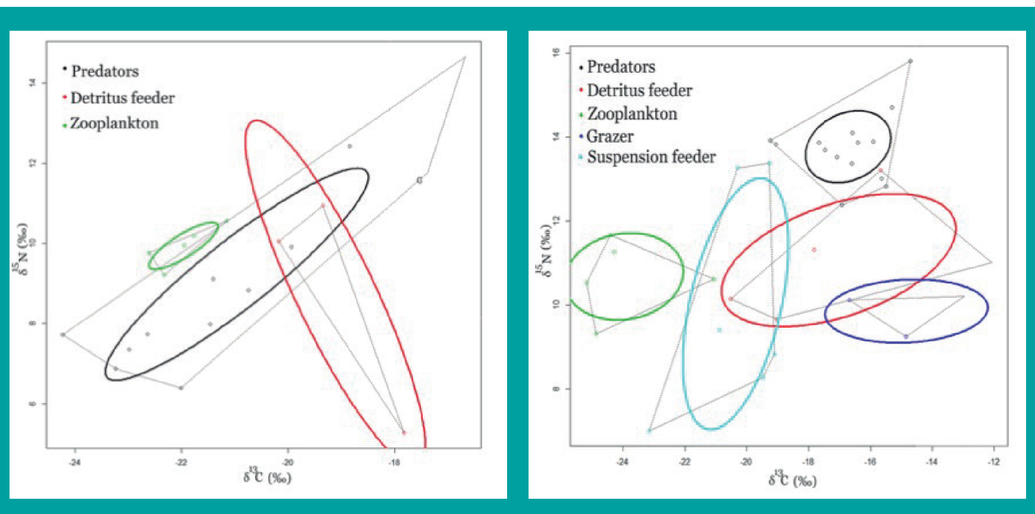

Figure 3.
Isotopic niche width of the major feeding modes present at a) The Inner section and b) Middle section of the Martínez-Baker Fjord. Solid lines enclose the standard ellipse area (SEA), representing the isotopic niche of consumer. Dotted lines are the convex hulls representing the total niche width of the different consumer.

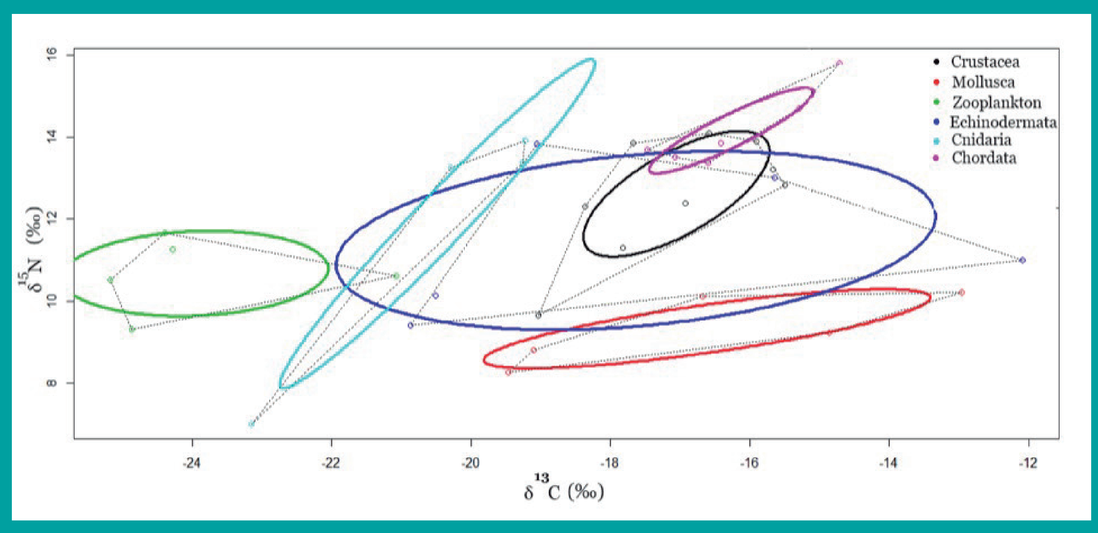

Figure 4.
Isotopic niche width of the major Phylum present at The Middle section of the Martínez-Baker Fjord. Solid lines enclose the standard ellipse area (SEA), representing the isotopic niche of consumer. Dotted lines are the convex hulls representing the total niche width of the different consumer.