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Melting glacier impacts the community structure of Bacteria, Fungi and Archaea in Chilean Patagonia fjord system

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Seasonal and spatial variability in microbial community composition was studied by analyzing sequences of Bacteria, Archaea and Fungi in the fjord adjacent to the glacier Jorge Montt (48º20'S; 73º30' W), which has evidenced one of the most significant retreats during the past century in Patagonian Icefields. A detailed description of prokaryotic (Bacteria and Archaea) and fungal communities was carried out by pyrosequencing of 16S rRNA gene and the ITS region, respectively. Our results showed high diversity of operational taxonomic units (OTUs) in bacteria followed by the fungal community. In contrast, Archaea was characterized by low OTU abundance in most of the sampling sites and depths. Similarity in OTU composition evidenced a microbial community structure associated with hydrographic features of the fjord basin, where strong stratification maintained by the continuous input of meltwaters produces differences in the microbial composition between surface and bottom waters. Our results also showed seasonal changes in microbial components, evidencing the presence of OTUs related to cold and glacier environments in surface waters during autumn, when a wider layer of meltwater was observed. We identified at least three different microbial communities inhabiting the downstream fjord ecosystem: i) a surface waters community in autumn, with a predominance of OTUs matching with Cyanobacteria, ii) a bottom water community in autumn, where fungal OTUs predominated, and iii) a microbial community during winter with a significant presence of OTUs of Archaea. The composition of these microbial communities agrees with patterns of bacterial communities in glacial environments, marine sediments and waters and with fungal composition in coastal, marine and continental airborne. Our results indicate that hydrodynamic and water column characteristics play a main role in structuring microbial community and suggest that the progressive input of meltwater can strongly impacts the microbial composition and therefore the heterotrophic activity in the Chilean Patagonia fjord ecosystem. This research was funded by FONDECYT grant 11110515.