# SILVER ACCUMULATION IN CHIRONOMID LARVAE IN RELATION TO THEIR ECOLOGICAL PREFERENCES IN AN ULTRAOLIGOTROPHIC LAKE

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## Introduction

Chironomidae (Insecta: Diptera) comprise one of the most abundant, diverse, and representative aquatic insects (Walker, 1995). Their larvae represent an association between producers and secondary consumers, acting as prey of both invertebrates and vertebrates (Tokeshi, 1995).

The Northern Patagonia Andean range is considered a region with low anthropic impact, characterized by a large diversity of glacial oligotrophic lakes. Nahuel Huapi National Park (NHNP), situated in this region, is characterized to be a large reservoir of freshwater resources and by its remoteness. However, a previous work observed that Lake Moreno (41°5 S; 71°33´W, 758 m above sea level) received silver (Ag) inputs over natural background (0.1 $\mu g \cdot g^{-1}$) from the second half of 20$^{th}$ century (Ribeiro Guevara et al., 2005). Silver, in its ionic form, has been ranked among the most toxic metals to aquatic biota; despite this, its occurrence and trophic transfer in natural waters have received much less scientific attention than others elements (Revenga et al., 2011).

We carried out a seasonal study of Ag concentrations ([Ag]) in chironomid larvae inhabiting different substrates in Lake Moreno Oeste, in order to evaluate a relationship between their ecological preferences (substrate, feeding habits) and metal concentration. This is a key aspect on Ag trophodynamics, given that sediments are a storage site for heavy metals in lake systems, and chironomids may act as a doorway organism to lake trophic webs.

## Methods

Chironomid larvae were collected seasonally from different substrates in two bays in Lake Moreno Oeste between March 2014 and February 2015. Selected substrates were: the macrophyte *Myriophyllum* sp., sediment under submerged (*Myriophyllum* sp. and *Nitella* sp.) and emergent macrophytes (*Schoenoplectus californicus)*, stones and sediment at 4 and 20 m deep. [Ag] in larvae were determined by Instrumental Neutron Activation Analysis (INAA).

## Results

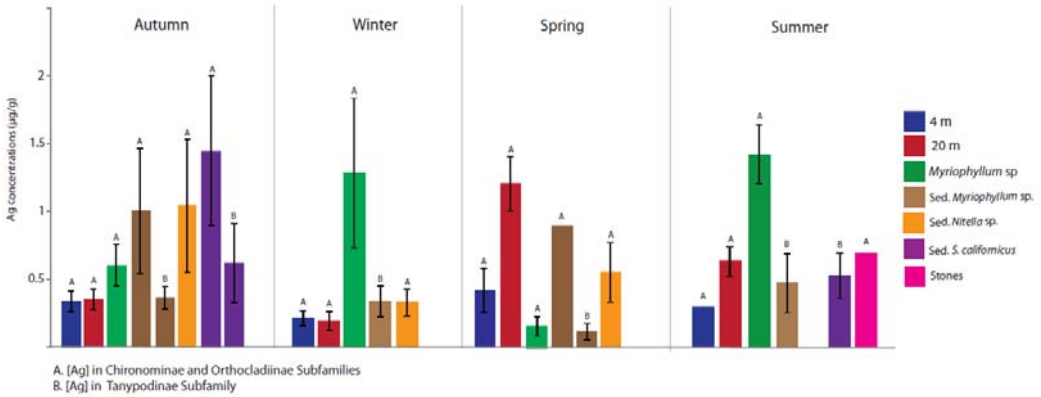


**Figure 1.** [Ag] in chironomid larvae collected seasonally from different substrates in two bays in Lake Moreno Oeste. The absence of bars indicates that chironomid larvae were not found in these substrates during these seasons.

Higher [Ag] were recorded in larvae inhabiting *Myriophyllum* sp. (Fig.1). Submerged plants can accumulate large amounts of pollutants (Pokorny et al., 2015) and transfer them to insects feeding on them. [Ag] recorded in larvae taken from the sediment under the macrophytes were also high (Fig.1), possibly related with the ability of plants to accumulate Ag principally in their root systems (Rate, 1999), affecting larvae living and feeding there. The lower [Ag] recorded in larvae belonging to the subfamily Tanypodinae could be associated with the predatory habits of this group (Ashe et al., 1987).

Although [Ag] recorded in larvae inhabiting sediment at 20 m depth during autumn and winter were low, [Ag] during spring and summer were notably higher (Fig.1). This may be related with the increase in metabolic rate associated with higher temperatures (Nichols & Playle, 2004).

## Conclusion

The spatial and temporal distributions of chironomid larvae and their feeding habits affect [Ag] bioaccumulation. This information should be considered in trophodynamic studies in lake trophic webs.

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