

Potential heterogeneity in crustacean zooplankton assemblages in southern Chilean saline lakes

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Abstract

The Chilean saline lakes are distributed mainly in the Atacama desert in northern Chile and the southern Patagonian plains. The scarce studies are restricted mainly to northern Chilean saline lakes, and these revealed that the main component in these ecosystems are the halophylic copepod *Boeckella poopoensis* Marsh 1906, or the brine shrimp *Artemia franciscana* (Kellog, 1906), and both species do not coexist. The present study consisted of field observations in zooplankton assemblages in southern Chilean saline lakes (51-53 °S). These first observations revealed three different patterns, one saline lake only with *A. persimilis* (Piccinelli and Prosdocimi, 1968), a second lake only with *B. poopoensis*, and a third lake with *A. persimilis*, *B. poopoensis* and unidentified harpacticoid copepod. These results are different in comparison with the observations in the literature that described the non-coexistence between *B. poopoensis* with brine shrimps. Ecological and biogeographical topics were discussed.

Keywords: *Boeckella poopoensis*, *Artemia*, saline lakes.

Heterogeneidade potencial em associações crustáceas do zooplâncton em lagos salinos chilenos do sul

Resumo

Os lagos salinos chilenos são distribuídos principalmente no deserto de Atacama no Chile do norte e em planícies do sul da Patagônia. Os estudos escassos são restringidos principalmente aos lagos salinos chilenos do norte, e estes revelaram que o componente principal nestes ecossistemas é halofílico copepod *Boeckella poopoensis* Marsh 1906 ou o camarão de salmoura *Artemia franciscana* (Kellog, 1906), e ambas as espécies não coexistem. O estudo atual consistiu em observações do campo em reuniões do zooplâncton nos lagos salinos chilenos do sul (51-53 °S). Estas primeiras observações revelaram três testes padrões diferentes: um lago salino somente com *Artemia persimilis*, Piccinelli & Prosdocimi, 1968; um segundo lago somente com *B. poopoensis*; e um terceiro lago com *A. persimilis*, *B. poopoensis* e o não identificado harpacticoid copepod. Estes resultados são diferentes em comparação com as observações da literatura que descreveram a não coexistência entre o *B. poopoensis* com camarões de salmoura. Os tópicos ecológicos e biogeográficos foram discutidos.

Palavras-chave: *Boeckella poopoensis*, *Artemia*, lagos salinos.

Chile is a sort of bio-geographical island isolated by the Pacific Ocean (West), the Andes Mountains (East), Glaciers in the extreme south, and the Atacama Desert in the north, one of the driest in the world. It stretches from latitude 30° south to 52° south with salty lakes at both ends with rather contrasting weather conditions, a somewhat unusual situation as salty lakes tend to be located mostly in tropical and subtropical areas (Van Stappen, 2003). The southern Chilean Patagonia has a semiarid climate and the numerous shallow water bodies found in the area exhibit a wide salinity gradient caused mainly by high evaporation rates due to extremely windy conditions (Gajardo et al., 1998), hence zooplankton assemblages vary in species richness according to the lake sampled. Here we report the salinity, conductivity and zooplankton composition of

three lakes located in protected areas of the administrative Magallanes region (51-54° S): 1) Amarga lagoon (“bitter” lagoon; 50° 29’ S / 72° 45’ W; 3 m maximum depth) at the entrance of Torres del Paine National Park, the first saline lake reported for southern Chile (Gajardo et al., 1998); 2) Ana lagoon (52° 04’ S and 69° 47’ W; < 2 m maximum depth) in Pali Aike National Park, an arid plain close to the Argentinean border; and 3) De los Cisnes lagoon (53° 14’ S and 70° 00’ W; 3 m maximum depth), a saline lake located in Tierra del Fuego island. These sites were visited in January 2008, zooplankton samples were collected using horizontal hauls with a plankton net of 20 cm diameter and 80 µm mesh size, the specimens were fixed with absolute ethanol for identification according to previous reports (Bayly, 1992; Gajardo et al., 1998).

Conductivity and salinity were measured in situ using a YSI-30 sensor.

Results revealed that Amarga lagoon parallels conditions to salty lakes in northern Chile (Gajardo et al., 1998) as it shows high salinity and conductivity (105.0 g/L; 111.2 mS/cm) with only the presence of *A. persimilis*. Nevertheless, the fact that a different species, *A. persimilis*, is found in Amarga lagoon, whilst *A. franciscana* is exclusively observed in the Atacama Desert in northern Chile, suggests that both habitats are either ecological barriers for the survival of both species, or other conditions (latitude, temperature) act as a geographical barrier between them. Although Ana lagoon tends to be similar in salinity (79.6 g/L) and conductivity (96.5 mS/cm) levels to Amarga lagoon, only the copepod *Boeckella poopoensis* (Marsh, 1906) was found, whilst in De los Cisnes lagoon both *A. persimilis*, *B. poopoensis* and harpacticoids copepods were found, though this site has low salinity (45.2 g/L) and conductivity (67.2 mS/cm) in comparison with the other three sites. The presence of cladocerans and rotifers was not observed, a similar situation reported for saline lakes of the South American Altiplano (De los Rios, 2005; De los Rios and Gajardo, 2010).

One important result is the presence together of the halophylic copepod *B. poopoensis* and *Artemia* in De Los Cisnes lagoon at the time of collection, something unexpected (Hurlbert et al., 1986), though a similar finding of non coexistence was reported for shallow saline lakes in central Argentina (Echaniz et al., 2006; Vignatti et al. 2007) and Altiplano (De los Rios and Gajardo, 2010). As supposed by Hurlbert et al. (1986) *Artemia* and halophylic copepods (in example *B. poopoensis*) would not coexist because copepods would predate *Artemia* nauplius. Regarding this point, we do not know if this predation ability is associated to *A. franciscana* exclusively, whilst this could not be the case for *A. persimilis*. The obtained results denoted that more ecological studies of zooplankton assemblages in southern Patagonian shallow ponds are necessary, considering that these ecosystems are exposed to climate changes that are associated with drying periods that would affect its salinity and as a consequence, the aquatic communities (De los Ríos, 2005).

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