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# Quaternary mollusc assemblages from the lower basin of Salado River, Buenos Aires Province: Their use as paleoenvironmental indicators

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## ABSTRACT

Quaternary mollusc assemblages preserved in the Salado basin are described and analyzed in order to reconstruct past environments and evaluate spatial and temporal variations. Five localities were analyzed, in which 48,998 individuals of eight continental gastropod species were recovered: *Heleobia parchappii*, *Antillorbis nordestensis*, *Biomphalaria peregrina*, *Drepanotrema heloicum*, *Uncancylus concentricus*, *Pomacea canaliculata*, *Succinea meridionalis* and *Miradiscops brasiliensis*. As well, other species typical of marine-estuarine environments have been found, among which *Heleobia australis* is highlighted. Based on changes in the composition and abundance of the assemblages, different environments could be recognized. Quaternary mollusc assemblages have low taxonomic heterogeneity and spatial and temporal variations. Assemblages recovered from Late Pleistocene–Early Holocene sediments are characterized by low species richness and abundance, with a single species in numerous examples. In the Middle Holocene, the shells became more constant and more diverse. Late Holocene assemblages have high species richness, freshwater, terrestrial and amphibious habits, and show some differences among different localities. Several episodes of flooding have been identified through the record of fossiliferous horizons with high density of shells, mainly *Heleobia parchappii*. These events that affected the area of influence of the Salado River occurred at least during the Late Holocene.

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## 1. Introduction

Molluscs constitute one of the main components of modern freshwater communities, being found in a wide array of habitats, with different life history strategies and complex ecological interactions (Köhler et al., 2012). They are also among the dominant fossils recorded in continental Quaternary deposits (De Francesco, 2013), present in different types of depositional settings, including fluvial, lacustrine, glaciolacustrine, and palustrine sediments (Miller and Bajc, 1989).

Quaternary continental molluscs have been worldwide used to reconstruct different habitats (e.g., Roth and Reynolds, 1990; Rousseau, 1991; Magnin, 1993; Rousseau and Puisségur, 1999; Moine et al., 2002; Pisút and Cejka, 2002; Sharpe and Forester, 2008; Köhler et al., 2012). They are a very useful tool for

geochronologic, isotopic and climatic studies (Zanchetta et al., 1995; Bonadonna et al., 1999; Leng et al., 1999; Bridgland and Maddy, 2002). The analysis of fossil assemblages allows determination of paleotemperatures and productivity (Rousseau, 1991; Bonadonna and Leone, 1995; Zanchetta et al., 1995; Bonadonna et al., 1999; De Francesco and Hassan, 2013), hydrological characteristics (Pisút and Cejka, 2002), and chemical composition (Sharpe and Forester, 2008) of the water bodies they inhabited.

In Argentina, study of the ecology of freshwater molluscs has been scarcely developed, with little information on the ecological requirements and habitats of many species. Recently, some exploratory studies have been performed (e.g. Ciocco and Scheibler, 2008; De Francesco and Hassan, 2009; Seuffert et al., 2010; Tietze and De Francesco, 2010; Tietze et al., 2011; Hassan et al., 2012; Seuffert and Martín, 2013) providing new insights into the usefulness of molluscs as paleobioindicators. The environmental information gathered on modern communities can be extrapolated into the fossil record (De Francesco, 2013), where the same species are represented. Despite the low richness exhibited by freshwater species, they can be reliably used as paleoenvironmental

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bioindicators (Ciocco and Scheibler, 2008; Sharpe and Forester, 2008; Tietze and De Francesco, 2010; Tietze et al., 2011). Even though most species exhibit wide ranges of tolerance or can be found indistinctly in different water bodies, they are still useful to recognize differences at a microhabitat scale (Tietze and De Francesco, 2010).

There is no information about the taxonomic composition of the numerous Quaternary mollusc assemblages found along the river margins of the Salado River basin. This is surprising, as the basin has historically been the focus of many geological, geochronological and paleontological studies (e.g. Fidalgo et al., 1973, 1981; Figini et al., 1995; Fucks et al., 2007, 2012, 2015; Pomi, 2009; Mari et al., 2013; Prado et al., 2013; Scanferla et al., 2013). Therefore, the aim of this study is to analyze the mollusk assemblages preserved in the Salado River basin in order to (1) evaluate the spatial and temporal variations and (2) reconstruct past environments.

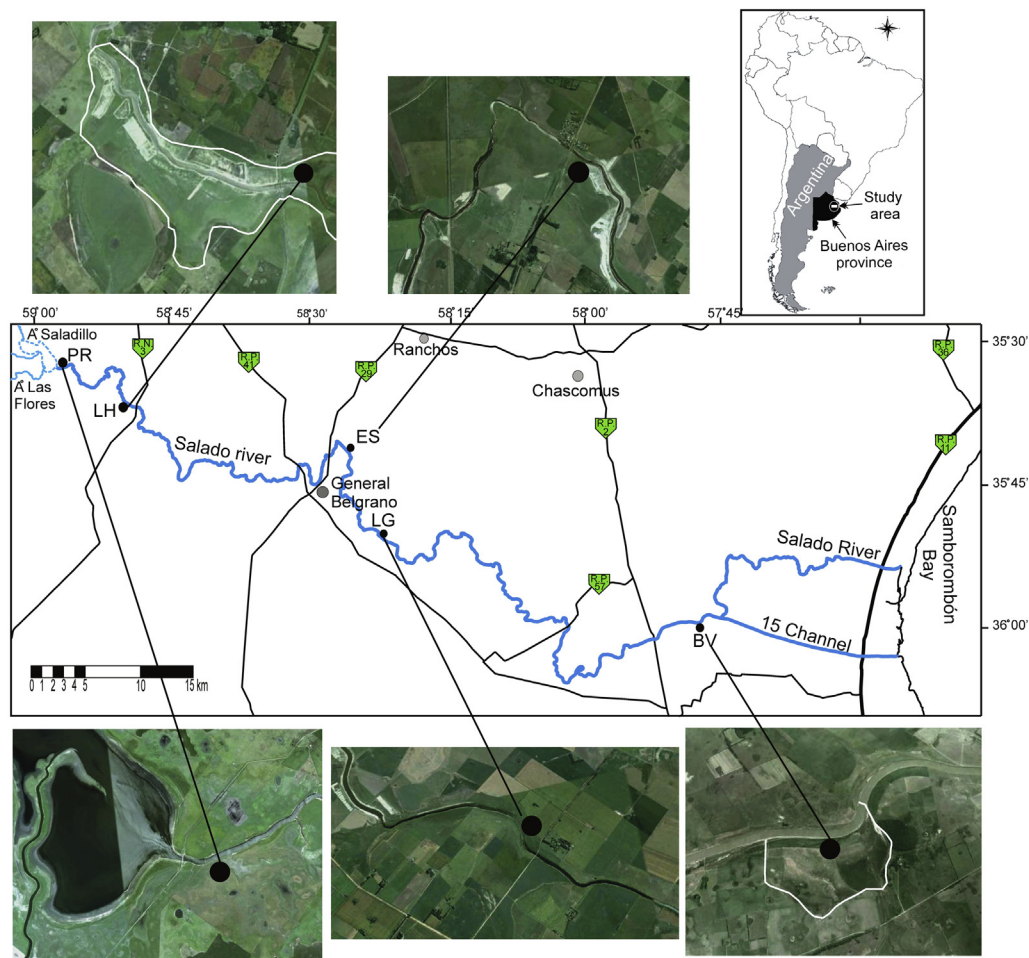
## 2. Regional setting

The Salado River basin (Fig. 1) is located in northeastern Buenos Aires Province, within the domain of the Pampa Deprimida region which is a graben filled by Cenozoic sediments, lying between 35° and 38° S and 57° and 61° W. The Salado River is one of the largest

water courses in the Buenos Aires Province, 700 km long; its basin is about 140,000 km<sup>2</sup> equivalent to almost 20% of the province (CFI, 1962).

The study area is located in the lower sector of the Salado River basin, where the main channel of the Salado River has a poorly-developed drainage system, which is intercepted by deflation basins and lakes, in an environment of low slope, ranging between 0.25 and 1.7%. Besides the deflation basins, low longitudinal hills transverse to the regional slope and nearshore shells beds (Fucks et al., 2012) produce a system of low morphogenetic potential. This generates water excess in times of widespread flooding in rivers and lakes (Quirós et al., 2002; Vazquez et al., 2009), and a significant decrease in flow, even with interruption of the course and total drying of lentic bodies in periods of drought.

There are several exposures of Quaternary sediments in the Salado River basin that reach more than 5 m in height, and are ideal sampling scenarios due to the abundant concentrations of molluscs. Although the ages of the units are between 14 ka and 0.5 ka, comprising the late Pleistocene–Holocene interval, it is only in the Late Holocene that the highest species abundance and diversity is found. A precise chronologic chart of the study area was established on the basis of previous studies (Fucks et al., 2012; Mari et al., 2013). Following the stratigraphic scheme proposed by Fucks et al. (2015), four lithostratigraphic units have



**Fig. 1.** Study area, location and QuickBird pictures of samples sites, in LH and BV the limit of paleolakes are indicated. Abbreviations: BV = Buena Vista de Guerrero; LG = Puente Las Gaviotas; LH = Los Horneros, ES = Estación Río Salado, PR = Puente Romero.

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