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New cockles (Bivalvia: Cardiidae: Lymnocardiinae) from Late Pleistocene Lake Karapınar (Turkey): Discovery of a Pontocaspian refuge?

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ABSTRACT

Three species of lymnocardiine cockles (Bivalvia: Cardiidae) from Late Pleistocene deposits near Karapınar (Konya Basin, Anatolia, South Turkey) are reported. Two of the three species are described as new (*Monodacna pseudocolorata* and *Adacna yaninae*). A third species (*Hypanis ?plicatum*) is represented by two incomplete valves. Radiocarbon ages of circa 35–43 kA were obtained for the fauna. The lack of lymnocardiine cockles in Pleistocene Anatolian inland lake deposits raises the possibility that the new record represents a short lived occurrence. We raise the possibility that the Karapınar Basin cockles may have been introduced from the Black Sea region through avian dispersal, although we cannot rule out their cryptic existence in the region during the Pleistocene. The apparent absence of *Monodacna colorata* group of cockles in the Black Sea Basin during the last glacial raises the possibility that the Karapınar region may have served as a true refugium rather than just a sink for Pontocaspian biota.

1. Introduction

A great variety of so-called Pontocaspian species inhabit the northern Black Sea, the Caspian Sea and (formerly) Lake Aral. Pontocaspian biota include fish, molluscs, crustaceans but also planktonic groups such as dinoflagellates and diatoms that have evolved in the past two million years and became adapted to the unusual salinity regimes in these lakes and seas (Nevesskaya et al., 2005). Although most of the development of the Pontocaspian biota is staged around the Caspian Sea, Pontian (Black Sea) and Marmara Sea basins (e.g. İslamoğlu and Tchepalyga, 1998; Nevesskaja et al., 2001; İslamoğlu, 2009; Yanina, 2014 and references therein), satellite areas such as the Balkans and Anatolia may have played a role in their evolution as well. Several of the present-day Pontocaspian genera may have originated in western Anatolian lakes systems (Wesselingh et al., 2008; Wesselingh and Alçiçek, 2010). Anatolia also has been shown to be a "sink" for Pontocaspian taxa such as the gastropod genus *Falsipyrgula* (Wilke et al., 2007).

Yet the presence of three, relatively tall species of lymnocardiine cockles in Quaternary samples presented to us from the Konya region in south-central Turkey, 600–800 km away from the main Pontocaspian basins, came as a great surprise. The new find has the potential to elucidate the role of satellite regions in the evolution of Pontocaspian biota. The objective of this paper is to describe the new species and to explore implications for the development of Pontocaspian biota. The question we address is: what role have satellite regions, like Anatolia, played in the evolution of Pontocaspian biota. Were they mere sinks, or could they have been sources and even refuges?

2. Geological setting and material

The study area is located in the Karapınar subbasin which is the NE–SW extension of the Quaternary paleolake-system of the Konya Basin in the semiarid southern Central Anatolian Plateau (Fig. 1). The Konya Basin is a large (4300 km^2) complex lake basin that currently is mostly a dry plateau at altitudes of 1000–1030 m.a.s.l. Several relic lakes are present within the basin complex. To the south and west the Konya Basin is bordered by the Taurus mountains and to the north by low hilly areas that separate the basin from the Tuz Lake Basin (Lahn, 1946, 1948; De Ridder, 1965; Roberts

Abbreviations used: H, height; LV, left valve; RN, number of ribs (including posterior ribs); RV, right valve; SD, semidiameter; sd, standard deviation; W, width.

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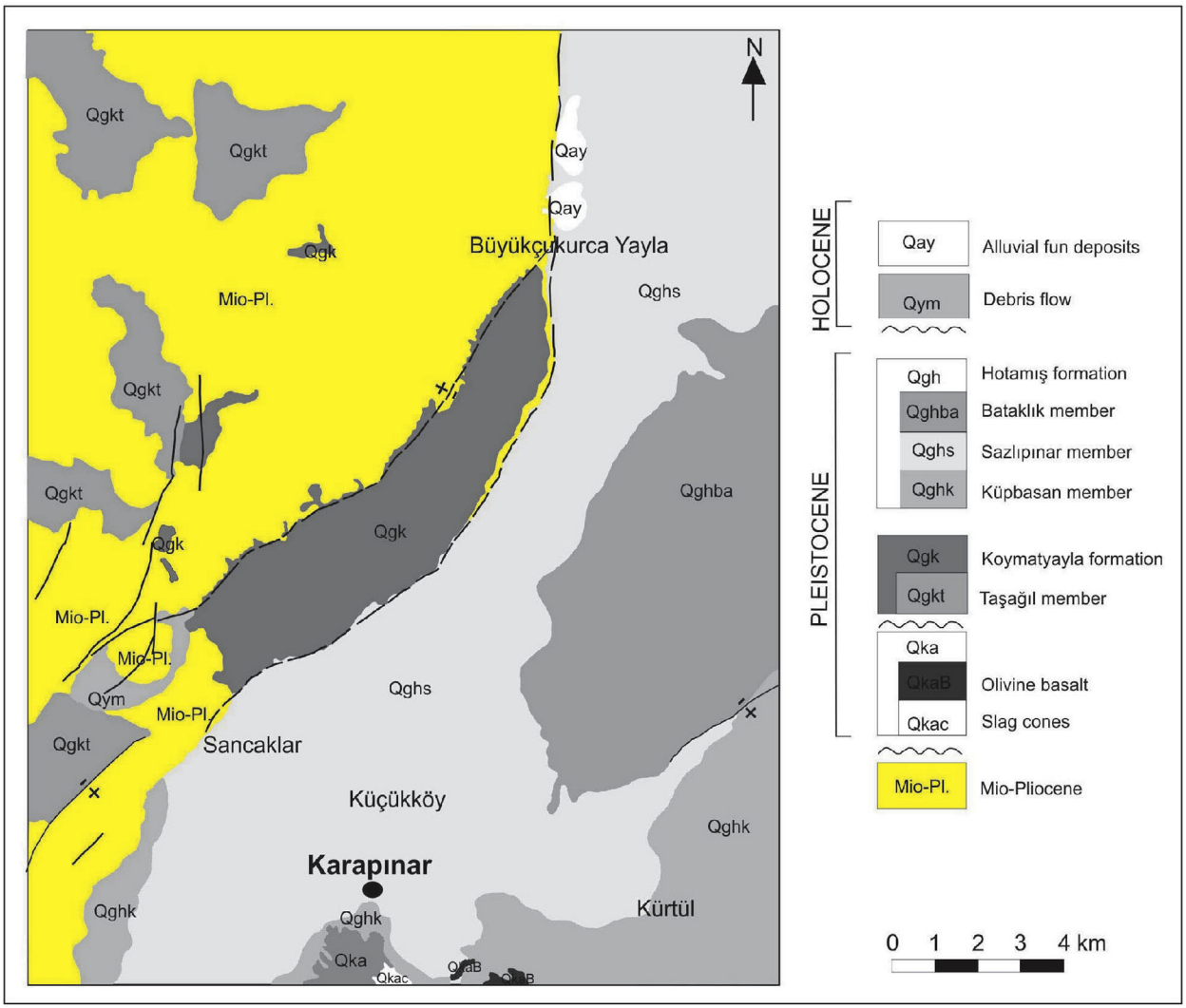

Fig. 1. Locality map (modified from MTA, 1:100.000 scaled Geological map, M31).

et al., 1999). The Konya Basin has a Late Neogene-Quaternary sedimentary fill made up of brackish – fresh water sediments representing lacustrine, marsh and fluvial/stream settings (Lahn, 1946, 1948; De Ridder, 1965; Erol, 1969, 1983, 1985, 1990; Roberts et al., 1979; Ulu et al., 1994; Fontugne et al., 1999; Roberts et al., 1999).

The waxing and waning of lake phases in the region during the late Neogene and Quaternary has been due to a delicate hydrological balance between precipitation and evaporation (Kuzucuoğlu et al., 1999; Ulu et al., 1994). In this region groundwater flows have played a very prominent role in the development of aquatic habitats, as is shown for example by the occurence of karst features such as sinkholes (locally named as obruk, dolin, uvala). Furthermore, Neogene-Quaternary volcanism has been active as shown by volcanic deposits and the presence of crater lakes (maar structures: De Ridder, 1965; Kuzucuoğlu et al., 1998a, 1998b, 1999; Fontugne et al., 1999). Spatial and temporal dynamics of the Konya Lake Basin system were controlled by the complex interplay between regional

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