

Preliminary study of the Telmen Lake's ancient terrace deposits in Western Mongolia

Khand Yo.¹, Ariunbileg S.²

¹*Paleontological center, Mongolian Academy of Sciences*

²*Institute of Geology and Mineral Resources, Mongolian Academy of Sciences*

E-mails: Khandyo@Yahoo.com., s_ariunbileg@yahoo.com

1. Introduction

Recently, core study taken from bottom sediments of lakes is activated due to changing (warmth) of Global climate. The lacustrine sediments of lakes well reflect environmental and paleoclimate changes, therefore, they have been important subject to studies of Holocene climate, environmental changes, genetic conditions and

period of origin. Besides this, the study of ancient terrace sediments is an important parts of the paleo environmental investigations. The ancient terrace sediment study is starting in Mongolia.

In this paper, we present new data from the sediment profile of the ancient terrace 3 of Lake Telmen that had not previously been published. Lake Telmen (48°50' N, 97°20' E, 1782 m a.s.l) is located on the extreme western edge of the Hangai Region in an intermountain depression between the Tarvagatai and Hangai mountain ranges. The lake receives fluvial input from reverseiraining the Tarvagatai and Hangai Mountains, but input is River Khooloi Gol on the west of the lake and has no outflow. Lake Telmen is slightly salty and shows pronounced lake level changes (Peck et al., 2002).

The Lake Telmen was formed by tectonic events, therefore, lakeshore has non-even forms. There are some ancient terraces along with southern and northern shore. Peck identified ancient lake terrace and paleolagoon locations and 15 m high paleo terraces along with southern shore of the lake. First, second and third terraces are represented by accumulative terraces, while forth and fifth terraces are formed by erosion- abrasion processes (P.Khosbayar, 2005). We obtained profile section 220 m long (Fig.1) from the ancient terrace 3 and sampled for lithological and ostracods study of relict highstand depositional features.

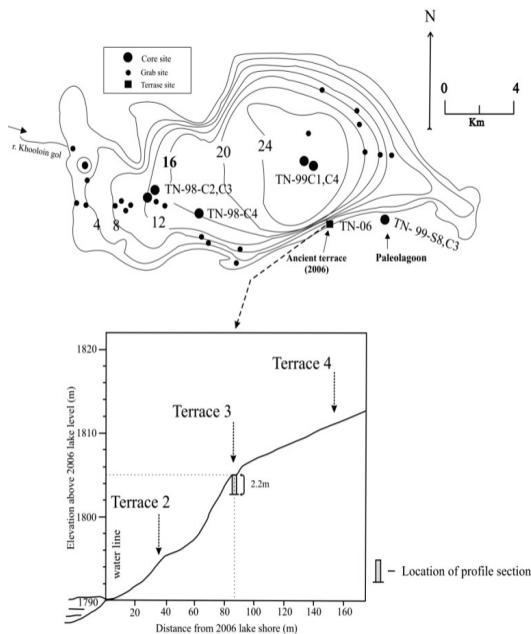


Fig.1. LAKE TELMEN BATHYMETRY MAP WITH CORE, SURFICIAL GRAB SAMPLE LOCATIONS (peck et al., 2002) AND ELEVATION PROFILE OF THE ANCIENT TERRACE (2006)

2. Materials

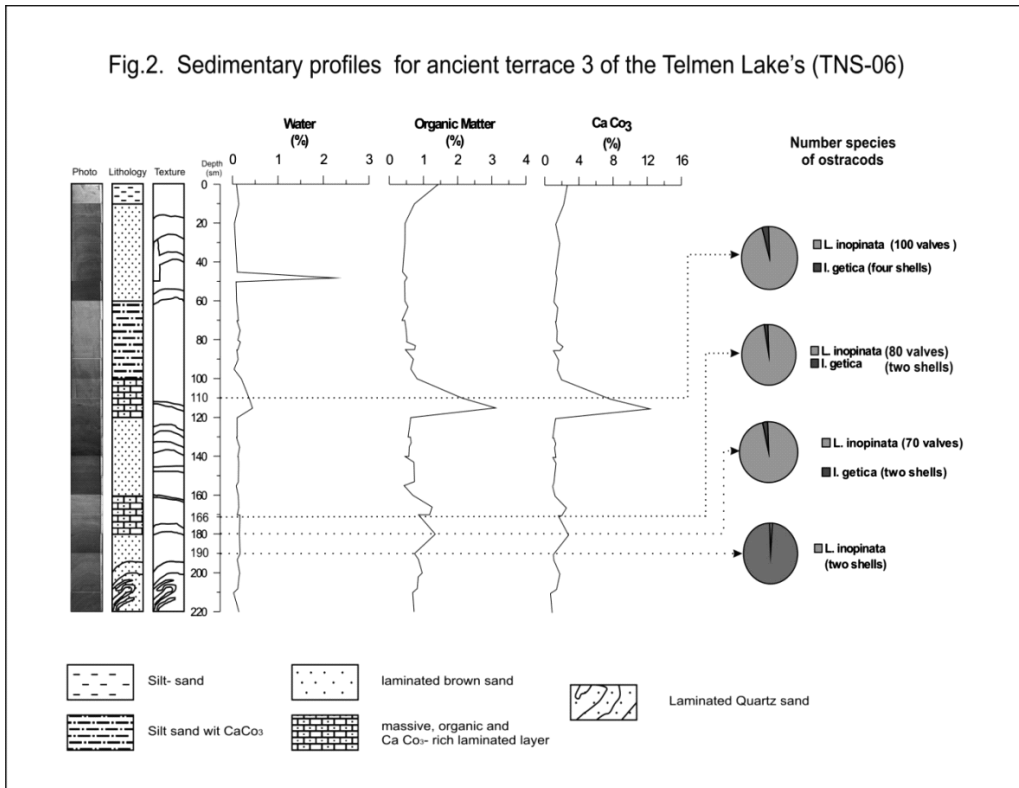
A 220 cm sediment sample (TNS-06) collected from the sediment profile of the ancient Terrace-3 on the southern shore of the lake Telmen in 2006 with located at coordinates: 48°48.217' N and 97°22.578' E (1805 m a.s.l; distance from 2006 lakeshore 87 m, Fig. 1), has been divided as 10 cm interval from top to the bottom. All the sample pieces have been analysed for the water content, carbonate content, TOC, mineralogical size, lithological and mineralogical description. Top 10 samples from the sediment profile section were collected for ostracod analysis.

3. Preliminary results

The following lithology was observed in the sediments of Telmen Lake ancient terrace-3: a silty sand

unit at the depth of 0-10 cm; a unit of laminated bedded brown sand with high water content at the depth of 10-60 cm; a silty sand with more organics and carbonate at the depth of 60-100 cm; a unit of massive and laminated layer is rich in organic trashes and carbonaceous matter at the depth of 100-120 cm and 160-180 cm; and laminated quartz unit at the bottom 180-220 cm of the terrace profile section (Fig. 2).

The lithological profiles show a relationship between organic matter and carbonaceous content, and two major intervals of massive, organic rich sediment at the 100-120 and 160-180 cm depth of the terrace section. Fine-grained sediment is rich in organic trashes and carbonaceous matter containing ostracods *Limnocythere inopinata* and *Ilyocypris getica*. These species are in a wide variety of habitat ranging from shallow littoral zone of lakes to small ponds and from fresh water to highly alkaline water basins (Geiger,



1994). The massive organic and carbonaceous rich intervals indicate that climate was warm and lake water changed to saline water. The two intervals of massive sediments were same as the record in the lacustrine sediments of core TN 99C1, C4 of the Lake Telmen (Peck et al, 2002, Fig.1).

4. Discussions

These two massive intervals in the ancient terrace-3 have a good correlation with data of massive intervals in Unit A of lacustrine core TN99 C1 and C4 of Lake Telmen. There are three major intervals of massive sediment (85-97 cm, 127-130 cm and 174-185 cm) of core sediments referring to age (1310-1540, 2130-2190 and 2940-3150 cal yr) with the timing of lake-level highstand as measured by terraces (1260-1710 cal.yr.). According to the data of Peck et al., 2002., the plant, macrofossils samples gathered from the terrace-3 indicate that the lake level was at Terrace-3 height at 1260-1400 cal yr ago.

The massive intervals in the terrace profile sediments blacked the age of (1260-1400 cal.yr). By opinion of Peck et al.(2002), the time, when limnic water level had been at Terrace-3, was warmer than the laminaevelandy layer with low organic veland. The terrace profile section ioncharacterized by alternative changes in the ratio of lake-level. During referred period to the major massive intervals, climate was warm and water level was lownd. Although, there were several cold and dry periods and water depth changed to shallow, they had been reflected in thick laminated sand containing low organic mater.

According to recent data of ancient terrace studies, the lake water level had been at 1805 m asl before 1260 to 1400 cal year ago. During this period, content of lacustrine sediments had been changed depending on ancient climate changes; water level was at higher elevation and climate was warmer, deposits were rich in organic and carbonaceous matters, at that time. Although, the thick sandy sediment layer refers to origi-

nate less organic matter due to climate has turned to cold.

Judging on the deposit layer rich in massive organic sediments identified in ancient terraces located along with southern shore of Lake Telmen has similarity to lake bottom core feature (sample TN99 C1 and C4), we might conclude that northern part of lake basin plunged and paleo lake levels was at Terrace 3 around 1805m height over 1000 year ago, due to neo-tectonic movement. The highstand elevation variation in terrace height is recorded as relict of ancient terraces on the southern part of Lake Telmen. And we have observed that the deepest place (24 m) of water is on southern part of lake, close to southern shore, just to north from southern terraces.

Ostracod analysis.

The ostracods found from the four levels of the lowermost an ancient terrace belong to the following species: *Limnocythere inopinata* (Baird,1843), *Ilyocypris getica* Masi,1906. Among these ostracods *Limnocythere inopinata* is generally dominated in terms of numbers and *Ilyocypris getica* is extremely rare.

Limnocythere inopinata is by far the most frequent species, which is not present in most of the samples but also in high abundances (Fig. 2). This species shows a wide variety of habitats ranging from the shallow littoral zone of lakes to small ponds and from freshwater to highly alkaline water bodies (Geiger, 1994). A maximum abundance is reported for a salinity range of 3-9 ‰ (Kempf, 1986; Holmes et al., 1999). The species is unable to swim and prefers calm waters rich in macrophyte debris on the lake (Meisch, 2000).

L. inopinata tolerates high chloride levels and occurs in waters that are enriched in $\text{Na-HCO}_3\text{-CO}_3$ (Holmes et al., 1999).

Ilyocypris getica is characteristic of small, shallow water bodies such as ponds and slow flowing streams and prefer temporary waters and are so far not reported from lakes (Meisch, 2000). They are stenothermal for a temperature range of 10-15 °C and tolerate a slight

increase of salinity (Meisch et al., 1996). They are characterized by palaeoarctic distribution and fossil records range from Pleistocene to Recent.

Although the composition of ostracods found from an ancient terrace deposits of Telmen Lake in Western Mongolia is monotonous, most of them are overlapped with strata that contain high content of organics and carbonates. This shows that ancient water lakes had a favourable living condition for *L.inopinata*.

A previous study of Telmen Lake has established the age of ancient terrace deposits using radiocarbon as dating back to 1260-1400 cal.yrs. (Peck et al., 2002). It allowed us easily to determine the age of deposits containing the ostracods.

Despite detailed studies of some lakes on the territory of Mongolia were initiated last few years, an investigation of ancient terrace deposits, especially their fauna and flora, is still remain a subject of research.

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