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Prehistoric shell middens, seascapes and landscapes at Lake Siranda (Las Bela, Balochistan) Preliminary results of the 2011 fieldwork season

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Abstract

The first season of archaeological surveys carried along the shores of Lake Siranda (Las Bela, Balochistan) in January 2011 has shown the presence of two prehistoric shell middens characterised by fragments of mangrove and marine shells as well as chipped stone artefacts. The shell middens were AMS dated to the middle Holocene by one single specimen of Terebralia palustris gastropod. Their presence indicates that mangrove environments exploited by groups of shellfish gatherers existed in the area at least since the above period, and that the present-day lake depression was in fact a shallow tidal lagoon of the Arabian Sea, the shores of which had been settled at least during part of the Neolithic.

Keywords

Balochistan, Las Bela, Lake Siranda, Shell middens, Mangrove environments, Shellfish gatherers

1. Preface

This paper is a preliminary report of the surveys carried out at Lake Siranda in January 2011. Its scope is to describe the finds we discovered, discuss the results we obtained and frame them into the general picture of the archaeology of Las Bela province and the northern coast of the Arabian Sea.

Very little is known of the archaeology of Lake Siranda and the region that surrounds it. This is mainly due to the absence of any systematic survey along the coast of Las Bela (Khan, 1979a), the only exception being that of Sir A. Stein, who provided us with a detailed description of the geography of the province (Stein, 1943: 194-219), during his research aimed at the definition of the route followed by Alexander on his retreat to Babylon across the country of the Oreitai.

In his paper, A. Stein describes the place where the Macedonian army camped, which is briefly reported by Arrian (Alexandrou Anabasis, VI: 5) close to "*a water not large*", translated by Sir A. Stein (1943: 214) as "*a small (sheet) of water*", possibly the eastern shore of Lake Siranda. This place was probably chosen by Alexander because of the scarcity of water in "*mostly an uninhabited desert, presenting a wilderness of hills and cliffs with swampy or arid clay plains*" with capricious rainfalls "*the greater part in summer, some in winter*" (Field, 1959: 17), "*situated as it is just without the limits of the south-west monsoon*" (Carless, 1855; see also Pithawalla, 1953: 21).

The most important archaeological site in the area is Kot-Bala (better known as Balakot), which was discovered by R. Raikes in 1960 (Raikes, 1968), and later reported by A.R. Khan (1979b: 3). The site, located in the Khurkera alluvial plain, some 5 miles east-south-east of the southernmost coast of Lake Siranda, and 2 miles north of the course of the Windar, was excavated by G.F. Dales in the 1970's (Dales, 1974; 1979; 1981). It is a multi-stratified mound with occupation layers and structures attributed to the Chalcolithic and Bronze Age periods, radiocarbon-dated between 5200±135 (UCLA-1923A) and 4210±80 (UCLA-1293D), and 4050±130 (HAR-1992) and 3890±100 uncal BP (HAR-1993) respectively (Possehl, 1988: 171-172). Nevertheless these results are from samples collected from a reverse stratigraphic position, and their reliability has been greatly disputed by (see Shaffer, 1986: 74).

The study of the faunal remains collected during the excavations showed an "*enormous quantity*" of broken specimens of *Terebralia palustris* gastropods "*gathered for food*" (Meadow, 1979: 296), which are supposed to indicate the presence of a mangrove environment rather close to the site.

"*Weathered samples of these shells*" are reported also by R.E. Snead (1966: 60) from the eastern shore of Lake Siranda, a shallow depression "*about two miles north of the Miáni village. When full it is about 9 miles long and 2 miles broad. Its general situation is north and south. The average depth of water in the cold weather is 3 to 5 feet, but the part known as* kun *in the south-west corner attains to a depth of 22 feet. On the occurrence of floods the level is raised some 10 or 12 feet* (Minchin, 1907: 9).

The lake, surrounded by sand dunes on its western and eastern sides (Snead, 1967; 1969: 33-35; Snead and Frishman, 1968), is considered by many authors a playa remnant of the Sonmiani lagoon (Snead, 1966). It receives water from the Watto River and through it from large branches of Porāli and Kharrari rivers, the first of which holds in solution a large quantity of saline ingredients (Hughes, 1878: 125), at its northern end, and sometimes also from the Windar River from the south-eastern side, caused by overflow from the dam mentioned below. In order to prevent egress of the water and allow some kind of cultivation (nowadays no longer practiced; recently large earthy dams have been built for the same reason along the southeastern side of the depression), a dam known as Bandar Windar was erected under Jam Mir Khan II around the mid XIX century (Minchin, 1907: 10), and occasionally the lake was crossed by boats coming from Damb.

According to R.E. Snead, at the present time only two overflows from the lake are possible, at the opposite (N and S) extremities of it (Snead 1966: Figure 15). As a matter of fact, after normal floods large part of the water is slowly absorbed or evaporated and large parts of the surface are consequently covered with mud cracks and salt spots.

Little is known of the early history of the lake. It is accepted by the authors that it was formerly part of the present Sonmiani lagoon (Miani Hor), sharing with it its dominant environmental aspects, and that it "*functioned as a tidal lagoon in the not-too-distant past*" (Snead, 1966: 60). According to the above author this depression was formerly connected to Sonmiani from which was later separated by sand dune formations, later stabilized by vegetation (Snead, 1969: 34), although this opinion needs further investigations to be accepted.

2. The 2011 Survey

A preliminary survey was undertaken in the depression by two of the writers (P.B. and R.N.) and Prof. M.K. Badini of the University of Balochistan, Quetta on January 10th and 11th, 2011 (Figure 1). The surveys were aimed at 1) the discovery of prehistoric shell middens, which were supposed to exist in the area due to the recovery by R.E. Snead (1966: 118 and Figure 15) of weathered samples of *Terebralia palustris* and *Telescopium telescopium* mangrove shells along the eastern shore of the lake, 2) the definition of the past extension of the mangroves following the description by the above author of recently-disappeared mangrove environments (Snead, 1966: Figure 21), and 3) the eventual prehistoric/historic connections of the Siranda basin with the Sonmiani lagoon, and the Arabian Sea in general, and 4) the reasons why, and when, it changed into a (seasonal) freshwater lake. Thus the research began from the central-eastern coast of the depression and later extended to its central part.

Two shell middens were discovered (Figure 2) the characteristics of which are provided in Table 1. They consist of concentrations of fragmented shells of mangrove molluscs (*Terebralia palustris* and *Telescopium telescopium*) and Arcidae, from which a few chipped stone artefacts made from chert of unknown sources were collected (Table 1; Figure 3). One single specimen of *T. palustris* was AMS-dated from each site showing that they were settled during the second half of the 7th (SRN1) and the end of the 7th/beginning of the 6th millennium uncal BP (SRN2) (Table 2). The location of the following points has been taken with a GPSmap 60CSx device, using WGS 84 as Map Datum.

SRN1 (25°32'31.1"N-66°37'09.5"E, 5m asl). This low, almost circular shell midden, some 20m in diameter, is located along the central-eastern shore of the basin, where a seasonal stream enters it, at an altitude of some 5m (Figures 4 and 5). The site is characterized by (mainly) fragmented, weathered and decoloured *T. telescopium* and *T. palustris* mangrove gastropods and *Anadara* sp. shells. The site surface is covered also with freshwater gastropods.

SRN2 (25°31'31.0"N-66°36'48.9"E, 2m asl). Only a small part of this small shell midden is exposed, given that it is mostly covered by a sand dune with a north-south orientation. Its was found because of the recovery of *T. telescopium* and *T. palustris* on its surface. The site is located some 2km south-west of SRN1 at an altitude of 2m (Figure 6).

Except for the above prehistoric shell middens, other sites where sampled mainly for molluscs identification (see Table 3). They are:

SRN3 (25°31'44.6"N-66°36'49.6"E, 2m asl). Is a low, vegetated sand dune, some 250 m north of SRN2, totally covered with freshwater gastropods, a sample of which was systematically collected from a surface of 2 sq. m. From this site comes a chert flakelet (Figure 3, n. 5). The site, from which mangrove shells were not recovered, did not yield any other trace of human activity.

SRN4 (25°32'07.0"N-66°37'02.3"E, 3m asl). Freshwater gastropods were collected randomly from this spot, from which fragments of mangrove shells, mainly *T. telescopium* were noticed, most probably indicating the presence of a shell middens in its surroundings.

SRN5 (25°33'40.4"N-66°35'36.4"E, 6m asl). Is located in the northernmost part of the lake surveyed in 2011. Among the sparse, bushy vegetation of Figure 7 a scatter of *Circenita callipyga* marine bivalves was observed and partly collected a few dozen metres east of the shrine of Haji Syed Baba.

SRN6 (25°31'48.9"N-66°37'16.9"E, 10m asl). Another collection from a spot very rich in the freshwater gastropod *Melanoides tuberculata*.

SRN7 (25°31'32.9"N-66°36'44.2"E, 4m asl). From the slope of a sand dune, west of SRN2, comes one specimen of *Anadara* cf. *uropygmelana* whose valve shows breakages on the side margin probably due to opening by man.

3. Botanical aspects

At present Sonmiani lagoon is characterized by a small but interesting mangrove cover, the only surviving site along the whole Pakistani coast where *Avicennia marina*, *Ceriops tagal* and *Rhizophora mucronata* co-exist (Saifullah and Rasool, 2002), in spite of severe human pressure exerted in the course of centuries.

Settled very close on the west to the Las Bela Axis (one of the important tectonic elements of the region), the whole coastal and adjacent areas have been submitted to strong epeirogentic movements in the past that are still active (Snead, 1967). It is admitted that uplift movements cut the ancient connections between Miani and Siranda, causing eventually silting of the inner basin. Quoting the Survey of India 1915, R.E. Snead (1966: Figure 21) points to the presence of living mangroves some 4 or 5 kms along the south-western side of Siranda Lake at the end of XIX century, but no traces of these have survived or are visible any longer, and the information deserves further control.

Studies of the vegetation in the Las Bela area have been carried out by several authors since Boissier's explorations mid XIX century: a general account is given in Snead and Tasnif (1966). Nowadays the vegetation, as it was possible to examine during the short survey in January 2011, is mostly formed by halophytic Chenopod herbs and shrubs on the muddy flats (*Arthrocnemum indicum*, *Haloxylon* sp., *Salsola baryosma*, *Suaeda monoica*, *Salsola* spp.); on sandy dunes *Aerva javanica*, *Calotropis procera*, *Acacia* sp. and *Prosopis cineraria*; on the surroundings sandy hills *Tamarix* spp., *Salvadora oleoides*, *Acacia* sp.

Nothing of this flora points to a past existence of a lagoon with localized mangrove swamps and only a detailed coring project could provide sound palaeoenvironmental data. The scattered presence of shells of mangrove molluscs (*T. telescopium* and *T. palustris*) would point to a former local presence of this kind of association, but an off-site collection of molluscs should also be taken into account, as it has been suggested in the not far Chalcolithic/Bronze age site of Balakot (Meadow, 1979).

In her studies on pollen assemblage at Balakot, some 5 miles east-south-east of southern side of Siranda Lake, McKean (1983) concludes that in the late Holocene the climate was not wetter than that of the present. Her pollen diagram shows the dominance of desert/dune scrub taxa, and particularly Chenopodiaceae family, with close similarities to modern pollen assemblages of the area. It has been suggested by the same author, that Chenopod pollen was deposited by the wind blowing from coastal dunes and Siranda Lake, with its possible larger connection to Sonmiani lagoon, would have therefore approached the coastline to the site. Another important point is the total absence of mangrove pollen in the Balakot diagram. Despite mangroves (particularly *Rhizophora*) produce fairly high quantities of pollen, its circulation is limited by the density of the canopy and would not travel far from the original source. Therefore the absence of mangrove pollen at Balakot does not imply necessarily the absence of mangroves even in the ancient Siranda Lake. Only further research and the possible presence of mangrove macro-remains (wood and/or charcoal) buried in the sediment of Siranda would contribute to the solution to this problem.

4. The malacological remains

Malacological remains were collected from different spots of the central-western and (SRN 5) e central parts (SRN 3, SRN 4, SRN 6, SRN 7) of the basin, the shores of which are covered with a scarce bushy vegetation (Figure 7) that slowly disappears towards the centre of the dried lake, where wide sandy spaces prevail. The altitudes of the above sites vary from 2 to 10m. Shell spots are common to many of the surfaces of the central portion of the lake crossed during the survey. The above samples have been collected from specific spots for a first qualitative analysis.

Two are the most important components: 1) a few coastal marine species, from sites SRN4, SRN5, SRN6 and SRN7, and 2) freshwater species that prevail from SRN3, SRN4 and SRN6 (Figure 8). SRN6 yielded also one land snail (Figure 10 and Table 3).

Zootecus chion: five species of *Zootecus* have been described from the Indian Subcontinent and its adjacent regions (Ramakrishna and Mitra, 2010). *Z. chion* is reported from both Karachi and Balochistan, Las Bela plain included, where it is signaled as a subspecies of *Zootecus insularis* (Ehrenberg, 1831) (Haas, 1959; Snead, 1966; Thomas, 1999). Although this genus needs a taxonomic revision, the attribution of 7 specimens from SRN6 to the species *chion* (Pfeiffer, 1856), based on the smaller dimension of the shell, compared with *Zootecus insularis*, seems to be correct (A. Schileyko *in litt*., 10.03.2011; E. Neubert *in litt*., 07.04.2011).

Although *Z. chion* and *Z. insularis* are both reported from arid and semi-arid environments, their presence seems to be connected with vegetation covers of soils close to water-related environments, where it reaches the highest percentage of individuals per sq. m. during drier and hotter seasons (Garg *et al*., 2009).

The five freshwater species are common in the Middle East and the Indian Subcontinent (Abdel Azim and Gismann, 1956: 415; Snead, 1966; Thomas, 1999; Subba, 2003; C.A.M.P., 2005; Pointier *et al*., 2005; Burdi *et al*., 2008; Sarang and Sharma, 2009; Liu *et al*., 2010). They live into low hydro-dynamic shallow water environments characterized by shoreline vegetation with *Phragmites* e *Typha*. They are often found on the bottom-surface during dry seasons (Plaziat, 2005).

Bellamya bengalensis (banded-pond-snail) is a benthic pond snail living in quiet freshwater, on the bottom muds and in estuarine brackish water also at a minimum distance of 10 m from the sea, where it is present in shore deposits. It is commonly found floating on the water surface among aquatic vegetation. It can survive temporary during the periodic drying out of the water supply (Hora, 1951; Ali *et al*., 1987; Subba Rao, 1989: 227; Nazneen and Begum, 1994; Plaziat, 2005). This species has already been recorded from Siranda by R. E. Snead (1966: 118). In some regions of India it is used as poultry food (Rabbi, 2009).

Melanoides tuberculata is abundant from SRN3 and SRN6 where many juvenile specimens with 3-5 spires probably indicating a local population, have been collected. This species prefers shallow, sparsely vegetated freshwater habitats with a maximum temperature of 34°C, with a maximum concentration of 600 individuals per sq. m. in residual waters during the summer months (Starmühlner, 1984; Sarang and Sharma, 2009). Concentrations of dead individuals are known from the periphy of Lake Siranda, after its dissecting (Snead, 1966). This euryhaline species is generally associated with low salinity environments (0.2-3.0‰) although it tolerates salinity up to 23.0‰ (Plaziat, 2005).

Lymnaea acuminata: it is reported from Balochistan and India also as *Lymnaea luteola* Lamarck, 1822. It can be distinguished because it is less slim, with a more ovate aperture less covering the penultimate spire (Hubendick, 1951: 161, fig. 343). Its ordinary physiology is at 20-25 °C while at some 40°C it is subject to stress (Suresh *et al*., 1994; Jgyasu and Singh, 2010).

Gyraulus euphraticus: hid usual habitat is the sub-aqueous portion of the rooted vegetation of lakes and swamps.

Indoplanorbis exustus: it is an invasive species of rapid spread because of its great fertility. It is widely diffused from Central Africa to the Arabian Peninsula and from the Middle East to South-East Asia and the Philippines (Pointier *et al*., 2005; Liu *et al*., 2010). Snead (1966: 118) reports it from Siranda. It is typically for stagnant waters with rich vegetation and organic debris, also found near the banks of slowly running waters. It lives in waters up to 34°C, which cause great mortalities. The greatest concentration of living individuals occurs during the winter, due to climatic factors (Starmühlner, 1984; Sarang and Sharma, 2009).

The limited number of marine specimens is exclusively due to the selective collection. The two gastropods, and the three bivalves, are related to mangrove environments (Reid *et al*., 2008; Shanmugam and Vairamani, 2011) (Figure 9).

Telescopium telescopium is essentially an estuarine form of upper intertidal zone. It feeds on organic detritus and surface algae found on exposed mudflats where aerial daily exposure originates a terrestrial environment with bare substratum temperatures exceeding 50°C during the sunny days (Hora, 1951; Lasiak and Dye, 1986). Given its large dimension, up to 110 mm, this gastropod plays a very important alimentary role and, like *Anadara rhombea* and *Terebralia palustris*, is collected and sold in the Indian markets (Sriraman *et al*., 1988; Jerald, 1994; Solaiman, 2007). *T. telescopium*, *T. palustris* and *Tibia sp*. are reported from the eastern shore of lake Siranda (Snead 1966: 60). Their presence was first connected with the "*a tidal lagoon in the not-too-distant past*" (Snead, 1966: 60).

Thais lacera lives in mangrove swamps, in the intertidal band sandy bottoms and rocks covered with mud (Wijsman and Riegl, 2001). It has been collected from sites discovered along the coast of Makran where it has been radiocarbon-dated to 4685±85 uncal BP (Ly-5132) at Pasni, and 5960±105 uncal BP at Paleri Kaur (Sanlaville *et al*., 1991).

Anadara rhombea: only one valve was collected from SRN4 for identification. Empty valves of this species are recorded for the polluted stations along the final part of the ephemeral Lyari River, seasonally flowing into the Arabian Sea near Karachi (Nazneen and Begum, 1994).

Anadara cf. uropygmelana: only one valve was collected from SRN7 for identification. Further fragments and entire shells were recovered in 1991 in the Holocene littoral shores at Pasni (Ly-4914: 4235±65 uncal BP), in the sediments of Ankara Kaur (Ly-5138: 5550±130 uncal BP) and Jiwani lagune (Ly-5232: 2725±70 uncal BP), all sites of the Pakistani Makran (Sanlaville *et al*., 1991).

Circenita callipyga: the identification of the valves of this Veneridae is uncertain given their fragmentary state of preservation, without posterior area where the presence of a pallial sinus seems to be absent. This bivalve lives in the shallow waters of the upper intertidal zone, on sandy and muddy bottoms of subsidiary channels beside the main mangrove channels where it encounters high temperatures up to 31°C.

C. callipyga and other species belongs to archaeological mollusc massive assemblages collected for food (Beech *et al*., 2000; Feulner and Hornby, 2006; Bagher *et al*., 2007).

To sum up: *Melanoides tuberculata* is the commonest species especially from SRN3 and SRN6 both located in the central part of the dry basin. Spots are common from many areas from which water retreated, causing the death of adult and young individuals (Plaziat, 2005) or resulting from floods that transported and left inside water holes both living individuals and empty shells. The collected specimens do not show any trace of abrasion and weathering.

The habitats of the 5 freshwater snails and terrestrial *Z. chion* are not related with mangrove environments where intertidal species live.

5. Discussion

The discovery of shell middens and other evidences of prehistoric activity in the Siranda basin contribute to the interpretation of some of the events that took place in the lower Las Bela province, which are of basic importance for the understanding of the first human settling along the northern coast of the Arabian Sea. The possibility that the Siranda depression was filled with marine waters in the past had already been suggested by a few authors. The impression that the lake "*had been formed by the gradual recession of the sea*" (Minchin, 1907: 10), that it was "*at one time connected to Miani Khor*" (Snead, 1969: 34) and "*functioned as a tidal lagoon*" (Snead, 1966: 60) had already been perceived.

Nevertheless no attempt has ever been made at developing a defined chronology of the events that took place in the area, and understand when and why the lake connections with the sea were interrupted. The scarce information reported by the classical authors seem to indicate that Siranda had already turned into a freshwater basin in the 4th century cal BC, although we do not have any data helping define when the change happened.

The brief survey conducted in January 2011 has shown that the coasts of Lake Siranda were temporarily or seasonally settled for the first time during the second half of the 7th millennium uncal BP, and that the oldest sites in the region consist of shell middens, which were exploited for the gathering of edible mangrove molluscs. This phenomenon is largely attested from many sites along the coasts of the Arabian Sea and the Persian Gulf (Boivin and Fuller, 2009; Biagi *et al*., 2013).

The available radiocarbon evidence shows that the first inhabitants started to settle along the shores of the northern Arabian Sea around the beginning of the 7th millennium uncal BP, and that the seafaring activity in this part of the ocean started in this period (if not slightly before), as shown by a set of radiocarbon dates from the coast of Las Bela and the Indus delta shell middens (Biagi, 2011).

Opposite to what is known from most of the other middens of the Arabian Sea, the Siranda sites are very rich in *Telescopium telescopium* gastropods. It is difficult to state whether this species is a precise environmental indicator, given the scarcity of data available from the entire territory. It is nevertheless important to remark that *Terebralia palustris* is reported from Balakot by R.H. Meadow (1979: Fig. 6), where it is very common in the Indus horizon (67% of the total shell assemblage), while it reaches only 18% in the Chalcolithic layers.

The available data from Las Bela coast are still very fragmentary and thus difficult to interpret. They show that changes took place in the local mangrove ecosystems, and in the exploitation of the mangrove resources at least since the middle of the Atlantic climatic period.

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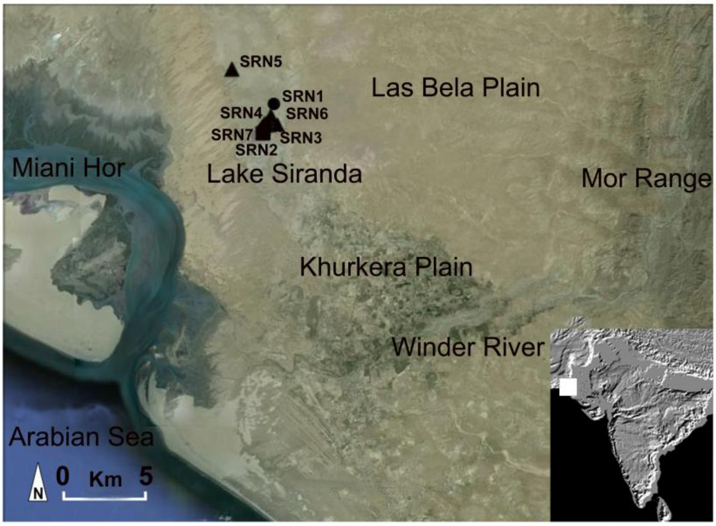

Fig. 1: Location of Lake Siranda in its geographical context (*drawing C. Franco and P. Biagi*)

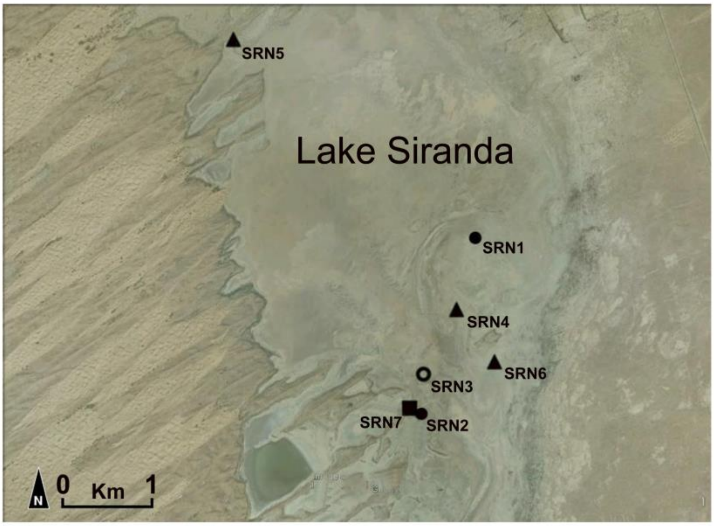

Fig. 2: Lake Siranda: distribution map of the sites mentioned in the text. Shell middens (dot), chert tool (circle), shell spots (triangle), *A. uropygmelana* (square)(*drawing C. Franco*)

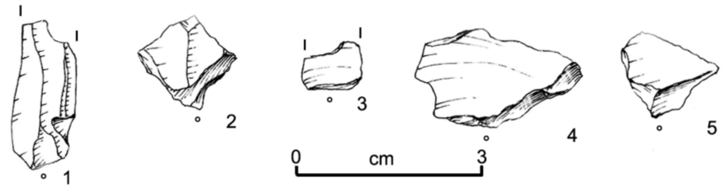

Fig. 3: Lake Siranda: chipped stone artefacts from SRN1(1-3), SRN2 (4) and SRN3 (5)(*drawings P. Biagi and G. Almerigogna*)

Site	Material	Typology	Colour (Munsell)	Condition	Measures (mm)	Figure
SRN1	chert	bladelet	strong brown - 7.5YR5/6	proximal fr.	(25)x10x02	3, n. 1
SRN1	chert	microflakelet	dusky red - 10R3/3	complete	15x18x03	3, n. 2
SRN1	chert	microflakelet	reddish brown - 2.5YR4/4	proximal fr.	(08)x10x02	3, n. 3
SRN2	chert	microflakelet	bluish grey - 2 for gley 6/1	complete	14.5x14.5x03	3, n. 4
SRN3	chert	flakelet	unknown	complete, burnt	16.5x25x03	3, n. 5

Table 1: Lake Siranda: main characteristics of the chipped stone artefacts collected from sites SRN1-SNR3

Site	Lab. n°	Coordinates	Uncal BP	Cal BC 1 sigma	Cal BC 2 sigmas	Delta 13C	Material	Altitude
SRN1	GrA-50325	25°32'31.1"N-66°37'09.5"E	6305±40	4615-4481	4682-4437	-6.213	*T. palustris*	5m
SRN2	GrA-50323	25°31'31.0"N-66°36'48.9"E	5950±40	4259-4113	4306-4046	-4.638	*T. palustris*	2m

Table 2: Lake Siranda: AMS dates from sites SRN1 and SRN2 calibrated with the reservoir value of 229±27 (*Reimer and Reimer, 2001*)

Fig.4: Lake Siranda: shell midden SRN1 with the indication of the point from which one *T. palustris* specimen was collected for AMS dating (*photograph P. Biagi*)

Fig. 5: Lake Siranda: chert bladelet and fragmented mangrove gastropods *in situ* on the surface of SRN1 (*photograph P. Biagi*)

Fig. 6: Lake Siranda: shell midden SRN2 with the indication of the point from which one *T. palustris* specimen was collected for AMS dating (*photograph P. Biagi*)

Fig. 7: Lake Siranda: the vegetated area of SRN5 from which a scatter of *Circenita callipyga* marine bivalves was collected for AMS dating (*photograph P. Biagi*)

Fig. 8: Lake Siranda: SRN6 scatter of *Melanoides tuberculata* freshwater gastropods from the surface of the dissected lake (*photograph P. Biagi*)

Fig. 9: Lake Siranda: marine molluscs: *Circenita callypiga* (SRN5); *Anadara rhombea* (SRN4); *Anadara* cf. *uropygmelana* (SRN7); *Thais lacera* (SRN5) (*photograph A. Girod*)

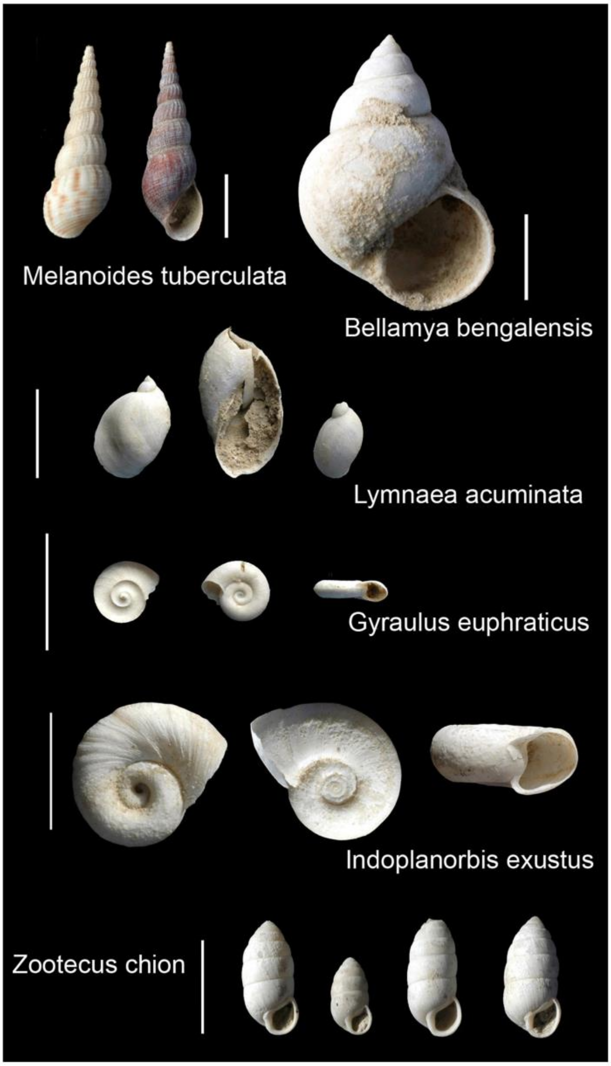

Fig. 10: Lake Siranda: freshwater and land snails from the bottom of the basin. Bars = 1cm (*photograph A. Girod*)

MOLLUSCS	SITES				
	SRN3	SRN4	SRN5	SRN6	SRN7
Land snails					
Zootecus chion (Pfeiffer, 1856)				7	
Freshwater Gastropods					
Bellamya bengalensis (Lamarck, 1822)	3				
Melanoides tuberculata (Müller, 1774)	167	25	4	173	
Lymnaea acuminata (Lamarch, 1822)	5			2	
Gyraulus euphraticus (Mousson, 1874)	2				
Indoplanorbis exustus (Deshayes, 1834)	7			5	
Sea Gastropods (mangroves)					
Telescopium telescopium (Linnaeus, 1758)		1		1	
Thais lacera (Born, 1778)			2		
Sea Bivalves (mangroves and mud)					
Anadara rhombea (Born, 1778)		1			
Anadara cf. *uropygmelana* (Bory St. Vincent, 1824)					1
Circenita callipyga (Born, 1780)			10		

Table 3: Lake Siranda: number of the mollusc specimens collected from SRN3-SRN7 (see figures 9 and 10)