Geoarchaeological History of the Oldest Site Hareer's Tells, in Basrah City, Southern Iraq

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Abstract

Four sites were chosen, in Hareer region, north of Basrah governorate, South Iraq. Eighty samples were collected from the sites, twenty samples from every site to 5m in depth. The sampling was carried out for each 0.25 m along the trench. Faunal assemblages show three biofacies: first, a marsh to fluvial environment B1 was found at depth from the ground surface to about 1-1.5m. Second, a shallow/ upper estuarine, brackish marsh environment B2 was found at depth 1.5m to about 3-3.5m. Third, a lower estuarine to marine environment B3 was found at depth 3.5- 5m. Probably, estuarine fauna; *Elphidum excavatum, Ammonia beccarii,* and *Cyprideis torosa* existence at most sites proposes a marine covering. Out of 80 samples, eight specimens were analyzed by the C_{14} method to delineate the sediments ages. These ages were 1167-1276 cal CE; 69-245 cal CE; -1385 to -1146 cal CE; and -4717 to -4546 cal CE and -6638 to - 6456 cal CE which fall in Seljuk, Abbasid and Mamluk/Mongol; Parthian and Sassanian; Kassite as estuarine, and brackish marsh to fluvial and fresh marsh environments; and Ubaid 2, Ubaid0-Neolithic, as lower estuarine to marine environment, respectively.

Key words: Archaeology, Mineralogy, sedimentology, biofacies, Hareer Tell, Basrah, Iraq.

1. Introduction

Harrer tells are situated between Al-Mashab and Al-Sallal Rivers in the northern part of Basrah city where extent the southern marshland. The Mesopotamian plain in the lower is a broad, flat deltaic complex with shallow freshwater marshes such as Baghdad & Zechri, and brackish water like Shafi & Hammar marshes which thought to be formed as recently as 640-552 BP[1] with around < 3 m depth surrounded by extensively vegetated marshes, locally called the Ahwar. The history of marshlands originated during the Holocene period following the end of the last glacial maxima. According to the literature, the Shatt Al- Arab/Tigris– Euphrates and Karun Rivers region was subjected to an extensive marine transgression in the Middle and Late Holocene, resulting in a shoreline far north of its present position, in response to rapid sea-level rise, followed by a delta progradation due to eustatic sea-level changes [1,2,3,4,5, and 6]. A marine unit of Holocene age (Hammar Formation) underneath the fluvial deposits was already detected by [7] in the Shatt Al- Arab area. Some researcher believed that the Tigris and Euphrates Rivers flowed separately into the Arabian Gulf and that the build–up of their silt hard gradually pushed the coastline farther and farther south. Lees and Falcon [8] advanced a new theory that is a weight of accumulated silt causes a corresponding subsidence of the earth surface and the coastline has, therefore, remained largely unchanged since Biblical. The surface sediments of the Ahwar are either fluvio-lacustrine or aeolian in origin [6]. Other sources of sediments are biological activity and chemical precipitation within the lakes and marshes [7 and 9]. The deltaic sediments show the narrow spread distribution and are restricted in the deltaic places of Tigris and Euphrates Rivers in the marsh area dominated by silt fraction [10]. These deltas have been constructed during sea-level fluctuations and climatic changes [11].

This research is an attempt to explain the geoarchaeological history of the Hareer’s Tells by recognizing the sedimentary environments, and the sediment’s age during the end of Holocene.

2. Materials and Methods

The study area is located in the southern part of Mesopotamian plain, south of Iraq, Latitudes (30° 35′ 58. 91″ -30° 36′ 38. 88″ N), and Longitudes (47 ° 41′ 27- 47° 42′ 12 E). Four sites were chosen for sampling distributed in the study area (Fig. 1). Eighty samples of different depths were chosen to conduct the analysis described accordingly. Sampling was carried out during 21-23 of September 2013 by using Poclain machine by forming trenches in each site and the visual description and sampling were done in the trenches with depth, which was draw by Sedlog 3.0 program, and vertical description of lithology for each site (Fig.2). The radiocarbon 14C dating for eight samples was identified by using AMS radiocarbon 14C dating technique at the NSF-Arizona –AMS laboratory. For 43 samples were washed by 230 mesh sieve to remove the fines (silt and clay) particles. The residual of sand and fauna were collected and dried, then picked, using 0.001 mm hairbrush. The Foraminifera, Ostracoda and other fauna were spread carefully on a 60 chambered sorting tray and observed under a binocular microscope and identified to species level. In the present investigation, the widely employed classification proposed by [12] has been followed by foraminifera, Moore and Bitrat [1961 in 13] for Ostracoda, [14] for Gastropods and [15] for Pelecypoda.

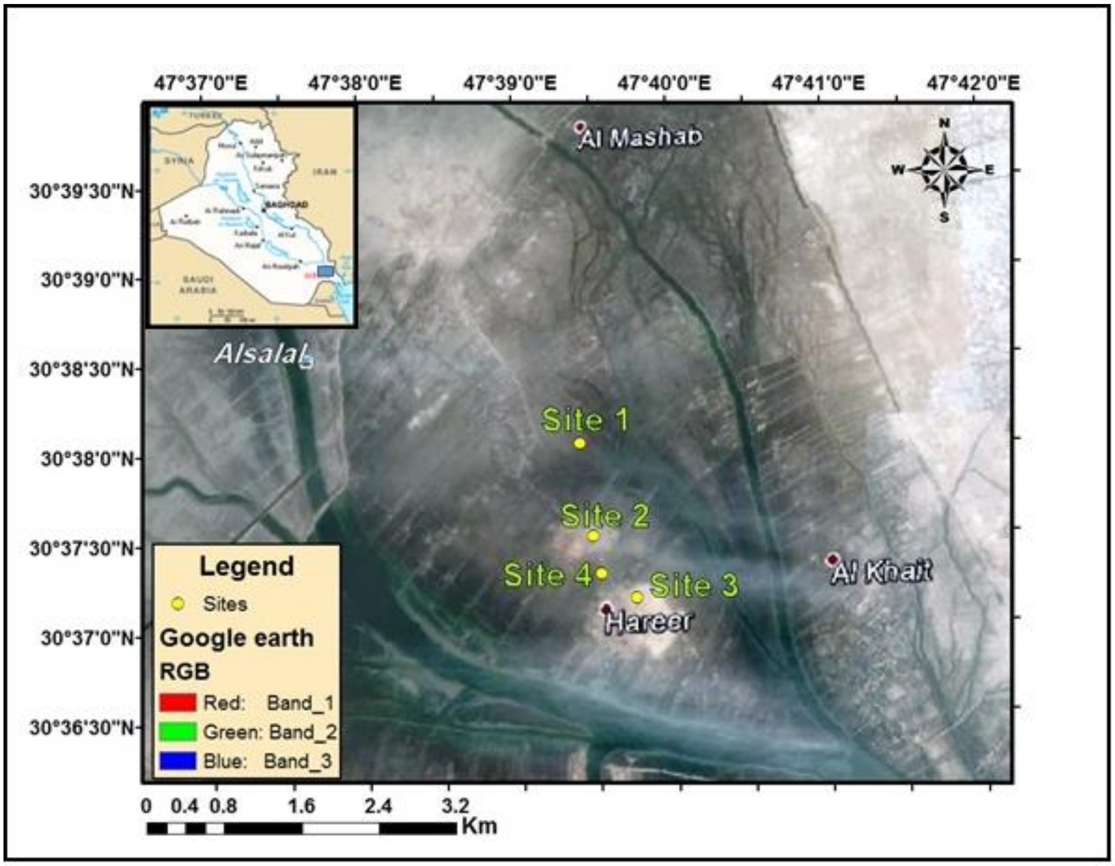


Fig.1. Location Map of the study area.

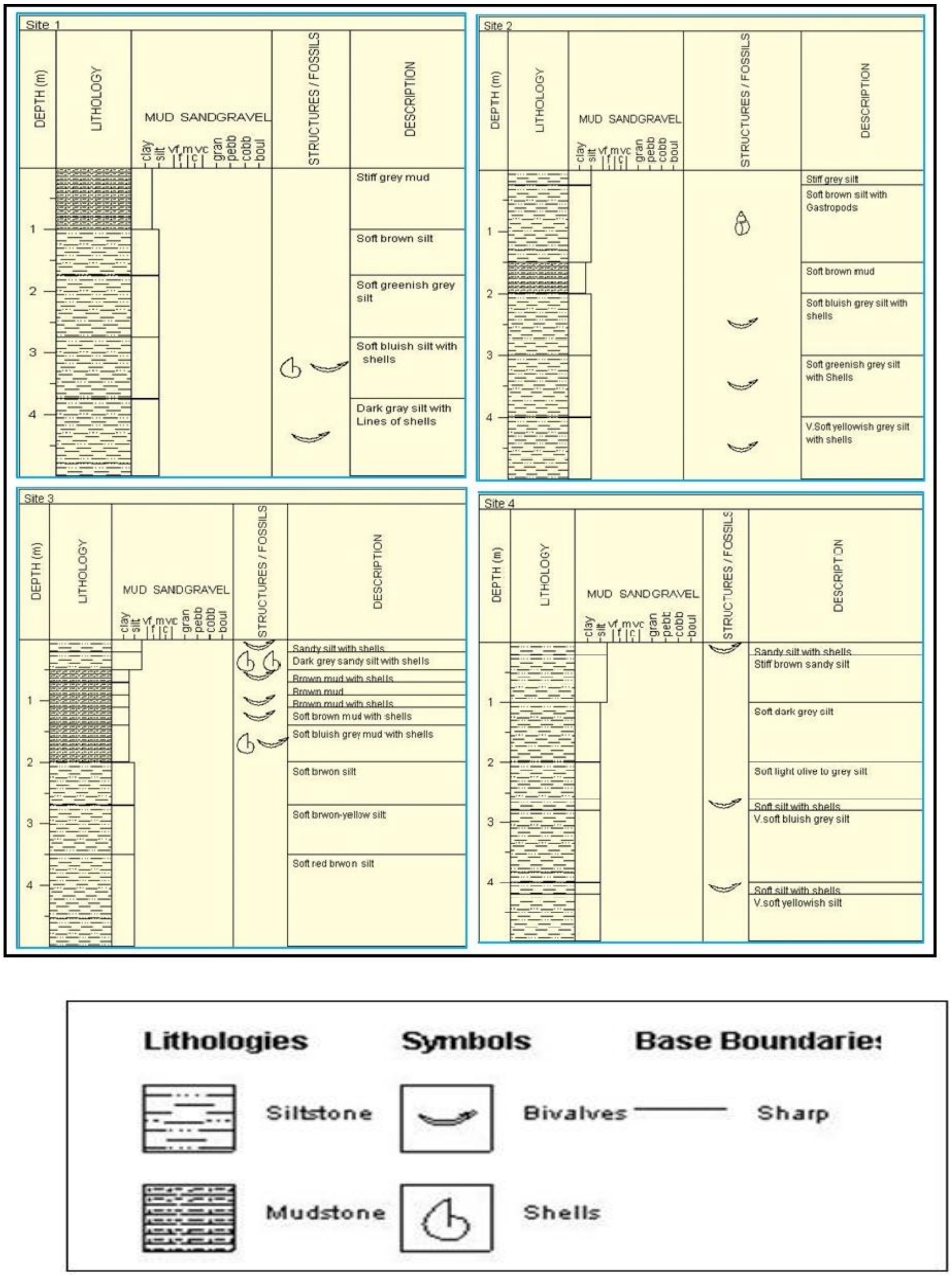


Fig. 2. Vertical description of the lithology of the sites.

3. Results

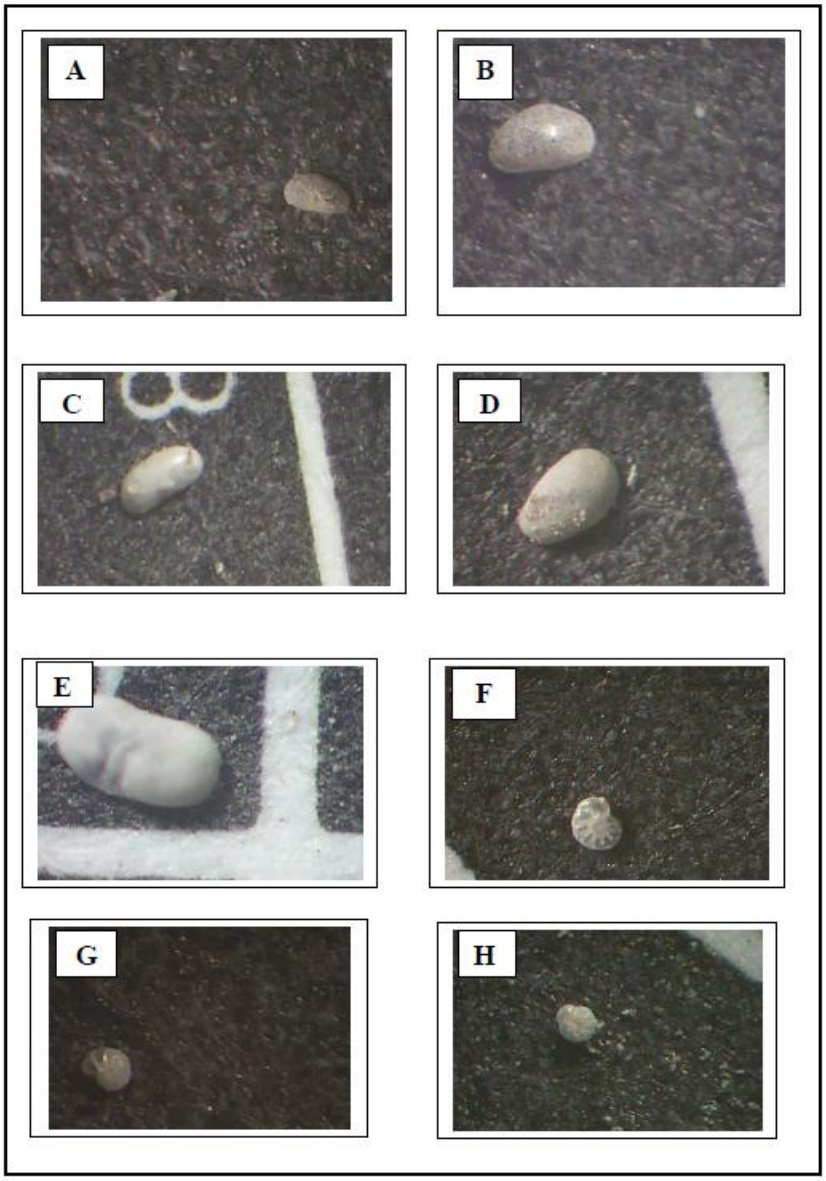
Two fossils and six sediments samples were identified their ages by using AMS Radiocarbon 14C dating method. The ages of fossils samples gave maximal age about 1882-1705 Cal BP (1m depth) and minimal age 783 - 675 Cal BP (0.25m depth) (Table 1). The sediments samples g ages Max. 8587 - 8405 Cal BP at depth 4.8m and Min. 654 -536 Cal BP at depth 0.50 m (Table1)

Table (1): Radiocarbon 14C dating for the current study.

The identified fauna in sites samples (Plates 1 and 2) are: *Cyprideis torosa*, *Condona neglect*, *Cypridopsis* sp., *Candona wanlessi*, and *Ilyocypris bradyi* of Ostracods. *Elphidum excavatum*, *Ammonia beccarii*, *Triloculina* sp., *Elphidum* sp.*1*, and *Elphidum* sp.*2* of Foraminifera. *Bellamya bengalensis and Melanopsis praemorsum* of Gastropods. *Cobiculla fluminalis* and *Macrocallista umbonclla* of Pelecypoda (Table 2).

Sample No.	Site No.	Type	Sample Depth/m	Genus	14C Age BP	+/-	Cal Bp
H1	1	Shell	0.25	*Bellamya, Melanoides*	802	38	783-675
H7	4	Sediment	0.5		591	36	654- 536
H5	3	Sediment	0.6		2217	38	2334- 2145
H3	2	Shell	1	*Melanopsis, Melanoides*	1854	39	1882-1705
H6	3	Sediment	1.1		1420	37	1382- 1286
H4	2	Sediment	1.25		3009	29	3334-3095
H2	1	Sediment	4.25		5786	35	6666- 6495
H8	4	Sediment	4.8		7700	55	8587-8405

Plate (1)



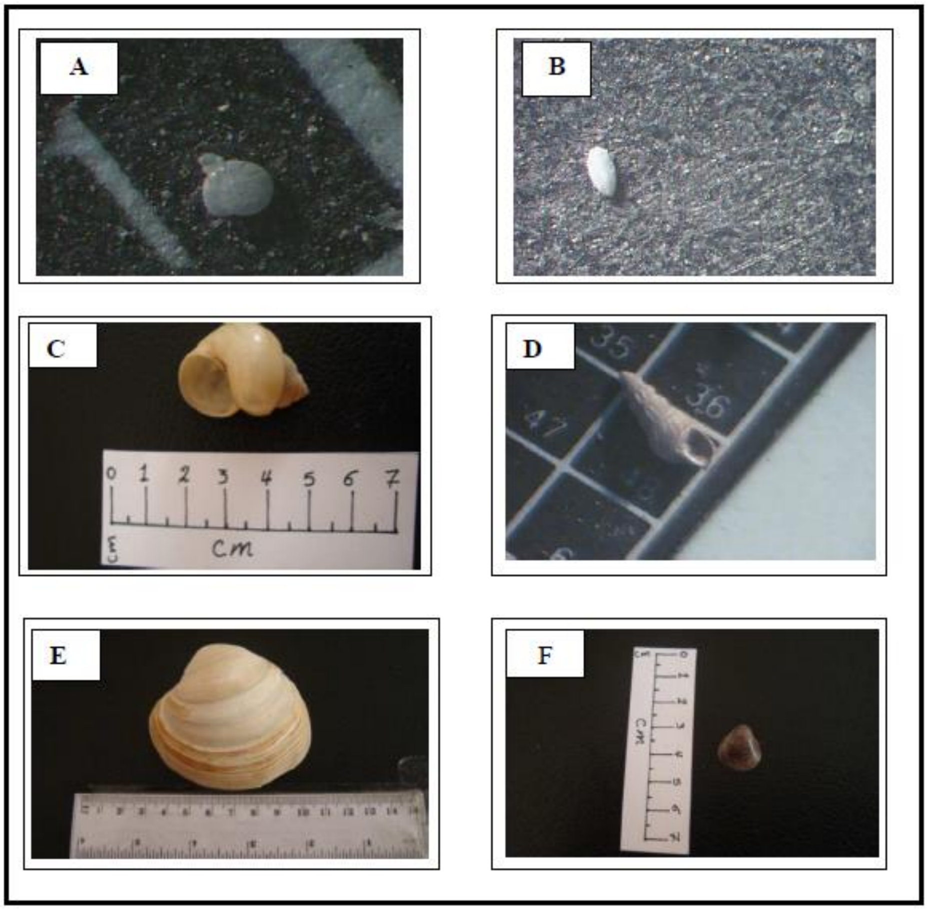
A-Cyprideis torosa (Jones, 1858), *B-Candona* neglecta (Sars, 1887).

C-Candonillo wanlessi (Staplin, 1963), *D-Cypridopsis* sp.

E-Ilyocypris bradyi (Norman, 1889), *F-Elphidium* sp.1.

G-Elphidium sp.2, *H-Elphidium excavatum* (Cushman, 1922). Magnification 180 x.

Plate (2)



A-Ammonia beccarii (Brunnich, 1772), *B-Triloculina* sp.

C-Bellamya bengalensis (Lamarck, 1809), *D-Melanopsis praemorsum* (Muller, 1774).

E-Corbicula fluminalis (Muller, 1774), *F-Macrocallista umbonclla* (Muhlfed, 1811).

Magnification 180 x.

Table (2) Fauna assemblages.

Site	Sample	Depth (m)	Species Name and Assemblages													
			Ammonia beccari	*Bellamya bengalensis*	*Candonillo wanlessi*	*Condona neglecta*	*Corbicula fluminalis*	*Cyprideis torosa*	*Cypridopsis sp.*	*Elphidum excavatum*	*Elphidum sp.1*	*Elphidum sp.2*	*Ilyocypris bradyi*	*Macrocallista umboncella*	*Melanopsis praemorsum*	*Triloculina sp.*
1	1A	0-0.25	--	++	+++	+++	--	--	--	--	--	--	+++	+++	+++	--
	1B	0.5	--	+++	+++	+++	-	-	++	--	--	--	+++	+++	+++	--
	1D	1	+++	--	-	+	++	++	++	--	++	+++	-	++	++	++
	1F	1.5	+++	--	-	-	+++	+++	-	+++	+++	+++	-	++	++	++
	1H	2	+++	--	--	--	+++	+++	-	+++	+++	+++	-	++	++	+++
	1J	2.5	+++	-	--	--	+++	+++	-	+++	+++	+++	--	++	++	+++
	1L	3	+++	---	--	--	+++	+++	-	+++	+++	+++	--	++	+++	+++
	1N	3.5	+++	---	---	---	+++	+++	--	+++	+++	+++	--	+	+++	+++
	1P	4	+++	---	---	---	+++	+++	--	+++	+++	+++	--	-	-	+++
	1R	4.5	+++	---	---	---	+++	+++	--	+++	+++	+++	---	-	-	+++
	1T	5	+++	---	---	---	+++	+++	--	+++	+++	+++	---	--	-	+++
2	2A	0-0.25	--	+++	+++	+++	--	--	+	--	--	--	+++	+	++	--
	2B	0.5	--	+++	+++	+++	--	--	+	--	--	--	++	+++	+++	--
	2D	1	-	+	+	++	--	--	++	--	+	+	+	++	+++	-
	2F	1.5	+++	--	-	-	+++	+++	+++	+++	+++	+++	-	++	++	++
	2H	2	+++	--	--	--	+++	+++	+++	+++	+++	+++	-	++	++	+++
	2 J	2.5	+++	-	--	--	+++	+++	+++	+++	+++	+++	--	++	++	+++
	2L	3	+++	---	---	--	+++	+++	+++	+++	+++	+++	--	++	-	+++
	2N	3.5	+++	---	---	---	+++	+++	+++	+++	+++	+++	--	+	-	+++
	2P	4	+++	---	---	---	+++	+++	+++	+++	+++	+++	--	-	-	+++
	2R	4.5	+++	---	---	---	+++	+++	+++	+++	+++	+++	---	-	-	+++

Table (2) cont.

			Ammonia beccari	Bellamya bengalensis	Candonillo wanlessi	Condona neglecta	Corbicula fluminalis	Cyprideis torosa	Cypridopsis sp.	Elphidum excavatum	Elphidum sp.1	Elphidum sp.2	Ilyocypris bradyi	Macrocallista umbonclla	Melanopsis praemorsum	Triloculina sp.
	3A	0-0.25	--	+++	+++	+++	--	--	--	--	--	--	+++	+++	+++	--
	3B	0.5	--	+++	+++	+++	-	--	-	--	--	--	++	+++	+++	--
	3D	1	--	++	+	+	+	--	-	--	--	--	+	++	++	-
	3F	1.5	-	+	+	+	+	-	+	--	-	-	+	++	++	-
	3H	2	+++	--	--	--	+++	+++	++	+++	+++	+++	-	++	++	+++
3	3J	2.5	+++	-	--	--	+++	+++	++	+++	+++	+++	--	++	++	+++
	3L	3	+++	---	--	--	+++	+++	++	+++	+++	+++	--	++	-	+++
	3N	3.5	+++	---	---	---	+++	+++	+++	+++	+++	+++	--	+	-	+++
	3P	4	+++	---	---	---	+++	+++	++	+++	+++	+++	--	-	-	+++
	3R	4.5	+++	---	---	---	+++	+++	++	+++	+++	+++	---	-	-	+++
	3T	5	+++	---	---	---	+++	+++	++	+++	+++	+++	---	--	-	+++
	4A	0-0.25	--	+++	+++	+++	--	--	--	--	--	--	+++	+++	++	--
	4B	0.5	--	++	++	+++	-	--	--	--	--	--	++	++	+++	--
	4D	1	--	+	+	++	+	--	-	-	-	+	+	+++	++	-
	4F	1.5	-	-	-	++	++	-	+	+	++	++	-	++	++	+
	4H	2	+	+	--	++	+++	+	++	++	++	++	-	++	++	-
4	4J	2.5	++	-	--	--	+++	+++	-	+++	+++	+++	--	++	++	+++
	4L	3	+++	---	--	--	+++	+++	-	+++	+++	+++	---	++	+	+++
	4N	3.5	+++	---	---	---	+++	+++	--	+++	+++	+++	--	+	-	+++
	4P	4	+++	---	---	---	+++	+++	--	+++	+++	+++	--	-	-	+++
	4R	4.5	+++	---	---	---	+++	+++	--	+++	+++	+++	---	-	-	+++
	4T	5	+++	---	---	---	+++	+++	--	+++	+++	+++	---	--	-	+++

+ Few, ++ Rich, +++ Abundant, - Appearance and absence, - - Absence

- - - Completely absence.

4. Discussion

The southern part of the Mesopotamian plain depends on two rivers; Tigris and Euphrates. These rivers transport notable quantities of sediments as suspended and bedload before entering the marsh area. The marshes have the main effect on sediments transport. Most of the coarse sediments (coarse and fine sand) were transported by these rivers (Tigris and Euphrates) have been greatly reduced after the marsh area and only the fine sediments (very fine sand, silt, and clay) passed to Shatt Al-Arab River [16], which are mainly originated from river bank erosion as clarified by Albadran [17].

The foraminifera of *Ammonia beccarii* and the Ostracoda of *Cyprideis torosa* are the dominant microfauna' species in this area. *Cyprideis torosa* which found in a wide range of salinity [Holmes, 1992 in 18], but the occurrence of smooth may be represented in the marine environment [19]. Besonen [20] elucidated that the environment of *Cyprideis torosa* could be brackish-marine. But the occurrence of *Cyprideis torosa* and *Cyprideis* sp. in these sites could signify the brackish environment [11, 21 and 22]. Also, there are species of foraminifera such as *Ammonia beccarii* and *Elphidium* sp. could represent brackish environment [11, 21, 23, and 24]. According to Javaux and Scott [25], the *Ammonia beccarii* occurs in a wide range of sedimentary environments; mangroves, brackish water, lagoon and near shore. Black [26] and Martens and Savatenalinton [27] mentioned that the species; *fluminalis*, *Elphidum* sp.1, *Elphidum* sp.2, *Cpridopsis* sp. represent the brackish environment. According to each of [28, 29 and 30], the Species; *Ammonia beccarii*, *Elphidium excavatum* and *Triloculina* sp. and *Cyprideis torosa* signified the marine environment. Macfadyen and vita Finzi [31] and Al-Jaberi [32] estimated that the mollusks of *Corbicula fluminalis* and *Macrocallista umbonclla* represent the freshwater environment.

On the basis of the abundance and types of fauna along the depth of the sediments and from the previous discussion of the fauna environments, three biofacies have been identified in this study: starting from the top, the first biofacies **B1** was found at a surface to about 1-1.5m in depth (Fig. 3). This facies is represented by some species; *Bengalensis, Melanopsis praemorsum, Candona neglecta, Candona wanlessi, Umbonclla* and *Ilyocypris bradyi*, and all of these species reflect a marsh to fluvial Environment (Table 3). The second biofacies, **B2** was found at the depth from 1.5m to about 3-3.5m (Fig. 3). The facies is represented by four main species; *fluminalis, Elphidum* sp.1, *Elphidum* sp.2, *Cpridopsis* sp. These species present in a high amount, and all of these species reflect a shallow/ upper estuarine, brackish marsh environment (Table 3). The third biofacies, **B3** found below 3.5m (Fig. 3), is dominant in the study area, it's distinguished in four sites, represented by three main species of foraminifera; *Ammonia beccarii*, *Elphidium excavatum,* and *Triloculina* sp., and one main species of Ostracoda which was represented by *Cyprideis torosa*. These species present in a high amount, and all of these species reflect a lower estuarine to the marine environment (Table 3). The important observation in this facies is the increase with the depth of the following species; *Ammonia beccarii*, *Elphidium excavatum*, *Triloculina* sp. *Cyprideis torosa* (Table 2).

From these biofacies, it could conclude that the study area was a scene of a lower estuarine to the marine environment, followed by shallow/upper estuarine, brackish marsh environment and at the end was a marsh to a fluvial environment (Table 3).

As the area represents an archaeological site in Basrah governorate, this study tries to determine the historical period of the area. The chronology providing approximate ages of archaeological sites follow [33], which provides a comprehensive review of adjustments made since the publication of Iraq [34]. The age of sample H1 is 783-675 Cal BP about 1167-1276 Cal CE (Table 4), which is located within periods Seljuk, Abbasid, and Mamluk /Mongol in the table of historical periods (Table 4), While sample H3 gave age 1882-1705 Cal BP about 69-245 cal CE, which represents Parthian and Sassanian period. Sample No. H4 gave age 3334 - 3095 Cal BP about -1385 to -1146 Cal CE which is located within Kassite period. These samples are from biofacies 1 and 2, which mean that during the periods of Seljuk, Abbasid, Mamluk /Mongol, Parthian, and Sassanian the study area was a scene of the marsh to fluvial environments. The sample H2 gave age 6666- 6495 Cal BP about -4717 to -4546 Cal CE which represents Ubaid 2 period. The sample H8 gave age 8587-8405 Cal BP about -6638-6456 Cal CE, which represents Ubaid0-Neolithic. These samples are from biofacies 3, which signified that during the periods of Ubaid 2, and Ubaid0-Neolithic the study area was a scene of lower estuarine to a marine environment. Most probably, erosional and depositional events and changes in climate, sea-level and cultural practices (especially irrigation) during the last 3000 years have all played their part in marine environment growth and evolution in the study area.

Aqrawi [6] indicated gradual climatic changes toward greater aridity started around 5746-5662 calBP. As results, highly salinized Mesopotamian soils were developed around 4516-4425 calBP. These arid climatic conditions still prevail in the present-day setting of the study area. This date has followed the biofacies 3, which could explain that the study area was experienced an aridity after the marine transgression. Pournelle [33] indicated that in Qarmat Ali, marine sediments, when taken from the bottom of which were dated from cores F –H to about 6000 BCE, extend to one meter above present sea level, indicating that sea level in past must have been somewhat higher than that.

Many others, had the radiocarbon dating in Mesopotamia plane, such as [35] emphasized that the presented dates for organic-rich sediments sample extracted from a borehole core at 4 m of Basrah ranged between 7689±96Cal BP to 4435±135 Cal BP. Marine and marsh were the environment of these sediments and Fossil *Melanoides tuberculata* shell sample collected from the third tier down of gray libn (mud- brick) of Eridu, ranged between 7689±96Cal BP to 4435±135 Cal BP, the freshwater-brackish marsh was the environment of these fossils. Al-Asfour [36] when determining the age of the shells from the lower four terraces northwestern Gulf, the age is 3689-3260 Cal Bp.

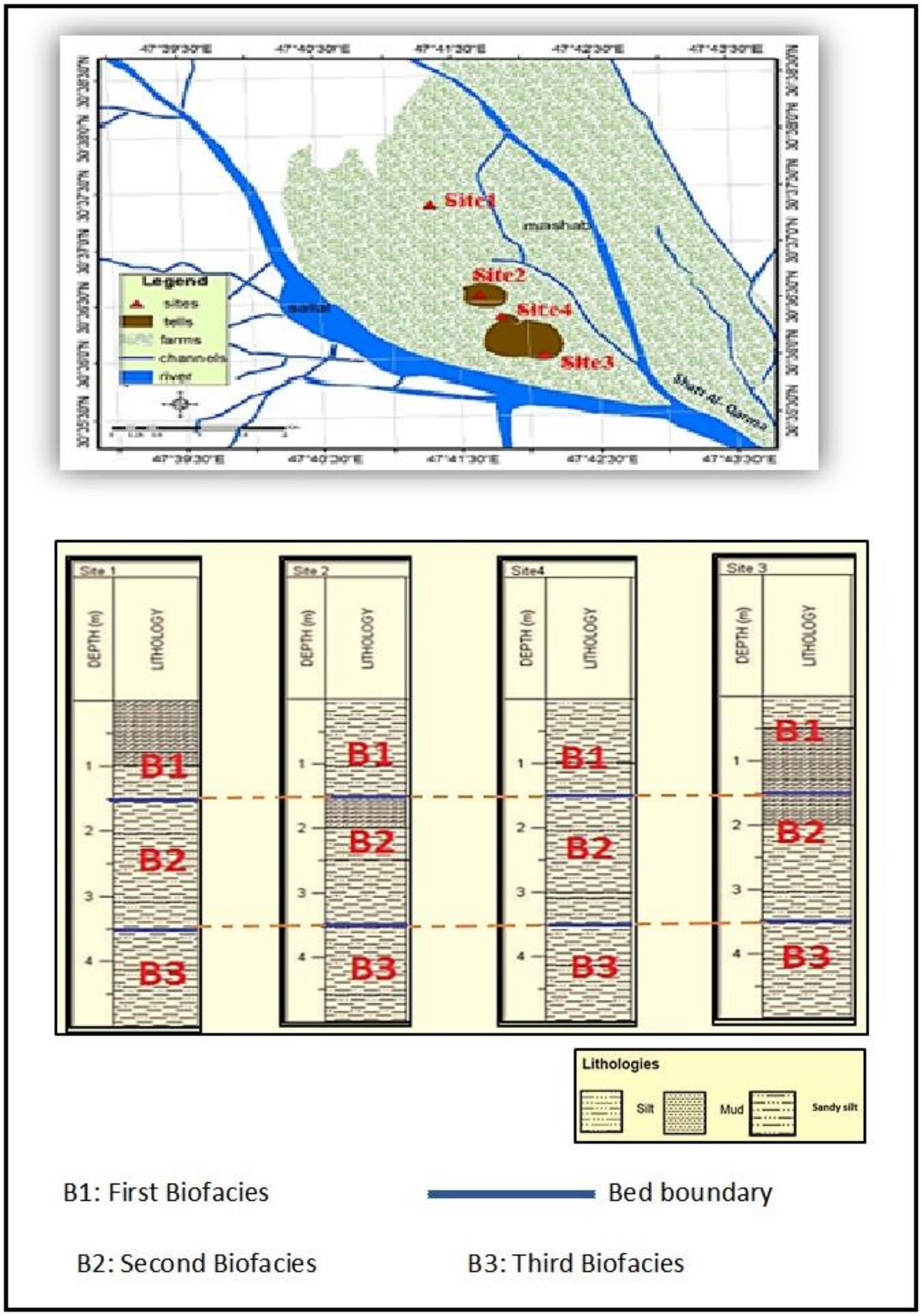


Fig. 3. Biofacies of the sites.

Table -3. Summarize of fauna by environmental conditions.

Genus	Species	Environmental conditions
Bellamya (Lamarck, 1809)	*Bellamya bengalensis* (Lamarck, 1809)	Fresh marsh- fluvial.
Melanopsis (Muller,1774)	*Melanopsis praemorsum* (Muller,1774)	
Candona (Baird , 1845)	*Candona neglecta* (Sars , 1887)	
Candonillo wanlessi (Staplin, 1968)	*Candona wanlessi* (Staplin, 1968)	
Macrocallista (Von muhlfed , 1811)	*umbonclla* (Muller , 1774)	
Ilyocypris bradyi (Norman , 1889)	*Ilyocypris bradyi* (Sars , 1890)	
Elphidum (Monfort , 1808)	*Elphidum SP.1*	Shallow through upper estuarine, brackish marsh.
Elphidum (Monfort , 1808)	*Elphidum SP.2*	
Cypridopsis (Mullur , 1894)	*Cpridopsis SP*.	
Corbicula (Muller, 1774).	*fluminalis* *(Muller, 1774).*	
Cyprideis (Jones , 1857)	*Cyprideis torosa* (Jones , 1850)	Low energy benthic marine through lower estuarine.
Elphidum (Monfort , 1808)	*Elphidium excavatum* (Cushman , 1922)	
Ammonia (Brunnich , 1772)	*Ammonia beccarii* (Brunnich , 1772)	
Triloculina (Reuss dʾ orbigny, 1826)	*Triloculina SP*.	

.

Table – 4. Environment and assemblage of each Historical period.

Site	Sample No.	Depth (m)	Cal CE[ox cal [4.2 [Int cal13	Historical period	Environments	Fossils
1	H1	0.25	1167-1276	*Seljuk-Abbasid-Mamluk/Mongol*	Marsh to fluvial Environment	*Bellamya bengalensis* *Melanopsis praemorsum* *Candona neglect* *Candona wanlessi* *Macrocallista umbonclla* *Ilyocypris bradyi*
4	H7	0.5	1296- 1415	*Abbasid*		
3 and 2	H5 and H3	0.6 and 1	-385 to - 196 and 69-245	*Parthian-Sassanian*		
3	H6	1.1	568-665	*Sassanian*		
2	H4	1.25	-1385 to -1146	*Kassite*		
1	H2	4.25	-4717 to -4546	*Ubaid 2*	Lower estuarine to Marine Environment	*Cyprideis torosa* *Elphidium excavatum* *Ammonia beccarii* *Triloculina Sp.*
4	H8	4.8	-6638 to -6456	*Ubaid0-Neolithic*		

Conclusions

The sediments reflect that the clastic sediments traveled from the source area by the river and secondary by the wind via. The olive-gray soil layer of the sediments in the study area indicate saline and anaerobic and quiet environment conditions. Biofacies results showed that the area underwent various environmental conditions that left its mark on the biological distribution and were as follows: Lower estuarine to marine environment at depth 3.5- 5m during the Holocene beginning about 8587 Cal BP to about 6495 Cal BP under the effect of marine waters, followed by Shallow/ Upper estuarine, brackish marsh environment at depth; 1.5m to about 3-3.5m, and finally followed by Marsh to a fluvial environment at depth; from the surface to about 1-1.5m. The results of the carbon dating show that the region was passed through historical periods beginning with Ubaid0-Neolithic to the Abbasid period.

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ألتأريخ الاثاري لأقدم موقع في تل حرير في مدينة البصرة، جنوب العراق

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المستخلص

أختيرت اربعة مواقع في منطقة حرير شمال مدينة البصرة، جنوب العراق. جمعت 84 عينة من المواقع وبواقع عشرين عينة من كل موقع والى عمق 5 متر من السطح. تم اختيار النماذج من كل مسافة 25 سم على عمق الخندق الذي حفر. أظهرت المجاميع الحيوانية ثلاث سحن احيائية: الاولى B1 بيئة الاهوار الى الانهاروالتي ظهرت من السطح والى عق 1 و 1.5 متر. الثانية B2 بيئة ضحلة الى بيئة مصبات عليا واهوار مويلحة، ظهرت عند عمق من 1.5 الى 3 و 3.5 متر. الثالثة B3 مصبات سفلى الى بحرية والتي ظهرت عند العمق 3.5 متر والى نهاية الخندق. حيوانات المصبات: *Elphidum excavatum, Ammonia beccarii, Cyprideis* torosa و والموجودة في اغلب المواقع تبين التغطية البحرية للمنطقة. من مجموع 80 عينة تم تحليل 8 عينات بواسطة الكاربون 14 لمعرفة اعمار النماذج. وكان العمر 1167-1276 : 69- 245: -1146 الى -1385: -4546 الى - 4717: -6456 الى -6683 والتي تعود الى العهد السلجوقي والعباسي والمماليك / المنغولي والفرثي والساساني: بيئة المصبات والاهوار المويلحة الى الانهار والاهوار العذبة خلال الكيشي، والعبيد 2 والعبيد 0 الى العصر الحجري الحديث يمثل بيئة المصبات السفلى الى البحريةعلى التوالي