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# Systematics and environmental analysis of microfauna in selected oilfields in southern Iraq

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**Abstract**

This study investigated the species and genera of microorganisms, total organic carbon, and sedimentation patterns in oil field areas in southern Iraq, focusing on twelve fields across Basrah and Amara Governorates. Sedimentation analysis revealed that the Halfaya and Amara fields in Amara Governorate experienced the most severe sedimentation, followed by the Majnoon field. Moderate sedimentation was observed in Al-Zubair, West Qurna 1, and West Qurna 2, while Safwan, Artawi, and Umm Qasr had minimal sedimentation. The study also examined microfossil groups, including Foraminifera, Ostracoda, and Mollusca, to infer environmental conditions. Foraminifera species such as Ammonia beccarii, Ammonia tepida, and Elphidium incertum were abundant, indicating a shallow, mixed saltwater environment with fluctuating temperatures. The presence of Ammonia sp. and Elphidium species suggested periods of drought and varying salinity. Ostracoda genera like Cyprideis torosa, characterized by shell nodules, indicated environments with low salinity and high organic material or silica content. Other genera, such as Candoniella and Hemicytheridea paiki, pointed to fluctuating freshwater to brackish conditions and shallow to deep marine environments, reflecting turbulent marine advance and retreat. The findings suggest that the study areas experienced significant environmental fluctuations, including marine transgression and regression, uplift, and erosion, particularly in Amara Governorate. These processes influenced sedimentation patterns and the distribution of microfossils, providing insights into the region's paleoenvironmental history. The study highlights the complex interplay of geological and environmental factors shaping the oil fields of southern Iraq.

**Keywords:** Recent (Holocene), Microfauna, Oilfield, Environments and South of Iraq

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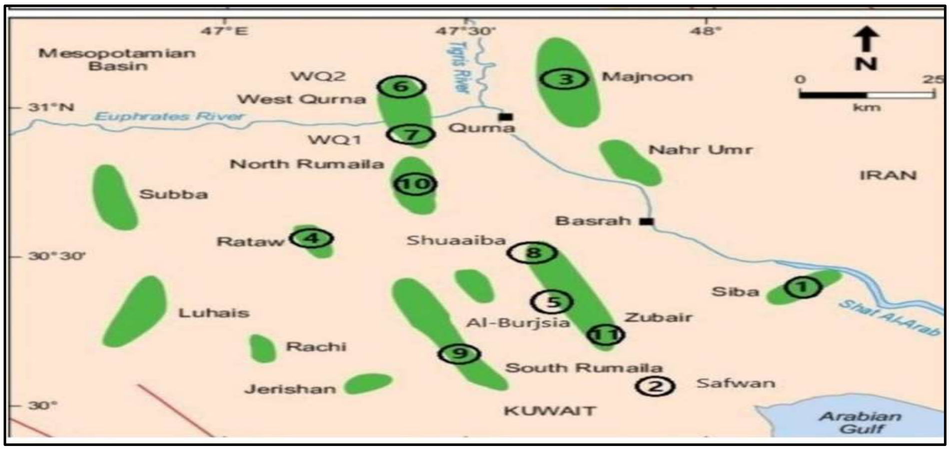
## Introduction

Microfauna was first known in the 6th century BC by the Greek scientist Xenophanes, who identified fossilized sea snails in sedimentary rocks in Sicily, Italy, and tried to explain them. For centuries, scientists could not explain how microfauna were formed. For example, in the Middle Ages, *Ammonia* shells were considered extinct marine snails. The horns of the ram, the sacred animal of the Egyptian god Amun, from which the name was later derived. The German researcher Agricola Georgius) 1494 - 1555. She was the first to use the word Fossilium, which means fossil in Arabic and published a book in which she described and attempted to classify plant microfauna and some snails into animal fossils of gastropods.The German doctor Conard Gesner is considered the first to present a large number of microfauna bodies, only weeks after his death from the plague. In the same period, that is, during the sixteenth century, microfauna were referred to as remains of ancient living organisms in some writings by Bernard Palissy in 1589. In the seventeenth century, it was agreed that microfauna were of organic origin, but they were not exploited in in-depth studies. In the eighteenth century, the study of microfauna was known to a large extent, and this was after the flourishing and brilliance of a number of young researchers who expressed their ideas boldly after the end of the Renaissance and the advent of the modern era, as researchers noticed that there was a difference between fossils extracted from successive sedimentary layers. From them, microfauna were used to know the chronological stratigraphic order.

Foraminifera was first recorded in literature in the 6$^{th}$ century BC by Herodotus, who observed nematodes in the rocks from which the Egyptian pyramids were built. However, they were not recognized as fossil remains of living organisms until nearly 2,000 years later. This was by Agricola in 1558 AD. The smaller foraminifera were first described by *Beccarius* in 1731. The primitive nature of these organisms was first demonstrated by Dujardin in 1835. The first large-scale systematic work was that of d'Orbigny (1826), in which 5 families, 52 genera, and 544 types were recognized. Since he defined the genera and species within narrow limits and also cited their geological occurrence, this early taxonomic work also represents the earliest biological application of this group of organisms. While early continental researchers focused on stratigraphic applications of foraminifera and descriptions of animals (e.g., Berthelin, Terquem, d'Orbigny', Reuss), English researchers generally focused on morphological studies and descriptions of modern animals (e.g., Brady, Carter, Williamson, Heron-Allen, ). The major morphological groups are the result of 500 million years of evolution in many independent lineages, and there is now a large body of morphological patterns of foraminifera. Loeblichand Tappan (1964) estimated that there are approximately 100 families, more than 1200 genera, and about 27,000 species of foraminifera described in the literature.Ostracoda are the most successful groups in colonizing diverse environments from deep sea to shallow sea, lakes, and freshwater to humid and terrestrial environments. Salinity and temperature are the main environmental controls on the distribution of Ostracoda, and they are one of the most useful groups in reconstructing paleoecology. The shell of Ostracoda contains valuable information about hydrology and rainfall, especially in lake deposits that lack other calcareous shells. They have a long geological history of more than 400 million years, having evolved in the Ordovician. The present study was based on the classifications of Moore and Pitrat (1961) and (Hartman and Puri, 1974) for mollusks. These classification systems are based on the main dimensions of classification, which include shell morphology, external ornamentation, dorsal articulation, and internal plates. The most common classification system places them within the phylum Arthropoda as a subclass of the class Crustacea. Three orders of ostracodes have been recognized from the Quaternary to the Pliocene: Myodocopida, PIatycopida, and Podocopida. The four superfamilies of Podocopida have distinctive muscle patterns.The study aims to classify the types of fossils found in the selected fields for study and to identify their environments and genera, determine organic carbon TOC%, calculate the total sedimentation of the basins based on the presence of fossils, and Finally link the disappearance and presence of fossils to the sedimentary cycles or the rise and fall of the study areas.

**Materials and Methods**

The study area is located in southern Iraq Figure (1), specifically in Basra Governorate, represented by several models, numbering 39 models, from different wells in the fields of southern Iraq, including (West Qurna 1 and West Qurna 2 fields, Majnoon and Zubair




fields, Artawi, North Rumaila, South Rumaila, Safwan, Siba, Luhais and Burjisiya, in addition to the Amara field) .

**Figure (1): Geographical location of south Iraq with locations of the oil fields and wells used in this study (after Al-Ameri *et al.*, 2013).**

The living groups in the non-solidified sediments were sorted by the sorting method, where a part of the original sample (30-50 g) was taken and placed in a glass container with a quantity of water for 3-4 days, then washed by the wet bee method using a 230 mesh sieve, then left to dry at room temperature and stored in plastic tubes and the necessary information was fixed on them. After that, the process of picking was carried out to isolate them from the mineral and rocky grains of the sediments; then, they were stored in unique glass slides and examined with a binocular microscope for the purpose of identifying their types. The work was done in the laboratories of the Material Geology Department of Science, University of Basrah

**Determination of the percentage of total organic carbon in the sediments of the study area TOC%:**

The method of El-Wakeel and Riley (1975) was used to measure the total organic carbon in the sediments by taking 0.3 g of dry sedimentary samples, crushing them well and placing them in a Pyrex test tube. 10 ml of chromic acid solution was added to it slowly, and then the test tubes were placed in an oven at a temperature of 175 °C for 3 minutes. After that, the tube was placed in a water bath until it cooled, and the contents were transferred to a volumetric flask and the volume was completed to 100 ml with distilled water free of ions. After that, a few drops of Diphenylamine indicator were added. Then, the calibration process was carried out.

**Analysis of the sedimentation and development of the sedimentary basin of the study area**

The Excel 2007 program was used to calculate the rates of sedimentation, sedimentation and uplift in the sedimentary basin, as well as to draw a geological history chart for the sedimentation rates in the study wells.

## Results

### Total organic carbone TOC%

Table (1) shows the results of total organic carbon in the study areas. The percentages ranged between very high and very low in some areas, which is attributed to the effect of the region's sediments and their supply of organic sediments due to the dispersion of living organisms and the effect of water currents and stagnation of environments due to the difference in areas and their distance from each other. The highest values were recorded in the Amara area (20), (10), (15). Also, in the West Qurna 1 areas, the value of total organic carbon was (10.248) and North Rumaila (10.906). The high carbon percentage may indicate the stagnation of the area and the weakness of water currents in addition to the continuous supply of organic materials. The lowest percentages were in the areas of Burjisiya (2.017), South Rumaila (3.377), Zubair (4.503) and Shuaiba (4.863). The higher silt percentage than sand is evidence of the stagnation of these areas and their lack of water currents.

**Table (1):** Shows the percentage of the Total organic Carbone within the studied areas

| Stations name | TOC% |
|---|---|
| Seba | 9.375 |
| Safwan | 8.961 |
| Majnoon | 8.550 |
| Ratawi | 5.813 |
| Burjisiya | 2.017 |
| West Qurna1 | 10.248 |
| West Qurna2 | 5.444 |
| Shuaiba | 4.863 |
| South Rumaila | 3.377 |
| North Rumaila | 10.906 |
| Zubair | 4.503 |
| Amara 1 | 10 |
| Amara 2 | 10 |
| Amara 3 | 15 |
| Amara 4 | 20 |

### Analysis of the sedimentation and development of the sedimentary basin of the study area

The results of the analysis were as follows:

**Table (2):** Thickness ratios and total sedimentation rate and total Subsidence for the study areas.

| Hf-3 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
|---|---|---|---|---|---|---|---|---|---|---|
| Bakhiary | 0 | 0.4 | 42 | | | | | | 1536.80 | 13.97 |
| Upper Fares | 42 | 0.37 | 1398.8 | 0.37 | 1398.8 | | | | | |
| Lower Fares | 1440.8 | 0.42 | 516.2 | 0.35 | 516.2 | 0.47 | 629.2529625 | | 656.25 | 12.62 |
| Am-1 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Bakhiary | 0 | 0.4 | 25 | | | | | | | |
| Upper Fares | 25 | 0.37 | 1299 | 0.37 | 1301.13 | | | | 1422.13 | 12.93 |
| Lower Fares | 522 | 0.36 | 497 | 0.36 | 497.00 | 0.47 | 600.52 | | 627.52 | 12.07 |
| Mj-1 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Alluvium/Hammar | 0 | 0.4 | 23.5 | | | | | | | |
| Upper Fares/Dibdibba | 23.5 | 0.38 | 927 | 0.38 | 928.51 | | | | 1048.01 | 9.53 |
| Lower Fares | 950.5 | 0.39 | 293 | 0.39 | 293.88 | 0.48 | 343.88 | | 370.88 | 7.13 |
| WQ-12 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Alluvium/Hammar | 0 | 0.4 | 226 | | | | | | | |
| Dibdiba | 206 | 0.39 | 208 | 0.40 | 211.24 | | | | 538.24 | 4.89 |
| Lower Fares | 414 | 0.34 | 353.2 | 0.36 | 363.08 | 0.38 | 374.54 | | 401.54 | 7.72 |
| WQ-220 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Alluvium/Hammar | 0 | 0.4 | 362 | | | | | | | |
| Dibdiba | 362 | 0.38 | 185 | 0.40 | 189.99 | | | | 652.99 | 5.94 |
| Lower Fares | 547 | 0.33 | 405 | 0.36 | 424.16 | 0.38 | 435.56 | | 462.56 | 8.90 |
| Lu-12 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0 | 0.40 | 54 | | | | | | 155 | 1.41 |
| Lower Fares | 54 | 0.39 | 90 | 0.40 | 90.86 | | | | 117.86 | 2.27 |
| Zb-47 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0 | 0.39 | 292.00 | | | | | | 393.00 | 3.57 |
| Lower Fares | 292 | 0.36 | 180.00 | 0.39 | 188.51 | | | | 215.51 | 4.14 |
| Ns-1 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Alluvium/Hammar | 0.00 | 0.40 | 294.00 | | | | | | 395.00 | 3.59 |
| Lower Fares | 294.00 | 0.37 | 86.00 | 0.40 | 90.23 | | | | 117.23 | 2.25 |
| R-172 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0.00 | 0.39 | 366.00 | | | | | | 467.00 | 4.25 |
| Lower Fares | 366.00 | 0.35 | 206.00 | 0.39 | 217.87 | | | | 244.87 | 4.71 |
| Ru-72 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0.00 | 0.40 | 163.00 | | | | | | 264.00 | 2.40 |
| Lower Fares | 163.00 | 0.38 | 88.00 | 0.40 | 90.48 | | | | 117.48 | 2.26 |
| UQ-1 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0.00 | 0.40 | 166.40 | | | | | | 267.40 | 2.43 |
| Lower Fares | 166.40 | 0.37 | 180.60 | 0.39 | 185.62 | | | | 212.62 | 4.09 |
| Rt-2 | Top (m) | phi (%) | Thickness (m) | | To (m) | | | | S (m) | Rs (cm/1000y) |
| Dibdiba | 0.00 | 0.40 | 133.55 | | | | | | 234.55 | 2.13 |
| Lower Fares | 133.55 | 0.38 | 155.40 | 0.39 | 158.93 | | | | 185.93 | 3.58 |

**Geological history of tectonic sedimentation**

The process of calculating basin sedimentation begins by reconstructing the deepest rock unit in the stratigraphic column to its initial thickness and total density during the deposition of the layer so that its upper surface is below sea level after gradually removing the effect of the column layers' load. Table (2) above shows the results of calculating the total sedimentation and sedimentation rate for the study wells. This reflects the sedimentation history and its effect on the burial history of the region's fields, as the effect of the sedimentation rate and total sedimentation differs from one region to another. The study area was divided into regions with very severe sedimentation, severe sedimentation, medium sedimentation, and low sedimentation. We note that in the regions of very severe sedimentation, the sedimentation rates appear to be very high and are represented in (Amara). As for the regions of severe sedimentation, they are in (Majnoon, West Qurna 1, West Qurna 2). The areas of medium settlement are in (Al-Zubair, North Rumaila, Umm Qasr). As for the areas of very little settlement, they were in (Al-Lahees, Al-Nasiriyah, Artawi, and South Rumaila). The results show the intensity of settlement during successive periods, and the geological records from 40 million years ago to the present time show that tectonic and sedimentary settlement increases suddenly, which results in the appearance and disappearance of some types and genera of microfossils due to tectonic movements.

The significant difference in the rates of settlement and uplift in the study areas is believed to be due to the Alpine movement or the activity of the basal faults or due to their proximity to the collision sites and the space they provide suitable for the growth of sediments or vice versa, and since the Tigris secondary zone is close to the collision areas, its impact is more significant than the Zubair secondary zone. (Fahd, 2010). The results indicate that the West Qurna, North Rumaila and Al-Luhais regions are the most exposed to uplift and erosion due to geological processes and tectonic movements. This is reflected in the presence of microfossils in abundance in the West Qurna region, with their many types and genera, and also due to the abundance of water, which is the medium that carries all microorganisms. The low sedimentation rates reflect the uplift of the study areas and, consequently, the uplift of fossils buried in the depths and their appearance in abundance on the surface. Most species and genera were found in the Majnoon field, West Qurna, Al-Sibah and Al-Zubair, which are areas with little sedimentation. As for the areas of intense sedimentation, such as the Amara field and South Rumaila, few models were found from the surface because they are areas with severe sedimentation and burial.

The change in the state of the two basins in terms of saturation and production of limestones that were deposited is attributed to the activity of the Tikrit-Amara fault north of the Tigris secondary zone and the Qurna rift fault south of the Tigris secondary zone, which affected the region and were previously indicated as faults (Goff and Jassim, 2006), in addition to the effect of the Hormuz salt (Beydoun, 1993) in the region, which greatly affected the emergence of oil traps in the region (Al-Mutawwari, 2002). We conclude that the tectonic movements of the basal faults, up or down, which occurred during that period affected the study area, causing the region to sink in the form of two unequal basins. It was characterized by being more settled in the fields of the secondary Zubair range, with both ranges being affected by a driving force from below, causing the emergence of a high area separating the two basins. It is believed that this force is the result of the rush of Hormuz salts through the region.

**Systematic of microfauna**

Diagnosis of 12 species and 6 genera, 3 subfamilies, 2 families, 3 superfamilies, and 1 suborder of Foraminifera represented by (*Rotalina*) according to Loeblich and Tappan, 1988. This suborder has a calcareous wall and is the most widespread as it includes 5 types. Several factors, including temperature, availability of nutrients, abundance of oxygen, and salinity, determine the distribution of Foraminifera. The most widespread species are *Amonnia* and *Elphidium*. Because of their ability to live in mixed waters and varying temperatures, their presence together indicates periods of drought in the region. As for Ostracoda, they were diagnosed with 11 species and 8 genera, 4 subfamilies, 7 families, 2 superfamilies, and 1 suborder represented by (Podocopina). The most critical and widespread genera of Ostracoda in Basra are *Cyprideis torosa*. Its presence indicates a shallow environment and brackish and freshwater as for Mollusca. Gastropoda, one species, belongs to one genus belonging to one family represented by (*Viviparidae*) in the genus *Ballamya bengalensis*. Its presence indicates coastal environments, marshes, swamps and mud. Pelecepoda was also represented by one species of one genus belonging to one family, which is (Calyptraeidae) and the genus is *Calyptraea chinensis*. Its presence indicates brackish marine environments. The types of Foraminifera we found are:

**1- *Ammonia***: Its presence: It is one of the common genera that is characterized by its great flexibility to live and resist changing salinity levels. It is also found in environments with a salinity of 40‰ (Said, 1950). It is more common in coastal areas and river estuaries and also in shallow areas (Murray, 1976), and it can also adapt to rapid changes in salinity and temperature. The most important species found in the study area are (*A. beccari*), (*A. tepida*), (*A. dentata*). (Plate1. A, B, and C) respectively.

**2**. ***Elphidium***: *Elphidium* is considered one of the common species of foraminifera and is found in shallow and tropical waters. It lives in wet environments of up to 30% and at somewhat varying temperatures. It is found in marshes, supra-tidal flats and coastal lagoons. The most important species found in the study area are (*E.excavatum*),(*E.Crispum*),(*E.hispidu* -*lum*),(*E.Lessonii*),(*E.selseyens*),(*E.adv -enum*) (Plate1.D, E, F, G and H) respectively.

Types of Ostracoda we found are :

**1- *Alocopocythere***: This species is found in lakes and highly saline environments (Khalaf and Elewi, 1989), Saline and marine waters (Plate1.I).

**2- *Canadona***: This genus ranges from mixed to saline environments with a salinity of 15% (Neal, 1988 in Holems, 1992), And between a temperature of 5-8) C° (Plate1.J).

**3- *Cyprideis torosa***: This species is found in large quantities in all areas of the current study. It is characterized by the appearance of nodules on its shells due to the low salinity of the water in which it lives to less than (6-10)%. Its presence provides evidence that the environment contains a high percentage of silica and organic materials (Carbonal *et al.,* 1988). It also can live in fresh water and live in unusually high levels of salinity (Plate1.K).

**4- *Llyocypris***: This species is found in epi littoral environments with a salinity range of (0.3-6). (Mouarguiart, 1992) while the temperature ranges from 4-19 degrees Celsius. (Alm 1961 in Dedeckker, 1981; and Al-Jumaily, 1994) Among the species of this genus in the study area is Llyocypris gibba. It lives in freshwater environments. Up to a salinity range of 6% (Dedeckker,1981 in loffler, 1961) and it is also found in slightly cold waters (Plate1.L).

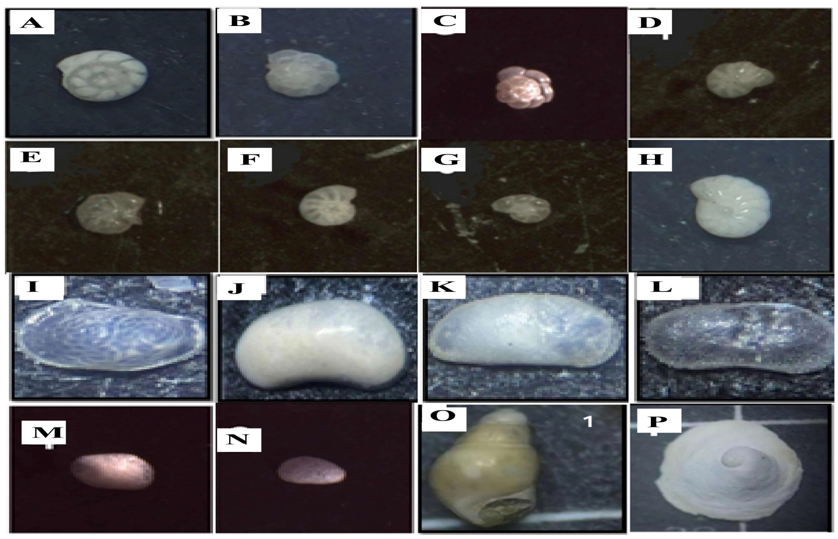
**5- *Candoniella***: It lives in saline environments ranging from 1.4 to 4.5% (Hiller,1972 in Dedeckker,1981) and a temperature ranging from 5.3 to 23 (Al-Jumaily, 1994). Among the species found in our current study are Candoniella simpsoni and Candoniella-albicanalbicans (Plate1.M).

**6-*Hemicytheridea***: It lives in shallow water environments (Al-Jumaily, 1994), tidal flats, coastal lagoons and deep waters ranging from 94 to 200 meters. (Al-Shareefi, 1997 and Piak, 1977 and Khala) (Plate1.N).

Types of Molluscs we found are:

**1- *Ballamya bengalensis***: It is large and lives in the muddy bottoms of ponds and marshes of calm, fresh water. During times of floods or high water, the shells move to the marsh areas on the edges (Plate1.O).

**2- *Calyptraea chinensis***: It is a thick-shelled marine species found in all lakes, marshes, and Tigris River channels. It is common at a rate of 30 to 80% and is buried in layers of sand and mud. It is abundant in muddy bottoms (Plaziat and Younis, 2005) (Plate1.P).




**A.** *Ammonia beccarii*, (Linne, 1758), side view,40x, **B.** *Ammonia tepida, (*Cushman, 1926), external view,40x, **C.** *Ammonia dentata* (Parker and Jones). 40x, side view, **D.** *Elphidium crispum* (Linnaeus, 1758). 40x, side view. **E.** *Elphidium hispidulum* Cushman, 1936. 40x, side view, **F.** *Elphidium lessonii (*d'Orbigny). 40x, side view, **G.** *Elphidium selseyense* Heron-Allen and Earland. 40x, side view, **H.** *Elphidium advenum* (Cushman, 1922), 40x, side view, **I.** *Alocopocythere reticulate,* (Hartmann, 1964), external view,40x, **J.** *Candona neglecta*,(Sars, 1887), external view,40x, **K.** *Cyprideis torosa*,(Jones, 1850), external view, 40x, **L.** *IIyocypris gibba,*(Ramdoher,1808), external view, 40x, **M.** *Candoniella simpsoni* (Sharpe) n. comb, 40x, side view, **N.** *Hemicytheridea reticulate Kingma,* 1948. 40x, side view, **O.***Bellamya bengalensis,*(Lamarck, 1822), 40x, **P.***Calyptraea chinensis,*(Linnaeus, 1758) 20x.

**Discussion**

Twelve species and 6 genera were diagnosed, 3 subfamilies, 2 families, 3 superfamilies, and 1 suborder of Foraminifera, which was represented by (Rotalina) according to Loeblich and Tappan, 1988. This suborder is a calcareous walled order and is the most widespread, as it includes 5 species. Several factors, including temperature, availability of nutrients, abundance of oxygen, and salinity, determine the distribution of Foraminifera. The most widespread species are Amonnia and Elphidium. Because of their ability to live in mixed waters and varying temperatures, their presence together indicates periods of drought in the region. As for Ostracoda, 11 species and 8 genera were diagnosed, 4 subfamilies, 7 families, 2 superfamilies, and 1 suborder, which was represented by (Podocopina).

The most critical and widespread genera of Ostracoda in Basra are Cyprideis torosa. Its presence indicates a shallow environment and brackish and fresh water. As for snails, one species belongs to one genus belonging to one family represented by (Vivipariidae) in the genus Ballamya bengalensis, and its presence indicates coastal environments, marshes, swamps and mud. Shellfish were also represented by one species of one genus belonging to one family, which is (Calyptraeidae) and the genus Calyptraea chinensis. Its presence indicates brackish marine environments. The modern era in Iraq is somewhat complex, especially in the Mesopotamia Valley, as these low-lying areas formed suitable basins to receive massive sediments.

Despite the tectonically calm region in the last ten thousand years, the movement of the sea's advance and retreat played a fundamental role in the Mesopotamia Valley plain, as a considerable change in the types of sediments and the bio- and environmental features is evident. Since the Pleistocene ice began to melt, the features of Mesopotamia Valley began to change from one place to another. The lower layers of the Quaternary era show the apparent influence of salt water coming from the sea, the stages of sea level fluctuations, and the spread of estuary sediments in many areas in Basra. The deltaic sediments formed as a result of the confluence of the Tigris and Euphrates rivers in the open sea, followed by a marine retreat through several stages, forming low-lying areas that represented the stages of the sedimentary plain, which contributed to the emergence of freshwater lakes linked to sea channels, salty and muddy lakes, and other highly saline lagoons affected by seawater.

This is what appeared in the results of the sedimentation of the basins of the study areas, as it showed many areas that were exposed to severe uplift and erosion, and other areas that were exposed to severe sedimentation. What was shown in the results of the life groups found in these areas indicates the mixing of their presence in all environments.

**Conclusion**

The study showed that the spread of the species of *Ammonia* Sp and *Cyprideis* proves that they are not transmitted due to their widespread in all the study areas, The similarity of the microfauna identified in the study areas is evidence that there is an overlap in the factors controlling the transfer and distribution of sediments, The presence of the species *Elphidium tepida*, *Ammonia becaril* ,*Cyprideis torosa* and *Elphidium incertum*, in the study areas is evidence of the areas being affected by marine nature, as their presence together indicates coastal environments with salinity, Based on the microfauna, it was shown that the area is affected by the waters of river estuaries and tidal currents in addition to fresh river floodwater.

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**دراسة تصنيفية وبيئية للمستحاثات الدقيقة في حقول نفطية مختارة جنوب العراق**

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المستخلص
أُجْريت هذهَ الدراسة لتحديد ألانواع والأجناس للمجاميع الحياتية الدقيقة في مناطق الدراسة الواقعة ضمن جنوب العراق والتي هي عبارة عن مناطق الحقول النفطيه متمثله في 11 حقل في محافظة البصرة وحقل واحد في محافظة العمارة. وأيضاً تناولت الدراسة جزءاً بسيطاً من موضوع حساب التجلس للأحواض المختارة من الحقول النفطية في جميع مناطق الدراسة وربطها بظهور وإختفاء المستحاثات في المناطق التي حدث فيها الرفع والنحت أو التجلس الكلي. أظهرت النتائج أن اكثر المناطق التي تعرضت للتجلس الحاد هي في محافظة العمارة في حقل حلفاية وحقل العمارة وبلمرتبة الثانية حقل مجنون. أما مناطق التجلس المتوسط كانت والزبير وغرب القرنة 1 وغرب القرنة2. أما مناطق التجلس القليل جداً فقد كانت في سفوان، رطاوي، أم قصر. تناولت الدراسة الحالية المجاميع الحياتية من الفورامينيفرا والاوستراكودا والقواقع والمحاريات، وتبين من خلال النتائج توزيع هذه المجاميع في مناطق الدراسة أن اهم انواع الفورامنيفيرا التي وجدت هي *Amonnia beccarii*, *Ammonia tepida*, *Ammonia dentata*, *Ammonia* , *Elphidium incertum* حيث إن وجود هذه الانواع بكثرة في مواقع الدراسة يدل على بيئة ضحلة مالحة مختلطة ذات درجات حرارة متباينة. أما هذه ألاجناس تشير إلى البيئات البحرية المالحة ودرجات حرارة متباينه وإنها تعيش في بيئات مختلطة وبيئات قارية (بحيرات شاطئية، أهوار، مسطحات فوق المد) ووجود انواعه مع. *Ammonia* sp يدل على فترات جفاف، . وإن اهم انواع ال *Elphidium* هي:
*Elphidium hispidulum, Elphidium excavatum, Elphidium crispum, Elphidium advenum, Elphidium lessonii, Elphidium discoidale, Elphidium selseyense*.
أما اهم انواع الاوستراكودا المسجلة فهوه *Alocopocythere* الذي يتواجد في البحيرات والبيئات عالية الملوحة والمياه البحرية والعذبة. *Cyprideis torosa* يعتبر اهم جنس منتشر في محافظه البصرة يتواجد بنسبة كبيره في مناطق الدراسة يميزه العقد في أصدافه دليل على انخفاض الملوحة وزيادة نسبه المواد العضوية او السيلكا في البيئات المتواجد بها .كما أنهُ يستطيع العيش في المياه العذبة ولديه القدرة على العيش في المياه المالحة، Candoniella تعيش في بيئات عذبة إلى مالحة ودرجه حرارة متباينة. *Hemicytheridea paiki* يعيش ضمن البيئات الضحلة ومسطحات المد والبحيرات الشاطئية والمياه العميقة ووجود هذا النوع يدل على أن المنطقة مضطربة بين تقدم وتراجع بحري. ومن النتائج الموضحه والاجناس التي وجدت نستنتج أن مناطق الدراسة جرى عليها تقدم وتراجع بحري متذبذب وعمليات رفع ونحت وتجلس حاد خاصه في محافظه العمارة.