

## Paleocene -Eocene Ostracoda From Selected Wells in West, North and Central Iraq

Nisren M. Aziz  
Department of Geology  
College of Science  
University of Mosul

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### ABSTRACT

Twenty two ostracoda species belonging to eight genera were described from Avanah ,Sinjar, Khurmala, Aaliji, Akashat and Jaddala Formations, (Paleocene-Eocene) of North, West and Central Iraq of which four species are new, *Abyssocypris zumarensis*, sp. nov., *Argilloecia hejranensis* sp. nov., *Argilloecia baajensis* sp. nov., *Schizocyllhere anbarensis* sp. nov. The identified species show strong affinities to those in India, North Africa and the Middle East (Southern New Tethys).

**Keywords:** Eocene, Iraq, Ostracoda, Paleocene, Tethys.

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### أوستراكودا الباليوسين - الأيوسين من آبار مختارة غرب، شمال و وسط العراق

نسرین مال الله عزیز  
قسم علوم الأرض  
كلية العلوم  
جامعة الموصل

### الملخص

تمت دراسة أوستراكودا تكاوين افانا ، خورماله، عليجي، عكاشات، سنجار، وجدالة في غرب، شمال ووسط العراق، حيث تم تشخيص (٢٢) نوعاً تعود إلى (٨) أجناس منها أربعة أنواع سجلت لأول مرة: *Abyssocypris zumarensis*, sp. nov., *Argilloecia hejranensis* sp. nov., *Argilloecia baajensis* sp. nov. , *Schizocyllhere anbarensis* sp. nov.

إن هذه الأجناس الموصوفة تظهر علاقة تشابه قوية مع أجناس الأوستراكودا المميزة في الهند و شمال وشرق أفريقيا و الشرق الأوسط (مناطق بحر التيثس الجنوبي الجديد).  
**الكلمات الدالة:** الأيوسين، العراق، أوستراكودا، الباليوسين، التيثس.

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## INTRODUCTION

The main studied area is located in the central unit of the foothill zone and Rutba-Jezira zone, (Fig. 1). in which nine sections (Paleocene – Eocene) were chosen across the basin extending from NW to the SE and including four smaller areas which are:

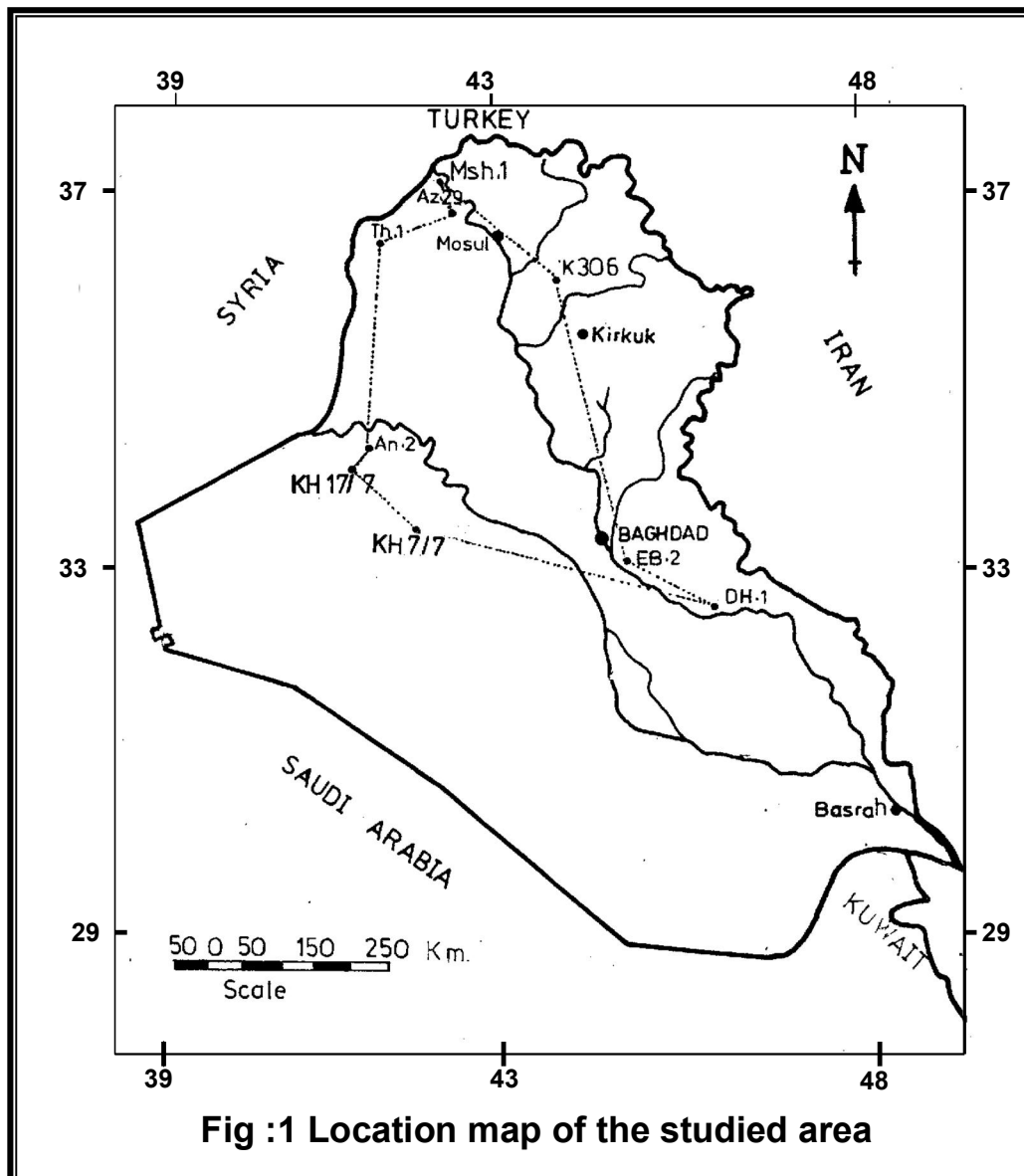
- 1- **Mosul area:** Mushorah 1 (Msh. 1); Tell – Hajer 1 (Th.1); Ain – Zalah 29 (Az.29).
- 2- **Kirkuk area:** Kirkuk 306 (K. 306).
- 3- **East Baghdad area:** East Baghdad 2 (Eb.2); Dhifria 1 (Dh. 1).
- 4- **Western desert area:** Key holes 17/7,7/7( KH 17/7).( KH 7/7); Anah 2 (An.2), All Figured specimens are stored at Mosul University, Geology Department, Tertiary Collection. Under the prefix Mo. = Mosul university, the following abbreviations are used:

T. = Tertiary Collection,	Av. =Avanah Formation,
J.= Jaddala Formation,	Ak.= Akashat Formation,
Aa = Aaliji Formation,	Kh= Khurmala Formation,
S.=Sinjar Formation,	L. = Lower, U. = Upper,
M. = Middle.	

This paper is based on a Ph. D.( Paleocene- Eocene Ostracoda from selected wells in west, north and middle Iraq. Nisren M. Azez,1997. Thesis completed at the Mosul University.

### SYSTEMATIC DESCRIPTIONS

<b>Class:</b>	Crustacea	Pennant, 1777
<b>Subclass:</b>	Ostracoda	Latreille, 1806
<b>Order:</b>	Podocopida	Muller, 1896
<b>Suborder:</b>	Podocopina	Sars, 1866
<b>Family:</b>	Bythocyprididae	Maddocks, 1969
<b>Genus:</b>	<i>Bythocypris</i>	Brady, 1880
<b>Type Species :</b>	<i>Bythocypris reniformis</i>	Brady, 1880



*Bythocypris indica* Nagori, 1993

(Pl. 1 , Fig. 1)

1993 *Bythocypris indica* Nagori, p. 574, pl. 1, Figs. 7, 9.

**Material:** (12) Carapaces, Upper Paleocene - Lower Eocene, Khurmala Formation, K. 306, at depth (1100 - 1050) m.

**Figured specimen:** Mo. T. Kh. 14.

**Remarks:** These specimens differ in being more higher, inflated posteriorly than the specimens described by Nagori, 1993 from Upper Paleocene of India.

**Previous records:** This species was recorded for the first time from southeast Pondicherry, India Nagori, 1993 (M.- U. Paleocene).

***Bythocypris* sp. 1 Foster, Swain and Petters, 1983**

**(Pl. 1 , Figs. 2, 3)**

1983 *Bythocypris* sp. 1 Foster, Swain and Petter, p. 109, pl. 2, Figs. 12 - 15, Pl. 5, Figs. 12 - 13.

**Material:** (12) Carapaces, Upper Paleocene – Lower Eocene, Khurmala Formation, K. 306, at depth (1100) m.

**Figured specimens:** Mo. T. Kh (15 - 15.1).

**Remarks:** These specimens differs from *B* - sp.1 Foster *et al.*, 1983, Nigeria (Paleocene) in having more round anterior margin.

**Previous records:** This species was recorded by Foster *et al.*, 1983, from Paleocene of Nigeria.

***Bythocypris windami* Butler and Jones, 1957**

**(Pl. 1, Figs. 4, 5)**

1957 *Bythocypris windami* Butler and Jones, p. 197, pl. 1, Fig. 8a-e.

**Material:** (6) Carapaces, (Lower Paleocene – Lower Eocene), Aaliji Formation, Eb. 2, at depth (1850- 1875) m.

**Figured specimen:** M. T. Aa. (6 - 6.1).

**Previous records:** This species was recorded by Butler and Jones, 1957 from Upper Cretaceous (Campanian) of America; also by Al-Shareefi, 2004 from Upper Cretaceous of Iraq.

**Superfamily:** Cypridacea Baird, 1845

**Family:** Pontocyprididae Muller, 1894

**Genus:** *Pontocyprilla* Lyubimova, 1955

**Type-species:** *Pontocyprilla praetexta* Sars, 1866

***Pontocyprilla recurva* Esker, 1968**

**(Pl. 1, Fig. 6)**

1968 *pontocyprilla recurva* Esker, p. 323, pl. 1, Figs. 6, 7.

**Material:** (15) Carapaces, Lower Paleocene – Lower Eocene, Aaliji Formation, Msh. 1, at depth (1420 - 1390) m.

**Figured specimen:** Mo. T. Aa. 7.

**Previous records:** This species was recorded in Iraq by Al-Ubadi, 1989, from the Late Cretaceous; Esker, 1968 from the Danian of Tunisia, and by Jain, 1975 from Maastrichtian of India.

**Genus:** *Abyssocypris* van Den Bold, 1974.

**Type-species:** *Abyssocypris tipica* Van Den Bold, 1974.

***Abyssocypris adunca* (Esker, 1968)**

**(Pl. 1, Fig. 7)**

1968 *Bythocypris adunca* Esker, pl. 321, pl. 2, Figs. 10 - 12.

1982 *Abyssocypris adunca* (Esker) ; Donze, Colin, Damotte, Oertli, Peypoouet and Said, p. 281, pl. 2, Figs. 3, 4.

**Material:** (18) Carapaces, L - U. Paleocene, Akashat, Formation, KH, 17/7, at depth (630 - 620) m.

**Figured specimens:** Mo. T. Ak. 5.

**Previous recorded:** This species was recorded from Tunisia by Esker, (1968). (Danian) as genus *Bythocypris*, then it was transferred to genus *Abyssocypris* by Donze *et al.*, 1982. Al-Ubadi, (1989) from the Cretaceous of Iraq by Bassiuni and Morsi, (2000) from the Paleocene - Early Eocene of Egypt.

***Abyssocypris zumarensis* sp. nov.**

**(Pl. 1, Figs. 8-11)**

**Derivation of name:** After zumar town in Mosul Governate, NW. Iraq.

**Holotype:** Carapace, Fig. 8, Mo. T. Aa. 8.

**Paratype:** Three carapaces, Figs. 9-11, Mo. T. Aa. (8, 8.1, 9, 9.1).

**Type locality:** Ain - Zalah well 29. NW. Iraq.

**Type horizon:** Aaliji Formation(L. Paleocene - L. Eocene) at depth (300m).

**Materials:** (22) Carapaces.

**Diagnosis:** A species of ostracoda genus *Abyssocypris* of thin, small, tumid, elongate shell, with distinct overlapping.

<b>Dimensions (mm)</b>	<b>L.</b>	<b>H.</b>	<b>W.</b>	<b>L/H</b>
Carapace right valve Male (Mo. T. Aa. 8)	0.28	0.31	0.59	0.90
Carapace dorsal view Male (Mo. T. Aa. 8.1)	0.28	0.32	0.59	0.88
Carapace right valve Female (Mo. T. Aa. 9)	0.26	0.35	0.60	0.74
Carapace dorsal view Female (Mo. T. Aa. 9.1).	0.26	0.35	0.60	0.74

**Description:** Carapace with moderately rounded anterior margin and tapering posterior end, tumid, elongate in lateral view, Dorsal margin convex, ventral margin sinuous, concave anteriorly, convex behind the middle lateral surface smooth Left valve overlapping right valve along all margins, sexual diamorphism well distinguished as a which male, more elongate, narrow and less high than females. Most of the specimens have been found as closed carapaces so that the internal features were not seen.

**Remarks:** The present species is fairly similar to *Abyssocypris adunca* Donze *et al.*, 1982; Itterbeck *et al.*, (2007). But differs in being higher, inflated posteriorly and in having rounded posterior ventral corner. The Iraqi species is also characterized by its tumid, maximum height anterior to the middle. *Abyssocypris* sp. Morsi *et al.*, (2008). from (Paleocene - Eocene) of Egypt shows some similarities to Iraqi specimens but differs in having more convexity of dorsal margin and less rounded anterior end.

**Occurrence:** Aaliji Formation (L. Paleocene - L. Eocene) NW. Iraq.

**Genus:** *Argilloecia* Sars, 1866.

**Type species:** *Argilloecia cylindrical* sars, 1866.

***Argilloecia hiwanneensis* Howe and Lea, 1936.**

**(Pl. 1, Fig. 12)**

1936 *Argilloecia hiwanneensis* Howe and Lee, 7: 1-96, pl. 2, Figs. 6-7.

**Material:** (13) Carapaces, Jaddala Formation (Middle - Upper Eocene), Ain-zalah, 29, at depth (900 - 995) m.

**Figured specimens:** Mo. T. J. 5, Ain-Zalah. 29.

**Previous records:** This species recorded in U.S.A by Howe and Lee, 1936 from the Oligocene and Egypt by Abdel Minum, 1990 from Early Eocene.

***Argilloecia* sp. 1 Said, 1978**

**(Pl. 1, Fig. 13)**

1978 *Argilloecia* sp. 1 said, p. 219, pl. 24, Fig. 12.

**Material:** (1) Carapaces, Khurmala (L - U. Eocene) K. 306, N - Iraq, at depth (950-1125) m.

**Figured specimens:** Mo. T. Kh. 16.

**Remark:** These specimens differ from *A. sp.1* Said, 1978 in having narrower posterior margin.

**Previous records:** This species was recorded in Tunisia by Said, 1978 from the Early Paleocene.

***Argilloecia heijranensis* sp. nov.**

**(Pl. 1, Figs. 14, 15)**

**Derivation of name:** From its occurrence in the Heijran village, NW. Iraq.

**Holotype:** Carapace (Mo. T. Aa. 10).

**Paratype:** Carapace (Mo. T. Aa. 11).

**Type locality:** Msh. 1, North Iraq.

**Type horizon:** Aaliji Formation (L. Paleocene - L. Eocene), at depth (1425 - 1450) m.

**Material:** (18) carapaces.

**Diagnosis:** A species of *Argilloecia* with elongate carapace in lateral view. Right valve larger than left valve. Dorsal margin broadly arched, ventral margin straight, posterior end narrowly rounded and lateral surface smooth.

<b>Dimensions (mm)</b>	<b>L.</b>	<b>H.</b>	<b>W.</b>	<b>L/H</b>
Female carapace right valve (Mo. T. Aa. 10)	0.13	0.17	0.38	0.76
Male Carapace dorsal view (Mo. T. Aa. 11)	0.14	0.16	0.35	0.87

**Description:** Thick with elongate carapace in lateral view. Dorsal margin slightly concave curving down posteriorly. Ventral margin slightly concave anteriorly, convex upwards to join the rounded postero-ventral cone lateral surface smooth. Right valve larger than left valve, overlapping conspicuously along the entire margins, except at postero - ventral corner when the two valves coincide. In dorsal view, carapace biconvex narrower anteriorly with slightly pointed anterior end and broadly ovate posterior end, maximum thickness and width posteriorly.

**Remarks:** The present species show affinities with *Argilloecia hiwanneesis* Howe and Lea, 1936 but the former different in being higher inflated posteriorly, and having rounded posterior ventral corner. Also the Iraqi species shows some similarities to *Argilloecia Mesa* Szczechura, 2000 from Eocene of Antarctic peninsula but the later differs in being. Less pointed posteroventrally and more pronounced the valve overlapping.

**Occurrence:** Aaliji Formation (L. Paleocene – L. Eocene) and Jaddala Formation (Middle and Upper Eocene).

***Argilloecia baajensis* sp. nov.**

**(Pl. 2, Figs. 1, 2)**

**Derivation of name:** After baaj country in Nenevah Governate.

**Holotype:** Carapace, Mo. T. J. 6.

**Paratype:** Carapace, Mo. T. J.6 (1-2).

**Type locality:** Tell-Hajer 1, NW. Iraq.

**Type horizon:** Jaddala Formation (M. U. Eocene), at depth (1930-1970) m.

**Materials:** (20) carapace.

**Diagnosis:** A species of the ostracoda genus *Argilloecia* with large, tumid, elongate to subacute in lateral view and posterior end pointed ventrally.



<b>Dimensions (mm)</b>	<b>L.</b>	<b>H.</b>	<b>W.</b>	<b>L/H</b>
Male carapace left valve (Mo. T. J. 6)	0.56	0.27	0.24	2.07
Female carapace dorsal view (Mo. T. J. 6.1).	0.54	0.29	0.25	1.86

**Description:** Carapace large elongate to subovate in lateral view. Dorsal margin convex, ventral margin sinuous, concave anteriorly, convex behind the middle. Anterior end obliquely rounded, posterior end pointed. Lateral surface smooth, right valve larger than left valve and strong overlapping along anterior and dorsal margin.

**Remark:** The present species shows some similarities to *Argilloecia* sp. Bassiouni and Luger, 1990, but the later differs in having more in plated posterior end, and rounded posterior ventral corner.

**Occurrence:** Jaddala Formation (Middle and Upper Eocene) NW. Iraq.

**Genus:** *propontocypris* Sylvester-Bradley, 1957

**Type species:** *pontocypris trigonella* Sars, 1866

***Propontocypris eocaenica* Neale and Singh, 1985**

**(Pl. 2, Fig. 3)**

1985 *Propontocypris eocenica* Neale and Singh (p. 365, pl. 42, Figs.5-7).

**Material:** (8) Carapaces, Khurmala Formation, K. 306, at depth (1050-1100) m.

**Figured specimens:** Mo. T. Kh. 17.

**Previous records:** This species was recorded in India by Neale and Singh, (1985) from Middle Eocene.

**Family:** Paracyprididae Sars, 1923

**Subfamily:** Paracypridinae Sars, 1826

**Genus:** *Paracypris* Sars, 1868

**Type species:** *Paracypris polita* Sars, 1868

***Paracypris jonesi* Bonnema, 1940**

**(Pl. 2, Fig. 4)**

1940 *Paracypris jonesi* Bonnema, p. 115, pl. 3, Figs. 24 - 28.

**Material:** (8) Carapaces, (U. Paleocene – L. Eocene) Khurmala Formation, K. 306, at depth (1000 - 1100) m.

**Figured specimens:** Mo. T. Kh. 17.1.

**Previous records:** This species was recorded from Hollanda, Bonnema, (1940) (Maastrichtian); Tunisia, Esker. (1978), Said, (1978), Donze *et al.*, (1982); Egypt, Abdel Munium, (1990); Iraq, Al-Shareefi, (2004). from Upper cretaceous.

***Paracypris maghaensis* Khalifa and Cronin, 1979**

**(Pl. 2, Fig. 5)**

1979 *Paracypris maghaensis* Khalifa and Cronin, p. 174, pl. 1, Figs. 3, 4.

**Material:** (6) Carapaces, Akashat (L. U. Paleocene KH17/7, West Desert Iraq), at depth (486) m.

**Figured specimens:** Mo. T. AK. 6.

**Previous records:** This species was recorded from the L. Eocene Egypt, Khalifa and Cronin, (1979).

***Paracypris rectoventra* Sohn, 1959**

**(pl. 2, Fig. 6)**

1959 *Paracypris rectoventra* Sohn, p. 61, pl. 4, Figs. 30 - 32.

**Material:** (9) Carapaces. Khurmala Formation (L- U. Paleocene), K. 306, at, depth (955 - 1125) m.

**Figured specimens:** Mo. T. Kh. 8.

**Previous records:** This species was recorded from the Paleocene of Pakistan by Sohn, (1959), in Sohn, (1970).

***Paracypris* sp. Salahi, 1966**

**(Pl. 2, Fig. 7)**

1966 *Paracypris* sp. Salahi, p. 7, pl. 1, Figs. 29, 30, 34.

**Material:** (12) Carapaces, L- U. Paleocene, Akashat Formation, KH 17/7 (600-650) m. West Desert Iraq.

**Figured specimens:** Mo. T. Ak. 7.

**Previous record:** Liyba, Salahi, (1966), (Maastrichtian - Paleocene); Tunsia, Said, (1978), (Maastrichtian - Paleocene).

**Family:** Macrocypridae G - W Muller, (1912).

**Genus:** *Macrocypris* Brady, (1888).

**Type species:** *Cythere minna* Baird, (1850).

***Macrocypris* sp. Abdel Muinum, 1990**

**(Pl. 2, Fig. 8)**

1990 *Macrocypris* sp. Abdel Munium, p. 70, pl. 4, Figs. 13-15.

**Material:** (8) Carapaces, L- U. Paleocene, Khurmala Formation, K. 306, at depth (955-1125) m, N. Iraq.

**Figured specimens:** Mo. T. Kh. 18.1.

**Previous records:** Egypt, Abdel Muinum, (1990). Lower Eocene.

**Super family:** Cytheracea Baird, 1850

**Family:** Cytheridae Baird, 1850

**Subfamily:** Cytherinae Baird, 1850

**Genus:** *Schizocythere* Triebel, 1950

**Type species:** *Schizocythere hollandica* Triebel, 1950

***Schizocythere depressa* Mehes, 1936****(Pl. 2, Fig. 9)**1936 *Schizocythere depressa* Mehes, p. 25-26, pl. III, Figs. 5.8.**Material:** (16) Carapace, Middle Eocene, Avanah Formation, K. 306, at depth (930-940) m, N. Iraq.**Figured specimens:** Mo. T. Av. 1.**Previous records:** Budapest, Mehes, 1936, Eocene; Hungary, Monostori: 1977, 1985, Middle Eocene.***Schizocythere* sp. cf. *S. deopanica* Neale and Singh, 1985****(Pl. 2, Fig. 10)**1985 *Schizocythere deopanica* Neale and Singh, p. 268, pl. 43, Figs. 6 - 9 - 11.**Material:** (12) Carapace, Middle-Upper Eocene Jaddala Formation, Th. 1, at depth (1420) m, NW. Iraq.**Figured specimens:** Mo. T. J. 7.**Remarks:** This species compares closely with *S. deopanica* Neale and Singh, 1985 from M. Eocene of India, which it resembles in size and shape but shows slight difference in the presence of posterior slope to posterodorsal corner of the valve and details of arrangement of the reticulation in lateral surface of valve.**Previous records:** India, Neals and Singh, 1988, Middle Eocene ; N. Iraq, Aziz, 1994, M. Eocene (Avanah Formation).***Schizocythere* sp. cf. *S. rakhiensis* Siddiqui, 1981****(Pl. 2, Fig. 11)**1981 cf. *Schizocythere rekhiensis* Siddiqui, p. 234-235, pl. 18, Figs. 1 - 4.

**Material:** (9) Carapace (Middle Paleocene - Lower Eocene), Sinjar Formation, Th. 1, at depth (2000 - 2030)m, NW. Iraq.

**Figured specimens:** Mo. T. Snj. 1

**Remarks:** This species closely similar to *S. rekhiensis* Siddiqui, 1981 from Pakistan (Early Eocene) in all details but the latter slightly differs in the shape of the posterodorsal and less develop caudal process in upper part.

***Schizocythere anbarensis* sp. nov.**

**(Pl. 2, Figs. 12, 13)**

**Derivation of name:** From its After anbar country in the west Iraq.

**Holotype:** carapace, (Mo. T. Ak. 8)

**Pacatype:** carapace, Mo. T. Ak. 9.

**Type locality:** KH 17/7 Western Desert Iraq.

**Type Horizon:** Akashat Formation (Lower - Upper Paleocene), at depth (500 - 520) m.

**Materials:** (15) carapaces.

**Diagnosis:** A species of ostracoda genus possessing posterodorsal tubercle, distinct caudal process in the upper part of posterior end.

<b>Dimensions (mm)</b>	<b>L.</b>	<b>H.</b>	<b>W.</b>	<b>L/H</b>
Female carapace (Mo. T. Ak. 8)	0.35	0.22	0.29	1.59
Male dorsal view (Mo. T. Ak. 8.1)	0.36	0.20	0.24	1.80

**Description:** Thick, small, quadrate carapace in laterel view. Anterior end rounded, posterior end with distinct caudal process in the upper part. Dorsal and ventral margin slightly straight concered by dorsal and ventral ridge with sulcus antero dorsal, Surface strongly reticulate with well posterodorsal tuberele. Eye spot present. Maximum length over the middle point, greatest height under eye spot. Maximum width in the middle. Sexual dimorphism well distinct, male longer and less higher than female which is tumid.

**Remarks:** This species shows some resemblance to *schizocythere sellarius* Al-Furaih, 1980 from Early Paleocene of Saud Arbia, but the latter differs in having more elongate sharp caudal process and irregular deep pitted on the surface in addition to that with prominent eye tubercle.

*Schizocythere shamalensis* Khalafand Aziz, 2002 from M. Eocene deposits of Iraq, but the latter differs in having strong developed ventral swelling and truncated posterior end in the middle.

### *Schizocythere* sp. A

(Pl. 2, Fig. 14)

**Material:** (1) carapace, Lower Paleocene - Lower Eocene, Khurmala Formation K. 306, at depth (1000-1050) m, N. Iraq.

**Figured specimens:** Mo. T. Kh. 19.

**Remarks:** Species of genus *schzocythere* with elongate to subovate carapace, obliquely. thick rounded anterior end, narrower rounded without caudal pross posteriorly, distinct eye tubercle, lateral surface with coarse pitted, thick and irregular marked ventral ridge more pronounced dorsal ridge. This species show some similarities to *Schzocythere sorensis*. Siddiqui, (1981), but the former differs in posterodorsal corner of the valve and detail of arrangement of the ornamentation and lacking the caudal process. The present species is left under open nomenclature due to the lack of material.

### *Schizocythere* sp. B

**Material:** (1) Carapace, Khurmala Formation (Lower Paleocene - Lower Eocene), K. 306, at depth (1000-1050) m, N. Iraq.

**Figured specimens:** Mo. T. Kh. 20.

**Remarks:** Species of genus *Schizocythere* which is small elongate and thick carapace in lateral view . Anterior end broad rounded, posterior end without caudal process also thick surface with deep and regular pitted for the lacks of specimens it was left under open nomenclature. it differs from *S. sp. A*, by the shape of anterior and posterior ends. as well as the pattern of ornamentation.

## CONCLUSIONS

The ostracod species of (Paleocene - Eocene) from the Avana Khurmala, Aaliji, Akashat, Sinjar and Jaddala Formations of North, West and Central Iraq show strong similarities to faunas from India, Pakistan, Saudi Arabia, the Eastern Mediterranean, the Caribbean region and North Africa. The ostracoda genus *Bythocypris*, *Pontocyprilla*, *Abyssocypris*, *Argilloecia*, *Propontocypris*, *Paracypris* and *Schizocythere* occur abundantly in study area and represented by four new species namely: *Abyssocypris zumarensis* sp. nov., *Argilloecia hejrranensis* sp. nov., *Argilloecia baajensis* sp. nov., *Schizocythere anbarenis* sp. nov., a literature survey shows that these genera have been recorded previously in adjacent areas from the Paleocene – Eocene of Western India, North Africa and the Middle East.

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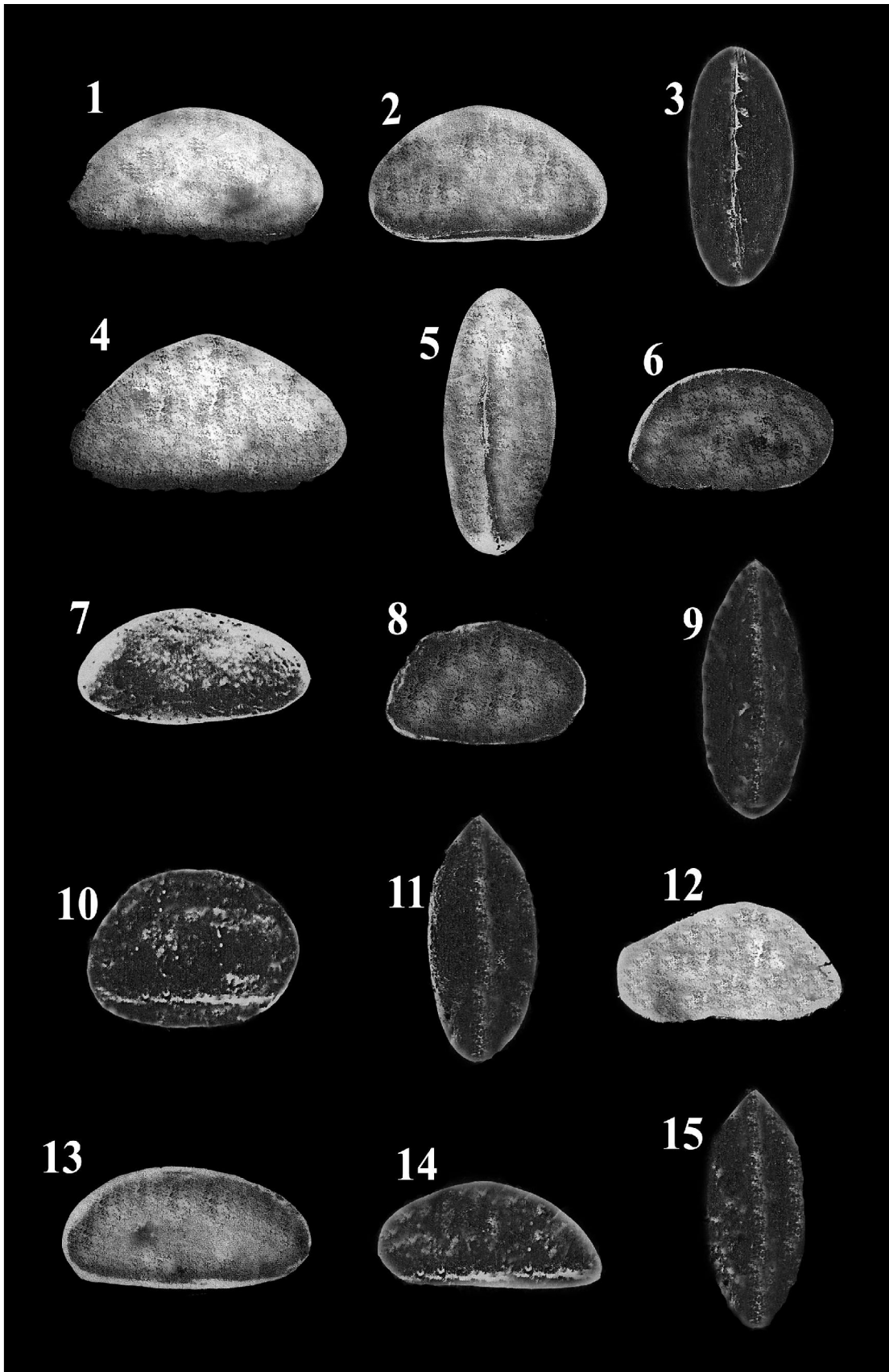
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**PLATE 1**

- Fig. 1:** *Bythocypris indica* Nagori, 1993.  
External carapace right valve , ( Mo. T. Kh . 14) , X.71
- Fig. 2, 3:** *Bythocypris* sp.  
1. Foster , Swain and Petters  
2. External carapace right valve , ( Mo. T. Kh . 15) , X.86 ,  
3. Dorsal view , ( Mo. T. Kh . 15.1) , X.80
- Fig. 4, 5:** *Bythocypris windhami* Butler and Jones, 1957 ,  
4. External carapace right valve , ( Mo. T.Aa.6) X.76  
5. Dorsal view , ( Mo. T.Aa.6.1)X.76
- Fig. 6:** *Pontocyprilla recurva* Eskar, 1968 .  
External carapace right valve (Mo.T.Aa.7) X.75
- Fig. 7:** *Abyssocypris adunca* Eskar, 1968 .  
External carapace right valve (Mo.T.AK.5)X.125
- Fig. 8-11:** *Abyssocypris zumarensis* sp. nov. ,  
8. External carapace right valve (Mo.T.Aa.8)X.138  
9. Dorsal view , ( Mo. T.Aa.8.1)X.148  
10. External carapace right valve (Mo.T.Aa.9)X.96  
11. Dorsal view , ( Mo. T.Aa.9.1)X.102
- Fig. 12:** *Argilloecia hiwanensis* Howe and Lea, 1936.  
External carapace left valve (Mo.T.J.5)X.163
- Fig. 13:** *Argillocea* sp.1 Said, 1978.  
External carapace left valve (Mo.T. Kh.16)X. 150
- Fig. 14, 15:** *Argillocea hejranensis* sp. nov .  
14. External carapace left vale (Mo.T.Aa.10)X.130  
15. Dorsal view , ( Mo. T.Aa.10)X.132

## PLATE 1



**PLATE 2**

**Fig. 1, 2:** *Argilloecia baajensis* sp. nov .

1. External carapace left valve (Mo.T.J.6), X.108

2. Dorsal view , ( Mo. T.J.6.1)X.102

**Fig. 3:** *Propontocypris eocaenice* Neale and Singh ,1985.

External carapace right valve (Mo.T.Kh.17), X.210

**Fig. 4:** *Paracypris joesi* Bonnema,1940.

External carapace right valve (Mo.T.Kh.17.1), X.97

**Fig. 5:** *Paracypris maghaensis* Khalifa and Cronin, 1979.

External carapace right valve (Mo.T.Ak.6), X.91

**Fig. 6:** *Paracypris rectoventata* Sohn, 1959.

External carapace right valve (Mo.T.Kh.18), X.72

**Fig. 7:** *Paracypris* sp. *salahi* , 1966.

External carapace right valve (Mo.T.Ak.7), X.92

**Fig. 8:** *Microcypris* sp. Ab-del-Muinium,1990 .

External carapace left vale (Mo.T.Kh.18.1), X.85

**Fig .9:** *Schizocythere depressa* Menes,1936.

External carapace right valve (Mo.T.Av.1), X.200

**Fig. 10:** *Schizocythere* sp. cf. *S. deopanica* Neale and Singh,1985.

External carapace right valve (Mo.T.J.7), X.208

**Fig. 11:** *Schizocythere* sp. cf. *S. rakhiensis* Siddiqui, 1981.

External carapace right valve (Mo.T.Snj.1), X.222

**Fig. 12,13:** *Schizocythere anbarensis* sp. nov.

12. External carapace right valve (Mo.T.Ak.8)X.104

13. Dorsal view , ( Mo. T.Ak.8.1), X.184

**Fig. 14:** *Schizocythere* sp.A.

External carapace right valve (Mo.T.Kh.19),X.159

**Fig. 15:** *Schizocythere* sp.B.

External carapace right valve (Mo.T.Kh.20),X.164

## PLATE 2

