

Some Ostracoda Species of Tanjero Formation (Late Campanian- Maastrichtian) of Diana Area, NE Iraq.

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ABSTRACT

Eleven ostracode species belonging to eight genera were described and illustrated for the first time from Tanjero Formation (Late Campanian-Maastrichtian) at Diana, North East Iraq, which six species are new: *Cytherella suranensis* sp. nov.; *Cytherella omarians* sp. nov.; *Bairdia dianaensis* sp. nov.; *Bythocypris sirwanensis* sp. nov.; *Bairdoppilata halabijaensis* sp. nov. and *Limburgina kaniensis* sp. nov.

Keywords: Ostracode, Late Campanian-Maastrichtian, Tanjero, Diana, Iraq.

بعض انواع الاوستراكودا من تكوين تانجيرو (الكامبانيان المتأخر - الماسترختيان) من
منطقة ديانا، شمال شرقي العراق

نسرين مال الله عزيز
كلية العلوم
قسم علوم الأرض
جامعة الموصل

المخلص

في هذا البحث تم تشخيص احد عشر نوعا من الاوستراكودا تعود الى ثمانية اجناس من تكوين
تانجيرو (الكامباني المتأخر - الماسترختي) منطقة ديانا، شمال شرقي العراق، حيث تم وصف ستة
انواع منها جديدة:

Cytherella suranensis sp. nov. ; *Cytherella omarians* sp. nov.; *Bairdia
dianaensis* sp. nov.; *Bythocypris sirwanensis* sp. nov.; *Bairdoppilata halabijaensis*
sp. nov. and *Limburgina kaniensis* sp. Nov

الكلمات الدالة: الاوستراكودا، الكامبانيان المتأخر - الماسترختيان، تانجيرو، العراق.

INTRODUCTION

According to Bellen *et al.* (1959) the Tanjero Formation is first defined and described by Dunnington (1952) from the selected type section at Sirwan valley, 2 Km to the south of Kani Karweshkan village, near Halabja town and at the right bank of Sirwan river (upstream of Dialla river). Tanjero Formation in the study area (Fig. 1) consists of succession bedded of shale, mudstone, and a few bedded from sandstone, sandy limestone and marl limestone (Fig. 2), the Kolosh Formation uncomfortably overlies, the unconformity is marked by a bed of conglomerate, 2m thick, at the base of the Kolosh Tanjero Formation (olive - green). The Shiranish Formation gradationally underlies the Tanjero Formation, for appearance first to sandstone overlapping with shale as well to change the color of sedimentation from light blue of Shiranish Formation to olive green of Tanjero Formation. The Formation is deep water origin but shows shallow water development at different horizons (Kassab, 1975). All the figured specimens of Tanjero Formation (Tn.) are deposited in Mosul University (Mo.), Cretaceous collection with prefix (Cr.) and Diana area (Da.).

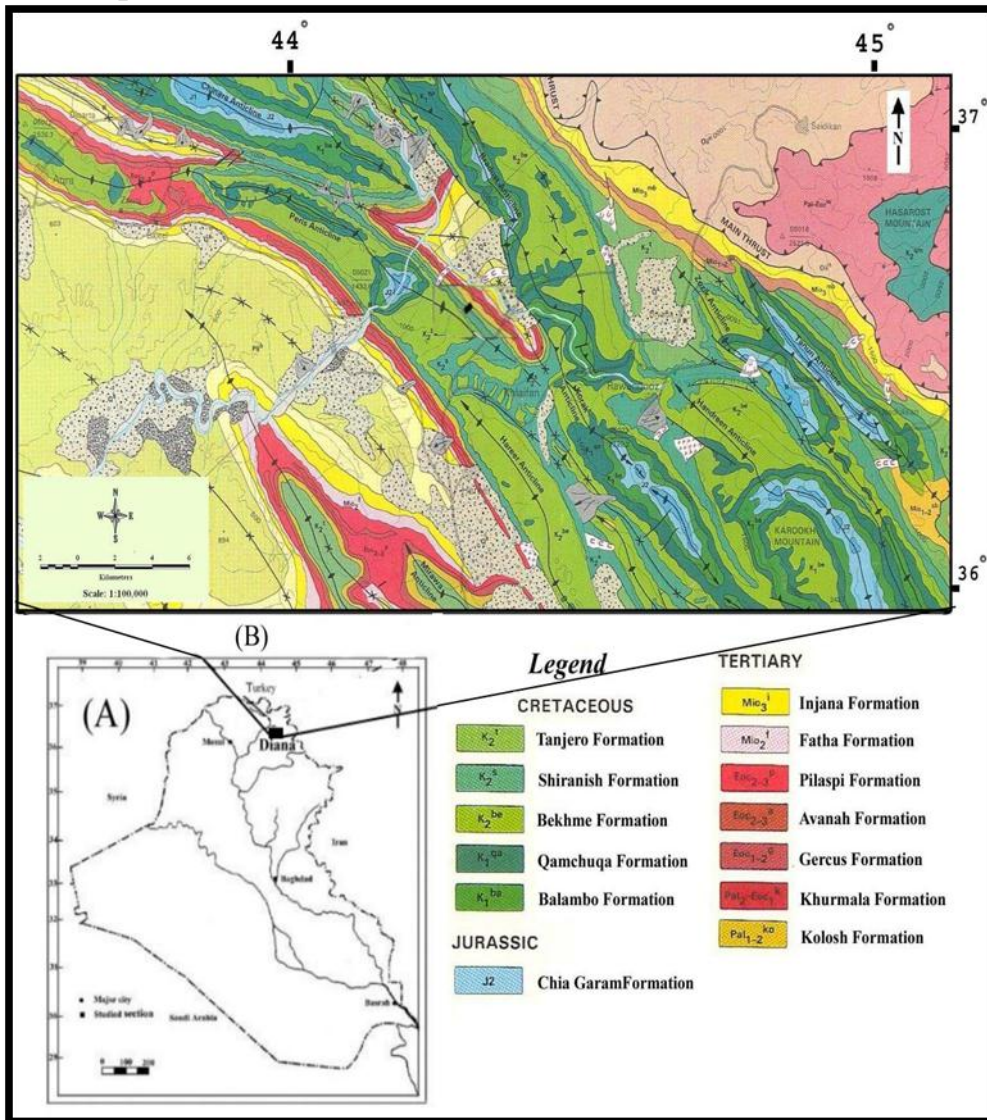


Fig.1: Location Map of the Studied Area.

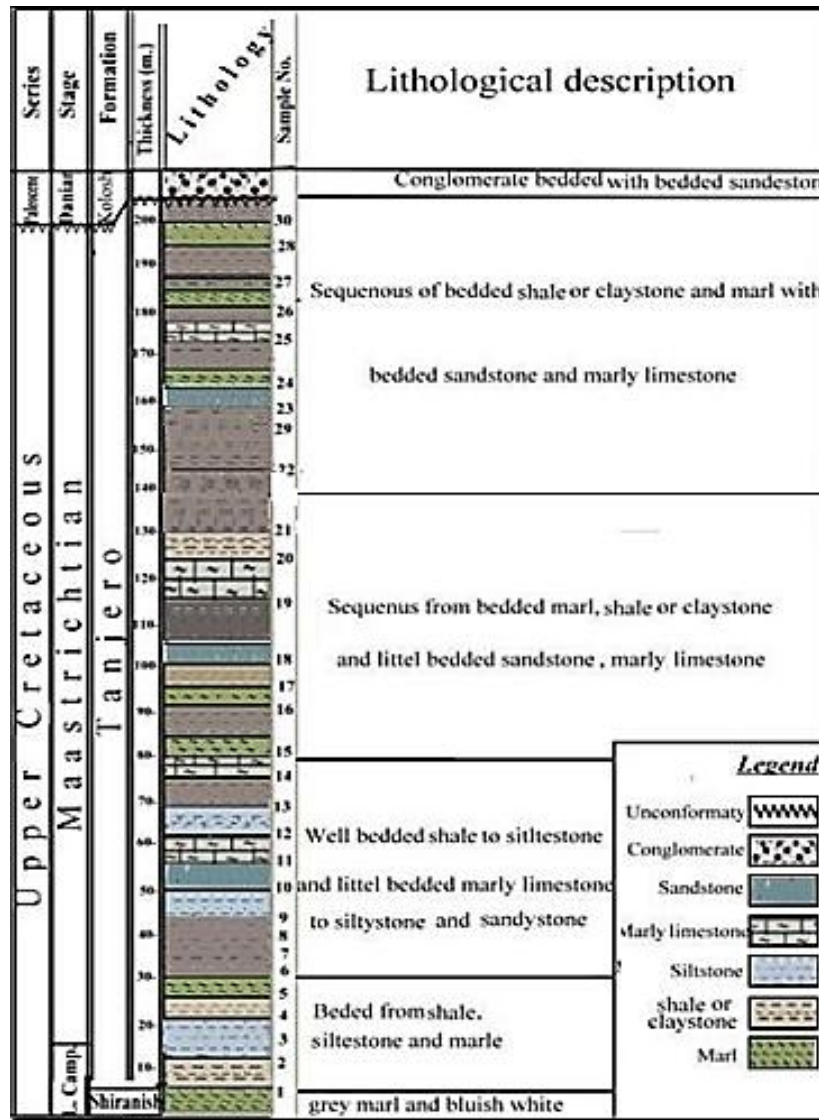


Fig. 2: Stratigraphic Column of the Tanjero Formation in Diana Area, NE Iraq.

SYSTEMATIC DESCRIPTIONS

Phylum Crustacea Pennant, 1773
Class Ostracoda Latreille, 1806
Order Podocopida Muller, 1894
Suborder Platycopina Sars, 1866
Genus *Cytherella* Jones, 1849

Type Species: *Cytherina ovate* Roemer, 1840

Cytherella lagenalis Marliere 1958

(Pl.1, Fig. a)

1958 *Cytherella lagenalis* Marliere, P. 8, Pl. 1, Fig. 3.**Materials:** (4) carapaces**Figured specimen:** Carapace Mo. Cr. Tn.1, Tanjero Formation (Late Campanian-Early Maastrichtian), NE Iraq , Sample No. Da.10 .**Remarks:** The present specimen is closely identified to *Cytherella lagenalis* Marliere 1958, which was originally description from the Maastrichtian of Egypt (Morsi, *et al.*, 2008), but the latter differs in having weakly tumid posterior end .**Occurrence:** Late Maastrichtian - Paleocene of Belgium (Marliere, 1958); Egypt (Morsi, 2000, Ismail and Ied, 2004, Shahin, 2005, Morsi, *et al.*, 2008, El-Nady, *et al.*, 2008); Maastrichtian of Egypt (Abd- Elshafy, *et al.*,2002); of Iran (Shirazi, *et al.*, 2011) .*Cytherella cf. fragisilis* Neal, 1962

(Pl.1, Figs. b1,b2)

1962 *Cytherella fragisilis* Neal, P. 429, Pl. 1, Figs. 5 - 7.**Materials:** (12) carapaces**Figured specimen:** Carapace Mo. Cr. Tn.(2,3), Tanjero Formation (Late Campanian- Early Maastrichtian), N E Iraq , Sample No. Da. 22.**Remarks:** The present species is similar with *Cytherella fragisilis* Neal, described by(Ishizaki, 1992) from Campanian in Japan, but differs in having more broadly rounded anterior margin, and weaker posterior overlap.*Cytherella suranensis* sp. nov.

(Pl. 1, Figs. c1,c2)

Derivation of name: After Suran town in Erbil Governorate, NE, Iraq.**Diagnosis:** A species with a sub parallel dorsal and ventral margins also having well developed depression in the half anterior of carapace.

Dimensions (mm)	L.	H.	W.	L/H
Carapace, dorsal view (Mo. Cr. Tn.4)			0.29	
Carapace external left valve (Mo. Cr. Tn.5)	0.86	0.52		1.65

Holotype: Carapace, Mo. Cr. Tn.4**Paratype:** Carapace, Mo. Cr. Tn.5 .

Type locality and Horizon: Tanjero Formation (Late Campanian- Maastrichtian)
Diana area, NE. Iraq, Sample No.Da.6 .

Materials: (11) carapaces

Description: Carapace tumid ovate- elongate in lateral view, regularly and well-rounded anterior and posterior ends, a species with a subparallel dorsal and ventral margins with well-developed depression in the half anterior carapace, **maximum** length in the middle, maximum height at the middle. Right valve large than the left, overlapping seen a long the dorsal, ventral margin and anterior, surface pitted in posterior margin.

Remarks: This species shows some similarities to *Cytherella* sp.3 Dingle, 1981 from the Maastrichtian in south Africa, but the latter differs in having a distinct anterior rim and more developed tumid posterior half.

Cytherella omariansis sp. nov.

(Pl. 1, Figs. d1-d3)

Derivation of name: From the name of Professor Dr. Farouq S. Al-Omari for his contribution to the micropalaentological studies in Iraq.

Diagnosis: A carapace recognized by its sub-rectangular to sub-quadrate in lateral view, blunt and broadly rounded anterior end .

Dimensions (mm)	L.	H.	W.	L/H
Carapace external, left valve (Mo. Cr. Tn.6)	0.84	0.55		1.53
Carapace dorsal view (Mo. Cr. Tn.7)			0.38	
Carapace external, right valve (Mo. Cr. Tn.8)	0.85	0.53		1.60

Holotype: Carapace, Mo. Cr. Tn.6 .

Paratype: Two Carapaces, Mo. Cr. Tn.7,8.

Type locality and Horizon: Tanjero Formation (Late Campanian- Maastrichtian)
Diana area, NE. Iraq, Sample No.Da.14.

Materials: (16) carapaces

Description: Carapace sub-rectangular in the lateral view, maximum length at the middle, greatest height anteriorly, maximum width at the last third of the carapace , anterior margin blunt and broadly rounded, posterior margin tumid and narrower than the anterior with prominent dorsal, anterior and posterior rim, ventral margin slightly straight with a concave centrally, dorsal margin broadly convex than the ventral, lateral surface is apparently smooth, right valve larger than the left, overlapping more prominent along the ventral , dorsal and posterior margins.

Remarks: This species shows some similarities to *Cytherella* sp.A Al-Ubidee, 1989 from the middle Maastrichtian in northeastern Iraq, but the latter differs in having more developed rounded anterior and posterior end with more conspicuous overlapping anteriorly.

Suborder Podocopina Sars, 1866
Superfamily Bairdlacea Sars, 1866
Family Bairdiidae Sars, 1866
Genus *Bairdia* McCoy, 1846
Type species: *Bairdia curta* McCoy, 1846

Bairdia dianaensis sp. nov.
 (Pl. 1, Figs. e1, e2)

Derivation of name: After Diana area country, Erbil city in the NE Iraq.

Diagnosis: A species of the genera *Bairdia* characterized by broadly strong arched dorsal margin and distinct produced posterior end sub ventrally.

Dimensions (mm)	L.	H.	W.	L/H
Carapace external left valve (Mo. Cr. Tn.9)	0.73	0.36		2.02
Carapace dorsal view (Mo. Cr. Tn.10)			0.32	

Holotype: Carapace, Mo. Cr. Tn. 9.

Paratype: Carapace, Mo. Cr. Tn. 10 .

Type locality and Horizon: Tanjero Formation (Late Campanian - Maastrichtian)
 Diana area, NE Iraq, Sample No. Da. 29.

Materials: (9) carapaces

Description: Carapace with typical bairdoid outline, anterior margin narrowly rounded in the middle, obliquely rounded below, posterior end produced sub-ventrally, maximum length near the ventral margin, greatest height at the middle, maximum width in the middle, dorsal margin strong arched, ventral margin slightly convex, carapace surface smooth, left valve larger than right valve, overlapping along the ventral and the lower part of the posterior end.

Remarks: The species differs from *Bairdia* sp. aff. *trigonalis* Jones in Esker, 1968 from Maastrichtian- Danian in Tunisia, but the latter differs in having less developed produced posterior end and less arched dorsal margin.

Genus *Bairdoppilata* Coryll, Sample and Jennings, 1935
Type species: *Bairdoppilata maryni* Coryll, Sample and Jenning, 1935

Bairdoppilata halabijaensis sp. nov.
 (Pl.1, Figs. f1,f2)

Derivation of name: After Halabija in Sulimaniah Governearate.

Diagnosis: A species of *Bairdoppilata* with the following characterize: More elongate- sub trapezoid carapace tumid in lateral view, slightly pointed posterior end and triparted dorsal margin.

Dimensions (mm)	L.	H.	W.	L/H
Carapace external left valve(Mo. Cr. Tn.11)	0.89	0.44		2.20
Carapace dorsal view(Mo. Cr. Tn.12)			0.36	

Holotype: Carapace, Mo. Cr. Tn.11.

Paratype: Carapace, Mo. Cr. Tn.12.

Type locality and Horizon: Tanjero Formation (Late Campanian- Maastrichtian)
Diana area, NE. Iraq, Sample No. Da. 27.

Materials: (4) carapaces.

Description: Carapace elongate sub trapezoid in the lateral view, highest in front of middle, greatest length near ventral margin, widest medially in dorsal view, anterior margin narrow rounded in the middle part with a concave in the upper, posterior end slightly narrow and pointed, dorsal margin triparted, ventral margin slightly straight with a distinct concave centrally, lateral surface smooth, overlapping it along all margins.

Remarks: The present species resembles *Bairdoppilata* sp. Shirazi *et al.*, 2011, from the Maastrichtian in Iran, the latter differs in it's broadly arched dorsal margin and more rounded anterior end. The present species also shows some similarities to *Bairdoppilata andersoni aqualis* Dingle, 1981 from Campanian- Early Maastrichtian of Tunisia, but differs in having distinctive concave in the upper part of anterior and less strongly arched dorsal margin, has less ventral overlap and more dorsal overlap.

Family Bythocyprididae Maddocks, 1969

Genus *Bythocypris* Bradly, 1880

Type species: *Bythocypris windhami* Butler and Jones, 1957

Bythocypris sirwanensis sp. nov.

(Pl.1, Figs. g1,g2)

Derivation of name: After Sirwan area, a country near Diana village NE Iraq.

Diagnosis: Carapace distinguish by its reniform in lateral view, large size obliquely rounded anterior and posterior ends, strongly arched dorsal and concave ventral.

Dimensions (mm)	L.	H.	W.	L/H
Carapace external, right valve (Mo.Cr.Tn.13)	0.79	0.39		2.3
Carapace dorsal view (Mo. Cr. Tn.14)			0.28	

Holotype: Carapace, Mo. Cr. Tg.13.

Paratype: Carapace, Mo. Cr. Tn.14.

Type locality and Horizon : Tanjero Formation (Late Campanian - Maastrichtian)
Diana area, NE Iraq, Sample No. Da.25.

Materials: (9) carapaces

Description: Carapace reniform elongate in the lateral view, large size, anterior and posterior ends obliquely rounded, maximum length at the middle, greatest height in the middle, ventral margin concave, dorsal margin strong arched , maximum width at the middle , well developed pronounced overlap ventrally, surface smooth or a few punctuate.

Remarks: This species shows resemblance to *Bythocypris adunca* Esker, 1968, but the latter differs by having a distinct overlapping a round entire margin and less convex dorsal margin .

Subfamily Pontocypridinae Muller, 1894

Genus *Pontocyprilla* Lyubimeva, 1955

Type species: *Pontocyprilla recurva* Esker, 1968

Pontocyprilla recurva Esker, 1968

(Pl.1, Fig. h)

1986 *Pontocyprilla recurva* Esker, P.323 , Pl.1 , Figs. 6 - 7

Materials: (14) carapaces

Figured specimen: Carapace Mo. Cr. Tn.15, Tanjero Formation (Late Campanian - Maastrichtian), NE Iraq , Sample No. Da. 10 .

Remarks: The present specimen is closely similar in appearance to *Pontocyprilla recurva* Esker, 1968 in Tunisia.

Occurrence: Maastrichtian - Danian in Tunisia (Esker, 1968; Said, 1978), Maastrichtian of India (Jain, 1975), Libyan (El-Wear, 1992), Iraq (Al-Ubidee, 1989), Maastrichtian- Paleocen in Tunisia (Said-Benzart, 1998), Algeria (Damotte and Fleury, 1987), Maastrichtian- Early Eocene of Egypt (Boukary. *et al.*, 1982; Bassionouni and Luger, 1990; Morsi, 1999; Bassiouni and Morsi, 2000; Ismail and Ied, 2004; Morsi, *et al.*, 2008), Campanian of Tunisia (Donze *et al.*, 1982), Late Campanian- Maastrichtian in Iraq (Al-Shareefi, *et al.*, 2004) .

Superfamily Cytheracea Baird, 1950

Family Cytheridae Baird, 1850

Subfamily Cytherinae Baird, 1850

Genus *Apterloschizocythere* Bate, 1972

Types pecies: *Apterloschizocythere geniculata* Bate, 1972

Apateloschizocythere fimbrata Bassiouni and Luger, 1990

(Pl.1, Fig. i)

1990 *Apateloschizocythere fimbrata* Bassiouni and Luger P. 816, Pl. 12,

Figs. 16-21.

2004 *Amphicytherura?* sp. (Bassiouni and Luger)-Ismail and Ied, P. 105, Pl. 2,
Fig. 1 - 2.

2008 *Apateloschizocythere fimbrata* (Bassiouni and Luger)-Morsi, *et al.*, P. 167,
Pl. II, Fig.5.

Materials: (9) carapaces

Figured specimen: Carapace Mo. Cr. Tn.16, Tanjero Formation (Late Campanian
- Maastrichtian), NE Iraq, Sample No. Da. 12.

Remarks: The species was closely similar to *Apateloschizocythere fimbrata*
Bassiouni and Luger, 1990 from the Maastrichtian of Egypt (Morsi, *et al.*,
2008), but the latter differs which slightly coarsely reticulate.

Occurrence: Maastrichtian of Egypt (Bassiouni and Luger, 1990 , Ismail and Ied,
2004 and Morsi, *et al.*, 2008).

Family Trachyleberididae Sylvester -Bradly, 1948
Subfamily Trachyleberidinae Sylvester - Bradly, 1948
Genus *Acanthocythereis* Howe ,1963
Type species: *Acanthocythereis araneosa* Howe ,1963

Acanthocythereis denticulate Esker, 1968

(Pl.1, Fig. j)

1968 *Acanthocythereis denticulate* Esker, P. 328, Pl. 2, Figs. 6-7; Pl. 4, Fig. 1.

2008 *Acanthocythereis ? denticulate* (Esker) - Morsi, *et al.*, P. 168, Pl. II,
Fig.18 - 19.

Materials: (5) carapaces.

Figured specimen: Carapace Mo. Cr. Tn.17, Tanjero Formation (Late Campanian
- Maastrichtian), NE Iraq , Sample no. 14 .

Occurrence: It was previously recorded from the Maastrichtian of Tunisia
(Esker, 1968; Donze, *et al.*, 1982) ,the Maastrichtian of Egypt (Ismail and Ied,
2004; Shahin, 2005) and from Maastrichtian - Eocene of Egypt (Honigstein
and Rosenfeld, 1995; Morsi, *et al.*, 2008).

Genus *Limburgina* Deroo, 1966

Type species : *Cytherina citata* Reuss, 1846

Limburgina kaniensis sp. nov.

(Pl.1, Figs. k1-k3)

Derivation of name: After Kani Karweshkan village which is near the study area,
country governorate, northern Iraq.

Diagnosis: A species of ostracoda genus *Limburgina* with a sub-quadrate carapace in lateral view and subtriangular with slightly pointed end posteriorly, with well-developed ventral and dorsal ridges.

Dimensions (mm)	L.	H.	W.	L/H
Carapace external, left valve(Mo. Cr. Tn.18)	0.72	0.400		1.8
Carapace dorsal view(Mo. Cr. Tn.19)			0.39	
Carapace external, right valve (Mo. Cr.Tn.20)	0.74			1.8

Holotype: Carapace, Mo. Cr. Tn.18.

Paratype: Two carapaces, Mo. Cr. Tn.19,20 .

Type locality and Horizon: Tanjero Formation (Late Campanian- Maastrichtian) Diana area, NE. Iraq, Sample no.Tn.16.

Materials: (8) carapaces.

Description: Carapace sub-quadrate in the lateral view, anterior end broadly rounded with two rows of nods ,eye tubercle prominent, greatest length at the middle, maximum height below eye tubercle, posterior end subtriangular with slightly pointed end, ventral and dorsal ridges well developed, maximum width lies on the sub-central tubercle surface a strongly reticulate, sub central tubercle prominent which extends medial rib towards the posterior , ventral margin containing a row of (5) nods upwards as a result of the confluence of contract (muri) which is parallel to the ventral margin.

Remarks: The present species shows some similarity with the *Limburgina? aldjahizi* sp. Al-Bashir, 1986, which recorded from Upper Cretaceous in west Iraq, but it differs in having more developed oblique rib in ventral margin and distinct ornamentation. Also similar to the *Limburgina verricula* Butler and Jones, 1957 in (Hazel and Brouwers, 1983) from Campanian in the Atlantic and Gulf Coastl Province, but it differs in having more antero marginal rim and also different in shape of The postero-dorsal process.

CONCLUSION

The general and important results derived from this investigation are follows: Eleven Ostracod species are belonging to eight genera which six species of them are new and have been recorded, systematically identified and described for first time at Diana section, northeast Iraq.

Cytherella lagenalis, *Cytherella cf. fragilis*, *Cytherella suranensis* sp. nov., *Cytherella omari* sp. nov., *Bairdia dianaensis* sp. nov., *Bairdoppilata halabijaensis* sp. nov., *Bythocypris sirwanensis* sp. nov., *Pontocyprella recurva*, *Apterloschizocythere fimbriata*, *Acanthocythereis denticulate*, *Limburgina kaniensis* sp. nov.

Which show that the faunas extracted from the study section are largely dominated by the type of species wandering along the southern realm of the Tethys and can be generally assigned to the deeper marine environment (outer shelf - upper bathyal).

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EXPLANATION OF PLATE – 1

We used (OPTIKA, B-35 POL) microscope with magnification (40X) and also we used the computer for treatment this Photos by using Adobe, photoshop (CS5 ME. INK. 2007) program.

Fig. a: *Cytherella lagenalis* Marliere 1958

External carapace, left valve (Mo. Cr, Tn.1).

Figs. b1-b2: *Cytherella cf. fragilis* Neale, 1962

b1 : External carapace, left valve (Mo. Cr, Tn.2).

b2 : External carapace, dorsal view(Mo. Cr, Tn.3).

Figs. c1-c2: *Cytherella suranensis* sp. nov

c1 : Holotype, external carapace, dorsal view(Mo. Cr, Tn.4).

c2 : Paratype, external carapace, left valve (Mo. Cr, Tn.5).

Figs. d1-d3: *Cytherella omari* sp. nov

d1 : Holotype, external carapace, left valve (Mo. Cr, Tn.6).

d2: Paratype, external carapace, dorsal view (Mo. Cr, Tn.7).

d3 : Paratype, external carapace, right valve (Mo. Cr, Tn.8).

Figs. e1-e2: *Bairdia dianaensis* sp. nov

e1 : Holotype, external carapace, right valve(Mo. Cr, Tn.9).

e2 : Paratype, external carapace, dorsal view(Mo. Cr, Tn.10).

Figs. f1-f2: *Bairdoppilata halabijaensis* sp. nov.

f1: Holotype, external carapace, right valve (Mo. Cr, Tn.11).

f2 : Paratype, external carapace, dorsal view (Mo. Cr, Tn.12).

Figs. g1-g2 : *Bythocypris sirwanensis* sp. nov

g1 : Holotype, external carapace, right valve(Mo. Cr, Tn.13).

g2 : Paratype, external carapace, dorsal view(Mo. Cr, Tn. 14).

Fig. h: *Pontocyprilla recurva* Esker, 1968

External carapace, right valve (Mo. Cr, Tn.15).

Fig. i: *Apterloschizocythere fimbrata* Bassiouni and Luger, 1990

External carapace, left valve (Mo. Cr, Tn.16).

Fig. j : *Acanthocythereis denticulate* (Esker, 1968).

External carapace, Left valve (Mo. Cr, Tn.17).

Figs. k1-k3 : *Limburgina kaniensis* sp. nov

k1: Holotype, external carapace, Left valve (Mo. Cr, Tn.18).

k2 : Paratype, external carapace, dorsal view(Mo. Cr, Tn.19).

k3 : Paratype, external carapace, right valve (Mo. Cr, Tn.20).

Plate 1



bar = 150µm