On Some Species Of The Ostracode Genera Cytherella, Bairdia and Bairdopilata From Avanah Formation, Dohuk Area, Northern Iraq.

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Abstract

Thirteen Ostracode species belong to the genera Cytherella, Bairdia and Bairdopilata were identified from Avanah Formation (M. Eocene), Dohuk area, Northern Iraq. These species previously recorded from India, Pakistan and Middle East. The stratigraphic distribution and the environmental significance of the described species were outlined.

Introduction

The present paper is part of work investigating Ostracoda from Avanah Formation, Dohuk area Geli-Bessri, northern Iraq. (1). All the figured specimens were deposited at Geology Dept. Mosul University under prefix.

Mo: Mosul University.
T: Tertiary Collection.
Av: Avanah Formation.
All dimensions in (mm.)

Avanah Formation

The formation was first described in Iraq by (2) from Kirkuk well 116 located on Avanah dome of Kirkuk oil field N. Iraq. At Dohuk area, the Formation is represented with good exposure of which the studied section is located at Geli-Bessri about 6 Km east of Dohuk city along the Dohuk-Zawita road at latitude (36° 46 5 N) and longitude (43° 15 10 E) (Fig.1). The thickness of the Formation at Geli- Bessri 30 ms (Fig.2). At the studied section the Formation consists of hard well bedded recrystallized limestone alternating with shale, marly shale and marly limestone beds. Pila sp Formation overlain conformably the Avanah Formation which consists of dolomitic recrystallized and chalky limestone with chert nodules, while Gercus Formation underlain unconformably the Avanah Formation with mainly clastic components. (3) (1). (4), recorded different species belong to the following genera Alveolina, Orbitolites, Somalina, Spiroculina.

(3) recorded the following larger Foraminifera from the studied section. Alveolina ellipticavar.nutalli, A.fusiformis, A.unnicri, A.cf.oblonga, Coskinalina liburnica, Rhapy donina urenxis, R.cf. huberi, Somalina danieli, Opertobolites cf. domvillei, Orbitolites complanata et al., in the present study thirty surface samples were investigated from the Avanah Formation at Geli Bessri section. The samples yielded well preserved Ostracode species.

Systematic Description

The classification of Ostracodes is followed that of (5). (6).

Class Ostracoda Latereille, 1806
Order podocopida G.W. Muller,1894 Family Cytherillidae Sars, 1866 Genus Cytherella Jones, 1849

Type-species Cytherella ovata Roemer, 1840
Cytherella tawica Tewari and Singh 1966
Pl. 1, Fig.1
1966 Cytherella tawica (7), p. 127, pl.2, figs 3 a-d
Material: Eleven specimens.
Horizon: Avanah Formation, sample No. Do.27.
Dohuk area.
Dimensions: L. H. W. L/H.
Carapace Mo.T.Av.1 0.55 0.31 0.22 1.77
Remarks: This species was originally described from the lower Eocene of Kutch area (8) The Iraqi specimens were identical with Cytherella tawica (7), with slight differences in the anterior end.
Family : Bairdiid Sars, 1888.
Genus : Bairdia Mc'coy, 1844
Type-species: Bairdia curtus Mc'coy, 1844
Bairdia kutchensis Tewari and Tandon 1960
Pl.1 Fig.2
1960 Bairdia indica (8), PP.148-149.
Text.fig.1, figs.1a-b
1972 Bairdia kutchensis (8) in (9)
P.483,pl.1.Fig.10
Material: Twenty specimens
Horizon: Avanah Formation, Dohuk area, sample No. Do.34
Dimension: L. H. W. L/H.
Carapace Mo.T.Av.2 0.92 0.59 0.49 1.55
Pl.1, Fig.2
Remarks: This species was originally described as Bairdia indica by (8) from the M. Eocene of Kutch area India. (10) marked that the name B. indica is preoccupied by Nesidea (Bairdia indica) (11) from the Tertiary deposits of Brono. (9) renamed the species Bairdia kutchensis instead of B. indica. The Iraqi specimens entirely identical in all characters with the Indian species Bairdia subdeitoidea (Munster) (12)
Pl.1, Fig.3
1934 Bairdia subdeitoidea (Munster) in (13).
P.344, Fig.1
Material: Thirty one specimens
Horizon: Avanah Formation , Dohuk area, sample No. Do.37
Dimensions: L. H. W. L/H.
Carapace Mo.T.Av. 3 1.24 0.81 0.62 0.53
Pl.1 Fig.3
<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1</td>
<td>Greenish gray shale and marls with evaporites and coarse sandstone</td>
</tr>
<tr>
<td>Layer 2</td>
<td>Pale brown shale</td>
</tr>
<tr>
<td>Layer 3</td>
<td>Yellowish gray to pale brown shale and marly shale</td>
</tr>
<tr>
<td>Layer 4</td>
<td>White gray massive recrystallized limestone</td>
</tr>
<tr>
<td>Layer 5</td>
<td>White to pale yellow hard massive bedded recrystallized fossiliferous limestone</td>
</tr>
<tr>
<td>Layer 6</td>
<td>Brownish gray shale, sandy shale marl, and marly shale</td>
</tr>
<tr>
<td>Layer 7</td>
<td>Yellowish brown to reddish bedded recrystallized fossiliferous limestone</td>
</tr>
<tr>
<td>Layer 8</td>
<td>Yellowish white gray massiive bedded fossiliferous limestone</td>
</tr>
<tr>
<td>Layer 9</td>
<td>Yellowish white thin bed of shaly limestone</td>
</tr>
<tr>
<td>Layer 10</td>
<td>Light bluish gray thin bedded shaly limestone</td>
</tr>
<tr>
<td>Layer 11</td>
<td>Pale gray shale</td>
</tr>
<tr>
<td>Layer 12</td>
<td>Yellowish white recrystallized limestone</td>
</tr>
<tr>
<td>Layer 13</td>
<td>Brownish gray thin bedded shale</td>
</tr>
<tr>
<td>Layer 14</td>
<td>Yellowish white gray bedded fossiliferous limestone</td>
</tr>
<tr>
<td>Layer 15</td>
<td>Greenish white shale</td>
</tr>
<tr>
<td>Layer 16</td>
<td>Yellowish gray bedded fossiliferous limestone</td>
</tr>
<tr>
<td>Layer 17</td>
<td>Dendritic limestone</td>
</tr>
<tr>
<td>Layer 18</td>
<td>Middle Eocene Avanah Formation</td>
</tr>
<tr>
<td>Layer 19</td>
<td>Middle Eocene</td>
</tr>
<tr>
<td>Layer 20</td>
<td>Medium</td>
</tr>
<tr>
<td>Layer 21</td>
<td>Thin</td>
</tr>
</tbody>
</table>

Fig. 2 Lithological Section
Remarks: *Bairdia subdeitoidea* was originally described from the M.Eocene beds of NW India (12). The Iraqi specimen's slightly differs from the Indian species in having narrower posterior end.

*Bairdia poddari* Lyubimova, Guha and Mohan . 1960

Pl.1, fig 4

1960 Bairdioppilata poddari (14)

P.21-23, pl.1,fig.1a-b

1972 Bairdioppilata poddari: (14) in (9)

P.488P1,fig.12

Material: Twenty specimens

Sample: No.Do.35

Horizon: Dohuk area (M.Eocene).

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.4 0.89 0.61 0.48 1.45

Remarks: Originally the species was described under the genus *Bairdioppilata* by (14) from the M.Eocene of India. (9) reassigned the species to the genus *Bairdia* on the basis of internal features. The Iraqi specimens fairly identical with Khosla specimens.

*Bairdia beragnaeensis* Tewari and Singh, 1960

Pl.1, Fig.5

1966 Bairdia beraguensis (7). p. 119-120, PL I, figs 4a-d

1970 Bairdioppilata sy. (15). p.60,Pl.1 figs;5-6

1972 Bairdia beraguensis (7) in (9)

p.483,Pl.1,Fig.8

Material: Twenty eight specimens

Horizon: Dohuk area, Avanah Formation (M.Eocene).

Sample: No.Do.34

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.5 1.29 0.80 0.65 1.61

Remarks: Originally described from the M. Eocene beds of India (7). The Iraqi specimens differs from the Indian species in having broadly convex dorsal margin.

*Bairdia dohukensis* Khalaf and Aziz, 1994

Pl.1, Fig.6-8 1994

*Bairdia dohukensis* (16), P.235 - 245

Pl.1, Fig. 1-3

Material: Twenty seven specimens

Horizon: Dohuk area (M.Eocene).

Sample: No.Do.37

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.6 0.99 0.64 0.54 1.54

Pl.1, Fig.6

Carapace Mo.T.Av.7 1.02 0.67 0.56 1.52

Pl.1, Fig.7

Carapace Mo.T.Av.8 1.01 0.66 0.56 1.53

Pl.1, Fig.5

Remarks: Previously Formation (M.Eocene) N.Iraq (16)

*Bairdia eocaenica* Khalaf and Aziz 1994

Pl.1, Figs.9.10

1994 Bairdia eocaenica (16), P.235-245,

Pl.1,Figs.4.5

Material: Twenty specimens

Horizon: Avanah Formation, (M.Eocene)

Sample: No.Do.34,

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.9 0.70 0.51 0.53 1.37

Pl.1, Fig.9

Carapace Mo.T.Av.1 0.74 0.53 0.56 1.39

Pl.1, Fig.10.

Remarks: *Bairdia eocaenica* has so far been recorded from the Avanah Formation (M.Eocene) N.Iraq (16), and from Khurmala Formation (M.Eocene) Shaqlawa area (17).

*Bairdia bhateai* Khalaf and Aziz ,1994

P.1.2, Figs. 1-2

1994 Bairdia bhateai (16) P.235-245

Pl.1,Figs.6-7

Material: Twenty one specimens.

Horizon: Avanah Formation (M.Eocene).

Sample: No.Do.37

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.11 1.29 0.77 0.61 1.67

P.1.2, Fig.1

Carapace Mo.T.Av.12 1.29 0.77 0.63 1.63

P.1.2,Fig.2

Remarks :Originally described from the M. Eocene Avanah Formation Dohuk area N. Iraq (16) also recorded from Khurmala Formation M.Eocene Shaqlawa area (17)

*Bairdia angulata* Khalaf and Aziz, 1994

P.1.2, Figs. 3, 4.

1994 Bairdia angulata (16)

P.235-245, Pl.1,Fig.8,9.

Material, Twenty specimens.

Horizon: Avanah Formation , M.Eocene.

Sample: No.Do37

Dimensions: \( L \), \( H \), \( W \), \( L/H \)

Carapace Mo.T.Av.13 1.24 .71 .60 1.74

P.1.2,Fig.3

Carapace Mo.T.Av.14 1.24 .71 .60 1.74

P.1.2,Fig.4

Remarks : *Bairdia angulata* previously described From Avanah Formation (M.Eocene) N.Iraq (16)

*Bairdia* SP.A

P.1.2, Fig.5

Material: Two carapace.

Horizon: Avanah Formation (M.Eocene).

Sample: No.Do34.

Dimensions: \( L \), \( R \), \( W \), \( L/H \)

Carapace Mo.T.Av.15 1.36 0.82 0.59 1.63

P.1.2,Fig.5

Description: Thick carapace, subtriangular is lateral view with greatest height at the anterior part, maximum length just below the centre of the body. Anterior margin narrowly rounded, posterior margin is slightly pointed. Dorsal margin strongly convex, ventral margin broadly convex.

Remarks: The present species shows some similarities to the *Bairdia* Sp.2 (18) recorded from Maastrichtian-Danian deposits of Tunisia but the Iraqi species differs in having different dorsal and ventral margins. Due to the lack of material the present species, left under open nomenclature.

Genus: *Bairdioppilata* Coryell, Sample & Jenings, 1935.
Type species: Bairdioppilata martym coryell, Sample & Jenning,1935.  
Bairdioppilata gliberti Keij, 1957  
P1.2, Fig. 6,7  
1957 Bairdioppilata gliberti (19), P.53, P1.1, Fig. 18-21.  
Material: sixteen specimens.  
Horizon: Avanah Fm (M.Eocene).  
Sample: No.Do36.  

Dimensions  
<table>
<thead>
<tr>
<th>Carapace Mo.T.Av. 16</th>
<th>Carapace Mo.T.Av. 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. 1.24</td>
<td>L. 1.24</td>
</tr>
<tr>
<td>H. .84</td>
<td>H. .84</td>
</tr>
<tr>
<td>W. .63</td>
<td>W. .63</td>
</tr>
<tr>
<td>L/H 1.47</td>
<td>L/H 1.47</td>
</tr>
</tbody>
</table>

Remarks: The Iraqi specimens entirely agreed with Bairdioppilata gliberti (19), recorded from M.Eocene of France. B.gliberti also reorded from Eocene sequence of western India (9).  

Bairdioppilata rajnathi Tewari and Tandon 1960  
P1.2, Figs 8,9  
1960 Bairdoppilata rajnathi, (8) P.ISOJoe Figs.5 a-b.  
Material: Ten specimens.  

Dimensions  
<table>
<thead>
<tr>
<th>Carapace Mo.T.Av. 18</th>
<th>Carapace Mo.T.Av. 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. .94</td>
<td>L. .89</td>
</tr>
<tr>
<td>H. .57</td>
<td>H. .56</td>
</tr>
<tr>
<td>W. .61</td>
<td>W. .59</td>
</tr>
<tr>
<td>L/H 1.64</td>
<td>L/H 1.58</td>
</tr>
</tbody>
</table>

Remarks: B.rajnathi previously recorded from L.Miocene of W.India (8), (9), recorded the species from M-Eocene of NW.Iraqi, (20), (1) recorded the species from M-U Eocene from north Iraq.  

Bairdioppilata rakhdiensis Khosla and Pant, 1988  
P1.2,Fig 10  
1988 Bairdioppilata rakhdiensis (21), P.337-338-Fig.2.2H.  
Material: Eight specimens.  
Horizon: Avanah Formation (M.Eocene).  
Sample: No Do. 34.  

Dimensions:  
<table>
<thead>
<tr>
<th>Carapace Mo. T.Av.20</th>
<th>Carapace Mo. T.Av.21</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. 1.17</td>
<td>L. 1.17</td>
</tr>
<tr>
<td>H. 0.82</td>
<td>H. 0.82</td>
</tr>
<tr>
<td>W. 0.59</td>
<td>W. 0.59</td>
</tr>
<tr>
<td>L/H 1.41</td>
<td>L/H 1.41</td>
</tr>
</tbody>
</table>

Remarks: Originally recorded from Indian Eocene, (20) and recorded from Avanah Formation,Dohuk area, north Iraq (1).  

**General Conclusions**  
1. On the basis of the stratigraphic occurence of Ostracode species in the present study, compared with the stratigraphic value of larger Foraminifera recorded by (3), Middle Eocene age confirmed to the Avanah Formation Dohnk area, N.Iraq (Table 1).  
2. The majority of Cytherella species lives in normal saline, shallow water enviroment in addition to that the genera Bairdia and Bairdioppilata reorded from shallow warm water under normal salinity (5), (22)  
The above genera were recorded from the Avanah Formation, Dohuk ara associated withe the Ostracode genera Xestoleberis Echinocythereis Occultocythereis, Herman ites, phalcocythere, and Quadracythere,all were known from shallow enviroment under normal salinity. Therefore from the above informations we can conclude that the Avanah Formation was deposited under shallow water environment, warm temperature and normal salinity with well oxygeneted conditions.  
3. In genral ostracode genera and species recorded from the Avanah Formation shows strong affmtes with those described from the Eocene of India, Pakistan North Africa and Middle east explained that the migration route from Africa towards Middle east.

**Table. 1 Stratigraphical Occurrence of Ostracode species in Iraq and other regions.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Khurmala</th>
<th>Avanah</th>
<th>Damman</th>
<th>Serikagni</th>
<th>Other.regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctherella tawacia</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(L. Eocene)</td>
</tr>
<tr>
<td>Bairdia poddri</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>India(M. Eocene)</td>
</tr>
<tr>
<td>Bairdia berguaensis</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>India(L-M. Eocene)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pakistan(L. Eocene)</td>
</tr>
<tr>
<td>Bairdia kutchensis</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>India(L-M.Eocene)</td>
</tr>
<tr>
<td>Bairdia subdealtoidea</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(M.)Eocene</td>
</tr>
<tr>
<td>Bairdia dohukensis</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(M.)Eocene</td>
</tr>
<tr>
<td>Bairdia eocaenica</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(M.)Eocene</td>
</tr>
<tr>
<td>Bairdia bhatai</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(M.)Eocene</td>
</tr>
<tr>
<td>Bairdia angulate</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>India(M.)Eocene</td>
</tr>
<tr>
<td>Bairdoppilata gliberti</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>France (M.Eocene)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Turkey, Hungery (M. Eocene)</td>
</tr>
<tr>
<td>Bairdoppilata rajanithi</td>
<td>X</td>
<td></td>
<td></td>
<td>-</td>
<td>Lower Miocene(India)</td>
</tr>
<tr>
<td>Bairdoppilata rakhdiensis</td>
<td>X</td>
<td></td>
<td></td>
<td>-</td>
<td>India(M. Eocene)</td>
</tr>
</tbody>
</table>
Explanation of plate 1

Fig. 1 Cytherella tawaica Sing and Tewari 1966 x14
(Mo.T.As.1)...
Carapace L.V. lateral view

Fig. 2 Bairdia kutchensis Tewari and Tandon 1960
X.68 Mo.T.Av.2
Carapace R.V. lateral view.

Fig. 3 Bairdia subdeltoidea (Munster) Latham 1938 x.50
Ms.T.Av.3
Carapace L.W. lateral view.

Fig. 4 Bairdia poddari Lyubimova et al 1960 x.74
Mo.T.Av.4
Carapace R.V. lateral view.

Fig. 5-8 Bairdia dohukensis Khalaf and Aziz 1994
X.64 Mo.T.Av.6 Carapace R.V. lateral view.
X.63 Mo.T.Av.7 Carapace L.V. lateral view.
X.62 Mo.T.Av.8 Carapace dorsal view.

Fig. 5, 9, 10 Bairdia eocaenica Khalaf and Aziz 1994
X.85 Mo.T.Av.9 Carapace R.V. lateral view.
X.86 Ms.T.Av.10 Carapace L.V. lateral view.

PLATE -1-
Expiation of plate 2

Figs. 5, 1, 2 Bairdia bhataei Khalaf and Aziz 1994
X.49 M.T.Av.1 Carapace R.v. lateral view
X.48 Mo.T.Av.12 Carapace L.v lateral view
Figs. 3, 4 Bairdia angulata Khalaf Aziz 1994
X.49 Mo.T.Av.13 Carapace R.V.lateral view
X.50 Mo.T.Av.14 Carapace L.V.lateral view
fig5. Bairdia sp.A
X.50 Mo.T.Av.15 Carapace Rv.lateral view

Figs. 6, 7 Bairdoppilata gliberti Keij, 1957
X.50 Mo.T.Av.16 Carapace R.v.lateral view
X.50 Mo.T.
Figs. 8, 9 Bairdoppilata rajanathi Teweri and Tandon, 1960.
X.64 Mo.T.Av.18 Carapace Rv lateral view
X.72 Mo.T.Av.19 Carapace Rv lateral view
Fig. 10 Bairdoppilata rakhiensis Knosla and pant 1988.
X.53 Mo.T.Av. Carapace Rv lateral view

PLATE -2-
Reference


11- Doeglas, 1931 in Bold 1964 (10).


Cytherella, Bairdia and Bairdioppilata

بعض انواع متحجرات الاوستراكودا للأجناس سايثيرلا، بيرديا، بيرديوباليتا

من تكوين آفانا منطقة دهوك - شمال العراق

صالح خضر خلف ونسرين مال الله عزيز

قسم علوم الأرض، جامعة الموصل , الموصل ، العراق


من تكوني آفانا منطقة دهوك - شمال العراق

( باulously Bierdia, Cytherella and Bairdioppilata

( بايلاست للانواع الموصوفة.)

المشخص:

تم تشخيص ثلاثة عشر نوعاً من الاوستراكودا تعود إلى اجناس سايثيرلا، بيرديا، بيرديوباليتا من تكوين Cytherella, Bairdia and Bairdioppilata آفانا (الإيوسين الأوسط) -منطقة دهوك- شمال العراق، هذه الأنواع سجلت سابقاً من الهند، باكستان ومناطق أخرى من الشرق الأوسط، تم تحديد الانتشار الطبيقي والأهمية البيئية للأنواع الموصوفة.