

## CENOMANIAN-TURONIAN OSTRACODS FROM WEST - CENTRAL SINAI, EGYPT

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### ABSTRACT

*Cenomanian - Turonian ostracods have been collected from four stratigraphic sections (Gebel Nezzazat, Gebel Mukattab, Gebel Ekma and Gebel Qabeliat) southeast of Abu Rudeis West -Central Sinai. Eighteen ostracod species, belonging to seven families, are indentified, illustrated and their stratigraphic ranges discussed. Most of these genera and species were recorded from strata of the same ages in Tunisia, Algeria, Iran, Lebanon and Israel.*

*The depositional environments were interpreted from the assemblages characterizing the various stratigraphic subdivisions. The lower part of the Raha Formation (Abu Had Member) was deposited in a shallow marine environment while the ostracodal fauna of the middle part ( Mukattab Member) suggests a shallow marine environment but relatively deeper than the Abu Had Member. The upper part of the Raha Formation (Ekma Member) is devoid of ostracoda. The environmental implications of the Abu Qada and Wata Formations suggest an increase in water depth in northern part of the study area. Taxonomic notes of the identified species are discussed.*

*Key Wards : Ostracods - Cenomanian -Turonian -Sinai - Egypt.*

### INTRODUCTION

Form the beginning of geological exploration in Egypt up to the early eighties of this century the study of Cenomanian -

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Turonian exposures in west central Sinai stressed on stratigraphic subdivisions and nomenclature (Hume *et al.*, 1920; Moon and Sadek, 1925; Omara, 1956; Ghorab, 1961; Lewy and Raab, 1977 and Bartov and Steinitz, 1977).

The present work deals with the study of the lateral and vertical variations of the ostracodal assemblages of the Cenomanian - Turonian succession extending from north to south, more or less between the latitudes of Abu Rudeis and Gebel Abu Durba and from east west between the line of faults limiting the major basement exposures of Sinai and the shore of the Gulf of Suez (Fig. 1).

Most of the examined samples yield a higher proportion of ostracods with smooth carapaces than ornamented forms. The lower part of the Raha Formation (Abu Had Member) yield ostracods in all studied sections while the middle part (Mukattab Member) provides ostracods in Gebel Nezzazat and Gebel Mukattab only. The upper part of the Raha Formation (Ekma Member) did not yield ostracods (noteworthy that Ekma Member was missing at Gebel Qabeliat and Gebel Mukattab). The Abu Qada Formation yields ostracods at Gebel Nezzazat and Gebel Qabeliat while the Wata Formation provides ostracods in all studied sections

### LITHOSTRATIGRAPHY

The stratigraphical distribution of ostracodal species in the studied section are represented on range charts (figs. 2,3 ,4 &5). In the following paragraphs, each rock unit is discussed from older to younger with particular stress on their ostracodal faunal content.



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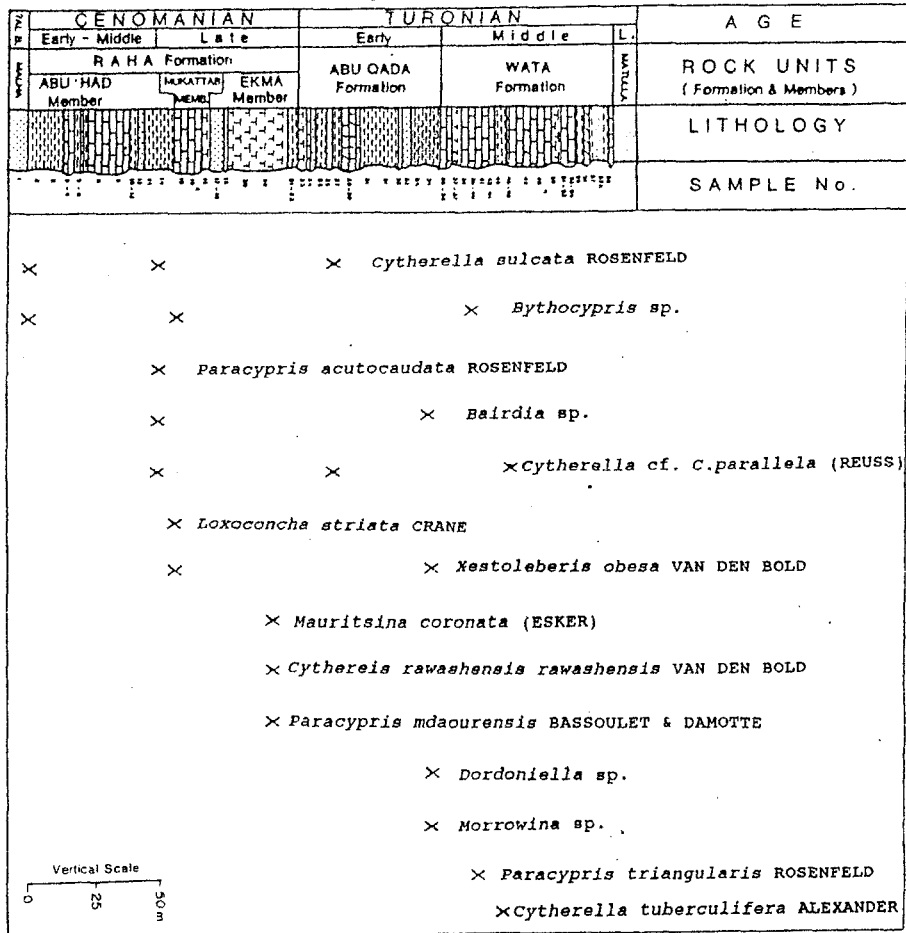


Fig.2: Stratigraphic distribution chart for Cenomanian - Turonian ostracod species identified in Gebel Nezzazat section.

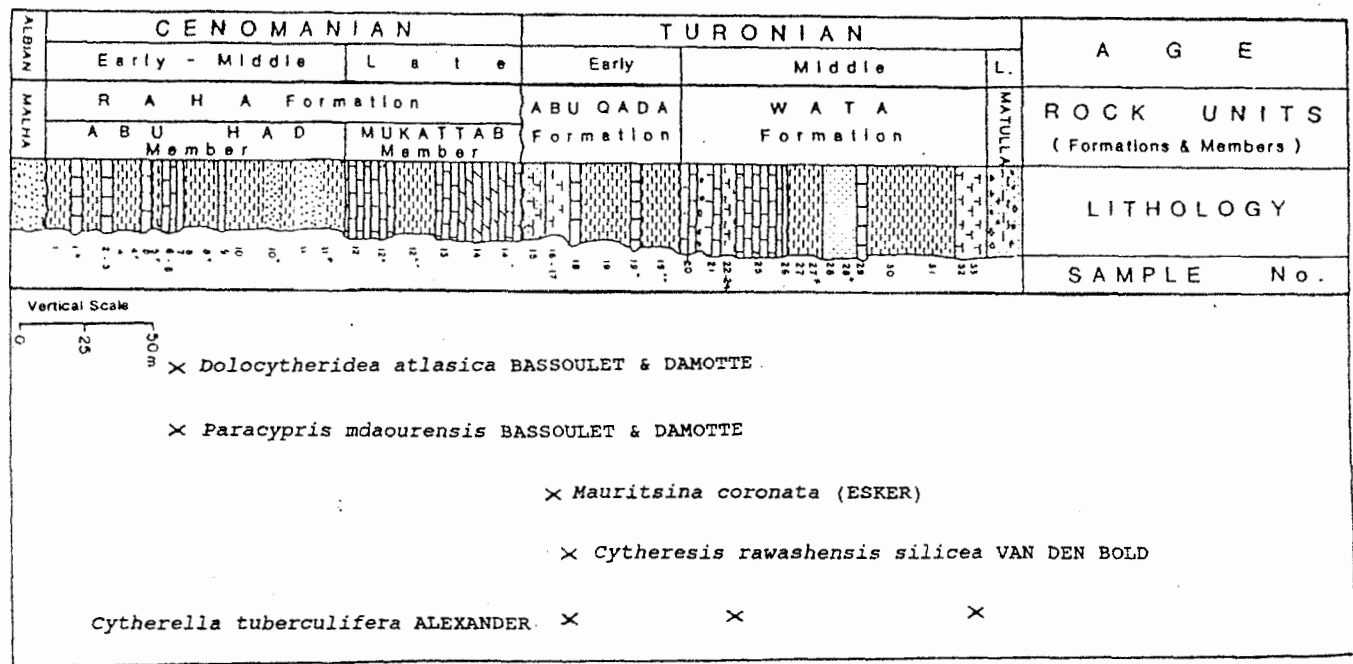


Fig.3: Stratigraphic distribution chart for Cenomanian - Turonian ostracod species identified in Gebel Qabeliat section.

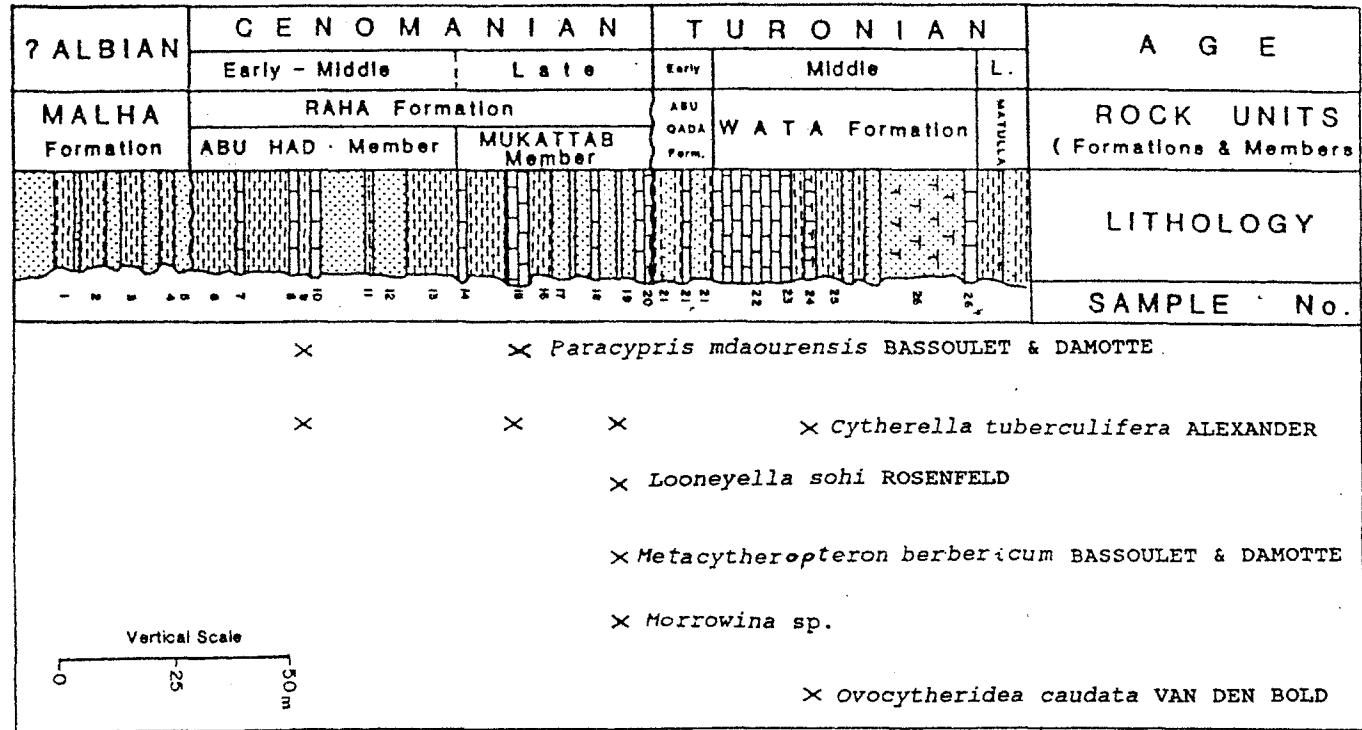


Fig.4: Stratigraphic distribution chart for Cenomanian - Turonian ostracod species identified in Gebel Mukattab section.

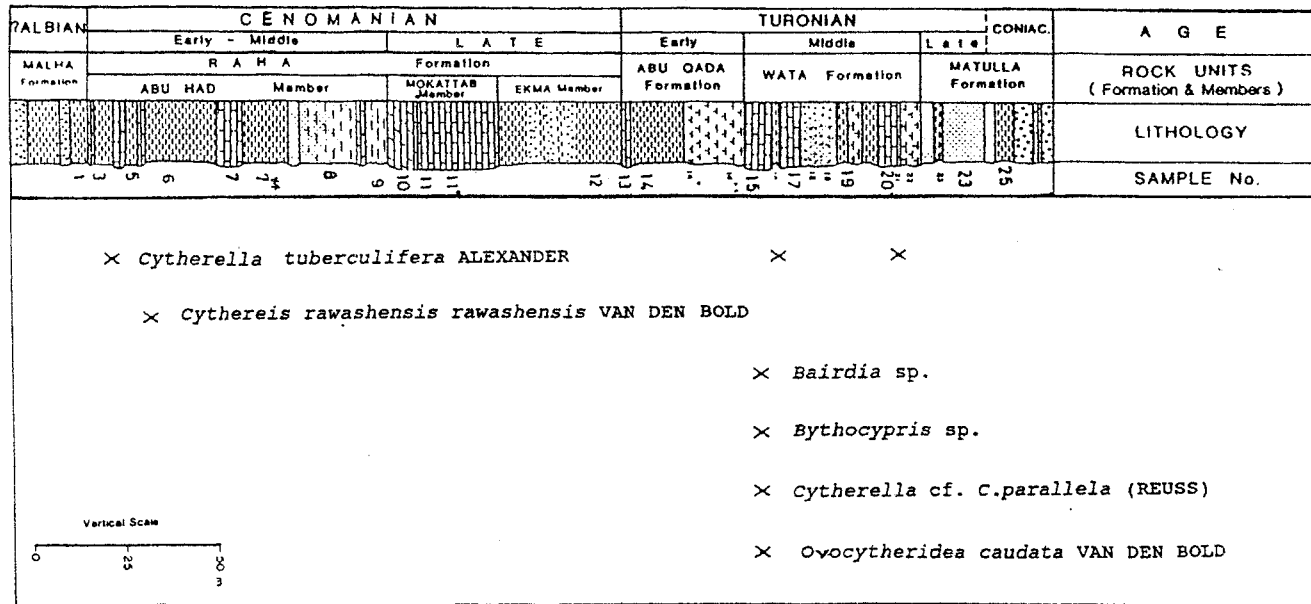


Fig.5: Stratigraphic distribution chart for Cenomanian - Turonian ostracod species identified in Gebel Ekma section.

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## **1. Raha Formation (Cenomanian)**

This rock unit was established by Ghorab (1961) and is subdivided into three members according to Chérif et al. (1989a) as follows :

### **1.1. Abu Had Member (early to middle Cenomanian)**

This subdivision of the Raha Formation was established by Ghorab (1961). In the studied area it is a sequence of fossiliferous calcareous sandstones, shales, marls and limestones yielding oyster banks. The thickness of the Abu Had Member ranges from 51 to 118 m. This member overlies the Nubia Sandstone and underlies the Mukattab Member. At Gebel Nezzazat, the Abu Had Member yields *Cytherella sulcata* and *Bythocypris* sp. At Gebel Mukattab, it yields *Paracypris mdaouerensis* and *Cytherella tuberculifera*. At Gebel Ekma, it provides *Cythereis rawashensis rawashensis* and *Cytherella tuberculifera*. At Gebel Qabelliat, it yields *Paracypris mdaouerensis* and *Dolocytheridea atlasica*.

The overall constitution of the above mentioned ostracod association suggests a Cenomanian age (Rosenfeld and Raab, 1974). the ostracod content of the Abu Had Member (*Cytherella*, *Paracypris* and *Mauritsina*) suggests a shallow marine environment.

### **1.2. Mukattab Member (late Cenomanian)**

This subdivision of the Raha Formation was established by Cherif et al. (1989a) to designate a cliff-forming hard predominantly calcareous sequence overlying the Abu Had Member. At Gebel Mukattab and Gebel Qabelliat, this member underlies unconformably



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the Abu Qada Formation. In the other two sections (Nezzazal and Ekma), this member underlies conformably the Ekma Member. The thickness of the Mukattab Member ranges from 21 to 50 m.

At Gebel Nazzazat, the Mukattab Member yeild : *Paracypris acutocaudata*, *Cytherella sulcata*, *C. cf. parallea*, *Bairdia* sp., *Xestoleberis obesa*, *Loxoconcha striata* and *Bythocypris* sp. At Gebel Mukattab it yields : *Cytherella tuberculifera*, *Paracypris mdaouerensis*, *Metacytheropteron berbericum*, *Looneyeiia sohi* and *Morrowina* sp. At Gebel Ekma and Gebel Qabeliat no ostracods could be separated. Here, it is interesting to notice that Cherif *et al.* (1989a) mentioned that the Mukattab Member yield some pelecypods, but no foraminifera were recognized, probably because of the recrystallized and often dolomitized limestone facies in Gebel Ekma and Gebel Qabeliat.

The ostracod content of the Mukattab Member suggests a shallow marine environment. The presence of few *Metacytheropteron* and *Xestoleberis* individuals together with the brackish genera (*Looneyella*) may point to a coastal marine environment with continental fresh water influence. Furthermore, the facies of the Mukattab Member reflects an environment relatively deeper than that of Abu Had Member.

#### **1.3. Ekma Member (late Cenomanian)**

Cherif *et al.* (1989a) established this rock unit to designate a sequence of sandstone with thin streaks of soft marls, shales and limestone intercalations. This member overlies the hard cliff-forming Mukattab Member and underlies the Abu Qada Formation. The Ekma

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Member attains 30m. thick at Gebel Nazzazat and 50m thick at Gebel Ekma. In Gebel Mukattab and Gebel Qabeliat, the Ekma Member is missing. The Ekma Member is devoid of ostracods. The frequent intercalations of brown to reddish brown cross-bedded sandstone suggest a regressive probably non marine, episode of the late Cenomanian sea over the study area.

## **2. Abu Qada Formation (Early Turonian)**

This rock unit was established by Ghorab (1961). In the studied localities, it is a sequence of shales and marls with occasional beds of sandstones and limestones. The thickness of the Abu Qada Formation ranges from 15 to 58m. This formation underlies the Wata Formation in all sections and unconformably overlies the Mukattab Member in Gebel Mukattab and Gebel Qabeliat, while in Gebel Nazzazat and Gebel Ekma the Abu Qada Formation conformably overlies the Ekma Member.

The ostracod content of the Abu Qada Formation at Gebel Nazzazat includes *Cytherella sulcata*, *C. cf parallela*, *Paracypris, madaouerensis*, *Cythereis rawashensis rawashensis* and *Mauritsina coronata*. At Gebel Qabeliat, it yield : *Cythereis rawashensis silicea*, *Mauritsina coronata* and *Cytherella tuberculifera*. It is worth mentioning that the two localities, Gebel Mukattab and Gebel Ekma, did not yield ostracods. The ostracod content of the two mentioned sections suggests a shallow marine environment. The numerous carapaces of genus *Paracypris* may reflect a normal open rather deeper marine environment.

### 3. Wata Formation (Middle Turonian)

This rock unit was established by Ghorab (1961). It is a sequence of hard limestone beds overlying the Abu Qada Formation and underlying a sequence of coarse siliciclastic (sandy to conglomeratic) beds belonging to the Matulla Group (Cherif *et al.*, 1989b). The thickness of the Wata Formation ranges from 58 to 87m. The ostracod content of the Wata Formation at Gebel Nazzazat includes *Bairdia* sp., *Morrowina* sp., *Dordoniella* sp., *Bythocypris* sp., *Cytherella tuberculifera*, *C.* cf. *parallela*, *Paracypris triangularis* and *Xestoleberis obesa*. At Gebel Mukattab, it yields *Cytherella* cf. *parallela*, *C. tuberculifera*, *Bairdia* sp., *Bythocypris* sp. and *Ovocytheridea caudata*. At Gebel Qabeliat, the ostracod content is very rare including only *Cytherella tuberculifera*. The ostracod content of the Wata Formation suggests a shallow marine to marine environment due to the presence of *Xestoleberis*, *Paracypris*, and *Bythocypris*. In general, the environmental implications of the Abu Qada and Wata Formations suggest an increase in the water depth in the northern part of the investigated area.

#### SYSTEMATIC DESCRIPTION

Eighteen ostracod species are identified, illustrated and discussed. The types of the studied material are deposited in the Geological Museum of the Department of Geology, Faculty of Science, Menoufia University, Shibin El Kom, Egypt.

Phylum	Arthropoda
Class	Crustacea
Order	Ostracoda

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Suborder Platycopa Sars, 1866

Family Cytherellidae Sars, 1866

Genus *Cytherella* Jones, 1949

*Cytherella cf. C. Parallela* (Reuss)

Pl. 1, fig. 1

1958 - *Cytherella cf. parallela* (Reuss), P. 1501, pl.1, figs. 1-9.

1974- *Cytherella cf. parallela* (Reuss)- Rosenfeld Raab, p. 3, pl, figs. 1 & 2.

Dimension : L=0.73 mm      H= 0.42mm

Stratigraphic distribution : This form was recorded from the Lower Cretaceous of France (Oertli, 1958). Rosenfeld and Raab (1974) recorded this form in the Cenomanian- Turonian deposits of Israel. In the studied material, it is found in samples 14,26 and 45 of Gebel Nazzazat section and in samples 15 of gebel Ekma section.

*Cytherella sulcata* Rosenfeld

pl. 1, fig. 2

1974- *Cytherella sulcata* Rosenfeld, p. 5, pl. 1, figs. 6-8, pl. 4, figs. 1 & 2.

Remark : Valves are unequal, where the right valve is overlapping the left one.

Dimensions : L=0.70mm      H=0.48mm.

Stratigraphic distribution : This species was first described by Rosenfeld and Raab (1974) in the Cenomanian deposits of Negev area. In the studied material, it is recorded from samples 3.15 and 31 of Gebel Nazzazat section.

**Genus *Morrowina* Loetterle, 1937**

*Morrowina* sp.

pl. 1, fig. 4

Remarks : Carapace is ovate in lateral view. The anterior and posterior margins are around . It has a finely pitted surface and a shallow median pit.

Dimensions : L=0.62mm      H=0.30mm

Stratigraphic distribution : it is recorded in the Upper Cretaceous deposits of U.S.A. (Crane,1965). In the studied material, it is found in sample 34 of Gebel Nazzazat section.

Suborder Podocopa Sars, 1866.

Family Bairdiidae Sars, 1888.

Genus *Bairdia* McCoy, 1844.

*Bairdia* sp.

pl. 1, fig. 3

Remarks : This form resembles the form that described by Rosenfeld and Raab (1974) in the Cenomanian -lower Turonian deposits of Israel.

Stratigraphic distribution : In the studied material, it is found in sample 15 of Gebel Ekma section and in sample 34 of Gebel Nazzazat section.

Dimensions : L=0.90mm      H= 0.65mm.

Genus *Bythocypris*, 1880.

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*Bythocypris* sp.

Pl. 1, Fig. 5

Remarks : The kidney- shape carapace characterizes the genus *Bythocypris*. This form has a convex dorsal margin and a concave ventral one. Both posterior and anterior ends are rounded. The surface ornamentation is smooth.

Stratigraphic distribution : In the studied material, it is found in sample 15 of Gebel Ekma section and in samples 39 & 40 of Gebel Nazzazat section.

Dimensions; L=0.75mm H=0.34mm

Family Paracyprididae Sars. 1923

Genus *Paracypris* Sars, 1866

*Paracypris acutocaudata* Rosenfeld

Pl. 1, fig. 6

1974-*Paracypris acutocaudata* Rosenfeld, P. 8, Pl. 1, figs. 22-24

Remarks : Carapace is elongate and highest near anterior margin. The dorsal margin is convex and slightly sloping downward posteriorly. Valves are compressed and the surface is smooth.

Dimensions : L =0.28mm H =0.35mm

Stratigraphic distribution : It was first described in the upper Cenomanian deposits of Negev area in Israel by Rosenfeld and Raab (1947). In the studied material, it is found in sample 14 of Gebel Nazzanat section.

***Paracypris madaouerensis* Bassoulet and Damotte**

**pl. 1, fig. 7**

1969- *Paracypris madaouerensis* Bassoulet & Damotte, p. 14, 2, fig. 10

1974- *Paracypris madaouerensis* Bassoulet & Damotte- Rosenfeld & Raab, p. 7, pl. 1, fig. 19-31

Remark : This form has a more rounded anterior margin of the left valve and short posterior margin.

Dimensions : L = 0.75mm      H = 0.35mm

Stratigraphic distribution : It was recorded from the Upper Cretaceous of Algeria (Bassoulet & Damotte, 1969) and from the Upper Cretaceous of Israel (Rosenfeld & Raab, 1974). In the studied material, it is found in sample 20 of Gebel Nazzazat section and samples 9 and 15 of Gebel Mukattab section.

***Paracypris triangularis* Rosenfeld**

**pl. 1, fig. 8**

1974- *Paracypris triangularis* Rosenfeld, p. 8, pl. 1, figs. 25-27

Discussion : This species differs from *P. madaouerensis* Bassoulet & Damotte (1969) by a more pointed posterior and by a distinct triangular dorsal margin of the left valve with maximum height at the middle of the valves.

Dimensions : L = 0.70mm      H = 0.35mm.

Stratigraphic distribution : It was first described by Rosenfeld and Raab (1974) in the Lower Turonian rocks of the Negev area, Israel. In the studied material, it is found in samples 39 and 40 Gebel Nazzazat section.

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Family Cytherideidae Sars, 1925

Genus *Dolocytheridea* Triebel, 1938

***Dolocytheridea atlasica* Bassoulet & Damotte**

pl. 1, fig. 9

1969- *Dolocytheridea atlasica* Bassoulet & Damotte, p. 139, pl. 2, figs. a-d.

1974- *Dolocytheridea atlasica* Bassoulet & Damotte- Rosenfeld & Raab, p. 11, pl. 2, figs. 12 & 13.

Dimensions : L = 0.55mm      H = 0.30mm.

Stratigraphic distribution : It was recorded by Rosenfeld and Raab (1974) in the Cenomanian deposits of Israel. In the studied material, it is found in samples 5 and 6 of Gebel Qabeliat section.

Genus *Ovocytheridea* Grekoff, 1951.

***Ovocytheridea caudata* Bold**

pl. 1, fig. 10

1964- *Ovocytheridea caudata* Bold, p. 119, pl. 14, fig. 4.

Remarks : A species of the genus *Ovocytheridea* with elongated carapace, somewhat like *Paracypris*. The dorsal margin of this species is convex while the ventral one is straight. The anterior end is irregularly rounded while the posterior end rounded.

Dimensions : L = 10.82mm      H = 0.44mm

Stratigraphic distribution : This form was recorded from the Flint Series and *Acteonella* Series of Abu Roash area in Egypt (Bold, 1964). In the studied material it is found in sample 23 of Gebel



Mukattab section and sample 15 of Gebel Ekma section.

Family Cytheruridae Miller, 1894

Genus *Metacytheropteron* Oertl, 1957

***Metacytheropteron berbericum* (Bassoulet & Damotte)**

pl. 2, Fig. 1

1969- *Cytheropteron berbericum* Bassoulet & Damotte, p. 137, pl. 2, fig. 7.

1974-*Metacytheropteron berbericum* (Bassoulet & Damotte)-Rosenfeld & Raab, p. 12, pl. 2, figs. 26-28; pl. 5,3&4

Remarks : The inconspicuous winglike process and the almond shape relate this species to *Metacytheropteron* and to *Cytheropteron*.

Dimensions : L =0.48mm                      H=0.32mm118

Stratigraphic distribution : This species was recorded in the Cenomanian deposits of Israel ( Rosenfeld & Raab,1974). In the studied material , it is found in sample 19 of Gebel Mukattab section

Family Progonocytheridae Sylvester & Bradley, 1948

Genus *Looneyella* Peck, 1951

***Looneyella sohi* Rosenfeld**

pl. 2, fig. 2

1974- *Looneyella sohi* Rosenfeld, p. 15, pl. 2, figs. 23-25;pl. 4, figs. 9 &10

Remarks : It has a straight margin with inflated ventrum, round, shallow subcentral and posterodorsal knobs separated by a shallow transversal sulcus characterizes this from. The surface has a weak

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and irregular reticulation.

Dimensions : L = 0.26mm      H = 0.32mm.

Stratigraphic distribution : This species was recorded in the upper Cenomanian- Turonian sequence of Israel (Rosenfeld & Raab, 1974). In the studied material, it is found in sample 19 of Gebel Mukattab section.

Subfamily Mauritsininae Deroo, 1962.

Genus *Mauritsina* Deroo, 1962.

*Mauritsina coronata* (Esker)

pl. 2, fig. 3

1968-*Cythereis coronata* Esker, p. 323, pl. 1, figs. 1-3; pl. 4, fig. 5.

1977-*Mauritsina coronata* (Esker) - Bassiouni *et al.*, p. 4, pl. 1, figs. 5-7.

1982-*Maurotsina coronata* (Esker)-Boukhary *et al.*, p. 16, pl. 1, figs. 5-8.

Dimensions : L = 0.83mm      H = 0.48mm

Stratigraphic distribution : This was first described by Esker (1968) in the Danian deposits of Tunisia. It was also recorded by Bassiouni *et al* (1977) in the Lower Eocene sequence at Luxor, Egypt. Faris (1982) found this species in the Danian of Ain Amur in Kharga Oasis. In the studied material, it is found in sample 20 of Gebel Nazzazat section and samples 16 and 17 of Gebel Qabeliat section.

*Cythereis rawashensis rawashensis*      **Bold**

pl. 2, fig. 4

1964-*Cythereis rawashensis rawashensis* Bold, p. 124, pl. 15, fig. 1

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Remarks : This species is characterized by a carapace with well developed reticulation and meshes are some what punctate or subdivided with small bands.

Dimensions : L = 0.75mm            H = 0.36mm

Stratigraphic distribution : It was first described by Bold (1964) in the *Acteonella* Series (Turonian) of Abu Rawash area. In the studied material, it is found in sample 6 of Gebel Ekma section and sample 20 of Gebel Nazzazat section.

*Cythereis rawashensis silicea* Bold

pl. 2, fig 5

1964-*Cythereis rawashensis silicea* Bold, p. 12, pl. 15, fig. 2

Remarks : A subspecies of *rawashensis* with small carapace, finely reticulate, ventral view only developed on posterior end.

Dimensions : L = 0.65mm            H = 0.33mm

Genus *Dordoniella* Apostolescu, 1955.

*Dordoniella* sp.

pl. 2, fig. 6

Remarks : There is a well marked depression of the valves. It has a smooth to finely punctate surface.

Dimensions : L= 0.40mm            H =0.30mm

Stratigraphic distribution : In the studied material, it is found in sample 34 of Gebel Nazzazat section.

Family Xestoleberididae Sars, 1928.

genus *Xestoleberis* Sars, 1866.

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*Xestoleberis obesa* Bold

pl. 2, fig. 7

1964-*Xestoleberis obesa* Bold, p. 132, pl. 14, fig. 10

Remarks : A species of the genus *Xestoleberis* with oval side view and widely elliptical dorsal view.

Stratigraphic distribution : It was first described by Bold (1964) from the Cenomanian -Turonian deposits (Rudistae, Limestone, *Acteonella* and flint Series) of Abu Rawash area. In the studied material, it is found in sample 34 of Gebel Nazzazat section. Family Loxoconchidae Sara, 1925

Genus *Loxoconcha* Sars, 1866

*Loxoconcha striata* Crane

pl. 2, fig. 8

1965-*Loxoconcha striata* Crane, p. 230, pl. 8, fig. 9

Remarks : This species is characterized by a surface ornamentation composed of narrow longitudinal ridges that converge anteriorly and posteriorly and a lower median ridge that bifurcates toward the posterior.

Dimensions : L = 0.42 mm      H = 0.22 mm.

Stratigraphic distribution : It was described by Crane (1965) in the Upper Cretaceous Chalk of Alabama, U. S. A. In the studied material, it is found in sample 15 of Gebel Nazzazat section.

## SUMMARY AND CONCLUSION

Four Stratigraphic section (Gebel Nazzazat, Gebel Mukattab, Gebel Ekma and Gebel Qabeliat) were measured to investigate the ostracod content and evaluate paleoenvironmental conditions of the Cenomanian -Turonian exposure located southeast of Abu Rudeis in West -Central Sinai. Eighteen ostracod species were identified illustrated and their stratigraphic ranges discussed. The identified ostracod species were extracted from Cenomanian -Turonian rocks of Raha, Abu Qada and Wata formations. The identified species belong to seven families; Cytherellidae, Bairdiidae, Paracyprididae, Cytherididae, Progonocytheridae, Xestoleberidae and Loxoconchidae.

From the ostracod assemblages, the depositional environments of the studied sequence were interpreted. The Abu Had member of the Raha Formation was deposited in a shallow marine environment. The ostracod content of the Mukattab Member suggests also a shallow marine environment but relatively deeper than that of the Abu Had Member. Although the Ekma Member is devoid of ostracods, the frequent intercalations of brown to reddish brown cross-bedded sandstones mark a regressive episode of the late Cenomanian sea over the study area. The environment implications of the Abu Qada and Wata formations suggest an increase in the water depth in the northern part of the investigated area.

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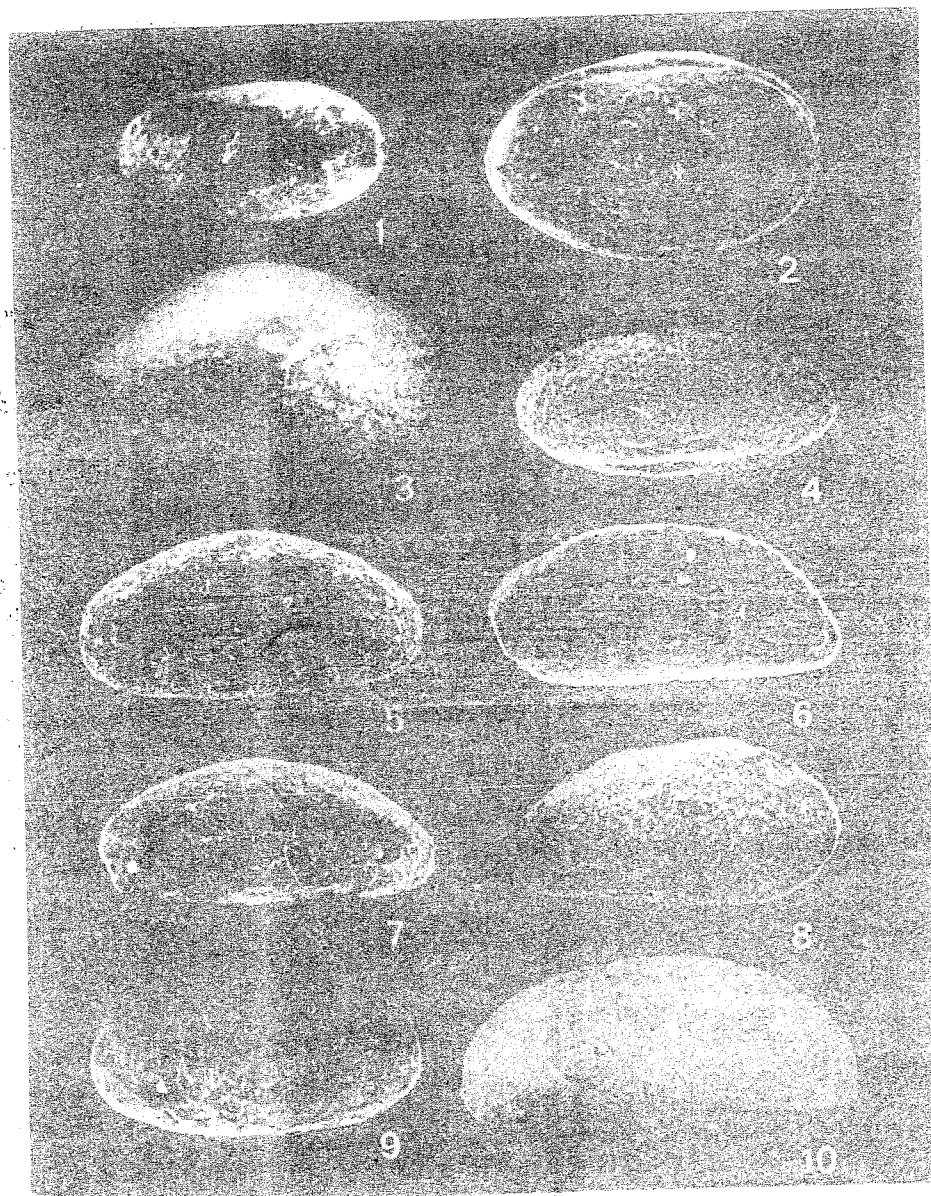
**PLATE 1**

Fig.

1. *Cytherella* cf. *parallela* (X70) Turonian, Wata Formation, sample no. 15, Gebel Ekma section. Carapace, lateral view from the left.
2. *Cytherella sulcata* (X150) Turonian, Abu Qada Formation, sample no. 31, Gebel Nazzazat section. Carapace, lateral view from the left.

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# PLATE I





# PLATE 2

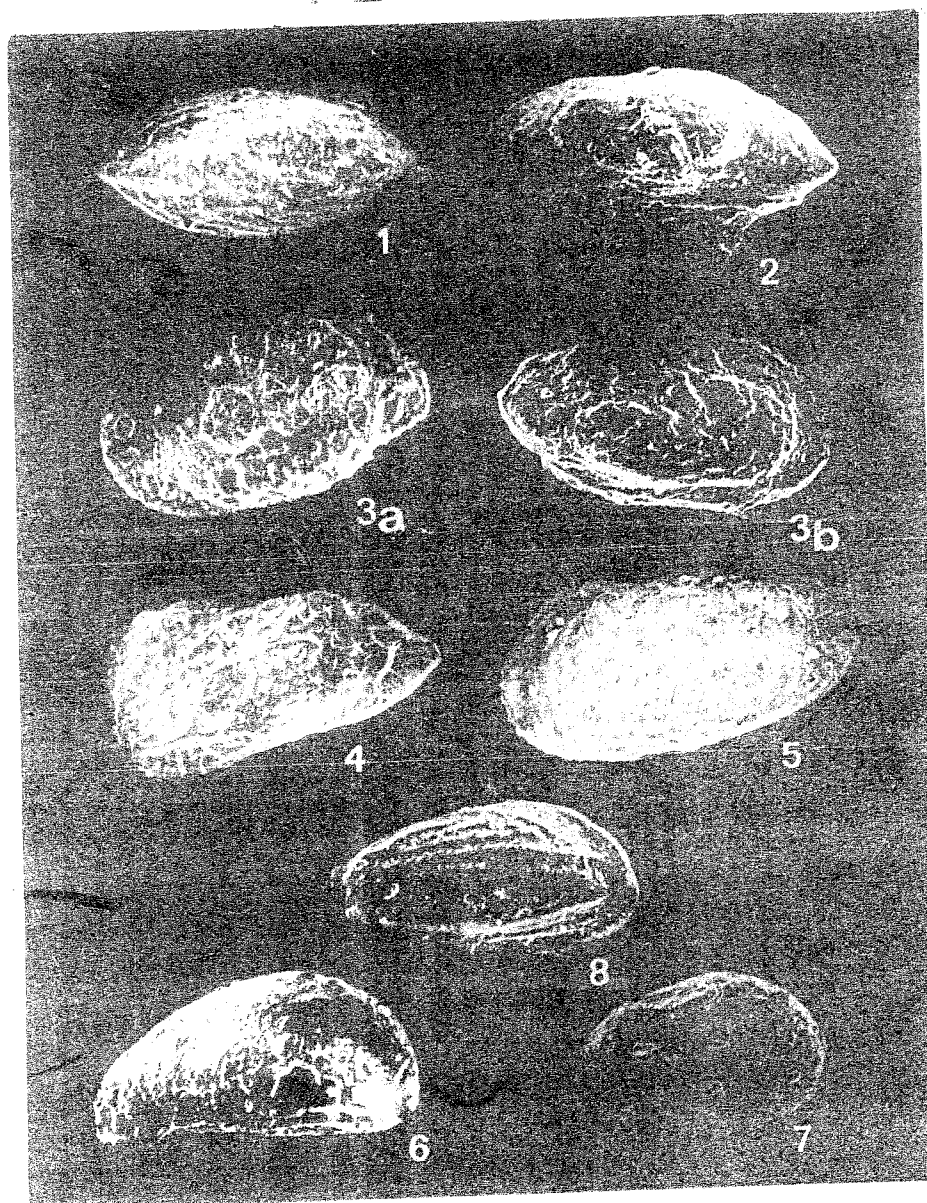


PLATE 2.

Fig.

1. *Metacytheropteron berbericum* (X100) Cenomanian, Raha Formation, sample no. 19, Gebel Mukattab section. Carapace, ventral view.
2. *Looneyella sohi* (X100) Cenomanian, Raha Formation, sample no. 19, Gebel Mukattab section. Carapace, lateral view from the left.
3. *Mauritsina coronata* Cenomanian, Raha Formation
  - a. Carapace, lateral view from the left (X75) sample no. 17, Gebel Qabeliat section.
  - b. Carapace, lateral view from the right (X 75) sample no. 20, Gebel Nazzazat section .
4. *Cytheris rawashensis rawashensis* (X 100) Cenomanian, Raha Formation, sample no. 6, Gebel Ekma section. Carapace, lateral view from the left.
5. *Cytheris rawashensis silicea* (X100) Turonian, Abu Qada Formation, sample no. 18, Gebel Qabeliat section. Carapace, lateral view from the left.
6. *Dordoniella* sp. (X150) Turonian, Abu Qada Formation sample no. 34, Gebel Nazzazat section. Carapace, lateral view from the right.
7. *Xestoleberis obesa* (X150) Turonian, Abu Qada Formation, sample

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3. *Bairdia* sp. (X75) Turonian, Abu Qada Formation, sample no. 34, Gebel Nazzazat section. Carapace, lateral view from the right.
4. *Morrowina* sp. (X 75) Turonian , Abu Qada Formation, sample no. 34, Gebel Nazzazat section. Carapace lateral view from the left.
5. *Bythocypris* sp. (X100) Turonian, Wata Formation, sample no. 40, Gebel Nazzazat section. Carapace, lateral view from the left.
6. *Paracypris acutocaudata* (X100) Cenomanian, Raha Formation, sample no. 14 Gebel Nazzazat section. Carapace, lateral view from the left.
7. *Paracypris mdaouerensis* (X75) Cenomanian, Raha Formation, sample no. 9, Gebel Nazzazat section. Carapace, lateral view from the left.
8. *Paractpris triangularis* (X150) Turonian, Wata Formation, sample no. 40, Gebel Nazzazat section. Carapace, lateral view from the right.
9. *Doloccytheridea atlasica* (X75) Cenomanian, Raha Formation, sample no. 6, Gebel Qabeliat section. Carapace, lateral view from the right.
10. *Ovocytheridea caudata* (X100) Turonian, Wata Formation, sample no. 23, Gebel Mukattab section. Carapace, lateral view from the right.

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no. 34, Gebel Nazzazat section. Carapace, lateral view from the right.

8. *Loxoconcha striata* (X100) Cenomanian, Raha Formation, sample no. 15, Gebel Nazzazat section. Carapace, lateral view from the right.

**استراكودا السينوماني - التوروني من غرب وسط سيناء - مصر**

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يتناول البحث دراسة ثمانية عشر نوعاً من الإستراكودا تنتمي إلي كل من السينوماني والتوروني (عصر الطباشيري) في منطقة غرب وسط سيناء حيث جمعت العينات الحقلية من جبل نزازات وجبل مقطب وجبل عكمه وجبل قابليات. وقد تم تعريف وتوضيح هذه الأنواع ودراسة المدي الإستراتيجرافي لها حيث أن معظم هذه الأنواع تم تسجيلها من نفس العمر في كل من تونس والجزائر وإيران ولبنان وإسرائيل.

وقد أمكن إستنتاج بيئة الترسيب لكل من الوحدات الإستراتيجرافية المختلفة حيث وجد أن عضو أبوحاد لمتكون الراحة (السينوماني) قد ترسب في بيئة ضحلة بينما تدل إستراكودا عضو مقطب (متكون الراحة) إنه قد ترسب في بيئة ضحلة لكنها أعمق نسبياً من عضو أبوحاد هذا علاوة علي أن عضو عكمة (متكون الراحة) يخلو من الإستراكودا.

من ناحية أخرى أظهرت إستراكودا متكون أبوقاعدة و متكون الوطأ (تورونيان) زيادة في عمق المياه خاصة في الناحية الشمالية لمنطقة الدراسة (جبل نزازات) .