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MIDDLE CRETACEOUS (CENOMANIAN) OSTRACODA
FROM THE WASIA FORMATION OF SAUDI ARABIA¹

ALI A. F. AL-FURAIH

Department of Geology, King Saud University, Riyadh, Saudi Arabia

Abstract.—Five ostracode species, *Metacytheropteron pleura* sp. nov., *Glenocythere triangularis* Al-Abdul-Razzaq, *Glenocythere bahreinensis* Al-Abdul-Razzaq, *Limburgina arabica* sp. nov., and *Phyrocythere streblolophata* (Al-Abdul-Razzaq), are recorded from test wells ST-23 and ST-33 in the Middle Cretaceous of Saudi Arabia. These ostracodes are useful for stratigraphical correlation within the Arabian Gulf region.

CENOMANIAN OSTRACODES of the Middle East are known mainly through the works of Grosdidier (1973), Rosenfeld and Raab (1974), Al-Abdul-Razzaq (1979), and Al-Abdul-Razzaq and Grosdidier (1981). Ostracode genera and species reported here from the Wasia Formation (Cenomanian-?Turonian) of Saudi Arabia were previously recorded in strata of the same age in Kuwait and Bahrain by Al-Abdul-Razzaq (1979) and Al-Abdul-Razzaq and Grosdidier (1981), and in Iran by Grosdidier (1973). This supports the suggestion of Al-Abdul-Razzaq and Grosdidier (1981) that these ostracodes are useful for correlation of Cenomanian beds in the Arabian Gulf region.

According to Powers and others (1966) and Powers (1968), the Wasia Formation is a highly

variable succession of rocks of continental and shallow-marine origin. It represents deposits of rapidly changing and widely shifting transgressive and regressive cycles. The Wasia Formation is divided from top to bottom into the Mishrif, Rumaila, Ahmadi, Wara, Mauddud, Safaniya, and Khafji members. The highest five members are named after formations in southeastern Kuwait. The lowest two members are named after areas in Saudi Arabia where they have greatest economic significance. These two lowest members can also be traced northward, where together they are equivalent to the Burgan Formation throughout Kuwait and the Nahr Umr Formation in southeastern Iraq. The Wasia Formation contains commercial oil at several levels in the fields of Safaniya and Dammam in Saudi Arabia. Equivalent units are also important producers of oil in

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Bahrain, Kuwait, and Iraq. (For more stratigraphic details see Powers and other, 1966; Powers, 1968.)

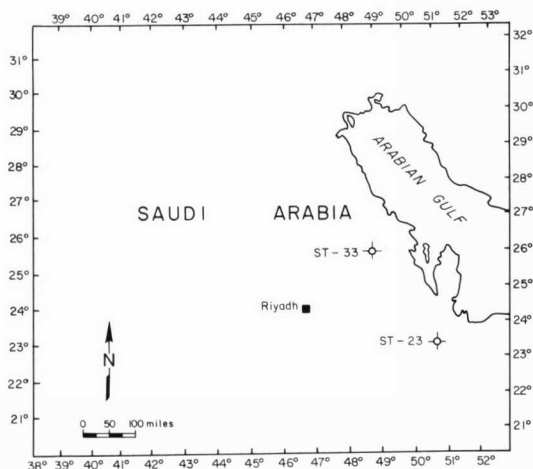


Fig. 1. Location of wells from which ostracodes were recovered.

Material for this study consists of subsurface cutting samples from test wells ST-23 (lat 23°36' N., long 51°17' E.) and ST-33 (lat 25°46' N., long 48°53' E.), drilled by the Arabian American Oil Company (Fig. 1).

Repository.—All figured specimens are deposited with collections of the Geology Department, King Saud University, Riyadh, Saudi Arabia.

Acknowledgments.—Roger L. Kaesler critically read the typescript of this paper and placed his collection at my disposal. Abdullah Al-Shamlan (Deputy Ministry of Petroleum for Technical Affairs, Saudi Arabia) arranged for the well samples. The Deputy Ministry of Petroleum for Technical Affairs and Companies of Saudi Arabia provided the well samples and permitted publication of this paper. The Department of Geology, University of Kansas, provided research facilities during my appointment as adjunct associate scientist. King Saud University provided financial support.

SYSTEMATIC PALEONTOLOGY

Order PODOCOPIDA Müller, 1894
 Suborder PODOCOPINA Sars, 1866
 Superfamily CYTHERACEA Baird, 1850
 Family CYTHERURIDAE Müller, 1884
 Subfamily CYTHEROPTERINAE Hanai,
 1957

Genus *METACYTHEROPTERON* Oertli, 1957

Metacytheropteron pleura sp. nov.

Plate 1, figures 1, 2

Metacytheropteron parnesi Sohn; Grosdidier, 1973,
 pl. 6, fig. 54a-e.

Derivation of name.—Greek, rib, with reference to ribbing pattern.

Diagnosis.—Small carapace with longitudinal ridges. Prominent, lightly raised ventrolateral ridge extending from anteroventral margin to caudal process. Ventral area of carapace flattened.

Holotype.—Male carapace (Pl. 1, fig. 1), KSU.G.OS. 160.

Material.—Seven specimens from ST-23 (depth 4,655-4,870 ft), 2 specimens from ST-33 (depth 4,170-4,175 ft).

Type locality and horizon.—ST-23, sample 4,865-4,870 feet below surface, Wasia Formation, Cenomanian.

Dimensions (mm).—Holotype, male carapace: length, 0.51; height, 0.24; width, 0.24. Paratype, female carapace (KSU.G.OS. 161): length, 0.46; height, 0.25; width, 0.27.

Description.—Carapace elongate, ovoid, tapering posteriorly. Dorsal and ventral margins converging posteriorly to form caudal process. Dorsal margin strongly arched in female morph. Left valve slightly larger than right. Sexual dimorphism rather marked; males more elongate, less high and wide than females. Shell surface ornamented with longitudinal ridges. Marginal denticulations not observed. Eye spot faintly developed. Internal features not seen.

Remarks.—Although external details of *M. pleura* sp. nov. are typical of *Metacytheropteron*, it is referred to the genus with some doubt owing to lack of internal details, which are, in my opinion, important in differentiating genera of the Cytheruridae. Grosdidier (1973) figured representatives of this species as *Metacytheropteron parnesi* Sohn (1968); however, *M. pleura* differs from *M. parnesi* in details of outline and ridge arrangement. *M. houpettensis* Grosdidier (1964) is easily differentiated from *M. pleura* by rib arrangement, and the left valve overreaches the right valve strongly along the dorsal margin.

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948

Subfamily TRACHYLEBERIDINAE
Sylvester-Bradley, 1948

Genus GLENOCY THERE Al-Abdul-Razzaq, 1979

***Glenocythere triangularis* Al-Abdul-Razzaq, 1979**

Plate 1, figure 3

Glenocythere triangularis Al-Abdul-Razzaq, 1979, p. 928-930, pl. 2, fig. 5-8; pl. 3, fig. 4.

Material.—Four specimens from ST-23 (depth 4,865-4,870 ft).

Locality and horizon.—ST-23, sample 4,865-4,870 feet below surface, Wasia Formation, Cenomanian.

Dimensions (mm).—Female carapace (KSU.G.OS. 162): length, 0.83; height, 0.49; width 0.51.

Remarks.—Sayyab (1956) found forms identical to *Glenocythere triangularis* in the Cenomanian of the Arabian Gulf area.

***Glenocythere bahreinensis* Al-Abdul-Razzaq, 1979**

Plate 1, figures 4, 5

Glenocythere bahreinensis Al-Abdul-Razzaq, 1979, p. 921-927, pl. 1, pl. 3, fig. 1; Al-Abdul-Razzaq and Grosdidier, 1981, p. 188, pl. 1, fig. 5.

Material.—Five specimens from ST-33 (depth 4,865-4,870 ft), 3 specimens from ST-33 (depth 4,170-1,175 ft), Wasia Formation, Cenomanian.

Dimensions (mm).—Male carapace (KSU.G.OS. 163); length, 0.95; height, 0.56; width 0.51. Female carapace (KSU.G.OS. 164): length, 0.90; height, 0.55; width 0.51.

Remarks.—This species has been fully described by Al-Abdul-Razzaq (Al-Abdul-Razzaq, 1979; Al-Abdul-Razzaq and Grosdidier, 1981). I do not share their opinion that *Cythereis* IRC₂ Grosdidier (1973) is identical to *Glenocythere bahreinensis*. *Cythereis* IRC₂ differs in having a more triangular posterior end that is pointed ventrally, particularly in the right valve (see Grosdidier, 1973, pl. 8, fig. 65a,d). Although the two species differ in arrangement of ridges, they appear to be closely related.

Genus LIMBURGINA Deroo, 1966

***Limburgina arabica* sp. nov.**

Plate 1, figures 6, 7

Derivation of name.—From its occurrence in Arabia.

Diagnosis.—Species of *Limburgina* with a massive, posterior, cardinal process. Surface reticulate with thick muri. Prominent, short, median, longitudinal ridge in posterior part of valve.

Holotype.—Male carapace (Pl. 1, fig. 6), KSU.G.OS. 165.

Material.—Seventeen specimens from ST-23 (depth 4,655-4,870 ft).

Type locality and horizon.—ST-23, sample 4,655-4,660 feet below surface, Wasia Formation, Cenomanian.

Dimensions (mm).—Holotype, male carapace (KSU.G.OS. 165): length, 0.69; height, 0.33; width, 0.32. Paratype, female carapace (KSU.G.OS. 166): length, 0.66; height, 0.32; width, 0.33.

Description.—Carapace subrectangular in lateral view, with broadly rounded anterior margin, parallel dorsal and ventral margins, and triangular posterior end. Dorsal margin straight, appearing sinuous because of projecting tubercles. Anterior margin with double row of small denticles. Carapace surface reticulate, fossae with thick muri. Subcentral tubercle distinct, with sulcus posterior to it. Eye tubercle distinct. Ventrolateral ridge well developed; prominent, short, median, longitudinal ridge on posterior part of valve. Posterior cardinal

process massive, with small tubercle anterior to it. Left valve slightly larger than right, overlapping it posterodorsally. Sexual dimorphism apparent, more elongate forms interpreted as males. Internal characters not seen.

Remarks.—Representatives that are here assigned to this species have been reported by Sayyab (1956) from the Middle Cretaceous of the Arabian Gulf area. *Limburgina aurora* Neale (1975) from the Upper Cretaceous of Gingin, Western Australia, bears some similarity to *L. arabica* but differs in having a less prominent median ridge. *L. arabica* is easily distinguished from *L. formosa* Bate (1972) by having a more triangular posterior end, particularly in the left valve; moreover, the line of greatest length passes slightly below the midpoint instead of slightly above it. *Cythereis fabroni* Bischoff (1963) from the Albian of Lebanon differs in having an elongate dorsal ridge and less distinctly tapered posterior end.

Genus PHYROCYPHERE Al-Furaih, 1980

Phyrocypere streblophata (Al-Abdul-Razzaq), 1981

Plate 1, figures 8-10

Ostracode C₂ Glintzboeckel and Magné, 1959, pl. 3, fig. 27.

Cythereis C₂ (Glintzboeckel and Magné), Grekoff, 1969, p. 232, pl. 1, fig. 5.

Cythereis IRE₃, Grosdidier, 1973, pl. 8, fig. 67a-c.

Cythereis streblophata Al-Abdul-Razzaq and Grosdidier, 1981, p. 183-185, pl. 1, fig. 7-10; pl. 2, fig. 6-8.

Veeniacypereis streblophata (Al-Abdul-Razzaq), Bismuth and others, 1981, p. 233, pl. 1, fig. 3,4.

Material.—Nine specimens from ST-23 (depth 4,655-4,870 ft).

Locality and horizon.—ST-23, sample 4,655-4660 feet below surface, Wasiaa Formation, Cenomanian.

Dimensions (mm).—Male carapace (KSU.G.OS. 167): length, 0.69; height, 0.37; width, 0.32. Male carapace (KSU.G.OS. 168): length, 0.71; height, 0.38; width, 0.34. Female carapace (KSU.G.OS. 169): length, 0.68; height, 0.39; width, 0.37.

Remarks.—*Phyrocypere streblophata* closely resembles *P. irrigata* Al-Furaih (1980) but is differentiated by its more prominently developed posterior cardinal angle. Furthermore, *P. irrigata* has a more pronounced subcentral tubercle, heavier ridges, and high rims, particularly the ventral rim. Representatives of this species from the Middle Cretaceous of the Arabian Gulf area have been reported by Sayyab (1956) as *Cythereis arabica*. Glintzboeckel and Magné (1959) and Grekoff (1969) found *P. streblophata* in Cenomanian rocks of eastern Algeria and Tunisia. Grosdidier (1973) found identical forms in Albian and Lower Cenomanian rocks of the Coastal Fars, Iran. Al-Abdul-Razzaq and Grosdidier (1981) described this species from the lower Ahmadi Formation of early Cenomanian age in Kuwait; Bismuth and others (1981) reported *P. streblophata* from Upper Cenomanian rocks of Tunisia.

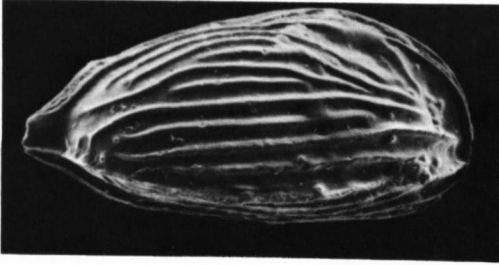
EXPLANATION OF PLATE 1

FIGURE

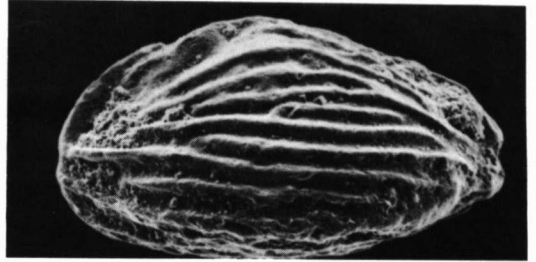
- 1,2. *Metacytheropteron pleura* sp. nov.—1. Male carapace, holotype, right-lateral view, ×118, KSU.G.OS. 160.—2. Female carapace, paratype, left-lateral view, ×130, KSU.G.OS. 161.
3. *Glenocythere triangularis* Al-Abdul-Razzaq, 1979. Female carapace, right-lateral view, ×73, KSU.G.OS. 162.
- 4,5. *Glenocythere bahreinensis* Al-Abdul-Razzaq, 1979.—4. Male carapace, left-lateral view, ×63, KSU.G.OS. 163.—5. Female carapace, right-lateral

view, ×67, KSU.G.OS. 164.

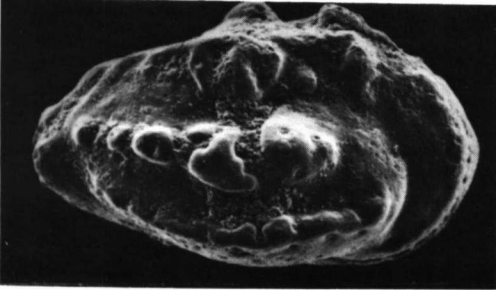
- 6,7. *Limburgina arabica* sp. nov.—6. Male carapace, holotype, left-lateral view, ×86, KSU.G.OS. 165.—7. Female carapace, paratype, right-lateral view, ×90, KSU.G.OS. 166.
- 8-10. *Phyrocypere streblophata* (Al-Abdul-Razzaq), 1979.—8. Male carapace, right-lateral view, ×86, KSU.G.OS. 167.—9. Male carapace, right-lateral view, ×84, KSU.G.OS. 168.—10. Female carapace, left-lateral view, ×87, KSU.G.OS. 169.



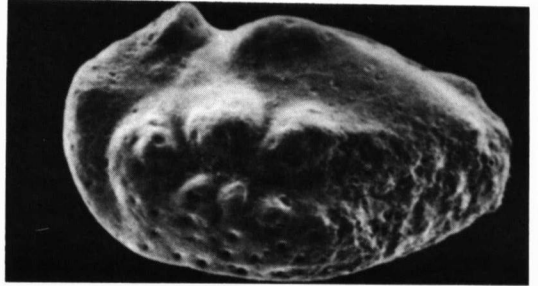
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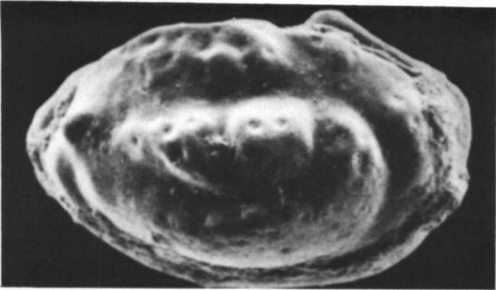
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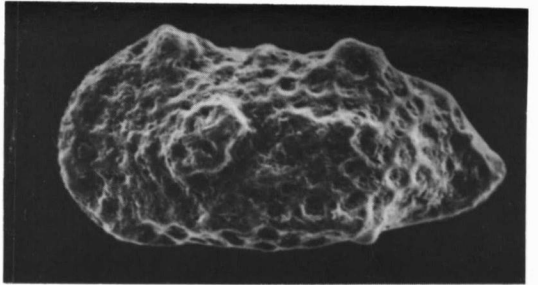
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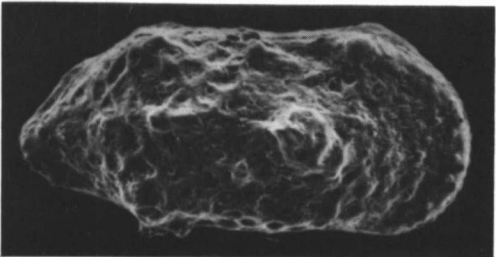
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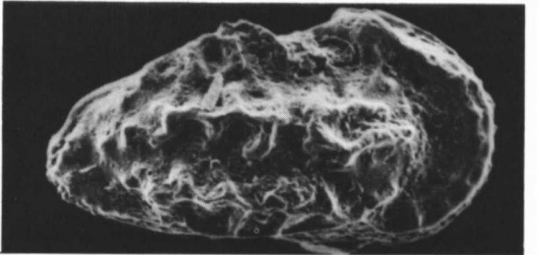
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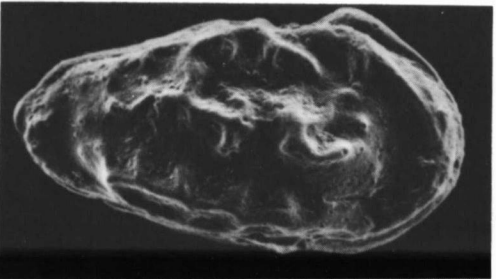
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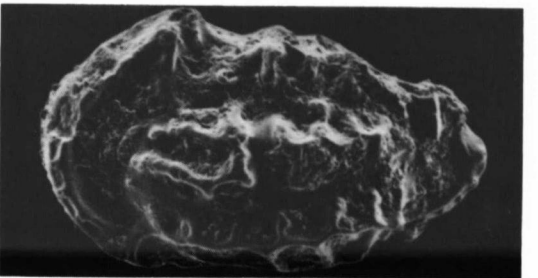
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