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CALLOVIAN-OXFORDIAN OSTRACODES FROM THE HAMAKHTESH HAGADOL SECTION, SOUTHERN ISRAEL

ABSTRACT

Callovian-Oxforian ostracodes are reported from two sections of the HaMakthesh HaGadol exposure, southern Israel. The assemblage consists of sixteen species, belonging to fourteen genera. *Mandelstmia hirschi* and *Micropneumatocythere laevireticulata* are described as new species. The faunas exhibit similarities to those of contemporaneous sequences from Sinai and Saudi Arabia.

Key words: Ostracodes, Jurassic, Callovian-Oxfordian, Israel, Middle East, New Species.

RESUMEN

Se presenta un estudio de los ostrácodos del Calloviense-Oxfordiense presentes en dos secciones de los afloramientos de Makhtesh HaGadol, sur de Israel. La asociación consiste de dieciséis especies pertenecientes a catorce géneros. Se describen dos nuevas especies: *Mandelstamia hirschi* y, *Micropneumatocythere laevireticulata*. Las faunas presentan semejanzas con las contemporáneas de Sinaí y Arabia Saudita.

Palabras clave: Ostrácodos, Jurásico, Calloviense-Oxfordiense, Nuevas especies, Israel.

INTRODUCTION

The HaMakhtesh HaGadol outcrop in the Negev, southern Israel (Figure 1), an elliptical erosion ca. 15 km long and 6 km wide, reveals about 200 m thick Callovian-Oxfordian sediments. The section is composed mainly of limestones, shales and chalks. Two reference sections were taken in 1963 (Goldberg, 1963; Eliezri, 1963; see also Picard and Hirsch, 1987, fig. 11). The sections were investigated for their mega- and microfossil content (for references, see Picard and Hirsch, 1987, p. 34, fig. 11). Ostracodes of Eliezri's section were checked by Oertli (in Maync, 1966).

The aim of this study is to describe systematically the ostracode faunas from the HaMakhtesh HaGadol exposure. For this purpose, Goldberg's section was resampled and checked for ostracodes, their distribution is given in Figure 2. The distribution of the ostracodes from Eliezri's section (Figure 3) is based on formerly picked material. The lithology and subdivision of the strata are according to the columnar sections of Goldberg (1963) and Eliezri (1963). Ostracodes are found in common to rare occurrences throughout both sections. The assemblages consist of sixteen species, belonging to fourteen genera; two species are described as new and six species are left in open nomenclature.

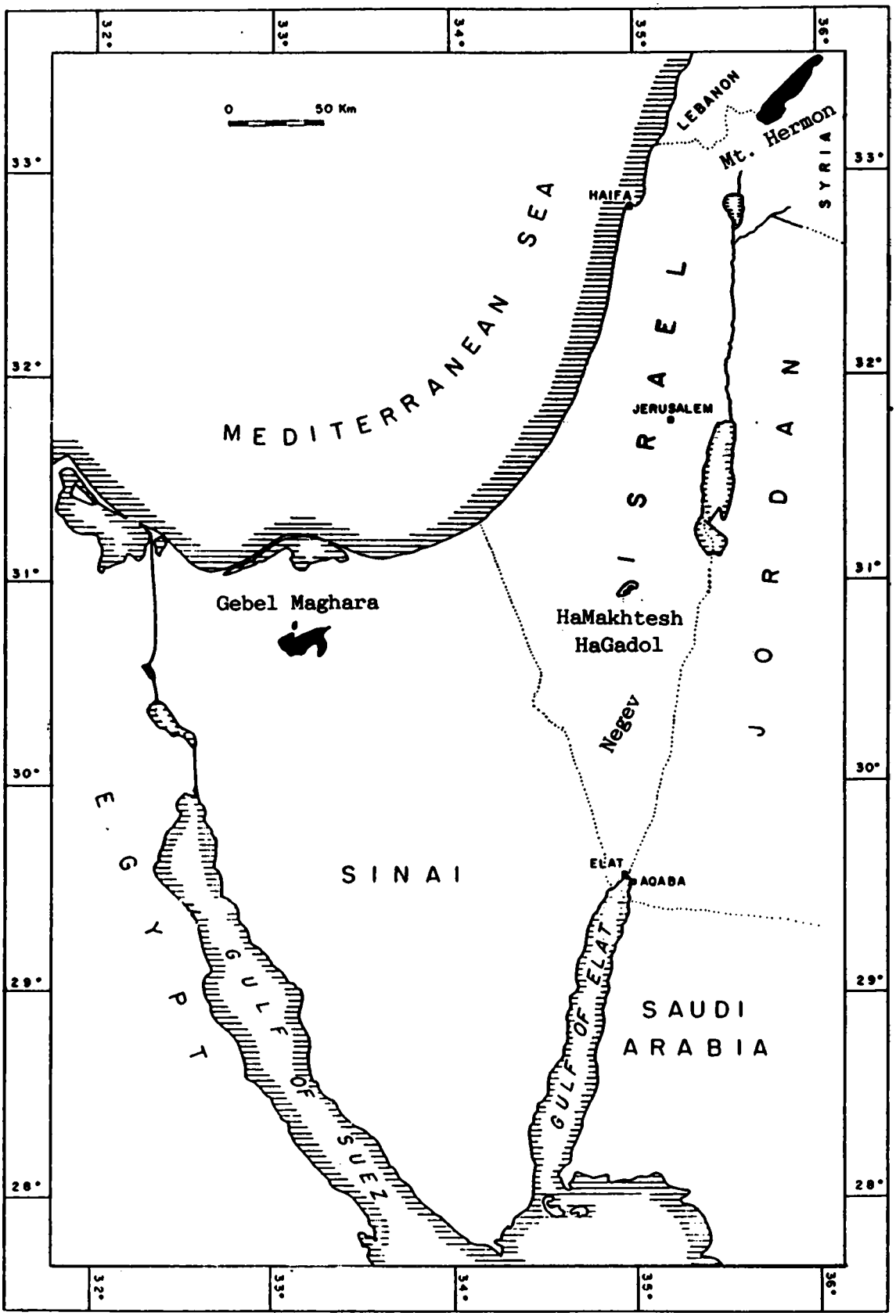

Figure 1: Location map.

SYSTEMATIC DESCRIPTIONS

All the examined and described ostracodes are deposited in the ostracode collections of the Geological Survey of Israel, Stratigraphy and Oil Division, catalogued under the signs AR 601-675/87 and HAT 1-100. The abbreviations l, h, w in this chapter refer to length, height and width of the representative types and M, F to male and female specimens, respectively. The «Stratigraphic ranges» in this chapter represent ranges for the HaMakhtesh HaGadol sections only. The ostracode assemblage zones *Ektyphocythere zoharensis* (JJ-4) and *Exophthalmocythere? kidonensis* (JJ-5) and their ages (Callovian and Oxfordian, respectively) are described in Rosenfeld *et al.* (1987a and b).

Genus **Cytherella** Jones, 1849

Cytherella index Oertli, 1959

Plate 1, Figure 3

1959 *Cytherella index* Oertli, p. 16, pl. 1, figs. 13-25.

1963 *Cytherella index* Oertli, Grekoff, p. 1720, pl. 1, figs. 6-9.

1966 *Cytherella index* Oertli, Oertli, in Maync, pl. 9, figs. 7-9.

1987 *Cytherella index* Oertli, Depêche *et al.*, p. 226, pl. 1, fig. 4.

Measurements (mm):

l	*h*	*w*
0.83	0.46	0.32

Remarks: Cytherella index Oertli was first described from the Oxfordian of Switzerland and France (Oertli, 1959). It is found also in the Callovian of Madagascar (Grekoff, 1963), in the Callovian-Oxfordian of Saudi Arabia (Depêche et al., 1987) and in the (Callovian?-) Oxfordian of Israel (Maync, 1966).

Material and distribution: About hundred carapaces and valves in the middle and upper

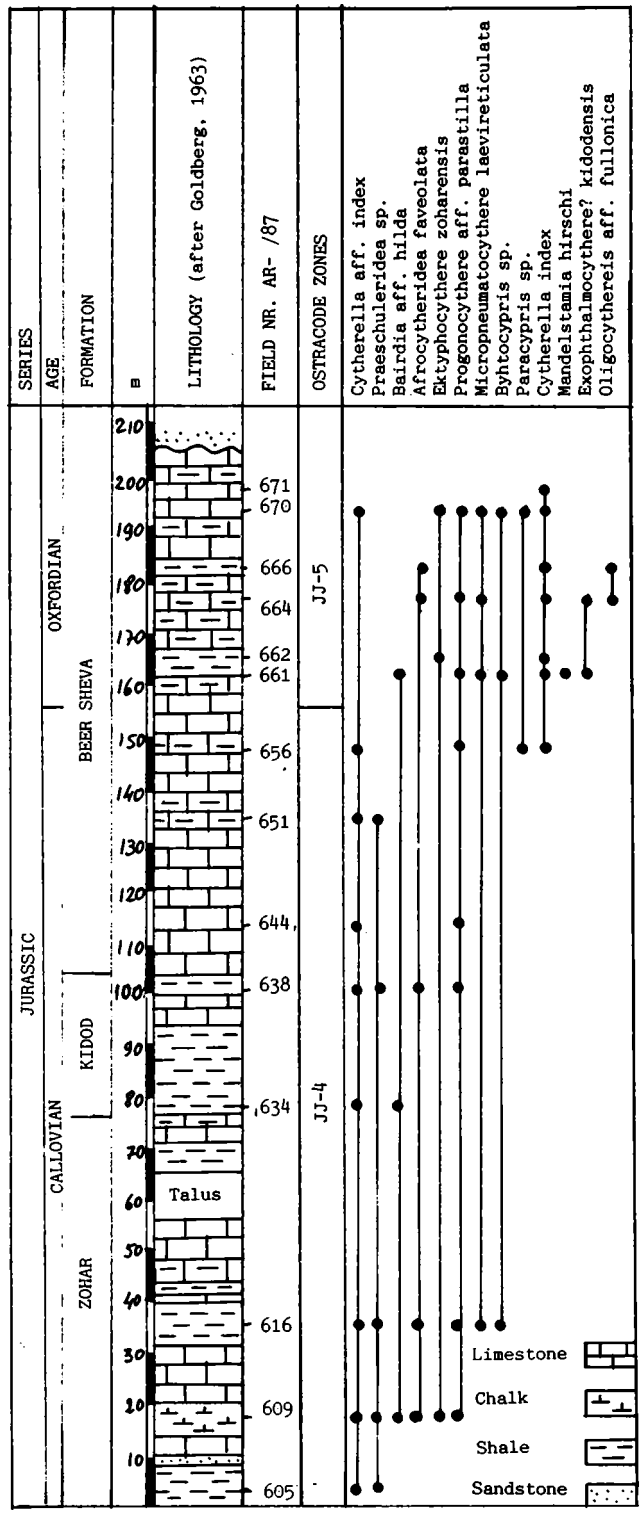

Figure 2: Distribution of ostracodes in Goldberg's HaMakhtesh Hagadol section.

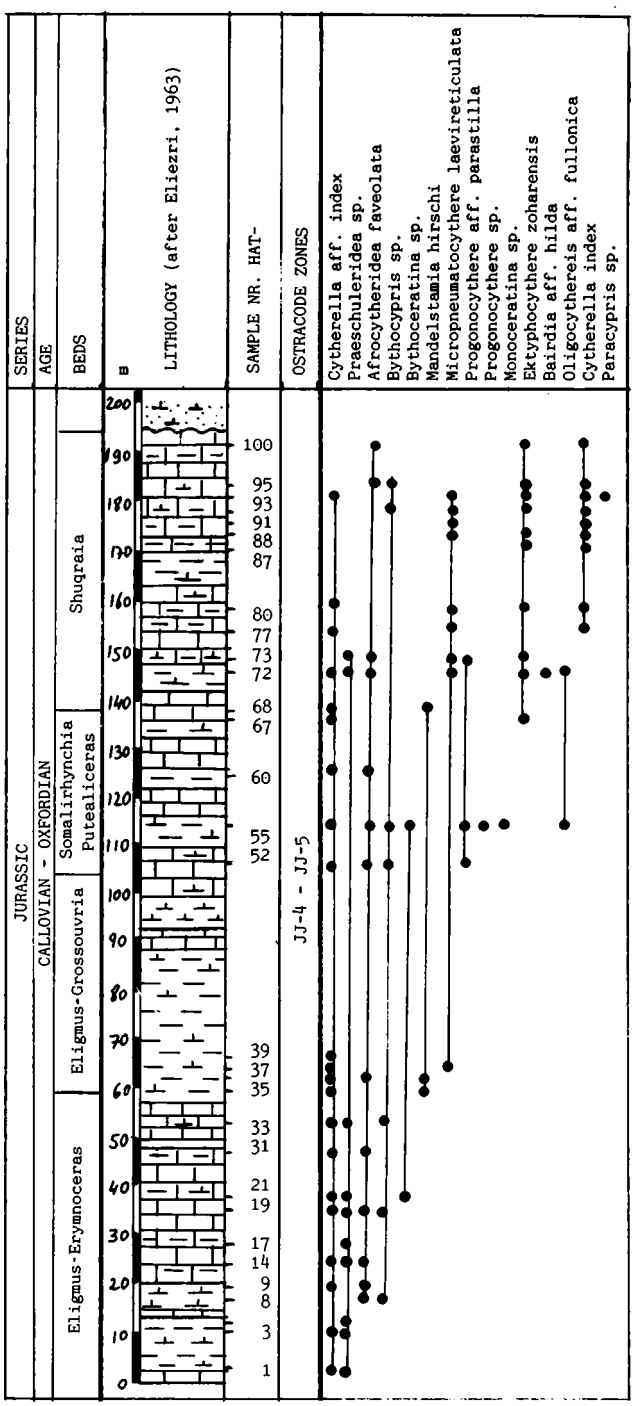

Figure 3: Distribution of ostracodes in Eliezri's Ha-Makhtesh Hagadol section.

parts of the sections of Goldberg (1963) and Eliezri (1963).

Stratigraphic range: Callovian-Oxfordian.

Cytherella aff. **index** Oertli, 1959

Plate 1, Figures 1-2

1966 *Cytherella* sp. 3, Oertli, in Maync, pl. 10, figs. 84-85.

1987 *Cytherella* aff. *index* Oertli, Depêche *et al.*, p. 226, pl. 1, fig. 5.

Measurements (mm):

l	*h*	*w*
0.65	0.36	0.27
0.68	0.44	—

Remarks: This very common species was described from the Bathonian-Oxfordian of Israel (Maync, 1966) and from the Bajocian-Oxfordian? of Saudi Arabia (Depêche *et al.*, 1987).

Material and distribution: More than hundred carapaces and valves, mostly from the lower and middle parts of both sections, rare specimens also in the upper parts.

Stratigraphic range: Callovian-Oxfordian.

Genus **Bairdia** McCoy, 1844

Bairdia aff. **hilda** Jones, 1884

Plate 1, Figures 4-5

1884 *Bairdia hilda* Jones, pl. 34, fig. 20.

1966 *Bairdia* aff. *hilda* Jones, Oertli, in Maync, pl. 9, figs. 27-32.

1969 *Bairdia hilda* Jones, Bate, pl. 1, figs. 5-6, pl. 4, fig. 5.

1987 *Bairdia* aff. *hilda* Jones, Depêche *et al.*, p. 228, pl. 1, fig. 12.

Measurements (mm):

l	*h*	*w*
1.13	0.60	0.48
0.78	0.46	0.40

Remarks: Bairdia aff. *hilda* Jones is reported hitherto from Bajocian-Callovian strata of Israel

(Maync, 1966) and Saudi Arabia (Depêche *et al.*, 1987).

Material and distribution: Twelve carapaces and valves throughout both sections.

Stratigraphic range: Callovian-Oxfordian.

Genus **Bythocypris** Brady, 1890

Bythocypris sp.

Plate 1, Figures 6-7

Measurements (mm):

l	*h*	*w*
0.70	0.31	0.32
0.65	0.29	0.24

Material and distribution: Twenty carapaces throughout both sections.

Stratigraphic range: Callovian-Oxfordian.

Genus **Paracypris** Sars, 1866

Paracypris sp.

Plate 1, Figure 8

1987 *Paracypris* sp., Rosenfeld *et al.* (1987b), p. 238, pl. 1, fig. 5.

Measurements (mm):

l	*h*	*w*
0.62	0.23	0.19

Remarks: The specimens, found in the HaMakhtesh HaGadol section, are identical with those from the Oxfordian of Mount Hermon, Golan Heights (Rosenfeld *et al.*, 1987b).

Material and distribution: Five carapaces from the Beer Sheva Formation of Goldberg's section and the upper part of Eliezri's section.

Stratigraphic range: Oxfordian.

Genus **Praeschuleridea** Bate, 1953

Praeschuleridea sp.

Plate 1, Figures 9-12

1987 *Praeschuleridea* sp. (aff. sp. 1 Oertli, 1969). Depêche *et al.*, p. 245, pl. 9, figs. 15-16.

Measurements (mm):

l	*h*	*w*
0.63	0.40	—
0.53	0.36	0.30
0.59	0.38	0.32
0.52	0.39	—

Remarks: Our specimens are identical with those, reported by Depêche *et al.* (1987) from the Bathonian-Callovian (Bathonian-Oxfordian, see fig. 5) of Saudi Arabia. They differ from *P. hornei* Rosenfeld and Gerry (in Rosenfeld *et al.*, 1987a; Bathonian of Gebel Maghara, Sinai and Bajocian-Bathonian of Israel, Maync, 1966, pl. 10, figs. 67-69) by having a rounded posterior end. In this feature they are similar to the *Praeschuleridea* aff. sp. 1 (Maync, 1966, pl. 9, figs. 42-47; Bathonian of Israel).

Material and distribution: About fifty carapaces and valves throughout both sections.

Stratigraphic range: Callovian-Oxfordian.

Genus **Mandelstamia** Ljubimova, 1955

Mandelstamia hirschi n. sp.

Plate 2, Figures 1-3

Derivation of name: In honour of Dr. F. Hirsch, Geological Survey of Israel, Jerusalem, researcher of the Jurassic stratigraphy of Israel.

Holotype: Female carapace, AR 661, pl. 2, fig. 1.

Paratypes: Two male carapaces, pl. 2, figs. 2-3.

Type locality: HaMakhtesh HaGadol.

Type stratum: Beer Sheva Formation.

Diagnosis: Mandelstamia with middorsal sulcus and entirely papillated surface.

Measurements (mm):

l	*h*	*w*	
0.57	0.34	0.37	Holotype F
0.57	0.34	0.31	Paratype M
0.56	0.34	0.33	Paratype M

Description: Medium sized carapace with broadly rounded anterior and posterior ends. Dorsal and ventral margin nearly straight, subparallel. Eye-spot distinct. Well developed mid-

dorsal sulcus, reaching the central zone. Entire surface covered by many small papillae, arranged in concentric lines, best seen in peripheral regions. Posterior zone tumid, especially in females. Interior features not observed.

Remarks: M. hirschi n. sp. is similar to *M. rectilinea* Malz, 1958 (see Kilenyi, 1969, p. 133, pl. 29, figs. 1-6; Kilenyi, in Bate and Robinson, 1978, p. 278, pl. 8, figs. 7-10, Kimmeridge of England and Denmark), but differs mainly by the specific papillated surface ornamentation and the lack of pits. Also *Mandelstamia* sp., recorded from the Callovian of Saudi Arabia (Depêche *et al.*, 1987, p. 237, pl. 6, fig. 7) shows a certainly different type of ornamentation with large pits.

Material and distribution: Six carapaces from both sections.

Stratigraphic range: Callovian-Oxfordian.

Zones: JJ-4 - JJ-5 zones.

Genus **Progonocythere** Sylvestr-Bradley, 1948

Progonocythere aff. **parastilla** Whatley, 1964

Plate 2, Figures 4-5

1987 *Progonocythere* aff. *P. parastilla* Whatley, Rosenfeld *et al.*, 1987a, p. 258, pl. 6, figs. 10-11.

Measurements (mm):

l	*h*	*w*
0.50	0.29	0.27
0.54	0.30	0.34

Remarks: This species was also found in the Kidod Formation of Gebel Maghara, Sinai (Rosenfeld *et al., op. cit.*).

Material and distribution: Seventeen carapaces, occurring in the Zohar, Kidod and Beer Sheva Fms. and their equivalents in both sections.

Stratigraphic range: Callovian-Oxfordian.

Progonocythere sp.

Plate 4, Figure 8

Measurements (mm):

l	*h*	*w*
0.47	0.25	0.23

Remarks: This small and rare species shows a rather smooth surface, due to bad preservation, with some remnants of a punctuated sculpture. It resembles, therefore, *P. mundula* Grekoff, 1963 (p. 1738, pl. 4, figs. 92-95) from the Callovian of Madagascar, which possesses a strongly punctuated to pitted surface.

Material and distribution: Two carapaces from the middle part of Eliezri's section.

Stratigraphic range: Callovian.

Genus **Micropneumatocythere Bate, 1963**

Micropneumatocythere laevireticulata n. sp.

Plate 2, Figures 6-9

?1987 *Micropneumatocythere* sp. 1, Depêche *et al.*, p. 237, pl. 9, figs. 9-10.

Derivation of name: Leavis- Latin, weak; reticulatus- L., reticulate from the carapace ornamentation of the species.

Holotype: Female carapace, AR 616, pl. 2, fig. 9.

Paratypes: One female and two male carapaces, pl. 2, figs. 6-8.

Type locality: HaMakhtesh HaGadol.

Type stratum: Zohar Formation.

Diagnosis: Micropneumatocythere with weak surface ornamentation and strongly projecting subcentral ventrolateral margin.

Measurements (mm):

l	*h*	*w*	
0.50	0.31	0.37	F Holotype
0.53	0.32	0.37	F Paratype
0.50	0.28	0.29	M Paratype
0.52	0.31	0.32	M Paratype

Description: Small carapaces, oval in dorsal view (pl. 2, fig. 8). Anterior end broadly rounded, posterior end pointed centrally. Dorsal margin convex, ventral margin sinously to slightly convex. Ventrolateral margin projecting strongly over the central margin, subcentrally. Surface

weakly reticulated, sometimes appearing smooth, due to bad preservation. Left valve larger than right, overlapping almost on the entire valve. Sexual dimorphism pronounced, males less convex and less tumid than females. Hinge as in the genus.

Remarks: The *Micropneumatocythere* specimens, figured by Depêche *et al.* (1987, *op. cit.*) from the Callovian of Saudi Arabia show a rather smooth surface, but are in all other features identical with the Israeli species. The lack of ornamentation pattern in the Saudi Arabian species may depend on bad preservation, therefore, they are probably synspecific with *M. laevireticulata* n. sp.

Material and distribution: About thirty carapaces and valves from the lower and upper parts of both sections.

Stratigraphic range: Callovian-Oxfordian.

Zones: JJ-4 - JJ-5 zones.

Genus **Monoceratina** Roth, 1928

Monoceratina sp.

Plate 2, Figure 10

Measurements (mm):

l	*h*	*w*
0.39	0.24	0.22

Remarks: Our single specimen resembles *Monoceratina* sp. *B* (Rosenfeld *et al.*, 1987a, p. 256, pl. 5, fig. 15; Bathonian from Gebel Maghara, Sinai), but differs from the latter in its smaller posterior area.

Material and distribution: One carapace from the middle part of Eliezri's section.

Stratigraphic range: Callovian.

Genus **Bythoceratina** Hornibrook, 1953

Bythoceratina sp.

Plate 2, Figure 11

?1987 *Bythocytheratina* sp., Depêche *et al.*, p. 246, pl. 9, fig. 3.

Measurements (mm):

l	*h*	*w*
0.36	0.19	0.17

Remarks: Our rare specimens show a deep subcentral sulcus and three posterior knobs. They are faintly reticulated to smooth. In these features they are very similar to the specimen, figured by Depêche *et al.* (1987, *op. cit.*), but the species from the Callovian of Saudi Arabia is somewhat larger.

Material and distribution: Three carapaces from the lower and middle parts of Eliezri's section.

Stratigraphic range: Callovian.

Genus **Afrocytheridea** Bate, 1975

Afrocytheridea faveolata Bate, 1975

Plate 3, Figures 1-10

1963 *Lophocythere?* 4777 Grekoff, p. 1730, pl. 3, figs. 53-54.

1963 *Lophocythere* 323 a Grekoff, p. 1730, pl. 2, figs. 47.

1966 *Progonocythere?* aff. *anoda* Peterson, Oertli, in Maync, pl. 10, figs. 81-83.

1975 *Afrocytheridea faveolata* Bate, p. 196, pl. 8, figs. 12-13.

1987 *Afrocytheridea faveolata* Bate, Depêche *et al.*, p. 243, pl. 7, figs. 1-10.

1987 *Afrocytheridea* cf. *faveolata* Bate, Depêche *et al.*, p. 243, pl. 7, figs. 11-15.

Measurements (mm):

l	*h*	*w*
0.79	0.43	0.39
0.78	0.41	0.41
0.78	0.43	0.41
0.72	0.43	0.36
0.71	0.40	—
0.72	0.39	—
0.63	0.37	0.35
0.73	0.37	0.40
0.70	0.43	0.42
0.68	0.37	0.40

Remarks: A. faveolata Bate is geographically widely distributed and occurs in the Callovian of Madagascar (Grekoff, 1963) and Tanzania (Bate, 1975). Both forms *(A. faveolata* and *A.* cf. *faveolata)*, described by Depêche *et al.* (1987) from the Callovian and Oxfordian of Saudi Arabia, are grouped in the present study into the same species. Therefore, *A. faveolata* occurs in the same stratigraphic range in Saudi Arabia and in the HaMakhtesh HaGadol section (Callovian-Oxfordian); its total range in Israel is given by Maync (1966) as Late Bathonian-Oxfordian. The size difference in the ornamentation of the Saudi Arabian specimens may be due to paleoecological or evolutionary effects, which reflect only intraspecific variations.

Material and distribution: About eighty carapaces and valves throughout both sections.

Stratigraphic range: Callovian-Oxfordian.

Genus **Exophthalmocythere** Triebel, 1938

Exophthalmocythere? kidodensis Rosenfeld and Gerry, 1987

Plate 4, Figures 1-2

1987 *Exophthalmocythere kidodensis* Rosenfeld and Gerry, in Rosenfeld *et al.*, 1987a, p. 264, pl. 5, fig. 5.

1987 *Exophthalmocythere? kidodensis* Rosenfeld and Gerry, in Rosenfeld *et al.*, 1987b, p. 243, pl. 3, fig. 1.

Measurements (mm):

l	*h*	*w*
0.56	0.31	0.29
0.57	0.32	0.30

Remarks: This species was described from the Oxfordian in the Kidod Formation of Gebel Maghara, Sinai and Mount Hermon, Golan Heights

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PLATE 1

(Abbreviations: RV=right valve, LV=left valve, DV=dorsal view; AR=Goldberg's section, HAT=Eliezri's section).

Figs. 1-2. *Cytherella* aff. *index* Oertli.
1. LV, AR 609.
1. RV, AR 616.

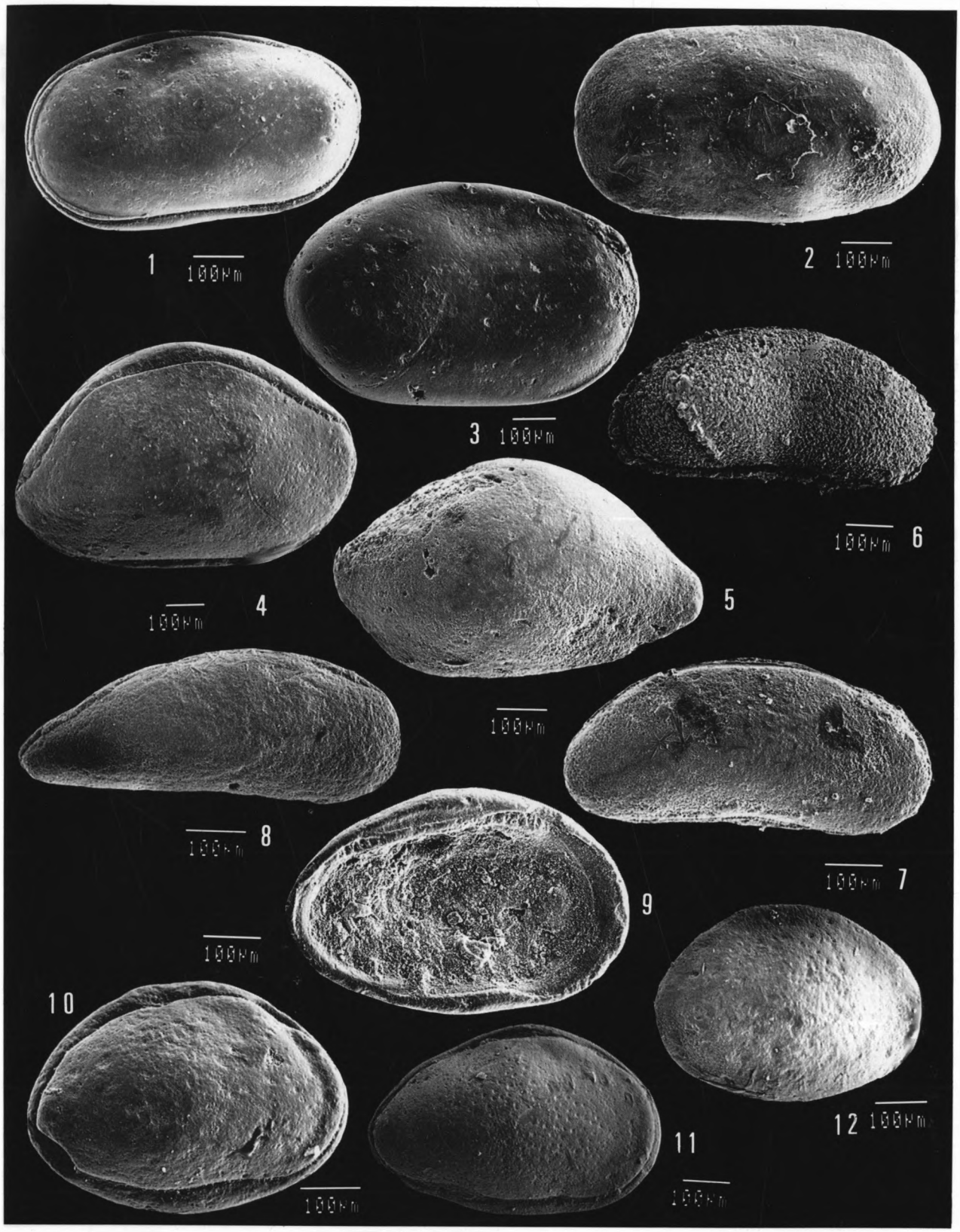
Fig. 3. *Cytherella index* Oertli.
RV, AR 661.

Figs. 4-5. *Bairdia* aff. *hilda* Jones.
4. RV, AR 661.
5. LV, AR 609.

Figs. 6-7. *Bythocypris* sp.
6. RV, HAT 92.
7. RV, AR 661.

Fig. 8. *Paracypris* sp.
RV, AR 670.

Figs. 9-12. *Praeschuleridea* sp.
9. LV, hinge, AR 609.
10. RV, AR 609.
11. RV, HAT 72.
12. LV, HAT 14.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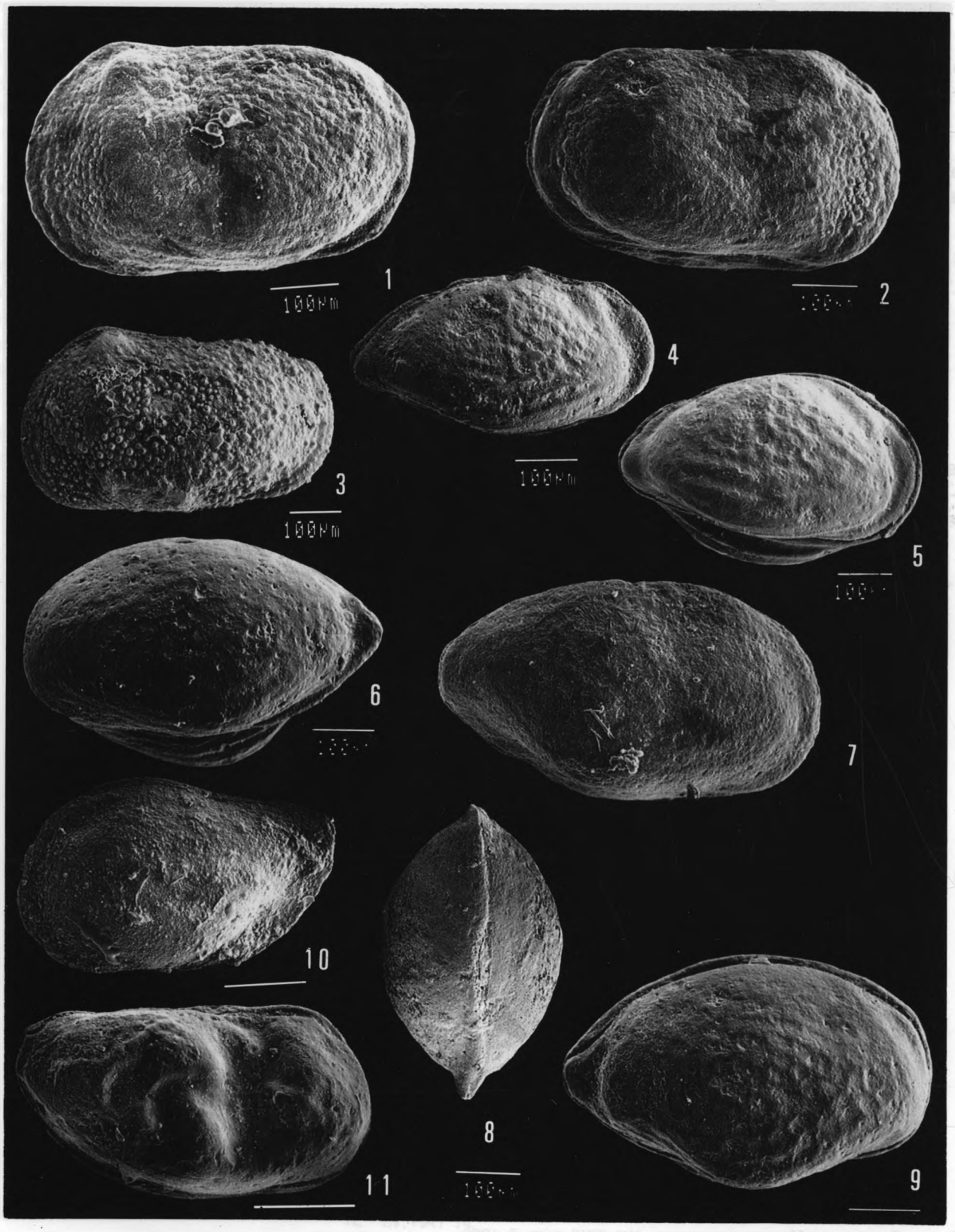
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(Rosenfeld *et al.*, 1987a and b). In the HaMakhtesh HaGadol section (Goldberg's section only) it was found in sediments of the Beer Sheva Formation.

Mental: Four carapaces.

Stratigraphic range: Oxfordian.

Genus **Ektyphocythere** Bate, 1963

Ektyphocythere zoharensis Rosenfeld and Gerry, 1987

Plate 4, Figures 3-6

1987 *Ektyphocythere zoharensis* Rosenfeld and Gerry, in Rosenfeld *et al.*, 1987a, p. 263, pl. 6, figs. 5-6.

1987 *Amicytheridea dierallaensis* (Basha), forme B, Depêche *et al.*, p. 232, pl. 3, figs. 13-16.

Measurements (mm):

l	*h*	*w*
0.58	0.34	0.37
0.59	0.38	0.38
0.46	0.31	0.31
0.61	0.34	0.36

Remarks: E. zoharensis was first described from the Callovian Zohar Formation in Gebel Maghara, Sinai within in the *E. zoharensis* (JJ-4) assemblage zone (Rosenfeld *et al.*, 1987a). It is reported also from Callovian strata of Saudi Arabia (Depêche *et al.*, 1987). In the HaMakhtesh HaGadol sections it is found in the Zohar and Beer Sheva Fms. in Goldberg's section and in the upper part of Eliezri's section. Therefore, the stratigraphical range of this species must be extended to the Oxfordian (JJ-4 and JJ-5 zones).

A regular, scattered distribution of normal pores can be observed in specimens with slightly eroded surface reticulation (pl. 4, fig. 6).

PLATE 2

Figs. 1-3. *Mandelstamia hirschi* n. sp.
1. LV, Holotype, AR 661.
2. RV, Paratype, AR 661.
3. LV, Paratype, HAT 68.

Figs. 4-5. *Progonocythere* aff. *parastilla* Whatley.
4. RV, HAT 55.
5. RV, HAT 55.

Figs. 6-9. *Micropneumatocythere laevireticulata* n. sp.
6. LV, Paratype, AR 616.
7. RV, Paratype, AR 670.
8. DV, Paratype, HAT 72.
9. RV, Holotype, AR 616.

Fig. 10 *Monoceratina* sp.
LV, HAT 55.

Fig. 11 *Bythoceratina* sp.
RV, HAT 55.

Material: About thirty five carapaces and valves.

Stratigraphic range: Callovian-Oxfordian.

Genus **Oligocythereis** Sylvester-Bradley, 1948

Oligocythereis aff. **fullonica** (Jones and Sherborn), 1988

Plate 4, Figure 7

1966 *Oligocythereis* aff. *fullonica* (Jones and Sherborn), Oertli, in Maync, pl. 9, figs. 16-18.

1987 *Oligocythereis* aff. *O. fullonica* (Jones and Sherborn), Rosenfeld *et al.*, 1987a, p. 264, pl. 5, fig. 7.

1987 *Oligocythereis* aff. *O. fullonica* (Jones and Sherborn), Depêche *et al.*, p. 238, pl. 5, figs. 20-21.

Measurements (mm):

l	*h*
0.46	0.31

Remarks: This species has a wide stratigraphical range: It was recorded from the Bathonian of Sinai (Rosenfeld *et al.*, 1987a), the Late Bathonian-Oxfordian of Israel (Maync, 1966) and the Callovian-Oxfordian of Saudi Arabia (Dêpeche *et al.*, 1987).

Material and distribution: Five carapaces from the Beer Sheva Formation in Goldberg's section and the middle and upper parts of Eliezri's section.

Stratigraphic range: Callovian-Oxfordian.

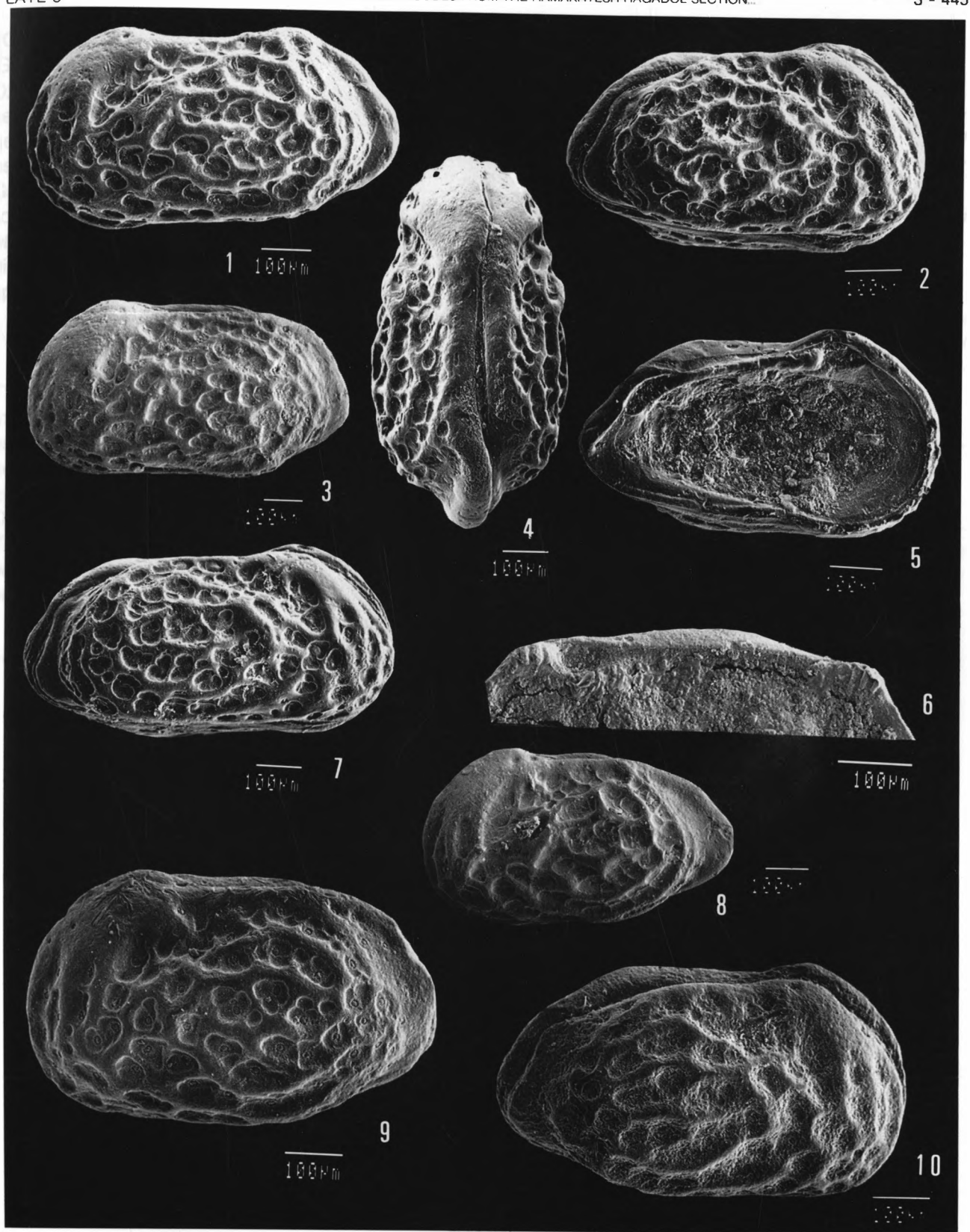
CONCLUDING REMARKS

According to the distribution of the shallow marine ostracodes in the HaMakhtesh HaGadol sections, a Callovian-Oxfordian age can be attributed to these strata. Diagnostic ostracode species for the Callovian *Ektyphocythere zoharensis* (JJ-4) and the Oxfordian *Exophthalmocythere? kidodensis* (JJ-5) assemblage zones were observed. In Goldberg's section, the base of the Oxfordian can be given by the first occurrence of *Exophthalmocythere? kidodensis* in sample AR 661 (Figure 2). This species was not found in the material from Eliezri's section, therefore the Callovian-Oxfordian succession in this sequence can not be divided by ostracodes (Figure 3). According to other fossils from these samples (see Picard and Hirsch, 1987), the base of the Oxfordian is placed above sample HAT 68.

Five of the here described ostracode species are also recorded from the subsurface of Israel

PLATE 3

Figs. 1-10. *Afrocytheridea faveolata* Bate.
1. LV, AR 609.
2. RV, AR 609.
3. LV, AR 609.
4. DV, AR 609.
5. LV, hinge, AR 616.
6. RV, hinge, HAT 55.
7. RV, AR 664.
8. LV, HAT 95.
9. LV, AR 664.
10. RV, AR 664.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(Oertli, in Maync, 1966). Two HaMakhtesh Ha-Gadol ostracode species were observed in the Oxfordian sediments from Mount Hermon (Rosenfeld *et al.*, 1987b), but there the assemblages represent deeper water environments. The ostracode assemblages of the HaMakhtesh Ha-Gadol exposure reveal certain similarities to Callovian and Oxfordian strata of Sinai (Rosenfeld *et al.*, 1987a: three common species) and Saudi Arabia (Depêche *et al.*, 1987: eight common species).

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PLATE 4

Figs. 1-2. *Exophthalmocythere? kidodensis* Rosenfeld and Gerry.
1. LV, AR 664.
2. RV, AR 664.

Figs. 3-6. *Ektyphocythere zoharensis* Rosenfeld and Gerry.
3. LV, AR 662.
4. RV, AR 662.
5. LV, AR 609.
6. LV, HAT 73.

Fig. 7. *Oligocythereis* aff. *fullonica* (Jones and Sherborn).
LV, HAT 55.

Fig. 8. *Progonocythere* sp.
RV, HAT 55.

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