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NEW JURASSIC FORAMINIFERA FROM EGYPT

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Two new genera *Paramigros* and *Abuhammadina* as well as 19 new species and subspecies were described from the subsurface Jurassic in the area east to the Nile Delta. They are benthic textulariin and millolilin forms representing 12 genera and 9 families.

Key words: Foraminifera, Jurassic, Egypt.

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INTRODUCTION

The aim of this paper is to show the new taxa from Jurassic deposits from the Abu Hammad well no. 1. Abu Hammad Jurassic well no. 1 lies about 13 km to the east south of Zagazig, east Nile Delta, Lat. 30° 24' 7.07" N. and Long. 31° 50' 4.39" E (fig. 1). The subsurface Jurassic succession in this well measures 2.341 m thickness and lies unconformably between pre-Jurassic and Cretaceous sediments. Abd-Elshafy and Ibrahim (1987) subdivided this succession into litho-, bio-, eco- and chronostratigraphic units (fig. 2); they identified 146 foraminiferal species from the microfaunal content of 815 washed rock samples, among these foraminifera seven species and one subspecies were new. Reinvestigation of the picked slides revealed the presence of two new genera and other 11 new species. All the new foraminifera recorded in 1987 and now are described, photographed by using the Scanning Electron Microscope and systematically arranged according to Loeblich and Tappan (1964, 1984).

The type slides of the described foraminifera are deposited in the Department of Geology, Zagazig University, Egypt (abbreviated ZU). The type locality of all described forms is Abu Hammad well no. 1.

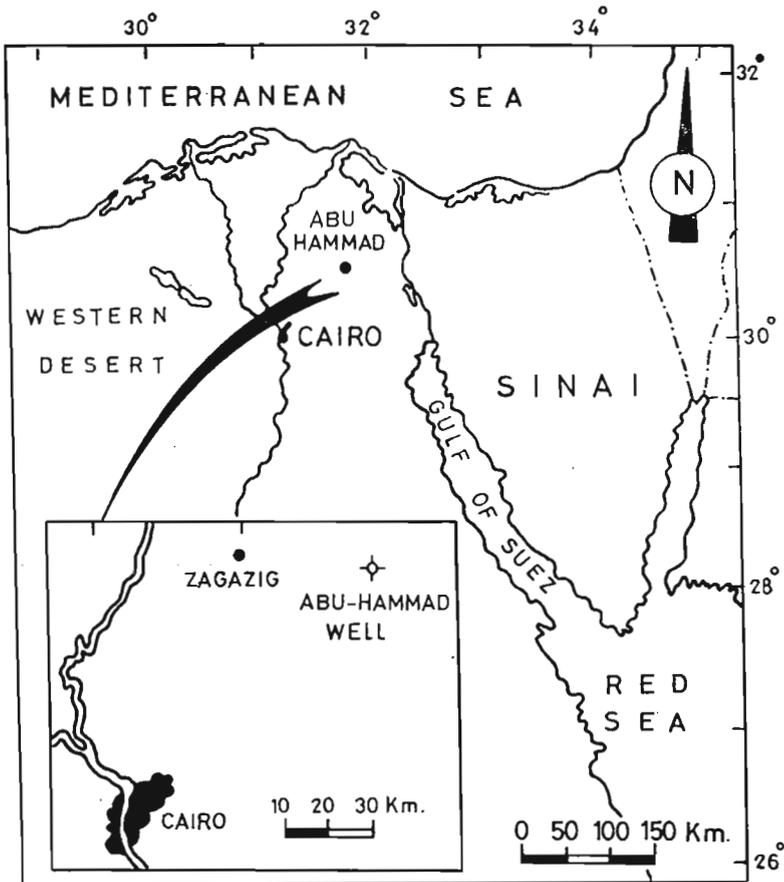


Fig. 1. Location map of Abu Hammad well no. 1.

DESCRIPTIONS

Order **Foraminiferida** Eichwald, 1830
 Suborder **Textulariina** Delage et Herouard, 1896
 Superfamily **Ammodiscacea** Reuss, 1862
 Family **Ammodiscidae** Reuss, 1862
 Subfamily **Ammodiscinae** Reuss, 1862
 Genus **Hemidiscus** Schellwien, 1898
***Hemidiscus faragi* sp. n.**

(pl. 1: 1a, b)

Holotype: ZU-J 1001; pl. 1: 1.

Type horizon: Bathonian.

Type locality: Abu Hammad well no. 1, depth 2.040 m.

Derivation of the name: in honour of Prof. I. A. M. Farag, author of the first thesis on the Egyptian Jurassic.

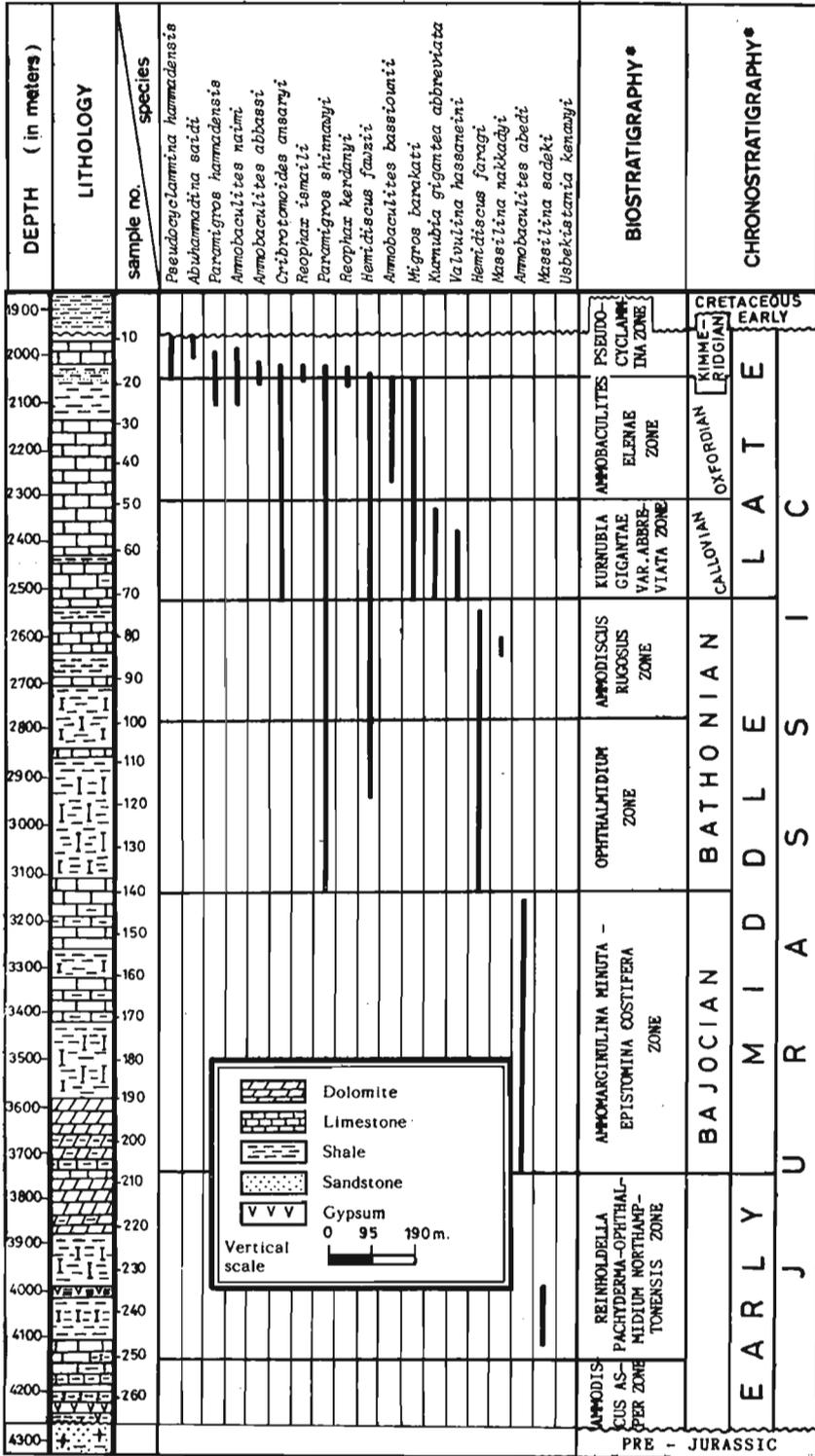


Fig. 2. Distribution of the new Jurassic foraminifera in the log of Abu Hamnad well no. 1. After Abd-Elsahfy and Ibrahim (1987).

Material. — 85 specimens.

Description. — Test free, small, discoidal, consisting of a proloculus followed by an undivided tubular chamber, planispirally coiled, forming 5 to 7 volutions, increasing rapidly in size, coiling in later volutions is irregular on one side; spiral sutures depressed, distinct in the outer volutions; wall finely arenaceous, surface weakly pitted, aperture circular at the end of the tubular chamber. Diameter of the test: 0.3 mm.

Remarks. — *H. faragi* differs from *Hemidiscus* sp. described by Bhalla and Abbass (1978) by the rapid increase in diameter of volutions and its weakly pitted wall; *H. sp.* is tentatively referred to the genus *Hemidiscus* (Bhalla and Abbass 1978).

Occurrence. — As for the holotype.

Hemidiscus fawzii sp. n.

(pl. 1: 2a, b)

Holotype: ZU-J 1002; pl. 1: 2.

Type horizon: Bathonian — Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2940 m.

Derivation of the name: in memory of the late Prof. M. E. Fawzi, an Egyptian paleontologist.

Material. — 73 specimens.

Description. — Test free, small, ovate in general outline, slightly biconcave, consisting of a proloculus followed by a tubular chamber increasing gradually in size, planispirally coiled in the early part becoming irregular on one side in the later part; it forms 6—7 volutions; periphery subrounded; spiral sutures distinct, depressed; wall arenaceous, finely cancellate; aperture ovate at the end of the tube. Diameter of the test: 0.25 mm.

Remarks. — This species differs from *H. faragi* sp. n. by its ovoid aperture, biconcave test, gradually increasing tube and cancellate wall.

Occurrence. — As for the holotype.

Subfamily *Usbekistaninae* Vyalov, 1968

Genus *Usbekistania* Suleymanov, 1960

Usbekistania kenawyi sp.n.

(pl. 1: 3a, b)

Holotype: ZU-J 1003; pl. 1: 3.

Type horizon: Middle part of the Lias.

Type locality: Abu Hammad well no. 1, depth 4.110 m.

Derivation of the name: in honour of Prof. A. I. Kenawy, the outstanding Egyptian micropaleontologist.

Material. — 6 specimens.

Description. — Test free, small, consisting of proloculus and an undivided tubular second chamber, spirally coiled along vertical axis with a final stage planispirally coiled in the plane superperpendicular to the axis; spiral sutures deep throughout the test; wall finely agglutinated, surface smooth; aperture circular to ovate at the end of the tube. Maximum diameter of the test: 0.25 mm.

Remarks.—The here presented Liassic form has a long spire and very large test in comparison with the Eocene *U. mubarekensis* Suleymanov (1960) which is the only form which can be compared.

Occurrence.—As for the holotype.

Superfamily **Hormosinacea** Haeckel, 1894

Family **Hormosinidae** Haeckel, 1894

Subfamily **Reophacinae** Cushman, 1910

Genus **Reophax** Montfort, 1808

***Reophax ismaili* sp. n.**

(pl. 1: 4; fig. 3: 1)

Holotype: ZU-J 1004; pl. 1: 4.

Type horizon: Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2.030 m.

Derivation of the name: in honour of Prof. M. M. Ismail, the outstanding Egyptian geologist.

Material.—22 specimens.

Description.—Test free of medium size, elongate; 3—4 chambers arranged uniserially, increasing rapidly in size as added, the final chamber is relatively large forming about half of the test, inflated and subcircular in cross-section; suture slightly depressed, curved, generally indistinct; wall coarsely agglutinated of rather well sorted grains, surface rough; aperture terminal, oval. The grains of the wall are mostly pellets, oolites and some organic fragments. Length of the test: 1.25 mm, breadth: 0.75 mm.

Remarks.—This species differs from other known *Reophax* species by its very coarsely agglutinated wall, large final chamber and rounded cross-section.

Occurrence.—As for the holotype.

***Reophax kerdanyi* sp. n.**

(pl 2: 1; fig. 3: 2)

Holotype: ZU-J 1005, pl. 2: 1.

Type horizon: Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2.090 m.

Derivation of the name: in honour of Prof. M. T. Kerdany, the Egyptian micropaleontologist.

Material.—19 specimens.

Description.—Test free, large; four to five large inflated chambers, in a straight uniserial arrangement, increasing gradually in size as added; sutures indistinct, slightly depressed, curved; wall finely to very coarsely agglutinated, with moderate amount of cement, surface rough; aperture terminal, elongate. Length of the test: 1.8 mm, breadth: 0.8 mm.

Remarks.—*R. kerdanyi* differs from *A. ismaili* by its large size, elongate aperture, more cement in mineral wall composition and the gradually increasing chambers.

Occurrence.—As for the holotype.

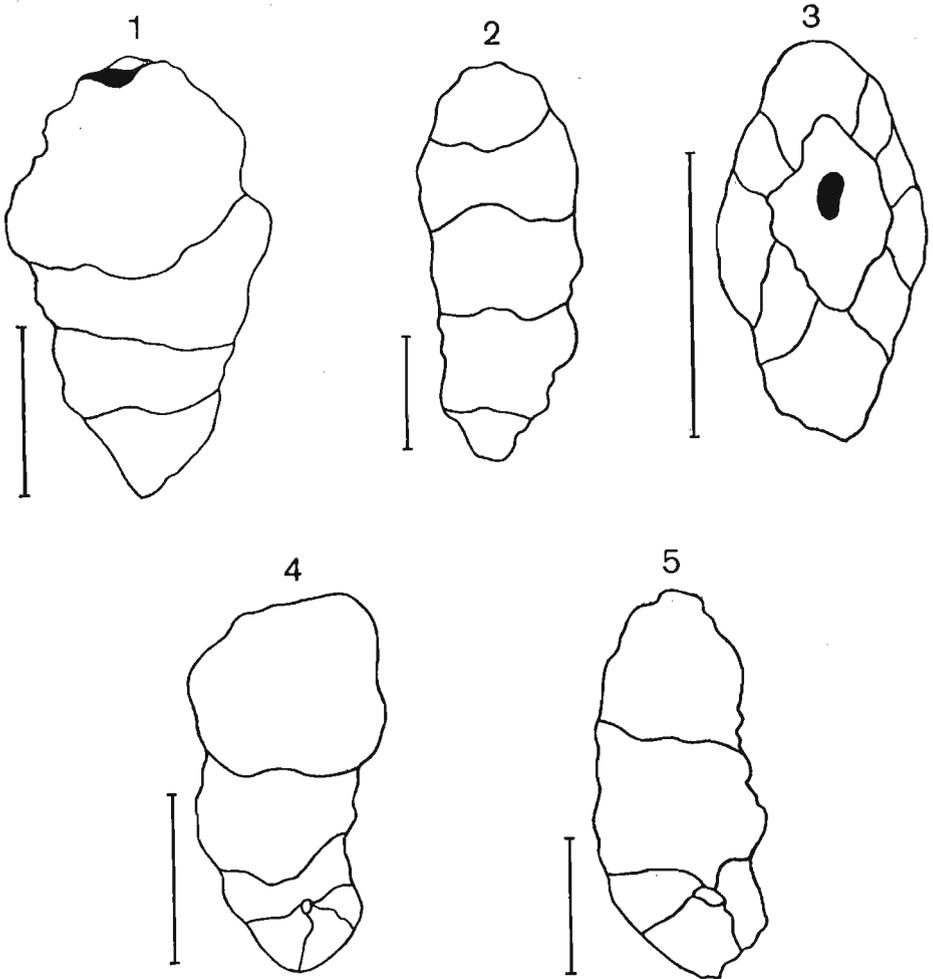


Fig. 3. Arrangement of chambers in the following species: 1 *Reophax ismaili*, side view; 2 *R. kerdanyi*, side view; 3 *Cribrostomoides ansaryi*, apertural view; 4 *Ammobaculites abedi*, side view; 5 *A. naimi*, side view. Scale bar 0.5 mm.

Superfamily **Lituolacea** de Blainville, 1827

Family **Haplophragmoididae** Maync, 1952

Genus *Cribrostomoides* Cushman, 1910

Cribrostomoides ansaryi sp.n.

(pl. 2: 2a, b; fig. 3: 3)

Holotype: ZU-J 1006, pl. 2: 2.

Type horizon: Callovian — Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 1.990 m.

Derivation of the name: in honour of Prof. S. E. Ansary, one of the pioneers in Egyptian micropaleontology.

Material. — 66 specimens.

Description. — Test of medium size, globose to oval in shape; almost completely planispirally involute, with a tendency to be trochospiral, i.e. partially evolute in the last half of the final whorl, which consists of 4—6 inflated, irregularly triangular chambers; sutures curved, slightly depressed; periphery subrounded, lobulate; wall coarsely arenaceous; aperture nearly ovate at the center of the apertural face. Length of the test: 0.9 mm, maximum diameter: 0.6 mm.

Remarks. — This form is similar to *Cribrostomoides canui* (Cushman) (see Gordon 1962) in type of coiling, position and shape of aperture, but differs in possessing oval shape, lower number of chambers, more coarsely arenaceous wall and lobulate periphery.

Occurrence. — As for the holotype.

Family *Lituolidae* de Blainville, 1827
Subfamily *Ammomarginulininae* Podobina, 1978
Genus *Ammobaculites* Cushman, 1910
Ammobaculites abbassi sp.n.
(pl. 2: 3a, b)

Holotype: ZU-J 1007; pl. 2: 3.

Type horizon: Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 2.000 m.

Derivation of the name: in honour of Prof. H. L. Abbass, the outstanding Egyptian paleontologist.

Material. — 32 specimens.

Description. — Test of medium size, compressed, highly lobate giving a rose-shaped outline, planispirally involute, tending to be uniserial; the last whorl consists of four chambers, typically sector-shaped in outline, increasing gradually, and another pear-shaped chamber completing the whorl, and having a uniserial appearance; the last chamber has more than 1/3 the width and half the length of the test; periphery subrounded, wall granular with distinct amount of cement and moderately smooth surface; sutures nearly straight, depressed; aperture rounded with a pronounced neck and rough lip, at the terminal of last chamber. Length of the test: 1.2 mm, diameter of the planispiral part: 1 mm, length of the uniserial part: 0.8 mm.

Remarks. — The rose-like shape, pronounced granular neck and shape of chambers distinguish this form from other *Ammobaculites* species.

Occurrence. — As for the holotype.

Ammobaculites abedi sp. n.
(pl. 2: 4; fig. 3: 4)

Holotype: ZU-J 1008; pl. 2: 4.

Type horizon: Bajocian.

Type locality: Abu Hammad well no. 1, depth 3.650 m.

Derivation of the name: in honour of Prof. M. M. Abed, the distinguished Egyptian paleontologist.

Material. — 13 specimens.

Description. — Test free, large; early portion planispirally involute consists of 3 chambers; later portion uniserial, formed of 2 inflated chambers, the last chamber is pyriform and increases rapidly occupying 1/2 the test; periphery slightly lobulate; sutures faint, curved; wall arenaceous with coarse grains and distinct amount of cement; aperture terminal, rounded. Length of the test; 1.00 mm, width: 0.70 mm.

Occurrence. — As for the holotype.

Ammobaculites bassiounii sp. n.

(pl. 2: 5a, b)

Holotype: ZU-J 1009; pl. 2: 5.

Type horizon: Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2.080 m.

Derivation of the name: in honour of Prof. M. A. Bassiouni, the outstanding Egyptian micropaleontologist.

Material. — 14 specimens.

Description. — Test free, large, consisting of 4–5 compressed chambers forming the planispiral part, followed by 3 inflated chambers in the uniserial part; wall is nearly uniform, medium grained; sutures straight, depressed in the planispiral part and slightly curved, depressed in the uniserial portion; last chamber is pear-shaped; aperture terminal, central and crescent. Length of the test: 1.8 mm, width: 1 mm.

Remarks. — This species is closely similar to *Ammobaculites coprolithiformis* (Schwager) (see Gordon 1962) but differs in having a very distinct crescent aperture.

Occurrence. — As for the holotype.

Ammobaculites naimi sp. n.

(pl. 2: 6; fig. 3: 5)

Holotype: ZU-J 1010; pl. 2: 6.

Type horizon: Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2030 m.

Derivation of the name: in honour of Prof. A. A. Naim, the outstanding Egyptian paleontologist.

Material. — 22 specimens.

Description. — Test free, large, elongate; early planispiral portion consists of 2–3 chambers followed by 2 uniserial chambers increasing gradually in size as added; sutures indistinct, slightly depressed; wall very coarsely arenaceous, resulting in a very rough surface; aperture terminal, slightly ovate. Length of the test: 2 mm, width: 0.9 mm.

Remarks. — This species differs from *A. abedi* sp. n. in having a larger test, chambers increasing gradually, more rough test surface and in lacking a pyriform last chamber.

Occurrence. — As for the holotype.

Subfamily *Choffatellinae* Maync, 1958
 Genus *Pseudocyclammia* Yabe et Hanzawa, 1926
Pseudocyclammia hammadensis sp. n.
 (pl. 3: 1a, b)

Holotype: ZU-J 1011; pl. 3: 1.

Type horizon: Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 1980 m.

Derivation of the name: after the Abu Hammad area.

Material. — 82 specimens.

Description. — Test large, moderately compressed, planispirally involute with a deep, moderately wide umbilicus at one side; the last whorl consists of 7—9 triangular, moderately wide chambers; the sutures are distinct, depressed and sigmoidal in shape; periphery subrounded, lobate; agglutinated wall with outer imperforate layer and cancellate surface; aperture is formed of large pores loosely distributed on the narrow apertural face. The maximum diameter of the test: 1 mm.

Remarks. — This species can be easily distinguished from *P. jaccardi* (Schrodet 1894) and *P. powersi* (Redmond 1964) by its wide chambers and strongly lobate periphery, and from *P. ukrainica* Dain (1958) by its more compressed test, wide and deep umbilicus and more lobate periphery.

Occurrence. — As for the holotype.

Genus *Abuhammadina* gen. n.

Type species: *Abuhammadina saidi* sp. n.

Derivation of the name: after Abu Hammad area.

Diagnosis. — Test of medium size, trochospiral, shallow concavo-convex; having a cribrate, umbilical-extraumbilical aperture.

The genus is monotypic.

Geographical and geological range. — As for the type species.

Comparison. — This genus is similar to *Pseudocyclammia* Yabe et Hanzawa, 1926, and *Everticyclammia* Redmond, 1964, in the structure of the wall of the test but differs in having a typical trochospiral coiling and umbilical-extraumbilical aperture.

Abuhammadina saidi sp. n.

(pl. 3: 2a b c)

Holotype: ZU-J 1012; pl. 3: 2.

Type horizon: Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 1.960 m. z

Derivation of the name: after Prof. R. Said, eminent Egyptian paleontologist.

Material. — 8 specimens.

Description. — Test free, slightly compressed, unequally biconcave, trochospiral; dorsal side evolute, consists of two whorls with 4 visible chambers in the first whorl, 7—8 distinct chambers appear in the second whorl as the case in the involute ventral side; chambers are triangular and moderately high; sutures distinct, depressed, slightly sigmoidal; periphery lobulate, subrounded; wall agglutinated with outer

imperforate layer, thick, with coarse epidermal structure; aperture cribrate, as a group of pores irregularly scattered over the apertural face of the last chamber and extending to become umbilical-extraumbilical. The diameter of the test: 1 mm; other individuals reach to 1.25 mm in diameter.

Occurrence. — As for the holotype.

Superfamily Verneuilinacea Cushman, 1911

Family Verneulinidae Cushman, 1911

Genus *Migros* Finlay, 1939

Migros barakati sp. n.

(pl. 3: 3)

Holotype: ZU-J 1013; pl. 3: 3.

Type horizon: Callovian — Oxfordian.

Type locality: Abu Hammad well no. 1, depth 2600 m.

Derivation of the name: in honour of Prof. Dr. M. G. Barakat, author of the first thesis on Jurassic foraminifera of Egypt.

Material. — 7 specimens.

Description. — Test elongate, twisted, tapering toward the beginning, ovate in section; earlier triserial part consists of 5 rows of chambers forming 2/3 of the entire test; later biserial part consists of 2 pairs of chambers, increasing gradually in size as added; sutures distinct, depressed; wall finely arenaceous, smoothly finished; aperture elongate, loop-shaped extending on the apertural face. Length of the test: 0.4 mm, maximum width: 0.2 mm.

Remarks. — It differs from *M. magharaensis* (Said et Barakat, 1958) by its twisted test and larger triserial than biserial portion of the test.

Occurrence. — As for the holotype.

Genus *Paramigros* gen. n.

Type species: *Paramigros hammadensis* sp. n.

Derivation of the name: due to the similarity to the genus *Migros*.

Diagnosis. — Test free, elongate, begins as triserial then becomes biserial; wall arenaceous; aperture of semicircular-shape, occupying the lower half of the exposed part of the last chamber.

The genus is monotypic.

Remarks. — This genus can be distinguished from *Gaudryina* d'Orbigny, 1839 and *Migros* Finlay, 1939 in having a semicircular aperture extending from the base to the center of the last chamber.

Occurrence. — As for the type species.

Paramigros hammadensis sp. n.

(pl. 3: 4a, b, 5)

Holotype: ZU-J 1014; pl. 3: 4, 5.

Type horizon: Oxfordian — Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 2020 m.

Derivation of the name: after the Abu Hammad area.

Material. — 30 specimens.

Description. — Test small, elongate, tapering toward the initial end, greatest width near the apertural end; test begins as triserial then becomes biserial; the triserial part consists of four rows comprising 1/3 of the entire test; the biserial portion contains one row of chambers forming 2/3 of the entire test; chambers globose, increase gradually in size as added in the triserial part and increase suddenly in the biserial part; sutures distinct, depressed; wall arenaceous, smoothly finished; aperture semicircular occupying the lower half of the exposed part of the last chamber. Length of the test: 0.15 mm, maximum width: 0.1 mm.

Occurrence. — As for the holotype.

Paramigros shinnawii sp. n.

(pl. 4: 1, 2)

Holotype: ZU-J 1015; pl. 4: 1, 2.

Type horizon: Bathonian — Kimmeridgian.

Type locality: Abu Hammad well no. 1, depth 2.670 m.

Derivation of the name: in honour of Prof. A. El Shinnawi, the outstanding Egyptian geologist.

Material. — 93 specimens.

Description. — Test small, elongate, tapering toward the beginning, twisted; earlier triserial part consists of 5 rows of chambers forming 2/3 of the entire test; the biserial part consists of 2 rows of chambers; chambers globular, increasing gradually in size as added; sutures markedly depressed; periphery distinctly lobulate especially in the triserial portion; wall arenaceous, rather roughly finished; aperture semicircular occupying the lower half of the last chamber. Length of the test: 0.4 mm, maximum width: 0.15 mm.

Remarks. — This species differs from *P. hammadensis* sp. n. by its twisted test, larger size, rough wall surface and the triserial part equalling twice the biserial one reversing, in this respect, the case in *P. hammadensis*.

Occurrence. — As for the holotype.

Family *Valvulinidae* Berthelin, 1880

Genus *Valvulina* d'Orbigny, 1826

Valvulina hassaneini sp. n.

(pl. 4: 3)

Holotype: ZU-J 1016; pl. 4: 3.

Type horizon: Callovian.

Type locality: Abu Hammad well no. 1, depth 2.400 m.

Derivation of the name: in honour of Prof. A. M. Hassanein, the Egyptian biostratigrapher.

Material. — 48 specimens.

Description. — Test elongate, twisted, triangular in cross section, triserial with 7 rows of chambers increasing gradually in size; wall finely arenaceous; sutures depressed; aperture with a valvular tooth. Length of the test: 0.5 mm, maximum width: 0.3 mm.

Remarks. — It differs from *Valvulina ayounmusaensis* Osman et Hassanein, 1965 in having longer and twisted test and more gradually increasing chambers.

Occurrence. — As for the holotype.

Superfamily **Ataxophragmiacea** Schwager, 1877
 Family **Pfenderinidae** Smout et Sugden, 1926
 Subfamily **Kurnubiinae** Redmond, 1964
 Genus *Kurnubia* Henson, 1948
Kurnubia gigantea abbreviata subsp. n.
 (pl. 4: 4a, b)

Holotype: ZU-J 1018: pl. 4: 4.

Type horizon: Callovian.

Type locality: Abu Hammad well no. 1, depth 2.450 m.

Derivation of the name: abbreviatus (Lat.) — shortened, due to the smaller test than that in *Kurnubia gigantea gigantea* Ebeid.

Material. — 111 specimens.

Description. — Test small, elongate, trochospirally coiled, formed of about 8 whorls, last 2 whorls constitute about 2/3 of the whole test; chambers distinct, somewhat inflated, 4—6 in a whorl; sutures distinct, depressed, wall material agglutinated, consisting of a calcitic microskeletal remains (Hansen and Abd-Elshafy 1988); surface usually smooth with lustrous appearance exhibiting usually few chamberlet divisions: apertural face nearly flat with a porous plate, aperture concealed below the porous plate. Length: 1.1 mm, maximum diameter: 0.5 mm.

Remarks. — The present specimens fit the characters of the species defined by Ebeid (1969), but differ in smaller size representing about 25—50% the size of the holotype of *K. gigantea gigantea* Ebeid.

Occurrence. — As for the holotype.

Suborder **Miliolina** Delage et Hérouard, 1896
 Superfamily **Miliolacea** Ehrenberg, 1839
 Family **Miliolidae** Ehrenberg, 1839
 Subfamily **Miliolinae** Ehrenberg, 1839
 Genus *Massilina* Schlumberger, 1893
Massilina nakkadyi sp. n.
 (pl. 4: 5a, b)

Holotype: ZU-J 1017; pl. 4.

Type horizon: Bathonian.

Type locality: Abu Hammad well no. 1, depth 2.630.

Derivation of the name: in memory of the late Prof. S. E. Nakkady, the outstanding Egyptian micropaleontologist.

Material. — 5 specimens.

Description. — Test large, compressed, ovate in outline; early portion small quinqueloculine, later chambers added alternately on opposite sides representing 4/5 of the test; chambers of quinqueloculine portion are small and lobe-shaped,

the later added chambers are large, curved and nearly tubular; sutures rather indistinct and depressed; wall calcareous imperforate, surface cancellate; aperture oval at the end of last chamber. Length of the test: 0.75 mm, maximum width: 0.5 mm.

Occurrence.—As for the holotype.

Massilina sadeki sp. n.

(pl. 4: 6)

Holotype: ZU-J 1019; pl. 4: 6.

Type horizon: Bajocian—Bathonian.

Type locality: Abu Hammad well no. 1, depth 3.330 m.

Derivation of the name: in memory of the late Prof. H. Sadek, the leading Egyptian geologist.

Material.—11 specimens.

Description.—Test small, tapering at both ends, twisted, with cancellate surface; early portion quinqueloculine, later chambers added in one plane on alternative sides of the test; 5—6 elongate (tubular) chambers are visible on the two sides; periphery rounded; sutures distinct, depressed, curved; wall porcellaneous, dull in appearance; aperture at the end of the chamber. Length of the test: 0.4 mm, maximum width (at the center of the test): 0.20 mm.

Occurrence.—As for the holotype.

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NOWE TAKSONY OTWORNIC JURAJSKICH Z EGIPTU

Streszczenie

W wierceniach Abu Hammad 1, położonym na wschód od delty Nilu (fig. 1) stwierdzono występowanie utworów jurajskich o miąższości 2.341 m, które znajdują się w niezgodności sedymentacyjnej w stosunku do starszego podłoża i do nadległych osadów kredowych. Abd Elshafy i Ibrahim (1987) dokonali w tych utworach podziałów lito-, bio-, eko- i chronostratygraficznych (fig. 2) i zidentyfikowali 146 gatunków i podgatunków otwornic. Spośród tej fauny, w niniejszej pracy przedstawione zostały opisy 19 nowych gatunków i podgatunków bentosowych otwornic zlepieńcowatych (fig. 3; pls. 1—4), należących do 15 rodzajów z 11 rodzin, z czego dwa są nowe: *Abuhammadina* i *Paramigros*.

EXPLANATION OF PLATES 1—4

Plate 1

- 1ab. *Hemidiscus faragi* sp. n.: sample no. 19, specimen ZU-J 1001.
- 2ab. *Hemidiscus fawzyi* sp. n.: sample no. 118, specimen ZU-J 1002.
- 3ab. *Uzbekistania kenawyi* sp. n.: sample no. 247, specimen ZU-J 1003.
4. *Reophax ismaili* sp. n.: sample no. 17, specimen ZU-J 1004.

All in side view, scale bar 0.1 mm

Plate 2

1. *Reophax kerdanyi* sp. n.: sample no. 24, specimen ZU-J 1005, side view.
- 2ab. *Cribrostomoides ansaryi* sp. n.: sample no. 13, specimen ZU-J 1006, a side view, b edge view.
- 3ab. *Ammobaculites abbassi* sp. n.: sample no. 14, specimen ZU-J 1007, a side view, b edge view.
4. *Ammobaculites abedi* sp. n.: sample no. 197, specimen ZU-J 1008, side view.
- 5ab. *Ammobaculites bassiounii* sp. n.: sample no. 23, specimen ZU-J 1009, a side view; b edge view.
6. *Ammobaculites naimi* sp. n.: sample no. 17, specimen ZU-J 1010, side view.

Scale bar 0.5 mm

Plate 3

- 1ab. *Pseudocyclammina hammadensis* sp. n.: sample no. 12, specimen ZU-J 1011, a, b side view.
- 2abc. *Abuhammadina saidi* sp. n.: sample no. 10, specimen ZU-J 1012, a ventral view, b dorsal view, c thin section (light microscope, x'nicoles).
3. *Migros barakati* sp. n.: sample no. 80, specimen ZU-J 1013, side view.
- 4ab, 5. *Paramigros hammadensis* sp. n. specimens in side views; 4a, b holotype, sample no. 16, specimen ZU-J 1013; 5 sample No. 18, specimen ZU-J 1014.

Scale bar 0.5 mm if not stated otherwise

Plate 4

- 1, 2. *Paramigros shinnawii* sp. n.: 1 a specimen from sample no. 81, 2 holotype, sample no. 87, specimen ZU-J 1015.
3. *Valvulina hassaneini* sp. n.: sample no. 57, specimen ZU-J 1016.
- 4ab. *Kurnubia gigantea abbreviata* subsp. n.: sample no. 62, specimen ZU-J 1017, a, b opposite side views.
- 5ab. *Massilina nakkadyi* sp. n.: sample no. 83, specimen ZU-J 1018, a, b opposite side views.
6. *Massilina sadeki* sp. n.: sample no. 161, specimen ZU-J 1019.

All in side view, scale bar 0.1 mm if not stated otherwise

