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NEW PLANKTONIC FORAMINIFERA FROM THE SUBSURFACE CONIACIAN AND SANTONIAN OF SOUTHEASTERN IRAQ .

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ABSTRACT

Five new planktonic species , Heterohelix nakkadyi , Heterohelix pseudoguembeliniformis , Pseudoguembelina pseudocarinata , Ventilabrella tricamerata , Globigerinelloides carteri and two new subspecies , Sigalia carpatica sayyabi and Globotruncana concavata dentata from the Coniacian and Santonian of southeastern Iraq are described and their stratigraphic positions established .

INTRODUCTION

The type section designated to be in the BPC well Zubair no . 8 , in the Ad — Dibdibba gravel and and sand region (Dibdibba Formation) , just to the southwest of the village of Zubair , northwest of the head of the Arabian Gulf and about 25 km west of the Basrah city in southeastern Iraq . The section is stratigrap—

hically well represented and contains abundant planktonic foraminifera . Itconsist of the following Upper Cretaceous formations , Khasib , Tanuma , Sadi , Hartha , Qurna , and Tayarat formations.

Regarding the geomorpholoy and lithologic composition of the area and succession Macfadyen (1938) , Al -- Naqib (1967) and Darmoian (MS . a) publications are recommended .

Holotypes , Paratypes , and figured specimens are in the personal collection of the author and will be deposited in the Natural History Museum , Basrah , Iraq .

ACKNOWLEDGMENTS

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SYSTEMATIC PALEONTOLOGY

The classification employed here , with slight modification is taken from the " Treatise on Invertebrate paleontology , Part C Protista " , Loeblich and Tappan (1964) . Departure from this classification include the recognition of the genera Sigalia Reiss (1957) and , following Brown (1969) Ventilabrella Cushman (1928) .

Family HETEROHELICIDAE Cushman , 1927

Subfamily HETEROHELICINAE Cushman , 1927

Genus HETEROHELIX Ehrenberg , 1843

Heterohelix nakkadyi Darmoian n . sp .

Plate 1 , figues 1 — 3

Description : Test medium sized , biserial , moderately compressed , gradually expanding periphery in early stage slightly later strongly indented ; in apertural view periphery narrowly rounded ; initial chambers small , followed by 4 — 5 pairs of inflated , reniform chambers increasing slowly in size as added ; penultimate pairs of chambers nearly of the same size and shape , partially separated bp deepiy depressed median area ; sutures straight to slightly curved and depressed, much deeper in last portions ; wall calcareous,densely perforate ; peripheral margins coarsely and constantly striated or with perforations arranged in longitudinal lines ; aperture a high and narrow opening at the inner margin of the last chamber with perminent , well pronounced and thickened lips extending down to the penultimate chambers .

Dimensions of holotype : Length 0.40 mm . , width 0.27 mm.

Remarks : Heterohelix nakkadyi n. sp. is distinguished by its compressed test , a tendency to develop diverging adult chambers and its surface ornament . It is morphologically similar both to Güblerina cuvillieri Kikoine and Ventilabrella compressa van der Sius . It is separated from both by its regularly tapering test , ; striated surface ; early reniform later as wide as high chambers and by the absence of a true chamber divergence .

H . nakkdyi n. sp . is named after Dr . S. E, Nakkady late professor of Micropaleontology in Egypt .

Occurrence : Rare in the Tanuma and the lower part of the Sadi Formations .

G . renzi / H . pseudoguembeliniformis zone -- G . concavata subzone .

Heterohelix pseudoguembeliniformis Darmoian n . sp .

Plate 1 , figures 4 — 6 .

1967 Heterohelix sp . cf . Heterohelix moremani (Cushman) — PESSAGNO pl . 48 . figs . 7 — 8 , (not fig . 9).

Description : Test small , biserial , moderately compressed , about as long as broad , moderately tapering , maximum breadth at the last pair of chambers ; periphery indented throughout ; in apertural view periphery rounded ; chambers initially planispiral , followed by 6 pairs of inflated wider than high chambers which increase rapidly in size as added ; sutures strongly depressed , straight , oblique ; wall calcareous perforate ; surface smooth ; aperture a low arch on the inner margin of the last chamber bordered by well debeloped flap .

Dimensions of holotype : Length 0.28 mm . , width 0.12 mm .

Remarks : Heterohelix pseudoguembeliniformis n . sp . is morphologically similar to H . pulchra (Brotzen) but differs in having a lesser compressed and thicker test, inflated, non -- reniform chambers and straight , oblique sutures . It differs from H . moremani (Cushman) in its smaller size , sutural characters , arrangement and shape of chambers which increase regularly in size and in the possession of an apertural flap . The small specimens described by Pessagno (1967) as having low arched apertures , probably belong in the present species . They have inflated , wider than high chambers , straight oblique sutures and flap like apertural extentions .

H . pseudoguembeliniformis n. sp , may represent the transit--

ional stage through which H. pulchra (Brotzen) evolved from H. moremani (Cushman) .

Occurrence : Abundant in the Khasib and Tanuma formations . G. renzi / H . pseudoguembeliniformis zone .

Genus PSEUDOGUEMBELINA Bronnimann and Brown , 1953

Pseudoguemelina pseudocarinata Darmoian n. sp .

Plate 1 , figures 7 -- 9 ; plate 2 , figures 1 -- 2 .

Description : Test small , biserial , strongly , compressed , early stage rapidly later slowly tapering ; maximum breadth at the last pair of chambers ; periphery in very early stage entire later slightly in dented with keel -- like thickening of chambers margins ; periphery in apertural view subtruncated ; chambers initially plani-- spiral , minute and not inflated , followed by 5 pairs of rapidly increasing chambers ; last 2 -- 4 chambers large , slightly wider than high , subrectangular and inflated , in cross section perpendi-- cular to the axis of growth , chambers narrow , rhomboid , margins acute ; sutures in early stage flush , later deeply depressed and straight ; wall calcareous , finely perforate ; surface ornamented by equally distributed striae ; primary aperture a moderate sized opening at the base of the final chamber ; supplementary apertures in the adult stages along the median line sometimes covered by elongated thin apertural flaps .

Dimensions of holotype : Length 0.41 mm . , width 0 . 25 mm . , thickness 0.9 mm .

Main variation :

1 — Pseudokeel either partially developed or covering the

whole margin of the test .

3 — Chambers either symmetrical throughout or early slightly twisted .

Remarks : Pseudoguembelina pseudocarinata n . sp . is distin-- guished by its moderately to strongly compressed test keel -- like (pseudokeel) marginal thickening and entire early part ; subtru-- ncate periphery in apertural biew ; subrectangular chambers in laretal view and rhomboid in sectioned top view .

Ps . pseudocarinata n . sp . is morphologically similar to each of the following Heterohelix species , all of which appear at a stratigraphically younger level except the first which is older , H . planata (Cushman) . H. carinata (Cushman) . H, pachyma-- rginata Stenestad , H. globocarinata (Cushman) and H. glabrans (Cushman) . Compressed specimens of Ps . pseudocarinata resemble H. carinata (Cushman) but differ in having striae covering the whole surface of the test , keel -- like marginal thickening rather than a true keel and supplementary apertures between the abult chambers . However , since Cushman's description of H. carinata no one has made a detailed study of the type specimen . If the holotype is examined and found to have a wholly striated test surface , thickened peripheral margins and supplementary apertures, then it might be possible to include the present new species in its synonymy . Both H . planata (Cushman) and H . globocarinata (Cushman) are morphologically related to Ps . pseudocarinata , they differ in having less compressed and larger tests , rounded rather than rhomboid chambers in apertural view . The keel , if present restricted to the early portion . However , H . globocarinata has a strongly inflated and enlarged last pair of chambers ,

a larger primary aperture and has longer stratigraphic range . *H. pachymarginata Stenestad* shows limbate , raised sutures at least in its early stages ; a marginal keel -- like thickening restricted to the initial portion and formed by the extension of its raised limbate sutures along this part of the test . Furthermore , H . pachymarginata lacks the characteristic subtruncated periphery in apertural view .

Ps . pseudocarinata is more closely related to H : glabrans (Cushman) . The species agree in the apertural characteristics and to a lesser extent in those of the supplementary apertures . However , they have a different surface ornamentation and keel character . In addition , H . glabrans has a less compressed test and younger stratigraphic range .

The writer has feeling that H . glabrans (Cushman) and Ps . pseudocarinata n . sp , are from the same ancestral stock , namely H . planata stock . On the other hand , by smoothening the test surface , developing the marginal thickening into a true keel and development of supplementary apertures Ps . pseudocarinata might possibly have evolved into H . carinata .

Occurrence : Abundant in the Tanuma Formation . G. renzi / H . pseudoguebeliniformis zone . Very rare in the lower part of the Sadi Formation , G. concavata subzone .

Genus SIGALIA Reiss 1957

Sigalia carpatica Salaj and Samuel

Plate 2 , figures 4 -- 5

1955 Ventilabrella deflaensis (Sigal) . -- BETTENSTAEDT and WICHER , p . 11 , pl . 1, fig . 2 .

1957 Ventilabrella deflaensis (Sigal) . -- WICHER and

in its much more triangular test shape ; in its less coarse early costate ornamentation and less thickened and curved sutures .

S . carpatica has possibly evolved from S . deflaensis . This is suggested by their stratigraphical distribution and by the occur-- rence of several transitional forms .

Occurrence : rare in the upper part of the Tanuma Formation , abundant in the lower part of the Sadi Formation . G . renzi / H . pseudoguembeliniformis zone -- G . fornicata subzone .

Previous records of occurrence : Austria , Bavaria , France , and Morocco ,Coniacian -- Santonian ; Palestine , North Africa and West Carpathians , Santonian .

Sigalia carpatica sayyabi Darmoian n . subsp .

Plate 2 , figures 6 -- 9 .

Remarks : Subspecies differing from the typical in having 3 chambers in the last growth stage ; much more oblique , strongly raised , beaded sutures and much more strongly serrated margins .

S . carpatica sayyabi n . subsp . differs . from Ventilabrella tricamerata n. sp. (description follows) in having raised , beaded sutures , serrated periphery and flat subrectangular chambers .

This subspecies is named after Dr . A. Al -- Sayyab of the Iraq National Oil Company , Baghdad , Iraq .

Occurrence : Rare , in the uppermost part of the Tanuma and lower part of the Sadi formations . G . renzi / H . pseudoguembe-- liniformis zone -- G . concavata subzone .

Genus VENTILABRELLA Cushman 1928

Ventilabrella tricamerata Darmoian n . sp .

Plate 3 , figures 1 — 3 .

BETTENSTAEDT , p . 30 , text -- fig . 3a -- c .

1966 Sigalia carpatica SALAJ and SAMUEL , tab . 37 , fig . 2 .

Description : Test medium sized , compressed , flattened ; apical portion sharply pointed , followed by rapid expansion in breadth giving a fairly broad triangular outline ; peripheral outline in early stage entire , later serrated ; periphery in apertural view truncated , with two parallel keel -- like thickening enclosing a depressed band which often extends along both peripheral margins of the test joining the sutural extensions and giving the test a peripherally serrate appearance ; chambers in maximum nine pairs but normally seven pairs , biserially arranged , increasing rapidly but showing no divergence , first 3 pairs rather appressed , followed by subrectangular chambers ; sutures flush to slightly raised in early portion becoming more strongly raised , limbate and granular in later development with prominent beads ; wall calcareous , perforate except for the granulated parts and truncated margins ; surface coarsely ornamented in the early part , less rough to nearly smooth in the adult stage ; aperture a low opening on the inner margin of the last chamber .

Remarks : Sigalia carpatica Salaj and Samuel is morphologically resembles both S . deflaensis (Sigal) and S : carpatica sayyabi Darmoian (description follows) . It is distinguished from the first by its much more compressed test; flat and subrectangular chambers (as against the moderately inflated chambers of S. deflaensis) ; serrated margins ; truncated periphery ; haevier ornamentation in the early portion and strongly raised , beaded sutures . It differs from the second in lacking the third chamber between last pair ;

Description : Test small , compressed ; early stages of Guembelina type , biserial , adult chambers tending to become triserial in adding an extra third chamber between the last pair ; periphery slightly lobate ; periphery in apertural view narrowly rounded ; chambers 13 in number , moderately inflated , last pair with a third chamber which is rounded , compressed , level with the other two in lateral as well as apertural views ; individual chambers inflated , slightly wider than high ; sutures nearly straight , depressed , slightly oblique except the last pair which seems more curved and less oblique ; wall calcareous , perforate ; surface coarsely striate except in last three chambers , much more strongly so on peripheral margins , the striation fading out gradually towards apertural end ; aperture multiple .

Dimensions of holotype ; Length 0.28 mm . , width 0 . 20 mm., thick . 0.06 mm ,

Remark : Ventilabrella tricamerata Darmoian n. sp. differs from V . glabrata Cushman in having , three compressed chambers in the last portion instead of a proliferation of inflated chambers , and a blunt , longer rather than short apical end . It differs from V . eggeri Cushman in having a more compressed test and a striate rather than merely roughened surface .

V . tricamerata is distinguished from the morphologically similar V . ornatissima Cushman and Church (paratype figure 15) in having a more compressed test , three chambers in the adult stage and coarser surface ornament . It differs from Güblerina compressa (van der Slus) in lacking chambers of Güblerina type, in having the surface covered with medium to coarse striae , especially on the peripheral edges , (van der Slus did not mention the

surface character of his specimens but his figured form shows it smooth) . Furthermore , G . compressa has an aberrant chamber independently occupying the central nonseptate area , while the third chamber in the new species is a normal unit in a triserial stage .

As suggested by its morphologic features , V . tricamerata possibly evolved from S . deflaensis , later passing into V . ornati-- ssima on one side and . V . glabrata on the other hand ,

Occurrence : Rare specimens were found in the upper part of the Khasib Formation and abundant in the Tanuma Formation . G . renzi / H . pseudoguembeliniformis zone ,

Family PLANOMALINIDAE Bolli , Loeblich and Tappan , 1957

Genus GLOBIGERINELLOIDES Cushman and Ten Dam , 1948

Globigerinelloides carteri Darmoian n. sp.

Plate 3 , figures 4 -- 5

Description : Test medium sized , biumblicate , planispirally coiled ; periphery ovoid , moderately lobate ; axial periphery broadly rounded ; chambers 7 in the last whorl , the early ones of which are small , globular , slightly appressed while the last two are ovoid , strongly appressed,strongly compressed in a direc-- tion perpendicular to the apertural face , increasing regularly in size as added ; sutures straight , radial and depressed ; umbilici small and shallow ; wall calcareous , perforate ; surface finely hisped , the hispidity gradually decreasing towards the last chamber; aperture interiomarginal , equatorial , a rather low opening ; relict apertures hardly seen in holotype but in some well preserved

specimens they remain open in the umbilical region as supplementary apertures .

Dimensions of holotype : Length 0.30 mm . , width 0 . 22 mm . , maximum thickess (of last chamber) 0.20 mm . .

Main variation : The last two or three chambers usually are so compressed that they fuse and give the appearance of single chamber .

Remarks . Globigerinelloides carteri n . sp . is distinguished from Gl . asperum (Ehrenberg) by the character of its last two or three chambers ; the slow increase in chambers size and low arched apertural opening .

The holotype of Gl . ehrenbergi (Barr) differs from Gl . carteri in having a partially evolute test ; a greater number of chambers in the last whorl ; a nearly circular outline and sutures. In addition , its last two chambers are nither ovoidal nor appressed. The writer has examined the holotype of this species at the British Museum of Natural History , London .

Gl . carteri is similar to Gl . aissana (Sigal) , originally described from the Cenomanian of north Algeria as Globigerinella aissana . However , as the type description cortains no information about the surface ornamentation and chambers character , and as its sutures seem distinctly curved , this writer considers the two species to be distinct . This species is named after Mr. D. J. Carter, of the Imperial College of Science and Technology , London .

Occurrence : Rare in the upper part of the Khasib Formation, rare to abundant in the Tanuma and lower part of the Sadi formations . G . renzi / H . pseudoguembeliniformis zone -- G . concavata subzone .

Family GLOBOTRUNCANIDAE Brotzen 1942

Genus GLOBOTRUNCANA Cushman 1927

Gltbotruncana concavata concavata (Brotzen)

1934 Rotalia concavata BROTZEN . -- P . 66 . pl.3 , fig , 6 ,

1957 Globotruncana concavata (Brotzen) . -- BOLLI . p . 57 , pl.13 . figs . 3a -- c .

Occurrence : Very abundant in the lower part of the Sadi Formation .

G . concavata subzone .

Previous record of occurrence : The Coniacian of the Isle of Wight (England) and Cuba ; the Upper Coniacan -- Santonian of Algeria and Jamaica ; the Lower Santonian of Tunisia and Italy ; the Santonian of Trinidad , Switzerland , France , West Carpathians and Madagascar and the Campanian -- Santonian of Palestine .

As stated by Esker (1969) , other reports concerning the occurrence of G . concavata (Brotzen) in younger beds (Campanian or Masestrichtian) need re -- examination .

Globotruncana concavata dentata Darmoian n . subsp .

Plate 3 , figures 6 -- 9 .

Description ; Test medium sized , planoconvex , coiled in a very low trochospire : spiral side flat , umblilcal side strongly convex ; equatorial periphery quadrilobate , moderately lobate with two closely spaced , delicately beaded marginal keels , the lower keel diverges umbilically at the last chamber and forms delicate umbilical ridges , the upper keel diverges onto the spiral side of the test at the late portion of each chamber and is embedded in the sutural

depressions ; axial periphery truncated;chambers on the spiral side 11 , arranged in 2½ whorls , the initial chambers are small , very slightly protruding , globigerine , followed by slightly larger chambers ; the last whorl is composed of 4 , larger , crescentic shaped , slightly inflated , slightly overlapping chambers , increasing rather rapidly in size as added ; each chamber has an angular extension of the peripheral margin resembling a spine which is usually well developed on the first chamber of the last whorl ; only chambers of the last whorl visible from the convex umbilical side , strongly protruding , inflated and trunco -- conical in shape ; sutures on the spiral side distinct , slightly curved , depressed ; on the umbilical side the sutures are limbate , radial and depressed; umbilicus small , shallow , surrounded by delicately beaded ridges ; wall calcareous , perforate except for the imperforate keels and peripheral band surface finely hisped on both the spiral and the umbilical sides ; primary aperture interiomarginal , umbilical ; tegilla with accessory apertures only poorly preserved .

Dimensions of holotype : Length 0.47 mm . , Width 0 . 37 mm . , thickness (of last chamber) 0. 19 mm . .

Main variation :

1 — The spiral side is either flat , very slightly raised or concave .

2 — The periumbilical keel is either slightly or moderately developed .

Remarks ; Concave specimens of G . concavata dentata n . subsp . resemble G . concavata repanda Bolli in the test shape . number of chambers and the surface ornamentation , but differ in having a smaller test size , a small umbilicus , spine -- like marginal

projection and chambers in the last whorl which are elongated and increase rather rapidly in size . Moreover , the early chambers of the last whorl in G . concavata repanda are strongly inflated . spherical to subspherical in shapes and strongly sloping towards the central area .

Occurrence : Rare in the lower part of the Sadi Formation. G . concavata subzone .

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PLATE 1

1 — 3 Heterohelix nakkadyi n. sp .

1 , X 80 , holotype , Tanuma Formation .

2 , X 85 , paratype , Tanuma Formation .

3 , X 105 , paratype , Tanuma Formation .

4 — 6 Heterohelix pseudoguembelinformis n . sp .

4 , X 110 , holotype , Khasib Formation .

5 , X 115 , paratype , Khasib Formation .

6 , X 95 , paratype , Khasib Formation .

7 — 9 Pseudoguembelina pseudocarinata n . sp .

7 , X 90 , holotype , Sadi Formation .

8 , X 102 , holotype , Sadi Formation .

9 , X 150 , paratype , Sadi Formation .

PLATE 2

1 — 2 Pseudoguembelina pseudocarinata n . sp .

X 135 , paratype , Sadi Formation .

3 Pseudoguembelina sp. cf. Ps. pseudocarinata .

X 125 , Sadi Formation .

4 — 5 Sigalia carpatica Salaj and Samuel .

X 110 , Sadi Formation .

6 — 9 Sigalia sayyabi n . subsp .

6 , X 110 , holotype , Sadi Formation .

7 , X 100 , holotype , Sadi Formation .

8 , X 97 , paratype , Sadi Formation .

9 , X 125 , paratype , Sadi Formation .

PLATE 3

1 — 3 Ventilabrella tricamerata n . sp .

1 — 2 , X 145 , holotype , Khasib Formation .

3 , X 150 , paratype , Khasib Formation .

4 — 5 Globigerinelloides carteri n. sp .

4 , X 125 , holotype , Tanuma Formation .

5 , X 187 , paratype , Tanuma Formation .

6 — 9 Globtruncana concavata dentata n . subsp .

6 , X 85 , holotype , Sadi Formation .

7 , 8 , 9 , X 85 , paratypes , Sadi Formation .

Note : The magnifications stated above are not correct because of the reduction in size of the plate occurred at the press .

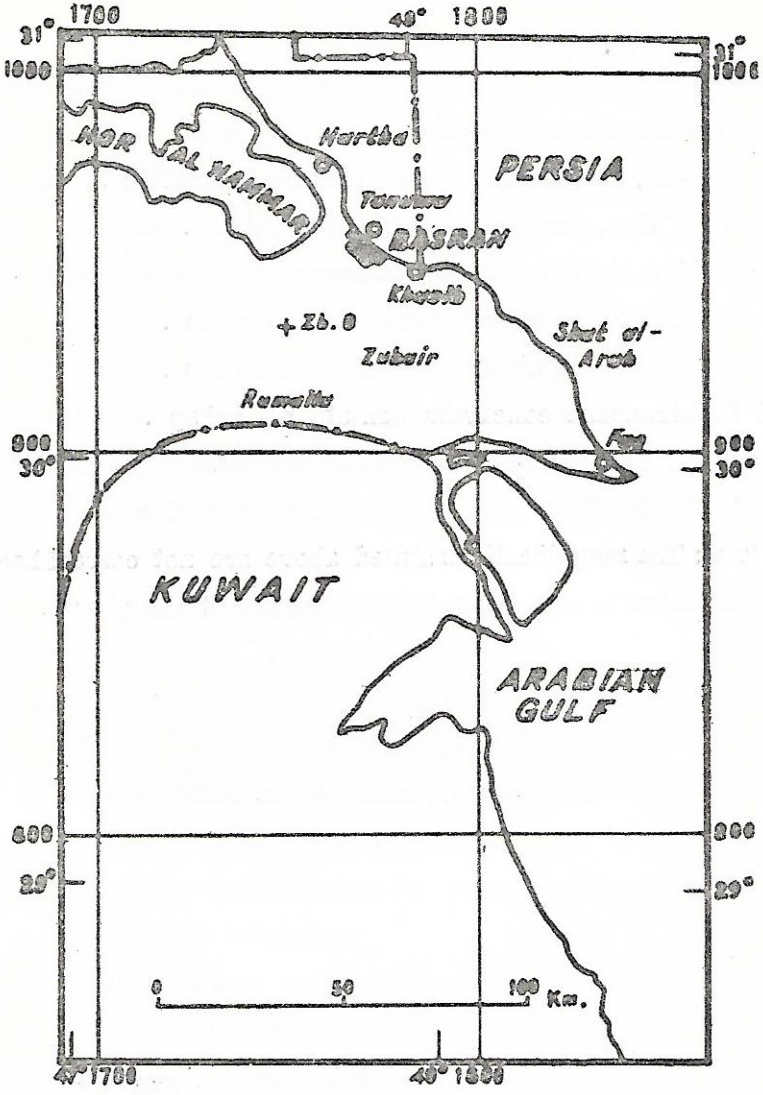
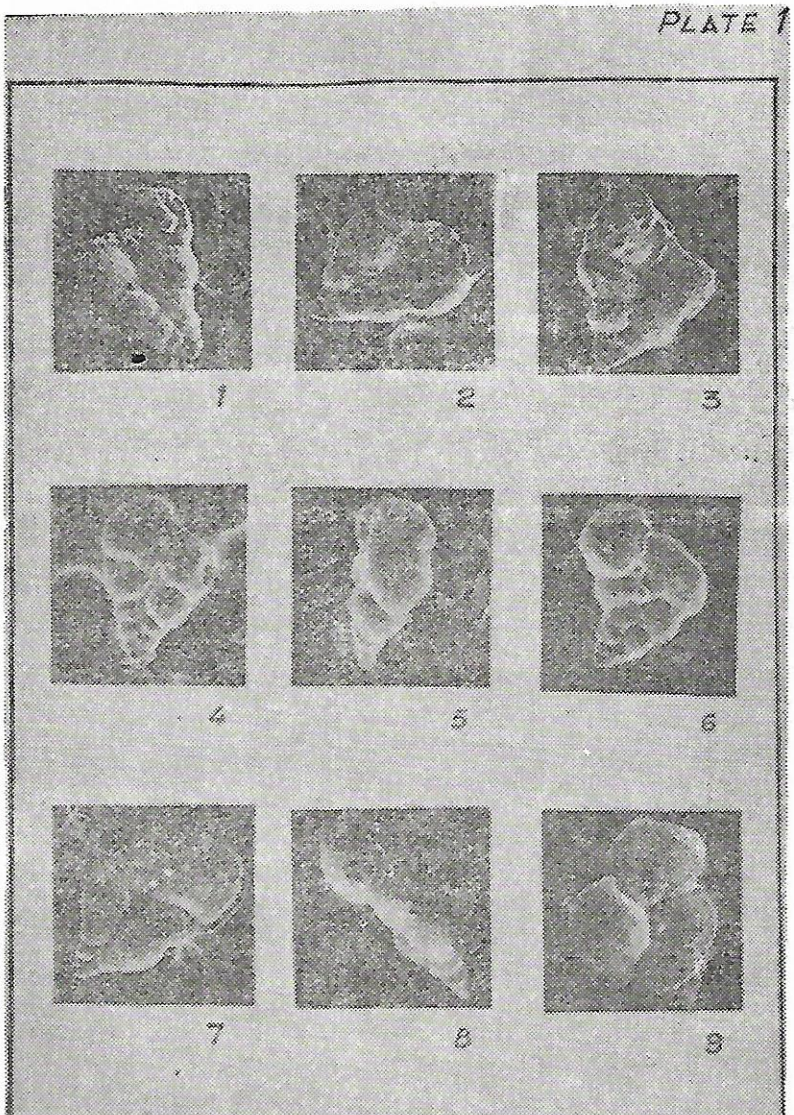


FIG. 2.
Map of southeastern Iraq showing the Position of the B.P.C. well Zubair No. 8.

PLATE 1



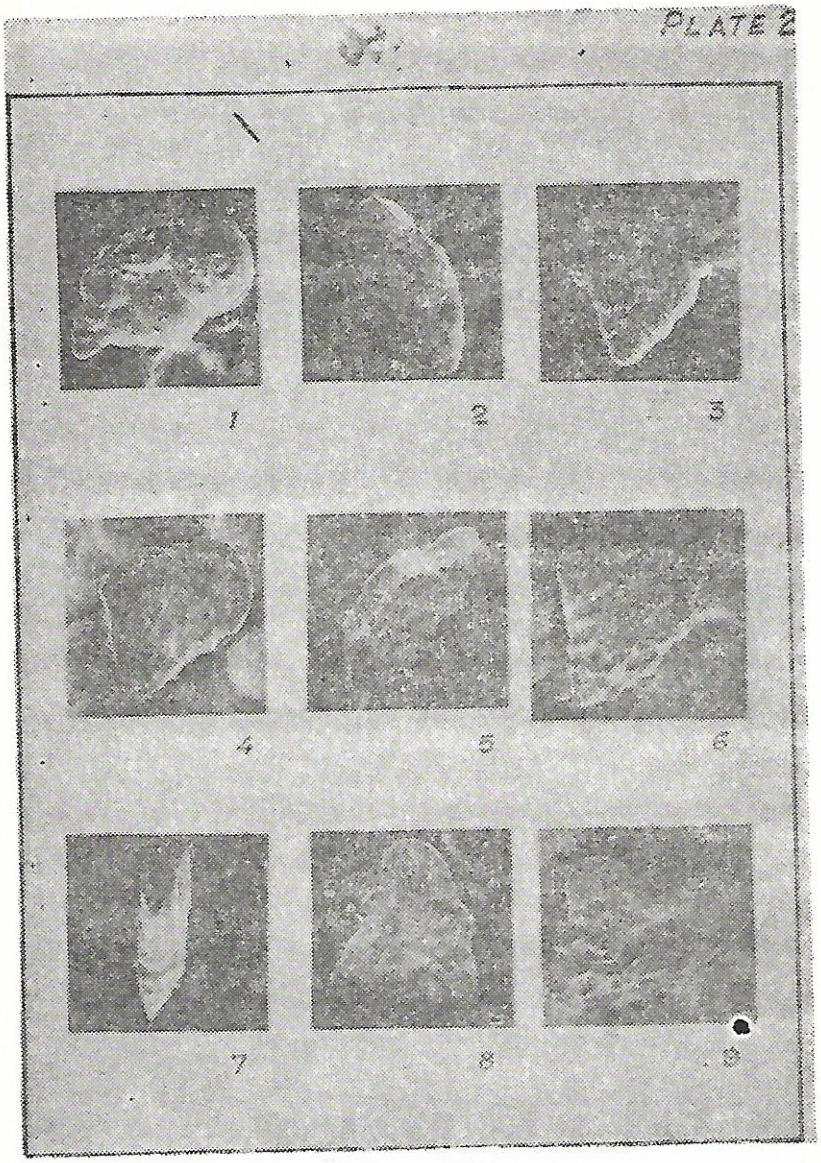


PLATE 2
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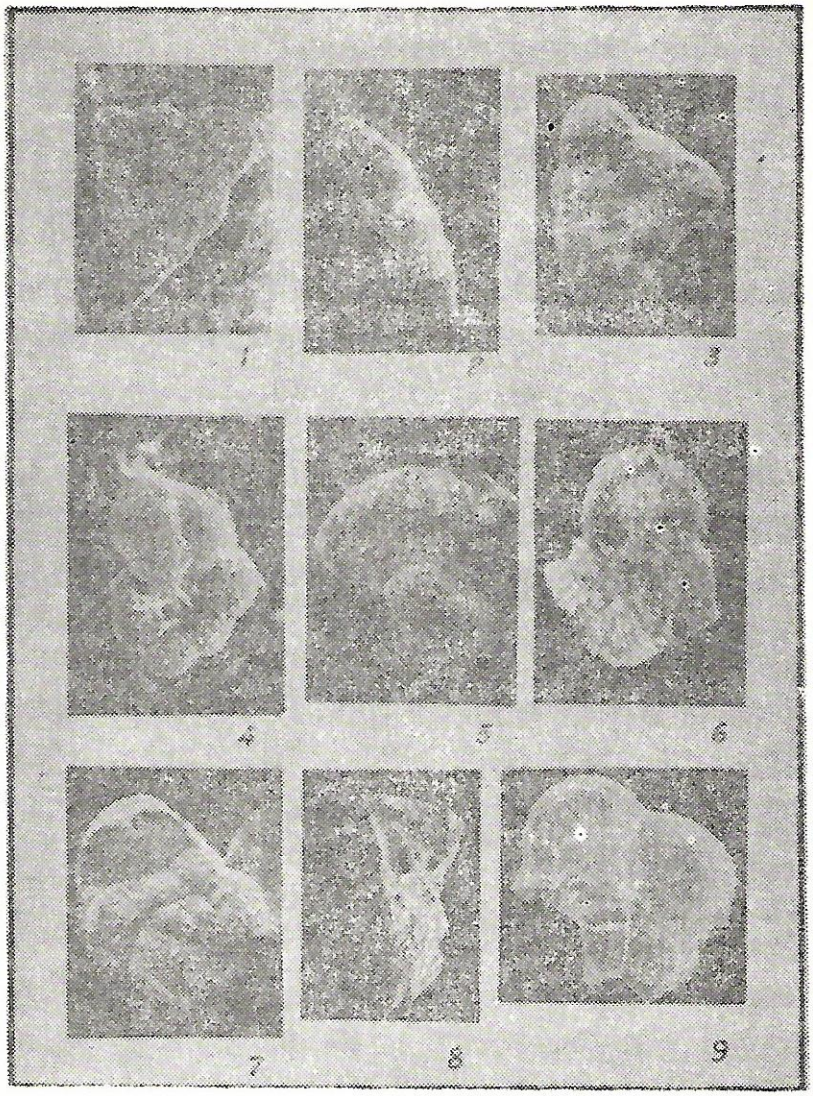
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