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Danian ostracodes from Tunisia

ABSTRACT

Eleven new species of ostracodes are named and described from the Zebbeus Formation near Le Kef, Tunisia. The samples studied were from the Danian part of the Zebbeus Formation, the Danian age being based on the foraminifers contained in the samples. The ostracode fauna appears to be more closely related to northern European late Maastrichtian faunas than to other previously described African ostracode faunas.

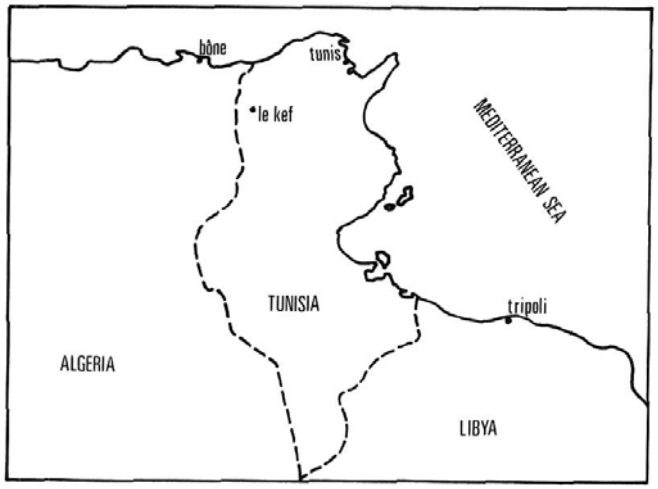
INTRODUCTION

Ostracodes from samples dated as Danian in age were obtained from the vicinity of Le Kef, Tunisia, North Africa. The outcrop studied is located in the Oued R'mel southwest of Le Kef in northwestern Tunisia (see text-figures 1 and 2). In this valley occur steeply dipping beds ranging in age from middle Maastrichtian to Paleocene. The upper Maastrichtian and the Paleocene marls, including a few marly limestone beds, belong to the Zebbeus Formation, which is the equivalent of the El Haria Formation of central and southern Tunisia.

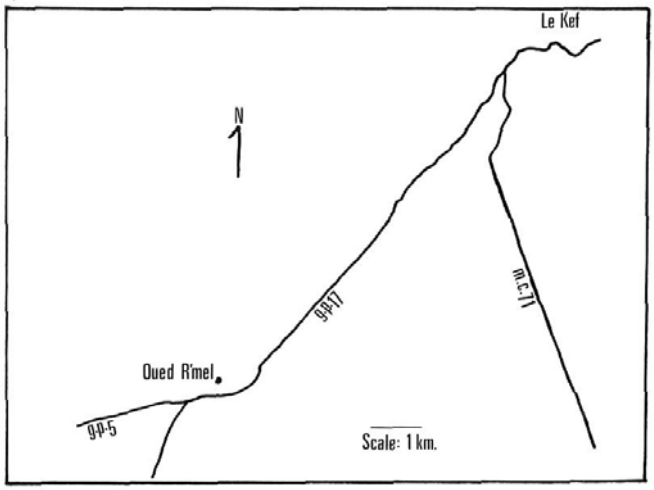
DISCUSSION OF FAUNA

Samples from the upper Maastrichtian marls contain mostly planktonic foraminifers. Samples from the lower part of the Danian section contain *Globigerina daubjergensis* Brönnimann, *Globigerina triloculinoides* Plummer, *Globorotalia pseudobulloides* (Plummer) and *Globorotalia trinidadensis* Bolli. Few benthonic foraminifers occur with them, and the ostracode fauna consists almost entirely of complete carapaces of smooth or finely punctate species. Higher up, in the zone of *Coleites reticulosus* (Plummer), the more ornamented ostracode species appear with a predominantly benthonic foraminiferal fauna. This is at and above the marly limestone beds. The water depth in this depositional area appears to have become shallower after the end of the Maastrichtian.

Twenty species of ostracodes which were found in the samples are illustrated. Additional species were found but, due to their rare occurrence, were not described or illustrated. Many of the individual specimens are recrystallized and consist of complete carapaces. This has made the study of these species difficult and has sometimes obscured important features. From these twenty species, eleven new species are described and named. Only three species appear to have been described previously: *Bairdia septentrionalis* Bonnema, 1941, and *Paracypris jonesi* Bonnema, 1941, from the late Maastrichtian of Holland and *Costa? warriensis* (Reyment, 1963) reported from the Danian of Nigeria and Libya. The fauna seems to be more closely related to the northern European late Maastrichtian faunas than to the previously described African ostracode faunas. This would suggest that there may have been a marine connection between the North Sea Basin and the Tethys during the Danian. Future work on African ostracodes may yield more information on the possible existence of this marine connection and faunal migration route.



TEXT-FIGURE 1
Index map showing the location of Le Kef in northwestern Tunisia.



TEXT-FIGURE 2
Sketch map showing the route from Le Kef to the locality in the Oued R'mel where the samples were collected.

SYSTEMATIC DESCRIPTIONS

Genus CYTHERELLA Jones, 1849

Cytherella meijeri Esker, **n. sp.**
Plate 1, figures 4–5

Name: After Dr. Max Meijer, Petrofina Co., Brussels, Belgium.

Holotype: A complete female carapace, H.V.H. no. 8429, plate 1, figure 4.

Paratypes: A complete male carapace, H.V.H. no. 8430, plate 1, figure 5; a complete female carapace, a complete male carapace, and a right valve of a male, H.V.H. no. 8431.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subrectangular in lateral outline, broadly rounded anterior and posterior ends. Dorsal margin slightly sinuate, sloping down slightly towards the posterior end. Ventral margin nearly straight. Greatest height anterior to middle, greatest length through middle. A shallow sulcus extends about two fifths of the height down from the middle of the dorsal margin. Posterior portion of valve coarsely punctate; remainder of valve usually smooth but sometimes coarsely punctate at anterior end. Right valve overlaps left valve evenly all around except along the posterior one third of the dorsal margin, where the overlap is very slight.

Carapace compressed ovate in dorsal view with slight carina at the anterior and posterior ends. Greatest width near posterior. Edge of left valve fits into groove of right valve all around. Muscle scars not observed. Female valves are more inflated across the posterior and slightly shorter in length.

Dimensions: In mm., holotype, female, L. 0.59, H. 0.35, W. 0.26; paratypes: complete carapace, male, L. 0.73, H. 0.38, W. 0.26; complete carapace, female, L. 0.61, H. 0.38; complete carapace, male, L. 0.63, H. 0.35; right valve, male, L. 0.61, H. 0.33.

Remarks: Cytherella meijeri is closely related to *C. gamardensis* Deltel, 1964, but is more inflated and tapers more towards the posterior in dorsal view. *C. meijeri* differs from *C. posteropunctata* Reyment, 1960, in lacking the short posterior process. The coarsely punctate anterior end present in a couple of specimens of *C. meijeri* does not appear to be a typical characteristic.

Genus BYTHOCYPRIS Brady, 1880

Bythocypris gohrbandti Esker, **n. sp.**
Plate 1, figure 14

Name: After Dr. Klaus Gohrbandt, Mobil Oil Libya, Ltd., Tripoli, Libya.

Holotype: A complete carapace, H.V.H. no. 8432, plate 1, figure 14.

Paratypes: Four complete carapaces, H.V.H. no. 8433.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subtriangular in lateral view; ventral margin essentially straight; dorsal margin convex, consisting of four nearly straight portions at

slight angles with one another; rounded anterior and posterior ends. Greatest height in the middle; greatest length along the ventral border. Dorsal margin slopes down towards the anterior and posterior ends from the position of greatest height. Carapace surface smooth, finely punctate and shiny. Left valve overlaps right valve around entire margin; overlap greatest along anterior half of dorsal margin. Hinge not seen; only complete carapaces found.

Carapace elongate elliptical in dorsal view; greatest width across middle. Numerous adductor muscle scars in a circular pattern. Numerous scattered normal pore canals. No apparent dimorphism. Molts similar to adults.

Dimensions: In mm., holotype, L. 0.97, H. 0.51, W. 0.42; paratypes: L. 0.72, H. 0.36; L. 0.85, H. 0.41; L. 1.00, H. 0.51; L. 0.79, H. 0.40.

Remarks: Bythocypris gohrbandti appears to be closely related to *B. gibsonensis* Howe and Chambers, 1935, but has a less well-rounded anterior end and greater height in proportion to length, causing a more strongly convex dorsal margin.

"Bythocypris" adunca Esker, **n. sp.**
Plate 2, figures 10–12; plate 4, figure 4

Name: adunca (L.) – bent inward, referring to the offset in the ventral overlap.

Holotype: A complete female carapace, H.V.H. no. 8434, plate 2, figure 10.

Paratypes: A complete male carapace, H.V.H. no. 8435, plate 2, figures 11–12; two female left valves, male left valve, H.V.H. no. 8436, plate 4, figure 4.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace elongate elliptical in lateral outline; convex dorsal margin; nearly straight ventral margin; rounded anterior and posterior ends. In right valve rounded anterior end followed by a straight dorsal segment which slopes upward to the middle of the dorsal margin, after which a straight segment slopes down to the posterior cardinal angle and the rounded posterior end. Greatest height through middle; greatest length slightly below the middle. Left valve overlaps right valve around the entire margin; overlap greatest at anterior and posterior of dorsal margin and along ventral margin. Carapace surface finely punctate; shells very thick.

Carapace elongate elliptical in dorsal view, greatest width from the middle to slightly posterior to the middle. In ventral view the overlap is offset anterior to the middle; behind this point the overlap of the left valve is greater. Hinge consists of a smooth bar with a groove above it in the left valve. In the right valve the smooth bar which fits into the groove is slightly wider at the anterior and posterior ends, forming nascent terminal teeth. Moderately wide anterior vestibule and narrow posterior vestibule. Numerous straight radial pore canals; normal pore canals not discernible. The numerous adductor muscle scars form a circular area. The high number of muscle scars may possibly be due to poor preservation of a much smaller number of sutured muscle scars. Molts are similar to adults in appearance. Male carapaces appear to be longer than female carapaces.

Dimensions: In mm., holotype, L. 0.63, H. 0.38, W. 0.31; paratypes: complete male carapace, L. 0.78, H. 0.41, W. 0.34; female left valve, L. 0.71, H. 0.40; male left valve, L. 0.76, H. 0.41; female left valve, L. 0.61, H. 0.38.

Remarks: "Bythocypris" adunca appears to be closely related to *"B." pykna* van den Bold, 1960, from which it can easily be distinguished by the less pronounced overlap, more elongate shape and more regularly rounded anterior end. This species almost certainly does not belong to *Bythocypris* Brady, 1880. The thick shell, lack of normal pore canals, shape and overlap separate it from *Bythocypris*. It probably belongs to a new genus together with *"B." pykna* van den Bold (see discussion by van den Bold, 1960).

"Bythocypris" sp.
Plate 2, figure 8

Description: Carapace reniform in lateral outline; dorsal margin convex; anterior and posterior ends broadly rounded; ventral margin nearly straight, very slightly concave in front of the midpoint. Greatest length along the ventral margin; greatest height posterior to middle. Surface finely punctate. Compressed elongate elliptical in dorsal view; greatest width in the middle. Left valve overlaps right valve around entire margin. Adductor muscle scars consist of a circular arrangement of five scars. Molts appear similar to adults.

Dimensions: In mm., complete carapace, L. 0.78, H. 0.31, W. 0.28.

Remarks: Known only from a few complete carapaces. Similar in appearance to *B. goodlandensis* Alexander, 1929, but appears to have a more regularly rounded anterior end.

Genus KRAUSELLA Ulrich, 1894

"Krausella" ouedrmelensis Esker, **n. sp.**
Plate 3, figures 7–8 ; plate 4, figure 3

Name: After the type locality, Oued R'mel, near Le Kef, Tunisia.

Holotype: A complete carapace, H.V.H. no. 8438, plate 3, figures 7–8.

Paratypes: Two complete carapaces, left valve, H.V.H. no. 8440 ; left valve, H.V.H. no. 8439, plate 4, figure 3.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

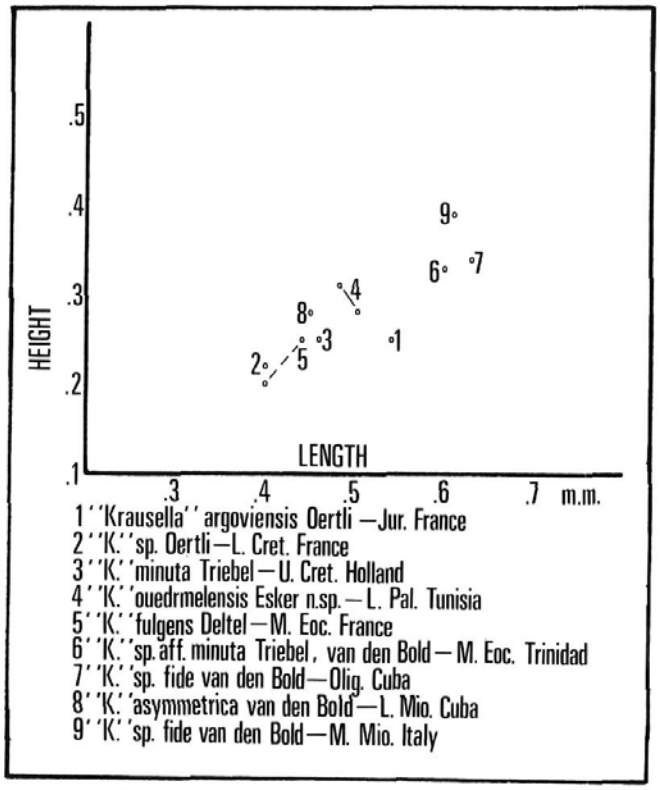
Description: Carapace subelliptical in lateral view; dorsal margin convex except just anterior of the posterior end, where it is slightly concave; ventral margin slightly convex; anterior end rounded; posterior end weakly pointed in the left valve, in the right valve drawn out into a distinct spine. Greatest height through or just anterior to the middle ; greatest length below the middle. Overlap very strong ; left valve greater than right ; overlap weakest dorsally on the posterior end, absent only where the spine in the right valve projects back to, or slightly beyond, the border of the left valve.

Carapace subrhomboidal in dorsal outline. Greatest width in the middle. Valves depressed along the hinge. In ventral view, valves curved up along median part of the free edges. Valves inflated and lacking ornamentation. Hinge consists of long crenulated terminal sockets separated by a smooth bar in the left valve. Radial pore canals appear to be very numerous and simple. Normal pore canals unknown. Muscle scars not recognizable. Dimorphism and molts are unknown.

Dimensions: In mm., holotype, L. 0.34, H. 0.31, W. 0.31 ; paratypes : L. 0.38, H. 0.30 ; L. 0.38, H. 0.28 ; L. 0.38, H. 0.30 ; L. 0.30, H. 0.28.

Remarks: "Krausella" ouedrmelensis is closely related to *"K." minuta* Triebel, 1936, but has stronger overlap and is subrhomboidal in dorsal view, while *"K." minuta* is subelliptical in dorsal view.

Van den Bold (1960) stated that there has been an apparent increase in the size of the species of *"Krausella"* with time. The dimensions of various species of *"Krausella"* from the Mesozoic and the Tertiary were plotted (text-figure 3). From this plot, there does not appear to be a single direct line of increasing size of species of *"Krausella"* as time progressed. There may be more than one line of evolution which could explain these size differences. Also, *"K." fulgens* Deltel, 1965, plots as a straight line and most probably reflects the range in size



TEXT-FIGURE 3
Sizes of various species of *"Krausella"* ranging in time from Jurassic to Middle Miocene and showing no single direct line of increasing size.

of various growth stages instead of dimorphism. Possible dimorphism may be indicated by the size differences of specimens of *"K." ouedrmelensis*. Some individuals appear to be shorter and higher than others, but dimorphism is not definitely established in *"Krausella"*.

Genus PARACYPRIS Sars, 1866

Paracypris sp. A.
Plate 3, figure 9

Description: Carapace elongate subtriangular in lateral outline ; dorsal margin convex, consisting of a nearly straight anterior portion, a nearly straight dorsal portion, followed by a sharply sloping straight posterior portion which forms a pointed posterior. Posterior end pointed, small and rounded ; anterior end broadly rounded ; ventral margin slightly sinuous, slightly concave in the middle and curving upwards slightly at the posterior end. Greatest length along ventral margin ; greatest height anterior to the middle. Left valve overlaps right valve ; overlap greatest at the anterior and posterior portions of the dorsal margin, least at the posterior end of the ventral margin.

Carapace elongate elliptical in dorsal view; greatest width across the middle. Surface punctate. Hinge adont, consisting of a groove in the left valve. Marginal area difficult to observe, appears to be widest anteriorly and at the posterior end of the ventral margin. Radial pore canal arrangement not clear. Adductor scars consist of a dorsal curved row of three with a nearly straight row of four scars below them. There may possibly be a couple of other smaller scars located below these. Dimorphism and molts are unknown.

Dimensions: In mm., L. 1.06, H. 0.50, W. 0.40, H.V.H. no. 8441.

Remarks: Known only from a few specimens and appears somewhat similar to *Bythocypris? gibsonensis* Howe and Chambers, 1935, but has a more strongly pointed posterior end and a less well-rounded anterior end.

Paracypris sp. B.
Plate 1, figure 12

Description: Carapace elongate subtriangular in lateral outline; dorsal margin consists of a straight anterior portion and a straight posterior portion meeting at an angle about two-fifths of the length from the anterior end; anterior end broadly rounded; posterior end pointed; ventral margin slightly concave. Greatest length along ventral margin; greatest height in the middle.

Carapace compressed elongate elliptical in dorsal view; greatest width in the middle. Left valve overlaps right valve around entire margin; overlap greatest in front of the position of greatest height. Surface punctate. Adductor muscle scars in a circular pattern with five irregular individual muscle scars. Molts similar to adults.

Dimensions: In mm., L. 0.72, H. 0.35, W. 0.30, H.V.H. no. 8442.

Genus PONTOCYPRELLA Mandelstam, 1955

Pontocyprella recurva Esker, **n. sp.**
Plate 1, figures 6–7; plate 4, figure 7

Name: recurva (L.), bent or curved back, referring to the lateral outline of the dorsal margin.

Holotype: A complete female carapace, H.V.H. no. 8443, plate 1, figures 6–7.

Paratypes: A male left valve, H.V.H. no. 8444, plate 4, figure 7; male right valve, complete male carapace, complete female carapace, H.V.H. no. 8445.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace elongate ovate in lateral view. Dorsal margin almost straight for approximately one third of the length back from the anterior end, convex for the remainder until about nine-tenths of the length from the anterior end, at which point the posterior margin curves sharply downward towards the pointed posterior end. Ventral margin very slightly concave in the middle and convex at the anterior and posterior ends; anterior end broadly rounded ventrally and narrowly rounded dorsally. Greatest length above ventral margin; greatest height anterior to the middle. Surface finely punctate. Left valve overlaps right valve; greatest overlap in the middle of the ventral margin and in the anterior part of the dorsal margin; no overlap in the dorsal part of the anterior end.

Carapace compressed elongate ovate in dorsal view, greatest width posterior to the middle. Hinge adont, consisting of a smooth groove in the left valve and a bar in the right. Marginal area wide at the anterior and posterior ends. Radial pore canals moderate in number, straight and simple. Normal pore canals simple and numerous. No muscle scars were observed. Males appear to be longer than females. Molts appear to have a more strongly convex and concave dorsal margin.

Dimensions: In mm., holotype, L. 0.90, H. 0.35, W. 0.35; paratypes: male left valve, L. 0.94, H. 0.43; male right valve, L. 0.89, H. 0.41; complete male carapace, L. 0.74, H. 0.36; complete female carapace, L. 0.77, H. 0.40.

Remarks: Pontocyprella recurva appears to be closely related to *P. superba* Neale, 1962, but has a less sharply pointed posterior end and a more complex dorsal margin. *P. recurva* can be distinguished from *P. alexanderi* Howe and Laurencich by the possession of the dorsal projection on the anterior end.

Genus CYTHEREIS Jones, 1849

Cythereis coronata Esker, **n. sp.**
Plate 1, figures 1–3; plate 4, figure 5

Name: coronata (L.), wreathed or crowned, referring to the peculiar scalloped ridges in the grooves around the anterior and posterior ends.

Holotype: A complete female carapace, H.V.H. no. 8446, plate 1, figures 1–2.

Paratypes: Male left valve, H.V.H. no. 8447, plate 1, figure 3; male left valve, plate 4, figure 5; male right valve, female left valve, H.V.H. no. 8448.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subtrapezoidal in lateral view. Dorsal margin nearly straight except for distinct humps at the cardinal angles; ventral margin nearly straight; dorsal and ventral margins converge slightly towards the posterior; anterior end rounded; posterior end pointed; valves flattened ventrally. Greatest height at anterior cardinal angle; greatest length along the middle. Anterior and posterior ends have ridges around the borders, separated from the remainder of the carapace by anterior and posterior grooves. A small scalloped ridge extends along the anterior groove with another less well-scalloped ridge behind it. The inflated anterior end of the main part of the valves appears to be finely polygonal in outline bordering the anterior groove. The posterior end has a similar arrangement. Both the anterior and the posterior ends are denticulate. Three longitudinal rows of short spines or nodes are present, as well as a large subcentral muscle tubercle bearing a spine. A sulcus runs from above and in front of the subcentral muscle tubercle, passing around behind it, curving forward again, and ending midway between the subcentral tubercle and the anterior groove. There are a few spines immediately below the dorsal row of spines. The middle row of spines usually consists of about four short spines or nodes on the posterior third of the valve and curves slightly upwards towards the posterior end. The ventral row of spines is on a ridge which is concave towards the dorsal margin. Usually there are two closely grouped spines above the ventral row and posterior to the subcentral muscle tubercle. An eye tubercle is present.

Carapace ovate in dorsal view with compressed anterior and posterior ends; valves inflated; greatest width anterior to the middle across the subcentral muscle tubercle. Ventral view shows two irregular, smooth ridges running approximately parallel to the outer spinose ventral ridge. Very small spines between these ridges form a vaguely reticulate pattern. Hinge of left valve consists of a crenulated anterior socket followed by a smooth knoblike tooth and a faintly crenulated bar with a crenulated socket at the posterior end. Marginal area moderately wide at the anterior and posterior ends. Radial pore canals moderately numerous, straight and simple. Normal pore canals numerous and scattered over the smooth surface of each valve; also, each spine bears at least one pore canal. No muscle scars were visible.

Female carapace shorter and slightly more inflated across the posterior than the male carapace. Molts show the ventral row of spines most prominently with the middle row of spines absent or only represented by one or two spines. The molt shape is the same as that of the adult, but the molt has fewer spines.

PLATE 1

All figures ×138

1–3 *Cythereis coronata* Esker, n. sp.
1, complete female carapace, holotype, right lateral view, H.V.H. no. 8446; 2, dorsal view of holotype; 3, male left valve, paratype, lateral view, H.V.H. no. 8447.

4–5 *Cytherella meijeri* Esker, n. sp.
4, complete female carapace, holotype, left lateral view, H.V.H. no. 8429; 5, complete male carapace, paratype, left lateral view, H.V.H. no. 8430.

6–7 *Pontocyprella recurva* Esker, n. sp.
6, complete female carapace, holotype, right lateral view, H.V.H. no. 8443; 7, holotype, dorsal view.

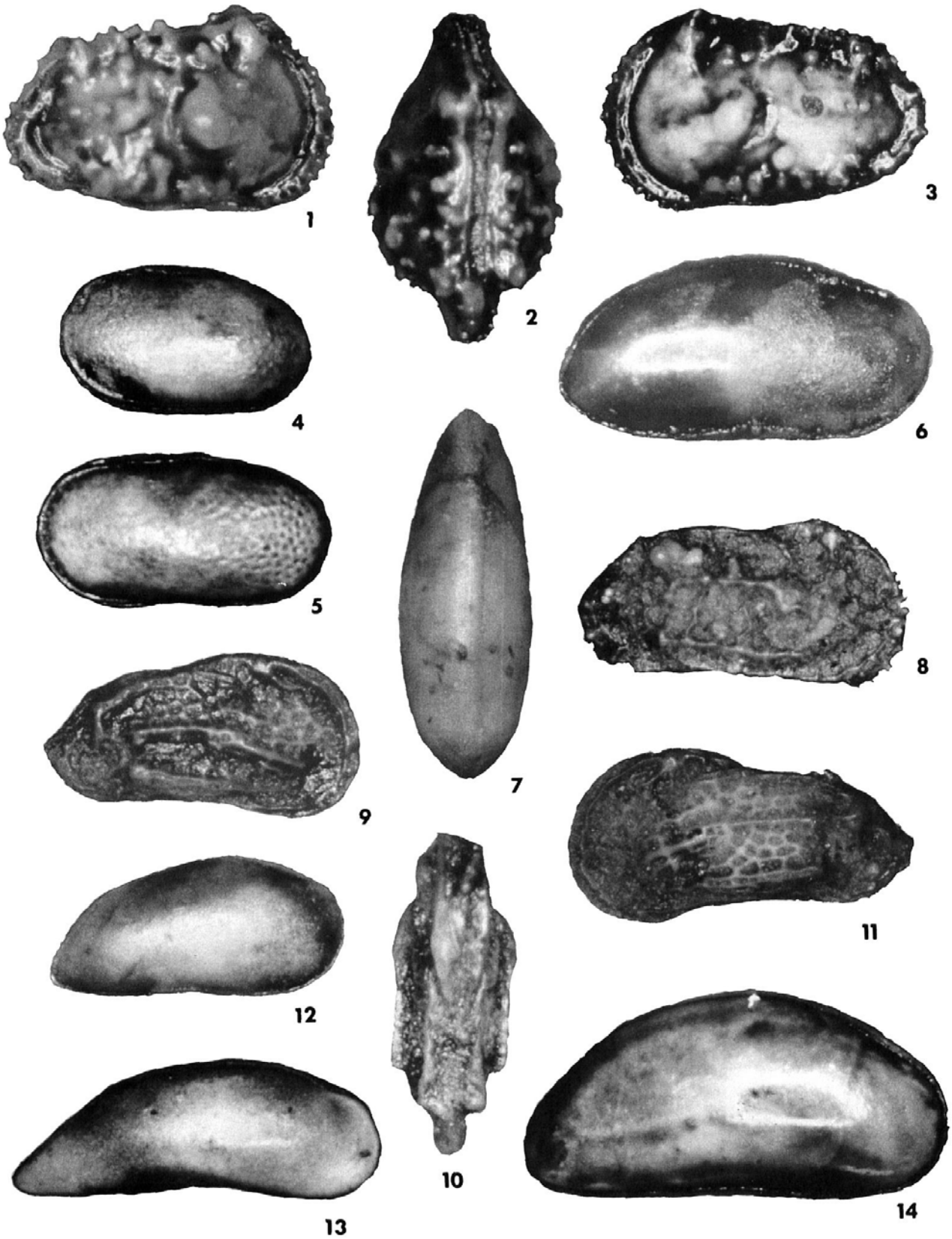
8 *Costa? warriensis* (Reyment)
Right valve, lateral view, H.V.H. no. 8467.

9–11 *Isocythereis acies* Esker, n. sp.
9, complete female carapace, holotype, right lateral view, H.V.H. no. 8450; 10, holotype, dorsal view; 11, male left valve, paratype, lateral view, H.V.H. no. 8451.

12 *Paracypris* sp. B.
Right lateral view of complete carapace, H.V.H. no. 8442.

13 *Paracypris jonesi* Bonnema
Right lateral view of complete carapace, H.V.H. no. 8465.

14 *Bythocypris gohrbandti* Esker, n. sp.
Complete carapace, holotype, right lateral view, H.V.H. no. 8432.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Dimensions: In mm., holotype, L. 0.79, H. 0.49, W. 0.44; paratypes: L. 0.78, H. 0.37; L. 0.76, H. 0.36; L. 0.79, H. 0.49; L. 0.76, H. 0.36.

Remarks: Cythereis coronata is closely related to *C. teiskotensis* (Apostolescu, 1961) but is less inflated and more evenly tapered towards the anterior end in dorsal view. It also has a lower ventral ridge, extending below the ventral margin and ending behind and below the subcentral tubercle. In addition, *C. coronata* has more spines, and the peculiar scalloped ridges in the grooves around the anterior and posterior ends appear to be characteristic of this species.

Cythereis sp.
Plate 2, figures 1–2

Description: Carapace subtrapezoidal in lateral view; dorsal margin straight, sloping down towards the posterior; anterior end broadly rounded and denticulate; ventral margin straight; posterior end pointed and denticulate. Greatest height at anterior cardinal angle; greatest length above ventral margin. Surface has a reticulate, slightly spinose ornamentation with a prominent subcentral muscle tubercle, a prominent eye tubercle, a row of spines along the dorsal margin and another along a ventral ridge. Anterior and posterior ends possess marginal ridges. Left valve overlaps right valve slightly around the entire margin.

Carapace subovate in dorsal view with compressed posterior and anterior ends; greatest width slightly posterior to the middle. Prominent spines on the subcentral tubercle and on the posterior end of the ventral ridge. Flattened ventral side with three pairs of longitudinal ridges, the posterior ends of which turn in towards the free border, where they terminate. Hinge in right valve consists of a crenulate anterior and a crenulate posterior tooth separated by an anterior socket and a smooth groove. Normal pore canals appear to be numerous, some exiting through spines. Radial pore canals, muscle scars and dimorphism uncertain. Molts appear to be very similar to adult carapaces.

Dimensions: In mm., L. 0.92, H. 0.56, W. 0.54; L. 1.04, H. 0.51; L. 0.82, H. 0.44, molt; L. 1.01, H. 0.53; L. 1.04, H. 0.54.

Genus ISOCYTHEREIS Triebel, 1940

Isocythereis acies Esker, **n. sp.**
Plate 1, figures 9–11; plate 4, figure 6

Name: acies (L.), sharp point, referring to the sharply pointed posterior end.

Holotype: A complete female carapace, H.V.H. no. 8450, plate 1, figures 9–10.

PLATE 2

1–2 *Cythereis* sp.
1, right lateral view of complete carapace, ×138; H.V.H. no. 8449; 2, dorsal view of complete carapace.

3–5 *Cytheropteron lekefense* Esker, n. sp.
3, complete female carapace, holotype, left lateral view, ×138, H.V.H. no. 8459; 4, holotype, dorsal view, ×144; 5, male left valve, paratype, lateral view, ×144, H.V.H. no. 8460.

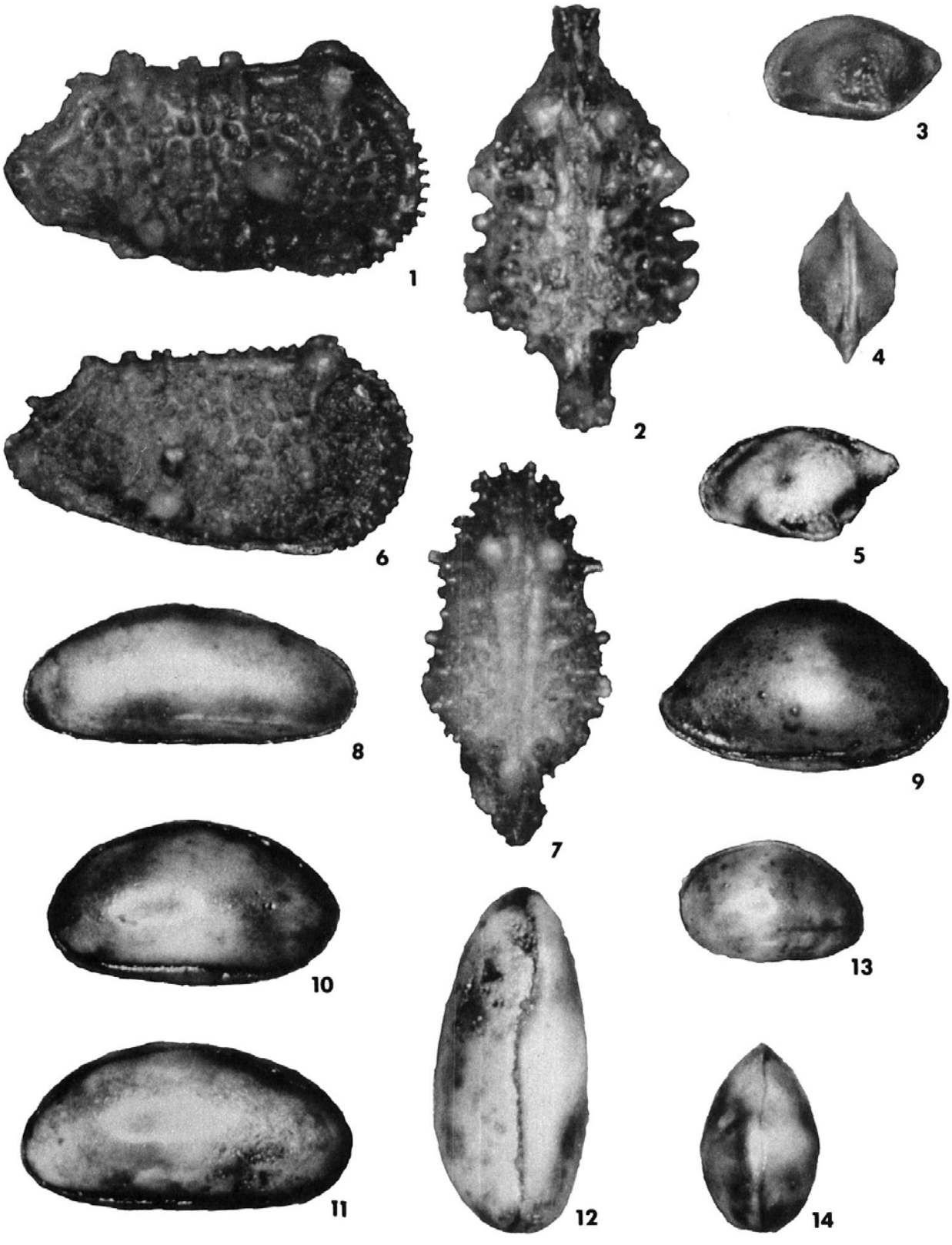
6–7 *Acanthocythereis denticulata* Esker, n. sp.
6, complete female carapace, holotype, right lateral view, ×144, H.V.H. no. 8453; 7, holotype, dorsal view, ×138.

8 *"Bythocypris"* sp.
Right lateral view of complete carapace, ×138, H.V.H. no. 8437.

9 *Bairdia* sp. aff. *B. trigonalis* Jones
Right lateral view of complete specimen, ×138, H.V.H. no. 8468.

10–12 *"Bythocypris" adunca* Esker, n. sp.
10, complete female carapace, holotype, right lateral view, ×144, H.V.H. no. 8434; 11, complete male carapace, paratype, right lateral view, ×138, H.V.H. no. 8435; 12, paratype, ventral view, ×144.

13–14 *Xestoleberis tunisiensis* Esker, n. sp.
13, complete female carapace, holotype, right lateral view, ×138, H.V.H. no. 8462; 14, holotype, dorsal view, ×144.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Paratypes: Male left valve, H.V.H. no. 8451, plate 1, figure 11; female left valve, plate 4, figure 6; female right valve, male right valve, H.V.H. no. 8452.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Elongate subrectangular in lateral view; dorsal and ventral margins sinuous; anterior end broadly rounded; posterior end pointed and denticulate. Greatest length along the middle; greatest height through the anterior. There are three longitudinal ridges, the middle and ventral ridges being the more strongly developed. Dorsal ridge slightly curved, beginning in the middle of the dorsal margin and ending in front of the compressed posterior portion about one-sixth of the total length in front of the pointed posterior end. Middle ridge roughly divided into two, the posterior part of the ridge running forward from near the posterior end to approximately the mid-point, where the ridge is developed into a small subcentral tubercle and curves downward. In front of this tubercle, the ridge ends just behind the depression behind the anterior marginal ridge. Ventral ridge straight, running from one-fourth of the length in front of the posterior end forward to about one-fifth of the total length behind the anterior border. Eye spot not present. Entire surface covered by reticulate ornamentation. Left valve overlaps right valve slightly.

Carapace rectangular in dorsal view with compressed anterior and posterior ends; valves weakly inflated; greatest width anterior to the middle across the subcentral tubercle. Hinge of left valve consists of a smooth socket followed by a smooth knoblike tooth and smooth bar with a smooth socket at the posterior cardinal angle. Broad marginal area anteriorly and posteriorly, becoming narrower anteroventrally and posteroventrally. Radial pore canals long, straight, simple, and moderate in number. No muscle scars were observed. Female carapace shorter than male. Molts appear to be very similar to adult carapaces.

Dimensions: In mm., holotype, L. 0.78, H. 0.43, W. 0.31; paratypes: L. 0.84, H. 0.43; L. 0.73, H. 0.43; L. 0.84, H. 0.41; L. 0.74, H. 0.40.

Remarks: Isocythereis acies is closely related to *I. fissicostis* Triebel, 1940, but can be distinguished by the different hinge, all teeth being smooth, by the more prominently pointed posterior end, by the less sharply downward sloping anterior part of the median ridge, and by the location of the anterior marginal ridge closer to the anterior border.

Genus ACANTHOCYTHEREIS R. C. Howe, 1963

Acanthocythereis denticulata Esker, **n. sp.**
Plate 2, figures 6–7; plate 4, figure 1

Name: denticulata (L.), small-toothed, referring to the denticulate caudal process.

Holotype: A complete female carapace, H.V.H. no. 8453, plate 2, figures 6–7.

Paratypes: Male right valve, H.V.H. no. 8454, plate 4, figure 1; male left valve, female right valve, complete female carapace, H.V.H. no. 8455.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

PLATE 3

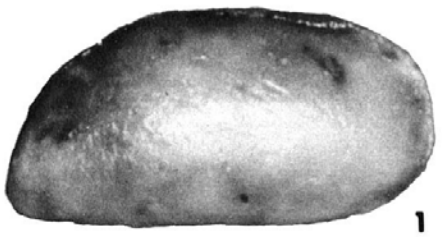
1–4 *Krithe echolsae* Esker, n. sp.
1, complete female carapace, holotype, right lateral view, ×138, H.V.H. no. 8456; 2, complete male carapace, paratype, left lateral view, ×144, H.V.H. no. 8457; 3, holotype, dorsal view, ×138; 4, paratype, dorsal view, slightly crushed, ×138.

5 *Bairdia septentrionalis* Bonnema
Right lateral view of complete specimen, ×95, H.V.H. no. 8466.

6 *Bairdia* sp.
Right lateral view of complete specimen, ×95.

7–8 *"Krausella" ouedrmelensis* Esker, n. sp.
7, complete carapace, holotype, right lateral view, ×138, H.V.H. no. 8438; 8, holotype, dorsal view, ×211.

9 *Paracypris* sp. A.
Right lateral view of complete carapace, ×144, H.V.H. no. 8441.



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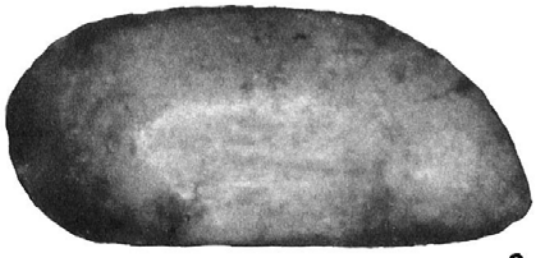

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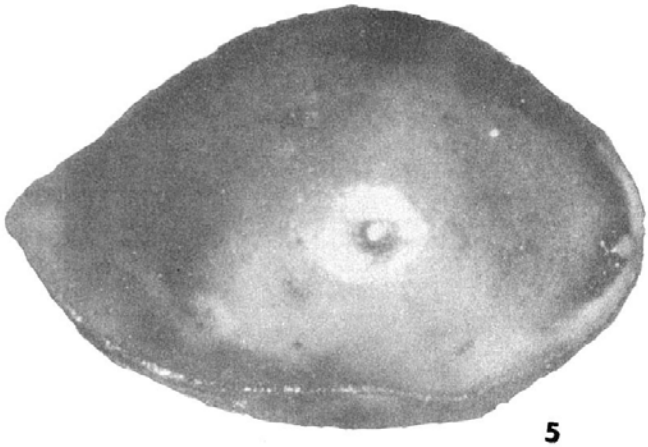

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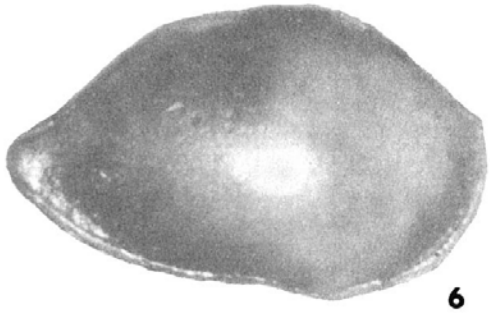

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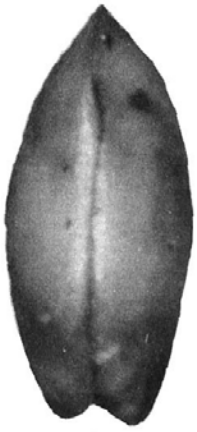

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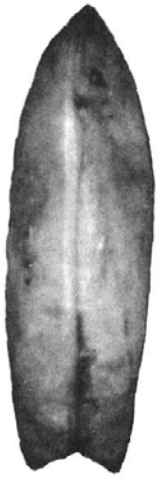

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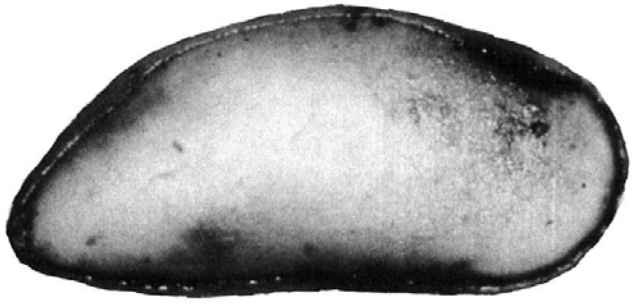

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8

Description: Lateral outline of carapace subtriangular, with a broadly rounded denticulate anterior end and a strongly pointed posterior end having one or sometimes more conspicuous spine or spines present on the concave dorsal side and several spines on the convex ventral side of the caudal process. Dorsal margin straight; ventral margin nearly straight. Greatest height through the anterior cardinal angle; greatest length along the middle. Entire surface covered with a reticulate pattern of ridges that bear many short slender spines and fewer short thick spines.

Carapace ovate in dorsal view; greatest width posterior to the middle. Very much compressed caudal process; anterior end with an anterior marginal ridge. Moderately inflated; strongest inflation ventrally. Overlap negligible. Hinge in the left valve consists of a deep anterior socket followed by a smooth peglike tooth, a crenulate bar and a terminal socket. In the right valve the posterior tooth is bifid, with a small depression located about midway on its side. Marginal area narrow both anteriorly and posteriorly. Marginal pore canals numerous, straight and simple. Normal pore canals appear to exit through at least some, if not all, of the spines covering the surface of the valves. Muscle scars not observed. Male valves appear to be longer than female valves. Early molts do not appear to be as triangular in lateral outline and do not have the caudal process as well developed.

Dimensions: In mm., holotype, L. 0.89, H. 0.49, W. 0.36; paratypes: L. 0.92, H. 0.38; L. 0.86, H. 0.49, L. 0.91, H. 0.49; L. 0.87, H. 0.36.

Remarks: Acanthocythereis denticulata is closely related to *A. horridula* (Bosquet, 1854) but lacks the subcentral tubercle and has a much more strongly developed concavo-convex posterior end, which also serves to distinguish it from *A. araneosa* Howe, *A. stenzeli* (Stephenson) and *A. frescoensis* (Apostolescu).

Genus KRITHE Brady, Crosskey and Robertson, 1874

Krithe echolsae Esker, **n. sp.**
Plate 3, figures 1–4

Name: After Professor Dorothy J. Echols, Washington University, St. Louis, Missouri.

Holotype: A complete female carapace, H.V.H. no. 8456, plate 3, figures 1, 3.

Paratypes: Complete male carapace, H.V.H. no. 8457, plate 3, figures 2, 4; male right valve, female left valve, complete male carapace, H.V.H. no. 8458.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subrectangular in lateral view with an obliquely truncated posterior end and a gently rounded anterior end. Dorsal margin very slightly convex; ventral margin straight; in right valves, dorsal margin noticeably incurved just in front of the anterior cardinal angle, ventral margin slightly concave in the middle to allow overlap of the left valve. Greatest height posterior to the middle; greatest length along the middle. Carapace compressed around the anterior end forming a narrow rim. Posterior end is slightly pointed at the ventral margin. Carapace smooth.

PLATE 4

1 *Acanthocythereis denticulata* Esker, n. sp.
Interior view of right valve, paratype, ×211, H.V.H. no. 8454.

2 *Xestoleberis tunisiensis* Esker, n. sp.
Interior view of right valve, paratype, ×211, H.V.H. no. 8463.

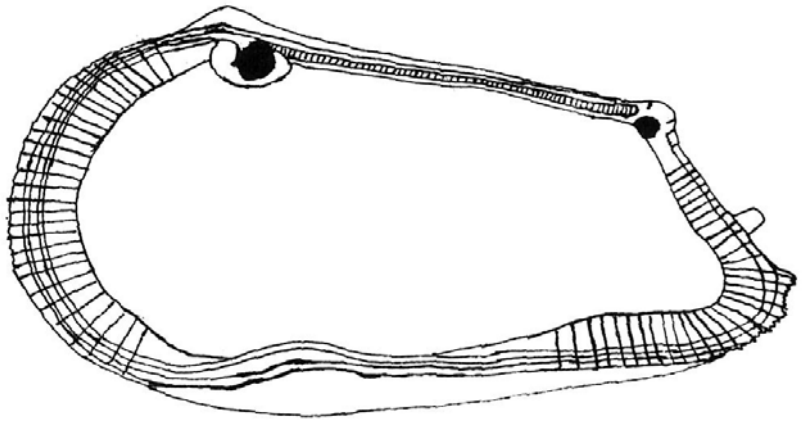
3 *"Krausella" ouedrmelensis* Esker, n. sp.
Interior view of left valve, paratype, ×211, H.V.H. no. 8439.

4 *"Bythocypris" adunca* Esker, n. sp.
Interior view of left valve, paratype, ×211, H.V.H. no. 8436.

5 *Cythereis coronata* Esker, n. sp.
Interior view of left valve, paratype, ×175, H.V.H. no. 8448.

6 *Isocythereis acies*, Esker, n. sp.
Interior view of left valve, paratype, ×211, H.V.H. no. 8452.

7 *Pontocyprella recurva* Esker, n. sp.
Interior view of left valve, paratype, ×211, H.V.H. no. 8444.



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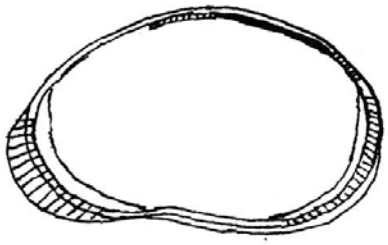

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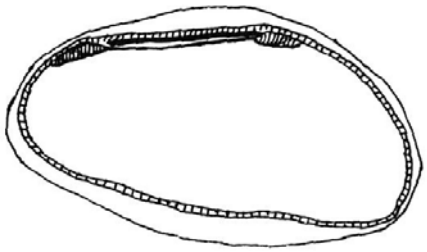

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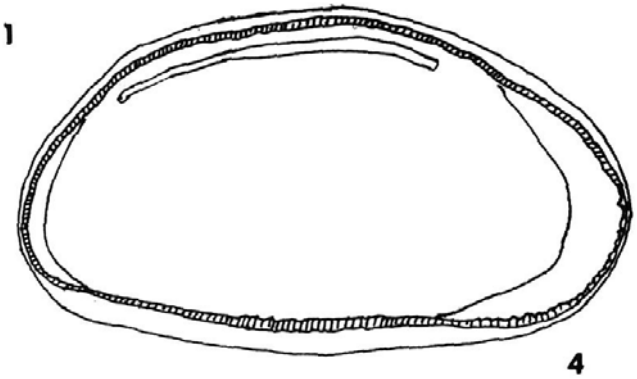

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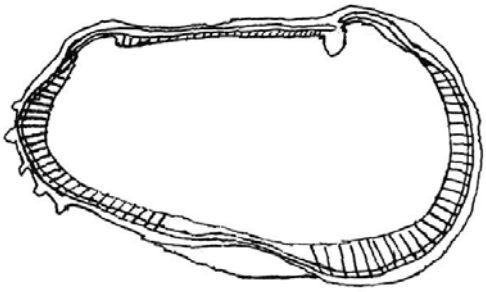

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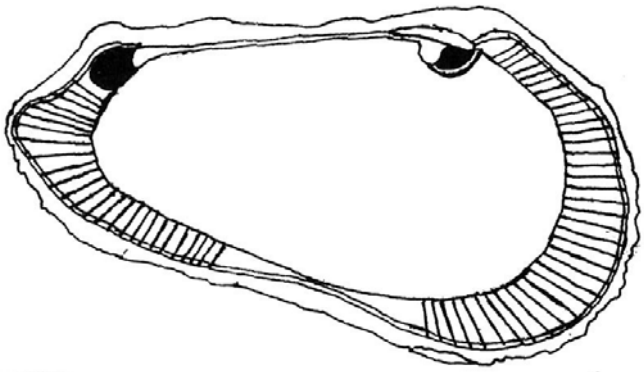

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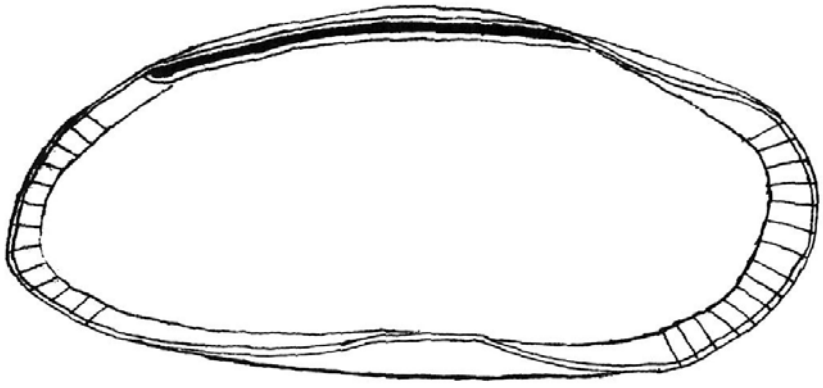

7

Dorsal view of carapace elongate elliptical; greatest width posterior to the middle. There is a very prominent, nearly circular depression in the indented posterior end of each valve. Hinge weakly developed, consisting of a groove in the left valve with a corresponding bar in the right valve. Normal pore canals straight, few and scattered. Marginal area moderately wide anteriorly and towards the ventral margin of the posterior end. Radial pore canals obscure because of preservation. No muscle scars were observed. Male carapace longer and not as inflated as the female carapace. Molts have the same general appearance as adults.

Dimensions: In mm., holotype, L. 0.78, H. 0.41, W. 0.35; paratypes: L. 0.87, H. 0.41; L. 0.79, H. 0.40; L. 0.78, H. 0.40; L. 0.83, H. 0.40.

Remarks: Krithe echolsae is closely related to *K. perattica* Alexander, 1934, but differs in that the males and females are proportionately wider and in being slightly more compressed around the anterior margin.

Genus CYTHEROPTERON Sars, 1866

Cytheropteron lekefense Esker, **n. sp.**
Plate 2, figures 3–5

Name: After the town of Le Kef, Tunisia.

Holotype: A complete female carapace, H.V.H. no. 8459, plate 2, figures 3–4.

Paratypes: Male left valve, H.V.H. no. 8460, plate 2, figure 5; complete male carapace, two complete female carapaces, H.V.H. no. 8461.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subrhomboidal in lateral outline; dorsal margin convex, sloping rather sharply down to an evenly rounded anterior end; ventral margin concave slightly anterior to the middle; posterior end angular with a short caudal process about one-third of the height down from the dorsal margin. Greatest length along the middle; greatest height in the middle. Valves inflated in the middle. Alae each have a sulcus that extends out towards the margin and is usually deepest towards the margin of the ala. Carapace usually finely punctate anteriorly, coarsely punctate to reticulate on the alae and on the posterior end; ornamentation variable among specimens but always more pronounced on the posterior end. Left valve overlaps right valve except for part of the caudal process.

Carapace alate subovate in dorsal view with compressed anterior and posterior ends. Alae sharply rounded towards the anterior, nearly straight across their posterior margins, which usually bear three or four short spines per ala. In ventral view there may be up to three pairs of longitudinal ridges on a carapace. Greatest width across the middle or slightly posterior to the middle across the alae. Hinge appears to be a crenulate median bar with small smooth terminal sockets in the left valve. Pore canals and muscle scars not discernible. Hinge difficult to determine with certainty. Females appear to be wider and to have a deeper and better developed sulcus, whereas in the male the sulcus may be nearly absent. Also, the male seems to be longer than the female.

Dimensions: In mm., holotype, L. 0.41, H. 0.25, W. 0.25; paratypes: L. 0.43, H. 0.26; L. 0.44, H. 0.26, L. 0.40, H. 0.25; L. 0.37, H. 0.25.

Remarks: Cytheropteron lekefense appears to be closely related to *C. aequivalve* Bonnema, 1941, but differs in the possession of spines along the posterior margin of the alae and in having a less strongly convex dorsal margin. *C. lekefense* shows considerable variation in the ornamentation and some variation in the shape of the alae.

Genus XESTOLEBERIS Sars, 1866

Xestoleberis tunisiensis Esker, **n. sp.**
Plate 2, figures 13–14; plate 4, figure 2

Name: After the country of Tunisia, where it occurs.

Holotype: A complete female carapace, H.V.H. no. 8462, plate 2, figures 13–14.

Paratypes: Male left valve, H.V.H. no. 8463, plate 4, figure 2; female left valve, complete male carapace, female left valve, H.V.H. no. 8464.

Type locality: Oued R'mel, near Le Kef, Tunisia.

Stratigraphic horizon: Zebbeus Formation.

Description: Carapace subovate in lateral view; dorsal margin broadly rounded, sloping down anteriorly to where it becomes more narrowly rounded subventrally; ventral border very slightly convex; posterior end broadly rounded. Greatest length above the ventral margin; greatest height in the middle. There is a narrow anterior rim, widest at the position of greatest length. Prominent eyespot. Left valve overlaps right valve along the ventral margin. Carapace shiny and finely punctate.

Carapace ovate in dorsal view; greatest width posterior to the middle. Valves upturned along the free borders in the middle of the ventral side. Hinge in right valve consists of a smooth bar with a few crenulations on each end, engaging with crenulated anterior and posterior sockets in the left valve. Marginal area of moderate

width anteriorly above the ventral margin with a vestibule, rather narrow and nearly equal in width all around the posterior end. Radial pore canals numerous, simple and straight. Normal pore canals moderate and open. Muscle scars not observed. Molts have the same general shape as adults but appear to be higher in relation to their length. Dimorphism not very pronounced, but females seem to be more inflated.

Dimensions: In mm., holotype, L. 0.35, H. 0.43, W. 0.26; paratypes: L. 0.41, H. 0.25; L. 0.42, H. 0.28; L. 0.42, H. 0.25; L. 0.35, H. 0.31.

Remarks: Xestoleberis tunisiensis is closely related to *X. marssoni* Bonnema, 1941, but is not as inflated and not as flattened ventrally.

ACKNOWLEDGEMENTS

I thank Professor W. A. van den Bold for his helpful suggestions and criticisms concerning the material presented in this paper. Also, I wish to thank Mr. L. Nichols for photographing the specimens. The types are deposited in the H. V. Howe collections, Geology Department, Louisiana State Universtiy (H.V.H. nos. 8429–8469).

REFERENCES

ALEXANDER, C. I.
1929 *Ostracoda of the Cretaceous of north Texas.* Texas, Univ., Bull., no. 2907, pp. 1–137, pls. 1–10.

1934 *Ostracoda of the Midway (Eocene) of Texas.* Jour. Pal., vol. 8, no. 2, pp. 206–237, pls. 32–35.

APOSTOLESCU, V.
1961 *Contribution à l'étude paléontologique (ostracodes) et stratigraphique des bassins crétacés et tertiaires de l'Afrique Occidentale.* Inst. Francais Petr., Rev., vol. 16, no. 7–8, pp. 779–867, pls. 1–18.

BOLD, W. A. VAN DEN
1960 *Eocene and Oligocene Ostracoda of Trinidad.* Micropaleontology, vol. 6, no. 2, pp. 145–196, pls. 1–8, text-figs. 1–5, charts 1–4.

BONNEMA, J. H.
1941 *Ostracoden aus der Kreide des Untergrundes der nordöstlichen Niederlande.* Natuurh. Maandbl., vol. 29, nos. 9–12, vol. 30, nos. 1–6, 35 pp, pls. 1–7.

BOSQUET, J.
1854 *Les crustacés fossiles du terrain crétacé du Limbourg.* Nederland, Comm. Geol. Beschr. Kaart, Verh., vol. 2, pp. 1–138, pls. 1–10.

DELTEL, B.
1964 *Nouveaux ostracodes de l'Éocène et de l'Oligocène de l'Aquitaine méridionale.* Soc. Linnéenne Bordeaux, Actes, vol 100, pp. 127–221, pls. 1–6.

HOWE, H V., and CHAMBERS, J.
1935 *Louisiana Jackson Eocene Ostracoda.* Louisiana, Geol. Survey, Bull., no. 5, pp. 1–65, pls. 1–6.

HOWE, H. V., and LAURENCICH, LAURA
1958 *Introduction to the study of Cretaceous Ostracoda.* Louisiana State Univ. Press, pp. 1–536, 1667 unnumbered text-figs.

HOWE, R. C.
1963 *Type Saline Bayou Ostracoda of Louisiana.* Louisiana, Geol. Survey, Bull., no. 40, pp. 1–62, pls. 1–4.

OERTLI, H. J.
1958 *Les ostracodes de l'Aptien-Albien d'Apt.* Inst. Français Petr., Rev., vol. 13, no. 11, pp. 1499–1537, pls. 1–9.

REYMENT, R. A.
1960 *Studies on Nigerian Upper Cretaceous and Lower Tertiary Ostracoda. Part 1: Senonian and Maestrichtian Ostracoda.* Stockholm, Univ., Contr. Geol., vol. 7, pp. 1–238, pls. 1–23.

1963 *Idem, Part 2: Danian, Paleocene and Eocene Ostracoda. Ibid.*, vol. 10, pp. 1–286, pls. 1–23.

STEPHENSON, M. B.
1944 *Ostracoda from the Reklaw Eocene of Bastrop County, Texas.* Jour. Pal., vol. 18, no. 5, pp. 448–454, pl. 76.

TRIEBEL, E.
1940 *Die Ostracoden der deutschen Kreide. III. Cytherideinae und Cytherinae aus der unteren Kreide.* Senckenbergiana, vol. 22, no. 3–4, pp. 160–227, pls. 1–10.

VEEN, J. E. VAN
1936 *Nachtrag zu der bis jetzt erschienenen Revision der Ostracoden der Maastrichter Tuffkreide und des Kunrader Korallenkalkes von Süd-Limburg.* Natuurh. Maandbl., vol. 25, nos. 11–12, pp. 170–188, pls. 9–10.