

# *Cyprideis baetica* n. sp. (Ostracoda, Cytheridae) from the Miocene of southeastern Spain

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A new species of *Cyprideis* is described and illustrated by scanning electron micrographs. Certain features of this form are basically new for *Cyprideis* and interesting from a general point of view: (1) the ontogenetical appearance of lateral nodes in as early an instar as A-5; (2) the concurrent presence of as many as eight lateral nodes in juveniles and seven in adults; and (3) sexual dimorphism and left-to-right asymmetry in the width of the anterior marginal zone.

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Introduction	1
Systematic description	2
Description	3
Biometry	6
Ecology	8
Remarks	8
References	9
Plates	10

## Introduction

In the Betic Cordilleras, southeastern Spain, there are several intramontane sedimentary basins which came into existence in Neogene times. One of these is

the Albox Basin between the Sierra de las Estancias and the Sierra de los Filabres in the province of Almería.

While engaged in a stratigraphic reconnaissance of this particular basin, a field party of our department collected a rock sample from the Miocene near Huércal-Overa that contained an undescribed and interesting species of *Cyprideis*.

A synopsis of the geology of the Albox Basin will be given elsewhere.

Part of the type material has been deposited in the Rijksmuseum van Geologie en Mineralogie (National Museum of Geology and Mineralogy; numbers prefixed with RGM), whilst the bulk of the material is stored in the collections of the Geological Institute of the University of Amsterdam under the numbers M. 1567-M. 1577.

#### *Acknowledgements*

I wish to thank Dr D. J. Beets for putting the original sample at my disposal and Mr R. Vissers for collecting additional material. I should like to express my appreciation to Carla Mulder-Blanken for her enthusiastic help in preparing the scanning electron micrographs.

### Systematic description

Genus *Cyprideis* Jones, 1857

*Cyprideis baetica* n. sp.

Text-figs. 2, 3; Plates 1-4.

*Name* — Baeticus (Latin) = Betic.

*Holotype* — A female right valve (RGM 173 727; Pl. 1, fig. 1). Length of holotype: 0.93 mm, height: 0.54 mm.

*Paratypes* — Two female left valves, two female right valves, one male left valve, one male right valve and one female carapace (RGM 173 728-173 732).

*Type locality* — North bank of the Barranco de Guzmaina, 200 m north-west from National Highway 340, south of Huércal-Overa, Province of Almería, Spain. UTM co-ordinates: 593 + 450 m, 4137 + 900 m.

*Type stratum* — Grey marl, Upper Miocene, probably "Messinian".

*Material* — Several hundred specimens, including adults of both sexes and the last six juvenile instars.

*Occurrence* — So far, the new species is only known from the type stratum at the type locality.

*Diagnosis* — A species of *Cyprideis* distinguished by the presence of a postero-ventral spine in the absence of any anterior marginal denticulations, a somewhat sinuate ventral margin and, most particularly, by the type of valve ornamentation and the pattern and potential maximum number of lateral nodes.

## DESCRIPTION

*Shape* — Female left valve: suboval in lateral view; anterior margin broadly rounded, without denticulations; dorsal margin gently arched, often showing a slight concavity at upper end of sulcus; posterior cardinal angle obtuse and rounded; posterior margin straight to gently arched; postero-ventral corner rounded; ventral margin straight to broadly sinuate with concavity below adductor scar field. Left valve overlaps the right along the entire periphery.

Female right valve: subpentagonal in lateral view; anterior margin semicircular, without denticulations; junction with dorsal margin depressed; dorsal margin strongly arched; posterior cardinal angle obtuse; posterior margin truncate, evenly arched; postero-ventral corner distinct, situated directly below posterior cardinal angle; ventral margin straight to somewhat sinuate, concavity at junction with anterior margin. One postero-ventral spine.

Male left valve: elongate suboval in lateral view; anterior margin broadly rounded, without denticulations; dorsal margin gently arched, occasionally showing slight concavity at upper end of sulcus; posterior cardinal angle obtuse and rounded; posterior margin straight to gently arched; postero-ventral corner rounded; ventral margin sinuate with concavity below adductor scar field, posterior end slightly upturned. Left valve overlaps the right along the entire periphery.

Male right valve: elongate subtriangular in lateral view; anterior margin semicircular, without denticulations; junction with dorsal margin depressed; dorsal margin strongly arched; posterior cardinal angle indistinct, dorsal margin merges into obliquely rounded posterior margin; postero-ventral corner rounded; ventral margin sinuate with concavities at junction with anterior margin and in front of postero-ventral corner. One postero-ventral spine.

Female carapace: cuneiform in dorsal view, widest near posterior end; anterior end pointed, posterior end flatly rounded; constriction in region of sulcus.

Male carapace: lanceolate in dorsal view, sides subparallel or slightly diverging towards the posterior; anterior end pointed, posterior end flatly rounded; slight constriction in region of sulcus.

*Sexual dimorphism* — Adult dimorphism strong. Females thickset and swollen posteriorly. Males longer and slimmer, ventral margin more clearly sinuate. The relative width of the anterior marginal zone is another dimorphic feature (see below).

*Surface* — The surface is generally pitted but the intensity of the ornamentation is extremely variable: specimens observed range from finely pitted to coarsely reticulate. On the ventral surface the pits coalesce into a longitudinal pattern of grooves. Pitting is absent or only very weakly developed on the dorsal surface and in a broad zone along the anterior margin. The smoothness of the anterior zone is particularly conspicuous in the more coarsely reticulate specimens.

There is a broad and shallow sulcus which tends to be the more distinct in specimens with the coarsest surface relief. In the males the sulcus may be weak.

Lateral nodes are common. They are especially evident in the females and best developed on right valves. In defining the positions of the nodes the system proposed by Sandberg (1964) is used (see Fig. 1). The most frequent node is the postero-ventral one (node 7). The intensity is variable but this node is present on nearly all female and male right valves and on many female left valves: it is rare on

male left valves. In addition, nodes 2 and 3 may be present (fairly common in females, rare in males). Some coarsely ornamented females show nodes or node-like elevations of the ornamentation in all seven positions indicated by Sandberg.

*Hinge* — Quadripartite, *Cyprideis*-type. In the right valve: an elongate anterior element with 12-14 small teeth, the posterior ones bifid; a finely crenulate, bipartite median element, consisting of a short antero-median socket (comprising about one-third of the element length) and a long postero-median bar; an elongate posterior element with about 6 small teeth. In the left valve: a loculate anterior socket with a low and broad ventral rim; a crenulate antero-median bar and postero-median groove; a loculate posterior socket with or without a low ventral rim.

*Muscle scars* — Cytherid type. Four adductor scars, close-set, middle one flattened. Fulcral spot prominent, often reaching and seemingly blurring upper adductor scar. Upper mandibular scar short (about as long as longest adductor scar), rounded or truncated, often tapering downward. Frontal scar V-shaped.

*Pore canals* — Marginal pore canals: straight or nearly so, enlarged in the middle; most canals simple, some bifurcate; number of canals in anterior marginal area: approximately 35 (observed range in 22 specimens: 31-38).

Normal pore canals: sieve-plates flush with surface, shortly oval to rounded triangular, rarely narrow and elongate; number of normal pore canals: approximately 75-85; maximum diameter in oval type approximately 0.020 mm, in elongate type up to 0.025 mm.

*Width of anterior marginal zone* — The width of this zone, with respect to total valve length, shows left-to-right asymmetry and sexual dimorphism. In both males and females, the zone is relatively wider in the left valves. Considering left and right valves separately, it is relatively wider in the females (for measures and method of determination, see under Biometry).

*Larval instars* — In the juvenile material six instars can be identified, representing the stages A-6 to A-1 in the system of Christensen (1963).

In comparison with the adults, the juveniles are relatively high and short. The A-6 larvae are more or less triangular in outline, the valves sharply tapering towards the posterior. A truncate posterior margin develops in A-5 and from this instar onward, outlines become more and more similar to those of the adults. The

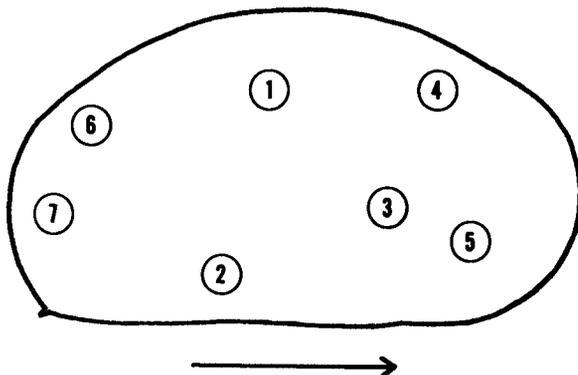


Fig. 1. Potential positions of lateral nodes in adult *Cyprideis baetica* n.sp. projected on a female right valve. The numerical designation of the positions is adopted from Sandberg (1964).

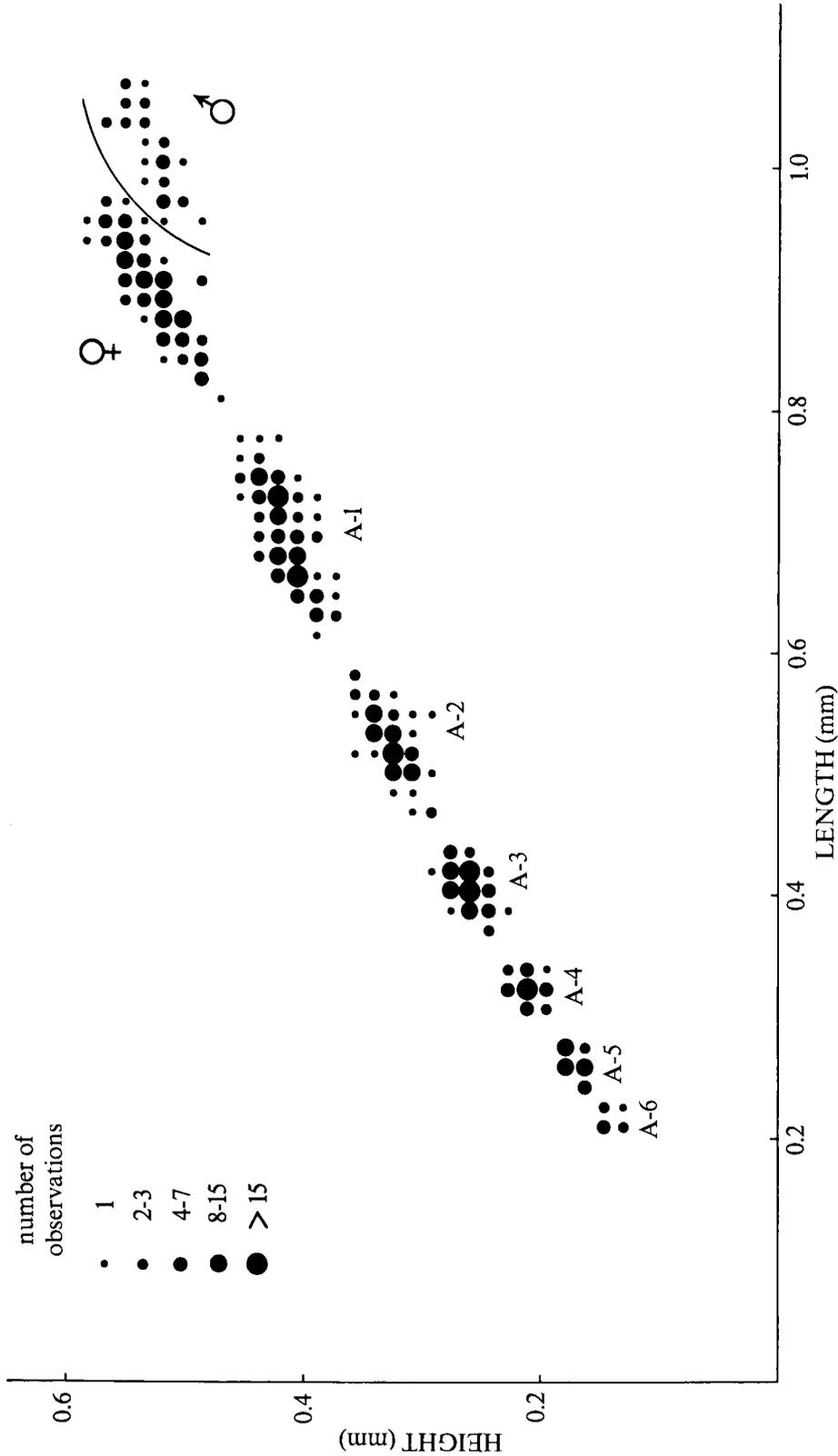


Fig. 2. *Cyprideis baetica* n.sp. Plot of length against height for the left valves in the type sample. For numbers of observations in the various instars, see Table I.

postero-ventral spine in the right valve appears for the first time in A-3. Anterior marginal denticulations are absent throughout the ontogenetical series observed.

The ornamentation is similar to that of the adults but finer. The pitting is generally coarsest in noded specimens. The early instars are predominantly smooth but fine pitting can already be seen in some A-6 individuals.

Lateral nodes are very common. They make their first ontogenetical appearance in A-5. A-5 and A-4 larvae may show up to five nodes (viz. nodes 1, 2, 3, 4 and 5). All seven Sandberg nodes are present from instar A-3 onward, nodes 2 and 5 being developed as elongate ridges. In instars A-2 and A-1 there are two separate nodes in the antero-dorsal area (Sandberg's position 4), bringing the total number of nodes up to eight.

There is evidence of sexual dimorphism in the A-1 instar (see under Biometry).

#### BIOMETRY

*Valve length and height* — Length and height measurements were taken using the technique mentioned in van Harten (1975). The descriptive statistics are given in Table I. In the A-1 instar bimodality is to be suspected (see Figs. 2 and 3). The apparent clustering around two centres in this instar is taken as an early expression of sexual dimorphism. If this is so, the left centre must be the female one and the right centre the male one.

*Relative width of the anterior marginal zone (AMZ)* — The relative width of the anterior marginal zone is defined as the width of this zone expressed as a fraction of the total length of the valve. It will be abbreviated as AMZ. The results mentioned in the description were obtained in the following way.

Four small samples were taken at random from the adult valve material. Female and male and left and right valves were sampled separately, each sample consisting of 20 specimens. The valves were immersed in glycerin and measured in transmitted light. The width of the anterior marginal zone was measured at the most anterior point of the valve and defined as the distance between the valve margin and the proximal edge of the inner lamella along a line parallel to the length of the valve.

AMZ values were determined on all specimens in the samples and the results analyzed non-parametrically by means of the Mann-Whitney U test. The differences between the left and right valves within sexes and between the females and

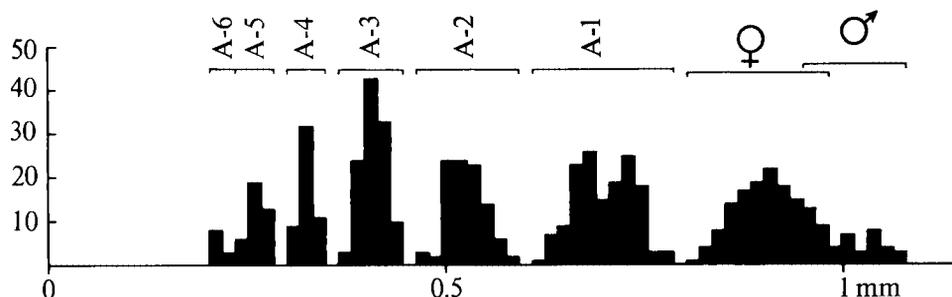


Fig. 3. *Cyprideis baetica* n.sp. Histogram of length for the left valves in the type sample. Based on the same data as Fig. 2.

	l e n g t h		i n		m m		h e i g h t		i n		m m		r	n
	mean	s	o.r.	o.r.	mean	s	mean	s	o.r.	o.r.	mean	s		
<i>left valves</i>														
adult males	1.016	0.033	0.950-1.080	0.950-1.080	0.530	0.019	0.479-0.576	0.479-0.576	0.751	37				
adult females	0.902	0.037	0.804-0.982	0.804-0.982	0.529	0.025	0.463-0.593	0.463-0.593	0.862	132				
A-1	0.700	0.036	0.609-0.787	0.609-0.787	0.417	0.017	0.365-0.463	0.365-0.463	0.710	149				
A-2	0.526	0.024	0.463-0.593	0.463-0.593	0.326	0.015	0.284-0.365	0.284-0.365	0.686	98				
A-3	0.409	0.016	0.365-0.446	0.365-0.446	0.262	0.011	0.219-0.300	0.219-0.300	0.500	113				
A-4	0.325	0.010	0.300-0.349	0.300-0.349	0.211	0.009	0.187-0.235	0.187-0.235	0.291	52				
A-5	0.263	0.011	0.235-0.284	0.235-0.284	0.172	0.008	0.154-0.187	0.154-0.187	0.542	38				
A-6	0.215	0.008	0.203-0.235	0.203-0.235	0.140	0.008	0.122-0.154	0.122-0.154	0.386	11				
<i>right valves</i>														
adult males	0.974	0.036	0.885-1.031	0.885-1.031	0.493	0.020	0.430-0.544	0.430-0.544	0.817	67				
adult females	0.872	0.039	0.755-0.966	0.755-0.966	0.493	0.024	0.414-0.544	0.414-0.544	0.892	178				

Table I. *Cyprideis baetica* n. sp. Descriptive statistics for the type sample (s = standard deviation; o.r. = observed range; r = coefficient of correlation between length and height; n = size of instar subsample).

males within similar valves were found to be highly significant ( $\alpha = 0.001$ ). AMZ means and observed ranges are given in Table II.

#### ECOLOGY

A mixohaline paleoenvironment is indicated by the composition of the thanatocoenosis. *Cyprideis baetica* n. sp. is abundant and by far the dominant species. *Ilyocypris gibba* (Ramdohr, 1808) and *Loxoconcha* spp. are common, other ostracods are less frequent. The foraminiferal fauna is dominated by abundant *Ammonia beccarii* (L.) and *Elphidium* spp.; other species — including *Neovalveolina melo* (Fichtel & Moll) and small pelagic forms — are rare.

#### REMARKS

Within the genus, *C. baetica* n. sp. belongs to a complex around the type species *C. torosa* (Jones, 1850) that is characterized by the squat shape of its females. These are rather short and laterally swollen in the posterior, their dorsal and ventral sides tending to converge backward (Kollmann, 1960; Krstić, 1968).

*C. baetica* is probably quite close to *C. ventroundulata* Krstić, 1968, which is similar in size and shape. In that species, however, anterior marginal denticulations are present on the female right valve.

*C. baetica* is rather similar in shape to *C. ruggierii* Decima, 1964. The two species share the unusual feature of having a postero-ventral spine while lacking anterior marginal denticulations. *C. ruggierii*, however, is somewhat larger and differs in type of ornamentation.

*C. baetica* in some respects resembles the American *C. salebrosa* van den Bold, 1963 (see also Sandberg, 1964). There are similarities in shape, size, type and variability of ornamentation, nodal pattern and shape of upper mandibular scar. *C. salebrosa* differs in lacking the postero-ventral spine and having a more sinuate ventral margin.

In *C. baetica* the potential number of nodes is larger than it is in any other described species of the genus. The nodes also appear earlier in the ontogeny than they seem to do in other species (see Sandberg, 1964 and Kilenyi, 1972).

	mean	o. r.
female left valves	8.43	7.39-9.69
female right valves	7.36	6.43-9.11
male left valves	7.34	5.60-8.36
male right valves	6.21	4.57-7.04

Table II. *Cyprideis baetica* n. sp. Means and observed ranges of AMZ in % in samples of 20 adult specimens.

It is not known whether the observations made on the relative width of the anterior marginal zone may be considered as highly specific. Pertinent data on other species are still wanting.

It would appear that pre-adult sexual dimorphism has not yet been described for ostracods. Nevertheless, features similar to those seen here can be observed in ontogenetical series of *C. torosa*.

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## Plate 1

*Cyprideis baetica* n.sp.

Stereo-pairs; magnification approximately x67.

Fig. 1. Female right valve in slightly oblique lateral view showing node 7. Holotype, RGM 173 727.

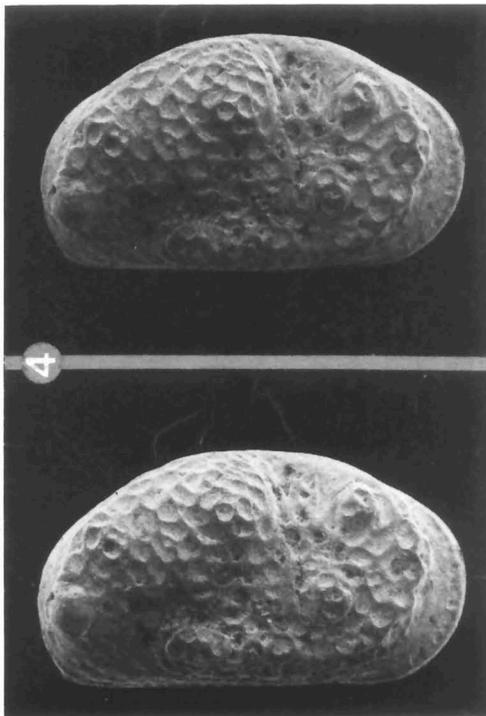
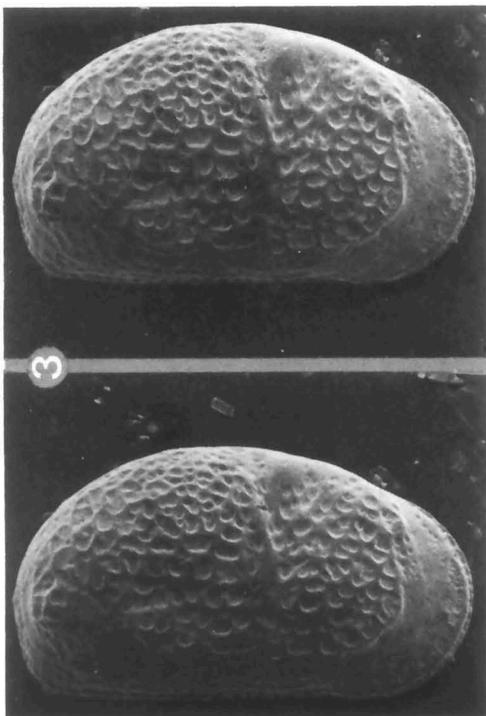
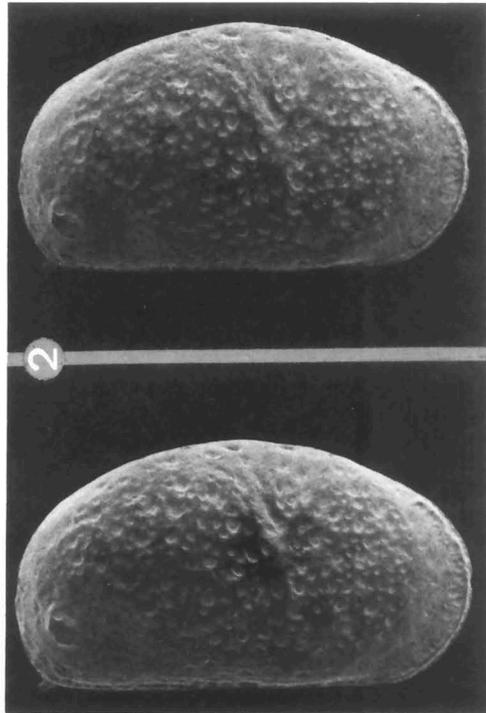
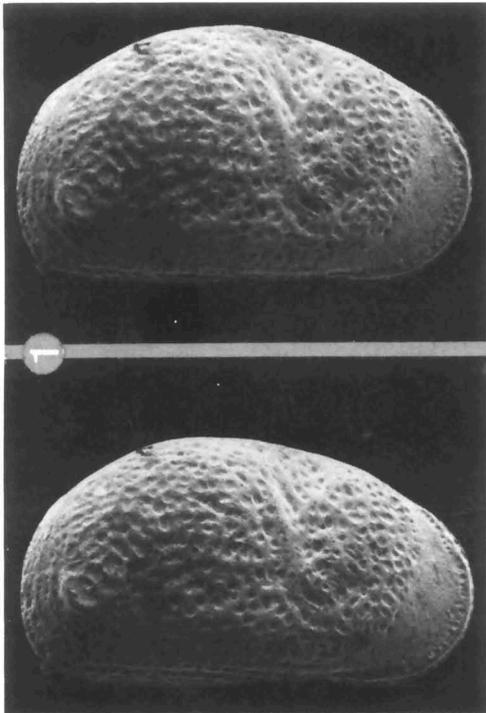
Fig. 2. Female right valve in lateral view showing node 7. Paratype, RGM 173 728.

Fig. 3. Female right valve in lateral view showing nodes 2, 3 and 7.

Fig. 4. Female right valve in lateral view showing nodes 1-7.

All specimens from the type sample, Miocene, near Huércal-Overa, Spain.

Plate 1



## Plate 2

*Cyprideis baetica* n.sp.

Magnification approximately x67.

Fig. 1. Male right valve in lateral view showing moderately developed node 7. Paratype, RGM 173 729.

Fig. 2. Male left valve in lateral view. Paratype, RGM 173 730.

Fig. 3. Male right valve in lateral view showing weakly developed node 7.

Fig. 4. Female left valve in lateral view.

Fig. 5. Male left valve in lateral view.

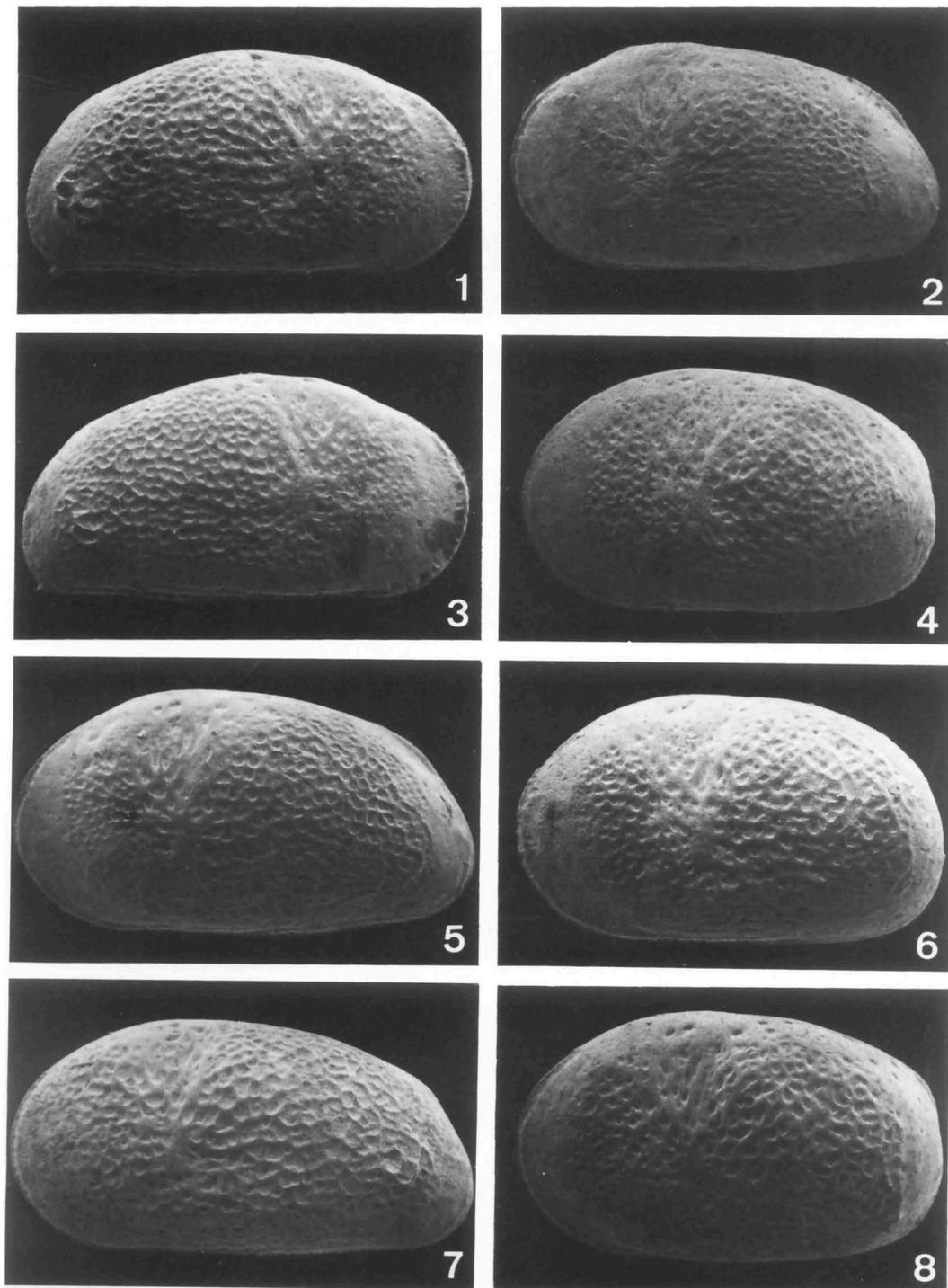
Fig. 6. Female left valve in lateral view.

Fig. 7. Male left valve in lateral view showing weakly developed node 7.

Fig. 8. Female left valve in lateral view showing weakly developed node 7. Paratype, RGM 173 731.

All specimens from the type sample, Miocene, near Huércal-Overa, Spain.

Plate 2



### Plate 3

*Cyprideis baetica* n.sp.

Fig. 1. Male carapace in dorsal view; note smooth dorsal surface and asymmetrical development of node 7. Approximately x67.

Fig. 2. Female carapace in dorsal view; note smooth dorsal surface and asymmetrical development of node 7. Approximately x67.

Fig. 3. Female carapace in ventral view; note coalescing of pits into longitudinal grooves on ventral surface and asymmetrical development of node 7. Approximately x67.

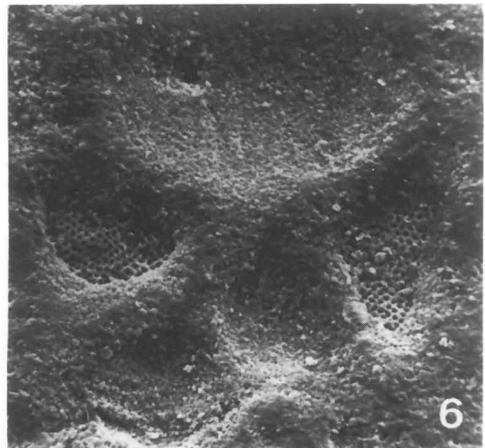
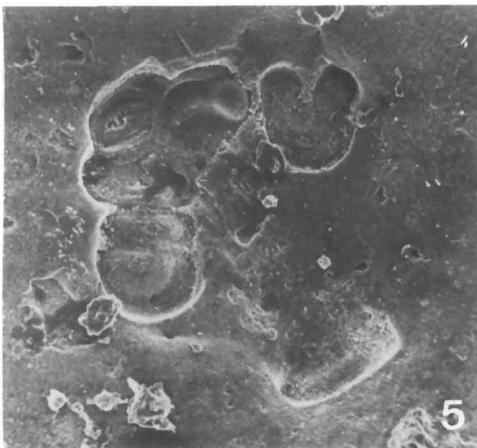
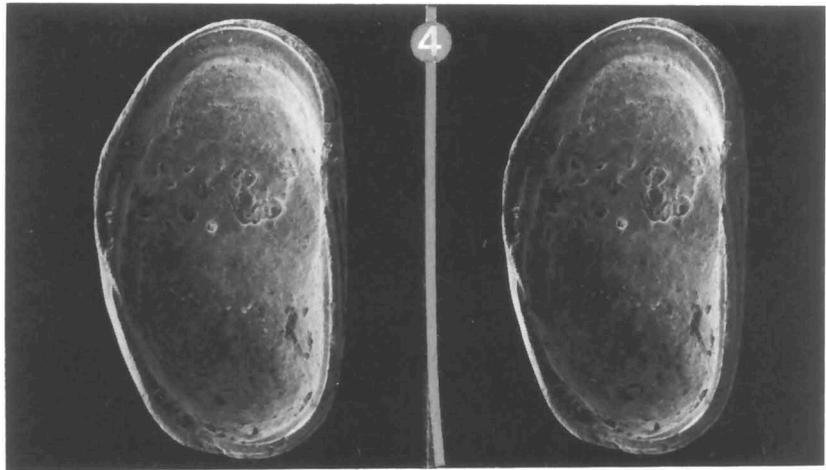
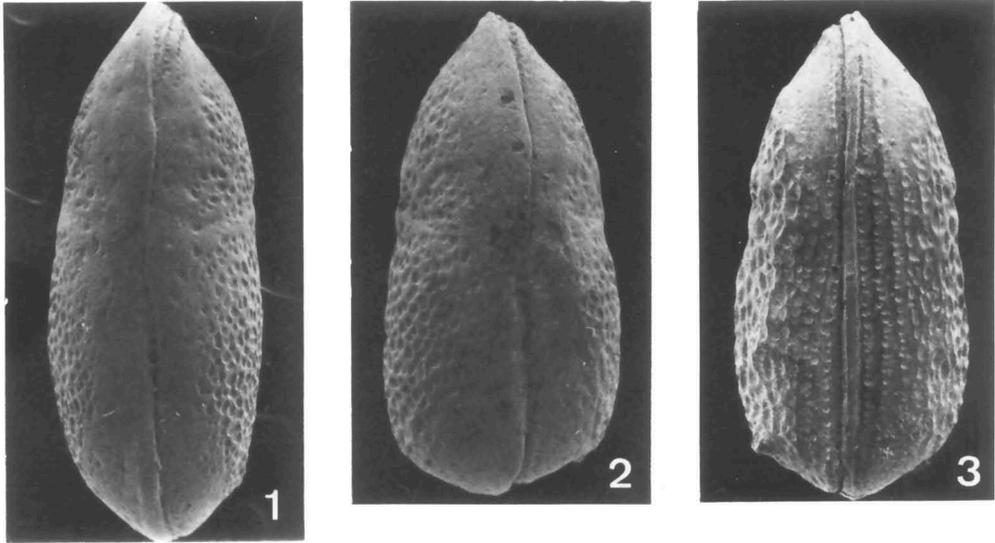
Fig. 4. Internal view of female left valve; stereo-pair. Approximately x67.

Fig. 5. Muscle scar field; inside of female left valve. Approximately x335.

Fig. 6. Sieve plates; outside of male right valve. Approximately x940.

All specimens from the type sample, Miocene, near Huércal-Overa, Spain.

Plate 3



## Plate 4

*Cyprideis baetica* n.sp.

Noding in juveniles; stereo-pairs.

Fig. 1. Right valve of A-5 larva in lateral view showing nodes 1-5. Approximately x140.

Fig. 2. Right valve of A-2 larva in lateral view showing maximum number of nodes; position 4 is occupied by two nodes. Approximately x70.

Fig. 3. Central part of same specimen as fig. 1. Approximately x350.

Fig. 4. Right valve of A-1 larva in lateral view showing maximum number of nodes; position 4 is occupied by two nodes. Approximately x70.

All specimens from the type sample, Miocene, near Huércal-Overa, Spain.

Plate 4

