Two extremely rare Australian fossil cowries (Gastropoda: Cypraeidae)

By Felix Lorenz, Buseck-Beuern (Germany)

Figs 1-2

Abstract

Two exceptionally complete specimens of *Palliocypraea gastroplax* McCoy, 1867 and *Eschatocypraea balcombica* F. A. Schilder, 1966 are illustrated and discussed.

Zusammenfassung

Zwei ungewöhnliche fossile Kauri-Arten aus dem Miozän Victorias werden porträtiert. *Umbilia* (*Palliocypraea*) *gastroplax* trägt einen breiten, dünnen Rand, der die gesamte Schale umgibt, vermutlich als Anpassung an sehr weichen Schlamm. *Eschatocypraea balcombica* ist eine interessante Art des Miozäns, die bislang nur von wenigen Exemplaren bekannt ist, deren Zuordnung zu den Eocypraeidae in Frage gestellt werden kann.

Introduction

The Miocene fossil Cypraeid fauna of Victoria, Australia is exceptionally well documented, as the shells are deposited in a soft clay that kept them from getting smashed and eroded. The Balcombe Clay (Middle Miocene) of Victoria yields a large amount of small Cowry-species of the genera *Notoluponia*, *Notocypraea* and *Austrocypraea*, whereas larger species usually belong to the genera *Umbilia* and *Zoila*. These are also the predominant components of the living Cypraeid fauna from the southern half of Australia today. Most extinct species have conchologically similar living relatives - with two rare exceptions. Recently, I was able to obtain specimens of each of these, which are here briefly portrayed and illustrated, for the first time in colour.

1) *Umbilia* (*Palliocypraea*) *gastroplax* McCoy, 1867

Shell of average size for genus; last whorl pyriform, tapering gently anteriorly with prominent wide flange extending around periphery of whorl; flange width about half width of last whorl, flange thickness about 1 mm. Transverse section of last whorl subtriangular. Spire umbilicate; spire whorls scarcely visible, covered with glaze. Posterior canal incorporated into shell flange, slightly reflexed dorsally, subcylindrical, almost tubelike anteriorly, almost closed on some specimens, closed on others; weak longitudinal sulcus present on left dorsal side of posterior canal and extending from middle of canal into umbilicus and across dorsum to posterior canal on some specimens. Anterior canal subcylindrical incorporated into shell flange; dorsal surface of canal bearing very weak sulcus. Aperture narrow, sinuous; with 30–39 labial teeth; teeth prominent, thin, short, tooth interspaces about twice width of teeth; inner lip with 24–30 short thin teeth about half width of interspaces; teeth set on narrow rounded ridge running from anterior canal to posterior canal. Fossula elongate, narrow, slightly depressed. Ventral surface on both sides of aperture uniformly convex (after Darragh 2002).

The bizarre "Flanged Cowry" was described on the basis of a large fragmented specimen that remained unique for a long time, yet received a lot of attention because of its outstanding features. Cossman (1906) placed in a separate genus *Palliocypraea*. In 1924 W. Greed, a collector from Hamilton, Victoria, discovered a nearly complete specimen with the same peculiar shell morphology. Chapman discussed and illustrated this find in 1929 and gave first considerations on this species: he compares the flange that encircles the entire shell with structures found in Strombidae and Aporrhaidae and concludes that the structures are not comparable. Only in *Palliocypraea gastroplax*, such an extreme extension of the shell's outline is found, whose formation requires great modifications also of the mantle, which must have been considerably extended to cover the shell. Chapman correctly concludes that: "The flange (...) has no morphological connection to an expanded lip, as in the genera mentioned, nor with the thin everted lip of an embryo cowry, which in after life becomes introverted and crenulate. The shelly flange is, therefore, an exogenous growth in continuity with the periphery of the shell and was probably the result of using up a redundancy of shell material as a secretion of the basal part of the mantle, which otherwise would have been utilised in adding to the body whorl of the extraordinarily thin cowry shell."

The specimens I was able to study reveal that the mantle did cover also the dorsal part of the shell as the flange has a glossy dorsal surface and consists of two layers of shell-matter.

Chapman assumes that *P. gastroplax* most likely lived at depths between 200 and 800 m, on a soft, muddy bottom. The function of the flange was to protect the shell from sinking into a muddy substrate. The closest living relatives

Fig. 1: *Umbilia siphonata*, 136 mm, Fyansford Formation, Miocene.

of *gastroplax* (*Umbilia armeniaca* Verco and *U. hesitata* Iredale) are found offshore Victoria and Tasmania, on soft muddy bottom among small sponges which they feed on. The formation of a lateral flange to protect the shell from sinking makes sense: in the D'Entrecastreaux Canal in southern Tasmania, I had the chance to observe *U. hesitata* in its habitat at 30 m. The shells live on a muddy bottom so soft that I could stick my arm into the ground without feeling and resistance.

The lateral flange, though a very extreme modification, may have taken a relatively short period of time to develop. While inhabiting an area with a thick layer of mud becoming more and more unstable and soft, those individuals with wider margins would have had a selective advantage over those with narrow shells that easily sank. Within few generations the tendency to form lateral extensions as a selective factor of survival would become enhanced to the point that the cost of forming such a flange would outweigh the advantages over competiting species with another strategy of survival, for instance *Umbilia siphonata* Chapman, 1922. That species had formed snorkle-like extensions of the canals in addition to a flattened, wide base (Fig. 1).

The complete shell under study has a siphonal canal that is pointing up, which may indicate that at certain times *P. gastroplax* was even half buried in mud, with only the sipho reaching above the surface. *P. gastroplax* obviously had a restricted range and only existed over a short period of time as it is found only on three sites, in particular strata, without great variation. In other words, it suddenly was there and then disappeared again, as an oddity among an otherwise conchologically stable genus. Many of the miocene fossils of Victoria can be found at many sites. *Gigantocypraea gigas* is found throughout Victoria and also in the cave-systems of the Nullarbour Plains of Western Australia (Morrison, pers. comm.).

Today, there are few complete specimens of *P. gastroplax* in museum collections and even less samples in private hands, usually reconstructed from fragments.

2) *Eschatocypraea balcombica* F. A. Schilder, 1966

This fascinating genus and species was introduced by F. A. Schilder in his uniquely precise and elaborate way, though based on a single specimen: "Shell elongatedly pyriform. Spire involute, therefore covered completely with callus. Dorsum with approx. 120 fine wavy striae (about 36 per cm length), which are only becoming indistinct in the median third, but more enhanced and narrower towards the terminal areas. Dorsum furthermore with typical transverse ridges and lines characteristic for some Eocypraea. Margins and terminals and base seemlingly smooth, very finely granulose under magnification. Right side very distinctly angularly margined (the margin is slightly bent up midways), left side evenly rounded, ends somewhat bent backwards. Anterior end rostrate and evenly blunt, posterior of the outer lip curved, exceeding far above the inner lip. Aperture rather wide, straight, curved left in the posterior third. Anterior

canal wide, but deep and sharply bordered, posterior canal widening towards the end. Outer lip fairly flattened, slightly declivous in front, wider medially, more rounded behind. Labial teeth short throughout, dense and fine, somewhat irregular midways. Inner lip inflated midways, tapering in front, with a sharp keel behind along the canal. Columellar teeth joining without a gap, short-foulded, somewhat enhanced in front, finer behind. Fossula moderately broad, rather steep, smooth, the front part being formed by a terminal ridge which sticks out slightly at the terminal, so that the inner margin behind looks somewhat depressed. This margin is completely smooth, somewhat keeled across one third of the shell's length, and behind the aforementioned weak incurvation completely straight. The front margin of the fossula is exposed, therefore not joint to the inner side of the shell's dorsum. The columella is smooth (not recognizable in the holotype). Dorsum now uniform pale brown, margins and terminals white (separated sharply). The base was probably more brownish."

"*Eschatocypraea* is separated from all known Cypraeacea from the Neogene of Victoria by the involute spire, the dense sprial lines of the dorsum and the smooth, not denticulate fossula. The involute spire prooves a relation to Ovulidae, the regular dentition throughout the inner lip to Eocypraeinae, although the intensity of the dorsal striae and the narrow fossula remind of Ovulidae."

"The conchological features of the terminal ridge, the fossula and the dorsal sculpture as well as the formation of the labral margin were regarded sufficiently distinct to create a new genus associated to *Eocypraea*, with tendencies to Ovulinae. (...) The morphological isolation is supported by the geography and stratigraphy from the mayority of the cretaceous palaeogene *Eocypraea* of the northern hemisphere."

Schilder explained the choice of name of *Eschatocypraea* as follows: eschatos (gr.) is the furthest point in room and time. Not only that *E. balcombica* lived at the terminal point of distribution and is the youngest member of the Eocypraeini, but also the last genus he expected to introduce, after 46 years of research in Cowries.

Ever since its description, *Eschatocypraea balcombica* represented a riddle to Cowry-taxonomists because the holotype remained a unique shell for decades. The specimen shown here is most likely the only good specimen outside Australia, apart from the holotype in the British Museum, which is conchologically identical in every regard.

According to modern classifications of the Cypraeoidea (e. g. Fehse, 2001) *Eschatocypraea* belongs to the Eocypraeidae, a group whose evolution proceeded independently from the true Cowries, Cypraeidae, for 50 or so million years. The classification is based mainly on the involute spire and the presence of fine dorsal ribbing. The internalized spire may have developed independently as it has in other families (e. g. Ovulidae, in which the protoconch is moved to the posterior end again in some members (e. g. *Dentiovula clava* Habe, 1992). Fine ribbing of the shell is also found in Cypraeidae (e. g. *Ipsa childreni* (J. E. Gray, 1825) whose juvenile shell shows a fine sculpture similar to that of *Eschatocypraea*). Other features of *Eschatocypraea balcombica*, such as the shell's shape and the formation of the dentition and the fossula is more cowry-like and closely resembles the genera *Austrasiatica* and *Palmulacypraea*. The arbitrary choice of conchological characteristics for the higher-level systematics may lead to results that turn opposite once a different choice is made. If this is the case here cannot be answered.

Concluding, I wish to thank Chris Goudey, Adam Anderson and Hugh Morrison.

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Address of the author:

Dr. Felix Lorenz
Friedrich-Ebert-Str. 12
D-35418 Buseck-Beuern
Germany
E-Mail: Felix.Lorenz@t-online.de

Fig. 2:
Left: *Palliocypraea gastroplax*, 107 mm long, 99.5 mm wide, Fyansford Formation, Balcombe Clay, Middle Miocene, Victoria.
Right: *Palliocypraea gastroplax*, fragment in original matrix, 125 mm long, Fyansford Formation, Balcombe Clay, Middle Miocene, Victoria.
Bottom: *Eschatocypraea balcombica*, 40.2 mm, Fyansford Formation, Balcombe Clay, Middle Miocene, Victoria.
All coll. Lorenz