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NOTES ON SIPHOCYPRAEA

Axel A. Olsson[1] and Richard E. Petit[2]

INTRODUCTION

In 1932, Schilder referred the so-called Mouse Cypraea (*Cypraea mus* Linné) of the southern Caribbean to the genus *Siphocypraea* Heilprin, 1887. Many like the senior author, who have collected *Cypraea henekeni* G. B. Sowerby I[3], a near relative of *C. mus* from the Miocene beds of Santo Domingo and many other places in the Caribbean region, even as far south as Ecuador, the reason for this startling generic assignment was not at first apparent. The type species of *Siphocypraea*, *S. problematica* Heilprin, 1887, of the Caloosahatchee marls of south Florida, was generally regarded as the only species of the genus, an aberrant form in a special fauna with many other singular, endemic genera and species of mollusks. In the Bulla stage, *S. problematica* was known to have a deep, circular or crater-like pit or depression over the apex, whereas in most other Cypraeas, the spire is elevated and pointed. Dall, 1890, considered this feature very important and from it he derived the comma-shaped or spiral apical sulcus so characteristic of *S. problematica* as the result of rotation of the posterior end of the outer lip around it. Soon afterwards, the Bulla stage of *Cypraea carolinensis* Conrad, 1841, of the Duplin Marl became known, also with a low, sunken apical area but which with growth did not produce a spiral or curved posterior canal. Meanwhile, Julia Gardner (1948), not understanding the significance of the depressed apex of the juvenile *Cypraea carolinensis*, proposed the generic term *"Akleistostoma"* with the Duplin species as type; a wholly unnecessary term as shown in previous articles. A few years ago, as the richly fossiliferous beds below the Caloosahatchee marls were penetrated along many canals and in pits, a somewhat older molluscan fauna came to light, and a bewildering series of specimens of *Siphocypraea* in countless numbers could be collected on the canal banks. Those individuals showed complete intergrading forms between *C. carolinensis* with a simple notch to others with a curved or spiral one approaching *S. problematica*. It was evident at once that *C. carolinensis* and *S. problematica* are species of the same direct evolutionary lineage.

Following the formation of the inrolled lip, growth in size by coiling ceases, and is replaced by a general enamelling of the surface by the mantle

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[3] Originally inadvertently spelled *henikeri*, named for Colonel Heneken.

lobes. Several species of *Cypraea* show extreme variation in size from small to large. This common condition led to the belief that a small *Cypraea* could go into retirement, reabsorb its lip reverting to the Bulla stage, and start growing again. This legend has neither been confirmed or wholly disproved. There is a great scarcity of fossil Cypraeas in the Bulla stage, perhaps to be explained in that the immature shell is thin and hence would be destroyed during fossilization.

This study began a short while back when the junior author received a fine series of growth forms of *S. mus* from a correspondent[4] in Venezuela. These specimens, as well as others collected by the senior author in Colombia, give incentive to a general review of both *Muracypraea* and *Siphocypraea* lineages, the two most important groups of Cypraeas in the American Tertiary.

LINEAGE OF *SIPHOCYPRAEA HENEKENI* AND *S. MUS, MURACYPRAEA* WOODRING, 1957

This lineage is the older, appeared at least as early as the lower Miocene (Woodring, 1959, p. 194), and has continued through to the Recent, represented in the southern Caribbean by *S. mus* (Linné). The principal Miocene species is *S. henekeni* (G. B. Sowerby I, 1850), first described from Santo Domingo but now known to be widely distributed throughout the Caribbean region and also in the eastern Pacific region south to Ecuador and possibly to Peru. It is most common in middle Miocene beds where it displays considerable variation of which many forms from different localities have been described as separate species, especially by Ingram.[5] The *S. henekeni* complex has been reviewed by Woodring, 1959, and synonymy listed. In the eastern Pacific region, the last representative of *Muracypraea* known is *S. cayapa* (Pilsbry and Olsson, 1941) from the Jama Formation, Ecuador of Pliocene age. As also noted by Woodring, 1957, *Muracypraea* reached the western Pacific, and Martin (1891-1922), in his large monograph of the Miocene of Java, illustrated specimens of his *Cypraea murisimilis* (plates 26,27) so similar to *S. henekeni* that they could be considered as the same species. It seems likely that *Muracypraea*

[4] Mrs. Jesse B. Jackson, Jr.

[5] Between 1939-47, W. M. Ingram worked on *Cypraea*, visited many musuems, and indiscriminately described a large number of fossil forms without knowledge of variation or geologic occurrence. Often no acknowledgment was made to the geologist who may have laboriously collected the specimens. Such naming is a habit which adds nothing but a clutter of useless names.

arose in Oligocene time, probably in the Tethyan Pacific, and first penetrated into the Caribbean in early Miocene, where it greatly flourished and managed to survive to the present time in a limited area.

Siphocypraea (Muracypraea) mus (Linné) Plate 18, figs. 3-3e

Cypraea mus Linné, 1758, Systema Naturae, Ed. 10. p. 721 (Carthagena, Gulf of Maracaibo).

Siphocypraea (*Akleistostoma*) *mus* (Linné), Coomans, 1963, Studies on Fauna of Curaçao and other Caribbean Islands, vol. XV, No. 68, pp. 52-63. pl. I a-b.

A series of growth forms of *S. mus* from the small Bulla stage to the adult was received by the junior author from a correspondent in Venezuela, and some are illustrated on Plate 18. A minor paper on the growth forms of *S. mus* based on Colombian specimens was published by Ingram, 1945 but adds nothing of significance and treats mainly of changes in color. An important paper on *S. mus* is that of Coomans which appeared in 1963 and presents much new information as well as a thorough review of the literature and the many names and generic combinations which authors have applied to this unusual species. The range of this species along the northern coast of South America is limited from about Río Hacha in northeastern Colombia on the west to about Isla Margarita in eastern Venezuela.[6]

A specimen of *S. mus,* collected by E. Daniel (Dec. 1932) supposedly at Turbo, Colombia, is in the collection of the United States National Museum. The record is considered dubious, and we have not accepted it. The town of Turbo is situated on the banks of the Río Atrato at the head of the Gulf of Atrato, a large river emptying a heavy load of sediment into the gulf and the adjacent shores are lined with mangrove swamps. A more unlikely place for a *Cypraea* could hardly be imagined.

The protoconch or nucleus of *S. mus* is large, resembling that of the top side of a *Natica,* its surface glazed over with callus but faint trace of pimples occur which may indicate an original, sinusigeroid embryonic shell. The nucleus is encircled by a faint line marking its termination although a general brown color continues for another turn then changes to the lighter shade of the final whorl.

[6] El Cordon, a locality referred to by Ingram and again by Coomans is situated on the northwest coast of the La Goajira Peninsula in northeastern Colombia. Coomans showed this locality on his map as being on the Paraguana Peninsula in Venezuela. The shells from El Cordon were collected by J. A. Nomland, a geologist for the Richmond Petroleum Company which carried on large scale exploration in coastal Colombia during the 1920 ths. This locality is shown on the American Geographical Society map, Barranquilla sheet, 1,000,000, as Cardon de los Remedios and is situated about 80 kilometers east of Río Hacha. The region is arid, covered with tall cactus (several large species of cactus commonly known as Cardon).

Specimen B (fig. 3d) is still in the Bulla stage; the length of its shell is 31 mm, over the apex, it is 30 mm. The posterior end of the lip is elevated and rounded, rising from 1 to 2 mm above the apical crater. In specimen C (fig. 3e), the formation of the inrolled lip has begun, but its inner edge is still sharp and the cross ribs on the base show mainly as color stripes; on the inner or body side, there are no denticles, except for a few small ones over the columellar section; length of shell is 32.4 mm, its height along the apical axis is 30 mm. In specimen D (fig. 3b), the formation of the outer lip is well advanced, its inner edge inrolled and thickened, and strongly cross-ribbed, while there is a continuous line of small denticles on the body side; its apical depression is reduced to a smaller size covered with callus concealing the spire; length of shell is 38.9 mm, and over the apex, it is 35.6 mm. The deposition of a surface callus has hardly begun and the juvenile pattern of zigzags remains.

These observations indicate that the principal growth in size is completed in the Bulla stage by secretions along the edge of the simple lip and in coiling; and as far as these specimens go, a fairly uniform pattern of size is adhered to. As the shell grows to maturity, further growth in size and weight is achieved by secondary deposits of enamel, along with a change of color pattern. The mantle secretion is thinly spread over the dorsum and sides. It is much heavier over the posterior end leading to the formation of the posterior lip protuberances and the formation of the canal notch.

S. mus shows considerable variations in the intensity of color and pattern and in the adult, no two specimens are exactly alike. In the juvenile form the pattern consists of narrow, close-set, zigzag stripes of brown between lighter areas, a design maintained through the Bulla stage and for a time after the lip has fully formed. In the mature adult and into the gerontic stage, a marked change takes place and a general glaze or enamel overlays the whole surface, thinnest over the dorsum, heavier on the base and sides, and as a filling in of the apical depression. The juvenile pattern of zigzags is covered over, and one of irregular spots and flecks appear. In general the adult marking is a confused blending of large spots of pale fawn brown between lighter areas, the spots sometimes joining into radial rows along the flanks. The dorsum mantle line is white or light in color, usually with an irregular blotch of dark brown at its end over the apical depression. The surface of the dorsum may be evenly rounded or domed,

smooth, or it may bear two conspicuous nodes or humps, one on each side of the mantle line at the posterior end. These dorsal humps have been considered deformities or abnormalities by some writers, but they represent significant morphological features and indicate relationship with the *S. henekeni* forms of the Miocene. *S. mus* is the last, surviving member of *Muracypraea.*

LINEAGE OF *SIPHOCYPRAEA PROBLEMATICA* HEILPRIN, *SIPHOCYPRAEA SENSU STRICTO*

This lineage appears to be younger than *Muracypraea,* the best known species (*S. problematica* Heilprin) is distributed in the upper Neogene formations from the Carolinas to Florida. The earliest known species is *S. chilona* (Dall) 1900, from the lower Miocene Chipola beds of Florida, but its juvenile stage with depressed apex is inferred only on the basis of a longitudinal section (Olsson and Petit, 1964, pl. 83, fig. 6) The subgenus attained is full development in the upper Neogene in a bewildering series of intergrading forms discussed in our former paper. The subgenus became extinct at the close of Caloosahatchee time, and no specimens have been found in the overlying Unit A to date.

In the typical and most advanced species (*S. problematica* Heilprin and *S. transitoria* Olsson and Petit, 1964), the comma-shaped, posterior sulcus is developed to the extreme. The formation for this curious feature can be seen in Plate 18, figure 2 which represents a partial longitudinal cut through the aperture to the dorsum. The small, thin-walled Bulla shell is seen inside the heavily thickened wall of the base and the thinner wall of the dorsum. The formation of the spiral sulcus can be clearly seen as due to two factors. First, the retention of a deep, apical depression through all stages of the group which does not become filled with callus as in *S. mus* or *S. henekeni*; secondly, followed by the elevation and thickening of the posterior end of the outer lip forcing it to rotate so its end comes to overhang the apical hollow; at the same time, the edge of the sulcus on the body whorl side thickens and raises into a calloused wall (fig. 2a, 2b) to conform in height with the outer lip.

FLUORESCENT PATTERN

A beautiful fluorescent pattern can often be produced on *Siphocypraea* from a few localities, and a series is illustrated in figure 1. The juvenile

pattern is formed by zigzag bands, replaced or overlain in the adult by one of small spots. Long-wave ultraviolet lamps of 3200-4000 angstrom units give the best results and the fluorescent pattern can be photographed using a very fast film and a special yellow filter over the lense (No. 8, K. 2. Wratten) must be used to eliminate all ultraviolet light from entering the camera. Preferably, the photography should be done in a darkened room.

GENERAL CONCLUSIONS

Siphocypraea sensu stricto and *Muracypraea* are members of the same generic group and represent two lineages which arose probably in Oligocene time and became fully differentiated in the Miocene. *Muracypraea* has the widest known distribution and in its typical form is found throughout the Miocene of the Caribbean region and in the Eastern Pacific as far south as Ecuador and Peru; it is also known from the Miocene of Java in forms indistinguishable from the Caribbean. It may well be of Tethyan origin with a distribution which encircled the earth. *Muracypraea* has usually an oblong, squatty shape and in its typical form carries two, dorsal humps bordering a shallow depression over the concealed apex resembling the enlarged eyebrows of a mouse, hence the name.

Siphocypraea s. s. is a special development from the same stock and is probably endemic to the Miocene of southeastern United States. In the Pinecrest beds (Duplin) of south Florida, the group proliferated to an astonishing degree and gave rise to a maze of variable, intergrading forms, but the subgenus became fully stablized in the Caloosahatchee marls in *S. problematica*, its most advanced species. The subgenus became extinct at the close of Caloosahatchee time.

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PLATES

EXPLANATION OF PLATE 18

Figure — Page

1-1c. **Siphocypraea (Siphocypraea) transitoria** Olsson and Petit — 281

Fluorescent patterns.

1. Adult, dorsal pattern, length 59 mm; No. 27619 PRI. 1a. Juvenile pattern, length 48.5 mm. 1b Juvenile pattern, length 51.3 mm; No. 27620 PRI. 1c. Adult, ventral pattern, length 48.3 mm. Kissimmee, Osceola County, Fla.; No. 27621 PRI.

2-2b. **Siphocypraea (Siphocypraea) transitoria** Olsson and Petit — 281

2. Longitudinal section through aperture showing apical sulcus and inner Bulla stage, length 49 mm. Brighton, Highlands County, Fla.; No. 27622 PRI. 2a. Showing elevated callus on body side of canal, length 38 mm; No. 27623 PRI. 2b. Apical view of same specimen. Kissimmee, Fla.

2c-2d. **Siphocypraea (Siphocypraea) problematica** Heilprin — 281

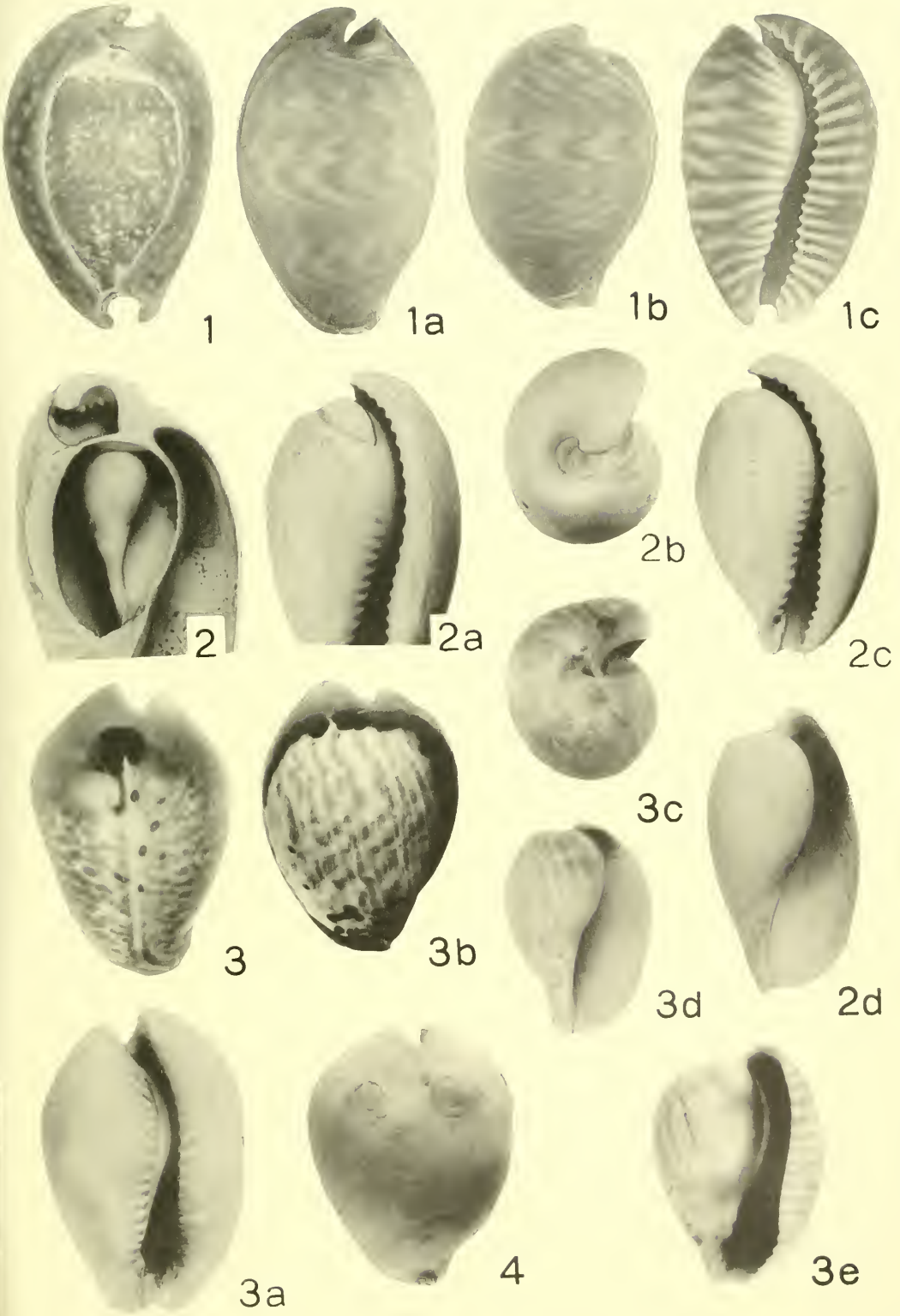
2c. Young shell with newly inrolled lip, length 45mm. 2d. Bulla stage, thin, posterior end of lip high, length 40.7 mm. Whitaker rock pit, west of La Belle, Hendry County, Fla.

3-3e. **Siphocypraea (Muracypraea) mus** (Linné) — 279

3, 3a. Adult, dorsal and basal view, length 49.4 mm; No. 27624 PRI. 3b. Young adult still retaining juvenile pattern, length 38.9 mm; No. 27625 PRI. 3c, 3d. Bulla stage, apical and ventral aspects, length 30.8 mm; No. 27626 PRI. 3e. Juvenile form with newly inrolled lip, no denticles on body side of apertur, length 32.4 mm; No. 27627 PRI. Ski Beach, Judibana, Venezuela.

4. **Siphocypraea (Muracypraea) henekeni** (Sowerby) — 278

Adult to show nodes on dorsum, length 57.3 mm. Middle Miocene, Gurabo Formation, Río Gurabo, Gurabo Adentro, Santo Domingo.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