From: La Conchiglia 294–295, p. 77–81

A morphometric analysis of the cowry *Cribrarula cumingii* (Gastropoda: Cypraeidae), with a revision of its synonyms.

by Felix Lorenz

In the small cowry *Cribrarula cumingii* remarkable variation in shell size may be observed. Traditionally, two formae are distinguished on the basis of this feature (*cumingii* and *cleopatra*). The taxonomic status of these forms is a long-debated subject. This study compares a series of more than 100 *Cribrarula cumingii* from various localities in Polynesia.

Material and menthods

A series of 108 specimens of fresh condition from Tahiti: Arue, Papeete, Hitiaa; Tuamotu: Manihi, Rangiroa Atoll; Huahine: Tefaererii was compared using standard measuring procedures (length, width, height and number of teeth (reduced, after Schilder & Schilder 1938). Also, the shell structure was compared using a Philips LX20 scanning electron microscope.

Shell dimensions and number of teeth

For the following comparisons, only undamaged, fully adult specimens were used. Smallest shell: 9,67 mm, largest shell: 27,90 mm.

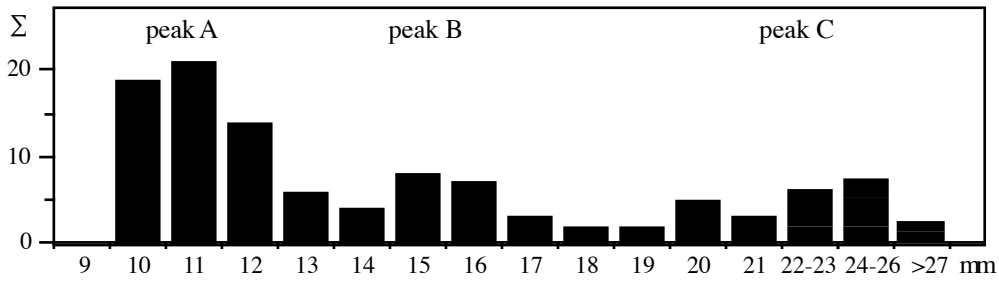

Table 1: Length of *Cribraria cumingii cumingii*

There are three peaks in size ranges that are more common than others (gaps). The peaks are roughly between lengths of 9,7 and 12,5 mm (peak A), 14,5 and 16,5 mm (peak B) and 19,5 to 25 mm (group C). Gaps are roughly: 12,5 to 14,5 mm (gap 1) and 16,5 to 18 mm (gap 2). There are only nine shells between 16 and 20 mm, which is less then ten percent of the material studied. The flatter but wider plateau of peak C is interpreted as an effect of the shell's larger sizes. Relative to the shell's length, the variability of the large set (peak C) is comparable to that of the smaller sets: The relative variability (standard deviation divided by average ($\sigma/\varnothing$), see Lorenz 1999) of small (<13 mm: $\sigma/\varnothing = 0{,}082$) and large shells (>20 mm: $\sigma/\varnothing = 0{,}092$) is about the same. The three peaks will in the following be called A (small

shells), B (medium sized shells), C (large shells). The width/length and height/length ratios were found to be constant throughout the entire size range. The three peaks in length-frequency (A, B, C) all have an average width/length ratio of 0,54 (A) to 0,55 (B, C) %. Reducing the counted number of labral teeth to a hypothetical shell of 25 mm length* reveals a consistent difference in dentition in the shells measuring 12 mm and less (A) against the larger specimens. In these, the reduced number of teeth is rather constant. In the reduced number of columellar teeth varies considerably, the difference between small (A) and larger shells (b, C) is slight.

* the calculation is done by the formula: $7+(\text{number of teeth counted}-7)\sqrt{(25/\text{length})}$

The shell formula (after Schilder 1938) of the total set measured in this study is 16 (55) 34:32 (enumerated: average length (width/length in percentage) labral : columellar teeth (reduced).

A	(specimens measuring 9,7 - 13,5):	11(54)43:34
B	(specimens measuring 13,6 - 16,0):	15(55)31:31
C	(specimens measuring 16,1 - 27,9):	21(55)31:32

From the morphometric comparison it becomes apparent that most of the smaller shells (A) mainly differ from the medium sized to large shells by much finer labral teeth and somewhat finer columellar teeth (reduced). B and C do not differ except in size. There is one specimen whose size would place it into group A, but the colour and shell structure (see below) identifies it as dwarfed shell of group B.

Colour and pattern

In all specimens examined the ground colour is plain white to orange-grey. In the medium sized to large shells (B and C) the darker coating is orange. The lacunae are small (average diameter/total shell length= 7,5 %) and numerous (average number: 43 in B and 47 in C). The lacunae and the dorsal line are framed with darker orange. The dorsal line is situated in the labral fourth of the dorsal dome, so that from dorsal view it is visible along the margin. In the medium sized shells (B) the doral line is more consipcuous than in the large shells (C). In A the dorsum is extremely thin and translucent. The internal coiling can be seen through the shell. The darker coating of the small shells is pale cream. The lacunae are comparatively larger (average diameter/total shell length= 9,5 %) and less numerous (average number: 31). They are framed with a barely darker ring. The dorsal line is narrow and situated in the labral third. From dorsal view it appears to be closer to the shell‘s axis than the lines of B and C. The marginal spotting of the medium sized and larger shells is dense and of variable size. There usually is a set of large spots above the labrum, and numerous smaller spots directly on

the labrum. On columellar side, the spotting may be less dense midway, especially in the large set (C). In both, the medium sized and the large shells, the average number of labral spots is 19, of columellar spots 14. In the set of small shells (A) the spots are somewhat less numerous: labrally there are 13 in average, on columellar side 11.

Shell structure

Between B and C hardly any conchological differences could be found. With the one abovementioned exception, all small shells of peak A are consistently different from B and C by the following features (refer to Plate 1: scanning electron microscope photos of B (top) and A (bottom). Scale: 0,3 mm.). In A the posterior extremity (Plate 1: a) is pronounced and rostrated, especially on labral side. The spire is exposed and deeply umbilicate (Plate 1: c) . In B and C the posterior extremity is more callous and shorter, partly covering the spire. The aperture in A is somewhat more curved to the left than in B and C. The labral teeth (Plate 1: b) of B and C are equally long throughout, the labrum is rather narrow. In A the teeth are very short midways, while becoming longer towards the extremities, the labrum is broader than in B and C, making the aperture narrower. In A the labrum is distinctly declivous posteriorly, which is not the case in B and C. The columellar dentition in A is elevated, forming a callous ridge bordering the aperture (Plate 1: d). Such a callus-ridge is not found in B and C. In A the terminal ridge is longer and wider than in B and C. No intergrades in any of the described differences could be traced amongst the specimens examined.

Distribution and habitat

As all shells were obtained from professional shell dealers, the evaluation of locality- and habitat data requires a certain degree of scepsis. The shells of B and C are reported from various localities in Huahine and Tahiti, whereas all specimens of A are labeled Tuamotu. Shells of B and C were collected from the intertidal zone to depth of more than 30 m, mostly at night. The shells of A were mostly collected empty, in shellgrit deposits at depths ranging from 1 to 5 m. One exception, which is already mentioned above, originates from Tahiti measures 9,9 mm and conchologically belongs to group B.

Discussion

Lorenz & Hubert (1993) recognize two distinct geographical subspecies of *Cribrarula cumingii*, namely *c. cumingii* from Tahiti and Tuamotu and *c. astaryi* Schilder 1971 from the Marquesas. Both subspecies are variable in size and shape. *C. c. astaryii* is found in a smaller, elongate form (typical) and a larger, callous form (forma *lefaiti* Martin & Poppe 1989). The nominate subspecies *c. cumingii* has traditionally been subdivided in a larger and a smaller variation. By definition, *c. cleopatra* Schilder & Schilder 1938 exceeds 20 mm. In their

Prodrome (1938) the Schilders describe the differences between *cumingii* and *cleopatra* as follows: “There are two striking varieties in size: the typical *cumingii* (11.54.40.34) varying from 9 to 16 mm. and rare giants, which we propose to call *cleopatra* (22.52.28.32).; we have never seen intermediate shells. Moreover *cleopatra* differs by the labial teeth, which are relatively coarser, and less numerous than the columellar ones, by the outer lip less declivous in front, the labial teeth produced more equally, the body whorl less inflate, the extremities less produced, the dorsal lacunae smaller and more numerous; it seems to live together with cumingii in eastern Polynesia (...).” In the treatise of the Dautzenberg-collection (1952) the features ascribed to typical *cumingii* in sensu Schilder & Schilder reveal that according to them, the typical *cumingii cumingii* is the small series of shells examined herein as “A”. Obviously, few specimens of the variety B have been known to the Schilders who seemlingly interpreted these as large *cumingii*. Their *cleopatra* corresponds to the set C of this work. They did not know any specimens between 16 and 20 mm, which may be explained with the frequencies of shell-length in the set examined herein (gap 2). Sowerby’s historical figures of *cumingii* show a large shell (Sowerby (1870), Pl. 31 fig. 349–350; all shells on this plate are depicted at the same scale, see also Plate 2, fig. 3–4 in this work). This specimen now in the collection of the British Museum of Natural Histroy is the holotype of *cumingii*. It is also illustrated in Taylor & Walls (1975, p. 143). The length of this shell is 27,8 mm, which is exceptionally large (see Plate 2, fig. 1–2). There is little doubt that Schilder & Schilder’s *cleopatra* is a synonym of *cumingii* in sensu strictu. Another type specimen illustrated on Sowerby’s plate 31 (fig. 351) is that of *compta* Pease 1860 (see Plate 2, fig. 5 in this work). It is shown in scale next to *cumingii* and measures about one third of the *cumingii*-type figure, is paler, and more rostrate. The original description of *compta* reads as follows: “Shell oblong-ovate, rather solid; colour pale fawn-yellow, ornamented with somewhat remote, round, white spots of irregular size, and a flexuous dorsal line of same colour; sides and base white, the former conspicuously dotted with dark brown; extremities produced, the posterior curving to the left; umbilical region concave; right side margined; aperture narrow, flexuose; teeth small, even, twenty eight on the outer lip, not extending over the middle; columella teeth twenty-three, not so stout as those on the outer lip, forming an even line on the inner edge of the aperture; columella smooth, sulcated longitudinally, gibbous above and dentated on the extreme inner edge.” The number of teeth reduced (considering that the holotype of *compta* measures approximately 10 mm) is 40:32. The labral teeth of *compta* are short, the aperture curved and the spire exposed and umbilicate. All these features clearly identify *compta* as the proper name for the morphologically distinct set of shells herein called “A”. The name *compta* has been synonymized with *cumingii* by all authors, whose attention was probably distracted by the abnormal dorsal line. Nobody noticed the marked differences in shell structure. The minute size of these shells has probably prevented their recognition.

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Conclusion

The set of shells examined herein allows the following conclusions: No perceptible differences except larger size could be found between medium sized specimens (B) and large specimens (C). Small shells (A), on the other hand, show consistent morphological differences which allow a distinction at least on subspecific level. There seems to be a geographic separation between the small shells (A) and the other two sets (B, C). The medium sized and large shells (B and C) occur in the same geographic area and habitat. Although B and C display a slight difference in size, they apparently belong to the same taxonomic unit whose correct name is *Cribrarula cumingii cumingii* Sowerby 1832. This subspecies seems to occur mainly in Tahiti and Huahine. The small shells here called "A" can be separated on the level of a subspecies differing from *cumingii* chiefly by the mostly smaller size, more numerous, shorter labral teeth, more rostrated posterior extremity, paler dorsal colour and fewer lacunae and marginal spots and finally by the callous ridge bordering the aperture on columellar side. Occasional specimens of *c. cumingii* may be equally small but otherwise differ by the other features enumerated here. The correct name for the subspecies from Tuamotu is *Cribrarula cumingii compta* Pease 1860. Plate 3 shows specimens of *cumingii compta* from Tuamotu (fig. 1–4) and typical *cumingii cumingii* from Tahiti (fig. 5-8). Scale: 5 mm.

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Plate 1

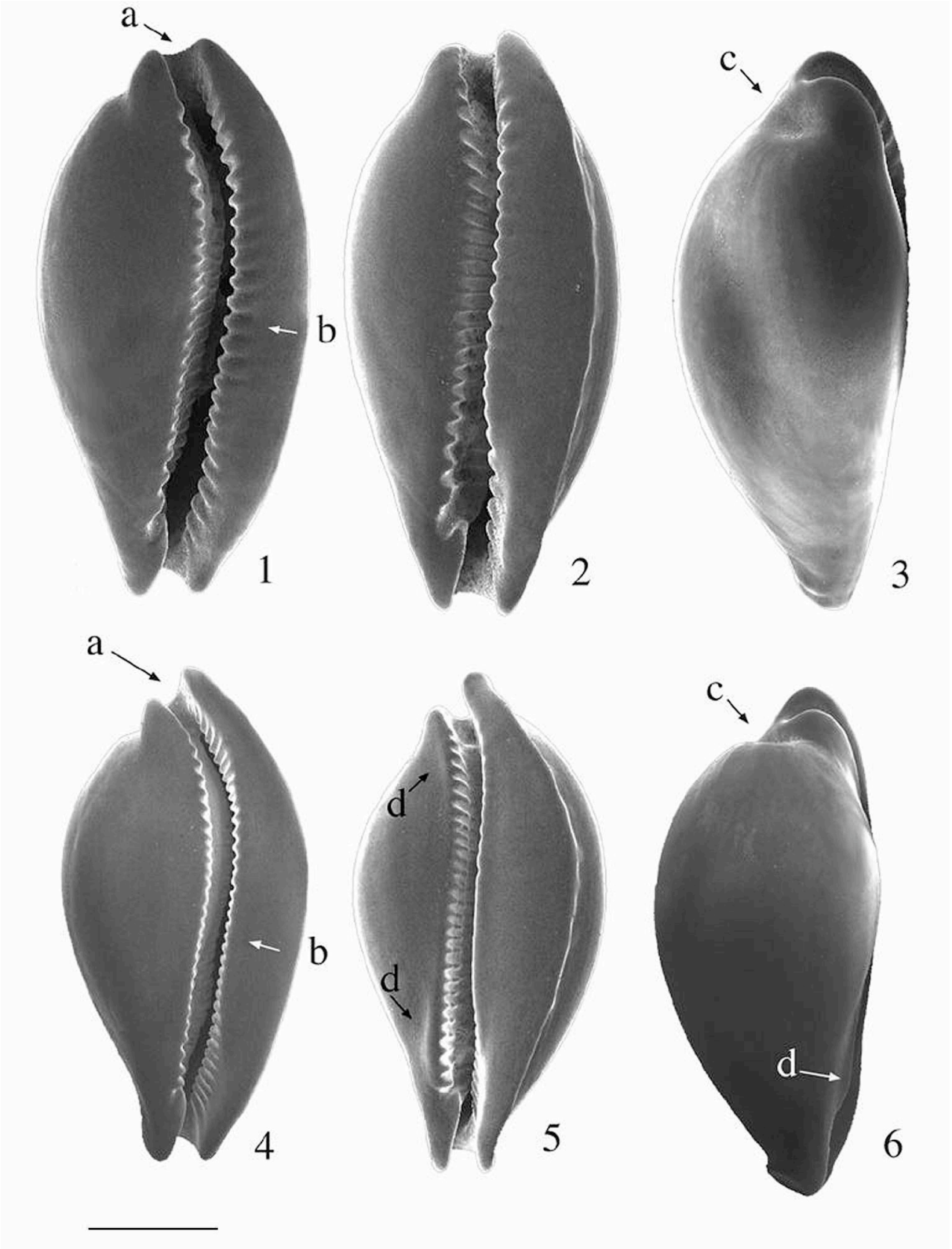

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Plate 2

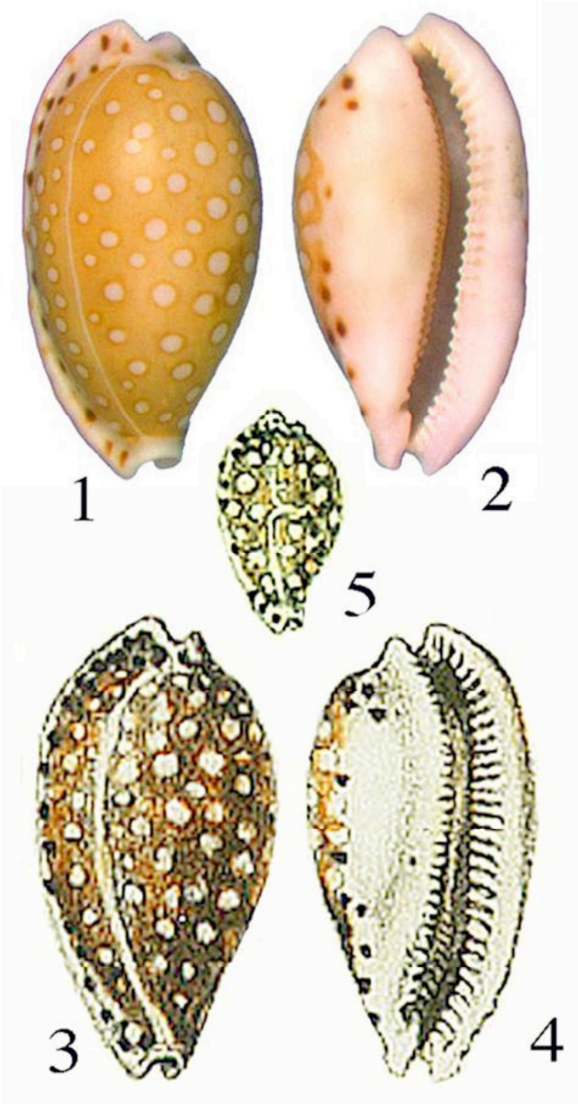

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Plate 3