

BLASICRURA INTERRUPTA (GRAY, 1824) AND RELATED TAXA

E.L. Heiman *)

Abstract: Diagnostic shell characters of *Blasicrura interrupta* (Gray, 1824) and *Blasicrura pallidula* (Gaskoin, 1849) are compared and the conclusion is drawn that a conchological gap between these taxa is absent. Hence *B. pallidula* should be considered a subspecies of *B. interrupta*.

This conchological study shows that populations of the species from an area of Eastern India to Western Thailand and the Andaman Sea, can be treated as the nominotypical subspecies *B. interrupta interrupta*; populations from the Philippines and near-by areas can be treated as the subspecies *B. interrupta pallidula* (Gaskoin, 1849); *interrupta*-like populations from Okinawa, North-West and Eastern Australia, Melanesia and Samoa can perhaps also be treated as subspecies but their exact taxonomic identity needs clarification in the future.

Key words: Mollusca, Gastropoda, Cypraeidae, *Blasicrura interrupta*, *Blasicrura pallidula*, intraspecific variation, taxonomy.

1. The nomenclatural history.**1.1. The nomenclatural history of *Cypraea interrupta*—Figs 1-6.**

The original description of *Cypraea interrupta* (Gray, 1824) reads:

Cypraea interrupta Gray, 1824.

“38. *Cypraea interrupta*.—The Broken-banded Cowry.

Testâ oblongo-ovatâ, subumbilicatâ, albido-caerulescente, interruptè trifasciatâ, punctisque fulvis nebulatâ; basi lateribusque albis; subtus convexâ, aequaliter subsulcatâ.

2. *decorticata*. Testâ albido-violaceâ, interruptè trifasciatâ; fasciis antice bifidis.

Inhabits. _____. Mus. Brit. J. Sowerby, Nost.

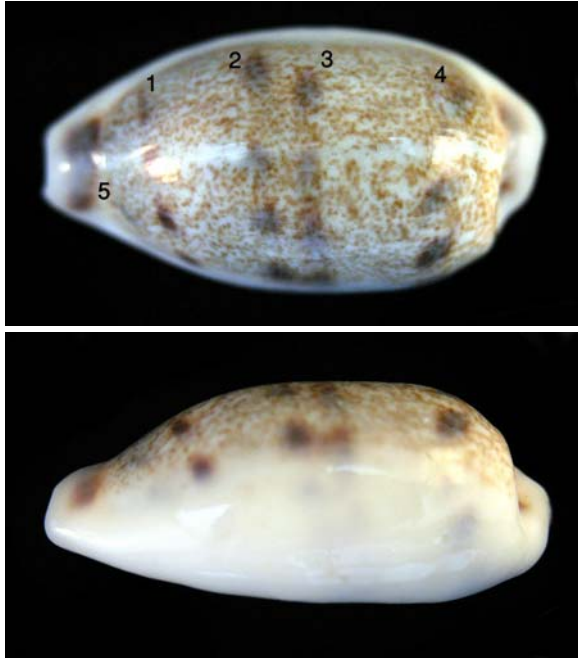
Shell oblong-ovate, blueish-white, clouded with minutely yellowish dots, and with three broken brownish bands, the two foremost of which are generally divided spirally into two, and the hinder one mostly single and formed of oblong transverse spots; the spire is slightly concave, covered; the base and sides white; the edge slightly thickened all round, rounded on the sides, and slightly produced at the posterior extremity; the anterior extremity ornamented with a brown lunate spot on its upper part; teeth smallish, even, slightly extended over the lips, so as to make the base evenly grooved.

This shell agrees in some measure with the description of *Cypraea tabescens* of Solander’s MSS. (Martini j.t. 28 f. 294, 295.) [Fig.6 below]; but the teeth are small and closed, and the bands are differently placed, as the hind one is only a little distance from the spire. I therefore consider it a distinct species, which is always to be known by its evenly sulcated base and articulated bands.”

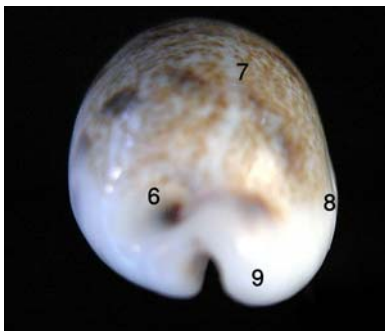
Cypraea tabescens mentioned above is in fact *Blasicrura teres* (Gmelin, 1791). There is no picture accompanying the description. A locality of the described shell is not mentioned and, according to Schilder (1966), the holotype of *C. interrupta* is unknown.

The malacological practice confirms the range of distribution of *C. interrupta* mentioned in works of students of cowries in the past: it is usually Sri Lanka, South-East India, and the Andaman Sea to Western Thailand.

The taxonomic identity of *C. interrupta* was never questioned. It was moved into the genus *Blasicrura* Iredale, 1930 and below this and the related taxa are mentioned as belonging to that genus.



1-5. *B. interrupta*, 25 mm, Andaman Sea



The shell characters are designated as follows:

- 1-4. Dorsal bands.
- 5. Greyish callosity above the anterior extremity.
- 6. Dark brown to black apex of the concave spire.
- 7. Dorsal line (sulcus).
- 8. Thickened and rounded right edge.
- 9. Slightly produced posterior extremity.

One detail in Gray's description is astonishing: he mentioned the depressed spire but did not mention the blackish apex of the spire—Fig. 5. The latter is distinctly visible in shells of *interrupta* and the related taxa. This shell character is not mentioned also in the Prodrôme, in Burgess (1970, 1985) and in Lorenz (1993, 2000).

Only Cate (1963) mentioned that *B. interrupta*, *B. quadrimaculata*, *B. pallidula*, *B. pallidula luchuana* (Kuroda, 1960), and *B. dayritiana* “possess the intense brownish-black nuclear apex.”



6. *B. teres*
(mentioned in the description of *interrupta* as *C. tabescens*).

Diagnostic shell characters of *B. interrupta* are summarized in Table 1 where shell characters of *Blasicrura pallidula* are also given.

Table 1

Diagnosing characters of *B. interrupta* (according to the original description) and *B. pallidula* according to Sowerby (1870); the data from the Prodrome are added for both taxa.

| # | shell character | description | <i>inter-rupta</i> | <i>palli-dula</i> | notes |
|----|------------------------|--|--------------------|-------------------|----------|
| 1 | shape | oblong-ovate to elliptical | V | | |
| 2 | profile | flat to slightly convex | V | | |
| 3 | dorsal color | bluish-white | V | | |
| 4 | dorsal pattern | clouded with yellowish spots | V | | |
| 5 | | 3 bands | V | | a |
| 6 | | 4 bands | | V | b |
| 7 | spire | depressed, covered | V | | |
| 8 | apex | blackish | V | | |
| 9 | base | white | V | | |
| 10 | sides | white | V | | |
| 11 | the margins | slightly thickened, rounded | V | | |
| 12 | anterior extremity | ornamented with a brown lunate spot on its upper part | V | V | |
| 13 | teeth | teeth smallish, even, slightly extended over the lips, so as to make the base evenly grooved | V | | c |
| 14 | push-button-like tooth | separates between the terminal fold and the first tooth of the columella | V | V | d |
| 15 | V-S formula | <i>interrupta</i> | 20.53.25.21 | | e |
| | | Melanesian <i>pallidula rhinoceros</i> | | 18.55.23.18 | f |
| | | Malayan <i>pallidula pallidula</i> | | 19.56.22.17 | |

Notes:

- a) “three interrupted zones, the central of which may be dissolved into two zones approaching each other and connected by a paler brown zone”.
- b) “four zones equally distant from each the other.” If one accepts the opinion stated in Schilder (1928) that there are 3-4 dorsal zones in *B. pallidula*, the conclusion will be that this diagnostic shell character is in this case not of a specific level.
- c) “*interrupta* differs from *pallidula* by the finer, close, and more numerous teeth, which are shorter so that they do not attain the middle of each lip”.
- d) This tooth is more often found in *pallidula* than in *interrupta*.
- e) According to the Prodrome.
- f) The difference between the subspecies of *B. pallidula* according to the Prodrome is: “The Melanesian *rhinoceros* (18.55.23.18) differs from Malayan *pallidula* (19.56.22.17) by the less attenuated extremities and the less acuminate hind top of the inner lip, by the teeth less produced and less distant, by the less interrupted dorsal zones, and by the sides frequently adorned with scattered small spots never observed in *pallidula*.”

1.2. The nomenclatural history of *Blasicrura pallidula*

This taxon is relevant to the current study because the shells are similar to those of *B. interrupta* and are sometimes confused in collections.

It was first described as a pale form of *Blasicrura quadrimaculata* (Gray, 1824)—see Appendix sections A1-A2. *Cypraea quadrimaculata* (Gray, 1824) can be easily separated from *C. interrupta* by the four large dark blotches at the shell extremities.

J.S. Gaskoin mentioned that f. ‘pallidula’ “is destitute of the large black spots on the outsides of the extremities and on the spire.” These are the main diagnostic shell character of *C. quadrimaculata* hence ‘pallidula’ must not be related to *quadrimaculata* but to another species because the main diagnostic characters of *quadrimaculata* are absent in this form; or it is an abnormal shell.

At the moment we cannot say to which species belonged the shell described by Gaskoin as ‘form pallidula’ because the type specimen of this form is unknown according to Schilder (1966). This fact apparently escaped the attention of many students of cowries in the past—Melvill (1888), Hidalgo (1906-1907), Sowerby (1870), Schilder (1924)—who treated ‘pallidula’ as a form of *B. quadrimaculata*.

In Sowerby (1870:8) f. *pallidula* is mentioned as *C. rhinoceros* Deshayes:

Note:-- Interrupta, quadrimaculata. Although we may characterize *C. interrupta* as having bands of flashes or long bent spots, etc., and *C. quadrimaculata* as having the four large, conspicuous, terminal, black spots, yet the one occurs without the band, and the other (var. “*pallidula*”) without the spots. Var. pp.274 and 275, has been designated as a distinct species, under the name of *rhinoceros* (Desh.), on account of the callous swelling of the anterior terminal deposit. The character exists in most specimens in a greater or less degree.”

One can see in Sowerby (1870):

on Plate 27 figs. 271-272—a shell of *C. interrupta*;

on Plate 27 figs. 273-274 and on Plate 37 fig. 535—shells of *C. rhinoceros* (Desh.);

on Plate 27 fig. 275—a shell representing (in Sowerby’s opinion) the form ‘pallidula’ of *C. quadrimaculata*.

Sowerby’s note is very interesting: he apparently considered (or even diagnosed) shells of *interrupta* without the dorsal bands although this is the main diagnostic character of the species!

In Schilder (1928) Sowerby’s approach is partly adopted and widened: *interrupta* and *pallidula* are treated as different species and the following shell characters are added:

a) Variety ‘pallidula’ is the same as *C. rhinoceros* due to the same number of teeth, the shining base, and the callosity on the anterior extremity instead of dark blotches in *quadrimaculata*, which are never absent.

b) There are 3-4 close dorsal bands in *interrupta* and 4 distant bands in *pallidula*.

c) In both *interrupta* and *pallidula* the short, push-button-like tooth, not connected with the fossula, separates between the terminal fold and the first tooth of the columella; it is more often found in *pallidula* than in *interrupta*.

In Schilder & Schilder (1938) the authors recycled the name ‘pallidula’ and provided a description of the species *Blasicrura pallidula* Gaskoin (1849). This name is an old available name of the form ‘pallidula’ mentioned above. More on the Schilders practice of recycling old cowry names see in Heiman (2008). This means that only the name ‘pallidula’ is used and only the diagnosing characters of *B. pallidula* given in the Prodrôme should be considered—Appendix section A 4.

The Schilders compared in the Prodrôme *B. pallidula* with *B. interrupta* and described a subspecies *B. pallidula rhinoceros*, which is also the recycled name and should be treated correspondingly.

Two other subspecies *B. pallidula simulans* Schilder & Schilder (1940)—Appendix section A 5—and *B. pallidula summersi* Schilder 1958—Appendix section A6—were later treated by the Schilders as synonyms of *B. pallidula*.

It is written in Schilder (1930):

“Gray’s collection (Brit. Mus.) contains five specimens, varying from 17.4 to 20.4 mm.; they are three-banded, the columellar teeth cross the inner half only of the lip, and the teeth are fine and numerous, for instance: 18.3(53)23:20. Therefore Gray did not know *pallidula* (Gask.), too, which is four-banded, with less numerous teeth, the columellar teeth being more elongate; there are about 22-25:19-22 teeth in *interrupta* of medium size, and 19-23:14-18 teeth in *pallidula*.”

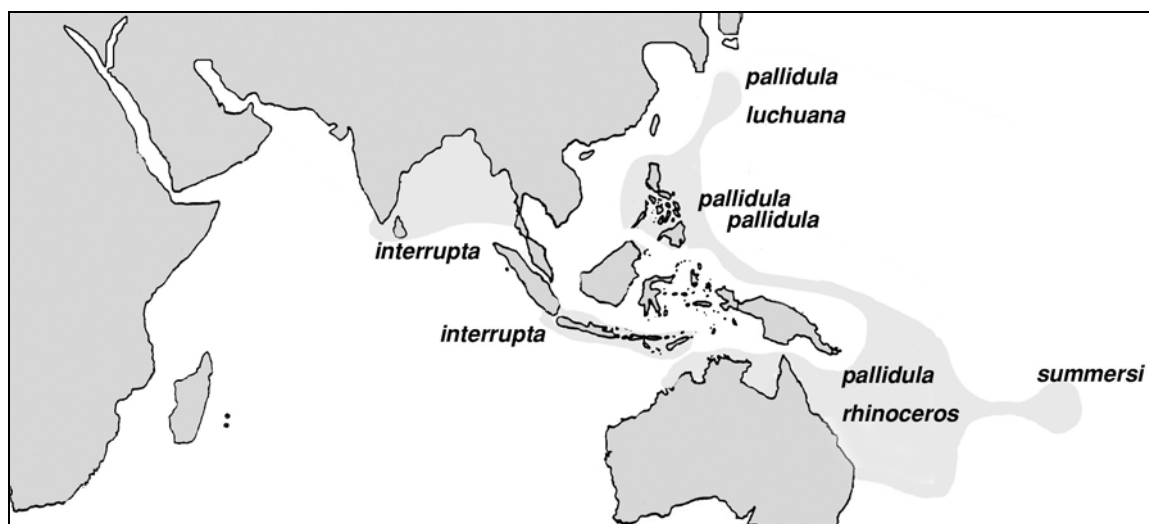
1.3. Distribution

The type specimens and the type localities of *B. interrupta* and *B. pallidula* are unknown.

In Schilder (1928) *B. interrupta* is mentioned from Ceylon; the origin of the five shells of *B. interrupta* mentioned in Schilder (1930) is not known. The malacological practice shows that shells of *B. interrupta* are mostly offered from the area Sri-Lanka-SE. India-Western Thailand although sometimes shells of *B. pallidula* are offered from the latter area too.

In the Prodrôme the range of distribution of the species is mentioned from Ceylon to SW Malaysia, W. Papua, and Sangu Islands. In Schilder & Schilder (1952) this range includes India, Sumatra, Moluccas, and the Sulu Sea.

Ceylon (Sri Lanka) is designated as the type locality of *B. interrupta* in Schilder (1966).



7. A possible ranges of distribution of *B. interrupta* and *B. pallidula* according to the previous works.

B. pallidula according to the Prodrôme inhabits “Central Malaysia to Luzon, Palau, W. Papua, S.W. Java, and Medan...Melanesia to Tonga, Samoa, Astrolabe Bay and Queensland (Capricorn Is.); Sharks Bay ?”

A preliminary map of distribution of the taxa under discussion can be seen in Fig. 7.

1.4. Problems and the aim of this study

Shells of *Blasicrura pallidula* and *B. interrupta* may be similar and sometimes they are confused in collections. The criterion of species accepted in the malacological practice states: a species must differ from all the other species of molluscs by at least one substantial diagnostic shell character without intermediates. In other words there must be a conchological gap between species.

One can see in Table 1 above that the conchological difference between *interrupta* and *pallidula* consists perhaps of the Vassière-Schilder formula, of the dorsal bands, and peculiarities of the teeth.

The difference in the average shell size and the average width to length ration is small if one takes into consideration the standard deviation of the shell length (usually 10% or more) and of the shell width (usually 2-3%). The conchological gap between the two taxa is absent in this case. The same is true regarding the

normalized teeth count: in cowries the standard deviation of this shell character is usually 1 tooth; so one should consider this when comparing different populations; the range of teeth may be (the average \pm 3 teeth). It follows that the number of teeth overlaps in the discussed taxa.

One should check the remaining shell characters: the dorsal bands and the peculiarities of the teeth in order to draw a conclusion whether the two taxa are separable conchologically at the specific level.

The Schilders themselves were reluctant regarding the specific level of *B. pallidula*:

In Schilder (1928) it is treated as a species.

In Schilder & Schilder (1938, 1952) they mentioned it as a valid species and discussed several of its subspecies.

In Schilder & Schilder (1966) it is mentioned as a valid species.

In Schilder (1967) it is listed as a subspecies of *B. interrupta*.

In Schilder & Schilder (1971) it is listed as a valid species again.

Students of cowries after the Schilders mentioned both taxa as different species.

It is not clear, what are the main diagnostic shell characters separating between them:

1. the number of transverse dorsal bands?
2. the possibility that only in *B. interrupta* the bands are interrupted?
3. the distance between the bands?

2. The conchological study

2.1. The studied conchological material

Below, as can be seen in Table 2, shells in the author's and other collections, pictures and descriptions in different conchological works, and pictures published on the Internet are used for comparison diagnostic characters of *B. interrupta* and *B. pallidula*. It should be remembered that in this case the conchological gap is implied and we are checking its presence using a sample test. Hence a number of the studied shells may be lesser than it is needed as the evidence of the presence of the gap.

Table 2

| taxa | shells in the author's and other collections | pictures on different sites of the Internet |
|----------------------|--|---|
| <i>B. interrupta</i> | 21 | 26 |
| <i>B. pallidula</i> | 38 | 76 |

2.2. Comparing shell characters

The diagnostic shell characters given by J.E. Gray and in the Prodrome are summarized in Table 3.



8. *B. interrupta*, 24 mm, Sri Lanka



9. *B. interrupta*, 18.8 mm, Sri Lanka, slightly subadult

Table 3
Diagnostic characters of *B. interrupta* and *B. pallidula*

| diagnostic characters | | <i>B. interrupta</i> | <i>B. pallidula</i> |
|--|------------------|--|---|
| the shell shape | | oblong-ovate or elliptical-ovate | |
| color of | the dorsum | bluish white clouded with minutely yellowish spots | |
| | the base & sides | white | |
| brown spot on the upper part of the anterior extremity | | may be present or absent | |
| the spire | | concave, covered | |
| the right margin | | slightly thickened, rounded on the sides | |
| the posterior extremity of the outer lip | | slightly produced | |
| the anterior extremity | | often ornamented with a brown lunate spot on its upper part | |
| dorsal line (sulcus) | | may be sometime visible | |
| dorsal bands | | “three broken brownish bands, the two foremost of which are generally divided spirally into two, and the hinder one mostly single and formed of oblong transverse spots”—note 2. | four bands equally distant each from the other |
| teeth | | finer, close, shorter so that they do not attain the middle of each lip | the teeth on the columellar side are larger, more prominent, more even, and fewer in number; while those on the lip are smaller and more numerous |

Notes:

1. J.E. Gray summarized the main diagnostic characters as follows: “evenly sulcated base and articulated bands.”

2. The Schilders added in the Prodrôme the following to the description of *interrupta*:

“three interrupted zones, the central of which may be dissolved into two zones approaching each other and connected by a paler brown zone, instead of four zones equally distant each from the other”.



10. *B. pallidula*, 19 mm, Australia



11. *B. pallidula*, 20.5 mm, New Caledonia

The V-S formula

It should be kept in mind that the Schilders gave in the Prodrôme the formulas for *interrupta* and for two subspecies of *pallidula* not as their main diagnostic character.

The number of the columellar teeth seems to be lesser in shells of *pallidula* from the Philippines than in *interrupta* but in populations of *pallidula* from Australia and Melanesia (the formula 18.55.23.18) this difference is not so prominent.

Hence statistical shell characteristics do not support the separation of *pallidula* from *interrupta* at a specific level.

The dorsal pattern

In both taxa the dorsal pattern consists of greyish to bluish background and numerous small tan or brownish spots.

The shell shape in both species may be oblong-oval to sub-cylindrical.

Color of the dorsum and base is practically the same in both species.

The spire may be concave and slightly covered by a callus or distinctly visible but in any case it is clear that the shell apex is brown to black.

The right margin may be round or slightly thickened, but in any case it is not margined in both taxa.

The posterior extremity is slightly produced in both taxa.

A brown lunate spot on the upper part of the anterior extremity is sometimes present but it may also be absent in both taxa or hardly visible.

The teeth

As can be seen above the form of the teeth is also similar. Columellar teeth may be slightly protruding on the base in *pallidula* but mostly they do not reach the middle of the base. Columellar teeth in *interrupta* do not reach the middle of the base too.

The labial teeth are distinct but usually they do not reach the 1/2 of the lip in both species.

A conchological gap between the two species is not found in the form and number of teeth.

Dorsal bands

A conchological gap, if it exists, can perhaps be found in the difference in the number and the form of the dorsal bands. Just the bands are traditionally treated as the diagnostic character separating between the two taxa.

One can see that definitions of the dorsal bands in the description of *interrupta* and *pallidula* are not clear enough. Gray mentioned three bands some of which may be divided into two, in other words there may be four and even five bands. The Schilders mentioned four bands in *pallidula*. Therefore the number of the dorsal bands may be the same in both taxa.

Perhaps the only conchological difference between *interrupta* and *pallidula* consists of the supposition that in the latter the dorsal zones are equally distant one from the other? This idea is checked below.

As mentioned above, Gray compared *interrupta* with *Cypraea tabescens* [*Blasicrura teres* (Gmelin, 1791)] in which the shell shape, teeth, and dorsal bands may be very similar and the spire is also depressed. But the right side is distinctly margined in *B. teres* and that seems to be the main diagnostic character separating between the two species; the blackish apex seems to be invisible in *B. teres*.

Perhaps Gray's description was based on an unusual not margined shell of *B. teres*? In this case a study of the type specimen may be extremely useful, but it is unknown as mentioned above.

According to the Prodrome:

“*interrupta* differs from *pallidula* by the ... “dorsum exhibiting **three interrupted zones**, the central of which may be dissolved into two zones approaching each other and connected by a paler brown zone, **instead of four zones equally distant from each the other.**” [In this article the text is underlined and written in bold letters by the present author].

Students of cowries after the Schilders treated the two taxa as valid species and mentioned their diagnostic characters not exactly according to works by Gray (1824) or the Prodrome.

It is written in Burgess (1970): “This species, *Cypraea interrupta* Gray, (Fig. L [on plate 8]) may be differentiated from other members of this group by the presence of **four dorsal bands which are not equally spaced**. The middle two bands are very close together, or occasionally fused, as in the specimen illustrated.”

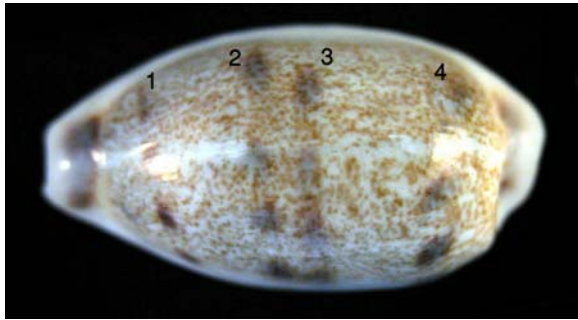
The same text is repeated in Burgess (1985) but one can see in a picture on p. 191 of the latter work that a distance between the three (not four) dorsal bands is practically the same.

Burgess (1970, 1985) mentioned also that in *interrupta* “the two central bands together occupy about the same space as do either of the other two” whereas in *pallidula* “four transverse dorsal bands are of equal width and equally spaced.”

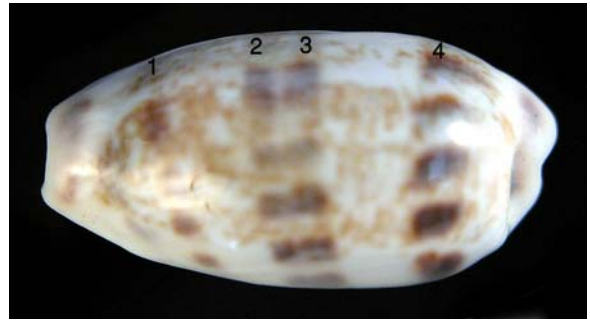
When comparing *interrupta* with similar taxa in Lorenz & Hubert (1993:160) the authors stressed the three dark interrupted bands (in the text on the next page they mentioned that the central band may be split). The same is repeated in Lorenz & Hubert (2000).

Krommenhoek (1996) compared the proportions of the dorsal bands in shells of *B. interrupta* from Sri Lanka and Java, Indonesia and indicated a certain difference between shells from the two areas. The four separate dorsal bands (not three as in the original description) are mentioned as typical for this species.

Pictures of *interrupta* and *pallidula* below show variation in the dorsal bands and other shell characters.



12-13. *B. interrupta*, Andaman Sea



14-15. *B. pallidula*, the Philippines



16. Sri Lanka (*pallidula* or *interrupta*?) 24 mm,



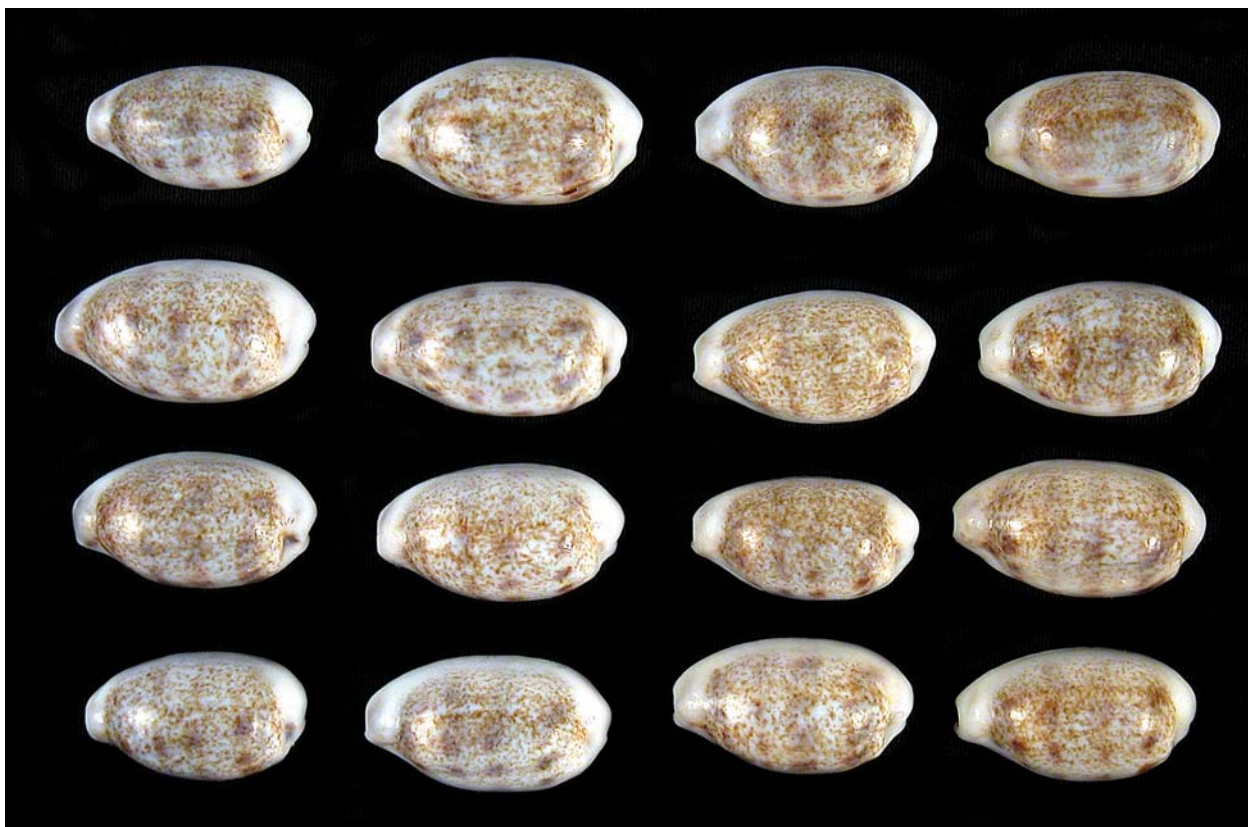
17. Sri Lanka, slightly subadult; 18.8 mm,



18. A batch of shells from Sri Lanka; *B. interrupta* ?



19. *B. pallidula*, 18-18.5 mm, Cebu, the Philippines



20. *B. pallidula*, the Philippines; shells with different number of the dorsal bands and a distance between the bands



21. *B. pallidula*, Sri Lanka, 17.8 mm HUI lot #567



22. *B. interrupta*, Sri Lanka, 23 mm HUI # lot 6886



23. *B. interrupta*, Sri Lanka,
21 mm HUI # lot 6886



24. *B. interrupta*, Sri Lanka, Sri Lanka,
21 mm HUI # lot 529

3. Summary and discussion

It was shown above that all diagnostic characters mentioned in the original descriptions of *B. interrupta* and *B. pallidula* vary considerably. That includes also the number and the position of the dorsal bands. So the conchological gap between the two taxa is not found in this study i.e. these taxa cannot be treated as different species.

The dorsal ornamentation of cowry shells seems to be the last one made by the mollusc during the process of building its shell, and, as the conchological practice shows, may be sometimes confusing as a diagnostic character of a specific level. The taxonomic identity of different populations of *Blasicrura teres* (Gmelin, 1791) is an example. Dorsal ornamentation in this species includes the dorsal bands, the dorsal spots and blotches, which may be present or absent in different groups of shells in populations of the species. *B. teres* was split into several species based on these variable shell characters, all of which may be present in one area as was demonstrated in Dayle (2004).

B. pallidula is known currently as a variable species and several of its subspecies are already described in the literature. Populations in the western part of its range of distribution were treated as *B. pallidula pallidula*, the nominotypical subspecies discussed above.

Populations of the Okinawa Islands were treated as a subspecies *B. pallidula luchuana* Kuroda (1960), which differs from *pallidula pallidula* by the presence of the small dark spots near the spire, by the dorsal sulcus often visible, and by the dorsal bands less visible; besides, *pallidula luchuana* seems to be endemic to the Okinawa Islands. All that should be checked again when more authentic conchological material will be available for study.

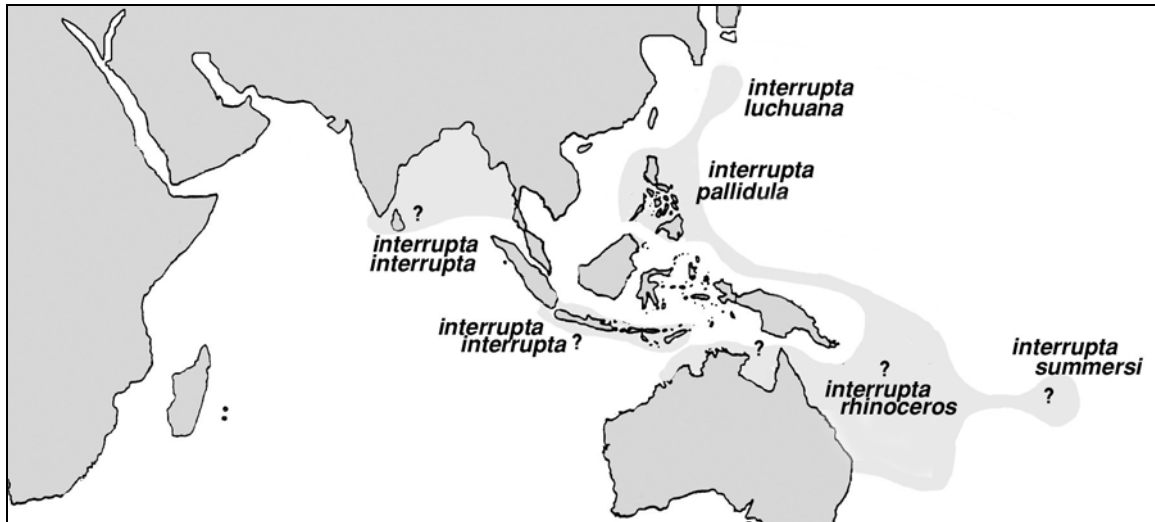
Populations of the southern part of the range—Australia and Melanesia—were treated as *B. pallidula rhinoceros*, *B. pallidula simulans*, and *B. pallidula summersi*. Shells of this group of populations are often greyish, callused and have substantially reduced dorsal bands, which are often hardly distinguishable. These facts do not help to separate *interrupta* from *pallidula* at a specific level and the taxonomic identity of these populations will be studied in the future.

It should be taken into consideration that the Schilders did not use the difference in dorsal bands when describing the subspecies *B. pallidula simulans* and *B. pallidula summersi*. In the description of *B. pallidula rhinoceros* they mentioned only the less interrupted dorsal zones. Currently we know that in the latter subspecies the dorsal zones are often invisible because shells are substantially callused.

4. A hypothesis: *B. pallidula* is a synonym of *B. interrupta*

A hypothesis that *B. pallidula* is a synonym of *B. interrupta* may settle the problem with the absence of the conchological gap between the two taxa.

In this case several subspecies of *B. pallidula* described in the past can be treated as subspecies of *B. interrupta*. The taxonomic identity of the other populations deserves additional study. Distribution of the subspecies of *B. interrupta* can be seen in a map Fig. 25 where the sign ‘?’ indicates a taxon of which the subspecific level still needs confirmation; that includes also populations of *B. interrupta interrupta*. To prove their subspecific level means to present the evidence that the majority of their shells differ from all the other populations of that species by at least one substantial shell characteristic.



25. A ranges of distribution of *B. interrupta* and its subspecies.

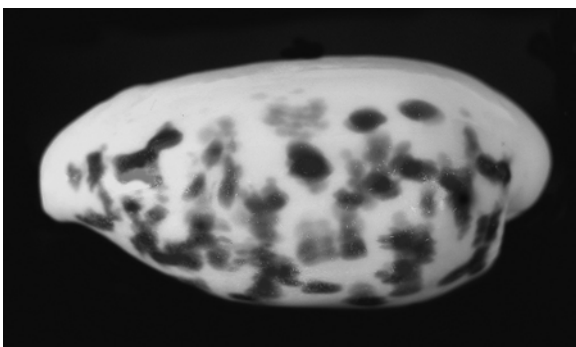
5. The main diagnostic characters

In the project “Intraspecific variation in living cowries” genera of Cypraeidae are accepted according to Schilder & Schilder (1971) and *interrupta* belongs to the genus *Blasicrura* Iredale, 1930, together with *B. pallidula* Gaskoin, 1849 *B. rashleighana* Melvill, 1888. The latter is treated as a form of *B. teres* (Gmelin, 1791) according to the project and *pallidula* is treated as a subspecies of *B. interrupta*.

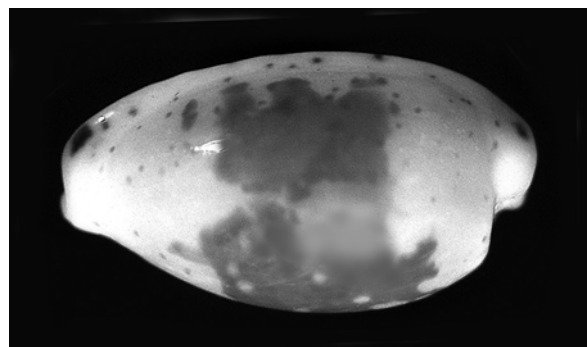
Shells of the five recent species of the genus *Blasicrura* have an elongated elliptical to subcylindrical shape, a rather flat profile and can be easily distinguished by their main diagnostic characters given below.

| species | the main diagnostic characters | pictures |
|--------------------------------------|---|----------|
| <i>B. coxeni</i> Cox, 1873; | large chestnut spots on the whitish dorsum | 26 |
| <i>B. goodallii</i> Sowerby, 1832; | four small blackish terminal spots, large dilacerate dorsal blotch | 27 |
| <i>B. interrupta</i> Gray, 1824; | the right side not margined, callosity above the anterior extremity | 28 |
| <i>B. quadrimaculata</i> Gray, 1824; | four blackish terminal spots, no dorsal blotch | 29 |
| <i>B. teres</i> Gmelin, 1791 | the right side is distinctly margined | 30 |

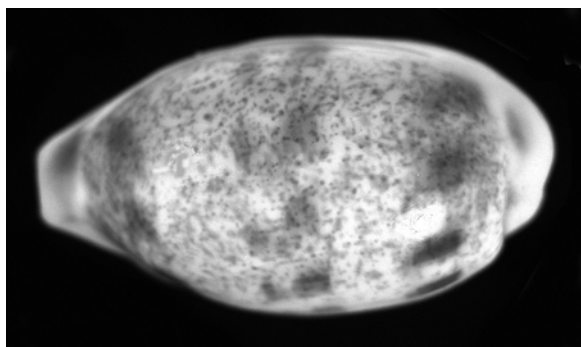
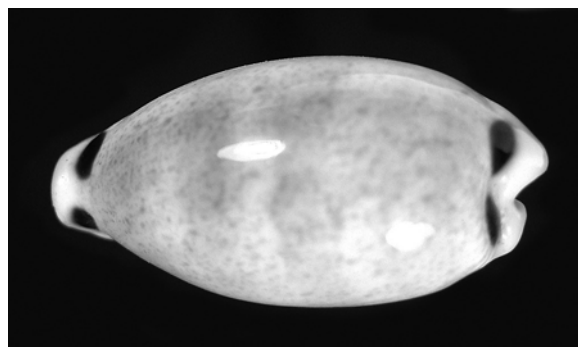
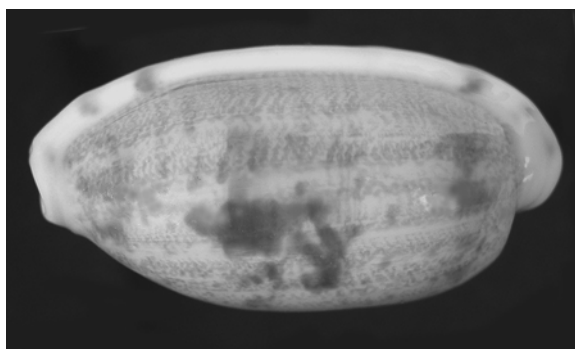
The taxonomic identity of *Blasicrura dayritiana* Cate, 1963 needs further study; in Schilder and Schilder (1971) this taxon known currently only from several localities in the Philippines is treated as a form of *B. pallidula*. Shells of *B. dayritiana* are variable, their shape varies from almost elliptical to elongate oval to almost deltoidal and that reminds a similar situation with *B. rashleighana*.



26. *B. coxeni* Cox, 1873



27. *B. goodallii* Sowerby, 1832

28. *B. interrupta* Gray, 182429. *B. quadrimaculata* Gray, 182430. *B. teres* Gmelin, 1791

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Literature

- Burgess, C. M. 1970. The living Cowries. 389 pp. A. S. Barnes & Comp. New York.
 1985. Burgess' Cowries of the World, 289 pp. Cape Town. Gordon Verhoef, Seacomber Publications.
 Dayle, R. 2004. The Visual Database of *Cypraea teres*-related shells from O'ahu, Hawai'i." Electronic book.
 Dharma, B. 2005. Recent & fossil Indonesian shells. Conchbooks. 424 pp.
 Gaskoin J.S. 1848. *Cypraea quadrimaculatae* var. *pallidula*. Proc. Zool. Society of London :97.
 Gray, J. E. 1824-1928. Monograph on the family Cypraeidae, a family of testaceous Mollusca. The Zoological Journal XLV:376-377.
 Heiman, E.L. 2004. Diagnosing cowry species. Published privately. 160 pp.
 2008. A preliminary list of old cowry names recycled by the Schilders. Version 01. Triton 18 September 2008 Supplement.
 Hidalgo, J.G. 1906-1907. Monografía de las especies vivientes del género *Cypraea*. Madrid. pp.493-494
 Ikeda, H., Omi, Y. & Hirota, Y. 2007. Cowries of Japan. 216 pp.
 Krommenhoek, W. 1996. Variability in *Cypraea carneola* Linné, 1758 and *Cypraea interrupta* Gray, 1824. Of Sea and Shore 19(1):51-53.
 Kuroda, 1960. *Cypraea (Blasicrura) pallidula luchuana*. Cat. Moll. Fauna Okinawa Is.:74, t. 3:40-45.
 Lorenz Jr. F. & Hubert, A. 1993. A Guide to worldwide Cowries. 571 pp. Christa Hemmen Verlag, Wiesbaden, Germany.
 Lorenz F. & Hubert, A. 2000. A Guide to worldwide Cowries. 584 pp. ConchBooks Hackenheim Germany.
 Melvill, J. C. 1888. A survey of the genus *Cypraea* (Linne), its nomenclature, geographical distribution, and distinctive affinities: with description of two new species, and several varieties. Memoirs and Proceedings of the Manchester literary and philosophical Society, (4)1:61.

- Okutani, T. 2000. Marine mollusks in Japan. Tokai University Press, Tokyo. 1175 pp.
- Rawlings C.E. 2009. *Cypraea (Eclogavena) dayritiana*-Dayrit's Cowry. American Conchologist 37(3):28-30.
- Raybaudi, L.M. 1992. Cypraeidae World Shells specialized catalogue. World Shells 1:60.
- Reeve, L. A. 1846. Conchologia iconica, Monograph of the Genus *Cypraea*. Pl.19#107.
- Schilder, F.A. 1924. Systematischer Index der rezenten Cypraeidae. Archiv für Naturgeschichte. Heft 4:203.
1926. Additions and corrections to Vredenburg's classification of the Cypraeidae. From the Records, Geological Survey of India Vol LVIII Part 4:358-
1928. Eine wenig bekannte Cypraeiden-Art. Archiv für Molluskenkunde 60:193-195.
1930. Remarks on type specimens of some recent Cypraeidae. Proceedings of the Malacological Society of London 49-58.
1958. Über drei seltene Cypraeacea. Arch. Mollusk. 87 (1/3):81-87.
1966. The type localities of living Cypraeidae. Malakologische Abhandlungen, Staatliches Museum für Tierkunde in Dresden 2(14):193-233.
- Schilder F.A. & Schilder, M. 1938. Prodrome of a monograph on living Cypraeidae. Proc. of Malacological Society of London, 23:119-231.
1940. Die Verbreitung und Häufigkeit der rezenten Cypraeidae. Archiv für Molluskenkunde 72(2/3):33-56.
1952. Ph. Dautzenberg's collection of Cypraeidae. Institute Royal des sciences naturelles de Belgique. Bruxelles. 243 pp. + 4 Plates.
1966. The size of ninety-five thousand cowries. The Veliger 8(4):208-215.
- Schilder, M. 1967. Length, breadth and dentition in living cowries. The Veliger 9 (4):369-376.
- Schilder M. & Schilder F.A., 1971. A catalogue of living and fossil cowries. Institut Royal des sciences naturelles de Belgique. 246 pp.
- Sowerby, G. B. I. 1870. Thesaurus Conchylorum, Vol. 1V. : p. 8, Pl. 27 # 275.

Appendices

A 1. A copy of the original description of *Cypraea quadrimaculata* Gray, 1824.

“39. *Cypraea quadrimaculata*.—The four-spot Cowry.

Testâ oblongo-ovata, albido-caerulescens; dorso punctis minutis, fulvis, nebulata; basi marginibusque albidis; extremitatibus nigro bimaculatis; subtus planulatâ inaequaliter semisculatâ.

Icon. Zool. Journ. t. *Inhabits*. ____ Mus. Nost.

Shell oblong-ovate, blueish-white, with the back speckled with minute fulvous dots; the spire flat; the base and margin white; the edge slightly thickened, rounded at the sides; the extremities rather produced, with two blackish-brown spots on the upper part of each; the base flattish; aperture rather narrow; teeth rather large, extended like ridges partly over both the lips; the hinder ribs, especially of the inner lip, large and rather prominent; columella plaited, front plaits largest; inside violet; axis diameter 4/10 of an inch.

This very distinct species bears much resemblance, at first sight, to the last [*Cypraea interrupta*]; but it has not any appearance of bands, and the teeth and furrows of the base are very different and more like those of *C. Asellus*. It is instantly distinguished from all the other *Cypraea* by the two black spots at each extremity. I have only seen one specimen of it, which is in my collection; nor have any of my friends recollected seeing it in any other cabinet; I am therefore inclined to consider it as rare.”

According to Schilder (1966) the holotype of *C. quadrimaculata* is unknown.

A 2. A copy of description of variety ‘pallidula’ by Gaskoin (1848).

“ 10. *Cypraea quadrimaculatae*, Gray—*varietas pallidula* (PalishCowry).

Cyp. sine maculis nigris; dentibus lateris columellari majoribus, prominentioribus; labii minoribus et numerosioribus; basi nitente.

This shell possesses characters, especially in colouring and general form, much in common with the former shell, but is destitute of the large black spots on the outsides of the extremities and on the spire; there is in some individuals a thin dark line across the outer surface of the anterior channel; the teeth on the columellar side are larger, more prominent, more even, and fewer in number; while those on the lip are smaller and more numerous; it never attains the size of the *quadrimaculata*, the teeth and base of which are always dull, while those of the variety are always polished (shining)."

According to Schilder (1966) the holotype of this taxon is unknown.

A 3. A copy of description of *Blasicrura pallidula* Gaskoin (1849) according in the Prodrome.

"...*quadrimaculata*...is bluish, minutely freckled with brown, and characterized by four blackish terminal spots visible even in worn shells. The other two species [*pallidula* and *interrupta*] show a greyish callosity placed above the anterior extremity, but no real terminal spots: *interrupta* (20.53.25.21) differs from *pallidula* by the finer, close, and more numerous teeth, which are shorter so that they do not attain the middle of each lip, and by the dorsum exhibiting three interrupted zones, the central of which may be dissolved into two zones approaching each other and connected by a paler brown zone, instead of four zones equally distant from each other."

"The Melanesian *rhinoceros* (18.55.23.18) differs from Malayan *pallidula* (19.56.22.17) by the less attenuated extremities and the less acuminate hind top of the inner lip, by the teeth less produced and less distant, by the less interrupted dorsal zones, and by the sides frequently adorned with scattered small spots never observed in *pallidula*."

A 4. About *Blasicrura pallidula simulans* Schilder & Schilder (1940).

This taxon is first mentioned in Schilder & Schilder (1940) as a West Australian form of *B. pallidula*, the formula 20.54.23.16. It differs from the nominotypical subspecies by the teeth density and in the other shell characters it is as Melanesian *pallidula rhinoceros*.

Later in Schilder & Schilder (1971) both *pallidula rhinoceros* and *pallidula simulans* are listed as synonyms of *B. pallidula*.

A 5. *Blasicrura pallidula summersi* Schilder (1958) is described from Tonga Islands as the most south-eastern subspecies of *B. pallidula*.

In this article Schilder mentioned receiving from Ray Summers two shells of *B. pallidula* from Tonga, which were found beached by Jens Ostergaard in 1926 after a hurricane. Schilder considered that these shells represent a new subspecies different from *B. pallidula rhinoceros* and he designated them as the holotype and a paratype (preserved in his collection). Later Schilder received from Ray Summers another 17 specimens from the same area. 30 additional shells similar to those from Tonga were found in several collections as well.

Schilder mentioned that shells from Fiji and Samoa belong, in his opinion, to a subspecies *B. pallidula rhinoceros*.

The shell size and proportions (the first four digits in the V-S formula) are given by Schilder as follows:

pallidula pallidula 19.56...

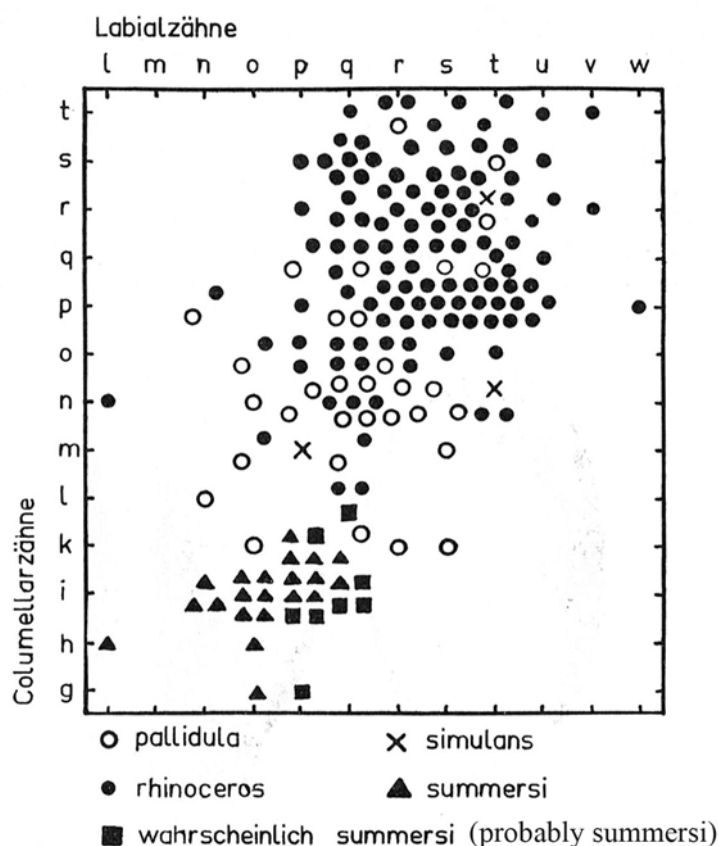
pallidula rhinoceros 18.55...

pallidula summersi 16:55..

This difference, in my opinion, is not prominent enough for separating these taxa at a subspecific level.

In the cited work Schilder mentioned also the difference between the subspecies in the teeth shape. Here he used a new parameter: closeness of columellar and of labial teeth. In Schilder (1958) one can see a graph where this new parameter for the four subspecies of *B. pallidula* is given (next page). The fifth taxon—"probably summersi" is also given on the graph.

It should be kept in mind that closeness of teeth introduced by Schilder instead of the normalized teeth count used earlier was not used in a conchological practice during last forty years and its effectivity for diagnosing cowry species is not yet confirmed.



31. Closeness of columellar and labial teeth in shells from different taxa related to *B. pallidula*.
After Schilder (1958).

In Schilder & Schilder (1971) *B. pallidula rhinoceros*, *B. pallidula simulans*, and *B. dayritiana* Cate (1963) are listed as synonyms; subspecies *B. pallidula pallidula*, *B. pallidula luchuana*, and *B. pallidula summersi* are recognized.

A 6. *Cypraea rhinoceros* Soubervie, 1865.

The Schilders separated in the Prodrôme two subspecies of *pallidula*:
“The Melanesian *rhinoceros* (18.55.23.18) [“Melanesia to Tonga, Samoa, Astrolabe Bay and Queensland (Capricorn Is.; Sharks Bay?) differs from the Malayan *pallidula* (19.56.22.17) [Central Malaysia to Luzon, Palau, W. Papua, S.W. Java, and Medan) by the less attenuated extremities and the less acuminate hind top of the inner lip, by the teeth less produced and less distant, by the less interrupted dorsal zones, and by the sides frequently adorned with scattered small spots never observed in *pallidula*.”

A 7. *B. pallidula simulans* Schilder & Schilder, 1940 is introduced in Schilder & Schilder (1940).

“...die westaustralische Form von (101) *pallidula* gleicht in der Dichte der Zähne (Formel 20.54.23.16) der malayischen *pallidula* (s. str.), in den übrigen Merkmalen aber der melanesischen *p. rhinoceros* (vgl. Schilder – Schilder 1938/9 P, p.164) und sei daher als *p. simulans* nov. abgetrennt;”

In Schilder & Schilder (1952) three subspecies of *B. pallidula* are mentioned:

Blasicrura pallidula pallidula Gaskoin, 1849.

Blasicrura pallidula rhinoceros Soubervie (1865).

Blasicrura pallidula simulans Schilder & Schilder 1940.

“...the W. Australian form of *pallidula* (101) [this is the number of *pallidula* in the Prodrome] is similar to the Malayan *pallidula* (s. str.) in the teeth density (formula 20.54.23.16) [the formula for the Melanesian *rhinoceros* is 18.55.23.18, and for *pallidula* s. str. it is 19.56.22.17], but in other shell characters it is similar to the Melanesian *rhinoceros* (see Schilder-Schilder 1938/9 P, p.164), and later on it is treated as *p. simulans* nov;”

In Schilder & Schilder (1952) *B. pallidula simulans* is mentioned as a very rare subspecies from Dampier, W. Australia; in In Schilder & Schilder (1971) this taxon is listed as a synonym of *pallidula*.

A 8. *B. pallidula luchuana* Kuroda, 1960.

In a work by Ikeda et al. (2007) the dorsal lines are visible in pictures of *quadrifasciata* (p.117), *pallidula* (p. 119), and *luchuana* (p. 121). In Okutani (2000:235, Plate 117) *luchuana* is treated as a valid species differing from *pallidula* “in having ovate shell, no dorsal transverse bands, a blackish brown spot on spire...” But the dorsal band is visible in pictures 54-56 of *B. quadrifasciata*, *B. pallidula pallidula* and *B. luchuana* respectively.