

**Diagnostic shell characters of *Erosaria acicularis* and *Erosaria spurca*
(Gastropoda, Cypraeidae)**

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Two diagnostic shell characters of *Erosaria acicularis* and *Erosaria spurca*, the base coloration and angularity of the left side, are studied statistically in batches of shells belonging to both taxa. All the 76 studied shells of *E. acicularis* have a white base and in all 476 shells of *E. spurca* the base coloration is from beige to tan. Hence the base coloration is considered a good diagnostic shell character allowing us to distinguish them on a specific level.

This study reveals that the percentage of shells with a more or less angulate left side varies from 92% to 82% per batch in *E. acicularis* and from 19% to 68% in *E. spurca*. The percentage of distinctly angulate shells is 62% and 9% respectively in *E. acicularis* and *E. spurca*. Thus the angularity of the left side may only be used as an auxiliary shell character when distinguishing between these species.

Key words: Gastropoda, Cypraeidae, *Erosaria acicularis*, *Erosaria spurca*, variability, diagnostic shell characters.

INTRODUCTION

Erosaria acicularis (Gmelin, 1791) inhabits the western Atlantic Ocean from Florida and the Bahamas to Brasil (Rio de Janeiro). It is known also from St. Helena and Ascension Island.

Erosaria spurca (Linnaeus, 1758) lives in the Mediterranean Sea and the waters of the Atlantic Ocean bordering the Canary Islands, the Cape Verde Archipelago and western coast of Africa from Morocco to Angola.

TAXONOMIC HISTORY AND INTRASPECIFIC TAXA

Schilder & Schilder (1938) mentioned that *E. acicularis* came very close to being listed as a separate species. They studied 321 shells of *E. acicularis* and 1656 shells of *E. spurca* but nevertheless listed *E. acicularis* as a subspecies of *E. spurca* in their last work (Schilder & Schilder, 1971). Perhaps this was due to the fact that shells of both taxa are similar in their general shape, profile, dorsal pattern, the average width to length ratio and the number of normalized labial and columellar teeth. The Schilders attached great importance to quantitative statistical shell characteristics of cowry populations and the Schilders' formulae are very close for both taxa. They sometimes statistically analyzed qualitative shell characters of cowry species but I did not find in the literature such a study concerning the above taxa.

Raybaudi (1982a) surveyed the taxonomic history of the above taxa and recognized *E. acicularis* as a valid species, presenting a table of shell characters useful for distinguishing between it and *E. spurca*. This approach was rejected by malacologists who do not recog-



Fig. 1. *Erosaria spurca cascabulorum*, the holotype from Talavera et al. (1986)

nize any intraspecific taxa in cowries (Burgess, 1985) but was later accepted by Lorenz & Hubert (1993, 2000).

The white color of the base in *E. acicularis* was listed in Raybaudi (1982a) as one of the diagnostic shell character of this species although he did not check this character statistically to confirm that it belongs to all individuals of *E. acicularis* (whereas in all individuals of *E. spurca* the base always seemed to be beige to tan). Such a study is necessary because the use of conchological methods for diagnosing cowry species assumes that species are groups of mollusc populations, the shells of which can be separated from all other cowry populations by at least one well-recognizable diagnostic character showing no intermediates even in extreme specimens.

Subspecies are geographically separated populations, the majority of their shells shares the main diagnostic shell characters of the species but differs from other populations of the same species by at least one shell characteristic.

According to the Prodrôme (Schilder & Schilder, 1938) *E. acicularis* differs from *E. spurca* by "the more reduced fossula with 1-3 instead of 2-5 denticles, and the more deltoidal shell with the left margin angular rather than rounded. In American *acicularis* (21.66.19.15) the dorsum is fulvous to orange with the lateral spot pale and less conspicuous than the ferruginous lateral pittings, while in *sanctahelenae* (24.63.20.15) from the Southern Central Atlantic the dorsum is brown with the dark lateral spots relatively more accentuated."

Malacologists who treat *E. acicularis* as species recognize also two subspecies: *E. acicularis acicularis* (Gmelin, 1791) and *E. acicularis sanctahelenae* Schilder, 1930.

Two subspecies of *E. spurca* are singled out in the Prodrôme: *Erosaria spurca spurca* (Linnaeus, 1758) from the Mediterranean Sea and *E. spurca atlantica* (Monterosato, 1897) [= *verdensium* Melvill, 1888] from S. Portugal, Madeira, W. Morocco to Guinea and Angola, which is smaller—the formula 22.62.20.16—and 'differs from the Mediterranean *spurca* (27.62.20.15) by the less convex base, the narrow aperture, and the labial teeth less distant and less sharply cut.'

Later a subspecies *Erosaria spurca cascabulorum* Talavera, Dionis & Gomez (1986) was described based on a couple of unusual over-callused shells from deeper water (90-120 m) around Tenerife, Canary Islands (fig. 1).

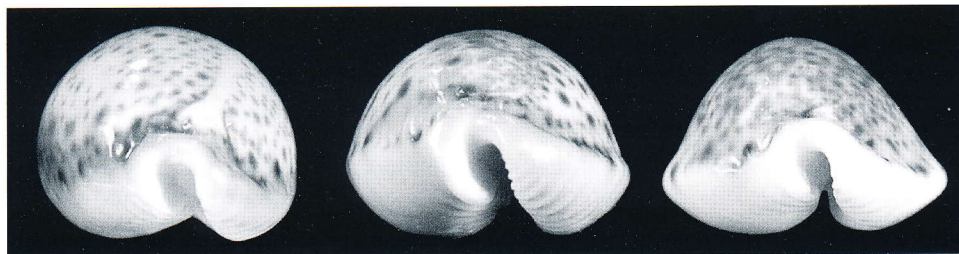


Fig. 2. *Erosaria spurca* (a, b) and *Erosaria acicularis* (c) viewed from the posterior extremity; from left to right: a-rounded left side; b-slightly angulate left side; c-distinctly angulate left side.

It seems to me that Talavera et al. (1986) overlooked the two works of Schilder & Schilder (1938, 1971) in which a subspecific rank of *E. spurca atlantica* is recognized because they described their new subspecies from the same area that the Schilders' subspecies came from. In any case a description of a new subspecies should be based on a statistical data of a reasonably large batch of shells and not on just a couple of specimens in order to have enough material to properly compare shell characteristics of the majority of individuals in the compared populations. These details are not given by Talavera et al. (1986). There have been no new reports on finding more shells similar to *E. spurca cascabulorum* nor have there been any publications of statistical data confirming the existence of separate deep water populations from the Canary Islands different from *E. spurca atlantica*. Because there is no confirmation that a separate group of populations of *E. spurca*, which differs from *E. spurca atlantica* of Canary Islands, is thriving in the same area and deserves a subspecific rank, I treat *E. cascabulorum* as synonym of *E. spurca atlantica*.

STATISTICAL STUDY OF QUALITATIVE SHELL CHARACTERS

A statistical study was conducted in order to check whether there is at least one diagnostic shell character to distinguish between *E. acicularis* and *E. spurca* at a specific level.

Two shell characters seemed to be suitable for this purpose: the base color and a shape of the left side. These shell characters were chosen for my statistical study.

The right side (margin) is always angulate in both species. The left side may be round (fig. 2a) or distinctly angulate (fig. 2c) but there is also the third intermediate possibility (fig. 2b) when the left margin is slightly angulate and can be better checked by palpation.

Lipparini & Negra (2002) traced a whole population of *E. spurca* along a portion of the Sicilian coast the shells of which have distinctly angulate left margins (fig. 2c). Strangely, they did not mention the intermediate form with slightly angulate left margins (fig. 2b.), which can be recognized in slightly subadult shells (the term subadult may be difficult to define accurately in cowries). An intermediate form was found by the present author in all studied batches of shells of *E. acicularis* and *E. spurca*, adult and subadult alike. The results of the statistical study are shown in table 1.

All 76 studied shells of *E. acicularis* have a white base. The base in the 476 studied shells of *E. spurca* is beige to tan hence these two taxa may be distinguished by this shell character. No intermediate forms are found in the studied batches hence this shell character can be considered as being diagnostic at a specific level.

In *E. acicularis*, 14% of all the studied shells have the left side rounded and in the remaining 86% the side is angulate although at different degrees. Most of *E. acicularis* shells with rounded left margin give the impression of being slightly subadult but it is difficult to decide in each case where the border is between a slightly subadult and a fully grown-up shell.

In *E. spurca*, 57% of the studied shells have left margin rounded and only in 43% of shells it is angulate. This shell character cannot be used to determine the specific level of a population due to the intermediate shells found in batches of both taxa but it can be used as an auxiliary diagnostic character because in 62% shells of *E. acicularis* the left side is distinctly angulate (fig. 2c) whereas in *E. spurca* only 9% of such shells were found. The probability of finding shells with a distinctly angled left side of the shell is considerably higher in *E. acicularis*.

Table 1. Shell characters and characteristics of *E. acicularis* and *E. spurca* (n is the total number of studied shells).

number of studied shells		24	24	28	105	180	59	60	40	32
		percentages of shells with a given shell character in populations of different areas								
		<i>acicularis</i> n = 76			<i>spurca</i> n = 476					
		Florida & Bahamas	Central America	Brasil	Canary Islands	Palmahim, Israel	Shikmona, Israel	Ashkelon, Israel	Rapoport col., Israel	Mediterranean Sea
base	coloured beige									
	to dark tan	0	0	0	100	100	100	100	100	100
	white	100	100	100	0	0	0	0	0	0
left side	rounded	8	16	18	69	58	47	32	50	81
	slightly angulate	29	21	21	28	35	41	50	35	3
	distinctly angulate	63	63	61	3	7	12	18	15	16

DISCUSSION

Erosaria acicularis conforms to the above criterion of a species and all its studied shells differ from shells of *E. spurca* by one character: the white base. But these two species have several common shell characters. It is possible that they evolved from a common ancestor and perhaps they share traces of certain old genes, which may produce unusual formae, such as unusual coloration of the base. Although I have not come across reports about finding shells of *E. acicularis* with beige or tan colored base or shells of *E. spurca* with a white base, I feel that such cases are possible. They would be considered exceptions,

which do not negate the conclusion that these two taxa can be recognized as separate species because the concept of a biological species in general and a cowry species in particular (see above) is based on idealization.

The old names, like *E. spurca verdensium* (Melvill, 1888) or *E. spurca cascabulorum*, are still mentioned in dealer's lists and the malacological literature although they are synonyms. Evaluating old names, whether they are now synonyms or not (*E. verdensium* Melvill, *E. atlantica* Monterosato), one should remember that many names which the Schilders designated for new subspecies in the Prodrôme refer only to the subject on hand and do not relate to any historical application by the person who originally coined that name. The Schilders merely wanted to 'recycle' vacant names (names that originally were applicable but due to lack of usage or other infringements of ICZN rules were no longer applicable to any existing population) instead of creating new names. This well meaning but poorly thought out tactic has complicated several otherwise straight-forward diagnostic exercises. The relevant examples are given and discussed by Heiman (2004). This naming tactic used by the Schilders has confused cowry students who erroneously supposed that the specimens and original descriptions, which were relevant to the old taxa, also represent conchological characters of the new cowry taxa that now carried these old names. The old original type material does not represent the subspecies designated in the Prodrôme; it is simply not relevant because the Schilders used names as if they had no history behind them.

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