

## Additions and corrections to the Scissurellidae and Anatomidae (Gastropoda Vetigastropoda) of the Mediterranean Sea, with first record of *Sinezona semicostata* Burnay et Rolán, 1990

Pasquale Micali<sup>1</sup> & Daniel L. Geiger<sup>2</sup>

<sup>1</sup>via Papiria 17, 61032 Fano, Pesaro-Urbino, Italy; e-mail: lino.micali@virgilio.it

<sup>2</sup>Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road, Santa Barbara, CA 93105-2936 U.S.A.; e-mail: dgeiger@sbnature2.org

---

### ABSTRACT

New information on the scissurellids fauna, Scissurellidae and Anatomidae (Gastropoda Vetigastropoda), in the Mediterranean Sea is presented. *Scissurella azorensis* Nolt, 2008, is confirmed from several localities in the Tyrrhenian Sea. *Sinezona semicostata* Burnay et Rolán, 1990, a species until now known from Cape Verde and Canary Islands, is reported for the first time in the Mediterranean, based on the record of 12 specimens at Linosa island (Sicily Channel), 35 m. *Anatoma crispata* (Fleming, 1828) does not occur in the Mediterranean; earlier misidentified records are corrected. *Anatoma eximia* Seguenza, 1880, appears to be a cold water guest species at the type locality Gallina, Reggio Calabria.

### KEY WORDS

*Anatoma*; *Scissurella*; *Sinezona*; Mediterranean.

Received 27.07.2015; accepted 21.08.2015; printed 30.09.2015

---

### INTRODUCTION

Scissurellidae and Anatomidae are two families of microscopic marine gastropods of world-wide distribution. They are amongst the smallest gastropods (0.5–11 mm, modal size ~1–3 mm), and are distributed in all fully marine oceans from the intertidal to the abyssal plain. They are members of the basal Vetigastropoda as evidenced by paired gills, a rhipidoglossate radula, and usually with a slit or hole in the shell above the mantle cavity. Unlike other Vetigastropoda such as abalone (Haliotidae), top snails (Trochidae Turbinidae), and slit shells (Pleurotomariidae), scissurellids lack a nacreous inner shell layer (see Geiger et al., 2008 for review).

The groups have been recently revised and monographed by Geiger (2012) on a global scale. As was

anticipated, some errors need to be corrected, and some additional data have come to light in the meantime (see also Pimenta & Geiger, in press). Here are addressed some novel data for the Mediterranean Sea.

### MATERIAL AND METHODS

Standard procedures for scanning electron microscopy (SEM) were employed (see Geiger et al., 2007; Geiger, 2012).

Some specialized terms are defined following Geiger (2012).

- Selenizone: the closed portion of the slit. Has lateral keel and growth markings (= lunules). The onset of the selenizone with growth defines the boundary between teleoconch I and II.

- Shoulder: on the teleoconch II, the portion of the shell between the apical suture and selenizone.
- Slit: the anteriormost portion of the selenizone, which is open at the apertural margin.
- Teleoconch I: postembryonic shell to the start of the selenizone.
- Teleoconch II: postembryonic shell from the start of the selenizone to the apertural margin.

ABBREVIATIONS AND ACRONYMS. DLG: Daniel L. Geiger collection, Los Angeles, California, U.S.A. DSC: Danilo Scuderi collection, Catania, Italy. M: Monotypy. OD: original designation. PMF: Pasquale Micali collection, Fano, Italy. SBMNH: Santa Barbara Museum of Natural History, Santa Barbara, California, U.S.A. SD: subsequent designation. USNM: United States National Museum, Smithsonian Institution, Washington (DC), U.S.A.

## SYSTEMATICS

### VETIGASTROPODA Salvini-Plawen, 1980

Vetigastropoda are typically divided into a number of superfamilies. Geiger (2012) discussed in detail the fundamental disagreement amongst various phylogenetic studies with respect to family-level relationships, further hampered by highly incomplete and incongruent taxonomic sampling of major lineages. With respect to the scissurellids, it seems clear that Scissurellidae and Anatomidae are not sister taxa, and Larocheidae and Depressizonidae have not been included in any formal phylogenetic assessment. Accordingly, the superfamily Scissurelloidea is untenable, unless it is restricted to Scissurellidae s.s. only. Using Scissurelloidea (or any other vetigastropod superfamily) in the narrow sense does not contain any classification information, therefore, is superfluous. Because superfamilies are not mandatory ranks as per ICZN 1999, the best and most honest representation of our understanding is to omit all superfamilies under Vetigastropoda at this time.

### Family SCISSURELLIDAE Gray, 1847

*Scissurella* d'Orbigny, 1824.

Type species: *Scissurella laevigata* d'Orbigny, 1824 (SD: Gray, 1847) (= *Scissurella costata* d'Orbigny, 1824)

### *Scissurella azorensis* Nolt, 2008

EXAMINED MATERIAL. France, Corsica SW, between Piscicucani and Paragan beaches, beach, 41.442°N, 9.115°E (DSC 2). Italy, Reggio di Calabria, Scilla, 50 m, 38.261°N, 15.715°E (DLG 2370, 4; DSC 4). Italy, Reggio di Calabria, Scilla, 50 m, 38.255°N, 15.714°E (DLG 2670, 1). Italy, Sicily, Trapani, Egadi Islands, Marettimo Island, Secca del Cammello, 30 m, 37.989°N, 12.065°E (DLG 1812, 3). Italy, Sicily, Trapani, 30 m, 38.024°N, 12.504°E (DLG 2386, 1). Italy, Sicily, Trapani, San Vito Lo Capo, Cape San Vito, 2.5 m, 38.185°N, 12.733°E (DLG 2542, 2). Italy, Sicily, Acitrezza, Lachea island, 5–30 m, 37.561°N, 15.163°E (DSC 11). Italy, Sicily, Brucoli, 3 m, 37.282°N, 15.188°E (DLG 2547, 5). Italy, Sardinia, Sant'Antioco, 39.066°N, 8.459°E (DLG 2607, 1). Italy, Pelagian Islands, Linosa (SBMNH 456685, 7; DSC 6). Italy, Linosa, Punta Calcarella, 35 m, 35.853°N, 12.880°E (PMF 8). Italy, Pelagian Islands, Lampedusa, Cala Croce, 6 m, 35.499°N, 12.590°E (DSC 3).

REMARKS. The species was described from the Azores, but was reported by Geiger (2012) also from a single lot from the Mediterranean sea. Since then, several additional lots have been found from Mediterranean sediment samples. Most (8 of 12) of those samples are from Sicily or the eastern tip of mainland Italy, while one is from Corsica and Sardinia to the north and Linosa and Lampedusa Islands to the south. The species have not been recovered from any other samples (e.g., Croatia, Spain, France).

*Scissurella azorensis* (Figs. 9–12) differs from *S. costata* by the more rounded whorls, lacking of flat shoulder, the lack of spiral threads on shoulder and base, teleoconch II of about 0.75 whorls, compared to 1–1.125 whorls.

### *Sinezona* Finlay, 1926.

Type species: *Schismope brevis* Hedley, 1904 (OD)

### *Sinezona semicostata* Burnay et Rolán, 1990

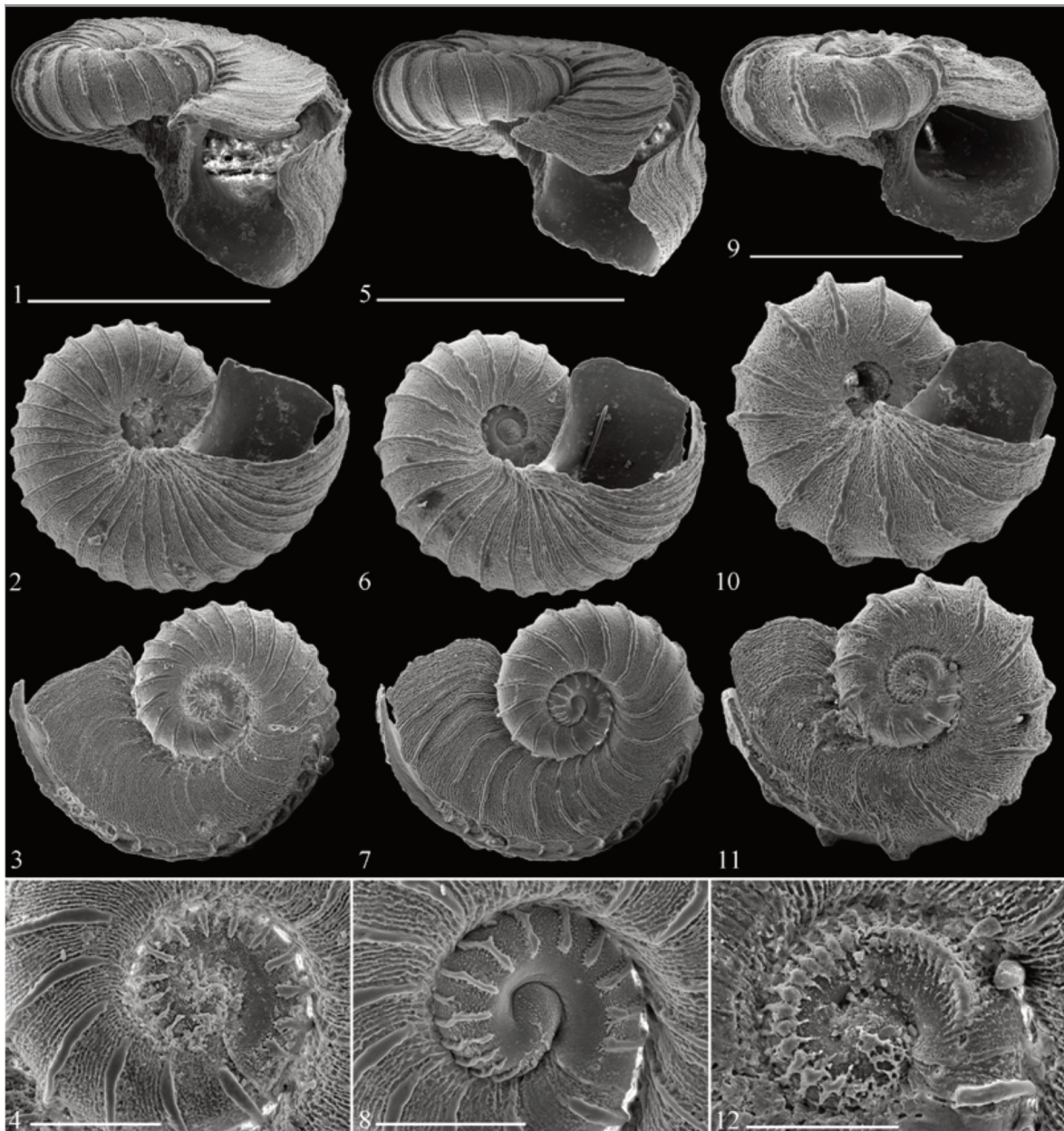
REMARKS. *Sinezona semicostata* was described by Burnay & Rolan (1990) from material collected at a depth of few meters at Boavista island (Cape Verde archipelago, eastern Atlantic), but it is also known from the Canary Islands and Madeira (Hernández et al., 2011; Geiger, 2012). The place-

ment in genus *Sinezona* Finlay, 1926 is indicated by the anteriorly closed slit. This character is difficult to observe in many shells, because the apertures of shells found in shell grit are usually damaged.

Twelve specimens have been found at Linosa in shell grit manually collected by SCUBA diving at Punta Calcarella (south-east of Linosa island, Sicily Channel) at a depth of about 35 m, most of them fully mature (Figs. 1–8), representing the first Mediter-

ranean record (SBMNH 456687, 7; PMF 8). Although similar to *Sci. azorensis*, *Sin. semicostata* is readily distinguished by the protoconch sculpture composed of half as many and much stronger axial cords (Figs. 1–4). The species' range is herewith expanded from the Cape Verde Archipelago, Madeira, and the Canary Islands, into the Mediterranean Sea.

Because *Sci. costata* d'Orbigny, 1824, a rather variable species, was found in numerous specimens



Figures 1–12. Scissurellids from Linosa, Pelagian Islands, Italy, 35 m. Figures 1–4. *Sinezona semicostata*. Figures 5–8. *Sinezona semicostata*. Figures 9–12. *Scissurella azorensis*. Scale bars shell = 500 µm. Scale bars protoconch = 100 µm.

in the same sample, we could exclude the possibility that the *Sin. semicostata* specimens were juvenile *Sci. costata*. In particular *Sin. semicostata* differs from *Sci. costata* by the much more depressed overall shape, the adapically angulated and flat shoulder as opposed to being horizontally oriented, the stronger and fewer axial ribs, and the wide umbilicus in *Sin. semicostata*. *Sinezona semicostata* is much smaller (to 0.67 mm) and the teleoconch II consists of about 0.3–0.5 whorl compared to up to 1.125 teleoconch II whorls in *Sci. costata* growing to 1.7 mm.

*Anatoma* Woodward, 1859

Type species: *Scissurella crispata* Fleming, 1828 (M: misidentified; SD: Geiger, 2012)

*Anatoma crispata* (Fleming, 1828)

REMARKS. The species is commonly, but mistakenly, indicated as part of the Mediterranean malacofauna (see Geiger, 2012 for comprehensive chresonymy). Geiger (2012) questioned some of his own earlier identifications of those Mediterranean occurrences, which were made prior to the revision by Hoisaeter & Geiger (2011), but was unable to re-evaluate that material prior to publication. Re-examination of material from USNM has confirmed the earlier suspicion. The following *A. "crispata"* lots were re-identified as:

*Anatoma aspera* (Philippi, 1844): USNM 181621, 181630, 181631, 181600, 181616, 181623, 181620.

*Anatoma eximia* (Seguenza, 1880): USNM 181597, 181601, 181598, 181599.

*Anatoma tenuisculpta* (Seguenza, 1880): USNM 83386, 126631, 181592.

The *A. aspera* records confirm the known distribution of the species, with one additional locality from Crete Island, representing one of the easternmost locations.

*Anatoma eximia* was re-surrected by Geiger (2012) as a valid species. It was described from fossil material from Gallina (near Reggio Calabria, Italy). The depositional environment of Gallina is well described by Dell'Angelo et al. (1998: 139): the levels described by Seguenza show sign of gravitational flow and canalization of debris. The

outcrop represents an epibathyal fauna dated to lower Pleistocene with additional material from the upper Pliocene and more littoral assemblages, referred to lower Pleistocene, with cold (or boreal) guests. More recent works (Ruggiero & Raia, 2014; La Perna & Vazzana, 2014; Vazzana et al., 2014) deal with the Calabrian (lower Pleistocene) fauna and reported the presence of cold guests, such as *Pseudamussium peslutrae* (Linnaeus, 1771) = *P. septemradiatum* (O.F. Müller, 1776). The Recent records of *A. eximia* are from the Mediterranean adjacent northeastern Atlantic, with a single record from the Mediterranean Sea (off Malaga). The new records are all from the North Atlantic. It appears that *A. eximia* should also be considered a cold guest at the type locality.

The new records of *A. tenuisculpta* are both from the North Atlantic as well as the Mediterranean (Sicily).

*Anatoma eximia* (Seguenza, 1880)

*Anatoma tenuisculpta* (Seguenza, 1880)

REMARKS. The publication date for those two taxa was erroneously indicated as 1877 by Geiger (2012), which, however, was the date of acceptance of the manuscript. Serge Gofas (pers. comm.) kindly pointed out that error.

## DISCUSSION

Despite the Mediterranean Sea being one of the best-studied bodies of water on the planet, including its malacofauna (e.g., Parenzan, 1970; Sabelli et al., 1990; Barash & Danin, 1992; Cossignani et al., 1992; Giannuzzi-Savelli et al., 1994, 1997, 1999, 2001, 2003, 2014; Ardovini & Cossignani, 1999; Doneddu & Trainito, 2005; Cossignani & Ardovini, 2011; Gofas et al., 2011; Scuderi & Terlizzi, 2012) new discoveries can still be made. Those are not necessarily restricted to minute molluscs; the re-discovery of the abalone species *Haliotis stomatiaeformis* (= *H. neglecta*) at Malta island, is a particularly striking example (Geiger, 1998; Geiger & Owen, 2001), as well as the cone species known from that general area (*Conus vayssierei* Pallary, 1906; *Conus desidiosus* A. Adams, 1853; *Conus fumigatus* Hwass in Bruguière, 1792).

Micromolluscs (< 5 mm total shell length: see Geiger et al., 2007 for review) are more in need of study and yield many more discoveries. Despite the very recent global monographic treatment of the scissurellids (Geiger, 2012), new discoveries can still be made as exemplified by the present contribution. It is striking, that both the abalone cited above, as well as the scissurellids reported here, have been found in the Southern Tyrrhenian Sea and the Sicily and its surrounding islands. Some of it may be due to available material and novel sensitivity of collectors. However, none of the numerous samples from North Africa, France, Spain, and the Adriatic Sea have yielded novel scissurellids (D. Geiger, pers. obs.).

#### ACKNOWLEDGEMENTS

Thanks to the staff of “Terraferma Diving” at Linosa, for the enthusiastic support to malacological activity of the first Author. Chad Walter, Ellen Strong, and Jerry Harasewych (USNM) kindly facilitated loans of material. Danilo Scuderi kindly provided data of his records.

#### REFERENCES

- Ar dovini R. & Cossignani T., 1999. Atlante delle conchiglie di profondità del Mediterraneo. L'Informatore Piceno, Ancona, 111 pp.
- Barash A. & Danin Z., 1992. Fauna Palaestina Mollusca I - Annotated List of Mediterranean Molluscs of Israel and Sinai. The Israel Academy of Sciences and Humanities, Jerusalem, 405 pp., 372 pls.
- Burnay L.P. & Rolán E., 1990. The family Scissurellidae in the Cape Verde Islands. Archiv für Molluskenkunde, 120: 31–45.
- Cossignani T. & Ar dovini R., 2011. Malacologia Mediterranea. L'Informatore Piceno, Ancona, 536 pp.
- Cossignani T., Cossignani V., Di Nisio A. & Passamonti M., 1992. Atlante delle Conchiglie del Medio Adriatico. L'Informatore Piceno, Ancona, 40 pp., 417 figs.
- Dell'Angelo B., Vazzana A. & Bertolaso L., 1998. Ritrovamento di piastre fossili di *Callistochiton* (Mollusca: Polyplacophora) nel Plio-Pleistocene della Calabria. Bollettino Malacologico, 33: 139–140.
- Doneddu M. & Trainito E., 2005. Conchiglie del Mediterraneo. Il Castello, Trezzano su Naviglio, 256 pp.
- Geiger D.L., 1998. Recent genera and species of the family Haliotidae (Gastropoda: Vetigastropoda). The Nautilus, 111: 85–116.
- Geiger D.L., 2012. Monograph of the Little Slit Shells. Santa Barbara Museum of Natural History, Santa Barbara, 2 vols., 1291 pp.
- Geiger D.L. & Owen B., 2001. The identity of *Haliotis stomatiaeformis* Reeve, 1846, from the Mediterranean Sea (Gastropoda: Vetigastropoda: Haliotidae). The Nautilus, 115: 77–83.
- Geiger D. L., Marshall B., Ponder W., Sasaki T. & Warén A., 2007. Techniques for collecting, handling, and preparing small molluscan specimens. Molluscan Research, 27 (Special Issue): 1–50.
- Geiger D.L., Nützel A., & Sasaki T., 2008. Vetigastropoda. In: W. Ponder & D. Lindberg (Eds.), Phylogeny and Evolution of the Mollusca. University of California Press, Berkeley, pp. 297–330.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1994. Atlas of Mediterranean Seashells, Volume 1 (Archeogastropoda). La Conchiglia, Rome, 125 pp.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1997. Atlas of Mediterranean Seashells, Volume 2 (Caenogastropoda part 1: Discopoda - Heteropoda). La Conchiglia, Rome, 258 pp.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1999. Atlas of Mediterranean Seashells, Volume 3 (Caenogastropoda part 2: Ptenoglossa). Evolver, Rome, 127 pp.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 2001. Atlas of Mediterranean Seashells, Volume 7 (Bivalvia: Protobranchia - Pteriomorpha). Evolver, Rome, 246 pp.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 2003. Atlas of Mediterranean Seashells, Volume 4 Part 1 (Neogastropoda: Muricoidea). Evolver, Rome, 298 pp.
- Giannuzzi-Savelli R., Pusateri F., Micali P., Nofroni I. & Bartolini S., 2014. Atlas of Mediterranean Seashells, Volume 5 (Heterobranchia). Edizioni Danaus, Palermo, 91 pp.
- Gofas S., Moreno D. & Salas C., 2011. Moluscos Marinos de Andalucía. Universidad de Málaga, Málaga, 2 vols., 798 pp.
- Hernández J.M., Rolán E. & Swinnen F., 2011. Parte 3: Gastropoda: Prosobranchia. In: E. Rolán (Ed.), Moluscos y Conchas Marinas de Canarias. Conch Books, Hackenheim, pp. 54–269.
- Høisaeter T. & Geiger D.L., 2011. Species of *Anatoma* (Gastropoda: Anatomidae) in Norwegian and adjacent waters, with the description of two new species. The Nautilus, 125: 89–112.
- ICZN (International Commission on Zoological Nomenclature), 1999. International Code of Zoological

- Nomenclature. 4th ed. The International Trust for Zoological Nomenclature, London, 29 + 306 pp.
- La Perna R. & Vazzana A., 2014. Marginelliform gastropods from the Early Pleistocene of Gallina (Reggio Calabria, Southern Italy). Giornate di Paleontologia, XIV edition - Bari, 11–13 June 2014. Volume dei riassunti, pp. 49–50.
- Parenzan P. 1970. Carta d'identità delle conchiglie del Mediterraneo Vol. 1 Gasteropodi. Bios Taras, Taranto, 283 pp.
- Pimenta A.D. & Geiger D.L. in press. Taxonomic revision of the Anatomidae (Mollusca: Gastropoda: Vetigastropoda) from Brazil, with description of four new species. Malacologia.
- Ruggiero E. & Raia P., 2014. *Oichnus taddeii*, a new fossil trace produced by capulids on brachiopod shells. Spanish Journal of Palaeontology, 29: 15–24.
- Sabelli B., Giannuzzi-Savelli R. & Bedulli D., 1990. Annotated check-list of Mediterranean Marine Mollusks, vol. 1. Libreria Naturalistica Bolognese, Bologna, 348 pp.
- Scuderi D. & Terlizzi A., 2012. Manuale di malacologia dell'Alto Ionio. Edizioni Grifo, Manduria, 186 pp.
- Vazzana A., Vertino A. & La Perna R., 2014. I coralli pleistocenici di Gallina (Reggio Calabria, Italia meridionale). Giornate di Paleontologia, XIV edition - Bari, 11–13 June 2014. Volume dei riassunti, pp. 71–72.