



Taxonomic notes on the *Alvania cimex*-complex in the Mediterranean Sea. *Alvania cingulata* (Philippi, 1836) junior synonym of *Alvania mamillata* Risso, 1826 (Gastropoda, Rissoidae)

Apuntes taxonómicos sobre el complejo de *Alvania cimex* en el Mar Mediterráneo. *Alvania cingulata* (Philippi, 1836) sinónimo posterior de *Alvania mamillata* Risso, 1826 (Gastropoda, Rissoidae)

Bruno AMATI*¹, Massimo APPOLLONI** and Carlo SMRIGLIO***

Recibido el 20-V-2017. Aceptado el 14-VI-2017

ABSTRACT

The rissoid species in the complex of *Alvania cimex* (Linnaeus 1758) are here revised: *Alvania cimex* (Linnaeus 1758), *Alvania mamillata* Risso, 1826, and *Alvania aartseni* Verduin, 1986 are here considered as valid. *Rissoa cingulata* Philippi, 1836, after examination of historical and living material is considered as a junior synonym of *Alvania mamillata*. A neotype is designated to stabilize its use. It is an ecophenotype with impoverished morphology, living in very shallow waters with fluctuating oxygen, salinity, temperature, and sulfur dioxide emissions.

Alvania cimex var. *depauperata* Monterosato, 1877 is confirmed as a junior synonym of *Alvania mamillata* Risso, 1826 based on the observation of syntypes.

RESUMEN

Se revisan las especies de rissoides del complejo de *Alvania cimex* (Linnaeus 1758): *Alvania cimex* (Linnaeus 1758), *Alvania mamillata* Risso, 1826 y *Alvania aartseni* Verduin, 1986 se consideran válidas. *Rissoa cingulata* Philippi, 1836, después de examinar el material histórico y material recolectado vivo, es considerado un sinónimo de *Alvania mamillata*. Se designa un neotipo para estabilizar su uso. Se trata de un ecofenotipo con morfología simplificada, viviendo en aguas de muy poca profundidad con oxígeno, salinidad y temperatura fluctuantes, y con emisiones de dióxido de azufre.

Alvania cimex var. *depauperata* Monterosato, 1877 se confirma como un sinónimo de *Alvania mamillata* Risso, 1826 basado en la observación de los sintipos.

INTRODUCTION

The genus *Alvania* Risso, 1826, belongs to the family Rissoidae Gray, 1847 and comprises species with small shells

(H 1-7 mm); ovate-conical, generally with axial and spirals elements forming a more or less robust clathrate sculpture,

* Largo Giuseppe Veratti, 37/D, 00146 Roma, Italy. bruno_amati@yahoo.it

** Museo Civico di Zoologia, Via Ulisse Aldrovandi, 18, 00197 Roma, Italy. massimo.appolloni@comune.roma.it

*** Dipartimento di Scienze, Università "Roma Tre", Viale Marconi, 446, 00146 Roma, Italy. csmriglio@alice.it

¹ Corresponding author

continuous peristome, and variable coloration. In the last thirty years the species belonging to the genus *Alvania* living in the Northeastern Atlantic and in the Mediterranean Sea, have been thoroughly studied. A complete bibliography can be found in the constantly updated Checklist (CLEMAM, 2017; WoRMS, 2017). This genus is present in the Mediterranean with c. 70 species (CLEMAM, 2017; WoRMS, 2017), some of which seem to be pretty rare and/or with very small geographical and bathymetric ranges (e.g. *A. alboranensis* Peñas and Rolán in PEÑAS ET AL., 2006, *A. algeriana* Monterosato, 1877, *A. clarae* Nofroni and Pizzini, 1991, *A. dipacoi* Giusti and Nofroni, 1989, *A. fractospira* Oberling, 1970 and *A. schwartziana* Brusina, 1866). The group of species related to *Alvania cimex* (Linnaeus, 1758), is very homogeneous, with ovate-conical profile and strong clathrate and tuberculate sculpture. As in several other groups of caenogastropods, protoconch features are commonly employed to diagnose species, sometimes facing with almost identical teleoconchs. *A. mamillata* and *A. cimex* have been distinguished in modern times only after VERDUIN (1986), based on paucispiral v. multispiral protoconch, respectively, yet they share a very similar apical sculpture consisting of fine cordlets and scattered micro-tubercles, whereas *A. aartseni* has a paucispiral protoconch with strong keel and irregularly welded tubercles. It has been recently suggested that *A. cimex* and *A. mamillata* might be two phenotypes of the same species with variable larval development strategies (planktotrophic / non-planktotrophic) (GOFAS, MORENO AND SALAS, 2011; OLIVER ET AL., 2015). The specific distinction of *A. cimex* and *A. mamillata* is based on the assumption that the dichotomy multispiral protoconch/ planktotrophic development v. paucispiral protoconch/ lecithotrophic development (JABLONSKI AND LUTZ, 1983) can be used in caenogastropods to recognise distinct sister species (BOUCHET, 1989; OLIVERIO, 1996a, 1996b, 1997; PUSATERI, GIANNUZZI-SAVELLI AND OLIVERIO, 2013). In fact, poecilogony (the ability of a species to use different devel-

opmental strategies, e.g. planktotrophy and lecithotrophy: CHIA, GIBSON AND QIAN, 1996) has not been so far reliably observed within the prosobranchs (BOUCHET, 1989), whereas it has been documented among opisthobranchs (WEST, HARRIGAN AND PIERCE 1984; GIBSON AND CHIA, 1995; KRUG ET AL., 2007). Therefore, at present we keep the taxa as separate species, although we believe that this issue is worth further studies, where molecular data will prove crucial.

In the Monterosato collection (MCZR), several vials containing specimens of *A. cimex* and *A. mamillata*, also included one vial (ex Sullioti collection) containing specimens from Messina of a particular form. These clearly represent the nominal taxon *Rissoa cingulata* Philippi, 1836, so far considered an uncommon and possibly valid species of *Alvania* (GARILLI, 2008; WoRMS, 2017; CLEMAM, 2017). CARUS (1893) listed, among others, material of *A. cingulata* collected by Sullioti at the 'Pantano del Faro', Messina. Probably these specimens originate from the same lot as those in the MCZR and in MNH (Berlin) (GARILLI, 2008). After comparing the Monterosato materials (ex Sullioti) and further samples collected alive (CS-PM) at the Pantano Piccolo (Lake of Faro), with others found in a few additional sites of the central Mediterranean Sea (see Material examined), we confirm the synonymy (based on morphological ground) with *A. mamillata* Risso, 1826, which shows a remarkable morphological variability of the shell.

MATERIALS AND METHODS

The studied samples are stored in public and private collections, as detailed in the heading of each species (see abbreviations). Photographs have been taken with a Sony Cyber-Shot digital camera mounted on a Kyowa KBS stereomicroscope, edited with the CombineZ software (HADLEY, 2006). Scanning Electron Microscopy (LIME, University "Roma Tre", Rome, Italy), was carried out by a Philips XL30. Current systema-

tics is based on the World Register of Marine Species. A lot of adult specimens, randomly selected from various lots have been measured: 8 specimens for *A. cimex*, 16 specimens for *A. mamillata*, 23 specimens for *A. mamillata* phenotype 'cingulata' and 9 specimens for *A. aartseni* (Tables I-II).

Abbreviations used

BA: Bruno Amati collection, Rome, Italy;
CS-PM: Carlo Smriglio and Paolo Mariottini collection, Rome, Italy;
DS: Danilo Scuderi collection, Belpasso, Catania, Italy;
IN: Italo Nofroni collection, Rome, Italy;
MCZR: Museo Civico di Zoologia di Roma, Italy;
MNH: Museum of Natural History Leibniz Institute for Evolution and Biodiversity at the Humboldt University of Berlin, Germany;

MNHN: Museo Nacional de Historia Natural, Santiago del Chile;
PM: Pasquale Micali collection, Fano, (AP), Italy;
SEM: Scanning Electron Microscopy;
?: incertae sedis;
min: minimum size;
max: maximum size;
sh: empty shell (s);
lv: live collected specimen (s);
Protoconch: d: diameter of nucleus; Do: diameter of first half whorl; DM: maximum diameter; nw: whorls number; h: height.
Teleoconch: H: height; W: width; Nw: number of teleoconch whorls; Nar+v: number of axial ribs + varix on the last whorl; Nslw: number of spirals on the last whorl; Nslw-ab: number of spirals on the last whorl (above the aperture); Nspw: number of spirals on the penultimate whorl.

SYSTEMATICS

Superorder CAENOGASTROPODA Cox, 1960 Superfamily RISSOIDEA Gray, 1847 Family RISSOIDAE Gray, 1847 Genus *Alvania* Risso, 1826

Type-species: *Alvania europea* Risso, 1826: 142, pl. IX, fig. 116 = *Alvania cimex* (Linnaeus, 1758) (*Turbo*), by subsequent designation Nevill, 1885: 105.

Alvania cimex (Linnaeus, 1758) (Fig. 1A,B; Fig. 3A and Tables I-II)

Turbo cimex Linnaeus, 1758: 761

?*Turbo calathiscus* Montagu, 1808: 132, pl. XXX, fig. 5

?*Alvania freminvillea* Risso, 1826: 141-142, pl. IX, fig. 118. Arnaud, 1978: 117, pl. 8, fig. 57 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* and *A. cimex*)

?*Alvania europea* Risso, 1826: 142, pl. IX, fig. 116. Arnaud, 1978: p. 116, pl. 8 fig. 54 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* and *A. cimex*)

?*Alvania pyramidata* Risso, 1826: 144. Arnaud, 1978: 131, pl. 8, fig. 61 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* and *A. cimex*)

?*Rissoa granulata* Philippi, 1836: 153

Alvania cimicina Locard, 1886: 239-240 (unjustified emendation); Locard, 1892: 156, fig. 135

Other iconographic references

Ponder, 1985: 135, figs 86 A-E;

Verduin, 1986: 28, fig. 2;

Amati, Nofroni and Oliverio, 1990: 48, fig. 4;

Giannuzzi-Savelli et al., 2002: 101, figs 386-387, 395a;

Garilli and Parrinello, 2010: 169, fig. 3-H;

Scaperrotta M, Bartolini S. and Bogi, 2011: 57, 4 unnumbered figs and unnumbered pl.; 154 '4 unnumbered figs';

Gofas, Moreno and Salas, 2011: 178, 3 unnumbered figs;

Garilli and Parrinello, 2012: 385, figs. 6A and 6B;

Antit and Azzouna, 2012: 121, figs D-E;

Oliver *et al.*, 2015: 113, figs 5-7;

Bitlis-Bakir and Öztürk, 2016: 448, pl.2, fig. 13.

Type material: *Turbo cimex*, Linnaeus, neotype designated by Verduin, 1986 (RMNH 55870 ex RGM 224547a); *Turbo calathiscus* Montagu (Royal Albert Memorial Museum, Exeter; probably lost) (Verduin, 1986: 29); *Rissoa granulata* Philippi (?Philippi collection at MNHB); *Alvania freminvillea* Risso, *Alvania europea* Risso, and *Alvania pyramidata* Risso (lectotypes and paralectotypes MNHN Paris) (ARNAUD, 1978).

Material examined: Italy. Torre Astura, beached, 2 sh (BA); Nettuno, beached, 2 sh (BA); Bosa Marina, Sardinia viii.2001, 12 sh (BA); Golfo Aranci, Sardinia, beached viii.1985, 1 sh (BA); S. Antiaco, Sardinia, 2 sh (BA); Cala Gonone, Dorgali, Sardinia, -2/4 m bioclastic coarse sand, viii.2010, 2 sh (BA); Taranto 2 sh (MCZR, L9.22137). France. Verghia, Corsica, -3 m bioclastic coarse sand viii.1988, 4 sh (BA). Spain. Malaga, bioclastic sand -5 m, 1 sh (BA). Greece. Nidri, Lefkada Is., among algae -5 m viii.1990, 2 sh (BA). Slovenia. Portoroz, beached, 85 sh (BA). Croatia. Umag, beached, 25 sh (BA); Lastovo Is., -38 m bioclastic coarse sand, 1 sh (BA); Zara (as *R. calathiscus*) 2 sh (MCZR s.n.); Zara 1 sh (MCZR L9.22137). Algeria. 41 sh, 1910 (Piersanti coll. XCIX.25 MCZR). Fossil: Montepellegrino (Sicily) 10 sh (Monterosato coll. ex Brugnone coll. MCZR L9.21880) (Fig 1D); Babbaurra (Sicily) 5 sh (Monterosato coll. ex Brugnone coll. MCZR L9.21880); Ficarazzi (Sicily) 7 sh (Monterosato coll. ex Brugnone coll. MCZR L9.21880).

Type locality: *Alvania cimex*: Koromačno, Labin, Croatia, Adriatic Sea (from neotype); *Turbo calathiscus*: Jura Island, United Kingdom; *Alvania freminvillea*, *Alvania europea* and *Alvania pyramidata*: région de Nice, Alpes-Maritimes, nowadays corresponding to the Côte d'Azur, France (Spada, 2016: 77); *Rissoa granulata*: Ognina, Sicily.

Distribution and habitat: The old records of *A. cimex* for the Atlantic (some of which are dated before the modern taxonomic separation of *A. cimex* and *A. mamillata*: Verduin, 1986), today unconfirmed, are reported by e.g. LOCARD (1892), HIDALGO (1917) and BORJA AND MUXICA (2001); this last record probably refers to an incorrect

identification. In addition, ROLÁN (1983) and ÁVILA (2000) did not report with certainly the species from Galicia and Azores, respectively. MAC ANDREW'S (1857) report of *R. granulata* Philippi from Azores, was rebutted by DAUTZENBERG (1889). In the Atlantic, confirmed occurrences of *Alvania cimex* are restricted to the Ibero-Moroccan gulf (RUEDA,

(Right page) Figure 1. A, B: *Alvania cimex* (Linnaeus, 1758). A: Bosa Marina (Sardegna, Italy), beached, height 4.75 mm (BA); B: fossil of Montepellegrino (Sicily), height 4.6 mm (MCZR). C: *Alvania mamillata* Risso, 1826, Palau (Sardegna, Italy), beached, height 5 mm (BA). D-H: *A. aartseni* Verduin, 1986. D: Melilla (Spanish North African territory), beached, height 3.4 mm (PM); E: Tipaza (Algeria), beached, height 3.6 mm (PM); F: Algiers (Algeria), beached, height 3.6 mm (MCZR); G: Sanary (France), beached, height 3.25 mm, SEM (coll. Locard, MNHN, Paris); H: protoconch, detail of the microsculpture, same specimen, SEM.

(Página derecha) Figura 1. A, B: *Alvania cimex* (Linnaeus, 1758). A: Bosa Marina (Cerdeña, Italia), explayada, altura 4,75 mm (BA); B: fósil de Montepellegrino (Sicilia), altura 4,6 mm (MCZR). C: *Alvania mamillata* Risso, 1826, Palau (Cerdeña, Italia), explayada, altura 5 mm (BA). D-H: *Alvania aartseni* Verduin, 1986. D: Melilla (territorio español del Norte de África), explayada, altura 3,4 mm (PM); E: Tipaza (Argelia), explayada, altura 3,6 mm (PM); F: Argel (Argelia), explayada, altura 3,6 mm (MCZR); G: Sanary (Francia), explayada, altura 3,25 mm, Microscopía electrónica de barrido (coll. Locard, MNHN, París); H: protoconcha, detalle de la microescultura, mismo ejemplar, MEB.

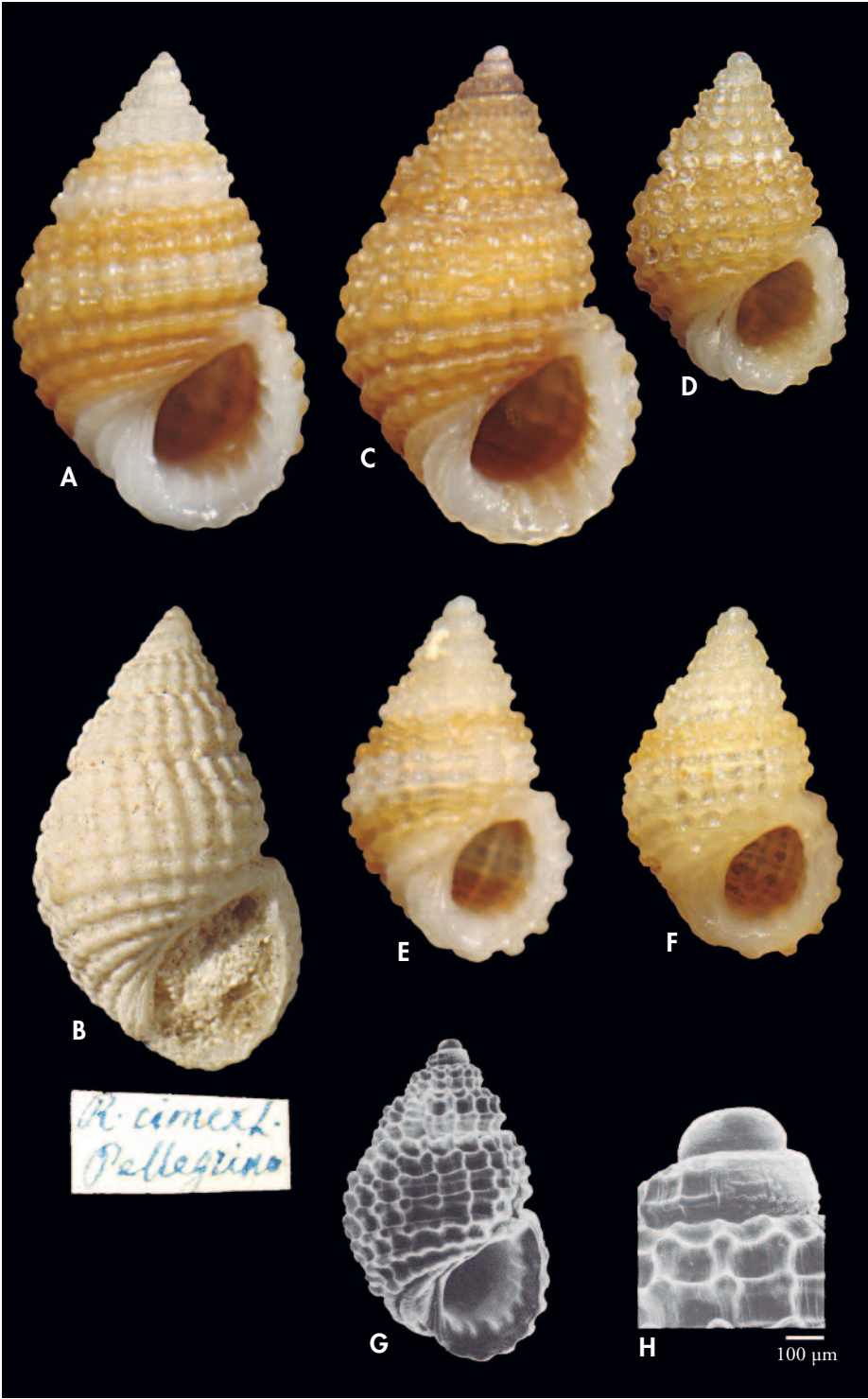


Table I. Measurements of the protoconch in the *Alvania cimex* group, in mm. d: diameter of nucleus; Do: diameter of first half whorl; DM: maximum diameter; nw: number of whorls; h: height; (L.F): Lake of Faro.

<i>Alvania cimex</i>	d	Do	DM	nw	h
Bosa Marina, Italy	0.07	0.15	0.33	2.0	0.35
Bosa Marina, Italy	0.09	0.17	0.38	2.1	0.37
Portoroz, Slovenia	0.11	0.17	0.38	2.6	0.37
Verghia, Corsica	0.10	0.17	0.35	2.0	0.37
Umag, Croatia	0.10	0.17	0.33	2.0	0.37
Nettuno, Italy	0.10	0.17	0.33	2.0	0.33
Nettuno, Italy	0.10	0.18	0.37	1.8	0.35
Min-max	0.07-0.11	0.15-0.18	0.33-0.38	1.8-2.6	0.33-0.37
Mean	0.09	0.17	0.35	2.07	0.36
<i>Alvania mamillata</i>	d	Do	DM	nw	h
Antignano, Italy	0.14	0.25	0.38	1.30	0.30
Orano, Algeria	0.15	0.20	0.32	1.25	0.28
Portoroz, Slovenia	0.15	0.30	0.35	1.20	0.36
Lampedusa Is., Italy	0.13	0.23	0.33	1.20	0.30
Kerkennah Is., Tunisia	0.13	0.23	0.32	1.25	0.30
Portocesarea, Italy	0.15	0.23	0.33	1.30	0.28
Umag, Croatia	0.13	0.25	0.33	1.30	0.30
Torre Astura, Italy	0.13	0.23	0.37	1.35	0.30
Vendicari Is., Italy	0.17	0.27	0.40	1.20	0.37
Pozzallo, Italy	0.12	0.23	0.33	1.25	0.31
Malta, Malta Is.	0.10	0.20	0.30	1.30	0.28
Cannizzaro, Italy	0.13	0.22	0.32	1.25	0.30
Cannizzaro, Italy	0.13	0.23	0.38	1.25	0.33
Zakynthos Is., Greece	0.14	0.25	0.33	1.25	0.28
Magnisi, Italy	0.13	0.23	0.33	1.25	0.30
Min-max	0.10-0.17	0.20-0.30	0.32-0.40	1.20-1.35	0.28-0.37
Mean	0.16	0.24	0.34	1.26	0.31
<i>Alvania mamillata</i> morphotype ' <i>cingulata</i> '	d	Do	DM	nw	h
Messina, Italy	0.15	0.275	0.40	—	0.30
Messina, Italy	0.125	0.25	0.35	1.2	0.30
Messina, Italy	0.125	0.25	0.40	1.3	0.30
Messina, Italy	0.125	0.25	0.375	1.2	0.30
Messina, Italy	0.125	0.25	0.35	1.2	0.30
Messina, Italy, neotype	0.14	0.25	0.40	1.4	0.30
Messina, Italy	—	—	—	—	0.30
Messina, Italy	0.15	0.25	0.425	1.3	0.30
Messina, Italy	0.15	0.25	0.40	1.2	0.30
Messina, Italy	0.15	0.25	0.40	1.25	0.30
Messina (L.F), Italy	0.14	0.225	0.347	1.4	0.35
Messina (L.F), Italy	0.125	0.30	0.40	1.3	0.30
Messina (L.F), Italy	0.14	0.25	0.40	1.3	0.35
Messina (L.F), Italy	0.15	0.225	0.39	1.25	0.30
Messina (L.F), Italy	0.15	0.25	0.44	1.3	0.35

Tabla I. Mediciones de la protoconcha en el grupo *Alvania cimex*, en mm. D: diámetro del núcleo; Do: diámetro de la primera media vuelta; DM: diámetro máximo; Nw: número de vueltas; H: altura; (L.F): Lago de Faro.

<i>Alvania mamillata</i> morphotype ' <i>cingulata</i> '	d	Do	DM	nw	h
Messina (L.F), Italy	0.125	0.225	0.40	1.3	0.275
Messina (L.F), Italy	0.125	0.25	0.40	1.25	0.30
Messina (L.F), Italy	0.15	0.275	0.39	1.2	0.30
Messina (L.F), Italy	0.15	0.25	0.41	1.2	0.26
Messina (L.F), Italy	0.125	0.25	0.40	1.2	0.35
Min-max	0.125-0.15	0.225-0.30	0.347-0.44	1.2-1.4	0.26-0.35
Mean	0.14	0.25	0.39	1.26	0.31

<i>Alvania aartseni</i>	d	Do	DM	nw	h
Melilla, Spain (N. Africa)	0.10	0.22	0.40	1.3	0.30
Melilla, Spain (N. Africa)	0.10	0.25	0.42	1.3	0.30
Tipaza, Algeria	0.10	0.22	0.40	1.35	0.30
Tarifa, Spain	0.10	0.20	0.35	1.25	0.30
Oran, Algeria	0.12	0.25	0.40	1.3	0.35
Alger, Algeria	0.11	0.22	0.42	1.35	0.30
Alger, Algeria	0.10	0.25	0.40	1.3	0.30
Sanary, France					0.28
Min-max	0.10-0.12	0.20-0.25	0.35-0.42	1.25-1.35	0.28-0.35
Mean	0.10	0.23	0.39	1.3	0.30

SALAS AND GOFAS, 2000). A convincing fossil record for Great Britain is reported by HARMER (1920). Mediterranean Sea: Italy (AMATI ET AL., 1990; SOPPELSA, CROCCETTA AND FASULO, 2007; VAZZANA, 2010; present study), Spain (VERDUIN, 1986; GOFAS ET AL., 2011; SCAPERROTTA ET AL., 2011; OLIVER ET AL., 2015; present study), France (PONDER, 1985; VERDUIN, 1986; present study), Tunisia (VERDUIN, 1986), Algeria (MONTEROSATO, 1877; present study), Croatia (VERDUIN, 1986; BRUNETTI AND VECCHI, 2012; present study), Slovenia (present study), Greece (GIANNUZZI-SAVELLI ET AL., 2002; GARILLI AND PARRINELLO, 2010; 2012; present study), Turkey (BITLIS-BAKIR AND ÖZTÜRK, 2016). According to SCAPERROTTA ET AL. (2011) *A. cimex* has a more restricted geographical distribution than *A. mamillata*. Our records show the contrary (see maps, Fig 3A-B). GOFAS ET AL. (2011) stated: "En fondos rocosos, en el estrato cavitario, también en praderas de *Posidonia oceanica*, en el

estrato de rizomas"; living in algal facies (DANTART, FRECHILLA AND BALLESTEROS, 1990); on hard substrate in the meso-infralittoral levels (BORJA AND MUXICA, 2001); infralittoral 0/-30 m (GRIBET AND PEÑAS, 1997); "del piso infralittoral rocoso con predominio de algas fofófilas y algunas zonas de arena (1-30 m)" (PEÑAS ET AL., 2006); on muddy-detritic bottoms -35 m (MAZZIOTTI, AGAMENONE AND TISSELLI, 2008). *A. cimex* and *A. mamillata* were collected (empty shell) sympatric at the following locality: Torre Astura and Nettuno (Italy); Golfo Aranci, S. Antioco and Cala Gonone (Sardinia); Portoroz (Slovenia); Umag, Lastovo Is. and Zara (Croatia). Fossil: Pliocene of England and France; Miocene, Pliocene and Pleistocene of England and Italy (HARMER, 1920; PETRACCI AND BERTAMINI, 2013; present study); Pleistocene of Sicily (Montepellegrino, Babbaurra e Ficarazzi: Bugnone collection, MCZR); Pleistocene of Tunisia (PALLARY, 1909: 42).

Table II. Measurements of the teleoconch in the *Alvania cimex* group, in mm. H: height, W: width; Nw: number of teleoconch whorls; Nar+v: number of axial ribs + varix on the last whorl; Nslw: number of spirals on the last whorl; Nslw-ab: number of spirals on the last whorl (above the aperture); Nspw: number of spirals on the penultimate whorl; j: juvenile specimen; (L.F): Lake of Faro.

<i>Alvania cimex</i>	H	W	Nw	Nar+v	Nslw	Nslw-ab	Nspw
Bosa Marina, Italy	4.9	3.0	4.7	18+v	10	4	3
Bosa Marina, Italy	4.9	3.0	4.75	18+v	10	4	3
Portoroz, Slovenia	5.2	3.2	5.2	15+v	9	4	3
Portoroz, Slovenia	5.3	3.3	4.7	21+v	10	4	3
Portoroz, Slovenia	4.5	2.8	4.5	17+v	10	4	3
Verghia, Corsica	5.2	3.1	4.8	22+v	10	4	3
Umag, Croatia	5.4	3.5	5	19+v	10	4	3
Umag, Croatia	5.2	3.2	5	17+v	10	4	3
Min-max	4.5-5.4	2.8-3.5	4.5-5.2	15-22+v	9-10	4	3
Mean	5.07	3.14	4.83	18.4+v	9.87	4	3
<i>Alvania mamillata</i>	H	W	Nw	Nar+v	Nslw	Nslw-ab	Nspw
Antignano, Italy	6.0	3.6	5.2	19+v	10	4	3
Golfo Aranci, Italy	5.3	3.2	4.75	22+v	10	4	3
Oran, Algeria	5.2	3.2	4.8	18+v	10	4	3
Portoroz, Slovenia	4.8	3.0	4.7	18+v	10	4	3
Lampedusa Is., Italy	4.7	2.8	4.5	18+v	9	4	3
Kerkennah Is., Tunisia	4.8	2.8	4.7	18+v	10	4	3
Porto Cesareo, Italy	7.0	3.5	6.0	22+v	10	4	3
Umag, Croatia	5.0	3.0	4.8	17+ v	10	4	3
Vendicari Is., Italy	2.4	1.6	3.4	19+ v	9	4	3
Canale di Sicilia, Italy	2.5	1.6	3.7	22+ v	9	4	3
Pozzallo, Italy	2.8	1.75	3.4	20+ v	8	4	3
Malta Is., Malta	4.0	2.5	4.7	14+ v	10	4	3
Cannizzaro, Italy	3.9	2.5	4.2	17+ v	9	4	3
Cannizzaro, Italy	4.3	2.65	4.3	20+ v	10	4	3
Zakynthos Is., Greece	4.3	2.75	4.5	17+ v	10	4	3
Magnisi, Italy	4.0	2.35	4.2	17+ v	11	5	4
Min-max	2.4-7.0	1.5-3.6	3.4-6.0	14-22+v	8-11	4-5	3-4
Mean	4.48	2.67	4.49	18.6+v	9.69	4.06	3.06
<i>Alvania mamillata</i> morphotype 'cingulata'	H	W	Nw	Nar+v	Nslw	Nslw-ab	Nspw
Torre Astura, Italy	4.2	2.4	4.7	30+v	10	5	4
Torre Astura, Italy	4.6	2.9	4.5	31+v	10	5	4
Torre Astura, Italy	4.1	2.6	4.3	26+v	9	4	4
Messina, Italy	4.6	2.85	4.5	40+v	11	5	4
Messina, Italy	4.1	2.6	4.4	41+v	10	4	4
Messina, Italy	3.95	2.5	4	38+v	11	5	4
Messina, Italy	3.6	2.35	4	36+v	9	4	4
Messina, Italy	3.9	2.45	4.1	40+v	11	5	4
Messina, Italy, neotype	3.75	2.35	4	59+v	11	5	4
Messina, Italy	4.45	2.75	4	—	11	5	4
Messina, Italy	3.85	2.4	4	41+v	10	4	4
Messina, Italy	3.85	2.45	4	50+v	9	4	4

Tabla II. Mediciones de la teleoconcha en el grupo *Alvania cimex*, en mm. H: altura, W: ancho; Nw: número de vueltas de teleoconcha; Nar + v: número de costillas axiales + variz en la última espiral; Nslw: número de espirales en la última vuelta; Nslw-ab: número de espirales en la última vuelta (por encima de la abertura); Nspw: número de espirales en la penúltima vuelta; j: ejemplar juvenil; (L.F): Lago de Faro.

<i>Alvania mamillata</i> morphotype 'cingulata'	H	W	Nw	Nar+v	Nslw	Nslw-ab	Nspw
Messina, Italy	3.6	2.35	3.8	44+v	11	5	4
Messina (L.F), Italy	4.45	2.7	4.3	47+v	11	5	4
Messina (L.F), Italy	3.9	2.5	4	42+v	11	5	4
Messina (L.F), Italy	4.05	2.5	4.25	39+v	10	4	4
Messina (L.F), Italy	4	2.35	4.1	44+v	9	5	4
Messina (L.F), Italy	4.1	2.45	4.2	54+v	10	4	4
Messina (L.F), Italy	4.25	2.75	4.2	44+v	11	5	4
Messina (L.F), Italy	4.05	2.6	4.1	39+v	11	5	4
Messina (L.F), Italy	4.05	2.6	4.2	38+v	9	4	4
Messina (L.F), Italy	4.5	2.8	4.3	37+v	11	5	4
Messina (L.F), Italy	4.75	2.9	4.5	40+v	11	5	4
Min-max	3.6-4.7	2.3-2.9	3.8-4.7	26-59+v	9-11	4-5	4
Mean	4.11	2.57	4.19	40.4	10.3	4.65	4
<i>Alvania aartseii</i>	H	W	Nw	Nar+v	Nslw	Nslw-ab	Nspw
Melilla, Spain (Morocco)	3.4	2.25	3.8	18+v	9	4	3
Tipaza, Algeria	3.6	2.3	4.1	14+v	9	4	3
Tarifa, Spain	2.15	1.5	3.1	—	—	—	—
Orano, Algeria	17 (j)	—	2.5 (j)	—	—	—	—
Sanary, France	3.4	2.2	3.7	18+v	9	4	3
Alger, Algeria	3.45	2.15	4	14+v	9	4	3
Alger, Algeria	3.65	2.25	4.2	14+v	9	4	3
Alger, Algeria	3.5	2.25	4.1	15+v	9	4	3
Alger, Algeria	3.6	2.2	4.1	15+v	9	4	3
Min-max	2.15-3.65	1.5-2.3	3.1-4.2	14-18+v	9	4	3
Mean	3.34	2.14	3.9	15.4+v	9	4	3

Description (Tables I-II): Shell of large size for the genus, height 3-5 mm (max 6.6 mm). Solid, ovate-conical, non-umbilicated, 3-6 flat or very little convex whorls. Protoconch multispiral: d 0.07-0.11 mm, Do 0.15-0.18 mm, DM 0.33-0.38 mm, nw 1.8-2.6, h 0.33-0.37 mm; protoconch I (embryonic shell) slightly twisted, sculptured by longitudinal cords with microscopic tubercles in between; protoconch I-II boundary weak but visible; protoconch II (larval shell) sculpted by scattered granules and discontinuous longitudinal spirals; granules very close to one another on the lower part tending to form conti-

nuous lines. Protoconch-teleoconch boundary clearly marked. Teleoconch sculpture with axials and spirals very strong, consisting, on the last whorl, of 15-22 axial ribs (varix excluded) and 9-10 spirals cords forming strong rounded tubercles at the intersection; 4 spirals above the aperture, three on the penultimate whorl. A small tubercle on the columella. Outer lip generally thickened by a large varix, denticulate on the inner side. Coloration variable, monochrome white to dark brown across all shades, occasionally with two brown bands, one subsutural the other basal. For a description of operculum and soft parts

(radula and head-foot) typical of the genus, see PONDER (1985: 38, 135, pl. 86, figs D-E).

Remarks: VERDUIN (1986: 27) has designated the neotype of *A. cimex* from material of the Adriatic Sea, certainly conspecific to that figured by PONDER (1985: 135, Fig. 86b-c), since he could not examine the collection Linnaeus (now available in the Linnean Society, London with good photographs online of those specimens <www.linnean.org>). The

photographed specimens of *Turbo cimex* are a mix of well preserved *Alvania cimex* group (seemingly rather *A. mamillata* than true *A. cimex*) and of beach-worn *Alvania montagui*. However DODGE (1959) questioned the authenticity of those specimens and therefore Verduin's neotype can be accepted. VERDUIN (1986: 27) checked that Gualtieri's specimens (also syntypes) deposited in Museum of Natural History (Pisa) are missing.

Alvania mamillata Risso, 1826 (Figs 1C; 2A-M; Fig. 3 B and Tables I-II)

Alvania mamillata Risso, 1826: 145, pl. IX, fig. 128. Arnaud, 1978: 123 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* and *A. cimex*)

?*Turbo calathiscus* Montagu, 1808: 132, pl. XXX, fig. 5

?*Alvania freminvillea* Risso, 1826: 141-142, pl. IX, fig. 118. Arnaud, 1978: 117, pl. 8, fig. 57 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* and *A. cimex*) (Verduin, 1986: 29)

?*Alvania europea* Risso, 1826: 142, pl. IX, fig. 116. Arnaud, 1978: 116, pl. 8, fig. 54 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* with *A. cimex*) (Verduin, 1986: 29)

?*Alvania pyramidata* Risso, 1826: 144. Arnaud, 1978: 131, pl. 8, fig. 61 (lectotype designated), treated as a synonym of *A. cimex* (before the specific separation of *A. mamillata* with *A. cimex*)

Rissoa cingulata Philippi, 1836: 152-153; Philippi, 1844: 128, pl. XXIII, fig. 14, new synonym

?*Rissoa granulata* Philippi, 1836: 153

Alvania cimex var. *depauperata* Monterosato, 1877: 34

Other iconographic references:

Bogi, Coppini and Margelli, 1984: 11, 1 unnumbered fig. sub nomine *A. cimex*;

Verduin, 1986: 28, figs 3-4;

Amati *et al.*, 1990: 48, fig. 7;

Giannuzzi-Savelli *et al.*, 2002: 101, figs 388, 395b;

Kowalke and Harzhauser, 2004: 119, fig. 6A

Garilli, 2008: 26, figs 15-23 (as *Alvania cingulata*);

Scaperrotta *et al.*, 2011: 66, 154, 1 unnumbered pl., 4 unnumbered figs;

Antit and Azzouna, 2012: 121, figs A-C;

Oliver *et al.*, 2015: 114, figs 8-13,

Bitlis-Bakir and Öztürk, 2016: 448, pl. 2, fig. 19.

Type material: *Alvania mamillata* Risso, lectotype and paralectotype selected by ARNAUD (1978: 123) (MNHN). *Rissoa cingulata* Philippi, "one possible syntype, ZMB (2326) ex coll. Philippi was destroyed by Byne's reaction (M. Glaubrecht, pers. comm., 2006)" (GARILLI, 2008: 27; confirmed by Christine Zorn, NMHB: pers. comm., 2017). Not found at NMHB, MNHN and MCZR; neotype (here designated), Messina, Sicily (Monterosato coll. ex Sullioti coll., MCZR) H 3.75 mm, W 2.35 mm (Figs 2B-F).

Material examined: Typical *A. mamillata*. Italy. Antignano -1.5 m, *Posidonia* meadow, viii.1978, 3 lv (BA); Giglio Is., Secca Subbielli -38 m, bioclastic coarse sand, 5 sh (BA); Santa Marinella, beached 1980, 3 sh (BA); Torrevadalliga, bioclastic coarse sand, 29 sh (BA); Torre Astura, beached 1978, 41 sh (BA); Nettuno, beached 1982, 7 sh (BA); S. Stefano Is., Ventotene, -40 m, 2 sh (BA); Monopoli, beached, 11 sh (BA); Porto Cesareo, beached viii.1983, 61 sh (BA); Taranto, 3 sh (MCZR L9.22137); Cala Gonone, Dorgali, Sardinia, 2/4.viii.2010, bioclastic coarse sand, 6 sh (BA); Sardinia, locality unknown -7 m, bioclastic coarse sand, 7.viii.1981, 6 sh (BA); Golfo Aranci, Sardinia, viii.1985, beached,

6 sh (BA); Palau, Sardinia, -2 m Posidonia meadow on muddy bottom, 16.viii.2010, 1 lv (BA); S. Antioco, Sardinia 12 sh (BA); S. Teodoro, Sardinia 1 sh (BA); Scilla vii.2015, -43/44 m bioclastic coarse sand, 34 sh (BA); Maratea, Santo Janni Is. -24 m, bioclastic coarse sand, 23 sh (BA); Pozzallo viii.1986 -40 m, 6 sh (BA); Lampedusa Is. Capo Grecale -50 m bioclastic coarse sand, vii.2009, 11 sh (BA); Lampedusa Is. Cala Calandra -30 m, bioclastic coarse sand 30.iv.1991, 55 sh (BA); Vendicari Island -28 m, 16 sh (BA); Messina (as *A. depauperata*), 5 sh (ex Sullioti coll., 1888, MCZR 22137); Cannizzaro, Sicily -30/45 m bioclastic coarse sand, 81 sh (BA); Ognina beached, 10.x.1982, 25 sh (BA); Levanzo Is. Punta Altarella -31 m bioclastic coarse sand, 3.v.1991, 28 sh (BA); Sicilian Channel -55 m, 1 sh (BA); Salina Is., 'Grotta dei Gamberetti' -35 m, 2002, >300 sh (BA); Pantelleria Island, loc. Scauri -13 m, bioclastic coarse sand, 12.vi.1991, 34 sh (BA); Magnisi, beached 13.iii.1970, legit Oberling >100 sh (BA); Capo Asparano, ix.1985 beached, 39 sh (BA); Is. delle Correnti -32 m, bioclastic coarse sand, viii.1985, 2 sh (BA); Porto Palo di Capo Passero, Sicily, beached, 3 sh (BA); Capo Passero Is. Porto Palo, Sicily, -28 m, bioclastic coarse sand, viii.1984, 3 sh (BA); Arenella, 89 sh (BA); Arenella, 89 sh (Monterosato coll. MCZR 22137); Malta. Malta Is., 12 sh (BA); Malta Is., 15 sh (BA); Croatia. Umag, beached, >500 sh (BA); Lastovo Is. -38/50 m, 35 sh (BA); San Lorenzo del Pasenatico -6 m rocky bottom, 31 sh (BA); Zara, 2 sh (as *R. calathiscus*) (MCZR s.n.); Zara, 4 sh (MCZR L9.22137); Slovenia. Portoroz, beached, >300 sh (BA); Algeria. Madah, Oran beached, viii.1977, 9 sh (BA); Tunisia. Kerkennah Is. Sidi Yousef, beached >100 sh (BA); Turkey. Aydinlik, beached, 4 sh (BA); Greece. Ionian Sea, locality unknown, beached, 15 sh (BA); Creta Is., Gournia, 9 sh (BA); Creta Is., beached, 4 sh (BA); Cefalonia Is. loc. Agia Efimia, -7/8 m bioclastic coarse sand viii.1990, 4 sh (BA); Zakynthos Is., -2/3 m bioclastic coarse sand, 22 sh (BA); Cyprus. Cape Greco Protaras, beached, ix.2011, 106 sh (BA).

Type locality: *Alvania mamillata*: no precise locality mentioned, région de Nice, Alpes-Maritimes, nowadays corresponding to the Côte d'Azur, France (Spada, 2016: 77); *Turbo calathiscus*: Jura Island, United Kingdom; *Alvania freminvillea*, *Alvania europea* and *Alvania pyramidata*: région de Nice, Alpes-Maritimes; *Rissoa cingulata*: originally Magnisi, Sicily; from neotype designation: Pantano del Faro, Messina, Sicily; *Rissoa granulata*: Ognina, Sicily; *Alvania cimex* var. *depauperata*: Algiers, Algeria. Morphotype '*cingulata*'. Italy. Torre Astura beached, 1977, 3 sh (BA); Trapani 10 sh (Monterosato coll. ex Brugnone coll. MCZR 21880); Messina, Sicily, (38° 16' 20" N - 15° 38' 10" E), connecting channel between the Tyrrhenian Sea and the Pantano Piccolo -0.5 m, viii.1983, 39 lv, (CS-PM); Messina, Sicily, (38° 16' 20" N - 15° 38' 10" E), connecting channel between the Tyrrhenian Sea and the Pantano Piccolo -0.5 m, viii.1983, 1 lv (BA); Messina, Sicily, (Monterosato coll. ex Sullioti coll., 1912, MCZR 22165), 57 sh (as *A. cingulata*), some fragmented; Lake of Faro, Messina, Sicily, between rocks, -0.2/0.3 m, 4 lv (DS); Messina, two vials with 179 sh and 38 sh (as *A. cingulata*), (Settepassi coll. MCZR).

Distribution and habitat:

Typical *A. mamillata*. Mediterranean Sea, Italy, Malta Is., Croatia, Slovenia, France, Spain, Algeria, Tunisia, Turkey, Greece, Cyprus, Lebanon. Rather common on the upper continental shelf, in algal facies (0/-30 m) (e.g. HERGUETA, 1996; SOPPELSA ET AL., 2007; MAZZIOTTI ET AL., 2008; VAZZANA, 2010; SCAPE-RRONTA ET AL., 2011; OLIVER ET AL., 2015; present study). *Alvania mamillata* and *Alvania cimex* were found (empty shell) sympatric at various Tyrrhenian and Adriatic localities (see under *A. cimex*).

Morphotype '*cingulata*'. Italy: Sicily various locality (PHILIPPI, 1836; 1844; ARADAS AND MAGGIORE, 1844; ARADAS AND BENOIT, 1870; MONTEROSATO, 1872; MONTEROSATO, 1884; SULLIOTTI, 1889; GARILLI, 2008; Brugnone, unpublished data; Scuderi pers. com.; present study);

Torre Astura (Italy, Central Tyrrhenian Sea: present study). Messina, Lake of Faro, Sicily, among the rocks -0.2/0.3 m; in the connecting channel between the Tyrrhenian Sea and Lake of Faro or Pantano Piccolo (38° 16' 20" N - 15° 38' 10" E); the population sampled was observed living in sciaphilous habitat, under stones in very shallow water -0.5 m, with presence of green algae in the intertidal zone. France: Some old records need confirmation (PETIT AND MARION FIDE WEINKAUFF, 1867; LOCARD, 1886 and CARUS, 1893).

Description (Tables I-II): Same as *A. cimex* but with paucispiral protoconch. Protoconch paucispiral: d = 0.10-0.17 mm, Do = 0.20-0.30 mm, DM = 0.30-0.40 mm, nw = 1.2-1.35, h = 0.28-0.37 mm, weakly sculptured on the whole surface by spiral striae and scattered micro tubercles in between.

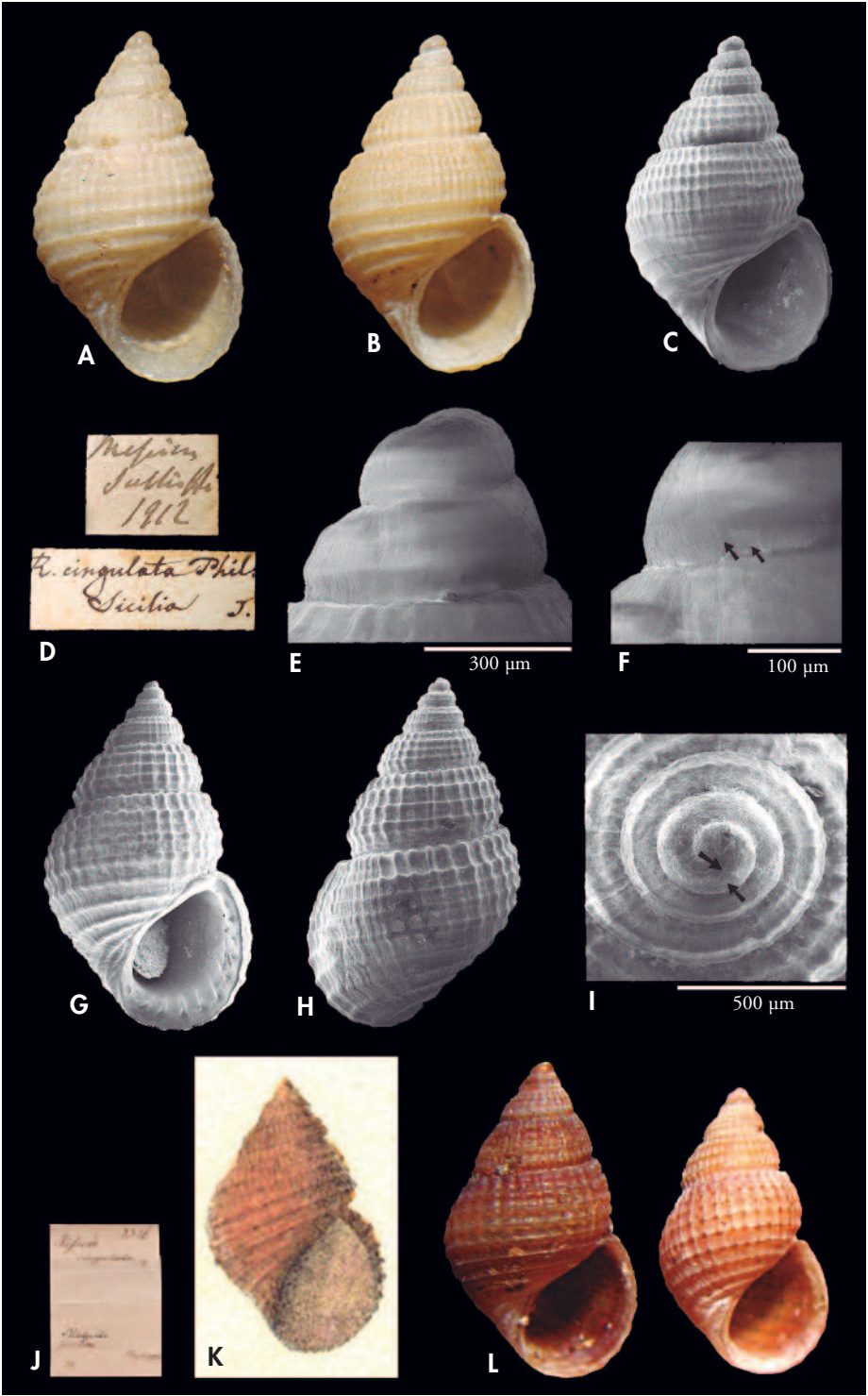
Remarks: This species presents an extreme variability in some aspects of shell morphology (VERDUIN, 1986). Variability is more evident in the size of shell ($H = <2.0-7.0$ mm) and in the thickness, in the number of axial ribs (14-22), in the number of spirals cords (8-11) and in their ruggedness. In mature specimens, the labial varix ranges can be thin or rather thick and the aperture can be smooth or lyrate internally. A small columellar tubercle is usually present, rarely absent or double. Coloration monochrome from white to brown with all shades, or with two brown bands, one subsutural, the other basal. Operculum typical of the genus, soft parts observed by CACHIA, MIFSUD AND SAMMUT (1996): "The animal is milky-white with a long foot and tentacles; the head region has creamy patches. ".

Description of the morphotype 'cingulata' (in parentheses the data of the neotype) (Tables I-II): Shell of medium size for the genus, ovate-conical in shape, fragile, height 3.6-4.8 mm (3.75 mm) width 2.35-2.9 mm (2.35 mm). Protoconch paucispiral, of 1.2-1.4 (1.4) convex whorls, height 0.30-0.35 mm (0.30 mm), diameter of the nucleus 0.125-0.15 mm (0.14 mm), diameter of the first half whorl 0.225-0.30 mm (0.25 mm), maximum diameter 0.35-0.44 mm (0.40 mm). Sculpture weak and rather eroded in the examined specimens, with fine spirals all over the surface, with scattered microtubercles (Figs 2E-F, I) (see also GARILLI, 2008: 26,

figs 20, 23). Teleoconch of 3.8-4.5 (4) convex whorls with marked canaliculated suture. Axial ribs 26-59 (59) on the last whorl, not interrupted at the base; spiral sculpture on the first whorl of two cords, 4 (4) on the penultimate whorl and 9-11 (11) on the last whorl of which 4-5 (5) above the aperture; specimens with spiral sculpture predominant on the axial one, have a cingulate appearance, especially on the base. Weak and rounded tubercles at the intersection, absent on the base. Umbilical chink not present. Large aperture, 1.75-2.2 mm high, and high as half the shell, round-ovate, thickened externally by a weak labial varix (2-3 times as wide as the axial ribs) internally smooth or, rarely, slightly stronger and with 9-11 elongated internal denticles. Coloration monochrome light beige to dark brown; rare specimens with two darker bands, one subsutural and another basal. Operculum thin, with eccentric nucleus. Soft parts not examined.

Remarks: PHILIPPI (1836) reported, using the Sicilian line, a height of $1\frac{3}{4}$ ''' corresponding to ca. 4.25 mm (SCUDERI AND AMATI, 2012). GARILLI (2008) referred a maximum height of 3.5 mm and a width of 2.2 mm. A moderate variability of the shell shape is primarily observed in the number of axial ribs (although it should be noticed that when they are weak, counting can be very difficult especially on the last portion of the last whorl). A weak additional intermediate

(Right page) Figure 2. A-M. *Alvania mamillata* Risso, 1826 morphotype 'cingulata' (Philippi, 1836). A. Messina, height 3.85 mm (MCZR); B. neotype (shell) from Messina, height 3.75 mm (MCZR); C. Scanning Electron micrograph of the neotype; D. original labels from Monterosato; E-F. protoconch and detail of the microsculpture of the neotype; G-H. Messina, Italy, Pantano Piccolo -0.5 m depth, height 4.6 mm (CS-PM); I. protoconch and detail of the microsculpture, same specimen; J. '*Rissoa cingulata*' original labels (MNH); K. original figure of *Rissoa cingulata* reproduced from Philippi. (1844: 128, pl. XXIII, fig. 14); L. M. Messina, Italy, Lake of Faro -0.2/0.3 m depth (DS).
(Página derecha) Figura 2. A-M. *Alvania mamillata* Risso, 1826 morfotipo 'cingulata' (Philippi, 1836). A. Messina, altura 3,85 mm (MCZR); B. neotipo (concha) de Messina, altura 3,75 mm (MCZR); C. Micrografía electrónica de barrido del neotipo; D. etiquetas originales de Monterosato; E-F. protoconcha, detalle de la microscultura, (MCZR); G-H. Messina, Italia, Pantano Piccolo -0,5 m de profundidad, altura 4,6 mm (CS-PM); I. Protoconcha y detalle de la microscultura, mismo ejemplar; J. '*Rissoa cingulata*', etiquetas originales (MNH); K. figura original de *Rissoa cingulata* reproducida de Philippi (1844: 128, lám. XXIII, figura 14); L. M. Messina, Italia, Lago de Faro -0,2 / 0,3 m de profundidad (DS).



varix has been rarely observed. Of the 57 specimens of Messina sample (MCZR) 32 (56.1%) have 5 spirals cords above the aperture and the remaining 25 (43.9%) 4 cords. In the sample of 40 specimens from the Lake of Faro (CS-PM) 21 (52.5%) have 4 spirals cords and 19 (47.5%) have 5; 97 specimens in total, 53.6% with 5 cords spirals and 47.4% with 4 cords. All specimens of the two lots have 4 spirals on the penultimate whorl.

The study of some syntypes of *A. cimex* var. *depauperata* Monterosato, 1877 in the Monterosato collection (MCZR) showed for most of them an intact paucispiral apex as in *A. mamillata*. The specimens with intact apex originated from various Sicilian and Algerian localities, all are small sized but with the same specific characteristics of *A. mamillata*. It is clear that the two names (*A. mamillata* e *A. cimex* var. *depauperata*) refer to the same species, with Risso's name prevailing for priority. It is now not possible to select a lectotype of *Alvania cimex* var. *depauperata* because the specimens, which were examined in the 80s, have been displaced by the curator and could not be found.

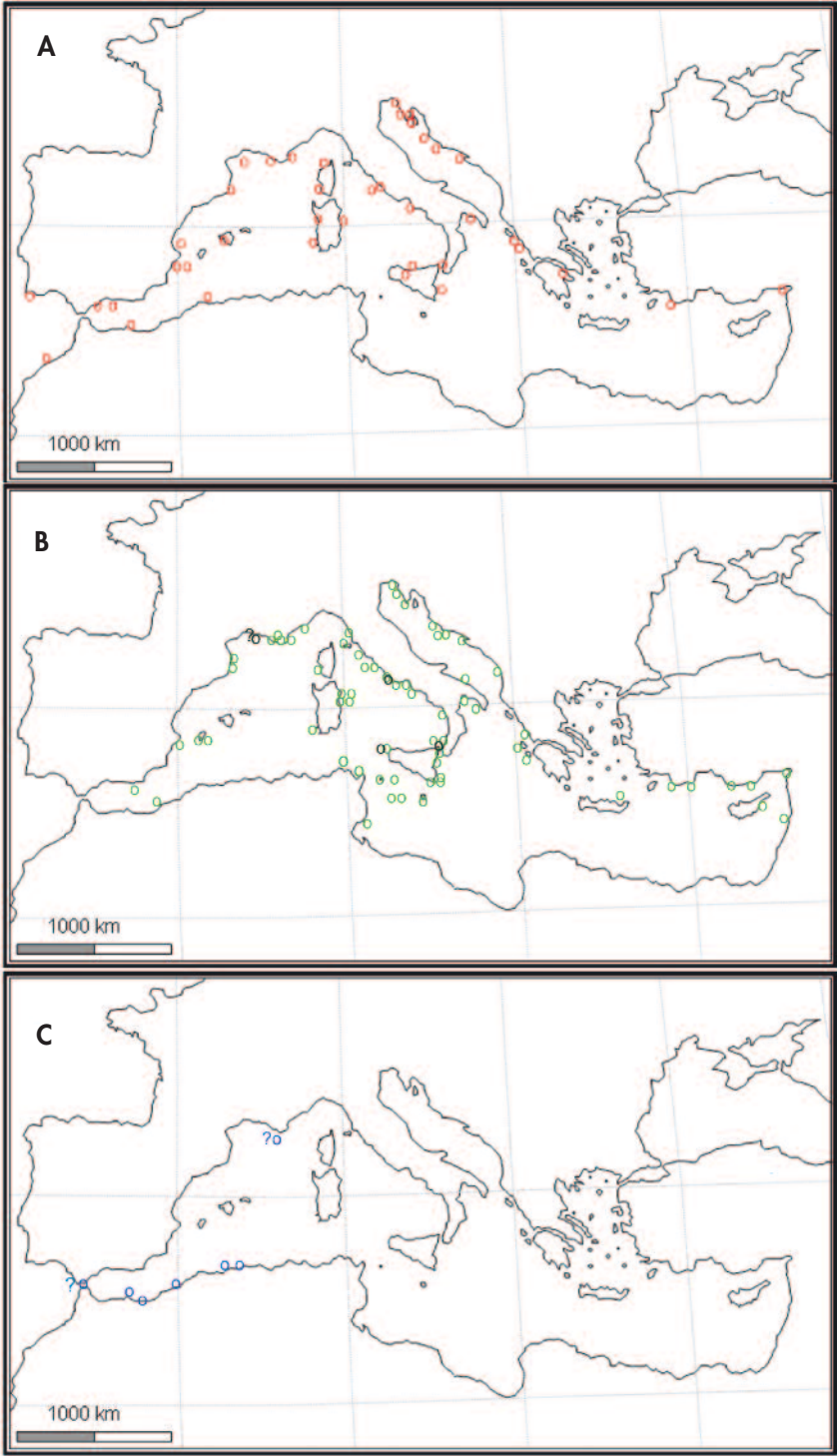
In Tunisia (Kerkennah Islands) there is a common form of *A. mamillata*, very similar to the morphotype '*cingulata*', which PALLARY (1912) believed to correspond to the variety *depauperata* Monterosato. This population has a smaller (H 2.3-3.0 mm) and less robust shell, predominantly monochrome white and rare specimens with weak darker bands, more numerous axial ribs on the last whorl (21-24). Almost all specimens examined have 4 spirals on the penultimate whorl, rarely 4 also on the third last whorl.

Some recent authors (e.g. NORDSIECK, 1972; PIANI, 1979), used the binomen *A. cingulata* in the genus *Galeodina* Monterosato, 1884 together with *A. carinata* (da Costa, 1778) and *A. tenera* (Philippi, 1844), but referring to varietal specimens of *A. carinata*. GIANNUZZI-SAVELLI ET AL. (2002) also depicted as *A. cingulata* one of the many morphs of *A. carinata*. GARILLI (2008) recognized the validity of the species and depicted three specimens from eastern Sicily (Messina and Siracusa). *Alvania cingulata* (Philippi 1836) is reported by CLEMAM (2017) as 'valid name', and by WoRMS (2017) as 'accepted'.

MONTEROSATO (1872: 35) mentioned for the first time *Rissoa cingulata* Philippi, 1836, and by this time he was likely having a very clear idea about the identity of the species, having examined in the Zoological Museum in Berlin Philippi's material described in 1836 ("ex typ.,") (the "Palermo" material has not been found in the Monterosato collection, MCZR). In an unpublished manuscript of Monterosato (Appolloni, Amati, Bartolini, Giannuzzi-Savelli, Mariottini, Oliverio, Pusateri, Scaperrotta and Smriglio, in prep.), presumably of the late 1870s, Monterosato reported that the material collected in Palermo consisted of a single specimen, compared personally with the holotype of Magnisi kept in the Berlin Museum. MONTEROSATO (1884: 161) placed the species in the new genus *Acinus* [= *Alvania* Risso, 1826 according to Ponder, (1985)], erected for the small group including *Turbo cimex* (type species) and allied. Here a brief description is provided for *Acinus cingulatus*: "Si congiunge con la precedente (*cimex*) per le varietà di colorito. Si distingue per essere più piccola, più sottile, per la trasparenza e per la scultura più obsoleta,

(Right page) Figure 3. A-C. Distribution species of *Alvania cimex*-complex. A. *Alvania cimex* (Linnaeus, 1758), red circles. B. *Alvania mamillata* Risso, 1826, green circles; morphotype *cingulata* (Philippi, 1836), dark green circle. C. *Alvania aartseni* Verduin, 1986, light blue circle. ? = dubious records to be confirmed.

(Página derecha) Figura 3. A-C. Distribución de las especies del complejo de *Alvania cimex*. A. *Alvania cimex* (Linnaeus, 1758), círculos rojos. B. *Alvania mamillata* Risso, 1826, círculos verdes; morfotipo *cingulata* (Philippi, 1836), círculos verde oscuros. C. *Alvania aartseni* Verduin, 1986, círculos celestes. ? = citas dudosas por confirmar.



dove predominano i cingoli spirali, specialmente verso la base" ["It is distinguished from the previous one (*cimex*) by its colour variations. It is diagnosed by being smaller, thinner, by its transparency and by the more obsolete sculpture, where the spiral cords predominate, especially toward the base"] and two localities are reported: Palermo and Magnisi. SULLIOTTI (1889: 34) wrote:

"*Rissoa cingulata*. Philippi. Enum. Moll. Sic... I suoi caratteri principali si riducono infatti a quello della maggior tenuità e leggerezza della conchiglia, della sua trasparenza e della sua scultura più obsoleta..." ["*Rissoa cingulata*. Philippi. Enum. Moll. Sic... Its main features are reduced to that of the greater weakness and lightness of the shell, its transparency and its obsolete sculpture"].

Alvania aartseni Verduin, 1986 (Figs 1D-H; Fig. 3C and Tables I-II)

Alvania aartseni Verduin, 1986: 29-31, fig. 6

Alvania cancellina Locard, 1892 'pars' 2 paralectotypes (Amati and Oliverio, 1989: 265)

Other iconographic references:

Amati and Oliverio, 1989: 267, 2 figs;

Oliverio and Amati, 1990: 85, 87, figs 3, 9;

Amati *et al.*, 1990: 49, 1 fig.;

Agamennone and Micali, 2009: 6, fig. 1;

Oliver *et al.*, 2015: 113, figs 2-4.

Type material: holotype (RMNH, no. 55849). Paratypes: RMNH 55850 (3 juvenile shells); van Aartsen coll. 10993 (1 full grown shell plus 24 juvenile ones); van Aartsen coll. 10746 (8 shells); van Aartsen coll. 11052 (2 shells); RMNH (4 shells labelled "*Rissoa* (*Alvania*) *cimex* L. var. *depauperata* Monts./Algeria").

Material examined: France: 2 sh, Sanary (record to be confirmed), paralectotypes of *Alvania cancellina* Locard, 1892 (MNH), (Amati and Oliverio, 1987: 267, 2 figs), Spain: 1 sh, Tarifa (record to be confirmed) (IN), 2 shs, Melilla, Moroccan coast (PM), Algeria: Algiers, 36 sh (Monterosato collection ex Joly, MCZR, L10.22128) in schedis as '*Alvania consobrina* Monts.' [never published], Oran, beached vii.1977 1 sh (BA), Tipaza, beached 1 sh (PM).

Type locality: Algeria, El Djemila (= La Madrague).

Distribution and habitat: Southern Mediterranean: Morocco (present study), Spanish territories on the Moroccan coast: Chafarinas Islands (OLIVER *ET AL.*, 2015, GOFAS *ET AL.*, 2011), Algeria (VERDUIN, 1986; AMATI AND OLIVERIO, 1989; GIANNUZZI-SAVELLI *ET AL.*, 2002; AGAMENNONE AND MICALI, 2009; present study); Southern France (to be confirmed, based on LOCARD, 1892; AMATI AND OLIVERIO, 1989). The record for Amalfi (Central Tyrrhenian) (GIANNUZZI-SAVELLI *ET AL.*, 2002) is a misidentification of another species: *A. amatii* Oliverio, 1986. Only empty shells found (-12/35 m) (OLIVER *ET AL.*, 2015).

Description (in parentheses the data of the holotype) (Tables I-II): The only morphology feature of *A. aartseni* allowing its discrimination from *A. cimex* or *A. mami-*

llata is the smaller size, H 2.15-3.8 mm (3.6 mm), W 1.5-2.3 mm (?) and the peculiar shape of the paucispiral protoconch: d mm 0.10-0.12 (0.12 mm); Do mm 0.20-0.25 (0.21 mm); DM 0.35-0.42 mm (?); nw 1.25-1.35 (1.3); h 0.28-0.35 mm (?), with slightly twisted nucleus, a marked keel producing a wide adapical platform, and sculptured by tubercles more or less welded between them, often obliquely arranged.

Remarks: Some specimens from Melilla (2 sh) and Tipaza (1 sh) showed protoconchs with a scarcely pronounced shoulder; 1 sh from Tarifa showed a protoconch with the shoulder nearly absent. Other specimens from Oran, Algiers and Sanary showed a clear shoulder on protoconch, conforming to the holotype.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge to Pasquale Micali (Fano, Pesaro-Urbino, Italy) and Italo Nofroni (Rome, Italy) for the loan of personal specimens of *A. aartseni*; Danilo Scuderi (Belpasso, Catania, Italy) for the use of personal photos of his specimens with the relevant ecological data *A. cingulata*. Special thanks to Andrea Di Giulio (Department of Science, "Roma Tre" University, Rome, Italy) for the SEM photographs, carried out at the LIME. We are indebted to Thomas von Rintelen and Christine Zorn (Museum für Naturkunde Berlin; Leibniz-Institut für Evolutions-und Biodiversitätsforschung an der Humboldt-Universität zu Berlin, Germany) and to Oscar Alfredo Galvez Herrera (Museo

Nacional de Historia Natural, Santiago de Chile) for research in the Philipp Collection and the precious collaboration. Thanks are also due to Anders Warén (Department of Invertebrate Zoology, Swedish Museum of Natural History, Stockholm, Sweden) and Marco Oliverio (Dipartimento di Biologia e Biotecnologie 'Charles Darwin', La Sapienza University of Rome, Italy) for the bibliographic help. We would like to thank Serge Gofas (Departamento de Biología animal, Universidad de Málaga, Spain) and Marco Oliverio (Dipartimento di Biologia e Biotecnologie 'Charles Darwin', Sapienza University of Rome, Italy) for their very helpful comments and the resulting improvements in the paper.

BIBLIOGRAPHY

- AGAMENNONE F. AND MICALI P. 2009. Melilla (Spagna): note su alcuni interessanti ritrovamenti malacologici e resoconto di un viaggio. *Malacologia Mostra Mondiale*, 63: 3-6.
- AMATI B., NOFRONI I. AND OLIVERIO M. 1990. Nuove specie e riscoperte nell'*Alvania*-group dal 1980 ad oggi per il Mediterraneo (Prosobranchia; Truncatelloidea). *La Conchiglia (The Shell)*, 22 (253-255): 47-49.
- AMATI B. AND OLIVERIO M. 1989. Prima segnalazione di *Alvania aartseni* Verduin, 1986 per le coste francesi, e considerazioni tassonomiche (Gastropoda: Rissoidea). *Atti Prima Giornata di Studi Malacologici CISM*: 265-267[1988].
- ANTIT M. AND AZZOUNA A. 2012. Mollusques des milieux littoraux de la baie de Tunis. *Iberus*, 30 (2): 107-133.
- ARADAS A. AND BENOIT L. 1872-1876. Conchigliologia vivente marina della Sicilia e delle isole che la circondano 1-3. *Atti Accademia Gioenia di Scienze Naturali*, 6:1-113, pl 1-2 (1870); 8: 113-226, pl 3-4 (1874); 10: 227-324, pl 5 [1876].
- ARADAS A. AND MAGGIORE G. 1844. Catalogo ragionato delle conchiglie viventi e fossili di Sicilia. *Atti dell'Accademia Gioenia di Scienze Naturali di Catania*, 20: 101-142.
- ARNAUD P.M. 1978. Révision des taxa malacologiques méditerranéens introduits par Antoine Risso. *Annales du Muséum d'Histoire Naturelle de Nice*, Tome 5: 101-150 [1977].
- ÁVILA S.P. 2000. The shallow-water Rissoidae (Mollusca, gastropoda) of the Azores and some aspects of their ecology. *Iberus*, 18 (2): 51-76.
- BITLIS-BAKIR B. AND ÖZTÜRK B. 2016. Rissoidea Species Distributed along the Turkish Levantine Coast. *Turkish Journal of Fisheries and Aquatic Sciences*, 16: 443-454.
- BOGI C., COPPINI M. AND MARGELLI A. 1984. Contributo alla conoscenza della malacofauna dell'Alto Tirreno. Il genere *Alvania*. *La Conchiglia (The Shell)*, 15 (180-181): 10-12.
- BORJA A. AND MUXIKA I. 2001. Actualización del catálogo de los moluscos marinos de la costa vasca, en campañas realizadas por AZTI. *Iberus*, 19 (2): 67-85.
- BOUCHET P. 1989. A review of poecilogony in gastropods. *Journal of Molluscan Studies*, 55: 67-78.
- BRUNETTI M.M. AND VECCHI G. 2012. La Malacofauna Plio-Pleistocenica del Torrente Stirone (Parma) VII: Rissoidae (II). *Parva Naturalia*, 9 (2010-2011): 65-119.
- CACHIA C., MIFSUD C. AND SAMMUT P.M. 1996. *The marine Mollusca of the Maltese Islands (Part Two: Neotaenioglossa)*. Backhuys publishers, Leiden, 228 pp.
- CARUS J.V. 1893. *Prodromus faunae mediterraneae sive descriptio animalium maris mediterranei incolarum quam comparata silva rerum quatenus innocui adiectis loci set nominibus vulgaribus eorumque auctoribus incommodum Zoologorum congressit*. Vol. 2, Schweizerbart'sche Verlagshandlung, Stuttgart, 854 pp.
- CHIA F.S., GIBSON G. AND QIAN P.Y. 1996. Poecilogony as a reproductive strategy of marine invertebrates. *Oceanologica Acta*, 19 (3-4): 203-208.

- CLEMAM. Check List of European Marine Mollusca (Gofas S. and Le Renard J., eds) 2017. Available from <<http://www.somali.asso.fr/clemam/biotaxis.php>> last consulted on 14.February.2017.
- DANTART L., FRECHILLA M. AND BALLESTEROS M. 1990. Fauna malacologica del Estany del Peix (Formentera). *Iberus*, 9 (1-2): 111-125.
- DAUTZENBERG, P. 1889. Contribution a la faune malacologique des îles Açores. *Résultats des campagnes scientifiques accomplies sur son yacht par Albert I er Prince Souverain de Monaco*, 1: 1-112, pl. 1-4.
- DODGE H. 1959. A Historical review of the mollusks of Linnaeus. Part 7. Certain species of the genus Turbo of the class Gastropoda. *Bulletin of the American Museum of Natural History*, New York, 118 (5): 207-258
- GARILLI, V. 2008. On some Neogene to Recent species related to *Galeodina* Monterosato, 1884, *Galeodinopsis* Sacco, 1895, and *Massotia* Bucquoy, Dautzenberg, and Dollfus, 1884 (Caenogastropoda: Rissoidae) with the description of two new *Alvania* species from the Mediterranean Pleistocene. *The Nautilus*, 122 (1): 19-51.
- GARILLI V. AND PARRINELLO D. 2010. Two similar new species of *Alvania* Risso, 1826 (Caenogastropoda: Rissoidae) from the late Cenozoic of Italy. *Molluscan Research*, 30 (3): 165-175.
- GARILLI V. AND PARRINELLO D. 2012. Taxonomy and palaeobiogeography of the Cenozoic Euro-Mediterranean rissoid gastropod *Galeodinopsis* and its relationship with close genera. *Acta Palaeontologica Polonica*, 59 (2): 379-406.
- GIANNUZZI-SAVELLI, R., PUSATERI, F., PALMERI, A. AND EBREO, C. 2002. *Atlante delle conchiglie marine del Mediterraneo*, Evolver, Roma, 258 pp (Prima ristampa).
- GIBSON G. D. AND CHIA F.S. 1995. Development variability in the poecilogonous opisthobranch *Haminoea calledegenita*: life history traits and effects of environmental parameters. *Marine Ecology - Progress Series*, 121 (1-3): 139-155.
- GIRIBET G. AND PEÑAS A. 1997. Fauna malacológica del litoral del Garraf (NE de la Península Ibérica). *Iberus*, 15 (1): 41-93.
- GOFAS S., MORENO D. AND SALAS C. 2011. *Moluscos marinos de Andalucía*. Universidad de Malaga servicio de Publicaciones e Intercambio Científico. Malaga, Vol.1, 342 pp.
- HADLEY A. 2006. Combine ZP public domain image processing software. Available from <<https://web.archive.org/web/20160221032141/http://www.hadleyweb.pwp.blueyonder.co.uk/>>
- HARMER F.W. 1920. *The Pliocene Mollusca of Great Britain, being supplementary to S. V. Wood's monograph of the crag mollusca*. Paleontographical Society. Printed for the Paleontographical Society. II (I): 1-652 + pl. XLV-LII.
- HERGUETA E. 1996. *Estudio de las taxocenosis malacológicas asociadas a concrecionamientos de Mesophyllum lichenoides (Ellis) Lemoine y a una pradera de Posidonia oceanica (Linnaeus) Delile del litoral almeriense*. Doctoral thesis, Universidad de Malaga, 860 pp.
- HIDALGO J.G. 1917. Fauna malacologica de España, Portugal y las Islas Baleares. *Trabajos del Museo Nacional de Ciencias Naturales, Serie Zoológica*, 30 : 1-752.
- JABLONSKI D. AND LUTZ R.A. 1983. Larval ecology of marine benthic invertebrates: Paleobiological implications. *Biological Reviews*, 58 (1): 21-89.
- KOWALKE T. AND HARZHAUSER M. 2004. Early ontogeny and palaeoecology of the Mid-Miocene rissoid gastropods of the Central Paratethys. *Acta Palaeontologica Polonica*, 49 (1): 111-134.
- KRUG P.J., ELLINGSON R.A., BURTON R. AND VALDÉS Á. 2007. A new poecilogonous species of sea slug (Opisthobranchia: Sacoglossa) from California: comparison with the planktotrophic congener *Alderia modesta* (Loven 1844). *Journal of Molluscan Studies*, 73 (1): 29-38.
- LINNAEUS C. 1758. *Systema Naturae*. Editio decima. 1. Regnum Animale Holmiae, Laurentii Salvii iv + 824 p.
- LOCARD A. 1886. *Prodrome de malacologie française. Catalogue général des mollusques vivants de France*. Mollusque marins. Lyon, H. Georg & Paris, Baillière. x + 778 pp.
- LOCARD A. 1892. *Les Coquilles marines des côtes de France, description des familles, genres et espèces*. Librairie J.-B.Baillière et fils, Paris. 384 pp.
- MAC ANDREW R. 1857. Report on the marine testaceous Mollusca of the North-East Atlantic and neighbouring Seas and the physical conditions affecting their development. *Twenty-Sixth Meeting of the British Association for the Advancement of Science*, London: 101-158 [1856].
- MAZZIOTTI C., AGAMENNONE F. AND TISSELLI M. 2008. Checklist della malacofauna delle Isole Tremiti (Medio Adriatico). *Bollettino Malacologico*, 44 (5-8): 71-86.
- MONTAGU G. 1808. Supplement to Testacea Britannica. White, London. 184 pp., pls. 17-30.
- MONTEROSATO, T.A. 1872. *Notizie intorno alle conchiglie Mediterranee*. M. Amenta, Palermo, 61 pp.
- MONTEROSATO T.A. 1877. Note sur quelques coquilles provenant des côtes d'Algérie. (Trad. di H. Crosse). *Journal de Conchyliologie*, 25 (1): 24-49, pl. 2, 3.

- MONTEROSATO T.A. 1884. Conchiglie littorali mediterranee. *Il Naturalista siciliano*, 3 (6): 159-163.
- NEVILL G. 1885. *Hand list of Mollusca in the Indian Museum, Calcutta. Part II. Gastropoda, Prosobranchia-neurobranchia (contd.)*. Government Printer, Calcutta. 306 pp.
- NORDSIECK F. 1972. *Die europäischen Meeresschnecken (Opisthobranchia mit Pyramidellidae; Rissoacea)*. Vom Eismeer bis Kapverden, Mittelmeer und Schwarzes Meer. I-XIII, Stuttgart: 1-327.
- OLIVER J.D., CALVO M., GUALLART J., SANCHEZ-TOCINO L. AND TEMPLADO J. 2015. Marine gastropods of the Chafarinas Island (South-western Mediterranean). *Iberus*, 33 (1): 97-150.
- OLIVERIO M. 1996a. Life-histories, speciation and biodiversity in Mediterranean prosobranch gastropods. *Vie et Milieu*, 46 (2), 163-169.
- OLIVERIO M. 1996b. Contrasting developmental strategies and speciation in N. E. Atlantic prosobranchs: a preliminary analysis. In Taylor J.D. (ed.): *Origin and evolutionary radiation of the Mollusca*, ch. 22, pp. 261-266. Oxford University Press.
- OLIVERIO M. 1997. Biogeographical patterns in developmental strategies of gastropods from Mediterranean *Posidonia* beds. *Bollettino Malacologico*, 32 (1-4), 79-88 [1996].
- OLIVERIO M. AND AMATI B. 1990. Una nuova specie del gruppo di *Alvania subcrenulata* (Gastropoda: Rissoidae). *Bollettino Malacologico*, 26 (5-9): 83-90.
- PALLARY P. 1909. Note sur la présence du *Mytilus Charpentieri*, Dunker dans une plage soulevée de la Tunisie. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord*, 1 (1): 41-42.
- PALLARY P. 1912. Sur la faune de l'ancienne lagune de Tunis. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord*, 4 (9): 215-228.
- PEÑAS A., ROLAN E., LUQUE A., TEMPLADO J., MORENO D., RUBIO F., SALAS C., SERRA A. AND GOFAS S. 2006. Moluscos marinos de la isla de Alborán. *Iberus*, 24 (1): 23-151.
- PETRACCI P. AND BERTAMINI R. 2013. Segnalazione di *Alvania cimex* (Linné, 1758) (Gastropoda, Caenogastropoda, Rissoidae) in una malacofauna del Miocene superiore. *Quaderno di Studi e Notizie di Storia Naturale della Romagna*, 38: 1-6.
- PIANI P. 1979. Rissoacea mediterranei. Digesta I. Le specie mediterranee del genere *Galeodina* Monterosato, 1884 (Gastropoda, Rissoacea). *Bollettino Malacologico*, 15 (3-4): 67-73.
- PHILIPPI R.A. 1836. *Enumeratio molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium, quae in itinere suo observavit*. Vol. 1 Schropp, Berlin [Berolini] xiv + 267 p., pl. 1-12
- PHILIPPI R.A. 1844. *Fauna molluscorum viventium et in tellure tertiaria fossilium regni utriusque Siciliae*. Halle [Halis saxonium]. Vol. II: 298 pp., pl. 13-28.
- PONDER W.F. 1985. A Review of the Genera of the Rissoidae (Mollusca: Mesogastropoda: Rissoacea). *Records of the Australian Museum*, Supplement 4: 1-221.
- PUSATERI F., GIANNUZZI-SAVELLI R. AND OLIVERIO M. 2013. A revision of the Mediterranean Raphitomidae 2: On the sibling species *Raphitoma lineolata* (B.D.D., 1883) and *Raphitoma smriglioi* n. sp. *Iberus*, 31 (1): 11-20.
- RISSO A. 1826. *Histoire naturelle des principales productions de l'Europe Méridionale et particulièrement de celles des environs de Nice et des Alpes Maritimes*. Paris, Levrault Vol. 4: IV + 439 + 12 pl. (molluscs) [November 1826].
- ROLAN E. 1983. Moluscos de la Ria de Vigo. I. *Gasteropodos. Thalassas*, Santiago de Compostela, 1 (1): 383 pp.
- RUEDA J., SALAS C. AND GOFAS S. 2000. A molluscan community from coastal bioclastic bottoms in the Strait of Gibraltar area. *Iberus*, 18 (1): 95-123.
- SCAPERROTTA M., BARTOLINI S. AND BOGI C. 2011. *Accrescimenti, stadi di accrescimentodei molluschi marini del Mediterraneo*. Vol. 3. L'Informatore Piceno, Ancona, 184 pp.
- SCUDERI D. AND AMATI B. 2012. Rediscovery and re-evaluation of a "ghost" taxon: the case of *Rissoa galvagni* Aradas & Maggior, 1844 (Caenogastropoda Rissoidae). *Biodiversity Journal*, 3 (4): 511-520.
- SOPPELSA O., CROCETTA F. AND FASULO G. 2007. I molluschi marini di Punta di Pioppeto (Isola di Procida – Campania). *Bollettino Malacologico*, 43 (1-8): 21-32.
- SPADA G. 2016. *Bela plicatilis* (Risso, 1826) a valid species (Gastropoda, Conoidea, Mangeliidae). *Bollettino Malacologico*, 52: 77-78.
- SULLIOTTI G.R. 1889. Comunicazioni malacologiche I. *Bollettino della Società Malacologica Italiana*, 14: 25-44.
- VAZZANA A. 2010. La malacofauna del Circa-litorale di Scilla (Stretto di Messina), *Bollettino Malacologico*, 46 (2): 65-74.
- VERDUIN A. 1986. *Alvania cimex* (L.) s.l. (Gastropoda, Prosobranchia) and aggregate species. *Basteria*, 50 (1-3): 25-32.
- WEINKAUFF H.C. 1867. *Die Conchylien des Mittelmeeres*, Bd. 1. Fischer, Cassel, 512 pp.
- WEST H.H., HARRIGAN J. AND PIERCE S.K. 1984. Hybridization of two populations of a marine opisthobranch with different developmental patterns. *Veliger*, 26: 199-206.
- WORMS, 2017. *Alvania* Risso, 1826. Accessed through: World Register of Marine Species at <<http://www.marinespecies.org/aphia.php?p=taxdetails&id=138439>> on 21.February 2017.

