Scientia Marina 81(3)
September 2017, 395-411, Barcelona (Spain)
ISSN-L: 0214-8358
doi: http://dx.doi.org/10.3989/scimar.04566.14A

The genus *Alvania* (Gastropoda: Rissoidae) along the Turkish Aegean coast with the description of a new species

Banu Bitlis [1], Bilal Öztürk [2]

[1] Institute of Marine Sciences and Technology, Dokuz Eylul University, 35430 Inciralti, Izmir, Turkey.
(BB) (Corresponding author) E-mail: banu.bitlis@deu.edu.tr, banubitlis@yahoo.com. ORCID iD: http://orcid.org/0000-0002-6542-8388
[2] Department Hydrobiology, Faculty of Fisheries, Ege University, 35100 Bornova, İzmir, Turkey.
(BO) E-mail: bilal.ozturk@ege.edu.tr. ORCID iD: http://orcid.org/0000-0002-5638-2496

Summary: This study deals with the distribution of the species of the genus *Alvania* along the Turkish Aegean coast. The investigated material was collected from different habitats (soft and hard bottoms, and macrophyte beds) at a depth range of 0-875 m, at 39 stations along the Aegean coast of Turkey between 1995 and 2014. Among the analysed benthic material, 537 living specimens and 249 empty shells belonging to 20 species of the genus *Alvania* were obtained. *Alvania marmarisensis* is described as a new species. *Alvania hispidula* was recorded for the first time from the Turkish Aegean coast. *Alvania mamillata* was found to be the most widely distributed species in the study area, while *Alvania colossophilus* was the rarest one. *Alvania cimicoides* and *Alvania testae* were found in the deepest samples (between 93 and 875 m). Certain taxonomic and ecological characteristics of the identified species, along with photographs, are also provided.

Keywords: Aegean Sea; Turkey; Mollusca; *Alvania*; ecology; distribution.

El género *Alvania* (Gastropoda: Rissoidae) a lo largo de la costa turca del Egeo con la descripción de una nueva especie

Resumen: Este estudio trata de la distribución de las especies del género *Alvania* a lo largo de la costa turca del Egeo. El material investigado fue recolectado de diferentes hábitats (fondos blandos y duros y camas de macrófitas) a una profundidad de 0-875 m, en 39 estaciones a lo largo de la costa del Egeo turco entre 1995 y 2014. Entre el material bentónico analizado, 537 especímenes vivos y se obtuvieron 249 conchas vacías pertenecientes a 20 especies del género *Alvania*. *Alvania marmarisensis* se describe como nueva especie. *Alvania hispidula* se registró por primera vez desde la costa turca del Egeo. Se encontró que *Alvania mamillata* era la especie más ampliamente distribuida en el área de estudio, mientras que *Alvania colossophilus* era la más rara. *Alvania cimicoides* y *Alvania testae* se encontraron en las muestras más profundas (entre 93 y 875 m). También se proporcionan ciertas características taxonómicas y ecológicas de las especies identificadas, junto con fotografías.

Palabras clave: mar Egeo; Turquía; Mollusca; *Alvania*; ecología; distribución.

Citation/Como citar este artículo: Bitlis B., Öztürk B. 2017. The genus *Alvania* (Gastropoda: Rissoidae) along the Turkish Aegean coast with the description of a new species. Sci. Mar. 81(3): 395-411. doi: http://dx.doi.org/10.3989/scimar.04566.14A

LSID: urn:lsid:zoobank.org:pub:8080E3FC-7C9F-492C-97B0-BABCC05F92C6

Editor: J. Templado.

Received: October 10, 2016. **Accepted**: April 20, 2017. **Published**: July 3, 2017.

INTRODUCTION

The Aegean Sea is an ecologically distinct part of the Mediterranean Sea due to its peculiar hydrographic characteristics. It is an area where the brackish waters of the Black Sea (17‰) merge with the saline waters of the eastern Mediterranean Sea (39‰) (Öztürk et al. 2006). According to Kocataş and Bilecik (1992), ecological features such as temperature, salinity and nutrients fluctuate significantly in the southern Aegean Sea due to the influence of the eastern Mediterranean Sea, and in the northern Aegean Sea due to the influence of the Black Sea. This ecological variation affects the biota in the area.

The genus *Alvania* Risso, 1826 belongs to the family Rissoidae, which is represented by a high number of genera and species in the northeast Atlantic and Mediterranean Sea (CLEMAM 2016). *Alvania* species are characterized by their typical clathrate sculpture on the teleoconch; ovate-conical shell with axial ribs, and spirals and nodules on their intersections varying according to the species. *Alvania* are differentiated from other rissoids by having either axial and spiral lines, or cords, on the surface of the teleoconch. The representatives of the genus have a worldwide distribution, with the exception of the Antarctic Ocean and sub-Antarctic regions (Ponder 1985), and most of the species (about 70%) inhabit the littoral depths, although some of them can be found in deeper areas (Avila et al. 2012). The *Alvania* species inhabiting shallow depths feed mostly on periphyton of macrophytes, whereas some bathyal species [e.g. *Alvania testae* (Aradas and Maggiore, 1844), *Alvania jeffreysi* (Waller, 1864) and *Alvania cimicoides* (Forbes, 1844)] feed on the detritus and foraminifers (Fretter and Graham 1978, Ponder 1985).

Comprehensive revisions of the Rissooidea based on morphological characters have been published by Coan (1964) and Ponder (1985). Recently, a phylogenetic analysis of this family testing the diagnostic utility of morphological traits was conducted by Criscione et al. (2016).

The genus *Alvania* has been the subject of several studies in the Mediterranean Sea (e.g. van Aartsen 1982a, b, c, Amati 2014), where 74 *Alvania* species are present according to Avila et al. (2012). However, few works include taxonomic or ecological information on the representatives of this genus in the eastern Mediterranean (van Aartsen et al. 1989, Cecalupo and Quadri 1996).

Regarding the Turkish coasts, some information on the genus can be found in Forbes (1844), Oberling (1969-1971) and Buzzurro and Greppi (1996), while some species (*A. amatii* was reported by Oliverio (1986), *A. datchaensis* was reported by Amati and Oliverio (1987) and *A. bozcaadensis* and *A. campanii* were reported by Tisselli and Giunchi (2013).

The aim of this study is to contribute to the knowledge of the *Alvania* species distributed in the Turkish Aegean Sea, including information on their taxonomy, bathymetric distribution, preferred habitats and patterns of distribution. Special attention has been paid to the protoconch due to its importance as a taxonomic character. It can be used to deduce the type of larval development, which has implications for the potential dispersal capacity of larvae in the distribution areas. A multispiral protoconch (typically with more than 2 whorls) suggests planktotrophic larval development, while a paucispiral protoconch (fewer than 2 whorls) is indicative of non-planktotrophic larval development.

MATERIALS AND METHODS

The *Alvania* specimens investigated in this study were collected during various cruises or research projects conducted along the Aegean coast of Turkey between the years 1995 and 2014. The samples were taken from various substrates [sand, mud, mixture of sand and mud, coralligenous, algae (*Padina pavonica*, *Cystoseira amentacea*, *C. crinita*, *C. foeniculacea f. schiffneri*, *C. spinosa*, *C. elegans, C. compressa*, *Halopteris scoparia*, *H. filicina*, *Ulva linza*), phanerogams (*Posidonia oceanica*, *Zostera noltei*, *Z. marina*, *Cymodocea nodosa*), the sponge *Aplysina aerophoba*, the scleractinian coral *Cladocora caespitosa*, the fan shell *Pinna nobilis* and rocky bottoms] at depths ranging from 0 to 875 m at 39 stations (Fig. 1, Table 1). Benthic samples (10-875 m) were taken by means of a dredge and van Veen Grap, while the shallower water materials (0-10 m) were collected by snorkelling and hand picking. The sampled material was sieved through 0.5 mm mesh and the retained material was fixed in 5% formalin solution. The *Alvania* specimens were separated from the other benthic materials using a stereomicroscope.

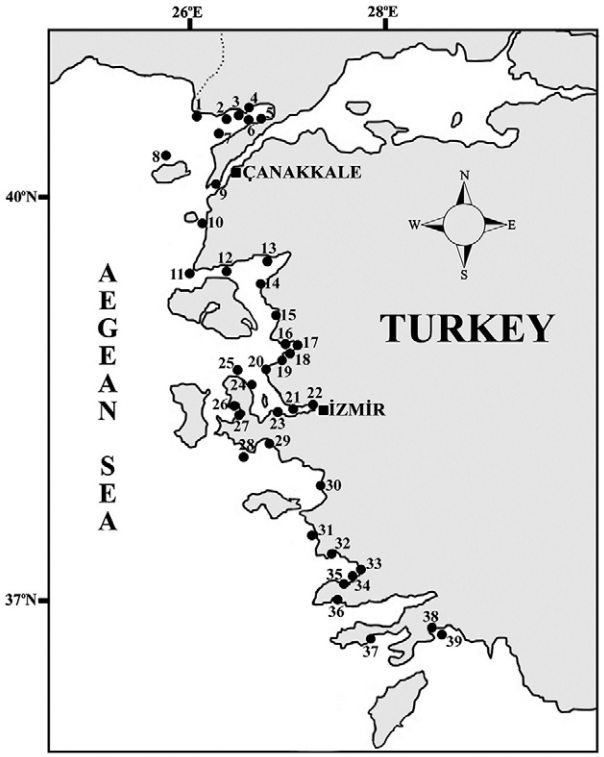

Fig. 1. – Map of the study area with the sampling stations.

Some shell features of the investigated species, such as total height (H) with standard errors, mean diameter (D) with standard errors, mean height (h) of the last whorl with standard errors and minimum and maximum values for each species [.....] are presented in the following order: H × D – h mm [..... mm; ….. mm].

The protoconch whorls of the investigated species were counted according to Warén (1974) and Verduin (1984), while the relevant specimens have been deposited in the museum of the Faculty of Fisheries (ESFM), Ege University (Izmir-Turkey).

RESULTS

As a result of the study of the material collected along the Turkish Aegean coast, we identified 537 specimens and 249 shells belonging to 20 species of

Table 1. – Coordinates, sampling dates, depth ranges, biotopes, methods and location of the sampled sites.

Sta.	Coordinates	Date	Depth range (m)	Biotope	Sampling method	Location
1	40°34′45″N-26°09′25″E	04.08.2000	5-8	*Posidonia oceanica* + Sand	Dredge	Saros Bay
2	40°32′45″N-26°25′15″E	04.08.2000	93	Mud		
3	40º33′00″N-26º30′20″E	04.08.2000	82	Sandy mud		
4.1	40°37′08″N-26°38′17″E	03.08.2000	32	Muddy sand		
4.2		03.08.2000	22	Muddy sand		
5.1	40°33′22″N-26°44′38″E	05.07.1995	0-0.5	Rock	By hand	
5.2		05.07.1995	1	*Padina pavonica*		
5.3		05.07.1995	2	*Cystoseira amentacea*		
6	40°31′07″N-26°36′36″E	03.08.2000	115	Mud	Dredge	
7	40°26′36″N-26°17′47″E	14.05.2001	680	Mud		
8	40°17′06″N-25°45′05″E	15.05.2001	875	Mud		
9.1	40°03′07″N-26°12′41″E	05.07.1995	0.5	*Cystoseira spinosa*	By hand	Çanakkale
9.2		05.07.1995	1	*Cystoseira foeniculacea f. schiffneri*		
9.3		05.07.1995	0.5	*Padina pavonica*		
9.4		05.07.1995	0.8-1.5	*Zostera noltei*		
9.5		05.07.1995	0-1	Rock		
10	39°46′57″N-26°09′24″E	26.09.1997	0.5-1	*Zostera noltei*		Ezine
11	39°28′25″N-26°03′17″E	25.08.2011	23	*Posidonia oceanica*	Grap	Bababurnu
12	39°29′06″N-26°20′19″E	16.07.1998	10	*Cladocora caespitosa*	By hand	Behramkale
13.1	39°33′37″N-26°49′52″E	06.07.1995	0.6	*Padina pavonica*		Altınoluk
13.2		06.07.1995	0-1	Rock		
14.1	39°21′30″N-26°38′02″E	06.07.1995	0-0.5	Rock		Cunda Island
14.2		06.07.1995	0.4	*Padina pavonica*		(Ayvalık)
14.3		06.07.1995	2	*Zostera noltei*		
14.4		06.07.1995	0.5	*Cystoseira elegans*		
15.1	39°07′35″N-26°50′05″E	07.07.1995	0-1	Rock		Dikili
15.2		07.07.1995	1	*Padina pavonica*		
15.3		07.07.1995	1	*Cystoseira crinita*		
15.4		17.03.2005	10	Sand	Grap	
16.1	38°51′04″N-26°54′56″E	07.03.2003	50	Coralligenous	Dredge	Çandarlı Bay
16.2	38°55′29″N-26°49′30″E	07.03.2003	46	Coralligenous sand		
16.3	38°55′36″N-26°49′10″E	22.11.2002	50	Mud		
16.4	38°55′36″N-26°49′10″E	07.03.2003	56-62	Coralligenous sand		
17.1	38°53′13″N-27°03′52″E	07.07.1995	3-4	*Pinna nobilis*	By hand	Şakran
17.2		07.07.1995	2.5	*Zostera marina*		
18	38°48′49″N-26°57′04″E	28.08.2011	13	*Posidonia oceanica*	Grap	Aliağa
19	38°46′12″N-26°55′27″E	04.10.2001	12	*Posidonia oceanica*	Dredge	Nemrut Bay
20.1	38°40′45″N-26°44′26″E	07.07.1995-08.05.1996	1	*Halopteris scoparia*	By hand	Foça
20.2		08.05.1996	0-0.5	Rock		
20.3		07.07.1995	0.5	*Padina pavonica*		
21.1	38°25′41″N-27°03′23″E	28.04.2013	23	Mud	Grap	İzmir Bay
21.2	38°25′27″N-26°58′46″E	08.10.2012	15	Mud		
22	38°29′16″N-26°39′26″E	13.02.2012-13.02.2002	12	*Posidonia oceanica*		
23.1	38°22′15″N-26°46′59″E	14.06.1995	0.5-1	*Padina pavonica*	By hand	Urla
23.2		14.06.1995	0.5	*Ulva linza*		
23.3		14.06.1995	0.5	*Zostera marina*		
23.4		14.06.1995	0.7	*Cystoseira crinita*		
24.1	38°39′49″N-26°29′22″E	20.09.1995-09.05.1996	0-2.5	Rock		Karaburun
24.2		20.09.1995	1.5	*Halopteris filicina*		
24.3		20.09.1995-09.05.1996	4	*Posidonia oceanica*		
24.4		09.05.1996	0.5-1	*Cystoseira crinita*		
25	38°40′45″N-26°30′51″E	01.04.2010	74	Muddy sand	Grap	
26.1	38°27′24″N-26°27′18″E	09.05.2007-20.02.2013	50-62	Muddy sand		Ildır Bay
26.2	38°27′12″N-26°27′18″E	08.01.2009	52	Sandy mud		
26.3	38°27′12″N-26°27′09″E	07.03.2007-26.03.2009	50-65	Sandy mud		
26.4	38°27′24″N-26°27′09″E	21.09.2006-16.09.2009	49-61	Sandy mud		
27.1	38°23′27″N-26°26′54″E	09.06.2003-03.10.2007	18-25	*P. oceanica*+Sand	Dredge	
27.2		22.02.2001-03.10.2007	45-60	Sand		
27.3		03.10.2007-25.06.2009	25-46	Sandy mud		
27.4		07.03.2007-31.10.2012	30-50	*P. oceanica*+Mud		
27.5		03.10.2007-20.02.2013	10-50	*P. oceanica*+Muddy sand		
27.6		07.05.2004/27.05.2004	5	*Zostera marina*+Sand		
28	38°06′15″N-26°27′22″E	14.09.2000	195	Mud		Çeşme
29.1	38°11′51″N-26°46′45″E	22.06.1995	0.3	*Padina pavonica*	By hand	Sığacık
29.2		22.06.1995	0-1	Rock		
29.3		22.06.1995	0.5	*Cystoseira compressa*		
29.4		22.06.1995	0.5-2	*Zostera marina*		
30.1	37°51′34″N-27°14′49″E	14.06.1996	0.5	*Padina pavonica*		Kuşadası
30.2		23.07.1995-14.06.1996	1	*Halopteris filicina*		
31	37°25′17″N-27°12′21″E	01.09.2011	36	Muddy sand	Grap	Didim
32.1	37°21′55″N-27°21′37″E	23.07.1995	1	*Cystoseira crinita*	By hand	
32.2		23.07.1995	0-1	Rock		
32.3		23.07.1995	3-4	*Pinna nobilis*		
32.4		23.07.1995	1-2	*Aplysina aerophoba*		
32.5	37°22′02″N-27°22′11″E	01.09.2011	24	Sand	Grap	

Table 1 (Cont.). – Coordinates, sampling dates, depth ranges, biotopes, methods and location of the sampled sites.

Sta.	Coordinates	Date	Depth range (m)	Biotope	Sampling method	Location
33.1	37°13′32″N-27°35′20″E	22.07.1995	0-1	Rock	By hand	Güllük
33.2		22.07.1995	2	*Cymodocea nodosa*		
33.3		22.07.1995	1	*Cystoseira foeniculacea* f. *schiffneri*		
34	37°08′33″N-27°30′12″E	08.05.2002-21.10.2001	9.5-13.5	*P. oceanica*+Sand	Dredge	Salih Island
35.1	37°05′04″N-27°27′59″E	22.07.1995	0-0.5	Rock	By hand	Torba
35.2		22.07.1995	0.7	*Cystoseira crinita*		
36.1	37°01′16″N-27°26′29″E	22.07.1995	0-1	Rock		Bodrum
36.2		22.07.1995	0.5	*Padina pavonica*		
36.3		22.07.1995	1.5	*Cystoseira crinita*		
36.4		22.07.1995	0.8	*Halopteris scoparia*		
36.5		16.07.1998	10	*Posidonia oceanica*		
37.1	36°43′04″N-27°41′33″E	20.07.1995	0-1	Rock		Datça
37.2		20.07.1995	1.5	*Cystoseira crinita*		
37.3		20.07.1995	0.7	*Padina pavonica*		
38.1	36°46′09″N-28°15′25″E	21.07.1995	1	*Cystoseira amentacea*		Turunç
38.2		21.07.1995	0-3	Rock		
39.1	36°45′19″N-28°21′14″E	01.10.2014	99	Mud	Dredge	Marmaris
39.2	36°46′24″N-28°20′42″E	01.10.2014	80	Mud		

the genus *Alvania*. One of them is considered as a new species and is here described and figured for the first time. Table 2 provides a list of the identified *Alvania* species, the number of living specimens and empty shells obtained of each one, and the stations, habitats and deep range where they were found.

Systematics

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

Type species: *Alvania europea* Risso 1826: 142, pl. 9, Fig. 116 = *Alvania cimex* (Linnaeus, 1758) (*Turbo*), by subsequent designation Nevill 1885: 105.

Alvania amatii Oliverio, 1986
(Fig. 2A, B)

Alvania amatii Oliverio, 1986

Mean dimensions (1 specimen and 3 shells): 2.02 (±0.22) × 1.23 (±0.08) – 1.42 (±0.12) mm [1.5 × 1.0 – 1.1 mm; 2.6 × 1.4 – 1.7 mm].

*Remarks***.** *Alvania amatii* is characterized by its smaller shell dimensions and paucispiral protoconch having 5 spiral threads.

Distribution. The species seems to be an eastern Mediterranean endemic (Oliverio 1986, van Aartsen et al. 1989). *Turkish coasts*: Aegean Sea (Oliverio 1986, van Aartsen and Kinzelbach 1990) and Levantine Sea (Buzzurro and Greppi 1996, Bitlis Bakır et al. 2012).

Alvania aspera (Philippi, 1844)
(Fig. 2C, D)

Rissoa aspera Philippi, 1844

Mean dimensions (9 specimens and 1 shell): 1.54 (±0.32) × 1.14 (±0.15) – 1.11 (±0.20) mm [0.7 × 0.6 – 0.6 mm; 3.7 × 2.1 – 2.4 mm].

Remarks. The medium-sized and strong shell, thick axial ribs wider than interspaces on the last whorl and paucispiral protoconch are some of the evident diagnostic features of *A. aspera*.

Distribution. *A. aspera* is an eastern Mediterranean endemic (Bogi et al. 1989, Barash and Danin 1992, Zenetos and van Aartsen 1995). Turkish coasts: Levantine and Aegean coasts (Demir 2003, Öztürk et al. 2008).

Alvania beanii (Hanley in Thorpe, 1844)
(Figs 2E, F, 3D, E, 7K)

Cingula beanie Hanley in Thorpe, 1844

Mean dimensions (39 specimens and 11 shells): 2.83 (±0.12) × 1.62 (±0.05) – 1.86 (±0.07) mm [2.8 × 1.6 – 1.9 mm; 3.9 × 2.1 – 2.4 mm].

Remarks. *A. beanii* has a multispiral protoconch. It differs from the similar *A. hispidula* in its greater number of spiral cords on the penultimate and last whorls of the teleoconch.

Distribution. Arctic Ocean (Hudenbick and Warén 1969), northeast Atlantic Ocean and Mediterranean Sea (Oliverio et al. 1986, Scaperrotta et al. 2011). *Turkish coasts:* Aegean Sea (Demir 2003), Sea of Marmara (Ostroumoff 1894, 1896) and Levantine Sea (Bitlis Bakır and Öztürk 2016).

Alvania bozcaadensis Tisselli and Giunchi, 2013
(Fig. 2. G, H)

Alvania bozcaadensis Tisselli and Giunchi, 2013

Dimensions of two specimens: 1.8 × 1.2 – 1.3, 1.0 × 0.8 – 0.9 mm.

Remarks. The species can be confused with *A. lanciae* (Calcara, 1845) and with the juveniles of *A. discors*, but *A. bozcaadensis* has no microsculpture on the surface of its protoconch and teleoconch, whereas *A. lanciae* bears microsculpture on both its protoconch and teleoconch. It differs from *A. discors* because the protoconch of the later species has a multispiral proto-

Table 2. – List of *Alvania* species collected during this study, stations, number of living specimens and empty shells, depth range and biotopes (S, sand; M, mud; Ms, muddy sand; Sm, sandy mud; Cor, coralligenous; Po, *Posidonia oceanica*; Zm, *Zostera marina*; Zn, *Zostera noltei*; Cn, *Cymodocea nodosa*; Pp, *Padina pavonica*; Ca, *Cystoseira amentacea*; Ccr, *C. crinita*; Cf, *C. foeniculacea* f. *schiffneri*; Cs, *C. spinosa*; Ce, *C. elegans*; Cco, *C. compressa*; Hs, *Halopteris scoparia*; Hf, *H. filicina*; Ul, *Ulva linza*; Aa, *Aplysina aerophoba*; Clc, *Cladocora caespitosa*; Pn, *Pinna nobilis*; R, rocky).

Species	Number of living specimens and empty shells	Biotope	Depth range (m)	Stations
Alvania amatii	1 spc., 3 sh.	R, Hf	0-1	Sta. 30.2, 1 sh.; sta. 33.1, 1 sp. + 1 sh.; sta. 36.1, 1 sh.
Alvania aspera	9 spc., 1 sh.	Ccr, Ce, Pp	0.5-1.5	Sta. 14.4, 1 sp.; sta. 23.1, 1 sp.; sta. 37.2, 7 sp. +1 sh.
Alvania beanii	39 spc., 11 sh.	Po, Cor, S, M, Ms	23-100	Sta. 11, 18 sp. +7 sh.; sta. 16.1, 2 sp.; sta. 16.2, 1 sp.; sta. 16.4, 1 sp.; sta. 25, 8 sp.; sta. 31, 1 sh.; sta. 39.1, 8 sp.+3 sh.; sta. 39.2, 1 sp.
Alvania bozcaadensis	2 spc.	Po, Aa	1-4	Sta. 24.3, 1 sp.; sta. 32.4, 1 sp.
Alvania cancellata	26 spc., 5 sh.	Po, S, Ca, Clc, Cor, M, Ms	2-74	Sta. 1, 2 sp.; sta. 5.3, 1 sp.+2 sh.; sta. 12, 4 sp.+3 sh.; sta. 15.4, 2 sp.; sta. 16.1, 3 sp.; sta. 16.4, 6 sp.; sta. 19, 2 sp.; sta. 25, 1 sp.; sta. 27.1, 2 sp.; sta. 34, 3 sp.
Alvania carinata	2 spc.	Po, S	5-8	Sta. 1, 2 sp.
Alvania cimex	31 spc., 35 sh.	Ca, Clc, R, Zn, S, Hf, Hs, Pp, Po, Ccr, Cco, Aa, Pn, M, Ms	0-30	Sta. 5.3, 1 sp.; sta. 12, 5 sp.; sta. 14.1, 3 sp.; sta. 14.3, 2 sh.; sta. 15.1, 1 sp.+1sh.; sta. 15.4, 3 sp.; sta. 20.1, 1 sp.; sta. 20.2, 4 sp.+3 sh.; sta. 20.3, 2 sp.+5 sh.; sta. 21.2, 1 sp.; sta. 22, 3 sp.; sta. 23.1, 2 sp.+3 sh.; sta. 23.4: 2 sh.; sta. 24.4: 1 sh.; sta. 27.4, 1 sp.+1 sh.; sta. 27.5, 5 sh.; sta. 29.2, 1 sh.; sta. 29.3, 2 sp.; sta. 30.2, 1 sh.; sta. 32.1, 5 sh.; sta. 32.3, 2 sp.+2 sh.; sta. 32.4, 3 sh.
Alvania cimicoides	3 spc., 11 sh.	M	195-875	Sta. 7, 1 sh.; sta. 8, 6 sh.; sta. 28, 3 sp.+4 sh.
Alvania colossophilus	1 sh.	Po, M	30	Sta. 27.4, 1 sh.
Alvania datchaensis	52 spc., 17 sh.	R, Po, Ccr, Cn, Pp, Ca, S	0-13.5	Sta. 15.1, 3 sp.; sta. 24.3, 5 sp.; sta. 32.1, 3 sp.; sta. 32.2, 2 sp.; sta. 33.1, 4 sp.; sta. 33.2, 2 sh.; sta. 34, 1 sp.; sta. 35.1, 2 sp.; sta. 35.2, 2 sp.; sta. 36.1, 4 sp.+1 sh.; sta. 36.2, 3 sp.; sta. 36.3, 12 sp.; sta. 37.1; 3 sp.; sta. 37.2, 3 sp.+13 sh.; sta. 38.1, 2 sp.+1 sh.; sta. 38.2, 3 sp.
Alvania discors	218 spc., 82 sh.	R, Pp, Cs, Zn, Ccr, Pn, Ul, Hf, Cf, Cco, Cn, Cs, Ca, Po, Hs	0-4	Sta. 5.1, 20 sp.; sta. 5.2, 2 sp.; sta. 5.3, 12 sh.; sta. 9.1, 19 sp.; sta. 9.2, 3 sp.+41 sh.; sta. 9.3, 4 sh.; sta. 9.4, 3 sh.; sta. 9.5, 1 sp.; sta. 13.2, 2 sh.; sta. 14.1, 4 sp.; sta. 14.2, 1 sh.; sta. 14.3, 4 sh.; sta. 15.3, 1 sh.; sta. 17.1, 1 sp.; sta. 23.1, 2 sp.; sta. 23.2, 1 sh.; sta. 24.1, 3 sp.+1 sh.; sta. 24.2, 5 sp.; sta. 24.3, 47 sp.; sta. 24.4, 14 sp.+5 sh.; sta. 29.1, 2 sp.; sta. 29.2, 1 sp.+3 sh.; sta. 29.3, 35 sp.+1 sh.; sta. 30.1, 2 sh.; sta. 30.2, 24 sp.; sta. 32.2, 8 sp.; sta. 33.1, 2 sp.; sta. 33.2, 2 sp.; sta. 33.3, 1 sh.; sta. 35.1, 3 sp.; sta. 35.2, 14 sp.; sta. 36.4, 1 sp.; sta. 37.1, 2 sp.; sta. 37.2, 3 sp.
Alvania geryonia	26 spc., 24 sh.	Ms, Ca, Po, R, S, Cor, M, Sm, Pn, Zm	3-58	Sta. 4.2, 1 sp.; sta. 5.3, 1 sp.; sta. 11, 1 sp.+3 sh.; sta. 14.1, 1 sp.; sta. 16.2, 3 sp.; sta. 18, 7 sh.; sta. 21.1, 1 sh.; sta. 22, 1 sp.; sta. 26.1, 1 sh.; sta. 26.3, 1 sp.+3 sh.; sta. 26.4, 2 sh.; sta. 27.1, 3 sp.+1 sh.; sta. 27.2, 3 sp.+2 sh.; sta. 27.3, 4 sp.+3 sh.; sta. 27.4, 1 sh.; sta. 27.6, 3 sp.; sta. 32.3, 2 sp.; sta. 34, 2 sp.
Alvania hispidula	2 spc., 4 sh.	Po, M, Ms	23-100	Sta. 11, 3 sh.; sta. 25, 1 sp.; sta. 39.1, 1 sp.+1 sh.
Alvania lactea	11 spc., 6 sh.	R, Zn, Clc, S, Hs, Pp	0-10	Sta. 5.1, 1 sh.; sta. 9.4, 1 sp.; sta. 10, 2 sp.; sta. 12, 1 sh.; sta. 14.3, 1 sh.; sta. 15.1, 1 sp.+1 sh.; sta. 15.4, 4 sp.; sta. 20.1, 2 sh.; sta. 29.1, 1 sp.; sta. 32.2, 1 sp.; sta. 35.1, 1 sp.
Alvania lineata	4 spc.	R, Ca, Po	0-4	Sta. 5.1, 1 sp.; sta. 5.3, 2 sp.; sta. 24.3, 1 sp.
Alvania mamillata	32 spc., 23 sh.	R, Pp, Ca, Cf, Zn, Ce, Zm, S, Hf, Pn, Po, Ccr	0-13	Sta. 5.1, 1 sp.+1 sh.; sta. 5.2, 2 sp.; sta. 5.3, 7 sp.; sta. 9.2, 3 sh.; sta. 9.4, 2 sh.; sta. 10, 2 sh.; sta. 14.1, 1 sh.; sta. 14.2, 2 sh.; sta. 14.3, 1 sp.; sta. 14.4, 2 sp.; sta. 15.1, 1 sp.; sta. 17.2, 1 sh.; sta. 18, 1 sp.; sta. 23.3, 2 sp.; sta. 24.1, 1 sh.; sta. 27.6, 1 sp.; sta. 29.4, 1 sh.; sta. 30.2, 11 sp.+2 sh.; sta. 32.2, 2 sh; sta. 32.3, 1 sh.; sta. 33.1, 1 sh.; sta. 35.1, 1 sp.; sta. 36.2, 1 sh.; sta. 36.5, 1 sh.; sta. 37.2, 1 sh.; sta. 37.3, 1 sp.; sta. 38.2, 1 sp.
Alvania punctura	42 spc., 24 sh.	Sm, Ms, M, S, Po	10-100	Sta. 3, 8 sp.; sta. 4.1, 5 sp.; sta. 16.3, 2 sp.; sta. 25, 20 sp.+14 sh.; sta. 26.1, 1 sp.+3 sh.; sta. 26.2, 1 sp.; sta. 26.3, 2 sh.; sta. 26.4, 2 sp.+1 sh.; sta. 27.2, 1 sp.; sta. 27.3, 2 sh.; sta. 27.4, 1 sh.; sta. 27.5, 1 sh.; sta. 32.5, 1 sp.; sta. 39.1, 1 sp.
Alvania scabra	6 spc.	Pp, R	0.5-1	Sta. 13.1, 2 sp.; sta. 15.2, 1 sp.; sta. 30.1, 1 sp.; sta. 35.1, 1 sp.; sta. 36.2, 1 sp.
Alvania testae	11 spc., 2 sh.	M	93-875	Sta. 2, 8 sp.; sta. 6, 3 sp.; sta. 8, 2 sh.
Alvania marmarisensis n. sp.	20 spc.	M	100	Sta. 39.1, 20 sp.

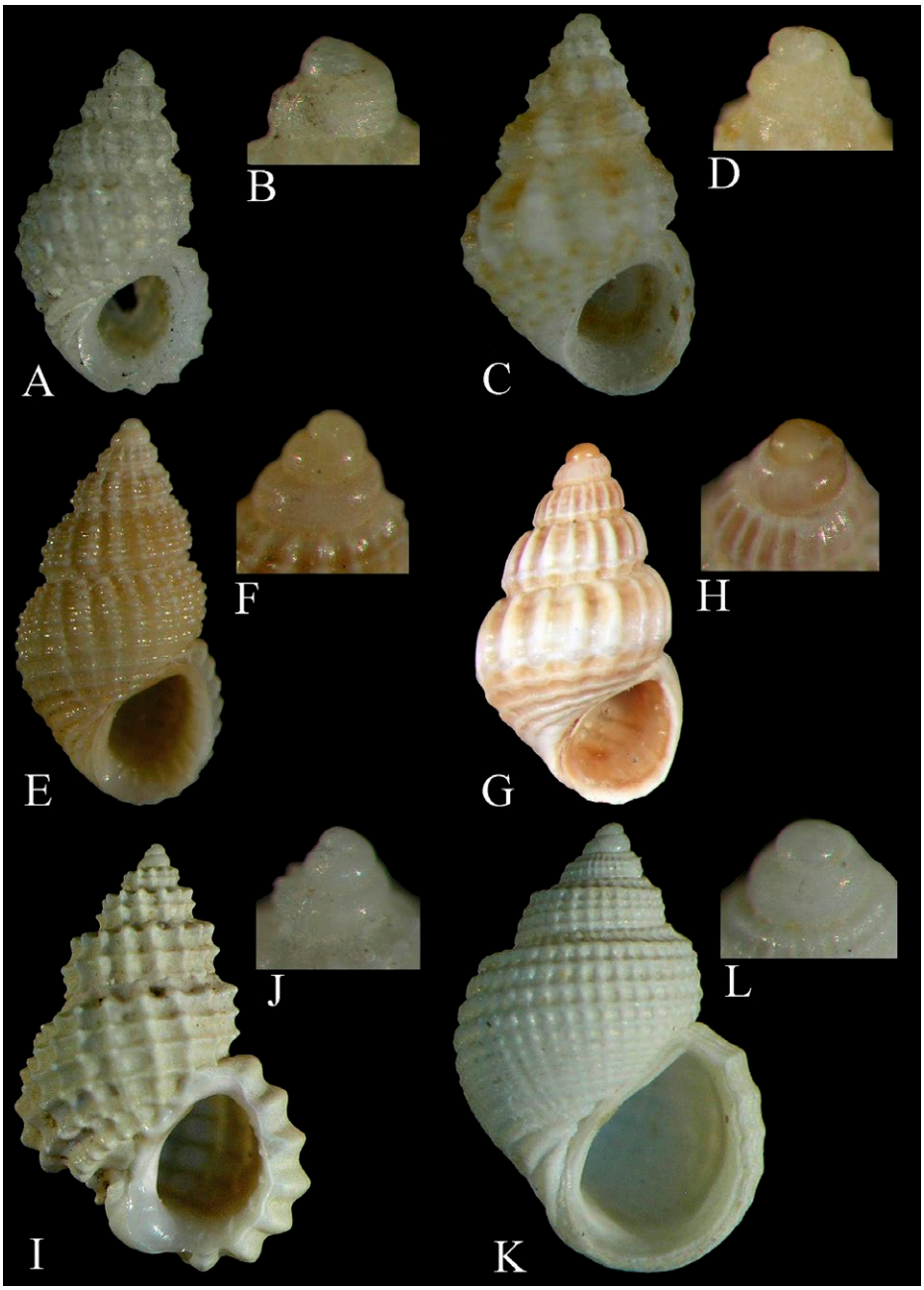

Fig. 2. – Frontal views and protoconchs of some *Alvania* species distributed in the Aegean Sea. A, B: *A. amatii* (H=2.6 mm); C, D: *A. aspera* (H=3.2 mm); E, F: *A. beanii* (H=3.1 mm); G, H: *A. bozcaadensis* (H=2.4 mm); I, J: *A. cancellata* (H=4.7 mm); and K, L: *A. carinata* (H=3.2 mm).

conch, while *A. bozcaadensis* has a blunt paucispiral apex and fewer axial ribs on the last whorl.

Distribution. Turkish coasts: Levantine and Aegean coasts (Tisselli and Giunchi 2013).

Alvania cancellata (da Costa, 1778)
(Fig. 2I, J)

Turbo cancellatus da Costa, 1778

Mean dimensions (26 specimens and 5 shells): 3.59 (±0.17) × 2.39 (±0.09) – 2.57 (±0.11) mm [0.9 × 0.8 – 0.7 mm; 4.9 × 3.3 – 3.5 mm].

Remarks. *Alvania cancellata* is one of the most common and characteristic species of the genus, because of its typical shell structure, large nodule on the base of the columella and multispiral protoconch.

Distribution. Northeast Atlantic Ocean and Mediterranean Sea (Fretter and Graham 1978, Gofas 2007). *Turkish coasts*: Levantine and Aegean coasts (Demir 2003), Sea of Marmara (Ostroumoff 1894, 1896, Aslan-Cihangir and Ovalis 2013).

Alvania carinata (da Costa, 1778)
(Fig. 2K, L)

Turbo carinatus da Costa, 1778

Dimensions of two specimens: 2.9 × 1.9 – 2.2, 3.4 × 2.4 – 2.6 mm.

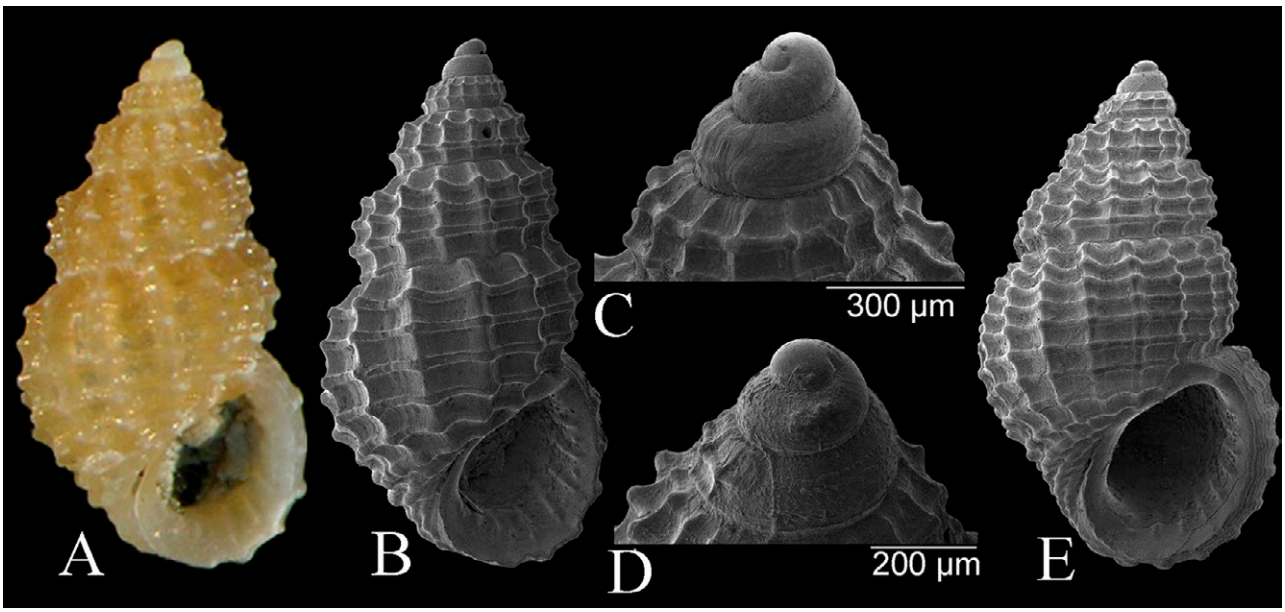

Fig. 3. – A-C, *Alvania hispidula,* frontal view of a specimen and its protoconch (H=3.4 mm); D, E, *Alvania beanii,* frontal view of a specimen and its protoconch (H=3.1 mm).

Remarks. *Alvania carinata* can be easily distinguished by the strong spiral sculpture of its teleoconch and paucispiral protoconch.

Distribution. Arctic Ocean (Hudenbick and Warén 1969), northeast Atlantic Ocean and Mediterranean Sea (van Aartsen 1982b). *Turkish coasts*: Levantine and Aegean coasts (Demir 2003).

Alvania cimex (Linnaeus, 1758)
(Fig. 4A, B)

Turbo cimex Linnaeus, 1758

Mean dimensions (31 specimens and 35 shells): 3.44 (±0.15) × 2.37 (±0.06) – 2.58 (±0.09) mm [1.4 × 1.3 – 1.2 mm; 5.7 × 3.4 – 4.0 mm].

Remarks. *A. cimex* is quite similar to *A. mamillata*, but they differ in the number of whorls of their protoconchs. The protoconch of *Alvania cimex* consists of 2-2.3 whorls, compared with about 1.3 whorls in *A. mamillata*. However, the protoconch figure given by Gianuzzi-Savelli et al. (1997: 100, fig. 395a) for *A. cimex* does not seem to belong to this species.

It is stated that the number of protoconch whorls was used as a discriminating feature of the shells, but according to some studies (Oliver et al. 2015, Criscione et al. 2016) the protoconch features do not suffice for correct identification. Oliver et al. (2015) considered that *A. cimex* and *A. mamillata* may be the same species because they have the same distribution, habitats and colour patterns, except for the larval life span. Similarly, Criscione et al. (2016: Fig. 2) stated that the two species shared the same 16S and 28S sequences in the maximum-likelihood phylogram. In this study, we have considered the two species as different taxa, following the current WoRMS (2016) and CLEMAM (2016) databases. Future genetic studies on the larval development of these two species should clarify this aspect.

Distribution. Northeast Atlantic Ocean and Mediterranean Sea (Barash and Danin 1992). *Turkish coasts*: Levantine Sea (Buzzurro and Greppi 1996, Bitlis Bakır et al. 2012), Aegean Sea (Kocataş 1978), Sea of Marmara (Oberling 1969-1971) and Black Sea (Öztürk 1998).

Alvania cimicoides (Forbes, 1844)
(Fig. 4C, D)

Rissoa cimicoides Forbes, 1844

Mean dimensions (3 specimens and 11 shells): 2.32 (±0.21) × 1.46 (±0.10) – 1.57 (±0.12) mm [1.2 × 0.9 – 0.9 mm; 3.5 × 2.0 – 2.3 mm].

Remarks. This species is characterized by its dark brown–coloured and multispiral protoconch. It is distributed mostly at bathyal depths.

Distribution. Arctic Ocean (Hudenbick and Warén 1969), eastern Atlantic Ocean and Mediterranean Sea (van Aartsen 1982a, Gofas 2007). *Turkish coasts*: Aegean and Levantine coasts (Forbes 1844, Demir 2003), Sea of Marmara (Ostroumoff 1896, Aslan-Cihangir and Ovalis 2013) and Black Sea (Bacescu et al. 1971).

Alvania colossophilus Oberling, 1970
(Fig. 4E, F)

Alvania colossophilus Oberling, 1970

Dimension (one shell): 3.7 × 2.2 – 2.3 mm.

Remarks. *A. colossophilus* may be confused with *A. lineata*, but the first species differs in the sculpture of its paucispiral protoconch and the stronger and larger size of the shell.

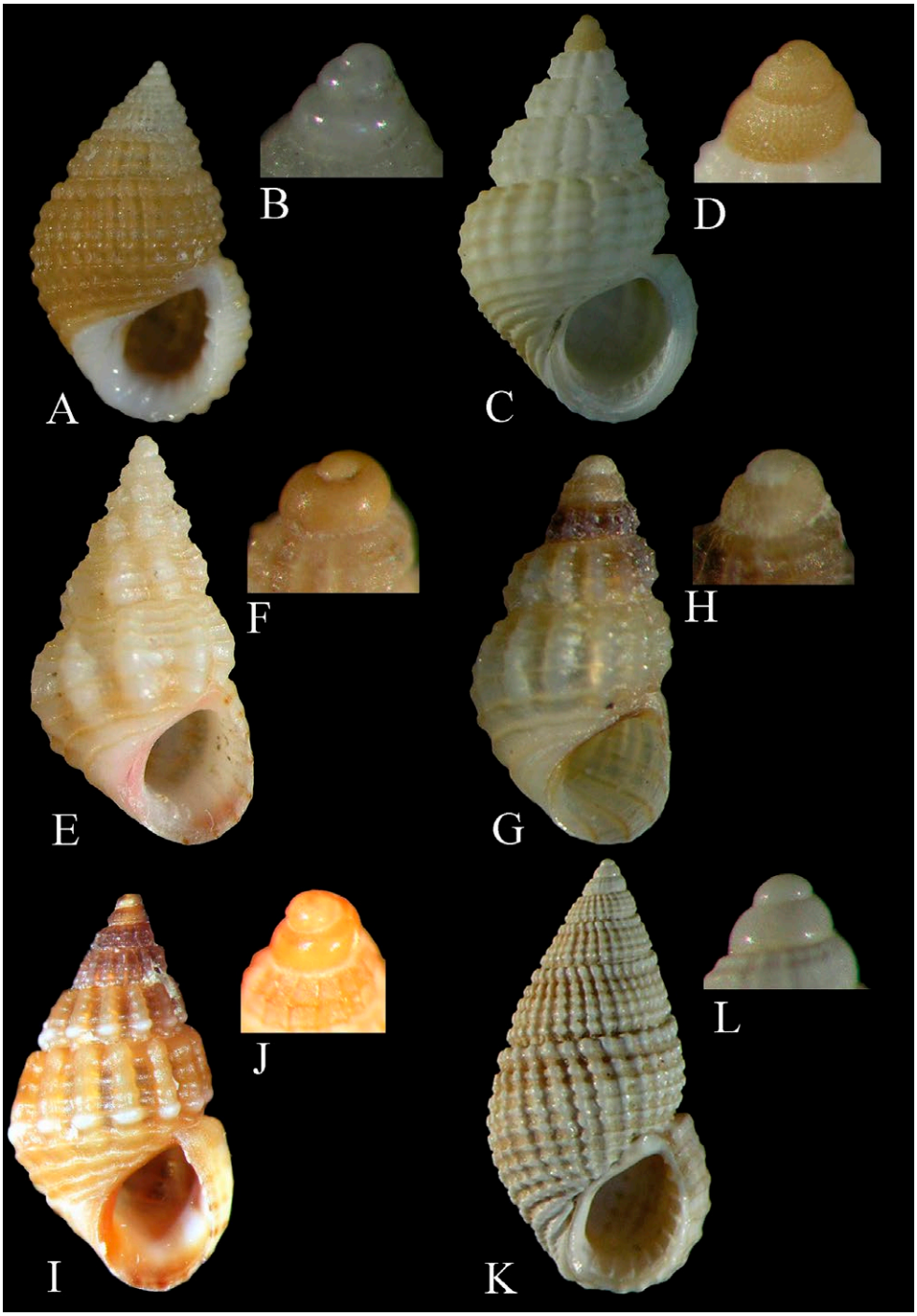

Fig. 4. – Frontal views and protoconchs of some *Alvania* species distributed in the Aegean Sea. A, B: *A. cimex* (H=5.0 mm); C, D: *A. cimicoides* (H=3.0 mm); E, F: *A. colossophilus* (H=5.0 mm); G, H: *A. datchaensis* (H=2.4 mm); I, J: *A. discors* (H=4.1 mm, protoconch H= 3.8 mm); K, L: *A. geryonia* (H=4 mm).

Distribution. The species appears to be an eastern Mediterranean endemic (Bogi et al. 1989, Gianuzzi-Savelli et al. 1997). *Turkish coasts*: Levantine Sea (Buzzurro and Greppi 1996, Bitlis Bakır et al. 2012) and Aegean Sea (Okuş et al. 2006).

Alvania datchaensis Amati and Oliverio, 1987 (Fig. 4G, H)

Alvania datchaensis Amati and Oliverio, 1987

Mean dimensions (52 specimens and 17 shells): 2.23 (±0.05) × 1.31 (±0.02) – 1.53 (±0.03) mm [1.0 × 0.8 – 0.8 mm; 3.0 × 1.8 – 2.0 mm].

Remarks. It can be distinguished from the other similar *Alvania* species by the sculpture of its paucispiral protoconch with zigzag spiral lines, and the outer lip without labial varix.

Distribution. It is endemic to the eastern Mediterranean Sea (Cecalupo and Quadri 1996, Amati 2012).

Turkish coasts: Levantine Sea (Buzzurro and Greppi 1996) and Aegean Sea (Amati and Oliverio 1987, van Aartsen and Kinzelbach 1990).

Alvania discors (Allan, 1818)
(Fig. 4I, J)

Turbo discors Allan, 1818

Mean dimensions (218 specimens and 82 shells): 3.12 (±0.09) × 1.97 (±0.03) – 2.13 (±0.05) mm [1.1 × 0.9 – 0.8 mm; 5.3 × 3.0 – 3.4 mm].

Remarks. The species is characterized by its polymorphic shell with a variable number of axial ribs (11-12) and spiral cords (8-9) on the last whorl. The protoconch is multispiral, and its shell may be completely brownish or with white bands.

Distribution. Northeast Atlantic Ocean and Mediterranean Sea (Barash and Danin 1992, Cecalupo and Quadri 1996). *Turkish coasts*: Levantine Sea (Buzzurro and Greppi 1996, Bitlis Bakır et al. 2012), Aegean Sea (Kocataş 1978) and Sea of Marmara (Oberling 1969-1971).

Alvania geryonia (Nardo, 1847)
(Figs 4K, L, 7J)

Rissoa geryonia Nardo, 1847

Mean dimensions (26 specimens and 24 shells): 3.29 (±0.10) × 1.91 (±0.04) – 2.27 (±0.06) mm [1.1 × 0.8 – 0.8 mm; 4.5 × 3.3 – 3.5 mm].

Remarks. *Alvania geryonia* can be misidentified with *A. cimex*, but the first one has more spirals on the penultimate whorl (5 spiral cords contrary to 3 spiral cords in *A. cimex*) and smaller granules on the teleoconch. The protoconch is multispiral.

Distribution. Northeast Atlantic Ocean and Mediterranean Sea (van Aartsen 1982a, Gofas et al. 2011). *Turkish coasts*: Levantine Sea (Demir 2003, Bitlis Bakır et al. 2012), Aegean Sea (Demir 2003, Çınar et al. 2012) and Sea of Marmara (Ostroumoff 1896, Demir 2003).

Alvania hispidula (Monterosato, 1884)
(Fig. 3A-C)

Acinus hispidulus Monterosato, 1884

The shell is solid with 4 convex teleoconch whorls and deep suture. Protoconch is multispiral. On the last whorl, above the aperture, there are 10-14 axial ribs, and 3 spiral cords on the last and penultimate whorls. There is a noteworthy distance between the first spiral cords and the suture. Thickened labrum and light brown coloured shell.
Mean dimensions (2 specimens and 4 shells): 3.42 (±0.09) × 1.72 (±0.10) – 2.19 (±0.06) mm [3.0 × 1.3 – 1.9 mm; 3.7 × 1.9 – 2.3 mm].

Remarks. *Alvania hispidula* is similar to *A. beanii* but differs in the number of spiral and axial ribs on the last whorl. *Alvania beanii* has a smaller shell and 6-7 spiral cords on the last whorl above the aperture, instead of 3 spirals in *A. hispidula* (4 in the penultimate whorl). The protoconch of *A. hispidula* (Fig. 3C) and *A. beanii* (Fig. 3D) are similar, but the protoconch of *A. beanii* has micro papillae.

Distribution. Atlantic Ocean and Mediterranean Sea (van Aartsen 1982a). *Turkish coasts*: Sea of Marmara (Ostroumoff 1896) and Aegean Sea (this study).

Alvania lactea (Michaud, 1832)
(Fig. 5A, B)

Rissoa lactea Michaud, 1832

Mean dimensions (11 specimens and 6 shells): 3.25 (±0.24) × 2.20 (±0.12) – 2.69 (±0.19) mm [1.2 × 1.1 – 1.1 mm; 4.8 × 3.0 – 3.8 mm].

Remarks. *A. lactea* differs markedly from the other species of the genus in its shell sculpture and large aperture. The protoconch is paucispiral.

Distribution. Arctic Ocean (Hudenbick and Warén 1969), North Atlantic Ocean and Mediterranean Sea (Barash and Danin 1992). *Turkish coasts*: Levantine Sea (Buzzurro and Greppi 1996, Bitlis Bakır et al. 2012), Aegean Sea (Demir 2003) and Sea of Marmara (Oberling 1960-1962, 1969-1971).

Alvania lineata Risso, 1826
(Fig. 5C, D)

Alvania costulosa Risso, 1826

Mean dimensions (4 specimens): 3.22 (±0.16) × 2.07 (±0.10) – 2.27 (±0.13) mm [2.8 × 1.9 – 2.0 mm; 3.6 × 2.3 – 2.6 mm].

Remarks. The species differs from the other species of the genus in its large paucispiral protoconch ornamented with spiral threads and in its strong shell, with its axial ribs as wide as the interspaces, with prominent spirals.

Distribution. Mediterranean Sea (Gofas et al. 2011). *Turkish coasts*: Aegean Sea (Kocataş 1978, Demir 2003), Levantine Sea (Demir 2003) and Dardanelles (Aslan-Cihangir and Ovalis 2013).

Alvania mamillata Risso, 1826
(Figs 5E, F, 6G, 7F-I)

Alvania mamillata Risso, 1826

Mean dimensions (32 specimens and 23 shells): 3.64 (±0.13) × 2.42 (±0.06) – 2.77 (±0.08) mm [1.4 × 1.2 – 1.1 mm; 4.9 × 3.2 – 3.7 mm].

Remarks. (See remarks for *A. cimex*). The paucispiral protoconch (about 1.3 whorls) and coarse granules on the teleoconch of *A. mamillata* are noteworthy features of the species.

Distribution. Northeast Atlantic Ocean and Mediterranean Sea (Zenetos and van Aartsen 1995). *Turkish coasts*: Levantine Sea (Bitlis Bakır et al. 2012) and Aegean Sea (van Aartsen and Kinzelbach 1990).

Alvania punctura (Montagu, 1803)
(Fig. 5G, H)

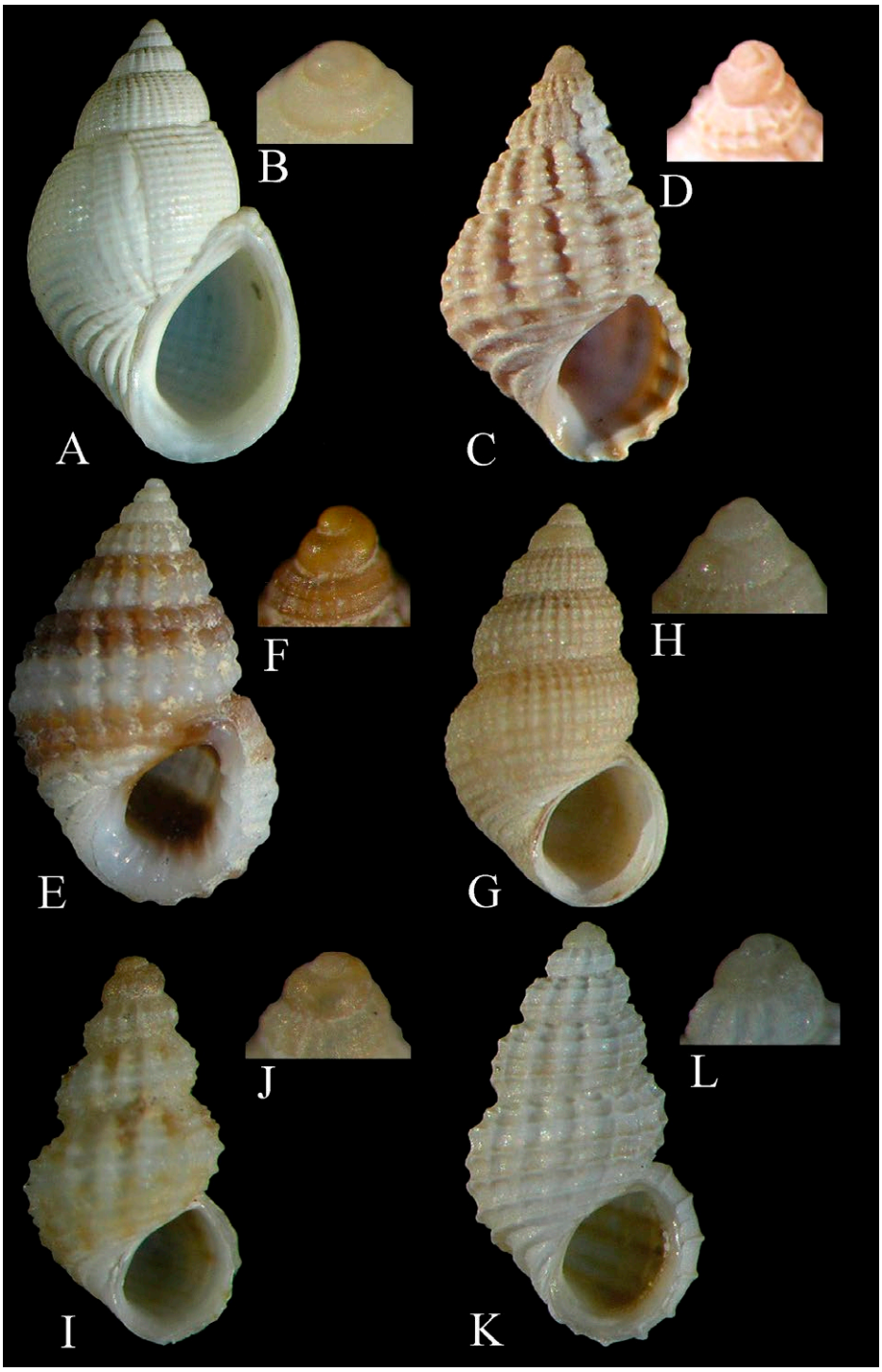

Fig. 5. – Frontal views and protoconchs of some *Alvania* species distributed in the Aegean Sea. A, B: *A. lactea* (H=5.0 mm); C, D: *A. lineata* (H=3.6 mm, protoconch H=2.8 mm); E, F: *A. mamillata* (H=4.6 mm); G, H: *A. punctura* (H=2.9 mm); I, J: *A. scabra* (H=2.1 mm); K, L: *A. testae* (H=2.5 mm).

Turbo punctura Montagu, 1803

Mean dimensions (42 specimens and 24 shells): 1.78 (±0.05) × 1.06 (±0.02) – 1.21 (±0.02) mm [1.1 × 0.8 – 0.8 mm; 2.5 × 1.3 – 1.5 mm].

Remarks. It is recognizable by its multispiral protoconch and clathrate sculpture of the teleoconch.

Distribution. Arctic Ocean (Hudenbick and Warén 1969), Atlantic Ocean and Mediterranean Sea (van Aartsen 1982c, Gofas 2007). *Turkish coasts*: Aegean Sea (Demir 2003) and Sea of Marmara (Ostroumoff 1896).

Alvania scabra (Philippi, 1844)
(Fig. 5I, J)

Rissoa scabra Philippi, 1844

Mean dimensions (6 specimens): 1.70 (±0.11) × 1.01 (±0.05) – 1.12

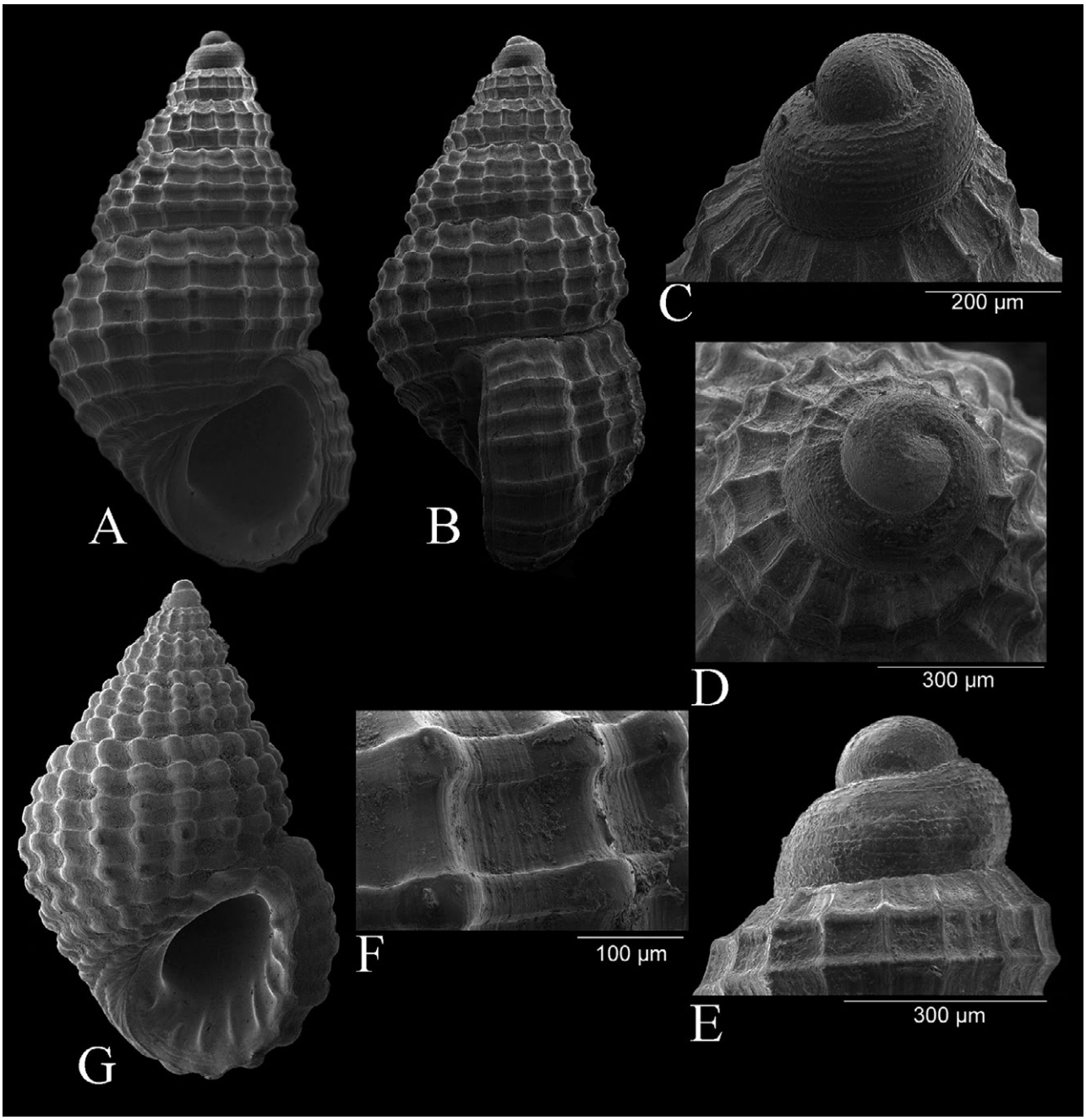

Fig. 6. – A-F: *Alvania marmarisensis* n. sp., frontal and lateral views of the holotype and its protoconch (C, D, E), and microsculpture on the teleoconch whorls (F) (H=3.3 mm, W=1.9 mm, LWH=2.2 mm, Marmaris, Turkey, 99 m. G: *Alvania mamillata*, frontal view of a specimen (H=4.6 mm).

(±0.05) mm [1.4 × 0.8 – 1.0 mm; 2.1 × 1.2 – 1.3 mm].

Remarks. *Alvania scabra* differs from similar *Alvania* species in having more spiral cords on the penultimate 4 and last whorls 7-8, respectively. The protoconch is paucispiral.

There are uncertainties about the synonyms of *A. scabra*. According to the Checklist of European Marine Mollusca (CLEMAM 2016), *A. oranica* was regarded as a synonym of *A. scabra*. van Aartsen (1982c) examined this idea and remarked that the mean difference between *A. scabra* and *A. oranica* consisted in having a fourth spiral (always) in the subsutural area of *A. oranica*, which is rarely found in *A. scabra*. In addition, Tringali (2001) indicated that the original description and figure of *A. oranica* given by Pallary (1900: 322, pl. 7, Fig. 4) was inadequate and still unclear and, due to this fact, *A. oranica* might be a synonym of *A. sculptilis* but not of *A. scabra*. Tringali (2001) also underlined that the figure of *A. oranica* provided by Gofas (1990: 130, Fig. 58) did not belong to *A. oranica*. He also stated that the figure of *A. scabra* in the study by van Aartsen et al. (1984) belongs to *A. sculptilis* (Monterosato, 1877) instead of *A. scabra.* In this study, we agree with Tringali's opinion about the original description of *A. oranica*, which is insufficient and requires improvement.

Distribution. Mediterranean Sea (van Aartsen 1982c, Gofas et al. 2011). *Turkish coasts*: Levantine Sea (Buzzurro and Greppi 1996) and Aegean Sea (van Aartsen and Kinzelbach 1990).

Alvania testae (Aradas and Maggiore, 1844) (Fig. 5K, L)

Rissoa testae Aradas and Maggiore, 1844

Mean dimensions (11 specimens and 2 shells): 2.26 (±0.05) × 1.22 (±0.03) – 1.42 (±0.03) mm [1.9 × 1.0 – 1.2 mm; 2.5 × 1.4 – 1.5 mm].

Remarks. *Alvania testae* is characterized by its shell shape. The shell is narrow and conical with 5-6 convex teleoconch whorls. Its protoconch is paucispiral. Aperture is roundish and outer lip opisthocline.

Distribution. Atlantic Ocean and Mediterranean Sea (Hoenselaar and Goud 1998, Gofas et al. 2011). *Turkish coasts*: Levantine Sea (Bitlis Bakır et al. 2012), Aegean Sea (Demir 2003, Öztürk et al. 2008) and Sea of Marmara (Ostroumoff 1896, Demir 2003).

Alvania marmarisensis n. sp. (Figs 6A-F, 7A-E)

Type material and type locality: Holotype (ESFM-GAS/2014-10): Marmaris, 99 m, Aegean Sea; H: 3.3 mm, W: 1.9 mm, BWH: 2.2 mm. Paratypes: 11 specimens (ESFM-GAS/2014-10).
Mean dimensions (20 specimens): 2.96 (±0.08) × 1.84 (±0.03) – 2.07 (±0.04) mm [2.3 × 1.6 – 1.7; 3.5 × 2.1 – 2.4 mm].

Etymology. The name of the species is derived from the name of the area (Marmaris) where the specimens were found.

Description. Shell (holotype): Conical in shape, not very solid, with 4.5 less convex teleoconch whorls. Protoconch (holotype) is paucispiral (~1.25 whorls) and its nucleus diameter is about 0.150 mm. It has irregular spiral lines with rounded micro papillae in the interspaces.

Teleoconch (holotype) has four spirals on the penultimate whorl, 15 axial ribs in the last whorl, 4 spiral cords above the aperture, and 5 spirals on the base. The suture is deep, with a slope between the first and second spiral cords in the penultimate and last whorls. It has small granules at the intersections of the axial ribs, with spiral cords on the teleoconch whorls. There are also fine growth lines on the teleoconch. The aperture is large and ovate. The outer lip is thickened, with 7 internal denticles. It is light-brown coloured, while the apex is often darker. The soft parts and operculum were not examined.

Remarks. Among the species distributed along the Turkish Aegean coast, *A. marmarisensis* has some similarities with *A. beanii*, *A. geryonia* and *A. mamillata* (Fig. 7). However, it differs from *A. beanii* and *A. geryonia* in the number of protoconch whorls and rounded irregular micro papillae. The teleoconch whorls of *A. beanii* are more convex and have a greater number of axial ribs (24-26) and spiral cords (6-7). *Alvania geryonia* has a differently shaped teleoconch, with nearly flat whorls, and 5 spirals on the penultimate whorl. The protoconch of *A. marmarisensis* is also similar to that of *A. mamillata* (Verduin 1986: 28, Fig. 3; Oliver et al. 2015: 114, Figs 9, 10, 12, 13), but differs from *A. mamillata* in being more rounded and having large micro papillae on the protoconch whorls. On the other hand, *A. mamillata* has a more solid shell and a higher number of axial ribs on the last teleoconch whorl (14-20), and coarser granules at the intersections of the axial ribs with the spirals.

Alvania marmarisensis n. sp. is also morphologically similar to some other Mediterranean species, (i.e. *Alvania dalmatica* Buzzurro and Prkic, 2007, *Alvania dianiensis* Oliverio, 1988, *Alvania hallgassi* Amati and Oliverio, 1985 and *Alvania oliverioi* Buzzurro, 2003). The new species differs from *Alvania dalmatica*, *A. dianiensis*, *A. hallgassi* and *A. oliverioi* in the features of its protoconch and teleoconch, geographic distribution and depth ranges (Table 3). *Alvania marmarisensis* has 1.15-1.25 protoconch whorls, which are ornamented with 5-6 interrupted spiral threads with micro papillae in the interspaces, whereas *A. dalmatica* has 1.3-1.5 protoconch whorls bearing 6-7 spiral threads of the same thickness, with no papillae in the interspaces (Buzzurro and Prkic 2007: 6, Figs b, c). In addition, the new species has more spiral cords on the penultimate whorl (4 spirals against 3 in *A. dalmatica*) and on the last whorl (8-9 spirals against 5-9 spirals in *A. dalmatica*), but the number of denticles inside the outer lip of *A. marmarisensis* is smaller (6-7) than that of *A. dalmatica* (7-11). The colour of *A. marmarisensis* is light brown without coloured stripes as in *A. dalmatica*.

A. marmarisensis differs from *A. hallgassi* in having fewer axial ribs on the last whorl (13-17 against 15-40) and no coloured stripes on the whorls. Apart from the differences in the teleoconch, *A. marmarisensis* has a lower number of protoconch whorls (1.15-1.25 against 1.5 in *A. hallgassi*) bearing micro papillae in the interspaces between the spirals, which are smooth in *A. hallgassi* (Amati and Oliverio 1985: 34, Figs 1, 2).

Alvania marmarisensis also differs from *A. oliverioi* in having a higher teleoconch (h=2.3-3.5 mm against h=1.54 mm) and a small number of axial ribs on the last whorl (13-17 against 39-40). The protoconch of *A. oliverioi* consists of 1.4 whorls with 4-5 weak spirals and regular micro papillae on the whorls (Buzzurro 2003: 44-45, Figs 2-4) (Table 3).

The protoconch of *A. marmarisensis* is similar to that of *A. dianiensis*, except for the protoconch whorls (1.5) (Oliverio 1988: 120, Figs 2-7). *Alvania marmarisensis* is also larger (h=2.3-3.5 mm) and has a higher number of teleoconch whorls (4-4.5) than *A. dianiensis* (h=2-2.4 mm and 3.2 whorls). *Alvania marmarisensis* also bears a higher number of spiral cords on the last whorl (8-9 against 6-7), and 4 spirals against 3 spirals above the aperture. There are four spirals on the penultimate whorl in *A. marmarisensis* against 3 spirals in *A. dianiensis*. The other difference between the aforementioned two species regards the microsculpture of the teleoconchs; *A. marmarisensis* has only fine growth lines contrary to fine spiral striae in *A. dianiensis* (Oliverio 1988, Romani 2014).

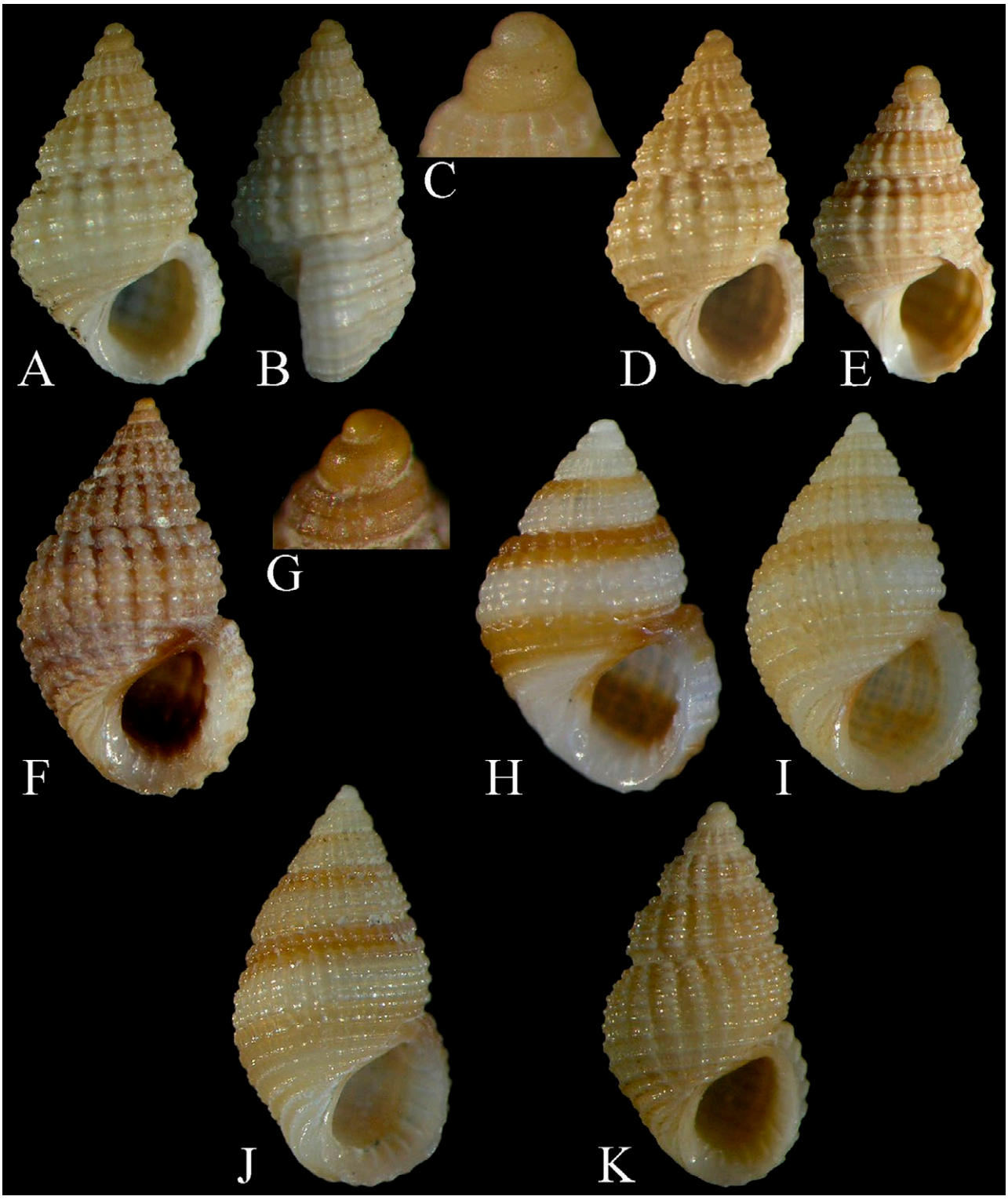

Fig. 7. – A-E, *Alvania marmarisensis* n. sp., frontal and lateral views of the holotype and its protoconch (C) (H=3.3 mm); D: frontal view of the paratype (H=3.9 mm); E: frontal view of a juvenil (H= 2.6 mm); F, G: *Alvania mamillata*, frontal view of a specimen and its protoconch (H=4.4 mm); H: *Alvania mamillata* (H=3.6 mm); I: *Alvania mamillata* (H=4.5 mm); J: *Alvania geryonia* (H=3.9 mm); K: *Alvania beanii* (H=3.1 mm).

There are also differences in the distribution areas and bathymetric ranges among *A. marmarisensis* and similar species (Table 3). With the exception of *A. marmarisensis* and *A. dalmatica*, all of the mentioned species were collected from infralittoral depths. *Alvania marmarisensis* was found at a depth of 99 m along the Aegean Sea coast (Marmaris) and *Alvania dalmatica* was recorded from the coasts of Croatia, Greece and the Adriatic Sea at depths ranging from 40 to 90 m (Buzzurro and Prkic 2007, Romani 2014). As regards the species that are similar to *A. marmarisensis*, *A. dianiensis* was reported from the Tyrrhenian, Ligurian

Table 3. – Some characteristics of protoconch and teleoconch, bathymetric ranges, and distribution of the *Alvania* species similar to *Alvania marmarisensis* n. sp. (H, total height of teleoconch; Nw, number of teleoconch whorls; Nar, number of axial ribs on the last whorl; Nsc, number of spiral cords on the last whorl; Nsca, number of spiral cords above the aperture; Nscp, number of spiral cords on the penultimate whorl; Npw, number of protoconch whorls; Psc, protoconch sculpture).

	A. marmarisensis	*A. dalmatica*	*A. dianiensis*	*A. hallgassi*	*A. oliverioi*
H	2.3-3.5	2.3-3.5	2-2.4	2-3	1.54
Nw	4-4.5	3.1-4	3.2	3	2.4-2.5
Nar	13-17	13-22	14-23	15-40	39-40
Nsc	8-9	5-9	6-7	8-11	10
Nsca	4	2-5	3	4-7	5
Nscp	4	3	3	3-4	3
Denticles	6-7	7-11	No	No	No
Npw	1.15-1.25	1.3-1.5	1.5	1.5	1.4
Psc	5-6 spiral threads, with micro papillae	6-7 spiral threads, with no micro papillae	5-6 spiral threads, with micro papillae	5-6 spiral threads, with no micro papillae	4-5 weak spirals, with micro papillae
Colour	Light brown, apex dark	Light yellow, with two stripes	Yellowish, whitish	Yellowish with two dark stripes	Whitish and light yellow with two stripes
Habitat	Mud	*Corallina rubrum*, coralligenous	Photophilic algae	Photophilic algae	Detritic mud
Depth	99 m	40-90 m	18-48 m	down to-20 m	4 m
Locality	Aegean Sea	Croatia, Greece, Adriatic Sea	Tyrrhenian Sea and Ligurian, Adriatic Sea	Ionian Sea, Sicily, Adriatic Sea, Tyrrhenian Sea and Cyprus	Cyprus
References	Present study	Buzzurro and Prkic (2007), Romani (2014)	Oliverio (1988)	Amati and Oliverio (1985), Romani (2014)	Buzzurro (2003)
Type material	GAS/2014-10 Museum of Faculty of Fisheries at Ege University (ESFM), Turkey Marmaris (Aegean Sea)	MSNM Mo 31380 Malacological Collection of Museo Civico di Storia Naturale of Milano (MNHM), Italy Islands of Mljet and Susac (Dalmatia, Croatia)	ZMA Moll. No. 3.88.019 Zoölogisch Museum Amsterdam (ZMA) Isle of Gianutri (Italy)	Coll. Oliverio, Coll. Amati, Coll. Hallgass Civico Museo Zoologico di Roma Otranto (Puglia)	MNHM Mo 26541 Malacological Collection of Museo Civico di Storia Naturale of Milano (MNHM), Italy Girne (Northern Cyprus)

and Adriatic Seas, from algal beds at depths ranging from 18 to 48 m (Oliverio 1988, Romani 2014), whereas *Alvania hallgassi* was described from infralittoral depths of the Ionian Sea (down to 20 m) (Amati and Oliverio 1985). This last species was also reported from Sicily, the Adriatic Sea, the Tyrrhenian Sea and the coasts of Cyprus (Oliverio et al. 1986, Cecalupo and Quadri 1996, Romani 2014). *Alvania oliverioi* was found along the Cypriot coastline at a depth of 4 m (Buzzurro 2003).

DISCUSSION

Among the analysed benthic material, we sorted 537 living specimens and 249 empty shells belonging to 20 species of the genus *Alvania.* Of the identified species, *Alvania marmarisensis* is described as a new species. The new species was only recorded near Marmaris at station 39.1 in muddy material sampled at 99 m depth.

A. mamillata was the commonest species, found at 18 stations in the Aegean Sea, followed by *A. discors*, found at 15 stations, whereas *A. colossophilus* was the rarest species with only one specimen found at station 27 (Table 2).

Alvania discors was the most abundant species, with 218 specimens and 82 shells, followed by *A. datchaensis* (52 specimens and 17 shells). However, *A. bozcaadensis*, *A. carinata* and *A. colossophilus* were only represented by a few specimens or shells (Table 2).

Regarding the bathymetric distribution of the identified species, most of them (14 species) were collected at depths ranging between 0 and 10 m, while 8 species (*A. beanii*, *A. cancellata*, *A. cimex*, *A. datchaensis*, *A. geryonia*, *A. hispidula*, *A. mamillata* and *A. punctura*) were found at depths between 10 and 25 m, 6 species (*A. beanii*, *A. cancellata*, *A. cimex*, *A. colossophilus*, *A. geryonia*, *A. punctura*) at depths between 25 and 50 m, and 7 species (*A. beanii*, *A. cancellata*, *A. geryonia*, *A. hispidula*, *A. punctura*, *A. testae, A. marmarisensis*) at depths between 50 and 100 m. *Alvania cimicoides* and *A. testae* were distributed at bathyal depths between 93 and 875 m (Table 2).

Bouchet and Warén (1993), in their study on the bathyal and abyssal mesogastropod species of the northeastern Atlantic Ocean, dealt with many rissoids, of which 21 species belong to the genus *Alvania*. Among the *Alvania* species reported by these authors, *A. cimicoides* was found at depths between 36 and 4700 m, and *A. testae* was collected at depths between 36 and 2400 m. In this study, those two species were also found at circalittoral and bathyal depths (93-875 m; sta. 2, sta. 6, sta. 7, sta. 8 and sta. 28).

Bitlis Bakır and Öztürk (2016) investigated Rissooidea species distributed along the Turkish Levantine coast and reported 15 *Alvania* species, which have also been examined within the context of this study. *A. beanii* (60-1302 m) and *A. testae* (100-200 m), which were sampled at circalittoral and bathyal depths in the mentioned study, were encountered in our study at depths between 23 and 100 m and 93 and 875 m, respectively.

Regarding the habitats where these species were found, seagrass meadows (*Posidonia oceanica*, *Zostera noltei*, *Z. marina*, and *Cymodocea nodosa*) were the most diverse, housing 14 species, followed by algal beds (*Padina pavonica*, *Cystoseira amentacea*, *C. crinita*, *C.*

foeniculacea f. schiffneri, *C. spinosa*, *C. elegans, C. compressa*, *Halopteris scoparia*, *H. filicina, Ulva linza*) and hard substrates (rock, *Cladocora caespitosa*, *Aplysina aerophoba, Pinna nobilis*), both with 11 species, and soft substrates (sand, mud, mixture of sand and mud, and coralligens) with 10 species (Table 2).

The preferred habitats of *Alvania* species found during this study are in agreement with those given by Antoniadou et al. (2005), Albano and Sabelli (2012), Pitacco et al. (2014). In the North Aegean Sea, *A. aspera*, *A. cimex*, and *A. mamillata* were reported from habitats of photophilic algae, and *A. discors* was found in soft sediments and in *P. oceanica* (Antoniadou et al. 2005). In this study, *A. aspera* was encountered in algal beds, while *A. cimex*, *A. discors* and *A. mamillata* were found in photophilic algae, soft sediments and *P. oceanica*. Albano and Sabelli (2012) examined the molluscan fauna inhabiting the leaves and rhizomes of *P. oceanica* distributed in the central Tyrrhenian Sea and reported *A. cancellata*, *A. hispidula* and *A. settepassii*. Likewise, *A. cancellata* and *A. hispidula* were encountered in *P. oceanica* meadows along the Turkish Aegean coast. Pitacco et al. (2014) stated that *A. cimex*, *A. discors* and *A. lineata* preferred *Cystoseira* beds in the Gulf of Trieste. In this study, those *Alvania* species were also found in *Cystoseira* communities (*C. amantacea*, *C. crinita*, *C. compressa*, *C. spinosa*, *C. foeniculacea* f. *schiffneri*). Poursanidis and Koutsoubas (2015) reported 15 *Alvania* species inhabiting the coralligenous habitats of the Mediterranean Sea, of which only *A. beanii*, *A. cancellata* and *A. geryonia* were found in this study. In a study carried out in the Mediterranean Sea by Poursanidis et al. (2016), 21 *Alvania* species were reported from the infralittoral rocky shores and photophilic algae, of which *A. cimex*, *A. discors*, *A. geryonia*, *A. lactea*, *A. lineata*, *A. mamillata*, *A. scabra* were also found during our study, in rocky and algal biotopes. Along the Levantine coast of Turkey, *A. mamillata*, *A. geryonia*, *A. discors* and *A. datchaensis* were found to be dominant in sandy biotopes, seagrass meadows and red algae (Bitlis Bakır and Öztürk 2016). As regards the species of this study, *A. mamillata* and *A. geryonia* were found in soft sediments, phanerogams, hard substrate and brown algae, whereas *A. discors* and *A. datchaensis* were encountered in phanerogam meadows, hard substrates and brown algae.

It is assumed that the difference in the number of protoconch whorls depends on differences in larval development (planktotrophic vs non-planktotrophic), which may affect the distribution range of the species. Therefore, eight *Alvania* species (*A. beanii*, *A. cancellata*, *A. cimex*, *A. cimicoides*, *A. discors*, *A. geryonia*, *A. hispidula* and *A. punctura*) with multispiral protoconch examined during this study have a wide distribution in the Atlantic Ocean and the Mediterranean Sea. However, *A. amatii*, *A. lineata, A. scabra, A. aspera*, *A. bozcaadensis*, *A. colossophilus* and *A. datchaensis* have a paucispiral protoconch and are endemic to the Mediterranean Sea, and some of them have a restricted distribution. However, contrary to the above, some *Alvania* species (*A. carinata*, *A. lactea*) with paucispiral protoconch are widely distributed in the Atlantic and Arctic Oceans, and in the Mediterranean. Therefore, it may be concluded that the geographical distribution of a species cannot be explained on the basis of protoconch type only, which in fact may also depend on other ecological or historical features.

The shell dimension data obtained from the study were compared with those of *Alvania* species distributed along the Levantine coast of Turkey (Bitlis Bakır and Öztürk 2016), and some species (*A. aspera*, *A. bozcaadensis*, *A. cimex*, *A. lactea* and *A. testae*) from the Turkish Levantine coast were found to be taller than those of our study. However, the shells of *A. discors*, *A. mamillata* and *A. scabra* from the Levantine Sea were smaller than those originating from the Turkish Aegean coast.

According to the checklist published by Öztürk et al. (2014), 27 *Alvania* species were reported along the Turkish coasts, of which 24 are known to be distributed along the Aegean coast of Turkey; six of these species [*A. campanii* Tisselli and Giunchi, 2013, *A. dorbignyi* (Audouin, 1826), *A. lanciae* (Calcara, 1845), *A. rudis* (Philippi, 1844), *A. settepassii* Amati and Nofroni, 1985 and *A. zetlandica* (Montagu, 1816)] reported from the Turkish Aegean coast in earlier studies were not encountered in this study. To date, *A. lanciae*, *A. rudis* and *A. zetlandica* have only been reported from the Aegean coast of Turkey by Demir (2003). Yokeş and Demir (2013) reported *A. settepassii* along the Turkish coasts for the first time (Gökova Bay), but this species has not been recorded again from the Turkish coasts.

Although with some doubts, *A. dorbignyi* is the only *Alvania* species considered as alien. Its distribution in the Mediterranean Sea is limited to the eastern basin only: Cyprus (Bogi et al. 1989), Israel (Barash and Danin 1992, Delongueville and Scaillet 2007) and Tunisia (Campani 2009). The origin of *A. dorbignyi* is still unclear. Nordsieck (1972) suggested that this species originates from the Red Sea, but Mienis (1985) did not share this opinion, arguing that the species may have Indo-Pacific origin or is an anti-Lessepsian migrant. We found no specimens of the species, but it is clear that its distribution and origin need to be investigated in detail.

As a result of this study, the number of *Alvania* species distributed along the Aegean coast of Turkey has increased to 26 species with the addition of *A. hispidula* and *A. marmarisensis* n. sp. The Aegean Sea has fairly high biological diversity, due to its hydrographic characters and geomorphologic structures. Regarding the molluscan fauna, the Aegean coast of Turkey is the richest coast of Turkey (Öztürk et al. 2014).

ACKNOWLEDGEMENTS

The authors are much indebted to Bruno Amati (Roma, Italy) and Morena Giunchi (San Zaccaria (RA), Italy) for their advice and confirmation of some *Alvania* species, and to the editor and two anonymous referees for their constructive comments.

REFERENCES

Albano P.G., Sabelli B. 2012. The molluscan assemblages inhabiting the leaves and rhizomes of a deep water *Posidonia oceanica* settlement in the central Tyrrhenian Sea. Sci. Mar. 76: 721-732.

Amati B. 2012. *Alvania consociella* Monterosato, 1884 junior synonym of *Alvania lanciae* (Calcara, 1845) (Prosobranchia, Rissoidae). Boll. Malacol. 48: 116-121.

Amati B. 2014. Description of *Alvania alicea* spec. nov. (Gastropoda, Rissoidae) from the Mediterranean Sea. Iberus 32: 87-95.

Amati B., Oliverio M. 1985. *Alvania* (*Alvaniella hallgassi* sp. n.) (Gastropoda; Prosobranchia). Notiz. CISMA 6: 28-34.

Amati B., Oliverio M. 1987. *Alvania datchaensis* sp. n. (Gastropoda; Prosobranchia). Notiz. CISMA 10: 46-53.

Antoniadou C., Koutsoubas D., Chintiroglou C. 2005. Mollusca fauna from infralittoral hard substrate assemblages in the North Aegean Sea. Belgian J. Zool. 135: 119-126.

Aslan-Cihangir H., Ovalis P. 2013. Seasonal variations and Structure of the Molluscan Assemblage in the Canakkale Strait (Turkey). Acta Zool. Bulgar 65: 233-250.

Avila S.P., Goud J., de Frias Martins A.M. 2012. Patterns of Diversity of the Rissoidae (Mollusca: Gastropoda) in the Atlantic and the Mediterranean Region. The Scientific World Journal 2012: Art. Id. 164890, 30 pp. https://doi.org/10.1100/2012/164890

Bacescu M.C., Müller G.I., Gomoiu M.T. 1971. Ecologie Marina. Cercetari de Ecologie Bentala in Marea Neagra. Editura Academiei Republicii Socialiste Romania 4, 357 pp.

Barash A., Danin Z. 1992. Annotated List of Mediterranean Molluscs of Israel and Sinai. The Israel Academy of Sciences and Humanities, Jerusalem, 405 pp.

Bitlis Bakır B., Öztürk B. 2016. Rissooidea Species distributed Along the Turkish Levantine Coast. Turk. J. Fish. Aquat. Sc. 16: 443-454.

Bitlis Bakır B., Öztürk B., Doğan A. et al. 2012. Mollusc Fauna of Iskenderun Bay with a Checklist of the Region. Turk. J. Fish. Aquat. Sci. 12: 171-184.

Bogi C., Cianfanelli S., Talenti E. 1989. Contributo alia conoscenza della malacofauna dell'isola di Cipro. In Nofroni L. (eds), Atti J Giornata di Studi Malacologici. C.I.S.M.A. Roma (1988), pp. 187-214.

Bouchet P., Warén A. 1993. Revision of the Northeast Atlantic bathyal and abyssal Mesogastropoda. Boll. Malacol. 3: 579-840.

Buzzurro G. 2003. A new species of *Alvania* from Cyprus (Gastropoda, Prosobranchia, Rissoidae). La Conchiglia 308: 43-46.

Buzzurro G., Greppi E. 1996. The Lessepsian molluscs of Taşucu (South-East Turkey). La Conchiglia 279: 3-22.

Buzzurro G., Prkic J. 2007. A new species of *Alvania* (Gastropoda: Prosobranchia: Rissoidae) from Croatian coast of Dalmatia. Triton 15: 5-9.

Campani E. 2009. An odd finding of *Alvania dorbignyi* (Gastropoda: Rissoidae). Mar. Biodiver. Rec. 2: 1-2. https://doi.org/10.1017/S1755267208000353

Cecalupo A., Quadri P. 1996. Contributo Alla Conoscenza Malacologica Per Il Nord Dell'Isola Di Cipro (part 3). Boll. Malacol. 31: 95-118.

Çınar M.E., Katağan T., Öztürk B., et al. 2012. Spatio temporal distributions of zoobenthos Mersin Bay (Levantine Sea, eastern Mediterranean) and the importance of alien species in benthic communities. Mar. Biol. Res. 8: 954-968. https://doi.org/10.1080/17451000.2012.706305

CLEMAM (Check List of European Marine Mollusca). 2016. Accessed 10.10.2016 at www.somali.asso.fr/clemam/index.php

Coan E. 1964. A Proposed Revision of the Rissoacean Families Rissoidae, Rissoinidae, and Cingulopsidae (Mollusca: Gastropoda). The Veliger 6: 164-171.

Criscione F., Ponder W.F., Köhler F., et al. 2016. A molecular phylogeny of Rissoidae (Caenogastropoda: Rissooidea) allows testing the diagnostic utility of morphological traits. Zool. J. Linn. Soc. London 179: 23-40. https://doi.org/10.1111/zoj.12447

Delongueville C., Scaillet R. 2007. Les espéces invasives de mollusques en Mediterranée. Novapex 8: 62.

Demir M. 2003. Shells of Mollusca Collected from the Seas of Turkey. Turk. J. Zool 27: 101-140.

Forbes E. 1844. Report on the Mollusca and Radiata of the Aegean Sea and on their distribution considered as bearing on Geology. In: Report of the 13th meeting of the British Association Advancement of Sciences, pp. 5-13.

Fretter V., Graham A. 1978. The Prosobranch Molluscs of Britain and Denmark Part. 4 Marine Rissoacea. J. Moll. Stud. 6: 54-241.

Gianuzzi-Savelli R., Pusateri F., Palmeri A., et al. 1997. Atlas of the Mediterranean Seashells (Caenogastropoda part 1: Discopoda-Heteropoda). Edizioni Evolver, Roma, 258 pp.

Gofas S. 1990. The littoral Rissoidae and Anabathridae of Sao Miguel, Azores. Acoreana 1990: 97-134.

Gofas S. 2007. Rissoidae (Mollusca: Gastropoda) from northeast Atlantic seamounts. J. Nat. Hist. 41: 779-885. https://doi.org/10.1080/00222930701298085

Gofas S., Moreno D., Salas C. 2011. Moluscos marinos de Andalucía: I. Introducción general, clase Solenogastres, clase Caudofoveata, clase Polyplacophora y clase Gastropoda (Prosobranchia). Servicio de Publicaciones e Intercambio Científico, Universidad de Málaga, Málaga. 342 pp.

Hoenselaar H.J., Goud J. 1998. The Rissoidae of the CANCAP expeditions, I: the genus *Alvania* Risso, 1826 (Gastropoda Prosobranchia). Basteria 62: 69-115.

Hudenbick B., Warén A. 1969. Smasnackor Vid Svenska Vastkusten 1. Slaktet *Alvania*. Sartryck ur Göteborgs Naturhistoriska Museums Arstryck 55-61.

Kocataş A. 1978. İzmir Körfezi Kayalık Sahillerinin Bentik Formları üzerinde Kalitatif ve Kantitatif Araştırmalar. Ege Üniversitesi Fen Fakültesi Monografiler Serisi. 12: 1-93.

Kocataş A., Bilecik N. 1992. Aegean Sea and its living resources. Water Products Research Institute, Bodrum. 88 pp.

Mienis H.K. 1985. Is *Alvania dorbignyi* (Audouin, 1826) A Lessepsian Migrant? Levantina 59: 652-654.

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 europaischen Meeresschnecken (Opisthobranchia mit Pyramidellidae; Rissoacea). Gustav Fischer Verlag, Stuttgart, 327 pp.

Oberling J.J. 1960-1962. Une collection de microgastéropodes marins d'Attique. De l'annuaire du musée d'histoire naturelle, Part A. 207-221.

Oberling J.J. 1969-1971. On the littoral mollusca of the sea of Marmara. Jahrbuch des Naturhistorischen Museum, Bern, 4: 183-218.

Okuş E., Yüksek A., Yokeş M.B., et al. 2006. Coastal and Marine Biodiversity Assessment of Gökova Specially Protected Area Final Report. Environmental Protection Agency for Special Areas, Ministry of Environment and Forestry of Turkey.

Oliver J.D., Calvo M., Guallart J., et al. 2015. Gasterópodos marinos de las islas Chafarinas (Mediterráneo suroccidental). Iberus 33: 97-150.

Oliverio M. 1986. *Alvania amatii* n. sp. (Gastropoda: Prosobranchia). Notiz. CISMA 7-8: 29-34.

Oliverio M. 1988. A new Prosobranch from the Mediterranean Sea, *Alvania dianiensis* n. sp. (Mollusca; Gastropoda). Bull. Zool. Mus. Univ. Amsterdam 11: 117-120.

Oliverio M., Amati B., Nofroni I. 1986. Proposta di Adeguamento Sistematico Dei Rissoidaea (sensu Ponder) Del Mar Mediterraneo Parte I: famiglia Rissoidae Gray, 1847 (Gastropoda: Prosobranchia). Notiz. CISMA 7-8: 35-52.

Ostroumoff A. 1894. K Estestvennoi istorii Bosfora. Prilojenie k LXXIV-my Tomu Zapisok Imper. Akademii Nauk, 5 pp.

Ostroumoff A. 1896. Otchet o dragirovkah i planktonniyh ulovaht ekspeditsia "Selyanika". Bull. Academie Imperiale des Sciences de St. Petersbourg 5: 33-92.

Öztürk B. 1998. Black Sea biological Diversity, Turkey. Black Sea Environmental Series No 9. United Nations Publish. 144 pp.

Öztürk B., Poutiers J.M., Önen M., et al. 2006. On the Occurrence of *Rhomboidella prideaux* (Leach, 1815) (Mollusca: Bivalvia: Mytilidae) in the Eastern Mediterranean. The Veliger 48: 215-219.

Öztürk B., Önen M., Doğan A. 2008. Türkiye Denizel Mollusca Türleri Tayin Atlası, Ankara, 103T154 nolu Tübitak Projesi, 468 pp.

Öztürk B., Doğan A., Bitlis-Bakır B., et al. 2014. Marine Molluscs of the Turkish Coasts: An Updated Checklist. Turk. J. Zool. 38: 1-48. https://doi.org/10.3906/zoo-1405-78

Pallary P.P. 1900. Coquilles Marines Du Littoral Du Departement D'oran. J. Conchyl 212-422.

Pitacco V., Orlando-Bonaca M., Mavric B. et al. 2014. Mollusc fauna associated with the *Cystoseira* algal associations in the Gulf of Trieste (Northern Adriatic Sea). Medit. Mar. Sci 15: 225-238.

https://doi.org/10.12681/mms.466
Ponder W.E. 1985. A review of the genera of the Rissoidae (Mollusca: Mesogastropoda: Rissoacea). Rec. Aust. Mus. 4: 1-221. https://doi.org/10.3853/j.0812-7387.4.1985.100
Poursanidis D., Koutsoubas D. 2015. A computerized database (CorMol) on the molluscan fauna from the Mediterranean reef ecosystems: Part I, the coralligenous formations. Quat. Int. 390: 29-43. https://doi.org/10.1016/j.quaint.2015.07.029
Poursanidis D., Koutsoubas D., Arvanitidis C., et al. 2016. ReefMedMol: Mollusca from the infralittoral rocky shores - the biocoenosis of photophilic algae - in the Mediterranean Sea. Biodivers. Data J. 4: e7516. https://doi.org/10.3897/BDJ.4.e7516
Risso A. 1826. Histoire naturelle des principales productions de l'Europe Méridionale et particulièrement de celles des environs de Nice et des Alpes Maritimes. Vol. 4. Paris, Levrault, 439 pp.
Romani L. 2014. *Alvania dalmatica* Buzzurro et Prkic, 2007 (Gastropoda Rissoidae): range extension, shell variability, habitat and relationships with *A. hallgassi* Amati et Oliverio, 1985. Biodiver. J. 5: 509-514.
Scaperrotta M., Bartolini S., Bogi C. 2011. Accrescimenti: Stadi di accrescimento dei Molluschi marini del Mediterraneo. Vol. 3, 184 pp.
Tisselli M., Giunchi L. 2013. Due nuove specie di *Alvania* (Gastropoda: Rissoidae) dal nord-ovest della Turchia. Quad. Studi Nat. Romagna 37: 163-174.
Tringali L.P. 2001. Marine malacological records (Gastropoda, Prosobranchia, Heterobranchia, Opisthobranchia and Pulmonata) from Torres de Alcala, Mediterranean Marocco, with the description of a new philinid species. Boll. Malacol. 37: 207-222.
van Aartsen J.J.. 1982a. Synoptic tables of Mediterranean and European Conchology (Gen. *Alvania*). La Conchiglia 14: 20-21.
van Aartsen J.J. 1982b. Synoptic tables of Mediterranean and European Conchology Genus *Alvania*: (Subg. *Alvinia* and *Galeodina*). La Conchiglia 14: 8-9.
van Aartsen J.J. 1982c. Sinoptic tables of Mediterranean and European Conchology Gen. *Alvania*: (Sbg.: *Arsenia* and *Alvaniella*). La Conchiglia 14: 4-6.
van Aartsen J.J., Kinzelbach R. 1990. Marine Molluscs from the İztuzu Beach near dalyan (Mediterranean coast of Turkey). Zool. Middle East 4: 103-112. https://doi.org/10.1080/09397140.1990.10637593
van Aartsen J.J., Menkhorst H.P.M.G., Gittenberger E. 1984. The marine Mollusca of the Bay of Algeciras, Spain, with general notes on Mitrella, Marginellidae and Turridae. Basteria Supplement 2: 1-135.
van Aartsen J.J., Barash A., Carrozza F. 1989. Addition to the Knowledge of the Mediterranean Mollusca of Israel and Sinai. Boll. Malacol. 25: 63-76.
Verduin A. 1984. On the taxonomy of some Recent European marine species of the genus *Cingula* s.l. (Gastropoda: Prosobranchia). Basteria 48: 37-87.
Verduin A. 1986. *Alvania cimex* (L.) s.l. (Gastropoda, Prosobranchia), an aggregate species. Basteria 50: 25-32.
Warén A. 1974. Revision of the Arctic-Atlantic Rissoidae (Gastropoda, Prosobranchia). Zool. Scripta 3: 121-135. https://doi.org/10.1111/j.1463-6409.1974.tb00810.x
World Register of Marine Species. 2016. WORMS web page. (accessed 10.10.2016). www.marinespecies.org
Yokeş M.B., Demir V. 2013. Ayvalık Adaları Tabiat Parkı Denizel Biyolojik Çeşitlilik Çalışması. Teknik rapor Serisi 20: 104.
Zenetos A., van Aartsen J.J. 1995. The deep sea Molluscan Fauna of the S.E. Aegean Sea and its relation to the neighbouring faunas. Boll. Malacol. 30: 253-268.