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Raphitoma (Gastropoda: Conoidea: Raphitomidae) Species Distributed Along the Turkish Coasts

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Abstract

The present study deals with the raphitomid species distributed along the Turkish coasts. The material was collected from different depths (0-200 m) and habitats between the years 1995 and 2018. The investigation of the material has resulted in the identification of 23 raphitomid species: *Raphitoma aequalis*, *R. atropurpurea*, *R. bicolor*, *R. brunneofasciata*, *R. concinna*, *R. contigua*, *R. corbis*, *R. densa*, *R. digiulioi*, *R. echinata*, *R. ephesina*, *R. farolita*, *R. hispidella*, *R. horrida*, *R. laviae*, *R. leufroyi*, *R. linearis*, *R. lineolata*, *R. locardi*, *R. papillosa*, *R. philberti*, *R. sophiae* and *R. spadiana*. Of the identified species, *Raphitoma brunneofasciata*, *R. densa*, *R. digiulioi* and *R. sophiae* are new records for the Turkish mollusc fauna, whereas one species is a new record for the Levantine coast of Turkey; one species is a new one for the Turkish Aegean coast, and five species are new reports for the Sea of Marmara. The identified species have mostly been found at depths down to 100 m, except for *R. contigua* encountered also at 200 m depth. However, a brief description of the studied species along with colour photographs, and some remarks on the distinguishing features from similar species have also been noted in the present study.

Introduction

The raphitomids are gastropods within the superfamily Conoidea and the history of classification of Conoidea and the results based on molecular analyses were described in detail by Puillandre et al. (2008, 2011) and Bouchet, Kantor, Sysoev, and Puillandre (2011), and the position of the family Raphitomidae as a clade of Conoidea was supported based on DNA analyses. These authors also remarked that Raphitomidae is the largest and most variable taxon within Conoidea, including 71 nominal genera (WoRMS, 2019) and many species distributed from the intertidal to hadal depths.

The genus *Raphitoma* Bellardi, 1847 was represented by 72 nominal species in the world ocean (WoRMS, 2019), of which around 50 species are estimated to be distributed in the Mediterranean Sea (Giannuzzi-Savelli, Pusateri & Bartolini, 2018a). Due to the species richness and overlapping of the shell characters, sometimes there were difficulties in the identification of some Mediterranean *Raphitoma* species until recently when started a revision consisting of different works (Pusateri, Giannuzzi-Savelli, & Oliverio, 2012, 2013; Pusateri, Giannuzzi-Savelli, & Bartolini, 2016, 2018; Pusateri, Giannuzzi-Savelli, & Stahlschmidt, 2017a, Pusateri, Giannuzzi-Savelli, Bartolini, & Oliverio, 2017b); Giannuzzi-Savelli et al., 2018 a; Giannuzzi-Savelli, Pusateri, & Bartolini, 2018 b, and Giannuzzi-Savelli, Pusateri, & Bartolini, 2019).

The ongoing revision of the raphitomids is mainly based on protoconch types (multispiral or paucispiral), which reflect differences in the larval development (i. e.,

planktotrophic or lecithotrophic), and on the protoconch morphology and teleoconch features (i.e., number of axial ribs, number of spiral cords above the aperture, height /diameter **(h/d)** ratio of the shell etc.) (Giannuzzi-Savelli et al., 2018a, figs 1-2).

Among the studies performed on the raphitomid species in earlier years along the European coasts, a significant one was that by Nordsieck (1977), in which within the subfamily Raphitominae (now a family) were considered 46 species and subspecies many of which turned out to be questionable. Later on, Cachia, Mifsud, and Sammut (2001) contributed to the knowledge of the Mediterranean *Raphitoma* species and reported 14 taxa from Maltese Islands, with their descriptive and distributional features. Recently, the *Raphitoma* species distributed along the Greek Seas have been subjected by Manousis, Kontadakis, Mbazios, Polyzoulis, and Galinou-Mitsoudi (2017) and Manousis, Kontadakis, Mbazios, and Polyzoulis (2018). In the last study were reported 27 species from the Greek coasts. In addition, Kontadakis, Mbazios, Polyzoulis, and Manousis (2019) introduced *Raphitoma melitis* and *R. sophiae* as species new for the science.

Some of the *Raphitoma* species distributed along the Turkish coasts have also been considered in several studies (Buzzurro & Greppi, 1996; Öztürk, 2001; Demir, 2003; Kabasakal, Karhan, & Kabasakal, 2005; Aslan-Cihangir & Ovalis, 2013) and, according to Öztürk, Doğan, Bitlis-Bakır, and Salman (2014), totally 18 species were reported from the Turkish coasts up to that date, of which the majority of the species (16 species) were reported along the Aegean coast, followed by the Sea of Marmara (10 species) and the Levantine Sea (8 species).

The aim of the present study is to contribute to the knowledge of the genus *Raphitoma* by studying the specimens which have been collected for almost 20 years along the Turkish coasts in light of the ongoing revision and current data.

Materials and Methods

The *Raphitoma* specimens subjected herein were collected during various cruises or research projects conducted along the Turkish coasts between the years 1995 and 2018. Deep water benthic samples were taken with sampling gears such as Van Veen Grab, Box Core, dredge and beam trawl, whereas the shallow water materials were collected by snorkeling. The major part of the material was sampled within the projects 104 Y 065 and 111 Y 268 supported by the Scientific and Technological Research Council of Turkey (TUBITAK), and the remaining part was obtained during various samplings with different purposes, carried out along the Turkish coasts. Several samples were achieved through the private collection of Kemal Geyran [Can Geyran Collection (**CGC**), Istanbul, Turkey], as well. Species identifications were mostly benefited from the publications within the frame of the ongoing revision of Mediterranean *Raphitoma* species mentioned above. Apart from the protoconch type, some shell features (i. e., total height of the shell, diameter of the shell, number of axial ribs, number of spiral cords, inner denticles of labrum and etc.) have also been taken into consideration. The average ratio of height/width **(d/h)**, average height (maximum height) and average width (maximum width) of the individuals, along with their **SD (S**tandart **D**eviation), have also been provided.

The studied materials were deposited in the museum collection of the Faculty of Fisheries (ESFM) at Ege University (Izmir-Turkey).

Results

The examination of the sampled *Raphitoma* specimens (104 specimens and 81 empty shells) revealed a total of 23 species (*Raphitoma aequalis*, *R. atropurpurea*, *R. bicolor*, *R. brunneofasciata*, *R. concinna*, *R. contigua*, *R. corbis*, *R. densa*, *R. digiulioi*, *R. echinata*, *R. ephesina*, *R. farolita*, *R. hispidella*, *R. horrida*, *R. laviae*, *R. leufroyi*, *R. linearis*, *R. lineolata*, *R. locardi*, *R. papillosa*, *R. philberti*, *R. sophiae* and *R. spadiana*). Of the determined taxa, *R. brunneofasciata*, *R. densa*, *R. digiulioi* and *R. sophiae* are new records for the Turkish mollusc fauna, whereas *R. aequalis* is new report for the Levantine coast of Turkey, *R. spadiana* is new one for the Turkish Aegean coast, and 5 species (*R. bicolor*, *R. contigua*, *R. hispidella*, *R. horrida* and *R. linearis*) are new records from the Sea of Marmara. Except for *R. contigua*, all species were found at depths down to 100m.

The identified species, and some shell and biotopes characteristics along with their distributional patterns, are given below.

***Raphitoma aequalis* (Jeffreys, 1867)** (Figure 1, *Defrancia linearis* var. *aequalis* Jeffreys, 1867: 369)

Material: 12.07.1997, Izmir Bay, Aegean Sea, sandy mud, 48 m, 1 sh; 25.06.2009, Ildır Bay, Aegean Sea, sandy mud, 46 m, 3 sh.; 06.06.2013, Çanakkale (Dardanelles Strait), 50 m, mud, 5 sh.; 13.06.2013, Silivri, Sea of Marmara, 25 m, mud with *Lithotamnion* sp. fragments, 1 sh.; 22.07.2014, Ildır Bay, Aegean Sea, sandy mud with shell fragments, 67 m, 2 spm; 26.07.2014, Güllük Bay, Aegean Sea, 44 m, sandy mud with shell fragments, 4 sh.; 25.08.2014, Güllük Bay, Aegean Sea, mud, 49 m, 5 spm; 07.02.2015, Ildır Bay, Aegean Sea, sandy mud, 61m, 1 spm; 15.02.2015, Güllük Bay, Aegean Sea, sandy mud with shell fragments, 50 m, 3 spm; 18.08.2016, Iskenderun Bay, Levantine Sea, 46 m, mud, 1 spm.

Shell solid and subfusiform with 4-5 convex teleoconch whorls. Protoconch multispiral with cancellated sculpture. Axial ribs orthocline or slightly prosocline, and their number varies between 8-10 on the last whorl. Four cordlets generally on penultimate whorl and 14-15 cordlets on body whorl, of which 5-6 above the aperture. Microgranules present in the

surface of the shell. Columella simple, slightly sinuous anteriorly, gently angled posteriorly. Sometimes, with weak denticles inside outer lip with the last two (close to the posterior sinus) more evident.

Aperture with siphonal canal of medium length, and a shallow posterior sinus. The ratio of **h/d** 2.26±0.07, height 4.9±0.56 (5.8 mm) and width 2.2±0.25 (2.5 mm). Colour dirty white with light brown thin lines on the cordlets.

Remarks: The species can be confused with *R. linearis*, but the latter species is with thicker axial ribs and more prominent and sparsely located brown spirals.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Gofas, Moreno, & Salas, 2011). *Turkish coasts*: Levantine Sea (*present study*), Aegean Sea (Öztürk et al., 2014) and Sea of Marmara (Ostroumoff, 1896).

***Raphitoma atropurpurea* (Locard & Caziot, 1900)** (Figure 2, *Clathurella atropurpurea* Locard & Caziot, 1900: 245)

Material: 20.09.1995, Izmir Bay, Aegean Sea, 0-2 m, rocks covered by algae, 2 spm; 07.03.2003, Çandarlı Bay, Aegean Sea, 50-62 m, coralligenous sand, 3 spm; 01.05.2003, Ildır Bay, Aegean Sea, 41 m, sand, 1 spm; 10.01.2004, Dalyan, Aegean Sea, 30 m, mud, 2 spm.

Shell fusiforme, with 6-8 teleoconch whorls in adult specimens. Protoconch multispiral of nearly 3 convex whorls with diagonally cancellated sculpture. On the body whorl, 17-19 orthocline or slightly prosocline axial ribs. Spiral sculpture of 6-7 cordlets above the aperture. There is strong and rectangular cancellation on teleoconch whorls with rectangular nodules at the intersection of axial ribs and spiral cordlets. Aperture elongate, columella slightly sinuous anteriorly in adult specimens and posteriorly angled in upper part. Anterior siphonal canal short, posterior sinus shallow. Inside outer lip 10-12 plicate denticles in adult specimens. The **h/d** ratio 2.74±0.21, height 7.25±3.43 (14.2 mm) and width 2.62±1.17 (5.1 mm). Colour usually tawny-brownish, sometimes with white blotches on body and (or) penultimate whorls.

Remarks: Among the species distributed along the Turkish coasts, the species may be misidentified for *Raphitoma laviae*, but *R. atropurpurea* can be diagnosed from it by less numerous and spaced axial ribs, and elongated tubercles at the intersection of axial ribs with cordlets. More details on the differences of the species from the congeneric ones can be found in the study by Pusateri et al. (2017b).

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Pusateri et al., 2017b). *Turkish coasts*: Aegean Sea (Öztürk, 2001 under *R. laviae*).

***Raphitoma bicolor* (Risso, 1826)** (Figure 3, *Pleurotoma bicolor* Risso, 1826: 214)

Material: 02.1993, Yeşilköy, Sea of Marmara, infralittoral depth, sand, 3 sh. (CGC); 07. 1994, Bozcaada Island, Aegean Sea, infralittoral depth, sand, 1 sh. (CGC); 06.06.2013, Dardanelles Strait (near Eceabat), mud with *Lithotamnion* sp., 25 m, 1 spm.

Shell solid and ovato-pupoid, with 5-6 slightly convex teleoconch whorls. Protoconch multispiral of nearly three whorls, and diagonally cancellate sculpture at the lower half of the last whorls. Teleoconch sculpture robust; on the body whorl 19-22 orthocline equidistant axial ribs with interspaces narrower than the ribs, and 13-18 cordlets, of which 6-7 above the aperture. Strong and slightly elongate tubercles at the intersections. No microgranules on the shell surface. Subsutural area narrow, with small tubercles in correspondence with the axial ribs. Aperture narrow, columella slightly sinuous. Outer lip with 9-11 strong inner denticles. Anterior siphonal canal short, anal sinus shallow. Siphonal fasciole in some shells more evident, with 6-7 nodulose cords. The ratio of **h/d** of the studied material was 2.59±0.18, average height 9.96±1.14 (11.7 mm) and average width 3.88±0.62 (4.8 mm). Colour pattern of uniformly brown background (from ligth to dark), with large whitish blotches, as wide as 1-3 axial ribs. A whitish suprasutural cordlet at least on the last whorl (Giannuzzi-Savelli et al., 2018a:25).

Remarks: The species was described in detail by Giannuzzi-Savelli et al. (2018a:25), with remarks on its diferences from the other similar congeneric species.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Giannuzzi-Savelli et al., 2018a). *Turkish coasts*: Levantine Sea (Giannuzzi-Savelli et al., 2018a), Aegean Sea (Giannuzzi-Savelli et al., 2018a) and Sea of Marmara (*present study*).

***Raphitoma brunneofasciata* Pusateri, Gianuzzi-Savelli & Oliverio, 2013** [Figure 4, *Raphitoma brunneofasciata* Pusateri, Giannuzzi-Savelli & Oliverio, 2013:18 (*Nomen novum pro Raphitoma brevis*, Nordsieck, 1977 non Seguenza, 1880)]

Material: 25.08.2014, Güllük Bay, Aegean Sea, 49 m, sandy mud with shell fragments, 1 spm; 16.02.2015, Güllük Bay, Aegean Sea, 47 m, sandy mud, 1 spm; 24.08.2018, Bozcada (Tavşan Island), Aegean Sea, 34 m, *P. oceanica*, 1 sh.

Shell fragil and biconic, with 4-5 teleoconch whorls. Protoconch multispiral and consists of three diagonally cancellated convex whorls, of which the last one bearing a weak keel before onset of teleoconch. On body whorl 12 orthocline axial ribs and 14-15 cordlets, of which 5 cordlets above the aperture. The spiral cords in their intersections with the axial ribs form small elongated tubercles, being spiny on the first adapical cords. Teleoconch whorls with wide subsutural area, strongly shouldered and separated by a deep suture. Aperture wide, columella slightly sinuous at the midle and angled at the upper part. Outer lip with inner plications in correspondence of spiral cordlets. Anterior siphonal canal open, posterior sinus not deep. Siphonal fasciole well marked with 5-7 cordlets on it. The dimensions of

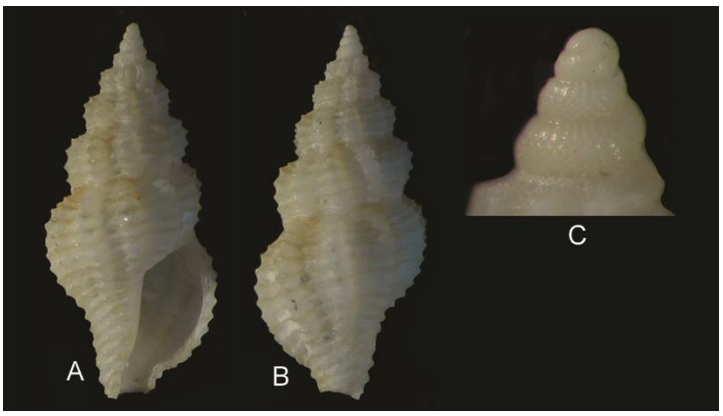

Figure 1. *Raphitoma aequalis*: ventral (A) and dorsal (B) views of a specimen and its protoconch (C). (A=B=5.4 mm, Güllük Bay, 44 m)

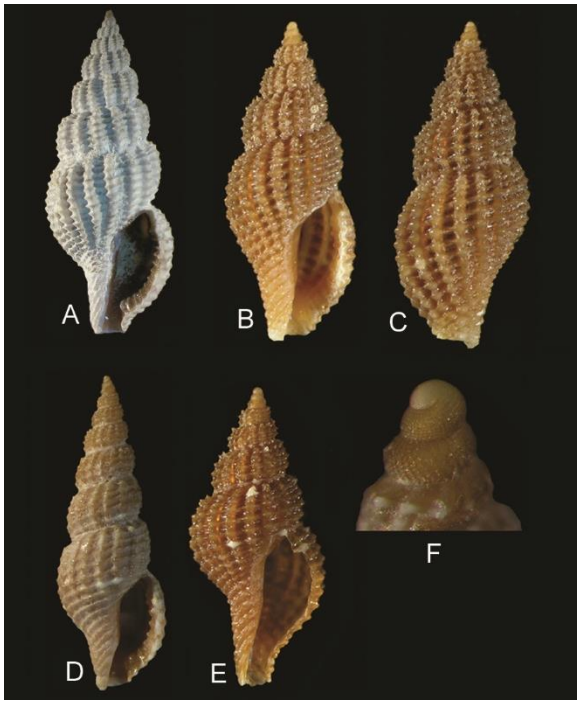

Figure 2. *Raphitoma atropurpurea*: ventral (A, B, D, E) and dorsal (C) views of four specimens and the protoconch (F) of the specimen E. (A=14.7 mm, Ildır Bay, 41 m; B=C=6.2 mm, D=8.4 mm, E=5.7 mm, Çandarlı Bay, 50-62 m)

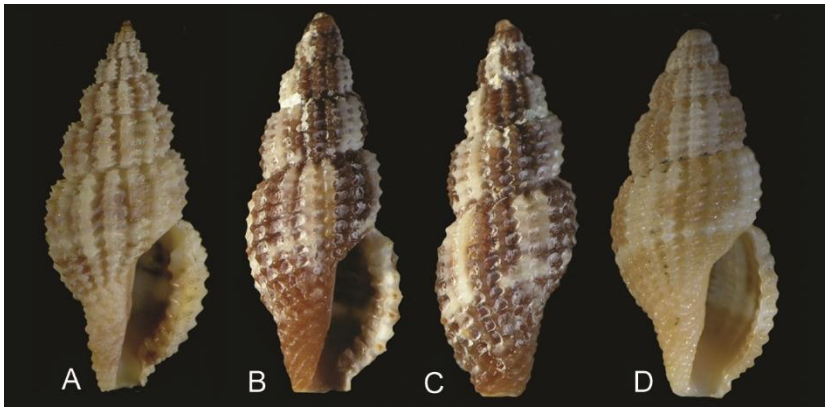

Figure 3. *Raphitoma bicolor*: ventral (A, B, D) and dorsal (C) views of three shells (A=10. 2 mm, Dardanelles Streat, 25m; B=C=10.2 mm, Bozcaada, 0-40 m; D=11.7 mm, Sea of Marmara, 0-40 m)

the investigated two specimens and one shell were 5.9 x 2.8 mm, 7.9 x 3.9 mm and 10.2 x 5.1 mm, with ratio of **h/d** between 2.0 and 2.1. Colour uniformly yellowish with a light brown subsutural band on the teleoconch whorls and a wider abapical one on the last whorl. Protoconch light brown.

Remarks: The species was reported under the name *Raphitoma brevis* from the Ibiza region by Nordsieck (1977:59) and, later on, the name being preoccupied, the species has been renamed by Pusateri et al. (2013: 18) as *Raphitoma brunneofasciata*. Due to its spicky appearance, the species can be confused with some specimens of *Raphitoma echinata* (Brocchi, 1814), but *R. brunneofasciata* can be diagnosed being more inflated and lack of denticles inside of outer lip and for the lowest number of protoconch whorls (3-3.2 vs 3.75-4). The species was investigated in detail by Manousis et al. (2018).

Distribution: Mediterranean Sea (Nordsieck, 1977 and Manousis et al., 2018). *Turkish coasts*: Aegean Sea (*present study*).

***Raphitoma concinna* (Scacchi, 1836)** (Figure 5, *Pleurotoma concinna* Scacchi, 1836: 12, fig. 18.)

Material: 12.07.1997, Izmir Bay, Aegean Sea, 28 m, sandy mud, 1 spm; 09. 1997, Sarsala Bay (Göçek), Levantine Sea, 1 m, rocky substrate, 2 spm (CGC); 06. 1998; Bozcaada Island, Aegean Sea, infralittoral sandy mud, 1 spm (CGC); 10.1999, Didim, Aegean Sea, 50-60 m, mud, 1 spm (CGC).

Shell solid with fusoid outline, robust and consists of 5-7 convex teleoconch whorls (rarely longer and slim). Protoconch multispiral, bearing 3 rounded whorls of which the last two ones with diagonally cancellated sculpture. Teleoconch sculpture consists of thick orthocline axial ribs equal to the interspaces and thin spirals running over the ribs. On the last whorl 12-15 orthocline or slightly prosocline axial ribs and 7-8 cordlets above the aperture.

Dense and rough growth lines present on the ribs, interspaces between them, and on subsutural ramps; scattered microgranules cover the whole surface.

Subsutural area wide, inclined and comma-like striated in appearance. Aperture wide, columella slightly sinuous. Outer lip strong and no denticles inside. Anterior siphonal canal of medium length, posterior sinus evident. Siphonal fasciole marked and with 6 rounded cordlets on it. The studied specimens were with a ratio of **h/d**=2.36 ±0.17, length 8.40 ±0.59 (9.2 mm) and width 3.58±0.50 (4.3 mm). One of the investigated specimens (Figure 5, D, E) was a bit different from the other ones being longer and slimmer, with a ratio of **h/d**= 2.76, height =14.1mm and width 5.1 mm. A colour patern mostly of grayish or yellowish background with sparse light brown cordlets. Protoconch whitish or light brown.

Remarks: The species is similar to *R. leufroyi* from which it differs by lacking of median whitish band on the teleoconch whorls and with the presence of brownish cordlets. Furthermore, *R. concinna* is generally with a fusoid outline versus the bi-conic one of *R. leufroyi*.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Nordsieck, 1977; Gofas et al., 2011). *Turkish coasts*: Levantine Sea (Bitlis-Bakır, Öztürk, Doğan, & Önen, 2012), Aegean Sea (Demir, 2003) and Sea of Marmara (Demir, 2003).

***Raphitoma contigua* (Monterosato, 1884)** (Figure 6, *Philbertia contigua* Monterosato, 1884: 133)

Material: 06.02.2002, Salih Island (Bodrum), Aegean Sea, 8 m, *P. oceanica*, 1 spm; 07.03.2003, Çandarlı Bay, Aegean Sea, 50 m, coralligenous sand, 1 spm; 17.06.2013, Şevketiye, Sea of Marmara, 200 m, sandy mud with shell fragments, 1 sh.; 22.04.2014, Ildır Bay (Çeşme), Aegean Sea, 60 m, sandy mud, 1 spm; 22.07.2014, Ildır Bay (Çeşme), Aegean Sea, 67 m, sandy mud with shell fragments, 2 spm; 25.08.2014, Güllük Bay, Aegean Sea, 46 m, sandy mud, 3 sh.; 25.10.2014, Ildır Bay (Çeşme), Aegean Sea, 64 m, sandy mud with shell fragments, 1 sh.; 07-08.02.2015, Ildır Bay (Çeşme), Aegean Sea, 61-68 m, sandy mud, 3 spm + 8 sh.; 25.11.2016, Ildır Bay (Çeşme), Aegean Sea, 25 m, mud, 1 sh.

Shell robust, sub-fusiform and teleoconch consists of 5-6 rarely 7 whorls. Protoconch multispiral of nearly three whorls, of which the first whorl with irregularly placed small tubercles and the last two whorls with diagonally cancellated sculpture. On the body whorl, a sculpture of 15-17 axial ribs and interspaces wider than the ribs, and 15-17 cordlets, twice narrower than the ribs, of which 6-7 cordlets above the aperture. Small and elongated tubercles at the intersection points of axial ribs and cordlets, forming a rectangular cancellation. Subsutural ramp narrow. Columella nearly straight or slightly sinuous in anterior part and angled posteriorly. Outer lip tick with 10-11 inner denticles. Siphonal canal short, anal sinus deep. Siphonal fasciole less evident with 6-7 nodulose cords. The investigated material showed a **h/d** ratio of 2.36±0.08, an average height of 9.11±2.29 (13.8 mm) and an average width of 3.84±0.92 (5.7 mm). Colour pale or uniformly tawny, sometimes with darker spots.

Remarks: Among the species distributed along the Turkish coasts, *R. contigua* is similar to *R. lineolata*, *R. atropurpurea* and *R. densa*. The differences between *R. contigua* and the other similar species were well clarified by Giannuzzi-Savelli et al. (2018a: 55).

Distribution: Eastern Atlantic Ocean (Guernsey Island and Galicia region) (Giannuzzi- Savelli et al., 2018a) Mediterranean Sea (Pusateri et al., 2012 and Manousis et al., 2018). *Turkish coasts:* Aegean Sea (Kabasakal et al., 2005 as *Raphitoma laviae* according to Giannuzzi-Savelli et al., 2018a: 35) and Sea of Marmara (*present study*).

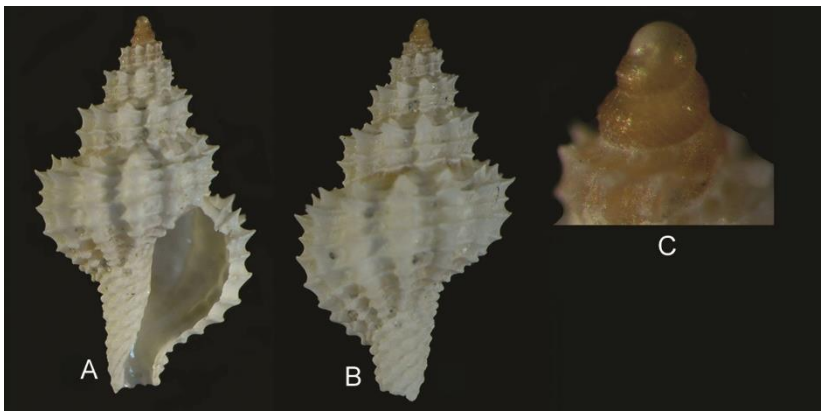

Figure 4. *Raphitoma brunneofasciata*: ventral (A), dorsal (B) views of a specimen and its protoconch (C). (A=B= 5.9 mm, Güllük Bay, 47 m)

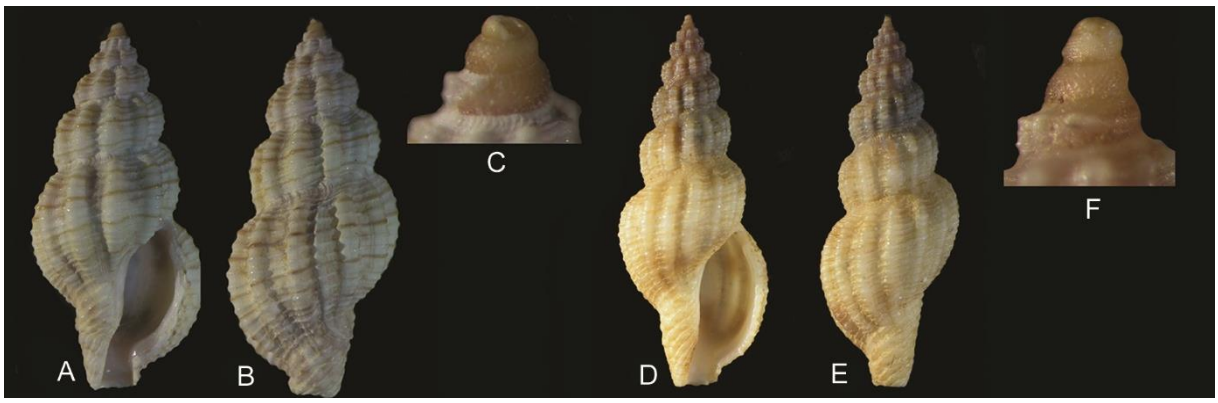

Figure 5. *Raphitoma concinna*: ventral (A, D), dorsal (B, E) views of two specimens and the protoconchs (C, F) of the specimens A and D (A=B=9.2 mm, Izmir Bay, 28 m; D=E=14.1 mm, Göçek, 1 m)

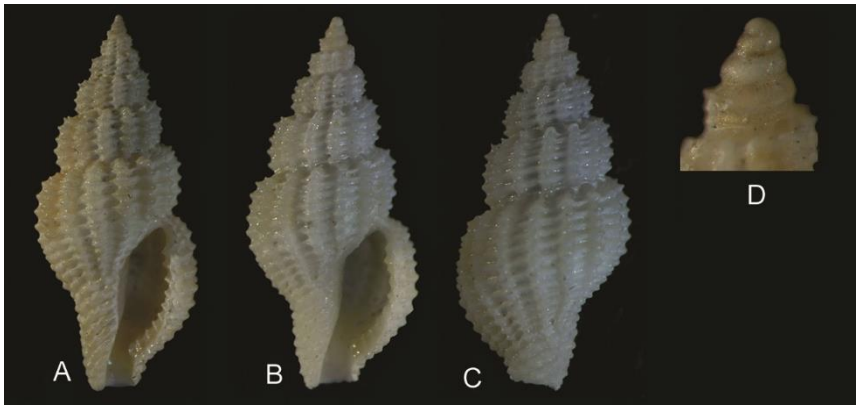

Figure 6. *Raphitoma contigua*: ventral (A, B) and dorsal (C) views of three specimens and the protoconch (D) of the specimen A. (A=9.3 mm, Ildır Bay, 61 m; B=C=10.5 mm, Ildır Bay, 25 m)

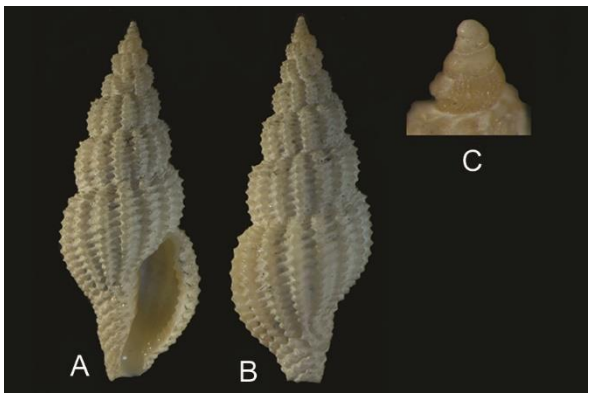

Figure 7. *Raphitoma corbis*: ventral (A) and dorsal (B) views of a specimen and its protoconch (C). (A=B=9.6 mm, Ildır Bay, 63.9 m)

***Raphitoma corbis* (Potiez & Michaud, 1938)** (Figure 7, *Pleurotoma corbis* Potiez & Michaud, 1838: vol. 1, p. 444, pl. 35, figs 1-2)

Material: 07.02.2015, Ildır Bay, Aegean Sea, sand + mud, 63.9 m, 1 spm.

Shell fusiform-acutes with 7 slightly convex whorls. Protoconch multispiral with a diagonally cancellate sculpture The last whorl with very short and weak keel before the onset of the teleoconch. Protoconch-teleoconch boundary flexuose and opisthocline.

On the teleoconch, a sculpture of 17 equidistant and slightly opisthocline axial ribs, with interspaces larger than the ribs, and 7 cordlets above the aperture. There is also two additional weak cordlets next the suture. Cancellation rectangular; at the intersection of axial ribs with the spirals with strong and elongated tubercles. No microgranules in the surface. Subsutural ramp narrow. Columella slightly sinuous anteriorly and angled adapically. Anterior siphonal canal short and wide. Outer lip with 12 strong inner plicate denticles. Siphonal fasciole with 8 strong nodulose cords. The studied specimen was with a ratio of **h/d**=2.74, length 9.6 mm and width 3.5 mm. Colour from firm brown to light hazel, rarely even some costae are equally clear. Sometime in the last whorl there is a lighter cordlet on the suture (Pusateri et al., 2018)

Remarks: *Raphitoma corbis* can be confused with *R. atropurpurea*, *R. laviae*, *R. lineolata* and *R. densa*. The differences of the species from the congeneric ones were discussed by Pusateri et al. (2018: 220).

Distribution: West and Central Mediterranean Sea (Pusateri et al., 2018). *Turkish coasts*: Aegean Sea (Pusateri et al., 2018: 221).

***Raphitoma densa* (Monterosato, 1884)** (Figure 8, *Philbertia densa* Monterosato, 1884: 133)

Material: 02.1993, Yeşilköy, Sea of Marmara, infralittoral depth, sand, 2 sh. (CGC); 10.2006, Didim, Aegean Sea, 50-60 m, mud, 1 spm (CGC); 06.2012, Kargı Bay (Datça), Aegean Sea, 1 m, sand, 1 sh. (CGC); 25.10.2014, Ildır Bay, Aegean Sea, 64.4 m, mud with shell fragments, 1 spm.

Shell solid and subfusiform with 6 inflated teleoconch whorls. Protoconch multispiral with a keel before the onset of the teleoconch. Teleoconch whorls densely sculptured with orthocline axial ribs and interspaces wider than the ribs, and cordlets intersecting with axial ribs and forming slightly elongated tubercles. The shell surface is covered by microgranules. The body whorl bears 16-19 axial ribs and 16-20 cordlets, of which 6-7 above the aperture. Suture incised, subsutural ramp narrow and with threads and small tubercles in correspondence with axial ribs. Siphonal fasciole indistinct, with 7 weakly nodulose cords. Columella nearly straight, angled adapically. Anterior siphonal canal of medium length, posterior sinus deep. Outer lip with 11 inner plicate denticles. The studied specimens are with a **h/d** ratio of 2.59±0,20, an average height of 8,82±0.56 (9.6 mm) and an average width of 3.42±0.22 (3.8 mm). Colour uniformly tawny or in colour patern of dark chestnut background with ash-grey spots over it.

Remarks: Regarding the general shape of *R. densa*, especially the specimens in uniformly tawny colour, can be confused with *R. contigua*, but *R. densa* differs from it by having axial ribs in much number and being slenderer.

Distribution: Mediterranean Sea (Nordsieck, 1977; Manousis et al., 2018). *Turkish coasts*: Aegean Sea (*present study*).

***Raphitoma digiulioi* Pusateri & Giannuzzi Savelli, 2017** (Figure 9)

Material: 19.02.2002, Izmir Bay, Aegean Sea, *P. oceanica*, 12 m, 1 spm; 10.04.2014, Güllük Bay, Aegean Sea, muddy sand with shell fragments, 48 m, 1 spm; 26.07.2014, Güllük Bay, Aegean Sea, sandy mud with shell fragments, 44 m, 1 spm; 15.12.2015, Güllük Bay, Aegean Sea, sandy mud, 44 m, 1 spm.

Shell solid, fusiform and bearing 5-6 convex teleoconch whorls. Protoconch multisipiral of about 3 whorls. The first whorl with orthogonally cancellate sculpture, the last two whorls diagonally cancellated at their lower half. On the teleoconch, axial sculpture of 17-19 orthocline or slightly opisthocline ribs on the body whorl, with interspaces as wide as the ribs in adult specimens or slightly wider in young individuals. Spiral sculpture of 15-16 cordlets, of which 6 cordlets above the aperture. Suture marked, subsutural ramp narrow. Aperture narrow and elongated, columella slightly sinuous anteriorly. Anterior siphonal canal of medium length and width, posterior sinus evident in adult specimens. Outer lip thin, with 8 inner denticles in adult ones. Siphonal fasciole with 6-8 slightly nodulose spiral cords. The **h/d** ratio in the investigated material was 2.46 ±0.09, average height 4.77±1.10 mm (6.3 mm) and average width 1.93 ±0.42 mm (2.5 mm). Colour of light brown or whitish beige background and whitish spots on ribs or a whitish cordlet at the aperture beginning level.

Remarks: The differences of the species from the similar ones such as *R. lineolata*, *R. atropurpurea*, *R. purpurea* and *R. laviae* were discussed by Pusateri et al. (2017b) and Manousis et al. (2018).

Distribution: Eastern Atlantic Ocean (Portugal coast) and Mediterranean Sea (Pusateri et al., 2017b: 175). *Turkish Coasts*: Aegean Sea (*present study*).

***Raphitoma echinata* (Brocchi, 1814)** (Figure 10, *Murex echinatus* Brocchi, 1814: 423, pl. 8, fig. 3)

Material: 14.06.1995, Eski Foça, Aegean Sea, rocky habitat, 0-2 m, 1 spm; 03.1997, Karataş (Adana), Levantine Sea, 70 m, mud, 1 spm (CGC); 09.1997, Sarsala Bay (Göçek), Levantine Sea, 1 m, rocky habitat, 1 spm (CGC); 01.05.2003, Ildır Bay,Aegean Sea, sand + *P. oceanica*, 15 m, 1 sh.; 06.06.2013, Dardanelles Strait (near Eceabat), mud with *Lithotamnion* sp., 25 m, 1 spm;

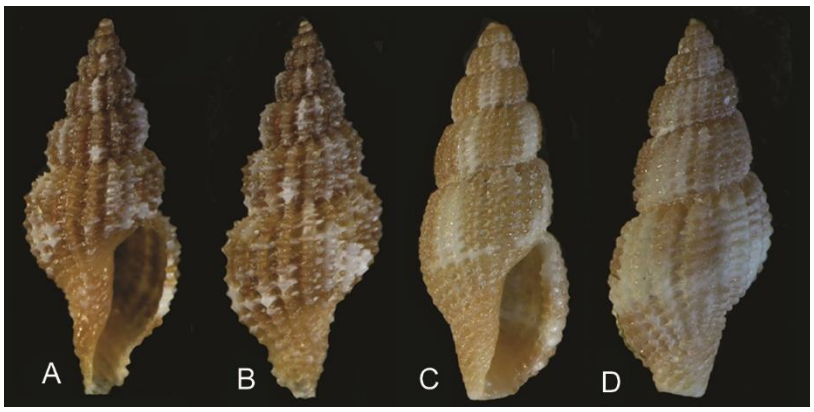

Figure 8. *Raphitoma densa*: ventral (A, C), dorsal (B, D) views of three specimens (A=B=8.4 mm, Didim, 50-60 mm; C= 9.1 mm, D=8.4 mm, Sea of Marmara, 0-40 m)

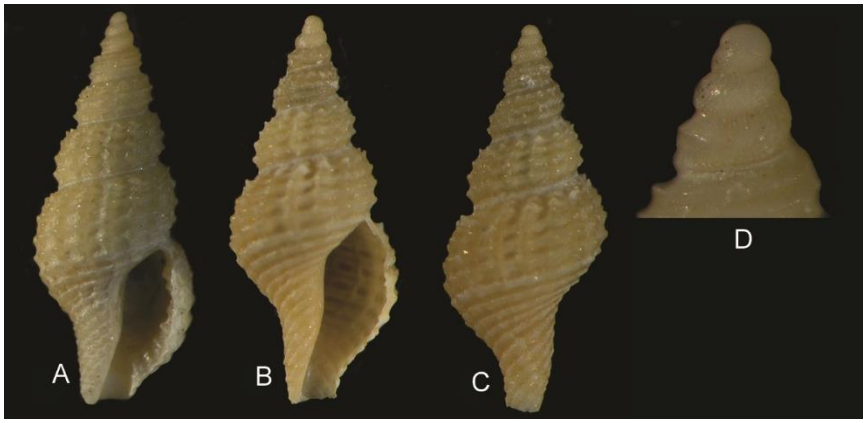

Figure 9. *Raphitoma digiulioi*: ventral (A, B), dorsal (C) views of two specimens and the protoconch (D) of the specimen A (A=4.8 mm, B=C=3.9 mm, Güllük Bay, 44 m)

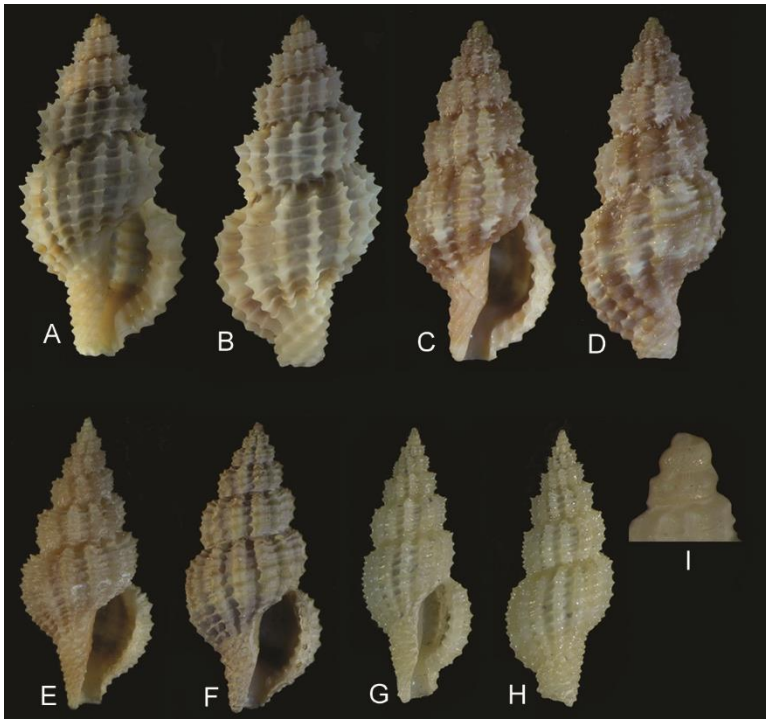

Figure 10. *Raphitoma echinata* complex: ventral (A, C, E, F, G), dorsal (B, D, H) views of five specimens and the protoconch (I) of the specimen G. (A=B=12.2 mm, Ildır Bay, 15 m; C=D=11.2 mm, Eski Foça, 0-2 m; E= 9.5 mm, Karataş, 70 m; F=9.6 mm, Ildır Bay, 64 m and G=H= 7.9 mm, Sea of Marmara, 100 m)

12.06.2013, Sea of Marmara (near Tekirdağ), sandy mud with shell fragments, 100m, 1 spm; 07.02.2015, Ildır Bay, Aegean Sea, sandy mud, 64 m, 1 sh.

Shell solid and fusoid, with 6-7 convex and shouldered teleoconch whorls. Protoconch multispiral and consists of about 3 whorls, of which the last two ones diagonally cancellated, and the last one carinated. On the teleoconch, a sculpture of 13-16 strong and orthocline or slightly opisthocline axial ribs on the body whorl, with interspaces as wide as twice of axial ribs, and 13-15 cordlets of which 5 cordlets above the aperture. In some specimens there areadditional weak spiral treads between the cordlets. Suture evident, subsutural area narrow. Aperture narrow, columella slightly sinuous. Anterior siphonal canal wide and of medium length, posterior sinus deep. Outer lip thick with 8-9 strong inner denticles. Siphonal fasciole well marked in some specimens and bears 5-6 nodulose cordlets. The ratio of **h/d** in the investigated material was 2.50±0.21, average height 10.22±1.46 mm (12.2 mm) and average width 4.14±0.76 mm (5.1 mm). Brownish or whitish in colour. In some specimens occur a brown band in the subsutural area and at the lower part of the body whorl. The protoconch is brownish in the specimens with colour patterns.

Remarks: The identification of *R. echinata* is rather problematic, and the figures given in several publications considering the species are different from each other, having varying shapes and diagnostic features, and in some studies carried out recently (Giannuzzi Savelli et al., 2018a; Manousis et al., 2018) have been mentioned of a *Raphitoma echinata* complex. The original description of the species by Brocchi (1814) lacks of details for a definite identification, except for "*acute* and *spiny tubercles*" at the intersection of axial ribs and cordlets, and a ratio of **h/d**= 3 (height= 9, width=3). Among the specimens considering within the present study and identified as *R. echinata*, it seems that the features of the specimen found in the Sea of Marmara (Figure 10, G, H) much more match with the original description by Brocchi (1814), regarding the spiny tubercles and the slender shape (**h/d**= 2.83). It is clear, however, that the species needs to be examined in detail and its description to be clarified (including a re-description). It is probable that some new taxa might be erected from this "*complex*" in the detailed studies which will be performed in the upcoming years.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Gofas et al., 2011). *Turkish coasts*: Levantine Sea (Demir, 2003), Aegean Sea (Öztürk, 2001) and Sea of Marmara (Demir, 2003).

***Raphitoma ephesina* Pusateri, Giannuzzi-Savelli & Stahlschmidt, 2017** (Figure 11)

Material: 06.1998, Bozcaada Island, Aegean Sea, infralittoral depth, sand, 2 sh. (CGC).

Shell small, robust and consists of 4-5 slightly convex teleoconch whorls. Protoconch multispiral, with 3.6 convex whorls being with diagonally cancellate sculpture on the lower two thirds, and subsutural orthocline axial ribs on the upper third (Pusateri et al., 2017a). A sculpture of 14-15 orthocline and strong axial ribs on the body whorl, and interspaces as broad as the ribs. Five prominent cordlets thinner than the ribs above the aperture. Suture not incised, subsutural area narrow. Columella simple and slightly sinuous anteriorly. Outer lip thickened, with 8 strong inner denticles. Siphonal canal of medium length and wide. Anal sinus evident and shallow. Siphonal fasciole evident, bearing 5 nodulose strong cordlets. The sampled two shells were with **h/d** ratio of 2.15 and 2.04, height 8.6 mm and 8.4 mm, width 4.0 mm and 4.1 mm. Background colour and cordlets usually soft cherry, except the over sutural cordlet, which is white. Many ribs are white or withish. The lower part of the last whorl is evenly soft cherry (Pusateri et al., 2017a).

Remarks: The species may be confused with specimens of *R. aequalis*, *R. bicolor* and *R. linearis*, but *R. ephesina* differs from *R. aequalis* by the lack of microgranules in sculpture and by the number of cords on the penultimate whorl (5 vs 6-7). It is different from *R. bicolor* being shorter with a more robust aspect and different protoconch, and it can be distinguished from *R. linearis* by the lack of microgranules in sculpture and by the number of cordlets on the penultimate whorl (5 vs 4). The differences of *R. ephesina* from the other congeneric ones were discussed by Pusateri et al. (2017a: 208).

Distribution: Mediterranean Sea (Pusateri et al., 2017a). *Turkish coasts*: Aegean Sea (Pusateri et al., 2017a).

***Raphitoma farolita* (Nordsieck, 1977)** (Figure 12, *Raphitoma servaini farolita* Nordsieck, 1977: 58, Pl. 18, fig. 147)

Material: 06.02.2002, Salih Island (Bodrum), Aegean Sea, 8 m, *P. oceanica*, 2 spm; 19.09.2002, Izmir Bay (Mordoğan), Aegean Sea, 25 m, sandy mud, 1 sh.

Shell strong, ovato-pupoid and consists of 5-6 slightly convex and shouldered teleoconch whorls. Protoconch paucispiral with cancellate sculpture. Teleoconch sculpture robust; on the body whorl 14-15 thick orthocline or slightly prosocline axial ribs, with interspaces as wide as twice the ribs, and 14-15 cordlets, of which 5-6 above the suture. Suture incised, cancellation rectangular, with strong and elongated tubercles at the intersections. Subsutural area narrow, sometimes with small tubercles in correspondence with the axial ribs. Aperture narrow and elongated. Anterior siphonal canal short, posterior sinus deep. Columella slightly sinuous. Outer lip thick, with 8-9 inner denticles. Siphonal fasciole slightly marked with 6-7 nodulose cords, and a short tail bearing 4-5 nodulose cords. The ratio of **h/d** in the investigated three specimens were 2.29, 2.34 and 2.45, height 5.5 mm, 6.8 mm and 5.9 mm and width 2.4 mm, 2.9 mm and 2.4 mm, respectively.

Colour pattern consists of light brown background with large whitish blotches on it. Protoconch brownish with whitish nucleus.

Remarks: Among the *Raphitoma* species distributed along the Turkish coasts, the species is somewhat similar to *R. contigua* and its sister species *R. bicolor*, but *R. farolita* differs from the mentioned two species by being with paucisipiral protoconch. *Raphitoma farolita* was investigated in detail by Giannuzzi-Savelli et al. (2018a) where its differences from the other congeneric species were also touched on.

Distribution: Mediterranean Sea (Nordsieck, 1977; Giannuzzi-Savelli et al., 2018a). *Turkish Coasts:* Aegean Sea (Giannuzzi-Savelli et al., 2018a: 28)

***Raphitoma hispidella* (Pusateri & Giannuzzi-Savelli, 2019)** [Figure 13, Giannuzzi-Savelli et al. (2019: 60-65, figs 11-25 (*nomen novum* for *Cordieria cordieri* var. *hispida,* Monterosato, 1890:187, non *Raphitoma hispida* Bellardi, 1877 (secondary homonymy)]

Material: 13.10.1998, Izmir Bay, 49 m, sandy mud, 1 sh.; 25.06.2009, Ildır Bay, Aegean Sea, 54 m, mud, 1 sh.; 24.06.2013, Sea of Marmara, 50 m, sandy mud with shell fragments, 1 sh.; 22.07.2014, Ildır Bay, Aegean Sea, 60 m, muddy sand with shell fragments, 2 sh.; 26.07.2014, Güllük Bay, Aegean Sea, 44 m, mud + sand with shell fragments, 1 spm; 25.10.2014, Ildır Bay, Aegean Sea, 63.7 m, sandy mud with shell fragments, 1 spm; 27.10.2014, Güllük Bay, Aegean Sea, 45 m, mud, 1 sh.; 07.02.2015, Ildır Bay, Aegean Sea, 61.6 m, sandy mud, 1 spm + 1 sh.; 15.02.2015, Güllük Bay, 44 m, mud with sand and shell fragments, 1 sh.; 15.02.2016, Güllük Bay, Aegean Sea, 49.5 m, sandy mud, 2 spm.

Shell fusiform, robust (in young specimens fairly fragile) with 5-6 convex teleoconch whorls. Protoconch multispiral consists of nearly 3.5 whorls, of which the first whorl square striped, and the other ones diagonally striated. The sculpture on teleoconch whorls consists of orthocline or slightly prosocline axial ribs with wide interspaces (in young specimens more spaced) and thin cordlets. On the last whorl 11-13 (rarely 10) axial ribs and 10-12 cordlets, of which 5 above the aperture. The cordlets above the aperture thicker than the lower ones. Elongated or spiny tubercles at the intersection points of axial ribs with cordlets. Particularly the first two cordlets with longer spines on the whorls of young specimens. Subsutural area wide, inclined and bearing a row of small tubercles in correspondence with the axial ribs on the last two whorls. Aperture narrower in adult specimens, columella slightly sinuous or almost straight anteriorly and angled posteriorly. Outer lip thick with 7-8 inner plicate denticles in the investigated specimens. Anterior siphonal canal long and sometimes twisted; anal sinus deep. Siphonal fasciole well marked and with 6-8 nodulose cords. The ratio of **h/d** in the studied material was 2.29±0.15, average height 6.48±2.71 (11.3 mm) and average width was 2.79±1.02 (4.6 mm). Colour yellowish-beige in adult and horny-whitish in young specimens, with a light brown subsutural band and another on the last whorl above the siphonal fasciole.

Remarks: *Raphitoma hispidella* was introduced by Monterosato, 1890 as *Cordieria hispida* from Palermo (Sicily) (Appolloni et al., 2018). Since the specific name was preoccupied (*Raphitoma hispida* Bellardi, 1877), a short time before this good taxon has been renamed by Giannuzzi-Savelli et al. (2019).

In several studies carried out in the past, the species has been considered as *Raphitoma cordieri* var. *hispida*, but *R. hispidella* is different from *R. cordieri* by always being smaller, having very large and arched subsutural area, and bigger protoconch (Giannuzzi-Savelli et al., 2019). The species may sometimes be confused with *R. horrida*, but the latter species being with paucispiral protoconch, can be easily distinguished from *Raphitoma hispidella* having only 4 cordlets above the aperture.

Distribution: Eastern Atlantic coast and Mediterranean Sea (Giannuzzi-Savelli et al., 2019). *Turkish coasts*: Aegean Sea (Giannuzzi-Savelli et al., 2019), Sea of Marmara (*present study*)

***Raphitoma horrida* (Monterosato, 1884)** (Figure 14, *Cordieria horrida* Monterosato, 1884: 131-132)

Material: 10.1996, Cunda Island (Aliağa), Aegean Sea, on the beach, 1 sh. (CGC); 07.1995, Güvercinlik, Aegean Sea, 1 m, rocky substrate, 1 sh. (CGC); 05.1998, Bozcaada Island, Aegean Sea, infralittoral depths, rocky and sandy substrates, 1 sh. (CGC); 13.06.2013, Silivri, Sea of Marmara, 10 m, muddy sand with shell fragments, 1 spm.

Shell fusiform and of small size, with shouldered and convex teleoconch whorls. Protoconch paucispiral bearing a fine square shape sculpture due to intersection of vertical and horizontal striae. Strong and rectangular cancellation on the teleoconch whorls due to the orthocline thick axial ribs, narrower than the interspaces, and thin spiral cordlets. On the body whorl 11-13 axial ribs and 10 cordlets, of which 4 above the aperture and thicker than the others. First cordlet on the whorls with spiny tubercles. Subsutural area wide with a row of spines in accordance of axial ribs. Siphonal fasciol well marked with 5 nodulose cords. Sutures deep. Aperture narrow, columella slightly sinuous. Anterior siphonal canal of medium length, posterior sinus as deep as the thickness of a rib. Outer lip thick and no denticles inside (in adult 8-9 plicate denticles). On the siphonal fasciole 4 nodulose cords. The **h/d** ratio was 2.20±0.09, average height 8.68±2.57 (11.6 mm) and average width 3.98±1.19 (5.1 mm) in the investigated material. A colour pattern of light brownish background with whitish gray sculpture on it. Protoconch fawn-coloured.

Remarks: The species is characteristic with its teleoconch sculpture and paucispiral protoconch.

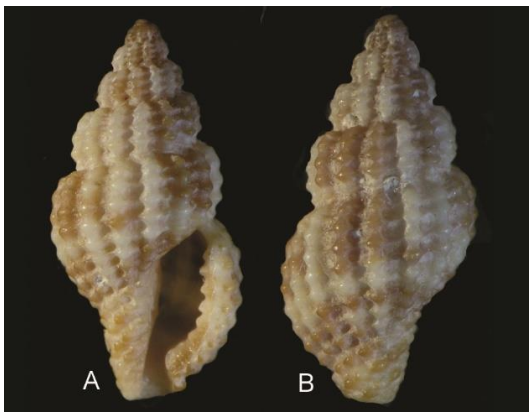

Figure 11. *Raphitoma ephesina*: ventral (A) and dorsal (B) views of a shell (A=B=8.6 mm)

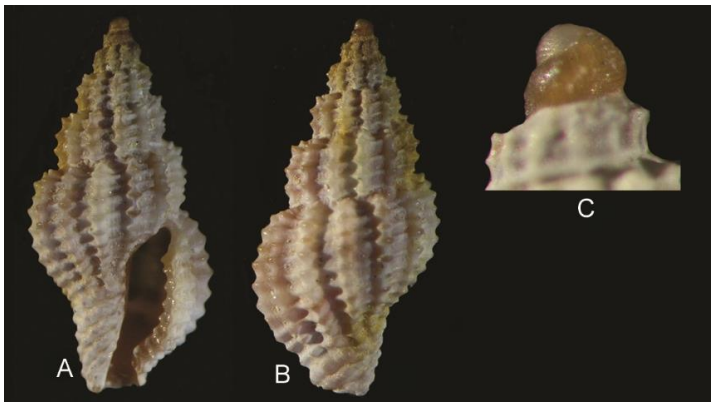

Figure 12. *Raphitoma farolita*: ventral (A), dorsal (B) views of a specimen and its protoconch (C). (A=B=5.5 mm, Salih Island, 8 m)

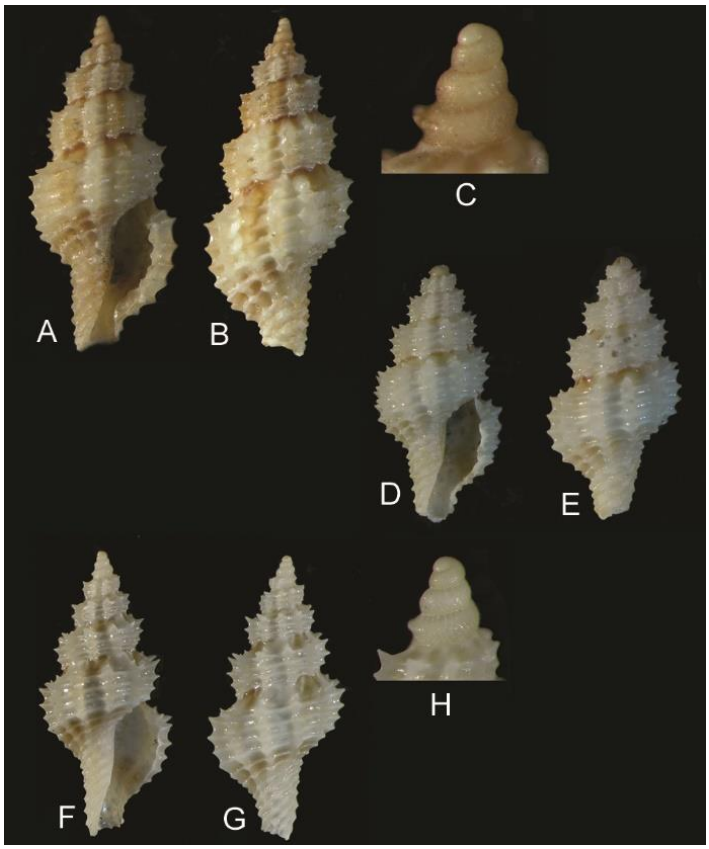

Figure 13. *Raphitoma hispidella*: ventral (A, D, F), dorsal (B, E, G) views of three specimens and the protoconchs (C, H) of the specimens A and F (A=B= 5.4 mm, Güllük Bay, 49 m; D=E= 4.9 mm, Ildır Bay, 60 m; F=G=5.5 mm, Güllük Bay, 44 m)

Distribution: Mediterranean Sea (Gofas et al., 2011). *Turkish coasts*: Aegean Sea (Öztürk, 2001) and Sea of Marmara (*present study*).

***Raphitoma laviae* (Philippi, 1844)** (Figure 15, *Pleurotoma laviae* Philippi, 1844. En. Moll. Sic. 2:170; pl. XXVI, fig. 17)

Material: 08.02.2002, Izmir Bay, Aegean Sea, 8 m, *P. oceanica*, 1 spm; 02.03.2003, Çandarlı Bay (Kızkulesi), Aegean Sea, 62 m, corralligenous sand, 1 spm; 09.10.2005, Kuşadası Bay, Aegean Sea, 0.1-3.0 m, rocky habitat; 1 spm; 21.04.2014, Akköy, Aegean Sea, sandy mud, 65 m, 1 spm; 08.2015, Yumurtalık (Adana), Levantine Sea, infralittoral depth, sand, 1 sh. (CGC); 15.12.2015, Güllük Bay, Aegean Sea, 45 m, silty sand, 1 spm.

Shell solid, subfusiform and consists of 4-5 slightly convex teleoconch whorls. Protoconch multispiral, bearing about three whorls, of which the first whorl with thin cancelattion and the other ones with a diagonally cancellated sculpture. A week keel before the onset of the teleoconch on the last whorl. Protoconch and teleoconch boundary strong and flexuous. Strong sculpture on the teleoconch whorls. Sculpture consists of 15-21 orthocline or slightly prosocline axial ribs, with interspaces a bit wider than the ribs. On the last whorl 15-17 cordlets, of which 6-7 cordlets above the aperture. Cancellation squared, with elongated pearl shaped tubercles on the intersections. Subsutural area narrow, with small tubercles in correspondence with the axial ribs and, sometimes, with one or two week treads. Columella slightly sinuous, anterior siphonal canal short and anal sinus shallow. Outer lip with 9-10 strong inner denticles. Siphonal fasciole with 4-6 nodulose cords. The **h/d** ratio was 2.62±0,11, average height 4.20±0.95 (5.3 mm) and average width 1.60±0.34 (2.00 mm) in the investigated specimens. Light or dark brown in colour, sometimes with tubercles lighter than the background. Sometimes whitish blotches on the teleoconch whorls.

Remarks: The species is characteristic with its pearl-shaped tubercles. The differences of *R. laviae* from the other similar congeneric species were given in detail by Giannuzzi-Savelli et al. (2018a:35).

Distribution: Mediterranean Sea (Nordsieck, 1977; Giannuzzi-Savelli et al., 2018a). *Turkish coasts*: Levantine Sea (Buzzurro & Greppi, 1996), Aegean Sea (Giannuzzi-Savelli et al., 2018a)

***Raphitoma leufroyi* (Michaud, 1828)** (Figure 16, *Pleurotoma leufroyi* Michaud, 1828:121-122, figs 5-6.)

Material: 07. 1998, Salih Island (Bodrum), Aegean Sea, 35 m, sandy mud, 1 sh. (CGC); 10.1998, Bodrum, Aegean Sea, 80 m, mud, 1 sh. (CGC); 13.06.2013, Silivri, Sea of Marmara, 25 m, sandy mud with *Lithothamnion* sp., 1 spm; 16.03.2015, Güllük Bay, Aegean Sea, 44 m, sandy mud, 1 spm; 25.08.2014, Güllük Bay, Aegean Sea, 49 m, sandy mud with shell fragments, 1 spm; 05. 2017, Yumurtalık (Adana), Levantine Sea, infralittoral depth, sand, 1 sh. (CGC).

Shell solid and bi-conic with 5-6 inflated teleoconch whorls. Protoconch multispiral and consists of three rounded whorls, of which the first one with concentric striae and the last whorls diagonally cancellated. Orthocline thick axial ribs and thin spiral cordlets consist the sculpture on the teleoconch whorls. On the body whorl 10-12 strong axial ribs and 16-17 spiral cordlets of alternate size, of which 6 cordlets above the aperture. Subsutural area wide, less inclined, with comma-like marks bearing three weak spirals. Aperture elongated, columella slightly sinuous. Anterior siphonal canal of medium length, posterior sinus less evident. Outer lip of medium thickness with no denticles inside. Siphonal fasciole marked, with 6 rounded cords interspaced wider than themselves. The **h/d** ratio in the investigated specimens was 2.37± 0.13, height 8.20±1.85 (10,7 mm) and width 3.43±0.66 (4.3 mm). Teleoconch whorls of yellowish colour, with a median whitish spiral band, and scattered brown spots. Adapically of whitish spiral band slightly brownish. The first protoconch whorl yellowish, while the last two are brownish or dark brown.

Remarks: The species is similar to *Raphitoma concinna*, from which it differs by the median whitish band on the teleoconch whorls, and being in a bi-conical outline.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Nordsieck, 1977 and Gofas et al., 2011). *Turkish coasts*: Levantine Sea (Buzzurro & Greppi, 1996), Aegean Sea (Demir, 2003) and Sea of Marmara (Demir, 2003).

***Raphitoma linearis* (Montagu, 1803)** (Figure 17, *Murex linearis* Montagu, 1803: 261, Pl. 9, fig. 4)

Material: 04.1994, Yeşilköy (Sea of Marmara), 30 m, sand, 2 sh. (CGC); 14.06.1995, Izmir Bay, Aegean Sea, *P. oceanica*, 4 m, 1 spm; 07.1995, Karaburun (Aegean Sea), 1 m, rocky habitat, 2 sh. (CGC); 09.1997, Sarsala Bay (Göçek), Aegean Sea, 1 m, rocky substrate, 2 sh. (CGC); 22.01.2001, Ildır Bay, Aegean Sea, 6 m, *P. oceanica* + sand, 1 spm; 07.03.2003, Çandarlı Bay, Aegean Sea, 62 m, coralligenous sand, 3 spm; 01.05.2003, Ildır Bay, Aegean Sea, 15 m, *P. oceanica* + sand, 2 spm; 08. 2012, Taşucu (Mersin), Levantine Sea, 1 m, sand, 1 sh. (CGC); 06.06.2013, Dardanelles Street, 25 m, sand, 1 spm; 26.07.2014, Güllük Bay, Aegean Sea, 44 m, sand + mud + shell fragments, 2 spm; 25.08.2014, Ildır Bay, Aegean Sea, 49 m, sandy mud, 1 spm; 16.02.2015, Güllük Bay, Aegean Sea, 47 m, sandy mud, 1 spm; 06.04.2017, Foça, Aegean Sea, 8 m, *P. oceanica*, 2 sh.; 01.08.2017, Gökova Bay, Aegean Sea, 30 m, muddy sand, 1 spm.

Shell robust, subfusiform, with 6-7 convex and shouldered teleoconch whorls. Protoconch multisipiral, with about 3.5 diagonally cancellated whorls. Sculpture of strong and thick axial ribs, with interspaces nearly as wide as the ribs, and thin spiral striae passing over the ribs. On the last whorl 8-11 orthocline axial ribs and 18-19 cordlets, of which 5 cordlets above the suture. Suture deep, with narrow, minutely granular subsutural area.

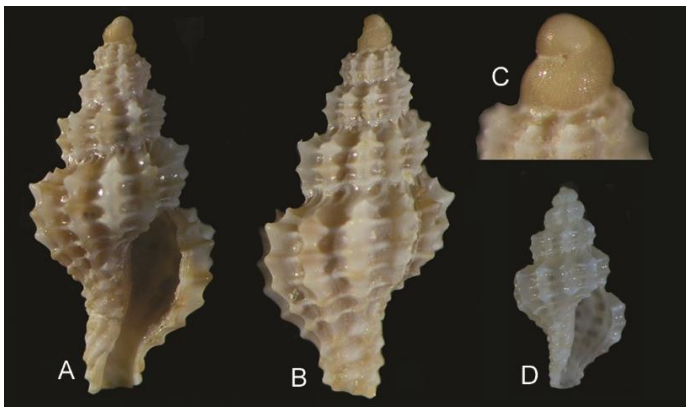

Figure 14. *Raphitoma horrida*: ventral (A, D), dorsal (B) views of two specimens and the protoconch (C) of the specimen A. (A=B=4.6 mm, Silivri, 10 m)

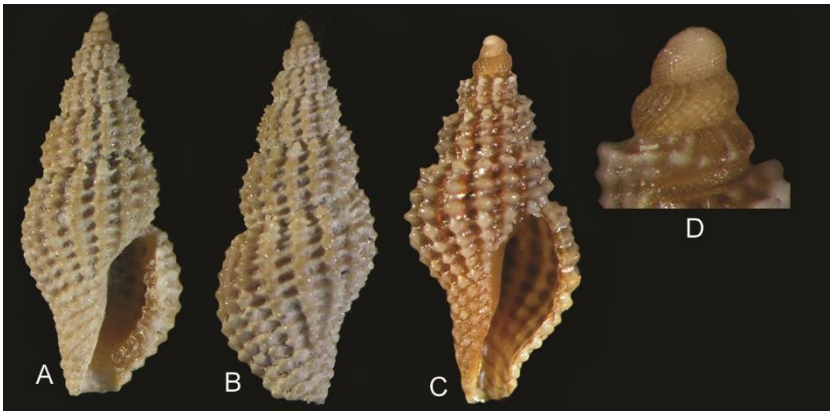

Figure 15. *Raphitoma laviae*: ventral (A, C), dorsal (B) views of two specimens and the protoconch (D) of the specimen (C). (A=B=5.1 mm, Izmir Bay, 8 m; C=2.9 x 1.2 mm, Kuşadası Bay, 0.1-3 m)

Figure 16. *Raphitoma leufroyi*: ventral (A, B, C), dorsal (D) views of three specimens and the protoconch (E) of the specimen (C). (A=7.1 mm, Yumurtalık, 0-40 m; B=8.5 mm, Silivri, 25 m; C=D=7.6 mm, Güllük Bay, 49 m)

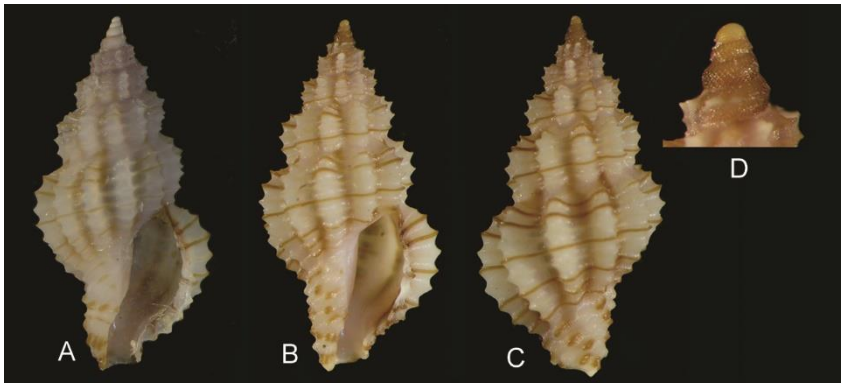

Figure 17. *Raphitoma linearis*: ventral (A, B), dorsal (C) views of two specimens and the protoconch (D) of the specimen B. (A=6.6 mm, Karaburun, 1 m; B=C=6.3 mm, Ildır Bay, 6 m)

The shell surface is covered by microgranules. Aperture elongate-oval, columella nearly straight. Anterior siphonal canal short, anal sinus shallow. Outer lip strongly varicated, with 6-7 denticles inside in adult specimens with the last two (close to the posterior sinus) more evident. Siphonal fasciole marked and bearing 6-7 cordlets with brown spots. The **h/d** ratio in the investigated material was 2.29±0.30, average height 6.03±0.74 (7.5 mm) and average width 2.64±0.21 (2.8 mm), respectively. Cream, horny or lilac white in colour, with fine brown spirals. Protoconch light brown.

Remarks: *Raphitoma linearis* is one of the well-known species distributed along the Turkish coasts, and the species is characteristic with its strong axial ribs and brown striae.

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Gofas et al., 2011: 338). *Turkish coasts*: Levantine Sea (Buzzurro & Greppi, 1996), Aegean Sea (Öztürk, 2001) and Sea of Marmara (*present study*). The species is widespread along the Turkish Aegean coasts.

***Raphitoma lineolata* (Bucquoy, Dautzenberg & Dollfus, 1883)** (Figure 18, *Clathurella purpurea* var. *lineolata* Bucquoy, Dautzenberg and Dollfus, 1883:92)

Material: 06. 1998, Bozcaada Island, Aegean Sea, infralittoral depth, sand, 1 sh. (CGC); 01.12.2004, Ildır Bay, Aegean Sea, 10 m, sand, 1 spm, 06.04.2017, Foça, Aegean Sea, 8 m, *P. oceanica*, 1 spm.

Shell solid, fusiform and consists of 5-6 convex teleoconch whorls. Protoconch multispiral of about 3 whorls, and the last two whorls are with diagonally cancellate sculpture on the lower parts. Axial sculpture of 20-22 slightly opisthocline axial ribs with interspaces as wide as the ribs. Spiral sculpture on the last whorl of 16-17 cordlets with interspaces wider than themselves, of which 6-7 cordlets above the aperture. Small and elongated tubercles at the intersection of axial ribs and spirals. Cancellation rectangular. Subsutural area narrow, suture deep. Aperture elongate and narrow. Columella nearly straight or slightly sinuous anteriorly. Outer lip thin, with 10-11 inner plicate denticles. Anterior siphonal canal of medium length and wide. Anal sinus evident. The **h/d** ratio of the investigated individuals were 2.66 and 2.68; height 7.2 mm and 5.1 mm, and width 2.7 mm and 1.9 mm, respectively. Light brown or orange tawny colour, with some white spots on the axial ribs or cordlets.

Remarks: *Raphitoma lineolata* may be confused with *R. contigua* and *R. smriglioi*. It differs from *R. contigua* by having a slenderer outline, less robust shell and possessing a white subsutural cordlet and white spots on the whorls, whereas from *R. smriglioi* it can be easily differentiated by its multispiral protoconch. The species was recently investigated in detail by Pusateri et al. (2013).

Distribution: Eastern Atlantic Ocean and Mediterranean Sea (Pusateri et al., 2013:13). *Turkish coasts*: Levantine Sea (Pusateri et al., 2013:13), Aegean Sea (Demir, 2003).

***Raphitoma locardi* Pusateri, Giannuzzi-Savelli & Oliverio, 2013** [Figure 19, *Raphitoma locardi* Pusateri & Giannuzzi Savelli, 2013: 18 (*nomen novum* pro *Clathurella cylindrica* Locard & Caziot, 1899 non Pease, 1860) (secondary homonymy)]

Material: 18.06.2001, Ildır Bay (Çeşme), Aegean Sea, *P. oceanica*, 6 m, 1 spm; 05.09.2002, Salih Island (Bodrum), Aegean Sea, 8 m, *P. oceanica* + sand, 1 sh.

Shell solid, fusiform, with 5-6 convex teleoconch whorls. Protoconch multispiral of about three whorls diagonally cancellated, and a weak keel on the last whorl before the onset of the teleoconch. Axial sculpture of 16-17 robust orthocline ribs on the body whorl, and interspaces a bit wider than the ribs. Spiral sculpture of 15-17 cordlets on the body whorl, of which 6 cordlets above the aperture. Small and elongated tubercles at the intersections. Cancellation rectangular. Aperture elongate and narrow. Columella slightly sinuous medially. Outer lip thin, with 10-11 strong inner denticles in adult specimens. Anterior sinus of medium length and wide, posterior sinus shallow. Siphonal fasciole indistinct, with 7-8 nodulose cords. The **h/d** ratio of the studied two specimens were 2.55 and 2.63; height 4.6 mm and 5.0 mm, and width 1.8 and 1.9 mm, respectively. Colour uniformly tawny-reddish, sometimes very dark, with whitish blotches as wide as two axial ribs, usually vanishing towards the suture (Giannuzzi-Savelli et al., 2018a).

Remarks: The classification history of the species and its differences from the similar congeneric species have been evaluated by Giannuzzi-Savelli et al. (2018a: 42). The species is different from the most similar *R. bicolor* by having a **h/d** ratio higher than 2.4.

Distribution: Mediterranean Sea (Giannuzzi-Savelli et al., 2018a). *Turkish Coasts:* Aegean Sea (Giannuzzi-Savelli et al., 2018a).

***Raphitoma papillosa* (Pallary, 1904)** (Figure 20, *Philbertia papillosa* Pallary, 1904:220, pl. 7 fig. 3)

Material: 06.06.2013, Dardanelles Strait, 25 m, mud with shell fragments, 2 spm; 07.06.2013, Şevketiye (Sea of Marmara), 25 m, mud with *Lithotamnion* sp., 1 spm; 26.06.2013, Bosphorus (41°04'40" N - 29°03'16" E), 100m, sandy mud with shell fragments, 8 sh.; 16.08.2015, Ildır Bay, Aegean Sea, 23 m, sand + algae, 1 spm; 12.10.2017, entrance of the Dardanelles Strait (39°58'24" N - 26°05'58" E), Aegean Sea, 25 m, *P. oceanica*, 1 sh.

Shell thin, sub-fusiform, with convex and shouldered teleoconch whorls. Protoconch paucispiral with irregularly cancellated sculpture. A sculpture of 19-23 orthocline or slightly prosocline axial ribs as wide as the interspaces on the body whorl, and 16-19 frequently located cordlets slightly thinner than the ribs. Suture weak, subsutural area narrow. Aperture elongated, slightly sinuous medially and angled adapically. Anterior siphonal canal short and wide, posterior sinus deep. Outer lip of medium thickness with 9-12 strong inner

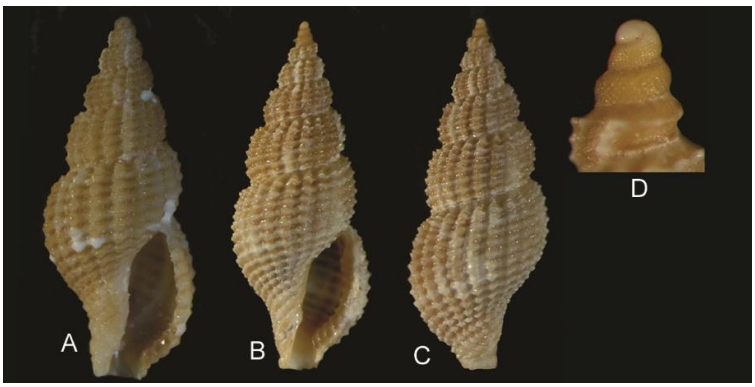

Figure 18. *Raphitoma lineolata*: ventral (A, B), dorsal (C) views of two specimens and the protoconch (D) of the specimen B. (A=9.5 mm, Bozcaada, 0-40 m; B=C=7.2 mm, Ildır Bay, 10 m)

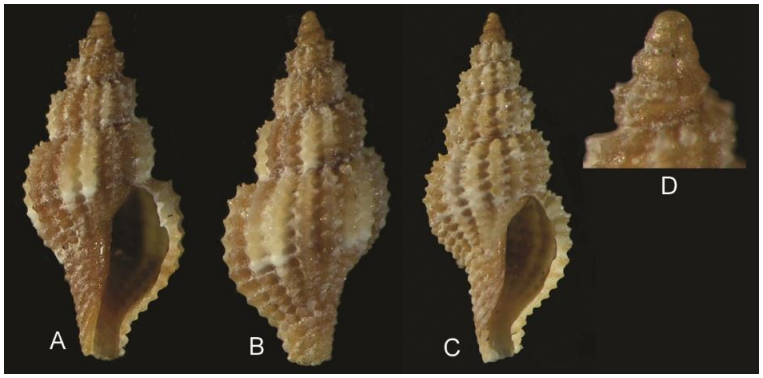

Figure 19. *Raphitoma locardi*: ventral (A, C) and dorsal (B) views of two specimens and the protoconch (D) of the specimen A (A=B=4.6 mm, Bodrum, 8 m; C=5.0 mm, Ildır Bay, 6 m)

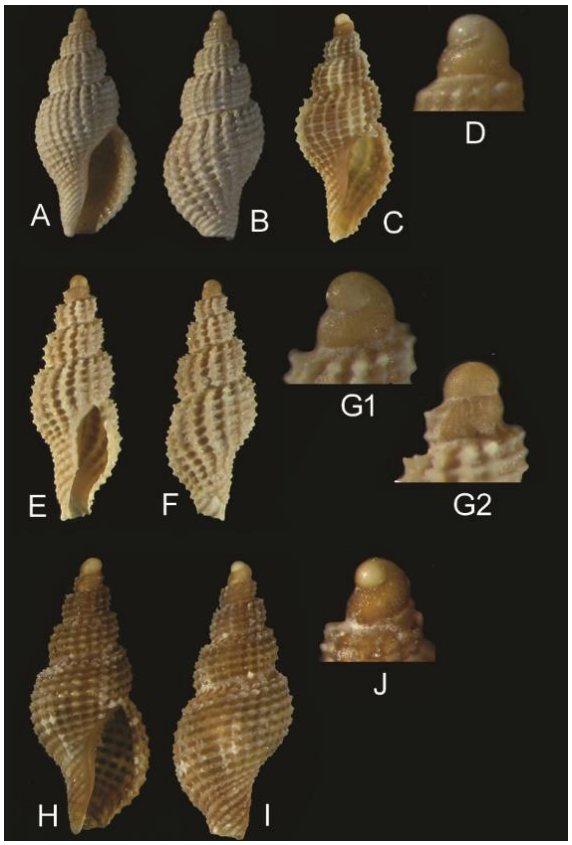

Figure 20. *Raphitoma papillosa*: ventral (A, C, E, H) and dorsal (B, F, I) views of four specimens and the protoconch (D) of the specimen A, the protoconch G1=G2 of the specimen E and the protoconch (J) of the specimen H. (A=B=5.2 mm, Bosphorus, 100 m; C=4.5 mm, Ildır Bay, 23 m; E=F=3.8 mm, entrance of the Dardanelles Strait, 25 m and H=I=4.5 mm, Dardanelles Strait, 25 m)

denticles. Siphonal fasciole indistinct with 8-9 weakly nodulose cords. The **h/d** ratio of the investigated material was 2.70±0.07, average height 5.27±0.35 (5.5 mm) and average width 1.96±0.14 (2.2 mm). Colour pattern consists of a background in whitish beige or variable hues of brown, with white blotches in some specimens.

Remarks: The shell of *R. papillosa* is rather variable in shape and sculpture. The paucispiral protoconch have a sculpture irregularly cancellate with scattered microgranules at protoconch/teleoconch boundary. *R. papillosa* differs from the similar congeneric species by its more fragile shell, acute papillose tubercles and by its less slender outline. The differences from the other species were discussed in detail by Giannuzzi-Savelli et al. (2018a:52). The specimen (Figure 20, E=F), although it is slenderer (**h/d** =2.92) and bears less number axial ribs (16) than the investigated conspecific ones, it was tentatively identified as *R. papillosa* due to the protoconch similarity and teleoconch sculpture.

Distribution: Mediterranean Sea (Nordsieck, 1977; Giannuzzi-Savelli et al., 2018a:51). *Turkish Coasts*: Aegean Sea (Demir, 2003), Sea of Marmara (Demir, 2003), Bosphorus (*present study*) and Dardanelles (*present study*).

***Raphitoma philberti* (Michaud, 1829)** (Figure 21, *Pleurotoma philberti* Michaud, 1829:261-262, figs 2, 3)

Material:15.12.2015, Güllük Bay, Aegean Sea, 45 m, sandy mud, 1 spm; 02. 03.2003, Çandarlı Bay, Aegean Sea, 62 m, sand, 4 spm; 06.04.2017, Eski Foça, Aegean Sea, 8 m, mud, 2 spm; 07.08.2017, Gökova Bay, Aegean Sea, 49 m, mud with algae, 1 spm.

The species is with a fusiform and slender shell consisting of 5-6 convex teleoconch whorls. Protoconch paucispiral, a bit variable in shape and size, and with irregular cancellation. A robust sculpture on the teleoconch whorls. 17-21 nearly orthocline axial ribs, with interspaces as wide as the ribs on the body whorl, and 17-19 cordlets of which 6-7 above the aperture. Strong and elongated tubercles at the intersections of the ribs with the cordlets. Suture evident, subsutural ramp narrow. Aperture elongated, columella slightly sinuous. Anterior siphonal canal short, posterior sinus deep in adult specimens. Outer lip strong with 9-11 inner denticles. Siphonal fasciole indistinct, with 6-7 nodulose cords. The ratio of **h/d** in the studied material was 2.61±0.09, average height 7.47±2.32 (10.6 mm) and average width 2.85±0.84 (4.0 mm). Shell colour from a light to dark brown background, with whitish blotches more evident on the last whorls, and as wide as two axial ribs. Some specimens with comma-shaped spots in the subsutural areas.

Remarks: *R. philberti* is one of the most similar species to *R. locardi*, from which it differs by its paucispiral protoconch (versus multispiral one in *R. locardi*). Among the species with paucispiral protoconch distributed along the Turkish costs, the species has also similarities with *R. papillosa* and *R. farolita*, but *R. philberti* differs from *R. papillosa* by its solid shell and robust sculpture, and from *R. farolita* by being slenderer and with less robust shell. The differences of the species from the other congeneric ones were studied in detail by Giannuzzi-Savelli et al. (2018a:45-46).

Distribution: Mediterranean Sea (Giannuzzi-Savelli et al., 2018a: 45). *Turkish Coast*: Aegean Sea (Pallary, 1917) and Sea of Marmara (Demir, 2003).

***Raphitoma sophiae* Kontadakis & Polyzoulis, 2019** (Figure 22, *Raphitoma sophiae* Kontadakis et al., 2019: 26-36, figs 4, 5, 6A)

Material: 22.07.2014, Ildır Bay, Aegean Sea, 67 m, sandy mud with shell fragments, 2 spm; 26.07.2014, Güllük Bay, Aegean Sea, 47 m, sandy mud, 1 spm; 25.10.2014, Ildır Bay (Çeşme), Aegean Sea, 64 m, sandy mud with shell fragments, 1 spm; 08.02.2015, Ildır Bay (Çeşme), Aegean Sea, 68 m, silty clay, 1 spm; 16.02.2015, Güllük Bay, Aegean Sea, 47 m, sandy mud, 1 sh.; 18.10.2017, Sarıgerme (Marmaris) (Aegean Sea), 54 m, mud, 1 spm.

Shell robust, fusiforme and consists of about 5-7 convex and shouldered teleoconch whorls. Protoconch multispiral, with three convex and cancellated whorls. On the last protoconch half whorl an evident weak keel. A sculpture of thick and orthocline axial ribs, with interspaces as wide as the ribs on the teleoconch whorls, and spiral cords thinner than the ribs. Body whorl bears 14-16 axial ribs and 15-18 cordlets, of which 6-7 cordlets above the aperture (versus 18 ribs and 25 cordlets according to Kontadakis et al., 2019). Suture deep, subsutural ramp moderately wide. Smooth and elongated tubercles at the intersection of axial ribs with cordlets. Aperture elongated, columella slightly sinuous. Anterior siphonal canal of medium length and wide in adult specimens, while posterior sinus deep and narrow. Outer lip thick (in adult specimens) and bears 10-11 plicate denticles. Siphonal fasciole slightly distinct, with 6-7 nodulose cords. Tail short, with 5 nodulose cords. The **h/d** ratio of the investigated specimens was 2.34±0.07, average height 7.74±1.89 (10.9 mm) and average width 3.30±0.79 (4.7 mm). Colour of light beige or whitish background with irregularly placed brown blotches or bands. Body whorl with a lighter spiral band at the beginning level of the aperture.

Remarks: The species differs from the similar congeneric ones by its brilliant shell and colour pattern. The distinguishing features of the species were discussed in detail by Kontadakis et al. (2019), where the species was redescribed satisfaing the requirements of availability under ICZN Art. 8.5).

Distribution: Mediterranean Sea (Aegean coast of Greece) (Kontadakis et al., 2019). *Turkish coasts*: Aegean Sea (*present study*).

***Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012** (Figure 23, *Raphitoma spadiana* Pusateri et al. (2012): 49-50, figs 8-13, 15 a-c)

Material: 07.1997, Merkezköy (Adana), Levantine Sea, 80 m, mud, 1 sh. (CGC); 15.09.2000, off the Büyük Menderes river, Aegean Sea, 69 m, mud, 1 spm; 12.2014, Arsuz (Iskenderun Bay), Levantine Sea, 80 m, sandy mud, 1 spm + 3 sh. (CGC); 27.07.2017, Ayvalık, Aegean Sea, 36 m, sandy mud with *Caulerpa* sp., 1 spm; 03.08.2017, Sarıgerme (Marmaris), Aegean Sea, 49 m, sandy mud with shell fragments, 1spm; 17.10.2017, Gökova Bay, 32 m, mud, 1 spm; 18.10.2017, Sarıgerme (Marmaris), Aegean Sea, 54 m, mud, 2 spm; 24.09.2018, Tavşan Island (near Bozcaada), Aegean sea, 27 m, muddy sand with *Caulerpa* sp., 1 sh.

Shell robust, sub-fusiform, with 6-7 slightly convex and shouldered teleoconch whorls. Protoconch paucispiral, with irregularly cancellate sculpture. Teleoconch sculpture consists of orthocline or slightly opisthocline axial ribs with interspaces wider than the ribs, and cordlets narrower than the ribs. 15-18 axial ribs and 17-22 cordlets on the body whorl, of which 6-7 cordlets above the aperture. Cancellation rectangular, small and elongated tubercles at the intersection of the ribs and cordlets. Sutur deep, subsutural ramp narrow, with small tubercles in correspondence with the axial ribs. Aperture elongated, columella slightly sinuous. Anterior siphonal canal short, posterior sinus evident. Outer lip thick in adult specimens and bearing 10-12 strong inner denticles. The ratio of **h/d** in the studied material was 2.60±0.12, average height 7.72±1.61 (9.9 mm) and average width 2.96±0,53 (3.7 mm). Siphonal fasciole distinct, with 7-8 nodulose cords. Colour uniform light tawny, with white or whitish blotches. According to Pusateri et al. (2012:50), some axial ribs can be entirely white on the first three teleoconch whorls and, the tenth spiral cordlet and the last two axial ribs can also be partly white on the body whorl.

Remarks: The type locality of the species is Lipari Island (Sicily), and its differences from the congeneric species have been discussed by Pusateri et al. (2012:50). Among the species distributed along the Turkish coasts, *R. spadiana* can be confused with *R. contigua*, from which it can be easily distinguished by its paucispiral protoconch.

Distribution: Mediterranean Sea (Pusateri et al., 2012:50). *Turkish coasts*: Levantine Sea (Giannuzzi-Savelli et al., 2018a) and Aegean Sea (*present study*).

Discussion

Within the present work, the specimens were identified to the specific level regarding some diagnostic characters of the shell such as protoconch type, macrosculpture, microsculpture, the **h/d** ratio of the shell and colour patterns, although the last one, even with living specimens, might be misleading because of variability (Høisæter, 2016). On the other hand, the protective liquids may cause loss of colour patterns of the shell as have been observed in *Raphitoma aequalis*, *R. contigua* and *R. densa* specimens dealt herein, becoming mostly uniformly yellowish or whitish (Figures 1, 6 B, C and 7 A-B). It is an evident fact that most of the raphitomid species have specific teleoconch diagnostic features, which facilitate the identification of the specimens. But sometimes it is possible to be observed overlapping of the features (i. e., number of axial ribs, number of cordlets, number of denticles inside the outer lip etc.) which may cause confusion or complicate the identification. Except for anatomy of the animal, the protoconch type (paucispiral or multispiral) seems to be more reliable diagnostic feature, especially in the distinction of sister species, i. e., *R. contigua*-*R. spadiana*, *R. philberti*-*R. locardi*, *R. lineolata*-*R. smriglioi* etc. (Pusateri et al., 2013:18, Table 1).

According to Öztürk et al. (2014), 18 raphitomid species have been reported along the Turkish coasts by that date, of which 8 species were reported from the Levantine coast, 15 species from the Aegean coast and 10 species from the Sea of Marmara. No raphitomid species have been collected from the Black Sea. Some faunistic studies were carried out in the past including more or less number of raphitomid species (i. e., Ostroumoff, 1896; Müller, 1985, Öztürk, 2001; Demir, 2003), however, due to the lack of detailed information and images, they do not allow for a reel assessment of the subjected species in light of the recent revisions. For instance, the specimens collected from Saros Bay (Aegean Sea) and identified as *Raphitoma laviae* (Kabasakal et al., 2005: 70), was recently corrected by Giannuzzi-Savelli et al. (2018a) as *R. contigua*. On the other hand, *R. purpurea* and *R. concinna* reported by the same author from Bozcaada Island and Saros Bay (Aegean Sea), respectively, do not seem to be correct identification. According to the illustration in the mentioned study, the first species can be attributed to *R. bicolor*, which is a species known from the region (Giannuzzi-Savelli et al., 2018a) and the second species is probably belongs to the *R. echinata* complex. Moreover, in the past, not less the number of researchers (Pallary, 1912; Porcheddu, Panoutsopoulou, Casu, & Cherchi, 1997; Chemello, Scotti, & Riggio, 1997; Tenekidis, 1989; Delamotte & Vardala-Theodorou, 1994; Cachia et al., 2001) that have noted the presence of *R. purpurea* at various localities in the Mediterranean Sea, based on misidentification (Giannuzzi-Savelli et al., 2018a: 168). According to the last study, the certainty known distribution of *R. purpurea* in the Mediterranean is the Alboran Sea (southern Spain and France). Therefore, the records of the species from the coasts of Turkey provided by various authors (Ostroumoff, 1896; Müller, 1985) (Table 1), which records were considered into the faunistic inventory by Öztürk et al. (2014), might also be based on misidentifications and should be removed from the inventory list. Demir (2003), listed 13 raphitomid species in his checklist, of which *Raphitoma alternans*, *R. alleryana* (under *R. bofilliana*) and *R. pruinosa* were given as uncertainly (?) identified. *Raphitoma* cfr. *alternans* was recently reported from the coast of Greece by Manousis et al. (2018), but later on the identification was corrected by Giannuzzi-Savelli

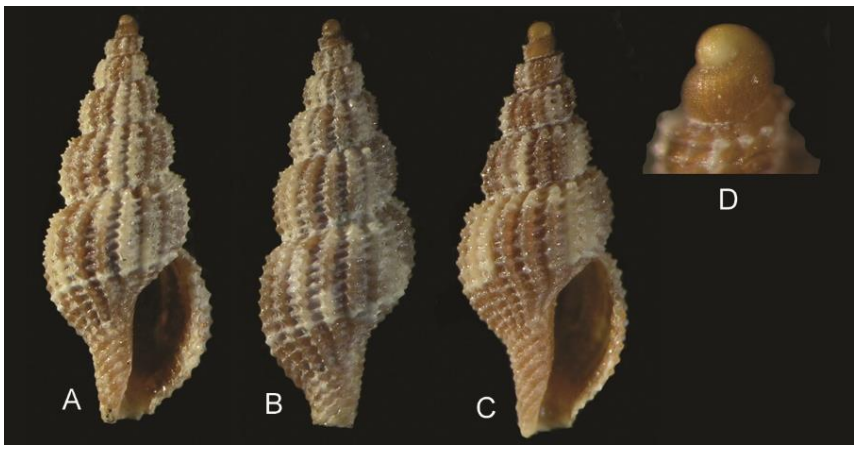

Figure 21. *Raphitoma philberti*: ventral (A, C) and dorsal (B) views of two specimens and the protoconch (D) of the specimen A (A=B=7.4 mm, Gökova Bay, 49 m; C=5.9 mm, Çandarlı Bay, 62 m)

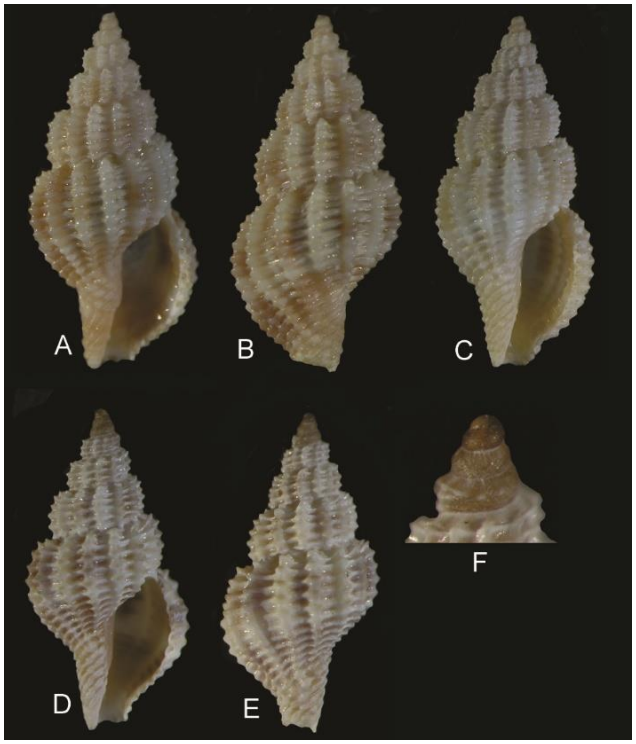

Figure 22. *Raphitoma sophiae*: ventral (A, C, D) and dorsal (B, E) views of three specimens and the protoconch (F) of the specimen D (A=B=7.1 mm, Ildır Bay, 68 m; C=8.5 mm, Güllük Bay, 47 m; D=E=5.2 mm, Marmaris, 54 m)

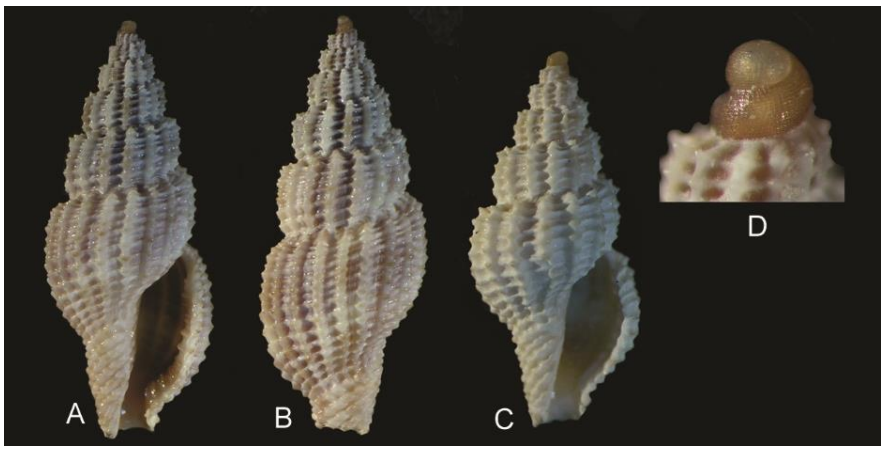

Figure 23. *Raphitoma spadiana*: ventral (A, C) and dorsal (B) views of two specimens and the protoconch (D) of the specimen A (A=B=9.4 mm, Marmaris, 54 m; C=5.9 mm, off Büyük Menderes river, 69 m)

Table 1. Checklist of *Raphitoma species* along the Turkish coasts (**LS**: Levantine Sea, **AS**: Aegean Sea, **SM**: Sea of Marmara, **B**: Bosphorus, **D**: Dardanelles and **FR**: First record from the area)

Species	LS	AS	SM	B	D
Raphitoma aequalis (Jeffreys, 1867)	**FR**	R12	R10	-	R1
Raphitoma atropurpurea (Locard & Caziot, 1900)	-	R11	-	-	-
Raphitoma alleryana (Sulliotti, 1889)	-	R4	-	-	-
Raphitoma alternans (Monterosato, 1884)	-	R4	R4	-	R13
Raphitoma bicolor (Risso, 1826)	R5	R5	**FR**	-	-
Raphitoma brunneofasciata Pusateri, Gianuzzi-Savelli & Oliverio, 2013	-	**FR**	-	-	-
Raphitoma concinna (Scacchi, 1836)	R2	R4	R4)	-	-
Raphitoma contigua (Monterosato, 1884)	-	R7	**FR**	-	-
Raphitoma corbis (Potiez & Michaud, 1838)	-	R16	**-**	-	-
Raphitoma cordieri (Payraudeau, 1826)	-	R10		-	R13
Raphitoma densa (Monterosato, 1884)	-	**FR**	-	-	-
Raphitoma digiulioi Pusateri & Giannuzzi Savelli, 2017	-	**FR**	-	-	-
Raphitoma echinata (Brocchi, 1814)	R4	R11	R4	-	-
Raphitoma ephesina Pusateri, Giannuzzi-Savelli & Stahlschmidt, 2017	-	R15	**-**	-	-
Raphitoma farolita Nordsieck, 1977	-	R5	-	-	-
Raphitoma hispidella Pusateri & Giannuzzi-Savelli, 2019	-	R6	**FR**	-	-
Raphitoma histrix Bellardi, 1847	R4	R12	**-**	-	
Raphitoma horrida (Monterosato, 1884)	-	R11	**FR**	-	-
Raphitoma laviae (Philippi, 1844)	R3	R11	-	-	-
Raphitoma leufroyi (Michaud, 1828)	R3	R4	R4	-	-
Raphitoma linearis (Montagu, 1803)	R3	R11	**FR**	-	R1
Raphitoma lineolata (Bucquoy, Dautzenberg & Dollfus, 1883)	R14	R4	-	-	-
Raphitoma locardi Pusateri, Giannuzzi-Savelli & Oliverio, 2013	-	R5	-	-	-
Raphitoma mirabilis (Pallary, 1904)	R4	R4	-	-	
Raphitoma papillosa (Pallary, 1904)	-	R4	R4	**FR**	**FR**
Raphitoma philberti (Michaud, 1829)	-	R13	R4	R8	R13
Raphitoma pruinosa (Pallary, 1906)	-	**-**	R4	-	-
Raphitoma pupoides (Monterosato, 1884)	-	**-**	-	R8	
Raphitoma purpurea (Montagu, 1803)	R3	R12	R9	R10	-
Raphitoma smriglioi Pusateri & Giannuzzi-Savelli, 2013	R14	R14	-	-	-
Raphitoma sophiae Kontakidis & Polyzoulis, 2019	-	**FR**	-	-	-
Raphitoma spadiana Pusateri & Giannuzzi-Savelli, 2012	R5	**FR**	-	-	-

R1: Aslan-Cihangir and Ovalis, 2013; R2: Bitlis-Bakır et al., 2012; R3: Buzzurro and Greppi, 1996; R4: Demir, 2003; R5: Giannuzzi-Savelli et al., 2018a; R6: Giannuzzi-Savelli et al., 2019; R7: Kabasakal et al., 2005; R8: Marion, 1898; R9: Müller, 1985; R10: Ostroumoff, 1896; R11: Öztürk, 2001; R12: Öztürk et al., 2014; R13: Palaryi, 1917; R14: Pusateri et al., 2013; R15: Pusateri et al., 2017a; R 16: Pusateri et al., 2018.

et al. (2018b) as *R. griseomaculata*, which is a raphitomid with paucispiral protoconch as *R. alternans*. It seems that *R. alternans* is distributed in the central Mediterranean only. On the other hand, *Raphitoma pruinosa*, which is one of the typical species of the Gulf of Gabés (Giannuzi-Savelli et al., 2018a) and was previously reported from the Cypriot coast by Buzzurro and Greppi (1997), appears to have a restricted distribution in the eastern Mediterranean. It was only recorded from the Sea of Marmara (Demir, 2003) along the Turkish coasts, but sometimes in the past, its identification has been mistaken for *Raphitoma papillosa*, both possessing a paucispiral protoconch (Giannuzzi-Savelli et al., 2018a:52). *Raphitoma alleryana*, which was reported from the Aegean coast of Turkey (Demir 2003:114) (Table 1), seems to be restricted only to the Thyrrhenian and central Mediterranean Seas.

Raphitoma mirabilis Pallary (1904), was reported as *Philbertia mirabilis* by Demir (2003:114) from the Turkish Levantine and Aegean coasts. But due to this single record from the eastern Mediterranean and the frequent confusions in the identification of some raphitomid species, the species should be tentatively included within the faunistic inventory of the area.

Along the Turkish coast, *Raphitoma laviae* was previously reported by Öztürk (2001: 55) from the Aegean Sea, but later on, the identified specimen checked according to Pusateri et al. (2017b), it appeared that the specimen belongs to *R. atropurpurea*. On the other hand, *Raphitoma contigua* mentioned in the checklist by Öztürk et al. (2014:867) based on Demir (2003) is an inaccurate datum.

As a result, 23 raphitomid species have been dealt within the present study out of 32 species known from the Turkish coasts (Table 1). The presence of some suspicious species along the Turkish costs reported in several studies carried out in the past, will probably keep its mystery until new records of the doubtful species.

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