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The Mollusca of Galicia Bank (NE Atlantic Ocean)

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Abstract. An illustrated checklist of the Mollusca of Galicia Bank, a large and deep seamount off the NW Iberian Peninsula, is provided. The studied material was collected in 8 samples of SEAMOUNT 1 cruise (1987), 7 samples of ECOMARG 0709 (2009) and 36 samples of BANGAL 0711 (2011), between 615 and 1768 m. A total of 212 species are known to occur at the Galicia Bank (1 Monoplacophora, 7 Solenogastres, 3 Polyplacophora, 132 Gastropoda, 54 Bivalvia, 6 Scaphopoda, and 9 Cephalopoda), 21 of which from previous studies only. Four species are described as new, 34 species are first record in Spanish waters and another 20 species first record for the Northern Spanish waters. Over 7500 specimens, representing 104 species, were collected alive, and 87 species were represented by empty shells only. Only 53 species were detected in both SEAMOUNT 1 and BANGAL 0711; most of the species are rare and more species can be expected if exploration is continued. There is a marked difference in species composition between the summit platform (615–1000 m) and the deeper part below 1500 m, with some genera (e.g., *Colus* and *Limopsis*) represented by alternative species. Endemism, if any, is very low and most of the species are widespread.

Keywords. Seamount, marine protected area, benthos, taxonomy, species richness.

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Introduction

Seamounts, such as Galicia Bank, are habitats of special interest due to their peculiar hydrological and sedimentary dynamics, and the fact that they harbour extensive hard substrate outcrops in deep-sea areas where soft substrates are usually prevalent (Wilson & Kaufmann 1987; Rogers 1994, 2018; Wessel 2007). Seamounts are defined as undersea topographic elements that rise more than 1000 meters above the surrounding seafloor, but currently there is a trend to use this term for reliefs of lesser elevation (Staudigel *et al.* 2010; Vázquez *et al.* 2015; Rogers 2018). From a biogeographical point of view they are as isolated as the emerged islands, taking into account that the organisms living on seamounts generally cannot live in the surrounding bathyal or abyssal bottoms and have reached the seamounts through dispersal events. A review on the structure, function and ecology of seamounts can be seen in Clark *et al.* (2010).

There are ca 810 seamounts in the North Atlantic Ocean, most of them along the Mid-Atlantic Ridge (Rogers 1994, 2018; Gubbay 2003). According to the official OSPAR database, 104 seamounts are within its area of competence, 74 of them located within the national Economic Exclusive Zone (EEZ) and only 30 in the High Seas (OSPAR Commission 2010). A total of 46 main seamounts are located along the Iberian margins (Vázquez *et al.* 2015).

The Galicia Bank (hereafter GB), is a large Northeast Atlantic seamount located about 120 nautical miles off NW Spanish coast and separated from the Iberian continental margin by the Galicia Inner Basin of ca 2500 m depth (Fig. 1). It is therefore qualified as a "coastal" seamount in contrast to oceanic seamounts such as the South Azorean Seamount Chain (Surugiu *et al.* 2008). With its summit at 625 m of depth, it can be classified as a deep seamount (White & Mohn 2004).

Because of its difficult access and of its depth, information about the GB has long remained scanty. It was probably known by Galician fishermen for decades, but the available scientific information is recent. The sinking of the 'Prestige' oil tanker in 2002 SW of the GB focused interest in this area and promoted intensive and multidisciplinary studies (e.g., Albaigés *et al.* 2006; Alonso *et al.* 2008; Ercilla & Vilas 2008; Vázquez *et al.* 2008, 2015; Ercilla *et al.* 2011), but knowledge about the biological and ecological aspects of the area is still limited.

The GB had remained off the track of the great explorations of the nineteenth century, which still provide a significant part of our knowledge of deep benthos. Surprisingly, it was discovered only in the mid-twentieth century (Heezen 1959; Black *et al.* 1964) and the first data on its fauna were provided by fisheries surveys carried out with fishing vessels by the Instituto de Investigaciones Marinas of Vigo (IIMV) during 1980–1981 (Rolán Mosquera & Pérez-Gándaras 1981). These preliminary data encouraged that the French SEAMOUNT 1 survey (September/October 1987), essentially directed to other seamounts further to the South (Gorringe, Josephine, Ampère, Lion, Seine), also visited GB (Bouchet & Métivier 1988). Furthermore, during the "FAUNA II" cruise (July 1991) two samples were taken in the upper zone of the GB and some results were published by García-Alvarez *et al.* (2000, 2001), Garcia-Alvarez & Salvini-Plawen (2001), García-Alvarez & Urgorri (2001), Salvini-Plawen (2006), on Solenogastres Gegenbaur, 1878, and Rolán & Suárez (2007) on *Calliostoma* Swainson, 1840.

Within the framework of the OMEX-II (Ocean Margin Exchange) programme (see Lavaleye *et al.* 2002), some data on the meio- and macrofauna community structure in relation to sediment composition of GB were provided by Flach *et al.* (2002), while Duineveld *et al.* (2004) revealed high concentrations of nutrients in the environment and the presence of deep-water corals in the bank's summit platform.

The German R/V *Victor Hensen* visited GB in April–May 1997 during the VH97 cruise, and collected five grab samples on the upper part of the bank between 760 and 880 m. That material was not available to use but provided one species of gastropod described by Engl *et al.* (2021).

In 2009, the Spanish Institute of Oceanography (IEO) carried out the ECOMARG program in several sites of the Iberian margin, including the GB. Also in 2009, the Diva-Artabria II-09 survey within the

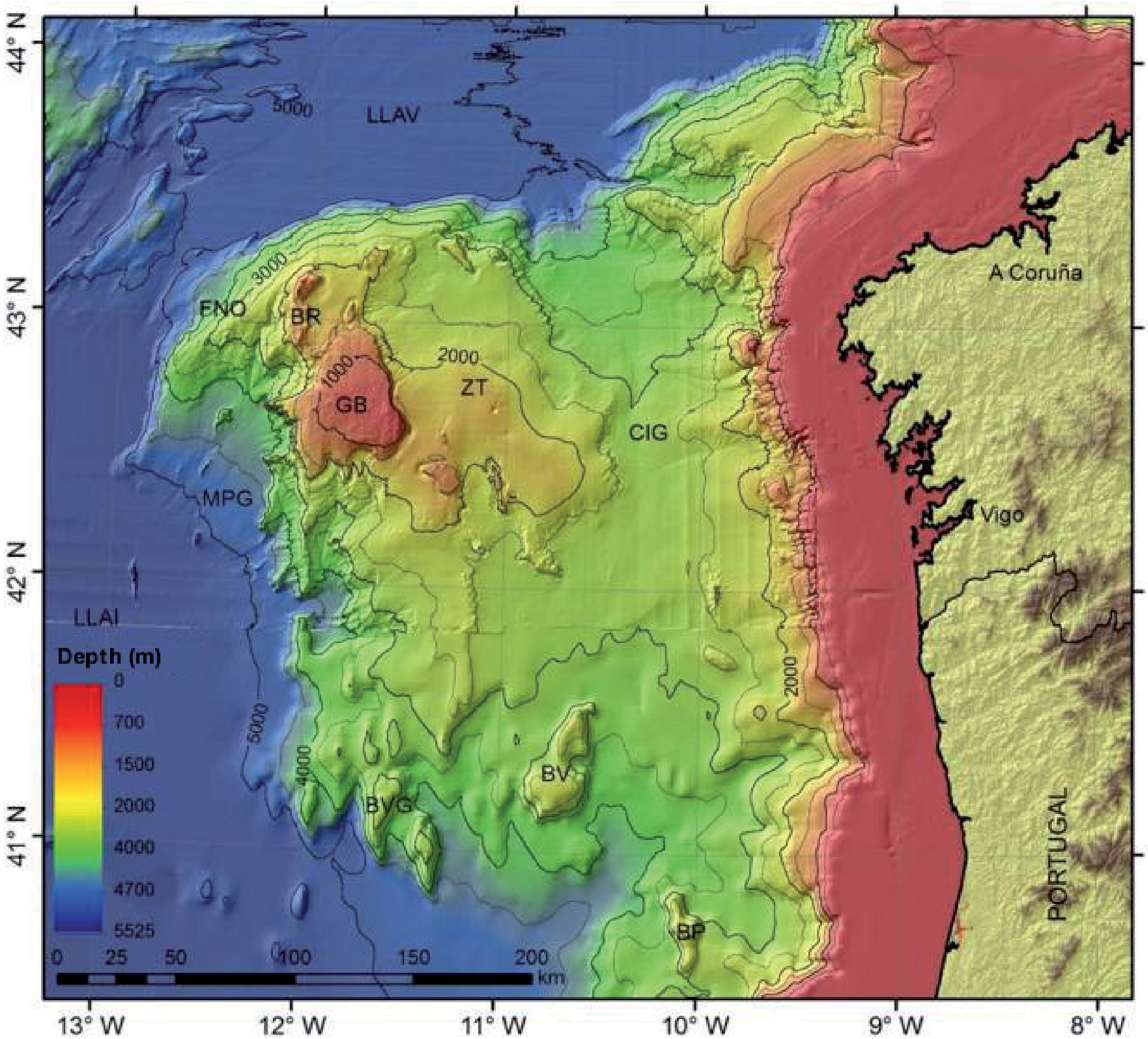

Fig. 1. The NW Iberian continental margin, with situation of the Galicia Bank (hereafter GB) and other geomorphological features of the area: Vasco da Gama Seamounts (BVG), Vigo Bank (BV), Oporto Bank (BP), Galicia Inner Basin (CIG), transition zone (ZT), northwestern flank (FNO), Rucabado and García seamounts (BR), the deep margin of Galicia (MPG), the Bay of Biscay abyssal plain (LLAV) and the Iberian abyssal plain (LLAI). Source: EEZ Project (multibeam echo sounder bathymetry) and GEBCO Digital Atlas.

project "Latitudinal gradients of biodiversity in the deep sea of the Atlantic Ocean" sampled Galicia Bank (Somoza *et al.* 2014), but this material was not available to us.

In recent years, an important effort has been allocated to the study of ten areas of Spanish jurisdictional waters within the LIFE+INDEMARES project "Inventory and designation of marine Natura 2000 areas in the Spanish Sea", whose main objective is to complete the identification of the high seas areas to be included in the Natura 2000 Network of Spain. This project intended to meet the commitments of the Framework Directive of the EU Marine Strategy and Aichi Biodiversity Target 11 of the Convention of Biological Diversity (CBD), which requires "10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas". The Galicia Bank was one of the ten areas prospected and was the objective of the INDEMARES BANGAL 0711 survey (from July 18 to August 10, 2011) with the R/V "*Miguel Oliver*" (see de la Torriente *et al.* 2014 for a general overview). As a follow-up of this programme, GB was formally proposed as a candidate Site of Community Importance (SCI) in July 2014 (Ministerio de Agricultura, Alimentación y Medio Ambiente 2014) and was adopted in the ninth update of the list of Sites of Community Importance for the Atlantic biogeographical region in November 2015. Furthermore, GB is one of the areas under evaluation for habitat monitoring in the European Union's Marine Strategy Framework Directive (2008/56/CE).

Among other reasons, this area was considered relevant for further research and conservation actions because of the presence of well developed and conserved priority habitats catalogued as vulnerable (OSPAR Commission 2008; Council of the European Communities 1992), such as cold-water coral community (reefs of *Lophelia pertusa* (Linnaeus, 1758) [currently *Desmophyllum pertusum*] and *Madrepora oculata* Linnaeus, 1758), and black and bamboo coral aggregations (Duineveld *et al.* 2004; Somoza *et al.* 2014; de la Torriente *et al.* 2014). Besides, the presence of some vulnerable species such as deep-water sharks (Bañón *et al.* 2016) and carnivorous sponges (Cristobo *et al.* 2015) has also been recorded. The presence of vulnerable habitats and threatened species listed on international conventions or lists, such as the Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR) or the International Union for Conservation of Nature (IUCN), is one of the key factors in conservation actions in both Habitats and Marine Strategy EU directives.

Several studies of some animal groups in the GB have been published as a result of the SEAMOUNT 1 or INDEMARES BANGAL 0711 surveys, such as polychaetes (Surugiu *et al.* 2008), decapod crustaceans (Cartes *et al.* 2014), fish (Bañón *et al.* 2016) and bryozoans (Souto *et al.* 2016), and some new species have been described (Baba & Macpherson 2012; Vicente *et al.* 2014; Gofas *et al.* 2014a; Cristobo *et al.* 2015; Souto *et al.* 2016). More recently, a couple of papers on the benthic habitats and communities of GB have been published by Serrano *et al.* (2017a, 2017b).

Molluscs are a conspicuous and important component of the seamount macrobenthos and the marine benthos in general. Several studies on some NE Atlantic seamounts have revealed the molluscan biodiversity richness (Peñas & Rolán 1999; Gofas 2000, 2002, 2005, 2007; Gofas & Beu 2002; Ávila & Malaquias 2003; Dijkstra & Gofas 2004; Krylova 2006; Hoffman *et al.* 2010, 2011a, 2011b, 2020a, 2020b, 2020c; Hoffman & Freiwald 2017; Peñas *et al.* 2019; Gofas & Hoffman 2020). Though molluscs also are a main component of GB benthos, only scattered references on the GB molluscan fauna were included in the context of broader taxonomic works (Rolán Mosquera & Pérez-Gándaras 1981; Rolán Mosquera 1983; Bouchet & Warén 1993; Dijkstra & Gofas 2004; Gofas 2007; Hoffman *et al.* 2019a; Engl *et al*. 2021) or in papers focused on particular species (Warén & Bouchet 1990; Salvini-Plawen 2006; Gofas *et al.* 2014a). Moreover, some mollusc species collected during SEAMOUNT 1 and INDEMARES BANGAL 0711 surveys were recorded by Serrano *et al.* (2017a, 2017b) and de la

Torriente *et al.* (2014), but despite of the fairly abundant material obtained from the above mentioned surveys, an exhaustive list of GB molluscs has not been published yet.

The objective of this paper is to increase the knowledge of the molluscan biodiversity of the GB synthesizing the information at hand, based essentially on samples collected by INDEMARES BANGAL 0711 and SEAMOUNT 1 surveys, but also on some other cruises and the published data from other sources.

Material and methods

Study area

The Galicia Bank is located entirely within the bathyal level, with an extensive summit platform culminating at 625 m depth. It is irregularly shaped, with a length of ca 60 km in the direction of its E–W axis and 84 km in the direction of the N–S axis, with the northern and western parts gently sloping towards the abyssal plain and the eastern edge forming a cliff to ca 1800 m. The bank is surrounded to the west and southwest by the Iberian Abyssal Plain, to the north by the Bay of Biscay Abyssal Plain, both deeper than 5000 m, and to the east by the Interior Basin of Galicia, with somewhat shallower depths of about 2500 m (Fig. 1). To the N–NW Rucabado and García Seamounts are located connecting with the Galicia escarpment, named the Northwestern Flank by Vázquez *et al.* (2008, 2015). The area delimited by the 1600 m isobath covers 2368 km^2.

Regarding water masses in contact with the sea bottom (Fiúza *et al.* 1998), the bank receives from the south some quite diluted waters of deep Mediterranean origin (Mediterranean Outflow Water, MOW) in two intervals of depth, the upper core centered around 780 m and the lower and more saline core around 1100–1200 m. A wedge of less saline and colder water from the Labrador (Labrador Sea Water, LSW), which lies between 1500 and 1800 m and moves southwards, locally accentuates the gradient with the deepest Mediterranean outflow. In the still deeper part, North Atlantic Water (NADW) has a core located around 2500–3000 m (de la Torriente *et al.* 2014). At the top of the bank, temperature was 11.15–11.17°C, at the bank break around 10.8°C, and in the deepest part (about 1600 m) drops to 6.07°C (Serrano *et al.* 2017a).

The substrate of the GB consists of basaltic lavas and oceanic crust, covered by sediments which are largely of pelagic origin (Ercilla *et al.* 2011). The Galicia Bank forms, along with the smaller banks of Vasco da Gama, Vigo and Oporto, a barrier relatively parallel to the coast. Towards the coast, the Interior Basin of Galicia captures the majority of the sediments originating from the continent (most of them are fluvial contributions of the Miño and Duero river basins) and channels them to the north and the south, preventing their arrival to Galicia Bank. Thus, the only sources of sediment on the bank itself, apart from the erosion of the substrate, are the remains of carbonate skeletons of the organisms that live on it, and the shells of small planktonic organisms which, after their death, sink to the bottom.

The platform located at the top of the bank is subject to strong currents (up to 30 cm s^{-1}). As a consequence of the obstacle which the current encounters against the seamount, stable eddies known as Taylor columns are formed, favouring a strong vertical mixing, a great primary production in superficial waters, and the retention of this production in the area. This facilitates the presence of aggregations of fish, especially large pelagic species, as well as of cetaceans and seabirds. These conditions also favour the development of large benthic species, especially filter-feeders such as corals and sponges which in turn contribute to increase structural complexity (de la Torriente *et al.* 2014).

The main benthic habitats and communities of the GB were described by Serrano *et al.* (2017a, 2017b). A large part of the summit (the shallowest part) is covered by a field of bioclastic sand waves with a medium grain size and low organic matter covering a total area of 215 km^2 (Duineveld *et al.* 2004;

Somoza *et al.* 2014). This sedimentary bottom is mainly dominated by ophiuroids (Serrano *et al.* 2017a). Somewhat deeper in the summit (at a depth of 800–1000 m) some semi-buried and exposed mounds of dead cold-water corals and coral debris appear with isolated patches of living reef of *Desmophyllum pertusum* (formerly known as *Lophelia pertusa*) and *Madrepora oculata* (Somoza *et al.* 2014). A seabed with polymetallic nodules was located south of the top of the bank at 800–900 m (de la Torriente *et al.* 2014). The bank break at the border of the summit, in the range 1000–1200 m, is characterized by rocky outcrops and an assemblage dominated by the urchin *Cidaris cidaris* Linnaeus, 1758 and the sponge *Thenea muricata* (Bowerbank, 1858). The flanks around the bank are partially covered by fine sands with the highest contents of organic matter. On the barren basalt hardgrounds black and bamboo corals, gorgonians and sponges form different assemblages. The deepest assemblage (1400–1800 m) is dominated by the holothurian *Benthogone rosea* Koehler, 1895. True and well-developed reefs of living cold-water corals (CWC hereafter) were located in Rucabado seamount in the depth range 1100–1200 m (Serrano *et al.* 2017b).

Material studied and sampling

The major part of the material studied was collected during the INDEMARES BANGAL 0711 survey. Additional material from previous cruises (fishing surveys of IIMV, 1980–1981; SEAMOUNT 1, 1987; ECOMARG 0709, 2009) was also studied, and previously published records (most of them based on SEAMOUNT 1 and FAUNA II samples) have been added to the species list.

In the INDEMARES BANGAL 0711 survey (chief scientist Alberto Serrano, Instituto Español de Oceanografía), operations were carried out with a rock dredge (15 hauls, between 779 and 1697 m deep), a beam trawl (11 hauls, between 744 and 1720 m deep), and an otter trawl (9 hauls, between 751 and 1764 m depth). A suprabenthic sled, pelagic nets, underwater video recording and CTD measurements were also performed. The processing of the biological samples was similar to the previous SEAMOUNT 1 and FAUNA II cruises. The coarse fractions, usually above 10 mm, were mostly sorted on board to major taxonomic groups and then separated to the species level in the laboratory. The finest fractions were preserved on board as bulk samples, and later sieved through 5, 2, 1 and 0.5 mm meshes, for separation under a stereoscopic microscope. Live animals were drawn and photographed on board whenever possible. Most of the material obtained consisted of shells, which have been taken into account in the recording of molluscs. The molluscan specimens of the INDEMARES surveys are currently at the laboratories of Universidad Autónoma de Madrid and Universidad de Málaga, and are to be deposited after their study in the Museo Nacional de Ciencias Naturales, Madrid (MNCN).

The "SEAMOUNT 1" cruise took place in September and October 1987 (chief scientist Philippe Bouchet, Museum national d'Histoire naturelle, Paris, hereafter MNHN), on board R/V "*Le Noroit*". Operations were carried out using a rock dredge (station numbers beginning with DW, see Table 1) or with a beam trawl (CP), and samples were processed as described in the preceding paragraph. The material of the "SEAMOUNT 1" cruise is shared between the Swedish Museum of Natural History of Stockholm (SMNH), and MNHN.

The ECOMARG 0709 cruise (chief scientist Francisco Sánchez, Instituto Español de Oceanografía) visited Le Danois Bank (also known as 'El Cachucho'), Cañón de Avilés and Galicia Bank, on board R/V "*Cornide de Saavedra*" in July 2009. On Galicia Bank, benthic operations included one rock dredge, 5 beam trawl and 3 otter trawl operations, all of them restricted to the summit platform of the bank (between 615 and 833 m depth). A preliminary report on the molluscs was presented by Salas *et al.* (2011).

Table 1 shows data, geographical coordinates and depth of the stations sampled and Fig. 2 shows their situation in the GB.

All live-taken specimens from INDEMARES BANGAL 0711 were quantified and used for an analysis of the affinity between samples. Most of these were stored in 70° ethanol and are available to the scientific community for further studies, including DNA sequencing. The SEAMOUNT 1 material has been sorted at the species level, mostly at Swedish Museum of Natural History, Stockholm, under the supervision of Anders Warén, but the abundance of each species and the proportion of live collected specimens have not been systematically quantified. Most of the molluscan material from all surveys consisted of shells and was stored dry. The empty shells in good condition have been considered, since they represent the potentially living fauna in bathyal areas where the population density of living individuals is low.

Illustrations are herein provided (Figs 3–44) for most of the species and emphasis is placed on those which are characteristic of certain habitats, in order to provide a tool that facilitates future monitoring of

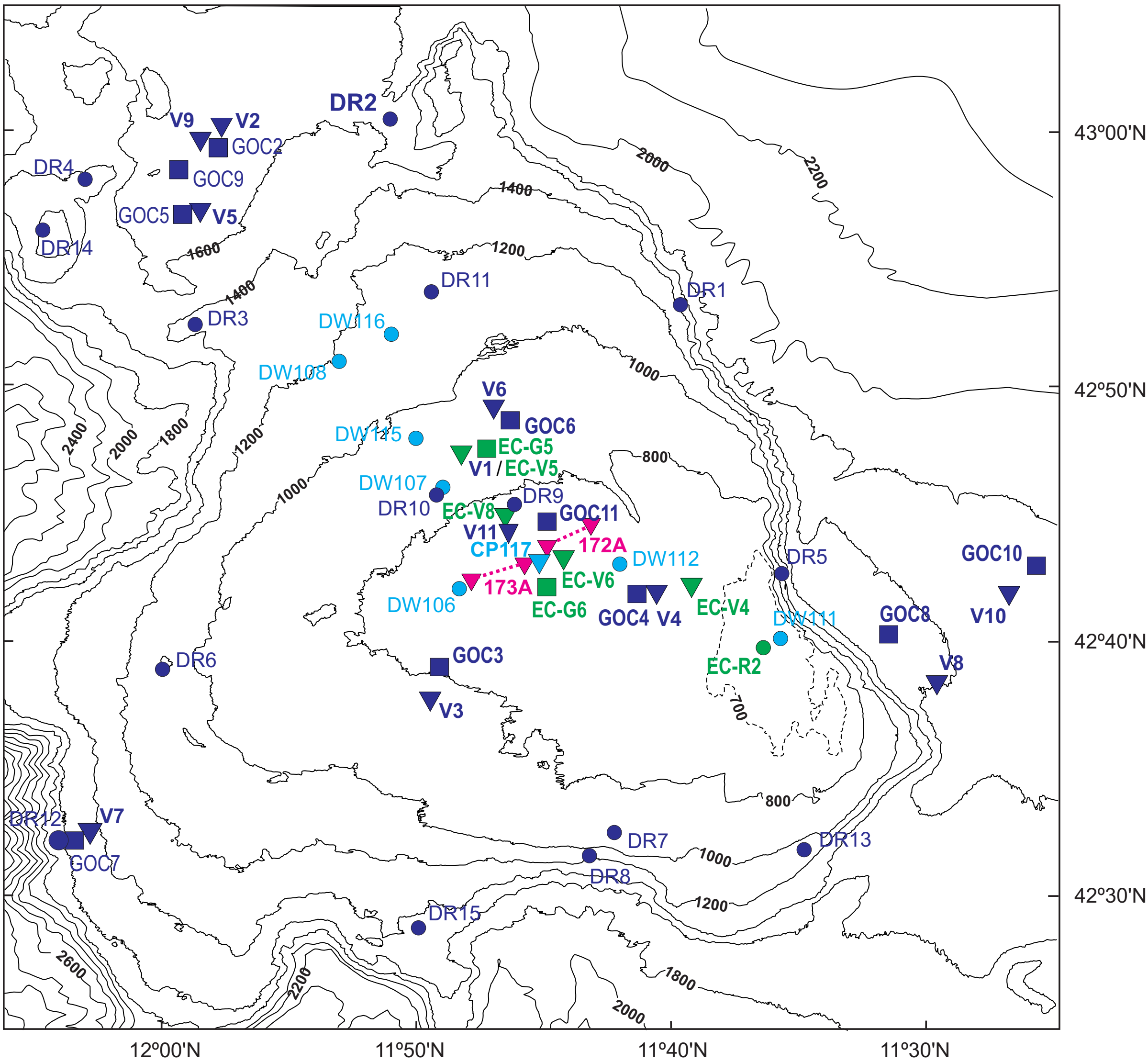

Fig. 2. Location of benthic samples used in this paper: SEAMOUNT 1 (turquoise), FAUNA II (red), ECOMARG 0709 (green) and INDEMARES BANGAL 0711 (deep blue). Symbols for sampling gears: rock dredge (circles; DW, R or DR), beam trawl (triangles; A, V or CP), otter trawl (squares; G or GOC). Isobaths every 200 m except for shallowest at 700 m; isobaths on the bank proper down to 2000 m from multibeam bathymetry (EEZ Project), completed with GEBCO regional bathymetry for the surroundings.

Table 1 (continued on next page). Sampling stations with their corresponding data, geographical coordinates and depth (m). Codes for sampling gears: DW, R, DR = rock dredge; A, CP, V = beam trawl; G, GOC = otter trawl.

Cruise	Station	Latitude	Longitude	Depth (m)	Date	Abbreviation in Table 2
SEAMOUNT 1	DW106	42°42′ N	11°48′ W	765	18 Oct. 1987	DW106
	DW107	42°46′ N	11°49′ W	850–870	18 Oct. 1987	DW107
	DW108	42°51′ N	11°53′ W	1110–1125	19 Oct. 1987	DW108
	DW111	42°40′ N	11°36′ W	675–685	19 Oct. 1987	DW111
	DW112	42°43′ N	11°42′ W	760–770	19 Oct. 1987	DW112
	DW115	42°48′ N	11°50′ W	880–885	19 Oct. 1987	DW115
	DW116	42°52′ N	11°51′ W	985–1000	20 Oct. 1987	DW116
	CP117	42°43′ N	11°45′ W	770	20 Oct. 1987	CP117
FAUNA II	172A	42°43.65′–42°44.70′ N,	11°44,99′–11°43.36′ W	761–768	28 Jun. 1991	FI-II 172A
	173A	42°42.37′ –42°43.00′ N	11°47.87′–11°45.78′ W	760–769	28 Jun. 1991	FI-II 173A
ECOMARG 0709	R2	42°39.95′ N	11°36.42′ W	615	23 Jul. 2009	ECR2
	V4	42°42.42′ N	11°39.31′ W	735	22 Jul. 2009	ECV4
	V5	42°47.40′ N	11°48.26′ W	876	23 Jul. 2009	ECV5
	V6	42°43.26′ N	11°44.23′ W	766	23 Jul. 2009	ECV6
	V8	42°45.01′ N	11°46.58′ W	782	25 Jul. 2009	ECV8
	G5	42°47.33′ N	11°47.45′ W	863	23 Jul. 2009	ECG5
	G6	42°42.17′ N	11°44.88′ W	764	23 Jul. 2009	ECG6
BANGAL 0711	DR1	42°53.21′ N	11°39.69′ W	1414	20 Jul. 2011	DR1
	DR2	43°00.36′ N	11°51.00′ W	1697	20 Jul. 2011	DR2
	DR3	42°52.48′ N	11°58.62′ W	1313	21 Jul. 2011	DR3
	DR4	42°58.42′ N	12°02.98′ W	1288	22 Jul. 2011	DR4
	DR5	42°42.63′ N	11°35.63′ W	1099	23 Jul. 2011	DR5
	DR6	42°38.87′ N	11°59.92′ W	1035	24 Jul. 2011	DR6
	DR7	42°32.39′ N	11°42.35′ W	938	25 Jul. 2011	DR7
	DR8	42°31.60′ N	11°43.26′ W	1138	25 Jul. 2011	DR8
	DR9	42°45.31′ N	11°46.27′ W	779	26 Jul. 2011	DR9
	DR10	42°45.90′ N	11°49.12′ W	826	26 Jul. 2011	DR10
	DR11	42°53.63′ N	11°49.41′ W	1100	4 Aug. 2011	DR11
	DR12	42°32.16′ N	12°03.79′ W	1585	5 Aug. 2011	DR12
	DR13	42°31.88′ N	11°34.73′ W	1046	6 Aug. 2011	DR13
	DR14	42°56.01′ N	12°05.02′ W	1130	7 Aug. 2011	DR14
	DR15	42°28.81′ N	11°50.03′ W	1410	8 Aug. 2011	DR15
	V1	42°47.34′ N	11°48.18′ W	867	26 Jul. 2011	V1
	V2	43°00.12′ N	11°57.67′ W	1706	29 Jul. 2011	V2
	V3	42°37.77′ N	11°49.46′ W	818	30 Jul. 2011	V3
	V4	42°41.94′ N	11°40.58′ W	744	31 Jul. 2011	V4
	V5	42°56.77′ N	11°58.53′ W	1631	2 Aug. 2011	V5
	V6	42°49.19′ N	11°46.89′ W	909	3 Aug. 2011	V6
	V7	42°32.50′ N	12°02.78′ W	1462	5 Aug. 2011	V7

Table 1 (continued). Sampling stations with their corresponding data, geographical coordinates and depth (m). Codes for sampling gears: DW, R, DR = rock dredge; A, CP, V = beam trawl; G, GOC = otter trawl.

Cruise	Station	Latitude	Longitude	Depth (m)	Date	Abbreviation in Table 2
BANGAL 0711	V8	42°38.48′ N	11°29.68′ W	1565	6 Aug. 2011	V8
	V9	42°59.61′ N	11°58.41′ W	1671	7 Aug. 2011	V9
	V10	42°41.87′ N	11°26.71′ W	1720	8 Aug. 2011	V10
	V11	42°44.21′ N	11°46.35′ W	768	9 Aug. 2011	V11
	GOC2	42°59.36′ N	11°57.76′ W	1672	28 Jul. 2011	GOC2
	GOC3	42°38.97′ N	11°49.09′ W	785	30 Jul. 2011	GOC3
	GOC4	42°41.938′ N	11°41.19′ W	751	31 Jul. 2011	GOC4
	GOC5	42°56.81′ N	11°59.08′ W	1656	2 Aug. 2011	GOC5
	GOC6	42°49.13′ N	11°46.59′ W	903	4 Aug. 2011	GOC6
	GOC7	42°32.24′ N	12°03.43′ W	1536	5 Aug. 2011	GOC7
	GOC8	42°40.34′ N	11°31.62′ W	1485	6 Aug. 2011	GOC8
	GOC9	42°58.50′ N	11°59.24′ W	1683	7 Aug. 2011	GOC9
	GOC10	42°42.98′ N	11°25.61′ W	1764	8 Aug. 2011	GOC10
	GOC11	42°44.69′ N	11°44.98′ W	765	9 Aug. 2011	GOC11

this marine protected area. Photographs were taken using a Nikon DXM camera mounted on a binocular stereo microscope, and then different views of the same specimen, focused on distinct planes, were assembled using the Combine ZP software (Hadley 2006). The images were stored in digital format, treated with the software Adobe Photoshop 5 to enhance contrast and clean the background. The detail of figure numbers for each species is given in Table 2. Different views of the same whole shell are always to scale, but not the different shells on the same plate. Shipboard drawings of living animals, made during the SEAMOUNT 1 cruise are presented in Supp. file 1 (Fig. S1)

Scanning electron micrographs were obtained mostly using a JEOL JCC 1100 scanning electron microscope at the Servicios Centrales de Apoyo a la Investigación of University of Málaga. For this, the shells were soaked in a 10% solution of sodium lauryl sulphate prior to a brief cleaning in an ultrasonic cleaner (except for very fragile shells which do not withstand this), then dried and mounted on stubs over an adhesive copper tape, and metallized. After imaging, the shells were unmounted and replaced in the collection with a reference to the image file. Some shells have been imaged with a variable-pressure scanning electron microscope (SEM) Hitachi S-3000N at the Inter-Departmental Research Service (SIDI) of Universidad Autónoma, Madrid, which operates with low vacuum and low voltage and backscatter detector, that allows to work with samples without metallizing.

The identification of the species was carried out using the reference taxonomic bibliography for the NE Atlantic regarding gastropods (Bouchet & Warén 1980, 1985, 1986, 1993; Warén 1989a, 1991, 1992, 1993, 1996; Beck *et al.* 2006; Hoffman *et al.* 2010, 2011a, 2011b, 2019a, 2019b), bivalves (Sanders & Allen 1973, 1977; Allen & Turner 1974; Oliver & Allen 1980a, 1980b; Allen & Morgan 1981; Allen & Hannah 1989; Warén 1989b; Allen *et al.* 1995; Salas 1996; Salas & Gofas 1997; Dijkstra & Gofas 2004; Killeen & Turner 2009; Oliver 2012, 2013) and scaphopods (Steiner & Kabat 2004), but also the classical works reporting on the XIXth century deep-sea expeditions (Jeffreys 1878–1885; Locard 1897–1898; Dautzenberg & Fischer 1896, 1897). Nomenclature and classification were checked against the World Register of Marine Species (WoRMS editorial board 2021). Keys are provided for some species-rich and difficult groups, but it must be taken into account that additional collecting is likely to bring in species not considered here. The new species, and those species which raise taxonomic issues, are given species entries in the main text, with a list of material examined, and a description and/or remarks. Other species of our material are only illustrated, listed in Table 2 and the material examined listed in the Supp. file 2 (Table S1).

The similarity between samples of the INDEMARES BANGAL 0711 cruise was evaluated using both qualitative (presence/absence) and quantitative data (fourth root transformed abundance data) of live-collected specimens per sample; the transformation is meant to mitigate the influence of highly dominant taxa. The Bray-Curtis similarity index was used as a meaningful and robust measure (Clarke 1993) for obtaining a cluster analysis (UPGMA method). A SIMPER (SIMilarity PERcentage) analysis was done in order to know the contribution of the species in the similarity/dissimilarity within and between the same groups of samples. The ANOSIM test, through a "R ANOSIM" value which varies between 1 and -1, indicates whether differences between groups are significant (R ANOSIM value approaching 1 or -1) or not (R ANOSIM value near 0). All these multivariate analyses were executed using the PRIMER6 software from Plymouth Marine Laboratory, UK (Clarke & Warwick 1994).

Regarding biogeographic relationships, distributions were assessed using the abovementioned sources already used for species identifications, and also the Malacolog database (Rosenberg 2009) for occurrence in the Western Atlantic. Six broad areas (the Ibero Moroccan Gulf, Bay of Biscay, the Western margin of the British Isles including Hatton and Rockall banks, the Lusitanian seamounts, the Azores, and the slope of North America) were compared using presence/absence data and the Bray-Curtis similarity index, also using PRIMER6.

Abbreviations

CWC	=	Cold Water Corals community
GB	=	Galicia Bank
sh	=	shell
spm	=	living specimen
v	=	valve

Collections acronyms

CER-MHNS	=	Emilio Rolán collection, now in Museo de Historia Natural, Santiago de Compostela, Spain
MNCN	=	Museo Nacional de Ciencias Naturales, Madrid, Spain
MNHN	=	Muséum national d'Histoire naturelle, Paris, France
NHMUK	=	Natural History Museum, London, United Kingdom

Results

Species diversity

Table 2 is a list of the 212 species (6 of them only identified to genus level) known to occur at the Galicia Bank (1 monoplacophoran, 7 solenogastres, 3 polyplacophorans, 132 gastropods, 54 bivalves, 6 scaphopods, and 9 cephalopods). Four species (*Anatoma corralae* Gofas & Luque sp. nov., *Anekes spiralis* Gofas & Luque sp. nov., *Ringicula crassidens* Gofas & Luque sp. nov., *Acteocina interrogens* Gofas & Luque sp. nov.) are deemed new to science and described below, 34 species are recorded for the first time in Spanish waters (Table 2), of which 6 species were already stated as such by Gofas *et al.* (2017) based on the preliminary study of this material and thereby already included in the official list of marine organisms present in Spain, released in 2017. Another 20 species are recorded for the first time in the North Atlantic demarcation (NOR) of Spanish waters, of which 7 were already stated as such by Gofas *et al.* (2017).

Table 2 (continued on next fifteen pages). List of known mollusc species of the Galicia Bank. Square brackets denote species or samples mentioned in the literature but not examined. Species with names in **bold** are further discussed in the text hereafter. Column "New?" indicates first records in Spanish waters (SPAIN), or in the North Atlantic demarcation (NOR) of Spanish waters (appended "17" if already mentioned in Gofas *et al.* 2017), and species new to science (sp. nov.). Column "Fig." provides reference to the illustration in the present paper; columns "spm" and "sh/v" indicate respectively live-collected specimens and shells, represented on a semi-quantitative abundance scale (1 = rare, 1 to 19; 2 = common, 20 to 99; 3 = abundant, 100 to 999; 4 = 1000 or more); details of the species counts are provided in the Supp. file 2 (Table S1). The subsequent columns indicate the sampling stations of Table 1 in which the species has been collected, ordered by three intervals of depth, with samples containing at least one live-taken specimen in **bold**; ; "Pérez Gándaras" refers to the preliminary IIMV samples collected in the 1980s with no more details. The last column gives bibliographic references mentioning the species on Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Class Monoplacophora Family Neopilinidae								
[*Laevipilina rolani* Warén & Bouchet, 1990]			1	1	**[DW116]**			Rolán Mosquera (1983), as *Acmaea* sp.; Warén & Bouchet (1990)
Class Solenogastres Family Hemimeniidae								
[*Hemimenia cyclomyata* Salvini-Plawen, 2006]			1		**[FI-II 173A]**			Salvini-Plawen (2006)
[*Hemimenia glandulosa* Salvini-Plawen, 2006]			1		**[FI-II 173A]**			Salvini-Plawen (2006)
Family Neopilinidae								
[*Neomenia oscari* Salvini-Plawen, 2006]			1		**[FI-II 173A]**			Salvini-Plawen (2006)
[*Neomenia simplex* Salvini-Plawen, 2006]			1		**[FI-II 173A]**			Salvini-Plawen (2006)
Family Pruvotinidae								
[*Luitfriedia minuta* García-Álvarez & Urgorri, 2001]			1		**[FI-II 173A]**			García-Álvarez & Urgorri (2001)
[*Unciherpia hirsuta* García-Álvarez, Urgorri & Salvini-Plawen, 2001]			1		**[FI-II 173A], DR15**			García-Álvarez *et al.* (2001)
[*Urgorria compostelana* García-Álvarez & Salvini-Plawen, 2001]			1		**[FI-II 173A]**			García-Álvarez *et al.* (2001)
Class Polyplacophora Family Leptochitonidae								
Leptochiton sp.			1			**DW108**	**V6**	
Family Ischnochitonidae								
Connexochiton platynomenus Kaas, 1979	NOR17	3A–B	1		**ECG5**			Gofas *et al.* (2017)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	**New?**	**Fig.**	**spm**	**sh/v**	**<1000 m**	**1000–1500 m**	**>1500 m**	**Reference**
Family Mopaliidae								
Placiphorella atlantica (Verrill & S. Smith, 1882)	NOR17	3 C	1				**DR2**	Gofas *et al.* (2017)
Class Gastropoda ***Subclass Patellogastropoda*** Family Lepetidae								
Propilidium exiguum (Thompson, 1844)		3D–E	1	1	**GOC6**, **V6**	DR15		Rolán Mosquera (1983), as *Propilidium crossei*
Iothia fulva (Müller, 1776)		3F–G		1	V3			
Family Patellidae								
Ansates pellucida (Linnaeus, 1758)				1	V4			
Subclass Vetigastropoda								
Family Lepetellidae								
***Lepetella* sp.**		3H	2	1		DR15	**V2**, V5, **V10**	
Family Addisoniidae								
***Addisonia* cf. *excentrica* (Tiberi, 1855)**		3I	1	1		DW108	**GOC9**	
Family Fissurellidae								
Diodora tenuiclathrata (Seguenza, 1863)		4A–C	1	1	[DW116], ECR2, **V6**, **GOC3**, **GOC6**, **GOC11**			Rolán Mosquera (1983), as *Capiluna edwardsi*; Corral Prado (2006)
Emarginula multistriata Jeffreys, 1882	NOR	4D–E		1	DW111			
Emarginula tuberculosa Libassi, 1859	SPAIN	4F–H		2	DW111, DW116	DW108		Rolán Mosquera (1983), as *Emarginula guernei*
***Emarginula christiaensi* Piani, 1985**		4I–J		1	DW106, DW111, DW116, ECR2	DW108		
Puncturella noachina (Linnaeus, 1771)				1	[DW116], V4			Corral Prado (2006)
Puncturella granulata (Seguenza, 1863)		4K–L		1		DW108		
***Puncturella agger* Watson, 1883**	SPAIN	5A–N	1	1	Pérez Gándaras, DW116, [CP117], V4, **GOC6**			Rolán Mosquera (1983), as *Puncturella profundi*; Corral Prado (2006), as *Cranopsis* sp.

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Fissurisepta granulosa Jeffreys, 1883		6A–B		1	Pérez Gándaras			
Profundisepta alicei (Dautzenberg & H. Fischer, 1897)		6C–D	1	2			**V2**, **V5**	
Profundisepta profundi (Jeffreys, 1877)	NOR	6E–G		1	[DW108], DW116, V4	DR15		Rolán Mosquera (1983), as *Fissurisepta* sp.; Warén & Bouchet (1990), as *Puncturella profundi*; Corral Prado (2006)
Cornisepta rostrata (Seguenza, 1863)		6H–J		1	[DW111], DW116			Corral Prado (2006), as *Cornisepta crossei*
Cornisepta microphyma (Dautzenberg & H. Fischer, 1896)	SPAIN	6K–M		1	Pérez Gándaras, V4			Corral Prado (2006)
Family Anatomidae								
***Anatoma richardi* (Dautzenberg & H. Fischer, 1896)**	NOR17	7A–I	1	2	**DW116**, **GOC6**			Gofas *et al.* (2017), as *A. tenuis*
Anatoma aspera (Philippi, 1844)		8A–C		2	DW116			Rolán Mosquera (1983), as *Scissurella crispata*
Anatoma eximia (Seguenza, 1880)		8D–I	2	2	**DW116**, **V3**, **V4**, **V6**, **V11**			
Anatoma umbilicata (Jeffreys, 1883)		9A–E	1	2			**V2**, **V5**, **V10**	
***Anatoma corralae* sp. nov.**	sp. nov.	10A–H	1	2			**V2**, **V5**, **V10**	INDEMARES preliminary report, misidentified as *Anatoma schioettei* Hoisaeter & Geiger, 2011
Family Calliostomatidae								
Calliostoma leptophyma Dautzenberg & H. Fischer, 1896		11A–B	1	2	**DW115**, **CP117**, **ECV5**, **V1**, **V6**, **V11**	**DR15**		Rolán Mosquera (1983), as *Calliostoma occidentale*; Rolán & Suárez (2007)
Calliostoma maurolici (Seguenza, 1876)		11C–D	1	2	**CP117**, **ECV5**, **ECV6**, **V1**, **V6**, **V11**, **GOC6**			
Family Solariellidae								
Bathymophila micans (Dautzenberg & H. Fischer, 1896)		11G–K	1	1		DR15	**V2**, **V5**, V8	
Family Eucyclidae								
Calliotropis vaillanti (P. Fischer, 1882)		11E–F	2	2		DR15	**V2**, **V5**, **V9**, **V10**	

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Family Seguenziidae								
Seguenzia elegans Jeffreys, 1885		12A–B	1	2			V2, V5, V10	
Seguenzia formosa Jeffreys, 1876	SPAIN	12C–D		1			V10	
Carenzia carinata (Jeffreys, 1877)		12E–G	1	2			V2, V5, V10	
Ancistrobasis reticulata (Philippi, 1844)		12H–J	1	1	**V6**	**DW108**, DR15	V2, V5	Warén & Bouchet (1990)
Asthelys munda (Watson, 1879)	NOR	13A–B		1		DR15		
Basilissopsis watsoni Dautzenberg & H. Fischer, 1897	SPAIN	13C–E		2		DR15	DR12	
Family uncertain (in superfamily Seguenzioidea)								
Vetulonia paucivaricosa (Dautzenberg, 1889)		13F–H	1	1	**DW116**, **V6**	**DW108**, **DR11**	V5	
Akritogyra similis (Jeffreys, 1883)	SPAIN	15A–B		2			V2, V5, V10	
***Moelleriopsis* sp.**		15C–D		1		DW108		
Anekes affinis (Jeffreys, 1883)	NOR	16A–E	1	2			**V5**	
Anekes paucistriata Warén, 1992	NOR	16F–K	1	2			**V5**	
***Anekes spiralis* sp. nov.**	sp. nov.	17A–H	1	1			V2, **V5**	
Mikro minimus (Seguenza, 1876)		14I–L		2			V5	
[*Mikro scalaroides (*Rubio & Rolán, 2013)]				1	[Pérez Gándaras]			Rubio & Rolán (2013)
[*Trenchia biangulata* Rubio & Rolán, 2013]				1	[Pérez Gándaras]			Rubio & Rolán (2013)
[*Trochaclis versiliensis* Warén, Carrozza & Rocchini, 1992]				1	[DW116]			Warén (1992)
Granigyra pruinosa (Jeffreys, 1883)	SPAIN	15G–J	1	1			V2, V5, **V10**	
Granigyra tenera (Jeffreys, 1883)	SPAIN	15K–L	1	1			**V10**	
Granigyra inflata (Warén, 1992)	SPAIN	17I–L	1	1			V2, **V5**, V10	INDEMARES preliminary report, misidentified *Ganesa nitidiuscula* Jeffreys, 1883

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Adeuomphalus sinuosus (Sykes, 1925)	SPAIN	13I–J		1			DR12, V5	
Family Colloniidae								
Cantrainea globuloides (Dautzenberg & H. Fischer, 1896)		13K–L	1	2	**DW116**, **V6**	**DR15**		Warén & Bouchet (1990), as *Leptothyra* sp.
Family Skeneidae								
Cirsonella romettensis (Granata-Grillo, 1877)		14A–C	1	3	**DW116**	**DW108**	V2, **V5**, **V10**	
Seamountiella azorica (Dautzenberg & H. Fischer, 1896)		14D–F	2	3	**DW116**	**DW108**	**V2**, **V5**, **V10**	
***"Skenea" ponsonbyi* (Dautzenberg & H. Fischer, 1896)**	SPAIN	15E–F		1			V2, V5, V9	
Family Pendromidaae								
Rugulina fragilis (G.O. Sars, 1878)		14G–H	1	1			**V2**	
Class Gastropoda ***Subclass Caenogastropoda*** Family Epitoniidae								
Epitonium dallianum (Verrill & S. Smith, 1880)		18A–B		1	DW116, V6			
Cylindriscala guernei (Dautzenberg & de Boury, 1897)	SPAIN	18D		1		DR15	V5	
Cylindriscala thalassae Bouchet & Warén, 1986	SPAIN	18C		1		DR14		
Opaliopsis atlantis (Clench & R.D. Turner, 1952)	NOR	18E		1	DW111			
Iphitus tuberatus Jeffreys, 1883		18F–G	1	3	DW111, DW116	**DW108**		Rolán Mosquera (1983), as *Iphitella tuberata*; Warén & Bouchet (1990)
Eccliseogyra folini (Dautzenberg & de Boury, 1897)	SPAIN	18H–J		1			V2, V10	
Family Eulimidae								
Melanella spiridioni (Dautzenberg & H. Fischer, 1896)	SPAIN	19A–C		1			V2, V5	
Melanella jeffreysi (Tryon, 1886)		19D–E		1			V2	
***Melanella* cf. *myriotrochi* Bouchet & Warén, 1986**	SPAIN	19F–G	1				**V2, V10**	

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
"Eulima" leptozona Dautzenberg & H. Fischer, 1896	SPAIN	19H–I		1	DW111			
"Eulima" anonyma Bouchet & Warén, 1986		19J–K		1			V2	
Eulitoma obtusiuscula Bouchet & Warén, 1986	SPAIN	19L–O		1		DR15		
Batheulima fuscoapicata (Jeffreys, 1884)		20A–B		1		DR15		
Fuscapex cabiochi Bouchet & Warén, 1986	SPAIN17	20C–D	1	1		**DR15**		Gofas *et al.* (2017)
Campyloraphion machaeropsis (Dautzenberg & H. Fischer, 1896)	SPAIN	20E–F		1		DW108	V5	
Bathycrinicola talaena (Dautzenberg & H. Fischer, 1896)	SPAIN	20G–H	1		**DW116**			
***Fusceulima digitalis* Hoffman & Engl, 2021**		20I–J		1	V4	DR15		Rolán Mosquera (1983), as *Balcis* sp.; Hoffman *et al.* 2021
Hemiaclis obtusa Bouchet & Warén, 1986		20K–L	1				**V10**	
Aclis walleri Jeffreys, 1867		20M–N		1			V5, V10	
Costaclis mizon (Watson, 1881)	NOR17	20O–P	1	2			V2, **V10**	Gofas *et al.* (2017)
Family Triphoridae								
Strobiligera brychia (Bouchet & Guillemot, 1978)		21C		1	[DW111], DW116	DW108		Rolán Mosquera (1983), as *Triphora brychia*; Bouchet & Warén (1993)
Strobiligera lubrica Bouchet & Warén, 1993	SPAIN	21A–B	1				**V8**	
Family Newtoniellidae								
Eumetula bouvieri (Dautzenberg & H. Fischer, 1896)		21D		1	[DW111, DW116]	[DW108], DR15		Bouchet & Warén (1993: fig. 1338)
Cerithiella metula (Lovén, 1846)		21E	1	1	DW116	**DW108**	V10	Bouchet & Warén (1993)
Family Rissoidae								
Alvania cimicoides (Forbes, 1844)		21H–I		1	DW 108			Bouchet & Warén (1993)
[*Alvania zetlandica* (Montagu, 1815)]				1	[DW111]			Bouchet & Warén (1993)
Alvania porcupinae Gofas & Warén, 1982		21F–G		1	[DW116]	[DW108], DR15	DR12	Bouchet & Warén (1993)
Gofasia galiciae Bouchet & Warén, 1993		21J–K		1	[DW106, DW111, DW116], V4	DR15		Bouchet & Warén (1993)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Pseudosetia amydralox Bouchet & Warén, 1993				1	[DW111, DW116], V4	DW108		Bouchet & Warén (1993)
Benthonella tenella (Jeffreys, 1869)		21L–N	2	4	V6		**V2**, **V5**, **V10**	
Family Naticidae								
Euspira fusca (de Blainville, 1825)			1	1	**V3**	DW108		
Euspira subplicata (Jeffreys, 1885)		22E–F	1	1	[DW116]	[DW108], DR15	V2, **V10**	Bouchet & Warén (1993), as *Polinices subplicata*
Family Capulidae								
Torellia delicata (Philippi, 1844)		22G–H		1	[DW106, DW116], V4		V5, V10	Bouchet & Warén (1993)
Family Haloceratidae								
Haloceras cingulatum (Verrill, 1884)	SPAIN17	22I–J	1				**V10**	Gofas *et al.* (2017)
Haloceras carinatum (Jeffreys, 1883)		22K		1	DW116			Warén & Bouchet (1991)
Family Ovulidae								
Pedicularia sicula Swainson, 1840		22L–M		2	[DW111], DW116, V3, V4	DW108		Bouchet & Warén (1993)
Family Ranellidae								
Ranella olearium (Linnaeus, 1758)		22A–B	1	1	DW111, DW116, **ECV4**, **ECV6**, **V3**			
Family Cassidae								
Oocorys sulcata P. Fischer, 1883		22C–D		1	DW116		V8	Bouchet & Warén (1993)
Family Muricidae								
Boreotrophon dabneyi (Dautzenberg, 1889)	SPAIN17	23C–F	1	1			**V2**, **V5**, **V9**, **V10**	Gofas *et al.* (2017)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Coralliophila richardi (P. Fischer, 1882)		23A–B	1	1	DW106, DW115, **ECV5**, **ECV6**, **ECV8**, **ECG6**, **GOC3**, **GOC11**			
Family Cystiscidae								
Gibberula abyssicola Locard, 1897		25K–M	2	3	DW111, **DW116**	**DW108**		
Family Belomitridae								
Belomitra quadruplex (Watson, 1882)		25J	1	1			**V10**	
Family Colidae								
Colus gracilis (da Costa, 1778)		24A–G	2	2	**DW111**, **DW112**, **ECR2**, **DR3**, **DR6**, **V3**, **V4**, **V6**	DR15		
Colus jeffreysianus (P. Fischer, 1868)		24H–K	2	2		DR5, DR15	**V2**, **V5**, **V10**	
Kryptos koehleri (Locard, 1896)		23L–M	3	3		DR15	**V2**, **V5**, **V8**, **V10**	
Family Buccinidae								
Troschelia berniciensis (King, 1846)		23J–K	2	1	**DW116**, **ECV4**, **ECV5**, **V6**		V2, V10	
Family Columbellidae								
Amphissa acutecostata (Philippi, 1844)		23G–I	3	3	**DW107**, **DW116**, **CP117**, **V6**	**DW108**, **DR11**, **DR15**, **GOC8**	**V10**	
Mitrella templadoi Gofas, Luque & Urra, 2019				1	DW116			Rolán Mosquera (1983), as *Columbella* sp.
Family Fasciolariidae								
Fusinus bocagei (P. Fischer, 1882)		25N–O	1	1	**DW106**, **DW111**, **ECV4**, **ECV6**, **ECR2**	DW108		

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Family Cancellariidae								
***Brocchinia* cf. *clenchi* Petit, 1986**	N. SP.	25A–E	1	1		DR15	**V2**, V5, **V9**, **V10**	
Brocchinia azorica (Bouchet & Warén, 1985)	SPAIN	25F–I		1			V2, V5	
Family Cochlespiridae								
Aforia serranoi Gofas, Kantor & Luque, 2014		26A–C	1	1			**V10**	
Family Borsoniidae								
Retidrillia pruina (Watson, 1881)		26D–E		1			V2, V5, V10	
Drilliola loprestiana (Calcara, 1841)		26F–G		1	DW116	DW108		
Family Mangeliidae								
Austrobela pyrrhogramma (Dautzenberg & H. Fischer, 1896)		26J–K		2	DW116			
Gymnobela abyssorum (Locard, 1897)		26H–I		1	DW106, DW116			
Gymnobela subaraneosa (Dautzenberg & H. Fischer, 1896)	SPAIN	27I–J		2	DW111, DW116	DW108		
Pleurotomella packardii Verrill, 1872		27C–D	1	1			**V2**, **V10**	
Pleurotomella coelorhaphe (Dautzenberg & H. Fischer, 1896)	NOR	27K–L		1	DW111, DW116	DW108		
Pleurotomella demosia (Dautzenberg & H. Fischer, 1896)	NOR	27O–P		1	DW111, DW116	DW108		
Pleurotomella eurybrocha (Dautzenberg & H. Fischer, 1896)	NOR	27M–N		2	DW111, DW116	DW108		
Pleurotomella gibbera Bouchet & Warén, 1980	NOR	27G–H		2	DW111, DW116, V6			
Neopleurotomoides callembryon (Dautzenberg & H. Fischer, 1896)		27E–F		3	DW111, DW116	DW108		
Kurtziella serga (Dall, 1881)		27A–B		2	DW106, DW115, DW116	DW108		

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Teretia teres (Reeve, 1844)		26N		1	DW106, DW116			
Teretia megalembryon (Dautzenberg & H. Fischer, 1896)	NOR	26L–M		1	DW116	DW108	V2	
Class Gastropoda ***Subclass Heterobranchia*** Family Architectonicidae								
Solatisonax hemisphaerica (Seguenza, 1876)	NOR	28A–C		1	V6			
Family Cimidae								
Atomiscala islandica Warén, 1989	SPAIN	29A–B		1		DR15		
Family Pyramidellidae								
Eulimella sp.		28I–J	1				**V10**	
***Turbonilla* cf. *paucistriata* (Jeffreys, 1884)**		28H	1	1			**V5**, V10	
Tibersyrnola unifasciata (Forbes, 1844)		28K–L		1	V4, V6			
***Tiberia* sp.**		28D–F	1	1			**V10**	
Family Acteonidae								
Acteon monterosatoi Dautzenberg, 1889		29D–E		1	DW111, DW116			
Crenilabium exile (Jeffreys, 1870)		29C		1	DW116	DW108	V10	
Family Ringiculidae								
***Ringicula nitida* Verrill, 1872**		29F–G		1			V2, V5, V9	
***Ringicula crassidens* sp. nov.**	sp. nov.	29H–K		1	V4	DR15		Rolán Mosquera (1983) as *R. blanchardi*?
Family Scaphandridae								
Scaphander punctostriatus (Mighels & C.B. Adams, 1842)		30A–C	3	4			**V2**, **V5**, V8, V9, **V10**	
Family Laonidae								
Laona quadrata (Wood, 1839)		30D–E	1	2		**V7**	**V2**, **V5**, **V10**	

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Family Retusidae								
Pyrunculus ovatus (Jeffreys, 1871)		30F–G	1	2	V6		**V2**, V5, V10	
Family uncertain (in Order Cephalaspidea)								
***Cylichnium oliviforme* (Watson, 1883)**		30H–J		1			V5, V10	
Family Tornatinidae								
***Acteocina interrogens* sp. nov.**	sp. nov.	30K–L		1	V4			
Class Bivalvia ***Subclass Protobranchia*** Family Nuculidae								
Nucula tumidula Malm, 1861		31A–B	1				**V2**, **V5**	
Nucula atacellana Schenck, 1939		31C–D	1				**V2**, **V10**	
Ennucula corbuloides (Seguenza, 1877)		31E–F	2	2			**V2**, **V5**, **V10**	
Family Nuculanidae/Yoldiidae								
Ledella messanensis (Jeffreys, 1870)		32A–B	3	2			**V2**, V5, **V10**	
***Ledella* cf. *orixa* (Dall, 1927)**	SPAIN	32C–D		1	V3, V4		V5	
Yoldiella semistriata (Jeffreys, 1879)	SPAIN	32G–H		1			V2, V5, V10	
***Yoldiella valorousae* Killeen & J.A. Turner, 2009**		32I–J	1	1			**V2**, V5, V10, DR12	
Family Tindariidae								
Tindaria sericea (Jeffreys, 1876)	SPAIN	31G–I	1	1			V2, **V5**	
Family Pristiglomidae								
***Pristigloma minima* (Seguenza, 1877)**		31J–K		1	DW111, V4		V2	Hoffman & Freiwald (2017)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Class Bivalvia ***Subclass Autobranchia*** Family Arcidae								
Asperarca nodulosa (Müller, 1776)		33A–D	3	2	DW106, **DW107**, DW111, **CP117**, **ECV5**, **ECV6**, **ECV8**, **ECG5**, **GOC3**, **GOC6**, **V1**, **V6**, **V11**	**DW108**, **DR3**, **DR5**, **DR6**, **DR7**, **DR8**, **DR11**, **DR14**, **DR15**, **V7**		
Bathyarca pectunculoides (Scacchi, 1835)		33E–G	1	1	DW116, V3, V4, V11	**DW108**		Rolán *et al.* (1990), as *Bathyarca grenophia*; Warén & Bouchet (1990)
Bathyarca philippiana (Nyst, 1848)		33H–J	2	2	DW106, **DW111**, **ECV4**, **V4**			
Family Limopsidae								
Limopsis cristata Jeffreys, 1876		34D–F	4	3			**V2**, **V5**, **V8**, **V9**, **V10**	
Limopsis minuta (Philippi, 1836)		34A–C	3	3	**DW106**, **DW111**, **DW115**, **DW116**, **ECV4**, **V3**, **V4**, **V6**, **V11**		V5	
Family Mytilidae								
Dacrydium wareni Gofas & Salas, 1997		34G–H	2	1	**DW111**, **DW116**, **CP117**, **GOC6**, **V6**	**DW108**		Rolán *et al.* (1990), as *Dacrydium vitreum*; Salas & Gofas (1997)
Dacrydium ockelmanni Mattson & Warén, 1977		34I–K	2	1		DR15	**V2**, V5, **V10**	
Family Propeamussiidae								
Propeamussium lucidum (Jeffreys in Wyville-Thomson, 1873)		35A–C	3	2		[DW108], V7	**V5**, **V8**, **V9**	Rolán *et al.* (1990); Dijkstra & Gofas (2004)
Parvamussium propinquum (E.A. Smith, 1885)	NOR17	35D–F	3	3			**V2**, **V5**, **V9**, **V10**	

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Catillopecten eucymatus (Dall, 1898)		35G–I	1	1	[**DW116**]	[**DW108**], **V7**	V5, **V8**, DR12	Dijkstra & Gofas (2004)
Cyclopecten antiquatus (Philippi, 1844)		35J–L	1	1	[DW116]	[**DW108**], **V7**		Rolán *et al.* (1990), as *Cyclopeccten hoskynsi*; Dijkstra & Gofas (2004)
Family Pectinidae								
Pseudamussium alicei (Dautzenberg & H. Fischer, 1897)			1	1	[**DW106**, DW111]			Dijkstra & Gofas (2004)
Pseudamussium sulcatum (Muller, 1776)		36A–C	1	1	[**DW111**, **DW116**, **CP117**], **ECG5**			
Aequipecten opercularis (Linnaeus, 1758)				1			V8	
Delectopecten vitreus (Gmelin, 1791)		36D–F	1	1	[**DW106**, **DW116**, **CP117**], **ECV5**, **GOC3**, **V1**	[**DW108**], **DR5**, **DR8**	**V10**	
Hyalopecten pudicus (E.A. Smith, 1885)		36G–H		1		DR4, DR15		
Family Spondylidae								
Spondylus gussonii Costa, 1830		37A–C	1	1	**DW111**, **ECV5**, **ECV8**, **ECR2**, **GOC3**, **GOC6**, **GOC11**, **V1**, **V6**, **V11**	**DR6**		
Family Anomiidae								
Heteranomia squamula (Linnaeus, 1758)		36I–J	1	1	**DW106**, **DW111**, **DW116**, **V11**			Rolán *et al.* (1990), as *Pododesmus* sp.
Family Limidae								
Lima marioni P. Fischer, 1882		37D–F	3	1	**ECV5**, **ECV6**, **GOC3**, **GOC6**, **GOC11**, **V1**, **V6**, **V11**			
Limatula laminifera (E.A. Smith, 1885)	SPAIN17	37G–H	2	2			**V2**, **V5**	Gofas *et al.* (2017)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Family Gryphaeidae								
Neopycnodonte zibrowii Gofas, Salas & Taviani, 2009				1	CP117, ECR2			
Family Astartidae								
Astarte sulcata (da Costa, 1778)				1		DW108		Rolán *et al.* (1990)
Family Thyasiridae								
Thyasira succisa (Jeffreys, 1876)		38A–C	1	2	**DW111**, **DW116**, **CP117**, **V3**, **V4**, **V6**, **V11**	**DW108**		
Family Veneridae								
Timoclea ovata (Pennant, 1777)				1		DW108		
Family Lasaeidae								
Syssitomya pourtalesiana Oliver, 2012	SPAIN17	38D–F	1	1			**V5**	Gofas *et al.* (2017)
Draculamya porobranchiata Oliver & Lützen, 2011	NOR	38G–I		1	V4			
Montacuta subsriata (Montagu, 1808)				1	V4			
Family Basterotiidae								
Atopomya dolobrata Oliver, 2013	SPAIN	38J–L		1	DW116, V3	DW108		
Family Poromyidae								
Poromya granulata (Nyst & Westendorp, 1839)		39A–D	1	1	DW106, DW115, V3, V4, V6, V11	V7		
Family Lyonsiellidae								
Lyonsiella abyssicola (G.O. Sars, 1872)	NOR17	39H–J	2	2			**V2**, **V5**, **V10**	Gofas *et al.* (2017)
Policordia gemma **(Verrill, 1880)**		39E–F	1	2			V2, V5, **V8**, **V10**	
Policordia **sp.**		39G	1	1			**V10**	Gofas *et al.* (2017), as *Policordia atlantica*
Family Verticordiidae								
Halicardia flexuosa Verrill & S. Smith, 1881	SPAIN17	40A–D		1			V10	Gofas *et al.* (2017)

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Halicardia angulata (Jeffreys, 1882)	NOR	40J–K		1	V3			
Haliris granulata (Seguenza, 1860)		40E–G		2	DW106, DW111, DW112, V3, V4, V6, V11		V10	Rolán *et al.* (1990) as *Haliris lamothei* (Dautzenberg & Fischer, 1897)
Spinosipella acuticostata (Philippi, 1844)		40H–I		2	**DW106**, **DW112**, **DW115**, **ECV5**, **V3**, **V4**, **V6**			Rolán *et al.* (1990), as *Verticordia acuticostata*
Family Cuspidariidae								
***Cuspidaria* cf. *rostrata* (Spengler, 1793)**		42G–I		1	V3, V4			Rolán *et al.* (1990), as *Cuspidaria capensis*
***Myonera paucistriata* Dall, 1886**		41A–C	1	1			**V10**	Gofas *et al.* (2017), as *Myonera angulata*
Jeffreysomya truncata (Jeffreys, 1882)		41D–F		1	V4		V5	
Rhinoclama teres (Jeffreys, 1882)		42A–C	1	2	V3	V7	**V2**, **V5**, V9, **V10**	
Rhinoclama semistrigosa (Jeffreys, 1882)		42D–F		1	V6	V7	V2	
Cardiomya cadiziana Huber, 2010		41G–I	1	1	DW106, V3, V4, V6	V7		Rolán *et al.* (1990), as *Cuspidaria curta*
Family Halonymphidae								
Halonympha depressa (Jeffreys, 1882)		43A–C	2	2	V3, V4, V6		**V2**, **V5**	Rolán *et al.* (1990), as *Halonympha ledaeformis*
Family Protocuspidariidae								
***Protocuspidaria verityi* Allen & Morgan, 1981**		43D–G	1	1	V3		**V2**, V9	Gofas *et al.* (2017) as *Protocuspidaria colpodes*
Protocuspidaria simplis Allen & Morgan, 1981	NOR	43H–K		1			V10	
Class Scaphopoda Family Dentaliidae								
Antalis agilis (M. Sars in G.O. Sars, 1872)		44D–F	2	2	**DW111**, **ECV4**, **ECV5**, **V1**, **V3**, **V4**, **V6**		**V5**	
Fissidentalium capillosum (Jeffreys, 1877)		44A–C	3	1			**V2**, **V5**, **V8**, **V9**, **V10**	

Table 2 (continued). List of known mollusc species of the Galicia Bank.

Species	New?	Fig.	spm	sh/v	<1000 m	1000–1500 m	>1500 m	Reference
Family Entalinidae								
Bathoxiphus ensiculus (Jeffreys, 1877)	NOR17	44G–H	4	2			**V2**, **V5**, **V8**, **V9**, **V10**	
Family Pulsellidae								
Pulsellum lofotense (M. Sars, 1865)		44L	2	1			**V2**, DR12	
Family Gadilidae								
Cadulus artatus Locard, 1897		44K	1	2	V3	DW108	**V2**, **V5**, DR12	
Cadulus monterosatoi Locard, 1897		44I–J	1	1		DW108	**V2**, **V9**, DR12	
Class Cephalopoda Family Ommastrephidae								
[*Todarodes sagittatus* (Lamarck, 1798)]			1				[**GOC9**, **GOC11**]	Valeiras *et al.* (2012)
Family Stauroteuthidae								
[*Stauroteuthis syrtensis* Verrill, 1879]			1			[**GOC8**]	[**GOC10**]	Valeiras *et al.* (2012)
Family Cranchiidae								
[*Teuthowenia megalops* (Prosch, 1847)]			1			[**GOC8**]		Valeiras *et al.* (2012) [abstract only]
[*Megalocranchia speculator* (Chun, 1906)]								Valeiras *et al.* (2012) [abstract only]
[*Taonius pavo* (Lesueur, 1821)]							[**GOC10**]	Valeiras *et al.* (2012) [poster only]
Family Gonatidae								
[*Gonatus steenstrupi* Kristensen, 1981]			1			[**GOC8**]	[**GOC9**]	Valeiras *et al.* (2012)
Family Mastigoteuthidae								
[*Mastigoteuthis* aff. *hjorti* Chun, 1913]			1			[**GOC8**]		Valeiras *et al.* (2012)
Family Opisthoteuthidae								
[*Opisthoteuthis grimaldii* (Joubin, 1903)]			1			[**GOC8**]	[**GOC9**]	Valeiras *et al.* (2012)
Family Megaleledonidae								
[*Graneledone verrucosa* (Verrill, 1881)]			1				[**GOC10**]	Valeiras *et al.* (2012)

Samples examined for this study yielded over 7500 specimens collected alive, representing 104 species (99 identified at the species level, 5 at the genus level only), as well as a significant number of shells which were only scored on a semi-quantitative scale (Table 2). Of our material, there are 87 species represented by empty shells only, whereas eight species (the three Polyplacophora, and *Strobiligera lubrica*, *Melanella* cf. *myriotrochi*, *Hemiaclis obtusa*, *Bathycrinicola talaena*, *Haloceras cingulatum*) are only represented by one living specimen, or more (3 for *Leptochiton* sp., 2 for *Melanella*) but no shells.

Twenty one more species (*Laevipilina rolani*, the seven Solenogastres, *Mikro scalaroides*, *Trenchia biangulata*, *Trochaclis versiliensis*, *Alvania zetlandica*, and the nine Cephalopods) previously recorded (most of them based on the study of other SEAMOUNT 1 material and some from the FAUNA II cruise) were not represented in the material we examined.

The overlap between the species detected in the two main cruises (SEAMOUNT 1 and BANGAL 0711) is limited: 82 of the species examined were collected during SEAMOUNT 1, 160 during BANGAL 0711, and only 53 of these are shared. Most of the species are rare (scored “1” in Table 2) and 23 are represented by only one specimen or shell (“singletons”).

Beam trawl samples from the survey listed in Table 1 revealed as the most efficient collecting gear for molluscs and for benthic macroinvertebrates in general, but specimens were also retrieved in most of the dredge and otter trawl samples.

Taxonomic notes, keys and new species descriptions

Phylum Mollusca Cuvier, 1795
Class Gastropoda Cuvier, 1795
Subclass Vetigastropoda Salvini-Plawen, 1980
Family Lepetellidae Dall, 1882

Genus ***Lepetella*** Verrill, 1880

Type species

Lepetella tubicola Verrill & S. Smith, 1880, by monotypy.

***Lepetella* sp.**
Fig. 3H

Material examined

GALICIA BANK • 1 sh; 42°28.81′ N, 11°50.03′ W; 1410 m; 8 Aug. 2011; BANGAL 0711 DR15; MNCN • 50 spm; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 3 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 10 spm, 40 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

Numerous living specimens from 0.4 to 1.7 mm of a *Lepetella* species were found at depths of 1706 m (V2) and 1720 m (V10), attached to the external surface of empty tubes of the onuphid polychaete *Hyalinoecia tubicola* (Müller, 1776), which is common on deepest (1470–1809 m) sedimentary bottoms of the GB (Serrano *et al.* 2017a). Dantart & Luque (1994), Lima *et al.* (2015) and Hoffman *et al.* (2019b) have described some new species of *Lepetella* in different areas of the Atlantic, and the latter authors mention the possible presence of the dubious taxon *L. ionica* Nordsieck, 1973 in the GB. Nevertheless, a comparative anatomical and molecular study of these deep-water specimens and specimens of N Atlantic shallower water species of *Lepetella* is necessary to ascertain if they belong to a different and perhaps undescribed species.

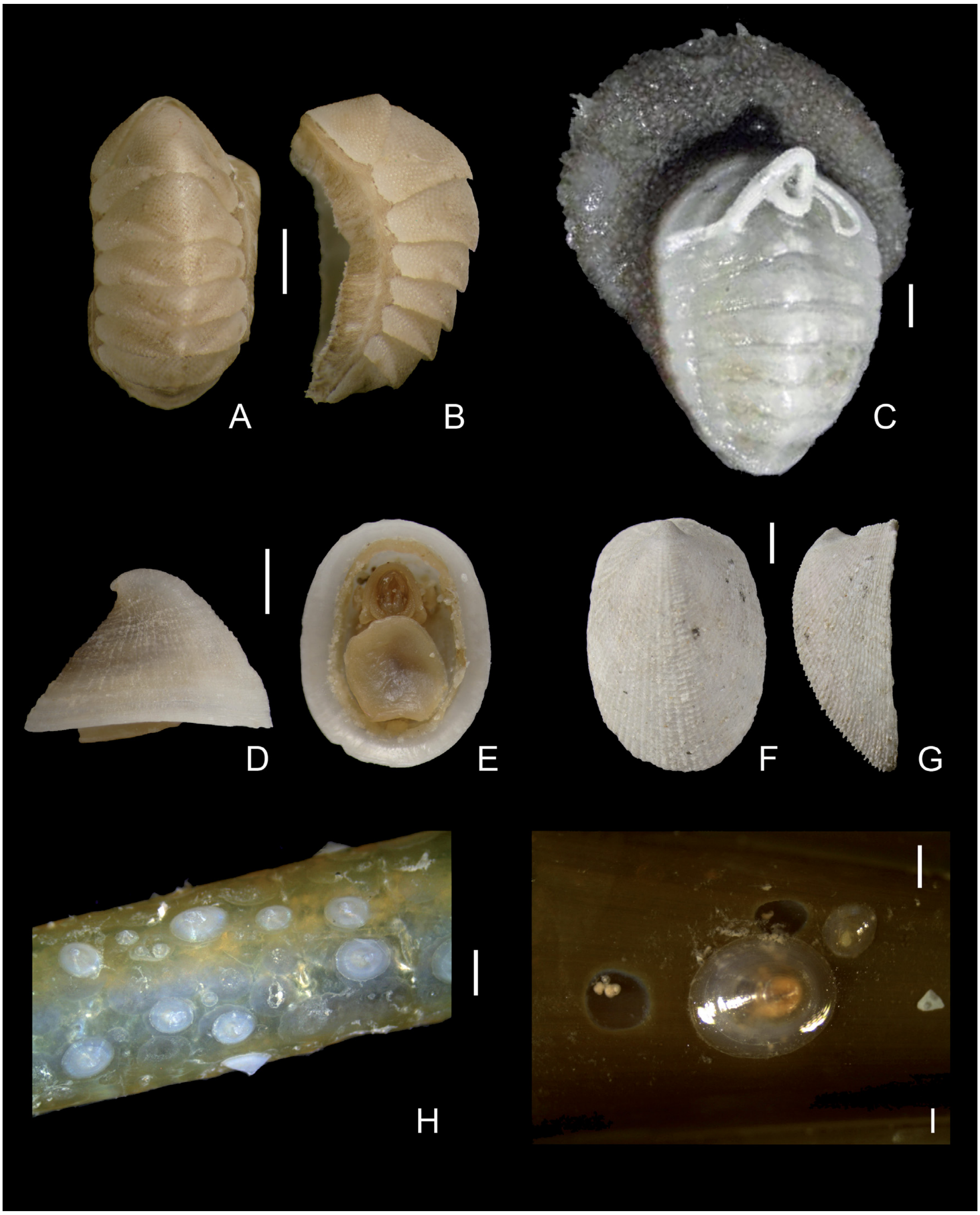

Fig. 3. Polyplacophora and Gastropoda (Patellogastropoda and Vetigastropoda Lepetelloidea). **A–B**. *Connexochiton platynomenus* Kaas, 1979, ECOMARG 0709, G5, 863 m, 4.8 mm. **C**. *Placiphorella atlantica* (Verrill & S. Smith, 1882), BANGAL 0711, DR2, 1697 m, 10.3 mm (shipboard photograph by Pilar Ríos, IEO). **D–E**. *Propilidium exiguum* (Thompson, 1844), BANGAL 0711, V6, 909 m, 3.8 mm. **F–G**. *Iothia fulva* (Müller, 1776), SEAMOUNT 1, DW116, 985–1000 m, 6.3 mm. **H**. Living *Lepetella* sp. on a tube of the polychaete *Hyalinoecia tubicola* (Müller, 1776), BANGAL 0711, V2, 1706 m (shipboard photograph). **I**. Two small (3.5 and 2.0 mm) living specimens of *Addisonia* cf. *excentrica* (Tiberi, 1855) on the inside surface of an egg-capsule of *Hydrolagus affinis* (de Brito Capello, 1868), near two holes in the wall of the egg-capsule, BANGAL 0711, GOC9, 1683 m (shipboard photograph). Scale bars = 1 mm.

Family Addisoniidae Dall, 1882

Genus ***Addisonia*** Dall, 1882

Type species

Addisonia paradoxa Dall, 1882, by original designation.

Addisonia* cf. *excentrica (Tiberi, 1855)
Fig. 3I

Gadinia excentrica Tiberi, 1855: 13, pl. 2 figs 5–6.

Addisonia excentrica – Watson 1886: 32. — Locard 1898: 93.

Material examined

GALICIA BANK • 1 sh; 42°51′ N, 11°53′ W; 1110–1125 m; 19 Oct. 1987; SEAMOUNT 1 DW108; MNHN • 5 spm; 42°58.50′ N, 11°59.24′ W; 1683 m; 7 Aug. 2011; BANGAL 0711 GOC9; MNCN.

Remarks

Three living specimens (3.5, 3.4 and 2.0 mm) were found on the inside surface of an empty egg-capsule of the smalleyed rabbitfish, *Hydrolagus affinis* (de Brito Capello, 1868) (Holochephali, Chimaeridae). Two specimens (3.5 and 2.0 mm) were attached close to small oval thinner areas or holes on the wall of the egg-capsule (Fig. 3I) caused by limpet rasping during feeding (Dantart & Luque 1994). The shell and the external morphology of the living specimens resemble those of *A. excentrica* from shallower depths, but given their small size, further anatomical and molecular study is needed to identify them with certainty. As far as we know, this is the deepest record (1683 m) for living specimens of any *Addisonia* species. Living specimens of *Addisonia excentrica* were found down to 330–426 m in the Mediterranean (Dantart & Luque 1994). The NW Atlantic *Addisonia paradoxa* (Dall, 1882), synonymized with *A. excentrica* by Dantart & Luque (1994), was found alive by Dall (1882) from 110 to 293 m, and McLean (1985) recorded it from 119 to 1170 m, deepest records being probably shells. *Addisonia enodis* Simone, 1996, described from Brazil, was recorded alive down to 184 m (Simone 1996; Lima *et al.* 2016) and the NE Pacific *A. brophyi* McLean, 1985 from 155 to 174 m depth. Besides, this is the first record of an *Addisonia* species living inside a holocephalan egg-capsule. In addition to two empty egg-capsules (only one of them with *Addisonia*), three specimens (2 females and one male) of *Hydrolagus affinis* were caught in the same sample (Bañón *et al.* 2016).

Family Fissurellidae Fleming, 1822

Key to species of Fissurellidae found in the GB (see also Bogi & Giusti 1994 for differentiating *Emarginula* spp.)

1. Anterior part of the aperture with a deep slit reaching the edge 2
– Anterior part of the aperture entire, shell with a slit or a hole not reaching the edge 4

2. Shell height > half length, commarginal sculpture of tightly packed, vermiculate cordlets ....
.... ***Emarginula christiaensi*** Piani, 1985 (Fig. 4I–J)
– Shell height ≤ half length, commarginal cords elevated and narrower than intervals 3

3. Apex definitely overhanging the posterior edge of the shell ....
.... ***Emarginula tuberculosa*** Libassi, 1859 (Fig. 4F–H)
– Apex not overhanging the posterior edge of the shell ....
.... ***Emarginula multistriata*** Jeffreys, 1882 (Fig. 4D–E)

4. Shell with a hole situated at the apex or close to it 5
– Shell with a slit situated between the apex and the anterior edge 10

5. Apex retaining coiled part with larval shell, and the hole immediately anterior to it 6
– Apex without coiled part, with the hole situated on it 7

6. Shell height > shell length, shell surface smooth ....
.... ***Profundisepta alicei*** (Dautzenberg & H. Fischer, 1897) (Fig. 6C–D)
– Shell height ≤ shell length, radial sculpture of granulose riblets ....
.... ***Profundisepta profundi*** (Jeffreys, 1877) (Fig. 6E–G)

7. Shell usually large, with a sculpture of radial and commarginal riblets ....
.... ***Diodora tenuiclathrata*** (Seguenza, 1863) (Fig. 4A–C)
– Shell always smaller than 10 mm with a sculpture of minute granules 8

8. Granules arranged along radial lines .... ***Fissurisepta granulosa*** Jeffreys, 1883 (Fig. 6A–B)
– Granules arranged quincuncially 9

9. Shell height nearly twice shell length ....***Cornisepta rostrata*** (Seguenza, 1863) (Fig. 6H–J)
– Shell height about the same as shell length ....
.... ***Cornisepta microphyma*** (Dautzenberg & H. Fischer, 1896) (Fig. 6K–M)

10. Shell sculpture formed by definite radial ribs intersecting commarginal cordlets ....
.... ***Puncturella asturiana*** (P. Fischer, 1882) [not found on GB]
– Shell sculpture formed by radial rows of granules, aligned to form ribs 11

11. Apex strongly curved, overhanging posterior edge ....
.... ***Puncturella granulata*** (Seguenza, 1863) (Fig. 4K–L)
– Apex weakly curved, not overhanging posterior edge ....
....***Puncturella agger*** Watson, 1883 (Fig. 5A–N)

Genus ***Emarginula*** Lamarck, 1801

Type species

Emarginula conica Lamarck, 1801 = *E. fissura* (Linnaeus, 1758), by monotypy.

Emarginula christiaensi Piani, 1985
Fig. 4I–J

Emarginula elata Locard, 1898: 82–83, pl. 4 figs 16–18 (junior homonym of *Emarginula elata* Libassi, 1859) [figures erroneously called as pl. 4 figs 13–15 in text and in plate caption].
Emarginula christiaensi Piani, 1985: 217–219, figs 65–67 (replacement name).

Material examined

GALICIA BANK • 1 sh; 42°42′ N, 11°48′ W; 765 m; 18 Oct. 1987; SEAMOUNT 1 DW106; MNHN • 2 sh; 42°40′ N, 11°36′ W; 675–685 m; 19 Oct. 1987; SEAMOUNT 1 DW111; MNHN • 1 sh; 42°52′ N, 11°51′ W; 985–1000 m; 20 Oct. 1987; SEAMOUNT 1 DW116; MNHN • 1 sh; 42°39.95′ N, 11°36.42′ W; 615 m; 23 Jul. 2009; ECOMARG 0709 R2; MNCN.

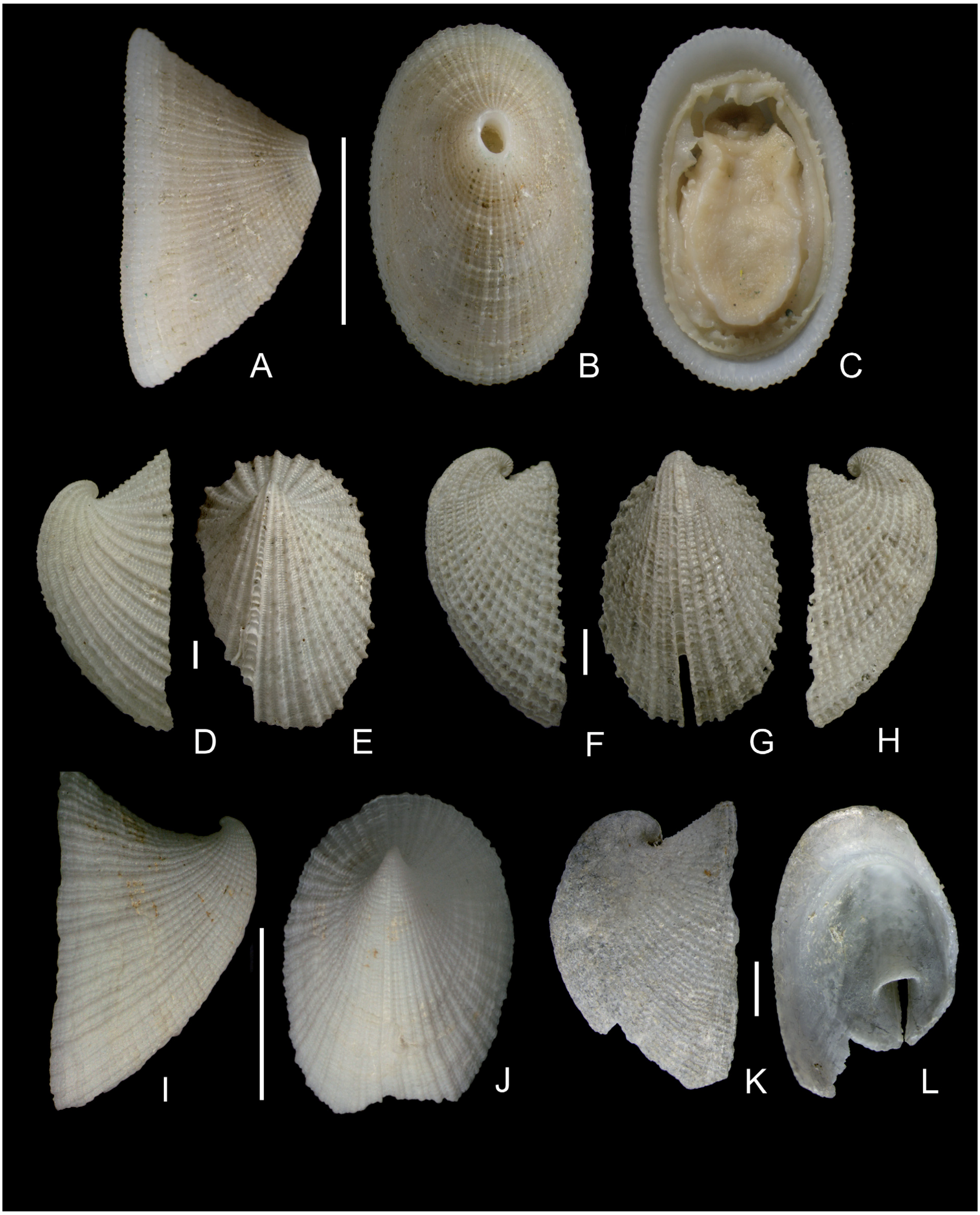

Fig. 4. Fissurellidae 1. **A–C**. *Diodora tenuiclathrata* (Seguenza, 1863), BANGAL 0711, GOC6, 903 m, 19.2 mm. **D–E**. *Emarginula multistriata* Jeffreys, 1882, SEAMOUNT 1, DW111, 675–685 m, 10.0 mm. **F–H**. *Emarginula tuberculosa* Libassi, 1859, SEAMOUNT 1, DW116, 985–1000 m, 6.1 mm. **I–J**. *Emarginula christiaensi* Piani, 1985, SEAMOUNT 1, DW106, 765 m, 20.0 mm. **K–L**. *Puncturella granulata* (Seguenza, 1863), SEAMOUNT 1, DW108, 1110–1125 m, 5.3 mm. Scale bars: A–C, I–J = 10 mm; D–H, K–L = 1 mm.

Remarks

This species was never formally compared with *Emarginula crassa* Sowerby, 1813, described as a Pliocene fossil in the Crag of Ipswich (England) and reported in the Recent fauna of the British Isles and Scandinavia (Forbes & Hanley 1850: 481) and off NW Spain in 748–1262 m (Dautzenberg & Fischer 1897: 179). The latter species is differentiated by having a lower profile, with the apex more central and less curved backwards, and in having a more attenuated sculpture. In our experience, it has never been possible to differentiate the two species in the same locality, therefore they could represent at most geographical variants or subspecies of the same taxon. In the fossil record, Marquet (1995) separated subspecies *Emarginula crassa crassa* from *E. crassa crassalta* Wood, 1874, which is very similar, if not identical, to *E. christiaensi*. However, both forms did not coincide in the same geological formation. More recently, Hoffman & Freiwald (2018) cited many empty shells of *Emarginula christiaensi* and two shells of *E. crassa* on the continental slope of Mauritania as if both were two different species, but they did not compare them and their figures do not show any differential character. The resolution of this taxonomic problem is beyond the scope of this work, but the name *Emarginula crassalta* Wood, 1874, would have priority if it were the same as *Emarginula christiaensi*.

Genus ***Puncturella*** Lowe, 1827

Type species

Patella noachina Linnaeus, 1771, by monotypy.

Puncturella agger Watson, 1883
Fig. 5A–N

Puncturella agger Watson, 1883: 32.

Puncturella agger – Watson 1886: 40, pl. 4 fig. 6.
Puncturella profundi (Jeffreys, 1877) – Rolán Mosquera & Pérez-Gándaras 1981: 6, pl. 1 fig. 4. — Rolán Mosquera 1983: 68.
Rimula granulata Seguenza, 1863 – Beck *et al.* 2006: 41. — Hoffman *et al.* 2011a: 90, pl. 108 figs 39–44.
Cranopsis sp. – Corral Prado 2006: 27–30.
Cranopsis agger (Watson, 1883) – Barrio González 2015: 109–123, figs 32–34.

Type material

Syntype
VIRGIN ISLANDS • 1 sh (Fig. 5J–L); off St. Thomas, north of Culebra Island; 18°38′30″ N, 65°5′30″ W; 390 fathoms; 25 Mar. 1863; Challenger expedition, Station 24, coral-mud; NHMUK 1887.2.9.130.

Material examined

GALICIA BANK • 2 sh; 42°52′ N, 11°51′ W; 985–1000 m; 20 Oct. 1987; SEAMOUNT 1 DW116; MNHN • 3 spm; 42°49.13′ N, 11°46.59′ W; 903 m; 4 Aug. 2011; BANGAL 0711 GOC6; MNCN • 1 sh; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN • 1 sh; Galicia Bank (no more details); 590–900 m; 1980–1981; G. Pérez-Gándaras, Instituto de Investigaciones Pesqueras de Vigo-CSIC leg.; CER-MHNS.

Description (based on material examined from GB)

Shell small (length 4.0 mm, width 2.9 mm, height 3.9 mm), with an oval outline in apertural view, in lateral view with a conical profile, the apex located in the posterior ¼ and in the upper ⅓ of the shell, curved towards the ventral side. Protoconch of one whorl, rounded, skewed to the right side, with a

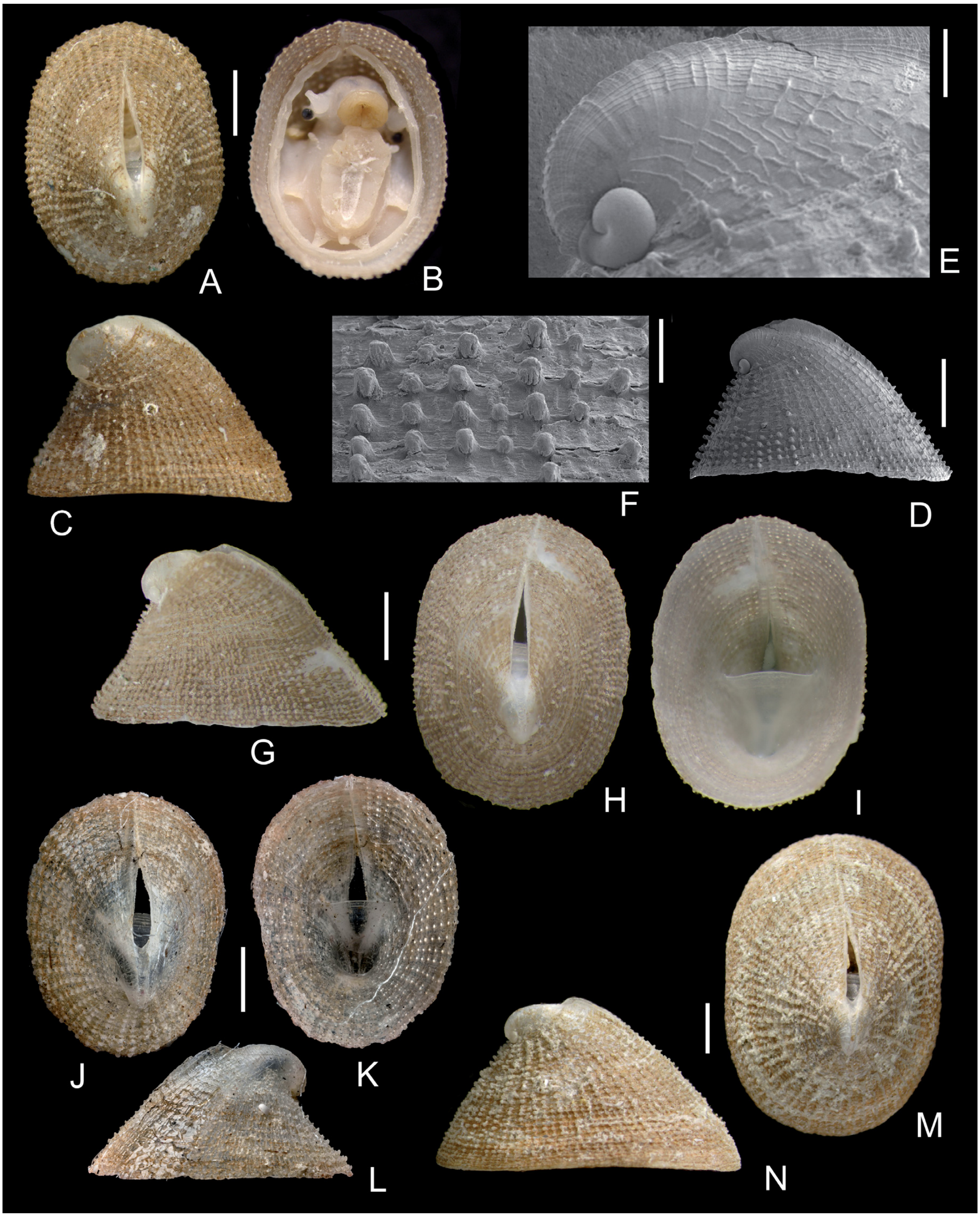

Fig. 5. Fissurellidae 2. *Puncturella agger* Watson, 1883. **A–C**. BANGAL 0711, GOC6, 903 m, 4.0 mm. **D–F**. SEAMOUNT 1, DW116, 985–1000 m, 4.0 mm, SEM micrographs of protoconch and sculpture. **G–I**. SEAMOUNT 1, DW116, 985–1000 m, 4.4 mm. **J–L**. Syntype (NHMUK 1887.2.9.130), Challenger expedition, Station 24 (18°38′30″ N, 65°5′30″ W) off Culebra Island, West Indies, 390 fathoms [713 m], 4.1 mm, courtesy and © NHMUK. **M–N**. Galicia Bank, campaigns 1980–1981 by Instituto de Investigaciones Pesqueras de Vigo-CSIC, 590–900 m, same specimen figured as *Puncturella profundi* (Jeffreys, 1887) in Rolán Mosquera & Pérez-Gándaras (1981: 6, pl. 1 fig. 4), and Rolán Mosquera (1983: 68), 6.0 mm. Scale bars: A–D, G–M = 1 mm; E–F = 200 μm.

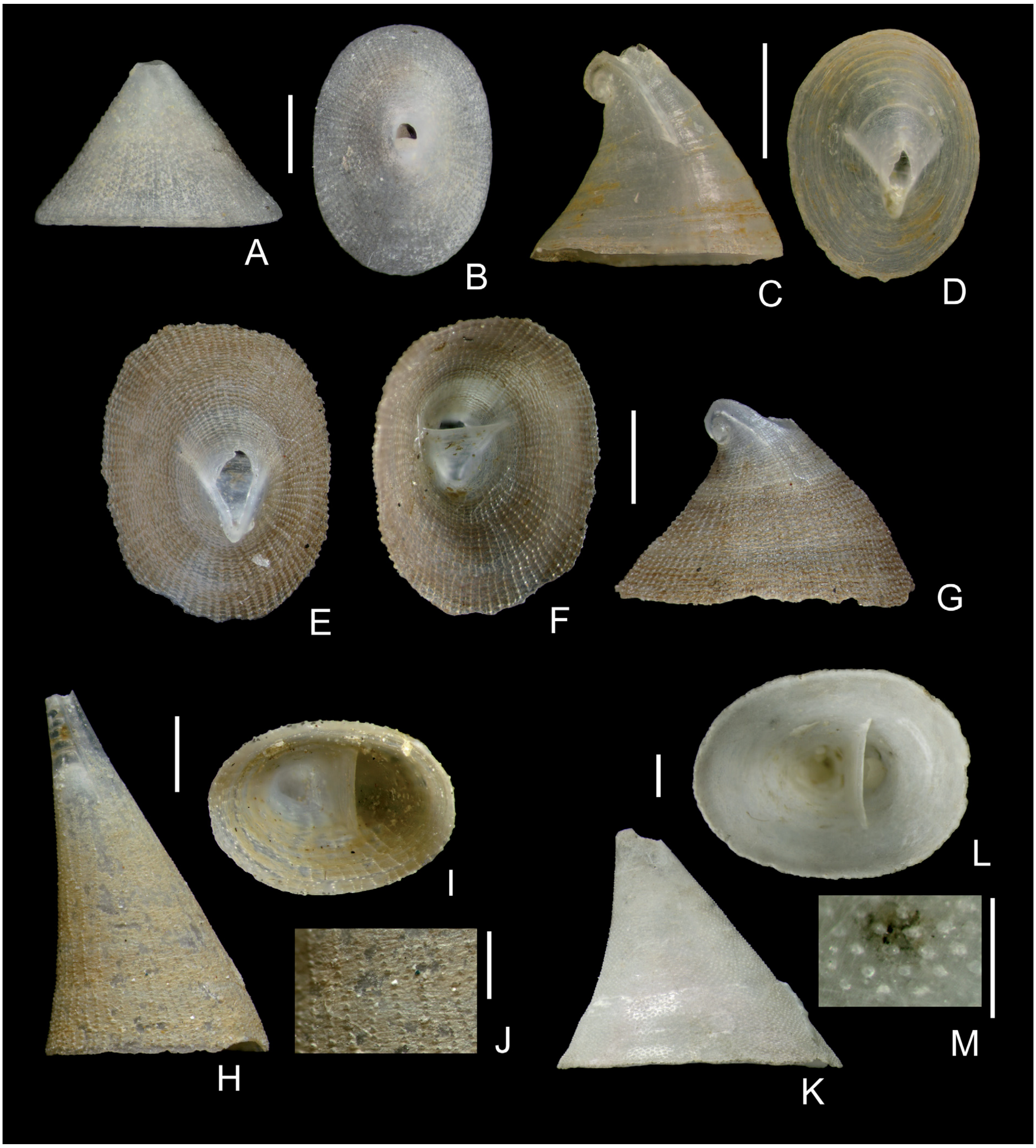

Fig. 6. Fissurellidae 3. **A–B**. *Fissurisepta granulosa* Jeffreys, 1883**.** Galicia Bank, 590–900 m, shell figured in Rolán Mosquera & Pérez Gándaras (1981), 3.2 mm. **C–D**. *Profundisepta alicei* (Dautzenberg & H. Fischer, 1897), BANGAL 0711, V5, 1631 m, 2.2 mm. **E–G**. *Profundisepta profundi* (Jeffreys, 1877), SEAMOUNT 1, DW116, 985–1000 m, 3.2 mm. **H–J**. *Cornisepta rostrata* (Seguenza, 1863), SEAMOUNT 1, DW116, 985–1000 m, 4.8 mm height. **K–M**. *Cornisepta microphyma* (Dautzenberg & H. Fischer, 1896), BANGAL 0711, V4, 744 m, 5.6 mm height. Scale bars: A–I, K–L = 1 mm; J, M = 500 µm.

diameter ca 245 µm (Fig. 5E). Selenizone small but well marked, narrower than the foramen, bordered by a smooth and slightly raised rim. Foramen elongate, narrowing anteriorly to a sharp point, located dorsally in the highest part of the shell, bordered on each side by a flange that continues that of the selenizone; width of the foramen 9% of the width of the shell; length 30% of the length of the shell. In front of the foramen, there is a double rib along which the two halves of the shell meet. Sculpture almost absent in the initial coiled part, then mainly constituted by small pustules, aligned along a median thread to form radial cords (Fig. 5F). The width of the interspaces between radial cords is equivalent to or somewhat greater than the thickness of the pustules, and the interval between pustules along a cord is less than the diameter of the pustules. In the abapical half of the shell, appear additional radial cords that grow rapidly in thickness until the primary cords are matched. There are around 80–90 radial cords reaching the growth edge of the shell, of which one-third was added in the abapical half. The pustules are also connected by fine, irregular commarginal lamellae. Aperture oval, contained in a plane, with its edge denticulated by the termination of the cords. Inner surface smooth, shiny, with a groove running from the foramen to the anterior edge. Large internal septum (one third of the total length of the shell), with sharp and almost straight anterior edge, concealing more than half of the foramen in apertural view.

Distribution

The type locality of *Puncturella agger* is Challenger station 24, off north of Culebra Island, Puerto Rico. It was subsequently recorded from Florida, Cuba and Mexico by Pérez Farfante (1947). Living specimens and shells are known from NW Galicia and Galicia Bank, shells only from Meteor, Hyères, Irving, Plato, Atlantis and Josephine seamounts (Corral Prado 2006, as *Cranopsis* sp.; Barrio González 2015, as *Cranopsis agger* (Watson, 1883)), and shells recorded as *Rimula granulata* Seguenza, 1863, from Ampère, Seine and Sedlo seamounts (Beck *et al.* 2006) and Rockall Bank (Hoffman *et al.* 2011a), see under remarks. The species has therefore an amphiatlantic distribution.

Remarks

This species has been reported from different locations in the northeast Atlantic with names which we consider wrong. Rolán Mosquera & Pérez-Gándaras (1981: 6, pl. 1 fig. 4) and Rolán Mosquera (1983: 68) recorded and illustrated for the first time one specimen from the Galicia Bank, misidentified as *Puncturella profundi* Jeffreys, 1877, which is a different species currently named *Profundisepta profundi* (Jeffreys, 1877), (see Fig. 6E–G herein). The specimen figured in the aforementioned papers is illustrated again here (Fig. 5M–N).

The shell figured by Micali & Villari (1989: figs 1–4) as *Rimula granulata* Seguenza, 1863, from the Pleistocene of Salice (Sicily) is somewhat similar to *P. agger*, but clearly differs in having an extremely inflated profile, with an apex much more anterior and much more curved towards the ventral edge so as to be situated near the half of the total height of the shell (in the upper third in *Puncturella agger*). The sculpture of this fossil species is also different, with the radial rows of tubercles all of similar size and thicker than the spaces between rows. An old shell, possibly subfossil, collected from the Galicia Bank (Fig. 4K–L) could represent the real *Puncturella granulata*, since it agrees in profile and sculpture with the original description and illustration of *Rimula granulata* by Seguenza (1863: 88, figs 6, 6a). Watson (1883: 31) reported and described a specimen of "*Puncturella (Cranopsis) granulata*, Seg. [*tuberculata* n. sp.]", also collected in the type locality of *Puncturella agger* (Challenger Sta. 24). However, it is not clear whether this identification is correct since Watson's (1886: 46, pl. 4 fig. 5) illustration is a copy of Seguenza's (1863: fig. 6) and he described his specimen as "peculiarly long and narrow" which does not fit the original description. This identification was nevertheless assumed by Pérez Farfante (1947: 125–126, pl. 54 figs 4–7) who also considered that *Puncturella watsoni* Dall, 1889 was the same as *P.* (*C.*) *granulata* sensu Watson (1883, 1886). *Puncturella watsoni* is also very close to the Western Atlantic *Puncturella larva* Dall, 1927 (see Pérez Farfante 1947).

Further specimens of *Puncturella agger* from SEAMOUNT 1 DW116 were recorded in Eva Corral's unpublished undergraduate project (Corral Prado 2006) as *Cranopsis* sp. Later, Lucia Barrio in her PhD Thesis (Barrio González 2015) described and illustrated as *Cranopsis agger* (Watson, 1883) a large amount of material (32 specimens and 362 shells) collected in several cruises from different localities of NW Galicia and several NE Atlantic seamounts (see under distribution).

Puncturella fornicata Locard, 1898, a valid species never reported since its original description from off Western Sahara, 782 m (Locard 1898: 78–79, pl. 5 figs 1–3), is somewhat similar to *P. granulata* in profile but with definite radial ribs as in *P. asturiana* and *P. noachina*.

None of the eight western Atlantic species of *Cranopsis* described and illustrated by Simone & Cunha (2014) is identical to *Puncturella agger*. *Cranopsis canopa* Simone & Cunha, 2014 is somewhat similar in profile and in having a relatively small septum, but it differs from *P. agger* in having fewer and broader axial ribs (46 versus up to 90 in *P. agger*), uniform axial ribs (*P. agger* usually has larger and smaller ribs intercalated), and the ventro-anterior edge of the septum concave, while in *P. agger* it is convex.

Family Anatomidae McLean, 1989

Genus ***Anatoma*** Woodward, 1859

Type species

Scissurella crispata Fleming, 1828, by monotypy.

Key to the species of *Anatoma* found in the GB (see also Geiger 2012)

1. Last whorl very broad, about 40% of diameter in apical view; suture of last whorl along selenizone or just below it .... ***Anatoma richardi*** (Dautzenberg & H. Fischer, 1896) (Fig. 7A–I)
– Last whorl less than 35% of diameter in apical view, suture definitely situated at a distance beneath selenizone 2

2. Umbilicus wide and deep, its diameter more than 10% of the shell diameter, adapical surface nearly smooth except for growth lines .... ***Anatoma umbilicata*** (Jeffreys, 1883) (Fig. 9A–E)
– Umbilicus less than 10% of the shell diameter, surface of shell with distinct sculpture of axial riblets and spiral threads 3

3. Selenizone situated high on the profile, making it stepped; adapical part of the whorl above it forming a shoulder and abapical part below it very convex ... ***Anatoma eximia*** (Seguenza, 1880) (Fig. 8D–I)
– Selenizone situated near the middle of the last whorl, not as above 4

4. Sculpture of conspicuous axial riblets, profile between suture and selenizone distinctly convex .... ***Anatoma aspera*** (Philippi, 1844) (Fig. 8A–C)
– Sculpture of tenuous ribs, profile between suture and selenizone rather flat .... ***Anatoma corralae*** Gofas & Luque sp. nov. (Fig. 10A–H)

Anatoma richardi (Dautzenberg & H. Fischer, 1896)
Fig. 7A–I

Scissurella richardi Dautzenberg & H. Fischer, 1896: 487; pl. 21 figs 2–3.

Anatoma richardi – Geiger 2012: 1108. — Ortega & Gofas 2019: 518–519.

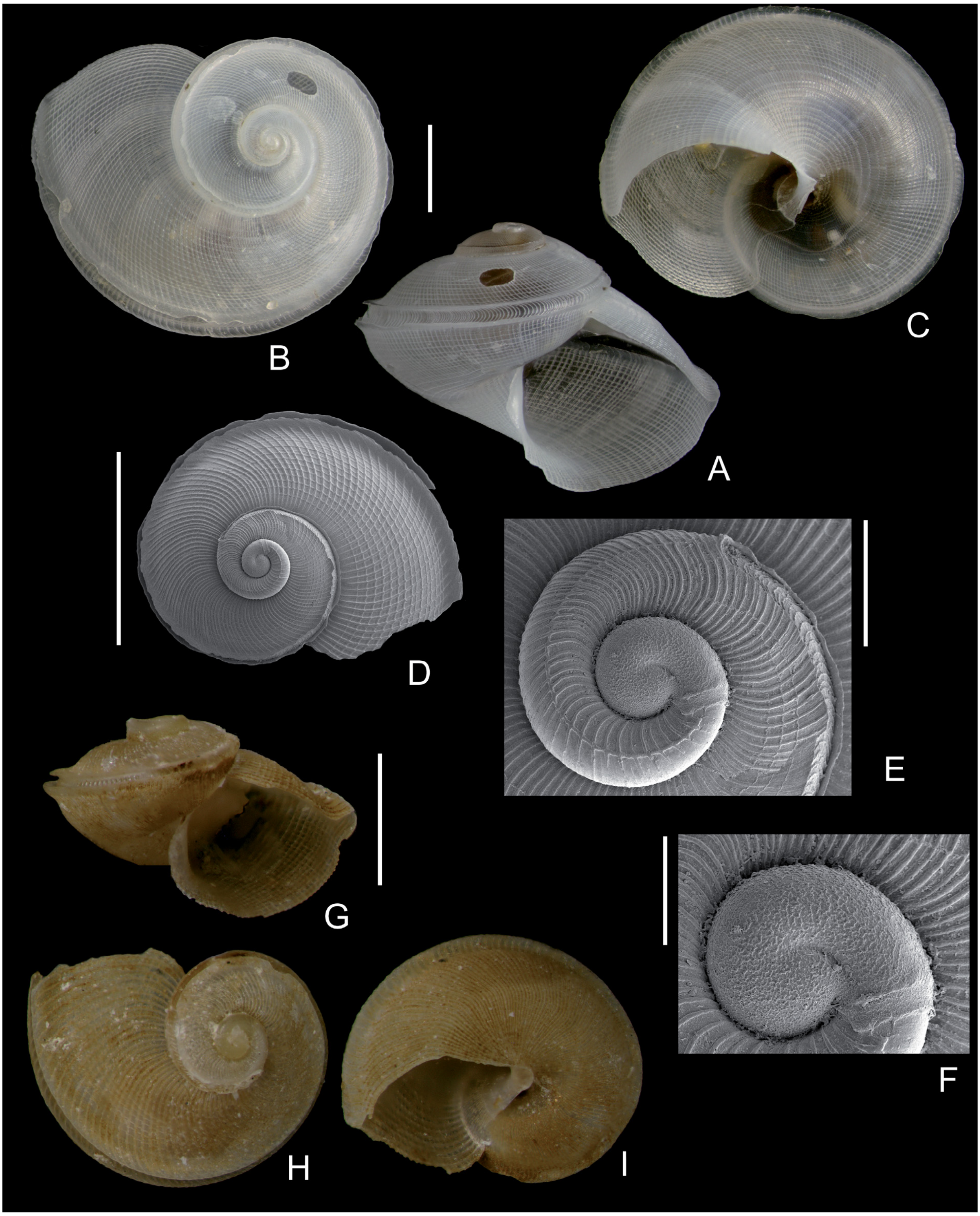

Fig. 7. Anatomidae 1. **A–C**. *Anatoma richardi* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 985–1000 m, diameter 4.2 mm. **D–F**. *A. richardi*, shell and detail of the protoconch and early teleoconch whorls, SEM micrograph, same locality, diameter 1.7 mm. **G–I**. *A.* cf. *richardi*, BANGAL 0711, GOC6, 903 m, diameter 2.3 mm. Scale bars: A–D, G–I = 1 mm; E = 200 µm; F = 100 µm.

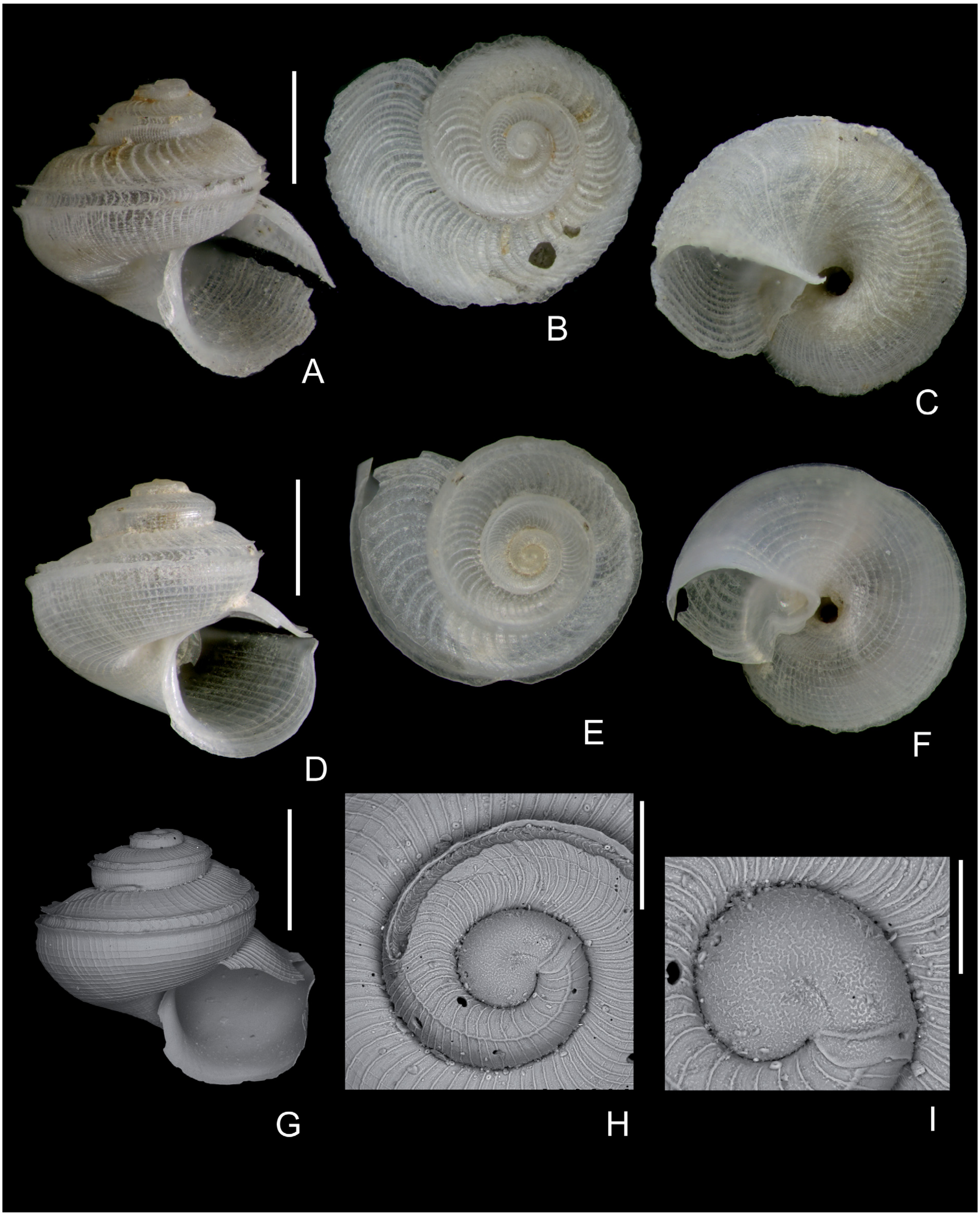

Fig. 8. Anatomidae 2. **A–C**. *Anatoma aspera* (Philippi, 1844), SEAMOUNT 1, DW116, 985–1000 m, diameter 2.8 mm. **D–F**. *Anatoma eximia* (Seguenza, 1880), SEAMOUNT 1, DW116, 985–1000 m, diameter 2.5 mm. **G**. A. *eximia*, SEM micrograph, BANGAL 0711, V4, 744 m, diameter 2.3 mm. **H–I**. *A. eximia*, SEM micrograph, details of protoconch and early teleoconch whorls of another shell, same locality. Scale bars: A–G = 1 mm; H = 200 µm; I = 100 µm.

Material examined

GALICIA BANK • 1 spm, 32 sh; 42°52′ N, 11°51′ W; 985–1000 m; 20 Oct. 1987; SEAMOUNT 1 DW116; MNHN • 3 spm; 42°49.13′ N, 11°46.59′ W; 903 m; 4 Aug. 2011; BANGAL 0711 GOC6; MNCN.

Remarks

Ortega & Gofas (2019) used this name for the *Anatoma* species which is common at depths less than 1000 meters in the Canary Islands, and concluded that the synonymy with *Scissurella tenuis* Jeffreys, 1877 proposed by Geiger (2012) was not warranted. The latter, with an abyssal type locality in the northwest Atlantic, differs by the configuration of the early whorls and the habitat. *Anatoma richardi*, originally described from off the Azores Islands in 1360 m, is also found on GB. In *A. richardi*, the suture of the body whorl may be more or less detached from the selenizone of the previous whorl (the "sutsel" in Geiger 2012), whereas in *A. tenuis* the suture is reported as always adjusted to it. *Anatoma tenuisculpta* (Seguenza, 1880), described from the Pleistocene of southern Italy and recorded as living in the Alboran Sea and Ibero-Moroccan Gulf and in several localities off NW Europe (Høisaeter & Geiger 2011; Geiger 2012), also belongs to this species group but is distinguished by having a higher profile with the last whorl even more clearly separated from the selenizone. We have never seen any

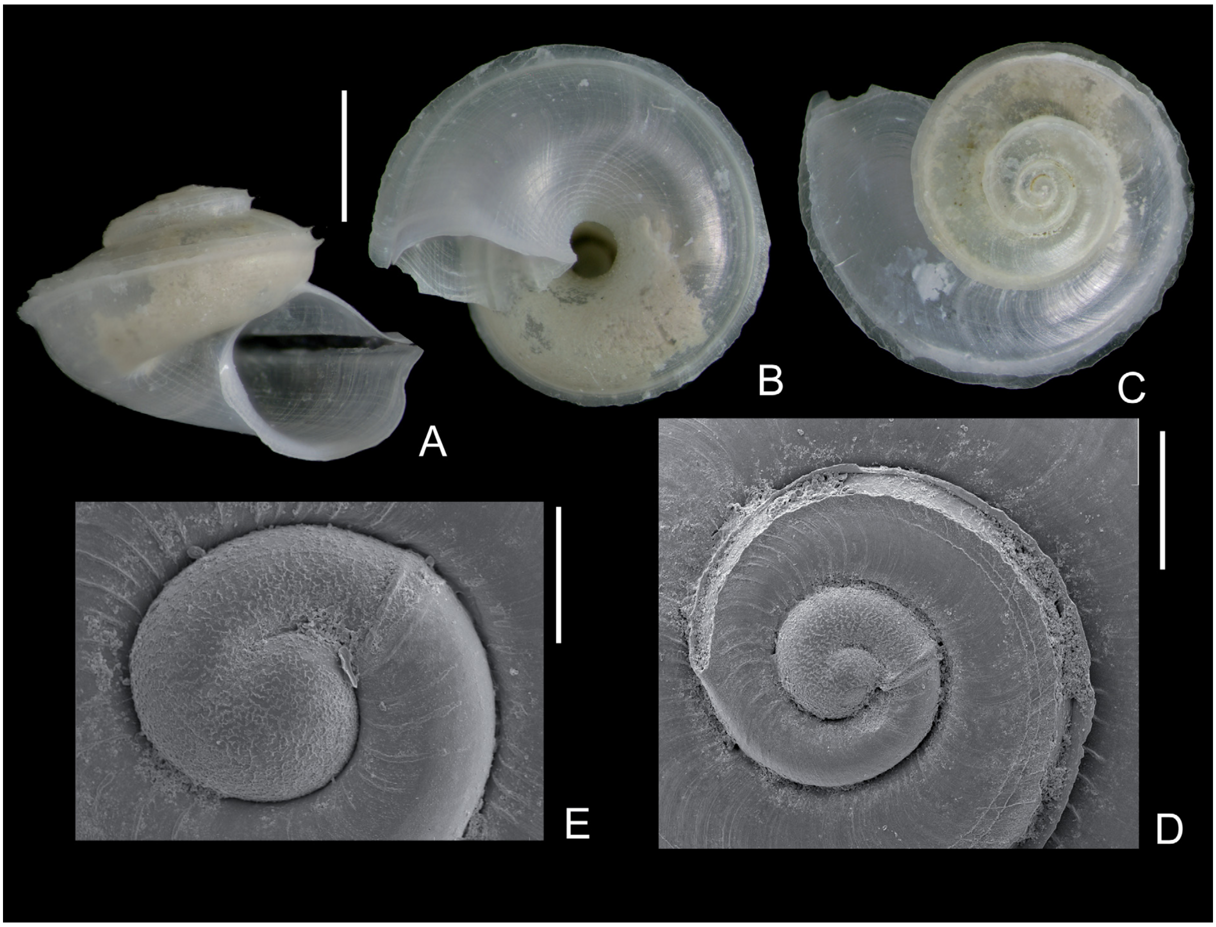

Fig. 9. Anatomidae 3. **A–C**. *Anatoma umbilicata* (Jeffreys, 1883), BANGAL 0711, V10, 1720 m, diameter 3.1 mm. **D–E**. Details of protoconch and early teleoconch whorls of another shell, same locality. Scale bars: A–C = 1 mm; D = 200 µm; E = 100 µm.

locality with *A. richardi* and *A. tenuisculpta* sympatric and separable, and the possibility that they represent morphological variation in a single species should be investigated. Some specimens from GB (Fig. 7G–I), here reported as *A.* cf. *richardi*, are rather stunted with a rather wide sutsel, but could not be convincingly delimited from typical *A. richardi*.

Anatoma corralae Gofas & Luque sp. nov.
urn:lsid:zoobank.org:act:990DA613-088E-477A-97C1-45B6207C044B
Fig. 10

Etymology

The specific name honours Eva Corral Prado, in recognition of her valuable contribution to malacology of this area.

Type material

Holotype

GALICIA BANK • 1 sh (Fig. 10D–F, 4.0 mm in diameter); 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN 15.05/200138H.

Paratypes

GALICIA BANK • 12 spm and 19 sh; same collection data as for holotype; MNCN 15.05/200138P.

Other material examined

GALICIA BANK • 6 spm, 14 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 3 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN.

Description

Shell up to 3.3 mm high and 4.1 mm maximum diameter, with low conical spire, angulate periphery, moderately inflated base and a small umbilicus. Protoconch of ¾ whorl, about 240 µm in maximum diameter, terminated by a slightly flaring edge; protoconch sculpture of irregular granules which tend to form spiral lines towards the periphery. Teleoconch I (until the beginning of the selenizone) about 1.1 whorl, with about 45–50 faint axial riblets, more indistinct in their adapical part, and with a distinct spiral thread abutting on the beginning of the selenizone. Teleoconch II with 2 to 2.5 whorls, separated by a deep suture, and the space between suture and selenizone (the "sutsel" according to Geiger 2012) somewhat wider than the latter. Marked peripheral keel, accentuated by the abapical edge of selenizone, which is more prominent than the adapical edge. Selenizone delimited by two narrow lamellae, inside with weakly marked growth stages. Adapical surface of whorls with axial riblets and very thin spiral threads; the riblets arched, much narrower than the interspaces, uneven and very irregularly spaced, attenuated upon reaching the selenizone, about 70 on the first whorl of teleoconch II, about 110–120 on the last whorl; spiral threads, about 20 in the last half-whorl, attenuated in the part that borders the selenizone. Base regularly convex, with sculpture of axial riblets and spiral threads similar in density and appearance to those of the adapical part; the ribs are somewhat flexuous and prolonged inside the umbilicus; the spiral cords, about 35–40, are somewhat weaker towards the periphery. Umbilicus small, without apparent funiculus. Aperture rounded, interrupted by an incision which extends on about ¼ of the last whorl and narrows at the edge. Colour white.

Distribution

So far only known from deep-water off the GB.

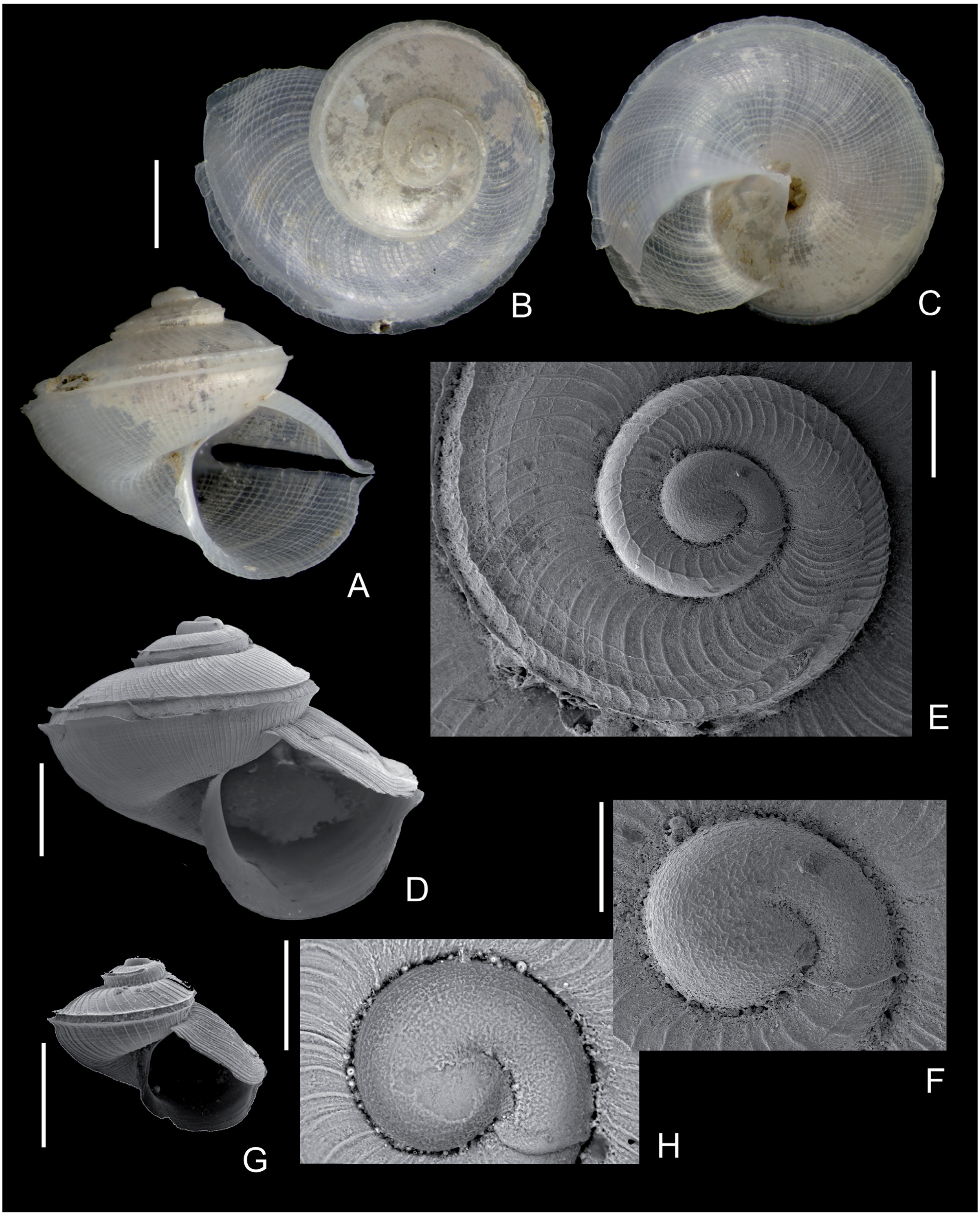

Fig. 10. Anatomidae 4. *Anatoma corralae* Gofas & Luque sp. nov. **A–C**. Paratype (MNCN 15.05/200138P), BANGAL 0711, V10, 1720 m, 4.0 mm diameter. **D–F**. Holotype (MNCN 15.05/200138H), SEM micrograph, BANGAL 0711, V10, 4.1 mm diameter. **E–F**. Details of early teleoconch whorls and protoconch of the holotype. **G–H**. Shell and detail of the protoconch, SEM micrographs, from BANGAL 0711, V5, 1631 m, 2.1 mm diameter. Scale bars: A–D, G = 1 mm; E = 200 µm; F, H = 100 µm.

Remarks

Anatoma corralae sp. nov. is most similar to *A. schiottei* Høisaeter & Geiger, 2011, described from the Norwegian Sea, and was mistaken for it in the preliminary report of INDEMARES BANGAL (Gofas *et al*. 2014b). It differs in being larger (4 mm, compared to 2.25 mm in *A. schiottei*), having a longer teleoconch I (more than one whorl vs 0.75 whorl) with much more numerous axial riblets (50 vs 15), and in lacking a funiculus in the umbilicus (conspicuous in *A. schiottei*, see Høisaeter & Geiger 2011: fig. 48). Nevertheless, both species share the same angular outline, the microsculpture of the protoconch with granules tending to be aligned along spiral lines, and the shape of the edge of the protoconch, which is only slightly flaring and has no secondary thickening. The protoconch microsculpture, unusual in the genus, suggests that they may be related.

Among the species locally present, *Anatoma umbilicata*, which is found together in the same hauls, differs clearly by its broad umbilicus and in being practically smooth. *Anatoma tenuisculpta* is quite similar to *Anatoma corralae* sp. nov. in size and outline, but differs in having a much coarser axial sculpture forming a regular lattice with small nodules at the intersections of riblets and spiral threads; it also has a much shorter teleoconch I, hardly over half a whorl. *Anatoma richardi*, which is found on GB but not in the same depth interval, also has such coarser sculpture, and its last whorl is more ample and its suture is not so far below the selenizone.

"Skeneimorph" species

This informal group includes the members of the family Skeneidae W. Clark, 1851 but also members of other Vetigastropod families including several genera of uncertain phylogenetic affinity (Hoffman *et al.* 2020c) which have been shown by Kano *et al.* (2009) to be related to the superfamily Seguenzioidea or to other non-vetigastropod clades, like neomphalids or heterobranchs (Haszprunar *et al.* 2011, 2016).

Key to the "skeneimorph" species found in the GB

1. Shell smooth and glossy, with reduced or filled umbilicus 2
– Shell smooth, but not glossy, or sculptured, with definite umbilicus 3

2. Shell nearly as high as broad ....***Cirsonella romettensis*** (Granata-Grillo, 1877) (Fig. 14A–C)
– Shell definitely broader than high (h/w less than 0.7) ....
....***Seamountiella azorica*** (Dautzenberg & H. Fischer, 1896) (Fig. 14D–F)

3. Axial sculpture obvious 4
– No axial sculpture 5

4. Axial sculpture of narrow, widely spaced ribs ....
....***Vetulonia paucivaricosa*** (Dautzenberg, 1889) (Fig. 13F–H)
– Axial sculpture of tightly packed wrinkles ....
.... **"*Skenea*" *ponsonbyi*** (Dautzenberg & H. Fischer, 1896) (Fig. 15E–F)

5. Surface, at least around the umbilicus, with a distinct sculpture 6
– No conspicuous sculpture, or only subsutural and/or periumbilical keel 13

6. Sculpture essentially spiral 7
– Sculpture different 9

7. Spiral sculpture only surrounding the umbilical area, sometimes a subsutural cord at least on the early whorls .... ***Moelleriopsis*** sp. (Fig. 15C–D)
– Spiral sculpture all over the shell 8

8. Shell yellowish, sculpture of small but definite spiral ridges ....***Rugulina fragilis*** (G.O. Sars, 1878) (Fig. 14G–H)
– Shell whitish, sculpture of minute spiral threads ....***Anekes spiralis*** Gofas & Luque sp. nov. (Fig. 17A–H)

9. Sculpture of oblique threads, which form a mesh 10
– Sculpture of minute granules all over the shell (may be very tenuous) 12

10. Sculpture forming an oblique mesh all over the shell 11
– Sculpture tenuous, restricted to apical and umbilical areas .... ***Anekes paucistriata*** Warén, 1992 (Fig. 16F–K)

11. Shell conical, aperture height about half of total height .... ***Anekes affinis*** (Jeffreys, 1883) (Fig. 16A–E)
– Shell globose, aperture height about two thirds of total height ....***Granigyra inflata*** (Warén, 1992) (Fig. 17I–L)

12. Aperture very broad, more than half the shell diameter ....***Granigyra pruinosa*** (Jeffreys, 1883) (Fig. 15G–J)
– Aperture diameter less than half the shell diameter .... ***Granigyra tenera*** (Jeffreys, 1883) (Fig. 15K–L)

13. Spiral keel present at least on the first teleoconch whorl 14
– Whorls convex, with no spiral keel even around umbilicus .... ***Akritogyra similis*** (Jeffreys, 1883) (Fig. 15A–B)

14. Abapical keel sharp and distant from the umbilicus ...... ***Trenchia biangulata*** Rubio & Rolán, 2013
– Abapical keel blunt and situated within the umbilicus, or at its edge 15

15. Shell higher than broad, subsutural keel on most whorls ....***Mikro scalaroides*** (Rubio & Rolán, 2013)
– Shell wider than high, subsutural keel fading on last whorls ....***Mikro minimus*** (Seguenza G., 1876) (Fig. 14I–L)

Family uncertain [in superfamily Seguenzioidea Verrill, 1884]

Genus ***Moelleriopsis*** Bush, 1897

Type species

Moelleriopsis abyssicola Bush, 1897, by original designation.

Moelleriopsis sp.
Fig. 15C–D

Material examined

GALICIA BANK • 1 sh.; 42°51′ N, 11°53′ W; 1110–1125 m; 19 Oct. 1987; SEAMOUNT 1 DW108; MNHN.

Remarks

A single shell from DW108 can be assigned to the genus *Moelleriopsis* from the broadly umbilicate shell with spiral cords circling the umbilical area. However, the last whorl increases in diameter much more than most of the species possibly present in the area (the Mediterranean *Moelleriopsis messanensis* (Seguenza, 1876); *M. richardi* (Dautzenberg & H. Fischer, 1896) and *M. normani* (Dautzenberg &

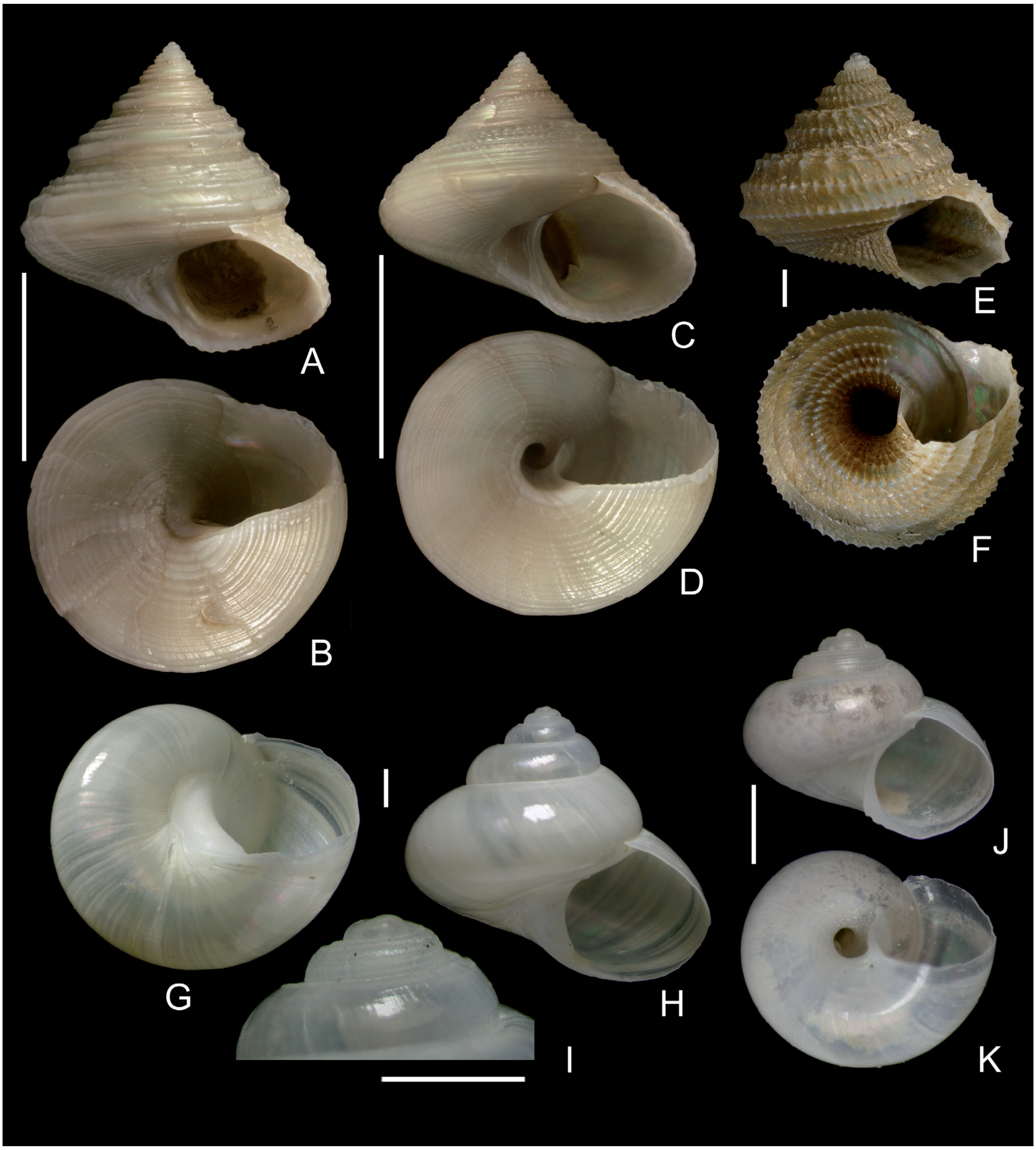

Fig. 11. Trochoidean families. **A–B**. *Calliostoma leptophyma* Dautzenberg & H. Fischer, 1896, ECOMARG 0709, V5, 876 m, 16.5 mm. **C–D**. *Calliostoma maurolici* (Seguenza, 1876), ECOMARG 0709, V5, 876 m, 15.6 mm. **E–F**. *Calliotropis vaillanti* (P. Fischer, 1882), BANGAL 0711, V9, 1671 m, 7.2 mm. **G–I**. *Bathymophila micans* (Dautzenberg & H. Fischer, 1896), BANGAL 0711, V8, 1565 m, 8 mm. **J–K**. *B. micans*, juvenile shell with open umbilicus, BANGAL 0711, V2, 1706 m, 3.2 mm. Scale bars: A–D = 10 mm; E–K = 1 mm.

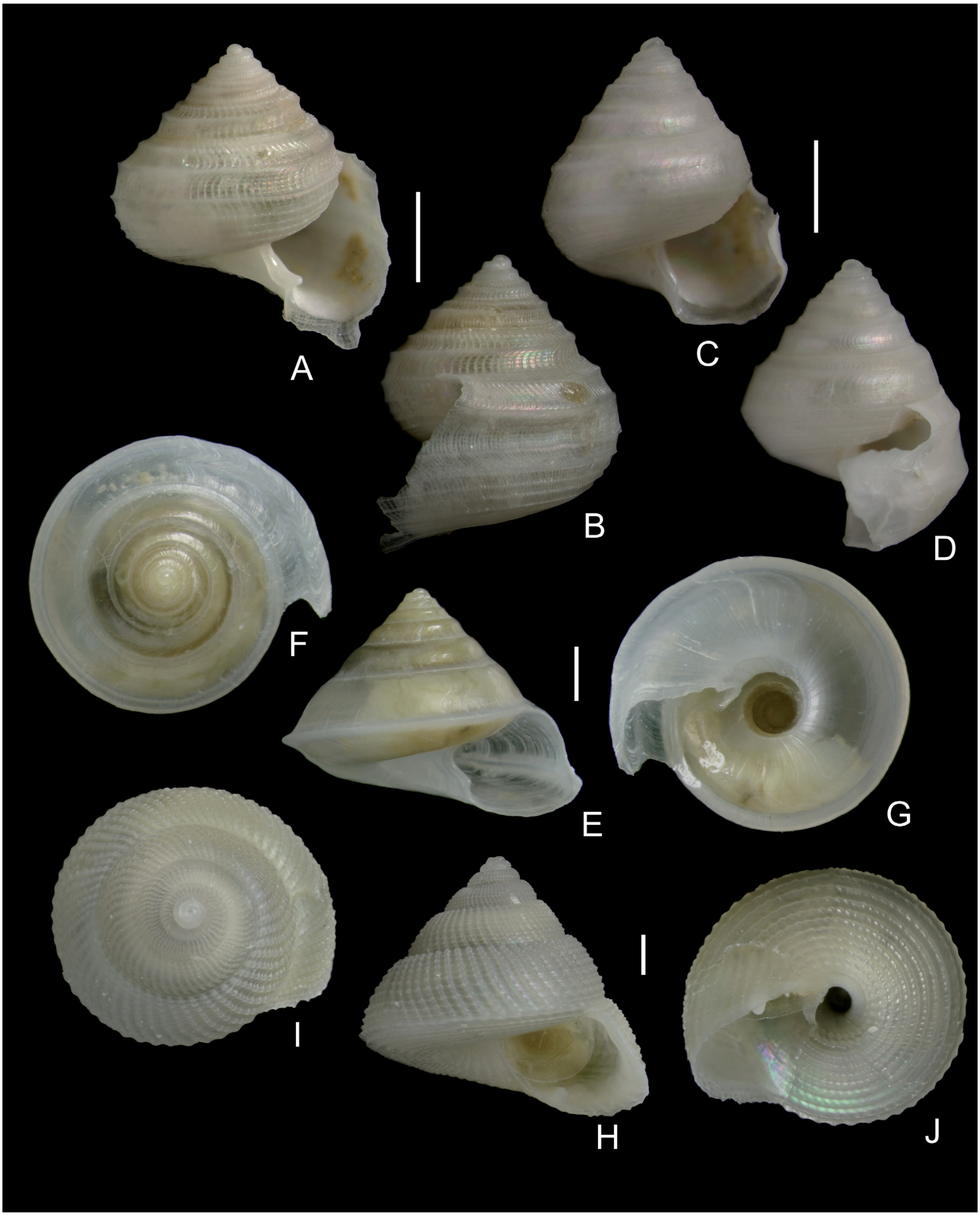

Fig. 12. Seguenziidae. **A–B**. *Seguenzia elegans* Jeffreys, 1885, BANGAL 0711, V10, 1720 m, height 3.4 mm. **C–D**. *Seguenzia formosa* Jeffreys, 1876, BANGAL 0711, V10, height 3.1 mm. **E–G**. *Carenzia carinata* (Jeffreys, 1877), BANGAL 0711, V10, height 4.2 mm. **H–J**. *Ancistrobasis reticulata* (Philippi, 1844), BANGAL 0711, V6, 909 m, height 6.5 mm. Scale bars = 1 mm.

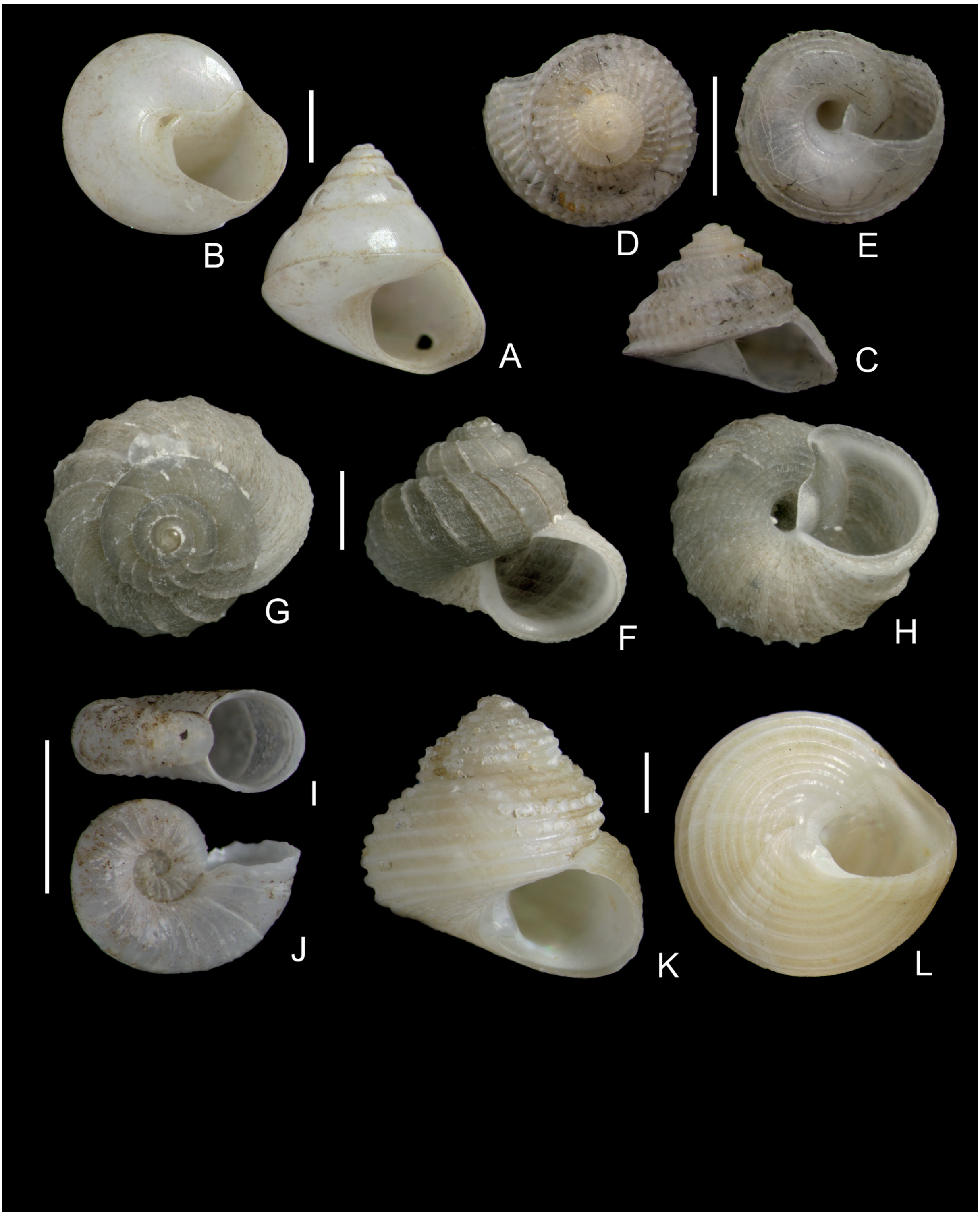

Fig. 13. Seguenzioidea and Colloniidae. **A–B**. *Asthelys munda* (Watson, 1879), BANGAL 0711, DR15, 1410 m, 3.2 mm. **C–E**. *Basilissopsis watsoni* Dautzenberg & H. Fischer, 1897, BANGAL 0711, DR12, 1585 m, 1.8 mm. **F–H**. *Vetulonia paucivaricosa* (Dautzenberg, 1889), BANGAL 0711, V6, 909 m, diameter 3.3 mm. **I–J**. *Adeuomphalus sinuosus* (Sykes, 1925), BANGAL 0711, DR12, 1585 m, diameter 1.5 mm. **K–L**. *Cantrainea globuloides* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 985–1000 m, 4.7 mm. Scale bars = 1 mm.

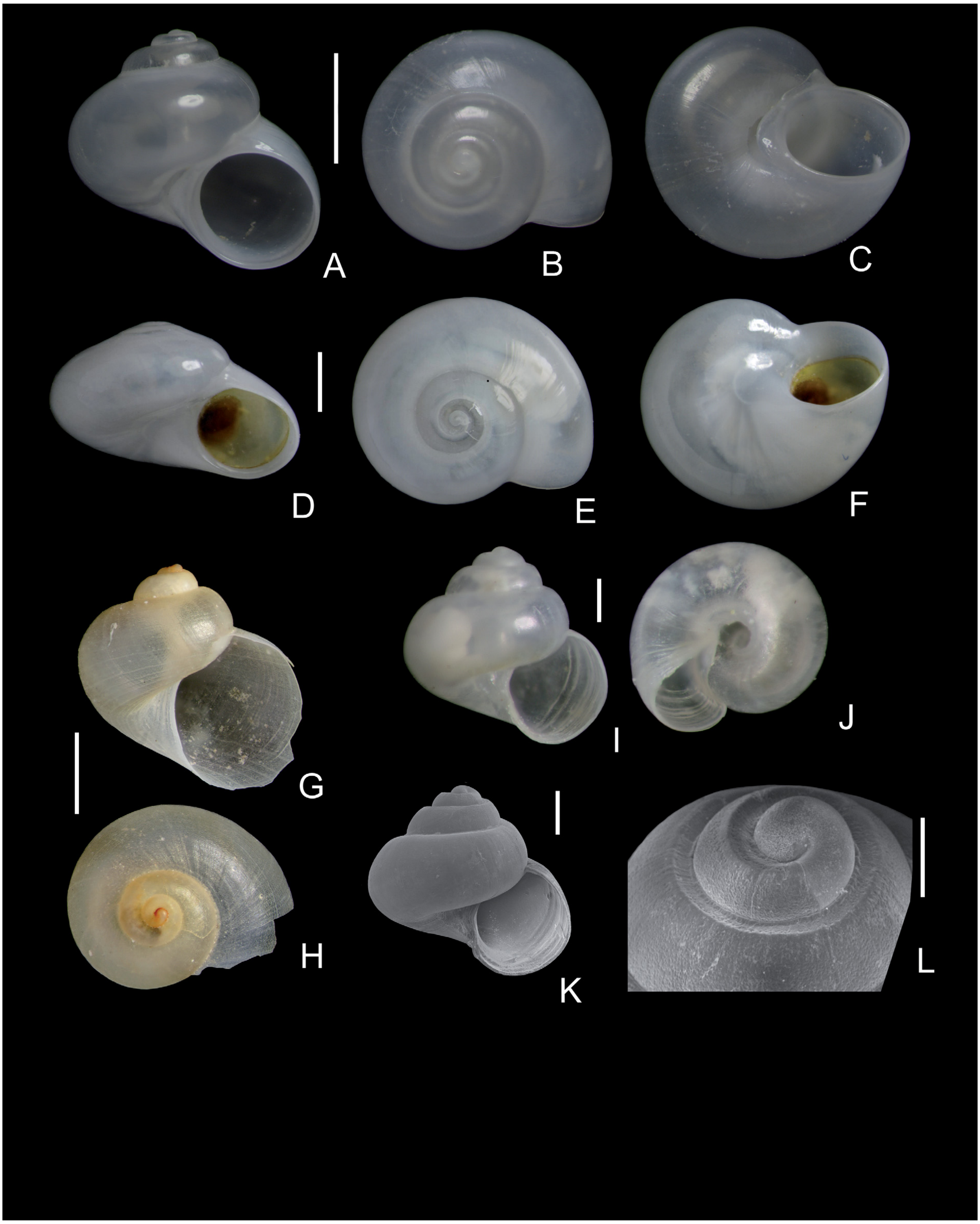

Fig. 14. Skeneimorph species 1. **A–C**. *Cirsonella romettensis* (Granata-Grillo, 1877), SEAMOUNT 1, DW116, 985–1000 m, 2.3 mm. **D–F**. *Seamountiella azorica* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW108, 1120–1125 m, 4.2 mm. **G–H**. *Rugulina fragilis* (G.O. Sars, 1878), BANGAL 0711, V2, 1706 m, 2.8 mm. **I–J**. *Mikro minimus* (Seguenza, 1876), BANGAL 0711, V5, 1631 m, 0.95 mm. **K–L**. *Mikro minimus*, SEM micrograph, same shell, and detail of protoconch and apical whorls. Scale bars: A–K = 1 mm: L = 100 µm.

H. Fischer, 1897), both described from the Azores; *M. atlantis* Hoffman, Gofas & Freiwald, 2020 and *M. meteorminora* Hoffman, Gofas & Freiwald, 2020, both from South Azorean Seamount Chain). *Moelleriopsis gritta* Hoffman, 2020 has a similar coiling but has a distinctive subsutural keel whereas this shell has such a keel only poorly expressed on the first part of the first teleoconch whorl. It probably belongs to an undescribed species but more material is needed before naming it.

Genus ***Skenea*** Fleming, 1825

Type species

Helix serpuloides Montagu, 1808, by subsequent designation.

"Skenea" ponsonbyi (Dautzenberg & H. Fischer, 1896)
Fig. 15E–F

Cyclostrema ponsonbyi Dautzenberg & H. Fischer, 1897: 176, pl. 4 figs 12–14.

Skenea ponsonbyi – Hoffman *et al*. 2020c: 71–73.

Material examined

GALICIA BANK • 4 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 5 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 2 sh; 42°59.61′ N, 11°58.41′ W; 1671 m; 7 Aug. 2011; BANGAL 0711 V9; MNCN.

Remarks

This is, to our knowledge, the first time that this species is reported outside the Azores (Dautzenberg & Fischer 1896) and the South Azorean Seamount Chain (Hoffman *et al*. 2020c). The external sculpture recalls that of *Moelleria costulata* (Møller, 1842), a boreal Atlantic species which belongs to the family Colloniidae Cossmann, 1917 and has a calcareous operculum fitting exactly the aperture; the flexuous contour of the aperture in the present species suggests that the operculum was flexible and that this similarity does not indicate reationship. For the time being, with no data on the living animal, there is no straightforward generic placement. *Cyclostrema* Marryat, 1819, a member of the family Liotiidae Gray, 1850 with also a calcareous operculum, is obviously inadequate and we conservatively use the catchall genus "*Skenea*", in a broad sense meaning a skeneimorph species, following in that WoRMS Editorial Board (2021).

Genus ***Anekes*** Bouchet & Warén, 1979

Type species

Anekes undulisculpta Bouchet & Warén, 1979, by original designation.

Anekes spiralis Gofas & Luque sp. nov.
urn:lsid:zoobank.org:act:CBA7FA0B-5656-47A2-ADE8-DEFE58E98B81
Fig. 17A–H

Etymology

The specific name refers to the characteristic spiral sculpture.

Type material

Holotype

GALICIA BANK • 1 sh (Fig. 17A–G, 1.7 mm in diameter); 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN 15.05/200139H.

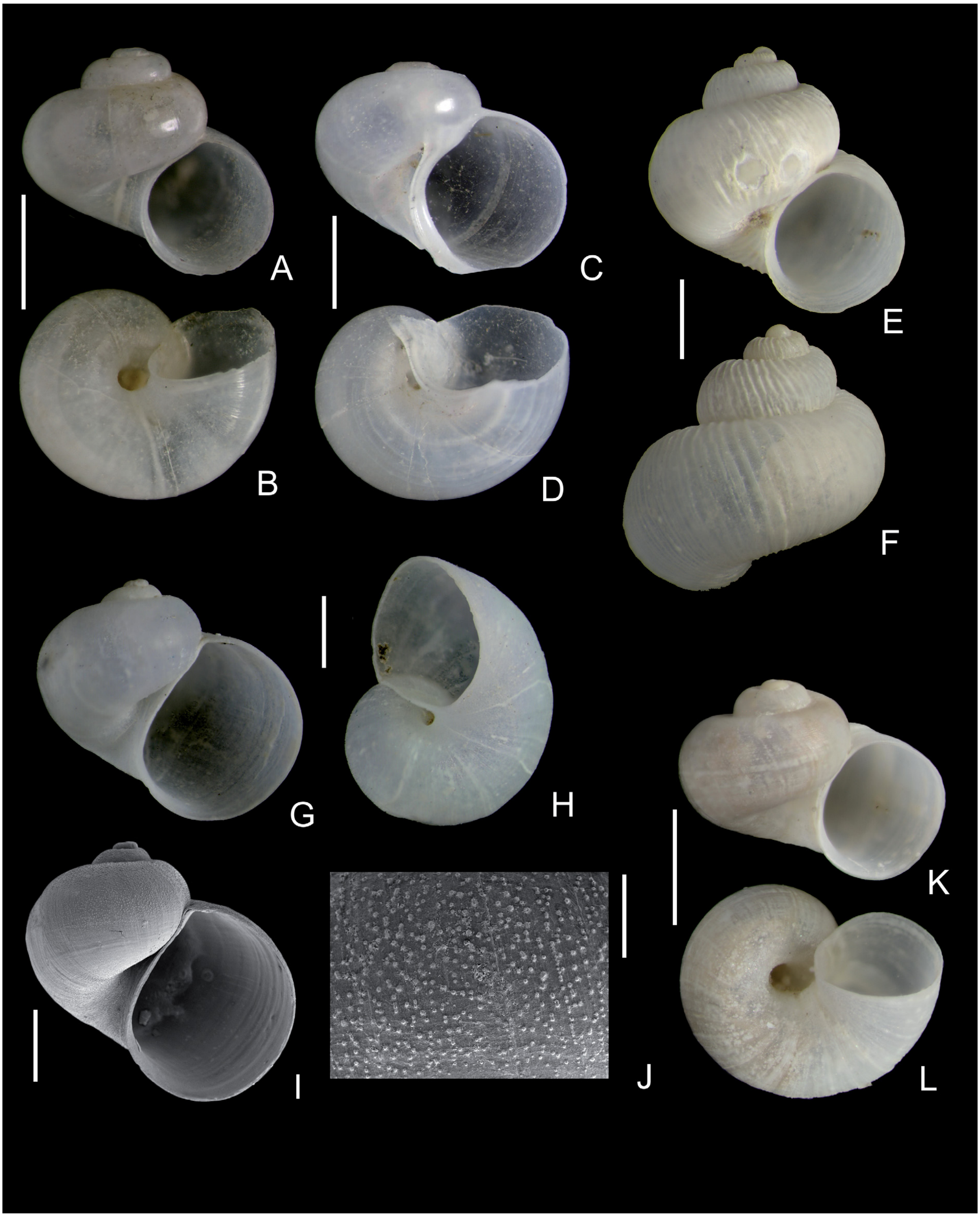

Fig. 15. Skeneimorph species 2. **A–B**. *Akritogyra similis* (Jeffreys, 1883), BANGAL 0711, V5, 1631 m, diameter 2.2 mm. **C–D**. *Moelleriopsis* sp., SEAMOUNT 1, DW108, 1120–1125 m, 2.7 mm. **E–F**. "*Skenea*" *ponsonbyi* (Dautzenberg & H. Fischer, 1896), BANGAL 0711, V9, 1671 m, 3.2 mm. **G–H**. *Granigyra pruinosa* (Jeffreys, 1883), BANGAL 0711, V10, 1720 m, 3.7 mm. **I–J**. SEM micrograph, same shell, and detail of microsculpture. **K–L**. *Granigyra tenera* (Jeffreys, 1883), BANGAL 0711, V10, 1720 m, 2.3 mm. Scale bars: A–I, K–L = 1 mm; J = 200 µm.

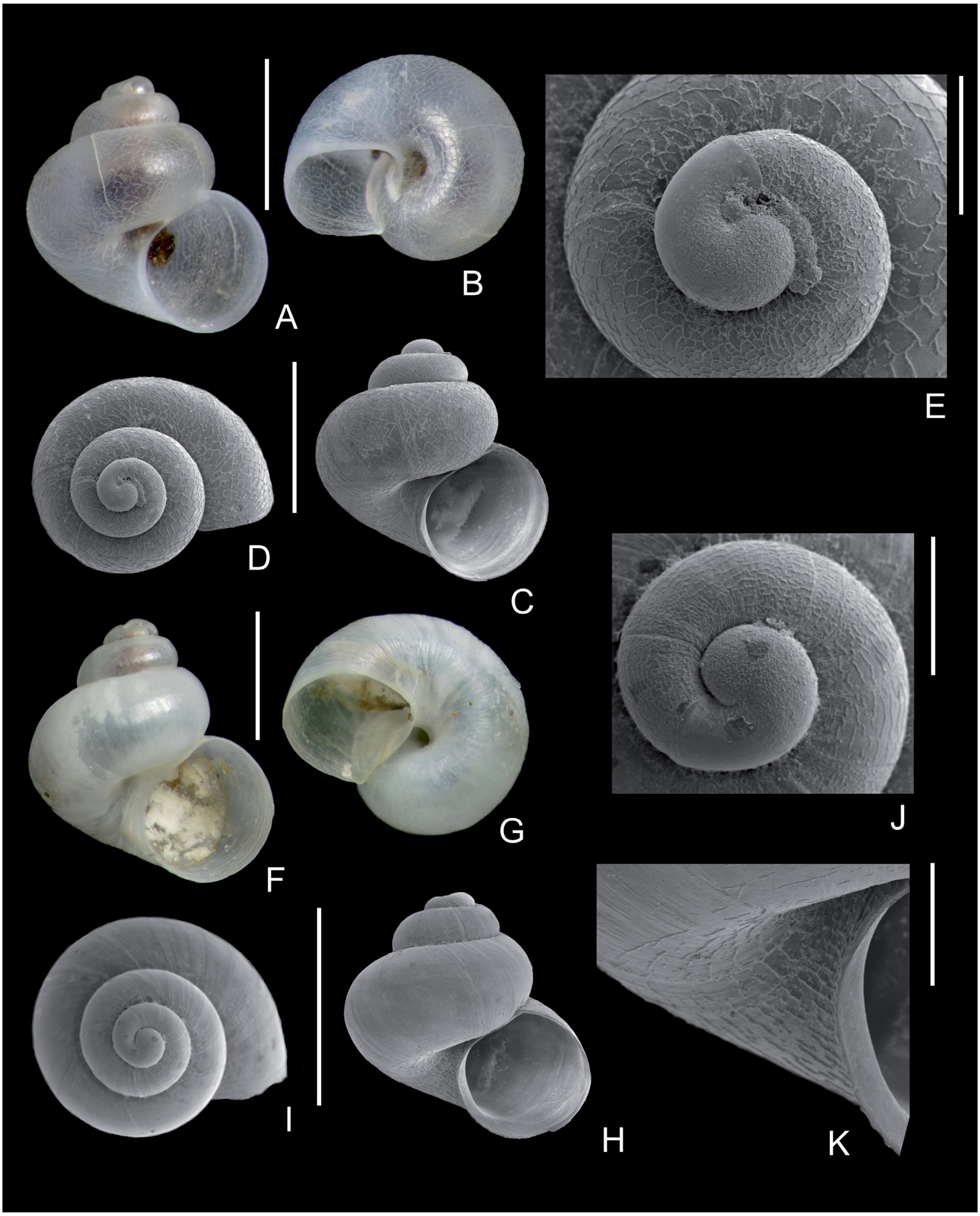

Fig. 16. Skeneimorph species 3. **A–B**. *Anekes affinis* (Jeffreys, 1883), BANGAL 0711, V5, 1631 m, diameter 1.4 mm. **C–E.** SEM micrograph, same specimen, and detail of protoconch and apical whorls, showing the characteristic "*Anekes* sculpture". **F–G**. *Anekes paucistriata* Warén, 1992, BANGAL 0711, V5, 1631 m, live taken specimen, diameter 1.9 mm. **H–K**. SEM micrograph of another shell, detail of protoconch and apical whorls, and detail of the umbilical area. Scale bars: A–D, F–I = 1 mm; E, J–K = 200 µm.

Paratypes

GALICIA BANK • 1 spm and 7 sh; same collection data as for holotype; MNCN 15.05/200139P.

Other material examined

GALICIA BANK • 1 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN.

Description

Shell minute, very fragile and translucent, up to 2.1 mm height and maximum diameter, trochiform, with a moderately low, slightly cyrtoconoid spire, a rounded periphery and body whorl, and a small but definite umbilicus. Protoconch of ¾ whorl, about 260 µm in maximum diameter, terminated by a simple, curved edge; protoconch sculpture of minute, irregularly spaced granules. Teleoconch with up to 3 convex whorls. First whorls sculptured by minute spiral threads, irregular in size and spacing, about half the size of interspaces; occasionally these threads are interrupted or anastomosing. The spiral threads become inconspicuous on the later whorls, persisting in the subsutural zone and within the umbilical area, but lacking in the median part of the body whorl, where only growth lines can be seen. Umbilicus narrow and deep, not delimited from the rest the whorl. Aperture evenly rounded except for a slight angle at the termination of the suture; outer lip very thin, slightly flexuous, slightly prosocline. Colour slightly yellowish on fresh shells, otherwise whitish.

Remarks

Species of *Anekes* are mostly characterized by a peculiar "*Anekes* sculpture" which consists of minute raised lines, anastomosing in a criss-cross pattern. In *Anekes affinis* (Jeffreys, 1883) this sculpture is spread over the entire surface and quite noticeable. *Anekes sculpturata* Warén, 1992 is similar but smaller (hardly exceeds 1 mm) and the microsculpture has a preferential orientation in the spiral direction, while in *A. affinis* it forms a non-directional network. In *Anekes paucistriata* Warén, 1992 the sculpture is evident only on the first whorl and may also occur in the umbilicus, but it is almost completely missing in intermediate surface and an attentive examination is required, under strong magnification and preferably under SEM, to detect it. This kind of sculpture is not exclusive of the genus *Anekes*, and it is also present on *Granigyra inflata* (Warén, 1992), originally described in *Anekes* but later (Warén 1996) found to have radular characters closer to *Granigyra* Dall, 1889.

Anekes spiralis sp. nov. differs from the other species of *Anekes* in that the microsculpture is definitely spiral, not just with a preferential orientation like in *A. sculpturata* or in *A. undulisculpta*, but a limited anastomosing pattern occurs on some (especially the very early) parts of the shell of *A. spiralis* sp. nov., supporting the generic placement.

Subclass Caenogastropoda Cox, 1960
Family Eulimidae Philippi, 1853

Key to the species of Eulimidae found in the GB

Adapted from Bouchet & Warén (1986), to whom we refer for a detailed account of identification criteria and for descriptive terminology. Caution must be taken as more species are likely to occur on GB, so that the identification through the key should be carefully checked against the illustrations; Bouchet & Warén (1986) should anyway be consulted regarding this group. The supraspecific classification in this group still needs elaboration, and "*Eulima*" with quotes is used (e.g., Bouchet & Warén 1986) as a catchall for nondescript species for which a generic assignment is not straightforward.

1. Apex and/or whole shell brownish or yellowish, or with a pattern with such colours 2
– Apex and rest of shell colourless 4

2. Teleconch with a blurry yellowish band ....
.... **“*Eulima*” *leptozona*** Dautzenberg & H. Fischer, 1896 (Fig. 19H–I)
– Teleoconch colourless or uniformly yellowish 3

3. Last whorl about half of the total height ....
.... ***Fuscapex cabiochi*** Bouchet & Warén, 1986 (Fig. 20C–D)
– Last whorl about 40% or less of the total height ....
.... ***Batheulima fuscoapicata*** (Jeffreys, 1884) (Fig. 20A–B)

4. Shell with a thin columella and an umbilical chink, without any scars of growth stages 5
– Shell with thickened columella, imperforate, with scars marking former growth stages (may need careful examination under strong illumination reflected on the glossy surface) 7

5. Shell rather large (may be > 10 mm), with distinct prosocline ribs ....
.... ***Costaclis mizon*** (Watson, 1881) (Fig. 20O–P)
– Shell small, smooth or with axial growth lines 6

6. Last whorl nearly half of the total height ....
.... ***Hemiaclis obtusa*** Bouchet & Warén, 1986 (Fig. 20K–L)
– Last whorl hardly more than one-third of total height .....***Aclis walleri*** Jeffreys, 1867 (Fig. 20M–N)

7. Shell axis straight, shell regularly coiled 8
– Shell axis bent or twisted 12

8. Whorls distinctly convex 9
– Whorls flat 10

9. Shell tall, last whorl less than half the total height ....
....***Melanella* cf. *myriotrochi*** Bouchet & Warén, 1986 (Fig. 19F–G)
– Shell relatively short, last whorl about 60% of total height ....
.... ***Bathycrinicola talaena*** (Dautzenberg & H. Fischer, 1896) (Fig. 20G–H)

10. Larval shell with more than two whorls, apex pointed ....
.... **“*Eulima*” *anonyma*** Bouchet & Warén, 1986 (Fig. 19J–K)
– Larval shell with less than 2 whorls, apex globose 11

11. Shell about 2 mm, cylindrical, with flaring outer lip ....
....***Fusceulima digitalis*** Hoffman & Engl, 2021 (Fig. 20I–J)
– Shell reaching more than 2 mm, high-conical, outer lip not flaring ....
....***Melanella jeffreysi*** (Tryon, 1886) (Fig. 19D–E)

12. Shell small (< 3 mm) and curved only in one plane, parietal edge continuous with columella ....
....***Eulitoma obtusiuscula*** Bouchet & Warén, 1986 (Fig. 19L–O)
– Shell large (> 5 mm), distorted, parietal edge and columella differentiated 13

13. Shell very slender (h/w > 3.6) ....
.... ***Campylorhaphion machaeropsis*** (Dautzenberg & H. Fischer, 1896) (Fig. 20E–F)
– Shell moderately slender (h/w about 3) ....
....***Melanella spiridioni*** (Dautzenberg & H. Fischer, 1896) (Fig. 19A–C)

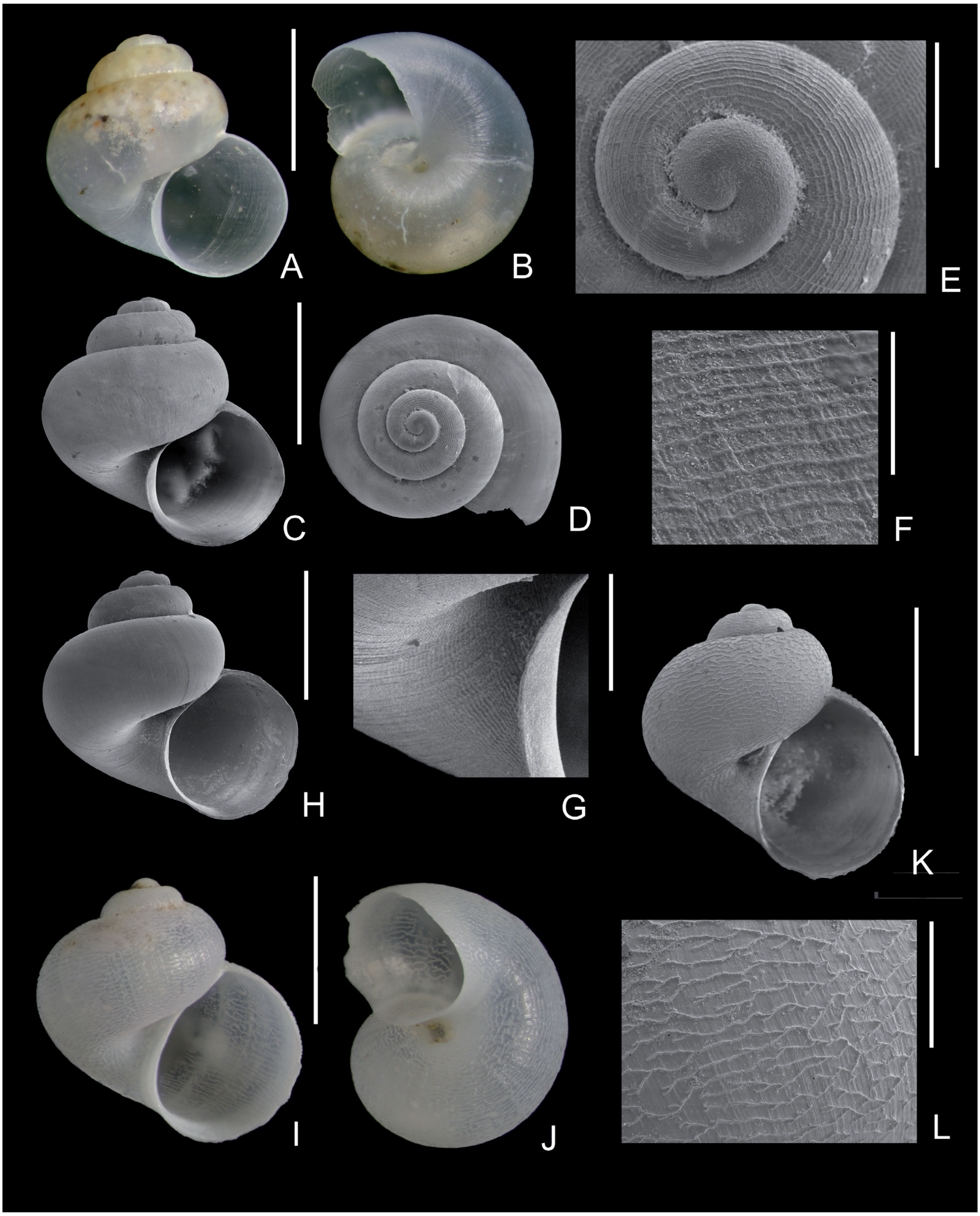

Fig. 17. Skeneimorph species 4. **A–H**. *Anekes spiralis* Gofas & Luque sp. nov. **A–B**. Holotype (MNCN 15.05/200139H), BANGAL 0711, V5, 1631 m, diameter 1.7 mm. **C–D**. SEM micrograph of the holotype. **E**. Apical view, protoconch and early teleoconch whorl of the holotype. **F**. Detail of the microsculpture of the adapical part of the last whorl. **G**. Detail of the umbilical area of the holotype. **H**. Paratype (MNCN 15.05/200139P), SEM micrograph, same locality, 2.0 mm. **I–J**. *Granigyra inflata* (Warén, 1992), BANGAL 0711, V5, 1631 m, diameter 1.8 mm. **K–L**. Same shell, SEM micrograph and detail of the microsculpture of the last whorl. Scale bars: A–D, H–K = 1 mm; E, G, L = 200 µm; F = 50 µm.

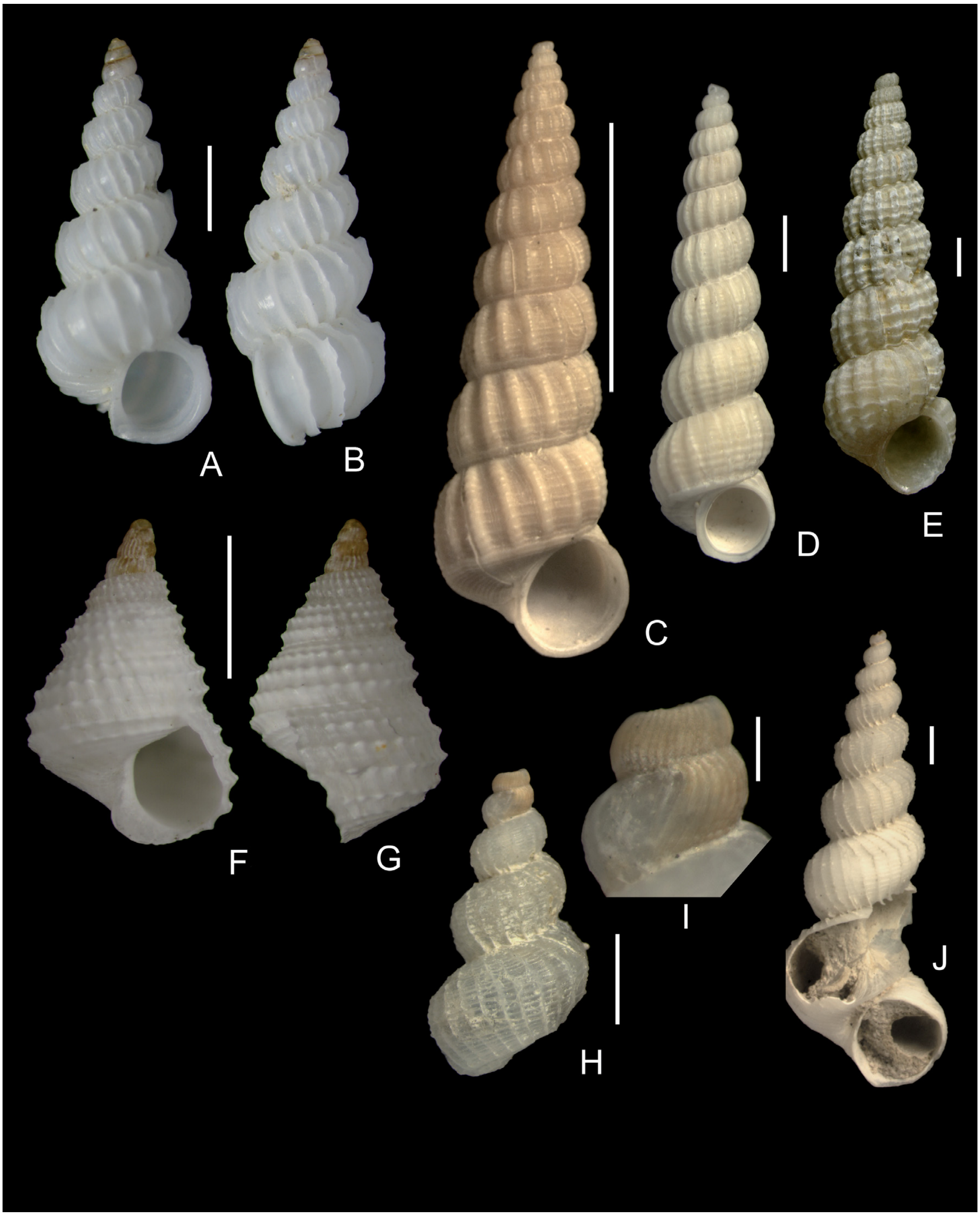

Fig. 18. Epitoniidae. **A–B**. *Epitonium dallianum* (Verrill & S. Smith, 1880), SEAMOUNT 1, DW116, 985–1000 m, 5.0 mm. **C.** *Cylindriscala thalassae* Bouchet & Warén, 1986, BANGAL 0711, DR14, 1130 m, 23.5 mm. **D**. *Cylindriscala guernei* (Dautzenberg & de Boury, 1897), BANGAL 0711, DR15, 1410 m, 8.5 mm. **E**. *Opaliopsis atlantis* (Clench & R.D. Turner, 1952), SEAMOUNT 1, DW111, 675–685 m, 11.0 mm. **F–G**. *Iphitus tuberatus* Jeffreys, 1883, SEAMOUNT 1, DW108, 1120–1125 m, 2.3 mm. **H–I**. *Eccliseogyra folini* (Dautzenberg & de Boury, 1897), shell and detail of protoconch, BANGAL 0711, V2, 1706 m, 3.4 mm. **J.** *E. folini*, BANGAL 0711, V10, 1720 m, 12.3 mm. Scale bars: A–B, D–H, J = 1 mm; C = 10 mm; I = 200 µm.

Genus ***Melanella*** Bowdich, 1822

Type species

Melanella dufresnei Bowdich, 1822, by monotypy.

Melanella* cf. *myriotrochi Bouchet & Warén, 1986
Fig. 19F–G

Melanella? myriotrochi Bouchet & Warén, 1986: 383, figs 906–907.

Material examined

GALICIA BANK • 1 spm; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 1 spm; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

This species was described on a single specimen, probably immature judging from the very thin, brittle aperture. The specimen illustrated here is larger and definitely adult, but has, like the holotype, a small mucronate protoconch, teleoconch whorls unusually convex for a eulimid, and a projecting profile of the outer lip, making this the closest match we could find among the species described from the area. This identification remains tentative, especially taking into account that the host holothurian species was not found in our material.

Genus ***Fusceulima*** Laseron, 1955

Type species

Fusceulima jacksonensis Laseron, 1955, by original designation.

Fusceulima digitalis Hoffman & Engl, 2021
Fig. 20I–J

Balcis sp. – Rolán Mosquera 1983: 199.

Material examined

GALICIA BANK • 1 sh; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN • 3 sh; 42°28.81′ N, 11°50.03′ W; 1410 m; 8 Aug. 2011; BANGAL 0711 DR15; MNCN.

Remarks

This recently described species is very different from any known eulimid in European waters. It is tentatively included in the genus *Fusceulima* Laseron, 1955, due to its small shell, with few, almost flat whorls, short aperture and curved outer lip (see diagnosis of *Fusceulima* in Bouchet & Warén 1986, Souza & Pimenta 2014 and Engl *et al.* 2021). It was described and illustrated for the first time as *Balcis* sp. by Rolán Mosquera (1983: 199), from the Galicia Bank.

Families Buccinidae Rafinesque, 1815 and Colidae Gray, 1857

Key to species of Buccinidae and Colidae found in the GB (see also Bouchet & Warén 1985)

1. Sculpture conspicuous, with definite spiral ridges 2
– Sculpture attenuated, consisting only of fine spiral grooves 3

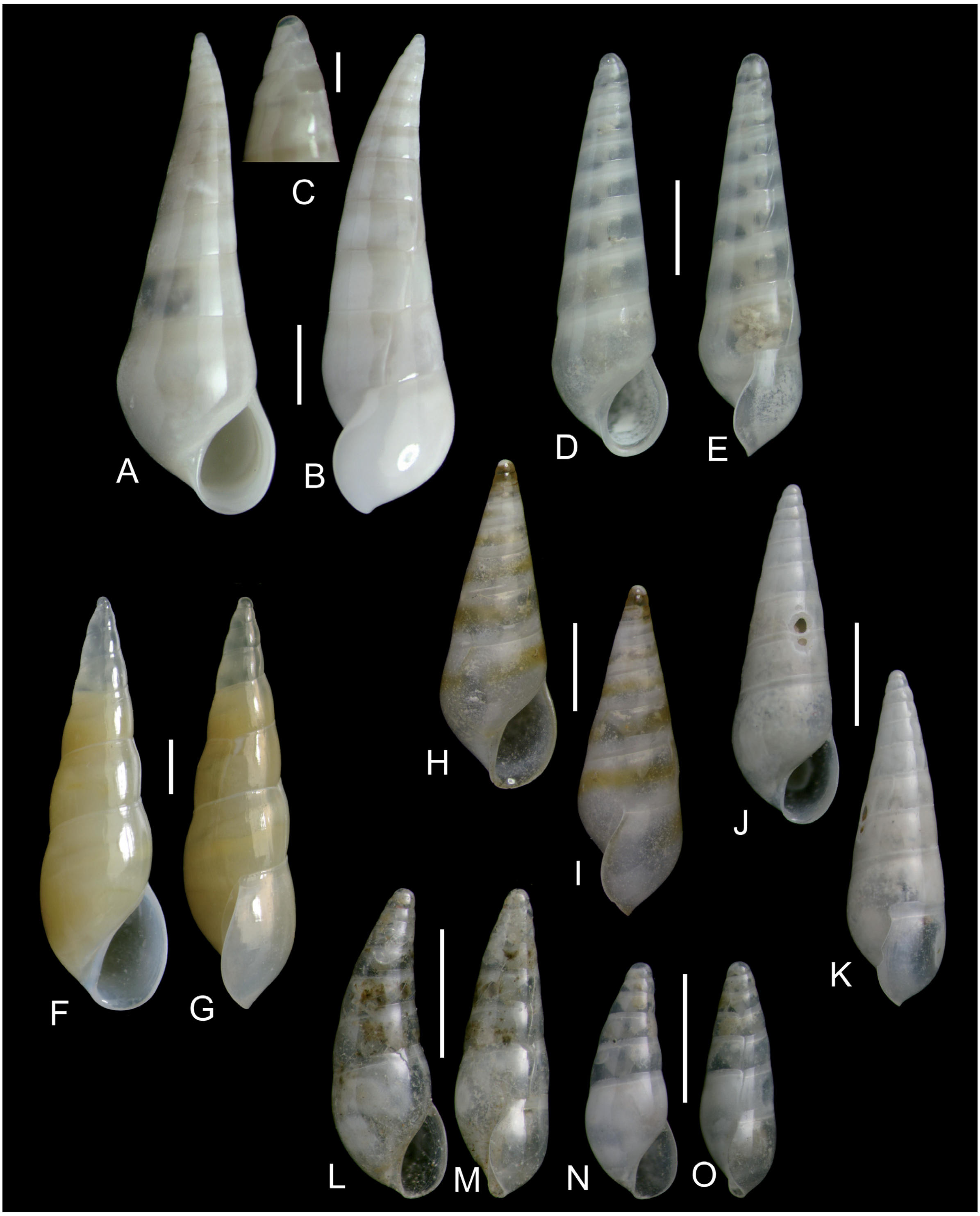

Fig. 19. Eulimidae 1. **A–C**. *Melanella spiridioni* (Dautzenberg & H. Fischer, 1896) and detail of protoconch, BANGAL 0711, V5, 1631 m, 6.0 mm. **D–E**. *Melanella jeffreysi* (Tryon, 1886), BANGAL 0711, V2, 1706 m, 4.3 mm. **F–G**. *Melanella* cf. *myriotrochi* Bouchet & Warén, 1986, BANGAL 0711, V2, 7.6 mm. **H–I**. "*Eulima*" *leptozona* Dautzenberg & H. Fischer, 1896, SEAMOUNT 1, DW111, 675–685 m, 3.8 mm. **J–K**. "*Eulima*" *anonyma* Bouchet & Warén, 1986, BANGAL 0711, V2, 3.3 mm. **L–O**. *Eulitoma obtusiuscula* Bouchet & Warén, 1986, BANGAL 0711, DR15, 1410 m, 2.4 and 1.85 mm. Scale bar for A–B, D–O = 1 mm; C = 200 µm.

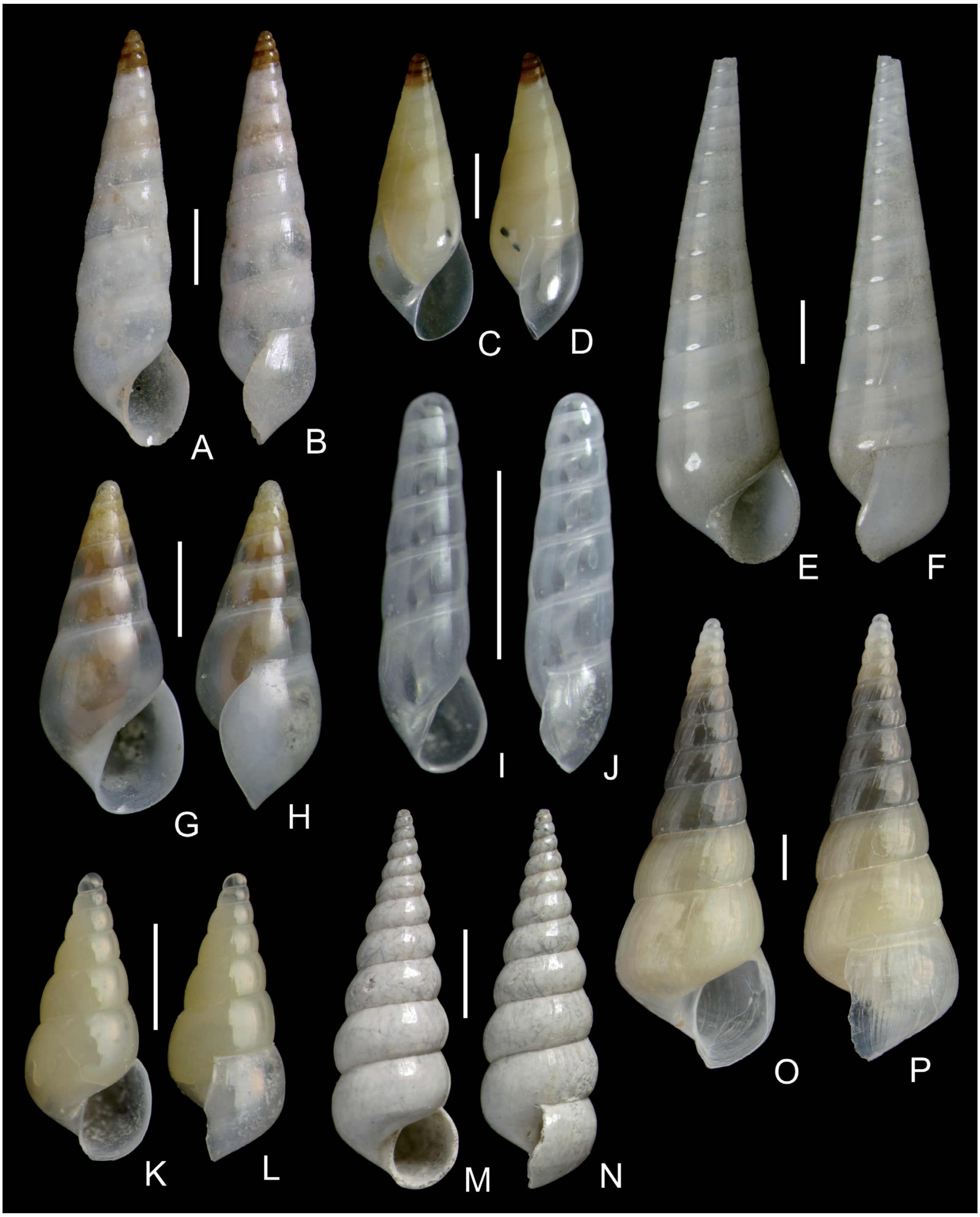

Fig. 20. Eulimidae 2. **A–B**. *Batheulima fuscoapicata* (Jeffreys, 1884), BANGAL 0711, DR15, 1410 m, 5.5 mm. **C–D**. *Fuscapex cabiochi* Bouchet & Warén, 1986, BANGAL 0711, DR15, 4.4 mm. **E–F**. *Campyloraphion machaeropsis* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW108, 1110–1125 m, 8.0 mm. **G–H**. *Bathycrinicola talaena* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 985–1000 m, 3.5 mm. **I–J**. *Fusceulima digitalis* Hoffman & Engl, 2021, BANGAL 0711, DR15, 2.0 mm. **K–L**. *Hemiaclis obtusa* Bouchet & Warén, 1986, BANGAL 0711, V10, 1720 m, 2.7 mm. **M–N**. *Aclis walleri* Jeffreys, 1867, BANGAL 0711, V5, 1631 m, 4.3 mm. **O–P**. *Costaclis mizon* (Watson, 1881), BANGAL 0711, V10, 9.8 mm. Scale bars = 1 mm.

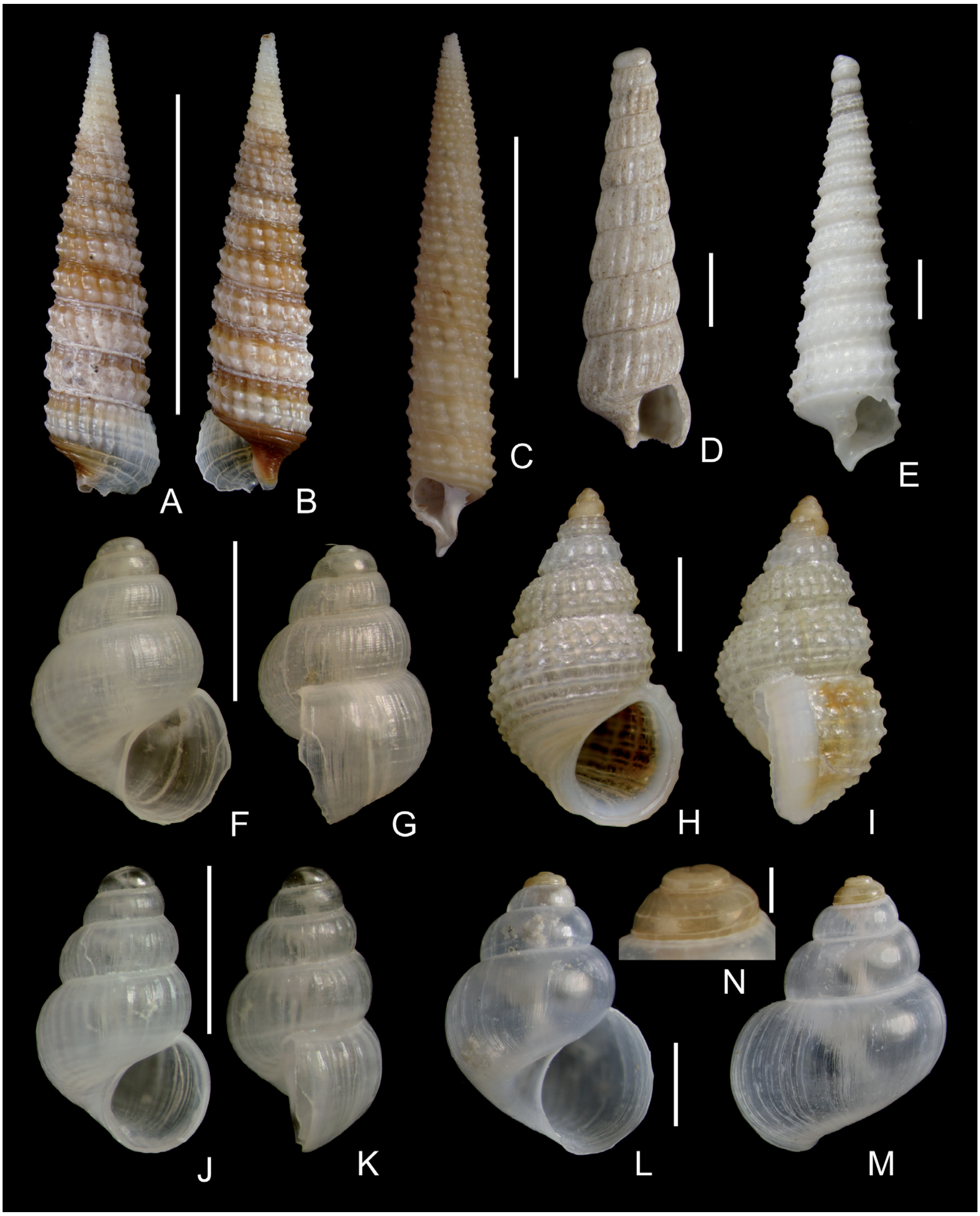

Fig. 21. Triphoridae, Newtoniellidae, Rissoidae. **A–B**. *Strobiligera lubrica* (Bouchet & Warén, 1993), BANGAL 0711, V8, 1565 m, 14.6 mm. **C**. *Strobiligera brychia* (Bouchet & Guillemot, 1978), SEAMOUNT 1, DW116, 985–1000 m, 21.5 mm. **D**. *Eumetula bouvieri* (Dautzenberg & H. Fischer, 1896), BANGAL 0711, DR15, 1410 m, 5.5 mm. **E**. *Cerithiella metula* (Lovén, 1846), BANGAL 0711, V10, 1720 m, 7.0 mm. **F–G**. *Alvania porcupinae* Gofas & Warén, 1982, BANGAL 0711, DR15, 1.8 mm. **H–I**. *Alvania cimicoides* (Forbes, 1844), SEAMOUNT 1, DW108, 1110–1125 m, 3.6 mm. **J–K**. *Gofasia galiciae* Bouchet & Warén, 1993, BANGAL 0711, DR15, 1.7 mm. **L–N**. *Benthonella tenella* (Jeffreys, 1869), BANGAL 0711, V5, 1631 m, 3.4 mm, and detail of the protoconch. Scale bars: A–C = 10 mm; D–M = 1 mm; N = 200 µm.

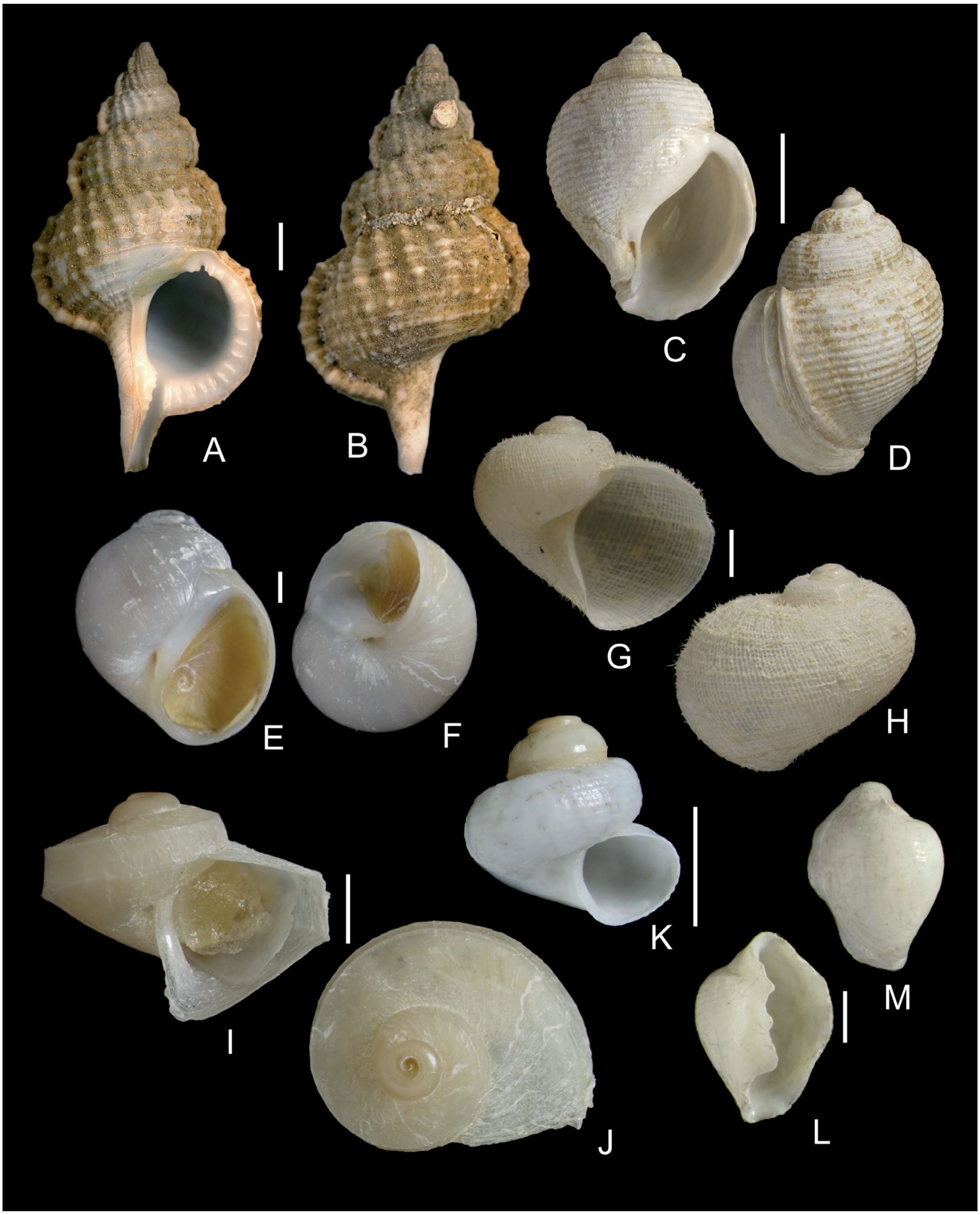

Fig. 22. Ranellidae, Cassidae, Naticidae, Capulidae, Haloceratidae, Ovulidae. **A–B**. *Ranella olearium* (Linnaeus, 1758), BANGAL 0711, V6, 909 m, 90 mm. **C–D**. *Oocorys sulcata* P. Fischer, 1884, BANGAL 0711, V8, 1565 m, 32 mm. **E–F**. *Euspira subplicata* (Jeffreys, 1885), BANGAL 0711, V10, 1720 m, 7.5 mm. **G–H**. *Torellia delicata* (Philippi, 1844), BANGAL 0711, V10, 5.2 mm. **I–J**. *Haloceras cingulatum* (Verrill, 1884), live-collected specimen, BANGAL 0711, V10, diameter 4.1 mm. **K**. *Haloceras carinatum* (Jeffreys, 1883), SEAMOUNT 1, DW116, 985–1000 m, diameter 1.8 mm. **L–M**. *Pedicularia sicula* Swainson, 1840, SEAMOUNT 1, DW108, 1110–1125 m, 3.7 mm. Scale bars: A–D = 10 mm; E–M = 1 mm.

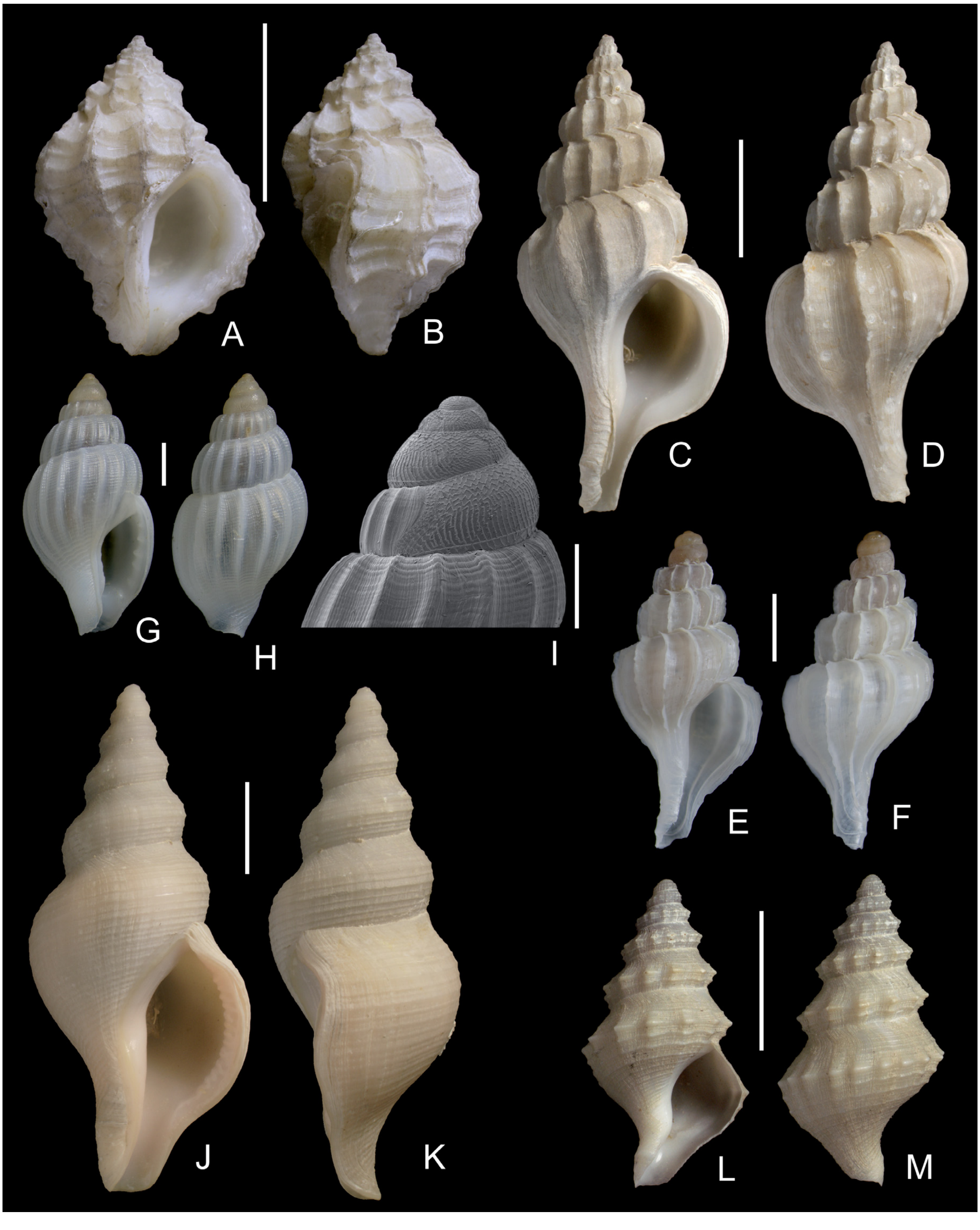

Fig. 23. Muricidae, Fasciolariidae, Columbellidae, Buccinidae, Colidae. **A–B**. *Coralliophila richardi* (P. Fischer, 1882), SEAMOUNT 1, DW106, 765 m, 17.9 mm. **C–D**. *Boreotrophon dabneyi* (Dautzenberg, 1889), BANGAL 0711, V5, 1631 m, 40.8 mm. **E–F**. *B. dabneyi*, juvenile specimen with well-preserved brown protoconch, BANGAL 0711, V2, 1706 m, 4.7 mm. **G–H**. *Amphissa acutecostata* (Philippi, 1844), SEAMOUNT 1, DW116, 985–1000 m, 6.0 mm. **I**. *A. acutecostata*, protoconch of another specimen, SEAMOUNT 1, CP117, 770 m. **J–K**. *Troschelia berniciensis* (King, 1846), ECOMARG 0709, V4, 735 m, 55 mm. **L–M**. *Kryptos koehleri* (Locard, 1896), BANGAL 0711, V8, 1565 m, 22.0 mm. Scale bars: A–D, J–M = 10 mm; E–H = 1 mm; I = 500 µm.

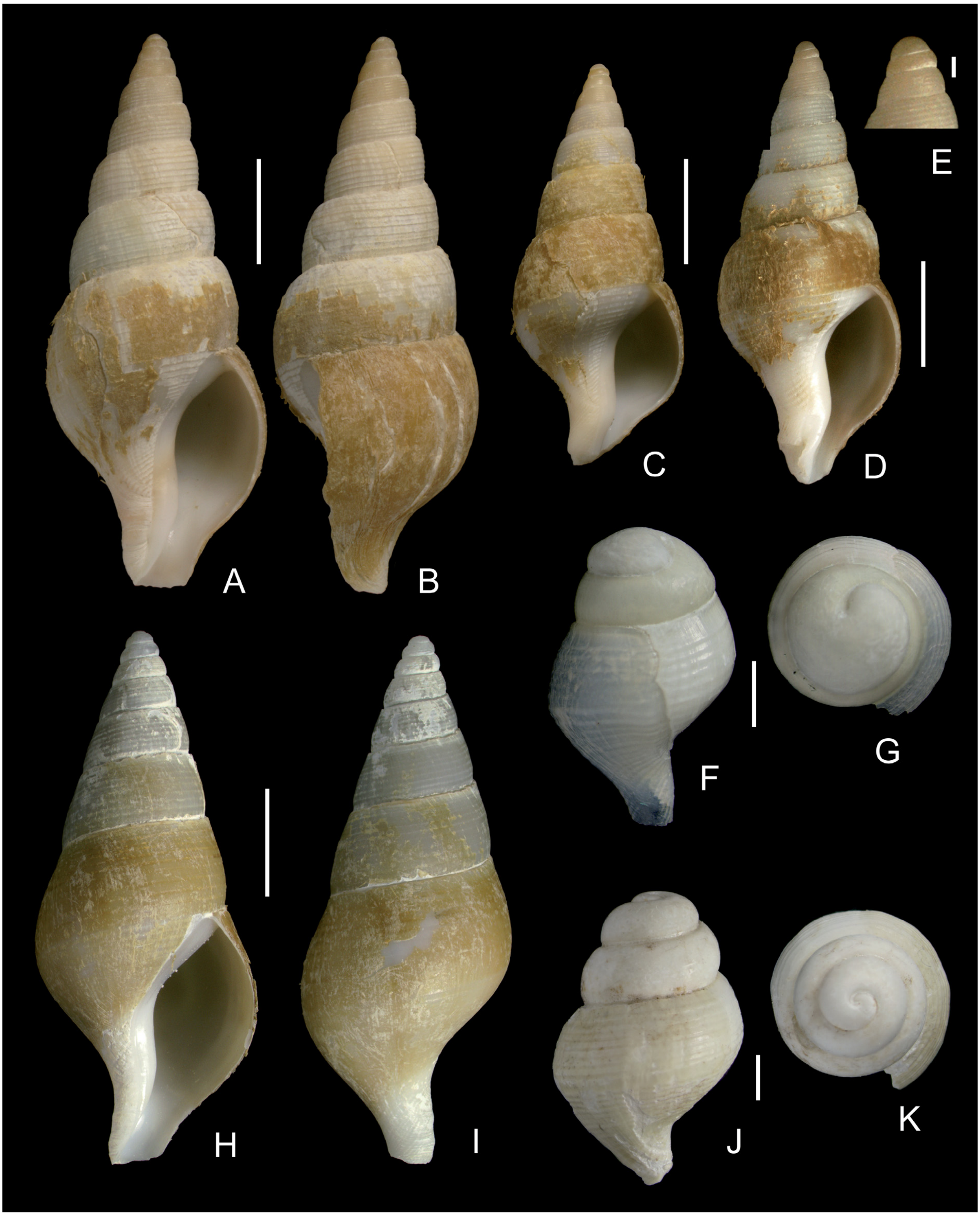

Fig. 24. Colidae. **A–D**. *Colus gracilis* (da Costa, 1778), ECOMARG 0709, R2, 615 m, 52 mm, 38 mm and 42 mm. **E**. Detail of apical whorls, same specimen as D. **F–G**. *C. gracilis*, juvenile shell with protoconch and half teleoconch whorl, BANGAL 0711, V4, 744 m, 4.5 mm. **H–I**. *Colus jeffreysianus* (P. Fischer, 1868), BANGAL 0711, V10, 1720 m, 49.3 mm. **J–K**. *C. jeffreysianus*, juvenile shell with protoconch and half teleoconch whorl, 6.5 mm, from the same locality. Scale bars: A–D, H–I = 10 mm; E–G, J–K = 1 mm.

2. Sculpture mostly spiral, shell commonly > 5 cm .... ***Troschelia berniciensis*** (King, 1846) (Fig. 23J–K)
– Sculpture with conspicuous knobs along the periphery .... ***Kryptos koehleri*** (Locard, 1896) (Fig. 23L–M)

3. Protoconch of little more than 1 whorl, with a large nucleus .... ***Colus gracilis*** (da Costa, 1778) (Fig. 24A–G)
– Protoconch of more than 2 whorls, with a small nucleus ....***Colus jeffreysianus*** (P. Fischer, 1868) (Fig. 24H–K)

Remarks

There are two species of *Colus* Röding, 1798 to be found on GB (Fig. 24), and their correct identification is crucial since they are an important component of the benthic community and food chain. Both have extremely similar shells and their accurate identification relies essentially on the diagnostic character of the protoconch. *Colus gracilis* is found on the summit platform and the adult is somewhat larger and more solid, whereas *C. jeffreysianus* has a broad distribution on the deeper part of the slope. *Colus aurariae* Fraussen, Rosado, Afonso & Monteiro, 2009, described from off Portugal in 200–500 m depth, differs from *C. gracilis* in having both early whorls and siphonal canal more stretched out; it was not found on GB.

Family Cancellariidae Forbes & Hanley, 1851

Genus ***Brocchinia*** Jousseaume, 1887

Type species

Voluta mitraeformis Brocchi, 1814, by monotypy.

Brocchinia* cf. *clenchi Petit, 1986
Fig. 25A–E

Brocchinia clenchi Petit, 1986: 23–26.

Brocchinia clenchi – Verhecken 2007: 311–313.

Material examined

GALICIA BANK • 5 spm and 7 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 5 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 1 spm (Fig. 25A–B, 10.8 mm high); 42°59.61′ N, 11°58.41′ W; 1671 m; 7 Aug. 2011; BANGAL 0711 V9; MNCN • 1 spm, 6 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN • 5 sh; 42°28.81′ N, 11°50.03′ W; 1410 m; 8 Aug. 2011; BANGAL 0711 DR15; MNCN.

Description

Shell rather solid, creamy white, conical and elongated, up to 10.8 mm in height, 5.4 mm width. Protoconch paucispiral, globose, of 1½ whorl, 330 µm in nucleus diameter and about 650 µm in maximum diameter, smooth, with a clear thickened edge marking the transition to teleoconch. Teleoconch with up to 5 convex whorls, first whorl with 2 initially smooth and then slightly nodulose spiral cords, with third cord appearing at the end of this whorl. Spiral sculpture formed by 3 nodulose spiral cords on last 2 whorls, and 3–4 more basal cords almost smooth on body whorl; uppermost basal cord meeting a level close to the suture at the posterior end of aperture. Axial sculpture formed by nodulose ribs, crossed by the three equally spaced upper spiral cords. Shell entirely marked by strong axial growth lines. Suture

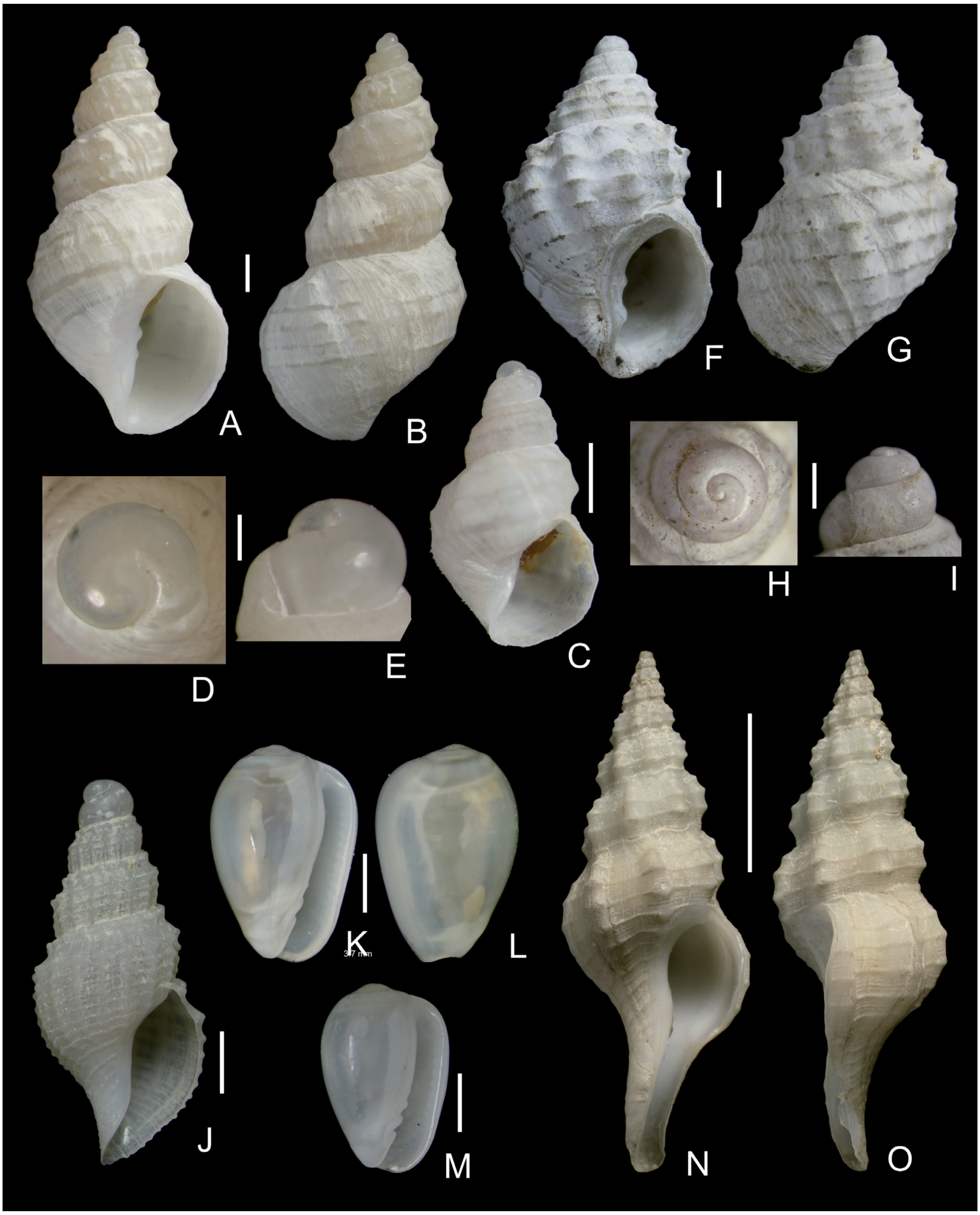

Fig. 25. Cancellariidae, Belomitridae, Cystiscidae, Fasciolariidae. **A–B**. *Brocchinia* cf. *clenchi* Petit, 1986, BANGAL 0711, V9, 1671 m, live collected specimen, 10.8 mm. **C**. *Brocchinia* cf. *clenchi*, juvenile specimen, BANGAL 0711, V2, 1706 m, 4.1 mm. **D–E**. Same specimen, detail of the protoconch. **F–G**. *Brocchinia azorica* (Bouchet & Warén, 1985), BANGAL 0711, V5, 1631 m, 9.3 mm. **H–I**. Detail of the protoconch of another shell, BANGAL 0711, V2. **J**. *Belomitra quadruplex* (Watson, 1882), BANGAL 0711, V10, 1720 m, 6.2 mm. **K–M**. *Gibberula abyssicola* Locard, 1897, SEAMOUNT 1, DW116, 985–1000 m, 3.7 and 3.2 mm. **N–O**. *Fusinus bocagei* (P. Fischer, 1882), ECOMARG 0709, V4, 735 m, 33 mm. Scale bars:A–C, F–G, J–M = 1 mm; D–E, H–I = 200 µm; N–O = 10 mm.

incised, with suprasutural furrow. Base conical, with 2 smooth spiral cords that emerge from the interior of the aperture. Aperture elliptical, outer lip thin, prosocline, smooth inside. Inner lip strongly reflected, with a thin and shiny vitreous callus on the parietal area. Columella somewhat inclined to right, with 2 strong folds, posterior larger, columellar end somewhat angled at its end and forming a weak siphonal canal when it meets the outer lip.

Remarks

Specimens and shells of this species were only found in the deepest BANGAL samples (1631–1720 m), together with shells of *Brocchinia azorica* (Bouchet & Warén, 1985) in samples V2 and V5.

Brocchinia clenchi Petit, 1986 was originally described from the Josephine Bank at 610–770 m depth (Petit 1986); the holotype being faintly sculptured and measuring 4.5 mm. The species was later found deeper (1350–1360 m) in the same locality; shells and specimens were recorded from the Canary Islands (65–1520 m), Selvagem Grande (830 m), Azores (15–1250 m) and off Western Sahara (1000–1100 m) (Verhecken 2002, 2007). Both extremes of the bathymetric range (15–1520 m) are based on live collected specimens (Verhecken 2007).

Verhecken (2007: fig. 29c–d) illustrated as *B. clenchi* two larger and more sculptured shells in a lot of six collected in PORCUPINE stn 28 (S of Sagres, 548 m, BMNH 1885.11.5.2607–12), which are closely similar to those from GB and were identified by Jeffreys (1885: 49) as '*Cancellaria mitraeformis*, Brocchi'. Verhecken (2007) noted that shells of *B. clenchi* of similar size coming from shallow or deep waters of the Canary Islands may be faintly or strongly sculptured, whereas shells from deeper water were larger (up to 8.5 mm). He nevertheless preferred to consider one species awaiting for more material from different localities. In disagreement with this view, Rolán & Hernández (2009) described *Brocchinia canariensis* as different from *B. clenchi*. These authors also concluded that the paratype of *B. clenchi* (a shell of 6 mm, BMNH 1855.4.4.202, from the Canary Islands) illustrated by Petit (1986), as "possibly the type of *Cancellaria pusilla* H. Adams, 1869" (a junior primary homonym of *Cancellaria pusilla* G.B. Sowerby I, 1832) was different from both *B. clenchi* and *B. canariensis*, therefore their choice to describe a new species from the Canaries rather than propose a replacement name for *C. pusilla*.

Other N Atlantic species, as *Brocchinia azorica* (Bouchet & Warén, 1985) (see Fig. 25F–I), *B. pustulosa* Verhecken, 1991, and *B. nodosa* (Verrill & S. Smith, 1885) have the inside of the outer lip smooth, but are larger and have a more solid and conical shell with stronger nodulose sculpture; *B. azorica* and *B. nodosa* also have multispiral protoconchs. The S Atlantic *B. decapensis* (Barnard, 1960) is the largest Atlantic species (up to 27.3 mm), and has also a more solid and conical shell. Finally, the NE Brazilian species *Brocchinia verheckeni* Barros & Lima, 2007 and *B. harasewychi* Barros & Lima, 2007, have a paucispiral protoconch, but they are smaller (up to 4.4 and 6.3 mm, respectively), less elongated than the species from GB, and have a stronger nodulose sculpture; *B. verheckeni* has lyrae inside the outer lip, whereas *B. harasewychi* lacks them (see Barros & Lima 2007).

Superfamily Conoidea Fleming, 1822

This species-rich superfamily is represented on Galicia Bank by members of the families Cochlespiridae Powell, 1942 (*Aforia* Dall, 1889), Borsoniidae Bellardi, 1875 (*Drilliola* Locard, 1897, *Retidrillia* J.H. McLean, 2000), Mangeliidae P. Fischer, 1883 (*Kurtziella* Dall, 1918), and mostly Raphitomidae Bellardi, 1875 (*Pleurotomella* Verrill, 1872, *Gymnobela* Verrill, 1884, *Austrobela* Criscione, Hallan, Puillandre & Fedosov, 2020, *Teretia* Norman, 1888, *Neopleurotomoides* Shuto, 1971). The separation of *Pleurotomella* species is very difficult, Bouchet & Warén (1980) should be consulted for identification in this genus.

Key to the species of Conoidea found in the GB

1. Sculpture formed by clearly predominant spiral cords or keels 2
– Sculpture of axial ribs and spiral cords 6

2. Shell up to 35 mm high, with two keels and finer spiral threads ....
.... ***Aforia serranoi*** Gofas, Kantor & Luque, 2014 (Fig. 26A–C)
– Shell usually less than 10 mm, not keeled or with only one subsutural keel 3

3. Last whorl hardly more than half of total height, protoconch ribbed ....
.... ***Drilliola loprestiana*** (Calcara, 1841) (Fig. 26F–G)
– Last whorl nearly two-thirds of total height, protoconch not ribbed 4

4. Subsutural keel present; sometimes a very faint ribbing ....
.... ***Gymnobela subaraneosa*** (Dautzenberg & H. Fischer, 1896) (Fig. 27I–J)
– No subsutural keel 5

5. Spiral cords coarse, protoconch small < 0.5 mm ....***Teretia teres*** (Reeve, 1844) (Fig. 26N)
– Spiral cords fine, protoconch large > 0.7 mm ....
....***Teretia megalembryon*** (Dautzenberg & H. Fischer, 1896) (Fig. 26L–M)

6. Spiral sculpture comprising spiral cords, and finer spiral threads in the interspaces of the main cords ....***Kurtziella serga*** (Dall, 1881) (Fig. 27A–B)
– Spiral cords or threads maybe unequal, but not as above 7

7. Protoconch whitish, with a marked peripheral keel and axial riblets ....
..........................***Neopleurotomoides callembryon*** (Dautzenberg & H. Fischer, 1896) (Fig. 27E–F)
– Protoconch generally brownish, with a cris-cross microsculpture of oblique riblets 8

8. Protoconch globose with a blunt apex 9
– Protoconch conical with a pointed apex 10

9. Whorls with a sharp keel bearing fine knobs .... ***Retidrillia pruina*** (Watson, 1881) (Fig. 26D–E)
– Whorls bluntly angular, with definite flexuose ribs ....
.... ***Pleurotomella packardii*** Verrill, 1872 (Fig. 27C–D)

10. Shell robust, distinctly shouldered, with fine spiral cordlets and broader axial folds 11
– Shell thin, not distinctly shouldered, with spiral cords and axial ribs 12

11. Shell stout (diameter more than half the height), ribs few ....
....***Gymnobela abyssorum*** (Locard, 1897) (Fig. 26H–I)
– Shell slender (diameter less than half the height), ribs numerous ....
.... ***Austrobela pyrrhogramma*** (Dautzenberg & H. Fischer, 1896) (Fig. 26J–K)

12. Shell rather solid, brownish with faint spiral banding ....
.... ***Pleurotomella gibbera*** Bouchet & Warén, 1980 (Fig. 27G–H)
– Shell white or vitreous except for brown protoconch 13

13. Ribs thin and flexuous, much narrower than interspaces; spiral cords delicate and also widely spaced ....***Pleurotomella coelorhaphe*** (Dautzenberg & H. Fischer, 1896) (Fig. 27K–L)
– Ribs rather robust, may be oblique but not definitely flexuous 14

14. Ribs and cords forming a definite lattice, with interspaces about twice as broad as those; ribs ca 12 on last whorl .... ***Pleurotomella eurybrocha*** (Dautzenberg & H. Fischer, 1896) (Fig. 27M–N)
– Ribs and cords with interspaces only slightly broader than them, ribs ca, 20 on last whorl ....***Pleurotomella demosia*** (Dautzenberg & H. Fischer, 1896) (Fig. 27O–P)

Subclass Heterobranchia
Family Pyramidellidae Gray, 1840

Members of the family Pyramidellidae, all of which are ectoparasites on other invertebrates (mostly annelids and molluscs), are unusually rare on GB, totalizing only 3 specimens and 8 shells.

Genus ***Tiberia*** Jeffreys, 1884

Type species

Pyramidella minuscula Monterosato, 1880, by subsequent designation.

***Tiberia* sp.**
Fig. 28D–F

Material examined

GALICIA BANK • 1 spm, 2 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

The genus *Tiberia* is diagnosed by being umbilicate and having a straight columella with three folds, of which the two abapical ones are inconspicuous. The type species *Pyramidella minuscula* Monterosato, 1880 has a rather thick shell with brown spiral bands, one below the suture and another one above it, prolonged on the middle part of the last whorl. One specimen collected in 1720 m deep on GB (Fig. 28D–F) is definitely a *Tiberia* but differs from *T. minuscula* in being colourless, and in having a very thin shell with a markedly keeled last whorl.

Pyramidella curtissima Locard, 1897, described from deep water (Travailleur 1881, stn 3, 3307 m; stn 30, 1203 m; Travailleur 1882, stn 13, 2030 m) off Portugal, is much stouter than the specimen illustrated here. The figured syntype could not be traced in the "Travailleur" and "Talisman" collection of MNHN, Paris; one shell with no indication of station number, labelled "Portugal" (Fig. 28G) is in poor condition, and four other shells from "Travailleur" 1881 stn 31 (not mentioned in Locard 1897) are the rissoid *Benthonella tenella*.

Without additional material at hand, the observed differences are not sufficient to demonstrate that our specimen is specifically distinct from *T. minuscula* and it is therefore reported as *Tiberia* sp.

Genus ***Turbonilla*** Risso, 1826

Type species

Turbonilla costulata Risso, 1826, by subsequent designation.

Turbonilla* cf. *paucistriata (Jeffreys, 1884)
Fig. 28H

Material examined

GALICIA BANK • 1 spm, 1 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 2 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

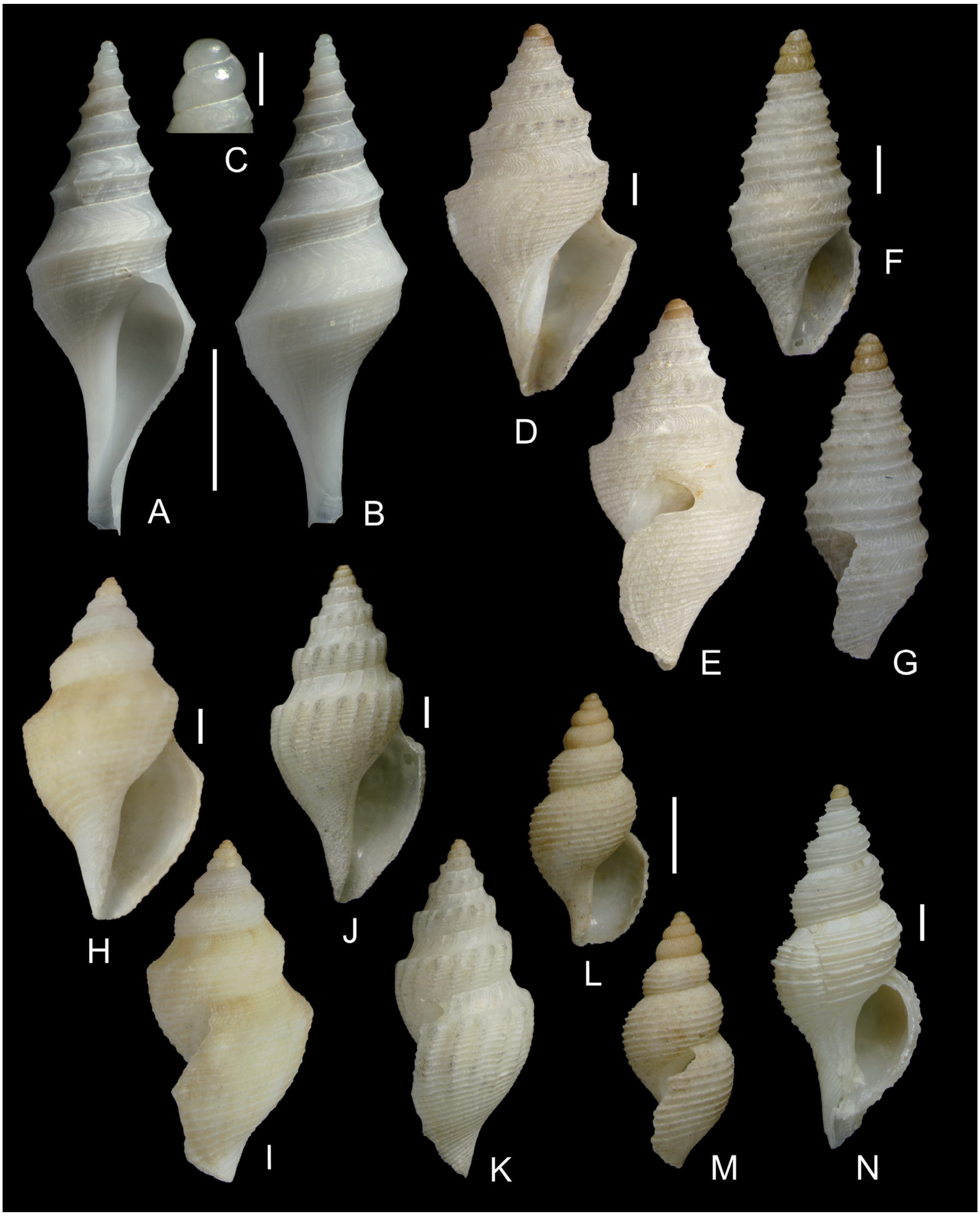

Fig. 26. Conoidea 1 (Cochlespiridae, Borsoniidae, Raphitomidae). **A–C**. *Aforia serranoi* Gofas, Kantor & Luque, 2014, holotype, BANGAL 0711, V10, 1720 m, 35 mm, and detail of the protoconch. **D–E**. *Retidrillia pruina* (Watson, 1881), BANGAL 0711, V5, 1631 m, 11.7 mm. **F–G**. *Drilliola loprestiana* (Calcara, 1841), SEAMOUNT 1, DW108, 1110–1125 m, 6.8 mm. **H–I**. *Gymnobela abyssorum* (Locard, 1897), SEAMOUNT 1, DW116, 985–1000 m, 10.0 mm. **J–K**. *Austrobela pyrrhogramma* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 10.8 mm. **L–M**. *Teretia megalembryon* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 985–1000 m, 3.3 mm. **N**. *Teretia teres* (Reeve, 1844), SEAMOUNT 1, DW106, 765 m, 10.1 mm. Scale bars: A–B = 10 mm; C–N = 1 mm.

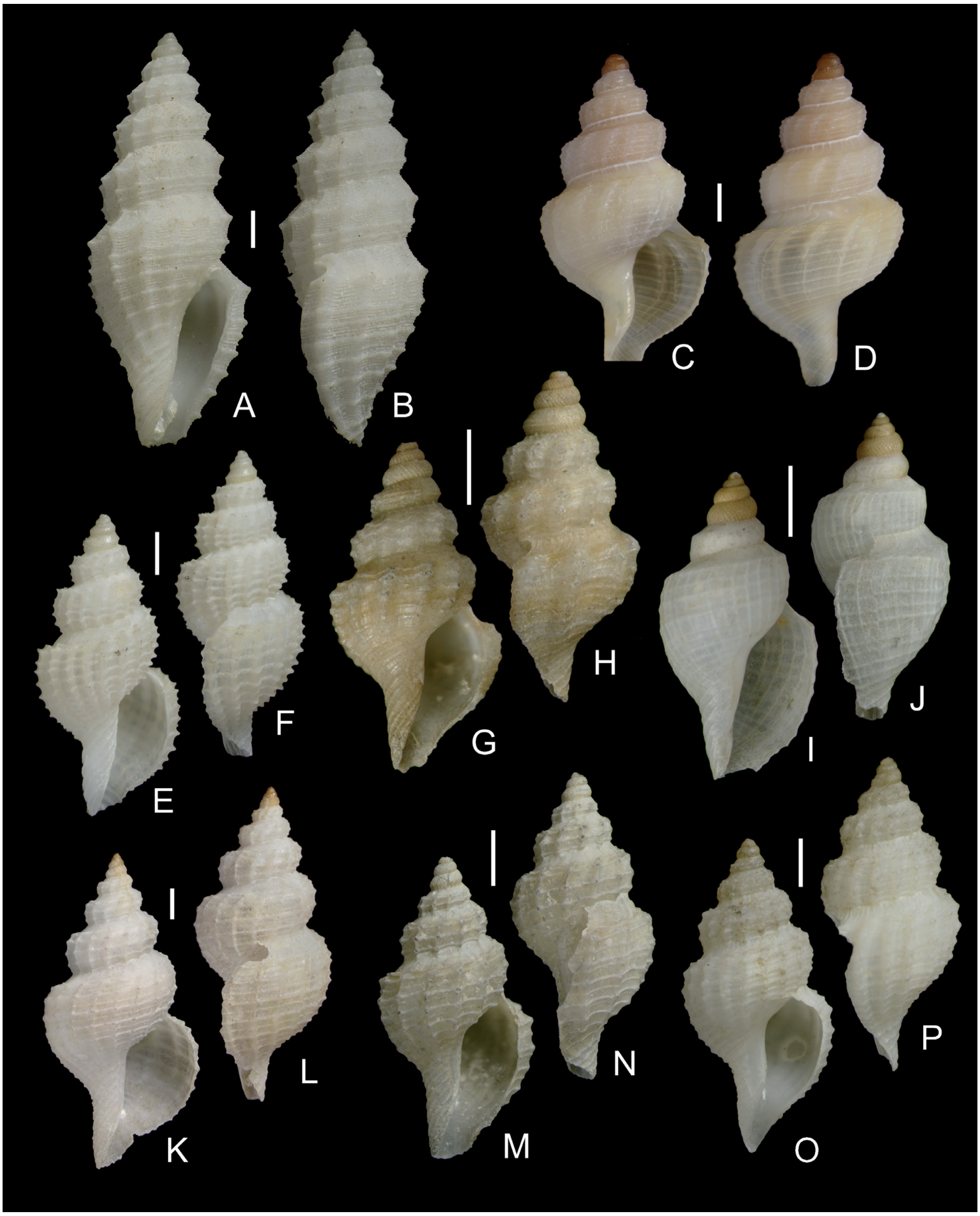

Fig. 27. Conoidea 2 (Mangeliidae, Raphitomidae). **A–B**. *Kurtziella serga* (Dall, 1881), SEAMOUNT 1, DW115, 880–885 m, 11.3 mm. **C–D**. *Pleurotomella packardii* Verrill, 1872, BANGAL 0711, V2, 1706 m, 8.9 mm. **E–F**. *Neopleurotomoides callembryon* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW111, 675–685 m, 7.1 mm. **G–H**. *Pleurotomella gibbera* Bouchet & Warén, 1980, SEAMOUNT 1, DW116, 985–1000 m, 4.2 mm. **I–J**. *Gymnobela subaraneosa* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 4.3 mm. **K–L**. *Pleurotomella coelorhaphe* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW116, 10.0 mm. **M–N**. *Pleurotomella eurybrocha* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW108, 1110–1125 m, 5.5 mm. **O–P**. *Pleurotomella demosia* (Dautzenberg & H. Fischer, 1896), SEAMOUNT 1, DW111, 6.5 mm. Scale bars = 1 mm.

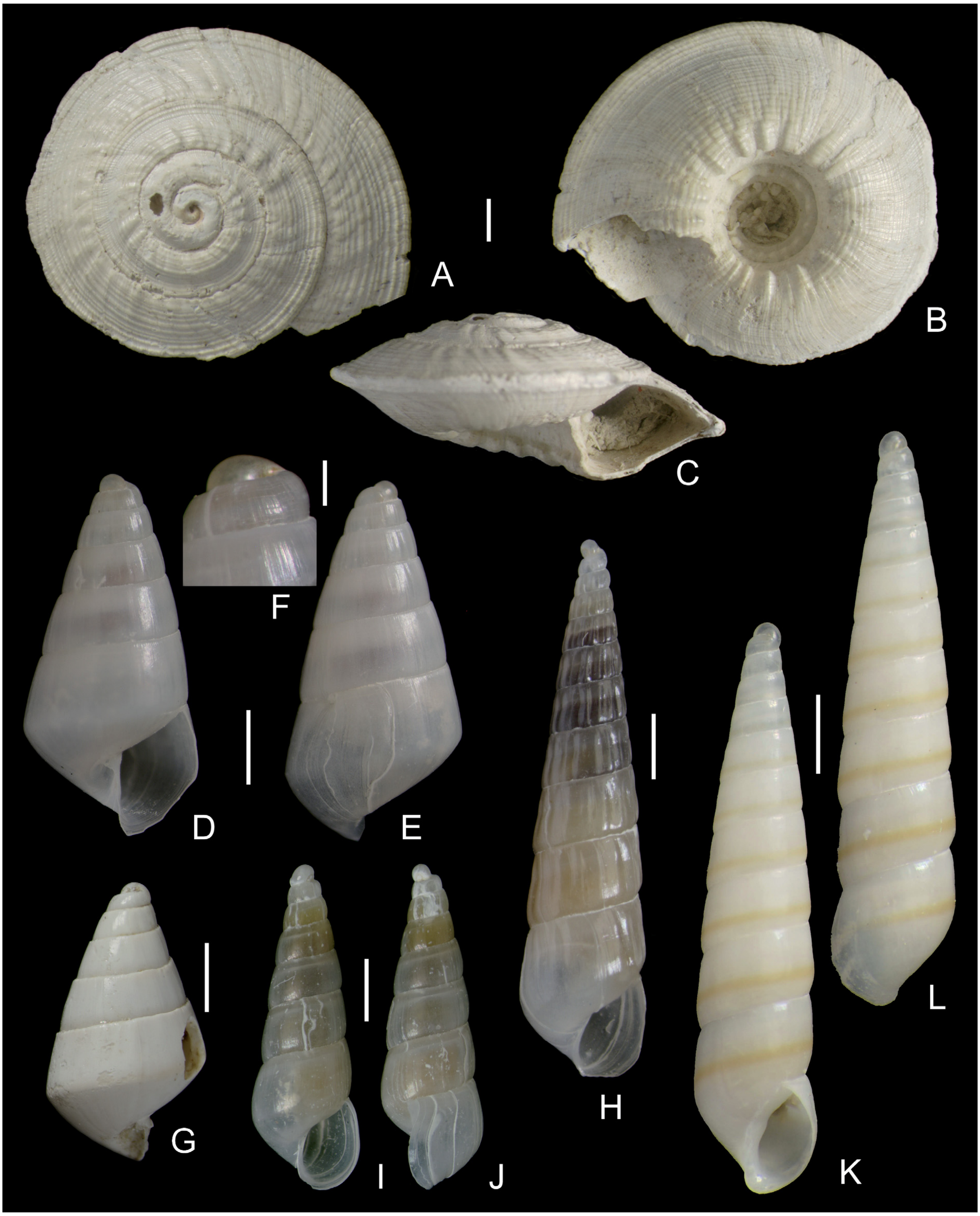

Fig. 28. Heterobranchia 1 (Architectonicidae, Pyramidellidae). **A–C**. *Solatisonax hemisphaerica* (Seguenza, 1876), BANGAL 0711, V6, 909 m, 8.9 mm. **D–F**. *Tiberia* sp., BANGAL 0711, V10, 1720 m, 4.8 mm. **G**. Syntype of *Pyramidella curtissima* Locard, 1897, Travailleur 1881 or 1882, 4.0 mm. **H**. *Turbonilla* cf. *paucistriata* (Jeffreys, 1884), BANGAL 0711, V5, 1631 m, 7.8 mm. **I–J**. *Eulimella* sp., BANGAL 0711, V10, 5.3 mm. **K–L**. *Tibersyrnola unifasciata* (Forbes, 1844), BANGAL 0711, V6, 7.2 mm. Scale bars: A–E, G–L = 1 mm; F = 200 µm.

Remarks

The single specimen and three shells resemble *Turbonilla paucistriata* (Jeffreys, 1884), originally described from much shallower depth of the Mediterranean (in the Sicily Channel), but differ in being more slender and having a more distinctly protruding protoconch, also of van Aartsen's (1987) "type B" i.e., with coiling axis making an angle of ca 100° with teleoconch axis. *Turbonilla amoena* (Monterosato, 1878) is also similar but broader. Not much more can be said without additional material from the area.

Family Ringiculidae Philippi, 1853

Genus ***Ringicula*** Deshayes, 1838

Type species

Marginella auriculata Ménard de la Groye, 1811, by subsequent designation.

Ringicula nitida Verrill, 1872
Fig. 29F–G

Ringicula nitida Verrill, 1872: 16.

Ringicula nitida – Bouchet 1975: 329–331.

Material examined

GALICIA BANK • 20 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 1 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 1 sh; 42°59.61′ N, 11°58.41′ W; 1671 m; 7 Aug. 2011; BANGAL 0711 V9; MNCN.

Remarks

Bouchet (1975) considered several deep-sea species of *Ringicula* as synonyms of *R. nitida* and, based on this, cited that species from several localities off the northwestern Iberian Peninsula, including GB. However, Mariottini *et al.* (2000) considered *R. nitida* as restricted to the Western Atlantic and referred the records by Bouchet (1975) to *R. gianninii* Nordsieck, 1974, which differs by having a higher spire, more convex whorls, and by forming a parietal tooth ("columellar tooth" in Mariottini *et al.* 2000) which *R. nitida* does not have. However, the specimens collected on GB have a low spire with slightly convex whorls and lack a parietal tooth, therefore being so similar to the lectotype of the American species (Mariottini *et al.* 2000: fig. 7) that, except for the geographic distance, we see no reason for their specific separation with the material at hand. The only difference observed is the number of spiral striae, which are around 30 in GB shells, less conspicuous in the abapical part of the whorls, while they are about 14 in the lectotype of *R. nitida*. Bearing in mind that most of the other heterobranchs present in the area such as *Acteon monterosatoi* Dautzenberg, 1889, *Crenilabium exile* (Jeffreys, 1870), *Pyrunculus ovatus* (Jeffreys, 1871) and *Scaphander punctostriatus* (Mighels & C.B. Adams, 1842) are considered amphiatlantic, we find more prudent to assign these specimens, tentatively, to *R. nitida* rather than describe them as a new species.

Ringicula crassidens Gofas & Luque sp. nov.
urn:lsid:zoobank.org:act:8E4FB886-47AD-479C-9B49-238DD01F4F27
Fig. 29H–K

Etymology

The specific name refers to the characteristic columellar folds ('*crassidens*', thick teeth).

Type material

Holotype

GALICIA BANK • 1 sh (Fig. 29H–I, 2.2 mm high); 42°28.81′ N, 11°50.03′ W; 1410 m; 8 Aug. 2011; BANGAL 0711 DR15; MNCN 15.05/200140H.

Paratypes

GALICIA BANK • 3 sh; same collection data as for holotype; MNCN 15.05/200140P.

Other material examined

GALICIA BANK • 20 sh; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN.

Description

Shell small (holotype height 2.2 mm), semi-transparent, not very solid, globose, with a well defined suture and moderately elevated spire. Protoconch of a little more than half a whorl, smooth, without microsculpture even at high magnification. Teleoconch formed by 2½ whorls, the first one almost smooth, the last with about 38–40 well marked, irregularly spaced spiral grooves which, under high magnification, appear as continuous series of square pits, and also with very fine growth lines; in the holotype there is also a growth stage in the last half whorl. Aperture slightly more than ⅔ of the total height, with two very marked columellar folds, the abapical one slightly larger, and with a very blunt and thick tooth in the middle of the parietal edge. Outer lip only slightly thickened, with a rounded edge. Very short siphonal canal. Colour uniformly white.

Remarks

This tiny species resembles *Ringicula blanchardi* Dautzenberg & H. Fischer, 1896, described from the bathyal of the Azores, with which it shares the considerable development of the parietal tooth and the very clear spiral sculpture. It differs from it, however, because of its smaller size and more globose shape and lower spire with almost one whorl less. The great development of the parietal tooth, absent even in adults of *R. nitida*, indicates that, despite the scarce thickening of the outer lip, these are adult shells. The specimen from the GB reported by Rolán Mosquera (1983: 280) as *Ringicula blanchardi* Dautzenberg & H. Fischer, 1896 is in such a bad state that it cannot be recognized.

Family uncertain

Genus ***Cylichnium*** Dall, 1908

Type species

Utriculus domitus Dall, 1889, by original designation.

Cylichnium oliviforme (Watson, 1883)
Fig. 30H–J

Utriculus oliviformis Watson, 1883: 332.

Utriculus sp. – Watson 1886: 648, pl. 48 fig. 6.
Utriculus oliviformis – Dautzenberg & Fischer 1896: 400.
Cylichnium oliviforme (Watson, 1883) – Fechter 1979: 37–38.

Material examined

GALICIA BANK • 7 sh; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 6 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

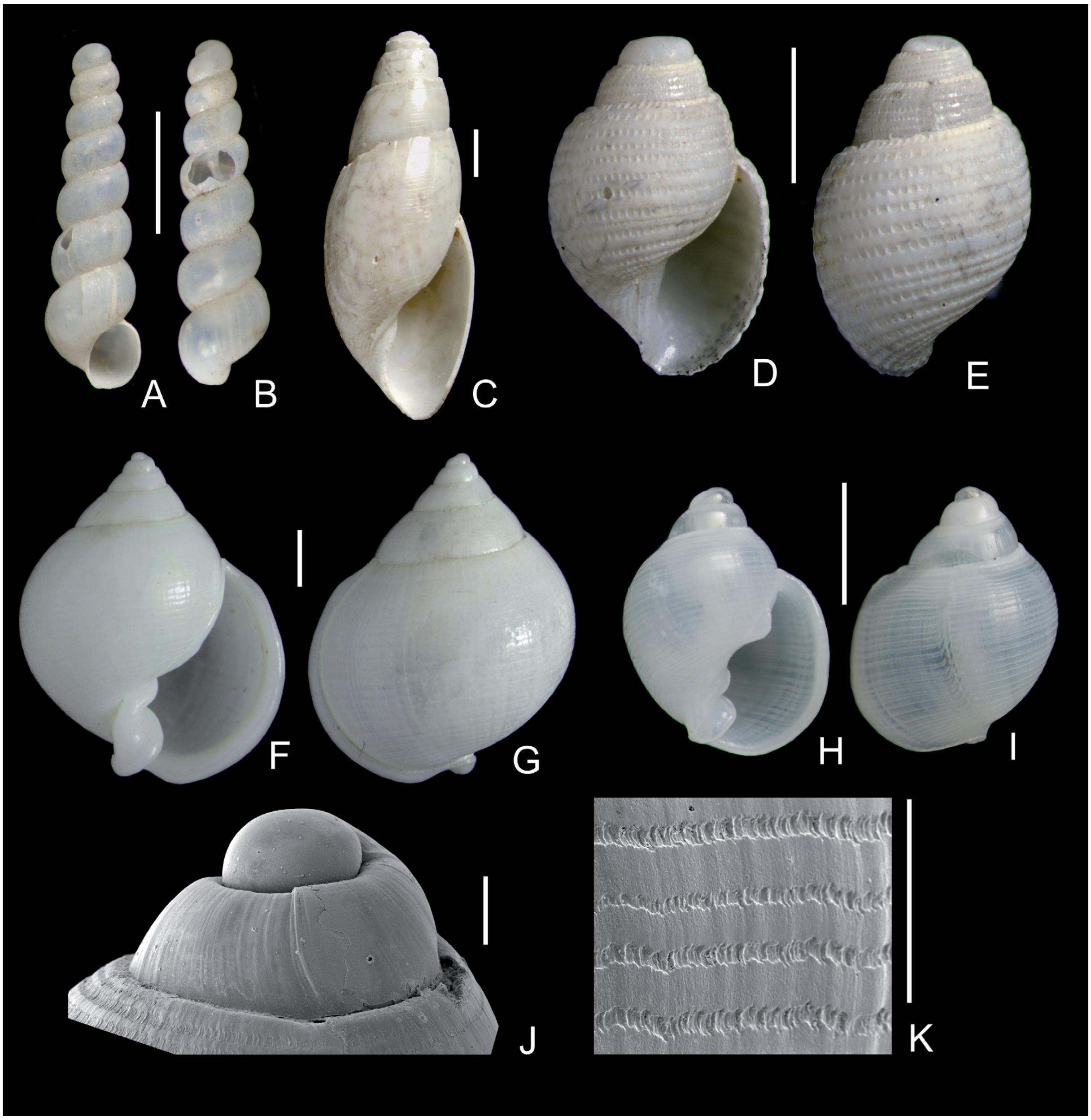

Fig. 29. Heterobranchia 2 (Cimidae, Acteonidae, Ringiculidae). **A–B**. *Atomiscala islandica* Warén, 1989, BANGAL 0711, DR15, 1410 m, 2.8 mm. **C**. *Crenilabium exile* (Jeffreys, 1870), BANGAL 0711, V10, 1720 m, 8.2 mm. **D–E**. *Acteon monterosatoi* Dautzenberg, 1889, SEAMOUNT 1, DW116, 985–1000 m, 2.5 mm. **F–G**. *Ringicula nitida* Verrill, 1872, BANGAL 0711, V2, 1706 m, 5.8 mm. **H–I**. *Ringicula crassidens* Gofas & Luque sp. nov., holotype (MNCN 15.05/200140H), BANGAL 0711, DR15, 2.2 mm high. **J**. Protoconch of a paratype (MNCN 15.05/200140P), same locality. **K**. Microsculpture of the second teleoconch whorl, same shell as J. Scale bars: A–I = 1 mm; J–K = 100 µm.

Remarks

This species was described tentatively by Watson (1883) and later retracted by Watson (1886) on the grounds of poor condition of the material examined, originating from off the Azores in 1000 fathoms (1850 m). The species was again found off the Azores by Dautzenberg & Fischer (1896) and confirmed as valid. It was later reported from off the NW Iberian Peninsula by Fechter (1979) and transferred to the genus *Cylichnium* Dall, 1908. The size given 0.32 inches (8.1 mm) and the depth of the type locality are in good agreement with our material. Bouchet (1975) reported *Cylichnium africanum* (Locard, 1897) from R/V "*Thalassa*" stn X336 in southern Bay of Biscay (44°11′ N, 05°10′ W, 1850–2050 m). He considered it distinct from *Cylichnium oliviforme* because, in his words, the latter is more distinctly flattened below the suture and has a finely reticulated sculpture in the upper part of the last whorl. Nevertheless, according to these characters we consider the shell figured by Bouchet (1975: pl. 4, c) as conspecific with our material. Conversely Locard (1897: pl. 2 figs 15–19) illustrated, to represent his *Aceras africana*, a shell in which the last whorl almost completely covers the spire whereas both the type of *C. oliviforme* and our specimens have a descending last whorl. Therefore, we follow Fechter (1979) in using the name *C. oliviforme* for the Iberian species.

Family Tornatinidae P. Fischer, 1883

Genus ***Acteocina*** Gray, 1847

Type species

Acteon wetherellii Lea, 1833, by original designation.

Acteocina interrogens Gofas & Luque sp. nov.
urn:lsid:zoobank.org:act:7B1EE4AD-8C25-4465-B07C-7E65B8F5F5C5
Fig. 30K–L

Etymology

The specific name refers to shape of the protoconch resembling a question mark.

Type material

Holotype

GALICIA BANK • 1 sh (Fig. 30K–L, 2.4 mm high); 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN 15.05/200141H.

Paratype

GALICIA BANK • 1 sh; same collection data as for holotype; MNCN 15.05/200141P.

Description

Shell small (holotype height 2.4 mm, diameter 1.2 mm), opaque white, cylindrical with a protruding spire. Protoconch of about 1.5 rounded whorls, with a diameter of ca 300 µm, sinistral with a very low spire, its coiling axis forming an angle of ca 100° with coiling axis of teleoconch, markedly protruding and distinctly demarcated from the teleoconch. The holotype has 2.5 teleoconch whorls, slightly convex, only ornamented with faint growth lines; last whorl being about 80% of total height in apertural view, and covering most of the previous teleoconch whorl, adapically with a sharp keel situated at a short distance from the suture and delimiting a flat subsutural shoulder. Aperture occupying two thirds of the total height, broadly rounded abapically and gradually narrowing adapically. Columella curved, continuous with the parietal wall, delimited by a very narrow callus. There is no umbilicus. External lip thin and cutting, straight in its median part, markedly curved at both ends.

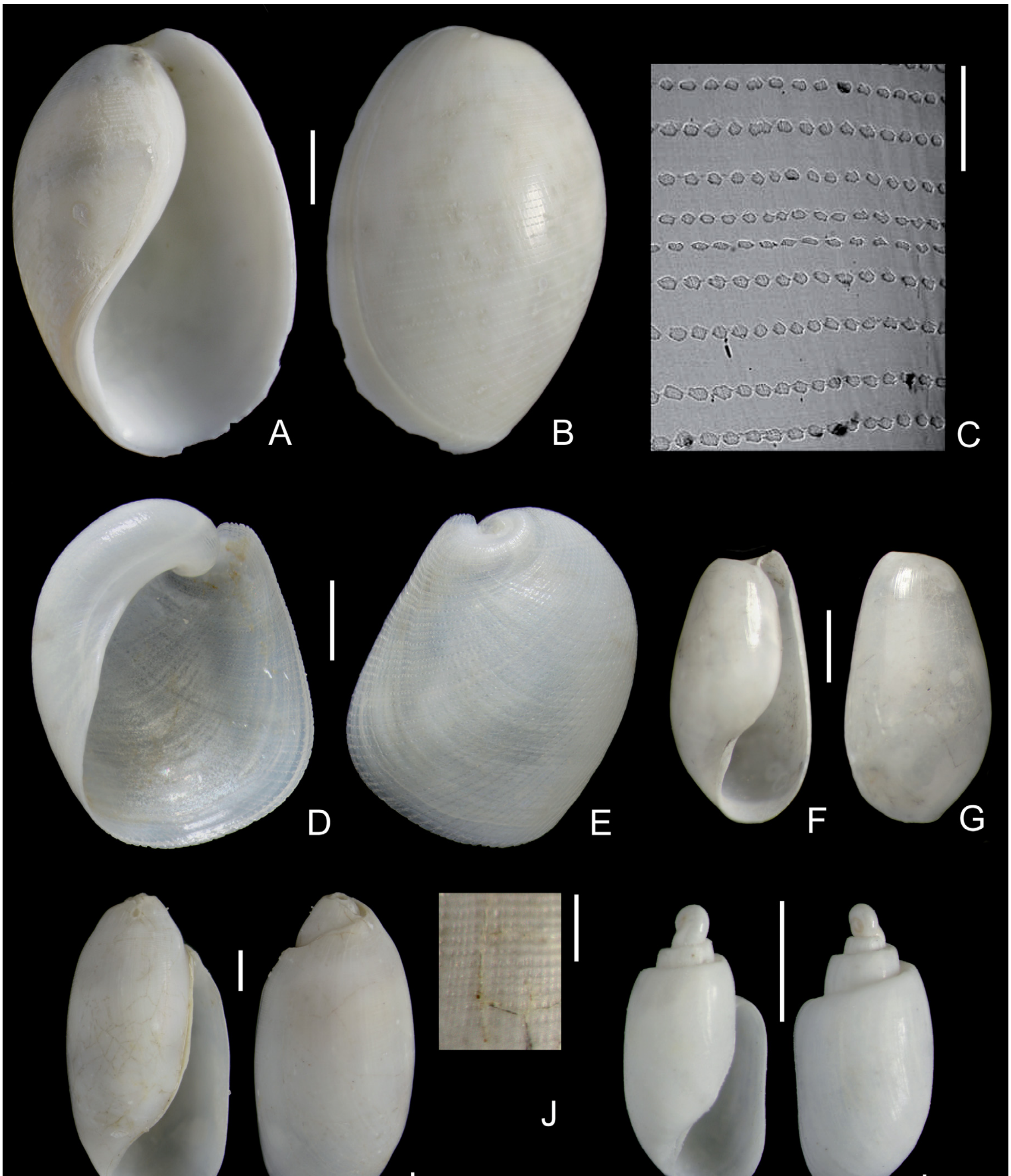

Fig. 30. Heterobranchia 3 (Scaphandridae, Philinidae, Retusidae). **A–B**. *Scaphander punctostriatus* (Mighels & C.B. Adams, 1842), BANGAL 0711, V2, 1706 m. 5.8 mm. **C**. *S. punctostriatus*, SEM micrograph of the sculpture of the body whorl, BANGAL 0711, V5, 1631 m. **D–E**. *Laona quadrata* (Wood, 1839), BANGAL 0711, V5, 4.4 mm. **F–G**. *Pyrunculus ovatus* (Jeffreys, 1871), BANGAL 0711, V5, 3.8 mm. **H–I**. *Cylichnium oliviforme* (Watson, 1883), BANGAL 0711, V10, 1720 m, 7.6 mm. **J**. Same specimen, detail of microsculpture of last whorl. **K–L**. *Acteocina interrogens* Gofas & Luque sp. nov., holotype (MNCN 15.05/200141H), BANGAL 0711, V4, 744 m, 2.4 mm. Scale bars: A–B, D–I, K–L = 1 mm; C, J = 200 μm.

Remarks

This species is so distinctive that we describe it despite the very scanty material. *Acteocina knockeri* (E.A. Smith, 1872), described from shallow water of Benin, West Africa, is twice as large, with a proportionally tiny hyperstrophic protoconch, and the adapical part of the whorls has two keels and bears axial folds which project, crown-like, on the subsutural flat. *Acteocina protracta* (Dautzenberg, 1889), described from deep water off the Azores, also has a much smaller protoconch and the last whorl accounts for 90% of total height in apertural view. We do not know of any Atlantic species approaching this GB species in shell morphology.

Class Bivalvia Linnaeus, 1758
Subclass **Protobranchia** Pelseneer, 1889

Key to genera and species of Protobranchia found on GB

See also Killeen & Turner (2009) for identification of many North Atlantic *Yoldiella* Verrill & Bush, 1897 and *Ledella* Verrill & Bush, 1897 species not found in the present material.

1. Hinge plate narrowing but not interrupted under the umbo, with teeth forming a continuous series 2
– Hinge plate interrupted beneath the umbo by a ligamental pit 3

2. Outline regularly oval, longer than high ..... ***Tindaria sericea*** (Jeffreys, 1876) (Fig. 31G–I)
– Outline rounded anteriorly and tapering posteriorly ..... ***Pseudoneilonella latior*** (Jeffreys, 1876) [not found on GB]

3. Outline triangular with rounded ends; inside of shell nacreous 4
– Outline rounded, oval, or with anterior end rounded and posterior end tapering; inside of shell not nacreous 6

4. Ventral margin smooth ..... ***Ennucula corbuloide****s* (Seguenza, 1877) (Fig. 31E–F)
– Ventral margin crenulated by the termination of internal rods 5

5. Shell plump, externally with fine radial microsculpture ..... ***Nucula atacellana*** Schenck, 1939 (Fig. 31C–D)
– Shell rather compressed, sculpture mostly commarginal ..... ***Nucula tumidula*** Malm, 1861 (Fig. 31A–B)

6. Posterior end acute or more or less angular 7
– Posterior end rounded, even if somewhat tapering 8

7. Posterior end acute, umbo anterior to vertical midline ..... ***Ledella messanensis*** (Jeffreys, 1870) (Fig. 32A–B)
– Posterior end bluntly angular, umbo posterior to vertical midline ..... ***Ledella* cf. *orixa*** (Dall, 1927) (Fig. 32C–D)

8. Shell less than 2 mm, white, rounded in outline ..... ***Pristigloma minima*** (Seguenza, 1877) (Fig. 31J–K)
– Shell larger, definitely longer than high 9

9. Shell inflated, posteriorly tapering ..... ***Yoldiella semistriata*** (Jeffreys, 1879) (Fig. 32G–H)
– Shell very compressed, posterior part broadly rounded ..... ***Yoldiella valorousae*** Killeen & J. A. Turner, 2009 (Fig. 32I–J)

Family Nuculanidae H. & A. Adams, 1858

Genus ***Ledella*** Verrill & Bush, 1897

Type species

Ledella bushae Warén, 1978, by subsequent designation, ICZN Opinion 1306.

Ledella* cf. *orixa (Dall, 1927)
Fig. 32C–D

Leda orixa Dall, 1927: 8–9.

Ledella oxira [sic] (Dall, 1927) – Allen & Hannah 1989: 148.

Material examined

GALICIA BANK • 1 sh; 42°37.77′ N, 11°49.46′ W; 818 m; 30 Jul. 2011; BANGAL 0711 V3; MNCN • 1 sh, 45 v; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN • 1 v; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN.

Remarks

This minute species is represented both in shallow and deep samples from INDEMARES BANGAL. The illustrated syntype (Fig. 32E–F), deemed to be a holotype in Allen & Hannah (1989), is larger, with more robust teeth, but otherwise shares with our specimens the unusual inequilateral outline with the pointed posterior part shorter than the anterior. Sizes (3.12 and 1.74 mm) reported by Allen & Hannah (1989) for additional specimens are in the same range. Although this may be an undescribed species similar to *L. orixa*, we prefer to use tentatively this name and await the availability of live-taken material for further study.

Family Yoldiidae Dall, 1908

Genus ***Yoldiella*** Verrill & Bush, 1897

Type species

Yoldia lucida Lovén, 1846, by original designation.

Yoldiella valorousae Killeen & J.A. Turner, 2009
Fig. 32I–J

Material examined

GALICIA BANK • 2 spm, 2 sh; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 2 sh, 1 v; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 1 v; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN • 1 v; 42°32.16′ N, 12°03.79′ W; 1585 m; 5 Aug. 2011; BANGAL 0711 DR12; MNCN.

Remarks

There is a complicated nomenclatural and taxonomic history for the small *Yoldiella* species originally described by Jeffreys (1876) as *Leda lata*, from abyssal depths of the North Atlantic. The name is a secondary homonym of *Nucula lata* Hinds, 1843, for which reason it was renamed *Leda jeffreysi* Hidalgo, 1877. Allen *et al.* (1995) considered that Jeffreys' type material comprised two different species; they used the preoccupied name *Yoldiella lata* for one of them and the replacement name *Yoldiella jeffreysi* for the

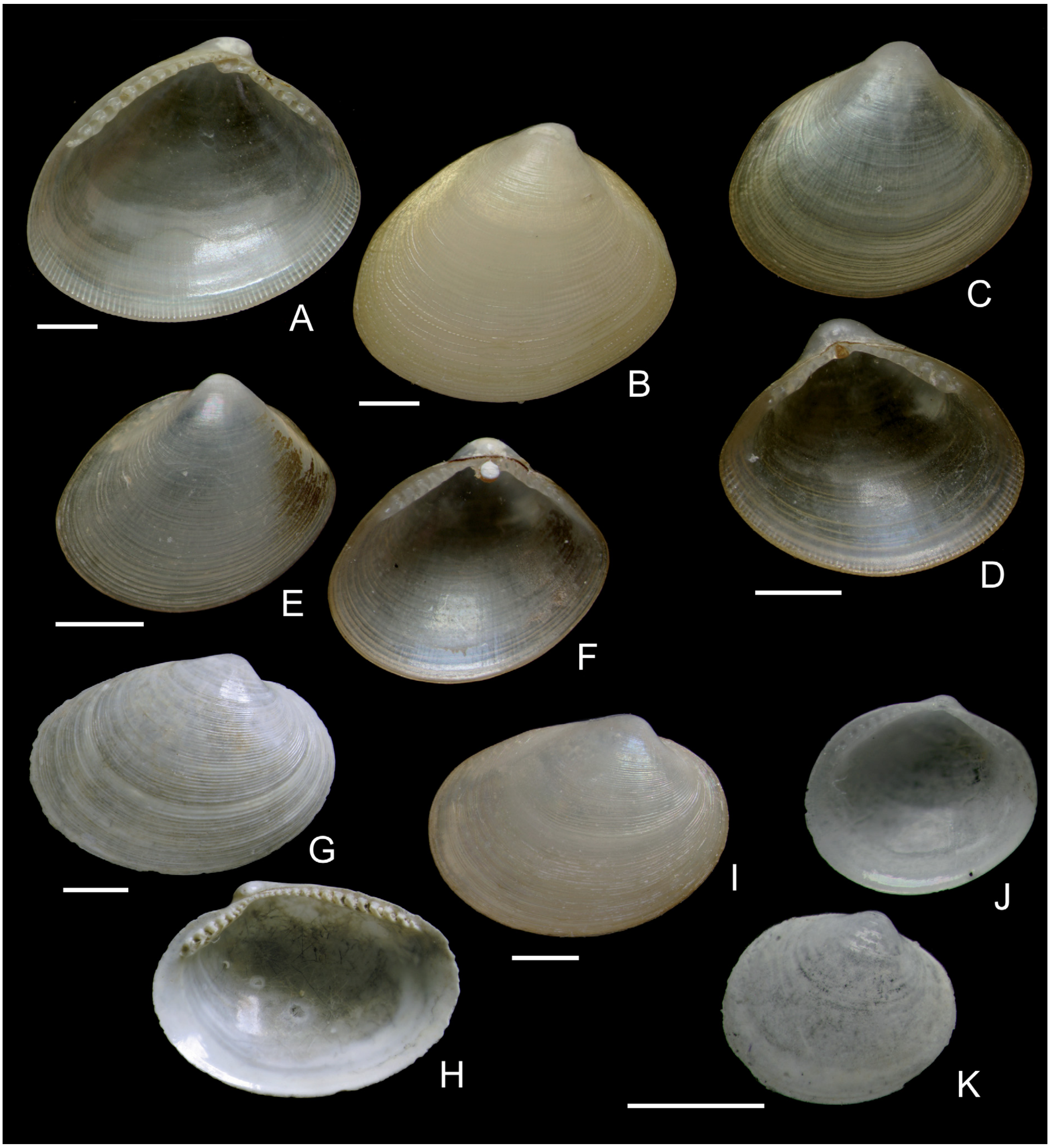

Fig. 31. Protobranchia 1. **A–B**. *Nucula tumidula* Malm, 1861, BANGAL 0711, V5, 1631 m, 5.5 and 5.4 mm. **C–D**. *Nucula atacellana* Schenck, 1939, BANGAL 0711, V10, 1720 m, 3.5 mm. **E–F**. *Ennucula corbuloides* (Seguenza, 1877), BANGAL 0711, V2, 1706 m, 3.2 mm. **G–H**. *Tindaria sericea* (Jeffreys, 1876), BANGAL 0711, V2, 4.7 mm. **I**. *Tindaria sericea*, BANGAL 0711, V5, 4.5 mm. **J–K**. *Pristigloma minima* (Seguenza, 1877), SEAMOUNT 1, DW111, 675–685 m, 1.7 mm. Scale bars = 1 mm.

other one, disregarding the nomenclatural rule (ICZN Art. 72.7) which makes them objective synonyms. The nomenclatural flaw was fixed by Killeen & Turner (2009), who endorsed the specific distinction, based *Yoldiella jeffreysi* on the lectotype of *Y. lata* (USNM 199696, from "Valorous" stn 16, west of Rockall Plateau, 1785 fms [3265 m]) designated by Allen & Hannah (1989) for their concept of *Yoldiella jeffreysi*, and named *Yoldiella valorousae* the second species (treated as "*Yoldiella lata*" in Allen & Hannah 1989), based on a shell (USNM 199695) from "Valorous" stn 9, off S Greenland, 1750 fms [3200 m]. Allen & Hannah (1989) and Killeen & Turner (2009) reported both species as widespread in the North Atlantic. Both species are similar in outline but *Y. valorousae* differs from *Y. jeffreysi* in being more compressed.

Family Pristiglomidae Sanders & Allen, 1973

Genus ***Pristigloma*** Dall, 1900

Type species

Glomus nitens Jeffreys, 1876, retained from replaced name.

Pristigloma minima (Seguenza, 1877)
Fig. 31J–K

Yoldia minima Seguenza, 1877a: 96.

Yoldia minima – Seguenza 1877b: 1178, pl. 5 figs 27, 27a–c.
Pristigloma minima (Seguenza, 1877) – Hoffman & Freiwald 2017: 69.

Material examined

GALICIA BANK • 1 sh; 42°40′ N, 11°36′ W; 675–685 m; 19 Oct. 1987; SEAMOUNT 1 DW111; MNHN • 1 v; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 2 v; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN.

Remarks

This minute species, originally described from the Pleistocene of Sicily (see Di Geronimo & La Perna 1997), has been reported from the Canaries (Ortega & Gofas 2019) and from several North Atlantic seamounts including GB (Hoffman & Freiwald 2017). *Pseudoglomus pompholyx* (Dall, 1890) from the Western Atlantic is superficially very similar, but larger (4 mm) and differs in that the ligament is set in a pit dorsally to the hinge line which remains unaffected (see Ockelmann & Warén 1998 for a good figure), whereas the present species has a resilifer interrupting the hinge. The generic placement could only be ascertained with live-taken specimens.

Subclass Autobranchia Grobben, 1894
Superorder Anomalodesmata
Family Lyonsiellidae Dall, 1895

Genus ***Policordia*** Dall, Bartsch & Rehder, 1938

Type species

Policordia diomedea Dall, Bartsch & Rehder, 1938, by original designation.

Policordia gemma (Verrill, 1880)
Fig. 39E–F

Material examined

GALICIA BANK • 6 v; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 2 v; 42°56.77′ N, 11°58.53′ W; 1631 m; 2 Aug. 2011; BANGAL 0711 V5; MNCN • 2 spm; 42°38.48′ N,

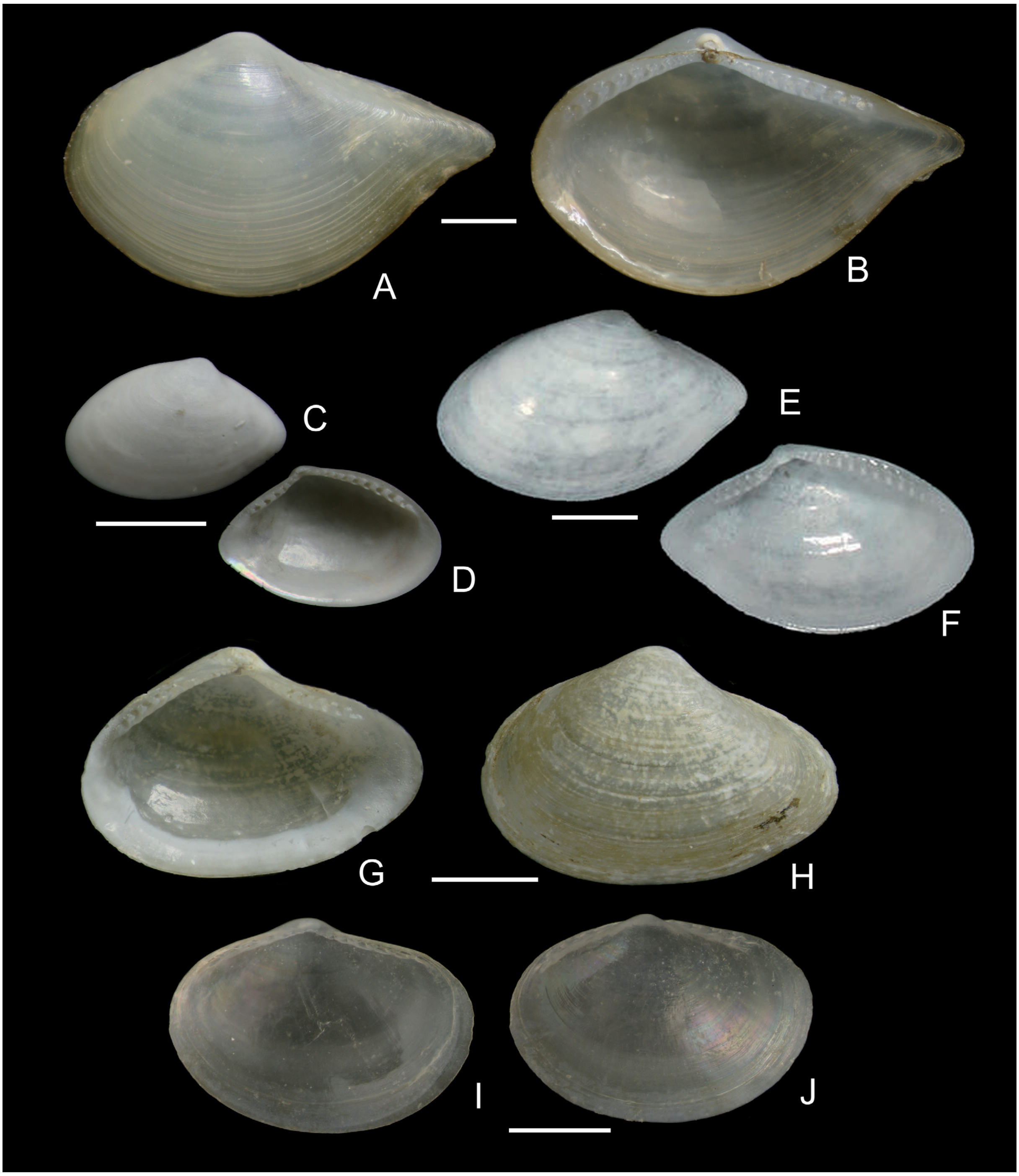

Fig. 32. Protobranchia 2. **A–B**. *Ledella messanensis* (Jeffreys, 1870), BANGAL 0711, V10, 1720 m, 5.8 mm. **C–D**. *Ledella* cf. *orixa* (Dall, 1927), BANGAL 0711, V5, 1631 m, 2.0 mm. **E–F**. Syntype (USNM 108190) of *Leda orixa* Dall, 1927, off Georgia 30.975°N, 79.6417°W, 538 m, R/V *Albatross*, 3.6 mm (photograph by Ellen Strong, reproduced with the permission of the National Museum of Natural History, Smithsonian Institution, 10th and Constitution Ave. N.W., Washington, DC 20560-0193 http://www.nmnh.si.edu/). **G–H**. *Yoldiella semistriata* (Jeffreys, 1879), BANGAL 0711, V2, 1706 m, 3.2 mm. **I–J**. *Yoldiella valorousae* Killeen & J.A. Turner, 2009, BANGAL 0711, V2, 1706 m, 3.0 mm. Scale bars = 1 mm.

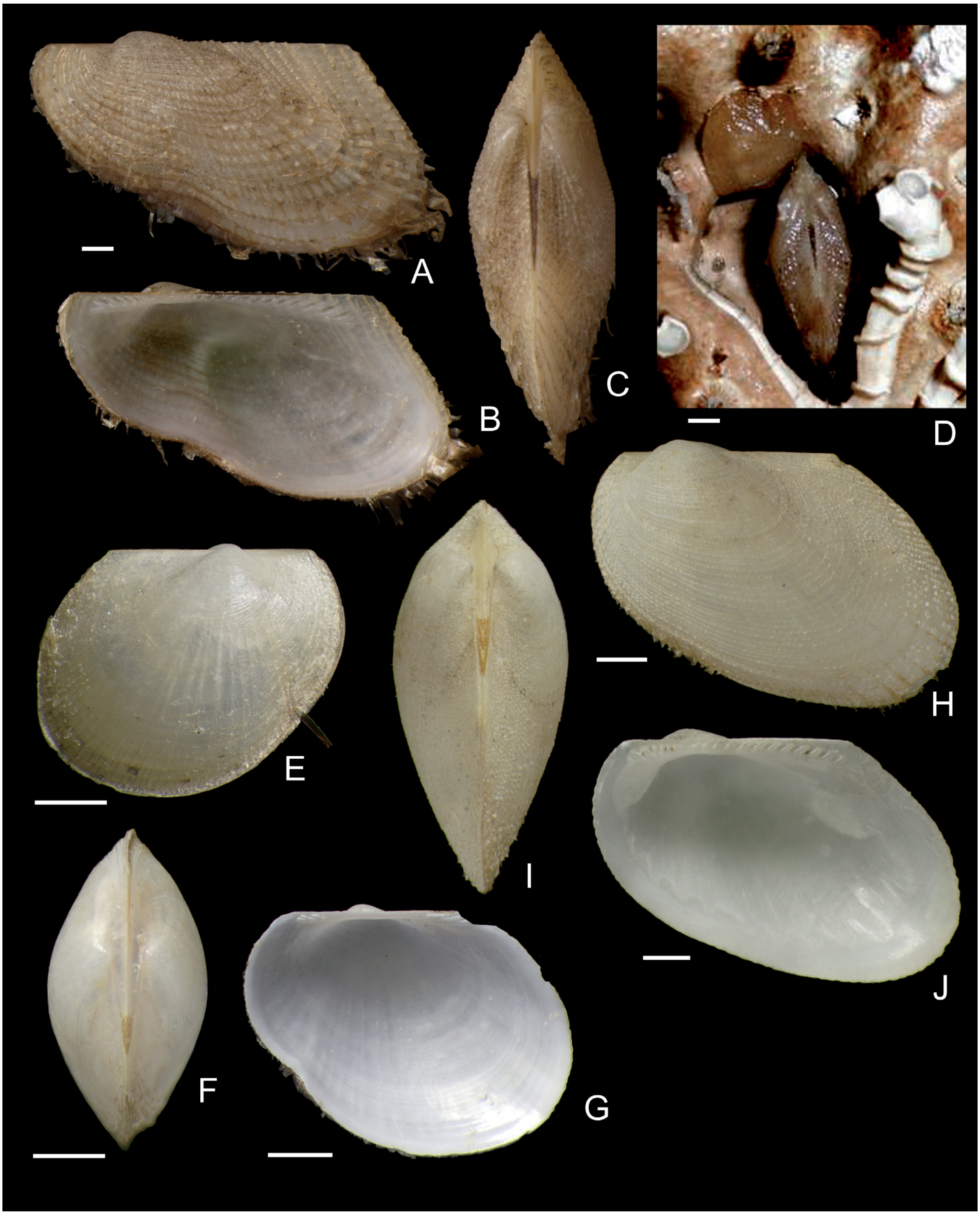

Fig. 33. Arcidae. **A–C**. *Asperarca nodulosa* (Müller, 1776), BANGAL 0711, DR14, 1130 m, 13.3 mm. **D**. *A. nodulosa* among dead coral branches, BANGAL 0711, GOC6, 903 m. **E–G.** *Bathyarca pectunculoides* (Scacchi, 1835), SEAMOUNT 1, DW108, 1110–1125 m, 4.3 mm, 4.4 mm and 5.1 mm. **H–J**. *Bathyarca philippiana* (Nyst, 1848), SEAMOUNT 1, DW111, 675–685 m, 7.2 and 7.9 mm. Scale bars = 1 mm.

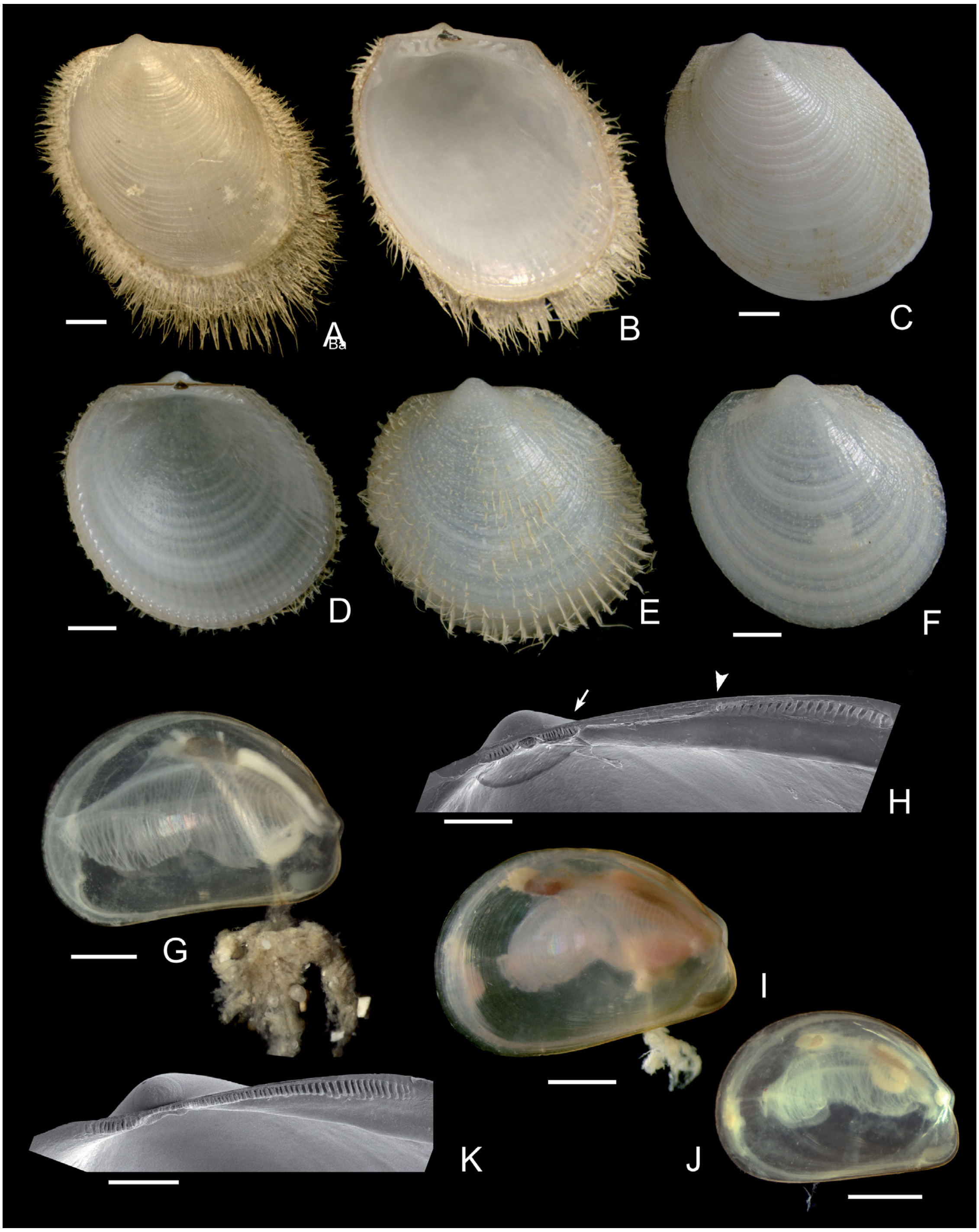

Fig. 34. Limopsidae and Mytilidae. **A–B**. *Limopsis minuta* (Philippi, 1836), ECOMARG 0709 V4, 744 m, height 7.8 mm. **C**. *Limopsis minuta*, valve without periostracum, same locality, 6.7 mm. **D–E**. *Limopsis cristata* Jeffreys, 1876, BANGAL 0711, V10, 1720 m, height 5.6 mm. **F**. *Limopsis cristata*, valve without periostracum, BANGAL 0711, V5, 1631 m, 5.3 mm. **G**. *Dacrydium wareni* Salas & Gofas, 1997, BANGAL 0711, V6, 903 m, 4.5 mm. **H**. *D. wareni*, SEM micrograph of the hinge of a right valve; arrow points to the posterior end of the first (embryonic) set of teeth, arrowhead to the beginning of the second set. **I–J**. *D. ockelmanni* Mattson & Warén, 1977, BANGAL 0711, V10, 4.4 and 3.3 mm. **K**. *D. ockelmanni*, SEM micrograph of the hinge of a right valve showing the continuous set of teeth. Scale bars: A–G, I–J = 1mm; H, K = 200 µm.

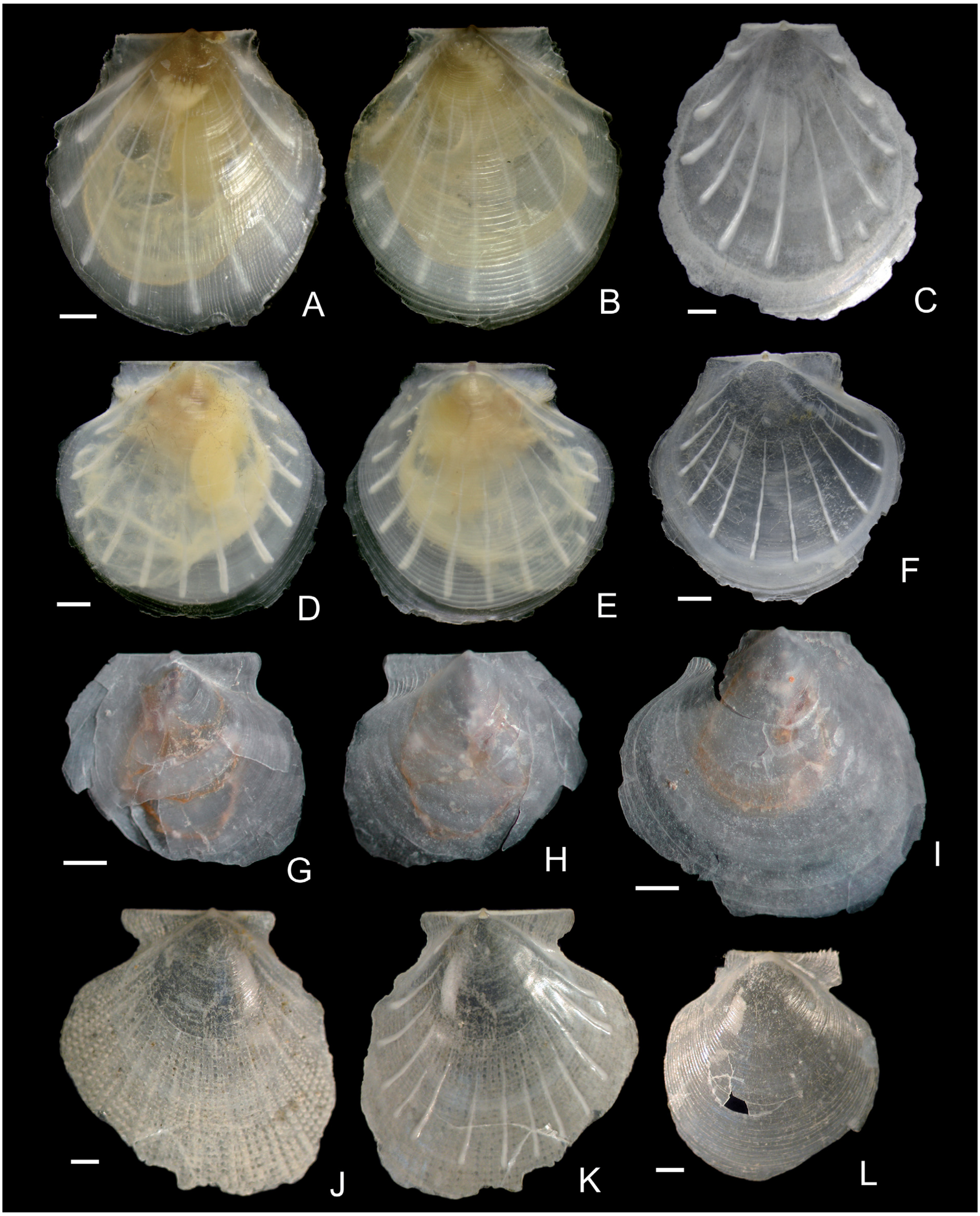

Fig. 35. Propeamussiidae. **A–B**. *Propeamussium lucidum* (Jeffreys in Wywille-Thomson, 1873), BANGAL 0711, V8, 1565 m, 8.2 mm. **C**. *P. lucidum*, BANGAL 0711, V7, 1462 m, 10.5 mm. **D–F**. *Parvamussium propinquum* (E.A. Smith, 1885), BANGAL 0711, V10, 1720 m, height 7.8 mm and 7.5 mm. **G–I**. *Catillopecten eucymatus* (Dall, 1898), SEAMOUNT 1, DW108, 1110–1125 m, 5.0 and 6.7 mm. **J–K**. *Cyclopecten antiquatus* (Philippi, 1844), SEAMOUNT 1, DW116, 985–1000 m, right valve, 10.2 mm. **L**. *C. antiquatus*, left valve, SEAMOUNT 1, DW108, 8.0 mm. Scale bars = 1 mm.

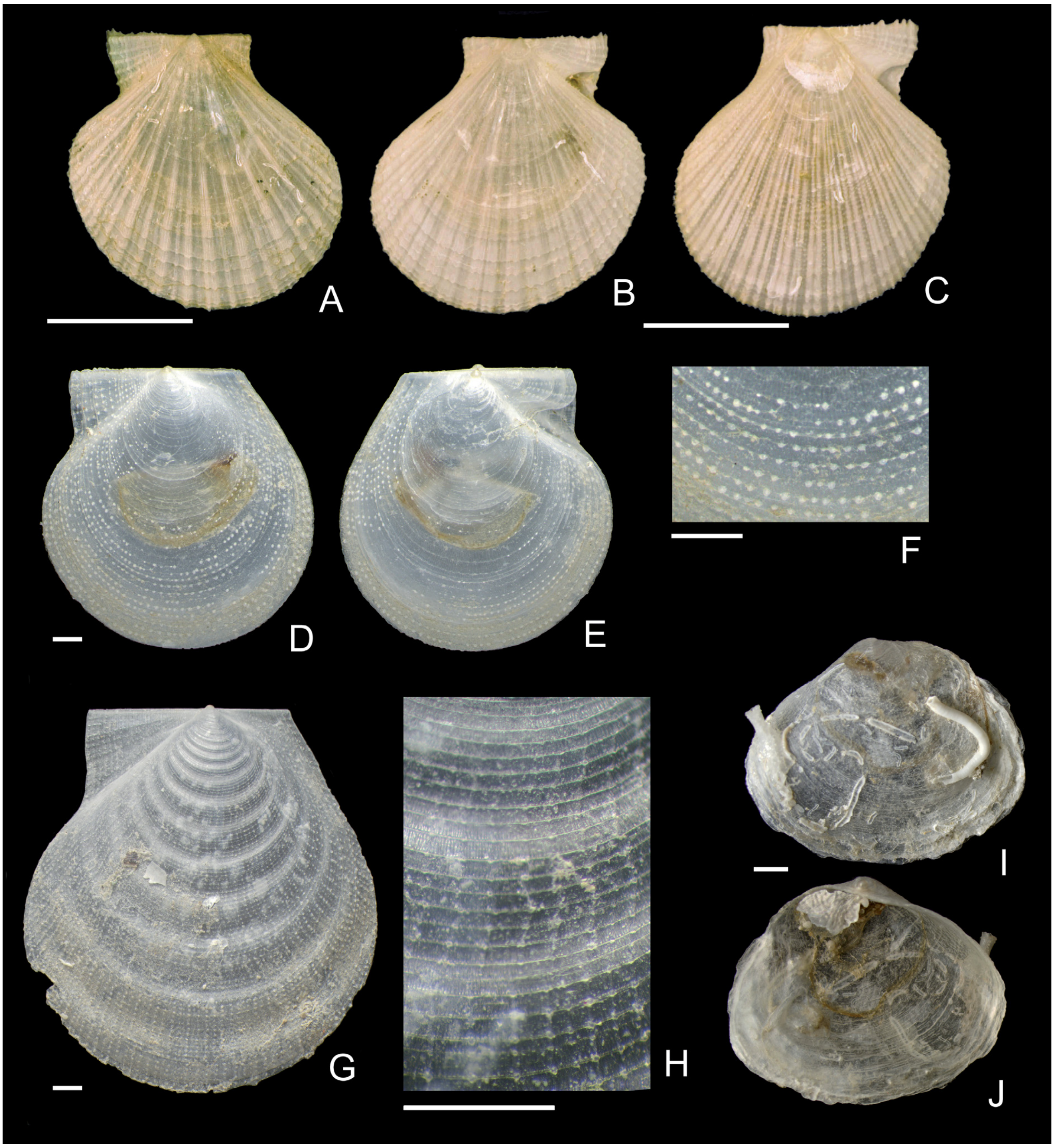

Fig. 36. Pectinidae, Anomiidae. **A–C**. *Pseudamussium sulcatum* (Müller, 1776), SEAMOUNT 1, DW116, 985–1000 m, 19.1 and 20.1 mm. **D–F**. *Delectopecten vitreus* (Gmelin, 1791), BANGAL 0711, GOC3, 785 m, 9.5 mm, and detail of the sculpture of the right valve. **G–H**. *Hyalopecten pudicus* (E.A. Smith, 1885), right valve, BANGAL 0711, DR15, 1410 m, height 13.2 mm, and detail of the sculpture. **I–J**. *Heteranomia squamula* (Linnaeus, 1758), SEAMOUNT 1, DW106, 765 m, 8.0 mm. Scale bars: A–C = 10 mm; D–J = 1 mm.

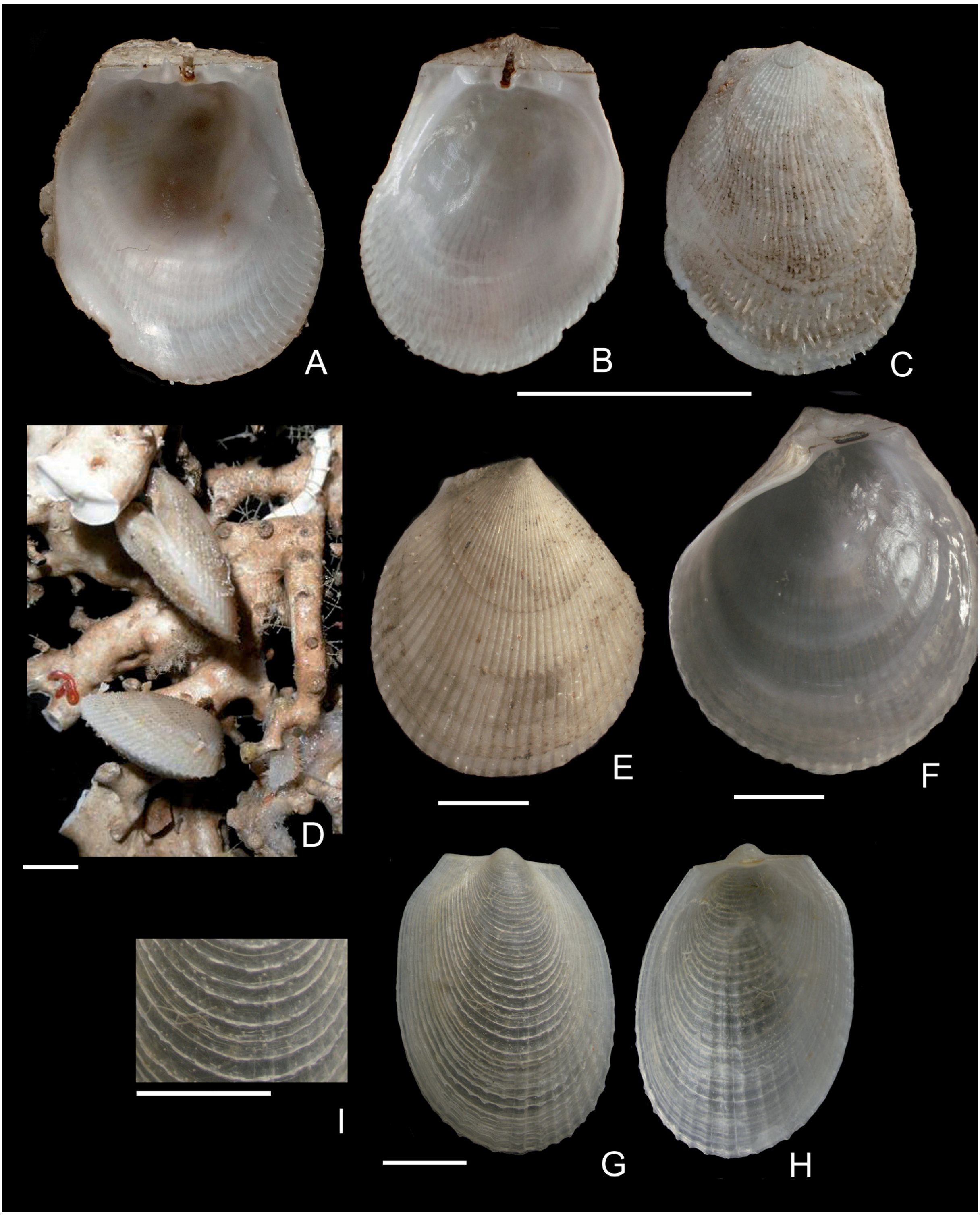

Fig. 37. Limidae, Spondylidae. **A–C**. *Spondylus gussonii* Costa, 1830, ECOMARG 0709, V5, 876 m, 14.5 mm. **D**. *Lima marioni* P. Fischer, 1882, among dead coral branches, BANGAL 0711, GOC6, 903 m. **E–F**. *L. marioni*, ECOMARG 0709, V5, 876 m, 35.5 and 41 mm. **G–H**. *Limatula laminifera* (E.A. Smith, 1885), BANGAL 0711, V2, 1706 m, height 3.6 mm. **I**. Same specimen, detail of the sculpture. Scale bars: A–F = 10 mm; G–I = 1 mm.

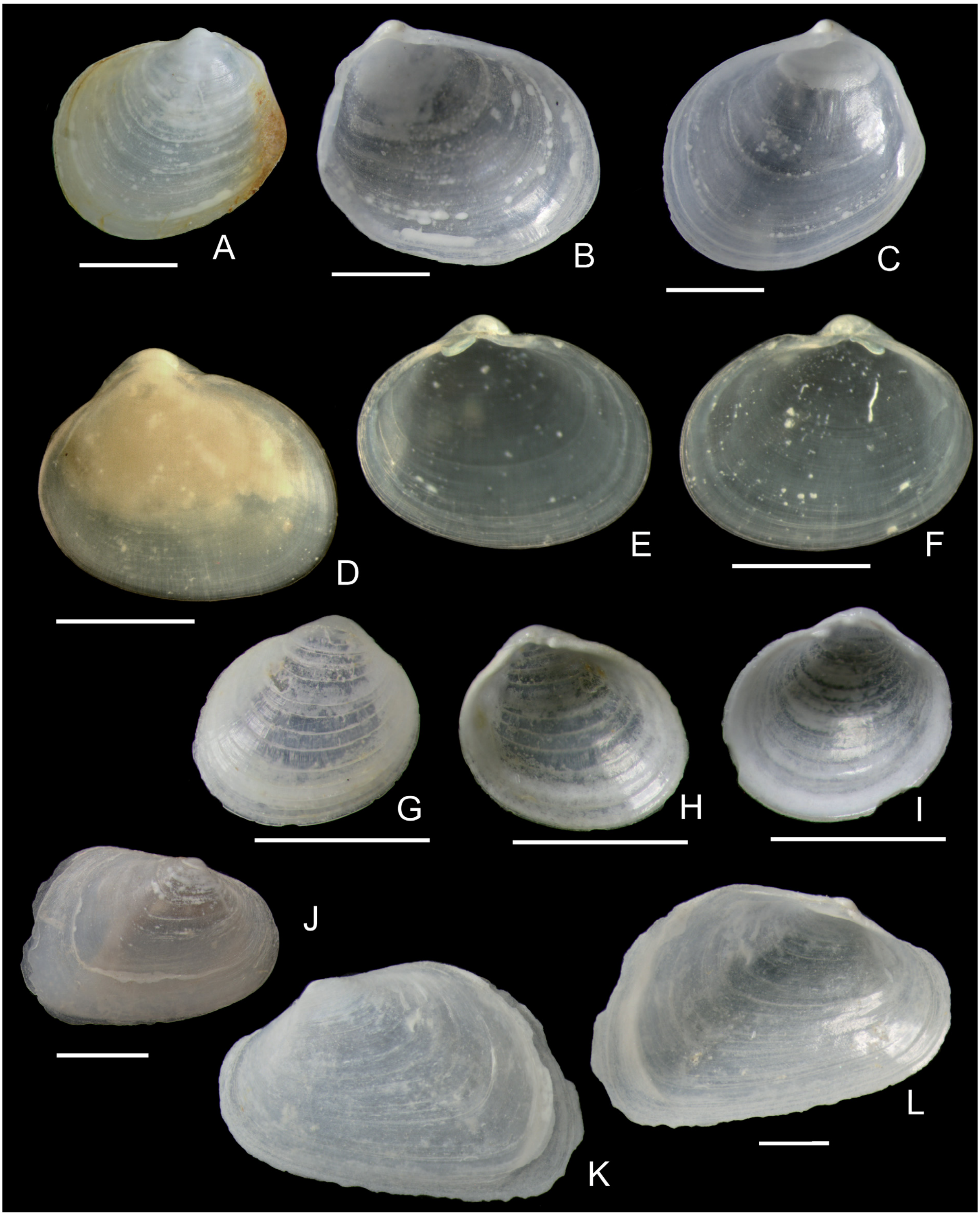

Fig. 38. Thyasiridae, Lasaeidae, Basterotiidae. **A–C**. *Thyasira succisa* (Jeffreys, 1876), SEAMOUNT 1, DW108, 1110–1125 m, 2.4, 2.9 and 2.7 mm. **D–F**. *Syssitomya pourtalesiana* Oliver, 2012, BANGAL 0711, V5, 1631 m, 2.2 mm. **G–I**. *Draculamya porobranchiata* Oliver & Lützen, 2011, BANGAL 0711, V4, 744 m, 1.3 mm. **J–L**. *Atopomya dolobrata* Oliver, 2013, SEAMOUNT 1, DW116, 985–1000 m, 2.8 and 5.2 mm. Scale bars = 1 mm.

11°29.68′ W; 1565 m; 6 Aug. 2011; BANGAL 0711 V8; MNCN • 3 spm, 6 v; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

Most of the specimens collected during BANGAL 0711 were assigned to *Policordia gemma* as represented on Fig. 39E–F. Nevertheless, a second species, represented by only three specimens and one shell, was present in sample V10 (1720 m) together with *P. gemma* and was tentatively identified in the preliminary INDEMARES BANGAL 0711 report (Gofas *et al.* 2014b) and in Gofas *et al.* (2017) as *Policordia atlantica* Allen & J.F. Turner, 1974.

***Policordia* sp.**

Fig. 39G

Material examined

GALICIA BANK • 3 spm, 1 sh; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

This second species differs in being less inflated and having an outline with a more produced posterior end, resulting in that the shell is longer than high (higher than long in *P. gemma*). Whereas our specimens agree in shape and size with the specimens from the Porcupine Sea Bight (1630–1640 m) illustrated on the NMW website (Oliver *et al.* 2016), we are reluctant to confirm this identification taking into account the taxonomic uncertainty surrounding *P. atlantica*.

Families Cuspidariidae Dall, 1886, Halonymphidae Scarlato & Starobogatov, 1983 and Protocuspidariidae Scarlato & Starobogatov, 1983

Key to genera and species of the superfamily Cuspidarioidea found on GB

1. Sculpture with definite radial ribs 2
– Sculpture only commarginal (may include faint ridges from umbo to posterior part), or surface of shell smooth 3

2. Two strong radial ribs on posterior half, anterior with commarginal undulations ....
....***Myonera paucistriata*** Dall, 1886 (Fig. 41A–C)
– Numerous fine radial ribs on posterior half ......***Cardiomya cadiziana*** M. Huber, 2010 (Fig. 41G–I)

3. Posterior rostrum short and stout 4
– Posterior rostrum tapering 6

4. Shell inflated, smooth and glossy .... ***Jeffreysomya truncata*** (Jeffreys, 1882) (Fig. 41D–F)
– Shell compressed, with marked growth lines and wrinkles on posterior part 5

5. An anterior lateral tooth on the right valve ....
....***Protocuspidaria verityi*** Allen & Morgan, 1981 (Fig. 43 D–G)
– No teeth on either valve ....***Protocuspidaria simplis*** Allen & Morgan, 1981 (Fig. 43 H–K)

6. Hinge of right valve with a small knob-like cardinal and no lateral teeth; posterior rostrum pointed, not definitely distinct from rest of the shell ....***Halonympha depressa*** (Jeffreys, 1882) (Fig. 43 A–C)
– Hinge of right valve with at least one (posterior) lateral tooth 7

7. Hinge of right valve with anterior and posterior lateral teeth (genus *Rhinoclama*) 8
– Hinge of right valve with only a posterior lateral tooth ....
.... ***Cuspidaria* cf. *rostrata*** (Spengler, 1793) (Fig. 42G–I)

8. Posterior part of shell (excluding rostrum) with widely spaced commarginal cordlets; anterior lateral long and lamellar .... ***Rhinoclama semistrigosa*** (Jeffreys, 1882) (Fig. 42D–F)
– Posterior part of shell (excluding rostrum) with growth lines only; anterior lateral short and bulging ....***Rhinoclama teres*** (Jeffreys, 1882) (Fig. 42A–C)

Genus ***Cuspidaria*** Nardo, 1840

Type species

Cuspidaria typus Nardo, 1840 = *Cuspidaria cuspidata* (Olivi, 1792), by monotypy.

Cuspidaria* cf. *rostrata (Spengler, 1793)
Fig. 42G–I

Material examined

GALICIA BANK • 3 v; 42°37.77′ N, 11°49.46′ W; 818 m; 30 Jul. 2011; BANGAL 0711 V3; MNCN • 4 v; 42°41.94′ N, 11°40.58′ W; 744 m; 31 Jul. 2011; BANGAL 0711 V4; MNCN.

Remarks

A specimen of this species from GB was figured by Rolán *et al.* (1990) as *Cuspidaria capensis* (E.A. Smith, 1885). Specimens from GB have a posterior rostrum shorter than usually seen in *Cuspidaria rostrata*, and are smaller, resembling in those features *Cuspidaria meteoris* Krylova, 2006, described from the mid-Atlantic seamount group. However, they do not show the sloping postero-ventral margin characteristic of the latter, and are therefore conservatively identified to the mainland species.

Genus ***Myonera*** Dall & E.A. Smith, 1886

Type species

Myonera paucistriata Dall, 1886, by original designation.

Myonera paucistriata Dall, 1886
Fig. 41A–C

Material examined

GALICIA BANK • 4 spm, 16 v; 42°41.87′ N, 11°26.71′ W; 1720 m; 8 Aug. 2011; BANGAL 0711 V10; MNCN.

Remarks

This species was mistaken in the preliminary INDEMARES BANGAL 0711 report (Gofas *et al.* 2014b), for the similar *M. angularis* (Jeffreys, 1876) which has been reported from off Portugal (type locality) and off northwestern Morocco (Salas 1996: fig. 127) but not in Spain. The latter differs in having only one sharp keel delimiting the smooth posterior area and in having more numerous and finer commarginal ridges on the anterior and median part of the shell. *Myonera acutecarinata* (Dautzenberg & H. Fischer, 1906), described from off the Cape Verde Islands, is also very similar but more tapering posteriorly. *Myonera bicarinata* E.A. Smith, 1896 and *Myonera dispar* (Dall, Bartsch & Rehder, 1938) have been synonymized by Allen & Morgan (1981) but cautiously retained as separate species by Huber (2010), taking into account their type localities in the Indian Ocean and off Hawaii, respectively.

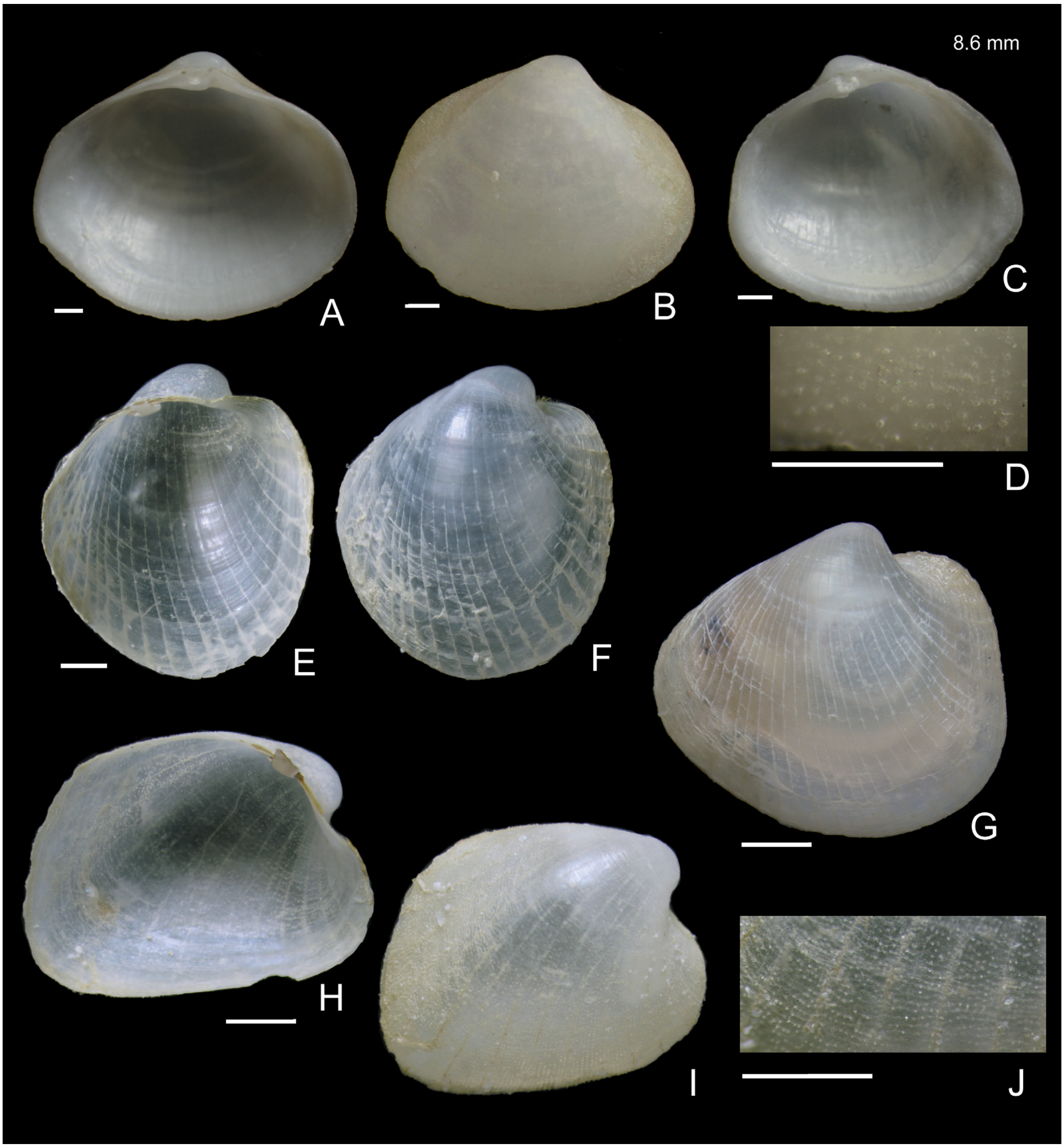

Fig. 39. Poromyidae, Lyonsiellidae. **A–D**. *Poromya granulata* (Nyst & Westendorp, 1839), SEAMOUNT 1, DW106, 765 m, 11.3 mm, 9.0 mm and 8.6 mm, and detail of the sculpture. **E–F**. *Policordia gemma* (Verrill, 1880), BANGAL 0711, V10, 1720 m, height 6.8 mm. **G**. *Policordia* sp., BANGAL 0711, V10, 1720 m, length 5.0 mm. **H–J**. *Lyonsiella abyssicola* (G.O. Sars, 1872), BANGAL 0711, V5, 1631 m, 5.0 mm, and detail of the sculpture. Scale bars = 1 mm.

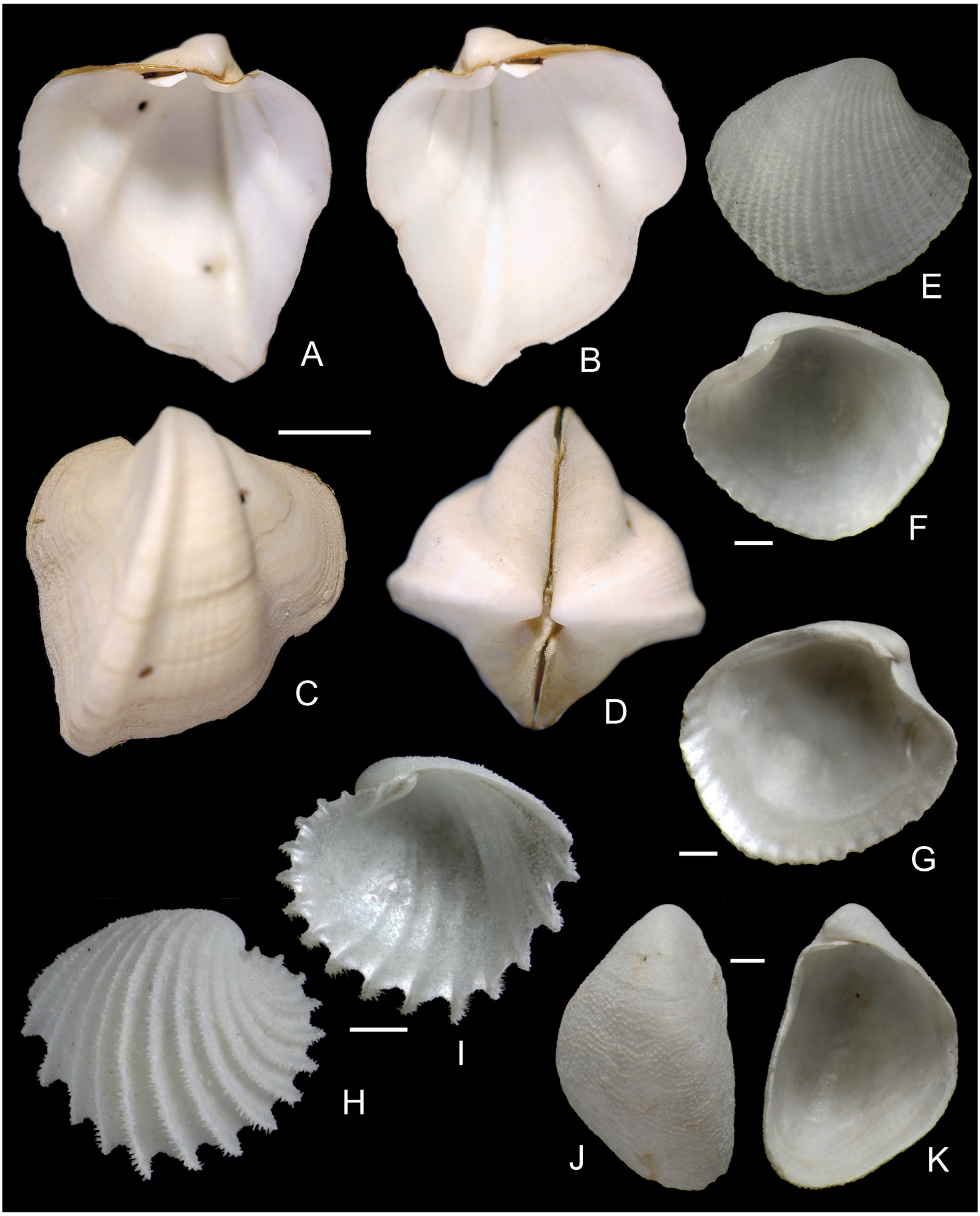

Fig. 40. Verticordiidae. **A–D**. *Halicardia flexuosa* Verrill & S. Smith, 1881, BANGAL 0711, V10, 1720 m, 38 mm. **E–G**. *Haliris granulata* (Seguenza, 1860), SEAMOUNT 1, DW106, 765 m, 6.9 and 7.3 mm. **H–I.** *Spinosipella acuticostata* (Philippi, 1844), BANGAL 0711, V3, 818 m, 5.0 mm. **J–K**. *Halicardia angulata* (Jeffreys, 1882), BANGAL 0711, V3, 818 m, height 8.6 mm. Scale bars: A–D = 10 mm; E–K = 1 mm.

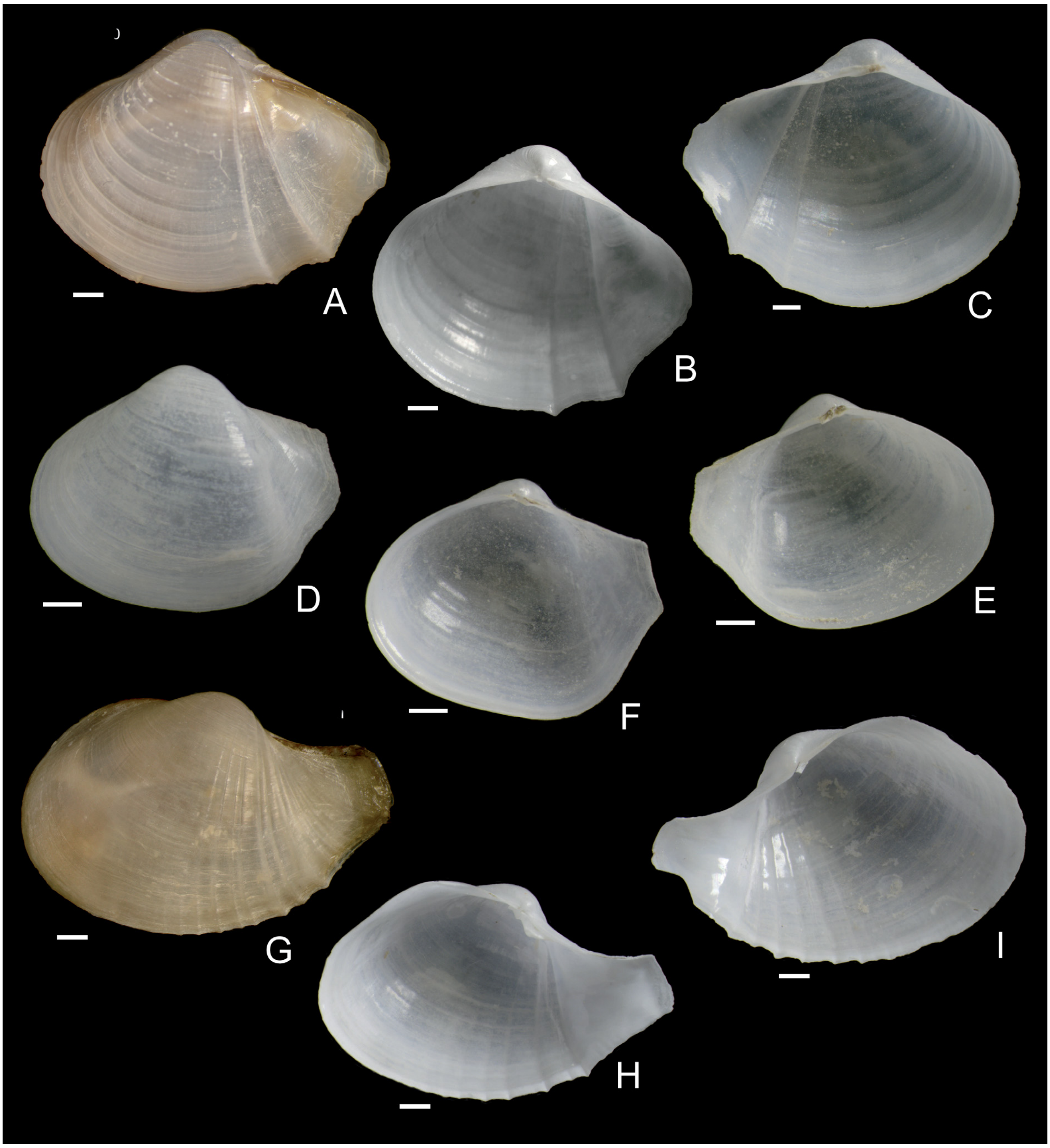

Fig. 41. Cuspidariidae. **A–C**. *Myonera paucistriata* Dall, 1886, BANGAL 0711, V10, 1720 m, 11.6 mm, 10.5 mm and 12.2 mm. **D–F**. *Jeffreysomya truncata* (Jeffreys, 1882), BANGAL 0711, V4, 744 m, 7.9 mm and 7.5 mm. **G–I.** *Cardiomya cadiziana* Huber, 2010, BANGAL 0711, V6, 909 m, 12.0 mm, 11.6 mm and 12.2 mm. Scale bars = 1 mm.

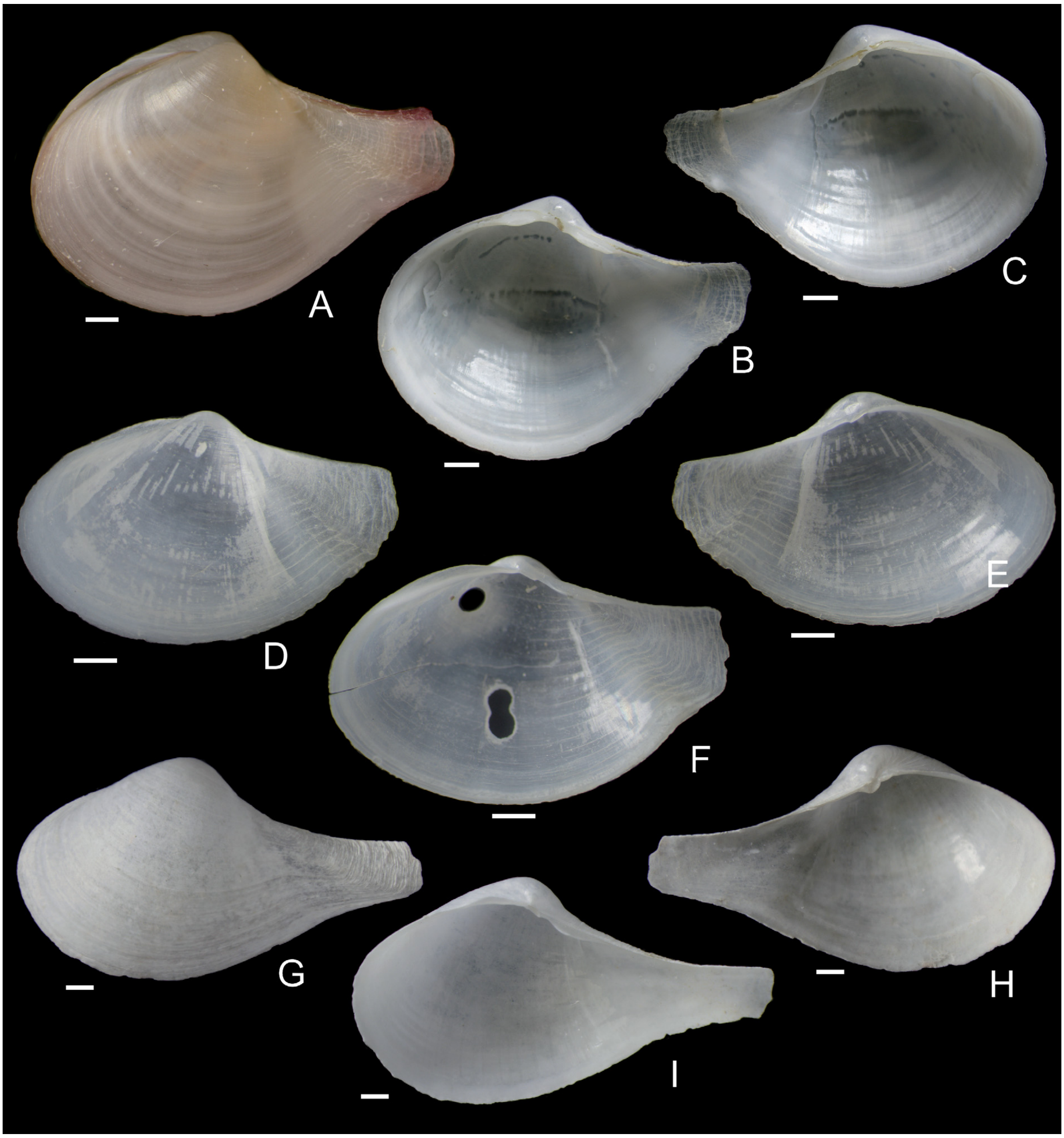

Fig. 42. Cuspidariidae. **A–C**. *Rhinoclama teres* (Jeffreys, 1882), BANGAL 0711, V5, 1631 m, 12.8 mm and 10.6 mm. **D–F**. *Rhinoclama semistrigosa* (Jeffreys, 1882), BANGAL 0711, V7, 1462 m, 9.1 and 8.7 mm. **G–I**. *Cuspidaria* cf. *rostrata* (Spengler, 1793), BANGAL 0711, V3, 818 m, 14.6 and 15.2 mm. Scale bars = 1 mm.

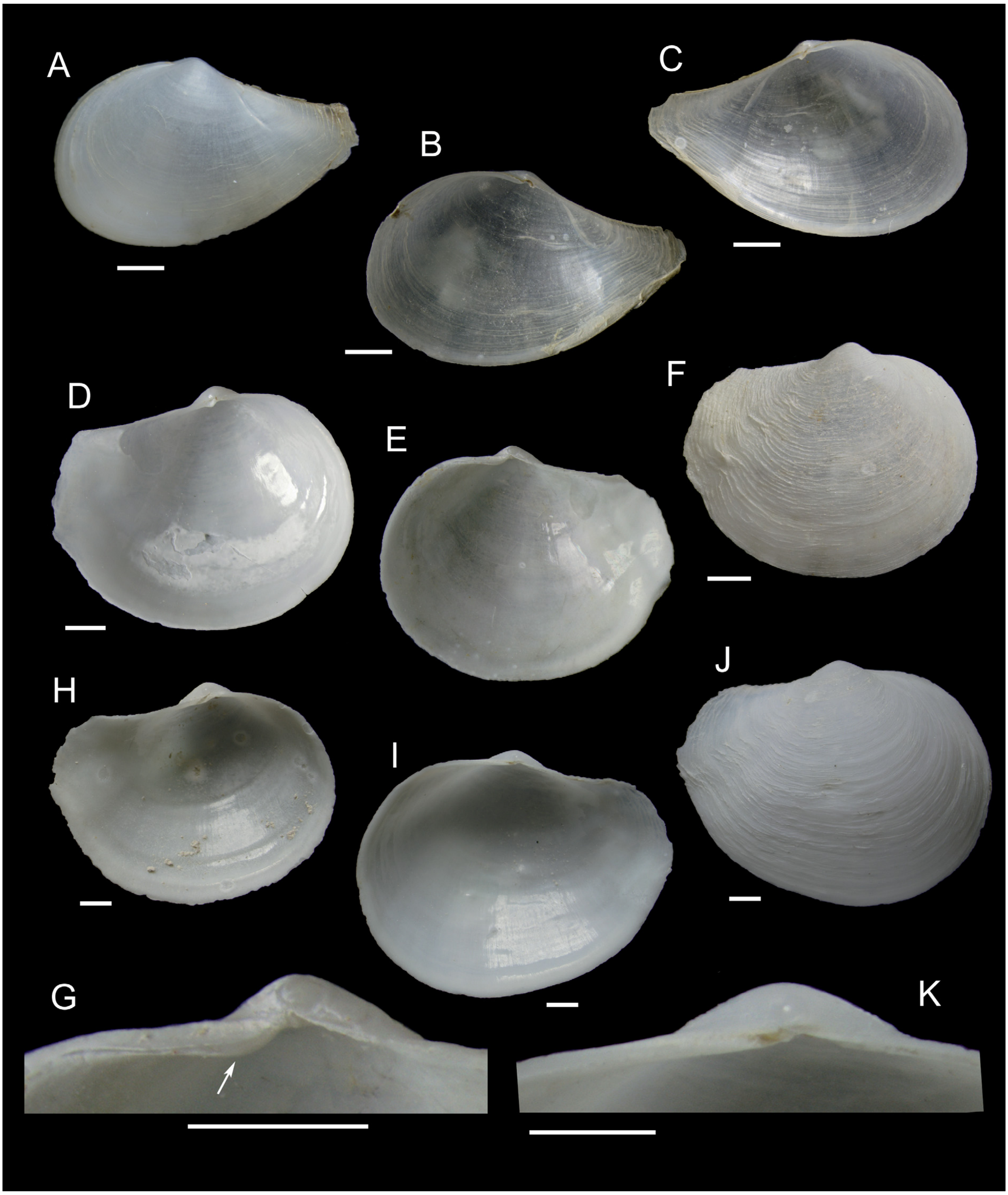

Fig. 43. Halonymphidae, Protocuspidariidae. **A–C**. *Halonympha depressa* (Jeffreys, 1882), BANGAL 0711, V2, 1706 m, 6.5 and 6.8 mm. **D–F**. *Protocuspidaria verityi* Allen & Morgan, 1981, BANGAL 0711, V2, 7.3 and 6.4 mm. **G.** Detail of the hinge of the right valve (same as E), the arrow points to the diagnostic anterior tooth. **H–J**. *Protocuspidaria simplis* Allen & Morgan, 1981, BANGAL 0711, V10, 1720 m, 9.0 mm, 10.1 mm. **K**. Detail of the hinge of the right valve (same as I), without tooth. Scale bars = 1 mm.

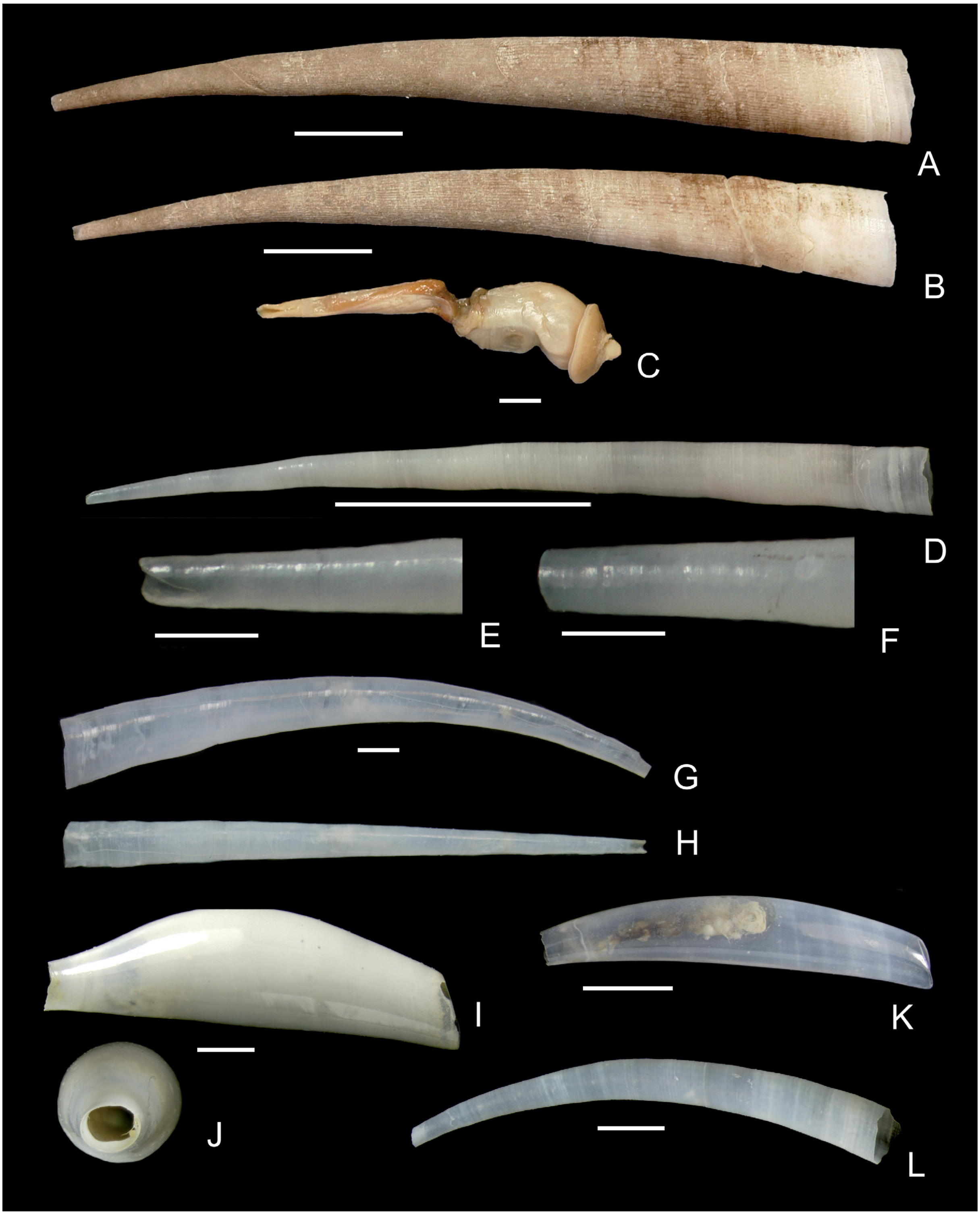

Fig. 44. Scaphopoda. **A–C**. *Fissidentalium capillosum* (Jeffreys, 1877), shell and soft parts, BANGAL 0711, V2, 1706 m, shells 80 and 74 mm. **D–F**. *Antalis agilis* (M. Sars in G.O. Sars, 1872), ECOMARG 0709, V5, 876 m, 32.8 mm and details of the posterior end. **G–H**. *Bathoxiphus ensiculus* (Jeffreys, 1877), BANGAL 0711, V5, 1631 m, 14.0 mm. **I–J**. *Cadulus monterosatoi* Locard, 1897, BANGAL 0711, V9, 1671 m, 7.2 mm. **K**. *Cadulus artatus* Locard, 1897. BANGAL 0711, V2, 4.3 mm. **L**. *Pulsellum lofotense* (M. Sars, 1865), BANGAL 0711, V2, 7.1 mm. Scale bars: A–D = 10 mm; E–L = 1 mm.

Family Protocuspidariidae Scarlato & Starobogatov, 1983

Genus ***Protocuspidaria*** Allen & Morgan, 1981

Type species

Protocuspidaria verityi Allen & Morgan, 1981, by monotypy.

Protocuspidaria verityi Allen & Morgan, 1981
Fig. 43D–G

Material examined

GALICIA BANK • 2 spm, 2 sh, 6 v; 43°00.12′ N, 11°57.67′ W; 1706 m; 29 Jul. 2011; BANGAL 0711 V2; MNCN • 3 v; 42°37.77′ N, 11°49.46′ W; 818 m; 30 Jul. 2011; BANGAL 0711 V3; MNCN • 1 v; 42°59.61′ N, 11°58.41′ W; 1671 m; 7 Aug. 2011; BANGAL 0711 V9; MNCN.

Remarks

This species was misidentified as *Protocuspidaria colpodes* (Dautzenberg & H. Fischer, 1897) in Salas (1996), in the preliminary INDEMARES BANGAL report (Gofas *et al.* 2014b) and in Gofas *et al.* (2017), on the grounds that could be an older name, but Krylova (1995) convincingly recognized these as separate species and the GB specimens would then go to *P. verityi*.

Bathymetric distribution of the species

There is a clearcut separation between mollusc communities on the shallower summit platform of GB and the deeper samples collected below the Mediterranean outflow (i.e., below 1200 m). This is highly supported when involving the beam-trawl catches only (Fig. 45B) by the Bray-Curtis similarity index and a R ANOSIM value of 0.7 (both on quantitative and on presence/absence data). The grouping of the deep samples is also retrieved when taking into account all samples (Fig. 45A), even though the sampled

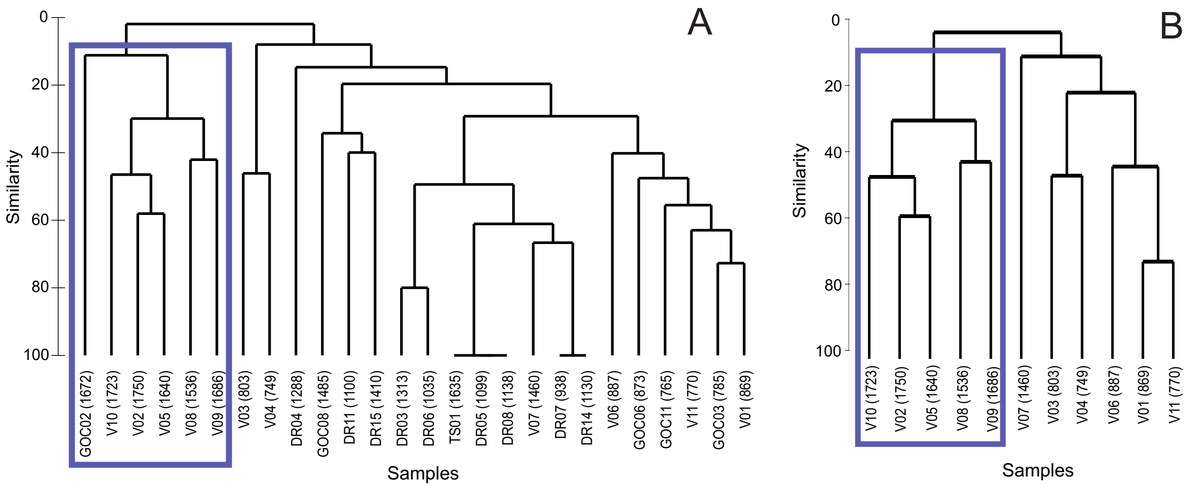

Fig. 45. Similarity between samples from the BANGAL 0711 campaign, based on presence/absence data of living specimens for molluscan species and on the Bray-Curtis similarity index (A, all samples; B, beam trawl samples only). Sample labels with depth in brackets. A similar topology was obtained using the abundance data transformed to fourth root.

Table 3. Contribution of the species to the similarity between samples.

	Av. Abund	Av. Sim	Sim/ SD	Contrib. %	Cum. %
Group S (shallow). Average similarity: 16.93					
Limopsis minuta (Philippi, 1836)	92.20	6.70	0.57	39.58	39.58
Lima marioni P. Fischer, 1882	18.40	6.47	0.49	38.21	77.79
Antalis agililis (M. Sars in G.O. Sars, 1872)	10.20	1.64	0.59	9.66	87.45
Asperarca nodulosa (Müller, 1776)	57.60	0.97	0.41	5.75	93.19
Group D (deep). Average similarity: 11.77					
Limopsis cristata Jeffreys, 1876	340.50	5.16	0.59	43.84	43.84
Bathoxiphus ensiculus (Jeffreys, 1877)	227.50	2.82	0.29	23.99	67.84
Fissidentalium capillosum (Jeffreys, 1877)	43.83	1.12	0.84	9.53	77.36
Parvamussium propinquum (E.A. Smith, 1885)	121.50	0.98	0.63	8.29	85.66
Propeamussium lucidum (Jeffreys in Wyville-Thomson, 1873)	29.50	0.71	0.40	6.02	91.67
Groups S & D. Average dissimilarity: 99.33					

surfaces and the meshed are unequal between dredge, beam trawl and otter trawl. Table 3 shows the contribution of the species to the similarity between samples, calculated on the quantitative data for beam trawls only.

Trophic groups

Filter feeders, mostly the bivalves, account for more than half of the individuals collected (Fig. 46). Among these, *Limopsis* Sasso, 1827 represent roughly half of the specimens of the "filter feeders" group (but different species on the plateau and in the deeper samples), while the presence of the many ectoparasitic species (mostly, in the family Eulimidae) is testimonial from a quantitative point of view.

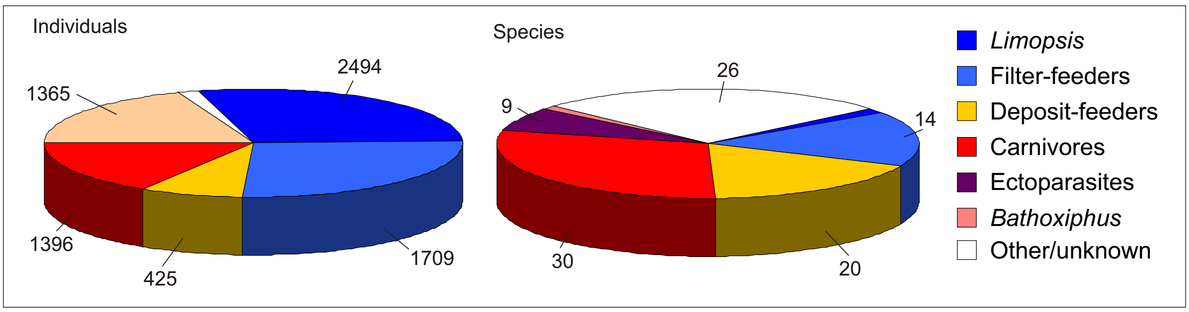

Fig. 46. Percentage of the different trophic groups, in number of live-taken individuals (left) and species represented by at least one live-taken specimen (right).

Discussion

Species diversity

The total number of species (212) could be considered relatively low, despite having considered fractions of less than 1 mm and despite a broad bathymetric range, compared with 269 species on Seine Seamount and 243 on Ampère Seamount (Beck *et al.* 2006), located further south of GB. However, both seamounts have a shallower summit (170 m depth in Seine Seamount, which rises from more than 4000 m, and 60 m in Ampère Seamount, which is part of the Horseshoe Seamounts chain and rises from 4800 m) and the bathymetric range sampled was different, with the presence of several littoral species. Conversely, the GB, with a summit at 625 m of depth, can be classified as a deep seamount and its malacofauna is mainly constituted by deepwater species. On the other hand, GB has been considered as a site of high diversity in terms of γ-diversity regarding the decapod and fish faunas by Cartes *et al.* (2014) and Bañón *et al.* (2016), respectively. Sixty-seven species of decapod crustaceans, 6 euphausiids, 19 peracarids and 1 ostracod were recorded at depths between 744 and 1808 m by Cartes *et al.* (2014), while Bañón *et al.* (2016) obtained 139 species of fishes within the campaigns of the project INDEMARES, that according to these authors represent 14.6% of the 955 species listed for the European Atlantic waters.

Of the total species for which material was examined, 49 (23%) have been collected only in one sample, and only 30 were collected in five or more. This means that most of the species have an irregular, haphazard and patchy distribution and that therefore the species collected can be a substantial underestimate of the total that really exist. Dredge DR15, as an example, yielded no less than ten species found only there, or there and in one more site. The species which appeared in more samples were the gastropods *Coralliophila richardi*, *Colus gracilis* and *Amphissa acutecostata*, the bivalves *Asperarca nodulosa*, *Limopsis minuta* and *Delectopecten vitreus*, and the scaphopod *Antalis agilis.*

The malacofauna of GB includes species that are usually considered rare. Representatives of the almost extinct class Monoplacophora are considered among the most unique findings in a faunistic campaign. *Laevipilina rolani* Warén & Bouchet, 1990, was found in the material of the SEAMOUNT 1 at 985–1000 m (DW116). The class Scaphopoda (the scaphopods), usually considered as a ‘minor class’, has an unusually prominent role on the GB, especially regarding the number of individuals (1777, 25% of the total of Mollusca in BANGAL 0711 campaign). These infaunal molluscs live buried in the sediment with the tapering end emerging from the surface. The most spectacular species, and one of the largest species in the class, is *Fissidentalium capillosum*, collected between 1640 and 1750 m. In shallower depths, only *Antalis agilis* is found, a quite ubiquitous species also present in the more muddy sediments on the continental margin.

Another unusual feature on GB is the relative abundance and diversity of the Solenogastres. These vermiform molluscs live associated with cnidarians, on which they feed, and are usually extremely rare. In the INDEMARES BANGAL 0711 campaign, 16 specimens of Solenogastres were collected in eight stations, representing at least 7 species, still awaiting study for identification or description and not taken into account in this study. It should be remembered that since the year 2000, eight new species of solenogastres have been described from the Galicia Bank (three of them giving rise to new genera; García-Alvarez *et al.* 2000, 2001; Garcia-Alvarez & Salvini-Plawen 2001; García-Alvarez & Urgorri 2001).

A few species (the gastropod *Ansates pellucida* and the bivalves *Aequipecten opercularis*, *Astarte sulcata* and *Timoclea ovata*), all of them represented by a single shell, are from shallow water. Obviously those species do not live, and did not live even during lowstands of the sea level, on GB. Their transport may have occurred through algal rafting for the first, or through the gut contents of fish moving from the shelf to the bank.

Bathymetric distribution and habitat

Only little more than half of the species (107) were found on the summit shelf of the GB shallower than 1000 m. On the soft bottoms of the summit platform the most abundant species was the bivalve *Limopsis minuta*, an epifaunal suspension-feeder, which lives attached to coarse particles by its byssus (Oliver & Allen 1980b) and is common on seamounts elsewhere (Beck *et al.* 2006). Other common species at the summit were the bivalves *Thyasira succisa*, *Spinosipella acuticostata* and *Haliris granulata*, among others, the gastropods *Gibberula abyssicola*, *Colus gracilis*, *Austrobela pyrrhogramma* and *Neopleurotomoides callembryon*, and the scaphopod *Antalis agilis*. Also common in the summit are some species of the genus *Anatoma* (*A. aspera*, *A. eximia*, *A. richardi*), probably where coral debris is present.

Between 800 and 1000 m appear some species more or less strictly associated to the CWC, such as the gastropods *Calliostoma maurolici*, *C. leptophyma*, *Coralliophila richardi*, *Iphitus tuberatus*, *Diodora tenuiclathrata*, *Profundisepta profundi*, *Puncturella agger* and *Emarginula christiaensi*, and the bivalves *Asperarca nodulosa*, *Lima marioni*, *Spondylus gussonii* and *Delectopecten vitreus*. Epifaunal bivalves normally use the dead corals as a substrate, on which they are cemented (*Spondylus*) or byssally attached. Some of the abovementioned gastropods probably feed on corals, on anemones or hydroids which grow on coral skeletons (*Calliostoma maurolici*, *C. leptophyma*, *Coralliophila richardi*, *Iphitus tuberatus*), or on epifaunal sponges (*Diodora tenuiclathrata*, *Puncturella profundi*, *P. agger*, *Emarginula christiaensi*). The association of deep white *Calliostoma* species and CWC has been pointed out on several occasions (e.g., Beck *et al.* 2006; Hoffman *et al.* 2019a) and *C. maurolici* has been photographed grazing on live *Madrepora oculata* and on the actiniaria *Phelliactis hertwigii* Simon, 1892, common in the CWC framework (Hoffman *et al.* 2019a). On the other hand, *Iphitus tuberatus*, *Asperarca nodulosa*, *Lima marioni*, *Delectopecten vitreus* and *Spondylus gussonii* are common species in the Mediterranean CWC ecosystem (see Rueda *et al.* 2019 for a review) and they are also widespread in the N Atlantic. Hoffman & Freiwald (2018) recorded *Diodora tenuiclathrata*, *Puncturella profundi* and *Emarginula christiaensi* in Pleistocene thanatocoenoses associated with CWC habitats along the continental shelf and slope off Mauritania and here only empty shells have been found, except for a living specimen of the former species. Deeper, in Rucabado seamount (stn DR14, 1130 m), where well-developed CWC reefs have been located, the epitoniid *Cylindriscala thalassae* and the pectinid *Delectopecten vitreus* have been obtained. The former is a very rare species only known previously from the type locality in the N part of the Bay of Biscay at 1055 m depth (Bouchet & Warén 1986). These authors pointed out that the species of the genus *Cylindriscala* are probably associated to sea anemones of CWC habitats. On the other hand, *D. vitreus* is widely distributed throughout GB and is a species of wide geographical and bathymetric distribution (Janssen & Krylova 2014).

Also noteworthy are two adjacent samples placed on the NW edge of the summit (DW116, 985–1000 m) and on the higher part of the shelf break (DW108, 1110–1125 m), where 41 and 42 species were respectively found, with 26 shared species. Quite abundant and almost exclusive of these samples are *Iphitus tuberatus* and *Pedicularia sicula* (only empty shells). This would indicate the presence in this area of CWC patches with the stylasterid coral *Errina* sp., because *P. sicula* is strictly associated to corals of that genus (Arnaud & Zibrowius 1979). A high number of "conoidean" species were found in both samples, being especially abundant empty shells of *Austrobela pyrrhogramma.*

The deepest samples of the campaign BANGAL 0711, between 1600 and 1720 m, were the most diverse. The most abundant mollusc species (not only in these samples, but in general in the campaign) were the bivalve *Limopsis cristata*, followed by the scaphopods *Bathoxyphus ensiculus* and *Fissidentalium capillosum* and the also epifaunal bivalve *Parvamussium propinquum*. The bivalves *Ledella messanensis*, *Ennucula corbuloides* and *Lyonsiella abyssicola* were also abundant and exclusive of the deepest samples. Among the gastropods, we noted the abundance of *Scaphander punctostriatus*, an infaunal species which feeds on small organisms, especially foraminifera, and moves within the sediment; perhaps due to this way of life we collected a large number of live juveniles, whereas adult shells were almost always empty. Also abundant in the deepest samples were *Colus jeffreysianus*, species of the family Eulimidae and "skeneimorph" species.

Sample V10, collected at 1720 m depth in the transition zone between the GB itself and the Inland Basin of Galicia, not far from the east cliff of the Bank, is unique. In this sample the species richness is one of the highest of the campaign (37 live collected species, 1995 individuals), with notable numbers of the carnivorous gastropods *Kryptos koehleri*, *Colus jeffreysianus* and *Troschelia berniciensis*, which are species shared with the slope of the continent itself along the entire Bay of Biscay and the Iberian west coast. Also in this sample, rare species such as the gastropod *Aforia serranoi* and the bivalve *Halicardia flexuosa* were found.

On the other hand, very few species were only found in samples from intermediate depths (1000–1500 m), all of them in low number, such as *Basilissopsis watsoni*, *Asthelys munda*, *Moelleriopsis* sp., *Batheulima fuscoapicata*, *Fuscapex cabiochi*, *Eulitoma obtusiuscula* or *Cylindriscala guernei*, but all of them represented only by a small number of empty shells. These depths correspond mostly to steep rocky slopes, difficult to sample with conventional gears, and are probably undersampled. Dredge BANGAL DR15 successfully sampled this interval and contains several unique species.

There is a striking pattern of congeneric species pairs occurring respectively on the summit platform and on the deeper slope below 1500 m: *Anatoma eximia* and *A. richardi* on the summit vs *Anatoma umbilicata* and *A. corralae* sp. nov. deep; *Colus gracilis* on the summit and *Colus jeffreysianus* deep; *Limopsis minuta* on the summit vs *Limopsis cristata* deep; *Dacrydium wareni* on the summit vs *Dacrydium ockelmanni* deep (see Table 2). The *Limopsis* species pair comprises two of the most abundant species, with hardly any overlap; the few valves of *L. minuta* collected in the deep stations being probably an artifact from specimens entangled in the trawl. This disjunct bathymetric distribution has also been reported for pairs of congeneric species of decapods by Serrano *et al.* (2017a).

Trophic groups

The GB is entirely situated below the photic zone and therefore the herbivorous species that predominate in shallow environments are completely absent. The species found are essentially distributed among more or less specialized filter feeders, detritivores and carnivores. Among the filter feeders are all the epifaunal bivalves, predominating quantitatively the *Limopsis* species, but other bivalves associated to white coral, such as *Lima marioni*, *Asperarca nodulosa* and *Spondylus gussonii* are also common.

Colus gracilis (Fig. 47) and *C. jeffreysianus* are among the largest gastropods, belonging to a genus of predatory habits, although quite eclectic in the choice of prey and occasionally scavengers. According to Kosyan (2007), stomach contents of these species revealed the presence of amphipod remains, while in other species of the same genus, foraminiferans, molluscs, brittlestars and other organisms were also detected, so everything indicates that they feed on small infaunal organisms without much specialization. There are many other species of gastropods with carnivorous habits, among which *Amphissa acutecostata* and *Kryptos koehleri* are relatively abundant.

The scaphopods, very abundant especially in the deepest samples, are known (Glover *et al.* 2003, with references) as predators that feed essentially on foraminifers and occasionally on other small organisms, which they collect in the sediment through tiny tentacles (the "captacules"). There are no concrete data on the diet of the species collected on GB, except those provided by Langer *et al.* (1995) on the genus *Fissidentalium*. However, for the tiny *Bathoxiphus ensiculus*, Steiner (1994) speculated that a detritivorous diet would be more likely considering its very long digestive tract; for this reason it has been scored as "unknown" in our counts.

A striking aspect in the deep benthos is the development of carnivorous habits in groups that usually are not. In this case are the bivalves *Propeamussium lucidum* (see Morton & Thurston 1989) and the septibranch bivalves (Reid & Reid 1974; Morton 1981). It is also worth mentioning the presence of the predatory polyplacophoran *Placiphorella atlantica* (see McLean 1962).

Among the proven detritivores can be mentioned the bivalves of the subclass Protobranchia, present although not very abundant in the deepest stations of the periphery of GB. The two species of this group that appear in a relatively high number were *Ennucula corbuloides* and *Ledella messanensis*, from which most of the specimens were collected in the V10 haul, in the transition zone towards the inner basin. In this trophic group also enter small gastropods such as *Cirsonella romettensis*, *Benthonella tenella*, *Anatoma* spp. and possibly the smaller scaphopods *Bathoxiphus ensiculus* and *Pulsellum lofotense*.

Some gastropods have highly specialized diets. This is the case of the tiny gastropods *Lepetella* sp. and *Addisonia* cf. *excentrica*, which feed respectively on the organic tubes of the onuphid polychaete *Hyalinoecia* Malmgren, 1867 and on egg cases of chondrichtyans. As mentioned above, there is also a close relationship between the gastropod *Pedicularia* Swainson, 1840 and stylasterid corals of the genus *Errina* Gray, 1835, typical of bathyal cliffs in current-swept hard bottoms (Arnaud & Zibrowius 1979). The sampling of this community is very difficult and it was not collected during the BANGAL 0711 campaign, but shells of *Pedicularia* were collected in 1987 during the SEAMOUNT 1 campaign and indicate that this interesting community exists on the NW ridge of the Bank. To the same category of specialized carnivores belong the *Calliostoma* species, *Coralliophila richardi* and Epitoniidae species, all them feeding on anthozoans, the Eulimidae, ectoparasites of echinoderms, and the Pyramidellidae, ectoparasites of polychaetes or other molluscs. The eulimids present a high species diversity in the GB, where diverse species of echinoderms dominate in certain habitats.

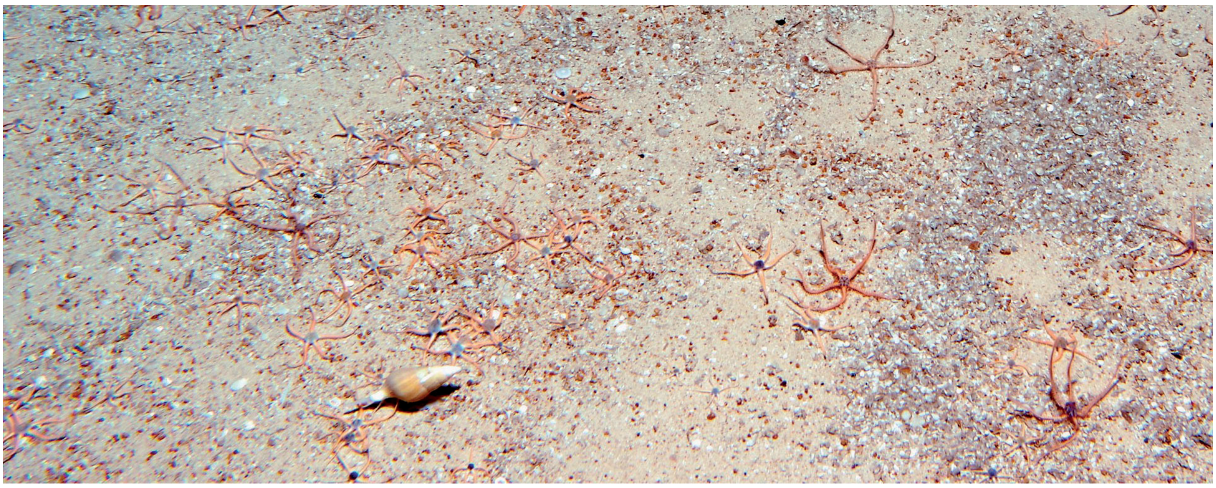

Fig. 47. A gastropod of the genus *Colus* Röding, 1798 (probably *C. gracilis* (da Costa, 1778)), roaming a sedimentary bottom of the summit platform where there are abundant brittlestars and small bivalves of the genus *Limopsis* Sasso, 1827 (probably *L. minuta* (Philippi, 1836), white dots in the photograph). Photo: Indemares project; Bangal_E09L1_0080.

Endemism and biogeographical relationships

A certain level of endemism can be expected in the benthic fauna of a remote seamount. This is not straightforward the case of GB, which is large and not very distant from the mainland slope. In fact, hardly any species were found to be endemic of Galicia Bank. Only a few solenogastres, and the gastropod species described herein, are only known from the original lot. The rissoid *Gofasia galiciae* Bouchet & Warén, 1993, at that time recorded as endemic, was later found (Gofas 2007) on other seamounts of the Ibero-Moroccan region. Souto *et al.* (2016) recorded 25 species of cheilostomate bryozoans in the GB, 12 of them described as new to science, and pointed out that the level of endemism could be between 48% and 60%. Nevertheless, Cartes *et al.* (2014) only considered the two newly described species as potentially endemic species among the 67 recorded decapods, and Bañón *et al.* (2016) did not find any endemic species among the 139 fish recorded in the GB.

From the first studies on seamounts emerged the general paradigm that they harbour high levels of endemism (see Rowden *et al.* 2010 for a review). However, recent studies have questioned this paradigm (e.g., Samadi *et al.* 2006; McClain 2007; Castelin *et al.* 2010, 2011), and the levels of endemicity may vary between seamounts, regions, and taxa, and it depend of a series of factors, among other the dispersal capability of species.

The dispersal and colonization capacity of molluscs generally depends on the type of larval development, being those with a prolonged larval phase (weeks or even months) in the plankton ("planktotrophic" development, larvae feed while they are in the water column) having the greatest capacity of dispersal, but those with direct development (intracapsular larval development, without planktonic phase) have better capacity to persist once installed in a locality. Between both extremes, many mollusc species have lecithotrophic larvae (that feed on yolk, though some species can also feed in the water column) of short duration, of hours or days. The knowledge from other seamounts suggests that a distance in the order of magnitude of 200 km is not a barrier to the dispersal of species with a short pelagic phase, for example the trochid and rissoid gastropods (Gofas 2005, 2007) and this may apply to many other gastropods, polyplacophorans, scaphopods and bivalves. These latter species may use intermediate seamounts with suitable habitats as "stepping stones", a matter discussed by several authors (e.g., Samadi *et al.* 2006; McClain 2007; Castelin *et al.* 2010, 2011). It is not likely that the width of the Galician Inland Basin could represent a barrier, so that most species are shared with the Iberian continental margin or even more widely distributed. Compared to the Iberian margin, the differentiation as a "GB seamount fauna" is not obvious and is only manifest through the presence of species such as *Seamountiella azorica*, *Puncturella agger*, *Ancistrobasis reticulata*, *Gofasia galiciae* or *Fusinus bocagei*, shared with the more remote seamounts of the Northeastern Atlantic, the Azores or the South Azores Seamount Chain (Beck *et al.* 2006; Gofas 2000, 2007) and not found along the mainland. Only 17 species are known exclusively from Galicia Bank, and these include eight Solenogastres never recorded again after their original description, the four species described as new herein, so that the level of endemism on GB, if not nil, is certainly very low compared to more remote seamounts.

The shared GB species with other N Atlantic areas is summarized in Fig. 48. The highest number is shared with Bay of Biscay and numbers decrease in relation to more distant sites. Altogether, a majority of GB species have a relatively wide distribution in the N Atlantic, and the number of shared species is quite even across all the areas considered.

Considering only the species present on GB (those behind the numbers on Fig. 48), the outcome of the similarity analysis (Fig. 49) was that GB clustered with Bay of Biscay, Ibero Moroccan Gulf and British Isles (i.e., areas of the continental margin) whereas Lusitanian seamounts and the Azores clustered separately. However, this similarity analysis must also take into account the species in the 500–2000 m depth interval which are present in the other areas and not on GB. When this is implemented, GB clustered

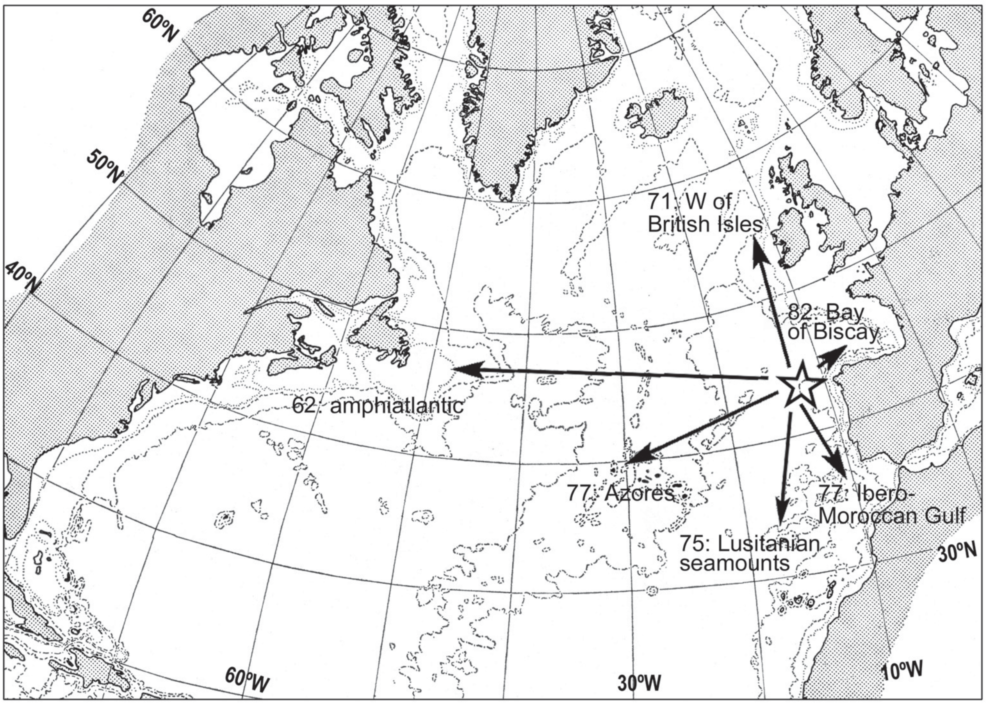

Fig. 48. Number of Galicia Bank species shared with other distant regions of the Atlantic (Bay of Biscay, Ibero-Moroccan region, seamounts of Lusitanian region and Western Atlantic).

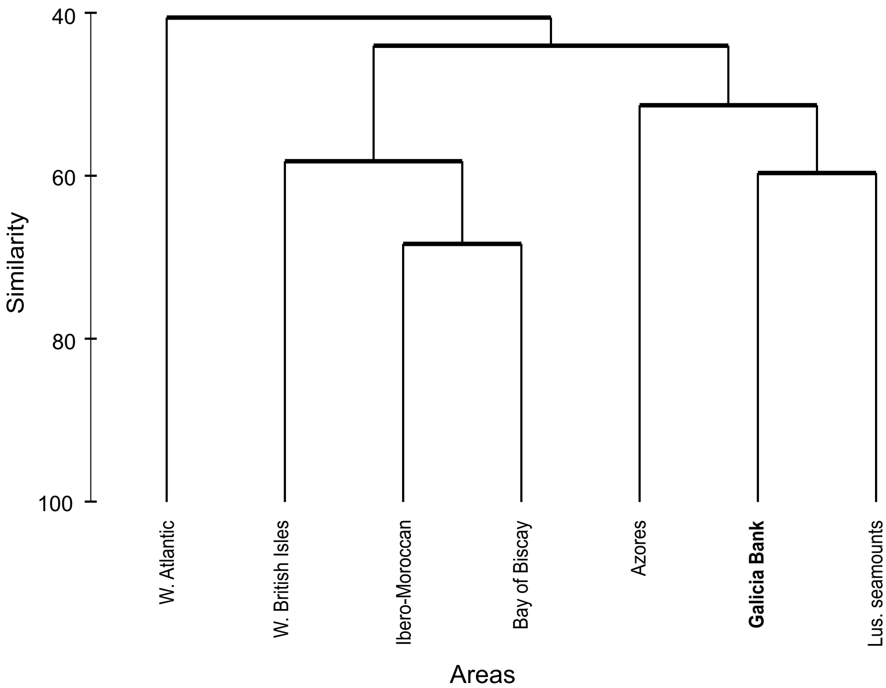

Fig. 49. Similarity between Galicia Bank and other areas of the North Atlantic, based on presence/absence data of molluscan species and on the Bray-Curtis similarity index. Areas as on Fig. 48.

with the Lusitanian seamounts and the Azores rather than with the mainland. We explain this because Bay of Biscay, Ibero Moroccan Gulf and British Isles slopes share many species that are not on GB, therefore supporting the consideration of GB as a seamount.

Conservation issues

It is common knowledge that the international conventions and legal texts in which species of molluscs are granted a protection regime are focused on the terrestrial and coastal environments. In the context of the Galicia Bank, and more generally of the bathyal fauna, it should be borne in mind that the species present there have never been evaluated for their possible inclusion in lists of protected or threatened species. With these circumstances, the only species collected in the GB and that is included in such lists is the gastropod *Ranella olearium*, listed in Annex II of the Bern and Barcelona conventions, the latter only relevant to the Mediterranean Sea. However, this lack of representation reflects the inadequacy of those lists for the management of the deep sea, rather than the lack of species of interest for conservation purposes in the area. Among molluscs present in the GB, a choice of representative species would include the oyster *Neopycnodonte zibrowii*, whose adult individuals may be hundreds of years old and which is structuring a habitat collected in the Spanish Inventory of Marine Habitats (code 04010403 "Scarps, walls and rocky slopes of the deep sea with *Neopycnodonte zibrowii*"; Templado *et al.* 2012). In the deepest part of the study area, species such as the scaphopod *Fissidentalium capillosum* and the bivalve *Halicardia flexuosa*, whose large size also suspect slow growth.

The GB was proposed to the European Commission to be included in the Natura 2000 list of Sites of Community Importance in 2014 (Ministerio de Agricultura, Alimentación y Medio Ambiente, 2014) and is planned to be proposed soon as Special Area of Conservation. Being huge and relatively undisturbed, it would also qualify as a UICN Type Ib area (wilderness areas, Dudley 2008) in terms of conservation goals. Nevertheless, a protection management plan is not yet approved. The remoteness and the difficult access to its vulnerable ecosystems are at the present time the better protection shield for the Galicia Bank.

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Supplementary material

Supp. file 1. Fig. S1. Shipboard drawings made during the SEAMOUNT 1 cruise, in the order of their reference number in Tables 2 and S1. https://doi.org/10.5852/ejt.2021.785.1605.5663

Supp. file 2. Table S1. Detail of Material examined. https://doi.org/10.5852/ejt.2021.785.1605.5665