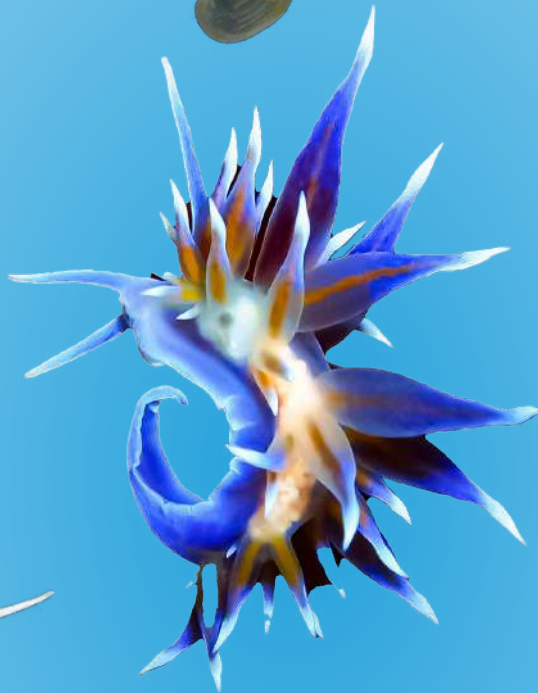
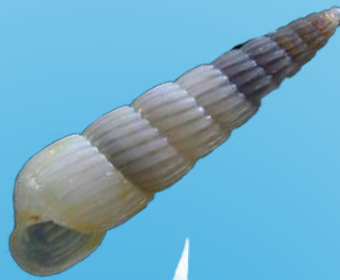




XENOPHORA

T A X O N O M Y

Supplément à Xenophora, Bulletin de l'Association Française de Conchyliologie



P. BAIL, D. LEDON, J.M. PACAUD

DESCRIPTION DE DEUX ESPÈCES NOUVELLES DE *LYRIA* GRAY, 1847 (GASTROPODA : VOLUTIDAE) DE L'OLIGOCÈNE SUPÉRIEUR (CHATTIEN) ET DU MIOCÈNE INFÉRIEUR (AQUITANIEN) DU SUD-OUEST DE LA FRANCE

G. MBAZIOS, T. ROZAKIS, G. ZAMINOS, S. KARYPIDIS, G. MINOS, . PAPAVALSILEIOU, C. KONTADAKIS, T. MANOUSIS, S. GALINOU-MITSOUDI
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G. PEREIRA DE QUEIROZ, O. CRABOS, G. POMPONET OLIVEIRAS, L. PASSOS DE ALMEIDA,
DESCRIPTION OF *VOLVARINA MEGAPEX* SP NOV, A NEW *MARGINELLIDAE* FROM BRAZIL

T. MANOUSIS, S. GALINOU-MITSOUDI

GREAT MOLLUSCAN DIVERSITY ASSOCIATED WITH A LIMITED *CYMODOCOA NODOSA* (UCRIA) ASCHERSON 1870 BED IN THERMAIKOS GULF, NORTH AEGEAN SEA, GREECE.

D. BERSCHAUER

THE TRUE IDENTITY OF *GRADICONUS ANABATHRUM* (CROSS, 1865)

numéro **35**

Avril 2022

D.L. Avril 2022 CPPAP 0123 G 82662
I.S.S.N. 2271-0906



Association Française de Conchyliologie

www.xenophora.org
2 square La Fontaine
75016 Paris

Président

Eric Monnier,

e-mail: ericm2007@hotmail.fr

194 Rue du Chateau des Rentiers - 75013 PARIS

Vice-Président - Editeur en chef

Fabrice Prugnaud

e-mail: fprugnaud@gmail.com

23 Rue des bons raisins - 92150 Suresnes



XENOPHORA TAXONOMY is a supplement to ***XENOPHORA***, the quarterly bulletin published by AFC. It is shipped to all AFC members with the regular publication.

Je ne sais pas parler de la mer. Tout ce que je sais c'est qu'elle me débarrasse soudain de toutes mes obligations. Chaque fois que je la regarde, je deviens un noyé heureux.

Romain Gary.

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Impression : Imprimerie Buxynoise - ☎ 03 85 92 05 29
4 Place de la Gare - 71390 BUXY

Description de deux espèces nouvelles de *Lyria* Gray, 1847 (Gastropoda : Volutidae) de l'Oligocène supérieur (Chattien) et du Miocène inférieur (Aquitarien) du sud-ouest de la France

PATRICE BAIL

2 square la fontaine 75016 Paris

E-mail: pat.bail@orange.fr

DANIEL LEDON

CR2P Centre de Recherche en Paléontologie – Paris

Muséum national d'Histoire naturelle, Sorbonne Université, CNRS

57 rue Cuvier, CP 38, 75005 Paris (France)

E-mail: dnledon@yahoo.fr

JEAN-MICHEL PACAUD

CR2P Centre de Recherche en Paléontologie – Paris

Muséum national d'Histoire naturelle, Sorbonne Université, CNRS

57 rue Cuvier, CP 38, 75005 Paris (France)

Email: pacaud@mnhn.fr

Résumé. Deux nouvelles espèces de Volutidae appartenant au genre *Lyria* sont décrites. *Lyria estotiensis* nov. sp. du Chattien (Oligocène supérieur) et *Lyria lozoueti* nov. sp. de l'Aquitarien (Miocène) du bassin de l'Adour (Sud-ouest de la France)

Mots clés. Mollusca, Gastropoda, Miocène, Oligocène, Systématique, *Lyria*, espèces nouvelles.

Abstract. Two new species of Volutidae belonging to the genus *Lyria* are described. *Lyria estotiensis* nov. sp. of Chattian (Upper Oligocene) and *Lyria lozoueti* nov. sp. of Aquitanian (Miocene) of the Adour Basin (Southwestern France).

Key words. Mollusca, Gastropoda, Miocene, Oligocene, Systematic, *Lyria*, new species.

Introduction. L'Oligocène et le Miocène inférieur du Sud-Ouest de la France se sont révélés d'une grande richesse paléontologique bénéficiant d'études anciennes et récentes multiples. Les Volutidae s'y manifestent par une grande diversité spécifique, prenant le relais après les extinctions de l'Éocène du Bassin parisien. Ils s'y répartissent en trois sous-familles : Athletinae Pilsbry & Olsson, 1954 avec 14 espèces valides, regroupées dans le genre *Athleta* Conrad, 1853. Volutinae Rafinesque, 1815 avec 12/13 espèces répertoriées, regroupées dans le genre *Lyria* Gray, 1847. Scaphellinae Gray, 1847 avec une espèce du genre *Euroscaphella* Van Dingenen, Ceulemans & Landau, 2014.

Cette abondance, récemment bien étudiée et inventoriée par LOZOUET (2019), a nécessité néanmoins une mise à plat des espèces du genre *Lyria*, souvent morphologiquement assez proches et objets de confusion taxonomique, laquelle a abouti à la caractérisation d'une espèce non nommée de l'Aquitarien de Meilhan (Landes), *Lyria lozoueti* nov. sp., jusque-là confondue dans l'extensif *Voluta subharpula* d'Orbigny, 1852, ainsi que d'une espèce restreinte au Chattien des environs d'Estoti, Saint-Paul-lès-Dax (Landes), ici nommée *Lyria estotiensis* nov. sp. dont nous donnons ici la description.

Matériel et méthodes. Ce travail s'appuie sur l'étude récente de LOZOUET (2019) sur les Neogastropoda de l'Oligocène supérieur du bassin de l'Adour et les données nouvelles qu'il développe.

Abréviations

MNHN.F Muséum National d'Histoire Naturelle, Collection de Paléontologie, Paris, France.

Stratigraphie. Nous listons ici les sites connus et signalons ceux où ont été trouvées des *Lyria*. Cette liste n'est pas exhaustive et sera sûrement complétée ou infirmée ultérieurement.

Langhien (Miocène moyen)

Saubrigues (Landes). *Lyria picturata* (Grateloup, 1834), *L. subcostata* (d'Orbigny, 1852).

Burdigalien (Miocène inférieur)

Saint-Paul-lès-Dax, Cabanes (Landes). *L. burdigalica* Peyrot, 1928, *L. primitiva* Peyrot, 1928.

Saint-Jean-de-Marsacq, Lahitet (Landes). – Pinot, Mandillot (Landes). *L. picturata* (Grateloup, 1834)

Saucats, Peloua (Gironde), *L. picturata* (Grateloup, 1834).

Léognan. *L. aquitanica* Peyrot, 1928.

Aquitarien (Miocène inférieur)

Meilhan, Carrière Vives (Landes). *L. lozoueti* nov. sp., *L. estotiensis* nov. sp.

Saint-Paul-lès-Dax, Maïnot (Landes). *L. aff. degrangei* Peyrot, 1928.

Saint-Morillon, Plantat (Landes). *L. aquitanica* Peyrot, 1928, *L. lozoueti* nov. sp.

Chattien (Oligocène supérieur)

Dépôts du paléocanyon de Saubrigues (Circalittoral à Bathyal supérieur)

Peyrehorade, Peyrères (Landes). *L. aturensis* Peyrot, 1928, *L. degrangei* Peyrot, 1928, *L. peyrehoradensis* Lozouet, 2019.

Peyrehorade, Tauziède (Landes). *L. aturensis* Peyrot, 1928.

Saint-Etienne-d'Orthe, ruisseau de l'Eglise, A, B, C, D (Landes). – Lartigaou, Lestrille (Landes). *L. degrangei* Peyrot, 1928.

Saint-Etienne-d'Orthe, ruisseau Verdun (Landes). *L. peyrehoradensis* Lozouet, 2019.

Dépôts littoraux

Saint-Paul-lès-Dax, Abesse B (Landes). – Abesse « Château » (Landes). – Bezoye, Falaise (Landes) – Bezoye B (Landes). – Estoti (Landes). *L. degrangei* Peyrot, 1928, *L. estotiensis* nov. sp.

Rupélien (Oligocène inférieur)

Gaas, Espibos (Landes). – Lagouarde, Larrat (Landes). *L. lesbarriziana* (Grateloup, 1845)

Priabonien (Éocène supérieur)

Peyrehorade, Arribaouts (Landes). *L. peyrehoradensis* Lozouet, 2019.

Systématique

Classe GASTROPODA

Super-famille VOLUTOIDEA Rafinesque, 1815

Famille VOLUTIDAE Rafinesque, 1815

Sous famille Volutinae Rafinesque, 1815

Tribu Lyriini Pilsbry & Olsson, 1954

Genre *Lyria* Gray, 1847

Espèce-Type: *Voluta nucleus* Lamarck, 1811 par désignation originale.
Origine : Récent, Australie

Diagnose : Coquille de taille modérée, souvent inférieure à 10 cm, ovoïde-fusiforme. Protoconque lisse, bulbeuse de 1 à 2 tours. Spire haute. Téléoconque de 5-6 tours, souvent sculptée de 10-14 solides côtes axiales, croisées ou non de stries spirales sur la partie antérieure du dernier tour. Lèvre externe souvent épaissie en varice. Plis columellaires caractéristiques formés de 3 gros plis antérieurs, adapicalement suivis de denticules ou lirations de tailles variables sur l'ensemble de la columelle. Canal siphonal bien dessiné. Fasciole indistincte.

Discussion : Déjà très identifiable dès le Danien (Paléocène inférieur) (PACAUD *et al.*, 2000 ; PACAUD 2018), le genre *Lyria* dérive probablement d'un ancêtre à identifier dans le Crétacé supérieur de la Téthys, origine qu'il partage très vraisemblablement avec le genre *Volutilithes* Swainson, 1830, avec qui les similitudes sont trop nombreuses pour être une simple convergence. Il s'intègre dans la sous-famille des Volutinae qui regroupe, outre les genres américains *Voluta* Linnaeus, 1758 et *Enaeta* H. & A. Adams, 1853, les genre *Harpulina* Dall, 1906 en Inde et *Callipara* Gray, 1847 est-africain ; ce dernier présentant les nombreux traits morphologiques proches des *Volutilithes* sus-cités. La séparation en sous-genres applicable aux espèces actuelles ne semble pas pertinente pour la majorité des fossiles oligo-miocéniques du Sud-Ouest ici étudiés, dont la morphologie souvent peu différenciée peut s'intégrer à ce qui est considéré comme *Lyria* sensu stricto. Les espèces du genre peuvent être soumises à de grandes variations intraspécifiques portant sur la longueur de la spire ou le diamètre du dernier tour, tout en gardant toujours le même motif résiduel de couleur de base ; ces deux caractères ne peuvent pas en conséquence être considérés comme robustes pour une détermination chez les fossiles.



Fig. 1. *Lyria estotiensis* nov. sp. Holotype MNHN.F.A70190 (leg. Lozouet), h: 24,6 mm.

***Lyria estotiensis* nov. sp.**
(Fig. 1, Planche I.)

Synonymie *Lyria* cf. *picturata* Lozouet, 2019 : 25, pl. 13 fig. 9-13.

Localité type. Saint-Paul-lès-Dax, Estoti (Landes), Chattien (Oligocène supérieur).

Matériel type. Holotype. MNHN.F.A70190 (leg. Lozouet).

Autre matériel examiné. MNHN : Saint-Paul-lès-Dax, Bezoye (B), 2 ex. (coll. Bail)

Distribution connue. Cette petite espèce, confinée au Chattien des environs de Saint-Paul-lès-Dax est restée longtemps méconnue et fut signalée pour la première fois par LOZOUET (2019).

Dimensions. Hauteur : 24,6 mm. – Diamètre : 11,2 mm.

Étymologie. De sa localité type, Estoti (Landes).

Description. Petite coquille ovale à spire courte. Téléoconque de 5 tours. Surface fortement érodée présentant sur les deux derniers tours une sculpture longitudinale atténuée homogène sur tous les spécimens examinés et ne pouvant être interprétée comme des restes de côtes fortement abrasées. Cordons spiraux visibles sur le quart antérieur du dernier tour. Columelle presque droite portant sur sa totalité 6 plis épais isomorphes.

Remarques. Malgré sa silhouette ovoïde rappelant *L. picturata* (Grateloup, 1834), la présence d'une sculpture axiale constituée de cordons spiraux antérieurs, une spire épaisse et des plis columellaires, elle en diffère fortement et peut évoquer un statut d'espèce valide malgré la pauvreté du matériel récolté (GRATELOUP, 1834). D'après LOZOUET (2019 : 25), une *Lyria* sp., signalée du Chattien d'Allemagne par JANSSEN (1979 : 301) pourrait correspondre à la même espèce.



Fig. 2. *Lyria lozoueti* nov. sp. Holotype MNHN.F.A85318 (leg. Lozouet), h : 56,3 mm

***Lyria lozoueti* nov. sp.**
(Fig. 2, Planche II.)

Localité type. Carrière Vives, Meilhan (Landes), Aquitanien supérieur (Miocène).

Distribution. Apparaît restreint à la localité type.

Matériel type. Holotype MNHN.F.A85318 (leg. Lozouet). Paratype MNHN.F.A85319 (coll. Ledon).

Dimensions. Hauteur : 56,3 mm, diamètre : 26,9 mm.

Autre matériel examiné. Meilhan (Landes) : 5 ex. (coll. Bail).

Étymologie. Espèce dédiée à Pierre Lozouet (MNHN) pour le renouvellement qu'il a apporté à la connaissance des Volutes fossiles du Sud-Ouest de la France.

Description. Coquille ovale à bords fortement convexes, lourde et solide. Protoconque arrondie, paucispirale, d'un tour lisse centré sur l'axe de la coquille. Transition protoconque/téleoconque abrupt. Spire courte, triangulaire, avec un angle subapical de 50°. Téleoconque de 6,5 tours régulièrement convexes sans dépression sous-suturale franche. Suture simple, peu déformée par les côtes axiales sur les 3 derniers tours. Sculpture axiale constituée de larges côtes arrondies, peu élevées, d'orientation orthocline, s'étendant sur l'ensemble de la téleoconque, laissant un espace intercostal large et concave, comptées 12-13 sur l'avant-dernier tour. Sculpture spirale constituée de sillons à peine visibles, devenant cordons marqués sur les 7-8 mm antérieurs jusqu'à l'encoche siphonale. Ouverture haute, étroite, formant en moyenne 68 % de la longueur totale de la coquille. Lèvre externe simple, avec la paroi externe épaissie formant une varice labiale bien marquée chez les spécimens adultes. Columelle calleuse, discrètement concave en son tiers postérieur, portant 12-15 plis serrés, réguliers, les 2-3 antérieurs plus épais et légèrement plus

obliques. Canal siphonal court et étroit.

Discussion. Par une taille adulte supérieure, son test lourd, ses côtes axiales épaisses et arrondies ne chevauchant pas la suture, *Lyria lozoueti* nov. sp. est facilement identifiable. Elle a été confondue avec *L. aquitanica* Peyrot, 1928 laquelle diffère par sa structure plus légère, par ses côtes plus minces recouvrant la suture, creusés d'une légère dépression subsuturale. La coquille est abondante, longtemps nommée *subharpula* puis *aquitanica* dans les collections.

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Planche I. *Lyria estotiensis* sp. nov., Oligocène Inferieur



A. Holotype MNHN.F.A70190 (leg. Lozouet), h: 24,6 mm
B. (coll. Bail), h : 23,7 mm.

Planche II. *Lyria lozoueti* nov. sp. de l'Aquitanien supérieur (Miocène)
de la Carrière Vives, Meilhan (Landes)



A. Holotype MNHN.F.A85318 (leg. Lozouet), h : 56,3 mm.

B. (coll. Bail).

C. (coll. Bail), h : 37,0 mm.

D. (coll. Bail), h : 48,4 mm.

E. (coll. Bail), h : 27,7 mm.

F. Paratype MNHN.F.A85319 (coll. Ledon), h : 55,0 mm.

G. (coll. Bail), h : 55,0 mm.

H. (coll. Bail), h : 39,2 mm.

New records and distributional status of marine Mollusca for the Hellenic Seas (by September 2021)

GEORGE MBAZIOS

Orfanidou 27, 11142 Athens, Greece Email: gmpazios@gmail.com

TASOS ROZAKIS

Louloudion 11, 15773 Zografou, Athens, Greece Email: 68anastasios@gmail.com

GIANNIS ZAMINOS

Markantonaki 10, 73141 Chania, Greece Email: tzouras09@gmail.com

STYLIANOS KARYPIDIS

Efrosynis 5, 56224 Evosmos, Thessaloniki, Greece Email: stelioskarip07@gmail.com

GEORGE MINOS

International Hellenic University (IHU) Department of Nursing, P.O. Box 141, 57400 Sindos, Thessaloniki, Greece
Email: gminos@otenet.gr

KYRIAKOS PAPAVALSILEIOU

Komninon 39, 55131 Kalamaria, Greece Email: kpapav@yahoo.com

CONSTANTINOS KONTADAKIS

Aristotelous 24, 16777 Hellinikon, Athens, Greece Email: costaskontadakis@yahoo.com

THANASIS MANOUSIS

PO Box 48 K, 57500 Epanomi, Greece Email: athanasiosmanousis@gmail.com

SOFIA GALINOU-MITSOUDI

International Hellenic University (IHU) Department of Environmental Engineering,
PO Box 141, 57400 Thessaloniki, Greece
Corresponding author Email: galimits@otenet.gr

Keywords

Greece, Lessepsian migrant, Mediterranean Sea, Mollusca, New Records

Abstract

The work is part of the ongoing study of the marine malacofauna of the entire Hellenic territory during the period from May 2021 to September 2021. It incorporates 11 species out of which 6 are known Lessepsian migrants, 2 are new for the Hellenic malacofauna, 7 exhibit a broader distribution, and 7 are second documented records for the area. Main taxonomic characteristics and ecological data, such as habitat, distribution and origin, are presented and discussed.

Introduction

The molluscan biodiversity of the Hellenic Seas has been influenced by environmental and anthropogenic changes described and discussed by a number of investigators (e.g. Galil, 2000; Galil and Zenetos, 2002; Zenetos *et al.*, 2005; Abdulla and Linden, 2008; Galil *et al.*, 2008; Zenetos *et al.*, 2009; Skliris *et al.*, 2011, Tsiaras *et al.*, 2012). Recent faunistic works revealed some 300 new species (Streftaris and Zenetos, 2007, Manousis *et al.*, 2010, Manousis *et al.*, 2012, Tzomos *et al.*, 2012, Manousis and Galinou-Mitsoudi, 2014, Crocetta *et al.*, 2013, Manousis *et al.*, 2017, Micali *et al.*, 2017, Romani *et al.*, 2017, Manousis *et al.*, 2018a,b; 2019, Mbazios *et al.*, 2020, Manousis *et al.*, 2020a-c, Kontadakis *et al.*, 2021, Manousis *et al.*, 2021a, b, Zaminos *et al.*, 2021). Detailed collecting efforts based on attentive human resources management continue to give us new records.

Methods

Sampling, handling and species recognition were conducted according to Manousis and Galinou-Mitsoudi (2014) and Mbazios *et al.* (2020) from May 2021 to September 2021 in certain locations throughout the Hellenic Seas. All 1st and 2nd documented records from the Hellenic Seas are listed in Table 1 with collection data. A brief description of certain findings is given below whenever additional information is supportive to their identification. They are all presented in Figures 1-2. The specimens are deposited in the premises of S. Karypidis, G. Mbazios, G. Minos, K. Papavasileiou, T. Rozakis, and T. Manousis. Scientists are welcome to have access to the biological material for inspection by appointment.

Results

The records

This work includes 11 completely identified species out of which 2 are known Lessepsian migrants, 2 are new for the Hellenic malacofauna, 2 exhibit a broader distribution to North Aegean Sea and 7 are second documented records for the area.

Abbreviations: **AS** – Aegean Sea, **Be** – Beached, **Co** – Common, **E** – Expanded, **EMS** – East Mediterranean Sea, **EMS1** – First record for the East Mediterranean Sea, **FFN** – Fish Farming Nets, **G1** – First record for Greece, **G2** – Second record for Greece, **KLM** – Known Lessepsian Migrant, **Ma** – Maerl, **MB** – Mixed Bottom, **MS** – Mediterranean Sea, **MoS** – Moored Ship, **Pos** – Posidonia, **Ra** – Rare, **SB** – Stony Bottom, **Un** – Uncommon,

WCMS – West and Central Mediterranean Sea.

Isognomon australicus (Reeve, 1858) (Fig. 1a). A known for the Mediterranean Sea Lessepsian migrant reported for Greece from Astypalaia, in the Eastern Aegean Sea (Lipej *et al.* 2017; Angelidis and Polyzoulis 2018), Plakias, Crete (Albano *et al.* 2021) and Saronic Gulf (Manousis *et al.*, 2021a).

Isognomon legumen (Gmelin, 1791) (Fig. 1b). Also a known for the Mediterranean Sea Lessepsian migrant reported for Greece initially from Karpathos Island (Micali *et al.*, 2017) and subsequently from Astypalaia, Eastern Aegean Sea (Angelidis and Polyzoulis 2018).

Dendostrea folium (Linnaeus, 1758) (Fig. 1c). This known Lessepsian migrant for Greece (Crocetta *et al.*, 2017) has been last reported from Anavissos Saronic Gulf (Manousis *et al.*, 2021a) and now this 2 years old specimen (Fig. 1c) from NW Aegean (Nea Potidaia, Chalkidiki).

Dendostrea frons (Linnaeus, 1758) (Fig. 1d). A known for the Mediterranean Sea Lessepsian migrant reported for Greece by Zenetos *et al.* (2011) without image documentation. The specimens were detached from the ropes of aquaculture cage nets and their age was estimated to 3 years plus based on the number of the posterior scars of the valves.

Mendicula ferruginosa (Forbes, 1844) (Fig. 1e). Previously reported once for Greece (Manousis *et al.*, 2021a)

Gibbula vimontiae Monterosato, 1884 (Fig. 2a). Previously reported once for Greece (Manousis *et al.*, 2018a).

Rissoa electrae Manousis, 2019 (Fig. 2b). Described recently as sp. n from Thermaikos Gulf (Manousis *et al.*, 2019).

Vexillum hypatiae (Pallary, 1912) (Fig. 2c) has been reported for Greece twice from Karpathos Island (Micali *et al.*, 2014, Mbazios *et al.*, 2020).

Aplus gaillardoti (Puton, 1856) (Fig. 2d) Described rather recently as sp. n from Astypalea, Kotsoumiti and Paxos Islands, Greece as well as from Lebanon by Aissaoui *et al.* (2016). This is the second image documented presence of the species in the Hellenic waters.

***Cingulina isseli* (Tryon, 1886)** (Fig. 2e). Our shells fit the given description for the species (<http://www.ciesm.org/atlas/Cingulinaisseli.html>) and the figure of NHMR. The depicted one is translucent-white, is elongated cirriconoid with 7 teleconch whorls, each bearing three robust spiral cords and evident incremental lines between the cords, and has base with 1 cord, sub circular aperture, umbilical rim, weak columellar fold and type A2 heterostrophic protoconch. It is 4 mm high and 1.35 mm wide. It remotely resembles *Seila trilineata* (Philippi, 1836) due to its turriculate outlook and the spirally decorated shell, but the latter is much bigger, conical, of light to dark brown colour and does not possess the heterostrophic protoconch. It also resembles the alien to the Mediterranean *Oscilla jocosa* Melvill, 1904, which is smaller, with proportionally larger body whorl, and sharper and somehow beaded spiral keels. The lack of tooth emphasized by van Aartsen (1994) is not significant as a distinguishing character, as there are specimens with a conspicuous tooth also (Zenetos *et al.*, 2004a).

Tibersyrnola unifasciata (Forbes, 1844) (Fig. 2f) has been previously reported for Greece (Manousis *et al.*, 2020a), though this time it was collected live and wet stored (96% ethanol).

Bulla arabica Malaquias & D. Reid, 2008 (Fig. 3a), a known Lessepsian migrant, has been initially reported for Greece from Saronikos Gulf by Vardala-Theodorou (1999) misidentified as *B. ampulla* Linnaeus, 1758 (Zenetos *et al.*, 2011; Crocetta *et al.*, 2017). Since then, it has been collected from the Gulf of Corinth, Monastiraki Gulf of Patras, Kimolos Island, and Fragkokastello Crete Island (present publication).

Amphorina linensis (Garcia-Gomez, Cervera & Garcia, 1990) (Fig. 3b). Elongated hyaline animal of some 15 mm, with an overall blue-white coloration and some irregular red-brown spots dorsally. The edge of the foot exhibits a fine iridescent white pigmentation which becomes more evident on the apices of the cerata, the rhinophores and the oral tentacles. The rhinophores are smooth and much longer than the oral tentacles. The cerata are arranged in rows and in some 9-10 groups, are elongated and narrower at the base, with the digestive gland inside light brown and visible by transparency. The species inhabits rocky infralittoral areas of the W and C Mediterranean Sea (Gofas *et al.*, 2011).

Discussion

This work includes results of the period from May 2021 to September 2021 and is part of the ongoing study of the marine malacofauna of the entire Hellenic territory. It incorporates 11 species out of which 1 is new for the Eastern Mediterranean Sea, 6 are known Lessepsian migrants and 2 are new for the Hellenic malacofauna, and 7 exhibit a broader distribution. An additional species (*Rissoa electrae*) is reported from a new locality.

Bioinvasions have been recognized as a serious threat in the Mediterranean (Galil *et al.*, 2015) with main vector of introduction the progressive entrance via the Suez Canal (Lessepsian migration or Erythrean invasion). Thus, the area most affected by this migration is the Levantine Sea (Por, 1990; Galil and Zenetos, 2002). Since Pancucci-Papadopoulou *et al.* (2005) have shown an increasing tendency in the introduction of alien species in the Hellenic Seas, 19 more Lessepsian migrants have been reported (e.g. Manousis *et al.*, 2010; 2020a-c; 2021a,b, Manousis and Galinou-Mitsoudi, 2014, Zenetos *et al.*, 2020, Kontadakis *et al.*, 2021). This number is added to the, by then, already known 28 Lessepsian migrants (Pancucci-Papadopoulou *et al.* 2005).

Isognomon australicus (Reeve, 1858) and *Isognomon legumen* (Gmelin, 1791) have both expanded to the Ionian Sea.

Dendostrea folium (Linnaeus, 1758) and *D. frons* (Linnaeus, 1758) have also expanded north: *D. folium* from the South Aegean Sea to North Aegean Sea, and *D. frons* to Argolic Gulf where established. *D. folium* has been originally reported for Greece by Zenetos *et al.* (2011) without image documentation.

Mendicula ferruginosa (Forbes, 1844) and *Gibbula vimontiae* Monterosato, 1884 are second image documented records for Greece (Manousis *et al.*, 2021a and Manousis *et al.*, 2018a, respectively).

Rissoa electrae Manousis, 2019 new findings - some tens of kilometers away from the type localities of Palioura, Epanomi and Cape, Epanomi (Manousis *et al.*, 2019) and three years after the original records, comprise further evidence that the species is a permanent inhabitant of Eastern Thermaikos Gulf. Since the first finding, its presence in other locations is carefully monitored.

Vexillum hypatiae (Pallary, 1912) is considered a rare species (Repetto *et al.*, 2005, Öztürk *et al.*, 2015). Its double record from Karpathos Island and now from North Crete with 6 specimens is indicative of a broader presence in the Sea of Crete and a status that should change from rare to uncommon.

Aplus gaillardoti (Puton, 1856) seems to have a broader presence in the Hellenic waters, as after its 1st report from Astypalea, Kotsoumiti and Paxos Islands (Aissaoui *et al.*, 2016), is now reported from the Saronic Gulf.

Our findings of *Cingulina isseli* in the Aegean Sea are indicative of a recent NW expansion of the species and establishment of an active population as our specimens are fresh and the area where found has been thoroughly and repeatedly searched in the past. The species presence is rather expected after taking into account the geographic position of the area which has been characterized as hotspot for alien species in the Mediterranean Sea (Zenetos *et al.*, 2020), the environmental conditions (e.g. higher temperature and salinity that are more favorable for the alien species arriving via the Suez Canal, as designated by Zenetos *et al.* in 2004b), the Eastern Mediterranean hydrography which is characterized by waterside currents moving anticlockwise from the coasts of Egypt to south of Turkey and then up to the Aegean Sea through the Dodecanese (Manousis and Galinou-Mitsoudi, 2014), and finally the recent finding of the long known Lessepsian minute Pyramidellid *Odostomia* sp. which exhibits a similar record history as that of *Cingulina isseli* (Zaminos *et al.*, 2021).

Tibersyrnola unifasciata (Forbes, 1844). This is the 2nd image documented report of the species from Greece as it has been previously reported once more (Manousis *et al.*, 2020a)

The finding of *Bulla arabica* in Kimolos Island of the Cyclades Archipelago is further evidence that the species has expanded throughout the South Seas of Greece.

Amphorina linensis (Garcia-Gomez, Cervera & Garcia, 1990) (Gofas *et al.*, 2011) was known until now from the West and Central Mediterranean. Its finding in the Eastern Mediterranean Basin is no surprise as the Hellenic Seas are only relatively recently intensively and extensively searched.

As mentioned above, the majority of the recorded alien species has expanded and/or established. The Hellenic marine ambient conditions nowadays seem to be suitable for those species as the Hellenic seas are being converted from temperate to sub tropic or tropic. During the summer of 2021 the sea temperature of N Aegean was measured to be over 30°C, even at depths of up to 20 m; identical to that of the tropic seas (<https://oceanexplorer.noaa.gov/facts/temp-vary.html>). If the climatic change continues, the biodiversity is expected to change even further with numerous organisms expected to be introduced and established all over the Mediterranean Sea

Acknowledgements

The authors are grateful to the anonymous referees for their useful contribution to improve the publication.

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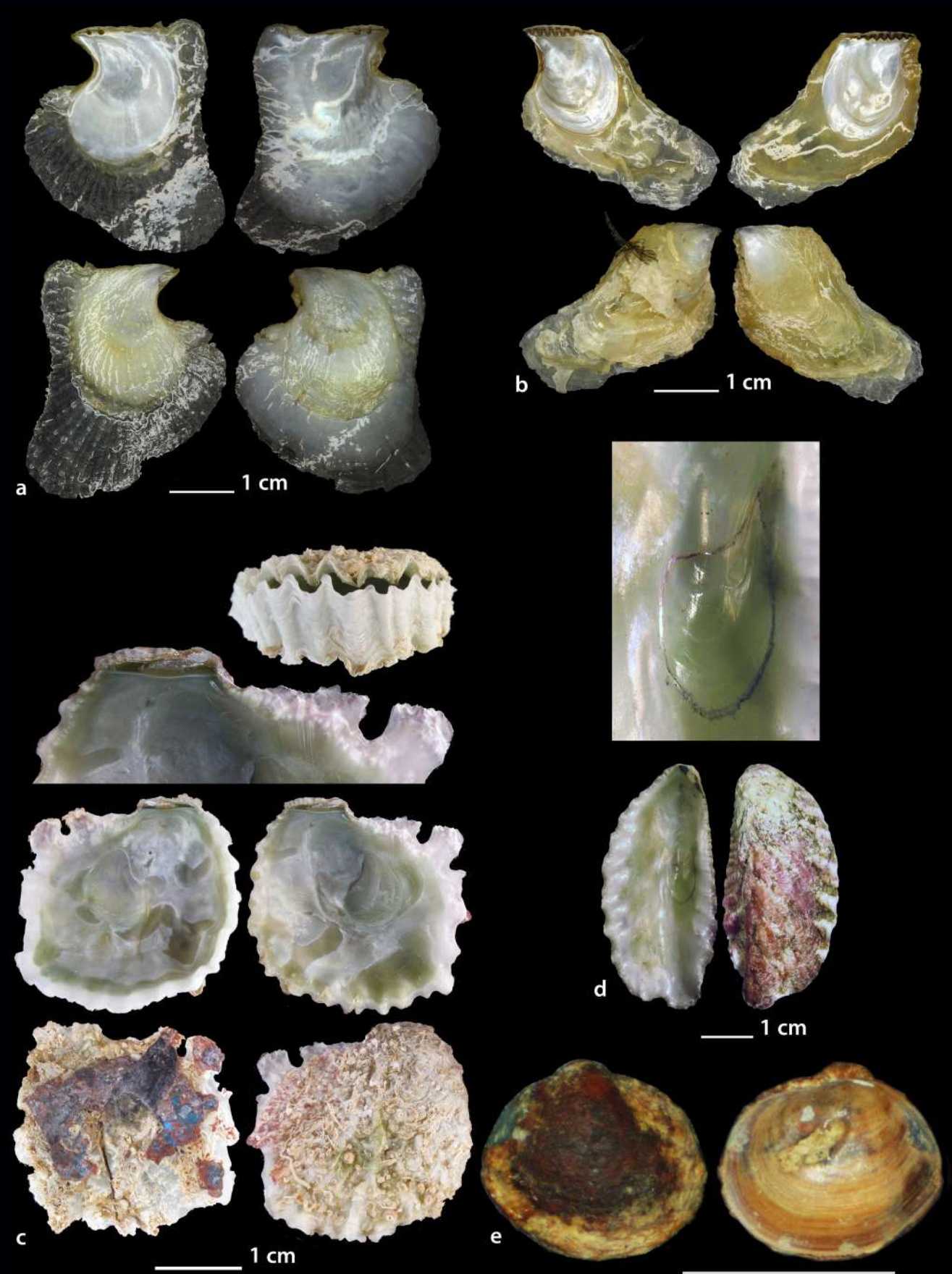
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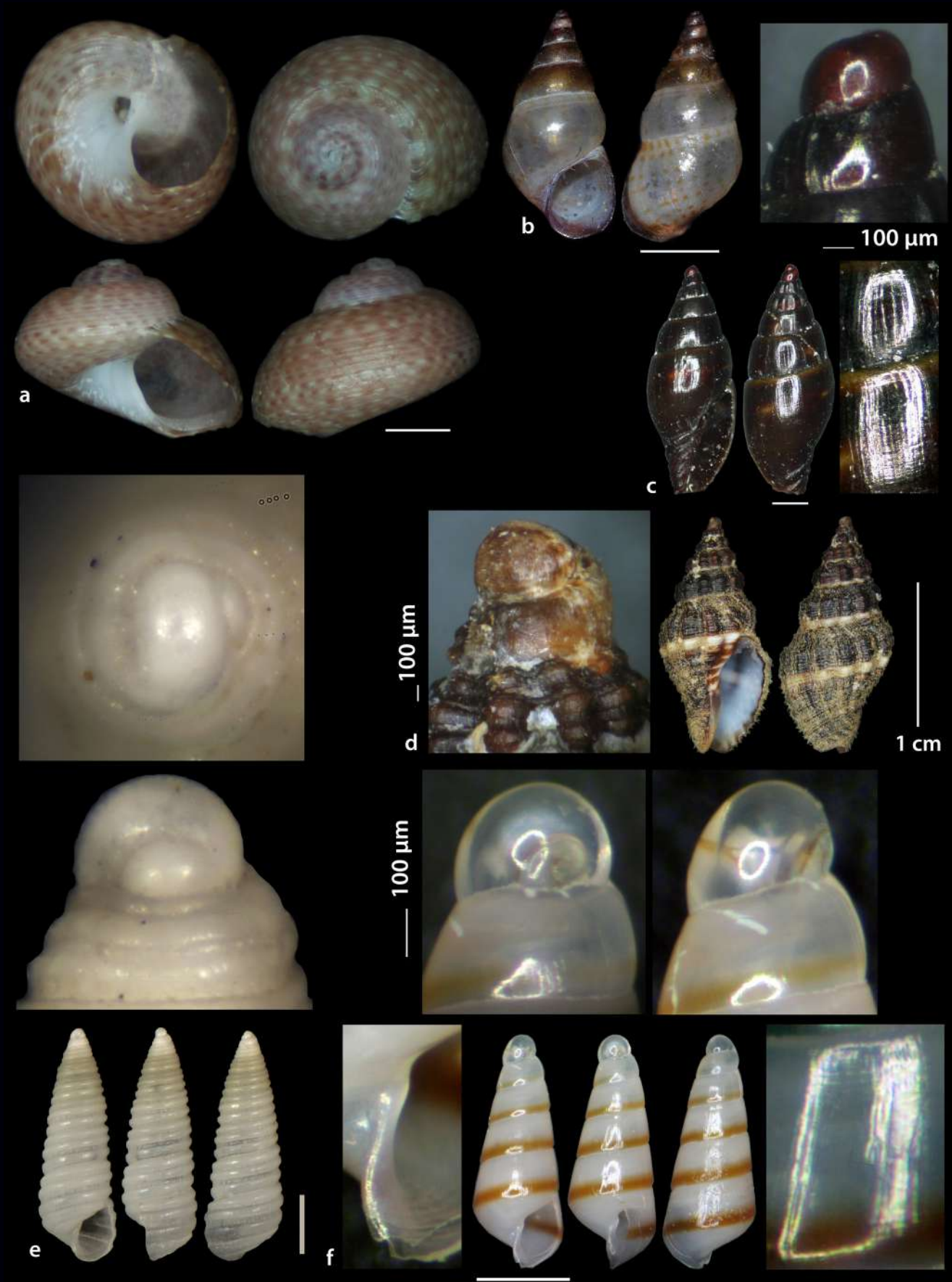
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PLATE 1



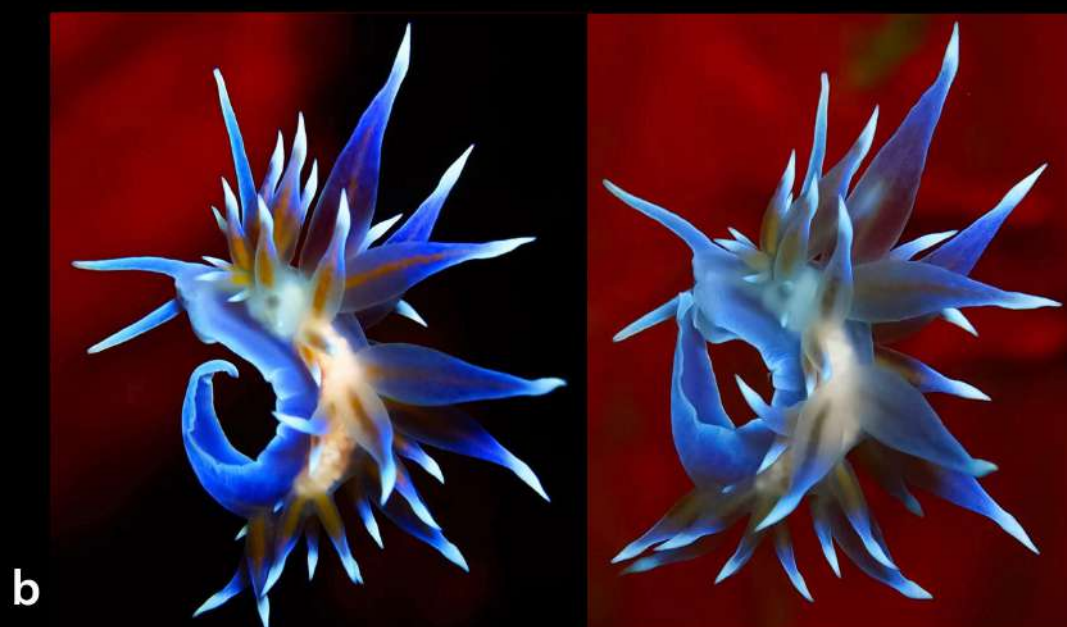
a. *Isognomon australicus* (Reeve, 1858), b. *Isognomon legumen* (Gmelin, 1791), c. *Dendostrea folium* (Linnaeus, 1758), d. *Dendostrea frons* (Linnaeus, 1758), e. *Mendicula ferruginosa* (Forbes, 1844). Barr = 1 mm, unless otherwise indicated.

PLATE 2



a. *Gibbula vimontiae* Monterosato, 1884, b. *Rissoa electrae* Manousis, 2019, c. *Vexillum hypatiae* (Pallary, 1912), d. *Aplus gaillardoti* (Puton, 1856), e. *Cingulina isseli* (Tryon, 1886), f. *Tibersynola unifasciata* (Forbes, 1844). Barr = 1 mm, unless otherwise indicated.

PLATE 3



a. *Bulla arabica* Malaquias & D. Reid, 2008,
b. *Amphorina linensis* (Garcia-Gomez, Cervera & Garcia, 1990). Barr = 1 cm..

Table 1: List of recorded species with collection data and corresponding references.

Class	Family	Species	Figure	Shells	Live	Depth m	Bottom	Area	Global coordinates	Rarity	Origin	Record	Relevant Literature
Bivalvia	Isognomomidae	<i>Isognomon australicus</i> (Reeve, 1858)	1a	1		2	SB	Mitikas, Preveza	38°59'N – 20°41'E	Un	KLM	E	Angelidis & Polyzoulis, 2018 Manousis <i>et al.</i> , 2021a
		<i>Isognomon legumen</i> (Gmelin, 1791)	1b	1		2	SB	Mitikas, Preveza	39°00'N – 20°42'E	Un	KLM	E	Micali <i>et al.</i> , 2017 Angelidis & Polyzoulis, 2018
	Ostreidae	<i>Dendostrea folium</i> (Linnaeus, 1758)	1c	1		2	MoS	Nea Potideaia, Chalkidiki	40°11'N – 23°19'E	Co	KLM	E	Crocetta <i>et al.</i> , 2017 Loderos <i>et al.</i> , 2020 Manousis <i>et al.</i> , 2021a
Gastropoda		<i>Dendostrea frons</i> (Linnaeus, 1758)	1d	50	5	5	FFN	Akra Thymi, Argolic Gulf	37°23'N – 23°03'E	Co	KLM	G2, E	Zenetos <i>et al.</i> , 2011, no image documentation http://www.marinespecies.org/aphia.php?p=image&tid=420779&pic=66524
	Thyasiridae	<i>Mendicula ferruginosa</i> (Forbes, 1844)	1e	1		40-80	MB	Gulf of Souda	35°28'N – 24°10'E	Ra	MS	G2	Manousis <i>et al.</i> , 2021a
	Trochidae	<i>Gibbula vimentina</i> (Montesato, 1884)	2a	4		0	Be	Stavros, Chania, Crete Island	35°35'N – 24°05'E	Un	MS	G2	Scaperrotta <i>et al.</i> , 2010
	Rissoiidae	<i>Rissoa electrae</i> Manousis, 2019	2b	5		0	Be	Kalamaria, Thessaloniki	35°16'N – 23°33'E	Un	AS	G2	Manousis <i>et al.</i> , 2018a
	Costellariidae	<i>Vexillum hypatinae</i> (Pallary, 1912)	2c	6		20	MB	Chania, Crete Island	40°58'N – 22°04'E	Ra	EMS1	E	Repetto <i>et al.</i> , 2005 Micali <i>et al.</i> , 2014
	Pisaniidae	<i>Aplous gaillardoti</i> (Paton, 1856)	2d	2		2	MB	Anavyssos, Saronic Gulf	37°44'N – 23°54'E	Un	EMS	G2	Aissaoui <i>et al.</i> , 2016
	Pyramidellidae	<i>Cingulina isseli</i> (Tryon, 1886)	2e	4		0	Be	-	40°23'N – 22°53'E	Un	KLM	G1, E	http://www.ciesm.org/alias/Cingulinaisseli.html
		<i>Tiberynola unifasciata</i> (Forbes, 1844)	2f	1		50	Ma	Toroni, Toroneos Gulf	39°58'N – 23°53'E	Ra	MS	G2	Giannuzzi-Savelli <i>et al.</i> , 2014
	Bullidae	<i>Bulla arabica</i> Malaquias & D. Reid, 2008	3a	1		5	Pos	Gulf of Corinth	37°58'N – 22°49'E	Un	KLM	G2, E	Manousis <i>et al.</i> , 2020a Vardala-Theodorou, 1999, as <i>B. ampulla</i> Linnaeus, 1758
						10	MB	Monastiraki, Gulf of Patras	38°24'N – 21°56'E				Malaquias & Reid, 2008
Eubranchiidae						5	MB	Kimolos Island	36°47'N – 24°34'E				Zenetos <i>et al.</i> , 2011
		<i>Amphorina lineensis</i> (Garcia-Gomez, Cervera & Garcia, 1990)	3b	1		20	MB	Porto Emnia, Keratea, Attica	37°47'N – 24°05'E	Un	WCMS	G1	Crocetta <i>et al.</i> , 2017 Manousis, 2021a, b Garcia-Gomez <i>et al.</i> , 1990 Gofas <i>et al.</i> , 2011 Korshunova <i>et al.</i> , (2020)

Description of a new Marginellidae from North-East Brazil.

GREGORIO PEREIRA DE QUEIROZ
Alameda Casabranca 1204, apt 04,
01408-000 São Paulo, SP, Brazil

OLIVIER CRABOS
Rua Juiz Orlando Heleno de Mello 119, casa 1, Condomínio Mirante de Piatã,
41650-465 Salvador BA, Brazil

GERALDO SEMER POMPONET OLIVEIRAS
Rua Arquimedes Gonçalves 62/501, Jardim Baiano,
40050-300 Salvador BA, Brazil

LAUDELINO PASSOS DE ALMEIDA
RUA RIO TROBOGY 806, LOTEAMENTO VEREDAS PIATÃ, C19, PIATÃ,
41650-295 SALVADOR BA, BRAZIL

Abstract:

Description of *Volvarina megapex* sp nov, a new *Marginellidae* from North East and South East Brazil,

Résumé:

Description de *Volvarina megapex* sp. nov. une nouvelle *Marginellidae* du Nord est et du Sud est du Brésil.

Introduction:

We organized a research group to clarify the rich malacological fauna from Brazil, with still many species to describe. From Salvador (Bahia), after our work on Jaspidiconus species, we observed an undescribed species, a *Volvarina* sp from Itapuã beach.

Keywords:

Seashells, Gastropods, Western Atlantic Ocean, Brazilian Molluscan Province, Bahia state, *Marginellidae*, *Volvarina*,

Abbreviations:

MZSP - Museu de Zoologia da Universidade de São Paulo, **UFRJ** - Museu Nacional da Universidade Federal do Rio de Janeiro, Brazil, **MNHN** Muséum national d'histoire naturelle, Paris, France, - **RECOLNAT** - Réseau national des collections naturalistes, **ANR** – Agence Nationale de la Recherche, **GP**- Geraldo Pomponet, **CDB** - Conquiliologistas do Brasil.

Systematics

Class **GASTROPODA**

Order **NEOGASTROPODA**

Super Family **VOLUTOIDEA** Rafinesque, 1815

Family **MARGINELLIDAE** Flemming, 1828

Genus *Volvarina* Hinds, 1844

Species *Volvarina megapex* sp. nov.

Type Material:

Holotype: adult specimen. Length: 4,7 mm; ; in MZSP registered as number 157110.

Paratype 1: adult specimen. Length 4,5 mm ; in UFRJ

Paratype 2: adult specimen. Length: 4,7 mm; ; in the collection of Geraldo Pomponet;

Paratype 3: Subadult specimen. Length: 4,2 mm; breadth: 1,7; in the collection of Gregório Pereira de Queiroz

Other material examined:

In the collections of Geraldo Pomponet Oliveira and Gregório Pereira de Queiroz, all from Itapuã beach, Salvador, Bahia State, dead shells collected on gravel bottom at seashore.

Type Locality

Itapuã beach, Salvador, Bahia State, Brasil

Description

Small shell for its group (length: 5 to 6 mm; breadth: 3.4 to 3.6 mm), having 3.5 whorls. The middle of the body is 3.5 wider than the anterior region and the apex, which gives it the approximate shape of a lozenge, one of its distinguishing features. The apex measures one-fifth of the total length of the shell and stands out from the shell body in its rounded, large and prominent shape, another distinctive feature. Protoconch is equally rounded and slightly indistinct in shape and color throughout the apex. Suture only lightly marked. Aperture measures approximately 4/5 of the total shell. It is narrower at the top and widened towards the opening. The outer lip is slightly thicker at the top, becoming thin near the opening. When viewed from the side of the shell, the lip forms a sharp curve, rising towards the posterior and siphonal canals. The

columella has four plaits, quite equal, in the region where the columella is perfectly white. The pattern body color is slightly pale golden orange, with two white bands on the lower half of the shell and a paler band almost indistinguishable from the background color on the upper shell. The two white bands below and the only paler band above cover the side of the outer lip.

Discussion

Volvarina megapex sp. nov. is easily distinguished from other species of *Volvarina* found on Itapuã beach and on other beaches in the city of Salvador, State of Bahia, Brazil, due to its especially large apex in relation to the shell body and the losange shape of its totality. We found another six species of *Volvarina* in Itapuã: *V. serrei* (Bavay 1913), *V. brasiliana* Boyer 2000, *V. tunicata* Boyer 2000, *V. bahiensis* (Tomlin 1917) mentioned in Worms as *Prunum bahiense*, *V. tripartita* Cossignani 2006 and what we consider a valid species, *V. germaini* (Bavay 1913) considered by Worms as a synonym of *V. serrei*. *Volvarina megapex* is distinguished from *V. serrei*, *V. brasiliana*, *V. tunicata* and *V. tripartita* by its smaller size, on average half the size of these adult species, and, as already stated, by its especially pronounced apex and the typical shape of your body in lozenge. *Volvarina megapex* sp. nov. is distinguished from *V. germaini* by being almost twice as large as the latter, also by differences in body shape and proportion between apex and body, as well as in design, as *V. germaini* has three thin stripes of intense gold color (the central one sharper than the others) in the white transparent body, while *V. megapex* sp. nov. has wide white bands. *Volvarina megapex* sp. nov. is closer to *V. bahiensis*, as both have the highest apex in relation to the body. However, *V. bahiensis* has a more elongated and thinner apex than *V. megapex* sp. nov.; *V. bahiensis* has a thinner and more elongated body (our comparative shell is 5 mm x 1,8 mm).

Another shell, *V. bavecchii* Cossignani 2006 could be compared, but it comes from Rio Grande do Norte only, 2000 kilometers from there, has a more orange color, and bigger shell (shell illustrated here 7,8 mm x 2,5). The main differences with *V. perexilis* (Bavay 1922) from Paraíba is that *V. megapex* sp. nov. has a lower spire, a beveled labrum in upper part and 5 folds on less than half of columellar edge against 6 folds on more than half of columellar edge for *V. perexilis*, and *V. perexilis* is smaller (2 to 4 mm compared to 5 to 6 mm for *V. megapex* sp. nov.). *V. perexilis* photo is courtesy from M. Caballer - 2014 Project : RECOLNAT (ANR-11-INBS-0004)

Distribution

So far, this species is known collected only on Itapuã beach, city of Salvador, State of Bahia, Brazil. Perhaps because of the little collection of microshells made by local collectors, as commented by Mr. Boyer in his article on *Volvarina* described by Bavay for Brazil, "but local collectors do not employ methods for collecting microshells in shallow environments" (Boyer, 2000, p. 36). However, this new species is a contribution of collectors who are dedicated to specific collections of microshells in the tidal zone. Other contributions should come, as well as the possible expansion of the distribution of the new species proposed here.

Habitat

This species was collected dead in gravel sediments at the intertidal level. Its habitat is unknown.

Etymology

From Latin, *mega apex* means great apex, which is one of the distinctive marks of the species.

Acknowledgements:

Luiz Simone from MZUSP who took the pictures and gave us good advices

Sergio Vanin for his unpublished work *Muricoidae 4, Marginellidae & Cystistidae*, CdB, 2019, and for his personal communication.

Literature cited:

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CDB <http://www.conchasbrasil.org.br>

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PLATE 1



1. *Volvarina megapex* sp nov Holotype MZSP 157110, 4,7 mm, Itapuã beach, Salvador, Bahia State, Brazil
2. *Volvarina megapex* sp nov Paratype 1 UFRJ 4,5 mm, Itapuã beach, Salvador, Bahia State, Brazil
3. *Volvarina megapex* sp nov Paratype 2 4,7 mm, Itapuã beach, Salvador, Bahia State, Brazil Coll. GP
4. *Volvarina megapex* sp nov Paratype 3 4,2 mm, Itapuã beach, Salvador, Bahia State, Brazil Coll. GP
5. *Prunum bahiense* (Tomlin, 1917), Itapuan Beach, Salvador, Bahia, Brazil
6. *Volvarina bavecchii* (Cossignani, 2006), Natal, Rio grande do Norte, Brazil
7. *Volvarina germaini* (Bavay, 1913), Itapuan Beach, Salvador, Bahia, Brazil
8. *Marginella perexilis* (Bavay, 1922), MNHN_IM_2000-1228 Lectotype Paraíba, North-East Brazil

Great molluscan diversity associated with a limited *Cymodocea nodosa* (Ucria) Ascherson, 1870 bed in Thermaikos Gulf, North Aegean Sea, Greece.

THANASIS MANOUSIS

PO Box 48 K, 57500 Epanomi, Greece

Email: athanasiosmanousis@gmail.com

SOFIA GALINO-MITSOUDI*

International Hellenic University (IHU)

Department of Environmental Engineering

PO BOX 141, 57400 Thessaloniki, Greece

*Corresponding author, Email: galimits@gmail.com

Keywords

Cymodocea nodosa, Molluscan assemblage, microhabitats, protected areas, salient, Aegean Sea, Greece

Abstract

The fauna of molluscs associated with a limited (80 m²) littoral *Cymodocea nodosa* salient bed in Thermaikos Gulf (North Aegean Sea) sited in a protected area (codes of NATURA 2000 GR1220011 and GR1220012) has been characterized in terms of divergence and in comparison with the surrounding area. The epifaunal (leaf strata) and infauna (rhizomes) species list (717 species) is based on sampling between October 2008 to November 2021. The dominant feeding guilds were deposit feeders, filter feeders and peryphiton grazers, but ectoparasites, seagrass grazers and an egg feeder also occurred. The molluscan fauna of this *C. nodosa* bed is partially derived from the local fauna, which includes many widely distributed species along the Hellenic coasts, but to a great extent is unique for the whole territory. Such fauna deserves much more important attention for conservation beside that of the Natura 2000.

Introduction

The Mediterranean Sea comprises less than 1% in surface area and volume as compared with the world oceans yet it includes a total of around 8500 species of macroscopic organisms, which indicates a rich biodiversity (Bianchi & Morri, 2000). Moreover, biodiversity in the Eastern Mediterranean Sea – close to the Suez Canal – has undergone modifications during recent decades, following the introduction of non-indigenous species, attributed to the expansion of shipping traffic, aquaculture activities and migration (Por, 1978, 1990; Galil & Zenetos, 2002; Streftaris *et al.*, 2005). Thermaikos Gulf (NW Aegean Sea) comprises one of the most complicated and multi-used ecosystems of the E. Mediterranean Sea as it receives an input of nutrient-rich freshwater from five rivers and some protected wetlands (Ramsar convention and Natura 2000 network). The result is very high productivity and biodiversity of its coastal waters, it is a main navigation line leading to the city of Thessaloniki, and it is affected by human activities in its entire coastal zone (i.e. urbanization, agriculture, fisheries, mussel farming and recreation). Currently, Thermaikos Gulf is considered as a sensitive ecosystem, according to the term “sensitive” that has been precisely defined by Hiscock & Tyler-Walters (2006) and Tyler-Walters *et al.* (2009). Also, important shallow coastal areas of Thermaikos Gulf and wetlands are protected by Ramsar Convention and/or Natura 2000 Network. The mollusc diversity of this ecosystem has been thoroughly investigated from October 2008 to September 2021 (Manousis

et al., 2010; Manousis, 2012; Manousis *et al.*, 2012; Manousis and Galinou-Mitsoudi, 2013; Manousis and Galinou-Mitsoudi, 2014; Manousis *et al.*, 2017; 2018a; 2018b; 2019; 2020a; 2020b; 2020c; 2021a; 2021b; Manousis, 2021a and b; Mbazios *et al.*, 2020; Mbazios *et al.*, 2022). The search has shown that the molluscs are one of the dominant groups of the marine benthic communities and they contribute largely to the local biodiversity as they are generally strongly associated with different types of habitat such as rocky reefs, soft bottoms and seagrass beds, among others. Apparently, the molluscan fauna associated with seagrass beds has received much attention in European seas. Along the Mediterranean coasts, the molluscan taxocoenoses have been widely studied for Neptune grass [*Posidonia oceanica* (Linnaeus) Delile, 1813] (Ledoyer, 1966; Templado, 1982; 1984a; 1984b; Russo *et al.*, 1984; Gambi *et al.*, 1992; Terlizzi and Russo, 1997; Hergueta, 1996; Scipione *et al.*, 1996), and some studies are also available for little Neptune grass (*Cymodocea nodosa* (Ucria) Asch.) (Scipione *et al.*, 1996; Chemello *et al.*, 1997; Terlizzi and Russo, 1997; Sfriso *et al.*, 2001; Ballesteros *et al.*, 2004). The molluscan taxocoenosis associated with eelgrass (*Zostera marina* Linnaeus, 1753) beds has been less studied (Ledoyer, 1966; Mars, 1966; Çinar *et al.*, 1998; Sfriso *et al.*, 2001; García Raso *et al.*, 2004; Arroyo *et al.*, 2006; Rueda *et al.*, 2008). This study aims at the biological and ecological aspects of the molluscan fauna found in particularly limited little Neptune grass beds, and the need for their attention and conservation.

Materials and Methods

Study area

The molluscan diversity of a certain area of the East Thermaikos Gulf coast was studied extensively and repeatedly over time from October 2008 to November 2021. More specifically, the studied area was subdivided into two subareas as follows.

a. A larger area along the east coast of Thermaikos Gulf starting from point A (Palioura, Epanomi, 40°25'N – 22°52'E) and stretching for some 13 km all along the coast to point B (Potamos, Epanomi, 40°22'N – 22°56'E) (Fig. 1a), from the seafront to some 20 m deep. The bottom of this area is characterized by habitat diversity including subareas of sand, mixed, *Posidonia oceanica* and *Cymodocea nodosa* beds, and sandbanks. Prevailing winds in the area are those of NW and N directions (Fig. 3a).

b. A much smaller salient plot “Plot X”, as we call it, of some 80 m² was also studied for its molluscan diversity, in Cape, Epanomi (40°23'16.93"N – 22°53'51.52"E) (Fig. 1). Plot X is characterized by a series of rocks facing NW and about 15 m from the shore,

forming a “fence” from the NW wind that is predominant throughout the year (Fig. 1b-d, 3a and c). “Protected” from the NW waves is a salient *Cymodocea nodosa* (Fig. 2a, 2c and d, 3c) with limited amount of *Caulerpa cylindracea* Sonder, 1845 (Fig. 2b). The salient bottom exhibits the morphology predicted in the model (Fig. 3b) (Mangor, 2021). The *C. nodosa* density/m² (Fig. 2d) in Plot X was estimated to $923 \pm \text{sd } 328$ (495-1251 shoots/m², abundant and dominant species).

It was observed that during most of the year and calm weather the bathymetry of the salient is from approximately 0.3 m (point 3) to 1.0 m (point 2). During the spring the bathymetry of the surrounding the salient Plot X area (Fig. 1d) to be 0.3 m (point 4) to 0.4 m (point 1) and 0.0 m on the salient.

Protection status

Due to its ecological value, a part of the study area A-B including the Plot X is protected according to NATURA 2000 Network (Fig. 1e) with codes a) GR1220012 as Sites of Community Importance (SCI) and Special Areas of Conservation - SAC (Habitat Directive 92/43/EEC) and b) GR1220011 as Sites of Protected Areas – SPA (Birds Directive 2009/147/EC).

Sampling and handling of epifaunal and infaunal species from area A-B

Sampling of the specimens was conducted from October 2008 to September 2021 by: 1. Sieving soft bottom material through a series of sieves with a mesh of 5 mm, 2 mm and 0.5 mm; 2. Diving down to a depth of 10 m of the infralittoral zone and collecting bottom material in plastic bags by means of a shovel; 3. Searching the supralittoral zone; 4. Searching only fresh trawled and discarded material from small scale fishing nets taken from vessels; 5. Soft brushing on holothurians, sea urchins and sponges either in situ or on live material brought temporarily to the surface; 6. Sampling vertical substrates (e.g. poles, embankments) by means of a metal pole scraper connected to a 120 µm mesh nylon net; 7. Dissociating matte material; 8. Keeping until examined and sorting out benthic material in cool sea water until photography of live specimens took place; 9. Maintaining cool conditions for the biological material in sea water by means of Dewar flask and gel freeze ice packs under the examination vessel.

Sampling of bottom material for epifaunal and infaunal species from Plot X

For bottom material acquisition from the 80 m² plot with *Cymodocea nodosa* bed, in particular, a flat metal shovel was used that was inserted to a depth of some 5 cm into the bottom and moving it parallel to the surface of pre-cut with the spade small square areas with width that of the shovel. Sampling was executed during strong low tides, especially during spring full moons, so that there is as much as less loss of the epifauna as possible. Root systems were dissociated before sieving. After cleaning with fresh water, shells were treated with a small amount of paraffin oil in acetone, left for acetone to evaporate

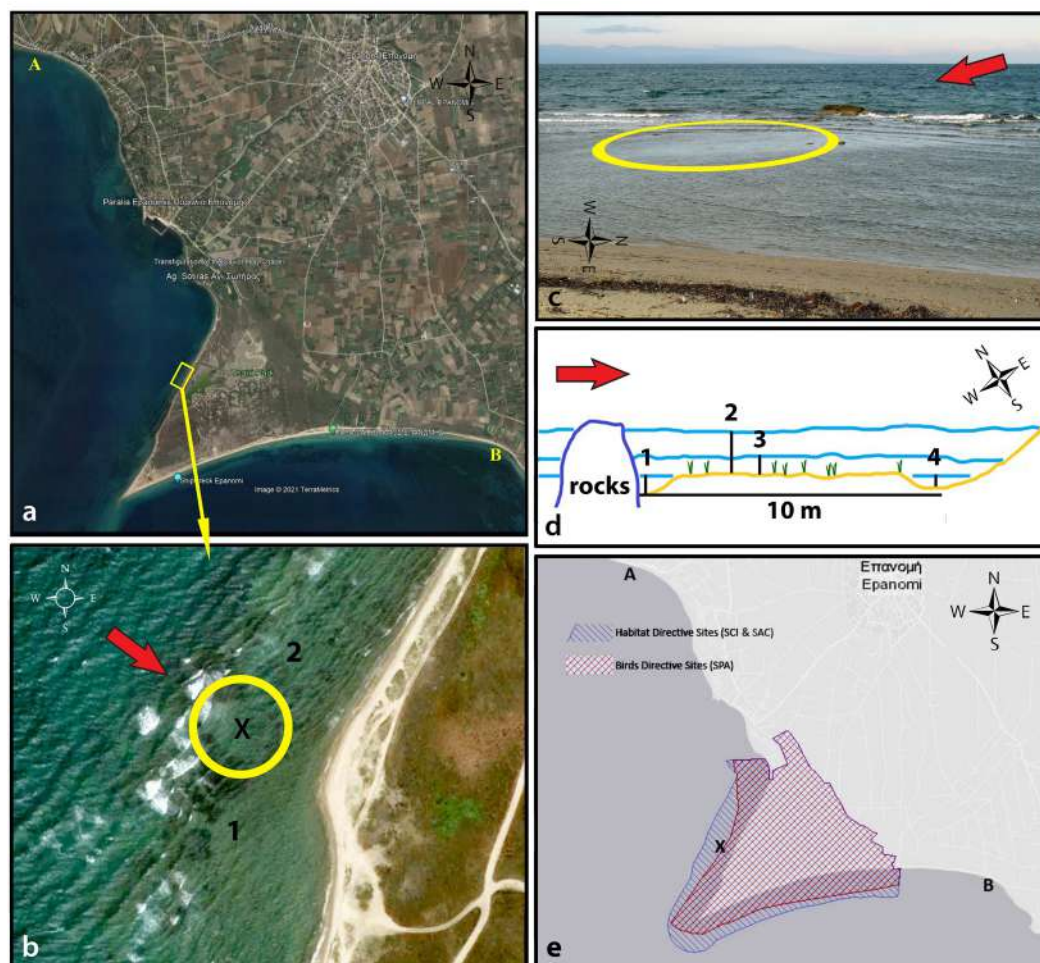


Figure 1: a. Area A-B with marked in yellow quadrangle the subarea where Plot X is situated, b. Top view (Google Earth) of Plot X marked in yellow circle, c. Eye level view of Plot X marked in yellow circle, d. Plot X in schematic presentation, transverse section perpendicular to the shore, not to scale, e. Protected area (shadowed) according to NATURA 2000 Network in the

and examined under a stereoscope with a magnification of up to 80x. For each species collected, the following data have been recorded: location, depth, type of habitat/substrate and size.

Sampling of sediment for granulometric analysis

For bottom acquisition for granulometric analysis, a smaller flat 12 cm wide shovel was used that was inserted to a depth of some 5 cm into the bottom and moving it parallel to the surface of pre-cut with the shovel small square areas with width that of the shovel. 3 samples were collected from 3 subareas (on the salient - point X - and at both sides of the salient - points 1 and

2) of Plot X (Fig. 1b). Samples from each of the three points 1, X and 2 (Fig. 1b) were 1 m apart from each other, parallel to the shore and 10 meters away from it.

Granulometric analysis

All substrate samples were analyzed for their grain size synthesis using sieves of mesh from 4 mm down to 63 μm (Fig. 5b).

Characterisation of the molluscan fauna

The species were characterized in terms of their preferential substrate (micro-habitats) within the little Neptune grass bed and their trophic group (feeding guilds). For that goal, several categories within each aspect were used (according to Rueda *et al.*, 2009) and those categories are presented in the abbreviations (see Results).

More specifically, the micro-habitat, the following categories were considered:

1. Demersal (benthic) species which may bury in the sediment (DMB);
2. Epibionts (which colonize) and ectoparasites (which feed on generally larger animals) (EEP);
3. Epifauna on vegetated substrates (EVS), species which live on *Cymodocea nodosa* leaves or macroalgae present within the little Neptune grass bed [e.g. *Asparagopsis armata* Harvey 1855, *Stypocaulon scoparium* (Linnaeus) Kützinger 1843)];
4. Hard bottoms epifauna (HBE), generally found on rocks or shells;
5. Hard bottoms infauna (HBI) referring to species which bore different types of hard substrata, such as stones or wood in which they live;
6. Organisms partly buried in soft bottoms (PBSB);
7. Soft bottoms epifauna (SBE), including gastropod and bivalve species that commonly inhabit the sediment layer covered by *C. nodosa*.
8. Soft bottoms infauna (SBI), mainly bivalves which are permanently buried in the sediment which is populated by *C. nodosa*.

Regarding the feeding guilds, the following categories were used (according to Rueda *et al.*, 2009):

1. Carnivores (C), feeding on other mobile organisms, such as mollusks or polychaetes;
2. Deposit feeders (DF), feeding on organic particles contained in the sediment covered by *C. nodosa*;
3. Ectoparasites and carnivores on preys without mobility (ECPWM) specialized in feeding upon larger organisms on which they complete their life cycle;
4. Filter feeders (FF) which capture food particles by means of their gills and/or mucous medium that they produce;
5. Herbivores of macroalgae and epiphytes (HME);
6. Microalgal grazers (MG) that feed on microalgae (e.g. diatoms) which cover *C. nodosa* leaves;
7. Oophagous (egg) or spawn feeders (OSF), including species that feed on egg masses of other organisms;
8. Scavengers (S), feeding upon remains of dead organisms;
9. Seagrass feeding herbivores (SFH) which ingest plant tissues;
10. Symbiont bearing species (SBS) which harbor symbiotic bacteria as a complementary food source.

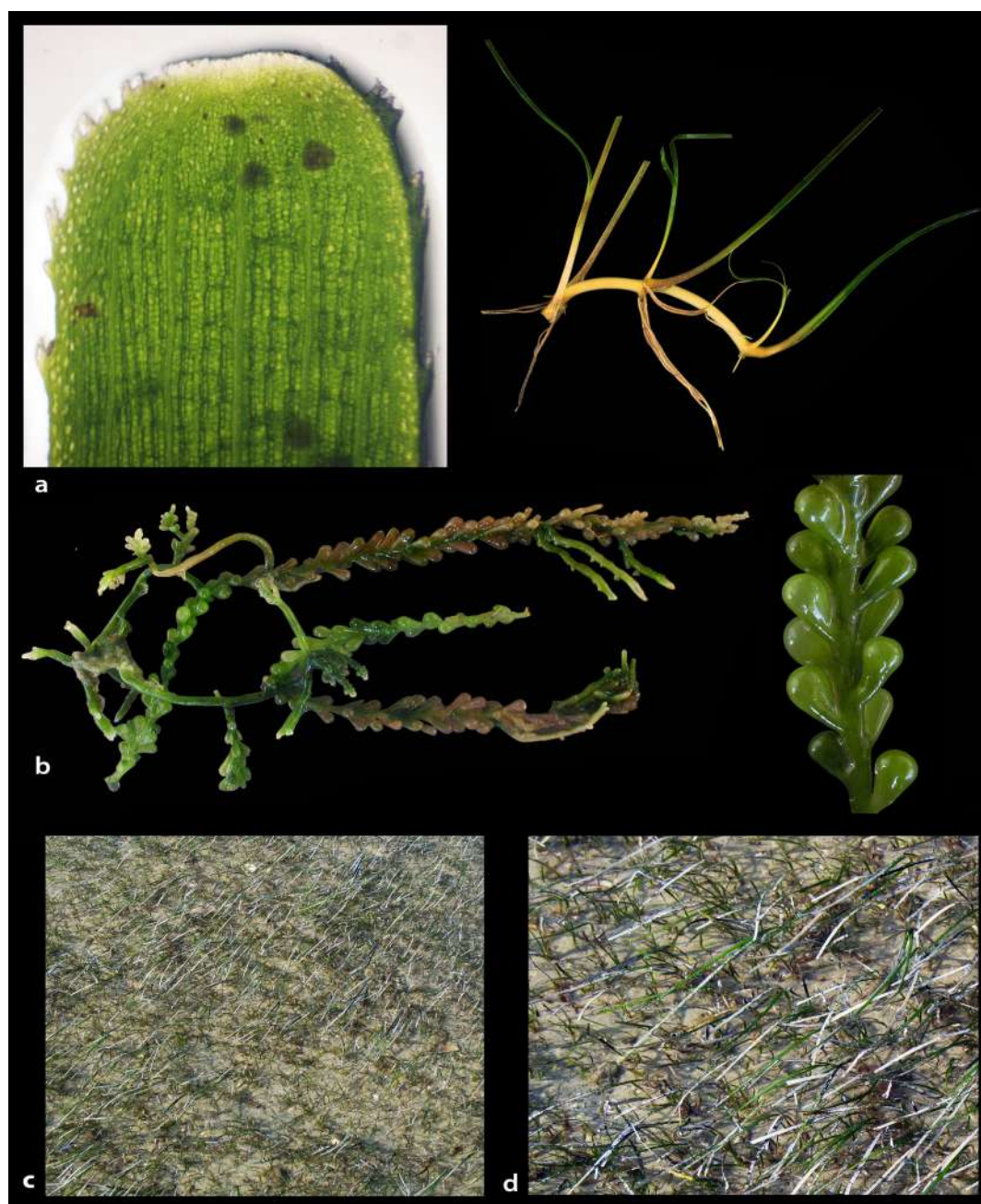


Figure 2: a. *Cymodocea nodosa* (Ucria) Asch. and b. *Caulerpa cylindracea* Sonder, 1845 sampled from Plot X, c. In situ view of Plot X vegetation, d. Focus on *C. nodosa* density.

Results

Abbreviations **CMP** = Carnivores on Mobile Preys, **DF** = Deposit Feeders, **DMB** = Demersals that May Bury, **ECPWM** = Ectoparasites and Carnivores on Preys Without Mobility, **EEP** = Epibionts and Ectoparasites, **EVS** = Epifauna on Vegetated Substrates, **FF** = Filter Feeders, **G1** = First record for Greece, **HBE** = Hard Bottoms Epifauna, **HBI** = Hard Bottoms Infauna, **HME** = Herbivores of Macroalgae and Epiphytes, **MH** = Microalgae Herbivores, **P** = Pelagic, **PBSB** = Partly Buried in Soft Bottoms, **PF** = Plankton Feeders, **S** = Scavengers, **SBE** = Soft Bottoms Epifauna, **SBI** = Soft Bottoms Infauna, **SBS** = Symbionts Bearing Species, **SFH** = Seagrass Feeding Herbivores

Composition and structure of molluscan fauna in areas A-B and Plot X

As presented in detail to species level and per family in Table 1 and in categories in Table 2 and Table 3, the whole area from point A to point B (Plot X included) (Fig. 1a) harbors 717 species in total out of which 339 species are found in plot X (Fig. 1b and c and Fig. 3c), or 47% of the total number of species. Among those 339 species encountered in Plot X, 86 species or some 25% for Plot X and 12% for A-B are unique as they were found only in Plot X.

The quantitative distribution of all species in area A-B, all species in plot X and all the unique ones in Plot X to the different micro habitats (preferential substrates) and to the different feeding guilds (trophic groups) is presented in tables 2 and 3, respectively.

The quantitative differences between the area A-B, the Plot X and the unique species in plot X as far as the different micro habitats are concerned are presented in Fig. 4a, while those as far as the different feeding guilds are concerned in Fig. 4b.

The qualitative (in families) and quantitative (number of species per family) distribution of the unique species in plot X as far as the micro habitats and the feeding guilds is concerned are presented in Tables 2 and 3, respectively.

As shown in Table 1, in the area A-B, as a whole (the Plot X included), gastropods were the most diverse Class with 486 species distributed to 109 families most diverse of which were Pyramidellidae and Rissoidae. Second Class in number of species was that of Bivalvia with 218 species distributed to 49 families among which predominant ones were those of Lasaeidae and Veneridae. In Plot X, in particular, gastropods were also the most diverse Class with 173 species common with area A-B plus 69 unique ones not included in the 484

already present in the whole area from point A to point B. Best represented families were Eulimidae, Rissoidae, Mangeliidae, Pyramidellidae and Retusidae. Gastropods were followed by bivalves with best represented families those of Mytilidae, Lasaeidae, Veneridae and Tellinidae. Interestingly, Plot X is rich in members of the families Mytilidae and Thraciidae (Bivalvia), and Hydrobiidae, Rissoidae, Omalogyridae, Retusidae, Haminoeidae, Philinidae, Pleurobranchidae, Aplysiidae and Nudibranchia families (Gastropoda) (Table 1). These later

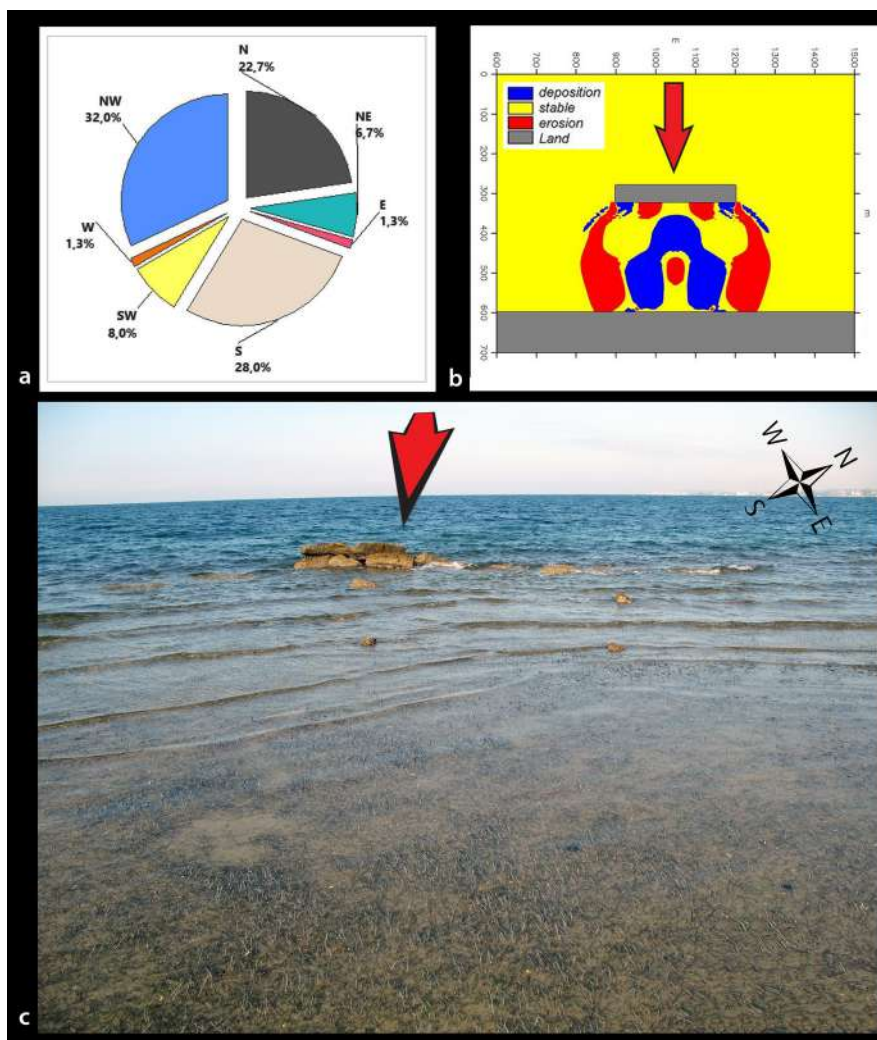


Figure 3: a. Percentage of yearly blowing winds in the area for the period 2015-2021, b. Computer generated 2D model of the expected morphological impact in cases analogous to Plot X (Mangor, 2021), c. In situ observation of the wave intensity in Plot X. Red arrows indicate prevailing NW winds direction.

families are represented by 52 species (or some 60%) out of all those 86 species unique ones in Plot X. In other words, the unique (86) species in Plot X (some 80 m²) represent some 12% of all other species collected from the whole area A-B plus Plot X.

Granulometric analysis

The substrate of Plot X and that of the surrounding area (Fig. 1, points 1, X and 2) do not differ statistically (ANOVA one way, $p=0.895>0.05$). Nevertheless, we can underline some minor differences e.g. Plot X exhibits minimal silt and clay, less fine sand, more medium-grained sand and more coarse sand (Fig. 5a and b).

Discussion

Plot X is the limited area that impressed us due to its high and unique molluscan biodiversity. The main characteristics of this area are: a) *Cymodocea nodosa* salient, b) very fine to coarse sand substrate, c) protection from the prevailing wind (NW), d) ecological protection (NATURA 2000), e) limited anthropogenic pressure. The substrate of the salient (Plot X) seems to be quite stable due to the rhizomes of *Cymodocea nodosa* while the cyclonic and anticyclonic sea currents – forming due to the natural rock barrier (breakwater) - maintain the salient and erode both its sides. At the same time the suspended organisms concentrate, the opportunities for different niches multiply in a variety of the microhabitats present and all contribute to high biodiversity. The hydrodynamic status contributes to the destabilization of the sand grains thus increasing the transfer capacity of solids (e.g. increase the bottom shear stresses) and they carry the sand from the edges of the salient to its center. There, where relative wave calm - accompanied by reduced solid transfer capacity - prevails, they deposit it. This alters the original bathymetry and creates both a salient in the “shadow” of the breakwater (Tsiaras *et al.*, 2020, Fig. 1b) and lateral erosion. Nevertheless, there must be a dynamic process with the hydrodynamic status varying and leading to slightly different sediment deposition as shown in satellite historic images (Google Earth).

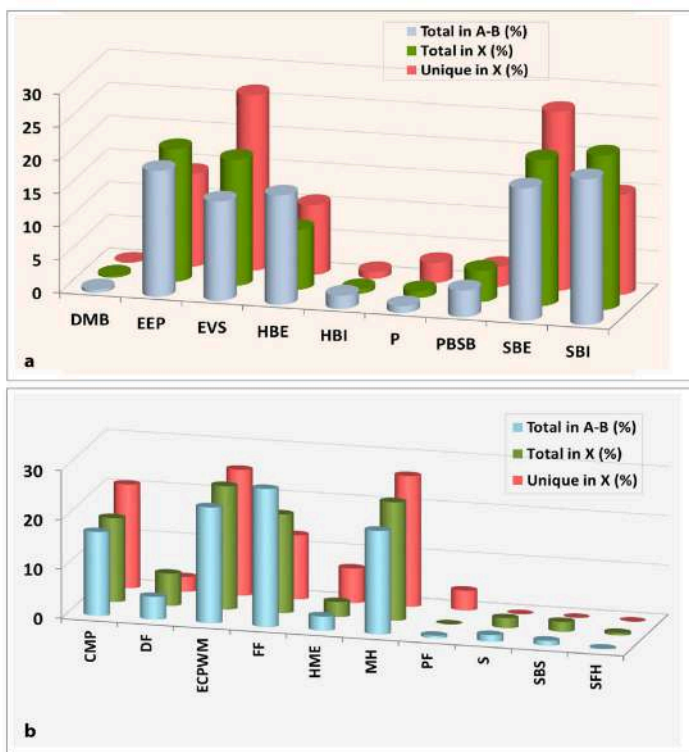


Figure 4: a. Quantitative (%) differences of species preferences - according to their micro habitat - between the area A-B, the Plot X and the unique in plot X species, b. Quantitative (%) differences according to the feeding guilds of species between the area A-B, the Plot X and the unique in plot X.

In relation to the micro-habitat preferences, Table 2 and Fig. 4a indicate that the geographical position of Plot X (Fig. 1a-c), its morphology (Fig. 1c and d) and the prevailing environmental conditions (Fig. 2a-d and Fig. 3a and c) (personal observation over a period of more than 13 years) seem to have worked strongly in favor of epibionts and ectoparasites (EEP), epifaunal

on vegetated substrates species (EVS), soft bottoms epifaunal ones (SBE) and soft bottoms infauna (SBI), and to a lesser extent in favor of hard bottoms epifaunal species (HBE), hard bottoms infaunal species (HBI), and partly buried in soft bottoms (PBSB). Pelagic species (P) cannot be taken into account as they were only collected as shells and are not directly connected to sea bottom. We are of the opinion that the high number of species and especially of the unique ones we dealt with for Plot X in this study are due to the presence of all the available microhabitats that can be colonized by molluscs. Seagrass beds generally include shoots, fine sediment and other organisms on which molluscs may live and become a dominant group (Hemminga and Duarte, 2000). Little Neptune grass leaves, for instance, may represent the main or exclusive food source for seagrass feeding herbivore species or the place where to find other food sources, such as perythton or epiphytes, which are important for grazers. Apparently, in *Cymodocea nodosa* the micro habitats available seem to be similar to those of other

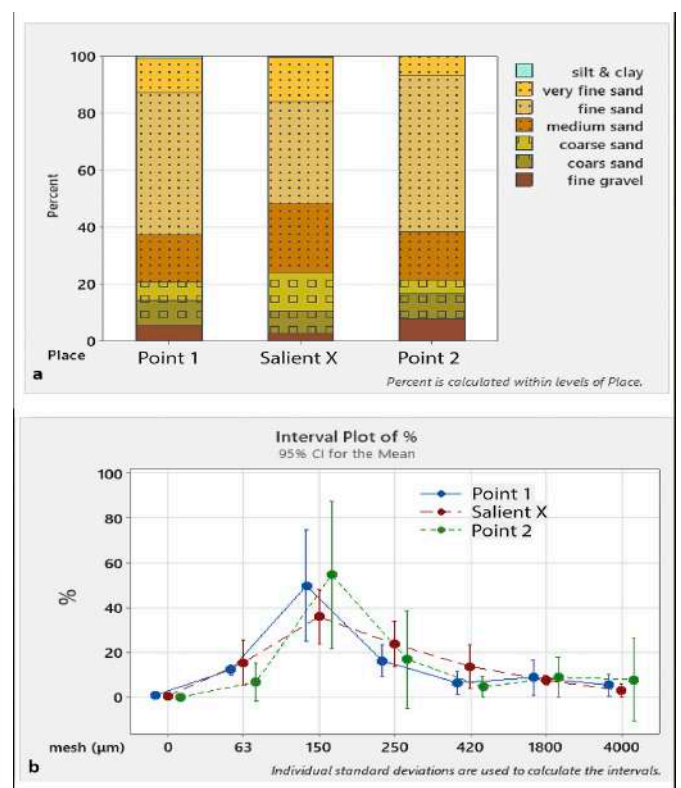


Figure 5: a. Grain size synthesis, b. Grain-size synthesis distribution curves with Confidence Intervals (95% CI) of the Mean.

seagrass beds (Rueda *et al.*, 2009).

In relation to the feeding guilds (Table 3 and Fig. 4b), the conditions seem to have strongly favored incomers belonging to carnivores on mobile preys (CMP), ectoparasites and carnivores on preys without mobility (ECPWM), filter feeders (FF), and microalgae herbivores (MH), while they acted to a lesser extent in favor of deposit feeders (DF) herbivores of macroalgae and epiphytes (HME), scavengers (S), symbionts bearing species (SBS) and plankton feeders (PF) which were only found as shells anyway and do not inhabit sea bottoms (Ciliidae, Creseidae, Limacinidae and Cymbuliidae, in Table 1). Predominant in Plot X are the carnivores that feed on mobile preys (58 spp. including 18 unique species) and 85 species (including 21 unique) that

feed on other invertebrates (e.g. Pyramidellidae). This seems to be attributed also to the high biodiversity of other groups of invertebrate hosts (such as Sipunculidae, Echinodermata and Annelida) that inhabit this little Neptune grass bed (personal observation).

Plot X malacofauna, as a whole, is dominated by three general groups of molluscan settlers, i.e. settled lecythotrophic and planktotrophic shelled larvae, immature individuals of small and larger in size species (personal observations) and small in size species belonging to a large extend to the Orders of Galeommatida, Pyramidelloidea, Cephalaspidea, Sacoglossa, Pleurobranchioidea, Aplysiida and Nudibranchia (Figs. 6-9). One can form a more thorough knowledge on that vibrant live community in a recent publication on the extant malacofauna of Greece (Manousis, 2021a), in which most live individuals depicted are collected from Plot X. This rich biocenosis is reminiscent of a study of a bivalve association from the Lower Pliocene of Harokopio (SW Peloponesus, Greece) (Schneider and Hochleitner, 2006). In that biocenosis, not only a great diversity of soft bottom fauna of molluscs is present in a small area as in Plot X, but same families (like Lasaeidae) and species [like *Litigiella glabra* (P. Fischer in de Folin & Périer, 1873), *Kurtiella bidentata* (Montagu, 1803) or *Tellimya ferruginosa* (Montagu, 1808)] which belong to that very family, are also present.

The area A-B, as a whole, offered 117 new species for Greece (see Introduction), among which 32 species, or 27%, have been found in Plot X, including some first reported for Greece Lessepsian migrants and a new species (Manousis *et al.*, 2019). The hard bottom infaunal (HBI) member *Petricolaria pholadiformis* was collected as shell belonging to an immature individual, thus its presence in Plot X could be characterized as accidental. Interestingly enough, though, quite a few hard bottom epifaunal (HBE) members have been collected only from Plot X and their presence in that soft bottom area should be addressed (Table 2). As described above, Plot X is “protected” from the waves by a series of rocks which could be the original micro habitat of species like *Fossarus ambiguous* and *Enginella leucozona* collected from the Plot, and they might have been washed away by the waves and ended in Plot X. Alternatively, as shown in the computer generated 2D model of the expected morphological impact in cases analogous to Plot X (Fig. 3b) (Mangor, 2021), the plot is expected to have an eroded sub area in its center and this is, indeed, the case; its center is somehow eroded, with less sand and with few small stones seen to emerge in its center (Fig. 3c). That’s the particular area where the rest of the findings, all nudibranchs (Table 2), were found overwintering under those stones and were collected during early spring strong low tides. This possibility enhances the character of Plot X type areas not only as “kindergartens” but also as “shelters” for species.

In conclusion, we are of the opinion that the observed great molluscan diversity associated with Plot X, and perhaps with all similar regions, is due to a synthesis of the prevailing hydrodynamic model, the *Cymodocea* participation in keeping the species locally and the protection by the rocks from strong waves which could scatter them, and that they all point to the need for their protection and preservation. Apparently, molluscs are a potent means to describe community composition and structure on a large scale, and biodiversity in marine ecosystems (Chemello *et al.*, 2000). Furthermore, their protection is in alignment with the regulations of the Biodiversity Conservation

Strategy (EU 2030 Biodiversity Strategy).

Acknowledgements

The authors are grateful to the anonymous referees for their contribution to improve the publication.

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Figure 6.



a. *Solemya togata* (Poli, 1791), b. *Limaria hians* (Gmelin, 1791), c. *Galeomma turtoni* W. Turton, 1825, d. *Epilepton clarkiae* (W. Clark, 1852), e. *Tellimya ferruginosa* (Montagu, 1808), f. *Phaxas pellucidus* (Pennant, 1777), g. *Abra nitida* (O. F. Müller, 1776), h. *Thracia phaseolina* (Lamarck, 1818), i. *Moerella donacina* (Linnaeus, 1758), j. *Gyroscala commutata* (Lamarck, 1822), k. *Melanella boscii* (Payraudeau, 1826), l. *Melanella polita* (Linnaeus, 1748), m. *Vitreolina curva* (Monterosato, 1874). Barr = 1 mm, unless otherwise indicated.

Figure 7.



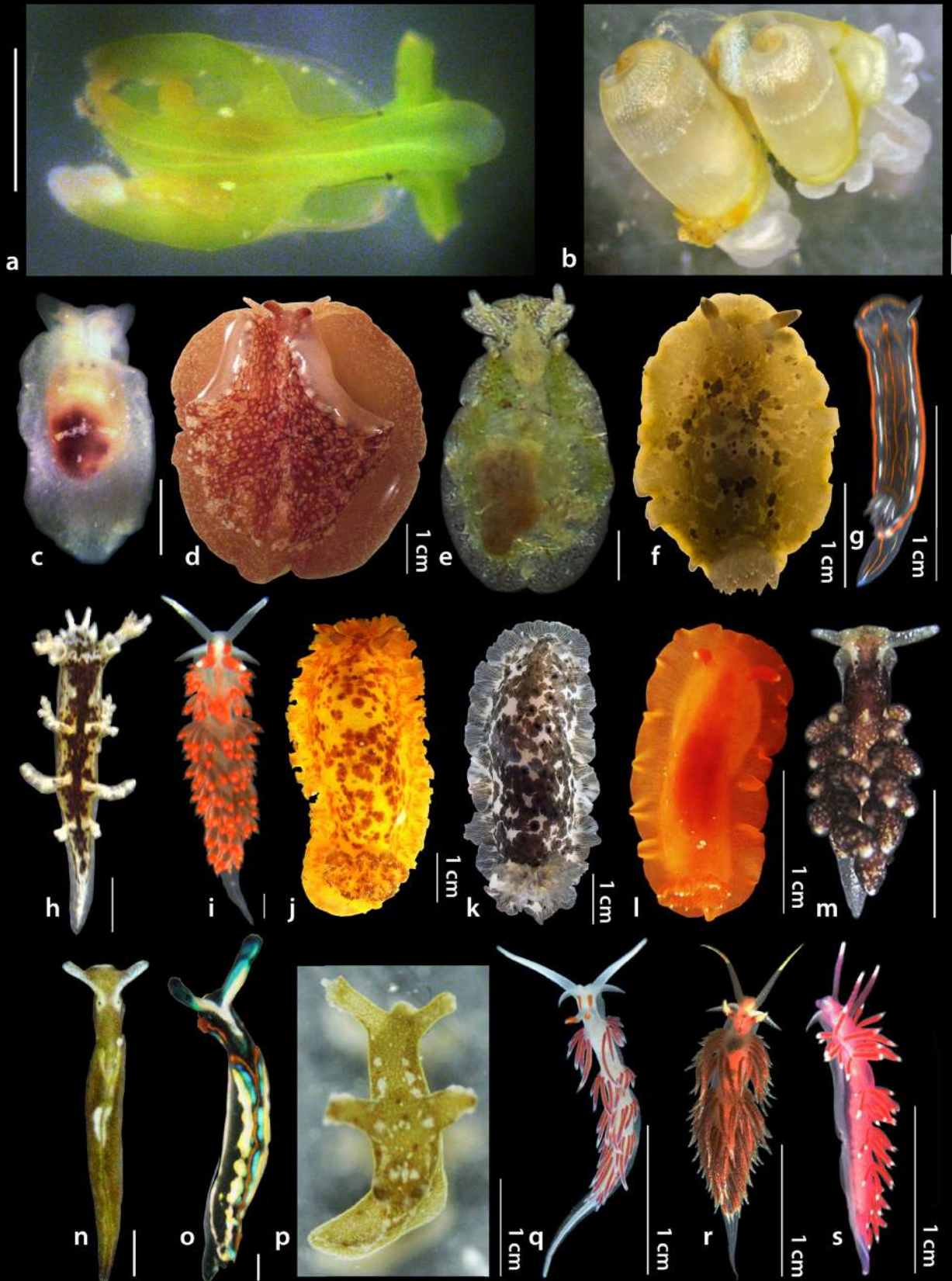
a. *Rissoa electrae* Manousis, 2019, b. *Euspira intricata* (Donovan, 1804), c. *Euspira nitida* (Donovan, 1804), d. *Euspira nitida* f. *albida* (Donovan, 1804), e. *Muricopsis cristata* (Brocchi, 1814), f. *Nassarius* sp. egg case with embryo, g. *Mangelia costulata* Risso, 1826, h. *Mangelia paciniana* (Calcare, 1839), i. *Mangelia unifasciata* (Deshayes, 1835), j. *Cyrillia linearis* (Montagu, 1803), k. *Tomura depressa* (Granata-Grillo, 1877). Barr = 1 mm.

Figure 8.



a. *Ondina warreni* (Thompson, 1845), b. *Turbonilla obliquata* (Philippi, 1844), c. *Ebala pointeli* (de Folin, 1868), d. *Murchisonella mediterranea* Peñas & Rolán, 2013, e. *Graphis albida* (Kanmacher, 1798), f. *Graphis barashi* van Aartsen, 2002, g. *Cima cylindrica* (Jeffreys, 1856), h. *Retusa crebrisculpta* (Monterosato, 1884), i. *Retusa leptoneilema* (Brusina, 1866), j. *Haminoea hydatis* (Linnaeus, 1758), k. *Roxaniella jeffreysi* (Weinkauff, 1866), l. *Weinkauffia turgidula* (Forbes, 1844), m. *Philine catena* (Montagu, 1803), n. *Philine denticulata* (J. Adams, 1800), o. *Philine quadripartita* Ascanius, 1772, p. *Camachoaglaja africana* (Pruvot-Fol, 1953). Barr = 1 mm, unless otherwise indicated.

Figure 9.



a. *Lobiger serradifalci* (Calcara, 1840), b. *Ascobulla fragilis* (Jeffreys, 1856), c. *Berthella stellata* (Risso, 1826), d. *Pleurobranchus membranaceus* (Montagu, 1816), e. *Petalifera petalifera* (Rang, 1828), f. *Doris pseudoargus* Rapp, 1827, g. *Felimare villafranca* (Risso, 1818), h. *Duvaucelia manicata* (Deshayes, 1853), i. *Berghia verrucicornis* (A. Costa, 1867), j. *Dendrodoris grandiflora* (Rapp, 1827), k. *Dendrodoris herytra* Valdés & Ortea in Valdés, Ortea, Avila & Ballesteros, 1996, l. *Dendrodoris limbata* (Cuvier, 1804), m. *Calliopaea bellula* d'Orbigny, 1837, n. *Elysia viridis* (Montagu, 1804), o. *Thuridilla hopei* (Vérany, 1853), p. *Notobryon bijecurum* Baba, 1937, q. *Cratena peregrina* (Gmelin, 1791), r. *Facelina annulicornis* (Chamisso & Eysenhardt, 1821), s. *Edmundsella pedata* (Montagu, 1816). Barr = 1 mm, unless otherwise indicated

Table 1: Annotated list of species per Family and Class.

						Number of families					Number of species				
	Area A-B	Plot X	Micro Habitat Preferential Substrate	Feeding Guild Trophic Group	GI	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
BIVALVIA						49	49	28	28	0	218	202	97	81	16
SOLEMYIDAE Gray, 1840															
<i>Solemya togata</i> (Poli, 1791)	+	+	SBI	SBS											
NUCULIDAE J. E. Gray, 1824															
<i>Ennucula aegaeensis</i> (Forbes, 1844)	+		SBI	DF											
<i>Nucula nitidosa</i> Winckworth, 1930	+		SBI	DF											
<i>Nucula nucleus</i> (Linnaeus, 1758)	+		SBI	DF											
<i>Nucula sulcata</i> Bronn, 1831	+		SBI	DF											
NUCULANIDAE H. Adams & A. Adams, 1858															
<i>Lembulus pella</i> (Linnaeus, 1758)	+		SBI	DF											
<i>Saccula commutata</i> (Philippi, 1844)	+	+	SBI	DF											
<i>Saccula illirica</i> (Carrozza, 1987)	+		SBI	DF	+										
ARCIDAE Lamarck, 1809															
<i>Acar clathrata</i> (Defrance, 1816)	+		DMB	FF											
<i>Anadara gibbosa</i> (Reeve, 1844)	+		DMB	FF											
<i>Anadara transversa</i> (Say, 1822)	+	+	DMB	FF											
<i>Arca noae</i> Linnaeus, 1758	+		HBE	FF											
<i>Arca tetragona</i> Poli, 1795	+		HBE	FF											
<i>Asperarca nodulosa</i> (O. F. Müller, 1776)	+		HBE	FF											
<i>Asperarca secreta</i> La Perna, 1998	+		HBE	FF	+										
<i>Barbatia barbatia</i> (Linnaeus, 1758)	+		HBE	FF											
<i>Batharca pentacostoides</i> (Scacchi, 1835)	+		DMB	FF											
<i>Batharca philippiana</i> (Nyst, 1848)	+		HBE	FF											
NOETIIDAE Stewart, 1930															
<i>Striarca lactea</i> (Linnaeus, 1758)	+		HBE	FF											
GLYCYMERIDAE Dall, 1908															
<i>Glycymeris bimaculata</i> (Poli, 1795)	+		SBI	FF											
<i>Glycymeris nummularia</i> (Linnaeus, 1758)	+		SBI	FF											
<i>Glycymeris pilosa</i> (Linnaeus, 1767)	+		SBI	FF											
MYTILIDAE Rafinesque, 1815											18	15	6	3	3
<i>Arcuatula senhousia</i> (Benson in Cantor, 1842)	+		SBE	FF											
<i>Crenella arenaria</i> Monterosato, 1875 ex H. Martin, ms.	+		SBE	FF											
<i>Dacrydium hyalinum</i> (Monterosato, 1875)	+		SBE	FF											
<i>Gregaria petagna</i> (Scacchi, 1832)	+		SBE	FF											
<i>Lithophaga lithophaga</i> (Linnaeus, 1758)	+		HBI	FF											
<i>Modiolula phaseolina</i> (Philippi, 1844)	+		SBE	FF											
<i>Modiolus adriaticus</i> Lamarck, 1819	+		SBE	FF											
<i>Modiolus barbatus</i> (Linnaeus, 1758)	+		SBE	FF											
<i>Musculista perfragilis</i> (Dunker, 1857)	+	+	SBE	FF											
<i>Musculus costulatus</i> (Risso, 1826)	+	+	SBE	FF											
<i>Musculus discors</i> (Linnaeus, 1767)	+		SBE	FF											
<i>Musculus subpictus</i> (Cantraine, 1835)	+	+	SBE	FF											
<i>Mytilaster lineatus</i> (Gmelin, 1791)	+		SBE	FF											
<i>Mytilaster marioni</i> (Locard, 1889)	+		SBE	FF											
<i>Mytilaster minimus</i> (Poli, 1795)	+	+	SBE	FF											
<i>Mytilus edulis</i> Linnaeus, 1758	+		SBE	FF											
<i>Mytilus galloprovincialis</i> Lamarck, 1819	+	+	HBE	FF											
<i>Septifer cumingii</i> Récluz, 1849	+	+	SBE	FF											
PINNIDAE Leach, 1819															
<i>Atrina fragilis</i> (Pennant, 1777)	+		SBE	FF											
<i>Pinna nobilis</i> Linnaeus, 1758	+	+	SBE	FF											
MARGARITIDAE Blainville, 1824															
<i>Pinctada imbricata radiata</i> (Leach, 1814)	+		HBE	FF											
PTERIIDAE Gray, 1847 (1820)															
<i>Pteria hirsuta</i> (Linnaeus, 1758)	+		HBE	FF											
PROPEAMUSSIIDAE Abbott, 1954															
<i>Cyclopecten brundisensis</i> Smriglio & Mariottini, 1990	+		SBE	FF	+										
<i>Cyclopecten hoskynsi</i> (Forbes, 1844)	+		SBE	FF											
<i>Similipecten similis</i> (Laskey, 1811)	+		SBE	FF											
PECTINIDAE Rafinesque, 1815															
<i>Aequipecten opercularis</i> (Linnaeus, 1758)	+		SBE	FF											
<i>Delectopecten vitreus</i> (Gmelin, 1791)	+		SBE	FF											
<i>Flexopecten glaber</i> (Linnaeus, 1758)	+	+	SBE	FF											
<i>Flexopecten hyalinus</i> (Poli, 1795)	+	+	SBE	FF											
<i>Manupecten pesfelis</i> (Linnaeus, 1758)	+		HBE	FF											
<i>Mimachlamys varia</i> (Linnaeus, 1758)	+	+	HBE	FF											
<i>Pecten jacobaeus</i> (Linnaeus, 1758)	+	+	SBE	FF											
<i>Talochlamys multistriata</i> (Poli, 1795)	+		HBE	FF											
SPONDYLIDAE J. E. Gray, 1826															
<i>Spondylus gaederopus</i> Linnaeus, 1758	+		HBE	FF											
<i>Spondylus</i> cfr. <i>spinosus</i> Schreibers, 1793	+		HBE	FF	+										
ANOMIIDAE Rafinesque, 1815															
<i>Anomia ephippium</i> Linnaeus, 1758	+	+	EHP	FF											
<i>Heteranomia squamula</i> (Linnaeus, 1758)	+		HBE	FF											
<i>Pododesmus patelliformis</i> (Linnaeus, 1761)	+		HBE	FF											
<i>Pododesmus squama</i> (Gmelin, 1791)	+		HBE	FF	+										
LIMIDAE d'Orbigny, 1846															
<i>Lima lima</i> (Linnaeus, 1758)	+		SBE	FF											
<i>Lima hians</i> (Gmelin, 1791)	+	+	SBE	FF											
<i>Lima loscombi</i> (G. B. Sowerby I, 1823)	+	+	SBE	FF											
<i>Lima tuberculata</i> (Olivier, 1792)	+	+	SBE	FF											
<i>Limatula gwynii</i> (Sykes, 1903)	+		SBE	FF											
<i>Limatula subauriculata</i> (Montagu, 1808)	+		SBE	FF											
<i>Limatula subovata</i> (Monterosato, 1875)	+		SBE	FF											
<i>Limea crassa</i> (Forbes, 1844)	+		SBE	FF											
OSTREIDAE Rafinesque, 1815															
<i>Ostrea edulis</i> Linnaeus, 1758	+		HBE	FF											
GRYPHAEIDAE Vyalov, 1936															
<i>Neopycnodonte cochlear</i> (Poli, 1795)	+		HBE	FF											
LUCINIDAE Fleming, 1828															
<i>Ctena decussata</i> (O. G. Costa, 1829)	+	+	SBI	SBS											
<i>Loripes orbiculatus</i> Poli, 1791	+	+	SBI	SBS											
<i>Loripinus fragilis</i> (Philippi, 1836)	+	+	SBI	SBS											

							Number of families					Number of species				
	Area A-B	Plot X	Microhabitat Preferential Substrate	Feeding Guild Trophic Group	GI		Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Lucinella divaricata</i> (Linnaeus, 1758)	+	+	SBI	SBS												
<i>Lucinoma borealis</i> (Linnaeus, 1767)	+	+	SBI	SBS												
<i>Myrtea spinifera</i> (Montagu, 1803)	+		SBI	SBS												
THYASIRIDAE Dall, 1900 (1895)																
<i>Axinnulus eximius</i> (Gaglini, 1992)	+		SBI	FF												
<i>Thyasira biplicata</i> (Philippi, 1836)	+		SBI	FF	+											
<i>Thyasira flexuosa</i> (Montagu, 1803)	+		SBI	FF												
UNGULINIDAE Gray, 1854																
<i>Diplodonta brocchii</i> (Deshayes, 1850)	+	+	SBI	FF	+											
<i>Diplodonta rotundata</i> (Montagu, 1803)	+	+	SBI	FF												
<i>Transkeia bogii</i> (van Aartsen, 2004)	+	+	SBI	FF												
<i>Transkeia globosa</i> (Forsskål in Niebuhr, 1775)	+		SBI	FF	+											
CHAMIDAE Lamarck, 1809																
<i>Chama asperella</i> Lamarck, 1819	+		HBE	FF												
<i>Chama aspersa</i> Reeve, 1846	+		HBE	FF												
<i>Chama circinata</i> Monterosato, 1878	+		HBE	FF												
<i>Chama gryphoides</i> Linnaeus, 1758	+	+	HBE	FF												
<i>Pseudochama corbieri</i> (Jonas, 1846)	+		HBE	FF												
<i>Pseudochama gryphina</i> (Lamarck, 1819)	+	+	HBE	FF												
GALEOMMATIDAE J. E. Gray, 1840																
<i>Galeomma turtoni</i> W. Turton, 1825	+	+	SBI	FF												
<i>Vasconella jeffreysiana</i> (P. Fischer in de Folin & Périer, 1873)	+		SBI	FF	+											
LASAEIDAE Gray, 1842												21	16	12	7	5
<i>Bornia geoffroyi</i> (Payraudeau, 1826)		+	SBI	FF												
<i>Bornia sebetia</i> (O. G. Costa, 1830)	+	+	SBI	FF												
<i>Coracuta obliquata</i> (Chaster, 1897)	+		SBI	FF												
<i>Devonia perrieri</i> (Malard, 1904)		+	SBI	FF	+											
<i>Epilepton clarkiae</i> (W. Clark, 1852)	+	+	SBI	FF												
<i>Epilepton solidulum</i> (Gaglini, 1992)	+		SBI	FF	+											
<i>Epilepton subtrigonum</i> (P. Fischer, 1874)	+		SBI	FF	+											
<i>Hemilepton nitidum</i> (W. Turton, 1822)	+	+	SBI	FF												
<i>Kella suborbicularis</i> (Montagu, 1803)	+		SBI	FF												
<i>Kelliopsis jozinae</i> van Aartsen & Carrozza, 1997	+		SBI	FF	+											
<i>Kurtiella bidentata</i> (Montagu, 1803)	+	+	SBI	FF												
<i>Kurtiella pellucida</i> (Jeffreys, 1881)	+		SBI	FF	+											
<i>Kurtiella tumidula</i> (Jeffreys, 1866)	+		SBI	FF												
<i>Lepton squamosum</i> (Montagu, 1803)	+		SBI	FF												
<i>Litigiella glabra</i> (P. Fischer in de Folin & Périer, 1873)		+	SBI	FF												
<i>Montacuta goudi</i> van Aartsen, 1997		+	SBI	FF	+											
<i>Montacuta substriata</i> (Montagu, 1808)	+		SBI	FF												
<i>Phascoliochloa phascolionis</i> (Dautzenberg & H. Fischer, 1925)		+	SBI	FF	+											
<i>Scacchia oblonga</i> (Philippi, 1836)	+	+	SBI	FF												
<i>Tellima ferruginosa</i> (Montagu, 1808)	+	+	SBI	FF												
<i>Tellima semirubra</i> (Gaglini, 1992)	+		SBI	FF												
SPORTELLIDAE Dall, 1899																
<i>Sportella recondita</i> (P. Fischer in de Folin, 1872)	+		SBI	FF												
CARDITIDAE Férussac, 1822																
<i>Cardita calyculata</i> (Linnaeus, 1758)	+		SBI	FF												
<i>Cardites antiquatus</i> (Linnaeus, 1758)	+	+	SBI	FF												
<i>Centrocardita aculeata</i> (Poli, 1795)	+		SBI	FF												
<i>Glans trapezia</i> (Linnaeus, 1767)	+	+	SBI	FF												
CARDIIDAE Lamarck, 1809												17	15	7	5	2
<i>Acanthocardia deshayesi</i> (Payraudeau, 1826)	+		SBI	FF												
<i>Acanthocardia echinata</i> (Linnaeus, 1758)	+		SBI	FF												
<i>Acanthocardia paucicostata</i> (G. B. Sowerby II, 1834)	+		SBI	FF												
<i>Acanthocardia spinosa</i> (Lightfoot, 1786)	+		SBI	FF												
<i>Acanthocardia tuberculata</i> (Linnaeus, 1758)	+	+	SBI	FF												
<i>Cerastoderma edule</i> (Linnaeus, 1758)	+		SBI	FF												
<i>Cerastoderma glaucum</i> (Bruguière, 1789)	+		SBI	FF												
<i>Fulvia fragilis</i> (Forsskål in Niebuhr, 1775)	+		SBI	FF												
<i>Laevicardium crassum</i> (Gmelin, 1791)	+		SBI	FF												
<i>Laevicardium oblongum</i> (Gmelin, 1791)	+		SBI	FF												
<i>Papillicardium minimum</i> (Philippi, 1836)	+		SBI	FF												
<i>Papillicardium papillosum</i> (Poli, 1791)	+	+	SBI	FF												
<i>Parvicardium exiguum</i> (Gmelin, 1791)	+	+	SBI	FF												
<i>Parvicardium hauniense</i> (Petersen & Russell, 1971)		+	SBI	FF	+											
<i>Parvicardium pinnulatum</i> (Conrad, 1831)	+	+	SBI	FF												
<i>Parvicardium scabrum</i> (Philippi, 1844)		+	SBI	FF												
<i>Parvicardium scriptum</i> (Bucquoy, Dautzenberg & Dollfus, 1892)	+	+	SBI	FF												
MACTRIDAE Lamarck, 1809																
<i>Mactra glauca</i> Bom, 1778	+	+	SBI	FF												
<i>Mactra stultorum</i> (Linnaeus, 1758)	+	+	SBI	FF												
<i>Spisula subtruncata</i> (da Costa, 1778)	+	+	SBI	FF												
MESODESMATIDAE Gray, 1840																
<i>Donacilla cornea</i> (Poli, 1791)	+	+	SBI	FF												
SOLENIIDAE Lamarck, 1809																
<i>Solen marginatus</i> Pulteney, 1799	+		SBI	FF												
PHARIDAE H. Adams & A. Adams, 1856																
<i>Ensis ensis</i> (Linnaeus, 1758)	+		SBI	FF												
<i>Ensis magnus</i> Schumacher, 1817	+		SBI	FF												
<i>Ensis minor</i> (Chenu, 1843)	+		SBI	FF												
<i>Phaxas pellucidus</i> (Pennant, 1777)	+	+	SBI	FF												
TELLINIDAE Blainville, 1814												14	13	12	11	1
<i>Arcopagia crassa</i> (Pennant, 1777)	+		SBI	DF												
<i>Arcopella balaustrina</i> (Linnaeus, 1758)	+	+	SBI	DF												
<i>Asbjornsenia pygmaea</i> (Lovén, 1846)		+	SBI	DF												
<i>Bosmprella incarnata</i> (Linnaeus, 1758)	+	+	SBI	DF												
<i>Fabulina fabula</i> (Gmelin, 1791)	+	+	SBI	DF												
<i>Gastrana fragilis</i> (Linnaeus, 1758)	+	+	SBI	DF												
<i>Macomangulus tenuis</i> (da Costa, 1778)	+	+	SBI	DF												
<i>Macomopsis cumana</i> (O. G. Costa, 1830)	+	+	SBI	DF												
<i>Moerella distorta</i> (Poli, 1791)	+	+	SBI	DF												
<i>Moerella donacina</i> (Linnaeus, 1758)	+	+	SBI	DF												
<i>Moerella pulchella</i> (Lamarck, 1818)	+	+	SBI	DF												

	Area A-B	Plot X	Micro Habitat Preferential Substrate	Feeding Guild Trophic Group	G1	Number of families					Number of species				
						Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Peronaea planata</i> (Linnaeus, 1758)	+	+	SBI	DF											
<i>Peronidea albicans</i> (Gmelin, 1791)	+	+	SBI	DF											
<i>Serratina serrata</i> (Brocchi, 1814)	+		SBI	DF											
DONACIDAE J. Fleming, 1828															
<i>Donax semistriatus</i> Poli, 1795	+	+	SBI	DF											
<i>Donax trunculus</i> Linnaeus, 1758	+	+	SBI	DF											
<i>Donax variegatus</i> (Gmelin, 1791)	+	+	SBI	DF											
PSAMMOBIDAE J. Fleming, 1828															
<i>Gari costulata</i> (W. Turton, 1822)		+	SBI	DF											
<i>Gari depressa</i> (Pennant, 1777)	+	+	SBI	DF											
<i>Gari fervensis</i> (Gmelin, 1791)	+		SBI	DF											
<i>Gari tellinella</i> (Lamarck, 1818)	+		SBI	DF											
SEMELIDAE Stoliczka, 1870															
<i>Abra alba</i> (W. Wood, 1802)	+	+	SBI	DF											
<i>Abra nitida</i> (O. F. Müller, 1776)	+	+	SBI	DF											
<i>Abra prismatica</i> (Montagu, 1808)	+		SBI	DF											
<i>Scrobicularia cottaradi</i> (Payraudeau, 1826)	+	+	SBI	DF											
<i>Scrobicularia plana</i> (da Costa, 1778)	+		SBI	DF											
SOLECURTIDAE d'Orbigny, 1846															
<i>Azorinus chamosolen</i> (da Costa, 1778)	+	+	SBI	FF											
<i>Solecurtus scopula</i> (W. Turton, 1822)	+		SBI	FF											
<i>Solecurtus strigilatus</i> (Linnaeus, 1758)	+		SBI	FF											
KELLIELLIDAE P. Fischer, 1887															
<i>Kelliella miliaris</i> (Philippi, 1844)	+		SBI	FF											
TRAPEZIDAE Lamy, 1920 (1895)															
<i>Coralliophaga lithophagella</i> (Lamarck, 1819)	+		HBI	FF											
GLOSSIDAE J. E. Gray, 1847															
<i>Glossus humanus</i> (Linnaeus, 1758)	+		SBI	FF											
VENERIDAE Rafinesque, 1815											20	19	14	13	1
<i>Callista chione</i> (Linnaeus, 1758)	+	+	SBI	FF											
<i>Chamelea gallina</i> (Linnaeus, 1758)	+	+	SBI	FF											
<i>Chamelea striatula</i> (da Costa, 1778)	+	+	SBI	FF											
<i>Clausinella fasciata</i> (da Costa, 1778)	+		SBI	FF	+										
<i>Dosinia exoleta</i> (Linnaeus, 1758)	+	+	SBI	FF											
<i>Dosinia lupinus</i> (Linnaeus, 1758)	+	+	SBI	FF											
<i>Gouldia minima</i> (Montagu, 1803)	+	+	SBI	FF											
<i>Irus irus</i> (Linnaeus, 1758)	+		HBI	FF											
<i>Lajankairia lajankairii</i> (Payraudeau, 1826)	+		SBI	FF											
<i>Lajankairia substriata</i> (Montagu, 1808)	+	+	SBI	FF											
<i>Petricola lithophaga</i> (Retzius, 1788)	+		HBI	FF											
<i>Petricolaria pholadiformis</i> (Lamarck, 1818)		+	HBI	FF											
<i>Pitar rudis</i> (Poli, 1795)	+	+	SBI	FF											
<i>Politapes aureus</i> (Gmelin, 1791)	+	+	SBI	FF											
<i>Politapes rhomboides</i> (Pennant, 1777)	+	+	SBI	FF											
<i>Ruditapes decussatus</i> (Linnaeus, 1758)	+	+	SBI	FF											
<i>Timoclea ovata</i> (Pennant, 1777)	+		SBI	FF											
<i>Venerupis geographica</i> (Gmelin, 1791)	+	+	SBI	FF											
<i>Venus casina</i> Linnaeus, 1758	+		SBI	FF											
<i>Venus verrucosa</i> Linnaeus, 1758	+	+	SBI	FF											
MYIDAE Lamarck, 1809															
<i>Sphenia binghami</i> W. Turton, 1822	+	+	SBI	FF											
CORBUIDAE Lamarck, 1818															
<i>Lentidium mediterraneum</i> (O. G. Costa, 1830)	+		SBI	FF											
<i>Varicorbula gibba</i> (Olivé, 1792)	+	+	SBI	FF											
GASTROCHAENIDAE Gray, 1840															
<i>Rocellaria dubia</i> (Pennant, 1777)	+		HBI	FF											
HIATELLIDAE J. E. Gray, 1824															
<i>Hiatella arctica</i> (Linnaeus, 1767)	+	+	HBE	FF											
PHOLADIDAE Lamarck, 1809															
<i>Barnea candida</i> (Linnaeus, 1758)	+		HBI	FF											
<i>Pholas dactylus</i> Linnaeus, 1758	+		HBI	FF											
TEREDINIDAE Rafinesque, 1815															
<i>Bankia gouldi</i> (Bartsch, 1908)	+		HBI	FF	+										
<i>Bankia carinata</i> (J. E. Gray, 1827)	+		HBI	FF	+										
<i>Lyrodus pedicellatus</i> (Quatrefages, 1849)	+		HBI	FF	+										
<i>Nototeredo norvegica</i> (Spengler, 1792)	+		HBI	FF											
<i>Teredo navalis</i> Linnaeus, 1758	+		HBI	FF											
XYLOPHAGIDAE Purchon, 1941															
<i>Xylophaga dorsalis</i> (W. Turton, 1819)	+		HBI	FF											
<i>Xylophaga praestans</i> E. A. Smith, 1903	+		HBI	FF											
THRACIIDAE Stoliczka, 1870 (1839)											5	3	5	3	2
<i>Thracia carbuloides</i> (Blainville, 1827)	+	+	SBI	FF											
<i>Thracia distorta</i> (Montagu, 1803)	+	+	SBI	FF											
<i>Thracia phaseolina</i> (Lamarck, 1818)	+	+	SBI	FF											
<i>Thracia pubescens</i> (Pulteney, 1799)		+	SBI	FF											
<i>Thracia villosiuscula</i> (MacGillivray, 1827)		+	SBI	FF											
PANDORIDAE Rafinesque, 1815															
<i>Pandora pinna</i> (Montagu, 1803)	+		SBI	FF											
CUSPIDARIIDAE Dall, 1886															
<i>Cardiomya costellata</i> (Deshayes, 1835)	+		SBI	FF											
<i>Cuspidaria cuspidata</i> (Olivé, 1792)	+		SBI	FF											
GASTROPODA						109	99	60	50	10	486	417	242	173	69
PATELLIDAE Rafinesque, 1815															
<i>Patella caerulea</i> Linnaeus, 1758	+		HBE	HME											
<i>Patella ulyssiponensis</i> Gmelin, 1791	+		HBE	HME											
LOTTIIDAE Gray, 1840															
<i>Tectura virginea</i> (O. F. Müller, 1776)	+		HBE	HME											
FISSURELLIDAE Fleming, 1822											8	1	1		
<i>Diodora gibberula</i> (Lamarck, 1822)	+		HBE	HME											
<i>Diodora graeca</i> (Linnaeus, 1758)	+		HBE	HME											
<i>Diodora italica</i> (Defrance, 1820)	+		HBE	HME											
<i>Emarginula adriatica</i> O. G. Costa, 1830	+		HBE	ECPWM											

	Area A-B	Plot X	Micro Habitat Preferential Substrate	Feeding Guild Trophic Group	G1	Number of families					Number of species				
						Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Emarginula huzardii</i> Payraudeau, 1826	+	+	HBE	ECPWM											
<i>Emarginula rosea</i> Bell, 1824	+		HBE	ECPWM											
<i>Emarginula sicula</i> J.E. Gray, 1825	+		HBE	ECPWM											
<i>Emarginula tenera</i> Locard, 1891	+		HBE	ECPWM											
SCISSURELLIDAE Gray, 1847															
<i>Scissurella costata</i> d'Orbigny, 1824	+		HBE	MH											
HALIOTIDAE Rafinesque, 1815															
<i>Haliotis mykanosensis</i> Owen, Hanavan & Hall, 2001	+		HBE	HME											
<i>Haliotis tuberculata</i> Linnaeus, 1758	+		HBE	HME											
TROCHIDAE Rafinesque, 1815											19	19	9	9	0
<i>Clanculus cruciatus</i> (Linnaeus, 1758)	+	+	HBE	MH											
<i>Gibbula albida</i> (Gmelin, 1791)	+	+	HBE	MH											
<i>Gibbula ardens</i> (Salis Marschlin, 1793)	+	+	HBE	MH											
<i>Gibbula guttatauri</i> (Philippi, 1836)	+	+	HBE	MH											
<i>Gibbula leucophaea</i> (Philippi, 1836)	+		HBE	MH											
<i>Gibbula magus</i> (Linnaeus, 1758)	+		SBE	MH											
<i>Gibbula philberti</i> (Récluz, 1843)	+		HBE	MH											
<i>Jujubinus exasperatus</i> (Pennant, 1777)	+		EVS	MH											
<i>Jujubinus gravinae</i> (Dautzenberg, 1881)	+		EVS	MH											
<i>Jujubinus striatus</i> (Linnaeus, 1758)	+		EVS	MH											
<i>Phorcus articulatus</i> (Lamarck, 1822)	+		HBE	MH											
<i>Phorcus richardi</i> (Payraudeau, 1826)	+	+	HBE	MH											
<i>Phorcus turbinatus</i> (Born, 1778)	+		HBE	MH											
<i>Steromphala adansonii</i> (Payraudeau, 1826)	+	+	HBE	MH											
<i>Steromphala adriatica</i> (Philippi, 1844)	+	+	HBE	MH											
<i>Steromphala divaricata</i> (Linnaeus, 1758)	+		HBE	MH											
<i>Steromphala rutilineta</i> (Michaud, 1829)	+		HBE	MH											
<i>Steromphala umbilicaris</i> (Linnaeus, 1758)	+	+	HBE	MH											
<i>Steromphala varia</i> (Linnaeus, 1758)	+	+	HBE	MH											
CALLIOSTOMATIDAE Thiele, 1924															
<i>Calliostoma canulus</i> (Linnaeus, 1758)	+		SBE	ECPWM											
<i>Calliostoma funiculatum</i> Ardovini, 2011	+		SBE	ECPWM	+										
<i>Calliostoma kochi</i> Pallary, 1902	+		SBE	ECPWM											
<i>Calliostoma virescens</i> Coen, 1933	+		SBE	ECPWM											
<i>Calliostoma zizyphinum</i> (Linnaeus, 1758)	+		SBE	ECPWM											
COLLONIIDAE Cossmann, 1917															
<i>Homalopoma sanguineum</i> (Linnaeus, 1758)	+		SBE	MH											
SKENEIDAE W. Clark, 1851															
<i>Parviturbo fenestratus</i> (Chaster, 1896)	+		EVS	MH											
<i>Skenea catenoides</i> (Monterosato, 1877)	+		EVS	MH											
<i>Skeneoides exilissima</i> (Philippi, 1844)	+		EVS	MH	+										
TURBINIDAE Rafinesque, 1815															
<i>Bolma rugosa</i> (Linnaeus, 1767)	+		SBE	MH											
PHASIANELLIDAE Swainson, 1840															
<i>Tricollia pullus</i> (Linnaeus, 1758)	+	+	EVS	MH											
<i>Tricollia speciosa</i> (Megerle von Mühlfeld, 1824)	+	+	EVS	MH											
<i>Tricollia tenuis</i> (Michaud, 1829)	+	+	EVS	MH											
NERITIDAE Rafinesque, 1815															
<i>Smaragdia viridis</i> (Linnaeus, 1758)	+	+	EVS	SFH											
CERITHIIDAE Fleming, 1822															
<i>Bittium lacteum</i> (Philippi, 1836)	+														
<i>Bittium latreilli</i> (Payraudeau, 1826)	+	+	SBE	MH											
<i>Bittium reticulatum</i> (da Costa, 1778)	+	+	SBE	MH											
<i>Cerithidium submamillatum</i> (De Rayneval & Ponzi, 1854)	+	+	SBE	MH											
<i>Cerithium olucastum</i> (Brocchi, 1814)	+		SBE	MH											
<i>Cerithium lividulum</i> Risso, 1826	+	+	SBE	MH											
<i>Cerithium protractum</i> Bivona Ant. in Bivona And., 1838	+	+	SBE	MH											
<i>Cerithium scabridum</i> Philippi, 1848	+		SBE	MH											
<i>Cerithium vulgatum</i> Bruguière, 1792	+	+	SBE	MH											
PLANAXIDAE Gray, 1850															
<i>Fossarus ambiguus</i> (Linnaeus, 1758)		+	HBE	MH											
POTAMIDIDAE H. Adams & A. Adams, 1854															
<i>Pirenella conica</i> (Blainville, 1829)	+	+	SBE	MH											
SILICULARIIDAE Anton, 1838															
<i>Petalopoma elisabettae</i> Schiaparelli, 2002	+		HBE	MH	+										
TURRITELLIDAE Lovén, 1847															
<i>Turritella communis</i> Risso, 1826	+	+	SBE	FF											
TRIPHORIDAE Gray, 1847															
<i>Marshallora adversa</i> (Montagu, 1803)	+	+	EEP	ECPWM											
<i>Metaxia metaxa</i> (Delle Chiaje, 1828)	+		EEP	ECPWM											
<i>Monophorus erythrosoma</i> (Bouchet & Guillemot, 1978)	+		EEP	ECPWM											
<i>Monophorus perversus</i> (Linnaeus, 1758)	+		EEP	ECPWM											
<i>Obesula marisnastri</i> Bouchet, 1985	+		EEP	ECPWM											
<i>Similiphora similior</i> (Bouchet & Guillemot, 1978)	+	+	EEP	ECPWM											
<i>Similiphora tricolor</i> Bouchet, 1997	+		EEP	ECPWM	+										
CERITHIOPSIDAE H. Adams & A. Adams, 1853											16	16	4	4	0
<i>Cerithiopsis atalaya</i> R. B. Watson, 1885	+		EEP	ECPWM	+										
<i>Cerithiopsis barleei</i> Jeffreys, 1867	+		EEP	ECPWM											
<i>Cerithiopsis fayalensis</i> R. B. Watson, 1880	+		EEP	ECPWM	+										
<i>Cerithiopsis iudithae</i> Reitano & Buzzurro, 2006	+		EEP	ECPWM	+										
<i>Cerithiopsis iadae</i> Prkic & Buzzurro, 2007	+		EEP	ECPWM	+										
<i>Cerithiopsis micalli</i> (Cecalupo & Villari, 1997)	+		EEP	ECPWM	+										
<i>Cerithiopsis minima</i> (Brusina, 1865)	+	+	EEP	ECPWM											
<i>Cerithiopsis oculisfictis</i> Prkic & Mariottini, 2010	+		EEP	ECPWM	+										
<i>Cerithiopsis petanii</i> Prkic & Mariottini, 2010	+		EEP	ECPWM	+										
<i>Cerithiopsis scalaris</i> Locard, 1891	+		EEP	ECPWM	+										
<i>Cerithiopsis tubercularis</i> (Montagu, 1803)	+	+	EEP	ECPWM											
<i>Costulopsis buzzurroi</i> (Cecalupo & Robba, 2010)	+		EEP	ECPWM	+										
<i>Costulopsis denticulata</i> (Cecalupo & Robba, 2010)	+	+	EEP	ECPWM	+										
<i>Costulopsis nana</i> Jeffreys, 1867	+	+	EEP	ECPWM	+										
<i>Dizoniopsis concatenata</i> (Conti, 1864)	+		EEP	ECPWM	+										
<i>Dizoniopsis cappelae</i> (Aradas, 1870)	+		EEP	ECPWM											
EPITONIIDAE Berry, 1910															
<i>Cirsotrema pumiceum</i> (Brocchi, 1814)	+		EEP	ECPWM											

						Number of families					Number of species				
	Area A-B	Plot X	Micro Habitat Preferential Substrate	Feeding Guild Trophic Group	GI	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Epitonium clathratulum</i> (Kannmacher, 1798)	+		ECP	ECPWM											
<i>Epitonium clathrus</i> (Linnaeus, 1758)	+	+	ECP	ECPWM											
<i>Epitonium muricatum</i> (Risso, 1826)	+	+	ECP	ECPWM											
<i>Epitonium turtonis</i> (W. Turton, 1819)			ECP	ECPWM											
<i>Gyroscolia commutata</i> (Lamarck, 1822)	+	+	ECP	ECPWM											
<i>Janthina globosa</i> Swainson, 1822			ECP	ECPWM											
<i>Opalia coronata</i> (Philippi & Scacchi, 1840)	+		ECP	ECPWM											
EULIMIDAE Philippi, 1853											21	20	8	7	1
<i>Acilis attenuans</i> Jeffreys, 1883	+		ECP	ECPWM											
<i>Acilis minor</i> (Brown, 1827)	+		ECP	ECPWM											
<i>Acrochalis callosa</i> Bouchet & Warén, 1986	+		ECP	ECPWM	+										
<i>Crinophtheiros comatulicula</i> (Graff, 1875)	+		ECP	ECPWM											
<i>Curveulima dautzenbergi</i> (Pallary, 1900)	+		ECP	ECPWM	+										
<i>Eulima bilineata</i> Alder, 1848	+		ECP	ECPWM											
<i>Melanelia alba</i> (da Costa, 1778)		+	ECP	ECPWM	+										
<i>Melanelia boscii</i> (Payraudeau, 1826)	+	+	ECP	ECPWM	+										
<i>Melanelia conoidea</i> (Kurtz & Stimpson, 1851)	+		ECP	ECPWM											
<i>Melanelia frielei</i> (Jordan, 1895)	+		ECP	ECPWM	+										
<i>Melanelia lubrica</i> (Monterosato, 1890)	+	+	ECP	ECPWM											
<i>Melanelia monterosatoi</i> (Monterosato, 1890)	+		ECP	ECPWM	+										
<i>Melanelia polita</i> (Linnaeus, 1758)	+	+	ECP	ECPWM											
<i>Melanelia pseudoglobosa</i> (Dautzenberg & H. Fischer, 1912)	+		ECP	ECPWM											
<i>Melanelia spiridioni</i> (Dautzenberg & H. Fischer, 1896)	+		ECP	ECPWM											
<i>Parvioris ibizensis</i> (F. Nordsieck, 1968)	+	+	ECP	ECPWM											
<i>Stictulima jeffreysiana</i> (Brosina, 1869)	+		ECP	ECPWM											
<i>Vitreolina curva</i> (Monterosato, 1874)	+	+	ECP	ECPWM											
<i>Vitreolina incurva</i> (Bucquoy, Dautzenberg & Dollfus, 1883)	+	+	ECP	ECPWM											
<i>Vitreolina perminima</i> (Jeffreys, 1883)	+		ECP	ECPWM											
<i>Vitreolina philippi</i> (de Rayneval & Ponzi, 1854)	+	+	ECP	ECPWM											
LITTORINIDAE Children, 1834															
<i>Melarhaphe neritoides</i> (Linnaeus, 1758)	+	+	HME	ECPWM											
CINGULOPSIDAE Fretter & Patil, 1958											1				1
<i>Eatonina fulgida</i> (J. Adams, 1797)		+	EVS	MH											
RISSOIDAE Gray, 1847											53	49	28	24	4
<i>Alvania aartseni</i> Verduin, 1986		+	EVS	MH	+										
<i>Alvania amatii</i> Oliverio, 1986	+		EVS	MH											
<i>Alvania aspera</i> (Philippi, 1844)	+		EVS	MH											
<i>Alvania beanii</i> (Hanley in Thorpe, 1844)	+		EVS	MH											
<i>Alvania cancellata</i> (da Costa, 1778)	+		EVS	MH											
<i>Alvania carinata</i> (da Costa, 1778)	+	+	EVS	MH											
<i>Alvania cimex</i> (Linnaeus, 1758)	+		EVS	MH											
<i>Alvania cimicoides</i> (Forbes, 1844)	+		EVS	MH											
<i>Alvania discors</i> (T. Brown, 1818)	+	+	EVS	MH											
<i>Alvania dorbignyi</i> (Audouin, 1826)	+		EVS	MH											
<i>Alvania geryonia</i> (Nardo, 1847)	+		EVS	MH											
<i>Alvania hispidula</i> (Monterosato, 1884)	+		EVS	MH											
<i>Alvania josefoi</i> Oliver & Templado, 2009	+		EVS	MH	+										
<i>Alvania lactea</i> (Michaud, 1830)	+		EVS	MH											
<i>Alvania lanceolata</i> (Calcar, 1845)	+		EVS	MH											
<i>Alvania lineata</i> Risso, 1826	+	+	EVS	MH											
<i>Alvania mamillata</i> Risso, 1826	+	+	EVS	MH											
<i>Alvania punctura</i> (Montagu, 1803)	+		EVS	MH											
<i>Alvania rudis</i> (Philippi, 1844)	+		EVS	MH											
<i>Alvania saracula</i> Granata-Grillo, 1877	+		EVS	MH											
<i>Alvania subcrenulata</i> (Bucquoy, Dautzenberg & Dollfus, 1884)	+		EVS	MH											
<i>Alvania testae</i> (Aradas & Maggiore, 1844)	+		EVS	MH											
<i>Alvania zetlantica</i> (Montagu, 1815)	+		EVS	MH											
<i>Crisilla semistriata</i> (Montagu, 1808)	+	+	EVS	MH											
<i>Manzonella crassa</i> (Kannmacher, 1798)	+	+	EVS	MH											
<i>Obtusella intersecta</i> (S. Wood, 1857)	+	+	EVS	MH											
<i>Obtusella macilenta</i> (Monterosato, 1880)	+	+	EVS	MH											
<i>Pusillina inconspicua</i> (Alder, 1844)	+	+	EVS	MH											
<i>Pusillina lineolata</i> (Michaud, 1830)	+	+	EVS	MH											
<i>Pusillina marginata</i> (Michaud, 1830)	+	+	EVS	MH											
<i>Pusillina philippi</i> (Aradas & Maggiore, 1844)	+	+	EVS	MH											
<i>Pusillina radiata</i> (Philippi, 1836)	+	+	EVS	MH											
<i>Rissoa aartseni</i> Verduin, 1985	+	+	EVS	MH											
<i>Rissoa auriscalpium</i> (Linnaeus, 1758)	+	+	EVS	MH											
<i>Rissoa electrae</i> Manousis, 2019	+	+	EVS	MH	+										
<i>Rissoa gemmula</i> P. Fischer in de Folin, 1869	+	+	EVS	MH											
<i>Rissoa guerini</i> Récluz, 1843	+		EVS	MH											
<i>Rissoa italiensis</i> Verduin, 1985	+		EVS	MH	+										
<i>Rissoa janusi</i> (Nordsieck, 1972)	+		EVS	MH	+										
<i>Rissoa ilacina</i> Récluz, 1843	+		EVS	MH	+										
<i>Rissoa membranacea</i> (J. Adams, 1800)	+	+	EVS	MH											
<i>Rissoa monodonta</i> Philippi, 1836	+	+	EVS	MH											
<i>Rissoa scurra</i> (Monterosato, 1917)	+		EVS	MH											
<i>Rissoa similis</i> Scacchi, 1836	+	+	EVS	MH											
<i>Rissoa splendida</i> Eichwald, 1830	+	+	EVS	MH											
<i>Rissoa ventricosa</i> Desmarest, 1814	+	+	EVS	MH											
<i>Rissoa violacea</i> Desmarest, 1814	+	+	EVS	MH	+										
<i>Setia bruggeni</i> (Verduin, 1984)	+	+	EVS	MH											
<i>Setia fusca</i> (Philippi, 1841)	+		EVS	MH	+										
<i>Setia lacourti</i> (Verduin, 1984)	+		EVS	MH											
<i>Setia scillae</i> (Aradas & Benoit, 1876)	+	+	EVS	MH	+										
<i>Setia turriculata</i> Monterosato, 1884	+	+	EVS	MH											
<i>Voorwindia tiberiana</i> (Issel, 1869)	+	+	EVS	MH											
RISSOINIDAE Stimpson, 1865															
<i>Rissoina bruguieri</i> (Payraudeau, 1826)	+	+	EVS	MH											
ANABATHRIDAE Keen, 1971															
<i>Nodulus cantortus</i> (Jeffreys, 1856)	+		EVS	MH											
CAECIDAE Gray, 1850															
<i>Caecum auriculatum</i> de Folin, 1868	+	+	EVS	MH											
<i>Caecum subannulatum</i> de Folin, 1870	+	+	EVS	MH											

	Number of families										Number of species				
	Area A-B	Plot X	Micro Habitat Preferential Substrate	Feeding Guild Trophic Group	GI	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Caecum trachea</i> (Montagu, 1803)	+	+	EVS	MH											
<i>Parastrophia asturlana</i> de Folin, 1870		+	EVS	MH											
COCHLIOPIDAE Tryon, 1866															1
<i>Eupaludestrina stagnorum</i> (Gmelin, 1791)		+	EVS	MH											
HYDROBII Stimpson, 1865											5	2	5	2	3
<i>Ecrabia maritima</i> (Müllerschewitsch, 1916)		+	EVS	MH											
<i>Ecrabia ventrosa</i> (Montagu, 1803)	+	+	EVS	MH											
<i>Hydrobia acuta</i> (Draparnaud, 1805)	+	+	EVS	MH											
<i>Hydrobia acuta neglecta</i> Muus, 1963		+	EVS	MH											
<i>Hydrobia glyca</i> (Servain, 1880)		+	EVS	MH											
IRAVADII Thiele, 1928															
<i>Ceratia proxima</i> (Forbes & Hanley, 1850)	+		EVS	MH											
<i>Hyala vitrea</i> (Montagu, 1803)	+		EVS	MH											
TORNIDAE Sacco, 1896															
<i>Circulus striatus</i> (Philippi, 1836)	+		EVS	MH											
<i>Tornus subcarinatus</i> (Montagu, 1803)	+	+	EVS	MH											
TRUNCATELLIDAE Gray, 1840															
<i>Truncatella subcylindrica</i> (Linnaeus, 1767)	+	+	EVS	MH											
VERMETIDAE Rafinesque, 1815															
<i>Dendropoma anguliferum</i> (Monterosato, 1878)	+		HBE	FF											
<i>Thylacodes arenarius</i> (Linnaeus, 1758)	+		HBE	FF											
<i>Thylacodes inopertus</i> (Leuckart, 1830)	+		HBE	FF											
<i>Thylacodius rugulosus</i> (Monterosato, 1878)	+		HBE	FF											
<i>Thylacodius semisurrectus</i> (Bivona-Bernardi, 1832)	+		HBE	FF											
<i>Vermetus granulatus</i> (Gravenhorst, 1831)	+		HBE	FF											
<i>Vermetus triquetus</i> Bivona-Bernardi, 1832	+		HBE	FF											
APORRHAIIDAE Gray, 1850															
<i>Aporrhais pespelecani</i> (Linnaeus, 1758)	+		SBE	FF											
CALYPTRAEIDAE Lamarck, 1809															
<i>Crepidula fornicata</i> (Linnaeus, 1758)	+		SBE	FF											
<i>Crepidula moulinsii</i> Michaud, 1829	+		SBE	FF											
<i>Crepidula unguiformis</i> Lamarck, 1822	+		SBE	FF											
CAPULIDAE Fleming, 1822															
<i>Capulus ungaricus</i> (Linnaeus, 1758)	+		SBE	FF											
VELUTINIDAE Gray, 1840															
<i>Lamellaria latens</i> (O. F. Müller, 1776)	+		PBSB	CMP	+										
<i>Lamellaria perspicua</i> (Linnaeus, 1758)	+		PBSB	CMP											
CYPRAEIDAE Rafinesque, 1815															
<i>Luria lurida</i> (Linnaeus, 1758)	+	+	HBE	ECPWM											
<i>Naria spurca</i> (Linnaeus, 1758)	+	+	HBE	ECPWM											
<i>Zonaria pyrum</i> (Gmelin, 1791)	+		HBE	ECPWM											
ERATOIDAE Gill, 1871															
<i>Erato voluta</i> (Montagu, 1803)	+		HBE	ECPWM											
OVULIDAE Fleming, 1822															
<i>Simnia spelta</i> (Linnaeus, 1758)	+		HBE	ECPWM											
NATICIDAE Guilding, 1834															
<i>Euspira fusca</i> (Blainville, 1825)	+		PBSB	CMP											
<i>Euspira guilleminii</i> (Payraudeau, 1826)	+	+	PBSB	CMP											
<i>Euspira intricata</i> (Donovan, 1804)	+	+	PBSB	CMP											
<i>Euspira macilenta</i> (Philippi, 1844)	+	+	PBSB	CMP											
<i>Euspira nitida</i> (Donovan, 1804)	+	+	PBSB	CMP											
<i>Notocochlis dillwynii</i> (Payraudeau, 1826)	+		PBSB	CMP											
<i>Sinum bifasciatum</i> (Récluz, 1851)	+		PBSB	CMP											
<i>Tectonatica sagralana</i> (d'Orbigny, 1842)	+		PBSB	CMP											
TONNIDAE Suter, 1913															
<i>Tonna galea</i> (Linnaeus, 1758)	+		SBE	CMP											
CASSIDAE Latreille, 1825															
<i>Galeodea echinophora</i> (Linnaeus, 1758)	+		SBE	CMP											
<i>Galeodea rugosa</i> (Linnaeus, 1771)	+		SBE	CMP											
PTEROTRACHEIDAE Rafinesque, 1814															
<i>Firolaidea desmarestii</i> Lesueur, 1817	+		P	CMP											
ATLANTIDAE Rang, 1829															
<i>Protatlanta souleyetii</i> (E. A. Smith, 1888)	+		P	CMP											
MURICIDAE Rafinesque, 1815															1
<i>Bolinus brandaris</i> (Linnaeus, 1758)	+	+	SBE	CMP											
<i>Hexaplex trunculus</i> (Linnaeus, 1758)	+	+	SBE	CMP											
<i>Murexsul cevikeri</i> (Houart, 2000)	+		SBE	CMP											
<i>Muricopsis cristata</i> (Brocchi, 1814)	+	+	SBE	CMP											
<i>Nucella lapillus</i> (Linnaeus, 1758)	+		SBE	CMP	+										
<i>Ocenebra edwardsii</i> (Payraudeau, 1826)	+		SBE	CMP											
<i>Ocenebra erinaceus</i> (Linnaeus, 1758)	+		SBE	CMP											
<i>Ocenebra aciculata</i> (Lamarck, 1822)		+	SBE	CMP											
<i>Stramonita haemastoma</i> (Linnaeus, 1767)	+	+	SBE	CMP											
<i>Trophonopsis muricata</i> (Montagu, 1803)	+		SBE	CMP											
<i>Typhinellus labiatus</i> (de Cristofori & Jan, 1832)	+	+	SBE	CMP											
CORALLIOPHILIDAE Chenu, 1859															
<i>Babelomurex cariniferus</i> (Sowerby, 1834)	+		HBE	CMP											
<i>Coralliophila meyendorffii</i> (Calcar, 1845)	+		HBE	CMP											
MARGINELLIDAE Fleming, 1828															
<i>Granulina marginata</i> (Bivona, 1832)	+	+	HBE	CMP											
MITRIDAE Swainson, 1829															1
<i>Episcomitra cornicula</i> (Linnaeus, 1758)		+	EVS	CMP											
COSTELLARIIDAE Mac Donald, 1860															
<i>Pusia ebenus</i> (Lamarck, 1811)	+		EVS	CMP											
<i>Pusia granum</i> (Forbes, 1844)	+	+	EVS	CMP											
BUCCINIDAE Rafinesque, 1815															
<i>Chauvetia procerula</i> (Monterosato, 1889)	+		EVS	CMP											
<i>Euthria comea</i> (Linnaeus, 1758)	+		EVS	CMP											
NASSARIIDAE Iredale, 1916											9	9	5	5	0
<i>Tritia cuvieri</i> (Payraudeau, 1826)	+		SBE	S											
<i>Tritia incassata</i> (Ström, 1768)	+	+	SBE	S											
<i>Tritia lima</i> (Dillwyn, 1817)	+		SBE	S											
<i>Tritia mutabilis</i> (Linnaeus, 1758)	+		SBE	S											
<i>Tritia neritea</i> (Linnaeus, 1758)	+		SBE	S											

	Area A-B	Plot X	Microhabitat Preferential Substrate	Feeding Guild Trophic Group	GI	Number of families					Number of species				
						Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Tritia nitida</i> (Jeffreys, 1867)	+	+	SBE	S											
<i>Tritia pellucida</i> (Risso, 1826)	+	+	SBE	S											
<i>Tritia reticulata</i> (Linnaeus, 1758)	+	+	SBE	S											
<i>Tritia varicosa</i> (W. Turton, 1825)	+	+	SBE	S											
PISANIIDAE Gray, 1857											5	4	3	2	1
<i>Aplous dorbignyi</i> (Payraudeau, 1826)	+	+	HBE	CMP											
<i>Aplous scaber</i> (Locard, 1891)	+		HBE	CMP											
<i>Aplous scacchianus</i> (Philippi, 1844)	+		HBE	CMP											
<i>Enginella leucazona</i> (Philippi, 1844)		+	HBE	CMP											
<i>Pisania striata</i> (Gmelin, 1791)	+		HBE	CMP											
COLUMBELLIDAE Swainson, 1840															
<i>Columbella rustica</i> (Linnaeus, 1758)	+	+	EVS	CMP											
<i>Mitrella scripta</i> (Linnaeus, 1758)	+		EVS	CMP											
FASCIOLARIIDAE Gray, 1853															
<i>Aptyxis syracusana</i> (Linnaeus, 1758)	+		SBE	CMP											
<i>Fusinus alternatus</i> Buzzurro & Russo, 2007	+		SBE	CMP											
<i>Fusinus dimitrii</i> Buzzurro & Ovals in Buzzurro & Russo, 2007	+		SBE	CMP											
<i>Fusinus parvulus</i> (Monterosato, 1884)	+		SBE	CMP											
<i>Fusinus pulchellus</i> (Philippi, 1840)	+		SBE	CMP											
<i>Fusinus rusticulus</i> (Monterosato, 1880)	+		SBE	CMP	+										
<i>Gracilipurpura rostrata</i> (Olivi, 1792)	+		SBE	CMP											
<i>Tarantinaea lignaria</i> (Linnaeus, 1758)	+		SBE	CMP											
BORSONIIDAE Bellardi, 1875															
<i>Drillula laprestiana</i> (Calcar, 1841)	+		SBE	CMP											
CLATHRELLIDAE H. Adams & A. Adams, 1858															
<i>Comarondia gracilis</i> (Montagu, 1803)	+		SBE	CMP											
CONIDAE Fleming, 1822															
<i>Conus ventricosus</i> Gmelin, 1791	+	+	SBE	CMP											
HORAICLAVIDAE Bouchet, Kantor, Sysoev & Puillandre, 2011															
<i>Haedropleura septangularis</i> (Montagu, 1803)	+	+	SBE	CMP											
MANGELIIDAE P. Fischer, 1883											22	19	15	12	3
<i>Bela cycladensis</i> (Reeve, 1845)	+		SBE	CMP											
<i>Bela decussata</i> (Locard, 1891)	+		SBE	CMP											
<i>Bela fuscata</i> (Deshayes, 1835)	+	+	SBE	CMP											
<i>Bela menkhursti</i> van Aartsen, 1988	+	+	SBE	CMP											
<i>Bela nebula</i> (Montagu, 1803)	+	+	SBE	CMP											
<i>Bela zonata</i> (Locard, 1891)	+	+	SBE	CMP											
<i>Mangella attenuata</i> (Montagu, 1803)	+	+	SBE	CMP											
<i>Mangella barashi</i> (van Aartsen & Fehr-de Wal, 1978)		+	SBE	CMP											
<i>Mangella callosa</i> (F. Nordsieck, 1977)	+	+	SBE	CMP											
<i>Mangella costata</i> (Pennant, 1777)	+		SBE	CMP											
<i>Mangella costulata</i> Risso, 1826	+	+	SBE	CMP											
<i>Mangella multilineolata</i> (Deshayes, 1835)		+	SBE	CMP											
<i>Mangella paciniana</i> (Calcar, 1839)	+	+	SBE	CMP											
<i>Mangella payraudeauti</i> (Deshayes, 1835)	+		SBE	CMP											
<i>Mangella scabrida</i> Monterosato, 1890	+		SBE	CMP											
<i>Mangella stasiana</i> Brusina, 1869	+	+	SBE	CMP											
<i>Mangella striolata</i> Risso, 1826		+	SBE	CMP											
<i>Mangella taeniata</i> (Deshayes, 1835)	+	+	SBE	CMP											
<i>Mangella tenuicostata</i> (Brugnone, 1862)	+		SBE	CMP											
<i>Mangella unifasciata</i> (Deshayes, 1835)	+	+	SBE	CMP											
<i>Mangella vaqueolini</i> (Payraudeau, 1826)	+	+	SBE	CMP											
<i>Sargenfriespira brachystoma</i> (Philippi, 1844)	+		SBE	CMP											
MITROMORPHIDAE T. L. Casey, 1904															
<i>Mitromorpha olivacea</i> (Cantraine, 1835)	+		SBE	CMP											
RAPHITOMIDAE Bellardi, 1875											16	16	2	2	0
<i>Clathromangella laiselleri</i> Oberling, 1970	+		HBE	CMP											
<i>Cyrtilla aequalis</i> (Jeffreys, 1867)	+		HBE	CMP											
<i>Cyrtilla linearis</i> (Montagu, 1803)	+	+	HBE	CMP											
<i>Leufroyia concinna</i> (Scacchi, 1836)	+		HBE	CMP											
<i>Leufroyia leufroyi</i> (Michaud, 1828)	+		HBE	CMP											
<i>Leufroyia villana</i> (Pusateri & Giannuzzi-Savelli, 2008)	+		HBE	CMP											
<i>Raphitoma bicolor</i> (Risso, 1826)	+		HBE	CMP											
<i>Raphitoma densa</i> (Monterosato, 1884)	+		HBE	CMP											
<i>Raphitoma echinata</i> (Brocchi, 1814)	+		HBE	CMP											
<i>Raphitoma laviae</i> (Philippi, 1844)	+		HBE	CMP											
<i>Raphitoma lineolata</i> (Bucquoy, Dautzenberg & Dollfus, 1883)	+		HBE	CMP											
<i>Raphitoma papillosa</i> (Pallary, 1904)	+		HBE	CMP											
<i>Raphitoma philberti</i> (Michaud, 1829)	+		HBE	CMP											
<i>Raphitoma smriglioi</i> Pusateri & Giannuzzi-Savelli, 2013	+	+	HBE	CMP											
<i>Raphitoma spadana</i> Pusateri & Giannuzzi-Savelli, 2012	+		HBE	CMP											
<i>Teretia teres</i> (Reeve, 1844)	+		HBE	CMP											
ARCHITECTONICIDAE Gray, 1850															
<i>Hellacius fallaciosus</i> (Tiberi, 1872)	+		EEP	ECPWM											
<i>Pseudotorinia architectae</i> (O. G. Costa, 1841)	+		EEP	ECPWM											
RISSOELLIDAE Gray, 1850											5	3	2	0	2
<i>Rissoella angelii</i> Manousis, 2021		+	EVS	MH	+										
<i>Rissoella diaphana</i> (Alder, 1848)	+		EVS	MH	+										
<i>Rissoella globularis</i> (Forbes & Hanley, 1853)		+	EVS	MH	+										
<i>Rissoella inflata</i> (Monterosato, 1880)	+		EVS	MH											
<i>Rissoella opalina</i> (Jeffreys, 1848)	+		EVS	MH	+										
OMALOGYRIDAE G. O. Sars, 1878											6	4	3	1	2
<i>Ammonicera fischeriana</i> (Monterosato, 1869)	+	+	EVS	MH											
<i>Ammonicera lignea</i> (Palazzi, 1988)	+		EVS	MH	+										
<i>Ammonicera rota</i> (Forbes & Hanley, 1850)	+		EVS	MH											
<i>Omalogyra atomus</i> (Philippi, 1841)		+	EVS	MH											
<i>Omalogyra disculus</i> Palazzi, 1988		+	EVS	MH	+										
<i>Retratortina fuscata</i> Chaster, 1896	+		EVS	MH	+										
XYLODISCULIDAE Warén, 1992															
<i>Xylodiscula lens</i> Warén, 1992	+		EVS	MH	+										
CORNIROSTRIDAE Ponder, 1980															
<i>Tamara depressa</i> (Granata-Grillo, 1877)	+	+	EVS	MH	+										
HYALOGYRINIDAE Warén & Bouchet, 1993															
<i>Hyalogyra zibrowii</i> Warén in Warén, Carrozza & Rocchini, 1997	+		EVS	MH											

							Number of families					Number of species				
	Area A-B	Plot X	Microhabitat Preferential Substrate	Feeding Guild Trophic Group	GI		Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Hyalogyrina amphorae</i> Warén, Carrozza & Rocchini, 1997	+		EVS	MH												
<i>Xenoskenoa pellucida</i> (Monterosato, 1874)	+	+	EVS	MH												
PYRAMIDELLIDAE Gray, 1840												64	54	41	31	10
<i>Brachystomia angusta</i> (Jeffreys, 1867)	+		EEP	ECPWM	+											
<i>Brachystomia eulimoides</i> (Hanley, 1844)	+	+	EEP	ECPWM												
<i>Brachystomia scalaris</i> (MacGillivray, 1843)	+	+	EEP	ECPWM												
<i>Doliella nitens</i> (Jeffreys, 1870)	+		EEP	ECPWM												
<i>Eulimella acicula</i> (Philippi, 1836)	+	+	EEP	ECPWM												
<i>Eulimella bogii</i> van Aartsen, 1994	+		EEP	ECPWM	+											
<i>Eulimella neotenuata</i> Gaglioli, 1992	+		EEP	ECPWM												
<i>Eulimella scillae</i> (Scacchi, 1835)	+		EEP	ECPWM												
<i>Eulimella ventricosa</i> (Forbes, 1844)		+	EEP	ECPWM												
<i>Euparthenia bulinea</i> (R. T. Lowe, 1841)	+		EEP	ECPWM												
<i>Euparthenia humboldti</i> (Risso, 1826)	+	+	EEP	ECPWM												
<i>Folinella excavata</i> (Philippi, 1836)	+	+	EEP	ECPWM												
<i>Folinella ghisolfi</i> van Aartsen, 1984	+		EEP	ECPWM												
<i>Liostomia clavula</i> (Lovén, 1846)		+	EEP	ECPWM												
<i>Megastomia canoidea</i> (Brocchi, 1814)	+	+	EEP	ECPWM												
<i>Megastomia conspicua</i> (Alder, 1850)	+		EEP	ECPWM												
<i>Odostomella dolium</i> (Philippi, 1844)	+	+	EEP	ECPWM												
<i>Odostomia acuta</i> Jeffreys, 1848	+	+	EEP	ECPWM												
<i>Odostomia lukisi</i> Jeffreys, 1859	+	+	EEP	ECPWM												
<i>Odostomia meyerlei</i> (Locard, 1886)		+	EEP	ECPWM	+											
<i>Odostomia nardo</i> Brusina, 1869	+		EEP	ECPWM												
<i>Odostomia plicata</i> (Montagu, 1803)	+	+	EEP	ECPWM												
<i>Odostomia schrami</i> van Aartsen, E. Gittenberger & Goud, 1998	+		EEP	ECPWM	+											
<i>Odostomia turriculata</i> Monterosato, 1869	+		EEP	ECPWM												
<i>Odostomia turrita</i> Hanley, 1844	+	+	EEP	ECPWM												
<i>Odostomia unidentata</i> (Montagu, 1803)	+	+	EEP	ECPWM												
<i>Odostomia</i> sp.		+	EEP	ECPWM	+											
<i>Ondina anceps</i> Gaglioli, 1992		+	EEP	ECPWM	+											
<i>Ondina crystallina</i> Locard, 1891		+	EEP	ECPWM	+											
<i>Ondina diaphana</i> (Jeffreys, 1848)	+		EEP	ECPWM	+											
<i>Ondina dilucida</i> (Monterosato, 1884)		+	EEP	ECPWM	+											
<i>Ondina divisa</i> (J. Adams, 1797)		+	EEP	ECPWM	+											
<i>Ondina neocrystallina</i> Gaglioli, 1992		+	EEP	ECPWM	+											
<i>Ondina vitrea</i> (Brusina, 1866)	+	+	EEP	ECPWM												
<i>Ondina warreni</i> (Thompson, 1845)	+	+	EEP	ECPWM												
<i>Parthenina clathrata</i> (Jeffreys, 1848)	+		EEP	ECPWM	+											
<i>Parthenina dantarti</i> (Peñas & Rolán, 2008)	+	+	EEP	ECPWM	+											
<i>Parthenina decussata</i> (Montagu, 1803)	+		EEP	ECPWM												
<i>Parthenina dollfusi</i> (Kobelt, 1903)	+	+	EEP	ECPWM												
<i>Parthenina emaciata</i> (Brusina, 1866)	+	+	EEP	ECPWM												
<i>Parthenina eximia</i> (Jeffreys, 1849)	+		EEP	ECPWM	+											
<i>Parthenina indistincta</i> (Montagu, 1808)	+	+	EEP	ECPWM												
<i>Parthenina interstincta</i> (J. Adams, 1797)	+	+	EEP	ECPWM												
<i>Parthenina juliae</i> (de Folin, 1872)	+		EEP	ECPWM												
<i>Parthenina manazona</i> (Brusina, 1869)		+	EEP	ECPWM												
<i>Parthenina monterosatii</i> (Clessin, 1900)	+		EEP	ECPWM												
<i>Parthenina multicostata</i> (Jeffreys, 1884)	+		EEP	ECPWM	+											
<i>Parthenina palazzii</i> (Micali, 1984)	+		EEP	ECPWM	+											
<i>Parthenina penchynoti</i> (Bucquoy, Dautzenberg & Dollfus, 1883)	+		EEP	ECPWM												
<i>Parthenina suturalis</i> (Philippi, 1844)		+	EEP	ECPWM												
<i>Parthenina terebellum</i> (Philippi, 1844)	+	+	EEP	ECPWM												
<i>Pyrgiscus crenatus</i> (Brown, 1827)	+		EEP	ECPWM	+											
<i>Pyrgiscus jeffreysii</i> (Jeffreys, 1848)		+	EEP	ECPWM												
<i>Pyrgiscus rufus</i> (Philippi, 1836)	+	+	EEP	ECPWM												
<i>Spiralinella incerta</i> (Milaschewich, 1916)	+	+	EEP	ECPWM												
<i>Spiralinella spiralis</i> (Montagu, 1803)	+	+	EEP	ECPWM	+											
<i>Tragula fenestrata</i> (Jeffreys, 1848)	+		EEP	ECPWM												
<i>Turbonilla acuta</i> (Donovan, 1804)	+		EEP	ECPWM												
<i>Turbonilla acutissima</i> Monterosato, 1884	+	+	EEP	ECPWM	+											
<i>Turbonilla gradata</i> Bucquoy, Dautzenberg & Dollfus, 1883		+	EEP	ECPWM												
<i>Turbonilla obliquata</i> (Philippi, 1844)		+	EEP	ECPWM												
<i>Turbonilla pusilla</i> (Philippi, 1844)	+	+	EEP	ECPWM												
<i>Turbonilla sinuosa</i> (Jeffreys, 1884)	+	+	EEP	ECPWM												
<i>Turbonilla subulina</i> Monterosato, 1889	+	+	EEP	ECPWM	+											
AMATHINIDAE Ponder, 1987																
<i>Clathrella clathrata</i> (Philippi, 1844)	+		EEP	ECPWM												
CIMIDAE Warén, 1993																
<i>Cima apicisbelli</i> Rolán, 2003	+		EEP	ECPWM	+											
<i>Cima cylindrica</i> (Jeffreys, 1856)	+	+	EEP	ECPWM	+											
<i>Cima minima</i> (Jeffreys, 1858)	+	+	EEP	ECPWM	+											
<i>Graphis albida</i> (Kanmacher, 1798)	+	+	EEP	ECPWM	+											
<i>Graphis barashi</i> van Aartsen, 2002	+	+	EEP	ECPWM	+											
MURCHISONELLIDAE Casey, 1904												6	5	5	4	1
<i>Ebala gradata</i> (Monterosato, 1878)	+	+	EEP	ECPWM	+											
<i>Ebala nitidissima</i> (Montagu, 1803)	+	+	EEP	ECPWM												
<i>Ebala pointeli</i> (de Folin, 1868)	+	+	EEP	ECPWM												
<i>Ebala striatula</i> (Jeffreys, 1856)		+	EEP	ECPWM												
<i>Murchisonella anabathron</i> (Hedley, 1906)	+		EEP	ECPWM	+											
<i>Murchisonella mediterranea</i> Peñas & Rolán, 2013	+	+	EEP	ECPWM												
ACTEONIDAE d'Orbigny, 1843																
<i>Acteon tomatis</i> (Linnaeus, 1758)	+	+	PBSB	CMP												
PLAKOBRANCHIDAE Gray, 1840												2	1	1	0	1
<i>Elysia nealae</i> Ostergaard, 1955	+		EVS	HME	+											
<i>Elysia viridis</i> (Montagu, 1804)		+	EVS	HME												
<i>Thuridilla hopei</i> (Vérany, 1853)		+	EVS	HME	+											
MNESTIIDAE Oskars, Bouchet & Malaquias, 2015																
<i>Mnestia girardi</i> (Audouin, 1826)	+		PBSB	CMP												
RETUSIDAE Thiele, 1925												11	8	8	5	3
<i>Retusa candidula</i> (Locard, 1891)		+	PBSB	CMP												
<i>Retusa crebriculpta</i> (Monterosato, 1884)	+	+	PBSB	CMP	+											
<i>Retusa laevisculpta</i> (Granata-Grillo, 1877)		+	PBSB	CMP	+											

							Number of families					Number of species				
	Area A-B	Plat X	Microhabitat Preferential Substrate	Feeding Guild Trophic Group	GI	Area A-B + X	Area A-B	Plat X	Plat X Common	Plat X Unique	Area A-B + X	Area A-B	Plat X	Plat X Common	Plat X Unique	
<i>Retusa leptoenilema</i> (Brusina, 1866)		+	PBSB	CMP												
<i>Retusa mamillata</i> (Philippi, 1836)	+	+	PBSB	CMP												
<i>Retusa minutissima</i> (Monterosato, 1878)	+	+	PBSB	CMP												
<i>Retusa nitidula</i> (Lovén, 1846)	+		PBSB	CMP	+											
<i>Retusa obtusa</i> (Montagu, 1803)	+		PBSB	CMP												
<i>Retusa tornata</i> (R. B. Watson, 1886)	+		PBSB	CMP	+											
<i>Retusa truncatula</i> (Bruguière, 1792)	+	+	PBSB	CMP												
<i>Retusa umbilicata</i> (Montagu, 1803)	+	+	PBSB	CMP												
RHIZORIDAE Dell, 1952																
<i>Volvulella acuminata</i> (Bruguière, 1792)	+	+	PBSB	CMP												
RINGICULIDAE Philippi, 1853																
<i>Ringicula auriculata</i> (Ménard de la Groye, 1811)	+		PBSB	CMP												
<i>Ringicula conformis</i> Monterosato, 1877	+		PBSB	CMP												
RUNCINIDAE H. Adams & A. Adams, 1854																
<i>Runcina adriatica</i> T. E. Thompson, 1980	+		EVS	HME	+											
BULLIDAE Gray, 1827																
<i>Bulla striata</i> Bruguière, 1792	+	+	PBSB	MH												
HAMINOEIDAE Pilsbry, 1895											9	5	8	4	4	
<i>Haloa japonica</i> (Pilsbry, 1895)	+		SBE	MH	+											
<i>Haminoea hydatis</i> (Linnaeus, 1758)	+	+	SBE	MH												
<i>Haminoea navicula</i> (da Costa, 1778)		+	SBE	MH												
<i>Haminoea orbignyana</i> (Férussac, 1822)		+	SBE	MH	+											
<i>Haminoea orteai</i> Talavera, Murillo & Templado, 1987		+	SBE	MH	+											
<i>Lamprohaminoea cyanomarginata</i> (Heller & T. E. Thompson, 1983)		+	SBE	MH												
<i>Roxaniella jeffreysi</i> (Weinkauff, 1866)	+	+	SBE	MH												
<i>Weinkauffia macandrewi</i> (E. A. Smith, 1872)	+	+	SBE	MH	+											
<i>Weinkauffia turgidula</i> (Forbes, 1844)	+	+	SBE	MH												
PHILINIDAE Gray, 1850											9	4	7	2	5	
<i>Hermania scabra</i> (O. F. Müller, 1784)	+		SBE	CMP												
<i>Philine angasi</i> (Crosse, 1865)		+	SBE	CMP	+											
<i>Philine catena</i> (Montagu, 1803)		+	SBE	CMP												
<i>Philine denticulata</i> (J. Adams, 1800)	+	+	SBE	CMP	+											
<i>Philine intricata</i> Monterosato, 1884		+	SBE	CMP	+											
<i>Philine iris</i> Tringali, 2001		+	SBE	CMP	+											
<i>Philine powelli</i> Rudman, 1970	+		SBE	CMP	+											
<i>Philine punctata</i> (J. Adams, 1800)		+	SBE	CMP	+											
<i>Philine quadripartita</i> Ascanius, 1772	+	+	SBE	CMP												
AGLAIIDAE Pilsbry, 1895											3	1	3	1	2	
<i>Biue fulvipunctata</i> (Baba, 1938)		+	SBE	CMP	+											
<i>Camachoagloja africana</i> (Pruvot-Fol, 1953)	+	+	SBE	CMP	+											
<i>Melanochlamys wildpreti</i> Ortea, Bacallado & Moro, 2003		+	SBE	CMP												
ALACUPPIDAE Oskars, Bouchet & Malaquias, 2015																
<i>Roxania monterosatoi</i> Dautzenberg & H. Fischer, 1896	+		SBE	CMP												
<i>Roxania utriculus</i> (Brocchi, 1814)	+		SBE	CMP												
CYLICHNIDAE H. Adams & A. Adams, 1854											2	1	2	1	1	
<i>Cylichna alba</i> (T. Brown, 1827)		+	SBE	CMP												
<i>Cylchna cylindracea</i> (Pennant, 1777)	+	+	SBE	CMP												
CLIIDAE Jeffreys, 1869																
<i>Clio pyramidata</i> Linnaeus, 1767	+		P	PF												
CRESEIDAE Rampal, 1973											3	0	3	0	3	
<i>Creseis clava</i> (Rang, 1828)		+	P	PF												
<i>Creseis virgula</i> (Rang, 1828)		+	P	PF												
<i>Styliola subula</i> (Quoy & Gaimard, 1827)		+	P	PF												
LIMACINIDAE Gray, 1840																
<i>Limacina trochiformis</i> (d'Orbigny, 1835)	+		P	PF												
CYMBULIIDAE Gray, 1840																
<i>Gleba cordata</i> Forsskål in Niebuhr, 1776	+		P	PF												
OXYNOIDAE Stoliczka, 1885																
<i>Lobiger serradifalci</i> (Calcar, 1840)	+	+	EVS	HME												
VOLVATELLIDAE Pilsbry, 1895											1	0	1	0	1	
<i>Ascobulla fragilis</i> (Jeffreys, 1856)		+	SBI	HME												
LIMAPONTIIDAE Gray, 1847											1	0	1	0	1	
<i>Calliopaea bellula</i> d'Orbigny, 1837		+	EVS	HME												
PLEUROBRANCHIDAE Gray, 1827											6	3	6	3	3	
<i>Berthella aurantiaca</i> (Risso, 1818)	+	+	SBE	ECPWM												
<i>Berthella ocellata</i> (Delle Chiaje, 1830)		+	SBE	ECPWM												
<i>Berthella plumula</i> (Montagu, 1803)		+	SBE	ECPWM	+											
<i>Berthella stellata</i> (Risso, 1826)	+	+	SBE	ECPWM												
<i>Berthellina edwardsii</i> (Vayssière, 1897)		+	SBE	ECPWM	+											
<i>Pleurobranchus membranaceus</i> (Montagu, 1816)	+	+	SBE	ECPWM												
HEDYLOPSIDAE Odhner, 1952																
<i>Hedylopsis spiculifera</i> (Kowalevsky, 1901)	+		SBI	ECPWM												
APLYSIIDAE Lamarck, 1809											7	4	4	1	3	
<i>Aplysia depilans</i> Gmelin, 1791	+		EVS	HME												
<i>Aplysia fasciata</i> Poiré, 1789	+	+	EVS	HME												
<i>Aplysia parvula</i> Mörch, 1863		+	EVS	HME												
<i>Aplysia punctata</i> (Cuvier, 1803)	+		EVS	HME												
<i>Bursatella leachi</i> Blainville, 1817	+		SBE	HME												
<i>Petalifera gravieri</i> (Vayssière, 1906)		+	EVS	HME	+											
<i>Petalifera petalifera</i> (Rang, 1828)		+	EVS	HME												
DORIDIDAE Rafinesque, 1815											2	1	1	0	1	
<i>Doris ocelligera</i> (Bergh, 1881)	+		HBE	CMP												
<i>Doris pseudoargus</i> Rapp, 1827		+	HBE	CMP												
CHROMODORIDIDAE Bergh, 1892											3	2	2	0	2	
<i>Felimare picta</i> (Schultz in Philippi, 1836)	+		HBE	ECPWM												
<i>Felimare villafranca</i> (Risso, 1818)		+	HBE	ECPWM												
<i>Felimida luteoargosa</i> (Rapp, 1827)	+		HBE	ECPWM												
DISCODORIDIDAE Bergh, 1891																
<i>Jorunna onubensis</i> Cervera, García-Gomez & García, 1986	+		HBE	ECPWM	+											
DENDRODORIDIDAE O'Donoghue, 1924											3	1	3	1	2	
<i>Dendrodoris grandiflora</i> (Rapp, 1827)		+	HBE	ECPWM												
<i>Dendrodoris herytra</i> Valdés & Ortea in Valdés, Ortea, Avila & Ballesteros, 1996		+	HBE	ECPWM	+											
<i>Dendrodoris limbata</i> (Cuvier, 1804)	+	+	HBE	ECPWM												
TRITONIIDAE Lamarck, 1809																

						Number of families					Number of species				
	Area A-B	Plot X	Micro Habitat Preference/ Substrate	Feeding Guild/Trophic Group	GI	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique	Area A-B + X	Area A-B	Plot X	Plot X Common	Plot X Unique
<i>Duvoucelia manicata</i> (Deshayes, 1853)	+		PBSB	ECPWM											
HANCOCKIIDAE MacFarland, 1923															
<i>Hancockia uncinata</i> (Hesse, 1872)	+		PBSB	ECPWM											
SCYLLAEIDAE Alder & Hancock, 1855											1	0	1	0	1
<i>Notobryon bijecurum</i> Baba, 1937		+		ECPWM	+										
TETHYDIDAE Rafinesque, 1815															
<i>Melibe viridis</i> (Kelaart, 1858)	+		PBSB	ECPWM											
AEOLIDIIDAE Gray, 1827															
<i>Berghia verrucicoma</i> (A. Costa, 1867)	+	+	HBE	ECPWM	+										
<i>Spurilla neapolitana</i> (Delle Chiaje, 1841)	+		HBE	ECPWM											
FACELINIDAE Bergh, 1889											2	1	1	0	1
<i>Cratena peregrina</i> (Gmelin, 1791)	+		HBE	ECPWM											
<i>Facelina annulicoma</i> (Chamisso & Eysenhardt, 1821)		+	HBE	ECPWM	+										
FLABELLINIDAE Bergh, 1889											1	0	1	0	1
<i>Edmundsella pedata</i> (Montagu, 1816)		+	HBE	ECPWM											
SIPHONARIIDAE Gray, 1827															
<i>Williamia gussoni</i> (O. G. Costa, 1829)	+	+	HBE	HME											
TRINCHESIIDAE F. Nordsieck, 1972															
<i>Trinchesia caerulea</i> (Montagu, 1804)	+		EVS	MH											
ELLOBIIDAE L. Pfeiffer, 1854											2	0	2	0	2
<i>Auriculinea bidentata</i> (Montagu, 1808)		+	EVS	MH											
<i>Ovatella firminii</i> (Payraudeau, 1827)		+	EVS	MH											
POLYPLACOPHORA						3	3	0	0	0	4	4	0	0	0
ACANTHOCHITONIDAE Pilsbry, 1893															
<i>Acanthochitona crinita</i> (Pennant, 1777)	+		HBE	MH											
<i>Acanthochitona fascicularis</i> (Linnaeus, 1767)	+		HBE	MH											
CALLOCHITONIDAE Plate, 1901															
<i>Callochiton septemvalvis</i> (Montagu, 1803)	+		HBE	MH											
CHITONIDAE Rafinesque, 1815															
<i>Rhyssoplax olivacea</i> Spengler, 1797	+		HBE	MH											
SCAPHOPODA						6	6	1	1	0	12	12	1	1	0
DENTALIIDAE Gray, 1847											7	6	1	0	1
<i>Antalis agilis</i> (M. Sars in G. O. Sars, 1872)		+	SBI	MH											
<i>Antalis dentalis</i> (Linnaeus, 1758)	+		SBI	MH											
<i>Antalis entalis</i> (Linnaeus, 1758)	+		SBI	MH											
<i>Antalis inaequicostata</i> (Dautzenberg, 1891)	+		SBI	MH											
<i>Antalis panorma</i> (Chenu, 1843)	+		SBI	MH											
<i>Antalis rassa</i> (Caprotti, 1966)	+		SBI	MH											
<i>Antalis vulgaris</i> (da Costa, 1778)	+		SBI	MH											
FUSTIARIIDAE Steiner, 1991															
<i>Fustiaria rubescens</i> (Deshayes, 1825)	+		SBI	MH											
GADILINIDAE Chistikov, 1975															
<i>Episiphon filum</i> (G. B. Sowerby II, 1860)	+		SBI	MH											
ENTALINIDAE Chistikov, 1979															
<i>Entalina tetragona</i> (Brocchi, 1814)	+		SBI	MH											
PULSELLIDAE Boss, 1982															
<i>Pulsellum lofotense</i> (M. Sars, 1865)	+		SBI	MH											
GADILIDAE Stoliczka, 1868															
<i>Cadulus jeffreysi</i> (Monterosato, 1875)	+		SBI	MH											

Micro habitat	DMB	EEP	EVS	HBE	HBI	P	PBSB	SBE	SBI
Number of species									
717									
Total in area A - plot X - B									
Total in area A-B	4 (0.5%)	118 (19%)	96 (15%)	104 (16.5%)	14 (2%)	5 (0.8%)	27 (4%)	125 (20%)	138 (22%)
Common in area A-B and plot X									
254									
Total in plot X									
339 (47% of 717)	1 (0.3%)	68 (20%)	65 (19%)	31 (9%)	2 (0.6%)	3 (0.9%)	16 (4.7%)	74 (22%)	79 (23.3%)
Unique in plot X									
86 (25% of 339)	0	12 (14%)	22 (25.6%)	9 (10.5%)	1 (1.2%)	3 (3.5%)	3 (3.5%)	23 (27%)	13 (15%)
DMB = Demensals that May Bury									
EEP = Epibionts and Ectoparasites									
EVS = Epifauna on Vegetated Substrates									
HBE = Hard Bottoms Epifauna									
HBI = Hard Bottoms Infauna									
P = Pelagic									
PBSB = Partly Buried in Soft Bottoms									
SBE = Soft Bottoms Epifauna									
SBI = Soft Bottoms Infauna									

Feeding Guild	CMP	DF	ECPWM	FF	HME	MH	PF	S	SBS	SFH
Number of species										
717										
Total in area A - plot X - B										
631	108 (17%)	29 (4.6%)	148 (23.5%)	176 (28%)	18 (2.9%)	132 (21%)	3 (0.5%)	9 (1.4%)	7 (1%)	1 (0.15%)
Total in area A-B										
254										
Common in area A-B and plot X										
339 (47% of 717)	58 (17%)	21 (6.2%)	85 (25%)	69 (20.4%)	9 (2.65%)	79 (23.3%)	0	5 (1.5%)	6 (1.8%)	1 (0.3%)
Total in plot X										
86 (25% of 339)	18 (21%)	2 (2.3%)	21 (24.5%)	14 (12.3%)	6 (7%)	22 (25.6%)	3 (3.5%)	0	0	0
Unique in plot X										
CMP = Carnivores on Mobile Preys										
DF = Deposit Feeders										
ECPWM = Ectoparasites + Carnivores on Preys Without Mobility										
FF = Filter Feeders										
HME = Herbivores of Macroalgae and Epiphytes										
MH = Microalgae Herbivores										
PF = Plankton Feeders										
S = Scavengers										
SBS = Symbionts Bearing Species										
SFH = Seagrass Feeding Herbivores										

The True Identity of *Gradiconus anabathrum* (Crosse, 1865).

David P. Berschauer
1385 12th Avenue NW, Cairo, Georgia 39828
shellcollection@hotmail.com

ABSTRACT *Gradiconus anabathrum* (Crosse, 1865) is determined to be a junior synonym of *Gradiconus scalaris* (Valenciennes, 1832). The synonymy with *Gradiconus floridanus* (Gabb, 1869) was in error and accordingly the name *Gradiconus floridanus* (Gabb, 1869) should be revived, and the ICZN should set aside the suppression of *G. floridanus* (Gabb, 1869) which is an endemic cone species found in the Suwannean Subprovince of the Carolinian Molluscan Province.

KEY WORDS *Gradiconus*, *G. anabathrum*, *G. floridanus*, *G. scalaris*, *G. maya*, Carolinian Molluscan Province, Suwannean Subprovince

INTRODUCTION

Conus anabathrum (Crosse, 1865) was a “lost species” for over one hundred years. Coomans *et al.* 1980 designated the type locality of *Conus anabathrum* to be “the coast of Florida” without any analysis or discussion whatsoever other than merely stating in their remarks section that “without a doubt the yellow coloured shell of *C. anabathrum* is conspecific with *Conus floridanus* Gabb, 1869 from Florida and the Bahamas.” This is taxonomy by decree and should be avoided as errors made in such pronouncements carry on into the literature.

At the time of the Coomans *et al.* 1980 manuscript *Conus floridanus* Gabb, 1869 was a well known species from the west coast of Florida, United States. Recognizing that this synonymy would disrupt nomenclature in the literature the authors stated: “For the stability of nomenclature it is, however, not to be recommended to change the well-known and established name of *Conus floridanus* into *C. anabathrum*, although the latter has four years priority. We consider *C. anabathrum* a senior synonym of *C. floridanus*. The status of *nomen oblitum* would be advisable for *C. anabathrum*.”

Without a ruling by the International Commission on Zoological Nomenclature to suppress the older name *Conus anabathrum* was required to be recognized as the proper name for the taxa. (International Code of Zoological Nomenclature, Article 23.1) Ultimately, in 1987 Walter Cernohorsky filed a petition with the International Commission on Zoological Nomenclature to suppress *anabathrum* in favor of *floridanus* (ICZN case 2563), and following the filing of an opposing comment by M.G. Harasewych and R.E. Petit, in 1989 the Commission issued a split decision denying the petition to suppress the name *anabathrum* in favor of *floridanus* (ICZN Opinion 1539). The ICZN opinion was based purely upon the legal grounds of the rule of priority, and no inquiry was made into whether in fact the synonymy was based on well reasoned analysis in the first place. Subsequent authors have followed and cited Coomans, without questioning, discussing or analyzing the morphology or biogeography of the two taxa in question (Vink, 1985; Vink, 1987; Tucker, 2010; Tucker & Tenorio, 2013; and Monnier *et al.*, 2018). None of these workers even considered the fact that the shell chosen as the holotype of *Conus anabathrum*

was collected by Hugh Cuming, a famous British naturalist who collected extensively in the Eastern Pacific from Mexico to Chile amassing over 30,000 specimens which were placed in the British Museum; Hugh Cuming did not collect any specimens from Florida or the Gulf of Mexico. (Dance, 1980)

Subsequently, *Conus anabathrum* was recognized as belonging in the genus *Gradiconus*. (Tucker & Tenorio, 2009; Tucker & Tenorio, 2013) Cone shells in the genus *Gradiconus* have a paucispiral protoconch and have lechithotrophic benthic development, *i.e.* they are direct developers with no planktonic larval stage. (Monnier *et al.*, 2018) Juveniles hatch directly from egg capsules and dispersal is limited to how far an individual can crawl in its lifetime within their habitat (Trovao, *et al.*, 1990; Duda & Rolan, 2005; Petuch & Myers, 2014). Accordingly, the synonymy of *Gradiconus anabathrum* (Crosse, 1865) and *Gradiconus floridanus* (Gabb, 1869) proposed by Crosse *et al.* 1980, did not make sense considering both the biogeography and the morphology of the shells.

SYSTEMATICS

Class **GASTROPODA**
Subclass **SORBECONCHA**
Order **PROSOBRANCHIA**
Infraorder **NEOGASTROPODA**
Superfamily **CONOIDEA**
Family **CONIDAE**
Subfamily **PUNCTICULIINAE**
Genus *Gradiconus* da Motta, 1991

Type species *Gradiconus gradatus* (Wood, 1828)

Original Description. “*T. elongato-turbinata*, laevis, pallide fulva, albo maculate; spira elongate, prominula, albo et fulvo variegata, arcuatim tenuissime striolata, apice obtusulo; sutra lineari; anfr. 9, embryonales albida, subrotundati, sequentes gradate, ultimus spirae longitudineum ter suerans, ad carunam et in parte media albo transversum maculatus, lineis transversis, interruptis, pallide castaneis, obscure cingulatus, versus basin sulcatus; apertura alba; labro ad suturatam sat valide emarginato. – Long. 28, diam. Maj. 12 millim.”

Description Translation. Shell elongate-turbinate, smooth, pale yellow, white-stained; spire elongate, prominent, white and yellow variegates, very finely striated arched, with a blunt tip; linear suture; whorls 9, embryonic whorls whitish, subrounded, following in a step, the body whorl three times the length of the spire, and in the middle part stained with a white transverse mark; aperture white; the lip to be sutured sufficiently strongly emarginate. Length 28, width 12 mm.

Type Material. The holotype is from the collection of Hugh Cuming and is maintained in the BMNH in London, England, and measures 28.3 mm in length and 13.0 mm in width.

Gradiconus anabathrum (Crosse, 1865)

(Plate 1, Fig. 1A, B)



Original engraving, 1865

Type Locality. Unknown.**Distribution.** Unknown.

Discussion. Crosse failed to designate a type locality, and accordingly this taxa was deemed a “lost species” for over one hundred years. Tomlin (1937) and Wagner & Abbott (1964) considered this taxa to be a variety of *Conus japonicus* Hwass in Bruguière, 1792 (another “lost species”, now treated as a *nomen dubium* and recognized as *Endemoconus spirophilis* Habe & Kosuge (1970) which is found in the Japonic an Indo-Malaysian Provinces from southern Japan to the Philippines). The taxa was largely ignored until Coomans *et al.* 1980 opined that *C. anabathrum* was synonymous with *Conus floridanus* Gabb, 1869, and no conchological or morphological analysis was mentioned by the authors.

Endemic Gradiconus Shells (Conidae) of the Carolinian Molluscan Province**Widespread Gulf of Mexico Fauna.**

Gradiconus largillierii (Kiener, 1847) Plate 3, Fig. A, B (Suwannean and Yucatanian Subprovinces)

Georgian Subprovince.

Gradiconus philippii (Kiener, 1847) Plate 2, Fig. E

Floridian Subprovince.

Gradiconus burryae (Clench, 1942) - Plate 3, Fig. G, H
Gradiconus mazzolii Petuch & Sargent, 2011 - Plate 3, Fig. C, D
Gradiconus patglicksteinae Petuch, 1987 - Plate 2, Fig. F
Gradiconus tranthami (Petuch, 1995) - Plate 2, Fig. G - I

Suwannean Subprovince.

Gradiconus floridanus (Gabb, 1869) - Plate 1, Fig. F-J, Plate 2, Fig. A

Gradiconus floridanus f. *floridensis* (Sowerby III, 1870) - Plate 2, Fig. B, C

Yucatanian Subprovince.

Gradiconus maya Petuch & Sargent, 2011 - Plate 3, Fig. E, F
Gradiconus sennattorum (Rehder & Abbott, 1951) - Plate 2, Fig. D

DISCUSSION

A comparison of the holotypes of *Gradiconus anabathrum* (Crosse, 1865) and *Gradiconus floridanus* (Gabb, 1869) reveals significant and important character differences. *G. anabathrum* has a scalariform spire, an elongated body with a narrow shoulder, the whorl tops are almost completely orange with occasional small white blotches, and the protoconch on the holotype is missing. (Plate 1, Figures A, B) By comparison *G. floridanus* has a fairly smooth slightly concave spire, a conical body with a moderately wide shoulder, the whorl tops are white with faint orange flammules, and the protoconch is a light pinkish-tan. (Plate 1, Figures F, G; see also recent specimens shown in Plate 1, Figures H-J) The morphological characters of these two shells are substantially different, and now forty years later it is impossible to determine on what rational basis Coomans found them to be conspecific. Further, it should be noted that *G. floridanus* is endemic to the west coast of Florida, in the Suwannean Subprovince of the Carolinian Molluscan Province, and is not found in the Bahamas as opined by Coomans. (Petuch & Berschauer, 2020)

A fresh look at the holotype *Gradiconus anabathrum* (Crosse, 1865) reveals that it has a scalariform spire reminiscent of a number of Eastern Pacific *Gradiconus* species. This makes logical sense considering that the type specimen was collected by Hugh Cuming, who collected extensively along the Eastern Pacific coast. (Dance, 1980) Until recently, *Gradiconus scalaris* (Valenciennes, 1832) was a poorly known and infrequently collected Eastern Pacific species, which was confused with a related taxa found further north in the Panamic Province. Another scalariform *Gradiconus* species with a higher and more scalariform spire was named in 1988 by da Motta, as *Gradiconus scalarissima* da Motta, 1988. It was at this point that *G. scalaris* was found to be distributed primarily from Costa Rica to Panama. (Tenorio, Tucker & Chaney, 2012) Although the holotype of *G. anabathrum* is a dead collected and beach worn specimen with a filed lip, it shares all of those same morphological characters with recent live collected specimens of *G. scalaris*. (see Plate 1, Figures C-E) Based upon the foregoing, *Gradiconus anabathrum* (Crosse, 1865) is determined to be a junior synonym of *Gradiconus scalaris* (Valenciennes, 1832), and its type locality is herein designated as off the west coast of Panama in the Eastern Pacific Molluscan Province. The synonymy with *Gradiconus floridanus* (Gabb, 1869) was in error, and accordingly the name *G. floridanus* (Gabb, 1869) should be revived and the ICZN Opinion 1539 set aside. *G. floridanus* (Gabb, 1869) is an endemic cone species found only in the Suwannean Subprovince of the Carolinian Molluscan Province.

Other findings.

Gradiconus floridanus (Gabb, 1869) is not found off the Yucatan Peninsula, Mexico, as previously reported by Vokes & Vokes, 1983, and that cone species is *Gradiconus maya* Petuch & Sargent, 2011 (Plate 3, Figures E, F), which is endemic to the Yucatanian Subprovince of the Carolinian Molluscan Province. Further, neither *G. floridanus* or *G. maya* are conspecific with *Gradiconus burryae* (Clench, 1942), which is a cone species endemic to the Floridian Subprovince of the Carolinian Molluscan Province. (Petuch & Berschauer, 2020)

ACKNOWLEDGMENTS

The author thanks Paul Callomon, Academy of Natural Sciences of Drexel University for cleaning and taking new photographs of the holotype of *Gradiconus floridanus* (Gabb, 1869). Further thanks are given to Paul Callomon, Bill Fenzan, Edward J. Petuch and Stephen Maxwell for discussions and assistance with this project. Thanks also to Eric Monnier, Loïc Limpalaër, Manuel Tenorio, Marcus Coltro, Anton Oleinik, Paul Kersten, Alexander Medvedev, and Bill Fenzan for the use of photos.

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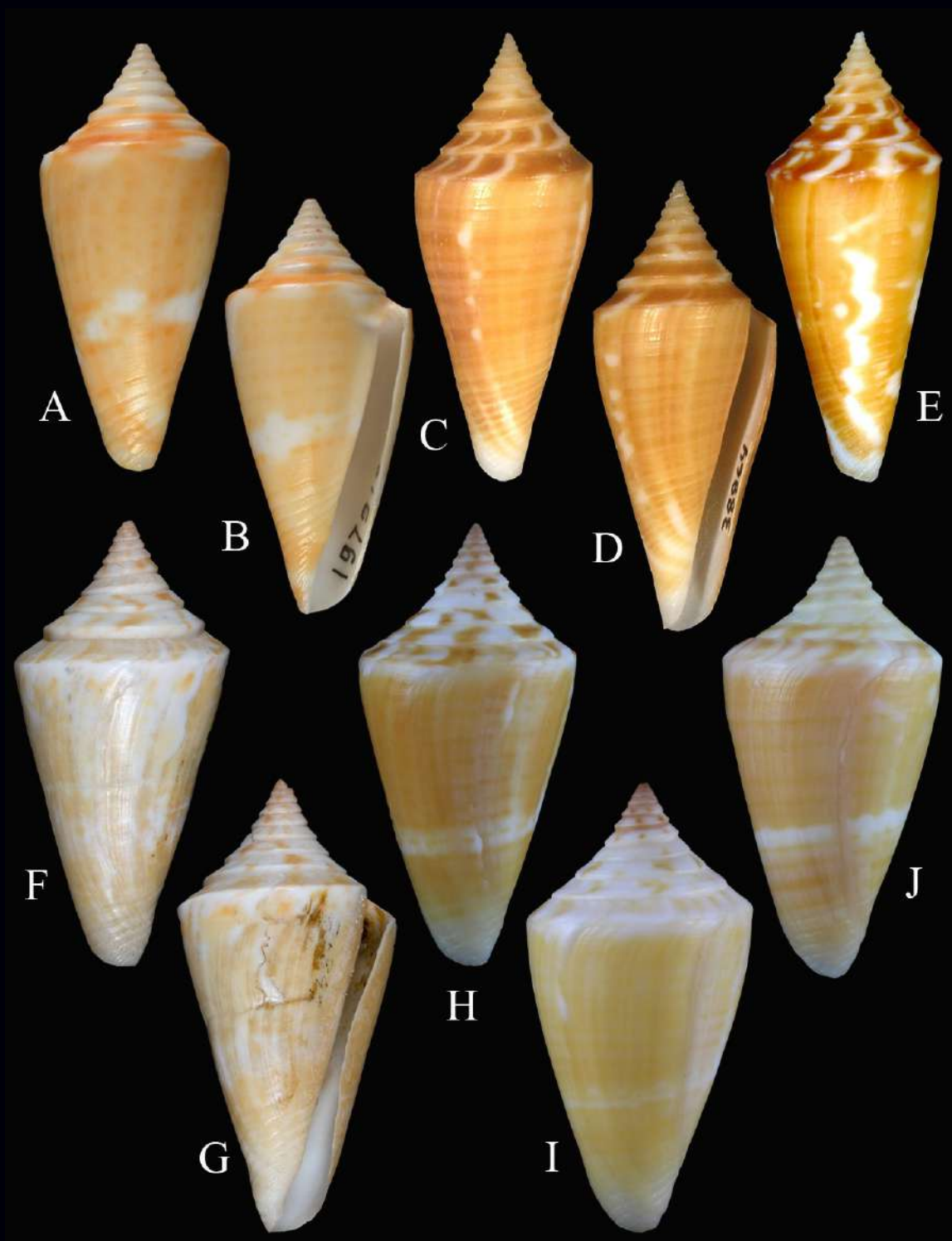


Plate 1. Comparison of *Gradiconus anabathrum*, *G. scalaris*, and *G. floridanus*. A, B = Holotype of *Gradiconus anabathrum* (Crosse, 1865) BMNH 1979182, locality unknown, length 28.5 mm; C, D = *Gradiconus scalaris* (Valenciennes, 1832), Antonio J. Montiero Collection, Isla Cebaco, Panama, 32.0 mm in length; E = *G. scalaris*, John Tucker Collection, Peninsula de Azuero, Panama, 29.8 mm in length; F, G = Holotype of *Gradiconus floridanus* (Gabb, 1869) ANSP 8097, Tampa Bay, Florida, USA, 48.0 mm in length; H - J = *G. floridanus*, dorsal views of three specimens from Marco Island, Florida, USA, Edward J. Petuch Collection, 39.0-42.0 mm in length.

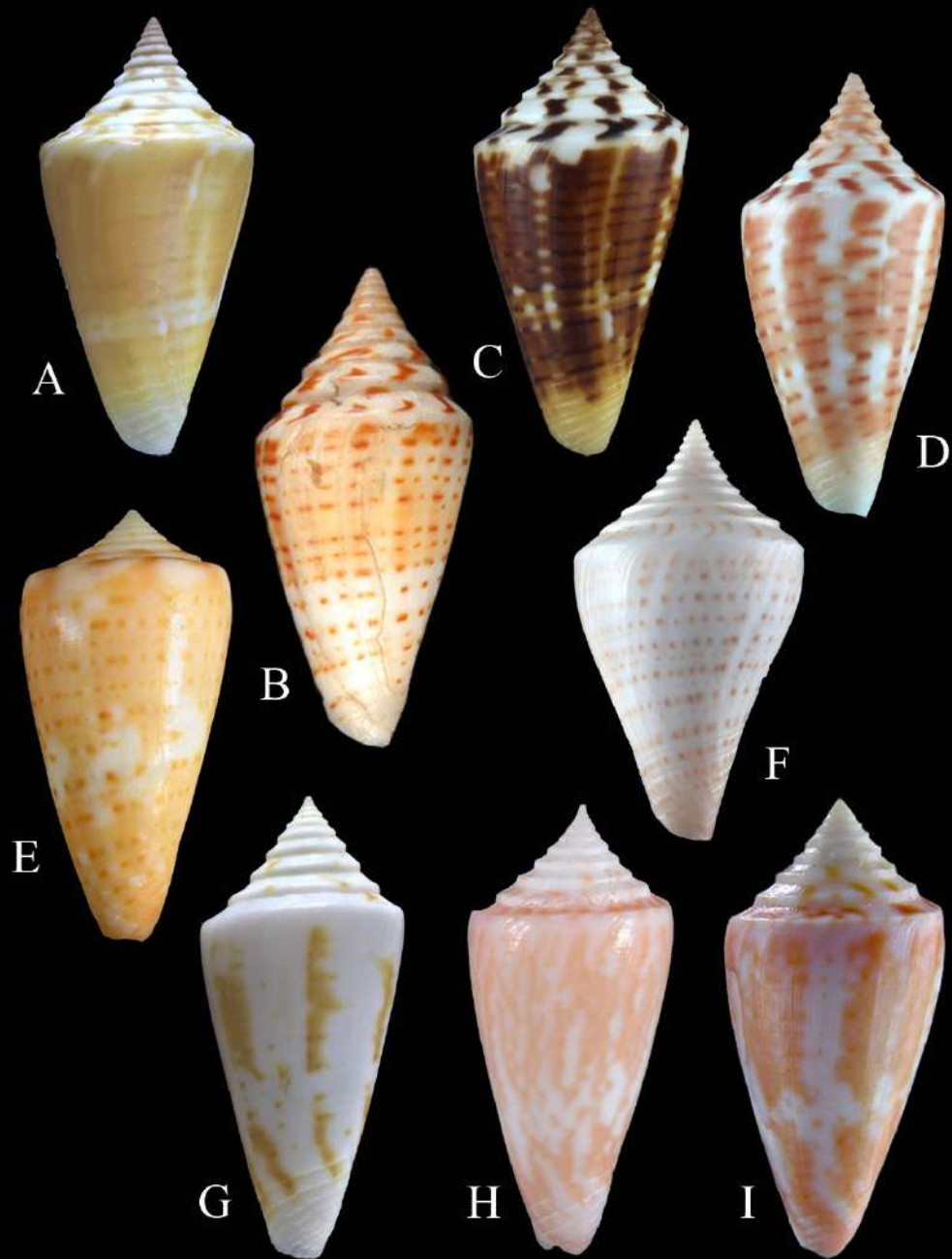


Plate 2. Comparison to other *Gradiconus* taxa. A = *Gradiconus floridanus* (Gabb, 1869), from Marco Island, Florida, USA, Edward J. Petuch Collection, 41.0 mm in length (shown for comparison to the form *floridensis*); B = Holotype of *Gradiconus floridanus* form *floridensis* (Sowerby III, 1870), BMNH 1874.12.11.282 Florida, USA, 42.5 mm in length; C = *G. floridanus* form *floridensis*, typical dark color form found in the Ten Thousand Islands, Camp Lulu Key, Florida, USA, Edward J. Petuch Collection, 42.0 mm in length; D = *Gradiconus philippi* (Kiener, 1847), Edward J. Petuch Collection, Beaufort, North Carolina, USA, 35.0 mm in length; E = Holotype of *Gradiconus patglicksteinae* Petuch, 1987, USMN 859880, Palm Beach Island, Palm Beach County, Florida, USA, 25.0 mm in length; F = *Gradiconus sennattorum* (Rehder & Abbott, 1951), Alacranes Reef, Yucatan, Mexico, Edward J. Petuch Collection, 35.0 mm in length; G = *Gradiconus tranthami* (Petuch, 1995), white color form with gold streaks, Edward J. Petuch Collection, Pickles Reef, Plantation Key, Florida, USA, 26.0 mm in length; H = Holotype of *G. antoni* (Cargile 2011), SBMNH 149822, Dry Tortugas, Florida, USA, a mottled pink color form of *G. tranthami*, 31.6 mm in length; I = *G. tranthami*, pink and orange mottled color form, Florida, USA, Alexander Medvedev, 30.9 mm in length.

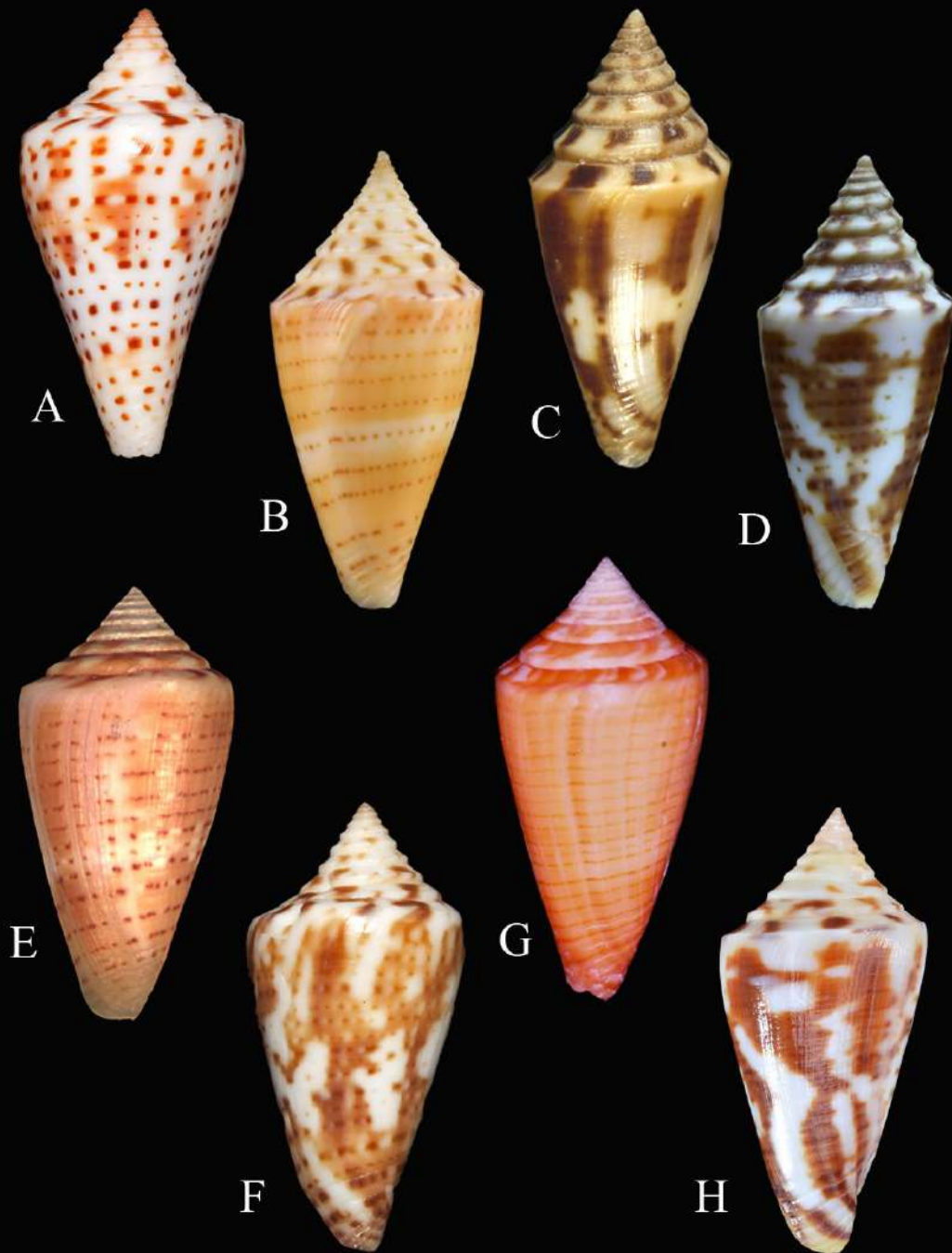


Plate 3. Comparison to other *Gradiconus* taxa. A = *Gradiconus largillierii* (Kiener, 1847), Panama City, Florida, USA, Edward J. Petuch Collection, 43.0 mm in length; B = *G. largillierii* (Kiener, 1847) orange color form, Dry Tortugas, Florida, USA, Edward J. Petuch Collection, 30.0 mm in length; C = Holotype of *Gradiconus mazzolii* Petuch & Sargent, 2011, LACM 3205, Little Torch Key, Florida, USA, 16.7 mm in length; D = *G. mazzolii*, Edward J. Petuch Collection, Middle Torch Key, Florida, USA, 21.0 mm in length; E = Holotype of *Gradiconus maya* Petuch & Sargent, 2011, LACM 3143, dark color form, Yucatan, Mexico, 27.9 mm in length; F = *G. maya*, pale color form, Laguna Yalahu, Isla Holbox, Quintana Roo, Mexico, Edward J. Petuch Collection, 28.0 mm in length; G = Holotype of *Gradiconus burryae* (Clench, 1942), MCZH 145296, Lower Matecumbe Key, Lower Florida Keys, USA, 34.5 mm in length; H = *G. burryae*, Missouri Key, Florida, USA, photo courtesy of Marcus Coltro, Femorale, Florida, USA, 35.2 mm in length.