Strombus
ISSN 1983-2214

Strombus 29(1-2), 8–15, 2025
https://strombusjournal.org

RESEARCH ARTICLE

Melongenid collection at the Science Museum of the University of Coimbra, Portugal

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Breves A., Rufino A.C., Abbate D., Simone L.R.L., Cunha C.M. (2025) Melongenid collection at the Science Museum of the University of Coimbra, Portugal. Strombus 29(1–2): 8–15.

Abstract: In the present study, we aim to register species of Melongenidae from various geographic localities housed in the Science Museum of the University of Coimbra. The collection comprises a total of 152 specimens across 21 lots, representing eight species from Venezuela, Brazil, Saint Helena, São Tomé and Príncipe, Senegal, Mozambique, Sri Lanka, India, the Philippines, and other regions. Specifically, 17 specimens were classified as *Pugilina tupiniquim*, with nine originating from the location labelled as "Brazil", donated in 1899 by Luís de Carvalho to the Coimbra Museum, and eight from "Ilha da Trindade". These specimens were presumably collected on Trindade Island, a Brazilian oceanic island located approximately 1,200 km east of the Brazilian coast, where no documented records of any Melongenidae species exist. The authenticity of this locality raises concerns, and further studies are necessary to clarify the provenance of these specimens and verify the accuracy of the associated data.

INTRODUCTION

Natural History Collections have increasingly gained recognition for their crucial role in documenting specimens, which are essential for the historical record of species occurrences and hold substantial value for ecological studies (Salvador & Cunha 2020).

The Science Museum of the University of Coimbra houses one of the most important Mollusca collections in Portugal. It is likely the oldest and largest collection in the country, comprising an estimated hundreds of thousands of specimens donated by naturalists, researchers, and collaborators from the 18th century to the present day (Breves et al. 2018). Its importance is further underscored by the destruction of almost the entire zoological collection of the National Museum in Lisbon following a fire in 1978 (Gamito-Marques 2022).

Article received on March 25 2025
Article accepted on June 30 2025

The origins of the Mollusca collection at the museum, like those of other natural history collections, date back to 1772 with the establishment of the Cabinet of Natural History by the Italian Domenico Agostino Vandelli (1735-1816). In 1774, shells from Goa (India) belonging to Joseph Rollem Van Deck (?-1773), were donated to the museum, and in 1775, Vandelli's private collection was purchased by the University of Coimbra (Casaleiro & Pereira 2018). The Mollusca collection expanded further through specimens donated or sold to the University of Coimbra and specimens collected during scientific expeditions to former Portuguese colonies during the Philosophical Journeys (Casaleiro & Pereira 2018). Over the years, it was enriched by incorporating several other notable collections, including those of D. Pedro V (1837-1861), Baron of Castelo de Paiva (1806-1879), Jacinto da Silva Mengo (1808-1866), Augusto Pereira Nobre (1865–1946), António Augusto Carvalho Monteiro (1848-1920), Luís de Carvalho (1839-1898), Gumerzindo Henriques da Silva (1926-1983), among others (Carvalho 1872; Ladeiro 1936; Carvalho 1945).

During the 1990s, the Mollusca collection was internally reorganized by the technician Esmeralda Bonifácio (1935-2014). The collection was structured based on the catalogues published by the University of Coimbra Press in 1916 (Ayres 1916) and 1936 (Ladeiro 1936) and classified by subcollections as follows: (1) "Coleção Geral-CG" (General Collection). This collection consists of a set of existing "exotic" shells (from locations around the world, excluding continental Portugal) that were incorporated into the Museum before the 20th century (Ayres 1916); (2) "Coleção Carvalho Monteiro-CM" (Carvalho Monteiro Collection). This collection comprises shells from the private collection of the Brazilian Portuguese António Augusto Carvalho Monteiro (1848-1920), which was donated to the Museum in 1932 by his son, Pedro Augusto de Melo de Carvalho Monteiro (Ladeiro 1936); (3) "Segue Carvalho Monteiro-SCM" (Segue Carvalho Monteiro Collection). This collection was named as such because the shells were not recognized to be part of the CG and CM collections, and it followed the taxonomic organization used in the catalogue of the latter collection.

THE MELONGENIDAE COLLECTION IN THE SCIENCE MUSEUM

In a process of dismantling a shell exhibition and preparing the Mollusca collections for new exhibitions at the Science Museum, we occasionally found specimens of Melongenidae gastropods from Brazil, which raised our interest in the species and their origins. We investigated and found that the Science Museum houses several specimens of this family from various localities and countries around the world across all the subcollections listed above.

The Melongenidae is a small family within the superfamily Buccinoidea, comprising just over 33 recent species (MolluscaBase 2025). Members of this family typically inhabit estuarine muddy substrates at river mouths, in shallow waters, and are occasionally found on rocks, stumps, and piers (Kosyan & Kantor 2004). A recent taxonomic review of *Pugilina* from the Atlantic was conducted by Abbate & Simone (2015). It was previously believed that only a single species of *Pugilina* inhabited both the eastern and western coasts of the Atlantic. However, based on the morphological characteristics of specimens examined in scientific collections, these authors described a new species from Brazil: *Pugulina tupiniquim* Abbate & Simone, 2015. This species is anatomically distinct from *Pugilina morio* (Linnaeus, 1758) from Western Africa. *Pugilina tupiniquim* is, so far, the only Brazilian melongenid species, distributed from the Caribbean Sea to the Brazilian coast.

Considering the historical relationship between Portugal and Brazil, it was decided to curate the melongenids to determine whether the newly described species was present in the museum collections. In this paper, we provide details of the melongenids houses in the Mollusca Collection of the Science Museum. The melongenid species found in the collections were characterized and

illustrated, and the associated data of the specimens were discussed, with a focus on those from inshore and offshore Brazilian waters.

MATERIAL AND METHODS

This work was carried out in 2021 within the Mollusca Collection of the Science Museum. We surveyed all the melongenids in the subcollections CG, CM, and SCM. The specimens, consisting solely of dry shells, were stored in dozens of stacked boxes within the Malacology technical reserve in the Science Museum. A curation process was conducted by the staff of the museum for three consecutive months to manage and preserve the historical specimens/lots of melongenids. All specimens were subjected to a superficial cleaning of the shell using a damp, clean cloth, without applying any chemical product, and their containers (typically acrylic or metal boxes) were replaced with new acrylic boxes. The aged cotton used in the 1990s was substituted with synthetic, acid-free materials to ensure proper accommodation and long-term preservation of the shells. Data associated with the specimens were retrieved from original labels, including their scientific names, countries of origin, former inventory numbers, and donor information (when available).

For this work, each specimen/lot was assigned a new inventory number. This was a directive from the museum's management to determine the extent of the collections and standardize the inventory number of the Zoology collection in general, among others. The labels were standardized alongside the original ones, including information on the collections (former inventory number, donor, and locality, when available). A taxonomic revision of the specimens was conducted to confirm, correct and update the scientific name as necessary. Images of all shells were captured in a standardized set of views, and the data for each lot was digitized. The catalogues by Ayres (1916) and Ladeiro (1936) were consulted to compare the current associated data of the specimens from the CG and CM collections, respectively.

RESULTS

The Melongenidae collection at the Science Museum consists of 152 specimens distributed across 21 lots (Table 1), representing eight distinct species (Fig. 1). The CG collection contains the largest number of specimens (n = 96), many of which include locality data and, in some cases, details regarding the donor and donation date (Table 1). The CM collection comprises 56 specimens, while the SCM collection includes two specimens. For the latter two collections, the specimens lack associated locality information (Table 1).

Sixty-seven specimens from the CG collection and 14 from the CM were originally identified as *Melongena morio*. Specimens in the CG collection were associated with various localities based on information from their original labels and catalogue numbers, as follows: “Brazil” (presumably from the Brazilian coast; ZOO.0006616; n = 9); “Ilha da Trindade” (presumably Trindade Island, off the coast of Brazil; ZOO.0012534; n = 8); “S. Thomé” (presumably São Tomé Island in the Democratic Republic of São Tomé and Príncipe; ZOO.0005522; n = 5); Senegal (ZOO.0012622; n = 33); and “Ceilão” (the historical name for Sri Lanka in the Indian Ocean; ZOO.0012623; n = 12).

Specimens from Brazilian inshore and offshore waters were reidentified as *Pugilina tupiniquim*. This reidentification included nine specimens of *P. tupiniquim*, which are known to have originated from Brazil and were donated to the Museum in Coimbra in 1899 by Luís de Carvalho, as well as eight

specimens that were purportedly collected on Trindade Island (Table 1). Specimens from Senegal, São Tomé, and Ceilão had their names updated to *P. morio* (Table 1).

Four specimens of *Melongena melongena* (Linnaeus, 1758) from the CG subcollection were identified as originating from India (ZOO.0012624) (Table 1). Three specimens of *M. patula* (Broderip & G. B. Sowerby I, 1829) in the CG subcollection were recorded from Bahía de Carracas (ZOO.0011438; ZOO.0011445). Additionally, five specimens of *M. patula* in the CM subcollection were noted to have an unknown locality.

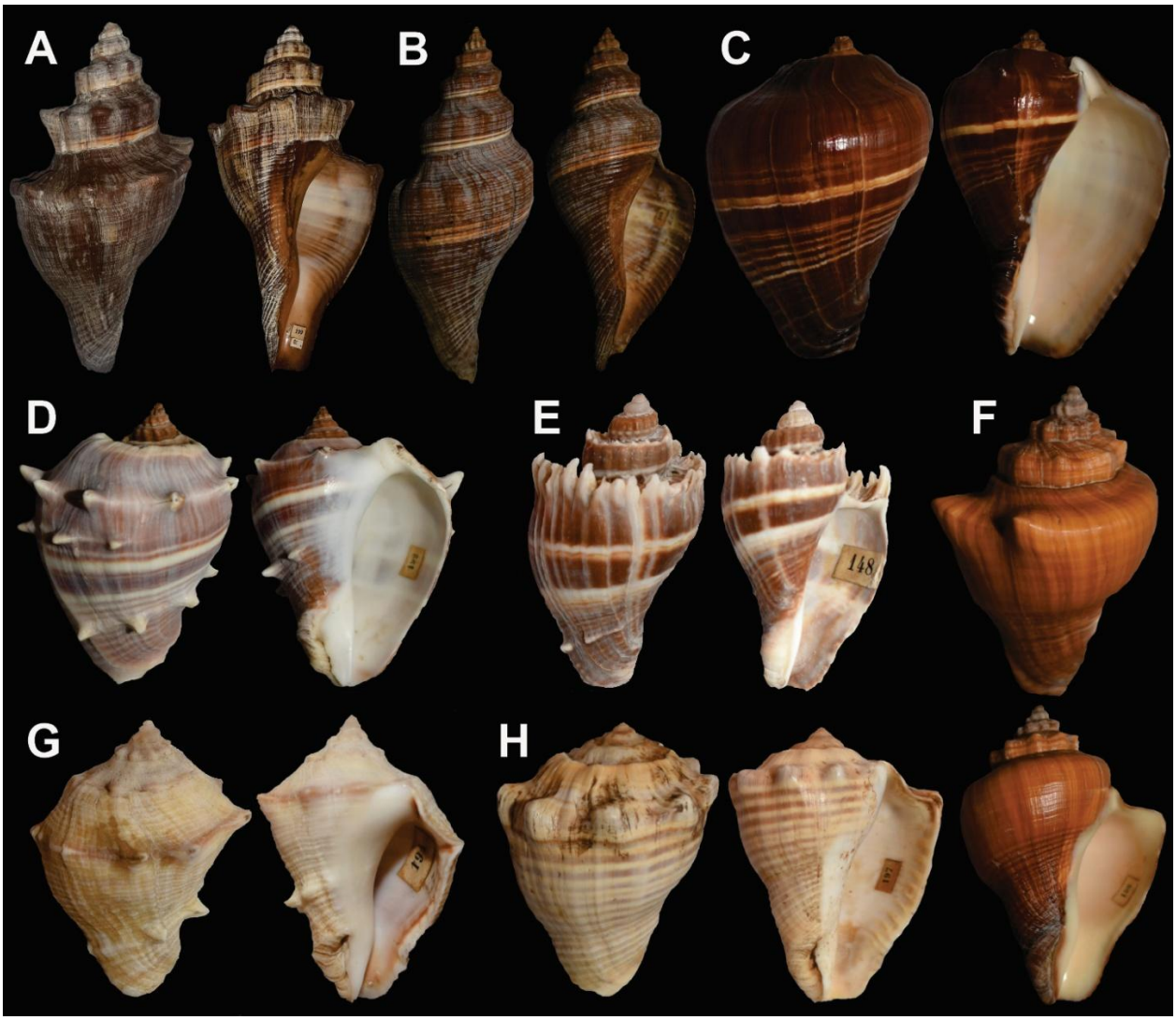

Figure 1. Dorsal and apertural view of the shells of species of Melongenidae in the Science Museum of the University of Coimbra: (A) *Pugilina tupiniquim* from "Ilha da Trindade" (ZOO.0012534; L 158 mm); (B) *P. morio* from "São Tomé" (ZOO.0005522; L 142 mm); (C) *Melongena patula* from "Bahia de Carracas" (ZOO.0011438; L 89 mm); (D) *M. melongena* from India (ZOO.0012624; L 64 mm); (E) *M. corona* from unknown locality (ZOO.0004248; L 53 mm); (F) *Volegalea cochlidium* from "Mares Orientaes" (ZOO.0011446; L 73 mm); (G) *Volema myristica* from "Ceilão" (ZOO.0012626; L 38 mm); (H) *V. pyrum* from Mozambique (ZOO.0011386; L 62 mm).

Two specimens in the CG subcollection and 15 in the CM subcollection, originally identified as *Melongena cochlidium* (Linnaeus, 1758), were subsequently updated to *Volegalea cochlidium*. The specimens in the CG subcollection were recorded as originating from "Estreito de Torres"

(ZOO.0012628), while those in the CM subcollection had unknown localities (ZOO.0001888). Additionally, nine specimens in the CG subcollection, initially identified as *M. pugilina* (Born, 1778) from the "Eastern Seas" ("Mares Orientaes"; ZOO.0011446), and one specimen in the CM subcollection, identified as *M. bucephala* (Lamarck, 1822) with an unknown locality (ZOO.0001889), were also updated to *V. cochlidium*.

Table 1. Melongenidae collection housed in the Science Museum of the University of Coimbra (MCUC): list of taxa (accepted names), number of specimens in each lot (N), name of the subcollection and who and when offered (between brackets), the locality where the specimens were supposedly collected, their former catalogue number (n°), the historical catalogue as reference, and the inventory number at MCUC.

Taxa	N	Subcollection (donation)	Locality	n°	References	Inventory nr.
Melongena patula (Broderip & G.B. Sowerby I, 1829)	3	CG	Baia de Carracas	191	Ayres (1916)	ZOO.0011438, ZOO.0011445
Melongena melongena (Linnaeus, 1758)	4	CG	India	192	Ayres (1916)	ZOO.0012624
Volema myristica Röding, 1798	3	CG	Filipinas	194a	Ayres (1916)	ZOO.0012625
Volema myristica Röding, 1798	3	CG	Ceilão	194b	Ayres (1916)	ZOO.0012626
Volegalea cochlidium (Linnaeus, 1758)	9	CG	Mares Orientais	196	Ayres (1916)	ZOO.0011446
Volema pyrum (Gmelin, 1791)	5	CG	Moçambique	197	Ayres (1916)	ZOO.0011386
Volegalea cochlidium (Linnaeus, 1758)	2	CG	Ceilão	198b	Ayres (1916)	ZOO.0012628
Pugilina tupiniquim Abbate & Simone, 2015	8	CG	Ilha da Trindade	199a	Ayres (1916)	ZOO.0012534
Pugilina morio (Linnaeus, 1758)	33	CG	Senegal	199b	Ayres (1916)	ZOO.0012622
Pugilina morio (Linnaeus, 1758)	5	CG (A.F. Moller, 1885)	São Tomé	199c	Ayres (1916)	ZOO.0005522
Pugilina tupiniquim Abbate & Simone, 2015	9	CG (Luís de Carvalho, 1899)	Brazil	199d	Ayres (1916)	ZOO.0006616
Pugilina morio (Linnaeus, 1758)	12	CG	Ceilão (Sri Lanka)	199e	Ayres (1916)	ZOO.0012623
Melongena patula (Broderip & G. B. Sowerby I, 1829)	5	CM (Pedro Carvalho Monteiro, 1932)	-	147	Ladeiro (1936)	ZOO.0001885
Melongena corona (Gmelin, 1791)	2	CM (Pedro Carvalho Monteiro, 1932)	-	148	Ladeiro (1936)	ZOO.0004248
Volema myristica Röding, 1798	12	CM (Pedro Carvalho Monteiro, 1932)	-	149	Ladeiro (1936)	ZOO.0001886
Volegalea cochlidium (Linnaeus, 1758)	1	CM (Pedro Carvalho Monteiro, 1932)	-	150	Ladeiro (1936)	ZOO.0001887
Volema pyrum (Gmelin, 1791)	5	CM (Pedro Carvalho Monteiro, 1932)	-	151	Ladeiro (1936)	ZOO.0001890
Volegalea cochlidium (Linnaeus, 1758)	15	CM (Pedro Carvalho Monteiro, 1932)	-	152	Ladeiro (1936)	ZOO.0001888
Pugilina sp.	14	CM (Pedro Carvalho Monteiro, 1932)	-	153	Ladeiro (1936)	ZOO.0001889
Pugilina sp.	1	SCM	-		-	ZOO.0012903
Pugilina sp.	1	SCM	-	182	-	ZOO.0012904

Eighteen specimens, originally identified as *Melongena galeodes* (Lamarck, 1843), had their scientific name updated to *Volema myristica* Röding, 1798. Among these, three specimens in the CG subcollection were attributed to Ceilão (Sri Lanka; ZOO.0012626), and three to the Philippines (ZOO.0012625). The remaining 12 specimens, housed in the CM subcollection, had unknown localities (ZOO.0001886) (Table 1). Ten specimens, initially identified as *M. paradisiaca* (Röding, 1798), were updated to *V. pyrum* (Gmelin, 1791). Of these, five specimens in the CG subcollection were from Mozambique (ZOO.0011386), while the other five in the CM subcollection had unknown localities (ZOO.0001890) (Table 1).

The two specimens from the SCM subcollection were identified only to the genus level as *Pugilina* sp., and their localities were unknown (ZOO.0012903; ZOO.0012904) (Table 1).

DISCUSSION

The curatorial process plays a crucial role in ensuring the accessibility of the collection to a diverse range of potential users, including taxonomists, ecologists and researchers specializing in biodiversity studies.

The discovery of nine specimens of *Pugilina tupiniquim* is of great significance, as this species was described in 2015. This collection had been curated prior to 2015, and these shells may have previously been used, revealing that this species, although unrecognised at the time, had been present in collections since 1899. The nine specimens of *P. tupiniquim* were known to have been collected in Brazil by Luis de Carvalho.

According to Costa (2018), Luís de Carvalho, a Brazilian naturalist, bequeathed part of his collection to the University of Coimbra in his will. Following his death in 1898, his will was executed, and his collection was sent to Portugal. After being delayed in Lisbon customs for several months, the 12 cabinets containing Luis de Carvalho's collection, which included birds, reptiles, insects, molluscs and other natural curiosities, finally arrived at the Coimbra Museum in November 1899. Little information is available about Luís de Carvalho, apart from his family connection to his renowned cousin, António Augusto Carvalho Monteiro, and a reference to a visit he made to the University of Coimbra when he was still a minor.

Pugilina tupiniquim is the only Brazilian species of melongenid, found from the Caribbean to Brazil, spanning the states of Pará to Santa Catarina. The record from Trindade, a Brazilian oceanic island located about 1,200 Km east of the mainland, remains uncertain and warrants further investigation. There is another possibility that “Ilha da Trindade” refers to a district of Paraty in the southern region of Rio de Janeiro state. However, *P. tupiniquim* currently exhibits a distribution gap from Espírito Santo to Paraná, making its occurrence in that area improbable. Another possibility is that “Ilha da Trindade” refers to the present-day Trinidad and Tobago, which may have been historically named “Ilha da Trindade”. *P. tupiniquim* occurs in the South Caribbean.

The specimens were likely handled by different curators and assistants over time, which may explain potential issues with label mix-ups and inventory discrepancies in the past. For instance, specimens of *Melongena patula*, a species native to the North Pacific, were allegedly collected from Baia de Caracas, which is possibly in Curaçao. However, this is an error, and these specimens should be identified as *M. melongena* (Coomans, 1958). The geographic distribution of *M. melongena* is restricted to the Caribbean and North Atlantic coast; therefore, specimens identified as *M. melongena* but collected from the Red Sea, India and Indonesia must be erroneous.

The majority of the remaining Melongenidae species in the Science Museum's collection is from Asia and Africa, collected by unknown naturalists and with uncertain dates. Five specimens of

Pugilina morio are known to have been collected in 1885 from São Tomé (at that time a Portuguese colony) and were donated by Adolpho Frederico Möller (1842–1920), listed in the former catalogue and label as "A. F. Moller". This Portuguese naturalist was assigned by the Ministry of the Navy and Overseas Territories to a scientific expedition to the islands of São Tomé and Príncipe (Semedo et al. 2021). He spent three months collecting plants and animals in the islands. At the end of his mission, he donated a valuable collection that significantly enriched the university museum (Henriques 1924).

Although the Science Museum has been updating its infrastructure and has recently established new technical reserves for the Zoology Collection within the same building (College of Jesus) as part of the University of Coimbra's heritage conservation strategy, the subcollections CG, CM, and SCM remain housed in their original technical reserve, retaining their prior organizational structure as outlined here. In such cases, in the event of a future transfer of the collections, there is always the risk of loss or data mismanagement among the specimens, which require special attention.

CONCLUSION

The melongenid gastropod species collected from various localities around the world more than a century ago and housed for over a hundred years in the Museum of the University of Coimbra, highlight the significance of uncovering the historical heritage of natural history museums in Portugal. Additionally, the preservation and curation of these collections is crucial for obtaining complementary information about the species and their geographic distribution, provided that the associated data is carefully analysed and preserved.

This work is a representative example of the need to preserve scientific collections, with its positive or negative implications reflecting on the progression of science for future generations.

ACKNOWLEDGEMENTS

We thank Freedman Jan and Graham Oliver for their valuable comments and suggestions, which greatly contributed to improving this work. The first author acknowledges the support provided by the Portuguese System for Monitoring Bivalve Mollusc (SNMB MONIT V, reference MAR-021.1.3-FEAMPA-00017). The authors are grateful to the Project PRISC –Portuguese Research Infrastructure of Scientific Collections (POCI-01–0145-FEDER-022168) and to the Project PORBIOTA – Portuguese E-Infrastructure for Information and Research on Biodiversity). We thank the anonymous reviewers and the editors of Strombus for improving this paper.

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