

Catalogue of Cenozoic echinoid type specimens in the Geological Museum (Lisbon, Portugal)

Catálogo dos espécimes-tipo de equinoides cenozoicos do Museu Geológico (Lisboa, Portugal)

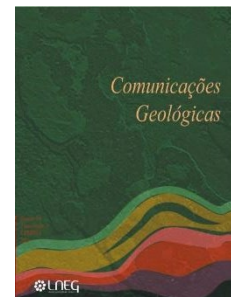
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Abstract: The present catalogue lists the Cenozoic echinoid type specimens housed in the collections of the Geological Museum (Lisbon, Portugal). This material comprises a total of 69 type specimens (seven holotypes, one paratype, 52 syntypes, two lectotypes, and seven paralectotypes) of fifteen Miocene species from Angola and Portugal. Additionally, it is considered that *Echinolampas* (*Echinolampas*) *maxima* de Loriol, 1896 is a valid species and *E. (E.) barcinensis* Lambert, 1907 is its junior synonym.

Keywords: Type specimens, Echinoidea, Miocene, Portugal, Angola.

Resumo: O presente catálogo enumera os espécimes-tipo de equinoides cenozoicos existentes nas coleções do Museu Geológico (Lisboa, Portugal). Este material compreende um total de 69 espécimes-tipo (sete holótipos, um parátipo, 52 sintipos, dois lectótipos e sete paralectótipos) de quinze espécies do Miocénico de Angola e de Portugal. Adicionalmente, considera-se que *Echinolampas* (*Echinolampas*) *maxima* de Loriol, 1896 é uma espécie válida e que *E. (E.) barcinensis* Lambert, 1907 é seu sinónimo mais recente.

Palavras-Chave: Espécimes-tipo, Echinoidea, Miocénico, Portugal, Angola.

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1. Introduction

The Geological Museum (Lisbon, Portugal) is part of the National Laboratory of Energy and Geology (LNEG) (former Portuguese Geological Survey, and the preceding organisms as the former Geological Commissions). Together with the LNEG's Litoteca (core store), it houses fossil specimens collected, in field works in Portugal and in the former Portuguese overseas, since the early second half of the 19th century. The type specimens are deposited in the Geological Museum (MG).

The fossil echinoid collection of the MG began to exist in the early days of the museum's foundation. The museum was founded in 1859 and the oldest known record of an echinoid deposited in its collections dates from 1861.

The ICZN (1999) recommendation 72F.4 states that institutions housing name-bearing type specimens or having them in possession or custody should publish lists of those types. Despite its long history and enormous quality of its fossil collections, the existing list of Cenozoic echinoids, used for the museum purposes, is here presented, organized, and published for the first time, with a complete compiled list of type specimens deposited in the MG.

2. Material and Methods

This catalogue includes all Cenozoic echinoid type material housed at the MG. This material was collected in Angola (Kwanza and Benguela Basins) and Portugal (Lower Tagus and Algarve basins). Even though echinoids were reported to occur in the Angolan Eocene (Dartevelle, 1953) and Neogene (Choffat, 1905; de Loriol, 1905; Fleury, 1923; Lambert, 1934; Caster, 1938; Dartevelle, 1953; Dartevelle and Roger, 1954; Gonçalves and Roman 1963; Gonçalves, 1971; Silva and Pereira, 2014; Pereira and Stara, 2017) and in the Portuguese Miocene (de Loriol, 1896; Ferreira, 1961; Ferreira, 1962; Kotchetoff *et al.*, 1975; Pereira, 2010, and many others) and Pliocene (Zbyszewski, 1959; Ferreira, 1961; Pereira, 2010), the Cenozoic echinoid type material housed at the MG is Miocene.

Species are taxonomically ordered (orders and families) following Kroh and Smith (2010) and Kroh and Mooi (2024). Species names are listed within the genus (or family) to which they are presently assigned, followed by MG collection number, status of type, locality data, age, publications with figured type specimens, and remarks, when appropriate. Species that are herein considered invalid are identified by their binomial original names followed by an asterisk.

The synonymy lists give the exact citation of the cited paper. Clarifying remarks are added in square brackets.

3. Results

The collection includes the syntypes (twenty primary spine fragments) of one species of the order Cidaroida (Angola), two holotypes and one paratype of two species (representing two

genera) of Camaradonta (Portugal), four syntypes of one species of Cassiduloida (Portugal); two holotypes, nineteen syntypes, one lectotype, and five paralectotypes of seven species (representing three genera) of Clypeasteroida (Angola and Portugal); three holotypes, nine syntypes, one lectotype and two paralectotypes of four species (representing four genera) of Spatangoida (Portugal).

Of the referred fifteen original species, eleven were established by de Loriol (in Choffat and de Loriol, 1888; de Loriol 1896; 1905), one by Ferreira (1962), two by Kotchetoff *et al.* (1975), and one by Pereira (2010).

Order Cidaroida Claus, 1880

Family Cidaridae Gray, 1825

***Cidaris vafellus* de Loriol in Choffat and de Loriol, 1888**

MG 32147a-v

Syntypes (20 primary spine fragments).

Dombe Grande, Benguela Basin, Angola.

Miocene (Choffat, 1905; Darteville, 1953; Darteville and Roger, 1954).

1888. *Cidaris vafellus* P. de Loriol, 1888; Choffat and de Loriol, p. 99, pl. 6; figs. 8-13 [six syntypes].

1953. *Cidaris vafellus* de Loriol; Darteville, p. 6-7, pl. A, fig. 1 [primary spine cross section – unidentified syntype].

Remarks: Species validity uncertain. This species was established based only on primary spine fragments. According to Darteville (1953), in the absence of any further details, the species should be left in the genus *Cidaris* “*lato sensu*”. In reality, due to the scarcity and poor quality of the type material, the validity of the species has to be considered uncertain.

Initially, Choffat and de Loriol (1888) attributed, not without some doubts, *C. vafellus* to the late Early Cretaceous. Later, Choffat (1905) expressed his conviction that those spine fragments were Miocene. This conviction would be confirmed about half a century later by Darteville (1953) and Darteville and Roger (1954).

Order Camarodonta Jackson, 1912

Family Trigonocidaridae Mortensen, 1903

Genus *Monilechinus* Pereira, 2010

***Monilechinus portucalensis* Pereira, 2010**

MG 25884a

Holotype.

Mutela, Almada, Lower Tagus Basin.

Serravallian.

2010. *Monilechinus portucalensis* Pereira, 2010; Pereira, p. 23-24, pl. 2, fig. 1.

MG 25884b

Paratype.

North Penedo, Sesimbra, Lower Tagus Basin.

Middle Miocene.

Family Parechinidae Mortensen, 1903

Genus *Psammechinus* L. Agassiz and Desor, 1846

***Arbacina mutellaensis* de Loriol, 1896 ***

MG 3385

Holotype (by monotypy).

Mutela, Almada, Lower Tagus Basin.

Serravallian.

1896. *Arbacina mutellaensis*, P. de Loriol, 1896; de Loriol, p. 8, pl. 1, fig. 10.

1961. *Arbacina mutelensis* P. de Loriol; Ferreira, p. 534-535, pl. 1, fig. 4.

2010. *Psammechinus dubius dubius* (Agassiz, 1840); Pereira, p. 25.

Remarks: Invalid species considered by Pereira (2010) as a junior synonym of *Psammechinus dubius dubius* (Agassiz, 1840a). According to this author, the illustrations provided by de Loriol (1896) are consistent with genus *Arbacina* Pomel, 1869, but they are not accurate. Even though the specimen is poorly preserved due to syntaxial rim cement growth (e.g., the pore-pairs are closed), it is possible to perceive that the pore-pairs are arranged in distinct arches and the tuberculation pattern is identical to the one presented by *P. dubius dubius* tests (Pereira, 2010).

Order Cassiduloida L. Agassiz and Desor, 1847

Family Echinolampadidae Gray, 1851

Genus *Echinolampas* Gray, 1825

Subgenus *Echinolampas* (*Echinolampas*) Gray, 1825

***Echinolampas* (*Echinolampas*) *maxima* de Loriol, 1896**

MG 3431

Syntype.

Marvila, Lisboa, Lower Tagus Basin.

Middle Miocene.

1896. *Echinolampas hemisphaerica*, Agassiz (Lamarck) var. *maxima*; de Loriol, p. 40, pl. 12, fig. 1.

1961. *Echinolampas barcinensis* Lambert; Ferreira, p. 551-552, pl. 15.

2010. *Echinolampas* (*Echinolampas*) *barcinensis* Lambert, 1907; Pereira, p. 38-40, pl. 6; pl. 7, fig. 1.

MG 3689

Syntype.

Casal das Rolas, Lower Tagus Basin.

Middle Miocene.

MG 13320

Syntype.

Between Forno do Tijolo and Pragal, Almada, Lower Tagus Basin.

Burdigalian-Langhian.

MG 13325

Syntype.

Palma, Lisboa, Lower Tagus Basin.

Middle Miocene.

Remarks: In 1907, when Lambert (1907) established the species *E. barcinensis* he was aware of its similarities with *E. hemisphaericus* var. *maxima* de Loriol, 1896 but he did not consider them as synonyms. Later, Lambert (1928) acknowledged that there were no specific differences between *Echinolampas hemisphaerica* var. *maxima* and *E. barcinensis* and therefore considered them as conspecific. Kroh (2005) and Pereira (2010) who presented detailed descriptions of *E. barcinensis* also clearly show that these two species are synonyms. Therefore, according to the principle of priority of the International Code of Zoological Nomenclature, the oldest name available for this species is *Echinolampas maxima* de Loriol, 1896.

Order Clypeasteroida L. Agassiz, 1835

Family Clypeasteridae L. Agassiz, 1835

Genus *Clypeaster* Lamarck, 1801

***Clypeaster delgadoi* de Loriol, 1896**

MG 3411a-b, MG 3677, MG 13318-13319

Syntypes.

Marvila, Lisboa, Lower Tagus Basin.

Middle Miocene.

1896. *Clypeaster delgadoi*, P. de Loriol, 1896; de Loriol, p. 26-28, pl. 9 [MG 3411a].

1961. *Clypeaster delgadoi* P. de Loriol; Ferreira, p. 541, pl. 14 [MG 3411a].

2010. *Clypeaster campanulatus* (Schlotheim, 1820); Pereira, p. 49-54, pl. 10 [MG 3411a], pl. 11 [MG 3677].

MG 13321

Syntype.

Between Sacavém and Boa Vista, Lisboa, Lower Tagus Basin. Middle Miocene.

2010. *Clypeaster campanulatus* (Schlotheim, 1820); Pereira, p. 49-54, pl. 12.

MG 13326, MG 13769-13771

Syntypes.

Marvila, Lisboa, Lower Tagus Basin.

Middle Miocene.

Remarks: Species validity uncertain. *C. delgadoi* is rather like *C. campanulatus* (Schlotheim, 1820), a species from the Langhian-early Serravallian of the Paratethys thoroughly described and figured by Kroh (2005). The only possible difference between these two species is test height: in *C. delgadoi* it ranges between 26% and 34% of test length (Pereira, 2010) while in *C. campanulatus* it ranges from about 30% to about 60% of the test length (Kroh, 2005).

***Clypeaster mutellensis* de Loriol, 1896 ***

MG 3407a-b

Syntypes.

Mutela, Almada, Lower Tagus Basin.

Serravallian.

1896. *Clypeaster mutellensis*, P. de Loriol, 1896; de Loriol, p. 21-22, pl. 7, figs. 1 [MG 3407b], 2 [MG 3407a].

1961. *Clypeaster mutellensis* P. de Loriol; Ferreira, p. 538, pl. 17, fig. 74 [MG 3407b].

2010. *Clypeaster olisiponensis* Michelin, 1861; Pereira, p. 65, pl. 18 [MG 3407b].

Remarks: Pereira (2010) considered this species invalid and included it in the synonymy of *Clypeaster olisiponensis* Michelin, 1861.

***Clypeaster palencaensis* de Loriol, 1896 ***

MG 3408a-b

Syntypes.

Forno do Tijolo, Palença, Almada, Lower Tagus Basin.

Burdigalian.

1896. *Clypeaster palencaensis*, P. de Loriol, 1896; de Loriol, p. 19-20, pl. 6, figs. 1 [MG 3408a], 2 [MG 3408b].

1961. *Clypeaster palencaensis* P. de Loriol; Ferreira, p. 537, pl. 3, figs. 15, 2 [MG 3408a].

2010. *Clypeaster olisiponensis* Michelin, 1861; Pereira, p. 65, pl. 20, fig. 2 [MG 3408a].

Remarks: Pereira (2010) considered this species invalid and included it in the synonymy of *Clypeaster olisiponensis* Michelin, 1861.

***Clypeaster papilionensis* Kotchetoff, Kotchetoff and Ferreira, 1975 ***

MG 3780

Holotype (by monotypy).

North Penedo, Sesimbra, Lower Tagus Basin.

Middle Miocene.

1975. *Clypeaster papilionensis* nov. sp.; Kotchetoff *et al.*, p. 75-78, pl. 6, figs. 1-2.

2010. *Clypeaster marginatus* Lamarck, 1816; Pereira, p. 61, pl. 17, fig. 1.

Remarks: Invalid species established based on a single incomplete pathological test, characterized by a smaller number of post-basiconal plates on its anterior half and consequent shorter perradial length of ambulacrum III. Taking in account all other test characteristics, Pereira (2010) considered this species as a junior synonym of *Clypeaster marginatus* Lamarck, 1816.

Family Scutellidae Gray, 1825

Genus *Parascutella* Durham, 1953

***Parascutella lusitanica* (de Loriol, 1896)**

MG 3414c

Lectotype.

Foz da Fonte, Sesimbra, Lower Tagus Basin.

Burdigalian.

1896. *Scutella lusitanica*, P. de Loriol, 1896; de Loriol, p. 12-13, pl. 2, fig. 1.

1961. *Scutella lusitanica* P. de Loriol; Ferreira, p. 546-547, pl. 12, fig. 65; pl. 13, fig. 67.

2010. *Parascutella lusitanica* (de Loriol, 1896); Pereira, p. 70-72, pl. 23, fig. 1.

MG 3414a

Paralectotype.

Porto Brandão, Almada, Lower Tagus Basin.

Burdigalian.

1896. *Scutella lusitanica*, P. de Loriol, 1896; de Loriol, p. 12-13, pl. 2, fig. 3.

MG 3414b

Paralectotype.

Torre de São Julião, Oeiras, Lower Tagus Basin.

Burdigalian.

MG 3633

Paralectotype.

50 m North of Charneca, road to Ameixoeira, Lisboa, Lower Tagus Basin.

Middle Miocene

MG 3636

Paralectotype.

Casal Vistoso, Lisboa, Lower Tagus Basin.

Middle Miocene.

MG 3772

Paralectotype.

Foz da Fonte, Sesimbra, Lower Tagus Basin.

Burdigalian.

1896. *Scutella lusitanica*, P. de Loriol, 1896; de Loriol, p. 12-13, pl. 2, fig. 2 [lateral view].

Remarks: Considering the position of the periproct and the petal length, Pereira (2010) reassigned this species to the genus *Parascutella* Durham, 1953. The lectotype and paralectotypes where designated also by Pereira (2010). The same author erroneously identified the specimen MG 3768 as a syntype of *P. lusitanica* (Pereira, 2010, p. 70-72, pl. 23, fig. 2).

***Scutella roquettei* de Loriol, 1896 ***

MG 3769

Holotype (by monotypy).

Portugal mainland.

Early-middle Miocene.

1896. *Scutella roquettei*, P. de Loriol, 1896; de Loriol, p. 13-14, pl. 3, fig. 3.

2010. *Parascutella smithiana* (Agassiz, 1841); Pereira, p. 76, pl. 24, fig. 3.

Remarks: Invalid species established based on a single juvenile test (gonopores are still closed). Due to the periproct position, distinct marginal indentations and wideness of the interporiferous zones, Pereira (2010) included this species within the synonymy of *P. smithiana* (Agassiz, 1841).

Family Atriclepeidae Stefanini, 1911

Genus *Amphiope* Agassiz, 1840b

Amphiope neuparthi de Loriol, 1905

MG 30238-30242

Syntypes.

Bom Jesus, Luanda, Kwanza Basin, Angola.

Early-middle Miocene (Pereira and Stara, 2018).

1905. *Amphiope neuparthi*, P. de Loriol, 1905; de Loriol, p. 133-134, pl. 3, fig. 1.

1953. *Echinodiscus* (*Amphiope*) *neuparthi* P. de Loriol; Darteville, fig. 16A; pl. 15, fig. 3 [X-ray photo].

2014. *Amphiope neuparthi* de Loriol, 1905; Silva and Pereira, p. 1381, fig. 3 [MG 30238].

2018. *Amphiope neuparthi* de Loriol, 1905; Pereira and Stara, p. 28-30, fig. D [MG 30240].

Remarks: The current whereabouts of the syntype figured by de Loriol (1896: pl. 3, fig. 1) whose X-ray was later presented by Darteville (1953, pl. 15, fig. 3) is unknown.

Order Spatangoida Agassiz and Desor, 1847

Family Schizasteridae Lambert, 1905

Genus *Opissaster* Pomel, 1883

Opissaster cotteri de Loriol, 1896

MG 3474

Holotype (by monotypy).

Portugal mainland.

Early-middle Miocene.

1896. *Opissaster cotteri*, P. de Loriol, 1896; de Loriol, p. 45-47, pl. 8, fig. 1.

1961. *Opissaster cotteri* P. de Loriol; Ferreira, p. 554-555, pl. 9, figs. 56, 59.

2010. *Opissaster cotteri* de Loriol, 1896; Pereira, p. 84-86, pl. 28, fig. 1.

Family Prenasteridae Lambert, 1905

Genus *Agassizia* Valenciennes in Agassiz and Desor, 1847

Agassizia algarbiensis Ferreira, 1962

MG 3793a-c

Lectotype (MG 3793a) and paralectotypes (MG 3793b-c).

Ferragudo, Portimão, Algarve.

Middle Miocene.

1962. *Agassizia algarbiensis*; Ferreira, p. 293-295, pl. 1, figs. 1, 3, 4-5 [MG 3793a], figs. 2, 6.

2010. *Agassizia algarbiensis* Ferreira, 1962; Pereira, p. 99-103, pl. 45, fig. 2 [MG 3793a].

Remarks: Species validity uncertain. Lectotype and paralectotypes designated by Pereira (2010). The whereabouts of one of the syntypes illustrated by Ferreira (1962: pl. 1, figs. 2, 6) is unknown. According to Pereira (2010), *A. faurai* LAMBERT, 1928 and *A. pachecoi* LAMBERT, 1928, two very poorly known species from the Miocene of Barcelona (Spain), seem to fall within the range of variation of *A. algarbiensis* and, in that case, they would be senior synonyms of the Portuguese species. Further studies are needed to confirm the (in)validity of these three species.

Family Brissidae Gray, 1855

Genus *Brissopsis* Agassiz, 1840b

Brissopsis lusitanicus de Loriol, 1896 *

MG 3471

Holotype (by monotypy).

Grilos, Lisboa, Lower Tagus Basin.

Serravallian.

1896. *Brissopsis lusitanicus*, P. de Loriol, 1896; de Loriol, p. 42-43, pl. 13, fig. 2.

2010. *Brissopsis crescentica* Wright, 1855; Pereira, p. 115, pl. 35, fig. 1.

Remarks: Invalid species considered by Pereira (2010) as a junior synonym of *Brissopsis crescentica* Wright, 1855.

Family Lovenidae Lambert, 1905

Genus *Echinocardium* Gray, 1825

Echinocardium olisiponensis Kottchetoff, Kottchetoff and Ferreira, 1975

MG 3611, 3614a-c, 3630, MG 3789-91, MG 3795a-b

Holotype (MG 3795a) and syntypes.

North Penedo, Sesimbra, Lower Tagus Basin.

Middle Miocene.

1975. *Echinocardium olisiponensis*; Kottchetoff *et al.*, p. 67-75, pl. 3, fig. 1 [MG 3795b – reversed image], fig. 2 [MG 3791]; pl. 4, fig. 3 [MG 3789a], fig. 4 [MG 3789b]; pl. 5 [MG 3795a].

2010. *Echinocardium olisiponensis* Kottchetoff, Kottchetoff and Ferreira, 1975; Pereira, p. 125-127, fig. 29; pl. 37, fig. 1 [MG 3795a], fig. 2 [MG 3795b].

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