

The scleractinian fauna of the Pliocene of Estepona basin (southwestern Spain): new findings

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ABSTRACT

Four species of Pliocene scleractinians from the Estepona Basin (Spain) are examined. One species of *Caryophyllia* Lamarck, 1801 (Caryophylliidae) and one of *Dendrophyllia* Blainville, 1830 (Dendrophylliidae) from El Lobillo are reported for the first time from this basin and from the Pliocene of the Mediterranean Sea. A species of *Phyllangia* Milne Edwards et Haime, 1848 (Caryophylliidae) from Arroyo Vaquero, already reported from the Pliocene of Siena (Italy), is also reported for the first time from Estepona basin. Finally, the report of *Flabellum vaticani* Ponzi, 1876 (Flabellidae) from Valerín Carretera is confirmed.

KEY WORDS

Caryophylliidae; Flabellidae; Dendrophylliidae; new findings; Estepona; Pliocene.

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INTRODUCTION

The fauna of Estepona (Spain), described by Spadini (2019), has provided a general framework for scleractinians in the Estepona Basin and has broadened knowledge of this group that inhabited the Mediterranean basin in the Pliocene. A total of 27 species belonging to the families Caryophylliidae (13 species), Dendrophylliidae (6 species), Flabellidae (5 species), Oculinidae (2 species), Micrabaciidae and Turbinoliidae (one species each), have already been reported. Subsequently, Spadini (2021) assigned three specimens collected in the sands of El Lobillo to an indeterminate species of the genus *Asterosmilia* Duncan, 1867, but this determination will probably have to be revised on the basis of new findings.

Here four species are examined: two (*Caryophyllia* sp. and *Dendrophyllia* sp.) not yet reported from the Estepona Basin or the Pliocene of

the Mediterranean. The third is a species of the genus *Phyllangia* Milne Edwards et Haime, 1848 already described from the Pliocene of Siena (Spadini, 2020). Finally, a doubtful report of *Flabellum vaticani* from the Estepona Basin (Spadini, 2019) is confirmed.

MATERIAL AND METHODS

The specimens of scleractinian corals studied here come from three different outcrops of the Estepona Basin: Arroyo Vaquero, El Lobillo and Valerín Carretera.

The Valerín Carretera deposit consists of medium to fine grained fossiliferous sands (bizcornil facies) very rich in fossils (Aguirre et al., 2005). The silts and fine grained sand of the lower part of the section coincide with the transition from the outer fan-delta to shelf settings. The Pliocene deposit of Chincheta consists of massive

homogeneous fossiliferous medium to fine grained sand. Fossils are dispersed throughout the sand, although occasionally they are concentrated in thin beds. The deposit of Arroyo Vaquero consists of sandy clays and clayey sands with a conglomerate. Above the conglomerate are sandy clays. The fauna is very similar to that of El Lobillo. By courtesy of M.M. Brunetti (Las Navas del Selpillar (Spain), I was able to examine the scleractinians from these sites.

Coral fossil samples were collected manually and were cleaned and brushed with water and hydrogen peroxide to remove sediment. Identification was performed on the basis of macro and micro-morphological characters related to corallum shape, development of radial elements, corallite diameter, number of pali and columella development according to Wells (1956), Zibrowius (1980), Cairns & Kitahara (2012) and Spadini (2015).

Observations were completed with optical equipment and the principal measurements were made with an analog caliper. Illustrations of the coralla and other details were made with a digital camera. The studied material is kept in the Museum of Natural Science, Accademia dei Fisiocritici, Siena (MUSNAF).

ABBREVIATIONS. S1–S5 = septa of cycles 1, 2, 3, 4, 5.

RESULTS

Systematics Palaeontology

Subclassis HEXACORALLIA Haeckel, 1866

Ordo SCLERACTINIA Bourne, 1900

Familia CARYOPHYLLIIDAE Dana, 1846

Genus *Caryophyllia* Lamarck, 1801

Caryophyllia sp. - Fig. 1

MATERIAL EXAMINED. El Lobillo, 2015–2016, legit M.M. Brunetti, a complete specimen.

DESCRIPTION. Corallum attached, robust (H = 38.6 mm), with large base and cylindrical to flared calice. Theca granular, especially in the central part of the corallite, longitudinal costae separated by not very evident furrows. Some costae are flat and smooth or with weak granulation, others have a cen-

tral, slightly vermiculated crest. Not very regular elliptical calice (29.4 x 24.2 mm), fossa of medium depth, septa numbering 106, slightly exserted, arranged hexamerally in twelve systems. Septa of the first three cycles very similar, S4 paliferous, slightly thinner and slightly shorter than the previous septa, S5 smaller than the penultimate. Axial edge of S1 slightly wavy. Pali numbering 23, opposite S4, about one third the length of the corresponding septa. Ornamentation of septa and pali consisting of fine granules, except for some pali with more evident granules. The crown of the pali is very close to the columella which is composed of many twisted and a few straight laminae disposed at a level lower than that of the pali.

REMARKS. Among the many species of *Caryophyllia*, the most similar seems to be *C. cyathus* (Ellis et Solander, 1786) which lives in the Mediterranean Sea and Atlantic Ocean, from the Gulf of Gascony to Morocco, the Canary Islands, Madeira, the Azores and Cape Verde (Zibrowius, 1980). Common characteristics of the specimen from the Pliocene of El Lobillo and current Mediterranean species are their dimensions, more or less turbinate shape, often cylindrical in the proximal part, the number of septa and the characters of the radial elements.

Caryophyllia cyathus lives on deep circalittoral bottoms, often with *Corallium rubrum*, and may descend to upper bathyal depths between 70 and 300 m (Zibrowius, 1980).

Genus *Phyllangia* Milne Edwards et Haime, 1848

TYPE SPECIES. *Phyllangia americana* Milne Edwards et Haime, 1849, by subsequent designation (Milne Edwards & Haime, 1850).

REMARKS. Various species of *Phyllangia* can be found along the Atlantic and Indo-Pacific coasts (Cairns & al., 1999). One of these, *Phyllangia mouchezii* (Lacaze-Duthiers, 1897), present in the Atlantic Ocean and Mediterranean Sea (Zibrowius, 1980), is considered a subspecies of *P. americana* Milne Edwards et Haime, 1848 (Chevalier, 1966; Cairns, 2000). The genus *Phyllangia* has already been reported by Spadini (2021) from the Pliocene of Siena (Italy). Other species have been described from the Miocene of Western Europe (Milne Edwards & Haime, 1848–1850; Michelotti, 1871;



Figure 1. *Caryophyllia* sp. Pliocene of El Lobillo. Complete specimen, H = 36.9 mm. Figure 2. *Phyllangia* sp. Pliocene of Arroyo Vaquero. Incomplete colony, D = 38.6 mm. Figure 3. *Flabellum vaticani* Ponzi, 1876. Pliocene of Valerin Carretera. Lower face of an incomplete specimen, D = 68.3 mm. Figure 4. *Dendrophyllia* sp. Pliocene of El Lobillo. Large incomplete branch, H = 83.3 mm.

Chevalier, 1961), Borneo (Gerth, 1923), Florida (Wells, 1947; Gane, 1900) and the Land of Fires (Squires, 1963).

***Phyllangia* sp.** - Fig. 2

Phyllangia sp., Spadini, 2020: 816–817, fig. 2.

MATERIAL EXAMINED. Arroyo Vaquero, 2015–2016, legit M.M. Brunetti, four colonies. El Lobillo, 2015–2016, legit M.M. Brunetti, one colony in poor state of conservation.

DESCRIPTION. The colonies of Arroyo Vaquero are well preserved but incomplete. The largest is composed of nine corallites and the smallest of only three. The largest colony measures 36.9 x 25.9 mm, the smallest a maximum of 24.4 x 18.8 mm. Corallites arise by extratentacular budding from a thick incrusting coenosteum. They are 5–6 mm tall, closely spaced or fused at their base. The theca is smooth or granular with the costae at the main septa. Shallow fossa, calice circular in small corallites or slightly elliptical in larger ones (max 15.1 x 11.6 mm). The largest calice, not well preserved, has 68 septa arranged hexamerally in five incomplete cycles. S1 and S2 are equal or subequal, thicker than the septa of higher cycles; S3 are at their base, forming an indistinct paliform lobe, present only in some septa. Some S4 seem to have slightly serrated margins. S5 are reduced and not very evident, present in the largest corallite. S1, S2 and S3 merge at the bottom of the calice, while S4 and S5 are free. The lateral faces of septa have sharp granules. Columella papillary, very small, composed of few elements. Endothecal dissepiments present.

REMARKS. The colonies from the Pliocene of Spain match the colony from Siena described by Spadini (2021). Among other species of this genus, this colony resembles *Phyllangia mouchezii*, currently living in the Mediterranean Sea (see Zibrowius, 1980).

Familia FLABELLIDAE Bourne, 1905
Genus *Flabellum* Lesson, 1831

Flabellum vaticani Ponzi, 1876 - Fig. 3

Flabellum sp., Spadini, 2019: 85–86, fig. 26.

MATERIAL EXAMINED. Valerin Carretera, 2015–2016, legit M.M. Brunetti, two incomplete specimens.

REMARKS. There was already a doubtful report of this species from the Pliocene of El Lobillo, based on a very incomplete specimen (Spadini, 2019). The two specimens examined differ in size and state of conservation, but the dimensions and ornamentation of the fragments found recently match the species in question perfectly.

Familia DENDROPHYLLIIDAE Gray, 1847
Genus *Dendrophyllia* Blainville, 1830

***Dendrophyllia* sp.** Fig. 4

MATERIAL EXAMINED. El Lobillo, 2015–2016, legit M.M. Brunetti, a large fragment.

DESCRIPTION. A large irregularly cylindrical and not completely preserved fragment, 83.8 mm high and approximately 35.5 mm in diameter. Costae flat, smooth or slightly grainy, thin, straight or sinuous, vermiculate, very close; the ribs become more rounded and more grainy near the calices. Intercostal spaces very thin with synapticle more evident near the calices. This large branch has five rows of irregularly overlapping calices with an average diameter of about 8–10 mm and a total of 15 poorly preserved calices. The best one has 48 septa, arranged in the Pourtalés plan. Septal ornamentation composed of granules. The columella is not preserved.

REMARKS. Though poorly preserved and irregular, the specimen has characters that place it in the Miocene group of *D. taurinensis* Milne Edwards & Haime, 1848 or *D. digitalis* Michelin, 1842, not hitherto known from the Pliocene, but better material is needed to define the characters and the relationships between these species.

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