

Deep-water Scleractinia (Cnidaria : Anthozoa) from southern Biscay Bay

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Abstract : Fifteen ahermatypic scleractinian species belonging to 5 families were collected from 25 stations in a small area of Central Cantabrian coast off Asturias (southern Biscay Bay). The specimens were obtained from the continental shelf and slope (depth range 50-1347 m) by means of an anchor-dredge and epibenthic sledge.

Résumé : Quinze espèces de Scléactiniaires ahermatypiques appartenant à cinq familles ont été récoltées en 25 stations d'une petite aire de la côte Cantabrique centrale au large des Asturies (partie Sud du Golfe de Gascogne). Les récoltes, sur le plateau et le talus continentaux, ont été faites au moyen d'une drague et d'un traîneau épibenthique à des profondeurs de 50 à 1347 m.

INTRODUCTION

The scleractinian coral fauna of the North eastern Atlantic and the Mediterranean has been revised by Zibrowius (1980). He reported 34 species from Biscay Bay, most of them already collected by the end of the nineteenth and the beginning of twentieth century. Based on collections from BIOGAS (POLYGAS) and INCAL cruises Zibrowius (1985) further reported 17 species in depths ranging from 400 to 4829 m, all of them previously recorded in the Biscay Bay. These earlier accounts did not specially reflect the faunal richness of relatively small areas. Given some hydrodynamic singularities recently described in the southern Biscay Bay (Botas *et al.*, 1989, 1990 ; Fernández *et al.*, 1993) benthos studies carried out along the Central Cantabrian shelf and slope are of particular interest. They also provide additional information on the scleractinian fauna of this area.

MATERIAL AND METHODS

Forty three benthic stations located along several transects perpendicular to the Central Cantabrian coast off Asturias (southern Bay of Biscay) were sampled during 1987 by the COFACE cruise (Central Cantabrian Oceanographic Cruise). The sampling stations were located on the shelf and the continental slope, depth ranging from 50 to 1347 m (Fig. 1). Scleractinian corals (more than 1100 specimens) were collected from 25 stations and represent 15 species in 5 families.

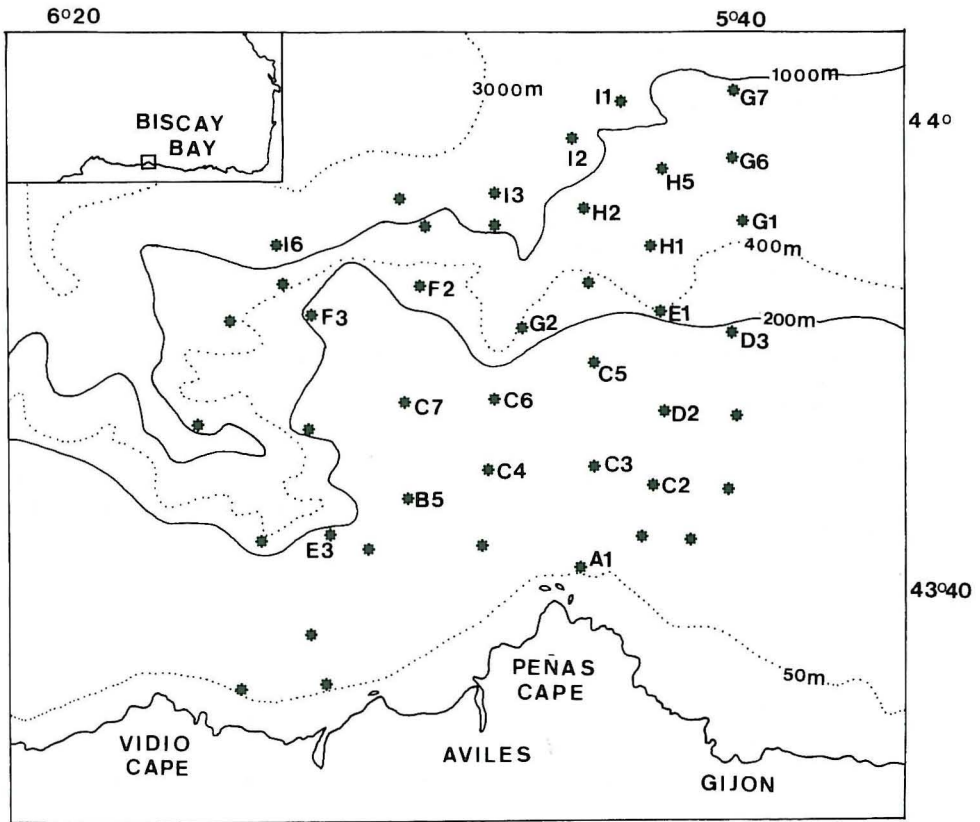


Fig. 1 Map showing the location of sampling stations in southern Biscay Bay. Stations with scleractinians are labelled.

Fauna samples were taken with an anchor-dredge or an epibenthic sledge and preserved in 4 % formaldehyde in seawater. At each station sediment samples were also taken. The granulometric characteristics of sediments are given according to Wentworth grade classification and have been published by Ocharan *et al.* (1989) and Alvarez-Claudio *et al.* (1990).

General station list

- A1 (43°40.90'N/5°49.20'W), 25-2-1987, 50 m, fine sand ; *Dendrophyllia cornigera*.
 B5 (43°44.00'N/5°58.95'W), 3-6-1987, 121 m, ? ; *Paracyathus pulchellus*, *D. cornigera*.
 C2 (43°44.82'N/5°44.91'W), 6-5-1987, 150 m, fine sand, stones and coral debris ;
Caryophyllia smithii.
 C3 (43°45.55'N/5°48.52'W), 6-5-1987, 146 m, fine sand and stones ; *C. smithii*.
 C4 (43°45.37'N/5°54.45'W), 26-2-1987, 130 m, coarse sand and coral debris ; *D. cornigera*.
 C5 (43°49.87'N/5°48.73'W), 29-6-1987, 150 m, sand and coral debris ; *C. smithii*, *D. cornigera*.

- C6 (43°48.38'N/5°54.00'W), 4-7-1987, 146 m, fine sand ; *C. smithii*.
 C7 (43°48.38'N/5°59.20'W), 4-7-1987, 154 m, medium size sand ; *C. smithii*.
 D2 (43°48.11'N/5°44.21'W), 29-6-1987, 161 m, fine sand ; *C. smithii*.
 D3 (43°51.23'N/5°40.69'W), 28-6-1987, 172 m, fine sand and coral debris ; *C. smithii*.
 E1 (43°52.65'N/5°44.34'W), 1-7-1987, 183 m, medium size sand and coral debris ;
C. smithii.
 E3 (43°42.62'N/6°03.70'W), 3-6-1987, 183 m, fine sand ; *C. smithii*.
 F2 (43°53.00'N/5°58.30'W), 2-7-1987, 307 m, fine sand ; *C. smithii*.
 F3 (43°51.93'N/6°04.71'W), 2-6-1987, 227 m, ? ; *C. smithii*.
 G1 (43°56.00'N/5°39.34'W), 28-4-1987, 468 m, very fine sand ; *C. smithii*.
 G2 (43°51.37'N/5°52.72'W), 26-2-1987, 300 m, fine sand ; *C. smithii*.
 G6 (43°58.69'N/5°39.97'W), 29-4-1987, 549 m, very fine sand and stones ; *Deltocyathus moseleyi*, *Stenocyathus vermiformis*.
 H1 (43°55.00'N/5°45.00'W), 1-7-1987, 702 m, fine sand and stones ; *Caryophyllia abyssorum*, *D. moseleyi*, *Desmophyllum cristagalli*, *Lophelia pertusa*, *S. vermiformis*.
 H2 (43°56.50'N/5°48.90'W), 1-7-1987, 893 m, very fine sand, stones and *Lophelia pertusa* bank ; *C. abyssorum*, *D. moseleyi*, *D. cristagalli*, *L. pertusa*, *Madrepora oculata*, *S. vermiformis*, *Dendrophyllia cornucopia*.
 H4 (43°46.49'N/6°10.19'W), 2-6-1987, 790 m, coarse silt ; *C. abyssorum*.
 H5 (43°58.06'N/5°43.95'W), 29-4-1987, 769 m, very fine sand, stones and *Lophelia pertusa* bank ; *C. abyssorum*, *D. cristagalli*, *L. pertusa*, *M. oculata*.
 I1 (44°01.09'N/5°46.65'W), 30-6-1987, 1098 m, stones and *Lophelia pertusa* bank ; *C. abyssorum*, *Caryophyllia cornuformis*, *L. pertusa*, *M. oculata*, *Flabellum alabastrum*, *Enallopsammia rostrata*.
 I2 (43°59.30'N/5°54.00'W), 2-7-1987, 1189 m, very fine sand, stones and coral debris ; *C. abyssorum*, *D. moseleyi*, *L. pertusa*, *E. rostrata*.
 I3 (43°57.20'N/5°54.00'W), 3-7-1987, 1347 m, ? ; *Stephanocyathus moseleyanus*.
 I6 (43°55.00'N/6°06.80'W), 4-7-1987, 1186 m, fine silt ; *C. abyssorum*, *Vaughanella concinna*, *E. rostrata*.

SYSTEMATIC ACCOUNT

Family Caryophylliidae Gray, 1846

Caryophyllia abyssorum Duncan, 1873

Reference and synonymy lists : Zibrowius, 1980, 1985.

Material : H1 (702 m), 3 dead specimens ; H2 (893 m), 8 live and 7 dead specimens ; H4 (790 m), 3 dead specimens ; H5 (769 m), 1 live specimen ; I1 (1098 m), 2 live and 4 dead specimens ; I2 (1189 m), 1 live and 1 dead specimen ; I6 (1186 m), 4 dead specimens.

Corallum elongate, subcylindrical sometimes curved. 1-4 cm high. Calice circular to slightly elliptical. Larger calicular diameter 0.5-2 cm. *C. abyssorum* is known in the nor-

theastern Atlantic from the Celtic Sea to Sahara and also in the Biscay Bay (Zibrowius, 1980, 1985).

Caryophyllia cornuformis Pourtalès, 1868

Reference and synonymy lists : Zibrowius, 1980, 1985.

Material : I1 (1098 m), 20 live and 24 dead specimens.

Corallum trochoid, more or less curved ; most of them are open in the basal region as pointed out by Zibrowius (1980) suggesting that they are free from the substratum. 0.5-2 cm high. Calice circular to slightly elliptical in shape. Larger calicular diameter 0.4-1 cm. *C. cornuformis* is known in the northeastern Atlantic from the Celtic Sea to Morocco and also in the Biscay Bay ; it is also known in western Atlantic (Zibrowius, 1980, 1985).

Caryophyllia smithii Stokes & Broderip, 1828

Reference and synonymy lists : Zibrowius, 1980, 1985.

Material : C2 (150 m), 21 live and 4 dead specimens ; C3 (146 m), 1 live and 1 dead specimen ; C5 (150 m), 23 dead specimens ; C6 (146 m), 2 live and 8 dead specimens ; C7 (154 m), 6 dead specimens ; D2 (161 m), 10 live and 6 dead specimens ; D3 (172 m), 200 live and 275 dead specimens ; E1 (183 m), 3 live and 2 dead specimens ; E3 (183 m), 3 live and 2 dead specimens ; F2 (307 m), 1 live specimen ; F3 (227 m), 1 live and 1 dead specimen ; G1 (468 m), 1 dead specimen ; G2 (300 m), 12 dead specimens.

Corallum trochoid, often slightly curved ; with an encrusting base when solidly attached to a substrate or with a narrow base and then often becoming free. 0.5-3 cm high. Calice circular in young specimens, elliptical and sometimes deformed in old specimens. Larger calicular diameter 0.3-2.5 cm. Sometimes bearing 2 or 3 younger corallites of quasi-colonial aspect. Attached to shells of *Aporrhais pespelicani*, *Dentalium* sp., bivalves and stones. *C. smithii* is widely distributed in the Atlantic and Mediterranean Sea (Zibrowius, 1980, 1985).

Deltocyathus moseleyi Cairns, 1979

Reference and synonymy lists : Zibrowius, 1980.

Material : G6 (549 m), 3 dead specimens ; H1 (702 m), 3 live and 5 dead specimens ; H2 (893 m), 3 live and 20 dead specimens ; I2 (1189 m), 1 dead specimen.

Corallum shallow conical. General shape and structures agree with previous descriptions (Zibrowius, 1980). 1.5 mm-0.6 cm high. Calice circular. Calicular diameter 0.6-1.5 cm. This species is known in the western and eastern Atlantic including Biscay Bay (Zibrowius, 1980, 1985).

Paracyathus pulchellus (Philippi, 1842)

Reference and synonymy lists : Zibrowius, 1980 ; Cairns, 1978 ; Zibrowius & Saldanha, 1976.

Material : B5 (121 m), 1 live specimen.

Corallum subcylindrical attached to a dead valve. 1.2 cm high. Calice slightly elliptical. Larger calicular diameter 0.8 cm. This species has a wide distribution in the Mediterranean and eastern Atlantic including Biscay Bay and also in the western Atlantic (Zibrowius, 1980).

Stephanocyathus moseleyanus (Sclater, 1886)

Reference and synonymy lists : Zibrowius, 1980.

Material : I3 (1347 m), 1 dead specimen.

Corallum shallow disc-shaped. 0.8 cm high. Calice subcircular. Larger calicular diameter 3 cm. *S. moseleyanus* is usually collected between 1000 and 2000 m and well known in the eastern Atlantic including Biscay Bay (Zibrowius, 1980).

Vaughanella concinna Gravier, 1915

Reference and synonymy lists : Zibrowius, 1980, 1985.

Material : I6 (1186 m), 1 dead specimen.

Corallum with a wide base fitting the typical description as pointed out by Zibrowius (1980). 1.5 cm high. Calice subcircular. Larger calicular diameter 2.2 cm. *V. concinna* is known in the eastern Atlantic and also in Biscay Bay. Depth range between 1000 and 2000 m (Zibrowius, 1980, 1985).

Desmophyllum cristagalli Milne Edwards & Haime, 1848

Reference and synonymy lists : Zibrowius, 1980, 1985 ; Zibrowius & Gili, 1990 ; Cairns, 1981.

Material : H1 (702 m), more than 300 live specimens on a rope ; H2 (893 m), 1 live specimen ; H5 (769 m), 12 dead specimens.

This species shows a significant morphological variation (Zibrowius, 1980 ; Zibrowius & Gili, 1990). Small live specimens growing in clusters of up to 30 individuals (pseudocolonies) on a sunk rope are 0.3-0.9 cm high and 0.3-1 cm in calicular diameter. The base varies in width. There are also some subcylindrical and elongate individuals 5-6 cm high and 0.6 cm in calicular diameter, usually curved in the lower part. The twelve dead specimens from station H5 are more or less conical on a narrow base, 4-6 cm high and 2-3.5 cm in larger calicular diameter. *D. cristagalli* is widely distributed in the Atlantic, Indian and Pacific Oceans and has a wide depth range. It is well known from Biscay Bay (Zibrowius, 1980, 1985).

Lophelia pertusa (Linné, 1758)

Reference and synonymy lists : Zibrowius, 1980, 1985 ; Zibrowius & Gili, 1990 ; Wilson, 1979a, b, c ; Strømngren, 1971.

Material : H1 (702 m), some live branches ; H2 (893 m), *Lophelia pertusa* live bank ; H5 (769 m), *Lophelia pertusa* live bank ; I1 (1098 m), dead fragments ; I2 (1347 m), several dead fragments.

L. pertusa shows a wide range of morphological variation. It is well known, together with *Madrepora oculata* and *Solenosmilia variabilis* to form extensive deep-water coral banks in the North Atlantic. *Lophelia* banks are found from Norway to northwest Africa. It is well known in Biscay Bay (Zibrowius, 1980, 1985). *L. pertusa* was particularly abundant in station H5 (less abundant in H2) where more than 50 kg of dead and live branches have been collected. Fragments and branches range from a few cm to more than 30 cm high. The larger calicular diameter ranges from 0.5 to 1.7 cm. Most of the branches are inhabited by an *Eunice* polychaete that causes modifications in the skeleton growth. The polychaete tube is recovered by the skeleton.

Family Oculinidae Gray, 1847

Madrepora oculata Linné, 1758

Reference and synonymy lists : Zibrowius, 1980, 1985 ; Cairns, 1978.

Material : H2 (893 m), many dead and live branches and fragments ; H5 (769 m), many dead and live branches and fragments ; I1 (1098 m), dead and live fragments.

Together with *L. pertusa*, *M. oculata* constructs deep-water coral banks in the North Atlantic. The material comprises small delicate and zig-zag shaped branches, fragments and more massif colonies more than 20 cm high with usually anastomosed branches. Calicular diameter 2-3 mm. *M. oculata* was especially abundant in the same station (H5) as *L. pertusa*. It also often shelters an *Eunice* polychaete. *M. oculata* has a wide distribution and is known in Biscay Bay (Zibrowius, 1980, 1985).

Family Flabellidae Bourne, 1905

Flabellum alabastrum Moseley, 1873

Reference and synonymy lists : Zibrowius, 1980, 1985, Zibrowius & Gili, 1990.

Material : I1 (1098 m), 12 dead specimens.

Corallum fan-shaped, 1.8-2.6 high. Calice more or less elliptical with a jagged calicular edge. Larger calicular diameter up to 3-4 cm. All specimens are eroded. *F. alabastrum* is an Atlantic species common at 1000-2000 m (continental slope) ; well known in Biscay Bay (Zibrowius, 1980, 1985).

Family Guyniidae Hickson, 1910

Stenocyathus vermiformis (Pourtalès, 1868)

Reference and synonymy lists : Zibrowius, 1980 ; Cairns, 1978.

Material : G6 (549 m), 2 dead specimens ; H1 (702 m), 44 live and 18 dead specimens ; H2 (893 m), 10 live and 25 dead specimens.

Corallum cylindrical, very elongate, usually arched or sinuous, suggesting a worm tube. 1-7 cm high. Calice circular ; calicular diameter 2-3 mm. Many specimens have a calice at both ends. Sometimes they grow in bundles of 2 to 10 individuals. Although most of them are entirely free, some are attached by the central part to small stones. *S. vermiformis* has a wide distribution including the Indian, Pacific and Atlantic Oceans, and the Mediterranean Sea. Well known in Biscay Bay as a bathyal species (Zibrowius, 1980).

Family Dendrophylliidae Gray, 1847

Dendrophyllia cornigera (Lamarck, 1816)

Reference and synonymy lists : Zibrowius, 1980.

Material : A1 (50 m), 1 live colony ; B5 (121 m), 2 dead fragments ; C4 (130 m), 1 small live branch ; C5 (150 m), 15 live and 18 dead branches and fragments.

A young colony with 3 corallites 3.5-7 cm high. Calice circular to slightly elliptical. Calicular diameter 0.4-1.2 cm. This Atlantic and Mediterranean species ranges from circalittoral to upper bathyal. Well known in Biscay Bay (Zibrowius, 1980).

Dendrophyllia cornucopia Portalès, 1871

Reference and synonymy lists : Zibrowius, 1980 ; Cairns, 1978.

Material : H2 (893 m), 1 dead colony and several dead branches and fragments.

The colony is 7 cm high and consists of a bigger main corallite with 5 secondary ones. Calice slightly elliptical. Calicular diameter 0.5-1.2 cm. Corallites more or less curved, hence the "cornucopia" shape. This bathyal species is known in the western and eastern Atlantic, including Biscay Bay (Cairns, 1978 ; Zibrowius, 1980).

Enallopsammia rostrata (Pourtalès, 1878)

Reference and synonymy lists : Zibrowius, 1973, 1980, 1985, Zibrowius & Gili, 1990.

Material : I1 (1098 m), 1 dead fragment ; I2 (1189 m), 2 live branches and 2 live fragments ; I6 (1186 m), 10 live and 8 dead fragments.

Small branches and fragments of colonies 4-8 cm high. Some calices show a developed rostrum, others do not. Calicular diameter 2-4 mm. Some branches show porous structures similar to the ascothoracid galls described by Zibrowius (1980). *E. rostrata* has a wide distribution in the Atlantic, Indian and Pacific Oceans. It is a typical bathyal species (Zibrowius, 1980 ; Zibrowius & Gili, 1990) and has been reported from several stations in Biscay Bay (Zibrowius, 1985).

CONCLUDING REMARKS

Scleractinian species richness in the Central Cantabrian sampling area shows relevant differences between sandy bottoms on the shelf and uppermost slope at moderate depth, and deeper bottoms of very fine sand and mud on the slope. Only few scleractinian species settle on sandy shelf bottoms ; so in most of those stations only one species is present. *Caryophyllia smithii* is mainly distributed along the continental shelf ; locally its skeletons are particularly abundant. On the contrary, in deeper areas where the slope is reduced, the scleractinian fauna is more diverse, comprising 5 to 7 species, especially in stations H2, I1, H5, H1 with *Lophelia pertusa* and *Madrepora oculata* banks. For example, the following may co-occur at the same station : *Caryophyllia abyssorum*, *L. pertusa*, *M. oculata*, *Deltocyathus moseleyi* and *Desmophyllum cristagalli*.

The most commonly represented species along the Cantabrian continental shelf and slope are : *C. smithii* (restricted to the continental and upper slope shelf ; 13 stations, depth 146-468 m), *C. abyssorum* (bathyal ; 7 stations, depth 702-1189 m) and *L. pertusa* (bathyal ; 5 stations, depth 702-1347 m). The species from the shallowest depth (50 m) is *Dendrophyllia cornigera*.

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