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Bathyal suprabenthic assemblages from the southern margin of the Capbreton Canyon ("Kostarrenkala" area), SE Bay of Biscay

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ABSTRACT

The bathyal suprabenthic fauna of the Kostarrenkala area (Capbreton Canyon, SE Bay of Biscay) was sampled during daytime at eight stations located on a bathymetric transect between 175 and 1000 m depth using a multinet suprabenthic sled. Two hundred and five suprabenthic taxa were recorded in this area, mainly amphipods, cumaceans, isopods and mysids. Total abundances ranged from 752 to 2640 ind./100 m^2, showing a decreasing trend with depth. Diversity values (H') ranged between 3.83 and 5.72, increasing significantly with depth. Multivariate analysis of abundance data discriminated three assemblages according to depth: shelf break (72 sp., 1924 ind./100 m^2), upper slope (93 sp., 1485 ind./100 m^2) and mid slope (135 sp., 857 ind./100 m^2) assemblages. Each assemblage was characterised by a distinct dominant species: the shelf amphipod *Westwoodilla caecula* at the shelf break, the isopod *Munnopsurus atlanticus* on muddy sand bottoms of the upper bathyal, and the amphipod *Rhachotropis gracilis* on mid-slope muddy bottoms below the mud line. Such a structure of bathyal assemblages seems to be generalised for the whole margin of the Bay of Biscay.

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1. Introduction

Located in the southeastern part of the Bay of Biscay (NE Atlantic Ocean), the Capbreton Canyon is a "gouf"-type submarine valley according to the morphological description of Shepard and Dill (1966), Vanney and Mougenot (1990), and to the classification proposed by Teixeira Gomes (1996). Such a major topographic structure separates the northern Aquitanian shelf from the narrower southern Cantabrian platform. It begins at less than 250 m from the shoreline in front of Capbreton town (early mouth of the Adour River) and extends through 135 nautical miles before ending on the abyssal plain at about 3500 m water depth (Vanney and Mougenot, 1990). Deeply cutting the continental shelf between the coast and the meridian 2°W, its upper part is narrow and sinuous whereas its lower part widens out to the open ocean. The upper canyon was recently surveyed using multibeam echo-sounder, high resolution seismic and sediment coring, thus giving new insights into morphology, structure and sediment dynamic (Cirac et al., 2001a,b).

Only a few studies have been conducted on benthic communities from the Capbreton Canyon (Le Danois, 1948; Sorbe, 1990; Borja et al., 2004), although recent investigations revealed that this gouf-type submarine valley shelters abundant benthic populations of supposedly rare species with respect to peculiar environmental conditions (Marquiegui and Sorbe, 1999).

The Kostarrenkala area (Fig. 1) is located on the southern Cantabrian margin of the Capbreton Canyon, west of 2°W (150–1000 m depth), laterally delimited by N–S tributary valleys. Its bottom is covered by muddy sand and muddy sediments (Rey and Medialdea, 1989). As demonstrated by Etcheber et al. (1999) for the Aquitanian margin, a mud-line probably occurs at about 600 m depth in the study area, a limit beneath which the mean grain-size remains constant with depth with a significant enrichment in organic carbon in response to the deposition of fine-grained material.

"Kostarrenkala" is also known as a productive fishing ground of the Cantabrian margin, mainly exploited by trawlers for demersal fishes with important commercial value such as *Merluccius merluccius* (Linnaeus, 1758), *Micromesistius poutassou* (Risso, 1827), *Trachurus trachurus* (Linnaeus, 1758) (Sánchez et al., 2002). During the previous CAPBRETON 87 cruise (July 1987), five bottom trawl samplings (Marinovich flat trawl; 12 mm mesh size in codend) were carried out at 150–300 m depth in the Kostarrenkala area. Twenty-seven fish species were registered in overall catches. *Gadiculus argenteus* Guichenot, 1850, *Scyliorhinus canicula* (Linnaeus, 1758), *Lophius budegassa* Spinola, 1807 and *M. poutassou* showed the highest contributions to total biomass (Castro, personal communication).

According to Brunel et al. (1978), suprabenthos includes swimming bottom-dependant animals (mainly small-sized crustaceans)

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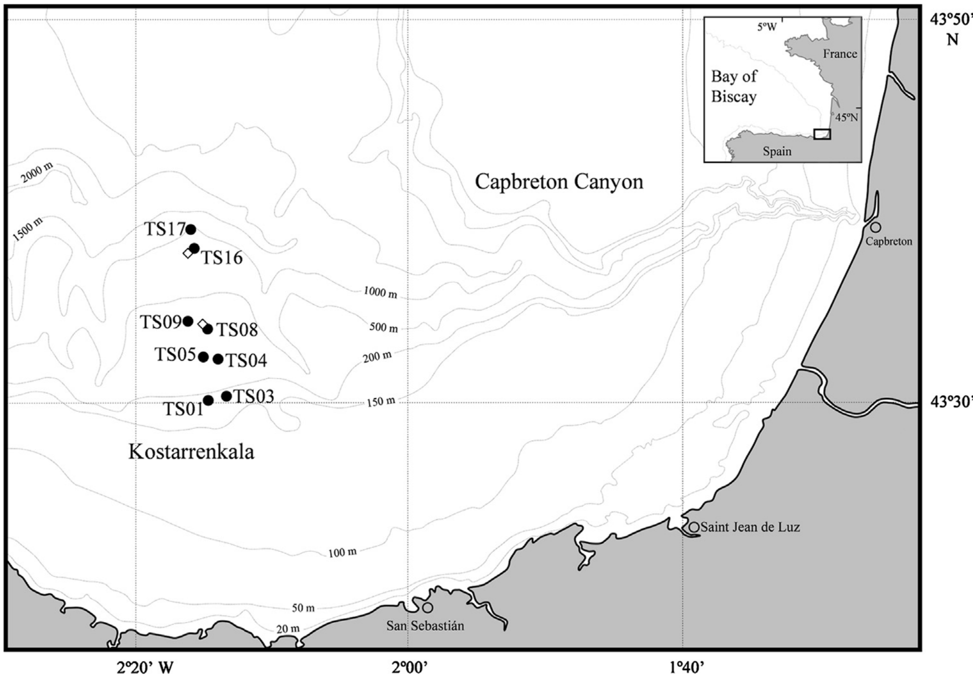

Fig. 1. Location of sampling stations TS01–TS17 (•, suprabenthic hauls; ◇, plankton hauls) carried out on the Kostarrenkala fishing ground, southern margin of the Capbreton Canyon (SE Bay of Biscay), during CAPBRETON 90 cruise.

which perform, with varying amplitude, intensity and regularity, seasonal or daily vertical migrations into the water column. Suprabenthic animals are known to be an important source of food for many demersal fishes, at least during their juvenile phase (Sorbe, 1981). However, their trophic role in benthic ecosystems has been probably underestimated because they are inefficiently sampled by grabs and box corers. Due to their swimming ability, these animals need to be sampled by specific gears equipped with plankton net and towed over the sea floor at an appropriate speed.

During the course of a French-Spanish co-operative research programme on the Capbreton ecosystem (see Sorbe, 1990), the macrobenthic fauna of the canyon was described by Aguirrezabalaga et al. (1988), Rallo (1988), Urzelai et al. (1990a,b), Rallo et al. (1993a,b), Díez et al. (1994), García-Arberas and Rallo (1994), Altuna (1995), San Martín et al. (1996), Aguirrezabalaga et al. (1999), Corbera and Sorbe (1999), Fernández-Leborans and Sorbe (1999), Marquiegui and Sorbe (1999), Núñez et al. (2000), Jaume and Sorbe (2001), Aguirrezabalaga et al. (2001, 2002), Aguirrezabalaga and Ceberio (2003, 2005a,b, 2006), Aguirrezabalaga and Carrera-Parra (2006), Kavanagh and Sorbe (2006), and Aguirrezabalaga and Gil (2009). Later on, Corbari and Sorbe (2001) presented preliminary observations on the structure of suprabenthic assemblages from the upper canyon (OXYBENT survey) and Sorbe et al. (2010) studied the benthic fauna on some shallow pockmarks within the Kostarrenkala area.

This paper focuses on the structure of the bathyal suprabenthic assemblages from the Kostarrenkala area, based on samples located along the slope between the shelf break of the Cantabrian margin and the thalweg of the Capbreton Canyon.

2. Materials and methods

2.1. Study area

Ogawa and Tauzin (1973) described the physicochemical environment at the water-sediment interface all along the Capbreton Canyon. The near-bottom waters generally showed low oxygen content due to their stagnation westward from the meridian 1°38′ W. Their mean level of oxygen saturation was about 50% but locally some values were less than 25% (hypoxia). Furthermore, between 1°50′W and 1°58′W, very low oxygen contents were measured in the near-bottom waters (minimum value at 20 cm above the sea floor: 1.96 ml l^{-1}) suggesting a tendency to confinement in this sinuous part of the canyon. Westwards from the meridian 2°W, the near-bottom waters showed a high oxygen content (5.74 ml l^{-1} at about 1600 m depth) probably due to a better circulation of water masses in this enlarged part of the canyon (oxygen saturation level: 75%). Tauzin (1974) measured the organic carbon content (percentage of dry sediment) of surficial sediments all along the bottom and the flanks of the canyon. The observed values fluctuated between 0.44% and 5.39% and an organic-rich area was detected at a bathymetric level located just above the afore-mentioned confinement area.

According to Tauzin (1974), the sea floor below 500 m depth is under the influence of the Mediterranean Overflow Water (MOW) characterised by a temperature of 9–10.5 °C, a high salinity (35.80) and an oxygen minimum at a depth of about 850 m (slightly inferior to 4.38 ml l^{-1}). The upper depths are under the influence of the Eastern North Atlantic Central Water (ENACW), a lower salinity water mass (minimum range: 35.51–35.54) characterised by a minimum temperature value of 10.8 °C (Durrieu de Madron et al., 1999).

A recent multibeam mapping of the Capbreton Canyon revealed the existence of circular to ellipsoidal pockmarks, distributed as N–S bathymetric alignments in the Kostarrenkala area (Bourillet et al., 2007; Gillet et al., 2008). These depressions are known to be formed by the escape of gases and associated waters from an underlying hydrothermal field (see Holvand and Judd, 1988). However, the actual seeping activity of these pockmarks, as well as the impact of gas extrusion on the surrounding deep suprabenthic/benthic fauna by reducing oxygen concentration in the near bottom waters remains to be elucidated (Sorbe et al., 2010).

2.2. Field sampling

Samplings were carried out during CAPBRETON 90 cruise in July 1990. Fig. 1 shows the study area in the southeastern part of

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