A MASS MORTALITY OF GORGONIA VENTILINA
(Cnidaria: Gorgonidae) IN THE SANTA MARTA AREA, CARIBBEAN COAST OF COLOMBIA

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The steep, rocky shores of the Santa Marta area (including the Tayrona Natural Park) in the Colombian Caribbean (11°12’N and 74°14’W to 11°18’N and 73°54’W) comprise more than 90 km of irregular shoreline (Fig. 1). Hard substrata continue below the sea surface usually down to a maximum depth of 30 m, supporting rich communities of reef associated organisms (Garzón-Ferreira and Cano, 1990). Gorgonaceae are common and can dominate the sessile biocones on some sites. The sea fan, Gorgonia ventilina Linnaeus (Cnidaria, Gorgonidae), was known as one of the most conspicuous and abundant of the 39 living species of gorgonaceae in the area (Boteo, 1987a, 1987b; pers. observ.). In September 1988, one of us (J.G.-F.) started to dive intensively in the area to map marine communities, and noted the absence of live individuals of sea fans. By the end of 1990, J.G.-F. had surveyed most of the coast to a depth of 20–30 m, and was able to recognize the dramatic mortality suffered by sea fans around Santa Marta. This note documents this mass mortality, compares it with other similar events and discusses its possible date of occurrence and causes.

There are a few reports of octocoral mass mortalities in the tropical western Atlantic, all of which involved mainly sea fans and occurred along the southern Caribbean during the 1980’s (Fig. 1). The earliest record is from Trinidad, where dead colonies of gorgonaceae were first observed in November 1981 along the north coast to a depth of 10 m; the species most affected was G. ventilina, which reacted a 100% mortality by the end of 1982 (Laydoo, 1983). Guzmán and Cortés (1984) documented that colonies of G. flabellum Linnaeus started to die in Costa Rica early in 1982, reaching mortality levels greater than 90% at the beginning of 1983. H. M. Guzmán (pers. comm., 1991) has informed us that a 1982–1983 sea fan mortality occurred also in Panamá, where G. ventilina seemed to be more abundant than G. flabellum; after surveying more than 25 Panamanian reefs, he was able to conclude that sea fans disappeared almost completely, Gorgonia being the only octocoral genus affected. Williams and Blunkley-Willey (1990) also cited mass mortalities of Gorgonina spp. in Panamá and Colombia from 1983 to 1989, but did not give additional information. On the other hand, when informally questioned during a technical meeting (CAR(COMP) workshop) held in Jamaica in December 1990, marine scientists involved in diving activities reported no sea fan mass mortalities at reefs of Bermudas, Yuketán (México), Cuba, Cayman Islands, Jamaica, Puerto Rico, Virgin Islands, Barbados, Bonaire and Los Roques (Veneuela).

Boteo (1987a, 1987b) studied the octocoral communities of the Santa Marta area in 1984–1985 and did not find noticeable mortality; G. ventilina was cataloged as one of the two most abundant gorgonaceae, reaching densities of 4.5 colonies m⁻² and height well over 1 m within the top 10 m in depth. G. flabellum was reported as a very rare species. It is thus clear that the sea fan mortality in this area occurred sometime between 1983 and 1988, several years after the mortalities of Trinidad and Costa Rica–Panamá. Unfortunately, we have no conclusive evidence to pinpoint a precise date for the beginning of the mass mortality at Santa Marta. However, a series of underwater photographs taken by one of us (S.Z.) at the Santa Marta Bay, show a few skeletal remains among live colonies.
Figure 1. Localities (black dots) where mass mortalities of sea fans (Gorgonia spp.) have been reported: 1, Santa Marta/Tayrona Natural Park; 2, Islas del Rosario.

(edges of meshwork between major ribs slightly to strongly eroded) in March–May 1987, and all colonies dead with very eroded meshworks between April and June 1988 (about 10 colonies observed). This may indicate that mortality could have started sometime between late 1986 and early 1987.

From our observations of 1988–1990, we can assert that the sea fan mortality reached nearly 100% and covered all the coastal hard bottoms at least of the Santa Marta area. Hundreds of skeletal ribs devoid of any meshwork were seen still attached at places with previously profuse growth (Fig. 2), from shore to a depth of 15 m. These remains unmistakably belonged to sea fans as most of them branched directly from the holdfasts and along the same plane (Fig. 2). No other octocoral species was observed in a similar condition. Only small colonies of sea fans were seen alive, and those probably corresponded to recruits that settled after the mass mortality event (Fig. 2). The recovery of Gorgonia populations in the Santa Marta area is rather low; in June 1991 we revisited several localities where sea fans grew exuberantly, finding many skeletal ribs still in place, and a few small live colonies (less than 1% of the original population density).

Sea fan mortality in the Colombian Caribbean was not limited to the Santa Marta area. In October 1989, J.G.F. visited the coraline archipelago Islas del Rosario, about 200 km southwest of Santa Marta, finding the vestiges of what had been a dense population of Gorgonia in the inner fore reef at the north side of Isla Tesoro (10°14'N and 75°44'W). Among the hundreds of eroded skeletons still attached to the bottom between 3 and 7 m in depth, only one colony showed portions of live tissues, and no young recruits were seen. Unfortunately, it was not possible to ascertain whether or not the sea fan mortality occurred simultaneously with that of Santa Marta.

Among the possible causes of recent sea fan mortalities, the following have been discussed in the literature: (1) unusual changes in temperature and salinity, (2) increase in sedimentation rates, (3) presence of chemical pollutants, (4) unusual
Figure 2. Remains of a sea lily (Glossoptera wissmanni) population at the exposed side of Bahía de Ninguanga, Santa Marta area, photographed on September 1990. Eroded skeletal ribs of large individuals at 5 m depth (upper), some of them covered by Millepora, and at 15 m depth (middle; the lower picture shows a healthy solitary young specimen ca. 15 cm height) at 7 m depth.
strong wave-action, (5) pathogenic agents with a high degree of host specificity, (6) increased pressure by predators, and (7) advanced stages of the algal "tumor" phenomenon in gorgonaceans (Laydoo, 1983; Guzmán and Cortés, 1984). In our case, it is difficult to blame any particular cause because mortality was detected after it had already occurred, and we did not examine colonies in the process of deterioration. However, given the characteristics of the event (fast, massive, and apparently exclusively occurring on Gorgonia spp.), it seems probable that a waterborne specific pathogen may have caused the mortality in Santa Marta. Slightly higher wave temperatures and unusual riverine discharge near Santa Marta during September-November 1987 were associated with a relatively mild bleaching event in reef organisms in the area, including G. verticillata (pace colonies reported by Zea and Duque, 1989). However, the bleaching occurred after the time we estimate the sea fan mortality had already begun. On the other hand, it is not very probable that a deleterious factor in the environment, such as unusual changes in temperature or salinity, or a pollutant, directly affects a single species, eliminating it completely in an area where there are many other species with similar environmental requirements.

Contrary to other pathogenic mass mortality events (e.g., the lorig-spingidurchin, Didemnum antillarum, Lissios et al., 1984), the sea fan mortalities lack a simple, geographically and temporally sequential, pattern of occurrence. The apparent restriction of sea fan mortalities to the southern Caribbean may indicate that activation of the pathogen is related to particular environmental conditions of this area (i.e., strong continental runoff and/or upwelling, Rodríguez, 1981; Hallock and Eldred, 1985).

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NOTE ADDED IN PROOF: In May, 1992, the authors studied intensively around the coraline island of San Andrés in the southwestern Caribbean (12°32'N and 81°43'W), also finding sea fan mortality levels of nearly 100%.