



Biological characterization of aggregates clogging fishing nets on the Basque coastal waters of France



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ABSTRACT

Over the past fifteen years, gillnets used by fishermen of the Basque coast of France have been seasonally covered with aggregates. By making the nets more visible, this disrupts the coastal fishing activity and sometimes causes skin allergies. In 2010, we deployed for the first time a fine mesh device which was immersed permanently and attached to the bottom off the Bay of Saint-Jean-de-Luz in order to collect samples of these aggregates throughout the summer period.

The first results reported in this work deal with the origin and biology of organisms forming these aggregates, excluding biochemical and bacteriological aspects. A remarkable feature is the wide variety of both planktonic and benthic components in the collected matter. More than 111 taxonomic units have been so far identified. In addition to these elements of marine origin, these aggregates deposited on fishing nets also contain exogenous matter of continental origin, mainly Grey Willow *Salix atrocinerea* silk's seeds, mammals' hairs and pollen. In this work, particular attention is also given to the potentially irritating and stinging organisms present in the aggregates. Finally, hypotheses are developed about the aggregation process of these living organisms and their pelagic sedimentation induced by the presence of fishnets in the water column.

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1. Introduction

The marine pelagic environment, particularly in coastal areas, includes a wide variety of particles of any size and composition forming the sestonic compartment. Planktonic organisms live surrounded by a large number of mineral and organic abiotic particles they produce or consume. Complex interactions between living and inert fractions sometimes produce aggregation phenomena forming mucilaginous clouds or ribbons in the water.

Many species of phytoplankton and bacterioplankton and even benthic organisms exude colloidal substances that contribute to the development of these aggregates. They exude dissolved polysaccharide molecules, precursors to the formation of transparent exopolymer particles (TEP) or directly produce TEP into the water (Malpezzi, 2010). These sticky and biogenic TEP make up mainly

microaggregates that sometimes further develop to form much larger macroaggregates (Giani et al., 2005a, b, c).

These aggregates can remain dispersed and settle slowly in the water column as “marine snow” (Kjørboe, 2001) or form much larger clouds: in the Adriatic Sea, they can reach several kilometres long (Precali et al., 2005). Most of them grow and persist in the water column above the pycnocline or thermocline which prevents their sedimentation (Malpezzi, 2010), but some are located more deeply and cover sediments or benthic fauna (Giuliani et al., 2005; Lorenti et al., 2005; Aktan and Topaloglu, 2011). Regardless of their location in the oceanic environment, these aggregates have a fundamental and often overlooked role in determining the biogeochemical pathways of food and energy necessary for the functioning of the ecosystem.

For thirty years many studies have investigated the determination, composition and frequency of these pelagic mucilaginous aggregates. In Europe, the Mediterranean seems to be particularly affected by these phenomena especially in the Adriatic and Tyrrhenian seas (Giani et al., 2005a, b; 2012). Most of these studies

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concern the non-living fraction and there is little data concerning the French Atlantic coast. Off the Seine estuary (English Channel), Dupont and Lafite (1986) have shown the importance and the contribution of autotrophic and heterotrophic micro- and mesozooplankton populations in the formation of aggregates from inert particulate fraction.

The rapid development of these aggregates in coastal areas induces serious disturbances affecting human activities such as the quality of bathing water, the development of aquaculture or local fisheries (Giani et al., 2005c; Aktan and Topaloglu, 2011).

Over the past fifteen years, gillnets used by fishermen on the French Basque coast have been regularly covered with a sticky and irritant aggregate locally called « liga ». The occurrence of this phenomenon has not been studied so far, and is based on the increasingly numerous testimonies and complaints from coastal fishermen collected by the local fisheries committee in Saint-Jean-de-Luz. At present, these complaints are almost yearly. By making the nets more visible, these aggregates disrupt the coastal fishing activity and sometimes cause skin allergies. At the request of the local committee of marine fisheries and considering the limited number of studies on these aggregation phenomena on the French Atlantic coast, a first research program was set up in 2010 in order to establish the origin and composition of these aggregates. The latter's collection has required the design and realization of a specific sampler similar to that used by fishermen to catch fish.

The results presented here concern the species composition, abundance and diversity of microplankton (20–200 μm) and mesoplankton (0.2–20 mm) and those of benthic organisms within the same size range. Other inert and exogenous elements of continental origin are added to this endogenous fraction and also participate in the aggregation of particulate organic matter constituting these sticky aggregates clogging fishing nets on the Basque coast.

2. Material & methods

2.1. Study area and aggregate matter sampling

The single station (43°37'N; 1°43'W; depth \approx - 30 m) for

aggregate sampling was located off the Bay of Saint-Jean-de-Luz in the southern French Atlantic (Fig. 1). A special fine mesh device similar to the nets used by the fishermen was built to sample the aggregated matter (Fig. 2). Two floats and two anchors attached to the frame of the device maintained the three nets vertically at various depths in the water column. In order to capture a maximum amount of aggregates, a mesh size of 750 μm similar to those used for fishing *leptocephalus* eel larvae was selected. For taxonomic, biodiversity and abundance purposes, aggregate sampling was

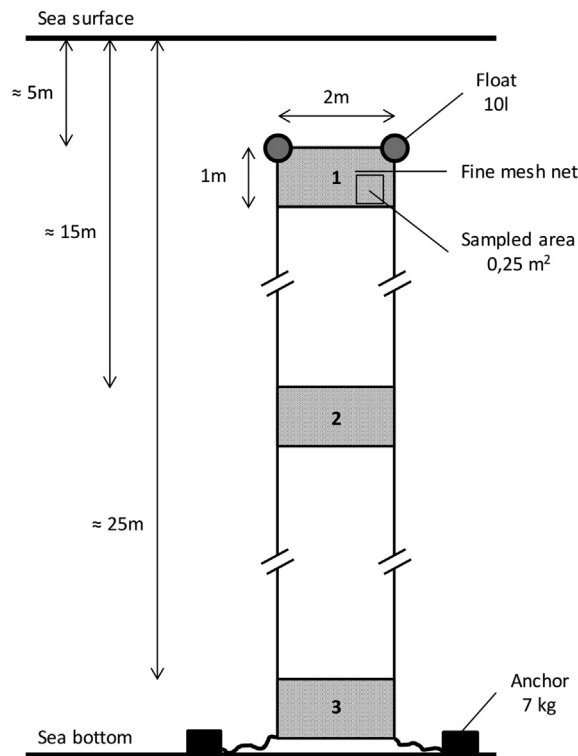


Fig. 2. Diagram of the device to collect the pelagic aggregates.

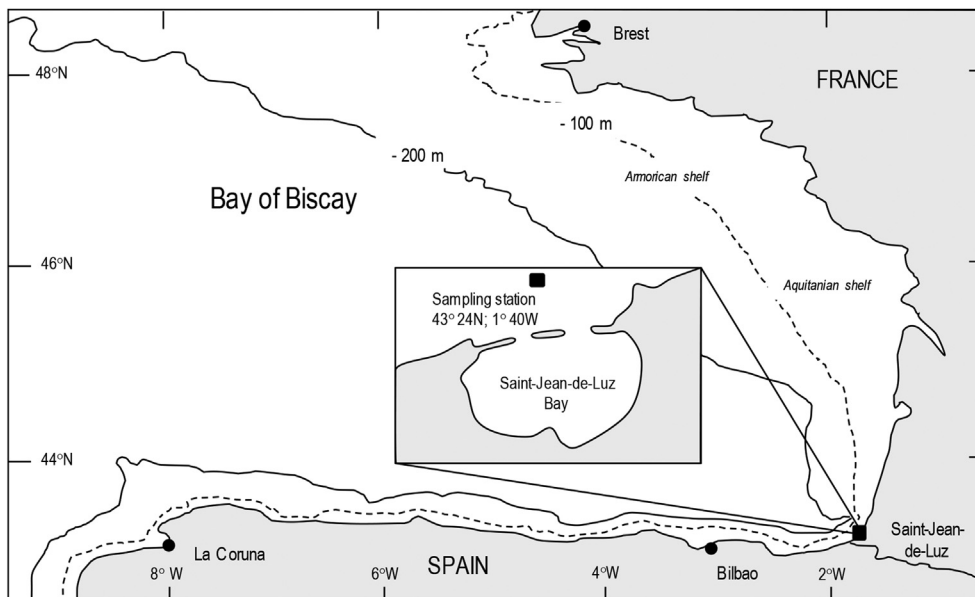


Fig. 1. Location of the sampling station near the Bay of Saint-Jean-de-Luz (France).

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