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How algae influence sessile marine organisms: The tube worms case of study

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ABSTRACT

Tube worms and phytobenthic assemblages in three infralittoral and shallow circalittoral Mediterranean benthic communities developed between 5 and 35 m depth at Punta del Lazzaretto (Giglio Island, Central Thyrrenian sea) were investigated. Despite being three algae-dominated habitats, these displayed different covering both in terms of algal layers and algal morphologies, reflecting different structural organizations. Twenty-eight serpulid taxa have been reported, increasing both diversity and density values from most photophilic to most sciaphilous habitats. Multivariate analyses showed how algal thalli and tube worm assemblages were strongly correlated; substrata are influenced both physically and biologically, providing different conditions for tube worm settlement.

1. Introduction

Serpulid worms (Annelida, Polychaeta), belonging to the large clade Sabellida, live in tubes which they build from a mixture of calcium carbonate and organic matrix; this group is able to colonize a large variety of marine habitats and man-made substrates, from lagoons to abyssal depths (Kocak et al., 1999; Bianchi and Morri, 2000, 2001; Casoli et al., 2015). They constitute a basic component of carbonate bioconstructions from tropical to boreal latitudes and shape the sea floor by acting as secondary builders (Fagerstrom, 1991; Rosso and Sanfilippo, 2009) or more often as binders, increasing the secondary substrate by coating and fastening other tubes or partially filling crevices (Sanfilippo et al., 2013). Tubes allow the worms to stay with their crown millimeters to centimeters above the sea floor, where suspension-feeding activity is favoured (Bosence, 1979). Serpulids have been relatively well studied (Bianchi, 1979a, 1979b; Balduzzi et al., 1995; Çinar, 2006; Ten Hove and Kupriyanova, 2009). So far several species have been recognized as lessepsian migrants, and they have been introduced into the Mediterranean Sea by major non indigenous species vectors (Zibrowius, 1992; Ben-Eliahu and Fiege, 1996; Zenetos et al., 2005; Hopkins and Forrest, 2008). However the relationship between tube worms and other components of benthic communities are still poorly understood, particularly in the Coralligenous habitat and in some infralittoral algal biotopes.

Variation in light and water movement are considered to be the main abiotic factors influencing the vertical zonation of macrobenthic communities, as highlighted by Pérès and Picard (1964) and Riedl (1964), respectively. Both the aforementioned drivers, together with other abiotic (*i.e.* salinity, substrate and nutrient availability) and biological (*i.e.* predation, competition and recruitment) factors, act in synergy to influence the distribution of marine organisms. In the Mediterranean sea both shallow subtidal assemblages and deep subtidal rocky habitats have been reported to be dominated in biomass cover by photophilic algae and calcareous algae, the latter of which are known to prefer dim light conditions (Boudouresque, 1984; Ballesteros, 2006). Simultaneously William and Seed (1992) recognized marine algae as biological formers of habitat complexity, underlining that different macroalgae do not support benthic fauna in the same way. Even though ecological studies have often discussed the several factors characterizing the composition of benthic communities, only a few recent cases have accounted for the role of algae in modifying and structuring the faunal assemblages. Polychaetes, crustaceans and molluscs appear to be strongly linked to structural patterns

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provided by algae. Composition and abundance of amphipods, harpacticoid copepods, ostracods, gastropods and vagile polychaetes differed significantly in relation to algal assemblages, and consequently to algal structure (Edgar, 1983; Abbiati et al., 1987; Giangrande, 1988; Gibbons, 1988; Chemello and Russo, 1997; Chemello et al., 1997; Hull, 1997; Chemello and Milazzo, 2002). Although all cited studies examined the role of algae in influencing the faunal taxa, it must be highlighted that the analyzed groups constituted only the motile component of the assemblage. In this context, this paper represents an interesting and rare study of a widespread sessile group.

The aim of this work is to investigate serpulid assemblages in relation to habitats' structural heterogeneity provided by the algae. This study focuses on vegetation features able to provide a suitable environment for tube worm colonization in three different neighboring infralittoral and shallow circalittoral Mediterranean biotopes.

2. Material and methods

The study has been carried out at island of Giglio (Central Tyrrhenian Sea, Italy), about one kilometer north of Giglio harbour (10°55′16,053″ E, 42°21′40,986″ N) (Fig. 1). Giglio island has been incorporated in the Tuscan Archipelago National Park (DPR 22/07/1996) due to its notable landscape and natural interest. However there are no national environmental protection measures for the marine areas. The sampling stations were located at Punta del Lazzaretto, along the East coast of the island. This site is characterized by isolated large boulders and rocks lying at 10 m depth and surrounded by *Posidonia oceanica* (L.) Delile meadow. Steep walls develop from 20 m to 40 m depth, ending on gently sloped sandy bottom. Ecological features of the rocky subtidal bottom of the same site were described by Balduzzi et al. (1995) who studied zoobenthos zonation up to 25 m depth. The investigated communities are found established side by side in the study site. Shallow infralittoral assemblages (called S, 5–10 m depth) and *Phyllophora*

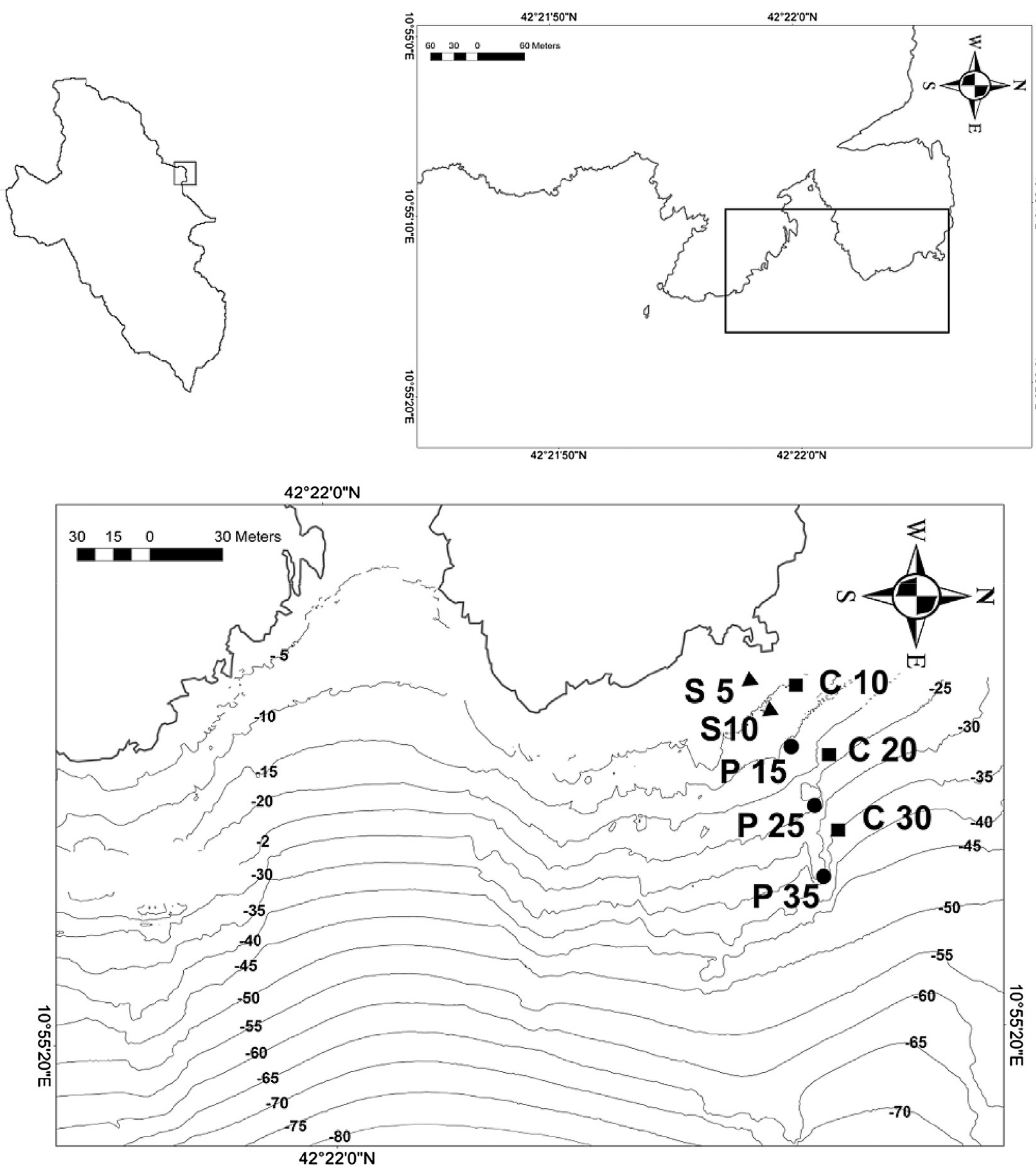

Fig. 1. The study area showing the location of sampling stations. Different symbols have been used to distinguish the habitat investigated: triangles indicate Shallow infralittoral stations (S), circles identify *P. crispa* assemblage samples (P) and squares are placed in correspondence of Coralligenous outcrops (C).