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## PRELIMINARY SURVEY ON THE VERMETID BIOCONSTRUCTION ALONG THE APULIAN COAST IN THE PROVINCE OF BRINDISI

### INDAGINE PRELIMINARE SULLE BIOCONSTRUZIONI A VERMETIDI LUNGO LA COSTA PUGLIESE NELLA PROVINCIA DI BRINDISI

**Abstract** – This study describes for the first time vermetid platforms along the Adriatic coast of Apulia, in the province of Brindisi. The study has been carried out on the coastline between Savelletri and "Lamaforca" for approximately 24.5 linear km. The vermetid bioconstruction is present along the coast as a thin encrustation. In the first 7 kilometres of coastline, bioconstructions were almost absent, while they were more concentrated on the coastline between Torre Canne and Villanova; bioconstruction was also present on the coastline between Villanova and Lamaforca, although in smaller quantities. Morphological investigations confirmed that the bioconstructor species was *Dendropoma cristatum* (Biondi, 1859); data on the density of individuals and the size of shell apertures were in line with data from studies carried out in the rest of the Mediterranean Sea. These data represent a preliminary record on vermetid bioconstruction in Apulia, but further studies are needed to describe it also along the Ionian coast.

**Key-words:** Bioconstruction, vermetid, *Dendropoma cristatum*, Apulian coast, Adriatic Sea.

**Introduction** - Vermetid reefs are particular coastal bioconstructions characteristic of shallow rocky coastlines. In the Mediterranean Sea, they are typical of warm regions, especially on abrasion platforms. These bioconstructions play an important role as habitat engineers, as they improve habitat complexity (Chemello *et al.*, 2009). Vermetid reefs contribute in different ways to widen the available ecological niches for a variety of benthic and fish assemblages: by limiting physical disturbances, by providing refuge from predation and critical nursery habitat, by affecting the strength of competitive interactions, or representing themselves important food resources (Consoli *et al.*, 2008; Chemello, 2009).

They also play an important role in preventing or slowing wave-induced coastal erosion while also being indicators of good ecological status due to their sensitivity to temperature and sea level rises (Chemello *et al.*, 2000). Vermetid reefs are result of the bioconstructive action of the gastropod mollusc *Dendropoma cristatum* (Biondi, 1859), belonging to the family Vermetidae, in association with coralline algae such as *Neogoniolithon brassica-florida* ((Harvey) Setchell & Mason, 1943) and *Lithophyllum byssoides* ((Lamarck) Foslie, 1900). According to Chemello (2009) vermetid bioconstructions develop along four main morphologies influenced by different environmental parameters; among these, the inclination of the substrate can determine the presence of a "true" vermetid reef or a thin encrustation. Along the Adriatic coast of Apulia (southern Italy) in the province of Brindisi, characterized by a low inclination of the substrate, a thin encrustation of *D. cristatum* was for the first time detected, covering discontinuously about 25 linear km. The aim of this study was to describe distribution, extension and population parameters of this peculiar bioconstruction as it seems important for the biodiversity of the lower mesolitoral.

**Materials and methods** – The study was performed on the coastline between Savalletri and Lamaforca for a total of 24.5 linear km (Fig. 1). The entire area was divided into three sites: Savalletri-Torre Canne, Torre Canne-Villanova and Villanova-Lamaforca. For cartographic surveys, each site was divided into sheets at a scale of 1:800 and in each sheet, a grid of numbered quadrants 30x30m each side was created near the coastline (Fig. 2). In order to map the vermetid encrustation in the investigated area, for each quadrant, the linear extension (meter), the width (as linear distance between the inner and the outer edges) and the extension in m<sup>2</sup> were recorded. Along the study area, three 20-meter-long survey transects were fixed, detecting the exposure (measured using a compass), substrate inclination (measured using a goniometer), settlement substrate type and depth. In each transect, in order to detect the thickness of the vermetid encrustation, the density of *Dendropoma cristatum* and the shell apertures diameters, two quantitative samplings square 10x10cm were carried out. For each sample, the surface area was measured using ImageJ software (Rasband W.); the density ( $D=N_{ind}/cm^2$ ) was calculated by counting the number of the shell apertures of *D. cristatum*. The shell apertures diameters was measured using a stereomicroscope and then the data were divided into eight size classes between 0.5 and 4 mm.



Fig. 1 - The study area.  
Area di studio.

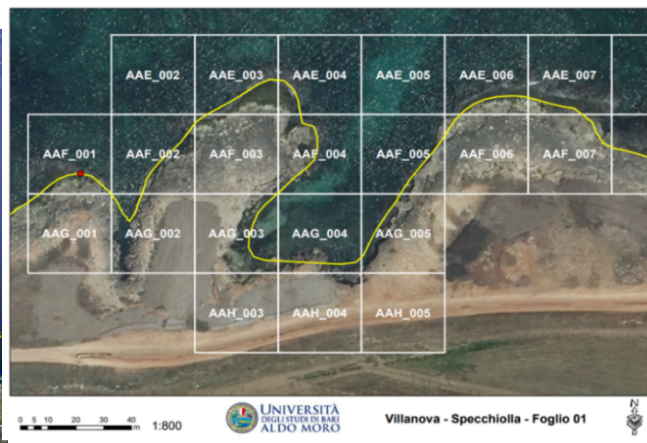


Fig. 2 - Example of a monitoring sheet (Sheet 01 of Villanova-Lamaforca site).  
Esempio di un foglio di monitoraggio (Foglio 01 dell'area Villanova-Lamaforca)

**Results** - The results of the mapping operations indicated that the vermetid bioconstruction in the Savalletri-Torre Canne site (about 6 linear km) was almost absent (Fig. 3). In the Torre Canne-Villanova site (12 km), the vermetid bioconstruction was not present for the first 7 km of the coastline; from this point onwards, for approximately 5 km, the discontinuous presence of vermetid bioconstruction was recorded as far as the port of Villanova, where the vermetid platforms disappeared in correspondence with the built-up areas. In this site the vermetid bioconstruction covers 2879.7 linear m and occupies an area of 813 m<sup>2</sup> (Fig. 3). In the Villanova-Lamaforca site (6.5 km), the bioconstruction was absent along the first 3.5 km; in the remaining 3 km, it extends for 682.8 m occupying an area of 140 m<sup>2</sup> (Fig. 3). The investigated coast is SE-NW oriented (mean value of exposition  $300^{\circ} \pm 50^{\circ}$ ), presents an average substrate inclination of  $8^{\circ} \pm 2.3^{\circ}$  and is characterized by a settlement substrate of calcarenite.

The width of vermetid bioconstruction, measured between the outer and inner edges, varied from 10 cm to 1 m in the first site and from 10 cm to 2 m in the other two sites.

The analysis of the six quantitative samples squares showed that the vermetid bioconstruction in the first transect showed an average thickness of  $6 \pm 2.83$  mm; in the second and third transect, the average thickness recorded was  $7.75 \pm 1.06$  mm and  $5.05 \pm 0.64$  mm, respectively. The density of *D. cristatum* ranged from a minimum of 1.4 individuals/cm<sup>2</sup> to a maximum of 6.3 individuals/cm<sup>2</sup> with an average value of  $3.07 \pm 1.76$  individuals/cm<sup>2</sup>. The sizes of the diameters of the shell apertures ranged from a minimum of 0.63 mm to a maximum of 3.85 mm, with an average value of  $1.7 \pm 0.26$  mm (Fig. 4). The analysis of the diameters size distribution showed that most individuals presented an diameter of the shell aperture between 1-2 mm; 15 individuals showed larger dimensions of the diameter (2-3 mm) and more rarely it was observed diameters between 3-4 mm.

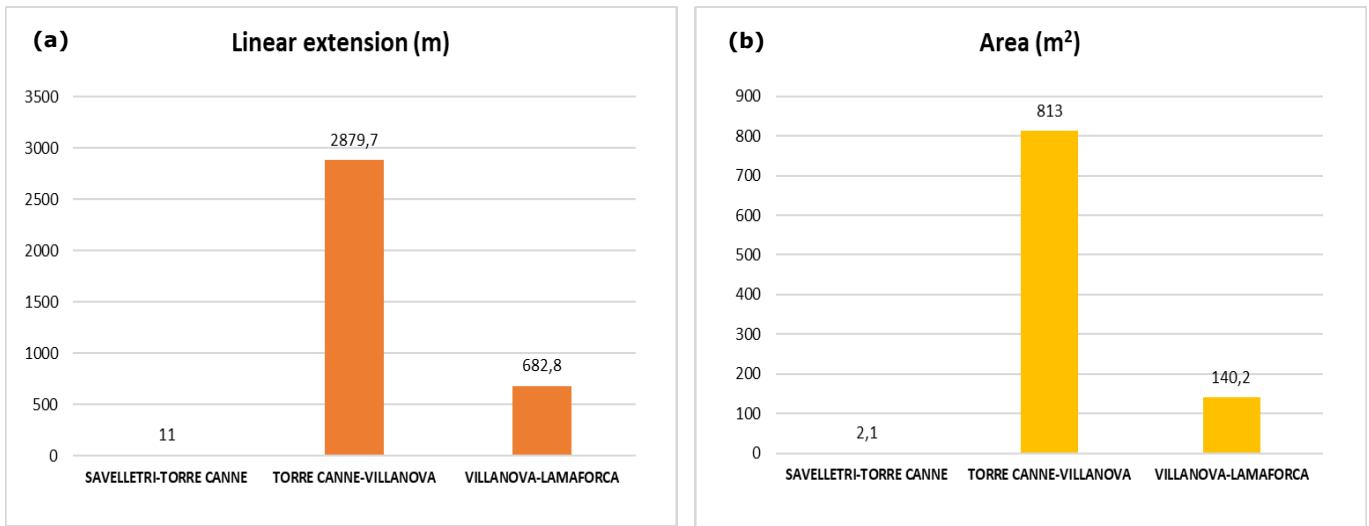


Fig. 3 - Linear extension (a) and area (b) occupied by Vermetid bioconstruction in the three survey sites.  
*Estensione lineare (a) e area (b) occupata dalla biocostruzione a Vermetidi nei tre siti di indagine.*

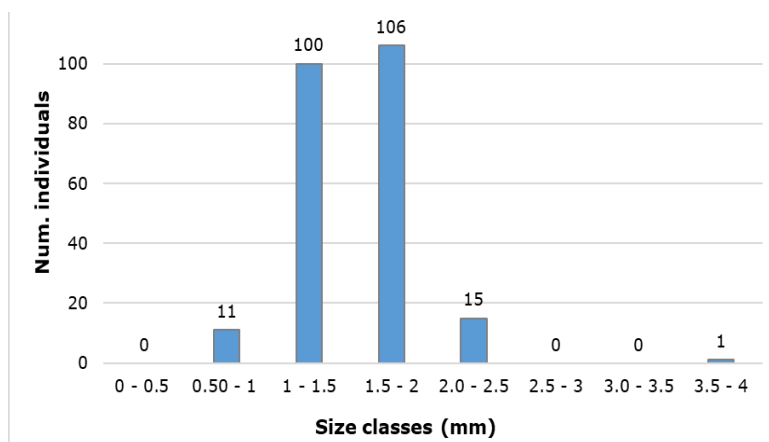


Fig. 4 - Size classes distribution of the shell apertures diameters.  
*Distribuzione per classi di grandezza dei diametri delle aperture delle conchiglie.*

**Conclusions** - Exposure, substrate slope and type of settlement substrate are the main factors influencing the development of vermetid platforms (Dieli *et al.*, 2001). The coastal area studied in this research presents an average substrate inclination of 8°. According to literature, the vermetid bioconstructions developing under this condition are reduced in thickness and width and are mainly found as thin concretions (Dieli *et al.*, 2001; Chemello, 2009).

It was observed that the greatest presence of vermetid bioconstruction was detected at Torre Canne-Villanova site and partially at Villanova-Lamaforca site; on the contrary, vermetid bioconstruction were almost absent at Savelletri-Torre Canne site, characterized by long sandy sections.

The mean value of density of *Dendropoma cristatum* is in line with literature data (La Marca & Chemello, 2012). The data referring to the diameters of the shell apertures (mean value  $1.73 \pm 0.27$  mm) are also in line with Templado *et al.* (2016) who claim that the maximum outside whorl diameter up to 4 mm in isolated or loosely aggregated individuals, smaller in dense aggregations (normally ranging from 1.5 to 2.0 mm).

Although the northern limit distribution of the vermetid platforms seems not to exceed 38° lat. North (Chemello, 2009) in the study area located in the province of Brindisi along the Adriatic Apulian coast, vermetid bioconstruction occupied a total surface of approximately 1000 m<sup>2</sup>, representing the northernmost report for the insular Italy until now. The limited geographic distribution of these bioconstructions combined with the increasing number of anthropogenic threats and rapid climate changes highlight the urgency of implementing protection actions at an international level for the conservation of this important intertidal habitat.

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