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SUBSTRATUM RECOGNITION
AS SETTLEMENT CUE FOR LARVAE
OF *DENDROPOMA CRISTATUM* (BIONDI, 1859)

*RICONOSCIMENTO DEL SUBSTRATO
COME STIMOLO PER IL SETTLEMENT DI LARVE
DI DENDROPOMA CRISTATUM (BIONDI, 1859)*

Abstract - Despite the ecological relevance of the vermetid bioconstructions in the Mediterranean, little is known about the early life stage of *Dendropoma cristatum*. This study describes the preference for settlement substrata from *D. cristatum* larvae. A field experiment was carried out to test the suitability of crustose coralline algae (CCA), *D. cristatum* adults and two inorganic substrata as settlement surfaces. The number of settling larvae varied among the four treatments with higher settlement success on organic surfaces. CCA and *D. cristatum* individuals seem to promote attachment of young larvae and to induce the metamorphosis in recruits. This is probably due to biological or physical properties of the preferred substrata which result essential for the early development of the vermetid bioconstruction.

Key-words: larval settlement, habitat selection, substrata preferences, reef formation.

Introduction - Habitat recognition from dispersive propagules greatly increases the post-settlement survival chances of marine sessile organisms (Harrington *et al.*, 2004). Active substratum selection, indeed, can help to minimize the possibility of settling in unsuitable habitats (e.g., Grosberg, 1981), determining the variance in adult populations, distribution and abundance (Raimondi, 1990; Palma *et al.*, 1999). Vermetid gastropods of genus *Dendropoma* are able to form colonies embedded in crustose coralline algae (CCA), generating important reefs of temperate and sub-tropical rocky coast. Despite the importance of these bioconstructions as habitat promoting biodiversity and forming abrasion-resistant reefs, little is known about the early life stage of *Dendropoma* (Spotorno-Oliveira *et al.*, 2015). To detect settlement and recruitment drivers is essential for understanding accretion processes of this coastal key habitat and for approaching to the restoration of damaged vermetid reefs. Moreover, *Dendropoma* has crawling larvae and substratum characteristics are probably relevant for their settlement. While on Brazilian reefs Spotorno-Oliveira *et al.* (2015) tested the preference for larvae of *D. irregulare* to settle on live CCA, little is known about the south-central Mediterranean reef building *Dendropoma cristatum*. This study describes the suitability of different substrata as attachment site for *D. cristatum* larvae, as result of bio-physical characteristics.

Materials and methods - The study was conducted in the marine protected area Capo Gallo-Isola delle Femmine (NW Sicily), in September and October 2014. Artificial settlement surfaces were constructed by attaching chips of three different natural substrata on forex disks (7 cm of diameter): *Dendropoma cristatum* adults and *Neogoniolithon brassica-florida* (Harvey) Setchell & L.R. Mason, two organic settlement surfaces, which are the two main reef builder species, and limestone rocks. Since epoxy resin was used to stick the substrata to the disks, a fourth typology of forex disks was covered by epoxy resin, as artefact control. The combination of the four typologies of settlement surfaces was repeated six times, for a total of 24 settlement disks. These disks were fixed on the seaward edge of the reef, where recruitment rate is higher (Chemello, 2009) and left in the field for 20 days.

Once collected, the disks were observed under the light microscope to record the number of recruits settled on each substratum.

Results - A total of 377 recruits were observed to settle on all substrata tested, but the number of settling larvae varied among the four treatments: 148 individuals were found on *Neogoniolithon* disks, 146 on *Dendropoma* adults and 52 and 31 respectively on limestone and epoxy resin. Statistical analysis of these data showed significant differences in settlement success respect to the substratum typology ($p=0.0007$). Pair-wise test confirmed higher settlement differences among organic and not organic substrata: *Neogoniolithon* vs Limestone, $p=0.0005$; *Neogoniolithon* vs epoxy resin, $p=0.0002$; *Dendropoma* vs Limestone, $p=0.0313$; *Dendropoma* vs Epoxy resin, $p=0.013$. Settlement on *Neogoniolithon* and on *Dendropoma* was 39.26% and 38.73% respectively, while the 13.79 and 8.22% of individuals chose limestone and epoxy resin as suitable attachment surfaces.

Conclusions - Field studies to understand larval behaviour of gregarious vermetidae and early stage of reef formation are few, although habitat selection by larvae is known to be relevant on post-settlement survival and adult distribution patterns (Mundy and Babcock, 1998; Baird *et al.*, 2003). This study analyzes the influence of the substratum typology on *Dendropoma cristatum* settlement and verifies if the substratum properties may affect larvae during habitat selection process. As showed, *D. cristatum* larvae are able to recognize and actively choose which substratum is suitable for their attachment. Therefore, inter and intra-specific interactions among *D. cristatum* larvae and adult individuals and the coralline algae *N. brassica-florida* may be hypothesized to exist and to be fundamental for the reef development. This is also observed for many other biogenic habitats (e.g. coral reefs, Harrington *et al.*, 2004). In order to predict variations in population abundance and in the perspective to develop reef rehabilitation possibility, other biological and physical factors, such as the presence of the microbial biofilm and the substratum complexity, require to be tested in future studies as drivers of settlement.

References

- BAIRD A.H., BABCOCK R.C., MUNDY C.P. (2003) - Habitat selection by larvae influences the depth distribution of six common coral species. *Mar. Ecol. Prog. Ser.*, **252**: 289-293.
- CHEMELLO R. (2009) - Le biocostruzioni marine in Mediterraneo. Lo stato delle conoscenze sui reef a vermeti. *Biol. Mar. Mediterr.*, **16** (1): 2-18.
- GROSBERG R.K. (1981) - Competitive ability influences habitat choice in marine invertebrates. *Nature*, **290**: 700-702.
- HARRINGTON L., FABRICIUS K., DE'ATH G., NEGRI A. (2004) - Recognition and selection of settlement substrata determine post-settlement survival in corals. *Ecology*, **85** (12): 3428-3437.
- MUNDY C.N., BABCOCK R.C. (1998) - Role of light intensity and spectral quality in coral settlement: implications for depth-dependent settlement. *J. Exp. Mar. Biol. Ecol.*, **223**: 235-255.
- PALMA A.T., STENECK R.S., WILSON C.J. (1999) - Settlement driven, multiscale demographic patterns of large benthic decapods in the Gulf of Maine. *J. Exp. Mar. Biol. Ecol.*, **241**: 107-136.
- RAIMONDI P.T. (1990) - Patterns, mechanisms, consequences of variability in settlement and recruitment of an intertidal barnacle. *Ecol. Monogr.*, **60** (3): 283-309.
- SPOTORNO-OLIVEIRA P., FIGUEIREDO M.A.O., TÂMEGA F.T.S. (2015) - Coralline algae enhance the settlement of the vermetid gastropod *Dendropoma irregulare* (d'Orbigny, 1842) in the southwestern Atlantic. *J. Exp. Mar. Biol. Ecol.*, **471**: 137-145.