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MORTALITY EVENTS ALONG THE CAMPANIA COAST (TYRRHENIAN SEA) IN SUMMERS 2008 AND 2009 AND RELATION TO THERMAL CONDITIONS

EVENTI DI MORTALITÀ LUNGO LE COSTE DELLA CAMPANIA (MAR TIRRENO) NELLE ESTATI 2008 E 2009 E RELAZIONI CON LE CONDIZIONI TERMICHE

Abstract *- Local mass mortality events of anthozoans and bivalves were observed along the Campania coast (Tyrrhenian Sea) in late summer 2008 and 2009 and both related to high water surface temperatures. The gorgonian* Eunicella cavolinii *was the damaged species inside the cave "Grotta Azzurra" off Palinuro (Salerno) in late summer 2008, while in 2009 a strong mortality was observed along the coast off the island of Ischia, affecting the gorgonians* Eunicella singularis*,* E. cavolinii *and* Paramuricea clavata*, as well as for the first time the thermophilic scleractinian* Astroides calycularis *and the bivalve* Spondylus gaederopus*.*

Keyw-words*: Anthozoa, Bivalvia, mass mortality, thermal conditions, Tyrrhenian Sea.*

Introduction – Trans-phyletic mass mortality phenomena are frequent in the Western Mediterranean in the least decade due to global climate change and summer heat waves (Garrabou *et al*., 2008). Along the Campania coast (Tyrrhenian Sea) such events have been first documented in the Gulf of Naples in 2002 and 2003, this latter related to a large scale heat-wave (Garrabou *et al*., 2008), and in 2005 related to a local thermal anomaly (Cigliano & Gambi, 2007); both events affected the most common local Gorgonacea, *Paramuricea clavata, Eunicella singularis* and *Eunicella cavolinii*. In this paper we report two further mortality events along the Campania coast occurring in summers 2008 and 2009, which affected key-organisms in areas of high ecological relevance, such as the marine cave with sulphur water springs "Grotta Azzurra" off Palinuro (Salerno) (Benedetti-Cecchi *et al*., 1998), and the coast of the island of Ischia (part of the MPA "Regno di Nettuno").

Materials and methods – The mass mortality event of the gorgonian *Eunicella cavolinii* was visually observed within the Grotta Azzurra off Palinuro in mid October 2008, while quantitative monitoring was carried out during summer 2009. Three horizontal transects 20 m long were carried out at 15 m, 20 m and 25 m depth. In each transect six random 1 m^2 plots were considered for estimate of colony density and extent of tissue damage and necrosis. Mortality of various Anthozoa and Bivalvia was observed off the island of Ischia during the first two weeks of September 2009, and visually estimated along the cliff off Sant'Angelo, one of the most pristine sites of the island.

Results – In the Grotta Azzurra the gorgonian *Eunicella cavolinii*, one of the most abundant and conspicuous organisms inside the cave, was heavily affected by the mortality especially in the first 20 m depth. At 15 m depth a mean of 77% of the counted colonies were completely dead, while a mean of 8.5% had still all tissues alive (Fig. 1); at 25 m the trend was reversed (significant at the Student t-test, $p>0.01$) (Fig. 1). Whole alive colonies, at all studied depths, were represented by more than 80% by juveniles (>15 cm height). At the island of Ischia mass mortality was observed

at the beginning of September 2009 in various sites around the island. Along the pristine cliff of Sant'Angelo we observed the gorgonians *P. clavata, E. singularis* and *E. cavolinii* with various extent of tissue necrosis (about 75% of all individuals) up to 25-28 m depth. Up to 15 m depth also the scleractinian *Astroides calycularis* and the bivalve *Spondylus gaederopus* were affected by mortality. *A. calycularis* showed about 20% of the colonies completely or partially dead, with white corallites, in an appearance similar to that of bleached corals. *S. gaederopus* appeared with the lower valves attached to the rocks and the upper valves detached on the bottom. Analysis of the surface water temperature profiles, revealed for both summers thermal anomalies with extremely high values in August and September: max up to 28-29°C on the surface, and up to 25-26 °C at 30 m depth. For Palinuro the mortality event in summer 2008 represents the first documented in this area, while for Ischia that in summer 2009 represents the fourth mass mortality occurring since 2002, thus jeopardizing the local survivorship of some species (e.g., *E. singularis*) which were affected in all the events. In addition, to our knowledge this is the first time that the thermophilic *A. calycularis* is affected by mortality.

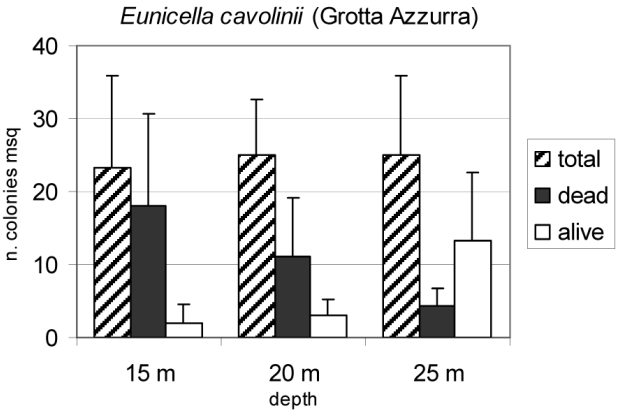

Fig. 1 - Mean density of total, deas and alive *Eunicella cavolinii* colonies at three depths within the Grotta Azzurra off Palinuro, after the mass mortality event in summer 2008. Bars = s.d.
Densità media totale e di colonie morte e vive di Eunicella cavolinii *a tre profondità nella Grotta Azzura di Palinuro, a seguito della moria di massa dell'estate 2008. Barre = d.s.*

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