

HYDROZOANS AS PIONEER COLONIZERS AFTER A MASS MORTALITY EVENT IN THE SEA OF MARMARA

Nur Eda Topçu^{1*}, Luis F. Martell¹, Izzet Noyan Yilmaz² and Melek Isinibilir³

¹ Istanbul University Fisheries Faculty - These authors contributed equally to this study - edatopcu@istanbul.edu.tr

² Istanbul University Marine Sciences and Management

³ Istanbul University Fisheries Faculty

Abstract

A recent mass mortality of benthic suspension feeders was observed in the Sea of Marmara, in summer 2015. Hydrozoans colonizing dead organisms' skeletons and emptied habitats were sampled by scuba diving. Four species of benthic hydroids highly increased their density after the mass mortality. *Obelia dichotoma* and *Bougainvillia muscus* increased their abundance by almost 10 times. Future potential shifts of assemblages will be kept monitored in the Sea of Marmara.

Keywords: *Hydroids, Zoobenthos, Marmara Sea*

Introduction Recently, a mass mortality of benthic suspension feeders was observed in the Sea of Marmara, in summer 2015, affecting mainly massive sponges and gorgonians. A series of thermal anomalies recently affected benthic assemblages causing mass mortalities at some locations in the western Mediterranean Sea [1; 2]. After the outbreaks, ecosystem shifts due to the disappearance of long lived, slow growing suspension feeders and decreased complexity/resilience of bioconstructions were reported [3]. In the Sea of Marmara, shortly after the disappearance of massive sponges and gorgonians, fast-growing and highly tolerant hydrozoans were observed, proliferating on dead organisms' skeletons and emptied habitats. The aim of this study was to observe the colonization by hydroid colonies, determine the species and estimate the increase of their abundance.

Material and Methods Samplings for Hydrozoans were conducted in August and October 2015 at two sites that were mainly affected by the event (Fig.1). The depth strata of the mass mortality event included the area between the halocline layer [15-20 m] until 40 m. and this zone was surveyed for prevalent hydrozoan colonies colonizing a diverse range of substrates and dead organisms' skeletons. Hydroid colonies and fragments of substrates supporting hydrozoan colonies were collected. Sample collections were realized in duplicates, optimized by spending the same effort at the same depth gradient. Samples were fixed in 4% formaldehyde-sea water solution and later transferred to 70% ethanol and identified to species level in the laboratory. The great majority of hydrozoan colonies were of similar size, and thus the total number of polyps in each site was estimated for each sample by multiplying the amount of polyps in 40 colonies with the total number of colonies observed.

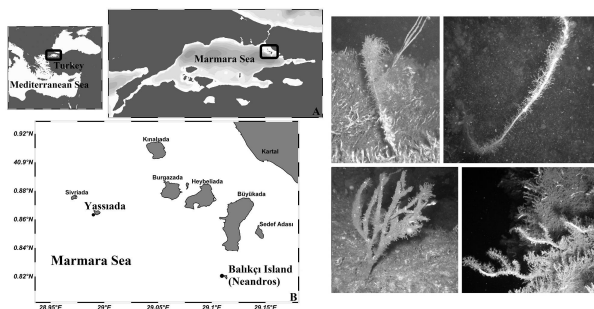


Fig. 1. On the left side; location of the mass mortality event (A) and of sampling stations (B). On the right side, *Bougainvillia muscus* and *Obelia dichotoma* colonies on dead gorgonians, sponges and rocky substrates.

Results and Discussion Four species of benthic hydroids (Fig. 2) were highly abundant after the mass mortality event and were found colonizing dead sponge and gorgonian skeletons, mollusk shells, polychaete tubes and other rocky substrates. All colonies were found reproductive, with the highest values occurring in October. *Bougainvillia muscus* and *Obelia dichotoma* are common and abundant species in the northern Sea of Marmara (Topçu unpubl. data) but their abundances were highly increased in October, compared to previous samplings, particularly on dead

gorgonians, sponges and polychaete tubes (Fig. 1) while most other hydrozoan species were absent or became less prevalent.

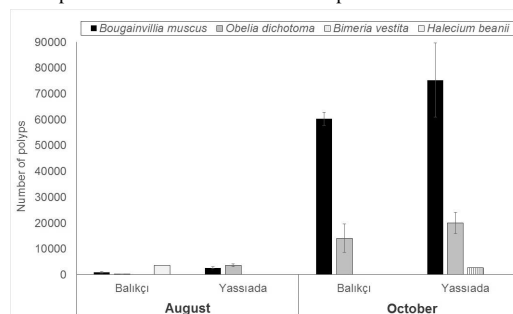


Fig. 2. Mean number of polyps of different species at each station in August and October. Error bars are standard deviations.

Obelia dichotoma appeared as a species highly tolerant to disturbances and was previously reported to increase its coverage by 46% in disturbed communities at the Brazilian coasts [4]. Similarly *B. muscus* was not found on natural habitats along the southern Iberian Peninsula whereas it was a common species in commercial harbours [5]. These two species seem to have adopted an opportunistic behaviour vis-à-vis the emptied habitats and the available skeletons, while the disturbance eliminated less tolerant species in the northeastern Marmara Sea. *Obelia dichotoma* and *Bougainvillia sp.* were among the pioneer colonizers after a mass outbreak in the Adriatic Sea as well and contributed to the shift of the community from slow- to fast-growing organisms [3]. Potential shifts of assemblages will be kept monitored in the Sea of Marmara.

References

- Cerrano C., Bavestrello G., Bianchi C.N., Cattaneo-vietti R., Bava S., Morganti C., Morri C., Picco P., Sara G., Schiaparelli S., Siccardi A., Sponga F., 2000. A catastrophic mass-mortality episode of gorgonians and other organisms in the Ligurian Sea (North-western Mediterranean), summer 1999. *Ecol. Lett.* 3:284-293.
- Garrabou J., Coma R., Bensoussan N., Bally M., Chevaldonné P., Cigliano M., ..., Cerrano C., 2009. Mass mortality in Northwestern Mediterranean rocky benthic communities: effects of the 2003 heat wave. *Glob. Change Biol.* 15:1090-1103.
- Ponti M., Perlini R.A., Ventrà V., Grech D., Abbiati M., Cerrano C., 2014. Ecological Shifts in Mediterranean Coralligenous Assemblages Related to Gorgonian Forest Loss. *PLoS ONE* 9: e102782.
- Contardo Jara V., Myamoto J., Da Gama B.A., Molis M., Wahl M., Pereira R.C., 2006. Limited evidence of interactive disturbance and nutrient effects on the diversity of macrobenthic assemblages. *Mar. Ecol. Progr. Ser.* 308:37-48.
- Megina C., González-Duarte M., López-González P., Piraino S., 2013. Harbours as marine habitats: hydroid assemblages on sea-walls compared with natural habitats. *Mar. Biol.* 160:371-381.