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Abstract

Can Microbes Be Used as Early Warning Systems for Quality Assessment of Anthropogenically Disturbed Coastal Zones †

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Abstract: With anthropogenically-driven pressures drastically changing marine coastal ecosystems much international efforts have been focused on its protection. For that reason, Mediterranean states have accepted numerous regional and international contracts, including Water (WFD) and Marine Strategy Framework (MSFD) Directives, to protect and preserve its rich and unique natural heritage. Following guidelines defined in these directives impact of human activities on the ecological status of marine ecosystems is defined through measurement of an array of different parameters, however, these tools are still facing many challenges. Within the frame of the MicroLink project, funded by the Croatian Science Fundation, we will focus on the effect of anthropogenic pressures onto benthic microbial assemblages, including ecological network of bacteria, archaea, fungi and viruses. We believed that microbial assemblages could offer potential answer to some of the challenges facing marine protection programmes: (i) challenge of determining effects of multiple pollution pressures on the integrity of the coastal marine ecosystem, (ii) possible improvement of the existing biological indicators pool (iii) potential of applying fast and reliable state-of-the-art approaches to determine structural and functional integrity of marine ecosystems; and (iv) problems associated with assessment of the ecological status of marine sediments. Even though microbes dominate marine ecosystems and have pivotal role in biogeochemical cycling and pollutant elimination they are neglected in the EU quality legislation protocols. Changes exerted on the level of microbial communities could alter the trophic structure of the whole food web, eventually impairing marine ecosystem services. We will tackle this issues by combining a multi-trophic/multilayer approach and study study microbial communities (in anthropogenically-impacted vs reference environments) by using 4 different state-of-the-art methodologies (next generation sequencing, real-time PCR, multi-trophic network analysis, shotgun metagenomics) and on 4 different trophic levels (bacteria, archaea, fungi and viruses). Finally, there is an urgent need to define possible contribution and importance of monitoring microbial assemblages in achieving of Good Environmental Status which could offer us first step toward potential integration of microbial assemblages as indicators of marine environment quality.

Keywords: benthic microbial community; marine ecosystem; ecological indicators; pollution

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