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Aquatic Toxicology and Ecology

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Approaches for Inferring Associations between Chemical Exposures and Biological Effects for Field-exposed Organisms.

Abstract Title:

Assessing shipping-mediated impacts and environmental quality within the Grand Harbour, Valletta (Maltese Islands, Central Mediterranean)

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Abstract:

Shipping traffic has an impact on the marine environment and biodiversity. Within the framework of the BIODIVAlUE project, co-financed by the EU through a regional funding programme involving Malta and Sicily, an assessment of shipping-mediated impacts on the water column, sediments and the macrobenthos within the port environment has been conducted. The major industrial port in the Maltese Islands – the Grand Harbour – was chosen for this purpose. During June 2013, the soft bottom in-fauna of the port was sampled by means of a van Veen grab (with a total of 20 replicate samples at 6 different sampling stations), with collected sediment being also characterised for granulometric properties, heavy metal (Ni, Zn, Cu, Cd, Hg, Pb), PCB, PAH and plastic debris content. Evaluation of the biological impact of such pollution, using a rapid and sensitive method to obtain specific information on sediment toxicity, was conducted through the application of a bioassay battery composed of bacterial species *Vibrio fischeri* (Microtox system), the sea urchin *Paracentrotus lividus* and the crustacean *Corophium orientale*. Fouling communities within the same ports were sampled by means of scraping. Multivariate analysis were performed using PRIMER6 & PERMANOVA+ (Anderson, 2008; Clarke and Warwick, 2001). Granulometric analysis show homogeneous results in all stations with the predominance of very fine sand (silt). For PCBs, identified congeners were represented by highly chlorinated PCB species and values < 5 µg/Kg d.w. have been recorded. Sampling stations MP01, MP04 and MP05 represented higher concentrations of Hg, Cu, Pb, As, Ni, Cr. At the same stations high levels of ΣPAHs have been detected and high toxicity levels for *P. lividus* were recorded in every stations. C. Orientale bioassay showed a critical condition in several tested sample whereas microtox test recorded slight toxicity only at MPBN1 and MPBN4 station. The macrozoobenthic infauna was composed predominantly of polychaetes (F=88,89 %), molluscs (F=72,22%) and crustaceans (F=55,56%). A total of 1385 specimens belonging to 41 families were recorded. Cirratulidae, Corbulidae, Spionidae and Capitellidae were the most abundant families. Station MP04 shows the lowest value of biodiversity (H'=0). Micro, macro and

plastic fragments have been detected. All these results are indicative of a degraded port marine environment as a result of multifarious human activities within the same port.