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Ecogenotoxicological Impact of Marine Pollutants on Qatari Bivalves: An Experimental Approach

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The geographical and hydrological characteristics and industrial activities of the Arabian/Persian Gulf contribute to its classification as a stressed marine environment. The persistency of some contaminants released by human activity is putting additional pressure on this already fragile system. Several studies have assessed the chemical contamination levels in Qatari coastal sediments but this is one of a few studies that assessed their eco-genotoxicological impacts, by using cytogenetic endpoints in a local model bivalve species. Bivalves were specifically selected for this study due to their role as filter feeders, high tolerance for harsh environmental conditions, and availability around Qatar. In this project, determination of Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPHs) and trace metals in surface sediments and pearl oyster -Pinctada radiata- was conducted in samples collected from 3 coastal locations in Qatar: Umm Bab, Dukhan and Al-Wakra. The selected sites were expected to be dissimilar in regard to the chemical pollutant level and contaminants distribution due to the different anthropogenic activities. Initial aneuploidy levels –numerical abnormality in chromosomes- in oysters were examined between December 2015 to February 2016 through randomly selecting 140 well spread metaphases. Metaphases with 26 chromosomes were recorded as diploid or normal and the ones with less or more number of chromosomes considered aneuploidy (Ebied, 1999). The ability of the oysters to adapt in terms of chemical contaminants accumulation and aneuploidy level when moved between sites with different levels of chemical pollution was assessed in the second sampling in April 2016, and using experimental approach with three treatments (control, transplanted, and translocated). The control treatments were

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collected from the original site and kept there, the transplanted treatments consisted of individuals composed from the other two sites and moved to Al-Wakra and the opposite, while the translocated treatment were the ones moved from Dukhan to Umm Bab and versa vise. Statistical analysis showed significant difference between sediment in the three sites; TPHs concentrated in Umm Bab, higher concentrations of metals found in Dukhan, while PAHs concentrated the most in AL-Wakra. Hydrocarbons and metals were detected in higher doses in oyster tissues collected in first sampling comparing to those analyzed in the second sampling with consistency of accumulating same contaminants. Predation by gastropod whelks caused high mortality of oyster during the second stage of the study especially in Dukhan control while transplanted animals from Al-Wakra were the least selected by gastropods. Mortality rates in Dukhan were generally higher than in other sites, except for oysters transplanted from Al-Wakra to Dukhan. Positive correlation was found between the high levels of contaminants and aneuploidy during the first phase. Unexpectedly, to the usually observed in bivalves, there was a bigger percentage of abnormal cells with chromosomal gain (hyperdiploids) than with chromosomal loss (hypodiploids) in all treatments. Among all the treatments, transplanted oysters showed the lowest level of aneuploidy followed by translocated, then control. In other words: oysters moved from site to another, regardless of the contamination levels at origin and destination, showed some recovery from initial aneuploidy levels. Further research is needed to determine the underlying mechanisms for this pattern.