Use of sperm DNA integrity as a marker for exposure to contamination in Palaemon serratus (Pennant 1777): Intrinsic variability, baseline level and in situ deployment

In a previous study, the Comet assay was optimized for Palaemon serratus prawns in order to propose a biomarker for sperm quality in this species. However, better knowledge of its basal level and its natural variability, related to intrinsic biotic and environmental abiotic factors, is required before any relevant use of this biomarker in the field. To fulfill this goal, the present study proceeded in three steps: (i) the temporal variability of DNA integrity was followed monthly in a reference population over a 2-year period, (ii) the correlation between the main intrinsic biotic (i.e. size, weight and molting stage) and abiotic factors (i.e. water temperature) were recorded in the field, and the basal DNA integrity was assessed in order to scrutinize any confounding influence of factors unrelated to toxic response, (iii) the baseline level was used to discriminate biomarker response among different stations displaying contrasting contamination levels. The results of the two-year monitoring in the reference population revealed no correlation between the levels of spermatozoa DNA damage and temperature, body size, weight or molting stage. Only a slight variability between monthly samplings was detected. On the basis of these field-collected data, we defined a reference distribution (i.e. 52.6 ± 5.6 A.U) with a threshold value (i.e. 61.7 A.U). Finally, this threshold value proved its relevance to discriminate among stations with contrasting pollution levels around the Seine Bay. Indeed, the results suggest significant DNA damage in populations nearest the Seine estuary, a major source of contaminants in the Bay, and a lower effect in populations further away from the estuary. The overall conclusion was that the Comet assay on P. serratus spermatozoa could be a useful tool for the monitoring of the toxicological print within sperm and main globally the contamination exposure of crustaceans in marine waters.

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