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BETA-DIVERSITY ON TARDIGRADE FAUNA OF MALDIVIAN ISLANDS

BETA-DIVERSITÀ SULLA FAUNA A TARDIGRADI DELLE ISOLE MALDIVE

Abstract – The present study was carried out with the aim of improving the knowledge on tardigrade fauna of Maldives Archipelago through the analysis of beta diversity. The present results show that Maldivian Islands represent an interesting study area for the very rich tardigrade fauna represented by a total record of 28 species. The estimation of beta-diversity highlights a high turnover of diversity in the atolls of the Maldives and confirms that sediments type may play a key role in determining the species composition of the tardigrade fauna.

Key-words: meiofauna, Tardigrada, beta-diversity, Maldives.

Introduction – A joint research project on the biodiversity and ecology of meiofauna from Maldivian Islands has been carried out since 2004 with the aim of widening their scanty and fragmentary knowledge (Gallo *et al.*, 2007; Sandulli *et al.*, 2009; Semprucci *et al.*, 2009 and references therein). Beta-diversity estimate is largely applied for macrofauna assemblages, but quite neglected for the meiofauna ones (Gray, 2000). In this study we report the results of a first survey of the beta-diversity of the Maldivian tardigrades in order to estimate the turnover in the diversity composition at different level (i.e. between the different atolls and sediment types).

Materials and methods – Overall, 32 stations were sampled at North Ari and South Malé Atolls from 0.5 m to 53 m depth. Samples were collected by means of SCUBA-divers via hand-coring (corer surface area: 6.2 cm²). Meiofauna were anaesthetized with a MgCl₂ solution and preserved with 5% neutralized formalin-seawater. Animals were extracted from the sediment by decantation technique and all individuals were sorted and counted per taxa under a stereomicroscope. Tardigrades were individually studied under a compound microscope. The β -diversity (i.e. turnover diversity, estimated as % Bray-Curtis dissimilarity; Gray 2000) was calculated using SIMPER test (cut-off 50%) and the significance of the differences detected was analysed using the Analysis of Similarities (ANOSIM).

Results and conclusions – Overall, 28 species of tardigrades belonging to 4 families and 14 genera were found. ANOSIM showed a significant difference between the assemblages of tardigrades of the two atolls ($R^2=0.28$; $p=0.001$) with an overall dissimilarity value of 83% (SIMPER). The species that mainly contributed to the differences between atolls were *Halechiniscus greveni*, *Batillipes philippinensis*, *Dipodarctus subterraneus*, *Florarctus hulingsi* and *Styraconyx nanoqsunguak*, which were more abundant at South Malé, whereas *Batillipes* n. sp. and *Florarctus* n. sp. were only found at Ari North. Significant differences were detected also when the sediment types were considered (ANOSIM, $R^2=0.15$; $p=0.02$): in particular the

pairwise comparisons showed significant differences only between medium-fine vs. coarse sands ($R^2=0.20$; $p=0.02$) and fine vs. coarse sands ($R^2=0.20$; $p=0.04$). The species that contributed mainly to the differences between fine vs. coarse sands were *B. philippinensis*, *S. nanoqsunguak*, *H. greveni* (more abundant in fine sands) and *D. subterraneus*, and *Florarctus* n. sp. (more abundant in coarse sands). In this study, fine sands, that normally does not show very high number of species and individuals, showed an unexpected abundance of tardigrades. Instead, the species that especially contributed to the differences between medium-fine vs. coarse sands were *Batillipes* n.sp. (more abundant in medium-fine sands), *H. greveni*, *D. subterraneus*, *Florarctus* n.sp. (more abundant in coarse sands). The finding of *H. greveni* in all types of sediment confirms that this species has a wide adaptability. These results show clearly that the β -diversity of tardigrades is more influenced by larger spatial scale than other meiofaunal groups such as free-living nematodes (Raes *et al.*, 2007). Conversely, tardigrades appeared less affected by small sedimentological variations than nematodes, even if significant differences of species composition in relation to this environmental parameter were found (Semprucci *et al.*, 2008). The first record of *Pseudostygarctus rugosus*, *Tanarctus helleouetae*, *B. philippinensis*, *B. dicrocercus* and *B. similis* in the Indian Ocean is very remarkable.

The results of this study show that the composition of tardigrade fauna of Maldivian Archipelago was generally comparable to those observed in previous studies. These islands represent an interesting study area with a total of 28 species found until now. Furthermore, β -diversity analysis highlights a high turnover of diversity in Maldivian Islands and confirms that sediment type may play a key role in determining the species composition of the tardigrade fauna.

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