Bayed A. (ed.). Sandy beaches and coastal zone management – Proceedings of the Fifth International Symposium on Sandy Beaches, 19th-23rd October 2009, Rabat, Morocco
Travaux de l'Institut Scientifique, Rabat, série générale, 2011, n°6, 137-138.

The impact of a temporarily open/closed estuary on the community structure of a sandy beach macrobenthos in KwaZulu Natal, South Africa

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The South African coast has nearly 250 estuaries, and approximately 70% of these have been classified as temporarily open/closed systems. These estuaries are highly dynamic and are strongly influenced by seasonal rain cycles. For instance, estuarine phytoplankton decreases in individual size and total productivity during dry winter periods (Froneman 2006), while microphytobenthic biomass increases during summer rain periods (Skinner *et al.* 2006). When estuary mouths are open; these released huge amounts of estuarine water carrying organisms and nutrients into the ocean. These changes in the basic trophic levels of the food web affect via trophic cascading invertebrate and vertebrate assemblages. Based on the strong interactions between estuaries and adjacent environments, it is likely that changes in estuarine flow impact adjacent coastal systems, including sandy beaches. In this context, the aim of the study was to determine the influence of the temporarily open/closed Umlalazi estuary on the sandy beach macrofauna of Mtunzini beach, South Africa.

This study surveyed a series of eight intertidal transects arranged along a symmetrical gradient to the north and south of the mouth of the temporary open/closed Umlalazi River. Biological samples and environmental data were collected during the end of the dry phase, commence of the wet phase and the end of the wet phase. Standard multivariate approaches were used to evaluate the influence of the estuary on the benthic communities inhabiting the beach. The results revealed that (1) environmental parameters showed a clear temporal pattern, nMDS ordinations clustered separately measurements of the dry phase from the rainy phase, (2) total macrofauna and filter-feeders abundance significantly increased in the beach at the north of the estuary mouth through time (Fig. 1). Multivariate analysis also showed clear differences in the macrofauna community structure between dry phase and rainy phase. Beside, food availability (in terms of nanoplankton Chl *a* and microplankton phaeopigments), salinity, beach width and mean grain size were chosen as the set of environmental parameters that best describe the community, (3) macrofauna isotope ratios showed significant differences between beach sides through time, indicating the use of different food sources by sandy beach macrobenthos at each beach side. Hierarchical agglomerative cluster analysis of macrofauna isotopes ratios also grouped separately signatures of the dry phase from the rainy phase. Two-source mixing model showed an increase in the contribution of estuarine food sources to the bivalve *Donax madagascariensis* $\delta^{13}C$ signatures through time. It highlights the importance of estuarine sources in the energy requirements of sandy beach benthic species. Our results provide clear insights on the importance of precipitation and estuarine flow as factors structuring spatio-temporal patterns in sandy beach communities. (Lercari & Defeo 2003 and references therein).

In conclusion, this study demonstrates the importance of food availability, related to increase in precipitation and freshwater inflow, as main variable shaping the community structure/ along-shore distribution patterns of this sandy beach macrofauna community. Likewise, this also remarks the importance of the biological control structuring sandy beach macrofauna, even in these harsh and fluctuating environments.

References

Froneman P.W., 2006. The importance of phytoplankton size in mediating trophic interactions within the plankton of a southern African estuary. *Estuar. Coastal Shelf Sci.*, 70, 693-700.

Lercari D. & Defeo O., 2003. Variation of a sandy beach macrobenthic community along a human-induced environmental gradient. *Estuar. Coastal Shelf Sci.*, 58, 17–24.

Skinner T., Adams J.B. & Gama P.T., 2006. The effect of mouth opening on the biomass and community structure of microphytobenthos in a small oligotrophic estuary. *Estuar. Coastal Shelf Sci.*, 70, 161-168.

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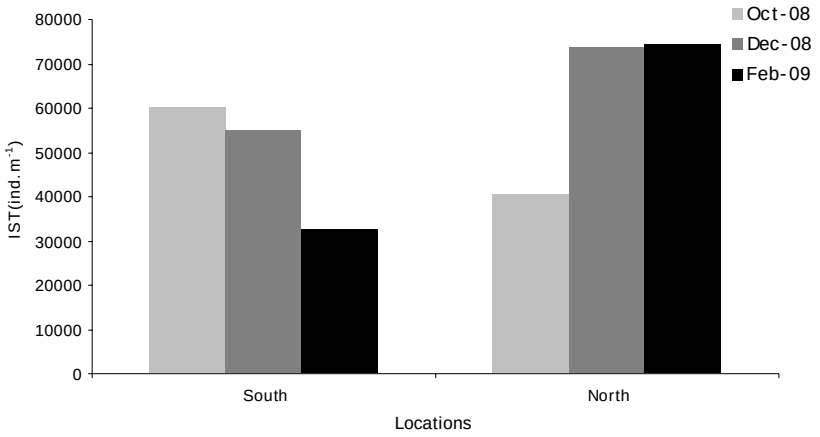

Figure 1: Individuals per strip transect (ind.m^{-1}) at Mtunzini beach per location in October, December 2008 and February 2009.