Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 9	Graz 2004

INFLUENCE OF SIZE-SORTING ON DIVERSITY ESTIMATES FROM TEMPESTITIC SHELL BEDS IN THE MIDDLE MIOCENE OF AUSTRIA

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Paleontological data are frequently extracted from genetically and stratigraphically complex shell beds. It is therefore very important to recognize taphonomic biases that can lead to major errors in paleoecological interpretations, for example on ancient local biodiversity. The strong influence of transport-related shell-size sorting on diversity estimates from single samples was studied in a transect of the middle Miocene Grund Formation (Lower Austria), which contains allochthonous psammitic event beds with channel-structures, sharp erosional bases and graded bedding. These event beds are interpreted as proximal tempestites and contain a densely packed, polytaxic molluscan assemblage. The faunal composition and taphonomic features of shells indicate that transport occurred from wave- or current-agitated nearshore habitats into a pelitic, inner shelf environment. The different skeletal concentrations contain a highly diverse molluscan fauna with a total of 130 species identified from more than 4200 individuals. Although the quantitatively most important species are the same in standardized samples from five different shell beds, species richness differs significantly among the three samples from the base of the transect and the two samples from its top. Diversity depends on size-sorting and therefore reflects the transport history of the individual tempestites, not the species richness of the original paleocommunity. Poorly sorted samples (indicating relatively minor transport) will approximate the diversity of single samples of that environment better than well-sorted samples (which indicate stronger transport). Diversities of shelly assemblages from parautochthonous and allochthonous assemblages can certainly not be directly compared. Even comparisons among tempestites are problematic because transport intensity governs diversity. The intensity of any taphonomic process, however, is difficult to predict without detailed investigations. The use of samples from taphonomically complex shell beds for diversity comparisons can bias results, especially on the fine level of local diversity patterns. Studies at such fine levels of resolution should consider the taphonomic framework of assemblages, which is necessary to recognize the dominant taphonomic factors and their intensities.