



Biodiversity structure of an exceptionally preserved Aquitanian bivalve assemblage (Meilhan, SW France)

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With 10 figures and 3 tables

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Abstract: Biodiversity estimates through geological times are difficult because of taphonomic perturbations that affect sedimentary records. Pristine shell assemblages, however, allow for calibration of past diversity. Diversity structures of two exceptionally preserved Miocene bivalve assemblages are quantitatively determined, compared with recent communities and used as paleoenvironmental proxy. The extremely rich assemblages were collected in Aquitanian (Early Miocene) carbonate sands of the Vives Quarry (Meilhan, SW France). Both paleontological and sedimentological data indicate a coral patch-reef environment, which deposits were affected by transport processes. Among two samples more than 28.000 shells were counted and 135 species identified. Sample Vives 1 is interpreted as a proximal debris flow and Sample Vives 2 as a sandy shoreface/foreshore environment influenced by storms. The two Vives assemblages have a similar diversity structure despite facies differences. Rarefaction curves level off at ~600 shells. The rare species account for more than 80 % of the species pool. The high values of PIE diversity index suggest a relatively high species richness and an even distribution of abundance of the most common species within the assemblages.

The fossil data are compared to death shell assemblages (family level) of a modern reefal setting (Touho area, New Caledonia). The shape of the rarefaction curves and PIE indices of Meilhan fossil assemblages compare well to modern data, especially those of deep (>10 m water depth), sandy depositional environments found downward the reef slope (slope and pass settings). In addition to primary ecological signals, the similarity of the Vives samples and the Recent deep samples derives from taphonomic processes. This assumption is supported by sedimentological and paleontological observations. Sediment transports gather allochthonous and in situ materials leading to mixing of various ecological niches. Such taphonomic processes are recorded in the diversity metrics. Environmental mixing and time-averaging of the shell assemblages disturb the preservation of local-scale diversity properties but favour the sampling of the regional-scale diversity.

Key words: Bivalves, Aquitanian, Miocene, diversity, species richness, preservation.

1. Introduction

The biodiversity of modern environments is described through direct observations and samplings. In contrast, the evaluation of palaeodiversity is not straightforward because of the taphonomic processes that affect the palaeontological records (BEHRENSMEYER

& KIDWELL 1985; MARTIN 1999; BEHRENSMEYER et al. 2000). Taphonomic studies of Recent ecosystems produced numerous examples of comparison between living ecosystems and death shell assemblages that allow quantification of taphonomic perturbations (KIDWELL & BOSANCE 1991; ZUSCHIN et al. 2000; KIDWELL 2001, 2002; ZUSCHIN & OLIVER 2003a, 2003b; TOMAŠOVÝCH