SORTING PHENOMENA OF BRACHIOPOD SHELLS IN SANDY BEACHES: TAPHONOMIC AND PALEOECOLOGIC IMPLICATIONS[1]

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Sorting phenomena is reasonable well known in bivalve mollusk assemblages in modern and ancient sediments. However, less well known is the unequal distribution of pedicle (ventral) and brachial (dorsal) valves of brachiopods (pedicle/brachial phenomenon) both in fossil or Present-day assemblages. Certainly, in the origin of these biased assemblages some processes and agents of selective sorting have been operative. Indeed, shell accumulations along coastal beaches are perhaps the most obvious example of death assemblages in which physical agents (e.g., waves and currents) brought hard parts to sites of reworking and burial. Present-day death assemblages of terebratulid brachiopod *Bouchardia rosea* shells found in sandy beaches of the northern coast of São Paulo State, Brazil, provide a unique example to study the factors affecting the distribution of opposing brachiopod valves. The Itamambuca beach (23º 58' 84"S/45º 29' 02" W) is characterized by coarse (33.3%) to medium (55.6%) sands, as well as by fine sands (11.1%). Sediments are well (22.2%) to moderately (77.8%) sorted. The energy gradient in the Itamambuca beach is reflexive in the south sector and dissipative in the north. Beach samples were collected from five squares of $1m^2$ at the foreshore, in the south sector, during low tides. Squares yielded a total of 2000 brachiopod shells, all represented by disarticulated valves. Out of these, 1887 were ventral valves (94.4%) and only 113 were dorsal ones (5.6%). Shells were also grouped according to their size into three size classes: 8mm, 6mm and 2mm. The 8mm size class yielded a total of 106 shells (5.3%): 96 ventral (90.6%) and 10 dorsal valves (9.4%). Brachiopod shells were abundant (n=1021 shells, 51.1%) in the 6mm size class, being 960 ventral valves (94%) and 61 dorsal ones (6%). Finally, the 2mm size class yielded 873 shells (47.3%): 831 ventral (95.2%) and 42 dorsal valves (4.8%). Our data clearly show that sorting (by size class and valve type) is a common phenomenon in the studied material. Pedicle/brachial valves are unequally represented, indicating that convex ventral valves are transported onshore preferentially, whereas the flat ventral valves are lagged behind. This is in accordance with the already published settling velocities of dorsal and ventral valves of *B*. *rosea*. Settling velocities for ventral valves is 15.35 cm/s, and 16.65 cm/s for dorsal ones. This may be explained by the fact that ventral valves have greater cross-sectional areas than dorsal ones of the same weight. The slower terminal fall velocity of convex ventral valves indicates that they could be kept for longer in the water column, been more easily transported than the flat dorsal do. Our data have obvious taphonomical and paleoecological implications: first, the bias between dorsal and ventral brachiopod valves in many fossil concentrations cannot be viewed as the result of differential resistance to fragmentation and abrasion solely. Second, the source of brachiopod shells in Itamambuca beach is probably located in the subtidal settings (10 to 35 meters of depth) from the vicinities of the beach where brachiopod-rich accumulations are common. *B*. *rosea* is an epifaunal, free-lying brachiopod that selectively colonize coarse siliciclastic/bioclastic platformal bottoms. Hence, the occurrence of *B*. *rosea* shells on sandy beaches providing a good example of out-of-habitat, landward transportation of brachiopod shells as sedimentary particles. In this context, the pediclel/brachial valve ratio may be one important taphonomic attribute to recognize authochtonous to allochthonous assemblages and to determine the taphonomic pathways of a given fossil assemblage, especially when combined with other taphonomic and stratigraphic signatures.