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# Systematic vertical and lateral changes in quality and time resolution of the macrofossil record: insights from Holocene transgressive deposits, Po coastal plain, Italy

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In siliciclastic marine settings, skeletal concentrations are a characteristic feature of transgressive intervals that provide insights into paleobiology and sequence stratigraphy. To investigate taphonomic signatures of transgressive intervals, we analyzed three cores from a Holocene depositional profile of the Po coastal plain, in northern Italy. Coupled multivariate taphonomic and bathymetric trends delineate spatial and temporal gradients in sediment starvation/bypassing, suggesting that quality and resolution of the fossil record vary predictably along the studied depositional profile. Moreover, joint consideration of taphonomic, bathymetric, and fossil density trends across the study area reveals distinctive signatures that are useful in characterizing facies associations and recognizing surfaces and intervals of sequence stratigraphic significance. Within the southern Po plain succession, taphonomic degradation of macroskeletal remains increases from proximal—nearshore to distal—offshore locations. This trend is discernible for both biologically-driven (bioerosion) and chemically/physically-driven (e.g., dissolution, abrasion) shell alterations. Compared to the up-dip (most proximal) core, the down-dip core is distinguished by shell-rich lithosomes affected by ecological condensation (co-occurrence of environmentally non-overlapping taxa) and by higher taphonomic alteration. The onshore-offshore taphonomic trend likely reflects variation in sediment-supply along the depositional profile of the Holocene Northern Adriatic shelf, with surface/near-surface residence-time of macroskeletal remains increasing down dip due to lower accumulation rates. These results indicate that, during transgressive phases, changes in sea-level (base level) are likely to produce down-dip taphonomic gradients across shelves, where the quality and resolution of the fossil record both deteriorate distally. The amino acid radiometrically calibrated dates on bivalves and the chronostratigraphic framework for this profile suggest that the high levels of taphonomic degradation observed distally developed over millennial time scales ($\sim$8ky). The patterns documented here may be characteristic of siliciclastic-dominated depositional systems that experience high-frequency, base-level fluctuations.