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# Identifying taxa from highly degraded shell micro-fragments in anthropogenic soils from Waterfall Bluff, South Africa

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Archaeomalacological analysis is generally undertaken on recovered macro-remains to characterize the overall composition of faunal remains in a deposit. Given the susceptibility of shell middens to a variety of taphonomic processes, it is assumed that the prior presence of shell in deposits may therefore occasionally be missed. Deteriorated micro-remains can mix indistinguishably into surrounding sediments and make their analyses and identification difficult, particularly in older deposits and in environments that experience rapid rates of weathering. This paper explores whether microscopic remains of deteriorated molluscs can be distinguished from other microscopic remains at the coastal rock shelter site of Waterfall Bluff in Mpondoland, South Africa. The methodology uses a multi-scalar approach integrating shell mineralogy and microstructure using the taxonomic distinctiveness of these features. The diagnostic features (e.g. morphology, hinges, spires, and apertures) used for identifying macro-remains are absent in micro-remains, therefore unique methods of identification are needed to identify these microscopic mollusc fragments. Through mineralogical analyses and scanning electron microscope (SEM) imaging, the nacreous remains of mussel shell were identified from previously unidentified degraded shell remains as well as sediment samples from Waterfall Bluff. These highly degraded remains were located under the dripline in the oldest deposits (LBCS) which are sharply comparable to the more well-preserved macro mollusc evidence in the younger (SRCS) deposits. These methods recovered ‘invisible’ evidence of shellfish remains, which led to additional and

clearer evidence of continued coastal foraging from Marine Isotope Stage 3 to the early Holocene (40 ka to 10 ka) on the South African coast.