



Cenozoic macroevolution in the deep-sea microfossil record: can we let go of species richness?

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The deep-sea microfossil record is an outstanding resource for the study of macroevolutionary changes in planktonic groups. Studies of plankton evolution and its possible link to climate changes over the Cenozoic have typically targeted apparent trends in species richness. However, most species are rare, and fossil richness is particularly vulnerable to the imperfections (incompleteness, reworking, age and taxonomic errors) of existing microfossil occurrence databases. Here we use an alternative macroevolutionary quantity: Summed Common Species Occurrence Rate (SCOR). By focusing on the most commonly occurring species, SCOR is decoupled from species richness, robust to preservation/sampling variability, yet sensitive to relative changes in the overall abundance of a group. Numerical experiments are used to illustrate the sampling behavior of SCOR and its relationship to (sampling-standardized) species richness. We further show how SCOR estimated from the NEPTUNE database (ODP/DSDP) can provide a new perspective on long-term evolutionary and ecological changes in major planktonic groups (e.g. coccolithophores and forams). Finally, we test possible linkages between planktonic SCOR records and proxy reconstructions of climate changes over the Cenozoic.