A HOLOCENE RECORD OF EVOLUTION IN DIATOM MORPHOLOGY FROM CUMBRES BOG (COLORADO, USA)

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We used landmark shape analysis on a Eunotia species group from a set of fossil diatom assemblages to better understand variability in diatom valve morphology. Cumbres Bog is a deep sub-alpine bog located on a high-elevation plateau (elevation=3050 m a.s.l.) in a remote region of the San Juan Mountains. The sediment record from Cumbres Bog was radiocarbon dated and spans the entire Holocene over several meters of core. Prior analyses of the diatom assemblages indicate that the bog has a long history of water level fluctuations, causing it to repeatedly alternate between lake and peat-bog states, gradually evolving into the bog that currently occupies the modern basin. Eunotia taxa similar to E. formica dominated many of the diatom assemblages during shallower-water bog intervals, and have continuously existed in diatom assemblages throughout the sediment record from at least the last 9,500 years. Scanning electron microscope analyses of these Eunotia species shows that while substantial variation in valve outline occurs throughout the record, the ultrastucture and valve features remain relatively constant. Because of the high morphological variability commonly observed in this diatom group and difficulty in distinguishing simple reliable characteristics to define speciation and species boundaries, we used traditional morphometrics and landmark analyses to evaluate differences in valve size and outline from a set of representative samples collected approximately every 1,000 years throughout the Holocene. Morphometric analyses indicate that long-term patterns in valve breadth and outline, particularly valve end shape, varied substantially throughout the Holocene; this variability more or less stabilized in the mid-Holocene around features that define at least one distinct new species that appears to have evolved from the original early Holocene populations.