**Online Supplementary Material Strömberg and McInerney, *Paleobiology,* 2011**

SUPPLEMENTARY TABLE 1. Hypotheses that are tested regarding GSSC assemblage composition in Neogene samples from Nebraska and Kansas.[1]

| Fossil GSSC assemblages | Hypothesis # | Hypothesis Description | Null hypothesis Description | Test metric[2] | Modern grass samples used for bootstrap test | Organ[3] | Urn (max ratio of test metric in modern samples) | Modern sample used for urn |
|---|---|---|---|---|---|---|---|---|
| GSSC assemblages with high % of OH TOT | 1 | Assemblage contains closed habitat grasses | Assemblage contains no closed habitat grasses | (CH TOT) / (OH TOT) | Open habitat (pooid, PACMAD) | LE | 0.00816 | *Sporobulus* LE |
| | | | | | | RE | 0.00962 | *Calamagrostis* RE |
| GSSC assemblages with high % of pooid forms | 2 | Assemblage contains potential $C_4$ grasses | Assemblage contains no potential $C_4$ grasses | (PAN + CHLOR) / (POOID-D + POOID-ND) | Pooid grasses | LE | 0.06960 | *Festuca* LE |
| | | | | | | RE | 0.10400 | *Nassella* RE |
| | 3 | Assemblage contains PACMAD grasses | Assemblage contains no PACMAD grasses | (PACMAD TOT) / (POOID-D + POOID-ND) | Pooid grasses | LE | 0.095 | *Festuca* LE |
| | | | | | | RE | 0.104 | *Nassella* RE |
| GSSC assemblages with high % of PAN + CHLOR | 4 | Assemblage contains pooid grasses | Assemblage contains no pooid grasses | (POOID-D + POOID-ND) / (PAN + CHLOR) | Panicoid and chloridoid grasses | LE | 0.42442 | *Sporobulus* LE |
| | | | | | | RE | no data | no data |
| GSSC assemblages with high % of PACMAD forms | 5 | Assemblage contains pooid grasses | Assemblage contains no pooid grasses | (POOID-D + POOID-ND) / (PACMAD TOT) | All PACMAD grasses ($C_3$/$C_4$) | LE | 0.42442 | *Sporobulus* LE |
| | | | | | | RE | no data | no data |

[1] Given the redundancy between phytolith assemblages produced by different grasses, hypothesis testing using bootstrapping was used to interpret grass community composition (see Strömberg 2005, Strömberg et al. 2007). Quantitative analysis of GSSC assemblages extracted from modern grasses provided the comparison (background universes, or urns) used for these tests. For each ratio, we used separate background universes for leaf and reproductive material whenever possible, as these plant tissues often have very different GSSC composition (Mulholland 1989; Piperno and Pearsall 1998; Strömberg 2003). Each case used the maximum ratios, providing for a conservative approach (Strömberg 2005). For example, in a fossil assemblage with high abundance of pooid morphotypes, we tested the hypothesis that PACMAD grasses were also present.

Ninety-five percent confidence intervals for the expected ratios (urns) were calculated for each fossil assemblage using bootstrapping with 1,000 replicates (Resampling Stats 5.0, available at http://www.resample.com/). We compared the upper limit of the confidence intervals to the observed ratio of fossil morphotypes [equivalent to a one-tailed test at $\alpha = 0.025$; Simon (1997)]. An observed ratio in the fossil GSSC assemblage that exceeds the upper 95% confidence limit for both leaf and reproductive material of the background universe, led to rejection of the null hypothesis. The null hypothesis cannot be rejected if the test metric does not exceed either of the upper 95% confidence limits; if the test metric surpasses the upper 95% confidence limit for the background universe for leaf, but not reproductive material, the interpretation is more equivocal and a closer look at particular diagnostic morphotypes is necessary (see Strömberg 2005; Strömberg et al. 2007).

OTHG morphotypes were not considered for these calculations. Note that the background universe ratios are based on a small number of comparative samples; as a result, this study should be viewed as a first attempt at quantifying the relative contribution of different types of grasses.

[2] CH TOT = closed-habitat GSSC morphotypes; OH TOT = POOID-D + POOID-ND + PACMAD TOT GSSC morphotypes.

[3] LE = leaf; RE = reproductive material.