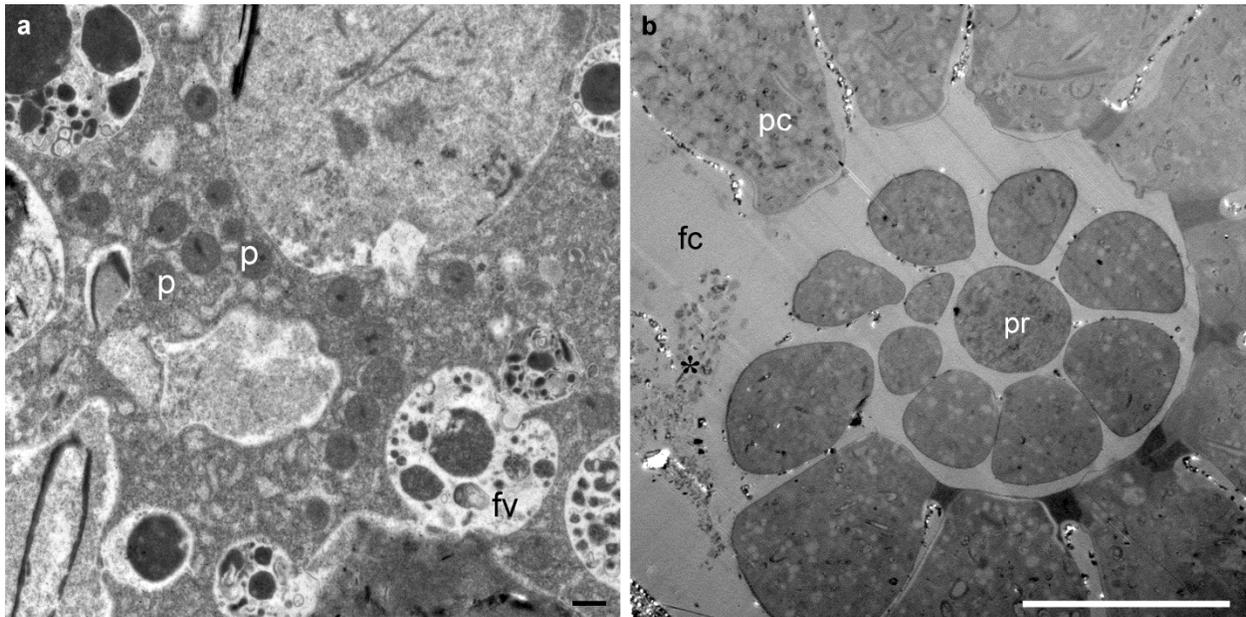


Keystone Arctic paleoceanographic proxy association with putative methanotrophic bacteria

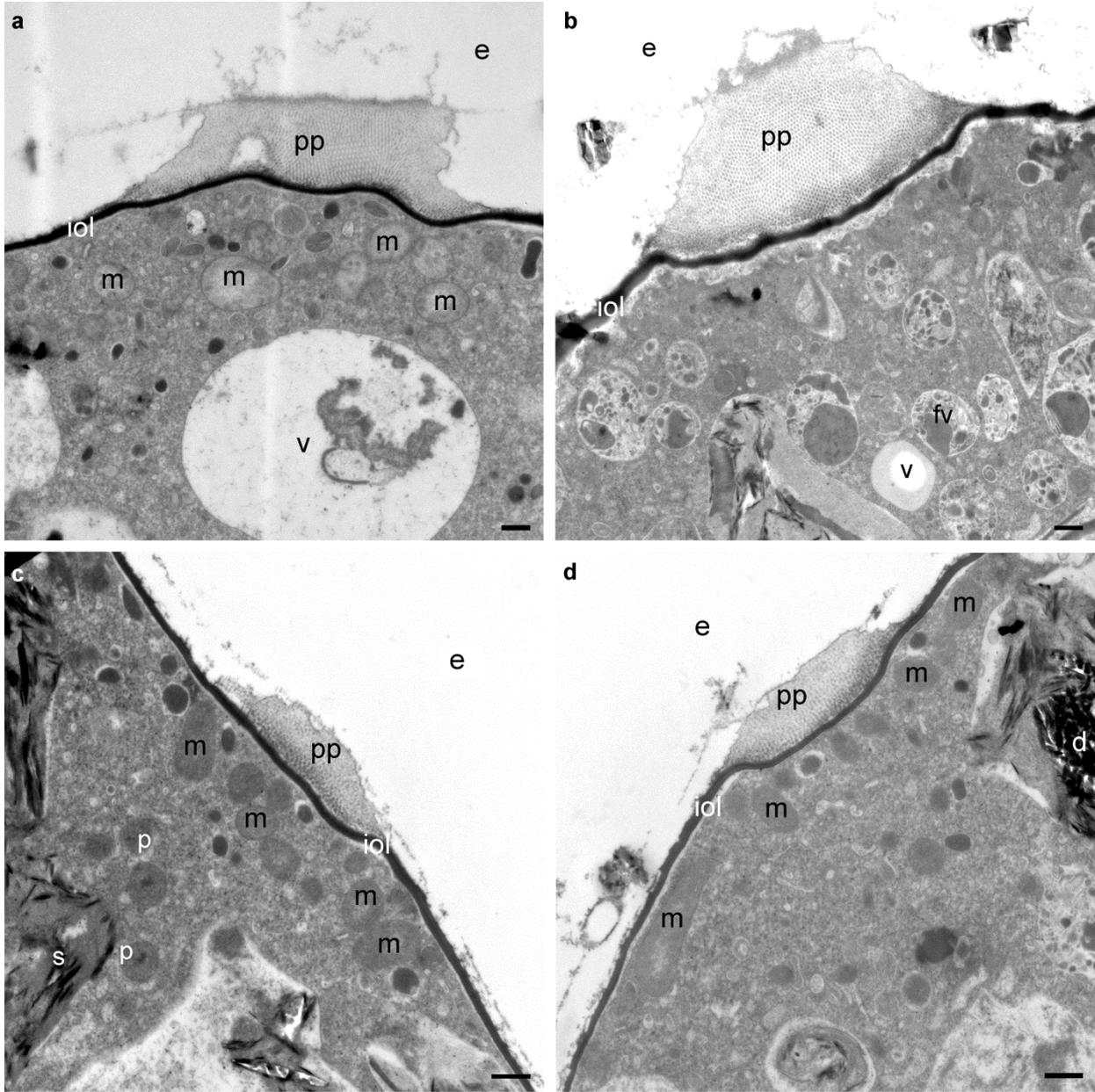
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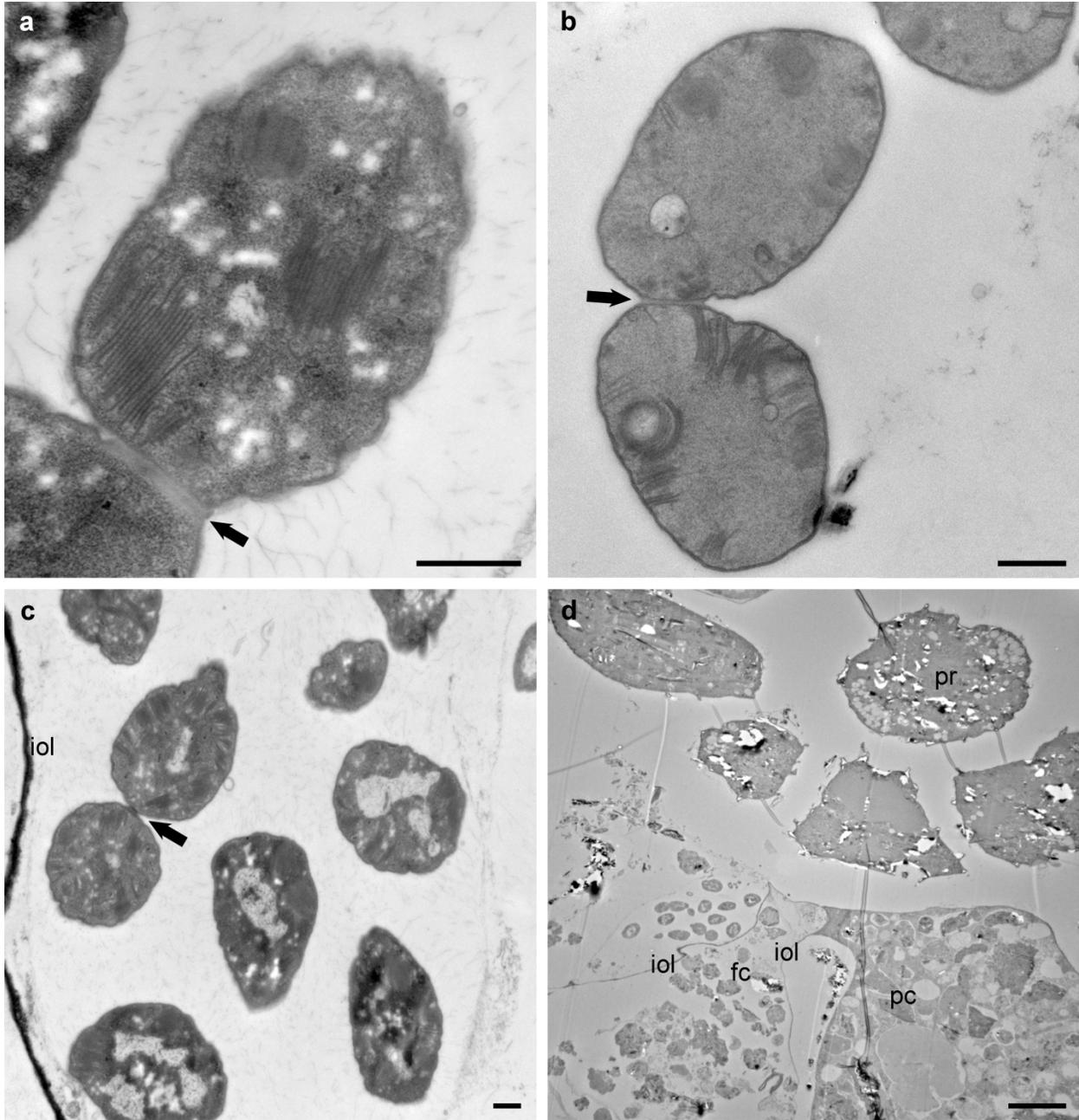
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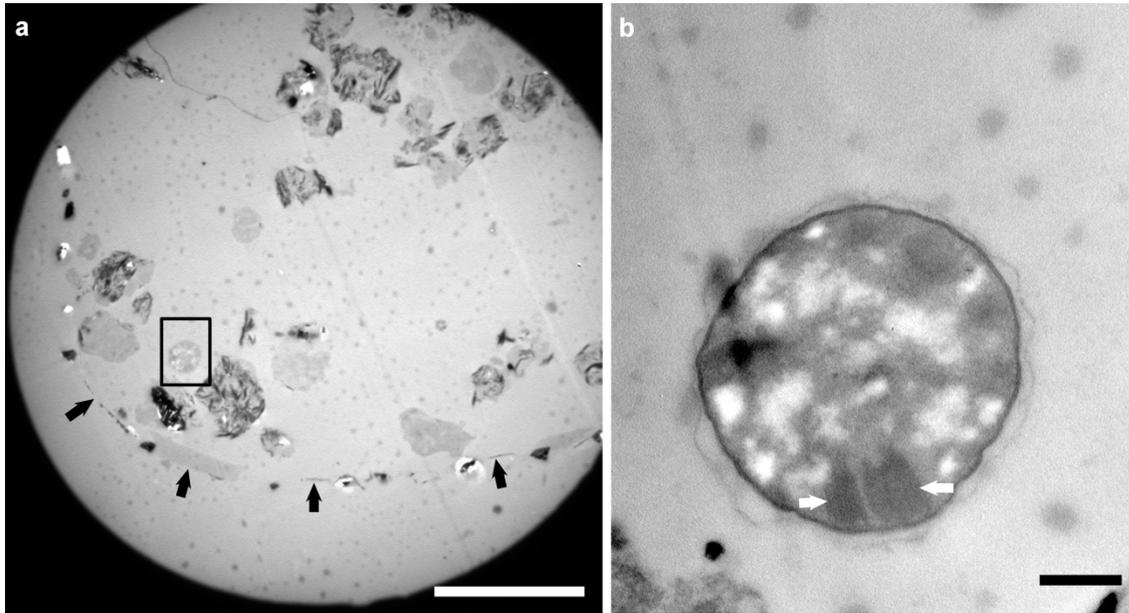
Supplementary Figure 1. TEM micrographs of *M. barleeanus*. (a) Cytoplasm of specimen 3 showing peroxisomes (p) and food vacuoles (fv). (b) Low magnification view of through entire whorl of specimen 4, showing material and debris associated with apertural region (*). fc = final chamber; pc = penultimate chamber; pr = proloculus. Scales: a = 0.5 μm ; b = 100 μm .



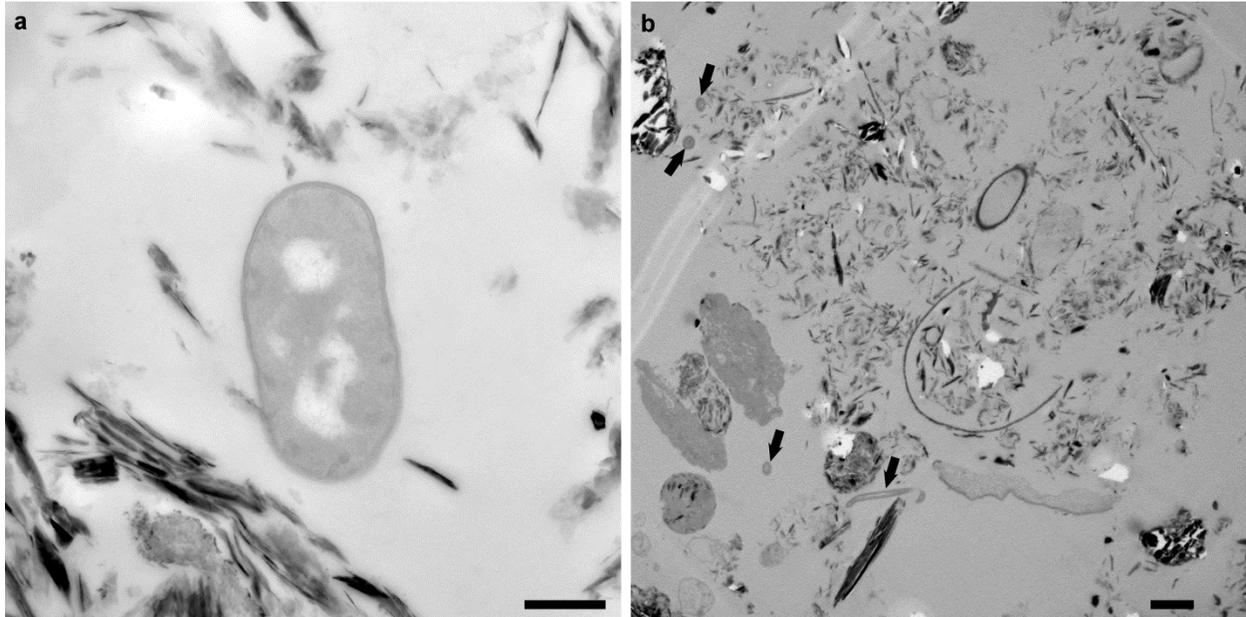
Supplementary Figure 2. TEM micrographs of *M. barleeanus* showing cross sections of pore plugs and underlying cytoplasm. (a) Note mitochondria are concentrated at the cell periphery (specimen 4). (b) Pore plug of specimen 2 lacking obvious mitochondria. Because the cytoplasm is so dense, mitochondria may be present but not discernable. (c, d) Mitochondria concentrated under pores of specimen 3. pp = pore plug; iol = inner organic lining; m = mitochondria; v = vacuole; fv = food vacuole; p = peroxisomes; d = inorganic debris; s = stercomata-like feature. Scales: a-d = 0.5 μm .



Supplementary Figure 3. TEM micrographs of microbes associated with *M. barleeanus*. (a) Close up showing stacked membranes in microbe attached (arrow) to a similar cell, on exterior of specimen 3. (b) A pair of microbes with stacked membranes associated with specimen 2. (c) Cluster of microbes in apertural region of specimen 3. This is a subset of microbes shown in Fig. 4a. (d) View of specimen 3 showing at low magnification, the orientation of microbe cluster in the apertural region. iol = inner organic lining; pr = proloculus. Scales: a-c = 0.5 μm ; d = 10 μm .



Supplementary Figure 4. TEM micrographs of *M. barleeanus* (specimen #3). (a) Low magnification view showing final chamber (delimited by black arrows), containing what could be a Type I methanotroph (outlined box). (b) Higher magnification view showing possible Type I methanotroph, where stacked membranes are discernable (white arrows). Scales: a = 10 μm ; b = 0.5 μm .



Supplementary Figure 5. TEM micrographs of *M. barleeanus*. **(a)** rod-shaped microbe associated with exterior of specimen 1. **(b)** Low magnification view of exterior-associated materials on specimen 4 showing microbes of varied size and shape (black arrows). Scales: a = 0.5 μm ; b = 2 μm .