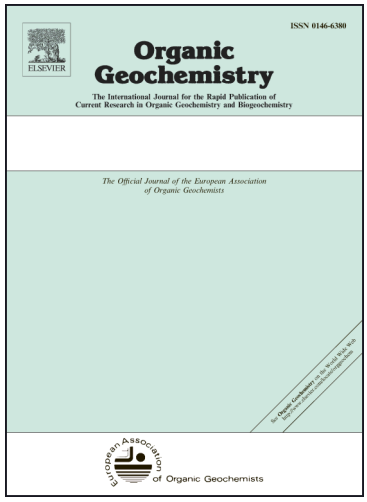

Biogeochemistry of intertidal microbial mats from Qatar: New insights from organic matter characterization

Mirosław Słowakiewicz, Fiona Whitaker, Lisa Thomas, Maurice E. Tucker, Yanhong Zheng, Przemysław Gedl, Richard D. Pancost

PII: S0146-6380(16)30212-1
DOI: http://dx.doi.org/10.1016/j.orggeochem.2016.09.006
Reference: OG 3457

To appear in: *Organic Geochemistry*

Received Date: 17 February 2016
Revised Date: 16 August 2016
Accepted Date: 20 September 2016

Please cite this article as: Słowakiewicz, M., Whitaker, F., Thomas, L., Tucker, M.E., Zheng, Y., Gedl, P., Pancost, R.D., Biogeochemistry of intertidal microbial mats from Qatar: New insights from organic matter characterization, *Organic Geochemistry* (2016), doi: http://dx.doi.org/10.1016/j.orggeochem.2016.09.006

Biogeochemistry of intertidal microbial mats from Qatar: New insights from organic matter characterization

Mirosław Słowakiewicz[a,b,c], Fiona Whitaker[d], Lisa Thomas[e], Maurice E. Tucker[d], Yanhong Zheng[a,b,f], Przemysław Gedl[g], Richard D. Pancost[a,b]

[a] *Organic Geochemistry Unit, School of Chemistry, University of Bristol, Cantock's Close BS8 1TS, UK*

[b] *Cabot Institute, University of Bristol, Cantock's Close, Bristol BS8 1UJ, UK*

[c] *Polish Geological Institute, ul. Rakowiecka 4, 00-975 Warszawa, Poland*

[d] *School of Earth Sciences, University of Bristol, BS8 1RJ, UK*

[e] *Department of Biology, Bath Spa University, Newton Park, Newton St Loe BA2 9BN, UK*

[f] *State Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, 710069 Xi'an, China*

[g] *Institute of Geological Sciences, Polish Academy of Sciences, ul. Senacka 1, 31-002 Kraków, Poland*

ABSTRACT

Understanding early organic matter (OM) alteration and preservation in marine carbonate-evaporite systems could improve understanding of carbon cycling and hydrocarbon source rock prediction in such environments. It is possible that organic-rich microbial mats are important contributors to preserved hydrocarbons and, to explore this, we examined changes in lipid composition in such a mat from a mesohaline intertidal lagoon, eastern Qatar. The mat reaches > 5 cm thickness over a carbonate mud substrate, rich in seagrass, gastropods and other small bioclasts. Clear lamination, with distinct downward colour changes from green to pink to brown, reflects different microbial mat communities. The layers contain spheroids of probable dolomite, the precipitation of which was plausibly bacterially-mediated. Lipids [*n*-alkanes, fatty acids (FAs), hopanoids, isoprenoid hydrocarbons, dialkyl glycerol diethers (DAGEs), and isoprenoid (0 to 4) and branched (Ia to IIIa) GDGTs] reflected the diverse mat-building phototrophic, heterotrophic and chemoorganotrophic microorganisms, as well as some likely allochthonous material (i.e. steroids, *n*-alkanols, high molecular weight *n*-alkanes). The lipids clearly documented the change in microbial community, with phytene(s) being the predominant hydrocarbon in the phototrophic surface layer. O_2 and pH dropped significantly 0.2 cm below the mat surface, coincident with the predominance of delta proteobacteria and increased concentrations of archaeal and bacterial glycerol dialkyl glycerol tetraether lipids and C_{15}/C_{16} and C_{16}/C_{17} dialkyl glycerol ether lipids in the deeper layers. Archaeol, likely of methanogen origin, was most abundant in the deepest layer. Allochthonous inputs occurred throughout the mat, including abundant steroids, especially dinosterol and dinostanol, possibly related to periodic algal