METHODS

Field measurements included pH, temperature, redox (Beckman Model ϕ295 equipped with a 3 in 1 electrode for pH, temperature, redox, and ion specific measurements) conductivity, salinity, total dissolved solids (Thermo-Orion Model 135A meter with dura-probe 4-electrode cell). Alkalinity was determined in the field using phenolphthalein and bromocresol green-methyl red indicators and titrated with sulfuric acid (HACH digital titrator kit #20637). Total alkalinity as reported here is the sum of bicarbonate and carbonate alkalinities. Twenty-four microbial mats (18 desiccated and 6 hydrated) were collected in sterile glass jars (combusted) and frozen in the field for transport back to the lab.

Mat samples were lyophilized in the lab and ground with a solvent-cleaned liquid-N_2-cooled agate mortar and pestle prior to extraction. Powdered mat samples (~250–275 mg) were extracted three times by ultrasonic method with a dichloromethane:methanol solution (4:1 by volume). Each extraction step was then combined to yield the total solvent extractable organic fraction. Saturated (hexane eluate) and aromatic (toluene eluate) hydrocarbons were isolated using column chromatography (100–200 mesh silica gel deactivated with 5% water; column size was 200 X 5 mm internal diameter). Lipid characterization and analysis were performed using gas chromatography (Agilent 6890 equipped with a flame-ionization detector) with 60 m HP-5 column and gas chromatography-mass spectrometry (Hewlett-Packard 5890 Series II with a 60 m HP-5 column coupled to a Finnegan TSQ-700 Mass Spectrometer). The gas chromatograph oven was programmed from 60°C (held for 1 min) at 4°C min^{-1} to 320°C and held for 84 min isothermally. Individual compounds were identified by mass difference with comparisons to

authentic standards and published mass chromatograms, and retention times. Previous analyses of microbial mats (Shiea et al., 1991; Dobson et al., 1988; Jahnke et al., 2004; Schouten et al., 2009; Wakeham, 1982; Wakeham and Frew, 1982) have revealed broadly similar lipid compositions and ranges of compound classes associated with equivalent environments and community structures. This study differs in its focus on a specific suite of samples representing a transition in the hydration state of microbial mats from submerged to emergent to desiccated. Indeed, our explicit goal was to explore the role of evaporation and desiccation in directing lipid biosynthesis, and thereby identify discrete molecular responses to these changing conditions. The results led to an emphasis on the abundances and distributions of WE.