**REVIEWER 1:**

Major concern

1. A major concern with regard to the transcriptomics of phototrophic mat communities is that the collection of samples at 9 AM and 9 PM is going to miss the major transcriptional activity of the cyanobacteria. Previous work on the diel cycling of microbial mats (e.g. Liu et al., 2011; Louyakis et al., 2018), have shown that even in the early morning the mats exhibit primarily heterotrophic activity and the peaks of photosynthetic activity occur at midday to late afternoon. Therefore, many of the assumptions made throughout the paper (e.g. 399-401; line 413) could be a product of sampling time points and not reflect the real activity of some parts of the community. As mentioned in lines 385-387, it's very likely that these transcriptional changes were not observed because of the time of day the samples were collected.

Liu, Z., Klatt, C. G., Wood, J. M., Rusch, D. B., Ludwig, M., Wittekindt, N., ... & Bryant, D. A. (2011). Metatranscriptomic analyses of chlorophototrophs of a hot-spring microbial mat. The ISME journal, 5(8), 1279.

Louyakis, A. S., Gourlé, H., Casaburi, G., Bonjawo, R. M., Duscher, A. A., & Foster, J. S. (2018). A year in the life of a thrombolite: comparative metatranscriptomics reveals dynamic metabolic changes over diel and seasonal cycles. Environmental Microbiology, 20(2), 842-861.

Also, in these same studies of diel cycling listed above it was shown the archaea were very active at midnight and at 6 AM so, it’s possible that the archaeal activity discussed on lines 410-412 might also be missed based on the sampling times and should be addressed.

2. Additionally, it appears no environmental measurements were taken (e.g. light PAR readings or oxygen measurements for the time points) in addition to the measurements listed on line 365). Based on diel measurements taken from other systems (e.g. Yellowstone mats, hypersaline and marine microbialites), it is very likely the study has not captured the major photosynthetic activity of the cyanobacterial community; therefore, as stated earlier many of the assumptions made in this study are not supported and that likely explains the lack of significant differences in the transcriptional activity between the 9 AM and 9 PM samples.

3. As there appears to be extensive heterogeneity with the samples collected and the fact they were collected over 50 m^2, perhaps a supplemental map or figure to show the collection locations of these samples would be valuable to the reader. Were there any geographical features (e.g. water availability, changes in surface characteristics, shading throughout the day) that would account for these differences in heterogeneity? There have several papers on mats that have discussed this aspect and perhaps a more detailed description of where the mats were collected and their environmental context could be elaborated.

Also, as the legend in FigS1 discusses “pairs of neighboring samples”, again a map of sample location might be useful to know how close the samples were from each other and better inform the reader.

4. In Figure 2A it doesn’t appear that any of the eukaryotes other than Chlorophyta listed in Figure 1 are included in Figure 2A and it wasn’t clear why this information was not included.

5. Line 416-417: there have been other studies on hypersaline mat ecosystems where the transcriptomics of the eukaryotes have been reported and so this statement is not accurate. For example, please see Edgcomb et al., 2014.

Edgcomb, V. P., Bernhard, J. M., Summons, R. E., Orsi, W., Beaudoin, D., & Visscher, P. T. (2014). Active eukaryotes in microbialites from Highborne Cay, Bahamas, and Hamelin Pool (Shark Bay), Australia. The ISME Journal, 8(2), 418.

Minor Comments

1. There were extensive formatting issues associated with the references. It would seem that the Environmental Microbiology formatting was not used. For example, when more than two authors are present then “et al.,” should be used (in italics). There were several instances where all the last names of more than two were listed (examples include but not limited to lines 63, 71, 80, 93….). Also, in several cases, the first initial of the author was included (e.g. line 87, 98, 545), none of the ‘et al.’ used were in italics. When multiple references were cited, often the years did not go in chronological order. It is suggested that the Environmental Microbiology output style be downloaded and used for your citation manager (e.g. Endnote) so that the citations are corrected.

2. The order of the figures in the supplemental material was not presented in the order discussed. Figure S1 was actually the last supplemental figures mentioned in the text. Another example was that Figure S3C, D was discussed before S3A, B (lines 183-185). I might also recommend organizing the panels of the figures as you discuss them. For example, in the figure legend, you describe panel C before B.

3. In general, it is recommended to run the paper through the program [grammarly.com](http://grammarly.com/) (or something equivalent to catch some of these smaller writing and grammar issues). Also, spaces between numbers and units are needed throughout the manuscript.

4. Typically, numbers less than 10 are spelled out (unless they are associated with a unit). For example, in lines 518, 519, 526, the numbers should be spelled out as they are not associated with units and are below 10.

5. In general, several abbreviations in the figure legends are not spelled out in the legends. For example in Figure S2, there is no descriptor on the color legend. What does 1.5 mean? Is that fold change as if it is transcripts per million as the figure legend suggests? In general, abbreviations such as MAG or TPM need to be spelled out to help the readers. Also in Figure S2, what does the T17 mean for all the labels and the other numbers?

6. The font size of Figures 1, 2 and 3 was rather small and should be increased. Even at 200% magnification, it was difficult to read and if published it would be very difficult to read when in print. Typically, the instructions to authors indicate a minimum font size of 6 pt should be used.

7. Suggestion: Lines 401-403: The discussion about differences in cyanobacterial metagenome and metatranscriptome has been previously published and discussed in microbial mats as well if you want to provide a mat example.

Mobberley, J. M., et al., (2015). Inner workings of thrombolites: spatial gradients of metabolic activity as revealed by metatranscriptome profiling. Scientific reports, 5, 12601.

Additional suggestions:

Line 24 – suggest removing “already”

Line 26 – should be “performed”

Line 34 – in my copy the sentence was in blue, perhaps change to black

Line 56 – should be “gives” as metatranscriptome is the subject.

Line 106 – reference is needed at the end of this statement, but this result could be a product of the time of day when this sample was collected.

Line 133 – end of the sentence “within then” seems to be missing part of the sentence.

Line 143 – eukaryotic should be in lowercase “Eukarya” is the domain name.

Line 220 – recommended adding the location of Lake Tyrell in Australia as readers might not be familiar with this location.

Line 499 – comma needed after “Here” (again running this through [grammarly.com](http://grammarly.com/) will help catch these issues).

Line 537 – recommended not starting a sentence with a number. If one has to start a sentence with a number, then the number needs to be spelled out.

**REVIEWER 2**

Although the study is novel and the results interesting, the manuscript needs significant reorganization to improve readability, and considerable minor improvements to language and grammar.  From the quality of the writing I find it extremely doubtful that all authors read the final version of the manuscript.  I’ve documented a few examples of the language issues below, but only a few examples.

Suggested major revisions:

•       Reorganize the manuscript to improve flow and readability.  Right now the reader bounces back and forth between the different components of the community, and the different analyses.  It’s hard to see the big picture or appreciate the key points.

•       The authors need to emphasize that transcripts are not an indicator of activity.  For example, the transcriptome can be frozen in time in (e.g.) hypersaline environments.

•       One of the major conclusions of the paper – that the observed eukaryote might play an outsized role in carbon fixation in the environment despite low abundance – contradicts earlier statements that the high transcript numbers associated with this community member can be explained by high basal metabolism and large cell volume (line 422).

•       Organelle genomes are certainly available for at least O. tauri (line 238).

Suggested minor revisions:

•       The whole first paragraph seems unnecessary.  The novelty of this study is it’s interrogation of halite nodule communities, so start with a description of those and why it’s important to understand them.

•       In the introduction the halite crystal environment seems to be confused with the classic endolithic environment.  Yes, halite nodules are rocks, but they differ in really important ways from quartz rocks or other endolithic environments.  They are far more porous, have large and well defined crystals (and thus boundaries), and, most importantly, are formed through evaporative processes.  This has a huge impact on the interior bio-physio-chemico environment.

•       Line 203 – viral transcripts are certainly suggestive of an active lytic cycle but are not definitive.  To make this case you would need to know something about the growth rate.

•       Line 235 – the way the chromosome length is stated makes it appear that the chromosome is complete.  If it were truly this length, that would be an astonishing and provocative finding.

•       Line 337 – I think you mean DESeq2

•       Line 349 – variance has a specific mathematical meaning, do you mean variation?

•       Fig. 6 – caption is insufficient to understand the plot.

•       Examples of grammatical errors, please thoroughly check manuscript:

o       Line 37 – eliminate “of” after “framework”

o       Line 56 – “gives” not “give”

o       Line 57 – “in a” before “previous”

The authors have made their data available, and the data seems to be uploaded correctly (thanks!).