WA’s TEC and PEC microbialites: some major knowledge gaps

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WA’s TECs and PECs

- Four microbialite TECs listed in WA
- Protected through EP Act, 2 under EPBC Act
- Seven microbialite PECs (no specific legislative protection)
- Land-use changes in catchments - significant issue
- Need to understand environmental water requirements of microbialite biota
TECs

• Stromatolite like freshwater microbialite community of coastal brackish lake (Clifton) (CR) (Ramsar)
• Stromatolite like microbialite community of coastal freshwater lakes (Richmond) (CR)
• Rimstone Pools and Cave Structures Formed by Microbial Activity on Marine Shorelines (Augusta) (EN)
• Stromatolite community of stratified hypersaline coastal lakes (Thetis) (VU)

PECs

• Brackish microbial community number 1 (Lake Walyungup) (P1)
• Hypersaline microbial community 1 (Government House Lake, Rottnest) (P2)
• Living microbial mats in hypersaline ponds (Pamelup Pond) (P2)
• Microbial tufa community (Black Point type) (P3)
• Stromatolite-like microbialite community of a Coastal Hypersaline Lake (Pink Lake) (P1)
• Microbial mantles of Nullarbor caves (especially Weebubbie Cave) (P1)
• Hypersaline community number 2 (Stromatolites of Hamelin Pool) P1)
Lake Richmond thrombololites

- Listed CR in WA 1996, Endangered under EPBC
- First genetic analysis of microbes just completed (Gilling 2012; Chilton, Neilan and Burns 2012)
- Some recent sampling of water parameters by Dr Ryan Vogwill (UWA)
- Curtin student projects just initiated (Prof Lindsay Collins - Curtin)
Barcharts showing taxonomy summaries - class level

Gilling 2012
Lake Richmond

Projects:

DEC: Collection of microbial samples, assistance with experimental design to ensure conservation outcomes

UWA: water sampling, assisting overseeing Curtin student projects

UNSW, Macquarie University: Prelim DNA analysis to identify functional groups ($$)

City of Rockingham and other land managers: general support and assistance with access

Curtin University: Supervising student projects
Lake Richmond

• Detailed characterisation of current (structure forming etc) biota linked to longer term hydrological studies required
• Long term monitoring of biota and hydrology required
Lake Clifton

- Early hydrological and taxonomic work eg Moore and Burne (1994)
- Recent hydrological monitoring related to some taxonomic studies (John et al. 2009, J. Alexander current studies)
- Recent detailed hydrological monitoring (DoW)
- Detailed longer-term compositional studies linked with hydrological studies required (re-characterising: follow-up to 1994 data)
- Curtin student studies initiated
Lake Thetis

- Taxonomic work etc by Grey *et al.* 1990, Grey and Planavski 2009
- Recent detailed hydrological studies (DoW)
- Recovery plan just completed
- DEC: 12 microbial samples in range of morphological types collected 2011, linked to water sampling
- Detailed characterisation of current biota linked to longer term hydrological studies required
- Long term biological, hydrological monitoring required
Augusta Tufa

- Some hydrological and associated work (Forbes et al. 2010)
- Analysis to characterise microbial biota linked to hydrological studies required
- Long term biological, hydrological monitoring required
Pink Lake

- Dr Linda Moore collected specimens (?1980s)
- 16 biological samples collected from Pink Lake 2011 (not yet genetically analysed), linked to water sampling
- Surface water sampling, water levels, water chemistry by DEC/DAFWA, Curtin. Water chemistry - PhD (early 2000s; Selva Marimuthu).
- DEC region measures monthly water levels, physical chemical parameters and nitrates from six bores around perimeter.
- Characterisation of microbialites (if active) linked to hydrological studies required
Lake Walyungup

- Initial sampling of water and potentially active microbialite matter (UWA and DEC)
- Activity level unknown, assemblage unknown, water requirements unknown
- Characterisation of biota of microbialites (if active) linked to hydrological studies required
- Long term biological, hydrological monitoring required
Shark Bay

• Many studies on structure, composition and water quality (eg Jahnert and Collins 2012, Reid *et al.* 2003, Playford and Cobain 1976).

• Linkage of hydrological data (eg historical and current sediment levels) with biological studies?

• Long term biological, hydrological monitoring required
Pamelup Pond

- Initial surveys by Drs Kath Grey and Linda Moore
- No targeted hydrological studies
- Recent biological sampling (not analysed) by DEC, water sampling UWA (R. Vogwill)
- No obvious cone shaped pinnacle mats noted as yet
- Characterisation of microbialites (if active) linked to hydrological studies required
- Long term biological, hydrological monitoring required
Other PECs

Rottnest: Government House Lake
• Hydrological and some taxonomic studies (John *et al.* 2009)
• Characterisation of biota linked to hydrological studies required
• Long term biological, hydrological monitoring required

Black Point Tufa
• Species composition of microbialites needs to be compared to Augusta tufa to determine if the assemblages should be considered as separate types.
• Characterisation of biota (if active) linked to hydrological studies required
• Long term biological, hydrological monitoring required

Microbial mantles
• Prof. Mike Gillings studies
• ?work required?
Other possible microbialites / microbial assemblages

- *Middle Island (Esperance)*
  Requires further investigation

- *Hutt Lagoon*
  Requires further investigation

OTHERS?
Selected References

- Chilton, A. Neilan, B., and Burns, B. (2012). Characterisation of freshwater thrombolite microbial communities from Lake Richmond via barcoded pyrosequencing. A report produced for Department of Environment and Conservation by the University of NSW.


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• Vogwill, R. I. J. (1996). Aspects of the Hydrogeology, Environmental Geochemistry and Sedimentology of Lake Walyungup, Rockingham, Western Australia, Honours dissertation Bachelor of Geology, Curtin University of Technology, Western Australia.