THROMBOLITE (STROMATOLITE-LIKE MICROBIOLITE) COMMUNITY OF A COASTAL BRACKISH LAKE (Lake Clifton) RECOVERY TEAM

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Summary

This report summarises the work carried out during the year 2002 on behalf of the Lake Clifton Thrombolite Community Recovery Team.

Introduction

The 'thrombolites of Lake Clifton' community was assessed as Critically Endangered in February 2000.

The Thrombolite community is formed by biologically influenced precipitation of aragonite in a coastal brackish lake (Lake Clifton). The community occurs on a relict foredune plain on Holocene sands at Lake Clifton, southwest of Mandurah and is a complex association of photosynthetic cyanobacteria and purple sulphur bacteria, eukaryotic microalgae and 'true bacteria'. Thrombolitic structures have an internal clotted structure as opposed to those that have a laminated organisation (which are stromatolitic). Both sorts of structures are formed through precipitation of calcium carbonate within the microenvironment of microbes as a result of photosynthetic and metabolic activity.

In order for thrombolites to continue to grow, they need a continuous supply of fresh groundwater that is low in nutrients and alkalinity. Nutrients that leach into the groundwater from agriculture, horticulture and residential gardens are impacting on the water quality of the lake, and algal blooms are already being observed within the lake. Algal blooms can smother the thrombolites and prevent growth. It is probable that the decline in annual rainfall over the past 25 years and perhaps the increase in groundwater usage have significantly increased the salinity of the lake. It is thought that the organisms that build the thrombolites are not able to tolerate the increased salt and there is concern that they may eventually die.

Since the recovery team was established in May 2002, the Lake Clifton thrombolites Recovery Team has overseen the writing of the Interim Recovery Plan. This report outlines the progress made in the finalisation of the Interim Recovery Plan and in managing the thrombolites from January to December 2002.

Recovery Team

The aim of the Lake Clifton Thrombolites Recovery Team (established in May 2002) is to oversee the preparation of an Interim Recovery Plan, and the implementation of recovery actions for the thrombolites. The team is structured to allow for the encouragement, promotion and participation of associated groups in the protection of the thrombolites community. This is done by linking private landowners, community groups, community catchment groups, local government authorities and other government agencies to carry out recovery projects.

Members of the team are:

David Mitchell (Chair)	The Department, Swan Region Program Leader Nature Conservation
John Blyth	WATSCU, Acting Manager
Jim Lane	The Department, Busselton Research
Brenton Knott	University of Western Australia
Linda Moore	Biological Consultant
Philip Commander	Water & Rivers Commission
Allan Pastega	Water & Rivers Commission (Regional) (was replaced late in 2002 by Bob Pond)
Michelle Mullarkey	Member of Peel Preservation Group; Peel Harvey Catchment Coordinator Committee
Fiona O'Connor	Coordinator, Lake Clifton Landcare Group
Jane O'Malley	Environmental Officer, City of Mandurah
Helen Ramsey	Development Officer, AGWA (Harvey District)
Anthony Barr	CSIRO
Steve Dutton	The Department, Ranger in Charge, Yalgorup National Park

Robyn Phillimore from WATSCU was the Executive Officer for the Team during 2002.

The Team met three times during 2002, in May, August and November.

Preparation of the Interim Recovery Plan.

The first draft of the IRP was presented to the Team in March 2002. The Team provided comments and sought additional input from experts outside of the Team, producing a final draft in December 2002.

NOTE: Given that the CSIRO water balance study (noted below) was completed before the IRP was forwarded to the Executive Director for approval, the Team has recently decided to update the IRP based on the new information included in the CSIRO study.

Recovery progress

This section summarises the recovery progress made for threats listed in the draft 2003-2008 Interim Recovery Plan.

Salinity/hydrological changes

Monitoring of salinity and water depth has been undertaken from 1985 to 2002 (and continuing) at Lake Clifton. This sampling has shown several jumps in lake salinity; from 15 to 22 g L^{-1} from 1985 to 1992; 22 to 28 g L^{-1} from 1994 to 2000; and in 2002 to around 33 to 34 g L^{-1} (Knott, B. unpublished data; Lane, J. unpublished data). If the situation

arises where the salinity of the lake is continuously higher than seawater the biology of the lake is likely to undergo massive change. The microbes may not be able to survive this change in salinity and therefore a change in the assemblage may occur.

In light of the increasing threat of salinity, Departmental funding was allocated in 2002 for CSIRO to undertake an investigation of the water balance of Lake Clifton to clarify the reasons and mechanisms behind the observed change in salinity. Recovery Team members provided historical information for the development of the model. Information collated included estimated water usage from bores, climate data, paleoclimatic data and chemical data.

The model has been designed and run and a final report was provided to the Recovery Team in March 2003. Four different climate regimes were modelled:

- average rain for last 100 years using data from Bureau of Meteorology
- average rain based on data before 1972
- average rain based on data post 1972
- both.

The report noted that the opening of the Dawesville Channel and the changes it has induced in the Harvey Estuary were unlikely to have any effect on Lake Clifton. It also concluded that the major factor affecting water levels and salinity of the lake is the rainfall regime, but that groundwater pumping in the vicinity of Lake Clifton also seems to be contributing.

Monitoring of the thrombolites

Samples from the microbial community on the thrombolites were collected by Linda Moore in December 2000. These samples have indicated that the microbial community is still healthy, with little change in dominant species. Funding for a person to undertake yearly monitoring of the thrombolites has been applied for through NHT2 late in 2002.

Nutrient enrichment problems

Despite recent emphasis on the changes in salinity, nutrient enrichment is still a major threatening process. Increased nutrients in Lake Clifton could impact on the thrombolites in three possible ways: by changing the species composition of the microbiolite communities; increase macro algae growth on the microbiolites; and increasing growth of micro-algal and other microbial organisms in the water body. The latter two would restrict light reaching the microbiolite community.

In the past there have been obvious growths of macroalgae on the thrombolites. Following the chocolate coloured algal mat that was found at Lake Clifton in 2002, Steve Dutton (Ranger in Charge, Yalgorup National Park) took samples to Jacob John at Curtin University for analysis. Dr John confirmed that it was diatomaceous material that had formed a mat on the bottom of the lake. After strong winds and possibly lower water levels, the mat had lifted off the bottom of the lake and drifted to the eastern shore where

the thrombolites were located. Dr John noted that this appeared to be a natural process and the mat would be reabsorbed back into the lake within 6 to 12 months. Nevertheless, presumably the growth of such algal mats is increased by nutrient enrichment and more frequent or more intense such occurrences could adversely affect the thrombolites.

A summary of what nutrient monitoring has been done to date has been written. Funding for nutrient monitoring has been included in the NHT2 funding proposal.

Tuart decline

The Minister for the Environment and Heritage established a Tuart Response Group (TRG) in response to the recent decline in Tuart around Lake Clifton and Preston. The scope of the TRG included investigating Tuart conservation in the whole of the southwest of WA. The TRG may also investigate hydrological changes as a possible driver of the tuart decline, and so these investigations have relevance to the Team. Similarly the work of the Team has relevance to the TRG. Recovery Team members of the Lake Clifton thrombolites team are also members of the TRG Recovery team, and liaison between the two groups will continue.

Information dissemination

As Lake Clifton is surrounded by private land on the east side, it is important that information is provided to the landowners to ensure actions on their lands do not impact the thrombolites. An introductory letter that informs adjacent land users of the significance of the thrombolites has been prepared and will be sent to landowners adjacent to the lake. Articles on the Lake Clifton thrombolites have also appeared in the Sunday Times and the Mandurah Mail.

An A4 sized poster that provides a description of the community and information about threats and recovery actions has been developed for the Lake Clifton and Lake Richmond thrombolites. The aim of the poster is to inform the general public about the significance of the thrombolites.

A letter has been drafted to send to the City of Mandurah and Shire of Waroona that provides a brief introduction to the values of Lake Clifton. This letter also informs the shires of the function of the Recovery Team and states that the recovery team would like the opportunity to comment on planning issues relating to the Lake Clifton area.

Future funding

Areas that will require future funding have been identified, and were included in a project submitted to the Commonwealth for funding under NHT2. These included monitoring of the health and composition of the thrombolites, establishment of a bore network, water and nutrients monitoring, and clarifying the long-term salinity regimes of the lake.

Success or otherwise of this application is not known at the time of writing this report.