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

ANNUAL REPORT 2003

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Summary

This report summarises the work carried out during the year 2003 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 these thrombolites to continue to grow, it is thought that they need a continuous supply of fresh groundwater that is low in nutrients and salinity and high in 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 expected that the organisms that build the thrombolites will not be 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 (IRP). This report outlines the progress made in the finalisation of the IRP and in managing the thrombolites from January to December 2003.

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)	CALM, Swan Region Program Leader Nature Conservation
John Blyth	WATSCU, Acting Manager
Jim Lane	CALM, 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) (no longer attends)
Anthony Barr	CSIRO
Steve Dutton	CALM, Ranger in Charge, Yalgorup National Park

Robyn Luu from WATSCU was the Executive Officer for the Team during 2003.

The Team met twice during 2003, in March and October.

Preparation of the Interim Recovery Plan

During the Recovery Team meeting in March 2003, it was decided to include the Lake Clifton modelling information (see below) in the IRP. This was to be completed and then sent to the Recovery Team members for final comment. The final draft of the IRP was then forwarded to the Swan Regional Manager for signing off. Regional approval was received in October 2003. The IRP has been provided to the Director of Nature Conservation for endorsement.

Recovery progress

This section summarises the progress in implementing recovery actions listed in the draft 2003-2008 Interim Recovery Plan.

An important outcome for the year was the results of the modelling of Lake Clifton hydrology by Tony Barr CSIRO. The main conclusions from the modelling were:

- The opening of the Dawesville Channel is unlikely to have any effect on Lake Clifton salinity.
- The major effect on the waters levels and salinity of the lake is the climatic conditions including rainfall and evaporation.

- Pumping of groundwater in the vicinity of Lake Clifton may reduce the inflow of fresh groundwater into the lake thereby increasing salinity. This is done through reducing the dilution effect and lowering the level of the lake and the watertable in the surrounding aquifer.

Salinity/hydrological changes

Monitoring of salinity and water depth has been undertaken from 1985 to 2002 (and continuing) at Lake Clifton. The salinity of the lake was measured in 2003, with a reading of 36.87 ppt in September and 37.09 ppt in November (Lane, J. unpublished data). This average salinity was higher higher than the 33 to 34 ppt recorded by Jim Lane in 2002. It is not certain what affect the increasing salinity will have on the thrombolites but it is thought that the original microbes may not be able to survive this change in salinity and therefore a change in the assemblage may occur.

An Honours project entitled "Water quality and invertebrate fauna in Lake Clifton, Western Australia" was undertaken in 2003 by Sarah Goater from the University of WA (UWA). Sarah measured salinity in the lake and concluded that:

- Data collected in July showed that there was an increase in salinity in the lake going from east to west, suggesting that the surface water input was now saline.
- Salinity measured in the southern end of the lake was up to 26.7g/L
- Salinity measured in the northern end of the lake was up to 59.7g/L
- Average salinity of the lake in July was 38g/L.

That is, the lake now appears to be very close to being consistently hypersaline!

Lake fauna

As part of her Honours project, Sarah Goater concluded that very small numbers of macroinvertebrates were found in the lake. However it was difficult to draw conclusions as to the reasons for, or significance of, this observation because baseline data, collected using the same methods, was not available. Brenton Knott from UWA noted that the decline in macroinvertebrates could be due to increasing salinity and/or bream introduction. UWA has funding available to undertake fauna sampling of a whole range of microbiolites in a number of lakes including Lake Clifton.

Thrombolites monitoring

No monitoring of the microbial community of the thrombolites was undertaken in 2003. Linda Moore has been contracted by WATSCU for the Recovery Team to prepare a fully costed monitoring program for the Lake Clifton thrombolites. The monitoring program will include water quality, lake and groundwater levels, physical condition of microbiolites and microbial assemblage. A draft program has been produced and provided to Recovery Team members for comment.

Nutrient enrichment problems

The chocolate coloured algal mat found at Lake Clifton in 2002 appears to have been a one off event with no further sightings seen since. A program developed by Linda Moore will include annual monitoring of nutrients (see above under Thrombolites monitoring).

Tuart decline

Liaison between the Tuart Response Group and the Lake Clifton Recovery Team continues. It was reported during 2003 that tuarts were crimsoning again with deaths occurring as far north as Baldivis.

Information dissemination

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. The posters have been placed at a winery adjacent to Lake Clifton. Many people who visit the winery see the posters and then go to see the thrombolites. As the original batch of 1000 posters have now all been given out to the general public, a new batch specifically for the Lake Clifton thrombolites is to be drafted and printed. These will then be sent to the winery for dispersal.

Collation of Information

During the previous Recovery Team meeting it was noted that the large amount of information available on Lake Clifton was difficult to locate. Therefore Sarah Goater, who previously undertook her Honours at UWA on Lake Clifton, was employed using NHT2 funds, to compile an annotated bibliography of the information available.

Future funding

Up to $15,000 had been received from NHT2 through the South West Region bid. Recovery Team members are to meet to discuss priorities for the use of NHT2 funds.