October 2000

WaterShed

contents

Where to Now for COAG Water Reforms?

by Professor Peter Cullen

On November 3rd this year the State Premiers will meet with the Prime Minister as the Council of Australian Governments (COAG). It is to be hoped that this meeting will have the same economic and environmental benefits that came out of the COAG water reform process in February 1994. That historic meeting in Hobart opened up the way for water trading which has seen water starting to move to higher value uses, and away from areas where it was causing degradation of the downstream river system. The 1994 COAG Agreement has required States to upgrade their legislative basis for managing water, and while some have been slow to achieve this, it is unlikely that these long overdue reforms could have been achieved without the earlier COAG Agreement.

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Prof Peter Cullen, Chief Executive of the CRC for Freshwater Ecology. Photo: M Ashkanasy, courtesy of Melbourne Water

Cooperative Research Centre for Freshwater Ecology

The Cooperative Research Centre for Freshwater Ecology improves the condition of Australia's rivers, lakes and wetlands

COAG meets again in November. Will they be able to do as well? Here are some suggestions.

Firstly, they need to recommit to completing the 1994 agenda. At that time the Council agreed that action was needed to arrest widespread natural resource degradation in all jurisdictions occasioned, in part, by water use and that a package of measures was required to address the economic, environmental and social implications of future water reform. This has not been achieved despite some progress. The unfinished business includes:

1994 COAG Reform Element	Making it work
Clear specification of entitlements in terms of ownership, volume, reliability, transferability and, where appropriate, quality.	Requires States to measure entitlements by volume. Not much progress on considering water quality.
Formal allocations for the environment, based on the best available scientific advice.	Process has started but it requires more than just ensuring the traditional extractive rights of farmers and declaring any residual for the environment. Requires clear entitlement for environment.
An integrated catchment management approach, and the integration of surface and groundwater management.	Progress has been patchy in establishing workable catchment management systems and integration of groundwater has been slow.
Formal designation of over-allocated rivers with appropriate remedial actions.	Some designations, remedial action has been more symbolic that real.
Appropriate research including consistent methodologies for determining environmental flow requirements.	This has been weak. Announced funds for environmental flow research appear to have been siphoned off for other purposes.
Develop comparisons of inter-agency performance.	If done this seems to have been kept secret.
Making greater use of wastewater in urban areas and strategies for handling stormwater.	Progress in both areas has been slow.
Protect areas of river which have a high environmental value.	Some progress but not many rivers designated or protected. Must be linked to catchments.

These are all worthy and necessary steps for us to move towards sustainable use of land and water. Governments should recommit to them, establish clear targets and develop some institutional arrangements, which might allow more progress.

Finishing off the 1994 agenda is necessary, but not sufficient to address the problems we now face. What are the next steps?

In rivers that are over-allocated it is necessary to buy back water for the environment. This can only be done where the property rights have been resolved and where mechanisms are in place to ensure later Governments don't just resume printing licences for water that is not there. We need rivers to have an environmental manager to make good use of the water that is available for the environment.

Water trading is not ecologically neutral. Relative ecological importance of traded water to the donor and receiving waters should be assessed and considered in the terms of the trade.

We need serious funding for river restoration. In degraded rivers we need to repair riparian zones, remove unneeded weirs and barrages and put effective fish ladders on the ones that must be retained. We need multi-level offtakes on storages to reduce the thermal pollution that impacts on native fish.

We need well designed and operated monitoring and assessment programs that provide publicly available data on river flow, water quality and ecological condition of rivers and their floodplains and wetlands. The data must be interpreted and made available in a timely manner to help inform all stakeholders. This requires in part an ongoing commitment to the National River Health Program.

We need to stop making the mistakes of the past, rather than blindly repeating them. Clearing land and then being surprised by salinity in 20-30 years is plain stupid with our present knowledge. Over-allocating rivers and degrading stream banks is not sustainable. We need to identify some intact river systems and protect them. We need to stop fooling ourselves and the world that having RAMSAR wetlands is any use unless we have RAMSAR catchments.

We now need to move beyond rivers to catchments. We know what has to be done. Regional targets have to be agreed, such as the flow and salinity targets agreed in the Murray-Darling Basin. The strong community based planning that has developed under NHT needs to address these regional targets using the best available technical information which has to be delivered to the communities. The plans need also to include State and National priorities in a way they have not yet done. When they have been approved, block funding should be approved to implement them.

Regional targets have to be agreed

Now is the time for those concerned with natural resource management in our country to contribute ideas to their State and Federal politicians. The forth-coming COAG meeting gives us the chance to take another giant step forward. We need good ideas, and we need to encourage our political leaders to have the courage to make a difference.

Workshop on Understanding Large-scale Ecological Studies and Management in Freshwater Systems

15 December 2000, 9.30 am to 4.00 pm

Key speakers include the internationally recognised ecologists:

- Professor Stephen Carpenter, Professor at the Centre for Limnology, University of Wisconsin,
- Professor Ray Hilborn, Professor in the School of Fisheries, University of Washington, and
- Professor Jim Kitchell, Professor at the Centre for Limnology, University of Wisconsin.

Experience overseas shows that it is possible to design and conduct large-scale, long-term ecological experiments to inform decision making in water resource management. Workshop participants will learn how management questions and problems can be framed scientifically and how ecological studies can be designed to inform the effective management of our water resources.

The workshop will provide an opportunity for questions and discussion.

Further information
The workshop will be held at the Bayview Conference Centre, Bayview Avenue, Clayton, Victoria.
For further information, contact Leanne Matheson on 03 9905 5632, Email: nne.matheson@sci.monash.edu.au
The registration fee for the Forum is $150 (includes GST).

Research Program A – Flow-related Ecosystem Processes

Program Leader: Dr Gerry Quinn

The program on flow-related ecological processes has three broad objectives:

- Determine the sensitivity of aquatic ecosystems and their key ecological processes to varying levels of flow regulation and abstraction over a wide geographic area;
- Determine how specific flow management options will affect different components of Australian aquatic ecosystems; and
- Develop appropriate tools for assessing the need for, and success of, environmental flow allocations and their management.

These objectives can be rephrased into three simple questions that set the management framework for research in this program:

- What is the relative ecological significance of different parts of the hydrograph[1]?
- How much can we modify these components before we have an ecological impact or how much water do we need to allocate to the environment to reverse current ecological impacts?
- How do other factors eg. water quality, habitat condition, land management practices etc. interact with flow to determine ecosystem structure and function?

A number of projects are underway to achieve these objectives. The Campaspe Flow Manipulation Experiment is continuing for 2000/01. This study will provide a unique experimental test of the effects of changing flow regimes on biota of lowland rivers at realistic spatial and temporal scales. It examines the effects of an environmental flow regime on fish and macroinvertebrate communities in the Campaspe River, in central Victoria. Data before the introduction of the flow regime in 2001 is still being collected, and will be compared with data from the nearby Broken River. The results should be valuable for water managers planning environmental flow regimes to improve the health of lowland rivers.

While the effects of flow on biota are important, understanding the ecological processes that drive these effects is also crucial. Another project is examining how the productivity of lowland rivers, especially production of various plants (algae,macrophytes[2], riparian vegetation[3]) and microbes, responds to specific flow events. The flow events to be studied include base-flow, rising hydrograph, bank-full and floods. This project will also consider cascading effects of altered productivity on the food webs in lowland rivers by examining trophic links[4] between key components of the biota.

A number of projects are underway

In conjunction with the Cooperative Research Centre for Catchment Hydrology, we are also undertaking a scoping study funded under the COAG Agreement on Water Reform. This study aims to develop a national

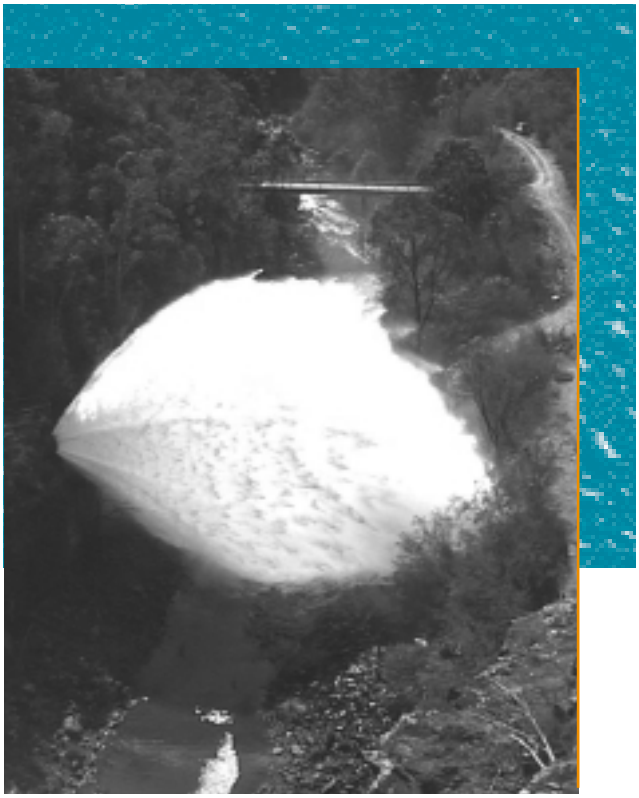
Dr Gerry Quinn, Program Leader

Ibis, part of the aquatic ecosystem.
Photo: B. van Aken,CSIRO Land & Water

set of hydrological variables that characterise flow regimes in rivers. The emphasis is on choosing variables that are ecological significant by evaluating their relationships with relevant biological variables.

Working with the program on restoration ecology (Program B), Program A will also produce guidelines for restoration of habitat and flow and the evaluation of the ecological effects of such restoration efforts. A number of restoration projects being undertaken by our partners will be used as case studies for the development of these guidelines.

1. A *hydrograph* illustrates the relation of discharge, stage velocity, or other water components with time, for a given point on a stream.
2. *Macrophytes* are aquatic plants that can be seen with the human eye, eg. reeds, water lilies.
3. *Riparian vegetation* is the vegetation growing on or near the banks of a stream. It is more dependent on water than vegetation found further upslope.
4. *Trophic*: related to the processes of energy and nutrient transfer from one level of organisms to another in an ecosystem, eg. from prey to predator.



A release of water from Bendora Reservoir for environmental flow. Cotter River, ACT.
Photo: Sue Nichols

The Knowledge Exchange Program

The application of our research to help support sustainable management is fundamental to the CRC's goal of helping to improve the health of inland waters. Over the past year, the CRC has provided information to land and water managers and decision-makers at all levels in the water industry via:

- Publications such as brochures, scientific and technical reports;
- Independent advice on water issues to politicians;
- Policy debate at Federal and State levels;
- Expert panels deliberating on specific water resource management issues;
- Specialist advice to water managers based on recent research outcomes;
- Consulting projects undertaken to address specific water resource management needs; and
- The CRC for Freshwater Ecology's knowledge exchange strategy.

Some knowledge exchange highlights from the past year are outlined below.

In a report produced for Environment Australia, the CRC identified the likely ecological outcomes of the Council of Australian Governments water reforms. This information, along with the consideration of emerging issues, will aid development, implementation and assessment of the COAG Water Reform Policy.

The CRC developed a framework for the Sustainable Rivers Audit (SRA) in close consultation with waterindustry representatives,which will be a significant part of future reporting on river health in the Murray Darling Basin. This work was an extension of the CRC's review "Ecological sustainability of rivers of the Murray-Darling Basin", undertaken as part of the Murray-Darling Basin Ministerial Council's "Review of the Operation of the Cap".

"Ecological sustainability of rivers..."

CRC staff played a major role in the development of the new ANZECC/ARMCANZ water quality guidelines, and presented workshops in all capital cities around Australia explaining the guidelines' philosophy and approach.

Joint CRCFE-CRCCH recommendations for the design of stormwater wetlands are being adopted by Melbourne Water Corporation in a major stormwater management project to reduce nitrogen loads to Port Phillip Bay. Knowledge generated from the CRCFE's urban stream research has underpinned and supported Melbourne Water Corporation initiatives to promote water sensitive urban design to the land development industry.

Mr Peter Cottingham, Knowledge Broker for the CRC Freshwater Ecology

Murray River between Barmah and Millewa. The Centre developed a framework for the sustainable Rivers Audit (SRA) which will be significant part of future reporting on river health in the Murray Darling Basin Photo: D Eastman

The CRC provided expertise through various committees, workshops, seminars and presentations for over eighty industry users and other organisations. Many CRC staff have provided expertise and recommendations for expert panels on water issues including:

- Technical Advisory Panels for Water Allocation & Management Plans in Queensland;
- Scientific Expert Panel for Southeast Queensland Regional Water Quality management Strategy;
- Landscape and Open Space Expert Advisory Panel for the Olympic Coordinating Authority;
- ACTEW Expert Panel on Trade Waste; and
- Murrumbidgee River Expert panel.

Consulting work continued as a significant part of the CRCFE's knowledge exchange activities. Consulting projects provide an opportunity to apply the CRC's knowledge and expertise to specific issues. Some examples include scoping studies of water resource management issues, the design of monitoring programs, and the review of water resource management initiatives.

A knowledge exchange strategy has been developed to guide the CRC's knowledge exchange activities. Key features of the Strategy are the preparation of knowledge exchange plans for the major CRC prorams, liaison with the end-users of research from the early stages of projects, and the synthesis and promotion of previous research outcomes, with emphasis on the implications for water resource management.

initiatives to promote water sensitive urban design

Given the range of issues being addressed by our partners, we look forward to making further contributions to water resource management in what promises to be another exciting year.

Dr John Whittington, Knowledge Broker for the CRC Freshwater Ecology.

Research Program D – Water Quality and Ecological Assessment

Four main projects comprise the core research in the Water Quality and Ecological Assessment Program:

1. Urbanisation and the Ecological Function of Streams led by Chris Walsh

Urban land use increases the rate of runoff because of hard surfaces like roads and roofs, and increases concentrations of nutrients and pollutants in that runoff. A major aim for urban stream managers is to reduce the amount of nitrogen entering streams. This project will assess the effects of catchment imperviousness and efficiency of urban drains on nitrogen transport and processing in streams. While the work centres on the Yarra River catchment, the outcomes will have direct relevance to the management of urban catchments throughout Australia.

Assoc Professor Richard Norris, Program Leader

2. Assessment and Delivery of Methods for Determining River Health led by Richard Norris

The adoption of ecological assessment methods has been slow in Australia. Their acceptance has improved recently because of standardised methods, more cost-effective approaches and simplified presentation of results. This project will evaluate assessment methods and their appropriateness for organisations, applicability to problems and cost effectiveness.

The Habitat Degradation component will develop a predictive habitat assessment method for fish and macroinvertebrates, enabling features of the habitat in need of rehabilitation or enhancement to be identified from a suite of catchment variables.

The Reference Condition Approach component will provide procedures for determining reference conditions based on good management practices.

3. Development of an Ecological Risk Assessment Framework led by Mike Grace

Although several groups within the CRC have been performing risk assessments over a number of years, little emphasis appears to have been directed at how ecological risk assessments (ERAs) should be performed. The first phase of the project will refine techniques and methods focussing on three high priority research & management areas within the CRC: nutrients, salinity and toxicants/pesticides. The second phase will employ the refined ERA method in trial/application projects.

4. Assessing the Ecological Health of Lowland Rivers, led by Glenn Wilson

This project, still in the formulation stage, will address this important issue in the western flowing rivers. The project, at early stages of development, will be based out of the new Goodiwindi laboratory.

Poor riparian habitat, Goodradigbee River at Wee Jasper, NSW.
Photo: P Sloane

Another important part of Program D are small studies designed to provide a summary of the literature, or to test ideas that might lead to fruitful future research. Four projects are in this category:

1. ***Ecological effects of dryland salinity on aquatic ecosystems, led by Daryl Nielsen and Terry Hillman.***

This began with a workshop that highlighted the rapidly increasing influence of dryland salinity (as distinct from ground water and drainage inputs) in the salinisation of aquatic systems. Two issues will be investigated in this study. Firstly, salt inputs well upstream of irrigation are influencing streams previously unaffected by salinity, and secondly, floodplain wetlands are being inundated by water of higher base-level concentration of salt, which in turn leads to accelerated salinisation from the seasonal cycle of filling and evaporation.

2. ***Macroinvertebrate Biomarkers: Links to Toxicosis and Changes in Populations or Communities, led by Ross Hyne and Bill Maher.***

The measurement of in situ growth and scope for growth of macroinvertebrates provide an early warning system that macroinvertebrates are stressed but provide little evidence of the cause of the stress. The use of in-situ growth measurements requires the effects of transplanting and cages on macroinvertebrate growth and survival to be established for each species. Several enzyme and other biomarkers may be valuable for providing early warning pollutant assessment.

3. ***'Dirty water' models: Predicting biological change in streams using simulated impacts, led by Richard Norris and Julie Coysh with Simon Linke, Chris Walsh and Satish Choy.***

'Dirty water' models can be used for predicting a taxonomic composition at a site without the use of a reference condition. These models use predictor variables likely to cause impact on the biological community. 'Dirty water' models have been built with macroinvertebrate data from metropolitan and agricultural areas using a range of predictor variables. These models will enable managers to assess the damage or improvement that would be indicated in the biological community in response to management or land-use activities.

Dragonfly larvae, an aquatic invertebrate.
Photo: K. Thomas

4. ***Diets of freshwater fishes in Australia, led by Angela Arthington and Brad Pusey.***

   This project aims to:

   a) review available information on the diets of freshwater fishes throughout Australia (native and introduced species) and assess major sources of variation in fish diets.
   b) classify fish into groups with similar diets to show how fish diets vary among species, and in different rivers and regions of Australia.
   c) evaluate similarity of the diets of native and introduced fish (e.g. mosquitofish, tilapia, weatherloach, redfin perch) to identify introduced species that eat native fish, or compete with them for food.

Associated projects are funded substantially from outside the CRCFE although they may use substantial staff time. They round out the research portfolio. Program D's Associated Projects are:

1. Predicting the ecological consequences of increasing salinity on wetland sustainability. Phase 1: How does increasing salinity select for plants and animals from seed-bank communities? (M Brock, D Nielsen).
2. Support and completion of Australia wide assessment of river health models, Phase 1 and 2 (R Norris).
3. Algal availability of phosphorus discharged from different catchment sources (R Oliver, D Baldwin, H King, Z Lorenz).
4. The occurrence and significance of photosynthetic bacteria in freshwater systems (R Croome, G Rees).
5. SEQRWQMS: Development of water quality monitoring program and evaluation of riparian rehabilitation (S Bunn).
6. Monitoring south coast ICOLLS for determining sustainable nutrient, organic carbon and suspended solids loads (B Maher).

Program D also adds value to the CRCFE's research by including a number of consultancies and exchanges of scientific knowledge. Some of these activities will be profiled in WaterShed next year.

SideStream

Thomson stressed river scoping study

DNRE has appointed the CRCFE to scope out the ecological information required to support the development of a river rehabilitation plan for the lower Thomson and Macalister rivers as part of its Stressed River Program. The rehabilitation plan, when implemented, will improve the condition of the lower Thomson River by returning aspects of the flow regime that have been lost since regulation and by improved aquatic habitat management.

The project has 2 phases, the first of which is the scoping stage in which key information gaps will be identified and an investigation program identified to fill the gaps. The second (larger) stage will involve the implementation of the investigative program and the development of the rehabilitation plan.

CRCFE staff involved in the scoping study include Barry Hart, Peter Cottingham, Tarmo Raadik, Gerry Quinn and Jan Barton. Brian Finlayson and Mike Stewardson from Melbourne University are also on the project team. The scoping study commences at the start of September and is to be completed by mid November.

Victorian river health strategy

A River Health Strategy is being developed for Victoria by the Victorian Catchment Management Council, DNRE and EPA, Victoria. Dr Jane Doolan from the DNRE is leading the departmental core group. A Consultative Committee representing all stakeholders is also involved. The CRCFE is well represented on the Scientific Advisory Committee by Barry Hart (Chair), Sam Lake and Lisa Dixon. Also on the Scientific Advisory Committee are Tom MacMahon and Ian Rutherford from CRC for Catchment Hydrology.

A first draft of the Strategy will be available by December 2000.

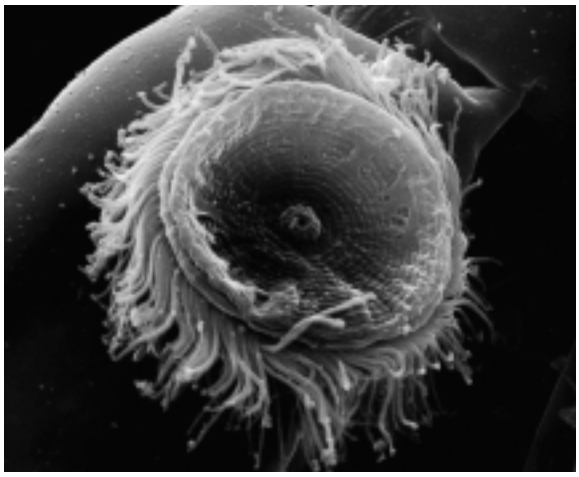


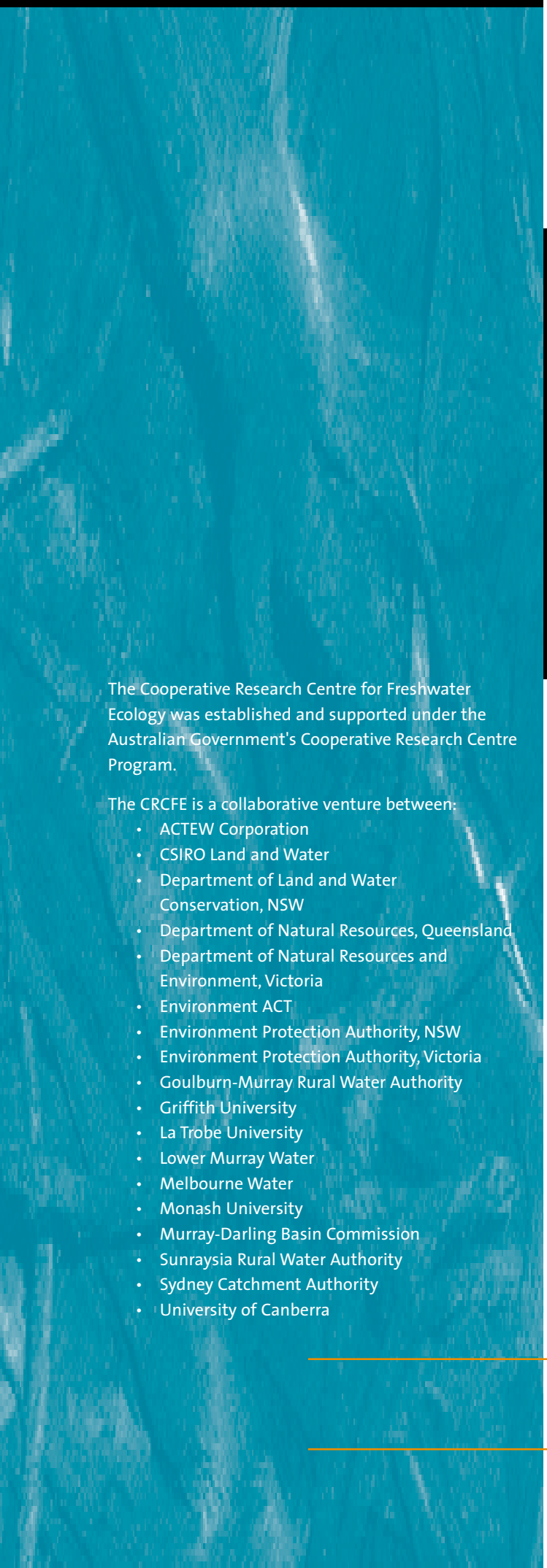
Photo: J Green (Univ. of Waikato, NZ) and Russ Shiel (MDFRC).

The feature creature for this issue:

Phylum Ciliophora
Class Oligohymenophorea
Order Mobilida
Family Trichodinidae
Genus *Trichodina*
Species *T. diaptomi*

A microinvertebrate, *Trichodina diaptomi*, a single-celled ciliophoran (Protista) which lives on the surface of *Boeckella*, a copepod microcrustacean, in upper R. Murray billabongs. This scanning electron micrograph of a 20 µm (0.020 mm) individual on the external surface of a copepod was taken at a magnification of 2,400X on a Philips SEM 505 at the Electron Optical Centre, University of Adelaide.

CRCFE web site:
http://freshwater.canberra.edu.au



Comments, ideas and contributions are welcome and can be made to:

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- CSIRO Land and Water
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- Environment ACT
- Environment Protection Authority, NSW
- Environment Protection Authority, Victoria
- Goulburn-Murray Rural Water Authority
- Griffith University
- La Trobe University
- Lower Murray Water
- Melbourne Water
- Monash University
- Murray-Darling Basin Commission
- Sunraysia Rural Water Authority
- Sydney Catchment Authority
- University of Canberra

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