

Diversity of river life

Bioregionalisation, conservation priorities and predictive models of aquatic biodiversity

Variety is the spice of life

Biodiversity reflects the variation in nature. Australia's tropical rivers, wetlands and estuaries are recognised for their high conservation value and most are in a healthy state. For example, the Daly River in the Northern Territory supports more species of fish than the whole of the Murray Darling Basin.

Aquatic biodiversity is often highly valued in the community for both its capacity to provide us with food and other useful resources and its cultural significance. This importance is increasingly being reflected in conservation and water resource planning. To effectively manage aquatic biodiversity, however, we need to know where the areas of high biodiversity are. It is also useful to know what causes some areas to have high biodiversity and others not. This project aims to answer these questions and so define biologically unique regions (bioregions) within northern Australia, based on patterns of aquatic biodiversity.



Photo: Ian Dixon



Photo: Michael Douglas

Patterns reveal hidden stories

Biodiversity can be assessed at a number of levels and this project will use two:

- *Species level biodiversity* – the distribution of fish and turtle species across northern Australia will be assessed because of their value to the community; and
- *Molecular or genetic level biodiversity* – genetic differences between individuals, reflected in characteristics such as size, colour or behaviour can be useful in distinguishing different species that look the same. It tells us about how species have evolved and what types of landscapes could be important for the evolution of future biodiversity.

A range of animal groups that are valuable to indigenous communities, industry and the wider community will be chosen for molecular assessment – for example, fish, shrimps, turtles and mussels.

These animal groups have different life cycles and different abilities to move within and among rivers. This means that their genetic patterns might be different and this will help identify the different features of northern Australian rivers that are important for the evolution of biodiversity.

Some surprising discoveries can come from this type of work. Using the same molecular techniques,



researchers have for example shown that a freshwater mussel from the inland rivers of central Queensland that was thought to be a single species is actually four species that otherwise looked the same. Other genetic studies of the barramundi in northern Australia have found populations in different estuaries were isolated in the past when sea levels were low but have become reconnected as sea levels have risen.

Managing for biodiversity

A better understanding of freshwater biodiversity will have practical application. Through this research, models will be developed relating the patterns of aquatic biodiversity to important environmental drivers such as hydrology (river flow), climate, landform, riparian (river bank) and aquatic habitat. The natural patterns of aquatic biodiversity in Australia's tropical rivers will be able to be better explained and predicted, and used in other TRaCK research to examine how particular development scenarios for river catchments might affect biodiversity.

Researchers will produce a map splitting the tropical north into bioregions based on fish and turtle distributions and their genetic make-up. Networks of areas with high conservation value (based on biodiversity attributes) will be identified to help conserve and manage the valuable freshwater biodiversity of Australia's northern rivers.

Who is on the team?

The project is led by Professor Jane Hughes from Griffith University and includes researchers from Griffith University, the University of Canberra and James Cook University.

The research team will also be involving indigenous communities in the collection of samples for molecular analysis.



Photo: Michael Douglas

How will this research help?

The findings from this research will help governments, regional natural resource management bodies and planning authorities to improve decisions on water allocation and better predict the impacts of water resource development on freshwater animals. For example if river flows are made unfavourable to a species in a particular catchment, what does this mean in terms of the survival of the species as a whole? This can then help the development of strategies and policies for environmentally sustainable economic and social development of northern Australia.

The project will also provide tools that will help identify networks of protected areas that can represent the full variety of species or ecosystems in northern river systems. This will assist governments and conservation agencies to create a more resilient parks and reserve system and help set aquatic restoration and conservation targets and objectives.

Team Contacts

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Where is the research happening?

This is a broad scale project and will cover as many catchments as possible across northern Australia. For example, information on freshwater fish diversity will be available for almost all major catchments from the Kimberley to Cape York Peninsula. Work started in April 2007 and will finish in 2010.



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