TRaCK
Tropical Rivers and Coastal Knowledge

River foodwebs

Bottom up and top down control of tropical river food webs

Who's eating who

Food webs describe "who is eating who" in an ecosystem – from the microscopic algae at the bottom of the food chain to the top predators such as fish and crocodiles. These complex interrelationships are a cornerstone of ecology – they govern how rivers function and help explain patterns of biodiversity. Essentially they tell us how ecosystems are "put together".

Tangled web

Although the food webs of Australia's tropical rivers are poorly understood, what is known is that they remain highly connected. Driven by the large wet season flows interspersed with long periods of no flow, energy, nutrients and animals move between the headwaters and the coast and out from the river banks to the floodplains and wider landscape. For example, juvenile barramundi move out onto the wetlands during the wet season, coming back to river channels, estuaries and the coast during the dry season.

Our current knowledge of these rivers suggests that microscopic algae on the bottom of river beds are the main source of organic matter sustaining invertebrates, fish, waterbirds and other life. A few common species of fish, shrimp and other large consumers seem to exert a strong influence, controlling the flow of energy and matter through the food web and exerting a strong

Photo: Michael Douglas

Photo: Michael Douglas

"top down" control on the algal and invertebrate communities, particularly as water levels fall. And unlike fish communities in cooler climates, fish in tropical rivers tend to be omnivorous – eating most things that come their way. As a result, tropical river food webs tend to be "short", diffuse and highly interconnected rather than long, linear chains.

This project will "drill into the detail" of how these complex river ecosystems work in northern Australia. Using a variety of experiments scientists will identify:

- the sources of organic matter which kick start tropical river food webs;
- what factors control the plant growth at the base of the food web;
- which animals "pull the strings" and thereby control what happens further up and down the food chain; and
- how the land and water based food webs relate to one another.

This project is linked to other TRaCK research projects investigating food webs in waterholes, floodplain wetlands and estuaries.

Playing Detective

Researchers will be using a variety of techniques to reveal the hidden stories behind river food webs.

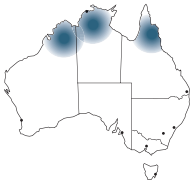
Plants and algae kick start food webs, providing the carbon and nitrogen - the "building blocks" of life. The sources of organic carbon supporting the food web will be identified by measuring the naturally occurring isotopes of carbon and nitrogen which act as a natural "signature". The signature of algae and other plants is passed on to the animals that eat them, so by analysing the tissue of an organism we can see what type of things it has been eating. Similarly, the extent to which aquatic and land based food webs are linked will be determined by introducing an isotope of nitrogen into the water, where it will be picked up by aquatic insects and act as a marker. Testing for this marker in the spiders, birds, lizards and mammals that inhabit the fringing river banks, will reveal the extent to which aquatic life finds its way into terrestrial food webs.

Shock treatment

Figuring out who's important in the food chain requires some creativity and innovation – researchers will be constructing small "electric fences" in streams to exclude larger animals such as fish and crustaceans. Although small in scale, the experiments are designed so that conclusions about whole rivers can be drawn.

Who is on the team?

The research is led by Associate Professor Michael Douglas from Charles Darwin University, along with scientists from Griffith University, University of WA, and the Northern Territory and Western Australian Governments.



Where is the research happening?

The research will commence in the Daly River (NT) which flows year round, and then contrasted with the seasonally flowing Mitchell River (Qld) and the Fitzroy River (WA). Work in the Daly will build on previous research activity and the project will finish in 2010.

How will this research help?

Food webs can be disturbed, with devastating consequences. Elsewhere in the world, the overharvesting of one group of animals in the food chain or the disruption of critical processes such as migration, has led to collapse of a food web and the loss of economic enterprises such as fisheries or the extinction of important species.

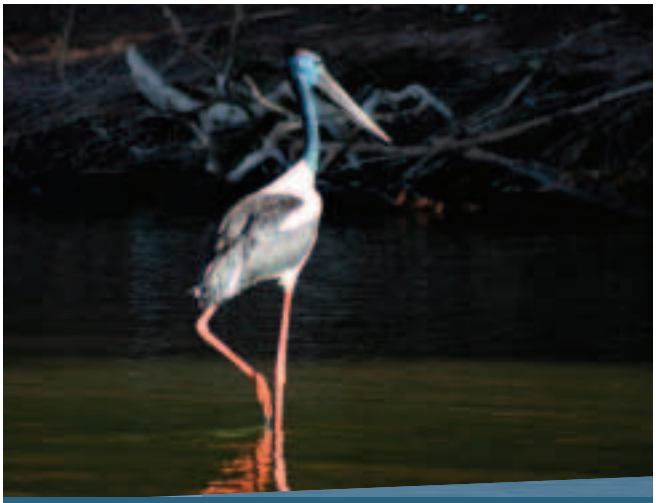


Photo: Ian Dixon

A better understanding of Australia's tropical river food webs will provide insight into how we might go about developing new economic enterprises in the north, without cutting the critical connections that bind ecosystems together. It will provide improved capacity to predict how environmental change such as global warming might alter river functioning, impact on biodiversity and affect important river dependent industries such as fishing, tourism and agriculture.

With this knowledge, government natural resource managers will be better able to manage for the whole river rather than individual components – ensuring for example, that water allocation, assessment of new developments and park management, work together rather than in isolation.

Natural resource groups and land managers will be in a position to better target their efforts and resources to those species and ecosystem processes that are the most critical for river health. The implications for example, of removing an important species in the food chain or adding a new exotic species will become clearer.

Team contacts

For more information on this project contact:

Michael Douglas
Charles Darwin University
michael.douglas@cdu.edu.au
phone 08 89467444

Australian Government
Department of the Environment, Water, Heritage and the Arts
Land & Water Australia
Australian Government Water Fund
Raising National Water Standards

To find out more about TRaCK
visit **www.track.gov.au**
email **track@cdu.edu.au**
phone **08 8946 7444**

TRaCK receives major funding for its research through the Australian Government's Commonwealth Environment Research Facilities initiative; the Australian Government's Raising National Water Standards Programme; Land and Water Australia and the Queensland Government's Smart State Innovation Fund

Foodwebs and Biodiversity