

Water regime dependence of fish in the

By Michael Douglas, Brad Pusey, Mark Kennard and Sue Jackson

Australia's tropical rivers account for about 70% of the country's total runoff and with water becoming an increasingly valuable commodity in southern Australia, there is growing interest in the water resources of the north, particularly for irrigated agriculture. However, there is also recognition that the substantial runoff from tropical rivers helps to sustain the commercially important northern coastal fisheries, as well as underpinning the wealth of natural and cultural values associated with these rivers. Natural resource managers are faced with increasing pressure to develop the catchments and water resources in parts of northern Australia, but the ecological impacts of the likely changes in flow regimes are poorly understood, particularly for the wet-dry tropics. This means that there is a clear need for a better understanding of the environmental water requirements of wet-dry tropical rivers to ensure that water allocation processes maintain biodiversity and ecological processes.

The need to understand the environmental water requirements is particularly pressing in the Daly River Catchment in the Northern Territory. Most of the Northern Territory's current irrigation activity occurs in the Daly River Catchment, and because of its reliable groundwater reserves and relatively good soils, further agricultural development, land clearing and water extraction are proposed for the area. Importantly, the Daly River is also recognised for its high conservation values (Blanch et al. 2005).

Environmental water requirements of riparian vegetation, macrophytes, algae and the pig-nosed turtle have recently been examined in the Daly River (see Erskine et al. 2003). The Daly has the highest base-flow of any river in the Northern Territory and these studies identified the importance of sustained groundwater inputs during the dry season for maintaining these biota. Projected water resource use in the lower Daly River will, however, alter dry season flows more than any other facet of the overall flow regime.

The Daly River supports nearly 50 species of freshwater and estuarine fish, including the critically endangered Freshwater sawfish and the Freshwater whipray, which is listed as vulnerable. It is also held to be one of the country's best rivers for recreational barramundi fishing. Fish are also of great value to indigenous inhabitants of the catchment. However, despite their ecological, economic and cultural significance, the environmental flow requirements of freshwater fish in the Daly River has not been investigated and this is recognised as a significant knowledge gap (Erskine et al. 2003). In fact, fundamental knowledge of the ecology of fish in the Daly, such as their distribution within the catchment, habitat preferences, breeding phenology is lacking.

A project recently commenced under LWA's Environmental Water Allocation Program is aimed at addressing these knowledge gaps. The collaborative project involves researchers from Charles Darwin University, Griffith University,

A tufa dam on the Douglas River, NT. These are natural features caused by a build up of calcium carbonate and could pose a natural barrier to fish movement in the dry season. Photos throughout this article, Michael Douglas.



.. wet-dry tropics



CSIRO Sustainable Ecosystems, the Northern Territory Government and the University of Wisconsin. The researchers are also working in collaboration with Aboriginal people from the Wagiman and Wardaman language groups. The broad aim of the project is to investigate variation in fish distribution and ecological requirements in the Daly River, as well as to document indigenous knowledge and learn about the cultural

significance of fish. The research team will then draw on all knowledge gained from scientific and indigenous investigations to describe linkages between natural variation in fish communities with natural gradients in flow regime. The hydraulic habitat in the Daly River will also be studied so that the ecological consequences of flow regime changes under different water use scenarios can be predicted.

The perennially flowing Douglas River, a tributary of the Daly River, NT.



Brad Pusey, Mark Kennard (Griffith University), Brenda Huddleston, Elizabeth Sullivan and Verona Huddleston (Wagiman Guardagun Rangers) discuss methods for sampling fish in the upper Daly River.

The project has five components

1. Consultation with Aboriginal traditional owners and documenting indigenous knowledge.
2. Field sampling of freshwater fishes and habitats of the Daly River.
3. Derivation of ecological traits and examination of variation in species' distributions, assemblage composition, habitat use and other ecological traits across a natural gradient in dry season discharge.
4. Development of conceptual models relating fish ecology and flow, characterising the flow requirements of freshwater fishes of the Daly River.
5. Development of a Bayesian Belief Network model to aid government in water resource scenario testing.



Brad Pusey and Mark Kennard (Griffith University) surveying potential study sites on the Douglas River, a perennially flowing tributary of the Daly River, NT. Mark is indicating the average size of the fish in the study pool.

The focus of the project to date has been on consultation with the Aboriginal traditional owners of the upper and middle reaches of the Daly River and identifying potential study sites. Project staff met in Darwin in October for detailed planning and for the first meeting of the project steering committee. The committee brought together representatives from the key stakeholder groups to comment on the project's objectives, methods and outcomes. This was followed by a field trip to the Daly River Catchment to identify study sites and to meet with the Wagiman Guardagun Rangers. Fish sampling will begin in the dry season of 2006 and will continue until the end of the dry season in 2007.

In summary, this project addresses issues that are significant at a number of levels. It will be of great significance at the local community level where Aboriginal communities will benefit from

the greater transfer and recording of indigenous knowledge, as well as being involved in the water resources planning processes. It will make a significant contribution to water allocation planning in the Daly River Basin, a system of recognised cultural, conservation and economic significance to the Northern Territory. The knowledge gained will also be directly applicable to other river systems in the Northern Territory and used in future planning processes. The increased knowledge of the habitat and flow requirements of fish will be of regional significance as it can be used to contribute to future water allocation planning throughout the wet-dry tropics of Australia. Finally, the proposed innovative methods of integrating knowledge from a variety of sources to develop conceptual and quantitative models to assist in water allocation planning will be a model for other parts of Australia to follow. ■

For further information

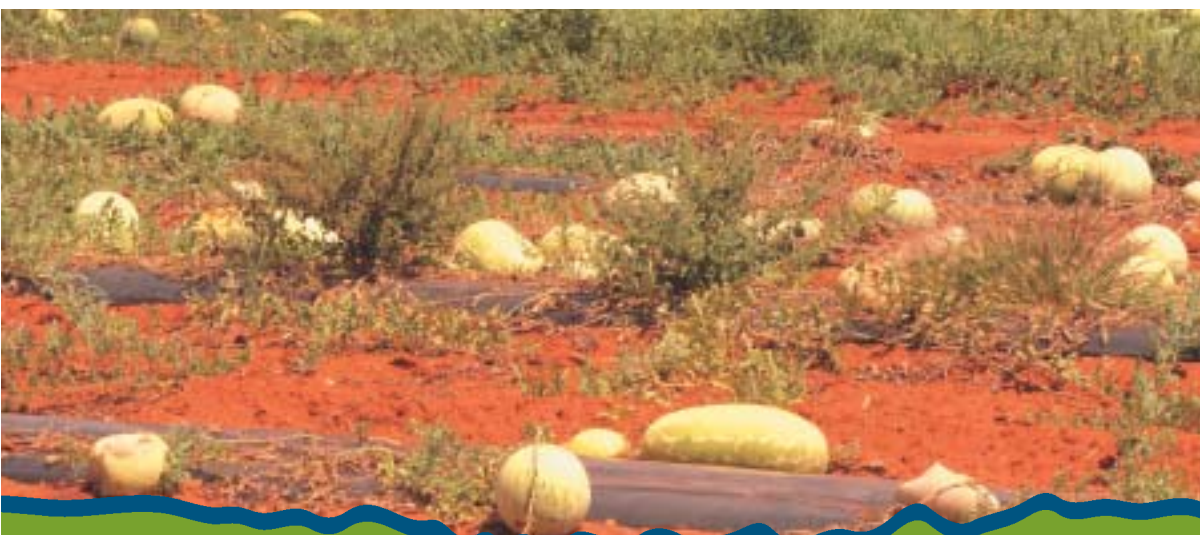
Dr Michael Douglas
School for Environmental
Research, Charles
Darwin University
Tel: (08) 89 467 261
E-mail: michael.douglas
@cdu.edu.au

or

Dr Brad Pusey
Centre for Riverine
Landscapes,
Griffith University
Tel: (08) 9756 8612
E-mail: bpusey
@westnet.com.au

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Fields of irrigated watermelons growing in the Daly River catchment.