

Daly River fish and flows project: an environmental flows study

September 2007 newsletter



This is the second in a series of newsletters
to provide information about a research project
on fish and environmental flows
in the Daly River in the Northern Territory

Why do we need to learn more about fish and their water needs in the Daly?

Australia's tropical rivers account for about 70% of the country's total runoff. With water becoming an increasingly valuable resource in southern Australia, there is growing interest in the water resources of the north, particularly for irrigated agriculture. There is also recognition that tropical river systems sustain important fisheries, and underpin a wealth of other natural and cultural assets valued by society.

The need to understand how our river systems work is particularly pressing in the Daly River catchment in the Northern Territory. Most of the Northern Territory's current irrigation activity is found in the Daly, and it is a region likely to experience further agricultural development due to its reliable groundwater reserves and relatively good soils. The Daly River is also recognised for its high conservation values, especially the large and permanent river flows.

The ecological impacts of changes in river flows are poorly understood, especially in the wet-dry tropics. Previous environmental flow studies in the Daly River have examined the water requirements of plants growing in and alongside the river, algae and the pig-nosed turtle. However, the river also supports more than 50 species of freshwater and estuarine fish, including some endangered and vulnerable species, but little is known about their environmental water requirements.

The Daly River Fish and Flows project aims to address this knowledge gap.

This project is a collaboration between Charles Darwin University, Griffith University, CSIRO Sustainable Ecosystems, the Northern Territory Government, the University of Washington, Wagiman people and the Guwardugan Rangers and the Wardaman Aboriginal Corporation. The project is funded by Land and Water Australia, the Natural Heritage Trust and TRaCK (Tropical Rivers and Coastal Knowledge research hub).

The broad aims of the project are 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. This information will be combined to produce models relating fish ecology and flow, which can be used in water planning. The knowledge gained will also be applicable to other river systems in northern Australia and for future planning processes.

This project commenced in the dry season of 2006 and with additional funding from TRaCK it will continue until 2009.

In the last newsletter we introduced the project describing what an environmental flow study is and how it is undertaken, including what sources of information the research team will rely on and how it will be sampling fish from various parts of the Daly river catchment.

This newsletter reports on the first year of field sampling and interactions with Wagiman and Wardaman traditional owners.



**Wagiman Rangers at
Claravale Crossing**

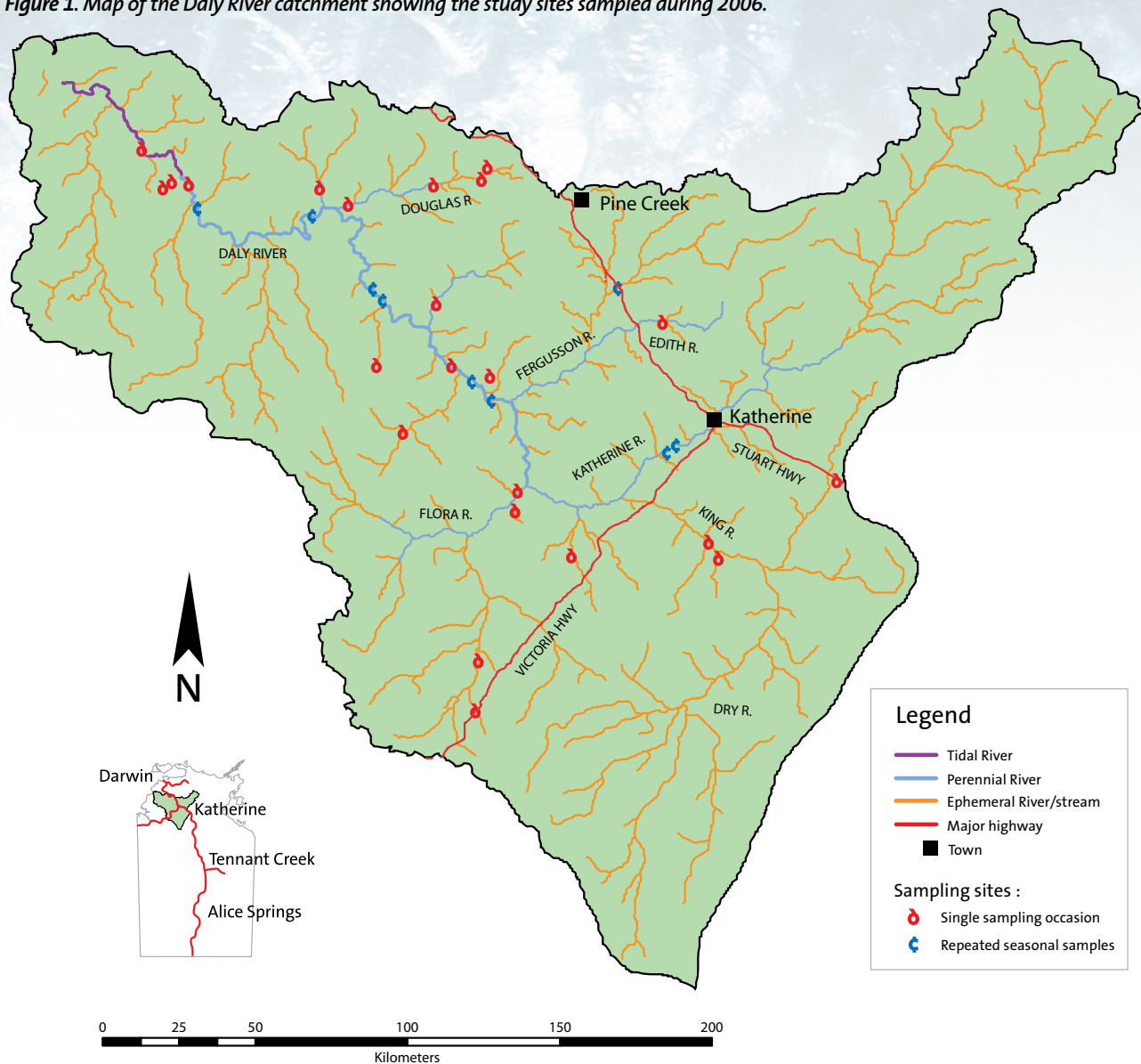
What have we discovered so far?

We are still in the early phases of this project and have yet to analyse much of the data collected thus far. We have collated all available information on fish distributions, and during 2006, sampled 33 locations throughout the catchment. We hope to increase this total to at least 55 sites by the end of the project and increase the coverage across the catchment. To date we have collected 42 species and a further 10 species are known to occur in the catchment from information gathered from the literature and museum records. From a regional perspective, this makes the Daly River comparatively diverse with respect to the number of fish species present. A full list of species recorded from the catchment is included in the accompanying insert.





Figure 1. Map of the Daly River catchment showing the study sites sampled during 2006.



Further sampling, particularly in the lower reaches of the river and in the upper Katherine Gorge sections (see **Figure 1**), is likely to increase substantially the number of species collected. None of the species we have collected so far are endemic to the Daly River basin (i.e. found only in this river) but further collecting may reveal the presence of endemic species, particularly in the upper reaches of the Katherine River where an undescribed species of gudgeon is known to occur.



Katherine River gudgeon



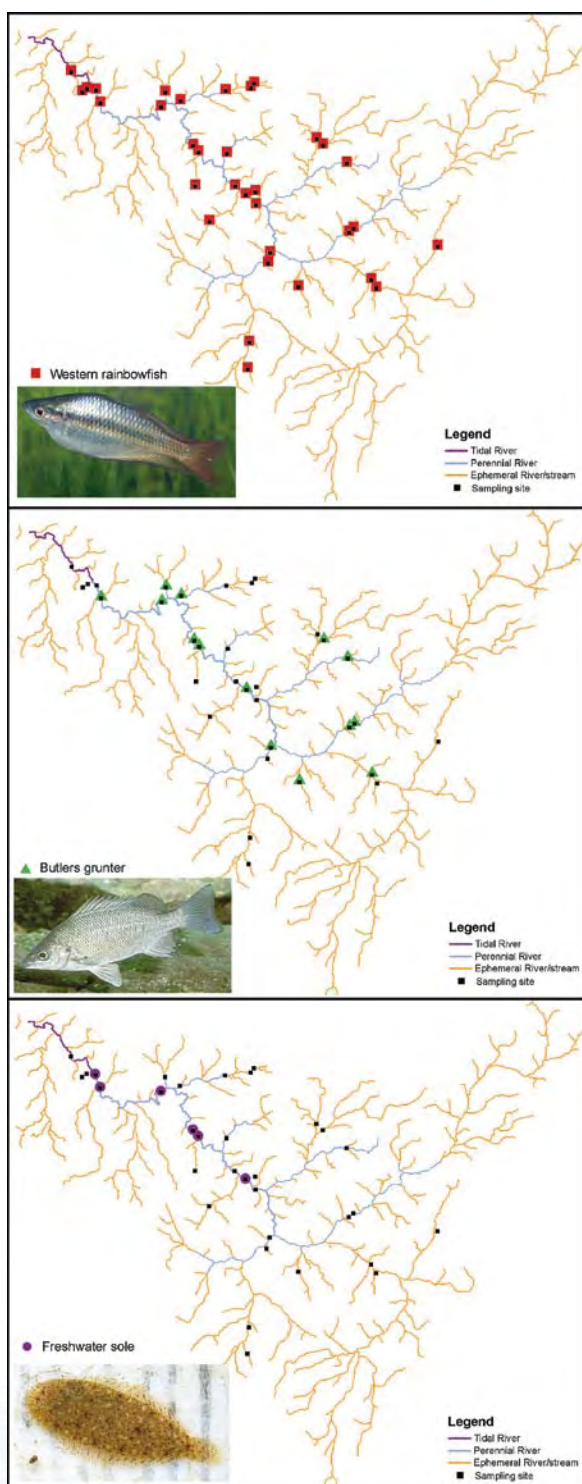


Figure 2. Map of the Daly River catchment showing the distribution of the western rainbowfish (*Melanotaenia australis*), Butler's grunter (*Syncomistes butleri*) and freshwater sole (*Aseraggodes klunzingeri*) based on sampling conducted during 2006.

We have commenced mapping the distribution of fish species but this cannot be finalised until all data is collected. However, **Figure 2** shows preliminary maps for three species with contrasting distribution patterns.

Many of the fish collected during sampling are measured before being returned to the water so that we can get information on the size structure of different populations. Comparison of population size structure can tell us when fish are breeding. The large number of small-sized Bony Bream found in the early dry season of 2006 (see **Figure 3**) indicates that they breed during the dry season when flows are reduced. A similar pattern was found for a number of species, including the Freshwater Longtom.

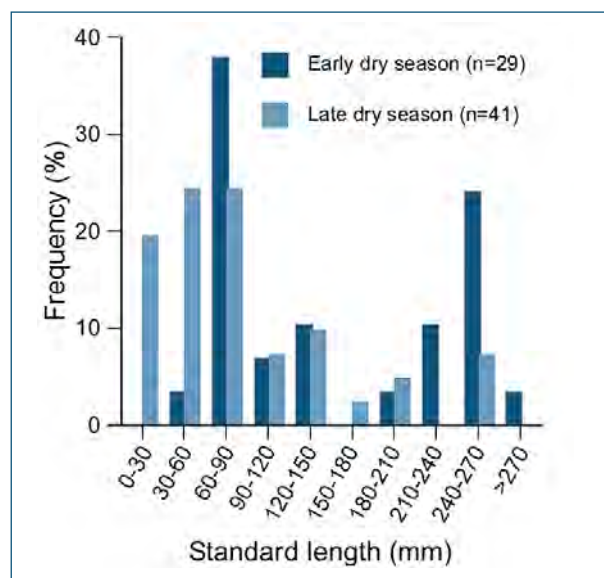


Figure 3. Length frequency distribution of bony bream (*Nematalosa erebi*) collected in the Daly River catchment during the early and late dry season of 2006 (sample sizes are given in parentheses). Note the large number of small individuals collected during the late dry season.

Other species such as black bream (*Hephaestus fuliginosus*) breed during the wet season and the size structure of populations tends to be dominated by small individuals in the early wet.



Size distributions can also tell us about patterns of fish movement. The big wet season of 2006 appears to have encouraged the upstream migration of many small barramundi from the most downstream reaches of the river. The population present in the early dry season of 2006 was dominated by small individuals and although some large individuals were present, it is likely that the large wet season flow stimulated the downstream migration of many reproductively mature male fish (see **Figure 4**).

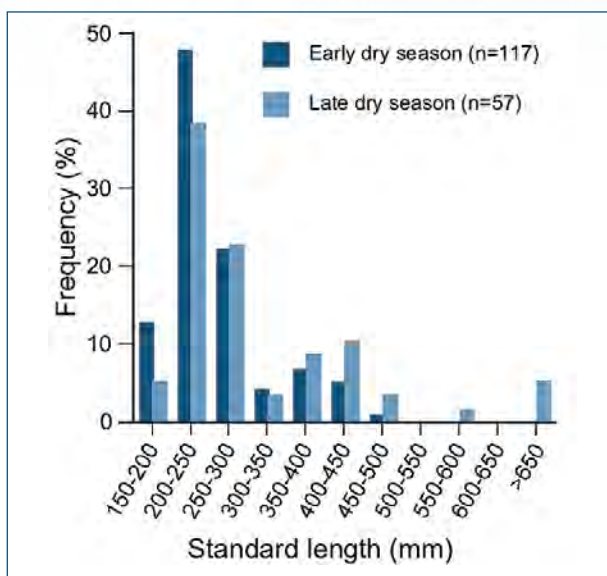


Figure 4. Length frequency distribution of barramundi (*Lates calcarifer*) collected in the Daly River catchment during the early and late dry season of 2006 (sample sizes are given in parentheses). Note the large number of small individuals collected on both sampling occasions.

Comparison of population size structure at different locations can also inform us about migration and movement. For example, many of the eel-tailed catfish move into small tributary streams to spawn and then migrate back to permanent waters in the main channel or larger tributaries. We see this reflected in the population size structure in these different habitats. Small streams contain many small fish (<100 mm SL) and few large fish whereas larger streams contain few small fish and more adults.

Traditional owner knowledge and participation

The project aims to involve Aboriginal traditional-owners in the fish research, as well as record their knowledge of fish and river behaviour and any stories relating to fish that people may wish to document. It is hoped that Aboriginal involvement in projects like this will enhance people's capacity to participate effectively in subsequent water allocation decisions.



Brad Pusey showing fish to Wagiman ladies at Umbrawarra Gorge

To date, the Wagiman Rangers and Wardaman traditional owners have joined as partners in the project and have contributed their time and knowledge to fish sampling activities at a number of sites, including the Claravale Crossing, Douglas Hot Springs, and Flora River. Two representatives from Wagiman (Mona Liddy) and Wardaman (Bill Harney) language groups are members of the Project Steering Committee and contribute to oversight of the entire project.



The topics discussed with traditional owners whilst conducting field work have included:

- language names for fish
- identification of fish species at particular locations
- knowledge of fish behaviour and movement
- uses for and traditional associations with fish
- stories about the role of fish in creating the landscape and social arrangements
- origins of the fish species and their biological features
- management issues, such as pressure on fish from overfishing, habitat change.

The use of the electro-fisher is a major drawcard in stimulating the interest and enthusiasm of all participating in field work. Perhaps the most exciting moment was when the freshwater sole was found at the Claravale Crossing. This little fish had not been seen by the Wagiman people present and all were fascinated by its existence and accounts of its features and behaviour.



Freshwater sole

One of the benefits arising from this element of the project is the extended observational period that informs Aboriginal people's knowledge base. The results from periodic sampling can be supplemented with information from traditional owners who may be present in the country prior to or outside sampling times. For instance, Wardaman people were able to confirm for the sampling team the presence of a garfish at the Flora River site over many years. We had collected only 1 specimen of this species (*Arramphus sclerolepis*) across all 33 sites and were unsure whether it was a permanent inhabitant of this part of the river or an occasional vagrant.



Members of research team and Wardaman people at Hayward Creek

The Wagiman Rangers are interested in monitoring the health of fish in their country, potentially providing useful information on disease and patterns of fish movement.





Another beneficial outcome is the opportunity that fish sampling provides for young Wagiman and Wardaman children to learn about the country, to hear from elders and from the fish specialists. For some older people, these events provide a chance to remember past activities and recall knowledge passed down many years ago.

Sampling with Wagiman and Wardaman traditional owners will continue this year. We are hoping to extend the project to include Jawoyn traditional owners who are responsible for country within the upper reaches of the Katherine River. A number of sites in that area are of interest to the fish specialists. The upper reaches of the river are known to contain some species not yet collected during the project, including the Katherine River gudgeon (*Hypseleotris* sp.) and Midgley's grunter (*Pingalla midgleyi*).

Communication activities

Lizzie Sullivan, who was until recently a staff member with the Wagiman Rangers, undertook a number of educational and promotional activities on behalf of the project team. She coordinated the production of a DVD of the first round of field work at the Sawmill Block (Claravale Crossing) by the Wagiman Rangers, presented at a women's Aboriginal ranger conference and conducted media interviews. Lizzie also made a presentation about the project at the annual conference of the Australian New Guinea Fishes Association (ANGFA) held in Darwin in early June 2007.

Brad Pusey and Mark Kennard of Griffith University also gave presentations at the ANGFA conference held in Darwin. They discussed how the Daly project complements other research on sustainable development in northern Australia and highlighted the importance of the flow regime to riverine organisms and ecology. Lizzie Sullivan's presentation at this forum provided a very good counterpoint to these scientific presentations and highlighted the social side of environmental flow management and indigenous involvement in the process.

The research team has produced a poster of fish in Wagiman country which we plan to discuss with traditional owners in August. This poster will include all the fish known from Wagiman country and their Wagiman language names. A similar poster could be also produced for other language groups.



Discussing the fish poster at Umbrawarra Gorge

What will we be doing during 2007?

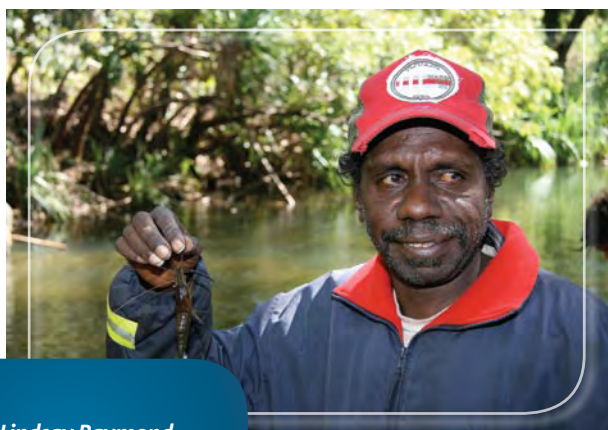
Field sampling of freshwater fish communities is the major activity for 2007. The dry season field trip has just finished and another is planned for September/October. Traditional owners visited key sites with the fish sampling teams at Umbrawarra Gorge and along the Flora River. Some of the findings of this work will be presented in following newsletters

A scientific workshop will be held in December to build a conceptual model of how we think fish ecology and river flows are linked. We will invite a number of scientists to help us build the model which will help estimate the effects of changes in flow regime.





Michael Douglas and Mona Liddy will be giving a joint presentation on the project for the RiverSymposium in Brisbane in September. Their presentation will be included in a session on capacity building and environmental flows.



Lindsay Raymond



Mark Kennard

Project Steering Committee

The Project Steering Committee is comprised of representatives from recreational fishing (Chris Makepeace, AFANT), tourism (Gary Higgins, Katherine Regional Tourism Association), conservation (Stuart Blanch, WWF), water planning (Ian Lancaster, NRETA), fisheries and primary industries (Andria Handley, DPIFM), Wardaman Association (Bill Harney), Wagiman (Mona Liddy) and funding agencies (Richard Davis, Land and Water Australia). It has met twice and had provided advice to the researchers on clarification of objectives, appropriate approaches to communication and methods for ensuring adoption of the research findings. These meetings have also provided a good way for updating key stakeholders on how the project is progressing.



Research team and Wardaman people at Hayward Creek

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