Cotton Catchment Communities CRC

information sheet

Environment

Biodiversity of Water Storages on Irrigation Farms in the Border Rivers Catchment

June 2006

Susan Lutton, Centre for Riverine Landscapes, Griffith University and Cotton CRC

Investigation of the ecological value of irrigation farm water storages

Comparison of on farm storages with nearby natural water bodies

On farm storages support a range of macroinvertebrate species

A number of fish, varying in size from 15 mm to 205 mm made it through the pumps intact.

Low numbers of exotic fish species come through the pumping process

Floodplains along river systems of the northern Murray-Darling Basin contain a diversity of wetland habitats, maintained through highly variable patterns of flood inundation. However, in catchments such as the Border Rivers, the development of irrigation farms on floodplain areas and subsequent flow regulation has influenced the extent and frequency of floods and led to a decrease in the distribution of wetlands. Due to the flow variability of the system, irrigators use on-farm water storages to store water until required for irrigation. With the decline in natural wetlands, these water storages may now represent a key form of artificial aquatic habitat within the Border Rivers. However, there has been little investigation into the ecological value of on-farm storages in Australia.

Photo by Susan Lutton

Fyke net set for fish sampling in a on-farm storage

Key Project Aims

The aim of this project is to investigate the ecological value of water storages on irrigation farms, with a focus on the Border Rivers Catchment. The principal objectives are to:

1. Describe the diversity and abundance of animal communities within on-farm storages;

2. Compare aquatic diversity between on-farm storages and adjacent natural water bodies;

3. Identify key Enviromental variables, such as flow history and physical features of storages, that explain differences in biodiversity; and

4. Determine the relative influence of different management options and habitat availability on storage communities.

The results will then be used to recommend best management practices to growers to optimize biodiversity outcomes for their storages.

Sampling Design

Site visits were carried out to survey over 100 on-farm storages in the Border Rivers Catchment and interviews with landholders provided physical data and information about management practices. This information was used to group the storages according to their physical attributes and how they are managed. It was found that the majority of storages in the catchment could be placed into one group (Table 1). This group, hereafter referred to as 'typical storages', comprised storages containing water sourced from allocated flows, unallocated flows and overland flows and also recycled tailwater.

Table 1: Mean values for characteristics of typical on-farm water storages in the Border Rivers catchment

	Mean	Standard Error
Age (Years)	9.9	0.8
Height (m)	4.6	0.1
Area (Ha)	35.7	1.8
Perimeter (km)	2.45	0.06
Capacity (ML)	1447.9	78.9
Distance from source (km)*	3.00	0.32

*Distance from source = distance to river from which flows are pumped

A number of storages from each group were selected such that sampling sites were spread throughout the catchment.

Photo by Susan Lutton

South Callandoon Lagoon

There are also many significant wetlands in the catchment including lagoons or waterholes in flood channels, anabranch channels and billabongs. These along with nearby storages were then sampled for fish and macroinvertebrates. Unfortunately, due to drought leading to limited river flows in the catchment, samples have not been collected for all sites. It is hoped that sampling will be completed in the coming year.

Fish Diversity between Natural Wetlands and Typical Storages

Fish are sampled using three fyke nets (see picture page 1) per site that are left in overnight. The nets are then emptied and fish are identified, counted and measured. With the exception of exotic species, such as carp, all individuals were returned unharmed to the water body. The fish assemblage of natural wetlands was comprised of 9 species of which 2 were exotic, while the assemblage of typical storages consisted of 6 native and 2 exotic species. All the fish species that were found in the storages were also found in the natural wetlands. The only fish species in the natural wetlands not found in the storages to date was the eel-tailed catfish, *Tandanus tandanus.*

Table 2. Fish fauna of natural wetlands and typical storages in the Border Rivers Catchment. Exotic species are marked with an asterisk.(*)

Common Name	Scientific Name	
Australian smelt	*Retropinna semoni*	Natural Wetlands & Storages
Australian smelt	*Retropinna semoni*	
bony bream	*Nematolosa erebi*	
carp gudgeons	*Hypseleotris spp.*	
European carp*	*Cyprinus carpio*	
golden perch	*Macquaria ambigua*	
goldfish*	*Carassius auratus*	
rainbowfish	*Melanotaenia fluviatilis*	
spangled perch	*Leiopotherapon unicolor*	
eel-tailed catfish	*Tandanus tandanus*	Wetlands only

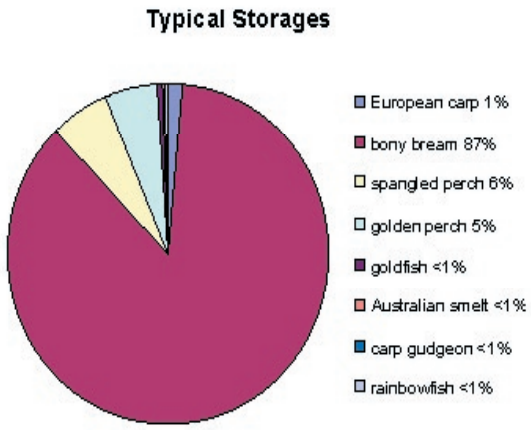

Figure 1a Percentage of different taxa collected from typical storages.

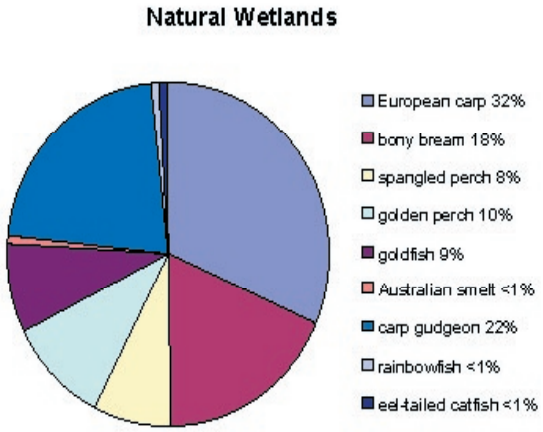

Figure 1b. Percentage of different taxa collected from natural wetlands.

However, as shown in Fig. 1a and 1b the catch in the storages was dominated by one species, bony bream, compared with the natural wetlands.

Macroinvertebrate Sampling

Three replicate macroinvertebrate samples are taken at each site using a 250 μm dip net. Samples are taken such that each sample is composed of all the different habitats available and in the proportions that they are represented at each water body – composite sampling. Final results are not available from the macroinvertebrate sampling as the samples are still being processed. However, from the samples processed so far it is clear that on-farm storages support a range of macroinvertebrate species. These include mayfly nymphs, midge larvae, water beetles, damselfly and caddis fly larvae and freshwater snails.

Photo by Susan Lutton

Midge Larvae, *Atrichopogon* sp.

Sampling During Water Harvesting

Fish samples were also collected during water harvesting to investigate which species were coming through the irrigation pumps from the river. A single fyke net was set up across the supply channel immediately behind the pumps and left for a known time.

Photo by Susan Lutton

Leiopotherapon unicolor – spangled perch

A number of fish, varying in size from 15 mm to 205 mm made it through the pumps intact. The species caught were similar to those being sampled from the storages themselves with the exception of one eel-tailed catfish

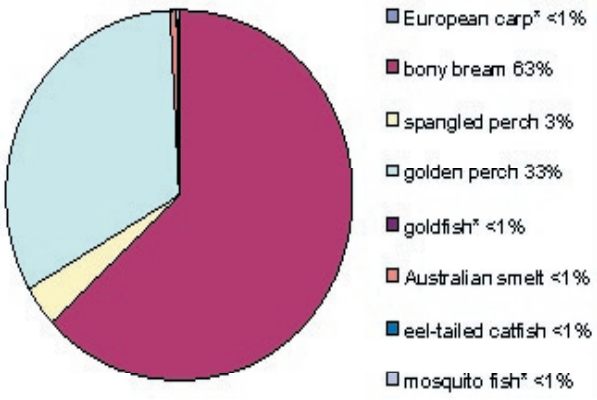

Figure 2. Percentage of different taxa collected during water harvesting. Exotic species are marked with an asterisk.

and the exotic species, mosquito fish (Fig. 2). Again the catch was dominated by bony bream. The surprising result was the very low numbers of exotic species coming through the pumps. Across all the sampling occasions exotic species made up less than 1% of the total fish catch.

Future Work

In the coming year I will continue sampling and, if there is significant rainfall in the catchment, be able to include sites that were not sampled this year. I will also collect macroinvertebrate and zooplankton samples over the irrigation season to see if fluctuating water levels are affecting the communities frequenting on-farm storages.

Improving the Ecological Value of your Storage

For more information on how to improve the ecological value of your on farm storage the Cotton CRC has produced an information brochure: "Design principles for healthy waterways on cotton farms" see the Cotton CRC website: www.cotton.crc.org.au or ring The Cotton CRC Technology Resource Centre on 02 6799 1534.

Acknowledgements

I would like to extend my thanks to the numerous property holders in the Border Rivers catchment who granted access to their properties. This research was funded by the Cotton Catchment Communities Cooperative Research Centre and the Cotton Research and Development Corporation.

Contacts

Susan Lutton, Centre for Riverine Landscapes, Griffith University and Cotton CRC, PO Box 1176, Goondiwindi, QLD 4390.
susan.lutton@student.griffith.edu.au;
http://www.gu.edu.au/centre/riverlandscapes/