



**Sediment and Phosphorus Bioturbation by Carp
(*Cyprinus carpio* L.) in Irrigation Drains near Griffith,
New South Wales**

Shaun Meredith, B.Sc. (Hons)

**Department of Zoology
University of Adelaide
in conjunction with
CSIRO Division of Water Resources,
Griffith, NSW**

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“If the correct stocking densities are maintained, common carp should prove to be an effective, cheap and long-term answer to submerged weed control in small shallow lakes and ponds. Achieving this level of control may, however, result in some characteristic changes to the environment. The most common feature is the distinctive green colouration of the water...”

Seagrave (1988) “Aquatic Weed Control” The Dorset Press, England

Addendum

p.56 Results for ANOVA on sedimentary phosphorus data are tabulated below:

Source	d.f.	F-ratio	P
Landuse	2	4.596	0.013
Length of Upstream Drainage (LUSDR)	3	3.491	0.020
Sampling Date	1	18.519	<0.001
Landuse x LUSDR	6	0.448	0.844
Landuse x Sampling Date	2	0.026	0.974
LUSDR x Sampling Date	3	0.344	0.794
Landuse x LUSDR x Sampling Date	6	0.069	0.999

p. 67 The small holes in the walls of the core sampler presented in Figure 3.1 are to enable water from above the core sample to escape without disturbing the sediment.

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Abstract: Carp (*Cyprinus carpio* L.) are abundant in many natural and constructed waters in the Murray-Darling Basin. This introduced fish has been implicated in the demise of aquatic plants and native fish, bank slumping, increasing turbidity, and more recently, increasing water column phosphorus concentrations. This study aims to assess the contribution of the benthic feeding behaviour of carp to phosphorus and sediment resuspension in the irrigation drainage network of the Mirrool catchment near Griffith, New South Wales.

An observation survey (Chapter 2) revealed carp were abundant in the drainage network during the irrigation season, but not so during the off-season. The increase in carp numbers during the irrigation season was shown to be due to upstream migration from more permanent waters downstream, entry through irrigation supply water, and to a lesser extent to the reconnection of overwintering sites within the drainage network. Large numbers of juvenile carp were also observed late in the irrigation season, indicating successful recruitment of carp within the drainage network. Based on this information, a model of the movement of carp to and from the drainage network is presented. When abundant in the drainage network, the distribution of carp was concentrated at the intersection of smaller lateral drains with the faster-flowing, deeper Main Drain "J". This distribution was not found to be related to differences in the physical attributes of sites studied, but to the diversity of habitat at the junction of lateral drains with the Main Drain.

Examination of the temporal and spatial distribution of sedimentary phosphorus (Chapter 3) revealed sediments in drains receiving water from a predominantly urban catchment contained higher concentrations of total phosphorus than those receiving rice/pasture runoff. Sedimentary total phosphorus was also found to be greatest at the upstream end of lateral drains, and least at the downstream end. Similarly, phosphorus concentrations in the sediments were greatest prior to the commencement of the irrigation season. The distribution of sedimentary total phosphorus in the Mirrool catchment was linked to spatial and temporal differences in runoff water quality and velocity, and to spatial differences in the geochemical and organic composition of sediments.

A pond experiment was conducted (Chapter 4) to further examine factors affecting water quality resulting from carp feeding behaviour. The variable effects of carp on turbidity, suspended sediment, total phosphorus and ISDP were attributed to the interaction of carp and the phosphorus content and particle size distributions of two different sediments used. The implications of these results on both past and future studies on the impact of carp are discussed.

Finally (Chapter 5), information on the spatial and temporal distribution of carp and sedimentary total phosphorus in the drainage network is combined with information attained during the pond experiment to assess the role of carp in sediment and phosphorus resuspension in the Mirrool catchment. It is concluded that the distribution of carp is such that concentration of sediment and phosphorus resuspended is likely to be inhibited, however, the export of resuspended phosphorus is enhanced.

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Signed:

Date:

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