

**Carp Exclusion Screens on wetland inlets:  
their value for control of common carp  
(*Cyprinus carpio* L.) and effects on offstream  
movements by other fish species in the River  
Murray, Australia**

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## Abstract

Carp screens are used in the Murray-Darling Basin (MDB) to prevent invasive alien common carp, *Cyprinus carpio* L. from entering wetlands, minimising their ecological impacts and denying them access to spawning habitat. The effectiveness of existing screen designs has not been evaluated, however, and little is known of their incidental effects on the lateral (instream-offstream) movements of other fish and aquatic fauna.

This study investigates new screen designs that are based on carp morphology, with allowances for the lateral movements of carp and other species. The aims were (1) to determine the spatial and (2) temporal nature of lateral fish movements in the River Murray, South Australia, (3) to describe the location and design of existing carp screens across the Murray-Darling Basin, (4) develop new designs optimised to prevent the passage of sexually-mature carp, and (5) to compare and evaluate the new and existing designs.

The spatial movements of fish between the Murray and six perennially-inundated wetlands were monitored using directional fyke nets set in wetland inlets from August to November 2006. Some 210,000 juvenile and adult fish from 18 species (14 native, four alien) were recorded over 13 weeks. The spatial movements of fish varied among wetlands, despite the proximity of the wetlands to each other, and showed no consistent directionality. This may have reflected the prevailing low-flow conditions (hence the absence of flow-related cues for movements), the virtually permanent connections between the wetlands and channel (maintained by weirs and other regulating structures) and the predominance of ‘generalist’ species with broad habitat requirements. Temporal movements generally were haphazard, but several small-bodied species increased in abundance over the 13 weeks, co-incidentally in response to increasing water temperature and day length. For most species, the balance of directional movements was from, rather than to, wetlands, possibly in response to falling water levels.

Existing carp screens are concentrated along the Murray in South Australia, but are used throughout the Murray-Darling Basin. In a Basin-wide survey, 54 carp screens were located, including eight mesh designs and varied dimensions. Morphometric data (from fish captured in the lateral-movement study) were used to develop two new designs to exclude sexually-mature carp (44-mm square grid mesh, ‘jail bar’ mesh with 31.4-mm gaps). Up to 92% of carp captured in the lateral-movement study would have been excluded by either new design.

The new screen designs and the most common existing design (Alu-Tread<sup>®</sup> walkway mesh) were trialled using directional fyke nets at 12 wetlands on the Lower Murray. The new designs allowed

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the passage of more small species (native species <250 mm total length) than the existing design, and excluded all adult common carp and turtles (Chelidae).

The new designs proposed here could be applied to, or adapted for, other carp-control technologies such as carp-separation cages. The ‘jail bars’ design especially is promising, but requires testing *in situ*, during higher flow conditions. In further development, extended monitoring of lateral movements could identify key time periods when carp screens need to be operated. Trials are also recommended to demonstrate the likely improvements in wetland water quality gained from use of carp screens.



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## Declaration

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 to Karl Aaron Hillyard 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.

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Karl Hillyard

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