Bringing native fish back to Slacks Creek, Logan. An urban catchment recovery story

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Key Points

- Design and construction of rock ramp fishway
- Impact of barrier on fish movement
- Urban waterway recovery
- Helping sustain native fish populations

Abstract

Following results from the Greater Brisbane Fish Barrier Prioritisation project, the Paradise Road culverts were identified as the first fish barrier remediation project to be undertaken in the City of Logan.

Prior to fishway construction, monitoring was undertaken to determine the number and species of fish able to pass through the Paradise Road culverts. A fish trap was set-up on the upstream side of the barrier over a five day period. The same standardised monitoring was undertaken post-construction to evaluate any changes in the number and diversity of fish now able to move freely past the barrier.

Pre-construction monitoring recorded a total of 18 individual fish comprising six species, able to move through the culverts. Post construction monitoring recorded 6,546 individual comprising 11 species (Moore. M *et al* unpublished, 2018). Representing a 36,596% increase in fish able to move through the culvert.

The results from the monitoring clearly indicate that

1. typical culvert road crossings can have a high impact on the ability of native fish to migrate into upstream habitats; and,

2. remediation of barriers to fish movement through construction of fishways can have a significant benefit to the diversity and abundance of native fish in urban creek catchments.

Keywords

Fish, passage, urban, stream, recovery

Introduction

Slacks Creek is a highly urbanised creek catchment in the City of Logan in south east Queensland. In 2013 Logan City Council launched the Slacks Creek Recovery Plan, a holistic catchment management plan aimed at improving the ecological health and function of Slacks Creek and while also improving the recreational and social amenity of the adjacent parklands.

In 2015, Catchment Solutions Pty Ltd partnered with Logan City Council, other local governments and Reef Catchments NRM to deliver the Greater Brisbane Fish Barrier Prioritisation project. This project identified several high priority barriers to fish movement within the Logan City Council area. The Paradise Road culvert crossing over Slacks Creek was ranked 36th highest barrier in the greater Brisbane focal area and 5th highest priority barrier within Logan City Council.

Based on this priority as the Paradise Road culverts over Slacks Creek were identified as the first fish barrier mitigation project to be undertaken within the City of Logan.

The Paradise Road culvert is a large structure. It consists of three large culvert barrels (3m wide x 4 m high) with a total width of 15m. It is 50m from the up stream limit to the downstream limit of the concrete apron with a fall of 500mm over the distance.

Logan City Council engaged fishway specialists, Catchment Solution Pty Ltd to undertake design and construction of a suitable fish way which would maximise the movement of native fish into the upper catchment of Slacks Creek.

The final approved design consisted of two fishway elements.

1. Rock-ramp fishway on the downstream end of the culvert connecting the existing bed of the creek to the concrete apron of the culvert structure

2. Horizontal baffle ridge fishway within the culverts.

In order to determine the effectiveness of the fishway, systematic monitoring was undertake prior to and following the construction of the fishway.

The results from before and after the construction of the fishway were compared based on total diversity of fish caught abundance based on fish caught per trapping effort.

Methodology

Fish monitoring was undertaken on the upstream side of the culverts prior to and following construction of the fishway.

The traps used were purpose built fish traps designed to capture all fish which successfully pass through the culverts. They are made of 10mm stainless steel frame covers in shade cloth (4mm mesh size and 50% shade). The traps also have shade cloth wing walls used to guide fish into the trap.

Two slightly different designs of trap were used for the pre and post construction monitoring. Pre-construction monitoring used a single entrance trap measuring 1.4m x 1.0m x 1.1m. The post-construction monitoring used a larger trap with two entrances measuring 2.4m x 1.0m x 0.7m. Due to the specific site constraints one of the trap entrances was blocked off and all fish directed through the remaining single entrance. Although different sizes the traps used are effectively the same in how they work. The type of trap used was due to availability of the trap and does not reflect a difference in trapping method.

The traps were set to ensure that all fish moving upstream must pass through the trap. This ensures that all fish that successfully move through the culverts are captured and recorded.

Pre-construction monitoring commenced on 29 May 2017. The trap was set for a total of five day and checked each morning and afternoon. All fish captured were identified to species level and the body length measured.

Post-construction monitoring commenced on 9 October 2017. As per the pre-construction monitoring, the trap was set for a total of five day and checked each morning and afternoon. All fish captured were identified to species level and the body length measured.

Results

Preconstruction monitoring:

Sampling prior to the construction of the fishway at Paradise Road culvert resulted in the capture of a total of 18 fish from six species over the five day monitoring period. This represents an overall catch per unit effort (CPUE) of 4.12 fish/day.

Table 1: Preconstruction monitoring results

Migration classification	Common Name	Species Name	Size range (mm)	CPUE (fish/day)
Diadromous	Empire gudgeon	*Hypseleotris compressa*	21-64	0.62
	Long-finned eel	Anguilla reinhardtii	19-56	0.82
	Striped gudgeon	Gobiomorphus australis	19-69	0.82
Potamodromus	Hypseleotris species	Hypseleotris sp.	17	021
	Firetail gudgeon	Hypseleotris galii	31-46	062
	Western carp gudgeon	Hypseleotris klunzingeri	16-20	1.03
Total Species and overall CPUE			6	4.12

Post-construction monitoring:

Sampling following the construction of the fishway at Paradise Road culvert resulted in the capture of a total of 6,546 fish from 11 species over the five day monitoring period. This represents an overall catch per unit effort (CPUE) of 1384.18 fish/day.

Table 2: Post-construction monitoring results:

Migration classification	Common Name	Species Name	Size range (mm)	CPUE (fish/day)
Diadromous	Empire gudgeon	*Hypseleotris compressa*	16-72	272.14
	Long-finned eel	Anguilla reinhardtii	40-300	4.65
	Striped gudgeon	Gobiomorphus australis	14-112	812.62
	Sea mullet	Mugil cephalus	24-51	257.76
Potamodromus	Flathead gudgeon	Hypseleotris grandispes	19-62	12.69
	Firetail gudgeon	*Hypseleotris galii*	31-36	0.85
	Western carp gudgeon	*Hypseleotris klunzingeri*	18-34	8.88
Pest Fish	Mosquito fish	*Gambusia holbrooki*	12-44	12.26
	Platy	*Xiphophorus maculatus*	31-33	0.85
	Swordtail	*Xiphophorus helleri*	38	0.42
	Tilapia	*Oreochromis mossambicus*	125-390	1.06
Total species and Overall CPUE			11	1384.18

Discussion:

The results show that there is a large difference in the number of individuals successfully passing through the Paradise Road culvert following the construction of the fishway. The results show a 33,596% increase in fish successfully passing through the culvert structure following construction of the fishway.

This result can also be interpreted as the impact the culvert had, prior to construction of the fishway, on the ability of native fish to move into the upper Slacks Creek catchment. Only 0.3% of fish were able to successfully pass through the Paradise Road culverts prior to construction of the fishway.

No alien fish species were captured during the pre-construction monitoring. This may indicate that the larger deep bodied fish such as Tilapia and Carp are also impacted by barriers. However, based on observations taken by the author, Carp have been seen moving through the Paradise Road culvert during flow events and

Tilapia and Carp were both present in the upper Slacks Creek catchment prior to the construction of the fishway, indicating that these species are able to successfully move through the culverts.

Although representing 36.36% of the species captured, alien fish represented only 1.05% of the total number of individuals caught in the post construction monitoring. This result along with the knowledge that alien fish can are generally less impacted by waterway barriers, indicates that the construction of fishways to allow native species to move through waterway barriers does not significantly increase the presence of alien fish in the upper catchment.

Further investigations:

In order to determine if the construction of the fishway has led to changes in fish communities in the upper catchment is still needs to be determined. Monitoring has been undertaken in the upper catchment prior to the construction of the fishway by Resch. B and Silcox. H, 2016 (unpublished) and Resch. B and Wood. M, 2017 (unpublished). The results from these investigations indicated that the fish communities up stream of the Paradise Road culverts were depauperate in native fish diversity and abundance and dominated to alien fish including Mosquito fish, Guppies, Tilapia and Carp.

Further monitoring will provide information on any changes in the abundance and diversity of fish communities in the upper catchment of Slacks Creek which may be attributable to the improved access following the construction of the fishway.

Conclusion:

Monitoring fish diversity and abundance before and after the construction the Paradise rd fishway provides important insight into,

1. The benefits to native fish movement from removing barriers to migration and movement.
2. The high level of impact on fish migration caused by road crossings not designed to allow for fish passage
3. The effectiveness of the rock ramp and horizontal baffle fishway design used at Paradise Road, Slacks Creek

Acknowledgments

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References

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