



FIND
YOUR
SOLUTION.

catchmentsolutions.com.au

Gooseponds Fish Hotels – Increasing habitat complexity

January 2017
Trent Power

Catchment Solutions has taken all reasonable steps to ensure the information contained in this document is accurate at the time of publication. Readers should ensure that they make appropriate enquires to determine whether new information is available on the particular subject matter.

For further information contact:

Trent Power
Aquatic Ecologist
Catchment Solutions – Fisheries and Aquatic Ecosystems
Ph: (07) 4968 4212

© Catchment Solutions Pty Limited 2017

Copyright protects this publication. Except for purposes permitted by the Copyright Act, reproduction by whatever means is prohibited without the prior written consent by Catchment Solutions Pty Limited.

Enquires should be addressed to:

General Manager
Catchment Solutions Pty Limited
PO Box 815, Mackay Qld 4740
Tel: +61 7 4968 4200
Email: info@catchmentsolutions.com.au

Original Issue: Revision 1, January 2017

Document Revision: 1

File Path: U:\1. FAE Fisheries & Aquatic\FS Files\3. Project Files\8. Mackay Whitsundays\2. Wetland Projects\Gooseponds\Log_Hotels_MRC-FAE1028\Reports

Citation: Power, T., (2017) *Gooseponds Fish Hotels – Increasing habitat complexity*. Summary report for Mackay Regional Council. Catchment Solutions, Mackay

Contents

Background	1
Habitat Description	1
Introducing Large Woody Debris and Fish Hotels	3
Fish Hotel Design.....	3
Installation	4
Community Engagement	4
Media coverage	4
Information signage	5
Monitoring.....	5
Acknowledgements	8
References	8

Background

In 2014 an integrated pest fish management programme was implemented by Catchment Solutions to reduce the impact of tilapia in the Gooseponds Lagoons, North Mackay. The programme included distribution monitoring, predatory control trial and habitat improvement components. The purpose of undertaking habitat improvement was to increase resource availability for native fish species, thereby building resilience and allowing greater competition with the unwanted pests. As part of the habitat improvement works a feasibility study was undertaken to assess potential improvement options and complete necessary planning and design requirements of the preferred option. Specifically, these requirements included:

- Concept design of the preferred habitat improvement option (fish hotels).
- Identification of suitable locations for installation.
- Flood modelling to demonstrate no adverse impacts as a result of the fish hotel installations.
- Detailed structural design for construction of the fish hotel.
- Cost estimates for the construction and installation.

For further information relating to the feasibility study please refer to *Gooseponds Log (fish Hotel Feasibility Study - Final Report)*.

Following the completion of the feasibility study, funding was secured from Reef Catchments Limited (RCL), Rio Tinto and Mackay Regional Council (MRC) to construct and install fish hotels at the four sites identified in the feasibility study. As part of the project delivery pre and post installation fish monitoring was undertaken to provide an indication of species utilisation of the new habitats. This report documents the construction and installation process, and the results of fish community monitoring.

Habitat Description

The Gooseponds lagoons are a series of modified wetlands in the lower reaches of Janes Creek, a tributary of the lower Pioneer River (Figure 1). The complex consists of five lagoons, covering approximately 11 ha. The size of the individual lagoons varies from 0.5 ha to 5.0 ha. Depth of the lagoons also varies to maximum depth of 3.0 m. Habitat characteristics of each lagoon are listed in Table 1.

Landuse within the local catchment consist predominantly of intensive agriculture (sugar cane) in the upper catchment and urban development in the lower catchment surrounding the lagoons. The high levels of both agricultural and urban development are likely sources of the increased nutrient loads within the lagoons (Catchment Solutions unpublished data). The eutrophic conditions are favourable for the growth and proliferation of aquatic macrophytes and algae.



Figure 1. Location of Gooseponds Lagoons in relation to the Pioneer River Catchment (inset) and surrounding urban development. Locations of fish hotel installation sites are indicated by yellow boxes.

Habitat types within the complex consist primarily of open water, with high amounts of macrophytes and mud substrates. Woody debris (snags), undercut banks, and rocky substrate are limited throughout and the general riparian condition surrounding the lagoons is low (Table 1).

Table 1. Habitat characteristics of lagoons within the Gooseponds complex.

Site Name	Gooseponds 01	Gooseponds 02	Gooseponds 03	Gooseponds 04	Gooseponds 05
Water Body Type	Instream Pool				
Average Site Width (m)	30	25	15	10	60
Site Length (m)	1200	250	500	600	350
Average Riparian Width (m)	0	7	5	10	2
Riparian Condition	Very low	Low	Low	Low	Very Low
Open Water	High	High	High	High	High
Undercut Banks	Very Low	Low	Very Low	Moderate	Low
Mud Substrate	Very High				
Rocky Substrate	Low	Low	Very low	Very Low	Low
Aquatic Macrophytes	Very High	High	High	Low	Very High
Woody Debris	Very Low	Very Low	Very Low	Low	Very Low

Introducing Large Woody Debris and Fish Hotels

In undisturbed streams and wetlands there is often an abundance of large woody debris (LWD). The presence of this habitat type is a natural process that occurs when trees fall into the waterway. The large trunks and branches may be secured to the bank by roots that are still intact, or may be transported downstream and become lodged, forming log jams (Gippel et al 1996). It has been recognised that the complexity provided by LWD is beneficial for the fish communities present in the system (Cook & Robertson 1999). Several of the benefits include:

- Increased vertical and horizontal cover, reducing predation risks
- Visual isolation, reducing contact between fish
- Refuge from velocity, minimising energetic costs
- Increased surface area for vegetative and prey species growth
- Spatial reference points to assist fish with orientation to surroundings

In areas that have been cleared or developed, this natural process is interrupted and the benefits that these habitats provide are lost or reduced.

Fish Hotels are modular structures, designed to emulate LWD and engineered to withstand expected stream velocities at the installation sites. Using these structures, the benefits of instream LWD can be achieved with no increased risk to flooding or movement during high flow conditions.

Fish Hotel Design

The final configuration of the Fish Hotels were five modules aligned parallel to the bank. Each module consisted of two reinforced concrete base plates each weighing 275 kg, alternating stacked logs that were ~100 mm in diameter and a series of log cross members which intersected the central void. The stacked logs were secured to the base plates with 16 mm stainless threaded rod and the cross members were secured to the stacked logs with 10 mm stainless threaded rod. The final dimensions of each module were 2.0 m x 2.0 m wide base and 1.2-1.5m high. Photos of the Fish Hotels are shown in Figure 2. Construction was undertaken offsite and the assembled modules were transported to the Gooseponds using a flatbed crane truck.



Figure 2. Fish Hotel modules on site prior to installation (left), close up showing cross members (right).

Installation

Installation of the Fish Hotels was done with a 20 t Frenna crane. Riggers used ropes to hold each module parallel to the bank while the crane boomed out the required distance. The Fish Hotels were lowered into the water 10 m from the bank and were spaced 0.5 m apart.

Temporary marker sticks were used to identify the location of FH already placed and allowed the correct alignment to be maintained for each module. Photos of the installation process are provided in Figure 3.



Figure 3. Aligning and lowering the hotels into position was a challenging task, met by the experienced crane operators.

Community Engagement

Media coverage

Media coverage of the Fish Hotel Project was wide spread, through both convention and social channels. Stories of the installation were covered by local newspapers and television channels and shared to wider audiences on the respective websites. Each of the project partners followed project activities on Facebook and other social media websites, and the general feedback received was very positive. To further promote the fish hotel project, a short video of the project was also produced to host on the project partner's websites ([Gooseponds Fish Hotel Video](#))

Photos of the media day prior to installation are shown in Figure 4 below.



Figure 4. Left - Project partner representatives promoting the Gooseponds fish hotels. Right - Mackay regional councillor Fran Fordham and Rio Tinto Hail Creek Mine Community Development Fund board member Ellissa Howard, with Project Manager Trent Power.

Information signage

As the fish hotels are complete concealed below the surface of the water, local residence and users of the Gooseponds may not be aware of the installations or the benefits that these structures are providing to the waterway. To compliment the habitat improvement and pest fish management work completed through this project, an information sign has been developed for installation at the Gooseponds. The design of the fish hotel and pest fish sign is shown in Figure 5.



Figure 5. Information sign design for fish hotels and pest fish communications.

Monitoring

Pre and post installation monitoring was conducted at the fish hotel sites to provide an indication of species utilisation. Electrofishing was conducted on a single occasion prior to installation and again after the fish hotels had been in place for several months. Data collected from all the fish hotel sites were pooled together and are summarised below.

In total 11 species of fish were recorded from the fish hotel sites, 10 pre-installation and 10 post-installation. Of the species captured there were 4 were predatory (Figure 6) and 7 prey species (Figure 7). Two pest fish (mosquitofish and tilapia) were also present in captures.

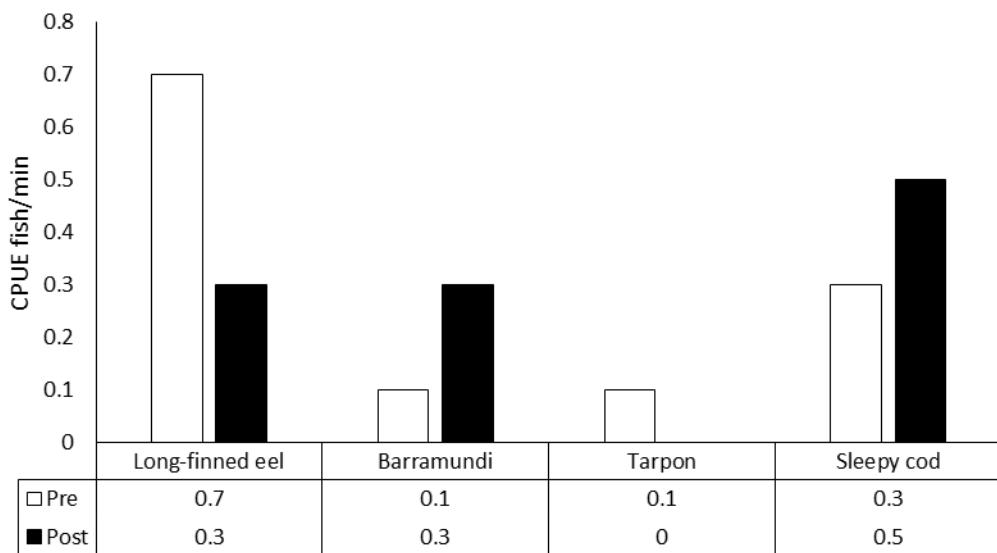


Figure 6. Predatory species captured during pre and post installation monitoring. Specific CPUEs is provided for each species in the table below the graph.

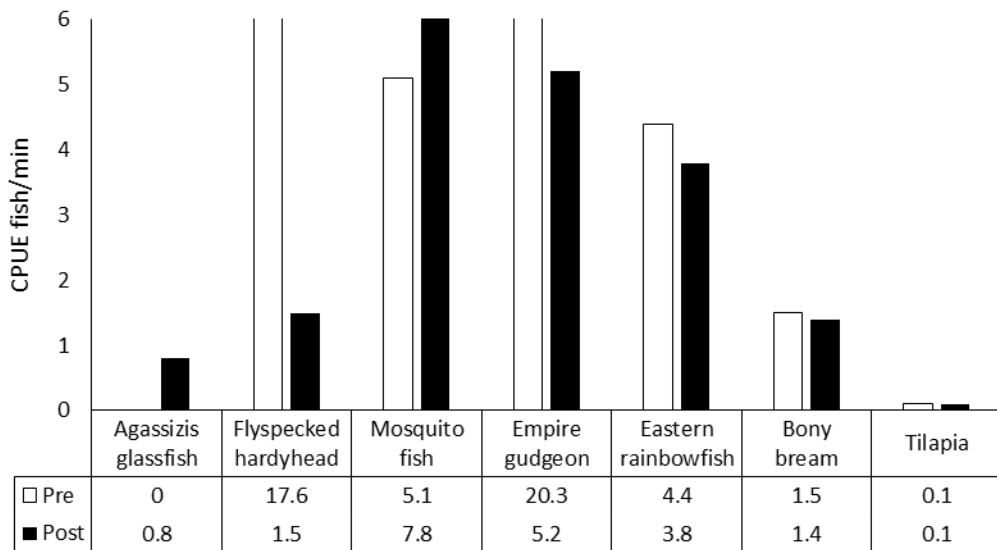


Figure 7. Prey species captured during pre and post installation monitoring. Specific CPUEs is provided for each species in the table below the graph.

Barramundi and sleepy cod were more abundant in post insulations and long-finned eel were less abundant. Tarpon were present in pre-installation captures but absent in the post-installation sampling. Eastern rainbowfish, mosquitofish, bony bream and tilapia recorded similar abundance during both rounds of sampling (Figure 7), while abundance of flyspecked hardyhead and empire gudgeon were notably lower in post installation samples.

Sampling conducted as part of this project has provided an indication that certain species may be utilising the fish hotels. Barramundi captures were three times higher after the fish hotels were installed and popular prey species of barramundi (flyspecked hardyhead and empire gudgeon) were in much lower abundance. To fully understand the extent that fish communities will utilise the fish hotels more in-depth monitoring and analysis is required. Such monitoring may include further fish community monitoring (netting/electrofishing) and acoustic tracking. Fish community monitoring of the various habitat types over several seasons will identify general prey/predator utilisation, while acoustic tracking will yield specific data on the rate of utilisation by larger predators.

Photos of fish community sampling and fish captured are provided in Figure 8 below.

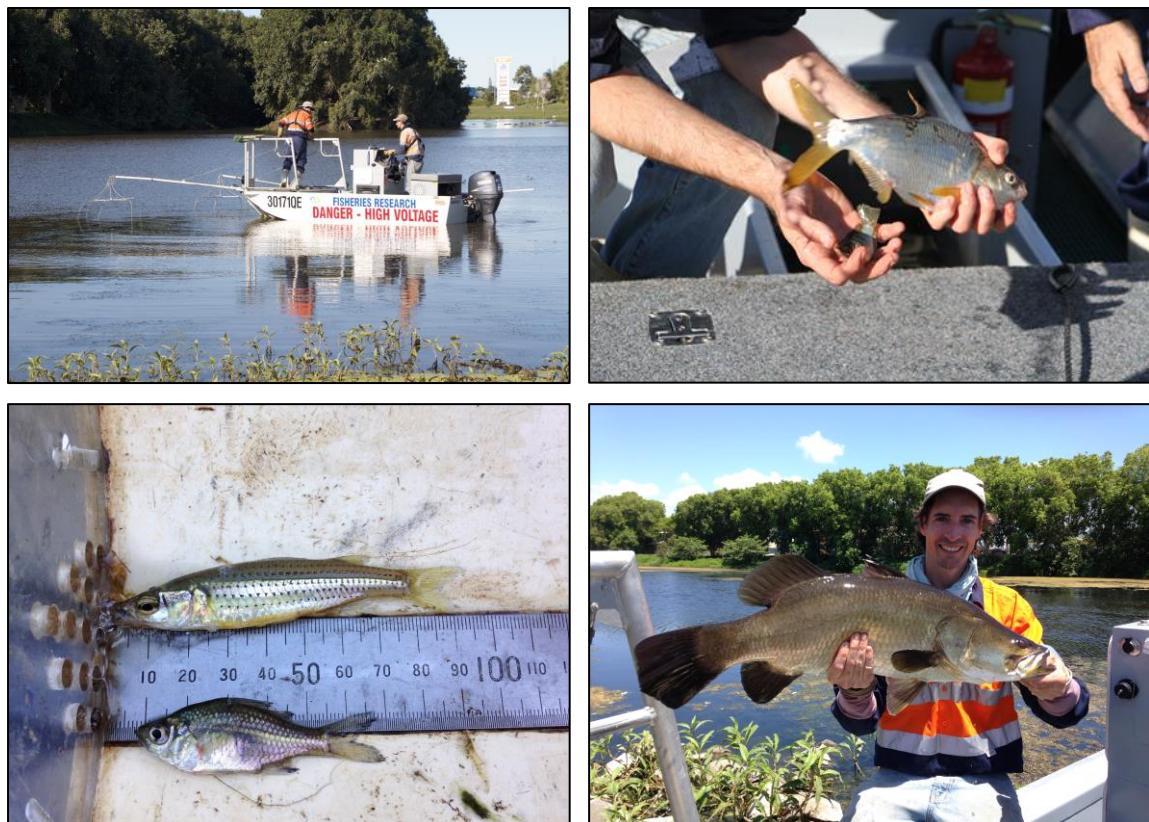


Figure 8. Top Left - Pre-installation fish community monitoring. Top Right - Bony bream and tilapia. Bottom Left - Flyspecked hardyhead and agassizis glassfish. Bottom Right - Large barramundi captured from fish hotel in Gooseponds Lagoon Five following installation

Acknowledgements

This project was a joint initiative of Reef Catchments Limited and Mackay Regional Council. Funding was provided as part of the Preventing the Spread of Tilapia in Southern Great Barrier Reef Catchments Project (SR14-00033) Reef Rescue System Repair 2013-2018; Mackay Regional Council Natural Environment Levy; and the Hail Creek Mine Community Development Fund.

References

- Crook, D. A., & Robertson, A. I. (1999). Relationships between riverine fish and woody debris: implications for lowland rivers. *Marine and Freshwater Research*, 50(8), 941-953.
- Gippel, C. J., Finlayson, B. L., & O'Neill, I. C. (1996). Distribution and hydraulic significance of large woody debris in a lowland Australian river. *Hydrobiologia*, 318(3), 179-194.
- Power, T. (2016). Gooseponds Log Hotel Feasibility Study – Final report prepared for Reef Catchments Limited. Catchment Solutions.



CATCHMENT SOLUTIONS

PHONE (07) 4968 4200

EMAIL info@catchmentsolutions.com.au

WEB www.catchmentsolutions.com.au

ADDRESS Suite 4/85 Gordon St | Mackay Queensland 4740

FIND
YOUR
SOLUTION.