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# Fish ladder monitoring update



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Cover image: Monitoring at Bakers Creeek fishway.

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## Background

Reef Catchments NRM, in collaboration with Catchment Solutions and Mackay cane farmer Shane Cowley have created a treatment train of wetlands to treat poor water quality run-off from adjacent sugar cane farms reaching the Great Barrier Reef (GBR) in the Bakers Creek Catchment (more info: https://catchmentsolutions.com.au/this-train-is-a-treat/)

The spillway at the downstream limit of the treatment train wetlands unfortunately washed away and became a significant scour hole during extreme flow turbulence caused by Severe Tropical Cyclone Debbie in 2017. The fish passage from the Bakers Creek estuary into the Bakers Creek treatment train wetlands was rehabilitated through the installation of a rock-ramp fishway completed in June 2019 after disaster recovery funds where secured through the Australian and Queensland Governments jointly funded Natural Disaster Relief and Recovery Arrangements (NDRRA) (more info: https://catchmentsolutions.com.au/bakers-creek-treatment-train-wetlands-fishway-construction/)

The treatment train wetlands located south of Mackay were constructed in 2014, to serve as a series of sediment and nutrient retention basins, treating sugar cane run-off and improving water quality before entering the estuary.

JCU Tropwater researchers are currently working in the final report that will illustrate the different treatment systems' efficacies to water quality improvements, including reduction of sediments, nutrients, and pesticides through our region (more info: *https://reefcatchments.com.au/water/treatment-train/treatment-train-trials/*)

This fish monitoring provides an indication that this type of treatment train, when efficiently connecting the wetland and estuarine habitats, can also provide important habitat for commercially and recreationally important fish species and a multitude of other native fish community species improving the wetland resilience.

Related information on different treatment system option can be accessed on the Wetland Info website *https://wetlandinfo.des. qld.gov.au/wetlands/management/treatment-systems/* 



### Methods

Catchment Solutions fishery ecologists assisted by RCL water and waterways project officer Carlos Bueno, conducted the monitoring of the reinstated rock-ramp fishway at the Bakers Creek treatment train outlet, over a total of two and half days from the 20th 21st and 27th to 28th of February, 2020. Fishway monitoring was undertaken to validate the success of the fishway at passing the entire community of fish species and size classes expected to move within the catchment. A purpose-built fish trap was set at the exit of the fishway, to evaluate the species, numbers and sizes of fish utilising the fishway to access the treatment train wetlands from the Bakers Creek estuary. Shade cloth wing walls were used to prevent fish from swimming around and underneath the trap, while sandbags were used to secure the trap and wing walls in place.

The monitoring that occurred from the 27th to the 28th followed a significant rain event with increased flows which provide ideal conditions for conducting fish passage assessments.

All individual fish captured in the fishway trap were identified to species level, counted, and measured to the nearest millimetre (fork length for forked-tailed species, total length for all other species). All native fish were then released upstream of the fishway, while pest fish species were euthanised as per Biosecurity Queensland legislation.



#### Ooralea Racecourse (Mackay Turf Club) (033329) Feb 2020 rainfall

Figure 1- Daily rainfall graph for the monitored period (BOM)

#### Water Quality

Water quality parameters were measured in situ using a YSI – Pro Plus multiprobe. Parameters monitored include:

- Temperature (°C)
- pH
- Dissolved oxygen (% saturation), and
- Electrical conductivity (μs/cm)

The water quality sampling method involved placing the probe into the water at a depth of 0.1 m and waiting for a short period of time for the readings to stabilise. After stabilisation, values were recorded for each of the water quality parameters. When conducting water quality measurements, two replicates were taken: the first being upstream of the fishway and the second being immediately downstream of the last ridge of the fishway. Water quality readings were taken at the commencement of each trap set period.

### **Results**

In total, 890 individual fish representing eight species (seven natives, one non-native) were captured at an overall rate of 365.7 fish successfully ascending the fishway per day. Native fish individuals represented 97.3% of the catch, with only 24 introduced mosquito fish recorded ascending the fishway, while migratory species represented 37.5% of the total native species caught. The size range of all fish captured ascending the fishway ranged between 11 mm and 220 mm, with the median size of all fish captured equating to 44.22 mm.

The Empire gudgeon (*H. compressa*) were the most abundant species (333.8 fish/day) making up 92% of the total catch, followed by Midgley's gudgeon (*H. species 1*) (13 fish/day) and introduced Mosquito Fish (*G. holbrooki*) (9.8 fish/day) which made up 3.6%, and 2.7% of the catch, respectively. Following this, most other species were captured in low abundances with only one Agassizi's glassfish (*A. agassizi*), two tarpon (*M. cyprinoides*) and three spangled perch (*L. unicolor*). Additionally, five long-finned eel (*A. reinhardtii*) individuals and five eastern rainbowfish (*M. splendida*) were captured.

The smallest fish recorded successfully ascending the fishway was an 11 mm Midgley's carp gudgeon, followed by an 18 mm mosquito fish and a 20 mm empire gudgeon. The largest fish species recorded was a 180mm long-fined eel, followed by a 115 mm tarpon, with the largest individuals of all other species less than 73 mm.

### Water quality

Temperature ranges between upstream and downstream of the fishway were consistent, ranging between 31.2°C and 34.4°C upstream of the fishway and 31.5°C and 34.6°C downstream of the fishway. The pH range varied between 5.74 and 6.68 both upstream and downstream, while dissolved oxygen saturation ranged between 25.6% and 45.1% saturation upstream and 32.7% and 60.8% saturation downstream. A general trend can be observed towards increasing dissolved oxygen concentrations moving from upstream to downstream of the fishway, due to the oxygenation of turbulent water moving through the fishway. Electrical conductivity readings also showed very little variation, ranging between 152 and 200 µs/cm both upstream and downstream of the fishway.

### Discussion

The results of the fishway monitoring demonstrate that the rock-ramp fishway is successfully passing different fish species, size classes and life-stages of fish in from Bakers Creek to the constructed treatment train. Significantly, the fishway was successful at passing juvenile diadromous and small bodied fish species which possess the weakest swimming abilities. Midgley's gudgeons as small as 11 mm were able to ascend the fishway, while long-finned eels as long as 220 mm were also able to ascend the fishway. In total, eight species ascended the fishway over the monitoring period, at a rate of 363.6 fish/day with a median body length of 44.22 mm.

This gives valuable insight into the species and number of individuals migrating upstream under increased flow conditions at the time of year sampled. With a total of eight species captured (seven natives, one introduced) and a median fish size of only 80.8 mm, this fishway has proven its ability at passing the entire fish community, in particular, for juvenile and small-bodied fish.









