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Wetland Walkabout: Post-restoration Fish Community Monitoring Report

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Background

In 2026, Catchment Solutions were engaged by Reef Catchments Limited (RCL) Natural Resource Management group to undertake a fish community assessment of restored wetlands at 'Wetland Walkabout', Mackay, QLD. The assessment forms part of the 'Wetland Walkabout' Restoration Project and aimed to assess the fish community condition post-restoration works.

Field surveys were conducted in February 2026 and focused on fish species migrating into the wetland from downstream estuarine habitats and fish species residing within the restored wetland. Box traps and fyke nets were used to assess the fish species richness, abundance, and size classes. Physico-chemical water quality parameters were recorded to determine environmental conditions associated with fish movement and utilisation of the wetland.

The 'Wetland Walkabout' restoration works were undertaken by Catchment Solutions with funding from RCL as part of the 'Beyond Barriers: Mackay and Isaac Coastal Wetland Rehabilitation' project. The works aimed to enhance ecosystem resilience and improve the wetlands' capacity to support aquatic flora and fauna by improving water quality, restoring fish passage, and increasing habitat connectivity between aquatic and estuarine systems, while also supporting the goals of the 'Reef 2050 Plan'.

At Wetland Walkabout, target outcomes included improved habitat availability for key fisheries species, such as barramundi, mangrove jack and sea mullet, as well as small-bodied species like empire gudgeon. Broader ecological benefits were also anticipated for wetland-dependent fauna such as waterbirds, saltwater crocodiles, and freshwater turtles.

To successfully achieve these outcomes, restoration activities at Wetland Walkabout specifically involved:

- Removal of a tidal floodgate lids
- Construction of permanent deep pool refuge habitat and connecting channels
- Reinstating intertidal flows
- Installation of complex instream habitat using hardwood timber logs with root balls.

This report summarises post-restoration fish community monitoring results and provides an overview of wetland condition, including habitat, vegetation, and other ecological indicators, with comparisons to pre-restoration baseline data where possible.

Site Details

Wetland Walkabout is a private nature reserve that adjoins the McCreadys Creek Reserve area. The site encompasses a range of coastal wetland ecosystems, including freshwater creeks, lagoons, and estuarine environments (Figure 1).

Figure 1: Map of the Wetland Walkabout complex and surrounds. Key locations include the existing wetlands (constructed) and pre/post fish community assessment sites.

Tidal Floodgate Site and Keeley's Road Wetland were the two sites selected to undergo restoration works. The post-restoration fish community assessment was undertaken at Keeley's Road Wetland.

Prior to restoration works, the Keeley's Road Wetland site was characterised as a former saltmarsh that had transitioned to a tidally blocked salt flat. Surface conditions did not exhibit typical characteristics of a coastal salt flat, with an absence of vegetation and minimal evidence of microbial or benthic activity (e.g., cyanobacterial mats). Tidal flap gates located downstream created an impoundment that reduced stream velocity through the site. Over the past ~50 years, sediment run-off from the upper catchment flowing into the new impoundment deposited soil at the Keely's Road wetland site. Sediment deposition raised land surface levels, subsequently blocking tidal movement from reaching the wetland site.

Hydrological connectivity to the site was limited. Inflows primarily occurred during the wet season (December to March), when runoff generated shallow ponding that typically persisted for a short period before evaporating early in the dry season (April to November) in most years (BoM 2025).

Freshwater inputs to the site were influenced by surrounding land uses. Upstream flows entered via the adjacent golf course, which contains water storage impoundments that periodically spill when capacity is exceeded. Additional runoff from urbanised areas of Andergrove appears to discharge into the golf course drainage system, where a channel conveys flows toward McCreadys Creek Reserve near the former tidal floodgate location. Overland flow from Keeley's Road and the surrounding areas also contributed to site inflows.

Keeley's Road forms a hydraulic and physical boundary between the site and the upstream extent of the Vines Creek Melaleuca swamp, a freshwater forested wetland (Moore et al 2007). Restoration works to improve habitat quality and condition were undertaken in December 2025. Restoration works included the provision of refugia and the installation of hardwood habitat logs. Refuge habitats were provided to prevent aquatic fauna from perishing every year at the site due to its modified shallow nature, which caused the wetlands to evaporate (Figure 2).

Figure 2: Keeley's Road Wetland during preliminary monitoring 2024 (left); Keeley's Road Wetland post-restoration 2026 (right).

Preliminary Fish Community Assessment

In November 2024, Catchment Solutions undertook a preliminary fish community assessment at two locations within Wetland Walkabout complex (Tidal Floodgate site and Timber Footbridge site), identified as potential restoration areas. The purpose of this monitoring was to determine baseline environmental conditions and fish community structure, before restoration.

The preliminary assessment focused on the fish residing within remnant pools and the suitability of these habitats to support fish. Indicators assessed included fish species richness, abundance, and size classes. The sampling techniques applied were fyke netting, cast netting, and seine netting.

The preliminary assessment indicated low species richness and abundance across both sites. Habitat conditions were constrained, with limited water depth and an absence of permanent refuge habitat. At the Timber Footbridge site, the water quality was also poor, with pH recorded as strongly acidic (2.86). Based on these observations, it was determined that habitat at each site provided limited suitability for fish under pre-restoration conditions.

Following the preliminary assessment, the Timber footbridge site was determined to be inaccessible to machinery required for restoration activities and did not undergo any restoration works.

The 'Keeley's Road Wetland' could not be surveyed during the preliminary assessment due to the absence of surface water. As such, fish monitoring could not occur.

Methodology

The scope of work comprised the following:

- Undertake post-remediation fish community assessment. The monitoring component incorporated the following specifics:
    - Number of sites: One restored wetland site within the 'Wetland Walkabout' complex, McCready's Creek, Mackay, QLD.
    - Number of monitoring events: One event in total – In the wet-season during a flow event
    - Monitoring Period and Duration: Field monitoring occurred from 16th to 20th of February 2026 for a total of 4.18 days of effort.
    - Monitoring Methods:
        - A purpose-built Box Trap was used to capture fish moving into the wetland via the outlet channel.
        - A fyke net was used to capture fish residing in the shallow reaches of the wetland in connecting channels.
- Data collation, analysis, and interpretation.
- Data presentation and reporting.
- Submission of report to Department of Primary Industries.

Fishway sampling was conducted under relevant permits:

- General Fisheries Permit (GFP #262816)
- Animal Ethics Approval

In situ measurements of physical water quality parameters were taken at the commencement of each sampling event:

- Temperature (°C),
- Dissolved Oxygen (% saturation and mg/L),
- pH, and
- Electrical Conductivity (µs/cm).

Water quality sampling was completed in accordance with the following best practice guidelines:

- Monitoring and Sampling Manual 2016 (DEHP 2016)

Box Trapping

Box trapping utilised purpose-built traps (Figure 3). Traps were constructed from 10 mm round bar with shade cloth (4.0 mm mesh size) covering the frame. Shade cloth wing walls prevented fish from swimming around the trap on either side, whilst sandbags and star pickets were used to secure the trap and wing walls in place. The trap consisted of a single cone entrance, with dimensions of 1.2 m x 1.2 m x 0.8 m.

The trap was set at the outlet channel of the 'Keeley's Road Wetland' and checked multiple times per day to minimise stress, potential predation, and escape of fish from within the trap.

Figure 3. Showing box trap set-up.

Fyke Netting

A single fyke net was employed at each site consisting of a single 5m wall configuration, with 600mm hoops and 4 mm mesh (Figure 4). The cod end of each fyke net was raised and held above the water surface by a star picket. A small surface float was placed inside the fyke net to ensure any air breathing animals did not drown if they were inadvertently trapped in the net. At both sites, a single fyke net was set perpendicular to the shore to direct fish into the funnel-shaped opening. The net was anchored to the ground with a star picket. The fyke net was set in the day and left overnight, before being checked and emptied the following day.

Figure 4. Showing Fyke net set up to monitor wetland fish communities.

Fish Processing

All fish captured during a set were identified to species level, counted, and measured to the nearest millimetre (fork length of forked-tail species, total length for all other species). If large numbers of a species were captured during a single set, all individuals were counted to determine the abundance of the species with a random subset of 25 fish measured to determine the size distribution of the species. After processing, all fish were released upstream of the fishway inlet. Fish abundance data was standardised using catch per unit effort (CPUE) as fish/day.

Water Quality Parameters

Water quality parameters including temperature, pH, dissolved oxygen, and electrical conductivity were measured using a YSI – Pro Quattro multiprobe during fishway monitoring.

The water quality sampling method involved placing the probe into the water at a depth of 0.1 m. After readings had stabilised, values were recorded for each of the water quality parameters. Water quality measurements were recorded from the middle portion of the fishway. The parameters recorded included:

- pH
- Dissolved Oxygen (mg/L & % saturation)
- Electrical Conductivity (µs/cm)
- Temperature (°C)

Limitations

Several constraints influenced the implementation and comparability of the monitoring program, including:

- The Tidal Floodgate site was excluded from the post-restoration fish community assessment. Access to the Tidal Floodgate site was not possible due to inundation of the surrounding area from wet-season rainfall, preventing safe deployment of sampling equipment at this location.
- Direct replication of the preliminary monitoring program was not achieved. One of the previously assessed sites was not included in the final restoration works, and the sampling methods applied during preliminary monitoring were not fully suited to the modified hydrological and habitat conditions of the restored wetland.
- The Keeley's Road Wetland could not be sampled during the preliminary monitoring period due to the absence of surface water, and therefore fish presence at this location could not be assessed. However, fish require water, and with no water, it was highly likely there were no fish.
- Monitoring was also undertaken under different seasonal conditions compared to the preliminary assessment. Due to the project funding completion date (May 2026), post-restoration monitoring occurred during the wet season rather than the dry season (October-December 2026), limiting direct comparability of fish assemblage data between survey periods.

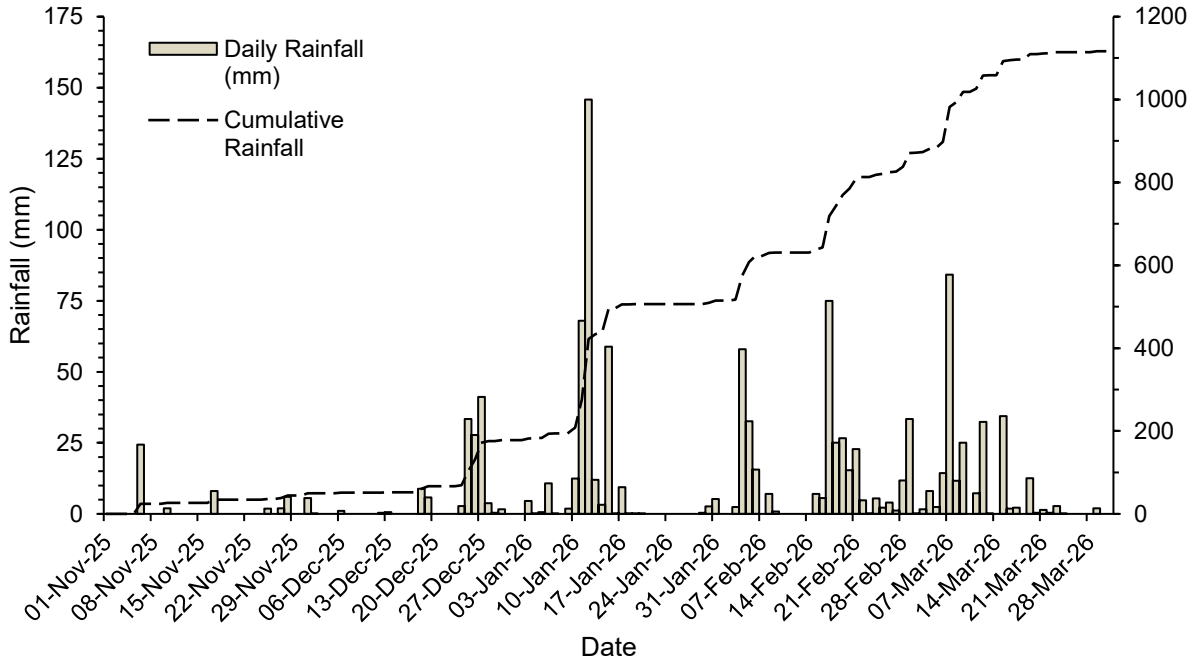

Figure 4: Daily and cumulative rainfall totals (mm) at Mackay M.o alert (#33119) from 01/11/2025 to 31/03/2026. (Source: BOM 2025)

Results

Sampling Effort

Sampling was conducted between the 16th – 20th February 2026. Set times varied between 6 and 26 hrs (Table 1). The total sampling effort was 4.18 days.

Table 1: Sampling Effort summary.

Event	Date	Trap Location	Effort (days)
Post-restoration	16/02/2026 – 20/02/2026	Keeley's Road Wetland Outlet	3.11
		Keeley's Road Wetland	1.07

Water Quality

The water quality parameters indicated the restored wetland was slightly brackish and exhibited moderate dissolved oxygen and acidic pH levels (Table 2).

Table 2: Water Quality parameters recorded at Keeley's Road Wetland.

Location	Date/Time	Temp. (°C)	D.O (mg/L)	D.O (%)	E.C (µS/cm)	pH
Keeley's Road Wetland Outlet	18/02/2026 10:00	28.5	4.5	58.9	5500	5.20
Keeley's Road Wetland	18/02/2026 10:10	29.1	3.74	50.1	6026	4.06

Fish Species Diversity and Abundance

Overall, a total of five fish species were recorded during fish community sampling at Keeley's Road Wetland, comprising two diadromous, two potamodromous, and one invasive species. A total of 1,098 individuals were captured at a rate of 262.68 CPUE (fish/day). The assemblage was strongly dominated by empire gudgeon, followed by barramundi, which accounted for 96.7% and 2.1% of the total catch, respectively.

At the Keeley's Road Wetland Outlet site, four fish species were recorded moving upstream into the wetland. Empire gudgeon were the most abundant species, followed by barramundi, which were recorded at catch rates of 341.48 and 3.54 CPUE (fish/day), and represented 98.1% and 1.0% of the catch, respectively.

At the Keeley's Road Wetland site, two fish species were recorded, comprising 15 individuals. Barramundi were the most abundant species, followed by tilapia (pest), which were recorded at catch rates of 11.21 and 2.80 (fish/day), and represented 80.0% and 20.0% of the catch, respectively.

Table 3: Fish species richness and abundances recorded at Keeley's Road Wetland site. Abundances were standardised as Catch per unit of effort (CPUE) as fish per day.

		Trap location	Keeley's Road Wetland Outlet		Keeley's Road Wetland	
		Sampling effort (day)	3.11		1.07	
Migratory Status	Species	Common name	(n)	CPUE (fish/day)	(n)	CPUE (fish/day)
Diadromous (2)	*Hypseleotris compressa*	Empire gudgeon	1062	341.48		
	Lates Calcarifer	Barramundi	11	3.54	12	11.21
Potamodromous (2)	*Hypseleotris species 1*	Midgley's carp gudgeon	9	2.89		
	Melanotaenia splendida splendida	Eastern rainbowfish	1	0.32		
Pest (1)	*Oreochromis mossambicus*	Tilapia			3	2.80
		Trap location total	**1083**	**348.23**	**15**	**14.02**
		Species Richness	**5**			
		Total Abundance	**1098**			
		Total CPUE (fish/day)	**262.68**			

Fish Fork Lengths

Fish fork lengths ranged from 14 – 186 mm at Keeley's Road Wetland. Barramundi represented the largest individuals, with a maximum fork length of 186 mm and a median of 154 mm. Empire gudgeon represented the smallest individuals with a median fork length of 20.5 mm.

Table 4: Fork lengths of fish captured during trapping operations at Keeley's Road Wetland site. Sizes recorded in millimetres (mm).

			Fish Length (mm)		
Migratory Status	Species	Common name	Min	Med.	Max
Diadromous (2)	*Hypseleotris compressa*	Empire gudgeon	14	20.5	53
	Lates Calcarifer	Barramundi	74	154	186
Potamodromous (2)	*Hypseleotris species 1*	Midgley's carp gudgeon	21	25	32
	Melanotaenia splendida splendida	Eastern rainbowfish	47	47	47
Pest (1)	*Oreochromis mossambicus*	Tilapia	100	110	130
		Grand Total	**14**	**30.5**	**186**

A length frequency plot was generated for empire gudgeon (Figure 5) and barramundi (Figure 6). Barramundi and empire gudgeon fork lengths most frequently ranged from 150 - 160 mm (43.5 %) and 15 – 20 mm (40.5%), respectively.

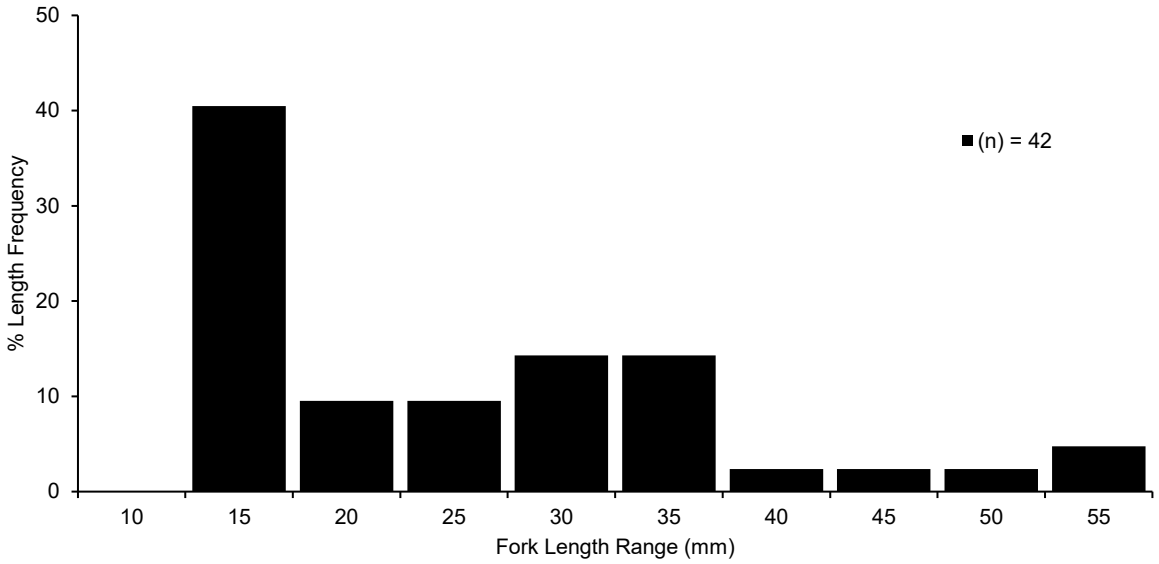

Figure 5: Percent length frequency plot for empire gudgeon (*H.compressa*) recorded at Keeley's Road Wetland.

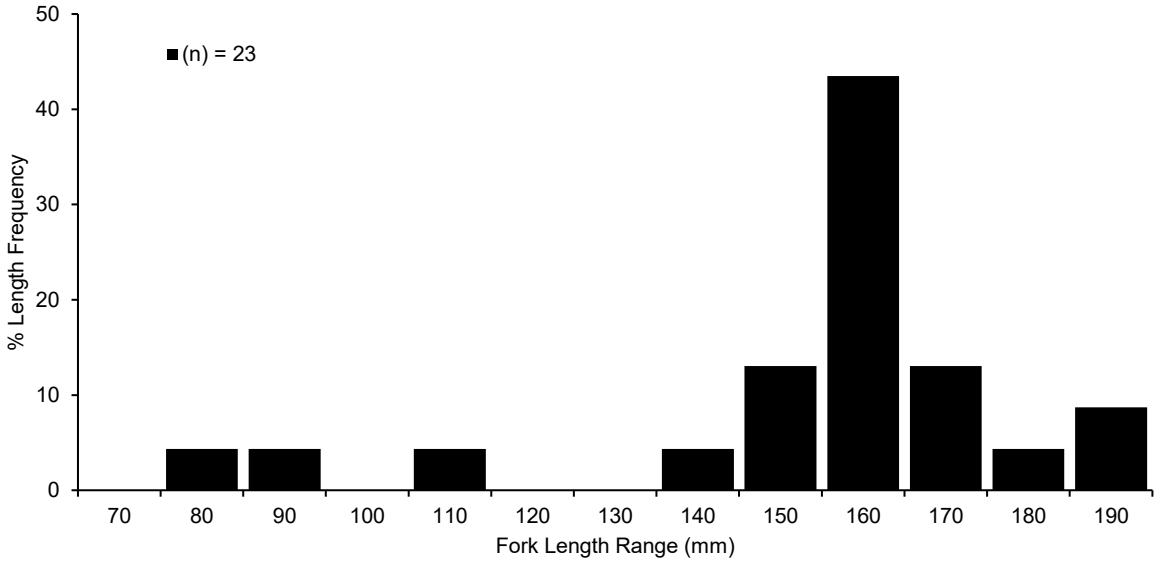

Figure 6: Percent length frequency for barramundi (*L. calcarifer*) recorded at Keeley's Road Wetland.

Discussion

The post-restoration fish community assessment at Wetland Walkabout indicates that Keeley's Road Wetland provides habitat that supports native fish species. The sampling was conducted in the middle of the central and northern Queensland wet season. This generally coincides with peak migration periods of native fish species, and the flow pulses during sampling provided ideal conditions to trigger upstream movements. Despite this, the species richness (five) and overall abundance (CPUE 262.68 fish/day) were low. The assessment was undertaken less than two months (54 days) following completion of the restoration works. Given this short establishment period, these results are not unexpected and suggest an early stage of ecosystem development. Further increases in fish diversity and abundance are likely as the system continues to establish.

Barramundi were recorded entering Keeley's Road Wetland and residing in the wetland. Barramundi are a diadromous species that migrate between marine and freshwater environments during their life-cycle, with adults moving downstream between November and February to spawn in the lower reaches of river and creek systems. Young or juvenile barramundi typically migrate upstream to freshwater or low-salinity habitats, such as wetlands, during their first wet-season at around 3-6 months of age (Munpholsri et al 2025). Wet-season flows provide floodplain connectivity and act as environmental cues that facilitate the upstream movement during early life stages (Munpholsri et al 2025). Wetlands provide important nursery habitat for juvenile barramundi, supporting high productivity and offering refuge from predation. Not all individuals adopt this life-history strategy, but those that enter freshwater habitats often exhibit faster growth rates and earlier maturation than individuals remaining in marine environments (Munpholsri et al 2025). The size ranges of barramundi recorded during the assessment are consistent with young-of-the-year or early juvenile barramundi. This indicates that the restored wetland is being utilised by early life stages and suggests active recruitment and use of the wetland as nursery or growth habitat following restoration.

Figure 7. Showing juvenile barramundi recorded in restored wetlands (left & bottom right), and juvenile empire gudgeon recorded migrating into wetlands (top right)

Aquatic flora at Keeley's Road Wetland is establishing following restoration. Macrophytes, including reeds and sedges, have densely colonised the shallow margins and edges of the wetland, while other native species were observed in deeper areas.

Hymenachne amplexicaulis (Hymenachne) is listed as a Category 3 restricted invasive plant under the '*Biosecurity Act 2014*' and is a major contributor to wetland degradation in the Mackay region (e.g. Tedlands, Sandringham, and Marklands wetlands). It degrades wetland systems by outcompeting native macrophytes and reducing dissolved oxygen levels through limited water movement and increased microbial activity during decomposition. Hymenachne was not observed at Keeley's Road Wetland during the assessment. Its continued absence is likely to be supported by reinstated tidal influence, with saline intrusion occurring during tides approaching or exceeding (Mean High Waster Spring) MHWS levels. As Hymenachne is intolerant of brackish and saline environments, its absence is expected to continue. (Wearne et al 2010).

Figure 8. Top and bottom; Showing restored wetland with hardwood habitat logs

Comparisons between post-restoration and preliminary fish community assessment data could not be reliably made. Differences in assessment sites and seasonal conditions (dry season versus wet season) limited safe access to key locations (i.e., Timber Footbridge and Tidal Floodgate) and reduced the ability to replicate previously applied sampling techniques. The open and deep refugia within the restored wetland were deemed unsafe for seine netting and cast netting, meaning fyke netting was the only sampling technique consistent with the

preliminary monitoring. As the Keeley's Road Wetland was not surveyed during the preliminary assessment, direct pre- and post-restoration results are not possible.

It is unlikely that the methods applied during this assessment were fully representative of the entire fish community in Keeley's Road Wetland. Sampling was largely limited to shallow habitats near the wetland margins and outlet channel. In contrast, deeper open-water areas were not effectively sampled. Electrofishing would typically be the preferred method for surveying these habitats, as it allows more comprehensive coverage of the wetland. However, following reinstatement of tidal connectivity, electrical conductivity levels at the site are likely too high for electrofishing to be effective. Despite this limitation, electrofishing may be suitable for future monitoring under certain conditions. For example, following significant rainfall events, freshwater inflows may reduce conductivity levels sufficiently to allow its application.

Conclusion

The post-restoration fish community assessment indicates that Keeley's Road Wetland is functioning as habitat for native fish species and is providing connectivity between the wetland and downstream estuarine environments. The high number of juvenile barramundi (Figure 9) recruits recorded migrating into the restored wetlands indicates that these habitats are functioning effectively as nursery areas for this iconic predatory species. Although overall species richness remained relatively low during the assessment, monitoring was undertaken only 54 days after completion of the restoration works, indicating that the wetland is still in an early stage of ecological establishment. It is anticipated that fish species diversity and abundance will increase over time as habitat conditions improve and ecological processes continue to develop.

Figure 9. Showing landholder Chris Rek (right) and RCL Senior Project Officer Carlo Bueno (Left) holding a juvenile barramundi recruit recorded migrating into the newly restored wetland habitats.

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