

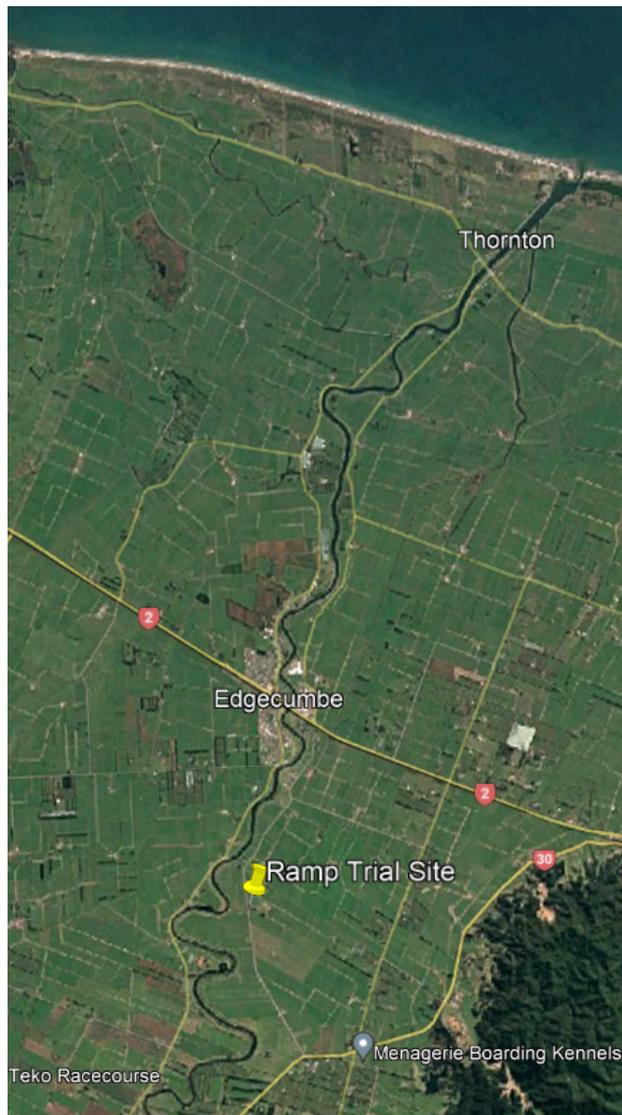
Client Report No 12072101

Client: Meika Kapa - Bay of Plenty Regional Council

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Project: Effectiveness of floating ramp fitted with mussel-rope for facilitating fish access into a perched culvert.

Location: See map 1



Map 1

Elevation: 2M

Distance from Ocean: 12.5km

Overview: As part of a region-wide fish passage remediation program, many structures in waterways have been remediated using various solutions including floating ramps. Depending on the gradient of a ramp and the flow rate over it, the effectiveness for weak native fish species is not well known.

Scope:

What was the problem?

The Rangitaiki River is the primary waterway of the Rangitaiki Plains, situated within the Bay of Plenty Region.

This is a private culvert on a tributary of the lower Rangitaiki River. The culvert is located approximately 12 km from the coast, with a diameter of 800mm, and is perched by 800mm with an undercut of 480mm. The culvert was identified as likely causing a barrier to fish migration. (Figure 1.).



Figure 1 - Outlet (December 2019)

Flow exited the culvert into a deep plunge-pool, presenting with significant scouring of the bed material.

The culvert barrel had no bed material, indicating that it was possibly a velocity barrier.

Pre-remediation surveys identified the presence of short-fin eel (*Anguilla australis*), common bully (*Gobiomorphus cotidianus*), and inanga (*Galaxias maculatus*) down-stream of the culvert, however no fish were captured upstream of the culvert.

We aimed to improve upstream passage for all fish species, especially inanga, bully, and eels that were only recorded downstream.

Transition of migrating species into the culvert by addressing the perch was the primary goal.

Fish passage remediation

A 2.4-meter floating ramp (ATS-Environmental) at approximately 30° gradient at time of installation.

The ramp was attached to the culvert with a flexible rubber coupling.

The ramp has a 15° “V” and a smooth surface i.e. not Miradrain® dimples as featured in the NZ Fish Passage Guidelines.

8 lengths of mussel-rope were fitted down the ramp in 2 bundles of 4 strands instead of using Miradrain®.

The mussel-rope passes over a 100mm high flexible v-baffle with 45° cut ends, fitted 300mm up from the outlet of the culvert (Figure 2).

Note: 4 x 100mm, x 600mm flexible baffles were fitted into the culvert to improve fish passage. These were important to increase depth and to create complex flows with low velocity zones but are beyond the scope of this particular study.



Figure 2 - Outlet (March 2020)

The rationale for this remediation was to:

1. Reduce velocity and gradient at outlet of culvert barrel, and provide connectivity between the culvert outlet and the plunge-pool.
2. The floating ramp would adjust to the changing level of the plunge-pool.
3. To provide fish a range of passage options including a suitable wetted margin at low flows with the rope providing suitable climbing substrate while disrupting laminar flow.
4. Use proven flexible baffle baffles to create a rest-pool, after ascending the ramp, and assist transition through the culvert.
5. The rope provides a foundation for natural establishment of aquatic vegetation.
6. To test a variation to the floating fish ramp design tested by Fake (2018) and LL011 but without the small, raised cusps (Miradrain®), to see if ramps with rope without these cusps still provide improvements in fish passage particularly for non-climbers, but at a reduced cost.

Methodology

A trapping survey was completed before (3 December 2019) and after (10 December 2019) the remediation was installed.

Due to limited accessible reach and cross-section depth, the fishing method selected was:

Five un-baited Gee-Minnow traps were set at 5m intervals upstream.

Five un-baited Gee-Minnow traps were set at 5m intervals downstream of the culvert.

Traps set at dusk and retrieved the following morning.

Results

Survey results are presented as Capture per Unit of Fishing Effort (CPUE) above and below the barrier before and after remediation.

Pre-remediation survey found a total of 12 fish downstream of the barrier (8 inanga, 1 short-fin eel, 3 common bully), with no fish captured upstream of the culvert (Table 1.).

After remediation, a total of 4 fish (1 common bully, 3 inanga) were captured downstream, while 125 fish were captured upstream of the culvert (3 common bully, 1 short-fin eel, 121 inanga) (Figure 3.).



Figure 3 - Fish captured upstream - December 10th 2019

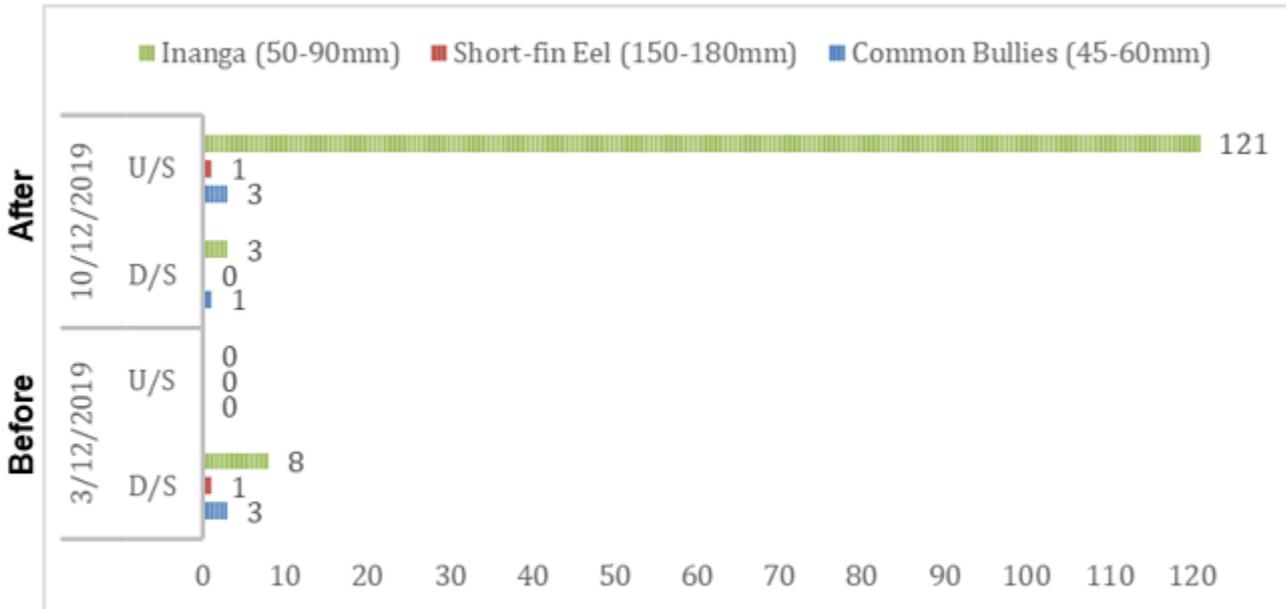


Table 1 - Data results

Table 1: Results of Gee-minnow surveys before (3 Dec 2019) and after (10 Dec 2019) remediation was installed.

The high numbers of inanga captured upstream of the culvert suggests the ramp worked well for this species. Too few common bullies were captured to determine if the ramp was effective for this species. As Gee Minnow traps do not target eels, no information on passage was gained for shortfin eels.

Discussion

1. Floating ramp with only mussel-rope only (no Miradrain®), improved upstream passage into an overhanging culvert for species and ages of fish captured downstream.
2. The ramp appeared to have reduced scour at the outlet, resulting in a redeposition of bed-material thereby reducing the gradient of the ramp.
3. To date, there have been no reports of blockages within the culvert as a result of the installation and no maintenance of the ramp has been required.
4. Fish migration by way of the remediation appears to occur quickly - surveys nightly may have proved an interesting insight into the timeframe and extent of species utilising the ramp.
5. The waterway characteristics limited the survey area.

References: Fake, D. 2021: Lesson Learnt 011 – Floating fish ramp provides passage for inanga on Irongate Stream. Prepared for NZ Fish Passage Action Group.

<https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/fish/fish-passage/lessons-learnt-case-studies/lessons-learnt-011-floating-ramps-irongate-stream.pdf>

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