Lessons Learnt 007

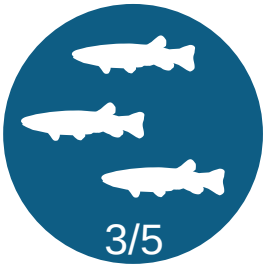
February 2020 V 2

Retrofitting weirs to create fish ramps in Gibbons Creek, Hamilton

This case study forms part of a series that provides key information and guidance about how to potentially improve a fish passage barrier in a New Zealand waterway.

While providing fish passage is advantageous to most fish, removing or remediating a barrier can also affect fish populations by introducing invasive species to new areas.

STRUCTURE TYPE



IMPROVEMENT RATING*

What was the problem?

Gibbons Creek is a catchment in central Hamilton that joins the Waikato River through Memorial and Parana Parks. Three rock weirs and one timber weir have reduced upstream fish passage (Figure 1) for the two weak swimming species, inanga (*Galaxias maculatus*) and common smelt (*Retropinna retropinna*).

Prior to installing these fish passes, we found only five native fish species were present in Gibbons Creek: tuna (shortfin eels (*Anguilla australis*), and longfin eels (*Anguilla dieffenbachii*)), banded kōkopu (*Galaxias fasciatus*), giant kōkopu (*Galaxias argenteus*) and common bullies (*Gobiomorphus cotidianus).* We also found the exotic fish species gambusia (*Gambusia affinis*) and catfish (*Ameiurus nebulosus*) prior to the installation.

What was the solution?

A collaborative project between NIWA, NZ Landcare Trust, Waikato Regional Council, Hamilton City Council, Waikato Raupatu River Trust, Waikato River Authority and Ngati Wairere aimed to enhance native biodiversity and maximise the number of species that will inhabit Gibbons Creek. The site was chosen as a demonstration site as its public park location meant that fish passage, the problem and the solutions could be demonstrated.

In 2016, we built concrete rock ramps on the true left side at the downstream face of three weirs (Figure 2) and physically removed the fourth (timber) weir. Ramps were built by laying rocks on geotextile and securing smaller rocks in place using rapid-set concrete to create a continuous wetted path for fish.

Although an overview of the design (V shaped rock channel with resting pools every 0.5 m) was created prior to the install, the detailed design of each ramp was determined on-site based on the size of rock that could be carried / transported to each location.

Following best-practice guidelines to ensure discharges from cement did not enter the stream, sandbags were used to divert the stream water along the unimpacted stream margin. The stream was diverted for 24-48 h to enable the cement to cure.

Boulders and logs were installed to protect banks from erosion, enhancing instream habitat.

* Improvement rating: 3/5 – Some improvement in upstream and downstream passage and for target species/life stages.

Figure 1: One of four weirs on Gibbons Creek that impeded passage for weak swimming fish, December 2015. *Photo: NIWA*

Figure 2: After installation of a concrete rock ramp to provide passage for swimming fish species, March 2016. *Photo: NIWA*

Monitoring results

We undertook single-pass electrofishing in two 75 m reaches before (Feb 2016), immediately after installation of the fish ramps (Mar 2016) and again a year after (Feb 2017) works were complete. Reach one was above the second weir with reach two upstream of the all three weirs.

Monitoring showed that installation of the fish ramps at the first three weirs and removal of the fourth weir allowed more fish species to access Gibbons Creek, including inanga and smelt for the first time (Figure 3). However, inanga and smelt were not recorded above the third retrofitted weir in March 2016 or February 2017.

Although higher numbers of exotic fish were also found above the weirs, including gambusia, catfish & goldfish, these species were already present further upstream and likely to have recruited from the headwater lakes. Despite this, the density and diversity of native fish has improved indicating that the ramps are beneficial overall to native fish passage.

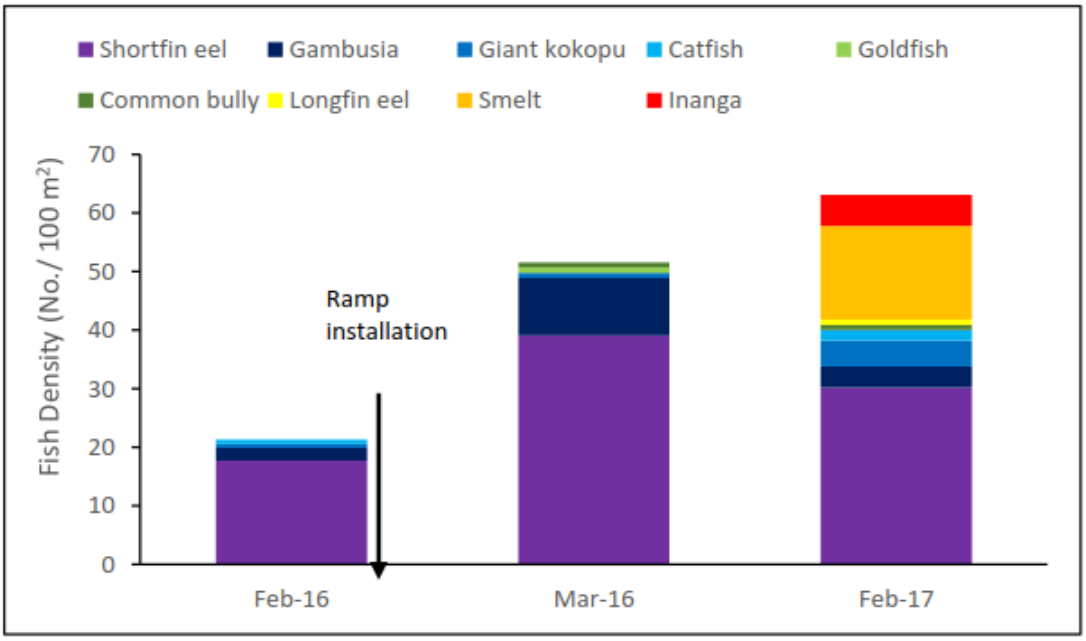


Figure 3: Standardised single pass electrofishing results of fish communities before and after installation of the fish ramps in Gibbons Creek. The survey reach is located upstream of the second retrofitted weir.

Did it work?

Yes, smelt and inanga successfully migrated upstream over the first two fish ramps within a year of installation. These species had not been found above the third fish ramp in monitoring completed up to February 2018, which suggests this ramp may still be a partial barrier to these weaker swimming fish.

Juvenile giant kokopu have been found above the three remaining modified weirs, showing that the changes are successful for both swimming and climbing native fish species.

Lessons learnt

1. Without monitoring we would not know which ramps were successful at improving fish passage.

2. Further modifications to weir three may be required to enable weak swimming fish species to pass upstream. This site has a naturally steeper gradient and at low flows the channel we created around the weir isn't always flowing. In these conditions, fish are still required to surmount the top section of the weir. Reducing the level of the channel entrance should remedy this issue.

3. Inexpensive concrete rock-ramps can mitigate low head / small migration barriers.

4. This project demonstrates small weir remediation is valuable. As this is in a public park this site raises awareness and educates the community about fish passage restoration work for native fish.

For further information

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This is a revised/updated version, original was published in April 2018.