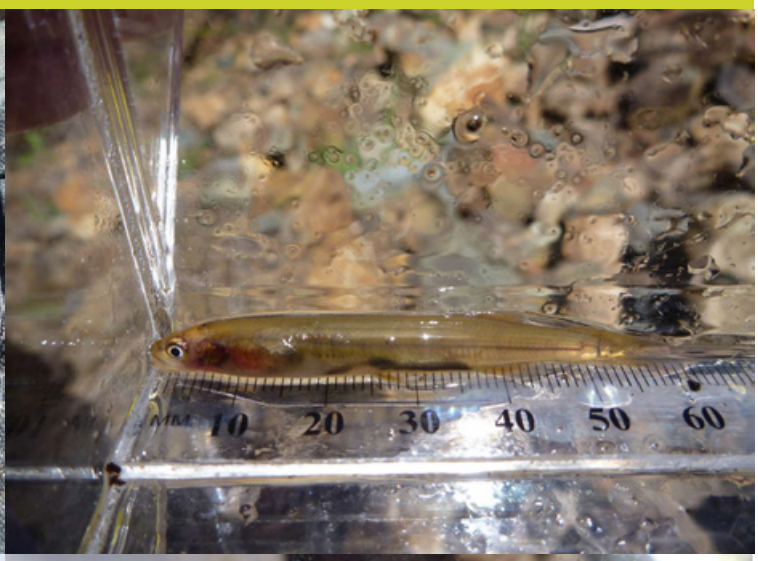
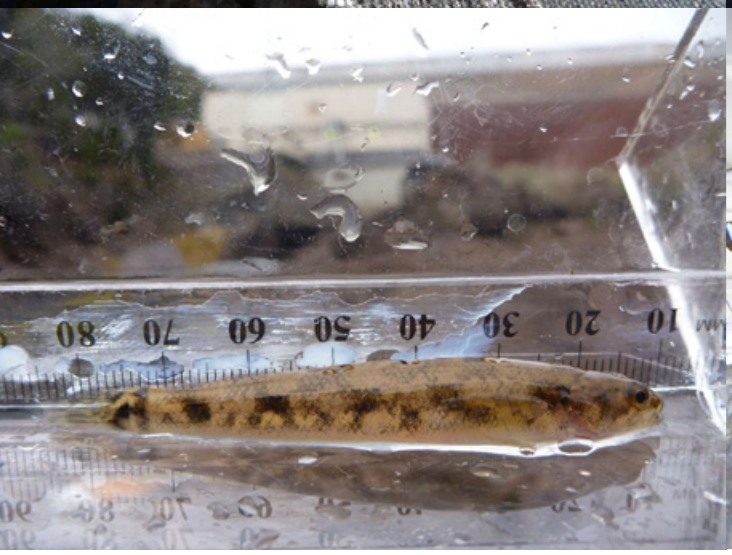
Mersey-Forth Water Management Review

TECHNICAL AND SOCIAL STUDY 2013





Fish Migration in the Mersey-Forth catchments

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Executive Summary

This Mersey-Forth Water Management Review technical study investigated options to facilitate fish migration and dispersal of native fish species throughout the Mersey-Forth catchments.

An investigation into fish migration issues, the identification of native fish accumulation points and an assessment of potential methods for facilitating fish passage was conducted at three sites in the Mersey-Forth catchments:

- Paloona Dam on the Forth River;
- Wilmot Dam on the Wilmot River; and
- Parangana Dam on the Mersey River.

From the sites assessed, the most suitable location for a fish capture system is at Paloona Dam. Wilmot Dam was not deemed suitable due to the distance of the site from tidal waters and the inconsistent flows immediately downstream of Wilmot Dam which would impact on the ability of some native fish species to access a fish trap/ladder system. At Parangana Dam, the distance from the sea and estuary, and the influence of downstream tributaries may make these upper river reaches less attractive to native migratory fish. A second fish capture trial will be conducted to confirm the feasibility of facilitating fish migration at Paloona Dam as low flows during the fish trial in November 2012 resulted in low numbers of fish being caught.

Acknowledgements

Contributions to producing this report were received from the following people:

All stakeholders who took the time to complete the survey and talk with Hydro Tasmania.

David Ikedife and Tim Shepherd (Entura) undertook the field investigations.

Kevin Macfarlane and Ray Brereton (Entura) carried out the fish trials.

Graeme Fleming (Hydro Tasmania) evaluated operational feasibility of potential fish migrations sites.

Technical and Operations group (Hydro Tasmania) for operational information.

Cover photographs: Fish species caught at the base of Paloona Dam. Clockwise from top left: *Geotria australis* (pouched lamprey); *Galaxias maculatus* (common galaxias); *Pseudaphritis urvillii* (Sandy) and *Galaxias brevipinnis* (climbing galaxias)

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1. Introduction

The aim of the study was to investigate options to facilitate fish migration and dispersal of native fish species throughout the Mersey-Forth catchments.

The objectives of the study were to:

- Assess the extent and location of accumulations of migrating fish in the Wilmot River downstream of Wilmot Dam; the Forth River downstream of Paloona Dam, and the Mersey River downstream of Parangana Dam; and
- Evaluate the potential to develop effective options to facilitate fish passage at Wilmot, Paloona and Parangana Dams, if considered appropriate.

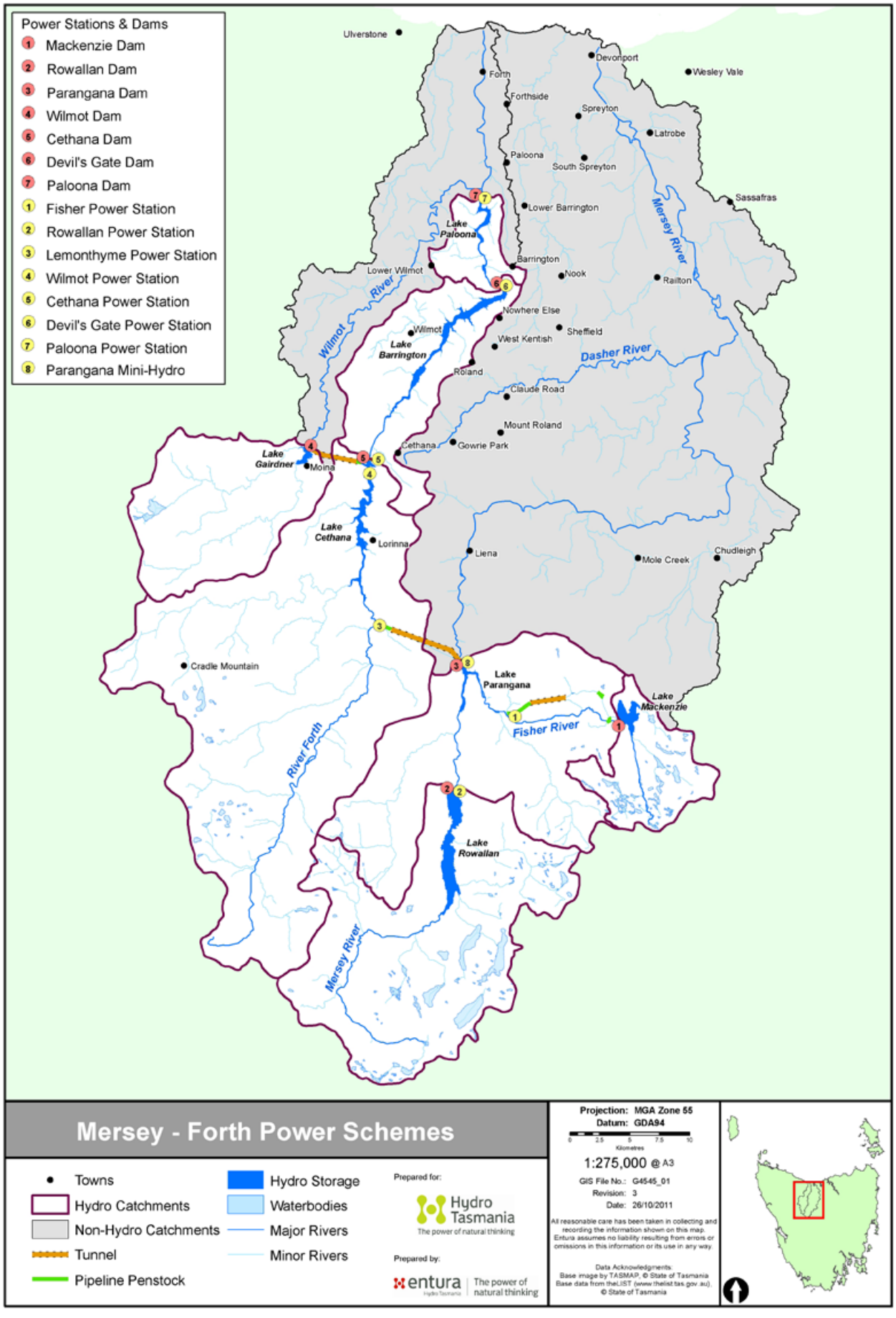
2. Background

Hydro Tasmania initiated a review of its operations in the Mersey and Forth River catchments in 2011 (Hydro Tasmania, 2011). In the stakeholder consultation stage of the Mersey-Forth Water Management Review it was identified that fish migration is a significant issue of concern in the Mersey-Forth catchments (Hydro Tasmania, 2012). The outcomes of the technical study to address fish migration in the Mersey-Forth catchments are reported on in this document.

There are currently no mechanisms in place that allow native fish migrating up the Forth, Wilmot and Mersey rivers to progress beyond the Paloona, Wilmot and Parangana Dam walls (Map 2.1). Freshwater native fish species (adults and juveniles) that are known to occur in the catchments include:

- *Anguilla australis* (Short-finned eels)*
- *Galaxias brevipinnis* (Climbing Galaxias)*
- *Galaxias truttaceus* (Spotted Galaxias) *
- *Lovettia sealii* (Tasmanian whitebait) *
- *Mordacia mordax* (Short-headed Lamprey)*
- *Geotria australis* (Pouched Lamprey)*
- *Galaxias maculatus* (Common Galaxias)*
- *Pseudaphritis urvilli* (Sandy)
- *Neochanna cleaveri* (Tasmanian Mudfish)
- *Prototroctes maraena* (Australian Grayling)

Species marked with an asterisk are known to accumulate, or are likely to accumulate, at the base of the dams during the spring/summer migration period.



Map 2.1: Map of the Mersey-Forth Power Scheme

3. Process

3.1 Field trip and fishing trials

A field trip was conducted in June 2012 to identify native fish accumulation points and investigate potential methods for facilitating fish passage at Paloona Dam and Wilmot Dam. The Forth River weir downstream of Paloona Dam which once acted as a barrier/bottle neck point for native fish was also assessed. The weir has been modified and now allows upstream migration of fish up to Paloona Dam (Inland Fisheries Service, 2011). Parangana Dam was assessed in November 2012.

Following the field trip in June 2012, fishing trials were subsequently carried out in November 2012 below Paloona Dam on the Forth River and Parangana Dam on the Mersey River. However, a fishing trial was not held at Wilmot Dam as the combination of low flow immediately downstream of Wilmot Dam, and the distance from tidal waters suggests that this site may not be suited for installation of a fish trap/ladder system (manual or automated).

The chosen method of fish capture for each fish trial was the use of fine meshed passively fished fyke nets designed to guide and capture foraging/migrating fish. The target and preferred location for setting these nets was as close to the vicinity of the base of the dam walls as possible, to capture and sample potential accumulations of migratory fish. The fyke nets at both river sites were checked each day with the catch removed, identified, measured and released.

3.2 Stakeholder engagement

Key stakeholders were identified from the 2011 Mersey-Forth Water Management Review stakeholder survey as potential sources of additional information on migratory fish accumulation sites within the Mersey-Forth catchments. Stakeholders included the Inland Fisheries Service, members of Anglers Alliance and local fishing groups. In October 2012, sixteen stakeholders were sent a survey (Appendix A) via email. Only one response was received. The comments from this survey suggested the following: Galaxiid species can be seen at Paloona Dam and in the Wilmot River from the end of October to January. Whitebait tend to stay in the lower reaches of the Forth River with few reaching Paloona Dam. From November to January other native species will start to migrate. In some years a large number of species were stranded at the base of Paloona Dam when only a small amount of water is discharged from the power station or when the power station is shut down.

Discussions were also held with the Technical & Operations group at Hydro Tasmania. The station operator at Paloona had observed numerous cormorants in the area recently with one observed to be feeding on an eel. He also perceived the area to be a popular spot for anglers and white baiters.

4. Outcomes

4.1 Fish passage facilitation options at Paloona Dam, Forth River

4.1.1 Preliminary site survey

A potential site for installing a manual, native fish catch system was identified on the downstream side of Paloona Dam (Photograph 4.1). Existing infrastructure, power and water supply, and vehicle access may support the installation of a fish ladder and trap providing it does not interfere with power station operations. The captured fish would then have to be manually transferred upstream in the catchment.

The height (43 m), gradient and lack of access infrastructure on the crest of Paloona Dam (Photograph 4.1), makes the establishment of a staged, external fish ladder that allows direct movement of fish from the Forth River into Lake Paloona unfeasible. The application of this method at sites of similar physical design and size has been expensive and has not always proven to be effective. A fish lift suitable for this site would also be prohibitively expensive.

Photograph 4.1: Upstream view of Paloona Dam with power station in centre of photo (under full discharge). The riparian valve can be seen on the right-hand corner of the station. Diversion tunnel and spillway can be seen in right of photo. The red arrow shows a potential site for installation of a manual native fish trap/ladder system downstream of Paloona Dam.

4.1.2 Fish trial

The Forth River was fished immediately downstream of Paloona Dam. Only 0.71 cumecs, which is required for urban water use, was being released from the riparian valve during the fishing period which took place over two days and two nights. The day before the survey, a recreational flow of approximately 25 cumecs was released for canoeing purposes.

A total of five fyke nets were set below the dam on the first day with an additional net added on the second day. A further three nets were set further downstream along the edge of the slow flowing tailrace (Photograph 4.2).

Photograph 4.2: Paloona Power Station tailrace and riparian valve pool/channel showing fyke net sites (highlighted in yellow)

4.1.3 Results

A total of 38 fish comprising four species were captured below the Paloona Dam over the two days and nights fished (Table 4.1). All captured fish were native species that migrate between sea and freshwater. The catch composed mainly of adult migratory pouched lamprey returning from the sea to spawn in freshwater, and upstream migrating juvenile galaxiids that had undergone their early marine/estuarine life stage. Fish captured were translocated into Lake Paloona in accordance with guidance given by the Inland Fisheries Service.

Table 4.1: Total number and length of species caught in the Forth River below Paloona Dam

Species	Fork Length (mm)	Total
Geotria australis (pouched lamprey)	600, 550, 550, 550, 550, 550, 550, 550, 580, 600, 430, 550	12
Galaxias brevipinnis (climbing galaxias)	45, 46, 43, 45, 43, 43, 45, 44, 47, 44, 45	11
Galaxias maculatus (jollytail)	59, 59, 59, 53, 57, 64, 61, 61, 55, 56, 57, 55, 56, 59	14
Pseudaphritis urvillii (sandy)	73	1

4.2 Fish passage facilitation options at Wilmot Dam, Wilmot River

4.2.1 Preliminary site survey

nder current hydropower operating conditions there are no downstream releases from the Wilmot Dam (Photograph 4.3). Two small tributaries enter the Wilmot River approximately 400 m downstream of the dam and provide varying natural inflows depending on rainfall. In the river reach, between the tributaries and the dam wall, flow is only experienced under spill conditions or high rainfall events.

Photograph 4.3: Wilmot Dam showing spillway and diversion tunnel to right of photograph

There are a number of conditions that currently preclude Wilmot Dam as a potential fish migration option. The distance of the site from tidal waters, approximately 50 km, and the inconsistent flows immediately downstream of Wilmot Dam would impact on the ability of some native fish species (e.g. *G. truttaceus*) to access a fish trap/ladder system installed at the foot of the Wilmot Dam. For these reasons, no fishing trials were conducted in the Wilmot River.

An investigation was undertaken to assess the feasibility of establishing a downstream flow in the Wilmot River as part of the Mersey-Forth Water Management Review process. With limited environmental or social benefit, and costs associated with operational requirements and the loss in electricity generation, it was concluded that a downstream flow in the Wilmot River will not be pursued. In addition, an investigation into acid drainage immediately downstream of Wilmot Dam was investigated as part of the Review. Findings from the investigation suggest that acid drainage at the toe of the dam is not considered to pose a significant threat to the environment and is considered low risk to migratory fish as the volumes are low and rapidly diluted in the Wilmot River. It is however likely that low dissolved oxygen levels rather than acidic water would pose a greater risk to fish.

4.3 Fish passage facilitation options at Parangana Dam, Mersey River

4.3.1 Preliminary site survey

During the fishing effort on the Mersey River, additional work was undertaken in the form of a site assessment to determine whether or not there is potential to develop some form of fish capture device in the vicinity of the dam's tailrace.

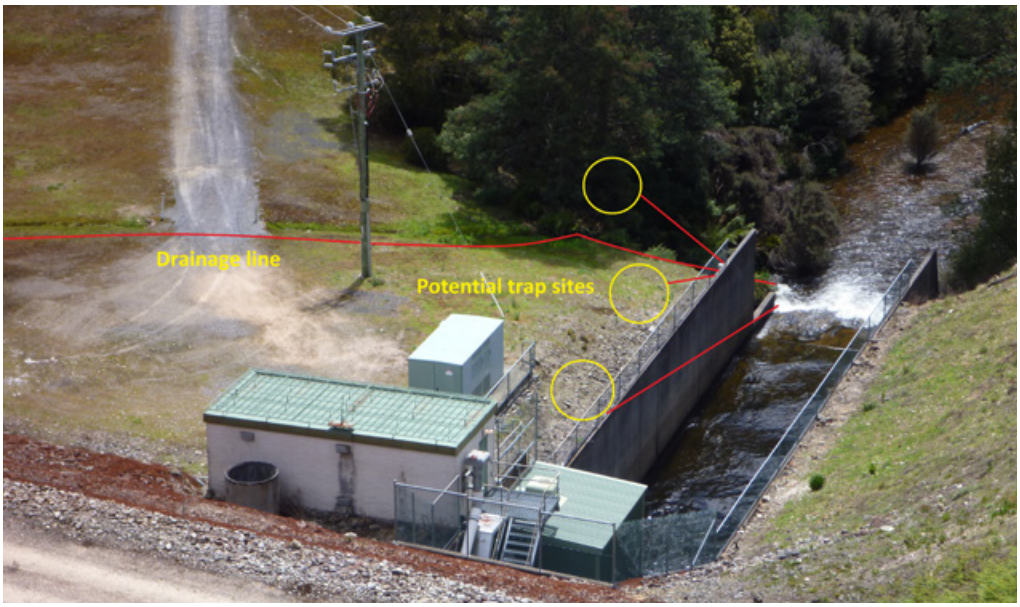
The Parangana Dam wall is a sizeable structure that since its construction has presented an unpassable barrier to migratory fish. To be feasible, the method of translocating these fish into Lake Parangana would depend on the ability to capture the fish in large numbers. Current methods employed at other dams within Tasmania use fish traps that direct fish along an entry ramp before being captured. A reliable water source is required if this method is to succeed. The site investigation revealed limited gravity fed water source options for a fish trap. There was however one water source below the dam wall which was discharging from a diversion pipe (Photograph 4.4 and Photograph 4.5). The water was found to be leakage from the dam and tunnel and although it is fairly constant, it can dry up for extended periods. The flow has reasonable velocity at its source but is limited in volume. It also appears that some volume is lost from an earthen drainage line as it approaches the final v-notch weir adjacent to the tailrace (Photograph 4.6). Should the water source be of future interest, a sealed pipeline may be required to carry the water and avoid leakage en-route to any proposed trap. Another method of bringing water to a useful location may require the use of a syphon from the top of the dam to a site suitable for a fish trap, likely to be adjacent to the concrete tailrace. A power source is located close to the tailrace and consequently, an electric water pump may also be an additional option. However, prior to any such consideration, evidence of significant native fish migration as far upstream as Parangana dam will be required.

The dam wall and mini-hydro systems are located behind a locked boom gate. Their proximity to the road and current public access within the area may cause some concern, although from observations on the day, no vandalism was obvious in the relatively remote location. Fencing may be an option if a trap were to be installed. Potential future trap sites are shown in Photograph 4.7, Photograph 4.8 and Photograph 4.9.

Photograph 4.4: View of the diversion channel and V-notch weir at Parangana Dam

Photograph 4.5: View from the top of Parangana Dam wall looking down to the tailrace, diversion pipe and channel and V-notch weir

Photograph 4.6: View from the top of Parangana Dam wall looking down to the tailrace



Photograph 4.7: Potential future trap sites indicated by yellow circles

Photograph 4.8: Lower V-notch weir where leakage water enters the Mersey River via the tailrace

Photograph 4.9: Upstream view of Parangana Dam tailrace showing potential traps sites

4.3.2 Fish trial

The tailrace of the mini hydro power station discharges at the foot of Parangana Dam and forms a fast flowing narrow and relatively shallow reach of water that provides an environmental flow to the middle Mersey River (Photograph 4.10). During the sampling period the water exiting the power station appeared to be of good quality with abundant macrophyte habitat in the deeper channel and gravel habitat dominating the shallower areas. Two shallow fyke nets were set in this locality, the fast flow preventing deeper fishing. Additional net sets directly below the concrete tailrace.

As a consequence of the high flow velocity near the tailrace another nearby fishing site was sought and located downstream. Approximately 170 metres downstream of the concrete tailrace section a large remnant river pool exists within the natural Mersey River. The slower velocity within the pool provided adequate sites to deploy a further four fyke nets over rocky substrate (Photograph 4.11 and Photograph 4.12). These nets, along with those further upstream, were fished for two consecutive days and nights with limited success.

Photograph 4.10: Upstream view of Parangana Dam tailrace releasing an environmental flow through the mini-hydro power station. One of the two fyke nets set in the immediate locality can be seen in the centre of the photograph

Photograph 4.11: Upstream view of fished pool on the Mersey River, approximately 170 m downstream of the Parangana Dam tailrace

Photograph 4.12: Downstream view of fished pool on the Mersey River, approximately 170 m downstream of the Parangana Dam

4.3.3 Results

Catches from the Mersey River were low with no native species captured. Over the fishing period only nine introduced brown trout fry (*Salmo trutta*) were captured, ranging in fork length between 20 mm and 28 mm (Table 4.2).

Table 4.2: Total number and length of species caught in the Mersey River below Parangana Dam

Species	Fork Length (mm)	Total
Salmo trutta (brown trout)	24, 24, 20, 25, 28, 24, 25, 26, 26	9

5. Summary of Study Outcomes

Field trips were initially conducted to assess Paloona, Wilmot and Parangana Dams as potential locations where fish passage could be facilitated. Findings from the site surveys suggest that there are a number of conditions that currently preclude Wilmot Dam; the distance of the site from tidal waters and the inconsistent flows immediately downstream of the dam which would impact on the ability of some native fish species to access a fish trap/ladder system. At Parangana Dam, it was reasoned that to be feasible, the method of translocating fish into Lake Parangana would depend on the ability to capture the fish in large numbers. Paloona Dam was found to be the most suitable location to assist fish migration.

The subsequent fish trials at the Mersey and Forth rivers were relatively unsuccessful with regard to catches, especially those on the Mersey River below Parangana Dam. A number of factors may have influenced this, including; seasonal timing, limited flows below Paloona Dam and distance upstream from the sea at Parangana.

Catches on the Mersey River were very small and limited to introduced juvenile brown trout, *Salmo trutta*. The low flow in these upper reaches, the distance from the sea and estuary, and the influence of downstream tributaries may make these upper river reaches less attractive to native migratory fish.

Flows at Paloona Dam during the trial were very low and believed to be the cause of the limited catch at the site. This is because the survey coincided with a very dry period and the primary head storage in the catchment (Lake Rowallan) was also shut down for maintenance work. It is recommended that should accumulations of migratory native fish be discovered during any future fish surveys, a fish trap system is likely to be the best first stage solution to capture and translocate fish. The design of the fish trap would be dependent upon the timing and size of the migration run, and the ability to develop a cost effective system to service and maintain the trap. It is recommended that additional fish surveys are undertaken during optimal seasonal periods with adequate flow.

6. Commitment and Way Forward

Due to the lower than normal flows at the time of the survey, a future fish trial at Paloona Dam will be conducted. This will be held when flows are more reflective of regular power station operation during the peak migration season. This would ensure that a more representative outcome is achieved.

If the fish capture trial and translocation logistics prove feasible and beneficial, the installation of a permanent ladder/trap at Paloona Dam will be considered under Hydro Tasmania's Aquatic Environment Program.

7. For More Information

The fact sheet for this study is available at **www.hydro.com.au/MFWMR-studies**.

To see all the Mersey-Forth Water Management Review technical and social studies go to **www.hydro.com.au/MFWMR-studies**.

Find out more about the Mersey-Forth Water Management Review at **www.hydro.com.au/MFWMR**.

8. References

Hydro Tasmania 2011. *Mersey-Forth Water Management Review.* Hydro Tasmania, Hobart, Tasmania.

Hydro Tasmania 2012. *Mersey-Forth Water Management Review. Stakeholder Consultation Report.* Hydro Tasmania, Hobart, Tasmania.

Inland Fisheries Service 2011. *Tasmanian Whitebait Fishery Regulatory Management Plan 2011-2015*. Inland Fisheries Service, Hobart, Tasmania.

Appendix

A Stakeholder survey

Mersey-Forth Water Management Review

Fish Migration Survey September 2012

Hydro Tasmania's Mersey-Forth Water Management Review stakeholder consultation process identified 14 social and technical studies for further investigation.

One of these studies is the Mersey-Forth fish migration project. The aim of the project is to investigate options to facilitate fish migration and dispersal of native fish species throughout the Mersey-Forth catchments.

To assist with this process, we would appreciate any information you may have on migratory fish accumulation sites within the Mersey-Forth catchments that would complement our existing knowledge. While fishing you may see any of the following migratory fish:

- *Anguilla australis* (Short-finned eels)
- *Galaxias brevipinnis* (Climbing Galaxias)
- *Galaxias truttaceus* (Spotted Galaxias)
- *Lovettia sealii* (Tasmanian whitebait)
- *Mordacia mordax* and *Geotria australis* (Short-headed Lamprey and Pouched Lamprey)
- *Galaxias maculatus* (Jollytail)
- *Prototroctes maraena* (Australian Grayling)

The information you provide will enable us to obtain a greater understanding of how best we can help to facilitate fish migration in the Mersey-Forth.

If you would like to assist the fish migration project, please complete the attached survey form and return it to us in the reply paid envelope; or complete the survey online at: www.hydro.com.au/MFWMR/.

Your response will be treated as confidential.

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1. Have you ever seen fish accumulating at specific sites in the Mersey, Wilmot and Forth Rivers? If so, please specify the location and if possible identify the fish species and the approximate number. If possible, please also specify which months you generally see the accumulation of the highest fish numbers?

2. If there is any additional information you would like to add regarding migratory fish in the Mersey-Forth catchments, please include this here.

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