Gooseponds Creek
Fish Passage Project

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Gooseponds Creek Fish Passage Project

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Introduction
The Gooseponds Creek Fishway Project was a joint project between the Mackay Whitsunday Natural Resource Management Group (MWNRMG) and the Queensland Fisheries Service (QFS). The project rehabilitated fish passage at seven barriers along Gooseponds Creek, a significant freshwater nursery habitat in the Lower Pioneer River System. The project also provided an educational focus for freshwater fish habitat rehabilitation in the Mackay Whitsunday Region. The project was a success from both a fish passage and educational point of view, with thousands of fish successfully utilising the fishways and numerous community and local authority groups visiting the fishways to see the implementation of fish passage technology. As such, the project has become a major focus of the MWNRMG Healthy Waterways Program.

Healthy Waterways Program
The Gooseponds Creek Fishway Project is one of the components of the Mackay Whitsunday Natural Resource Management Group (MWNRMG) Healthy Waterways Program, presently funded by the Natural Heritage Trust (NHT1). The initiative seeks to improve the management of aquatic resources within the region by improving water quality and habitat within the aquatic systems of the region. As a member of the MWRSG, the QFS Northern Fish Community and Fishway Monitoring Team are focusing on regional freshwater fisheries issues.

This project is one of three concurrent projects addressing some of these issues, the others being: the Rehabilitation of Freshwater Drains Project (Restoration of Freshwater Drainage Channels to Provide Stream Habitat for Juvenile Barramundi, Project No. 2002107); and the Reconstruction of Culverts and Causeways to Assist Migrations of Adult and Juvenile Fish Project (NHT1 No. 2012102). The long-term objective of these three projects was to improve or increase the amount of habitat available to fish and therefore increase the overall fish numbers by allowing species to complete their life cycles.

These projects did not aim to fix all the problems associated with fisheries declines in the region, as the problems are too large to address over a limited time period with limited funding. A primary aim of each project was to increase public awareness of particular issues, and then show how those problems could be addressed. Each project aimed to construct specific demonstration sites (which in a secondary role also facilitate ongoing research by DPI and other groups such as Central Queensland University) that illustrate what technologies and techniques can be used to successfully rehabilitate fish habitat. In this way, community groups interested in addressing local environmental problems can see what the solutions might be, and then be inspired to undertake the works themselves, or to lobby local authorities to take action on their behalf. One overriding objective of all three projects was to ensure that the scope of works undertaken, or the technologies employed, would be within the capacity for local community groups, or local councils, to undertake themselves.

Fish Passage in Small Freshwater Streams
The Gooseponds Creek Fishways Project was particularly concerned with the numerous barriers to fish passage (movement of fish within their environment) built on small
natural streams in both rural and urban areas. Mapping of these barriers is currently being undertaken by DPI, but preliminary estimates are that there are thousands for barriers in the Mackay-Whitsunday area. These barriers are built for a variety of purposes such as: irrigation supply, flow gauging and re-regulation, on-farm stock and irrigation supply; urban or industrial supply, flow management and flood control, road crossings or simply for urban beautification and recreational facilities.

Although many of these barriers may drown-out during high flow events (allowing fish passage), at all other times they block the movement of fish. This means previously interconnected small systems within the region are now fragmented and fish passage is severely disrupted. This has had major impacts on juvenile fish that have spawned lower down in the system and are attempting to migrate upstream, or require wide dispersal to ensure survival during the dry season. Because these fish are particularly vulnerable to mortality through predation and disease, as well as having little capacity to wait for a substantial rainfall event to occur, whole year’s recruitment can be lost in a very short period of time if migration is delayed.

The habitats that have become isolated (Figure 1) are important not only for supporting communities of relatively small native fish species such as gudgeons and rainbow fish, but are also important in the life cycle of larger migratory species, which often have important commercial and/or recreational importance such as mullet and barramundi.

![Figure 1](image_url)  
*Figure 1. Typical habitat available to migrating freshwater fish in small streams of the Mackay Whitsunday Region.*

Barramundi was used as the example in this project. Newly spawned barramundi move into and through these relatively small freshwater habitats during the first year of their
life. The loss of access to these habitats reduces the potential of these fish to survive and eventually recruit back into the main channels of the larger river systems.

Whilst community concern over the decline in the numbers of commercial and/or recreational species is already high, attention also need to be drawn to the lesser known fish species important for maintaining an overall healthy fish community.

Fishway Technology

Fishway development in Queensland has until now primarily focused on providing fish passage on large barriers, with a high priority placed on those barriers situated low down in river systems. By default, this has involved construction and research into fishways on relatively large barriers where fishways require considerable engineering input and generally cost hundreds of thousands of dollars to build.

Whilst this work on building fishways on large barriers is important, the importance of providing fish passage for the more numerous smaller barriers (less than two metres high) has also been recognised. Providing passage at these small barriers can be just as critical as at large barriers, especially in lowland wetland/creek systems. In these systems a small barrier can completely block fish passage as the streams are generally very low sloped, have only small rises in water levels and the fish are generally very small. Often, the fishway technology and construction technique required for low barriers is relatively simple, with limited engineering expertise required. This means that the costs of these structures are well within the reach of community groups backed by NHT funding. It is anticipated that by transferring the technology and techniques required for small fishway construction to community groups, the number of fishways built can be increased rapidly to a level that will have a meaningful effect on the restoration of fish communities.

Demonstration Sites

To enable the transfer of technology to the community, one of the primary aims of the project was to develop demonstration fishway sites. These sites demonstrate fishway technology that is within the reach of non-specialist groups with access to only relatively small levels of funding. This required the development of fishway designs with simple, straightforward construction techniques, and only minimal biological and engineering supervision from state and local government authorities.

Gooseponds Creek (Figure 2) was chosen as the site for the demonstration fishways as it contained a significant nursery habitat where access was restricted by several barriers within the creek. The system also had the advantage of flowing through the northern suburbs of Mackay where it was a significant recreation resource to the local community. This meant that the fishways, which were built at walking path crossing of the creek, would have hundreds of visitors each day just from people walking along the paths that connect each of the fishways. These high profile sites were ideal for this project, enabling fish to access vital habitat and the community to be educated about the values of fish passage in small freshwater streams.

Project Aims

In general the Gooseponds Creek Fishway Project was designed to fulfill a number of aims. These included:
1. Providing fish with unimpeded access to the full length of Gooseponds Creek.
2. Educating the community on the importance of fish passage in small streams.
3. Demonstrating that a variety of low cost/low technology fishways solutions are available to community groups for habitat rehabilitation.
4. Transferring the knowledge required to build fishways to the community and local authorities to undertake habitat rehabilitation works.

**Figure 2.** Location of Gooseponds Creek and demonstration fishway sites.
Fishway Construction

Construction was undertaken in the dry season to maximise the time available on-site for excavation machinery. Most construction work was done with a 25 tonne excavator and access for this machinery was the highest priority when planning construction timing.

Each fishway was constructed differently as a project aim was to demonstrate a variety of fishway technologies. Individual fishway designs were chosen depending on the physical conditions encountered at the site and how the different technologies suited the site. It would have been possible to use the rock-ramp fishway design at all sites, as this is the most versatile design. However, building a variety of different fishways demonstrated to the community the differences in construction techniques, costing and construction difficulties for each fishway type.

Fishways were built in order from the lowermost fishway to the uppermost fishway, with the exception of the Greenfields Rock Ramp Fishway (Fishway No. 4), which was constructed before to the other fishways when the Pioneer River Improvement Trust was reconstructing a flood-damaged weir. Fishways should generally be constructed from downstream to upstream as the lower structures play a greater role in inhibiting fish passage from estuaries into freshwater.

In total seven barriers had fish passage restored with five fishways built and two barriers drowned out due to fishway construction downstream.

Barrier No. 1 - Fishway No. 1 Combination V-notch Log and Rock-Ramp Fishway

Fishway No.1 required a combination of two different fishway types due to the complex nature of the site. This site had a small concrete weir at the head of a long thin incised channel (Figure 3). The weir consisted of a 5.0m sloping concrete and rock apron and a concrete crest 1.2m wide, while the downstream channel was around 1.0 – 1.5m wide and 0.8m deep. During flow events water velocities over the apron were too high to allow fish passage, while water depths in the downstream channel were too shallow to provide cover. Each of these aspects left fish open to predation as they accumulated in the shallow water below the concrete weir. To add to these difficulties the water level below the weir also fluctuated depending on tidal levels.

Due to these technical factors it was decided to build a rock ramp fishway on the small weir and apron and to include a number of v-notched log structures in the channel below the rock ramp fishway (Figure 4). These v-notched log falls would be used to regulate the water level at the base of the rock ramp fishway, which does not cope well with fluctuating tailwater levels. Another benefit of the v-notched logs was the reduction of water velocity within the channel and the creation of resting pools.

The construction of the fishway took two days to complete utilising an excavator for one day and a backhoe for a second day. Material used included 20m³ of rock and eight 4.0m by 400mm Gympie messmate logs. The construction steps were as follows:

1. Site surveyed and acid sulphate soil analysis completed. Acid sulphate soils were detected in the lower section of the channel and steps were taken for their neutralisation.
2. Site marked out prior to the first day of construction as per the site plans. The location of excavated areas, logs and rock ridges were marked to guide operators during excavation.

3. Old concrete/rock ramp removed, broken up and used as the foundation of the new rock ramp fishway.

4. Rock ramp fishway built below the crest of the weir, with rock trucked in from outside the site to provide materials for the rock ramp (Figure 5).

5. Holes excavated for each of the v-notched log falls and the logs inserted, aligned and covered in.

6. The channel protected at various places with rock armouring. This was formed from left over rock from the rock ramp construction. Particular attention was taken to protect the bank in the vicinity of the v-notch log falls to prevent erosion and movement of the logs.

7. Site cleaned up and revegetation undertaken to enhance the habitat values of the downstream channel (Figure 6).

8. Educational signs erected to provide information to the public about the project and the fishway.

Figure 3. Barrier No. 1 prior to construction of the combination V-notch log and Rock Ramp Fishway, showing concrete weir at the head of an incised channel.

No difficulties were encountered during construction, although alignment of the logs to form “Vees” was not easy and required some patience. Acid sulphate soils were also an issue in the lower section of the fishway where holes for the logs were being excavated,
but these were neutralised by the application of lime and did not prove to be a problem. The total cost of construction of this fishway was around $4,000

Figure 4. Construction diagrams for the log and rock-ramp fishway at Barrier No.1.

Figure 5. Rock being delivered for inclusion in the rock-ramp fishway at Barrier No.1. The rock-ramp fishway is partially completed in front of the excavator.
Figure 6. Fishway No.1, combination V-notched log and Rock Ramp fishway after completion of construction

Barrier No. 2 - Drown-out

Barrier No.2 did not require a fishway as the structure was drowned out by the construction of the fishway at Barrier No.1 downstream. Barrier No.2 consisted of a concrete weir that formed the upstream wall of the pool created by Barrier No.1 (Figure 7). The height of this structure was at the same level as the crest level of Barrier No.1 and only created a fish passage problem during low flows when water flowing across the crest was to shallow to allow passage. As Fishway No.1 elevated the level of the upstream pool by 100mm to allow passage across the crest of that barrier, the level of water across the crest of Barrier No.2 was also elevated by 100mm (Figure 8). This increased depth is adequate to provide passage under all flow conditions except no flow conditions.
Figure 7. Barrier No. 2 exposed during the recent dry conditions

Figure 8. Barrier No. 2 drowned out by fishway construction downstream
Barrier No. 3 - Fishway No. 2 Vertical-Slot Fishway

A number of different fishway designs could be have been used at this site, but as it was easier to construct here than at other sites, a vertical-slot fishway was installed. This site was made up of two submerged concrete walls 20m apart, in between which rock rubble has been placed to prevent erosion. Running from bank-to-bank across the space between these walls was a 3.0m wide concrete walkway (Figure 9). During flow events water velocities over the walkway were too high to allow fish passage and this created a barrier to migration.

Figure 9. Site of fishway No.2, showing concrete walkway and rock rubble fill.

The construction of the fishway took two weeks to complete utilising an excavator for the entire period. Materials used included 20m$^3$ of rock, 10m$^3$ of concrete, eight 1200mm by 900mm concrete culverts, 20m of 1.2m wide walkway mesh, 30m of various size steel bar, 6 sheets of 2.4m by 1.2m ply, 6 sheets of 2.4m by 1.2m marine grade aluminum, various timber formwork and numerous nuts and bolts. To conserve the structural integrity of the two concrete walls, the fishway was built so as not to modify the walls in any way. These walls formed the ends of the ponds upstream and downstream of the structure and could not be modified without extensive engineering works. The fishway was also required to pass through the concrete walkway, which was modified to accommodate the fishway.

Construction occurred as follows:

1. Site surveyed and engineering plans drawn to PRIT specifications.
2. Site marked out as per plans with location of excavated areas, concrete and culverts to guide operators during excavation.
3. Channel for fishway below walkway excavated

4. Walkway cut with concrete saw and removed. Channel excavated further to top of fishway

5. Concrete foundation of fishway channel boxed up, poured and allowed to cure (Figure 10).

![Fishway construction](image)

**Figure 10.** Fishway No.2 under construction, concrete foundation of fishway is being smoothed to the required gradient as per the fishway design.

6. Culverts placed on top of foundation, with 100mm gaps between culverts.

7. Steel rods were inserted into the foundations in gaps between culverts, boxed up and concrete poured to seal up walls of fishway.

8. Baffles, which had been constructed off site, were inserted into channel and bolted in place (Figure 11).

9. Steel railway line placed across channel at the intersection point of the walkway to enable walkway mesh to support the weight of council vehicles.

10. Concrete ramps also built at walkway intersection to allow bike and truck access across fishway

11. Walkway mesh was secured to the top of the fishway to prevent ingress of debris and as protection against people accessing the fishway.
12. Trash rack bolted to exit of fishway to prevent debris from clogging the fishway

13. Exit channel above fishway rock lined to prevent erosion and to create rock ramp affect during very low flows

14. Educational signage erected to provide information to the public about the project and the fishway.

As the vertical slot fishway design is a more technical fishway design, a number of difficulties were encountered during construction. The fishway was constructed inside of the wall that formed the downstream pool, which impacted on entrance conditions as the water through this point became very shallow. This also led to an increase in deposition in the lower section of the fishway as sediment was unable to be scoured away as designed due to lower water velocities in the lower cells. Another issue in this area was vandalism that occurred on a daily basis, measures to prevent damage from vandalism increased the cost of the fishway greatly. Public safety was also an issue with this design, at other locations it would not have been necessary to place mesh on top of the fishway, but in a public place such as Gooseponds Creek it is advisable. The total cost of construction of this fishway was around $10,000
Barrier No. 4 - Fishway No. 3 V-notched Log-ramp Fishway

Barrier No.4 was also made up of two submerged concrete walls 20m apart, in between which rock rubble has been placed to prevent erosion. Running from bank-to-bank across the space between these walls was a 3.0m wide low-level bridge, under which was a concrete apron. During flow events water velocities over the concrete apron were too high to allow fish passage, this created a barrier to migration.

The layout of this site allowed a v-notched log-ramp fishway to be constructed. This design utilises a series of v-notched logs laid across the flow path to break up the flow of water and creating a series of small falls. These log weirs also provide a series of resting pools for fish that are ascending the fishway. The top log in the series also backs up water across the concrete apron under the footbridge. This was an essential aspect of the design as this was the area where fish had the greatest difficulty ascending the barrier.

The construction of the fishway took one day to complete using an excavator. Materials used in construction included five 600mm diameter Gympie Messmate logs, 10m$^3$ 400mm rock, ten 2.0m lengths of railway line and ten bags of concrete. The railway line was used to pin-down the logs and ensure they did not move during high flows. The concrete and rock were used to seal up sections of the fishway and provide roughness and erosion protection within the fishway.

Construction occurred in the following sequence:

1. Logs were modified with a chainsaw to allow railway line pins to be inserted.
2. Site surveyed and engineering plans drawn to PRIT specifications (Figure 13).
3. The site was cleared of vegetation and marked out for the placement of logs.
4. Channels for logs were excavated.
5. Individual logs were laid in place (Figure 14).
6. Railway line was inserted through precut holes at each end of each log to pin the log in place.
7. V-notches were cut in each log in an alternate fashion.
8. Rock was placed at the end of each of the logs and below each notch to prevent erosion and destabilisation of the fishway.
9. Concrete was placed in each of the railway line pinholes and along the top edge of the top log to seal the fishway.
10. Educational signage erected to provide information to the public about the project and the fishway.

This fishway was relatively simple to construct and there were few problems encountered. Important considerations included the appropriate selection of timber for a wet/dry environment and sealing the top section of the fishway to prevent leakage of water under the logs. Total construction costs for this fishway were around $2,000.

Figure 13. Construction diagrams for the V-notched log-ramp fishway downstream of Willets Road on Gooseponds Creek.
Figure 14. A Log-ramp fishway under construction at barrier No.4 on the Gooseponds, Mackay Queensland November 2001

Figure 15. The completed V-notched Log-ramp fishway at Barrier No.4 on Gooseponds Creek.
Barrier No. 5 - Drown-out

Barrier No.5 did not require a fishway as the structure was drowned out by the construction of the fishway at barrier No. 4 downstream. Barrier No.5 consisted of a concrete weir that formed the upstream wall of the pool created by barrier No.4 (Figure 16). The height of this structure was at the same level as the crest level of barrier No.4 and only created a fish passage problem during low flows when water flowing across the crest was too shallow to allow passage. As fishway No.3 elevated the level of the upstream pool by 100mm to allow passage across the crest of that barrier, the level of water across the crest of barrier No.5 was also elevated by 100mm. This increased depth is adequate to provide passage under all flow conditions except no flow conditions.

Figure 16. Barrier No. 5 exposed during the recent dry conditions

Barrier No. 6 - Fishway No. 4 Rock-Ramp Fishway

Barrier No.6 consisted of a 0.5m high concrete and steel weir that was built to regulate upstream water levels for control of flooding and maintenance of the artificial lake system upstream (Figure 17). This weir was breached during flooding in February 2000 and was replaced later that year by PRIT. As a condition of the Waterway Barrier Works Permit for the reconstruction of the weir, a fishway was required to be built on the new structure. PRIT agreed to build the fishway as part of their reconstruction and this resulted in the first fishway being installed on the Gooseponds Creek system. Although this fishway was funded and built by PRIT it has been included in this project as it was
the catalyst for efforts to retrofit fishways to all the other barriers in the system and underwent the same design and construction process as the other fishways.

![Figure 17. Barrier No. 6 prior to the construction of the full width rock-ramp fishway.](image)

The weir was suited to the construction of a full width rock ramp fishway as it was fitted with the extra protection works that PRIT were undertaking below the weir to protect it from erosion. The design consisted of a 400mm high sheet pile and concrete weir, downstream of which the rock ramp would extend. The rock ramp had 4 ridges that extended from bank-to-bank and created small 100mm falls through the length of the fishway. The ridges also created a series of pools within the fishway that allowed the fish to rest during their ascent. The furthest upstream ridge butts up against the concrete weir and when flow occurs backs up 100mm of water over the weir crest. The rock ramp fishway also extends up the banks to provide a low flow zone adjacent to the bank during high flow periods, when flow velocities are too high in the center of the stream.

The construction of the fishway took three days to complete, with an excavator used for the entire period. Materials used included 80m³ of 400mm diameter rock and 10m³ of 600-800mm rock.

Construction occurred in the following sequence:

1. Site surveyed and engineering plans drawn to PRIT specifications.
2. Diversion channel excavated to allow flow of creek to bypass construction site.
3. Area below weir extensively filled with rock to bring up the bed level of the stream to form the base of the fishway.
4. Excavator compressed fill to stabilise the base of the fishway.

5. The toe of the fishway below water level is stabilised with extra large rocks to a 1:3 slope.

6. Individual rocks of the lowest ridge were set in place at the head of the toe slope.

7. Placement of individual rocks for each of the other ridges commenced, with construction starting on the Northern bank to allow the excavator to work its way back across the stream to the access point (Figure 18).

Figure 18. Fishway No.4 during the middle stages of construction. The bottom two ridges have been put in place and rocks are being placed on the northern bank of the fishway as the excavator works its way back out of the fishway.

8. The excavator worked on each of the top three ridges as it worked its way back to the access point.

9. The fishway was sealed with black clay as each section was completed and the excavator is forced to move back towards the access point.

10. The excavator finished construction on the high flow section of the fishway on the southern bank.

11. The excavator filled in the diversion channel, allowing flow over the fishway.

12. Work crew watered in the black clay with fire hoses to ensure that the fishway was sealed and that water does not flow under the fishway.
13. The placement of rocks in the top ridge was fine-tuned by hand to ensure that sufficient depth of water flows over the weir crest.

14. Educational signs erected to provide information to the public about the project and the fishway.

This fishway had very few difficulties associated with its construction. Costs were increased by the large quantity of fill rock that was required below the weir to form the fishway base. Erosion had scoured out a large hole below the weir that required around 60m$^3$ of rock rubble to fill. This significantly increased the cost of the fishway to approximately $28,000. This cost was covered by PRIT as part of the weir reconstruction costs and it is likely that the cost could have been reduced if the fishway was constructed as part of the regular fishway construction program.

Figure 19. The completed Fishway No. 4 immediately after construction during the first flow through the fishway.

Barrier No. 7 – Fishway No. 5 Bypass Channel Fishway

Barrier No.7 consisted of a 2.0m high concrete causeway across Gooseponds Creek to provide road access across the creek along Hicks Road. Passing through the causeway were two 400mm diameter pipes that were elevated 1.0m above the downstream water level. Although a 2.0m high structure, passage was only required to be provided over the 1.0m difference between upstream headwater and downstream tailwater levels. With extensive rip-rap erosion protection works and the presence of a sewage line and optic
fibre cable, the area below the causeway was quite complicated. This required an innovative approach to the design of any fishway installed at this site.

Given this complicated arrangement directly downstream of the causeway and the need to ensure that the structural integrity of the erosion protection works were not affected, it was decided not to bring the fishway through this section of the channel at all. Instead a bypass channel type fishway was built through the vacant parkland adjacent to the road crossing, avoiding all the difficulties associated with the area below the road crossing. The bypass channel fishway design utilised a low slope channel with a series of rock ridges and pools set at wide intervals. This provided a nature-like channel that goes around the structure away from the original stream channel. As the upstream exit of the fishway is set below the level of the pipes that go through the road crossing, water can flow through the bypass channel before it begins to flow through the pipes. This ensures that the majority of flow goes through the bypass channel, providing the best stimulus for fish to find and use the fishway.

The construction of the fishway took 10 days to complete, with an excavator used for the entire period and a truck required for 5 days. Materials used included 80m$^3$ of 400-600mm diameter rock, 10m$^3$ of 600-800mm rock, four 1m$^3$ concrete blocks, eight 1.2m*0.9m concrete culverts, 10m$^3$ of stabilised sand and 10m$^3$ concrete.

Construction occurred in the following sequence:

1. Site surveyed and engineering plans drawn to PRIT specifications (Figure 20).
2. Construction commenced with the excavation of a channel through the road for the culverts (Figure 21).
3. Culverts put in place and backfilled with stabilised sand, new road constructed over top of culverts.
4. Concrete headwall poured around upstream culvert to prevent movement.
5. Location of Telstra cable and sewerage line identified to ensure services were not damaged.
6. Channel downstream of the road was excavated and sloped to design specification.
7. Control structure buried 2.0m downstream of the culverts in channel. This structure maintains a minimum water depth (300mm) through the culverts.
8. 10m$^3$ concrete blocks placed on northern bank of channel between culverts and high bank to prevent flows off the road eroding the channel.
9. Concrete headwall poured around downstream culvert to prevent movement of this section of the fishway.
10. Rocks placed at specified intervals to form ridges within the channel.
11. Rock armoring placed on the bed and banks of the channel to prevent erosion of the channel during high flow events (Figure 22).
12. Site cleaned up and all excess material removed.
13. Placement of rocks in the ridges was fine-tuned by hand during first flow to ensure that steps between pools are even.
14. After first large flow event fishway repaired where rocks have moved from high water velocities
15. Educational signs erected to provide information to the public about the project and the fishway.

**Figure 20.** Plans for the bypass channel fishway at Barrier No.7.
Figure 21. Placement of culverts under road during construction of Fishway No.5.

Figure 22. Excavation of the fishway channel downstream of the road, showing concrete blocks protecting the left bank, the rock ridges in the base of the channel and the rock armoring on the right bank.
A number of difficulties were associated with the construction of this fishway. They include:

- Construction had to be brought forward as contractors for a nearby estate were about to seal the dirt road. This would have meant that culverts could not be placed under the road as per the design.
- Working with an excavator near a Telstra cable is prohibited and therefore hand excavation was required in this section of the channel.
- Ensuring the sewerage line was not disturbed required planning and liaising with council.
- It was necessary to block the road for most of a day to insert the culverts under the road, this required special permission from main roads and council.
- As a lot of material was removed to form the channel, it was necessary to find a place to dispose of the fill.

Costs were increased by the complex nature of the site, the large number of culverts and the large quantity of fill rock that was required. Total costs for the fishway were around $10,000.
Fishway Assessment

Introduction

Sampling of each of the fishways, except Fishway No.3, was undertaken after construction to demonstrate the effectiveness of each of the designs at passing the juvenile fish utilising Gooseponds Creek as grow-out habitat.

Sampling was conducted during the 2001/2002 and 2002/2003 wet seasons but was severely restricted by a lack of flows due to well below average rainfall. As a consequence, Gooseponds Creek had little or no flow for all but a few weeks in each season. As the majority of migratory fish species are stimulated to move during wet season flow events, the lack of flows did not give an opportunity to juveniles of many species to migrate during the sampling period. The reduced number of flow events meant that only 41 days of sampling could be conducted on four of the fishways in the system. This is well below the level of sampling usually required for a full fishway assessment and as such, the data presented does not fully show the success of the fishways at passing all species recorded in the system. Further sampling will be undertaken during future flow events to establish the movement of species not encountered in the sampling to date.

Methods

Trapping surveys were conducted on four of the five fishways from June to December 2000 for fishway No. 4 and from January to February 2002 for fishway 1, 2 and 5. Fishway No. 3 was not trapped during the sampling period as there was insufficient flow to set traps at this site. Sampling was conducted to ascertain the effectiveness of the fishways to pass fish. Two traps, a block-net design and a cone trap design, were used during sampling, each on different fishway types. The block-net design was used on fishways with rock ramps, while the cone trap design was used on fishways constructed with culverts. The block-net trap (Figure 24) consisted of a fine mesh (2mm) netting wall, weighted along the bottom to prevent fish escaping under the net and set across the full width of the stream channel. Sewn into this netting wall were a number of bait traps (2mm mesh size) that were sealed on their upstream end. Fish were directed by the netting wall into the bait traps where they remained trapped until sampling ceased.

The cone trap (Figure 24) consisted of a steel-framed box that was covered in fine mesh (2mm) netting with a single top to bottom entrance that reduced to a small opening via a cone. Fish entered through the cone and remained trapped in the trap until sampling ceased. Both nets were set in a uni-directional manner to capture fish migrating upstream. Sampling the entrance and exit of the fishway with these traps was carried out for 6-hour periods during daylight hours on consecutive days, with traps cleared at the end of sampling in the afternoon. Traps could not be left overnight due to problems with vandalism.

All netted fish were identified and recorded on site. Lengths to the nearest millimetre were recorded (fork length was recorded for forked tail species and total length for all other species). Sub-samples of 50 fish were measured and the remainder counted when more than 50 individuals of a single species were encountered. All fish were immediately released upstream of the fishway after individual samples had been processed.
Kolmogorov-Smirnov signed rank tests were performed on the size-distribution of individual species between entrance and exit samples. The tests were used to detect any significant difference in size classes of a particular species between entrance and exit samples. For the purposes of this report, species chosen for analysis were those which provided substantial numbers of fish in both entrance and exit samples.

**Results**

A total of 5281 individuals of 15 species (Table 1) were captured from all fishways over the sampling period. Fishway No. 1 had a total of 1185 individuals of 13 species (Table 1) captured from 3 paired days of sampling. *Ambassis agrammus* (Sailfin glassfish), *Craterocephalus stercusmuscarum* (fly-specked hardyhead), *Hypseleotris compressa* (empire gudgeon) and *Nematalosa erebi* (bony bream) dominated catches. Fishway No. 2 had a total of 2436 individuals of 8 species captured from 4 paired days of sampling with *H. compressa* dominating catches. No fish were captured at Fishway No. 3 as there was insufficient flow to set traps. Fishway No. 4 had a total of 1128 individuals of 7 species over 12 paired days of sampling with *H. compressa* again dominating catches. This fishway was generally sampled during the dry season and had lower catches than those encountered from the other fishways. Fishway No. 5 had a total of 532 individuals of 5 species from only 2 paired days of sampling with *H. compressa* dominating catches. Migratory species that have been recorded in the system by electrofishing sampling but not captured during the fishway sampling include, *Lates Calcarifer* (barramundi), *Lutjanus argentimaculatus* (mangrove jack), *Mugil cephalus* (striped mullet) and *Acanthopagrus australis* (yellowfin bream).

*H. compressa* was the most numerous species captured and accounted for just over 4000 of the total individuals captured. This species was well represented at all fishways with individuals captured on all but two days of the 42 days sampled. Of interest with this species is the high catch associated with a rising flow on the 13/2/02. A large number of this species (1454), or 72% of the bottom trap catch for fishway No. 2, were captured in the bottom trap during 3-hours of trapping through the initial rise of water at the beginning of the season’s only flow event. Further sampling during this flow event could not be attempted as water levels prevented the deployment of traps. However, thousands...
of fish were observed accumulating below the fishway and hundreds of fish were observed crossing the causeway along the opposite bank from the fishway as the structure approached drownout.

**Table 1.** Pooled totals for all species captured from top and bottom sampling of four fishways along Gooseponds Creek, 2000-2001.

<table>
<thead>
<tr>
<th>Species</th>
<th>Fishway No.1</th>
<th>Fishway No.2</th>
<th>Fishway No.4</th>
<th>Fishway No.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rock-ramp</td>
<td>Vertical slot</td>
<td>Rock-ramp</td>
<td>Bypass channel</td>
</tr>
<tr>
<td>v-log</td>
<td>3 paired days</td>
<td>4 paired days</td>
<td>12 paired days</td>
<td>2 paired days</td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Top</td>
<td>Bottom</td>
<td>Top</td>
</tr>
<tr>
<td><em>Ambassis agrammus</em></td>
<td>223</td>
<td>4</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td><em>Anguilla reinhardtii</em></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Arius graeffei</em></td>
<td>23</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Craterocephalus</em></td>
<td>11</td>
<td>198</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td><em>Gambusia holbrooki</em></td>
<td>9</td>
<td>80</td>
<td>27</td>
<td>46</td>
</tr>
<tr>
<td><em>Gerres filamentosus</em></td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Glossamia aprion</em></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Hypseleotris</em></td>
<td>18</td>
<td>283</td>
<td>2024</td>
<td>207</td>
</tr>
<tr>
<td><em>Hypseleotris species</em></td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><em>Leiopotherapon</em></td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Melanotaenia</em></td>
<td>7</td>
<td>59</td>
<td>39</td>
<td>19</td>
</tr>
<tr>
<td><em>Mogurnda adspersa</em></td>
<td>0</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td><em>Nematalosa erebi</em></td>
<td>159</td>
<td>99</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td><em>Scatophagus argus</em></td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Selenotoca multifasciata</em></td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>455</td>
<td>730</td>
<td>2145</td>
<td>291</td>
</tr>
</tbody>
</table>

Length frequency data (Figure 25) was analysed for all species from all fishways to compare the size range of fish that were attempting to move through the fishway (bottom) and those that had successfully ascended the fishway (top). The smallest fish to attempt migration was *A. agrammus*, which was recorded attempting to migrate through Fishway...
No.1 at sizes as small as 7mm. The smallest fish to successfully ascend any of the fishways was a 15mm *C. stercusmuscarum* that was captured at the top of Fishway No.1. The largest fish recorded migrating during the sampling period was a 350mm *Anguilla reinhardtii* (long-finned eel). The majority of fish recorded moving through the Goosponds Creek fishways were between 7mm and 70mm long. As sampling was restricted by the lack of flow, there was limited opportunity for larger fish to move within the system and this data reflects limited sampling at times when large fish may have been moving.

![All species from all fishways](image)

**Fig. 25.** Length frequency of all species from all fishways sampled on Gooseponds Creek, 2000-2001. Size distribution of all species from the bottom (grey bars) and top (black bars) of fishway numbers 1, 2, 4 and 5 on Gooseponds Creek.

Comparative percentage-frequency of length histograms were prepared for individual species where they exhibited significant numbers of fish in both bottom and top samples. Remaining species could not be tested due to small sample sizes. Species analysed include *H. compressa*, *C. stercusmuscarum* and *N. erebi*. *C. stercusmuscarum* and *N. erebi* were only analysed for fishway No.1, as they did not occur in sufficient numbers for analysis at the other fishways. *H. compressa* occurred in significant numbers at all fishways and analysis was carried out for each individual fishway for this species.

Difference in size distribution was also analysed for *C. stercusmuscarum* and *N. erebi* (Figure 26) between bottom and top samples of fishway No.1 using a Kolmogorov-Smirnov signed rank test (a=0.05). In each case a significant difference was found between the bottom and top samples, *C. stercusmuscarum* ($D_{11,90} = 0.478$, $P=0.0228$) and *N. erebi* ($D_{94,63} = 0.495$, $P<0.0001$).
**Fig. 26.** Length frequency of *C. stercusmuscarum* and *N. erebi* from fishway No.1. Size distribution of *C. stercusmuscarum* and *N. erebi* from the bottom (grey bars) and top (black bars) of fishway number 1 on Gooseponds Creek 2000-2001.

These results were affected by the schooling nature of these species and the limited replication of samples due to low flows. In the case of *C. stercusmuscarum*, small size classes in the bottom trap samples were exacerbated by a single large catch in the top trap that have led to significant differences occurring. For *N. erebi* a large catch of very small fish on the last day that sampling could be undertaken has also unbalanced the data leading to significant differences between top and bottom samples.

Difference in size distribution of *H. compressa* (Figure 27) between bottom and top samples for each fishway was determined using a Kolmogorov-Smirnov signed rank test ($a=0.05$). No significant differences were found between the bottom and top samples of fishways No.2 ($D_{200,149} =0.068$, $P=0.8977$) and No. 5 ($D_{104,90} =0.076$, $P>0.9999$). However, significant differences were found between the bottom and top samples of fishways No.1 ($D_{18,84} =0.365$, $P=0.0385$) and No. 4 ($D_{329,208} =0.126$, $P=0.0350$).

The significant difference between the bottom and top samples of *H. compressa* in fishway No.1 is the result of a single large catch in the top trap that accounted for $85\%$ of the total catch which has unbalanced the data leading to a significant difference occurring. The significant difference in bottom and top catches for fishway No.4 occurs for unidentified reasons.
**Fig. 27.** Length frequency of empire gudgeon from four fishways on Gooseponds Creek, 2000-2001. Size distribution of empire gudgeon (*Hypseleotris compressa*) from the bottom (grey bars) and top (black bars) of fishway numbers 1, 2, 4 and 5 on Gooseponds Creek.
Discussion

Approvals processes

Negotiations for the approval of construction of the fishways were a complex process involving numerous local and state authorities. The primary organisations involved included, Mackay City Council, Pioneer River Improvement Trust, Department of Natural Resources and Mines, Department of Primary Industries and the Environmental Protection Agency. Each of these organisations played a significant role in the approval process and could potentially refuse to approve the construction. Therefore, it was essential that all organisations were kept fully informed of the intentions of the project and any issues that arose that may have affected the decisions being made by that organisation. The organisation of this approvals process was more complex than originally anticipated, with rehabilitation works of this nature not usually handled by most of the organisations concerned. In future a Habitat Rehabilitation Approvals Process (HRAP) such as is currently being drawn up by QFS will guide project coordinators through the process of applying to the appropriate authorities for approval to construct a fishway. This will simplify the approvals process and ensure that the early months of a project are not wasted trying to figure out all the organisations involved in the approvals process. The HRAP will be fully outlined in the upcoming Mackay Whitsunday Fish Habitat Rehabilitation Strategy.

Fishway Success

Although the assessment of each of the fishways has been limited by the lack of flows that have occurred throughout 2001-2003, data collected demonstrates that the fishways have passed significant numbers of fish. With the successful passage of fish as small as 15mm through the fishway, it is likely that larger fish will be able to successfully use the fishways as they have a stronger swimming ability. Of concern is the passage of fish smaller than 15mm, such as the 7mm long perchlets encountered at Fishway No.1. It is unlikely that any fishway could be built to successfully pass these small fish without increasing construction costs well above those that could be sustained by community groups. However, as the fishways have successfully allowed thousand of other fish to freely pass upstream, it is unlikely that the hindering of this small section of the fish community will affect overall productivity. In general the fishways will have a positive affect on the fish communities of Gooseponds Creek, with free movement from top to bottom of the system now possible.

Ongoing Environmental Management Plan

Ongoing maintenance of the fishways is essential to ensure that they keep functioning according to their design. A number of aspects of the design may be compromised after a period of no maintenance. High flow may cause movement of rocks within the fishway that create steps greater than design criteria, they can also create erosion in or below the fishway that weakens the fishway and can lead to damage in subsequent high flows. Vigorous plant growth in tropical areas may also become a problem as the fishway can become overgrown with weeds such as paragrass. These weeds choke the fishway preventing them functioning as per their design and have been a particular problem in
Gooseponds Creek where all the fishways have been compromised by the excessive growth of weeds. As part of the project, plantings of suitable shade trees has been undertaken, but since these plantings take a number of years to mature and begin to shade weeds it is essential that ongoing maintenance keeps the weeds in check.

To ensure the fishways function as they were designed, it is essential that the fishways receive ongoing maintenance. This maintenance should take the form of regular inspections of the fishways to identify damage and excessive weed growth and programs to mitigate these problems Environmental management plans for each of the fishways identifying possible problems and actions to be taken to ensure continued operation have been prepared. It is envisioned that after the initial two-year maintenance period conducted by QFS that the fishway maintenance could be taken over by local authorities such as Mackay City Council. Negotiations for this ongoing maintenance have not been finalised, but it is considered essential that the local authorities take ownership of these structures to give a sense of community commitment to the ongoing rehabilitation of fish communities.

Public Relations and Community Awareness

The public relations and community awareness benefits of the Gooseponds Creek Fishway Project have been tremendous. The project has generated numerous positive articles in local newspapers (Appendix 1) and on local radio and has also generated publicity through statewide publications such as the Courier Mail and Sunday Mail. Media articles published in relation to the Gooseponds Creek Fishway Project on both radio and in newspapers include:

a. ABC Mackay Regional Radio - Radio Segment “Fishy Bits” (since Feb 02 DPI has had a monthly spot providing updates on current DPI projects including the Drains Rehabilitation Project).

b. ABC Mackay Regional Radio (June 2000) “Mackay Boasts State’s First Rock-ramp Fishway”

c. 4MK Mackay Radio (June 2000) “Mackay Boasts State’s First Rock-ramp Fishway”

d. The Courier-Mail (June 2000) “Hooked”

e. The Sunday Mail (July 2000) “Green Solution on Fish Movement”

f. Prime News, Newsletter for DPI Staff (July/August 2000) “Mackay Boasts State’s First Rock-ramp Fishway”

g. The Daily Mercury, Mackay (November 2001) “Fishways Progress”

h. State Government Community Cabinet Meeting (November 2001) “Fishways Progress”

i. The Pioneer News (Feb 2002) “Fish Flood In”

In addition to publicity received through media articles it has been important to give in-depth information to the community about the progress and successes of the project. To this end, the project leader presented information about the project to the community through a number of forums, these included:
2. 2001 State Regional Group Collective meeting
4. 2002 Southern Fish Stocking Groups workshop
5. 2002 Mackay Whitsunday Regional Strategy Groups - Healthy Waterways Workshop
6. 2002 Riversymposium, the scarcity of water, the future of rivers, the future of water. International Conference.
7. 2003 Mackay Whitsunday Natural Resource Management Group – Healthy Waterways Workshop (to be held in May)

The project has a high profile within the community as a result of the publicity and these presentations. This has led to numerous requests from school, local community and council groups for “Fishway Tours” which have been run on a regular basis since the start of the project. The responses from the community in relation to these tours has been excellent with groups such as the Sarina Integrated Catchment Management Association and Mackay Area Fish Stocking Association seeking funding to construct fishways in other areas within the Mackay Whitsunday Region. In general the Mackay community has become very aware of the need for rehabilitation of freshwater habitats and access to those habitats.

Fish Habitat Rehabilitation Handbook

To build on the successes of the Gooseponds Creek Fish Passage Project the Mackay Whitsunday Natural Resource Management Group and Pioneer Integrated Catchment Management Association in conjunction with the QFS initiated a project to identify, prioritise and co-ordinate freshwater fish habitat rehabilitation works in the Mackay Whitsunday Region. The Mackay Whitsunday Freshwater Fish Habitat Rehabilitation Strategy will bring together information and experiences from the Gooseponds Creek Fish Passage Project, the Rehabilitation of Freshwater Drains Project and the Reconstruction of Culverts and Causeways Project, as well as information from other fisheries projects throughout the state. This information will be combined to produce a handbook that will outline:

- The past and present condition of fish communities of the region.
- Identify the key threatening processes to these fish communities.
- Prioritise areas in need of rehabilitation.
- Outline the habitat rehabilitation approvals process.
- Provide techniques for successful rehabilitation.

This handbook will be the first to provide in-depth information on the condition and rehabilitation strategies for freshwater fish habitats in the Mackay Whitsunday Region. It will also provide a blueprint for community groups, local authorities and other Regional...
Strategy Groups to implement freshwater fish habitat rehabilitation strategies in the Mackay Whitsunday Region and other areas throughout the state.

Conclusions

The Gooseponds Creek Fish Passage Project has been a spectacular success in the Mackay Whitsunday Region. The project has become a major cornerstone of the Mackay Whitsunday Natural Resource Management Group’s Healthy Waterways Initiative, giving vision and hope to groups trying to rehabilitate aquatic ecosystems in the region.

The project has successfully passed thousands of fish through the seven barriers in Gooseponds Creek that previously blocked passage to the whole system. This has allowed the juveniles of numerous species of fish to access this vital nursery habitat in the lower Pioneer River System. This will eventually lead to an increase in the productivity of the whole system, resulting in a more healthy fish community in the Pioneer River System.

The project has also ensured that the community is aware of the consequences of inadequate fish passage in local streams. Limiting fish passage, even with small barriers, reduces fisheries productivity as populations are unable to expand to their maximum potential. Having recognised this problem the community of the Mackay Whitsunday Region have become active in ensuring further fishways are built to rehabilitate fish habitats in local streams.

In the past, the construction cost of fishways has been a major issue as they were considered to be very expensive. However, with each of the fishways in the Gooseponds Creek Project, costs were kept very low compared to fishways constructed in other areas. The project has successfully demonstrated that low cost/low technology fishways can be funded and built by community groups to provide effective solutions to fish passage.

The demonstrations sites of the Gooseponds Creek Project have effectively helped to transfer technology to community groups and local authorities. Many of groups in the Mackay Whitsunday area are actively planning new fishways to be constructed by the local community in their local areas.

Acknowledgments

The National Heritage Trust through the Mackay Whitsunday Natural Resource Management Group funded this study. Wayne Hagedoorn and Michael Kerslake provided extensive technical assistance and fieldwork. Rachel Mackenzie, Peter Jackson and Kristen Woods of the Queensland Fisheries Service reviewed and provided constructive and useful comment on the draft manuscript.

Special thanks go to Bill Disher (Pioneer River Improvement Trust) and John Clarke (Mackay City Council) who provided engineering advice during the design and construction of the fishways; Helen Paulsen (Mackay City Council) and Will Higham (Pioneer Integrated Catchment Management Association) who provided help with vegetation management; Woodco Services for providing reduced cost excavation services at all of the fishways; and Rocla Mackay for providing reduced cost culverts for Fishway No. 2.
The authors are particularly grateful to Julia Carpenter of the Mackay Whitsunday Natural Resource Management Group for initiating the project and supporting the team to implement fish habitat rehabilitation in the Mackay Region.

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Appendix 1

Examples of media articles published in relation to the Gooseponds Creek Fish Passage Project.
Fish flood in

By Tim sedan-Vaughan
The start of the wet season has heralded a flood of fish into Mackay waterways and justified the importance of recently constructed fishways along the Gooseponds Creek system.

Thousands of baby macquarie perch, blackfish, longtom, mullet, white and sea bass have flooded into Gooseponds Creek after last week’s deluge.

Queensland Fisheries biologists Tim Madden and Steve McGoff were delighted with the number and variety of fish species migrating into the Gooseponds Creek fishways system after record heavy rain across the district.

Another 3000 baby fish are planned for construction in the next three months from Finch Hatton, Ross, Ferrymead, the Lagoon and at Bellawale Creek, Williac.
Hooked

Geoff Orr

A NEW fishway has been constructed in the Mackay district to allow the free movement of native fish species.

"Yes days' work and $27,000 in State Government funding has resulted in Queensland's first rock ramp fishway being built on Mackay's Gooseponds Creek. Gooseponds Creek is an important fish nursery in the Pioneer River catchment.

Queensland Primary Industries Department senior fisheries biologist Tim Mansden, of Mackay, said the recently completed fishway was incorporated in a Pioneer River Improvement Trust project to replace a weir within the Gooseponds recreational reserve.

Under Queensland fisheries regulations, the new weir required a fishway and ODPI was approached to help with its design and construction.

"We started with a pile of rocks and an excavator," Mansden said. "With the assistance of PRIT's construction supervisor Bill Disher, Mackay City now has a very cost effective, green engineering solution to ensure the free movement of native fish species."

He said a fish survey had identified the area as a nursery for barramundi and other species, including tarpon, mullet, empire gudgeons, snakehead gudgeons, scats and eels.

"All these species need to migrate to maintain their populations," Mansden said.

"While the rock ramp fishway does have its limitations, it can be used to transfer fish through in-stream barriers to the high. The design mimics features of natural stream riffles.

"Its simplicity, ease of construction and inexpensive repair and maintenance opens the way for its use at literally thousands of statewide sites."

"This is particularly relevant in water courses severely degraded by urban and agricultural expansion."

Mansden said PRIT, Mackay City Council and QDPI Fisheries had now lodged a Natural Heritage Trust funding application to install six different fishway designs.

They would have a dual role for practical fish transfer and for public education as part of the Gooseponds beautification project.

Successful Natural Heritage Trust regional projects would be announced in September.

Mansden said the continuing DPI Fisheries survey of fish movement through the Pioneer River’s Dumbangton Weir fish lock had recorded the first entrapment of a rare jungle perch.

Like Australian bass, jungle perch spawns in estuarine waters and then returned to freshwater.

Most thinking anglers return these fine little sporting fish to the water unharmed. They are usually found in rainforest creeks and streams and respond well to lures.

FRIDAY, JUNE 30, 2000  THE COURIER-MAIL — 9
Mackay boasts State's first rock ramp fishway

PHW says work and $23,000 State Government funding support has moved Queensland's first rock ramp fishways built on Mackay's Gooseponds Creek, an important fish nursery habitat in the Pioneer River Catchment.

Queensland Fisheries Service senior fisheries biologist, Tim Murdoch, Mackay, said the recently completed fishway was incorporated in a Pioneer River Important Tour (PRT) project to replace an existing timber high weir within the Gooseponds recreational reserve.

Tim said under the State's Fisheries Act, the new weir required a fishway and DPI was approached to assist with the design and construction advice.

"We started with a pile of rocks and an idea around, and with the assistance of PHW's construction supervision, Bill Dobie, Mackay City now has a very cost effective, green engineering solution to manage the free movement of native fish species," he said.

Chinese delegation visits Gympie

DPI Olympic staff recently hosted a 15-member delegation from China researching fishery management and administration in the Beijing area. The purpose of the visit was to study Queensland's fishery management practices, including stock assessment, taxation and enforcement techniques. Members of the Chinese fisheries delegation were hosted by DPI's Fishery Officer, Bill Dobie, GDPI's Director Environmental and Fisheries Division and DPI's Chief Executive Officer, John Fearon.

Cuppa for cancer

Rockhampton Parliament DPI staff joined others with State Environmental Protection Agency, DPI colleagues in May for Australia's Biggest Morning Tea fundraiser to aid the Queensland Cancer Fund. Here at Parliament, the event which targeted the mostly well-dressed outdoor food staff recruitment area raised a cool $1,021 for the worthy cause thanks to the efforts of Queenslanders Prime 102.5 FM, The Gulf FM, 91.9 Capricorn FM, 88.5 FM, and DPI's Agency for Food and Fibre Science's Queensland Reef Industry Investment Project Officer, Tina Brookes.

Charters Towers DPI mentors UQ student

With some assistance from DPI staff at Charters Towers, a University of Queensland student has been awarded an Animal Science Problem Based Research into cattle grazing.

Pippa Clarkes, an Agricultural Science student at St Lucia, Brisbane, undertook her final-year project at the Wamboin research farm, part of the Charters Towers. The project titled "Plant species selection for cattle grazing a semi-arid tropical savannah", was completed under the supervision of DPI's Agency for Food and Fibre Science's Queensland Reef Industry Investment Project Officer, Dr Peter O'Sullivan.

Peter said Pippa's project provided some interesting results on time controlled grazing.

"The results showed that cattle followed a definite sequence of species selection with time spent in a paddock," he said.

"Cattle first grazed the most preferred species, then the species of intermediate palatability and largely ignored the species of low palatability." said Peter.

"This showed that, contrary to popular belief, cattle cannot be forced to graze the less preferred species in a paddock. When they do, it will always be at the expense of the better, more palatable species."
Green solution on fish movement
Appendix 2
An example of one of the educational signs erected at each of the fishways.
Appendix 3

Poster presented at the Sustaining our Aquatic Environments – Implementing Solutions National Conference and other conferences and workshops.
Appendix 4

Example of an abstract of scientific publication and powerpoint presentation for International Conferences.

Implementation of a strategic fish Passage restoration strategy for the Mackay Whitsunday Region.

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And
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Abstract

Within the Mackay Whitsunday region fish populations have been affected by widespread urban and agricultural development, leading to significant declines in habitat availability. Small freshwater streams are highly valued nursery habitats for juvenile fish, but are greatly affected by development. Species such as barramundi, mangrove jack and sea mullet utilise these small freshwater streams as food rich nurseries in which to grow, before returning to mainstream habitats.

The Mackay Whitsunday Regional Strategy Group has produced a fish passage restoration strategy that identifies streams in need of fish passage restoration, either through rehabilitation of linking habitats or by provision of passage at barriers. The Gooseponds Creek Fishways project is one project implementing this strategy “onground” through the construction of a number of fishways on weirs within the Gooseponds Creek system. These fishways enable juvenile fish to reach habitat alienated by barriers within the system, with results of sampling showing up to 500 fish per hour moving upstream through the fishways, highlighting the need for habitat linkage within these small streams. This project is also providing an education focus for community groups, local councils and private landholders, to enable further implementation of the regional fish passage restoration strategy.

The fishways built within the Gooseponds Creek recreation area demonstrate the ability of community groups to successfully fund and construct fishways that can pass thousands of fish per year, providing a highly visible display of the community commitment to the improvement of the fisheries productivity of the streams of the Mackay Whitsunday region.
Implementation of a Strategic Fish Passage Restoration Strategy for the Mackay Whitsunday Region

Tim Maraden, Dave McGill and Garry Thorncroft

Mackay Whitsunday Region

Dumbleton Weir

Life Cycle of Barramundi

Strategic Fish Passage Restoration Strategy

- Focus was on large streams, which had few barriers (>20 in region)
- Large streams require high cost, high technology fishways
- Little likelihood of construction of large stream fishways due to cost
- Small stream habitat rapidly diminishing due to barriers to migration (>2000 in region)
- Given one of this habitat high likelihood that fish communities affected
Future Directions

- Continue to further fisheries during annual XRT breeding cycle. Fishways currently at planning stage due to completion Year 2003.
- Complete identification and prioritisation of all barriers to migration including ground-truthing data collected.
- Collect additional historical data to identify species distributions and abundances.
- Collect recent scientific data to identify current species distributions and abundances.
- Produce a past and present condition of freshwater system Report (Jan 2002), which outlines changes, identifies problem areas and outlines future directions and priorities for rehabilitation.
- Continue to implement strategies throughout length of WNP, with funding for 3-5 fishways per year.