



Fitzroy Floodplain Lagoons Fish Surveys

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Bill Sawynok

Infofish Services PO Box 9793 Frenchville Qld 4701

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Front Cover photographs: (top) Electrofishing in Springers Lagoon during the May 2007 survey
(bottom) Spangled Perch electrofished in Springers Lagoon during the September 2006 survey.

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Table of Contents

Summary	4
1. Background	6
2. Objectives	6
3. Fitzroy Floodplain Lagoons	6
4. Methods	7
5. Results of Fish Surveys	9
5.1 Results of Electrofishing Surveys	9
5.2 Results of Castnet Surveys	10
6. Connectivity of Wetland Lagoons	11
6.1 Yeppen Lagoon	11
5.2 Springers Lagoon and Duck Pond	14
5.3 12 Mile Creek Lagoon	16
5.4 Larcom Vale Creek	18
7. Fish Survival in Wetlands	20
8. Use of Wetlands by Diadromous Species	22
9. References	24

List of Figures

Figure 1: Sites of Fitzroy Floodplain wetlands	7
Figure 2: Electrofishing at 12 Mile Creek Lagoon during April 2007	8
Figure 3: Castnetting at Springers Lagoon in October 2006	9
Figure 4: Connectivity of Yeppen Lagoon and Springers Lagoon to Gavial Creek	11
Figure 5: Electrofishing in Yeppen Lagoon in September 2006	12
Figure 6: Barramundi over 1m long electrofished in Yeppen Lagoon	13
Figure 7: Springers Lagoon	14
Figure 8: Duck Pond in September 2006	15
Figure 9: Duck Pond dry in May 2007	15
Figure 10: Connectivity of 12 Mile Creek and Larcom Vale Creek	16
Figure 11: 12 Mile Creek Lagoon in September 2006	17
Figure 12: Electrofishing in 12 Mile Creek Lagoon in April 2007	17
Figure 13: Section of Larcom Vale Creek electrofished	18
Figure 14: Section of Larcom Vale Creek surveyed by castnetting and heavily infested with hymenacne	19
Figure 15: Same section of Larcom Vale Creek following treatment of hymenacne	19
Figure 16: Barramunid electrofished in Larcom Vale Creek in September 2006	22
Figure 17: Mangrove Jack electrofished in Raglan Creek in 1999	23

List of Tables

Table 1: Summary of sites and surveys undertaken	7
Table 2: Species, numbers and sizes from castnetting survey at Duck Pond	10
Table 3: Species, numbers and sizes from castnetting survey at Larcom Vale Creek in June 2007	11

Summary

As part of the Great Barrier Reef Coastal Wetlands Protection Plan (GBRCWPP) the Fitzroy Basin Association (FBA) and the Great Barrier Reef Marine Park Authority agreed to co-invest in a project to improve wetlands on the southern Fitzroy floodplain. The floodplain is primarily used for grazing with the wetlands having been impacted by grazing management practices.

Works proposed to improve the wetlands reflect the ecological impacts and key management challenges of this landscape. These primarily include strategic fencing, grazing, managing fire risk and woody weed control. It was also considered that a fish fauna survey was required to provide information of the use of wetlands by fish and how this may relate to future management strategies.

Four key wetlands that were considered to be representative of the floodplain wetlands were selected. Surveys were proposed before and during the wet season to assess connectivity to the marine system and to profile the key fish species using the wetland lagoons.

The wetland lagoons selected were:

- Yeppen Lagoon (floodplain lagoon)
- Springers Lagoon (floodplain lagoon)
- 12 Mile Creek Lagoon (instream lagoon)
- Larcom Vale Creek (instream lagoon)

Surveys were conducted by electrofishing and/or castnetting to obtain a representative sample of the fish in the lagoons. Species, numbers and size profiles were obtained for surveyed species. Use of the wetland lagoons by diadromous species and connectivity to the marine system were assessed along with survival of fish in the wetland lagoons over the period September 2006 to June 2007 along with providing a historical perspective.

Due to the drought conditions only Larcom Vale Creek was connected to the marine system during the study period and then only from September 2006 to January 2007. None of the other lagoons were connected to the marine system which is likely to be the first time in at least 25 years that none of these have been connected for at least some of the time. The dry conditions meant that the lagoons were lower and in a poorer state at the end to the wet season than at the start, especially 12 Mile Lagoon, which is an unprecedented occurrence. The 12 Mile Lagoon was likely to dry up completely however rain in June 2007 has filled the lagoon again.

As a result there was no migration in or out of the lagoons and only limited opportunities for migration at Larcom Vale Creek. It is also likely that this would have reduced breeding by potamodromous species as flows are likely to trigger breeding for a number of species.

There was some evidence of breeding of Bony Bream in Larcom Vale Creek with the presence of fish in the 50-80mm size range in the May 2007 survey while fish in that size range were absent in the September 2006 survey. There was no evidence of Bony Bream breeding at the other lagoons.

It is possible that other potamodromous species also bred during the wet season however there is limited evidence to support this. In Larcom Vale

Creek there were 26 Eastern Rainbowfish from 22-46mm in the June 2007 castnetting survey indicating that there may have been an earlier spawning.

There was an increase in fish abundance at the end of the wet season at 3 of the 4 sites. CPUE from the electrofishing surveys at Yeppen Lagoon increased by 97%, at Springers Lagoon it increased by 142%, at Larcom Vale Creek it increased by 133% while at 12 Mile Lagoon it decreased by 595%. The 12 Mile Lagoon was in the poorest state with no connectivity to the marine system and a drop of greater than 1m in the water level.

Diadromous species were surveyed at all sites with 3 species recorded in Springers Lagoon ranging through to 10 species in Larcom Vale Creek. The number of diadromous species is related to the level of connectivity from the lagoons to the marine system with Springers Lagoon having the least connectivity and Larcom Vale Creek having the greatest connectivity.

Diadromous high level predatory species Barramundi were recorded in Yeppen Lagoon and Larcom Vale Creek however the fish in Yeppen Lagoon were possibly from a stocking that occurred in 2000. Anecdotal information suggests that there were Barramundi at all sites following the 1991 flood but they have not been recorded from Springers Lagoon and 12 Mile Lagoon in the past 10 years.

The other predatory species, Tarpon, were recorded in both Larcom Vale Creek and 12 Mile Lagoon and they were recorded in Yeppen Lagoon through to at least 1990 and were still present for a number of years after the 1991 flood.

Another predatory species, Mangrove Jack, have previously been recorded in Larcom Vale Creek but was not recorded in any of the surveys.

While fish abundance remained robust in Larcom Vale Creek there was a significant change in the use of part of the creek by fish. The upper reaches of the creek were severely impacted by Hymenacne during the initial survey in September 2006 with no fish being recorded in a castnetting survey at that time. Following the treatment of the Hymenacne the survey was repeated in June 2007 with 70 fish of 5 species being recorded. This provided evidence of the effect of Hymenacne on fish habitat and the need to address this impact if fish habitat is to be improved.

Fitzroy Floodplain Lagoons Fish Surveys

1. Background

Key freshwater wetlands along the coast adjacent to the Great Barrier Reef that were important to marine fish were identified for inclusion under the Great Barrier Reef Coastal Wetlands Protection Plan (GBRCWPP) (Veitch and Sawynok 2005).

As part of the GBRCWPP the Fitzroy Basin Association (FBA) and the Great Barrier Reef Marine Park Authority (GBRMPA) agreed to co-invest in a project to improve wetlands on the southern Fitzroy floodplain. The floodplain is primarily used for grazing with the wetlands having been impacted by grazing management practices.

Works proposed to improve the wetlands reflect the ecological impacts and key management challenges of this landscape. These primarily include strategic fencing, grazing, managing fire risk and woody weed control. It was also considered that a fish fauna survey was required to provide information of the use of wetlands by fish and how this may relate to future management strategies.

2. Objectives

The objectives of the lagoon surveys were to address the following:

- Species numbers and size profile of key species
- Fish survival in wetlands
- Use of wetlands by diadromous fish species
- Connectivity of wetlands to estuarine system

Objective 2 was modified from "dry season fish survival" to "fish survival in wetlands" to allow an assessment of fish survival over the survey period.

3. Fitzroy Floodplain Lagoons

Wetlands on the Fitzroy River floodplain were identified as part of a submission to GBRCWPP to improve the functioning of wetlands. A review of the proposed wetlands to be surveyed was undertaken in August 2006, in conjunction with FRCC and Jim Tait of Econcern. Due to the dry conditions and low water levels at a number of the potential lagoons, these were not considered suitable for survey.

The wetland lagoons selected were (*Figure 1*):

- Yeppen Lagoon (floodplain lagoon)
- Springers Lagoon (floodplain lagoon)
- 12 Mile Creek Lagoon (instream lagoon)
- Larcom Vale Creek (instream lagoon)



Figure 1: Sites of Fitzroy Floodplain wetlands

4. Methods

For the selected wetland lagoons it was proposed that they be surveyed twice, once during the dry season from September to October 2006 and once during the wet season period from February to April 2007. This would provide a comparison of fish species composition and abundance under different seasonal conditions.

For each of the wetlands connectivity to the marine system was assessed. This was done by examination of satellite imagery, aerial photography and ground survey.

As part of examining connectivity the Duck Pond was sampled to provide a comparison of species composition with Springers Lagoon and with the brackish lagoon on 12 Mile Creek to provide a comparison with the freshwater 12 Mile Creek Lagoon. Each site was surveyed by electrofishing, castnetting or both.

Table 1: Summary of sites and surveys undertaken

Site	Sept 2006 (Dry Season)	May 2007 (Wet season)
Yeppen Lagoon	Electrofishing	Electrofishing
Springers Lagoon	Electrofishing/Castnetting	Electrofishing
12 Mile Lagoon	Electrofishing	Electrofishing
Larcom Vale Creek	Electrofishing/Castnetting	Electrofishing/Castnetting
Duck Pond	Castnetting	
12 Mile Creek	Castnetting	Castnetting

Electrofishing surveys (*Figure 2*) were carried out by the Northern Fish Community and Fishway Monitoring Team, Fisheries and Aquaculture Development Group, Department of Primary Industries (DPI&F) based in Mackay. Separate reports have been provided by the DPI&F which include the detailed methodology used for the electrofishing surveys.



Figure 2: Electrofishing at 12 Mile Creek Lagoon during April 2007

Castnet surveys were carried out by Infotish Services. A standard nylon castnet with 20mm mesh and a 2.4m drop was used. The maximum area covered by the castnet is 18m² and most casts cover around 15m² or more (*Figure 3*). At each site up to 20 casts were made depending on the site size. For each cast the number of fish, species and fork length of each fish (or subset where there were in excess of 50 fish/cast) were recorded.

Castnet surveys were not conducted at Yeppen Lagoon or 12 Mile Lagoon. It was considered that the electrofishing surveys were adequate to obtain a representative sample of the fish populations in these lagoons.

A castnet survey was undertaken at Springers Lagoon in October 2006 however this produced a very limited result as the area able to be covered by castnet was very limited when compared to the electrofishing survey.

It was considered that the most appropriate use of castnetting was in areas where it was not possible to conduct electrofishing.

A castnet survey was undertaken at Duck Pond (*Figure 8*) to provide a comparison with species composition at Springers Lagoon. A repeat survey was proposed in May 2007 however by that time with the lack of rain the Duck Pond had completely dried (*Figure 9*).



Figure 3: Castnetting at Springers Lagoon in October 2006

A castnet survey was also undertaken in Larcom Vale Creek in October 2006 in the area severely infested by *Hymenacne* as this area was unable to be surveyed by electrofishing. A castnet survey was repeated in June 2007 in the same area following treatment of the *Hymenacne*.

Results of the castnet surveys are given as catch per unit effort (CPUE). CPUE is a measure of abundance that allows a comparison of results between sites and from successive surveys. CPUE from these surveys is the number of fish per cast.

CPUE from the electrofishing and castnetting cannot be directly compared but the results are indicative of fish abundance in the areas surveyed.

5. Results of Fish Surveys

5.1 Results of Electrofishing Surveys

Two separate reports have been prepared by the DPI&F covering the electrofishing surveys (Power and Marsden September 2006, June 2007). Details of the results of those surveys are contained in those reports however reference is made in relation to fish abundance, species composition and size ranges in this report.

5.2 Results of Castnet Surveys

Springers Lagoon

In September 2006 at Springers Lagoon a total of 20 casts with the castnet resulted in 3 Spangled Perch ranging in size from 88-120mm. The area able to be survey by castnet was very limited compared to the area covered by electrofishing. It was therefore considered that only the electrofishing data would be used at that site.

Duck Pond

In September 2006 at Duck Pond a total of 20 casts resulted in 29 fish of 4 fish species (*Table 2*), 8 freshwater shrimp and 3 freshwater turtle. No castnetting survey was possible in May 2007 as the Duck Pond had dried up.

Table 2: Species, numbers and sizes from castnetting survey at Duck Pond

Species	Number	Min Size (FL)	Max Size (FL)	Average (FL)
Diadromous Species				
Bony Bream (<i>Nematalosa erebi</i>)	16	65	122	103.5
Potoamodromous Species				
Banded Grunter (<i>Amniataba percoides</i>)	6	70	136	103.5
Hyrtl Tandan (<i>Neosilurus hyrtlii</i>)	5	155	185	171
Sleepy Cod (<i>Oxyeleotris lineata</i>)	2	280	280	280
Total	29			
CPUE (fish/cast)	1.45			

12 Mile Creek

Electrofishing only was conducted at the 12 Mile Creek lagoon. Castnetting was carried out in the brackish waterhole at the upper tidal limit of the creek. In October 2006 at the brackish waterhole 20 casts resulted in 12 Bony Bream (*Nematalosa erebi*) and 1 Sea Mullet (*Mugil cephalus*). CPUE was 0.65 fish/cast.

A further castnetting survey in February 2007 resulted in nil fish being caught. Between October 2006 and February 2007 there was very little rain and runoff and the water level dropped by greater than 1m. Most fish died in a fish kill in January 2007. This situation did not change through to May 2007 however the lagoon was filled by rain in June 2007.

Larcom Vale Creek

The castnetting survey was carried out in the area heavily infested with Hymenacne. In October 2006 at Larcom Vale Creek a total of 20 casts resulted in nil fish caught. In June 2007 another survey was undertaken in the same area and 20 casts resulted in a total of 70 fish of 6 species as shown in *Table 3*. The CPUE was 3.5 fish/cast.

Table 3: Species, numbers and sizes from castnetting survey at Larcom Vale Creek in June 2007

Species	Number	Min Size (FL)	Max Size (FL)	Average (FL)
Diadromous Species				
Bony Bream (<i>Nematalosa erebi</i>)	5	57	65	60.8
Empire Gudgeon (<i>Hyseleotris compressa</i>)	4	48	74	65.3
Potoamodromous Species				
Eastern Rainbowfish (<i>Melanotaenia splendida</i>)	26	22	46	31.0
Flyspeckled Hardyhead (<i>Craterocephalus stercusmuscaum ste</i>)	33	20	43	29.4
Glass Perchlet (<i>Ambassis agassizi</i>)	1	42		
Mosquitofish (<i>Gambusia holbrooki</i>)	1	28		
Total	70			
CPUE (fish/cast)	3.5			

6. Connectivity of Wetland Lagoons

6.1 Yeppen Lagoon

Yeppen Lagoon connects to Gavial Creek through two other lagoons being the Woolwash Lagoon and Frogmore Lagoon then joins Gavial Creek. Yeppen Lagoon is approximately 9.7km from the upper tidal limit of Gavial Creek and approximately 2.9km upstream from Woolwash Lagoon (Figure 4).

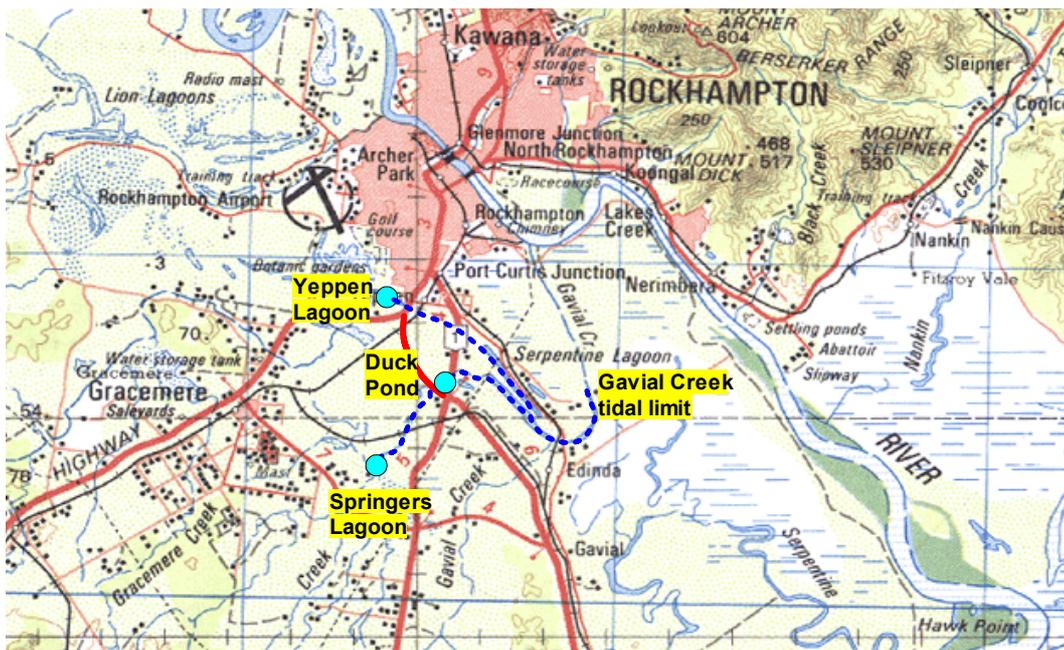


Figure 4: Connectivity of Yeppen Lagoon and Springers Lagoon to Gavial Creek

There are no significant artificial barriers that restrict connectivity of Yeppen Lagoon to Gavial Creek and the greatest impediment to fish movement is the 2.9km of dry watercourse between lagoons. There is one concrete culvert on the old Bruce Highway near the Hasting Deering site however this does not significantly impede fish movement.

In the past Woolwash Lagoon and Frogmore Lagoon were permanent freshwater lagoons. Barramundi were tagged in these lagoons from around 1998 to 2006 (Sawynok 2002, 2003, 2004, 2005; Suntag 2007). The last Barramundi tagged in Woolwash Lagoon was in March 2004. Around May 2005 there was a major fish kill in Woolwash Lagoon before it dried completely. It has remained dry since that time.

Frogmore Lagoon continued to hold fish until a major fish kill there in May 2006 and the lagoon also dried up in early 2007. The last Barramundi tagged in Frogmore Lagoon was in December 2005.

While the Woolwash and Yeppen Lagoons dried up Yeppen Lagoon has continued to hold water. Yeppen Lagoon receives water in a number of ways. Runoff from rainfall events however the catchment for the lagoon is very localised and small. Seepage from the adjacent urban areas of Rockhampton also provides water to the lagoon and is likely to be the reason it still has water while other lagoons have dried up.

Water from the Fitzroy River will back up Gavial Creek during moderate flooding when flows in the river are around 2 million megalitres and river heights exceed 7m (Sawynok 1998, 2002). This last occurred in 2003 however water only backed up to Frogmore and Woolwash Lagoons. The last time water backed up to Yeppen Lagoon was possibly in 2000.



Figure 5: Electrofishing in Yeppen Lagoon in September 2006



Figure 6: Barramundi over 1m long electrofished in Yeppen Lagoon

During major flooding events the Fitzroy River breaks its banks upstream from Rockhampton and flows across the floodplain, filling all the lagoons including Yeppen before linking back up with the estuarine reaches of the river. The last time this occurred was in 1991.

From 1998 to 2000 there were 9 flow events in the Fitzroy River where flows were around 2 million megalitres or greater where Woolwash Lagoon. Frogmore Lagoon and possibly Yeppen Lagoon were likely to have been connected to Gavial Creek and allowed recruitment of diadromous species to the lagoons. Since 2000 there has been no external recruitment of fish to Yeppen Lagoon. In 2000 there were around 1,000 Barramundi fingerlings stocked into Yeppen Lagoon (Shaun Pobar pers comm).

The electrofishing surveys (*Figure 5*) recorded 6 very large Barramundi in Yeppen Lagoon all over 1m in length (*Figure 6*) in the September 2006 survey and 1 fish in the May 2007 survey. These fish are likely to be the remnants of the stocking in 2000. The survey recorded a total of 5 diadromous species with the others being Sea Mullet, Bony Bream, Longtom, Forktail Catfish and Long-finned Eel which indicates at least a degree of connectivity.

From around 1988-2000 with high river flows of over 2 million megalitres it was possible for connectivity of Yeppen Lagoon to Gavial Creek to occur every 2-3 years however for the past 7 years there has been no connectivity.

5.2 Springers Lagoon and Duck Pond

Springers Lagoon (*Figure 7*) is on Teatree Creek which flows across the Fitzroy River floodplain through a poorly defined depression to join Scrubby Creek, then Frogmore Lagoon and finally Gavial Creek. It is approximately 9.4km upstream from the upper tidal limit of Gavial Creek and approximately 2.9km from the Duck Pond which is normally the next body of permanent or semi-permanent water below Springers Lagoon (*Figure 4*).



Figure 7: Springers Lagoon

There are two artificial barriers to connectivity between Springers Lagoon and the Duck Pond. There is a concrete road causeway immediately below the railway line just downstream of Springers Lagoon. This causeway has a single round culvert and FRCC is currently addressing improving connectivity. The other barrier is a wall built to pond water just upstream of the Bruce Highway. However this wall allows water to flow around it so is unlikely to be a significant impediment. There is also a culvert downstream from the Duck Pond that impedes fish movement. The Northern Fish Community and Fishway Monitoring Team will be addressing these barriers under contract from FRCC in 2007/08.

There are two ways that Springers Lagoon can connect to Gavial Creek. Runoff from rainfall events, however the catchment for the lagoon is not large and requires a significant rainfall event, probably in excess of 100mm, before it will connect through to the Duck Pond. As with other lagoons on the floodplain during major flooding events the lagoon will fill when Fitzroy River breaks its banks upstream from Rockhampton and flows across the floodplain. The last time this occurred was in 1991.

Duck Pond is further downstream from Springers Lagoon and is the next lagoon that is permanent or at least semi-permanent. As well as receiving water in the same way as Springers Lagoon the Duck Pond also fills when moderate flooding occurs in the Fitzroy and backs up through the lagoon system.



Figure 8: Duck Pond in September 2006



Figure 9: Duck Pond dry in May 2007

Anecdotal information indicates that Barramundi were in Springers Lagoon following the 1991 flood however there has been no record or anecdotal information that indicates they have been in the lagoon in the past 10 years. There were 3 diadromous species recorded in the 2 electrofishing surveys of Springers Lagoon. Two of these were Eel species which can migrate beyond obstacles that impede other species.

The surveys showed that there were 3 species recorded at both Duck Ponds and Springers Lagoon. Only 4 species were recorded at Duck Pond however this may be the result of a very small pool of water remaining and many of the smaller species may have been eaten by the larger predatory fish. There were no diadromous species recorded in Duck Pond even though it has greater connectivity to the estuarine system than Springers Lagoon.

The drought conditions that have prevailed for the past few years continued between the surveys in September 2006 and May 2007 with well below average rainfall each month over the wet season. This results in no flow out of Springers Lagoon and the drying up of the Duck Pond.

5.3 12 Mile Creek Lagoon

The 12 Mile Creek Lagoon is a freshwater lagoon on the southern side of the Bruce Highway and is the last permanent water in the creek upstream from the estuary (Figure 10). It is 2.8km upstream from the upper tidal limit on 12 Mile Creek and about 1.0km from the next downstream freshwater lagoon which extends to just above the tidal limit. The catchment area of 12 Mile Creek is small being only 80km². Connectivity between the 12 Mile Creek Lagoon and the downstream estuary only occurs following significant rainfall events of around 100mm or more (Sawynok 2002).

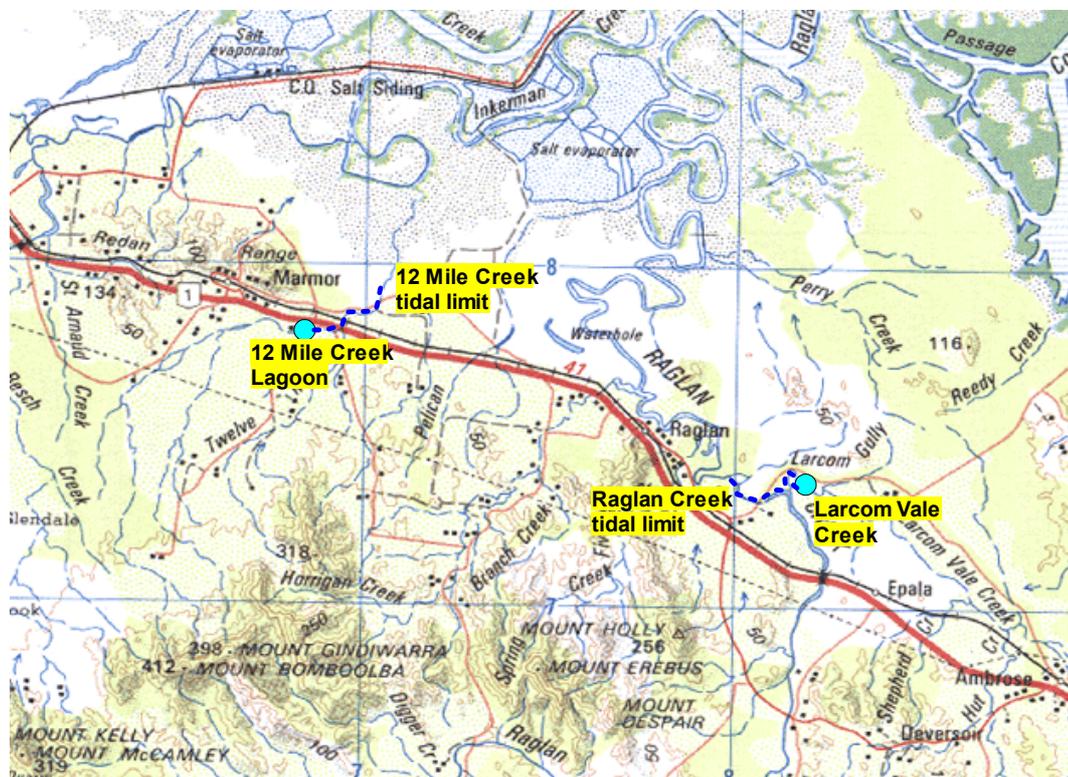


Figure 10: Connectivity of 12 Mile Creek and Larcom Vale Creek



Figure 11: 12 Mile Creek Lagoon in September 2006



Figure 12: Electrofishing in 12 Mile Creek Lagoon in April 2007

Rainfall data is available for 12 Mile Creek from the adjacent Cheetham Saltworks with the gauge within the catchment of the creek. Monitoring of fish in the downstream brackish lagoon at the tidal limit has been going on for over 20 years (Sawynok 1998, 2002, 2003, 2004 and 2005). Fish use of the lower section of 12 Mile Creek is better known than any other Central Queensland site. However no information has been previously documented from the 12 Mile Creek Lagoon.

There are no significant barriers to fish movement between the 12 Mile Creek Lagoon and the tidal lagoon. Para grass in the creek bed immediately below the freshwater lagoon may inhibit fish passage at times. The creek passes under the Bruce Highway and the North Coast Railway line however both have adequate culverts that allow fish passage during flows. There is a gravel crossing on 12 Mile Creek Road but this does not impede migration during flows.

From October 2006 to May 2007 rainfall was significantly below average, with a maximum monthly rainfall of 58mm in December 2006 (Cheetham Saltworks rainfall data) and there was no flow in 12 Mile Creek. This is rare as in most years there is at least some flow. Four diadromous species were recorded in the 12 Mile Creek lagoon including Tarpon (*Megalops cyprinoides*) however no Barramundi were caught. Barramundi and Tarpon were recorded in this lagoon following the 1991 flood (per obs) however no recording of Barramundi have been made in the last 10 years. Tarpon have been recorded consistently from 1991 to the present time (pers obs).

5.4 Larcom Vale Creek

Larcom Vale Creek is a tributary of Raglan Creek and is part of a large lagoon on Raglan Creek known as Black Lagoon. Larcom Vale Creek is approximately 2.5km above the upper tidal limit of Raglan Creek. Black Lagoon is separated from a much smaller downstream lagoon below Raglan Station Road. From this downstream lagoon it is about 1.0km to the upper tidal limit.



Figure 13: Section of Larcom Vale Creek electrofished



Figure 14: Section of Larcom Vale Creek surveyed by castnetting and heavily infested with hyacinth



Figure 15: Same section of Larcom Vale Creek following treatment of hyacinth

Raglan Creek is a spring fed stream that has traditionally flowed all year round however in the past 2 years has stopped flowing on a number of occasions.

In 2003 the old wooden bridge on Raglan Station Road over Raglan Creek was upgraded to a concrete culvert. This resulted in a significant barrier to fish movement by creating a 300mm drop at the bottom end of the culvert. In 2005 the FBA arranged for a rock ramp fishway to be installed and this has allowed fish passage when water has flowed over the fishway. DPI&F have monitored fish movement through the fishway and shown use by a range of species at very small sizes including diadromous species such as Sea Mullet (Power and Marsden 2007).

The electrofishing surveys were carried out in Larcom Vale Creek which joins Raglan Creek above Raglan Station Road. The survey recorded 10 diadromous species which is the largest number recorded at any site. The initial electrofishing survey in September 2006 went as far up the creek as the boat could go. Further progress upstream was prevented by dense Hymenacne. Above the area electrofished a castnetting survey was carried out in October 2006. This was in the area heavy infested with Hymenacne. No fish at all were recorded during that survey yet immediately below that area there was an abundance of fish recorded by electrofishing. The follow up castnetting survey in June 2007 resulted in 70 fish of 5 species being recorded.

Larcom Vale Creek was the only site where naturally recruited Barramundi (*Lates calcarifer*) were recorded with 14 fish recorded in the initial electrofishing survey and 3 in the second survey. A total of 862 Barramundi have been tagged in Black Lagoon since 1988/89 with fish being tagged in every year. Of 58 recaptures of these fish 21 were recaptured in the lagoon while 37 (63.8%) have been recaptured downstream in the marine system (Suntag 2007). This indicates the high level of connectivity with the marine system.

7. Fish Survival in Wetlands

The normal weather cycle in this region is a dry winter with little rainfall followed by storms generally starting in October. This storm build up lasts through to December when wet season rainfall occurs, which usually results in the heaviest rainfall events in the yearly cycle. Wetland lagoons on the Fitzroy floodplain are generally disconnected from the marine system during winter and spring and connect up in late spring, summer and autumn following significant rainfall events.

Fish populations fluctuate in accordance with this cycle. During the dry season when the wetlands are disconnected fish populations generally decrease due to mortality from predation by fish and birds and reach a low level of generally larger fish in late spring. When the wetlands connect to the marine system diadromous fish migrate to the wetlands and many potamodromous species breed. This results in a significant increase in the fish populations in wetlands during the wet season.

Over the past 4 years there have been drought conditions with much less than average rainfall, particularly during the wet season. During those years Raglan Creek flowed all year round in the first two years however flows have been interrupted in the last 2 years. The 12 Mile Lagoon was connected to the marine system for at least brief periods in all but the last year. Yeppen

Lagoon was not connected at all during those years. Springers Lagoon may have been briefly connected but not sufficiently to allow fish migration upstream, except for perhaps Eels.

During the 2006-07 year rainfall was even less than in previous years. With the dry preceding years water levels were low towards the end of winter and early spring (but not significantly different from the same time in previous years due to good rainfall in June 2006 – 145mm at 12 Mile Creek). With the failure of storm rains and very low levels of wet season rainfall only Raglan Creek was connected to the marine system for a period until around January 2007. It has not run since that time.

None of the remaining wetland lagoons were connected to the marine system during the wet season. This is the first time this has occurred, at least in the last 25 years (Sawynok per obs). This resulted in all lagoons being lower in May 2007 than in September 2006 with Duck Pond drying completely. The 12 Mile Lagoon was over 1m lower and was likely to dry up completely, however rain in June 2007 has filled the lagoon again.

While Springers Lagoon was only slightly lower at the time of the survey for much of the time from October 2006 – May 2007 the level was up to more than 1m lower than at the survey times.

This meant that there were no opportunities for diadromous species to migrate from the marine system to the lagoons, except for a period to Larcom Vale Creek, and breeding of potamodromous species was likely to have been limited with the very low water levels.

There was some evidence of breeding of Bony Bream in Larcom Vale Creek with the presence of fish in the 50-80mm size range in the May 2007 survey while fish in that size range were absent in the September 2006 survey. There was no evidence of Bony Bream breeding at the other lagoons.

It is possible that other potamodromous species also bred during the wet season however there is limited evidence to support this. In Larcom Vale Creek there were 26 Eastern Rainbowfish from 22-46mm in the June 2007 castnetting survey indicating that there may have been an earlier spawning.

There was an increase in fish abundance at the end of the wet season at 3 of the 4 sites. CPUE from the electrofishing surveys at Yeppen Lagoon increased by 97%, at Springers Lagoon it increased by 142%, at Larcom Vale Creek it increased by 133% while at 12 Mile Lagoon it decreased by 595%. The 12 Mile Lagoon was in the poorest state with no connectivity to the marine system and a drop of greater than 1m in the water level. There was no evidence of breeding of any species in that lagoon.

While fish abundance remained robust in Larcom Vale Creek there was a significant change recorded in the use of part of the creek by fish. The upper reaches of the creek were severely impacted by Hymenacne during the initial survey in September 2006 with no fish being recorded in the castnetting survey at that time. Following the treatment of the Hymenacne the survey was repeated in June 2007 with 70 fish of 5 species being recorded. This provided evidence of the effect of Hymenacne on fish habitat and the need to address this impact if fish habitat is to be improved.

8. Use of Wetlands by Diadromous Species

Diadromous species were surveyed at all sites with 3 species recorded in Springers Lagoon ranging through to 10 species in Larcom Vale Creek. The number of diadromous species is related to the level of connectivity from the lagoons to the marine system with Springers Lagoon having the least connectivity and Larcom Vale Creek having the greatest connectivity.

Diadromous high level predatory species Barramundi were recorded in Yeppen Lagoon and Larcom Vale Creek (*Figure 16*) however the fish in Yeppen Lagoon were possible from a stocking that occurred in 2000. Larcom Vale Creek is likely to be the only site where Barramundi have been naturally recruited. This is supported by tagging data which shows regular migration from the lagoon to the marine system. Anecdotal information suggests that there were Barramundi at all sites following the 1991 flood but they have not been recorded from Springers Lagoon and 12 Mile Lagoon in the past 10 years.



Figure 16: Barramundi electrofished in Larcom Vale Creek in September 2006

The other predatory species, Tarpon, was recorded in both Larcom Vale Creek and 12 Mile Lagoon and they were recorded in Yeppen Lagoon through to at least 1990 (Suntag 2007) and would have been present for several years after the 1991 flood.

Another diadromous predatory species, Mangrove Jack (*Lutjanus argentimaculatus*), has previously been recorded in Black Lagoon on Raglan Creek (*Figure 17*) (Russell et al 2003, Suntag 2007). Larcom Vale Creek is a tributary and part of the same lagoon. However Mangrove Jack was not recorded in any of the surveys. A specimen of around 500mm was caught in the adjacent Raglan Creek section of this lagoon in June 2007 indicating that the species is still present.



Figure 17: Mangrove Jack electrofished in Raglan Creek in 1999

9. References

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