



Lake Callemondah Tracking Stocked Barramundi



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Front Cover photographs: (top) The freshwater section of Lake Callemondah looking upstream from the dam wall and (bottom) saltwater tidal section of Auckland Creek below the Callemondah dam wall.

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Acknowledgements

The efforts of the Gladstone Area Water Board fish hatchery are acknowledged. The hatchery produces fingerlings that are used to stock local waterways. A world class fishery has been established for Barramundi stocked into Lake Awoonga however some of their other efforts are less well known. This includes the stocking of Lake Callemondah in the urban environs of Gladstone. The efforts of Ken Cowden and Andrew Hamilton in raising and supplying Barramundi fingerlings for stocking into Lake Callemondah and other waterways in Central Queensland are acknowledged.

Also acknowledged are the efforts of members of the Gladstone Sportfishing Club. Since 2000/01 club members have tagged Barramundi that have been stocked into Lake Callemondah. The efforts of Bob Pirie as Tagging Coordinator for the club are also acknowledged as his efforts in collecting the data have assisted in making this report possible.

Also acknowledged is the support of the Department of Primary Industries for their continuing support of the Suntag program. That program has made possible the collection and storage of data that has been used in this report.



Summary

Lake Callemondah is a small artificial freshwater water lake situated on Auckland Creek in the urban environs of Gladstone. The lake is fed by stormwaters flowing from the western residential suburbs of Gladstone, A low concrete and rock dam wall separates the impounded freshwater from the tidal reaches of Auckland Creek.

Barramundi fingerlings have been stocked into Lake Callemondah to create an urban Barramundi fishery. Fingerlings were produced by the local Gladstone Area Water Board hatchery and stocked into the lake from 1999. A total of 11 stockings have occurred since that time with about 19,869 Barramundi fingerlings released.

As these fish grow towards maturity they migrate to the saltwater when there is a freshwater flow or flooding and the water overtops the dam wall. As the dam wall is low the fish are able to negotiate this without serious damage

This stocking and subsequent tagging of some of the fish has provided a unique opportunity to examine fish stocked in freshwater and their subsequent distribution in the adjacent marine system.

In Lake Callemondah from 2000/01 to 2005/06 468 Barramundi have been tagged and 79 (16.9%) individual fish have been reported as recaptured. A total of 85 recaptures, including multiple recaptures of the same fish, have been reported. Most fish were tagged in 2001/02 and 2002/03 when 391 (83.5%) were tagged.

Growth was calculated for fish where the tag and recapture lengths were known and the fish were at liberty for more than 30 days. Of the 85 recaptures there were 70 (82.4%) where growth data was available.

The growth rate of stocked fish varies with an average growth rate of 152mm per year with most growths ranging from 50-250mm/year. This compares with growth rates of wild stock Barramundi in the Fitzroy River of from 223-329mm/year.

Fish grow at different rates through their lives and during different seasons. Young fish grow faster and the growth slows as they age. Fish estimated to be between one and two years of age grew at a rate of around 216mm per year, those two years and older at a rate of around 150mm. It is likely that fish less than one year of age grew at 300-500mm per year.

Of the recaptures, data on movement are available for 80 (93.0%) fish. A total of 36 (45.6%) fish were recaptured in Lake Callemondah while 43 (54.4%) were recaptured elsewhere in the adjacent marine system. A total of 20 (25.0%) fish were recaptured below the dam in the saltwater reaches of Auckland Creek and 23 (28.8%) fish were caught in Gladstone Harbour and adjacent estuaries. The greatest distance moved was 36km for a fish recaptured near the Bruce Highway in the Boyne River.

Prior to flooding in February 2003 26 of 27 recaptured tagged fish were recaptured in the lake. After the flooding, for fish tagged prior to the flow, 45 of the 49 recaptures were recaptured downstream in the saltwater. This shows that a high proportion of the stocked fish migrate to the marine system when opportunities arise.

Lake Callemondah

Tracking Stocked Barramundi

1. Background

Lake Callemondah is a small artificial freshwater water lake situated on Auckland Creek in the urban environs of Gladstone (*figure 1*). The lake is fed by stormwaters flowing from the western residential suburbs of Gladstone,



Figure 1: Lake Callemondah is situated in the urban environs of Gladstone near the airport (Google Earth image)

A low concrete and rock dam wall separates the impounded freshwater from the tidal part of Auckland Creek (*figure 2*). The surface area of the lake at Full Surface Level (FSL) is approximately 16.3ha.

Lake Callemondah remains at FSL most of the time and requires about 30-50mm of rain in the catchment to overflow (Bob Pirie *pers comm*). There are two overflow pipes (one at each end of the wall) that release water before the water flows over the wall (*figure 3*).

Barramundi occur naturally in the tidal section of Auckland Creek but are unable to access the freshwater section above the dam wall as there is no fishway to allow upstream migration. Prior to the construction of the wall, Barramundi are likely to have used the upper reaches of Auckland Creek as a nursery area for young fish. Stocking in the lake thus may in part mimic a natural process that once occurred.



Figure 2: Extent of Lake Callemondah and connection to Auckland Creek (Google Earth image)



Figure 3: Low flow event showing overtopping of the Callemondah dam wall

Barramundi fingerlings have been stocked into Lake Callemondah to create an urban Barramundi fishery. Fingerlings were produced by the local Gladstone Area Water Board hatchery and stocked into the lake from around late 1999. The Gladstone Sportfishing Club is the current holder of the permit to stock the lake with a maximum of 2,800 fish per year.

As these fish grow towards maturity they migrate to the saltwater when there is a freshwater flow or flooding and the water overtops the dam wall (*figure 3*). As the dam wall is low (around 2m) the fish are able to negotiate this without serious damage.

This stocking has provided a unique opportunity to examine fish stocked in freshwater and their subsequent distribution in the adjacent marine system.

2. Objectives

The objectives of this report are to examine the:

- The stocking that has occurred in Lake Callemondah.
- Growth rates of stocked fish.
- Distribution of stocked fish in the adjacent marine system.

3. Methods

The initial release of Barramundi fingerlings into Lake Callemondah was in late 1999 with fingerlings provided by the GAWB fish hatchery. There have been 11 releases of fingerlings since that time.

By 2000/01 the fish initially stocked had reached a size (*figure 4*) where they were able to be caught and members of the Gladstone Sportfishing Club commenced targeting and tagging these fish. Tagging of fish in the lake has continued since that time.

Tagging (*figure 5*) and the recording of recaptures have been carried out in accordance with the Work Instructions for Suntag as available from www.info-fish.net. Data have been stored in the Suntag database.

Data from recaptures were used to examine the growth rates of tagged fish. Annual growth was calculated by linear extrapolation of the difference in length when tagged and recaptured. Growth was only calculated for fish that had been at liberty for more than 30 days. Growth was assessed for fish based on approximate age.

Data from recaptures was also used to determine movement from the tag to the recapture location. The shortest distance, following a water route, between the tagging and recapture location was used to calculate the distance moved.

Monthly rainfall data were obtained for Gladstone Airport (Bureau of Meteorology 2007) as this is within the catchment of Auckland Creek. These data were used to assess the opportunities for fish to migrate from the lake to the saltwater. Where possible the most likely flow event when migration occurred was assessed by examining flows between dates of tagging and recapture.



Figure 4: John Platten with a typical Barramundi caught in Lake Callemondah



Figure 5: Typical tagged Barramundi in Lake Callemondah (tag circled)

4. Results

4.1 Barramundi Stocked in Lake Callemondah

Stocking of Barramundi fingerlings into Lake Callemondah commenced in late 1999 however detailed records of stocking are only available of stockings from November 2001 (Gladstone Area Water Board Hatchery 2007). The date, approximate size and numbers of Barramundi fingerlings stocked into Lake Callemondah are shown in *table 1*. Since that time a total of approximately 19,869 fish have been stocked.

SPECIES	DATE	SIZE (MM)	NUMBER
BARRAMUNDI	Late 1999	50	4000
BARRAMUNDI	Late 2000	50	4000
BARRAMUNDI	16-Nov-01	50	300
BARRAMUNDI	12-Dec-01	45	3700
BARRAMUNDI	20-Dec-02	38	2312
BARRAMUNDI	20-Dec-02	38	280
BARRAMUNDI	08-Apr-03	50	1700
BARRAMUNDI	13-Jan-04	85	1062
BARRAMUNDI	08-Dec-04	75	785
BARRAMUNDI	17-Dec-04	85	480
BARRAMUNDI	23-Dec-04	55	1250
TOTAL			19869

Table 1: Barramundi stocked into Lake Callemondah

4.2 Stocked Barramundi Tagged and Recaptured

In Lake Callemondah from 2000/01 to 2005/06 468 Barramundi have been tagged and 79 (16.9%) individual fish have been reported as recaptured. Most fish were tagged in 2001/02 and 2002/03 when 391 (83.5%) were tagged. *Table 2* shows the number of fish tagged each year and the number from each year that were later recaptured.

Of the 79 recaptures 36 (45.6%) were in Lake Callemondah while 43 (54.4%) were recaptured elsewhere in the adjacent marine system.

YEAR	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	TOTAL
TAGGED	6	281	110	4	16	51	468
RECAPTURED	6	55	14	0	1	3	79
RECAPTURED IN LAKE	5	27	1	0	1	2	36
RECAPTURED ELSEWHERE	1	28	13	0	0	1	43
MULTIPLE RECAPTURES	0	6	0	0	0	0	6

Table 2: Fish tagged each year and later recaptured

4.3 Size of Fish Tagged

Of the 468 fish tagged the total length (TL) at tagging was available for 420 (89.7%). *Figure 6* shows the sizes of fish stocked and later tagged over time while *figure 7* shows the size range of tagged fish.

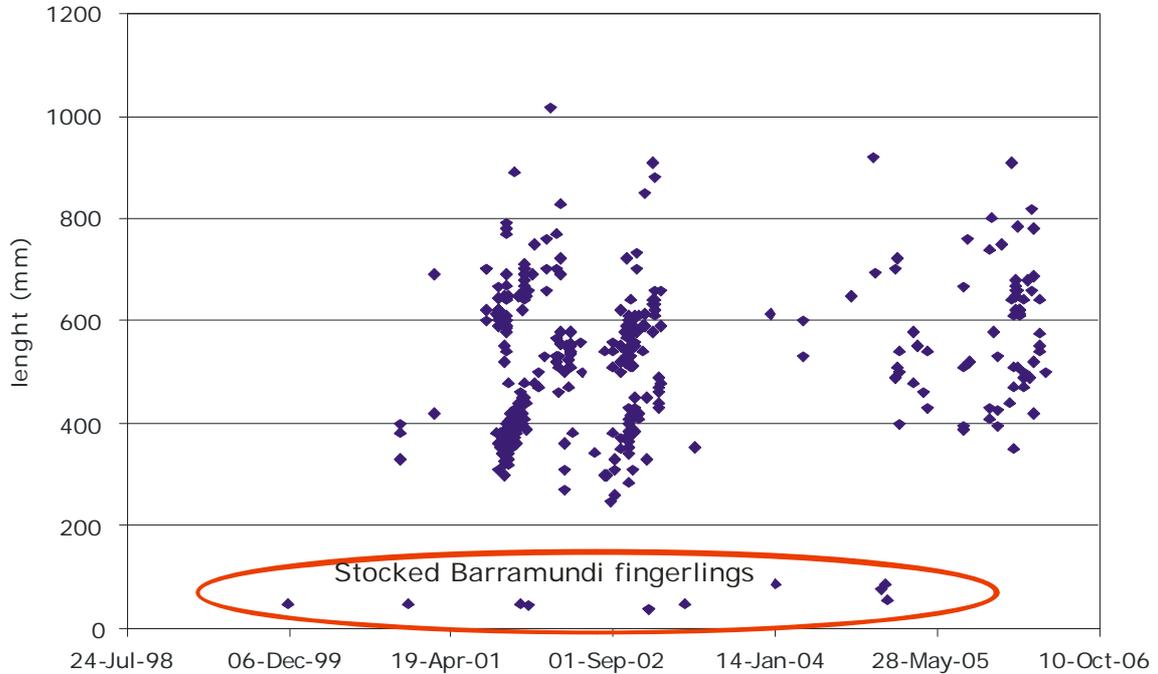


Figure 6: Sizes of Lake Callemondah Barramundi stocked and later tagged over time

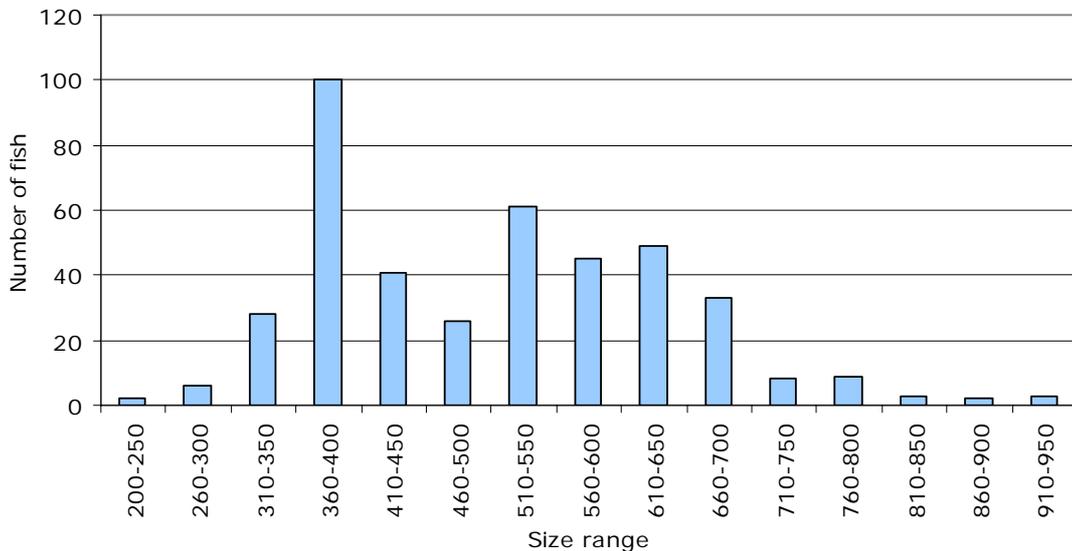


Figure 7: Size range of Barramundi tagged in Lake Callemondah

4.4 Growth of Stocked Fish

Growth was calculated for fish where the tag and recapture lengths were known and the fish were at liberty for more than 30 days. Of the 85 recaptures there were 70 (82.4%) where growth data was available. *Figure 8* shows the calculated annual growth rate based on the estimated age of the fish on recapture.

The growth rate of stocked fish varies with an average growth rate of 152mm per year with most growths ranging from 50-250mm/year. This compares with growth rates of wild stock Barramundi in the Fitzroy River of from 223-329mm/year (Sawynok 1998).

Fish grow at different rates through their lives and during different seasons. Young fish grow faster and the growth slows as they age. Fish estimated to be between one and two years of age grew at a rate of around 216mm per year, those two years and older at a rate of around 150mm (*figure 8*). It is likely that fish less than one year of age grew at 300-500mm per year.

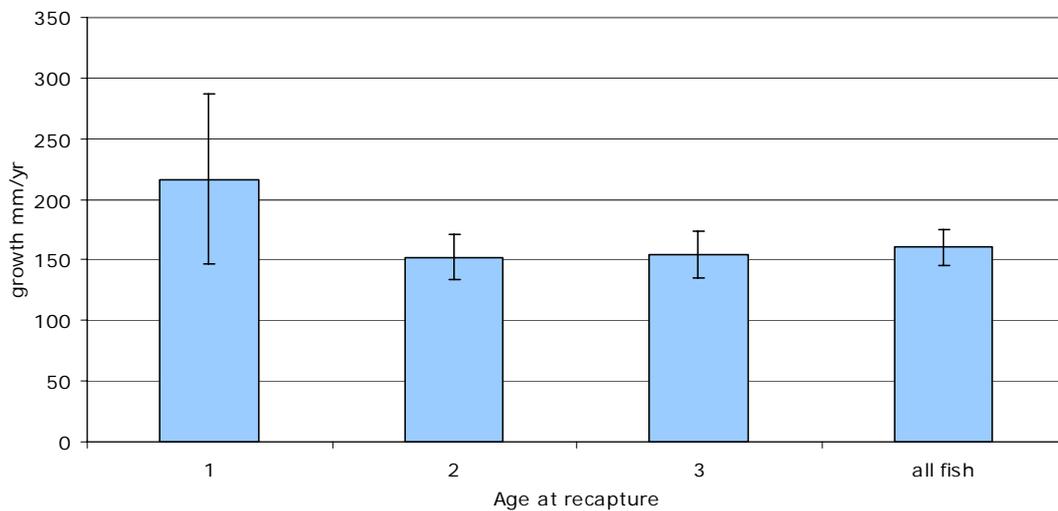


Figure 8: Annual growth of Barramundi stocked in Lake Callemondah based on estimated age at recapture

4.5 Movement of Stocked Barramundi

A total of 85 recaptures, including multiple recaptures of the same fish, have been reported. Of these, data on movement are available for 80 (93.0%) fish and *figure 9* shows the distance fish were recaptured away from the tagging location.

A total of 36 (45.6%) fish were recaptured in Lake Callemondah and are shown as having moved 0km. A total of 20 (25.0%) fish were recaptured from 1-8km down the creek in the saltwater section of Auckland Creek. A total of 23 (28.8%) fish were caught at distances greater than 8km in Gladstone Harbour and adjacent estuaries (*figure 10*). The greatest distance moved was 36km for a fish recaptured near the Bruce Highway in the Boyne River.

Figure 11 shows the monthly rainfall at Gladstone Airport in the Auckland Creek catchment and Barramundi sizes. While it only requires 30-50mm of rainfall in the catchment to stimulate flow over the dam wall it is considered that at least 100mm of rainfall in a month is likely to be required before there is sufficient flow that would allow downstream migration of fish.

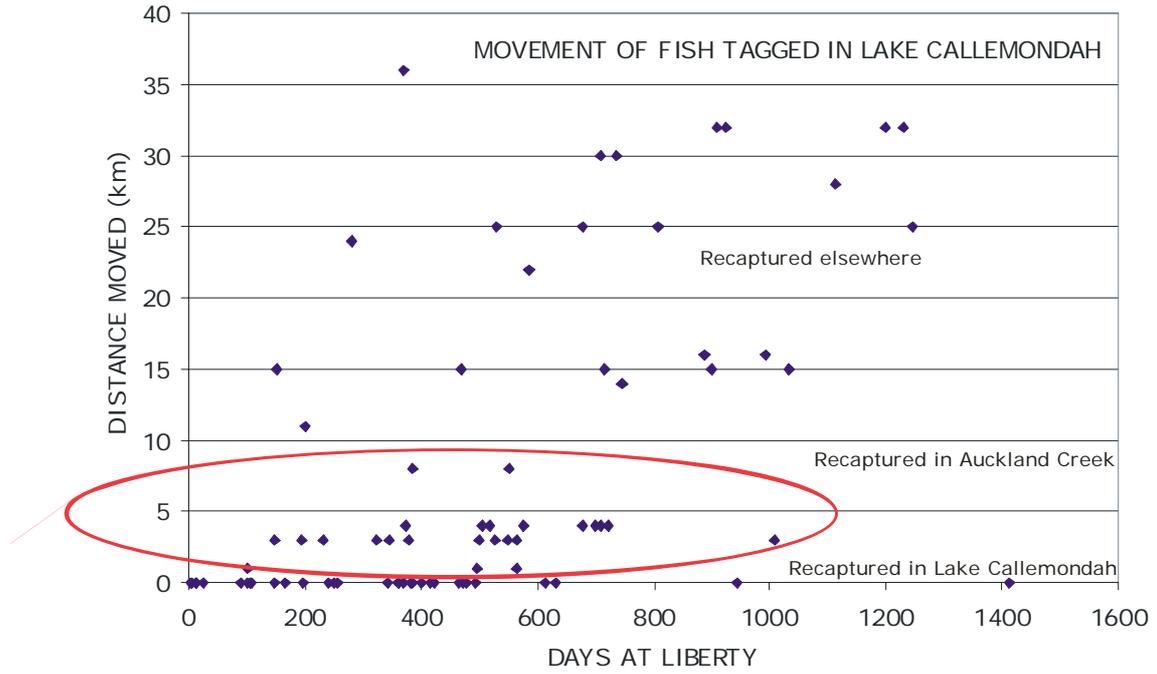


Figure 9: Distance moved for fish tagged in Lake Callemondah compared with days at liberty

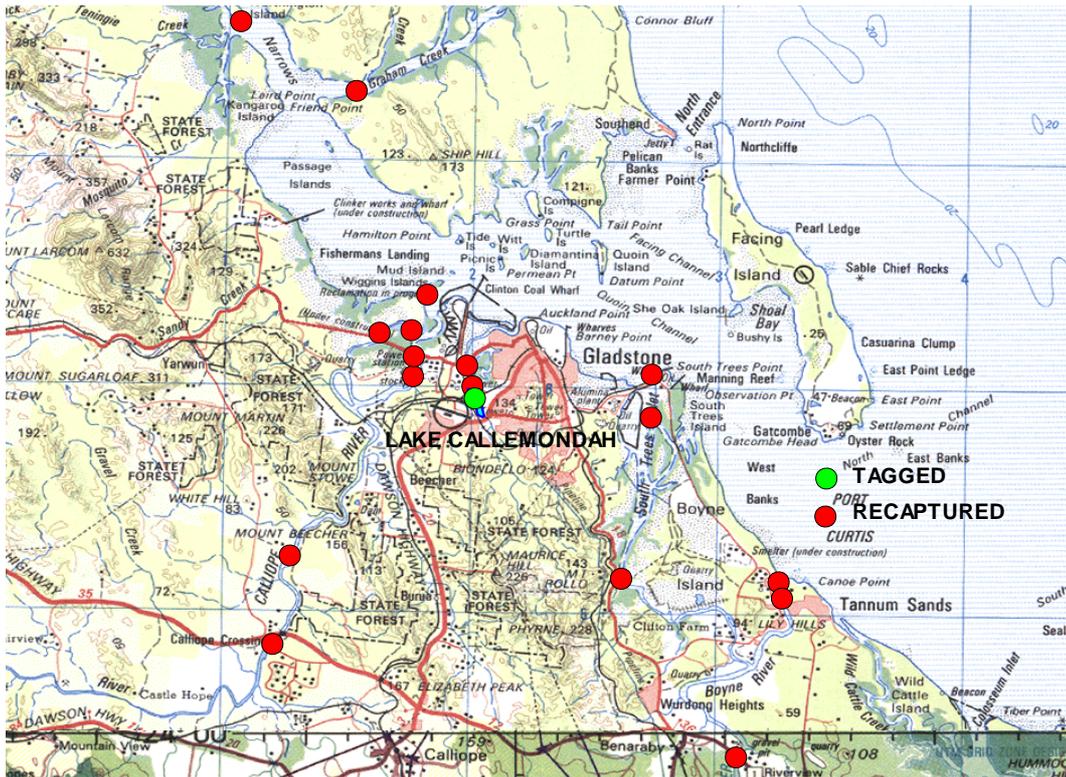


Figure 10: Locations where Barramundi tagged in Lake Callemondah have been recaptured

The largest flow event occurred in February 2003 (*figure 11*) when there was 647mm of rain recorded. Prior to that time a large number of fish were tagged however after that flow event there were few fish tagged in the size range that would be expected for those fish. It is likely that the majority of fish migrated downstream to the saltwater on that flow event. Of 27 recaptures of fish prior to that flow event only one fish was recaptured downstream from

the dam with all other fish recaptured in the lake. Of the fish tagged in the lake prior to that flow event 45 of 49 fish recaptured were recaptured downstream in the saltwater. This flow event is likely to have been when the fish migrated downstream.

Of the four fish, tagged in the lake prior to the flow, recaptured in Lake Callemondah these had at least one opportunity to leave the lake but did not do so. One fish that has been out the longest time of 1413 days, or almost 4 years, was recaptured in the lake.

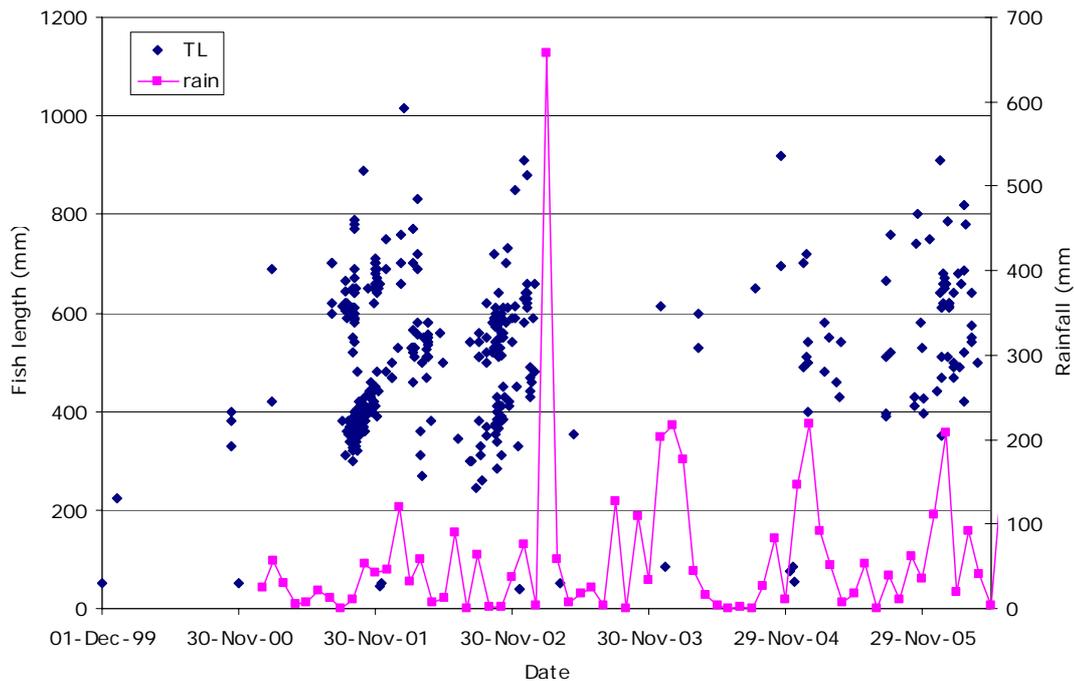


Figure 11: Monthly rainfall for Gladstone Airport Jan 2001-June 2006 and Barramundi stocked and tagged showing effect of flooding in February 2003

5. Discussion

The stocking of Barramundi into Lake Callemondah has provided increased fishing opportunities within the city and also nearby waterways. It is also probable that the stocking may have provided fish that could contribute to Barramundi spawning in the district.

The tagging of stocked fish has provided a unique opportunity to study the effects of stocking in the Gladstone area. Lake Callemondah is one of the few examples of a freshwater impoundment adjacent to the marine system that has been stocked with a fish that uses both freshwater and marine habitats.

Lake Callemondah also has the added advantage of having a low wall which is frequently overtopped during local heavy rain and flooding events. This allows stocked Barramundi to enter the marine system on a regular basis and with some of those fish tagged it has allowed data to be collected on their subsequent distribution. With 54.4% of recaptures of fish tagged in the lake and recaptured in the marine system this shows that there is a significant movement of stocked fish to the marine system when the opportunity occurs. The greatest movement of fish is likely to have been associated with the flooding in February 2003.

The growth rate of stocked fish is less than that for wild fish in the adjacent Fitzroy River. As Lake Callemondah is small, the stocking rate was high and the food supply limited, a lower growth rate is not unexpected, however growth in the first year is comparable or higher to that in the Fitzroy River.

6. References

Bureau of Meteorology (2007): Monthly Rainfall data from January 1998 - December 2006 for Gladstone Airport 039326 23°52'11"S 151°13'17"E and 16.6m elevation

Gladstone Area Water Board Hatchery (2007): Data on Barramundi stocked into Lake Callemondah from 1999-2004

Sawynok W (1998): Fitzroy River Effects of Freshwater Flows on Fish: National Fishcare project 97/003753: Infofish Services