

Gladfish



2014

Assessing Trends in Recreational Fishing in Gladstone Harbour and Adjacent Waterways





Gladstone Recreational Fishing Project
Gladfish 2014

Nov 2013 – Oct 2014

Assessing Trends in Recreational Fishing in Gladstone Harbour and
Adjacent Waterways

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Recreational fishing is an important social activity in the Gladstone area and the project was established as a 1 year project with data collected from Sep 2011-Oct 2012 to determine indicators of trends in recreational fishing in the Gladstone Area. The project data collection was extended from Nov 2012 – Oct 2014 with the project finalised in Mar 2015.

The project brought together a range of government, industry and community interests with an interest in the project through the Gladfish-Crystal Bowl-CapReef Reference Group. The support of QGC for this project has been pivotal in it achieving what it has achieved. The support and contribution of all members of the reference group is acknowledged.

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1. SUMMARY

This project has developed a number of indicators of trends in recreational fishing in the Gladstone area based on an assessment of catch and effort, Barramundi stocks (including stocked fish), fishers' views of fishing, Boyne Tannum Hookup, tagging, Mud Crab, fish health and recruitment of key species. This report should be read in conjunction with the Gladfish 2012 and Gladfish 2013 reports.¹

The status and trends in recreational fishing shows a long-term trend of increasing fishing effort and decreasing catch rates (Gladfish 2012). The influx of Barramundi from Lake Awoonga provided a significant boost to Barramundi stocks that, in turn, resulted in a shift in the species composition with a significant increase in Barramundi in the recreational catch, although that has reduced in 2014. While fish health issues dominated the media in 2011 and 2012 the incidence of fish in poor condition reported was much lower in 2013 and 2014 and mostly in the Boyne River.

Status and trends in recreational fishing can be summarised as:

Fishing effort –

- ✦ Fishing effort has increased steadily over the past 6 years by around 25% and based on population projections is likely to continue to increase (Gladfish 2012)
- ✦ Boat registrations in the Gladstone Regional Council area increased by 36.1% from 2006-2014 and 1.9% from 2013-2014
- ✦ The estimated annual number of fishing trips from Gladstone boat ramps from summer 2011-12-spring 2012 was 26,400, from summer 2012-13-spring 2013 was 31,500 (19.3% increase) and from summer 2013-14-spring 2014 was 31,000 (1.7% decrease)

Catch rates –

- ✦ Catch rates have declined steadily with Wanderers Fishing Club catch rates falling by 50-60% from 1985-2010 and by around 35% based on surveys in 1995-97 and the survey in 2011/12 (Gladfish 2012)
- ✦ Seasonal catch rates from 2006-2014 have fluctuated from a high of 25.9 fish/trip in autumn 2014 to a low of 8.5 fish/trip in winter 2010 and for kept fish ranged from a high of 7.9 fish/trip in autumn 2008 to a low of 0.02 fish/trip in summer 2011-12
- ✦ The catch rate increased from winter 2012 with 5.2 fish/trip caught and 1.4 fish/trip kept to autumn 2014 with 25.9 fish/trip caught and 6.1 fish/trip kept
- ✦ There was little change in annual catch rates from 2006-2014 although catch rates from 2006-2010 should be viewed with caution

Species composition of the catch –

- ✦ From 2006-14 Mud Crab were 22.4% of the catch and 20.7% of the kept catch (underestimated), Bream were 20.7% of the catch and 20.3% of the kept catch and Barramundi were 8.6% of the catch and 2.2% of the kept catch

¹ Gladfish 2012 and Gladfish 2013 reports available from www.info-fish.net/gladfish

- ✦ Species that increased in the catch were Mud Crab, Barramundi, Blue and King Threadfin while those that declined were School Mackerel, Stripey Snapper and Longfin Rockcod

Fishers' views (surveys in 2014 and 2012) –

- ✦ The profile of fishers responding to the surveys in 2012 and 2014 has changed with more respondents younger in age from 21-30 however came from the Gladstone area, had mostly fished 6-20+ years, went fishing 10-20+ days in the past year and rated fishing as their first or second most important outdoor activity
- ✦ Barramundi and Mud Crab remain the most targeted species while Bream and Mud Crab remain the most caught species
- ✦ 94.4% of respondents were very satisfied or quite satisfied with the overall quality of fishing in 2014 compared with 80.2% in 2012
- ✦ 14.6% of fishers had caught or seen a diseased fish in 2014 with most seen in the Boyne River compared with 32.5% that had caught or seen a diseased fish in 2012
- ✦ There was little change in fishers' views on the impact on fish stocks of recreational fishing (low), commercial fishing (high) and coastal development (high)

Barramundi –

- ✦ It was estimated that 30,000+ Barramundi (GAWB estimate 20,000) left Lake Awoonga from Dec 2010-Jun 2011 with approximately 1,200 perishing, principally due to physical trauma during the early stages of the spill event
- ✦ Lake Awoonga was stocked with around 986,500 Barramundi fingerlings from 2010-2014
- ✦ An unknown number of Barramundi, mostly in the size range 500-600mm, left the lake when it spilled in 2012 and 2013
- ✦ A number of Crystal Bowl predictions were made in Nov 2013 for the 2014 Barramundi season in Gladstone including size ranges, catch rates, stock size and recruitment
- ✦ Predictions were checked against observations in Jun 2014 and Nov 2014
- ✦ Observed fish in size ranges and catch rates for the 2014 Barramundi season were all within the 20% range predicted by the Crystal Bowl back in Nov 2013
- ✦ No prediction of stock size was made for Gladstone due to insufficient data however the number of tagged Barramundi in the area was used to provide a benchmark for measuring change in stock level
- ✦ Barramundi stock benchmark in Gladstone is currently set at ~800 tagged fish or 50% of number of tagged fish in 2013
- ✦ Barramundi measured in the recreational catch from Feb-May 2011 mostly ranged from 450-649mm (34.8%) and 800-1,199mm (58.9%) following the spill of fish from Lake Awoonga
- ✦ Barramundi measured in the recreational catch from Feb-May 2014 mostly ranged from 450-799mm (77.8%) and from 800-1,199mm (13.1%)
- ✦ The average size of Barramundi each season has been over the minimum legal size of 580mm from summer 2010-11 to spring 2014
- ✦ The average annual growth rate for Barramundi for fish less than 650mm in the Boyne River was 52.6 ± 6.9 mm, in the Calliope River was 89.4 ± 12.0 mm and for the Fitzroy River it was 100.9 ± 6.0 mm

- ✦ The average annual growth rate for Barramundi for fish over 650mm in the Boyne River was 36.3_{-9.0}mm, in the Calliope River was 56.3_{-14.4}mm and for the Fitzroy River it was 128.7_{-34.0}mm
- ✦ The commercial catch of Barramundi was 249.0t in 2011, 23.4t in 2012, 37.9t in 2013 and 11.1t in 2014 (part only)
- ✦ The commercial CPUE of Barramundi was 540.0kg/day in 2011, 143.3kg/day in 2012, 131.2kg/day in 2013 and 76.1kg/day in 2014 (part only)
- ✦ The recreational catch of Barramundi for 2012 was estimated at 8.4t compared with the commercial catch of 23.3t and for 2103 it was estimated at 7.3t compared with the commercial catch of 37.9t
- ✦ The recreational catch for 2014 was estimated at 4.7t compared with the commercial catch of 13.1t (part year Feb-Aug)
- ✦ In grid maps GLD, BRG, CR02 and CISG (excluding impoundments) there were 6,269 Barramundi tagged from 1985-2014 with 4,583 (73.1%) tagged in the last 4 years from 2010-2014 compared with 1,686 (26.9%) over the previous 25 years
- ✦ There were 15,474 Barramundi tagged in Lake Awoonga, Lake Callemondah and Duck Ponds (freshwater impoundments) from 1985-2014 with 13,555 (87.6%) from 1995-2000 being fish tagged when stocked at an average of 184mm in Lake Awoonga
- ✦ From 1985-2014 there were 202 grids where barramundi were tagged with 931 tagged in the Pikes Crossing area in grid BRG/AA20 after they exited Lake Awonga from late 2010 and 14 grids where over 100 fish were tagged
- ✦ From Nov 2012-Oct 2014 there were 83 grids where Barramundi were tagged with 326 tagged in the Pikes Crossing area in grid BRG/AA20 after they exited Lake Awoonga from late 2010 and 5 grids where over 100 fish were tagged
- ✦ The recapture rate for Barramundi from 1985-2014 was 17.4% and that compares with 17.4% for the Fitzroy River and 7.4% for the overall Suntag rate
- ✦ Barramundi that spilled from Lake Awoonga in 2011, 2012 and 2013 have strongly influenced Barramundi stocks in the Boyne River, Calliope River and Gladstone Harbour
- ✦ Numbers of large barramundi over 800mm in the Boyne River have reduced significantly from 60.1% in 2011 to 6.4% in 2014
- ✦ Numbers of large barramundi over 800mm in the Calliope River have remained reasonably steady being 45.3% in 2011 and 40.2% in 2014
- ✦ River flows and rainfall were conducive to moderate recruitment in 2014 and recruitment was assessed as moderate
- ✦ Long range forecast for NINO34 suggest near El Nino conditions for the 2015 recruitment period indicating poor recruitment
- ✦ Of the Barramundi tagged in Lake Callemondah 61.4% were recaptured after going over the spillway and 91.0% of these were recaptured within 30km
- ✦ Of the Barramundi stocked and tagged in Lake Awoonga 49 fish have been recaptured since Dec 2010 in the Boyne River, in adjacent waterways and as far south as the Burnett River at Bundaberg (180km)
- ✦ Of the 1,720 Barramundi tagged in the Pikes Crossing area 258 (15.0%) fish have been recaptured in the Boyne River, in adjacent waterways, as far north as the Ross River at Townsville (760km) and as far south as the Burnett River at Bundaberg (180km)
- ✦ From 2010-2014 a further 986,500 Barramundi (around 50mm) were stocked in Lake Awoonga

Mud Crab -

- ✦ Commercial catch of Mud Crab and the catch rate has steadily increased from 1990-2014 with peaks in 2004, 2005, 2010, 2013 and likely 2014 (when all data available)
- ✦ The recreational catch rate of Mud Crab from summer 2012-13 to spring 2014 ranged from 26.3 crab/trip in summer 2012-13 to 11.3 crab/trip in spring 2013 and the kept catch rate ranged from 5.0 crabs/trip in summer 2012-13 to 2.0 crabs/trip in spring 2013
- ✦ The number of crabs released for each crab kept ranged from 2.0 in winter 2013 to 5.5 in spring 2014
- ✦ The most popular crabbing location was the Calliope River with 54.1% of trips while the Boyne River was the least crabbed with 6.7% of trips

Tagging –

- ✦ A total of 26,501 fish were tagged from 1985-2014 with 2,228 (8.6%) recaptured with the top species being Barramundi, Yellowfin Bream, Goldspotted Rockcod, Dusky Flathead, Pikey Bream, Mangrove Jack and Blackspotted Rockcod with over 1,000 fish tagged
- ✦ The overall recapture rate from 1985-2013 for all species was 8.6% compared with the overall Suntag rate for the whole state of 6.6%
- ✦ The overall recapture rate from 1985-2014 for key species was 3.9% for Yellowfin Bream, 5.1% for Dusky Flathead, 5.5% for Pikey Bream and 6.6% for Mangrove Jack
- ✦ From 1985-2014 there were 409 grids where fish were tagged with 4,699 fish tagged at the mouth of the Boyne River in grid BRG/N24, mostly during the Boyne Tannum Hookup
- ✦ From Nov 2012-Oct 2014 there were 110 grids where fish were tagged with 308 fish tagged at the mouth of the Boyne River in grid BRG/N24
- ✦ From 1985-2014 there were 52 grids where 100 or more fish were tagged and from Nov 2013-Oct 2014 there were 2 grids where 100 or more fish were tagged
- ✦ Average annual growth was 55.3mm for Dusky Flathead, 18.5mm for Yellowfin Bream, 19.5mm for Pikey Bream and 50.9mm for Mangrove Jack
- ✦ The recapture rate for fish tagged by the Gladstone Sportfishing Club during the Boyne Tannum Hookup from 2000-13 was 5.3%
- ✦ Over 90% of all fish were recaptured within 20km from where tagged with 92.5% for Yellowfin Bream, 97.4% for Pikey Bream, 95.0% for Dusky Flathead and 95.1% for Mangrove Jack
- ✦ Few fish were recaptured over 100km from where tagged with 0.7% for Yellowfin Bream, 0% for Pikey Bream, 3.1% for Dusky Flathead and 1.4% for Mangrove Jack
- ✦ The recapture rate for fish tagged by the Gladstone Sportfishing Club during the Boyne Tannum Hookup from 2000-2014 was 5.2%
- ✦ Of the fish recaptured from those tagged in the Boyne Tannum Hookup 76.7% were recaptured within 6 months
- ✦ Of the fish recaptured from those tagged in the Boyne Tannum Hookup 40.4% were recaptured within 1km and 95.2% were recaptured within 20km of where released
- ✦ One Dusky Flathead tagged in the 2005 Boyne Tannum Hookup was recaptured 175km south in the Elliott River just over 4 months (129 days) after release

Boyne Tannum Hookup -

- ✦ Catch and effort data were collected from the Boyne Tannum Hookup from 2005-2014 with the focus on offshore trips from 2005-2009 under CapReef and then on estuary/inshore trips from 2010-2014 under Gladfish
- ✦ There has been little change in trends for estuary catch rates over the past 8 years and in the harbour and inshore rates over the past 10 years

Fish health issues –

- ✦ Large Barramundi mostly over 1m continued to die in the Boyne River from around Nov 2013-Mar 2014 with at least 20 large fish found dead in Jan 2014
- ✦ A large Barramundi around 1-1.2m long was found dead in the Boyne River in Nov 2014
- ✦ No dead or diseased fish were directly reported from the Calliope River, Gladstone Harbour or the Narrows however fishers had caught/seen diseased fish as reported in the fishers' views survey

Recruitment of key species –

- ✦ The most number of recruits of all species was in 2012 when there were 2.9 fish/cast and the least number of recruits was in 2013 when there were 1.4 fish cast
- ✦ The most number of recruits of all species (fish/cast) was recorded at Manns Weir on the Boyne River, Boat Creek and Targinnie Creek
- ✦ The most caught species at all sites were Flattail Mullet, Bony Bream and Yellowfin Bream
- ✦ Yellowfin and Pikey Bream measured indicated there were recruits from both year 0 and year 1 fish

2. PROJECT RATIONALE

Industry growth in Gladstone, including the LNG projects, will contribute to regional population growth over the next few years. Recreational fishing is an important local social activity and participation could increase in line with expected population growth.

Port Curtis, including the Narrows and adjacent waterways, supports defined fish habitat areas. It is important that ongoing information on the quality of the fishing experience is monitored over time. The **Gladstone Recreational Fishing Project** (now Gladfish) will contribute to this monitoring initiative. This information can be used to support impact mitigation initiatives, as required, to maintain the quality of the fishing experience in Port Curtis.

Infish studies, including in Port Curtis, have developed a range of monitoring criteria related to recreational fishing. These are based on the following components:

1. Fishing effort data to describe longer-term trends in fishing effort, from boat trailer counts at boat ramps over time and examining boat registrations;
2. Trends in catches through comparing overall catch rates from boat ramp surveys and obtaining fishing trip details directly from fishers;
3. Monitoring Barramundi, Barred Javelin, Bream and Mullet recruitment as primary target species with recruitment being assessed through identification of nursery areas, castnet surveys of juveniles and monitoring environmental cues that affect recruitment;
4. Barramundi stocking (Lake Callemondah and Lake Awoonga) monitored through tagging;
5. Barramundi stocks assessed by examining size composition of the catch obtained from boat ramp surveys, tagging records and measured fish from frames collected as part of the Long Term Monitoring Program of Queensland Fisheries (collecting fish frames is separately funded by FQ), examination of the commercial catch from logbook data;
6. Barramundi stocks predicted for the 2014 and 2015 seasons based on the "Crystal Bowl" model developed for the Fitzroy River;
7. Secondary target fish species' movements and growth monitored through tagging and recapture data collection;
8. Long-term trends in catch rates obtained from boat ramp surveys during the Boyne Tannum Hook Up;
9. Trends in catch rates of Wanderers Fishing Club compared with historical records (assessed in Gladfish 2012);

The Project will facilitate interaction with recreational fishers, a core stakeholder group in Port Curtis, and provide an opportunity to promote good practice in recreational fishing.

The principal outcome of this Project will be to contribute to the broader objective of developing a long-term database of recreational fishing activity in Port Curtis. This includes historical comparison of caught fish, fish sizes, numbers of fishers, harbour use

and areas of habitat within Port Curtis. This data will be used to inform design/development of mitigation programs including measures for protection of fish stocks.

The Project is being undertaken in conjunction with a portfolio of other Gladstone Harbour initiatives. Gladstone Harbour Initiatives is a component of the QCLNG Social Impact Management Plan (SIMP) Marine and Traffic Management Action Plan. The SIMP has been developed to address the Coordinator-General's Report on the Environmental Impact Statement, Appendix 1 Part 3 Conditions 1-15.

The Gladstone Harbour Initiatives component of the SIMP is designed to protect the use and environmental qualities of Gladstone Harbour including:

1. Initiatives to enhance safe enjoyment of the Harbour, Narrows and adjacent creeks;
2. Support for environmental protection.

The Project is overseen by the Gladfish-Crystal Bowl-CapReef Reference Group and delivered in consultation with the Local Marine Advisory Committee (LMAC), a member of the Gladstone LNG Regional Community Consultative Committee, and the Gladstone Sportfishing Club, a core marine stakeholder named in the QCLNG Social Impact Management Plan (SIMP). The Gladfish-Crystal Bowl-CapReef Reference Group includes representation from a number of important marine stakeholders for Port Curtis, for example: Fisheries Queensland; Great Barrier Reef Marine Park Authority (GBRMPA); Fitzroy Basin Association; Gladstone Ports Corporation and Queensland Seafood Industry Association. It also includes representation from James Cook University (JCU) and Central Queensland University (CQU).

The interest in and success of the 2012 partnership with Infish Australia lead to the continuation of this program. The QCLNG construction project still has 24 months to completion and will still have impacts on the harbour until the project is finalised. This program allows for ongoing engagement with key stakeholders as well as a valuable monitoring program on the harbour. The continuation will be expanded slightly to mirror Crystal Bowl allowing for further understanding of Barramundi numbers and recruitment.

3. OBJECTIVES

The objectives of the Gladfish 2013-15 project are:

Objective 1: to support increased understanding of long-term trends in recreational fishing in Gladstone Harbour, the Narrows and adjacent waterways through sourcing additional data for the Infish database;

Objective 2: to promote sustainable fishing practices in Gladstone Harbour, the Narrows and adjacent waterways. Determine trends in recreational fishing through indicators identified in phase 1 of the project

1. Provide information on recruitment of key species including Barramundi, Barred Javelin, Bream and Mullet
2. Use the Crystal Bowl concept to predict the status of Barramundi stocks in the Gladstone area
3. Communicate the information to the Gladstone community

4. INDICATORS OF TRENDS IN RECREATIONAL FISHING

Trends in recreational fishing were assessed based on the following:

1. Fishing effort through trailer counts at boat ramps over time
2. Fishing effort through boat registrations
3. Catch through comparing overall catch rates over time from boat ramp surveys and fishing trip details direct from fishers
4. Species composition of the catch
5. Catch rates from boat ramp surveys during the Boyne Tannum Hookup
6. Tagging of fish, recapture rates and locations where fish tagged
7. Fish movement and growth through tagging
8. Barramundi as an indicator species
9. Barramundi recruitment through castnet surveys of juveniles and monitoring environmental cues that affect recruitment
10. Barramundi stocking (Lake Callemondah and Lake Awoonga) through stocking records and tagging
11. Barramundi stocks by examining size composition of the catch from boat ramp surveys, tagging records and measured fish
12. Comparison of Barramundi commercial and recreational catch
13. Mud Crab as an indicator species
14. Initial assessment of Mud Crab commercial and recreational catch
15. Initial assessment of Barred Javelin, Bream and Mullet recruitment
16. Survey of fishers to understand perceptions of their fishing experience and compare that with actual catch rates

Data previously collected was assessed in the Gladfish 2012 report to assist in the development of indicators by providing a historical context. Data used in that report were:

1. CapReef boat ramp surveys from 2005-2009
2. Boat registrations 2006-2012
3. Catch rates of Wanderers Fishing Club historical records 1985-2010
4. Catch rates from previous boat ramp surveys 1996-1998 and 2011-2012
5. Trailer counts and boat ramps surveys 2006-2012
6. Suntag tagging 1985-2012
7. Tagging and boat ramp surveys from Boyne Tannum Hookup 1999-2012
8. Recruitment surveys 1999-2004 and 2011-2012
9. Stocking and tagging records for Lake Awoonga and Lake Callemondah
10. Commercial catch data for Barramundi from 1990-2012
11. River flow data for Calliope River from 2000-2012 and Boyne River from 2000-2012

5. TRENDS IN FISHING EFFORT

Fishing effort refers to the number of fishing trips that are undertaken over time. Fishing trips can either be from a boat or landbased. The majority of fishing in the Gladstone area is from a boat launched at a boat ramp however in some areas boats are launch from the bank eg Boyne River (railway bridge). Landbased fishing occurs from almost every location where there is public access to the shore with likely over 100 locations. The Gladfish 2012 and 2013 reports provided details of fishing effort from 2006-2013.

Seasons for the calculation of fish effort were adjusted so that the Barramundi closed season is included in a single season. Therefore seasons were:

1. Spring - Aug-Oct
2. Summer - Nov-Jan (Barramundi closed season)
3. Autumn - Feb-Apr
4. Winter - May-Jul

Trends in fishing effort were assessed by examining:

5. Boat registrations 2006-2014
6. Trailer counts at key boat ramps Spring 2011-Spring 2014

Key boat ramps where trailer counts were made:

1. Auckland Creek (VMR)
2. Auckland Creek (Morgan Street)
3. Gladstone Marina
4. Calliope River (Power station)
5. South Trees Inlet (Toolooa Bend)
6. Boyne River (Bray Park)

Other ramps where limited trailer counts were made:

7. Calliope River (Historical Village)
8. Targinnie Creek (Phillips Landing)
9. Boyne River (Tannum Sands)
10. Boyne River (Benaraby)
11. Boyne River (Pikes Crossing)
12. Narrows (Ramsay Crossing)

BOAT REGISTRATIONS

Boat registrations are an indicator of trends in fishing effort as recreational fishing is the main use of smaller boats up to around 8m. Boat registrations were obtained for June each year from 2006-2014 for the Gladstone Regional Council area. Boat registrations were assessed for motorboats (no sails) up to 8m.² These were considered to be the vessels most likely to be used for recreational fishing. *Figure 1* shows the number of registrations at June each year. From 2006-2014 the number of boat registrations rose from 5,396 to 7,342 (36.1% increase) with a 1.9% increase in 2014 compared to the previous year.

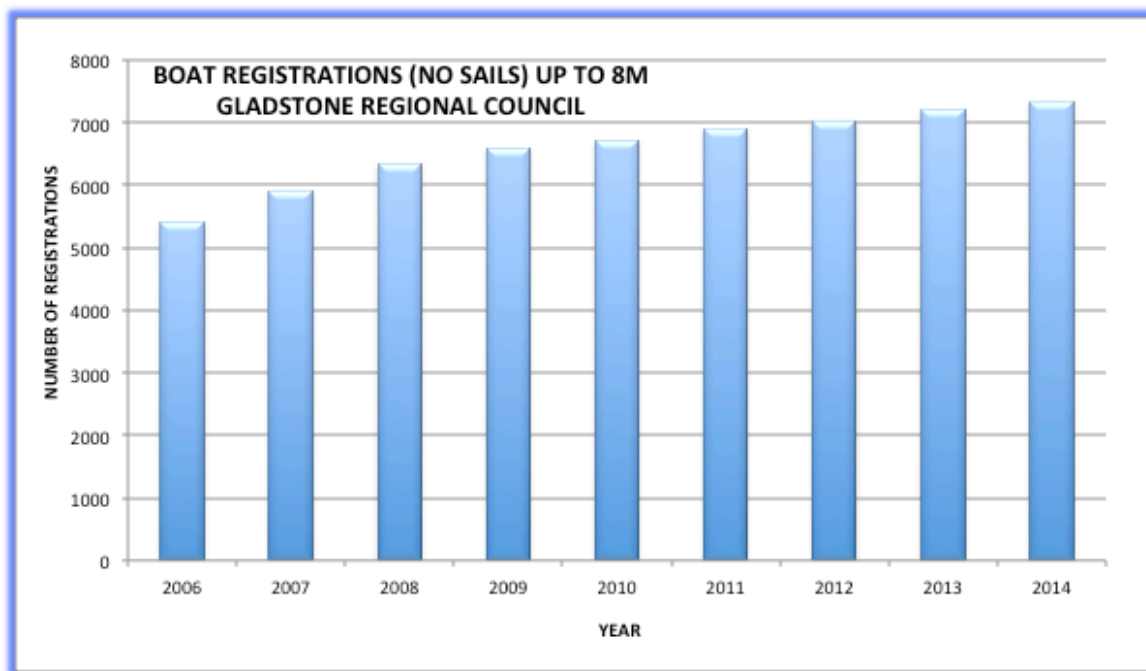


Figure 1: Number of motorboats (no sails) up to 8m in length registered in the Gladstone Regional Council area at June from 2006-2014

Boat registrations in the Gladstone Regional Council area increased by 36.1% from 2006-2014 and 1.9% from 2013-2014

FISHING EFFORT 2011-2014

Figure 2 shows the number of days where trailer counts were made at the key boat ramps from spring 2011-spring 2014. There were a total of 4,638 counts on 906 days. There were a further 40 days of counts at minor boat ramps.

² Boat registrations obtained from the Department of Transport and Main Roads

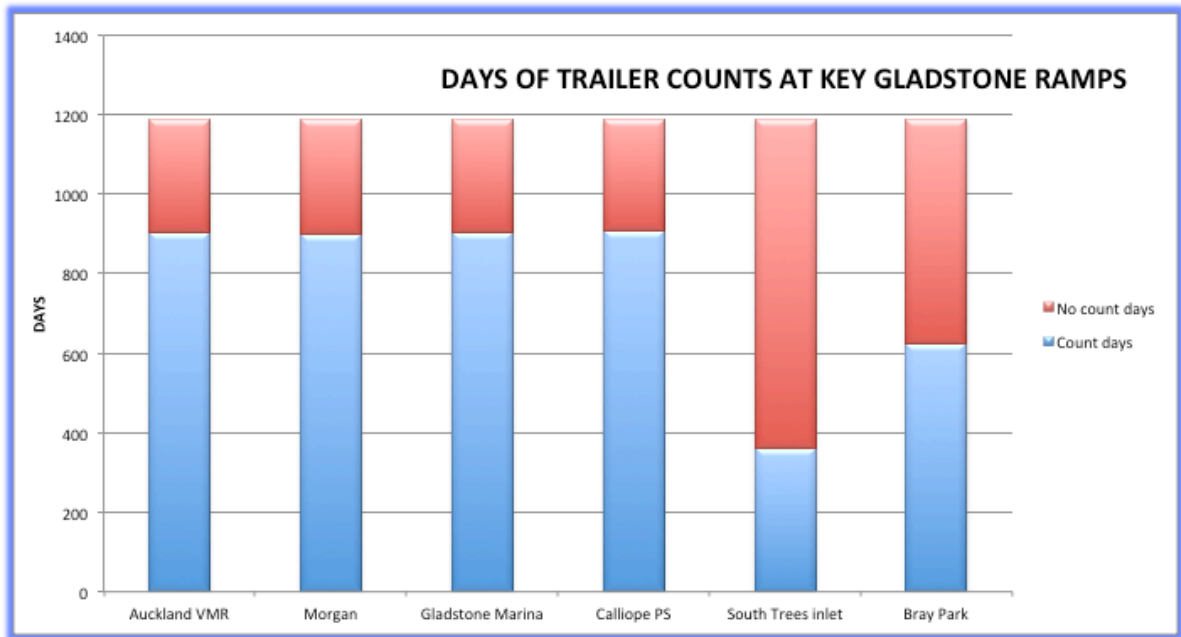


Figure 2: Days of trailer counts at key boat ramps from spring 2011-spring 2014

In the Gladfish 2012 report a relationship was established between the number of trailers at the Gladstone ramps and at Bray Park to improve the estimate of the number of trailers at Bray Park. A correction factor was applied to the trailer counts to provide an estimate of the total number of trips each day. Not all trips were fishing trips and a correction was applied to estimate the number of fishing trips.

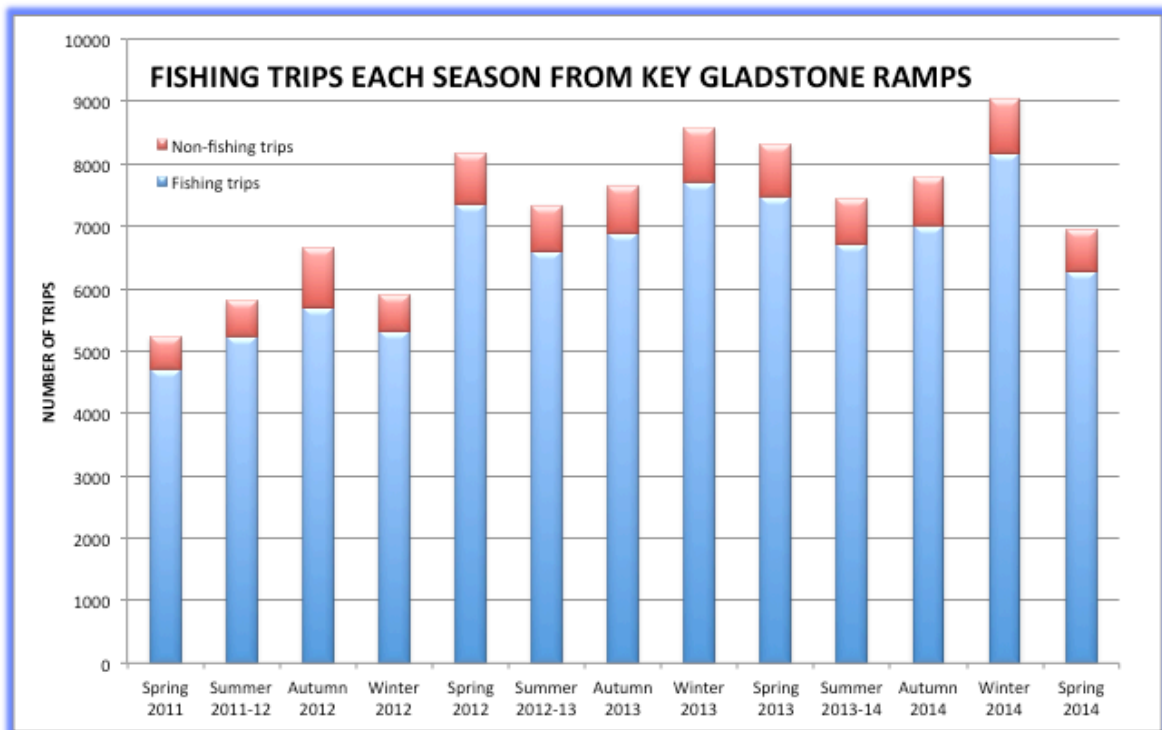


Figure 3: Estimated number of trips each season from key Gladstone boat ramps

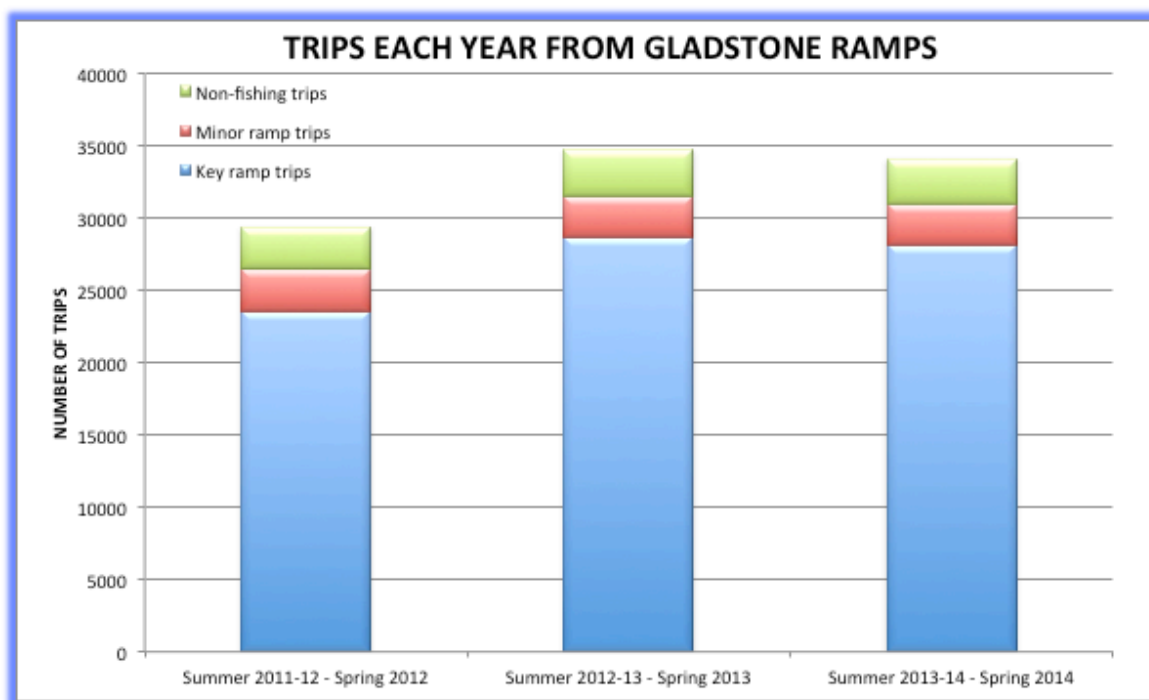


Figure 4: Estimated number of trips each year from key Gladstone boat ramps

From spring 2011-spring 2014 there was an increase in the estimated number of fishing trips from key boat ramps as shown in *figure 3*. Due to fish health issues there was a total fishing closure in Gladstone Harbour from 16 Sep-7 Oct 2011. This would have affected the number of trips recorded in spring 2011 and probably had some residual effect in summer 2011-12.

The number of trips each year from summer 2011-12-spring 2014 was estimated as shown in *figure 4*. Based on the limited number of trailer counts at other ramps an indicative daily estimate was made of 7.8 trailers/day for all ramps combined. This resulted in an estimate of a further 2,860 fishing trips per year. For summer 2011-12-spring 2012 the estimated number of fishing trips was 26,400, for summer 2012-13-spring 2013 the estimated number was 31,500 (19.3% increase) and for summer 2013-14-spring 2014 was 31,000 (1.7% decrease).

In spring 2014 a drop in the number of trips was noted. This was likely due to the completion of construction on industrial plants and the departure of workers, reducing the population and the numbers going fishing.

The estimated annual number of boat fishing trips for summer 2011-12-spring 2012 was 26,400, from summer 2012-13-spring 2013 was 31,500 (19.3% increase) and for summer 2013-14-spring 2014 was 31,000 (1.7% decrease)

6. TRENDS IN CATCH

Catch details from CapReef boat ramp surveys and direct from fishers from autumn 2006-winter 2009. From spring 2009-autumn 2011 trip details were only obtained direct from fishers, mostly members of Gladstone Sportfishing Club and may not be representative of overall catch rates. Catch details from spring 2011-spring 2014 were obtained from Gladfish boat ramp surveys and direct from fishers.

Catch rates are for trips to Gladstone Harbour, Facing Island, Boyne River, South Trees Inlet, Wild Cattle Creek, Calliope River and the Narrows south of Ramsay Crossing. Catch rates are based on a standard fishing trip which was based on 2 fishers fishing for 7.5 hours for boat fishing. This allowed a comparison with previous CapReef catch rates.

Seasons for the calculation of catch rates were adjusted (see section 5).

Trends in catch were assessed by:

1. Seasonal catch from boat ramp surveys for spring 2011-spring 2014
2. CapReef seasonal catch from autumn 2006-winter 2009
3. Gladstone Sportfishing Club members seasonal catch from spring 2011-autumn 2011
4. Catch rates in Boyne Tannum Hookup 2007-2014
5. Species composition of the catch from 2006-2014

CATCH RATES 2006-2013

Figure 5 shows the total average catch and kept catch rates for fish and crabs each season from autumn 2006-spring 2013. The catch rate fluctuated from a low of 8.5 fish/trip in summer 2006-07 to a high of 25.9 fish/trip in autumn 2014. Catch rates were highest from spring 2007 to autumn 2010 with lower catch rates from winter 2010 to winter 2012. Catch rates then increased from spring 2012-spring 2013. The kept catch rate fluctuated from a low of 0.02 fish/trip in summer 2011-12 (influenced by fish health issues) to a high of 7.9 fish/trip in autumn 2008. The kept catch rate follows a similar pattern to the overall catch rate. Catch rates were generally highest in autumn and lowest in winter.

Figure 6 shows the annual average catch rates from 2006-2014. The trendlines show little change in the catch rates over time however catch rates from 2006-2010 should be treated with caution as from 2006-2008 were collected during CapReef, where the focus was on offshore trips, and from 2008-2010 where data from trips made by Gladstone Sportfishing Club only were available.

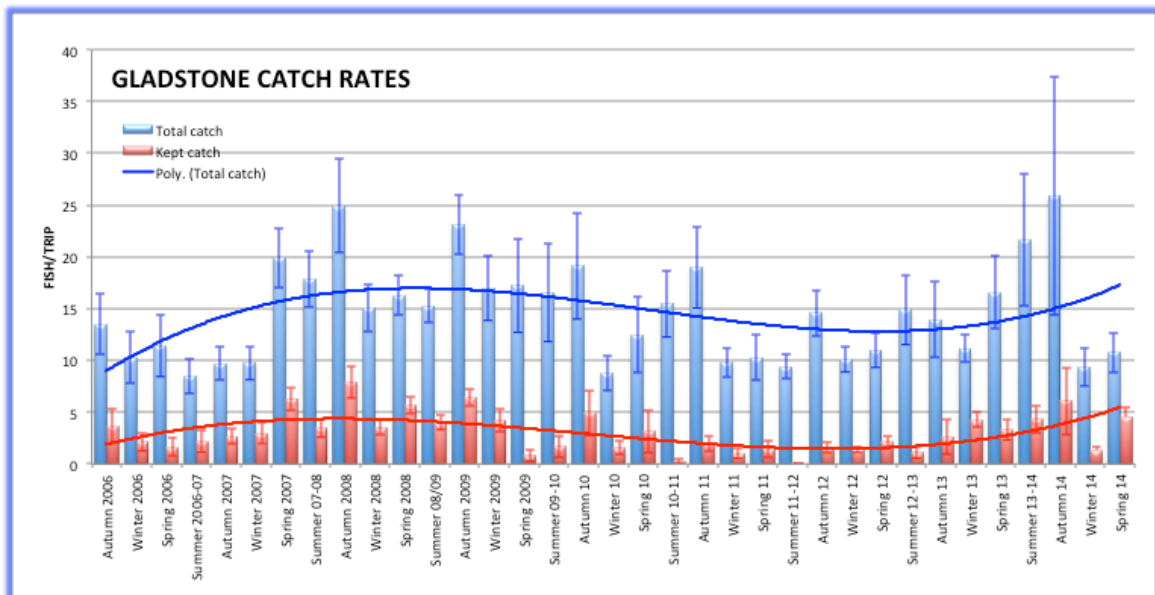


Figure 5: Seasonal catch rates Gladstone area from 2006-2013 (limited data from spring 2009-autumn 2011)

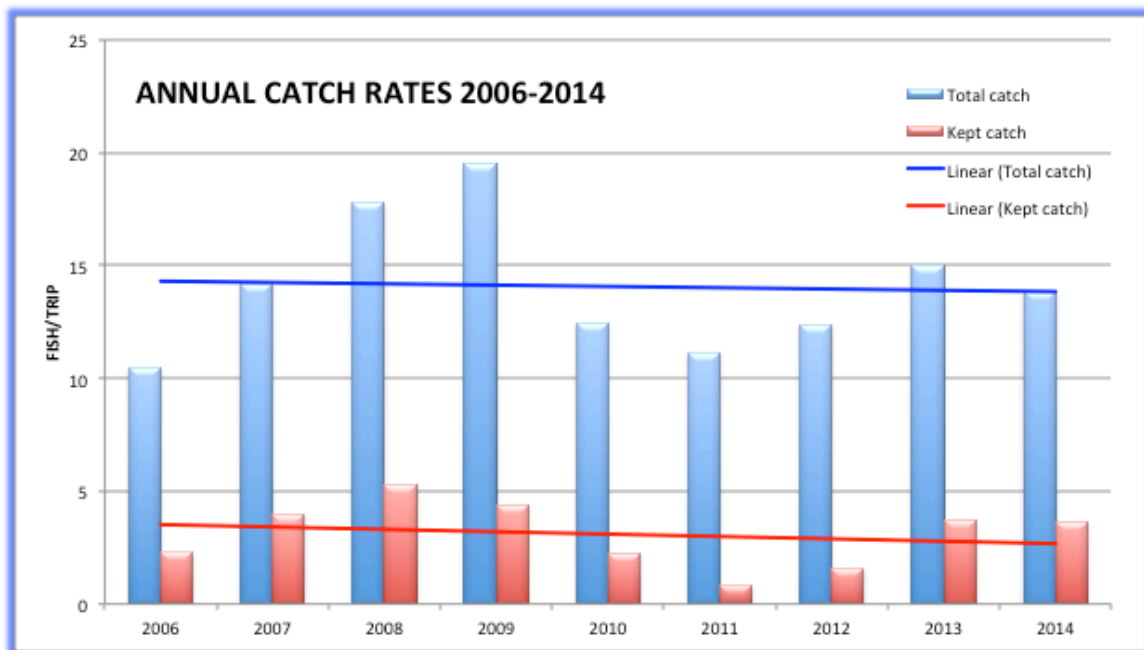


Figure 6: Annual catch rates for the Gladstone area from 2006-2014

Seasonal catch rates from 2006-14 have fluctuated from a high of 25.9 fish/trip in autumn 2014 to a low of 8.5 fish/trip in winter 2010 and for kept fish ranged from a high of 7.9 fish trip in autumn 2008 to a low of 0.02 fish/trip in summer 2011-12

The catch rate increased from winter 2012 with 5.2 fish/trip caught and 1.4 fish/trip kept to autumn 2014 with 25.9 fish/trip caught and 6.1 fish/trip kept

There was little change in the annual catch rates from 2006-2014 although rates from 2006-2010 should be viewed with caution

SPECIES COMPOSITION

Numbers of each species caught and kept were recorded for each trip during boat ramp surveys and when trip details were obtained direct from fishers. From winter 2006-spring 2014 there were 8,904 trips recorded for 51,937 fish caught and 11,894 (22.9%) kept.

Figure 7 shows the total number of the top 10 species kept and released on those trips. Bream includes Yellowfin and Pikey Bream and Flathead includes Dusky and Bartail Flathead. These species were combined, as they were not always accurately identified. Mud Crabs were not recorded in surveys until spring 2007 and were poorly recorded from spring 2009 to summer 2009-10 so Mud Crab are likely to be a more significant part of the catch than indicated. Mud Crab, Bream and Barramundi were the 3 most caught species.

Figure 8 shows the percentage of each of the top 10 species in the catch. Mud Crab were 22.4% of the catch and 21.5% of the kept catch, however as they were poorly recorded to 2009-10 they are more likely to have been over 30% of the catch and kept catch. Bream were 20.7% of the catch and 20.3% of the kept catch. Barramundi were 8.6% of the catch however were only 2.2% of the kept catch. Grass Emperor were 3.5% of the catch and 8.2% of the kept catch.

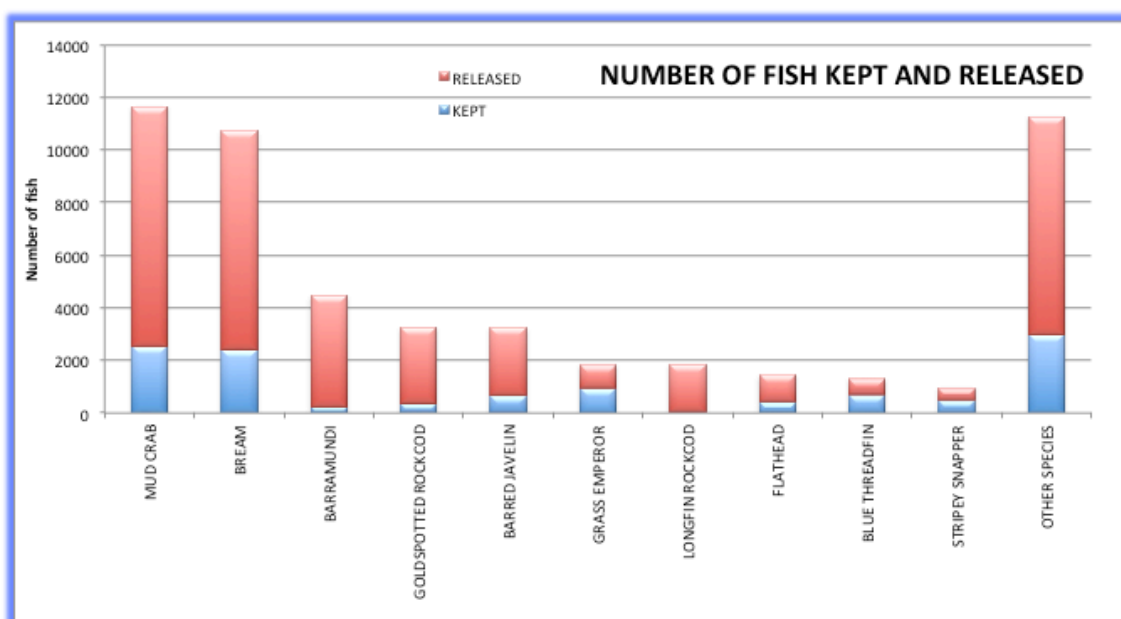


Figure 7: Numbers of species caught and kept from 2006-14

Figure 9 shows the percentage of each species that were kept and released. Blue Threadfin was the most kept species at 55.2%, Grass Emperor and Stripecy Snapper were the next most kept species at 53.0% each. The least kept species was Longfin Rockcod at 1.6%. As this species only grows to around 400mm and with a minimum legal size of 380mm, few fish are over legal size. Barramundi is the second most released species at 94.0%. The minimum legal size for Barramundi is 580mm and there is a maximum size of 1200mm. There is also a closed season from Nov-Jan each year where all fish must be released and many legal sized fish are released voluntarily.

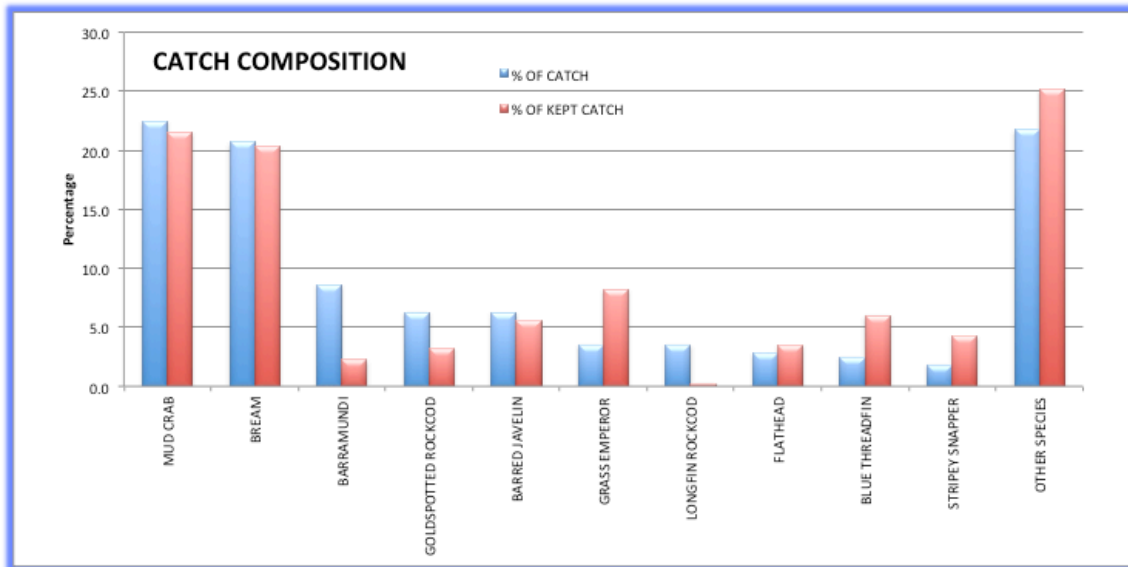


Figure 8: Percentage of species in the total and kept catch from 2006-2013

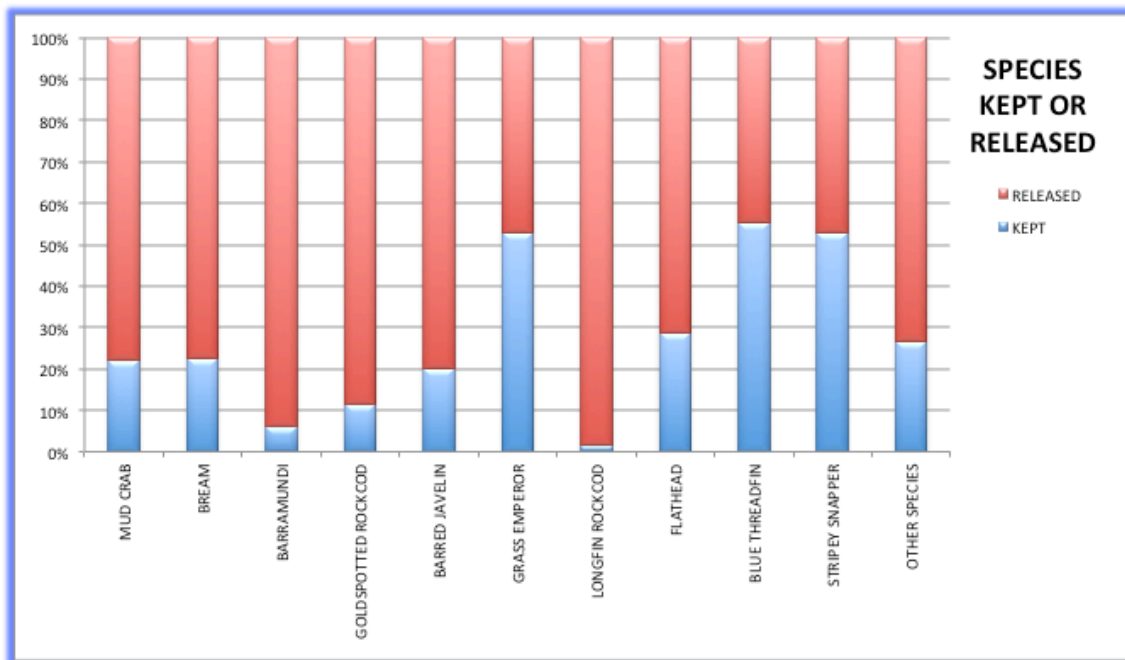


Figure 9: Percentage of key species kept and released 2006-2014

Figure 10 shows the percentage of each species in the catch each year and figure 11 the percentage of each species in the kept catch from 2006-07 to 2013-14. Species that have increased in the catch are Mud Crab and Barramundi. Mud Crab were not consistently recorded during boat ramp surveys until spring 2011 so in earlier catches to 2010-11 are underestimated. Barramundi were 2.2% of the catch and 0.8% of the kept catch from 2006-07 to 2009-10 and in 2011-12 increased to 23.5% of the catch and 4.8% of the kept catch following the spilling of fish from Lake Awoonga (see section 8). In 2013-14 they had dropped to 7.1% of the catch and 1.4% of the kept catch. Species that have reduced in the catch are School Mackerel (previously in the top 10 species), Stripey Snapper and Longfin Rockcod.

King Threadfin did not feature in catches from 2006-07-2011-12 with a maximum of 4 being recorded in any of those years. In 2013-14 they comprised 1.1% of the catch and 1.0% of the kept catch. This suggests a significant increase in their stocks.

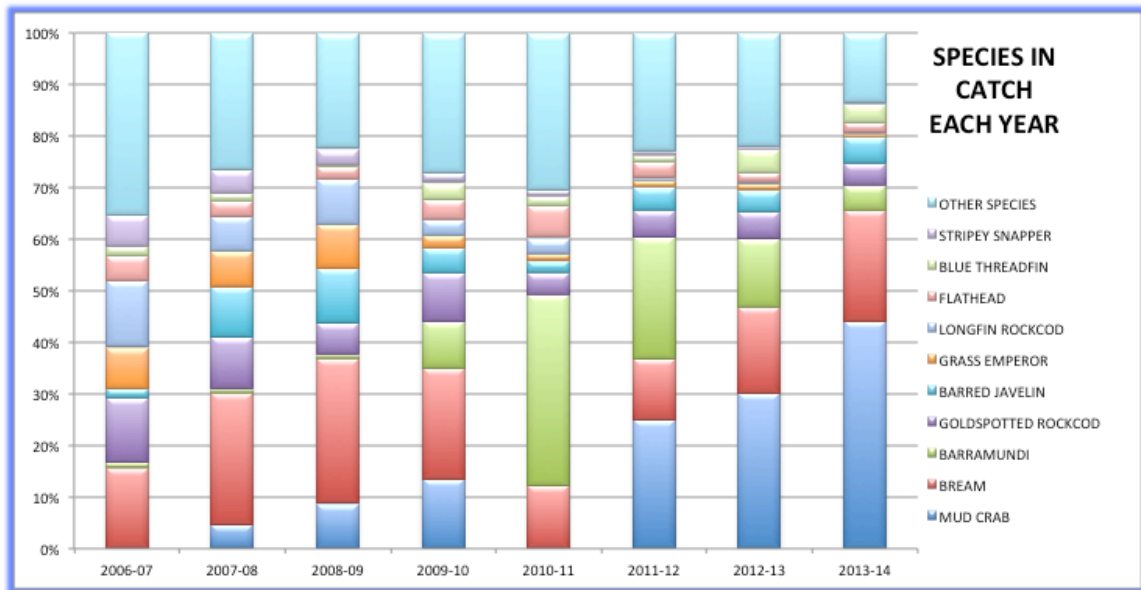


Figure 10: Percentage of each species caught each year from 2006-2013

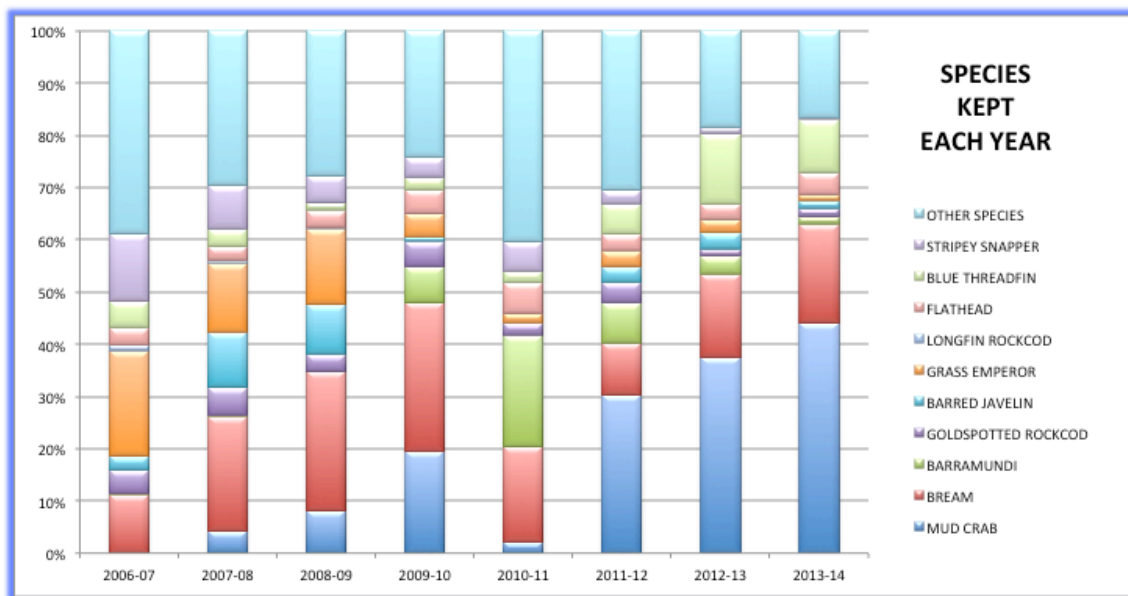


Figure 11: Percentage of each species kept each year from 2006-2013

From 2006-14 Mud Crab were 22.4% of the catch and 20.7% of the kept catch (underestimated), Bream were 20.7% of the catch and 20.3% of the kept catch and Barramundi were 8.6% of the catch and 2.2% of the kept catch

Species that increased in the catch were Mud Crab, Barramundi, Blue and King Threadfin while those that declined were School Mackerel, Stripey Snapper and Longfin Rockcod

7. FISHERS' VIEWS OF RECREATIONAL FISHING

Surveys of fishers' views on recreational fishing in the Gladstone area were undertaken in 2012 and in 2014. The surveys undertaken as

- ✦ Interviews of fishers using a paper form or iPad at boat ramps and other locations where recreational fishers were encountered (eg Boyne Tannum Hookup, tackle store)
- ✦ An online version of the survey

The 2012 survey was delayed due to the fishing closure and fish health issues in the second half of 2011 and was undertaken from Mar-Jun 2012 with 216 surveys (203 completed). The 2014 survey was undertaken from Sep-Nov 2014 with 265 surveys (247 completed).

There were 22 questions in the 2012 survey and 20 questions in the 2014 survey with 19 questions common to both surveys so that changes between the surveys could be assessed.

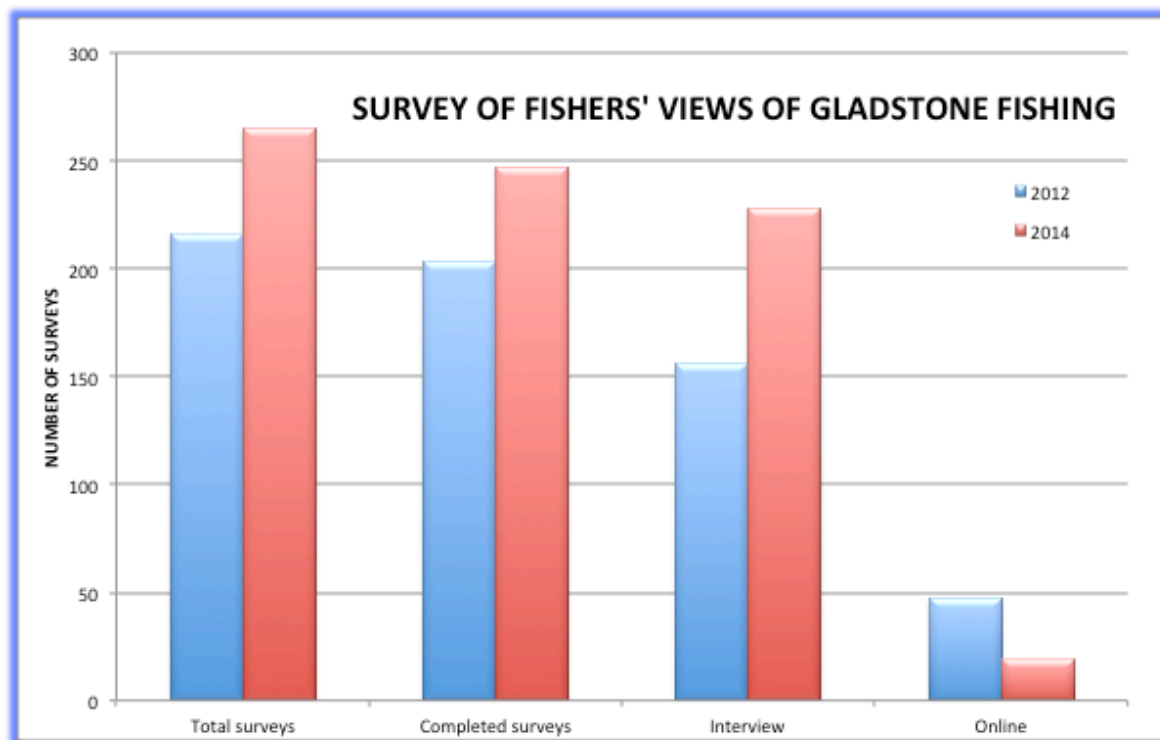


Figure 12: How responses to the fisher survey were received

Figure 12 provides a summary of the responses to the questionnaire in each year while table 1 provides a profile of the fishers responding. Significant changes between surveys were that fishers went fishing on more days in 2014 than in 2012 and fishers were younger in 2014. Fewer fishers in 2014 rated fishing as their most important outdoor activity however about the same percentage rated fishing as their first and second most important activities.

Fisher profile	2014	2012	Change
Live in Gladstone area	88.9%	96.4%	-7.5%
Gender – male	94.7%	93.5%	+1.2%
Age group 21-30	30.0%	12.5%	+17.5%
Age group 41-50	17.4%	29.6%	-12.2%
Fished area for 6-20+ years	70.0%	80.6%	-10.6%
Went fishing in last year 10-20+ days	89.5%	75.5%	+14.0%
Fishing most important outdoor activity	44.1%	72.7%	-28.6%
Fishing second most important activity	37.7%	15.3%	+22.4%

Table 1: Summary of profile of fishers that responded to the surveys in 2012 and 2014

Locations fished	2014	2012	Change
Gladstone Harbour fished in last 12 months	15.6%	13.6%	+2.0%
Calliope River fished in last 12 months	19.8%	17.2%	+2.6%
Boyne River fished in last 12 months	16.4%	17.4%	-1.0%
Narrows fished in last 12 months	6.1%	9.2%	-3.1%
Awoonga fished in last 12 months	2.5%	5.4%	-1.9%
Offshore fished in last 12 months	4.5%	13.0%	-8.5%
Harbour fished most in last 12 months	21.2%	9.2%	+11.0%
Calliope River fished most in last 12 months	30.1%	27.5%	+2.6%
Boyne River fished most in last 12 months	14.4%	23.7%	-9.3%
Narrows fished most in last 12 months	7.1%	5.3%	+1.8%
Awoonga fished most in last 12 months	0.0%	1.0%	-1.0%
Offshore fished most in last 12 months	8.1%	25.1%	-17.0%

Table 2: Summary of locations fished from the surveys in 2012 and 2014

Species caught	2014	2012	Change
Target Mud Crab	20.4%	18.0%	+2.4%
Target Barramundi	24.3%	36.1%	-11.8%
Target Bream	0.9%	2.3%	-1.2%
Target King Threadfin	10.4%	0.0%	+10.4%
Target reef fish	6.7%	17.4%	-10.7%
Mud Crab most caught	19.9%	20.9%	-1.0%
Barramundi most caught	5.3%	28.7%	-23.4%
Bream most caught	19.9%	20.2%	-0.3%
King Threadfin most caught	4.6%	0.0%	+4.6%
Reef fish most caught	1.2%	17.8%	-16.6%
Catch same number of fish as other fishers	63.2%	55.1%	+8.1%

Table 3: Summary of species caught from the surveys in 2012 and 2014

Fishing satisfaction	2014	2012	Change
Very satisfied	41.3%	25.9%	+15.9
Quite satisfied	53.0%	52.3%	+0.7%
Not very satisfied	4.9%	15.3%	-10.4%
Not at all satisfied	0.0%	1.4%	-1.4%

Table 4: Fishing satisfaction from the surveys in 2012 and 2014

Fish health	2014	2012	Change
Caught/seen diseased fish in last 12 months	14.6%	32.6%	-18.0%
Seen in Boyne River	72.2%		
Seen in Gladstone Harbour	8.3%		
Seen in Calliope River	5.6%		
Seen Graham Creek	2.8%		
Seen elsewhere	2.8%		
Not concerned about diseased fish	11.3%	20.3%	-8.0%
Moderately concerned about diseased fish	47.4%	29.7%	+17.7%
Very concerned about diseased fish	41.3%	50.0%	+8.7%
Impact of diseased fish low	24.2%	27.8%	-3.5%
Impact of diseased fish moderate	27.6%	26.9%	+0.7%
Impact of diseased fish high	41.5%	45.3%	-3.8%

Table 5: Fishing health from the surveys in 2012 and 2014

Impact on fish stocks	2014	2012	Change
Impact of recreational fishing low	69.8%	67.5%	+2.3%
Impact of recreational fish moderate	21.9%	20.3%	+1.6%
Impact of recreational fishing high	1.5%	12.3%	-10.8%
Impact of commercial fishing low	8.8%	10.9%	+2.1%
Impact of commercial fishing moderate	18.9%	22.6%	-3.7%
Impact of commercial fishing high	65.7%	66.4%	-0.7%
Impact of coastal development low	12.1%	10.4%	+1.7
Impact of coastal development moderate	18.5%	21.7%	-3.2%
Impact of coastal development high	62.7%	67.9%	-5.2%

Table 6: Impact on fish stocks from the surveys in 2012 and 2014

Tables 2-6 provided a summary of responses to the questions asked and a comparison between the 2014 and 2012 surveys. For locations fished Gladstone Harbour, Boyne River and Calliope River remain the most fish locations with an increase in fishing in the harbour. There were fewer fishing offshore.

Barramundi and Mud Crab remain the key target species however there has been a significant drop in Barramundi as the most caught species. Of interest is the targeting of King Threadfin with no targeting and none being the most species caught in 2012 however they have become a target in 2014. While Bream remain very low as a target species they remain the most caught species with little change from 2012 to 2014.

The number of fishers very satisfied with fishing in Gladstone has increased while the numbers not very satisfied or not at all satisfied have decreased.

The number of fishers that caught or seen a diseased fish in the past 12 months has fallen. Most fish were seen in the Boyne River however some fish were seen in most locations (see also section 12). There was no question in 2012 about the location of diseased fish. The level of concern about diseased fish has risen in 2014 compared to 2012. There was little change in the views on the impact of diseased fish on stocks with most considering the impact as moderate or high.

There was little change in their views on the impacts of recreational fishing, commercial fishing and coastal development on fish stocks although fewer thought that recreational fishing had a high impact.

Both surveys provide a snapshot of what fishers' views are on fishing and the status of fish stocks in the Gladstone area. These views are influenced by changes that have occurred over the time between surveys. These influences include a reduction in Barramundi due to the extraction of fish that spilled from Lake Awoonga from 2011-2013 and poor-moderate natural recruitment. There has been an increase in the King Threadfin stock due to good natural recruitment over the past few years and the likely drift of fish from the Fitzroy River.

There has been a shift in fishing back to the harbour as the construction phase of the industrial development on Curtis Island winds down and there is less boat traffic on the harbour and fewer diseased fish being encountered there.

The incidence of diseased fish is lower in 2014 however the level of concern has risen. This may be related to the persistence of diseased fish now occurring for over 4 years.

The profile of fishers responding to the surveys in 2012 and 2014 has changed with more respondents younger in age from 21-30 however came from the Gladstone area, have mostly fished 6-20+ years, went fishing 10-20+ days in the past year and rated fishing as their first or second most important outdoor activity

Barramundi and Mud Crab remain the most targeted species while Bream and Mud Crab remain the most caught species

94.3% of survey respondents were very satisfied or quite satisfied with the overall quality of fishing in 2014 compared with 80.2% in 2012

14.6% of fishers had caught or seen a diseased fish in 2014 with most seen in the Boyne River compared with 32.5% that had caught or seen a diseased fish in 2012

There was little change in fishers' views on the impact on fish stocks of recreational fishing (low), commercial fishing (high) and coastal development (high)

8. BARRAMUNDI

Barramundi (*Lates calcarifer*) is an iconic species that is highly sought after throughout its entire range across tropical Australia including the Gladstone area, especially by commercial fishers and the more avid and experienced recreational fishers. Barramundi was selected as an indicator species for more detailed assessment.

Barramundi took on a greater level of importance when very large numbers of fish spilled from Lake Awoonga from Dec 2010-Jun 2011. This was the first time the dam had spilled since the dam wall was raised in 2002 and flows over the spillway continued until Jun 2011. Barramundi were observed going over the spillway (*figure 13*) within days and over the following weeks large numbers of Barramundi continued to go over the spillway.



Figure 13: Barramundi on the Awoonga spillway Jan 2011

Based on the commercial catch of Barramundi in 2011 it is estimated that 30,000+ large Barramundi spilled from Lake Awoonga. The Gladstone Area Water Board estimated that 20,000 mature-sized Barramundi spilled from Lake Awoonga, however this was an underestimate. Approximately 1,200 fish perished, principally due to physical trauma during the initial stages of the spill event.³ Some of these fish moved down the Boyne River, with reports of fish from "Awoonga" in many areas of the Gladstone Harbour, Calliope River and elsewhere up and down the coast. This was an unprecedented event that resulted in more Barramundi, especially large fish, in the Gladstone area than in any

³ Gladstone Area Water Board website www.gawb.qld.gov.au "Summary of GAWB Report to the Gladstone Fish Health Scientific Advisory Panel"

time in modern history. This led to a bonanza for local and visiting fishers but was overshadowed by significant fish health issues that emerged in 2011.

With fish leaving the lake when the dam spilled the lake was stocked with 207,000 Barramundi fingerlings in 2010/11. A further 344,000 fingerlings were stocked in the lake in 2011/12 (see *table 8*).

The dam spilled again from Jan-Feb 2012 with more stocked fish leaving the dam however the size range of these fish was generally smaller around 500-600mm. No estimate of the number of fish that left Awoonga over that time was available however was considered to be less than the numbers in 2010/11.

The dam spilled again from Jan-Jun 2013 and more stocked fish left the lake. The size range was mostly 500-600mm but no estimate of numbers was possible due to the turbidity of the water.

It was estimated that 30,000+ Barramundi (GAWB estimate 20,000) left Lake Awoonga from Dec 2010-Jun 2011 with approximately 1,200 perishing, principally due to physical trauma during the early stages of the spill event

An unknown number of Barramundi, mostly in the size range 500-600mm, left Lake Awoonga when it spilled in 2012 and 2013

CRYSTAL BOWL BARRAMUNDI STOCKS 2014

The “Crystal Bowl” was initially developed to predict stocks of Barramundi in the Fitzroy River. In 2013 this was extended to Gladstone and an initial prediction made for 2014. Crystal Bowl reports covering predicted compared with observed for the Fitzroy River and Gladstone were produced in Jun 2014 and in Nov 2014.⁴

The following predictions were made for Gladstone in Oct 2013 for the 2014 season:

1. Legal fish size range predict 56% from 580-799mm 16% from 800-1200mm
2. There will be an unusual number of fish above 1000mm (remnants from 2011 Awoonga spill)
3. Catch rates for legal fish down 20-40% compared with 2013
4. Moderate/high numbers of fish in the Boyne River
5. Moderate numbers of fish in the Calliope River
6. High numbers of stocked fish in Boyne River, Calliope River and Gladstone Harbour that spilled from Awoonga in 2013
7. No prediction of stock levels compared with benchmark due to insufficient data
8. Forecast conditions suggest moderate natural recruitment with moderate uncertainty
9. Fish health issues may affect stock in Boyne River in particular

⁴ Looking into the “Crystal Bowl” November 2014 – Barramundi Fitzroy River and Gladstone Review of 2014 season Predictions for 2015 season available from www.crystal-bowl.com.au

10. There could be another spill from Awoonga in 2014 as it is anticipated that it will only be 400mm from spilling in Dec 2013 and this would significantly increase numbers of fish from 400-580mm
11. There is a high likelihood of more stocked fish spilling from Lake Callemondah

Underpinning the predictions

1. Size range of fish from recreational catch by taggers Feb-Oct 2013 and 2014
2. Commercial catch Feb-Jul 2013 and Feb-Aug 2014 (full season data not yet available)
3. Tag and recapture data Feb-Oct 2013 and 2014
4. Recruitment surveys Jan-May 2014
5. River flows and rainfall 2013-2014
6. Bureau of Meteorology long range NINO forecast for wet season 2014
7. Estimated number of tagged fish each year
8. Stocked fish records

Comparison of 2013 predictions for 2014 with observed

Table 7 is a comparison of predictions with observed for the 2014 season:

MEASURE	PREDICTED	OBSERVED
GLADSTONE		
Stock level	No prediction	
Fish in size range 580-799mm	56%	51.6%
Fish in size range 800-1200mm	16%	23.2%
Catch rates for legal fish compared with 2013	Down 20-40%	-37.3% taggers -42.6% comm (part year only)
Catch rates for undersized fish was not predicted due to uncertainty of fish spilling from Awoonga 2012-2013	No prediction	-12.6% taggers
Recruitment	Moderate	Moderate

Table 7: Comparison of 2013 predictions with observed fro 2014 season

Predicted versus actual size ranges for 2014 season

1. Bars on predictions indicate range of predictions (*figures 14 and 15*)
2. Sizes within predictions for all size ranges (*figure 14*)
3. 74.8% of fish were of legal size
4. Catch rates for legal fish were within predictions (*figure 15*)
5. Commercial catch rates are comparing full year data for 2013 and Feb-Jun 2014 as complete monthly data not available (to be updated when full season data available)

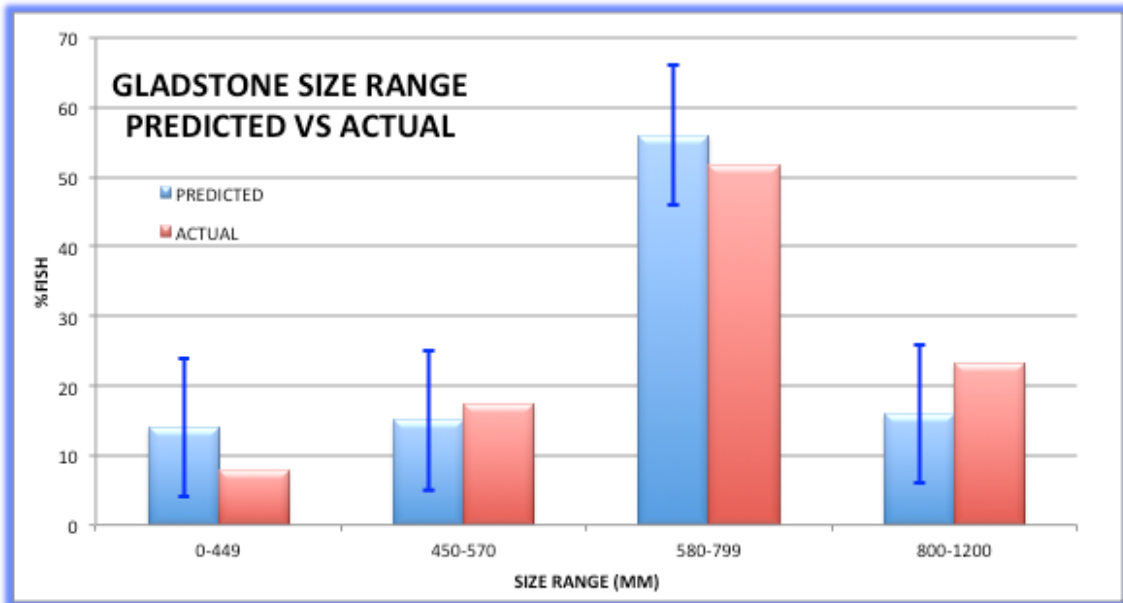


Figure 14: Barramundi 2014 season predicted and actual for fish in size ranges

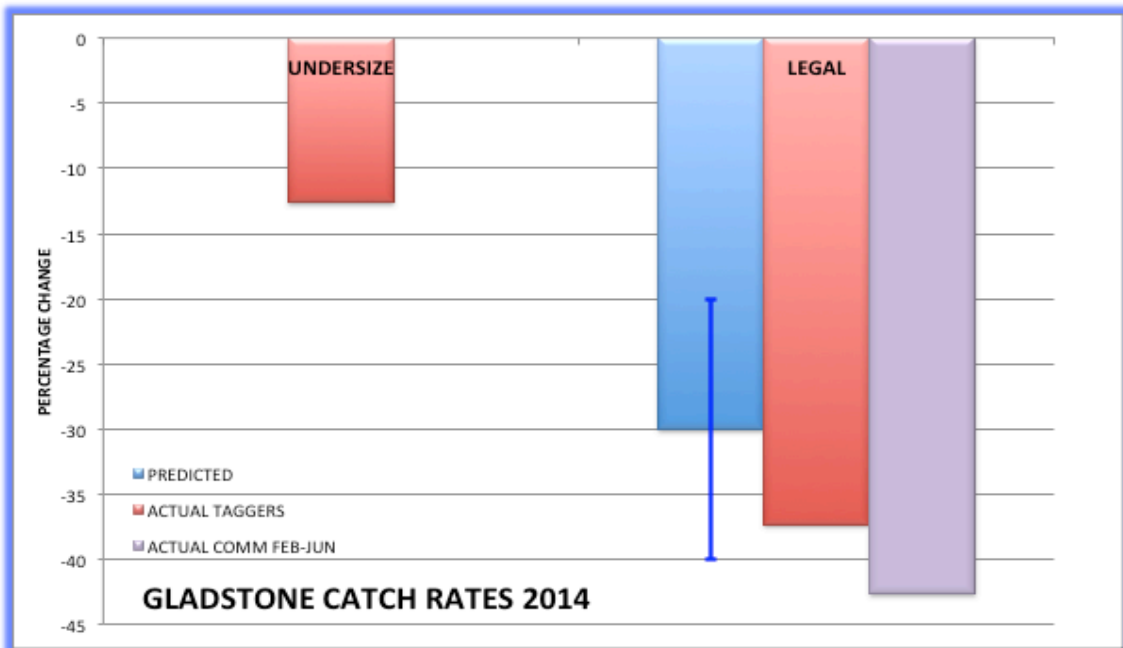


Figure 15: Barramundi 2014 season predicted and actual for catch rates

A number of Crystal Bowl predictions were made in Nov 2013 for the 2014 Barramundi season in Gladstone including fish in size ranges, catch rates, stock size and recruitment

Predictions were checked against observations in Jun 2014 and at the end of the season in Nov 2014

Observed fish in size ranges and catch rates for the 2014 Barramundi season were all within the 20% range predicted by the Crystal Bowl back in Oct 2013

BARRAMUNDI STOCKS BENCHMARK

The number of tagged fish in the Gladstone area, covered by Suntag maps GLD, CISG, BRG and CR02 (*figure 48*), were estimated for each year from 1985-2014 to provide a benchmark for measuring change in stock level. Numbers were estimated based on the number of fish tagged, natural and fishing mortality, tag shedding rates and recaptures (including an estimate of non-reporting). *Figure 16* shows the estimated number of tags each year with the significant boost following the spilling of fish from Lake Awoonga.

1. Stock benchmark (100%) set at 50% of numbers of fish in 2013
2. Highest number of tagged fish in river in 2013 (~1,800 fish)
3. Benchmark number of tagged fish (~800)
4. 2014 is a progress figure as the data from the commercial catch is incomplete with data only available from Feb-Jun (will be updated when complete season catch is available)

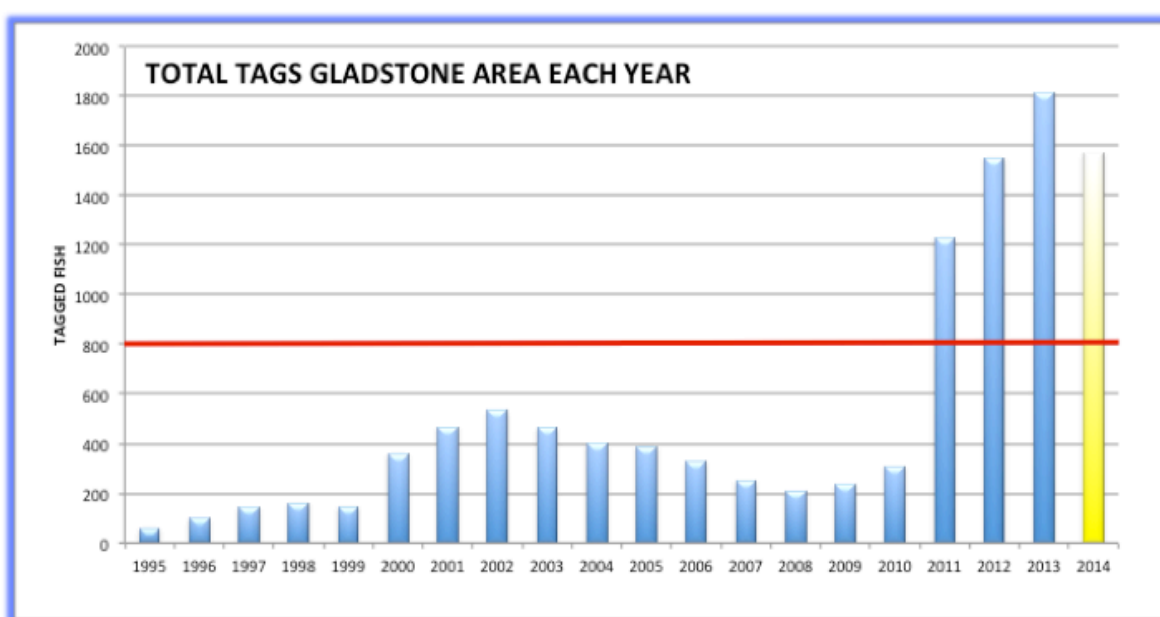


Figure 16: Estimated number of tagged fish in Gladstone each year compared to benchmark

No prediction of stock size was made for Gladstone due to insufficient data however the number of tagged Barramundi in the area was used to provide a benchmark for measuring change in stock level

Barramundi stock benchmark in Gladstone is currently set at ~800 tagged fish or 50% of number of tagged fish in 2013

BARRAMUNDI SIZES

The recreational catch of Barramundi was used to provide a profile of the size range of fish in the stocks. The recreational catch provided the most representative data as the commercial catch only includes legal sized fish. Barramundi measurements were obtained during boat ramp surveys, recruitment surveys and by taggers when tagging fish. *Figure 17* shows a typical Barramundi being measured after being tagged.



Figure 17: Barramundi being measured after tagging

The number of Barramundi measured from the recreational catch from Feb-May each year, in each 50mm size range, was used to assess the proportion of the fish in each size range.

Figure 18 shows the size range of 297 Barramundi measured from the recreational catch from Feb-May 2014. There were 59.8% of the fish from 580-799mm and 12.0% of fish from 800-1,200mm.

Figure 19 shows the numbers of fish in each size range in 2011, 2012, 2013 and 2014. The 2011 fish shows the 2 size ranges of fish from 400-649mm (34.5%) and larger fish from 800-1,199mm (57.2%). that spilled from Awoonga. In 2012 fish from these size ranges still dominated however numbers overall were down. It is likely that some of the reduction in the larger fish resulted from fish dying as a result of the fish health issues. In 2013 the dominant size range was 550-799mm (79.5%) with fewer fish in the larger size range 800-1,199mm (14.8%).

In 2014 the dominant size range was 450-799mm (77.8%) with a further reduction of fish from 800-1,199mm (13.1%). More large Barramundi died in the Boyne River during 2014. For the Boyne River in 2014 there were fewer fish over 800mm (6.4%) compared with 2011 (60.1%). However for the Calliope River in 2014 the proportion of fish over 800mm was still high (40.2%) compared with 2011 (45.3%).

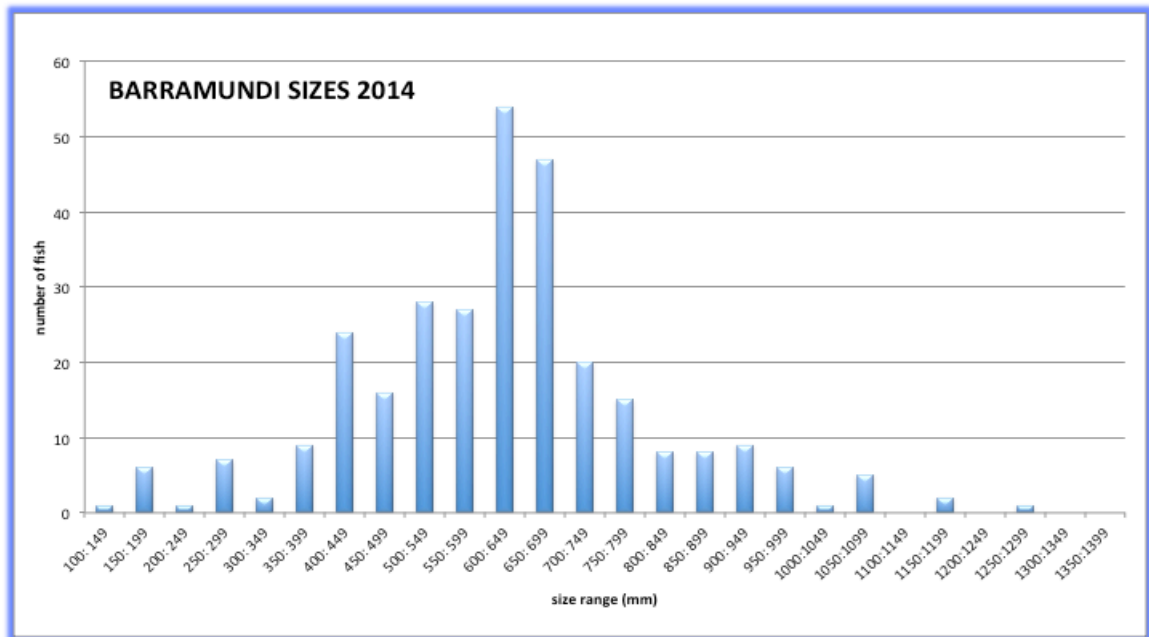


Figure 18: Number of Barramundi in each size range from Feb-May 2014

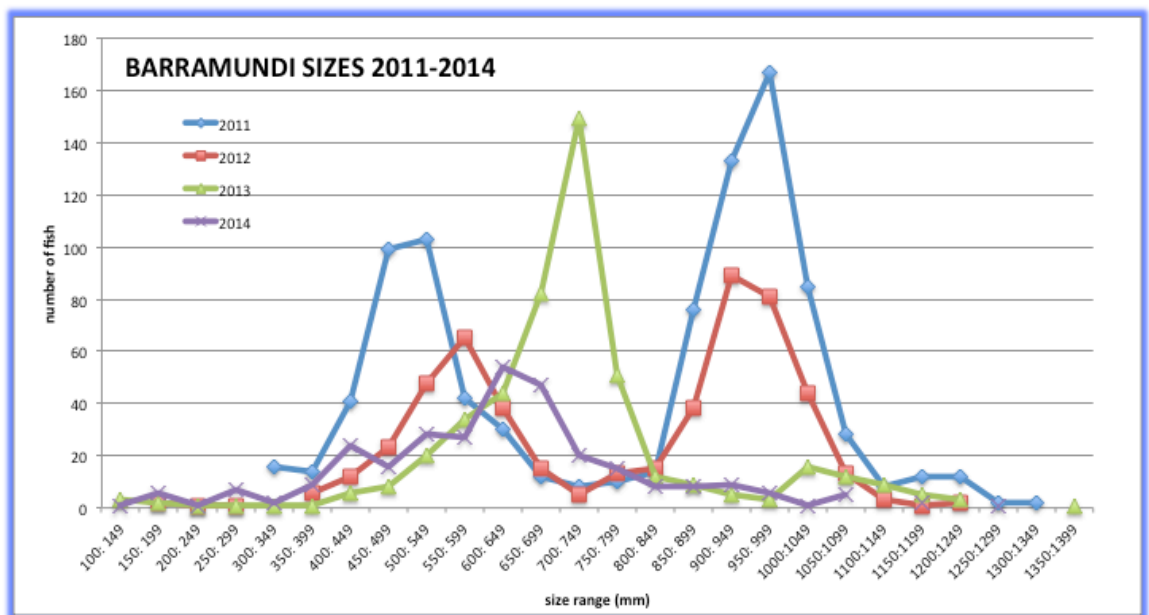


Figure 19: Number of Barramundi in each size range from Feb-May 2011-14

Figure 20 shows the average size of Barramundi in each season from autumn 2008 to spring 2014. From summer 2010-11 (when fish spilled from Awoonga) to spring 2014 the average length has been over the minimum size of 580mm each season.

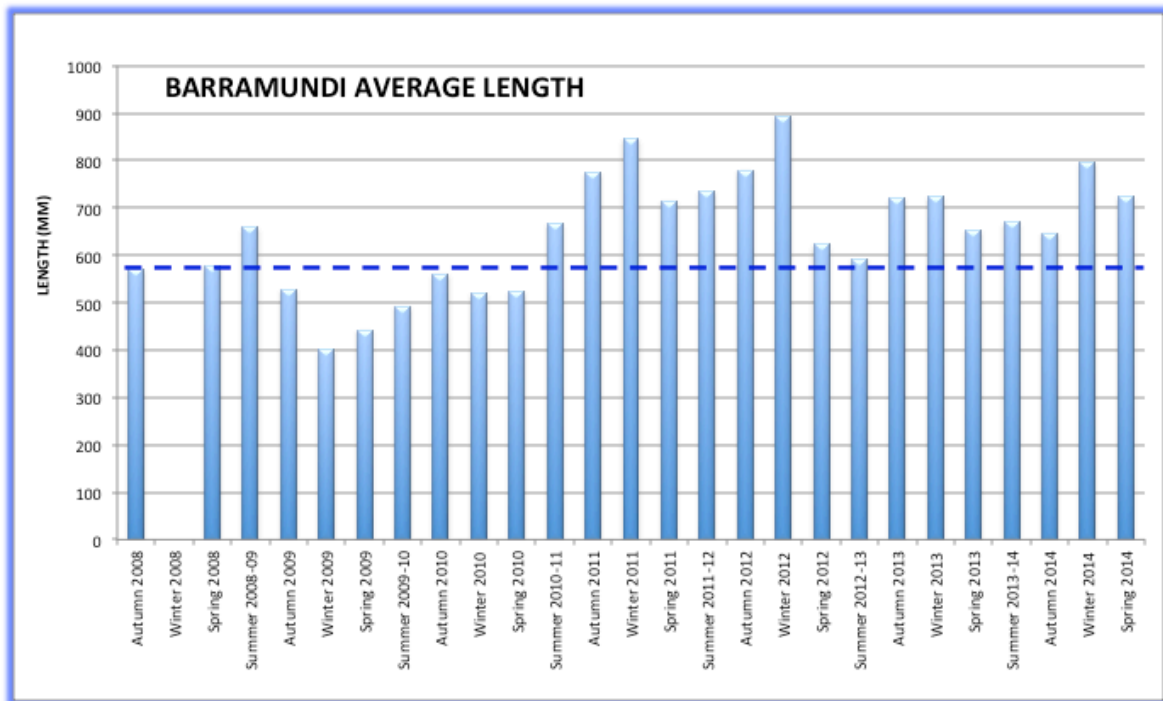


Figure 20: Average size of Barramundi from 2008-2014

Barramundi measured in the recreational catch from Feb-May 2011 mostly ranged from 450-649mm (34.5%) and 800-1,199mm (57.2%) following the spilling of fish from Lake Awoonga

Barramundi measured in the recreational catch from Feb-May 2014 mostly ranged from 450-799mm (77.8%) and from 800-1,199mm (13.1%)

The average size of Barramundi each season has been over the minimum legal size of 580mm from summer 2010-11 to spring 2014

BARRAMUNDI GROWTH

Growth provides data that allows an assessment of fish moving from one size class to another. Barramundi growth was assessed based on the length of the fish when tagged and recaptured. Fish that were out for more than 90 days and had positive growth were included. Growth was assessed for fish less than 650mm and 650mm and above in both the Boyne and Calliope Rivers that were tagged from Jan 2011-Oct 2014. This corresponds with 2 size ranges of fish that spilled from Lake Awoonga and were found in the rivers. Annual growth was also compared with the adjacent Fitzroy River.

There were 196 recaptures in the Boyne River, 131 for fish tagged less than 650mm and 65 for fish tagged 650mm and over. There were fewer recaptures of Calliope River fish with a total of 87, 50 for fish tagged less than 650mm and 37 for fish tagged 650mm and over. For the Fitzroy River there were 527 recaptures, 499 for fish tagged less than 650mm and 28 for fish tagged 650mm and over.

Figure 21 shows the growth of fish compared with the days out for fish less than 650mm when tagged in the Boyne and Calliope Rivers from Jan 2011-Oct 2014. This indicates that the growth of fish less than 650mm was higher in the Calliope River than in the Boyne River.

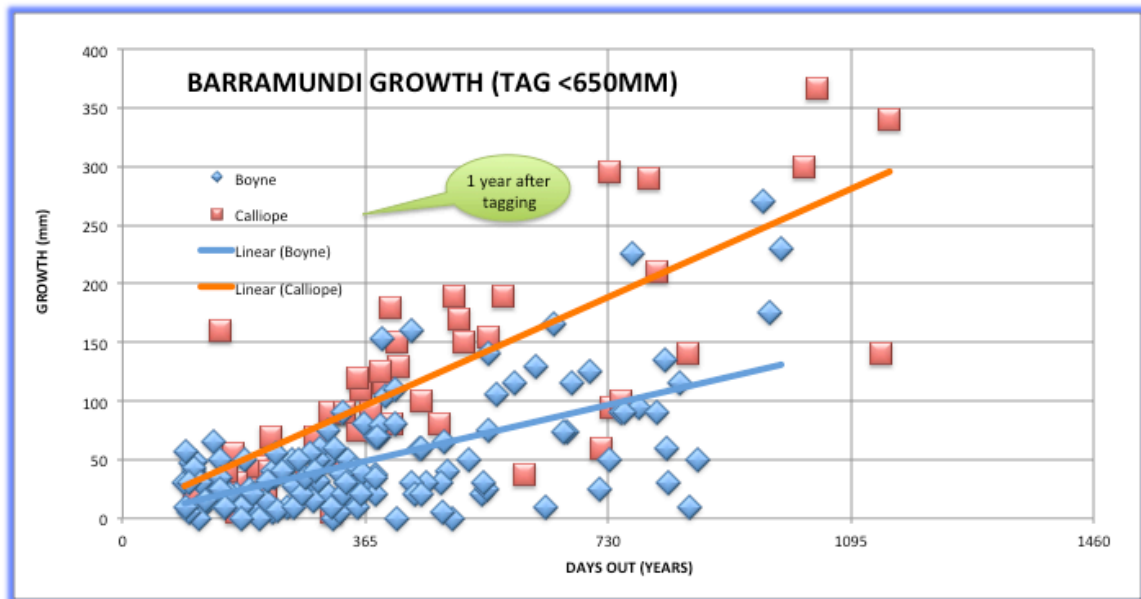


Figure 21: Growth of Barramundi tagged at 650mm or less in the Boyne and Calliope from Jan 2011-Oct 2012

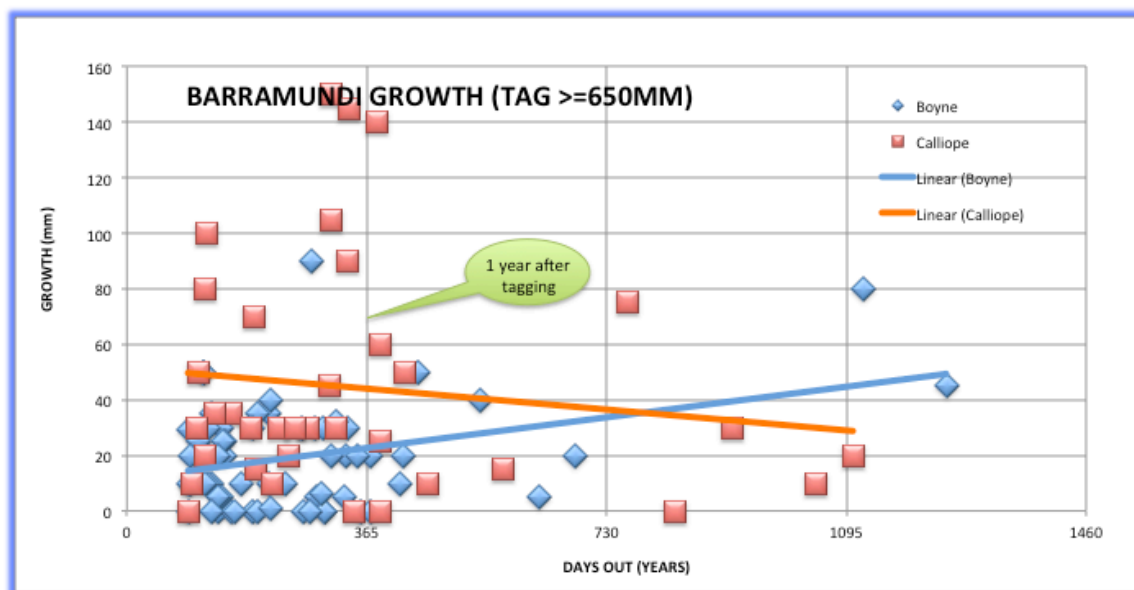


Figure 22: Growth of Barramundi tagged at over 650mm in the Boyne and Calliope from Jan 2011-Oct 2012

Figure 22 shows the growth of fish compared with the days out for fish 650mm and over when tagged in the Boyne and Calliope Rivers from Jan 2011-Oct 2014. This indicates that the growth of fish over 650mm produced a mixed result with growth higher in the Calliope River in the first 2 years but then similar growth after that.

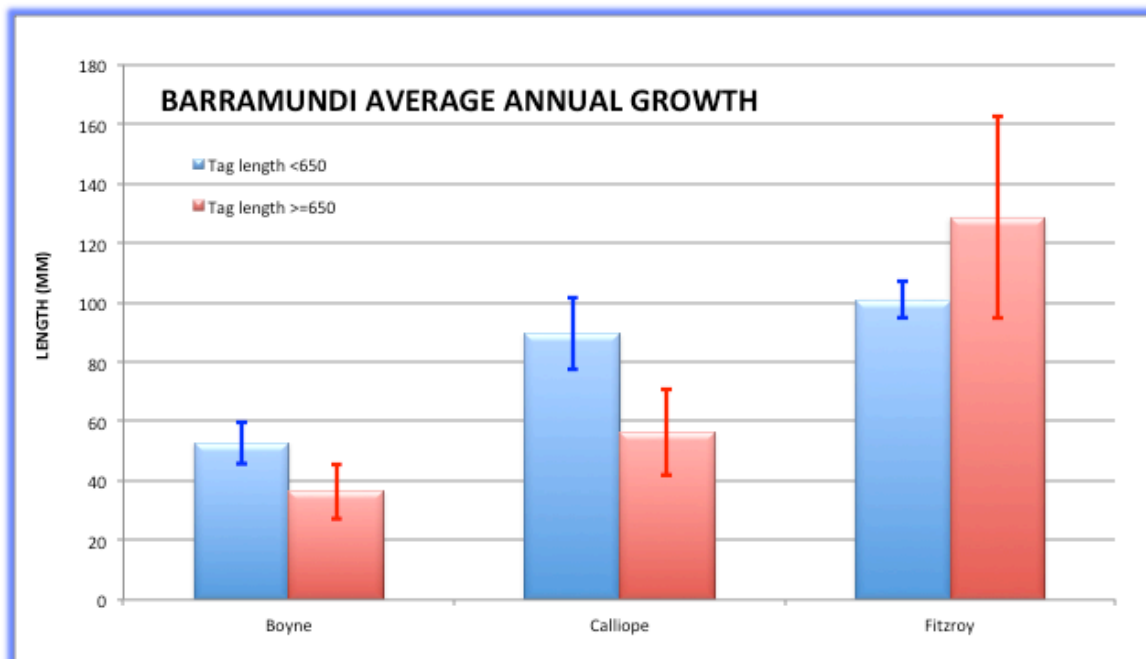


Figure 23: Average annual growth of Barramundi in the Boyne, Calliope and Fitzroy Rivers tagged from Jan 2011-Oct 2014

Figure 23 shows the average annual growth (and 95% confidence) of Barramundi tagged in the Boyne, Calliope and Fitzroy Rivers and then recaptured. The average annual growth rate for the Boyne River for fish tagged at less than 650mm was 52.6±6.9mm and for fish 650mm and over was 36.3±9.0mm. For the Calliope River for fish tagged at less than 650mm the growth rate was 89.4±12.0mm and for fish 650mm and over was 56.3±14.4mm per year. For the Fitzroy River the growth rate for fish tagged less than 650mm was 100.9±6.0mm and for fish over 650mm it was 128.7mm±34.0mm per year.

The growth rate for the Fitzroy River is higher for both groups of fish however the growth rate for fish tagged at 650mm and over in the Fitzroy River should be treated with caution as the number of fish in that size range was low (28). The lower growth rates for the Calliope and Boyne River could be the result of increased competition for food following the increase in fish in those rivers from Awoonga.

The average annual growth rate of Barramundi for fish less than 650mm in the Boyne River was 52.6±6.9mm, for the Calliope River it was 89.4± 12.0mm and for the Fitzroy River it was 100.9±6.0mm

The average annual growth rate of Barramundi for fish over 650mm in the Boyne River was 36.3±9.0mm, for the Calliope River it was 56.3±14.4mm and for the Fitzroy River it was 128.7±34.0mm

COMMERCIAL CATCH OF BARRAMUNDI

The commercial catch of Barramundi was obtained from logbook data 1990-2014⁵ (data for 2014 incomplete). Data were for grids S30 and S31 that covers the Gladstone Harbour as shown in figure 24.

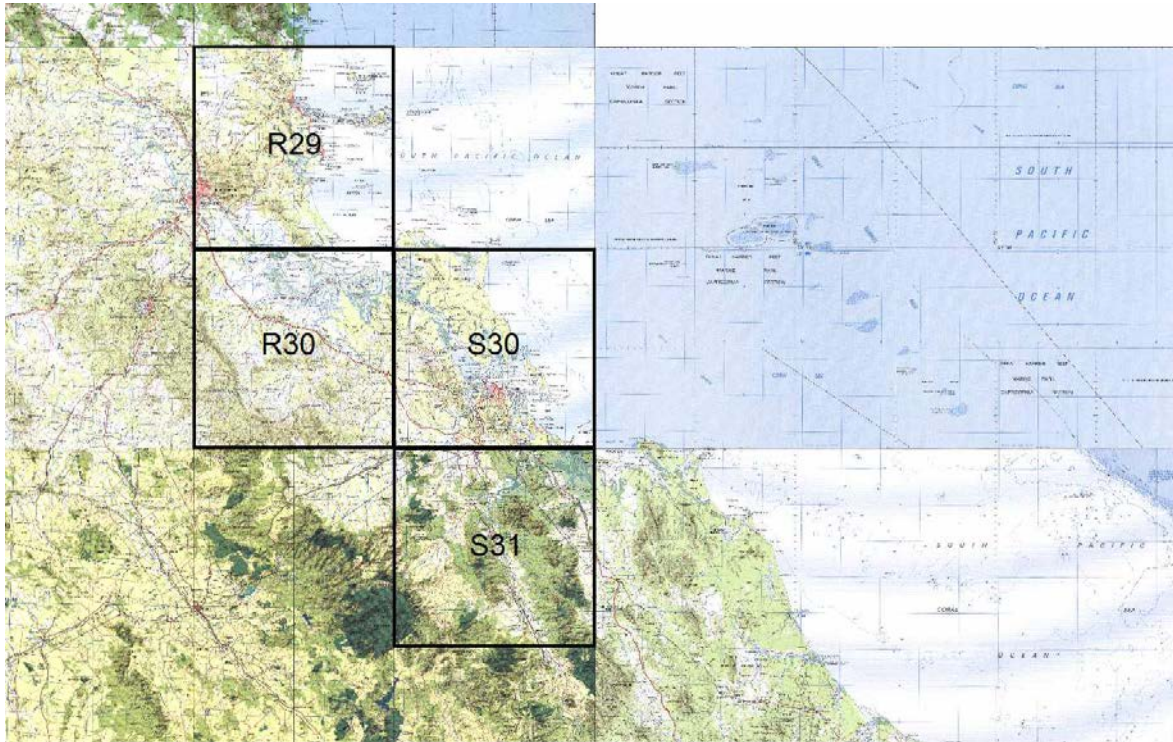


Figure 24: Commercial catch grids for Central Queensland with Gladstone grid S30 and S31

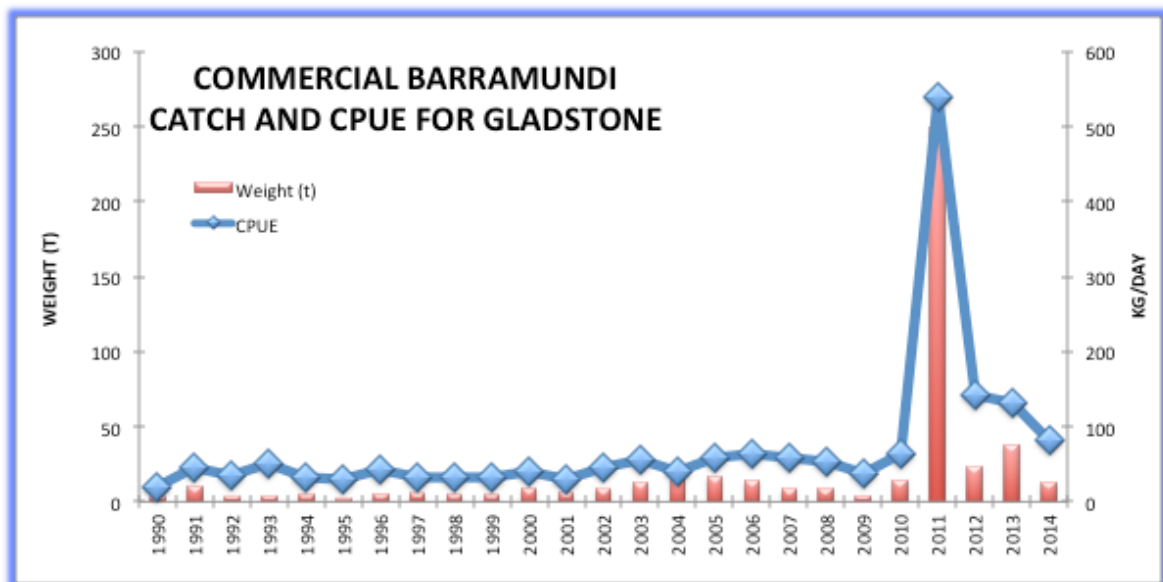


Figure 25: Commercial catch (tonnes) of Barramundi and CPUE for Gladstone grid S30 and S31 from 1990-2014 (data incomplete for 2014 Feb-Aug only)

⁵ Commercial catch data from Department of Agriculture, Fisheries and Forestry at <http://qfish.daff.qld.gov.au/>

Commercial catch per year (tonnes) and catch per unit effort (CPUE) for grids S30 and S31 for each year are provided in *figure 25*. There is a closed season from Nov-Jan each year so the catch data are for the 9 months from Feb-Oct.

From 2000-10 the commercial catch ranged from a low of 4.0t in 2009 to a high of 16.8t in 2005. In 2011 it rose to a high of 249.0t, an increase of over 1,760% over the previous year. The significant increase in the catch in 2011 is attributed in part to the large number of "Awoonga" Barramundi that entered the fishery in early 2011. From 2000-2010 the commercial catch per unit effort (CPUE) ranged from a low of 30.6kg/day in 2001 to a high of 64.2kg/day in 2006. In 2011 it rose to 540.0kg/day, which was an increase of 860% over the previous year. In 2012 the catch dropped significantly, mainly due the difficulty in marketing product following the health issues in the area. The commercial catch was 13.11t for Feb-Aug 2014 (data for year incomplete).

The commercial catch of Barramundi was 249.0t in 2011, 23.3t in 2012, 37.9t in 2013 and 13.11t in 2014 (Feb-Aug)

The commercial CPUE of Barramundi was 540.0kg/day in 2011, 143.4kg/day in 2012, 131.2kg/day in 2013 and 83.0kg/day in 2014 (Feb-Aug)

RECREATIONAL CATCH OF BARRAMUNDI

Recreational catch of Barramundi were available from fishing trips details obtained from boat ramp surveys and direct from fishers. Seasonal catch was calculated for Barramundi caught and kept each season from autumn 2006-spring 2014 based on the following:

Recreational catch (numbers) = trips x catch rate (standard trip)

Trips = boat trips x catch rate + landbased trips x catch rate

Boat trips

Total boat trips (season) = average boat trips (day) x days (season)

Boat trips (day) = trailer count (hour) x 1/correction factor (hour)

Correction factor = boats fishing (hour)/total boats (day)

Boat fishing = boats (left ramp) – boats (returned ramp)

Standard boat trip = 2 fishers x 4 hours fished (average trip)

Landbased trips

Total landbased trips (season) = average fishers (day) x days (season)

Landbased trips (day) = fisher count (hour) x 1/correction factor (hour)

Correction factor = fishers (hour)/total fishers (day)

Fishers = fishers (started fishing) – fishers (finished fishing)

Standard landbased trip = 1 fisher x 2 hours fisher (average trip)

Figure 26 shows the number of Barramundi caught and kept per trip each season from spring 2011 to spring 2014. The most fish caught was in autumn 2013 when an estimated 14,034 fish were caught and 1,528 kept. In each Barramundi season autumn was the most productive season and this coincided with the opening of the season. Winter catches were the least as low water temperatures reduce the catchability of Barramundi. The lowest catch was in winter 2012 with an estimated 1,063 fish caught and 125 kept.

The percentage of Barramundi caught that were kept was 8.0%.

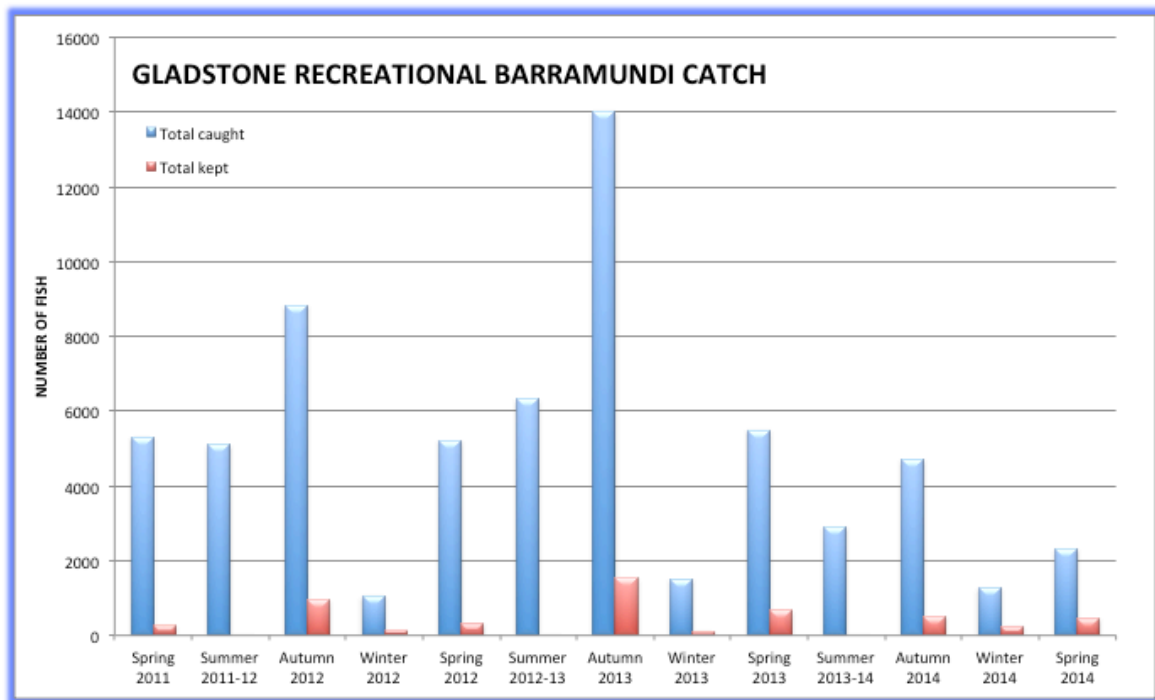


Figure 26: Estimated number of Barramundi caught/kept each season from spring 2011-spring 2014

The recreational catch of Barramundi was most in autumn 2013 with around 14,000 Barramundi caught and 1,525 kept and was least in winter 2012 with around 1,050 fish caught and 125 kept

The percentage of Barramundi kept from autumn 2006-spring 2014 was 8.0%

COMPARING COMMERCIAL AND RECREATIONAL CATCH

A comparison of commercial and recreational catch was made for 2012, 2013 and 2014. Commercial catch for 2014 was incomplete as data were only available from Feb-Aug. This comparison will be updated when complete data for 2014 is available.

Weight of the recreational catch was calculated so that it could be compared with the commercial catch. For each season the average length of fish kept and released were used to estimate the average weight of fish kept/released and then the weight of the recreational catch.

Recreational catch (tonnes/year) = number of fish kept/year x average weight (kg) x 1000
 Average weight (kg) = average weight of fish (average length kept)

Figure 27 shows the comparison of the recreational and commercial catch. In 2012 the commercial catch was 23.3t compared with the estimated recreational catch of 8.4t (36.2% of the commercial catch). In 2013 the commercial catch was 37.9t compared with the estimate recreational catch of 7.3t (19.3% of the commercial catch). The data for the commercial catch in 2014 is incomplete being only available for Feb-Aug.

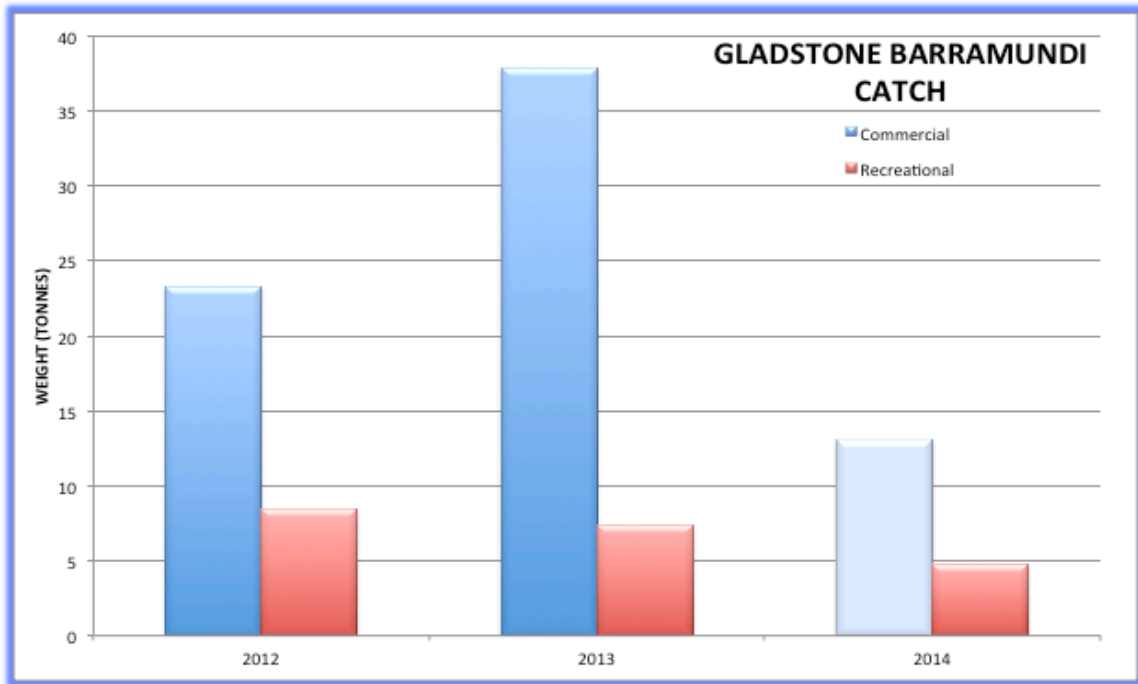


Figure 27: Comparison of commercial and recreational catch 2012, 2013 and 2014
(incomplete Feb-Aug only)

The recreational catch of Barramundi for 2012 was estimated at 8.4t compared with the commercial catch of 23.3t and for 2013 was estimated at 7.3t compared with the commercial catch of 37.9t

The recreational catch of Barramundi for 2014 was estimated at 4.7t compared with the commercial catch of 13.1t (part year Feb-Aug)

BARRAMUNDI TAGGING

From 1985-2014 there were 6,269 Barramundi tagged. *Figure 28* shows a typical large Barramundi tagged in the Pikes Crossing area in early 2011. This was one of a large number of fish in excess of 1m that spilled from Awoonga and were subsequently tagged.

Figure 29 shows the number of fish tagged (excluding impoundment) each 5 years since 1985 in Suntag maps BRG, CR02, CISG and GLD (*figure 48*). Note that the data for 2010-15 only covers 4 years. From 1985-2010 there were 1,686 Barramundi tagged while in the 4 years since then there have been 4,583 (73.1% of total) tagged, which is 2.7 times more than in the previous 25 years. This is mostly due to the increase in stocks from Awoonga fish and good natural recruitment from 2008-10.



Figure 28: Typical large Barramundi tagged in the Pikes Crossing area in early 2011

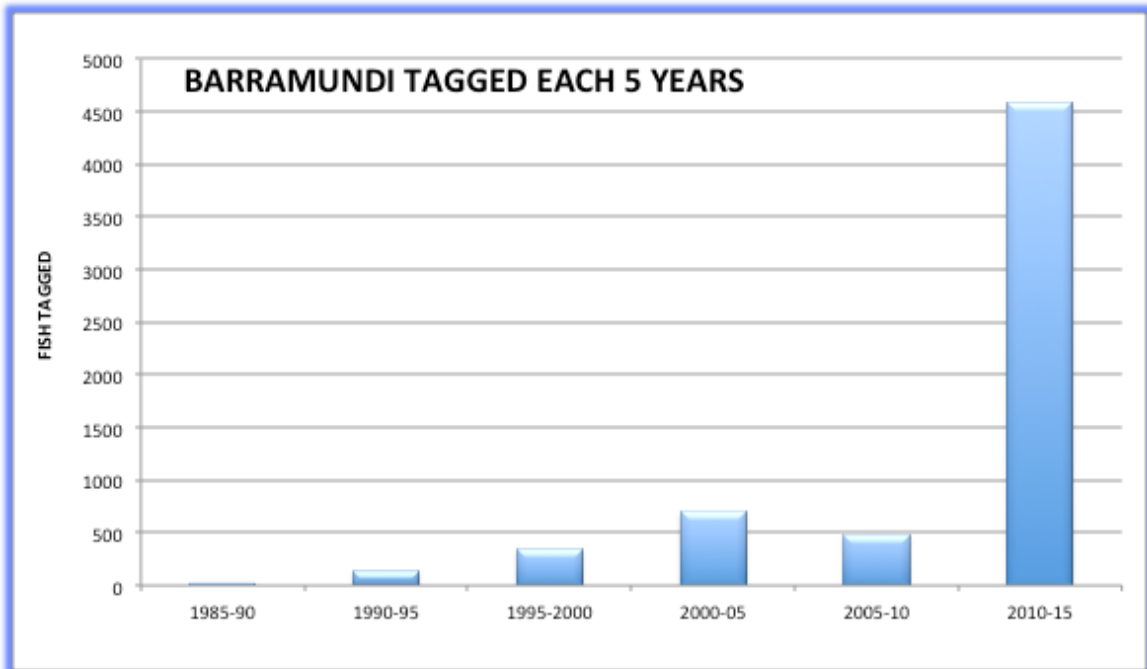


Figure 29: Numbers of Barramundi tagged (excluding impoundments) each 5 years from 1985-2014

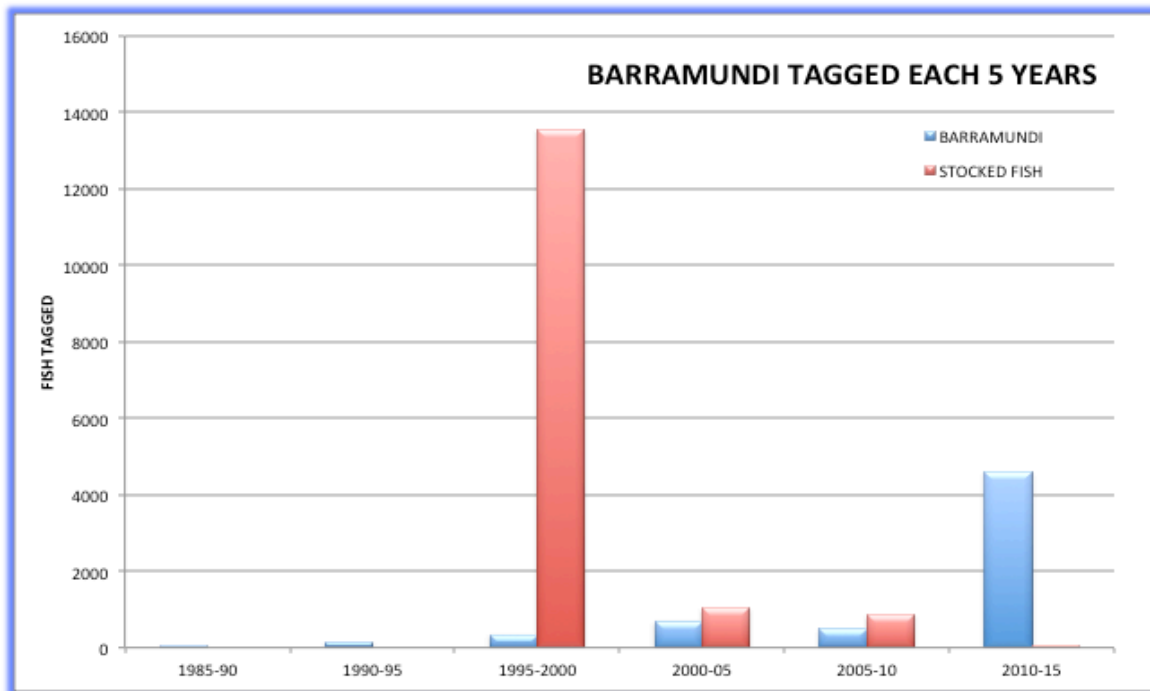


Figure 30: Barramundi (including stocked fish in impoundments) tagged each 5 years from 1985-2014

Figure 30 shows the number of fish tagged (including impoundment) each 5 years since 1985. Impoundments include Lake Awoonga, Lake Callemondah and the Duck Ponds. From 1985-2014 there were 15,474 Barramundi tagged in the impoundments with 13,555 (87.6%) tagged from 1995-2000. Most fish in that period were fish around 200mm that were tagged when stocked into Lake Awoonga. There were several thousand more fish tagged stocked fish released into Lake Awoonga from 2005-2010 however the records were lost.

In grid maps GLD, BRG, CR02 and CISG (excluding impoundments) there were 6,269 Barramundi tagged from 1985-2014 with 4,583 (73.1%) tagged in the last 4 years from 2010-2014 compared to 1,686 (26.9%) over the previous 25 years

There were 15,474 Barramundi tagged from 1985-2014 in Lake Awoonga, Lake Callemondah and Duck Ponds (freshwater impoundments) with 13,555 (87.6%) from 1995-2000 being fish tagged when stocked at average of 184mm in Lake Awoonga

TAG LOCATIONS

Figure 31 shows the locations where Barramundi were tagged from 1985-2014 in maps GLD, BRG, CR02 and CISG (excluding impoundments). There were 202 grids where Barramundi were tagged with the largest number being 931 in BRG/AA40, which is in the Pikes Crossing area. All these fish were tagged after the fish spilled from the dam in late 2010. There were 14 grids where 100 or more Barramundi were tagged (shown in red on figure 31).

From Nov 2012-Oct 2014 there were 83 grids where Barramundi were tagged with the largest number being 326 in BRG/Z20. There were 5 grids where over 100 fish were tagged as shown in *figure 32*.

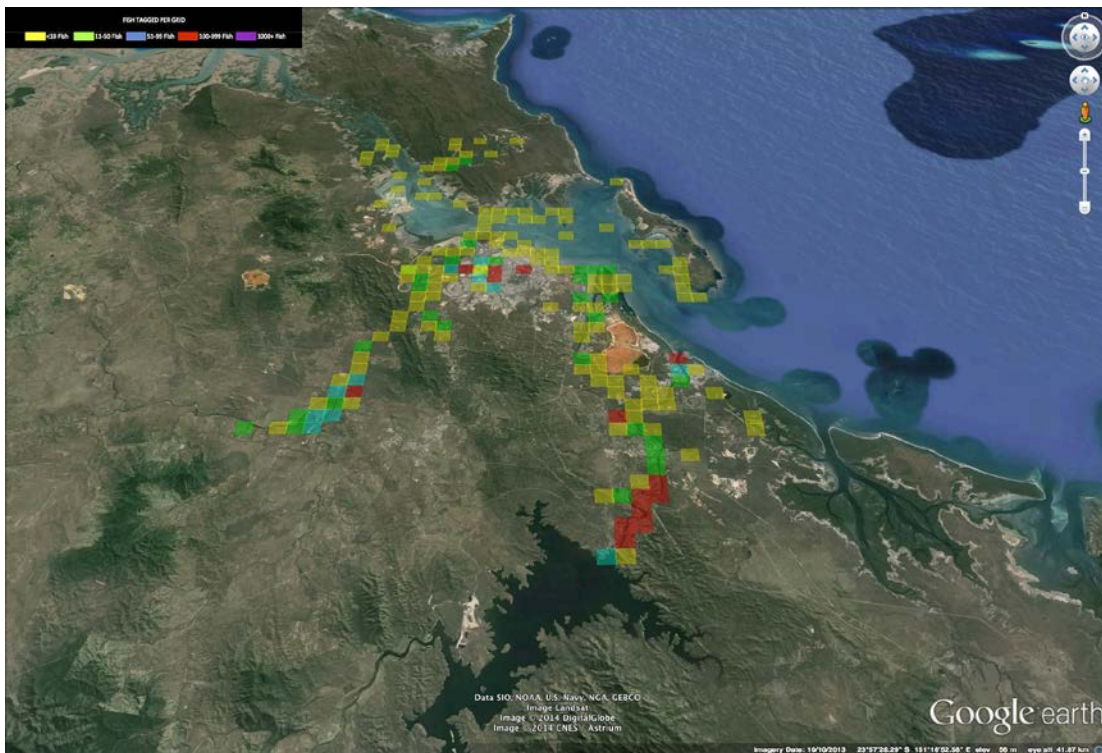


Figure 31: Locations where Barramundi were tagged from 1985-2014

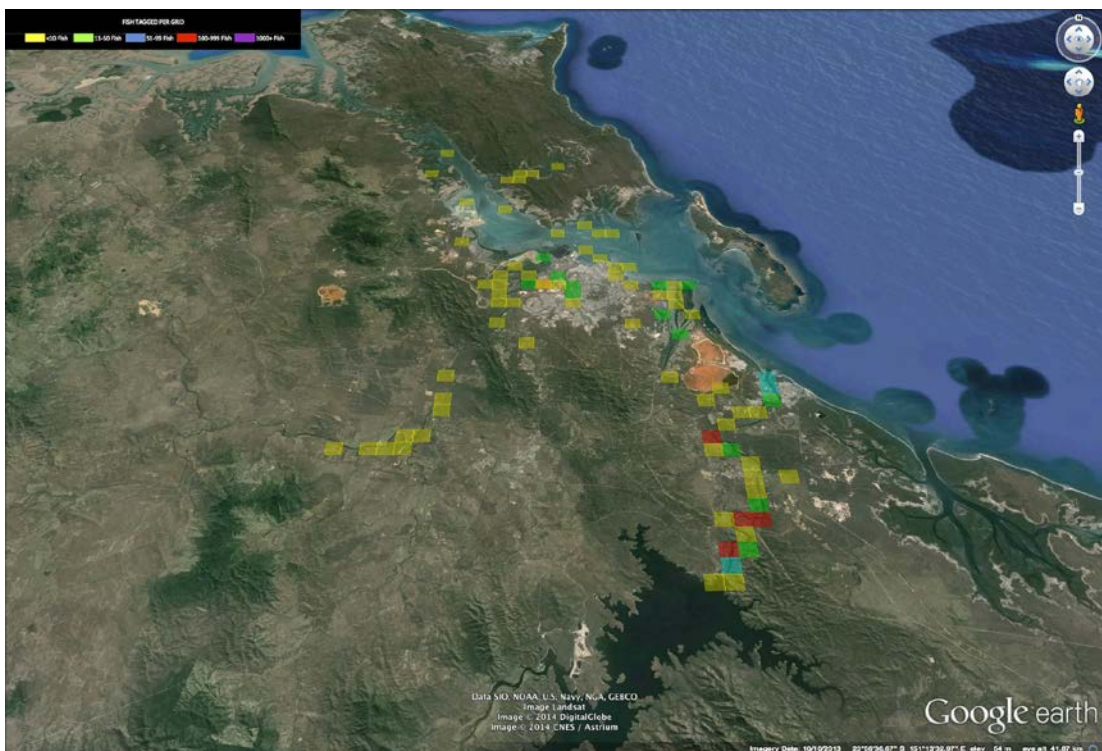


Figure 32: Locations where Barramundi were tagged from Nov 2012-Oct 2014

From 1985-2014 there were 202 grids where Barramundi were tagged with 931 tagged in the Pikes Crossing area in grid BRG/AA20 after they spilled from Lake Awoonga from late 2010 and 14 grids where over 100 fish were tagged

From Nov 2012-Oct 2014 there were 83 grids where Barramundi were tagged with 326 tagged in the Pikes Crossing area in grid BRG/Z20 after they spilled from Lake Awoonga from late 2010 and 5 grids where over 100 fish were tagged

RECAPTURE RATES

Figure 33 shows the recapture rate for Barramundi and all species for each 5 years from 1985-2014. The recapture rate ranged from a high of 29.2% in 1985-90 to 15.0% in 2010-14. Recapture rates for 1985-90 and 1990-95 need to be treated with caution due to the low numbers of fish tagged over those years. The overall recapture rate from 1985-2014 was 17.4% while the overall recapture rate for Barramundi under Suntag was 7.4% and for the Fitzroy River was 17.4%.⁶ It should be noted there has been under reporting of recaptures by commercial fishers in the Gladstone area with 43 (3.9%) from 1985-2014 and 15 (2.2%) from Nov 2012-Oct 2014. Anecdotal information suggests that many recaptures by commercial fishers go unreported.

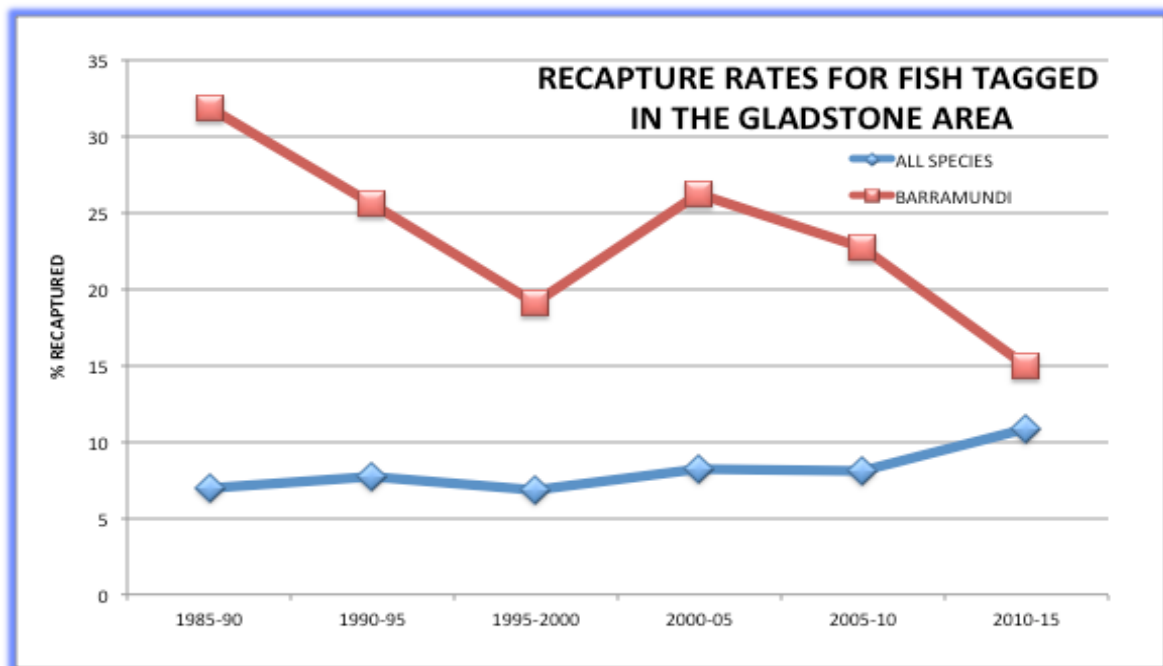


Figure 33: Recapture rate for Barramundi and all species for each 5 years from 1985-2013

The recapture rate for Barramundi from 1985-2014 was 17.4% and that compares with 17.4% for the Fitzroy River and 7.4% for the overall Suntag rate

⁶ Infofish Citizen Science and Suntag Report 2013/14

BARRAMUNDI AND RIVER FLOWS

Tagging data were used to provide a timeline of Barramundi sizes in the Boyne River, Gladstone Harbour and the Calliope River. Barramundi that spilled from Lake Awoonga in 2011, 2012 and 2013 have strongly influenced the Barramundi stocks in the Boyne River, Calliope River and Gladstone Harbour.

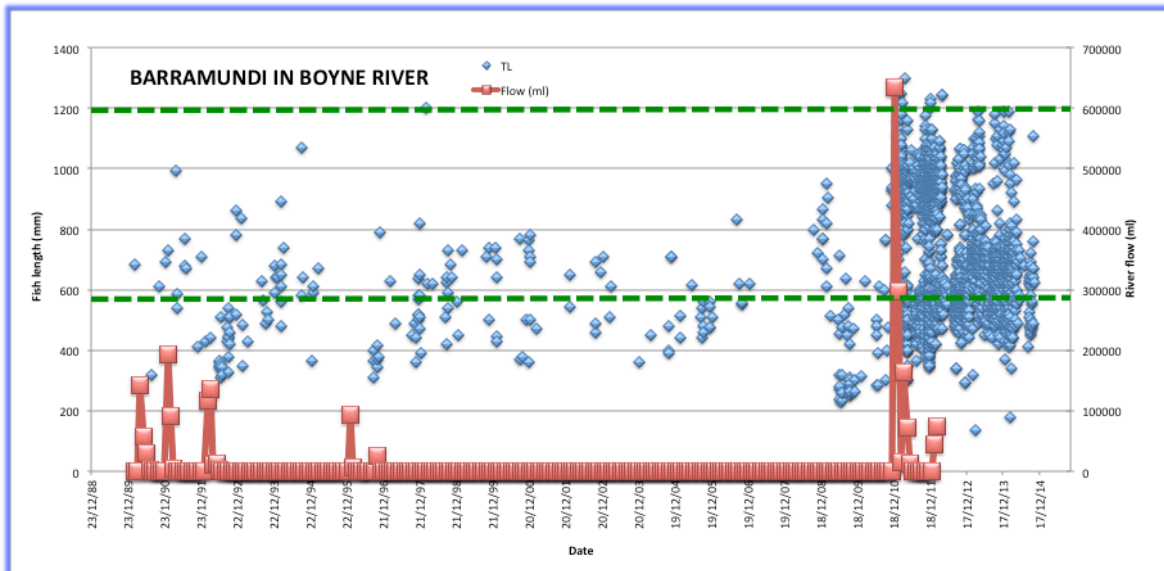


Figure 34: Number and size of Barramundi tagged in the Boyne River and river flows from 2000-2014

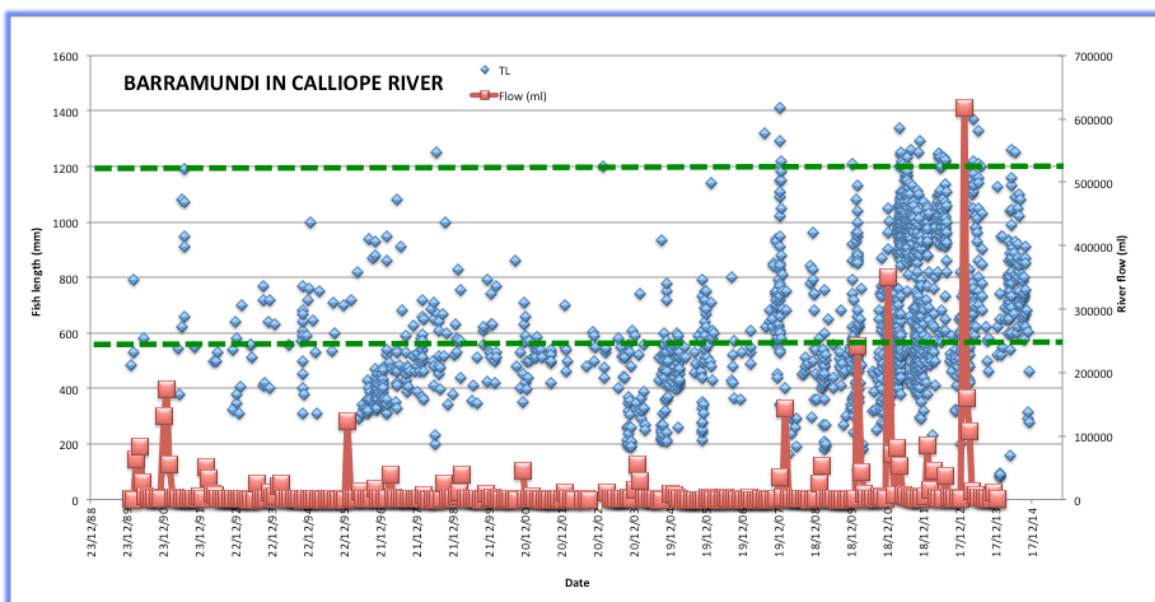


Figure 35: Number and size of Barramundi tagged in the Calliope River and river flows from 2000-2014

Figure 34 show the number and size of fish tagged/measured in the Boyne (map BRG) compared with river flow⁷. There has been a significant reduction of large Barramundi over 800mm in the Boyne. In 2011 fish over 800mm were 60.1% of those measured while

⁷ Boyne River flow for Station 133005A from Department of Natural Resources and Mines

by 2014 this had fallen to 6.4%. As well as these fish being caught and kept many large Barramundi died during 2013 and 2014 (see section 12).

Figure 35 shows the number and size of fish tagged/measured in the Calliope River (map CR02) from 2000-2014⁸. This shows that following the spilling of fish from Lake Awoonga in Dec 2010 some fish made it into the Calliope River. In contrast with the Boyne River the number of fish over 800mm in the Calliope River has remained high with 40.2% above that size in 2014 compared with 45.3% in 2011. Fish health issues affected the Calliope River less with fewer dead fish with no reports in 2013 and 2014. However diseased fish were reported in the fishers' views survey (table 5).

Figure 36 shows the number and size of fish tagged in Gladstone Harbour (map GLD). Fish stocked in Lake Callemondah and the Duck Ponds have been separately identified to indicate the contribution of stocked fish to the harbour area. The reduction in the numbers of fish tagged in the harbour from 2011-2013 is likely to reflect a reduction in fishing effort due to fish health issues and increased boat traffic associated with industrial development on Curtis Island.

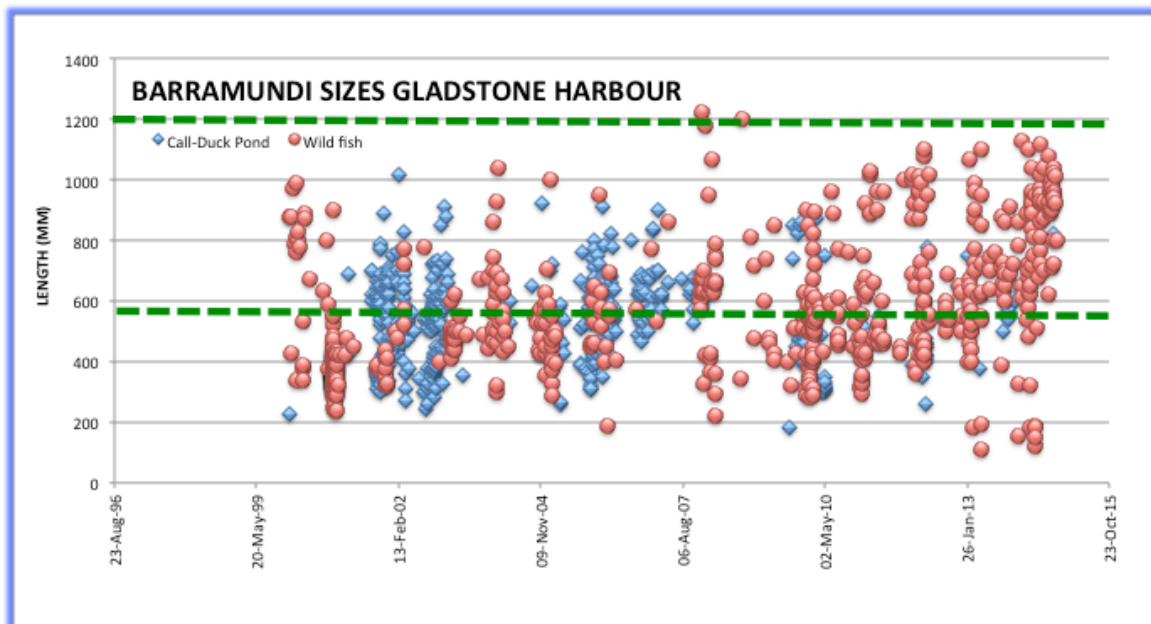


Figure 36: Number and size of Barramundi tagged in Gladstone Harbour from 2000-2013

Barramundi that spilled from Lake Awoonga in 2011, 2012 and 2013 have strongly influenced Barramundi stocks in the Boyne River, Calliope River and Gladstone Harbour

Numbers of large Barramundi over 800mm in the Boyne River have reduced significantly from 60.1% in 2011 to 6.4% in 2014

Numbers of large Barramundi over 800mm in the Calliope River have remained reasonably steady being 45.3% in 2011 and 40.2% in 2014

⁸ Calliope River flow for Station 132001A at Castlehope from Department of Natural Resources and Mines

BARRAMUNDI RECRUITMENT

An estimate of annual recruitment is required to be able to forecast what stocks will look like in the future. Details of previous recruitment surveys were provided in the Gladfish 2012 and 2013 reports.

Surveys were undertaken using a standardised castnet method with a fixed number of casts at each site. Based on the site size and characteristics this involved 5, 10 or 20 casts. The numbers of fish of each species caught in each cast were recorded to allow a catch rate of fish/cast to be calculated for each survey. All Barramundi recorded were measured and fish over 150mm were tagged. Barramundi spawning generally occurs from Oct-Jan each year and recruits enter nursery areas from Jan-Apr. Recruitment surveys were undertaken from Jan-May when new recruits were expected to be in the nursery areas.

In 2014 there were 30 surveys undertaken at 9 sites from Jan-May using the standardised survey method. Due to flooding a number of sites were inaccessible or unable to be surveyed during that time. *Figure 37* shows the sites surveyed in 2014 and other sites where recruits were reported.

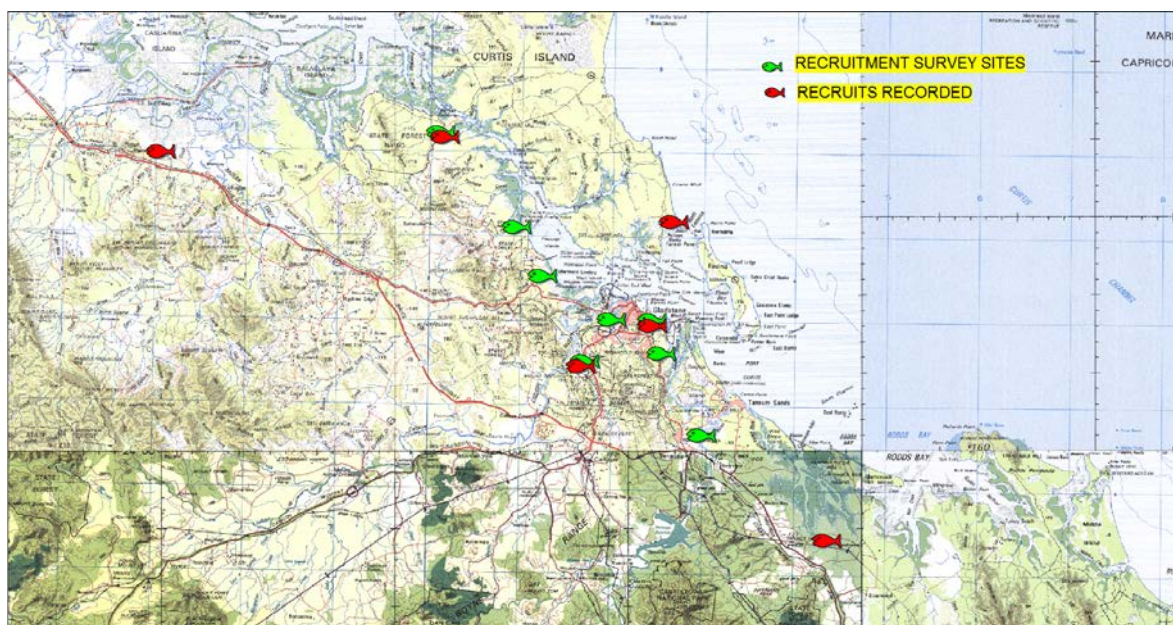


Figure 37: Sites of Barramundi recruitment surveys in the Gladstone area where recruits were recorded in 2013

A total of 17 new recruits were recorded at 7 sites that were Munduran Creek, Beecher Creek, Barney Point, Wappentake Creek, Calliope River (historical village), Boat Creek and Auckland Creek (below Callemondah). A further 3 recruits were recorded outside of recruitment surveys. The 12 Mile Creek at Marmor is used as a reference site for recruitment with data available for the past 28 years.



Figure 38: Assessment of Barramundi recruitment in Gladstone and the Fitzroy River 2011-2014

The environmental factors that influence Barramundi recruitment are known. Recruitment depends on rainfall, river flows and timing of flows. Strong recruitment requires above average wet season rainfall and high river flows, particularly in Jan-early Feb. Conditions in 2014 were suitable for moderate recruitment and it was assessed as being moderate. *Figure 38* shows the assessment of recruitment in Gladstone and the Fitzroy River from 2011-2014.

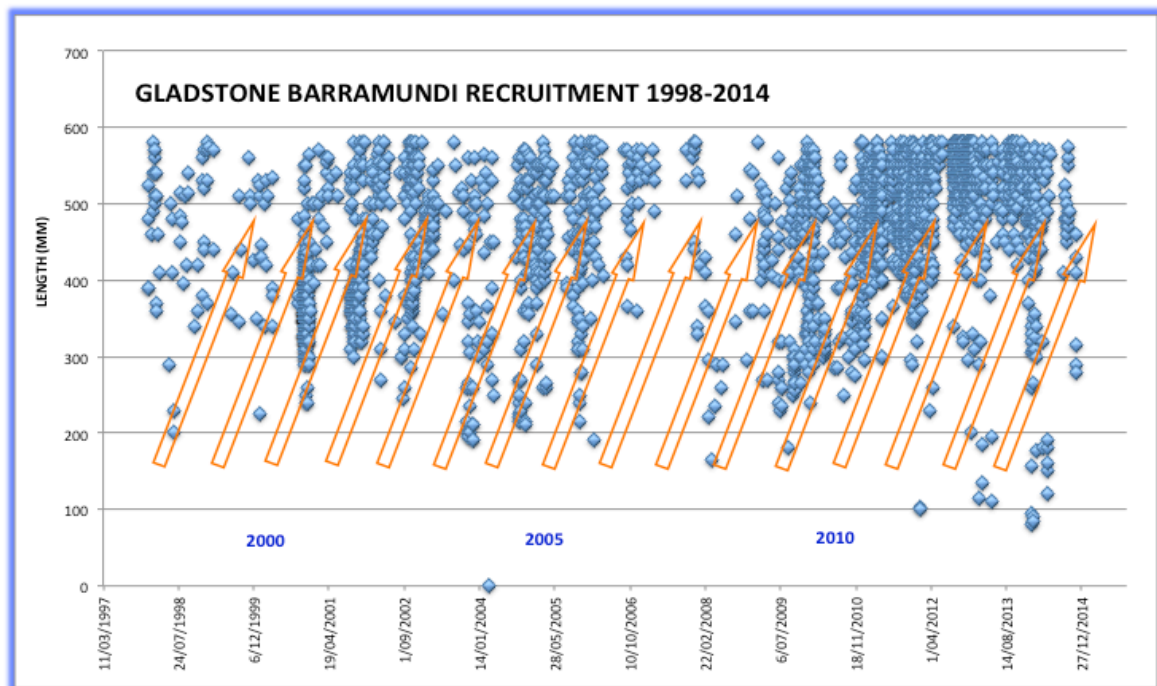


Figure 39: Gladstone Barramundi recruitment 1998-2014 (arrows show growth of fish over time)

Following the completion of surveys recruitment continues to be monitored by recording the numbers of fish in the 0-350mm size range from Jul-Aug and 0-400mm from Sep-Oct in the recreational catch and from tag records. There were no fish recorded in those size ranges in the Gladstone area in 2014. *Figure 39* shows recruitment in Gladstone from 1998-2014. Based on this recruitment in the Gladstone area was assessed as moderate.

As recruitment is dependent on rainfall and river flows, by monitoring weather predictions, this can provide an indicator of conditions during the recruitment period. The Bureau of Meteorology (BOM) provides a prediction of sea surface temperature (SST) anomaly that is a significant predictor of rainfall. The long range forecast for NINO34⁹ (*figure 40*) for the Barramundi recruitment period of Jan-May 2015 is for near El Niño conditions with a 20-25% of exceeding median rainfall through to Jan 2015.

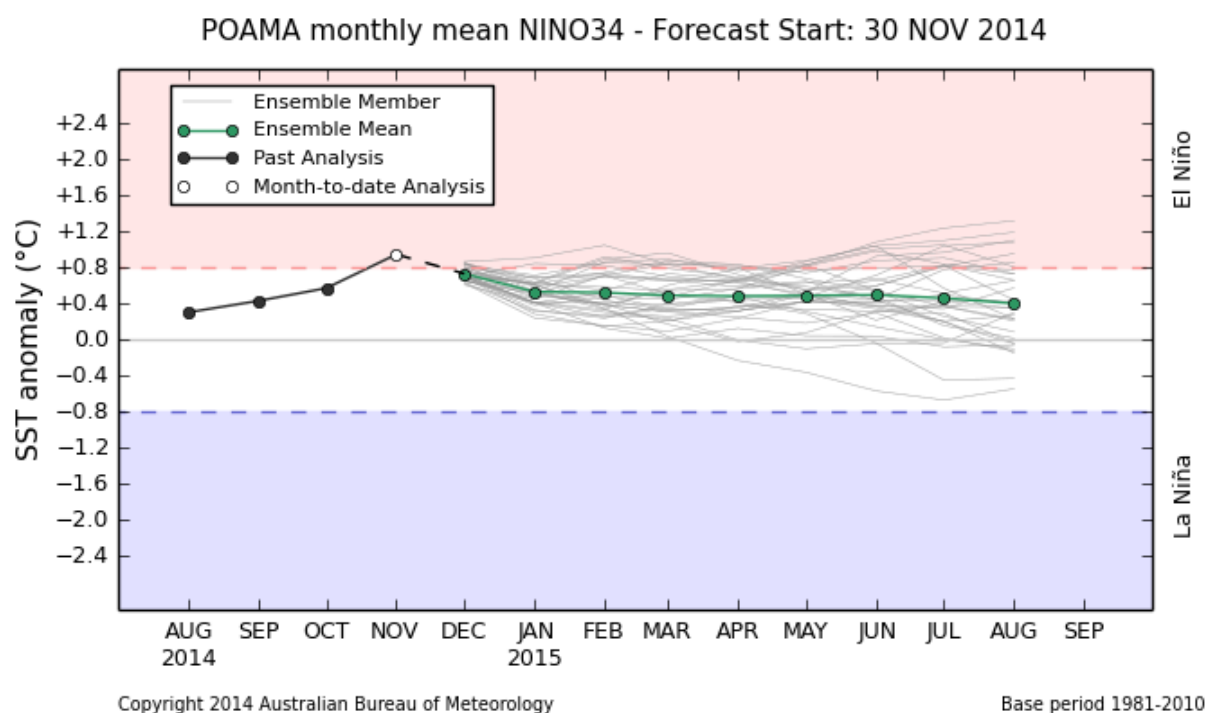


Figure 40: BOM long range forecast for NINO34 for 2015

River flows and rainfall were conducive to moderate recruitment in 2014 and recruitment was assessed as moderate

Long range forecast for NINO34 suggest near El Niño conditions for the 2015 recruitment period indicating poor recruitment

STOCKED BARRAMUNDI IN LAKE AWOONGA AND LAKE CALLEMONDAH

Details of stocking in Lake Awoonga and Lake Callemondah and the distribution of tagged stocked fish following spilling from the lakes were reported in Gladfish 2012. Lake Awoonga spilled for the first time since the dam wall was raised in 2002 from Dec 2010-

⁹ BOM long range forecast for NINO34 from <http://www.bom.gov.au/climate/poama2.4/poama.shtml>

Jun 2012. It spilled again from Jan-Feb 2012 and again from Jan-Jun 2013. Each time Barramundi stocked in the lake spilled into the Boyne River and were then distributed through adjacent waterways. There was a minor spill in 2014 but this was insufficient for fish to spill from the lake.

The fishery in Lake Awoonga declined and the lake was stocked again with 986,500 fish (50mm) from 2010-2014 (table 8). This allowed the fishery in the lake to be maintained although some of these fish exited during the spill events in 2012 and 2013.

Year	Awoonga	Callemondah
2010/2011	207,000	7,000
2011/2012	344,000	7,000
2012/2013	220,500	7,000
2013/2014	198,000	
2014/2015	17,000 (so far)	

Table 8: Number of Barramundi stocked in the Gladstone area 2010-2014

Stocked fish tagged in the lake and fish tagged below the spillway in the Pikes Crossing area were used to assess the distribution of stocked fish. A total of 10,034 Barramundi were tagged in the lake since 2000 and 49 (0.5%) of those were recapture below the dam. One further fish tagged in the lake was recaptured in 2014. A total of 1,720 were tagged in the Pikes Crossing area from Manns Weir to the Awoonga spillway from Jan 2011-Oct 2014 with 258 (15%) recaptured. These were fish that were tagged in map BRG grids AB19, AB20, AA20, Z20, Z21 and Y21.

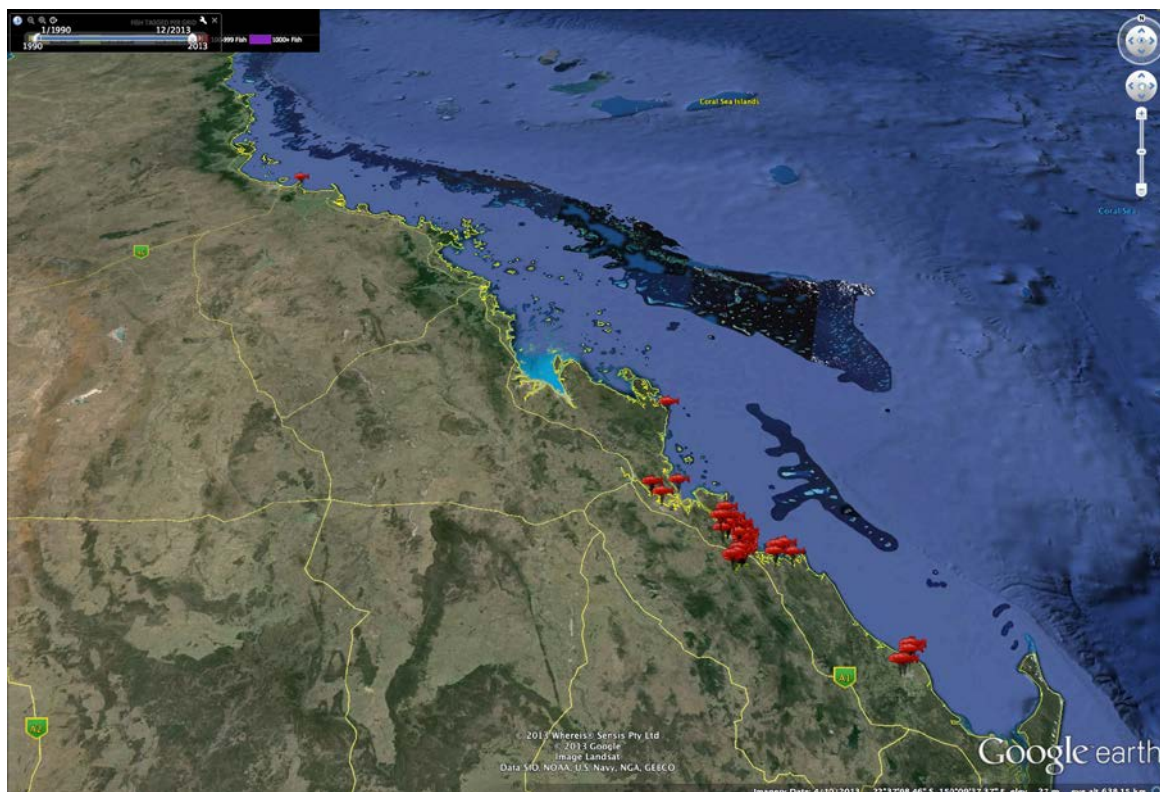


Figure 41: All locations where Barramundi tagged in Lake Awoonga and at Pikes Crossing were recaptured

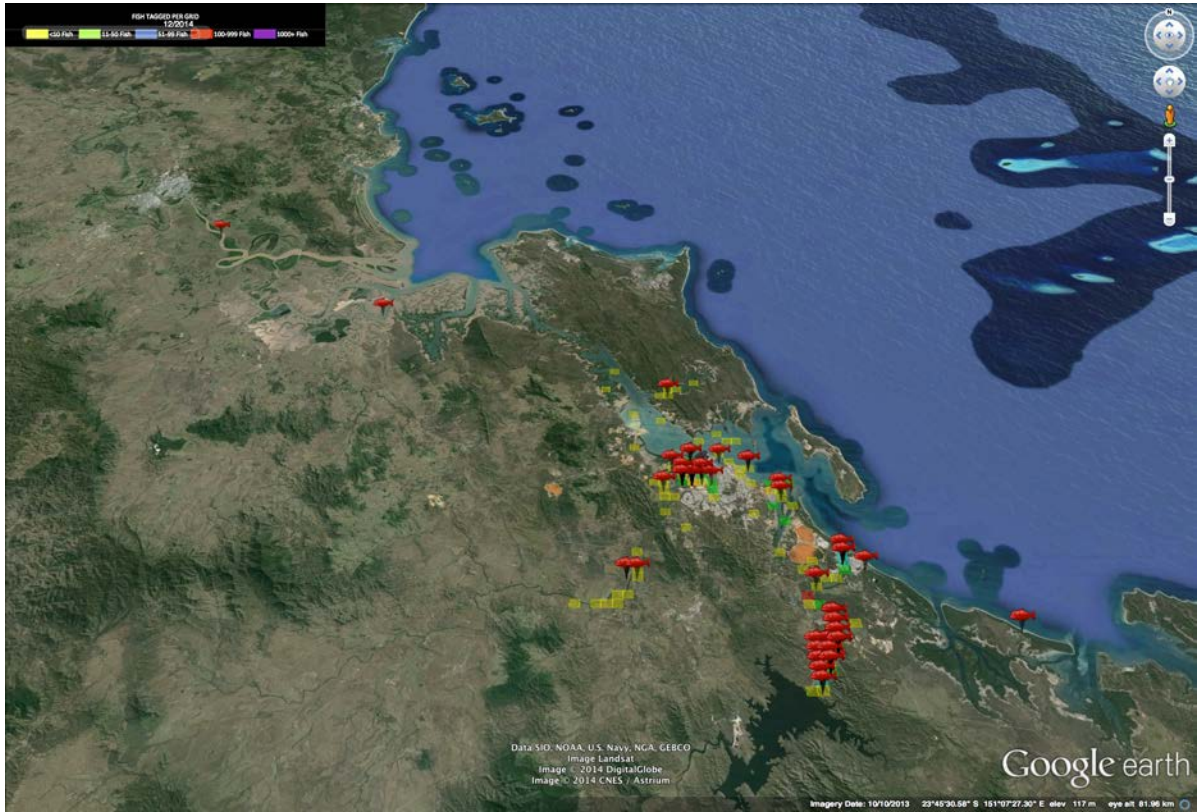


Figure 42: Locations from Fitzroy River to Turkey Beach where Barramundi tagged in Lake Awoonga and at Pikes Crossing were recaptured

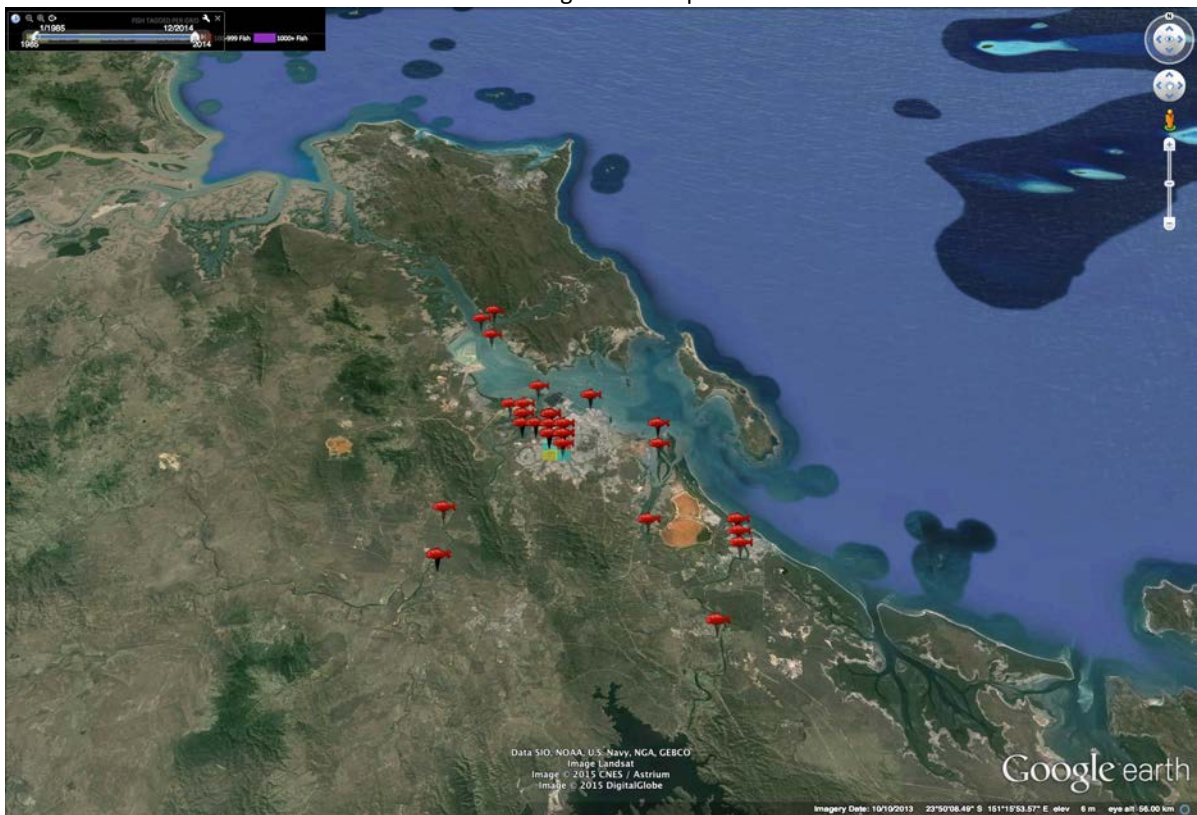


Figure 43: Locations where Barramundi tagged in Lake Callemondah were recaptured

Figures 41 and 42 show where fish tagged in the lake and in the Pikes Crossing area have been recaptured. One fish was recaptured as far north as the Ross River at Townsville (760km) to the north and 6 fish have been caught to the south in the Burnett River at Bundaberg (180km).

Barramundi have been stocked regularly into Lake Callemondah with an estimated 7,000 released annually in the last few years. From 2000 there were 637 Barramundi tagged in the lake with 127 (19.9%) recaptures. Of those 78 (61.4%) were recaptured after spilling from the lake. Of the fish that spilled from Lake Callemondah 71 (91.0%) were recaptured within 30km. Two fish were recaptured around 180km south in the Burnett River at Bundaberg. Figure 43 shows where fish tagged in Lake Callemondah have been recaptured in the Gladstone area.

As Lake Callemondah backs up behind a small weir and is close to full capacity it is likely that it will spill in 2015 if there is sufficient rainfall. This will likely spill more fish into Auckland Creek and the adjacent waterways.

Of the Barramundi tagged in Lake Callemondah 61.4% were recaptured after going over the spillway and 91.0% of these were recaptured within 30km

Of the Barramundi stocked and tagged in Lake Awoonga 49 fish have been recaptured since Dec 2010 in the Boyne River, in adjacent waterways and as far south as the Burnett River at Bundaberg (180km)

Of the 1,720 Barramundi tagged in the Pikes Crossing area 258 (15.0%) fish have been recaptured in the Boyne River, in adjacent waterways, as far north as the Ross River in Townsville (760km) and as far south as the Burnett River at Bundaberg (180km)

From 2010-2014 a further 986,500 Barramundi (around 50mm) were stocked in Lake Awoonga

9. MUD CRAB

Mud Crab (*Scylla serrata*) is an important species that is highly sought after by both commercial and recreational fishers in Gladstone. Mud Crab has been added as an indicator species for more detailed assessment. An initial assessment was made of:

- ✦ Commercial Mud Crab catch 1990-2014
- ✦ Recreational Mud Crab catch rates

Commercial Mud Crab data were obtained for Gladstone grids S30 and S31 from 1990-2014¹⁰ (data for 2014 incomplete). *Figure 44* shows the annual catch in tonnes and kg/day. There has been a steady increase in the catch from 1990-2010 with peaks in 2003 and 2004. The highest commercial catch was 174.2t in 2003. The catch in 2013 was the 4th highest at 144.8t. The catch data for 2014 is incomplete with catch details only available for Jan-Jul. Progress catch is 137.9t. When all data are available it is possible that 2014 will exceed all previous years.

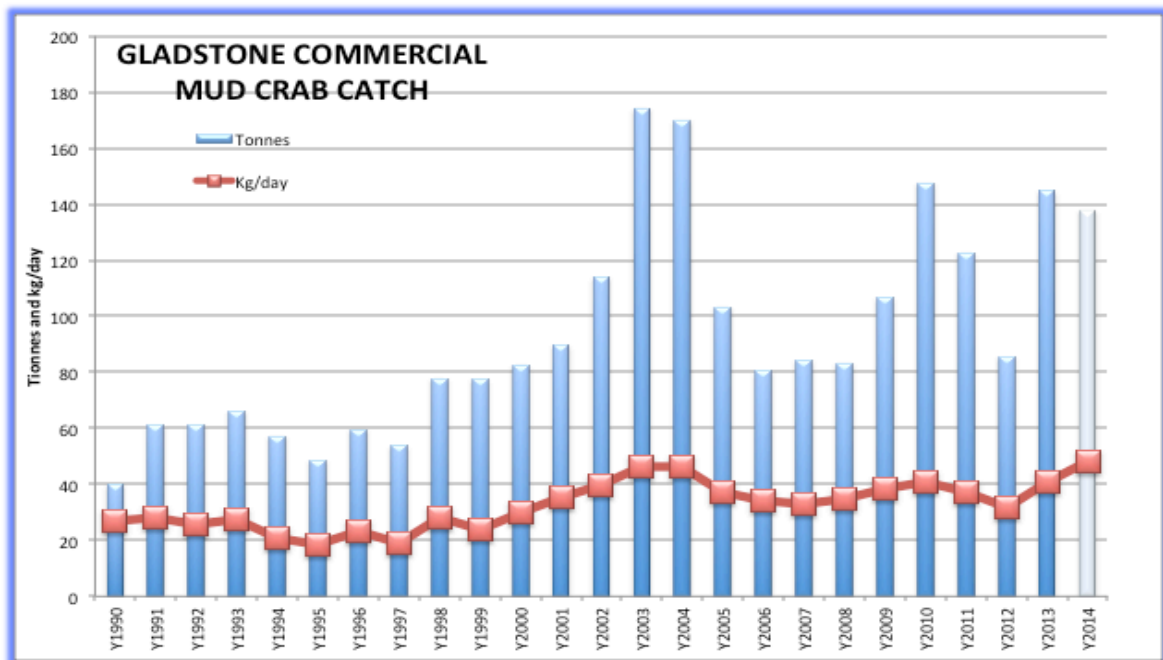


Figure 44: Gladstone commercial Mud Crab catch 1990-2014 (data for 2014 incomplete)

Recreational Mud Crab catches are regulated with a maximum of 4 pots/person, a minimum width of 150mm and only male crabs can be taken. Crab trips are different to fishing trips in that often crab pots are deployed, left overnight and then retrieved the following day. As the pots are effectively fishing for that whole time the fishing time has been calculated as the total fishing time for the pots.

The median crab trip was 2 fishers (8 crab pots) fishing for 25 hours. *Figure 45* shows the catch rates for the recreational Mud Crab catch for each season from summer 2012-13 to

¹⁰ Commercial catch data from Department of Agriculture, Fisheries and Forestry at <http://qfish.daff.qld.gov.au/>

spring 2014. Catch rates ranged from 26.3 crabs/trip in summer 2012-13 to 11.3 crabs/trip in spring 2013. Kept catch rates ranged from 6.5 crabs/trip in winter 2013 to 2.2 crabs/trip in spring 2013.

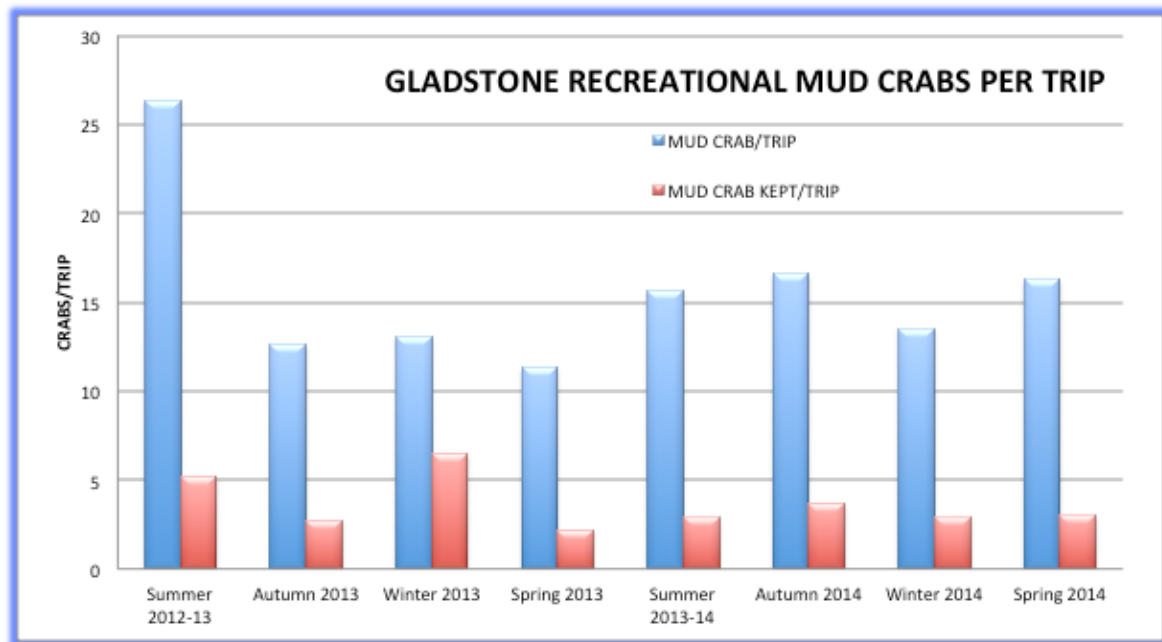


Figure 45: Recreational Mud Crab catch rate summer 2012-13 to spring 2014

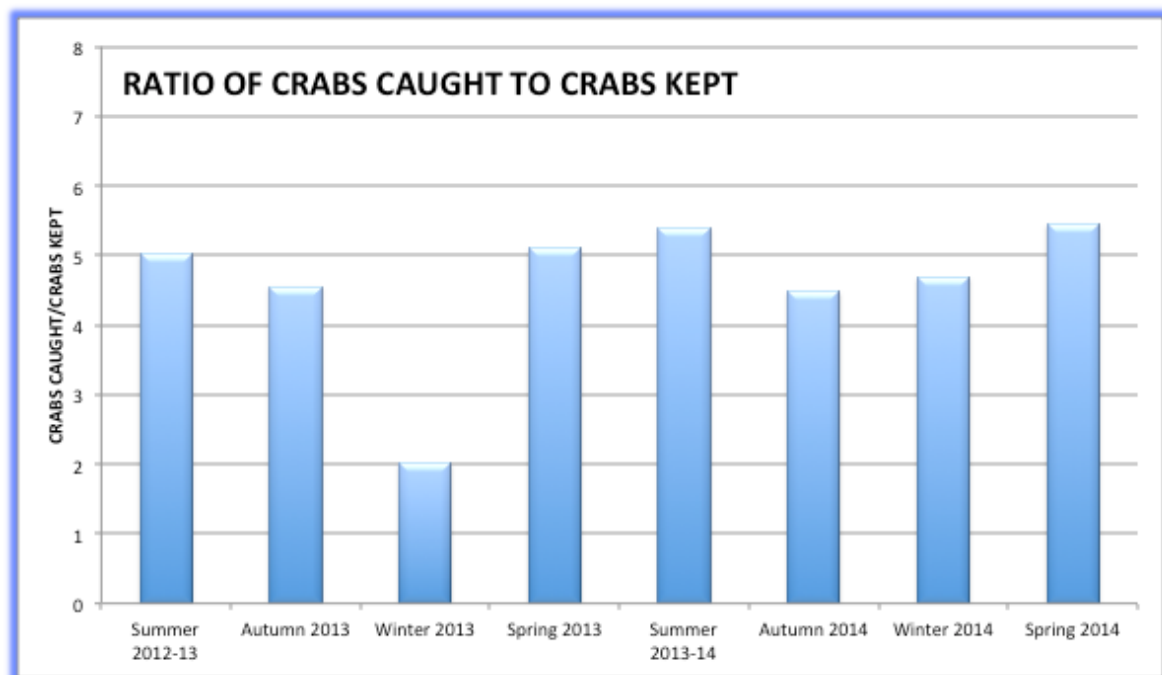


Figure 46: Ratio of Mud Crabs caught to kept summer 2012-13 to spring 2014

Figure 46 shows the ratio of Mud Crabs caught to kept from summer 2012-13 to spring 2014. That is the number of crabs released for every crab kept. Released Crabs included all female and undersized Crabs. This ranged from a low of 2.0 in winter 2013 to a high of 5.5 in spring 2014.

Figure 47 shows the locations of crabbing trips from summer 2012-13 to spring 2014 with 54.1% of trips to the Calliope River and 6.7% of trips to the Boyne River.

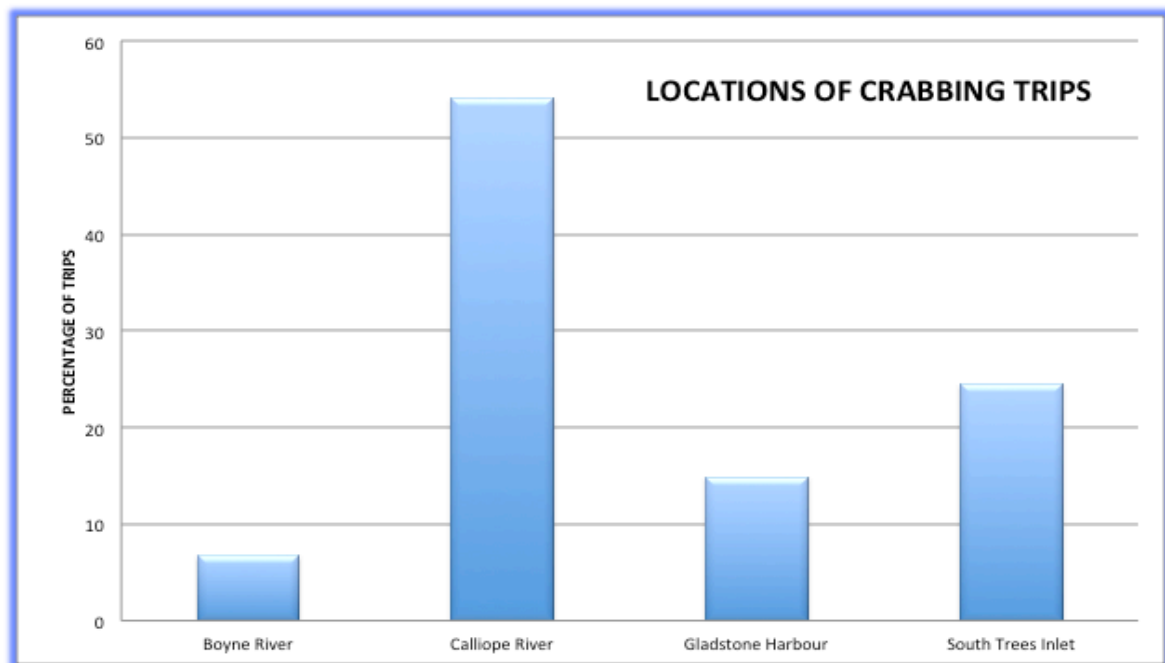


Figure 47: Location of crabbing trips from summer 2012-13 to spring 2013

Commercial catch of Mud Crab and the catch rate has steadily increased from 1990-2014 with peaks in 2004, 2005, 2010, 2013 and likely 2014 (when all data available)

The recreational catch rate of Mud Crab from summer 2012-13 to spring 2014 ranged from 26.3 crabs/trip in summer 2012-13 to 11.3 crabs/trip in spring 2013 and the kept catch rate ranged from 5.0 crabs/trip in summer 2012-13 to 2.0 crabs/trip in spring 2013

The number of crabs released for each crab kept ranged from 2.0 in winter 2013 to 5.5 in spring 2014

The most popular crabbing location was the Calliope River with 54.1% of trips while the Boyne River was the least crabbed with 6.7% of trips

10. FISH TAGGING

Species, tag locations, recapture rates and movement were assessed using:

1. Tag data and recapture data from 1985-2014
2. Boyne Tannum Hookup tagging 2000-2014

TAGGING 1985-2014

Tagging commenced in the Gladstone area around 1985 and has continued since that time. Locations where fish were tagged were recorded on Suntag grid maps.¹¹ Grid maps covering the Gladstone area are:

1. Gladstone Harbour - GLD
2. Calliope River - CR02
3. Boyne River - BRG
4. Curtis Island (part) - CISG
5. Lake Awoonga - GLA

Grids on these maps are 1km². Locations where fish were tagged were recorded as map/grid eg BRG/M24 is the mouth of the Boyne River. *Figure 48* shows maps BRG, CR02, CISG and GLD that were used in the analysis of tagging data.

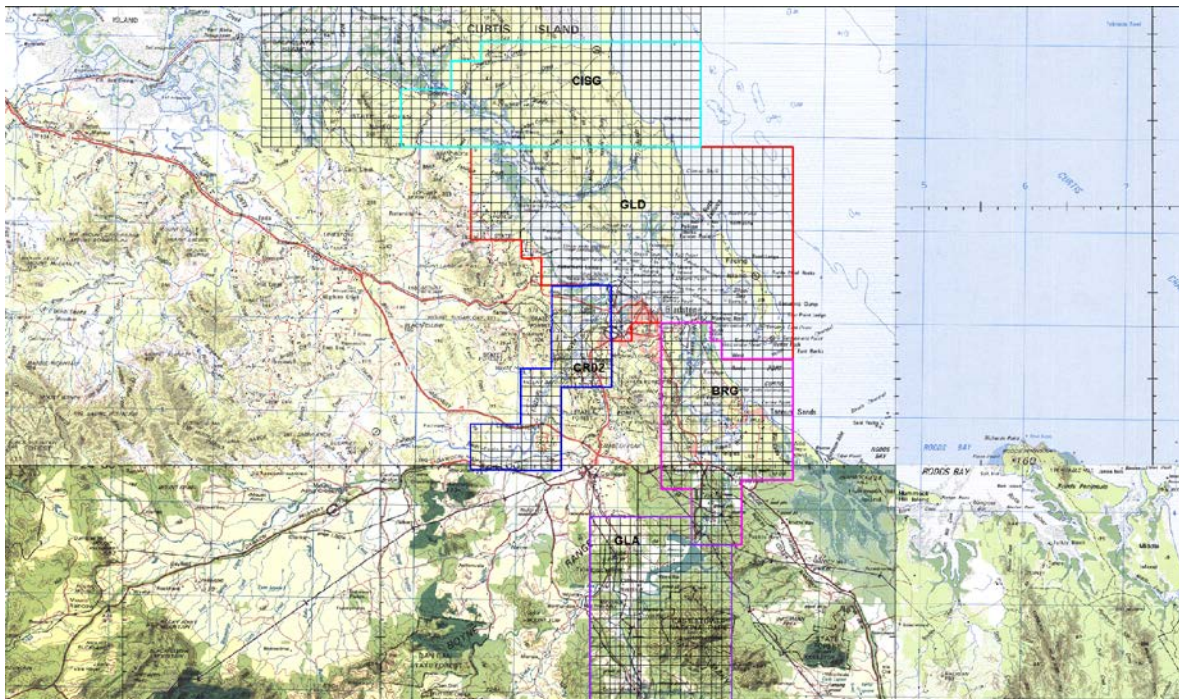


Figure 48: Suntag grid maps used to record tagging locations

Tagging included around 35 species with *table 9* showing the numbers of the top 10 species tagged over that time. From Jul 1985-Oct 2014 there were 26,501 fish tagged and 2,228 (8.6%) recaptured. *Figure 49* shows the numbers of fish tagged each 5 years in the

¹¹ Suntag grid maps are available at www.suntag.org.au

estuary covered by Suntag maps BRG, CR02, CISG and GLD. The data does not include tagging of stocked fish in Lake Awoonga and Lake Callemondah (see section 8). Note that the data for 2010-15 only covers Jul 2010-Oct 2014. This results from the significant increase in Barramundi tagged.

Species	Tagged	Species	Tagged
BARRAMUNDI	6,270	MANGROVE JACK	1,808
YELLOWFIN BREAM	3,762	BLACKSPOTTED ROCKCOD	1,056
GOLDSPOTTED ROCKCOD	3,382	BARRED JAVELIN	926
DUSKY FLATHEAD	3,136	BLUE THREADFIN	617
PIKEY BREAM	2,727	GIANT TREVALLY	599

Table 9: Numbers of top 10 species tagged from 1985-2014

Details of Barramundi tagging are in section 9. Apart from Barramundi the most tagged species were Yellowfin Bream, Goldspotted Rockcod, Dusky Flathead, Pikey Bream, Mangrove Jack and Blackspotted Rockcod with over 1,000 fish tagged of each species.

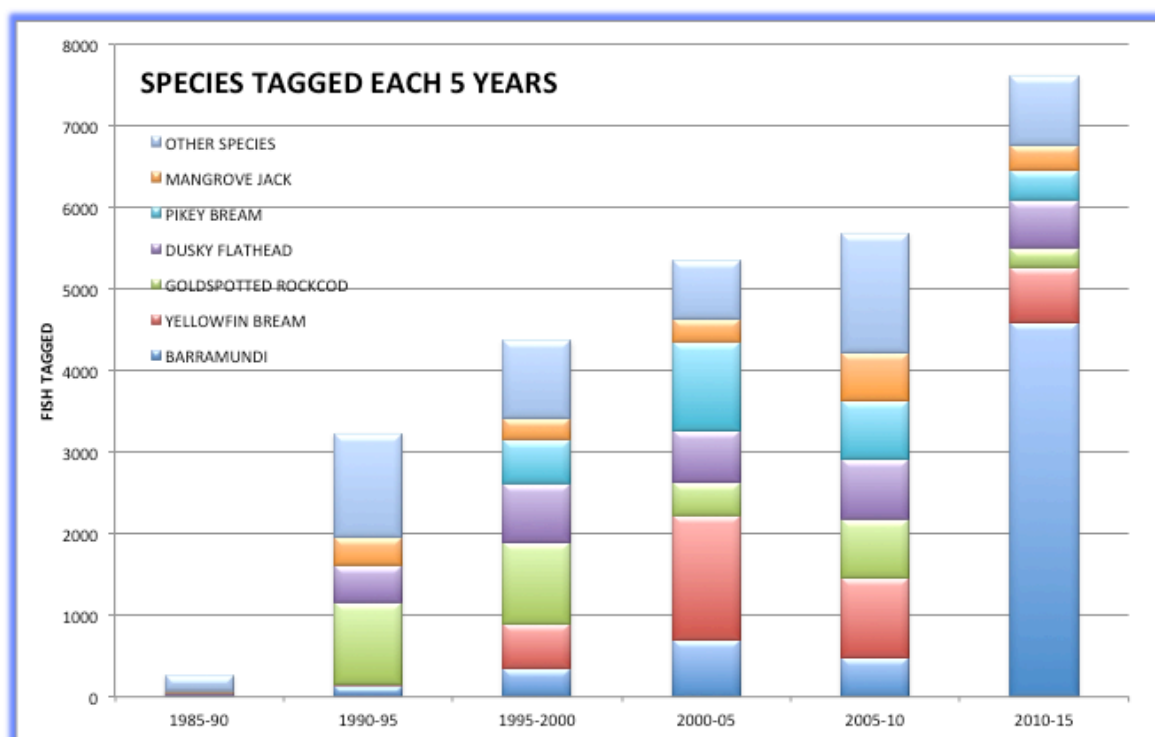


Figure 49: Numbers of key species tagged each 5 years from 1985-2015

A total of 26,501 fish were tagged from 1985-2014 with 2,228 (8.6%) recaptured with the top species being Barramundi, Yellowfin Bream, Goldspotted Rockcod, Dusky Flathead, Pikey Bream, Mangrove Jack and Blackspotted Rockcod with over 1,000 fish tagged

RECAPTURE RATES

Figure 50 shows the percentage of key species recaptured each 5 years in Suntag maps BRG, CR02, CISG and GLD. The overall recapture rate rose steadily over the period from 6.9% in 1985-90 to 10.9% in 2010-15. The recapture rate is related to fishing effort¹² and the trend is that it has increased over time.

Recapture rates are shown for key species other than Barramundi. Recapture rates for Yellowfin Bream rose from 0% in 1985-90 to 3.2% in 2010-15. For Dusky Flathead it has fallen from 11.5% in 1985-90 to 3.1% in 2010-15. For Pikey Bream it has ranged from 0% in 1990-95 to 7.0% in 2010-15. For Mangrove Jack it has ranged from 0% in 1995-90 to 5.7% in 2010-15 although it reached a high of 8.4% in 2005-10. The recapture rate for 2010-15 only represents the rate from Jul 2010-Oct 2014 and will change when the period is completed. The drop in the rate for some species is likely to have resulted from a shift in focus to Barramundi.

The overall recapture rate from 1985-2014 for the key species was 3.9% for Yellowfin Bream, 5.1% for Dusky Flathead, 5.5% for Pikey Bream and 6.6% for Mangrove Jack. The overall recapture rate for fish in the Suntag program from 1985-2014 was 6.6%, for Yellowfin Bream was 3.9%, for Dusky Flathead was 8.6%, for Pikey Bream was 4.6% and for Mangrove Jack was 6.3%.¹³ This indicates that the recaptures rates for the Gladstone area are not significantly different to the rates in the overall Suntag program for these key species.

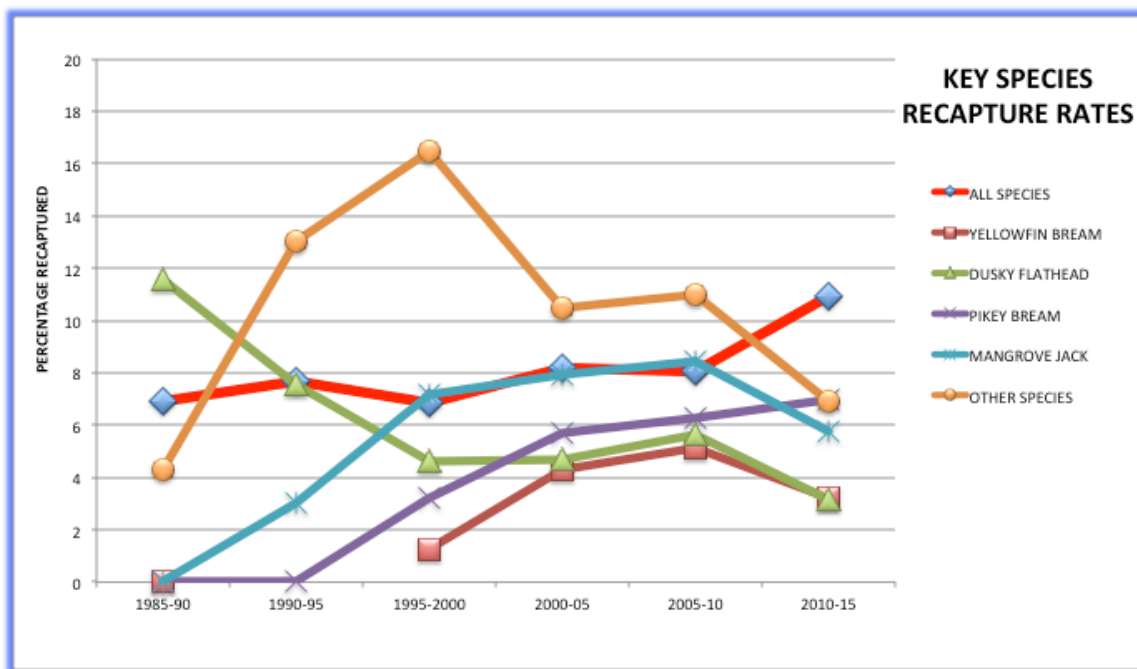


Figure 50: Recapture rates for key species tagged for each 5 years from 1985-2015

¹² Infofish Citizen Science and Suntag report Sawynok 2014

¹³ Infofish Citizen Science and Suntag report Sawynok 2014

The overall recapture rate from 1985-2014 for all species was 8.6% compared with the overall Suntag rate of 6.6%

The overall recapture rate from 1985-2014 for the key species was 3.9% for Yellowfin Bream, 5.1% for Dusky Flathead, 5.5% for Pikey Bream and 6.6% for Mangrove Jack

TAG LOCATIONS

Figure 51 shows the grids where fish were tagged from 1985-2014. There were 409 grids where fish were tagged. The largest numbers tagged were 4,699 in BRG/N24 with most of these tagged and released during the Boyne Tannum Hookup. There were 52 grids where 100 or more fish were tagged (shown in red in figure 51). From Nov 2013-Oct 2014 there were 110 grids where fish were tagged with 2 grids where over 100 fish were tagged with 308 in grid BRG/N24 (figure 52).

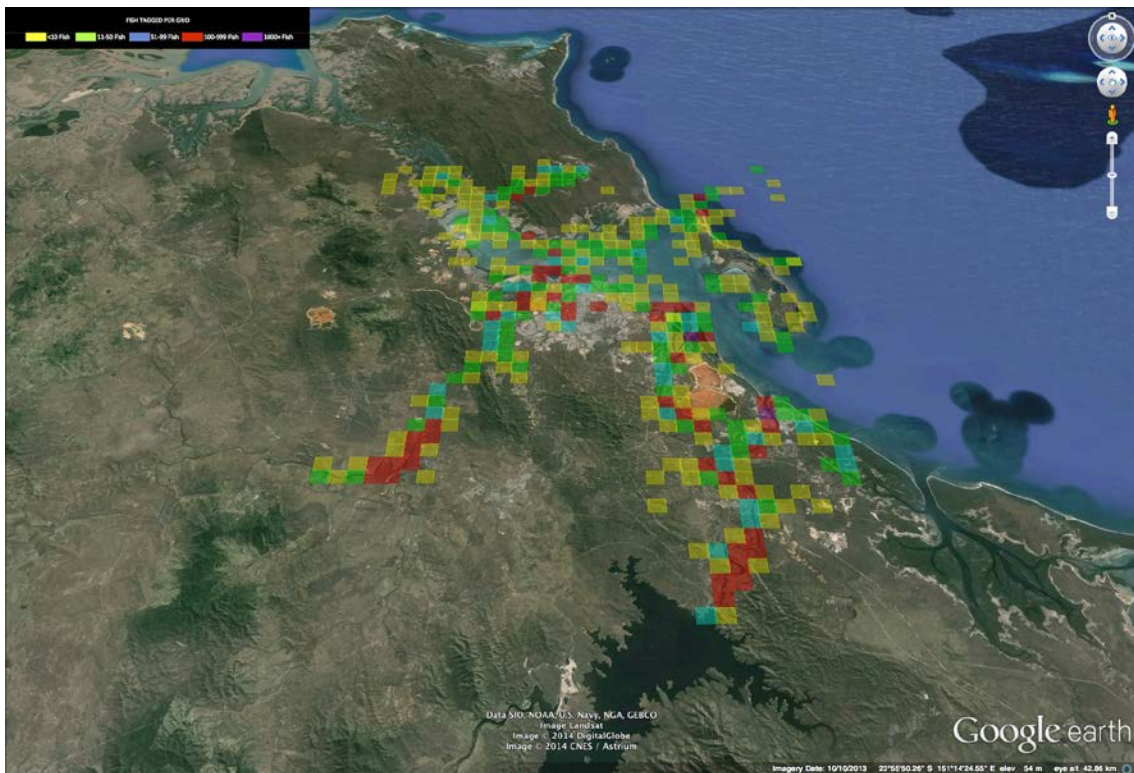


Figure 51: Locations where fish were tagged from 1985-2014

From 1985-2014 there were 409 grids where fish were tagged with 4,699 fish tagged at the mouth of the Boyne River in grid BRG/N24, mostly during the Boyne Tannum Hookup

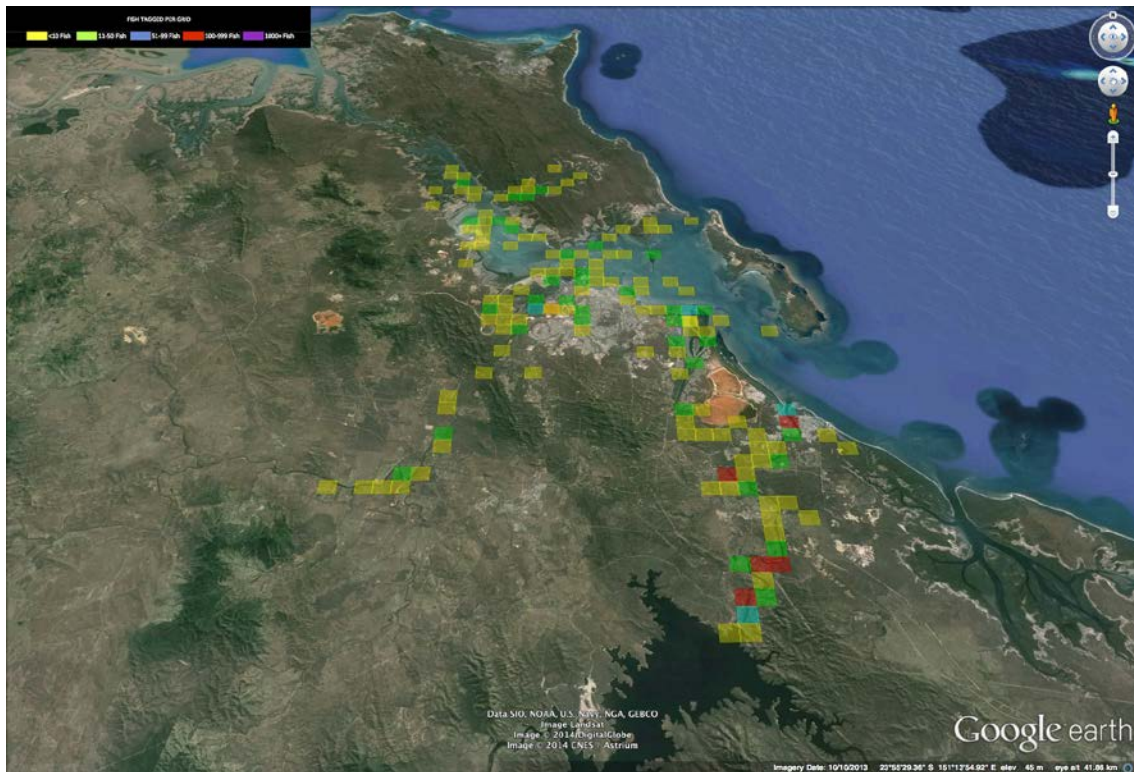


Figure 52: Locations where fish were tagged from Nov 2012-Oct 2014

From Nov 2012-Oct 2014 there were 110 grids where fish were tagged with 308 fish tagged at the mouth of the Boyne River in grid BRG/N24

From 1985-2014 there were 52 grids where 100 or more fish were tagged and from Nov 2013-Oct 2014 there were 2 grids where 100 or more fish were tagged

KEY SPECIES GROWTH

There were 52 recaptures of Yellowfin Bream and 62 recaptures of Pikey Bream that were recaptured over 90 days after tagging and showed positive growth. *Figure 53* shows the annual growth of Bream. The average annual growth for Yellowfin Bream was $18.5\text{mm} \pm 4.6\text{mm}/\text{year}$ (95% confidence) and for Pikey Bream was $19.5\text{mm} \pm 4.6\text{mm}/\text{year}$. The longest time out for a Yellowfin Bream was 1,008 days (2.75 years) that grew 20mm. The longest time out for a Pikey Bream was 1,816 days (5 years) that grew 15mm. The average annual growth for Yellowfin and Pikey Bream is similar although the trend line in *figure 53* suggests that Yellowfin Bream is faster growing. However recapture numbers are low and the time out for Yellowfin Bream is less than 3 years so that results should be considered indicative only.

There were 56 Dusky Flathead recaptures that were recaptured over 90 days after tagging and showed positive growth. The average annual growth of Dusky Flathead was $55.3\text{mm} \pm 11.3\text{mm}/\text{year}$ (95% confidence). The longest time out for a Dusky Flathead was 779 days (2.1 years) that grew 70mm. *Figure 54* shows the annual growth of Dusky

Flathead. Female Flathead grow faster than males so that would account for the wide spread of growth of individual fish.¹⁴

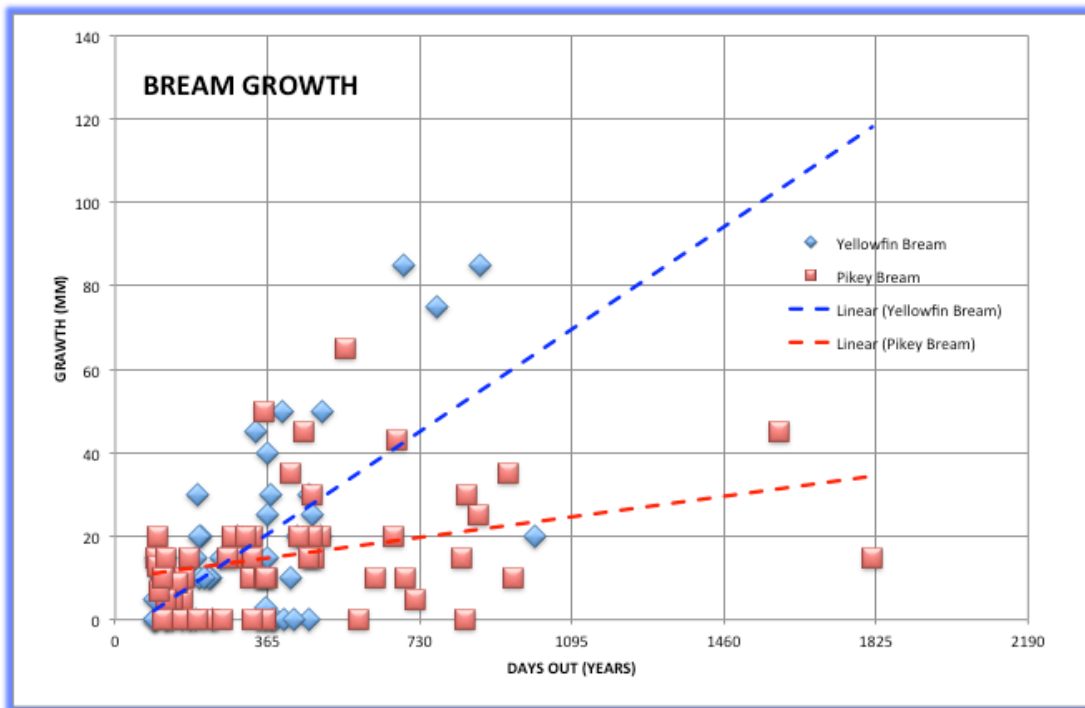


Figure 53: Annual growth of Yellowfin and Pikey Bream

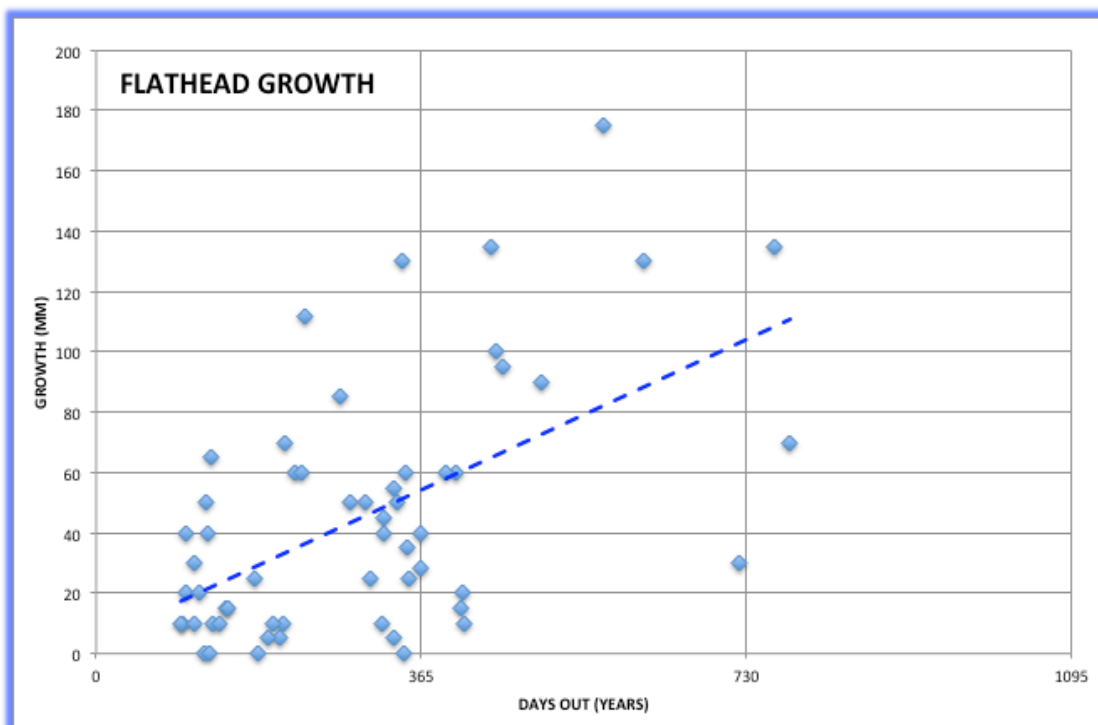


Figure 54: Annual growth of Dusky Flathead

¹⁴ Reproduction and growth of Dusky Flathead (*Platycephalus fuscus*) in NSW estuaries – Gray and Barnes 2008

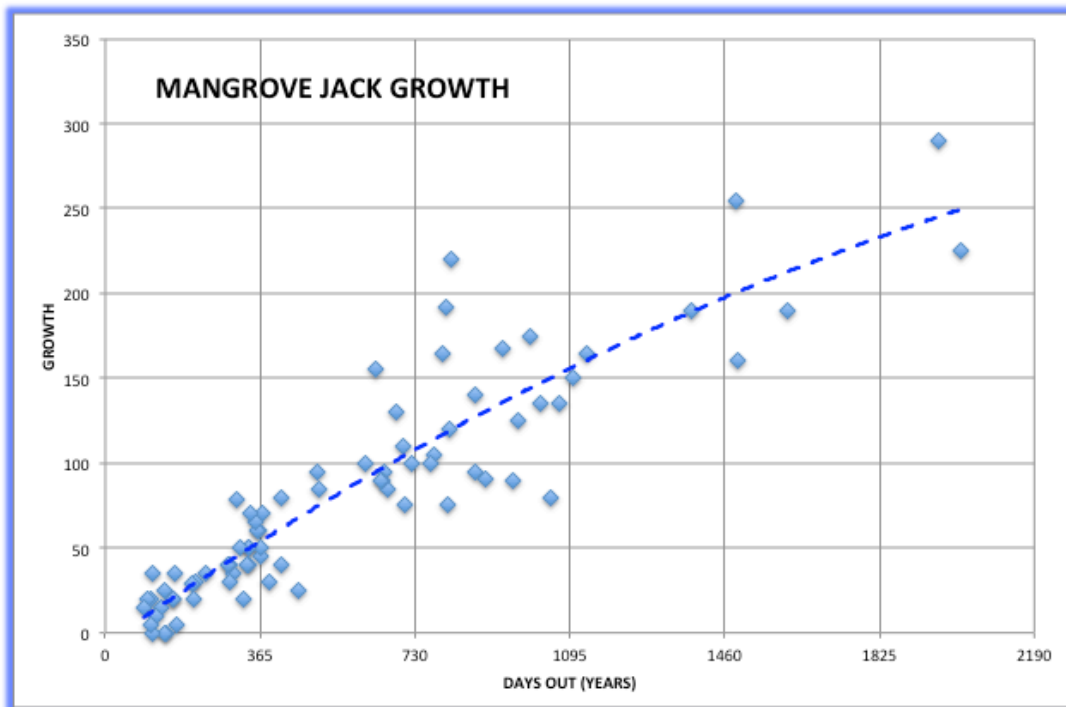


Figure 55: Annual growth of Mangrove Jack

There were 79 Mangrove Jack recaptures that were recaptured over 90 days after tagging and showed positive growth. The average annual growth of Mangrove jack was 50.9 ± 22.3 mm/year (95% confidence). The longest time out for a Mangrove Jack was 2,106 days (5.5 years) that grew 225mm. *Figure 55* shows the annual growth of Mangrove Jack. *Figure 56* shows the annual growth for the key species.

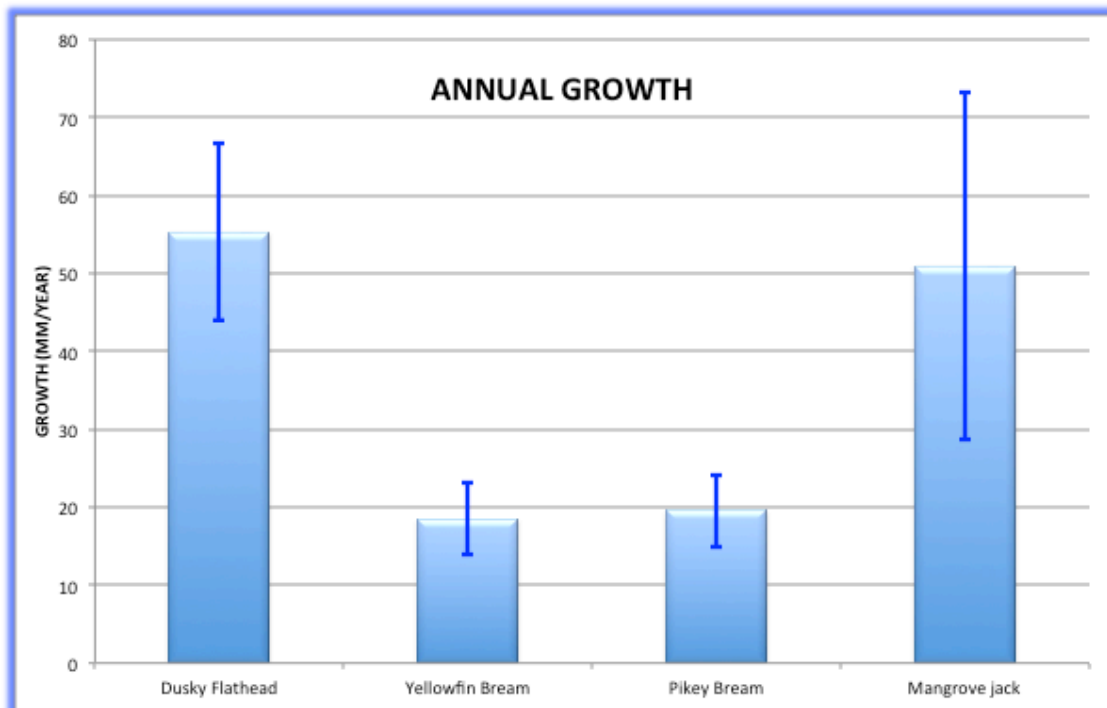


Figure 56: Annual growth of Dusky Flathead, Yellowfin Bream, Pikey Bream and Mangrove Jack

Average annual growth was 55.3mm for Dusky Flathead, 18.5mm for Yellowfin Bream, 19.5mm for Pikey Bream and 50.9mm for Mangrove Jack

KEY SPECIES MOVEMENT

There were 146 Yellowfin Bream and 151 Pikey Bream recaptured where the distance moved between where tagged and recaptured could be calculated. Distance moved was calculated as the shortest distance between locations along the watercourse. *Figure 57* shows the distance moved for both Bream species compared with the days out. For Yellowfin Bream 92.5% of fish were recaptured within 20km of where tagged. Only 0.7% (1 fish) was recaptured over 100km from where tagged. This was a fish tagged in the Calliope River and recaptured to the south at Round Hill Head. For Pikey Bream 97.4% were recaptured within 20km and no fish were recaptured over 100km from where tagged.

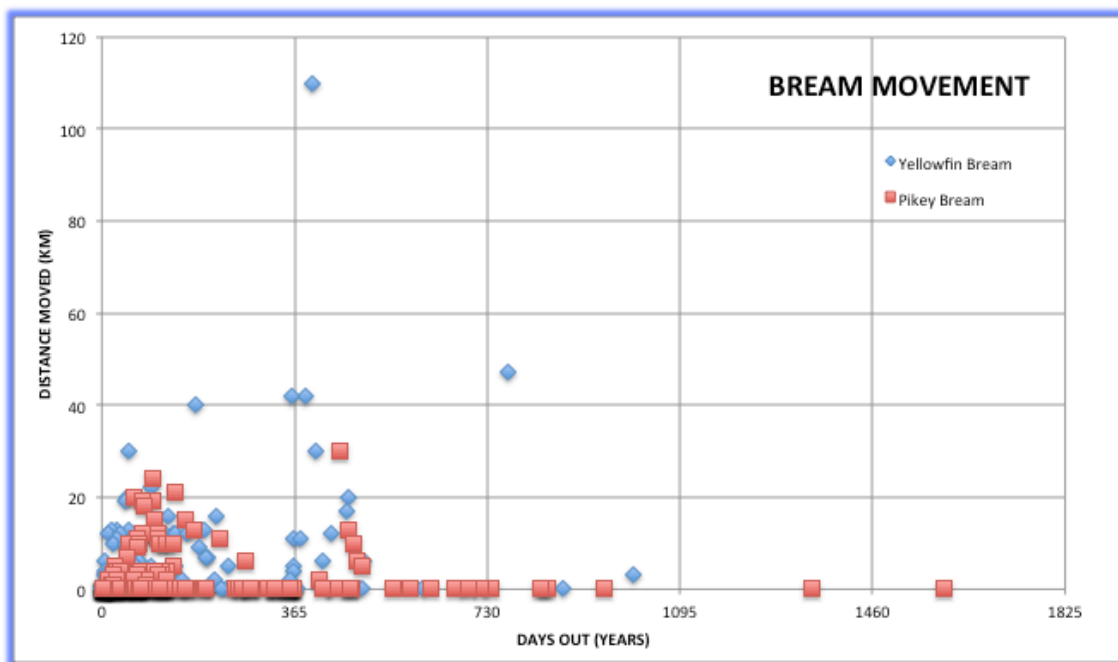


Figure 57: Movement of Yellowfin and Pikey Bream compared with days out

There were 159 Dusky Flathead recaptured where distance moved could be calculated. For Dusky Flathead 95.0% of fish were recaptured within 20km of where tagged. *Figure 58* shows the distance moved by Dusky Flathead compared with the days out. There were 3.1% (5 fish) recaptured over 100km from where tagged. All fish moved south along the coast to as far as the Elliott River south of Bundaberg (175km).

There were 144 Mangrove Jack recaptured where the distance moved could be calculated. For Mangrove Jack 95.1% were recaptured within 20km of where tagged. *Figure 59* shows the distance moved by Mangrove Jack compared with days out. There was 1.4% (2 fish) that were recaptured over 100km from where tagged. However there were 5 fish that moved offshore to the reef. Mangrove Jack use estuaries as juveniles and then move to offshore reefs as they mature.

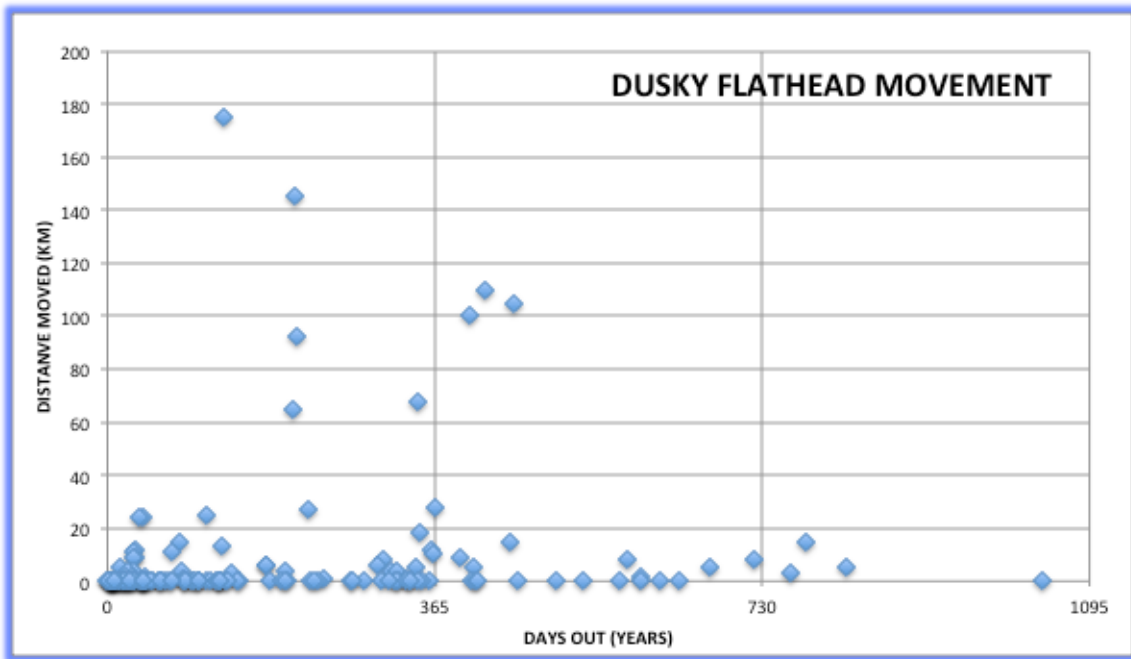


Figure 58: Movement of Dusky Flathead compared with days out

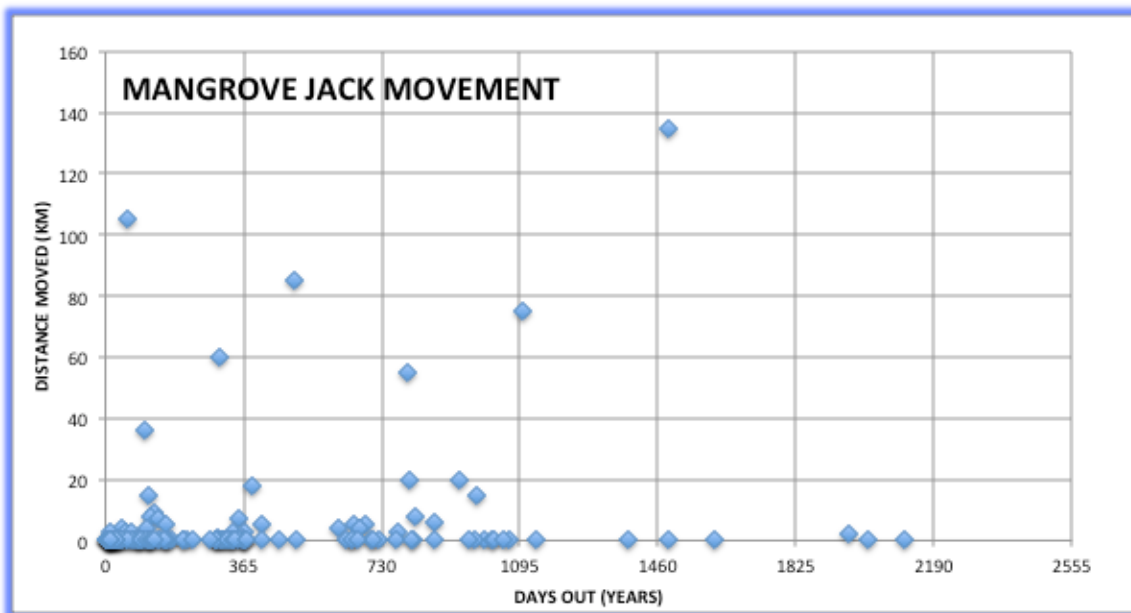


Figure 59: Movement of Mangrove Jack compared with days out

Figure 60 shows the percentage of fish that were recaptured at varying distances from where tagged. For all species over 90% were recaptured within 20km of where tagged indicating that they have significant reliance on their local habitat. It is likely that some movements for all species were associated with migration for spawning, particularly for Mangrove Jack. Dusky Flathead long distance movement may not be associated with spawning. Figure 61 the locations where Dusky Flathead were tagged and recaptured and figure 62 shows the locations where mangrove Jack were tagged and recaptured.

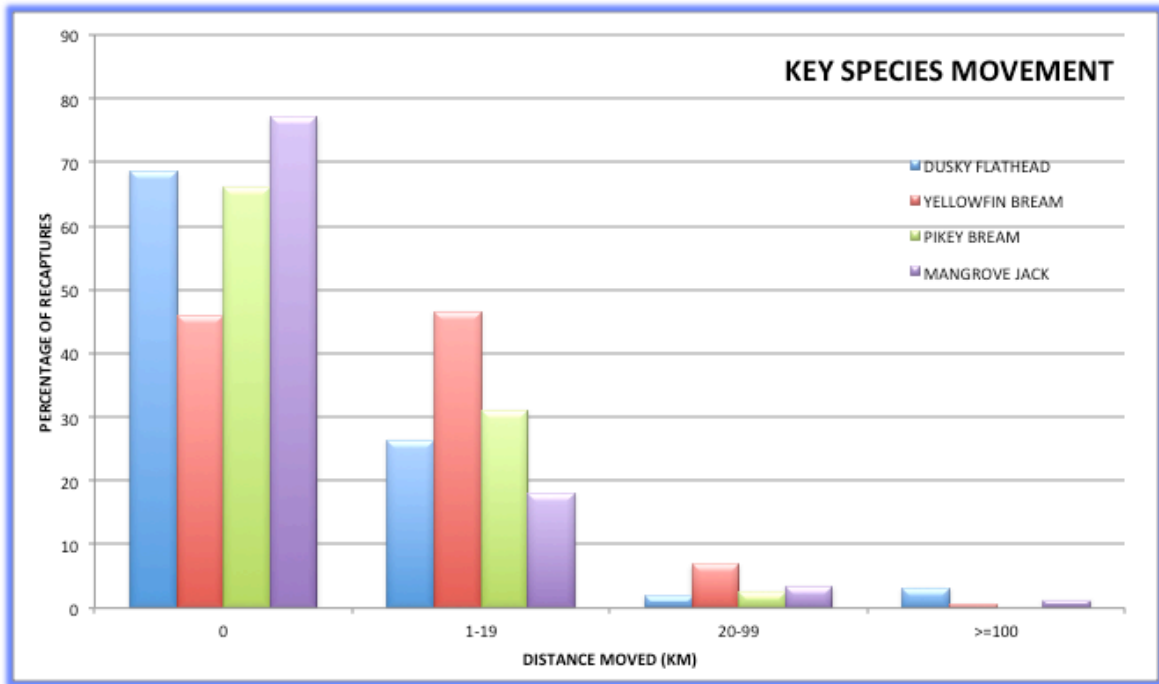


Figure 60: Distance moved by key species

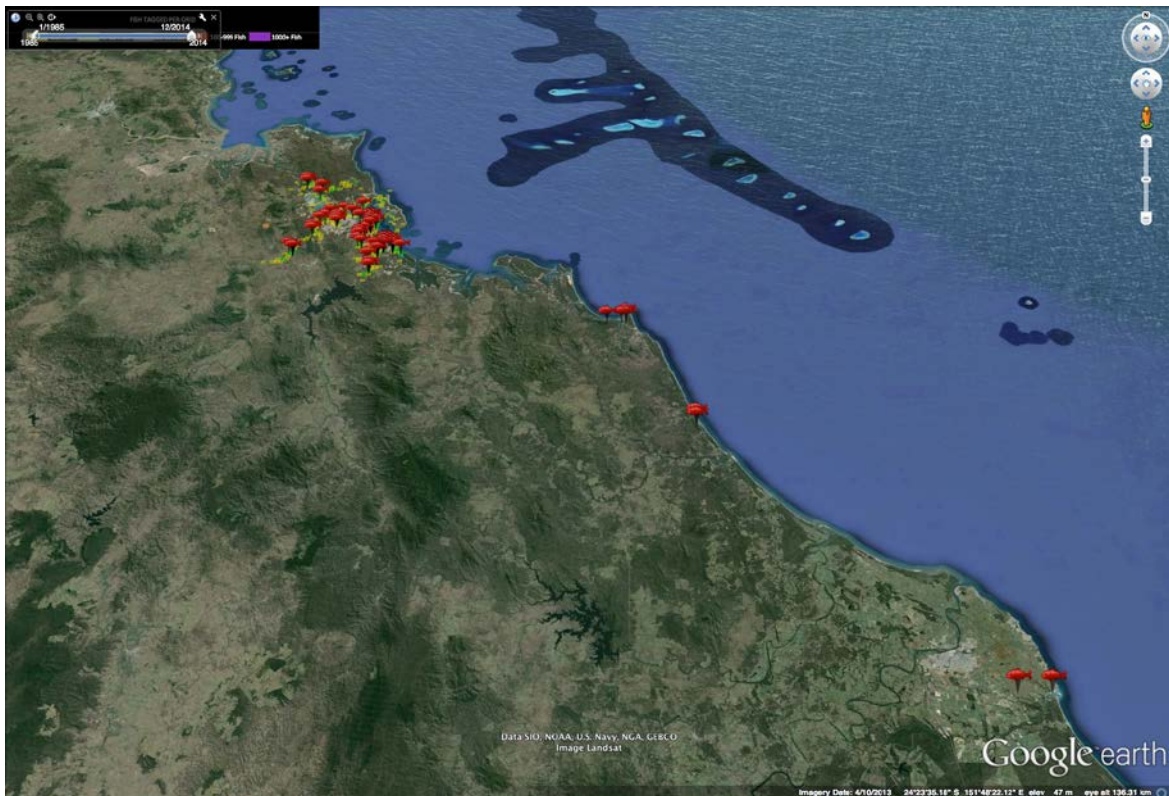


Figure 61: Locations where Dusky Flathead were tagged and recaptured

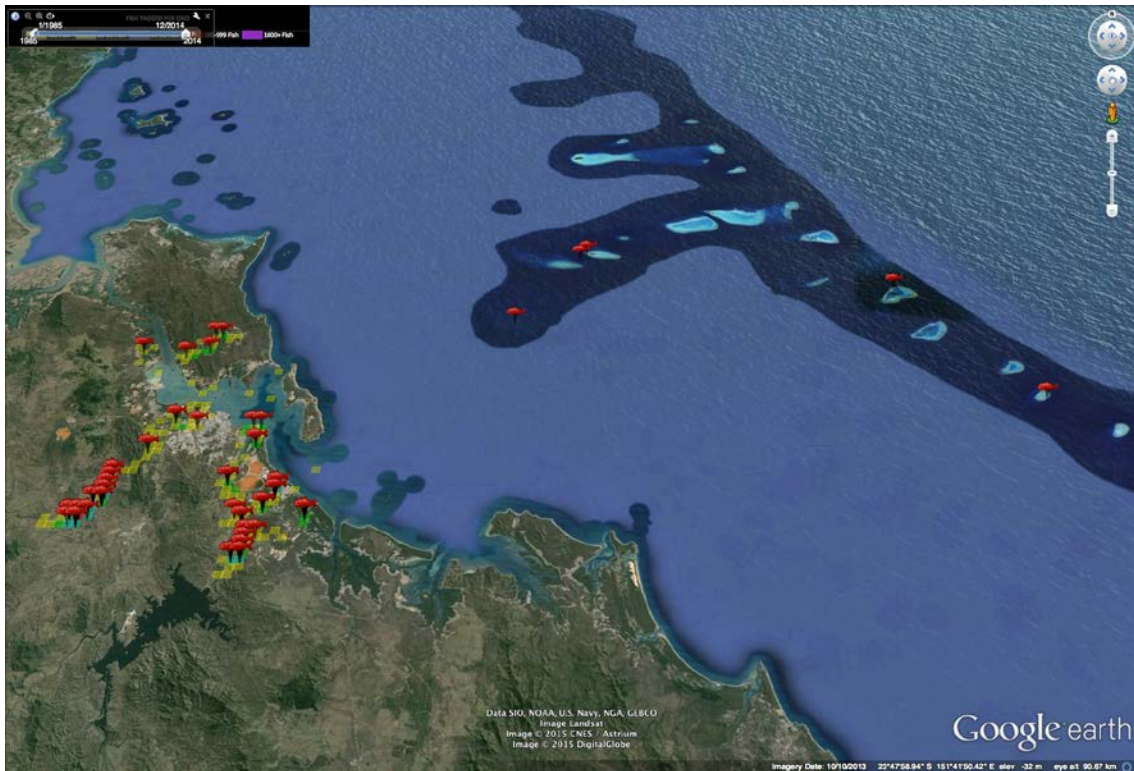


Figure 62: Locations where Mangrove Jack were tagged and recaptured

Over 90% of all fish were recaptured within 20km of where tagged with 92.5% for Yellowfin Bream, 97.4% for Pikey Bream, 95.0% for Dusky Flathead and 95.1% for Mangrove Jack

Few fish were recaptured over 100km from where tagged with 0.7% for Yellowfin Bream, 0% for Pikey Bream, 3.1% for Dusky Flathead and 1.4% for Mangrove Jack

BOYNE TANNUM HOOKUP TAGGING

From 2000 the Gladstone Sportfishing Club tagged fish brought to the live weigh-in section of the Boyne Tannum Hookup at Bray Park near the mouth of the Boyne River (*figure 63*). Fish that were presented live in good condition were tagged, kept in a large live display tank and then released progressively over the duration of the competition. A video of the 2013 live weigh-in can be viewed on YouTube.¹⁵ All fish were released at the Bray Park boat ramp at BRG/N24. Key species tagged were:

1. Dusky Flathead
2. Yellowfin Bream
3. Pikey Bream
4. Barred Javelin
5. Mangrove Jack

¹⁵ Boyne Tannum Hookup live weigh-in video can be viewed at http://www.youtube.com/watch?feature=player_embedded&v=ZKqSGmsRxuc



Figure 63: Gladstone Sportfishing Club marquee with live weigh-in and fish display tank at the 2013 Boyne Tannum Hookup

Figure 64 shows the numbers of fish tagged in each Hookup and the recapture rate for fish tagged each year. From 2000-14 there were 4,340 fish tagged with 227 (5.2%) recaptures. The recapture rate is less than the overall rate for the area of 8.6%. Figure 65 shows the number of key species tagged in all Hookups and their recapture rates.

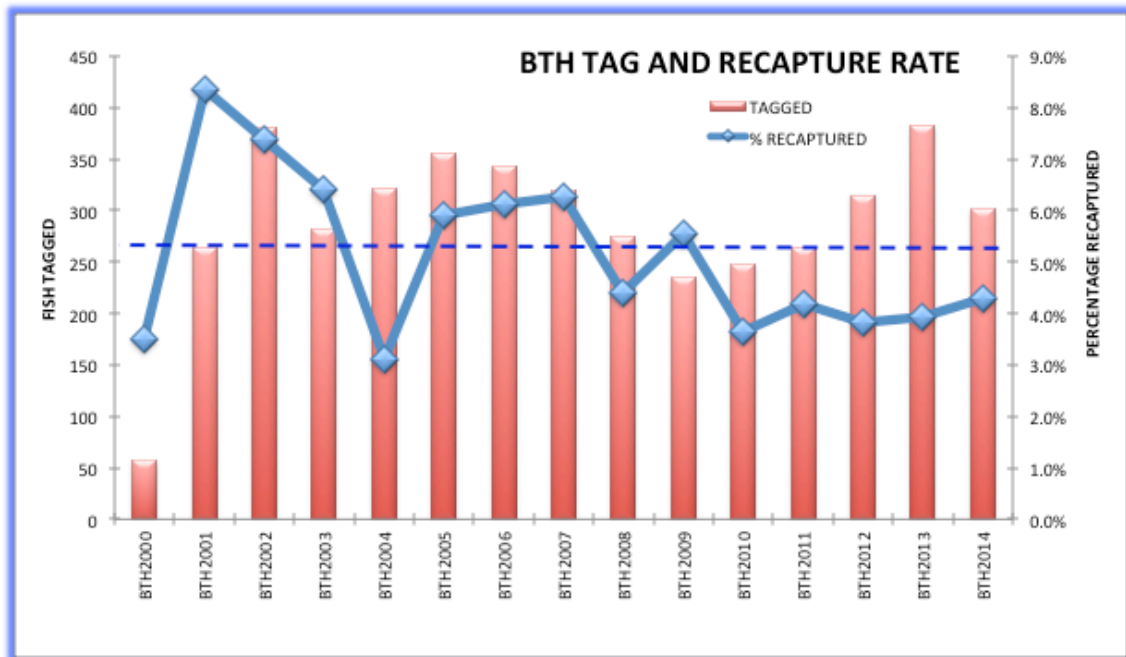


Figure 64: Fish tagged and recapture rates from Boyne Tannum Hookup 2000-14

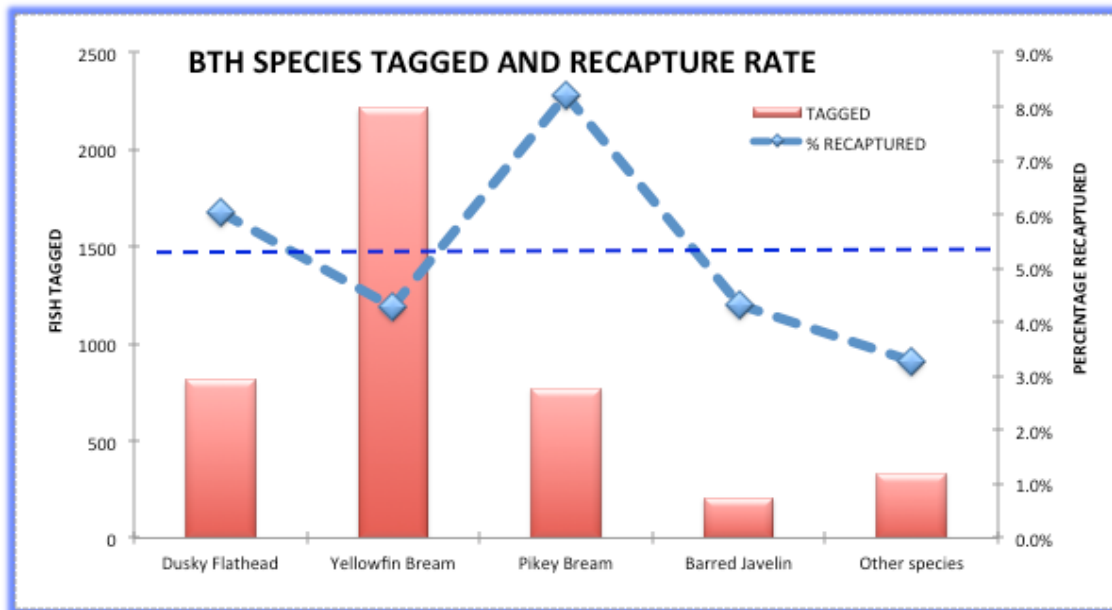


Figure 65: Recapture rate of key species tagged in Boyne Tannum Hookup 2000-14

Of the 227 fish recaptured 174 (76.7%) were recaptured within 6 months of release. Of those recaptures there were 222 that had sufficient data to determine movement. All fish were released at the Bray Park boat ramp (BRG/N24) with 11 (4.8%) recaptured 20km or more from where they were released. A total of 92 (40.4%) were caught in the same area as tagged (moved less than 1km). The furthest distance a fish was recaptured from the release site was a Dusky Flathead caught in the Elliott River at Bundaberg 175km south after being at liberty for just 129 days (just over 4 months) after the 2005 Hookup. *Figure 66* shows the distance fish moved compared to the days out. *Figure 67* shows the locations where tagged fish were recaptured after release in the Boyne Tannum Hookup.

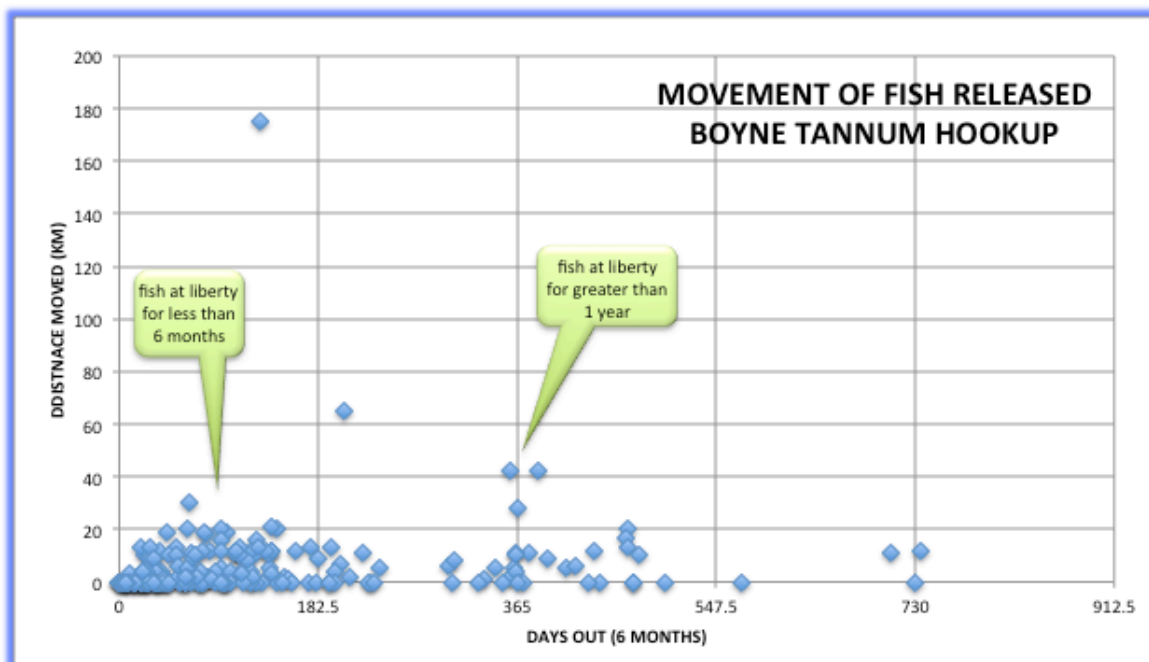


Figure 66: Movement of tagged fish released in Boyne Tannum Hookup 2000-14

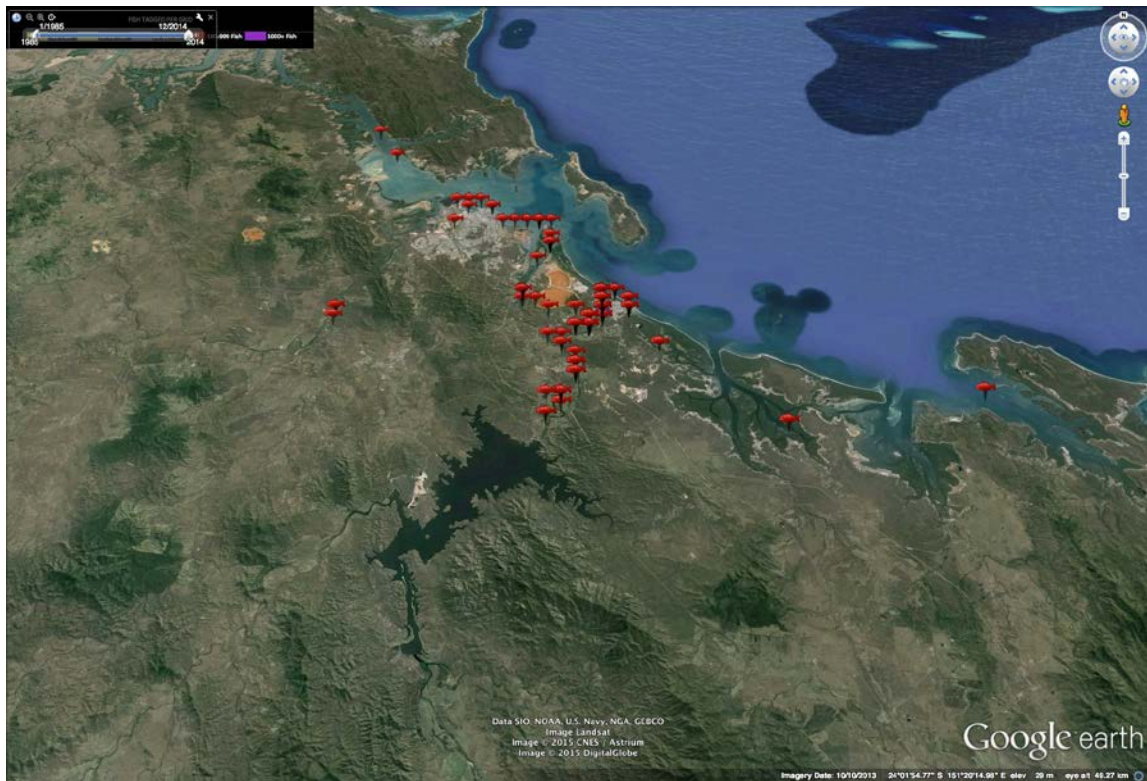


Figure 67: Locations where tagged fish released in the Boyne Tannum Hookup were recaptured

The recapture rate for fish tagged by the Gladstone Sportfishing Club during the Boyne Tannum Hookup from 2000-2014 was 5.2%

Of the fish recaptured from those tagged in the Boyne Tannum Hookup 76.7% were recaptured within 6 month

Of the fish recaptured from those tagged during the Boyne Tannum Hookup 40.4% were recaptured within 1km and 95.2% were recaptured within 20km of where released

One Dusky Flathead tagged in the 2005 Boyne Tannum Hookup was recaptured 175km south in the Elliott River just over 4 months (129 days) after release

11. BOYNE TANNUM HOOKUP

The Boyne Tannum Hookup is an annual fishing competition that is held each year on the Queen's birthday weekend in June, except 2013 and 2014 when the event was held in May. It is one of the largest fishing competitions in Queensland often attracting in excess of 3,000 entrants. The competition is centred on Bray Park near the mouth of the Boyne River but there are no boundaries for where entrants can fish.

Data on catch and effort in the Boyne Tannum Hookup were collected each year since 2005. In 2005 and 2006 details were only obtained for offshore fishing trips while from 2007 details of trips in Gladstone Harbour and local estuaries were also obtained. Where people fish during the Hookup is strongly influenced by the wind conditions with offshore trips significantly reduced when winds exceed 15knots.

Trends in the Boyne Tannum Hookup were assessed by:

1. Effect of wind speed on fishing in the event 2005-2014
2. Fishing locations 2005-2014
3. Catch rates for the Outer Harbour and estuaries 2007-2014

EFFECT OF WIND SPEED ON FISHING

Figure 68 shows the wind speed during each of the Hookups. In 2014 wind speeds at 9:00am and 3:00pm were all around 15knots or less however maximum wind speeds were from 20-25knots each day. These conditions resulted in a significant number of trips to offshore locations.

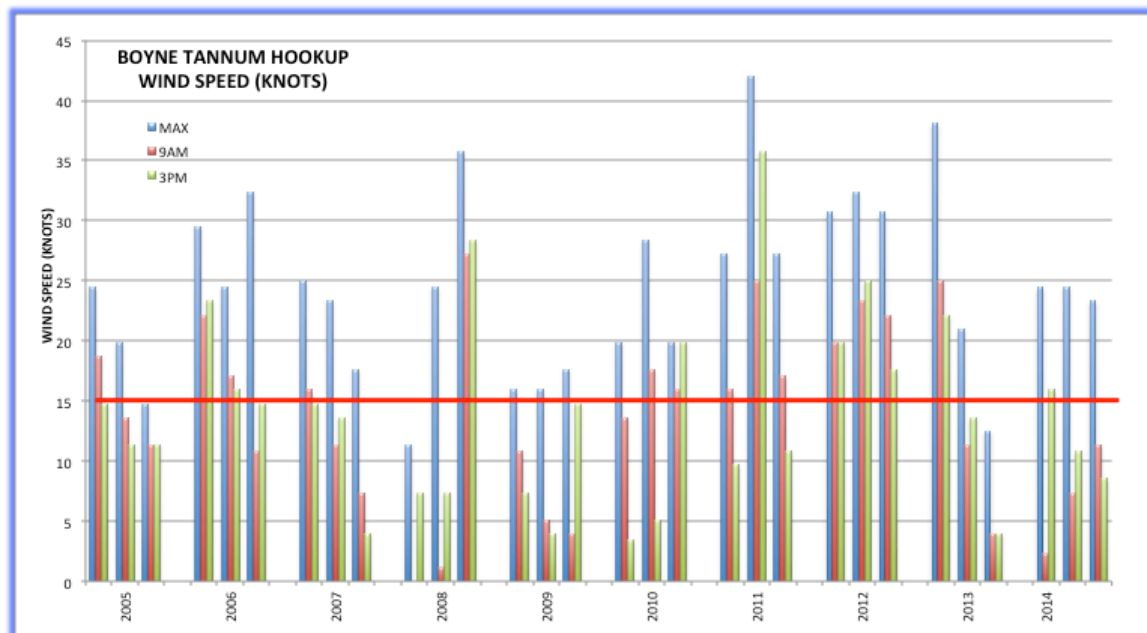


Figure 68: Wind speed (knots) during the Boyne Tannum Hookup from 2005-2014

FISHING LOCATIONS

Fishing locations were categorised as:

1. Offshore (islands, wide grounds, offshore reefs)
2. Harbour and Inshore (Gladstone Harbour and Facing Island)
3. Estuary (Boyne River, South Trees Inlet, Calliope River and Narrows)

Figure 69 shows the percentage of trips, for which catch data were obtained, to estuary/harbour and inshore and offshore locations from 2007-2014. There was a high correlation between offshore trips and wind speed as shown in figure 68.

From 2007-2009 collecting data from offshore trips under CapReef was the focus so that the number of estuary trips was an underestimate. From 2010-2014 the focus has been on trips to estuary/harbour and inshore locations so the number of offshore trips is underestimated expect for years 2011 and 2012 where wind conditions were not favourable for offshore fishing.

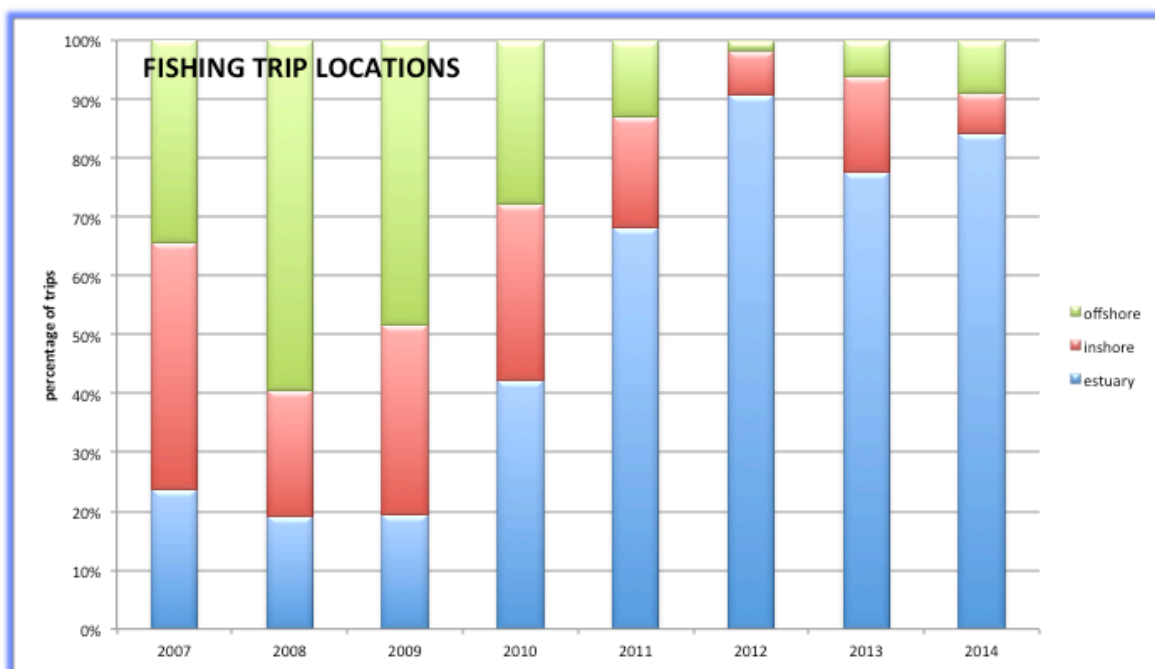


Figure 69: Percentage of trips in Boyne Tannum Hookup to estuary, inshore and offshore locations 2007-14

Catch and effort data were collected from the Boyne Tannum Hookup from 2005-2014 with the focus on offshore trips from 2005-2009 under CapReef and then on estuary/inshore trips from 2010-2014 under Gladfish

BOYNE TANNUM HOOKUP CATCH RATES

Figure 70 shows the adjusted catch rates for estuary trips each year while figure 71 shows the adjusted catch rates for harbour and inshore trips. Catch rates for estuary have fluctuated from 7.2-11.1 fish caught/trip and 0.5-2.2 fish kept/trip. There has been little

change in the trend for estuary for both fish caught and kept over the 8 years from 2007-2014 as shown by the trendlines in *figure 71*.

Catch rates for harbour and inshore have fluctuated from 3.8-10.6 fish caught/trip and 1.2-2.4 fish kept/trip. There has also been little change in the trend for harbour and inshore trips for both fish caught and kept over the past 10 years from 2005-2014. Fish health issues could have influenced lower catch rates in 2011 in that year.

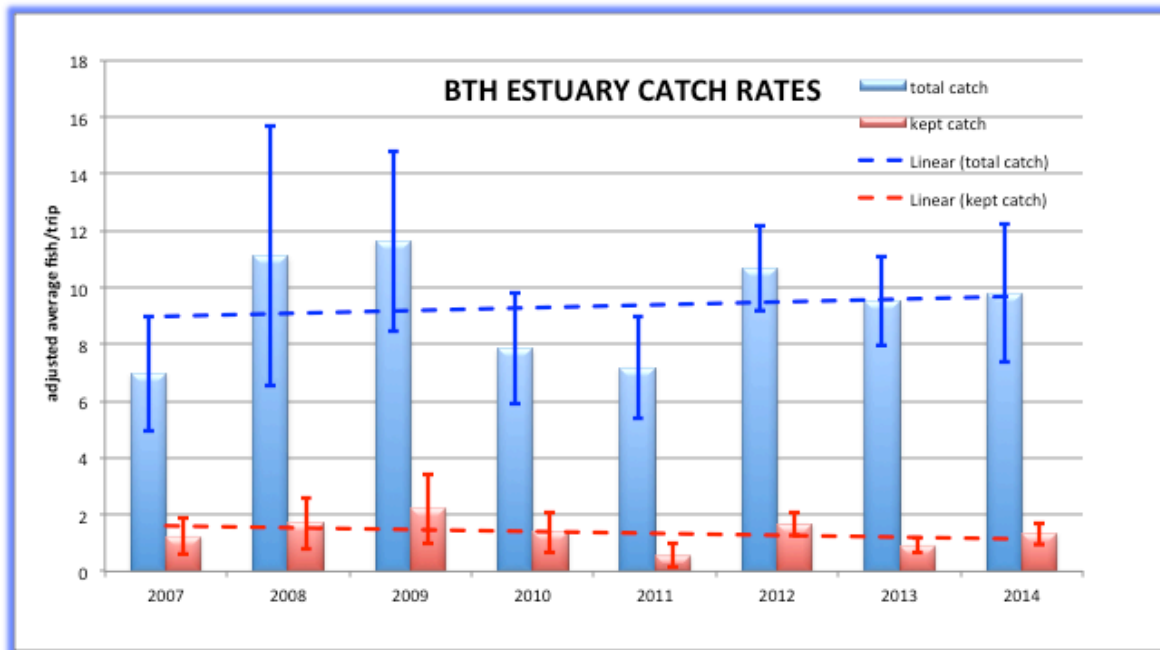


Figure 70: Catch rates for estuary areas during the Boyne Tannum Hookups from 2007-2014

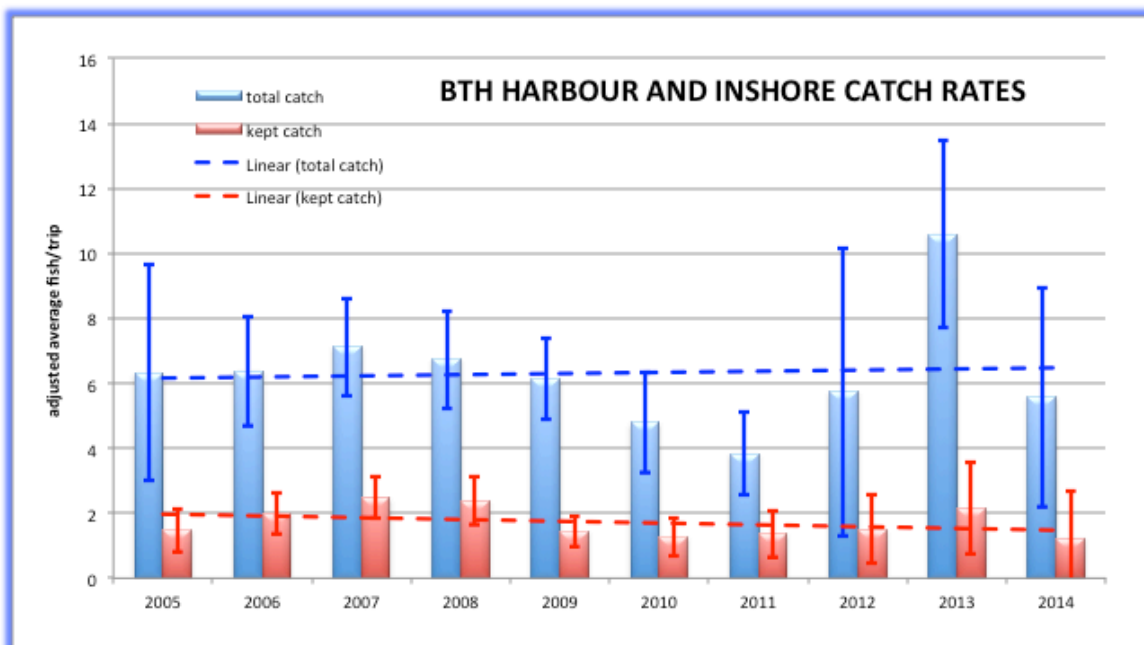


Figure 71: Catch rates for harbour and inshore during the Boyne Tannum Hookup from 2005-2013

There has been little change in the trends for estuary catch rates over the past 8 years and in harbour and inshore rates over the past 10 years

12. ASSESSMENT OF FISH HEALTH

Information on fish with health issues was provided in the Gladfish 2012 and 2013 reports. Lake Awoonga spilled again in 2014 however there was not enough water going over the spillway to allow fish to leave the lake.

Following reports from local fishers in January 2014 of more dead Barramundi in the Boyne River a survey was undertaken by Infofish Australia on 26 January 2014 to record the fish deaths. *Figure 72* shows the area surveyed in the upper Boyne River from the railway bridge above Benaraby upstream to Manns weir.

The only dead fish observed were large Barramundi with no other species recorded. There were 19 Barramundi scattered along the river in various stages of decomposition with the earliest ones probably dying several months earlier (*figure 73*). All except 2 fish were estimated at 1m+ in length. There was one fish around 500mm and another around 700mm. Of those fish there were 4 that appeared to have died in the previous day or two (*figure 74*). These fish appeared to be in good condition with no signs of lesions. One fish had bulging cloudy eyes, while the other 3 had slightly cloudy eyes.

Reports of dead fish continued until Mar 2014. No further reports were received however part of a large dead Barramundi was found floating in the Boyne River about 1km downstream from the Bruce Highway bridge at Benaraby in Nov 2014 (*figure 75*). This fish was estimated to have been 1-1.2m in length.



Figure 72: Locations where dead barramundi were recorded in the Boyne River in Jan 2014



Figure 73: Decomposed Barramundi Jan 2014



Figure 74: Recently dead Barramundi Jan 2014



Figure 75: Dead Barramundi in Boyne River Nov 2014

There were no direct reports of dead or diseased fish of other species or from Gladstone Harbour, Calliope River or the Narrows. However in the fishers' views survey the respondents indicated that they had caught/seen diseased fish in the Calliope River, Gladstone Harbour, Graham Creek and elsewhere (*table 5*).

Large Barramundi mostly over 1m continued to die in the Boyne River from around Nov 2013-Mar 2014 with at least 20 large fish found dead

A large Barramundi around 1-1.2m long was found dead in the Boyne River in Nov 2014

No dead or diseased fish were directly reported from the Calliope River, Gladstone Harbour or the Narrows however fishers had caught/seen diseased fish as reported in the fishers' views survey

13. RECRUITMENT OF OTHER SPECIES

An understanding of recruitment of various fish species is important in understanding the dynamics of stocks. In 2013 monitoring of recruitment was extended to include an initial assessment of recruitment of a number of other species besides Barramundi. These were:

1. Yellowfin Bream (*Acanthopagrus australis*)
2. Pikey Bream (*Acanthopagrus berda*)
3. Barred Javelin (*Pomadasyds kaakan*)
4. Sea Mullet (*Mugil cephalus*)
5. Flattail Mullet (*Liza dussumieri*)

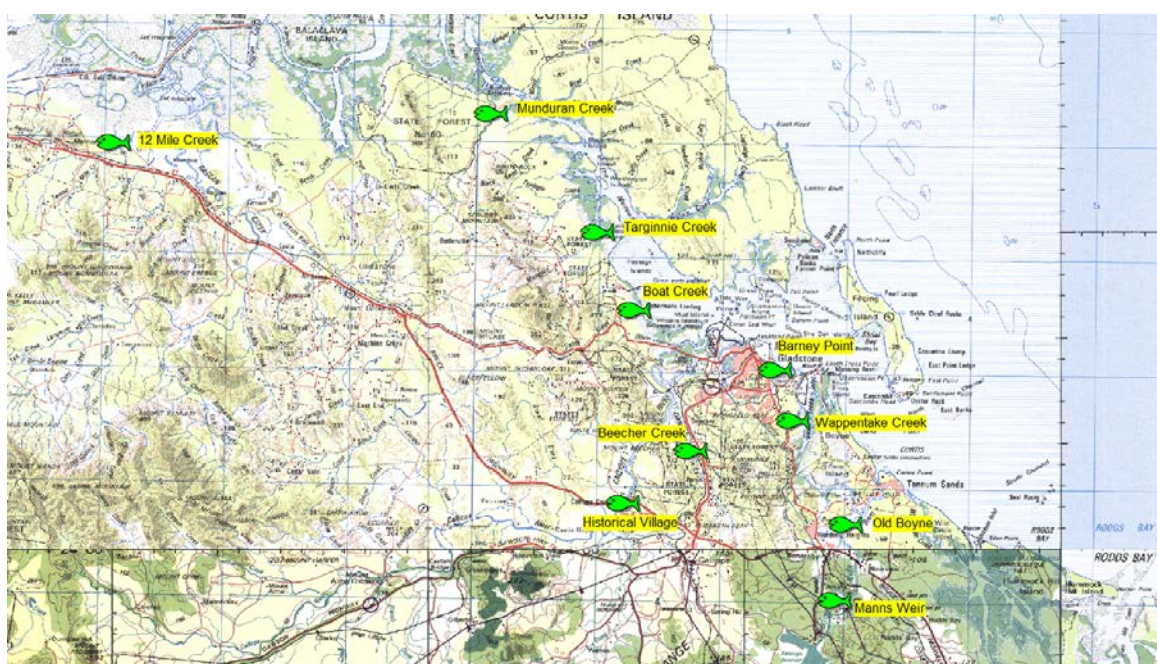


Figure 76: Locations of recruitment surveys 2012-2014

RECRUITMENT SURVEY SITE	2012	2013	2014
MUNDURAN CREEK	3	3	4
BOAT CREEK	0	1	4
BEECHER CREEK	3	4	4
OLD BOYNE	2	1	0
CALLEMONDAH	3	4	5
TARGINNIE CREEK	1	1	0
BARNEY POINT	0	4	5
WAPPENTAKE CREEK	0	4	3
HISTORICAL VILLAGE	0	0	2
MANNS WEIR	0	0	1
TOTAL	12	22	28

Table 10: Locations and number of recruitment surveys 2012-2014

As there has been no previous data collected on recruitment of these species in the Gladstone area the initial assessment was to monitor the incidence of recruits of these species during recruitment surveys for Barramundi. Recruitment surveys from 2012-2014 were examined for recruits of these species. The standardised survey method described in Gladfish 2012 and outlined on page 49 was used.

Figure 76 shows the locations of all sites surveyed from 2012-2014 while table 10 provides the details of sites and number of surveys.

In 2012 there were 12 surveys undertaken at 5 sites from Jan-Apr. In 2013 there were 22 surveys undertaken at 8 sites from Jan-May. Due to flooding in 2013 a number of sites were inaccessible or unable to be surveyed during that time. There were 28 surveys at 8 sites in 2014 from Jan-May.

Figure 77 shows the number of fish of all species per cast at all sites from 2012-2014. The highest number was 2.9 fish/cast in 2012 while the lowest number was 1.4 fish/cast in 2013. The lower number in 2013 was partly due to the flooding that occurred distributing the fish more widely.

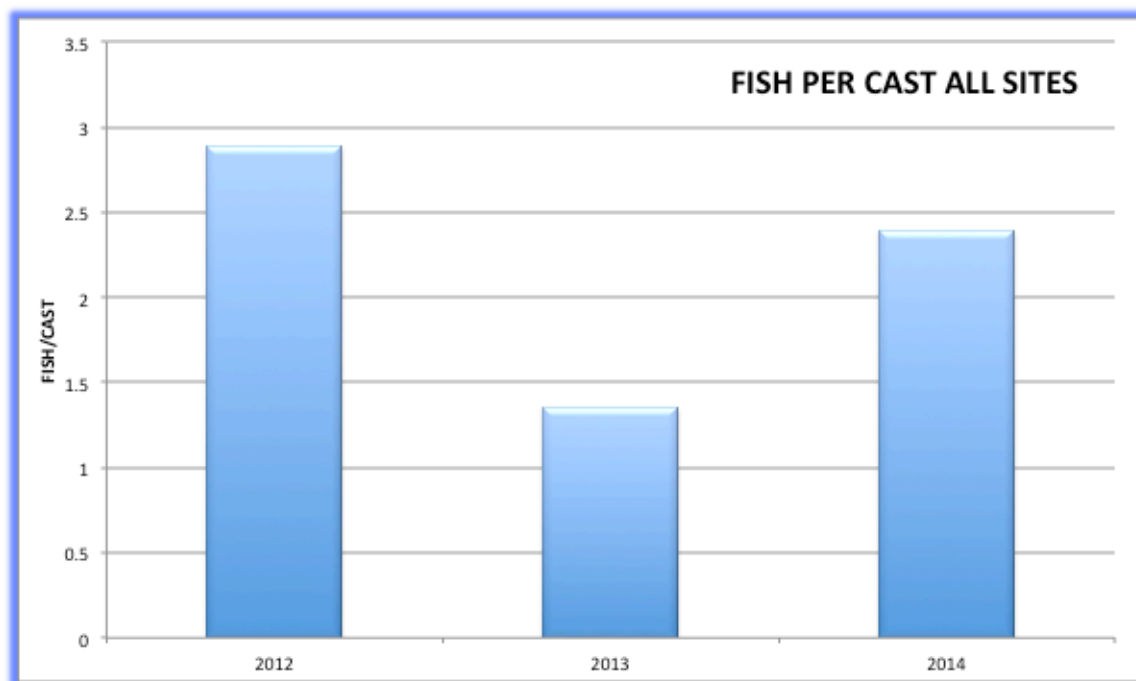


Figure 77: Fish/cast of all species at all sites from 2012-2014

Figure 78 shows the fish/cast at each site from 2012-2014. Not all sites were surveyed each year however Manns Weir on the Boyne River, Boat Creek and Targinnie Creek produced the greatest number of fish/cast overall.

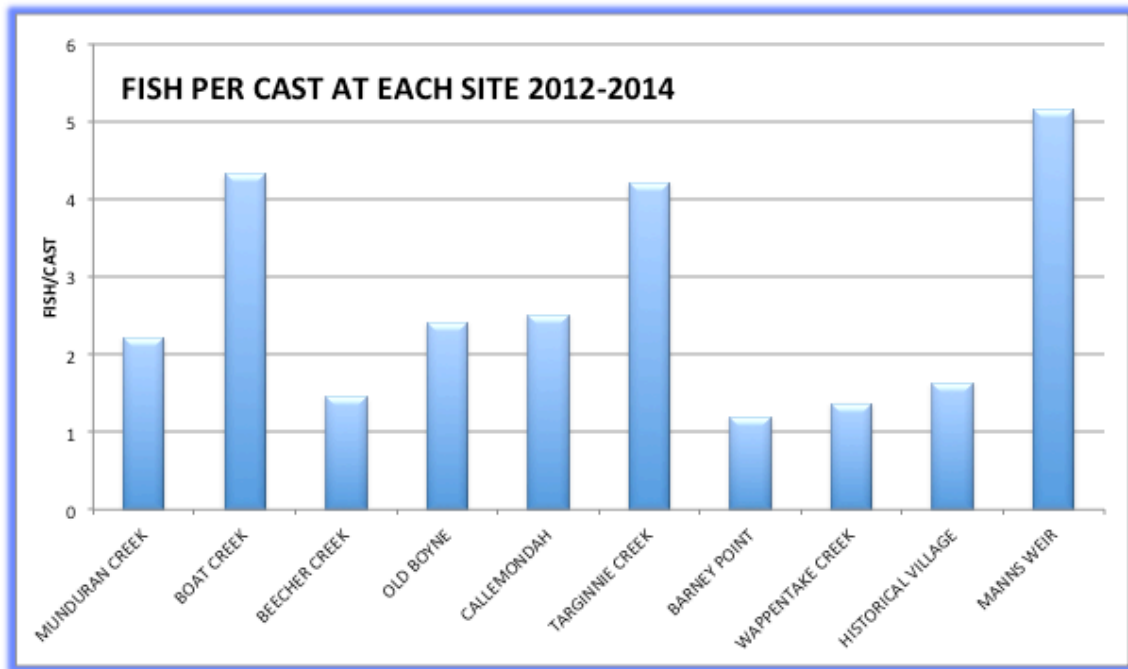


Figure 78: Fish/cast at each site 2012-2014

Figure 79 shows the number of fish of key species per cast over all sites. Overall Flattail Mullet were the most frequently caught species in each year followed by Bony Bream and Yellowfin Bream.

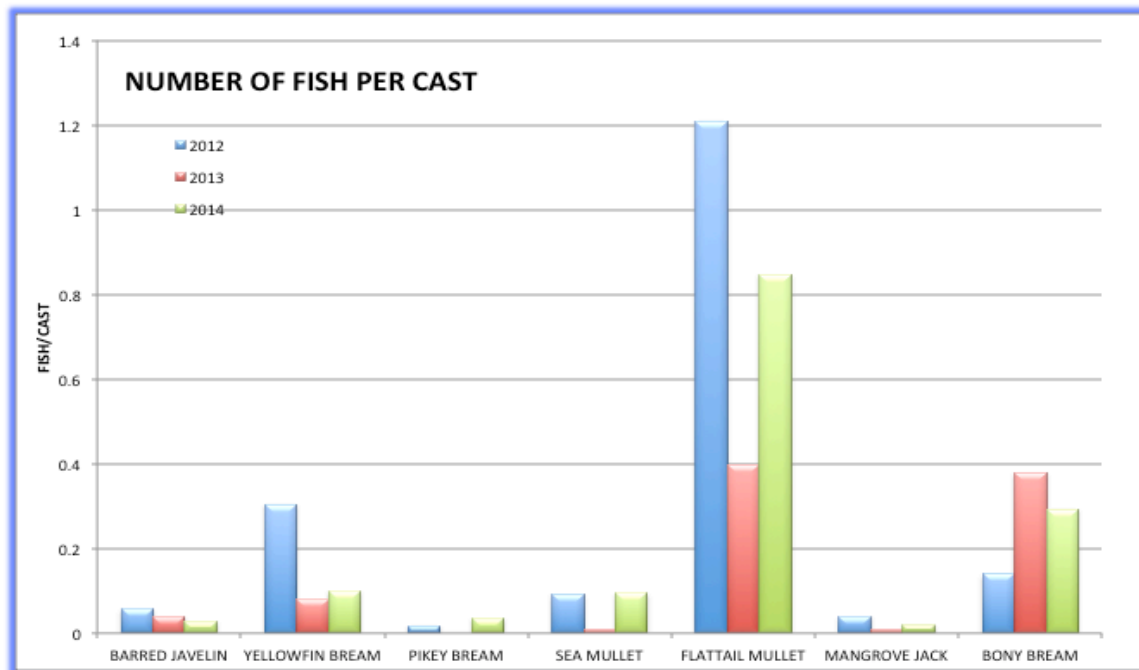


Figure 79: Number of each species/cast at all sites from 2012-2014

Figure 80 shows the fork length of Yellowfin and Pikey Bream recorded over time from 2012-2014. For 2013 and 2014 this shows the recruits growing over time and it is likely that the fish from 50-80mm are year 0 recruits (spawned in the winter from Jun-Sep).

Larger fish from 100-200mm are likely to be fish spawned in the previous winter and are 1+ years old.

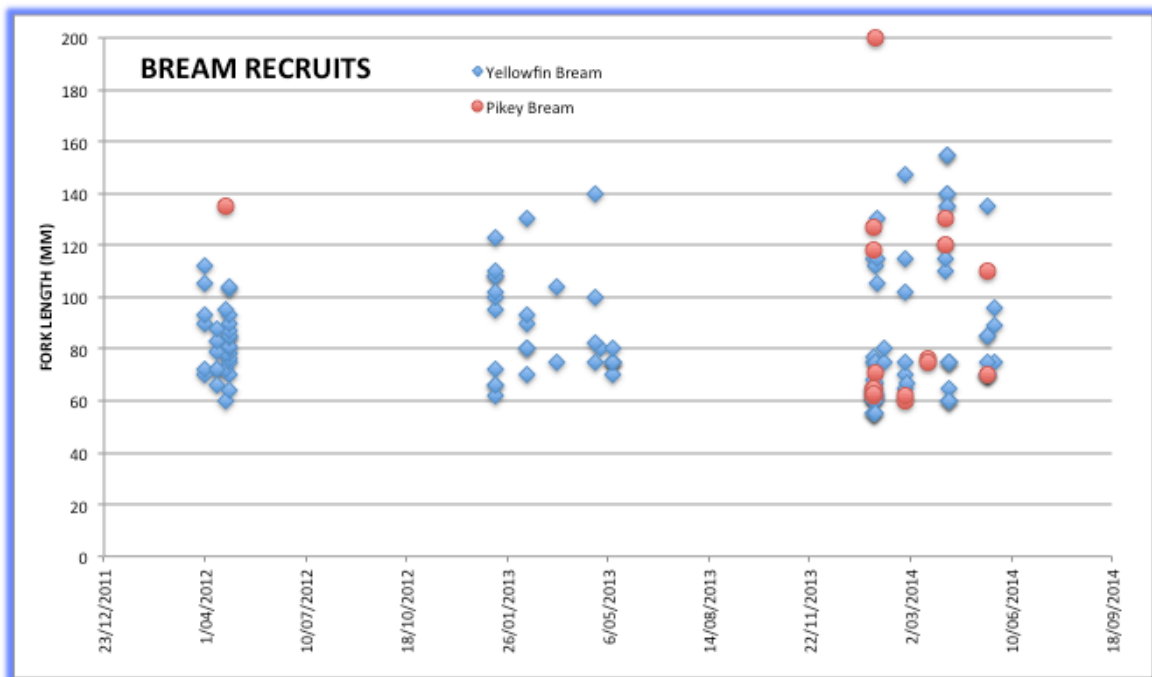


Figure 80: Fork length of Yellowfin and Pikey Bream recruits recorded 2012-2014

The most number of recruits of all species was in 2012 when there were 2.9 fish/cast and the least number of recruits was in 2013 when there were 1.4 fish/cast

The most number of recruits of all species (fish/cast) was recorded at Manns Weir on the Boyne River, Boat Creek and Targinnie Creek

The most caught species at all sites were Flattail Mullet, Bony Bream and Yellowfin Bream

Yellowfin and Pikey Bream measured indicated there were recruits from both year 0 and year 1 fish

14. CONCLUSIONS

This project has collected data over the past 3 years to monitor a number of indicators providing trends in recreational fishing in the Gladstone area. The indicators are based on an assessment of catch and effort, Barramundi stocks (including stocked fish), Boyne Tannum Hookup, tagging, Mud Crab and recruitment of a number of key species.

The status and trends in recreational fishing shows a long-term trend of increasing fishing effort and decreasing catch rates. While the long term trend in catch rates is downward they have fluctuated but remained steady over the past 3 years.

The influx of Barramundi from Lake Awoonga provided a significant boost to Barramundi stocks that, in turn, resulted in a shift in the species composition with a significant increase in Barramundi in the recreational and commercial catch. In 2014 the numbers of Barramundi had been significantly reduced from fishing effort, poor to moderate natural recruitment and continued fish deaths, particularly in the Boyne River.

Gladfish has also taken an important step in providing the community with an improved understanding of fish stocks. The use of the Crystal Bowl to predict Barramundi stocks is a first in many ways as it provides information that the fishing industry and community can use in making decisions about the future. The predictions when tested against what was observed have proven to be reasonably accurate. Providing predictions allows a greater lead time for individual and community response in both good and bad times.

Monitoring recruitment of fish is an important component of developing an understanding of the dynamics of fish stocks. It is also important in being able to predict stocks into the future. More importantly it provides an early warning if recruitment varies from that expected. The predictions for Barramundi in 2015 are that stocks are trending downward but are dependent on recruitment. Unlike other areas where stocks are reliant on natural recruitment fish spilling for Lake Awoonga and Lake Callemondah supplement stocks.

While fish health issues dominated the media in 2011 and 2012 the incidence of fish in poor condition or dead reported was lower in 2013 and 2014 although there were still sick fish and dead fish, mostly Barramundi, recorded in the Boyne River. Fishers also indicated they had caught/seen sick fish throughout the Gladstone area. Fishers were more concerned about fish health issues in 2014 compared with 2012 and this could be because the fish health issues have persisted for over 3 years.

The Gladfish reports provide a snapshot of the status of fish stocks in the Gladstone area but more importantly provide a useful benchmark for assessing changes in the future.