



Noosa River Bass

Suntag Tagging and Recaptures

1983-2009



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Cover photographs: (Top) Noosa River in the early morning (Bottom) Patrick Murphy with a large Noosa River Bass which is likely to be in excess of 20 years old (Patrick Murphy photographs)

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Acknowledged is the contribution of all ANSA Qld members that have tagged Australian Bass in the Noosa River and made this report possible.

Thanks to Patrick Murphy of the Brisbane Valley Anglers for the photographs on the front cover of this report.



Summary

Tagging of Australian Bass (*Macquaria novemaculeata*) commenced in the Noosa River in the early 1970s. This tagging was carried out by members of the Brisbane Sportfishing Club and other clubs joined in over the next few years.

From 1970-71 to 1984-85 it is recorded that 405 Bass were tagged in the Noosa River and 14 recaptured however the records for these fish are no longer available. Ross Cobb of the Brisbane Sportfishing Club recalls that he tagged around 1,500 Bass in the late 1970s and early 1980s however these records have not been able to be located.

From 1985-86 to 2008-09 (January 2009) there was a total of 1,656 Bass tagged in the Noosa River. A further 6 fish were recorded in the database which were fish recaptured after 1985-86 but tagged prior to that time between 1982-83 and 1984-85.

Of these fish there have been 151 (9.1%) individual fish recaptured. Of the fish recaptured there were 7 that were recaptured a second time.

Tagging effort was mostly within the Cooloolo National Park from the top end of Lake Cootharaba to National Park camp 15 some 30km upstream and also in the first 6km of Kin Kin Creek. The greatest numbers of fish were tagged in the 9km reach from Harry's Hut upstream to camp 5.

Of the recaptures there were 115 (72.8%) fish that were recaptured where they were at liberty for greater than 365 days (1 year). There were 7 fish that were at liberty for over 2,822 days (8 years) with the longest time being 4,004 days (almost 11 years).

Recapture rates range from a low of 1.0% for fish tagged in 1988-89 to a high of 22.2% for fish tagged in 2003-04 (however the number of fish tagged that year were very low). A more comparable high was 20.0% for fish tagged in 2001-02. Recapture rates for fish tagged between 1985-86 and 1988-89 were lower than the overall rate. These were for tags that did not have the 1800 (or earlier 008) toll free number to report tags so the rate of reporting was generally lower. The recapture rates for fish tagged in the last few years are expected to increase over the next few years as more of these fish are recaptured.

The average annual growth rate was 14.2mm \pm 16.6mm. Growth rates were around 20mm per year for fish 200mm long dropping to around 10mm per year for fish around 400mm. It is likely that fish around 400mm could be up to 20-25 years old.

The overall average size of fish tagged was 250-299mm. Lengths of fish tagged each year shows that the average length of fish tagged went from around 250mm in the mid 1980s to around 300mm in the early 1990s and has remained much the same since then.

Of the recaptures 59 (45.7%) were recaptured in the same area as tagged. A further 40 (31.0%) fish were recaptured within 5km of where tagged. The greatest distance moved by a fish was 33km down river to Lake Cooroibah. No fish were recaptured outside the Noosa River although one fish from the earlier tagging was reported to have been recaptured in the Maroochy River. Of the 70 fish that moved there were 41 (58.6%) that moved upstream and 29 (41.4%) that moved downstream.

Male Bass tend to inhabit the lower estuarine reaches of rivers while females inhabit the upstream freshwater reaches. From May to August fish move downstream to the estuary to spawn. The movement of fish obtained from the tagging data shows some downstream movement associated with migration for spawning as the fish caught downstream were all caught in autumn and winter when it is expected they would be moving for spawning.

The Noosa River Bass fishery is primarily a catch and release fishery with very few adult fish removed from the river, at least in the freshwater reaches. As a result it is likely there is still a healthy population of fish over the minimum legal length of 300mm.

Noosa River Bass

Suntag Tagging and Recaptures 1983-2009

1. Introduction

Tagging of Australian Bass (*Macquaria novemaculeata*) commenced in the Noosa River in the early 1970s. This tagging was carried out by members of the Brisbane Sportfishing Club and other clubs joined in over the next few years.¹ At that time the program was called the Recreational Sportfish Tagging program and was managed by the Queensland Fisheries Service, now Primary Industries and Fisheries (DPI&F) of the Department of Employment, Economic Development and Innovation (DEEDI).

In 1986-87 the responsibility for the tagging program was handed over to the Australian National Sportfishing Association Qld Inc (ANSA Qld) and it eventually became known as Suntag. At the time of taking over the program it was decided that data from 1985-86 would be entered into the database and earlier data would not be included. This meant that a substantial amount of data on tagging of Australian Bass in the Noosa River was lost over time.

From 1970-71 to 1984-85 it is recorded that 405 Bass were tagged in the Noosa River and 14 recaptured however the records for these fish are no longer available.² Ross Cobb of the Brisbane Sportfishing Club recalls that he tagged around 1,500 Bass in the late 1970s and early 1980s however these records have not been able to be located.³ A small number of fish tagged from 1982-83 to 1984-85 were recaptured and these records were entered into the database.

Since 1985-86 there have been fish tagged in the Noosa River on an ongoing basis however in some years the effort has been low.

The upper Noosa River is within the Cooloolo National Park managed by the National Parks and Wildlife Service (NPWS) and the current management plan was introduced in 1987.⁴ Previous to that plan there were no limits on vessels used for fishing in the park. Following the introduction of the plan there were a number of restrictions introduced. The use of outboards on power boats is limited up to campsite 3 with a 6 knot speed limit. Electric motors and non-motorised vessels are permitted past campsite 3. This has limited the fishing effort somewhat, especially in the upper reaches of the river above campsite 3.

2. Aims

The aims of this report are to examine tagging and recapture data in relation to:

- Numbers of fish tagged and recaptured each year;
- Time at liberty;
- Recapture rates and trends;
- Growth;
- Movement;
- Length/frequency; and
- Location where fish caught.

¹ Pers comm. Michael Dohnt and Steve Watson Brisbane Sportfishing Club

² Queensland Fisheries Service Sportfish Tagging Program Summary Report (unpublished 1986)

³ Pers comm. Michael Dohnt Brisbane Sportfishing Club

⁴ Pers comm. Mark Gough Department of Environment and Natural Resources

3. Methods

Tags used to tag fish throughout the period were standard Hallprint TBA (gun or anchor) or PDS (dart or spear) tags. Tagging of a Noosa Bass is shown in *figure 1*. Tagging was carried out in accordance with the procedures in the Suntag Tagging Manual (available at www.info-fish.net).

Fish were captured, measured for total length and fork length. This information along with the tag number, date of capture and location where the tagged fish was captured was reported to the Infofish central repository using the standard Suntag form and loaded into the Suntag database. The current database that stores the data is Infofish 2006 and is located at <http://database.info-fish.net> however is only accessible to authorised users that have been allocated a login and password.

Recaptured tagged fish were reported to the Suntag hotline (toll free 1800 077 001). The tag number, length of the fish, the location and date of its capture were recorded at this time along with details of the person that recaptured the fish.

Locations where fish were tagged and recaptured were recorded using a map and grid reference from Suntag maps (available at www.info-fish.net). Suntag maps covering the Noosa River are Upper Noosa River (SC23) and Noosa River (SC22).



Figure 1: Tagging of a Noosa River Bass in 1996

Recapture rates were calculated for fish tagged in each year. This was calculated as:

$$RR = BR_t / BT_t$$

Where

RR = recapture rate

BR_t = Number of recaptures of fish tagged in any time period

BT_t = Number of fish tagged in same time period

Multiple recaptures of the same fish were excluded when calculating the recapture rate.

Time at liberty was calculated as:

$$D_{r-t} = \text{date}_r - \text{date}_t$$

Where

D_{r-t} = time in days between tagging and recapture

date_r = date of recapture

date_t = date of tagging

Tag and recapture data from 1983-2009 were analysed to estimate growth for Australian Bass in the Noosa River.

Growth rates were calculated using 2 different methods.

a) Annual growth rate

The annual growth rate was calculated as:

$$\text{AGR} = ((\text{TL}_r - \text{TL}_t) / D_{r-t}) * 365$$

Where

AGR = annual growth rate in millimeters

TL_r = total length on recapture

TL_t = total length on tagging

D_{r-t} = time in days between tagging and recapture

Fish with apparent negative growth, where lengths were not recorded and fish that were at liberty for less than 30 days were excluded when calculating growth. Fish with major outlier growth rates were assumed to be erroneous and excluded.

Linear daily growth rates were calculated and then converted to annual growth rates.

b) Modelling growth equations

Growth of fish was assessed using GROTAG which estimates growth parameters from tag and recapture data.

GROTAG uses least squares regression techniques to estimate L_{inf} and K by minimising the difference between predicted and observed lengths at recapture.

GROTAG uses a modification of the von Bertalanffy growth equation described by Francis (1988). This can be described as:

$$\text{TL}_r = L_{inf} * (1 - \exp(-K * (D_{r-t})) - (\text{TL}_t * (1 - \exp(-K * (D_{r-t})))$$

Where

TL_r = total length on recapture

L_{inf} = asymptotic length

K = instantaneous daily growth rate

D_{r-t} = time in days between tagging and recapture

This was then used to calculate the size of fish for each year of age and growth curves were generated from these data.

Movement of Australian Bass was determined by calculating the distance between tagging and recapture locations to the nearest km calculated using MapInfo GIS software. The distance calculated was the shortest distance via water from the tag to the recapture location.

Length/frequency of fish tagged in any year were assessed based on 5cm intervals of length. The numbers of fish in each size interval were calculated to determine if there has been any change in the size structure over time.

Locations where fish were tagged and recaptured were assessed based on the numbers of fish caught in each map grid. This allowed an assessment of where the fish were tagged and recaptured in the river.

4. Noosa River Tagging Area

Tagging of Australian Bass was in the area of the Noosa River upstream from Lake Cootharaba and covered by the Suntag grid map Upper Noosa River (SC23) as shown in figure 2. Grids on this map are approximately 1.15km x 1.15km.

One fish was tagged in the lower saltwater reaches of the Noosa River at Noosa Sound which is on Suntag grid map Noosa River (SC22).

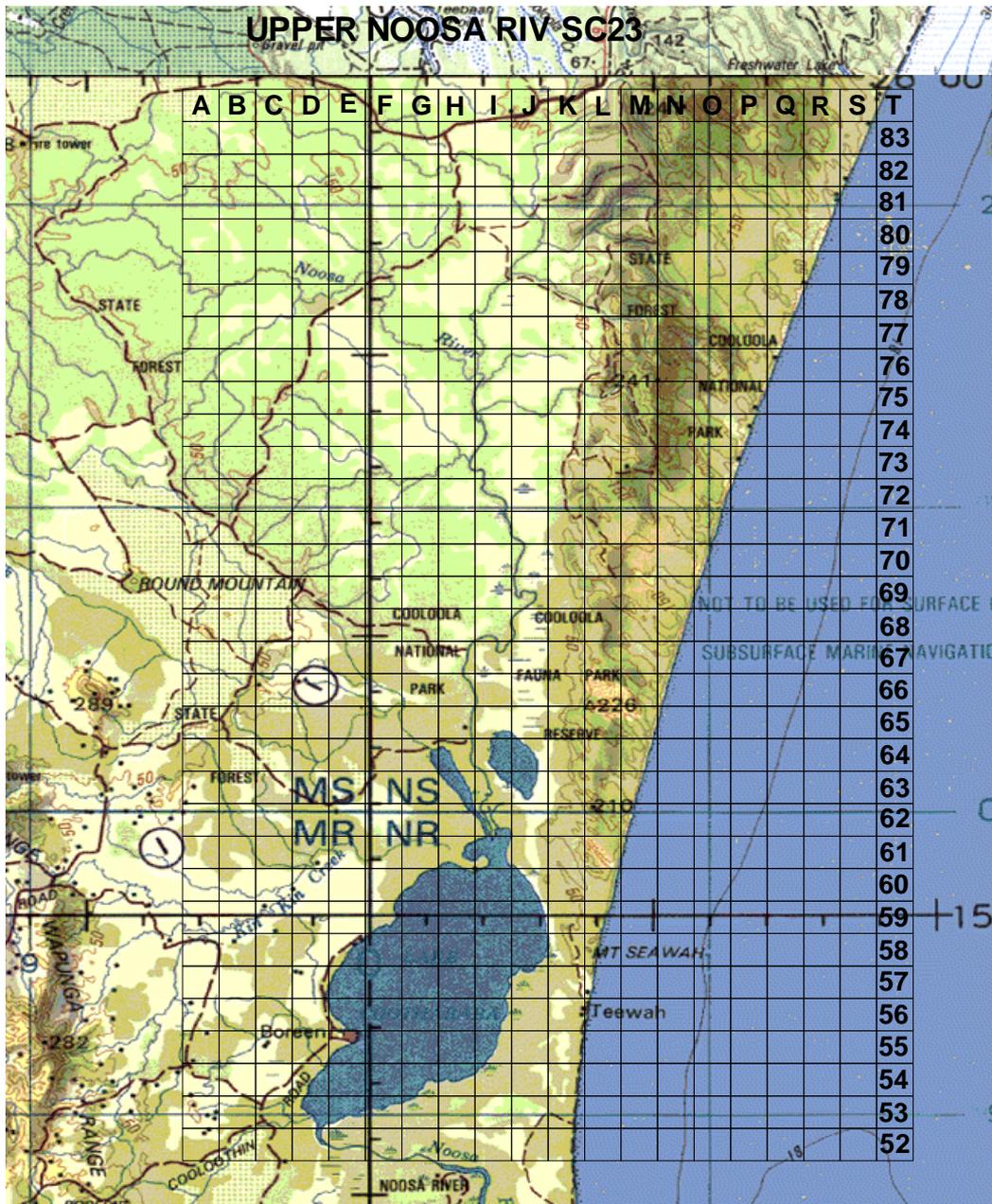


Figure 2: Suntag grid map of Upper Noosa River where Australian Bass were tagged

5. Results

5.1 Fish Tagged and Recaptured

From 1985-86 to 2008-09 (January 2009) there was a total of 1,656 Bass tagged in the Noosa River. A further 6 fish were recorded in the database which were fish recaptured after 1985-86 but tagged between 1982-83 and 1984-85.

Of these fish there have been 151 (9.1%) individual fish recaptured. Of the fish recaptured there were 7 that were recaptured a second time.

Figure 3 shows the number of fish tagged each year and figure 4 shows the recapture rate for fish tagged in that year.

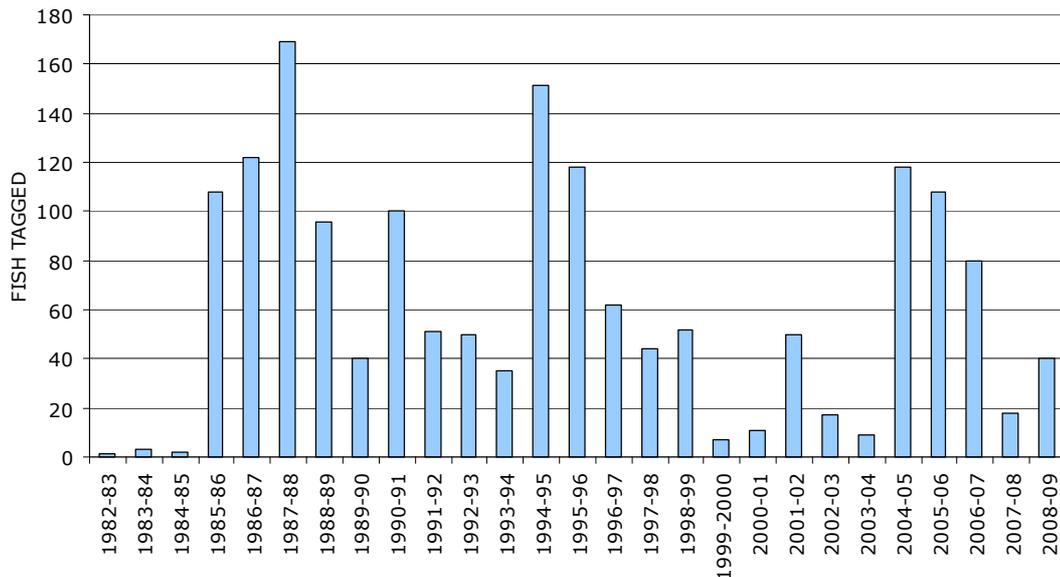


Figure 3: Numbers of Bass tagged each year from 1985-86 to 2008-09

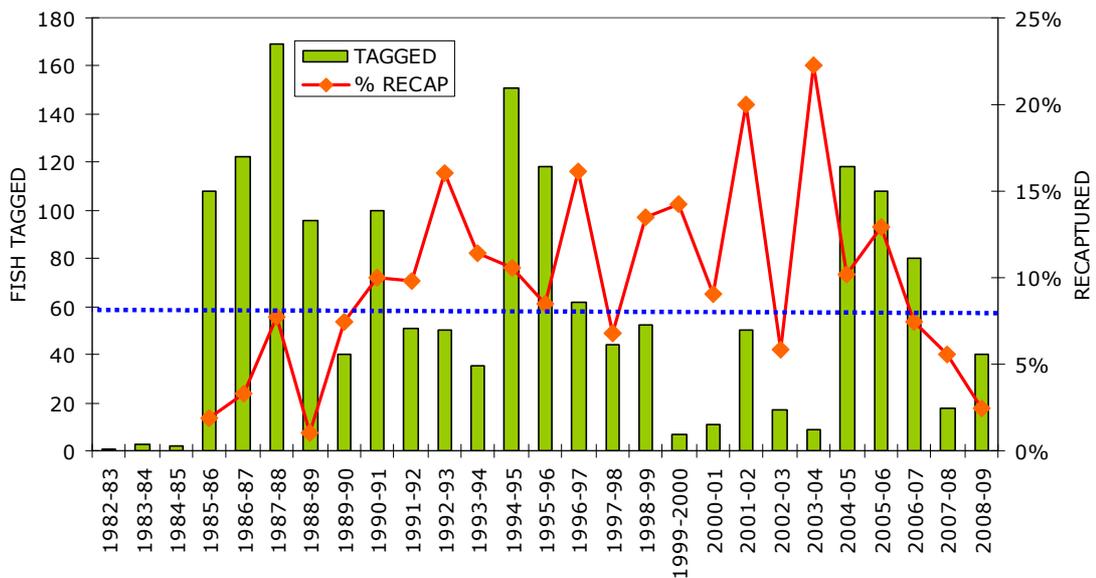


Figure 4: Tagging of fish each year and the recapture rate for fish tagged in that year

5.2 Time at Liberty

Of the recaptures of Bass there were 115 (72.8%) fish that were recaptured where they were at liberty for greater than 365 days (1 year). *Figure 5* shows the recaptures from the shortest to the longest time at liberty.

There were 7 fish that were at liberty for over 2,822 days (8 years) with the longest time out being 4,004 days (almost 11 years).

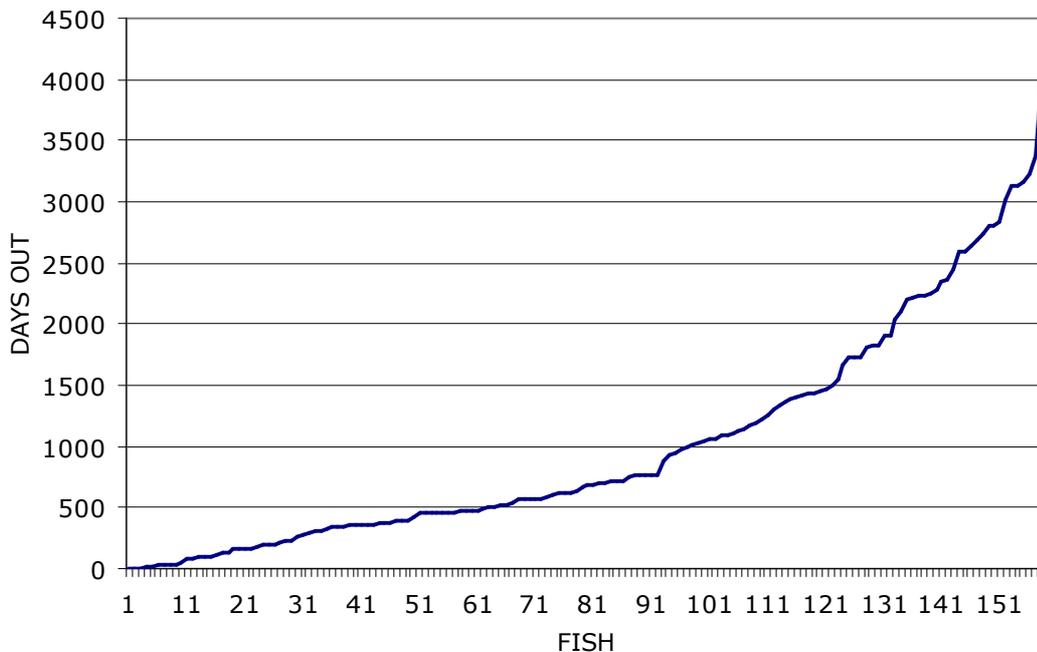


Figure 5: Days between tagging and recapture for Noosa River

5.3 Trends in Recapture Rates

Recapture rates ranged from a low of 1.0% for fish tagged in 1988-89 to a high of 22.2% for fish tagged in 2003-04 (however the number of fish tagged that year were very low). A more comparable high was 20.0% for fish tagged in 2001-02. The dotted line on *figure 4* shows the overall recapture rate of 8.0% for all Bass in the Suntag program.⁵ Recapture rates for fish tagged between 1985-86 and 1988-89 were lower than the overall rate. These were for tags that did not have the 1800 (or earlier 008) toll free number to report tags so the rate of reporting was generally lower. The recapture rates for fish tagged in the last few years are expected to increase over the next few years as more of these fish are recaptured.

Figure 6 shows a logarithmic trendline for recapture rates each year showing a steady increase in the recapture rates over time. However any interpretation of this needs to be treated with caution due to the low numbers of fish tagged in some years.

⁵ W Sawynok (2008): Suntag Research Report 2007/08: available at www.info-fish.net

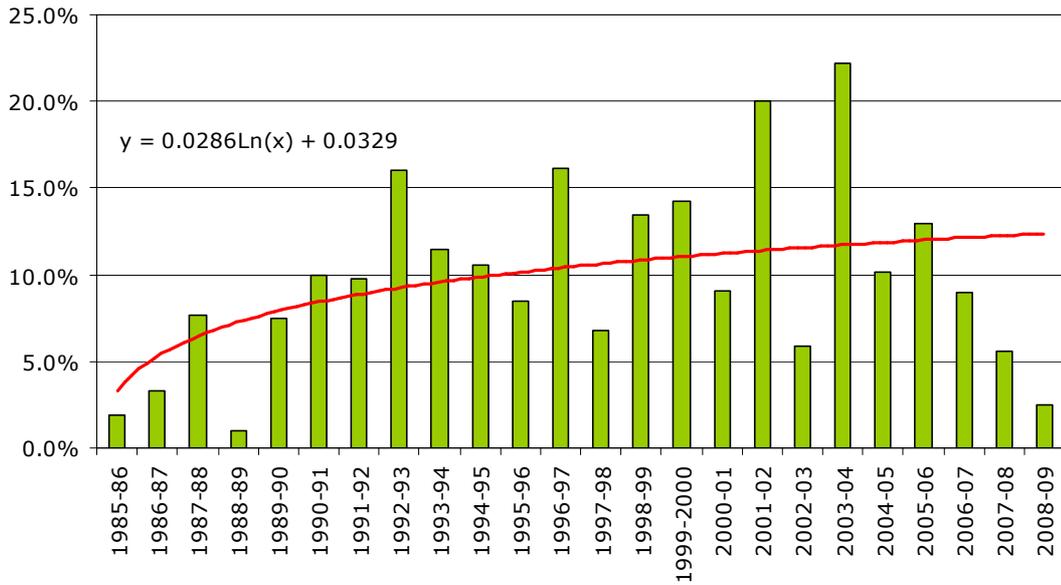


Figure 6: Recapture rates showing a logarithmic trendline for fish tagged each year

5.4 Growth

Of the 158 recaptures there were 110 fish with sufficient data to calculate growth. The average annual growth rate was $14.2\text{mm} \pm 16.6\text{mm}$ at the 95% confidence level.

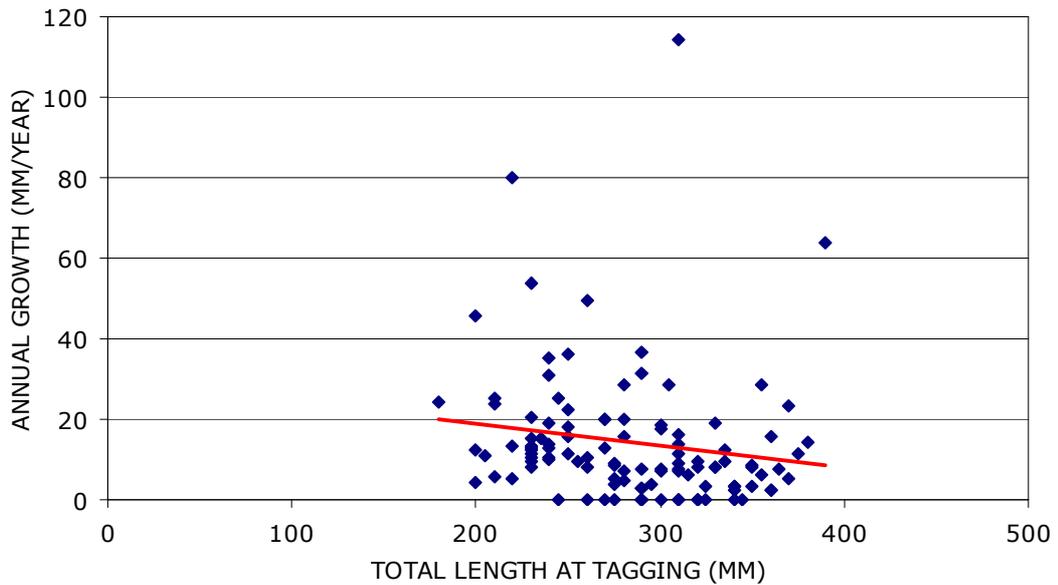


Figure 7: Growth rates of fish based on total length when tagged

Figure 7 shows the annual growth rate for fish based on the length at tagging. The trendline indicates a growth rate of around 20mm per year for fish 200mm long dropping to around 10mm per year for fish around 400mm.

Figure 8 shows the growth curve for Bass in the Noosa River. This indicates that fish around 400mm could be up to 20-25 years old.

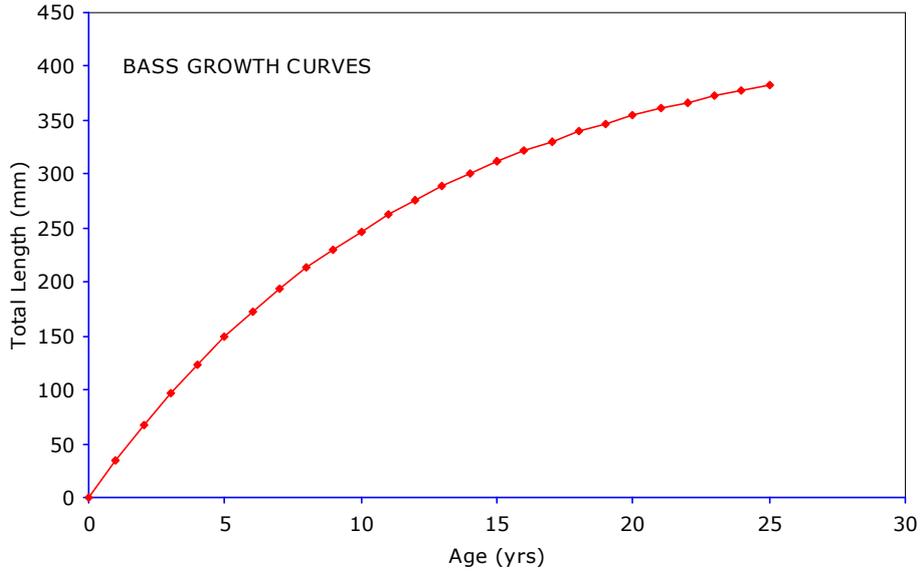


Figure 8: Growth curve of Bass in Noosa River

5.5 Movement

A total of 129 fish had sufficient data to determine movement. Of these 59 (45.7%) were recaptured in the same area as tagged. A further 40 (31.0%) fish were recaptured within 5km of where tagged. The greatest distance moved by a fish was 33km down river to Lake Cooroibah. No fish have been recaptured outside the Noosa River (see Discussion). *Figure 9* shows the comparison of the distance moved and days out between tagging and recapture.

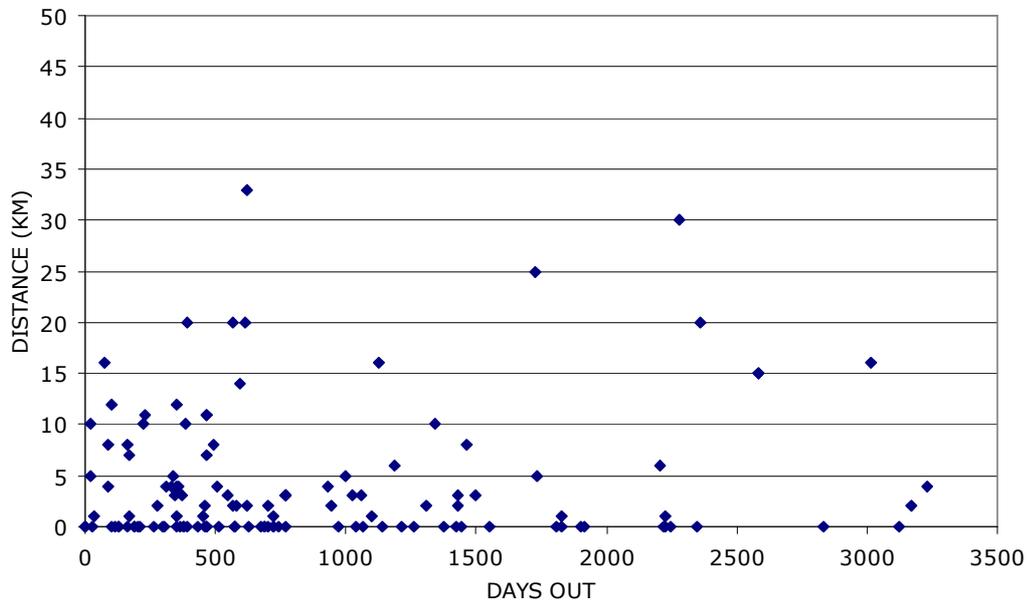


Figure 9: Distance Bass moved in the Noosa River compared with days out

Of the 70 fish that moved there were 41 (58.6%) that moved upstream and 29 (41.4%) that moved downstream. There were 9 fish that were recaptured downstream from Lake Cootharaba (figure 12). One fish was recaptured in autumn while the rest were caught in winter suggesting that these movements were likely to be associated with spawning migration.

5.6 Length/Frequency

Figure 10 shows the length/frequency of tagged Bass cumulative each year. The legal size limit for Bass is 300mm⁶ and figure 10 does not show a marked drop off in fish above that size.

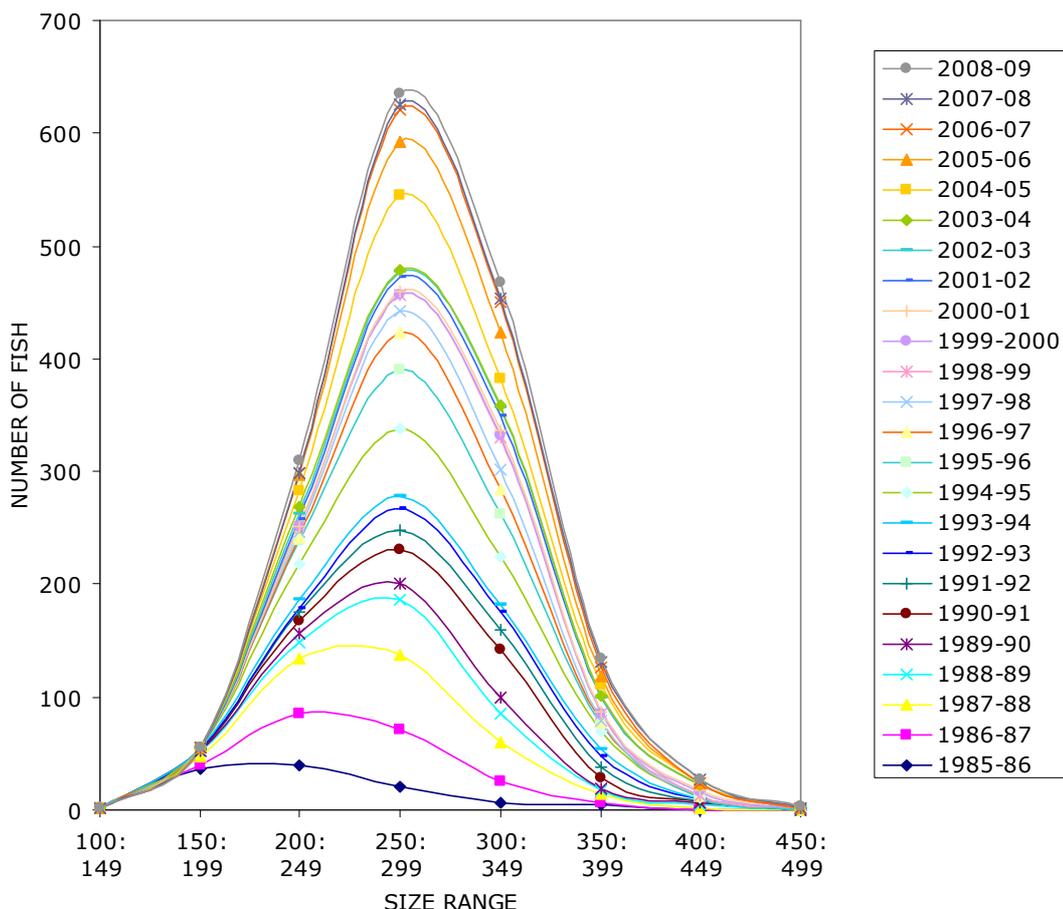


Figure 10: Cumulative size range of Bass each year

Figure 11 shows the length of Bass on the date tagged or recaptured from 1983-2009 along with a trendline showing the change in the average length of the fish. Lengths of fish tagged each year indicated that the average length of fish tagged went from around 250mm in the mid 1980s to around 300mm in the early 1990s and remained much the same since then.

⁶ Recreational fishing rules and regulations for Queensland (March 2009)

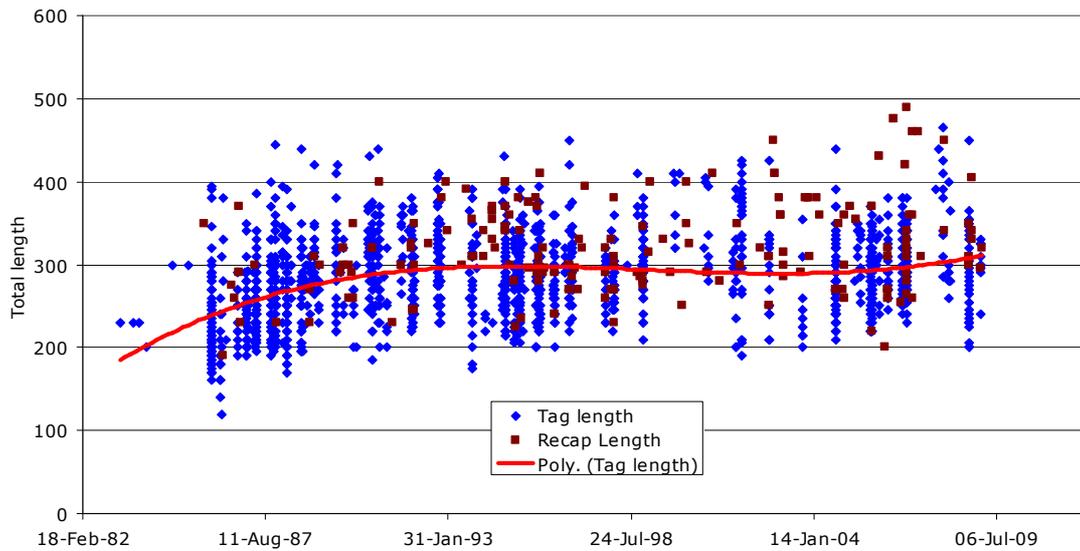


Figure 11: Lengths of Bass tagged and recaptured from 1983 to 2009

5.7 Locations where Fish Tagged and Recaptured

Figure 12 shows the locations where total numbers of fish have been tagged and recaptured. Tagging effort in the Noosa River was from the top end of Lake Cootharaba to 30km upstream to National Park camp 15 and also in the first 6km of Kin Kin Creek. The greatest numbers of fish were tagged in the 9km reach from Harry's Hut upstream to camp 5.

Below where the river flows into Lake Cootharaba all the fish recorded except 1 were recaptures. These recaptures were likely to be associated with downstream migration for spawning.

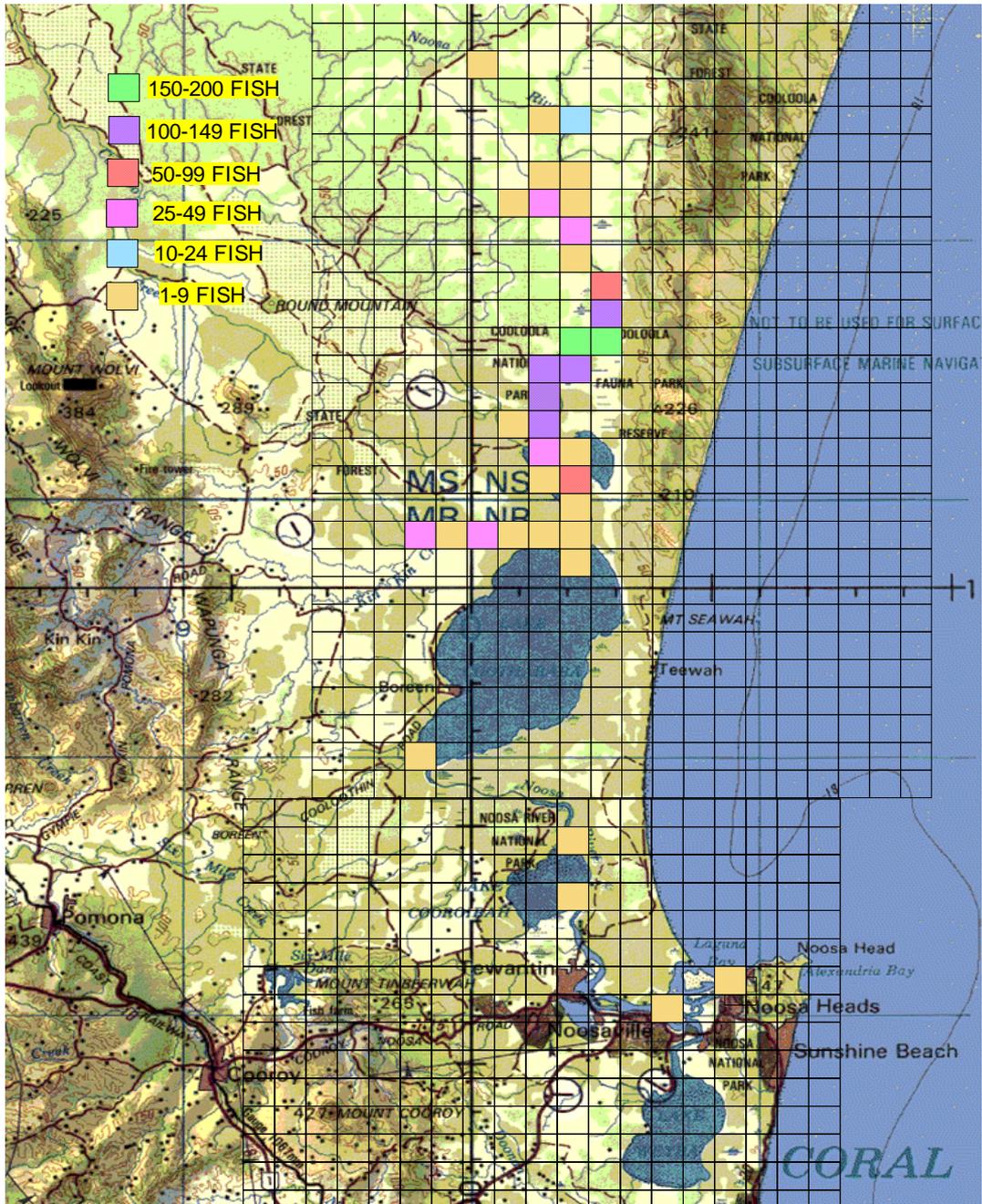


Figure 12: Locations where Bass were tagged and recaptured in the Upper Noosa River

6. Discussion

Almost all of the tagging of Bass in the Noosa River has been within the Cooloola National Park upstream from Lake Cootharaba in the freshwater reaches. This is the area where most Bass are found. However it also reflects the activities of taggers that target Bass in the upper reaches of the river. Only 1 fish was tagged in the saltwater estuary part of the river.

With 115 (72.8%) fish being recaptured over a year and 7 (4.4%) over 8 years after tagging it would suggest that there is low rate of tag shedding by Bass. This is supported by fish being recaptured up to 14 years after tagging in some impoundments.⁷

Based on the growth rates, time at liberty and movement of fish it indicates that the Noosa River population of Bass is slow growing with fish being long lived and staying within the river system. It is likely that fish over 400mm in length are over 20-25 years old. Maximum age of Bass has been recorded at 22+ years.⁸

Male Bass tend to inhabit the lower estuarine reaches of rivers while females inhabit the upstream freshwater reaches. From May to August fish move downstream to the estuary to spawn.⁹ The movement of fish obtained from the tagging data shows some downstream movement associated with migration for spawning as the fish caught downstream from Lake Cootharaba were all caught in autumn and winter when it is expected they would be moving for spawning.

There were no recaptures of fish outside the Noosa River however it was reported that a Bass tagged during the 1970s was recaptured in the Maroochy River. The recapture was made after extensive flooding in the Sunshine Coast area and it is possible that during that time the rivers were connected through some low lying swamp areas between Lake Wyeba and the Maroochy River near Coolum Creek.¹⁰

The size/frequency data indicated a normal distribution of fish with an average size of fish tagged from 250-299mm. There was a steady increase in the average size of fish tagged from the mid 1980s to the mid 1990s however little change beyond that time. It is possible that there was increased recruitment during the 1980s which is reflected in the increase in the average fish length from the mid 1980s to the mid 1990s. From the mid 1990s to the present there is little evidence of any substantial boost in recruitment at any time. This would likely be reflected in a decrease in the average length of fish tagged.

The Noosa River Bass fishery is primarily a catch and release fishery with very few adult fish removed from the river, at least in the freshwater reaches above Lake Cootharaba. As a result it is likely that there is still a healthy population of fish over the minimum legal length of 300mm.

⁷ W Sawynok and J Platten (2009): Growth, Movement and Survival of Stocked Fish in Impoundments and Waterways of Queensland 1987-2008: in press

⁸ Harris JH (1985): Age of Australian Bass *Macquaria novemaculeata* (Perciformes: Percichthidae) in the Sydney Basin: Australian Journal of Marine and Freshwater Research 36: 235-246

⁹ GR Allen, SH Midgley, M Allen (2003): Field Guide to Freshwater Fishes of Australia: edition 2

¹⁰ Pers comm. Michael Dohnt Brisbane Sportfishing Club