Queensland **the Smart State**

Fisheries Long Term Monitoring Program

Preliminary Assessment of Juvenile Mangrove Jack around Weipa, May 2004

March 2005

Queensland Government
Department of Primary Industries and Fisheries

Fisheries Long Term Monitoring Program

Preliminary Assessment of Juvenile Mangrove Jack around Weipa, May 2004

March 2005

Rose, D.B.

Lunow, C.P.

Stapley, J.M.

Kistle, S.L.

Department of Primary Industries and Fisheries
Queensland
ISSN 0727-6273
QI05011

For further information contact:

Darren Rose at DPI&F, Northern Fisheries Centre PO Box 5396 Cairns Q 4870

Ph: (07) 4035 0100 Fax: (07) 4035 1401

This document may be sited as:

Rose, D.B., Lunow, C.P., Stapley, J.M. and Kistle, S.L. (2005). Fisheries Long Term Monitoring Program, Preliminary Assessment of Juvenile Mangrove Jack around Weipa, May 2004. Department of Primary Industries and Fisheries, Queensland.

Acknowledgements:

We would like to thank John Russell, DPI&F Northern Fisheries Centre, for providing valuable advice on survey methods, timings, habitat information and general fish biology of mangrove jack. We would also like to thank the Queensland Boating and Fishing Patrol staff, Bob Russell and Bill Nason at Weipa, for their co-operation and assistance with the smooth running of this survey.

Dr Malcolm Dunning and Sue Helmke are thanked for reviewing this report.

We also thank the following people for passing on their local knowledge, which helped in identifying potential sites to sample for juvenile mangrove jack:

Phil Aspinal, Dave Donald and Josh, Corporal Rob Duffy — Scherger RAAF base,

Anthony Gomez, Greg Howard, Grahame McComiske, Alex Murray, Pugwash, Bill Sawynok, Pete and Liana Tonin.

Contents

Executive Summary

Because of concerns raised by the Gulf Fisheries Management Advisory Committee (GulfMAC), Fisheries Long Term Monitoring Program staff were asked by the fishery manager to investigate the presence, abundance and size class distribution of juvenile mangrove jack around Weipa.

The mangrove jack survey in fresh and upper estuarine waters near Weipa was conducted in the first week of May 2004. The survey was timed to coincide with the LTMP Weipa mud crab survey to utilise available field staff and minimise costs. Of the eighty-eight mangrove jack observed, sixty-four were captured and released. Ninety percent were tagged before being released. The smallest fish was 57 mm TL and the largest sampled was 460 mm TL. The most commonly caught size class within the sample was 300 mm to 350 mm. Only four fish within the 0^+ age group (< 100 mm TL), were captured.

Although limited, there was evidence for recruitment of mangrove jack from the 2003–04 spawning event. Low water clarity in two of the three sampling locations may have affected the ability of the survey to detect the 'young of the year' fish (less than a year old). Timing of any future surveys later in the year may address this problem. However, previous work indicates fish in this first age class are typically in the lower reaches of the estuaries where the electrofishing survey technique is not appropriate. Developing a technique to target these 'young of the year' fish in the lower estuarine areas is extremely difficult, as the technique would need to be non-destructive and standardised to allow for annual comparisons of trends within a time series data set.

Comparison with previous Queensland east coast studies (Russell *et al.* 2003) indicates a similar size class distribution was obtained for the Russell River for this species using electrofishing techniques. This indicates the electrofishing technique has its greatest strengths in assessing past recruitment events (i.e. two to three years prior to the timing of the survey).

The larger size classes identified in the survey indicate successful past recruitment events. However, with no baseline to compare catches, size class distribution or catch rates in the Weipa region, it is not possible to determine the relative strength of past recruitment events. The preliminary data collected in Weipa would provide a baseline for any future work to monitor the recruitment of mangrove jack into the upper reaches of local estuaries.

Introduction

In response to concerns raised by members of the Gulf Fisheries Management Advisory Committee (GulfMAC), staff of the DPI&F Long Term Monitoring Program undertook a preliminary survey to locate and evaluate the abundance of juvenile mangrove jack, *Lutjanus argentimaculatus*, in the Weipa region.

Based on the successful surveys conducted by Russell *et al.* (2003), a sampling regime was established for targeting juvenile mangrove jack. The regime involved electrofishing in freshwater and upper estuarine reaches targeting areas of likely mangrove jack habitat, along the banks, snags and rock bars.

The aim of the survey was to provide preliminary information on the presence, abundance and size class distribution of juvenile mangrove jack in the Weipa area to aid fisheries managers in determining if recent recruitment had been successful.

Methods

Sampling Technique

The fish were collected using a generator-powered Smith-Root Model 7.5 GPP electrofisher fitted to a 4.3 m vessel. The sampling methodology used in Weipa followed Russell *et al.* (2003), as developed in the FRDC Mangrove Jack Project 1999/122. Sampling focused effort on habitats known to support mangrove jack, such as upper tidal and freshwater areas, drains, rock bars and snags. The total length (mm) of each fish captured was recorded, together with habitat type before fish were released. Fish greater than 200 mm TL were also tagged.

Site Habitat

From the knowledge gained from the Suntag database (Bill Sawynok pers. comm. 2004) and discussions with local recreational and commercial fishers and local Queensland Boating and Fisheries Patrol officers, numerous potential survey sites were identified (see Appendix 1). However, only the three most suitable rivers were assessed in this survey due to the requirements of the electrofishing method and vessel, and the limited survey time available.

The three sites surveyed were the Pine River, Myall Creek and the Triluck Creek (Figure 1). The Pine River is designated a catch and release river and is well known to local fishers, visitors and to staff of the Department of Primary Industries and Fisheries for its abundant mangrove jack populations and has the larger number of mangrove jack tag records in the 'Suntag' database.

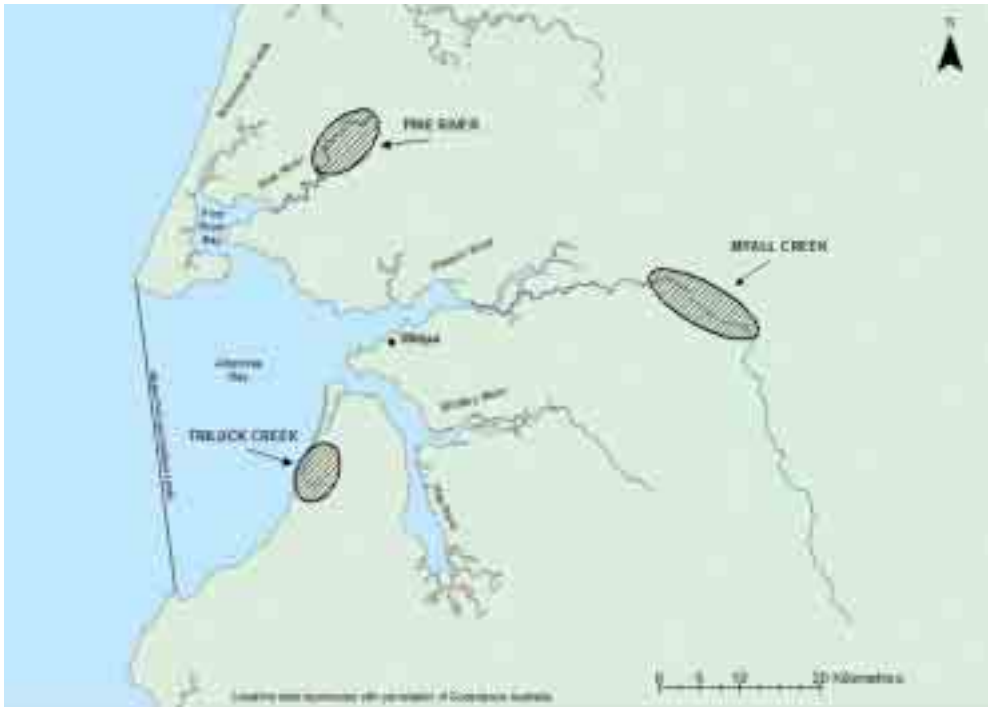

Figure 1. Weipa mangrove jack survey sites Myall Creek, Pine River and Triluck Creek

Water Quality

Water quality was measured at each survey site using a Horiba U-10 water quality meter. Temperature, salinity, pH and turbidity were recorded to assess the suitability for electrofishing.

Catch-per Unit Effort (CPUE)

Catch rates from the survey were calculated as per Russell *et al*. (2003) by dividing the total number of fish caught by the total electrofishing time in seconds and multiplying by 1000 CPUE was calculated for all sites.

Age Estimates

There is insufficient age at length data for mangrove jack from the Gulf of Carpentaria to give confidence in estimating age from length data. Age estimates used in this report are based on Queensland east coast information from Russell *et al.* (2003). Caution should be applied when interpreting such data as Weipa fish may have different growth rates to their east coast counterparts.

Results

Site Assessments

At the time of sampling, the Pine River was turbid. Remnants of seasonal freshwater runoff increased flow rates and allowed sampling well into the lower estuarine sites where Russell *et al*. (2003) documented higher catches rates of juvenile mangrove jack. However, this increased flow caused difficulty in sampling as staff were not able to see the fish stunned by the electrofisher within sixty centimetres or less of the surface, where they can be collected in scoop nets.

Site	Myall Creek	Pine River	Triluck Creek
pH	6.6	6.84	7.01
Visibility (m)	0.5 to 1.2 m	0.5 to 1 m	2 m +
Salinity (%)	0	0.2 to 0.8	0.0 – 0.4
Temperature	29	27.8	28

Table 1. Water quality measures at each survey site in Weipa

Myall Creek has many rock bars, drains and snaggy habitats. The water turbidity was also high at this site (Table 1). In the very upper reaches, where water visibility was greatest, few mangrove jack were found and those present were larger fish. These findings support Russell *et al.* (2003) comments identifying reduced numbers with increasing distance from the mouth of a river.

Triluck Creek was substantially different to the other two rivers surveyed. Turbidity in this creek was low (Table 1). The survey site spanned from the upper estuarine area well up into the freshwater habitat. Again, higher concentrations of fish were found in the upper estuary and, with the clearer water, smaller fish that had rolled over on the bottom when stunned were observed and retrieved. At the other sites, these smaller fish would not have been observed in the highly turbid waters.

Abundance

The total catch per unit effort for Weipa was 2.31 mangrove jack per 1000 seconds (Table 2). The catch per unit effort between the sites was variable with the highest CPUE of 4.36 fish per 1000 seconds at Triluck Creek.

Site	Myall Creek	Pine River	Triluck Creek	Total
Seconds fished	10 805	9123	7801	27 729
Number of fish caught	12	18	34	64
CPUE (No. fish/1000 sec)	1.11	1.97	4.36	2.31
Number of fish observed	1	9	14	24
Number line caught			4	4
Number observed while line fishing			12	12
			Total	**104**

Table 2. Summary of catch and effort data along with fish observations at each site in Weipa

A total of sixty-four mangrove jack were captured and measured using the electrofisher. Within the sample, fifty-eight fish were tagged. There were nineteen legal-sized mangrove jack captured in the upper estuarine and freshwater regions. The majority of the legal-sized fish came from the Pine River site. A further 24 fish were observed but not captured while electrofishing (Table 2). The size class structure of the mangrove jack sampled in Weipa ranged from 50–100 mm to 450–500 mm total length, with the most commonly caught size class being 300–350 mm TL (Figure 2). The smallest mangrove jack in the catch sample measured 57 mm TL from Triluck Creek. The largest mangrove jack was 460 mm TL from Myall Creek (Appendix 1).

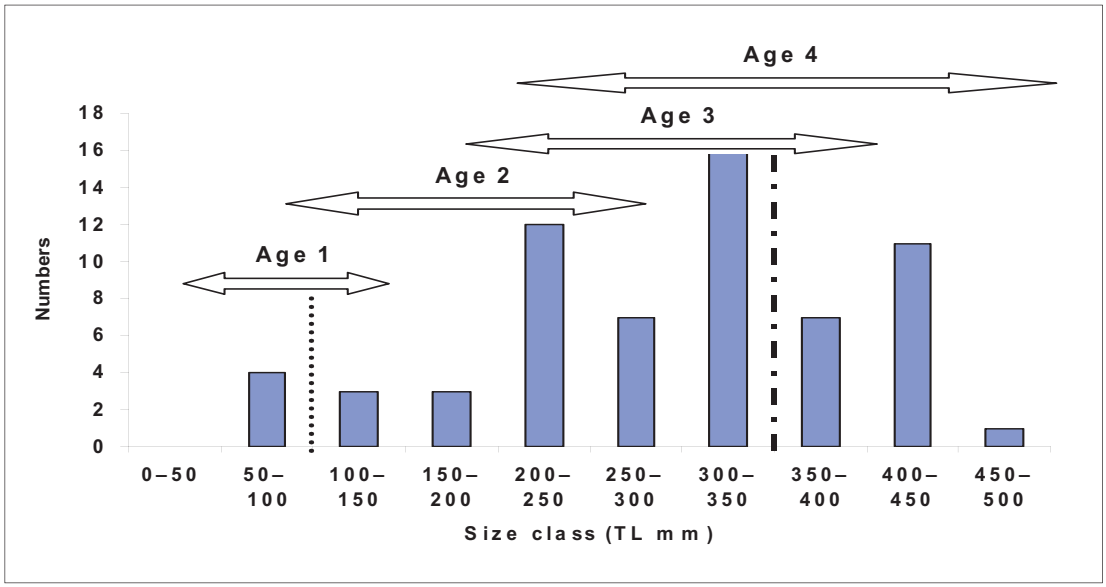

Figure 2. Abundance of mangrove jack by 50 mm size classes pooled data from all sites in Weipa. The dot-dash line — · — denotes the minimum legal size for the species. The size classes below the dotted line ..... denote those juvenile fish considered to be this year's recruits. Age estimates are based on information for mangrove jack from the east coast of Queensland (Russell et al, 2003).

The majority of mangrove jack caught in Weipa came from the Triluck Creek site where water turbidity was lowest (Appendix 1). There were seven different size classes ranging from 50–100 mm to 350–400 mm TL in Triluck Creek, while Myall Creek and the Pine River contained only five size classes. At the latter sites, no fish below the 200–250 mm size class were observed. However, lack of water clarity affected the ability to observe smaller fish at these sites (Table 1). These sites did, however, contain more fish in the larger size ranges when compared to the Triluck Creek site (in Appendix 1). If the current survey techniques are to be used, then the timing of the survey may have to be synchronised with higher water clarity in all the rivers/creeks surveyed.

Discussion

Preliminary data from the Long Term Monitoring Program mangrove jack survey in Weipa indicates few 'young of the year' fish were present in the sites surveyed in May 2004. The 'young of the year' fish are considered to be those juvenile mangrove jack that are less than 100 mm length of caudal fork (LCF) (< 1yr old)(Russell *et al.* 2003). There are a number of conclusions that could be made from this survey: low levels of recruitment are occurring; sampling was biased; or juvenile mangrove jack reside in the lower estuarine areas that were not sampled during this survey.

Although some level of recruitment has occurred during the 2003–04 spawning season, it is not possible to comment on the strength of recruitment based on the limited data obtained during this single survey. This preliminary survey is the first step in obtaining a reliable technique for estimating mangrove jack recruitment strength in the Weipa region. The data collected in this survey have provided baseline information on the juvenile mangrove jack population for 2004 and, with caution, may be compared with future survey results to monitor the recruitment of mangrove jack in waters around Weipa. Recruitment of all fish is known to be variable between years and this has also been demonstrated for mangrove jack (Russell *et al*. 2003). Annual long term monitoring of these populations would provide the ability to assess relative recruitment strength between years and allow the identification of any significant population fluctuations.

Young of the year mangrove jack observed in this survey all came from Triluck Creek where water clarity was greatest. When stunned, these small fish were observed to roll over and sink. Generally the larger fish would roll over and float to the surface, therefore increasing the chances of capture. It can be speculated that the sample collected in Weipa was biased. In the Pine River and Myall Creek, small fish may have been present but not seen due to the low water clarity. It is suggested that this technique for sampling may be more appropriate at another time of year when water clarity is greater, thereby maximising the chance to observe these smaller fish.

Between July and September there is typically no freshwater runoff in these rivers and visibility is greater. Additionally, during neap tides, water movement should be minimal. Both of these factors contribute to maximal electrofishing efficiency. By September, fish hatched during the previous spawning season should have reached a larger size and may have moved further upstream than if surveys were undertaken earlier in the year. This will increase the chances of encountering the fish in the upper estuarine areas where electrofishing can take place and also allows the capture of larger fish that are more susceptible to electrofishing and more obvious to netters trying to capture them when stunned.

On the east coast of Queensland, Russell *et al*. (2003) observed 20–30 mm mangrove jack settling at the mouth of an estuarine system as early as February. Recruitment into the freshwater riverine habitats was gradual and over an extended period with the majority of young of the year fish collected from March to July. It may be assumed that in Weipa, the young of the year fish may still reside in the lower estuary sites, which could not be sampled using the electrofisher due to salinity levels.

Russell *et al.* (2003) found that mangrove jack are not fully recruited into the upper tidal areas until around 175 mm LCF (approximately two years old), with the majority of fish in these waters between the 175 mm to 375 mm size classes. Interestingly, the overall distribution of mangrove jack size classes found in Weipa was similar to that found in the Russell River on the east coast of Queensland by Russell *et al.* (2003). Results from these studies suggest that in the upper estuarine and freshwater reaches, the electrofishing sampling technique has greater ability to collect those individuals from recruitment events two or three years ago.

Numbers of fish in each size class increased reaching a maximum in the 300 mm to 350 mm class with the largest fish sampled measuring 460 mm total length (Figure 2). The lower numbers of larger mangrove jack in these waterways is attributed to the offshore migration of this species as it matures (Russell *et al*. 2003).

Recommendations

- Any future electrofishing surveys in this location should be undertaken around September when environmental conditions are expected to maximise the efficiency of electrofishing surveys for small mangrove jack.
- Annual surveys need be undertaken in order to establish relative recruitment strength between years.
- Otolith samples need to be collected from the Weipa region to develop accurate length at age estimates for this area. The age estimates used in this report were based on an east coast of Queensland age length key, which may reflect growth at different rates.

References

Russell, J.D., McDougall, A.J., Fletcher, A.S., Ovenden, J.R. and Street, R. (2003). Biology, management and genetic stock structure of mangrove jack (*Lutjanus argentimaculatus*) in Australia. FRDC Project Number 1999/122. QO03003. Brisbane. Department of Primary Industries, Queensland and the Fisheries Research and Development Corporation. 189 p.

Appendix 1. Abundance of mangrove jack at each site by 50 mm size classes.