# BARRAMUNDI FISHERY STATUS REPORT 2009

## INTRODUCTION

Barramundi (*Lates calcarifer)* is widely distributed in the Indo-Pacific region and northern Australia. It is valued for its flesh quality, fighting ability, size and readiness to take artificial lures. These qualities have made barramundi an iconic species that supports important commercial and recreational fishing industries. Barramundi is also harvested by Aboriginal people and has significant economic, health and cultural value to this sector.

The Barramundi Fishery is currently fished within sustainable limits after recovering from a period of over-fishing in the 1970s. Since management intervention in the 1980s, catch rates in both the commercial and recreational sectors have increased. However, in certain accessible and heavily-fished areas, harvest from all sectors needs to be carefully monitored to assess whether it is approaching full utilisation. Management of these specific areas is currently under review with a view to ensuring catches remain sustainable in the longer term.

In 2009, the Northern Territory (NT) Government commenced a voluntary buy-back of Barramundi Fishery licences, with the aim of removing three licences from the fishery and investigating possible area closures to commercial barramundi fishing. Four licences were removed from the fishery and the government is currently investigating the possible future closure of Bynoe Harbour and the Finniss River area to commercial barramundi fishing.

## PROFILE OF THE FISHERY

### Commercial Sector

***Area***

The commercial sector of the fishery operates from the high water mark to 3 nautical miles seaward of the low water mark and is restricted to waters seaward of the coast, river mouth or legislated closure lines. Fishing is not permitted within the confines of Kakadu National Park, the Mary River Fish Management Zone, Darwin Harbour, Shoal Bay, or in various key river systems. In addition, fishers may not operate or anchor within the Dugong Protection Area in the south-western Gulf of Carpentaria. The Barramundi Fishery Management Plan specifies closure lines, defining the inland boundary of the fishery.

The commercial fishing season operates each year from 1 February through to 30 September. The areas where commercial fishing is most concentrated have changed over time. Historically, the highest catches came from Chambers and Anson bays. However, over the last ten years, the highest catches have occurred in Van Diemen Gulf, East Arnhem Land, Anson Bay, Central Arnhem Land and the Limmen Bight.

Commercial operators in the NT fish over tidal mud flats and associated gutters, and inside a restricted number of rivers, using monofilament gillnets. Nets are set and retrieved from dinghies and fish are processed onboard motherships. Nets can only be set across half a watercourse and must not be set within 25 m of another net in rivers. Outside river mouths, the minimum legal mesh size is 150 mm (6 inches) and within a river, the minimum legal mesh size is 175 mm (7 inches). The maximum net allowance per licence is 1000 m (10 units of 100 m) and there are restrictions on the amount of spare net that may be stored onboard vessels.

***Catch***

The primary target species are barramundi and king threadfin (*Polydactylus macrochir*). Barramundi are generally large enough to get caught in a 150 mm gillnet by the end of their fourth year. Commercial operators target barramundi that are usually three to eight years old.

The commercial catch in 2009 was 615 tonnes of barramundi and 278 tonnes of king threadfin.

This represents a decline from the 2008 harvest for barramundi from 641 tonnes and king threadfin from 331 tonnes (Figure 1).

A number of byproduct species are also taken in the commercial fishery, depending on their marketability. The most commonly retained byproduct species are black jewfish (*Protonibea diacanthus*), sandbass (*Psammoperca waigiensis*), tripletail (*Lobotes surinamensis*) and assorted reef fish (Figure 2). Sharks are also a common byproduct although the amount that can be taken is restricted to 500 kg of converted whole shark weight on board each vessel at any time.

In 2009, the total amount of retained byproduct was 44 tonnes, which is 5% of the total harvest, representing a decline of 14 tonnes from the 58 tonnes retained in 2008. Consequently, the catch of most byproduct species declined, with the noticeable exception of sandbass, tripletail and queenfish (Figure 2).

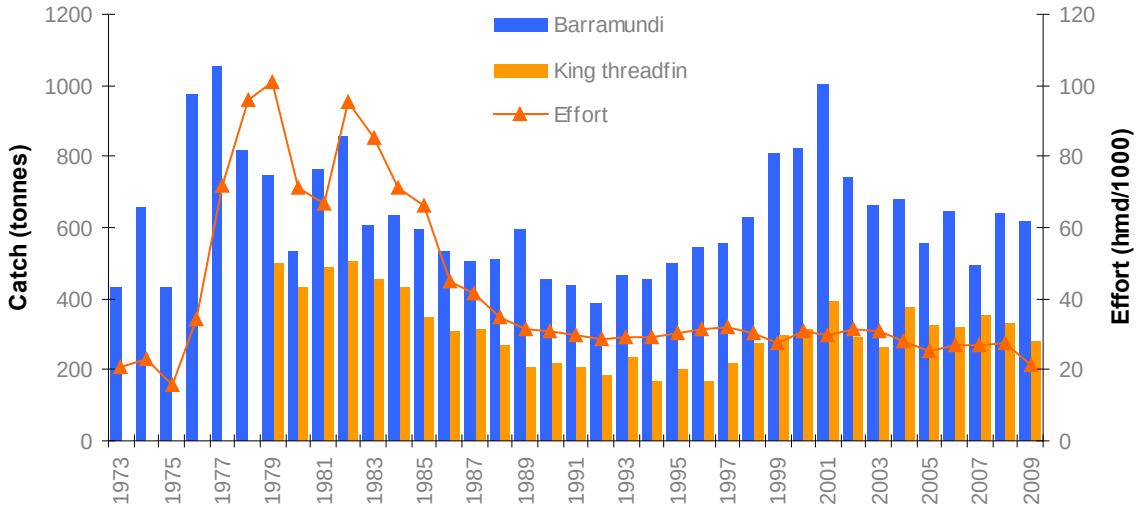


**Figure 1.** Catch and effort for the commercial Barramundi Fishery from 1973 to 2009

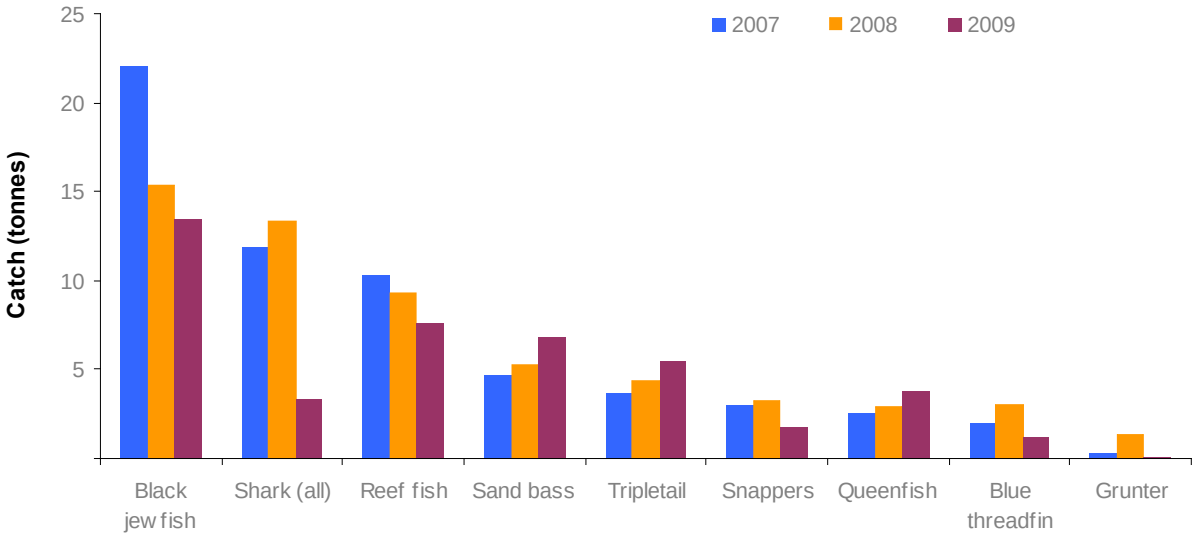


**Figure 2.** Byproduct composition for the Barramundi Fishery from 2007 to 2009

***Effort***

There were 20 fully transferable licences in the commercial fishery in 2009, all of which were fully utilised. Most of them were 'full 10 unit' licences (1 unit = 100 m net) equating to a total of 16 500 m of net. Effort is measured in '100 m net days' (hmnd), where one hmnd equals 100 m of gillnet set for one day.

In 2009, 21 076 hmnd were expended in the commercial Barramundi Fishery which was a decline from the 27 441 hmnd of effort in 2008 (Figure 1). The 2009 effort figure is the lowest recorded in this fishery since 1975. Despite the buy-back of four licences in 2009, catches have remained high suggesting either an increase in efficiency by operators, advances in technology and/or an increase in abundance of fish stocks.

The distribution of commercial effort has changed significantly over the past 10 years, moving away from areas where recreational activity has increased (e.g. Chambers Bay, Darwin area and Anson Bay) to more remote areas, such as Arnhem Land.

***Catch Rates***

The catch per unit of effort (CPUE) for barramundi showed a sharp downward trend in the late 1970s and early 1980s, reaching levels as low as 7.1 kg/hmnd. This decline was probably caused by a combination of excessive fishing effort and several consecutive years of poor rainfall during the wet season. Following management changes, the CPUE has steadily increased, reaching 20.8 kg/hmnd in 1998. The 2009 barramundi CPUE was 29.2 kg/hmnd, which is the highest value since 2001 (Figure 3).

In recent years, the CPUE for king threadfin has shown a very similar trend to that of barramundi catches. These trends indicate that the fishery has largely recovered from the period of overexploitation during the 1970s, where the CPUE was as low as 5.0 kg/hmnd. In 2009, the CPUE of king threadfin was 13.2 kg/hmnd, which is among the highest values recorded for this species (Figure 3).

While fluctuations in the CPUE for both species most likely reflect annual variation in environmental conditions, recent increases suggest that fishers are becoming better at catching fish and/or fish abundances have increased.

***Marketing***

Historically, barramundi and king threadfin have been sold as frozen fillets to local and interstate markets. However, many fishers are now providing barramundi wings and swim bladders, and selling whole barramundi and king threadfin fresh on ice to local and southern markets.

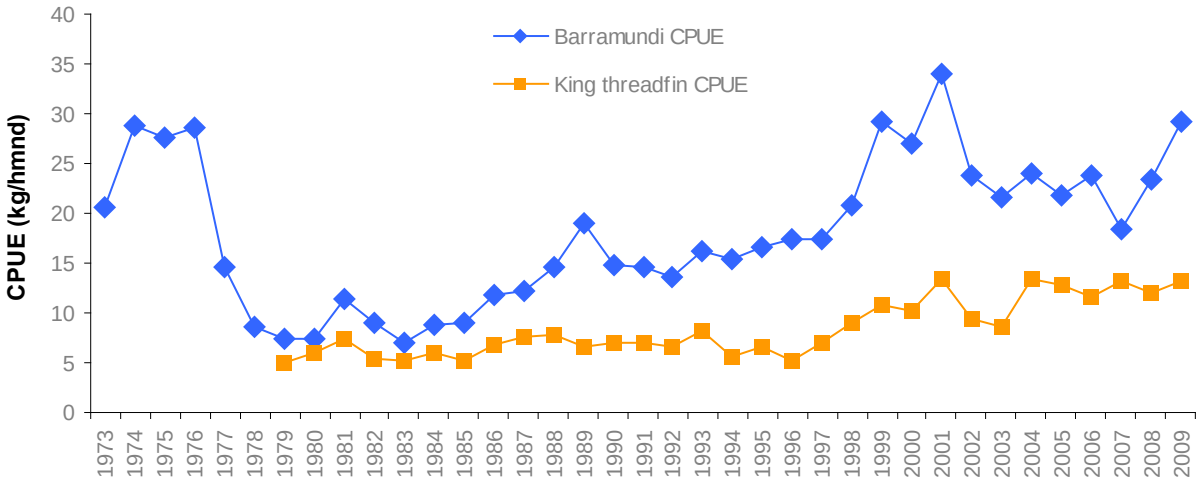


**Figure 3.** Commercial catch per unit effort (CPUE) for barramundi and king threadfin in the Barramundi Fishery from 1973 to 2009

## Recreational Sector

### *Area*

Barramundi have historically been caught by anglers throughout inland billabongs and the upper reaches of rivers and creeks. Improvements in technology and greater access to the coast have allowed many anglers to now target larger barramundi in the tidal mouths of rivers and estuaries.

Seasonal closures are currently in place, restricting recreational fishing from spawning grounds near the mouths of the Daly and Mary rivers, between 1 October and 31 January, each year.

Darwin Harbour, Bynoe Harbour and the Mary, Daly, Finnis and Alligator rivers are important fishing locations due to their proximity to Darwin. Further south, the Victoria, Roper and McArthur rivers are also well utilised by NT anglers from outside Darwin and by those from interstate.

### *Fishing Method*

Recreational fishing for barramundi is mostly carried out from boats of between 4 and 6 m in length, using light weight rods and reels, fly fishing gear and handlines to cast or troll a wide range of lures. Live bait is also effective. Mullet are the most popular live bait species used in estuaries, while freshwater prawns or 'cherabin' (*Macrobrachium rosenbergii*) are favoured in billabongs and the upstream portions of rivers.

Gear restrictions apply in the Mary River Fish Management Zone and additional controls (including a prohibition on the use of bait or double and treble hooks) are in place within 100 m of the Shady Camp Barrage.

### *Catch*

Recreational fishers also target the same species caught by the commercial sector. Many species caught by recreational fishers are released.

Barramundi caught in the non-tidal reaches of rivers and billabongs are generally one to five years old, whereas those caught in the tidal reaches near river mouths can range between one and 15 years old (fish of three to ten years of age are most common).

In 2000, Coleman (2004) identified barramundi as the most popular target species, with an estimated total catch of over 400 000 and an annual harvest of 100 400. The total number of barramundi caught was 67% higher than that

recorded in 1995 (240 000), although the actual number of retained fish has remained about the same (Coleman 1998; Coleman 2004). Recreational fishing surveys indicate an increasing trend in catch and release within the recreational sector of the fishery. In 2000, it was estimated that 76% of the barramundi caught were released, an increase from 58% recorded in the 1995 survey.

Another recreational fishing survey of the NT was initiated in 2009. The results are expected in 2011. With an increasing population, better technology and larger boats, it is expected that the catch of barramundi will increase substantially from that in 2000.

A specific possession limit of two barramundi applies in the Mary River Fish Management Zone with a limit of five applicable elsewhere in the NT. A minimum length of 55 cm for barramundi applies for both the recreational and commercial sectors throughout the NT.

***Effort***

Recreational fishers often fish for a range of species. Barramundi fishing is quite specific in the choice of fishing equipment and location. In 1995, targeted barramundi fishing accounted for 38% of the total recreational fishing effort in the NT, amounting to over 840 000 hours. In 2000, targeted barramundi fishing effort increased to 43% of the total recreational fishing effort, but the number of hours fished declined from those in 1995 to 788 726.

***Catch Rates***

Angler creel surveys in the Mary River indicate that the total catch rate increased from 0.11 barramundi per angler hour in 1986 to 0.23 barramundi per angler hour in 1995. The subsequent FISHCOUNT survey (Coleman 1998) and the National Recreational Fishing Survey: the Northern Territory (Coleman 2004) determined that the number of fish caught per hour (all species) in the Mary River region remained consistent at 0.54 fish per angler hour. However, the proportion of barramundi caught in 2000 had increased significantly accounting for 63% of all fish caught compared with only 43% of all fish caught in 1995.

## Fishing Tour Operator Sector

The number of Fishing Tour Operators (FTOs) utilising the NT's aquatic resources is growing, driven primarily by client demand.

***Area***

FTOs have traditionally targeted barramundi in Darwin Harbour, the Daly and Mary Rivers and the Tiwi Islands. However, an increase in the use of larger boats has led to recent expansions by this sector into the Western Coastline of the NT, Anson Bay, Van Diemen Gulf, Cobourg Peninsula and Central Arnhem Land. Generally, FTOs utilise the mouths of rivers to target large barramundi at the end of the wet season and switch to freshwater billabongs during the dry season.

***Fishing Method***

FTOs and their clients use the same fishing gear as recreational fishers. Casting or trolling of artificial lures account for roughly 95% of targeted barramundi fishing effort (linehours), while live bait accounts for the remaining 5%. The relative proportions of lure and bait fishing have remained reasonably stable since 1995.

***Catch***

In 2009, FTO clients caught 47 937 barramundi, representing a decline of 1.4% on the 2008 FTO catch. According to FTO logbook information, 86% (41 418) of barramundi caught in 2009 were released and 14% (6519) were retained. Assuming a post-release mortality rate of 10% (de Lestang et al. 2004), the FTO sector would therefore have removed around 10 661 barramundi in 2009.

The proportion of fish released by FTO clients has remained relatively consistent since 1995. FTO clients generally retain a smaller proportion of caught barramundi than do non-guided recreational fishers. The higher release rate is probably related to more education by guides as well as clients generally being more interested in

the experience of catching a barramundi rather than taking fish home.

The most productive areas where barramundi were caught in 2009 were the Mary and Daly river systems, Arnhem Land and Tiwi Islands.

In 2009, FTO clients caught 2010 king threadfin, representing an increase of 7% on the 2008 FTO catch of 1877. According to FTO logbook information, 63% (1274) of king threadfin caught in 2009 were released and 37% (736) were retained. The most productive areas for king threadfin include the Tiwi Islands, Mary River and Darwin/Bynoe/Dundee area.

***Effort***

In 2009, there was a decline in the number of linehours targeting barramundi from 77 893 in 2008 to 73 599 hours in 2009.

***Catch Rates***

The catch rate for barramundi remained stable from 1995 to 1998 at 0.5 barramundi per hour. From 1998, it gradually increased to 0.8 fish per hour by 2001, but declined to 0.4 fish per hour in 2003. In 2009, the catch rate improved to 0.65 barramundi per hour. The fluctuations in FTO catch rates have followed a similar trend to the commercial fishery. Catch rate fluctuations are likely to be linked to recruitment to the fish population, which is affected by rainfall and river flows.

## Indigenous Sector

Barramundi are harvested by Aboriginal people in coastal and some inland areas of the NT. Barramundi have significant economic, health, cultural and totemic values for Aboriginal people.

***Area***

Most fishing for barramundi occurs in inland rivers that drain into the sea or in inshore coastal waters.

***Fishing Method***

Over 90% of all fishing is shore-based, using baited lines and spears.

***Catch***

Coleman (2004) found that Indigenous fishers harvested 44 134 barramundi in 2000; few fish were released.

## Non-retained Species

Commercial gillnets placed on mudflats and in rivers are relatively selective for barramundi and king threadfin. Non-target species may be either retained as byproduct or discarded as bycatch, depending on market price.

A small percentage of bycatch that is often discarded includes catfish, blue threadfin, queenfish, trevally and sharks. Bycatch has been noted to increase when nets are set in deep channels rather than over shallow mud flats.

The Barramundi Licensee Committee has agreed on restrictions limiting the take of shark, as part of the National Plan of Action on Sharks. Commercial barramundi fishers must have no more than 500 kg of converted whole shark weight on board each vessel at any time and must unload all shark products prior to commencing their next voyage.

In 2000, recreational fishers targeting barramundi also caught threadfins, snappers, grunters and catfish. Overall, 35.9% of all these were retained (Coleman 2004). Some species were more likely to be retained than others, e.g. most of the threadfins were retained, while most of the catfish were released.

FTO logbook returns indicate that blue salmon, tarpon, saratoga, sooty grunter and catfish were all caught while targeting barramundi. Overall, 10% of these were retained with blue salmon and sooty grunters having the highest retention rate.

***Threatened Species Interaction***

Data on interactions with threatened, endangered and protected (TEP) species in the fishery has been collected since 2003 as part of the commercial fishing logbook process. Gillnets are relatively selective in catching targeted finfish species; however, the incidental capture of

dugongs, crocodiles, sawfish and turtles has been previously recorded in the fishery.

No TEP species interactions were recorded by onboard observers during 2009; however there were reported and publicised interactions with narrow sawfish in the Fog Bay area. To assist in minimising the incidental capture of these species in the future, the commercial fishery has conducted a comprehensive review of its Environmental Management System and associated Code of Practice.

To minimise dugong interaction, a Dugong Protection Area is in place in the south-western Gulf of Carpentaria, which effectively excludes commercial fishers from fishing and anchoring in this area.

## Ecosystem Impact

The full effects of removing numbers of predators, such as barramundi, and quantities of biomass from such systems are unknown. Previous stock assessment models suggest that less than 10% of the total barramundi stock is harvested annually. This suggests ecosystem impacts are unlikely to be excessive.

## Social Impact

The commercial sector of the fishery employs around 100 people as crew and another 50 in the processing, trading and marketing of barramundi to local and interstate markets. A large service industry also supplies gear and consumables to barramundi operators and services equipment and freights the product.

Barramundi fishing is an iconic feature of the NT and a popular recreational pastime. About 30% of the resident population go fishing and most recreational fishers target barramundi at some time. Recreational fishers also purchase gear, bait, fuel and service for equipment from local businesses (Coleman 2004).

Many interstate and overseas tourists come to the NT to catch wild barramundi as the NT has a reputation for providing high numbers of large fish. Visitors accounted for 37% of the total fishing effort (hours) in the NT in 2000, an increase from 23% in 1995 (Coleman 1998; Coleman 2004).

Barramundi also holds a totemic value in some Indigenous communities. Abundance of barramundi is important not only as a major food source of some coastal communities but as an important component of Indigenous wellbeing.

## Economic Impact

At the point of first sale in 2009, the overall catch value of the commercial Barramundi Fishery was $4.93 million. In 2009, the barramundi component was just over $3.94 million and the king threadfin component was about $0.86 million. The value of byproduct sold in 2009 was about $0.12 million.

The recreational sector also contributes to the NT's economy, especially in the service and fishing tackle industries. In 2000, it was estimated that over $35 million was spent on recreational fishing in the NT, although this cannot be directly attributed to any one fishery (Coleman 2004).

Whilst the fishery is not the most valuable of the NT's fisheries in terms of catch value at first point of landing, its return to the community is substantial.

# STOCK ASSESSMENT

## Monitoring

Monitoring of the fishery is largely focused on analysis of catch and effort trends in the commercial fishery based on monthly catch returns provided by licence holders. The information provided by recreational fishers is also used.

An observer was present on commercial barramundi boats for nine days in 2009. Of the 374 fish caught during these trips, 64% were barramundi, 13% king threadfin and 5% sharks. Overall, 5% of the catch was discarded comprising mainly catfish and mud crabs. Pending funding allocations, the current

monitoring program will be modified from 2010 to include annual monitoring trips in all of the major river systems. This will increase the amount of information on size structure of target species across the NT and catch composition of byproduct and bycatch species to provide more detailed information for stock assessment models.

## Stock Assessment Methods and Reliability

The fishery was first assessed using catch and effort data in 1978 and 1979; it has been assessed a number of times since then. The early assessments were not completely successful due to poor knowledge of barramundi stock structure. However, improved knowledge in this area as well as the development of better modelling techniques have made subsequent models of the fishery more reliable.

A new model was expected in 2008 (Grace et al. 2008). However, the amount of time and money still to be invested to make it functional has rendered its completion infeasible. Currently, exploitation rate data (from commercial and FTO logbook returns and recreational tag returns) is being examined to assess its suitability as a substitute for assessing stocks of barramundi across the NT.

The barramundi population of the NT has largely recovered from the overexploitation of the 1970s. The current level of exploitation in all targeted stocks is considered to be sustainable. However, there is some concern about the pressure on particular stocks in the easily-accessible and heavily-fished areas such as the Daly and McArthur rivers.

## Current Harvest Status

No direct estimates of total harvest rate are available for the fishery, but output from the stock assessment model indicates that the overall commercial harvest rate is currently around 10%. This estimate could be verified with increased reporting of tag returns by commercial fishers. The model output also indicates that the total biomass of barramundi is currently at around 85% of un-fished levels. The precision of these estimates is likely to increase with increasing activity in commercial catch monitoring.

None of the management trigger reference points were reached during 2009 (see Table 1) suggesting that target, byproduct and bycatch species are being fished sustainably within the fishery. More refined trigger points and performance measures will be developed and incorporated into the Barramundi Fishery Management Plan. The trigger points will be reviewed annually to assist in setting the harvest rate of the fishery.

## Future Assessment Needs

Currently, independent monitoring of the barramundi stocks is only conducted in a small section of the Mary River system. Genetic and scale microchemistry studies have revealed that each river system and associated embayments hold separate populations of barramundi in the NT (Shaklee and Salini 1985; Keenan 1994; Pender and Griffin 1996; Chenoweth et al. 1998). Consequently, the current monitoring program requires expansion into many of the major river systems in the NT to facilitate independent assessment of the health of each population.

Catch and release fishing is becoming increasingly popular as anglers become aware of barramundi biology and conservation values. Increasingly, fish that could legally be retained are being released. Research has been conducted on the physiological effects and survival of released juvenile barramundi. However, there is still a need for research on the lethal and sub-lethal effects of catching and releasing large size (>90 cm) barramundi, given that most of them are likely to be females. Specifically, identifying the effect catch and release have on the fecundity of large females is important to determine the effect of recreational fishing on egg production in barramundi.

Given that king threadfin comprise a large proportion of the catch in the fishery, the reproductive biology, habitat use and genetic

stock structure of this species need to be understood further.

Future assessment of the commercial sector of the fishery is needed to meet the NT and Australian Governments' commitment to ecologically sustainable development. This assessment includes identifying the impact of the fishery on bycatch species, byproduct stocks and the environment in general.

# RESEARCH

## Summary

Research on barramundi in NT waters began in 1972 with sampling and tagging on the Mary River and sampling on the Victoria and Roper river systems. The after effects of Cyclone Tracy prevented any barramundi research between 1974 and 1977. Research recommenced in late 1978 with an assessment of the fishery and an extensive sampling to establish baseline biological information on barramundi stocks. Results of the 1978-79 assessment highlighted substantial over-fishing, which led to licence reductions and identified the rising significance of recreational fishing.

During the mid 1980s, concerns were raised about the status of barramundi stocks in the Mary River system. Between 1986 and 1987 a major assessment of the status of barramundi was undertaken in the Mary River system. This included intensive monitoring of both commercial and recreational catches. Results from this study showed that the stock was over-fished, with evidence of a substantial reduction in the numbers of mature fish. The results of that study forced a seasonal closure to protect spawning fish accompanied by a reduced recreational bag limit (Griffin 2006). The closure was an industry-led initiative to ensure long-term viability of the fishery.

In addition, an annual fishery-independent monitoring study has been conducted on Corroboree Billabong since 1987. Results from the study revealed a very consistent pattern of cyclical abundance with high numbers of recruits every second year.

An estimated 1509 barramundi were in the 660 m study site in 2009. This was above the long-term average of 827 fish and substantially higher than the 823 fish caught in 2008. Most fish (57%) were between one and two years old. The 2009 data continues the alternating trend of year class strength where 2007 had high numbers of one-year-old fish, whereas in 2008 there were high numbers of new recruits. The presence of numerous one-year-old fish appeared to depress the new recruits in 2007 and 2009 through either competition or predation.

Research effort between 1996 and 2001 focussed on the assessment of the possible impacts of saline intrusion control activity on barramundi in the Mary River wetlands region (de Lestang and Griffin 2000; de Lestang et al. 2001). Placing saline intrusion control walls (barrages) along the wetlands significantly reduced the composition and relative numbers of barramundi and other fish in areas affected by control works. This may possibly reduce growth and survival of juvenile barramundi. Placing spillways that allowed fish to cross the walls reduced these negative effects.

Between 2002 and 2004, research effort concentrated on quantifying the survival and physiological effects of recreational catch-and-release on barramundi in a freshwater habitat. This showed that around 90% of barramundi survive being caught and released in fresh water. Barramundi that had been caught on a line had higher levels of stress hormones (cortisol) and showed signs of muscle fatigue (lactate), which suggests that fish were stressed by being line-caught. Survival also varied significantly throughout the year. Those fish sampled in warmer months suffered more stress and lower survival (80%) after three days compared with fish caught in cooler months, which showed 100% survival after three days (de Lestang et al. 2004). Another trial found that "fish-friendly" knotless landing nets caused less damage to fish skin and fins than more traditional knotted mesh

landing nets (de Lestang et al. 2008). Knotless landing nets are recommended to minimise injuries and increase the chance of post-release survival.

## Incorporation into Management

Monitoring of the barramundi stock in the Mary River during 1986 and 1987 provided vital information to support major changes to the management of commercial and recreational sectors.

Research in the Mary River wetlands identified the beneficial effects of spillways within saline intrusion control walls. This has been incorporated into saline intrusion control works.

Data from creel surveys and population monitoring in the Mary River has made a significant contribution to adjustment of fishing controls in the region, including the size limit and the banning of the use of live bait and treble hooks at the Shady Camp Barrage.

The long-term monitoring of barramundi numbers in Corroboree Billabong has led to a greatly improved understanding of the reasons behind fluctuations in the population and informed responses to concerns about reported and perceived declines in fishing success.

The results from the post-release survival study strongly support the use of catch-and-release as a management tool in freshwater environments. The effect of season on both the stress response and post-release survival of barramundi is significant and will be used as a guide for future management strategies.

## Current Research

On-going research projects include:

- Annual assessment of barramundi recruitment and populations in the Mary River.
- On-board monitoring of the commercial Barramundi Fishery.
- Investigations into how different river flow patterns affect barramundi and king threadfin populations.
- Determining the stock structure of king and blue threadfins – do separate populations exist across northern Australia, or can the species be managed as one continuous stock?
- Tag/recapture programs on the Daly, Mary, Roper and Victoria rivers.
- Comprehensive survey of recreational fishing catch and effort across the NT.

# MANAGEMENT/GOVERNANCE

## Management

***Objective***

Management objectives, performance criteria and trigger points for the fishery will be defined by the future review of the Barramundi Fishery Management Plan. The proposed objectives for the fishery are listed in Table 1. Such measures will assist in the long-term sustainability of the fishery.

***History***

Conservative management, focussing on the containment of fishing effort, protection of breeding stocks through seasonal closures and a minimum size limit reducing fishing pressure on juvenile fish, has been adopted to protect the barramundi resource. The fishery has been actively managed since the 1960s and controlled under the Barramundi Fishery Management Plan since 1991.

***Current Issues***

The issues currently facing the management of barramundi stocks in the NT relate mainly to resource sharing between the commercial and recreational fishing sectors. Improvements in technology have allowed recreational fishers to travel farther afield in search of barramundi. This has meant that recreational and commercial fishers now often fish for barramundi in the same waters, which has led to conflict in some of the

more popular areas, such as Chambers Bay, Finniss River, Anson Bay and Roper River.

In 2009, the NT Government commenced a voluntary buy-back of Barramundi Fishery licences, with the aim of removing three licences from the fishery and investigating more area closures to commercial barramundi fishing. Four licences were removed from the fishery and the NT Government is currently considering the possible future closure of Bynoe Harbour and the Finniss River area to commercial barramundi fishing.

There is a specific need to resolve questions concerning the impact of recreational catches on barramundi stocks in heavily-utilised areas, increased targeting of mature female barramundi, user conflict issues, land and sea access issues for pastoral leases, Aboriginal land and Kakadu, as well as localised habitat issues (e.g. saltwater intrusion in the Mary River catchment) and minimising interactions with TEP species.

***Future Plans***

It is anticipated there will be buy back of additional commercial licences in future from the fishery.

It is also proposed that a Fishery Management Advisory Committee be re-established for the fishery to provide ongoing advice with respect to barramundi management. This will include advice on strategic direction and management objectives for the fishery, future directions for recreational and commercial fisheries management and amendments to the Barramundi Fishery Management Plan. Any Management Advisory Committee for the fishery will be made up of representatives from key stakeholder groups and government representatives.

The results of the recreational fishing survey of the NT in 2009-10 will provide valuable information concerning the recreational harvest of barramundi stocks. This data will be incorporated into future modelling and stock assessments to further define the state of the fishery.

## Compliance

Monitoring, compliance and enforcement activities are undertaken by the Water Police Section of the NT Police, Fire and Emergency Services, under the NT *Fisheries Act 1988*. Major issues of concern during 2009 with respect to compliance in the commercial sector were the use of gillnets in excess of entitlement, fishing in closed waters and the inadequate marking of gear. Recreational fishing issues include non-compliance with general possession limits, retaining undersize barramundi, removing skin from fillets and fishing in seasonally closed areas.

## Consultation, Communication and Education

Key stakeholder groups, such as the Barramundi Licensee Association, the Amateur Fishermen's Association of the NT and the Guided Fishing Industry Association of the NT, are consulted on matters relating to the sustainable management of the fishery.

A series of Aboriginal Consultative Committees have been formed to enable DoR to engage with Indigenous groups on matters relevant to the sustainable management of fish and aquatic life in the NT.

Prior to commencing fishing operations, all new entrants to the commercial fishery must attend an interview with the Aquatic Resource Manager responsible for the fishery. These interviews provide the fisher with an understanding of the legislation, status of the fishery, research, management, compliance issues and reporting requirements for interactions with TEP species. In addition, a SeaNet extension officer provides information and advice on reducing environmental impacts and works directly with the industry, managers and researchers to develop and implement improved fishing gear technology and methods.

An information package is available for recreational fishers on all aspects of barramundi fishing in the NT. It includes information on fishing methods, locations of boat ramps, catch

and release practices, as well as a copy of the recreational fishing controls booklet, outlining regulations applying to the recreational sector.

Presentations are made to schools, community groups and fishing clubs on best practice handling techniques and issues affecting sustainability of the resource.

Senior Research Scientist – Dr Thor Saunders
Aquatic Resource Management Officer – Mr Steven Matthews

## REFERENCES

Chenoweth, S. F., Hughes J. M., Keenan, C. P., and Lavery, S. (1998). Concordance between dispersal and mitochondrial gene flow: isolation by distance in a tropical teleost, *Lates calcarifer* (Australian barramundi). *Heredity* **80:** 187-197.

Coleman, A. P. M. (1998). FISHCOUNT. A Survey of Recreational Fishing in the Northern Territory. Summary. Department of Primary Industry and Fisheries *Fishery Report* 41.

Coleman, A. P. M. (2004). The National Recreational Fishing Survey: Department of Business, Industry and Resource Development *Fishery Report* 72.

de Lestang, P. and Griffin, R. K. (2000). Impacts of Saline Intrusion on Barramundi in the Mary River Region. Department of Primary Industry and Fisheries *Fishery Report* 50.

de Lestang, P., Allsop, Q. A., and Griffin, R. K. (2001). Assessment of Fish Passageways on Fish Migration. Department of Primary Industry and Fisheries *Fishery Report* 60.

de Lestang, P., Griffin, R. K., and Allsop, Q. A. (2004). Assessment of the Post-release Survival and Stress Physiology of Barramundi (*Lates calcarifer*). Department of Primary Industry and Fisheries *Fishery Report* 73.

de Lestang, P., Griffin, R. K., Allsop, Q. and Grace, B. S. (2008) Effects of two different landing nets on injuries to barramundi, an Australian sport fish. *North American Journal of Fisheries Management*. 2008; **28:** 1911-1915.

Grace, B., Handley, A., and Bajhau, H. (2008). Managing, Monitoring, Maintaining and Modelling Barramundi. Department of Primary Industry and Fisheries *Fishery Report* 90.

Griffin, R. K. and Kelly, M. E. (2001). Fishery Assessment Report: Northern Territory Barramundi Fishery 1999. Department of Primary Industry and Fisheries *Fishery Report* 56.

Griffin, R.K. (2006). Half a Century on: Barramundi Research in Australia – The Linkage between Research and Management. Department of Primary Industry, Fisheries and Mines *Fishery Report* 84.

Keenan, C. P. (1994). Recent evolution of population structure in Australian barramundi, *Lates calcarifer* (Bloch): an example of isolation by distance in one dimension. *Australian Journal of Marine and Freshwater Research* 45: 1123-1148.

Pender, P. J. and Griffin, R. K. (1996). Habitat history of barramundi (*Lates calcarifer*) in a North Australian river system based on barium and strontium levels in scales. *Transactions of the American Fisheries Society* **125:** 679-689.

Shaklee, J. B. and Salini, J. P. (1985). Genetic variation and population subdivision in Australian barramundi, *Lates calcarifer* (Bloch). *Australian Journal of Marine and Freshwater Research* **36***:* 203-218.

**Table 1.** Harvest status against planned management objectives, performance indicators, trigger points and management actions for the Barramundi Fishery

| Species or Group | Management Objective | Performance Indicator | Performance measure | Harvest Status for 2008 | Management action |
|---|---|---|---|---|---|
| Target species barramundi, king threadfin | To maintain the sustainability of the barramundi fishery resource. | Significant decline in the annual catch or a significant increase in fishing effort. | If catch or effort by any sector, or the fishery as a whole, increases or decreases by 20% for each year for two consecutive years. | Barramundi catch increased by 30% in 2008 then decreased by 14% in 2009 – trigger reference point not reached.<br>King threadfin catch decreased by 7% in 2008 then decreased by 16% in 2009 – trigger reference point not reached. | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |
| Target species barramundi, king threadfin | Each sector (FTO, recreational, commercial, Indigenous) to optimise the monetary value of their catch. | That all sectors are achieving the maximum worth from their catch. | If the monetary value of fishing by a fishery sector changes by more than 20% for each year for two consecutive years. | N/A | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |
| Target species barramundi | Maintain and enhance quality fishing experiences for recreational fishers into the future. | A significant number of recreational fishers or FTO clients do not enjoy their barramundi fishing experience. | If more than 20% of participants in stakeholder fishing surveys or FTO clients state that they are unsatisfied with their barramundi fishing experience. | N/A | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |
| Byproduct species jewfish, shark (all), reef fish, sandbass, tripletail, snappers, queenfish, blue threadfin, grunter | Ensure ecological sustainability of byproduct species. | Monitoring of commercial logbook returns and onboard monitoring of commercial vessels. | If any byproduct species increases or decreases by 50% for each year for two consecutive years. | Catches for all byproduct species remained within trigger point limits – trigger reference point not reached. | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |
| Bycatch species | Ensure ecological sustainability of bycatch species. | Monitoring of commercial logbook returns and onboard monitoring of commercial vessels. | If bycatch species increase by more than 50% in any year for two consecutive years. | Bycatch remained within trigger point limits – trigger reference point not reached. | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |

| Species or Group | Management Objective | Performance Indicator | Performance measure | Harvest Status for 2008 | Management action |
|---|---|---|---|---|---|
| Threatened endangered, or protected (TEP) species and/or communities | Ensure the continued protection of species and communities listed under EPBC Act and as listed under the Territory Parks and Wildlife Conservation Act. | TEP species and or communities are identified in NT waters. | Identifiable impacts observed by commercial fishers, fisheries observers or other agencies regarding EPBC Act listed species or communities. | There were no identifiable impacts observed on EPBC Act listed species or communities – trigger reference point not reached. | Stakeholders to make recommendations to the Executive Director of Fisheries regarding the implementation of a threat abatement plan, if required.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |
| Ecosystem components | Minimise effects on ecosystem components. | Identification of threatening processes. | Identification of significant negative interaction with components of the natural ecosystem. | There were no significant negative interactions within the ecosystem where the barramundi fishery occurs – trigger reference point not reached. | Stakeholders to make recommendations to the Executive Director of Fisheries regarding appropriate remedial action.<br>Amended arrangements to be implemented within 12 months of trigger being reached. |