

Barramundi (2020)

Lates calcarifer



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Kimberley Gillnet and Barramundi Managed Fishery	Sustainable	Catch, CPUE, effort
Northern Territory	Northern Territory	Sustainable	Stock assessment, biomass, fishing mortality, catch, catch rate
Queensland	Central East Coast	Sustainable	Stock assessment, catch, effort, length and age frequencies
Queensland	Mackay	Sustainable	Stock assessment, catch, effort, CPUE
Queensland	North-East Coast	Sustainable	Stock assessment, catch, effort, CPUE, length and age frequencies
Queensland	Northern Gulf of Carpentaria	Sustainable	Stock assessment, catch, effort, CPUE
Queensland	Princess Charlotte Bay	Sustainable	Catch, effort, CPUE
Queensland	South-East Coast	Negligible	Catch
Queensland	Southern Gulf of Carpentaria	Sustainable	Stock assessment, catch, effort,

			CPUE, length and age frequencies
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STOCK STRUCTURE

Barramundi (*Lates calcarifer*; also known as Asian sea bass) are a large, predatory fish within the family Centropomidae, that are found across most of the Indo-West Pacific region, from the Arabian Gulf to China, Taiwan, Papua New Guinea and northern Australia [FAO 2020]. They are protandrous hermaphrodites (maturing as males first, then changing sex to female; Moore [1979]) that exhibit individual variation in habitat utilisation/migratory patterns during their life history [Crook et al. 2016], with the exception of spawning events, which always occur in highly saline estuarine or marine waters.

The different life history contingents described by Crook et al. [2016] include: 1) an “estuarine” contingent, that remains in marine and estuarine habitats; 2) a “catadromous, sequential hermaphrodite” contingent, that enters freshwater reaches for a period of time, then migrates downstream and changes sex in marine waters; and 3) a “catadromous, delayed female spawning” contingent, that enters freshwater reaches and changes sex in this environment before migrating downstream.

Genetic stock structure of Barramundi is complex. Keenan [1994] described 16 subpopulations of this species (through allozyme analyses) across most of its Australian range, with each subpopulation encompassing an individual catchment, or several adjacent catchments. More recently, Jerry et al. [2013] and Loughnan et al. [2019] described 21 distinct subpopulations (through microsatellite analyses) from samples collected over a wider geographic range than that of Keenan [1994]; noting that both recent works were based on the same set of tissue samples, many of which were initially collated by Keenan [1994].

Difficulties in obtaining relevant biological and catch-and-effort information from each biological stock in Western Australia and the Northern Territory precludes individual assessments of these stocks. Therefore, the assessments for these jurisdictions were undertaken at the level of the management unit (Kimberley Gillnet and Barramundi Managed Fishery, Western Australia; and Barramundi Fishery, Northern Territory).

The state of Queensland initiated a long-term monitoring program for Barramundi in 2000, with sampling regions following the boundaries of the six Queensland stocks described by Keenan [1994] [Fisheries Queensland 2010]. The assessment for Queensland Barramundi stocks presented here follows the same boundaries as Keenan [1994] and the abovementioned fisheries monitoring program, but also considers ‘vagrant’ fish, that venture south of 26° South (and which were not sampled by Keenan [1994]), as a seventh biological stock. The seven biological stocks within Queensland are: Southern Gulf of Carpentaria, Northern Gulf of Carpentaria, Princess Charlotte Bay, North-East Coast, Mackay, Central East Coast and South-East Coast.

It is acknowledged that the recent works of Jerry et al. [2013] and Loughnan et al. [2019] identified eight genetic stocks of Barramundi in Queensland, but there are practical limits on how many assessments can be conducted on this species. Additionally, tag-recapture information for Barramundi in Queensland indicates that the boundaries of the subpopulations identified by Jerry et al. [2013] and Loughnan et al. [2019] are somewhat porous, as individual Barramundi do move between subpopulations (Infish Australia [2014, 2020]). This includes large female fish, that often move after flood events. The seven stock regions reported upon for Queensland capture most of the dynamics of the genetic subpopulations, which in Barramundi are thought to be highly responsive to regional climatic events [Staunton-Smith et al. 2004, Robins et al. 2005, Halliday et al. 2010, Halliday et al. 2012].

Extensive stocking of Barramundi fingerlings in catchments on the east coast of Queensland is unlikely to compromise the above stock structure as parents from the same genetic stock are used to produce fingerlings. The assessments of the individual management units encompassing Western Australia and the Northern Territory are based on the biological stocks that receive the highest harvest rates, and whose status is assumed to be representative of the highest level of exploitation that occurs on any biological stock within each unit.

Here, assessment of stock status is presented at the management unit level—Kimberley Gillnet and Barramundi Managed Fishery (Western Australia), Barramundi Fishery (Northern Territory); and the biological stock level—Southern Gulf of Carpentaria, Northern Gulf of Carpentaria,

Princess Charlotte Bay, North-East Coast, Mackay, Central East Coast and South-East Coast (Queensland).

STOCK STATUS

Central East Coast The most recent stock assessment on 2017 data estimated the exploitable biomass of the stock to be 71 per cent of unfished levels, with egg production at 50 per cent [Streipert et al. 2019]. High river flow increases catchability and produces strong year-classes for this species [Staunton-Smith et al. 2004]. Floods in 2010, 2011 and 2013, in this area, have consequently affected catch and recruitment into the fishery. In 2011, there was a five-fold increase in commercial catch, mainly due to stocked fish from Lake Awoonga and other impoundments moving into the stock following the flood in late 2010 and early 2011. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Spatial closures for commercial fishers increased at the end of 2015 in the Central East Coast biological stock areas. Reductions in net licences and exclusion of commercial fishing from the main Barramundi fishing area has reduced commercial fishing pressure in the closed areas. Size limits and seasonal closures for recreational and commercial Barramundi fishing ensure a proportion of the spawning stock is protected [Russell and Garrett 1985]. The recreational catch estimate of 5 t is comparatively small (2013–14 survey) and less than half that reported during the 2010–11 survey [Webley et al. 2015]. Management changes, improved fishing infrastructure and promotion of the net-free zone are likely to have changed recreational fishing. However, there are no current catch and effort estimates. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Central East Coast biological stock is classified as a **sustainable stock**.

Kimberley Gillnet and Barramundi Managed Fishery The harvest strategy for Barramundi in the Kimberley Gillnet and Barramundi Managed Fishery in the Kimberley region of Western Australia is based on a constant commercial catch policy, where the annual commercial catches of Barramundi are allowed to vary within a target catch range, which is based on a historical catch range during which the fishery was stable and levels of exploitation were considered to be sustainable. The target catch range was calculated as 33–44 tonnes (t) [Newman et al. 2020]. Barramundi is also an indicator species [see Newman et al. 2018] for the North Coast Nearshore and Estuarine Resource and as such the stock status of Barramundi subsequently determines the risk-level for the biological sustainability of the suite of species in the North Coast Nearshore and Estuarine Resource.

The Barramundi catch in 2019 was 47 t; above the target catch range, but below the upper end of the limit range (23–54 t). The catch was achieved with a high catch per unit effort (CPUE: ~139 kg per block day) across the fishery, and indicates this level of catch is based on increased recruitment and not increased effort in the fishery. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

In 2013, two licenses were removed from the Broome coast area of the fishery [Newman et al. 2020]. This area of the fishery is now only exposed to recreational and Indigenous fishing. This effort removal has reduced the potential level of fishing mortality. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Kimberley Gillnet and Barramundi Managed Fishery (Western Australia) management unit is classified as a **sustainable stock**.

Mackay

The most recent stock assessment on 2017 data estimated the exploitable biomass of the stock to be 59 per cent of unfished levels, with egg production at 43 per cent [Streipert et al. 2019]. Reported commercial catch from the Mackay stock has reduced from the historical high level in 2016 [QFISH 2020] and is slightly below the previous 10-year average. Nominal CPUE has trended marginally downwards since 2016. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Days fished have fluctuated along with annual catch over the past 20 years. There has been a generally decreasing trend in the number of operators reporting catch. Recreational catch estimates were 11 t in 2013–14. Queensland's 580–1200 mm slot size limits for Barramundi ensures the protection of a proportion of the spawning stock by protecting both small males and large females. Seasonal (1 November–1 February) and spatial closures reduce fishing pressure. New management arrangements in November 2015, included a reduction in net licences and spatial closures to commercial netting, including one in the Mackay biological stock area. The effect of these changes on commercial fishing pressure in Mackay is minimal and closures in other regions do not appear to have displaced effort into this region. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Mackay biological stock is classified as a **sustainable stock**

North-East Coast

The most recent stock assessment on 2017 data estimated the exploitable biomass of the stock to be 53 per cent of unfished levels, with egg production lower at 25 per cent [Streipert et al. 2019]. While commercial catches have been lower in 2019 compared to the previous 10 year average, nominal CPUE increased to near historical highs [QFISH 2020]. Age frequencies (based on annual age-length key and length frequency data) show continued recruitment into the fishery. Biological monitoring and anecdotal reports indicate there are large (> 1 m) fish present in the stock. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Fishing effort is not controlled at the biological stock level and is managed as part of the broader East Coast Inshore Fin Fish Fishery. The number of active commercial operators accessing this stock over the last five years has been the lowest since 1998 when compulsory logbook records began. The number of days fished commercially has also declined to below 1 500 days, the lowest in over 20 years. Domestic recreational harvest is relatively high with over 12 000 fish (approximately 46 t) taken and an additional 32 000 Barramundi were released after capture in 2013–14 [Saunders et al. 2018]. Although Barramundi have a high release survival rate (approximately 90 per cent) [Halliday et al. 2001, De Lestang et al. 2004] a proportion of released fish should be considered in fishing mortality estimates [QDAF 2018]. Spatial closures for the stock have been demonstrated to benefit Barramundi [Ley and Halliday 2004]. Queensland size limits (580–1200 mm slot limit) protect a proportion of the spawning stock, as individuals can be sexually mature as males at 535 mm [Garrett and Russell 1982]. A seasonal closure from 1 November–1 February protects Barramundi during the October–February spawning season [Russell and Garrett 1985]. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the North-East Coast biological

stock is classified as a **sustainable stock**.

**Northern
Gulf of
Carpentaria**

The small river systems in the Northern Gulf of Carpentaria are unlikely to support a high biomass of Barramundi. Commercial catch has been rising since a historical low of 4 t in 2011, peaking at 35 t in 2018 before decreasing slightly to 25 t in 2019 [QFISH 2020]. The most recent stock assessment on 2017 data estimated the exploitable biomass of the stock to be 73 per cent of unfished levels, with egg production at 61 per cent [Streipert et al. 2019]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Commercial fishing effort has increased in recent years, but is still relatively low, with only six active operators and 344 fishing days within the region in 2017. This is the highest level of effort since 2006. Recreational catch in 2013–14 was recorded as similar to the commercial catch of the same year (12 t), though recreational estimates are uncertain [Webley et al. 2015]. A seasonal closure during October–January protects the stock during the spawning season. Biological evidence indicates that the growth rate of fish in this stock may be slower and fish may mature earlier than in other stocks [Davis 1987], therefore the Queensland minimum size limit (580 mm) protects a much larger proportion of the spawning population. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Northern Gulf of Carpentaria biological stock is classified as a **sustainable stock**.

**Northern
Territory**

The most recent assessment of the Barramundi Fishery (Northern Territory) management unit (using data to the conclusion of 2019) indicated that this stock was impacted by high fishing pressure in the late 1970s and early 1980s, falling to 36 per cent of the unfished (1950) biomass [Grubert et al., unpublished]. However, there has been a strong recovery since that time, with the annual biomass as a proportion of virgin biomass exceeding 60 per cent for the last two decades, reaching 88 per cent by the end of 2019.

Monitored stocks have a broad length and age distribution, with little sign of a reduction in the proportion of older age classes, despite abundance surveys showing low levels of recruitment during recent, drier than average wet seasons [NTG 2018]. The above evidence indicates that the biomass of the stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

The current (2019) fishing mortality rate, as a proportion of fishing mortality at maximum sustainable yield (MSY), was estimated at 19 per cent, roughly one fifth of the rate required to achieve MSY [Grubert et al., unpublished]. Recaptures from tagging programs also suggest that the annual harvest rate for all sectors combined is consistently below five per cent. The above evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Barramundi Fishery (Northern Territory) management unit is classified as a **sustainable stock**.

**Princess
Charlotte
Bay**

The stock extends around 600 km from Cape Bedford north of Cooktown to the tip of Cape York [Keenan 1994]. The commercial catch is small (less than 5 t per year 2015–19), and the 2019 level is a historical low [QFISH 2020]. While nominal catch rates are within historical levels, this indicator is limited by variable seasonal conditions, and changes in fishing power and fisheries and protected area management.

Recreational catch surveys from 1986 to 1991 estimated the catch of national

park visitors at between 4.4 t and 9.4 t by 1 150 to 2 450 visitors per year [Russell and Hales 1993]. In 2017 over 18 000 visitors camped in national parks in this region [QDES 2018], and more off-park accommodation options are now available. Extrapolation of the data is not possible due to the possible changes in length of stay and reasons for visits. However, available information suggests recreational fishing would dominate the catch from the Princess Charlotte Bay stock. The commercial catch and effort is very small and at historical low levels.

The large reduction in the number of commercial operators and days fished for this stock is primarily a response to large spatial closures applied to Princess Charlotte Bay in 2009. These closures were principally a mechanism to limit fishery interactions with protected species and have restricted fishing to the very low levels observed in recent years. A seasonal closure on targeting or harvesting Barramundi during November–February protects the stock during spawning. Minimum and maximum size limits and high release survival also reduce fishing pressure.

The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Princess Charlotte Bay biological stock is classified as a **sustainable stock**.

South-East Coast Stock status for the Queensland South-East Coast biological stock is reported as Negligible due to low or zero catches from this stock and the stock is not subject to targeted fishing. Average commercial catch in the past 10 years was 31 kg. Four of those years reported zero harvest. Phone and boat ramp surveys have not recorded any recreational catch. Fishing is unlikely to be having a negative impact on the stock.

Southern Gulf of Carpentaria The biomass of the southern Gulf of Carpentaria stock was considered to be heavily depleted in the early-1980s [Welch et al. 2002, Campbell et al. 2017], prompting management changes to aid recovery [Healy 1992]. From 1989 to 2011 calendar years commercial catch increased from 520 t to a peak of 960 t [QFISH 2020]. Catches and nominal CPUE then decreased substantially during 2013–15. There has been a rising trend in commercial catches and nominal catch rates since 2015. Catches in 2019 (496 t) were below the 2003–12 average, however CPUE (28 kg/100 m net/day) has increased. Fishery-dependent monitoring indicated a broad spread of ages was present in 2018. The most recent stock assessment on 2017 data estimated the exploitable biomass of the stock to be 39 per cent of unfished levels, although egg production was lower at 27 per cent [Streipert et al. 2019]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Fishing pressure on this stock is moderated by the existing size limits (580–1200 mm slot limit) that protect large, fecund females [Davis 1984] and allow most males to mature before entering the fishery [Davis 1982]. Fishing pressure is further reduced by a seasonal closure during the majority of the spawning season and spatial closures for commercial fishing that include all freshwater reaches in the stock area. Fishery-dependent monitoring indicates there is no evidence of truncation of fish sizes and size frequency distributions have been consistent from 2015–2019. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Southern Gulf of Carpentaria biological stock is classified as a **sustainable stock**.

BIOLOGY

Barramundi biology [Davis 1982]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Barramundi	35 years, 1500 mm TL	Maturity (50 per cent) Northern Territory: Males 2–5 years, 730 mm TL Females 5–7 years, 910 mm TL. Queensland: Males 2–5 years, 640 mm TL, Females 5–7 years, 820 mm TL

DISTRIBUTION



Distribution of reported commercial catch of Barramundi

TABLES

Fishing methods	Northern Territory	Queensland	Western Australia
Charter			
Hook and Line	✓	✓	✓
Commercial			
Cast Net	✓		
Gillnet	✓		✓
Handline	✓		
Net		✓	
Recreational			

Hook and Line	✓	✓	✓
Net	✓		
Spearfishing	✓	✓	✓

Management Methods			
	Northern Territory	Queensland	Western Australia
Charter			
Bag limits			✓
Gear restrictions	✓	✓	
Limited entry	✓		✓
Passenger restrictions	✓		✓
Possession limit	✓		✓
Seasonal closures	✓	✓	
Size limit	✓		✓
Spatial closures	✓		✓
Spatial zoning	✓	✓	✓
Commercial			
Gear restrictions	✓	✓	✓
Limited entry	✓	✓	✓
Mesh size regulations	✓		
Seasonal closures	✓	✓	✓
Size limit	✓	✓	✓
Spatial closures	✓	✓	✓
Spatial zoning	✓	✓	✓
Vessel restrictions	✓	✓	✓
Recreational			
Bag limits			✓
Gear restrictions	✓	✓	✓
Licence			✓
Licence (Recreational Fishing from Boat License)			✓
Possession limit	✓	✓	✓

Seasonal closures	✓	✓	
Size limit	✓	✓	✓
Spatial closures	✓	✓	✓
Spatial zoning	✓	✓	

Catch			
	Northern Territory	Queensland	Western Australia
Charter	24.5 t		5 t
Commercial	276.065 t	657.416 t	48.806 t
Indigenous	154 t (in 2001)	Unknown	Unknown
Recreational	155 t (in 2010)	166 ± 30 t (2013–14)	6 t (2017–18)

Western Australia – Recreational (catch) Boat-based recreational catch between 1 September 2015 and 31 August 2016 from Ryan et al. [2019]. Please note that catches of Barramundi are underestimates as shore-based and boat-based fishers that only operated in freshwater were out of scope of the survey.

Western Australia – Recreational (management methods) A Recreational Fishing from Boat Licence is required for the use of a powered boat to fish or to transport catch or fishing gear to or from a land-based fishing location.

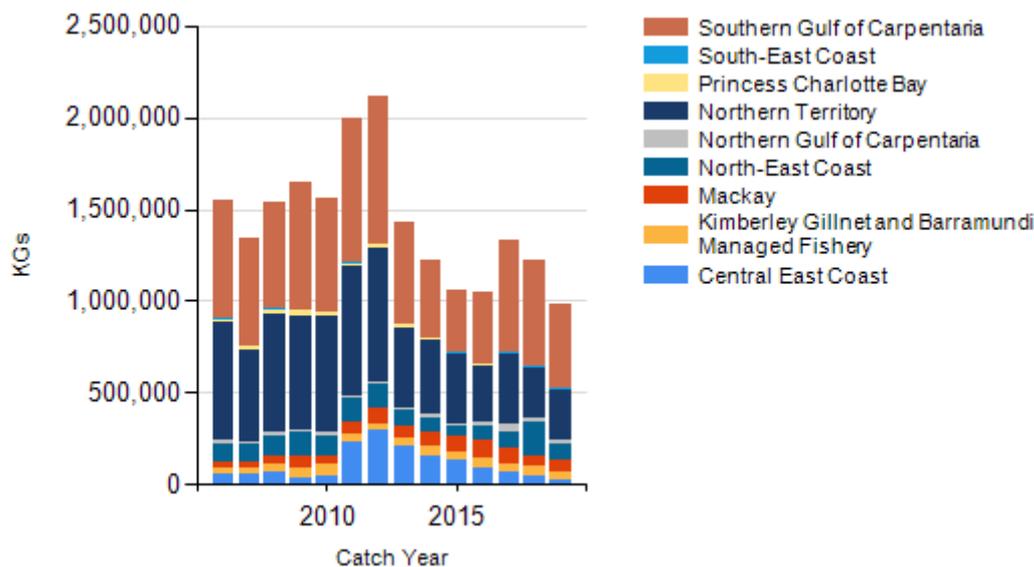
Western Australia – Indigenous (management methods) Subject to application of Section 211 of the *Native Title Act 1993* (Cth), and the exemption from a requirement to hold a recreational fishing licence, the non-commercial take by Indigenous fishers is covered by the same arrangements as that for recreational fishing.

Northern Territory – Indigenous (management methods) The *Fisheries Act 1988* (NT), specifies that “...without derogating from any other law in force in the Territory, nothing in a provision of this Act or an instrument of a judicial or administrative character made under it limits the right of Aboriginals who have traditionally used the resources of an area of land or water in a traditional manner from continuing to use those resources in that area in that manner”.

Northern Territory – Charter (management methods) In the Northern Territory, charter operators are regulated through the same management methods as the recreational sector, but are subject to additional limits on licence and passenger numbers.

Queensland – Indigenous (management methods) for more information see <https://www.daf.qld.gov.au/business-priorities/fisheries/traditional-fishing>

CATCH CHART



Commercial catch of Barramundi - note confidential catch not shown.

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