Banana Prawn

Penaeus indicus, Penaeus merguiensis

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STOCK STATUS OVERVIEW

Stock status determination

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Queensland	East Coast	ECIFFF, ECOTF, RIBTF	Sustainable	Catch, stock assessments
Western Australia	Exmouth Gulf Prawn Managed Fishery	EGPMF	Sustainable	Catch
Western Australia	Kimberley Prawn Managed Fishery	KPMF	Sustainable	Catch, catch projections
Western Australia	Nickol Bay and Onslow Prawn Managed Fisheries	NBPMF, OPMF	Sustainable	Catch, catch projections
Commonwealth	Northern Prawn Fishery	NPF	Sustainable	Catch, CPUE, trigger limits

ECIFFF East Coast Inshore Fin Fish Fishery (QLD)
ECOTF East Coast Otter Trawl Fishery (QLD)
EGPMF Exmouth Gulf Prawn Managed Fishery (WA)
KPMF Kimberley Prawn Managed Fishery (WA)
NBPMF Nickol Bay Prawn Managed Fishery (WA)
NPF Northern Prawn Fishery (CTH)
OPMF Onslow Prawn Managed Fishery (WA)
RIBTF River and Inshore Beam Trawl Fishery (QLD)

STOCK STRUCTURE

In Australia the standard fish name Banana Prawn is a group name which refers to *Penaeus merguiensis* and *Penaeus indicus*[1]. Here, only *Penaeus merguiensis* is considered, and referred to as Banana Prawn. The biological stock structure of Banana Prawn is uncertain. There is some evidence that there may be separate biological stocks of Banana Prawn in the Northern Prawn Fishery (Commonwealth); however, the boundaries of the biological stocks are unknown[2]. Stocks in Western Australia and Queensland are widely separated, but it is not known whether these are completely independent stocks[3].

Here, assessment of stock status is presented at the management unit level—Northern Prawn Fishery (Commonwealth), Exmouth Gulf Prawn Managed Fishery (Western Australia), Nickol Bay and Onslow Prawn Managed Fisheries (Western Australia), Kimberley Prawn Managed Fishery (Western Australia) and East coast (Queensland).

STOCK STATUS

Northern Prawn Fishery

Recruitment of Banana Prawns in the Northern Prawn Fishery (Commonwealth) (NPF) is highly variable and thought to be largely determined by seasonal environmental conditions, particularly rainfall[4]. As a result, a reliable stock–recruitment relationship has not been established and no formal stock assessment has been conducted for this stock and status determination is based on a weight-of-evidence approach.

The harvest strategy for Banana Prawns in the NPF is designed to facilitate the capture of larger prawns, while allowing for sufficient escapement to ensure adequate remaining spawning biomass, thereby preventing growth and recruitment overfishing and providing higher returns by minimising the capture of small prawns. This is achieved by controlling the timing of the fishing season (which impacts prawn size) and the length of the season, the end of which is determined using catch-rate thresholds[5]. The harvest strategy is designed to perform effectively under conditions of substantial variation in biomass, which are largely environmentally-driven. Although fishing mortality is thought to have been high for Banana Prawns in some years[6], the species has shown resilience to fishing pressure, with strong subsequent recruitment following historical high levels of catch.

In 2015, total reported commercial landings were 3901 tonnes (t), slightly below the average catch of the preceding 10 years (2006–15) of 4475 t. These catch levels indicate that that the biomass available in 2015 was close to the 10-year average. The above evidence indicates that the biomass of this stock is unlikely to be recruitment overfished[7].

The harvest strategy for Banana Prawns causes the closure of the season when catch rates fall below a trigger level that is associated with permitting sufficient prawns to escape to ensure an adequate spawning biomass for subsequent recruitment (based on an analysis of historical data [5]). Harvesting of Banana Prawns has been undertaken in accordance with this harvest strategy for almost a decade. During this period, Banana Prawn annual recruitment (as evidenced by catches) has been maintained and continued a pattern of high natural variability from year-to-year.

Effort expended on Banana Prawns in the NPF in 2015 was 2249 vessel days with a fleet of some 50 vessels. This is below the average for the most recent decade (2815 days, with a fleet of some 50 vessels) and substantially below effort in previous decades which were well in excess of 4000 days and with a substantially larger fleet.

The above evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment overfished [7].

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

Exmouth Gulf Prawn Managed Fishery

Banana Prawn landings are generally low (or zero) in this fishery, with historical landings (1963–2015) ranging from 0–74 t. Landings in 2015 were 46 t [8], up from 29 t the previous year. This increased catch probably resulted from increased spawning stock between 2012 and 2014, as a result of continued favourable environmental conditions for Banana Prawn (moderate rainfall over December–March and warmer than average water temperatures).

Given the environmentally driven nature of Banana Prawn recruitment [4] and the recent increase in catches, the above evidence indicates that the biomass of the management unit is unlikely to be recruitment overfished, and the current level of fishing pressure is unlikely to cause the management unit to become recruitment overfished.

On the basis of the evidence provided above, the Exmouth Gulf Prawn Managed Fishery (Western Australia) management unit is classified as a **sustainable stock**.

Nickol Bay and Onslow Prawn Managed Fisheries

Historical commercial catch levels from 1989–98 have been used as the basis for calculating target catch ranges, within which management aims to keep catches. The target catch range for Nickol Bay is 40–220 t and for Onslow is 2–90 t [8]. Annual commercial catch projections, within which it is expected that catches should remain, for the fishing season in Nickol Bay are estimated based on wet-season rainfall (December–March). The commercial catch projection for the 2015 fishing season

was 50–75 t. Total commercial catch for 2015 was 85 t, which is slightly above the projected catch range, but below the upper limit of the target catch range. Five boats fished the Nickol Bay fishery in 2015, with a total effort of 133 boat days. Two boats fished the Onslow fishery with a total effort of 24 boat days, landing a low quantity of Banana Prawns whilst primarily targeting Brown Tiger Prawns. Since 2012, very low effort has been expended in the Onslow fishery as a result of disruption to fishing activities and area access due to resource developments in the region with effort levels in the 5 years prior to 2012 being between 60 and 260 boat days.

On the basis of annual trends in landings and effort, and more recently from analysis of annual catch rates and the results of preliminary stock production models and a biomass dynamics model (unpublished, Western Australia Department of Fisheries), the Banana Prawn stock in Nickol Bay is currently considered to be being fished at a sustainable level. There has been no marked declining trend in overall landings across the entire time series despite very marked reductions in effort in recent years (with catches typically fluctuating within the lower half of the catch target range). There has also been no decline in peak catch rates in recent years in the two main fishing grounds and estimates from the biomass dynamics model indicate a declining trend in fishing mortality due to lower fishing effort. Estimates from the biomass dynamics model also indicate high levels of spawning biomass in recent years relative to the estimated unfished level.

The above evidence indicates that the biomass of the management unit is unlikely to be recruitment overfished, and the current level of fishing pressure is unlikely to cause the management unit to become recruitment overfished.

On the basis of the evidence provided above, the Nickol Bay and Onslow Prawn Managed Fisheries (Western Australia) management unit is classified as a **sustainable stock**.

Kimberley Prawn Managed Fishery

Historical commercial catch levels from 1989–98 have been used as the basis for calculating target catch ranges, within which management should try and keep catches. The target range in the Kimberley Prawn Managed Fishery (Western Australia) is 200–450 t [8] although, due to much reduced effort in this fishery in recent years, this target range is under review. Annual commercial catch projections for the fishing season, within which it is expected that catches should remain, are based on January and February rainfall levels in Kalumburu and Derby [8]. The commercial catch projection for the 2015 fishing season was 210–315 t. Total commercial catch for 2015 was 170 t, which is below both the target catch range and projected catch range for 2015. The management unit operates under an upper limit effort cap of 1500 vessel days (based on historical effort levels) and only 286 vessel days were fished in 2015.

On the basis of annual trends in landings and effort since 1980 and, more recently, catch rates, the Banana Prawn stock is currently considered to be fished at a sustainable level. There has been no marked declining trend in landings across the entire time series and landings have been maintained despite relatively low levels of effort compared with historical levels. Fishing effort (vessel days) in the past 5 years has been well below the levels that provided the highest catches in the history of the fishery. Fishing mortality is estimated to be low, with a preliminary biomass dynamics model indicating around 760 days of fishing are required to achieve maximum sustainable yield (MSY)

under average environmental conditions. The model estimated that levels of spawning stock biomass have been maintained at more than 50 per cent of unfished biomass levels.

There has been a marked increase in annual mean catch rates since about 2005, following a marked reduction in the number of fishers harvesting the available stock. Fishers are currently aiming to optimise returns by maximising their efficiency, with the majority fishing only when catch rates are high, and targeting larger and higher-quality prawns by fishing later in the year. Permanent closures have been introduced in all the major rainfall catchments, as well as temporal closures in two of the catchment areas (known as 'size management fish grounds') to protect smaller prawns and their habitats.

The above evidence indicates that the biomass of the management unit is unlikely to be recruitment overfished, and the current level of fishing pressure is unlikely to cause the management unit to become recruitment overfished.

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

East Coast

There appears to be no long-term trend in the annual Banana Prawn catch with total catches showing considerable variation between years. In more recent years, these fluctuations have become more pronounced with a record high total catch reported in 2011 (1304 t), followed by a record low total catch in 2012 (331 t) and the second-highest total catch in 2013 (1104 t). These fluctuations were reflected in the effort data with total annual effort peaking in 1998 at 14 858 days fished before declining to between 4287 (2012) and 11 103 (2004) days fished over the 1999–2016 period.

Environmental factors would more than likely have contributed to these fluctuations with rainfall and river flow rates intimately linked to Banana Prawn recruitment rates and biomass availability [3]. The most recent quantitative assessment of the East coast (Queensland) management unit was based on catch-and-effort data from 1988–2004 and estimated an average annual MSY estimate of 802 t [3]. Total commercial catch of Banana Prawns since 2013 has stabilized at a level below the MSY estimate; at 667–670 t [3]. The above evidence indicates that the biomass of the management unit is unlikely to be recruitment overfished.

Recent ecological risk assessments found that there was a low risk of the management unit becoming recruitment overfished at 2009 effort levels [9,10]. Since 2009, there has been a 16 per cent decrease in effort directed at Banana Prawn (days when Banana Prawn was caught), indicating that, despite an increase in fishing power in the East Coast Otter Trawl Fishery fleet (0.4–3.1 per cent per year) [11], fishing pressure on the management unit is not increasing. The above evidence indicates that the current level of fishing pressure is unlikely to cause the management unit to become recruitment overfished.

On the basis of the evidence provided above, the East coast (Queensland) management unit is classified as a **sustainable stock**.

BIOLOGY

Banana Prawn biology [2,3,12]

Biology

Species	Longevity / Maximum Size	Maturity (50 per cent)
Banana Prawn	1–2 years; >240 mm TL	~6 months; 120–150 mm CL

DISTRIBUTIONS

Distribution of reported commercial catch of Banana Prawn

TABLES

Fishing methods

	Commonwealth	Western Australia	Queensland
Commercial			
Otter Trawl	✔		✔
Unspecified		✔	
Various		✔	
Beam Trawl			✔
Net			✔
Recreational			
Cast Net		✔	✔
Indigenous			
Cast Net			✔

Management methods

Method	Commonwealth	Western Australia	Queensland
Commercial			
Effort limits	✔		
Gear restrictions	✔	✔	✔
Limited entry	✔	✔	✔
Spatial closures	✔	✔	✔
Temporal closures	✔	✔	✔
Vessel restrictions	✔		✔
Indigenous			
Gear restrictions			✔
Recreational			
Bag limits		✔	
Licence		✔	
Possession limit			✔

Active vessels

	Commonwealth	Western Australia	Queensland
	53 in NPF	6 in EGPMF, 11 in KPMF, 5 in NBPMF, 2 in OPMF	25 in ECIFFF, 134 in ECOTF, 45 in RIBTF

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Catch

	Commonwealth	Western Australia	Queensland
Commercial	3.90Kt in NPF	45.86t in EGPMF, 174.21t in KPMF, 85.21t in NBPMF	9.12t in ECIFFF, 519.31t in ECOTF, 147.68t in RIBTF
Indigenous		Unknown	Unknown
Recreational		Unknown	Unknown

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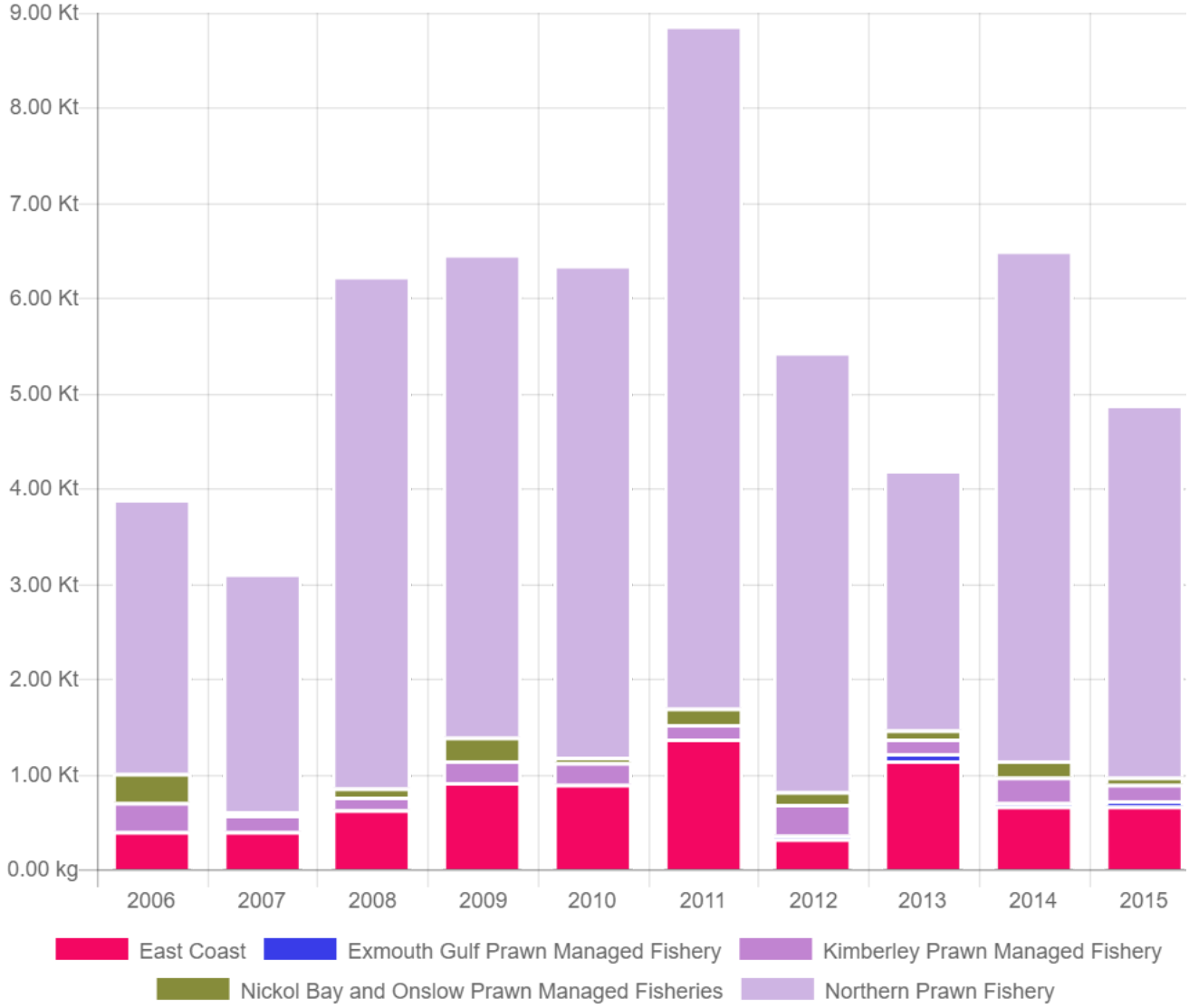
a Commonwealth – Recreational The Australian Government does not manage recreational fishing in Commonwealth waters. Recreational fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters, under its management regulations.
b Commonwealth – Indigenous The Australian Government does not manage non-commercial Indigenous fishing in Commonwealth waters, with the exception of the Torres Strait. In general, non-commercial Indigenous fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters.
c Queensland – Indigenous In Queensland, under the Fisheries Act 1994 (Qld), Indigenous fishers are able to use prescribed traditional and non-commercial fishing apparatus in waters open to fishing. Size and possession limits, and seasonal closures do not apply to Indigenous fishers. Further exemptions to fishery regulations can be obtained through permits.
d New South Wales – Indigenous Subject to the defence that applies under 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.

CATCH CHART



Commercial catch of Banana Prawn

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

- The impact of trawling on habitats is managed in all jurisdictions. In Queensland, the Great Barrier Reef Marine Park (GBRMP) occupies 63 per cent of the East Coast Otter Trawl Fishery (ECOTF) [12], 34 per cent of which is open to trawling [13], but effort is highly aggregated, occurring within only a small fraction of the open area. South of the GBRMP, the fishery operates in only 10 per cent of the area open to trawling [14]. In Western Australia, extensive permanent and temporary closures result in the fleet operating in less than 30 per cent of the Exmouth Gulf, and less than 3 per cent of the north coast region [12]. Fishing operations are restricted to areas of sand and mud, where trawling has minimal long-term physical impact [15–19]. The Northern Prawn Fishery (Commonwealth) (NPF) also uses a system of closures (spatial and seasonal) to manage the fishery, as well as other input controls (for example, limited entry, gear restrictions). A total of 2.1 per cent of the total managed area of the fishery is subject to permanent closures, and 8.3 per cent is subject to seasonal closures [19].

- Although the incidental capture of byproduct and bycatch species by trawling can lead to a range of ecosystem effects [20], studies in Queensland and Western Australia found no significant difference in biodiversity or overall distribution patterns of seabed biota between trawled and non-trawled areas [18,21]. An assessment of trawl-related risk in the GBRMP found that the ECOTF posed no more than an intermediate risk of overfishing species assemblages exposed to trawling [8]. Spatial contraction and/or temporal reduction in effort in these jurisdictions (see above) are likely to have mitigated the ecosystem impacts of trawling. Similarly, in the NPF, the ecological risk management report identifies priority species at high risk. However, no target or protected species have been assessed as high risk because of the fishery [22].
- The use of bycatch reduction devices (BRDs) in trawling can significantly reduce bycatch—by more than 50 per cent by weight in some fisheries [23]. In the ECOTF, the use of BRDs became mandatory in 1999, and the introduction of turtle excluder devices (TEDs) in 2001 largely eliminated capture of most large bycatch species, including turtles, sharks and rays [24]. BRDs and TEDs became mandatory in the NPF in 2001. Use of TEDs in the NPF reduced turtle bycatch from 5700 individuals per year (pre-2001) to approximately 30 per year (post-2001) [12]. The introduction of TEDs in the Western Australian trawl fisheries in 2003 reduced turtle bycatch by more than 95 per cent [25]. BRDs and TEDs have been mandatory in the Exmouth Gulf Prawn Managed Fishery (Western Australia) since 2003 and in all northern Western Australian prawn fisheries since 2005. All prawn trawlers operating in Western Australia must use TEDs and BRDs, including secondary fish exclusion devices and hoppers to increase survival of returned fish. Commitment to continuous improvement in bycatch mitigation has facilitated increased use of best-practice TEDs and BRDs in the ECOTF since 2008. Recent ecological risk assessments of the fishery have acknowledged the reduced impact of trawling and a general absence of high risk of overfishing bycatch species [8,13].

ENVIRONMENTAL EFFECTS ON BANANA PRAWN

- The abundance of prawns can be highly variable. It is influenced by environmental factors, including water temperatures, cyclones and broad-scale oceanographic features [4].
- River flow as a result of rainfall is highly correlated with offshore commercial catches of Banana Prawns [3,4]. In the south-eastern Gulf of Carpentaria, it has been suggested that increased river flow has different effects on different stages of the Banana Prawn life cycle: high flows can increase emigration of juveniles from estuaries; increased flows can prevent immigration, settlement and survival of post-larvae; and rainfall run-off may increase overall productivity, through the contribution of increased nutrient input to increased growth and survival rates [3].
- The 2013 catch was the second-highest on record in the East coast (Queensland) management unit, almost all (98 per cent) of which was taken south of Mackay [8]. Clustering of high catches among neighbouring regional sub-stocks is believed to be in response to

major flooding of central and southern Queensland streams, following record rainfall associated with Tropical Cyclone Oswald in January 2013 [25].

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