

King Threadfin (2023)

Polydactylus macrochir



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia	Sustainable	Catch
Northern Territory	Northern Territory	Sustainable	Stock assessment, biomass estimate, fishing mortality, catch, catch rate
Queensland	Central East Coast	Sustainable	Stock assessment, biomass estimate, maximum sustainable yield, catch, fishing effort
Queensland	Far North East Coast	Undefined	Catch, fishing effort
Queensland	Gulf of Carpentaria	Depleted	Stock assessment, biomass estimate, maximum sustainable yield, catch, fishing effort
Queensland	Mackay East Coast	Sustainable	Stock assessment, biomass estimate, maximum sustainable yield, catch, fishing effort

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Queensland	North East Coast	Sustainable	Stock assessment, biomass estimate, maximum sustainable yield, catch, fishing effort
Queensland	South East Coast	Sustainable	Stock assessment, biomass estimate, maximum sustainable yield, catch, fishing effort

STOCK STRUCTURE

King Threadfin have numerous populations across northern Australia that are separated by 10 to 100s km or by large, coastal geographical features [Moore et al. 2011; Welch et al. 2010]. Apart from the Gulf of Carpentaria, there is a lack of information on the degree to which this separation indicates separate biological stocks, and on boundaries between possible stocks. The Queensland stock assessment of King Threadfin was conducted based on six assessment regions; five on the east coast plus one in the Gulf of Carpentaria [Leigh et al. 2021], here they are considered the best approximation of biological stock.

This assessment of stock status is presented at the jurisdictional level—Western Australia and Northern Territory; and at the biological stock level— Far North East Coast, North East Coast, Mackay East Coast, Central East Coast, South East Coast and Gulf of Carpentaria (Queensland).

STOCK STATUS

Central East Coast Central East Coast is located along the Queensland east coast from Stanage Bay to the Fitzroy River in Rockhampton (Assessment Region 4 in Leigh et al. [2021]). Year class strength (based on an analysis of age frequency) has been found to be positively correlated with spring and summer freshwater flows and coastal rainfall in the Fitzroy River region [Robins et al. 2005; Halliday et al. 2007; Halliday et al. 2008]. The area experienced average or above average rainfall during the summers of 2009–10 to 2012–13, including some significant flood events. This likely improved King Threadfin catchability and productivity, however these catch benefits are no longer evident in the reported harvests.

The most recent stock assessment of King Threadfin [Leigh et al. 2021] estimated the spawning biomass in 2019 at 54% (all scenarios resulted in estimates between 34 and 66%) of the unfished 1945 levels. Maximum sustainable yield (MSY) was estimated at 47 t. For the 10 years prior to 2015–16, average commercial harvest (51 t) was marginally above MSY. Mean commercial harvest substantially reduced, to less than 1 t in 2021–22 largely due to the introduction of a Net Free Zone in late 2015 and associated net buy-back program [Whybird et al. 2018] and the commencement of regional individual transferable quota (ITQ) in late 2021. Recreational harvest could not be estimated at stock level, the estimate in 2019–20 [Teixeira et al 2021] for the whole east coast was 14 t. The above evidence indicates the biomass of this stock is unlikely to be depleted and the stock is not considered to be recruitment impaired.

The stock assessment model estimated that the biomass of King Threadfin in Central East Coast was close to the limit reference point of B20 between 2000

and 2015 [Leigh et al. 2021]. Due to management changes the total number of commercial licences accessing the fishery in this region has reduced from 51 operators and 1,354 days in 2014–15 to 6 operators and just 34 days in 2021–22. The effect of reduced fishing mortality from commercial catch and effort reduction resulted in a substantial increase in modelled biomass but this rise is uncertain due to a lack of monitoring data. 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, King Threadfin in the Central east coast stock is classified as a **sustainable stock**.

Far North East Coast

The Far North East Coast stock extends along the east coast of Queensland from the tip of Cape York to Cooktown (Assessment Region 1 in Leigh et al. [2021]). Fishing effort is highly constrained by management restrictions on commercial operations and difficult access for recreational fishers.

Commercial harvest was concentrated in Princess Charlotte Bay, however the introduction of Special Management Area in this region in 2004 has almost completely phased out commercial fishing [Leigh et al. 2021; GBRMPA 2020]. In 2021 a regional quota system was introduced and most of the quota was purchased by the World Wildlife Fund, as a conservation measure. This has reduced the fishable quantities to below economic viability. There has been no commercial harvest reported in the region since 2019–20 and the 10-year average harvest from 2010–11 was approximately 5 t. Prior to this catch fluctuated from 5 to 28 t. There are no estimates of recreational harvest at stock level, however levels are likely to be very low due to the remoteness to major population centres.

No stock assessment has been conducted as harvests in the region are small and inconsistent, and no biological monitoring data were available. There is insufficient information to confidently classify the status of this stock.

On the basis of the evidence provided above, King Threadfin in the Far North East Coast Stock is classified as an **undefined stock**.

Gulf of Carpentaria

The most recent stock assessment of King Threadfin in the Queensland Gulf of Carpentaria [Leigh et al. 2021] estimated the spawning biomass in 2019 at 5% (3 to 7% across scenarios) of the unfished (1945) level. Maximum sustainable yield (MSY) was estimated at 355 t [Leigh et al. 2021]. Reconstructed total harvest history from the stock assessment showed very high fishing pressure in the 1970's and continuing into the 1990s (peaking at 183% of the level that would sustain BMSY). Five of the last 10 years of commercial harvest of King Threadfin from the Gulf of Carpentaria have been above 50% of the modelled MSY.

Low flow is likely to negatively impact King Threadfin year class strength and catchability [Halliday et al. 2008]. Poor wet seasons from 2013 to 2015 reduced available habitat and this has been demonstrated to have had a negative effect on recruitment, growth rates and survival of Barramundi in the Gulf of Carpentaria, a co-target species of this fishery [Robins et al. 2021].

Stock recovery was not evident in the standardised catch rates from the main fishery in the southern Gulf of Carpentaria (up to 2019) assessed by Leigh et al. [2021]. However, in 2021–22, record high nominal catch rates were reported in

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conjunction with a harvest of 277 t, a harvest level not reached since 2011–12. Recent favourable environmental conditions may have improved survival and recruitment, however more evidence would be required to consider the stock to be recovering from its recruitment impaired state.

High discard mortality, variable growth, late female maturity and size at transition to female (larger than legal size) make this species susceptible to overfishing [Moore 2011; Moore et al. 2017]. Population age structure changes occurred between studies of King Threadfin conducted in 1986–90 [Garrett 1992, Bibby et al 1997], 2007–09 [Moore 2011], and 2015–2022 [Leigh et al. 2021; QDAF 2023]. The age and size structure in the more recent studies was truncated, having a younger maximum age and changing sex when smaller and younger [Moore et al. 2011; Leigh et al. 2021]. Moore et al. [2017] considered fishing pressure the likely cause of the observed age and mortality changes.

A 14-week temporal commercial closure does offer some protection as it coincides with most of the king threadfin spawning season [Bibby et al. 1997; Garrett 1992]. From 1990–91 to 2010–11, fishing effort decreased from 102 operators reporting 7,333 catch days to 66 operators reporting 3,891 days. In 2021–22, 67 operators reported harvest from 3,316 days. There has been no recent change to management in the Gulf of Carpentaria Inshore Fin Fish Fishery that would further constrain the effort for this species. The above evidence indicates that this level of fishing mortality is expected to prevent the stock from recovering from its recruitment impaired state.

On the basis of the evidence provided above, the Gulf of Carpentaria (Queensland) biological stock is classified as a **depleted stock**.

**Mackay
East Coast**

Mackay East Coast (Assessment Region 3 in Leigh et al. [2021]) extends south of Lucinda to Stanage Point along the north-eastern Queensland coast. Leigh et al. [2021] estimated that the spawning biomass in 2019 was 64% of the unfished levels. A lack of contrast in the data provided wide confidence intervals but, in all scenarios, results were above 42%. Maximum sustainable yield (MSY) was estimated at 125 t. Commercial harvest in 2021–22 (20 t) was half the 20-year average harvest and a third of the maximum historical commercial harvest (60 t recorded in 2011–12 in this region), since logbook reporting commenced in 1988. Recreational harvest could not be estimated at stock level, the estimate in 2019–20 [Teixeira et al 2021] for the whole east coast was 14 t. The above evidence indicates the biomass of this stock is unlikely to be depleted and the stock is not considered to be recruitment impaired.

Total commercial effort in Mackay East Coast has been declining. Compared to 2011–12 levels, the number of licences decreased from 60 to 28 in 2021–22 and effort decreased from 1,111 to 304 days fished. The decrease in commercial effort can be attributed to the introduction of a Net Free Zone in late 2015 and associated net buy-back program [Whybird et al. 2018] and the commencement of regional individual transferable quota (ITQ) in late 2021. Spatial and temporal closures on the Queensland east coast reduce commercial and recreational fishing pressure on King Threadfin. 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, King Threadfin in the Mackay East Coast Stock is classified as a **sustainable stock**.

North East Coast

The North East Coast ranges from Cooktown to Lucinda along the Queensland east coast (Assessment Region 2 in Leigh et al. [2021]), is an area strongly influenced by monsoonal rainfall events. The most recent stock assessment [Leigh et al. 2021] estimated that the spawning biomass of King Threadfin in the North East Coast in 2019 was 60% (36 to 91% across all scenarios) of the 1945 unfished levels. MSY was estimated at 65 tonnes (t) [Leigh et al. 2021], which has not been exceeded, since logbook records commenced in 1988. The 20-year average commercial harvest for this region was 31 tonnes (t) and harvest in 2021–22 was 8 t. Recreational harvest could not be estimated at stock level, the estimate in 2019–20 [Teixeira et al 2021], for the whole east coast was estimated at 14 t. The above evidence indicates the biomass of this stock is unlikely to be depleted and the stock is not considered to be recruitment impaired.

Commercial effort for King Threadfin (number of active licences and number of days fished) has decreased in North East Coast from 60 licences and 1,120 days fished in 2011–12 to 21 licences and 213 days fished in 2021–22. The decline in commercial fishing effort can be partially attributed to the introduction of a Net Free Zone in Trinity Bay near Cairns in late 2015 and associated net buy-back program [Whybird et al. 2018] and the commencement of regional individual transferable quota (ITQ) in September 2021. A 14-week seasonal closure for co-targeted Barramundi also reduces commercial and recreational fishing pressure for King Threadfin during some of the spawning season [Bibby et al. 1997; Garrett 1992]. 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, King Threadfin in the North East Coast Stock is classified as a **sustainable stock**.

Northern Territory

Knowledge of the genetic stock structure of King Threadfin in Northern Territory (NT) waters is limited. Welch et al. [2010] detected two different stocks in the NT from two locations sampled (i.e. Chambers Bay and Blue Mud Bay). Finer-scale sampling conducted in Queensland and Western Australia revealed stocks separated by distances of tens to hundreds of kilometres or by large, coastal geographical features [Welch et al. 2010; Moore et al. 2011]. The existence of multiple biological stocks in these states suggests that the stock structure of King Threadfin in the NT is likely to be more complex than currently described.

In addition to genetic traits, the year class strength (i.e. productivity) of King Threadfin is affected by freshwater flow and coastal rainfall [Halliday et al. 2008]. Therefore, differences in these environmental drivers between adjacent catchments (as is evident in the NT; BOM 2020) may over-ride genotypic differences in productivity between neighbouring stocks.

Given uncertainties regarding the actual number of biological stocks of King Threadfin in NT waters, and current management arrangements for this species [as a single management unit], the assessment presented here was undertaken at the jurisdictional level.

The most recent assessment of King Threadfin in the Northern Territory (using data to the conclusion of 2019) indicated that the stock was impacted by high fishing pressure in the late 1970s and early 1980s, falling to 47% of the unfished (1950) biomass [Grubert and Saunders, unpublished]. However, there has been a strong recovery since that time, with the annual biomass as a proportion of virgin biomass exceeding 60% for the last two decades, reaching 98% by the

end of 2019. In addition, commercial fishing effort and catches have declined significantly in recent years. During the decade from 2001–10, annual catches averaged 323 t. In 2022 (the most recent year of available data), catches were 129 t. The above evidence indicates that the biomass of the stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

The contemporary (2019) fishing mortality rate, as a proportion of fishing mortality at maximum sustainable yield (MSY), was estimated at 16%, roughly one sixth of the rate required to achieve MSY [Grubert and Saunders unpublished]. The standardised catch per unit effort (CPUE) in 2019 was also at a historical high, following a significant increase in this indicator over the last decade (noting that this trend may in part be driven by an increase in targeting of King Threadfin). 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, King Threadfin in the Northern Territory is classified as a **sustainable stock**.

South East Coast

The South East Coast (Assessment Region 5 in Leigh et al. [2021]) extends from inshore of Fraser Island to the Queensland/New South Wales border. The most recent stock assessment [Leigh et al. 2021] estimated the spawning biomass in 2019 at 69% (33 to 96% across all scenarios) of the unfished 1945 levels. Maximum sustainable yield (MSY) was estimated at 50 t. The region experienced average or above average rainfall during the summers of 2009–10 to 2012–13, including some significant flood events. Commercial harvest averages increased from 10 t (1998–1999 to 2009–10) to 36 t between 2009–10 and 2016–17. Increases in catchability and productivity from these events are no longer evident in the reported harvests and average harvest has returned to previous levels. Recreational harvest could not be estimated at stock level, the estimate in 2019–20 [Teixeira et al 2021] for the whole east coast was estimated at 14 t. The above evidence indicates the biomass of this stock is unlikely to be depleted and the stock is not considered to be recruitment impaired.

Fishing pressure on this stock has substantially reduced in recent years. The number of active commercial net operators in 2021–22 reduced to 32 from the 2012–13 peak of 72 operators, and effort decreased from 806 to 180 days over this same period. Spatial and temporal closures on the Queensland east coast also restrict commercial and recreational fishing pressure on King Threadfin. 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, King Threadfin in the South East Coast Stock is classified as a **sustainable stock**.

Western Australia

King Threadfin is one of the indicator species [Newman et al. 2018] for the North Coast Nearshore and Estuarine Resource (NCNER) and as such the stock status of King Threadfin contributes to determining the risk-level for the sustainability of the suite of species available for harvest in the NCNER. King Threadfin is currently only landed by the Kimberley Gillnet and Barramundi Managed Fishery (KGBMF). There is currently no formal harvest strategy for King Threadfin, but catches are evaluated against a period of stable catches from 2004–13, which averaged 74.5 t. This assessment of King Threadfin is supported by predictions for biomass and harvest rate from a data-limited Catch-MSY assessment model, with catches compared periodically to a model prediction for maximum sustainable yield (MSY).

In 2022, the commercial King Threadfin catch within the KGBMF of 13.3 t, was well below the average catch of the 2004–13 period and over the past 10 years, catches have been well below the average catch for the period from 2004–13. In recent years, overall commercial effort directed towards this species (and annual catches) have declined, in part due to two commercial gillnet licenses being removed in 2013 from the Broome coast area of the fishery [Trinnie et al. 2023], along with closures to commercial fishing along the Pilbara coast and Eighty-mile beach in the mid-2000s. This large area of the fishery is now only exposed to recreational, charter and indigenous fishing.

Catch levels of King Threadfin across the NCNER over the last 10 years (2013–22) ranged from 11.7–54.8 t, with a mean annual catch of 26.9 t. This is therefore much less than the average catch recorded for the previous 10 years (95.4 t). King Threadfin are mostly caught by commercial fishing, with the recreational and charter components of the total catch averaging approximately 21% in past 10 years. The Catch-MSY model applied to data on annual catches for this species since 1976, indicate that annual catches increased steadily until the mid-1990s, and then exceeded the upper 95% confidence intervals for this MSY prediction from 1997–2004. Since the mid-2000s however, catches have remained at or well below the mean MSY prediction. The trend of catches being higher relative to MSY is also consistent with the predicted values for biomass falling below the limit reference point (0.5BMSY) for several years, before increasing to around BMSY in recent years, and recent fishing mortality remaining well below FMSY. However, it is important to recognise that Catch-MSY is a data-limited technique with relatively strong assumptions, dependent on user inputs. For this assessment, these included specified ranges for initial depletion (0.5–0.975, based on assumed catches pre-1976), final depletion (0.15–0.7, calculated by the program based on recent catches relative to maximum recorded annual catch) and medium resilience ($r=0.3–0.8$, noting this species has a longevity of approximately 10 years in WA). The above evidence indicates that the current biomass of this stock is unlikely to be depleted and that current level of fishing mortality is unlikely to be sufficiently high to cause the stock to become recruitment overfished.

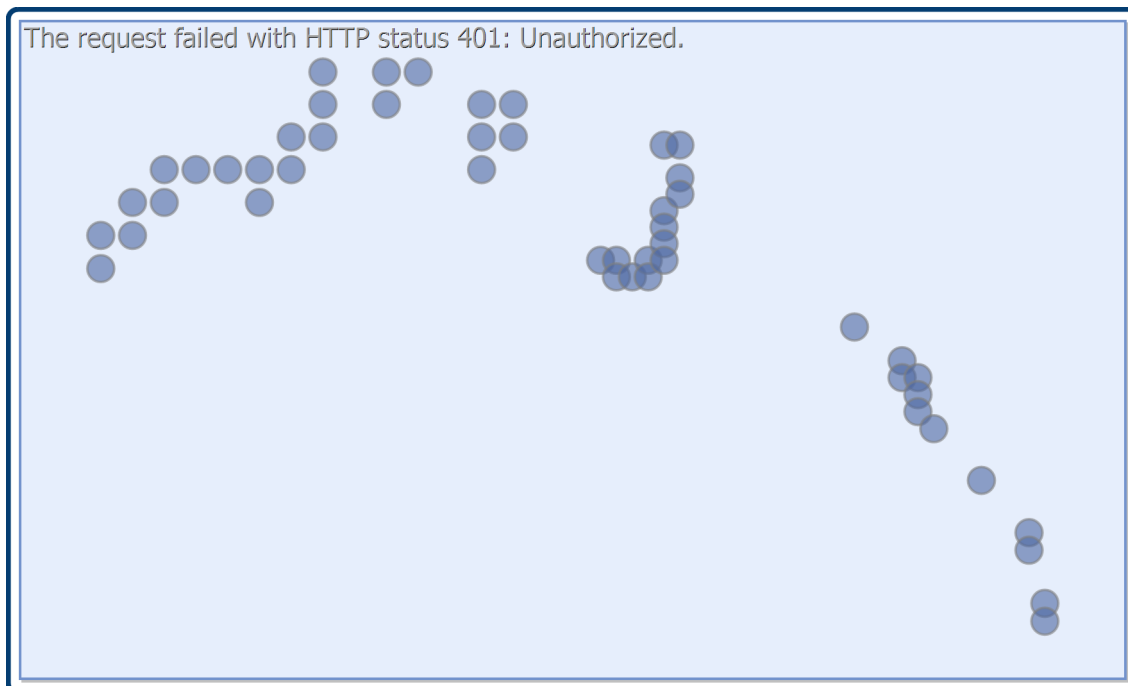
On the basis of the evidence provided above, King Threadfin in Western Australia is classified as a **sustainable stock**.

BIOLOGY

King Threadfin biology [Welch et al. 2010]

Species	Longevity / Maximum Size	Maturity (50 per cent)
King Threadfin	22 years, 1,600 mm TL	Males 2 years, 610 mm TL Females 6 years, 1,000 mm TL

DISTRIBUTION



Distribution of reported commercial catch of King Threadfin - note confidential catch not shown.

TABLES

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

Management Methods			
	Northern Territory	Queensland	Western Australia
Charter			
Bag limits			✓

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Bag/possession limits		✓	
Gear restrictions	✓	✓	
Limited entry	✓		✓
Passenger restrictions	✓		✓
Possession limit	✓		
Seasonal or spatial closures		✓	
Size limits		✓	
Spatial closures	✓		✓
Spatial zoning	✓		✓
Temporal closures	✓		
Commercial			
Gear restrictions	✓	✓	✓
Harvest Strategy		✓	
Individual transferable quota		✓	
Limited entry	✓	✓	✓
Mesh size regulations	✓		
Processing restrictions		✓	
Seasonal or spatial closures		✓	
Size limits		✓	
Spatial closures	✓		✓
Spatial zoning	✓		✓
Temporal closures	✓		
Total allowable catch		✓	

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Vessel restrictions	✓	✓	✓
Recreational			
Bag limits			✓
Bag/possession limits		✓	
Gear restrictions	✓	✓	
Licence (Recreational Fishing from Boat License)			✓
Possession limit	✓		
Seasonal or spatial closures		✓	
Size limits		✓	
Spatial closures	✓		✓
Spatial zoning	✓		
Temporal closures	✓		

Catch	Northern Territory	Queensland	Western Australia
Charter	1.5 t	Included in recreational estimate	< 1 t
Commercial	145.691 t	314.192 t	19.0707 t
Indigenous	Unknown	Unknown	Unknown
Recreational	9 t (2010)	20 t (2019–20)	5.2 t ± 1.7 se

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Western Australia – Recreational (Catch). Boat-based recreational catch is from 1 September 2020–31 August 2021. These data are derived from those reported in Ryan et al. [2022]. It is important to note that catches of King Threadfin are underestimated as shore-based fishers were out of scope of the survey. Shore based catches of King Threadfin are not known.

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.

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

Queensland – Commercial (Management Methods). Harvest strategies are available at: <https://www.daf.qld.gov.au/business-priorities/fisheries/sustainable/harvest-strategy>

Queensland – Commercial (Catch). Queensland commercial and charter data has been sourced from the commercial fisheries logbook program. Further information available through the Queensland Fisheries Summary Report: <https://www.daf.qld.gov.au/business-priorities/fisheries/monitoring-research/data/queensland-fisheries-summary-report>

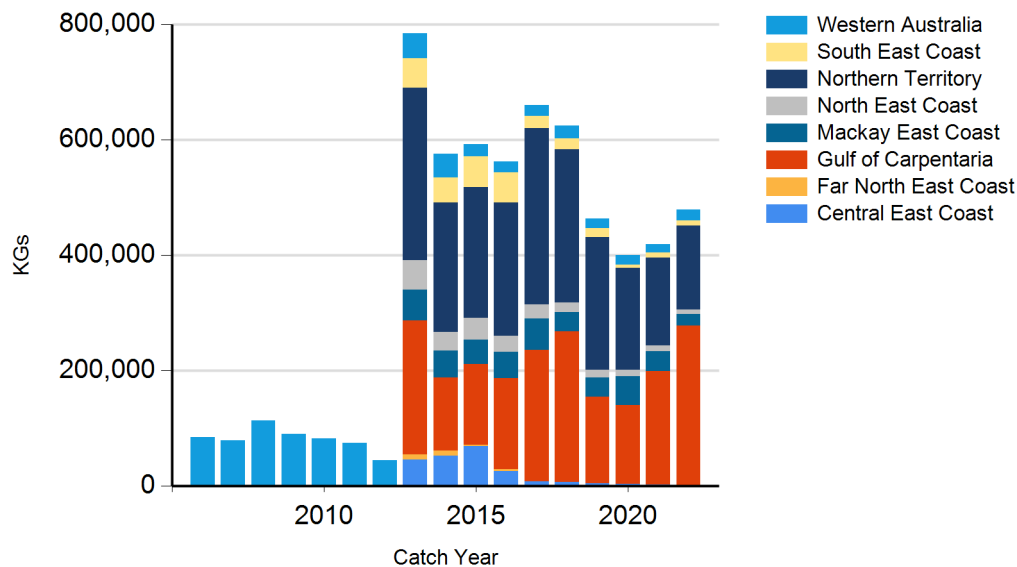
Queensland – Recreational Fishing (Catch). Data are based at the whole of Queensland level and derived from statewide recreational fishing surveys. Where possible, estimates have been converted to weight (tonnes) using best known conversion multipliers. Conversion factors may display regional or temporal variability. In the absence of an adequate conversion factor, data are presented as number of fish.

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 license and passenger numbers.

Northern Territory - Indigenous (Management Methods). The Fisheries Act 1988 (NT), specifies that: “Unless expressly provided otherwise, nothing in this Act derogates or limits the right of Aboriginal people who have traditionally used the resources of an area of land or water in a traditional manner to continue to use those resources in that area in that manner.”

CATCH CHART

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Commercial catch of King Threadfin - note confidential catch not shown.

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