

Spanish Mackerel (2023)

Scomberomorus commerson



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Commonwealth	Torres Strait Spanish Mackerel Fishery	Sustainable	Stock assessment, catch, spawning biomass
Western Australia	Mackerel Managed Fishery	Sustainable	Catch, catch rate, Catch-MSY
Northern Territory	Northern Territory	Sustainable	Stock assessment, biomass, fishing mortality, catch, catch rate
Queensland	Gulf of Carpentaria	Depleting	Stock assessment, catch, effort, standardised catch rate, length and age compositions
Queensland, New South Wales	East Coast	Depleted	Stock assessment, biomass, fishing mortality, catch, effort, standardised catch rate, length and age compositions, TAC

STOCK STRUCTURE

In Australia there are three distinct genetic stocks of Spanish Mackerel (*Scomberomorus*

commerson) as determined using single nucleotide polymorphisms (SNPs): a northern/western Australia stock, which extends from Perth in Western Australia across the Northern Territory and the Queensland waters of the Gulf of Carpentaria, a Torres Strait stock, and an east coast Australian stock, which spans from Cape York in north Queensland waters, to its southern extent in northern New South Wales [Williams et al. 2022].

Using SNPs methodology, Williams et al. [2022] provided higher resolution than previous genetics studies which used allozyme, mitochondrial DNA, and microsatellite DNA [Buckworth et al. 2007]. Of note, all studies consistently supported the existence of these three separate stocks. However, evidence from otolith microchemistry, parasite analysis and limited adult movement (at scales greater than 100 km) indicates the likely existence of smaller adult stocks with limited interaction [Lester et al. 2001; Moore et al. 2003; Buckworth et al. 2007].

While the northern/western Australia biological stock extends over multiple jurisdictions, there is evidence of limited adult movement and differences in biological and fishery characteristics for this stock [Mackie et al. 2003]. Consequently, we have taken the conservative step of assessing the northern/western stock at the jurisdictional level. Conversely, while the east coast Australian stock also extends over multiple jurisdictions, there is evidence of large movements along latitudinal gradients between north Queensland and northern New South Wales. In addition, joint stock assessments for the east coast were undertaken at the biological stock level.

Here, assessment of stock status is presented at the biological stock level—Torres Strait Spanish Mackerel Fishery (Commonwealth) and East Coast (Queensland and New South Wales); management unit level—Mackerel Managed Fishery (Western Australia), Gulf of Carpentaria (Queensland); and jurisdictional level—Northern Territory.

STOCK STATUS

East Coast This cross-jurisdictional stock has components in Queensland and New South Wales [Ovenden and Street 2007]. Stock status for the entire East Coast biological stock has been established using combined information from these jurisdictions. Most of the harvest is taken within Queensland waters (90.5%) [Tanimoto et al. 2021] with smaller catches being reported from New South Wales during the late Summer to Autumn period [Stewart et al. 2015].

In 2019–2020, the combined harvest across all fishing sectors was 515 tonnes (t) [Tanimoto et al. 2021]. Around 270 t of this catch was retained by commercial fishers which is marginally above the 10-year annual harvest average (263 t). The vast majority of the recreational harvest is retained in Queensland waters with the sector retaining an estimated 171 t of Spanish Mackerel each year [Teixeira et al. 2021]. There are no reliable estimates of the recreational harvest in NSW waters [Murphy et al. 2022]. However, recreational Spanish Mackerel harvest rates in New South Wales are much lower when compared to Queensland [Tanimoto et al. 2021].

Long-term fishery-dependent monitoring of fish length and age compositions displays continuous but variable recruitment into the fishery each year (1999–00 to 2021–22 inclusive) [Tanimoto et al. 2021; QDAF Unpublished Data]. The most recent stock assessment [Tanimoto et al. 2021] produced a range of biomass estimates between 14% and 57% of unfished (1911) levels. Four of the eight scenarios were less than 20%, two were less than or equal to 21%, and one scenario did not show evidence of significant decline. However, this last scenario relied on implausible parameter values and did not account for hyperstability. The agreed base case scenario estimated that spawning biomass in 2019–20 was 17% (\pm 4%) of the unfished level. Tanimoto et al. [2021] suggested that spawning biomass had declined as a result of high harvests

during the 1970s, early 1980s and early 2000s.

Fishing pressure for Spanish Mackerel has historically concentrated on a small area of important spawning grounds off the coast of Townsville [Tobin et al. 2013, Tobin et al. 2014]. Buckley et al. [2017] and Tobin et al. [2014] noted long term reductions in both the number of Spanish Mackerel spawning aggregations and in commercial catch rates in the region. O'Neill et al. [2018] estimated that fishing pressure for East Coast Spanish Mackerel from 2011–12 to 2015–16 was near a point equivalent to fully-fished. Fishing mortality has previously exceeded levels to maintain Spanish Mackerel stock biomass above the limit reference point of 20% [O'Neill et al. 2018; Tanimoto et al 2021].

The above evidence indicates that the biomass of this stock is likely to be depleted and the stock is therefore considered to be recruitment impaired.

The commercial harvest of Spanish Mackerel on the east coast is primarily managed through a total allowable catch (TAC) limit and Individual Transferable Quotas (ITQs). These systems date back to 2004 and their introduction coincided with the rezoning of the Great Barrier Reef Marine Park. These reforms contributed to a substantial reduction in participation rates which declined from 542 commercial operators reporting Spanish Mackerel catch in 1997–98 to less than 180 over the post-2004 period [Jacobsen et al. 2019; Tanimoto et al. 2021].

Further management reforms were introduced into Queensland's fishery across 2022 and 2023 in response to the low biomass estimates [Tanimoto et al. 2021]. These reforms included: a) two three-week closed seasons in waters off the state's north starting in October 2022, and two three-week closed seasons in southern waters starting in February 2023, both occurring annually; b) reducing the annual total allowable commercial catch from 578 tonnes to 165 tonnes; and c) reducing the recreational in-possession limit from three per person and six per boat to one per person and two per boat. These measures aim to protect vulnerable spawning aggregations in north Queensland and reduce total rates of fishing mortality.

The level of fishing mortality under the reformed management framework is expected to allow the stock to recover from its recruitment impaired state. However, measurable improvements in biomass are yet to be detected.

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

Gulf of Carpentaria

The Gulf of Carpentaria (Queensland) Spanish Mackerel management unit has a commercial line and net component—the Gulf of Carpentaria Line Fishery and the Gulf of Carpentaria Inshore Fishery, respectively. Harvests by sector are approximately 97% commercial, 2% recreational and 1% charter [Webley et al. 2015; Langstreth et al. 2018; Bessell-Browne et al. 2020]. Of the reported commercial harvest, approximately 80% is taken by line fishers with the remaining 20% caught by gillnet. The indigenous catch for this management unit is considered negligible [Henry and Lyle 2003; Tanimoto et al. 2021].

Fishing mortality for the Queensland Gulf of Carpentaria stock has exceeded recommended levels for most of the previous decade. The latest stock assessment model estimated that the overall population size of Spanish Mackerel in the Queensland Gulf of Carpentaria is small (unfished biomass between 1,150 to 1,350 t). This assessment further concluded that the stock could only

maintain a relatively small harvest [Bessell-Browne et al. 2020]. The model results suggest an equilibrium Maximum Sustainable Yield (MSY) biomass of 29% of unfished spawning biomass at a harvest rate of 228 t per year (all sectors). When compared, commercial harvests were above the estimated MSY for nine of the past 15 years (since 2006–07).

The annual Spanish Mackerel catch in the Gulf of Carpentaria declined from 323 t to 227 t from 2008–09 to 2009–10. Harvest levels for the post-2010 period have remained low; albeit it with a higher degree of variability (range = 176 to 281 t). The majority of Spanish Mackerel harvest is taken by line operations. Participation (number of licences) and effort (days fished) in the line sector declined from the mid-1990s to the mid-2010s before stabilising [Bessell-Browne et al. 2020]. However, data collected since 2010 has shown that the standardised catch rates in this sector have continued to decline (data up to 2018) [Bessell-Browne et al. 2020]. While effort levels in the gillnet sector have shown a degree of variability, nominal catch rates have also declined from a peak in 2013–14. The above evidence indicates that the current level of fishing mortality is likely to cause the stock to become recruitment impaired.

The most recent stock assessment [Bessell-Browne et al. 2020] estimates that biomass in 2018 was between 29% and 40% of the unfished (1940) level. Model results suggested that biomass declined to 60% of unfished spawning biomass between 1940 and 1995 and, although variable, has continued to decline. The downward trend in biomass has been particularly steep over the post-2011 period. O'Neill et al [2018] recommended a more precautionary limit reference point of 25–30% unfished spawning biomass be used to account for a reduction in the spawning potential due to the harvesting of large mature fish and catch hyperstability. The lower biomass estimate for the Gulf of Carpentaria Spanish Mackerel stock has now reached the biological limit suggested by O'Neill et al [2018] with standardised catch rates confirming a downward biomass trend over the 2011 to 2018 period [Bessell-Browne et al. 2020]. Nominal catch rates to 2021–22 also indicate a declining biomass trend.

Length and age frequencies from routine fishery-dependent monitoring of commercial line catches from 2007 to 2022 indicate relatively consistent recruitment. Length and age compositions for most years shows that the majority of the catch since 2007 consists of fish between 2–6 years of age [Langstreth et al. 2018]. While length and age structures suggest recruitment was limited in 2018 and 2019, these events may have been exacerbated by extreme ocean warming events during 2015 and 2016 [Benthuisen et al. 2018]. Extreme increases in water temperature can negatively impact the reproductive output of many tropical fish species [Pankhurst and Munday 2011] and conditions observed in the Gulf of Carpentaria during 2015–16 may have exacerbated the effects of declining biomass over the post-2017 period. Of notable importance, length and age data shows that recruitment improved and was more consistent from 2020 onwards. This data indicates that stock recruitment is unlikely to be impaired despite the observed decline in biomass. The key caveat being that recruitment to this stock is likely subject to environmental perturbation.

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

**Mackerel
Managed
Fishery**

The Western Australian Mackerel Managed Fishery (MMF) predominantly targets Spanish Mackerel (*Scomberomorus commerson*). An age-based assessment of Spanish Mackerel in Western Australia is currently underway. The previous assessment, conducted during 1999–2002 when catches were higher than current levels, used catch and effort, biological information, age structure data, and yield-per-recruit modelling indicating the stock was sustainable and could sustain a high level of fishing [Mackie et al. 2003]. Ongoing Catch-MSY analysis (SimpleSA package) infers the Western Australia stock is likely to be above the target biomass and is stable at current catch levels, which are below the estimated MSY.

Catch and fishing effort throughout the MMF have been relatively stable since 2006, following the introduction of quotas and reductions in vessels due to management changes, with total catches mostly within the tolerance range (246–430 t) [Newman et al. 2023]. The catch rates for the two main northern fishery areas (Kimberley and Pilbara, covering Exmouth to the Northern Territory border), have declined over recent years due mainly to major changes in operators, but remain above historical levels, indicating a relatively high but possibly declining abundance of Spanish Mackerel in these management areas. Catch rates in the southern (Gascoyne–West Coast) area have declined in recent years, after the influence of the 2011 heatwave that apparently increased abundance of Spanish Mackerel for a period in southern WA [Pearce et al. 2011]. Additionally, the average sizes recorded in the commercial and charter catches have been stable since 2006 and the catch distributions have not markedly changed over this period. Thus, based on the available information, the weight of evidence assessment [Lewis 2020] determined it is likely that there is an acceptable moderate depletion of the stock. The above evidence indicates that the biomass of this stock is unlikely to be depleted.

The total commercial catch of Spanish Mackerel in Western Australia for 2021 was 238 t, below the tolerance range of 246–430 t. Apart from 2021 and a similar catch in 2018, the catches have been within the tolerance range for most years since management changes in 2006. The charter catch has been stable since 2008, between 14–20 t. The estimated boat based recreational fishing harvest weights of Spanish Mackerel have declined from 69–109 t to 35–78 t (95% confidence intervals), between the 2011–12 to 2020–21 statewide surveys, respectively [Ryan et al. 2022]. The lower recent recreational catch estimate can be attributed in part to declining recreational effort levels in the northern bioregions, and also to a likely lower abundance associated with lower water temperatures in the West Coast Bioregion, as is reflected in the lower commercial catches and catch rates. A PSA and previous Yield Per Recruit (YPR) analysis suggests the species has a low risk of overexploitation with appropriate management. The minimum size limit for Spanish Mackerel in Western Australia (900 mm TL) is similar to the size at maturity for this species [Mackie et al. 2003], which helps with sustainability as commercial line fishers avoid areas with undersize fish and means that the spawning stock is essentially the same as the exploited stock. Thus, the weight of evidence assessment concluded the current management settings are maintaining risk to the stock at acceptable, medium levels. 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 Mackerel Managed Fishery (Western Australia) management unit is classified as a **sustainable stock**.

Northern Territory

The harvest of Spanish Mackerel in the Northern Territory is managed through a catch-sharing arrangement between all user groups [NTG 2009]. This agreement aims to maintain the cumulative harvest of Spanish Mackerel within a precautionary allowable catch of 450 t per annum. The proportion of the allowable catch allocated to each user group was based on historical logbook data and catch estimates from the National Recreational and Indigenous Fishing Survey [Henry and Lyle 2003] as follows: 76% (342 t) to Spanish Mackerel Fishery licensees, 3% (13.5 t) to Offshore Net and Line Fishery licensees, 1% (4.5 t) to Demersal Fishery licensees, 3% (13.5 t) to Fishing Tour Operator licensees, 16% (72 t) to recreational fishers and 1% (4.5 t) to Indigenous fishers.

The cumulative catch by all sectors ranged from 319 to 560 t, at an annual average of 441 t for the 10 years spanning 2013–22. The proportion of the catch caught by each sector during this time approximated the allocations described above (i.e. 71%, 4%, < 1%, 3%, 13% and 2%, respectively).

The most recent assessment of the Spanish Mackerel resource in the Northern Territory (using data to 2019) indicated that stocks are unlikely to have dropped below 68% of the unfished biomass and that the biomass at the conclusion of 2019 was 72% of the unfished level [Grubert et al. unpublished]. The above evidence indicates that the biomass of this stock is unlikely to be depleted.

The same assessment indicated that the relative fishing mortality rate (i.e. U_{2019}/U_{MSY}) in 2019 for the Northern Territory stock of Spanish Mackerel was 0.43, less than half of the rate required to achieve MSY. The current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, Spanish Mackerel in the Northern Territory is classified as a **sustainable stock**.

Torres Strait Spanish Mackerel Fishery

Spanish Mackerel in Torres Strait comprise a separate biological stock from Spanish Mackerel on the Queensland east coast and those further west across northern Australia [Begg et al. 2006; Buckworth et al. 2007; Williams et al. 2022].

An updated stock assessment was conducted in 2021, using data to 2020–21 [O'Neill et al. 2022] and combinations of two historical catch series and three values for natural mortality in six model scenarios to form a grid of likely outcomes for the stock. The median spawning biomass in 2020–21 was 29% of the unfished (1940) level across 6 model scenarios (ranging from 18% to 48%) [O'Neill et al. 2022]. All 6 model scenarios were above the agreed limit reference point (LRP) of 20% of unfished level, although the lower confidence intervals for some models did fall below the LRP [O'Neill et al. 2022]. The updated estimate of median spawning biomass is higher than the 2019 estimate (23%) but slightly lower than the 2020 estimate (30%). This is in part due to a recent increase in standardised catch per unit effort [CPUE] rates following a period of decline (since 2009–10), and evidence for recent recruitment returning to about average levels [O'Neill et al. 2022]. The above evidence indicates that the biomass of the stock is unlikely to be depleted.

Spanish mackerel harvest in the Torres Straits peaked at 300 t in the 2005 fishing year, prior to fishery quota and allocation reforms. Since 2007, commercial harvests have declined to below the maximum sustainable yield [MSY] of 131 t [Butler et al. 2022]. In 2020–21, the total available commercial

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catch [TACC] was 74 t, after deducting the predicted traditional catch (15 t) and recreational catch (5 t) from the recommended biological catch [RBC] of 94 t [AFMA 2020]. Total catch in 2020–21 fishing season was 32.3 t (55.7 t in 2019–20) [Butler et al. 2022], and below the TACC. This level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

The impact of environmental factors on the stock, the potential for hyperstability in catch rates and declining CPUE are some causes for concern for the stock and will require further investigation and monitoring [AFMA 2021; O’Neill et al. 2022]. However, the above evidence indicates that the biomass of this stock is unlikely to be depleted and this level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

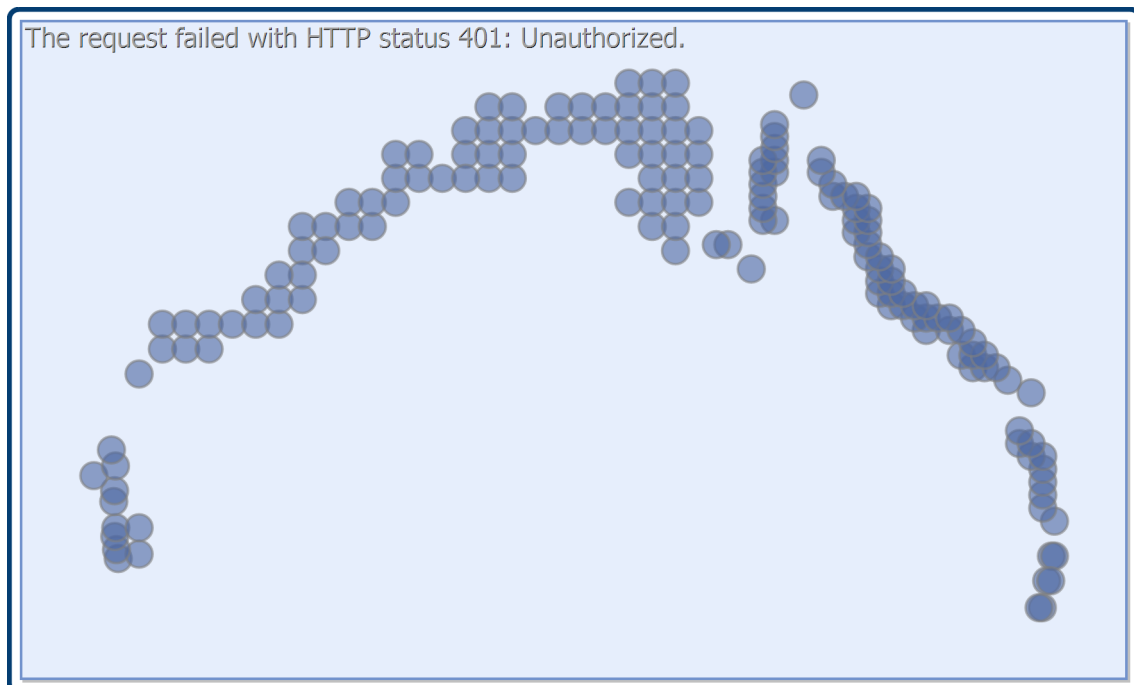
On the basis of the evidence provided above, the Torres Strait Spanish Mackerel Fishery biological stock is classified as a **sustainable stock**.

BIOLOGY

Spanish Mackerel biology [McPherson 1992; McPherson 1993; QDAFF 2013]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Spanish Mackerel	26 years, 2,400 mm FL	2 years, 800 mm FL

DISTRIBUTION



Distribution of reported commercial catch of Spanish Mackerel

TABLES

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Fishing methods					
	Commonwealth	New South Wales	Northern Territory	Queensland	Western Australia
Charter					
Handline		✓		✓	✓
Hook and Line		✓	✓	✓	✓
Spearfishing					✓
Commercial					
Drifting longline		✓			
Gillnet			✓		
Hand Line, Hand Reel or Powered Reels					✓
Hook and Line		✓			
Line				✓	✓
Net				✓	
Trolling		✓	✓		✓
Unspecified	✓		✓		
Various		✓			
Recreational					
Handline		✓	✓	✓	✓
Hook and Line			✓	✓	
Spearfishing		✓	✓	✓	✓

Management Methods					
	Commonwealth	New South Wales	Northern Territory	Queensland	Western Australia
Charter					
Bag and possession limits		✓			
Bag limits		✓			
Bag/possession limits				✓	
Gear restrictions		✓	✓	✓	
Licence		✓			
Limited entry			✓		

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Marine park closures		✓			
Possession limit			✓		
Seasonal or spatial closures				✓	
Size limit		✓			✓
Size limits				✓	
Spatial closures		✓	✓		✓
Spatial zoning					✓
Vessel limits			✓		
Commercial					
Catch restrictions			✓		
Gear restrictions		✓	✓	✓	
Harvest Strategy				✓	
Individual transferable quota				✓	
Limited entry	✓	✓	✓	✓	✓
Marine park closures		✓			
Processing restrictions				✓	
Quota					✓
Rotational closures				✓	
Seasonal or spatial closures				✓	
Size limit	✓	✓			✓
Size limits				✓	
Spatial closures	✓	✓	✓		✓
Total allowable catch				✓	
Vessel restrictions	✓	✓	✓	✓	✓

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Recreational					
Bag and possession limits		✓			
Bag limits		✓			✓
Bag/possession limits				✓	
Gear restrictions		✓	✓	✓	
Licence		✓			✓
Marine park closures		✓			
Possession limit			✓		✓
Seasonal or spatial closures				✓	
Size limit		✓			✓
Size limits				✓	
Spatial closures		✓	✓		✓

Catch	Commonwealth	New South Wales	Northern Territory	Queensland	Western Australia
Charter			8.6 t	Unknown	14 t
Commercial	53.2 t	7.35945 t	307.058 t	483.97 t	228.496 t
Indigenous		Unknown	Unknown	Negligible	Unknown
Recreational		26 t (in 2013–14)	45 t (+/- 14 t se, 2018–19)	171 t (in 2019–20)	56 t (+/- 11 t se, 2020–21)

Commonwealth – Commercial (Active vessels). Total number of TIB licences; this is not an indicator of licence activity.

Commonwealth – Commercial (Management Methods/Catch). Data provided for the Commonwealth align with 2021–22 financial year.

Commonwealth – Recreational. The Australian Government does not manage recreational fishing, including charter fishing, in Commonwealth waters. Recreational and charter fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters, under its management regulations.

Commonwealth – Indigenous. (a) 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. In the Torres Strait, both commercial and non-commercial Indigenous fishing is managed by the Torres Strait Protected Zone Joint Authority (PZJA) through the Australian Fisheries Management Authority (Commonwealth); the Department of Agriculture, Fisheries and Forestry (Queensland); and the Torres Strait Regional Authority. The PZJA also manages non-Indigenous commercial fishing in the Torres Strait; and (b) 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.

Western Australia – Recreational (Catch). Western Australian boat-based recreational catch surveys from 1 Sept 2020–30 Aug 2021 [Ryan et al 2022]. Shore-based recreational catches are largely unknown.

Western Australia – Recreational (Management Methods). Western Australian boat-based recreational licence required.

Western Australia – Charter (Catch). Estimate based on numbers of fish caught multiplied by their average weight.

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.”

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

Queensland – Recreational Fishing (Catch). Data are based at the whole of Queensland level and derived from state-wide 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 presented as number of fish.

Queensland – Commercial (Catch). Queensland commercial and charter data have 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>

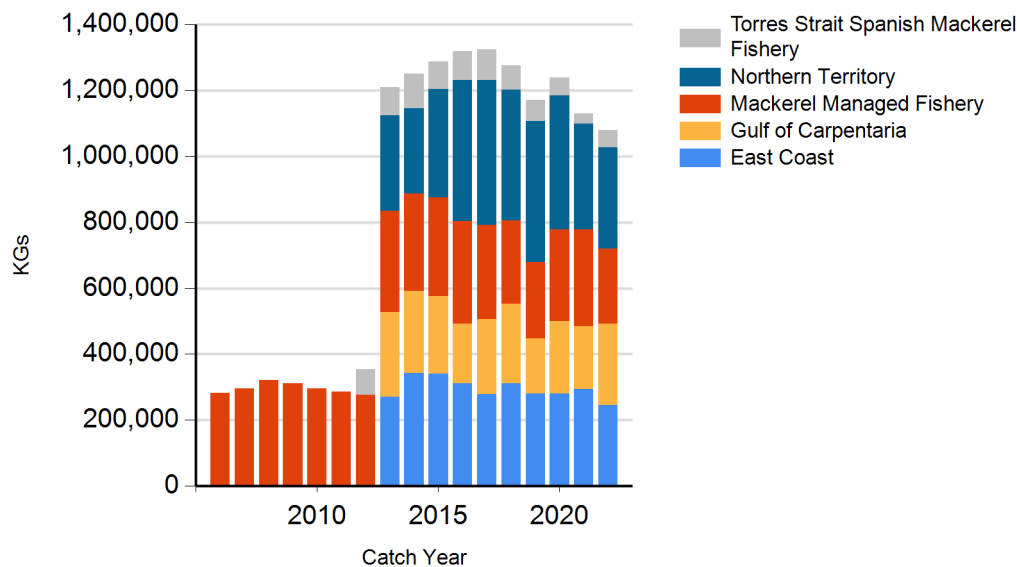
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New South Wales – Recreational (Catch). Murphy et al. [2020].

New South Wales – Indigenous (Management Methods). More information available at: <https://www.dpi.nsw.gov.au/fishing/aboriginal-fishing>

CATCH CHART

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Commercial catch of Spanish Mackerel - note confidential catch not shown. Years shown on this graph are Australian financial years (e.g. 2015 refers to the financial year beginning 01 July 2014 and ending 30 June 2015).

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