Mulloway (2020)

Argyrosomus japonicus

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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia	Sustainable	Catch MSY, Catch, CPUE
Queensland	Queensland	Undefined	
New South Wales	New South Wales	Depleted	Catch, Catch rates, Size Composition, Yield-per-recruit, Mortality Rates, Spawning Potential Ratio
South Australia	South Australia	Sustainable	Catch, CPUE, age structure

STOCK STRUCTURE

Mulloway has a wide distribution in Australia, from the Gascoyne region on the west coast of Western Australia, around the southern coasts of the continent, and up to the Wide Bay–Burnett region on the east coast of Queensland [Kailola et al. 1993].

Biological stock structure for Mulloway in Australia is uncertain. It has been suggested that a single panmictic population occurs in Australia [Archangi 2008]. However, regional differences in genetics, and otolith morphology and chemistry suggest sub-structuring between populations in New South Wales, South Australia and Western Australia [Barnes et al. 2015, Ferguson et al. 2011].

Here, assessment of stock status for Mulloway is presented at the jurisdictional level—Western Australia, Queensland, New South Wales and South Australia.

STOCK STATUS

New South Commercial landings of Mulloway in New South Wales steadily declined from

Wales

almost 400 t in the mid-1970s to a historic low of 37 t in 2008–09, and have been less than 100 t per year since the mid-1990s [Hughes 2020]. In 2019, the total State-wide commercial catch was 48 t. No trends are evident in commercial CPUE for the two main fishing methods, estuary mesh netting and ocean line fishing since 2009 [Hughes 2020]. The most recent estimate of the recreational harvest of Mulloway in NSW was approximately 12 000 fish weighing an estimated 90 t during 2017–18 [Murphy et al. 2020]; greater than the commercial catch (72 t) in the same period [Hughes 2020]. This estimate only encompassed harvest from NSW households within which a long-term (1-3 year) Recreational Fishing Fee licence holder resided (RFL household). Re-analysis of the previous survey done during 2013–14 [West et al. 2015] for all NSW residents, to allow a comparison with the recent survey, produced an estimate of approximately 19 000 Mulloway harvested by RFL households during 2013–14 [Murphy et al. 2020]. In 2000–01 the National Recreational and Indigenous Fishing Survey [Henry and Lyle 2003] estimated recreational harvest by all fishers in NSW waters at approximately 117 000 fish, noting that this estimate was for a species grouping 'Mulloway/jewfish' which encompassed related species, including teraglin (*Atractoscion atelodus*). While these survey results are not directly comparable due to different sampling frames, the two most recent surveys likely represent a decline in recreational harvest through time. The annual average lengths of Mulloway landed by the commercial fishery have declined since the mid-1990s, but have been stable since the mid-2000s except for the effect of increasing the legal minimum length in 2013 [Silberschneider and Gray 2005, Silberschneider et al. 2009, Hughes 2020]. Up until 2016–17, the New South Wales commercial Mulloway fishery was based largely on juveniles, and the truncated length composition of fish in commercial landings since the early-2000s was indicative of a heavily fished stock (around 80 per cent of catch was less than 700 mm, the approximate length at maturity for female Mulloway in New South Wales) [Silberschneider and Gray 2005, Silberschneider et al. 2009, Hughes 2020]. Only since 2015–16 has the average length of Mulloway in the commercial fishery increased to be greater than 700 mm and only since 2017–18 has the proportion of fish in the landed catch < 700 mm fallen below 10% [Hughes 2020].

Fishing mortality has been consistently estimated to be several times greater than natural mortality over the past 10 years [Hughes 2020]. Since the early-2000s, the spawning potential ratio (SPR) for Mulloway in New South Wales has been consistently estimated to be below the threshold reference point of 20 per cent with reasonable probability indicating that there may be a risk of recruitment failure [Goodyear 1993, Mace and Sissenwine 1993]. SPR for Mulloway is currently estimated to be between 10 and 27 per cent [Hughes 2020]. This SPR estimate (less than 20 per cent virgin level with reasonable probability) infers low spawning stock biomass at all plausible estimates of M. The above evidence indicates that the biomass of the part of the stock that occurs in New South Wales waters is likely to be depleted and that recruitment is likely to be impaired.

In 2013, a recovery program for Mulloway was introduced in New South Wales designed to arrest the decline in commercial and recreational Mulloway fisheries. Management changes to the recreational fishery included an increase in legal minimum length from 450 to 700 mm and a 60 per cent reduction in the daily bag limit. Management changes to the commercial fishery included the above increase in legal minimum length (with bycatch allowances of fish between 450 and 700 mm TL for the estuarine mesh net fishery) and a 500 kg trip limit for the beach-hauling net sector. In 2018, the recreational bag limit was reduced further to one fish per person and the bycatch allowance for undersized fish in the commercial estuarine mesh net fishery was removed. The above evidence indicates that current fishing mortality is constrained by management to a level that should allow the stock to recover from its recruitment impaired state; however measurable improvements are yet to be detected.

On the basis of the evidence provided above, Mulloway in New South Wales is

classified as a **depleted stock**.

Queensland

Mulloway are predominantly taken by recreational anglers in Queensland, who harvested an estimated 16 000 fish in 2013–14 (around 98 t based on a mean weight of 6.1 kg) [Webley et al. 2015]. The species is a minor component of the commercial East Coast Inshore Fin Fish Fishery (ECIFFF), with around 5.6 t taken by net and line fishing in this fishery in 2019, and a ten-year annual average catch of 8.6 t [QFISH 2020]. In 2019, the total State-wide commercial catch was 8.89 t. The legal minimum length for Mulloway in Queensland was raised from 450 to 750 mm total length (TL) in 2009, which likely reduced fishing-related mortality, especially for juveniles. There is no published assessment of this species in Queensland, and there are no data available to estimate biomass or exploitation rates. In addition, there is no knowledge on recruitment or harvestable biomass. This prevents assessment of current stock size or fishing pressure. Consequently, there is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, Mulloway in Queensland is classified as an **undefined stock**.

South Australia

The Lakes and Coorong Fishery (LCF) has historically been the most productive of South Australia's fisheries for Mulloway, and contributed 93 per cent of the State's total commercial catch of the species in 2018–19. Small catches are also taken by the Marine Scalefish Fishery (MSF). The most recent assessment for Mulloway in the LCF was completed in 2020, and used a weight-of-evidence approach that considered fishery data and fishery age structures to the end of June 2019 [Earl 2020].

The primary indicators for biomass and fishing mortality are total catch, targeted CPUE from commercial gillnet fishers and fishery age structures. Commercial landings of Mulloway in South Australia peaked at 145 t in 2000–01 and then progressively declined to 22 t in 2010–11. This downward trend was associated with a decline in targeting of Mulloway using gillnets in the LCF during the Millennium Drought (2000s) and likely reflected a decline in fishable biomass in the Coorong estuary [Earl 2020]. Since then, higher catches by the LCF have contributed most to moderately high state-wide landings, including short-term peaks of of 108 t and 127 t in 2012–13 and 2017–18, respectively. The total state-wide catch of 117 t in 2018–19 was the third highest on record. The recent high catches have been associated with historically high gillnet CPUE in the LCF and likely reflect high abundance of Mulloway in the Coorong estuary. The state-wide recreational catch of Mulloway was estimated at 60 t in 2013–14, which represented approximately 46 per cent of the State-wide harvest [Giri and Hall 2015].

Annual age structures for Mulloway from the Coorong estuary have been stable since 2001–02 (i.e. dominated by juveniles) and are consistent with those for Mulloway from other estuaries around Australia [Silberschneider et al. 2009; Stewart et al. 2020]. The 2019–20 age structure included 2–8 year old fish and was dominated by three (36 per cent) and four (30 per cent) year olds that originated from spawning during 2016–17 and 2015–16, respectively. The lack of older fish in the age structure likely relates to an ontogenetic migration of individuals from the Coorong estuary to the adjacent marine environment, and the removal of older fish by fishing. Nevertheless, the presence of multiple age classes in the age structure from the estuary in 2019–20 indicates that recruitment has occurred in recent years.

Since 2001–02, annual age information for Mulloway from the nearshore marine environment adjacent the Coorong estuary has been limited due to the small number of samples and small sample sizes available in most years. The age structure of fish from commercial and recreational catches in 2019–20 was based on a moderate sample size (n=72), and showed similar patterns to

several periods during the previous two decades. These Mulloway had a wide range of estimated ages (5–24 years), were dominated by 6–9 year olds and comprised mostly (> 97 per cent) of individuals above the age at maturity (5–6 years). Fish older than 11 years were rare despite the potential for this species to reach 41 years of age in SA. The lack of older fish in the age structure likely relates to the removal of older fish by fishing and may also reflect an extended period of poor recruitment during the Millennium Drought (2000s).

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 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, Mulloway in South Australia is classified as a **sustainable** stock.

Western Australia

The majority of Mulloway catches in WA are landed by commercial fishers, making up approximately 70-80 per cent of the total catch over the last ten years [Gaughan and Santoro, 2020]. Annual commercial catches have declined from around 60 t in 2001–02, but have remained relatively steady since 2007–08 at 11–28 t. In 2019, the total State-wide commercial catch was 13 t. The recent lower catch levels are associated with reductions in fishing effort by the main demersal fisheries that catch Mulloway (the West Coast Demersal Scalefish (Interim) Managed Fishery (WCDSIMF) and Gascoyne Demersal Scalefish Managed Fishery (GDSMF) [Gaughan and Santoro, 2020]. Boat-based recreational and charter catches of Mulloway remain low, i.e. < 10 t per year, with most landed in the Gascoyne and West Coast Bioregions [Gaughan and Santoro, 2020; Ryan et al. 2019]. Shore-based recreational catches of Mulloway are unknown.

At the Western Australia stock level, catch per unit effort (CPUE) of Mulloway derived from line fishing methods has remained low since 2008 (after management changes to the WCDSIMF and GDSF) at approximately 2–6 kg per block day (reporting blocks are 60nm×60nm) [DPIRD, unpublished data]. This reflects the low level of commercial targeting of this species. CPUE of those two main fisheries that land Mulloway has been highly variable in the last 10 years. Although CPUE has increased slightly in recent years, this was mostly in the West Coast Bioregion and is not reflected in substantial increases in catch or from changes in targeting [DPIRD, unpublished data].

A data-limited Catch-MSY model of the Western Australian stock of Mulloway produced an MSY of 36 t (95 per cent CLs: 25–49 t) and annual catches have fluctuated within or below this band since 1975–76, except for between 1999 and 2002 [DPIRD, unpublished data]. Estimated fishing mortality experienced by the stock in 2018 was 0.05 year[-1] (95 per cent CLs: 0.03 to 0.12 year[-1]). As the upper 95 per cent CL of this performance indicator is below the estimated level of FMSY (0.15 year[-1]), the stock is unlikely to deplete to a level at which recruitment could be impaired if the current level of catch is maintained. The point estimate for relative stock biomass in 2018 (the depletion level) was 0.66 of the estimated unfished level (95 per cent CLs = 0.38–0.79) [DPIRD, unpublished data]. The point estimate of this performance indicator was above the threshold of 0.5 (BMSY), and the target is considered as any stock biomass level above BMSY. 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 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, Mulloway in Western Australia is classified as a **sustainable stock**.

BIOLOGY

Mulloway biology [Farmer 2008, Ferguson et al. 2013, Silberschneider and Gray 2008]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Mulloway	42 years, 2000 mm TL	2–6 years, 510–1070 mm TL

DISTRIBUTION

Distribution of reported commercial catch of Mulloway

TABLES

Fishing methods				
	New South Wales	Queensland	South Australia	Western Australia
Charter				
Hook and Line	✓			
Rod and reel				✓
Commercial				
Beach Seine				✓
Dropline				✓
Fish Trap	✓			
Gillnet			✓	✓
Hand Line, Hand Reel or Powered Reels				✓
Handline			✓	
Haul Seine	✓			✓
Hook and Line	✓			
Line		✓		✓

Mesh Net	✓			
Net		✓		
Otter Trawl	✓			✓
Seine Nets			✓	
Set longline			✓	
Unspecified			✓	
Various	✓			
Recreational				
Gillnet			✓	
Hook and Line	✓	✓	✓	✓
Spearfishing	✓	✓		

Management Methods				
	New South Wales	**Queensland**	**South Australia**	**Western Australia**
Charter				
Bag limits	✓			✓
Gear restrictions	✓	✓		
Licence	✓			✓
Limited entry				✓
Marine park closures	✓	✓	✓	✓
Passenger restrictions				✓
Possession limit	✓	✓		✓
Size limit	✓	✓		✓
Spatial closures	✓	✓		
Temporal closures		✓		
Commercial				
Bycatch limits	✓			
Catch limits	✓			✓
Effort limits	✓		✓	✓
Gear restrictions	✓	✓	✓	✓
Limited entry	✓	✓	✓	✓
Marine park closures	✓	✓	✓	
Size limit	✓	✓	✓	✓
Spatial closures	✓	✓	✓	✓

Temporal closures			✓	
Vessel restrictions	✓			✓
Recreational				
Bag limits	✓		✓	✓
Gear restrictions	✓	✓	✓	
Licence	✓			
Licence (boat-based sector)				✓
Marine park closures	✓	✓	✓	✓
Possession limit	✓	✓		✓
Size limit	✓	✓	✓	✓
Spatial closures	✓	✓	✓	
Temporal closures		✓	✓	

Catch				
	New South Wales	Queensland	South Australia	Western Australia
Charter				2 t
Commercial	47.778 t	8.88855 t	116.974 t	12.8371 t
Indigenous	Unknown	Unknown	Unknown	Unknown
Recreational	12,135 (± 2,744) individuals (90 t) in 2017-18	98 t (in 2013–14)	60 t (in 2013–14)	2 t (2017/18)

Western Australia – Recreational (Catch totals) Shore based catches are unknown, thus landings are likely to be underestimated.

Western Australia – Indigenous (Management methods) 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.

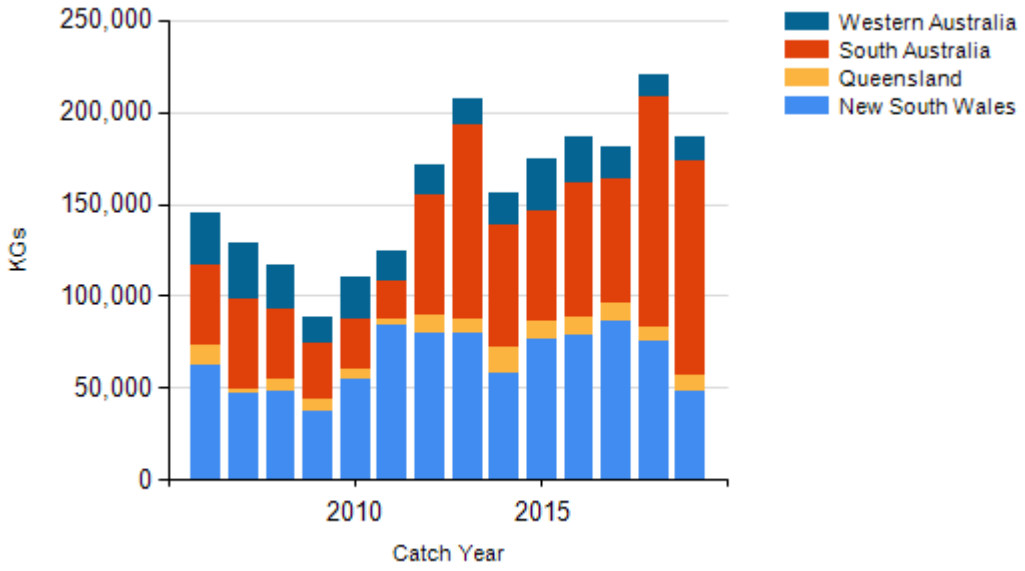
Queensland – Indigenous (management methods) for more information see https://www.daf.qld.gov.au/business-priorities/fisheries/traditional-fishing

New South Wales – Commercial (Management methods) Fishers using haul nets in the New South Wales commercial Ocean Hauling Fishery are permitted a bycatch allowance of 500 kg of Mulloway per day.

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

New South Wales – Indigenous (management methods)
https://www.dpi.nsw.gov.au/fishing/aboriginal-fishing

CATCH CHART



Commercial catch of Mulloway - note confidential catch not shown

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