

Sea Mullet (2020)

Mugil cephalus



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia	Sustainable	Catch
Queensland, New South Wales	Eastern Australia	Sustainable	Spawning stock biomass, Catch, CPUE, Length and age compositions

STOCK STRUCTURE

Sea Mullet (*Mugil cephalus*) was formerly regarded as a single species with a global distribution; however recent genetic evidence indicates that they are in fact a complex of many cryptic species. Sea Mullet along the west and east coasts of Australia are regarded as distinct species [Durand et al. 2012, Krück et al. 2013]. The population structure within Western Australia is yet to be fully examined but given the extensive coastline and wide latitudinal range, it is possible that this jurisdiction hosts more than one biological stock (or species). Given this uncertainty, Sea Mullet within each Bioregion are currently managed as separate units. Limited tagging and genetic studies [Thomson 1951, Watts and Johnson 1994] suggest mixing of fish throughout the West Coast Bioregion (WCB), where the majority of the catch is taken. Extensive tagging studies [Kesteven 1953] suggest a single east coast biological stock of Sea Mullet, extending from central Queensland to eastern Victoria.

Here, assessment of stock status is presented at the jurisdictional stock level for Western Australia and the biological stock level for Eastern Australia.

STOCK STATUS

Eastern Australia

This cross-jurisdictional biological stock has components in Queensland and New South Wales. Each jurisdiction assesses the part of the biological stock that occurs in its waters. The status presented here for the entire biological stock has

been established using evidence from both jurisdictions.

The Queensland component of the Eastern Australia biological stock has a long history of stable commercial landings, with current harvest sitting slightly above pre-1980s averages. However, due to unfavourable weather conditions in 2019, a substantially reduced harvest of 750 tonnes (t) was seen, particularly in the Fraser region in the northern reaches of the Queensland stock. This reduced harvest sits well below the long-term average of around 1 928 t (1988–2019) and roughly half the previous year (1 416 t, 2018). Length frequency information from routine monitoring shows stable distributions of fish sizes harvested by the Queensland fishery [QFISH 2020]. Age frequency information shows fish from three to five years old dominate catches, but older fish are present, and recruitment has been consistent with evidence of recent strong year classes. Results from the most recent stock assessment suggested gear-specific harvesting of varying age and length classes, with the Ocean Beach sector harvesting large females and a greater proportion of older fish [Lovett et al. 2018]. Indications of temporal cyclic recruitment since 1990 have produced a similar pattern in exploitable biomass. Biomass was estimated to be around 50 per cent in 2016, an increase from previous estimates of 40 per cent in 2009 and the mid 1990s (Lovett et al. 2018). The above evidence indicates that the biomass of the Queensland component of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Nominal effort in the Queensland component of the fishery has reduced markedly from 7 563 days in 2015 to 4 918 in 2019, and the number of fishers reporting '*Mullet - (unspecified)*' catch has reduced from 250 fishers to 201 fishers over the same period [QFISH 2020]. Length frequency information shows an increase in the modes for the fishery, and catch is predominantly above minimum legal size. Age frequency information shows continued recruitment to the fishery and evidence of strong year classes. Estimated fishing mortality was high compared with estimates of natural mortality, but they show a stable trend in combination with consistent catches. The above evidence indicates that the current level of fishing pressure is unlikely to cause the Queensland component of the stock to become recruitment impaired.

The New South Wales component of the Eastern Australian biological stock is assessed annually in terms of landings and CPUE in both the estuary and ocean fisheries [Stewart 2020]. The annual spawning run fishery on ocean beaches is also assessed in terms of fish sizes and ages in landings. An age and sex structured population model using data up to 2016 indicated that the biomass of the entire exploitable stock was around 50 per cent of virgin levels in 2016 [Lovett et al. 2018]. Median catch rates in NSW post 2016 increased for the estuary fishery and increased then declined to around 2016 levels for the ocean hauling fishery [Stewart 2020] indicating that biomass has not declined since that time. Typical length and age frequency compositions were found in landings in 2017–18 and 2018–19, with most fish being between three and six years of age [Stewart 2020], suggesting no large changes in the stock. The above evidence indicates that the biomass of the New South Wales component of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

The total landed catch (NSW and QLD combined) in 2017–18 was approximately 4 114 t and in 2018–19 was approximately 3 817 t, and well below the estimates of MSY (range 6 000 to 6 700 t) [Lovett et al. 2018]. Landings in New South Wales in 2018–19 (2 650 t) were below the long-term (10 year) annual average (around 3 000 t). Fishing effort is constrained, with the reported number of fisher days in the ocean and estuarine fisheries in 2018–19 at historically low levels of approximately 490 and 11 500 respectively, down from around 1 000 and 15 000 days respectively in 2009–10 [Stewart 2020]. The size compositions of fish in ocean landings have remained stable, while the age compositions of fish in this fishery are generally between two and five years old, with some variations in year class strength [Stewart et al. 2018, Stewart 2020]. Relatively high levels of fishing mortality have been documented on the spawning run ocean beach fishery [Stewart et al. 2018]; however when

considered in combination with a complex life-history strategy that has evolved to promote population resilience and includes 'skipped breeding' partial migration, whereby a proportion of adult fish do not participate in the spawning run each year [Fowler et al. 2016], these periodic high levels of fishing mortality are sustainable. The above evidence indicates that the current level of fishing pressure is unlikely to cause the New South Wales component of the stock to become recruitment impaired.

On the basis of the evidence provided above, the entire Eastern Australian biological stock is classified as a **sustainable stock**.

Western Australia

The current assessment of Sea Mullet in south-west WA is primarily based on estimates of biomass. This performance indicator is periodically (at least every five years) compared to reference levels based on estimates of Maximum Sustainable Yield (MSY). The estimated biomass expected to achieve MSY (BMSY) is considered as the threshold reference level for the stock, and 50 per cent BMSY is set as the limit reference level.

A Catch-MSY model (CMSY; Froese et al. 2017) was fitted using catch data for Sea Mullet in south-west WA to estimate the MSY for the stock. Whilst outputs from the CMSY model were uncertain, the results suggest that annual catches have largely remained below the estimated MSY of 642 t over the history of the fishery. The model indicate that stock biomass gradually decreased from 1941 to the early 1980s as a result of increasing catches and exploitation up to, and briefly exceeding, the level expected to achieve MSY. A subsequent reduction in catches has resulted in the biomass rebuilding to 86 per cent of the unfished level in 2018. As the estimated value of this performance indicator is above the threshold, the stock is considered not to be depleted to a level at which recruitment could be impaired.

The fishing mortality of the stock in 2018 was estimated to be at 19 percent of the estimated fishing mortality at MSY (FMSY) of 0.31 year⁻¹, with an estimated probability of 100 percent that it is below this threshold reference level.

The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. The above evidence also 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 Western Australia jurisdictional stock is classified as a **sustainable stock**.

BIOLOGY

Sea Mullet biology [Virgona et al. 1998, Smith and Deguara 2002, Gaughan et al. 2006, Fisheries Queensland 2016]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Sea Mullet	Western Australia 12 years, 790 mm FL Eastern Australia 16 years, 640 mm FL	Western Australia Males and Females 370 mm TL Eastern Australia Males 300 mm TL, Females 330 mm TL

DISTRIBUTION



Distribution of reported commercial catch of Sea Mullet

TABLES

Fishing methods	New South Wales	Queensland	Western Australia
Commercial			
Beach Seine			✓
Gillnet			✓
Haul Seine	✓		✓
Line		✓	
Mesh Net	✓		
Net		✓	
Various	✓		
Recreational			
Beach Seine		✓	
Cast Net		✓	✓
Coastal, Estuary and River Set Nets			✓
Hook and Line	✓	✓	✓
Traps and Pots	✓		

Management Methods	New South Wales	Queensland	Western Australia

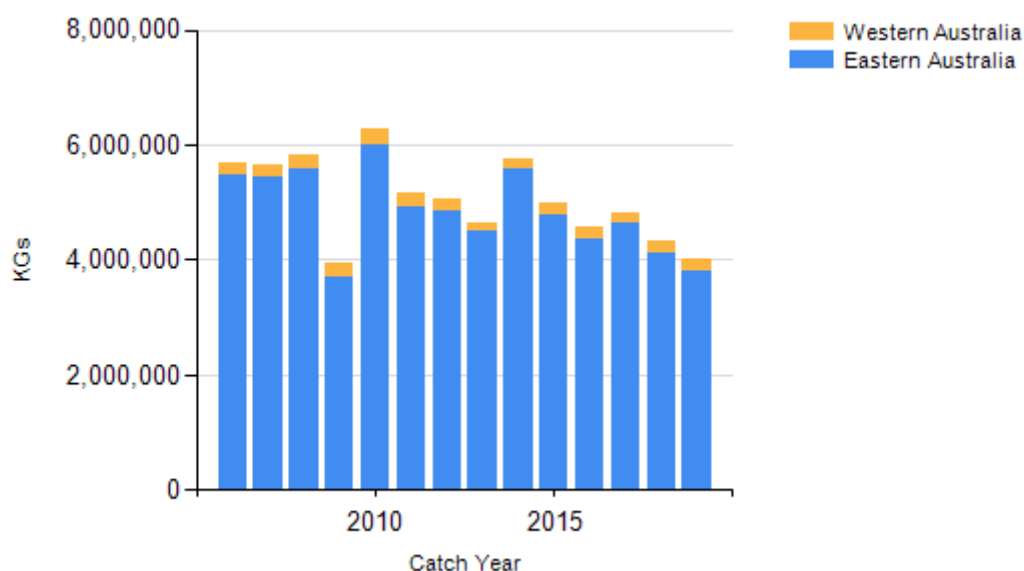
Charter			
Possession limit		✓	
Size limit		✓	
Commercial			
Gear restrictions	✓	✓	✓
Limited entry	✓	✓	✓
Marine park closures	✓		
Size limit	✓	✓	
Spatial closures	✓	✓	✓
Temporal closures	✓	✓	
Vessel restrictions	✓		✓
Recreational			
Bag and possession limits			✓
Bag limits	✓		✓
Gear restrictions	✓		✓
Licence	✓		✓
Marine park closures	✓		
Possession limit	✓	✓	
Size limit	✓	✓	
Spatial closures	✓		✓

Catch			
	New South Wales	Queensland	Western Australia
Commercial	2651 t	1166.14 t	194.761 t
Indigenous	Unknown	Unknown	Unknown
Recreational	Unknown	Negligible	Insufficient data

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

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

CATCH CHART



Commercial catch of Sea Mullet - note confidential catch & not shown

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