

# Sea Mullet (2018)

*Mugil cephalus*



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## STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Western Australia	EGBSMNMF, EGBSMNMF    FBLC19    FBLC84    SBBSMNMF    SCEMF    SWCBNF    WCBBFNMF    WCEMF    WL (NC, GC, WC)    WL (SC), FBLC19, FBLC84, SBBSMNMF, SCEMF, SWCBNF, WCBBFNMF, WCEMF, WL (NC    GC    WC), WL (SC)	Sustainable	Catch, CPUE
Queensland, New South Wales	Eastern Australia	ECIFFF, EGF, N/A, OHF	Sustainable	Catch, CPUE, length and age frequencies

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), OHF Ocean Hauling Fishery (NSW), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), EGBSMNMF Exmouth Gulf Beach Seine and Mesh Net Managed Fishery (WA), SBBSMNMF Shark Bay Beach Seine and Mesh Net Managed Fishery (WA), SCEMF South Coast Estuarine Managed Fishery (WA), SWCBNF South West Coast Beach Net Fishery (Order) (WA), WCBBFNMF West Coast (Beach Bait Fish Net) Managed Fishery (WA), WCEMF West Coast Estuarine Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA), FBLC19 Fishing Boat Licence Conditions (WA), FBLC84 Fishing Boat Licence Conditions (WA), WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions (WA), EGBSMNMF || FBLC19 || FBLC84 || SBBSMNMF || SCEMF || SWCBNF || WCBBFNMF || WCEMF || WL (NC, GC, WC) || WL (SC) Various Fisheries combined due to 3 boat rule (WA)

## STOCK STRUCTURE

Sea Mullet was formerly regarded as a single species with a global distribution. However, recent genetic evidence indicates that 'sea mullet' is actually a complex of many cryptic species. Sea Mullet along the west and east coasts of Australia are now regarded as distinct species [Durand et al. 2012, Krück et al.

2013].

Extensive tagging studies [Kesteven 1953] suggest a single east coast biological stock of Sea Mullet, extending from central Queensland to eastern Victoria. 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.

Here, assessment of stock status is presented at the biological stock level—Eastern Australia; and the jurisdictional stock level—Western 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 Australian biological stock has a long history of stable commercial landings. In 2017, 1 730 t was reported landed, which is below the long-term average of around 2 000 t. Length frequency information from routine monitoring shows stable distributions of fish sizes harvested by the Queensland fishery [QDAF 2018]. Age frequency information shows fish from three to five years old dominate catches, but older fish are present. Recruitment has been consistent, with evidence of recent strong year classes. 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 from 7 563 days in 2015 to 7 252 in 2017, and the number of fishers reporting mullet (unspecified) catch has reduced from 250 fishers to 244 fishers over the same period [QDAF 2018]. Length frequency information shows an increase in the modes for the fishery, and catch is well above minimum legal size. Age frequency information shows continued recruitment to the fishery and evidence of strong year classes. Estimates of fishing mortality are 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 et al. 2015]. The annual spawning run fishery on ocean beaches is also assessed in terms of fish sizes and ages in landings. Landings in New South Wales in 2016–17 (2 200 t) were below the long-term (10 year) annual average (around 3 000 t). The reported number of fisher days in the ocean and estuarine fisheries in 2016–17 were at historically low levels of approximately 417 and 13 000 respectively, down from around 1 000 and 15 000 days respectively in 2009–10. Typical length and age frequency compositions were found in landings in 2016–17, with most fish being between three and seven years of age [NSWDPI unpublished], 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.

Commercial median catch rates in the New South Wales component of the fishery have remained stable in the estuary fishery (kg per day of mesh netting) and increased slightly in the ocean fishery (kg per day of beach hauling) since

the early 1980s [NSWDPI unpublished]. 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. 2015, NSW DPI unpublished]. 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 Australia biological stock is classified as a **sustainable stock**.

## **Western Australia**

Sea Mullet occurs in all coastal regions of Western Australia, but commercial targeting of this species is mainly restricted to waters from Shark Bay southwards [Gaughan and Santoro 2018]. Recreational catches are estimated to be negligible in each Bioregion. The current assessment of Sea Mullet in each Bioregion is based on annual catch and catch per unit effort (CPUE) trends in the main commercial fisheries. The CPUE may not be a reliable index of abundance in each of the main fisheries due to the multi-species nature of these fisheries, which makes it difficult to quantify the effort targeted towards individual species. Biological sampling, including age structure, is currently underway to provide more information about stock status and population structure in Western Australia.

In recent years, the total annual commercial catch in Western Australia has been about 200 t. In three of the four Bioregions, the annual catch has declined by at least 75 per cent since the late 1970s, mostly due to commercial effort reductions in coastal and estuarine areas. The exception is the South Coast Bioregion (SCB) where catches have been stable. When viewed together, the long-term catch trends across all Bioregions suggest there may have been a southwards range shift by Sea Mullet in Western Australia since around 1980 in response to warming ocean temperatures. An abrupt change in Sea Mullet catch distribution immediately after the 2010–11 marine heatwave event along the west coast (i.e. a sharp decline in Gascoyne Coast Bioregion [GCB] catch and an increase in WCB catch) is consistent with a southwards range shift in response to warmer temperatures [Gaughan and Santoro 2018].

Commercial catches in the GCB have been declining since around 1980. The current GCB catch is about 50 t, which is low compared to the historical peak level of about 250 t in the early 1980s. Although there may have been some stock reduction due to climatic changes, most of the catch decline is attributable to declining effort levels. There has been declining market demand for Sea Mullet in this Bioregion, which has resulted in low targeting in recent years. The nominal annual CPUE in the main fishery (Shark Bay Beach Seine and Mesh Net Managed Fishery), which contributes about 95 per cent of the catch, has been relatively stable over several decades which suggests stable stock availability. Although the abundance trend in this Bioregion is uncertain, the current level of targeting is low compared to historical levels and this rate of fishing mortality is unlikely to cause the stock to become recruitment impaired.

Commercial catches in the WCB have also been declining since around 1980. This reflects a substantial reduction in effort due to fishery closures, licence buy-backs, and reduced targeting. The current WCB catch is about 125 t, which is low compared to the historical peak level of about 400 t during the late 1970s. The catch increased slightly over the past five years. The Peel-Harvey Estuary, which is part of the West Coast Estuarine Managed Fishery, now accounts for about 80 per cent of the catch within the Bioregion. The standardised annual CPUE in this estuary has been relative stable since 1980, apart from an

increasing trend in the past five years. The CPUE data suggests stable long-term stock availability, with a recent increase. The current WCB catch and effort are low compared to historical levels, and this rate of fishing mortality is unlikely to cause the stock to become recruitment impaired. Catch and CPUE both increased recently, which indicates the stock biomass is unlikely to be depleted and recruitment is unlikely to be impaired.

Commercial catches of Sea Mullet in the SCB have been stable since the late 1970s. Nominal annual CPUE in the main fishery (South Coast Estuarine Managed Fishery), which contributes > 95 per cent of the catch, has been stable over the past 20 years. This evidence indicates that biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the rate of fishing mortality in the SCB 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** [Fisheries Queensland 2016, Gaughan et al. 2006, Smith and Deguara 2002, Virgona et al. 1998]

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

Commercial Catch Methods	New South Wales	Queensland	Western Australia
Beach Seine			✓

Gillnet			✓
Haul Seine	✓		✓
Haul Seine/Beach Seine	✓		
Mesh Net	✓		
N/A		✓	
Net	✓	✓	
Unspecified	✓		✓

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

<b>Management Methods</b>			
	<b>New South Wales</b>	<b>Queensland</b>	<b>Western Australia</b>
<b>Charter</b>			
Possession limit		✓	
Size limit		✓	
<b>Commercial</b>			
Gear restrictions	✓	✓	✓

Limited entry	✓	✓	✓
Marine park closures	✓		
Size limit	✓	✓	
Spatial closures	✓	✓	✓
Temporal closures	✓	✓	
Vessel restrictions	✓		✓
<b>Indigenous</b>			
Bag limits	✓		✓
Gear restrictions			✓
Native Title	✓		
Section 37 (1d)(3)(9), Aboriginal cultural fishing authority	✓		
<b>Recreational</b>			
Bag and possession limits			✓
Bag limits	✓		✓
Gear restrictions	✓		✓
Licence	✓		✓
Marine park closures	✓		
Possession limit	✓	✓	
Size limit	✓	✓	
Spatial closures	✓		✓
<b>Active Vessels</b>			
	<b>New South Wales</b>	<b>Queensland</b>	<b>Western Australia</b>
	275 Fishing Business in EGF, 33 Fishing Business in OHF,	229 in ECIFFF,	&lt;3 in EGBSMNMF, 6 in SBBSMNMF, 22 in SCEMF, 9 in SWCBNF, &lt;3 in WCBBFNMF, 11 in WCEMF, 9 in WL (SC), &lt;3 in FBLC19, &lt;3 in FBLC84, 9 in WL (NC II GC

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|--|--|--|------|
|  |  |  | WC), |
|--|--|--|------|
- EGF Estuary General Fishery(NSW)  
OHF Ocean Hauling Fishery(NSW)  
ECIFFF East Coast Inshore Fin Fish Fishery(QLD)  
EGBSMNMF Exmouth Gulf Beach Seine and Mesh Net Managed Fishery(WA)  
SBBSMNMF Shark Bay Beach Seine and Mesh Net Managed Fishery(WA)  
SCEMF South Coast Estuarine Managed Fishery(WA)  
SWCBNF South West Coast Beach Net Fishery (Order)(WA)  
WCBBFNMF West Coast (Beach Bait Fish Net) Managed Fishery (WA)  
WCEMF West Coast Estuarine Managed Fishery(WA)  
WL (SC) Open Access in the South Coast(WA)  
FBLC19 Fishing Boat Licence Conditions(WA)  
FBLC84 Fishing Boat Licence Conditions(WA)  
WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions(WA)

Catch	New South Wales	Queensland	Western Australia
<b>Commercial</b>	1154.32t in EGF, 0.628t in N/A, 1045.24t in OHF,	1727.46t in ECIFFF,	200.568t in EGBSMNMF    FBLC19    FBLC84    SBBSMNMF    SCEMF    SWCBNF    WCBBFNMF    WCEMF    WL (NC, GC, WC)    WL (SC),
<b>Indigenous</b>	Unknown	Unknown	Unknown
<b>Recreational</b>	Negligible	Negligible	Unknown

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), OHF Ocean Hauling Fishery (NSW), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), EGBSMNMF Exmouth Gulf Beach Seine and Mesh Net Managed Fishery (WA), SBBSMNMF Shark Bay Beach Seine and Mesh Net Managed Fishery (WA), SCEMF South Coast Estuarine Managed Fishery (WA), SWCBNF South West Coast Beach Net Fishery (Order) (WA), WCBBFNMF West Coast (Beach Bait Fish Net) Managed Fishery (WA), WCEMF West Coast Estuarine Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA), FBLC19 Fishing Boat Licence Conditions (WA), FBLC84 Fishing Boat Licence Conditions (WA), WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions (WA), EGBSMNMF || FBLC19 || FBLC84 || SBBSMNMF || SCEMF || SWCBNF || WCBBFNMF || WCEMF || WL (NC, GC, WC) || WL (SC) Various Fisheries combined due to 3 boat rule (WA),

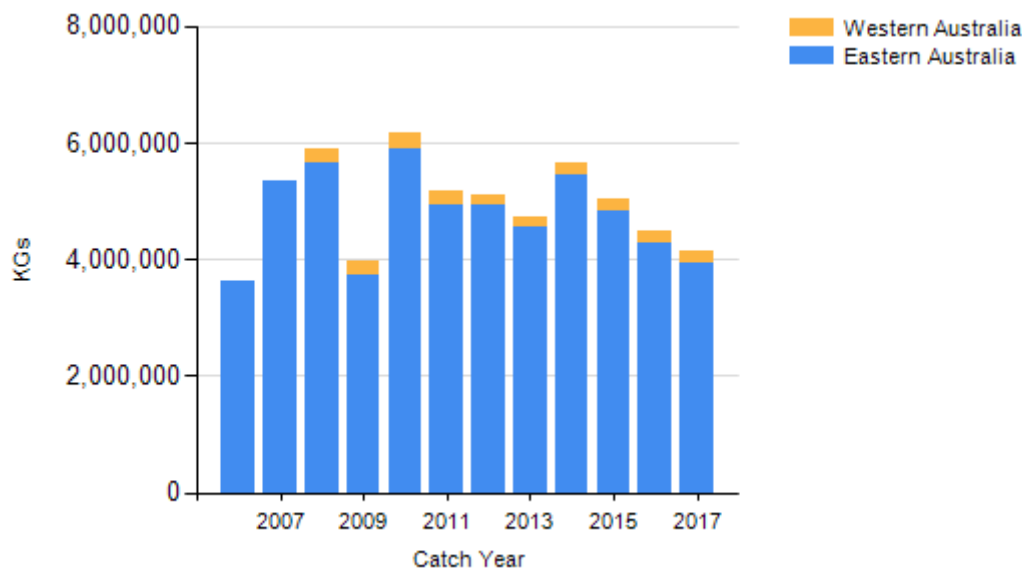
**Queensland – Indigenous (management methods)** In Queensland, under the *Fisheries Act 1994*, Indigenous fishers are able to use prescribed traditional and non-commercial fishing apparatus in waters open to fishing. Size and possession limits and seasonal closures do not apply to Indigenous fishers. Further exemptions to fishery regulations can be obtained through permits.

**New South Wales – Indigenous (management methods)** (a) Aboriginal Cultural Fishing Interim Access Arrangement—allows an Indigenous fisher in New South Wales to take in excess of a recreational bag limit in certain circumstances; for example, if they are doing so to provide fish to other community members who cannot harvest for themselves, (b) The Aboriginal cultural fishing authority is the authority that Indigenous persons can apply to take catches outside the recreational limits under the *Fisheries Management Act 1994* (NSW), Section 37 (1d)(3)(9), Aboriginal cultural fishing authority, and (c) In cases where the *Native*



*Title Act 1993* (Cth) applies fishing activity can be undertaken by the person holding native title in line with S.211 of that Act, which provides for fishing activities for the purpose of satisfying their personal, domestic or non-commercial communal needs. In managing the resource where native title has been formally recognised, the native title holders are engaged with to ensure their native title rights are respected and inform management of the State's fisheries resources.

## CATCH CHART



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

## EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

### ENVIRONMENTAL EFFECTS on Sea Mullet

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