

# Estuary Cobbler (2023)

*Cnidoglanis macrocephalus*



**Rodney Duffy:** Department of Primary Industries and Regional Development, Western Australia, **Amy Smoothey:** New South Wales Department of Primary Industries

## STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia South Coast Estuaries	Sustainable	Catch, Biomass, Catch Rate, SPR, Recruitment Index, BDM
Western Australia	Western Australia West Coast Estuaries	Sustainable	Catch, Effort
New South Wales	New South Wales Estuary General	Undefined	

## STOCK STRUCTURE

There is a single species of Estuary Cobbler in Australia (*Cnidoglanis macrocephalus*). The species occurs across the southern half of Australia in estuaries, embayments and marine environments [Kowarsky 1975; Lenanton and Potter 1987]. Most of the commercial catch, however, is taken in estuarine waters [Duffy et al. 2023a,b; Smith and Lenanton 2021]. Evidence from Western Australia indicates that there are genetic differences between estuarine populations and adjacent marine populations [Ayvazian et al. 1994]. There is no information on the species' stock structure in eastern Australia, although it is likely to be complex with multiple separate biological stocks.

Here, assessment of stock status is presented at the Management Unit level—Western Australia West Coast Estuaries, Western Australia South Coast Estuaries and New South Wales Estuary General.

## STOCK STATUS

**New South  
Wales  
Estuary  
General**

During the past 10 years, commercial catches from the Estuary General Fishery have gradually decreased from 17.6 tonnes (t) in 2014 to 7.9 t in 2022. Declines in landings coincide with large reductions in total report fishing effort from the Estuary General mesh net fishery. However, between 2020 and 2022, catches have been stable between 9.5 and 7.9 t. The majority are caught using mesh nets and taken largely as by-catch or by-product. As in Western Australia, most of the NSW Estuary Cobbler catch comes from a small number of estuaries. While the total recreational and indigenous harvest is unknown, it is thought that those caught by recreational fishers are mostly released alive [West et al. 2015]. There is insufficient information to confidently classify the status of this stock.

On the basis of the evidence provided above, the New South Wales Estuary General management unit is classified as an **undefined stock**.

**Western  
Australia  
South Coast  
Estuaries**

Estuary Cobbler is a primary target species of the South Coast Estuarine Managed Fishery (SCEMF). Each estuary is considered to host a discrete breeding stock that is distinct from populations in adjacent ocean waters and in other estuaries [Ayvazian et al. 1994]. The majority (> 50%) of the catch of Estuary Cobbler from south coast estuaries has been taken from a single estuary, Wilson Inlet. Stock status of Estuary Cobbler in south coast estuaries is assessed for this estuary only.

The most recent full assessment for Estuary Cobbler in 2019 (unpublished) utilised a combination of the following data: commercial catch and effort, commercial gillnet (2010–2017) and fishery-independent gillnet survey (late 1980s, mid-2000s and 2017–18) catch per unit effort (CPUE), fishery-independent trap survey recruitment index data (2007–2019) and commercial and fishery-independent gillnet survey size and age composition data. Multiple types of assessment models were applied, some of which included catch curve and per recruit analysis, and Schaefer biomass dynamics models and a tag-attribution model for estimating natural mortality (M) and fishing mortality (F).

Results from several assessment models fitted to the catch and catch rate data for Estuary Cobbler in Wilson Inlet suggest a Maximum Sustainable Yield (MSY) of around 50 t for the stock. Commercial catch and CPUE data provide no indication of a decline in abundance, although they exhibit substantial inter-annual variability (likely associated with variations in annual recruitment success). Juvenile recruitment has been highly variable but without a directional trend since the recruit-index sampling started in 2007. There is no evidence that recruitment failure occurred in any year. Truncated length distributions and strongly truncated age distributions in recent years provide evidence for high fishing pressure on adult fish in the areas of the estuary open to fishing. The area closed to fishing (approximately 20%) is expected to provide a level of increased resilience to the Estuary Cobbler stock, as evidenced by a higher proportion of older fish in this area.

Estimates of fishing mortality (F) and spawning potential ratio (SPR) from equilibrium catch curve and per-recruit analyses are uncertain and highly sensitive to the assumed value of natural mortality (M) for the species, which differed depending on the methods used to derive this important parameter. However, catch curve estimates of (long-term average) F based on the fishery-independent age samples did not differ markedly from an estimate of F obtained from a tag-attribution model fitted to cobbler tag-recapture data collected between 2011 and 2014.

Outputs from a Schaefer biomass dynamics model, fitted to annual catch and CPUE data (and a tag-attribution model estimate of  $F$ ), indicate that, on average, exploitation since 2000 has been above the average level expected to maintain catches at MSY. This was predicted to have reduced the stock biomass to just below BMSY (i.e., the threshold level) in 2018. Model projections of stock biomass in the 2019 assessment suggest that maintaining catches at a level below MSY (40 t or less) is likely to recover the stock to above BMSY by 2021. Catches since 2018 have averaged approximately 23.5 t, well below the 40 t estimate of MSY, and, therefore, in line with model projections, the stock is considered sustainable following the 2021–22 season [Duffy et al. 2023a].

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 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 South Coast Estuaries management unit is classified as a **sustainable stock**.

**Western  
Australia  
West Coast  
Estuaries**

Nearly the entire commercial catch of Estuary Cobbler in the West Coast Bioregion is taken in the Peel-Harvey Estuary, part of the West Coast Estuarine Managed Fishery. For this reason, the stock status of Estuary Cobbler in this estuary is used as an indicator of stock status for all Western Australia West Coast Estuaries. Recreational catch from boat-based anglers is considered to be negligible [Ryan et al. 2022]. Shore based recreational catch and Customary catch is unknown, but also thought to be negligible.

The most recent stock assessment, completed in 2023 (unpublished), follows the Western Australian Department of Primary Industries and Regional Development (DPIRD) risk-based Weight of Evidence assessment approach (WOE). The WOE assessment utilised commercial catch data and catch-MSY analysis, effort data, and fishery-independent data available from the Peel-Harvey Estuary to support stock status.

Catch-MSY analyses were undertaken using a full catch series from 1941 to present and yielded a prediction of 84 t (CL 65 to 110 t) for MSY. The Catch-MSY method is reliant on several strong assumptions, including assumed priors for population carrying capacity, stock productivity (or resilience), and initial and final depletion. A key source of uncertainty for assessment of Estuary Cobbler in Peel-Harvey Estuary relates to a likely decline in population carrying capacity associated with the very marked environmental changes that include eutrophication, algal blooms, increased salinity, reduced freshwater inputs and the construction of an artificial oceanic entrance channel [Smith and Lenanton 2021]. As such, the predicted MSY from the above Catch-MSY analysis is likely to be much higher than that for the current environment.

To develop a prediction for MSY for Estuary Cobbler in the Peel-Harvey Estuary, for current environmental conditions, catch-MSY analysis was also conducted using commercial catch data from 2000 onwards. This period was chosen for two reasons; firstly, it begins several years post-opening of the new artificial oceanic connection to the Peel-Harvey Estuary that occurred in 1994. Secondly, fishery-independent catch per unit effort (CPUE) data indicate there has not been a decline in Estuary Cobbler abundance during this time, suggesting carrying capacity may be stable (Potter et al. 2016). The predicted MSY from this analysis, 3.8 t (CI 2.14 to 6.25 t), was much lower than that predicted from the full time series reflecting the much lower catches that have occurred over

STATUS OF AUSTRALIAN FISH STOCKS REPORT  
Estuary Cobbler (2023)

recent decades. Commercial catch of Estuary Cobbler over the last two decades has largely been within or below the range predicted for MSY, although it exceeded this level in three years between 2008 and 2011 with a maximum catch during this time of approximately 9 t. The current low level of catch that has been consistent over a decade is considered sustainable under current environmental conditions.

There have been large reductions in fishing effort directed towards catching Estuary Cobbler in the Peel-Harvey Estuary, both through reduced boats operating in the fishery (> 40 boats in 1980s, to about 10 boats since the 2000s) and an approximate 66% reduction in annual fishing days from the late-1970s to the present. Further reductions in effort directed towards Estuary Cobbler have occurred due to the finfish fishery now targeting Sea Mullet and Yellowfin Whiting with haul nets. Gill nets, which traditionally took most of the Estuary Cobbler catch, are now rarely used. In addition to these changes, there is information suggesting that commercial fishers actively avoid catching cobbler due to low market demand and, in consultation with managers, have agreed to maintain catches at a low level. Therefore, overall, a very low level of fishing effort is directed towards Estuary Cobbler in Peel-Harvey Estuary.

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 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 West Coast Estuaries management unit is classified as a **sustainable stock**.

## BIOLOGY

**Estuary Cobbler biology** [Chuwen et al. 2011; Gray 2022]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Estuary Cobbler	16 years [Wilson Inlet, WA, unpublished], 910 mm	2.9 years (95% CL=2.6–3.1 years): 419 mm TL (95% CL=399–438 mm TL) Wilson Inlet
Estuary Cobbler	20 years [New South Wales], 700 mm	Unknown

## DISTRIBUTION



Distribution of reported commercial catch of Estuary Cobbler

**TABLES**

<b>Fishing methods</b>	<b>New South Wales</b>	<b>Western Australia</b>
<b>Charter</b>		
Rod and reel		✓
<b>Commercial</b>		
Gillnet		✓
Haul Seine	✓	✓
Mesh Net	✓	
Otter Trawl	✓	
Various	✓	
<b>Recreational</b>		
Hook and Line	✓	✓
Net		✓
Spearfishing	✓	

STATUS OF AUSTRALIAN FISH STOCKS REPORT  
Estuary Cobbler (2023)

<b>Management Methods</b>		
	<b>New South Wales</b>	<b>Western Australia</b>
<b>Commercial</b>		
Fishing gear and method restrictions	✓	
Gear restrictions		✓
Limited entry	✓	✓
Spatial closures	✓	✓
Temporal closures	✓	✓
Vessel restrictions		✓
<b>Recreational</b>		
Bag limits	✓	✓
Gear restrictions	✓	✓
Licence	✓	
Licence (boat-based sector)		✓
Spatial closures		✓
Spatial zoning	✓	

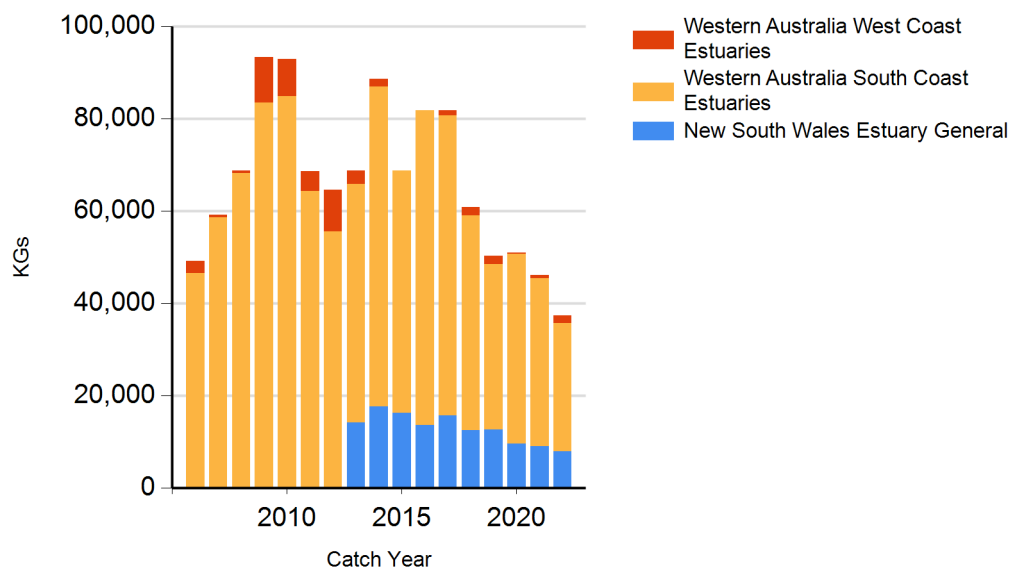
<b>Catch</b>		
	<b>New South Wales</b>	<b>Western Australia</b>
<b>Commercial</b>	7.9103 t	29.4054 t
<b>Indigenous</b>	Unknown	Unknown
<b>Recreational</b>	Unknown	Negligible (2020–21) Boat-based

**Western Australia – Recreational (Management methods).** In Western Australia a recreational fishing license is only required for fishing from a boat

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

**New South Wales – Recreational (Catch).** Murphy et al. [2022].

## CATCH CHART



Commercial catch of Estuary Cobbler - note confidential catch not shown

References	
Kowarsky 1975	Kowarsky, J 1975, An ecological study of the estuarine catfish, <i>Cnidoglanis macrocephalus</i> . Ph.D. thesis. University of Western Australia, Nedlands, WA.
Ayvazian et al. 1994	Ayvazian, SG, Johnson, MS and McGlashan, DJ 1994, High levels of genetic subdivision of marine and estuarine populations of the estuarine catfish <i>Cnidoglanis macrocephalus</i> (Plotosidae) in southwestern Australia. <i>Marine Biology</i> 118: 25–31
Chuwen et al. 2011	Chuwen, BM, Potter, IC, Hall, NG, Hoeksema, SD and Laurenson, LJB 2011, Changes in catch rates and length and age at maturity, but not growth, of an estuarine plotosid ( <i>Cnidoglanis macrocephalus</i> ) after heavy fishing. <i>Fishery Bulletin</i> , 109(3): 247-260
West et al. 2015	West, LD, Stark, KE, Murphy, JJ, Lyle, JM and Ochwada-Doyle, FA 2015, Survey of recreational fishing in New South Wales and the ACT, 2013–14, Fisheries Final Report Series 149, NSW Department of Primary Industries, Sydney.
Murphy et al. 2022	Murphy, JJ, Ochwada-Doyle, FA, West, LD, Stark, KE and Hughes, JM, Taylor, MD 2022, Survey of recreational fishing in NSW, 2019/20. NSW DPI - Fisheries Final Report Series No. 161.
Lenanton & Potter 1987	Lenanton, RCJ & Potter, IC 1987, Contribution of estuaries to commercial fisheries in temperate Western Australia and the concept of estuarine dependence. <i>Estuaries</i> 1987 10:1, 10(1), 28–35.
Duffy et al. 2023a	Duffy, D, Harris, B, Brooks, Blazeski, S and Quinn, A 2023, South Coast Estuarine And Nearshore Scalefish And Invertebrate Resource Status Report 2022. In SJ Newman, BS Wise, KG Santoro and DJ Gaughan (ed.s), Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries, Department of Primary Industries and Regional Development, Western Australia. pp. 213-221

STATUS OF AUSTRALIAN FISH STOCKS REPORT  
Estuary Cobbler (2023)

Duffy et al 2023b	Duffy, R, Quinn, A, Brooks, B and Blazeski, S 2023, West Coast Nearshore And Estuarine Finfish Resource Status Report 2022. In SJ Newman, BS Wise, KG Santoro and DJ Gaughan (ed.s), Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries, Department of Primary Industries and Regional Development, Western Australia. pp. 63-70
Smith & Lenanton 2021	Smith, KA and Lenanton, RCJ 2021, Almost forgotten: Historical abundance of eel-tail catfish populations in south-western Australian estuaries and their decline due to habitat loss and historical overfishing. <i>Regional Studies in Marine Science</i> , 41, 101605.
Ryan et al. 2022	Ryan KL, Lai, EKM and Smallwood, CB 2022, Boat-based recreational fishing in Western Australia 2020/21. Fisheries Research Report No. 327 Department of Primary Industries and Regional Development, Western Australia. 221pp
Gray 2022	Gray, CA 2022, Life history characteristics of the estuary eeltail catfish <i>Cnidoglanis macrocephalus</i> (Plotosidae) in eastern Australia. <i>Ichthyol Res</i> 69, 267–274 (2022). <a href="https://doi.org/10.1007/s10228-021-00836-z">https://doi.org/10.1007/s10228-021-00836-z</a>