

## Assessment Authors and Year

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## Stock Status

Current stock status	On the basis of the evidence contained within this assessment, Southern Shortfin Eel is currently assessed as <b>Undefined</b> for the NSW component of the stock.
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## Stock structure & distribution

The Southern Shortfin Eel (*Anguilla australis*) is widespread in coastal streams of south-eastern Australia, from the Pine River in southern Queensland to the Murray River in South Australia, and Tasmania, and also occurs in New Zealand and western Pacific Islands (Allen *et al.*, 2002; Beumer, 1996). This species is occasionally reported in inland systems west of the Great Dividing Range and typically prefers low-flow or still habitats. Genetic studies indicate that Shortfin Eel represents two geographically separate subspecies; *A. australis australis* in Australia and *A. australis schmidtii* in New Zealand and western Pacific islands (Shen & Tzeng, 2007). Because there is currently no cross-jurisdictional stock assessment undertaken for the shared stock, the assessment of the stock status is completed at the jurisdictional level.

The data presented in this summary relate to the New South Wales (NSW) part of the stock.

## Biology

The Southern Shortfin Eel is a slow growing species with a lifespan of 18–35 years for females and 14–24 years for males (Todd, 1980). The species is sexually dimorphic, with females reaching a larger maximum size (110 cm total length, TL) than males (60 cm TL) (Beumer, 1996). Both sexes are semelparous, spawning once at the end of their lifecycle and then dying, with a late age at maturity of 10–35 years and 48–102 cm TL for females and 6–24 years and 34–60 cm TL for males (Todd, 1980). Most of their lifecycle occurs in estuarine and freshwater systems, followed by migration downstream as mature adults to spawn in deep tropical ocean waters of the Coral Sea (Jellyman, 2016). This life history strategy can make eels particularly vulnerable to recruitment overfishing (Hoyle & Jellyman, 2002). Larval eels pass through a range of developmental stages in the ocean before re-entering estuaries as juvenile glass eels, where they are targeted by commercial fisheries as they undergo initial pigmentation to yellow eels, after which they migrate further upstream to become resident and continue development into adults.

### FISHERY STATISTICS

#### Catch information

##### Commercial

Total annual commercial catches of Southern Shortfin Eel in NSW waters have fluctuated widely, with a rapid increase in the early 1990s to a peak of 82.2 tonnes (t) in 1993/94 before decreasing to 3.2 t in 1996/97, and then increasing to a second peak of 46.8 t in 1998/99 before steadily decreasing to 4.3 t in 2005/06 (Fig. 1). Since then catches have remained at less than 10 t, and have been less than 1 t over the last six years.

Commercial catches of Southern Shortfin Eel are taken almost exclusively by eel trapping in the Estuary General Fishery (EGF), which is only permitted to operate in 75 coastal rivers and eel trapping is excluded from all freshwater and inland river reaches. Historical catches were reported from across the seven broad estuary regions along the NSW coastline, with eleven main estuaries dominating the catches (Fig. 2). Many of these estuaries are still fished for Longfin Eel (*A. reinhardtii*) and it is unknown why Shortfin Eel have almost disappeared from catches since 2009/10. Anecdotal information from fishers suggests that their lower market value relative to Longfin Eels has resulted in reduced targeting of eels in the stillwater habitats preferred by Shortfin Eel and increased discarding of the species. Historic species misidentification may have also contributed towards changes in recent catch trends.

Southern Shortfin Eel are also targeted by commercial trap fisheries in Queensland, Victoria and Tasmania. About 80% of the commercial catch of freshwater eels in Australia comes from Victoria, and Southern Shortfin Eel comprise up to 95% of the total catch (Jellyman, 2016). Victorian catches ranged between 131–310 t in the 1980s and 1990s, before declining to 32 t in 2010/11. This decline was attributed to the Millennium drought between 2000 and 2010. Since then, annual catches in Victoria have ranged between 36–95 t and are much larger than current NSW catches. Tasmanian catches of combined eels have historically ranged between 30–70 t and comprise approximately 95% Southern Shortfin Eel (Victorian Fisheries Authority *et al.*, in press).

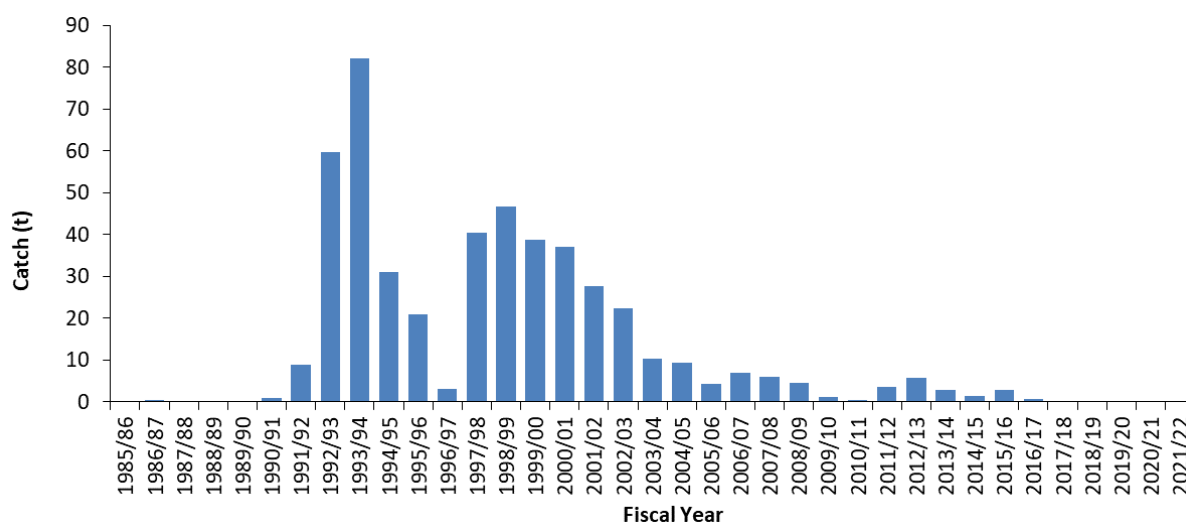


Figure 1. Annual commercial landings (tonnes) of Southern Shortfin Eel taken from NSW waters (1985/86–2021/22) for all fishing methods.

# Stock Status Summary – 2022/23



## NSW Stock Status Summary – Southern Shortfin Eel (*Anguilla australis*)

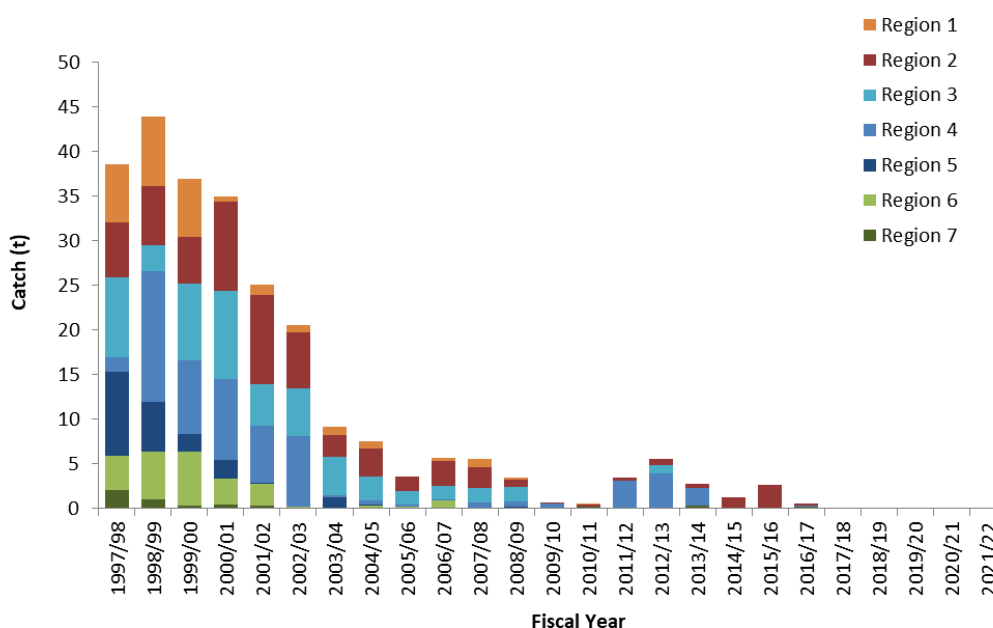


Figure 2. Annual commercial catches of Southern Shortfin Eel by the eel trapping sector in different regions of the NSW Estuary General Fishery from 1997/98 to 2021/22.

### Recreational & Charter boat

Recreational catches of freshwater eels are not separated according to species. The most recent estimate of the recreational harvest of combined freshwater eels in NSW was approximately 2,605 eels during 2019/20 (Murphy *et al.*, 2022). A further 8,744 eels were estimated to be caught and released. These estimates were based on a survey of Recreational Fishing Licence (RFL) Households, comprised of at least one fisher possessing a long-term (1 or 3 years duration) fishing licence and any other fishers resident within their household. The equivalent estimates from previous surveys in 2017/18 and 2013/14 were around 2,955 and 1,024 eels harvested, with an additional 8,744 and 16,479 eels estimated to be caught and released, respectively (Murphy *et al.*, 2020). Historically, relative to the commercial catch, these recreational harvests are very small, comprising approximately 3.7% of the total harvest of freshwater eels from NSW waters in 2013/14.

### Aboriginal cultural fishery

A survey of Aboriginal cultural fishing in the Tweed River catchment identified river eels as one of the main components of freshwater catches (Schnierer & Egan, 2016). However, Southern Shortfin Eel only accounted for 0.8% of the total Aboriginal catch from the area (Schnierer, 2011). Total catches in the region were estimated to range between 105–290 Southern Shortfin Eel per annum (Schnierer, 2011). Statewide estimates of the annual Aboriginal harvest of Southern Shortfin Eel in NSW waters are unknown.

### Illegal, Unregulated and Unreported

The amount of illegal, unregulated and unreported catches of Southern Shortfin Eel in New South Wales are unknown.

### Fishing effort information

Commercial fishing effort data for Southern Shortfin Eel was collected as number of days fished on monthly records prior to July 2009 and as numbers of traps fished per daily event after July 2009. To form a longer time series of effort, recent daily events were re-aggregated, with effort in days fished estimated from the number of fishing events entered for each fisher in each month where Southern Shortfin Eel was reported on at least one day.

In the eel trapping sector of the EGF, reported effort for Southern Shortfin Eel was stable at around 1 800 days fished per annum between 1997/98 and 2001/02, then declined rapidly to 252 days fished in 2006/07 and 16 days fished in 2009/10 (Fig. 3). Since then, reported annual effort has remained below 200 days fished in all years and has been less than 5 days per annum over the last 5 years.

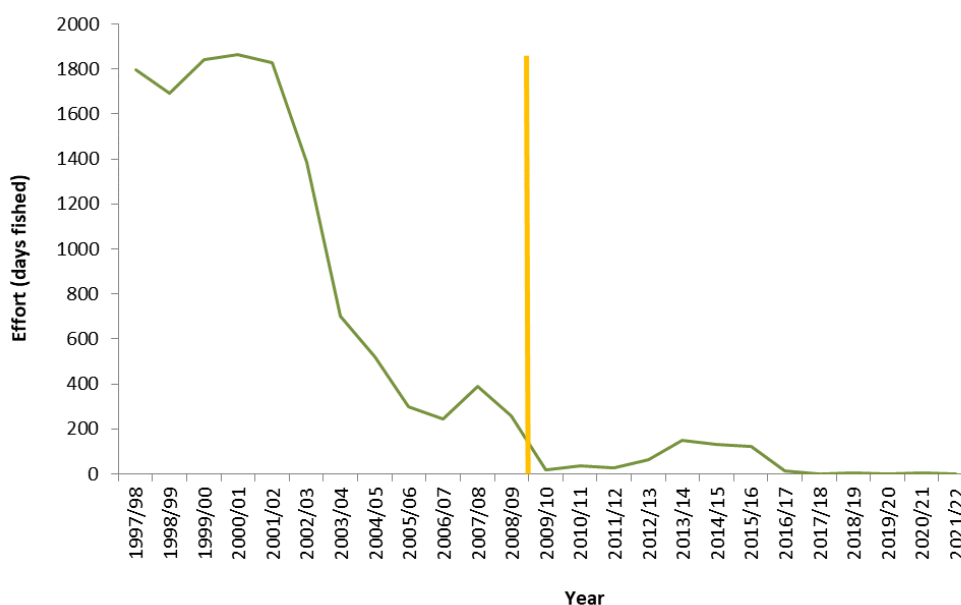


Figure 3. Annual effort (in days fished) for eel trapping fishers of the NSW Estuary General Fishery that reported landing Southern Shortfin Eel on at least one day in each month (1997/98 to 2021/22). The vertical gold line indicates the change from monthly to daily catch reporting.

### Catch Rate information

Monthly catch rates (catch-per-unit-effort, CPUE in kg per day fished) for Southern Shortfin Eel taken by eel traps in the EGF were compiled from monthly records between 1993 and 2009. Insufficient data were available to compile a catch rate series from daily event records between 2010 and 2022. Monthly catch rates were standardized for month, region and fishing business using the r-package 'rforcpe' (Haddon, 2023).

The mean standardised monthly catch rates fluctuated around an overall decreasing trend from 1993 to 2009 (Fig. 4). Prior to 2000, most annual catch rates were above the long-term average; whereas after 2000, most were below the long-term average. It is unknown where current catch rates may be relative to these historic levels.

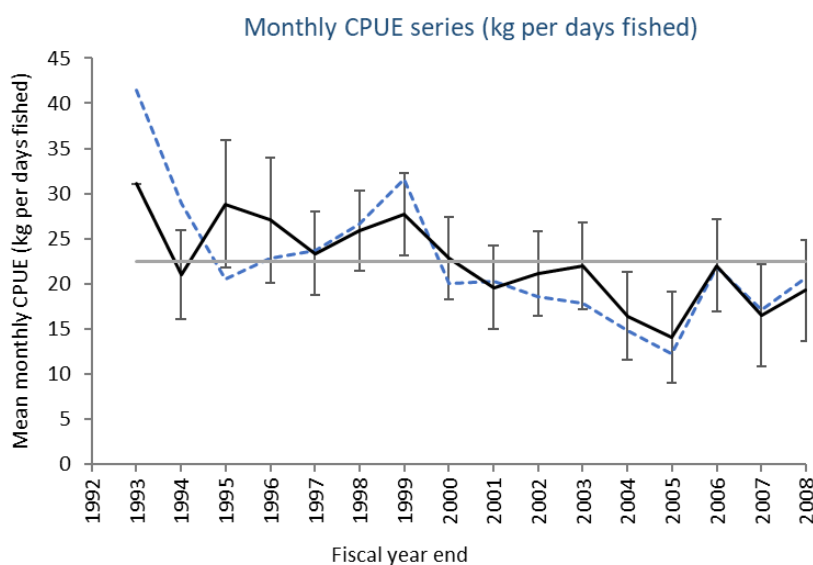


Figure 4. Mean standardised catch rates (catch-per-unit-effort, CPUE) of Southern Shortfin Eel for the eel trapping sector in the NSW Estuary General Fishery, estimated from monthly records (1993–2009) in kg per days fished. The dashed and solid lines indicate the nominal and standardised mean CPUE, respectively; and the grey horizontal line indicates the long-term average for the series.

## STOCK ASSESSMENT

### Stock Assessment Methodology

Year of most recent assessment:

2023

No quantitative joint stock assessment of the entire biological stock is undertaken.

Assessment method:

A weight-of-evidence approach was used for the current stock status assessment of Southern Shortfin Eel in NSW waters, relying on analyses of catch and effort data from the eel trapping sector of the EGF.

Main data inputs:

Commercial catch and effort data – for all NSW commercial fisheries by fiscal years (1990/91–2021/22).

Recreational catches – estimated annual catches for combined freshwater eels from four periods – national recreational and indigenous fishing survey (2000/01) and NSW recreational fishing surveys (2013/14, 2017/18 and 2019/20).

Commercial catch rates historical – reported annual monthly CPUE data for the eel trapping sector of the EGF by calendar years in kg per days fished (1993–2008) – standardised.

# Stock Status Summary – 2022/23



## NSW Stock Status Summary – Southern Shortfin Eel (*Anguilla australis*)

### Key model structure & assumptions:

The CPUE standardisations and analyses assume that the annual catch rates are a relative index of abundance and are not unduly influenced by other factors that are not accounted for through standardisation.

Catch rates were standardised for the influences of different months, estuary regions and fishing businesses.

Using fishing effort as an indicator of relative fishing pressure assumes that fish catchability and fishing power have not changed significantly over the monitoring period.

### Sources of uncertainty evaluated:

None assessed.

## Status Indicators - Limit & Target Reference Levels

There is no harvest strategy in place for Southern Shortfin Eel in NSW, so a weight-of-evidence approach has been applied in this stock assessment with nominated indicators and reference points in line with the current NSW Harvest Strategy Policy (NSW DPI, 2021).

Biomass indicator or proxy	Trend in annual standardised catch rates of the eel trapping sector of the commercial EGF was used as an index of relative abundance.
Biomass Limit Reference Point	Current catch rates were compared to the long-term averages of each time series.
Biomass Target Reference Point	None specified.
Fishing mortality indicator or proxy	Trend in the total fishing effort of the eel trapping sector of the EGF was used as an indicator of relative fishing pressure.
Fishing mortality Limit Reference Point	Current effort levels were compared against historic levels.
Fishing Mortality Target Reference Point	None specified.

## Stock Assessment Results

### Stock Assessment Result Summary

Biomass status in relation to Limit	<p>There were insufficient recent catch rate data to form a reliable time series for analyses of trends in relative abundance. Current catches are much smaller than historic catch levels prior to 2009. Targeted fishing for Longfin Eel still occurs in many of the estuaries where catches of Southern Shortfin Eel were historically reported. Fisher identification and catch reporting of the two species may not be reliable.</p> <p>The assessment of current level of biomass is considered too uncertain to confidently assign a SAFS status determination.</p>
Biomass status in relation to Target	Not assessed.
Fishing mortality in relation to Limit	<p>Reported fishing effort for the species by eel trapping declined rapidly during the 2000s from 1,866 days in 2000/01 to a mere 16 days in 2009/10 and has been less than 5 days per annum over the last five years.</p> <p>The weight of evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment overfished.</p>
Fishing mortality in relation to Target	Not assessed.
Current SAFS stock status	<p>There is insufficient information available to confidently classify the status of this stock. On this basis, the NSW part of the Southern Shortfin Eel stock is currently assessed as an <b>undefined stock</b>.</p>

### Fishery interactions

The EGF eel trapping gears interact with other commercial and non-commercial by-catch species, a range of endangered, threatened and/or protected (ETP) species and freshwater habitats. However, the current regulations for eel trapping in the EGF, which include restricting eel fishing to tidal estuarine waters and some farm dams and artificial impoundments and using wingless baited traps are likely to be limit the amount of interactions with protected species such as platypus.

The use of traps with no wings reduces drowning of platypuses, and prevents mortality of small forage fish species, which might be captured by "gilling" in the wings of fyke nets (Grant, 1993). Furthermore, The EGF share management plan mandates that all eel traps must have a 100 mm rigid ring fit to funnel entrances to prevent air breathing animals (such as freshwater turtles and platypus) from entering the traps. Traps in freshwater dams and impoundments must also include



an air pocket in the cod end. Mesh size and other gear restrictions are regulated to increase the target species selectivity of the traps and cod ends. Research results suggest that these measures significantly decrease the levels of by-catch associated with these fishing gears (Grant *et al.*, 2004).

Interactions with animals protected under the *Environment Protection and Biodiversity Conservation Act* 1999 were subjected to a detailed risk assessment in an environmental impact statement (EIS) for the fishery undertaken during fisheries management strategy development (NSW Fisheries 2001). An updated threat and risk assessment for all components of the NSW marine estate was completed in 2017 (Fletcher and Fisk 2017). The EGF was considered a moderate threat to species and communities protected under the *NSW Fisheries Management Act* 1994 and *Biodiversity Conservation Act* 2016. Compulsory logbook reporting of all interactions with ETP species was mandated in 2005 and these are reported annually to the Department of Environment and Energy (NSW DPI, 2017).

### Qualifying Comments

The extremely low catches of Southern Shortfin Eel in NSW since 2009/10, are difficult to interpret, given that targeting of Longfin Eel is still occurring in estuaries where the former species was historically caught in large numbers. Several possible scenarios could explain the decline in Southern Shortfin Eel catches, including:

- the species is still caught, but is no longer retained because it is not the preferred species for export markets;
- stillwater habitats within estuaries, preferred by Southern Shortfin Eel, are no longer targeted to avoid discarding the species in response to poor market demand;
- species misidentification or misreporting artificially inflated historic catches of Southern Shortfin Eel or current eel catches are all reported as Longfin Eel, irrespective of the species caught;
- the species range had contracted further south in response to climate change and no longer occurs in large numbers in NSW coastal rivers;
- or of greatest concern, the species is no longer caught due to recruitment failure in the main estuaries where commercial eel trapping still occurs.

The commercial EGF is permitted to operate in only a limited number of estuaries along the NSW coast, which provides some protection for a potentially large percentage of eel stock. Nevertheless, further research and consultation with industry is warranted to ascertain the underlying causes of the almost complete disappearance of Southern Shortfin Eels from NSW commercial fishery catch data in recent years before the fishery transitions from an ITCAL to TACC in 2024.

Compliance activity suggests that some unreported, illegal fishing in freshwater systems closed to fishing may have occurred, which is not considered in this assessment.

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