

# Stock Status Summary 2021



NSW Stock Status Summary Longfin Eel  
(*Anguilla reinhardtii*)

## Assessment Authors and Year

Hall, K.C. 2020. NSW Stock Status Summary 2018/19 – Longfin Eel (*Anguilla reinhardtii*).  
NSW Department of Primary Industries, Fisheries NSW, Coffs Harbour. 8 pp.

## Stock Status

|                      |                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current stock status | On the basis of the evidence contained within this assessment, Longfin Eel is currently assessed as <b>Sustainable</b> for the NSW component of the stock. |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Stock Structure

The Longfin Eel (*Anguilla reinhardtii*) has a wide species distribution that extends the entire eastern Australian coast from Cape York to Tasmania, and is also found at Lord Howe Island and Norfolk Island (Beumer and Sloane 1990). The stock structure was investigated via a microsatellite genetic study, and the results indicated a single panmictic biological stock along the east coast (Shen and Tzeng 2007). However, there is currently no cross-jurisdictional stock assessment undertaken for the shared stock, so the assessment of the stock status is presented at the jurisdictional level.

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

## Biology

The Longfin Eel is a slow growing species that takes up to 22 years for males and 52 years for females to reach sexual maturity (Walsh et al. 2004; Walsh et al. 2006). The species is sexually dimorphic, with a larger size at sexual maturity for females (74–142 cm total length, TL) than males (44–62 cm TL) (Walsh et al. 2003). The species lives in estuarine and freshwater systems east of the Great Dividing Range until reaching sexual maturity, and then migrates downstream and into the deep tropical ocean waters of the Coral Sea to spawn once before dying (Jellyman 1987). This semelparous life history strategy can make eels particularly vulnerable to recruitment overfishing (Hoyle and Jellyman 2002). Furthermore, recruitment of juvenile Longfin Eel into NSW estuaries can be highly variable in response to environmental conditions (Silberschneider 2005).

## Stock Status – New South Wales

### Catch Trends - Commercial Fisheries

Commercial catches rapidly increased in the early 1990s to supply a newly established live export market to China and peaked at 167 t in 2000/01 (Fig. 1). After a sharp decline in the early 2000s catches remained at around 80 t until the last four years when the export market failed and processing facilities closed. As a result catches decreased from 82.6 t in 2014/15 to 8.2 t in 2018/19.

The New South Wales commercial fishery targets the fully pigmented sub-adults or 'yellow eels' that return to estuaries on their migration back into freshwater systems; and does not permit any

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fishing above tidal waters. Most of the commercial catch is taken by eel trapping in the Estuary General Fishery (EGF), with seven main estuaries on average accounting for 73% of the catch. In particular, historical catches were largest in Regions 2 on the north coast and Region 4 on the central coast (Fig. 2).

Longfin Eel are also harvested by trap fisheries in Queensland, Victoria and Tasmania, but NSW catches have historically accounted for the largest percentage of total harvests. Queensland commercial catches averaged 19.8 t per annum between 2009 and 2016, but have recently declined to 4.8 t in 2017, 10.7 t in 2018 and 6.1 t in 2019 (QDAF, unpublished data).

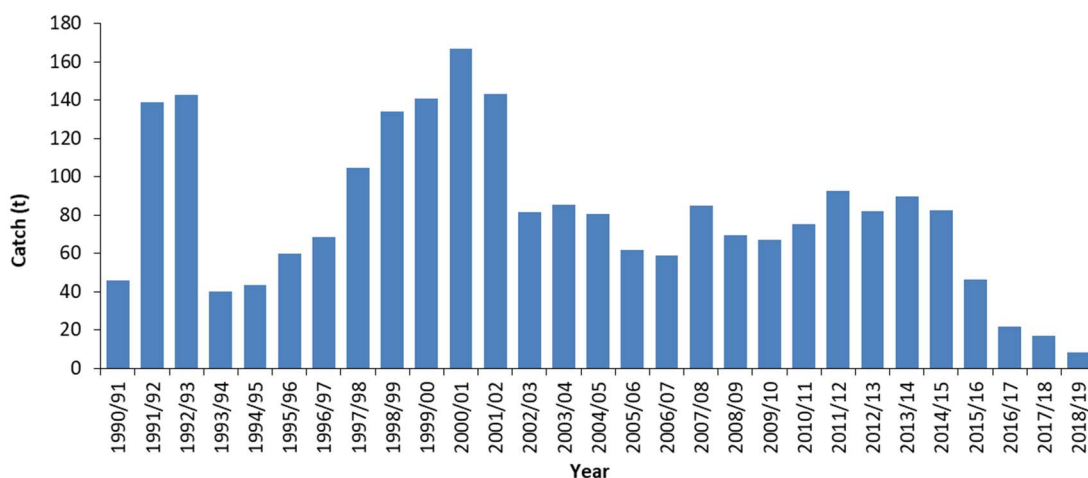


Figure 1. Annual commercial landings (tonnes) of Longfin Eel taken from NSW waters (1990/91–2018/19) for all fishing methods.

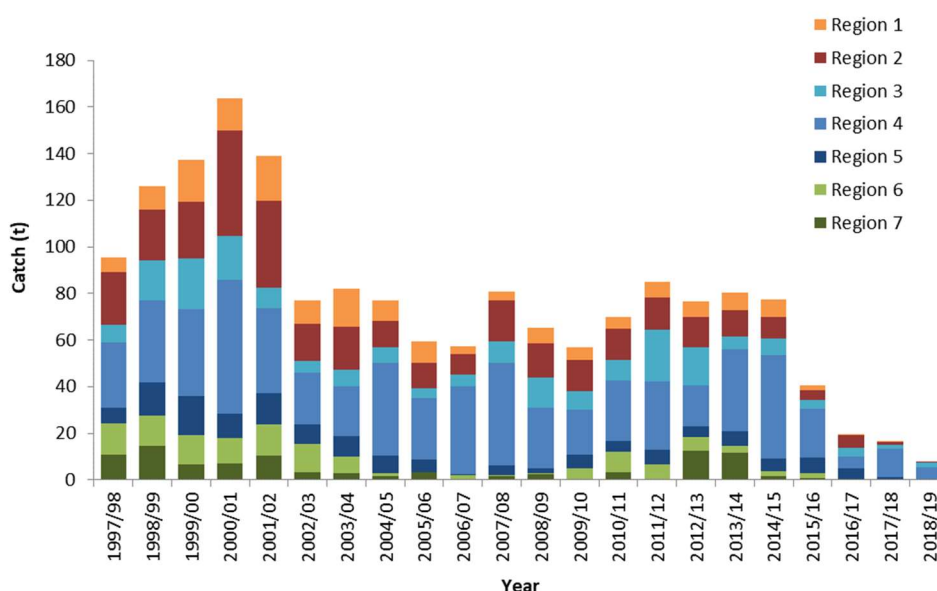


Figure 2. Annual commercial catches of Longfin Eel by the eel trapping sector in different regions of the NSW Estuary General Fishery from 1997/98 to 2018/19.

### Catch Trends - Recreational and Indigenous

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 2 955 eels or around 2.2 t during 2017/18 (Murphy et al. 2020). 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 estimated recreational harvest in 2013/14 was approximately 60% smaller at around 1,024 eels, but an additional 16,479 eels were estimated to be caught and released (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.

A survey of Aboriginal cultural fishing in the Tweed River catchment identified river eels as one of the main components of freshwater catches (Schnierer and Egan 2016). However, Longfin 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 117–350 Longfin Eel per annum (Schnierer 2011). Statewide estimates of the annual Aboriginal harvest of Longfin Eel in NSW waters are unknown.

### Fishing Effort Trends - Commercial Fisheries

Commercial fishing effort for Longfin 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 Longfin Eel was reported on at least one day.

Reported commercial fishing effort for Longfin Eel increased from below 5,000 days fished in 1997/98 to a peak of 6,721 days fished in 2001/02, before declining to 1,008 days fished in 2010/11 (Fig. 3). Fishing effort then increased steadily to around 1,880 days fished in 2014/15, but has rapidly declined over the last four years to just 157 days fished in 2018/19. Current fishing effort accounts for only 2.3% of the peak levels reported in the early 2000s.

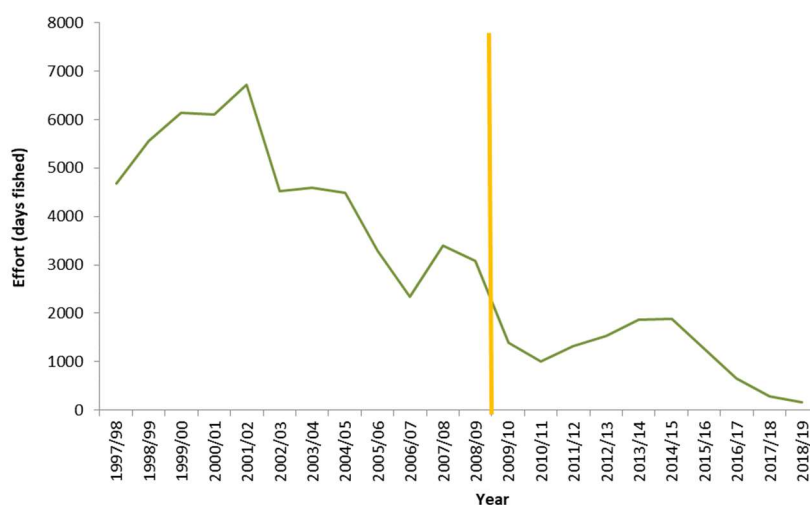


Figure 3. Annual effort (in days fished) for eel trapping fishers of the NSW Estuary General Fishery that reported landing Longfin Eel on at least one day in each month. The vertical gold line indicates the change from monthly to daily catch reporting.

## Catch Rate Trends - Commercial Fisheries

Monthly catch rates (catch-per-unit-effort, CPUE in kg per day fished) for Longfin Eel taken by eel traps in the EGF were compiled from monthly records between 1998 and 2009 and re-aggregated daily records between 2010 and 2019. Catch rates were standardized for month, region and authorised fisher using the r-package 'cede' (Haddon 2018). Continuity of the time series across the catch reporting change in July 2009 must be interpreted with caution. Daily catch rates (CPUE in kg per eel trap) were also compiled from daily fishing event records from 2010 to 2019 and standardised for month, region and authorised fisher.

The mean standardised monthly catch rates of Longfin Eel steadily declined between 1991 and 2002 and then remained relatively stable for three years before rising slightly until 2009. Between 2011 and 2015 catch rates (in kg per day) declined again before rising between 2015 and 2017 and then rapidly declining over the last two years (Fig. 4). In contrast, recent daily catch rates (in kg per trap) indicate a more stable trend, with a less pronounced decline over the last two years. The differences between the two recent catch-rate series likely result from a further reduction in effort through a decreased number of traps fished per day. Consequently, daily catch rates in kg per trap are likely to be the most reliable indicator of relative abundance

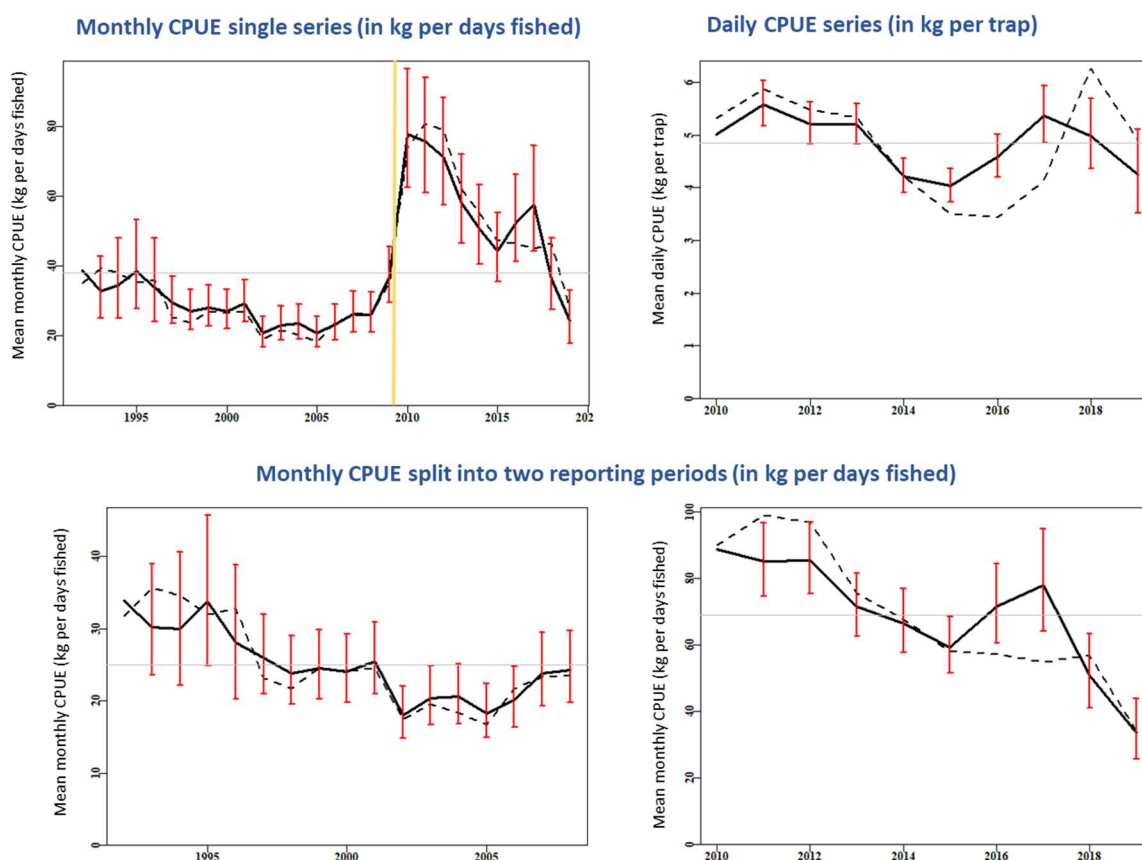


Figure 4. Mean standardised catch rates (catch-per-unit-effort, CPUE) of Longfin Eel for the eel trapping sector in the NSW Estuary General Fishery, estimated from monthly records (1992–2009) and re-aggregated daily records (2010–2019) in kg per days fished (top left and bottom) and from daily fishing event records in kg per trap (top right). The dashed and solid lines indicate the nominal and standardised mean CPUE, respectively; the gold vertical line indicates the change from monthly to daily catch reporting and the grey horizontal line indicates the long-term averages for each series.

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The distribution of reported fishing effort (in days fished) changed considerably following the catch reporting change in July 2009 (Fig. 5), which resulted in a dramatic increase in monthly catch rates (in kg per days fished) between 2009 and 2010 in the longer, single time-series. This suggests that a single time-series of monthly catch rates encompassing the catch reporting change is not a reliable option for this species.

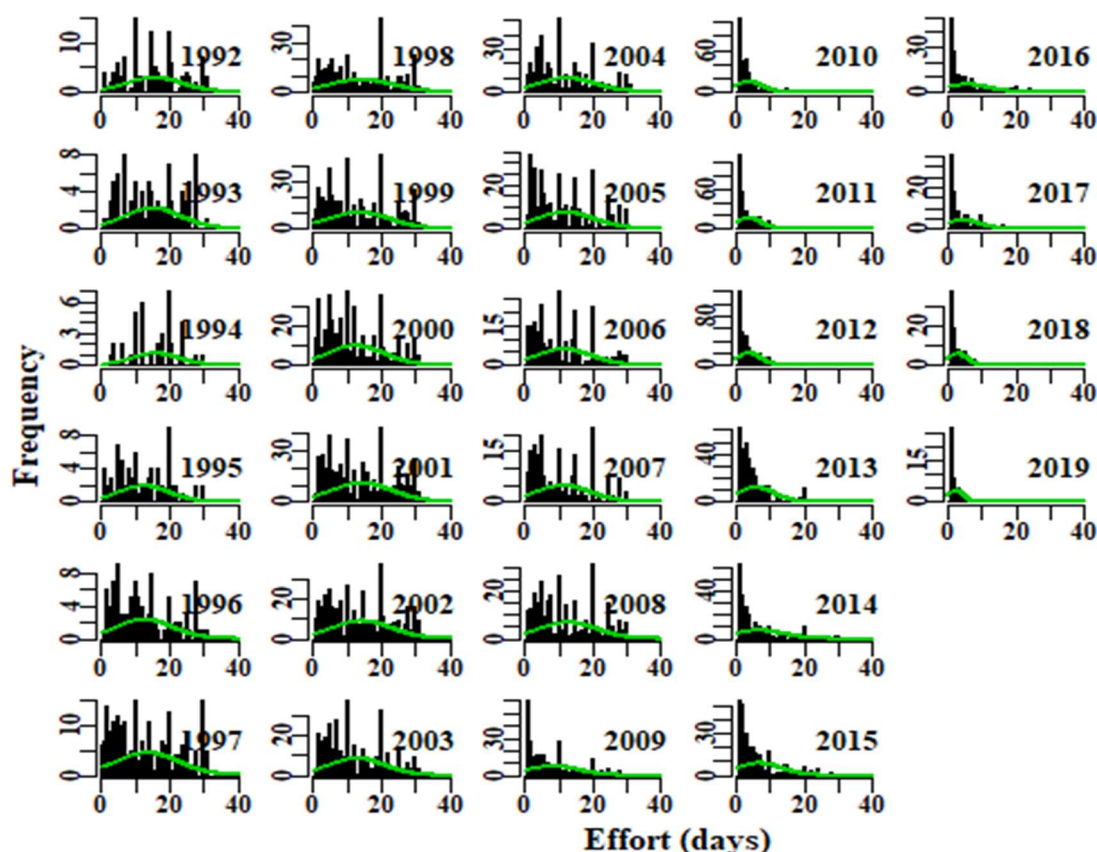


Figure 5. Distribution of monthly fishing effort (in days fished) for Longfin Eel by the eel trapping sector of the NSW Estuary General Fishery, estimated from monthly records (1999–2009) and re-aggregated daily records (2010–2019) following a change in catch reporting requirements in July 2009.

## Stock Assessment Methodology

|                                |                                                                                                                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Year of most recent assessment | 2020<br>No quantitative joint stock assessment of the entire biological stock is undertaken.                                                                                                                             |
| Assessment method              | A weight-of-evidence approach was used for this stock status assessment of Longfin Eel in NSW waters. It relies on analyses of standardised catch rates and total fishing effort for 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– 2018/19).                                                                                                                  |

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|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <p>Recreational catches – estimated annual catches for combined freshwater eels from three periods – national recreational and indigenous fishing survey (2000/01) and NSW recreational fishing surveys (2013/14 and 2017/18).</p> <p>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 (1991–2019) – standardised.</p> <p>Commercial catch rates recent – reported annual daily CPUE data for the eel trapping sector of the EGF by calendar years in kg per trap (2010–2019) – standardised.</p> |
| Key model structure and assumptions | <p>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.</p> <p>Catch rates were standardised for the influences of different months, estuary regions and authorised fishers.</p> <p>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.</p>                                                                       |
| Sources of uncertainty evaluated    | Changes in fishing effort distribution following catch reporting changes from monthly to daily event reporting in July 2009.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Status Indicators and Limit Reference Levels

|                                         |                                                                                                                                                                                                                                                                     |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biomass indicator or proxy              | <p>None specified in a formal harvest strategy.</p> <p>In the interim, for the purposes of this stock assessment the trend in annual standardised catch rates of the eel trapping sector of the commercial EGF were selected as an index of relative abundance.</p> |
| Biomass Limit Reference Level           | <p>None specified in a formal harvest strategy.</p> <p>In the interim, for the purposes of this stock assessment the current catch rates were compared to the long-term averages of each time series.</p>                                                           |
| Fishing mortality indicator or proxy    | <p>None specified in a formal harvest strategy.</p> <p>In the interim, for the purposes of this stock assessment trends in the total fishing effort of the eel trapping sector of the EGF was used as an indicator of relative fishing pressure.</p>                |
| Fishing mortality Limit Reference Level | <p>None specified in a formal harvest strategy.</p> <p>In the interim, for the purposes of this stock assessment current effort levels were compared against historic levels.</p>                                                                                   |

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## Stock Assessment Results

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biomass status in relation to limit    | <p>Trends in historical monthly catch rates from commercial eel trapping suggest that some reduction in biomass may have occurred between 1990 and 2009. Standardised daily catch rates since 2010, suggest there was some increase in biomass between 2014 and 2017, but that current catch rates are below the recent 11-year average. An interim total commercial access level (ITCAL) of 139.9 t was introduced in 2017 and will remain in place until transitioning to an adjustable TAC in 2024. Current harvests are well below the ITCAL and it is unknown whether a TACC of that magnitude would be sustainable.</p> <p>The weight of evidence suggests that recent low harvest rates have permitted some biomass recovery following earlier declining catch rates and that the current stock biomass in NSW waters is unlikely to be recruitment overfished.</p> |
| Fishing mortality in relation to limit | <p>Current fishing effort is very low (2.3%) relative to past levels. This is providing a temporary hiatus and the current low level of fishing mortality is unlikely to cause the stock to become recruitment impaired.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Previous SAFS stock status             | <p>Longfin Eel is being assessed nationally according the Status of Australian Fish Stocks (SAFS) framework for the first time in 2020.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Current stock status                   | <p>On the basis of the evidence above, which includes extremely low levels of fishing effort over the last four years, the NSW part of the Longfin Eel stock is currently assessed as a <b>sustainable stock</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Qualifying Comments

- Current levels of fishing effort are extremely low and are likely to permit some recovery of biomass.
- 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.
- The influence of catch reporting changes on commercial catch rates, especially during the transition from monthly to daily reporting in July 2009, limits their application as an index of relative abundance.
- Effort distributions changed significantly after July 2009 and indicate that a single, long-term series of monthly catch rates is not a reliable option for this species.
- Standardised daily catch rates (in kg per trap) since 2010 are likely to be a more reliable index of abundance.
- Some species misidentification and/or misreporting of freshwater eels is likely and may cause increased uncertainty in stock status assessment results.
- Compliance activity suggests that some unreported, illegal fishing in freshwater systems closed to fishing may have occurred, which is not considered in this assessment.

## References

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