

# Gould's Squid (2023)

*Nototodarus gouldi*



**Rocio Noriega:** Australian Bureau of Agricultural and Resource Economics and Sciences, **Katie Cresswell:** Institute for Marine and Antarctic Studies, University of Tasmania, **Karina Hall:** New South Wales Department of Primary Industries

## STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Commonwealth, New South Wales, Tasmania	South-Eastern Australia	Sustainable	Catch rates, catch, effort

## STOCK STRUCTURE

Genetic studies support the hypothesis of a single biological stock of Gould's Squid throughout southeastern Australian waters [Jackson and McGrath-Steer 2003]. Two techniques, statolith shape and statolith elemental composition, have also been used to determine dispersal patterns of Gould's Squid and evidence of separate stocks [Virtue et al. 2011; Green et al. 2015]. Samples were collected from Victoria and the Great Australian Bight. Adult statolith shape provided evidence that adults caught in the two locations belonged to different stocks, however, statolith elemental composition suggested that Gould's Squid caught at each location had hatched throughout their distribution [Green et al. 2015]. Hence, genetic homogeneity of the species is suspected to be a function of egg mass and juvenile drift resulting from seasonal longitudinal ocean currents rather than large-scale migration between the two regions [Green et al. 2015]. Also, this drift appears to provide more juvenile squid from Victoria to the Great Australian Bight than occurs in the opposite direction. The current dominance of Victorian and Tasmanian regions in terms of fishing effort means that a single-stock approach to management is appropriate at this time [Green et al. 2015].

Here, assessment of stock status is presented at the biological stock level—South-Eastern Australia.

## STOCK STATUS

**South-  
Eastern  
Australia**

Gould's Squid is fished in Commonwealth, New South Wales and Tasmanian waters. The status presented here is for the entire biological stock and has been established using evidence from all jurisdictions.

Historically, Japanese commercial jig vessels fished waters off southern Australia in the 1970s and in the southern Australian Fishing Zone in the 1980s under joint-venture partnerships with Australian companies. The highest catch of Gould's Squid from south-eastern Australian waters of 7,914 tonnes (t) was taken by Japanese jig vessels in 1979–80. Commercially viable jig catch rates were also achieved in south-eastern waters, particularly in western Bass Strait, proving the feasibility of a fishery for Gould's Squid. Taiwanese and Korean vessels were also licensed to fish in Bass Strait until 1988, with annual catches ranging from 13 t to 2,309 t.

The majority of Commonwealth catch is taken by squid jigging and demersal trawling. In 2021, 939 t of squid were reported from two Commonwealth fisheries; the Southern Squid Jig Fishery (SSJF; 487 t) and the Southern and Eastern Scalefish and Shark Fishery (SESSF; Commonwealth Trawl Sector, CTS 405 t and Great Australian Bight Trawl Sector, GABTS; 47 t).

During the past 10 years, SSJF annual catches have fluctuated between 832 t (2012) and 2 t (2014). Catch decreased considerably in 2020 to 67 t but increased to 487 t in 2021.

High costs relative to revenue, combined with the highly variable biomass and/or availability of the stock, are understood to be the main reasons for the reduced effort since 2008 [Noriega and Curtotti 2022]. Following increased effort in 2018 (2,281 jig-hours) and 2019 (2,234 jig-hours), effort declined in 2020 (1,711 jig-hours). Anecdotal reports suggest the fleet experienced some difficulty in locating squid in 2020 [AFMA 2020]. In 2021, effort was the highest since 2012 (2,899 jig-hours) [Noriega and Curtotti 2022].

In the CTS, the annual catch over the same period was between 944 t (2012) and 260 t (2014). On average, CTS catch made up 60% of the total Commonwealth Gould's Squid catch between 2012 and 2021. In the GABTS, annual catch has remained fairly stable, averaging around 44 t since 2010. Fishing effort in the CTS and GABTS has decreased substantially since the mid-2000s when total trawl effort was around 140,000 hours. In 2021–22, combined fishing effort in these sectors was 56,404 trawl hours [Emery et al. 2022; Moore et al. 2022], down from 65,102 trawl hours in 2020–21.

Gould's Squid are taken in small quantities as by-product of the New South Wales Ocean Trawl Fishery [Hall 2020]. Annual landings from New South Wales steadily decreased from 59 t in 1997–98 to a minimum of 4.9 t in 2010–11, and then increased to 12.2 t in 2018–19 [Hall 2023]. The most recent catch in 2021–22 was slightly smaller at 8.8 t [Hall 2023]. Most of the earlier decline was in catches from the prawn trawl sector along the northern coast in response to a concurrent rapid decrease in fishing effort from 9,905 fisher days in 1997–98 to 1,172 fisher days in 2012–13. Since then effort has increased slightly and was 2,578 days fished in 2021–22. Over the same period, standardised commercial catch rates of the fish trawl and prawn trawl sectors of the Ocean Trawl Fishery fluctuated around a generally decreasing trend until 2010–11 but have increased steadily since to above the long-term average in 2020–21 and 2021–22 [Hall 2023]. The level of harvest from NSW waters is relatively insignificant compared to amounts removed from the stock in other jurisdictions.

Gould's Squid are sporadically present in high abundances in Tasmanian waters between late summer and early autumn, especially off the south-east coast (for example, in years 2000, 2007, 2012, 2013 and 2021). In such years of high local abundance, dual-endorsed automatic squid-jig vessels have commonly concentrated their fishing effort in Tasmanian state waters before moving back to more traditional fishing grounds in Commonwealth waters. In consequence, interannual variation in Tasmanian catches of Gould's Squid has been high [Sharples et al. 2023]. In 2021–22, 244 t of catch was reported under Tasmanian scalefish licences [Sharples et al. 2023].

Gould's Squid is short lived (with a maximum life span of 12 months), spawns multiple times during its life, and displays highly variable growth rates, and size and age at maturity [Jackson and McGrath-Steer 2003]. These characteristics mean that the population may be less susceptible to fishing mortality than longer-lived species. However, the short life expectancy also implies that successful recruitment in any given year may be susceptible to environmental conditions and fishing pressures [Jackson and McGrath-Steer 2003; Noriega and Curtotti 2022].

The high historical catches of Gould's Squid taken by foreign vessels in the late 1970s and the 1980s may indicate that a large annual harvest can be taken from the stock in years of high abundance without adversely reducing recruitment and biomass for subsequent seasons. While total fishing effort and catch in 2021 was higher than in the previous few years, it was low when compared with historical levels and unlikely to drive the stock into an overfished state. Furthermore, nominal catch rates from the Commonwealth Trawl Sector, the Tasmanian Scalefish Fishery and New South Wales Ocean Trawl Fishery have been relatively stable over time which suggest long-term stability in the availability, and perhaps biomass, of Gould's Squid in the areas fished.

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 above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

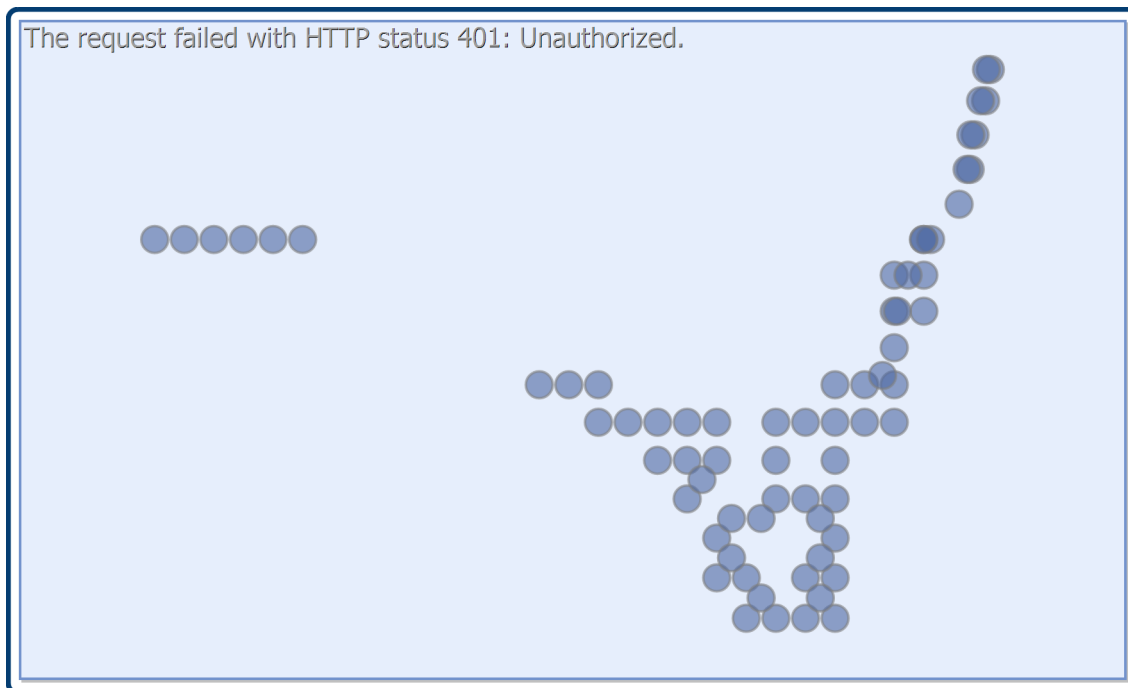
On the basis of the evidence provided above, the South-Eastern Australia biological stock is classified as a **sustainable stock**.

## BIOLOGY

**Gould's Squid biology** [Jackson and McGrath-Steer 2003]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Gould's Squid	< 1 year, 350–400 mm ML	6–9 months, 170–300 mm ML

## DISTRIBUTION



Distribution of reported commercial catch of Gould's Squid

**TABLES**

<b>Fishing methods</b>	<b>Commonwealth</b>	<b>New South Wales</b>	<b>Tasmania</b>
<b>Charter</b>			
Hook and Line		✓	
Squid Jigging		✓	
<b>Commercial</b>			
Danish Seine	✓		
Midwater Trawl	✓		
Otter Trawl	✓	✓	
Squid jigs (mechanised)	✓		✓
Unspecified			✓
Various		✓	
<b>Recreational</b>			
Hook and Line		✓	✓
Squid Jigging		✓	✓

STATUS OF AUSTRALIAN FISH STOCKS REPORT  
Gould's Squid (2023)

Management Methods			
	Commonwealth	New South Wales	Tasmania
<b>Charter</b>			
Bag limits		✓	
Gear restrictions		✓	
Spatial closures		✓	
<b>Commercial</b>			
Effort limits	✓	✓	
Gear restrictions		✓	
Limited entry	✓	✓	✓
Spatial closures		✓	✓
Temporal closures			✓
Trigger limits	✓		
Vessel restrictions	✓	✓	✓
<b>Recreational</b>			
Bag and possession limits			✓
Bag limits		✓	✓
Gear restrictions		✓	✓
Spatial closures		✓	
Temporal closures			✓

Catch			
	Commonwealth	New South Wales	Tasmania
<b>Charter</b>		162 squid (2021–22)	
<b>Commercial</b>	420.778 t	8.6156 t	244.493 t
<b>Indigenous</b>	Unknown	Unknown	Unknown
<b>Recreational</b>	Unknown	Unknown	21 t in 2012–13

**Commonwealth – Commercial (Catch).** Commonwealth data are presented for 2021–22 financial year.

**Commonwealth – Recreational.** The Australian Government does not manage recreational fishing in Commonwealth waters. Recreational fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters, under its management regulations.

**Commonwealth – Indigenous.** The Australian Government does not manage non-commercial Indigenous fishing in Commonwealth waters, with the exception of the Torres Strait. In general, non-commercial Indigenous fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters.

**New South Wales – Commercial (catch).** Data are provided in financial years.

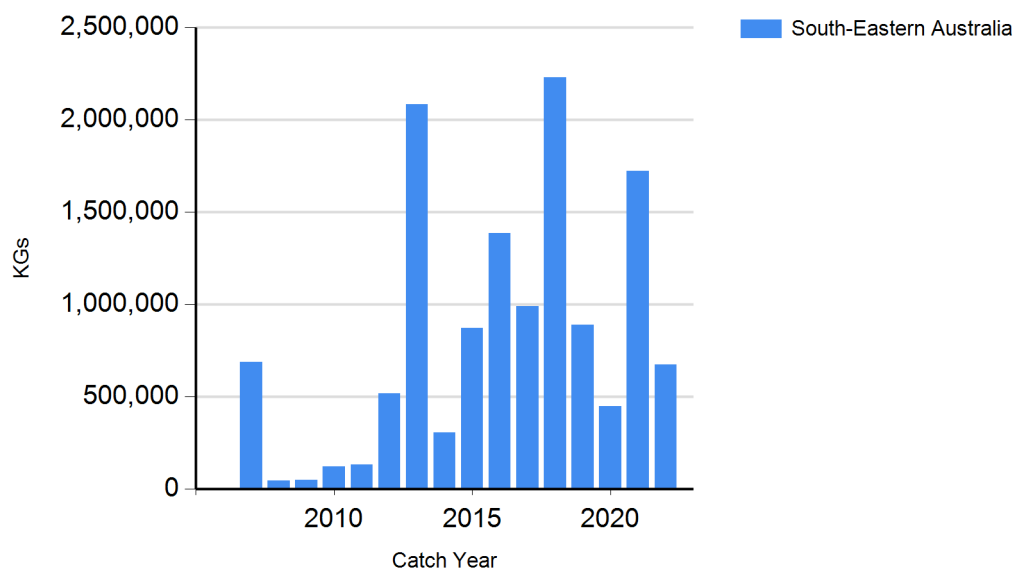
**New South Wales – Indigenous (management methods).** <https://www.dpi.nsw.gov.au/fishing/aboriginal-fishing>.

**Tasmania – Commercial (catch).** Catches reported for the Tasmanian Scalefish Fishery are for the period 1 July to 30 June the following year. The most recent assessment available is for 2021–22.

**Tasmania – Recreational (management methods).** In Tasmania, a recreational licence is required for fishers using dropline or longline gear, along with nets, such as gillnet or beach seine. A bag limit of 15 individuals and a possession limit of 30 individuals is in place for recreational fishers.

**Tasmania – Indigenous (management methods).** <https://fishing.tas.gov.au/Documents/Policy%20for%20Aboriginal%20tags%20and%20allotting%20an%20UIC.pdf>

## CATCH CHART



Commercial catch of Gould's Squid - note confidential catch not shown

STATUS OF AUSTRALIAN FISH STOCKS REPORT  
Gould's Squid (2023)

<b>References</b>	
Jackson and McGrath-Steer 2003	Jackson, GD and McGrath-Steer, BL 2003, Arrow squid in southern Australian waters—supplying management needs through biological investigations, final report to the Fisheries Research and Development Corporation, project 1999/112, Institute of Antarctic and Southern Ocean Studies, University of Tasmania, Hobart.
Virtue et al. 2011	Virtue, P, Green, C, Pethybridge, H, Moltschaniwskyj, N, Wotherspoon, S and Jackson, G 2011, Arrow squid: stock variability, fishing techniques, trophic linkages—facing the challenges, final report to the Fisheries Research and Development Corporation, project 2006/12, Institute for Marine and Antarctic Studies, Hobart.
Green et al. 2015	Green, C, Robertson, S, Hamer, P, Virtue, P, Jackson, G and Moltschaniwskyj, N 2015, Combining statolith element composition and Fourier shape data allows discrimination of spatial and temporal stock structure of arrow squid ( <i>Nototodarus gouldi</i> ), <i>Canadian Journal of Fisheries and Aquatic Sciences</i> DOI: 10.1139/cjfas-2014-0559.
Hall 2023	Hall, KC 2023, NSW Stock status summary 2022/23 – Gould's Squid ( <i>Nototodarus gouldi</i> ), NSW Department of Primary Industries, Coffs Harbour, NSW.
Hall 2020	Hall, KC 2020, NSW Stock status summary 2018/19 – Gould's Squid ( <i>Nototodarus gouldi</i> ), NSW Department of Primary Industries, Fisheries NSW, Coffs Harbour, NSW.
Moore et al. 2022	Moore, A, Keller, K and Tuynman, H 2022, Great Australian Bight Trawl Sector, in Patterson, H, Bromhead, D, Galeano, D, Larcombe, J, Timmiss, T, Woodhams, J and Curtotti, R (eds), <i>Fishery status reports 2022</i> , Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
AFMA 2020	AFMA 2020, Southern Squid Jig Fishery Resource Assessment Group (SquidRAG) meeting 25, minutes, 23 June 2020, Australian Fisheries Management Authority, Canberra.
Noriega and Curtotti 2022	Noriega, R and R Curtotti 2022, Southern Squid Jig Fishery, in Patterson, H, Bromhead, D, Galeano, D, Larcombe, J, Timmiss, T, Woodhams, J and Curtotti, R (eds), <i>Fishery status reports 2022</i> , Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
Emery et al. 2022	Emery, T, Wright, D, Keller, K, Woodhams, J and Curtotti, R 2022, Commonwealth Trawl and Scalefish Hook sectors, in Patterson, H, Bromhead, D, Galeano, D, Larcombe, J, Timmiss, T, Woodhams, J and Curtotti, R (eds), <i>Fishery status reports 2022</i> , Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
Sharples et al. 2023	Sharples, R, Cresswell, K, Hartmann, K and Krueck, N, 2023, Tasmanian Scalefish Fishery Assessment 2021/22, Institute for Marine and Antarctic Studies, University of Tasmania.