

Golden Perch (2020)

Macquaria ambigua



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Queensland	Queensland	Undefined	Fishery independent surveys, recreational fishing survey
New South Wales	New South Wales	Undefined	Historical fishery catch, fishery-independent surveys, recreational fishing surveys
Victoria	Victoria	Recovering	Nominal CPUE
South Australia	South Australia	Sustainable	Catch, CPUE, age composition

STOCK STRUCTURE

Golden Perch occur throughout most of the Murray–Darling system, except at high altitudes, as well as in the Lake Eyre and Bulloo drainage systems of Queensland, New South Wales and South Australia, and the Dawson-Fitzroy river system in southern Queensland [Lintermans 2007]. Translocated fish also occur in numerous other waterways and impoundments throughout south-eastern Australia [Allen et al. 2002].

Golden Perch in the Murray-Darling Basin are genetically distinct from Golden Perch in the Lake Eyre, Bulloo and Fitzroy systems [Faulks et al. 2010a,b; Beheregaray et al. 2017]. Murray-Darling Golden Perch form a well-connected metapopulation with low-level basin-wide population structure, reflecting their ability to migrate and disperse long distances [Faulks et al. 2010b; Beheregaray et al. 2017; Attard et al. 2018; Zampatti et al. 2018a]. However, subtle genetic differences and regional differences in population structures driven by unique recruitment sources suggest sub-structuring across some regions. Examples include the Lower Lakes [Earl et al. 2015] and Paroo River [Attard et al. 2018], and potentially the physically disconnected and hydrologically impacted Victorian tributaries of the Murray River and some NSW tributaries of the Barwon-Darling (e.g. Lachlan River [Shams et al. 2020]). Sub-structuring is also evident in the Lake Eyre Basin [Faulks et al. 2010b]. Although genetic studies suggest

the existence of several biological stocks, there are differences in management arrangements and available information in the various jurisdictions that access Golden Perch.

To account for these differences, assessment of stock status is presented here at the jurisdictional level—Queensland, New South Wales, Victoria and South Australia.

STOCK STATUS

New South Wales An inland commercial fishery existed for Golden Perch in New South Wales (NSW) up until 2001, with records available from as early as 1883 until the fishery was closed. Minor bycatch of Golden Perch does occur through the Common Carp commercial fishery in NSW, although this fishery is specifically designed to minimise catch of non-target species [Cameron Westaway, DPI Fisheries, personal communication]. Analysis of the commercial fishery records, from 1947 to 1996, indicated that total annual catches peaked in 1954–55 at 310 tonnes (t), 293 t in 1975–76 and 173 t in 1993–94 [Reid et al. 1997]. Substantial fluctuations in annual harvest were apparent, with harvest ranging from 40.4 t in 1947–48 to the observed peak of 310 t in 1954–55 [Reid et al. 1997]. Variation in commercial harvest is attributed to the inter-relationship between effort, catchability and preceding recruitment events [Reid et al. 1997]. This can be attributed to the link between adult abundance as a lagged function of river inflows in the preceding 3+ years, with elevated summer flows associated with higher year-class-strength [Roberts et al. 2008]. Capture within any given month closely aligned with daily river flows [Reid et al. 1997], with passive capture methods (gillnets in still or slow flowing water or drum nets in flowing water) successfully exploiting the species' pre-disposition to move large distances during periods of elevated river discharge [Koster et al. 2017; Thiem et al. 2020].

Concerns have been raised in the literature regarding population fragmentation and observed reductions in the abundance of Golden Perch, occurring as a result of river regulation and habitat modification [Cadwallader 1978]. Specifically, dams and weirs interrupt the migratory pathways of all size classes [Harris et al. 2017], alter the availability of lotic habitat [Mallen-Cooper and Zampatti 2018], reduce the timing and volume of river flows [Walker and Thoms 1993] (required to complete life-cycle), cause direct mortality [Baumgartner et al. 2006] and exacerbate extreme climatic events which can lead to fish kills [Australian Academy of Science 2019]. These concerns prompted research into the development of hatchery techniques for artificial propagation and subsequent stocking of Golden Perch into NSW waters, supported by a growing interest from the recreational fishing sector [Lake 1967a; Lake 1967b; Rowland 1983; Rowland 1996]. An estimated 25 million Golden Perch have now been stocked in dams and rivers throughout Australia's eastern states, with NSW contributing approximately 9 million fish [Hunt and Jones 2018]. Recent evidence suggests that stocking into impoundments is needed to support put-and-take fisheries as natural recruitment is limited, whereas stocking into rivers is providing variable support to existing populations as most are sustained by natural recruitment [Crook et al. 2015; Forbes et al. 2015a; Thiem et al. 2017; Zampatti et al. 2019], with the level of connectivity (or conversely the number of impassable weirs) a key determinant in natural recruitment. Large-scale dispersal of juveniles (and to a lesser extent adults) may be masking the relationship between local-scale river flows and recruitment, with regular movements among connected river systems driving population fluctuations more than localised spawning [Zampatti et al. 2019; Zampatti et al. 2018; Zampatti et al. 2015].

Golden Perch form a component of a largely mixed recreational fishery in NSW, with anglers often targeting the species in combination with species such as Murray Cod in both rivers and impoundments. Recent estimates of recreational harvest of Golden Perch in NSW/ACT waters indicates that harvest in 2017–18 was estimated at 75 604 individuals (\pm a standard error of 14 859 individuals),

representing a decrease from the estimated 111 176 (\pm 16 451) individuals harvested in 2013–14 [Murphy et al. 2020]. Both catch and harvest rates are higher in rivers than impoundments and catch and release is a major component of this fishery, with an estimated 39% of captured Golden Perch harvested in 2013–14 and 40% in 2017–18 [Murphy et al. 2020]. These estimates largely align with those from a targeted creel survey in one 76 km reach of the Murrumbidgee River, where Forbes et al. [2015b] estimated that 39% of Golden Perch captured by recreational anglers harvested in 2012–13. Recreational fishing for Golden Perch is open year-round, and a current harvest restriction applies to Golden Perch recreationally captured in NSW waters, including a minimum legal length of 300 mm, a daily bag limit of 5 individuals and a possession limit of 10 individuals per licence holder. Unquantified indigenous harvest of Golden Perch does occur, and the species is considered culturally important [Cameron Westaway, DPI Fisheries, personal communication].

To-date there has been insufficient research undertaken to estimate the total abundance, biomass or population trend of Golden Perch at the local scale, or across the State as a whole. Substantial effort has been invested into quantifying the current age structure of the stock [Zampatti et al. 2019], and quantifying vital population statistics including growth, instantaneous mortality and annual mortality rates [Wright et al. 2020] as well as recreational catch, effort and harvest (presented above). As such, there is currently insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, Golden Perch in New South Wales is classified as an **undefined stock**.

Queensland Golden Perch in Queensland are represented by three separately evolving metapopulation lineages [Beheregaray et al. 2017]. These lineages occur separately in the Murray–Darling Basin, Lake Eyre catchment and Fitzroy–Dawson systems. Queensland has never supported a commercial fishery for Golden Perch. However, Golden Perch are a key target for recreational fishing in Queensland and have been translocated into most south east Queensland drainages to create recreational fisheries.

It is generally accepted that native fish populations in the Murray–Darling Basin’s rivers have declined to an estimated 10 per cent of the levels before European settlement [Murray–Darling Basin Commission 2004]. The decline is thought to have resulted from a combination of flow regulation, habitat degradation, reduced water quality, barriers to movement, introduced species and overexploitation from illegal fishing [Murray–Darling Basin Commission 2004]. Recognising these declines and the importance of recreational fishing in western Queensland, Fisheries Queensland initiated the Recreational Fishing Enhancement Program in the 1980’s and commenced a stocking program. Stocking ceased in the mid 1990’s in the Lake Eyre Basin as most declines were found to be localised events due to overfishing. Monitoring found good populations of Golden Perch away from the few easily accessible locations with strong natural recruitment events. Approximately 500 000 Golden Perch are stocked elsewhere in Queensland annually with the majority being stocked into impoundments.

Surveys of recreational angler participation and catch within Queensland were conducted in 2000, 2010, 2014 and 2019 [James Webley pers. comm., Webley et al. 2015]. Unfortunately, these surveys don’t differentiate between the three genetically separate populations of Golden Perch found in Queensland nor those stocked in impoundments. However, the estimates may provide an indication of trends. Estimates from these surveys for catch, harvest, and numbers released of Golden Perch have progressively declined over time as has angler targeted effort for this species. It was estimated that anglers harvested 262 000 \pm 38 000 fish in 2000 (Henry and Lyle 2003), followed by 87 000 \pm 1 500 (Taylor et al. 2012) and 78 000 \pm 17 000 (Webley et al. 2015) in 2010 and 2013 respectively. Initial results from the 2019 survey suggest that this has declined

further to less than 10% of that in 2000 at only 20 000 fish, however this estimate must be used with caution due to a medium relative standard error and changes to sampling areas that may impact on the estimates for Golden Perch [James Webley pers. comm.]. Recent research has further demonstrated the impact anglers have on Golden Perch populations, with a strong relationship found between the mean length of Golden Perch and their proximity to population centres. As the distance from town increased so did the mean length within the population [Michael Hutchison unpub. data].

Extensive drought conditions were experienced throughout 2018, 2019 and 2020. These conditions resulted in widespread localised fish kills throughout western Queensland. Unfortunately, most of these were not well documented or quantified due to the remote locations. The impacts on the Golden Perch populations are not yet known, though Golden Perch are highly mobile enabling them to move between regions and access favourable environmental conditions [Zampatti et al. 2018].

The Murray–Darling Basin Authority Murray-Darling Basin Fish Survey (MDBFS) formerly the Sustainable Rivers Audit, fishery-independent monitoring suggest an increase in numbers in the Condamine–Balonne and Warrego rivers, whilst the population in the Paroo River is recovering after blackwater events during 2018–19. Little recent data is available on the populations in Lake Eyre Basin or the Fitzroy–Dawson river systems. Further water development and mining on the Fitzroy–Dawson may impact on Golden Perch within this catchment in the near future.

On the basis of the evidence provided above, Golden Perch in Queensland is classified as an **undefined stock**.

South Australia

Golden Perch is an important species for commercial and recreational fisheries in South Australia. Historically, the commercial fishery had three main sectors: the River (or Reach) Fishery; the Lake Eyre Basin Fishery (LEBF); and the Lakes and Coorong Fishery (LCF). The River Fishery was established in 1923 and operated in the lower Murray River, before it was closed in 2003 [Ferguson and Ye 2012]. The LEBF was established in 1992, and has one licensed fisher that operates on the pastoral holding of Mulka Station. The LEBF is a unique fishery due to its dependence on the dispersion of Golden Perch to the region during large-scale flood events within the system. As such, the fishery has operated and reported catches in seven of the past 28 years. The LCF is the main commercial fishery for Golden Perch in South Australia, targeting the species in the Lower Lakes of the Murray River (Lakes Alexandrina and Albert). The most recent assessment for Golden Perch in the LCF was completed in 2020, and used a weight-of-evidence approach that considered fishery catch and effort data to the end of June 2019 [Earl 2020].

The primary measures for biomass and fishing mortality are total catch and targeted gillnet catch per unit effort (CPUE) for the LCF [Earl 2020], and spatially-limited fishery-independent estimates of CPUE and age structures from electrofishing surveys undertaken in the Chowilla Anabranch and Floodplain system since 2005 [Fredberg et al. 2020]. The most obvious long-term trend in the commercial fishery data is the cyclical nature of the interannual variation in total catch, which has been closely linked with variations in targeting and CPUE. Catch peaked at 206 t in 1994–95, then declined to around 37 t in 2001–02, before increasing to a secondary peak of 152 t in 2006–07 [Earl 2020]. Since then, catches have been lower. Between 2013–14 and 2016–17, annual catches were between 79–88 t, before increasing to 105 t in 2017–18. Catch declined to 61 t in 2018–19, reflecting a decline in targeted fishing effort. Catch rates for gillnets in the LCF have increased to historically high levels over the past decade, and have been indicative of high fishable biomass. In 2018–19, CPUE for gillnets was the second highest recorded in the fishery.

Fishery-independent electrofishing survey data from 2005–2019 indicated that

Golden Perch were most abundant in the Chowilla Anabranch and Floodplain system (i.e. near the SA-NSW border) in 2011, after large-scale flooding in the Murray-Darling Basin, and were least abundant in 2005-2010, 2016, 2018 and 2019 in association with low River Murray flows [Fredberg et al. 2020]. Golden Perch are periodic strategists that spawn and recruit periodically in association with elevated river flows [Mallen-Cooper and Stuart 2003], and the high abundances in Chowilla in 2011 were a result of enhanced recruitment in association with overbank flooding [Zampatti and Leigh 2013]. The low abundances in Chowilla in 2019 reflect limited spawning and recruitment over recent years [Fredberg et al. 2020, and likely emigration of adult fish to upstream regions [Zampatti et al. 2018] associated with generally low flows that have prevailed in the southern Murray-Darling Basin [King et al. 2020]. The lack of recruitment in Chowilla in recent years is typical of the periodic strategy of Golden Perch and is a pattern that is reflected broadly across regions of the Murray-Darling Basin [King et al. 2020].

Golden Perch is a popular target for recreational fishers in South Australia. The State-wide recreational survey in 2013–14 estimated that 116 153 Golden Perch were captured, of which 37 367 fish were harvested [Giri and Hall 2015]. The estimated total recreational harvest weight was 37.4 t, which was 30 per cent of the State's total catch in 2013–14. 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 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 provide above, Golden Perch in South Australia is classified as a **sustainable stock**.

Victoria

Commercial harvest of Golden Perch in Victoria ceased in 2001 and there is no recent information on recreational harvest or effort at state level. In the absence of consistent, long-term estimates of population abundances and harvest by recreational anglers, the status of Golden Perch in Victoria was assessed using nominal catch estimates and length composition from infrequent and irregular fishery-independent (electrofishing) surveys of six indicator riverine populations (Broken Creek and River, Campaspe River, Goulburn River, Gunbower Creek, Loddon River and Wimmera River) [Conron et al. 2020].

In recent years, electrofishing survey catch per unit effort (CPUE; number of fish per machine minute) has increased in four indicator rivers (Campaspe River, Goulburn River, Gunbower Creek and Wimmera River), remained stable in one river (Broken Creek and River) and declined in one river (Loddon River) [Conron et al. 2020]. CPUE for Broken Creek and River, and Loddon River were below the average CPUE for the reference period (1996–2015, with the start year of the reference period for each river varying according to the year of initial survey) in the last two years of assessment, while CPUE since the early 2010s for the Campaspe River, Goulburn River, Gunbower Creek and Wimmera River have been above the average for the reference period.

All six indicator rivers are stocked annually with hatchery-bred juveniles, which may be masking natural recruitment. Regular stockings into the Campaspe, Goulburn and Loddon rivers is making a substantial contribution to populations [Ingram et al. 2015, Tonkin et al. 2019]. All Golden Perch sampled from the Campaspe River above Rochester were stocked and the majority of fish sampled from the Goulburn and Loddon rivers were stocked [Tonkin et al. 2019]. Despite regular stocking, the CPUE in the Loddon River has been declining since 2014. There is no information available to determine if stocked fish are contributing to fisheries in the Broken Creek and River, Gunbower Creek and Wimmera River.

There is no information on fishing pressure, biomass and size composition for Golden Perch in impoundments in Victoria, where populations are largely sustained by stocking rather than natural recruitment. In 2019, 3.23M Golden

Perch were released across Victoria [<https://vfa.vic.gov.au/recreational-fishing/fish-stocking>, accessed on 29-Oct-2020].

On the basis that CPUE appears to be increasing in four of six indicator rivers it is anticipated that the Golden Perch stock will continue to improve under favourable environmental conditions to support some natural recovery of populations.

Overall, the above evidence indicates that the biomass of this stock is likely to have been depleted and that recruitment was impaired. Furthermore, the above evidence indicates that the current level of fishing mortality should allow the stock to recover from its recruitment impaired state.

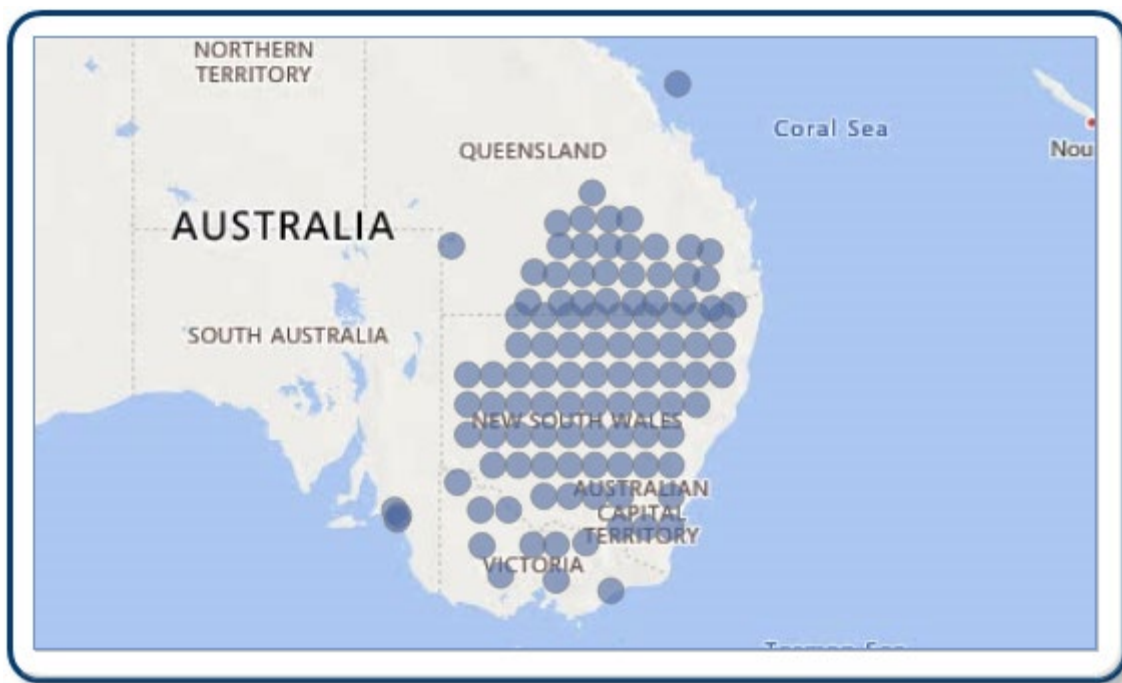
On the basis of the evidence provide above, Golden Perch in Victoria is classified as a **recovering stock**.

BIOLOGY

[Roberts et al. 2008; Forbes et al. 2015; Mallen-Cooper and Stuart 2003]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Golden Perch	27 years; 640 mm TL	~225–371 mm TL; ~2–4.9 years. Variable across geographical regions.

DISTRIBUTION



Distribution of reported commercial catch of Golden Perch.

TABLES

Fishing methods	New South Wales	Queensland	South Australia	Victoria

Commercial				
Gillnet			✓	
Net		✓		
Unspecified		✓	✓	✓
Recreational				
Gillnet			✓	
Hook and Line	✓	✓	✓	✓

Management Methods				
	New South Wales	Queensland	South Australia	Victoria
Commercial				
Gear restrictions			✓	
Limited entry			✓	
Size limits			✓	
Spatial restrictions			✓	
Temporal closures			✓	
Total allowable effort			✓	
Recreational				
Bag and boat limits			✓	
Bag and possession limits	✓			
Bag limits				✓
Gear restrictions	✓		✓	✓
Licence				✓
Possession limit		✓		
Size limit	✓	✓		✓
Spatial closures			✓	
Temporal closures			✓	

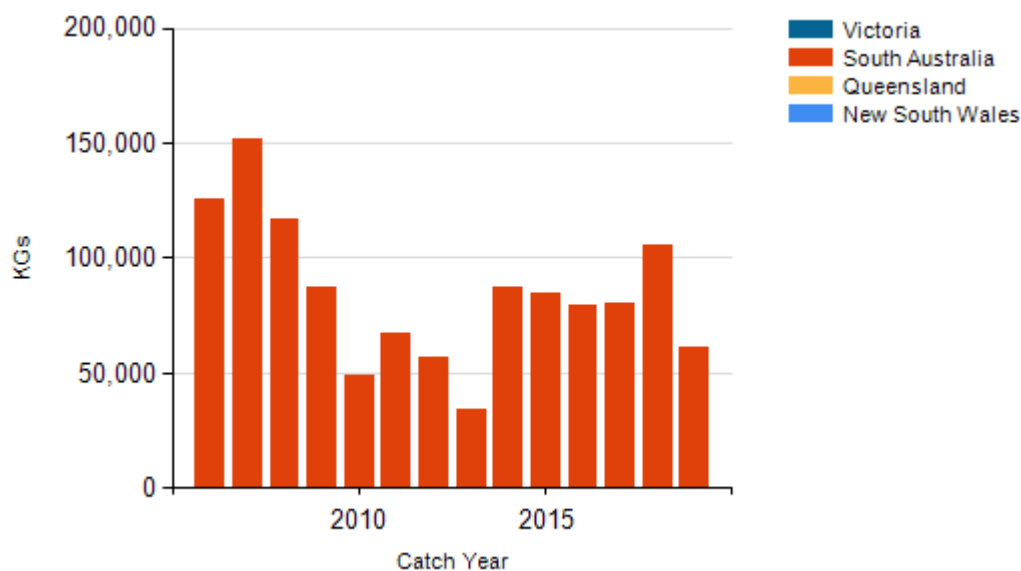
Catch				
	New South Wales	Queensland	South Australia	Victoria
Commercial	0 t	0.0307 t	61.3249 t	0 t
Indigenous	Unknown	Unknown	Unknown	Unknown

Recreational	75,604 individuals (2017-18)	20,000 individuals (2019-20)	37.4 t (in 2013–14)	Unknown
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Queensland – Indigenous (management methods) for more information see <https://www.daf.qld.gov.au/business-priorities/fisheries/traditional-fishing>.

Victoria – Indigenous (Management Methods) A person who identifies as Aboriginal or Torres Strait Islander is exempt from the need to obtain a Victorian recreational fishing licence, provided they comply with all other rules that apply to recreational fishers, including rules on equipment, catch limits, size limits and restricted areas. Traditional (non-commercial) fishing activities that are carried out by members of a traditional owner group entity under an agreement pursuant to Victoria’s *Traditional Owner Settlement Act 2010* are also exempt from the need to hold a recreational fishing licence, subject to any conditions outlined in the agreement. Native title holders are also exempt from the need to obtain a recreational fishing licence under the provisions of the Commonwealth’s *Native Title Act 1993*.

CATCH CHART



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