

## *Bidyanus bidyanus* Silver Perch

### Taxonomy

*Bidyanus bidyanus* (Mitchell, 1838)

### Current conservation status

Listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1995).

Categorised as Vulnerable in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

### Proposed conservation status

Endangered in Victoria

Criterion B2ab(iii,v)c(i,ii,iv)

### Species Information

#### Description and Life History

The Silver Perch is a moderate to large fish with a strongly compressed elongate-oval body covered in small, thin scales. The scales have dark margins, which gives the fish a reticulate appearance. Fish to 610 mm and 8 kg have been recorded. More commonly, however, they reach 410 mm and 2.5 kg. The head is small with a convex dorsal profile, terminating in a small mouth with upper and lower jaws of equal length; the operculum has two flat spines (the lower being larger). The eyes are small and are positioned high on the head close to the dorsal profile. Silver Perch have a single, long-based dorsal fin divided into two sections, the anterior section is deeply notched between each of the 12 large spines, and is followed by the soft-rayed posterior section. The short-based anal fin has three prominent spines followed by a soft-rayed section, and the caudal fin is weakly forked. A scaly sheath covers the bases of both the anal and dorsal fins. The lateral line is continuous, but not prominent. Colour varies with water turbidity but is generally dark grey to grey-brown dorsally, fading to silver laterally and white ventrally, while the fins are whitish to grey (Cadwallader and Backhouse 1983).

Silver Perch generally spawn over a protracted period from October to March when water levels increase and water temperatures rise. While spawning will occur >18 degrees C (Tonkin et al. 2007), maximum spawning occurs at about 23° C (Lake 1967a; King et al. 2015). Spawning has, however, been observed at temperatures of 21.6° C (Thurstan and Rowland 1995). Spawning may occur in flooded backwaters of low gradient streams (Lake 1967c), provided an increase in both water level and temperature occur. It is clear from these requirements that alterations to natural flooding and water temperature regimes have the capacity to seriously affect the spawning behaviour and potential spawning success of Silver Perch.

Spawning has been observed to occur in schools with females surrounded by males, followed by vigorous activity (sometimes with several males chasing a female (Lake 1967b) at which time both eggs and sperm are released into the water column. This behaviour was observed five or six times at intervals of 20 to 30 minutes (NSW fisheries 1915). Lake (1967b) noted that some individuals died following spawning.

Fecundity varies with fish size: up to around 500,000 eggs have been recorded from a 1.8 kg female (Lake 1967d), but approximately 300,000 eggs is more typical (Rowland 2004). Eggs are spherical, pelagic, non-adhesive, semi-buoyant, colourless and about 2.5-3 mm in diameter when water hardened (Thurstan and Rowland 1995). Eggs

are pelagic and drift downstream with the current; in still water, however, they will settle to the bottom (Cadwallader and Backhouse 1983). The greatest concentration of drifting eggs has been found closer to the shore and nearer the bottom (Tonkin et al. 2007). There is no apparent parental care of eggs following spawning (Lake 1967b). Eggs drift but hatch rapidly (within 28-31 hours at temperatures of 24-27 degrees C), and juveniles are free swimming by 5 days and commence feeding at 4-6 days (Lake 1967d, Guo et al. 1993).

Silver Perch migrate entirely in freshwater, usually after water temperatures increase above 20 degrees C. A wide variety of ages undergo upstream migration (sometimes over extensive distances). A highly mobile species with adults recorded to move up to 1200 km (Reynolds 1983; Tonkin et al. 2017). Immature fish move upstream from October to April, while mature fish move upstream over a shorter period from November to February (Mallen-Cooper et al. 1995). Increased migration has also been observed after increases in flow. The upstream migration of juvenile Silver Perch is thought to be for one or more of the following strategies: to optimise feeding, to enhance colonisation, or to compensate for the downstream drift of pelagic eggs and larvae (Mallen-Cooper et al 1995). The pelagic nature of Silver Perch eggs and larvae (they drift downstream for 12 to 15 days) is believed to be one of the factors responsible for the upstream migration of mature Silver Perch prior to spawning (Mallen-Cooper et al. 1995). Barriers to migration are believed to adversely affect these strategies.

Silver Perch are omnivorous, taking such items as zooplankton, crustaceans, aquatic insects and algae; the proportion of algae in the diet increases with age (Clunie and Koehn 2001b).

### Generation Length

The generation length of the Silver Perch is estimated to be 3 to 11 (midpoint 6) years. This is based on recent (2016) research on population dynamics of the southern Murray Darling population (Tonkin et al. 2017a), thus providing a lower bound of three years, an upper bound of eleven years and a likely midpoint of six years.

### Distribution

The natural range of Silver Perch includes most of the Murray-Darling drainage basin, excluding the cool, higher altitude upper reaches of streams on the western side of the Great Dividing Range (Merrick 1996), and includes southern Queensland, western New South Wales, northern Victoria and South Australia (Cadwallader and Backhouse 1983).

In Victoria, Silver Perch have been recorded from 12 river basins. Populations occur naturally in eight of these: the Upper Murray (Lake Hume stocking), Ovens River, Broken River, Goulburn River, Campaspe River, Loddon River, Murray Riverina and the Mallee. Silver Perch have been introduced into the other four river basins: Wimmera River, Yarra River, Werribee River and Corangamite. The majority of records are from the Goulburn River, Loddon River, Murray Riverina, and Mallee.

The population crashed in the 20th century due to river regulation, barriers, de-snagging etc. but in recent years there has been environmental watering, fishways and regulatory protection, so the taxon has stabilised in the current range.

### Habitat

Habitats include rivers and large streams, as well as lakes and impoundments. Rowland (1995) noted that the taxon occurs in both the cooler, clearer, upper reaches of the Murray Darling River system with gravel beds and rocky substrates, as well as in the turbid, slow flowing rivers in the west and north. While Silver Perch may be found in a range of conditions, Merrick and Schmida (1984) noted that they prefer fast flowing waters, particularly where there are rapids and races. In Victoria, Cadwallader and Backhouse (1983) indicated that open waters were preferred to those that were heavily snagged. In Sevens Creek, Cadwallader (1979) recorded Silver Perch in situations where cover was provided by debris, occasional stands of Phragmites and where the water was very turbid. Electrofishing surveys in the Murray River recorded the capture of Silver Perch mainly from open waters off sandy beaches (ARI unpubl. data).

### Threats

Cold water pollution (from low level outlets on dams) may lead to localised extinctions downstream of large dams if water consistently fails to reach temperatures required for spawning (23 degrees C).

River regulation may affect spawning success because spawning is at least partially initiated by rises in water level. River regulation may also alter both the quality and availability of floodplain habitats such as backwaters and billabongs in which Silver Perch have been recorded.

Barriers to migration and reductions in flow cues may limit or prevent adults and juveniles accessing or recolonising upstream habitats, and consequently prevent their dispersal and access to feeding areas and their ability to compensate for downstream drift of eggs and larvae. This may result in the local extinction of Silver Perch in affected stretches of river.

Deposited sediments may be detrimental to eggs and larvae of Silver Perch, particularly in still water habitats such as backwaters, floodplains and weir pools when the majority of sediment is transported during high flow events.

Introduced species e.g. Carp (*Carpio Cyprinus*) and Redfin (*Perca fluviatilis*) disturb habitats and prey on juveniles.

### IUCN Criteria

Criterion A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p style="text-align: center;">based on any of the following:</p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

### Evidence:

#### Ineligible under Criterion A

The past and future reductions in population are too small to meet any threshold for Criterion A.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

**Evidence:**

**Eligible under Criterion B2 as Endangered**

The Area of Occupancy (AoO) across the taxon's range is estimated to be 328 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

It is estimated to have 1 location, as a single barrier between Torumbarry and Euston could wipe out the entire southern Murray-Darling basin connected population.

It has a continuing decline in (iii) and (v). Recent recovery work i.e. flows, fishways, fisheries regulation and education have been successful so that numbers may be at break-even, in best-case climate scenarios. However, if there is another big drought and recovery actions are not fully implemented (e.g. flow recommendations and fish passage), then there will be a likely decrease. Given recent drying and heatwaves in the north, the long-term trend is likely to be a decline.

It is estimated to have extreme fluctuations in (i), (ii) and (iv) above. Under natural conditions, annual recruitment with some variability but not the extremes seen under regulated conditions. In Victorian tributaries, drought events can lead to extreme changes at a metapopulation scale. The EoO and AoO fluctuate with losses of populations in Victorian tributaries under drought conditions, then recolonisation.

Criterion C. Small Population size and decline		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b)	Extreme fluctuations in the number of mature individuals			

### Evidence:

#### Ineligible under Criterion C

It is suspected that there are 2,000 to 10,000 mature individuals, but this qualifier is too weak to satisfy this criterion.

Criterion D. Very small or restricted populations		Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)		< 50	< 250	< 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.		-	-	D2. Typically: AoO < 20 km <sup>2</sup> or number of locations ≤ 5

### Evidence:

#### Eligible under criterion D2 as Vulnerable

The taxon is inferred to be very restricted.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

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