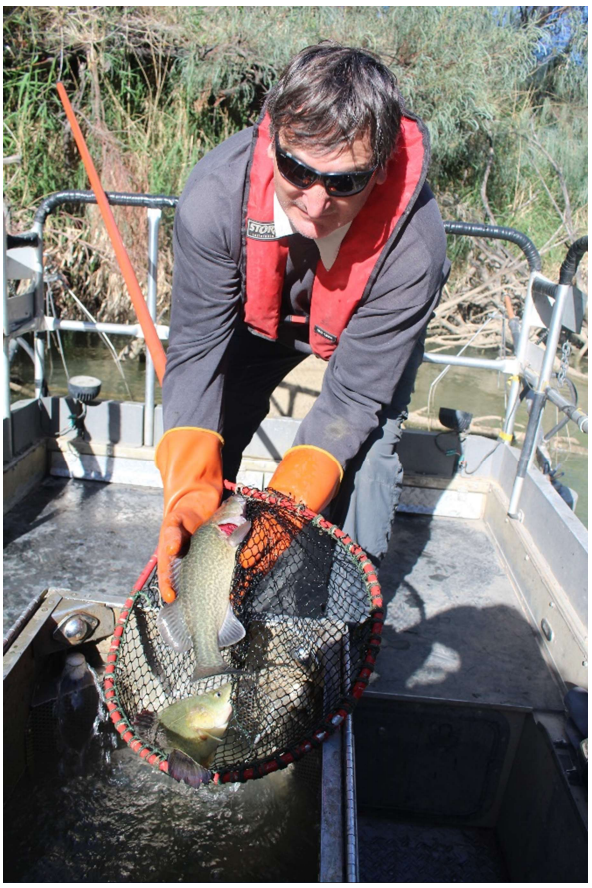
Native Fishery Report Cards - 2020



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Arthur Rylah Institute for environmental research

May 2021
Victorian Fisheries Authority
Science Report Series No. 16

Your fishing licence fees at work

Victorian Fisheries AUTHORITY

Native Fishery Report Cards - 2020

Brett A. Ingram and Jason Lieschke

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Executive Summary

Fishery report cards provide a quick and concise means of presenting complex and detailed fish population data in a simplified format for readers to digest. These report cards are being used by the Victorian Fisheries Authority (VFA) to engage and inform anglers about the status and health of important recreational species in the state.

The *Native Fish Report Card Program* (*NFRCP*), which commenced in 2017, uses fish population surveys to produce *Health cards* for 10 important recreational and threatened non-recreational native freshwater fish from 10 priority streams in Victoria in which they commonly occur. These priority rivers are identified as reference rivers for monitoring and assessment in the Victorian *Freshwater Fisheries Management Plan* (Victorian Fisheries Authority 2018). Results from fish surveys are summarised into a *Health Card* for each species and river and key health indicators assessed.

Electrofishing and fyke netting methods were used to capture fish. These methods are effective sampling tools for providing a snapshot of the presence and abundance of fish present at the time of sampling. But they do not catch all the fish present and often fish are observed but cannot not caught. Therefore, the numbers of fish presented in the *Native Fishery Report Cards* should be considered a sample only. There are likely to be many more fish in the waterways than just those recorded. Fish may also move about and populations will fluctuate due to natural variations over time.

Native fishery report cards presented in this report combine information from electrofishing surveys conducted for the *NFRCP* with comparable historic electrofishing surveys dating back to the early 1990s to assess long-term trends in catch rates, fish size structure (presence of multiple year classes, mature fish and recent recruits) and the current health of eight native fish species (Australian bass, estuary perch, Macquarie perch, trout cod, Murray cod, golden perch, freshwater catfish and silver perch) in selected Victorian streams. The VFA native fishery report cards combine and summarise results for two to four rivers for each species. These report cards aim to give fishers and managers a better understanding of the past and current health of these species.

An overall rating of Good was recorded for four species (Australian bass, estuary perch, Murray cod and trout cod), Moderate for two species (golden perch and Macquarie perch) and Low for two species (freshwater catfish and silver perch).

Summary of key health indicators for eight native fish species.

Stream	Rivers	2020 Results						
		5-year abundance	10-year abundance	Multiple year classes	Mature fish	Recent recruitment	Maximum size	Overall rating
Australian bass	Mitchell R. and Thomson R. and Macalister R.	⇔	?	✓	✓	✓*	✘	Good
Estuary perch	Glenelg R.	⇩	⇧	✓	✓	✘	✘	Good
Freshwater catfish	Lindsay R. and Mullaroo Ck and Wimmera R.	⇔	?	?	?	?	?	Low
Golden perch	Goulburn R., Gunbower Ck, Lindsay R. and Mullaroo Ck and Wimmera R.	⇩	⇔	✓	✓	✘	Some	Moderate
Macquarie perch	Ovens R. and Yarra R.	⇩	?	✓	Some	Some*	✘	Moderate
Murray cod	Goulburn R., Gunbower Ck, Ovens R., Lindsay R. and Mullaroo Ck	⇧	⇔	✓	Some	Some*	✘	Good
Silver perch	Gunbower Ck and Wimmera R.	⇔	⇔	?	?	?	?	Low
Trout cod	Goulburn R. and Ovens R.	⇩	?	✓	✓	✓	Some	Good

* May include stocked fish.

Introduction

Fishery report cards

Fishery report cards provide a quick and concise means of presenting complex and detailed fish population data in a simplified format for readers to digest. These report cards are being used by the Victorian Fisheries Authority (VFA) to engage and inform anglers about the status and health of important recreational species in the state. Fishery report cards have been prepared for popular estuarine fish, trout and freshwater native fish.

Native Fish Report Card Program (NFRCP) and on-line portal

The *Native Fish Report Card Program* (*NFRCP*), which commenced in 2017, uses fish population surveys to produce *Health cards* for 10 important recreational and threatened non-recreational native freshwater fish from 10 priority streams in Victoria in which they commonly occur. These priority rivers were selected in collaboration with catchment management authorities (CMAs), scientists and expert recreational fishers, and are identified as reference rivers for monitoring and assessment in the Victorian *Freshwater Fisheries Management Plan* (Victorian Fisheries Authority 2018).

The *NFRCP* is a partnership between the Department of Environment, Land, Water and Planning (DELWP) and the Victorian Fisheries Authority (VFA) and Recreational Fishing License Holders (through Recreational Fishing License Trust Recreational Fishing Grants Program).

Results from fish surveys were summarised into a *Health Card* for each species and river and key health indicators assessed, which were published electronically on the *Native fish report card portal* up until 2019 (https://www.nativefishreportcard.org.au/).

Native Fishery Report Cards in this report

Native fishery report cards presented in this report combine information from electrofishing surveys conducted for the *NFRCP* (2017 - 2020) (Figure 1) with historic electrofishing surveys dating back to the early 1990s to assess long-term trends in catch rates, fish size structure (presence of multiple year classes, mature fish and recent recruits) and the current health of eight native fish species (Australian bass, estuary perch, Macquarie perch, trout cod, Murray cod, golden perch, freshwater catfish and silver perch) in selected Victorian streams (Figure 2). The report cards combine and summarise results for two to four rivers for each species (Table 2). Previously these report cards have been published in the *2019 Murray Codference: Conference Proceedings* (Ingram *et al.* 2019).

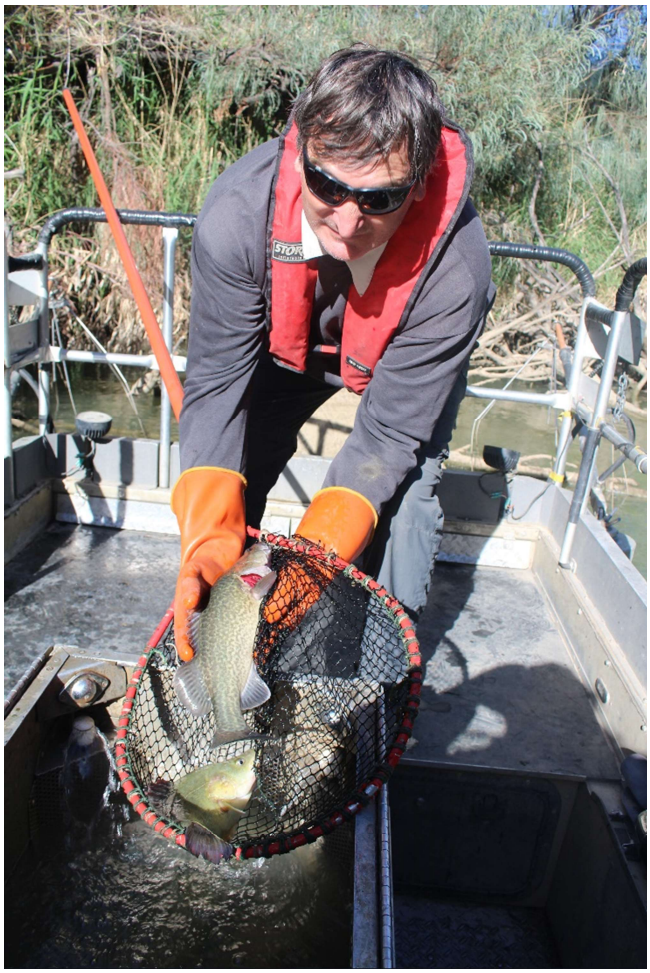

Figure 1. Jason Lieschke electrofishing Murray cod and golden perch

Objective

Combine fish survey results from the *NFRCP* with historic survey records to produce native fish health report cards for eight native fish species monitored in selected Victorian streams to give fishers and managers a better understanding of the past and current health of these species.

Table 1. Priority rivers and species survey as part of the *Native Fish Report Card Program*.

Priority river	Region	Recreational species	Threatened non-recreational species
Gellibrand River	Corangamite CMA	River blackfish	Australian grayling
Glenelg River	Glenelg Hopkins CMA	Estuary perch	
Lower Goulburn River	Goulburn Broken CMA	Golden perch Murray cod	Silver perch Trout cod
Gunbower Creek	North Central CMA	Golden perch Murray cod	Silver perch Trout cod
Lindsay River & Mullaroo Creek	Mallee CMA	Golden perch Murray cod	Silver perch
Mitchell River	East Gippsland CMA	Australian bass	Australian grayling
Ovens River	North East CMA	Golden perch Murray cod	Macquarie perch Trout cod
Thomson & Macalister rivers	West Gippsland CMA	Australian bass	Australian grayling
Wimmera River	Wimmera CMA	Freshwater catfish Golden perch	Silver perch
Yarra River	Melbourne Water	Macquarie perch Murray cod	Australian grayling

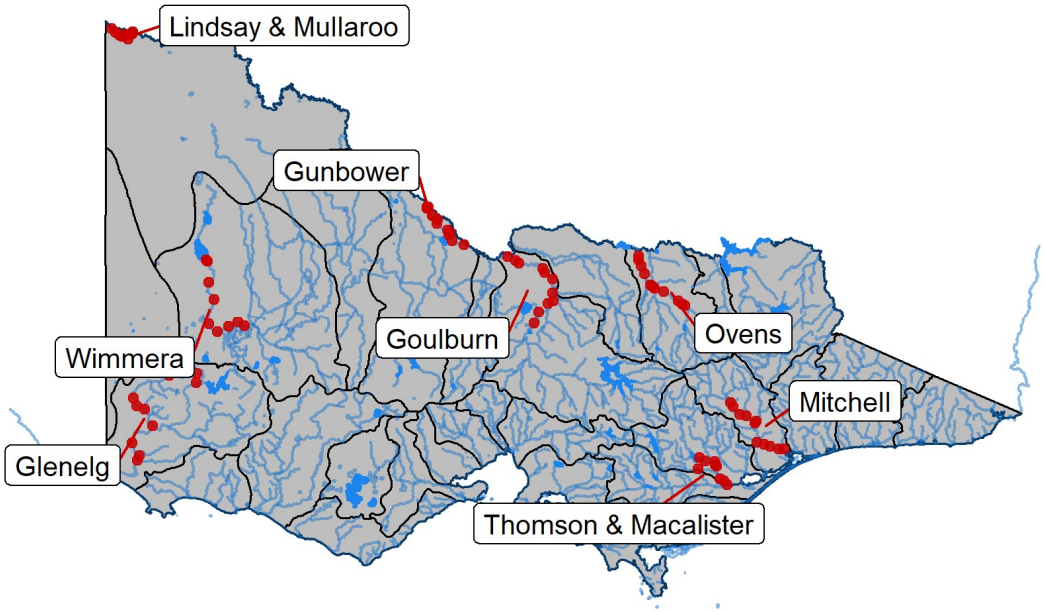

Figure 2. Location of streams surveyed for native fishery report cards in this report.

Table 2. Species and rivers assessed for each species that are presented in a fishery report card format in this report.

Species	Mitchell	Thomson & Macalister	Glenelg	Ovens	Goulburn	Gunbower	Lindsay & Mullaroo	Wimmera	Yarra
Australian bass	■	■							
Estuary perch			■						
Macquarie perch				■					■
Trout cod				■	■				
Murray cod				■	■	■	■		
Golden perch					■	■	■	■	
Silver perch						■		■	
Freshwater catfish							■	■	

Materials and Methods

NFRCP data (2017 – 2020)

Data collection (also known as sampling) for the *NFRCP* commenced in 2017 and is conducted once a year. Sampling was done in autumn to avoid the spring periods of peak migration when some native fish undertake long distance movements into or out of rivers. Previous surveys have also been conducted at this time of the year allowing a comparison between surveys.

Fish were sampled from multiple sites in each priority river, predominantly using electrofishing. Smaller streams, such as the Gellibrand River, were surveyed with a backpack electrofisher for approximately 90 minutes, while larger streams were surveyed with an electrofishing boat for 60 to 90 minutes. Fyke netting was also used in two rivers where target species that live on the bottom of the river are difficult to catch using electrofishing. These are river blackfish (Gellibrand River) and freshwater catfish (Wimmera River).

Electrofishing (Figure 3) and fyke netting are effective sampling tools for providing a snapshot of the presence and abundance of fish present at the time of sampling. But they do not catch all the fish present and often fish are observed but cannot not caught. Therefore, the numbers of fish presented in the *Native Fishery Report Cards* should be considered a sample only. There are likely to be many more fish in the waterways than just those recorded. Fish may also move about and populations will fluctuate due to natural variations over time.

Eight to 14 sites were surveyed in each stream, and 90 – 3,000 m of stream was surveyed at each site. The length of fish caught were measured (Figure 4) and their abundance (number of fish caught per length of stream) was estimated.

Figure 3. Electrofishing Murray cod (Photo. John Douglas, VFA).

Historic data (pre 2017)

The *NFRCP* data were combined with historic electrofishing survey data that were collected within the same river reaches using similar methods to the current surveys to assess long term trends in abundance (fish per 100 m). These historic data were sourced from:

- VFA fish surveys records (Kaiela Fisheries Station – 1982 to1993 and Snobs Creek – 1989 to 2011). Goulburn River (1996-2011), Gunbower Creek (1993-2007), Lindsay and Mullaroo (1994-1998), Mitchell River (1990-2001), Ovens River (1992-2011), Thomson and Macalister (1989-1999) and Wimmera river (1994-1999).
- The Living Murray Program (Murray-Darling Basin Authority) (https://www.mdba.gov.au/publications/brochure/living-murray-program). Gunbower Creek (2008-2017)
- The project, *Integrating fisher-derived and fishery-independent survey data to better understand and manage the Murray Cod fishery in the Murray-Darling Basin* (FRDC Project 2013/022) (Ingram and Raymond 2018). Goulburn and Ovens rivers (2015-2017)
- Monitoring fish stockings in Victoria: 2014 native fish surveys (Ingram *et al.* 2015). Goulburn River and Gunbower Creek (2014)
- Yarra River surveys conducted by DELWP on behalf of Melbourne Water (Tonkin *et al.* 2017). Yarra River (2007-2015)
- Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) (DELWP 2017a, DELWP 2017b). Glenelg River (2009-2018), Goulburn River (2004-2019), Thomson and Macalister rivers (2005-2016)), Wimmera River (2005- 2016), Yarra River (2007-2012)
- Mitchell River SRA/SB data supplied by DELWP. Mitchell River (2009).

Only historic data collected from locations within the same reach of river that surveyed for the *NFRCP* were used in the analyses.

In addition, angler catch rate information from the *Angler Fishing Diary Program* (*AFDP*) was presented for estuary perch in the Glenelg River. The *AFDP*, which commenced in 1997, is the principal means that the VFA uses to monitor recreational fisheries in Victorian estuaries for assessment purposes (Conron *et al.* 2010, Conron and Oliveiro 2016).

The *AFDP* provides time-series data on catch rates, catch length-frequency, and catch age-frequency composition for key target species in selected Victorian recreational fisheries, including estuary perch in the Glenelg River which was last assessed in 2016 (Ingram *et al.* 2016). Angler catch rate is not intended to be compared against electrofishing catch rate but rather provides an additional line-of-evidence for change in abundance over time.

How to read the native fishery report cards

This section provides a brief description of the information presented in the report cards. A more detailed description of the performance measures, how scores were assigned and how the overall rating for each species was determined is provided in Appendix I.

Each report card is broken into several sections. These are:

Overall rating

Overall rating of the health of the species in the selected rivers assessed as part of the report card, which is a synthesis of the fish population performance measures (health indicators). The Overall ratings are:

Fish population performance measures (health indicators)

Information about the abundance (catch rate) of fish and their sizes (length) provide performance measures used to indicate the health of the population. These performance measures are summarised to determine the overall rating for the species. The performance measures are.

Fish abundance

Trend (change) in fish abundance over last five years and last 10 years as indicated by average annual catch rate. Data may be from various sources including electro-fishing surveys and the *Angler Fishing Diary Program* (*AFDP*).

Scores: ⇧ Increasing ⇩ Decreasing. ⇔ Stable or variable (up and down)
? Insufficient information to assess.

Fish size (length/age)

Fish size performance measures are based on measurement (fish length) of fish caught in surveys over the last three years. Assessment is conducted only when 60 or more fish are measured in the three years combined, otherwise information to assess fish size is considered insufficient. Fish size categories are:

- Multiple size classes: A wide range of fish sizes present indicates regular successful spawning events and recruitment is occurring in the stream.

  Scores: ✓ Wide range of fish size classes present
  Some A few fish size classes present
  ✘ No fish caught or very few fish size classes present
  ? Insufficient fish measured to assess

- Mature size classes: Mature fish capable of spawning are present in the stream.

  Scores: ✓ Good numbers of mature fish present
  Some A few mature fish present
  ✘ No mature fish present
  ? Insufficient fish measured to assess

- Recent recruitment: Small fish (recruits presumed to be less than one year old) (<10 cm) are present indicates that fish have spawned recently (in last 12 months) in the stream. This may also indicate recent stocking of hatchery-bred fish.

  Scores: ✓ Good numbers of small fish present
  Some A few small fish present
  ✘ No small fish present
  ? Insufficient fish measured to assess

- Maximum size: The presence of fish approaching maximum size indicates sustainable fishing pressure (see Appendix I for maximum size of species).

Scores:		
	✓	Good numbers of fish approaching maximum size present
	Some	A few fish approaching maximum size present
	✘	No fish approaching maximum size present
	?	Insufficient fish measured to assess

Assessment statement

Provides a summary health assessment for the species in the selected rivers assessed.

Map

Map showing locations of selected rivers assessed for the species.

Monitoring Results

Monitoring results on the second page of the report card include the following information.

- Average annual catch rate of species in selected rivers based on all available data, and long-term average catch rate. This information was used to assess stock abundance performance measure, i.e. 5 year abundance trend and 10 year abundance trend.
- Size of fish caught in 2020 surveys, including size range of fish measured, percent of fish that were legal size, percent of fish that were mature and percent of fish that were recent recruits.
- Years that the selected rivers have been stocked with hatchery-bred fish.
- Number of hatchery-bred fish stocked into the selected rivers in the last four seasons.
- Length frequency distribution of fish caught during electro-fishing surveys of the selected rivers over last three years and number of fish caught each year in the selected rivers. This information was used to inform fish size performance measures, e.g. presence of recruits, mature fish and fish approaching maximum size.

Figure 4. Measuring and releasing a Murray cod (Photo. J. Douglas, VFA).

Results and discussion

Species present

Forty fish species were reported during surveys conducted in 2020, with 9 -17 species observed in each river. The most common species was Australian smelt being recorded in all nine rivers and most abundant in six rivers.

The most common large-body fish species was common carp. This species represented 42% of large-bodied fish caught and observed, was observed in all nine rivers and was the most common large-bodied fish observed in eight rivers and second most common behind river blackfish in Glenelg River (Figure 5).

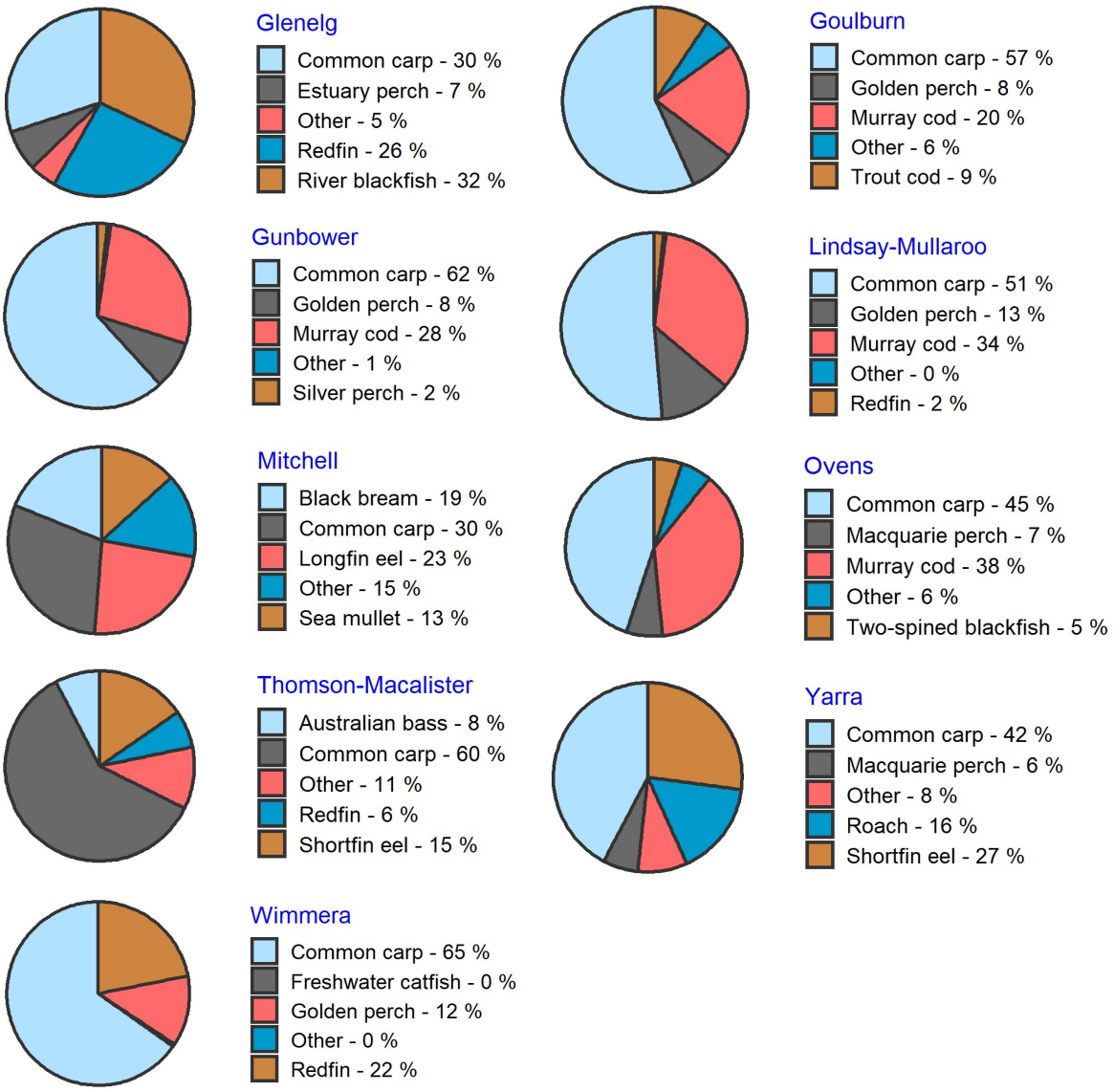

Figure 5. The most common large-bodied fish species caught and observed in each river during 2020 electrofishing surveys.

Fish abundance

Abundance records (as fish/ 100m) for eight native fish species from nine river systems (Table 2), recorded in electrofishing surveys conducted between 1982 and 2020, were used to assign five levels of fish abundance (see Appendix II), which were:

Abundance level	Low	Moderate	High	Very high	Exceptional
Electrofishing catch rate (fish/ 100m)	< 0.2	0.2-1.0	1.0-2.0	2.0 – 4.0	> 4.0

Historically, abundance has ranged from low (nil to 0.2 fish/100 m) (60% of records) to exceptional (>4 fish/100 m) (1% of records) (Appendix II), the greatest being 7.28 fish/100 m recorded for Australian bass in the Mitchell River in 2019 when many small fish (recruits) were caught. Throughout the 1990s and 2000s abundances were generally low to moderate, however, since the mid-2010s high, very high and exceptional abundances have been recorded for some species in some rivers (Appendix II).

In 2020, abundance estimates were generally down on the 2019 estimates for many fish populations, the exceptions being Australian bass in the Thomson-Macalister and Murray cod in the Lindsay-Mullaroo (see report cards). High river flow and increased water turbidity was encountered in the Goulburn and Ovens rivers during surveys that affected electrofishing efficiency and reduced catch rates.

Abundance was highest for Murray cod in the Ovens River (2.9 fish/100 m) followed by Australian bass in the Mitchell River (1.8 fish/100 m) (Figure 6). There were large numbers of Murray cod across a range of sizes in the Ovens River whereas the high abundance of Australian bass in the Mitchell River was due to a very large number of small fish being caught, which may have been hatchery-bred that were stocked recently.

Freshwater catfish and silver perch were lowest in abundance (< 0.06 fish/100 m) (Figure 6). Only three freshwater catfish were caught in 2020 surveys, two from the Lindsay-Mullaroo and one from the Wimmera River. Six silver perch were caught in Gunbower Creek and none were caught in the Wimmera River despite regular stocking of the latter with hatchery-bred fish.

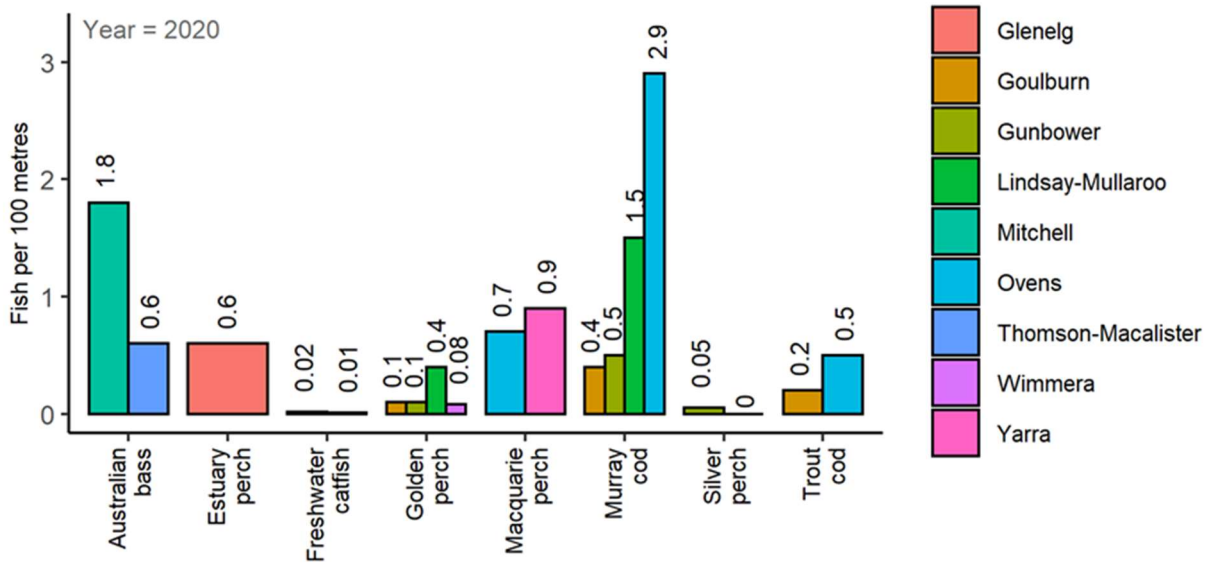

Figure 6. Average abundance of native fish species recorded in selected rivers surveyed in 2020.

Fish sizes

A summary of size ranges of eight native fish species recorded in selected rivers surveyed in 2020 is provided in Figure 7. The largest fish caught during surveys for each species in 2020 is presented in Figure 8. The length – weight relationships for eight native fish are presented in Appendix III.

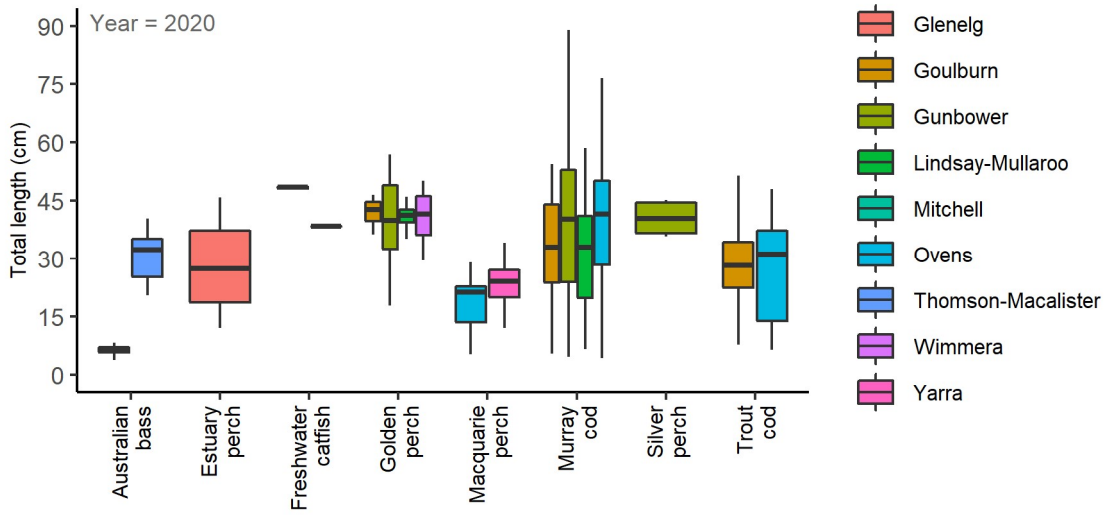

Figure 7. Size range (total length) of eight native fish species recorded in selected rivers surveyed in 2020 (Box = interquartile range with 25th, 50th (median) and 75th percentiles. Whisker = largest and smallest value within 1.5 times interquartile range)

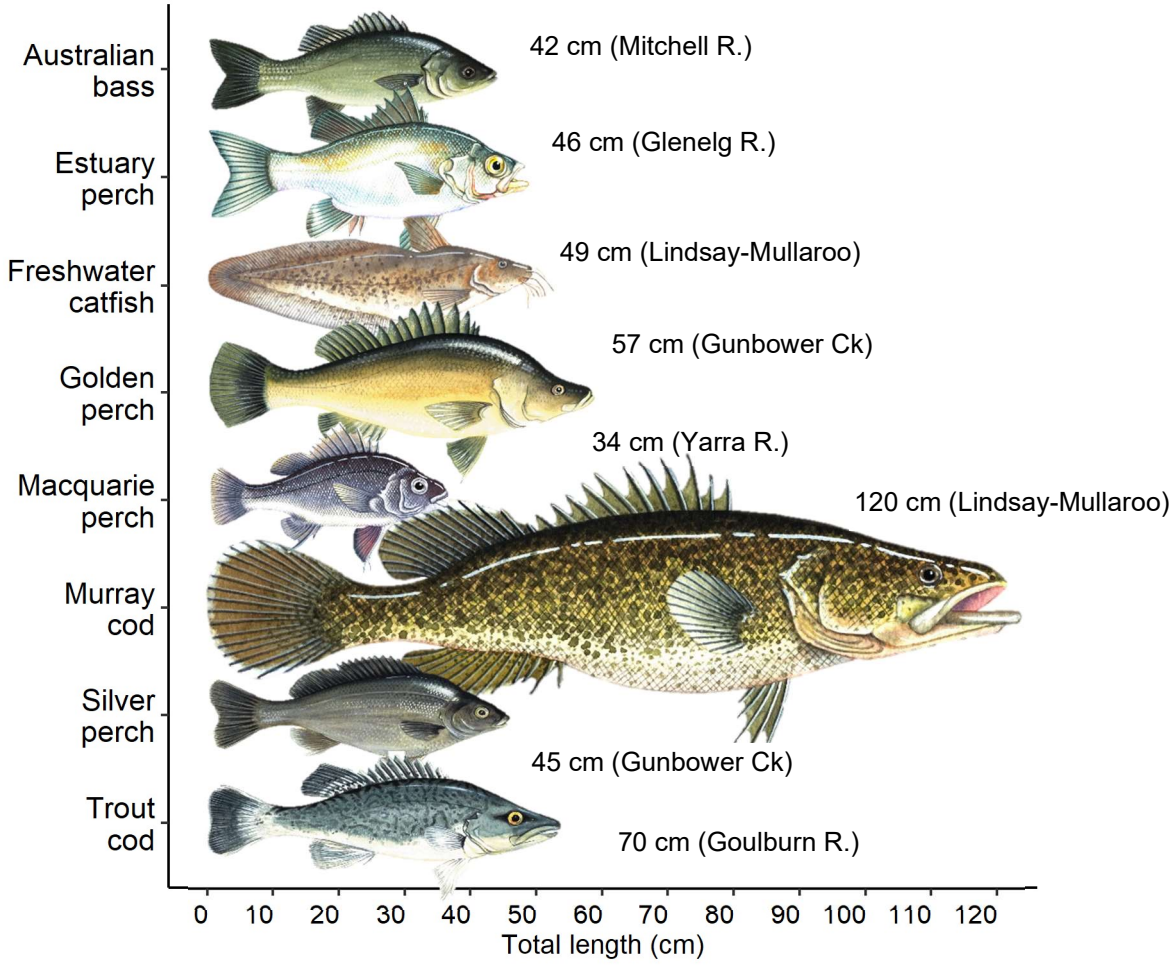

Figure 8. Largest fish caught during electrofishing surveys of native fish populations conducted in 2020.

Report card results

Information for eight native fish species and nine rivers is presented in the report cards and a summary of the key health indicators for the species assessed are provided in Table 3 and Table 4. An overall rating of Good was assigned to four species (Australian bass, estuary perch, Murray cod and trout cod), Moderate for two species (golden perch and Macquarie perch) and Low for two species (freshwater catfish and silver perch). Further information regarding these assessments is provided in the report cards following and Appendix I.

Table 3. Summary of key health indicators for eight native fish species.

Species	Rivers	2020 Results						
		5-year abundance	10-year abundance	Multiple year classes	Mature fish	Recent recruitment	Maximum size	Overall rating
Australian bass	Mitchell R. and Thomson R. and Macalister R.	⇔	?	✓	✓	✓*	✘	Good
Estuary perch	Glenelg R.	⇩	⇧	✓	✓	✘	✘	Good
Freshwater catfish	Lindsay R. and Mullaroo Ck and Wimmera R.	⇔	?	?	?	?	?	Low
Golden perch	Goulburn R., Gunbower Ck, Lindsay R. and Mullaroo Ck and Wimmera R.	⇩	⇔	✓	✓	✘	Some	Moderate
Macquarie perch	Ovens R. and Yarra R.	⇩	?	✓	Some	Some*	Some	Moderate
Murray cod	Goulburn R., Gunbower Ck, Ovens R., Lindsay R. and Mullaroo Ck	⇩	?	✓	Some	Some*	Some	Good
Silver perch	Gunbower Ck and Wimmera R.	⇔	⇔	?	?	?	?	Low
Trout cod	Goulburn R. and Ovens R.	⇩	?	✓	✓	✓	Some	Good

* May include stocked fish.

Table 4. Health rates for species and river system assessed in this report.

Species	Mitchell	Thomson & Macalister	Glenelg	Ovens	Goulburn	Gunbower	Lindsay & Mullaroo	Wimmera	Yarra	OVERALL
Australian bass	Good	Good								Good
Estuary perch			Good							Good
Macquarie perch				Moderate					Moderate	Moderate
Trout cod				Good	Good					Good
Murray cod				good	Moderate	Very good	Very good			Good
Golden perch					Good	Moderate	Moderate	Good		Moderate
Silver perch						Low		Low		Low
Freshwater catfish							Low	Low		Low

Acknowledgements

The authors acknowledge the support of the Department of Environment, Land, Water and Planning (DELWP) the Victorian Fisheries Authority (VFA) and the Recreational Fishing License Holders (through Recreational Fishing License Trust Recreational Fishing Grants Program) for funding the *Native Fish Report Card Program* (NFRCP).

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Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

Native Fishery Report Card – 2020: Australian bass

This report card describes the status of Australian bass in two stream systems, Mitchell River (Mit) and Thomson & Macalister rivers (T-M), in 2020 and trends in population key performance measures that are based on scientific data provided by scientific fishery surveys.

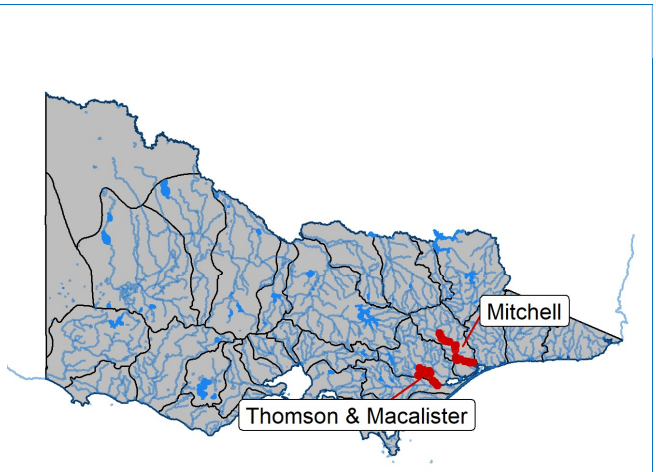
OVERALL RATING - 2020:	Good (variable)

Performance measures (health indictors)	Stream		Status
	Mit	T-M	
Stock abundance			
Trend in abundance over the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys.	⇧	⇩	⇔
Trend in abundance over the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys.	?	⇧	?
Fish size (length/age)			
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	✓	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 27 cm in the catch in recent 3 years.	**Some**	✓	✓
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	✓*	**Some**	✓*
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 43 cm) in recent 3 years.	✘	✘	✘

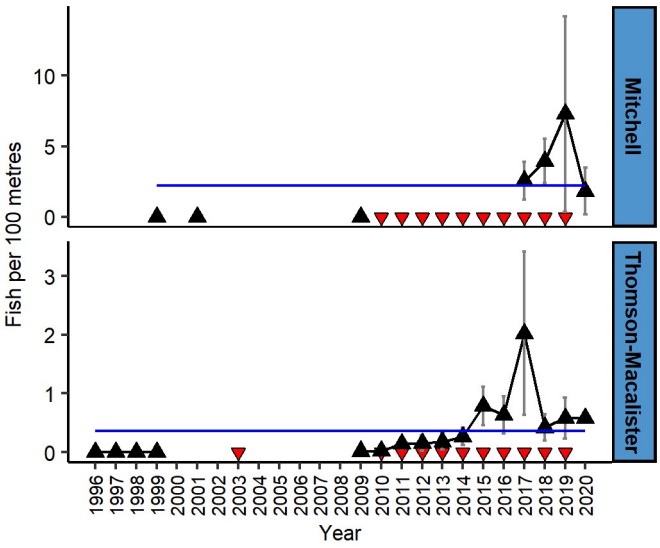
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * May include stocked fish.

Assessment statement

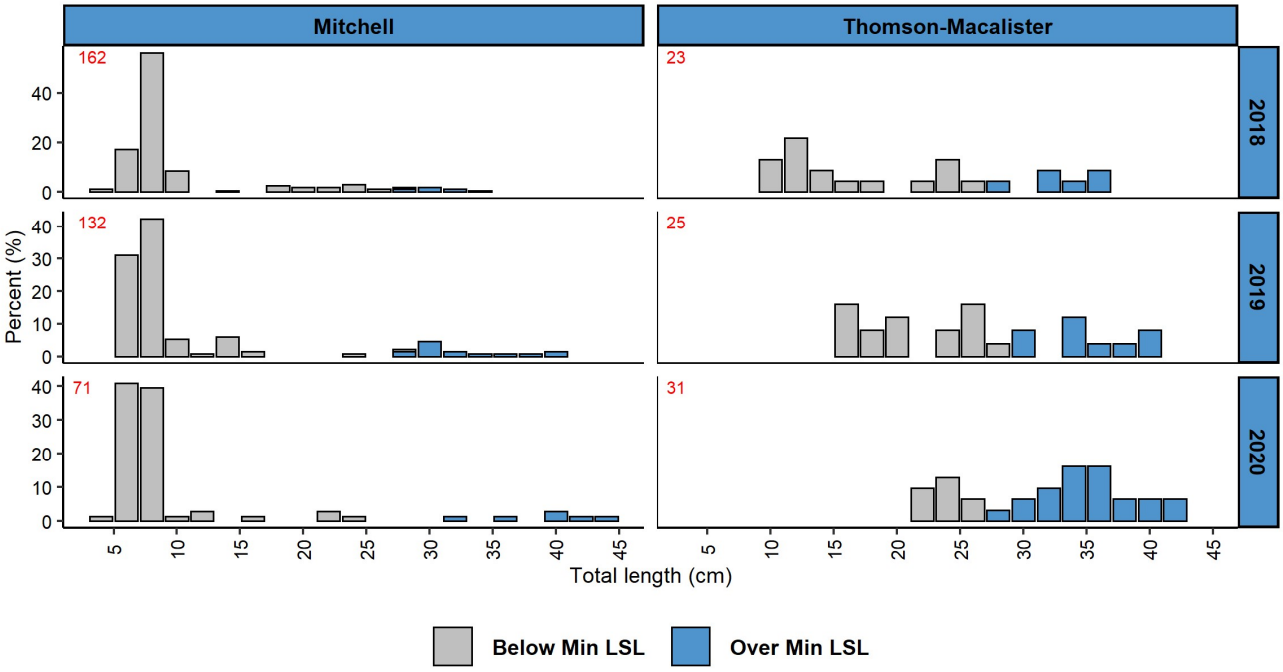
Australian bass represented 9% (Mitchell) and 8% (Thomson & Macalister) of large-bodied fish caught of fish caught and observed in 2020. Since 2017 Australian bass abundance ranged from moderate to exceptional. Electrofishing catch rate over the last 5 years has increased in the Mitchell. The electrofishing catch rate in the Thomson & Macalister declined over last 5 years but increased over the last 10 years. A wide range of fish sizes were observed in both streams over the last 3 years. The percentage legal size fish was higher in the Thomson & Macalister than the Mitchell. Large numbers of small fish were caught in the Mitchell over the last 3 years, which may be fish that were stocked. Despite large numbers of fingerlings being stocked into the Thomson & Macalister in recent years, very few small fish were observed over the last 3 years suggesting that there has been no recent recruitment and stockings have not been successful. Mature fish were present in both streams. On this basis the overall rating for Australian bass in 2020 was good, though variable between the two streams surveyed.



Australian bass captured and measured during electro-fishing surveys in 2020	Mit	T-M
Size range (cm)	4-42	20-40
Percent (%) that are legal size (≥ 27 cm)	8.5	71
Percent (%) that are mature (≥ 27 cm)	8.5	71
Percent (%) that are recent recruits (< 10 cm)	83	0
Number of fish measured	71	31
Stockings of rivers in recent seasons (1,000s stocked)		
2016/17	10	11
2017/18	150	46.5
2018/19	30	7
2019/20	44	8



Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of Australian bass caught during electro-fishing surveys of two streams. Red triangles = stocking years.



Size distribution
Length frequency distribution of Australian bass caught during electro-fishing surveys of two streams (Red numbers = number fish measured. LSL = legal size limit).

Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

Native Fishery Report Card – 2020: Estuary perch

This report card describes the status of the estuary perch in the Glenelg River in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys and recreational fishers (*Angler Fishing Diary Program*).

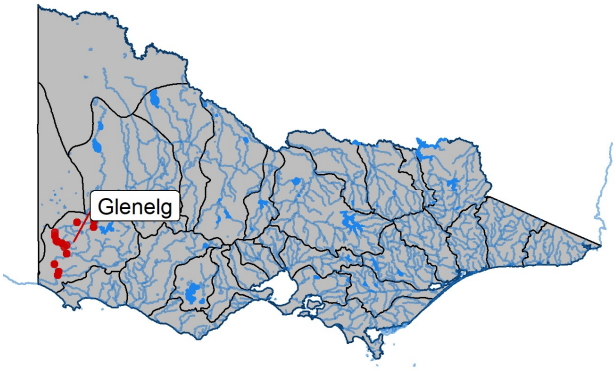
OVERALL RATING - 2020:	Good

Performance measures (health indictors)	Data source		Status
	Angler	Electro	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average catch rate from electro-fishing surveys and from *Angler Fishing Diary Program*	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average catch rate from electro-fishing surveys and from *Angler Fishing Diary Program*	⇧	⇧	⇧
Fish size (length/age)			
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	✓	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 27 cm in the catch in recent 3 years.	✓	✓	✓
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	✘	**Some**	✘
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 55 cm) in recent 3 years.	✘	✘	✘

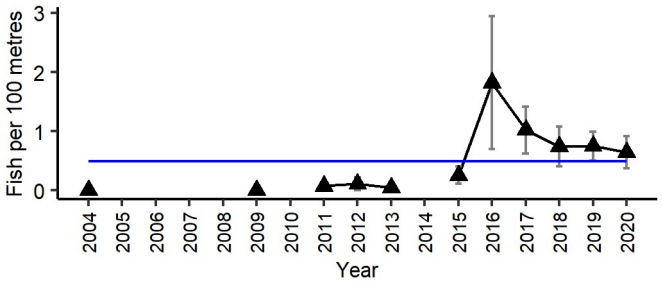
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present.

Assessment statement

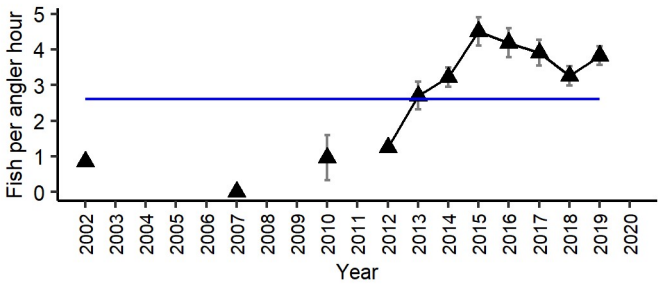
Estuary perch represented 7% of large-bodied fish caught of fish in electrofishing surveys in 2020 and 57% of angling species in 2019. Since 2017 estuary perch abundance (electrofishing data) has been moderate. Electrofishing and angling catch rates have declined over the last 5 years but increased over the last 10 years. Angler catch rates have increased steadily since the early 2010s, which may be due to better targeting by anglers, but has declined in recent years (data for 2020 not available). A wide range of fish sizes were observed in electrofishing surveys and angler catch over the last 3 years. 55% of fish caught by electrofishing in 2020 were legal size. Recent recruitment was not evident as no small fish (recruits) were caught by electrofishing in recent years. However, sites surveyed may be upstream of where recruitment is expected to occur. Mature fish were present, but fish approaching maximum size were absent. On this basis the overall rating for estuary perch in the Glenelg River in 2020 was good.



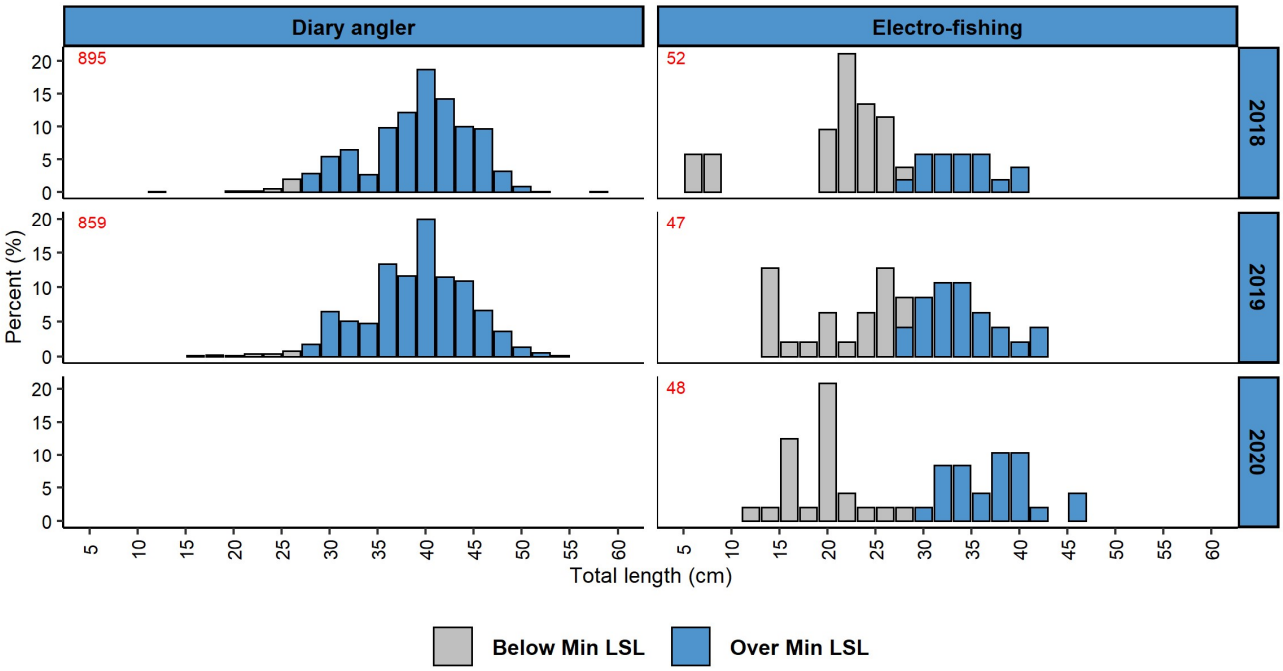
Estuary perch captured and measured during an electro-fishing survey of the Glenelg River in 2020 and by angler diarists in 2018	Angler Diary	Electro-fishing
Size range (cm)	16-53	12 – 46
Percent (%) that are legal size (≥ 27 cm)	98	50
Percent (%) that are mature (≥ 27 cm)	98	50
Percent (%) that are recent recruits (< 10 cm)	0	0
Number of fish measured	859	48
Stockings of river in recent seasons (1,000s stocked): **NIL**		



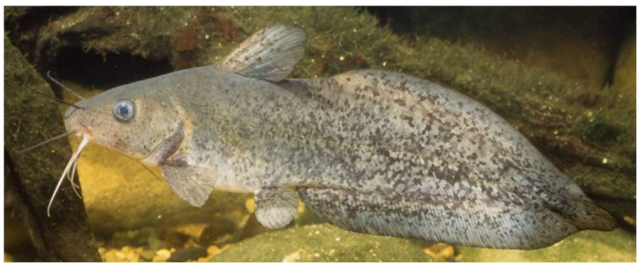
Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of estuary perch caught during electro-fishing surveys of the Glenelg River.



Angler catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of estuary perch caught by anglers in the Glenelg River (VFA Angler Diary Program).



Size distribution
Length frequency distribution of estuary perch in the Glenelg River caught by anglers and by electro-fishing (Red numbers = number fish measured. LSL = legal size limit).



Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

Native Fishery Report Card – 2020: Freshwater catfish

This report card describes the status of the freshwater catfish in two streams, the Lindsay and Mullaroo rivers (L&M) and Wimmera River (Wim) in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

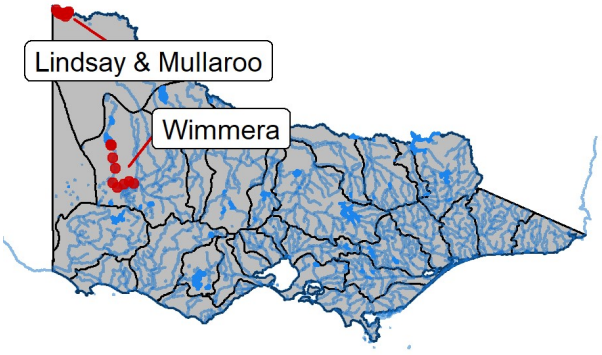
OVERALL RATING - 2020:	**Low**

Performance measures (health indictors)	Stream		Status
	L&M	Wim	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	⇔
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	?	⇔	?
Fish size (length/age)			
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	?	?	?
Mature fish capable of spawning present, as indicated by the presence of fish from 30 cm in the catch in recent 3 years.	?	?	?
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	?	?	?
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 36 cm) in recent 3 years.	?	?	?

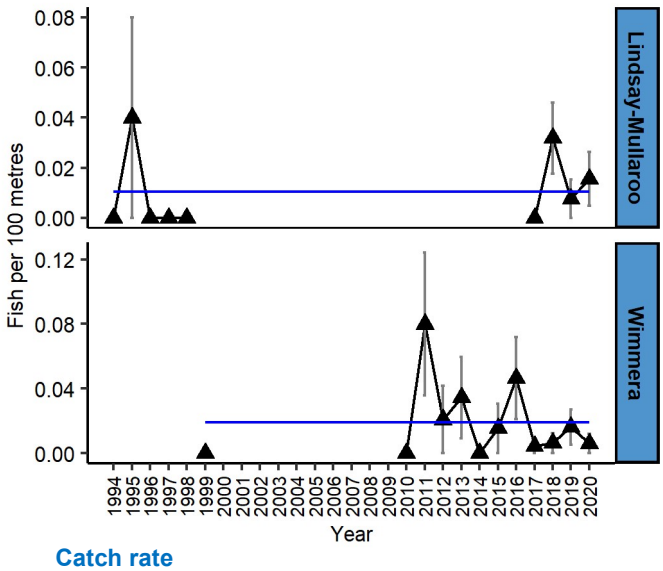
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present.

Assessment statement

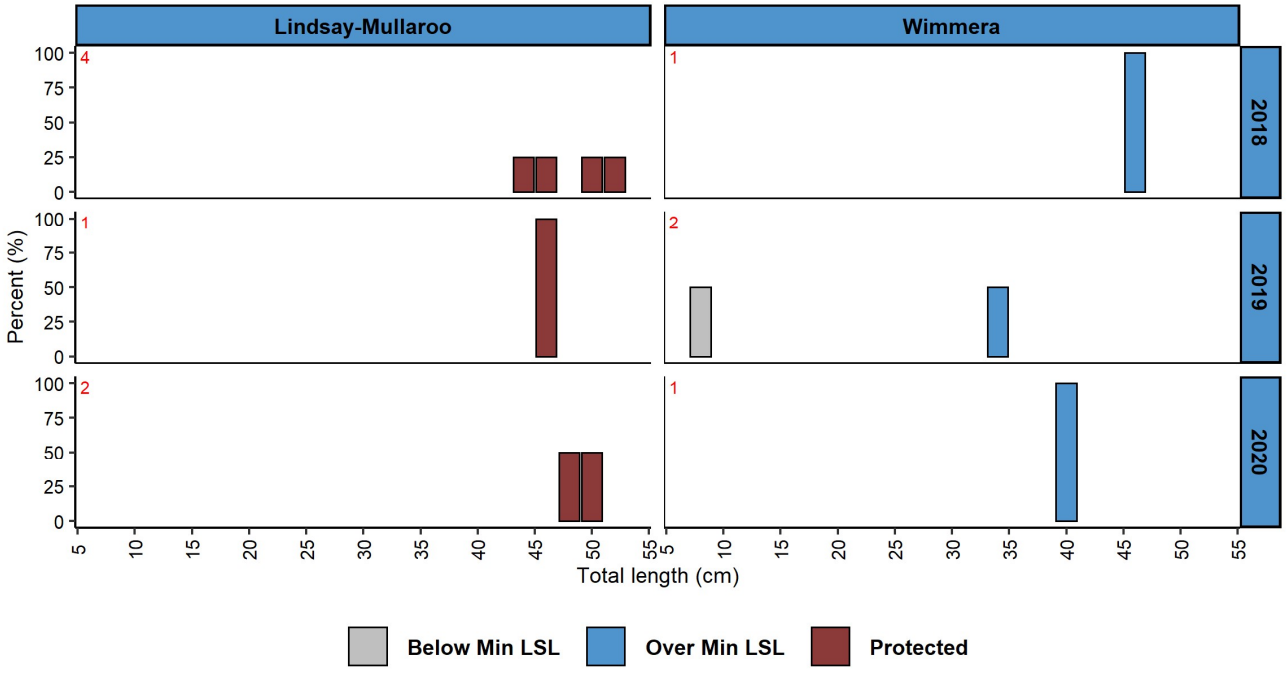
Freshwater catfish represented <1% of large-bodied fish caught during electrofishing surveys in both the Lindsay-Mullaroo (L&M) and Wimmera River (Wim) in 2020. Only three fish were caught in 2020 surveys, two from the Lindsay-Mullaroo and one from the Wimmera River. Electrofishing catch rate remains stable over the last 5 years for both streams and was stable but low (below long-term average) over the last 10 years for the Wimmera. There were insufficient fish measured over the last 3 years to assess fish size (length frequency) performance measures. On this basis the overall rating for freshwater catfish in 2020 was low due to the very low abundance of fish in the two streams surveyed. Freshwater catfish can be taken only from waters within the Wimmera Basin. Taking of freshwater catfish is prohibited in all other Victorian waters.



Freshwater catfish captured and measured during electro-fishing surveys of the Wimmera River in 2020	L & M	Wim
Size range (cm)	48-49	38
Percent (%) that are legal size (≥ 30 cm)	Protected	
Percent (%) that are mature (≥ 30 cm)		
Percent (%) that are recent recruits (< 10 cm)		
Number of fish measured	2	1
Stockings of river in recent seasons (1,000s stocked): **NIL**		



Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of freshwater catfish caught during electro-fishing surveys of two streams.



Size distribution
Length frequency distribution of freshwater caught during electro-fishing surveys of two streams (Red numbers = number fish measured. LSL = legal size limit).

Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

Native Fishery Report Card – 2020: Golden perch

This report card describes the status of golden perch in four streams, the Goulburn River (Gou), Gunbower Creek (Gun), Lindsay and Mullaroo rivers (L&M) and Wimmera River (Wim), in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

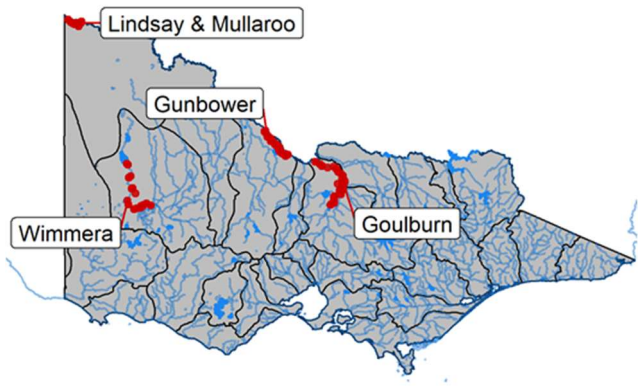
OVERALL RATING - 2020:	Moderate

Performance measures (health indictors)	Stream				Status
	Gou	Gun	L&M	Wim	
Stock abundance					
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇔	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	?	⇔	⇔
Fish size (length/age)					
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	✓	?	Some	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 30 cm in the catch in recent 3 years.	✓	?	✓	✓	✓
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	✘	?	✘	✘	✘
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 50 cm) in recent 3 years.	Some	?	✘	✓	Some

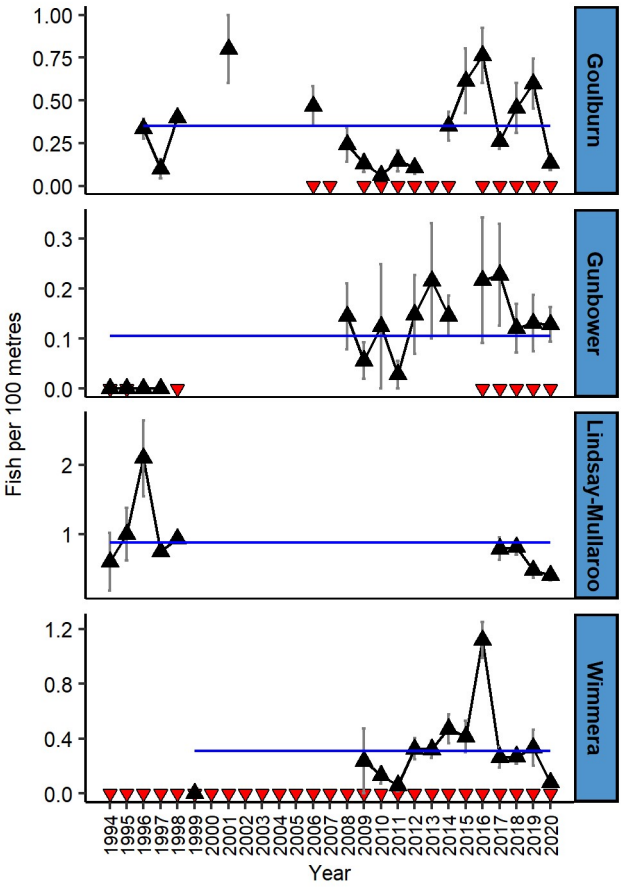
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * May include stocked fish.

Assessment statement

Golden perch represented 8-13% of large-bodied fish caught in the four streams surveyed, the Goulburn (Gou), Gunbower (Gun), Lindsay-Mullaroo (L&M) and Wimmera (Wim), in 2020. Since 2017 golden perch abundance ranged from low (Gou, Gun and Wim) to moderate (L&M). Electrofishing catch rate over the last 5 years has been stable in the Lindsay-Mullaroo but has declined in other streams. However, electrofishing catch rate over the last 10 years has been stable for most streams. Reduced catch in the Goulburn River in 2020 may have been due to high river flows and increased turbidity at the time of the survey. Stocking of hatchery-reared juveniles have occurred in three streams (Gou, Gun and Wim). A high percentage (82-100% of fish caught were legal size. performance measures for three streams (Gou, Gun and Wim). In the Lindsay-Mullaroo, a small range of fish sizes were observed as mature fish were present but recruits and fish approaching maximum size were absent. On this basis the overall rating for golden perch in 2020 was moderate.

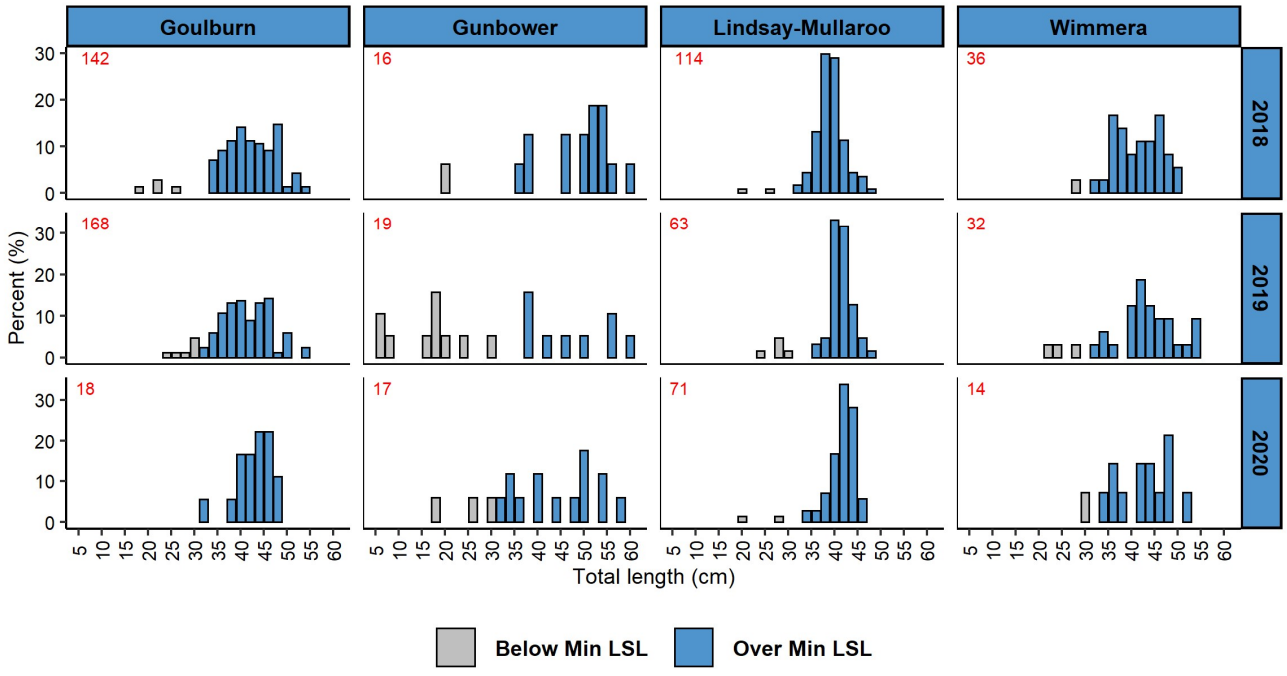


Golden perch captured and measured during electro-fishing surveys in 2020	Gou	Gun	L & M	Wim
Size range (cm)	31-47	18-57	20-46	30-50
Percent (%) that are legal size (≥ 30 cm)	100	82	97	93
Percent (%) that are mature (≥ 30 cm)	100	82	97	93
Percent (%) that are recent recruits (< 10 cm)	0	0	0	0
Number of fish measured	18	17	71	14
Stockings of rivers in recent seasons (1,000s stocked)				
2016/17	44	40.5	-	68
2017/18	59	200	-	110
2018/19	88.15	70	-	150
2019/20	61	70	-	80



Catch rate

Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of golden perch caught during electro-fishing surveys of four streams. Red triangles = stocking years.



Size distribution

Length frequency distribution of golden perch caught during electro-fishing surveys of four streams (Red numbers = number fish measured. LSL = legal size limit).

Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

Native Fishery Report Card – 2020: Macquarie perch

This report card describes the status of Macquarie perch in two streams, the Ovens River (Ove) and Yarra River (Yar), in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

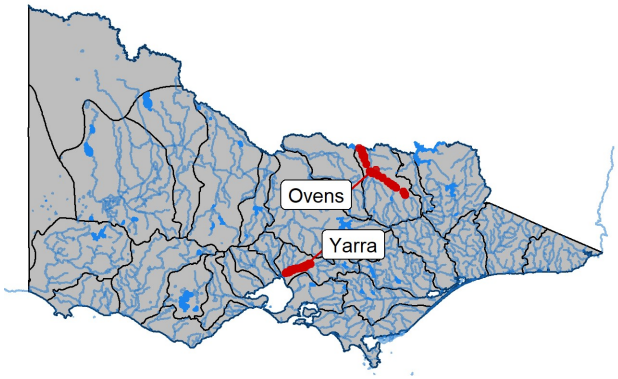
OVERALL RATING - 2020:	Moderate

Performance measures (health indictors)	Stream		Status
	Ove	Yar	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	?	⇔	?
Fish size (length/age)			
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	✓	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 30 cm in the catch in recent 3 years.	**Some**	**Some**	**Some**
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	✓*	**Some**	**Some***
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 36 cm) in recent 3 years.	✘	**Some**	**Some**

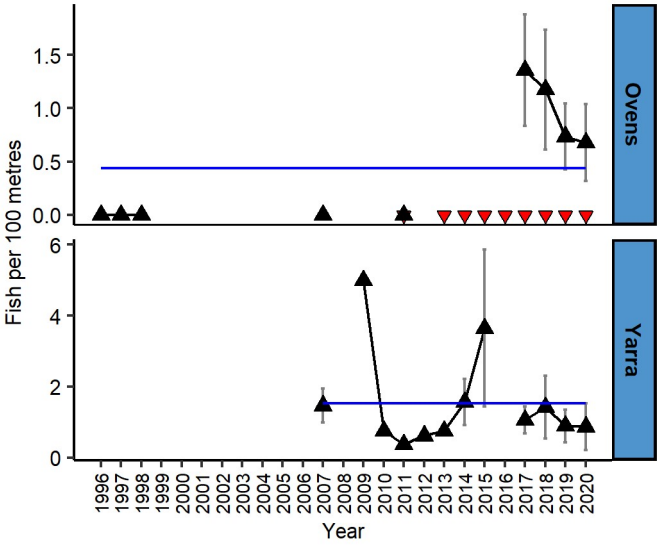
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * May include stocked fish.

Assessment statement

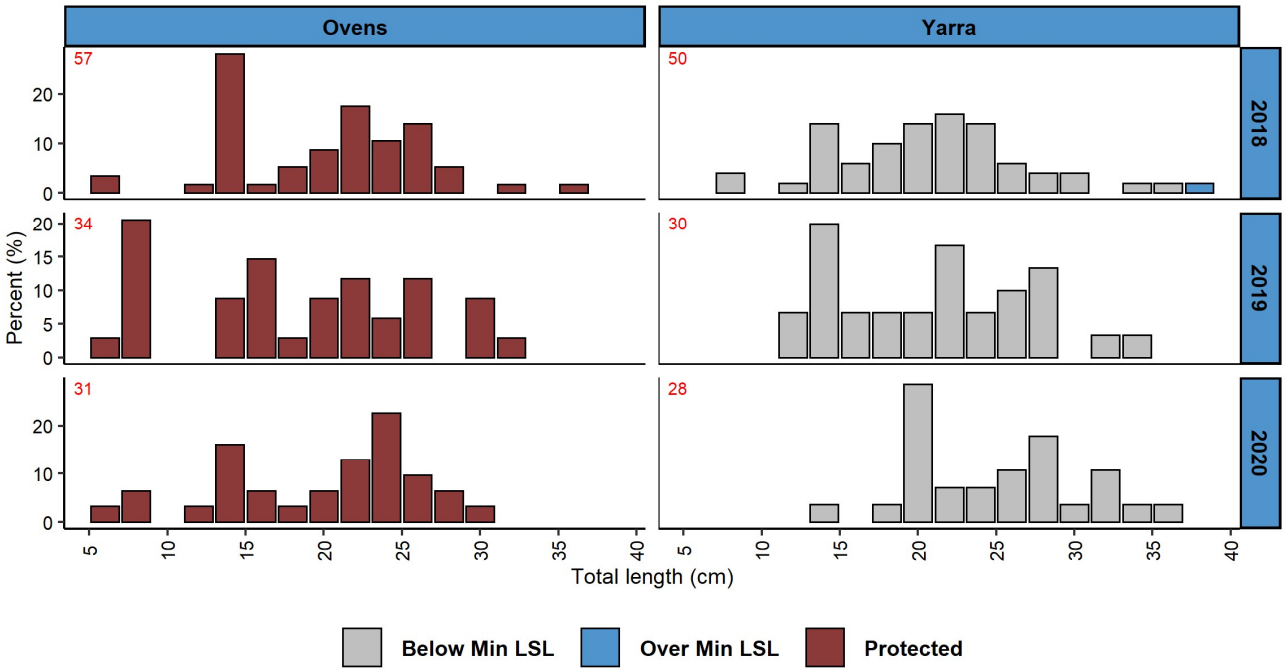
Macquarie perch represented 6-7% of large-bodied fish caught in the two streams surveyed, the Ovens (Ove) and Yarra (Yar) in 2020. Since 2017 Macquarie perch abundance was moderate. Electrofishing catch rates over the last 5 years have declined in both streams. Catch rate in the Yarra remains below the long-term average. Fish can be legally taken from the Yarra, but no legal-size fish were caught in 2020. A wide range of fish sizes were observed in both streams. Small fish were caught in the Ovens over the last 3 years, which may be from either recent natural spawnings or recent stocking of hatchery-bred fish, or both. No small fish were caught in the Yarra in the last 2 years. Some mature fish were present in the both streams over the 3 years. Some fish approaching maximum size were caught in the Yarra. On this basis the overall rating for Macquarie perch in 2020 was moderate. Macquarie perch can only be taken from Lake Dartmouth, the Yarra River and the Upper Coliban Reservoir (and their tributaries) where a bag limit, size limit and closed season apply. The taking of Macquarie perch in all other waters is prohibited.



Macquarie perch captured and measured during electro-fishing surveys in 2020	Ove	Yar
Size range (cm)	5 - 29	12 – 34
Percent (%) that are legal size (≥ 35 cm)	0	Protected species
Percent (%) that are mature (≥ 30 cm)	3	18
Percent (%) that are recent recruits (< 10 cm)	9.7	0
Number of fish measured	31	28
Stockings of rivers in recent seasons (1,000s stocked)		
2016/17	8.3	
2017/18	15	
2018/19	7.5	
2019/20	0.7	



Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of Macquarie perch caught during electro-fishing surveys of two streams. Red triangles = stocking years.



Size distribution
Length frequency distribution of Macquarie perch caught during electro-fishing surveys of two streams (Red numbers = number fish measured. LSL = legal size limit).

Native Fish Report Card
Supported by the Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

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Native Fishery Report Card – 2020: Murray cod

This report card describes the status of Murray cod in four streams, the Goulburn River (Gou), Gunbower Creek (Gun), Lindsay and Mullaroo rivers (L&M) and Ovens River (Ove), The Goulburn in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

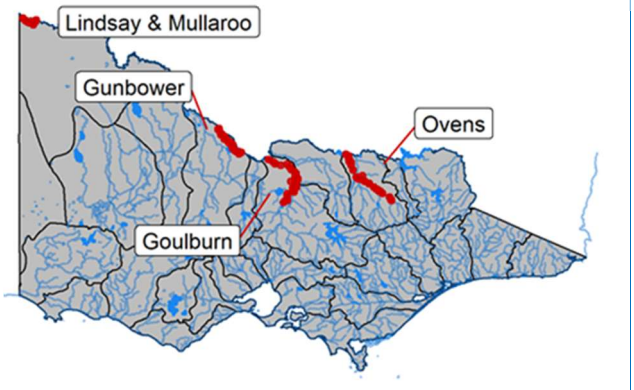
OVERALL RATING - 2020:	Good

Performance measures (health indictors)	Stream				Status
	Gou	Gun	L&M	Ove	
Stock abundance					
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇔	⇧	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇧	?	?	?
Fish size (length/age)					
Wide range of fish size classes present in recent 3 years, indicating regular successful spawning events and recruitment to the population.	✓	✓	✓	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 55 cm in the catch in recent 3 years.	**Some**	✓	**Some**	✓	**Some**
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	**Some***	**Some***	✓	✓*	**Some***
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 110 cm) in recent 3 years.	✘	**Some**	**Some**	✘	**Some**

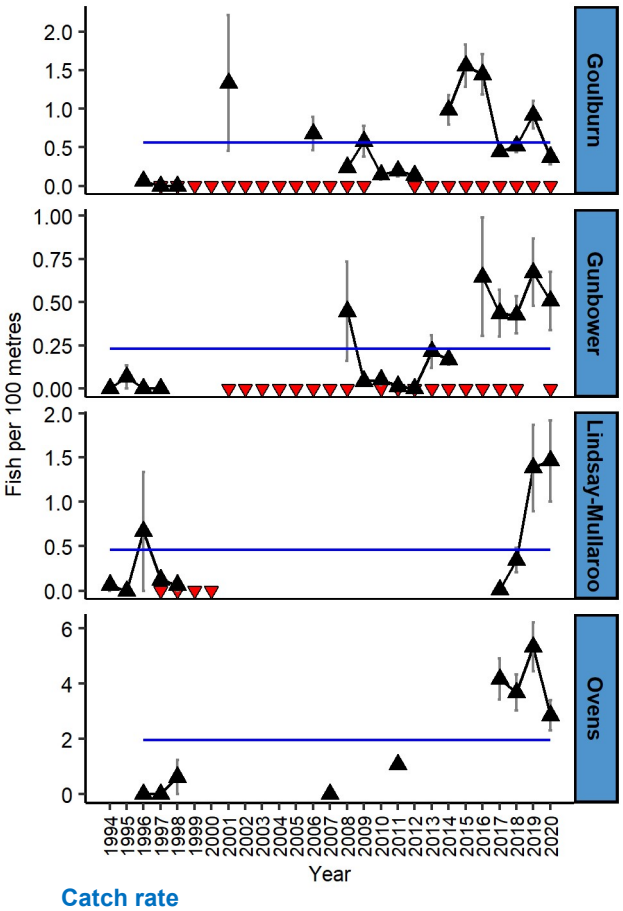
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * = May include stocked fish.

Assessment statement

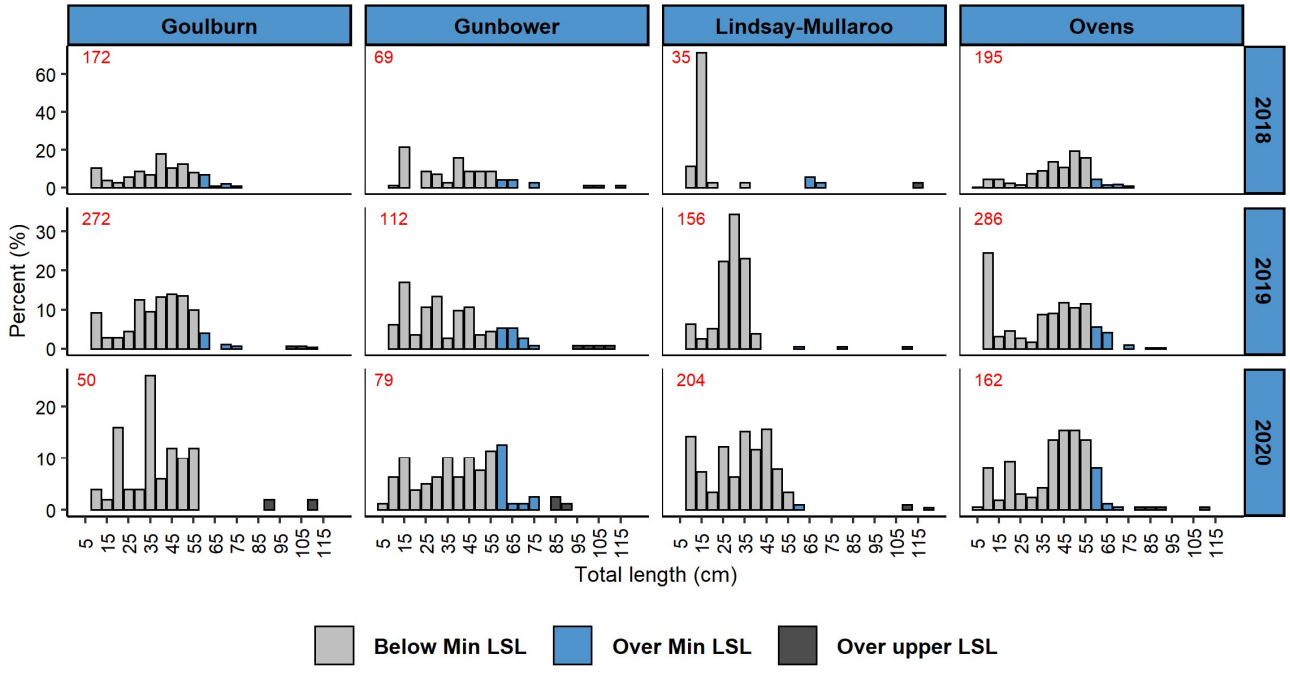
Murray cod represented 22% to 39% of large-bodied fish caught in the four streams surveyed in 2020. Since 2017 Murray cod abundance ranged from moderate (Gou and Gun) to very high (Ove). Over the last 5 years electrofishing catch rates have increased in two streams (L&M and Ove), been stable in one stream (Gun) and declined in one stream (Gou). Reduced catch in two streams (Gou and Ove) in 2020 may have been due to high flows and increased turbidity at the time of surveys. A wide range of fish size were observed in all streams. The percent of fish that were legal size (between 55 & 75 cm) ranged from nil (Gou) to 18% (Gun) in 2020. Small fish were present in all streams indicating either recent natural recruitment (L&M and Ove) or recent stocking of hatchery-bred fish. Small numbers of mature fish were present in all streams. Fish approaching the maximum size (>110 cm) were present in the Gun L&M only over the last 3 years. On this basis the overall rating for Murray cod in 2020 was good.



Murray cod captured and measured during electro-fishing surveys in 2020	Goulburn	Gunbower	Lindsay & Mullaroo	Ovens
Size range (cm)	5.4-108	4.6-89	6.5-120	4.2-109
Percent (%) that are legal size (between 55 & 75 cm)	0	18	1	10
Percent (%) that are mature (≥ 55 cm)	4	22	3	12
Percent (%) that are recent recruits (< 10 cm)	4	8	13	9
Number of fish measured	50	79	204	162
Stockings of rivers in recent seasons (1,000s stocked)				
2016/17	102.1	55.2		
2017/18	50	100		
2018/19	61	50		
2019/20	40	50.7		



Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of Murray cod caught during electro-fishing surveys of four streams. Red triangles = stocking years.



Size distribution
Length frequency distribution of Murray cod caught during electro-fishing surveys of four streams (Red numbers = number fish measured. LSL = legal size limit).

Native Fish Report Card
Supported by the
Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

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Native Fishery Report Card – 2020: Silver perch

This report card describes the status of the silver perch in two streams, the Gunbower Creek (Gun) and Wimmera River (Wim) in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2020:	Low

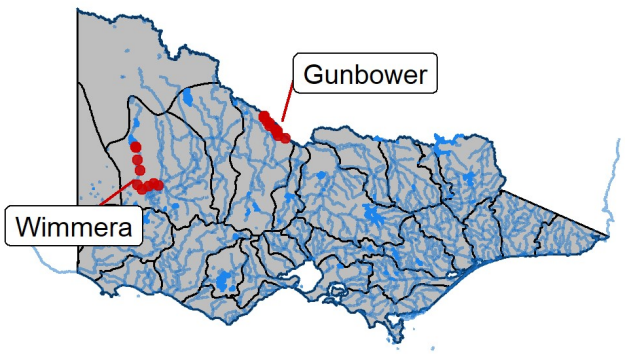
Performance measures (health indictors)	Stream		Status
	Gun	Wim	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	⇔
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	⇔
Fish size (length/age)			
Wide range of fish size classes present in recent three years, indicating regular successful spawning events and recruitment to the population.	?	?	?
Mature fish capable of spawning present, as indicated by the presence of fish from 30 cm in the catch in recent three years.	?	?	?
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent three years.	?	?	?
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 36 cm) in recent three years.	?	?	?

⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present.

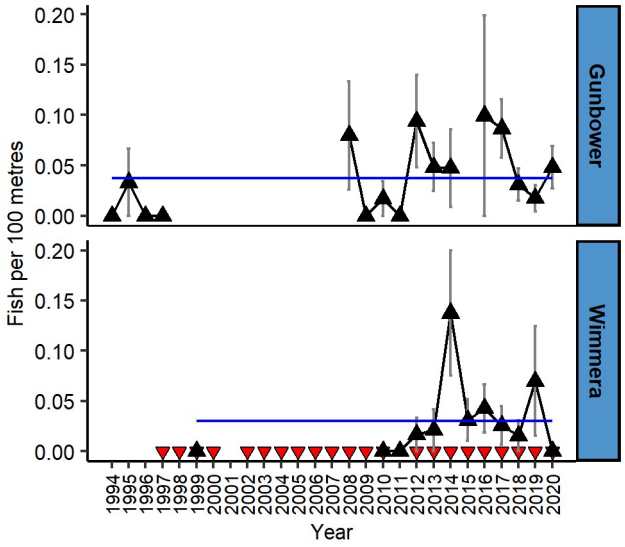
Assessment statement

Six silver perch were caught in the Gunbower Creek and no silver perch were caught in the Wimmera River during electrofishing surveys in 2020. Silver perch abundance in the Wimmera river is low despite regular (annual) stockings of fingerlings. Electrofishing catch rates has been stable over the last 5 years and 10 years for both streams surveyed. There were insufficient fish measured over the last 3 years to assess fish size (length frequency) performance measures. On this basis the overall rating for silver perch in 2020 was low due to the very low abundance of fish in the two streams surveyed.

The taking of silver perch is prohibited in rivers north of the Great Dividing Range (excluding those in the Wimmera Basin). Silver perch inadvertently caught in these waters must be returned to the water alive and with the least possible injury.

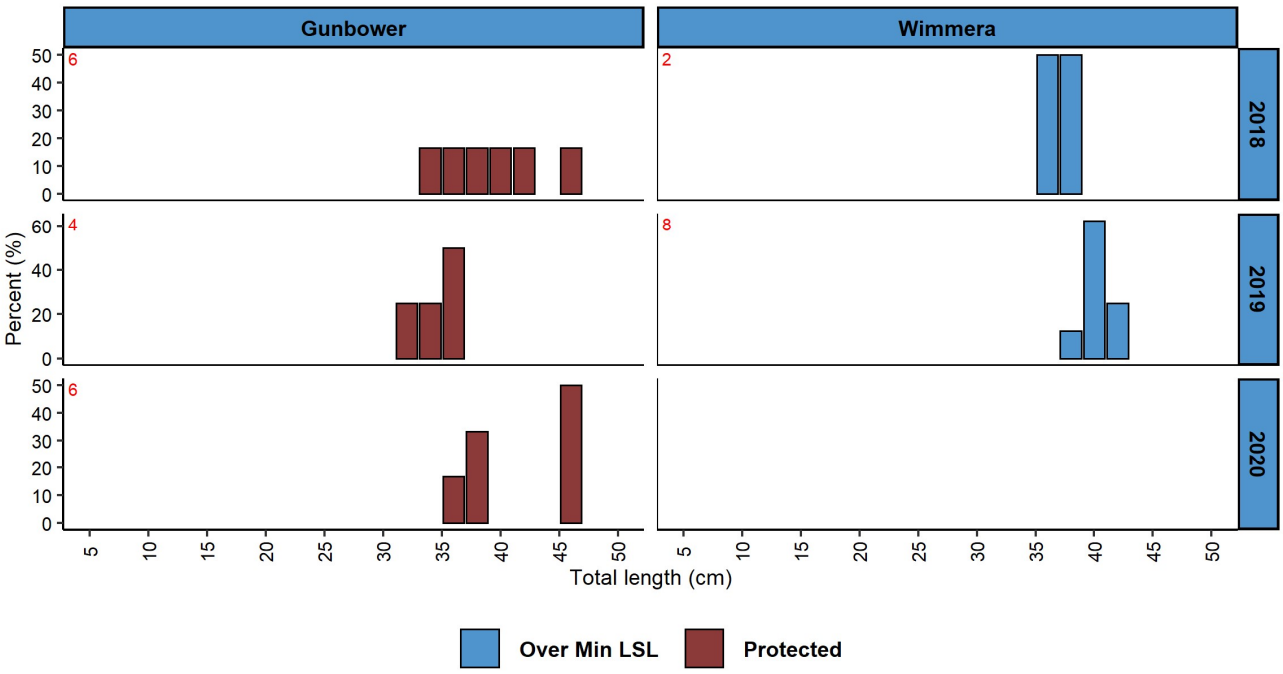


Silver perch captured and measured during electro-fishing surveys in 2020	Gun	Wim
Size range (cm)	36-45	
Percent (%) that are legal size (≥ 30 cm)	Protected	
Percent (%) that are mature (≥ 30 cm)		
Percent (%) that are recent recruits (< 10 cm)		
Number of fish measured	6	0
Stockings of rivers in recent seasons (1,000s stocked)		
2016/17		20
2017/18		20
2018/19		20
2019/20		50



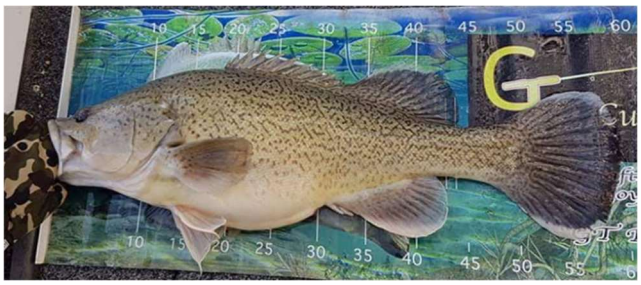
Catch rate

Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of silver perch caught during electro-fishing surveys of two streams. Red triangles = stocking years.



Size distribution

Length frequency distribution of silver perch caught during electro-fishing surveys of two streams (Red numbers = number fish measured. LSL = legal size limit).



Native Fish Report Card
Supported by the
Department of Environment, Land, Water and Planning, and Victorian Fisheries Authority.

VICTORIA State Government

Victorian Fisheries AUTHORITY

Native Fishery Report Card – 2020: Trout cod

This report card describes the status of trout cod in two streams, the Goulburn River (Gou) and Ovens River (Ove) in 2020 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

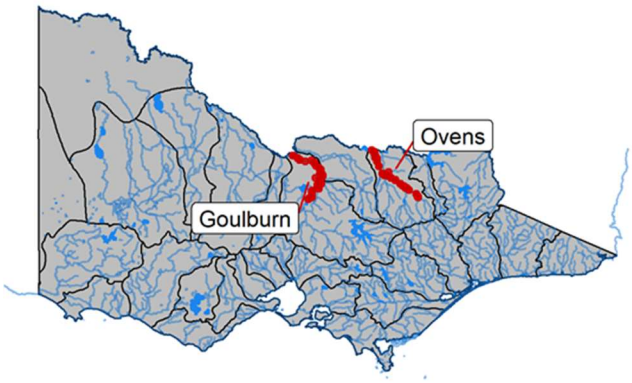
OVERALL RATING - 2020:	Good

Performance measures (health indictors)	Stream		Status
	Gou	Ove	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	?	?
Fish size (length/age)			
Wide range of fish size classes present in recent three years, indicating regular successful spawning events and recruitment to the population.	✓	✓	✓
Mature fish capable of spawning present, as indicated by the presence of fish from 30 cm in the catch in recent three years.	✓	✓	✓
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent three years.	**Some**	✓	✓
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 60 cm) in recent three years.	**Some**	**Some**	**Some**

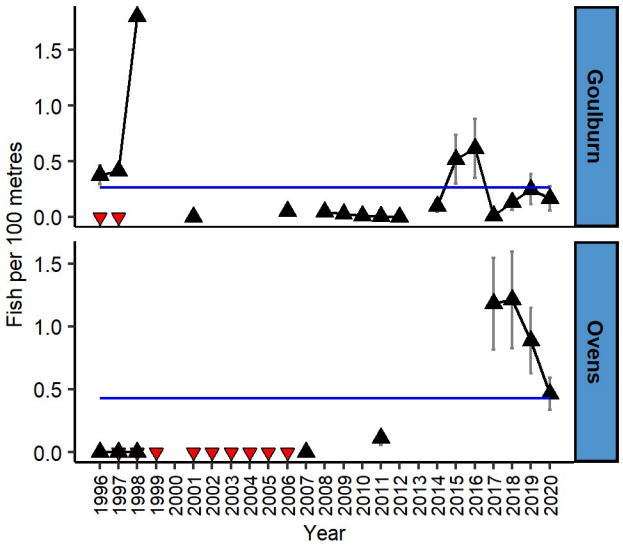
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present.

Assessment statement

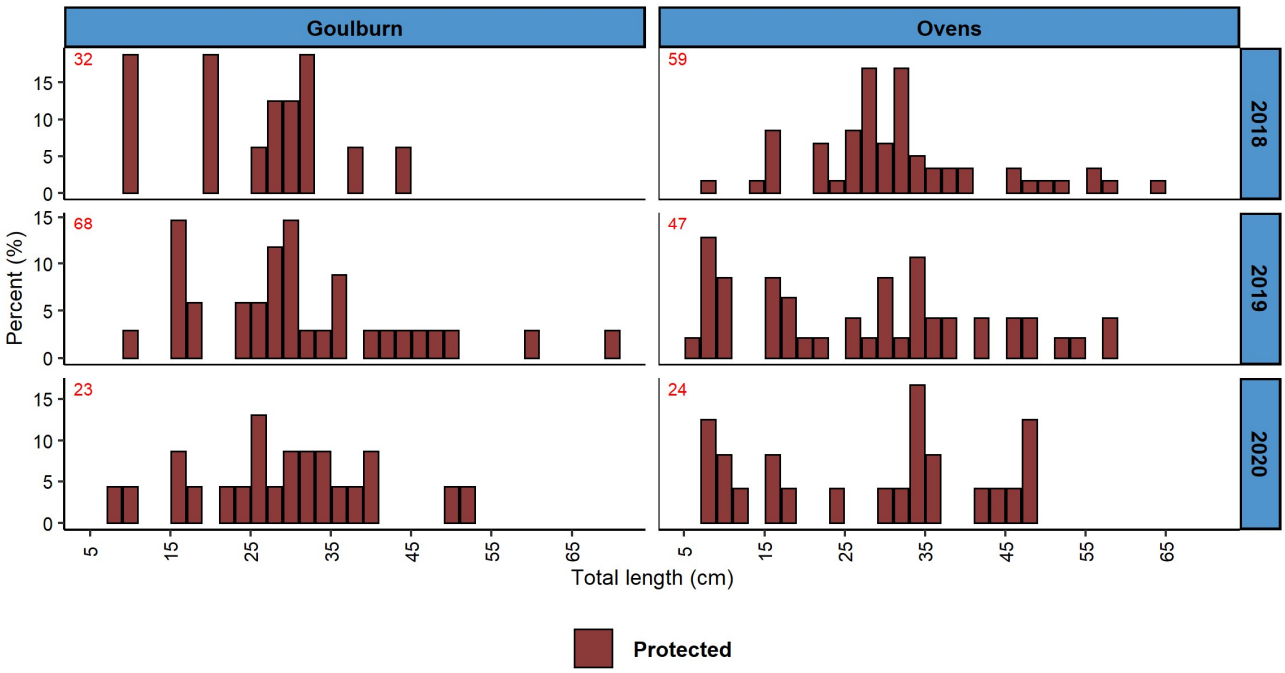
Trout cod represented <1% of the large-bodied fish caught in the two streams surveyed (Gou and Ove). Since 2017 trout cod abundance was low (Gou) to moderate (Ove). Electrofishing catch rates over the last 5 years has declined in both streams, especially so in the Ovens. Reduced catch in both streams in 2020 may have been due to high flows and reduced turbidity at the time of surveys. A wide range of fish sizes were observed in both streams. Small fish (recruits) were caught in both streams, indicating natural spawning in both streams has occurred in recent years. No stockings of hatchery-bred trout cod fingerings have occurred in these streams in recent years. Mature fish and fish approaching the maximum size (>60 cm) were present in both streams. On this basis the overall rating for trout cod in 2020 was good. Trout cod is a protected species. Taking or possessing trout cod is prohibited, except in Lake Sambell and Lake Kerferd where size and bag limits apply.



Trout cod captured and measured during electro-fishing surveys in 2020	Gou	Ove
Size range (cm)	9 - 70	6 - 58
Percent (%) that are legal size	Protected species	
Percent (%) that are mature (≥ 35 cm)	38	43
Percent (%) that are recent recruits (< 10 cm)	12	28
Number of fish measured	34	47
Stockings of rivers in recent seasons (1,000s stocked) **NIL**		



Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of trout cod caught during electro-fishing surveys of two streams.
Red triangles = stocking years.



Size distribution
Length frequency distribution of trout cod caught during electro-fishing surveys of two streams (Red numbers = number fish measured. LSL = legal size limit).

Appendix I: Performance measures rules and scoring

The following section describes:

- the performance measures used to assess fish species in each river and the rules applied to each performance measure to assign a score.
- How scores for each performance measure are summarized across multiple rivers for each species
- How scores for each performance measure are combined to obtain an overall rating for each species.

Assigning scores to performance measures and summation of scores to determine an overall rating for each species are intended to be objective and based on the available information.

Performance measures

Fish abundance

Trend (change) in fish abundance over time as indicated by average annual catch rate. Data may be from various sources including historic and contemporary electro-fishing surveys and the *Angler Fishing Diary Program* (*AFDP*). Periods of assessment may include the last five years, last 10 years and long-term (all available records for all years). It is noted that fish abundance can be strongly influenced by a number of variables including timing of surveys around recruitment (and stocking) events and environmental conditions that affect catching efficiency, such as stream flow velocity and turbidity.

Scoring rules:	• 5-year trend is assessed only when records are available for least 4 of the past 5 years (≥ 80% of years). • 10-year trend is assessed only when records are available for at least 8 of the past 10 years (≥ 80% years). • Long-term trend - assessed only when records are available for ≥ 70 % of years from earliest to latest record.
Scores:	⇧ Increasing (slope of linear regression line > 0.05) ⇩ Decreasing. (slope of linear regression < -0.05) ⇔ Stable or variable (up and down) (slope of linear trend between -0.05 and 0.05) ? Insufficient information to assess (as per scoring rules).

Fish size (length/age)

Fish size performance measures are based on measurement (fish length) of fish caught in surveys over the last three years. Assessment is conducted only when 60 or more fish are measured across all three years combined, otherwise information to assess fish size is considered insufficient. Fish size categories are:

Multiple size classes

A wide range of fish sizes present indicates regular successful spawning events and recruitment is occurring in the stream over the last three years. The minimum and maximum recorded length for the target species is identified from all available fishery survey records for that species. The range between these values is then divided into 10 size slots and the proportion of sampled fish in each slot is estimated. Scores are then determined based on the number of slots with fish present.

Scoring rules:	• Minimum of 60 fish measured over 3 years.	
Scores:	✓	Wide range of fish size classes present (fish in at least 5 of 10 size slots).
	Some	A few fish size classes present (fish present in 2 to 4 of 10 size slots)
	✘	No fish caught or very few fish size classes present (fish present in 1 of 10 size slots).
	?	Insufficient fish measured to assess (< 60 fish measured).

Mature size classes

Mature fish capable of spawning are present in the stream. Size at maturity is indicative only as this may vary between streams, years and sex of fish for each species. Scores are determined based on the proportion of fish sampled that are mature.

Scoring rules:	• Minimum of 60 fish measured over 3 years. • Size at maturity: Australian bass (≥ 27 cm), estuary perch (≥ 27 cm), freshwater catfish (≥ 30 cm), golden perch (≥ 30 cm), Macquarie perch (≥ 30 cm), Murray cod (≥ 55 cm), silver perch (≥ 30 cm) and trout cod (≥ 30 cm).	
Scores:	✓	Good numbers of mature fish present (10% or more of fish measured are over mature size).
	Some	A few mature fish present (up to 10% of fish measured are over mature size).
	✘	No mature fish present (No fish measured are over mature size).
	?	Insufficient fish measured to assess (< 60 fish measured).

Recent recruitment

Small fish (recruits presumed to be less than one year old) (<10 cm) present indicates that fish have spawned recently (in last 12 months) in the stream. This may also indicate recent stocking of hatchery-bred fish. Size is indicative only as growth of juveniles may vary between species, streams, time of year sampled and from one year to the next. Note that detection of small fish by electro-fishing can be difficult for some species (notably golden perch). Scores are determined based on the proportion of fish sampled that are small (<10 cm).

Scoring rules:	• Minimum of 60 fish measured over 3 years. • Fish with of length of < 10 cm	
Scores:	✓	Good numbers of small fish present (10% or more of fish measured are recruits).
	Some	A few small fish present (<10% of fish measured are recruits).
	✘	No small fish present (no recruits measured).
	?	Insufficient fish measured to assess (< 60 fish measured).

Maximum size

The presence of fish approaching maximum size indicates sustainable fishing pressure. Maximum size is indicative only as this may vary between streams and sex of fish for each species. Scores are determined based on the proportion of fish sampled that exceed the maximum.

Scoring rules:	• Minimum of 60 fish measured 3 years. • Maximum size: Australian bass (≥ 43 cm), estuary perch (≥ 55 cm), freshwater catfish (≥ 55 cm), golden perch (≥ 50 cm), Macquarie perch (≥ 36 cm), Murray cod (≥ 110 cm), silver perch (≥ 40 cm) and trout cod (≥ 60 cm).	
Scores:	✓	Good numbers fish approaching maximum size present (5% or more of fish measured are over maximum size).
	Some	A few fish approaching maximum size present (greater than zero, but <5% of fish measured are over maximum size).
	✘	No fish approaching maximum size present (No fish measured are over maximum size).
	?	Insufficient fish measured to assess (< 60 fish measured).

Summation of preformation measures and overall score determination

Estimating a summarised score for a species for which multiple rivers are assessed uses the median value for each performance measure for each river assessed. For example,

Performance measure		River1	River2	River3	Summary
Trend in abundance over the last 5 years:	Slope	-0.073	0.04	0.558	Median = 0.04
	Score	⇩	⇔	⇧	⇔
Mature fish present	Proportion of fish measured	0.04	0.076	0.132	Median = 0.076
	Score	**Some**	**Some**	✓	**Some**

To obtain an overall score, a numerical value is assigned to each performance measure according to the score;

3 for ⇧ and ✓

1 for ⇔ and **Some**

0 for ⇩ and ✘ and ?

The maximum numerical score that can be obtained for either a river or summary of rivers is the number of performance measures assessed multiplied by the maximum value of 3. For example,

6 performance measures multiplied by 3 = Maximum numerical score of 18.

The numerical score for each river assessed for a species is determined by adding the scores for each performance measure together and then dividing the value by the maximum numerical score. For example,

Performance measure	Numerical score	Overall score
Trend in abundance over the last 5 years = ⇧	3	**10 / 18** (0.556)
Trend in abundance over the last 10 years = ?	0	
Wide range of fish size classes present = ✓	3	
Mature fish present = **Some**	1	
Small fish under 10 cm present ✓	3	
of fish approaching maximum size present = ✘	0	

The following scale is then applied to assign an overall rating for the species (for either a river or summary of rivers):

Overall score	< 0.1	0.1 to < 0.4	0.4 to < 0.6	0.6 to < 0.9	≥ 0.9
Overall rating	LOW	MODERATE	GOOD	VERY GOOD	EXCELLENT

Appendix II: Abundance of native fish populations

Abundance records (as fish/ 100m) for eight native fish species recorded in electrofishing surveys conducted between 1982 and 2020 form nine river systems (Table 2). Quantile ranges were used to assign five levels of abundance (from low to exceptional) to these abundance records (**Error! Reference source not found.**, Figure 9, Figure 10).

Table 5. Abundance levels of native fish and associated quantile ranges, abundance ranges (fish/100 m) and number of observations (Based on average of all sites within each river each year recorded for electrofishing surveys conducted between 1982 and 2020).

Abundance level	Quantile range	Average abundance range (fish/100 m)	Number of observations	Percent of observations (%)
Low	< 0.05	0 – 0.19	158	60
Moderate	0.05 to < 0.25	0.21 – 1.01	74	28
High	0.25 to < 0.5	1.02 – 1.95	20	8
Very high	0.5 to < 0.99	2.02 – 3.95	8	3
Exceptional	≥ 0.99	4.17 – 7.28	3	1

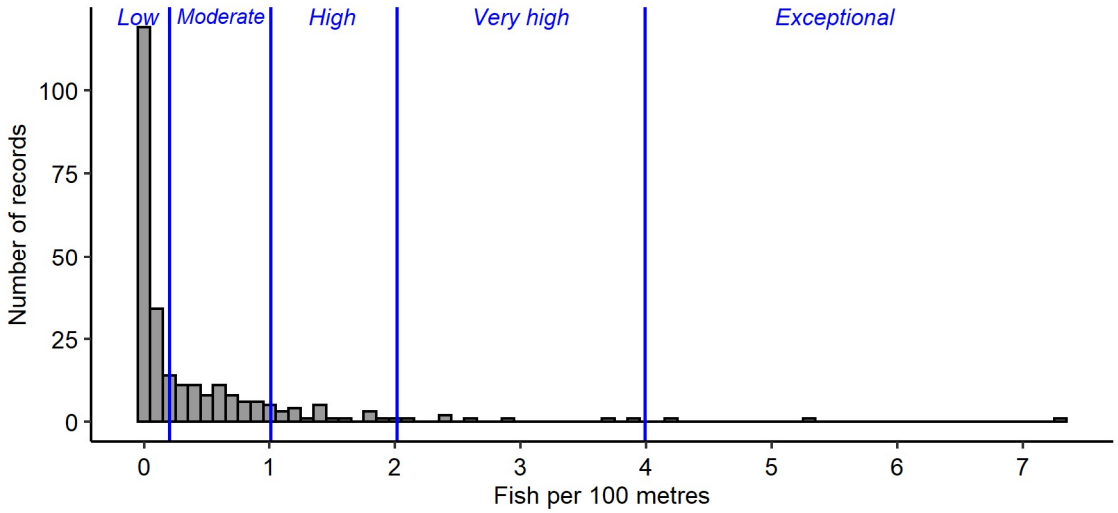


Figure 9. Frequency distribution native fish abundance (fish/100 m) for different abundance levels (Based on average of all sites within each river each year recorded for electrofishing surveys conducted between 1982 and 2020).

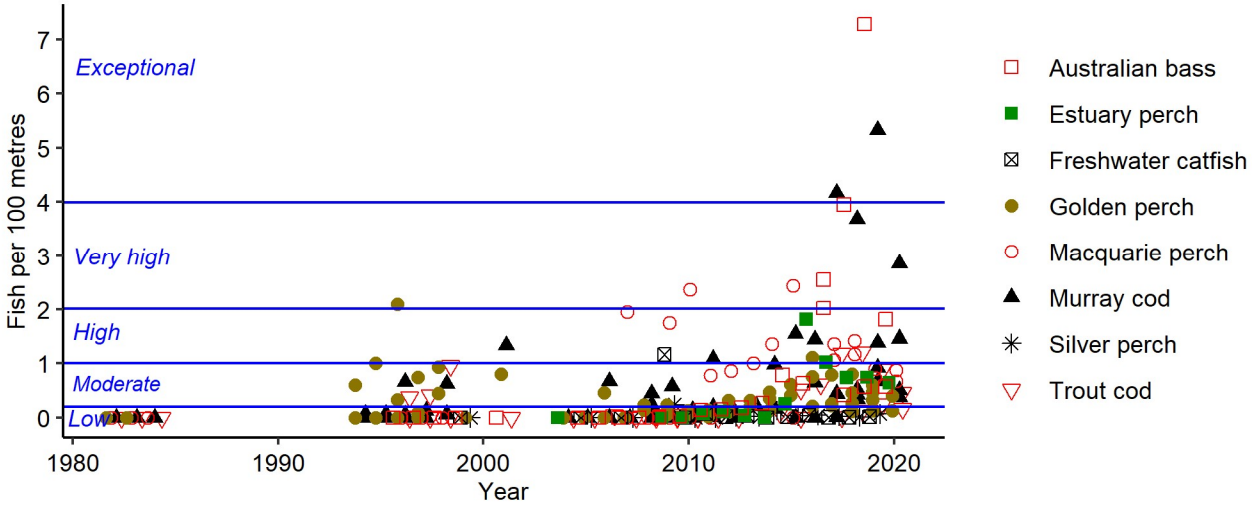
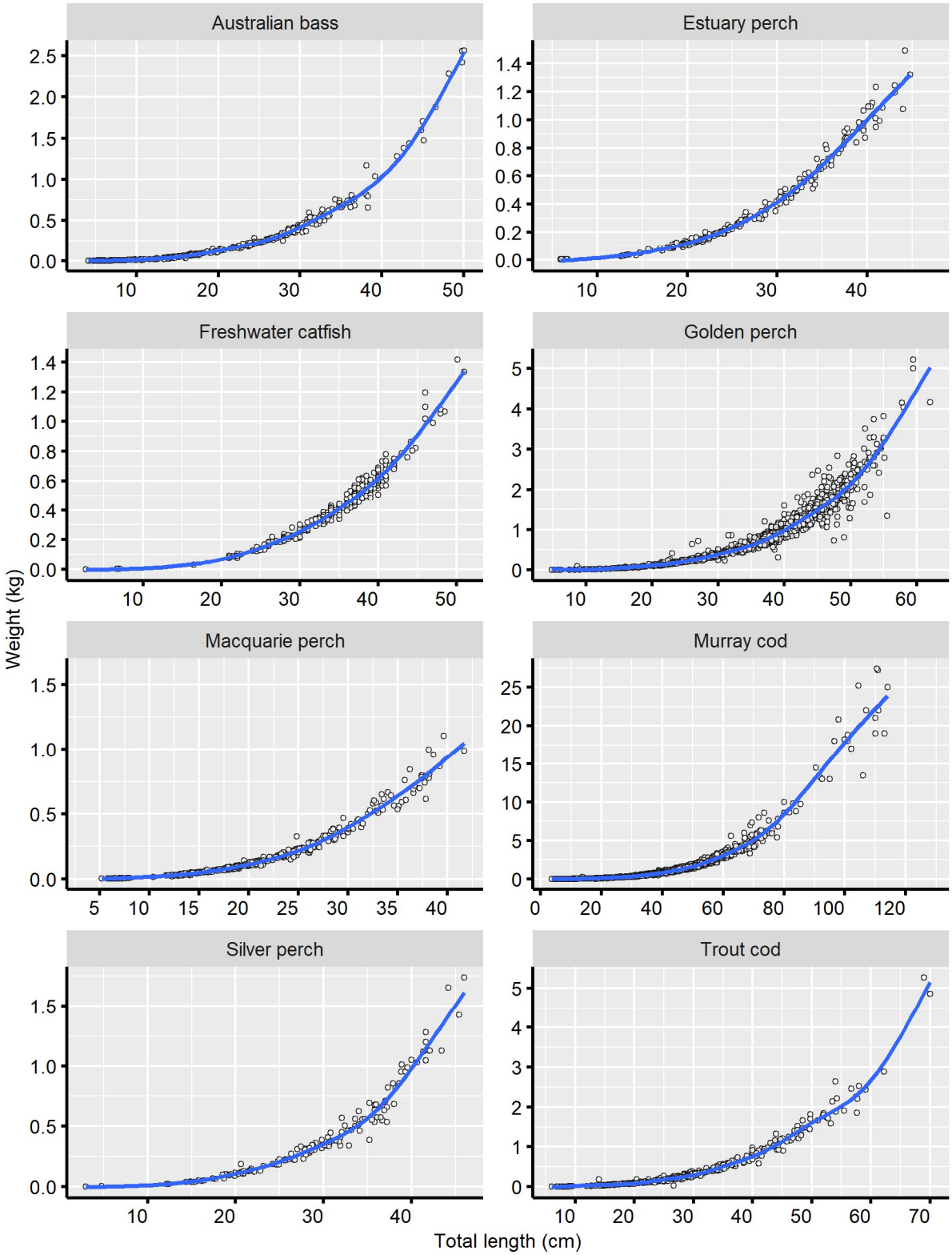


Figure 10. Average abundance records for eight native fish species estimated from historic and contemporary catch electrofishing catch records and associated abundance levels.

Appendix III: Native fish length – weight relationships



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