Native Fishery Report Cards – 2021:

Report cards for nine native fish species and status of small-bodied native fish species

VICTORIA State Government | Environment, Land, Water and Planning

Arthur Rylah Institute for environmental research

August 2022
Victorian Fisheries Authority
Science Report Series No. 31

Your fishing licence fees at work

Victorian Fisheries AUTHORITY

Native Fishery Report Cards – 2021:

Report cards for nine native fish species and status of small-bodied native fish species

Brett A. Ingram and Jason Lieschke

August 2022

Victorian Fisheries Authority
Science Report Series No. 31

Published by the Victorian Government, Victorian Fisheries Authority (VFA),
August 2022

Authorised by the Victorian Government, 1 Spring Street, Melbourne.

Printed by VFA Queenscliff, Victoria.

Preferred way to cite this publication:
Ingram, B.A. and Lieschke, J. (2022). Native Fishery Report Cards – 2021: Report cards for nine native fish species and status of small-bodied native fish. Victorian Fisheries Authority Science Report Series No. 31. 51 pp.

ISSN 2203-3122 (Print)
ISSN 2204-6933 (Online)

ISBN 978-0-6454159-8-8 (Print)
ISBN 978-0-6454159-9-5 (pdf/online/MS Word)

Author Contact Details:
Dr. Brett Ingram
Fisheries Management and Science Branch, Victorian Fisheries Authority
Private Bag 20, Alexandra. Vic. 3714.

Copies are available from the website www.vfa.vic.gov.au

For more information contact the VFA Customer Service Centre 136 186

Disclaimer

Accessibility

If you would like to receive this publication in an accessible format, such as large print or audio, please telephone 136 186, or email customer.service@vfa.vic.gov.au

Deaf, hearing impaired or speech impaired? Call us via the National Relay Service on 133 677 or visit www.relayservice.com.au

This document is also available in PDF format on the internet at www.vfa.vic.gov.au

Contents

List of Tables

List of Figures

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 has been conducted annually since 2017, uses fish population surveys to produce *Health cards* for nine important recreational and threatened non-recreational native freshwater fish from 10 priority streams in which they occur in Victoria. These species are Australian bass, estuary perch, freshwater catfish, golden perch, Macquarie perch, Murray cod, river blackfish, silver perch and trout cod (1-4 streams per species).

Electrofishing and fyke netting in some locations were used to capture fish. These methods are effective sampling tools that can provide a snapshot of the presence and abundance of fish at the time of sampling. But they do not catch all the fish present and often fish are observed but cannot be caught. Therefore, the numbers of fish presented in the *Native Fishery Report Cards* should be considered as a glimpse of the fish present only.

Results from these annual surveys are combined with results from similar historic fish surveys dating back to the early 1990s. These are then summarised into a *Native Fishery Report Card* to assess long-term trends in catch rates, fish size structure (presence of multiple year classes, mature fish and recent recruits) and to provide a health assessment for each species in selected streams.

Native Fishery Report Card results

An overall rating of Good was recorded for six species (Australian bass, estuary perch, golden perch, Murray cod, river blackfish and trout cod), Moderate for one species (Macquarie perch) and Low for two species (freshwater catfish and silver perch) (see table below)

Species	Rivers	2021 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.	⇔	⇧	✓	✓	✘	Some	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.	⇔	⇔	✓	✓	✘	✓	Good
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	Good
River blackfish	Gellibrand R. system**	⇩	?	✓	✓	Some	Some	Good
Silver perch	Gunbower Ck and Wimmera R.	⇔	⇔	?	?	?	?	Low
Trout cod	Goulburn R. and Ovens R.	⇩	?	✓	✓	✓	Some	Good

* May include stocked fish.

** including sites in tributaries.

Status of small-bodied native fish

There have been considerable declines in the distribution and abundance of many small-bodied native fish, and some are now considered threatened in Victoria. Although small-bodied native fish are also collected as part of fishery surveys to assess species of commercial and/or recreational value, their status is rarely included in fishery assessment reports. Results from current and historic fisheries surveys described in this report were used to assess the status of 24 species of small-bodied native fish, including two-spined blackfish, bony bream, seven galaxias species, Australian grayling, five gudgeon species, two lamprey species, unspecked hardyhead, three pygmy perch species, Murray-Darling rainbow fish, Australian smelt and tupong.

Small-bodied native fish were likely to be either under-represented or absent from surveys described in this report because the survey methods were not designed to target either small-bodied species or the habitats in which they may be more abundant (e.g. smaller river tributaries and backwaters). Some species are threatened, are less often recorded, have either patchy or restricted distributions and/or occur in small numbers. Consequently, status ratings for small-bodied native fish used presence-absence (detection frequency) data in selected streams.

Six small-bodied native fish species, mostly galaxias, had a detection rating of Rare or absent, five Occasionally detected, three Regularly detected and 10 Commonly detected (see table below).

Rare or absent	Occasionally detected	Regularly detected	Commonly detected
Galaxias, climbing	Gudgeon, Cox's	Blackfish, two-spined	Bream, bony
Galaxias, flatheaded	Gudgeon, dwarf flathead	Galaxias obscure	Galaxias, common
Galaxias mountain	Gudgeon, striped	Galaxias ornate	Grayling, Australian
Galaxias, spotted	Lamprey, shortheaded		Gudgeon, carp
Lamprey, pouched	Pygmy perch, southern		Gudgeon, flathead
Pygmy perch, Yarra			Hardyhead, unspecked
			Rainbowfish, Murray-Darling
			Pygmy perch, Ewen
			Smelt, Australian
			Tupong

Effects of the fishery slot limit regulation on length of Murray cod

Legal size limits are commonly used to manage the harvest of fish stocks including Murray cod. In the late 2000s a 60-100 cm slot limit was introduced to protect larger fish and then in 2014, this was changed to a 55-75 cm slot limit. This change aimed to improve recreational fishing outcomes by increasing the long-term sustainably of the fishery, the abundance of large fish and the number of mid-size fish available for harvest.

To assess the effects of slot limit of the Murray cod fishery Murray cod length records from electro-fishing surveys of Gunbower Creek, Lindsay River & Mullaroo Creek, Lower Goulburn River and Ovens River were split into four time-periods (pre-2009, 2009-2013, 2014-2018 and 2019-2021) and the proportion of fish greater than the maximum legal length of 75 cm (the current maximum legal size length limit) in each stream and time-period were compared.

Results suggest that introduction of the slot limit regulation may be having a positive effect on populations in the lower Goulburn River and Ovens River where the proportion of fish over 75 cm has increased slightly in recent years. However, this cannot be said for Gunbower Creek, Lindsay River & Mullaroo Creek as the proportion of fish over 75cm either did not increase or declined. Results in these streams may have been affected by there being fewer surveys conducted historically and catch rates being highly variable between years, as indicated by the large error bars.

Monitoring changes to Murray cod populations associated with regulation change is important to ensure the fishery is sustainably managed. To achieve this will require continued monitoring and analysis of trends in length distribution of Murray cod over time.

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 Fishery Report Cards for large-bodied native fish

Preparation of the *Native Fishery Report Cards* has been a partnership between the Department of Environment, Land, Water and Planning (DELWP), the Victorian Fisheries Authority (VFA) and Recreational Fishing License Holders (through Recreational Fishing License Trust Recreational Fishing Grants Program). The report cards use information from fish population surveys of important recreational and threatened non-recreational large-bodied native freshwater fish from 10 priority streams in Victoria in which they commonly occur (Table 1, Figure 1). The 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).

Native Fishery Report Cards for large-bodied species presented in this report combine information from contemporary electrofishing surveys 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 10 native fish species (Australian bass, Australian grayling, estuary perch, freshwater catfish, golden perch, Macquarie perch, Murray cod, river blackfish, silver perch and trout cod) in 10 priority Victorian streams (Figure 1). The report cards combine and summarise results for one to four rivers for each species (Table 2). Previously *Native Fishery Report Cards* have been published in 2019 (Ingram *et al.* 2019) and 2020 (Ingram and Lieschke 2021). DELWP also provides native fish report cards for fish communities in selected rivers (https://www.ari.vic.gov.au/research/field-techniques-and-monitoring/native-fish-report-card-program).

Status of small-bodied native fish

Although small -bodied native fish are regularly collected as part of fishery surveys to assess species of commercial and/or recreational value, their status is rarely included in fishery assessment reports. There has been considerable declines in the distribution and abundance of many small-bodied native fish (Lintermans *et al.* 2020) and some are now considered threatened under the Victorian *Flora and Fauna Guarantee Act (1988)* (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list) (Appendix I). Fishery surveys conducted for preparation of the *Native Fishery Report Cards* may also be used to assess the status of small-bodied native fish populations in selected Victorian streams.

Objectives

To provide fishers and managers a better understanding of the past and current health of Victorian fish species by:

- Assessing health of nine large-bodied native fish in 10 streams and produce *Native Fishery Report Cards* for these species
- Assessing the status of 24 small-bodied native fish species in 10 streams

Legal size limits are commonly used to manage the harvest of fish stocks (Noble and Jones 1999, Allen *et al.* 2008), and since the early 1900s a minimum legal length limit (MLL) regulation has been in place for Murray cod. In the late 2000s a 60-100 cm slot limit was introduced to protect larger fish and then in December 2014, this was changed to a 55-75 cm slot limit, which aimed to improve recreational fishing outcomes by increasing the long-term sustainably of the fishery, the abundance of large fish (>1m) in the population and the number of mid-size fish available for harvest (Department of Environment and Primary Industries 2014, Gwinn *et al.* 2015a). Monitoring changes to Murray cod populations associated with regulation change is important to ensure the fishery is sustainably managed. Modelling has suggested that noticeable increases in the abundance of large (1 m+) fish should occur between 5 and 10 years and will continue to increase over at least a 15-year period (Department of Environment and Primary Industries 2014, Gwinn *et al.* 2015a). Consequently, an evaluation in the change in of size structure of Murray cod populations following changes to slot regulations was also undertaken (Appendix II).

Table 1. Priority rivers and large-bodied species surveyed for the *Native Fishery Report Cards*.

Priority river	Region	Recreational species	Threatened non-recreational species
Gellibrand River system	Corangamite CMA	River blackfish	
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	
Ovens River	North East CMA	Golden perch Murray cod	Macquarie perch Trout cod
Thomson & Macalister rivers	West Gippsland CMA	Australian bass	
Wimmera River	Wimmera CMA	Freshwater catfish Golden perch	Silver perch
Yarra River	Melbourne Water	Macquarie perch Murray cod	

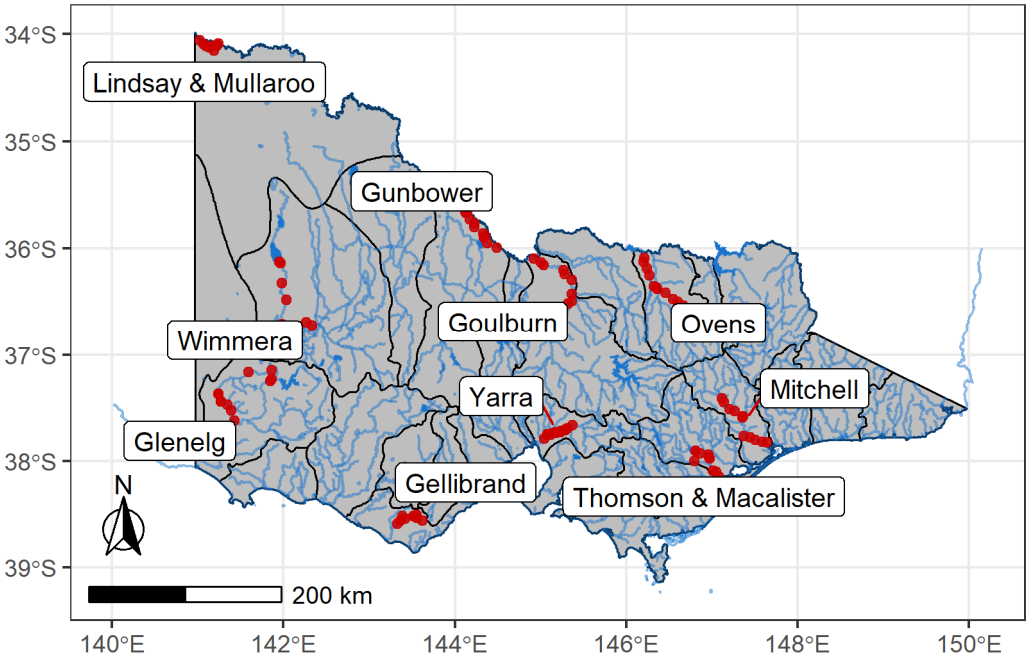


Figure 1. Location of streams surveyed for native fishery report cards in this report.

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

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

* Listed as threatened under the the *Flora and Fauna Guarantee Act (1988)* (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list)

Materials and Methods

Species, species distribution and conservation status

Scientific names for species described in this report, and their conservation status under the *Flora and Fauna Guarantee Act (1988)* (*FFG Act*) (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list, are provided in Appendix I. Species distribution descriptions in Cadwallader and Backhouse (1983), McDowall (1996) and Lintermans (2007) were used to identify rivers to be assessed for each species.

Contemporary survey data (2017 to present)

Contemporary survey data has been collected since 2017 by sampling fish from priority rivers in autumn to avoid the spring periods of peak migration when some native fish undertake long distance movements into or out of the rivers. Surveys conducted at the same time of the year also allows for a more precise comparison between survey years.

Fish were sampled from multiple sites in each priority river, predominantly using electrofishing. Smaller streams, such as the Gellibrand River system, were surveyed with a backpack electrofisher for approximately 90 minutes, while larger streams were surveyed with an electrofishing boat for 60 to 90 minutes. In some years 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 system) and freshwater catfish (Wimmera River – prior to 2020).

Electrofishing 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.

Each year, 8-14 sites were surveyed in each stream, and 90 – 3,000 m (typically up to 2,000 m) of stream was surveyed at each site. The length of fish caught were measured and their abundance (number of fish caught per length of stream) was estimated.

Historic survey data (pre-2017)

The contemporary survey *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 of contemporary survey data 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 previously assessed in 2016 (Ingram *et al.* 2016) and 2021 (Ingram *et al.* 2022). Angler catch rate is not intended to be compared directly 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 III.

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 III 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 2021 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.

Status of small-bodied native fish

Status ratings were determined for 24 small-bodied native fish species recorded in the rivers assessed for the *Native Fishery Report Cards* (Figure 1, Table 3). River selection for each species was based on the historical distribution of each species as described in Cadwallader and Backhouse (1983), McDowall (1996) and Lintermans (2007). In the mid-2010s the mountain galaxias was recognized as a group of species (species complex) and was consequently separated into a number of new species, including obscure galaxias and ornate galaxias (Raadik 2014) (see Appendix I for scientific species names).

Since the NFRC Program was not designed to target either smaller-bodied species or their habitats, absence of a small-bodied native fish species in surveys of a river does not necessarily mean the species is absent from that river but instead may reflect the ability to detect their presence. Small-bodied native fish were likely to be either under-represented or absent from surveys described in this report for the following reasons:

- Sampling methods, such as electro-fishing, targets larger-bodied species
- Habitats where some small-bodied native fish species are more abundant, such as smaller river tributaries, billabongs and shallow backwaters, were not sampled.

Some species of small-bodied native fish are threatened, are less often recorded, have either patchy or restricted distributions and/or occur in small numbers. Consequently, ratings for small-bodied species used presence-absence data only.

The number of fish collected and observed for all types of fishing gear used were combined for each species to indicate presence. Surveys of each river in each year surveyed where each species was not detected indicated absence. A health rating was assigned to each small-bodied native fish species based on the number of streams their presence was detected and the number of years their presence was detected over the last 5 years (since 2017) (Table 4).

Andrew Pickworth (ARI) with a large Australian bass

Jason Lieschke (ARI) recording survey catch data

Table 3. Small-bodied native fish and rivers assessed for each species (see Appendix I for scientific species names).

Species	Mitchell	Thomson & Macalister	Gellibrand	Glenelg	Ovens	Goulburn	Gunbower	Lindsay & Mullaroo	Wimmera	Yarra
Gudgeon, Cox's*	■	■								
Gudgeon, striped	■	■								
Grayling, Australian*	■	■	■							■
Galaxias, common	■	■	■	■					■	■
Galaxias, climbing	■	■	■	■						■
Galaxias, spotted	■	■	■	■						■
Tupong	■	■	■	■						■
Lamprey, pouched	■	■	■	■						■
Lamprey, shortheaded	■	■	■	■		■	■	■		■
Galaxias mountain (pre-2014)	■	■	■	■	■	■	■		■	■
Galaxias mountain (post-2014)	■				■	■	■			
Pygmy perch, Yarra*			■	■						
Galaxias ornate			■							■
Pygmy perch, Ewen*				■						
Galaxias obscure				■	■	■			■	
Blackfish, two-spined					■	■				
Gudgeon, carp					■	■	■	■	■	
Galaxias, flatheaded*					■	■	■	■		
Hardyhead, unspecked					■	■	■	■		
Rainbowfish, Murray-Darling*					■	■	■	■		
Bream, bony							■	■		
Gudgeon, dwarf flathead	■	■	■	■	■	■	■	■	■	■
Gudgeon, flathead	■	■	■	■	■	■	■	■	■	■
Pygmy perch, southern*	■	■	■	■	■	■	■	■	■	■
Smelt, Australian	■	■	■	■	■	■	■	■	■	■

* Listed as threatened under the the *Flora and Fauna Guarantee Act (1988)* (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list)

Table 4. Detection ratings for small-bodied native fish based on presence/absence in selected streams for the period since 2017 (streams surveyed for each species described in Table 3).

Detection rating	Description
RARE OR ABSENT	Present in one stream assessed for the species in at least 1 year, or absent in all streams assessed for species and absent in all years since 2017
OCCASIONALLY DETECTED	Present in some streams (less than half) in some years (up to 2 out of 5 years) in those streams assessed for the species since 2017
FREQUENTLY DETECTED	Present in most streams (half or greater) in some years (up to 2 out of 5 years) in those streams assessed for the species since 2017
COMMONLY DETECTED	Present in most streams (more than half) in most years (3 out of 5 years) in those streams assessed for the species since 2017

Results and discussion

Species present

Forty-nine fish species were reported during surveys conducted in 2021, with 10 -20 species observed in each river (Table 5). The most common species was Australian smelt being recorded in all 10 rivers and was the most common in five rivers.

The most common large-bodied fish species was common carp. This species represented 40% of large-bodied fish present, was observed in nine rivers, the exception being the Gellibrand River system, and was the most common large-bodied fish present in five rivers (Table 5). Further details on the more common species present in each river are provided in Appendix IV.

Table 5. Species present in rivers surveyed in 2021.

River	Number of species caught	Most common species (% of total)	Most common large-bodied species (% of total large-bodied species)
Gellibrand River system*	10	Common galaxias (47)	River blackfish (39)
Glenelg River	20	Gambusia (53)	Common carp (59)
Lower Goulburn River	10	Australian smelt (43)	Murray cod (34)
Gunbower Creek	12	Unspecked hardyhead (71)	Common carp (67)
Lindsay River & Mullaroo Creek	14	Bony bream (80)	Common carp (64)
Mitchell River	19	Longfin eel (18)	Longfin eel (31)
Ovens River	15	Australian smelt (54)	Murray cod (39)
Thomson & Macalister rivers	19	Australian smelt (83)	Common carp (35)
Wimmera River	10	Australian smelt (48)	Common carp (71)
Yarra River	15	Australian smelt (80)	Shortfin eel (47)
All rivers	**49**	**Australian smelt (31)**	**Common carp (40)**

* Including sites in tributaries.

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 2021, were used to assign five levels of fish abundance (see Appendix V), which nominally were:

Abundance level	Low	Moderate	High	Very high	Exceptional
Electrofishing catch rate (fish/ 100m)	< 0.25	0.25-1.25	1.25-2.5	2.5 – 5.0	> 5.0

Historically, abundance has ranged from low (nil to 0.25 fish/100 m) (57% of records) to exceptional (>5 fish/100 m) (1% of records) (Appendix V), the greatest being 5.3 fish/100 m recorded for Murray cod in the Ovens River in 2019 when many small fish (natural 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 V).

In 2021 abundance was highest for Murray cod in the Ovens River (3.8 fish/100 m), which was due to a large number of fish across a range of sizes, followed by river blackfish in the Gellibrand River system (1.6 fish/100 m) (Appendix V, Figure IV.3). Freshwater catfish and silver perch were lowest in abundance (< 0.06 fish/100 m) (Appendix V, Figure

IV.3). Only seven freshwater catfish were caught in 2021 surveys, two from the Lindsay-Mullaroo and five from the Wimmera River. Two silver perch were caught in Gunbower Creek and three were caught in the Wimmera River despite regular stocking of the latter with hatchery-bred fish.

Fish sizes

The length – weight relationships for eight native fish are presented in Appendix VI. A summary of size ranges of nine native fish species recorded in selected rivers surveyed in 2021 is provided in Appendix VI. The largest fish caught during surveys for each species in 2021 including the river basin it was caught in is presented in Figure 2.

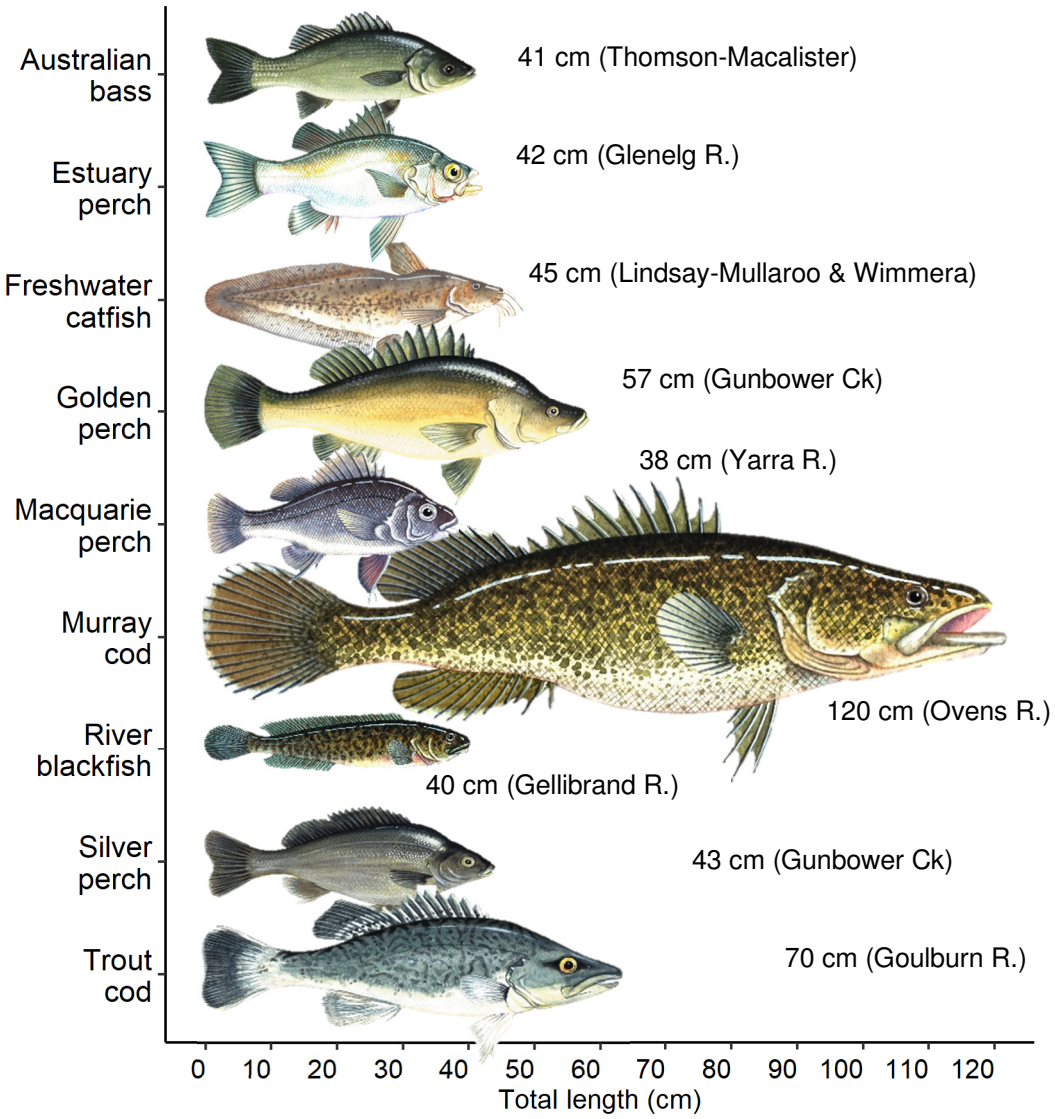


Figure 2. Largest fish caught during electrofishing surveys of native fish populations conducted in 2021.

Native fishery Report Card results

Information for nine native fish species and 10 rivers is presented in the report cards and a summary of the key health indicators for the species assessed are provided in Table 6 and Table 7. An overall rating of Good was assigned to six species (Australian bass, estuary perch, golden perch, Murray cod, river blackfish and trout cod), Moderate for one species (Macquarie perch) and Low for two species (freshwater catfish and silver perch). Further information regarding these assessments is provided in the report cards.

Table 6. Summary of key health indicators for eight native fish species.

Species	Rivers	2021 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.	⇔	⇧	✓	✓	✘	Some	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.	⇔	⇔	✓	✓	✘	✓	Good
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	Good
River blackfish	Gellibrand R. system	⇩	?	✓	✓	Some	Some	Good
Silver perch	Gunbower Ck and Wimmera R.	⇔	⇔	?	?	?	?	Low
Trout cod	Goulburn R. and Ovens R.	⇩	?	✓	✓	✓	Some	Good

* May include stocked fish.

Large river blackfish

Table 7. Health ratings for species in each river assessed in this report, and overall rating.

Species	Mitchell	Thomson & Macalister	Glenelg	Ovens	Goulburn	Gunbower	Lindsay & Mullaroo	Wimmera	Yarra	Gellibrand	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	Good				Good
Golden perch					Good	Very good	Moderate	Good			Good
Silver perch						Low		Low			Low
Freshwater catfish							Low	Low			Low
River blackfish										Good	Good

Detection ratings for small-bodied native fish

The presence and absence of 24 small-bodied native fish in surveyed streams since 1980 are presented in Figure 3. Detection ratings for these species is presented in Table 8. In the streams surveyed, six species (mostly galaxias) had a detection rating of Rare or absent, five Occasionally detected, three Regularly detected and 10 Commonly detected.

Galaxiids

Climbing galaxias, common galaxias and spotted galaxias occur in coastal drainages of Victoria. Common galaxias is widespread and commonly detected in all coastal rivers during surveys, and was the most common species recorded in the Gellibrand River system in 2021 (Table 5). Common galaxias recorded in the Wimmera River represent an introduced (translocated) population outside the species natural distribution. Climbing galaxias was rarely detected in surveys and was only recorded in the Gellibrand River system in 2019. Despite having a wide distribution, spotted galaxias was only recorded in the Gellibrand River system in 2018.

Flatheaded galaxias, which is listed as Vulnerable under the *FFG Act*, occurs in rivers north of the Great Dividing Range that are connected to the Murray River but has not been detected in the rivers surveyed since 1984 (Ovens River) and 1986 (Goulburn River).

Since 2014 mountain galaxias has not been recorded in surveys. Obscure galaxias was detected in both the Ovens and Glenelg rivers but not the Wimmera River, while ornate galaxias was regularly detected in the Gellibrand River system but not detected in the Yarra River.

Gudgeons

Species of carp gudgeon (incorporating western carp gudgeon, Midgley's carp gudgeon and Lake's carp gudgeon) were regularly recorded in all five inland rivers in most years.

Flathead gudgeon and dwarf flathead gudgeon are reported to occur in all rivers surveyed for this report. Flathead gudgeon were commonly detected in most years for all rivers except the Gellibrand River system where it was absent in all years. Dwarf flathead gudgeon were occasionally detected in the Thomson, Macalister and Mitchell rivers in some years only.

Cox's gudgeon, which is listed as Endangered under the *FFG Act*, and striped gudgeon occur in coastal rivers of east Victoria. Both species were recorded in the Mitchell River in some years but were absent in surveys of the Thomson & Macalister rivers. However, it is noted that distinguishing the two species can be difficult and that striped gudgeon in the Mitchell in 2017 and 2018 were Cox's gudgeon.

Other species

Australian grayling, which occurs in coastal drainages of Victoria, was recorded in four out of four streams in most years since 2017.

Australian smelt is one of the more widespread and common species in Victorian inland waters. The species was recorded in all rivers and in all years since 2017, and was the most common species recorded in five rivers (Lower Goulburn, Ovens, Thomson & Macalister, Wimmera and Yarra rivers) in 2021 (Table 5).

Bony bream is common in the Lindsay River and Mullaroo Creek system, being recorded in every year these streams were surveyed and being the most common species in 2021 (Table 5). Bony bream was recorded in most years in Gunbower Creek.

Two-spined blackfish occur in rivers in inland north-east Victoria. The species was present in the Ovens Rivers in the last four out of five years but was absent in the sites surveyed on the Goulburn River, which is not unexpected since two-spined blackfish are not expected to occur downstream of Goulburn Weir where the survey sites are located.

Two species of lamprey occur in Victoria. Pouched lampreys are rarely detected being recorded in only one stream in the last five years whereas shortheaded lampreys are more often detected being recorded in some years in three out of eight streams in the last five years.

Unspecked hardyhead were recorded in four inland rivers in most years and was the most common species observed in Gunbower Creek in 2021 (Table 5).

Ewen (variegated) pygmy occurs in the Glenelg River and, although listed as Endangered under the *FFG Act*, was recorded in surveys every year since 2009.

Southern pygmy perch occurs throughout Victorian coastal and inland waters. However, the species was only recorded from some coastal rivers only (Thomson & Macalister, Gellibrand and Glenelg rivers) in recent surveys. The Murray-Darling lineage of southern pygmy perch is listed as Vulnerable under the *FFG Act*. No Southern pygmy perch were detected in surveys of inland rivers.

Yarra pygmy perch occurs in coastal rivers west of Melbourne and is listed as Endangered under the *FFG Act*. In surveys since 2017 Yarra pygmy perch was recorded in just one year in the Glenelg River only.

Murray-Darling rainbowfish occurs in inland rivers that flow into the Murray River (Ovens River, Goulburn River, Gunbower Creek and Lindsay-Mullaroo rivers). Murray-Darling rainbowfish were commonly detected in several inland rivers except for the Ovens River where it was last recorded in 2007. The species is listed as Endangered under the *FFG Act*.

Tupong, which occurs in coastal drainages of Victoria was present in most streams surveyed in most years.

Further information on small-bodied native fish is provided by DELWP in native fish report cards for fish communities in selected rivers (https://www.ari.vic.gov.au/research/field-techniques-and-monitoring/native-fish-report-card-program).

Table 8. Detection ratings for small-bodied native fish in the rivers assessed in this report (ratings based on presence/absence in selected streams since 2017).

Rare or absent	Occasionally detected	Regularly detected	Commonly detected
Galaxias, climbing	Gudgeon, Cox's*	Blackfish, two-spined	Bream, bony
Galaxias, flatheaded*	Gudgeon, dwarf flathead	Galaxias obscure	Galaxias, common
Galaxias mountain	Gudgeon, striped	Galaxias ornate	Grayling, Australian*
Galaxias, spotted	Lamprey, shortheaded		Gudgeon, carp
Lamprey, pouched	Pygmy perch, southern*		Gudgeon, flathead
Pygmy perch, Yarra*			Hardyhead, unspecked
			Rainbowfish, Murray-Darling*
			Pygmy perch, Ewen*
			Smelt, Australian
			Tupong

* Listed as threatened under the the *Flora and Fauna Guarantee Act (1988)* (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list)

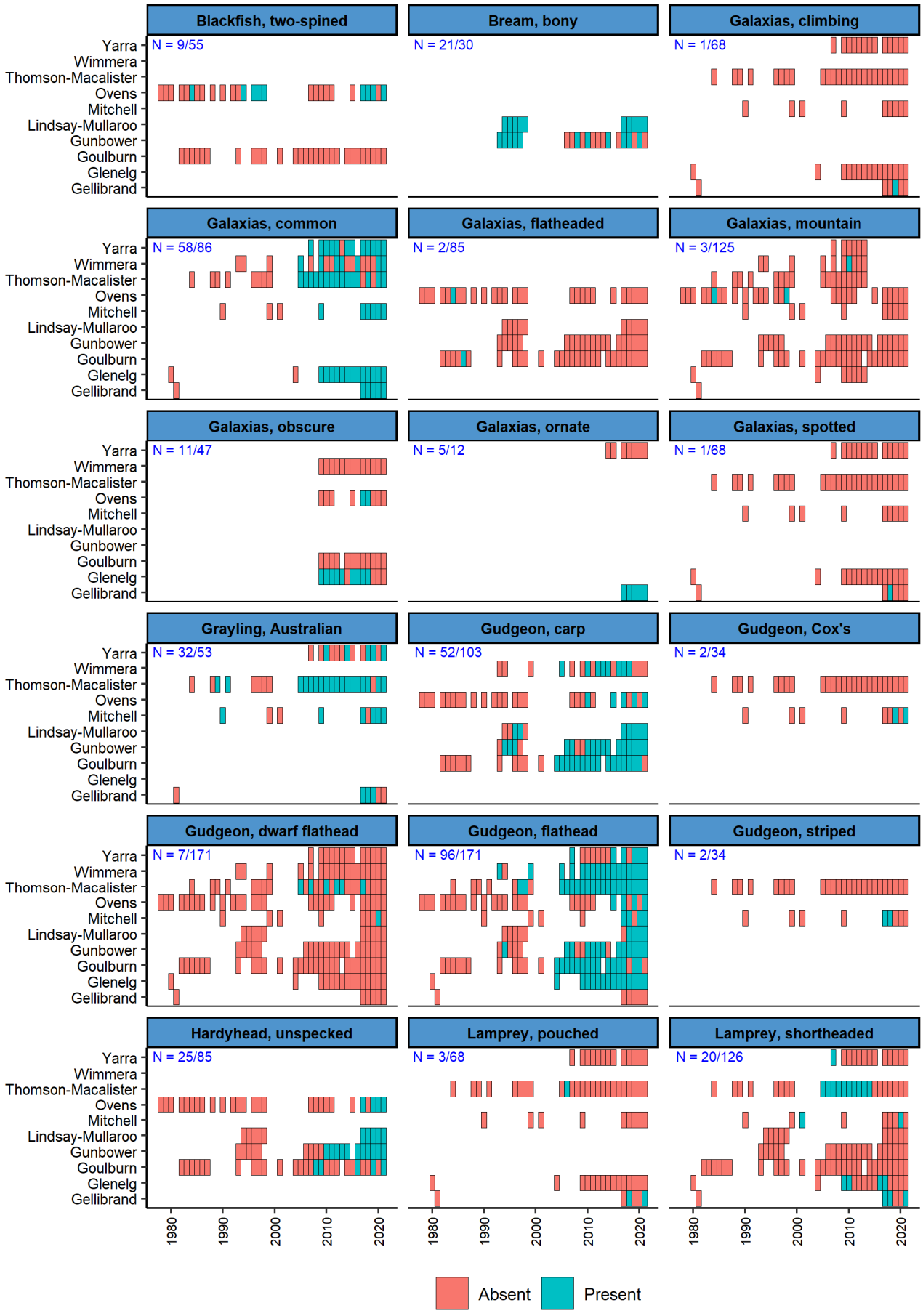


Figure 3. Presence and absence of small-bodied native fish in surveyed streams since 1980 (Each tile represents a year that each stream was surveyed. N = Number of years present / number of years surveyed for all streams).

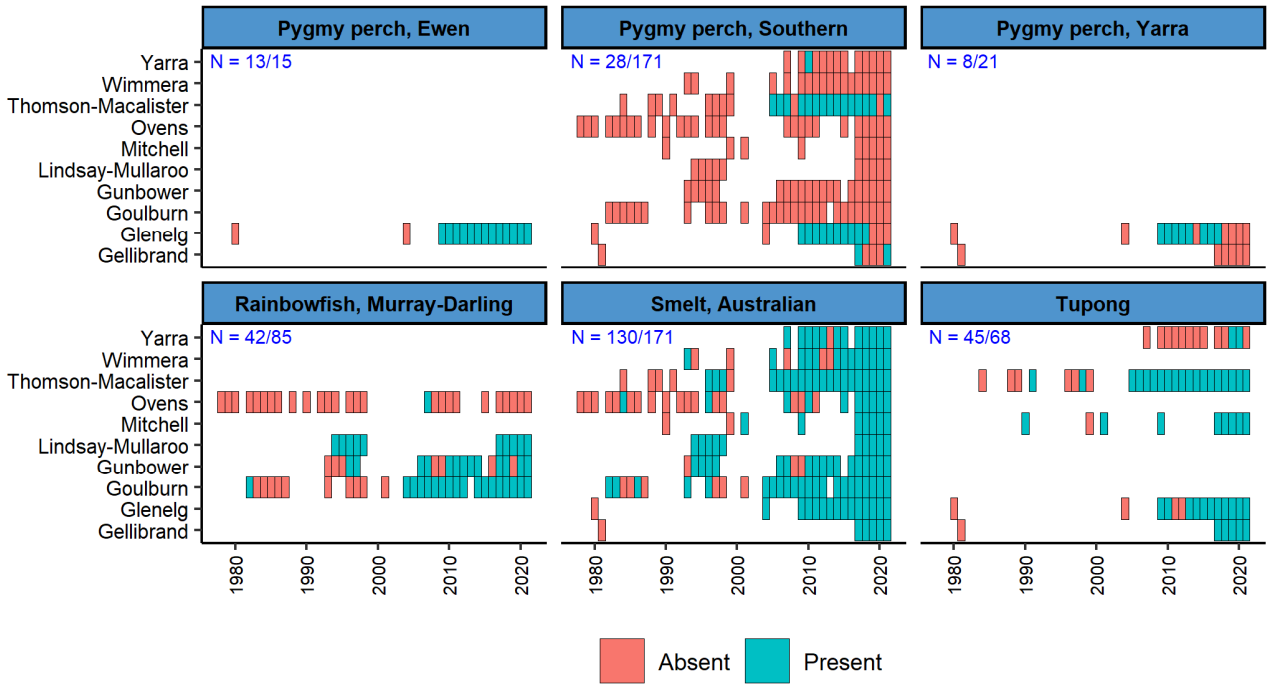


Figure 3. Continued. Presence and absence of small-bodied native fish in surveyed streams since 1980 (Each tile represents a year that each stream was surveyed. N = Number of years present / number of years surveyed for all streams).

Australian grayling

Ewen (variegated) pygmy perch

Small estuary perch

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).

The following ARI staff are thanked for assisting with surveys. Lauren Johnson, Adrian Kitchingman, Matthew Jones, Justin O'Connor, John Mahoney, Andrew Pickworth and Frank Amtstaetter.

Dion Iervasi from Austral Ecology sampled the Wimmera.

The authors wish to thank Fiona Warry (DELWP) and Taylor Hunt (VFA) for supporting the Native Fish Report Card Program (NFRCP) and development of these report cards for anglers. Fiona Warry (DELWP), Paul Reich (DELWP), Dr Greg Woodward (DELWP), Taylor Hunt (VFA), John Douglas (VFA), Justin Bell (VFA) and Simon Conron (VFA) are also thanked for their advice and comments on the report cards, performance measures and scoring methods therein.

References

Allen, M.S., Brown, P., Douglas, J., Fulton, W. and Catalano, M. (2008). An Assessment of Recreational Fishery Harvest Policies for Murray Cod in Southeast Australia. *Fisheries Research* doi:10.1016/j.fishres.2008.09.028.

Brown, P. (2010). *Sustainability of recreational fisheries for Murray cod: Creel Surveys on the Murray Goulburn, Ovens and Loddon rivers 2006–2008*. Recreational Fishing Grant Program - Research report. Department of Primary Industries, Victoria.

Brown, P. (2011). *Lower Goulburn River Angler Survey 2008-2009*. Fisheries Victoria Research Report Series No. 40.

Cadwallader, P.L. and Backhouse, G.N. (1983). *A Guide to the Freshwater Fish of Victoria*. Victorian Government Printing Office, Melbourne. 249 pp.

Conron, S., Bridge, N.F., Grixti, D., Ward, M. and Stokie, T.K. (2010). *Angler diary monitoring of recreational target fish stocks in selected Victorian estuaries*. Recreational Fishing Grant Program Final Report (Project numbers: 5/05/06/1, 06/07/3 and 07/08/14). Department of Primary Industries, Victoria, Queenscliff.

Conron, S.D. and Oliveiro, P. (2016). *State-wide Angler fishing Diary Program 2011-14* Recreational Fishing Grants Program Research Report June 2016. Department of Economic Development, Jobs, Transport and Resources, Queenscliff. 45 pp.

DELWP (2017a). *VEFMAP Stage 6 Part A: Program context and rationale*. A report by Arthur Rylah Institute for Environmental Research and Integrated Water and Catchments Division. Department of Environment, Land, Water and Planning, Victoria., Heidelberg.

DELWP (2017b). *VEFMAP Stage 6 Part B: Program design and monitoring methods* A report by Arthur Rylah Institute for Environmental Research and Integrated Water and Catchments Division. Department of Environment, Land, Water and Planning, Victoria., Heidelberg.

Department of Environment and Primary Industries (2014). *The use of slot limits to improve the Victorian Murray cod fishery. Consultation paper*. Department of Environment and Primary Industries, Melbourne. 16 pp.

Forbes, J.P., Watts, R.J., Robinson, W.A., Baumgartner, L.J., Steffe, A.S. and Murphy, J.J. (2015). Recreational Fishing Effort, Catch, and Harvest for Murray Cod and Golden Perch in the Murrumbidgee River, Australia. *North American Journal of Fisheries Management* 35 (4): 649-658.

Gwinn, D.C., Allen, M.S., Johnston, F.D., Brown, P., Todd, C.R. and Arlinghaus, R. (2015a). Rethinking length-based fisheries regulations: the value of protecting old and large fish with harvest slots. *Fish and Fisheries* 16 (2): 259-281.

Henry, G.W. and Lyle, J.M. eds. (2003). *The National Recreational and Indigenous Fishing Survey. FRDC Project No. 99/158*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. 188 pp.

Ingram, B.A., Hall, K. and Conron, S. (2016). *Recreational fishery assessment 2016 – western estuaries* Recreational Fishing Grants Program Research Report, December 2016. Victorian Government, Department of Economic Development, Jobs, Transport and Resources, Melbourne. 42 pp.

Ingram, B.A., Hunt, T.L., Lieschke, J. and Douglas, J. (2015). *Monitoring fish stockings in Victoria: 2014 native fish surveys*. Recreational Fishing Grants Program Research Report. Department of Economic Development, Jobs, Transport and Resources, Queenscliff. 50 pp.

Ingram, B.A. and Lieschke, J. (2021). *Native Fish Report Cards – 2020* Victorian Fisheries Authority Science Report Series No. 16. Victorian Fisheries Authority 33 pp.

Ingram, B.A., Lieschke, J. and Warry, F. (2019). Native fish report cards - 2019. Pp. 13-40. In: *2019 Murray Codference: Conference Proceedings (Shepparton, 8th December 2019)*. Victorian Fisheries Authority, Melbourne.

Ingram, B.A., Oliveiro, P. and Conron, S. (2022). *Angler Diary Program: Report cards for key species in coastal recreational fisheries, 2021*. Victorian Fisheries Authority Science Report Series No. 28. 48 pp.

Ingram, B.A. and Raymond, S. (2018). *Implementing better practice Murray cod fishery management*. Recreational Fishing Grants Program Research Report. November 2018. Victorian Fisheries Authority, Melbourne. 50 pp.

Lintermans, M. (2007). *Fishes of the Murray-Darling Basin: An Introductory Guide* Murray-Darling Basin Commission, Canberra. 157 pp.

Lintermans, M., Geyle, H.M., Beatty, S., Brown, C., Ebner, B.C., Freeman, R., Hammer, M.P., Humphreys, W.F., Kennard, M.J. and Kern, P. (2020). Big trouble for little fish: identifying Australian freshwater fishes in imminent risk of extinction. *Pacific Conservation Biology* 26 (4): 365-377.

McDowall, R.M. ed. (1996). *Freshwater Fishes of South-eastern Australia*. Reed Books, Chatswood. 247 pp.

Noble, R.L. and Jones, T.W. (1999). Managing fisheries with regulations. In: *Inland Fisheries Management in North America, 2nd edn* (Kohler, C.C. and Hubert, W.A. eds.), pp. 455-480. American Fisheries Society, Bethesda, MD.

Raadik, T.A. (2014). Fifteen from one: A revision of the *Galaxias olidus* Günther, 1866 complex (Teleostei, Galaxiidae) in south-eastern Australia recognises three previously described taxa and describes 12 new species. *Zootaxa* 3898 (1): 1-198.

Tonkin, Z., Kearns, J., Fanson, B., Mahoney, J., Ayres, R., Raymond, S., Todd, C. and O'Mahony, J. (2017). *An assessment of Macquarie perch population dynamics in the Yarra River*. Unpublished Client Report for Melbourne Water, June 2017. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Victorian Fisheries Authority (2018). *Freshwater Fisheries Management Plan 2018*. Victorian Fisheries Authority, Melbourne. 79 pp.

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

Native Fishery Report Card – 2021: 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 2021 and trends in population key performance measures that are based on scientific data provided by scientific fishery surveys.

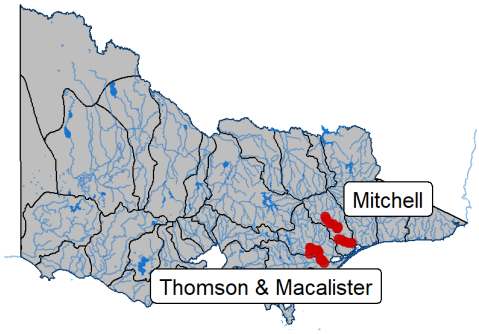
OVERALL RATING - 2021:	Good

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.	✓	✓	✓
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 (≥ 43 cm) in recent 3 years.	✗	✗	✗
Rating	Good	Good	Good

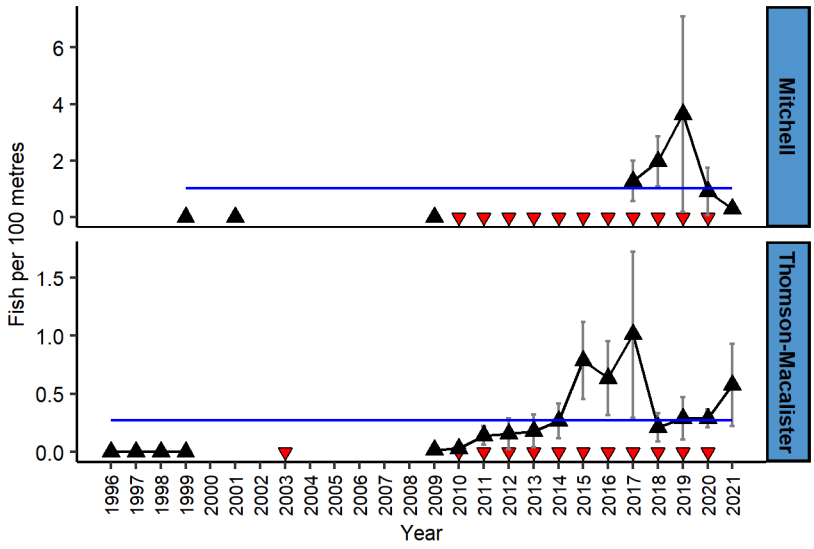
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✗ = Nil present. * May include stocked fish.

Assessment statement

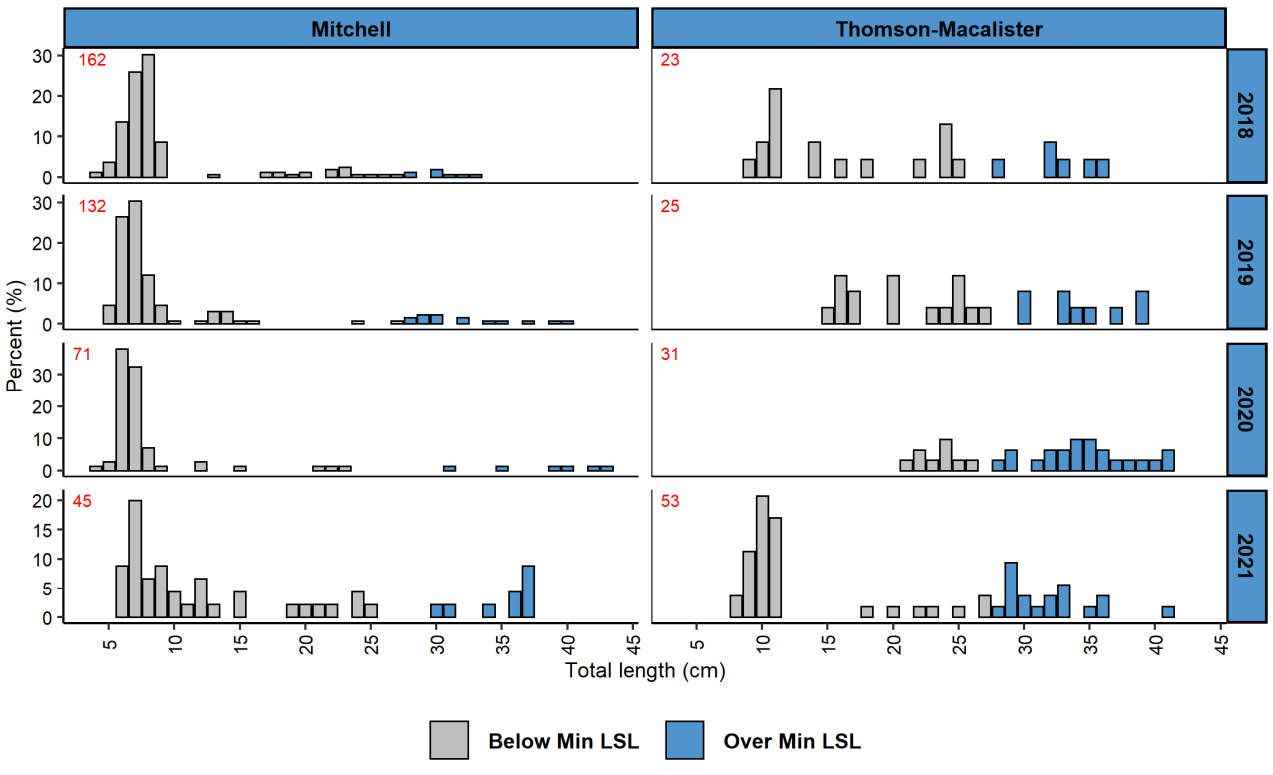
Australian bass represented 6% (Mitchell) and 11% (Thomson & Macalister) of large-bodied fish caught of fish caught and observed in 2021. Electrofishing catch rate over the last 5 years has declined in both rivers but has been stable in the Thomson & Macalister over the last 10 years. A wide range of 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. The presence of many small fish may indicate either recent natural recruitment has occurred or presence of recently stocked fish. Large numbers of small fish were caught in the Mitchell over the last 4 years. Large numbers of small fish were observed in the Thomson & Mitchell in 2021 but not in the previous years, suggesting recent recruitment and/or stockings success has been infrequent. Mature fish were present in both streams. On this basis the overall rating for Australian bass in 2021 was good.



Australian bass captured and measured during electro-fishing surveys in 2021	Mitchell	Thomson & Macalister
Size range (cm)	4-37	8-41
Percent (%) that are legal size (≥ 27 cm)	20	34
Percent (%) that are mature (≥ 27 cm)	20	34
Percent (%) that are recent recruits (< 10 cm)	49	36
Number of fish measured	45	53
Stockings of rivers in recent seasons (1,000s stocked)		
2017/18	150	46.5
2018/19	30	7
2019/20	44	8
2020/21	60	23



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 – 2021: Estuary perch

This report card describes the status of the estuary perch in the Glenelg River in 2021 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*).

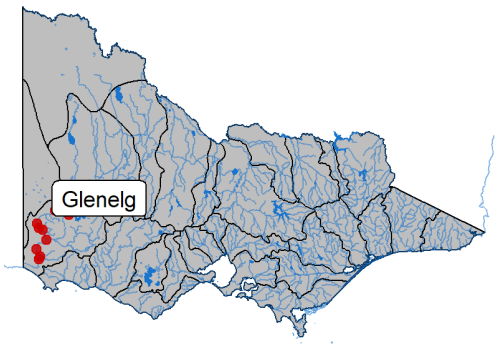
OVERALL RATING - 2021:	Good

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.	✘	✘	✘
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 55 cm) in recent 3 years.	**Some**	✘	**Some**
Rating	**Good**	**Good**	**Good**

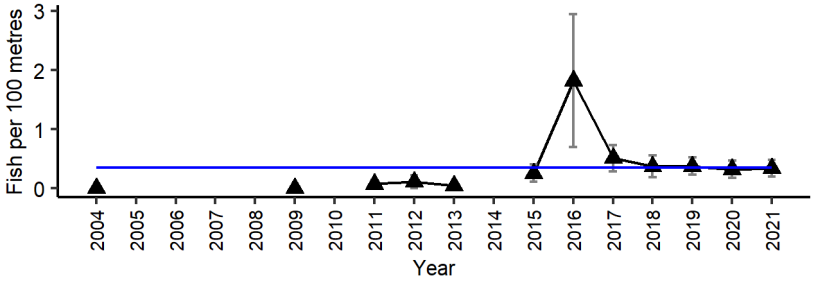
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present.

Assessment statement

Estuary perch represented 9% of large-bodied fish caught of fish in electrofishing surveys in 2021 and 67% of angling species in 2020. Electrofishing and angling catch rates have been mostly stable over the last 5 and 10 years. Angler catch rates have increased steadily since the early 2010s, which may be due to better targeting by anglers. 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 2021 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, and some fish approaching maximum size were present. On this basis the overall rating for estuary perch in the Glenelg River in 2021 was good.

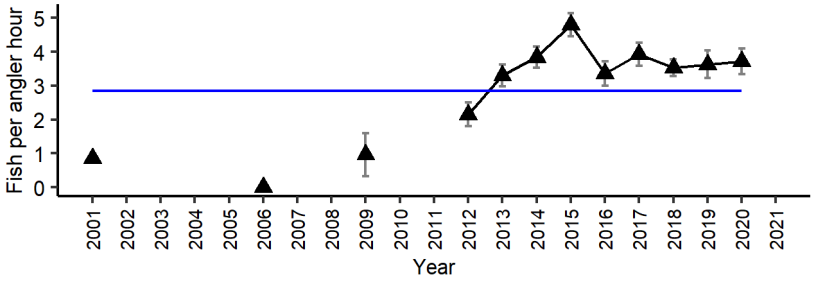


Estuary perch captured and measured during an electro-fishing survey of the Glenelg River in 2021 and by angler diarists in 2020	Angler Diary	Electro-fishing
Size range (cm)	14-58	15-42
Percent (%) that are legal size (≥ 27 cm)	94	55
Percent (%) that are mature (≥ 27 cm)	94	55
Percent (%) that are recent recruits (< 10 cm)	0	0
Number of fish measured	608	38
Stockings of river in recent seasons (1,000s stocked):	**NIL**	



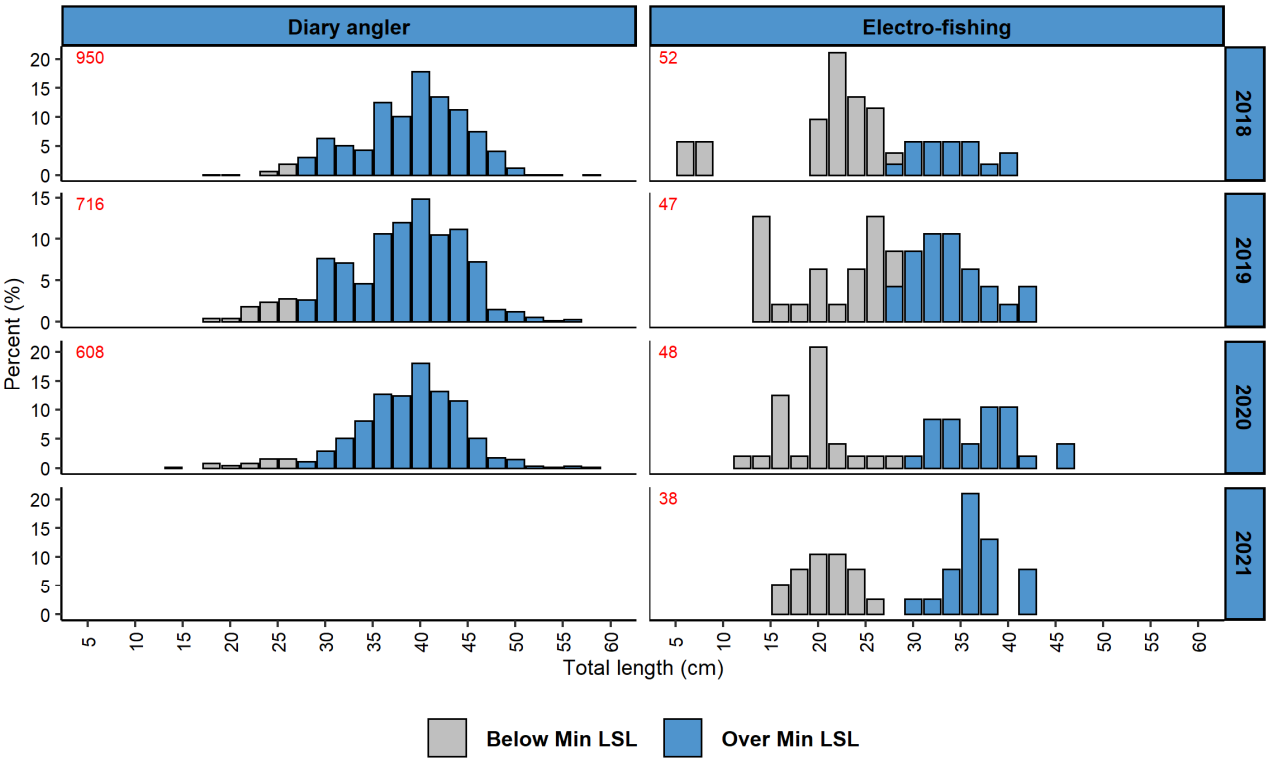
Catch rate

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.



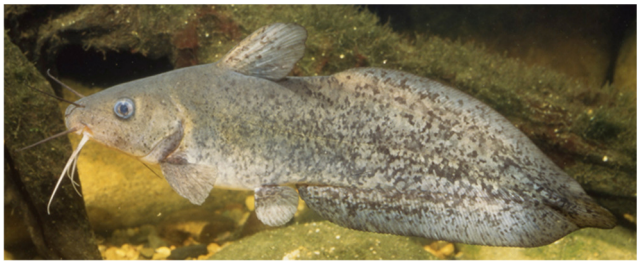
Angler catch rate

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 – 2021: 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 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2021:	**Low**

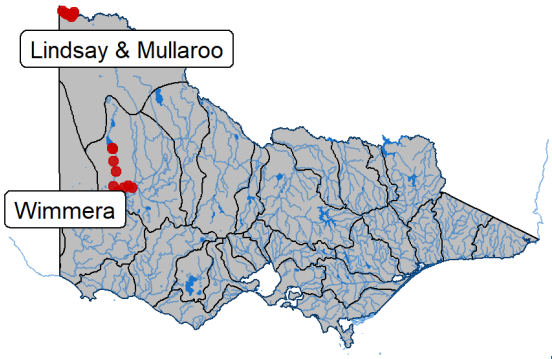
Performance measures (health indictors)	Stream		Status
	L&M	Wim	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	⇔
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing 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.	?	?	?
Rating	**Low**	**Low**	**Low**

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

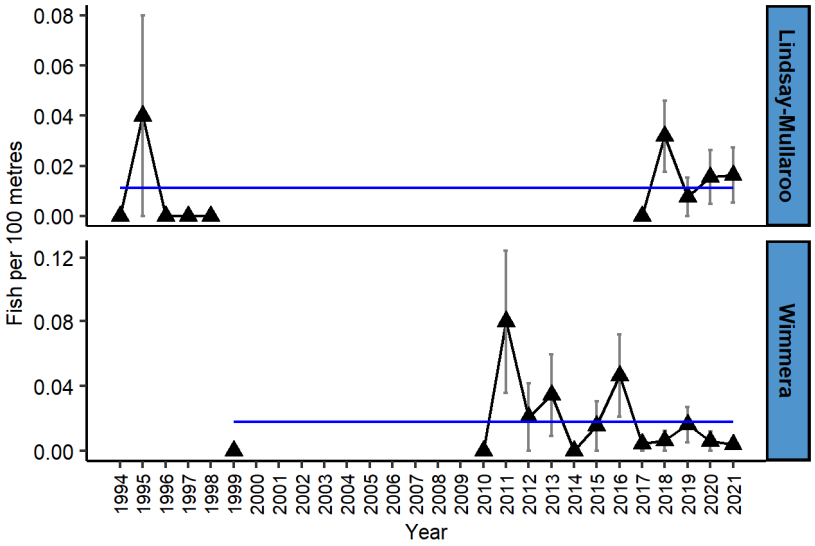
Assessment statement

Freshwater catfish represented <1% of large-bodied fish caught during electrofishing surveys in both the Lindsay-Mullaroo (L&M) and Wimmera River (Wim) in 2021. Only 10 fish were caught in 2021 surveys, five from the Lindsay-Mullaroo and five 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 2021 was low due to the very low abundance of fish in the two streams surveyed.

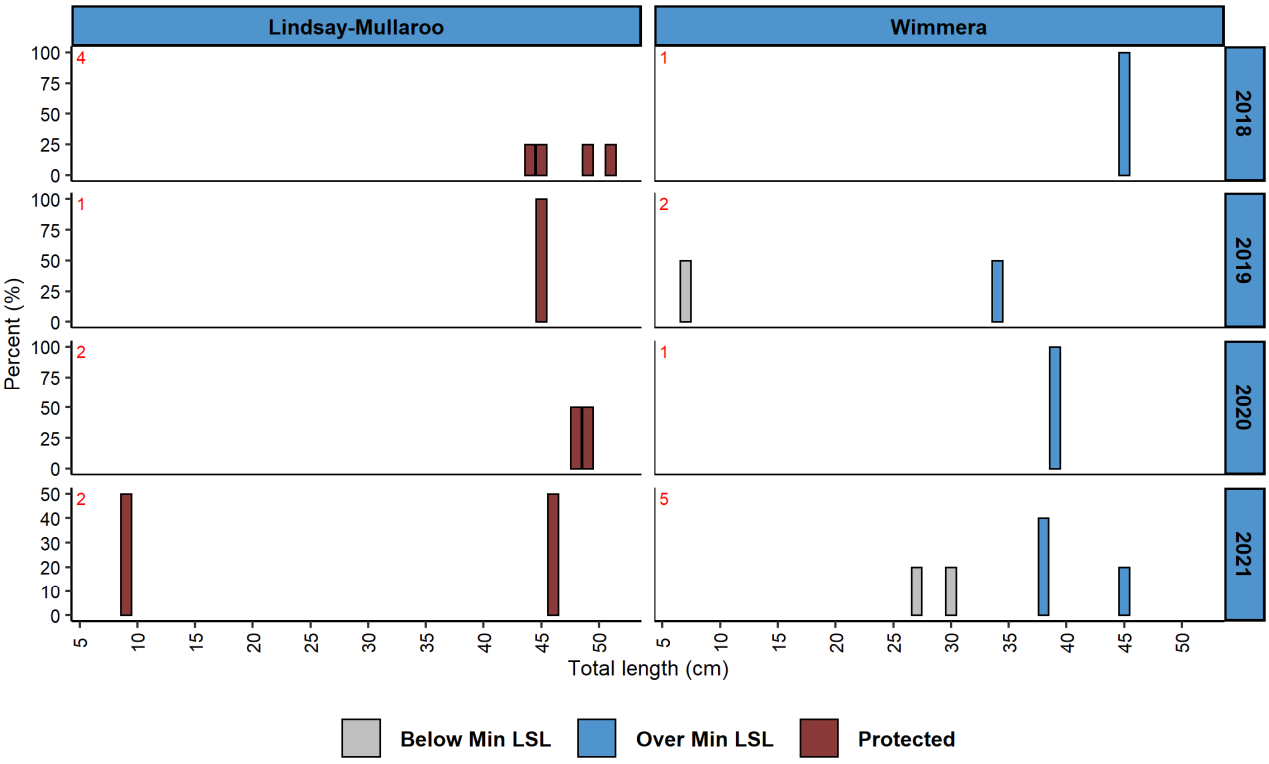
Freshwater catfish can be taken only from waters within the Wimmera Basin. Taking of freshwater catfish is prohibited in all other Victorian waters.



Freshwater catfish captured and measured during electro-fishing surveys of the Wimmera River in 2021	Lindsay & Mullaroo	Wimmera
Size range (cm)	8-45	27-45
Percent (%) that are legal size (≥ 30 cm)	Protected	60
Percent (%) that are mature (≥ 30 cm)	50	60
Percent (%) that are recent recruits (< 10 cm)	50	0
Number of fish measured	2	5
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 – 2021: 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 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

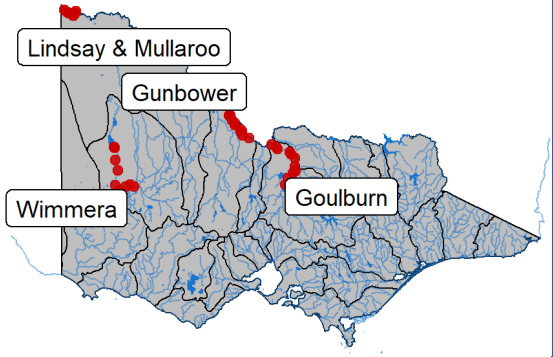
OVERALL RATING - 2021:	Good

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.	✘	Some*	✘	✘	✘
Signs of sustainable fishing pressure as indicated by the presence of fish approaching maximum size (≥ 50 cm) in recent 3 years.	Some	✓	✘	✓	✓
Rating	Good	Very Good	Moderate	Good	Good

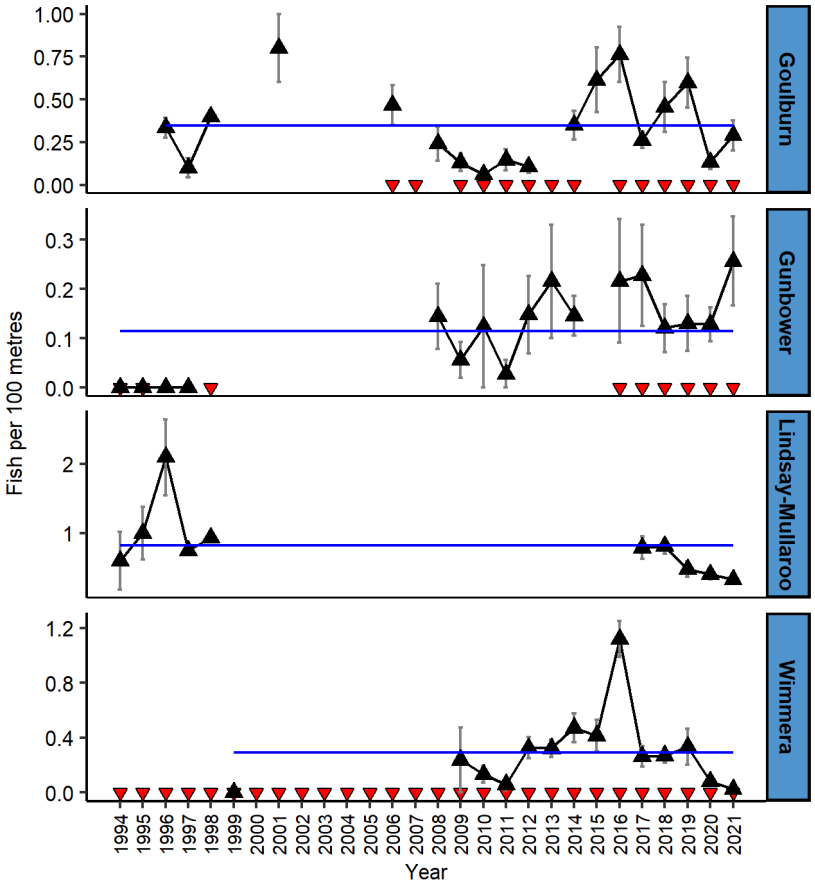
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * May include stocked fish.

Assessment statement

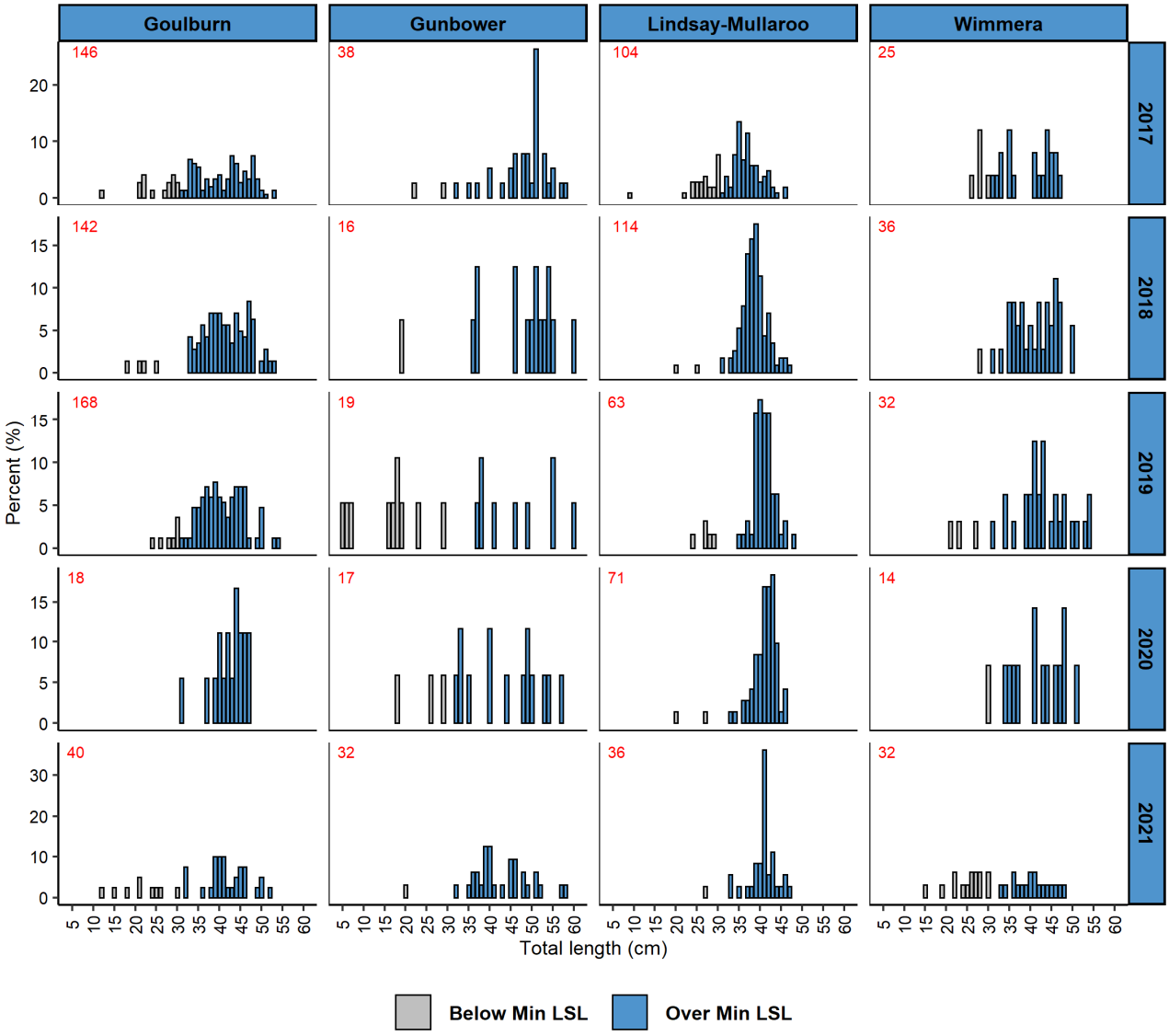
Golden perch represented 8-23% of large-bodied fish caught in the four streams surveyed, the Goulburn (Gou), Gunbower (Gun), Lindsay-Mullaroo (L&M) and Wimmera (Wim), in 2021. Electrofishing catch rate over the last 10 years has been stable in three steams (Gou, Gun and Wim) whereas catch rate over the last 5 years has been stable in two streams (Gou and Gun) but declined in two streams (L&M and Wim). Catch rates in recent years are above the long-term average in only one stream (Gun). A wide range of fish sizes, including mature fish, are present in most streams. A high percentage (56-97% of fish caught were legal size. Stocking of hatchery-reared juveniles has occurred in three streams (Gou, Gun and Wim). The absence of small fish in most streams surveyed suggests either limited recruitment has occurred, or few stocked fish are present. On this basis the overall rating for golden perch in 2021 was good.



Golden perch captured and measured during electro-fishing surveys in 2021	Goulburn	Gunbower	Lindsay & Mullaroo	Wimmera
Size range (cm)	12-52	20-57	27-47	15-48
Percent (%) that are legal size (≥ 30 cm)	77	97	97	56
Percent (%) that are mature (≥ 30 cm)	77	97	97	56
Percent (%) that are recent recruits (< 10 cm)	0	0	0	0
Number of fish measured	40	32	36	32
Stockings of rivers in recent seasons (1,000s stocked)				
2017/18	59	200	-	110
2018/19	88.15	70	-	150
2019/20	61	70	-	80
2020/21	60	70	-	100



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 – 2021: Macquarie perch

This report card describes the status of Macquarie perch in two streams, the Ovens River (Ove) and Yarra River (Yar), in 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2021:	Moderate

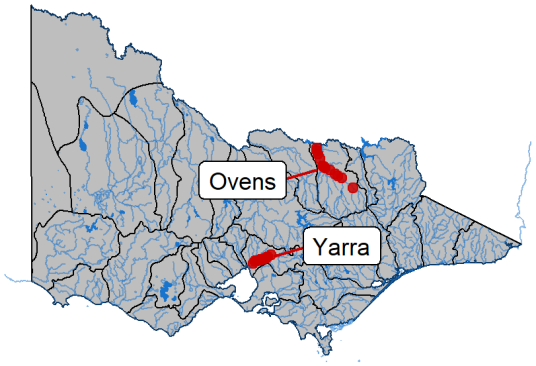
Performance measures (health indictors)	Stream		Status
	Ove	Yar	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing 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
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 (≥ 36 cm) in recent 3 years.	✘	Some	Some
Rating	Moderate	Moderate	Moderate

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

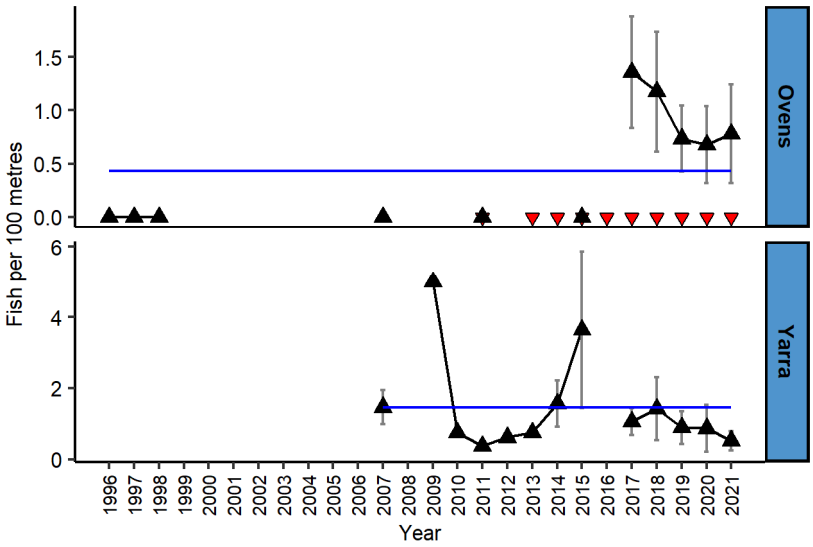
Assessment statement

Macquarie perch represented 6-9% of large-bodied fish caught in the two streams surveyed, the Ovens (Ove) and Yarra (Yar) in 2021. Electrofishing catch rates over the last 5 and 10 years have generally declined in both streams. Catch rate in the Yarra remains below the long-term average. Catch rate in the Ovens is above the long-term average, which may be the results of stocking of hatchery-bred fish and translocation of fish from Lake Dartmouth in recent years. A wide range of fish sizes were observed in both streams and some mature fish were present in both streams over the last 3 years. Some fish approaching maximum size were caught in the Yarra. 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 3 years. On this basis the overall rating for Macquarie perch in 2021 was moderate.

Macquarie perch can only be taken from Lake Dartmouth 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.

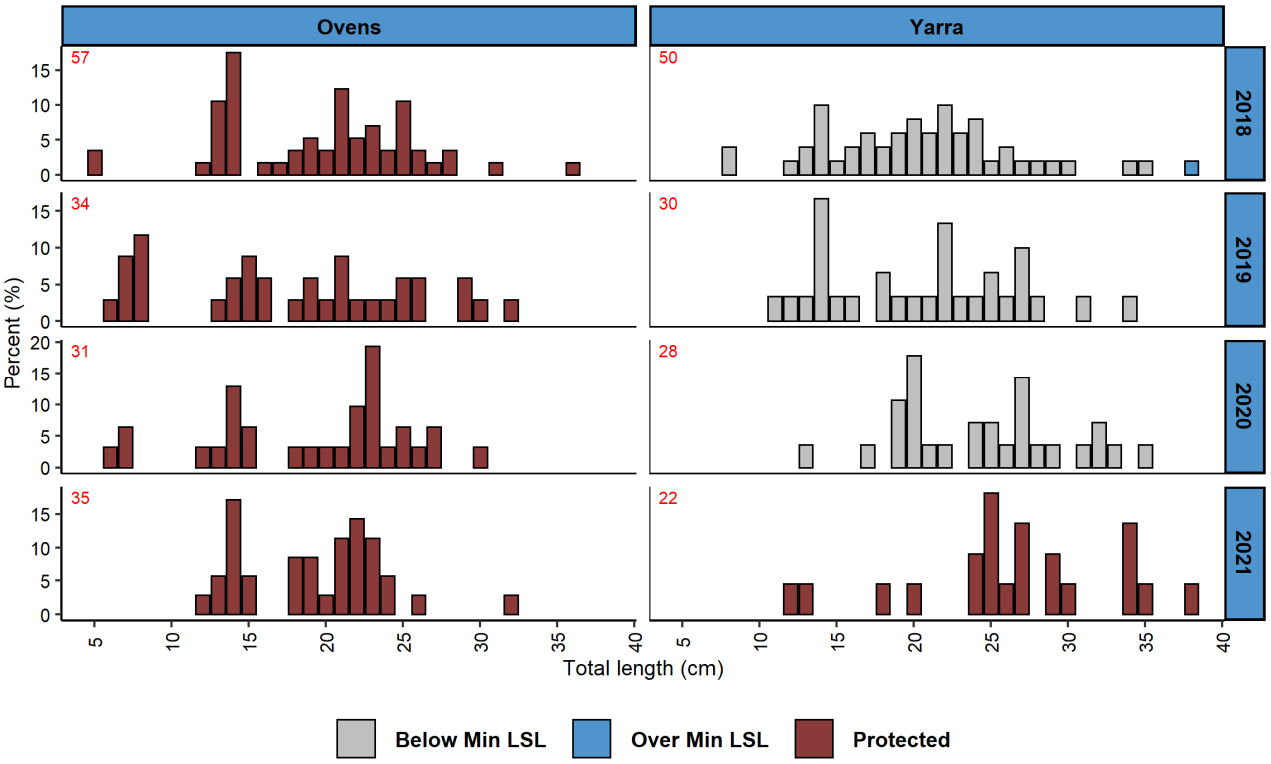


Macquarie perch captured and measured during electro-fishing surveys in 2021	Ovens	Yarra
Size range (cm)	12-32	11-38
Percent (%) that are legal size (≥ 35 cm)	Protected	Protected
Percent (%) that are mature (≥ 30 cm)	3	23
Percent (%) that are recent recruits (< 10 cm)	0	0
Number of fish measured	35	22
Stockings of rivers in recent seasons (1,000s stocked)		
2017/18	15	
2018/19	7.51	
2019/20	0.7	
2020/21	32	



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.

Native Fishery Report Card – 2021: 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 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

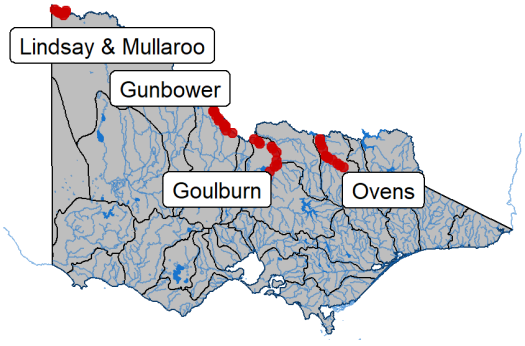
OVERALL RATING - 2021:	Good

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	✓	✓
Signs of recent recruitment, as indicated by the presence of fish under 10 cm in recent 3 years.	Some*	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	Some
Rating	Moderate	Very Good	Good	Good	Good

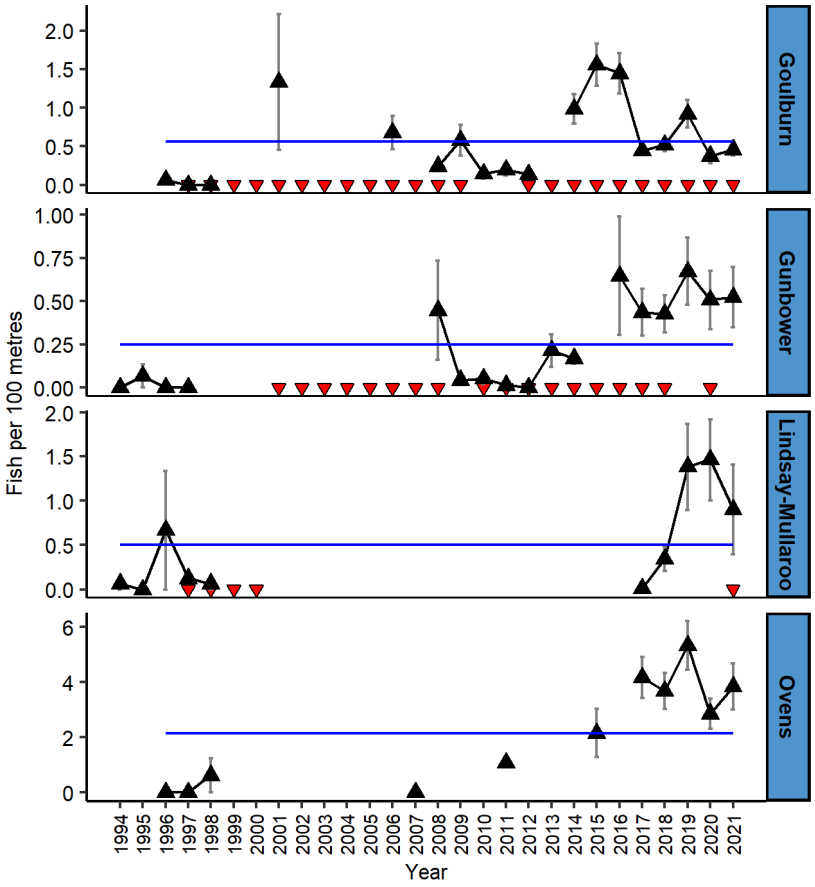
⇧ = Increasing, yes and positive. ⇩ = Decreasing, no and negative. ⇔ = Stable. **?** = Insufficient information.
✓ = Good numbers present. **Some** = Some present. ✘ = Nil present. * = May include stocked fish.

Assessment statement

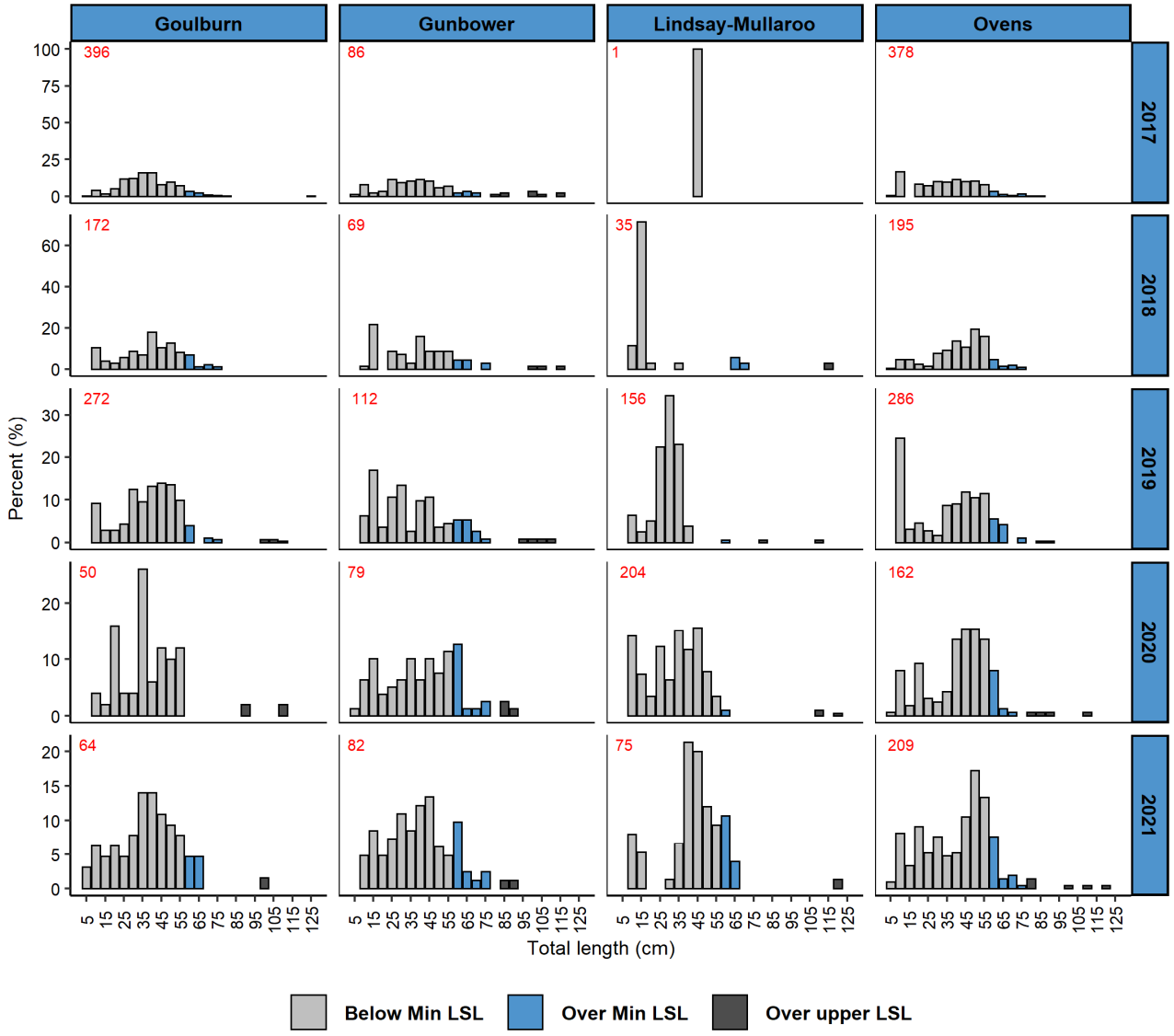
Murray cod represented 22% to 39% of large-bodied fish caught in the four streams surveyed in 2021. Since 2017 Murray cod abundance ranged from moderate (Gou and Gun) to very high (Ove). Over the last 5 years electrofishing catch rates have increased in one stream (L&M), been stable in two streams (Gou and Gun) and declined in one stream (Ove). Over the last 10 years, catch was stable in Gou, but increased in Gun. There were insufficient data to assess 10-year catch trends in other rivers. 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 2021. 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 and Ove over the last 3 years. On this basis the overall rating for Murray cod in 2021 was good.



Murray cod captured and measured during electro-fishing surveys in 2021	Goulburn	Gunbower	Lindsay & Mullaroo	Ovens
Size range (cm)	4-99	7-88	7-118	4-120
Percent (%) that are legal size (between 55 & 75 cm)	9	16	15	11
Percent (%) that are mature (≥ 55 cm)	11	18	16	14
Percent (%) that are recent recruits (< 10 cm)	9	5	8	9
Number of fish measured	64	82	75	209
Stockings of rivers in recent seasons (1,000s stocked)				
2017/18	50	100		
2018/19	61	50		
2019/20	40	50.7		
2020/21	128	65	27	

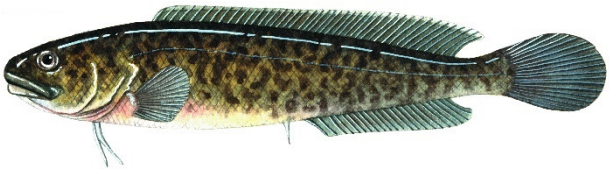


Catch rate
Average catch rate (± s.e.) (black line) and long-term average catch rate (blue line) of Murray cod caught during electro-fishing surveys of four streams. Red triangles = stocking years.



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.

Native Fishery Report Card – 2021: River blackfish

This report card describes the status of the river blackfish in the Gellibrand River system (Gel) in 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2021:	Good

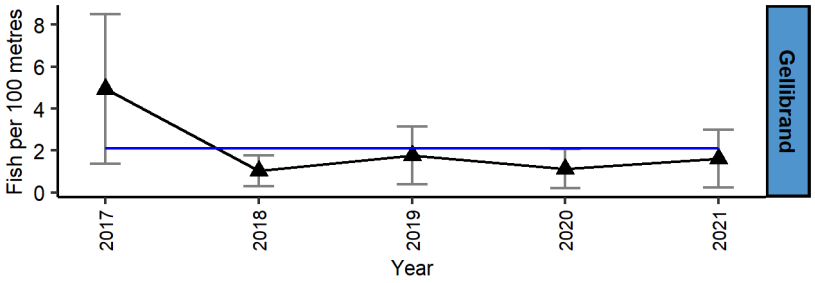
Performance measures (health indictors)	Gellibrand
Stock abundance	
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing surveys	?
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 12 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 (≥ 45 cm) in recent three years.	**Some**
Rating	**Good**

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

Assessment statement

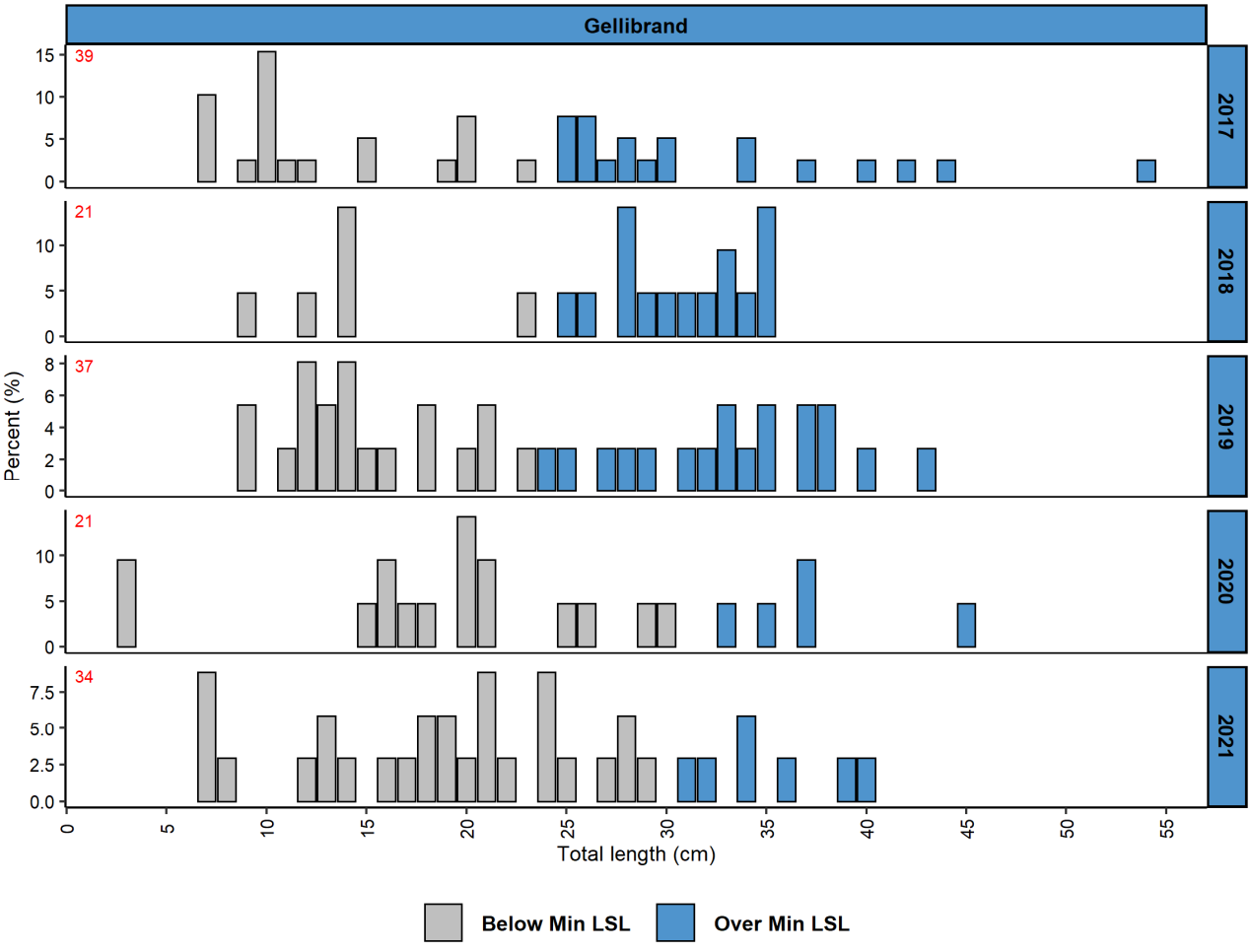
River blackfish represented 39% of large-bodied fish caught in the Gellibrand River system in 2021. River blackfish were more abundant in upstream sites and tributaries, such as Boggy Creek and Love Creek, than sites downstream in Gellibrand River. Electrofishing catch rate over the last 5 years has declined while there is insufficient information to assess trend in catch rate over the last 10 years. A wide range of fish size, including fish that are mature, were present over the last three years. Twenty-one percent of fish caught were of legal size (≥ 30 cm). Some small fish were present indicating recent natural recruitment. Some fish approaching the maximum size (>45 cm) were also present. On this basis the overall rating for river blackfish in the Gellibrand River system in 2021 was good.

River blackfish captured and measured during electro-fishing surveys in 2021	Gellibrand
Size range (cm)	6-40
Percent (%) that are legal size (≥ 30 cm)	21
Percent (%) that are mature (≥ 23 cm)	44
Percent (%) that are recent recruits (< 10 cm)	12
Number of fish measured	34
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 river blackfish caught during electro-fishing surveys of the Gellibrand River system.



Size distribution

Length frequency distribution of river blackfish caught during electro-fishing surveys of the Gellibrand River system (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 – 2021: Silver perch

This report card describes the status of the silver perch in two streams, the Gunbower Creek (Gun) and Wimmera River (Wim) in 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2021:	**Low**

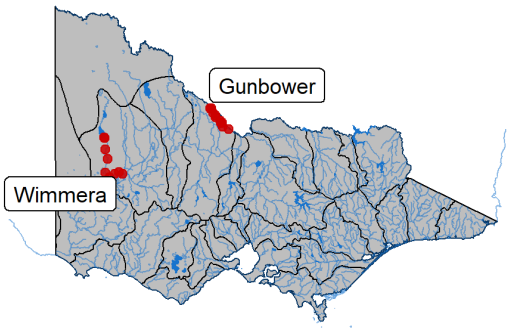
Performance measures (health indictors)	Stream		Status
	Gun	Wim	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇔	⇔	⇔
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing 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.	?	?	?
Rating	Low	Low	Low

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

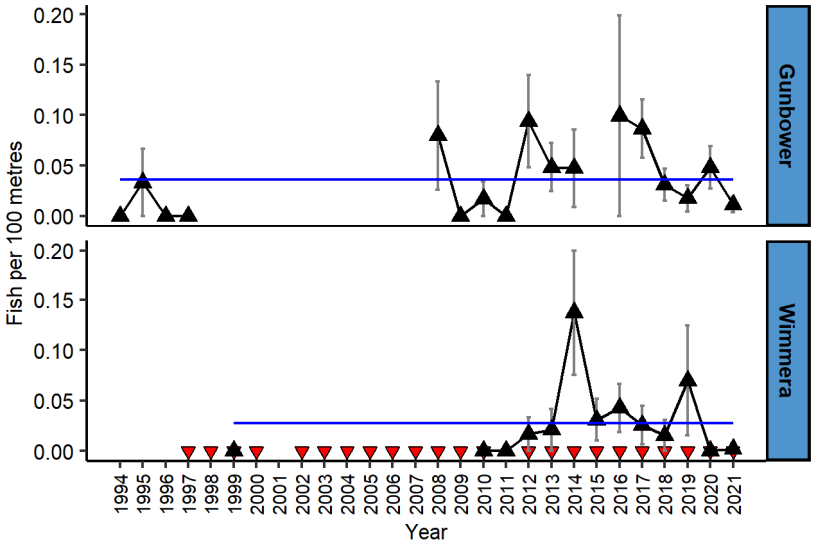
Assessment statement

During 2021 electrofishing surveys two silver perch were caught in Gunbower Creek and three in the Wimmera River. Electrofishing catch rates has been stable over the last 5 years and 10 years for both streams surveyed. Silver perch abundance in the Wimmera River is low despite regular (annual) stockings of fingerlings. 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 2021 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.

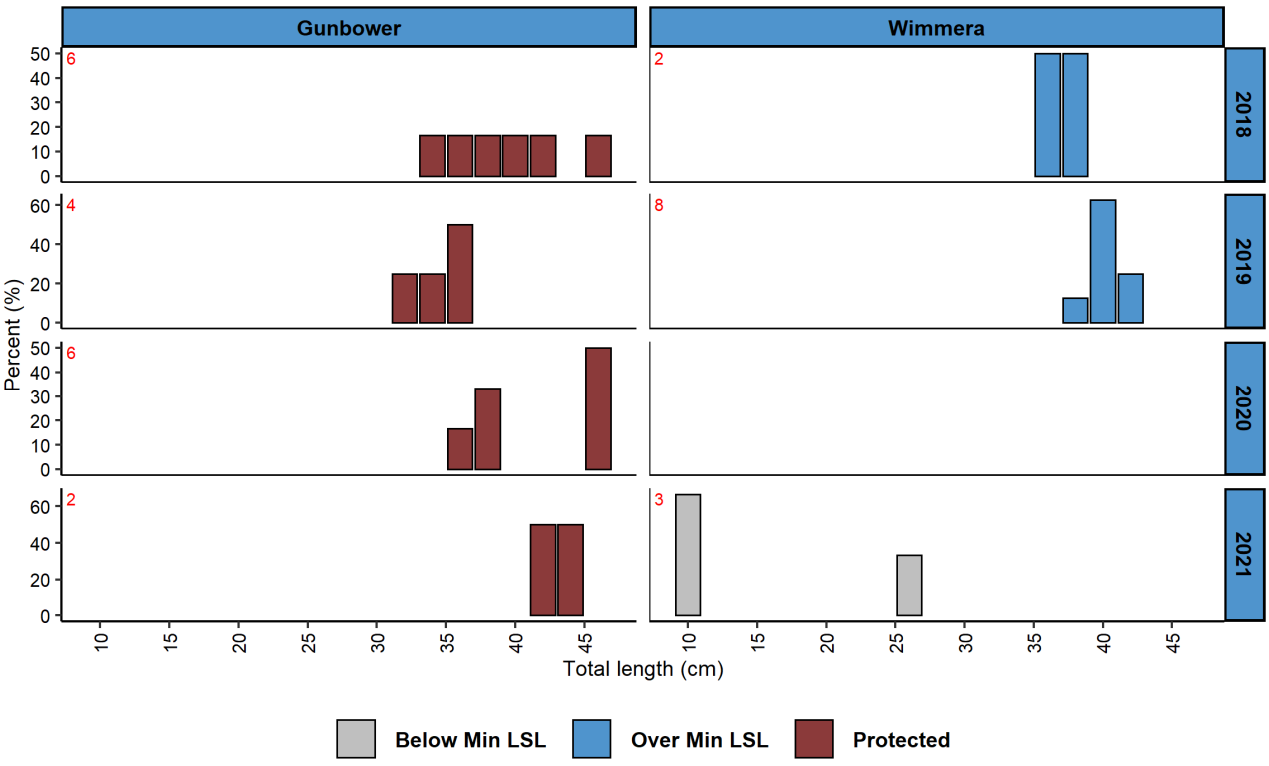


Silver perch captured and measured during electro-fishing surveys in 2021	Gunbower	Wimmera
Size range (cm)	41-43	9-26
Percent (%) that are legal size (≥ 30 cm)	Protected	
Percent (%) that are mature (≥ 30 cm)	100	0
Percent (%) that are recent recruits (< 10 cm)	0	67
Number of fish measured	2	3
Stockings of rivers in recent seasons (1,000s stocked)		
2017/18		20
2018/19		20
2019/20		50
2020/21		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.

Native Fishery Report Card – 2021: Trout cod

This report card describes the status of trout cod in two streams, the Goulburn River (Gou) and Ovens River (Ove) in 2021 and trends in key population performance measures that are based on scientific data provided by scientific fishery surveys.

OVERALL RATING - 2021:	Good

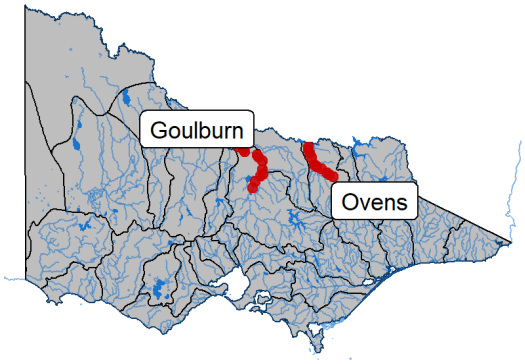
Performance measures (health indictors)	Stream		Status
	Gou	Ove	
Stock abundance			
Trend in abundance the last 5 years as indicated by trend in average annual catch rate from electro-fishing surveys	⇩	⇩	⇩
Trend in abundance the last 10 years as indicated by trend in average annual catch rate from electro-fishing 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**
Rating	**Good**	**Good**	**Good**

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

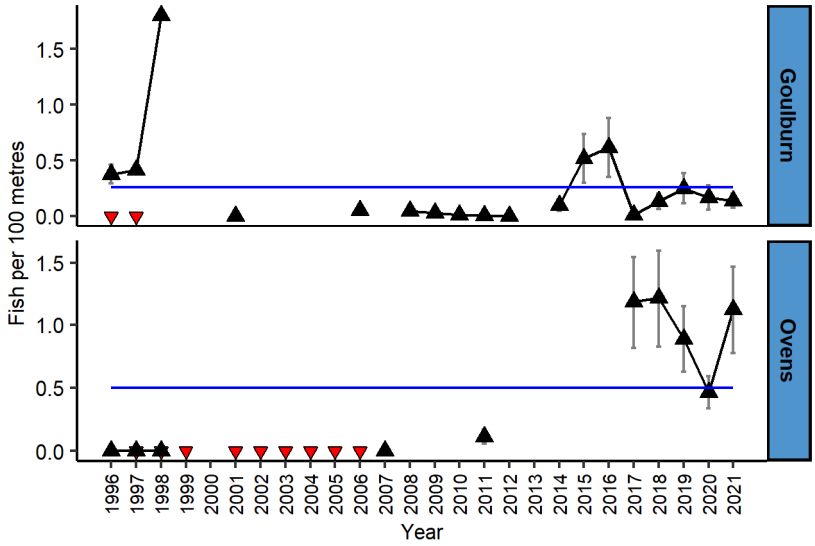
Assessment statement

In 2021 surveys trout cod represented 9% and 11% of the large-bodied fish caught in the Goulburn River and Ovens River, respectively. Electrofishing catch rates over the last 5 years has declined in both streams. Catch rate in the Goulburn River over the last 10 years has been stable whereas insufficient information is available for the Ovens River. A wide range of fish sizes were observed in both streams. Mature fish and fish approaching the maximum size (>60 cm) were present 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. On this basis the overall rating for trout cod in 2021 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.

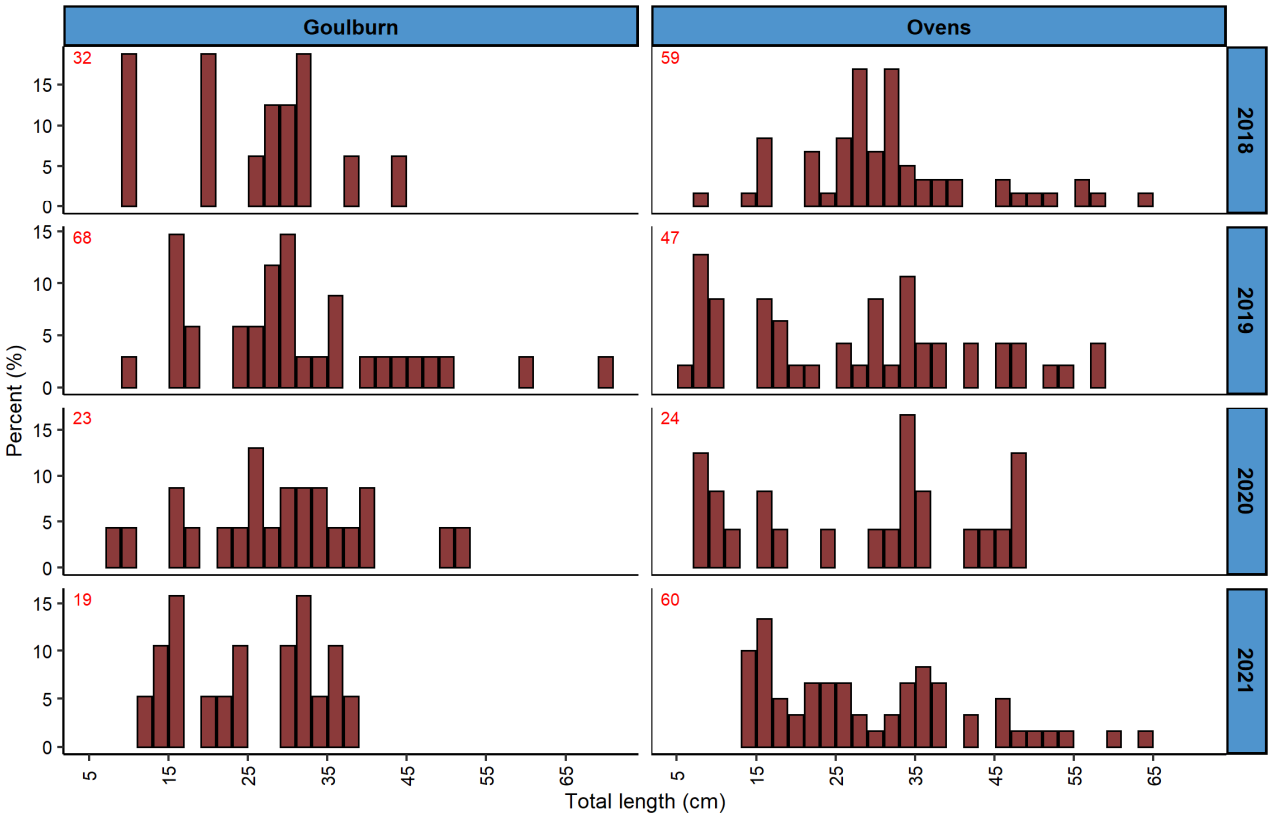


Trout cod captured and measured during electro-fishing surveys in 2021	Goulburn	Ovens
Size range (cm)	9 - 70	6 - 58
Percent (%) that are legal size	Protected species	
Percent (%) that are mature (≥ 35 cm)	38	43
Percent (%) that are recent recruits (< 10 cm)	12	28
Number of fish measured	34	47
Stockings 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: Common and scientific names of fish

Family	Common name	Scientific name	Comments	FFG status*
Mordaciidae	Shortheaded lamprey	*Mordacia mordax*		
Geotriidae	Pouched lamprey	*Geotria australis*		
Anguillidae	Longfin eel	*Anguilla reinhardtii*		
	Shortfin eel	*Anguilla australis australis*		
Clupeidae	Bony bream	*Nematalosa erebi*		
Plotosidae	Freshwater catfish	*Tandanus tandanus*		Endangered
Prototroctidae	Australian grayling	*Prototroctes maraena*		Endangered
Retropinnidae	Australian smelt	*Retropinna semoni*		
Galaxiidae	Climbing galaxias	*Galaxias brevipinnis*	Broad-finned galaxias	
	Common galaxias	*Galaxias maculatus*		
	Flathead galaxias	*Galaxias rostratus*		Vulnerable
	Mountain galaxias	*Galaxias olidus*	Part of *olidus* species complex	
	Obscure galaxias	*Galaxias oliros*		
	Ornate galaxias	*Galaxias ornatus*		
	Spotted galaxias	*Galaxias truttaceus*		
Artherinidae	Unspecked hardyhead	*Craterocephalus stercusmuscarum*		
Malanotaeniidae	Murray-Darling rainbowfish	*Melanotaenia fluviatilis*		Endangered
Percichthyidae	Australian bass	*Percalates novemaculeata*		
	Estuary perch	*Percalates colonorum*		
	Golden perch	*Macquaria ambigua*		
	Macquarie perch	*Macquaria australasica*		Endangered
	Murray cod	*Maccullochella peelii*		Endangered
	Trout cod	*Maccullochella macquariensis*		Endangered
Gadopsidae	River blackfish	*Gadopsis marmoratus*		Critically Endangered (upper Wannon River form)
	Two-spined blackfish	*Gadopsis binspinosus*		
Nannopercidae	Ewen pygmy perch	*Nannoperca variegata*	variegated pygmy perch	Endangered
	Southern pygmy perch	*Nannoperca australis*		Vulnerable (Murray-Darling lineage)
	Yarra pygmy perch	*Nannoperca obscura*		Vulnerable
Terapontidae	Silver perch	*Bidyanus bidyanus*		Endangered
Bovichtidae	Tupong (Congolli)	*Pseudaphritis urvillii*		
Eleotridae	Carp gudgeon	*Hypseleotris* Spp	Including western carp gudgeon (*H. klunzingeri*), Midgley's carp gudgeon (*H. sp1*) and Lake's carp gudgeon (*H. sp2*)	

Family	Common name	Scientific name	Comments	FFG status*
	Cox's gudgeon	*Gobiomorphus coxii*		Endangered
	Dwarf flathead gudgeon	*Philypnodon macrostomus*		
	Flathead gudgeon	*Philypnodon grandiceps*		
	Striped gudgeon	*Gobiomorphus australis*		
Cyprinidae	Common carp	*Cyprinus carpio*		
Paeciliidae	Gambusia (mosquitofish)	*Gambusia holbrooki*		

* Species listed as threatened under the the *Flora and Fauna Guarantee Act (1988)* (https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list)

Appendix II: Effects of the fishery slot limit regulation on length of Murray cod

Background

Legal size limits are commonly used to manage the harvest of fish stocks (Noble and Jones 1999, Allen *et al.* 2008), and since the early 1900s a minimum legal length limit (MLL) regulation has been in place for Murray cod. During the early 2000s MLL was 50 cm with a bag limit of two fish per person per day and only one of the two fish being equal to or greater than 75 cm. In the late 2000s a 60-100 cm slot limit was introduced to protect larger fish and then in December 2014, this was changed to a 55-75 cm slot limit, which aimed to improve recreational fishing outcomes by increasing the long-term sustainably of the fishery, the abundance of large fish (>1m) in the population and the number of mid-size fish available for harvest (Department of Environment and Primary Industries 2014, Gwinn *et al.* 2015a). Monitoring changes to Murray cod populations associated with regulation change is important to ensure the fishery is sustainably managed. Modelling has suggested that noticeable increases in the abundance of large (1 m+) fish should occur between 5 and 10 years and will continue to increase over at least a 15-year period (Department of Environment and Primary Industries 2014, Gwinn *et al.* 2015a). In 2018 a brief review of the slot regulation on Murray cod populations suggested it was too soon to detect a meaningful change in size structure of Murray cod and abundance of larger fish and that further monitoring of the size structure of populations will be required within the next 5-10 years to detect a change (Ingram and Raymond 2018). Consequently, an evaluation in the change in of size structure of Murray cod populations following changes to slot regulations was also undertaken here.

Methods

Murray cod length records from electro-fishing surveys conducted in the Gunbower Creek, Lindsay River & Mullaroo Creek, Lower Goulburn River and Ovens River were split into four time-periods for assessment purposes. These were:

Pre-2009: Before introduction of a slot limit regulation

2009 to 2013: Period of slot limit regulation introduction (60-100 cm) and adjustment (55-75 cm)

2014 to 2018: First 5-year period after slot regulation introduced

2019-2021. Last (recent) three years of records.

The proportion of fish greater than the maximum legal length of 75 cm in each stream and time-period were compared. period.

Results and discussion

The proportion of Murray cod over 75 cm (the current maximum legal size length limit) in all streams and in all time-periods has on average remained low and less than 0.1 (Figure II.1). Results suggest that introduction of the slot limit regulation in the early 2010s may be having a positive effect on populations in the lower Goulburn River and Ovens River where the proportion of fish over 75 cm has increased slightly in recent years (Figure II.1). However, this cannot be said for Gunbower Creek, Lindsay River & Mullaroo Creek as the proportion of fish over 75cm either did not increase or declined (Figure II.1). Results in these streams may have been affected by there being fewer surveys conducted historically and catch rates being highly variable between years, as indicated by the large error bars.

Other factors that may have influenced these results may include

- Increasing tendency for anglers to practice catch and release of larger Murray cod. Surveys of anglers has shown that more Murray cod are being released in recent years. In the early 2000s a national survey showed that 77.6% of angled Murray cod were released (Henry and Lyle 2003). Anglers fishing the Murray River and several Victorian rivers between 2006 and 2008 released 63-100% of fish (Brown 2010) while anglers fishing in the Murrumbidgee River in 2012-2013 released 95% of fish (Forbes et al. 2015).
- Changes in length frequent distributions in some streams being masked by stocking large numbers of small fish. The lower Goulburn River and Gunbower creek are stocked annually, the Lindsay River is occasionally stocked whereas the Ovens River is not stocked (see *Native Fishery Report Card – 2021: Murray cod*, this report).

Monitoring changes to Murray cod populations associated with regulation change is important to ensure the fishery is sustainably managed. To achieve this will need further and more detailed analyses and modelling to elucidate trends in length distribution of Murray cod over time.

References

Allen, M.S., Brown, P., Douglas, J., Fulton, W. and Catalano, M. (2008). An Assessment of Recreational Fishery Harvest Policies for Murray Cod in Southeast Australia. Fisheries Research doi:10.1016/j.fishres.2008.09.028.

Brown, P. (2010). Sustainability of recreational fisheries for Murray cod: Creel Surveys on the Murray Goulburn, Ovens and Loddon rivers 2006–2008. Recreational Fishing Grant Program - Research report. Department of Primary Industries, Victoria.

Department of Environment and Primary Industries (2014). The use of slot limits to improve the Victorian Murray cod fishery. Consultation paper. Department of Environment and Primary Industries, Melbourne. 16 pp.

Forbes, J.P., Watts, R.J., Robinson, W.A., Baumgartner, L.J., Steffe, A.S. and Murphy, J.J. (2015). Recreational Fishing Effort, Catch, and Harvest for Murray Cod and Golden Perch in the Murrumbidgee River, Australia. North American Journal of Fisheries Management 35 (4): 649-658.

Gwinn, D.C., Allen, M.S., Johnston, F.D., Brown, P., Todd, C.R. and Arlinghaus, R. (2015). Rethinking length-based fisheries regulations: the value of protecting old and large fish with harvest slots. Fish and Fisheries 16 (2): 259-281.

Henry, G.W. and Lyle, J.M. eds. (2003). The National Recreational and Indigenous Fishing Survey. FRDC Project No. 99/158. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. 188 pp.

Ingram, B.A. and Raymond, S. (2018). Implementing better practice Murray cod fishery management. Recreational Fishing Grants Program Research Report. November 2018. Victorian Fisheries Authority, Melbourne. 50 pp.

Noble, R.L. and Jones, T.W. (1999). Managing fisheries with regulations. In: Inland Fisheries Management in North America, 2nd edn (Kohler, C.C. and Hubert, W.A. eds.), pp. 455-480. American Fisheries Society, Bethesda, MD.

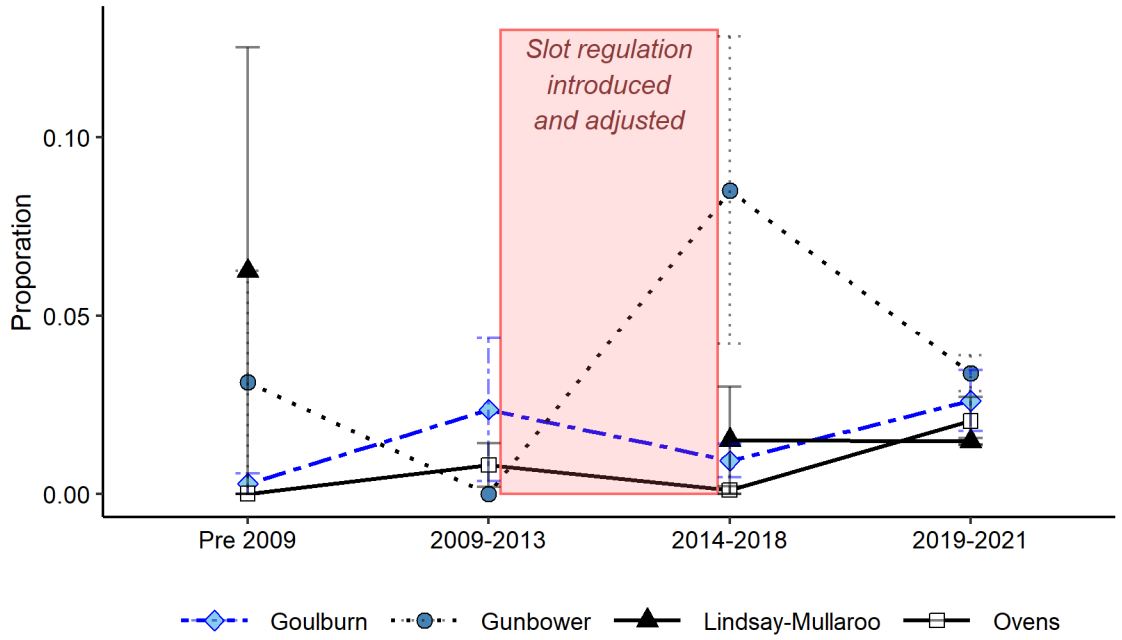


Figure II.1. Proportion of Murray cod from four streams that are over the current maximum legal length limit of 75 cm (values = mean and s.e. of annual measurements in each time period).

Appendix III: 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	

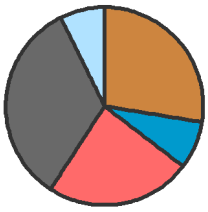
The following scale is then applied to assign an overall rating for the species (for either a river or summary of rivers):

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

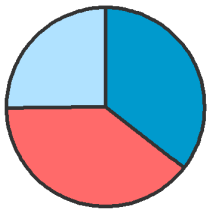
Appendix IV: Common species present in 2021 surveys

The most common species present in each river during 2021 electrofishing surveys, as a percentage of total number of all species present. The most common large-bodied fish species caught and observed in each river during 2021 electrofishing surveys, as a percentage of total number of large-bodied species present (excluding small-bodied species).

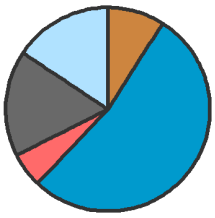
All Species	Large-bodied species



Gellibrand
- Australian smelt - 7 %
- Common galaxias - 33 %
- Other - 24 %
- River blackfish - 8 %
- Yarra spiny crayfish - 28 %

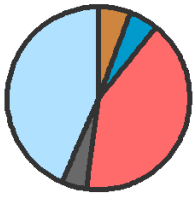


Gellibrand
- Brown trout - 25 %
- Other - 0 %
- River blackfish - 39 %
- Shortfin eel - 35 %

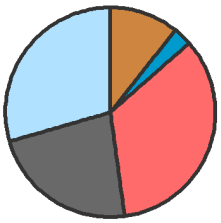


Glenelg
- Australian smelt - 16 %
- Common galaxias - 17 %
- Flathead gudgeon - 6 %
- Gambusia - 53 %
- Other - 9 %

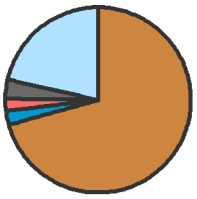
Glenelg
- Black bream - 8 %
- Common carp - 59 %
- Estuary perch - 9 %
- Other - 6 %
- River blackfish - 18 %



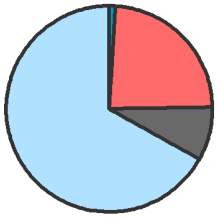
Goulburn
- Australian smelt - 43 %
- Common carp - 4 %
- Murray-darling rainbowfis
- Murray cod - 5 %
- Other - 6 %



Goulburn
- Common carp - 29 %
- Golden perch - 23 %
- Murray cod - 34 %
- Other - 3 %
- Trout cod - 11 %

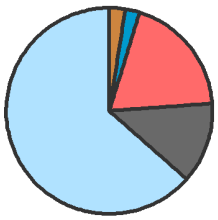


Gunbower
- Australian smelt - 21 %
- Common carp - 3 %
- Goldfish - 2 %
- Other - 2 %
- Unspecked hardyhead - 71



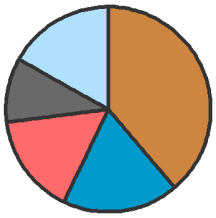
Gunbower
- Common carp - 67 %
- Golden perch - 8 %
- Murray cod - 24 %
- Other - 1 %

Lindsay-Mullaroo
- Australian smelt - 5 %
- Bony bream - 80 %
- Murray-darling rainbowfish
- Other - 7 %
- Unspecked hardyhead - 4



Lindsay-Mullaroo
- Common carp - 64 %
- Golden perch - 13 %
- Murray cod - 19 %
- Other - 2 %
- Redfin - 2 %

All Species	Large-bodied species



Mitchell

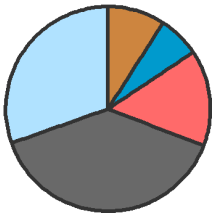
- Australian smelt - 17 %
- Common carp - 10 %
- Common galaxias - 16 %
- Longfin eel - 18 %
- Other - 39 %

Mitchell

- Black bream - 14 %
- Common carp - 17 %
- Longfin eel - 31 %
- Luderick - 16 %
- Other - 22 %

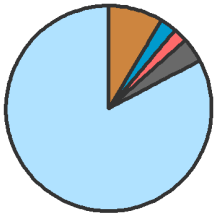
Ovens

- Australian smelt - 54 %
- Common carp - 12 %
- Murray cod - 15 %
- Other - 15 %
- Trout cod - 4 %



Ovens

- Common carp - 30 %
- Murray cod - 39 %
- Other - 15 %
- River blackfish - 7 %
- Trout cod - 9 %

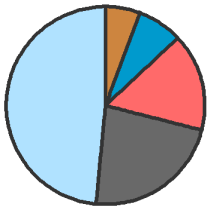


Thomson-Macalister

- Australian smelt - 83 %
- Common carp - 4 %
- Flathead gudgeon - 2 %
- Longfin eel - 3 %
- Other - 9 %

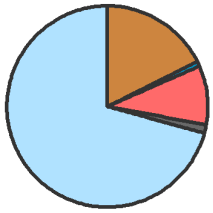
Thomson-Macalister

- Australian bass - 11 %
- Common carp - 35 %
- Longfin eel - 24 %
- Other - 11 %
- Unidentified eel - 18 %



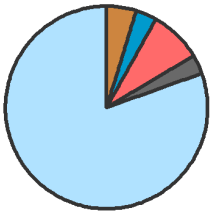
Wimmera

- Australian smelt - 48 %
- Common carp - 23 %
- Flathead gudgeon - 16 %
- Other - 7 %
- Redfin - 6 %



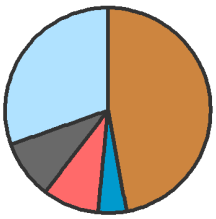
Wimmera

- Common carp - 71 %
- Freshwater catfish - 1 %
- Golden perch - 9 %
- Other - 1 %
- Redfin - 18 %



Yarra

- Australian smelt - 80 %
- Common carp - 3 %
- Common galaxias - 8 %
- Other - 3 %
- Shortfin eel - 5 %



Yarra

- Common carp - 30 %
- Macquarie perch - 9 %
- Other - 9 %
- Roach - 4 %
- Shortfin eel - 47 %

Appendix V: Abundance of native fish populations

Abundance records (as fish/100m) for nine native fish species recorded in electrofishing surveys conducted between 1982 and 2021 for 10 river systems is presented in Figure IV.1. Frequency distribution of these abundancies is provided in Figure IV.1. Abundance levels, quantile ranges and associated fish abundances are provided in Table IV.1.

Average abundance of native fish species recorded in selected rivers surveyed in 2021 is provided in Figure IV.3.

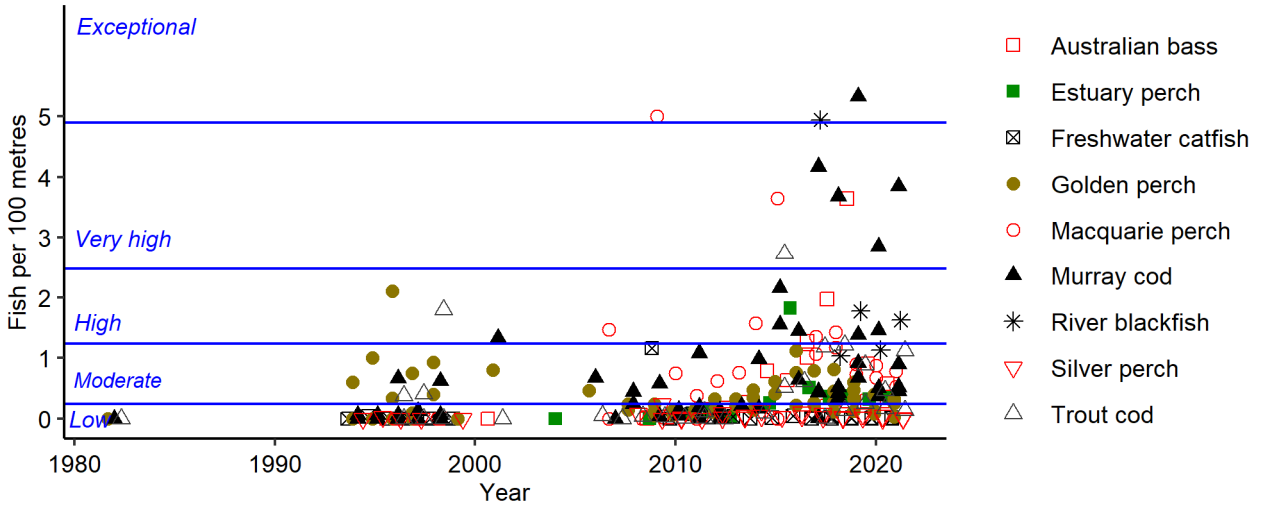


Figure IV.1. Average abundance records for nine native fish species estimated from historic and contemporary catch electrofishing catch records and associated abundance levels.

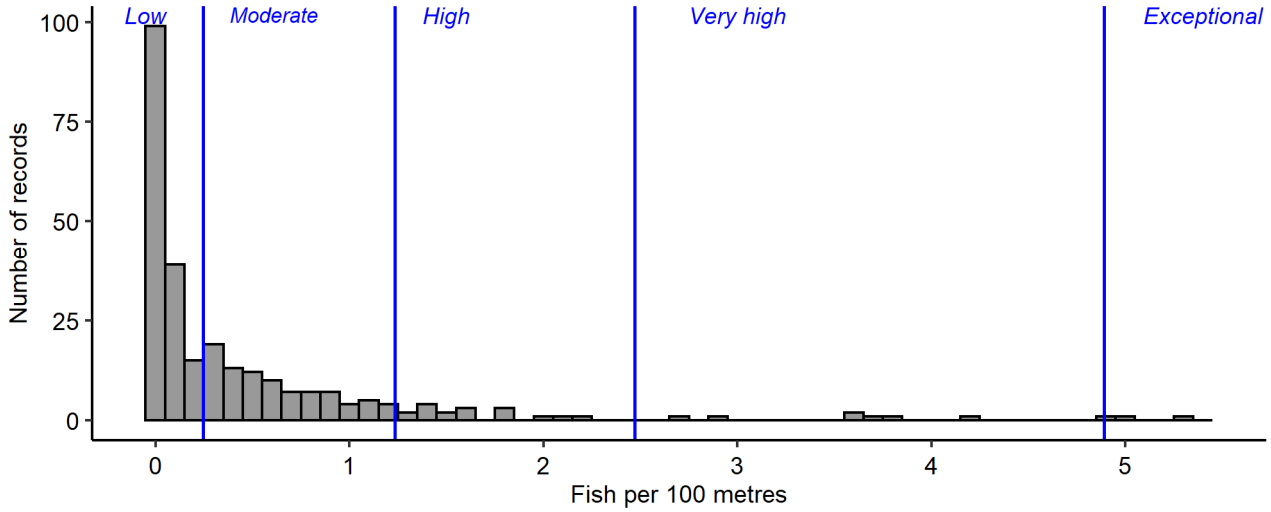


Figure IV.1. Frequency distribution native fish abundance (fish/100 m) for different abundance levels (Based on average of all sites within each river each year recorded for electrofishing surveys conducted between 1982 and 2021).

Table IV.1. 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 2021).

Abundance level	Quantile range	Average abundance range (fish/100 m)	Number of observations	Percent of observations (%)
Low	< 0.05	0 – 0.24	152	57
Moderate	0.05 to < 0.25	0.25 – 1.25	89	33
High	0.25 to < 0.5	1.28 – 2.15	17	6
Very high	0.5 to < 0.99	2.73 – 4.94	8	3
Exceptional	≥ 0.99	5.0 – 5.33	2	1

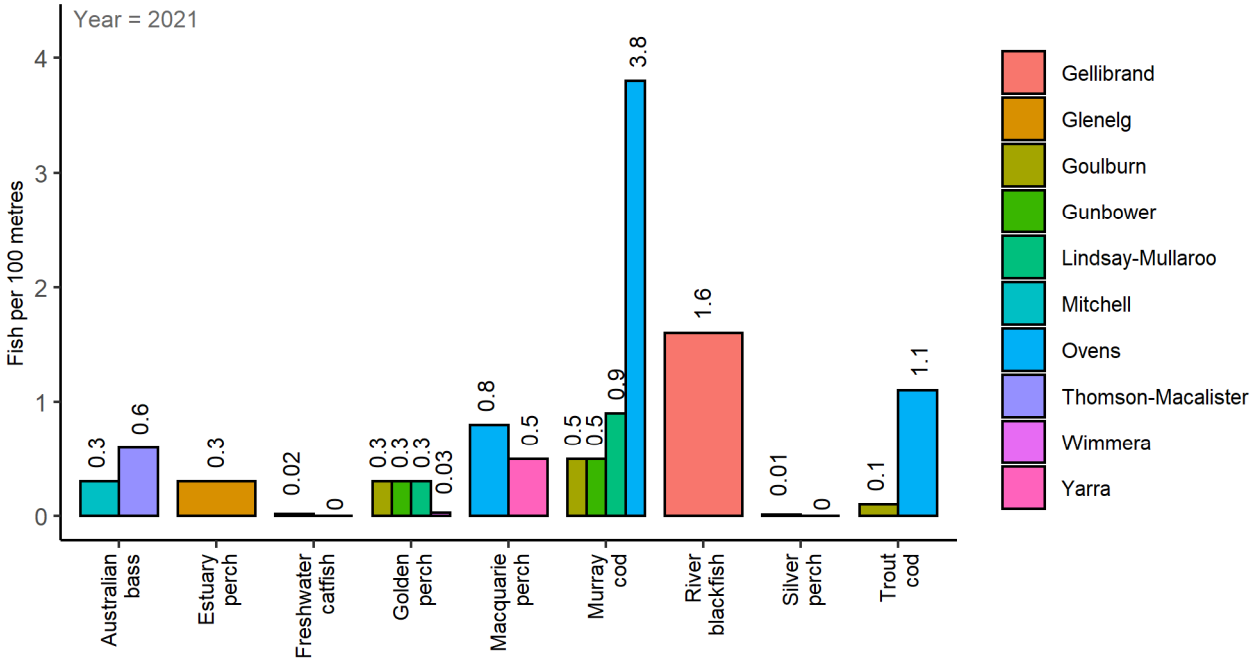
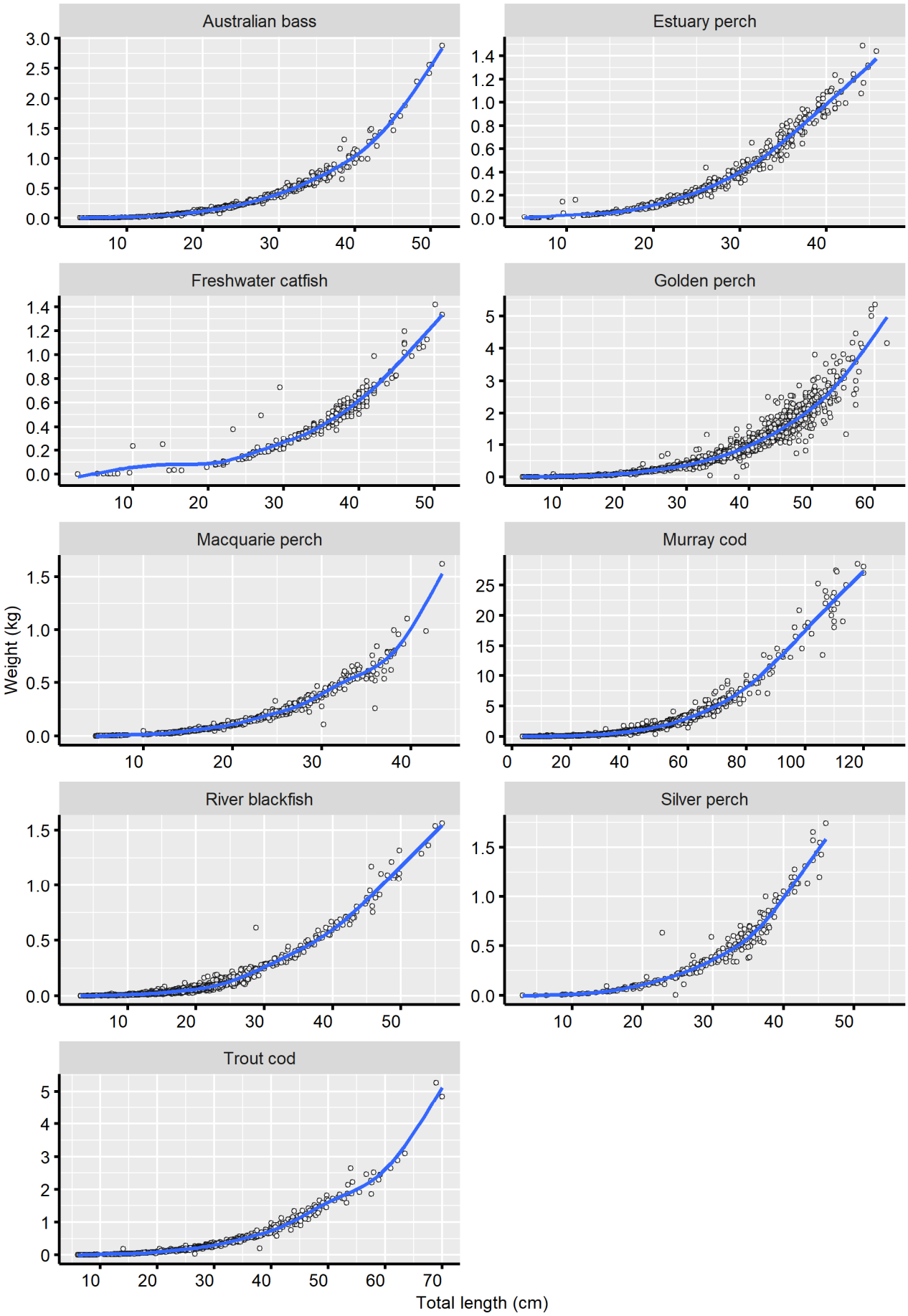
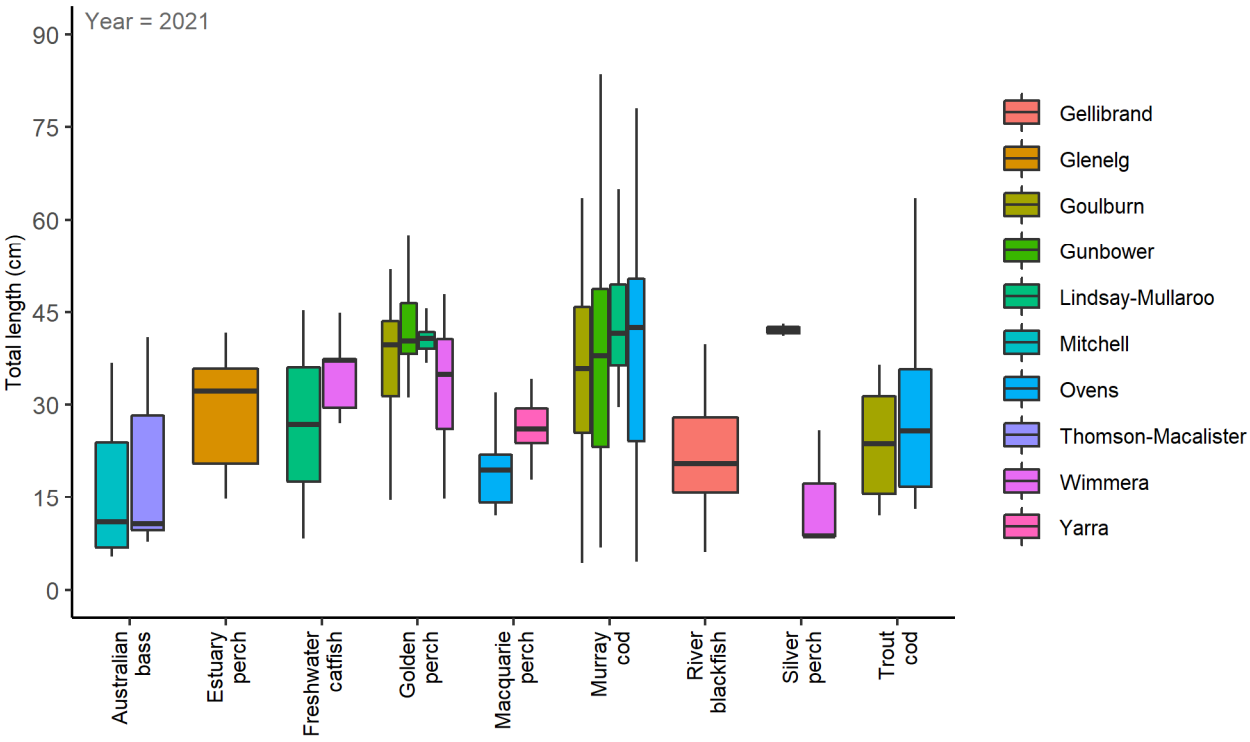


Figure IV.3. Average abundance of native fish species recorded in selected rivers surveyed in 2021.

Appendix VI: Native fish length – weight relationships





Size range (total length) of eight native fish species recorded in selected rivers surveyed in 2021 (Box = interquartile range with 25th, 50th (median) and 75th percentiles. Whisker = largest and smallest value within 1.5 times interquartile range)

Customer Service Centre **136 186**

vfa.vic.gov.au