

Chapter 10 Basin Plan Fish Monitoring Summary (2014/15 – 2023/24): NSW Lower Darling (Baaka) Water Resource Planning Area

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March 2025



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Citation Details

Please cite the overall report when referring to this chapter:

Schilling, H., Crook, D. 2025. Basin Plan Fish Monitoring Summary (2014/15 – 2023/24): Water Resource Planning Area Reports. NSW Department of Primary Industries and Regional Development. Port Stephens Fisheries Institute. 625pp. (PUB25/277)

Chapter cover image credit (Juvenile Murray cod): Jason Thiem (NSW DPIRD); Fish images credit: Gunther Schmida

Acknowledgements

This work is funded by the NSW Department of Primary Industries and Regional Development and the Commonwealth Government under the *Federation Funding Agreement – Environment on Implementing Water Reform in the Murray-Darling Basin*. The dataset used in the temporal analysis was generated by NSW DPIRD Fisheries from 1994–2024 and sourced from multiple internally and externally funded projects. The authors acknowledge past and present DPIRD Fisheries scientists, technicians and managers who contributed to its collection, as well as the ongoing support of external collaborators and funding agencies (in particular, the Murray–Darling Basin Authority, the Commonwealth Environmental Water Office, and the NSW Freshwater Recreational Fishing Trust). Thank you to Camila Leite Martins for assistance with formatting the reports. We continue to be thankful for the ongoing site access granted by private landholders across NSW and acknowledge that we work on Country which always was and always will be Aboriginal land. The fish surveys that generated the data used in our analyses were conducted under permits approved by the NSW Fisheries Animal Care and Ethics Committee.

Introduction

This report spans 2014/15 to 2023/24 and uses all suitable fish assemblage data collected by NSW DPIRD Fisheries using standardized electrofishing monitoring techniques. The format of the report follows and expands upon the previous reports (Schilling & Crook 2023, 2024). This report focusses on the New South Wales Lower Darling (Baaka) Water Resource Planning Area (WRPA) shown in Figure 10.1.

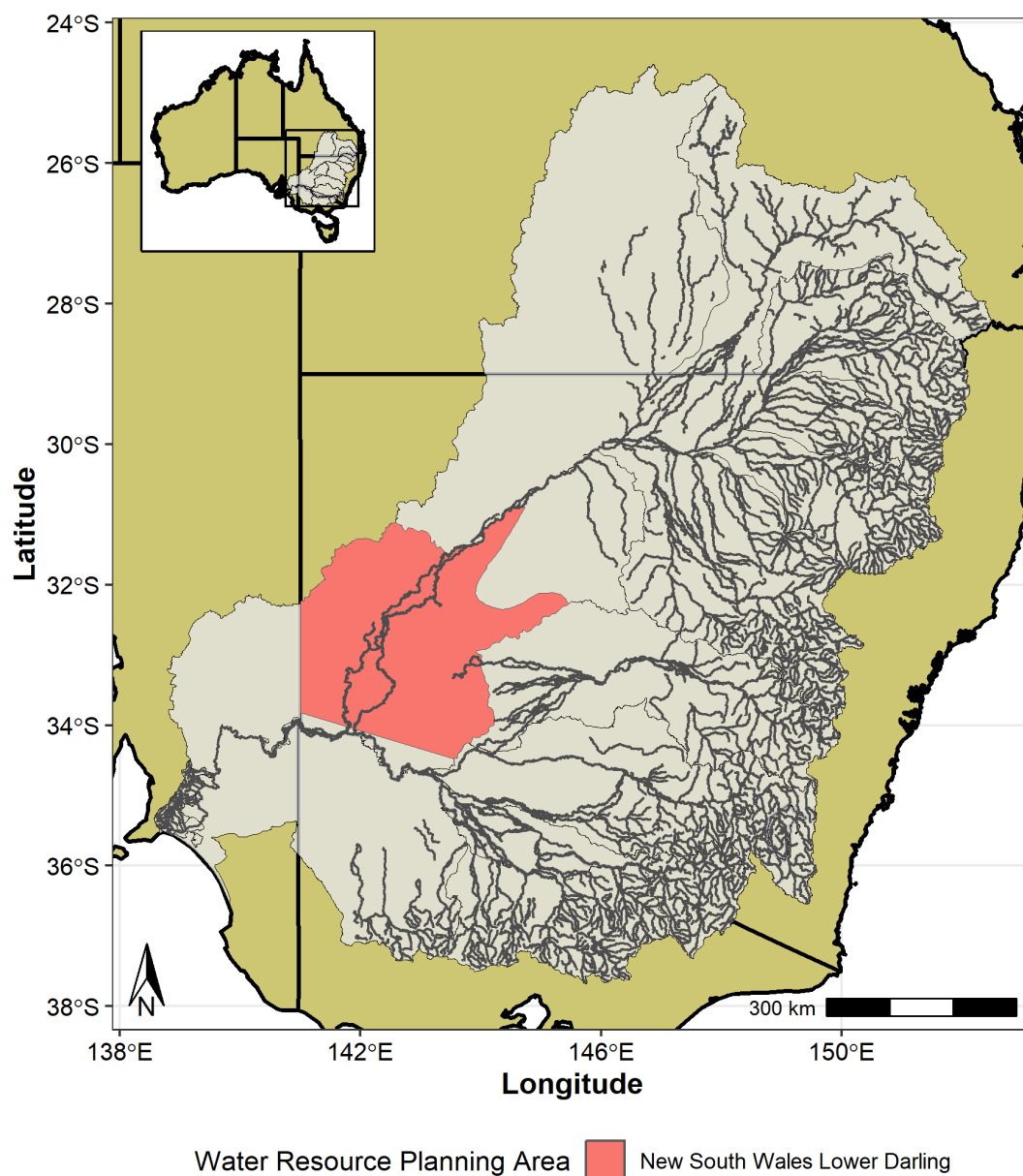


Figure 10.1: Murray-Darling Basin with the key region of this report highlighted. Inset map shows the whole of Australia with a box around the MDB.

What This Report Includes

This report starts with an overview of the standardised monitoring programs including sampling details and statistics. An overview of the hydrological and climatic conditions during the reporting period is also provided as context for interpreting the fish population status data.

Following the introductory sections, we present a summary of *fish diversity* across the New South Wales Lower Darling (Baaka) WRPAs. Separate plots for native and alien species show the total number of unique species observed at each site.

The main body of the report provides detailed information on the *population structure, relative abundance, health, and distribution* of six key fish species:

- Murray cod
- Golden perch
- Freshwater catfish (No fish were observed in this WRPAs during the reporting period)
- Bony herring
- Australian smelt
- Common carp

Population structure information includes length frequency plots of collected fish and the proportion of fish classified as Young of the Year (YOY). This information can be used to infer the size structure of populations and the level of recruitment each year. For additional context, we provide a summary table showing any stocking which occurred for the species in each year (if relevant).

Relative abundance and *relative biomass* (a unit-less measure representing the number (or biomass) of fish in an area) information is adapted from the modelled outputs from a more in-depth publication (Crook et al. 2023) which considers all available electrofishing data within the NSW Murray-Darling Basin (MDB). The updated analysis uses generalised linear mixed models to generate annual indices of relative abundance and biomass for each WRPAs. In this report we present the modelled time series of relative abundance showing the predicted number (or biomass) of fish observed per 90 second shot of electrofishing. The abundance and biomass trends for the New South Wales Lower Darling WRPAs are contrasted with the overall NSW MDB dataset. It should be noted that these are modelled estimates of relative abundance/biomass, not absolute abundance/biomass as absolute estimates would require extensive calibration surveys that are not included in the monitoring program.

Health information is provided as a summary of any visible health conditions recorded for the key species. The number of health conditions observed in a fish population is generally reflective of water quality, competition, and many other factors. Fewer observations of health conditions indicate healthier populations. The health conditions detailed are any that were observed as part of the biological measurements taken. We provide a comparison of the prevalence of health conditions in the New South Wales Lower Darling WRPAs and greater MDB (excluding the New South Wales Lower Darling WRPAs).

Distribution maps are provided for each species to show the observed distribution of each species from electrofishing samples. The distribution maps also show the relative abundance (number of fish observed per 90 seconds of electrofishing) at each site to give an indication of how the population is spread over the landscape.

Finally, the distributions and numbers of *Threatened species* are reported. The report includes threatened species that were recorded by standardised monitoring programs in the New South Wales Lower Darling WRPAs during the reporting period.

For each section of the report, we provide a *Summary Statement*. This statement provides a very brief overview of the key messages for each section.

Sampling Methods

Three main methods are used during routine fish monitoring surveys: boat electrofishing, backpack electrofishing and bait traps. This report mainly includes the electrofishing data with bait trap samples informing the distribution of small bodied species. The electrofishing was conducted using the standard methodology implemented in the Sustainable Rivers Audit (SRA; Davies et al. 2010). This usually includes 12 shots of 90 seconds “power on” during each sampling event.

As parts of this report compile data from multiple projects, there is some variation in how sites were chosen and the effort of sampling conducted each year (Table 10.1). Details of which projects contributed data to this report can be seen in Table 10.7. At each site, sampling gear was applied as suited to the local conditions with either boat, backpack, or a hybrid of the two, in addition to 10 unbaited bait traps set in edge margins. Most sampling occurred between the months of September and May.

Table 10.1: Sampling effort (Number of sites sampled) each sampling season in the Lower Darling WRPAs. Variation in sampling effort is due to different numbers of projects and interruptions to planned sampling such as flooding, site desiccation, and extreme weather.

Sampling Season	Number of Boat Electrofishing Sites	Number of Backpack Electrofishing Sites	Total
2014/2015	2	0	2
2015/2016	5	0	5
2016/2017	10	2	12
2017/2018	8	0	8
2018/2019	20	0	20
2019/2020	22	0	22
2020/2021	23	0	23
2021/2022	10	0	10
2022/2023	24	0	24
2023/2024	29	0	29

The sites sampled during the reporting period are shown in

Figure 10.2. A breakdown of sites sampled each sampling season is shown in the Appendix (Figure 10.32).

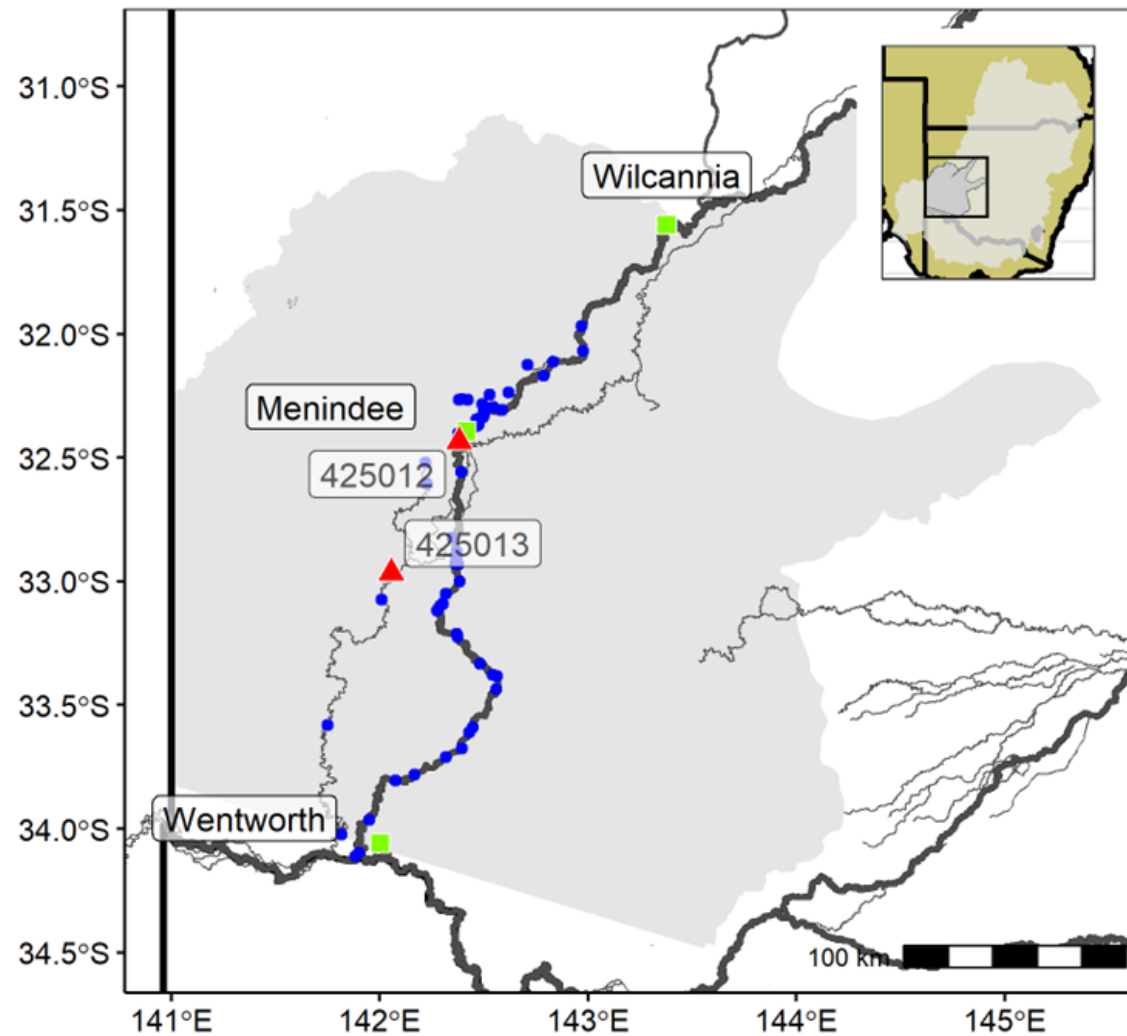


Figure 10.2: Sites (blue dots) sampled during the reporting period in the Lower Darling WRPA. Red triangles show key flow gauges along with their gauge ID number. Green squares show key towns.

Each sampling method has a different effectiveness at sampling each species. Table 10.2 shows the total numbers of each key species caught by each method.

Table 10.2: Number of each key species caught by sample method over the whole program in the Lower Darling WRP. Further data on total catch is provided in the Appendix.

Common name	Boat Electrofishing	Backpack Electrofishing	Bait Trap
Australian smelt	660	0	2
Bony herring	11,505	4	1
Common carp	19,225	10	385
Golden perch	1,280	0	4
Murray cod	349	0	0

A subset of sampled fish had biological measurements taken during the surveys, including but not limited to length and weight measurements and visual health assessments. Table 10.3 shows the number of biological measurements taken each year for the key species.

Table 10.3: Number of biological measurements taken for the key species each sampling season in the Lower Darling WRP.

Sampling Season	Australian smelt	Bony herring	Common carp	Golden perch	Murray cod
2014/2015	0	104	21	4	12
2015/2016	8	153	60	14	12
2016/2017	50	524	253	44	5
2017/2018	6	400	148	25	9
2018/2019	172	812	733	240	97
2019/2020	57	394	237	80	20
2020/2021	166	1,178	246	269	122
2021/2022	39	245	203	122	17
2022/2023	77	908	2,303	257	17
2023/2024	71	1,418	927	259	41

Climate Overview

The following is a summary of the climatic conditions during the reporting period in terms of how the observed conditions compare to long term records. These are direct extracts from the [Australian Bureau of Meteorology climate summaries archive](#) and are written in the given year. To interpret, 2014 states it was the warmest year on record, meaning 2014 was the warmest year on record up to and including 2014 but not including more recent years.

2014

New South Wales experienced its warmest year on record in 2014, with several heatwaves and persistently warm conditions across the State. Rainfall was well below average in the northeast, and close to average elsewhere.

2015

New South Wales recorded well above average temperatures in 2015. Nights were particularly warm, the sixth-warmest on record for the State. Rainfall was close to average for the state as a whole.

2016

2016 was a generally wet, warm year for NSW as a whole, with substantial variability throughout the year and across the state. Following a record-warm start to the year, May to September was the wettest such period on record for NSW, with cooler weather in much of the west of the state. Minimum temperatures were the warmest on record for the State as a whole, with record-warm daytime temperatures on parts of the east coast.

2017

The year 2017 was the warmest on record for New South Wales for both mean and daytime temperatures. It was also the State's driest year since 2006. Following the warmest summer on record for the State, heavy rain in March across the east then made way for a very dry winter and start to spring. Winter overnight temperatures were the lowest since 1997, but daytime temperatures remained above average for most of the year, and were the warmest on record overall.

2018

2018 was the warmest on record for New South Wales for both mean temperature and mean maximum temperature, whilst the mean minimum temperature was fourth-warmest on record. The year was dominated by very dry conditions, with the third-driest January to September on record. October to December saw some relief from the dry, with above average rainfall across parts of the State. Despite this, New South Wales experienced its sixth-lowest annual rainfall on record; its driest year since 2002.

2019

2019 was the driest and warmest year on record for New South Wales. Despite some rain in some months, most of the State received much less rainfall than usual, with the northeast and far west particularly dry. Heatwaves in January brought very high temperatures, and large fires from September onward caused extensive damage and persistent smoke.

2020

2020 saw above average temperature and rainfall in New South Wales. Temperatures were above average across the state in most months except during autumn. There was widespread rain during autumn and spring and in December, but early winter and November rain was below average.

2021

New South Wales had its 6th wettest year on record, with 2021 rainfall 30 % above average. This included significant floods along the east coast in March, and the state's wettest November on record. It was the state's coolest year since 1996, at 0.15 °C above the 1961–1990 average.

2022

2022 was exceptionally wet with the state-averaged annual total being the second-highest on record (since 1900) and many sites recording their highest annual totals on record. Maximum temperatures were lower than average with the state-averaged annual maximum temperature being the coolest since 1992. Minimum temperatures were generally warmer than average with the state-averaged annual minimum temperature being 0.73 °C above the 1961–1990 average.

2023

The state-averaged rainfall was 22.9 % below the 1961–1990 average. Rainfall was above average over small parts of the state's south, west of the Great Dividing Range, while being below average over most of the northern half of the state, especially over parts of the Northern Tablelands, Northern Rivers, Mid-North Coast, and Upper Hunter, where annual rainfall was in the lowest 10 % of historical records (since records began in 1900). State-averaged annual maximum temperature was 1.96 °C above the 1961–1990 average, which is the third highest on record.

2024

Rainfall totals in 2024 were above average to very much above average for the northern and western areas of the state, as well as central parts of the coast. Totals were below average for large parts of the south-east, as well as small parts of the state's north-east and south-west. 2024 was the third-warmest on record for all years since 1910, 1.55 °C above the 1961–1990 average.

Flow Data

Below shows a summary of flow data from a variety of flow gauges in the New South Wales Lower Darling WRP (Figure 10.3).

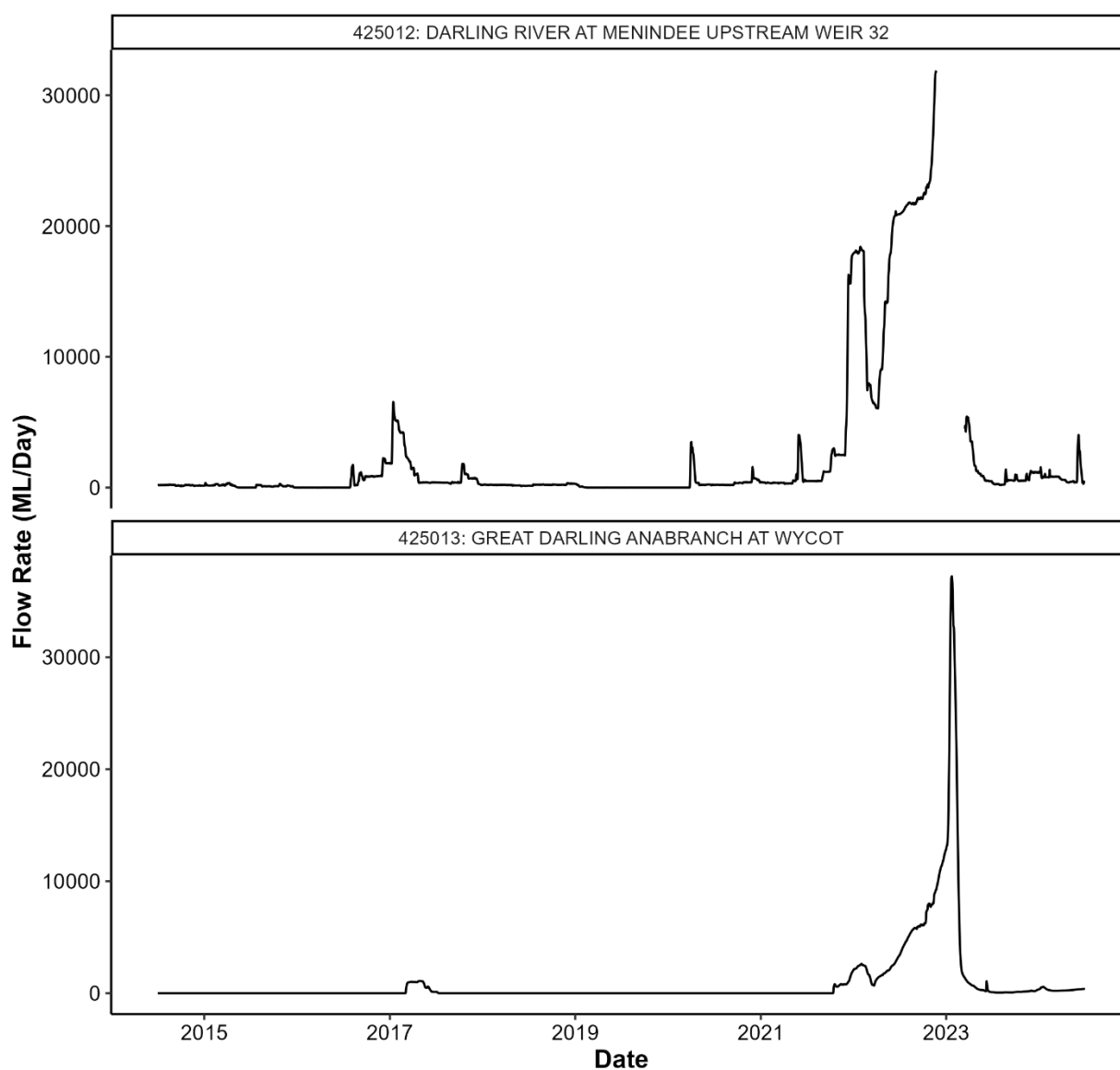


Figure 10.3: Flow data from various gauges in the New South Wales Lower Darling WRP over the reporting period. Gauge locations can be seen on Figure 10.2. Note the differing scales on the y-axis.

Water temperature data, where available, are also shown in Figure 10.4.

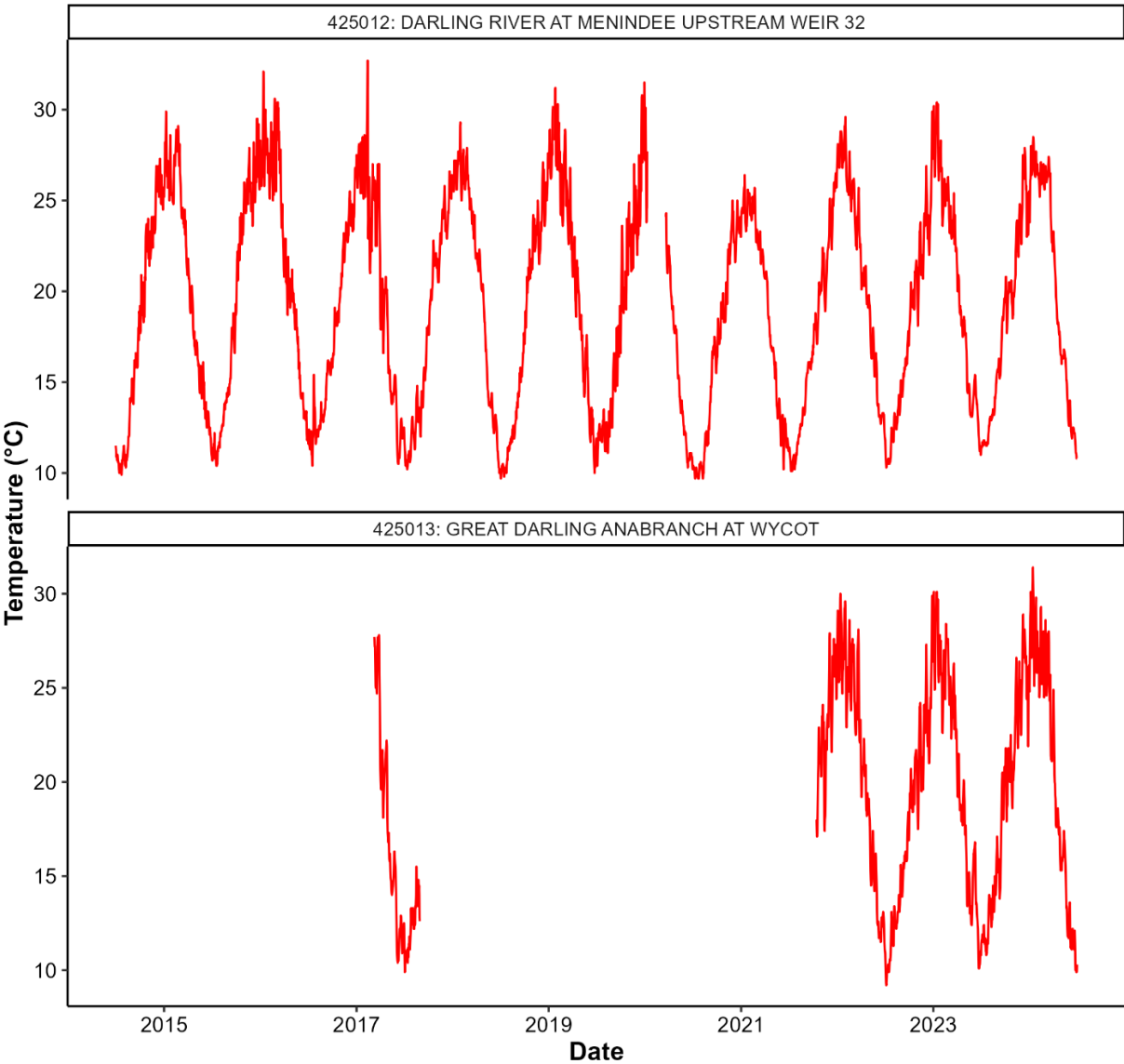


Figure 10.4: Water temperature data from various gauges in the New South Wales Lower Darling WRPAs over the reporting period. Gauge locations can be seen on Figure 10.2. Note the differing scales on the y-axis.

Species Diversity

A total of 15 fish species were observed across the New South Wales Lower Darling WRPAs including five alien species. Figure 10.5 shows the number of native species found at each site while Figure 10.6 shows the number of alien species found at each site. The full list of species caught and observed is presented in Table 10.8.

Summary Statement:

Native diversity was highest in the central area of the New South Wales Lower Darling region while the alien diversity was generally consistent across the region.

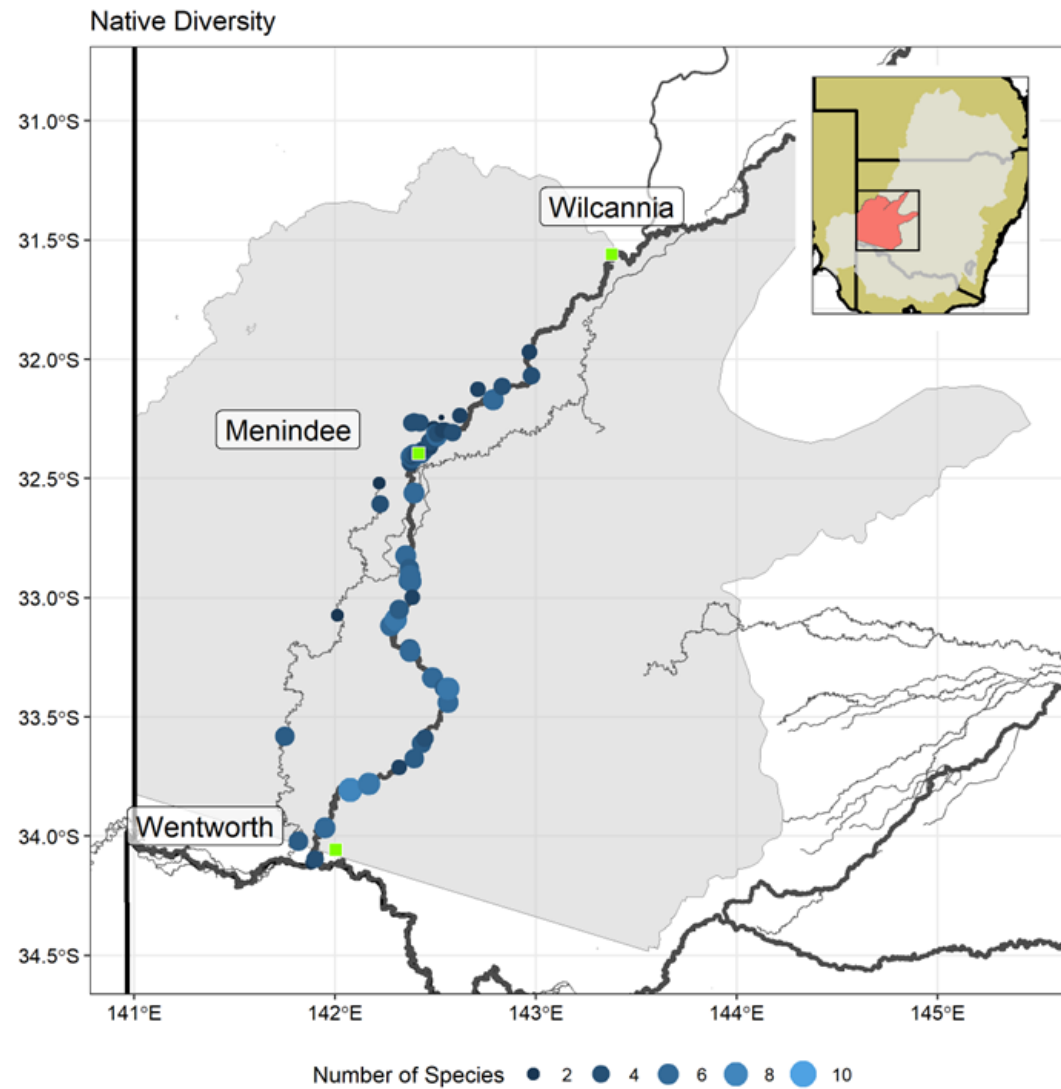


Figure 10.5: Native diversity across all sampling sites in the Lower Darling WRP. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded. Green squares represent key towns.

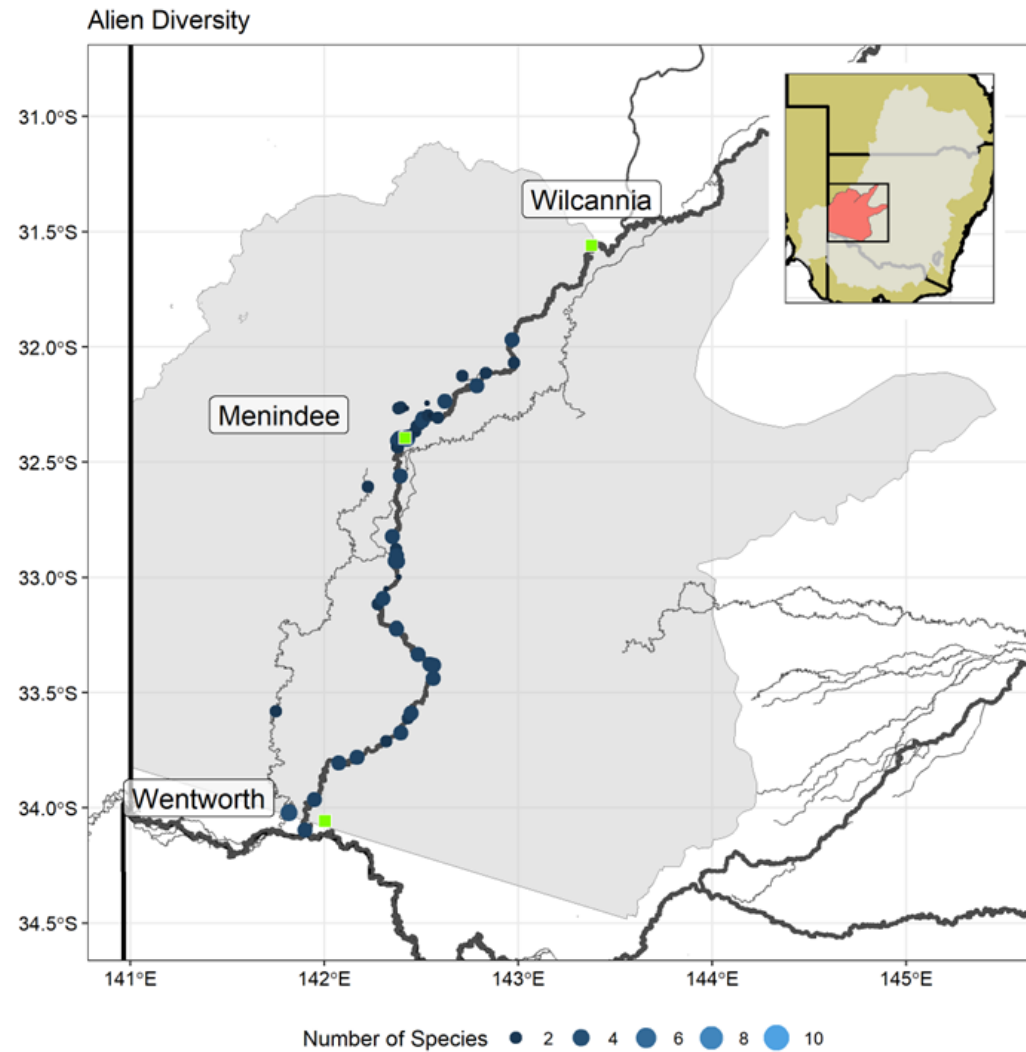


Figure 10.6: Alien diversity across all sampling sites in the Lower Darling WRPA. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded. Green squares represent key towns.

Murray cod



Population Structure

Figure 10.7 shows the observed length frequency plot for Murray cod for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 0 to 42, and 0 % to 34 % of measured fish within a season, with a mean percentage YOY of 12 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Murray cod was 12 % (1,375 out of 11,199).

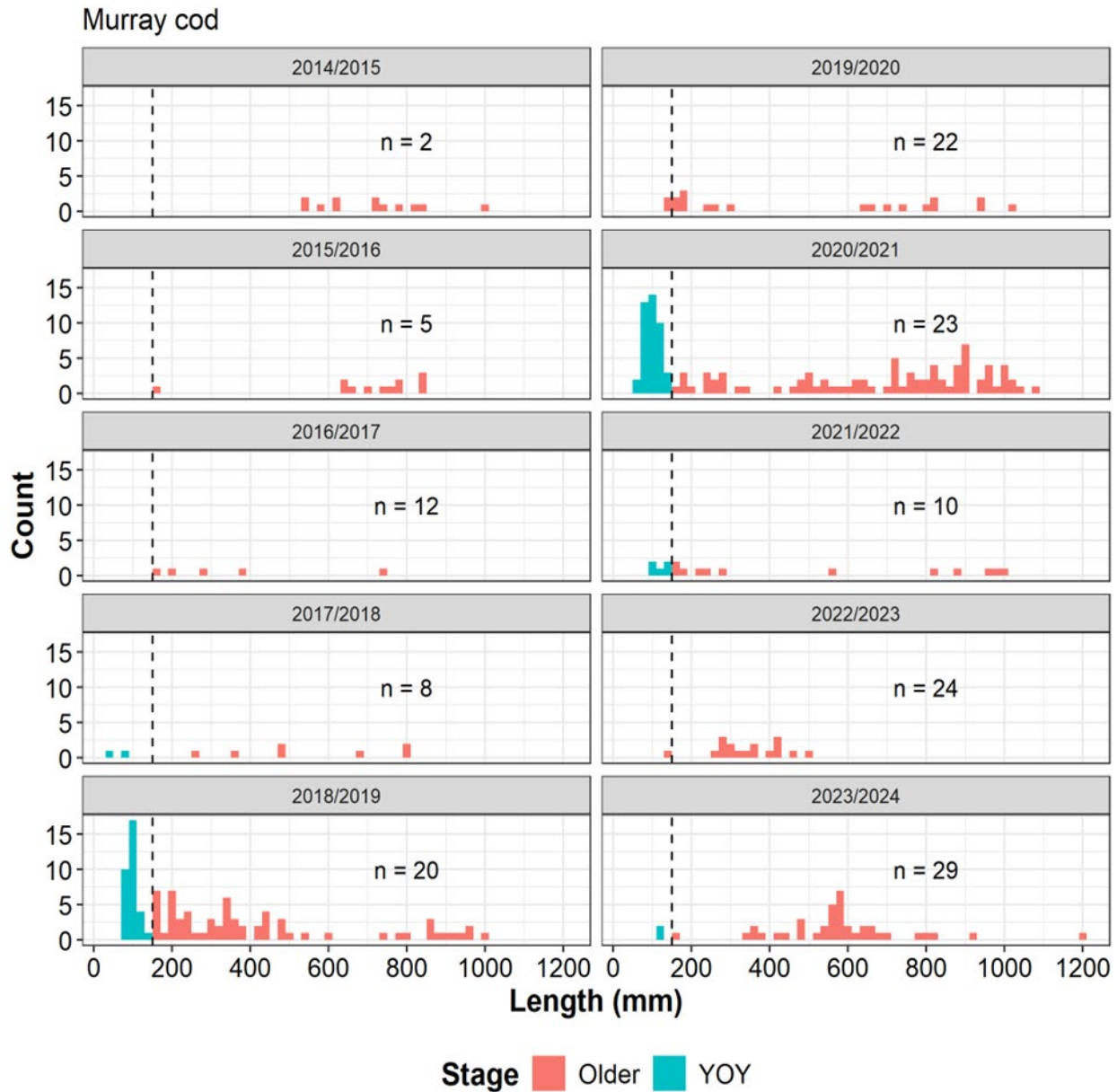


Figure 10.7: Length frequency plots for Murray cod by sampling season in the Lower Darling WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Irregular recruitment with only 2 YOY observed in 2023/24 despite a range of larger sized Murray cod observed.

Stocking

A total of 119,000 Murray cod were stocked into the waterways of the New South Wales Lower Darling WRPA during the reporting period. Of these fish, 0 (0 %) were stocked into impoundments while 119,000 (100 %) were stocked into rivers or creeks. Table 10.4 shows the detailed breakdown of stocking by season, location and life stage while Figure 10.8 shows the locations of stocking.

Table 10.4: Number and life stage of stocked Murray cod each sampling season in the Lower Darling WRPA.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2020/2021	River/Creek	Fry	60,000
2021/2022	River/Creek	Fry	59,000

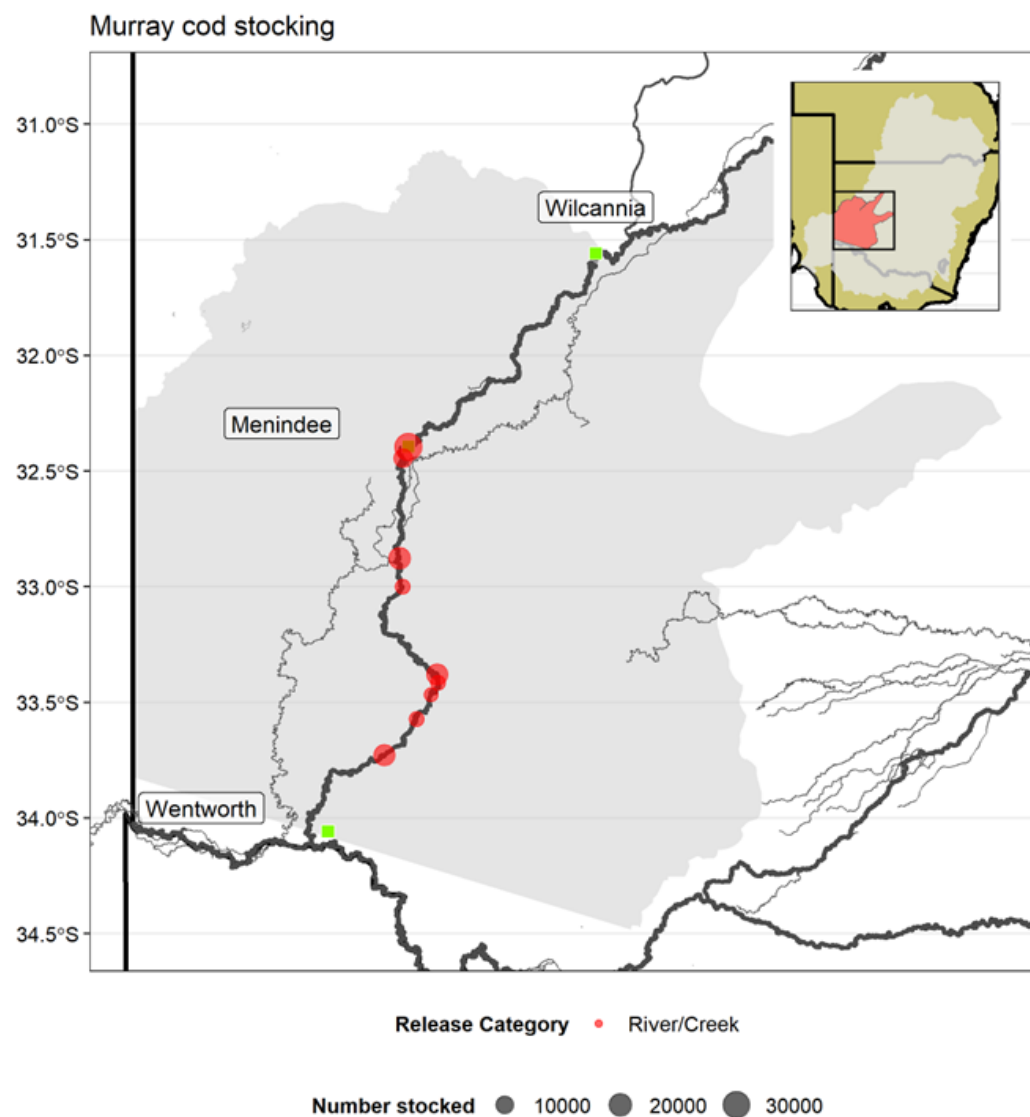


Figure 10.8: Locations of Murray cod stocking in the Lower Darling WRP. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares represent key towns.

Temporal Trends in Abundance

The relative abundance and biomass of Murray cod since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 10.9 show the abundance and biomass trends for the New South Wales Lower Darling WRP and the right-hand panels show the overall trends across the NSW MDB.

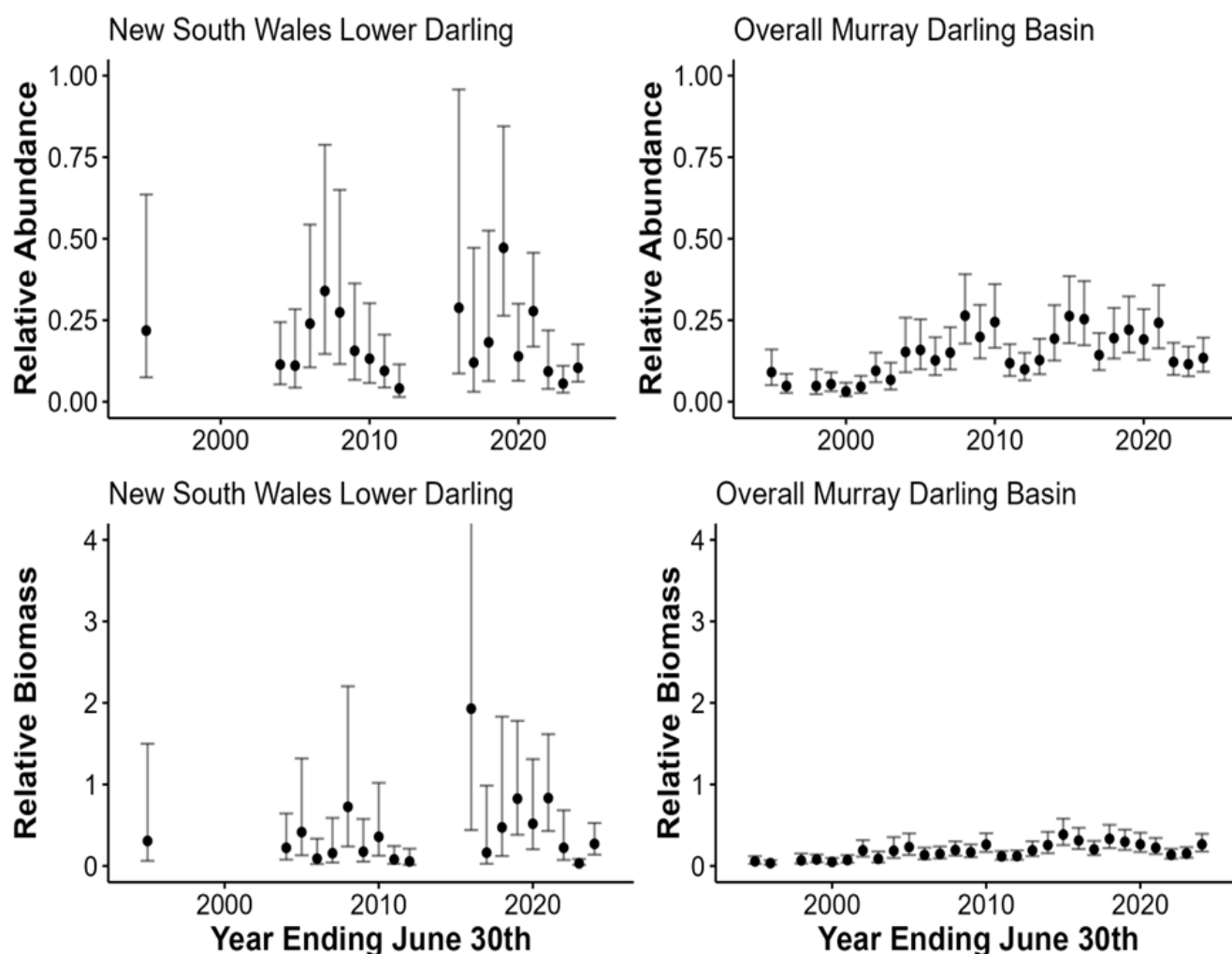


Figure 10.9: Relative abundance and biomass of Murray cod in both the New South Wales Lower Darling WRP and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Abundance and biomass variable since the 1990s. A decreasing trend in abundance and biomass since 2021/22. Recent abundance and biomass comparable to the wider NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2015/2016 to 60 % of sampled fish in 2016/2017 (Figure 10.10). The most common health issue for Murray cod in the New South Wales Lower Darling WRPAs was *Lernaea*, which was observed in a total of 72 fish, corresponding to 20 % of all Murray cod measured.

Across the other NSW MDB WRPA's, 16 % of Murray cod (1,738 out of 11,199 Murray cod) showed a health condition (excludes the New South Wales Lower Darling WRPAs).

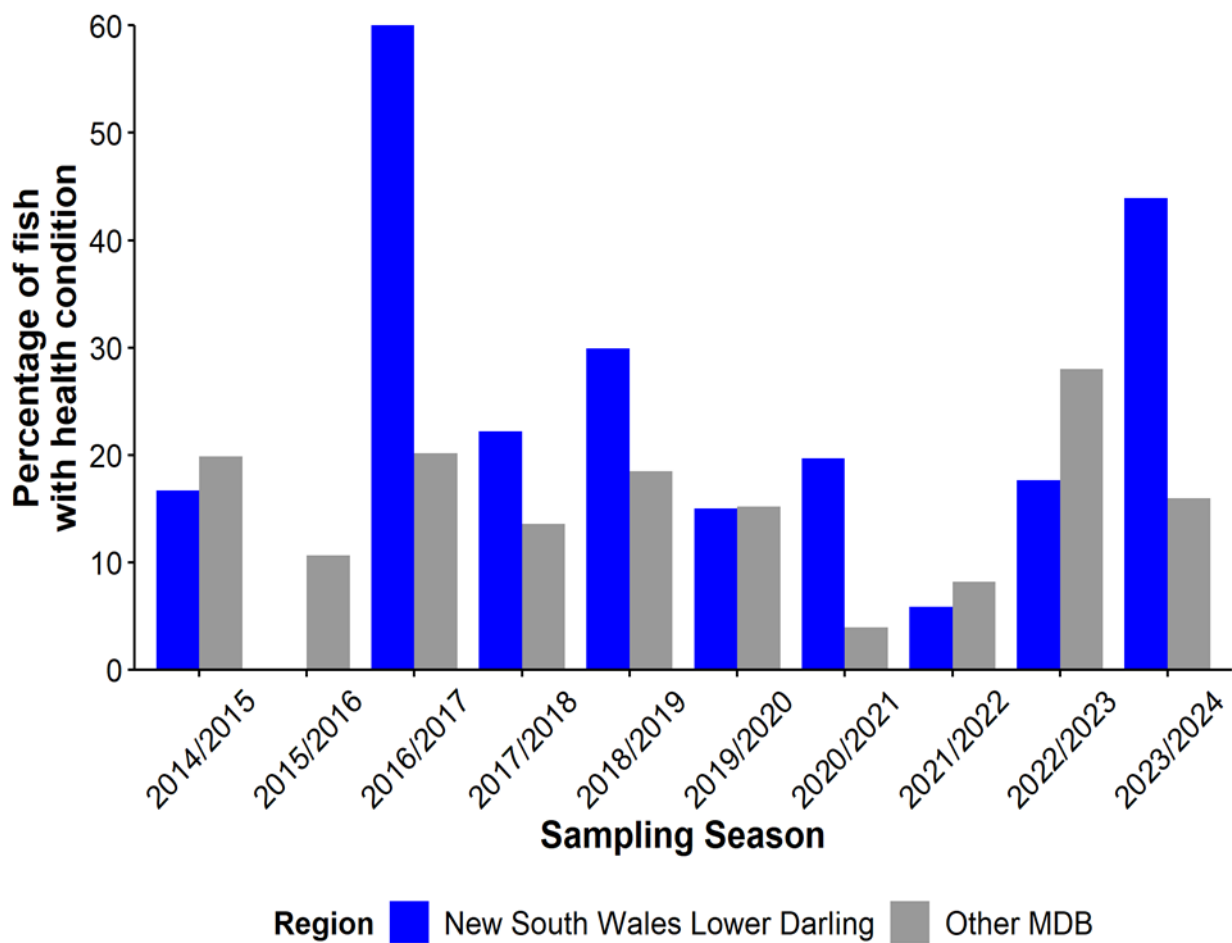


Figure 10.10: Timeseries showing the prevalence of health conditions in Murray cod. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

Presence of observable health conditions was variable across years but higher than the rest of the NSW MDB in 2023/24.

Distribution

Murray cod were recorded at 29 out of 77 sites in the New South Wales Lower Darling WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 0.97 fish caught per 90 seconds of electrofishing. Figure 10.11 shows the distribution and relative abundance of Murray cod across the New South Wales Lower Darling WRP.

Summary Statement:

Murray cod were recorded across the New South Wales Lower Darling WRP but less abundant or absent north of Menindee and the Great Darling Anabranch.

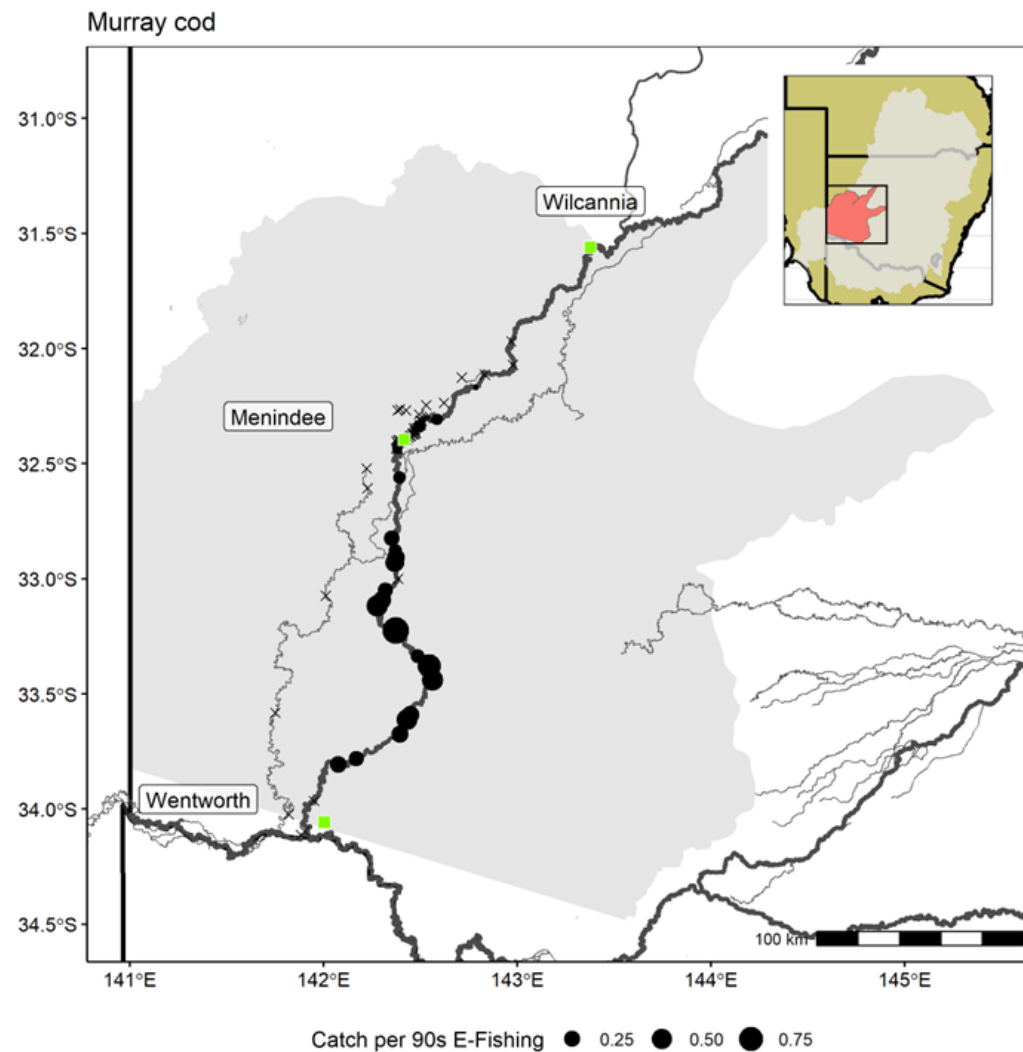


Figure 10.11: Distribution of Murray cod sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Golden perch



Population Structure

Figure 10.12 shows the observed length frequency plot for Golden perch for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 0 to 118, and 0 % to 55 % of measured fish within a season, with a mean percentage YOY of 15 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Golden perch was 6 % (449 out of 6,985).

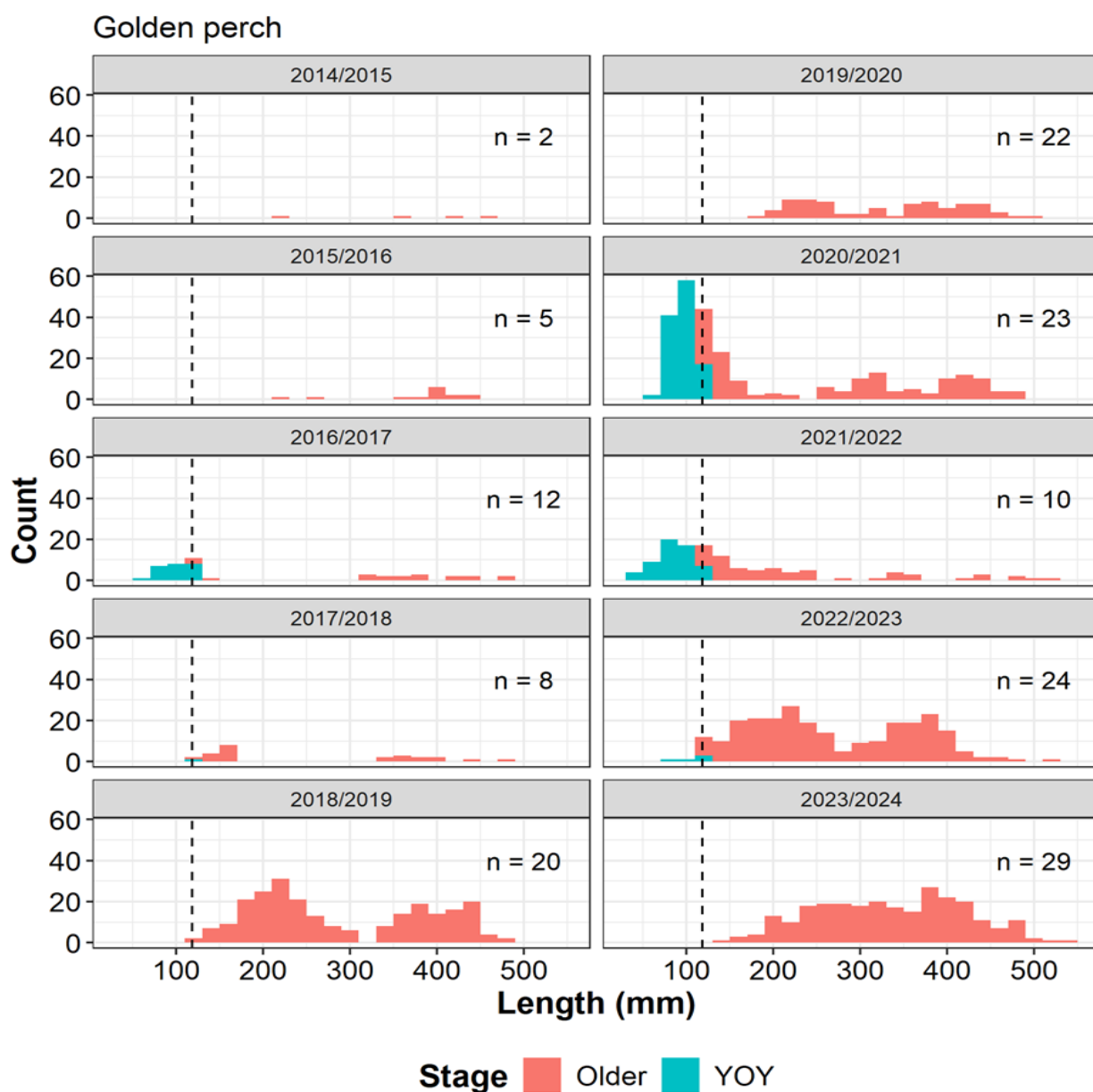


Figure 10.12: Length frequency plots for Golden perch by sampling season in the Lower Darling WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Irregular recruitment with no evidence of recruitment in 2023/24 (following very limited recruitment in 2022/23). A range of larger Golden perch were observed.

Stocking

A total of 60,000 Golden perch were stocked into the waterways of the New South Wales Lower Darling WRPAs during the reporting period. Of these fish, 0 (0 %) were stocked into impoundments while 60,000 (100 %) were stocked into rivers or creeks. Table 10.5 shows the detailed breakdown of stocking by season, location and life stage while Figure 10.13 shows the locations of stocking.

Table 10.5: Number and life stage of stocked Golden perch each sampling season in the Lower Darling WRPAs.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2020/2021	River/Creek	Fry	60,000

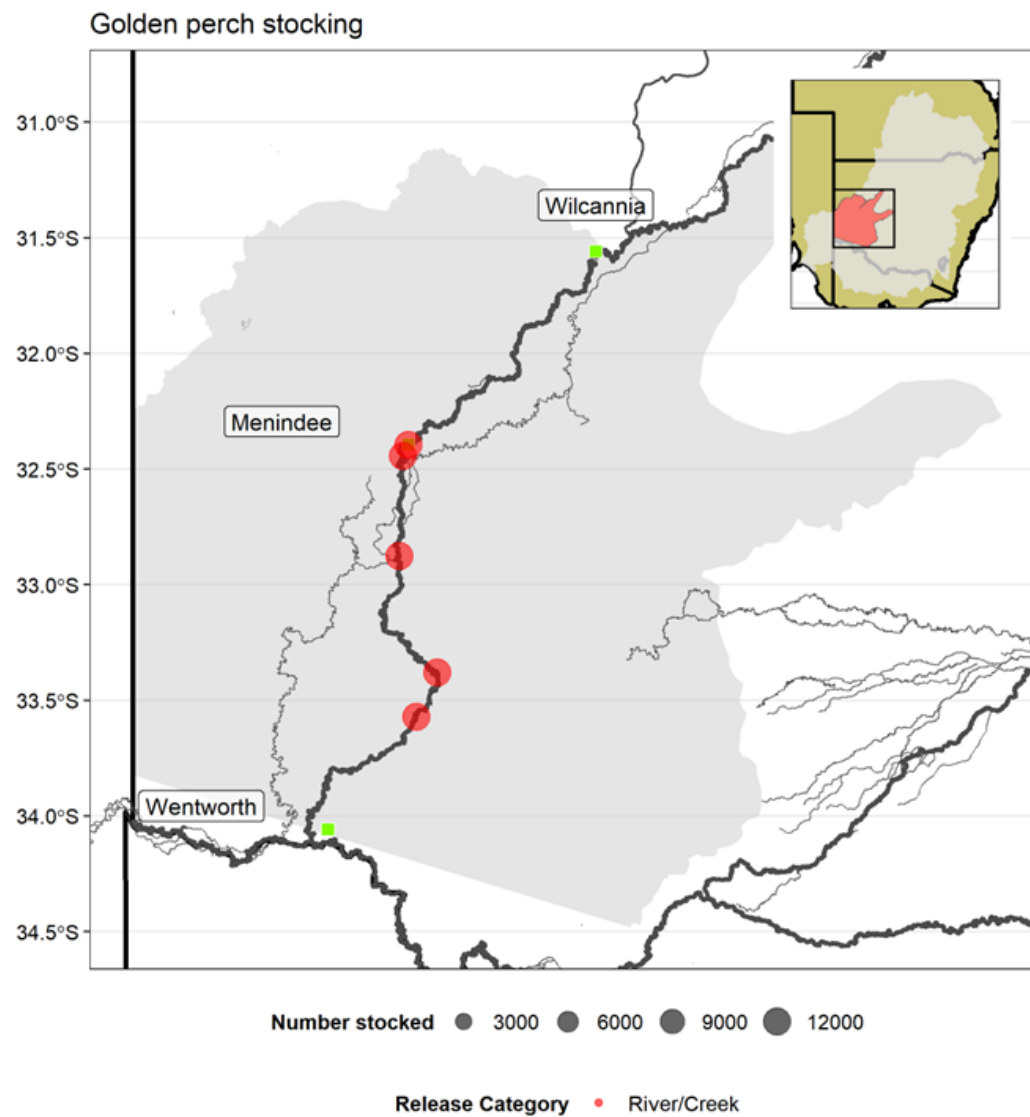


Figure 10.13: Locations of Golden perch stocking in the Lower Darling WRPA. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares represent key towns.

Temporal Trends in Abundance

The relative abundance and biomass of Golden perch since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 10.14 show the abundance and biomass trends for the New South Wales Lower Darling WRP and the right-hand panels show the overall trends across the NSW MDB.

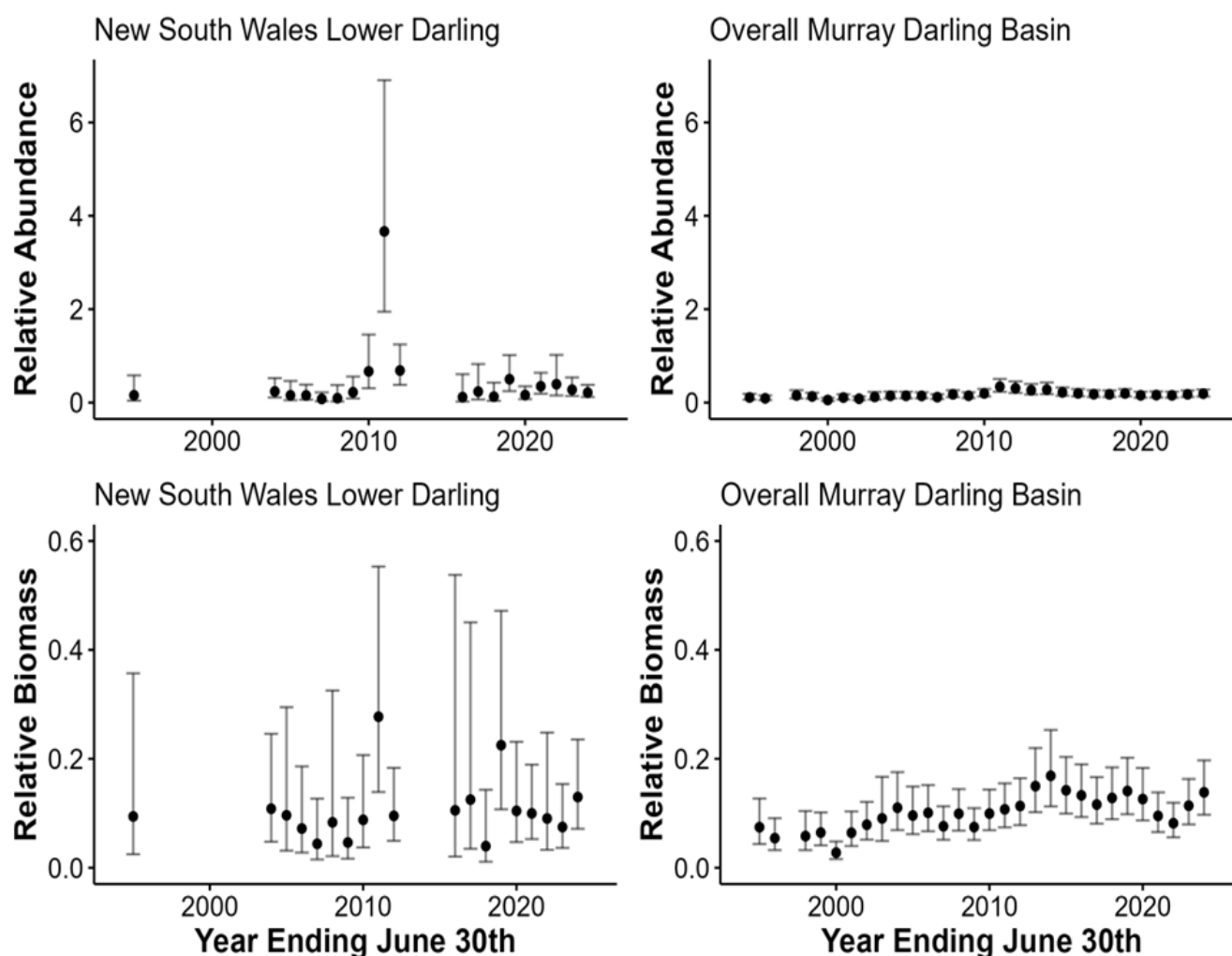


Figure 10.14: Relative abundance and biomass of Golden perch in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Golden perch abundance and biomass in the NSW Lower Darling WRP declined sharply after a large peak in 2010/11 and have been relatively stable at lower levels in recent years. Recent abundance and biomass are similar to the wider MDB.

Health

The prevalence of any health issues ranged from 4 % of sampled fish in 2021/2022 to 48 % of sampled fish in 2016/2017 (Figure 10.15). The most common health issue for Golden perch in the New South Wales Lower Darling water resource planning area was *Lernaea*, which was observed in a total of 215 fish, corresponding to 16 % of all Golden perch measured.

Across the other WRPA's, 26 % of Golden perch (1,787 out of 6,985 Golden perch) showed a health condition (excludes New South Wales Lower Darling).

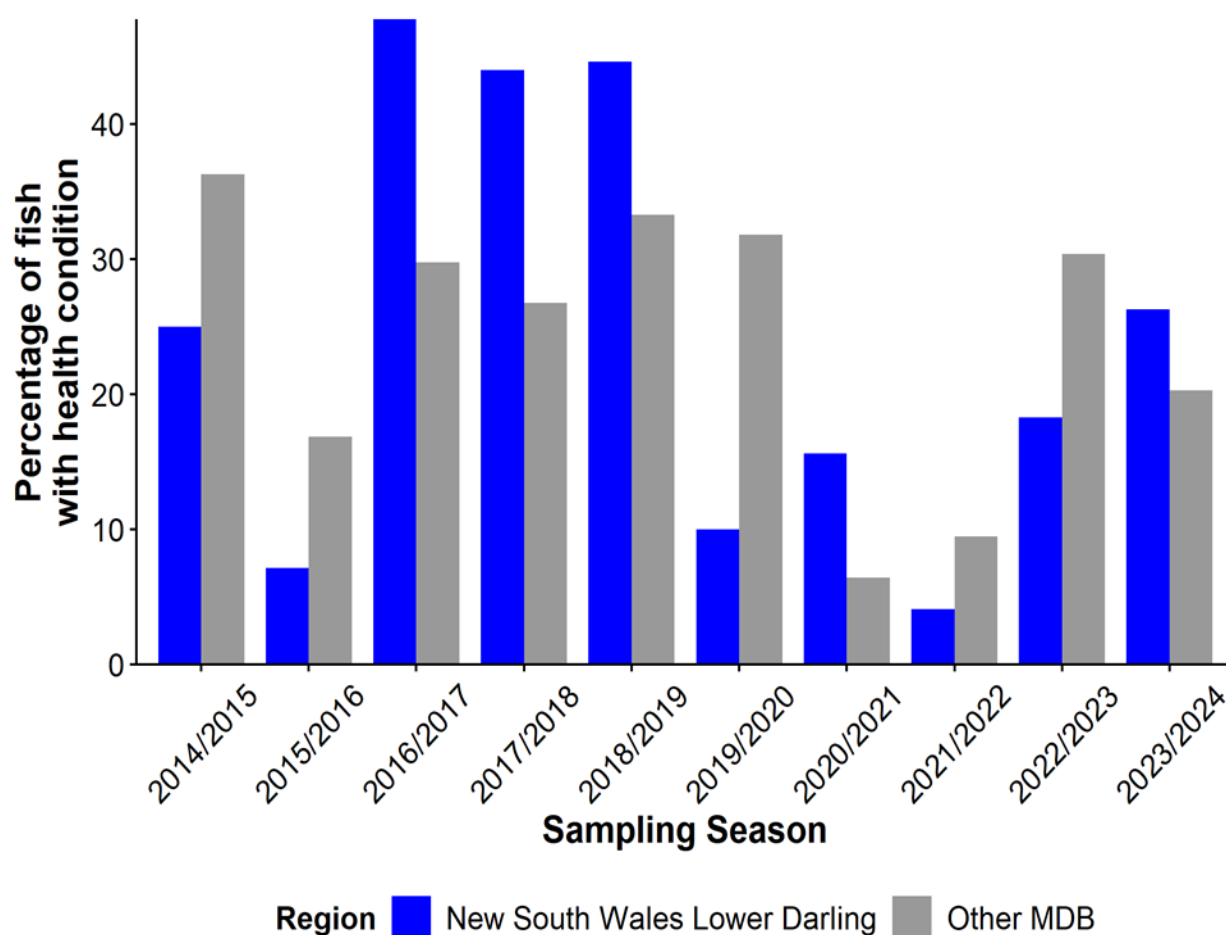


Figure 10.15: Timeseries showing the prevalence of health conditions in Golden perch. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

The presence of observable health conditions for Golden perch in the New South Wales Lower Darling was variable and generally tracked the average across the rest of the Murray-Darling Basin.

Distribution

Golden perch were recorded at 65 out of 77 sites in the New South Wales Lower Darling WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 2.58 fish caught per 90 seconds of electrofishing. Figure 10.16 shows the distribution and relative abundance of Golden perch across the New South Wales Lower Darling WRP.

Summary Statement:

Golden perch were generally present across the New South Wales Lower Darling region.

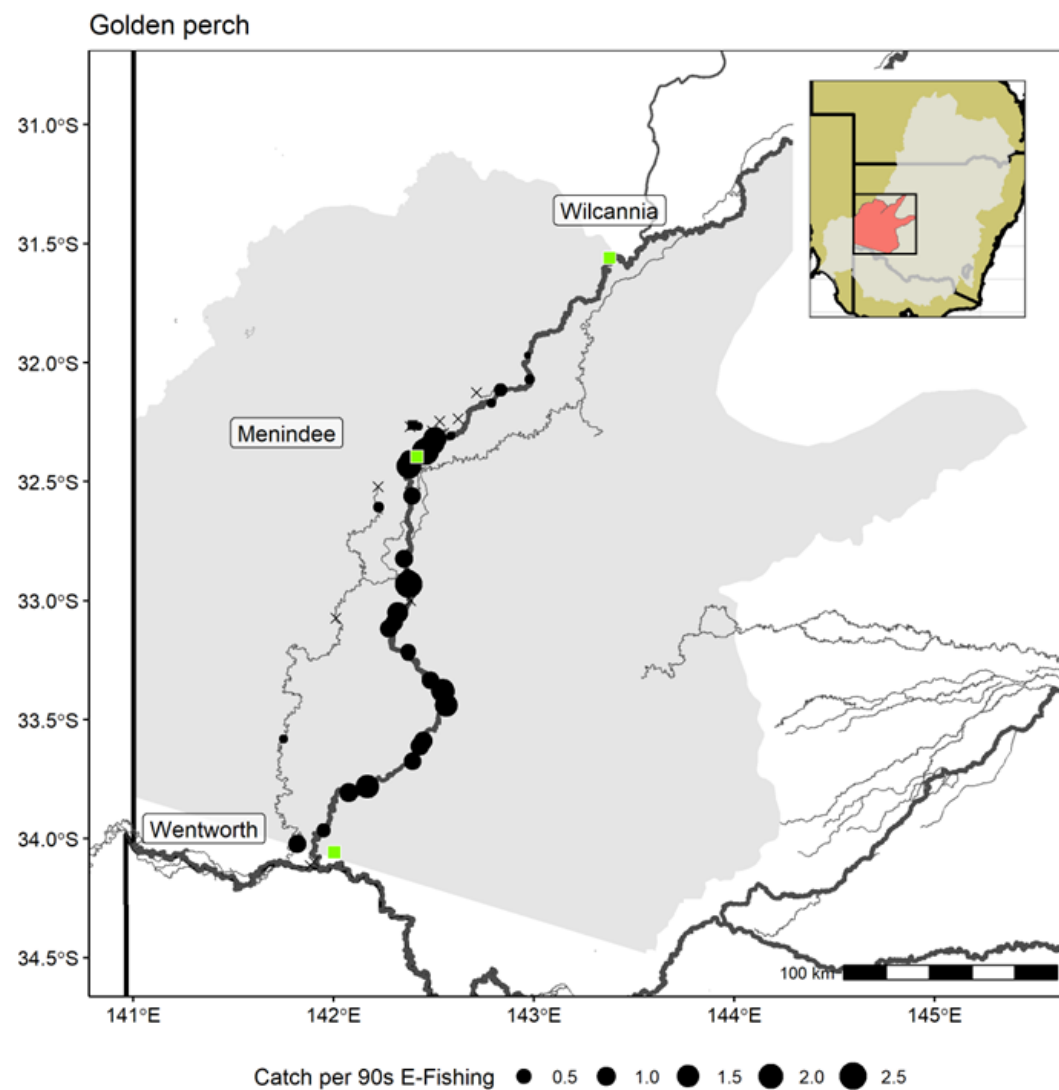


Figure 10.16: Distribution of Golden perch sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Freshwater catfish



Summary Statement:

No Freshwater catfish were observed in the NSW Lower Darling WRP during the reporting period. This suggests that Freshwater catfish are absent or in very low abundances in this region.

Bony herring



Population Structure

Figure 10.17 shows the observed length frequency plot for Bony herring for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 4 to 733, and 4 % to 73 % of measured fish within a season, with a mean percentage YOY of 28 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Bony herring was 24 % (11,512 out of 48,049). Bony herring are not a stocked species.

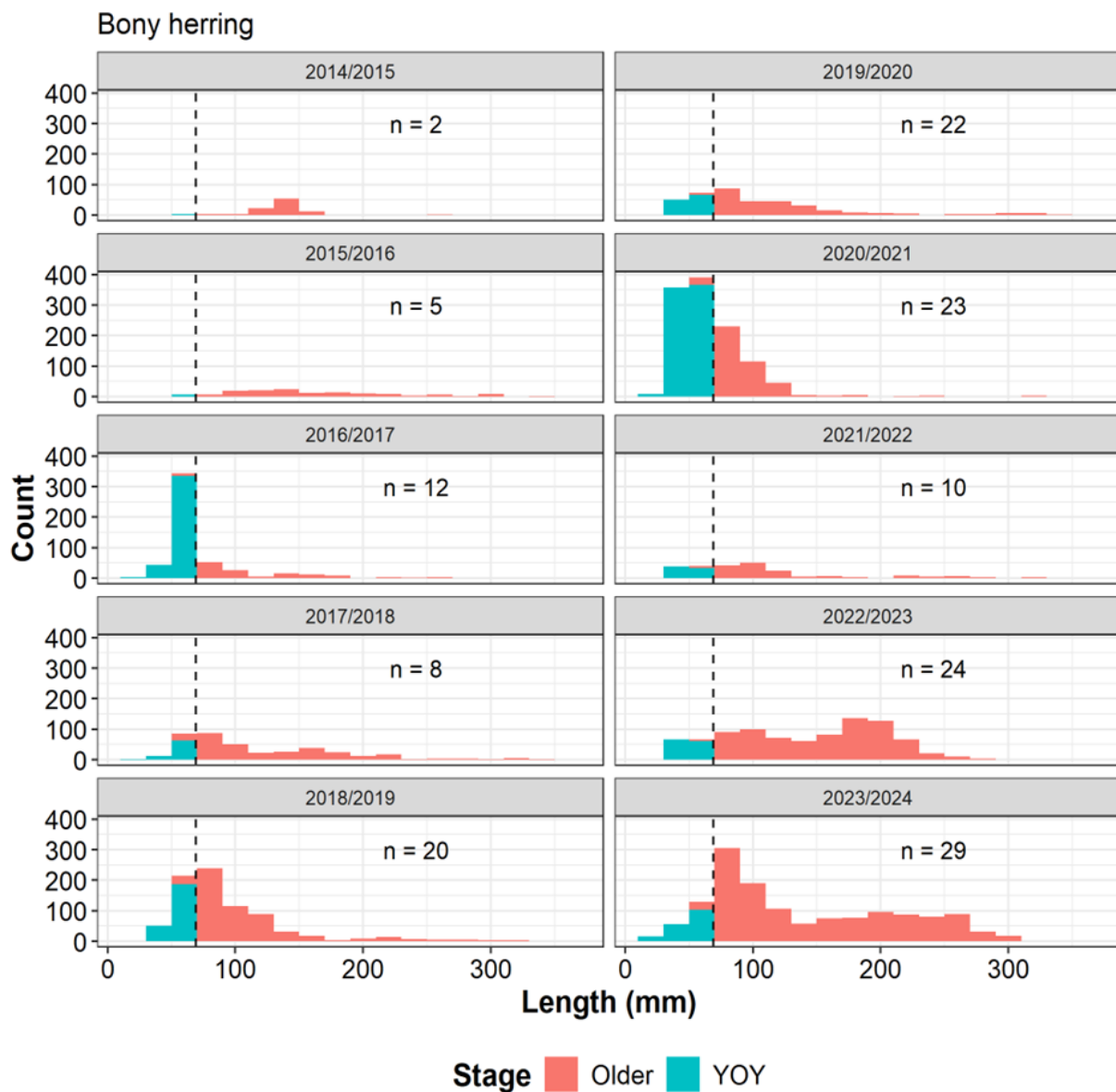


Figure 10.17: Length frequency plots for Bony herring by sampling season in the Lower Darling WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Regular recruitment since 2016/17 but variable numbers of young-of-year and few large fish in most years. Higher proportions of large fish in 2022/23 and 2023/24 than previous years.

Temporal Trends in Abundance

The relative abundance and biomass of Bony herring since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 10.18 show the abundance and biomass trends for the New South Wales Lower Darling WRPA and the right-hand panels show the overall trends across the NSW MDB.

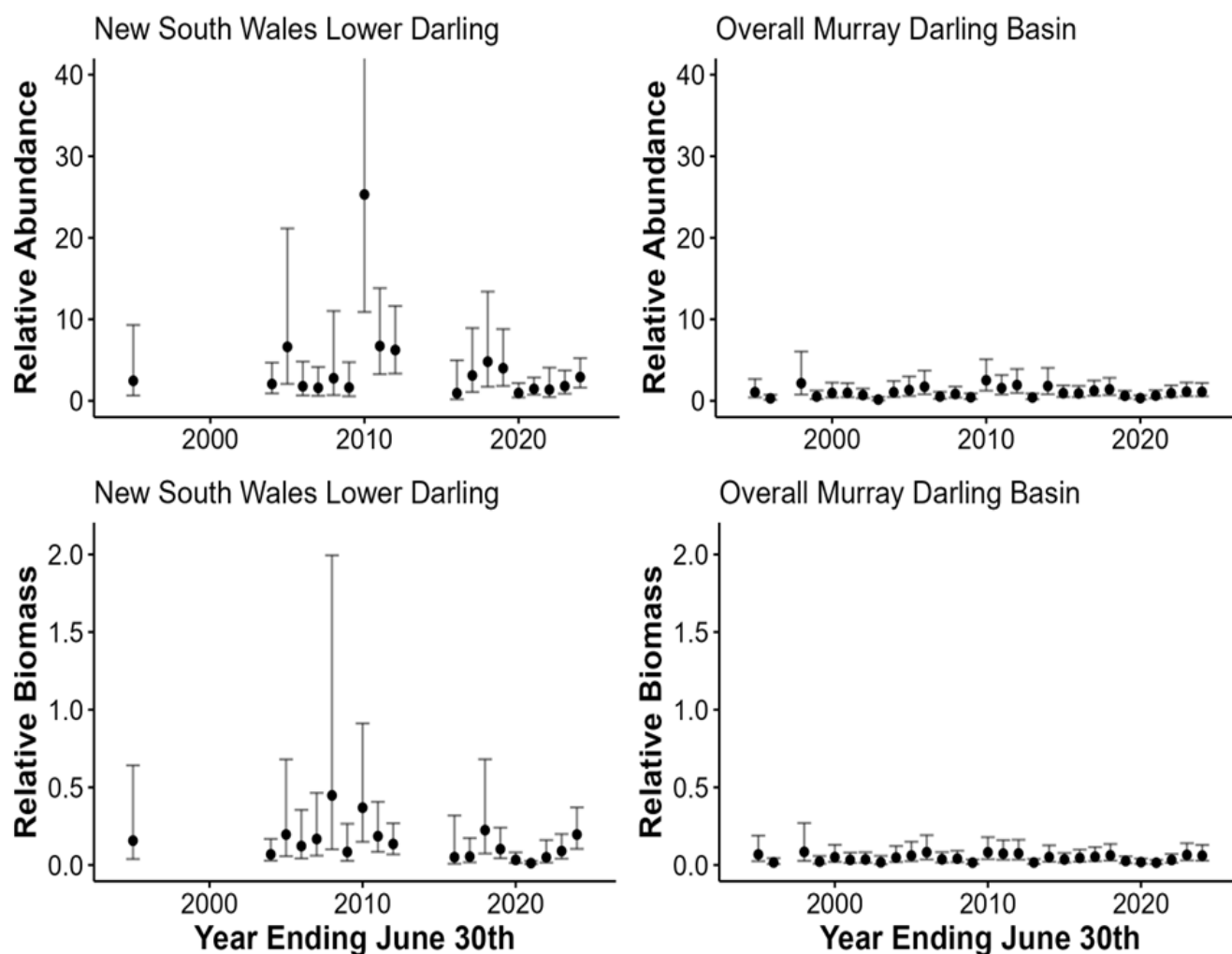


Figure 10.18: Relative abundance and biomass of Bony herring in both the New South Wales Lower Darling WRPA and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates. Note some error bars are truncated for clarity.

Summary Statement:

Fluctuations in abundance and biomass with peaks around 2010 and low values in 2019/20 and 2020/21. Abundance and biomass are trending upwards in recent years and are slightly higher than the overall NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in multiple years to 13 % of sampled fish in 2022/2023 (Figure 10.19). The most common health issue for Bony herring in the New South Wales Lower Darling WRPAs was Fungus, which was observed in a total of 92 fish, corresponding to 1 % of all Bony herring measured.

Across the other NSW MDB WRPA, 0.7 % of Bony herring (313 out of 44,515 Bony herring) showed a health condition (excludes the New South Wales Lower Darling WRPAs).

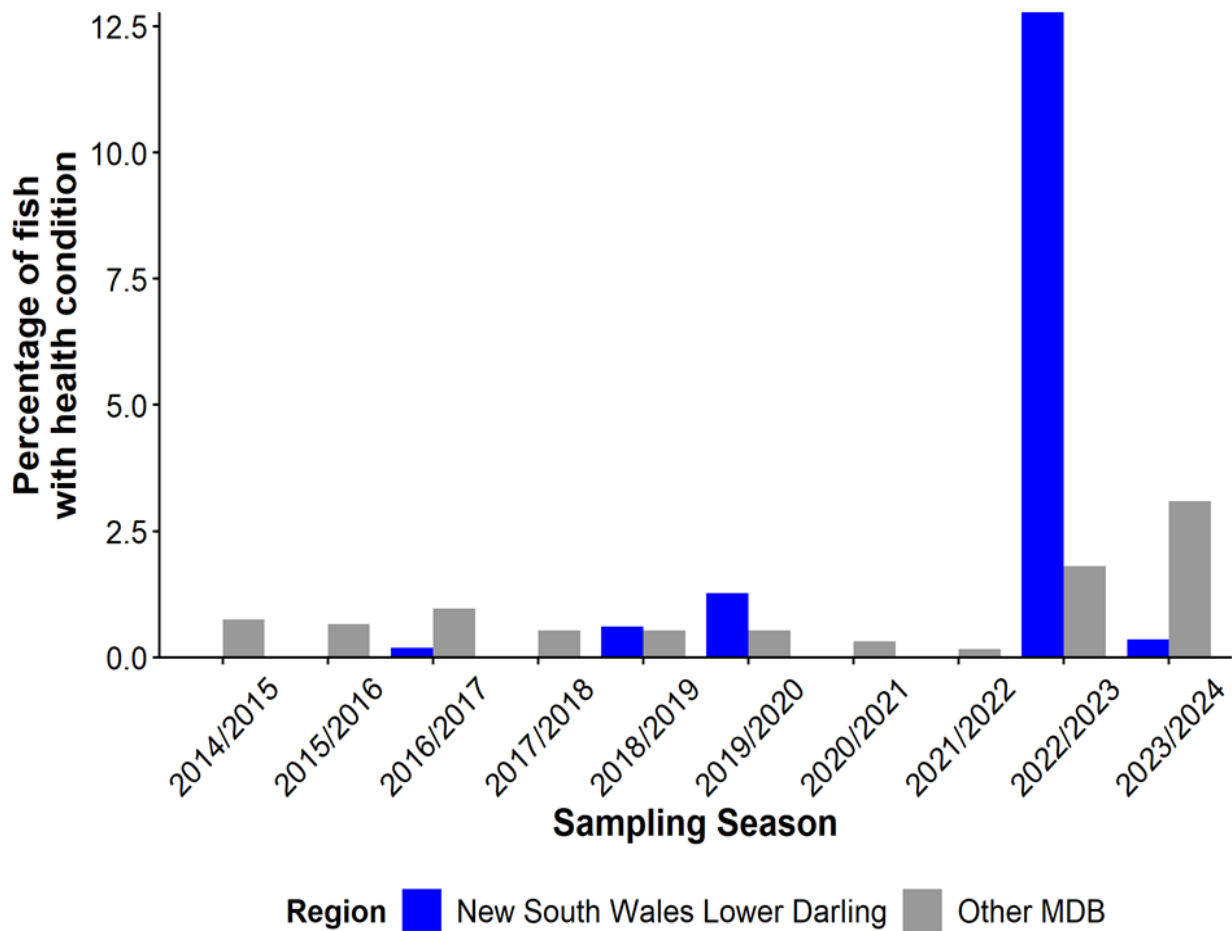


Figure 10.19: Timeseries showing the prevalence of health conditions in Bony herring. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA.

Summary Statement:

Presence of observable health conditions was lower than or similar to the rest of the Murray-Darling Basin in all years except 2022/23 when the proportion was much higher.

Distribution

Bony herring were recorded at 75 out of 77 sites in the New South Wales Lower Darling WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 64.5 fish caught per 90 seconds of electrofishing. Figure 10.20 shows the distribution and relative abundance of Bony herring across the New South Wales Lower Darling WRP.

Summary Statement:

Bony herring were recorded across the New South Wales Lower Darling WRP.

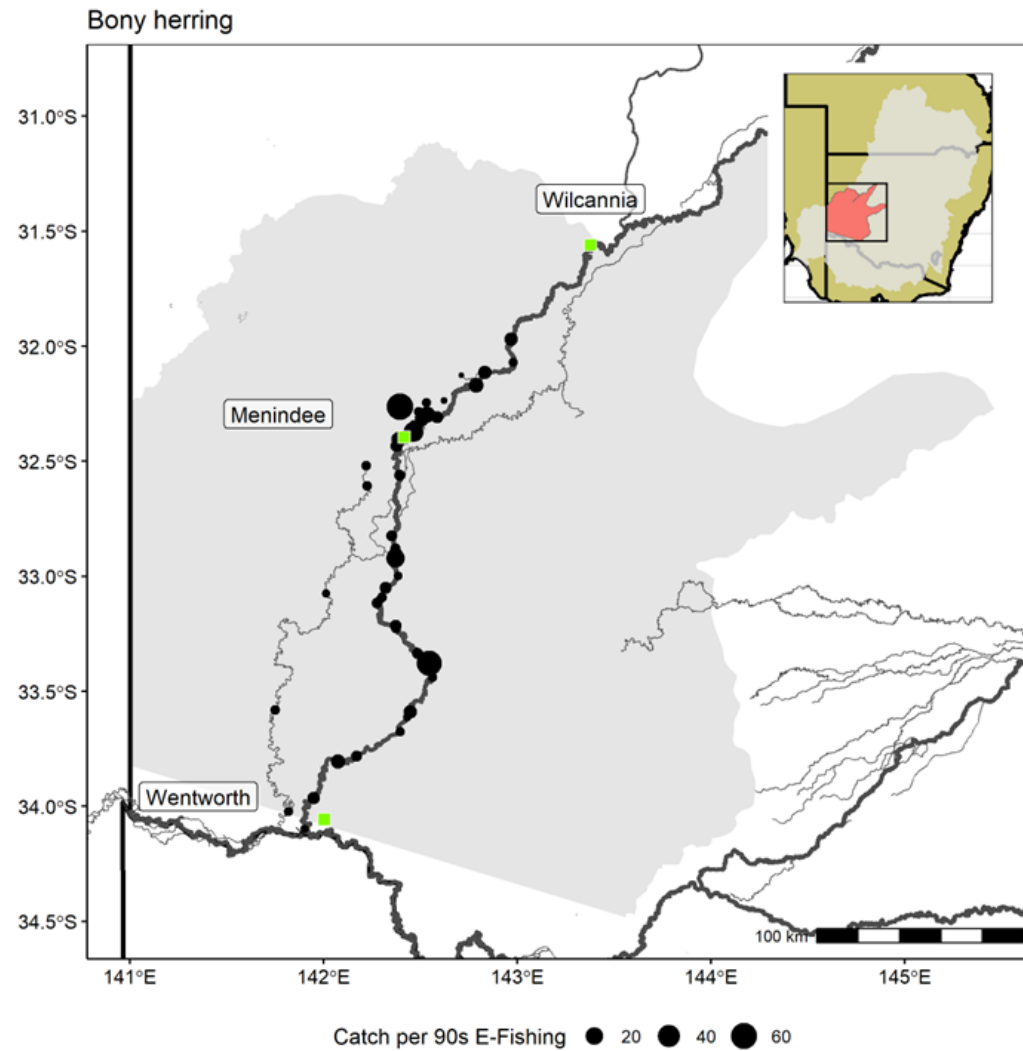


Figure 10.20: Distribution of Bony herring sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Australian smelt



Population Structure

Figure 10.21 shows the observed length frequency plot for Australian smelt for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 2 to 31, and 4 % to 88 % of measured fish within a season, with a mean percentage YOY of 31 %.

Across all MDB water resource planning areas during the reporting period, the percentage YOY for Australian smelt was 42 % (10,875 out of 25,783). Australian smelt are not a stocked species.

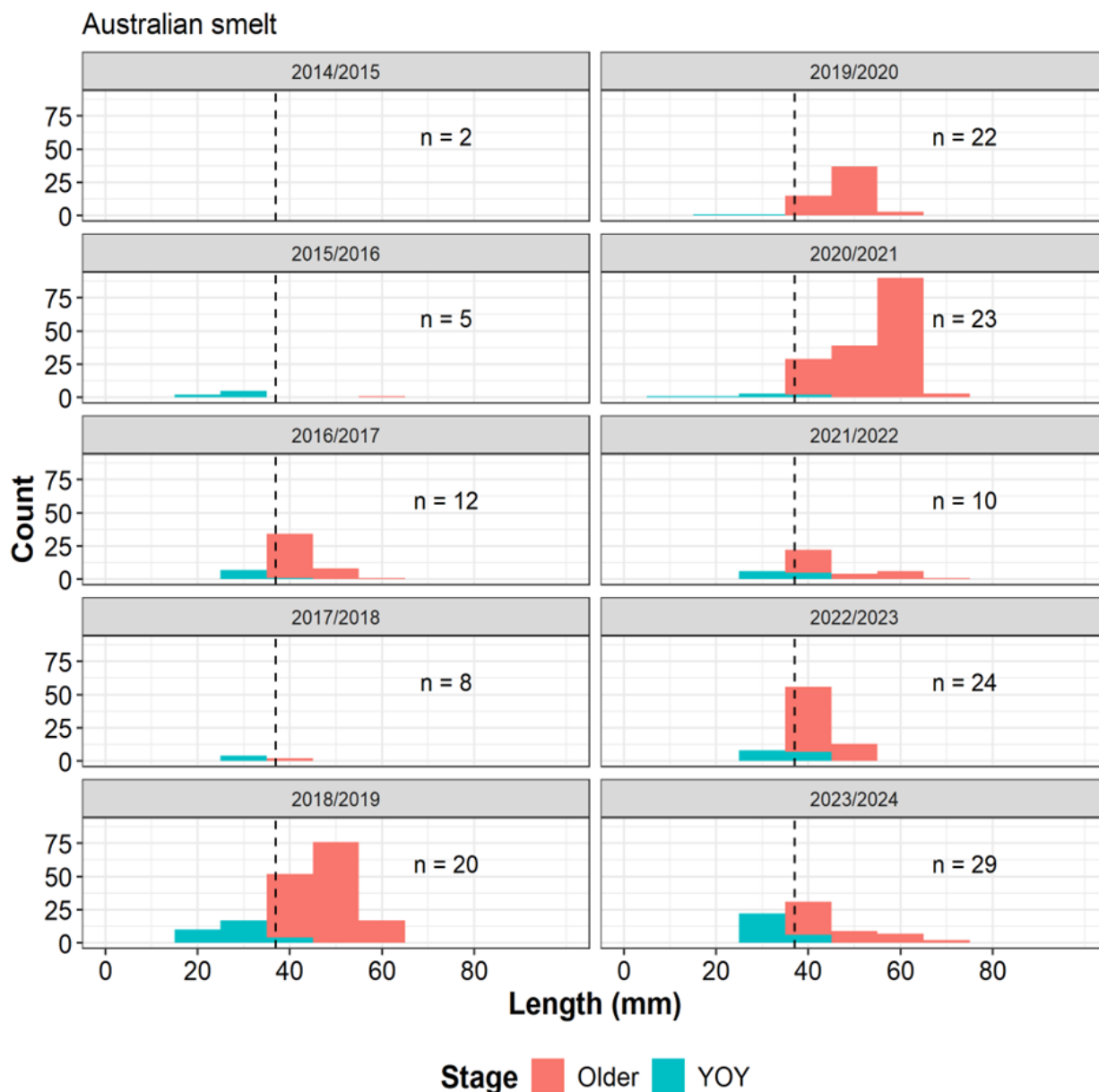


Figure 10.21: Length frequency plots for Australian smelt by sampling season in the Lower Darling WRP. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRP in a sampling season.

Summary Statement:

Evidence of regular recruitment with YOY and adult size ranges in most years. No Australian smelt were detected in 2014/15. There was reasonable recruitment and a range of size classes in 2023/24.

Temporal Trends in Abundance

The relative abundance of Australian smelt since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panel of Figure 10.22 show the abundance trends for the New South Wales Lower Darling WRP and the right-hand panel show the overall trend across the NSW MDB.

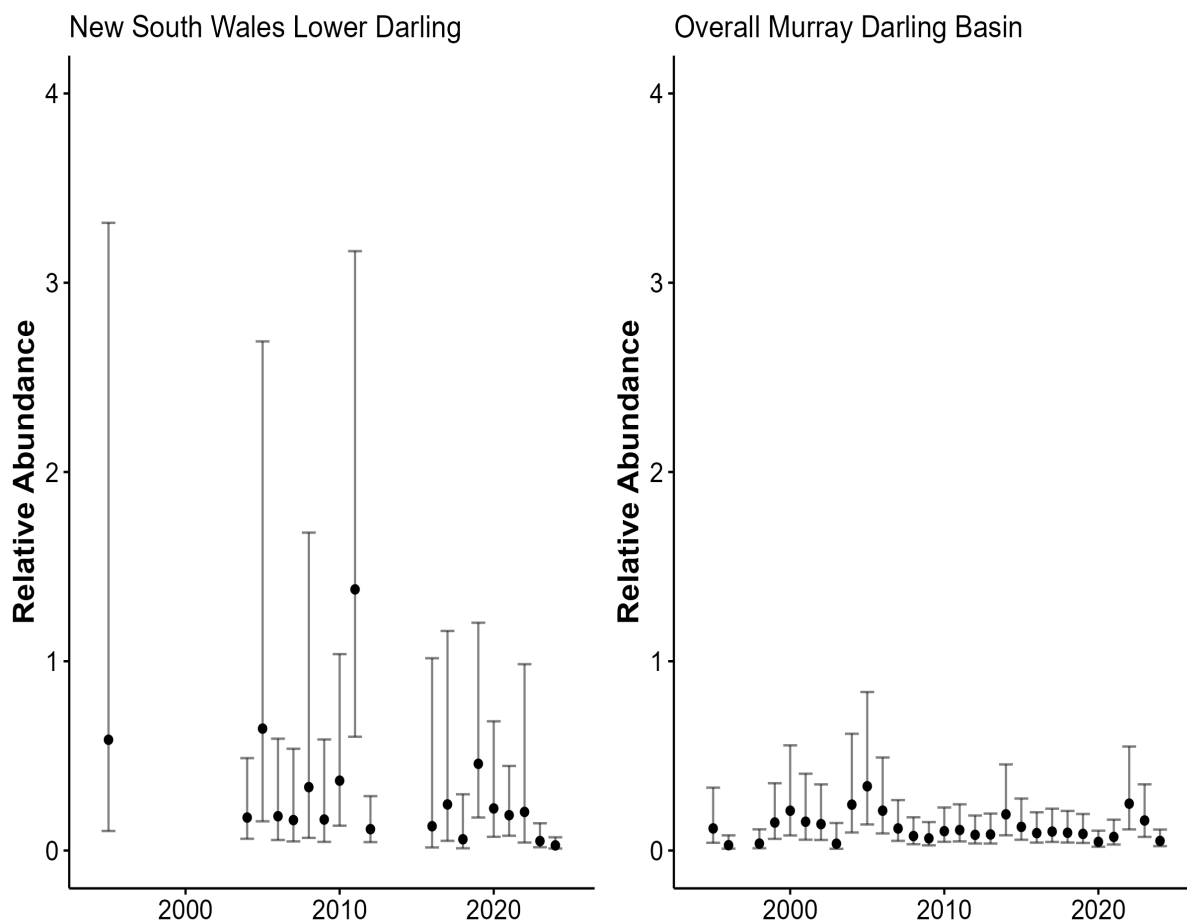


Figure 10.22: Relative abundance of Australian smelt in both the New South Wales Lower Darling WRP and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates. No modelling of biomass was done for Australian smelt.

Summary Statement:

Abundance is currently very low in the NSW Lower Darling and this is comparable to the wider NSW MDB. High abundances of Australian smelt were observed in this WRP in previous years.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in most years to 1.1 % of sampled fish to 2018/19 (Figure 10.23). The most common health issue for Australian smelt in the New South Wales Lower Darling WRPAs was Lesions, which was observed in a total of 1 fish, corresponding to <1 % of all Australian smelt measured.

Across the other NSW MDB WRPA, <1 % of Australian smelt (172 out of 27,284 Australian smelt) showed a health condition (excludes the New South Wales Lower Darling WRPAs).

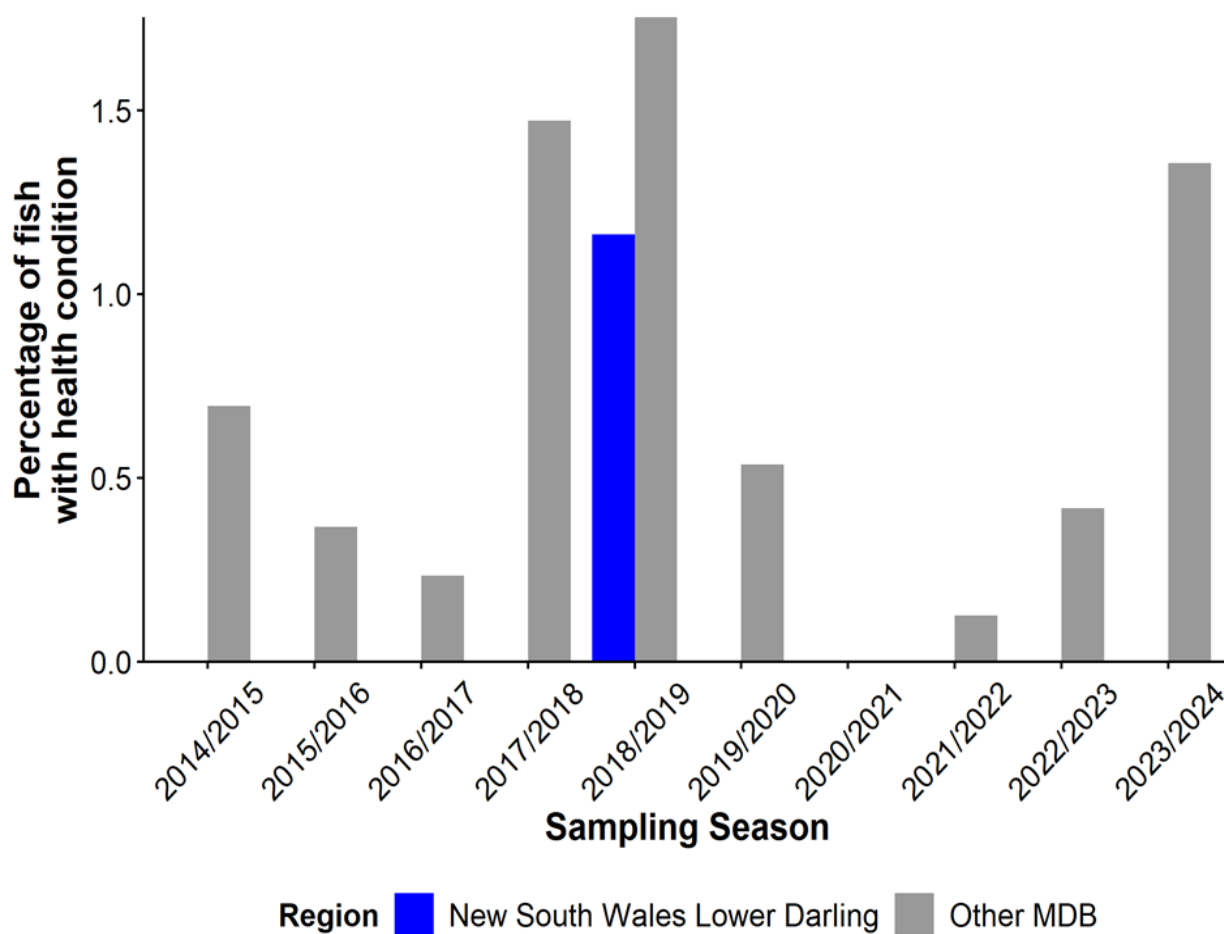


Figure 10.23: Timeseries showing the prevalence of health conditions in Australian smelt. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA.

Summary Statement:

Very few health issues were observed in Australian smelt in the NSW Lower Darling.

Distribution

Australian smelt were recorded at 53 out of 77 sites in the New South Wales Lower Darling WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 4.58 fish caught per 90 seconds of electrofishing. Figure 10.24 shows the distribution and relative abundance of Australian smelt across the New South Wales Lower Darling WRP.

Summary Statement:

Australian smelt were recorded across the NSW Lower Darling.

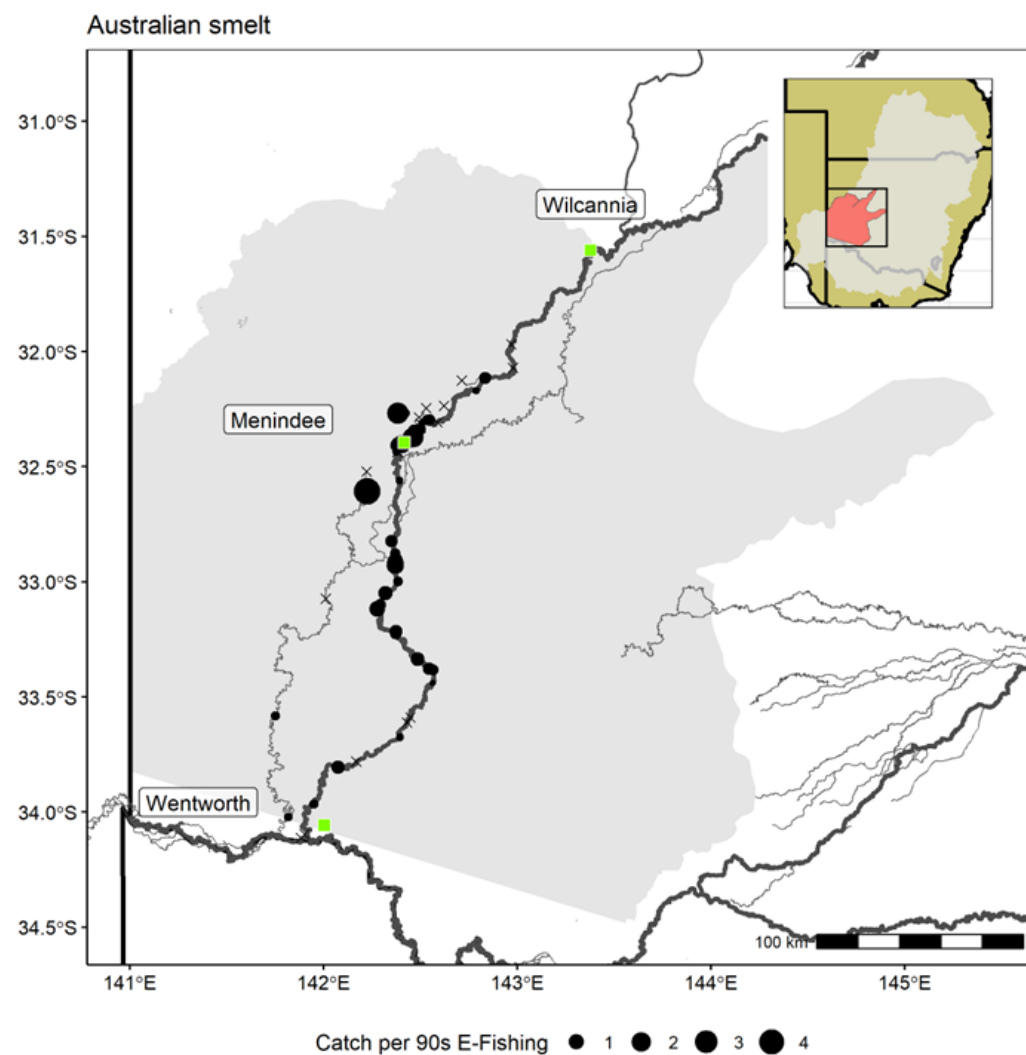


Figure 10.24: Distribution of Australian smelt sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Common carp



Population Structure

Figure 10.25 shows the observed length frequency plot for Common carp for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 1 to 1,844, and 2 % to 90 % of measured fish within a season, with a mean percentage YOY of 39 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Common carp was 55 % (32,632 out of 59,358). Common carp are not a stocked species.

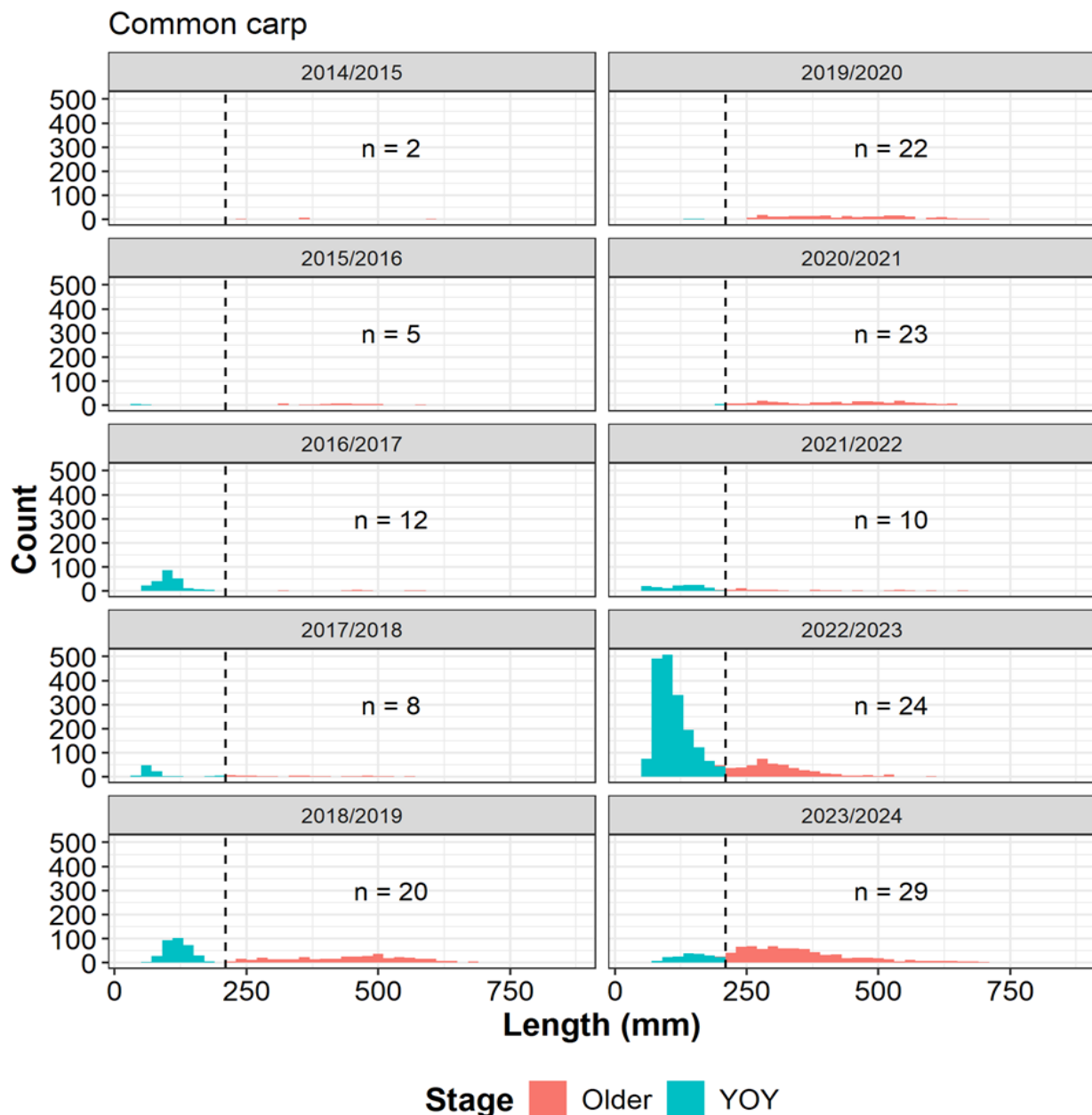


Figure 10.25: Length frequency plots for common carp by sampling season in the Lower Darling WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Moderate recruitment of in 2023/24, following very strong recruitment in 2022/23. A higher proportion of moderate size fish following the previous recruitment.

Temporal Trends in Abundance

The relative abundance and biomass of Common carp since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 10.26 show the abundance and biomass trends for the New South Wales Lower Darling WRP and the right-hand panels show the overall trends across the NSW MDB.

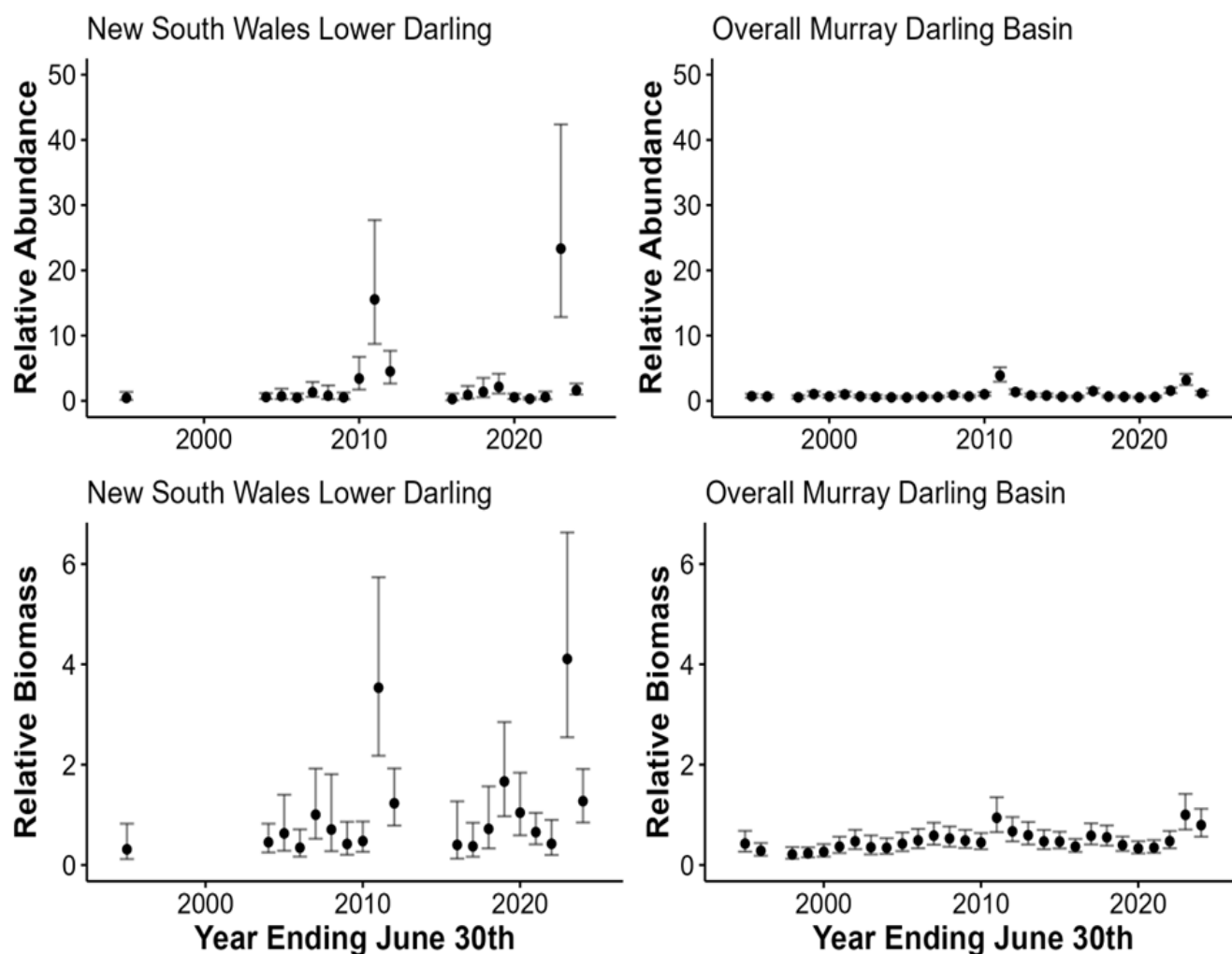


Figure 10.26: Relative abundance and biomass of Common carp in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Large increases in abundance and biomass after strong recruitment in 2022/23 have been followed by sharp declines. Abundance appears to be back at long term average but biomass remains slightly elevated.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2014/2015 to 7 % of sampled fish in 2020/2021 (Figure 10.27). The most common health issue for Common carp in the New South Wales Lower Darling water resource planning area was *Lernaea*, which was observed in a total of 59 fish, corresponding to 1 % of all Common carp measured.

Across the other WRPA's, 4 % of Common carp (2,307 out of 59,360 Common carp) showed a health condition (excludes New South Wales Lower Darling).

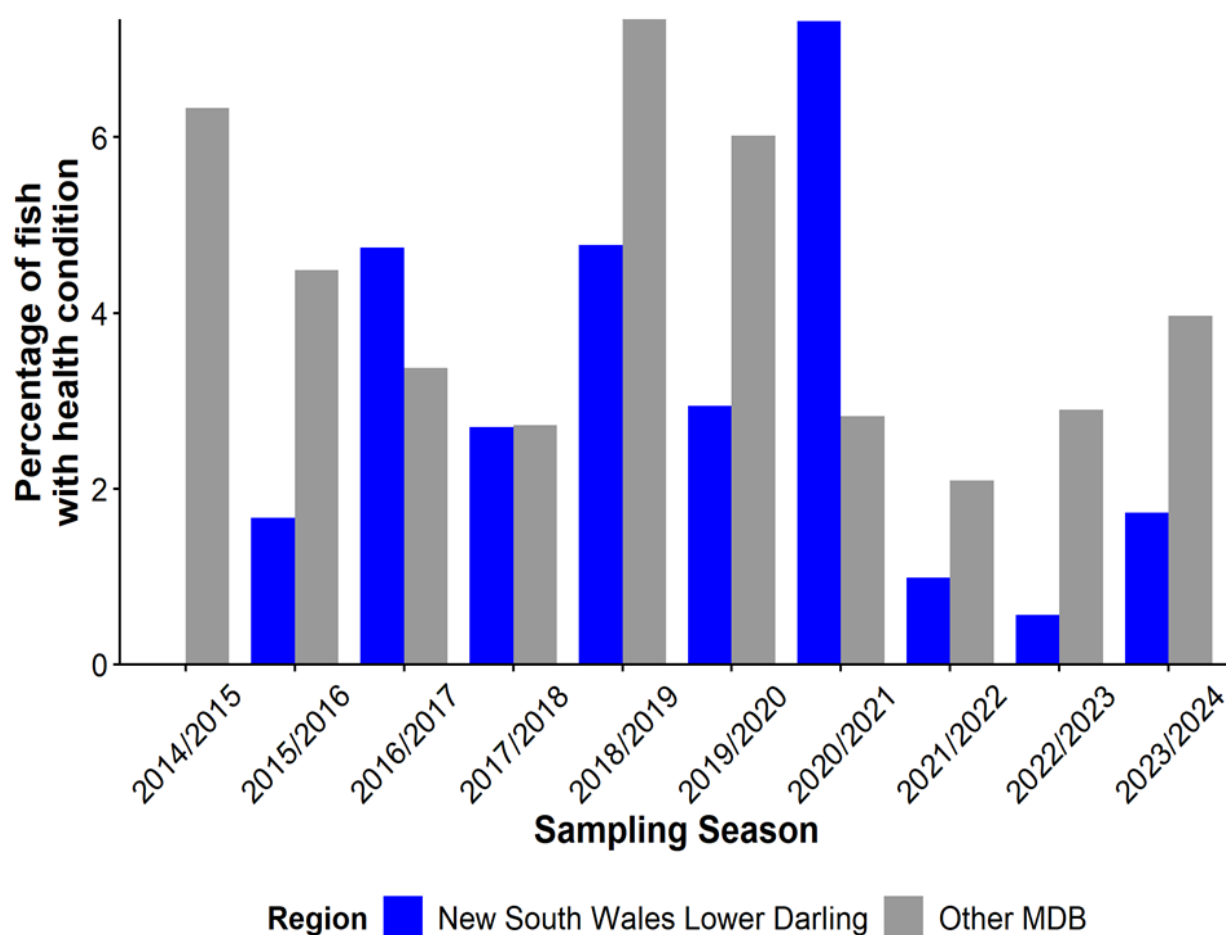


Figure 10.27: Timeseries showing the prevalence of health conditions in Common carp. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

The presence of observable health conditions for Common carp in the NSW Lower Darling was low to moderate and generally similar to the wider NSW MDB.

Distribution

Common carp were recorded at 73 out of 77 sites in the New South Wales Lower Darling WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 55.41 fish caught per 90 seconds of electrofishing. Figure 10.28 shows the distribution and relative abundance of Common carp across the New South Wales Lower Darling WRP

Summary Statement:

Common carp were found in relatively high abundance across the NSW Lower Darling region.

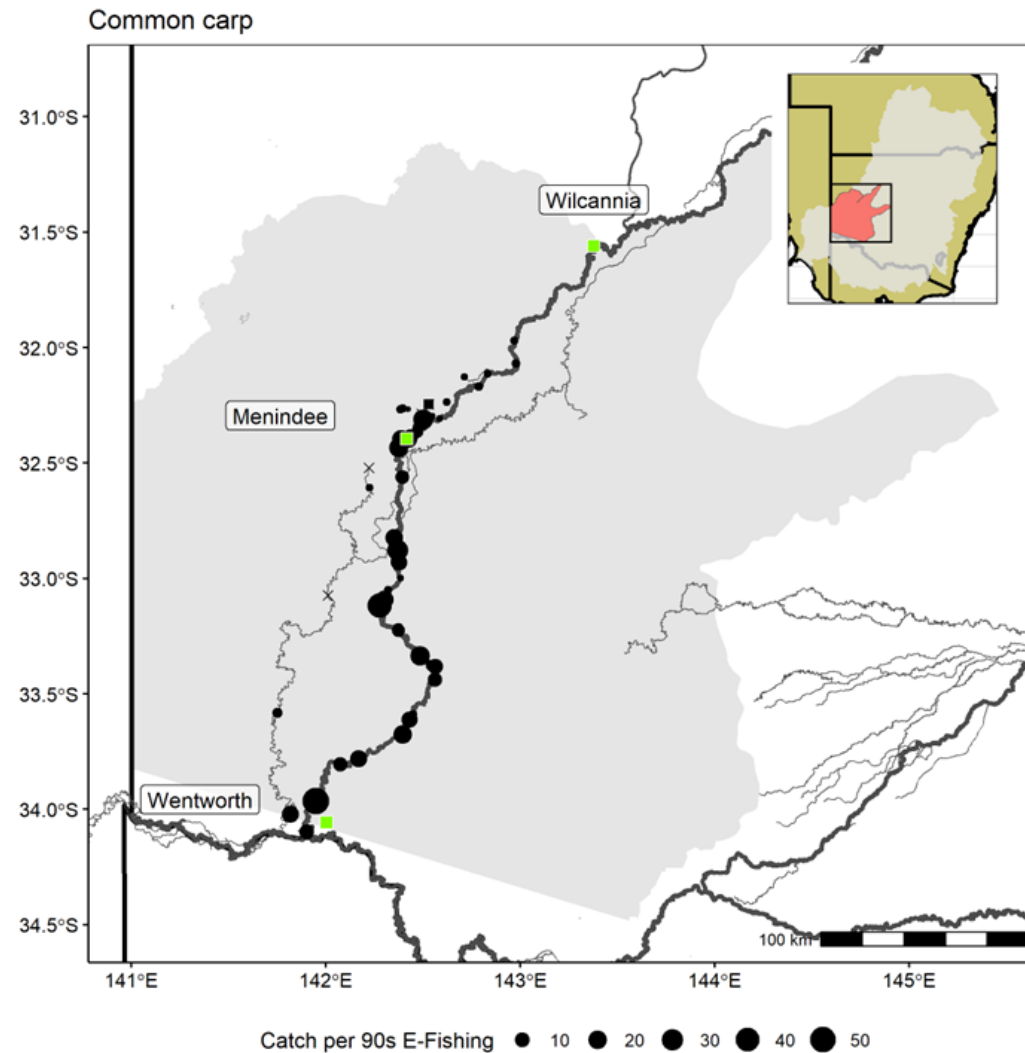


Figure 10.28: Distribution of Common carp sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X Green squares represent key towns..

Threatened Species

The following table (Table 10.6) shows the fish species listed under either the *NSW Fisheries Management Act 1994* (FMA) or the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) which were observed during standardised electrofishing surveys in the New South Wales Lower Darling Water Resource Planning Area during the reporting period. A list of all threatened fish species observed by NSW DPIRD Fisheries (as part of any sampling program in any area) is provided in Table 10.10.

Table 10.6: Listed species which were observed in this region during the sampling period. (* = FMA, # = EPBC)

Species	Common name	Total caught (observed)
<i>Ambassis agassizii</i>	Olive perchlet*	1 (0)
<i>Bidyanus bidyanus</i>	Silver perch*#	18 (0)
<i>Maccullochella peelii</i>	Murray cod#	349 (115)

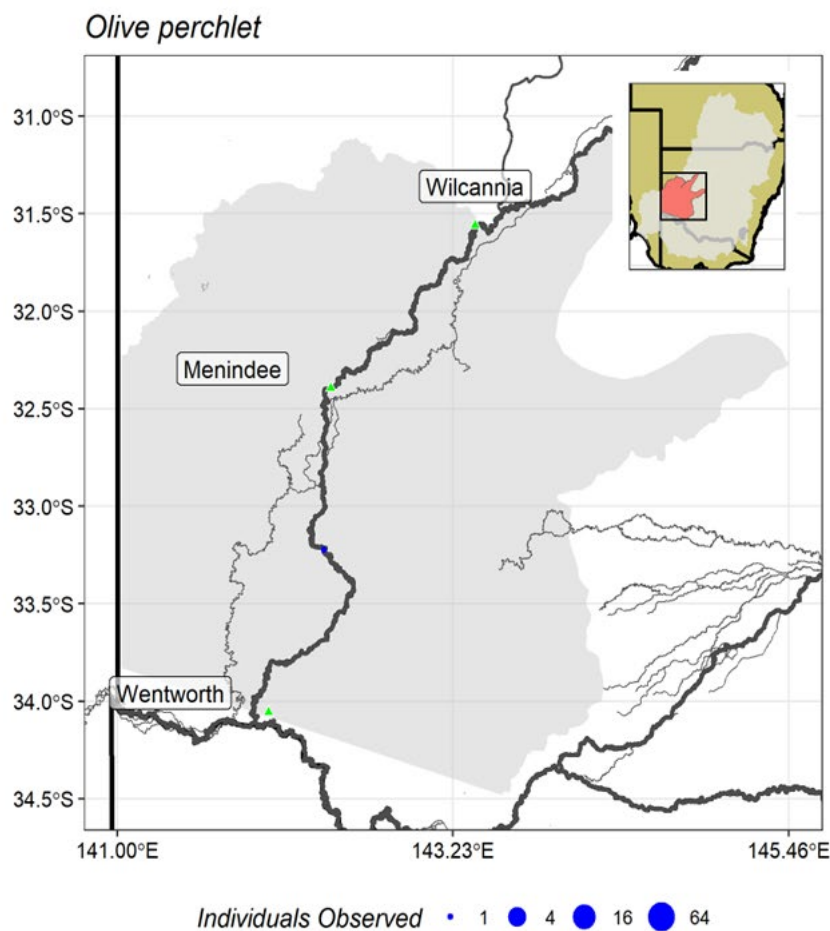


Figure 10.29: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Lower Darling WRP. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals.

Summary Statement:

One Olive perchlet was caught in the Lower Darling near Moorara in 2023 during electrofishing sampling. Another Olive perchlet was observed in 2022 in a fyke net in Balaka Lake (fyke net data is not included in most of this report but see Table 10.11).

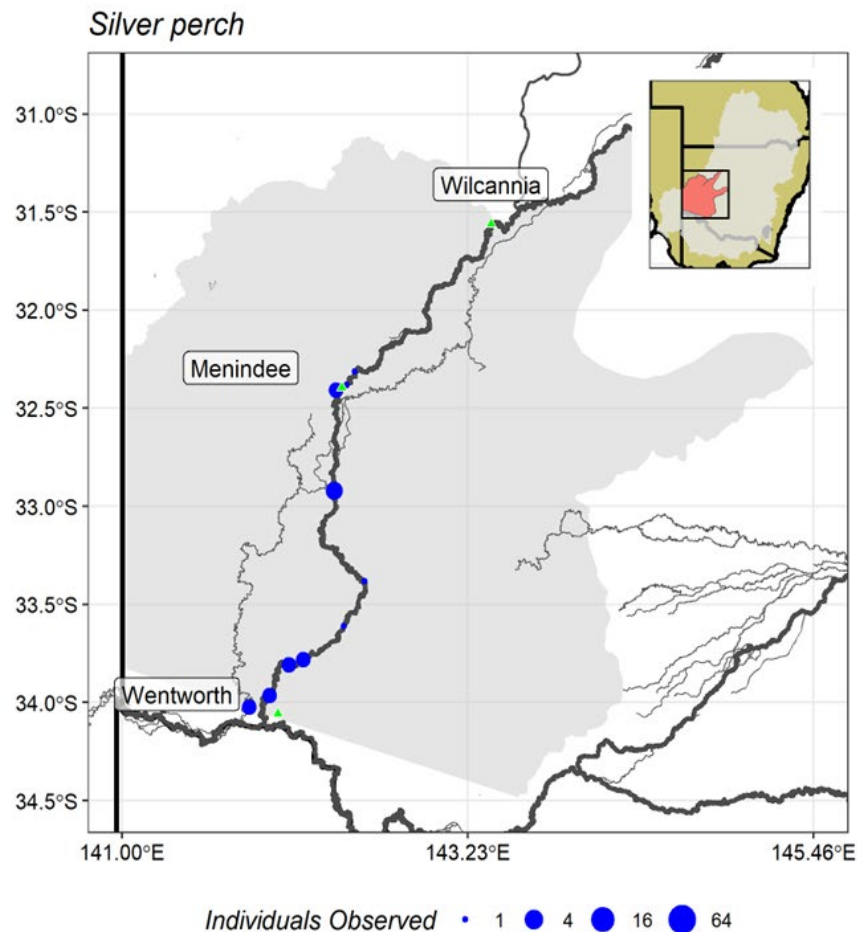


Figure 10.30: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Lower Darling WRP. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals.

Summary Statement:

A total of 13 Silver perch were caught at 7 sites in the New South Wales Lower Darling region. This includes 1 in 2016/17, 5 in 2018/19, 1 in 2019/20, 2 in 2020/21, 2 in 2021/22, 2 in 2022/23 and 5 in 2023/24.

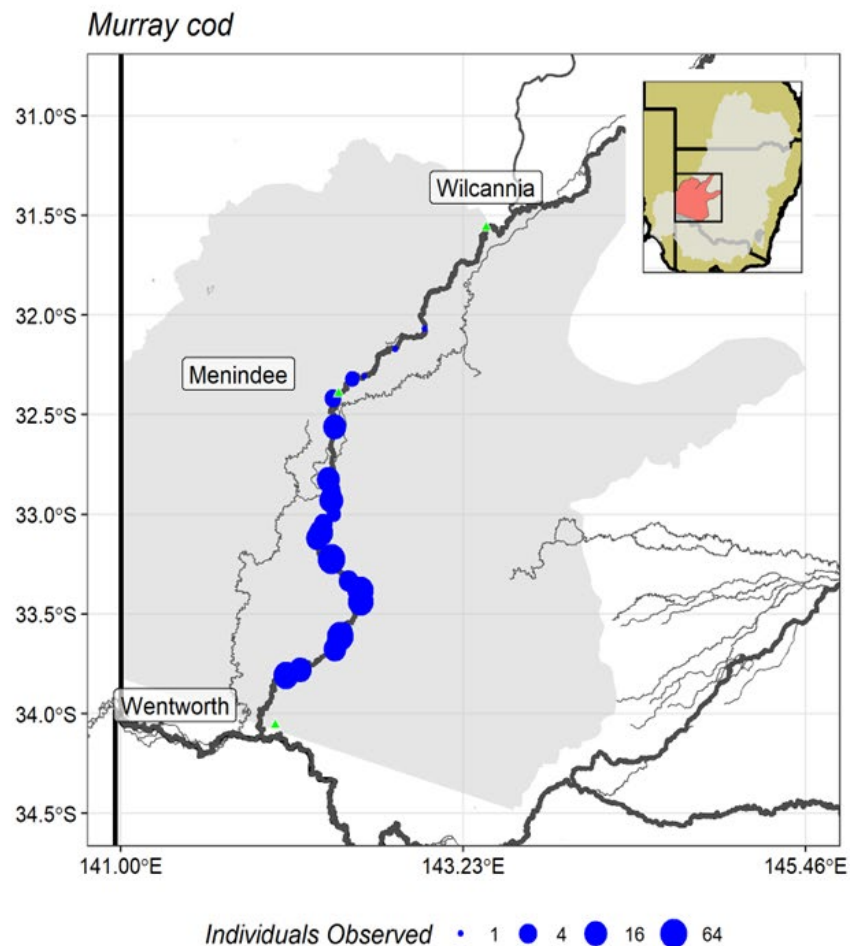


Figure 10.31: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Lower Darling WRPA. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals. Note the lower image shows a juvenile Murray cod.

Summary Statement:

A total of 464 Murray cod were observed at 33 sites in the New South Wales Lower Darling region, mostly in the southern region.

Appendix

This report contains data from the projects listed in Table 10.7.

Table 10.7 Projects included in this report. Sampling Events show the total number of sampling events included from each project. Sampling Seasons shows which sampling seasons each project contributed data to.

Project Name	Sampling Seasons	Sampling Events
Basin Plan Environmental Outcomes Monitoring	2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020	33
Basin Plan Environmental Outcomes Monitoring 2	2022/2023, 2023/2024	24
Darling E flows	2020/2021, 2021/2022, 2022/2023, 2023/2024	42
Darling River Health	2023/2024	16
Lower Darling Recovery	2018/2019, 2019/2020, 2020/2021, 2022/2023, 2023/2024	76
Murray-Darling Basin Fish Surveys	2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019, 2020/2021, 2021/2022, 2022/2023, 2023/2024	18

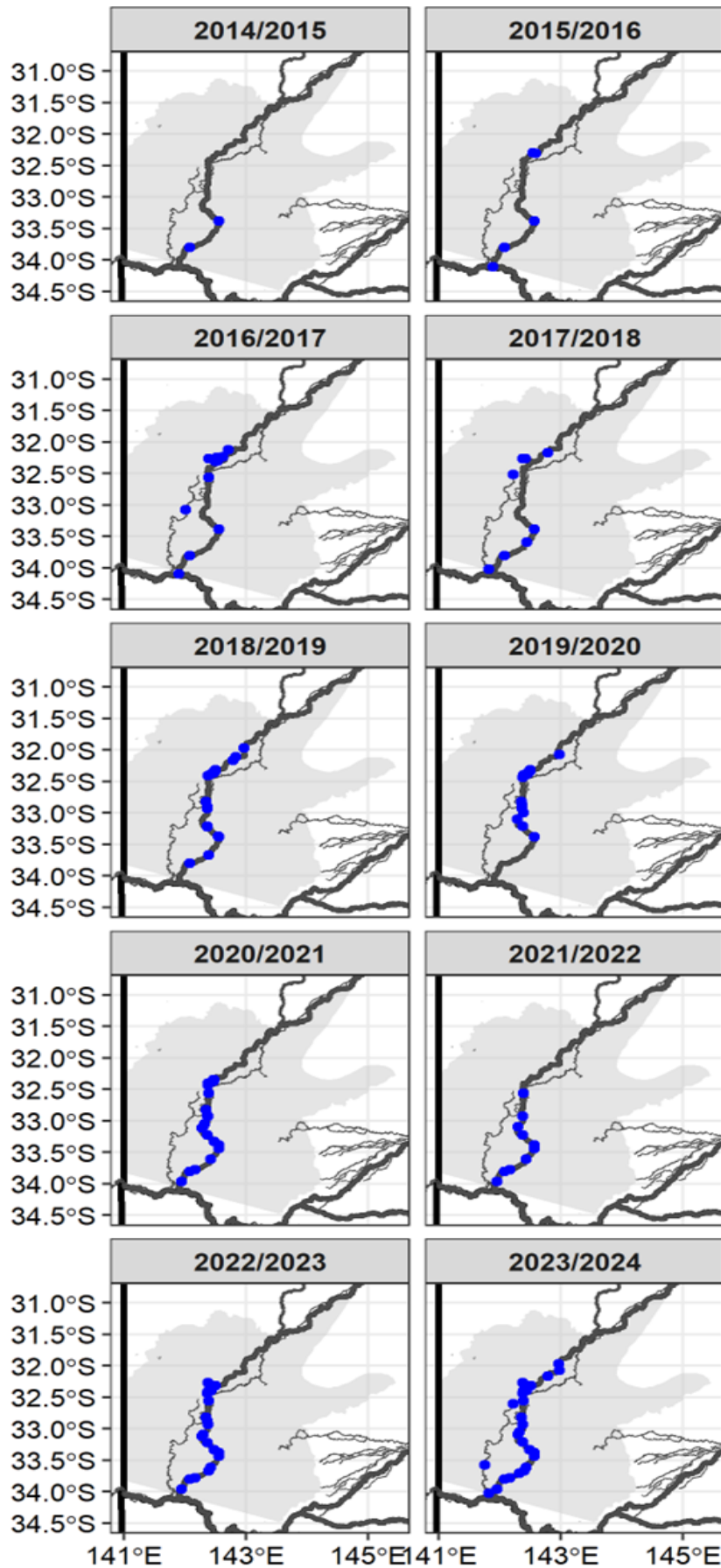


Figure 10.32: Sites sampled and included in this report by sampling season in the Lower Darling WRP. Dry sites are not shown.

Table 10.8 shows all species detected during this survey period as part of standardised monitoring projects (see Table 10.7). Note there are variations in effort between sampling seasons so this information should be considered in conjunction with Table 10.1. The Expected from Modelling column identifies species which are possible to occur based upon MaxENT habitat modelling (likelihood threshold > 0.33; NA represents no modelling was undertaken). Species that were possible from the modelling but not observed during standardised sampling in the New South Wales Lower Darling WRPAs were: Murray hardyhead, Flat-headed galaxias, Macquarie perch, Trout cod, Southern purple-spotted gudgeon, Flathead gudgeon, Dwarf flathead gudgeon, Freshwater catfish. It should be noted that the MaxENT modelling models habitat availability and is not always a reliable index of abundance, it merely indicates possible distribution based upon habitat. A full list of species observed during this period across the standardised monitoring protocols and sampling methods is presented in Table 10.11.

Table 10.8: Total number caught of each species by sampling season in the Lower Darling WRPAs.

Common name	Expected from modelling	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Australian smelt	YES	0	8	50	6	172	58	166	39	93	71
Bony herring	YES	272	160	1,665	858	2,431	393	1,902	490	1,263	2,078
Carp-gudgeon species complex	YES	36	621	225	1,380	1,898	204	266	28	1	181
Common carp	NA	21	60	311	239	796	237	245	318	16,108	1,258
Common carp - Goldfish hybrid	NA	0	0	0	0	0	0	0	0	1	0
Eastern gambusia	NA	1	16	159	71	88	4	21	7	20	3
Golden perch	YES	4	14	42	23	233	78	265	122	246	257
Goldfish	NA	1	48	16	10	137	5	9	16	592	44
Murray cod	YES	12	12	5	11	96	20	119	17	17	40
Murray-Darling rainbowfish	YES	0	0	6	0	0	0	9	3	1	1
Olive perchlet	YES	0	0	0	0	0	0	0	0	1	0
Redfin	YES	0	0	0	0	0	0	0	0	0	2
Silver perch	YES	0	0	1	0	5	1	2	2	2	5
Spangled perch	YES	0	0	2	0	0	0	0	3	185	19
Unspecked hardyhead	YES	0	1	4	0	0	0	1	0	0	0

The following table summarises the sampling methods for each species caught (Table 10.9).

Table 10.9: Total catch of each species by sampling method in the Lower Darling WRP.

Common name	Backpack Electrofishing	Bait Trap	Boat Electrofishing
Australian smelt	0	2	660
Bony herring	4	1	11,505
Carp-gudgeon species complex	7	4,213	620
Common carp	10	385	19,225
Common carp - Goldfish hybrid	0	0	1
Eastern gambusia	2	13	375
Golden perch	0	4	1,280
Goldfish	1	6	872
Murray cod	0	0	349
Murray-Darling rainbowfish	0	0	20
Olive perchlet	0	0	1
Redfin	0	0	2
Silver perch	0	0	18
Spangled perch	2	11	196
Unspecked hardyhead	0	0	6

Table 10.10: Listed threatened species recorded in the Murray-Darling Basin (from the NSW DPIRD Fisheries Freshwater Ecosystem research database). Species are listed under either the NSW Fisheries Management Act 1994 (FMA) or the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC).

Genus, species	Common Name	EPBC Status	FMA Status
<i>Ambassis agassizii</i>	Agassiz's glassfish, olive perchlet, western New South Wales population	NA	Endangered Population
<i>Bidyanus bidyanus</i>	Silver Perch, Bidyan	Endangered	Vulnerable
<i>Craterocephalus fluviatilis</i>	Murray Hardyhead	Endangered	Critically Endangered
<i>Galaxias rostratus</i>	Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow	Critically Endangered	Critically Endangered
<i>Galaxias tantangara</i>	Stocky Galaxias	NA	Critically Endangered
<i>Maccullochella macquariensis</i>	Trout Cod	Endangered	Endangered
<i>Maccullochella peelii</i>	Murray Cod	Vulnerable	NA
<i>Macquaria australasica</i>	Macquarie Perch	Endangered	Endangered
<i>Mogurnda adspersa</i>	Southern Purple Spotted Gudgeon	NA	Endangered
<i>Nannoperca australis</i>	Southern Pygmy Perch	Vulnerable	Endangered
<i>Tandanus tandanus</i>	Freshwater catfish, eel tailed catfish, Murray-Darling Basin population	NA	Endangered Population

Table 10.11 shows all species detected during this survey period across all programs and methods. Due to variations in project methods protocols, this data is presented only to give a complete list of species observed in the region. The Expected from Modelling column identifies species which are possible to occur based upon MaxENT habitat modelling (likelihood threshold > 0.33; NA represents no modelling was undertaken). Species that were possible from the modelling but not observed during standardised sampling in the New South Wales Lower Darling WRPAs were: Murray hardyhead, Flat-headed galaxias, Macquarie perch, Trout cod, Southern purple-spotted gudgeon, Flathead gudgeon, Dwarf flathead gudgeon, Freshwater catfish. It should be noted that the MaxENT modelling actually models habitat availability and is not always a reliable index of abundance, it merely indicates possible distribution based upon habitat. A list of species caught as part of standardised monitoring during this period is in Table 10.8.

Table 10.11: Total catch of each species by all sampling programs and all methods in the Lower Darling WRPAs. Note these include projects with sampling not representative of the community and the data should be used with caution.

Common name	Expected from modelling	2014/ 15	2015/ 16	2016/ 17	2017/ 18	2018/ 19	2019/ 20	2020/ 21	2021/ 22	2022/ 23	2023/ 24
Australian smelt	YES	0	8	50	6	172	58	352	2113	975	555
Bony herring	YES	272	160	1,701	858	2,431	393	3,140	2,244	1,611	2,214
Carp gudgeon species complex	YES	36	621	225	1,380	1,898	204	2,015	2,580	983	840
Common carp	NA	21	60	313	239	796	237	751	25,722	19,299	3,406
Common carp - Goldfish hybrid	NA	0	0	0	0	0	0	0	0	1	0
Eastern gambusia	NA	1	16	159	71	88	4	287	651	73	543
Golden perch	YES	4	14	42	23	233	78	714	574	419	271
Goldfish	NA	1	48	17	10	137	5	9	19	594	511
Murray cod	YES	12	12	5	11	96	20	119	17	17	40
Murray-Darling rainbowfish	YES	0	0	6	0	0	0	9	3	1	1
Olive perchlet	YES	0	0	0	0	0	0	0	1	1	0
Redfin	YES	0	0	0	0	0	0	0	0	0	2
Silver perch	YES	0	0	1	0	5	1	2	2	2	5
Spangled perch	YES	0	0	2	0	0	0	13	11	186	28
Unspecked hardyhead	YES	0	1	4	0	0	0	1	0	0	0

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