

CHAPTER 8

**Basin Plan Fish Monitoring Summary (2015/16 – 2024/25):
New South Wales Border Rivers Water Resource Planning
Area**

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8.1 Citation Details

Please cite the overall report when referring to this chapter:

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Report cover image credit: Jason Thiem, NSW DPIRD; Fish images credit: Gunther Schmida

8.2 Acknowledgements

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8.3 Introduction

This report spans 2015/16 to 2024/25 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, 2025b). This report focusses on the New South Wales Border Rivers Water Resource Planning Area (WRPA) shown in Figure 8.1.

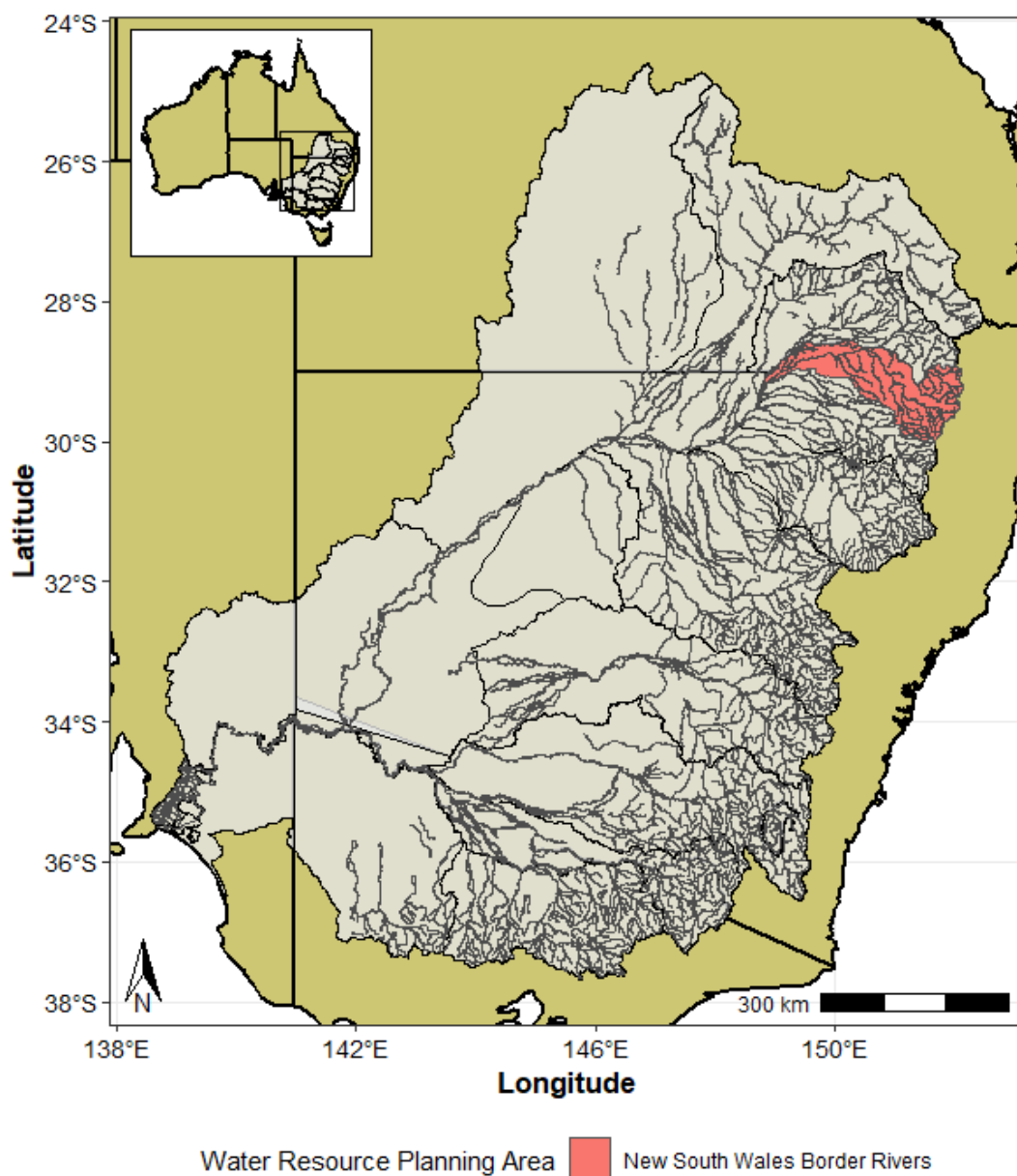


Figure 8.1: Murray-Darling Basin with the key region of this report highlighted. Inset map shows the whole of Australia with a box around the MDB.

8.3.1 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 Border Rivers 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
- Bony herring
- Australian smelt
- Common carp

Population structure information includes length frequency plots of observed 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 Border Rivers 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 Border Rivers WRPAs and greater MDB (excluding the New South Wales Border Rivers 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 Border Rivers 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.

8.3.2 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 the bait traps informing the distribution of small bodied threatened 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 each chapter of this report compiles data from multiple projects, there is some variation in how sites were chosen and the effort of sampling conducted each year (Table 8.1). Details of which projects contributed data to this report can be seen in Table 8.7. 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 that are set in areas of the sampling reach that are not electrofished. Most sampling occurred between the months of September and May.

Table 8.1: Sampling effort (Number of sites sampled) each sampling season in the New South Wales Border Rivers WRPA. 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	Number of Hybrid Sites	Total
2015/2016	20	3	2	25
2016/2017	27	1	0	28
2017/2018	23	3	1	27
2018/2019	27	8	3	38
2019/2020	11	14	8	33
2020/2021	15	7	1	23
2021/2022	6	6	1	13
2022/2023	23	7	1	31
2023/2024	16	6	1	23
2024/2025	24	9	5	38

The sites sampled during the reporting period are shown in Figure 8.2. A breakdown of sites sampled each sampling season is shown in the Appendix (Figure 8.38).

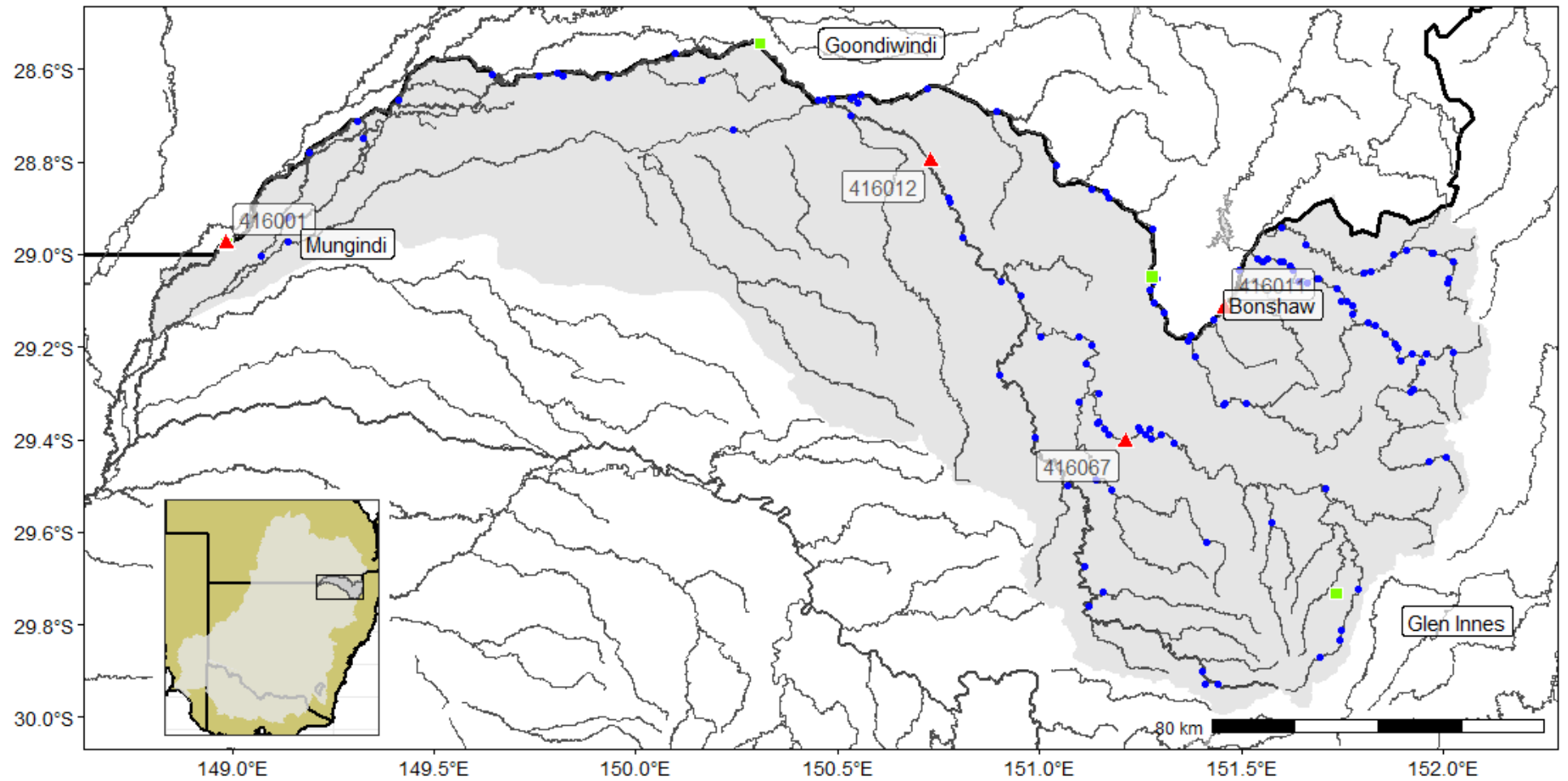


Figure 8.2: Sites (dots) sampled during the reporting period. Red triangles show key flow gauges along with their gauge ID number. Green squares show key towns

Each sampling method has a different effectiveness at sampling each species. Table 8.2 shows the total numbers of each key species caught by each method.

Table 8.2: Number of each key species caught by sample method over the 10 year period. Further data on total catch is provided in the Appendix.

Common name	Backpack Electrofishing	Boat Electrofishing	Bait Trap
Australian smelt	14	808	0
Bony herring	7	6,164	1
Common carp	93	2,200	4
Freshwater catfish	232	298	1
Golden perch	3	664	54
Murray cod	173	2,130	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 8.3 shows the number of biological measurements taken each year for the key species.

Table 8.3: Number of biological measurements taken for the key species each sampling season.

Sampling Season	Australian smelt	Bony herring	Common carp	Freshwater catfish	Golden perch	Murray cod
2015/2016	128	492	241	29	95	323
2016/2017	1	422	223	57	63	235
2017/2018	48	914	337	76	131	563
2018/2019	103	357	261	81	71	428
2019/2020	72	250	112	37	13	97
2020/2021	42	24	135	78	15	69
2021/2022	75	25	97	21	18	39
2022/2023	19	147	262	29	52	170
2023/2024	50	284	289	19	75	158
2024/2025	25	401	300	103	148	208

8.4 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, 2019 states it was the warmest year on record, meaning 2019 was the warmest year on record up to and including 2019 but not including more recent years.

8.4.0.1 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.

8.4.0.2 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.

8.4.0.3 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.

8.4.0.4 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.

8.4.0.5 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.

8.4.0.6 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.

8.4.0.7 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.

8.4.0.8 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.

8.4.0.9 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.

8.4.0.10 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. Mean maximum temperatures in 2024 were above average to very much above across the state, and highest on record around southern parts of the South West Slopes and Snowy Mountains districts.

8.4.0.11 2025

The 2025 NSW climate summary is not yet available but in early 2026 it will be available [here](#).

8.5 Flow Data

Below shows a summary of flow data from a variety of flow gauges in the New South Wales Border Rivers WRPA (Figure 8.3).

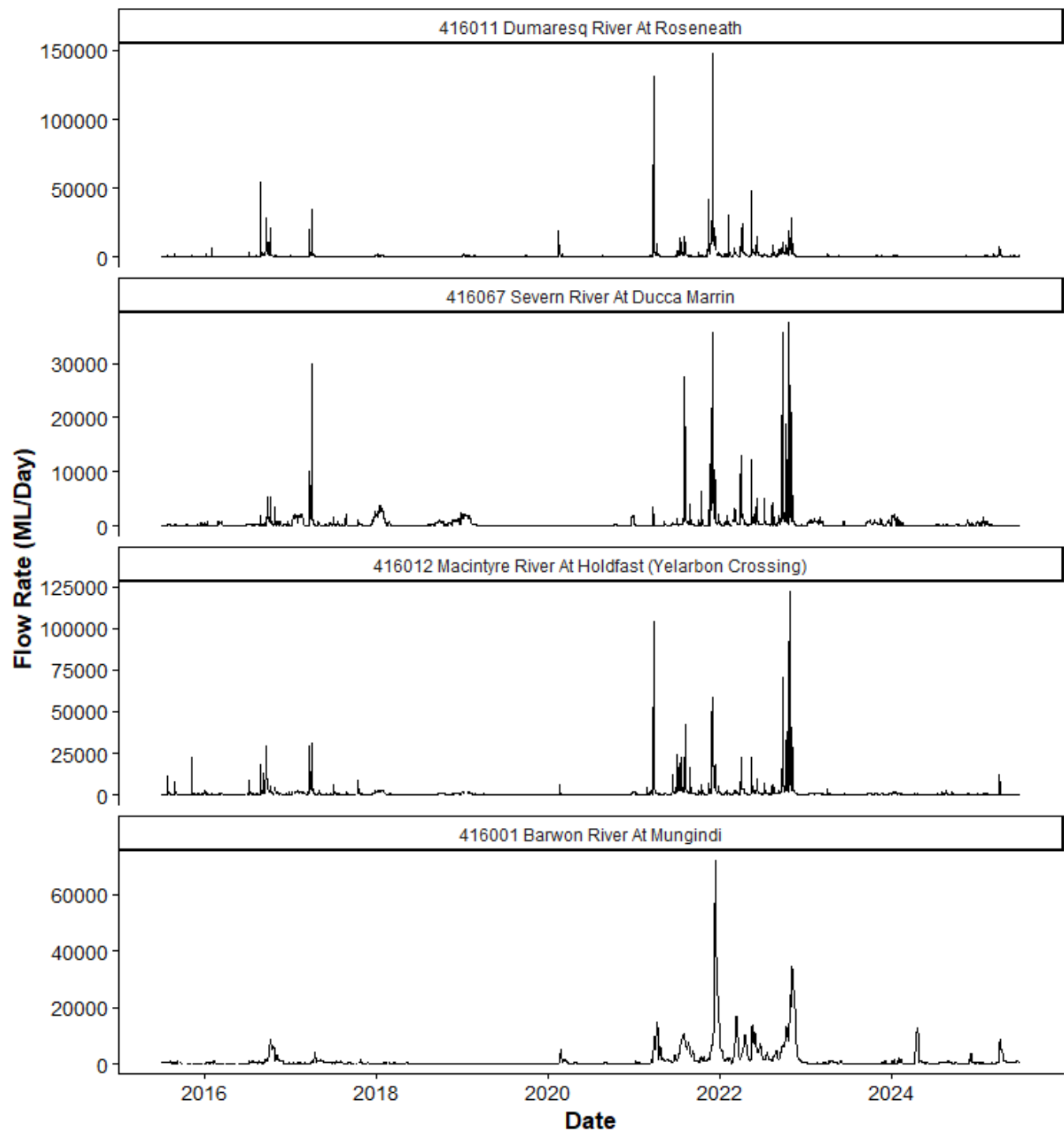


Figure 8.3: Flow data from various gauges in the New South Wales Border Rivers WRPA over the reporting period. Gauge locations can be seen on Figure 8.2. Note the differing scales on the y-axis.

Water temperature data, where available, are also shown in Figure 8.4.

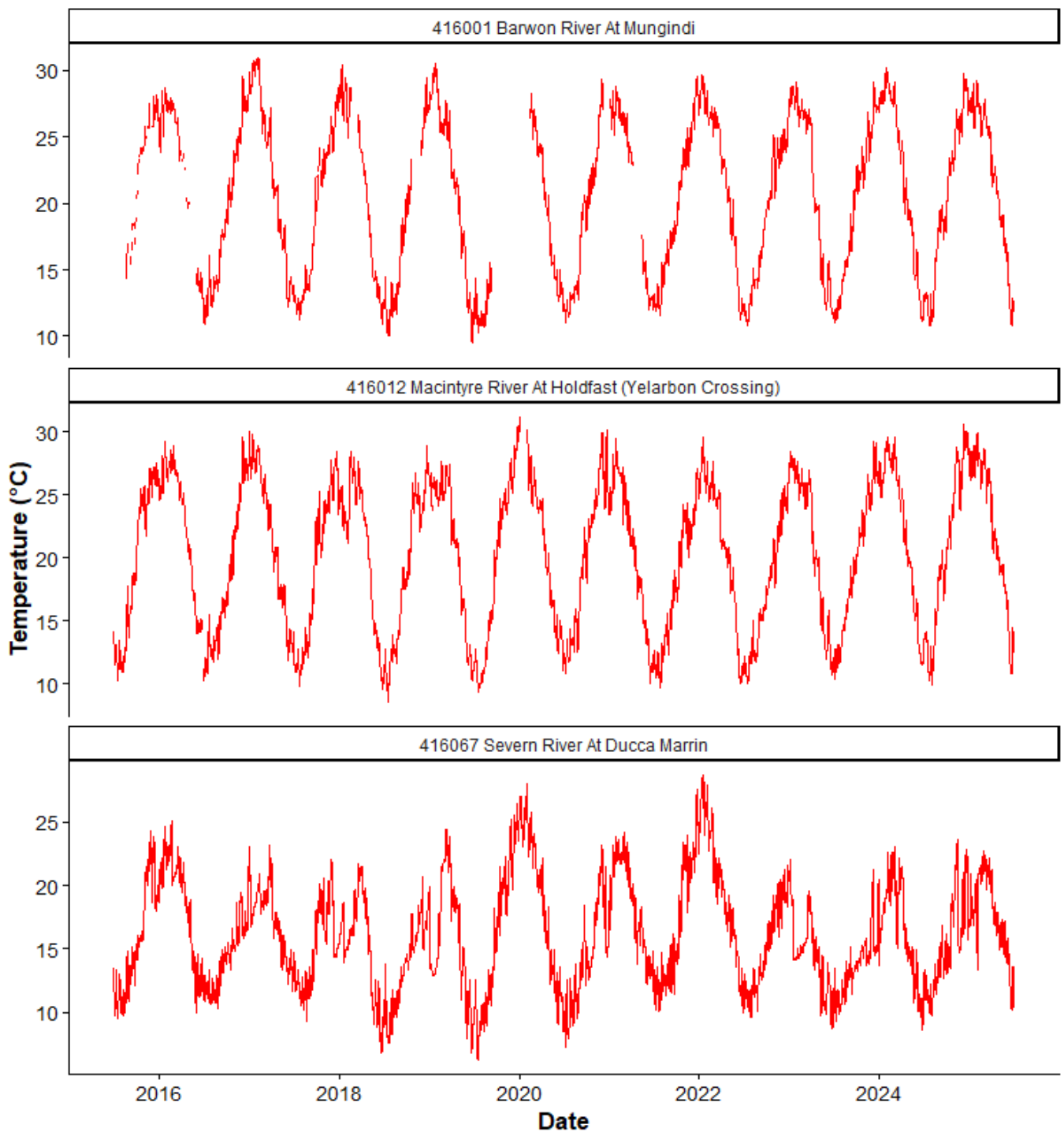


Figure 8.4: Water temperature data from various gauges in the New South Wales Border Rivers WRPA over the reporting period. Gauge locations can be seen on Figure 8.2. Note the differing scales on the y-axis.

8.6 Species Diversity

A total of 20 fish species were observed across the New South Wales Border Rivers WRPA including five alien species. Figure 8.5 shows the number of native and alien species found at each site. The full list of species caught and observed is presented in Table 8.8.

8.6.0.1 Summary Statement:

Native diversity was slightly higher in the central area of the NSW Border Rivers compared to other areas. Alien diversity was generally consistent across the region.

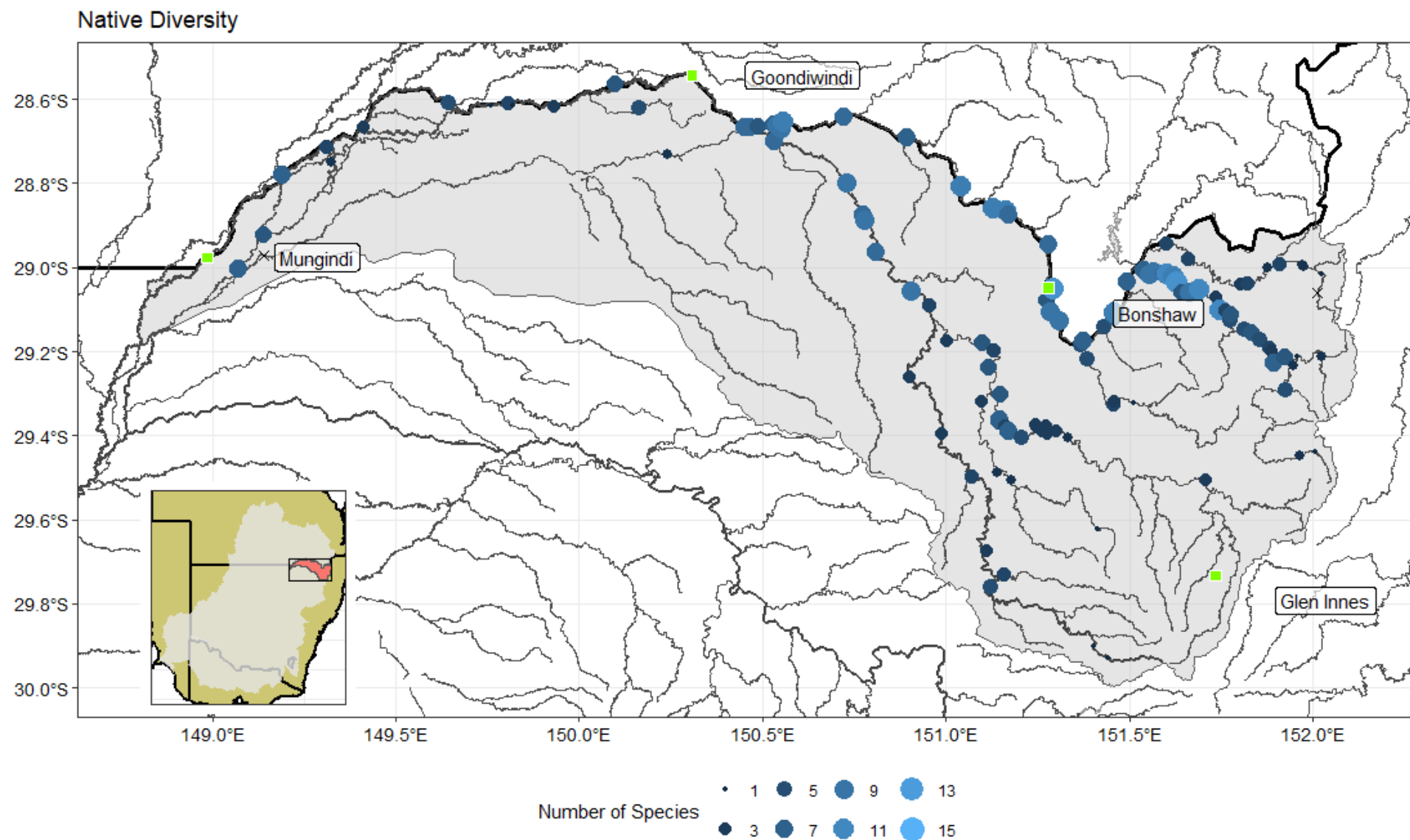


Figure 8.5: Native diversity across all sampling sites. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Green squares show key towns. Dry sites are excluded.

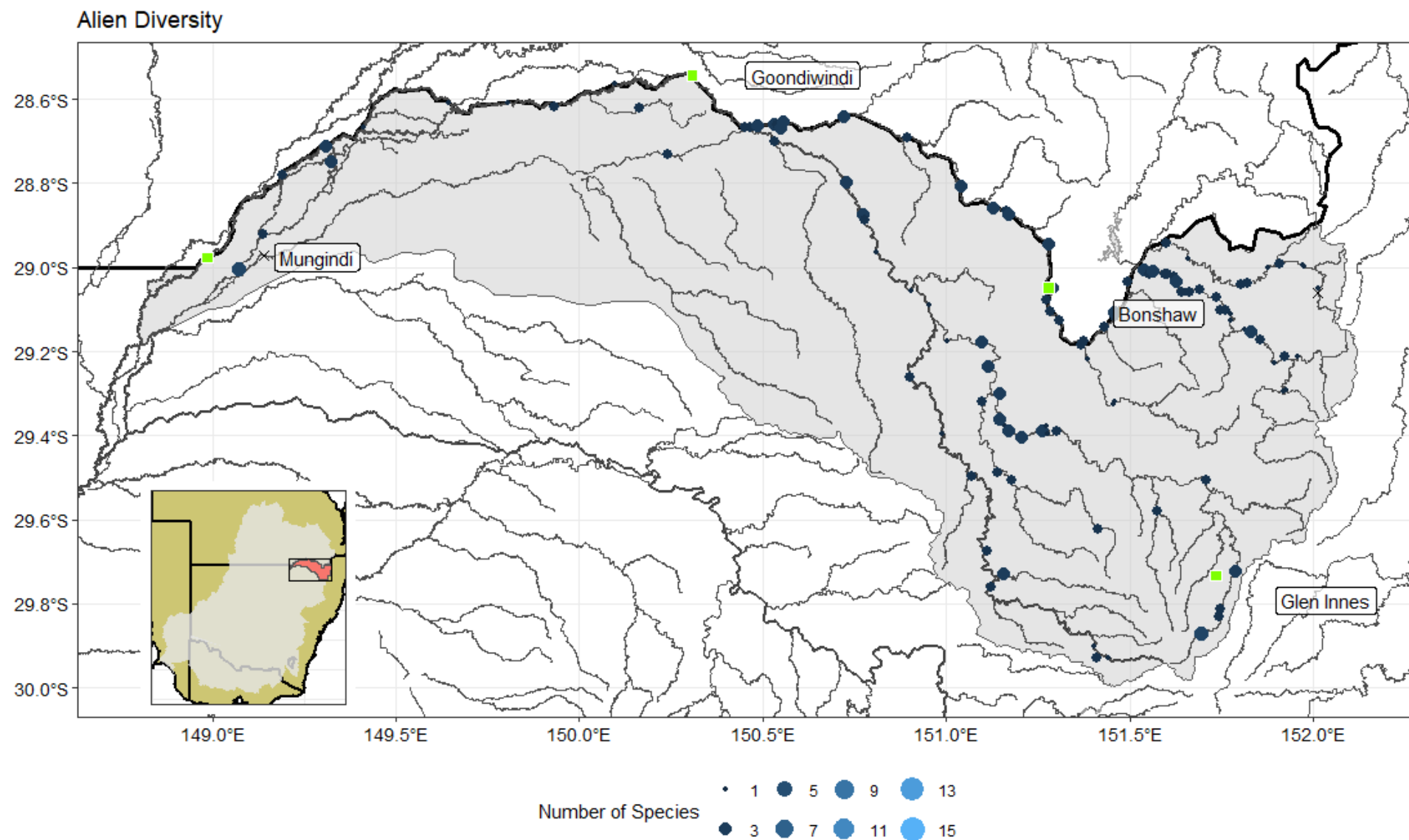


Figure 8.6: Alien diversity across all sampling sites. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Green squares show key towns. Dry sites are excluded.

8.7 Murray cod



8.7.1 Population Structure

Figure 8.7 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 1 to 83, and 1% to 23% of measured fish within a season, with a mean percentage YOY of 8%.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Murray cod was 12% (1,103 out of 9,141).

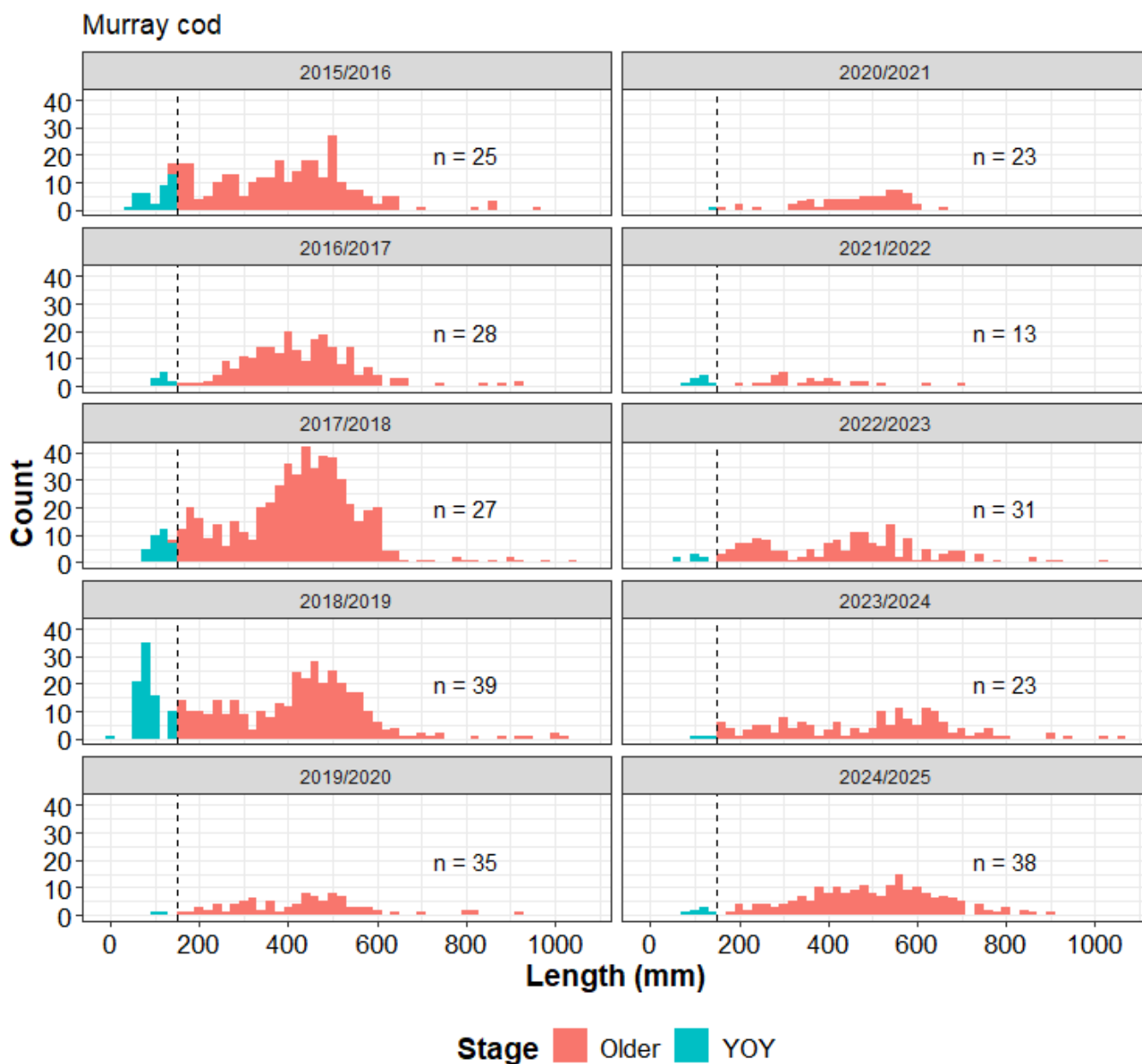


Figure 8.7: Length frequency plots for Murray cod by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.7.1.1 Summary Statement:

Recruitment evident in most years with possible recruitment failures in 2019/20 and 2020/21. A good range of size classes including YOY were observed in both 2024/25 but recruitment appears to have been low since 2018/19.

8.7.1.2 Stocking

A total of 465,130 Murray cod were stocked into the waterways of the New South Wales Border Rivers WRPA during the reporting period. Of these fish, 372,138 (80%) were stocked into impoundments while 92,992 (20%) were stocked into rivers or creeks. Table 8.4 shows the detailed breakdown of stocking by season, location and life stage while Figure 8.8 shows the locations of stocking.

Table 8.4: Number and life stage of stocked Murray cod each sampling season.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2015/2016	Impoundment	Fry	20,950
2015/2016	River/Creek	Fry	11,070
2016/2017	Impoundment	Fingerling	3,898
2016/2017	Impoundment	Fry	47,000
2016/2017	River/Creek	Fingerling	7,360
2016/2017	River/Creek	Fry	3,000
2018/2019	Impoundment	Fry	20,000
2018/2019	River/Creek	Fry	18,000
2019/2020	Impoundment	Fry	500
2019/2020	River/Creek	Fry	6,318
2020/2021	Impoundment	Fry	370
2020/2021	River/Creek	Fry	4,074
2021/2022	Impoundment	Fry	78,000
2021/2022	River/Creek	Fry	4,390
2022/2023	Impoundment	Fry	140,000
2022/2023	River/Creek	Fingerling	200
2022/2023	River/Creek	Fry	30,000
2023/2024	Impoundment	Fingerling	20,000
2024/2025	Impoundment	Fingerling	41,420
2024/2025	River/Creek	Fingerling	8,580

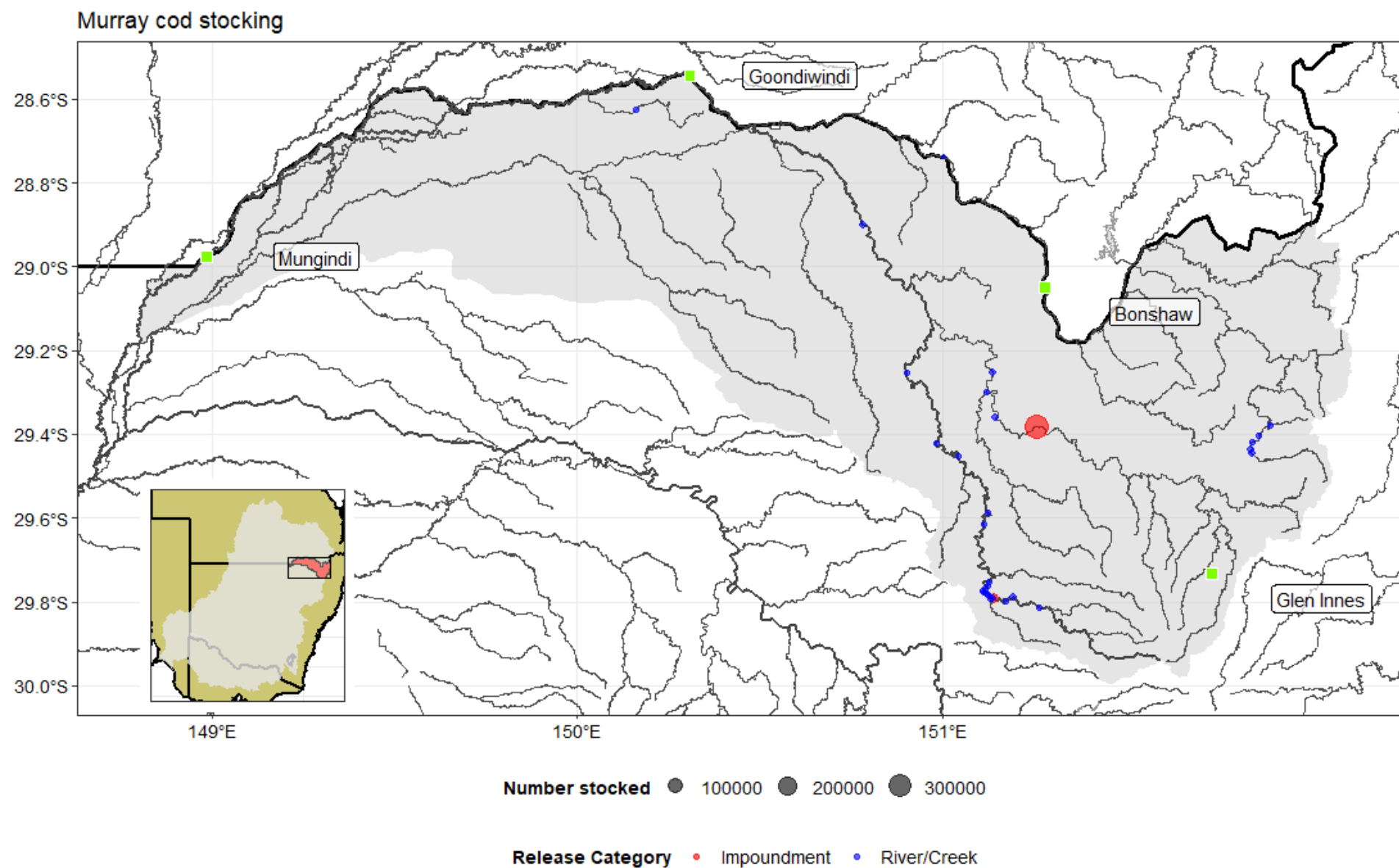


Figure 8.8: Locations of Murray cod stocking. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares show key towns.

8.7.2 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 8.9 show the abundance and biomass trends for the New South Wales Border Rivers WRPA and the right-hand panels show the overall trends across the NSW MDB.

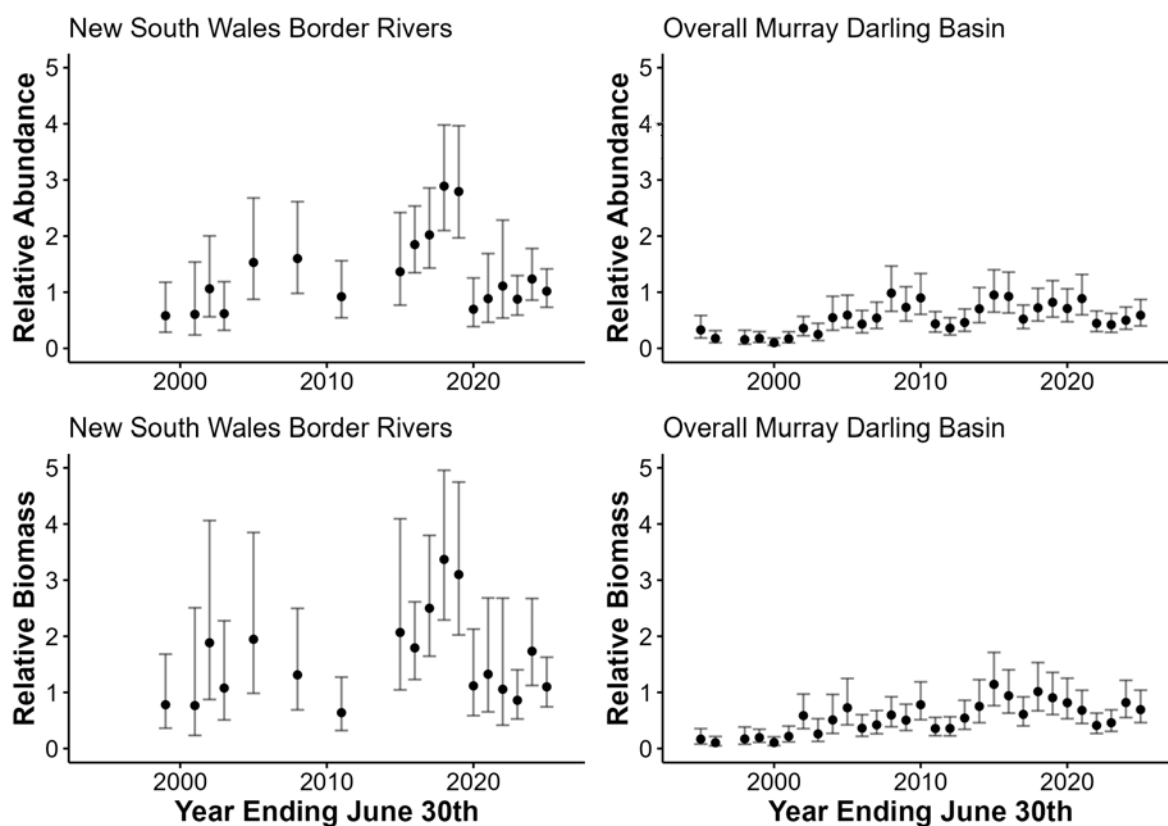


Figure 8.9: Relative abundance and biomass of Murray cod in this WRPA and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. Some error bars may be truncated for clarity.

8.7.2.1 Summary Statement:

An overall likely increase in abundance since the 1990s although both abundance and biomass appear to have declined since 2019. Relative abundance and biomass likely higher than the overall NSW MDB.

8.7.3 Health

The prevalence of any health issues ranged from 0% of sampled fish in 2021/2022 to 25% of sampled fish in 2023/2024 (Figure 8.10). The most common health issue for Murray cod in the New South Wales Border Rivers WRPAs was the presence of the parasite *Lernaea*, which was observed in a total of 109 fish, corresponding to 5% of all Murray cod measured.

Across the other NSW MDB WRPA, 17% of Murray cod (1,518 out of 9,141 Murray cod) showed a health condition (excludes the New South Wales Border Rivers WRPAs).

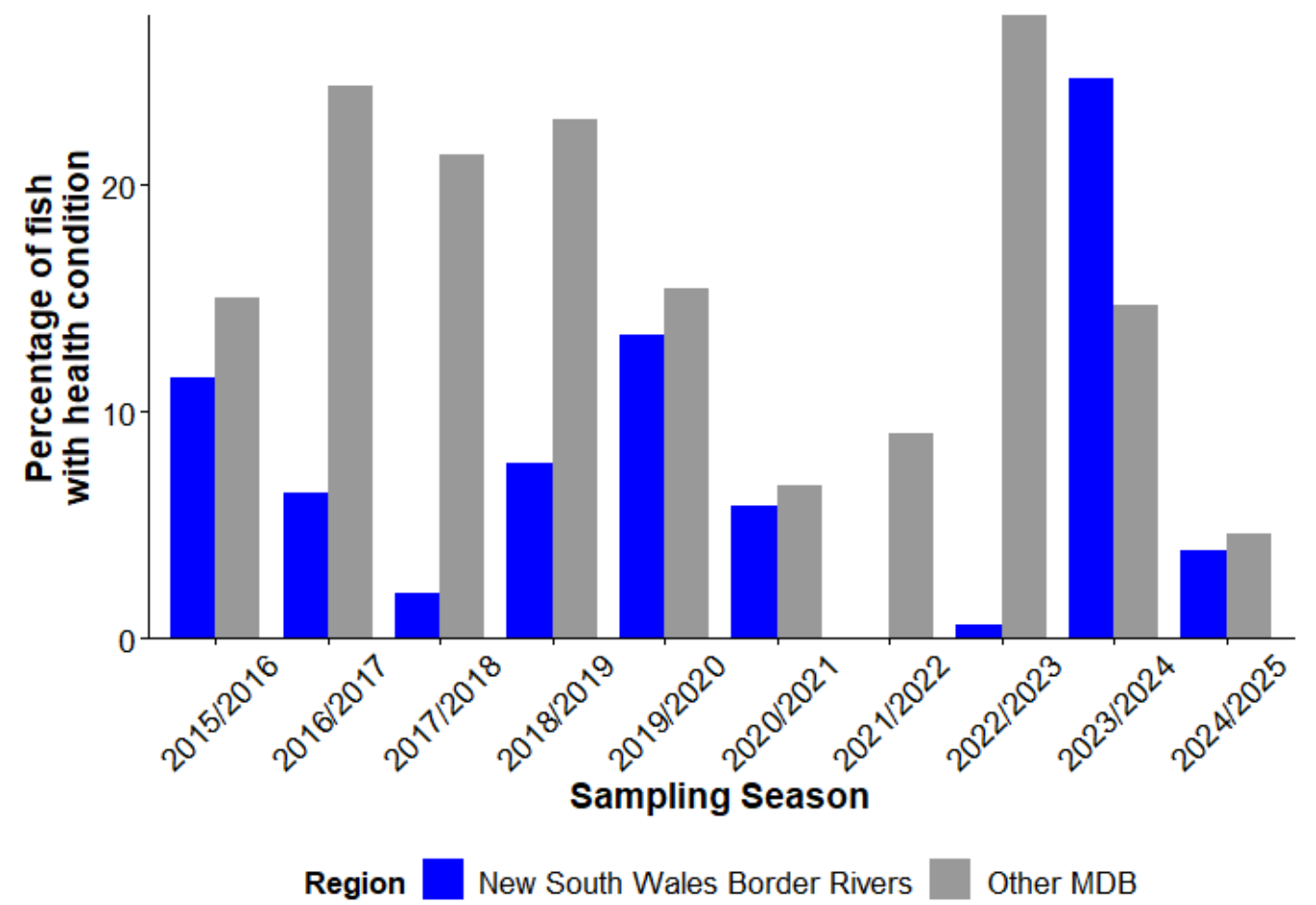


Figure 8.10: Timeseries showing the prevalence of health conditions in Murray cod. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA.

8.7.3.1 Summary Statement:

Presence of observable health conditions was variable across years with a low proportion of issues observed in 2024/25.

8.7.4 Distribution

Murray cod were recorded at 89 out of 130 sites in the New South Wales Border Rivers WRP. The maximum observed relative abundance at a site was 6.4 fish caught per 90 seconds of electrofishing. Figure 8.11 shows the distribution and relative abundance of Murray cod across the New South Wales Border Rivers WRP.

8.7.4.1 Summary Statement:

Murray cod were recorded across the eastern portion of the NSW Border Rivers WRP but less abundant or absent in western sites.

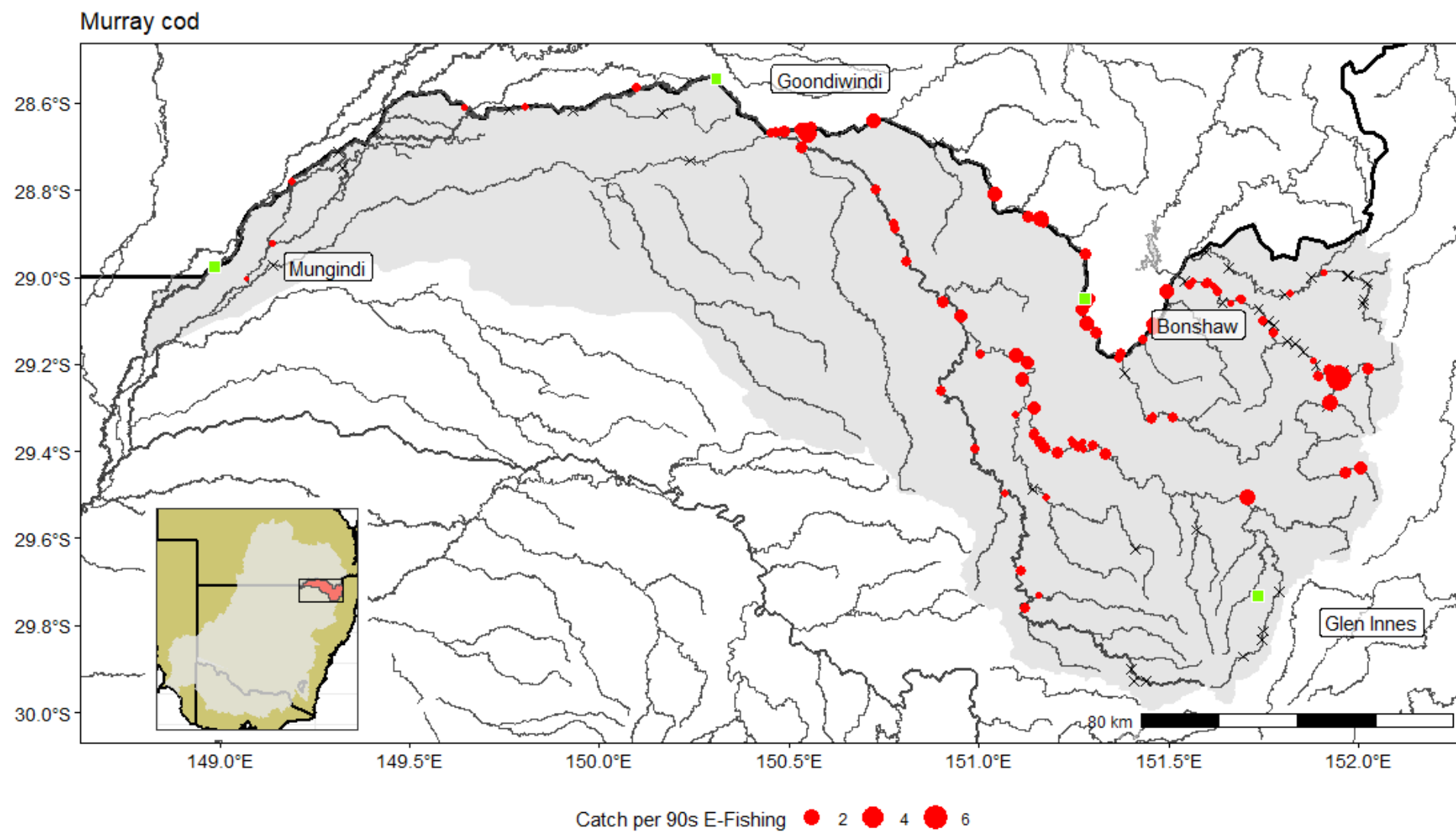


Figure 8.11: Distribution of Murray cod. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares show key towns.

8.8 Golden perch



8.8.1 Population Structure

Figure 8.12 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 12, and 0% to 17% of measured fish within a season, with a mean percentage YOY of 4%.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Golden perch was 9% (709 out of 8,218).

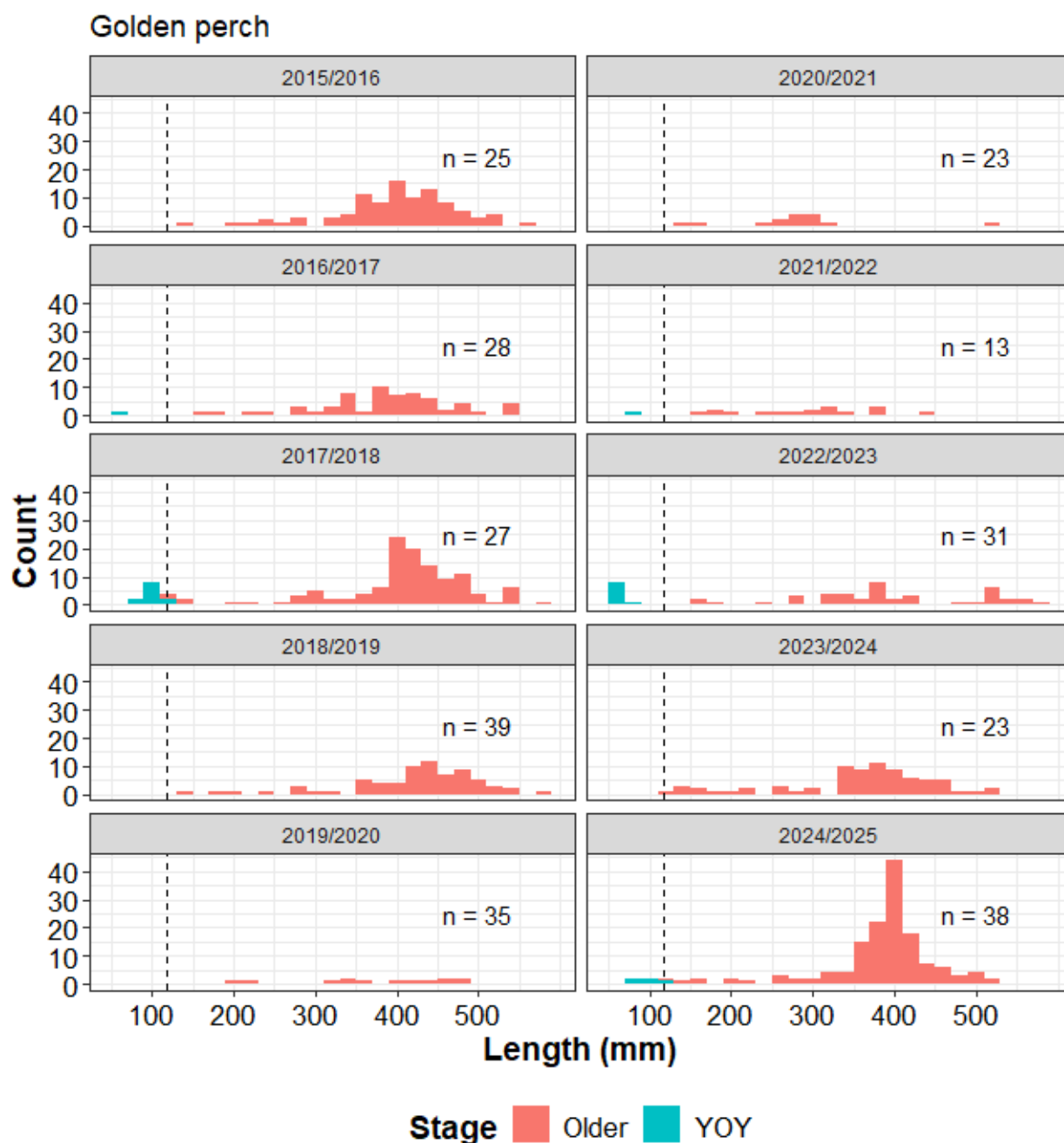


Figure 8.12: Length frequency plots for Golden perch by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.8.1.1 Summary Statement:

Limited recruitment. Young of the Year fish only evident in 2017/18, 2022/23 and 2024/25. A good size range of fish were observed in 2024/25.

8.8.1.2 Stocking

A total of 445,825 Golden perch were stocked into the waterways of the New South Wales Border Rivers WRPA during the reporting period. Of these fish, 328,079 (73.6%) were stocked into impoundments while 117,746 (26.4%) were stocked into rivers or creeks. Table 8.5 shows the detailed breakdown of stocking by season, location and life stage while Figure 8.13 shows the locations of stocking.

Table 8.5: Number and life stage of stocked Golden perch each sampling season.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2015/2016	Impoundment	Fry	1,906
2015/2016	River/Creek	Fry	39,638
2016/2017	Impoundment	Fingerling	1,285
2016/2017	Impoundment	Fry	30,000
2016/2017	River/Creek	Fingerling	15,612
2017/2018	Impoundment	Fry	41,000
2017/2018	River/Creek	Fry	5,000
2020/2021	Impoundment	Fry	65,110
2020/2021	River/Creek	Fry	40,024
2022/2023	Impoundment	Fry	100,000
2023/2024	Impoundment	Fingerling	46,278
2023/2024	River/Creek	Fingerling	17,472
2024/2025	Impoundment	Fingerling	42,500

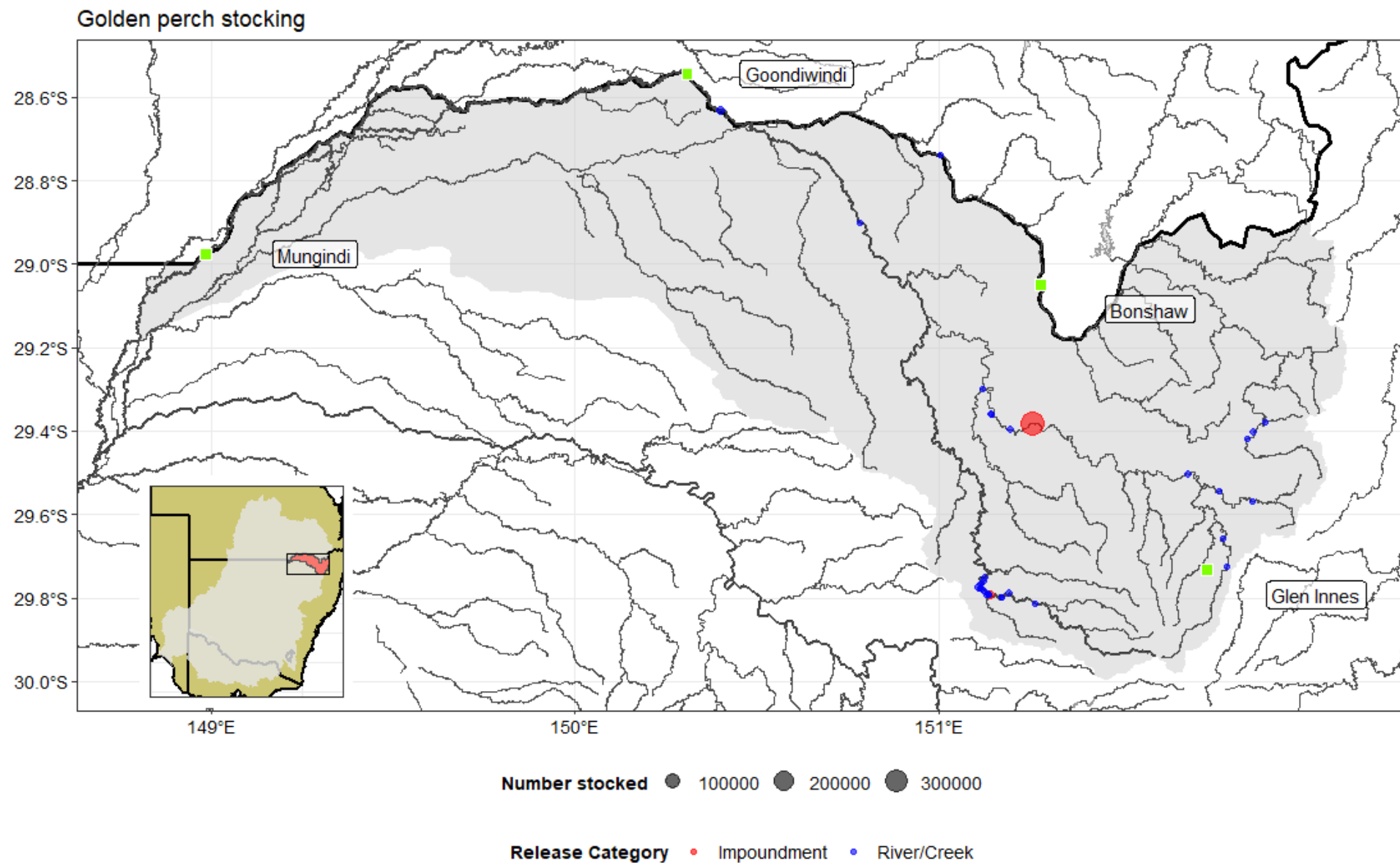


Figure 8.13: Locations of Golden perch stocking. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares show key towns.

8.8.2 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 8.14 show the abundance and biomass trends for the New South Wales Border Rivers WRPA and the right-hand panels show the overall trends across the NSW MDB.

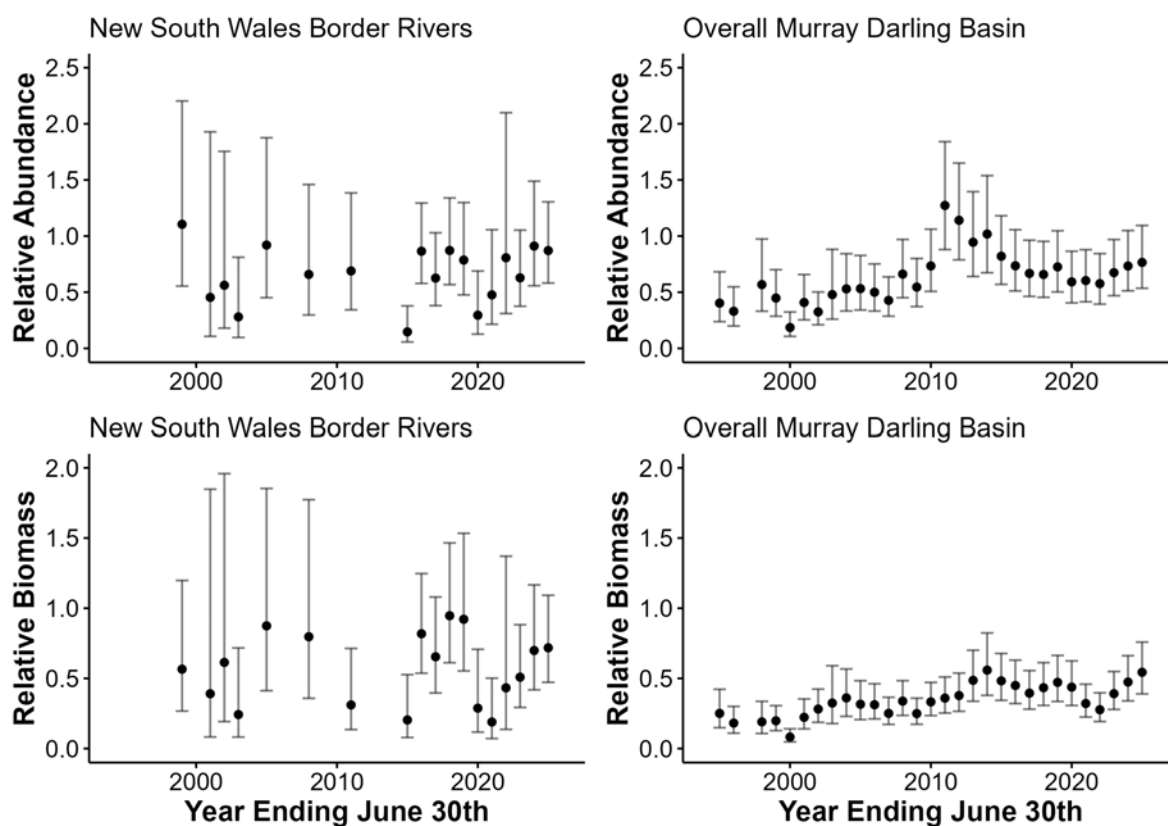


Figure 8.14: Relative abundance and biomass of Golden perch in both this WRPA and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. Some error bars may be truncated for clarity.

8.8.2.1 Summary Statement:

Abundance and biomass appear to have been variable over the past 25 years. Abundance and biomass are both currently trending upwards and are likely slightly higher than the overall NSW MDB.

8.8.3 Health

The prevalence of any health issues ranged from 6% of sampled fish in 2021/2022 to 33% of sampled fish in 2023/2024 (Figure 8.15). The most common health issue for Golden perch in the New South Wales Border Rivers water resource planning area was the presence of the parasite *Lernaea*, which was observed in a total of 79 fish, corresponding to 12% of all Golden perch measured.

Across the other WRPAs, 24% of Golden perch (1,932 out of 8,218 Golden perch) showed a health condition (excludes New South Wales Border Rivers).

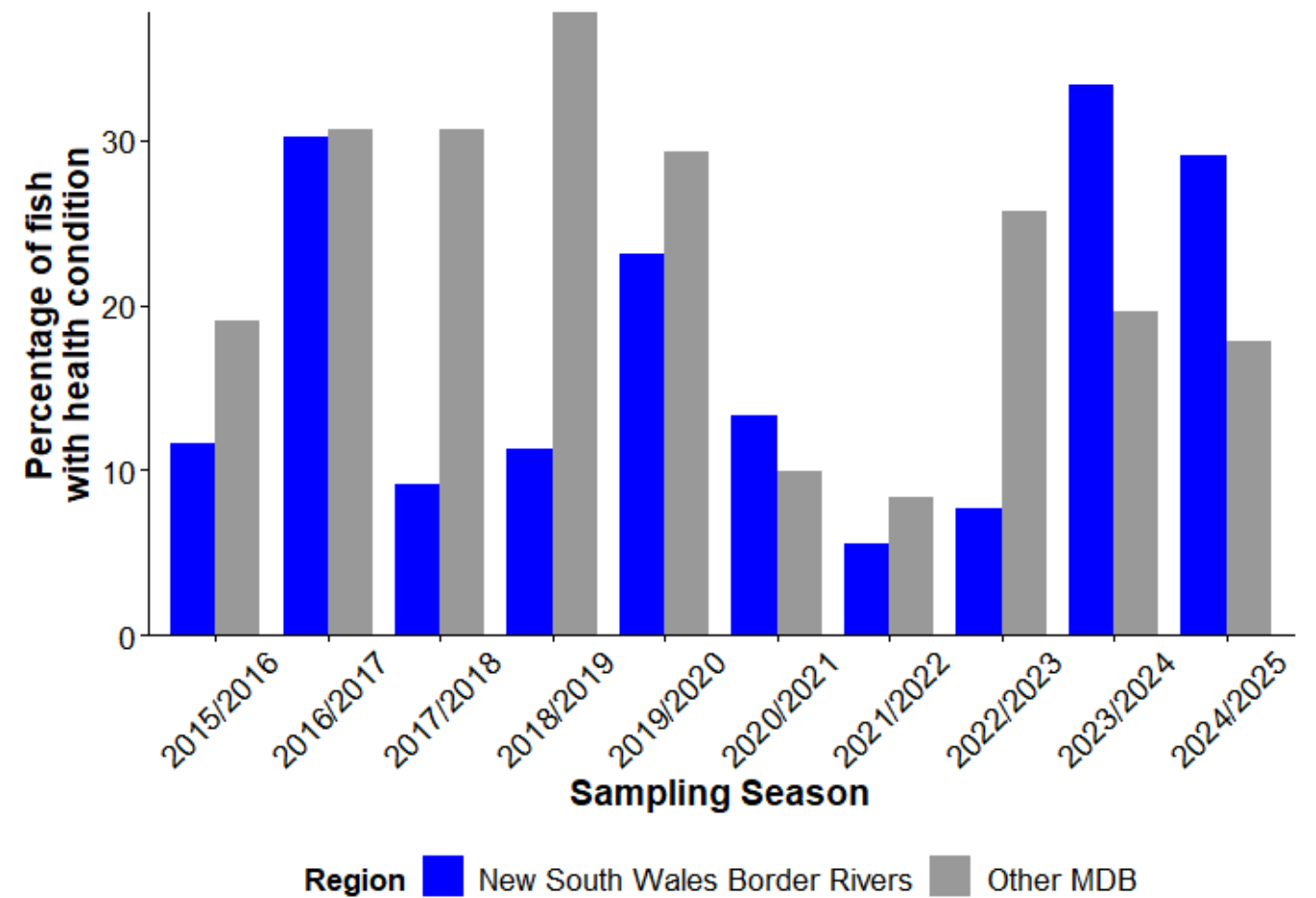


Figure 8.15: Timeseries showing the prevalence of health conditions in Golden perch. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

8.8.3.1 Summary Statement:

The presence of observable health conditions for Golden perch in the NSW Border Rivers was variable and ranged from low to moderate. 2024/25 showed a moderate proportion of reported health issues.

8.8.4 Distribution

Golden perch were recorded at 65 out of 130 sites in the New South Wales Border Rivers WRP. The maximum observed relative abundance at a site was 0.8 fish caught per 90 seconds of electrofishing. Figure 8.16 shows the distribution and relative abundance of Golden perch across the New South Wales Border Rivers WRP.

8.8.4.1 Summary Statement:

Golden perch were generally present across the NSW Border Rivers region.

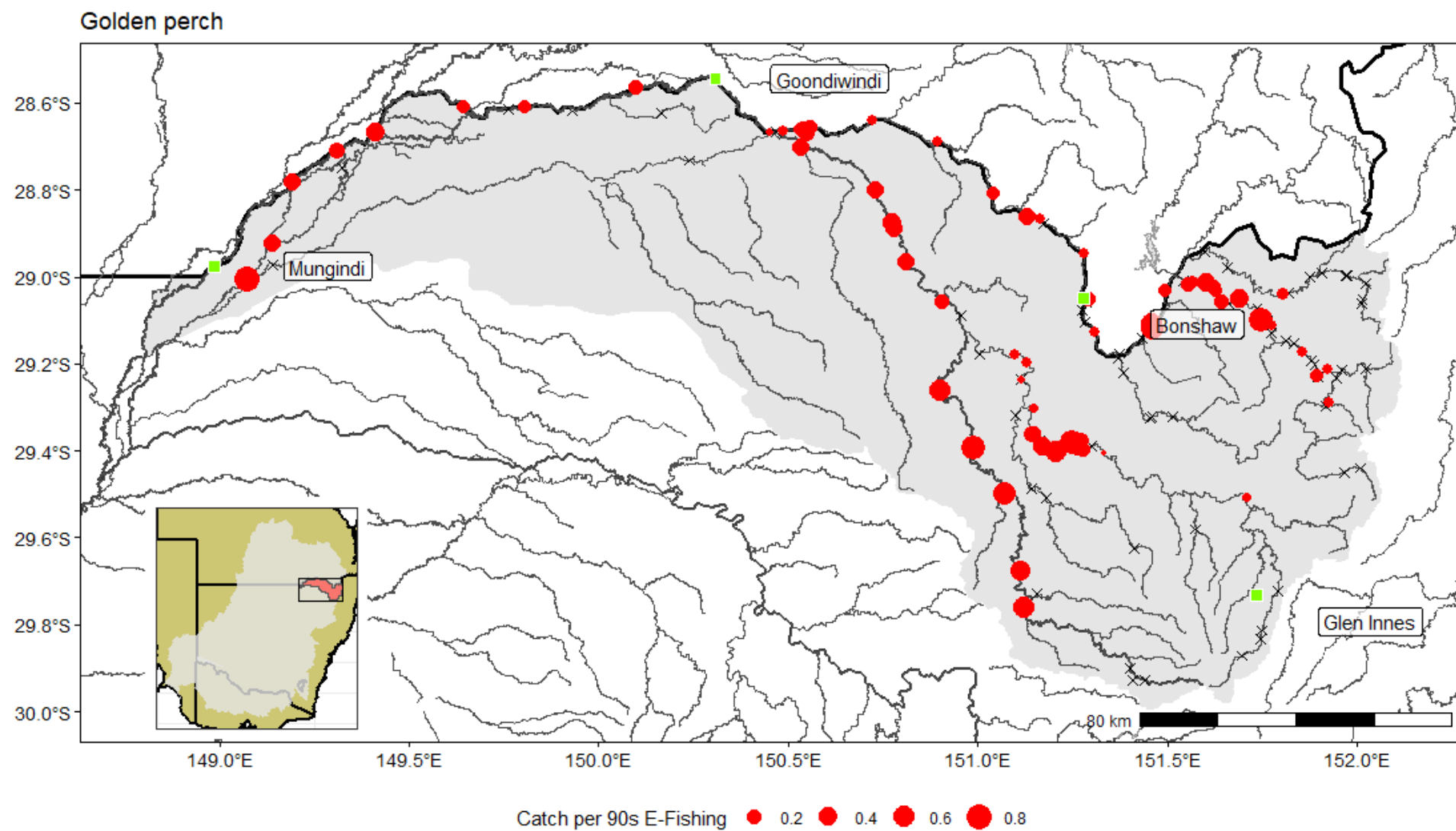


Figure 8.16: Distribution of Golden perch. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares show key towns.

8.9 Freshwater catfish



8.9.1 Population Structure

Figure 8.17 shows the observed length frequency plot for Freshwater catfish for each of the sampling seasons. The observed numbers of Young of the Year (YOY) ranged from 4 to 49, and 9% to 66% of measured fish within a season, with a mean percentage YOY of 37%.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Freshwater catfish was 39% (265 out of 685).

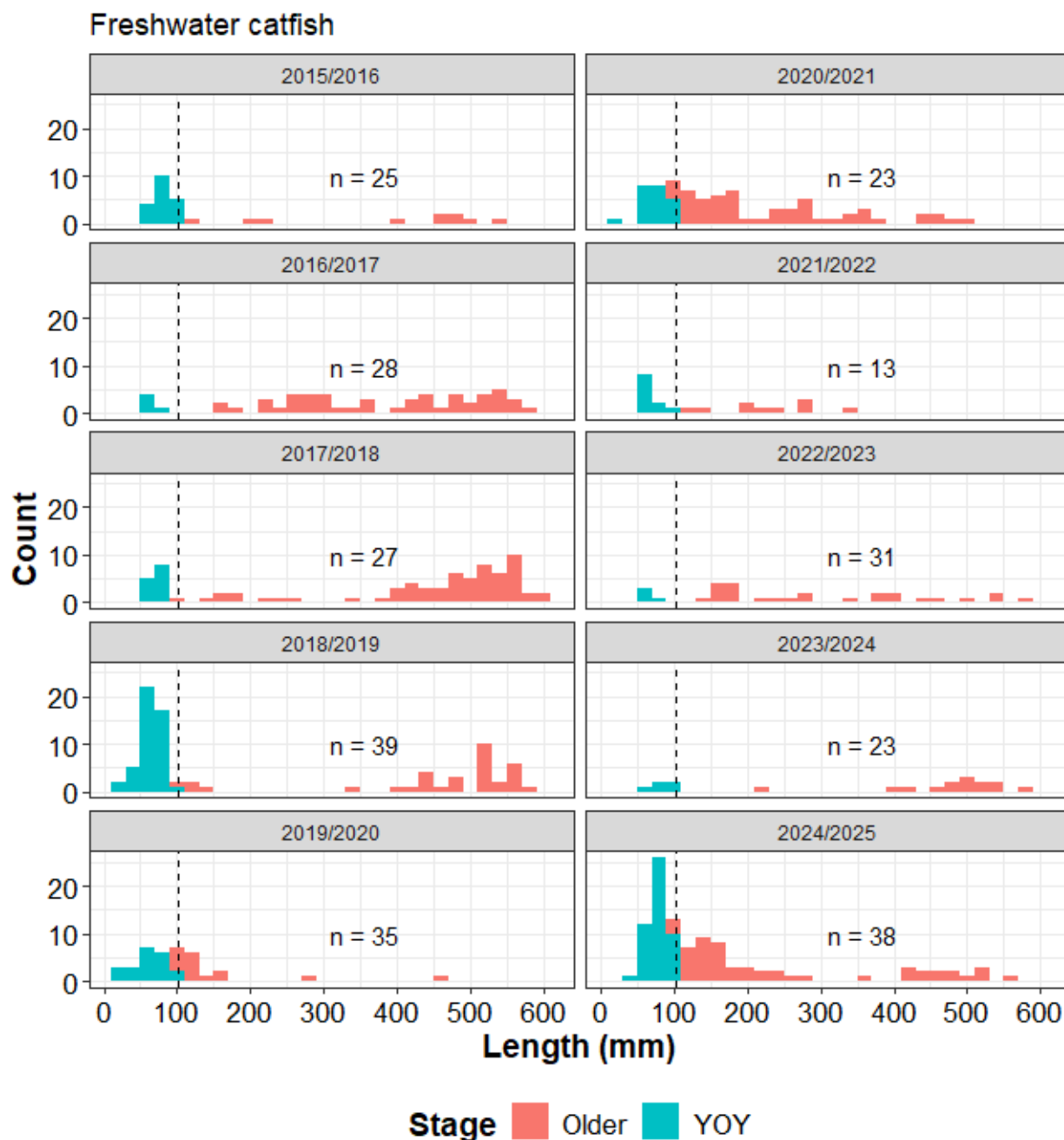


Figure 8.17: Length frequency plots for Freshwater catfish by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.9.1.1 Summary Statement:

Regular recruitment with YOY observed in all years. Strong recruitment evident from 2018/19 – 2020/21 and in 2024/25. A good range of size classes evident in 2024/25.

8.9.2 Temporal Trends in Abundance

The relative abundance and biomass of Freshwater catfish since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 8.18 show the abundance and biomass trends for the New South Wales Border Rivers WRPA and the right-hand panels show the overall trends across the NSW MDB.

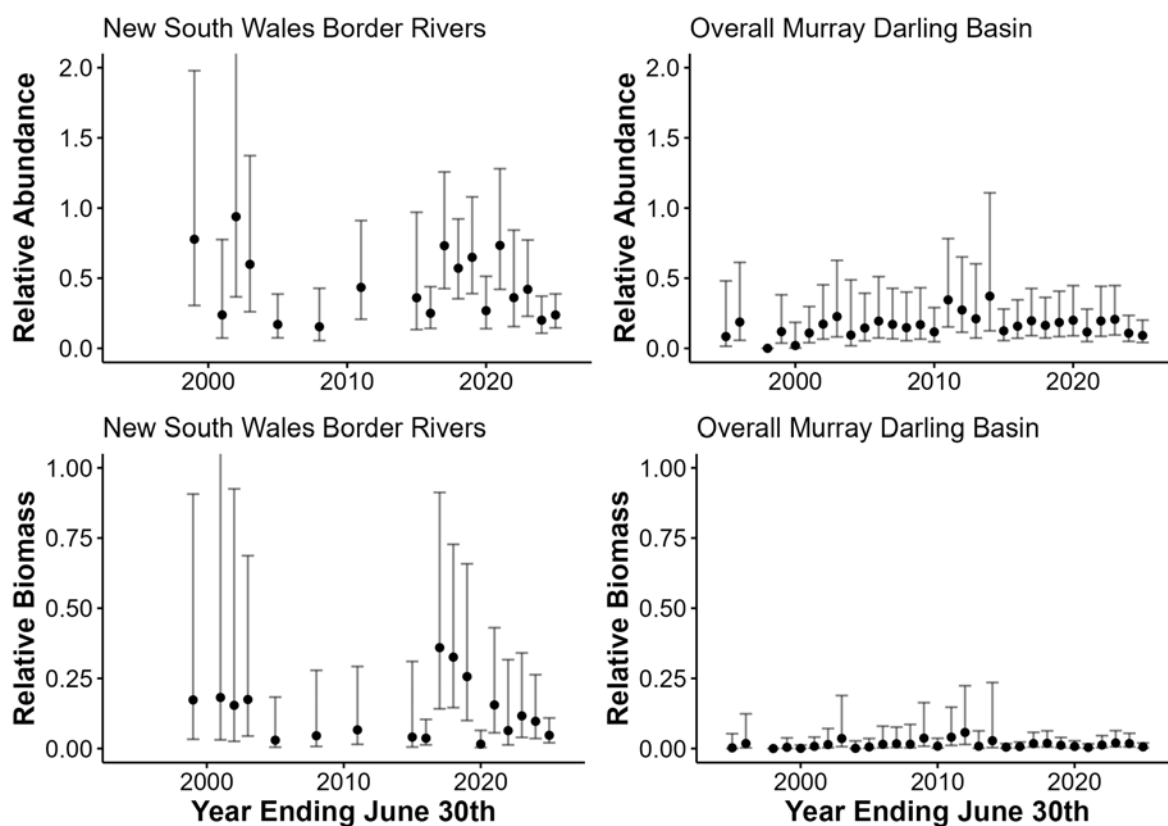


Figure 8.18: Relative abundance and biomass of Freshwater catfish in both this WRPA and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. Some error bars may be truncated for clarity.

8.9.2.1 Summary Statement:

Abundance and biomass of Freshwater catfish are at a relatively low level for this system, although there have been large fluctuations since the early 2000s. Recent abundance and biomass are slightly higher than the overall NSW MDB.

8.9.3 Health

The prevalence of any health issues ranged from 0% of sampled fish in 2015/2016 to 11% of sampled fish in 2023/2024 (Figure 8.19). The most common health issue for Freshwater catfish in the New South Wales Border Rivers water resource planning area was the presence of the parasite *Lernaea*, which was observed in a total of 3 fish, corresponding to 1% of all Freshwater catfish measured.

Across the other WRPAs, 2% of Freshwater catfish (13 out of 685 Freshwater catfish) showed a health condition (excludes New South Wales Border Rivers).

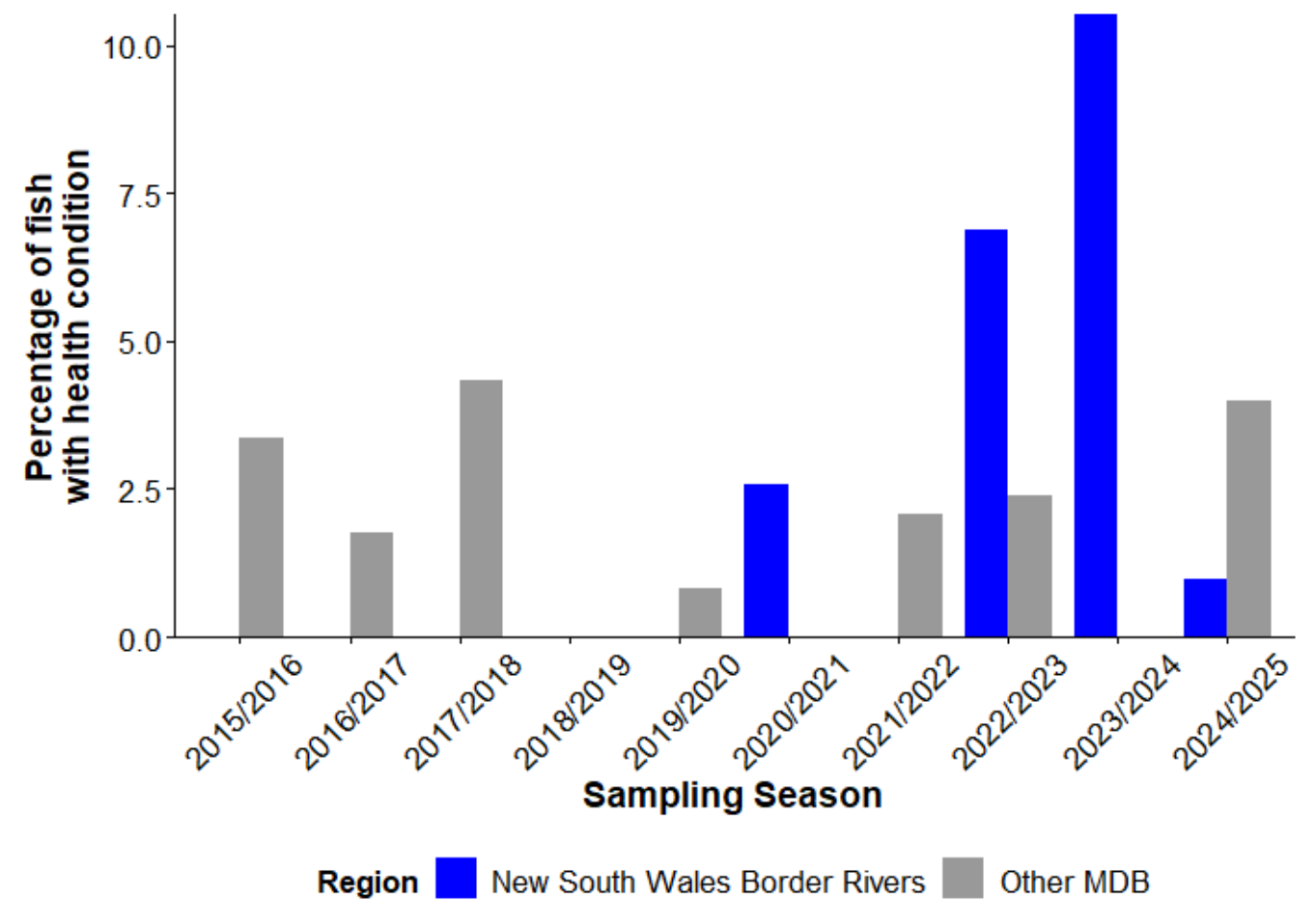


Figure 8.19: Timeseries showing the prevalence of health conditions in Freshwater catfish. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

8.9.3.1 Summary Statement:

The presence of observable health conditions for Freshwater catfish in the NSW Border Rivers was overall low except for 2022/23 and 2023/24 when the NSW Border Rivers showed a higher amount of health issues than the wider NSW MDB.

8.9.4 Distribution

Freshwater catfish were recorded at 71 out of 130 sites in the New South Wales Border Rivers WRP. The maximum observed relative abundance at a site was 2.1 fish caught per 90 seconds of electrofishing. Figure 8.20 shows the distribution and relative abundance of Freshwater catfish across the New South Wales Border Rivers WRP.

8.9.4.1 Summary Statement:

Freshwater catfish were generally recorded in the eastern NSW Border Rivers region.

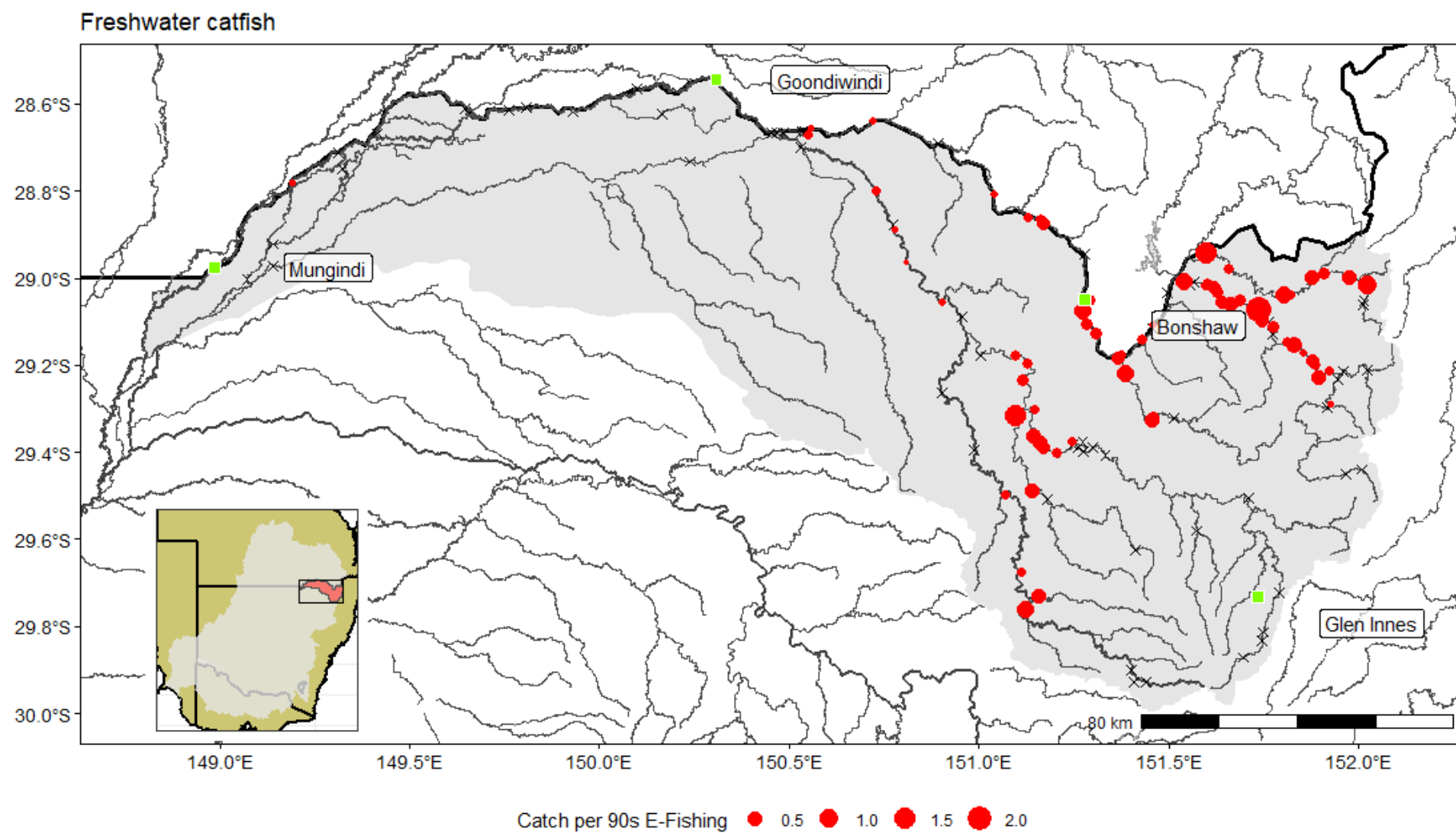


Figure 8.20: Distribution of Freshwater catfish. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares show key towns.

8.10 Bony herring



8.10.1 Population Structure

Figure 8.21 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 0 to 388, and 0% to 42% 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 Bony herring was 24% (12,767 out of 52,267). Bony herring are not a stocked species.

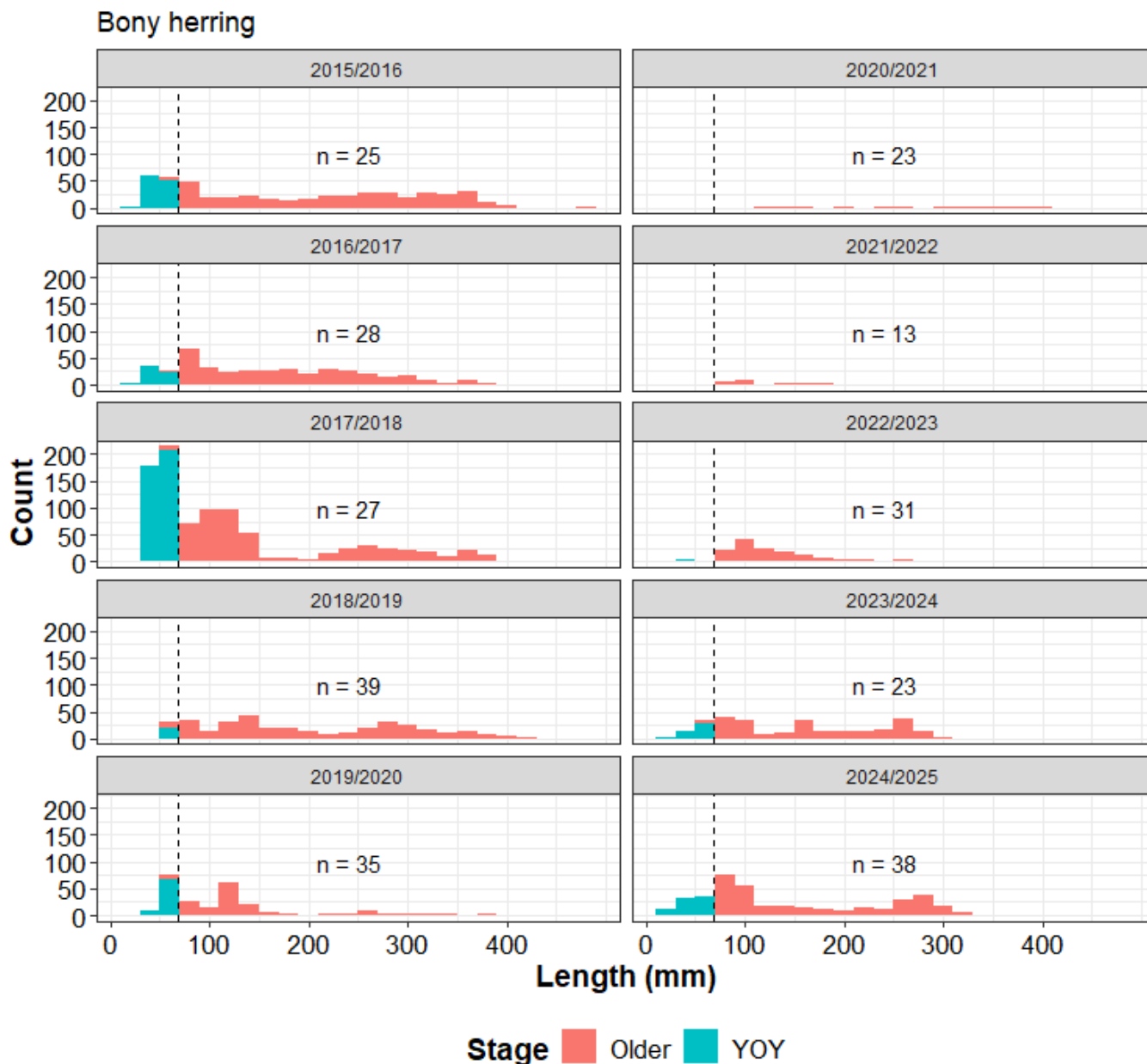


Figure 8.21: Length frequency plots for Bony herring by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.10.1.1 Summary Statement:

Sporadic recruitment with recruitment evident in 2023/24 and 2024/25 following 3 years of low/no recruitment. A good range of size classes were observed in 2024/25.

8.10.2 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 8.22 show the abundance and biomass trends for the New South Wales Border Rivers WRPAs and the right-hand panels show the overall trends across the NSW MDB.

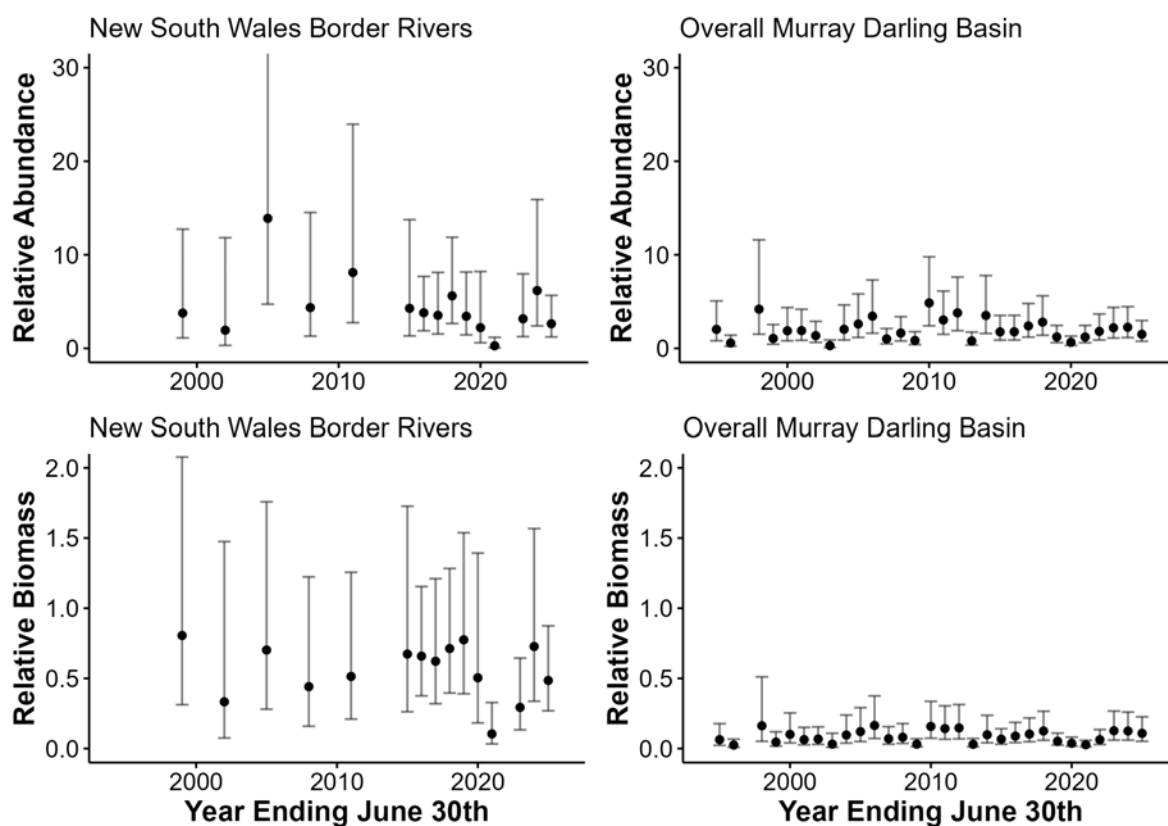


Figure 8.22: Relative abundance and biomass of Bony herring in both this WRPAs and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. Some error bars may be truncated for clarity.

8.10.2.1 Summary Statement:

Abundance and biomass have been relatively stable since the early 2000s. Recent abundance and biomass are likely higher than the overall NSW MDB.

8.10.3 Health

The prevalence of any health issues ranged from 0% of sampled fish in 2016/2017 to 5% of sampled fish in 2024/2025 (Figure 8.23). The most common health issue for Bony herring in the New South Wales Border Rivers WRPA was Ulcers, which was observed in a total of 10 fish, corresponding to <1% of all Bony herring measured.

Across the other NSW MDB WRPA's, 1% of Bony herring (626 out of 52,269 Bony herring) showed a health condition (excludes the New South Wales Border Rivers WRPA).

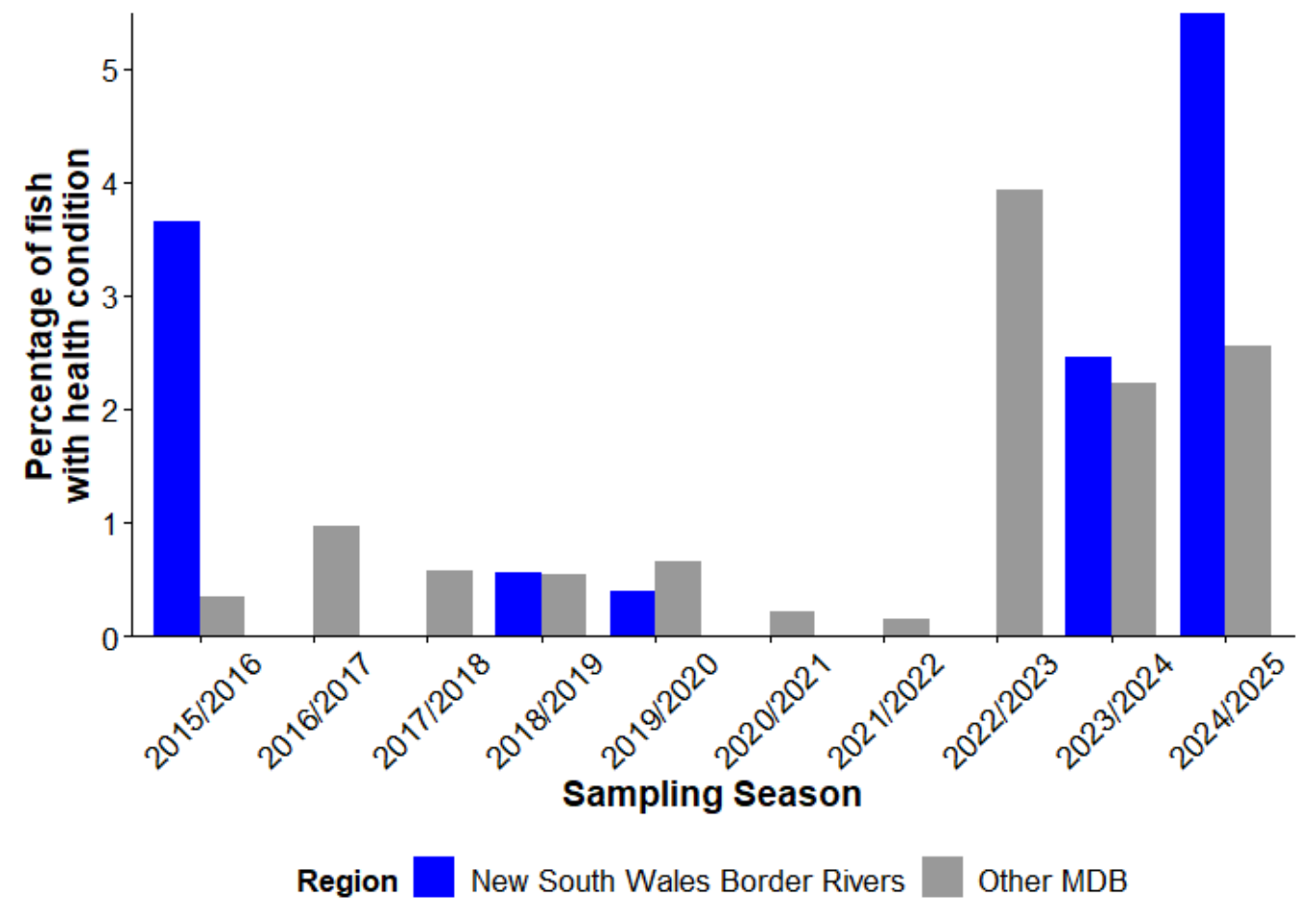


Figure 8.23: Timeseries showing the prevalence of health conditions in Bony herring. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

8.10.3.1 Summary Statement:

Presence of observable health conditions was low or absent in all years. A low number of health conditions were observed in 2024/25 although it is the highest in the time series.

8.10.4 Distribution

Bony herring were recorded at 45 out of 130 sites in the New South Wales Border Rivers WRP. The maximum observed relative abundance at a site was 64.9 fish caught per 90 seconds of electrofishing. Figure 8.24 shows the distribution and relative abundance of Bony herring across the New South Wales Border Rivers WRP.

8.10.4.1 Summary Statement:

Bony herring were recorded across the western half NSW Border Rivers WRP but appear to be absent or present only in very low abundances in the eastern region (except the Dumaresq River).

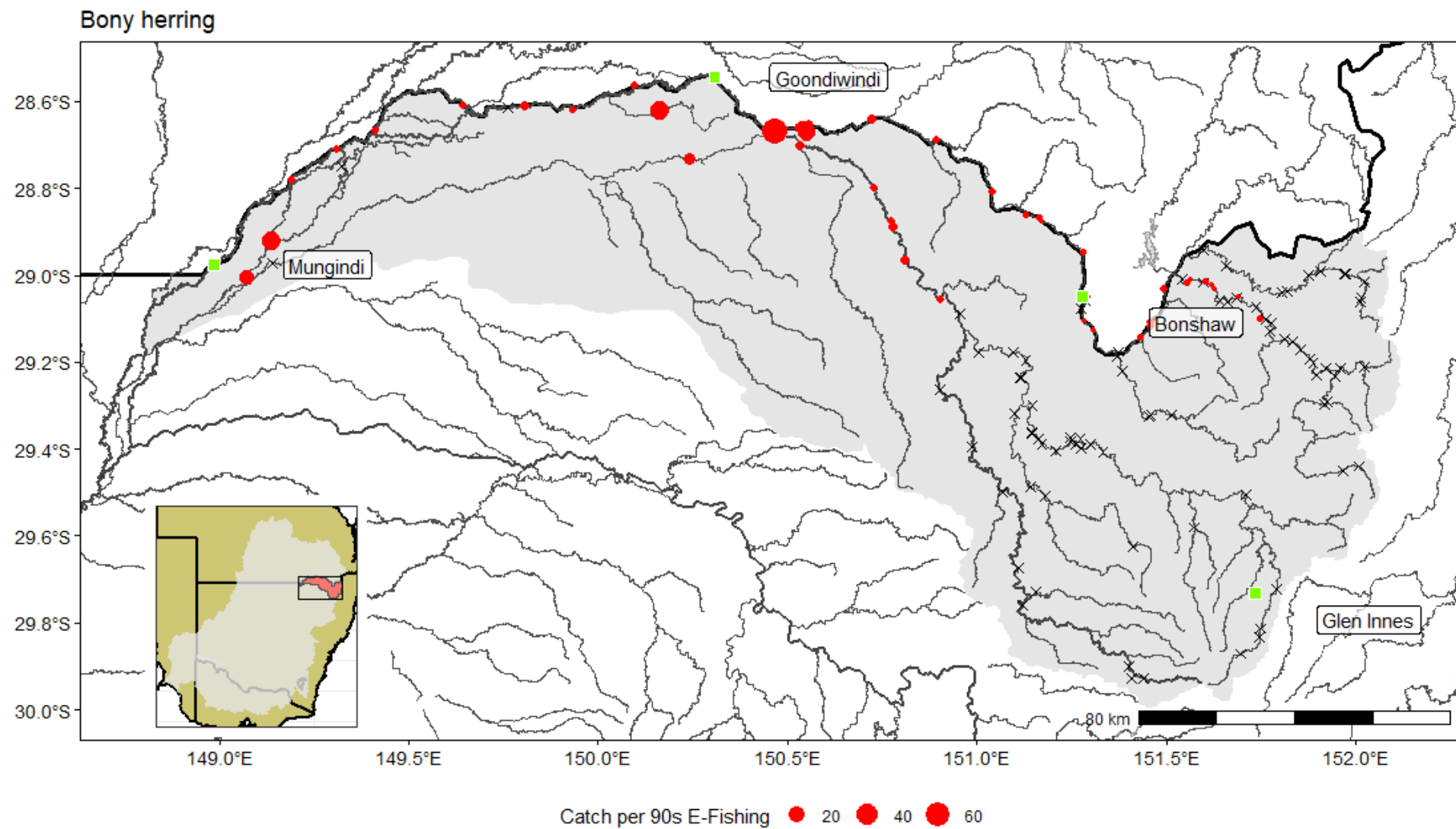


Figure 8.24: Distribution of Bony herring. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares show key towns.

8.11 Australian smelt



8.11.1 Population Structure

Figure 8.25 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 0 to 78, and 0% to 76% 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 Australian smelt was 43% (10,790 out of 25,258). Australian smelt are not a stocked species.

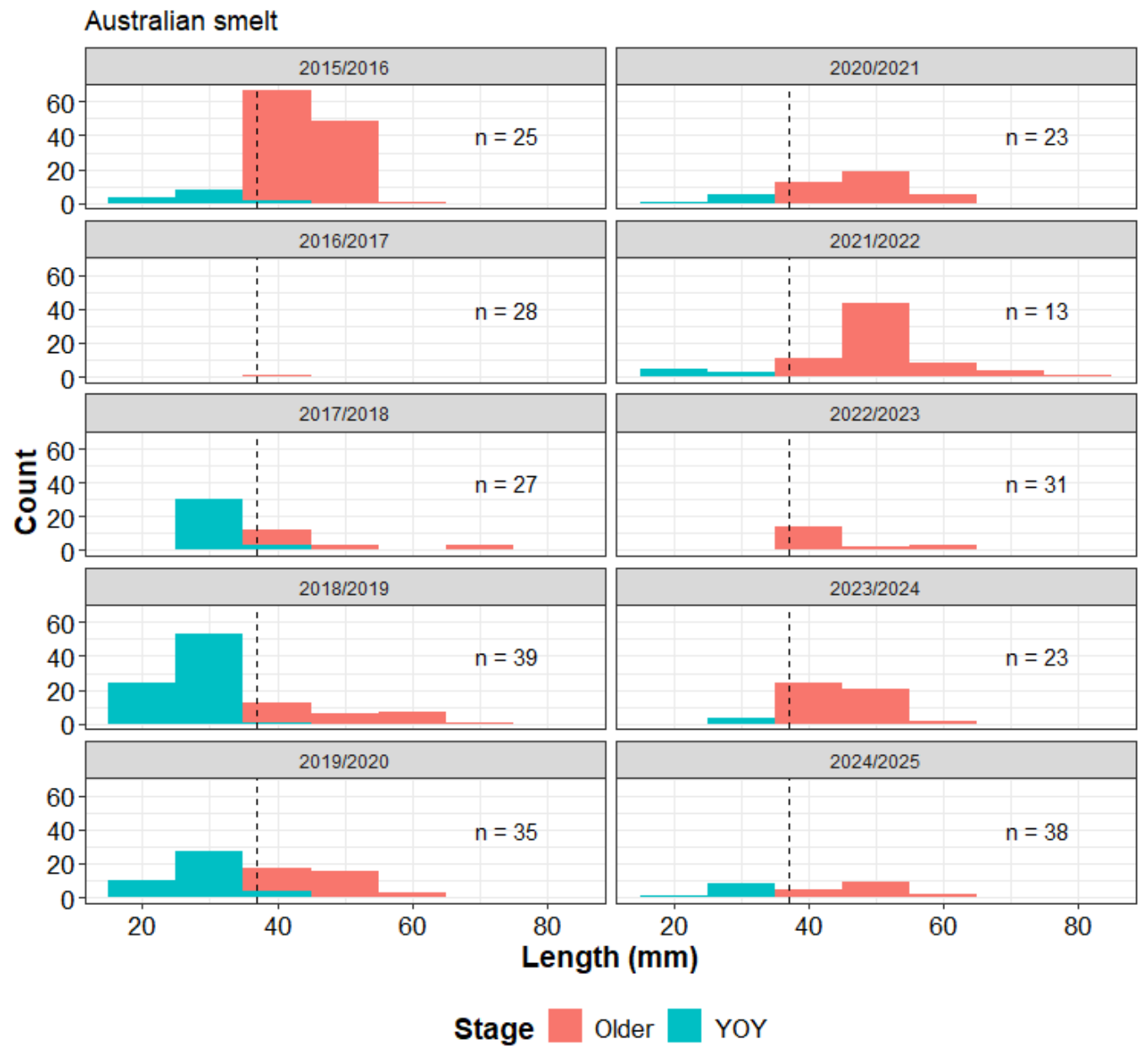


Figure 8.25: Length frequency plots for Australian smelt by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.11.1.1 Summary Statement:

Variable numbers of YOY with likely recruitment failure in 2016/17 and 2022/23. Low recruitment in 2023/24 and 2024/25.

8.11.2 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 8.26 show the abundance trends for the New South Wales Border Rivers WRPA and the right-hand panel show the overall trend across the NSW MDB.

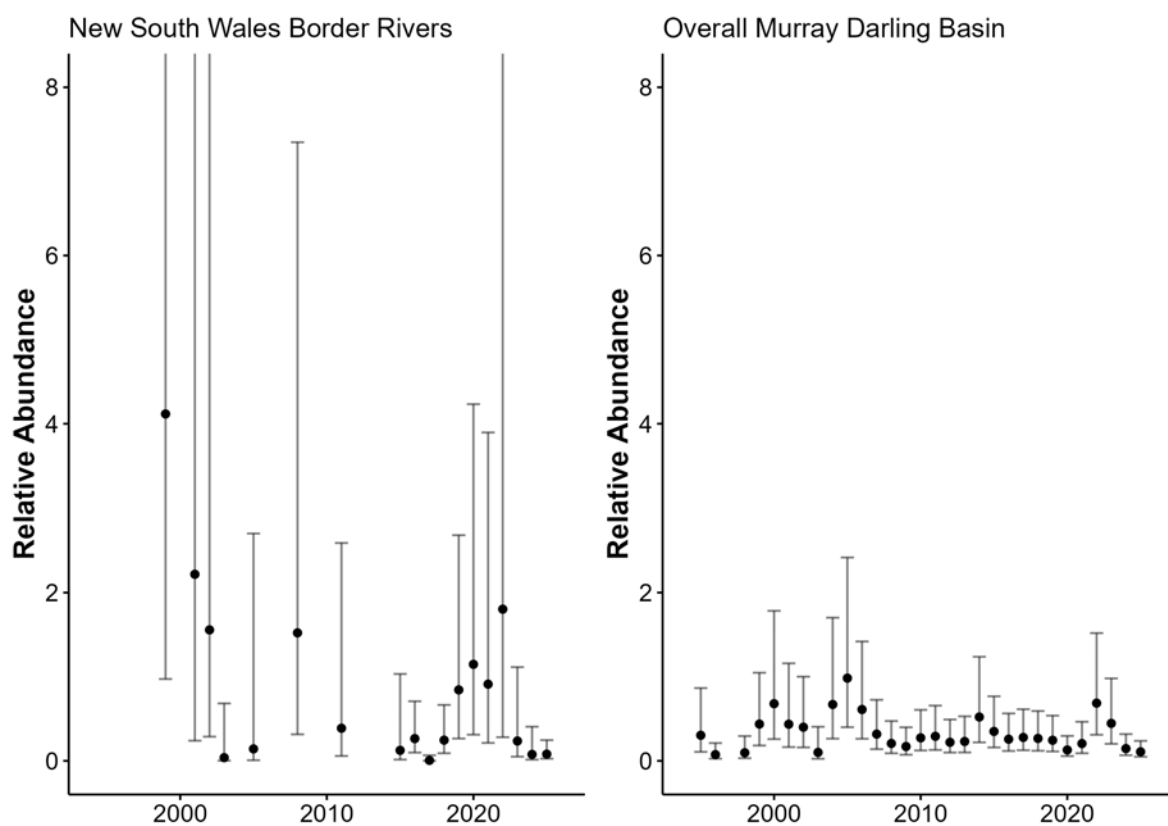


Figure 8.26: Relative abundance of Australian smelt in both this WRPA and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. No modelling of biomass was done for Australian smelt. Some error bars may be truncated for clarity.

8.11.2.1 Summary Statement:

While the data is variable, there is evidence of a likely decline in abundance since the early 2000s. Abundance is likely similar to the overall NSW MDB.

8.11.3 Health

Zero health issues were identified in the New South Wales Border Rivers WRPA during the reporting period.

Across the other NSW MDB WRPA, <1% of Australian smelt (151 out of 25,260 Australian smelt) showed a health condition (excludes the New South Wales Border Rivers WRPA).

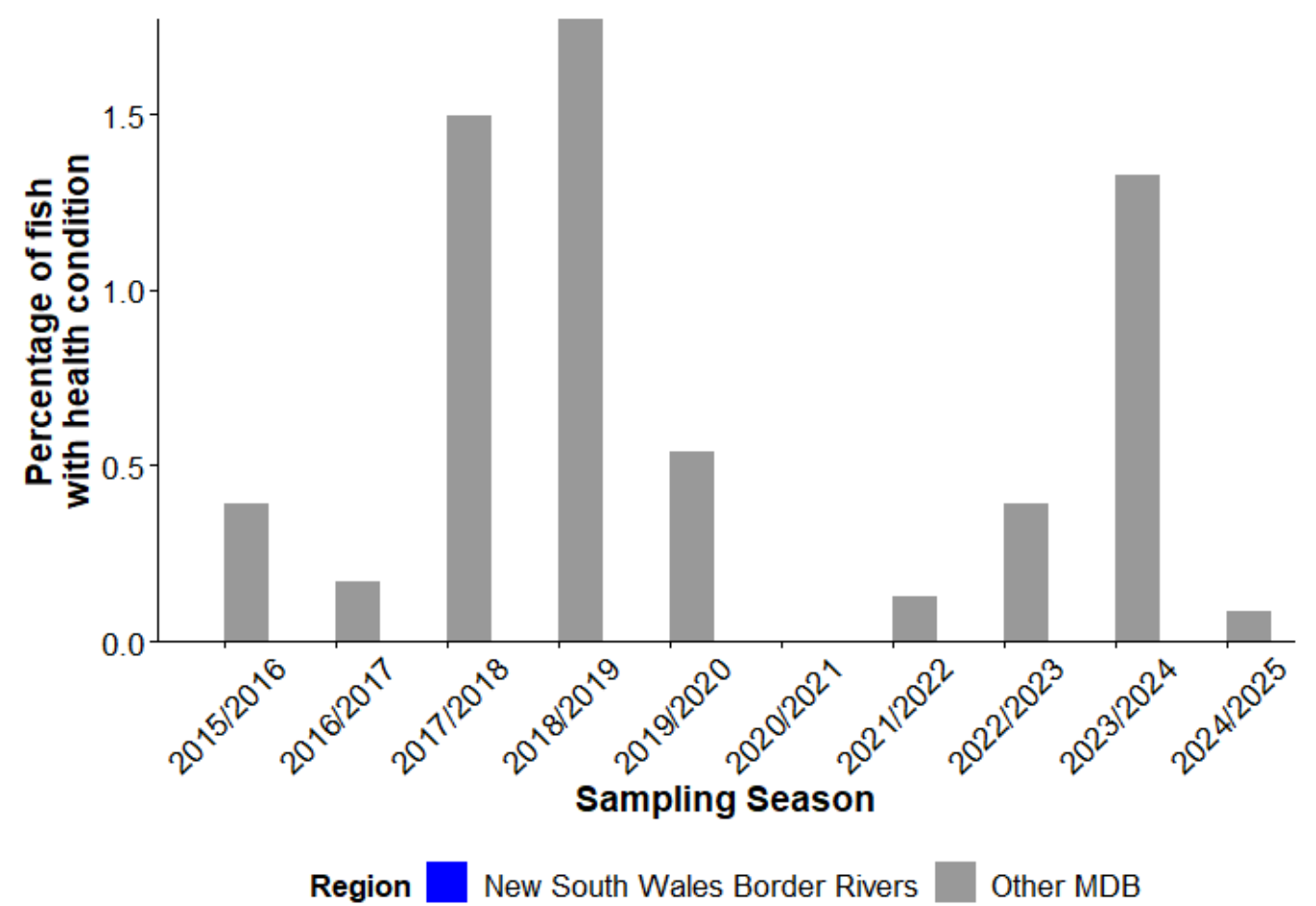


Figure 8.27: Timeseries showing the prevalence of health conditions in Australian smelt. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA.

8.11.3.1 Summary Statement:

No health issues have been reported for Australian smelt in the NSW Border Rivers since 2014/15.

8.11.4 Distribution

Australian smelt were recorded at 40 out of 130 sites in the New South Wales Border Rivers WRP. The maximum observed relative abundance at a site was 4.9 fish caught per 90 seconds of electrofishing. Figure 8.28 shows the distribution and relative abundance of Australian smelt across the New South Wales Border Rivers WRP.

8.11.4.1 Summary Statement:

Australian smelt were recorded across the eastern and central region of the NSW Border Rivers WRP.

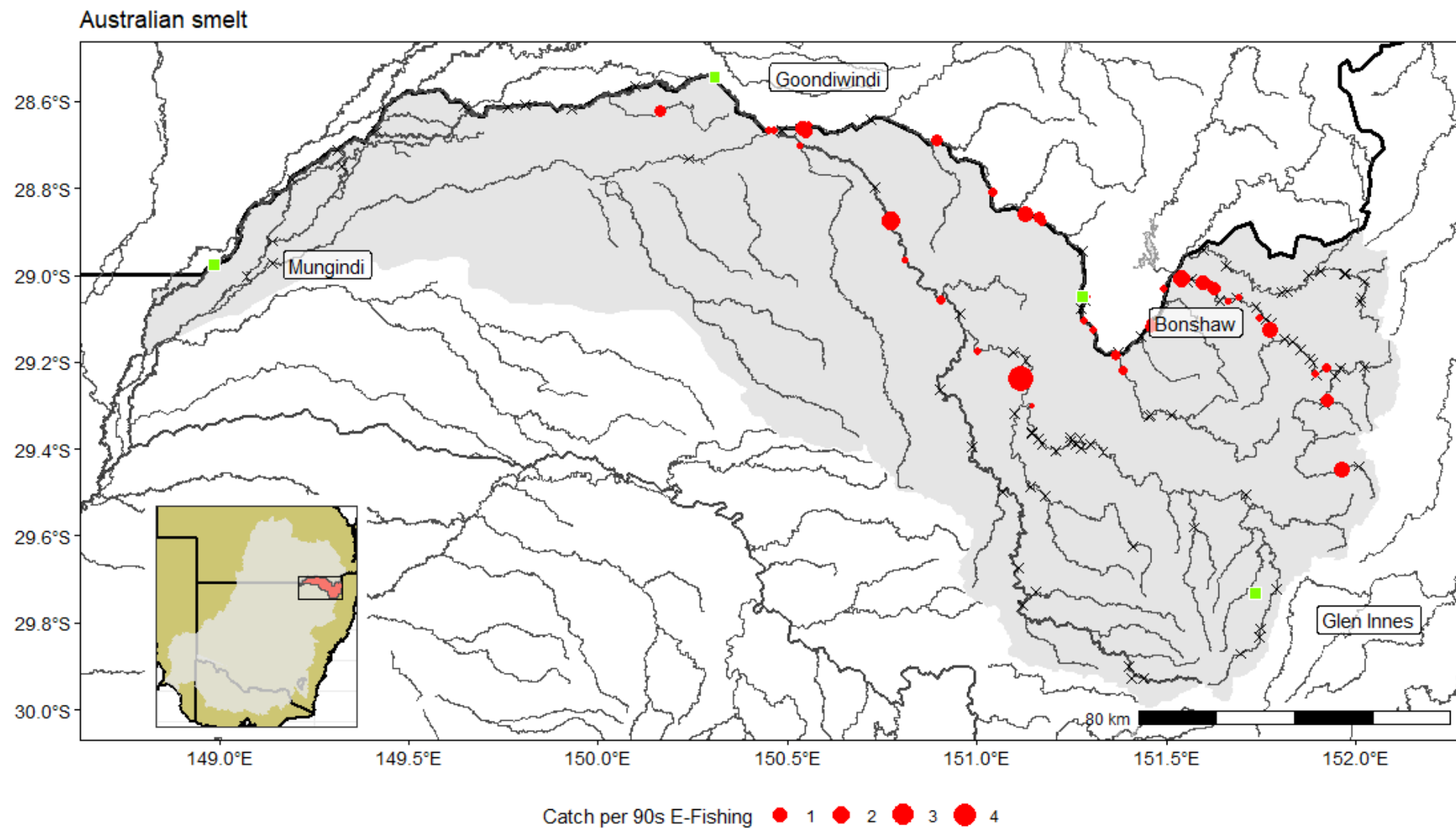


Figure 8.28: Distribution of Australian smelt. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X.

8.12 Common carp



8.12.1 Population Structure

Figure 8.29 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 5 to 91, and 2% to 62% of measured fish within a season, with a mean percentage YOY of 19%.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Common carp was 55% (35,782 out of 64,711). Common carp are not a stocked species.

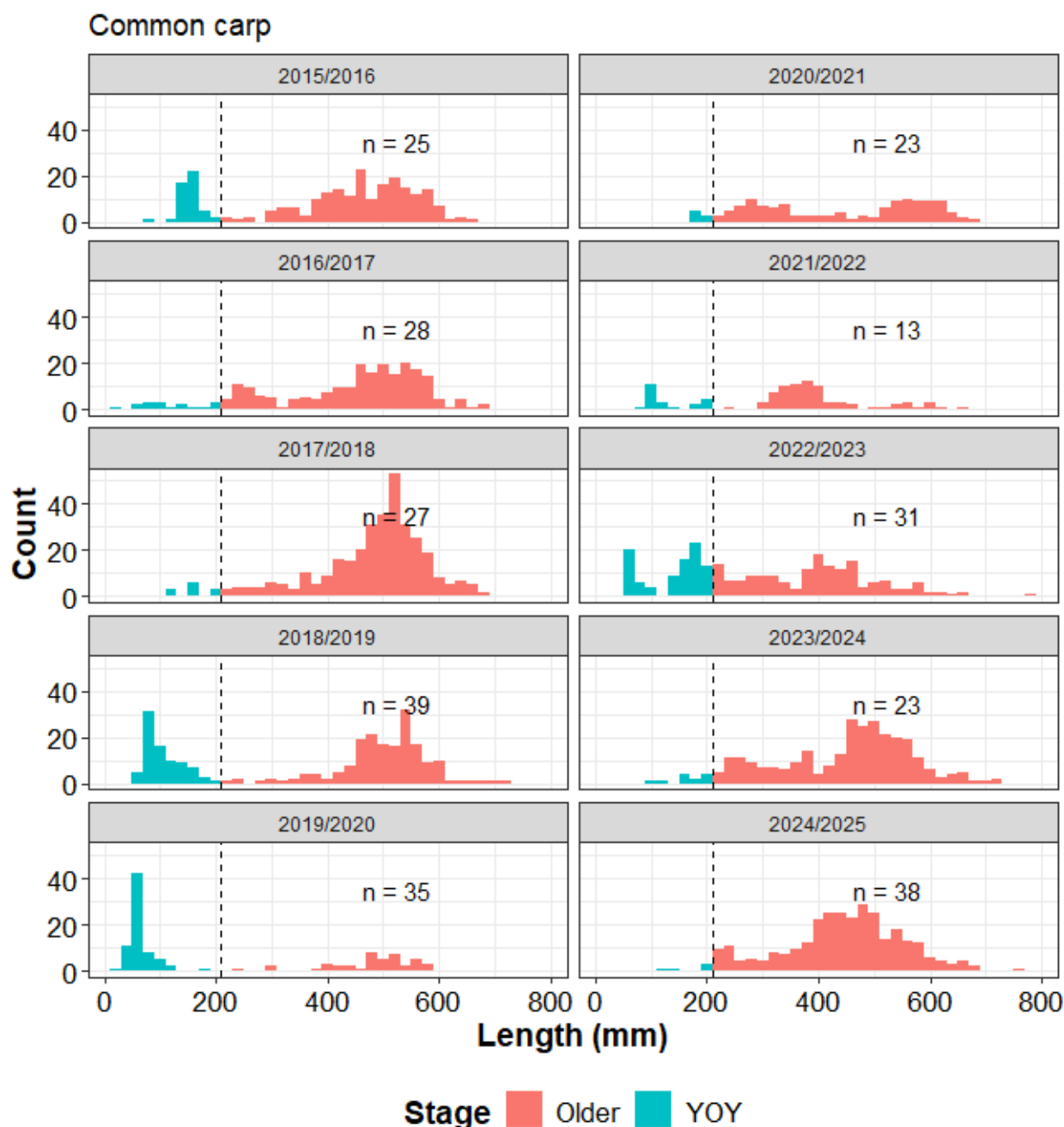


Figure 8.29: Length frequency plots for common carp by sampling season. YOY represents Young of the Year fish. n shows the number of sampling events in each season. Note some stages may appear either side of the cut-off line due to binning of data in the histogram.

8.12.1.1 Summary Statement:

Variable recruitment with very strong peaks in 2015/16, 2018/19, 2019/20 and 2022/23. Large fish (>500 mm) present in all years. Low recruitment in 2024/25 with evidence of multiple cohorts.

8.12.2 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 8.30 show the abundance and biomass trends for the New South Wales Border Rivers WRPA and the right-hand panels show the overall trends across the NSW MDB.

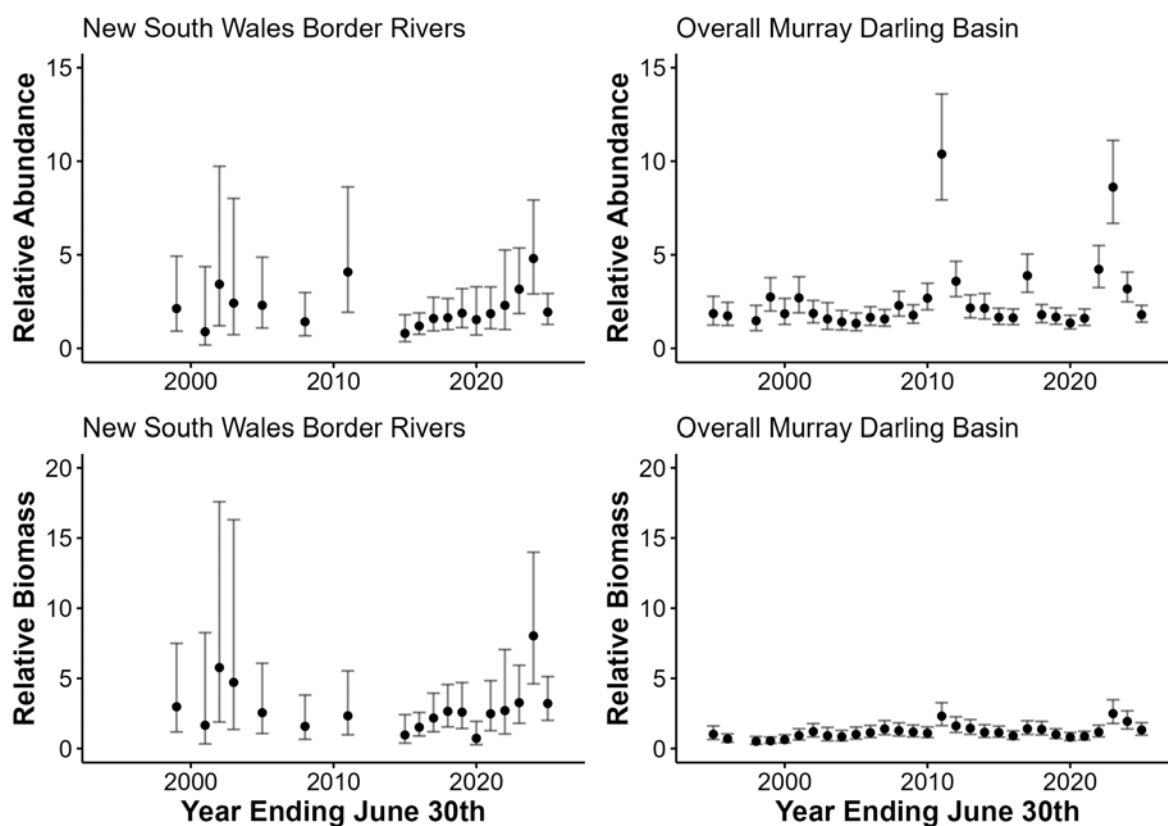


Figure 8.30: Relative abundance and biomass of Common carp in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95% confidence intervals around the estimates. Some error bars may be truncated for clarity.

8.12.2.1 Summary Statement:

Abundance and biomass both appear to be currently higher than levels in the early 2000s following recent strong recruitment. Abundance and biomass of carp declined in 2024/25 but is slightly higher than the overall NSW MDB.

8.12.3 Health

The prevalence of any health issues ranged from 0% of sampled fish in 2021/2022 to 5% of sampled fish in 2018/2019 (Figure 8.31). The most common health issue for Common carp in the New South Wales Border Rivers water resource planning area was the presence of the parasite *Lernaea*, which was observed in a total of 22 fish, corresponding to 1% of all Common carp measured.

Across the other WRPAs, 4% of Common carp (2,363 out of 64,713 Common carp) showed a health condition (excludes New South Wales Border Rivers).

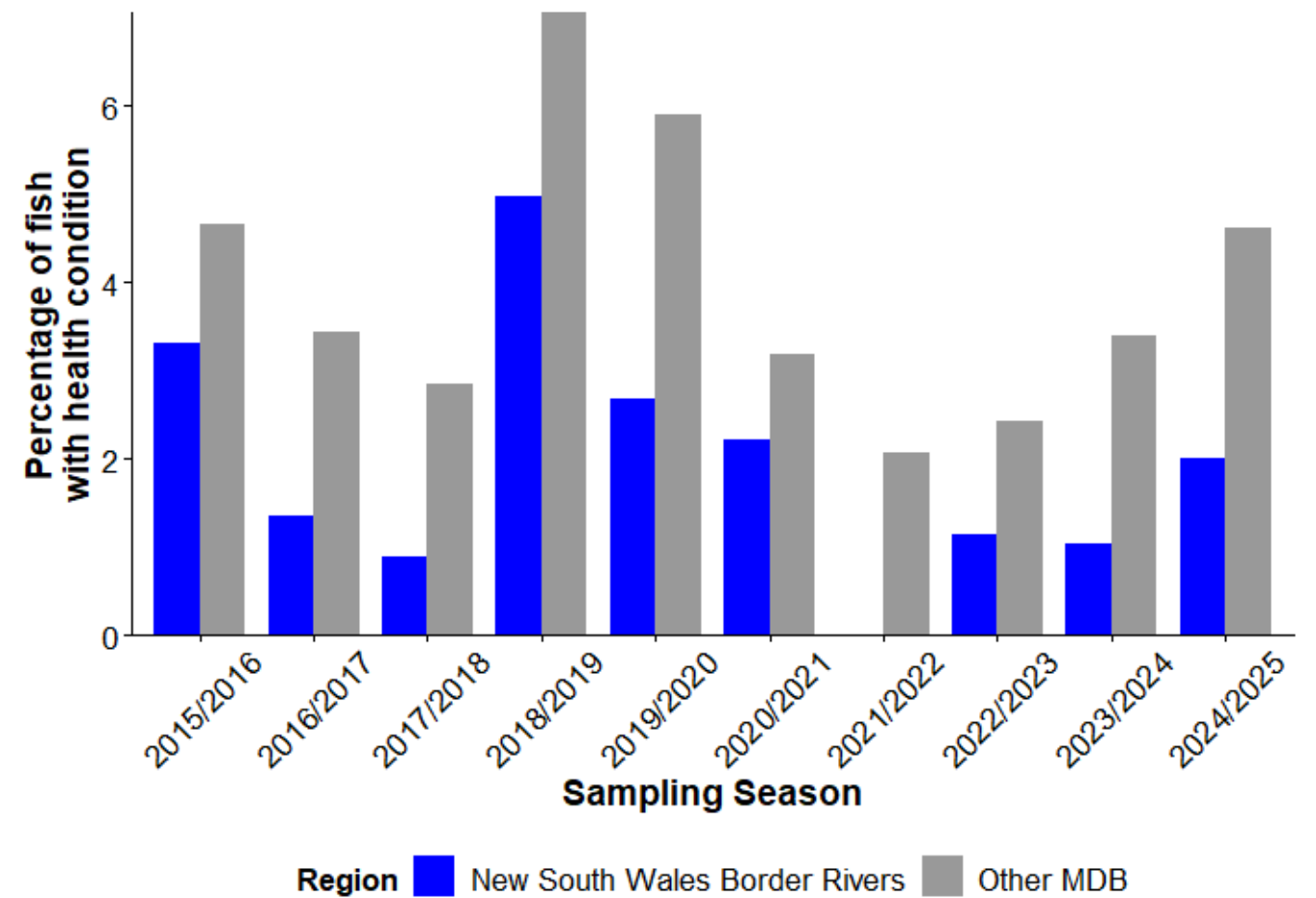


Figure 8.31: Timeseries showing the prevalence of health conditions in Common carp. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

8.12.3.1 Summary Statement:

The presence of observable health conditions for Common carp in the NSW Border Rivers was very low to low in all years and always lower than the wider NSW MDB.

8.12.4 Distribution

Common carp were recorded at 77 out of 130 sites in the New South Wales Border Rivers WRPA. The maximum observed relative abundance at a site was 3.9 fish caught per 90 seconds of electrofishing. Figure 8.32 shows the distribution and relative abundance of Common carp across the New South Wales Border Rivers WRPA.

8.12.4.1 Summary Statement:

Common carp were found across the NSW Border Rivers region except for some areas of the eastern upland region.

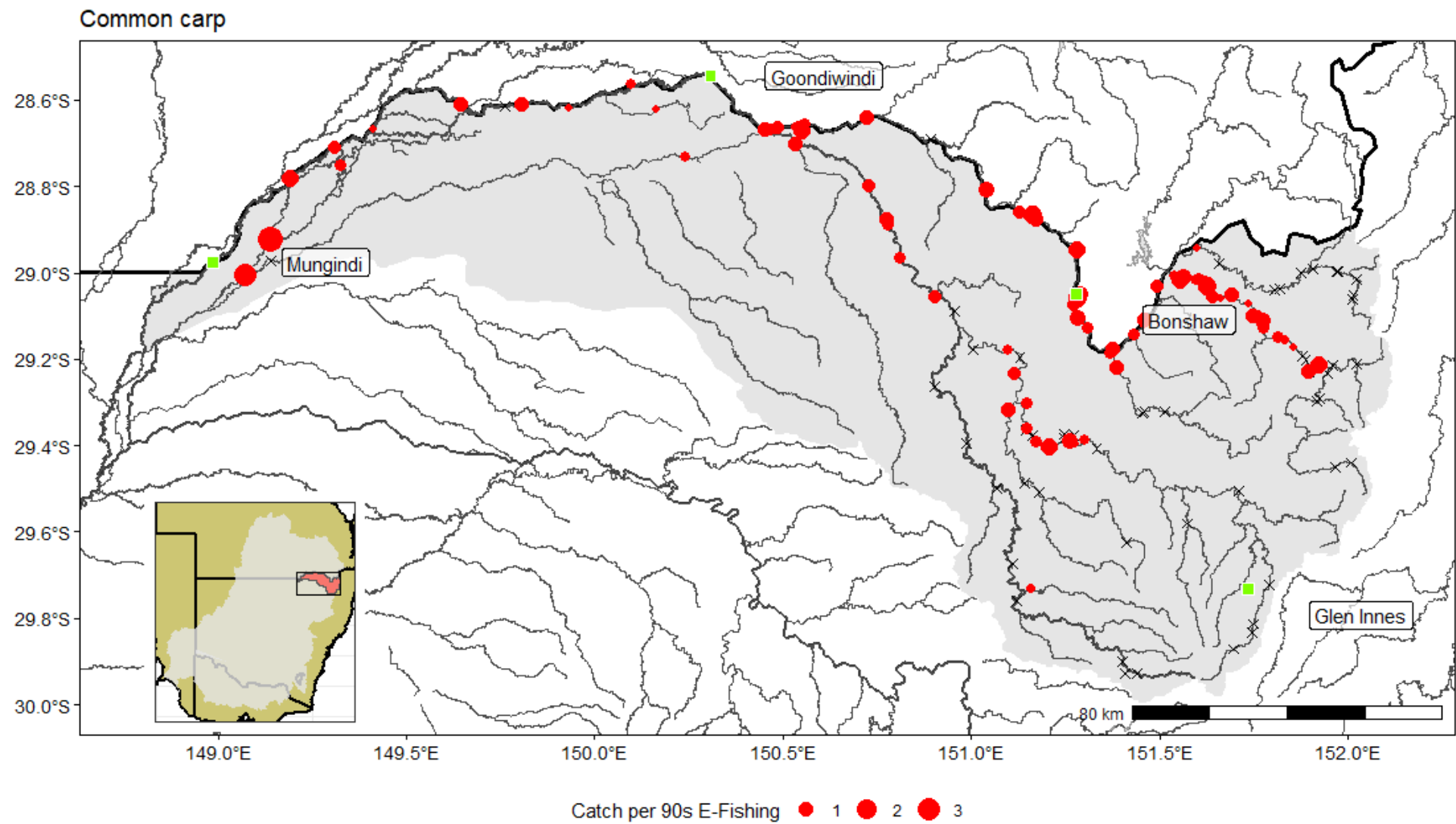


Figure 8.32: Distribution of Common carp. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares show key towns.

8.13 Threatened Species

The following table (Table 8.6) 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 in the New South Wales Border Rivers 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 8.10.

Table 8.6: Listed species which were observed in this region during the sampling period.

Species	Common name	Total caught	Total observed (not caught)
<i>Ambassis agassizii</i>	Olive perchlet	182	15
<i>Bidyanus bidyanus</i>	Silver perch	49	8
<i>Maccullochella peelii</i>	Murray cod	2,303	1,119
<i>Mogurnda adspersa</i>	Southern purple-spotted gudgeon	86	7
<i>Tandanus tandanus</i>	Freshwater catfish	531	127

The following pages provide more information on where each species was caught.

Olive perchlet

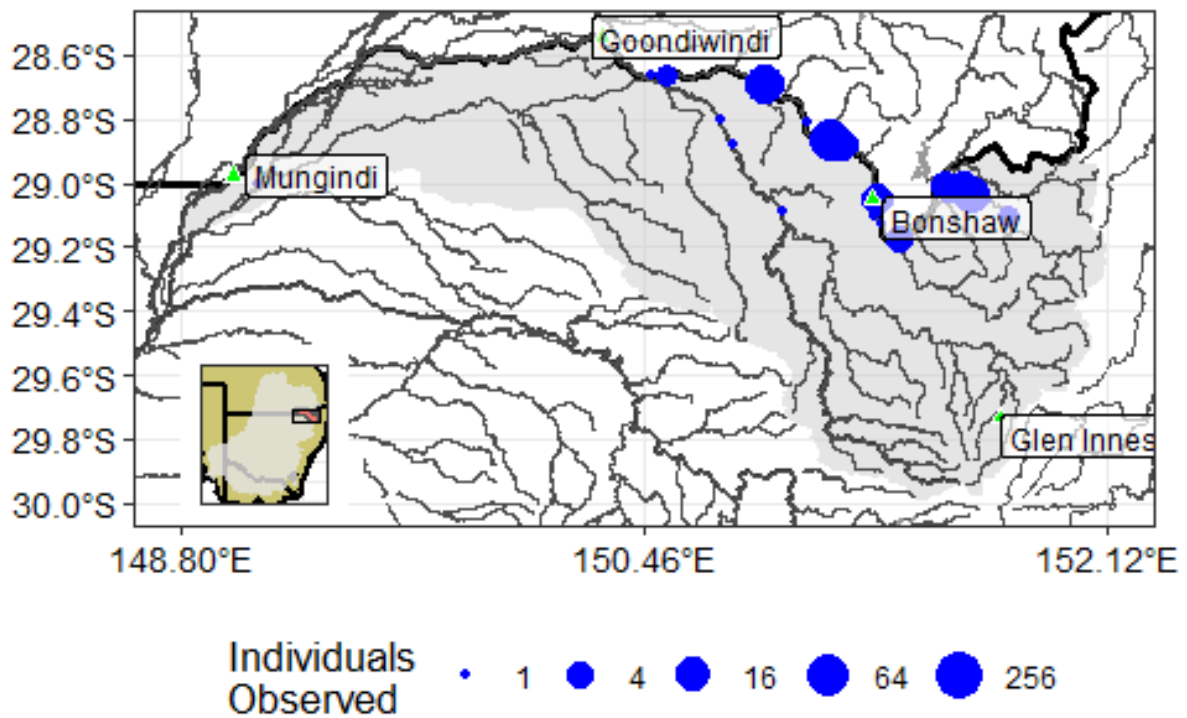


Figure 8.33: Distribution of the observed threatened species. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Green triangles show key towns.

8.13.0.1 Summary Statement:

A total of 182 Olive perchlet were captured across 26 sites during the reporting period. Individuals were caught in all years except 2021/22. 25 individuals were caught in 2024/25.

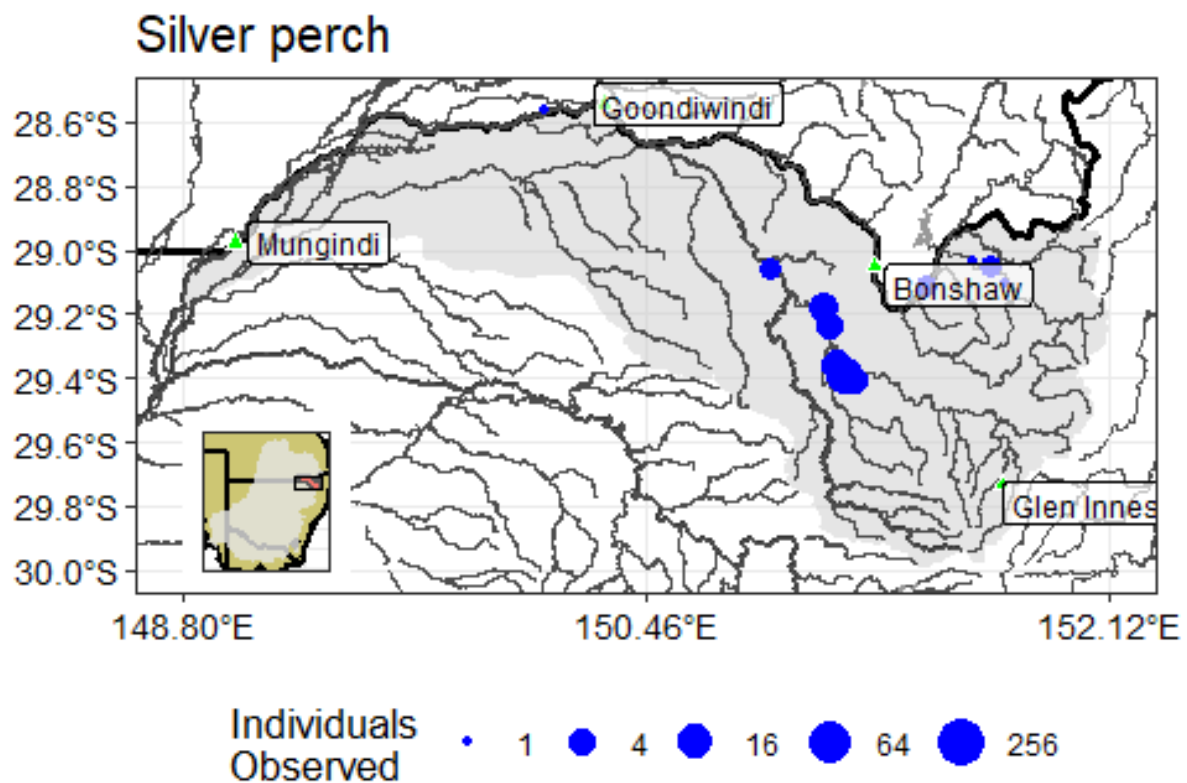


Figure 8.34: Distribution of the observed threatened species. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Green triangles show key towns.

8.13.0.2 Summary Statement:

A total of 49 Silver perch were captured across 12 sites during the reporting period. No individuals were caught from 2019/20 – 2021/22. 11 individuals were caught across 7 sites in 2024/25.

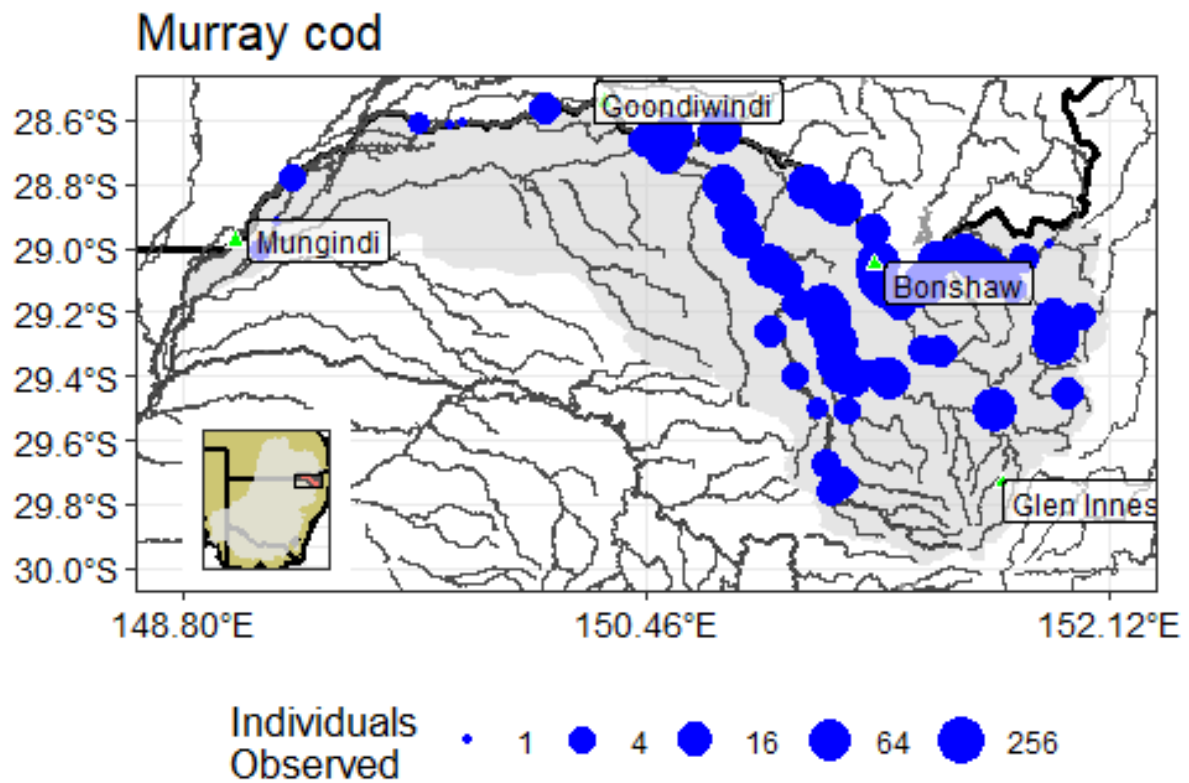


Figure 8.35: Distribution of the observed threatened species. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Green triangles show key towns.

8.13.0.3 Summary Statement:

A total of 2,303 Murray cod were captured across the NSW Border Rivers during the reporting period. For more details see the Murray cod section.

Southern purple-spotted gudgeon

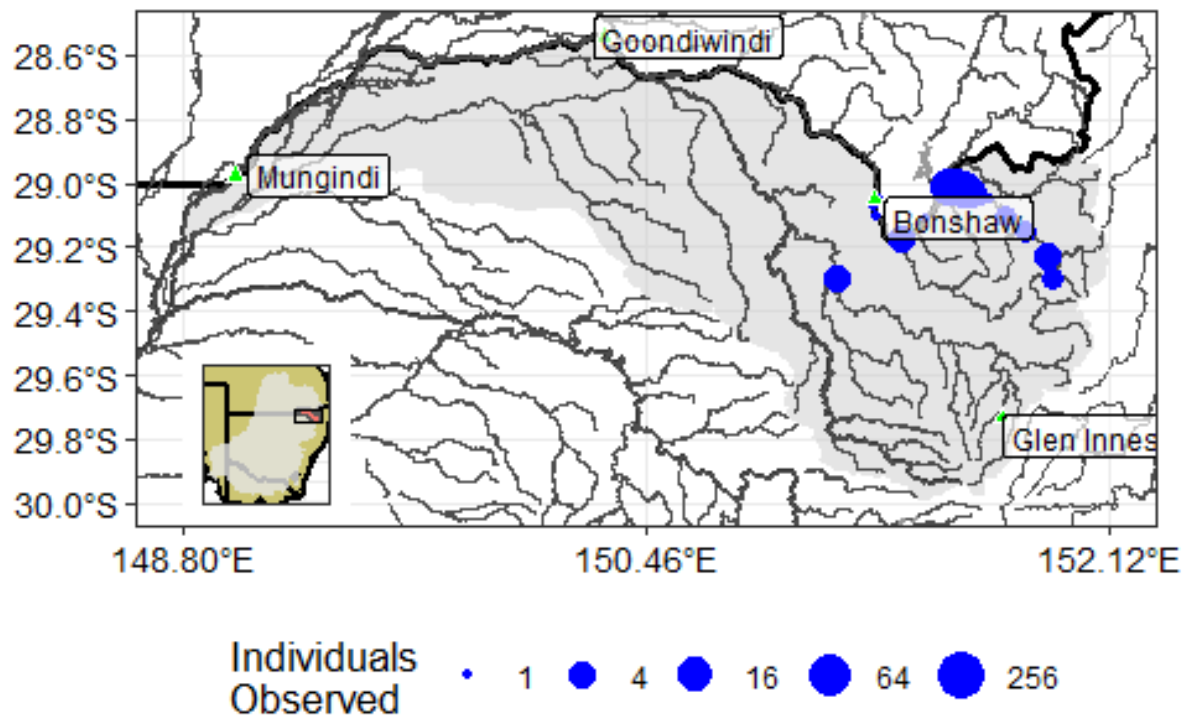


Figure 8.36: Distribution of the observed threatened species. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Green triangles show key towns.

8.13.0.4 Summary Statement:

A total of 86 Southern purple-spotted gudgeon were captured across 17 sites in the eastern NSW Border Rivers region. Individuals were captured in all years except 2015/16, 2017/18 and 2023/24.

Freshwater catfish

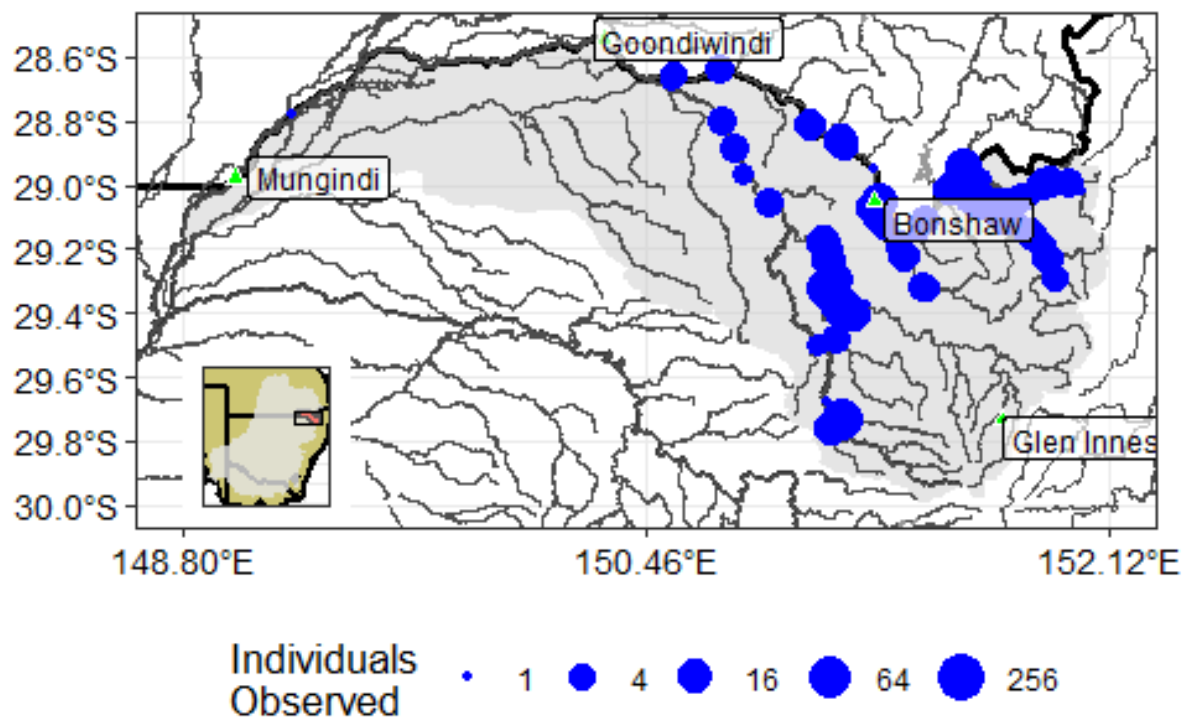


Figure 8.37: Distribution of the observed threatened species. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Green triangles show key towns.

8.13.0.5 Summary Statement:

A total of 531 Freshwater catfish were captured across the eastern half of the NSW Border Rivers region. Individuals were observed in all sampling years.

8.14 Appendix

This report contains data from the projects listed in Table 8.7.

Table 8.7: 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	2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020	163
Basin Plan Environmental Outcomes Monitoring 2	2022/2023, 2023/2024, 2024/2025	52
Cold Water Pollution	2022/2023, 2023/2024, 2024/2025	48
Drought response management	2019/2020	1
FlowMER2.0 - Northern Basin	2024/2025	10
Monitoring, Evaluating and Reporting - Inland	2015/2016	1
Murray Cod Slot Limit Assessment	2020/2021	6
Murray-Darling Basin Fish Surveys	2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020, 2021/2022, 2022/2023, 2023/2024, 2024/2025	40
Recreational Fishing Assessments in NSW	2018/2019, 2019/2020, 2020/2021, 2021/2022, 2022/2023, 2023/2024, 2024/2025	25
Three Dams	2020/2021, 2021/2022	20

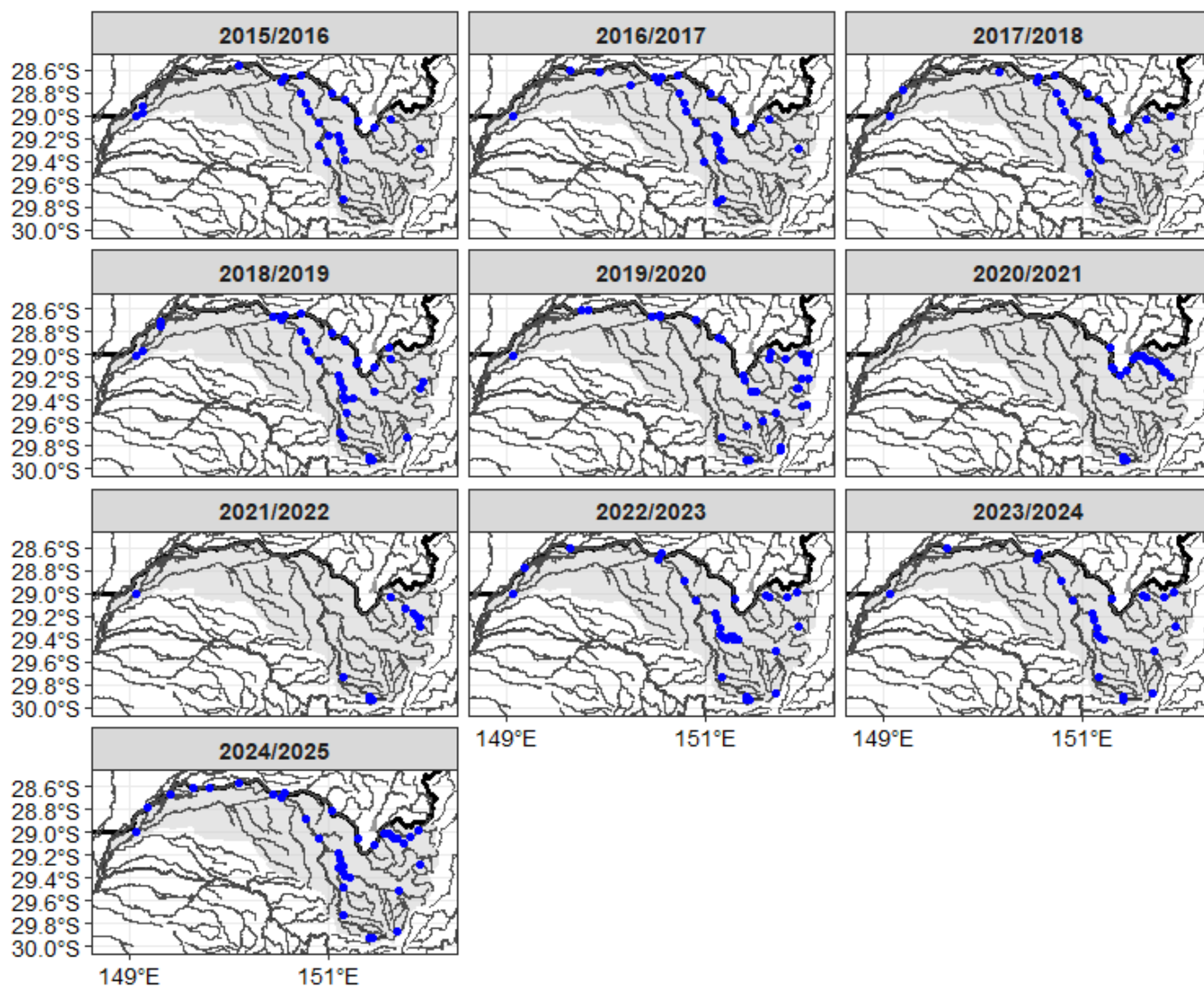


Figure 8.38: Sites sampled and included in this report by sampling season. Dry sites are not shown.

Table 8.8 shows all species detected during this survey period as part of standardised monitoring projects (see Table 8.7). Note there are variations in effort between sampling seasons so this information should be considered in conjunction with Table 8.1. 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 Border Rivers WRPAs were: Northern river blackfish, Macquarie perch, Dwarf flathead gudgeon, Brown trout. 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 8.11.

Table 8.8: Total number caught of each species by sampling season. Sampling season refers to the July-June ending June 30th of the specified year.

Common name	Expected from modelling	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Australian smelt	YES	387	1	48	103	72	42	75	19	50	25
Bony herring	YES	919	499	1,909	387	1,295	24	25	159	326	629
Carp gudgeon species complex	YES	2,685	851	4,841	5,848	4,063	1,839	487	7,755	1,911	1,445
Common carp	NA	241	222	337	260	112	135	97	260	323	310
Darling hardyhead	YES	11	4	2	5	7	0	0	187	40	10
Eastern gambusia	NA	253	69	307	1,517	525	131	15	348	180	337
Freshwater catfish	YES	29	57	76	81	37	78	21	29	19	104
Golden perch	YES	97	61	132	69	13	15	18	52	73	191
Goldfish	NA	13	31	58	115	44	9	20	276	83	12
Mountain galaxias	YES	0	0	0	15	22	0	0	0	0	0
Murray cod	YES	323	234	561	450	96	69	39	170	157	204
Murray-Darling carp-gudgeon	NA	0	13	0	0	0	0	0	0	0	0
Murray-Darling rainbowfish	YES	183	285	420	226	57	223	60	84	30	80
Olive perchlet	YES	3	4	2	13	105	22	0	1	7	25
Rainbow trout	YES	0	0	0	7	0	2	64	97	4	2

(continued)

Common name	Expected from modelling	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Redfin	YES	0	0	0	38	3	0	0	0	48	0
Silver perch	YES	6	7	12	4	0	0	0	5	4	11
Southern purple-spotted gudgeon	YES	0	1	0	4	3	71	3	1	0	3
Spangled perch	YES	11	13	19	152	37	6	21	40	3	13
Unspecked hardyhead	YES	59	55	227	938	660	608	10	70	113	248

The following table summaries the sampling methods for each species caught (Table 8.9).

Table 8.9: Total catch of each species by sampling method.

Common name	Backpack Electrofishing	Bait Trap	Boat Electrofishing
Australian smelt	14	0	808
Bony herring	7	1	6,164
Carp gudgeon species complex	2,113	22,854	6,758
Common carp	93	4	2,200
Darling hardyhead	32	2	232
Eastern gambusia	1,688	951	1,043
Freshwater catfish	232	1	298
Golden perch	3	54	664
Goldfish	150	3	508
Mountain galaxias	37	0	0
Murray cod	173	0	2,130
Murray-Darling carp-gudgeon	0	13	0
Murray-Darling rainbowfish	141	23	1,484
Olive perchlet	3	81	98
Rainbow trout	176	0	0
Redfin	48	0	41
Silver perch	1	0	48
Southern purple-spotted gudgeon	9	3	74
Spangled perch	24	22	269
Unspecked hardyhead	227	21	2,740

Table 8.10: 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 8.11 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 Border Rivers WRPAs were: Northern river blackfish, Macquarie perch, Dwarf flathead gudgeon, Brown trout. 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 8.8.

Table 8.11: Total catch of each species by all sampling programs and all methods in the region. Sampling season refers to the July-June ending June 30th of the specified year. Note these include projects with sampling not representative of the community and the data should be interpreted with appropriate caution.

Common name	Expected from modelling	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Australian smelt	YES	575	1	48	103	822	42	75	19	50	25
Bony herring	YES	936	499	1,909	387	1,295	24	25	159	326	629
Carp gudgeon species complex	YES	3,725	851	4,841	5,848	7,648	1,839	487	7,755	1,911	1,445
Common carp	NA	241	222	337	260	150	135	97	263	325	310
Darling hardyhead	YES	11	4	2	5	7	0	0	187	40	10
Eastern gambusia	NA	625	69	307	1,517	728	131	15	348	180	337
Freshwater catfish	YES	30	57	76	81	39	78	21	56	27	104
Golden perch	YES	97	61	132	69	13	15	18	90	73	191
Goldfish	NA	13	31	58	115	50	9	20	276	85	12
Mountain galaxias	YES	0	0	0	15	22	0	0	0	0	0
Murray cod	YES	323	234	561	450	96	75	39	175	161	204
Murray-Darling carp-gudgeon	NA	0	13	0	0	0	0	0	0	0	0
Murray-Darling rainbowfish	YES	314	285	420	226	71	223	60	84	30	80
Olive perchlet	YES	7	4	2	13	352	22	0	1	7	25
Rainbow trout	YES	0	0	0	7	0	2	64	97	4	2

(continued)

Common name	Expected from modelling	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Redfin	YES	0	0	0	38	3	0	0	0	48	0
Silver perch	YES	6	7	12	4	0	0	0	6	4	11
Southern purple-spotted gudgeon	YES	0	1	0	4	3	71	3	1	0	3
Spangled perch	YES	12	13	19	152	37	6	21	40	3	13
Unspecked hardyhead	YES	258	55	227	938	2,333	608	10	70	113	248

8.14.1 References

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