

Chapter 4 Basin Plan Fish Monitoring Summary (2014/15 – 2023/24): Intersecting Streams Water Resource Planning Area

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<i>Citation Details</i>	134
<i>Acknowledgement</i>	134
<i>Introduction</i>	135
What This Report Includes.....	136
Sampling Methods.....	137
<i>Climate Overview</i>	140
<i>Flow Data</i>	141
<i>Species Diversity</i>	144
<i>Murray cod</i>	147
<i>Golden perch</i>	148
Population Structure	149
Temporal Trends in Abundance	150
Health	151
Distribution.....	152
<i>Freshwater catfish</i>	154
<i>Bony herring</i>	155
Population Structure	156
Temporal Trends in Abundance	157
Health	158
Distribution.....	159
<i>Australian smelt</i>	161
<i>Common carp</i>	162
Population Structure	163
Temporal Trends in Abundance	164
Health	165
Distribution.....	166
<i>Threatened Species</i>	168
<i>Appendix</i>	170

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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 Intersecting Streams Water Resource Planning Area (WRPA) shown in Figure 4.1.

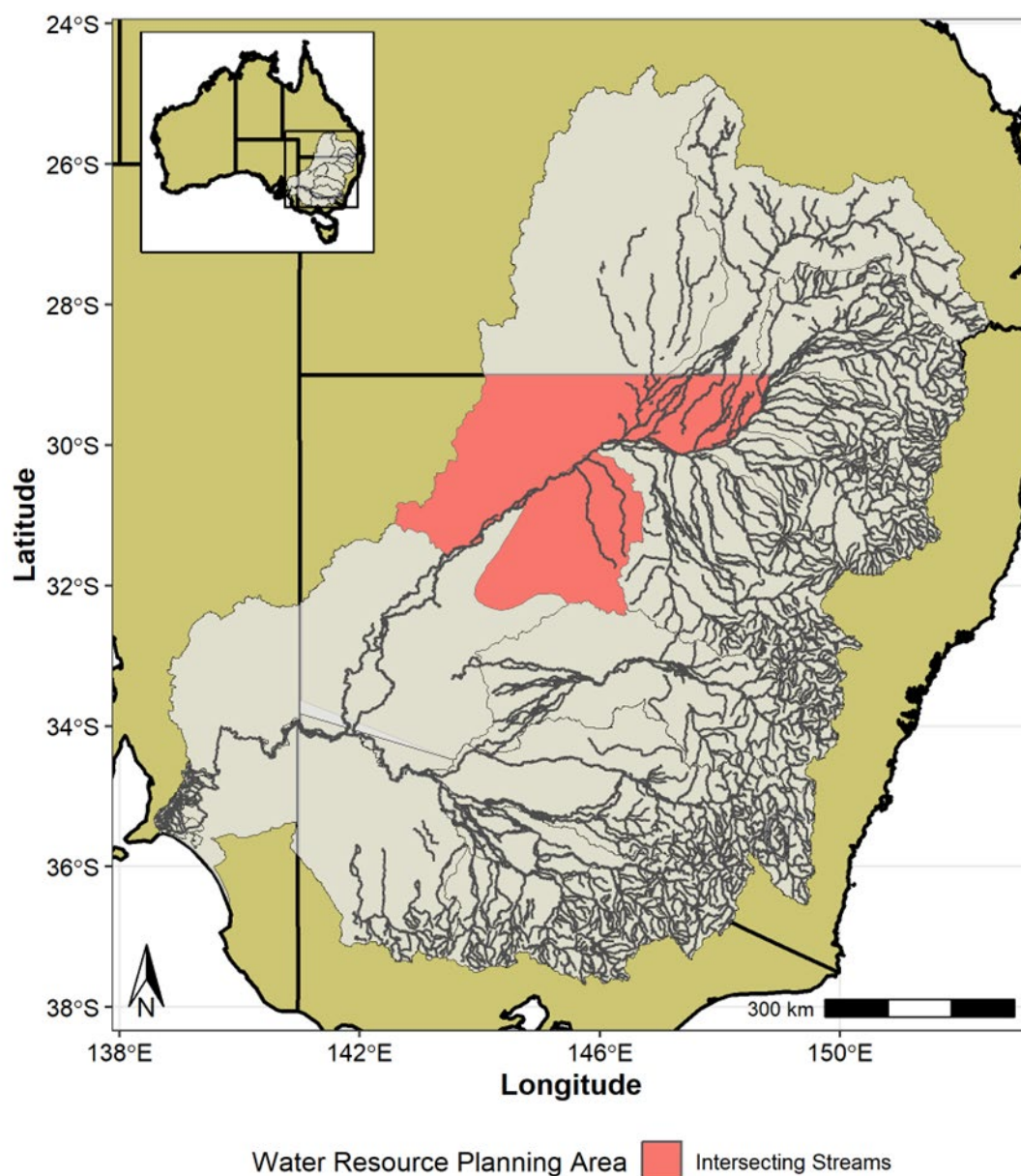


Figure 4.1: Murray-Darling Basin with the key region of this report highlighted. Inset map shows the whole of Australia with a box around the MDB.

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 Intersecting Streams 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 (not recorded in this WRPAs over the sampling period)
- Golden perch
- Freshwater catfish (not recorded in this WRPAs over the sampling period)
- Bony herring
- Australian smelt (very few recorded in this WRPAs over the sampling period)
- 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 Intersecting Streams 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 Intersecting Streams WRPAs and greater MDB (excluding the Intersecting Streams 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 Intersecting Streams 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 4.1). Details of which projects contributed data to this report can be seen in Table 4.5. 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 4.1: Sampling effort (Number of sites sampled) each sampling season in the Intersecting Streams 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
2014/2015	4	2	0	6
2015/2016	6	3	0	9
2016/2017	10	3	0	13
2017/2018	5	5	1	11
2018/2019	2	1	0	3
2019/2020	7	1	0	8
2020/2021	4	0	2	6
2021/2022	6	0	0	6
2022/2023	7	0	0	7
2023/2024	7	3	0	10

The sites sampled during the reporting period are shown in Figure 4.2. A breakdown of sites sampled each sampling season is shown in the Appendix (Figure 4.20).

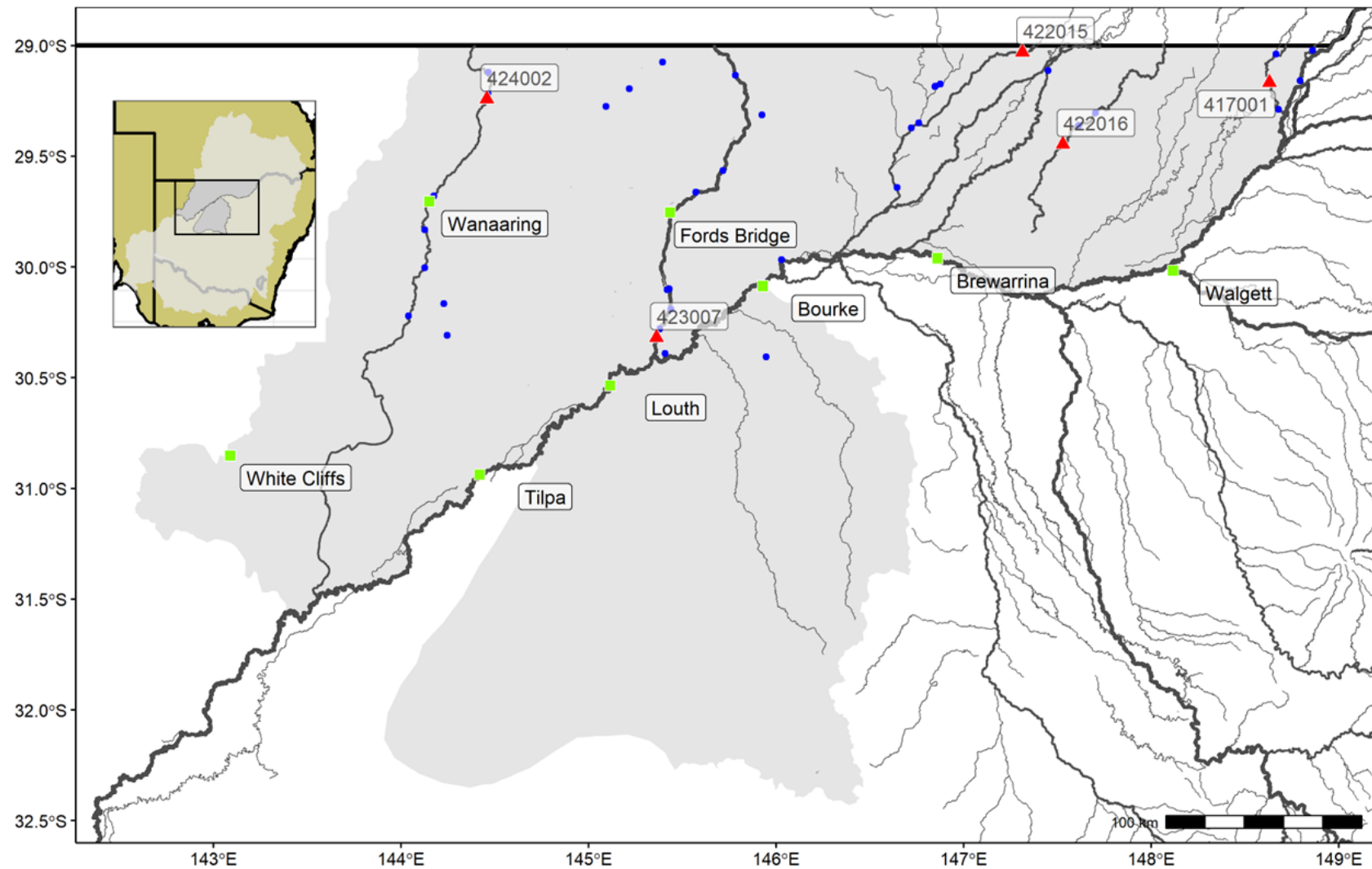


Figure 4.2: Sites (blue dots) sampled during the reporting period in the Intersecting Streams WRP. Red triangles show key flow gauges along with their gauge ID number. Green squares show key towns. The grey shaded area represents the water resource planning area.

Each sampling method has a different effectiveness at sampling each species. Table 4.2 shows the total numbers of each key species caught by each method.

Table 4.2: Number of each key species caught by sample method over the whole program in the Intersecting Streams WRPA. Further data on total catch is provided in the Appendix.

Common name	Boat Electrofishing	Backpack Electrofishing	Bait Trap
Australian smelt	3	0	0
Bony herring	4,841	60	8
Common carp	2,205	141	107
Golden perch	251	25	23

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 4.3 shows the number of biological measurements taken each year for the six key species.

Table 4.3: Number of biological measurements taken for the key species each sampling season in the Intersecting Streams WRPA.

Sampling Season	Australian smelt	Bony herring	Common carp	Golden perch
2014/2015	0	194	32	13
2015/2016	0	136	35	24
2016/2017	2	640	358	69
2017/2018	0	103	74	67
2018/2019	0	1	0	0
2019/2020	0	78	38	35
2020/2021	0	229	288	25
2021/2022	0	413	186	3
2022/2023	1	326	353	42
2023/2024	0	202	325	27

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 Intersecting Streams WRPA (Figure 4.3).

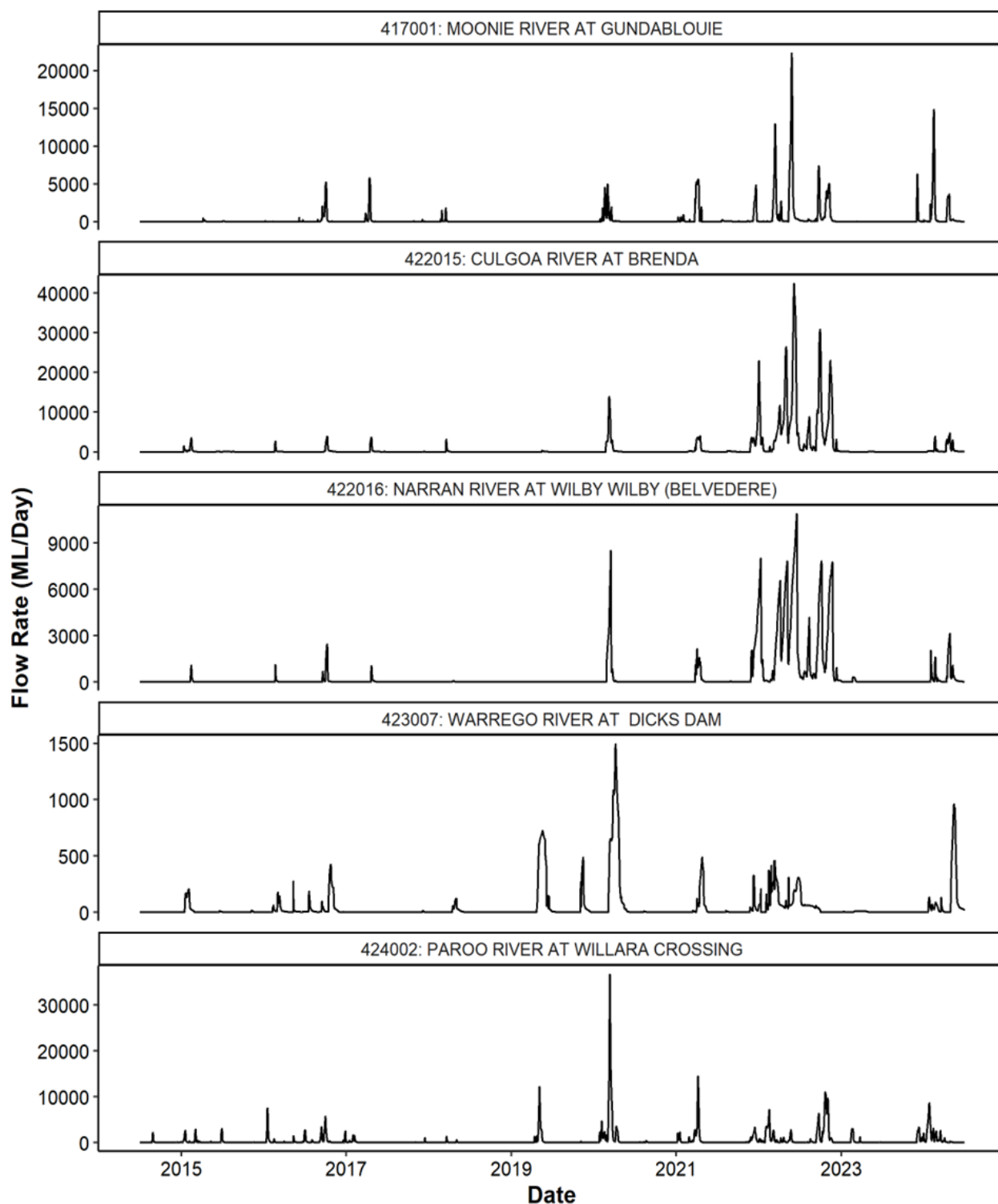


Figure 4.3: Flow data from various gauges in the Intersecting Streams WRPA over the reporting period. Gauge locations can be seen on Figure 4.2. Note the differing scales on the y-axis.

Water temperature data, where available, are also shown in Figure 4.4.

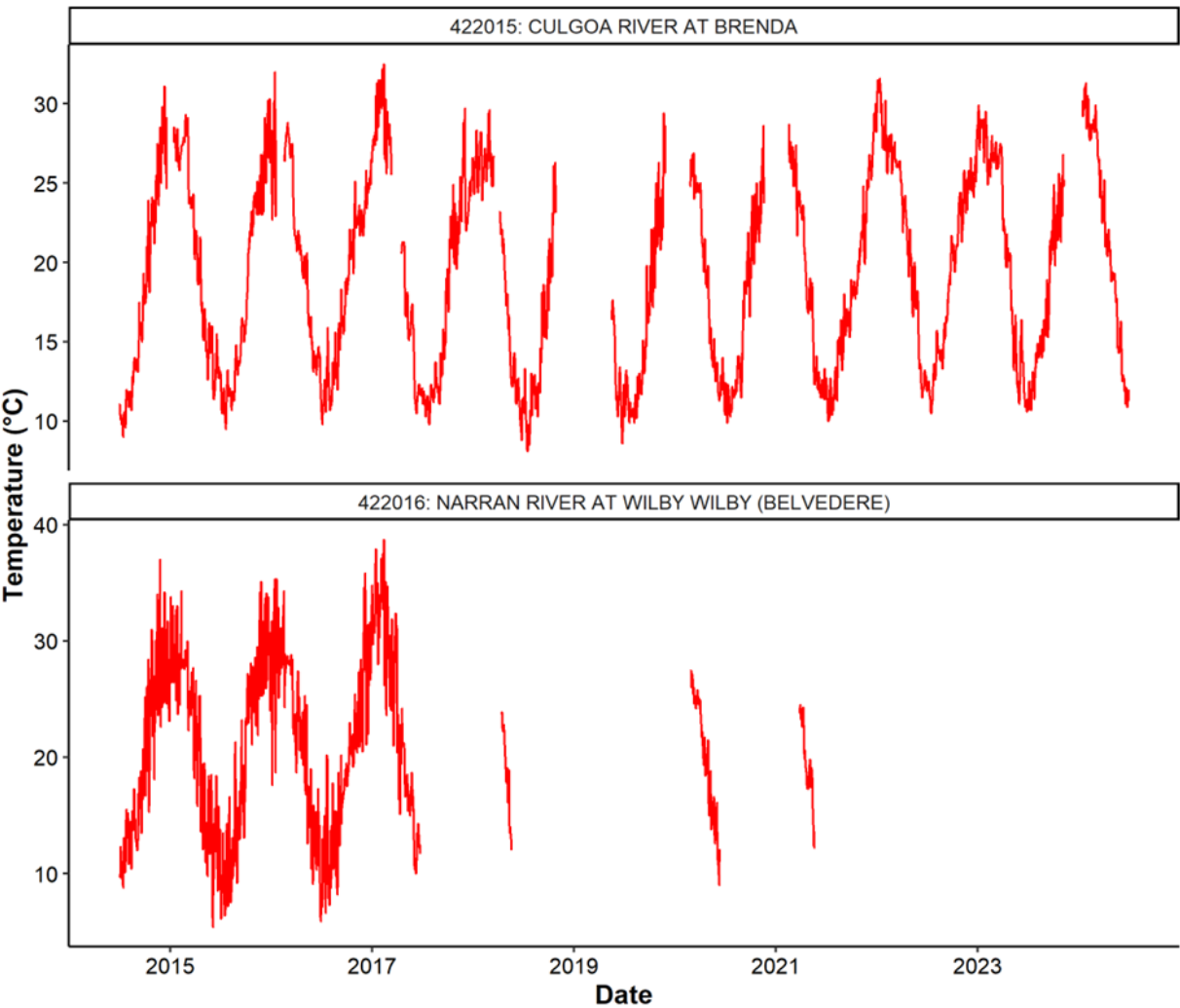


Figure 4.4: Water temperature data from various gauges in the Intersecting Streams WRPA over the reporting period. Gauge locations can be seen on Figure 4.2. Note the differing scales on the y-axis.

Species Diversity

A total of 12 fish species were observed across the Intersecting Streams WRPA including three alien species. Figure 4.5 shows the number of native species found at each site while Figure 4.6 shows the number of alien species found at each site. The full list of species caught and observed is presented in Table 4.6.

Summary Statement:

Native and alien diversity was generally consistent across the region with slight increases in the central area near the lower Warrego River.

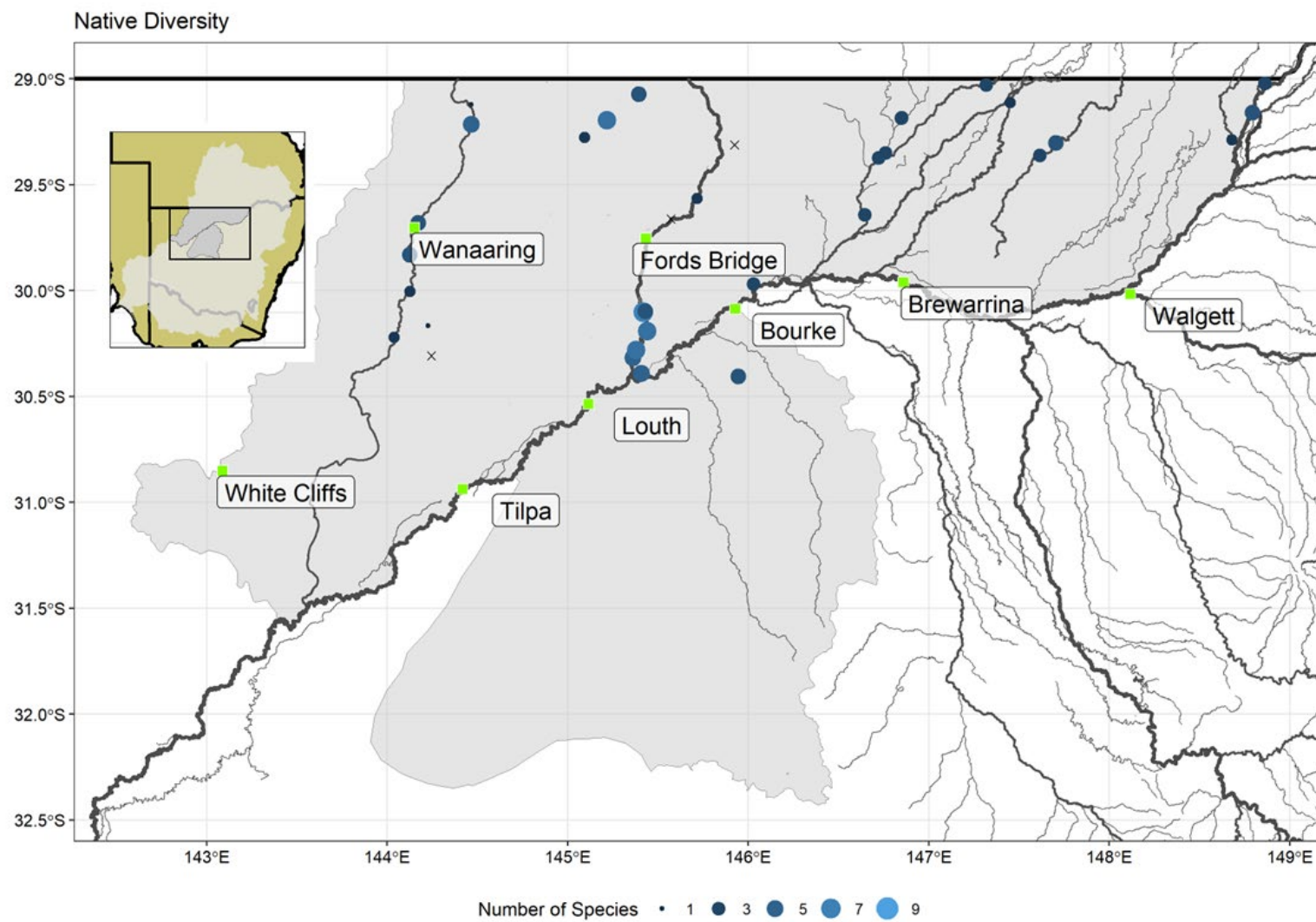


Figure 4.5: Native diversity across all sampling sites in the Intersecting Streams WRPA. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded. Green squares represent key towns.

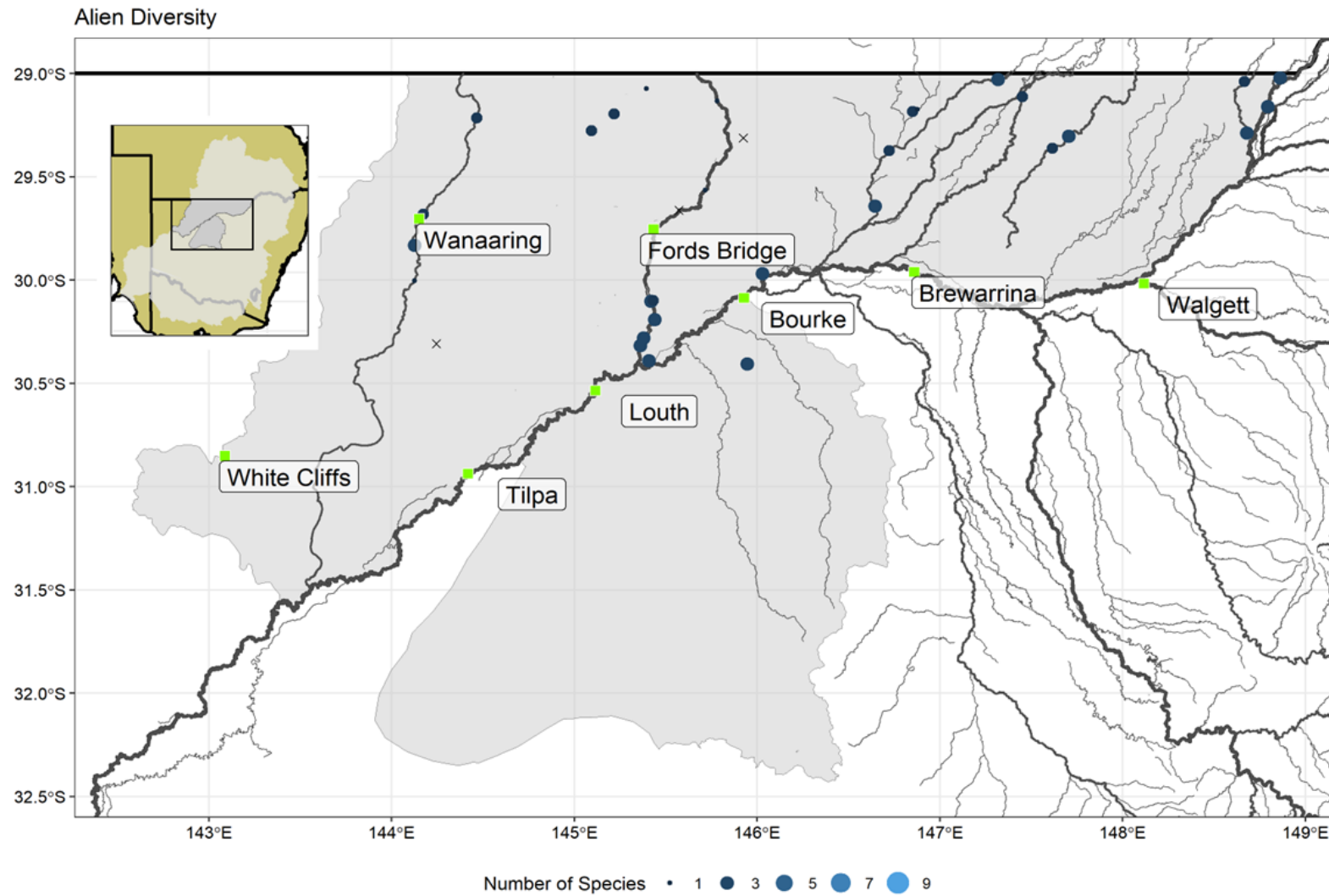


Figure 4.6: Alien diversity across all sampling sites in the Intersecting Streams WRP. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded. Green squares represent key towns.

Murray cod



Summary Statement:

No Murray cod were recorded in the Intersecting Streams WRPA suggesting they are absent or in very low abundances.

Golden perch



Population Structure

Figure 4.7 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 1 to 57, and 7 % to 92 % of measured fish within a season, with a mean percentage YOY of 47 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Golden perch was 6 % (514 out of 7,994).

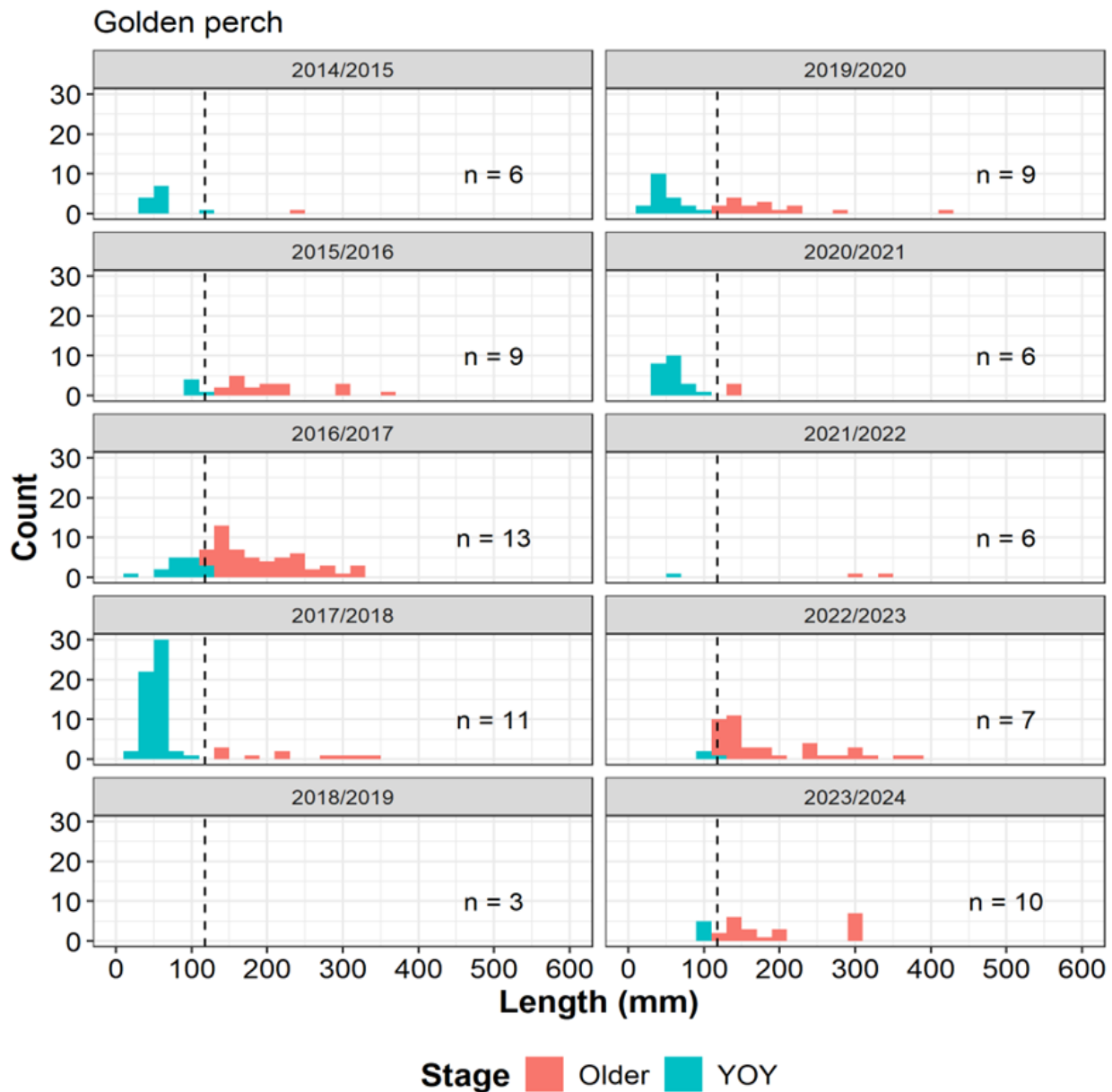


Figure 4.7: Length frequency plots for Golden perch by sampling season in the Intersecting Streams WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Sporadic recruitment with possible recruitment failures in 2018/19, 2021/22 and 2022/23. 2023/24 showed some moderate sized fish but very few YOY (note the low sampling effort in many years).

Stocking

No Golden perch were stocked in the Intersecting Streams WRPAs during the reporting period.

Temporal Trends in Abundance

The relative abundance and biomass of Golden perch since the early 2000s was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 4.8 show the abundance and biomass trends for the Intersecting Streams WRPAs and the right-hand panels show the overall trends across the NSW MDB.

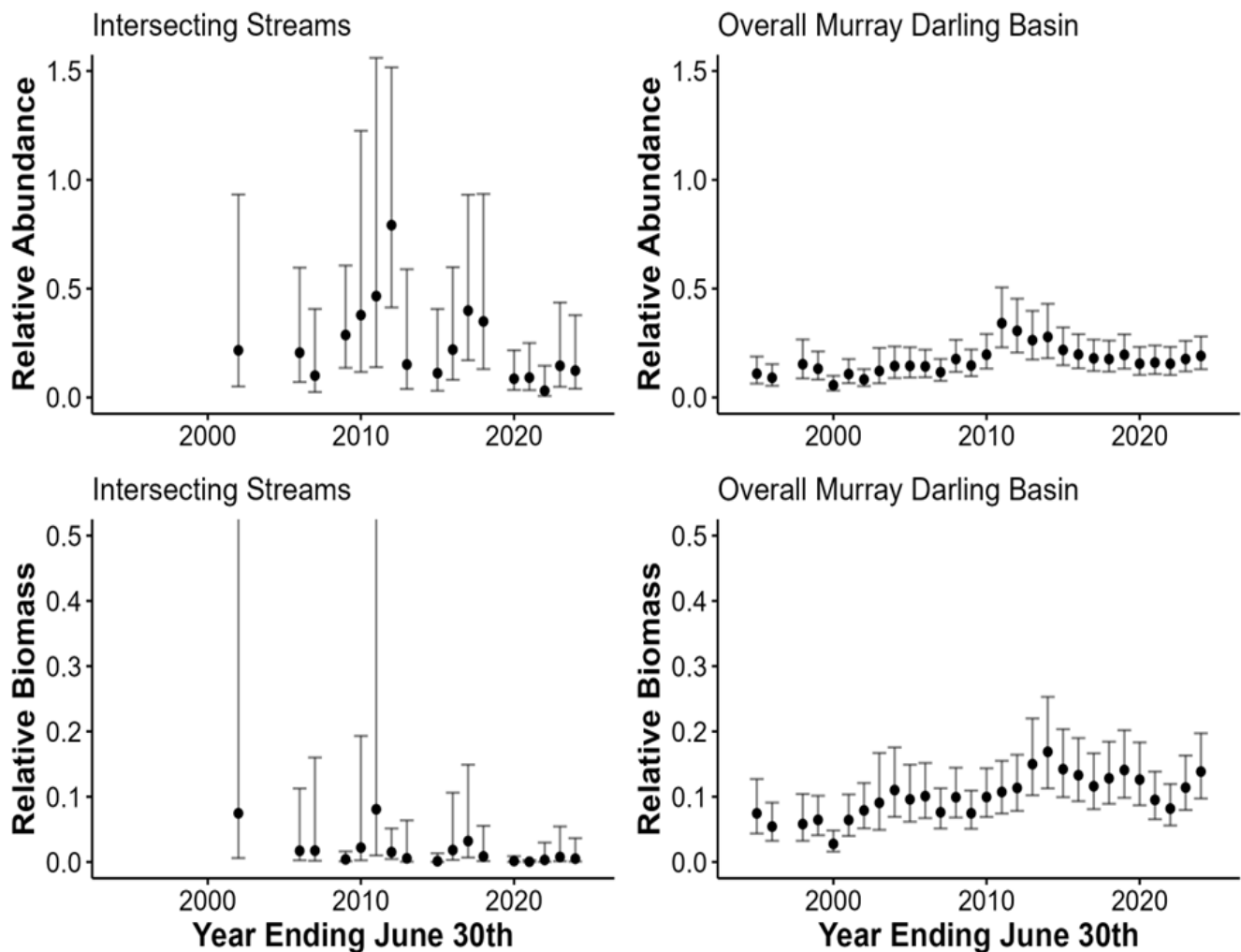


Figure 4.8: Relative abundance and biomass of Golden perch in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Relative abundance has fluctuated since the 2000s but has been trending slightly upwards since 2021 and is likely slightly lower than the overall NSW MDB. Biomass has remained relatively stable since 2020 and is considerably lower than the overall NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2014/2015 to 43 % of sampled fish in 2023/2024 (Figure 4.9). The most common health issue for Golden perch in the Intersecting Streams water resource planning area was Lernaean, which was observed in a total of 21 fish, corresponding to 7 % of all Golden perch measured.

Across the other WRPA's, 26 % of Golden perch (2,060 out of 7,994 Golden perch) showed a health condition (excludes Intersecting Streams).

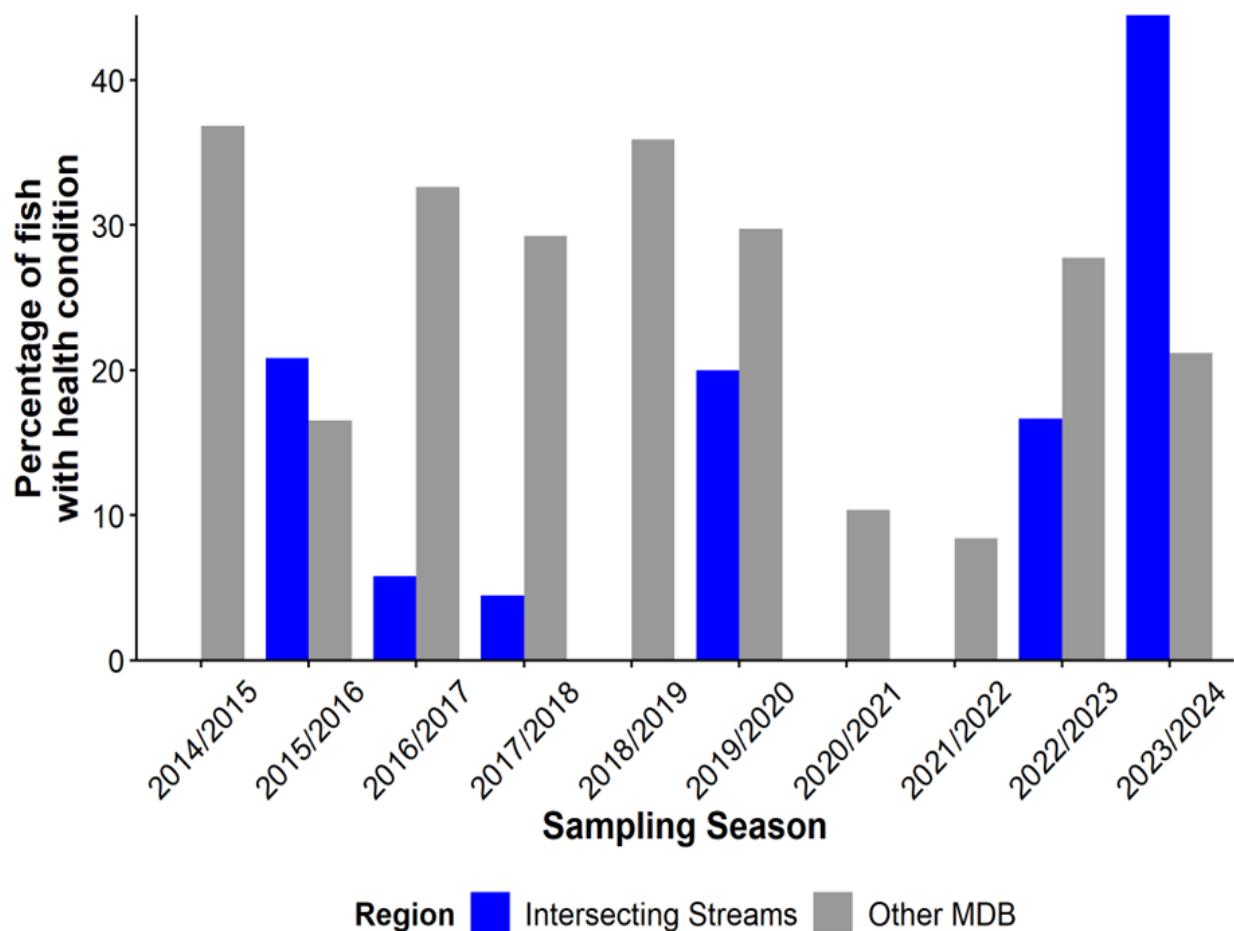


Figure 4.9: Timeseries showing the prevalence of health conditions in Golden perch. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

The presence of observable health conditions for Golden perch in the Intersecting Streams was variable and ranged from low to high. While most years showed similar occurrence to the rest of the NSW MDB, no health issues were recorded in 2014/15, 2020/21 and 2021/22. 2023/24 showed a much higher proportion of recorded health conditions than the wider NSW MDB and the highest in the timeseries for the Intersecting Streams WRPA.

Distribution

Golden perch were recorded at 29 out of 37 sites in the Intersecting Streams WRPAs from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 1.2 fish caught per 90 seconds of electrofishing. Figure 4.10 shows the distribution and relative abundance of Golden perch across the Intersecting Streams WRPAs.

Summary Statement:

Golden perch were generally found in the north and western regions of the Intersecting Streams WRPAs.

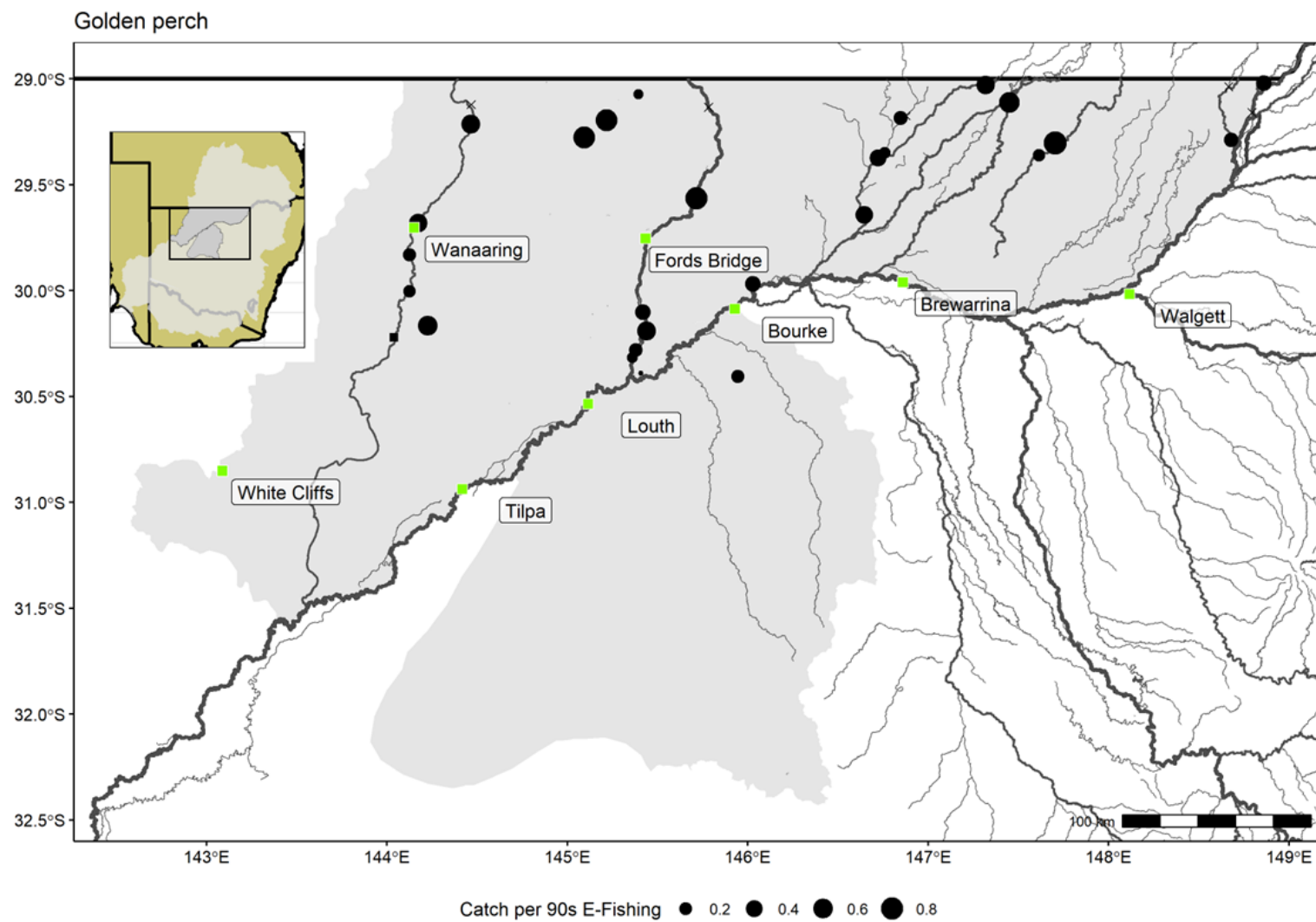


Figure 4.10: Distribution of Golden perch sampled from 2013/14 to 2023/24 in the Intersecting Streams WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Freshwater catfish



Summary Statement:

No Freshwater catfish were recorded in the Intersecting Streams WSPA suggesting they are absent or in very low abundances.

Bony herring



Population Structure

Figure 4.11 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 1 to 235, and 3 % to 100 % of measured fish within a season, with a mean percentage YOY of 44 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Bony herring was 24 % (12,544 out of 51,863). Bony herring are not a stocked species.

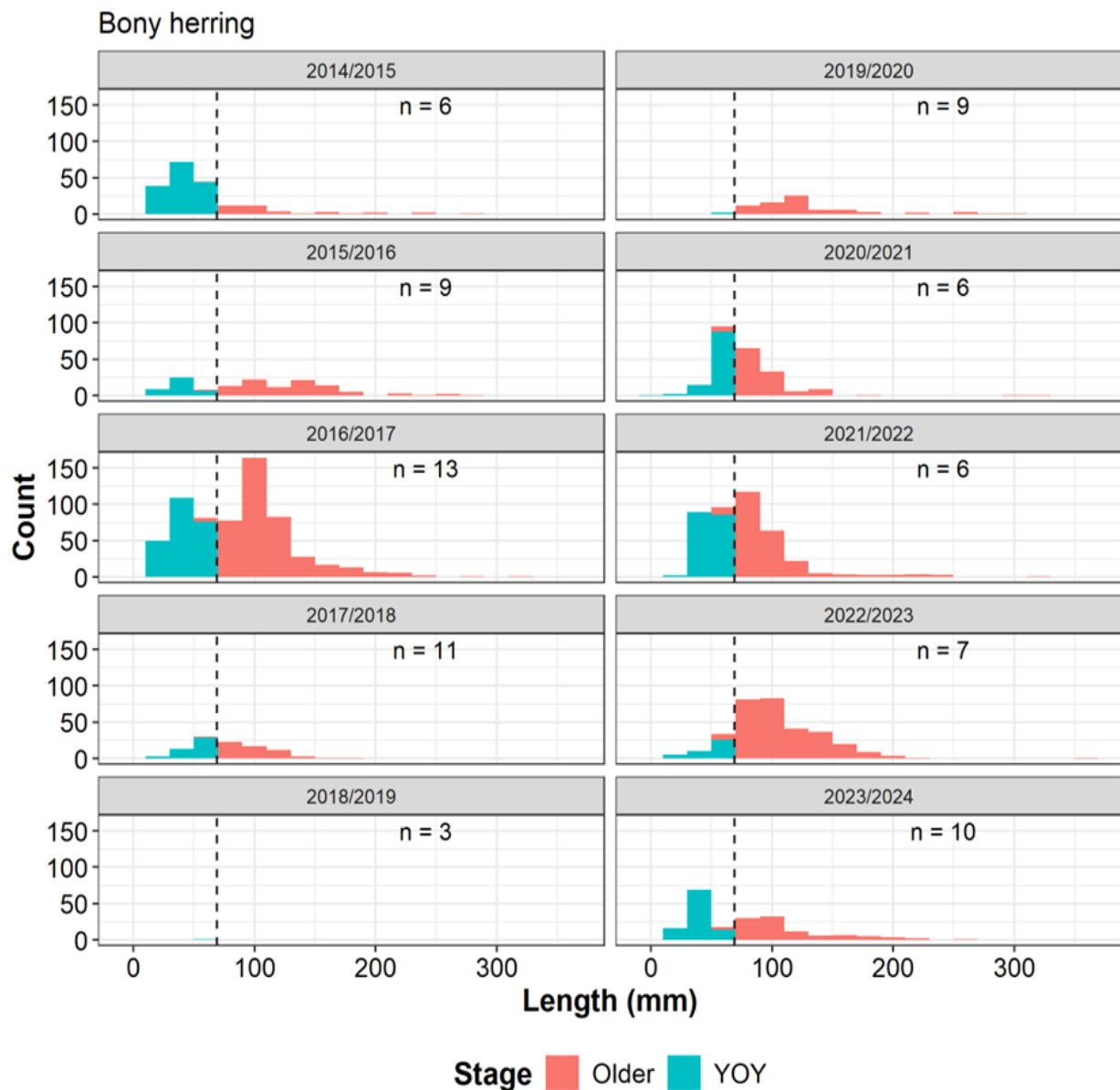


Figure 4.11: Length frequency plots for Bony herring by sampling season in the Intersecting Streams WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Regular recruitment in most years except 2018/19 and 2019/20. Note that low sampling effort in some years may limit the ability to detect recruitment in this WRPA.

Temporal Trends in Abundance

The relative abundance and biomass of Bony herring since the early 2000s was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 4.12 show the abundance and biomass trends for the Intersecting Streams WRPAs and the right-hand panels show the overall trends across the NSW MDB.

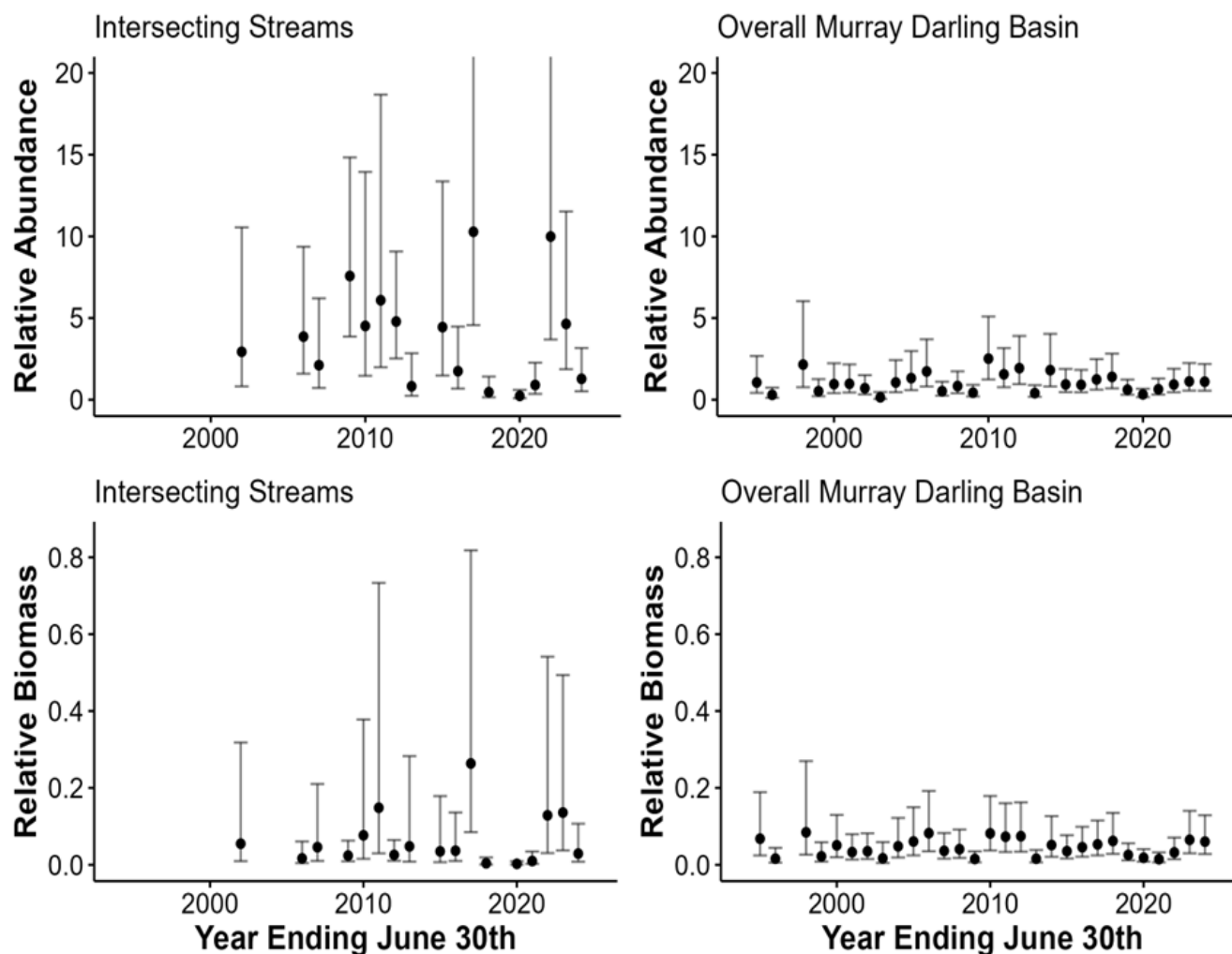


Figure 4.12: Relative abundance and biomass of Bony herring in both the Intersecting Streams WRPAs and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Abundance and biomass both highly variable since the 2000s but both show evidence of a decline over the last 3 years. Abundance and biomass in 2023/24 comparable to the overall NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2015/2016 to 8 % of sampled fish in 2023/2024 (Figure 4.13). The most common health issue for Bony herring in the Intersecting Streams WRPAs was Fungus, which was observed in a total of 33 fish, corresponding to 1 % of all Bony herring measured.

Across the other NSW MDB WRPAs, 0.98 % of Bony herring (508 out of 51,864 Bony herring) showed a health condition (excludes the Intersecting Streams WRPAs).

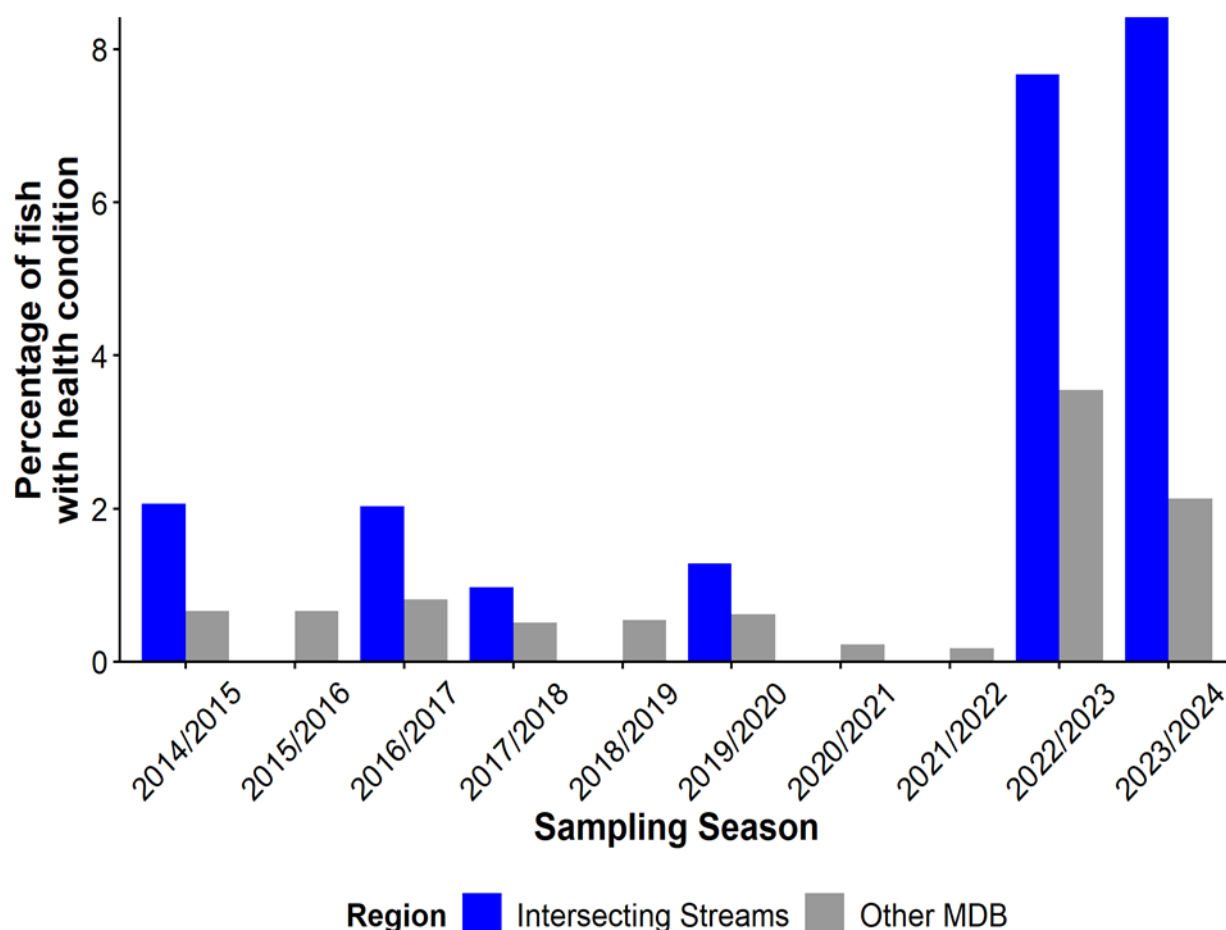


Figure 4.13: Timeseries showing the prevalence of health conditions in Bony herring. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

Summary Statement:

Presence of observable health conditions was low in all years but 2022/23 and 2023/24 showed a higher level of observed health conditions than other years.

Distribution

Bony herring were recorded at 27 out of 37 sites in the Intersecting Streams WRPA from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 42 fish caught per 90 seconds of electrofishing. Figure 4.14 shows the distribution and relative abundance of Bony herring across the Intersecting Streams WRPA.

Summary Statement:

Bony herring were recorded across the Intersecting Streams WRPA.

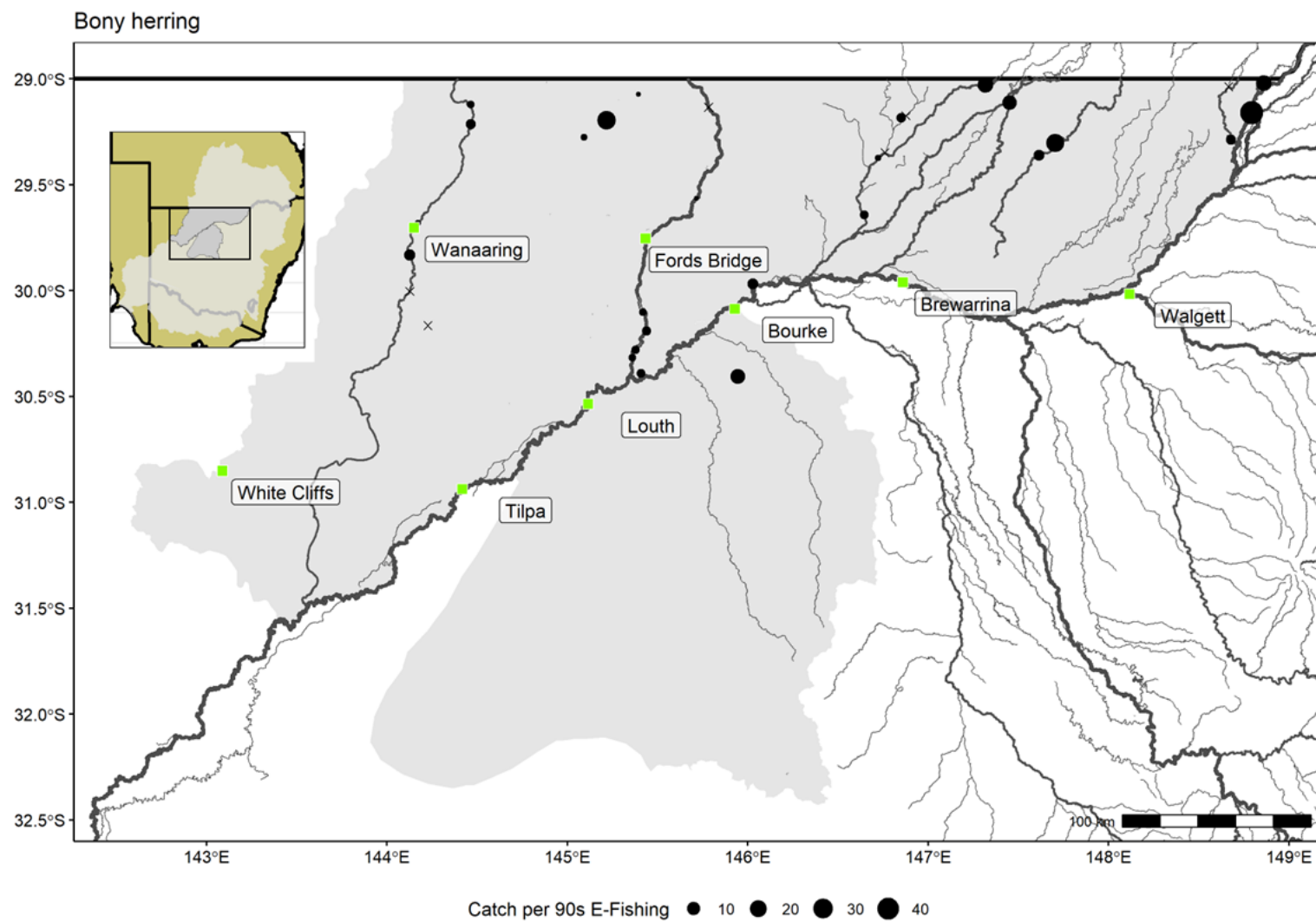


Figure 4.14: Distribution of Bony herring sampled from 2013/14 to 2023/24 in the Intersecting Streams WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Australian smelt



Summary Statement:

Only 3 Australian smelt were captured in the Intersecting Streams WRPAs during the reporting period (2 in 2016/17 and 1 in 2022; all 3 individuals being Young of the Year). This suggests Australian smelt are in very low abundances across this region. No health issues were observed in these three individuals.

Common carp



Population Structure

Figure 4.15 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 17 to 310, and 49 % to 97 % of measured fish within a season, with a mean percentage YOY of 81 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Common carp was 54 % (34,027 out of 62,801). Common carp are not a stocked species.

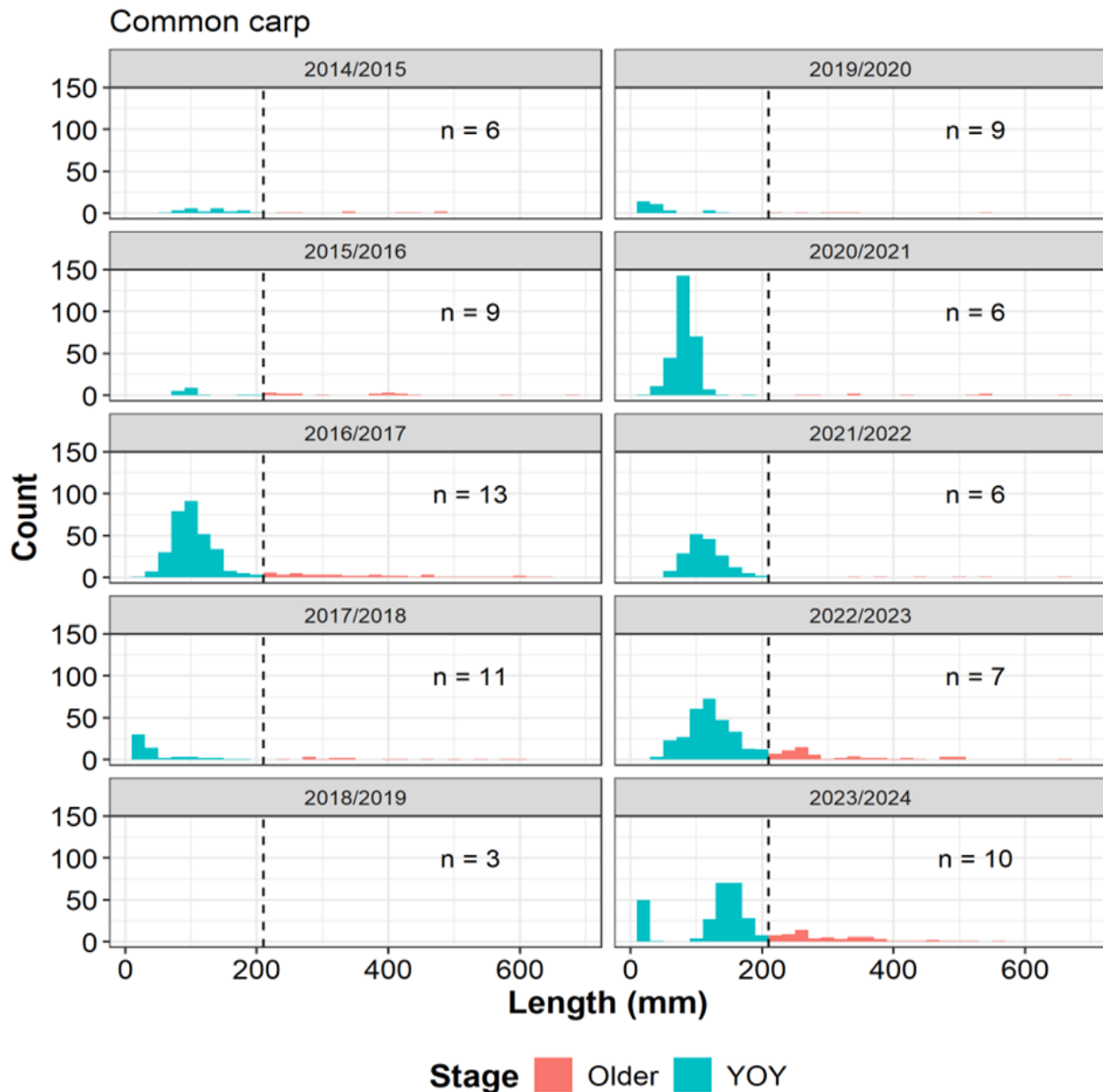


Figure 4.15: Length frequency plots for common carp by sampling season in the Intersecting Streams WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Variable recruitment with very strong peaks in 2016/17, 2021/22, 2022/23 and 2023/24. Large fish (>500 mm) present in low abundance in most years compared to other WRPAs. Note low sampling effort in some years.

Temporal Trends in Abundance

The relative abundance and biomass of Common carp since the early 2000s was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 4.16 show the abundance and biomass trends for the Intersecting Streams WRP and the right-hand panels show the overall trends across the NSW MDB.

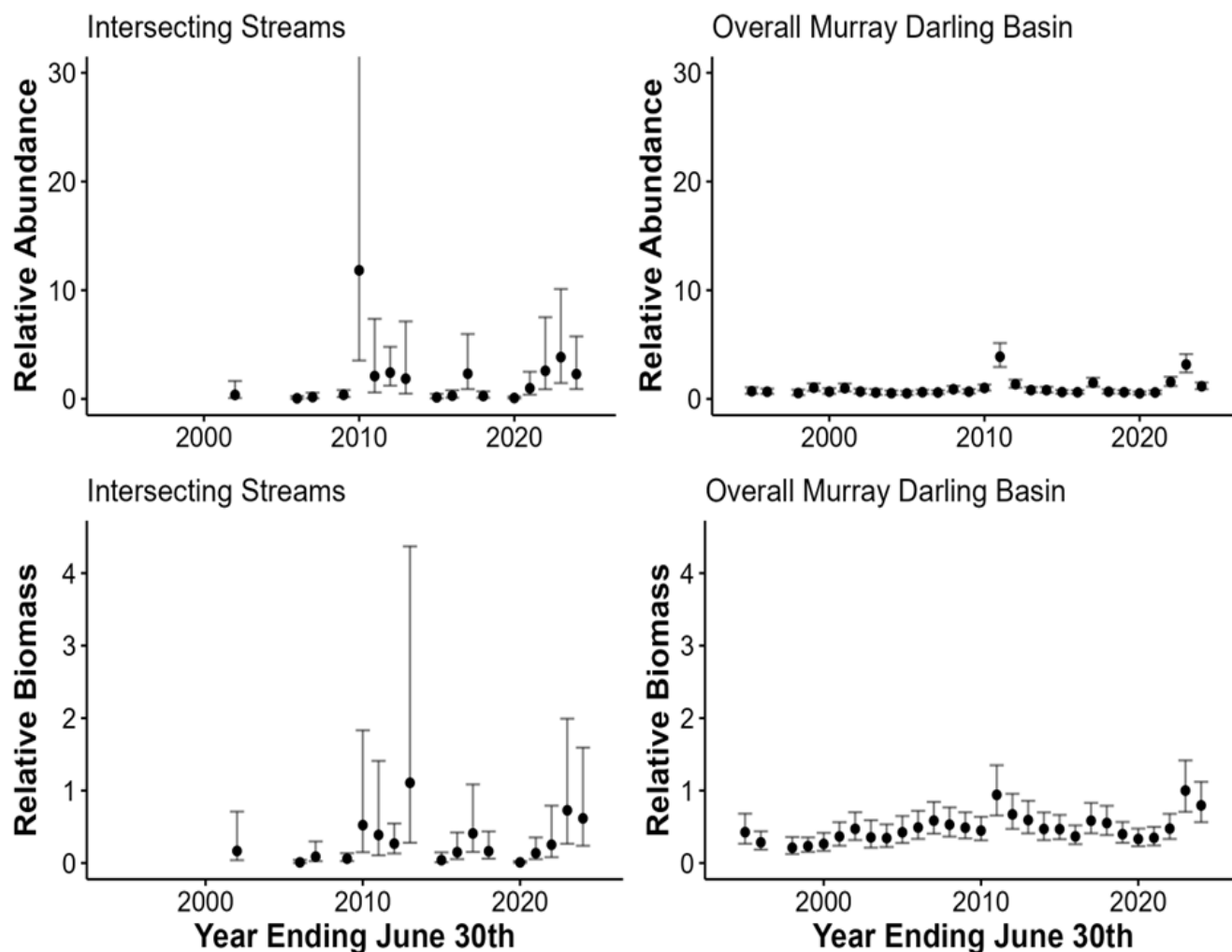


Figure 4.16: Relative abundance and biomass of Common carp in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

Abundance and biomass show evidence of an increase from the early 2000s and are comparable to the wider NSW MDB. Both abundance and biomass appear to have increased since 2020 when both were at very low levels.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2015/2016 to 13 % of sampled fish in 2023/2024 (Figure 4.17). The most common health issue for Common carp in the Intersecting Streams water resource planning area was Lesions, which was observed in a total of 45 fish, corresponding to 3 % of all Common carp measured.

Across the other WRPA's, 4 % of Common carp (2,353 out of 62,803 Common carp) showed a health condition (excludes Intersecting Streams).

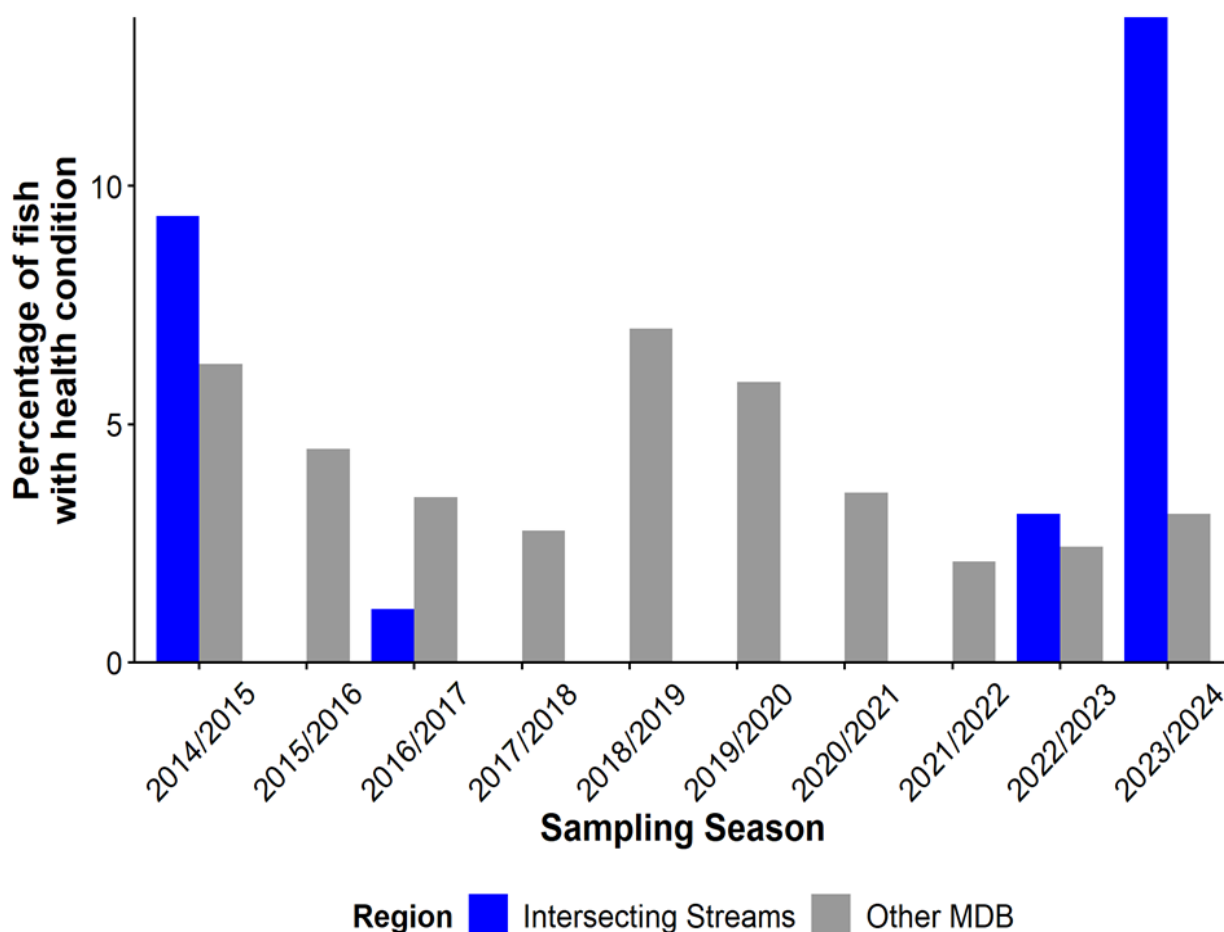


Figure 4.17: Timeseries showing the prevalence of health conditions in Common carp. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

The presence of observable health conditions for Common carp in the Intersecting Streams was low with small increases over time. The overall Murray-Darling Basin had higher rates of health conditions compared to the Intersecting Streams.

Distribution

Common carp were recorded at 26 out of 37 sites in the Intersecting Streams WRPA from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 15 fish caught per 90 seconds of electrofishing. Figure 4.18 shows the distribution and relative abundance of Common carp across the Intersecting Streams WRPA.

Summary Statement:

Common carp were found across the Intersecting Streams region.

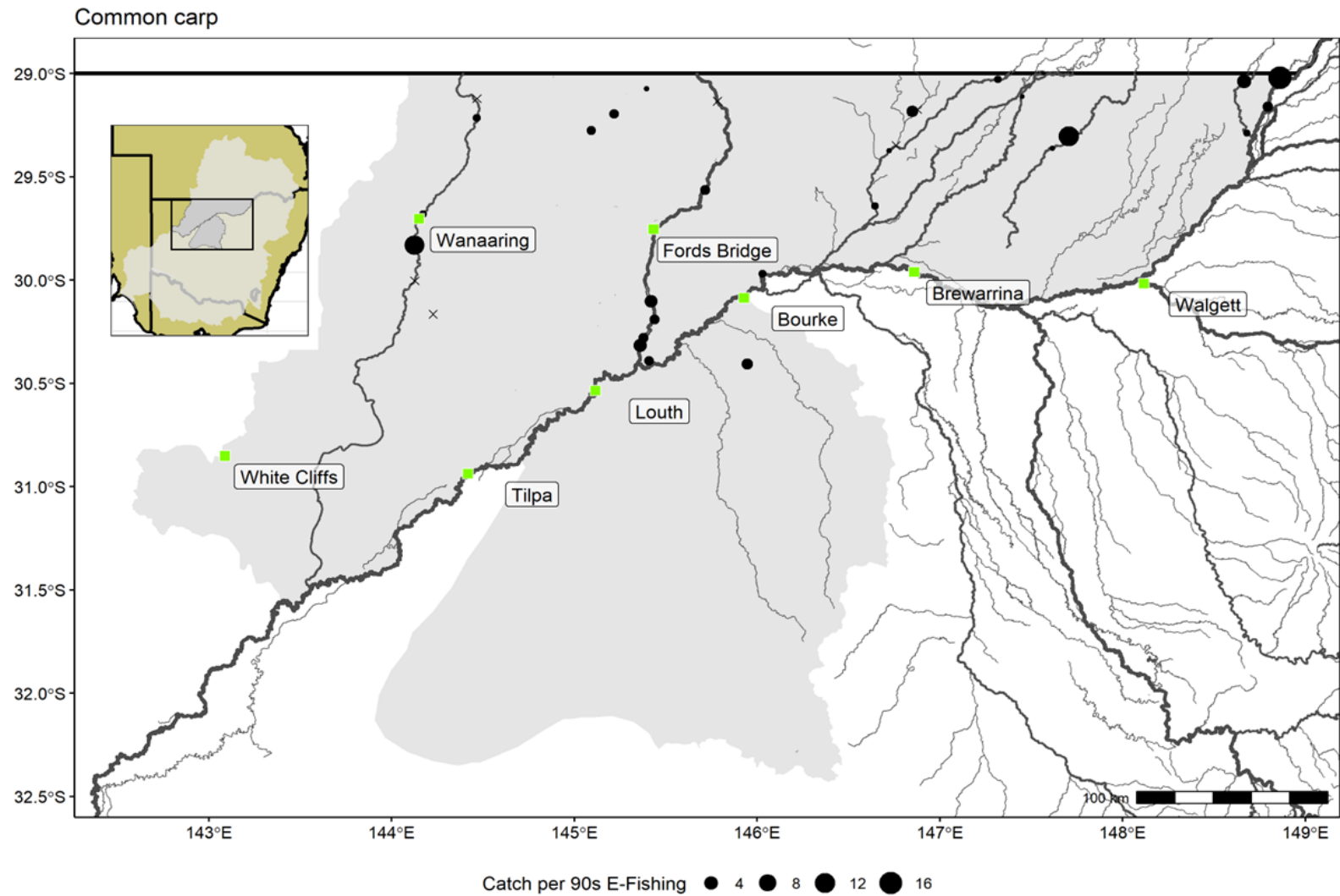


Figure 4.18: Distribution of Common carp sampled from 2013/14 to 2023/24 in the Intersecting Streams WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Threatened Species

The following table (Table 4.4) 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 Intersecting Streams 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 4.8.

Table 4.4: 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*	25 (1)

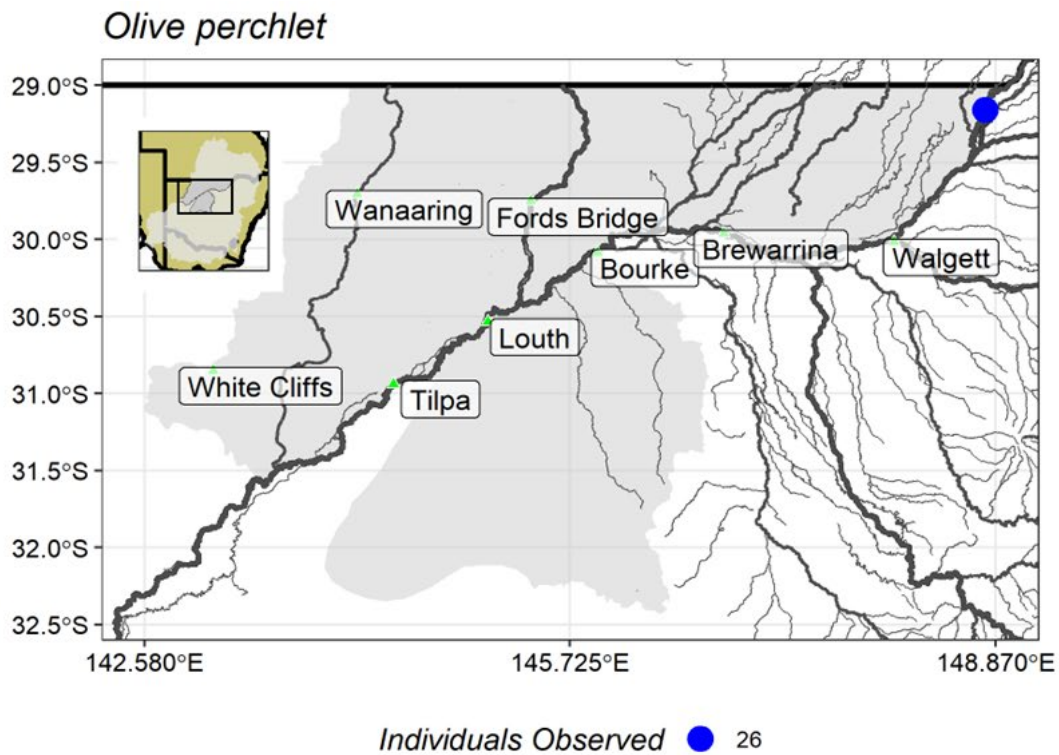


Figure 4.19: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Intersecting Streams WRPA. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance.

Summary Statement:

25 Olive perchlet were caught and one was observed at Cubberoo Lagoon in 2016/17. This site has not been sampled since.

Appendix

This report contains data from the projects listed in Table 4.5.

Table 4.5: 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	8
Monitoring, Evaluating and Reporting - Inland	2014/2015	3
Murray-Darling Basin Fish Surveys	2014/2015	2
Toorale Long Term Intervention Monitoring	2015/2016, 2016/2017, 2017/2018, 2019/2020, 2020/2021, 2021/2022, 2022/2023, 2023/2024	61

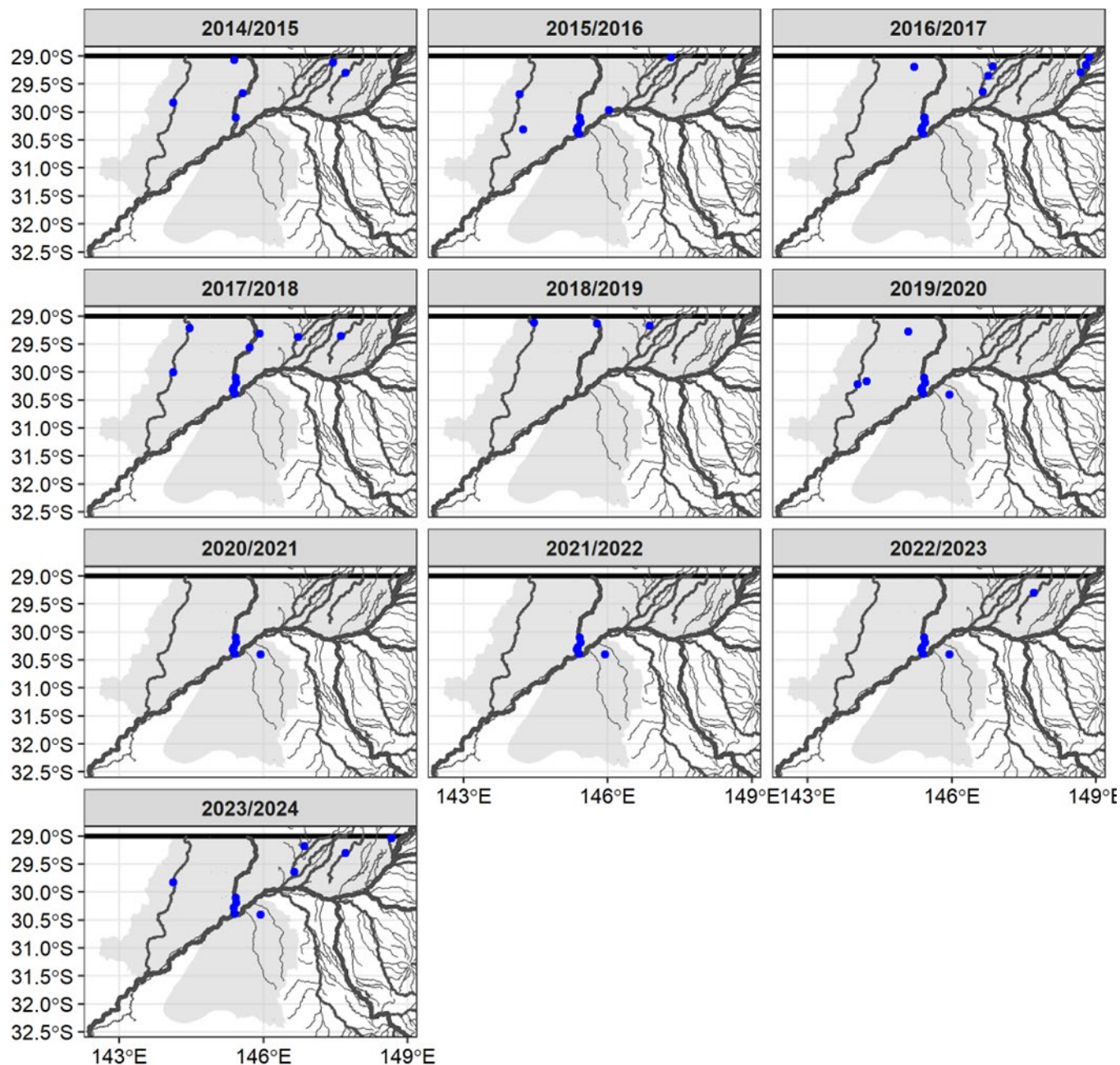


Figure 4.20: Sites sampled and included in this report by sampling season in the Intersecting Streams WRP. Dry sites are not shown.

Table 4.6 shows all species detected during this survey period as part of standardised monitoring projects (see Table 4.5). Note there are variations in effort between sampling seasons so this information should be considered in conjunction with Table 4.1. 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 Intersecting Streams WSPA were: Silver perch, Murray hardyhead, Unspecked hardyhead, Murray cod, Southern purple-spotted gudgeon, Freshwater catfish, Redfin. 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 4.9.

Table 4.6: Total number caught of each species by sampling season in the Intersecting Streams WSPA.

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	0	2	0	0	0	0	0	1	0
Bony herring	YES	676	275	1,827	103	1	78	392	648	467	442
Carp-gudgeon species complex	YES	9	6	2	0	0	37	5	1	0	0
Common carp	NA	32	35	465	74	0	38	383	186	725	515
Desert rainbowfish	NA	0	0	0	0	0	0	0	0	5	0
Eastern gambusia	NA	2	11	120	10	1	1	24	14	7	2
Golden perch	YES	13	23	69	67	0	35	25	3	41	23
Goldfish	NA	2	2	199	7	1	3	3	3	29	20
Hyrtl's catfish	YES	1	6	24	2	0	0	0	0	1	4
Murray-Darling rainbowfish	YES	0	5	24	3	0	0	2	2	0	1
Olive perchlet	YES	0	0	25	0	0	0	0	0	0	0
Spangled perch	YES	26	15	183	23	0	3	18	84	60	30

The following table summarises the sampling methods for each species caught (Table 4.7).

Table 4.7: Total catch of each species by sampling method in the Intersecting Streams WRP.

Common name	Backpack Electrofishing	Bait Trap	Boat Electrofishing
Australian smelt	0	0	3
Bony herring	60	8	4,841
Carp-gudgeon species complex	9	47	4
Common carp	141	107	2,205
Desert rainbowfish	0	0	5
Eastern gambusia	16	1	175
Golden perch	25	23	251
Goldfish	3	3	263
Hyrtil's catfish	7	14	17
Murray-Darling rainbowfish	5	0	32
Olive perchlet	0	2	23
Spangled perch	38	120	284

Table 4.8: 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 4.9 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 Intersecting Streams WSPA were: Silver perch, Murray hardyhead, Unspecked hardyhead, Murray cod, Southern purple-spotted gudgeon, Freshwater catfish, Redfin. 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 4.6.

Table 4.9: Total catch of each species by all sampling programs and all methods in the Intersecting Streams WSPA. 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	0	16	0	0	29	0	0	1	0
Bony herring	YES	676	292	2,726	122	1	130	532	830	539	455
Carp gudgeon species complex	YES	9	59	12	0	0	1,518	22	1	0	3
Common carp	NA	32	50	803	503	0	660	1,039	2,814	5,960	809
Desert rainbowfish	NA	0	0	0	0	0	0	0	0	5	1
Eastern gambusia	NA	2	12	447	29	1	13	42	17	9	3
Golden perch	YES	13	54	131	359	0	1,067	95	81	75	44
Goldfish	NA	2	4	402	7	1	13	133	18	147	58
Hyrtl's catfish	YES	1	171	892	5	0	4	3	370	991	583
Murray-Darling rainbowfish	YES	0	5	86	4	0	0	3	3	1	1
Olive perchlet	YES	0	0	25	0	0	0	0	0	0	0
Spangled perch	YES	26	262	857	40	0	22	574	3,392	2,931	176

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