

Chapter 8 Basin Plan Fish Monitoring Summary (2014/15 – 2023/24): Namoi Water Resource Planning Area

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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 Namoi Water Resource Planning Area (WRPA) shown in Figure 2.1.

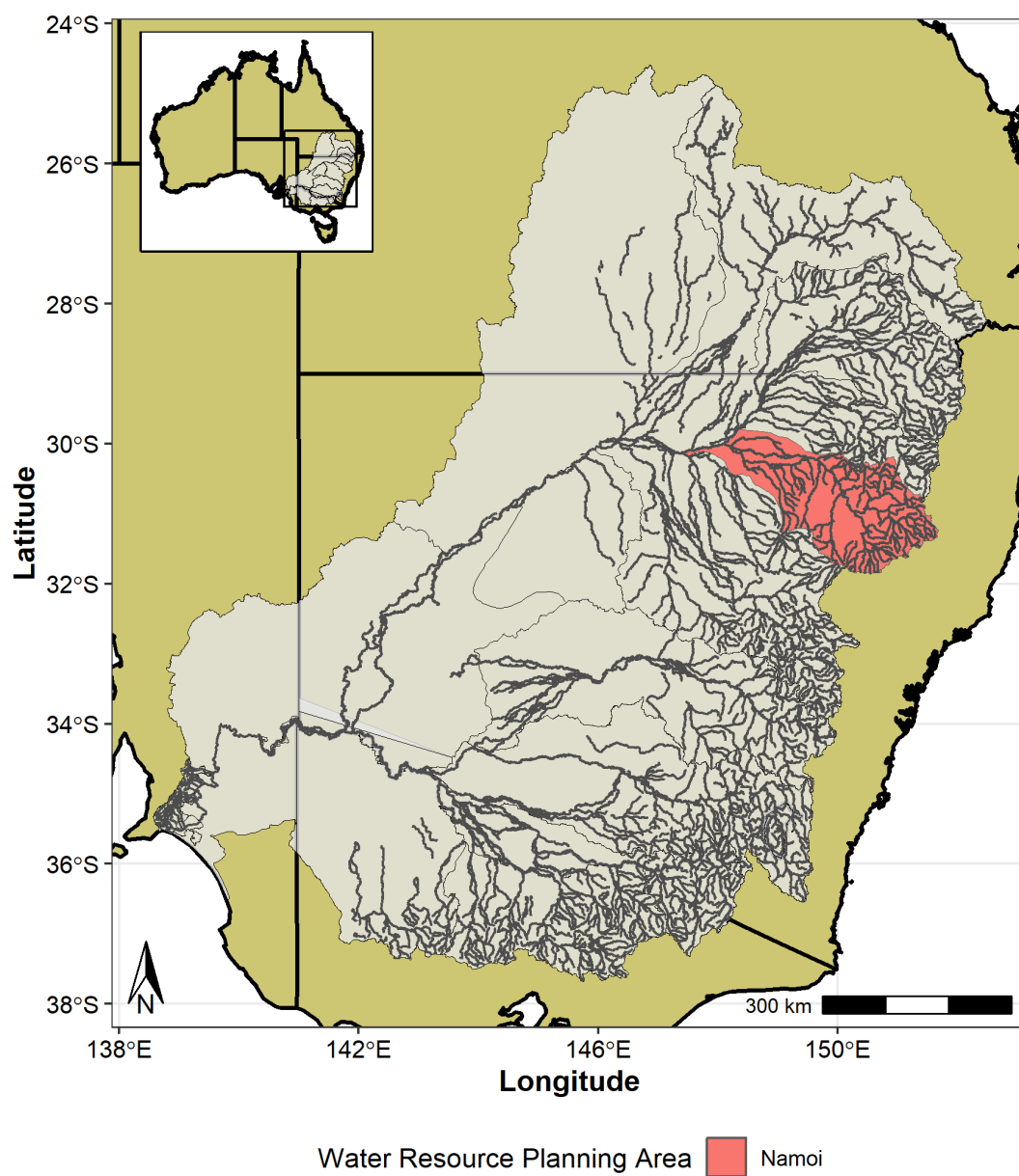


Figure 8.1: Murray-Darling Basin with the key region of this report highlighted. Inset map shows the whole of Australia with a box around the MDB.

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 Namoi WRP. 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 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 WRP. 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 Namoi WRP 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 Namoi WRP and greater MDB (excluding the Namoi WRP).

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 Namoi WRP 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 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 set in edge margins. Most sampling occurred between the months of September and May.

Table 8.1: Sampling effort (Number of sites sampled) each sampling season in the Namoi 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	3	2	9
2015/2016	15	12	3	30
2016/2017	17	6	9	32
2017/2018	18	3	5	26
2018/2019	19	10	3	32
2019/2020	6	6	4	16
2020/2021	4	9	0	13
2021/2022	15	11	0	26
2022/2023	19	12	2	33
2023/2024	18	12	1	31

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 8.36).

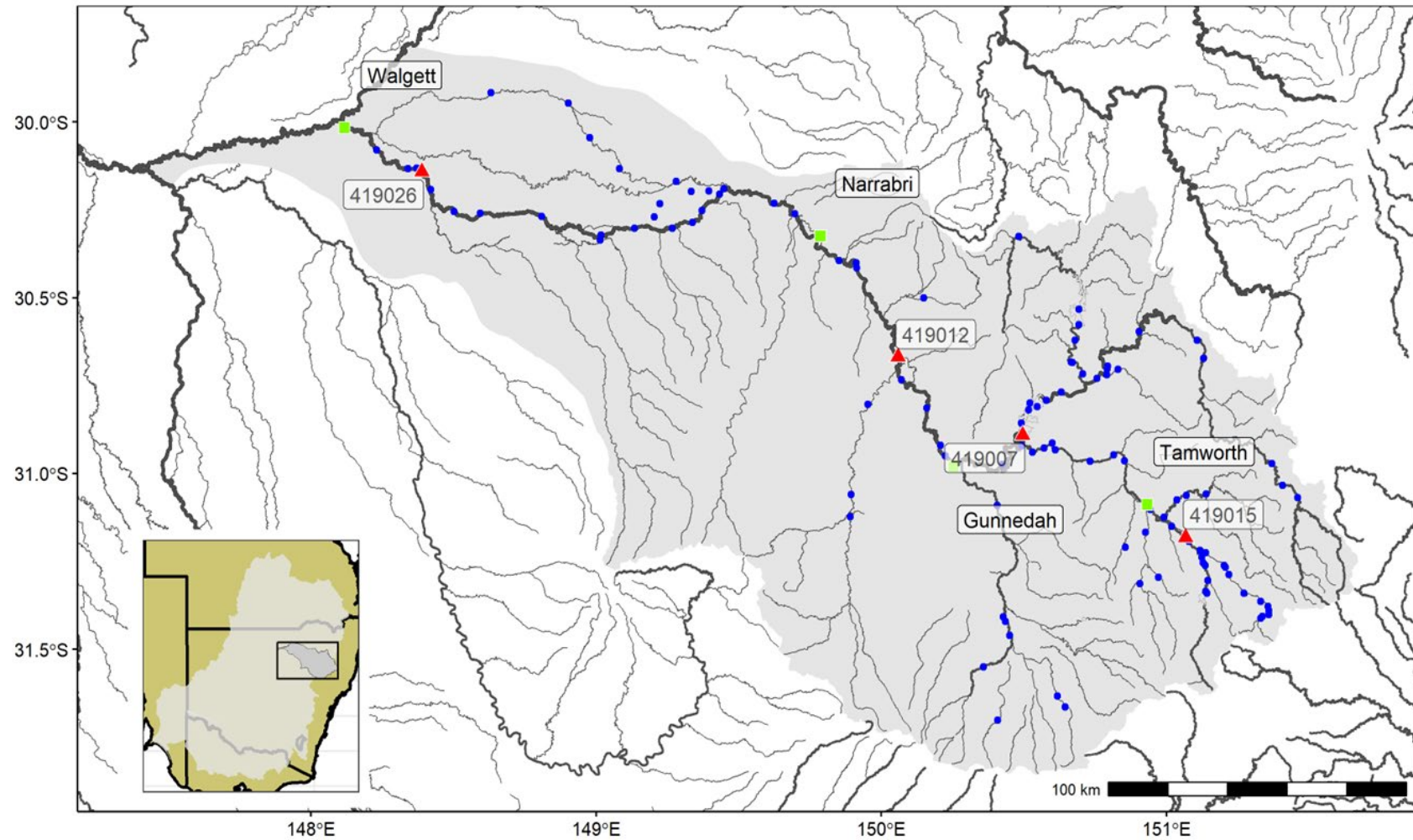


Figure 8.2: Sites (dots) sampled during the reporting period in the Namoi WRPA. Triangles show key flow gauges along with their gauge ID number. Green squares show major towns.

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 whole program in the Namoi WRP. Further data on total catch is provided in the Appendix.

Common name	Boat Electrofishing	Backpack Electrofishing	Bait Trap
Australian smelt	175	378	1
Bony herring	4,780	624	7
Common carp	3,385	1,332	201
Freshwater catfish	29	105	0
Golden perch	641	15	0
Murray cod	903	121	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 six key species.

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

Sampling Season	Australian smelt	Bony herring	Common carp	Freshwater catfish	Golden perch	Murray cod
2014/2015	3	77	154	0	6	38
2015/2016	315	680	704	8	62	146
2016/2017	28	911	672	35	136	120
2017/2018	42	447	377	2	114	144
2018/2019	1	235	508	6	69	202
2019/2020	28	79	214	22	33	35
2020/2021	0	11	80	1	13	9
2021/2022	81	47	320	26	43	84
2022/2023	12	368	593	24	108	152
2023/2024	24	141	300	10	92	108

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 Namoi WRP (Figure 8.3).

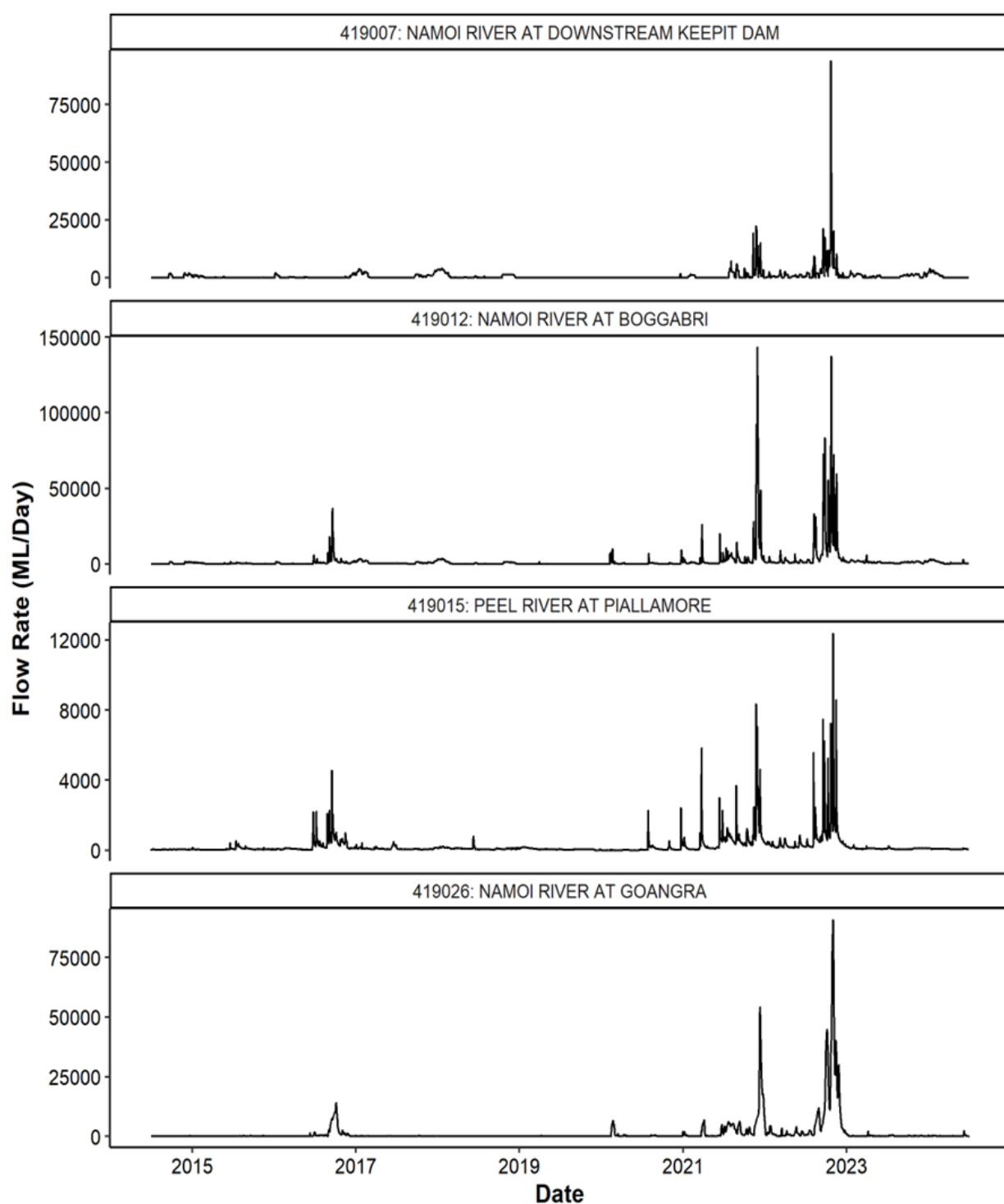


Figure 8.3: Flow data from various gauges in the Namoi WRP over the reporting period. Gauge locations can be seen on Figure 8.2. Note the differing scales on the y-axis.

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

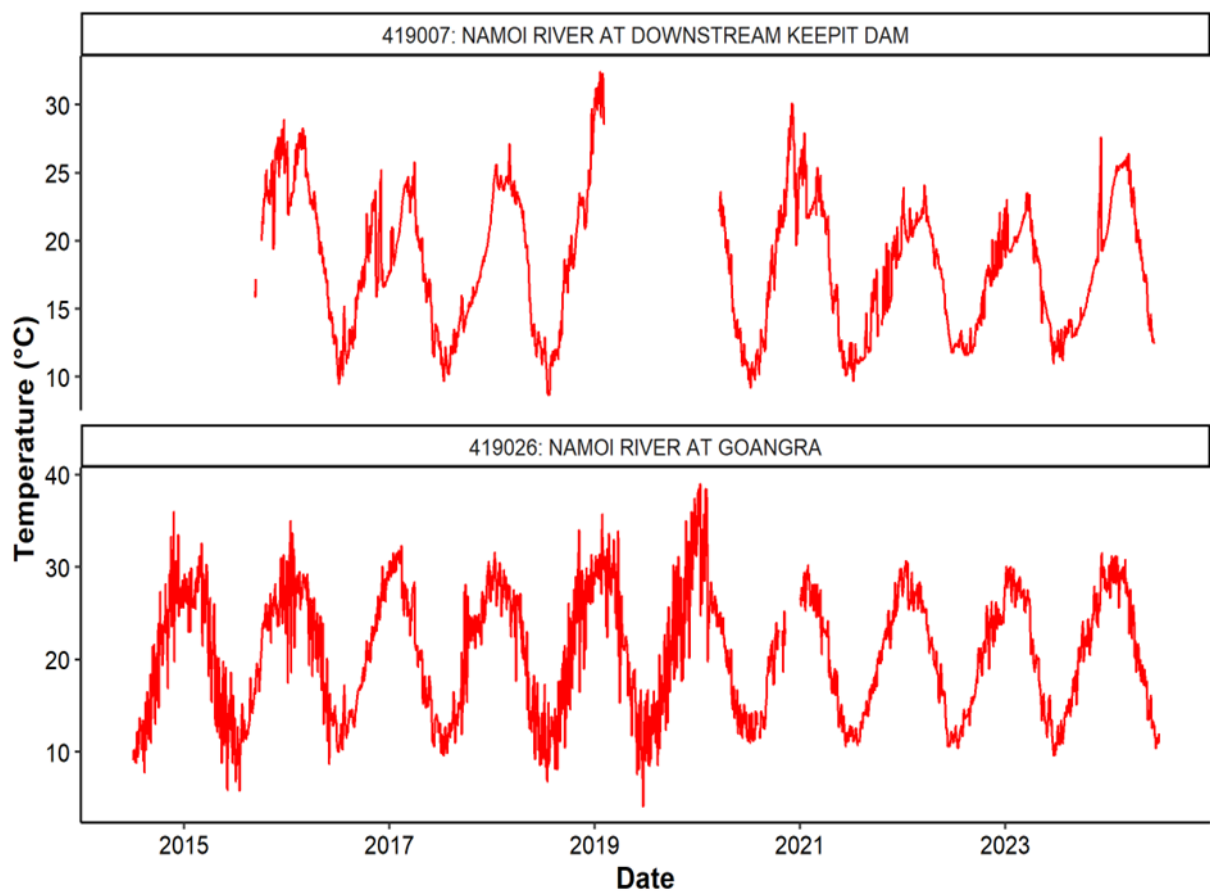


Figure 8.4: Water temperature data from various gauges in the Namoi WRPA over the reporting period. Gauge locations can be seen on Figure 8.2. Note the differing scales on the y-axis.

Species Diversity

A total of 18 fish species were observed across the Namoi WRPA including four alien species. Figure 8.5 shows the number of native species found at each site while Figure 8.6 shows the number of alien species found at each site. The full list of species caught and observed is presented in Table 8.8.

Summary Statement:

Native and alien diversity were generally consistent across Namoi region.

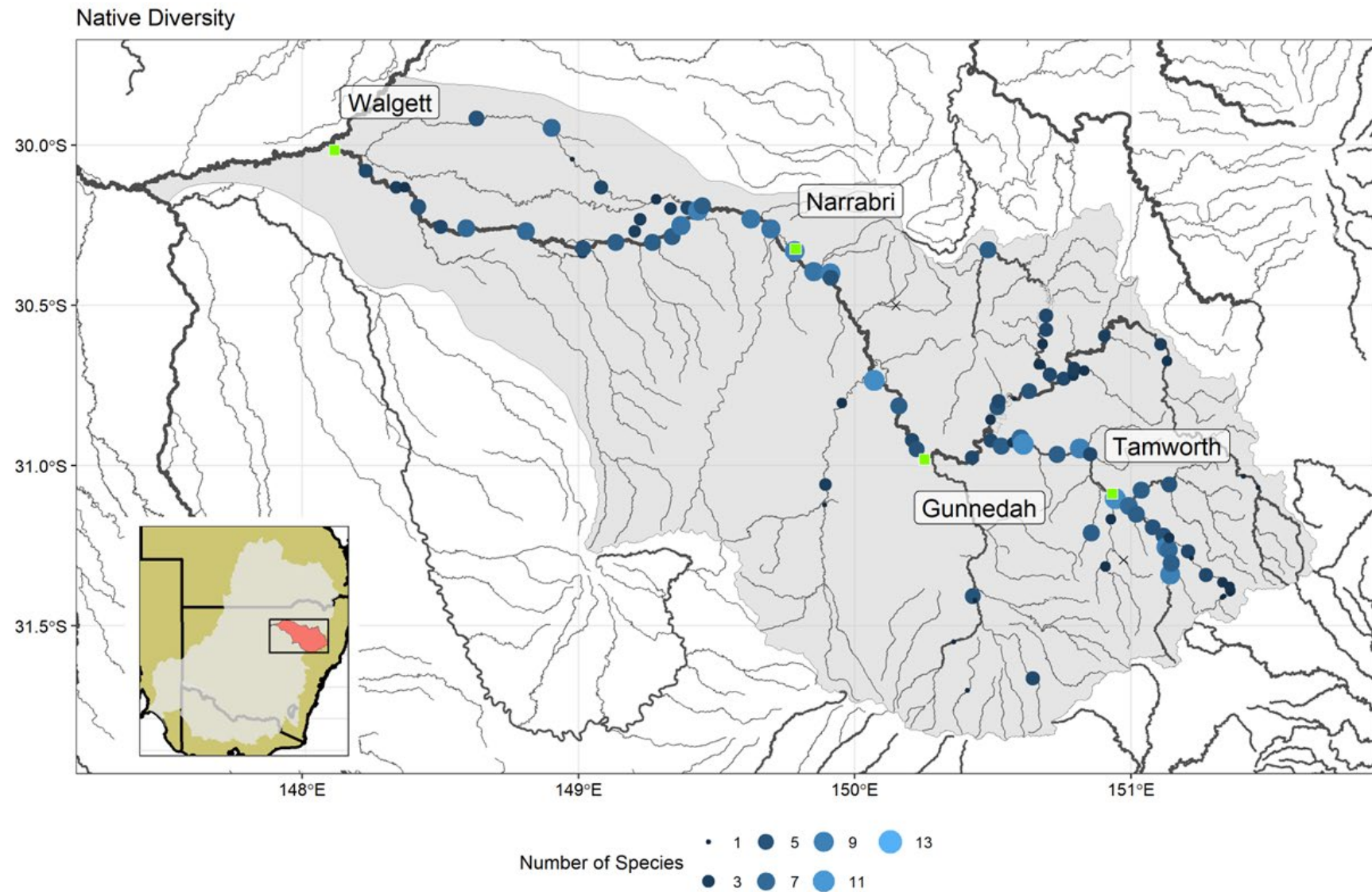


Figure 8.5: Native diversity across all sampling sites in the Namoi WRPA. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded.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

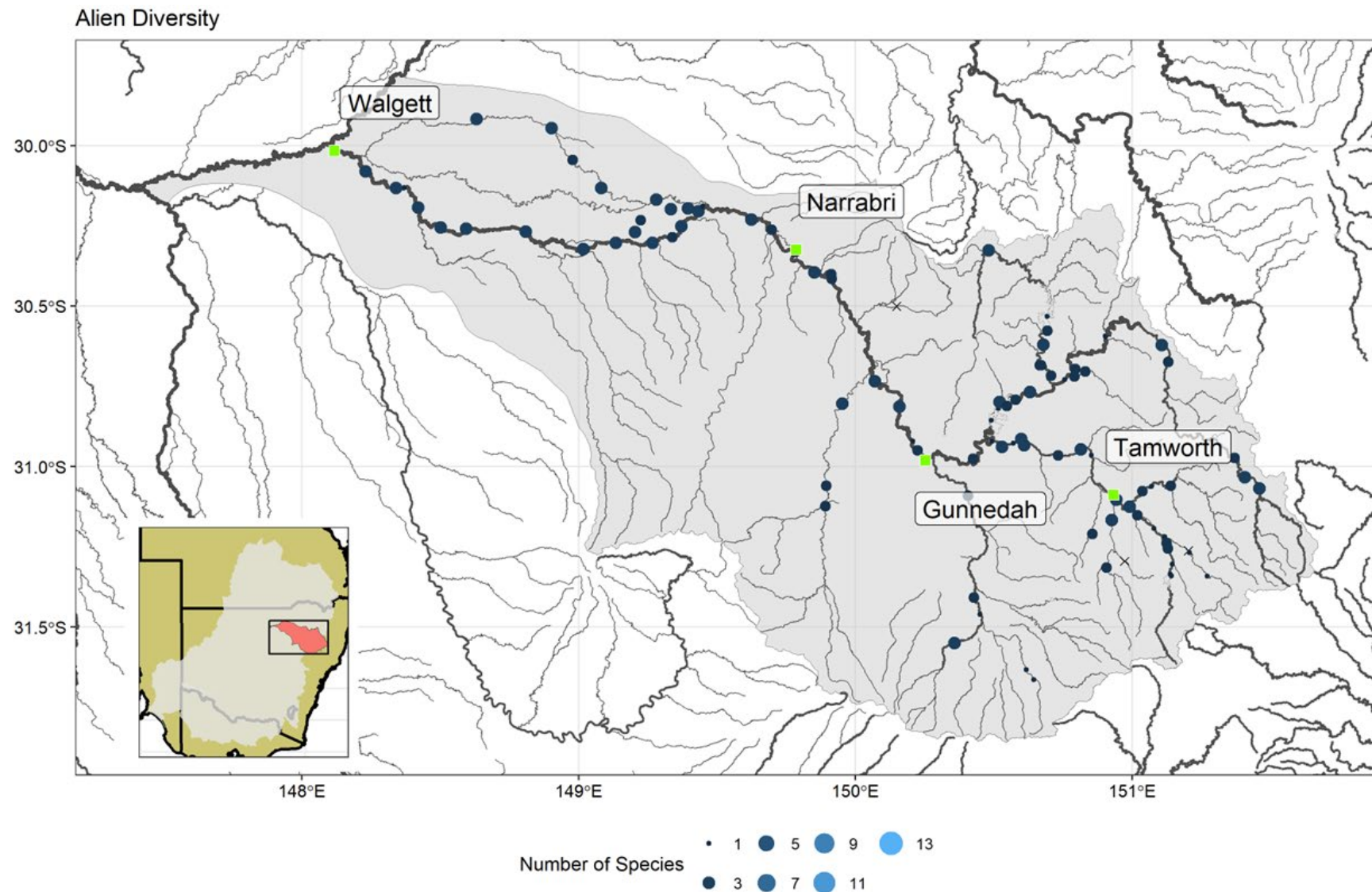


Figure 8.6: Alien diversity across all sampling sites in the Namoi WRPA. Bubble size represents the number of unique species observed at each site across all sampling methods and events. X represents a site that had water and was sampled, but no fish species were caught at all. Dry sites are excluded.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

Murray cod



Population Structure

Figure 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 0 to 27, and 0 % to 22 % of measured fish within a season, with a mean percentage YOY of 10 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Murray cod was 13 % (1,360 out of 10,513).

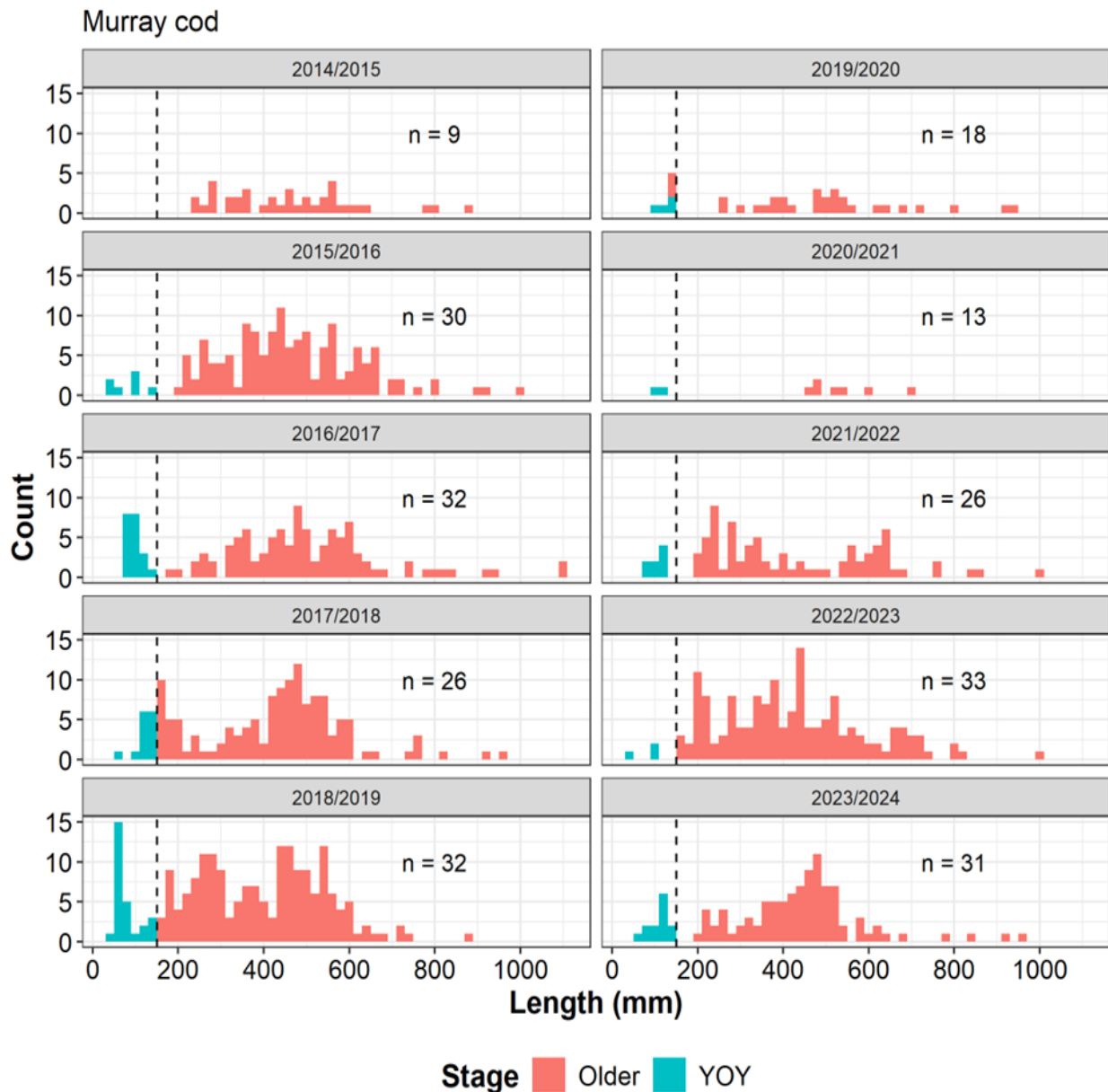


Figure 8.7: Length frequency plots for Murray cod by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Recruitment evident in most years with variable numbers of young-of-year. A good range of size classes in most years with YOY and larger fish observed in 2023/24.

Stocking

A total of 672,925 Murray cod were stocked into the waterways of the Namoi WRPA during the reporting period. Of these fish, 541,794 (80 %) were stocked into impoundments while 131,131 (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 in the Namoi WRPA.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2014/2015	Impoundment	Fry	2,000
2014/2015	River/Creek	Fry	14,858
2015/2016	Impoundment	Fry	30,000
2015/2016	River/Creek	Fry	6,494
2015/2016	River/Creek	Sub Adult	100
2016/2017	Impoundment	Fry	117,000
2016/2017	River/Creek	Fingerling	17,494
2018/2019	Impoundment	Fry	20,000
2018/2019	River/Creek	Fry	6,493
2019/2020	River/Creek	Fry	13,333
2020/2021	Impoundment	Fry	30,000
2020/2021	River/Creek	Fry	34,200
2021/2022	Impoundment	Fry	144,544
2021/2022	River/Creek	Fry	14,722
2022/2023	Impoundment	Fry	140,000
2022/2023	River/Creek	Fingerling	3,000
2022/2023	River/Creek	Fry	11,437
2023/2024	Impoundment	Fingerling	57,750
2023/2024	River/Creek	Fingerling	9,500

Murray cod stocking

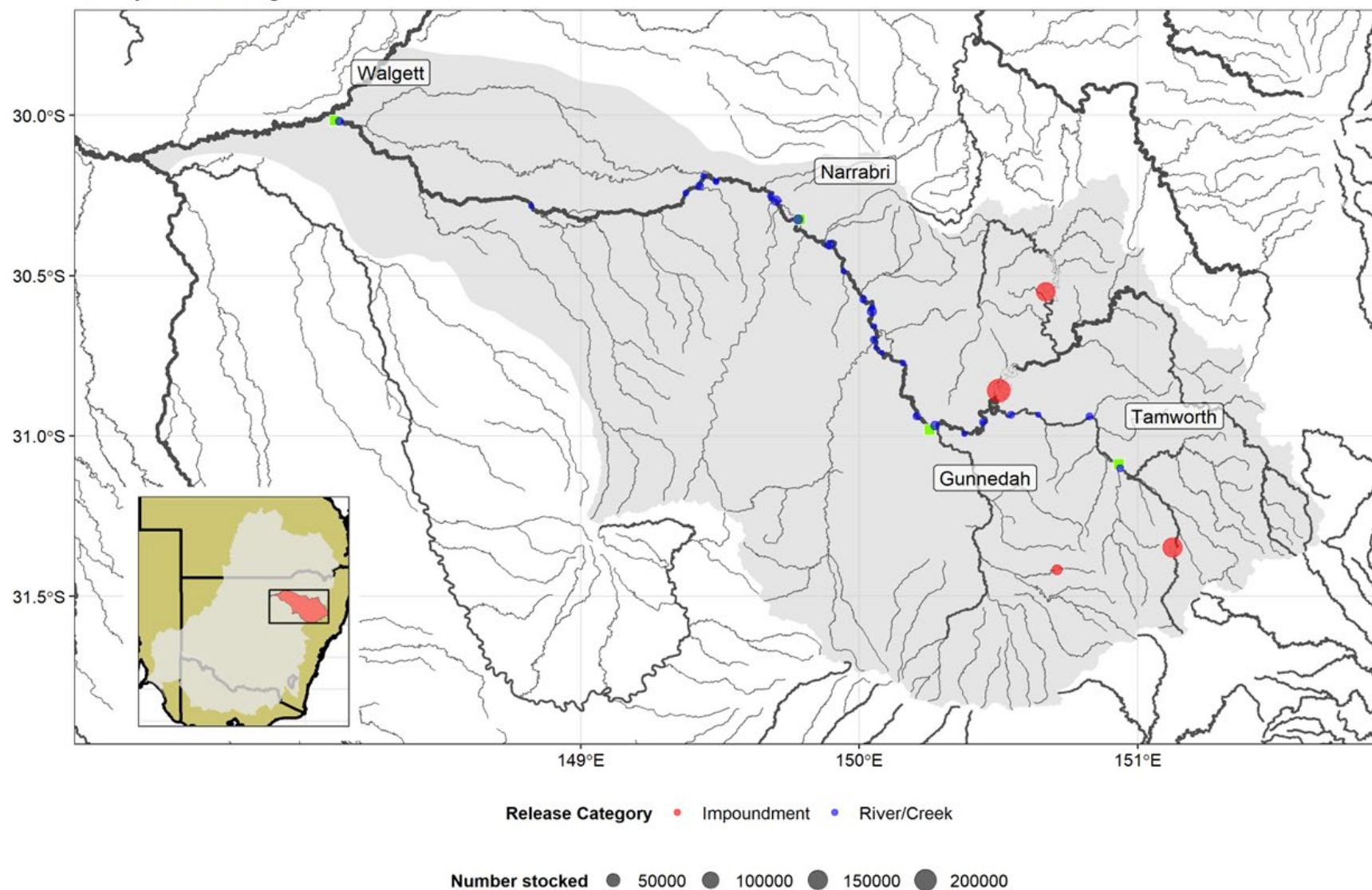


Figure 8.8: Locations of Murray cod stocking in the Namoi WRPA. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares represent key towns.

Temporal Trends in Abundance

The relative abundance and biomass of 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 Namoi WRP and the right-hand panels show the overall trends across the NSW MDB.

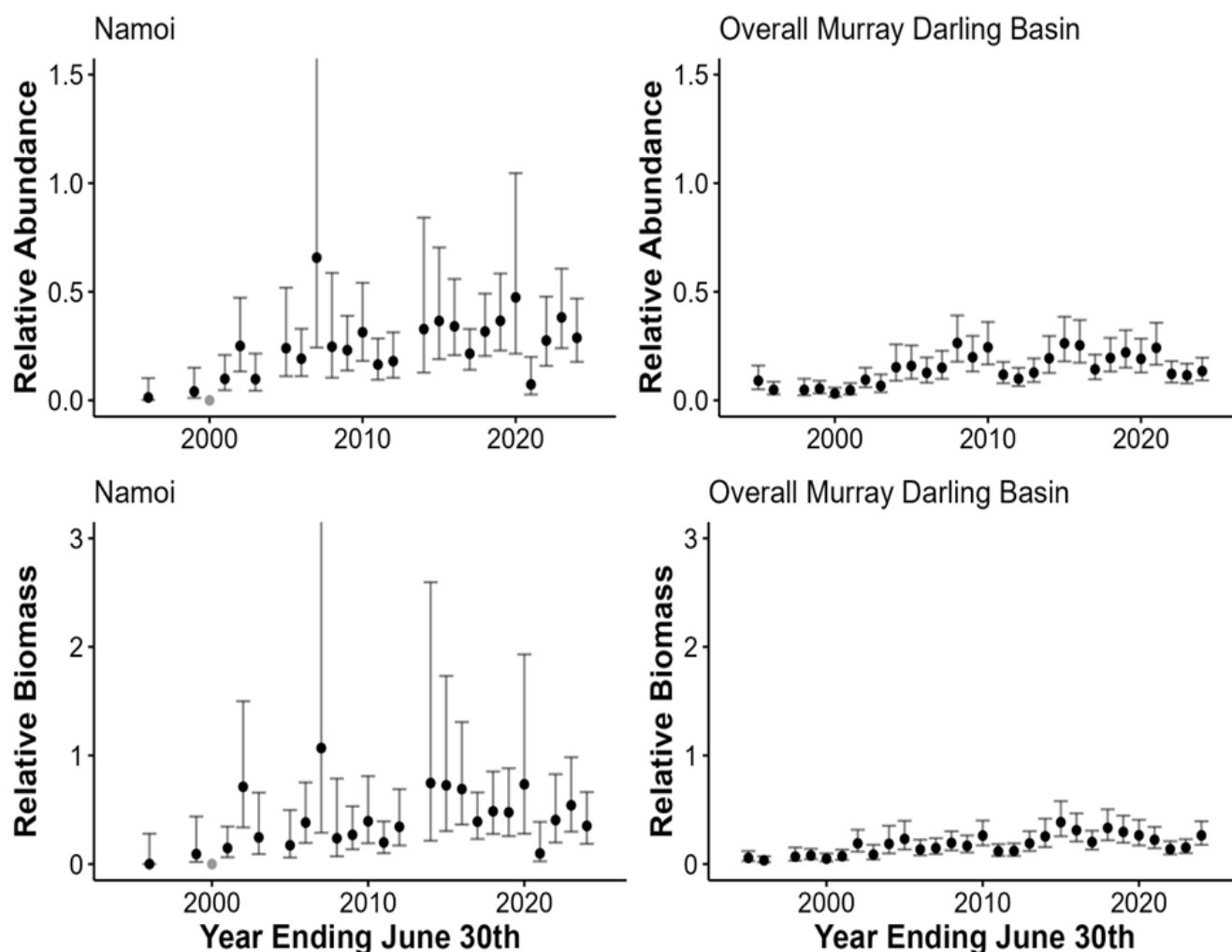


Figure 8.9: Relative abundance and biomass of Murray cod in both the Namoi WRP and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates.

Summary Statement:

An overall increase in abundance and biomass since the 1990s. Both abundance and biomass appear stable since 2021 and are comparable or slightly higher than the overall NSW MDB.

Health

The prevalence of any health issues ranged from 11 % of sampled fish in 2020/2021 to 42 % of sampled fish in 2018/2019 (Figure 8.10). The most common health issue for Murray cod in the Namoi WRPAs was *Lernaea*, which was observed in a total of 196 fish, corresponding to 19 % of all Murray cod measured.

Across the other NSW MDB WRPA, 15 % of Murray cod (1,578 out of 10,513 Murray cod) showed a health condition (excludes the Namoi WRPAs).

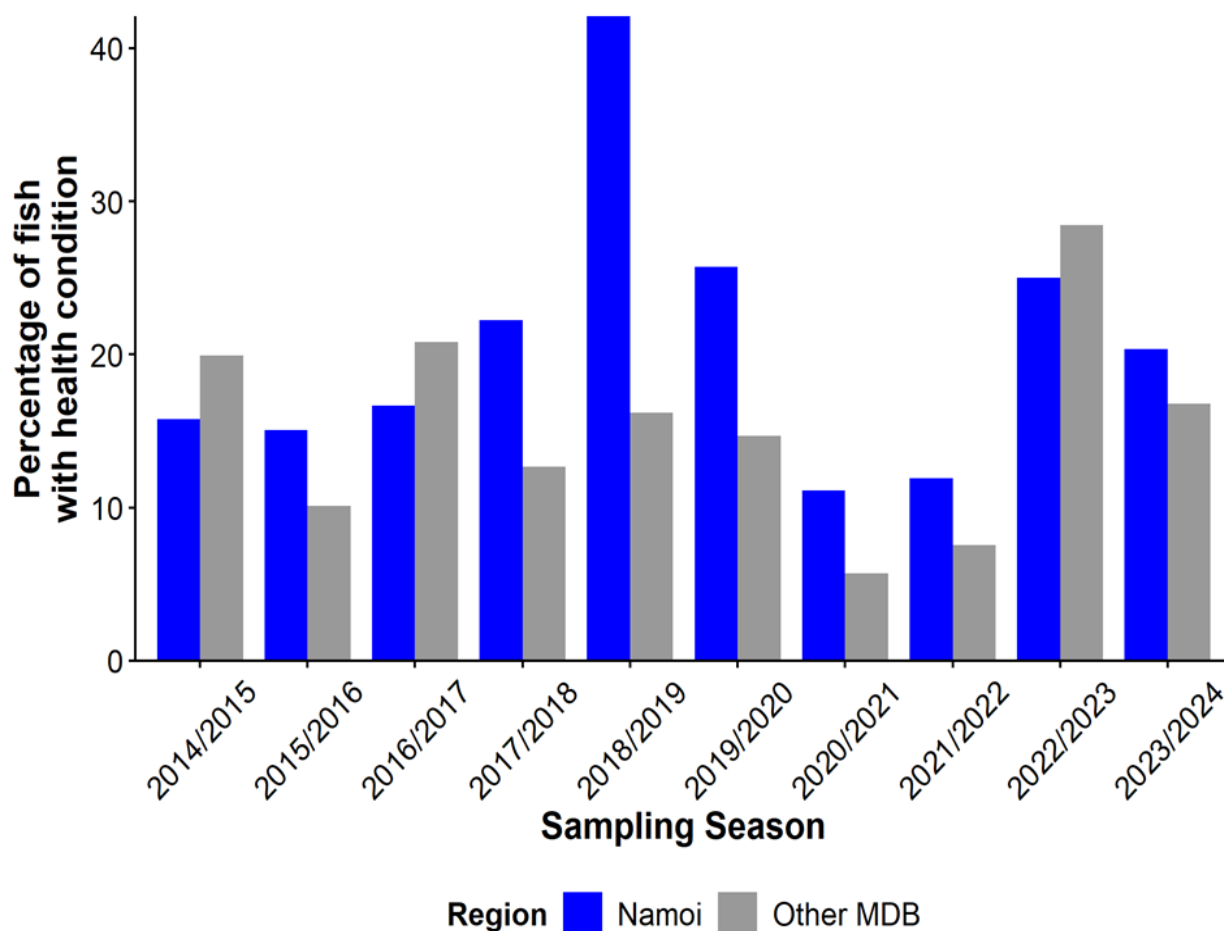


Figure 8.10: Timeseries showing the prevalence of health conditions in Murray cod. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA.

Summary Statement:

Presence of observable health conditions was variable across years and generally similar to the overall Murray-Darling Basin. There were a moderately high level of observed health issues in 2023/24.

Distribution

Murray cod were recorded at 58 out of 108 sites in the Namoi WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 2.2 fish caught per 90 seconds of electrofishing. Figure 8.11 shows the distribution and relative abundance of Murray cod across the Namoi WRP.

Summary Statement:

Murray cod were recorded across the Namoi WRP but less abundant or absent in western sites.

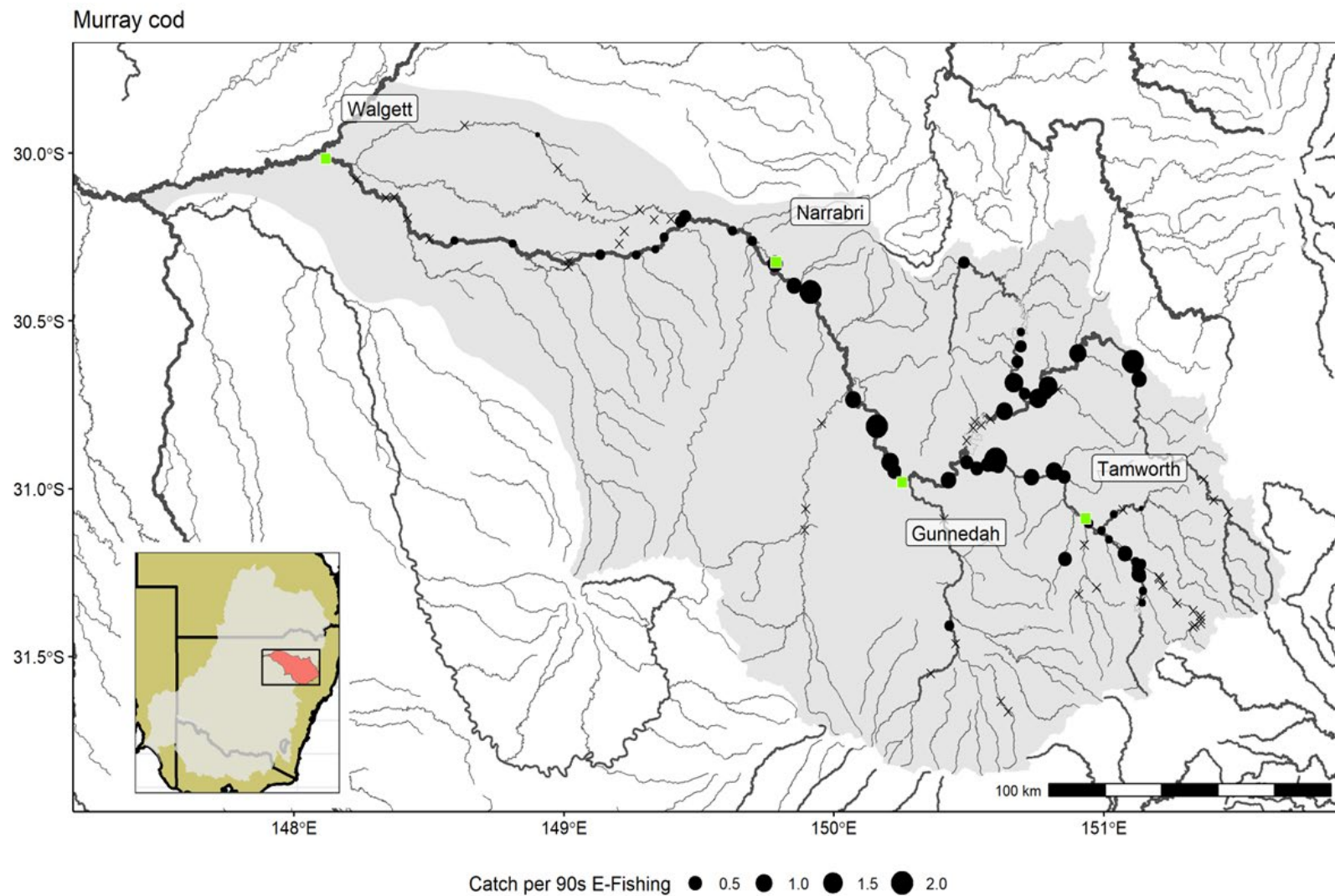


Figure 8.11: Distribution of Murray cod sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Golden perch



Population Structure

Figure 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 8, and 0 % to 62 % of measured fish within a season, with a mean percentage YOY of 7 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Golden perch was 8 % (641 out of 7,623).

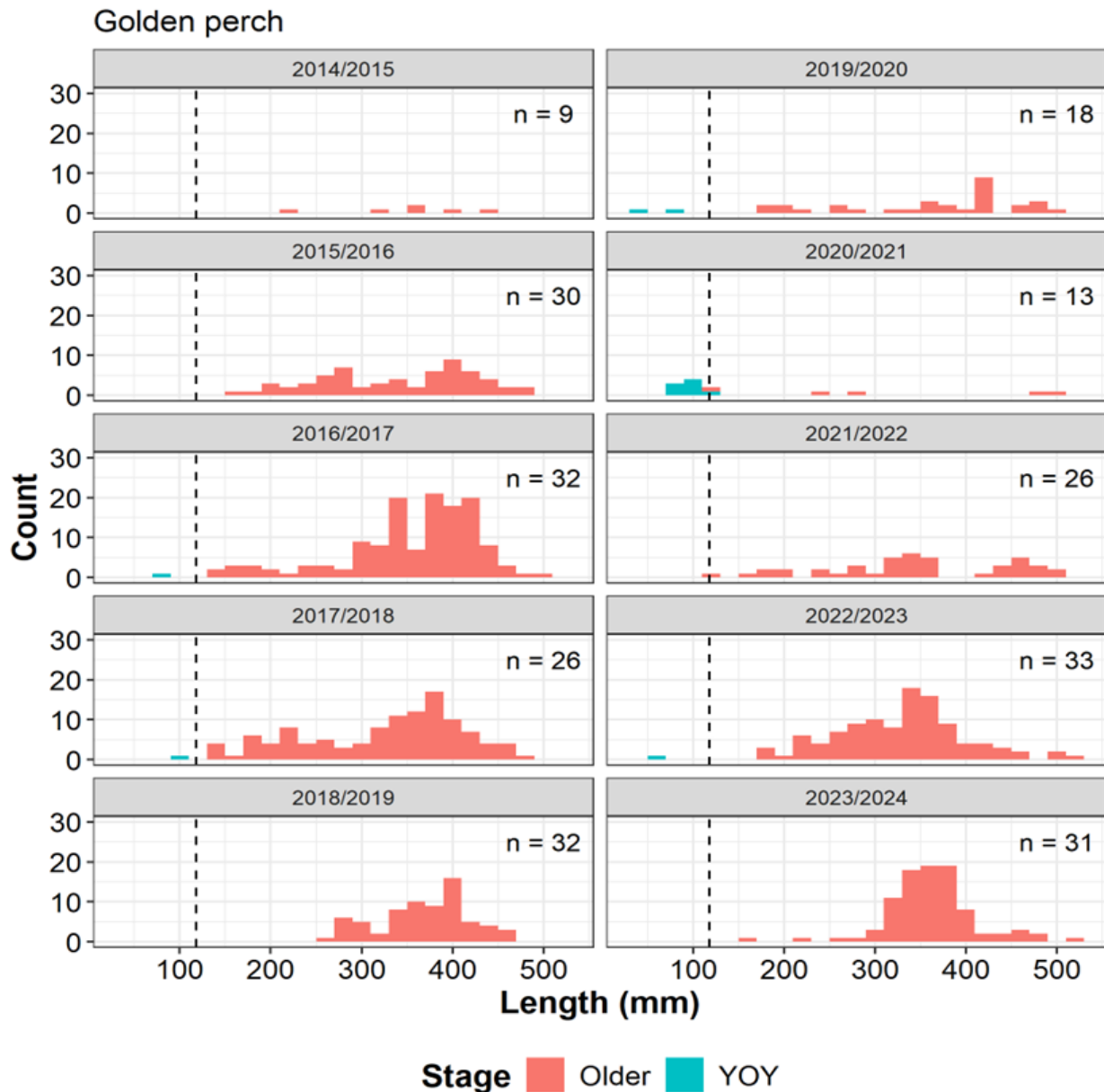


Figure 8.12: Length frequency plots for Golden perch by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Larger fish were consistently recorded across years but recruitment appears to be rare with many years of recruitment failure. Likely poor recruitment since 2021/22.

Stocking

A total of 786,277 Golden perch were stocked into the waterways of the Namoi WRP during the reporting period. Of these fish, 493,386 (62.8 %) were stocked into impoundments while 292,891 (37.2 %) 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 in the Namoi WRP.

Sampling Season	River/Creek or Impoundment	Life Stage	Number Stocked
2014/2015	Impoundment	Fry	3,000
2014/2015	River/Creek	Fry	18,181
2015/2016	Impoundment	Fry	1,000
2015/2016	River/Creek	Fry	58,320
2016/2017	Impoundment	Fry	87,000
2016/2017	River/Creek	Fingerling	35,723
2017/2018	Impoundment	Fry	47,000
2017/2018	River/Creek	Fry	14,363
2018/2019	Impoundment	Fry	30,000
2018/2019	River/Creek	Fry	22,000
2020/2021	Impoundment	Fry	106,000
2020/2021	River/Creek	Fry	24,000
2021/2022	Impoundment	Fry	7,273
2021/2022	River/Creek	Fry	10,923
2022/2023	Impoundment	Fry	90,000
2022/2023	River/Creek	Fry	40,703
2023/2024	Impoundment	Fingerling	122,113
2023/2024	River/Creek	Fingerling	68,678

Golden perch stocking

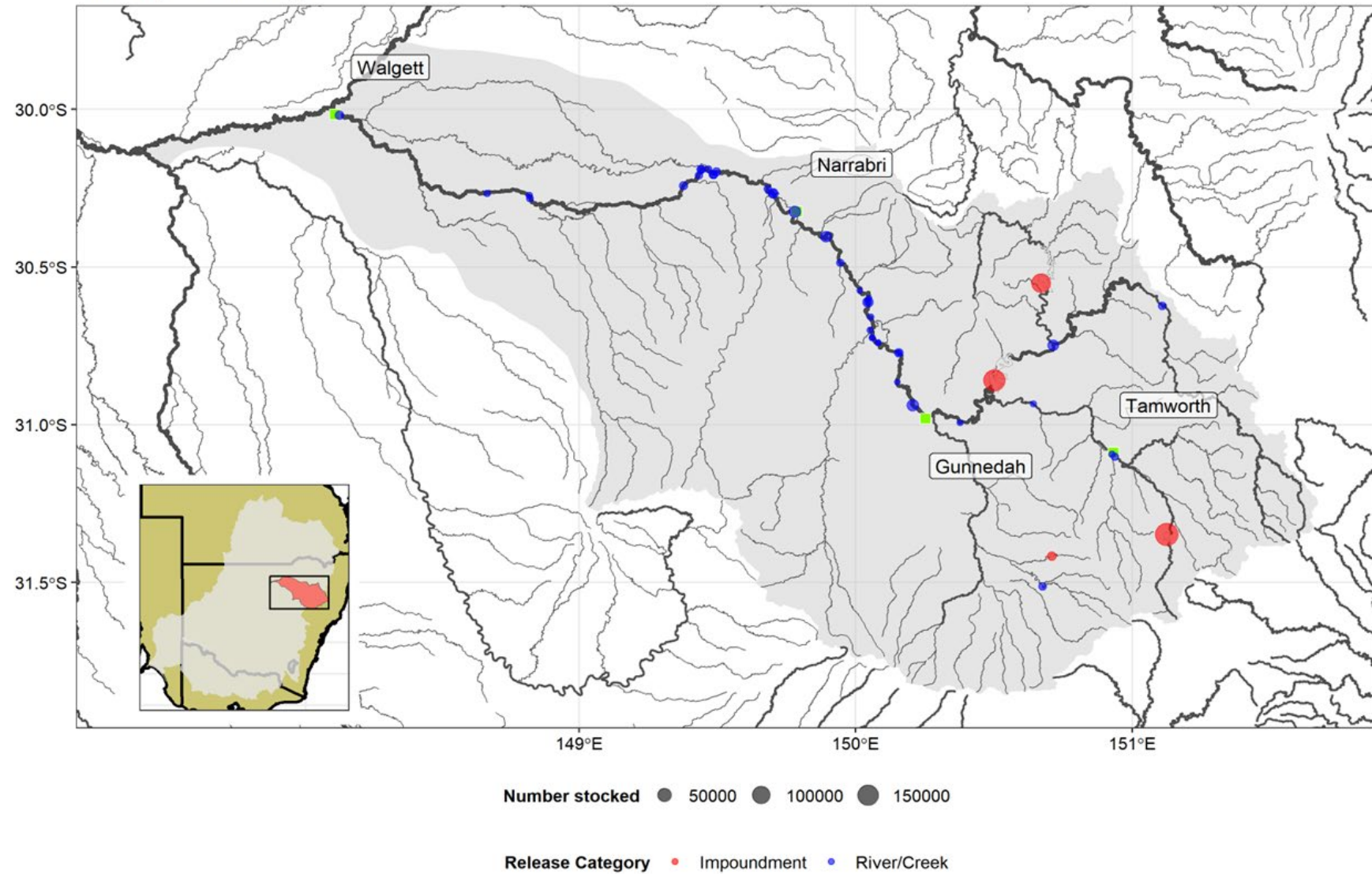


Figure 8.13: Locations of Golden perch stocking in the Namoi WRPA. Colours show whether a site was a river/creek site or an impoundment, while the size of the point reflects the total number of fish stocked over the reporting period. Green squares represent key towns.

Temporal Trends in Abundance

The relative abundance and biomass of Golden perch since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panels of Figure 8.14 show the abundance and biomass trends for the Namoi WRP and the right-hand panels show the overall trends across the NSW MDB.

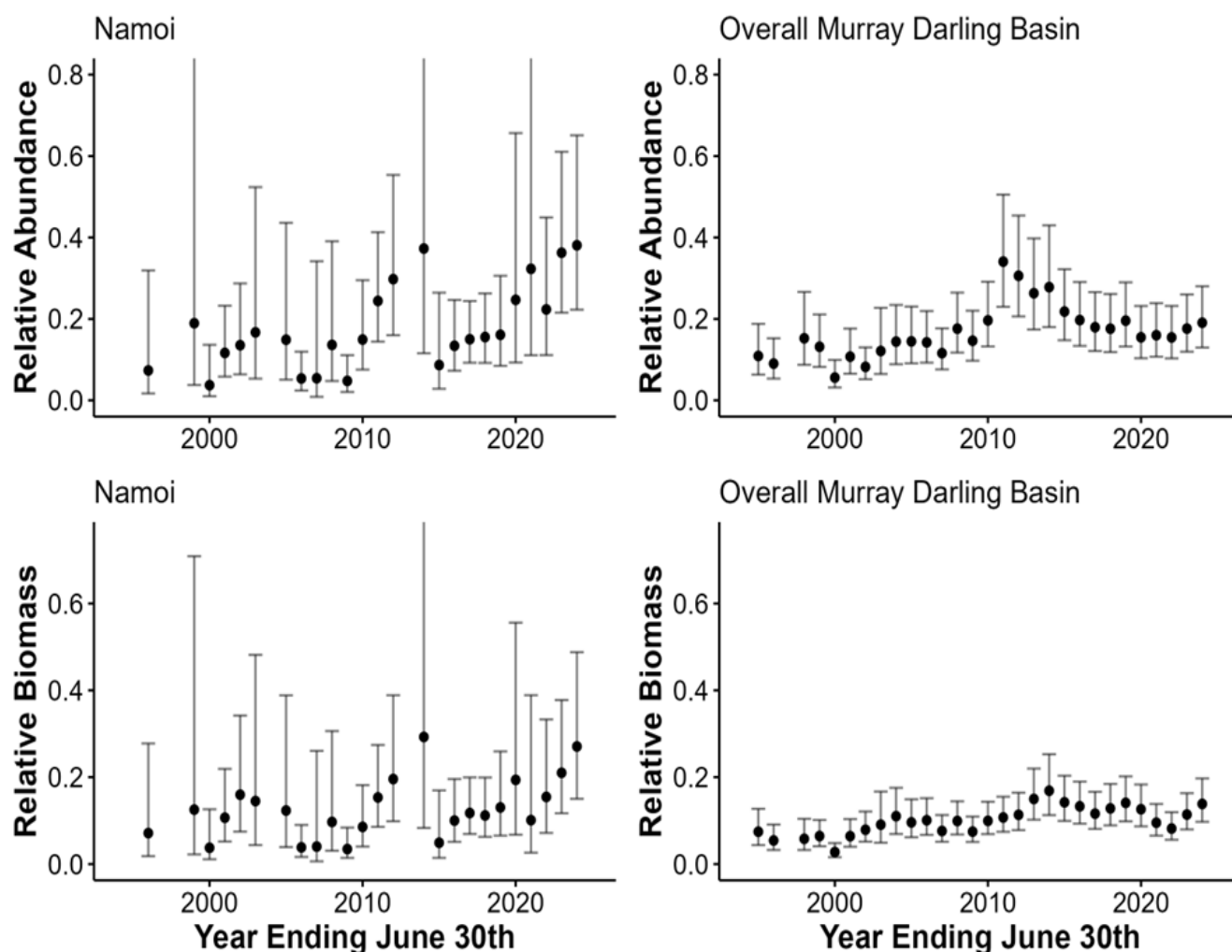


Figure 8.14: Relative abundance and biomass of Golden perch in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show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

Summary Statement:

Clear increases in abundance and biomass since the 1990s. Recent increases evident since 2022 and both abundance and biomass are higher than the overall NSW MDB.

Health

The prevalence of any health issues ranged from 14 % of sampled fish in 2021/2022 to 71 % of sampled fish in 2018/2019 (Figure 8.15). The most common health issue for Golden perch in the Namoi water resource planning area was *Lernaea*, which was observed in a total of 151 fish, corresponding to 22 % of all Golden perch measured.

Across the other WRPAs, 25 % of Golden perch (1,875 out of 7,623 Golden perch) showed a health condition (excludes Namoi).

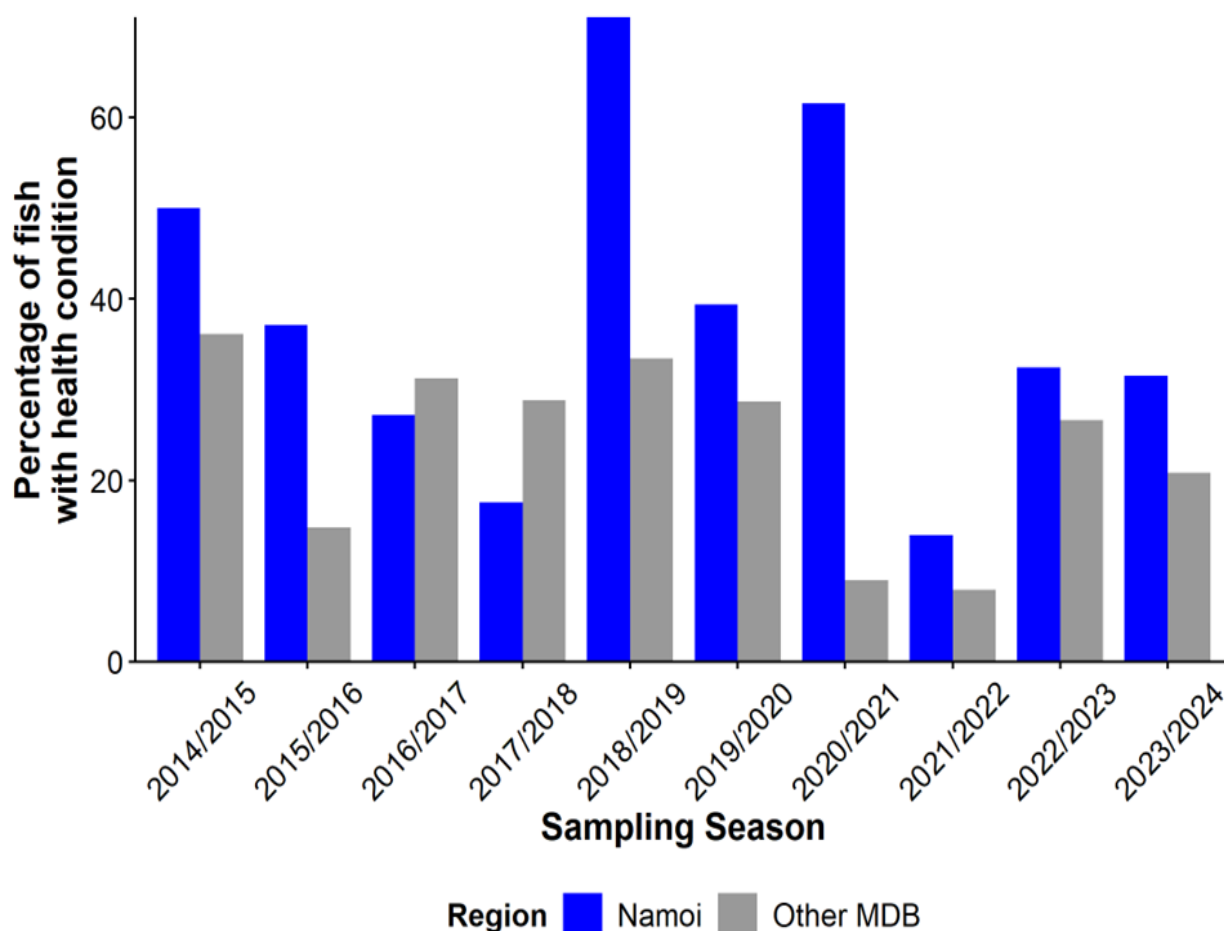


Figure 8.15: Timeseries showing the prevalence of health conditions in Golden perch. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

Summary Statement:

The presence of observable health conditions for Golden perch in the Namoi WRPAs was variable and generally tracked the average across the rest of the NSW Murray-Darling Basin except for 2018/19 and 2020/21 when it was considerably higher.

Distribution

Golden perch were recorded at 45 out of 108 sites in the Namoi WRPA from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 1.8 fish caught per 90 seconds of electrofishing. Figure 8.16 shows the distribution and relative abundance of Golden perch across the Namoi WRPA.

Summary Statement:

Golden perch were generally present across the Namoi region.

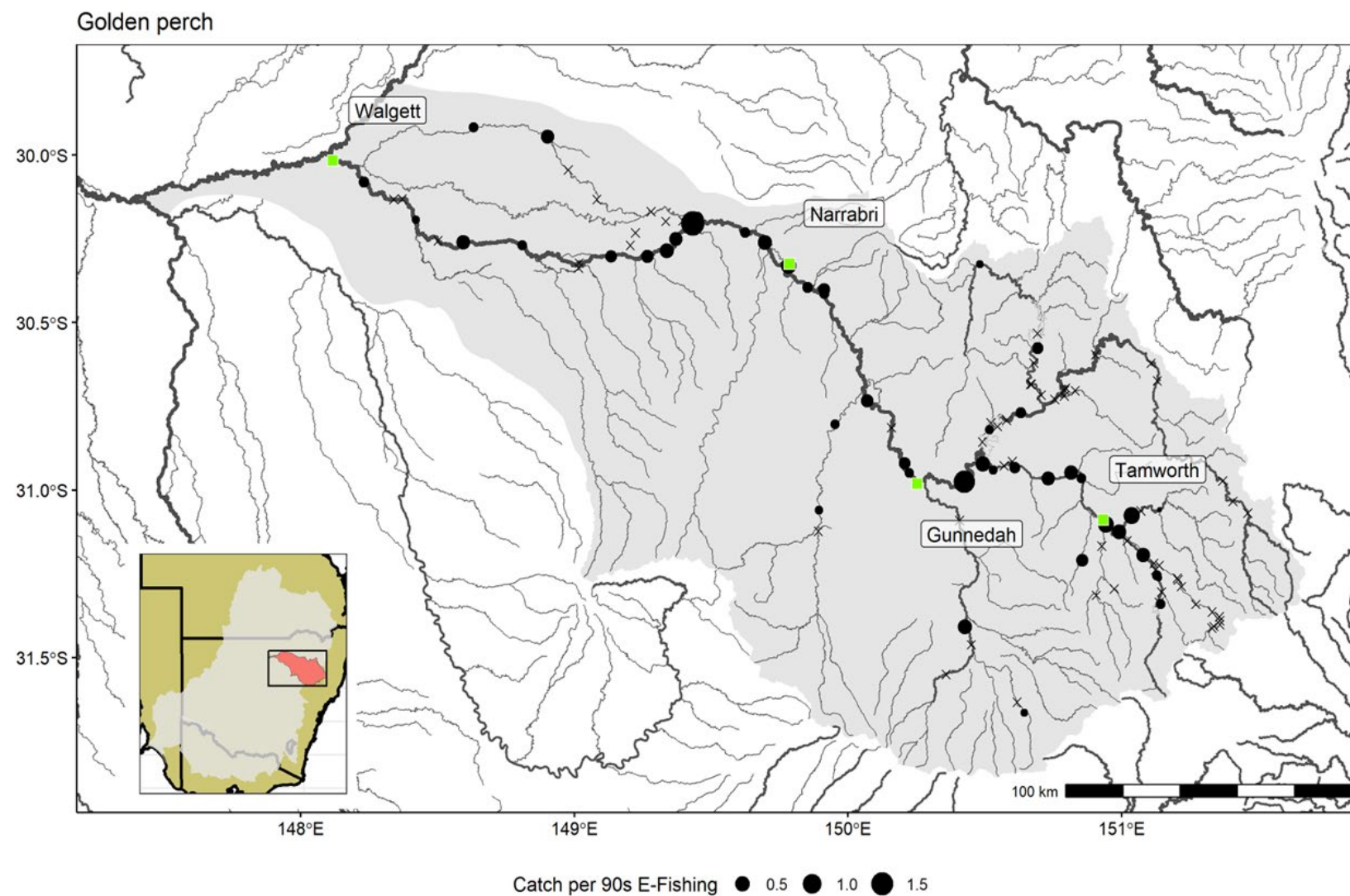


Figure 8.16: Distribution of Golden perch sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Freshwater catfish



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 0 to 31, and 0 % 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 Freshwater catfish was 37 % (348 out of 942).

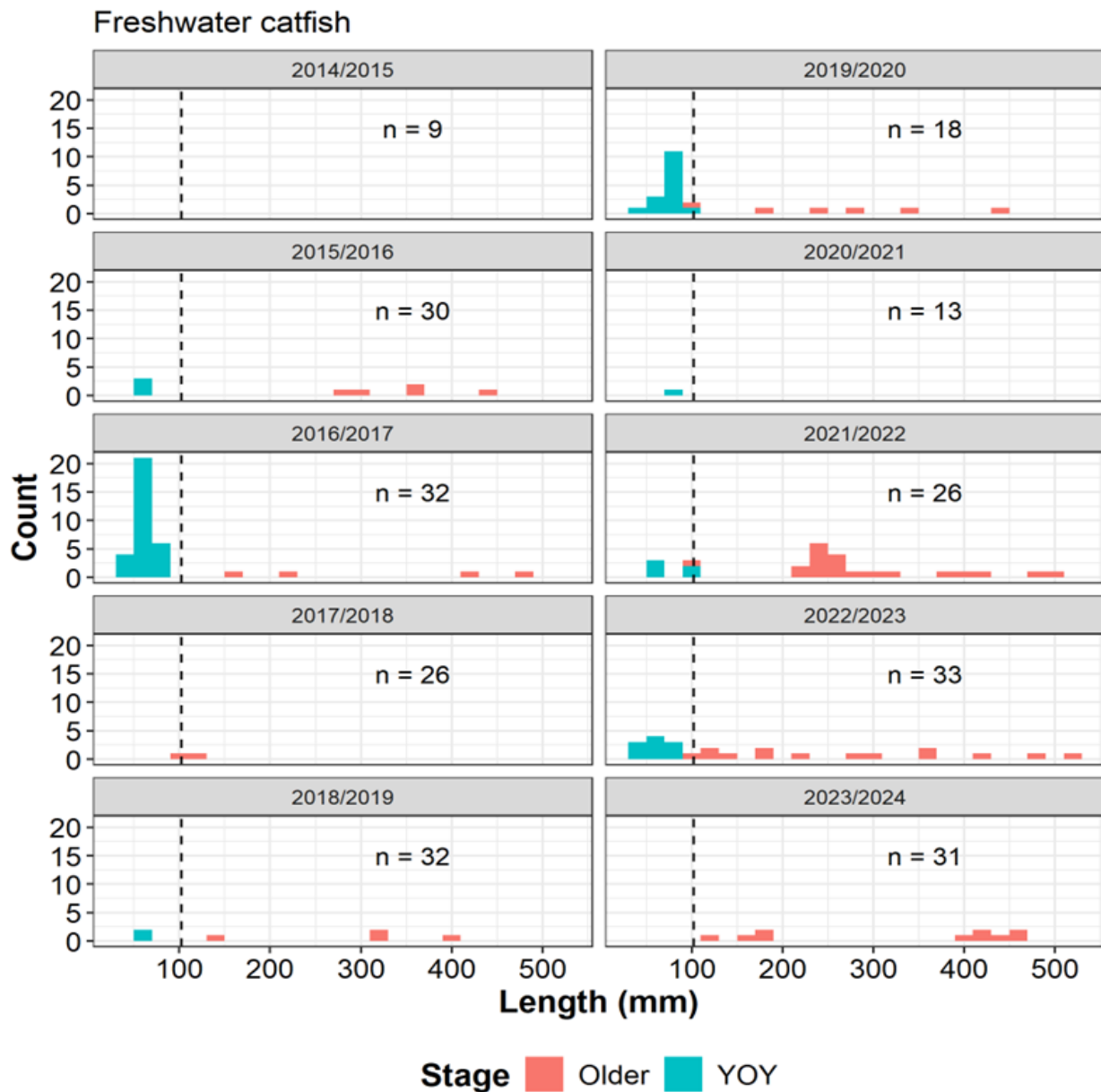


Figure 8.17: Length frequency plots for Freshwater catfish by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Sporadic recruitment with good recruitment events evident in 2016/17, 2019/20 and 2022/23. Possible recruitment failure in 2023/24.

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 Namoi WRPA and the right-hand panels show the overall trends across the NSW MDB.

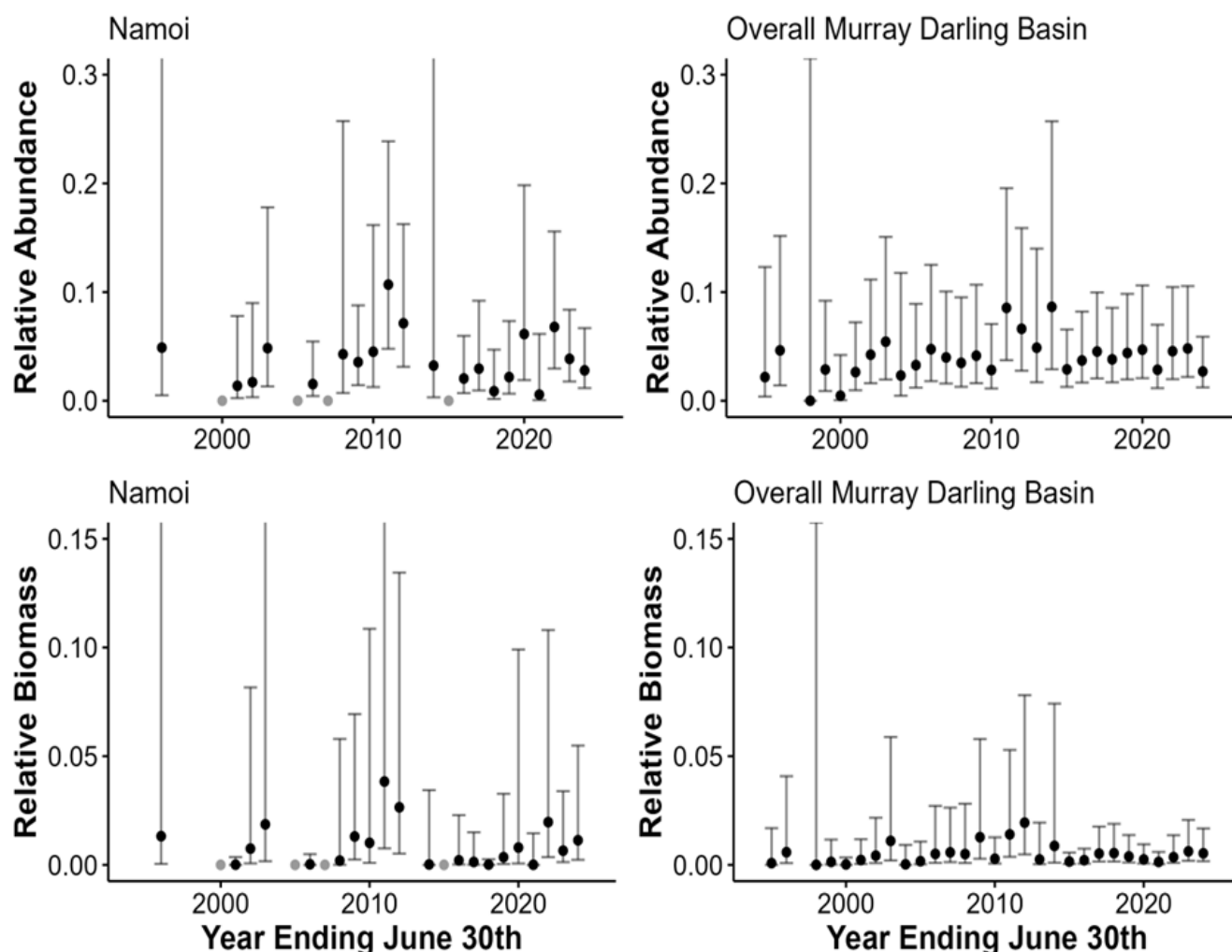


Figure 8.18: Relative abundance and biomass of Freshwater catfish in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence intervals around the estimates. Note some error bars have been truncated for clarity. Grey dots represent years where sampling was conducted but no fish were caught and error estimates were therefore not available.

Summary Statement:

Likely increase in abundance in the Namoi WRPA since the 1990s, matching the wider NSW MDB. Both abundance and biomass are stable over the last few years.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in most years to 4 % of sampled fish in 2023/2024 (Figure 8.19). The most common health issue for Freshwater catfish in the Namoi water resource planning area was Lernaean, which was observed in a total of 1 fish, corresponding to 1 % of all Freshwater catfish measured.

Across the other WRPAs, 2 % of Freshwater catfish (17 out of 942 Freshwater catfish) showed a health condition (excludes Namoi).

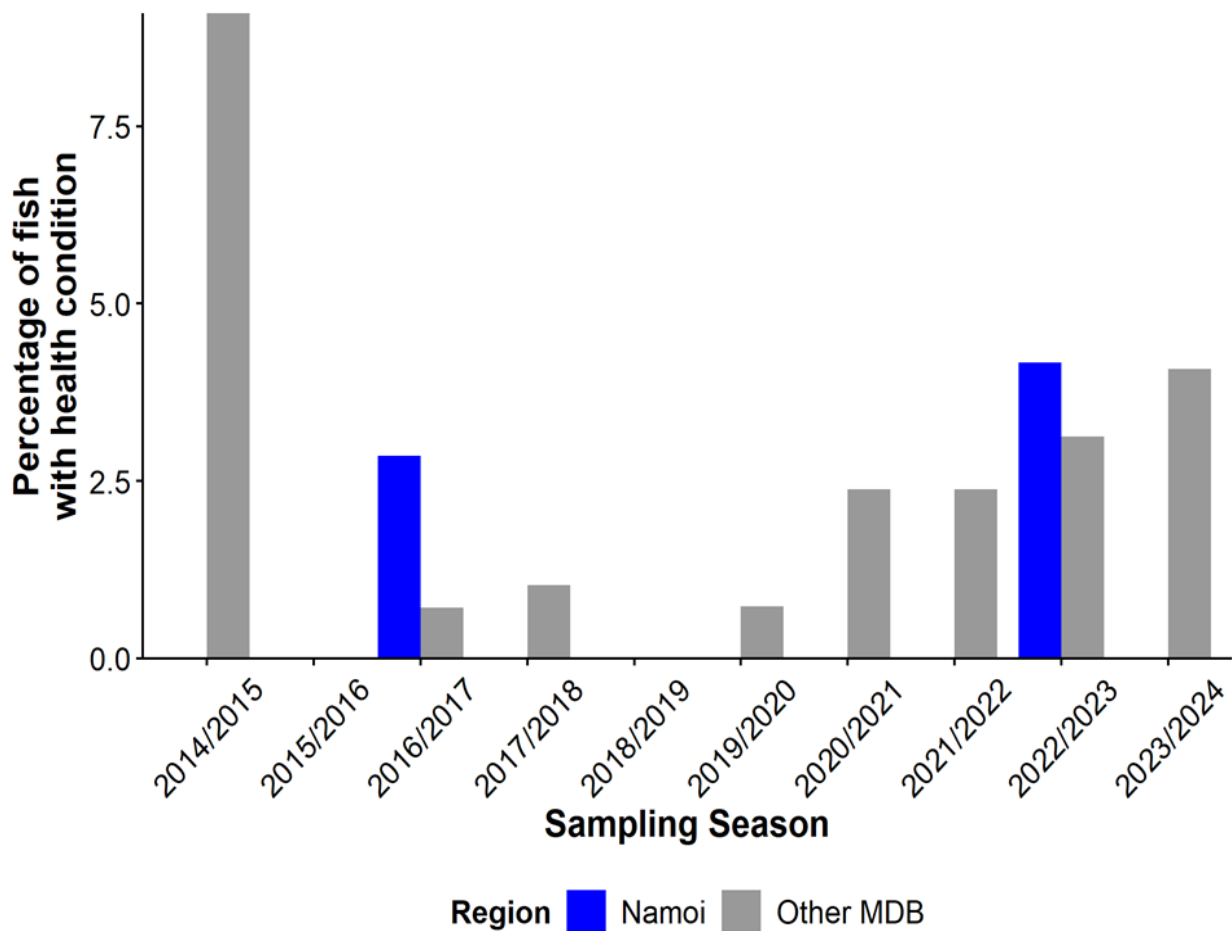


Figure 8.19: Timeseries showing the prevalence of health conditions in Freshwater catfish. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

Summary Statement:

The presence of observable health conditions for Freshwater catfish in the Namoi was overall low.

Distribution

Freshwater catfish were recorded at 29 out of 108 sites in the Namoi WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 1.6 fish caught per 90 seconds of electrofishing. Figure 8.20 shows the distribution and relative abundance of Freshwater catfish across the Namoi WRP.

Summary Statement:

Freshwater catfish were generally present across the eastern Namoi region but absent or in very low abundances across the central and western areas.

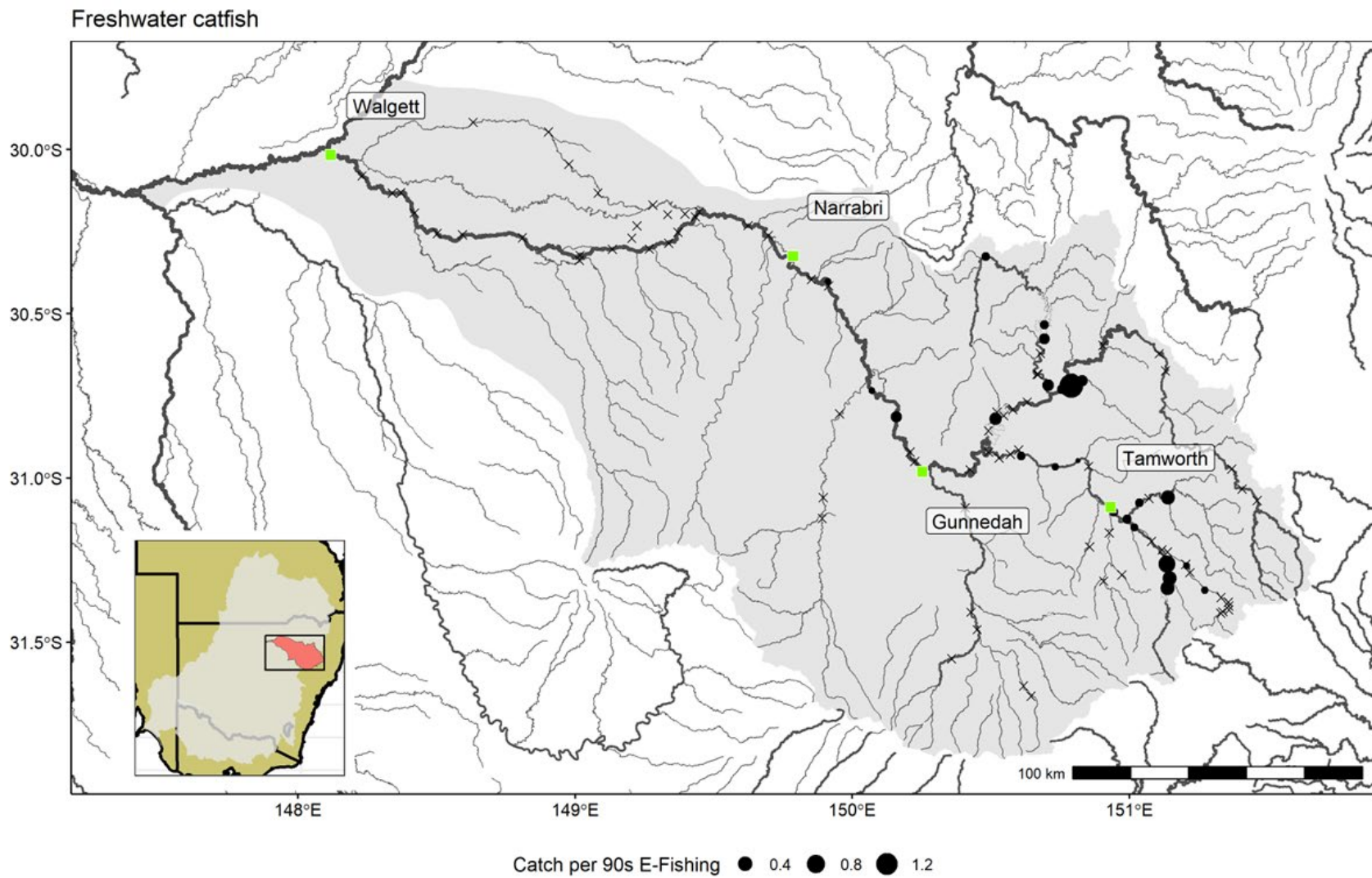


Figure 8.20: Distribution of Freshwater catfish sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Bony herring



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 187, and 0 % to 49 % 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 Bony herring was 25 % (12,865 out of 51,189). Bony herring are not a stocked species.

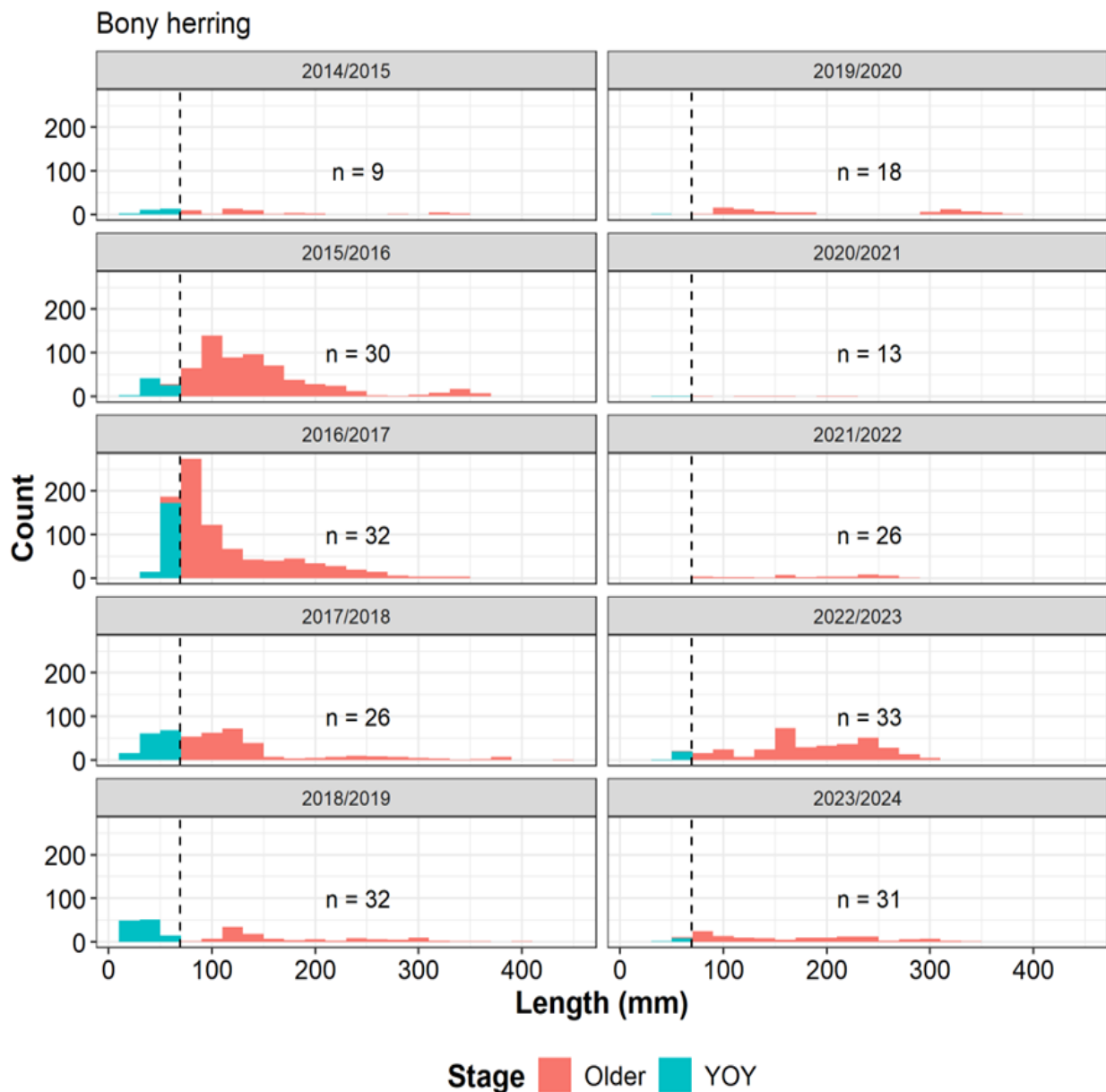


Figure 8.21: Length frequency plots for Bony herring by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Sporadic recruitment with variable numbers of young-of-year. Strong recruitment evident in 2015/16 – 2018/19. Low recruitment evident in 2023/24 but a range of larger sizes.

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 Namoi WRP and the right-hand panels show the overall trends across the NSW MDB.

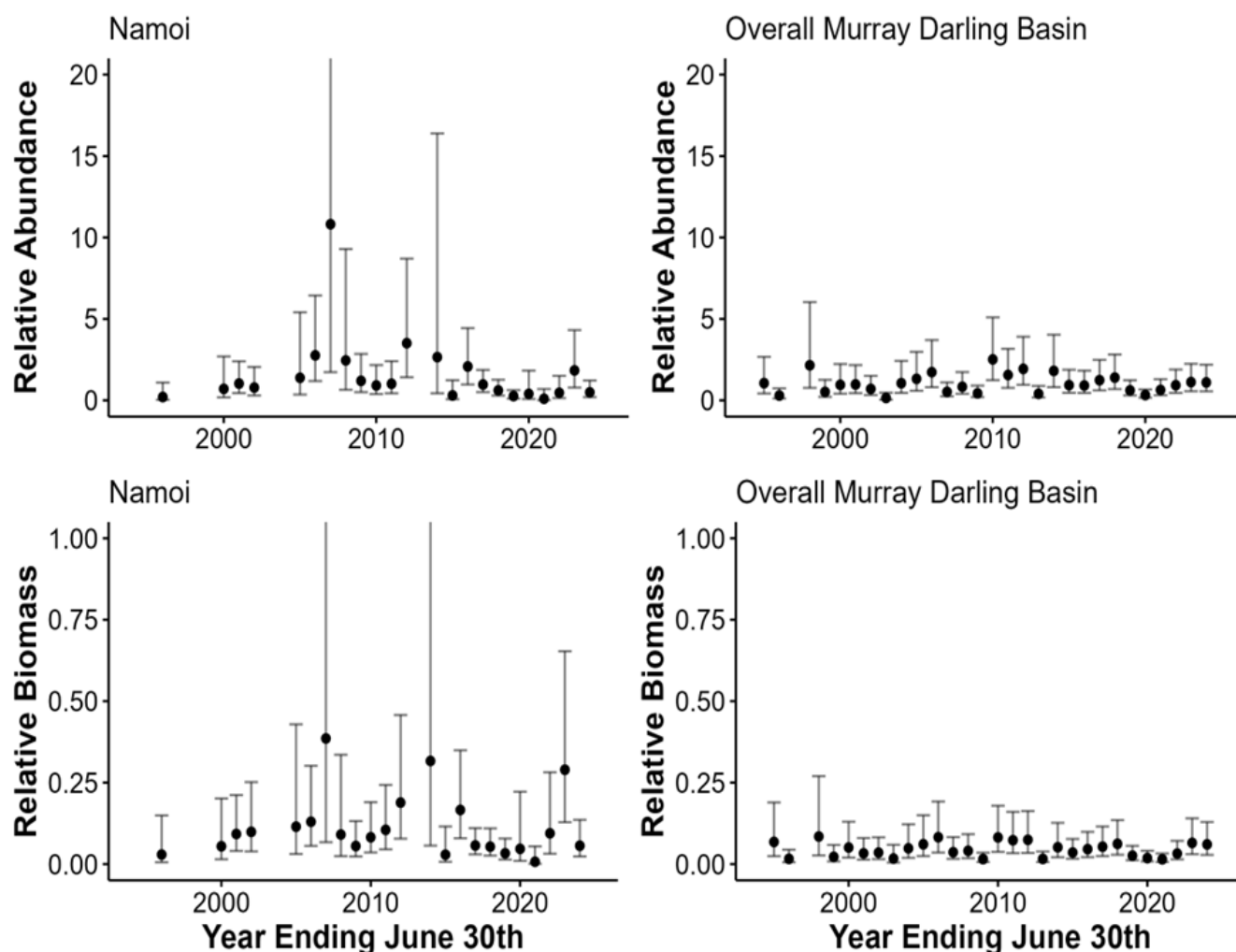


Figure 8.22: Relative abundance and biomass of Bony herring in both the Namoi and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence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

Summary Statement:

Likely increases in abundance and biomass since the 1990s but both abundance and biomass appear to have declined since 2022/23. Relative abundance and biomass similar to the overall NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in 2014/2015 and 2023/24 to 18 % of sampled fish in 2020/2021 (Figure 8.23). The most common health issue for Bony herring in the Namoi WRPA was *Lernaea*, which was observed in a total of 14 fish, corresponding to <1 % of all Bony herring measured.

Across the other NSW MDB WRPA's, 1 % of Bony herring (535 out of 51,189 Bony herring) showed a health condition (excludes the Namoi WRPA).

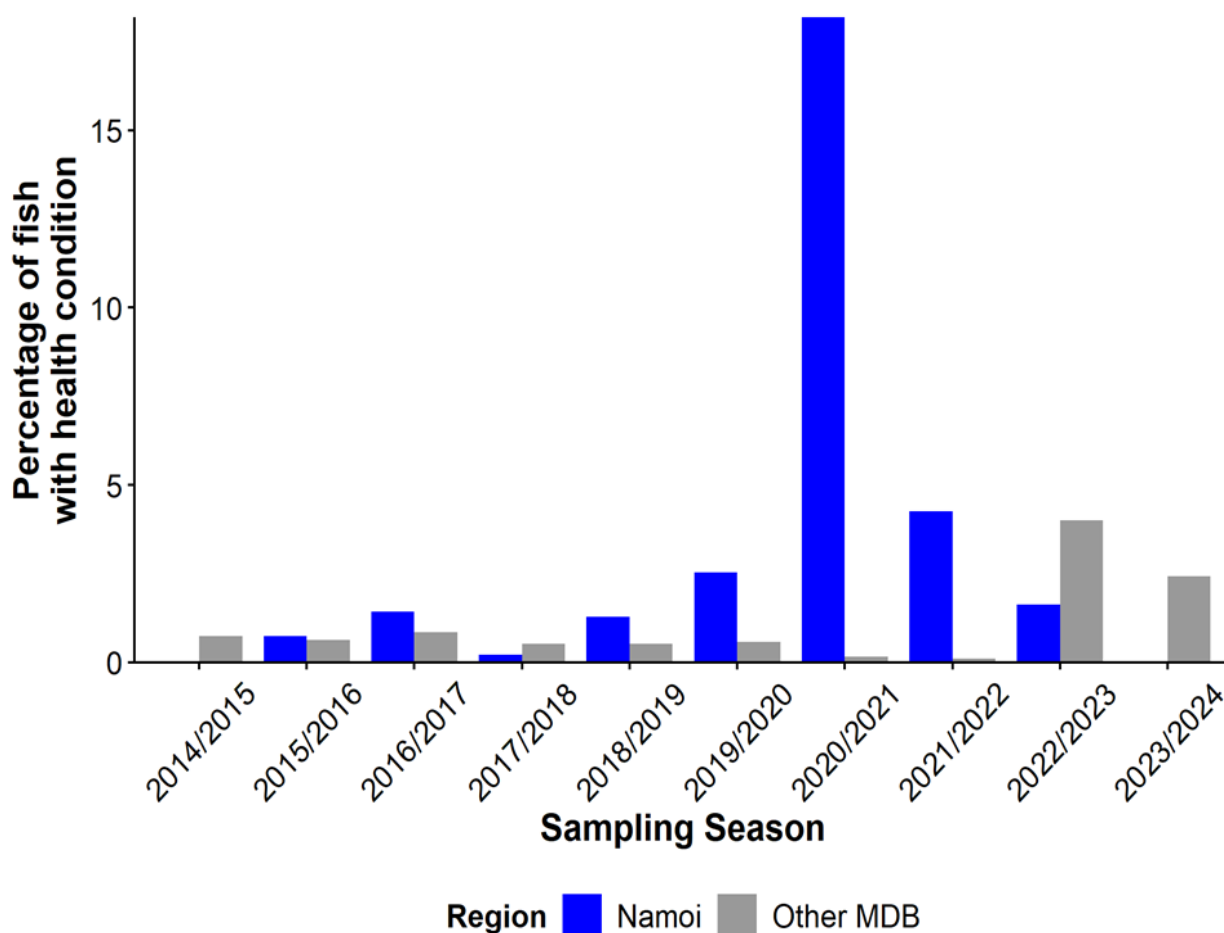


Figure 8.23: Timeseries showing the prevalence of health conditions in Bony herring. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

Presence of observable health conditions was generally very low except for 2020/21 where a moderate proportion of fish showed health issues.

Distribution

Bony herring were recorded at 48 out of 108 sites in the Namoi WRPA from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 27 fish caught per 90 seconds of electrofishing. Figure 8.24 shows the distribution and relative abundance of Bony herring across the Namoi WRPA.

Summary Statement:

Bony herring were recorded across the Namoi WRPA but appear to be absent or in low abundances in the upper catchment (east of Tamworth).

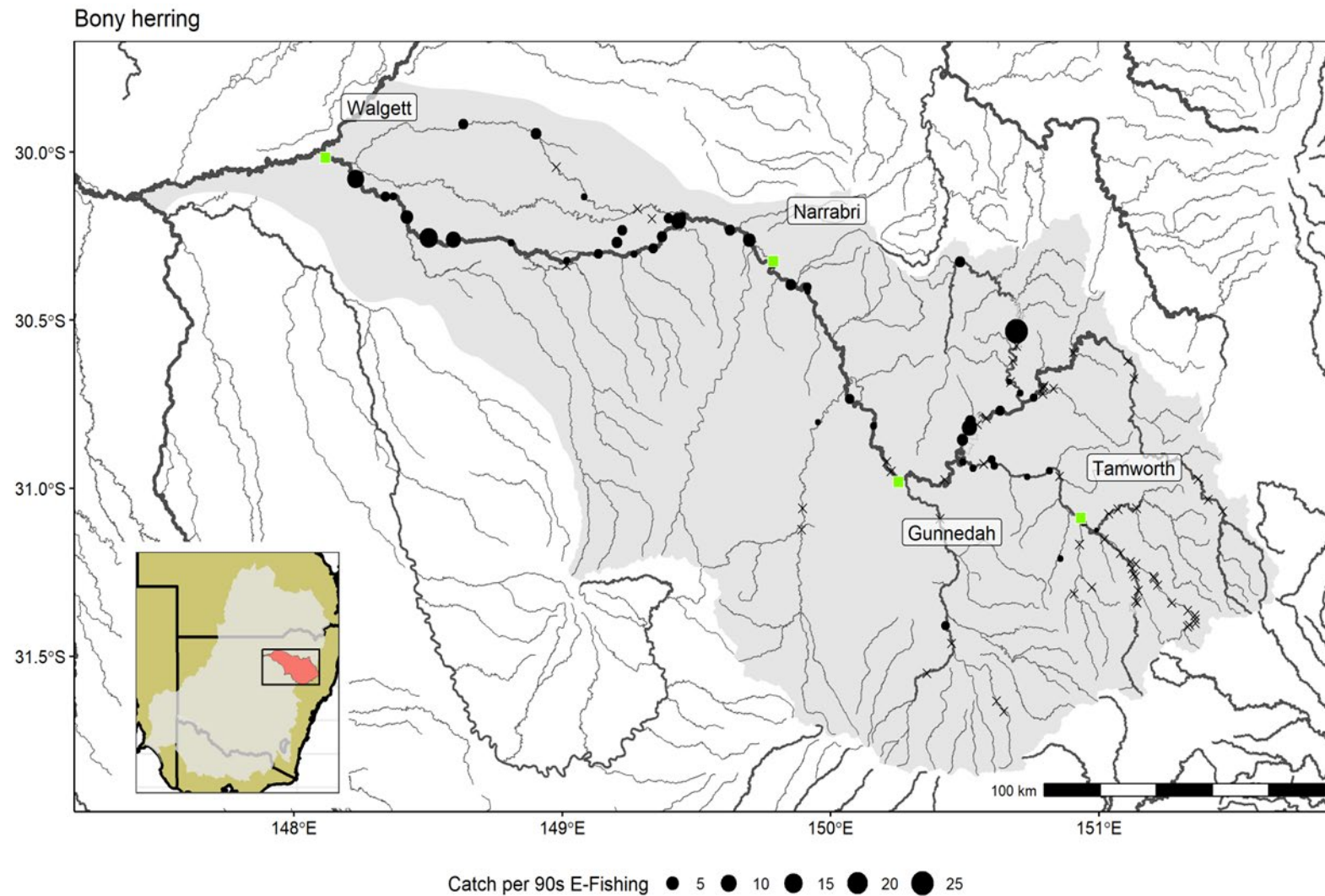


Figure 8.24: Distribution of Bony herring sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Australian smelt



Population Structure

Figure 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 1 to 249, and 7 % to 100 % of measured fish within a season, with a mean percentage YOY of 49 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Australian smelt was 41 % (11,207 out of 27,394). Australian smelt are not a stocked species.

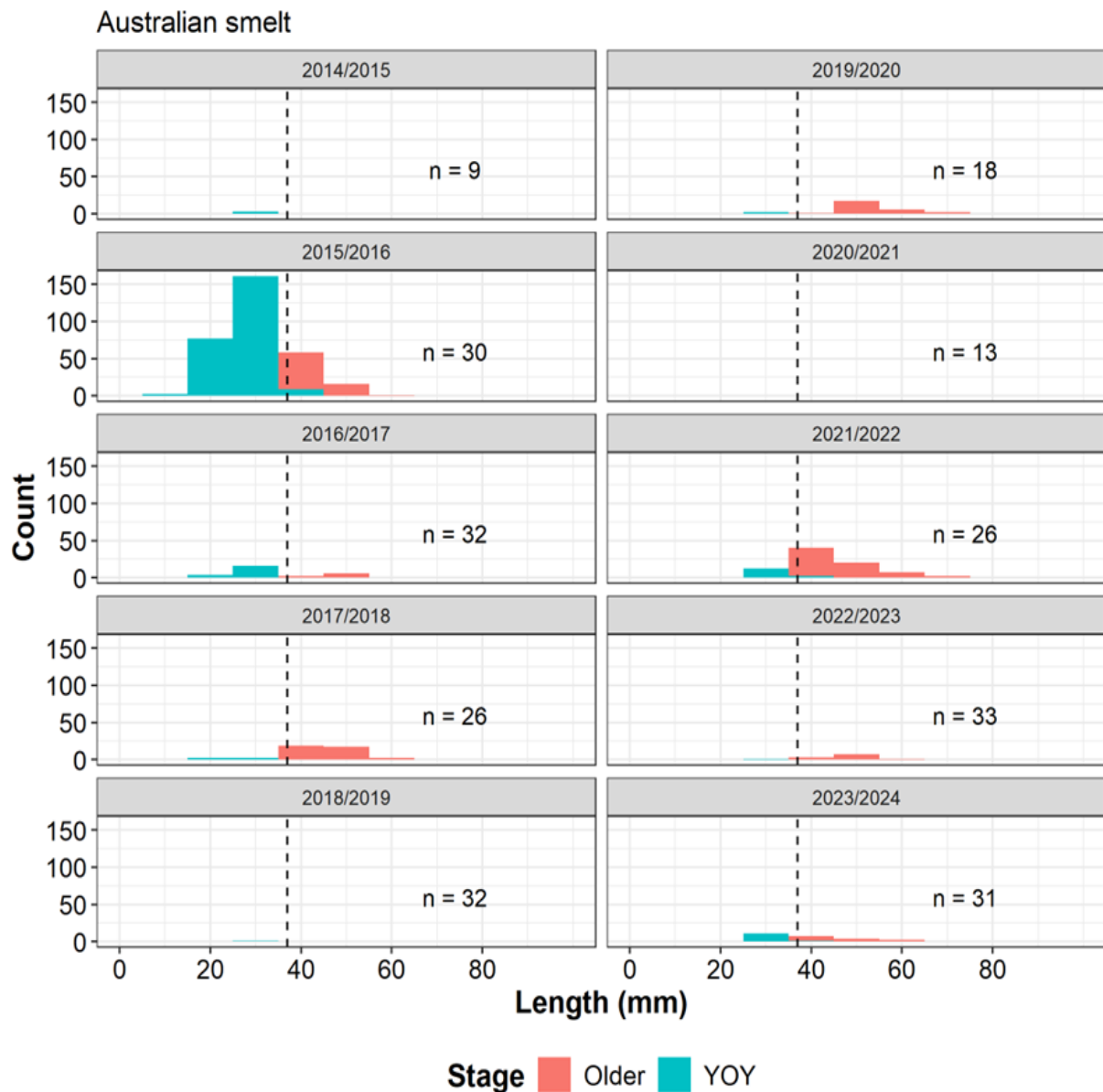


Figure 8.25 Length frequency plots for Australian smelt by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Sporadic recruitment with a strong recruitment pulse in 2015/16 and possible recruitment failures in 2014/15, 2018/19, 2020/21 and 2022/23. Low recruitment in 2023/24.

Temporal Trends in Abundance

The relative abundance of Australian smelt since 1994 was modelled based on all suitable boat electrofishing data. The left-hand panel of Figure 8.26 show the abundance trends for the Namoi WRPA and the right-hand panel show the overall trend across the NSW MDB.

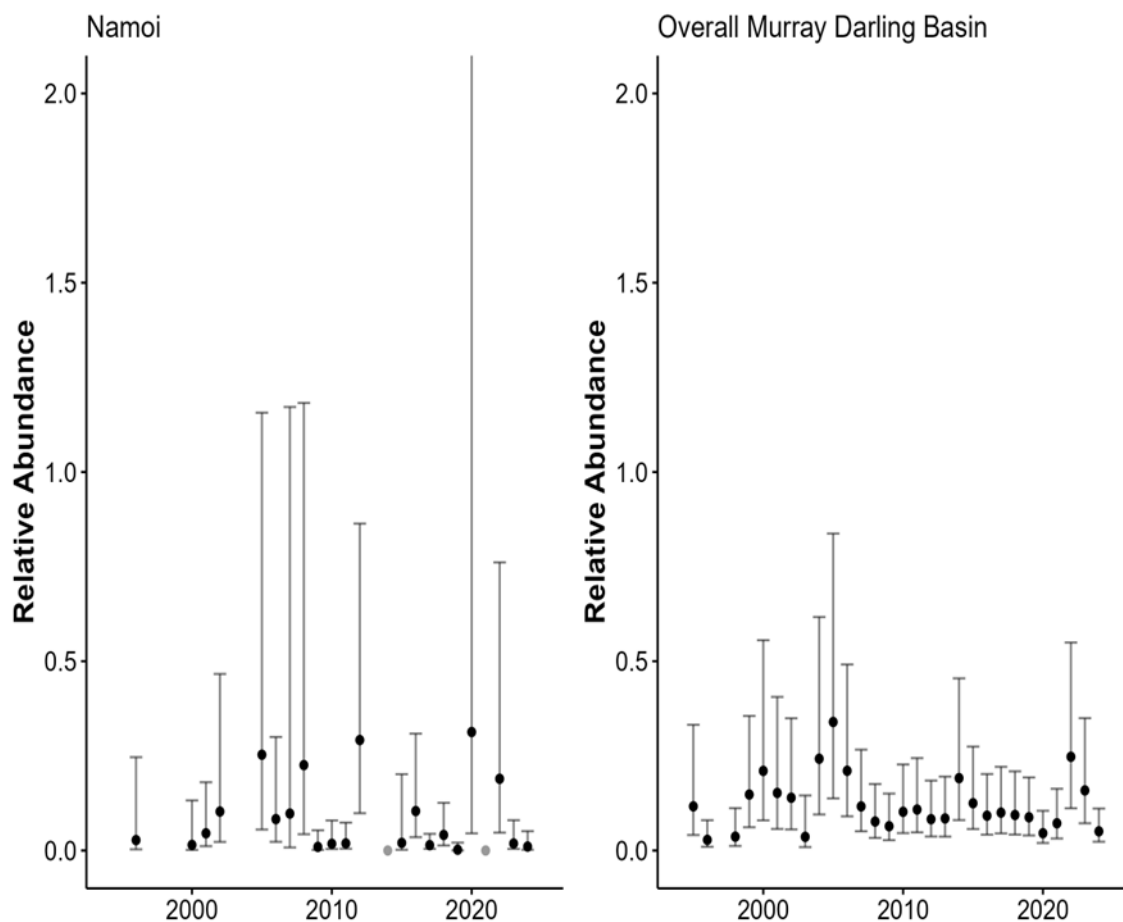


Figure 8.26: Relative abundance of Australian smelt in both the Namoi WRPA and the overall NSW MDB. These are model estimates based upon all boat electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95 % confidence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

Summary Statement:

Highly variable abundance with high certainty across the time series. Recent abundance lower than the overall NSW MDB.

Health

The prevalence of any health issues ranged from 0 % of sampled fish in most years to 2 % of sampled fish to 2015/2016 (Figure 8.27). The most common health issue for Australian smelt in the Namoi WRPAs was *Lernaea*, which was observed in a total of 6 fish, corresponding to <1 % of all Australian smelt measured.

Across the other NSW MDB WRPA's, <1 % of Australian smelt (168 out of 27,396 Australian smelt) showed a health condition (excludes the Namoi WRPAs).

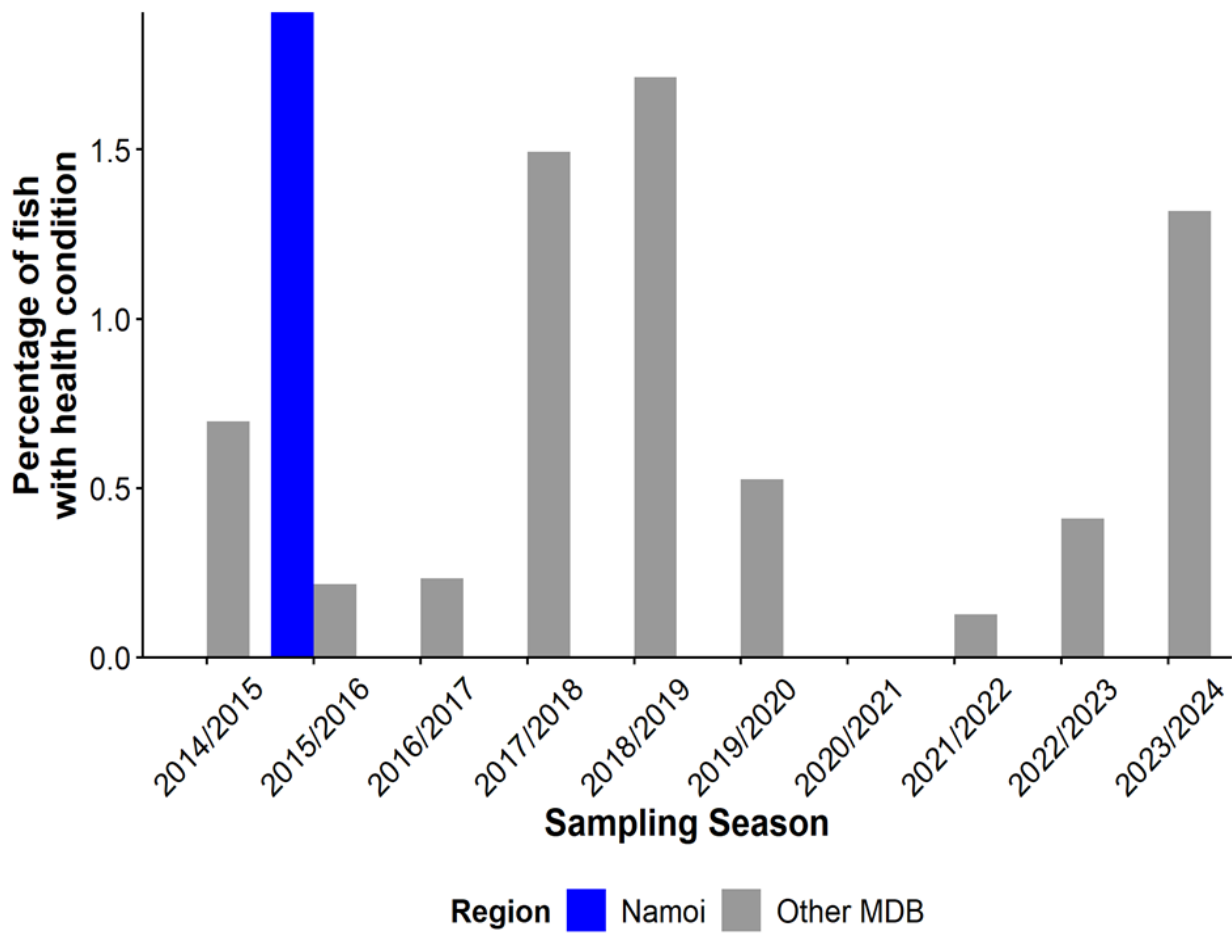


Figure 8.27: Timeseries showing the prevalence of health conditions in Australian smelt. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPA's.

Summary Statement:

Very few health issues were observed in Australian smelt in the Namoi.

Distribution

Australian smelt were recorded at 37 out of 108 sites in the Namoi WRP from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 2.8 fish caught per 90 seconds of electrofishing. Figure 8.28 shows the distribution and relative abundance of Australian smelt across the Namoi WRP.

Summary Statement:

Australian smelt were recorded across the Namoi WRP.

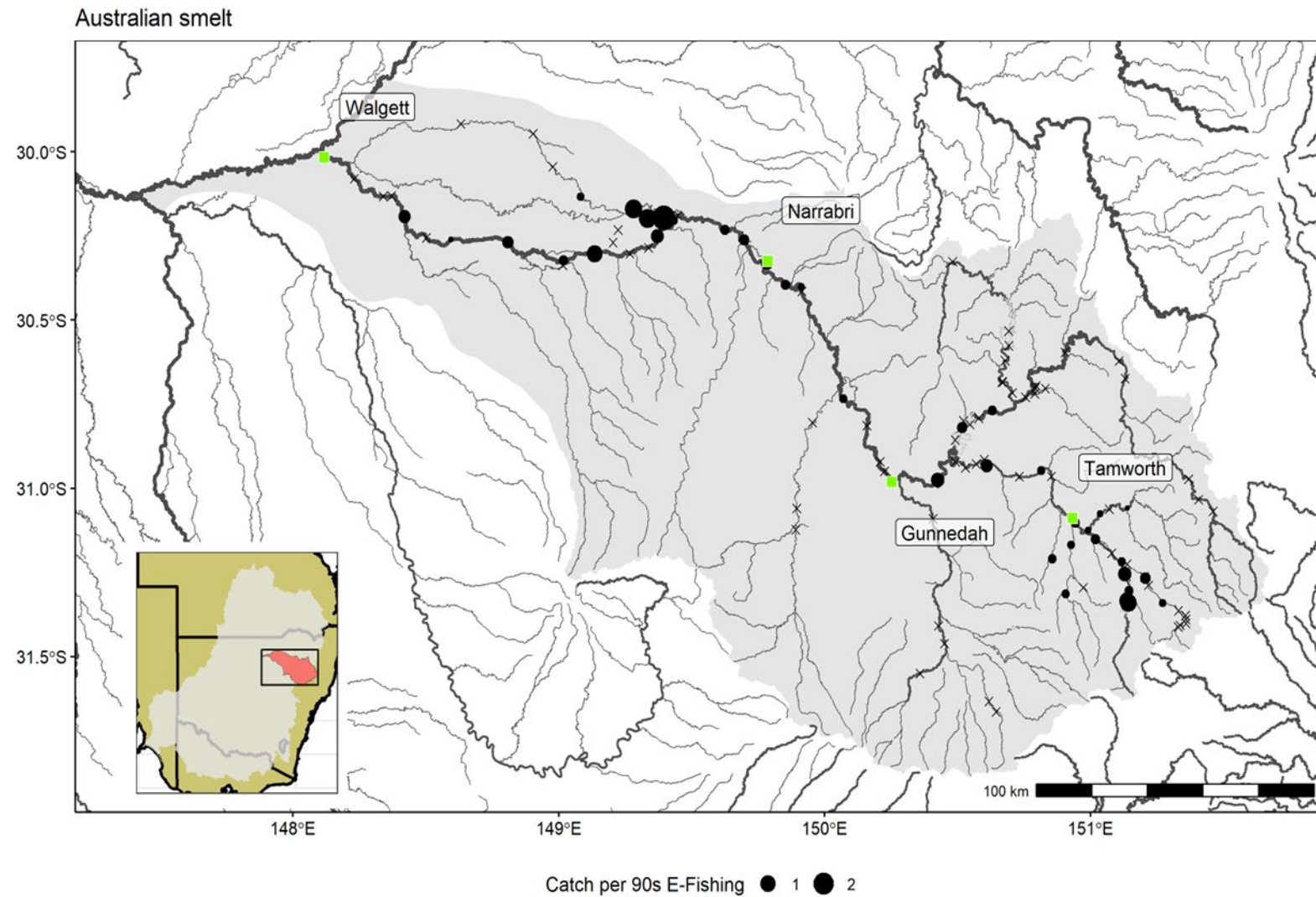


Figure 8.28: Distribution of Australian smelt sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Common carp



Population Structure

Figure 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 23 to 478, and 8 % to 78 % of measured fish within a season, with a mean percentage YOY of 46 %.

Overall, during the reporting period, across all the MDB water resource planning areas, the percentage YOY for Common carp was 56 % (33,727 out of 60,568). Common carp are not a stocked species.

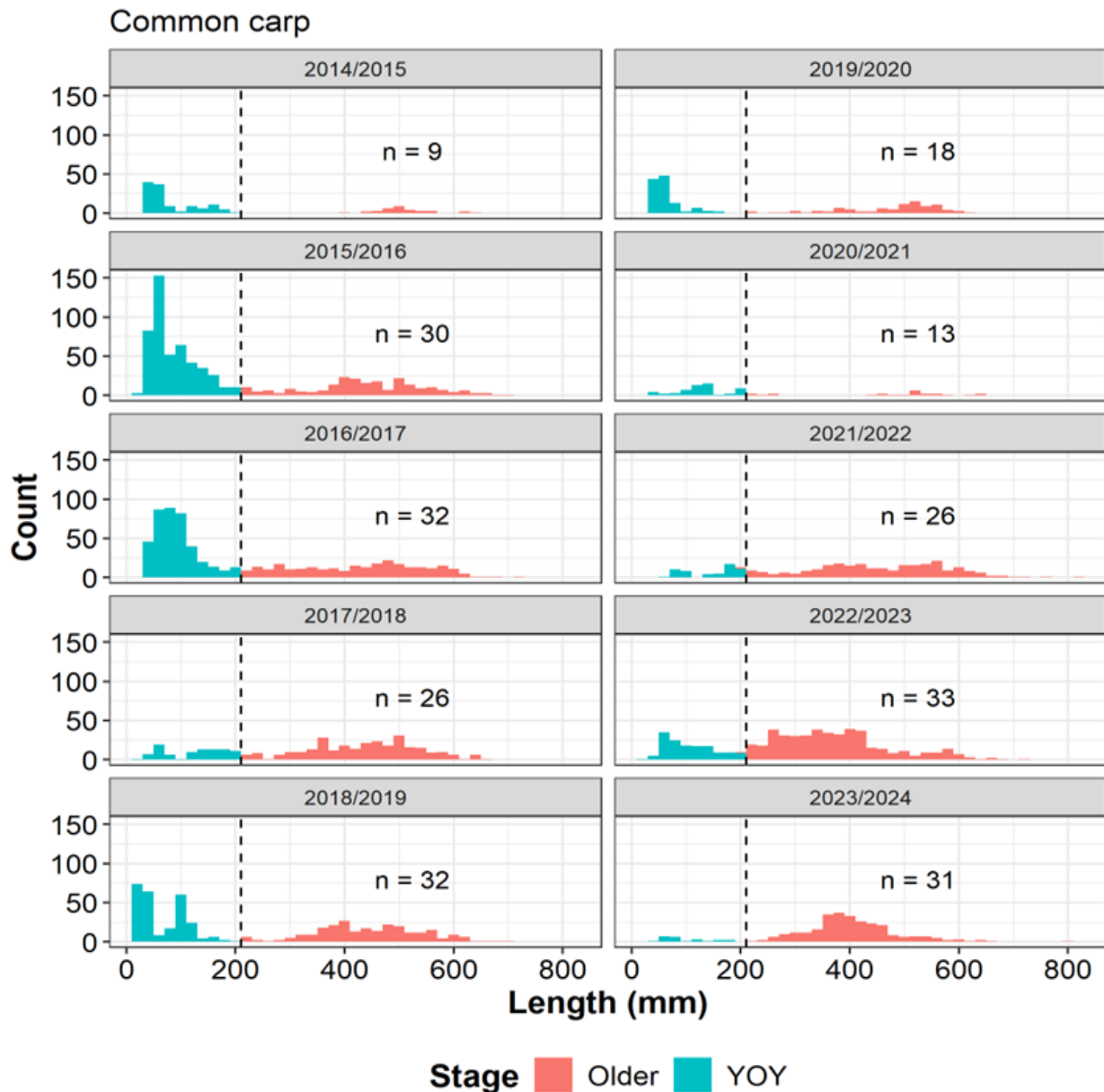


Figure 8.29: Length frequency plots for common carp by sampling season in the Namoi WRPA. YOY represents Young of the Year fish. n shows the number of sites sampled in the WRPA in a sampling season.

Summary Statement:

Variable recruitment with very strong peaks in 2015/16, 2016/17 and 2018/19. Large fish (>500 mm) present in all years. Low recruitment in 2023/24 following moderately strong recruitment in 2022/23.

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 Namoi WRP and the right-hand panels show the overall trends across the NSW MDB.

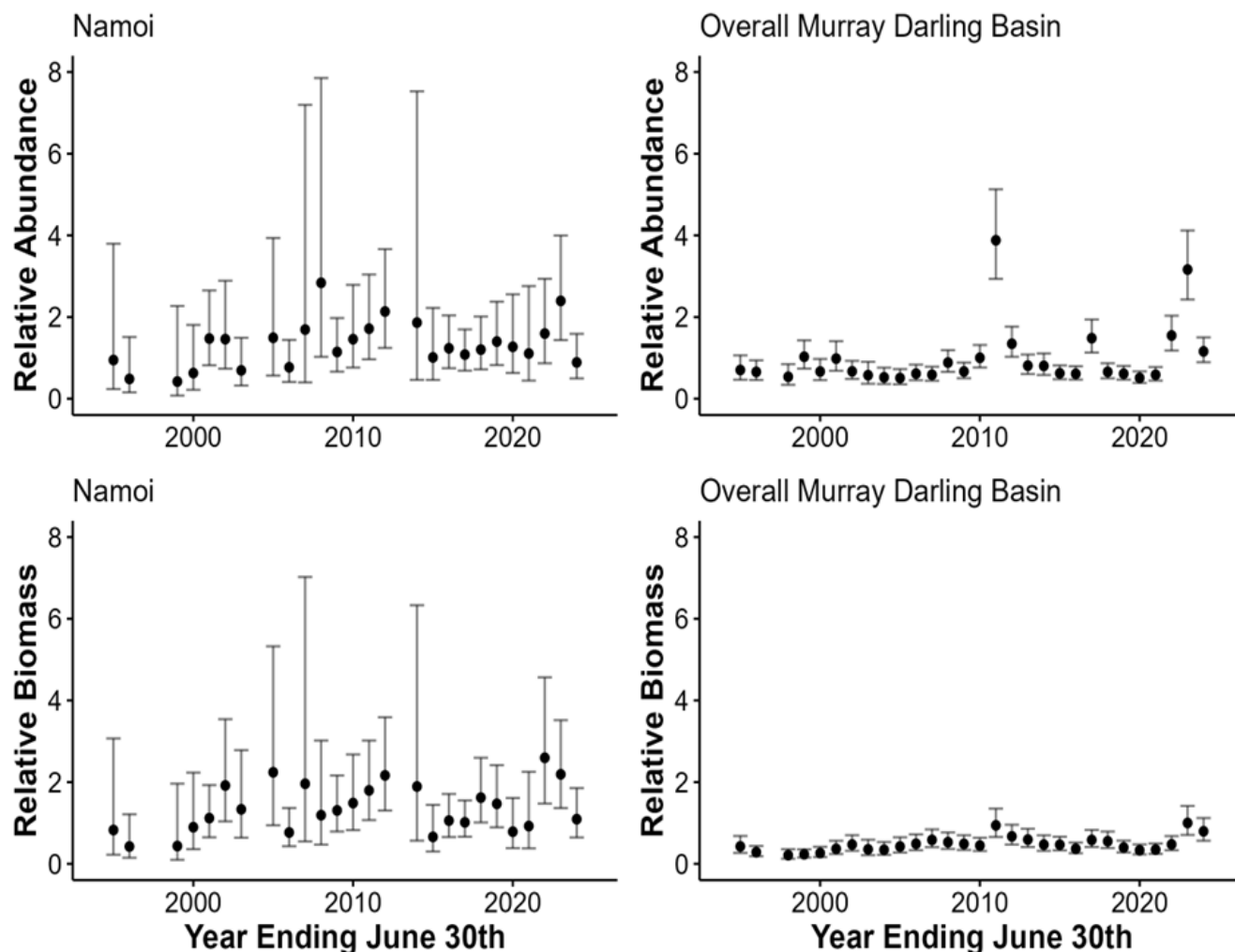


Figure 8.30: Relative abundance and biomass of Common carp in both this valley and the overall Murray-Darling Basin. These are model estimates based upon all electrofishing data within the NSW DPIRD Freshwater ecosystem database and the output of generalised linear mixed models. Error bars show the 95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

Summary Statement:

For Common carp in the Namoi, likely increase in biomass and abundance since the 1990s but there is evidence that both abundance and biomass have declined since 2022/23. Both abundance and biomass are similar to the overall NSW MDB.

Health

The prevalence of any health issues ranged from 2 % of sampled fish in 2023/2024 to 31 % of sampled fish in 2020/2021 (Figure 8.31). The most common health issue for Common carp in the Namoi water resource planning area was *Lernaea*, which was observed in a total of 141 fish, corresponding to 4 % of all Common carp measured.

Across the other WRPAs, 4 % of Common carp (2,207 out of 60,570 Common carp) showed a health condition (excludes Namoi).

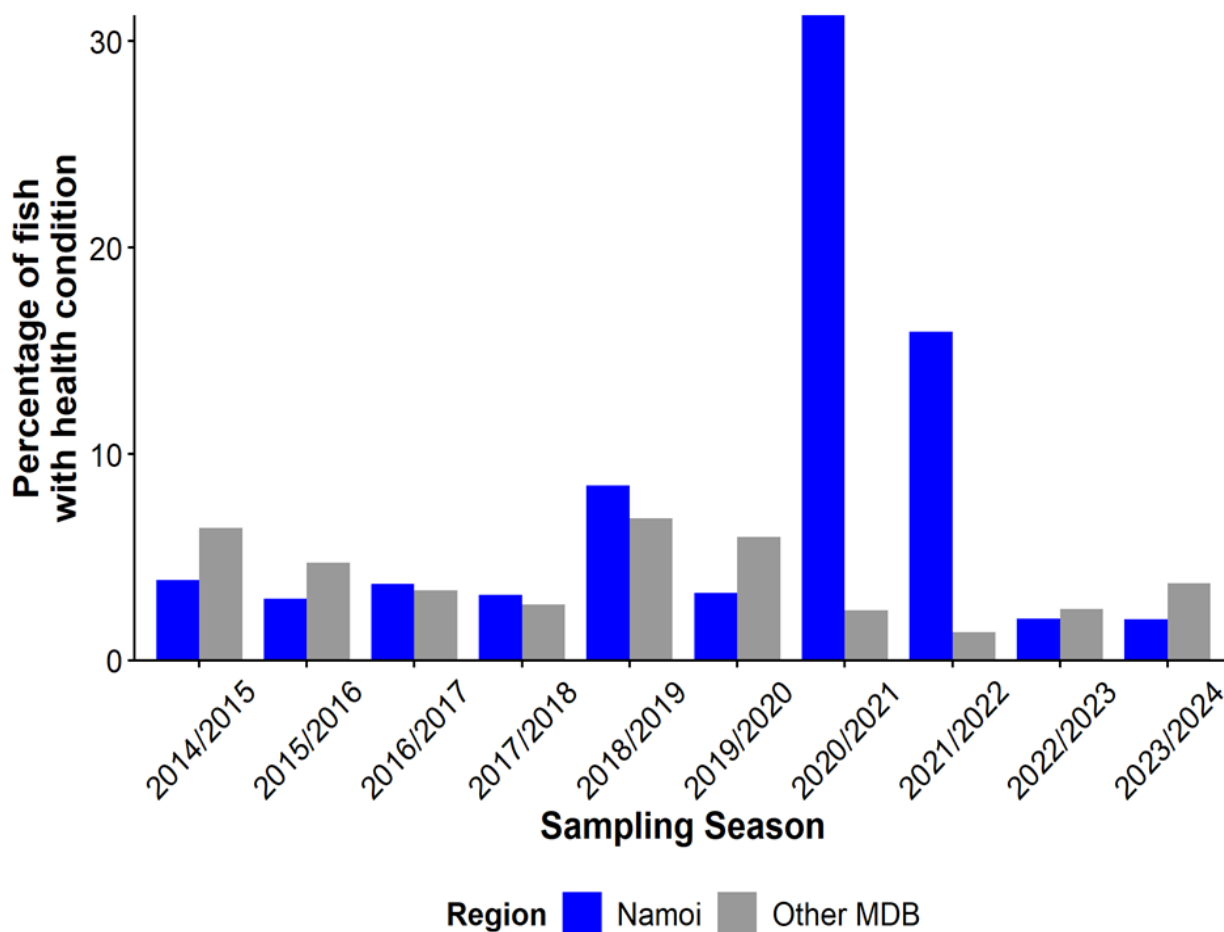


Figure 8.31: Timeseries showing the prevalence of health conditions in Common carp. Blue shows the region-specific data while the grey shows the average across the other NSW MDB WRPAs.

Summary Statement:

The presence of observable health conditions for Common carp in the Namoi was low to moderate and generally similar to the wider NSW MDB except for 2020/21 when the Namoi showed a high proportion of health issues.

Distribution

Common carp were recorded at 80 out of 108 sites in the Namoi WRPA from 2013/14 to 2023/24. The maximum observed relative abundance at a site was 15.8 fish caught per 90 seconds of electrofishing. Figure 8.32 shows the distribution and relative abundance of Common carp across the Namoi WRPA.

Summary Statement:

Common carp were found in relatively high abundance across the Namoi region.

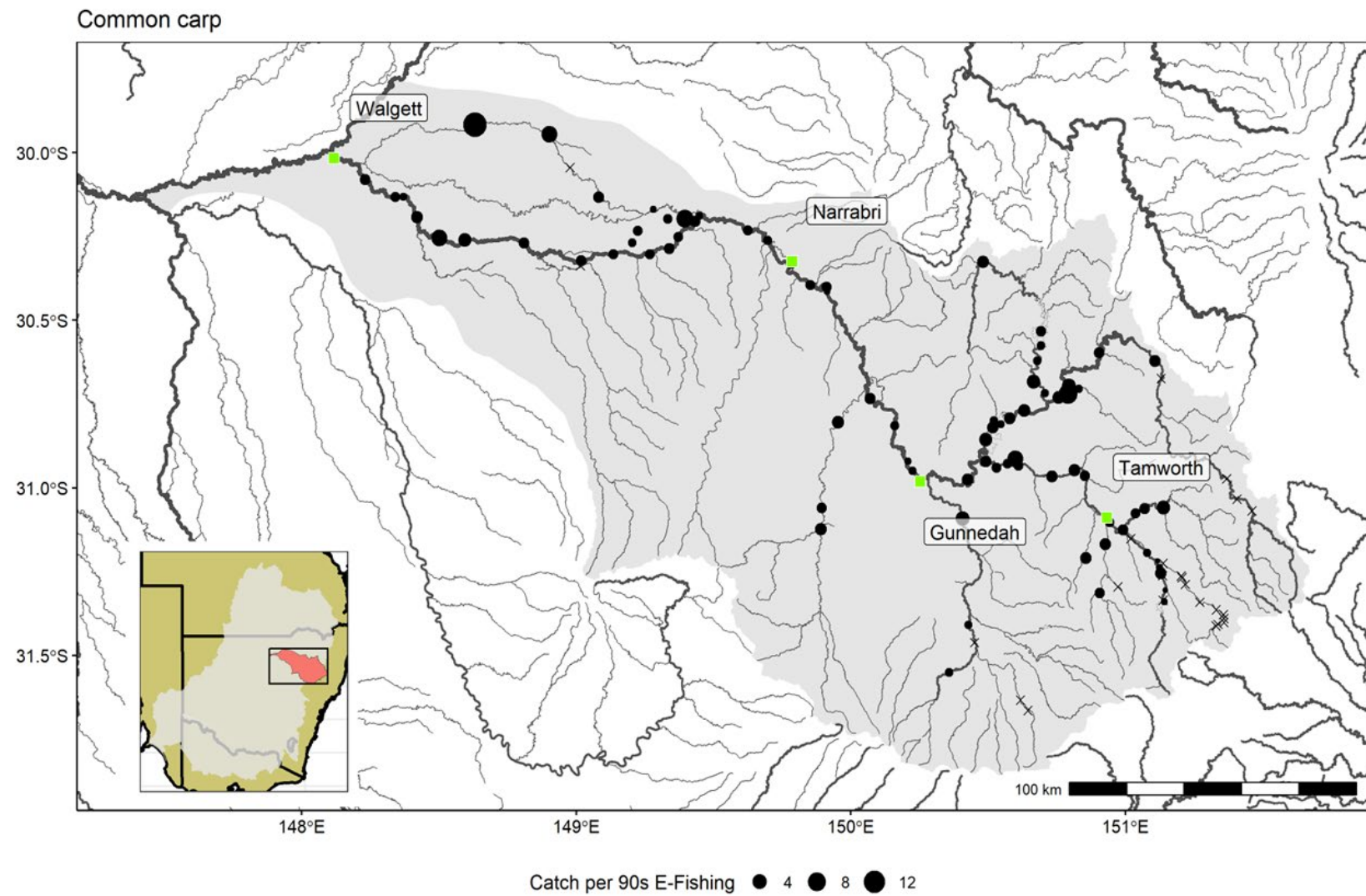


Figure 8.32: Distribution of Common carp sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents relative abundance. Sites that were sampled with electrofishing but did not contain the species are shown with an X. Green squares represent key towns.

Threatened Species

The following table (Table 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 during standardised electrofishing surveys in the Namoi 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. (* = FMA, # = EPBC)

Species	Common name	Total caught (observed)
<i>Bidyanus bidyanus</i>	Silver perch ^{*#}	20 (7)
<i>Maccullochella peelii</i>	Murray cod [#]	1,024 (373)
<i>Tandanus tandanus</i>	Freshwater catfish [*]	134 (32)

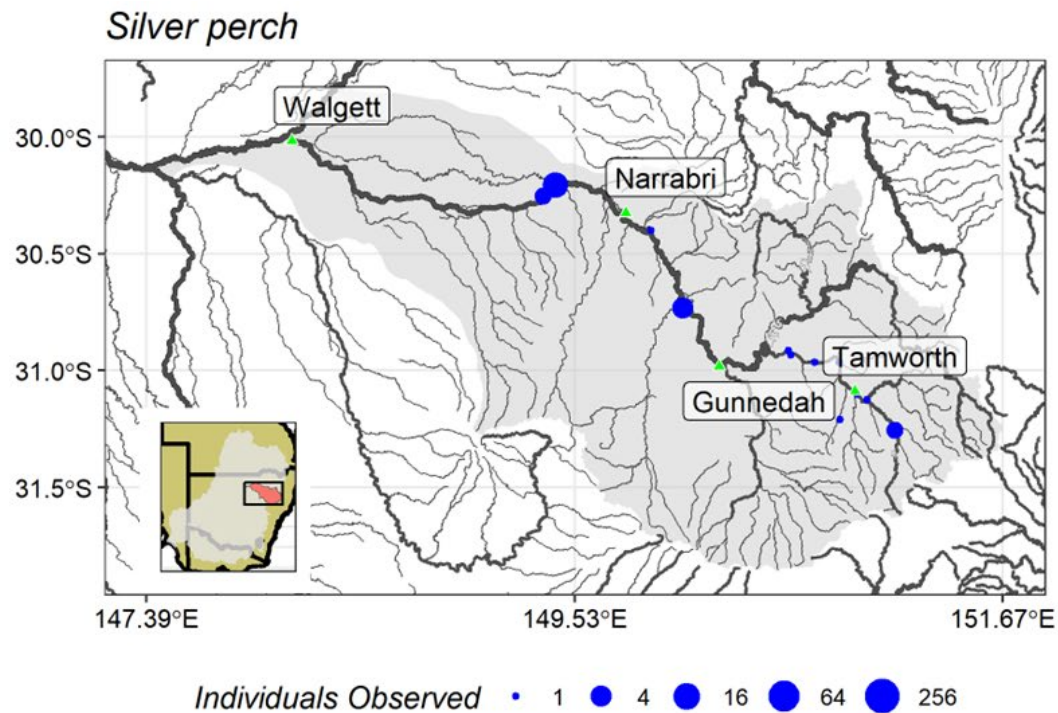


Figure 8.33: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance.

Summary Statement:

A total of 20 Silver perch were caught across 9 sites in the Namoi region, including 2 caught in 2023/24.

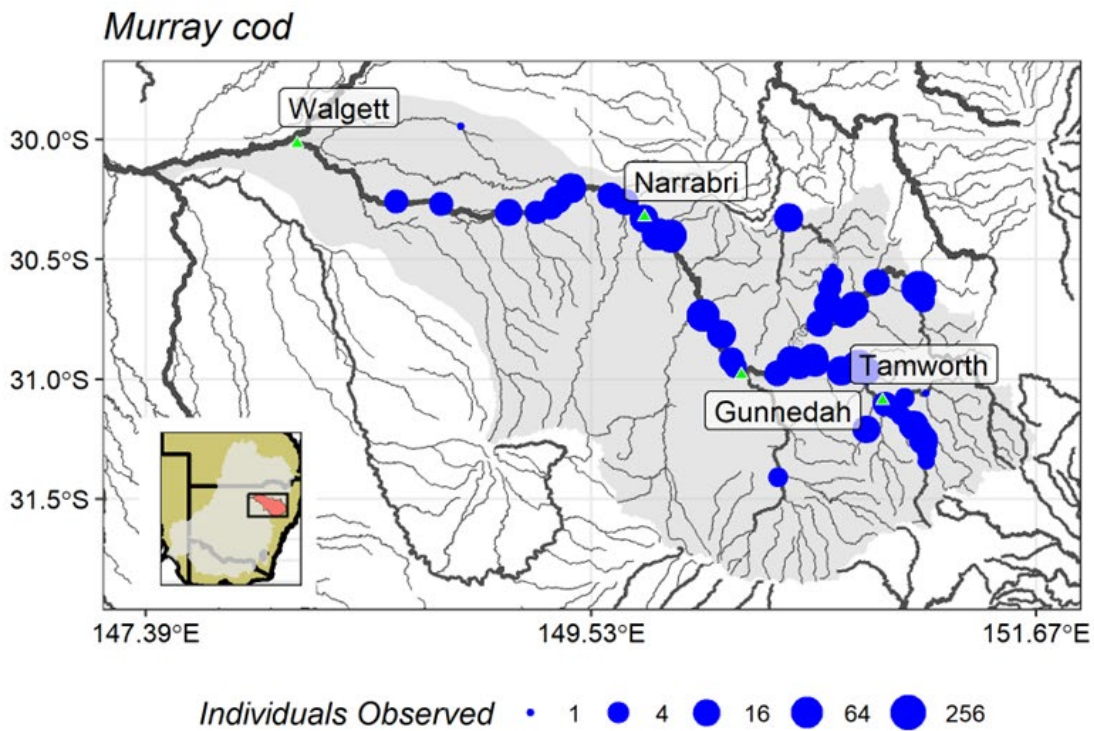


Figure 8.34: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Namoi WRPA. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance. Note the lower image shows a juvenile Murray cod.

Summary Statement:

Murray cod are widespread across the Namoi WRPA with 1024 being caught over the reporting period. For more details see the Murray cod section of this chapter.

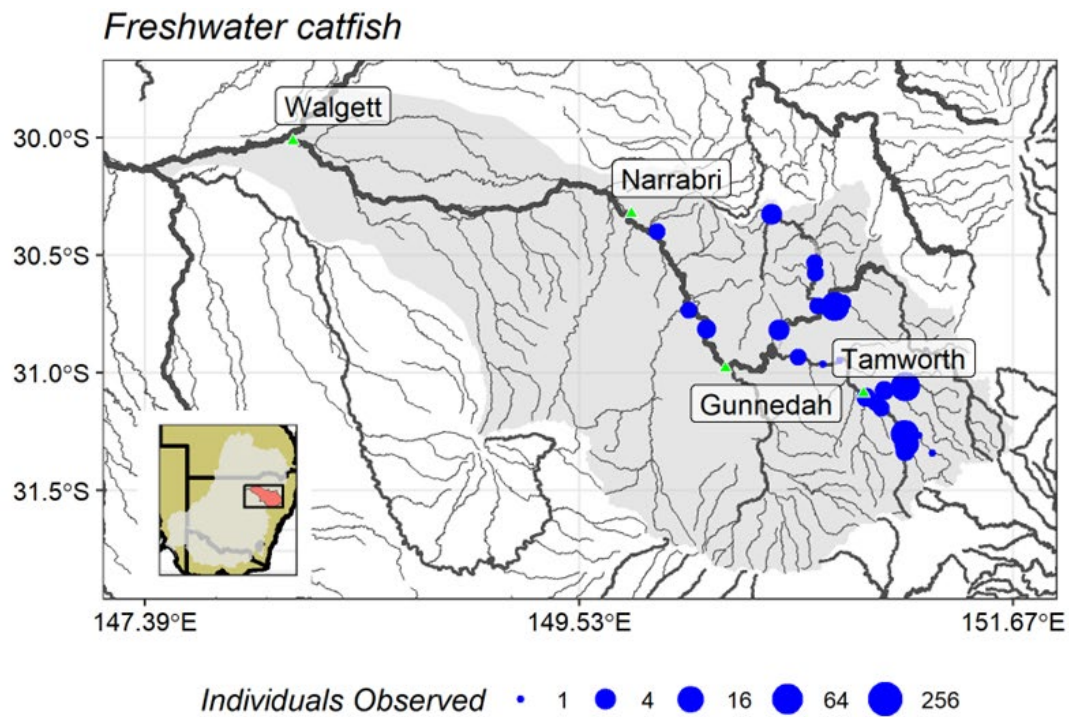


Figure 8.35: Distribution of the observed threatened species sampled from 2013/14 to 2023/24 in the Namoi WRP. Filled circles show sites where the species was present, and the size of the circle represents number of observed individuals abundance.

Summary Statement:

A total of 134 Freshwater catfish were captured across 29 sites in the Namoi region, although they are restricted to the eastern region. For more details see the Freshwater catfish section of this chapter.

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	2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020	68
Basin Plan Environmental Outcomes Monitoring 2	2022/2023, 2023/2024	30
Fish & Flows Intervention Monitoring - Peel	2021/2022, 2022/2023, 2023/2024	54
Murray-Darling Basin Fish Surveys	2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019, 2020/2021, 2021/2022, 2022/2023, 2023/2024	61
Namoi Fish and Flows	2015/2016, 2016/2017, 2017/2018, 2018/2019	92
Three Dams	2020/2021, 2021/2022	9

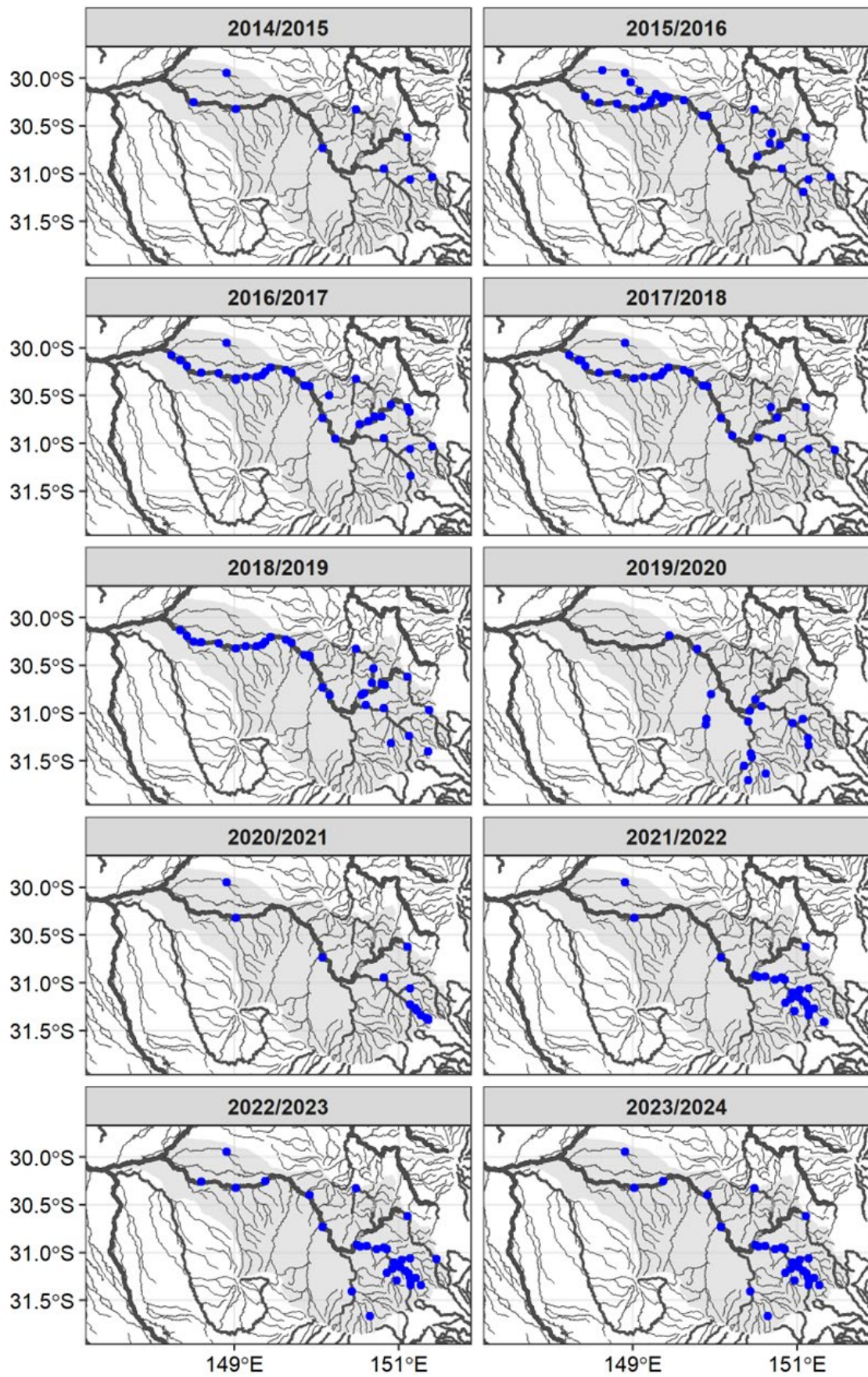


Figure 8.36: Sites sampled and included in this report by sampling season in the Namoi WRPA. Dry sites are not shown.

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 Namoi WRP were: Olive perchlet, Macquarie perch, Southern purple-spotted gudgeon, Dwarf flathead gudgeon, Redfin and 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 all protocols and sampling methods is presented in Table 8.11.

Table 8.8: Total number caught of each species by sampling season in the Namoi WRP.

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	3	335	28	42	1	28	0	81	12	24
Bony herring	YES	77	1,021	1,639	1,026	777	79	12	47	592	141
Carp-gudgeon species complex	YES	933	5,742	2,877	149	3,714	576	68	1,115	1,356	399
Common carp	NA	211	918	895	374	657	214	74	503	772	300
Darling hardyhead	YES	0	0	3	0	0	0	0	0	2	1
Eastern gambusia	NA	552	2,592	1,076	264	1,481	109	62	40	36	691
Flathead gudgeon	NO	0	0	0	0	0	0	0	0		1
Freshwater catfish	YES	0	8	35	2	6	22	1	26	24	10
Golden perch	YES	5	59	129	114	68	31	13	43	102	92
Goldfish	NA	62	484	96	37	177	21	0	74	51	24
Mountain galaxias	YES	0	0	0	1	0	0	13	433	43	31
Murray cod	YES	38	146	118	141	194	35	9	84	151	108
Murray-Darling rainbowfish	YES	3	111	65	117	20	6	1	36	178	41
River blackfish	NA	35	41	3	1	7	0	136	68	138	73
Rainbow trout	YES	2	3	0	0	0	0	0	1	17	0
Silver perch	YES	0	0	3	8	2	0	0	3	2	2
Spangled perch	YES	14	131	52	39	32	27	11	11	35	15
Unspecked hardyhead	YES	7	5	29	34	20	6	0	3	15	54

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

Table 8.9: Total catch of each species by sampling method in the Namoi WRPA.

Common name	Backpack Electrofishing	Bait Trap	Boat Electrofishing
Australian smelt	378	1	175
Bony herring	624	7	4,780
Carp-gudgeon species complex	4,345	12,240	344
Common carp	1,332	201	3,385
Darling hardyhead	1	0	5
Eastern gambusia	3,693	2,324	886
Flathead gudgeon	1	0	0
Freshwater catfish	105	0	29
Golden perch	15	0	641
Goldfish	566	9	451
Mountain galaxias	239	282	0
Murray cod	121	0	903
Murray-Darling rainbowfish	86	11	481
Northern river blackfish	405	6	91
Rainbow trout	3	0	20
Silver perch	0	0	20
Spangled perch	123	20	224
Unspecked hardyhead	23	58	92

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 Namoi WRPAs were: Olive perchlet, Macquarie perch, Southern purple-spotted gudgeon, Dwarf flathead gudgeon, Redfin and 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 Namoi WRPAs. Note these include projects with sampling not representative of the community and the data should be used with caution.

Common name	Expected from modelling	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Australian smelt	YES	3	335	28	42	1	28	0	81	12	24
Bony herring	YES	77	1,021	1,639	1,026	777	79	12	47	592	141
Carp gudgeon species complex	YES	933	5,742	2,877	149	3,714	576	68	1,115	1,356	399
Common carp	NA	212	918	895	374	657	214	74	503	772	300
Darling hardyhead	YES	0	0	3	0	0	0	0	0	2	1
Eastern gambusia	NA	552	2,592	1,076	264	1,481	109	62	40	36	691
Flathead gudgeon	NO	0	0	0	0	0	0	0	0	0	1
Freshwater catfish	YES	0	8	35	2	6	22	1	26	24	10
Golden perch	YES	5	59	129	114	68	31	13	43	112	92
Goldfish	NA	62	484	96	37	177	21	0	74	51	24
Mountain galaxias	YES	0	0	0	1	0	0	13	433	43	31
Murray cod	YES	38	146	118	141	194	35	9	84	151	108
Murray-Darling rainbowfish	YES	3	111	65	117	20	6	1	36	178	41
River blackfish	NA	35	41	3	1	7	0	136	68	138	73
Rainbow trout	YES	2	3	0	0	0	0	0	1	17	0
Silver perch	YES	0	0	3	8	2	0	0	3	2	2
Spangled perch	YES	14	131	52	39	32	27	11	11	35	15
Unspecked hardyhead	YES	7	5	29	34	20	6	0	3	15	54

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