



★ **FIGHT** *the* **BITE** ★

**SOUTH AUSTRALIAN
ARBOVIRUS AND
MOSQUITO MONITORING
AND CONTROL
ANNUAL REPORT:
2020-2021**

Health Protection Programs

Health Protection and Licensing Services



Government
of South Australia

SA Health

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Acronyms and Abbreviations

ARCAG	Arbovirus Response Cross Agency Group
BOM	Bureau of Meteorology
BFV	Barmah Forest virus
CDCB	Communicable Disease Control Branch, Department for Health and Wellbeing
DAWR	The Commonwealth Department of Agriculture and Water Resources
DHW	Department for Health and Wellbeing
ENSO	El Niño–Southern Oscillation
EVS	Encephalitis Vector Survey
HoR	Hierarchy of Response
HPO	Health Protection Operations, Department for Health and Wellbeing
HPP	Health Protection Programs, Department for Health and Wellbeing
ICPMR	Institute of Clinical Pathology & Medical Research, Westmead Hospital
KUNV	Kunjin virus
LHA	Local Health Authority
MVEV	Murray Valley encephalitis virus
RRV	Ross River virus

1. Executive Summary

The South Australian Arbovirus and Mosquito Monitoring and Control Annual Report (the annual report) summarises mosquito-borne disease notifications and mosquito surveillance and control activities undertaken by the Department for Health and Wellbeing (DHW) and local health authorities (LHAs) across the state. The report also details climatic influences on the 2020-21 mosquito season in South Australia. Arboviral surveillance is conducted to identify high risk periods and locations, providing opportunities to intervene and prevent or reduce cases of human infection.

The 2020-21 mosquito season was influenced by a La Niña weather event resulting in above average rainfall across most of South Australia. The detection of Murray Valley encephalitis virus (MVEV) and Kunjin/West Nile virus (KUNV) antibodies in sentinel chickens in autumn 2020 and predicted above average rainfall triggered a heightened Level 2 response. The DHW's Health Protection Programs (HPP) team worked closely with LHAs to ensure preparedness for the season and increased funding to support a heightened response.

HPP also continued to support LHAs through the South Australian mosquito management program and subsidy which included training, technical support, equipment and funding to undertake the following activities:

- ➔ Mosquito surveillance activities, including adult mosquito trapping and identification
- ➔ Viral analysis of trapped mosquitoes
- ➔ Mosquito larval control
- ➔ Local mosquito management training.

In addition to the support provided to LHAs, HPP continued to undertake mosquito trapping in the northern Adelaide region and coordinated the fourth season of the Globe Derby Park mosquito management aerial mosquito larvicide application program.

Surveillance activities along the River Murray during the 2020-21 mosquito season included adult mosquito monitoring, species identification, viral screening of trapped adult mosquitoes and heightened sentinel chicken surveillance. The South Australian sentinel chicken program detected MVEV and KUNV antibodies in December 2020, the second detection since the program's inception. Screening of trapped mosquitoes resulted in one detection of Barmah Forest virus (BFV) in February 2021.

Control measures implemented by LHAs included larvicide treatments at known breeding sites, identification and mapping of new breeding sites, local health promotion activities and public health messaging. In addition, DHW provided increased funding to extend coverage of the annual Fight the Bite campaign and developed monthly reporting to ensure clear and timely communication to relevant stakeholders.

The cooler than average summer followed the state's third-warmest spring which resulted in greater than average mosquito abundance across northern Adelaide and along the River Murray for most of the season. Increased mean (average) mosquito abundance during the early part of the season preceded a peak in arbovirus notifications during the season.

Arbovirus notifications were greater in the 2020-21 season compared to the previous two seasons. Exotic disease notifications were less than the previous two seasons. Most notified arbovirus cases likely acquired their infection in River Murray council areas like previous years, but the distribution of exposures increased in other areas of South Australia. No exotic mosquitoes were detected at South Australian international ports as part of the exotic mosquito detection surveillance and mitigation activities.

2. Introduction

The annual report provides an overview of the wide range of programs, surveillance and other activities undertaken in South Australia during the 2020-21 mosquito season which collectively aimed to:

- ➔ Monitor human mosquito-borne disease risk status
- ➔ Provide an early warning of the presence of the viruses known to cause mosquito-borne disease
- ➔ Inform activities to reduce mosquito breeding opportunities in high risk locations
- ➔ Advise the public and visitors to South Australia of the risks and how to protect themselves from mosquito-borne disease
- ➔ Promote interagency cooperation on matters relating to the monitoring, prevention and control of human mosquito-borne disease.

Mosquito monitoring and arbovirus prevention in South Australia is a multi-agency collaborative effort involving the work of a broad range of stakeholders (see appendix 1).

3. South Australian Arbovirus Coordinated Control and Operations Plan

The [South Australian Arbovirus Coordinated Control and Operations Plan](#) (the Plan) was prepared for the Chief Executive and approved by the Minister for Health and Wellbeing in 2015. The Plan details the strategies to be administered by DHW for mosquito control and the prevention of human cases of MVEV or KUNV.

The Plan guides collaboration between relevant state and local government agencies in South Australia in the areas of mosquito surveillance, management and control and provides the framework for the implementation of coordinated mosquito control programs. The plan establishes procedures for DHW officers to implement coordinated mosquito control programs and outlines the responsibilities, authorities, and mechanisms to minimise, manage and recover from an outbreak of MVEV or KUNV infection in South Australia.

The Hierarchy of Response (HoR) as detailed in the Plan is dependent upon on-going data and trends identified by surveillance activities, weather forecasting and disease notifications. The HoR was developed to guide decision making on an appropriate level of response that is proportionate to the risk or incidence of serious human arboviral diseases. The HoR specifies trigger conditions for each level of response and measures that should be considered for implementation at that level.

DHW declares the response level as low, medium, or high depending on the intelligence received. Level 1 or a low response represents normal surveillance and control activities during mosquito season. Levels 2 (medium) and 3 (high) are heightened response levels which may require additional resources and coordination.

At Level 2, DHW's primary role is to support local council run mosquito surveillance and control programs. At Level 3, DHW coordinates and supports local council mosquito control programs in targeted high-risk locations.

4. Arbovirus Response Cross Agency Group

The Arbovirus Response Cross Agency Group (ARCAG) was established in accordance with the Plan. The purpose of the ARCAG is to provide a mechanism for effective communication amongst key stakeholder agencies and organisations on all aspects of the planning and implementation of coordinated mosquito control programs.

The ARCAG assists DHW to plan and, if necessary, implement a state coordinated response through:

- ➔ Providing advice (technical, operational and strategic)
- ➔ Facilitating access to intelligence, information and resources
- ➔ Facilitating communication and decision making within the representative agencies, when required, to ensure an effective and timely response.

The ARCAG also considers the preparedness of representative agencies, other organisations and the state to support a state coordinated response should it be necessary and makes appropriate recommendations to government.

Meeting frequencies are determined by the HoR level for each mosquito season. ARCAG membership (see appendix 2) reflects the main purpose of the Plan to guide collaboration between relevant state and local government agencies in South Australia in mosquito surveillance, management and control.

5. 2020-21 season arbovirus response level indicators

In line with HoR, as detailed in the Plan, DHW considered the following indicators in relation to the risk of transmission of flaviviruses over the 2020-21 mosquito season:

- ➔ A La Niña weather event in the tropical Pacific. All surveyed international climate models indicated this La Niña event would persist through the southern hemisphere summer 2020–21. This increased the likelihood of above average spring and summer rainfall which is conducive to increased mosquito breeding.
- ➔ Around half the models anticipated a strong La Niña event, meaning there was a possibility it could result in similar conditions as experienced in 2010–12 which coincided with the last reported human cases of MVEV infection in South Australia.
- ➔ MVEV and KUNV antibodies were detected in blood samples taken from sentinel chickens during autumn 2020. This is accepted as a potential precursor to an increased risk of flavivirus transmission in the following mosquito season (see section 10 for further information on the South Australian sentinel chicken program).

The risk of local transmission of flaviviruses such as MVEV and KUNV was deemed to be at its highest since 2010-11, when two human cases (one fatal) of MVEV were notified in South Australia. Cases of RRV and BFV also had the potential to increase (as was the case in the 2010-11 and 2016-17 mosquito seasons).

The conditions detailed above required vigilance in mosquito surveillance and proactive strategies to manage and control the risk of human arboviral diseases in South Australia. As a result, a threat Level 2 response for the 2020-21 mosquito season was triggered in October 2020.

In accordance with the Plan, relevant LHAs were notified of the increased threat level and were requested to consider resourcing requirements necessary to sustain mosquito surveillance and control strategies over the 2020-21 season. LHAs were also asked to provide local risk management plans, maps identifying high risk locations and anticipated support requirements within their council areas.

6. Local Council Mosquito Management Subsidy

As LHAs for their areas, local councils are responsible for ensuring appropriate mosquito management on public land, including Crown Land, within their jurisdictions. To achieve the best possible public health outcomes, councils are encouraged to implement integrated programs incorporating a considered balance of surveillance, mosquito control, and health promotion activities. Where mosquito control activities are deemed necessary, these are targeted in locations which most directly impact on residents and visitors.

Local council subsidy funding for mosquito management (the subsidy) began in the summer of 2000-01. The aim of the subsidy is to support mosquito surveillance and control activities undertaken by, or on behalf of, local councils in specific high-risk mosquito breeding areas of South Australia where the cost of effective mosquito management exceeds available local council resources.

The subsidy covers up to half of the cost of mosquito control and surveillance undertaken by council on public land, including Crown Land. Funding for local council activities is assessed and allocated on an annual basis and is prioritised based on:

- Public health risk
- Amenity benefit

Councils report on their mosquito management activities monthly during the mosquito season. Adult mosquito trap abundance, species data and viral analysis is provided to SA Health by NSW Health Pathology, Medical Entomology, Institute of Clinical Pathology & Medical Research, Westmead Hospital (ICPMR).

2020-21 season subsidy funding

The budgeted expenditure for the 2020-21 subsidy program, based on a season threat Level 1, was \$50,000. Thirteen local councils were pre-approved for the subsidy for the 2020-21 season. Seven River Murray councils, two regional and two metropolitan councils subsequently submitted end of season claims.

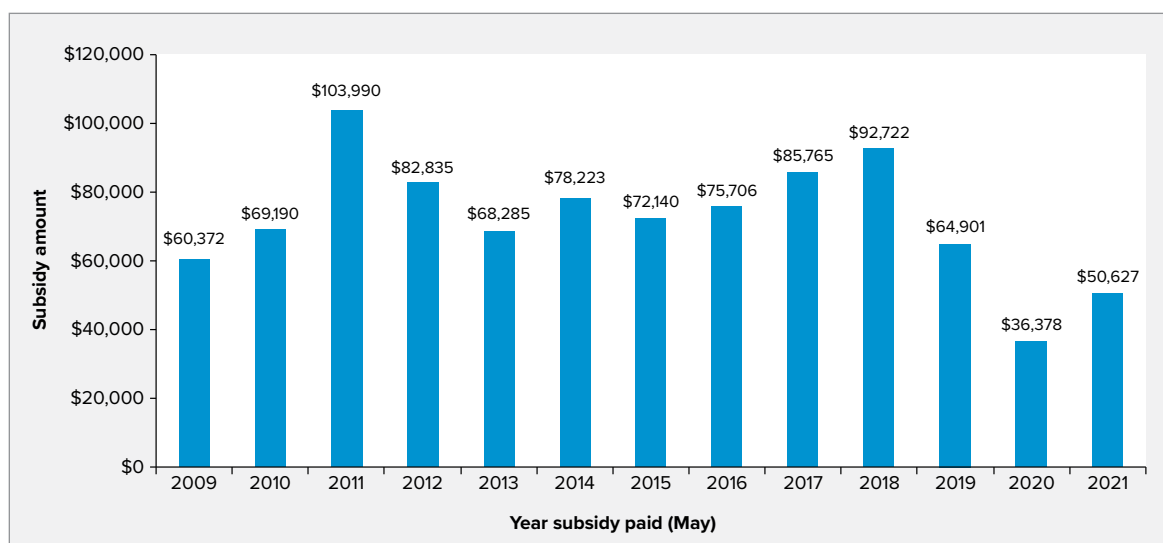


Figure 1 Mosquito subsidy costs 2009-2021

In response to the increased threat level for the 2020-21 mosquito season subsidy funding was increased to \$85,000. The additional funding was offered to River Murray councils to support increased local mosquito management activities. As shown in figure 1, the end of season subsidy expenditure totalled \$50,627. This included \$7,986 for courier costs, abundance and speciation data, and viral analysis of trapped mosquitoes provided by ICPMR.

7. Arbovirus prevention campaign (Fight the Bite)

Pursuant to the *South Australian Public Health Act 2011* (the Act), the Minister for Health and Wellbeing and DHW have statutory obligations to promote proper standards of public and environmental health in South Australia. As part of its responsibility, DHW uses the Fight the Bite campaign to advise and inform all South Australians about the health risks associated with mosquito bites and how individuals can reduce their risk of acquiring an arbovirus. Fight the Bite was first launched in 2004 and runs annually.

The campaign highlights the adverse effects of mosquito bites on human health and encourages individuals to adopt protective measures to reduce the likelihood of being bitten by mosquitoes and acquiring a mosquito-borne disease. In addition to raising awareness about health issues associated with mosquito bites, the campaign also aims to raise awareness about the importance of eliminating environments where mosquitoes live and breed.

Campaign resources are distributed to relevant councils and radio advertising is broadcast on local radio stations in affected areas.

To increase awareness about mosquito-borne disease and the importance of protecting against mosquito bites, the following tools and tactics are used as part of the Level 1 response:

- ➔ Advertising – An integrated advertising campaign to increase awareness of mosquito-borne diseases and protection measures, serving to motivate and remind target audiences to take appropriate action to prevent mosquito bites and the spread of mosquito-borne disease.
- ➔ Website – SA Health’s mosquito-borne disease information is available at www.sahealth.sa.gov.au/fightthebite. The short URL is used in print publications and in SA Health’s social media content.
- ➔ Social media – SA Health proactively promotes Fight the Bite messages through social media channels, including Facebook, Twitter and Instagram, for the duration of the campaign period.
- ➔ Digital assets – Internal communications including an email signature banner, screensavers and TV screens are distributed and displayed.
- ➔ Campaign pack – SA Health provides a campaign pack to partner agencies with a cover letter outlining activities and encouraging them to share the information in their local communities.

2020-21 season communications tools/tactics

The campaign is guided by the annual Fight the Bite communications plan and a standby communications action plan is developed to supplement the HoR if DHW declares that a Level 2 or Level 3 response is required.

For the 2020-21 season, in accordance with the Plan, the standby communications action plan was activated in response to the declaration of an increased threat level. An additional budget of \$20,000 was allocated to the Fight the Bite campaign increasing the overall budget for the 2020-21 season from \$25,000 to \$45,000. The additional funds were used to support additional advertising and social media coverage including additional material about how to Fight the Bite whilst on holiday and when camping.

Mosquito control and arbovirus prevention campaign

For the 2020-21 season, and in addition to the tools and tactics listed for a Level 1 response, SA Health's Fight the Bite campaign included:

- ➔ Further advertising
- ➔ Updated mosquito-borne disease information on the website to alert the public to the increased risk: www.sahealth.sa.gov.au/fightthebite
- ➔ Increased paid posts on SA Health's social media channels including Facebook, Twitter and Instagram
- ➔ Public health alert on SA Health's Facebook and Twitter.

8. Meteorological Data

Mosquito numbers in inland parts of South Australia are influenced by rainfall and temperature during the peak period for mosquito breeding, which usually spans the months of September through to April. In coastal saltmarsh areas, tidal inundation patterns significantly impact mosquito abundance, particularly during the months of January through to April.

Meteorological data is used in the prediction of MVEV risk by signalling conditions associated with previous outbreaks of MVEV infection in humans. This is particularly significant after a period of high and prolonged river flow when floodwaters recede and during times of high spring and summer rainfall spanning the months of September through to April. The broad areas of flood plain associated with the River Murray provide breeding opportunities for the main MVEV vector mosquito, *Culex annulirostris*.

2020-21 summary of weather (environmental) conditions

In September 2020 the Bureau of Meteorology (BoM) reported that the El Niño-Southern Oscillation (ENSO) outlook had moved to La Niña which indicated that a La Niña was established in the tropical Pacific. International climate models indicated this La Niña would persist until at least January 2021. Overall, models did not anticipate this event would be as strong as the La Niña of 2010-12, which was one of the four strongest La Niña events on record. The 2010-11 La Niña saw significantly higher than average notifications of cases of human arbovirus infection when 1,298 arbovirus infections were reported in South Australia.

The 2020-21 La Niña peaked in February 2021. In April 2021, the ENSO was neutral with no sign of El Niño or La Niña developing. Climate model outlooks suggest the tropical Pacific Ocean will remain at neutral ENSO levels at least until September 2021.

Wettest spring since 2011 and wettest summer since 2016-17

Rainfall was above average during the 2020-21 season. Spring rainfall for South Australia was 38% above average, the wettest since 2011 and summer rainfall was 14% above average, the wettest since 2016-17. Rainfall for spring was above average over large areas of central and northern South Australia. Both September and October were wetter than average months for the state, but spring ended with a much drier than average November.

December and February were wetter than average across large areas of the state's west and rainfall in January was average to above average in parts of the east. Rainfall in summer was above average in South Australia's west and along the southern coasts, but below average in parts of the east.

Third-warmest spring on record and coolest summer since 2001-02

Daytime temperatures for summer were below to very much below average across much of South Australia, particularly for the western pastoral districts, but close to average or above average in the far east of the state.

Both daytime and night-time temperatures were warmer than average for spring, with temperatures in September and November very much above average. The average temperature for spring was the third warmest on record for South Australia as a whole. Daytime temperatures for summer were below to very much below average across much of South Australia, particularly for the western pastoral districts, but close to average or above average in the far east of the state. Generally, temperatures were cooler than average for the state during December and February, but January temperatures were closer to average.

Acknowledgement

Content thanks to Bureau of Meteorology, Australian Government (content has been adapted).

9. Mosquito surveillance and control overview

HPP has developed and produced 3D printed Encephalitis Vector Survey (EVS) mosquito surveillance traps. All seven River Murray councils and one non-River Murray council undertook trapping in their local council areas during the 2020-21 season using these traps with support and training provided by HPP. HPP conducted weekly mosquito trapping in the Northern Adelaide area.

Identification and viral screening of mosquitoes trapped in northern Adelaide was not routinely undertaken during the 2020-21 mosquito season. Identification and viral screening of mosquitoes trapped in northern Adelaide was undertaken for one round of trapping during March 2021 as part of a trial of new trap shipping equipment. When required, DHW's Health Protection Operations (HPO) team carry out trapping in unincorporated areas. This was undertaken once during the 2020-21 season.

All mosquitoes trapped by HPO and the River Murray councils were sent to ICPMR for viral analysis. Each batch of trapped mosquitoes was processed according to trap location, counted, identified to species level and then ground and screened for RRV, BFV, MVEV and KUNV. A total of 36,415 mosquitoes trapped by the River Murray councils were sent to ICPMR for molecular viral screening. HPP sent 5,317 mosquitoes to ICPMR for speciation and viral screening during the 2020-21 season, HPO sent 52,903 mosquitoes and one regional council sent 395 mosquitoes. In total 95,030 mosquitoes were screened by ICPMR resulting in one BFV detection.

Northern Adelaide mosquito surveillance program

Northern Adelaide mosquito surveillance for the 2020-21 mosquito season commenced on 7 September 2020 and concluded on 29 April 2021. Mosquito surveillance was conducted at six locations (see appendix 3) over 34 weeks with a total of 201 dry ice baited EVS mosquito traps set. One of the 201 mosquito traps failed, and one was not included due to ant attacks. Restriction to the access route to the Swan Alley (SWA) trap location prevented trapping on three occasions.

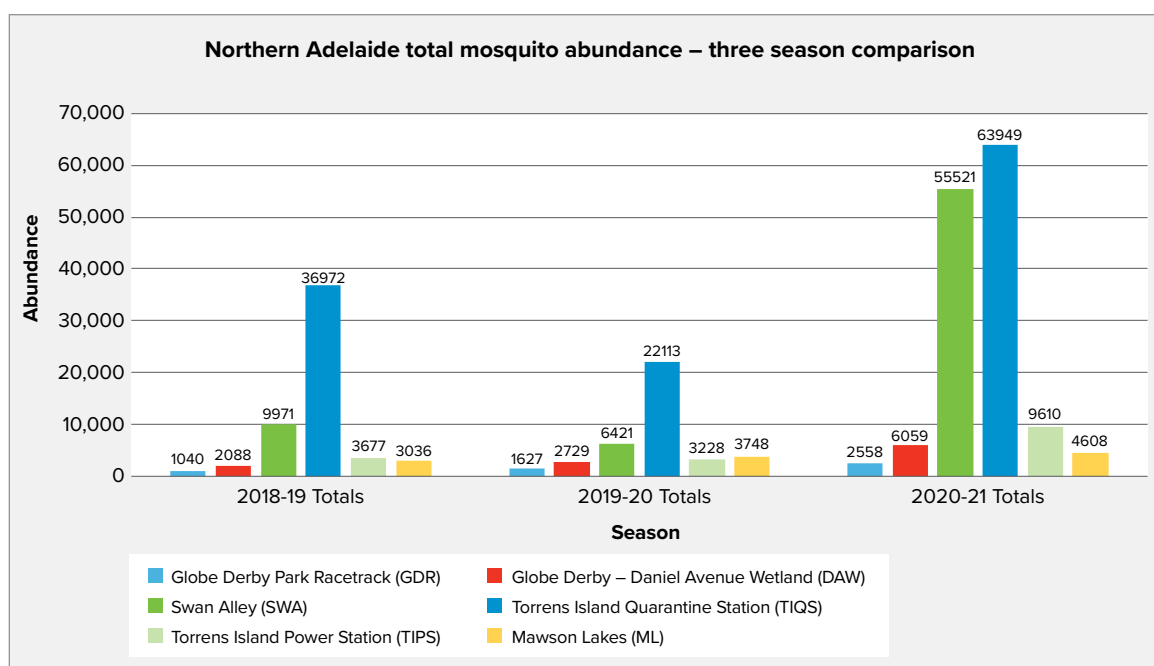


Figure 2 Northern Adelaide mosquito trapping total abundance – three season comparison

Trapped mosquitoes were counted, and the results were recorded. A total of 142,307 mosquitoes were trapped across the six trap locations over the eight months of the 2020-21 season which is an increase compared to the 2019-20 season (n=39,866) and the 2018-19 season (n=56,784). The average number of trapped mosquitoes across all trap locations for the 2020-21 season was 27,718 compared to 6,644 during the 2019-20 season and 9,464 during the 2018-19 season. As detailed in figure 2 all northern Adelaide trap locations had increased abundance compared to the previous three seasons.

October 2020 was the state’s ninth wettest on record and the wettest since 2010. This was preceded by a warmer than average September with the overall average temperature being the second highest on record. As shown in figure 3, October saw the highest monthly average mosquito abundance in the Torrens Island Quarantine Station (TIQS), Swan Alley (SWA) and Torrens Island Power Station (TIPS) traps.

The TIQS trap accounted for 45% of the seasons total catch (n=63,949) and the largest single catch of the season of 20,035 was at this trap location in October 2020. The SWA trap accounted for 39% (n=55,521) of the total season catch, with Daniel Avenue Wetlands (DAW) accounting for 4% (n=6,059), Mawson Lakes (ML) 3% (n=4,608) and Globe Derby Racetrack (GDR) 2% (n=25,590).

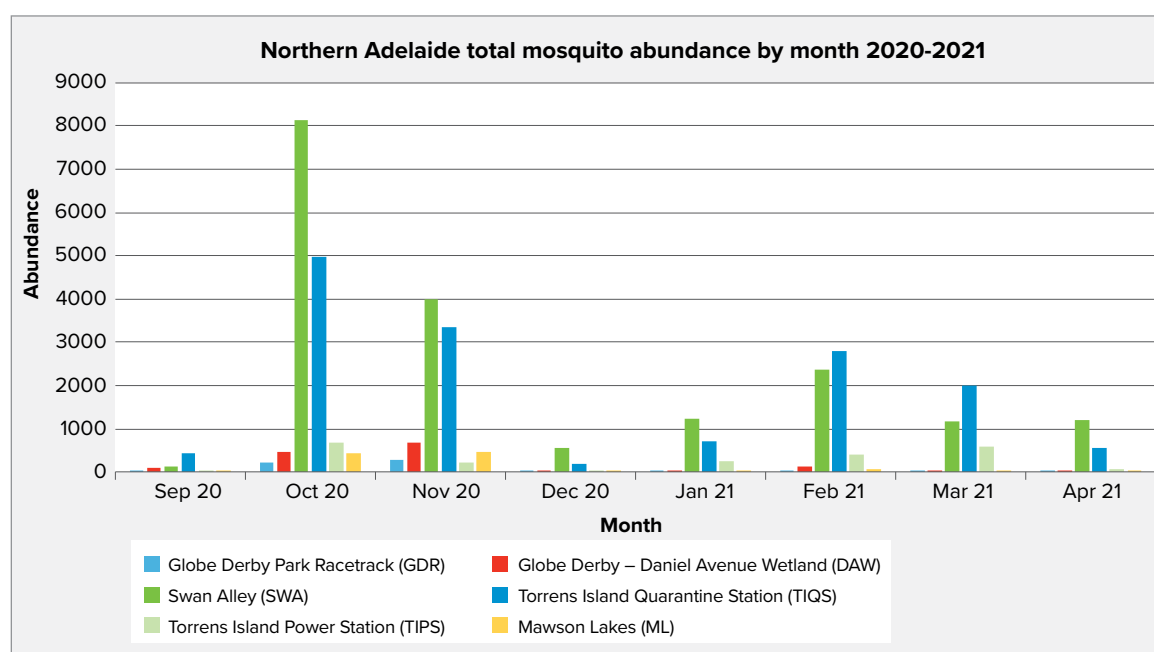


Figure 3 Northern Adelaide mean mosquito abundance by month 2020-21

Catches from the March 2021 round of trapping were sent to ICPMR to be processed according to trap location, counted, identified to species level, then ground and screened for MVEV, RRV, BFV and KUNV. No viruses were detected, and the most abundant species detected were *Aedes camptorhynchus* and *Aedes vigilax*.

Globe Derby Park Mosquito Management Program

Globe Derby Park is an outer metropolitan suburb located approximately 15km to the north of the Adelaide CBD. It is located adjacent to highly mosquito-prone saltmarsh and samphire habitats. Historically a comprehensive ground-based mosquito larvicide program was coordinated by DHW in the saltmarsh adjacent to Globe Derby Park. In 2017, an ongoing program of aerial application of Bti mosquito larvicide was established to replace the ground-based program. For 2020-21 the total cost of the aerial program for the mosquito season was \$36,151.50.

As shown in figure 4, there has been an ongoing reduction in average mosquito abundance over the past 10 years at trap sites in the suburb of Globe Derby Park (GDR and DAW). Average mosquito abundance at the SWA trap site, situated in the saltmarsh adjacent to the suburb of Globe Derby Park, has also decreased.

As shown in figure 4, average numbers of trapped mosquitoes at TIQS trap site over the past 10 seasons were consistently greater than for other trap sites. This trap location is used as a reference point as no treatment is undertaken at this site and environmental conditions are like those at the SWA trap site. No larval control was undertaken at this remote location which provides an indicator of likely mosquito numbers that would have been caught at the SWA trap site at the same time if comprehensive larval control was not being undertaken in that area.

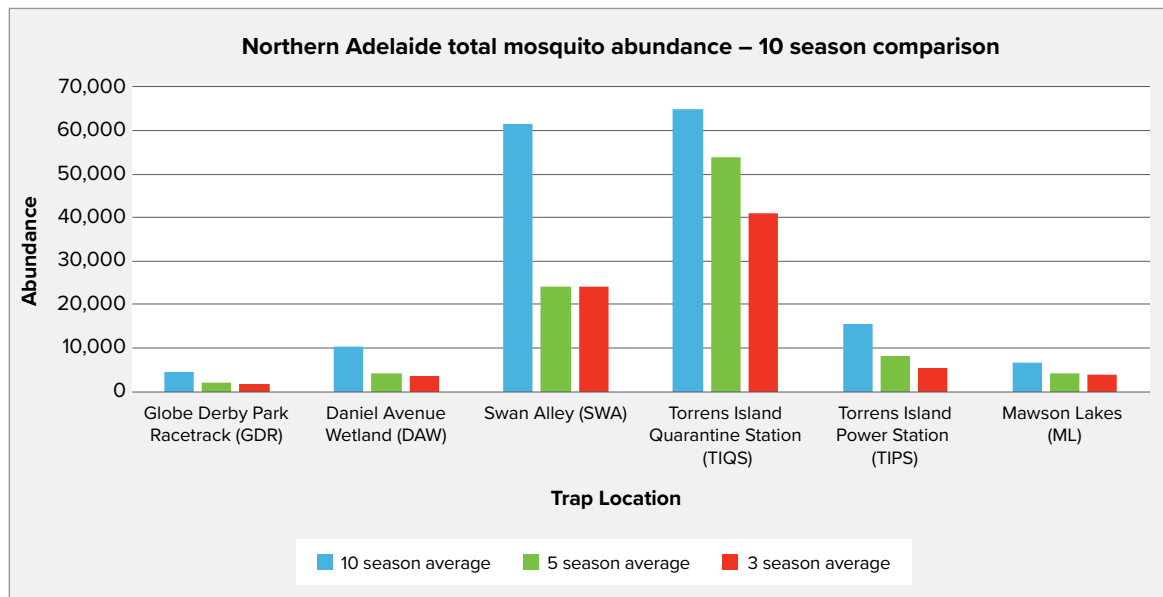


Figure 4 Northern Adelaide mean abundance – 10 season comparison

Health Protection Operations mosquito surveillance

In unincorporated areas of South Australia (areas outside of local government jurisdiction), any reference in the Plan to the roles and responsibilities of local councils are taken to be the roles and responsibilities of DHWs HPO section. In response to the increased threat level, the HPO team undertook trapping in unincorporated areas in the far north of SA in late October 2020. A total of 52,903 mosquitoes were trapped over eight locations. As shown in figure 5, the greatest number of mosquitoes were trapped at the Algebuckina (ALG) and Hookeys (HO1 & HO2) trap site locations.

Species data from trap catches identified significant numbers of *Aedes eidsvoldensis* particularly at the ALG, HO1 & HO2 and Oodnadatta (OOD) trap locations. Several arboviruses including RRV and MVEV are known to have been isolated from this mosquito species; however, no viruses were detected in any of the trapped mosquitoes. It is not known if *Aedes eidsvoldensis* can transmit arboviruses to humans.

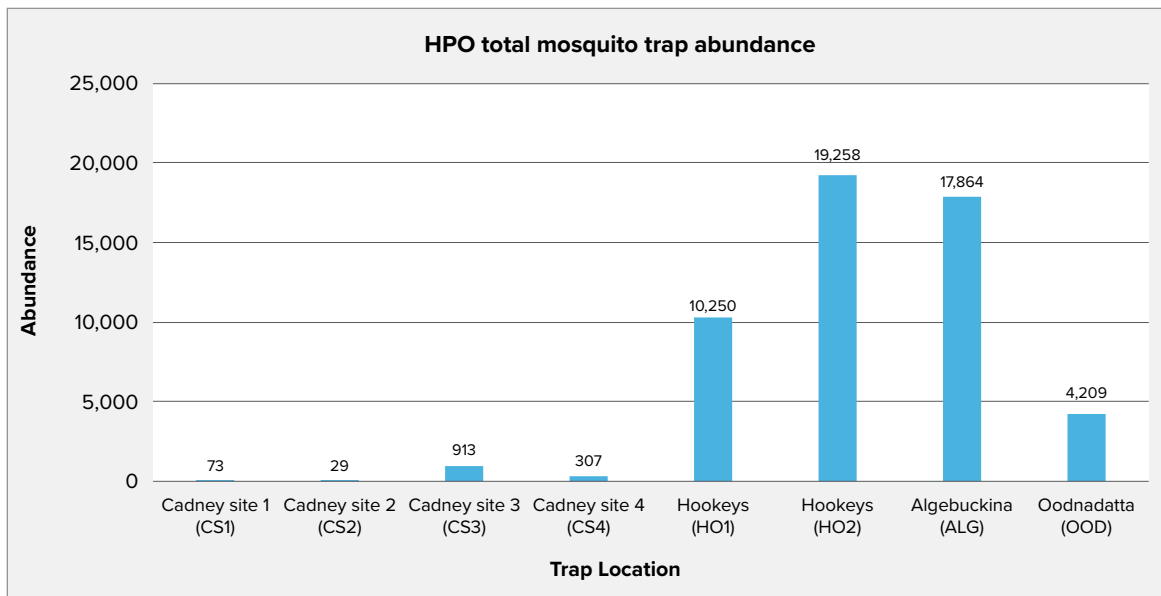


Figure 5 HPO total mosquito trap abundance October 2020

SA River Murray Council mosquito surveillance and control

Overview

During the 2020-21 mosquito season all seven River Murray councils elected to undertake trapping in their own council areas with support from HPP, which included the provision of trapping equipment and training. The program required each River Murray council to arrange for four EVS mosquito surveillance traps to be set monthly in strategically selected locations from September to April (eight times during the season). In response to the increased threat level and in accordance with the Plan, some councils elected to set up additional mosquito traps during the season to enable timely assessment of any risk to public health. See appendix 4 for River Murray mosquito surveillance trapping locations.

The early part of the 2020-21 season was dominated by the effects of La Niña, with above average spring rainfall in contrast to drier conditions during spring of the 2018-19 and 2019-20 seasons. As detailed in figure 6, mean mosquito abundance data was greater during the early part of the season for most River Murray council areas.

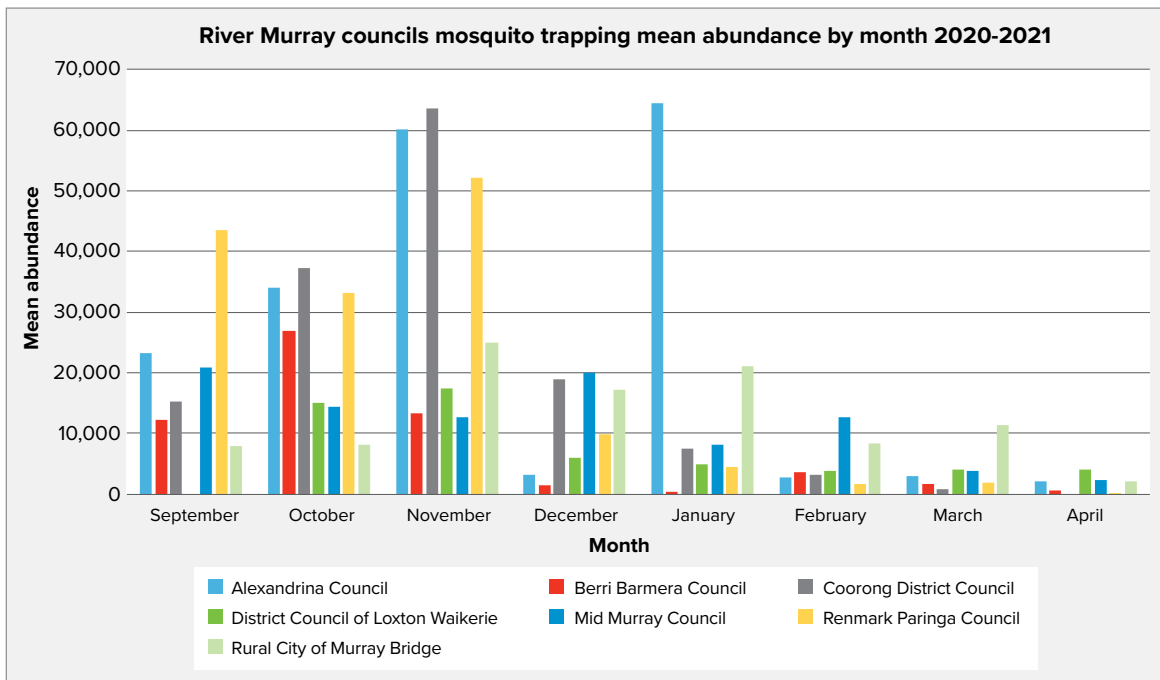


Figure 6 River Murray councils mosquito trapping mean abundance by month 2020-21

In addition, and in accordance with the HoR, the majority of River Murray councils initiated actions contained within their local mosquito risk management plans. Actions included increased surveillance of adult mosquitoes, mapping of high-risk locations and breeding sites within their council areas and additional larval control.

Figure 7 shows that in 2020-21 all River Murray councils had increased mean mosquito abundance compared to the previous two seasons, except for Coorong district council which had increased mean abundance compared to the 2018-19 mosquito season but decreased mean mosquito abundance compared to the 2019-20 season.

The upper River Murray councils of Berri Barmera, Loxton Waikerie and Renmark Paringa had similar patterns of mean mosquito abundance data over three seasons. All three of these councils had their least mean abundance in the 2019-20 season. In contrast, Alexandrina Council and Mid Murray Council had their least mean abundance in the 2018-19 season.

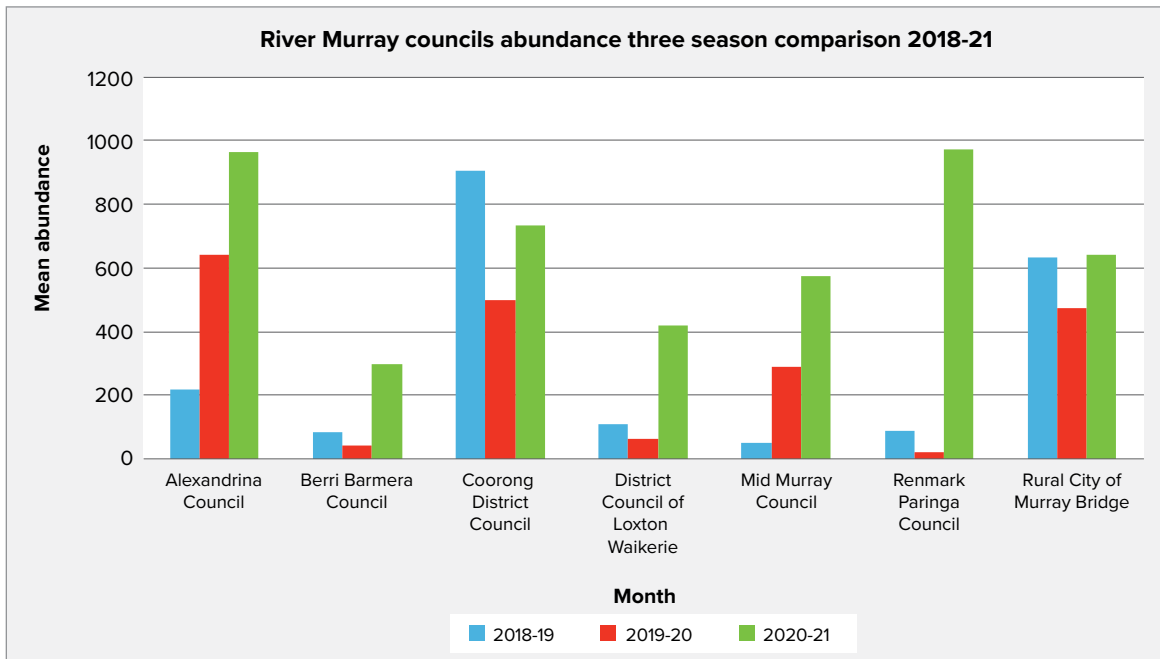


Figure 7 River Murray councils mosquito trap mean abundance by council area – three season comparison 2018-2021

The most abundant mosquito species trapped in the River Murray council areas during the 2020-21 season was *Aedes camptorhynchus* which accounted for 65% (n=23,778) of all trapped mosquitoes. *Culex annulostris* was next most abundant species caught in the River Murray council areas during the 2020-21 season, accounting for 14% (n=4961) of the total season catch.

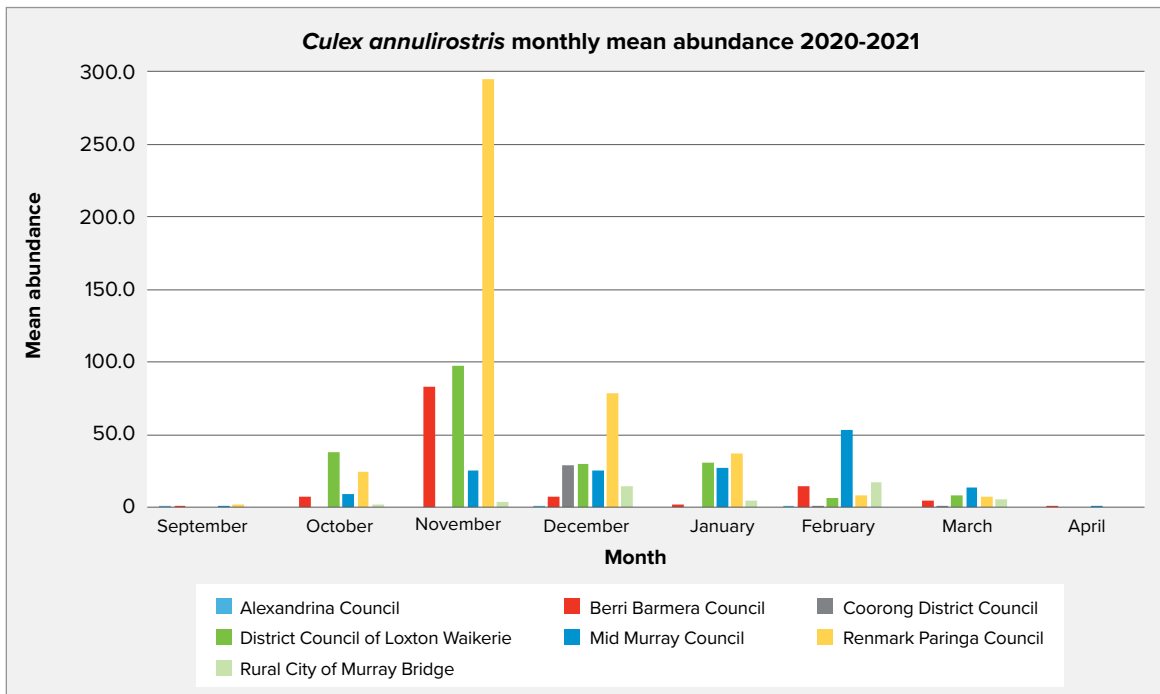


Figure 8 River Murray councils *Culex annulostris* monthly mean abundance 2020-2021

A total of 4942 *Culex annulirostris* were trapped in the River Murray council areas during the 2020-21 mosquito season. As detailed in figure 8, Renmark Paringa Council had the greatest mean abundance of *Culex annulirostris* of all River Murray councils for the season in November 2020 (n=1,472). Overall, the greatest abundance of *Culex annulirostris* in the River Murray council areas during the 2020-21 season was observed in November 2020. The greatest number of *Culex annulirostris* caught in a single trap during the 2020-21 season was 873 in the Renmark Paringa Council area.

Figure 9 shows increased total abundance of *Culex annulirostris* across all River Murray council areas compared to the previous two seasons.

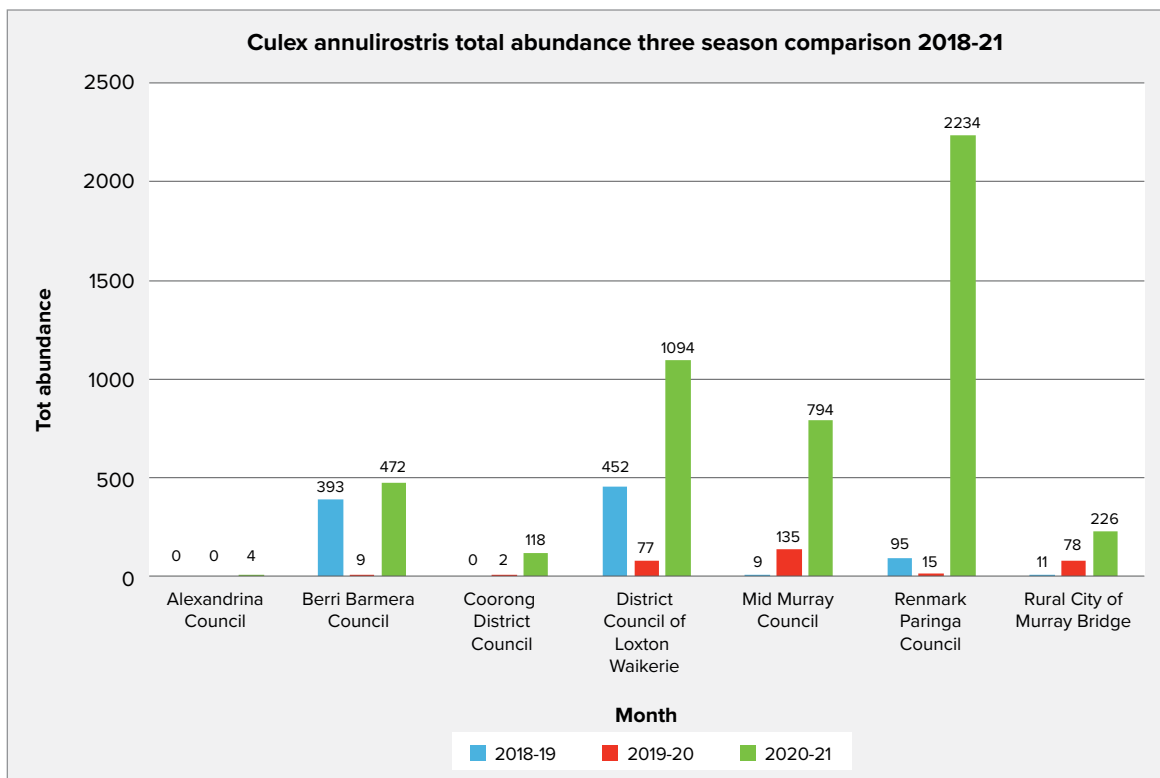


Figure 9 River Murray councils *Culex annulirostris* total abundance by council area – three season comparison 2018-2021

Alexandrina Council

Alexandrina Council officers have undertaken their own mosquito trapping since the start of the 2019-20 mosquito season. Alexandrina Council's mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at four locations (see appendix 4).

A total of 7,716 mosquitoes were trapped across the four trap locations over the eight months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=4,475) and the 2018-19 season (n=1,731). The average number of mosquitoes trapped monthly across all four trap locations during the 2020-21 season was 965 compared to 639 during the 2019-20 season and 216 during the 2018-19 season.

The most abundant species trapped in the Alexandrina Council area was *Aedes camptorhynchus*, which accounted for 86% (n=6,657) of the total season catch. The next most abundant species was *Culex globocoxitus*, which accounted for 6% (n=448) of the total season catch.

As shown in figure 10, the greatest single trap catch of the season was in January 2021 at the Clayton Bay (A1) trap location (n=2,507) of which 2,479 were *Aedes camptorhynchus*. This trap location had consistently higher total abundance compared to all other trap locations within Alexandrina Council area from September 2020 through to January 2021. Very few *Culex annulirostris* were trapped during the season (n=4). Relatively few mosquitoes were caught in all other traps during the season.

Alexandrina Council officers undertook all larval control activities during the season, which included the monitoring and restocking of s-Methoprene briquets in pre-existing larval treatment stations. Alexandrina Council also set up public information displays at the council building.

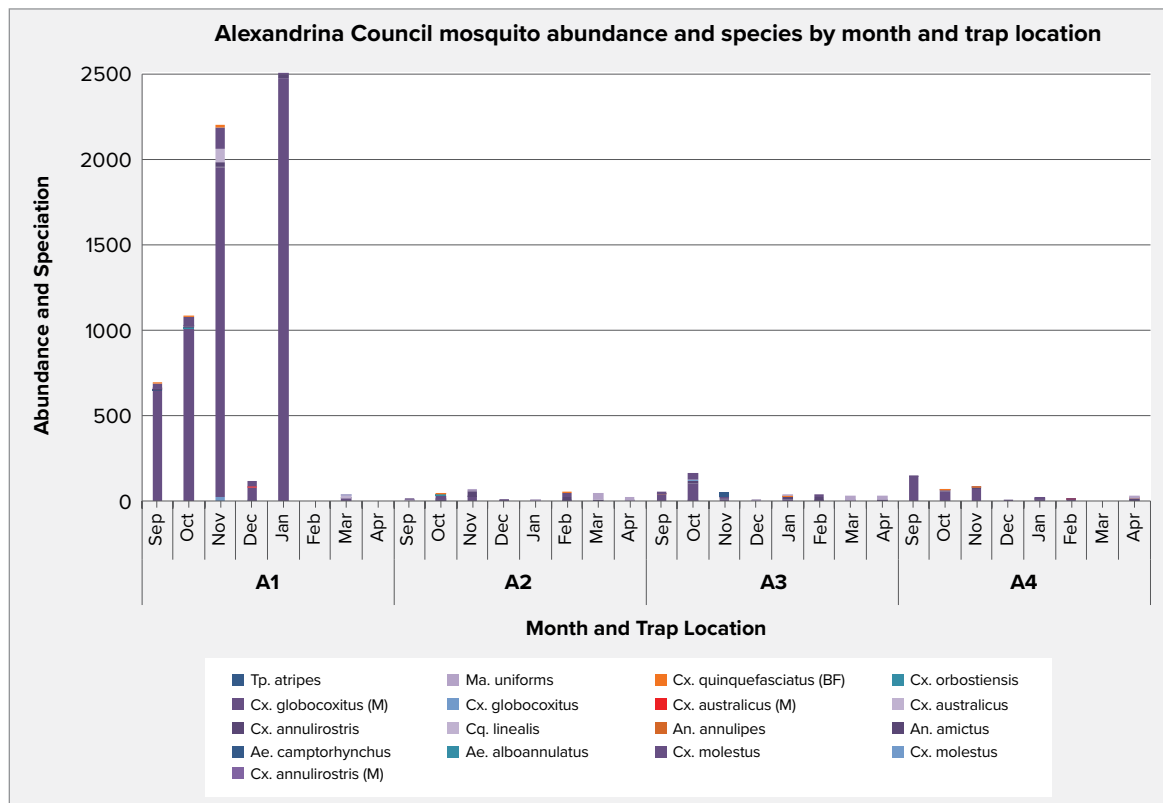


Figure 10 Alexandrina Council mosquito abundance and species by month and trap location

Berri Barmera Council

Berri Barmera Council officers have undertaken their own mosquito trapping since the start of the 2019-20 mosquito season. Berri Barmera Council's mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at four fixed locations (see appendix 4).

A total of 2,400 mosquitoes were trapped across the four trap locations over the eight months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=167) and the 2018-19 season (n=677). The average number of mosquitoes trapped monthly across all four trap locations during the 2020-21 season was 300 compared to 42 during the 2019-20 season and 85 during the 2018-19 season.

The most abundant species trapped in the Berri Barmera Council area was *Aedes camptorhynchus*, which accounted for 60% (n=1,448) of the total season catch. The next most abundant species was *Culex annulirostris*, which accounted for 20% (n=472) of the total season catch followed by *Anopheles annulipes*, which accounted for 10% (n=228) of the total season catch.

As shown in figure 11, the greatest single trap catch of the season was in October 2020 at Berri Caravan Park (B4) trap site (n=467), of which 434 (93%) were *Aedes camptorhynchus*. The greatest number of *Culex annulirostris* (n=167) caught in a single trap during the season was at the B4 trap site in November 2020. The Cobdogla (B5) trap catch included a greater than average number of *Culex annulirostris* in November 2020 (n=163).

Berri Barmera Council engaged a contractor to assist with the assessment, inspection and treatment of known larval breeding sites. The contractor mapped the sites on a live web-based program and each site was provided with a description, a photo and details on whether larvae was present and if treatment was applied. New larvae sites were also identified by the contractor and they were subsequently mapped, creating a valuable set of larval breeding site data for future seasons.

The Riverland Integrated Mosquito Management Plan (RIMMP) was implemented as the overarching strategy for mosquito management and helped determine council's response to a change in the season risk rating. To effectively deliver the objectives of the RIMMP, Berri Barmera Council developed a Seasonal Mosquito Management Implementation Plan for 2020-21 which outlined action that would be taken in the areas of monitoring, control and information management.

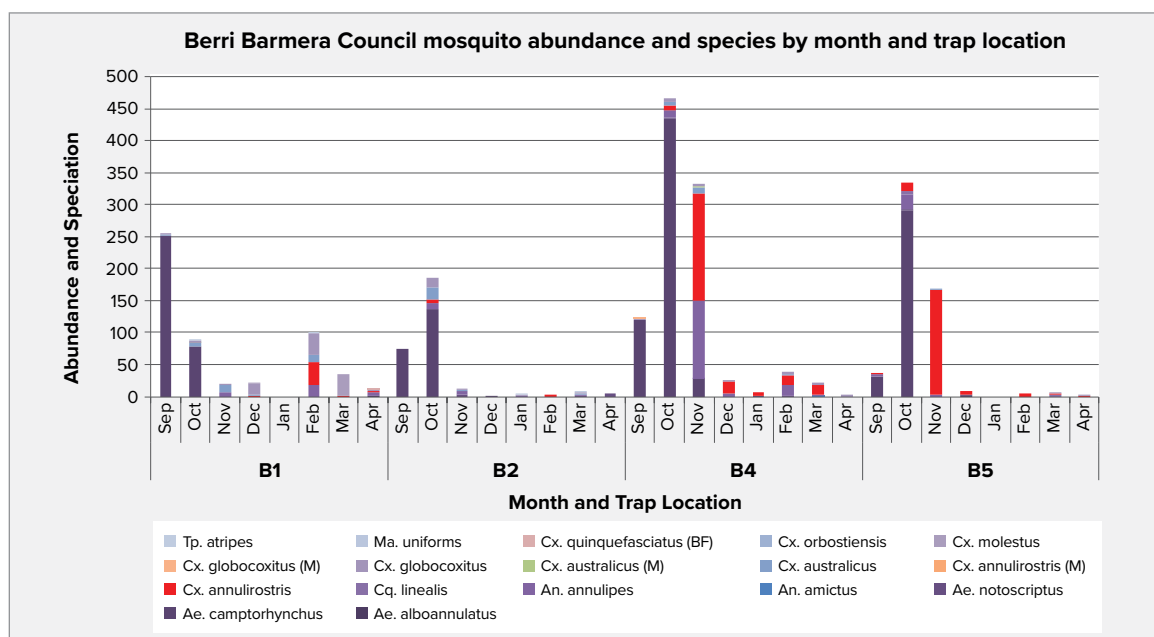


Figure 11 Berri Barmera Council mosquito abundance and species by month and trap location

Coorong District Council

Coorong District Council officers have undertaken their own mosquito trapping since the start of the 2020-21 mosquito season. Coorong District Council mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at four fixed locations (see appendix 4). An additional mosquito trap was set up in February 2021 following the detection of MVEV and KUV in the Meningie sentinel chicken flock in December 2020 (see appendix 4).

A total of 5,876 mosquitoes were trapped across the four trap locations over the eight months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=4,005) and a decrease compared to the 2018-19 season (n=7,258). The average number of mosquitoes trapped monthly across all trap locations during the 2020-21 season was 735 compared to 501 during the 2019-20 season and 907 during the 2018-19 season.

The most abundant species trapped in the Coorong District Council area was *Aedes camptorhynchus*, which accounted for 83% (n=4,887) of the total season catch. The next most abundant species was *Culex globocoxitus*, which accounted for 12% (n=683) of the total season catch. *Culex annulirostris* accounted for 2% (n=118) of the total season catch.

As shown in figure 12, the greatest single trap catch of the season was in November 2020 at the Narrung Campground (C11) trap site (n=1,662) of which 1,600 were *Aedes camptorhynchus*. Mosquito numbers at the Taillem Bend Golf Course (C1) and the Meningie School (C5) trap sites remained comparatively low throughout the season. The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Narrung Campground trap site in December 2020 (n=99). The additional mosquito trap set up at the Meningie sentinel chicken flock resulted in one mosquito (*Aedes camptorhynchus*) being trapped over a three-month period.

Coorong District Council undertook treatment and public awareness activities during the season in accordance with the council's Mosquito Management Plan. The Murraylands Mosquito Management Plan (MMMP) was implemented as the overarching strategy for mosquito management and helped determine council's response to a change in the season risk rating.

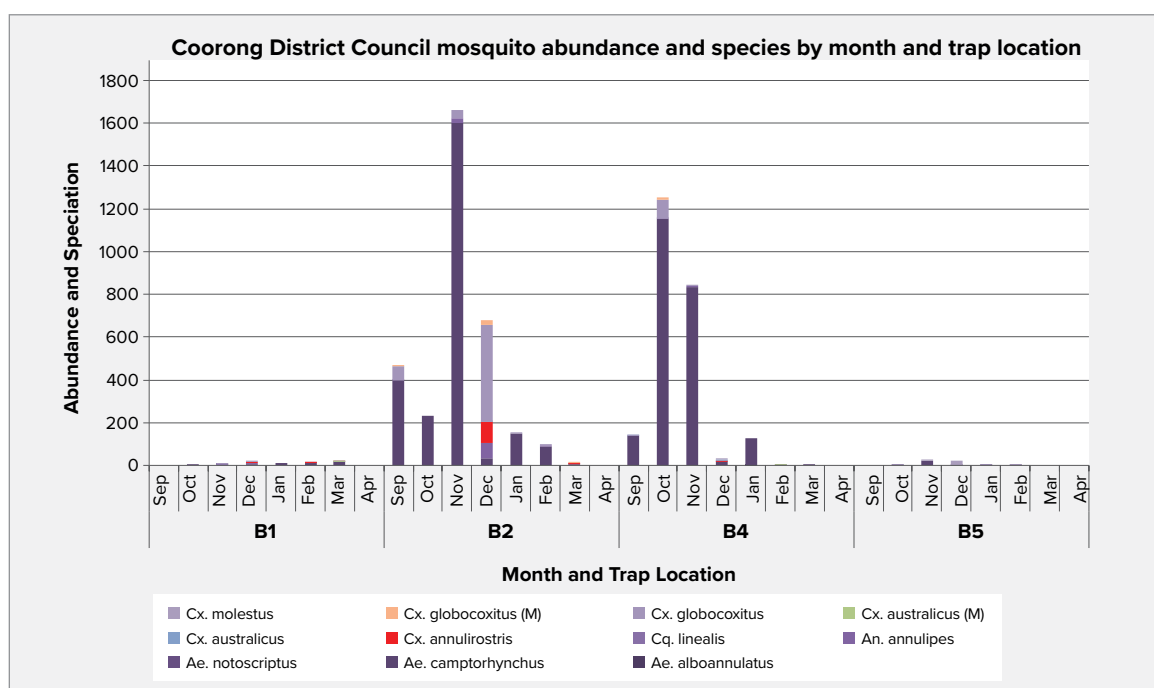


Figure 12 Coorong District Council mosquito abundance and species by month and trap location

District Council of Loxton Waikerie

Officers at the District Council of Loxton Waikerie have undertaken their own mosquito trapping since the start of the 2020-21 mosquito season. Mosquito surveillance activities included trapping once per month between October 2020 and April 2021 at five fixed locations (see appendix 4). An additional roving trap (L6) was set at Thiele in January 2021 and Paisley from February 2021 to April 2021 (see appendix 4).

A total of 2,525 mosquitoes were trapped across the five fixed trap locations over the seven months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=370) and the 2018-19 season (n=874). The roving trap (L6) trapped 401 mosquitoes in total over the 2020-21 season resulting in a total season catch of 2,926. The average number of mosquitoes trapped monthly across all trap locations during the 2020-21 season was 418 compared to 62 during the 2019-20 season and 109 during the 2018-19 season.

The most abundant species in the District Council of Loxton Waikerie area was *Culex annulirostris*, which accounted for 37% (n=1,094) of the total season catch. The next most abundant species was *Anopheles annulipes*, which accounted for 15% (n=427) of the total season catch followed by *Culex globocoxitus*, which accounted for 13% (n=386) of the total season catch.

As shown in figure 13, the greatest single catch of the season was in October 2020 at the Kingston Caravan Park (L4) trap site (n=245) of which 81 were *Aedes camptorhynchus*. The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Moorook Campground (L3) trap site in November 2020 (n=164).

Officers at the District Council of Loxton Waikerie undertook the inspection and treatment of known larval breeding sites during the season. Council also engaged a contractor to undertake data collection and web mapping of mosquito breeding sites. The Riverland Integrated Mosquito Management Plan (RIMMP) was implemented as the overarching strategy for mosquito management and helped determine council's response to a change in the season risk rating.

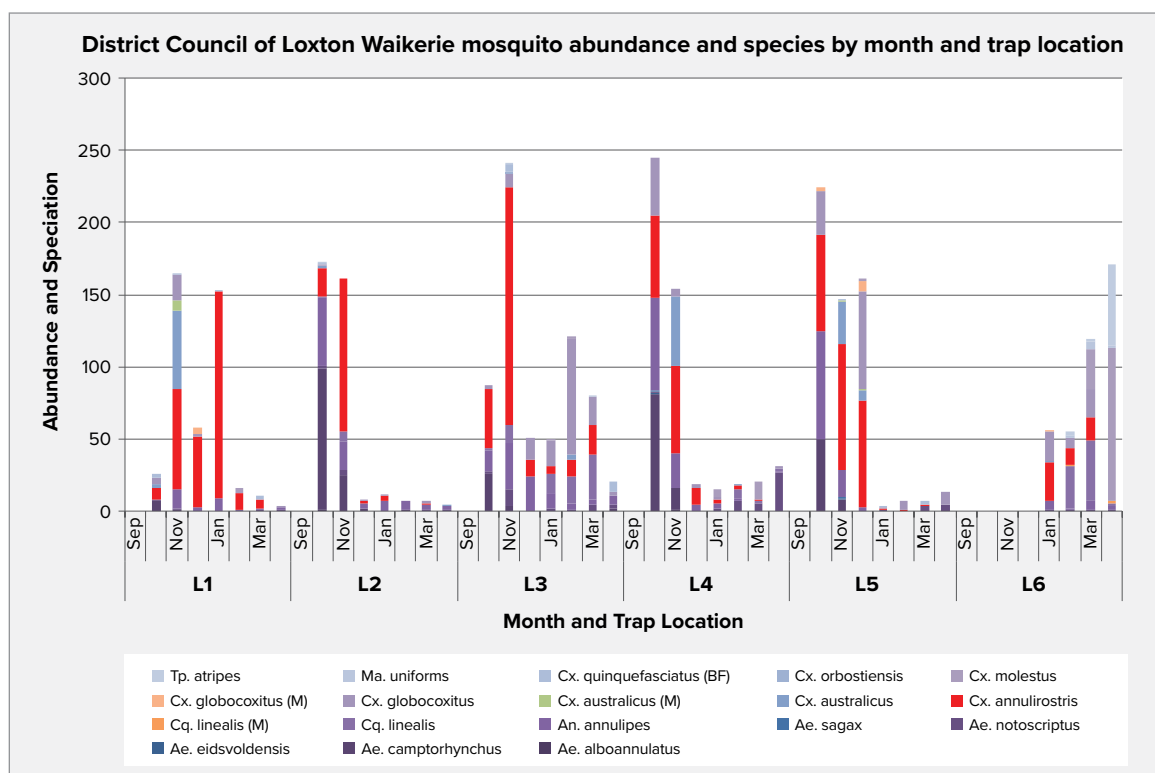


Figure 13 District Council of Loxton Waikerie mosquito abundance and species by month and trap location

Mid Murray Council

Mid Murray Council officers have undertaken their own mosquito trapping since the start of the 2020-21 mosquito season. Mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at four locations (see appendix 4). An additional trap was set up at Haythorpe (MM6) in November 2020 and trapping at this location was undertaken monthly until April 2021 and trapping was undertaken at Scrubby Flat in December 2020 (see appendix 4).

A total of 3,776 mosquitoes were trapped across the four fixed trap locations over the eight months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=2,305) and the 2018-19 season (n=403). The trap at Haythorpe resulted in 421 mosquitoes being trapped over six months and the one-off trap site Scrubby Flat site resulted in 404 mosquitoes being trapped. The total season catch during the 2020-21 season was 4,601. The average number of mosquitoes trapped across all trap locations for the 2020-21 season was 574 compared to 288 during the 2019-20 season and 50 during the 2018-19 season.

The most abundant species trapped in the Mid Murray Council area was *Aedes camptorhynchus*, which accounted for 56% (n=2,574) of the total season catch. The next most abundant species was *Culex annulirostris*, which accounted for 17% (n=794) of the total season catch followed by *Anopheles annulipes*, which accounted for 15% (n=676) of the total season catch.

As shown in figure 14, the greatest single trap catch of the season was in September 2020 at the Port Mannum (MM5) trap site (n=800) all of which were *Aedes camptorhynchus*. The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Morgan ferry (MM1) trap site in January 2021 (n=130).

Mid Murray Council officers undertook the inspection and treatment of known larval breeding sites during the season. The Murraylands Mosquito Management Plan (MMMP) was implemented as the overarching strategy for mosquito management and helped determine council's response to a change in the season risk rating. Mid Murray Council developed their individual council action plan which supported the implementation of monitoring, control, information management and public awareness activities.

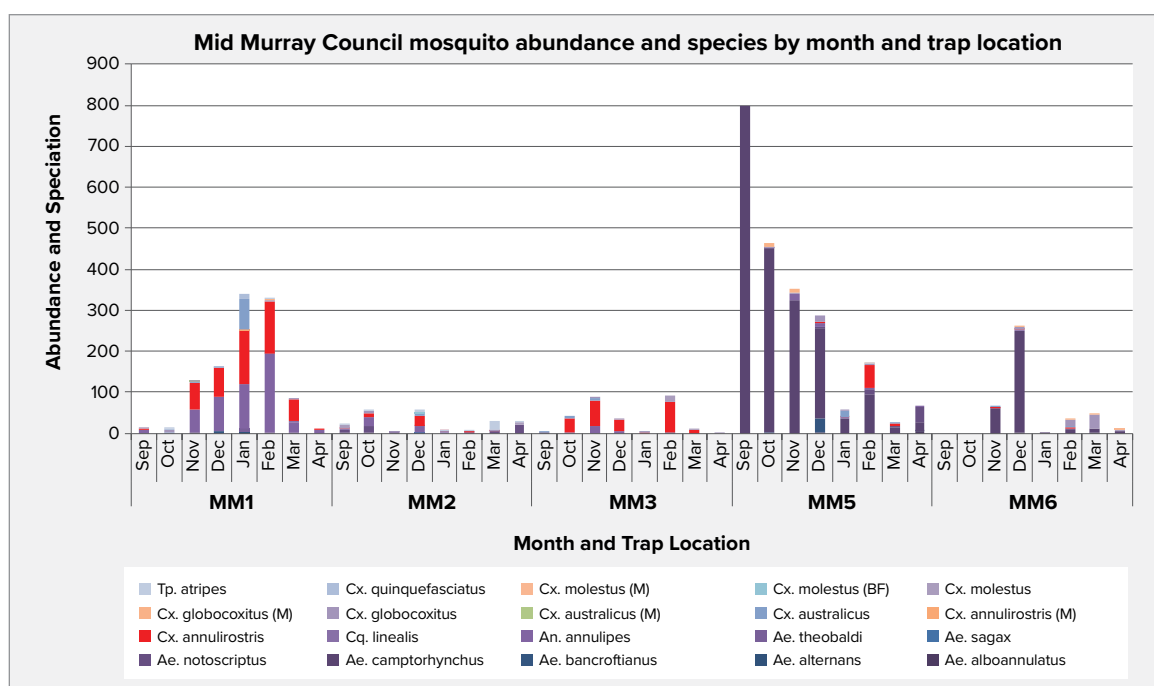


Figure 14 Mid Murray Council mosquito abundance and species by month and trap location

Rural City of Murray Bridge

Officers at the Rural City of Murray Bridge have undertaken their own mosquito trapping since the start of the 2020-21 mosquito season. Mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at four locations (see appendix 4). An additional trap was set up at Murray Bridge East (MB5) in November 2020 and trapping at this location was undertaken monthly until April 2021 (see appendix 4).

A total of 3,823 mosquitoes were trapped across the four fixed trap locations over the eight months of the 2020-21 season. The additional trap at Murray Bridge East resulted in 1,292 mosquitoes being trapped over a six-month period. The total season catch for the 2020-21 season across all five trap locations was 5,115 this was an increase compared to the 2019-20 season (n=3791) and the 2018-19 season (n=5,053). The average number of mosquitoes trapped monthly across all trap locations for the 2020-21 season was 639 compared to 474 during the 2019-20 season and 632 during the 2018-19 season.

The most abundant species trapped in the Rural City of Murray Bridge council area was *Aedes camptorhynchus*, which accounted for 66% (n=3,387) of the total season catch. The next most abundant species was *Culex globocoxitus*, which accounted for 16% (n=835) of the total season catch followed by *Culex annulirostris*, which accounted for 4% (n=226) of the total season catch.

As shown in figure 15, the greatest single catch of the season was in November 2020 at Wellington Caravan Park (MB4) trap site (n=586) of which 427 were *Aedes camptorhynchus*. The greatest number of *Culex annulirostris* caught in a single trap during the season was at the MB5 trap site in February 2021 (n=67).

Officers at the Rural City of Murray Bridge undertook the inspection and treatment of known larval breeding sites during the season. The MMMP was implemented as the overarching strategy for mosquito management and helped determine Council's response to a change in the season risk rating. In addition to monitoring and treatment at known breeding sites additional treatment was implemented as required.

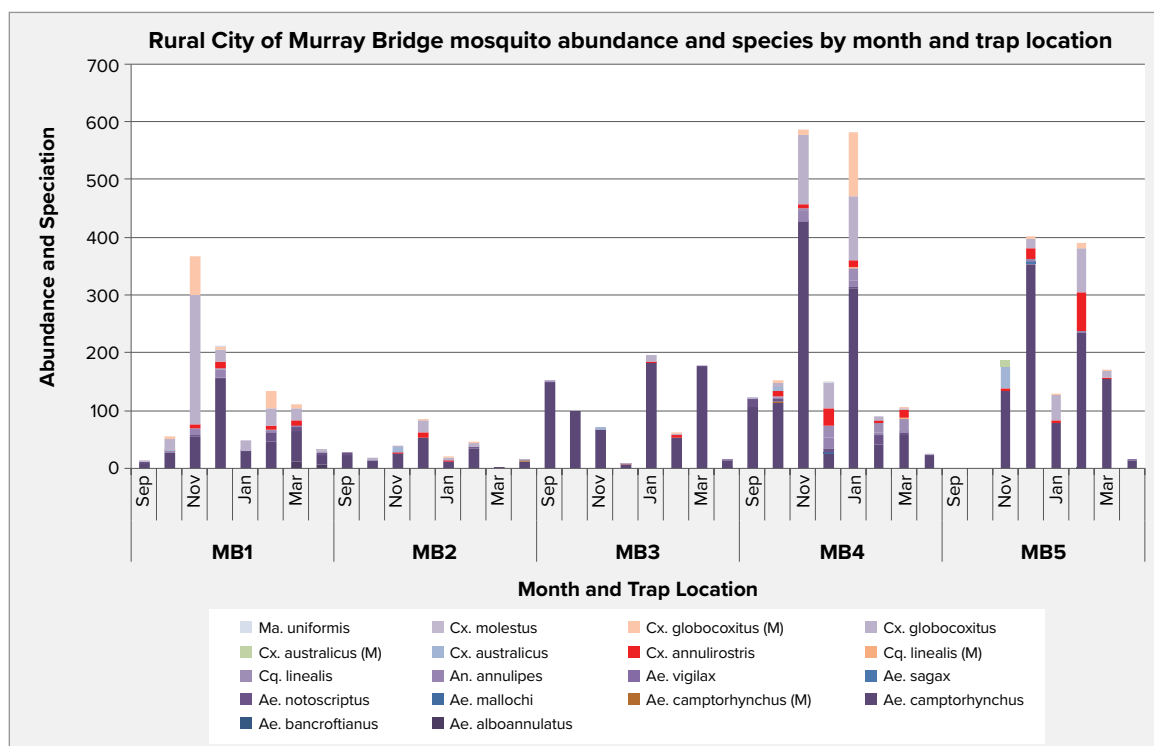


Figure 15 Rural City of Murray Bridge mosquito abundance and species by month and trap location

Renmark Paringa Council

Renmark Paringa Council officers have undertaken their own mosquito trapping since the start of the 2019-20 mosquito season. Mosquito surveillance activities included trapping once per month between September 2020 and April 2021 at five fixed locations (see appendix 4). Once off trapping was undertaken at Crescent (R6) during September 2020 (see appendix 4).

A total of 7,169 mosquitoes were trapped across the five fixed trap locations over the eight months of the 2020-21 season. This was an increase compared to the 2019-20 season (n=110) and the 2018-19 season (n=669). The trap at Crescent resulted in 621 mosquitoes being trapped. The total season catch for the 2020-21 season was 7,790. The average number of mosquitoes trapped monthly across all trap locations for the 2020-21 season was 974 compared to 22 during the 2019-20 season and 87 during the 2018-19 season.

The most abundant species trapped in the Renmark Paringa Council area was *Aedes camptorhynchus*, which accounted for 58% (n=4,505) of the total season catch. The next most abundant species was *Culex annulirostris*, which accounted for 29% (n=2253) of the total season catch followed by *Anopheles annulipes*, which accounted for 8% (n=621) of the total season catch.

As shown in figure 16, the greatest single trap catch of the season was in November 2020 at Bert Dix Park (R1) trap site (n=1,300) of which 873 were *Culex annulirostris* and 330 were *Anopheles annulipes*. The R1 trap site catch in November 2020 had the greatest number of *Culex annulirostris* caught in a single trap during the season.

Renmark Paringa Council engaged a contractor to assist with the assessment, inspection and treatment of known larval breeding sites. The contractor mapped the sites on a live web-based program and each site was provided with a description, a photo, and details on whether larvae was present, and treatment applied. New larvae sites were also identified by the contractor and they were subsequently mapped creating a valuable set of larval breeding sites data for future seasons.

The RIMMP was implemented as the overarching strategy for mosquito management and helped determine Council's response to a change in the season risk rating. To effectively deliver the objectives of the RIMMP Renmark Paringa Council developed a Seasonal Mosquito Management Implementation Plan for 2020-21 which outlined action that would be taken in the areas of monitoring, control and information management.

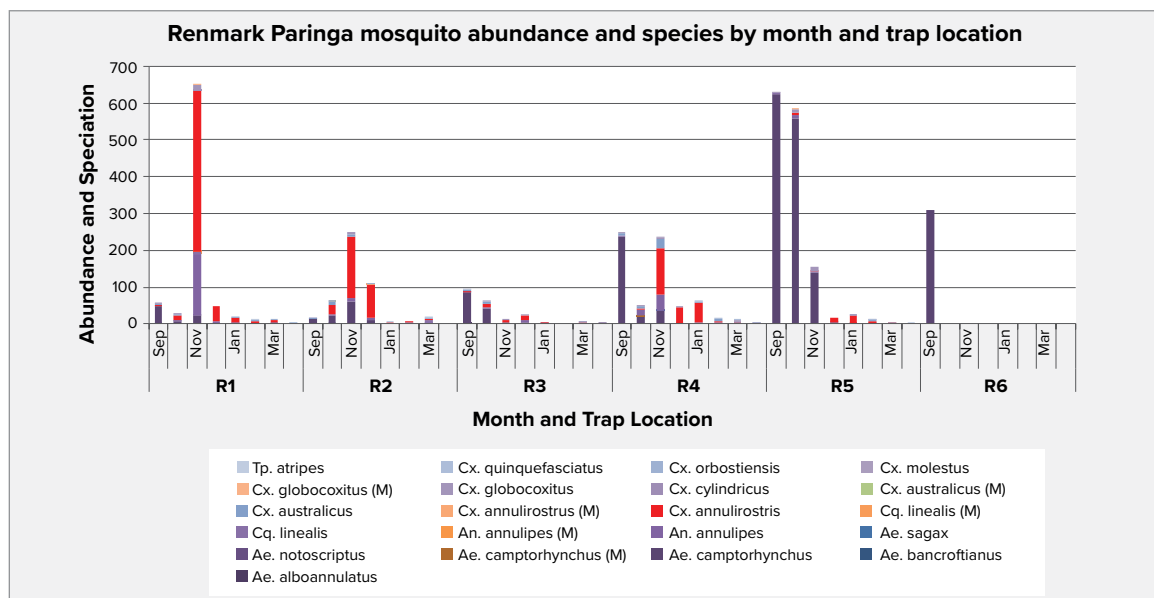


Figure 16 Renmark Paringa Council mosquito abundance and species by month and trap location

10. South Australian Sentinel Surveillance Program

The aim of the South Australian Sentinel Surveillance Program is to monitor for MVEV and KUNV in the environment before the presentation of human cases. Although only a few people who become infected with MVEV will develop symptoms, in those people who do, it is fatal in about 20% of cases and for those who survive, about 40% of cases will suffer permanent neurological damage. KUNV encephalitis is like MVEV encephalitis but is usually milder.

Chickens are a good indicator of mosquito-borne disease risk to the community as they readily produce antibodies to arboviruses once infected without developing symptoms. Six sentinel chicken flocks have been established along the River Murray in South Australia (see appendix 5). Each flock contains five chickens that have blood samples collected by local vets throughout the mosquito season according to a schedule determined by HPP.

The chicken blood samples are sent to ICPMR and tested for MVEV and KUNV antibodies. Sentinel chicken flock bleeds for the season commenced in October 2020 and the final bleeds were conducted during the last week of April 2021.

As shown in table 1, SA Health was notified that one of five blood samples collected from sentinel chickens located near Meningie in December 2020 tested positive for MVEV and KUNV antibodies. This was the second time sentinel chickens in South Australia have tested positive to these viruses since the program's inception in 2011, with the first in autumn 2020. This triggered a heightened Level 2 response according to the Plan, which included:

- ➔ SA Health briefing to Chief Public Health Officer (CPHO) and ARCAG on heightened risk and contingency planning
- ➔ Increased 'Fight the Bite' media coverage and resource distribution
- ➔ Media releases
- ➔ **Public Health Alert issued on 13 January 2021**
- ➔ Intensification of sentinel chicken viral screening programs with increased bleed frequency to a three-week bleed cycle at all sentinel chicken flocks.

New blood samples taken from the Meningie sentinel chicken flock all returned negative results for both KUNV and MVEV. Further testing of blood samples was conducted in parallel with the previous samples and results indicated that there had been no further seroconversions. These results suggest the infection occurred sometime shortly after the bleed was undertaken in November 2020. It is possible that other chickens in the flock were infected but the infection was undetected. As a result, the Meningie sentinel chicken flock were replaced. There were no further detections of MVEV or KUNV from any of the sentinel chickens this season.

In addition to their usual traps, Coorong Council also set a trap adjacent the sentinel chickens at Meningie in January 2021 which caught a single mosquito over a three-month period. No viruses were detected in this mosquito.

Collection Date	Flock	Tags	MVEV	KUNV	Retest Results Received	Retest Results
17/12/2020	MENINGIE	Blue	Negative	Negative	15/01/2021	Negative
		Red	Negative	Negative	15/01/2021	Negative
		Black	Negative	Negative	15/01/2021	Negative
		Olive	Titre 1/40	Titre 1/10	15/01/2021	Negative
		Yellow	Negative	Negative	15/01/2021	Negative

Table 1 MVEV and KUNV titre results in sentinel chicken flocks December 2020

11. Notifications of Arbovirus Infections

All arbovirus infections detected in humans in South Australia are notifiable under the SA Public Health Act 2011. The SA Health Communicable Disease Control Branch (CDCB) receive laboratory notifications for all positive arbovirus tests and medical notifications from doctors with place of acquisition when known. The two most common locally acquired arbovirus infections notified in South Australia are RRV and BFV.

As shown in figure 17, the number of arbovirus cases reported in South Australia was greater in 2020-21 than in the previous two seasons with cases peaking between December 2020 and February 2021. There were 107 arbovirus infections for the 2020-21 season (YTD) compared to 47 cases in 2019-20 and 48 cases in 2018-19. Although numbers were greater in 2020-21 than in previous seasons, they were less than the 2010-11 season where 1,298 arbovirus infections were reported.

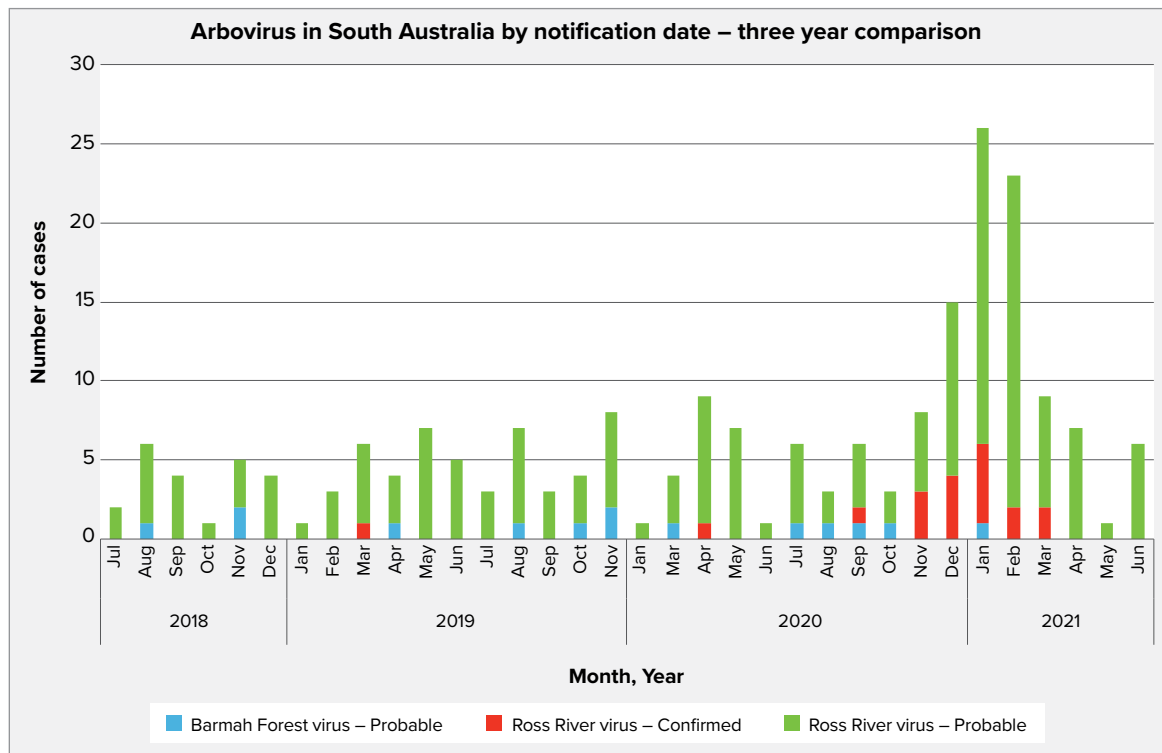


Figure 17 Arbovirus notifications in South Australia by notification date – three year comparison 2018-2021

Ross River virus (RRV)

RRV infection is the most notified mosquito-borne disease in South Australia. Patients with RRV infection experience a polyarthritic condition with or without other symptoms such as fever, headaches, lethargy, rash, and sore muscles. Serological testing is the only reliable way to diagnose an active RRV infection.

In the 2020-21 financial year there were 102 cases of RRV infection notified in South Australia. As shown in figure 18, this was an increase compared to 42 cases notified in 2019-20 and 48 cases notified in 2018-19.

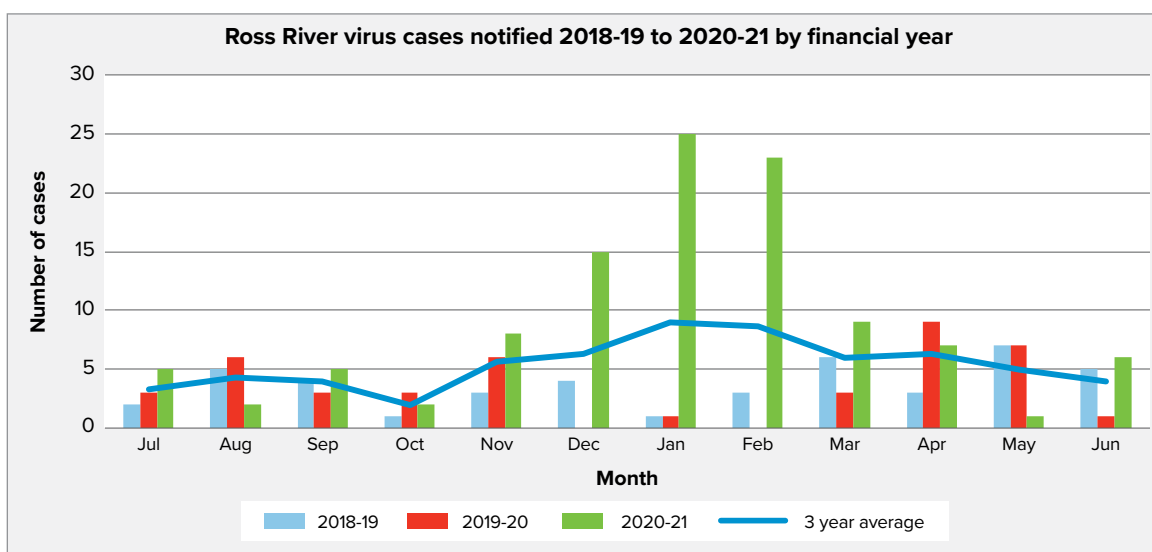


Figure 18 Ross River virus case notified in South Australia - three year comparison 2018-2021

Barmah Forest virus (BFV)

BFV infection is the second most notified mosquito-borne disease in South Australia. The virus is closely related to RRV and the symptoms of infection are similar. Serological testing is used to correctly diagnose the causative virus and differentiate an active infection from RRV infection.

In the 2020-21 financial year there were five cases of BFV notified in South Australia. This was the same as the number of notified cases in 2019-20 and an increase on the four cases notified in 2018-19.

Exposure locations

Locally acquired arbovirus infections in South Australia are most prevalent in the River Murray Council areas; Alexandrina Council, Berri Barmera Council, Coorong District Council, District Council of Loxton Waikerie, Mid Murray Council, Rural City of Murray Bridge, and Renmark Paringa Council.

For the 2020-21 season, 85% of cases with infections between October 2020 and April 2021 were interviewed to obtain information regarding their likely exposure. Of the interviewed cases, most infections recorded for 2020-21 were likely acquired in River Murray council areas area (47.6%), like the previous two seasons.

As shown in figure 19, the greatest number of arbovirus infections in the River Murray Council area for the 2020-21 season were likely acquired in the Alexandrina Council area (n=16). Mid Murray Council and Renmark Paringa Council both accounted for 18% of likely exposure locations. The Rural City of Murray Bridge had the fewest arbovirus infection notifications of all the River Murray councils at 4% (n=2).

In 2020-21, the distribution of cases reporting exposures outside of the River Murray council area increased compared to the two previous seasons, particularly from Eyre Peninsula (10.6%) and Kangaroo Island (6.5%). In the previous two seasons no cases had reported exposures from Kangaroo Island. Further to this, 5.6% of infections were reported to be acquired from central regions (including York Peninsula, Barossa and Clare) and 5.5% of infections were from the lower South East. An additional 10.3% of infections were reported to be acquired interstate.

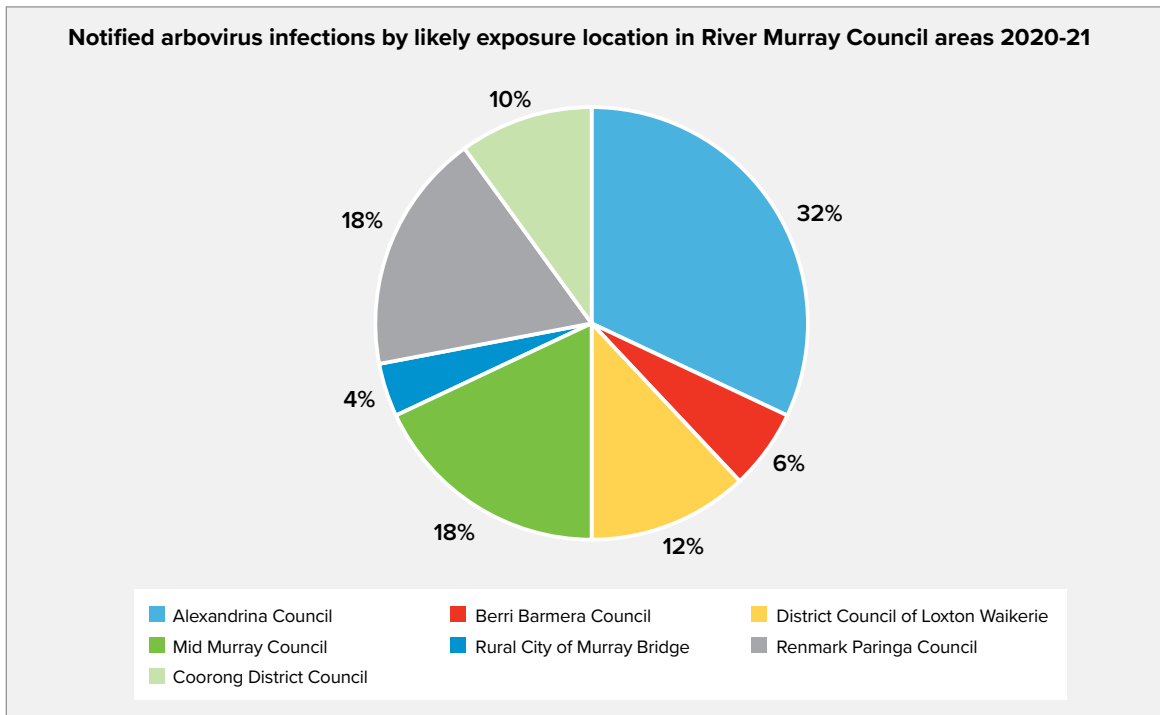


Figure 19 Arbovirus notifications by likely exposure location in River Murray council areas

Exotic mosquito-borne diseases

Mosquito-borne diseases not locally acquired within South Australia are considered exotic mosquito-borne diseases. These diseases are diagnosed in residents or visitors returning from international travel. The most common exotic mosquito-borne diseases diagnosed in South Australia are Dengue virus infection, Chikungunya virus infection, and Malaria (caused by infection with one of five different species of protozoan parasites).

All notified cases of exotic mosquito-borne diseases are followed up to determine whether the disease was acquired overseas. In the 2020-21 financial year, there was one Chikungunya case, one Dengue fever case, six Malaria cases, and no cases of the less common exotic mosquito-borne disease, Japanese Encephalitis virus, notified in South Australia. All cases were acquired overseas. As shown in figure 20, the number of reported cases of Chikungunya, Dengue fever and Malaria were reduced during the 2020-21 financial year compared to the previous two financial years. The most likely cause of this decline is the impact of COVID-19 on global travel.

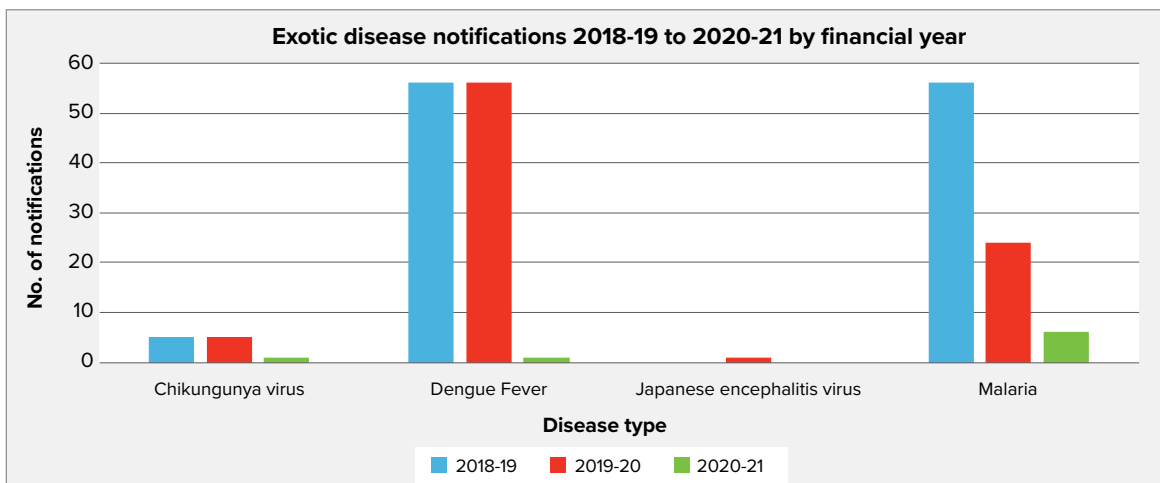


Figure 20 Exotic disease notifications in South Australia – three year comparison 2018-2021

12. Exotic Mosquito Detections

Some species of mosquito, not currently established in South Australia, are capable of transmitting diseases that can have severe impacts on the health of people and animals. For this reason, it is vital that processes are in place to ensure these mosquitoes are prevented from entering and becoming established in Australia. *Aedes aegypti* and *Aedes albopictus* are the two exotic mosquito species most frequently detected through inspection and surveillance procedures.

The Commonwealth Department of Agriculture and Water Resources (DAWR) conduct exotic mosquito detection surveillance and mitigation activities at international ports. DAWR performs mosquito vector monitoring within a 400m perimeter at international air and seaports and identifies mosquito breeding sites within the port area for remediation. DAWR encourages and promotes source reduction with stakeholders in the port area. Following ground surveys, sites requiring remediation are reported to the port authority and/or land/lease holder for action.

If exotic mosquitoes are detected at an international port, DAWR will notify SA Health. SA Health is responsible for coordinating surveillance and control activities in the port area extending beyond the 400m interception perimeter, or beyond the port area, and liaising with local government responsible for areas where an incursion has been detected.

There have been no detections of exotic mosquitoes at South Australian international ports since March 2016.

13. Future directions for mosquito surveillance and control in South Australia

The [South Australian Arbovirus and Mosquito Monitoring and Control Annual Report](#) will be published online at the completion of each subsequent mosquito season. SA Health will build on the data each year to form a comprehensive overview of mosquito activity across South Australia and the associated public health risks.

HPP will continue to produce the [South Australian arbovirus and mosquito monthly reports](#) which summarise the most recent available data to inform the current level of risk of mosquito-borne disease in South Australia.

14. Training videos and resources

HPP has developed a suite of videos to support LHAs in undertaking adult mosquito surveillance, which are available on the [SA Health website](#). HPP intend to extend the range of videos to include larval surveillance and control with the intention of building council capacity for mosquito surveillance and control across South Australia.

HPP will continue to 3D print and supply mosquito surveillance traps at no charge for all South Australian councils wishing to use them.

15. Further information

For further information regarding mosquito-borne disease, visit www.sahealth.sa.gov.au/fightthebite.

For further information on mosquito species found in Australia, including species detailed in this report, visit the [Department of Medical Entomology](#) website.

Appendix 1: Mosquito monitoring and arbovirus prevention stakeholders

- ➔ Health Protection Programs (HPP) Department for Health and Wellbeing
- ➔ Communicable Disease Control Branch (CDCB) Department for Health and Wellbeing
- ➔ Aerotech Australasia
- ➔ Arbovirus Response Cross Agency Group (ARCAG)
- ➔ Commonwealth Department of Agriculture and Water Resources (DAWR)
- ➔ Corporate Communications Branch, Department for Health and Wellbeing
- ➔ Local councils:
 - Alexandrina Council
 - Barunga West Council
 - Berri Barmera Council
 - City of Port Adelaide Enfield
 - City of Salisbury
 - City of Whyalla
 - Coorong District Council
 - District Council of Loxton Waikerie
 - Kingston District Council
 - Mid Murray Council
 - Port Pirie Regional Council
 - Rural City of Murray Bridge
 - Renmark Paringa Council
- ➔ NSW Health Pathology, Medical Entomology, ICPMR, Westmead Hospital
- ➔ One Health SA Working Group (formerly Zoonoses Working Group)
- ➔ Private pest control service providers
- ➔ Riverland veterinarians
- ➔ Sentinel chicken host families.

Appendix 2: Arbovirus response cross agency group membership

Coordinator – SA Health, Health Protection Programs	Murray and Mallee Zone Emergency Management Committee
Alexandrina Council	PIRSA – Biosecurity SA
Berri Barmera Council	Renmark Paringa
Coorong District Council	Rural City of Murray Bridge
Department of Environment and Water	SA Health, CDCB
District Council of Loxton Waikerie	SA Health, HPO
Environmental Protection Authority	SA Water
Mid Murray Council	

Table 2 Arbovirus response cross agency group

**Appendix 3:
Northern Adelaide mosquito surveillance program
trapping locations**

Trap Code	Trap Name	Location	Latitude / Longitude
DAW	Daniel Avenue Wetland	Globe Derby Park	-34.787358 / 138.586398
GDR	Globe Derby Racetrack	Globe Derby Park	-34.794579 / 138.589952
ML	Mawson Lakes	Mawson Lakes	-34.799232 / 138.597332
SWA	Swan Alley	Globe Derby Park	-34.790797 / 138.580558
TIPS	Torrens Island Power Station	Torrens Island	-34.805968 / 138.525777
TIQS	Torrens Island Quarantine Station	Torrens Island	-34.776148 / 138.523854

Table 3 Northern Adelaide mosquito surveillance trap locations

Appendix 4: South Australian River Murray councils trap locations

Council	Trap Code	Trap Name	Location	Latitude / Longitude
Alexandrina Council	A1	Island View	Clayton Bay	-35.49088889 / 138.922139
	A2	Cinema Court	Port Elliot	-35.53122222 / 138.67175
	A3	Bike Track	Port Elliot	-35.50752778 / 138.67175
	A4	Football Club	Goolwa	-35.50286111 / 138.780611
Berri Barmera Council	B1	Monash Playground	Monash	-34.23313889 / 140.558139
	B2	Glossop	Glossop	-34.26872222 / 140.526889
	B4	Berri Caravan Park	Berri	-34.28591667 / 140.612639
	B5	Cobdogla	Cobdogla	-34.24205556 / 140.396944
Coorong District Council	C1	Tailem Bend	Tailem Bend Golf Course	-35.26770 / 139.45880
	C11	Narrung	Alexandrina Drive	-35.51372 / 139.18406
	C12	Meningie Golf Course	Princes Hwy, Meningie	-35.69457 / 139.33673
	C5	Meningie School	Princes Hwy, Meningie	-35.68300 / 139.34086
	CSC	Sentinel chicken site	Princes Hwy, Waltowa	-35.63676 / 139.35530
District Council of Loxton Waikerie	L1	Thieles Floodplain	Loxton	-34.433861 / 140.591556
	L2	Boardwalk	Loxton	-34.450861 / 140.55894
	L3	Moorook Campground	Moorook South	-34.28872 / 140.368278
	L4	Kingston Caravan Park	Kingston on Murray	-34.22120 / 140.35023
	L5	Waikerie Caravan Park	Waikerie	-34.17517 / 139.98042
	L6	Roving sample (1)	Paisley	-34.343222 / 139.621667
	L6	Roving sample (2)	Thiele	-34.438864 / 140.584805

Mid Murray Council	MM1	Morgan Ferry	Morgan, Cadell Rd, North West Bend	-34.03900 / 139.67663
	MM2	Blanchetown Golf Course	Skurray, Blanchetown	-34.563222 / 139.597306
	MM3	Swan Reach Ferry	Angaston, Swan Reach	-34.56277778 / 139.59778
	MM5	Port Mannum	Port Mannum	-34.930278 / 139.303056
	MM6	Haythorpe	Haythorpe Reserve	-34.909583, 139.322694
Renmark Paringa Council	R1	Bert Dix Park	Lock 5 Rd, Paringa	-34.18241667 / 140.777361
	R2	Ski Site	Renmark	-34.17763889 / 140.76275
	R3	Jane Eliza	Murtho	-34.16327778 / 140.788889
	R4	Bookmark Creek	Twenty first St, Renmark	-34.17394444 / 140.728917
Rural City of Murray Bridge	MB1	Mypolonga School	Mypolonga	-35.041917 / 139.357933
	MB2	Sturt Reserve	Riverfront Rd	-35.123783 / 139.287850
	MB3	Murray Bridge Golf Course	Murray Bridge	-35.130617 / 139.269983
	MB4	Wellington Caravan Park	Wellington	-35.330133 / 139.382117
	MB5	Murray Bridge East	Avoca Dell Drive	-35.089444, 139.308056

Table 4 River Murray councils mosquito trap locations

Appendix 5: Sentinel chicken flock locations

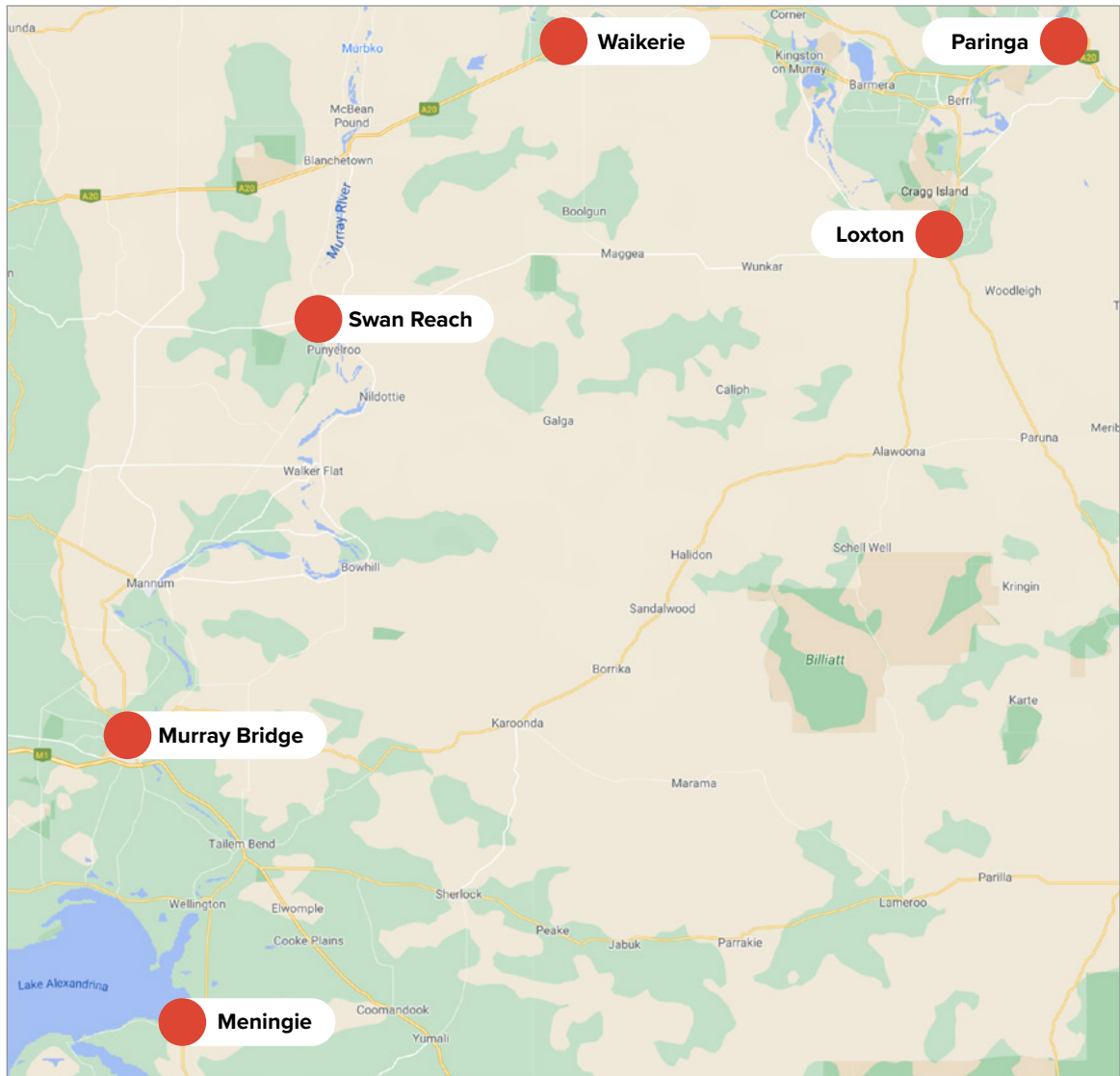


Figure 21 Sentinel chicken flock locations in South Australia

For more information

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