SOUTH AUSTRALIAN ARBOVIRUS AND MOSQUITO MONITORING AND CONTROL ANNUAL REPORT: 2021-2022

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 WaterResources
DHW	Department for Health and Wellbeing
DoH	Department of Health and Aged Care
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
JE	Japanese Encephalitis
JEV	Japanese Encephalitis virus
KOKV	Kokobera virus
KUNV	Kunjin/West Nile 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 2021-22 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 2021-22 mosquito season was influenced by a second La Niña weather event resulting in above average rainfall across most of South Australia. Several areas in South Australia were impacted by significant flooding. DHW worked closely with local stakeholders to provide resources and support to assist in the recovery effort in affected areas.

In February 2022 Japanese Encephalitis virus (JEV) was detected in pigs in the eastern states. JEV was also detected in pigs in various locations in southeast Australia including South Australia, this coincided with a cluster of acute human encephalitis cases in South Australia. Japanese encephalitis (JE) was declared a Communicable Disease Incident of National Signficance by the Department of Health and Aged Care (DoH) in March 2022 triggering a national response to the emerging situation. The DHWs Health Protection Programs (HPP) team worked closely with LHAs to ensure preparedness for the season and increased funding to support a heightened response to the increased threat level.

Enhanced surveillance activities along the River Murray during the 2021-22 mosquito season included increased adult mosquito monitoring, species identification, viral screening of trapped adult mosquitoes and heightened sentinel chicken surveillance. Screening of trapped mosquitoes resulted in one detection of JEV in January 2022, one Kokobera virus (KOKV) and three Ross River virus (RRV) detections during January 2022 and March 2022. The South Australian sentinel chicken program was enhanced in response to the JEV situation, with bleed frequencies increased. JEV and MVEV antibodies were detected in samples collected in February and March 2022.

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 continued monthly reporting to ensure clear and timely communication to relevant stakeholders. HPP 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.

Arbovirus notifications were higher in the 2021-22 season compared to the previous two seasons. Exotic disease notifications were lower 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.

Exotic mosquito detection surveillance and mitigation activities undertaken by the Commonwealth Department of Agriculture, Water, and the Environment (DAWE) resulted in the detection of live exotic mosquito larvae in imported goods at a South Australian Sea port. Movement of the imported goods resulted in a significant post border response co-ordinated by HPP.

2. Introduction

The annual report provides an overview of the wide range of programs, surveillance and other activities undertaken in South Australia during the 2021-22 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 arboviral infections such as Murray Valley encephalitis (MVEV) and Kunjin/West Nile virus (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 arboviral 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, DHWs 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, where 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. 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 DHW by NSW Health Pathology, Medical Entomology, Institute of Clinical Pathology & Medical Research, Westmead Hospital (ICPMR). DHW pay all ICPMR service charges with no cost to councils.

2021-22 season subsidy funding

The budgeted expenditure for the 2021-22 subsidy program, based on a season threat Level 1, was $62,000 including ICPMR costs. Fourteen local councils were pre-approved for the subsidy for the 2021-22 season. Seven River Murray councils, three regional and three metropolitan councils subsequently submitted end of season claims.

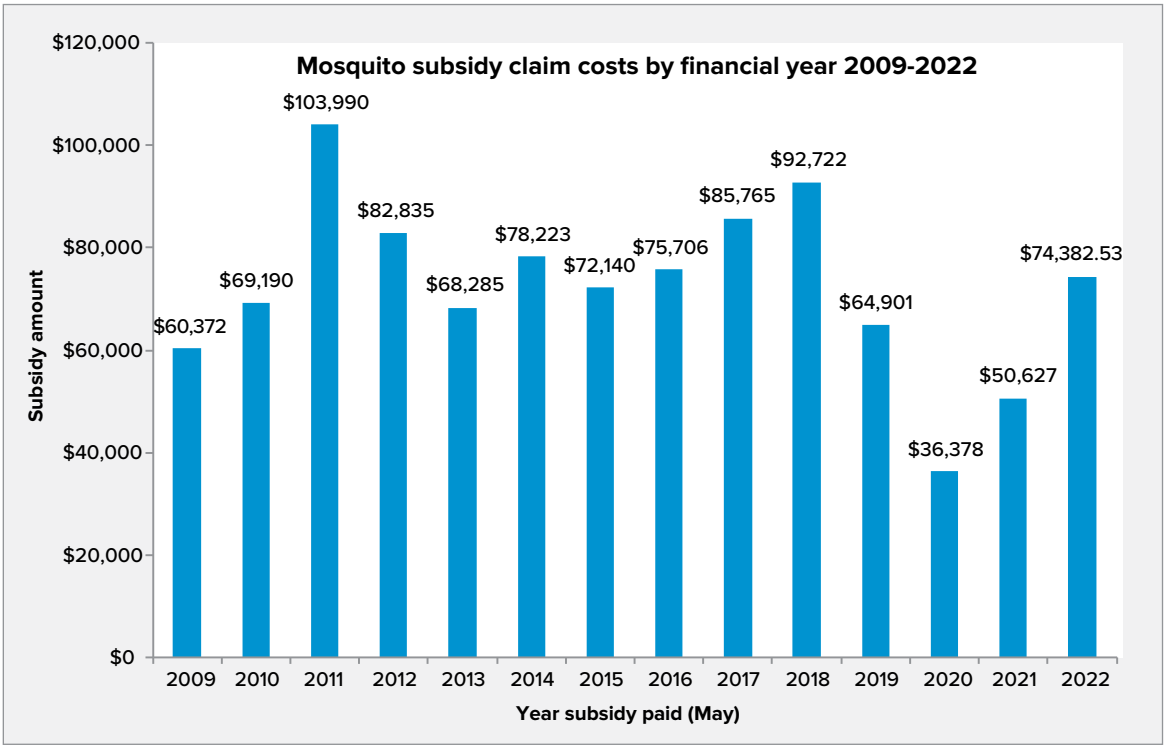


Figure 1 Mosquito subsidy costs by financial year 2009-2022

In response to the increased threat level during the 2021-22 mosquito season subsidy funding was increased to $71,500. The additional funding was offered to councils to support increased local mosquito management activities. As shown in figure 1, the end of season subsidy expenditure totalled $74,382.81 this included $15,680.72 for courier costs, abundance and speciation data, and viral analysis of trapped mosquitoes provided by ICPMR.

6. 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 promote 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.

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).

2021-22 season communications tools/tactics

The campaign is guided by the annual Fight the Bite communications plan. The standby communications action plan is in place to supplement the HoR if DHW declares that a Level 2 or Level 3 response is required. For the 2021-22 season, in accordance with the Plan, the standby communications action plan was activated in response to the declaration of increased risk of arboviral infection.

The Fight the Bite campaign budget increased from a planned $20,000 to a total spend of $78,219.19 for the 2020-21 season. In addition to the tools and tactics listed for a Level 1 response, SA Health's 2021-22 Fight the Bite campaign included:

- additional public advertising including targeted radio messaging, corflute signs, and venue ads.
- 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 and Instagram.
- public health alerts on SA Health's Facebook and Twitter.

7. 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 assessment of mosquito borne disease risk by signalling conditions associated with previous outbreaks of arbovirus 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 disease vector mosquito of concern, *Culex annulirostris*.

2021-22 summary of weather (environmental) conditions

In September 2021 the Bureau of Meteorology (BoM) reported that the El Niño-Southern Oscillation (ENSO) outlook had moved to La Niña WATCH, with a La Niña ALERT being issued in October 2021. In November 2021 a La Niña was established in the tropical Pacific. International climate models indicated this La Niña would persist until at least January 2022. 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 2021-2022 La Niña peaked in February 2022. However, in April 2022, the ENSO Outlook remained at La Niña, with most atmospheric and oceanic indicators persisting at La Niña levels.

Wettest spring since 2010, highest summer and autumn rainfall since 2016-17

Rainfall was above average during the 2021-22 season. Spring rainfall for South Australia was 53% above average, the wettest since 2010, and November 2021 was the state's wettest November on record.

At the end of spring, a low pressure system brought widespread rain and showers. The system resulted in high river levels, flood waters and ponding in low lying areas, impacting roads across South Australia's pastoral districts. Though summer 2021-22 started with a drier than average month in December, heavy rainfall in January and at the beginning of February resulted in large areas across the northern pastoral districts and on the Eyre Peninsula recording very much above average rainfall for the season.

State-wide, summer rainfall was around 57% above average, the highest since summer 2016/2017. Autumn rainfall was 12% below average, but still the highest since 2016, and April was particularly wet across parts of the north-east, centre and south-west, with a small area of highest on rainfall on record in the north-east.

Coolest spring since 2016

Even though temperatures were close to average in most places, it was still the coolest spring since 2016 for both mean maximum and mean minimum temperatures for the state overall.

Day time and night-time temperatures in summer were average to above average in the east, but days were cooler than average across large parts of the central and western districts. March and April were warmer than average, offsetting below average May temperatures in some regions, to make autumn warmer than average overall. Mean maximum temperatures were average to above average across the state. Mean minimum temperatures were in the warmest 10% of records for autumn in parts of the west, south-east and far north-east.

Acknowledgement

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

8. 2021-22 season arbovirus response level indicators

In accordance with the HoR, as detailed in the Plan, DHW considered the following indicators in relation to the risk of transmission of flaviviruses for the 2021-22 mosquito season:

September 2021 – Level 1 indicators

- a La Niña event during the 2020-21 season.
- a La Niña WATCH in the tropical Pacific.
- the detection of MVEV and KUNV antibodies in blood samples taken from sentinel chickens during Summer 2021. This is accepted as a potential precursor to an increased risk of flavivirus transmission in the following mosquito season (see section 11 for further information on the South Australian sentinel chicken program).

As the 2021-22 season progressed, indicators for heightened response levels were met.

January 2022 – Level 2 indicators

During January 2022 several arbovirus response indicators suggested increased arbovirus risk. Subsequently and in accordance with the HoR, the arbovirus response level was raised to threat Level 2. The triggers included:

- above average rainfall during spring/summer of 2020-21.
- above average RRV/BFV case notifications.
- high levels of rainfall during spring.
- a La Niña established in the tropical Pacific resulting in forecast summer rain at above average levels
- the detection of KUNV in horses in New South Wales.

Flooding event summary

In addition to the response indicators detailed above, heavy rainfall associated with a weather pattern related to ex-tropical cyclone Tiffany caused significant impacts in northern, central and western parts of the state in late January and early Febuary 2022.

Widespread flooding in the communities of the Far North, Flinders Ranges, Upper Spencer Gulf and Eyre Peninsula during January and early Febuary 2022 resulted in the declaration of a major emergency in these regions.

Flooding, pooling and excess surface water provided optimal habitat for mosquito breeding, and consequentially the risk of mosquito borne disease increased. Damage to critical infrastructure disrupted crucial supply lines meaning that products needed for larval control and personal protection in these areas were unavailable.

In response to the increased risk to public health, HPP liaised with the South Australian zone emergency management team and local communities to provide assitance to affected communities. Larvicide stocks, including S Methoprene and BTI liquid, were secured and supplies of personal repellent were sourced. In collaboration with stakeholders, HPP arranged for the deployment of the larvicide and personal repellents to communities to assist with the prevention and control of mosquito-borne diease. In addition to the physical response to the emergency, Fight the Bite campaign messaging was increased in affected areas, using targeted radio messaging and social media posts.

February 2022 – Level 3 indicators

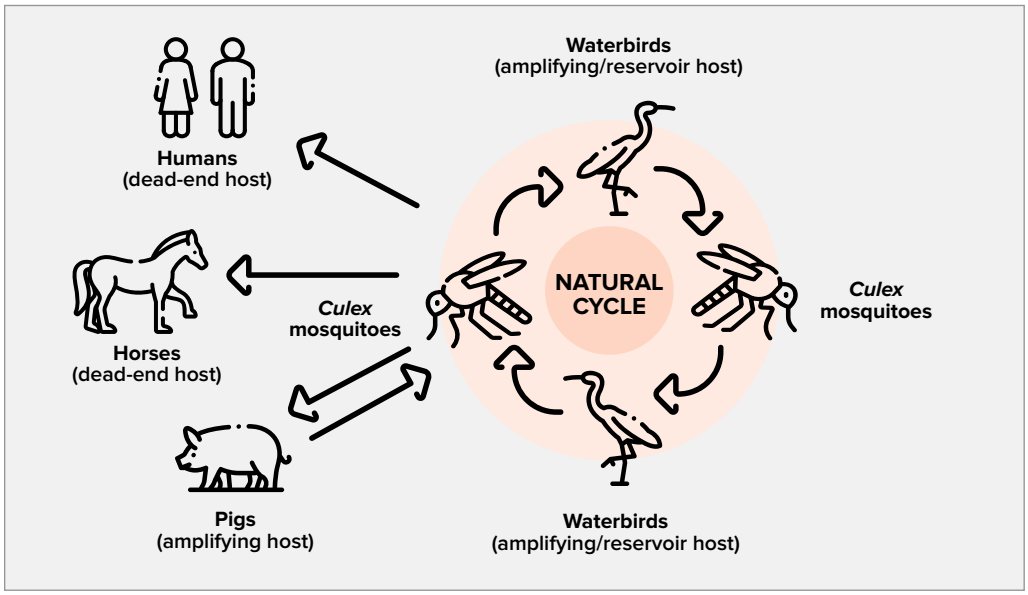
In early In February 2022 CDCB commenced an investigation into a cluster of acute human encephalitis cases in South Australia. The cluster coincided with the detection of Japanese Encephalitis virus (JEV), a member of the flavivirus family, in pigs in various locations in southeast Australia including South Australia.

The risk of local transmission of flaviviruses 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). Subsequently and in accordance with the HoR, the arbovirus response level was raised to threat Level 3.

Japanese Encephalitis outbreak summary

Japanese encephalitis (JE) is a serious disease caused by JEV. It is spread by mosquitoes primarily of the genus Culex, and although not overly competent, vector species of the genus Aedes and Verrallina play a role in transmission and environmental establishment. The main species of concern *Culex annulirostris*, has a wide geographical distribution and is abundant across Australia including South Australia.

JEV is endemic to parts of Asia and the Torres Strait region north of Australia. Animals can also be infected with JEV and may serve as reservoirs/amplifiers or dead-end hosts, but they cannot directly transmit the virus to humans. The virus maintains its lifecycle through wading birds, waterbirds, pigs and mosquitoes. Horses and humans are dead-end hosts, but pigs are a known amplifier of JEV (see figure 2).



Source: Image: https://www.outbreak.gov.au/current-responses-to-outbreaks/japanese-encephalitis

Figure 2 Japanese encephalitis disease spread pathway

As a result of the CDCB encephalitis investigation, nine human cases of JE were notified in South Australia (five confirmed and four probable) with dates of onset ranging from 19 January 2022 to 23 February 2022. In the 10 years prior to 2022 there has only been one single recorded case of locally acquired human JE in all of Australia, in the Tiwi Islands off Northern Territory. The only other recorded mainland case before that was in 1998 in Cape York Queensland. In total there has only ever been 14 other human cases identified in the last 10 years in all of Australia and all of these have been overseas travel acquired infections.

Notified cases of serious human arboviral diseases are rare in South Australia. However, when cases are notified or indicators suggest that the risk of cases is high, coordinated state government mosquito control programs are required in order to adequately protect public health. Coordinated state government mosquito control programmes require considerable resources beyond the capacity of local councils. They also require significant planning and preparedness which must happen before the trigger conditions for level 3 of the HoR are met.

The unfolding JEV situation in Australia was declared a Communicable Disease Incident of National Significance by the Department of Health and Aged Care (DoH) in March 2022. In response to the declaration a coordinated national response was set up. SA Health formed part of this national response by assisting national working groups of communicable disease, vaccine and arbovirus experts that were established to support the coordinated national response. SA Health also directly coordinated the rollout of JEV vaccines for at risk individuals within the State.

Testing undertaken in March 2022 showed that that JEV was present in samples collected from feral pigs the State's far north near Innaminka in December 2021. This is the earliest known JEV activity in South Australia. In late March 2022 HPP were advised that testing undertaken in February 2022 showed that JEV was present in samples collected from a deceased alpaca in the Adelaide Plains council area.

A key step in the local JEV response included several special ARCAG meetings to discuss local responses, the implementation of local mosquito management plans, resource requirements and to update the members on the outbreak investigation progress.

As JEV was not expected to emerge in Southern Australia it was not included as part of the routine arbovirus surveillance program. In response to the JEV situation HPP undertook the following actions:

- liaised with ICPMR to confirm expansion of viral screening program to include screening for JEV.
- liaised with all councils with mosquito surveillance programs to increase their routine adult mosquito surveillance frequency from monthly to fortnightly.
- sent mosquitoes trapped as part of the northern Adelaide surveillance program for speciation and viral screening.
- undertook targeted regional mosquito surveillance at multiple locations identified as high risk.
- sent mosquitoes trapped during targeted regional mosquito surveillance for identification and viral screening.
- requested viral screening of mosquitoes from one metropolitan council.
- increased sentinel chicken bleed frequency from monthly to weekly.
- increased Fight the Bite campaign messaging using printed resources, targeted radio messaging and social media posts.

It is not yet known how the virus has entered South Australia and the rapidity and extent of spread was not something previously contemplated by animal and human health experts.

No further human cases of JE have been reported to CDCB since February 2022 although investigations are continuing. Any further positive detections of JEV in farmed pigs in South Australia will be reported and investigated by the Department of Primary Industries and Regions (PIRSA).

9. Mosquito surveillance and control

Overview

Adult mosquito trapping in South Australia is undertaken using 3D printed encephalitis vector Survey (EVS) mosquito surveillance traps developed and produced by HPP. All seven River Murray councils, two metropolitan councils and one regional council undertook trapping in their local council areas during the 2021-22 season using these traps with support and training provided by HPP.

In addition to adult mosquito surveillance, several councils also conducted larval surveillance and control activities within their council area. One metropolitan and two regional councils undertook larval surveillance and control only in their council areas.

HPP conducted routine weekly mosquito trapping in the northern Adelaide area throughout the mosquito season. HPP also conducted targeted adult JEV mosquito surveillance in high-risk areas during March and April 2022.

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 Health Protection Operations (HPO) section. When required, HPO team carry out trapping in unincorporated areas of South Australia. This was undertaken once during the 2021-22 season in response to above average spring rainfall in the far north of the state.

For the period September 2021 to February 2022 all River Murray councils and metropolitan councils undertook routine monthly trapping. All mosquitoes trapped from September 2021 to February 2022 by each of the seven River Murray councils, one metropolitan council, one regional council and HPO were sent to ICPMR for speciation, enumeration, and molecular viral screening for RRV, BFV, MVEV and KUNV. During the early part of the season several batches of trapped mosquitoes were unable to be processed due degradation resulting from delays in courier transportation.

In response to the JEV situation, from March 2022 onward the frequency of routine adult mosquito trapping by all River Murray and both metropolitan councils increased from monthly to fortnightly. All mosquitoes trapped by all local councils were sent to ICPMR with viral screening expanded to include JEV. Mosquitoes trapped as part of the HPP JEV targeted surveillance were also sent to ICPMR. In March 2022 ICPMR commenced retrospective testing for JEV of mosquitoes trapped by local councils earlier in the season. However, increased demand resulted in delays in the reporting of some results.

During the 2021-22 season over 212,000 adult mosquitoes were trapped across multiple locations throughout South Australia. Of these, over 92,000 mosquitoes were sent to ICPMR for speciation and enumeration with over 56,000 mosquitoes screened for viruses. The main MVEV and JEV vector mosquito, *Culex annulirostris*, accounted for 5% of the total season catch (n=4702), 84% (n=3926) of which were trapped in River Murray council areas.

Northern Adelaide mosquito surveillance program

The northern Adelaide mosquito surveillance program for the 2021-22 mosquito season commenced on 2 September 2021 and concluded on 28 April 2022. Mosquito surveillance was conducted at six locations (see appendix 3) over 30 weeks with a total of 178 dry ice baited EVS mosquito traps set. One of the 178 mosquito traps failed and restriction to the access route to the Swan Alley (SWA) trap prevented trapping at this location on two occasions.

Trapped mosquitoes were counted, and the results were recorded. A total of 134,146 mosquitoes were trapped across the six trap locations over the eight months of the 2021-22 season which is a decrease compared to the 2020-21 season (n=142,307) and an increase compared to the 2019-20 season (n=39,866).

The average number of trapped mosquitoes across all trap locations for the 2021-22 season was 22,357 compared to 27,718 during the 2020-21 season and compared to 6,644 during the 2019-20 season. As detailed in figure 3, five of the six northern Adelaide trap locations had increased abundance compared to the previous two seasons and one trap location had decreased abundance compared to the previous season.

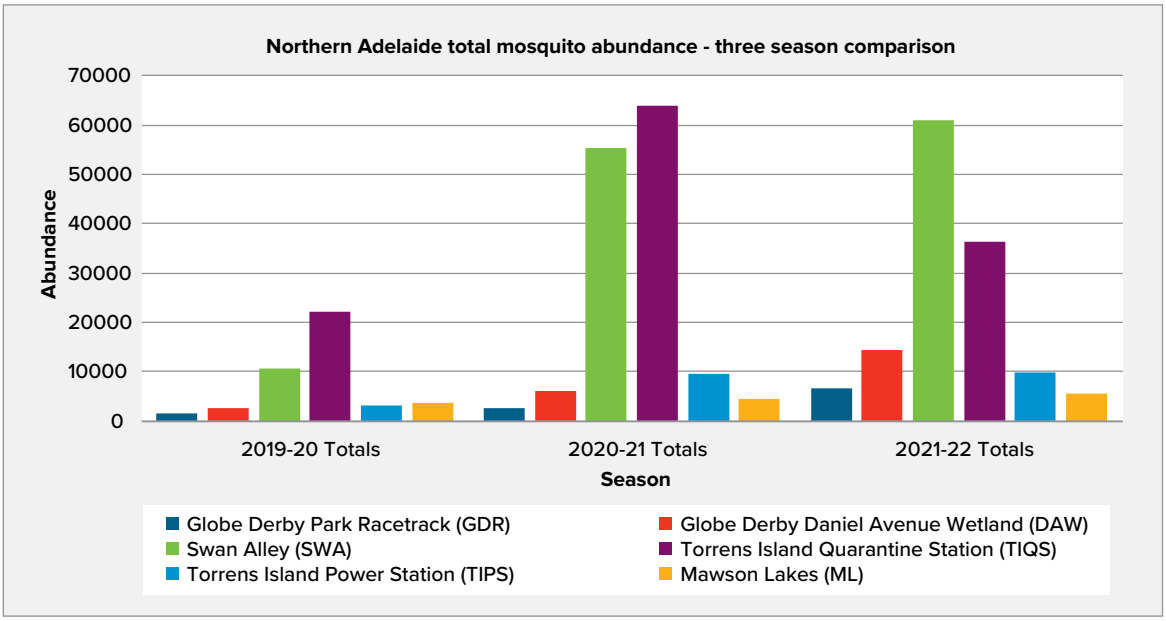


Figure 3 Northern Adelaide mosquito trapping total abundance - three season comparison

Spring was wetter and cooler than average in the Greater Adelaide region. Summer saw below average rainfall and average to above average mean maximum temperatures. However, in February 2022 state-wide rainfall was around 31% above average. Autumn in the Greater Adelaide region was warmer than usual with close to average rainfall and mean daytime and night-time temperatures were above average during March.

As shown in figure 4, February saw the highest monthly average mosquito abundance in the Swan Alley (SWA), Globe Derby Racetrack (GDR) and Daniel Avenue Wetlands (DAW) traps, and March saw the highest monthly average mosquito abundance for Torrens Island Quarantine Station (TIQS), Torrens Island Power Station (TIPS), and Mawson Lakes (ML) traps.

The SWA trap accounted for 46% of the seasons total catch (n=61,049) and the largest single catch of the season of 21,069 was at this trap location in February 2022. The TIQS trap accounted for 27% (n=36,469) of the total season catch, with DAW accounting for 11% (n=14,357), TIPS accounting for 7% (n=9,926), GDR for 5% (n=6,725), and ML 4% (n=5,619).

Identification and viral screening of mosquitoes trapped in northern Adelaide is not routinely undertaken. However, trapped mosquitoes from one round of trapping during March 2022 were sent to ICPMR in response the JEV outbreak (n=14,208).

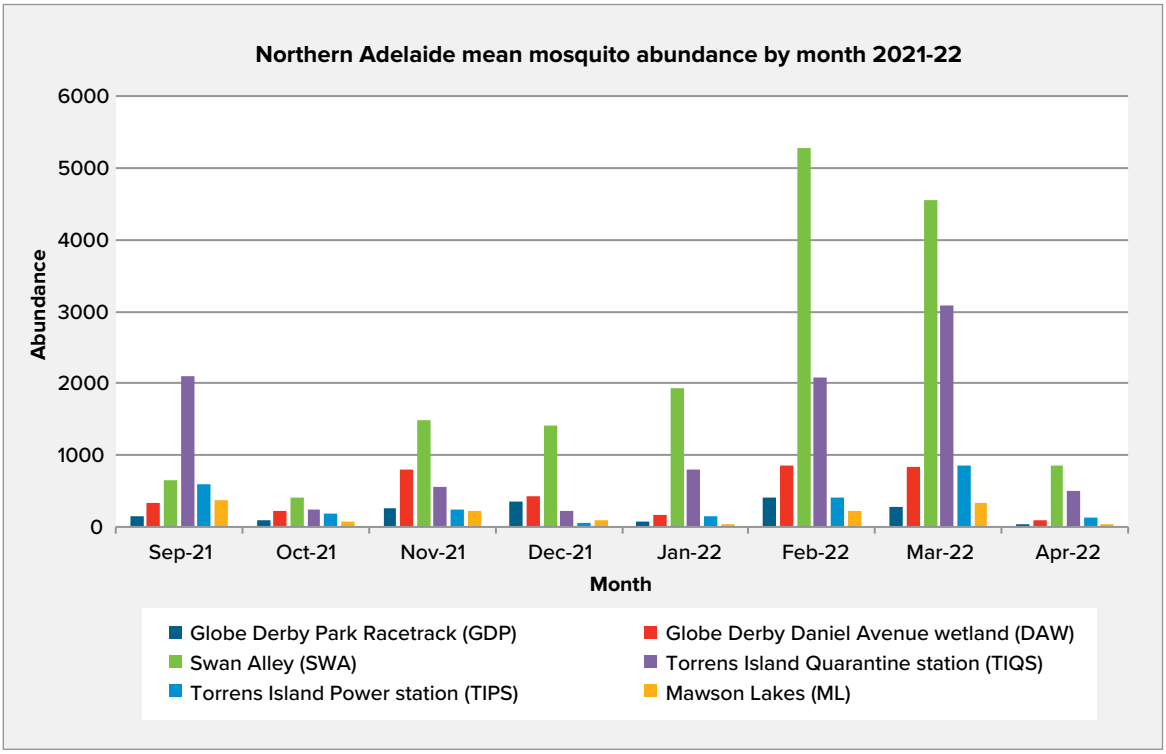


Figure 4 Northern Adelaide mean mosquito abundance by month 2021-22

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 2021-22 the total cost of the aerial program for the mosquito season was $36,151.50.

As shown in figure 5, average numbers of trapped mosquitoes at the SWA and TIQS trap site over the past 10 seasons were consistently greater than for other trap sites. The TIQS trap location is used as a reference point as no treatment is undertaken at this site and environmental conditions are similar to those at the SWA trap site. No larval control was undertaken at this remote location.

Figure 5 shows the average mosquito abundance over three seasons at the SWA trap site is higher compared to the five-season average abundance data, but considerably lower than the 10-season average reflecting the success of the Globe Derby Park mosquito management program.

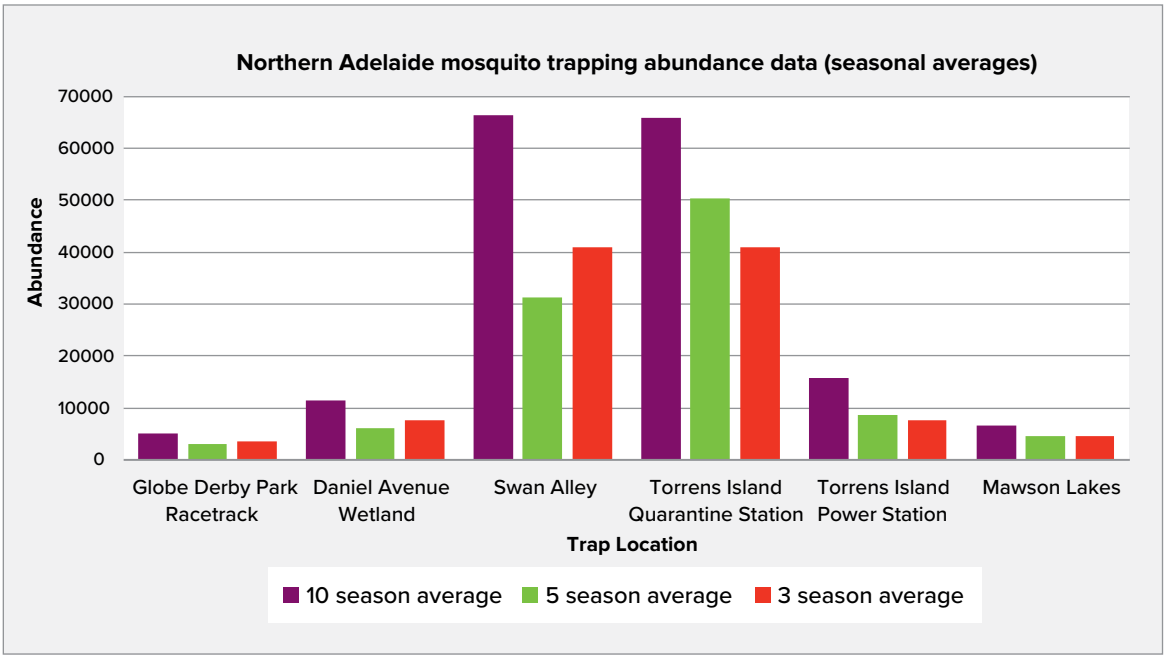


Figure 5 Northern Adelaide mean abundance - 10 season comparison

HPP Targeted JEV mosquito surveillance

As part of the State based JEV response, HPP conducted targeted adult mosquito surveillance trapping during March and April 2022. Trap locations were determined by potential human case exposure locations and piggeries confirmed or suspected to have been affected by JEV. A total of 5064 adult mosquitoes were trapped and all trapped mosquitos were sent to IPCMR for enumeration, speciation, and viral screening for JEV and other arboviruses of concern.

Table 1 summarises the key results from all HPP JEV surveillance trapping conducted throughout March and April. The data shows that what is thought to be the primary JEV vector mosquito species in South Australia, *Culex annulirostris*, accounted for around 50% of the total catch of mosquitoes trapped during the first two surveillance trips. Subsequent surveillance trapping saw a significant decline in the number of *Culex annulirostris* caught. JEV was not detected in any of the mosquitoes trapped during targeted HPP surveillance.

Table 1 Health Protection Programs targeted JEV surveillance trapped mosquito data March and April 2022

Date	**Council areas**	**No. of traps set**	**Total catch**	**Total Culex annulirostris** (% total catch)
05/03/2022	Loxton Waikerie	16	86	42(48.8)
09/03/2022	Mid Murray, Loxton Waikerie, Renmark Paringa	20	332	166 (50)
19/03/2022	Yankalilla, Victor Harbor, Alexandrina, Coorong	19	3741	120 (3.2)
28/03/2022	Coorong, Mid Murray, Murray Bridge	18	882	1 (0.1)
29/03/2022	Clare and Gilbert Valleys	11	18	0 (0)
05/04/2022	Light Regional and Adelaide Plains.	7	5	0 (0)

Health Protection Operations mosquito surveillance

HPO undertook trapping once during the 2021-22 season in mid-December 2021. Surveillance trapping over seven locations in unincorporated areas in the far north of South Australia resulted a total catch of 3,759 adult mosquitoes. All trapped mosquitos were sent to IPCMR for enumeration, speciation and viral analysis. Trap locations are detailed in appendix 4.

December 2021 was drier and warmer than average. However, State-wide November 2021 rainfall was the highest on record. Towards the end of the month, a low-pressure system brought widespread rain and showers that resulted high river levels, flood waters and ponding in low lying areas, and many roads were closed across South Australia's pastoral districts. Weather conditions during the trapping period were hot and windy which may have impacted trapped mosquito numbers.

As shown in table 2, the greatest number of mosquitoes were trapped at the Mount Dare, Algebuckina and Oodnadatta trap site locations. Speciation data from trap catches identified *Ae. eidsvoldensis* as the most prevalent species overall, particularly at the Algebuckina, Oodnadatta and Mount Dare trap locations. This species is predominantly collected in inland areas of New South Wales and is moderately uncommon. *Ae. bancroftianus* were the next most prevalent species identified, this mosquito is more common in inland regions and can be a nuisance after flooding or extensive rain. Several viruses including RRV and MVEV have been isolated from these mosquitoes, but it is not known if it can transmit to humans.

Relatively low numbers of *Culex annulirostris* were trapped at the Dalhousie Springs, Mount Dare and Oodnadatta trap locations. While the number of mosquitoes trapped at William Creek was low, *Culex annulirostris* accounted for 11% of mosquitoes trapped.

Table 2 Far North unincorporated areas mosquito surveillance trapping abundance data December 2021

Trap location	December 2021
Algebuckina (2 sites)	974
Coober Pedy (4 sites)	59
Dalhousie Springs (2 sites)	392
Hookey's Waterhole (1 Site)	39
Mount Dare (1 site)	1204
Oodnadatta (2 sites)	909
William Creek (3 Sites)	182

SA River Murray Council mosquito surveillance and control

Overview

During the 2021-22 mosquito season all seven River Murray councils conducted trapping in their own council areas with support from HPP, which included training and the provision of trapping equipment. The program required each River Murray council to arrange for a minimum of four EVS mosquito surveillance traps to be set monthly in strategically selected locations from September to April (eight times during the season).

Late spring of the 2021-22 season was dominated by the effects of La Niña, with the wettest November on record followed by above average summer rainfall which was the highest since summer 2016/2017. In response to the increased threat level and in accordance with the Plan, trapping frequency was increased from monthly to fortnightly from March 2022 to enable timely assessment of any risk to public health. See appendix 5 for River Murray mosquito surveillance trapping locations.

In addition to increased surveillance, and in accordance with the HoR, River Murray councils implemented actions contained within their local mosquito risk management plans. These actions included increased surveillance of adult mosquitoes, mapping of high-risk locations and breeding sites within their council areas and additional larval control. Some councils also undertook targeted adulticide treatment in high-risk public areas, such as public toilets.

Most councils also increased public messaging and the Department of Planning, Transport and Infrastructure gave approval to install “Fight the Bite” signage in all the ferries in the Murraylands region.

As detailed in figure 6, mean monthly mosquito abundance was greatest for four councils during spring, two councils during summer and one council during autumn.

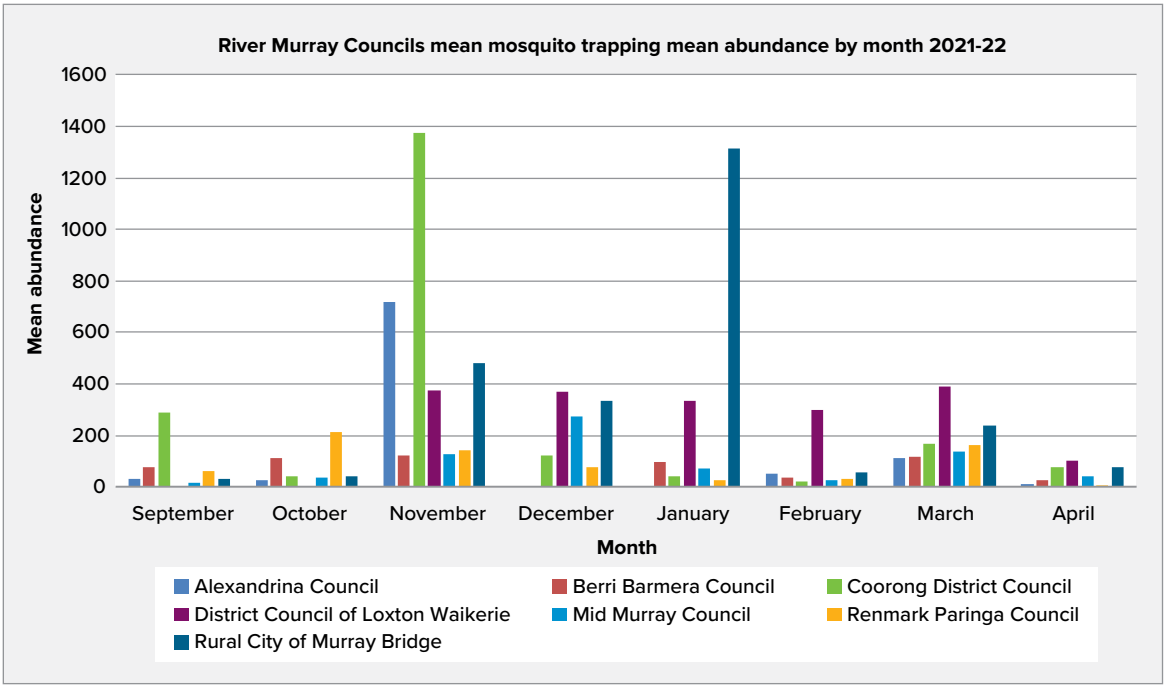


Figure 6 SA River Murray councils mosquito trapping mean abundance by month

Figure 7 shows that in 2021-22 four River Murray councils had increased mean trapped mosquito abundance compared to the previous two seasons. Two River Murray councils had decreased mean abundance compared to the 2020-21 season but increased mean abundance compared to the 2019-20 season. One council had decreased abundance compared to the previous two seasons.

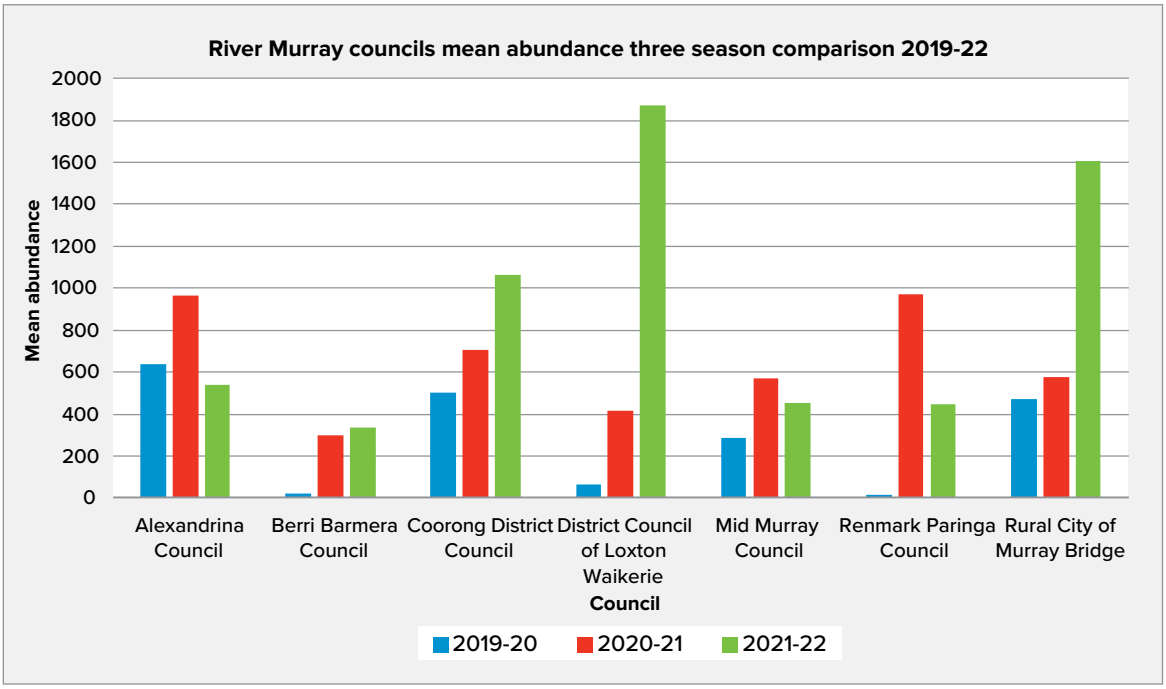


Figure 7 River Murray council mosquito trap mean abundance by council area - three season comparison 2019-22

A total of 44,796 mosquitoes were trapped by River Murray councils during the 2021-22 season. Figure 8 shows that the most abundant mosquito species trapped in the River Murray council areas during the 2021-22 season was *Aedes camptorhynchus* which accounted for 60% (n=26,941) of all trapped mosquitoes. *Culex globocoxitus* was next most abundant species caught in the River Murray council areas during the 2021-22 season, accounting for 11% (n=4841) of the total season catch. *Culex annulirostris* was the next most abundant species, accounting for 9% (n=3926).

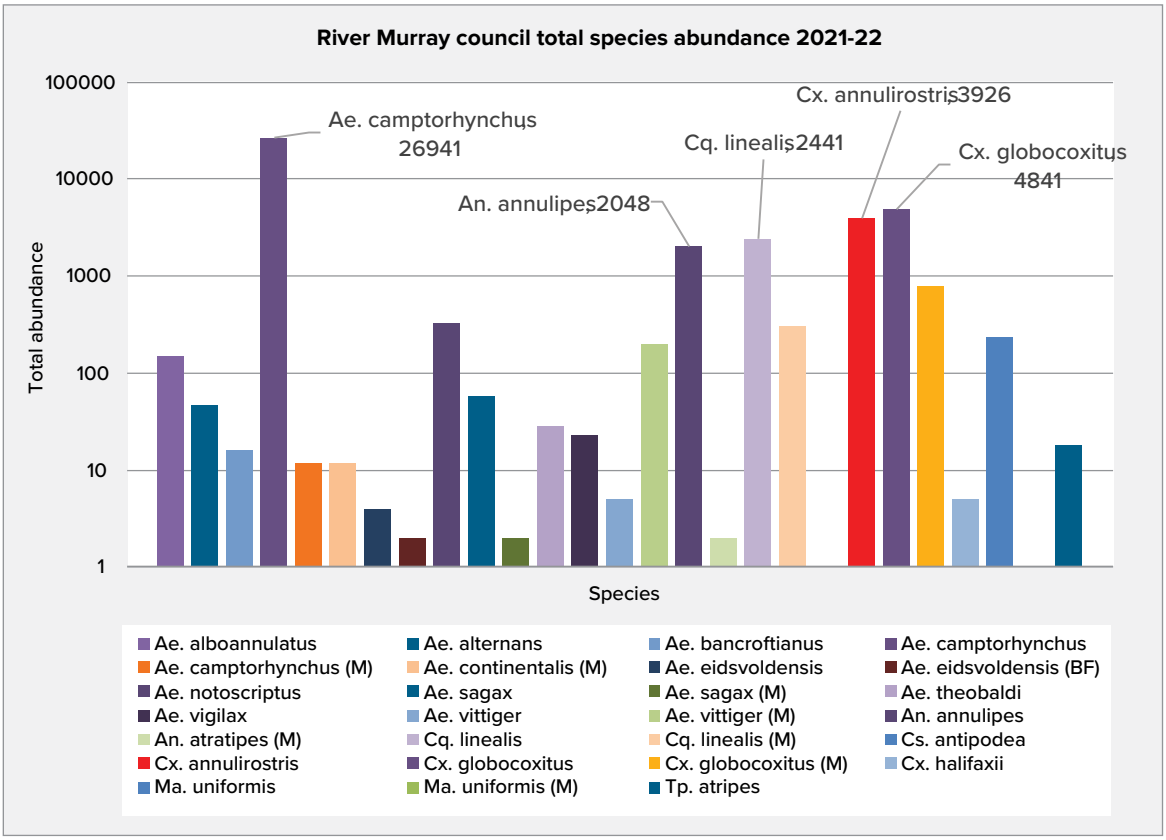


Figure 8 River Murray council total species abundance 2021-22

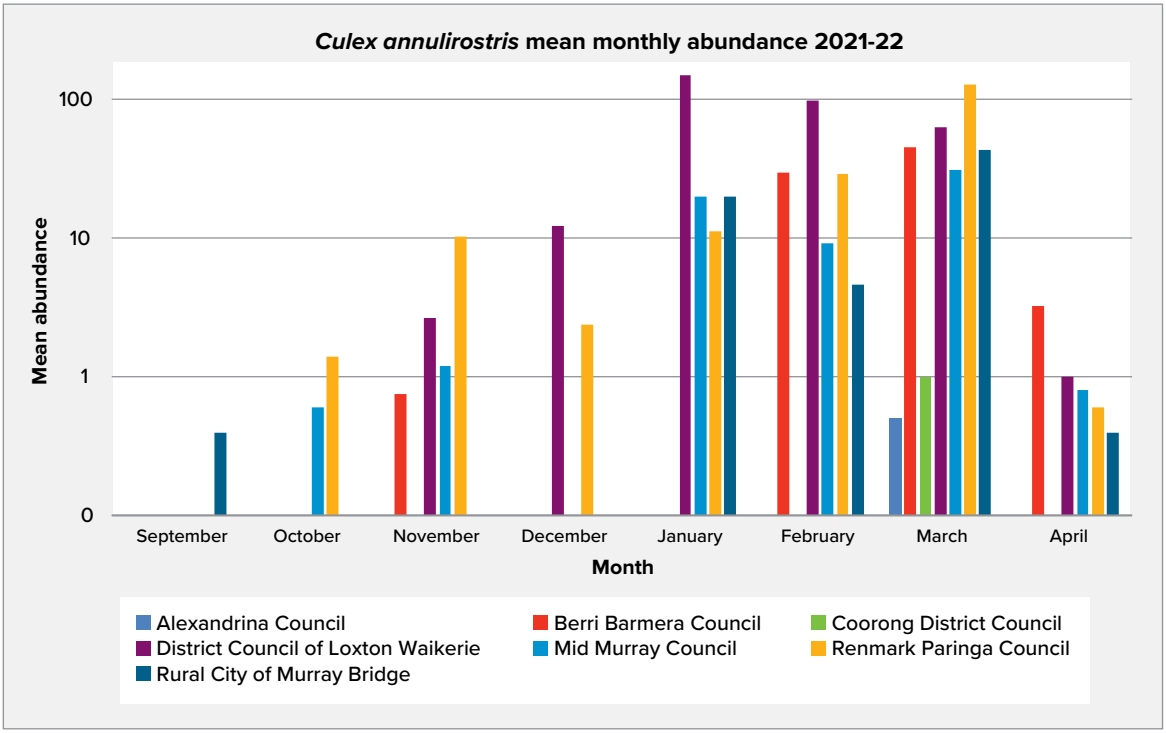


Figure 9 River Murray councils *Culex annulirostris* monthly mean abundance

A total of 3926 *Culex annulirostris* were trapped in the River Murray council areas during the 2021-22 mosquito season. As detailed in figure 9, the District Council of Loxton Waikerie trapped the greatest mean abundance of *Culex annulirostris* of all River Murray councils for the season in January 2022. Overall, the greatest abundance of *Culex annulirostris* in the River Murray Council areas during the 2021-22 season was observed in March 2022. The greatest number of *Culex annulirostris* caught in a single trap during the 2021-22 season was in January 2022 (n=372) in the District Council of Loxton Waikerie.

Figure 10 shows **increased total abundance of** *Culex annulirostris* in two River Murray council areas compared to the previous two seasons.

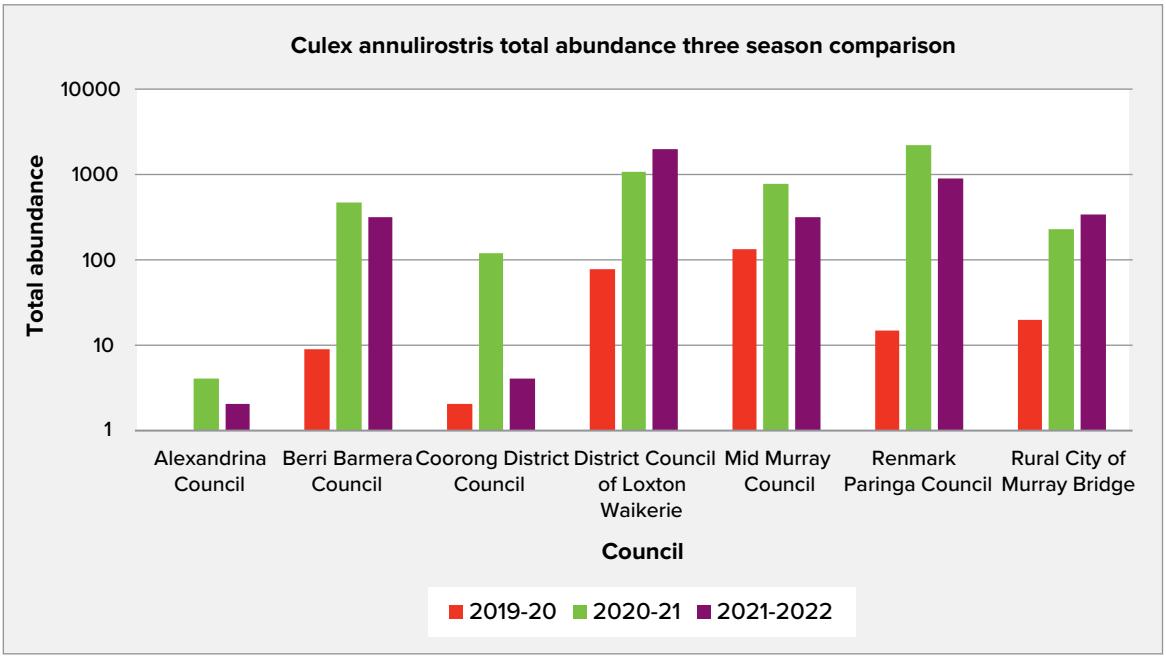


Figure 10 River Murray councils *Culex annulirostris* total abundance by council area - three season comparison 2019-22

Alexandrina Council

Alexandrina Council officers have undertaken their own mosquito trapping since the start of the 2019-20 mosquito season. Alexandrina Council's mosquito routine surveillance activities included trapping once per month at fixed locations during September to November 2021 and in February 2022 (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022. One additional trap location was also added in March and April (see appendix 4).

A total of 3,206 mosquitoes were trapped across four fixed trap locations over six months of the 2021-22 season. This was a decrease compared to the 2020-21 season (n=7716) and the 2019-20 season (n=4475). The average number of mosquitoes trapped monthly across all four trap locations during the 2021-22 season was 539 compared to 965 during the 2020-21 season and 639 during the 2019-20 season.

The most abundant species trapped in the Alexandrina Council area was *Aedes camptorhynchus*, which accounted for 83% (n=6667) of the total season catch. The next most abundant species was *Coquillettidia linealis*, which accounted for 5% (n=171) of the total season catch.

As shown in figure 11, the greatest single trap catch of the season was in November 2021 at the Clayton Bay (A1) trap location (n=1963) of which 1955 were *Aedes camptorhynchus*. This trap location had consistently higher total abundance compared to all other fixed trap locations within Alexandrina Council area from September 2021 through to April 2022. Very low numbers of *Culex annulirostris* were trapped during the season (n=2). Mosquito numbers in the other traps remained comparatively low throughout the season.

Alexandrina Council officers undertook larval control activities during the season, which included the monitoring and restocking of s-Methoprene briquets in pre-existing larval treatment stations.

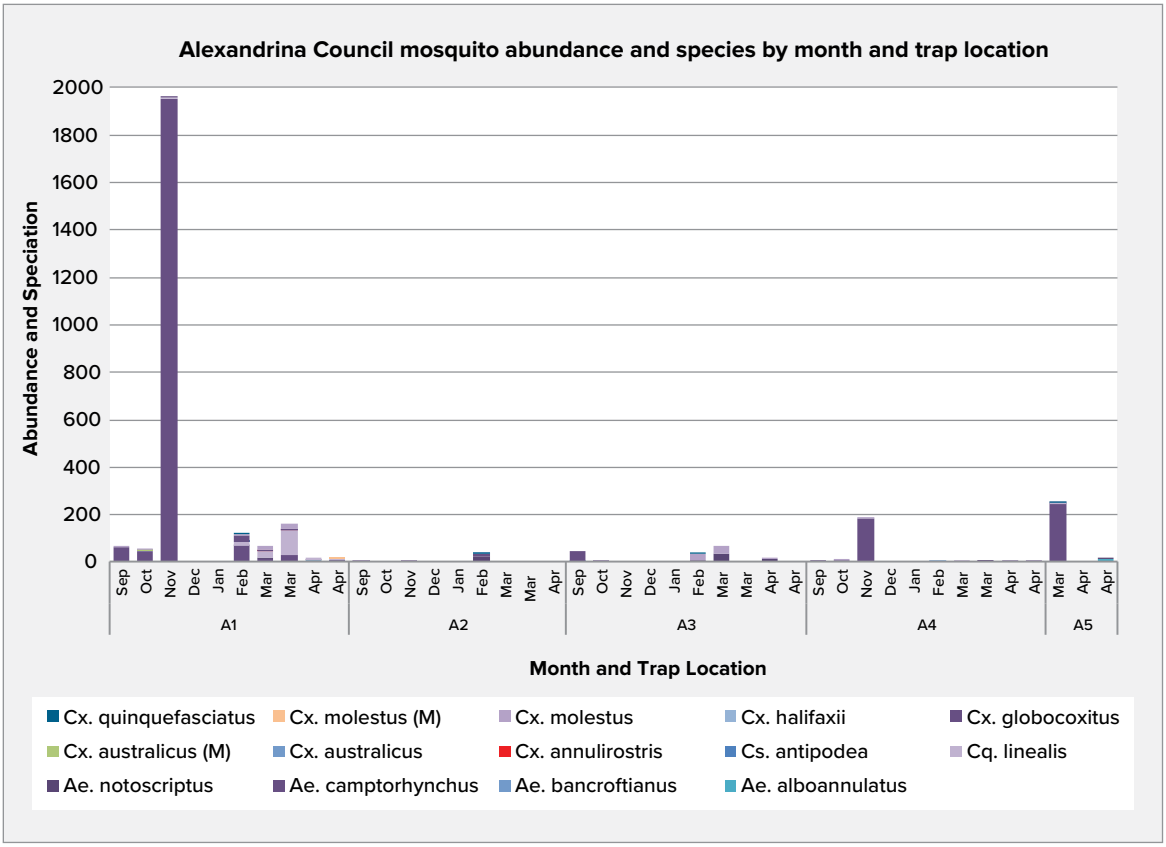


Figure 11 Alexandrina Council mosquito abundance and species by month and trap location

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 2021 and February 2022 at four fixed locations (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 2,345 mosquitoes were trapped across the four trap locations over the eight months of the 2021-22 season. This was a decrease compared to the 2020-21 season (n=2400) and an increase compared to the 2019-20 season (n=167). The average number of mosquitoes trapped monthly across all four trap locations during the 2021-22 season was 335 compared to 300 during the 2020-21 season and 24 during the 2019-20 season. Delays in courier transport during December 2021 and January 2022 resulted trapped mosquitoes being degraded and unable to be enumerated, speciated or screened for viruses.

The most abundant species trapped in the Berri Barmera Council area was *Aedes camptorhynchus,* which accounted for 64% (n=1067) of the total season catch. The next most abundant species was *Culex annulirostris,* which accounted for 19% (n=317) of the total season catch followed by *Culex globocoxitus,* which accounted for 4% (n=70) of the total season catch.

As shown in figure 12, the greatest single trap catch of the season was in October 2021 at Berri Caravan Park (B4) trap site (n=220), of which 206 (94%) were *Aedes camptorhynchus.* The greatest number of *Culex annulirostris* (n=70) caught in a single trap during the season was at the B4 trap site in February 2022.

Berri Barmera Council engaged a contractor to assist with the assessment, inspection, and treatment of known larval breeding sites. Several new sites were identified and added to the database for ongoing monitoring.

The Riverland Integrated Mosquito Management Plan (RIMMP) was implemented as the overarching strategy for mosquito management and helped determine Council's response to the increases in the season risk rating. To effectively deliver the objectives of the RIMMP, Berri Barmera Council developed a Seasonal Mosquito Management Implementation Plan for 2021-22 which outlined action that would be taken in the areas of monitoring, control, and information management.

Fight the Bite and encephalitis health alert information was shared to increase public awareness.

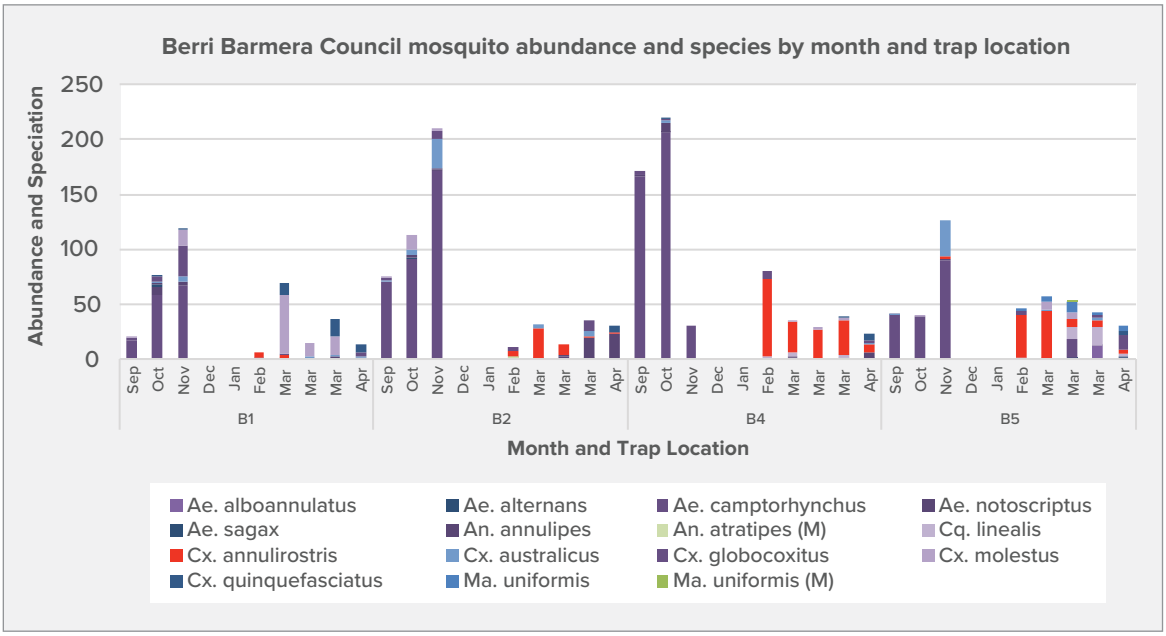


Figure 12 Berri Barmera Council mosquito abundance and species by month and trap location

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 engaged the Rural City of Murray Bridge to assist with mosquito surveillance during the 2021-22 season.

Coorong District Council mosquito surveillance activities included trapping once per month between September 2021 and February 2022 at four fixed locations (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 8,365 mosquitoes were trapped across the four trap locations over the eight months of the 2021-22 season. This was an increase compared to the 2020-21 season (n=5876) and the 2019-20 season (n=4005). The average number of mosquitoes trapped monthly across all trap locations during the 2021-22 season was 1066 compared to 705 during the 2020-21 season and 501 during the 2019-20 season.

The most abundant species trapped in the Coorong District Council area was *Aedes camptorhynchus,* which accounted for 95% (n=7,938) of the total season catch. The next most abundant species was *Culex globocoxitus,* which accounted for 3% (n=231) of the total season catch. *Culex annulirostris* accounted for less than 1% (n=5) of the total season catch.

As shown in figure 13, the greatest single trap catch of the season was in November 2021 at the Narrung Campground (C11) trap site (n=5251) of which 5007 were *Aedes camptorhynchus.* Mosquito numbers at the Tailem Bend Golf Course (C1) and the Meningie School (C5) trap sites remained comparatively low throughout the season. Very low numbers of *Culex annulirostris* were trapped during the season (n=5).

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. Council also coordinated the spraying of public toilets with residual insect spray prior to Easter and the April school holidays.

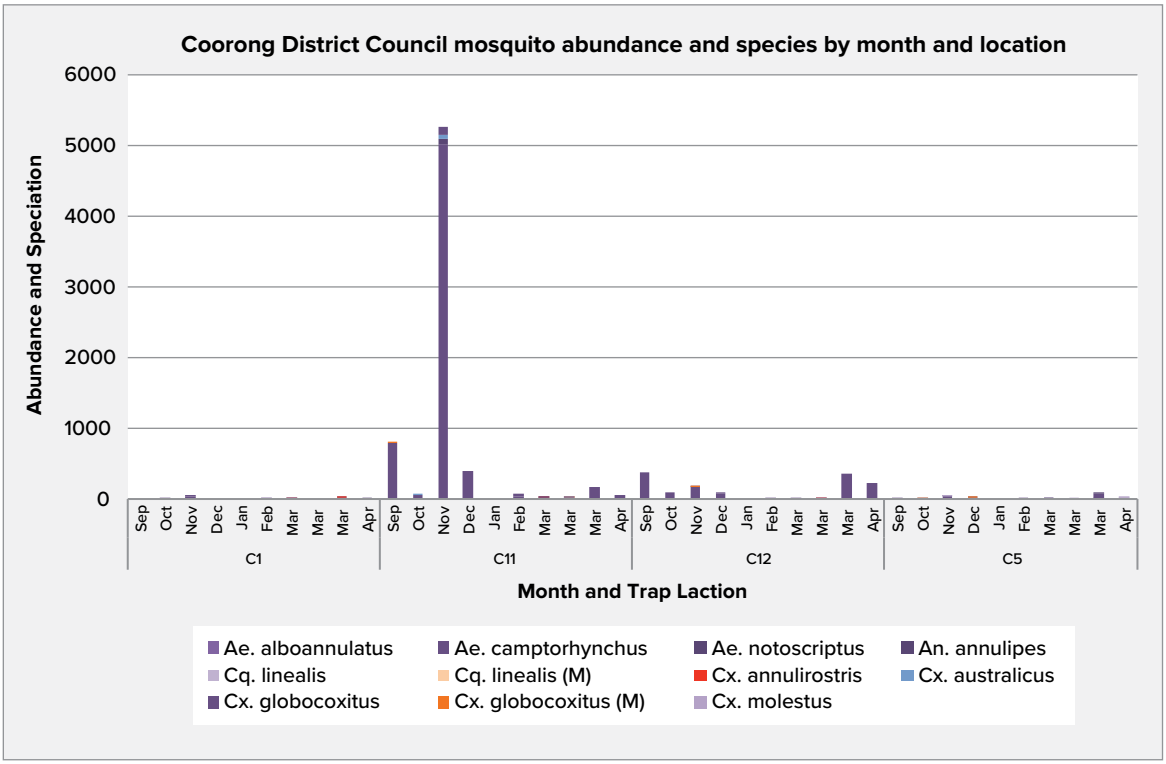


Figure 13 Coorong District Council mosquito abundance and species by month and trap location

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 2021 and February 2022 at six fixed locations (see appendix 4). As a result of courier delays, mosquitoes trapped in October 2021 were received by ICPMR in a degraded condition making them unsuitable for analysis. In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 11,239 mosquitoes were trapped across the six fixed trap locations over six months of the 2021-22 season. This was an increase compared to the 2021-22 season (n=2926) and the 2019-20 season (n=370). The average number of mosquitoes trapped monthly across all trap locations during the 2021-22 season was 1873 compared to 418 during the 2020-21 season and 62 during the 2019-20 season.

The most abundant species trapped in the District Council of Loxton Waikerie area was *Culex globocoxitus,* which accounted for 25% (n=2429) of the total season catch. The next most abundant species was *Culex annulirostris,* which accounted for 20% (n=2011) of the total season catch followed by *Aedes camptorhynchus,* which accounted for 18% (n=1803) of the total season catch.

As shown in figure 14, the greatest single catch of the season was in November 2021 at the Thieles Floodplain (L1) trap site (n=929) of which 435 were *Culex globocoxitus.* The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Moorook Campground (L3) trap site in January 2022 (n=372).

Officers at the District Council of Loxton Waikerie undertook the inspection and treatment of known larval breeding sites during the season. Larval surveillance was a key focus near populated areas. 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.

Health promotion increased with the distribution of Fight the Bite materials to key outlets including tourist information centres, council offices, all caravan parks in the district and some local post offices. Fight the Bite and JEV health alert corflute signage was placed throughout the council area.

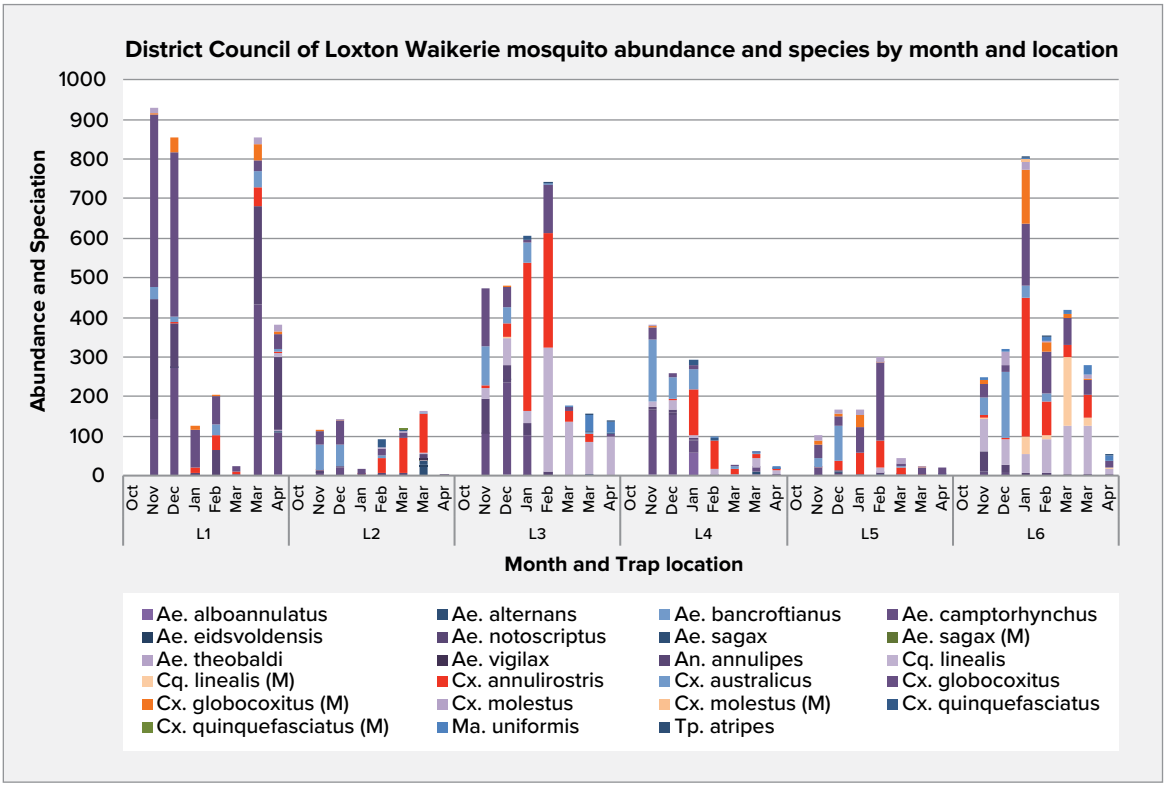


Figure 14 District Council of Loxton Waikerie mosquito abundance and species by month and trap location

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 2021 and February 2022 at five fixed locations (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 3,637 mosquitoes were trapped across the five fixed trap locations over the eight months of the 2021-22 season. This was a decrease compared to the 2020-21 season (n=4592) and an increase compared to the 2019-20 season (n=2305). The average number of mosquitoes trapped across all trap locations for the 2021-22 season was 455 compared to 568 during the 2021-22 season and 288 during the 2019-20 season.

The most abundant species trapped in the Mid Murray Council area was *Aedes camptorhynchus,* which accounted for 58% (n=2016) of the total season catch. The next most abundant species was *Coquillettidia linealis,* which accounted for 12% (n=427) of the total season catch followed by *Culex annulirostris,* which accounted for 9% (n=315) of the total season catch.

As shown in figure 15, the greatest single trap catch of the season was in December 2021 at the Port Mannum (MM5) trap site (n=1520) of which 1023 were *Aedes camptorhynchus.* The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Blanchetown Golf Course (MM2) trap site in March 2022 (n=92).

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 implemented their individual council action plan which supported the execution of monitoring, control, information management and public awareness activities. Health promotion increased with frequent social media posts, signage placed in all public toilets, public health alert signage placed in camping and reserve areas along the river, sporting groups were contacted and encouraged to promote the Fight the Bite program and local businesses were given promotional material to display. Mid Murray Council also coordinated the spraying of public toilets with residual insect spray prior to Easter and the April school holidays.

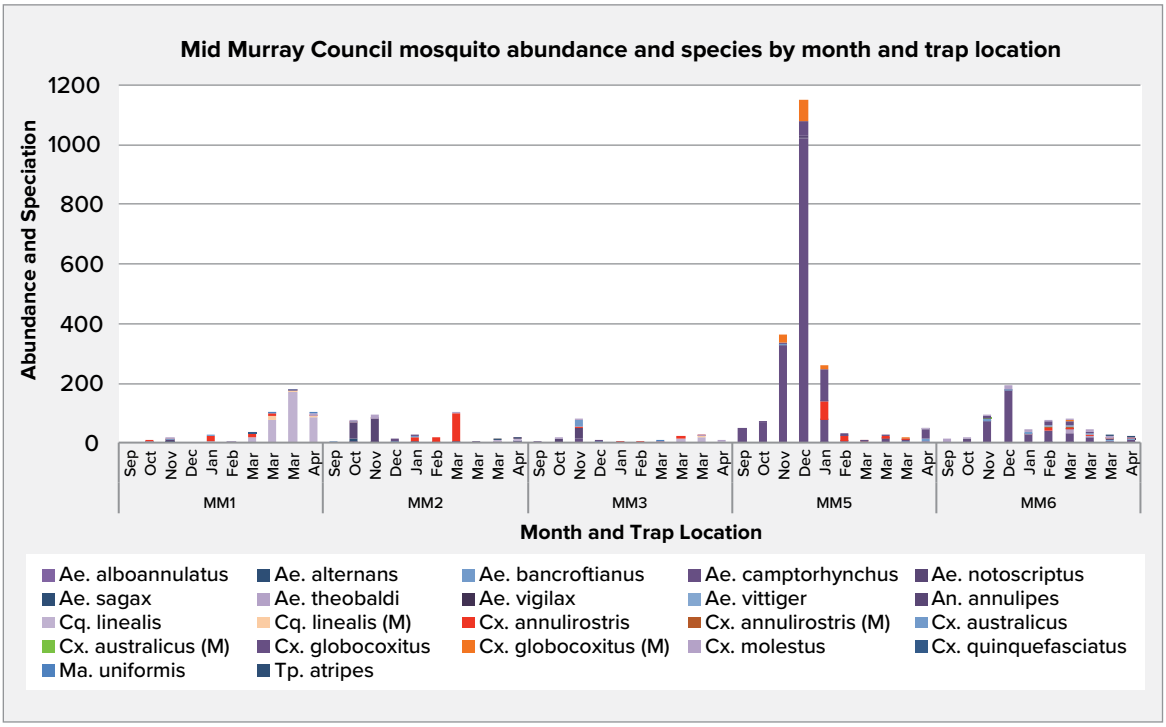


Figure 15 Mid Murray Council mosquito abundance and species by month and trap location

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 2021 and February 2022 at five fixed locations (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 12843 mosquitoes were trapped across the five fixed trap locations over the eight months of the 2021-22 season. This was an increase compared to the 2020-21 season (n=4597) and the 2019-20 season (n=3791). The average number of mosquitoes trapped monthly across all trap locations for the 2021-22 season was 1605 compared to 575 during the 2020-21 season and 474 during the 2019-20 season.

The most abundant species trapped in the Rural City of Murray Bridge council area was *Aedes camptorhynchus,* which accounted for 77% (n=9798) of the total season catch. The next most abundant species was *Culex globocoxitus,* which accounted for 12% (n=1562) of the total season catch followed by *Culex annulirostris,* which accounted for 3% (n=360) of the total season catch.

As shown in figure 16, the greatest single catch of the season was in January 2022 at Wellington Caravan Park (MB4) trap site (n=3129) of which 2865 were *Aedes camptorhynchus.* The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Mypolonga School (MB1) trap site in March 2022 (n=63).

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.

The Rural City of Murray Bridge developed their individual council action plan which supported the implementation of monitoring, control, information management and public awareness activities. Health promotion increased with frequent community messaging and the provision of Fight the Bite campaign materials. Council also coordinated the spraying of public toilets with residual insect spray prior to Easter and the April school holidays.

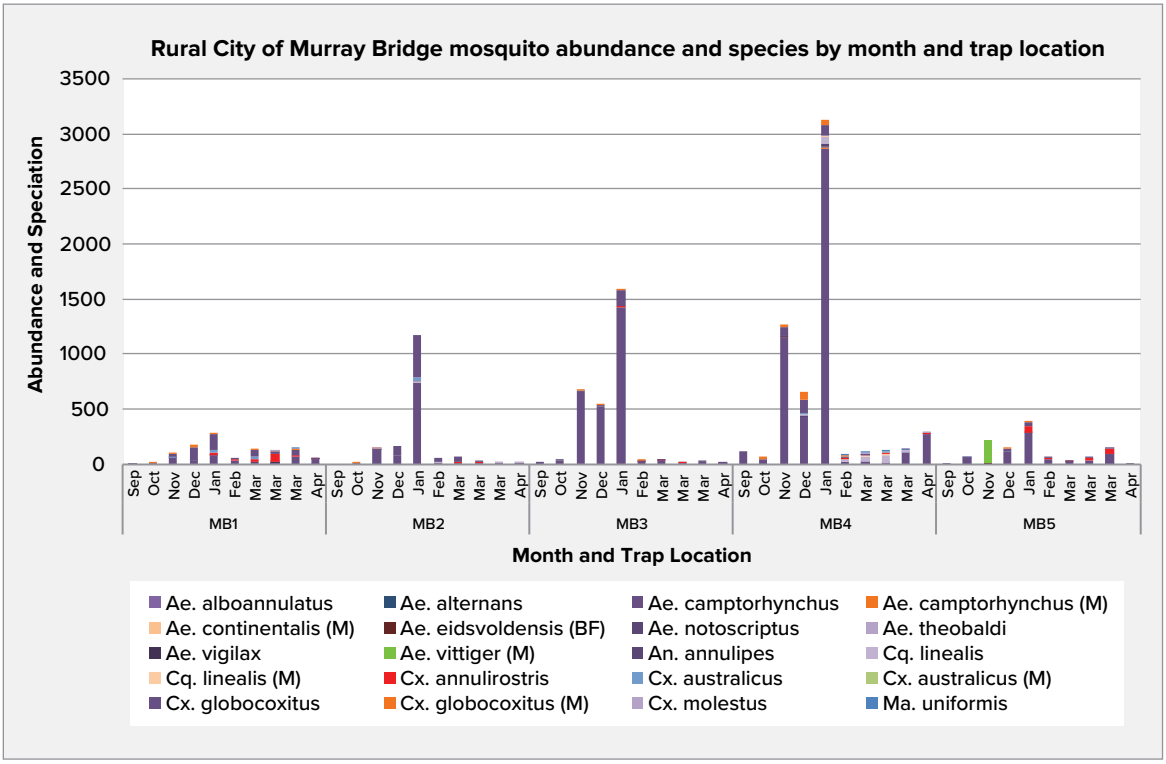


Figure 16 Rural City of Murray Bridge mosquito abundance and species by month and trap location

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 2021 and February 2022 at five fixed locations (see appendix 4). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022.

A total of 3562 mosquitoes were trapped across the five fixed trap locations over the eight months of the 2021-22 season. This was a decrease compared to the 2020-21 season (n=7790) and an increase compared to the 2019-20 season (n=110). The average number of mosquitoes trapped monthly across all trap locations for the 2021-22 season was 455 compared to 974 during the 2020-21 season and 16 during the 2019-20 season.

The most abundant species trapped in the Renmark Paringa Council area was *Aedes camptorhynchus,* which accounted for 50% (n=1715) of the total season catch. The next most abundant species was *Culex annulirostris,* which accounted for 27% (n=916) of the total season catch followed by *Anophelis annulipes,* which accounted for 12% (n=423) of the total season catch.

As shown in figure 17, the greatest single trap catch of the season was October 2021 at Ellen Park (R1) trap site (n=509) of which 499 were *Aedes camptorhynchus.* The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Ski site trap (R2) in March 2022 (n=209).

Renmark Paringa Council engaged a contractor to assist with the assessment, inspection, and treatment of known larval breeding sites. Several new sites were identified and added to the database for ongoing monitoring.

The RIMMP was implemented as the overarching strategy for mosquito management and helped determine Council's response to the increases in the season risk rating. To effectively deliver the objectives of the RIMMP Renmark Paringa Council developed a Seasonal Mosquito Management Implementation Plan for 2021-22 which outlined action that would be taken in the areas of monitoring, control, and information management. The seasonal plan was updated as the risk level increased.

Fight the Bite and JEV health alert information was shared digitally on Council's website, e-newsletters, and electronic notice boards. Physical posters were displayed in public places including public toilets, boat ramps, playgrounds, BBQ shelters, Lyrup ferry, etc. to increase public awareness.

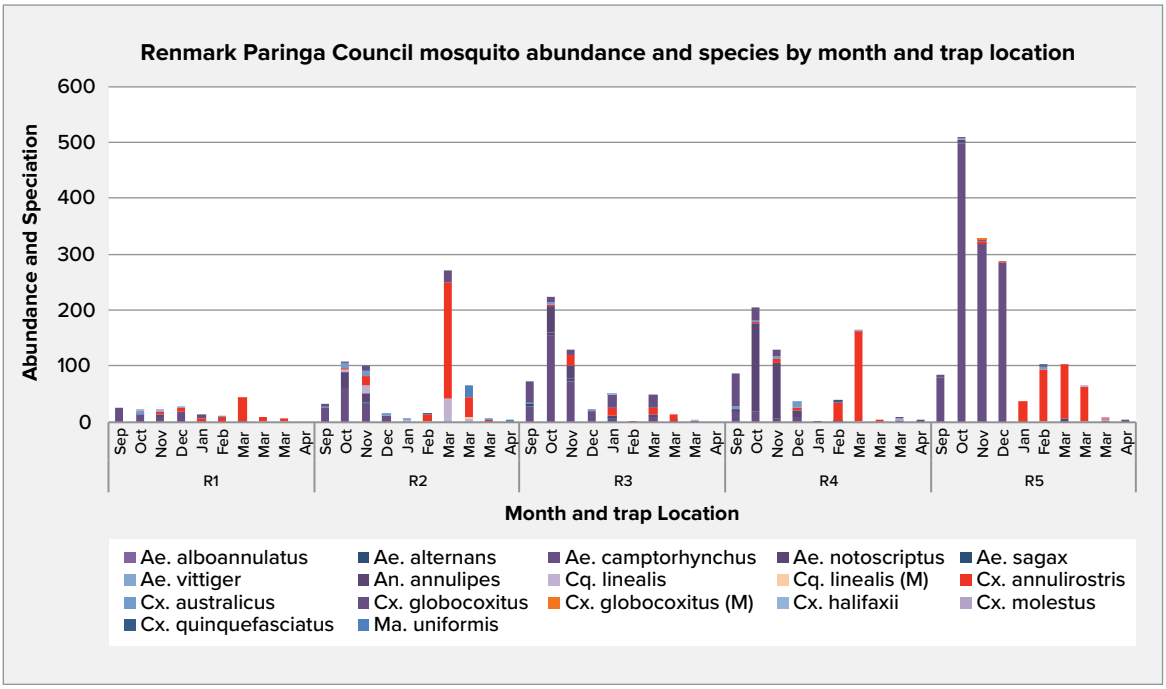


Figure 17 Renmark Paringa Council mosquito abundance and species by month and trap location

Metropolitan council mosquito surveillance and control

Mount Barker District Council

HPP met with officers from Mount Barker District Council during September 2021 to discuss the South Australian mosquito management subsidy funding program. HPP provided an overview of the program, provided onsite trapping training, visited proposed trapping locations, and provided trapping equipment to council.

Mount Barker District Council conducted mosquito surveillance activities which included trapping once per month between December 2021 and February 2022 at five locations (see appendix 6).

In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022. A further seven trap locations were added to the Mount Barker District Council surveillance program during March and April 2022 as part of the heightened response.

A total of 319 mosquitoes were trapped across 12 trap locations over five months of the 2021-22 season. The most abundant species trapped in the Mount Barker council area was *Culex molestus,* which accounted for 42% (n=135) of the total season catch. The next most abundant species was *Culex globocoxitus,* which accounted for 18% (n=58) of the total season catch followed by *Aedes notoscriptus,* which accounted for 11% (n=35) of the total season catch.

As shown in figure 18, the greatest single catch of the season was in February 2022 at Kennebec Court (M3) trap site (n=40) of which 37 were *Culex molestus.* The greatest number of *Culex annulirostris* caught in a single trap during the season was at the Parkview Drive (M5) trap site in February 2022 (n=6). *Culex annulirostris* accounted for 5% (n=16) of the total season catch.

Officers at Mount Barker District Council undertook the inspection and treatment of a larval breeding site during the season. Council carried out proactive health promotion by placing JEV health alerts around the district and distributing SA Health's Fight the Bite campaign information. Council's communication team also posted regular updates and health alerts on Councils Facebook page and website.

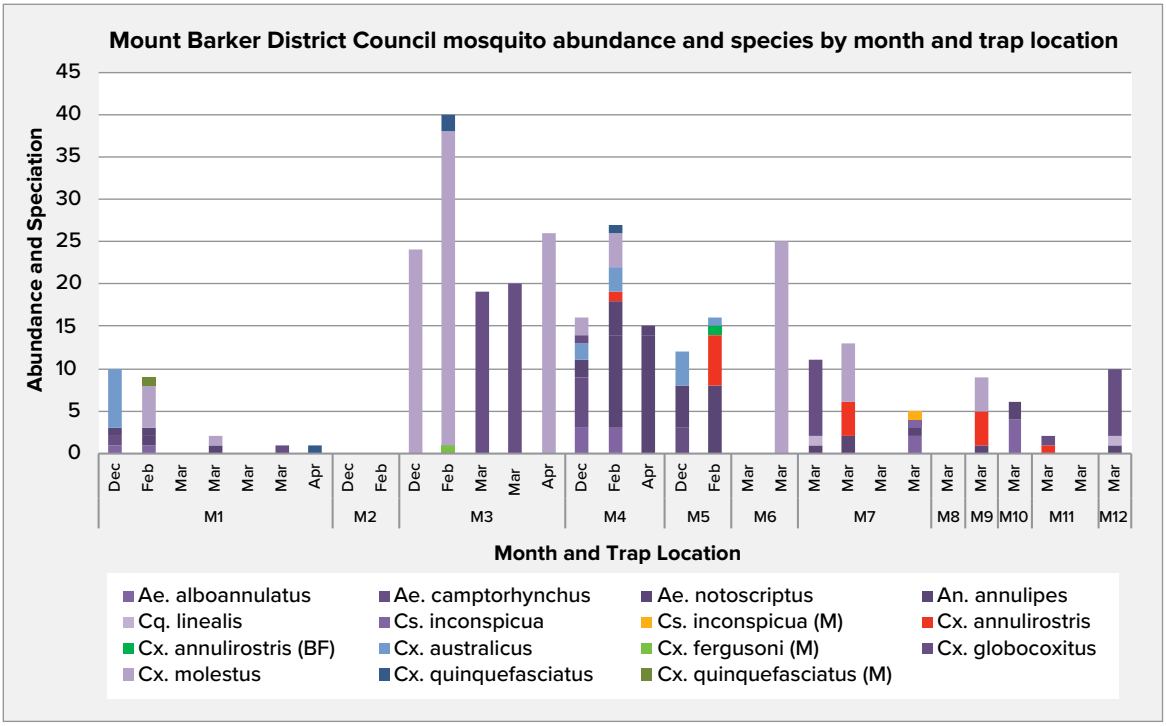


Figure 18 Mount Barker District Council mosquito abundance and species by month and trap location

City of Salisbury

The City of Salisbury engaged a contractor to undertake mosquito surveillance at various locations within their council area for the 2021-22 mosquito season. HPP met with the contractor to deliver onsite trapping training and provided trapping equipment.

Trapping commenced in October 2021 and trapped mosquitoes were sent to ICPMR to be counted and identified to species level. Mosquito surveillance activities included trapping once per month between October 2021 and February 2022 at 14 locations (see appendix 6). In response to the heightened risk level resulting from the JEV outbreak, trapping frequency was increased during March and April 2022 and viral screening of trapped mosquitoes was undertaken.

A total of 23575 mosquitoes were trapped across 14 trap locations over seven months of the 2021-22 season. The most abundant species trapped in the Salisbury area was *Aedes camptorhynchus,* which accounted for 43% (n=10178) of the total season catch. The next most abundant species was *Aedes vigilax,* which accounted for 42% (n=9840) of the total season catch followed by *Culex globocoxitus,* which accounted for 7% (n=1577) of the total season catch.

As shown in figure 19, the greatest single catch of the season was in November 2022 at the St. Kilda Mangroves (WTR) trap site (n=6745) of which 6541 were *Aedes camptorhynchus.* The greatest number of *Culex annulirostris* caught in a single trap was during March 2022 (n=92) accounting for 26% of all *Culex annulirostris* trapped during the season. *Culex annulirostris* accounted for 1.5% (n=353) of the total season catch.

As part of Council's Mosquito Management Plan, the City of Salisbury undertook treatment and surveillance at known breeding sites through a contracted service during the 2021-22 mosquito season. In addition, Council undertook a mosquito surveillance and breeding site review to identify any new breeding sites. This will inform the mosquito control program for the 2022-23 season and enable the development appropriate treatment and control strategies.

Council staff provided education and advice in the form of letters, brochures, social media, and website updates along with verbal advice to residents throughout the season and advised them of the SA Health Aerial Larvicide Mosquito control program and Council's treatment program. A direct mail out was conducted to over 1500 households providing advice on mosquito avoidance and the Fight the Bite messaging.

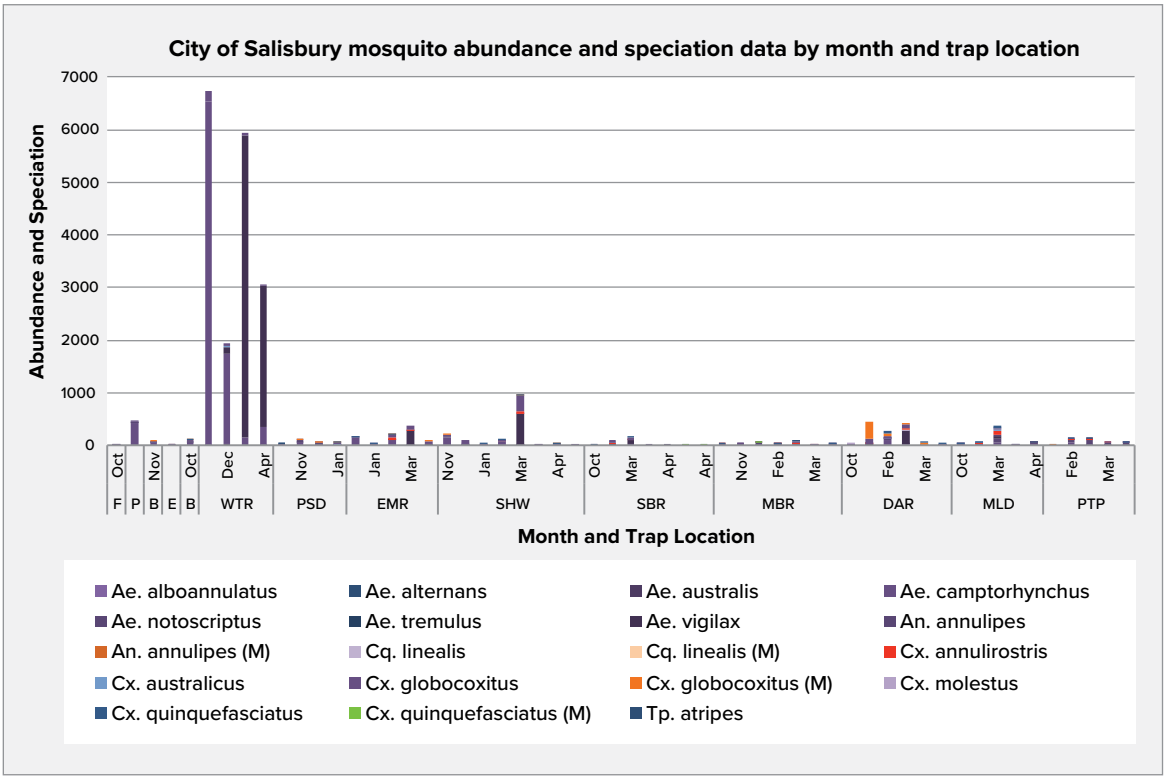


Figure 19 City of Salisbury Council mosquito abundance and species by month and trap location

City of Port Adelaide Enfield

The City of Port Adelaide Enfield enhanced their ongoing program of larval control within the council area. Council engaged a contractor to undertake larval control treatment at known high risk mosquito breeding sites during the 2021-22 mosquito season. Contractors assessed potential mosquito breeding and larval habitats to identify any new breeding sites to inform future planning. In addition, ad-hoc treatment was undertaken at high-risk locations as required.

Council provided public health messaging and education to the community through social media and produced a video as part of their on-going public health program.

Regional council mosquito surveillance and control

Barunga West Council

Officers of Barunga West Council undertook regular routine treatment and surveillance at known mosquito breeding sites. Established larval control points were inspected following rain events and king tides. Council also assessed potential mosquito breeding and larval habitats to identify any new breeding sites to inform future planning.

Council staff provided public health advice and information to the community using social media, local newspapers, and fight the bite campaign materials including brochures and leaflets.

District Council of Elliston

In response to increased mosquito activity and reported cases of RRV in the council area during the 2021-22 mosquito season, the District Council of Elliston engaged with HPP to obtain guidance on the development of a mosquito management plan.

In preparation for the implementation of an adult mosquito surveillance program during the 2022-23 mosquito season, an officer from council attended adult mosquito trapping training provided by HPP and was provided with adult mosquito trapping equipment to support surveillance activities. The District Council of Elliston prepared their mosquito management plan and developed their seasonal implementation plan to support mosquito monitoring, control, information management and public awareness activities for future seasons.

Council staff provided public health advice and information to the community via their website, social media, local community newsletters and fight the bite campaign materials.

Whyalla City Council

Whyalla City Council conducted adult mosquito trapping at two locations during December 2021 and February 2022. A total of 586 mosquitoes were with most abundant species being *Aedes camptorhynchus,* which accounted for 96% (n=560) of the total season catch.

Regular routine surveillance and control at mosquito breeding sites was undertaken between November 2022 and May 2022.

Arbovirus isolations from trapped mosquitos (whole trap grinds)

Trap catches from local councils, HPP targeted JEV surveillance trips, HPO trapping, and one round of trapping from the northern Adelaide surveillance program were all screened for arboviruses. Each batch of trapped mosquitoes sent to ICPMR was processed according to trap location, counted, identified to species level, and then ground and screened for viruses. One metropolitan council routinely sent trapped mosquitoes for speciation and enumeration, but not viral screening. However, mosquitoes trapped in this council area were screened for arboviruses in March and April 2022.

In mid-February 2022 Kokobera virus (KOKV) was detected in adult trapped mosquitoes in the Renmark Paringa Council area. Prior to this detection KOKV had not been detected in trapped mosquitoes in South Australia. Kokobera belongs to a group of unspecified flaviviruses, it can lead to a self-limiting febrile illness, in most individuals it presents as a headache, joint pain, muscle pain and general lethargy which can take months to clear, but in susceptible individuals may lead to more severe symptoms such as encephalitis. Kokobera is an uncommonly reported infection in humans, with only 3 confirmed cases in Australia between 2010-11.

In response to the JEV situation, the ICPMR viral screening program was expanded to include JEV in March 2022. Retrospective testing for JEV was undertaken for mosquitoes trapped earlier in the season. As a result of the retrospective testing, HPP was notified of the detection of JEV from mosquitoes trapped in mid-January 2022 in the Mid Murray Council area. Table 3 details the arbovirus isolations from trapped mosquitoes in South Australia during the 2021-22 mosquito season.

There were three detections of RRV from whole trap grinds from trapped mosquitoes during the 2021-22 mosquito season. The first detection was from mosquitoes trapped in the District Council of Loxton Waikerie in January 2022. The second and third detections were from mosquitoes trapped during March 2022. One of these detections was from mosquitoes trapped during routine surveillance by the City of Salisbury, the other was from mosquitoes trapped by HPP during targeted JEV surveillance in the Alexandrina Council area.

Table 3 Arbovirus isolations from whole trap grinds to April 2022

Arbovirus	RRV	BFV	MVEV	KUNV	KOKV	JEV
Alexandrina Council	1					
District Council of Loxton Waikerie	1					
Mid Murray Council						1
City of Salisbury	1					
Renmark Paringa Council					1	

10. South Australian Sentinel Surveillance Program

The aim of the South Australian Sentinel Surveillance Program has historically been to monitor for MVEV and KUNV in the environment before the presentation of human cases. 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. For the 2021-22 mosquito season bleeds commenced in October 2021 and concluded in April 2022.

In the early part of the 2021-22 mosquito season chicken blood samples were sent to ICPMR monthly and tested for MVEV and KUNV antibodies. In response to the JEV outbreak, chicken bleeding frequency was increased from monthly to weekly and screening was expanded to include testing for JEV antibodies. Viable samples from bleeds undertaken earlier in the season were also retrospectively tested for JEV.

As shown in table 4, blood samples taken from the Meningie flock on 18 February 2022 tested positive for MVEV antibodies. Blood samples taken from the same flock on 28 February 2022 returned positive results for both MVEV and JEV antibodies. These results suggest MVEV activity between 18 January 2022 and 18 February 2022 and JEV activity between 18 February 2022 and 28 February 2022. This was the third time sentinel chickens in South Australia have tested positive to MVEV since the program's inception in 2011, with the first being in autumn 2019-20 and the second being in summer 2020-21.

Retrospective testing of blood samples taken from the Murray Bridge flock on 29 March 2022 returned a positive result for JEV from one chicken. Blood samples taken from the flock on 8 March 2022 were negative for JEV indicating that the chicken became positive sometime between the two collection dates.

Increased demand for serological testing of sentinel chicken blood arising from the JEV outbreak resulted in delayed reporting of positive detections. Results for the blood samples collected in February 2022 were not received by HPP until April 2022.

Table 4 MVEV, KUNV and JEV results in sentinel chicken flocks

Collection Date	Flock	Tags	MVEV	KUNV	JEV
18/02/2022	Meningie	Black	Positive	Negative	Negative
		Blue	Positive	Negative	Negative
		Orange	Positive	Negative	Negative
28/02/2022	Meningie	Black	Positive	Negative	Positive
		Blue	Positive	Negative	Negative
		Orange	Positive	Negative	Positive
29/03/2022	Murray Bridge	Green	Negative	Negative	Positive
30/03/2022	Meningie	Black	Positive	Negative	Positive
		Blue	Positive	Negative	Negative
		Orange	Positive	Negative	Positive
05/04/2022	Murray Bridge	Green	Negative	Negative	Positive
19/04/2022	Murray Bridge	Green	Negative	Negative	Positive
03/05/2022	Murray Bridge	Green	Negative	Negative	Positive

11. Notification 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 detailed in section 8, human cases of JE were notified to CDCB in 2022. These are the first known locally acquired cases of JEV in South Australia.

As shown in figure 20, the number of RRV and BFV cases reported in South Australia was greater in 2021-22 than in the previous two seasons with cases peaking between January 2022 and April 2022. There were 223 RRV and BFV infections for the 2021-22 financial year compared to 113 cases in 2020-21 and 47 cases in 2019-20. Although numbers were greater in 2021-22 than the previous financial years, there were significantly fewer cases reported than the 2010-11 financial year where 1298 arbovirus infections were notified to CDCB.

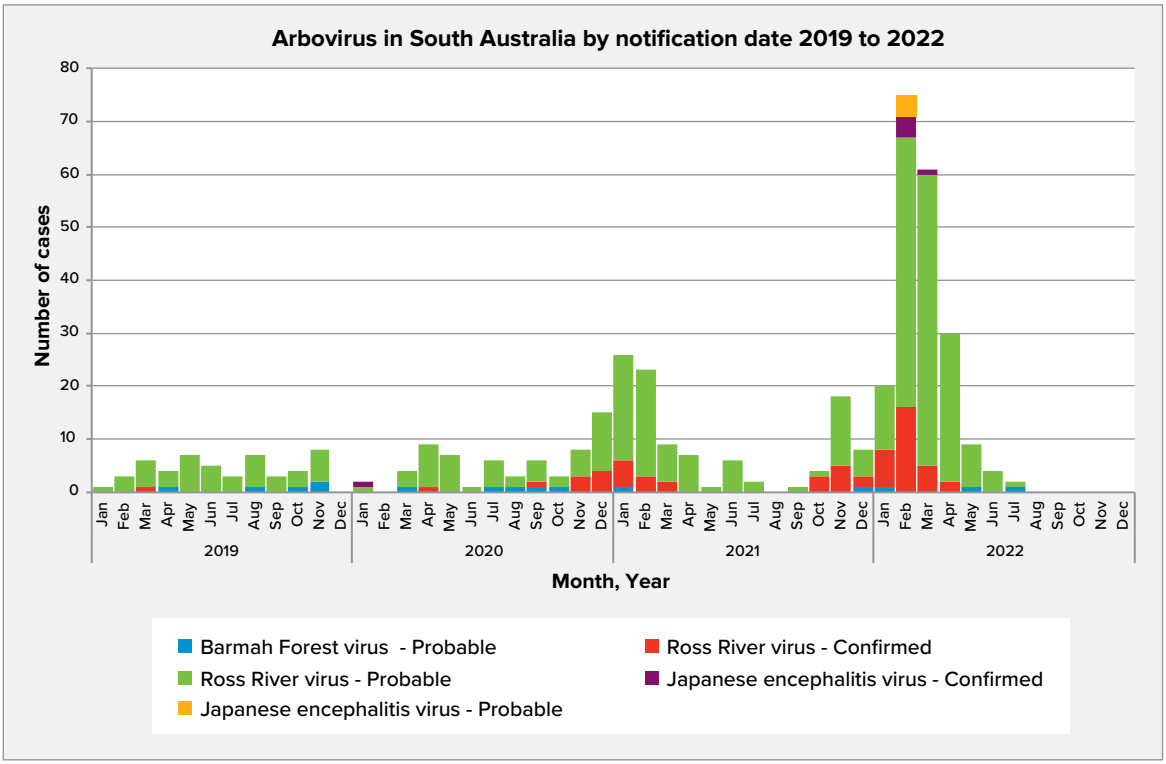


Figure 20 Arbovirus notifications in South Australia by notification date 2019-22 year to date

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 2021-22 financial year there were 220 cases of RRV infection notified in South Australia this was an increase compared to 108 cases notified in 2020-21 and 42 cases notified in 2019-20.

Barmah Forest virus (BFV)

Historically, BFV infection has been 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 2021-22 financial year there were three cases of BFV notified in South Australia. There were five notified cases in both the 2020-21 and 2019-20 seasons.

Japanese encephalitis virus (JEV)

Most people with Japanese encephalitis virus infection do not experience any illness. Patients with JEV infection may experience mild symptoms such as fever and headache. A small proportion will have encephalitis (inflammation of the brain). This may begin with symptoms such as tiredness, fever and headache, nausea, vomiting, or diarrhoea. Confusion, unusual behaviour, sleepiness, seizures, weakness, and abnormal movements may develop. Encephalitis can cause permanent damage to the nervous system or death. Japanese encephalitis is confirmed through a combination laboratory testing and clinical assessment.

In 2021-22 there were nine cases of JEV notified in South Australia. Reported cases of JEV comprised of six males and three females with an age range from 33 years to 79 years (median age 67 years). All notified cases of JEV were hospitalised, and two cases died.

Exposure locations

For the 2021-22 season, 65% of cases with infections between July 2021 and June 2022 were medically notified with information regarding their likely place of exposure. When cases are not medically notified, residential address is used as likely place of exposure.

Most infections recorded in 2021-22 were likely acquired in River Murray council areas accounting for 33% of cases, like previous seasons. The greatest number of arbovirus infections in the River Murray Council area for the 2021-22 season were likely acquired in the Mid Murray Council area which accounted for 10% of cases. The District Council of Loxton Waikerie and Berri Barmera Council together accounted for 11% of cases as their likely exposure locations.

The Rural City of Murray Bridge Council had the fewest arbovirus infection notifications of all the River Murray councils at 1% of cases. In 2021-22, the distribution of cases reporting exposures outside of the River Murray council area increased compared to the two previous seasons, particularly from Eyre Peninsula with 28% of cases. Elliston and Lower Eyre Peninsula councils reported 12% and 7% of cases respectively.

There were no cases with reported exposures from Kangaroo Island. Further to this, 5% of infections were reported to be acquired from central regions (including York Peninsula, Barossa, and Clare) and 3% of infections were from the lower South-East. An additional 4% of infections were reported to be acquired interstate.

Of the notified JEV cases, eight cases reported travel during their incubation period, one to Wentworth in New South Wales and seven cases had travelled to River Murray locations in South Australia.

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 2021-22 financial year, there was one Chikungunya case, one Dengue fever case, four Malaria cases, and no cases of overseas acquired JEV notified in South Australia. As shown in figure 21, exotic mosquito-borne disease notifications were reduced compared to the 2019-20 financial year. The most likely cause of this decline is the impact of COVID-19 on global travel.

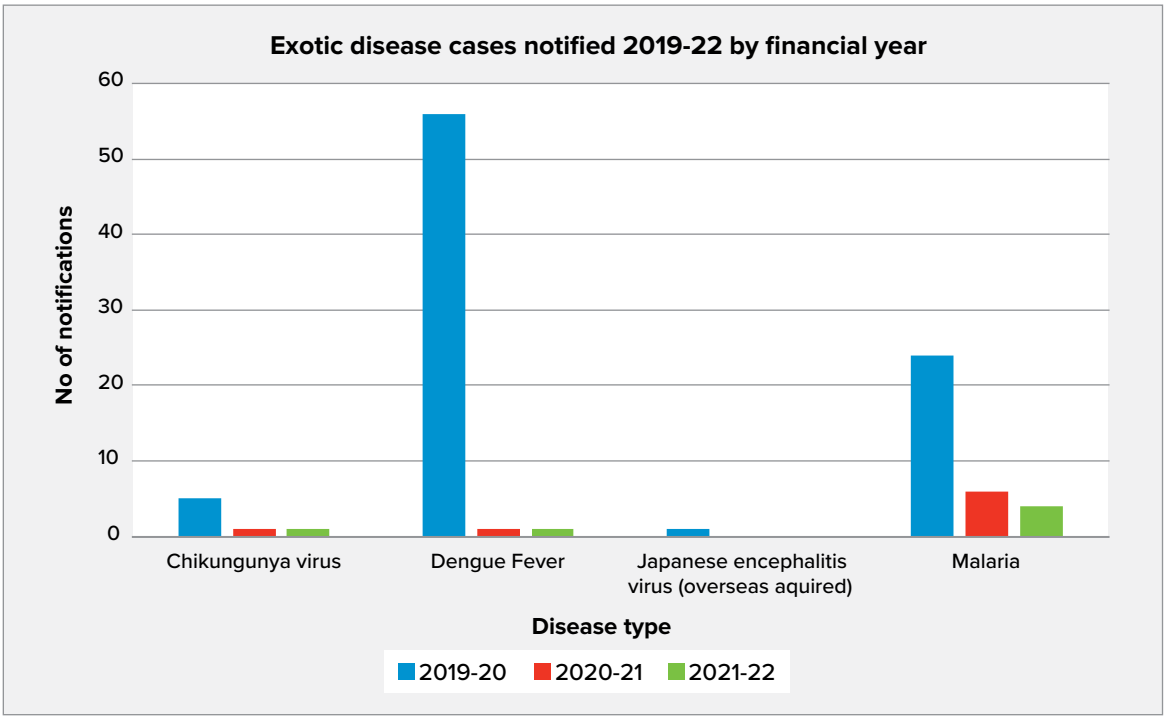


Figure 21 Exotic disease notifications in South Australia by Financial year - three-year comparison 2019-22

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, Water and the Environment (DAWE) conduct exotic mosquito detection surveillance and mitigation activities at international ports. DAWE performs mosquito vector monitoring within a 400m perimeter at international air and seaports and identifies mosquito breeding sites within the port area for remediation. DAWE 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, DAWE 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.

In October 2021, SA Health was notified by DAWE that live larvae and pupa of Asian Tiger Mosquitoes (*Aedes albopictus*) had been detected in imported goods at Port Adelaide Sea port. Further investigation identified that some of the imported goods had been transported to two other sites (in Penfield and Two Wells) outside of the port area. Prior to this event there had been no detections of exotic mosquitoes at SA ports since 2016 and no reported post border detections.

In response to the detection, SA Health, in conjunction with DAWE, initiated comprehensive surveillance and control operations. This involved extensive adulticide and larvicide treatments at the four sites in addition to prolonged adult mosquito surveillance in the affected areas. The surveillance trapping program did not identify local breeding of this invasive species indicating that the response was successful. The SA Health surveillance trapping concluded on 28 October 2021. DAWE will continue surveillance at the Port Adelaide seaport where the infested imported goods arrived.

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

As a result of the federal declaration of the JEV situation as a Communicable Disease Incident of National Significance, South Australia will receive funding under the Federation Funding Agreement (the Agreement). The total financial contribution of $2.7 million over the period of 18 April 2022 to 30 June 2023 will be made available to support the surveillance and control (where area has confirmed JEV present) of JEV mosquito vectors outside of infected premises.

The federal funding will support the expansion of existing surveillance and control programs, the implementation of new programs, stakeholder engagement and additional resources and training where required. SA Health have provided a project outline to DoH detailing additional mosquito and JEV monitoring and surveillance strategies and actions over the Agreement period.

Reporting

SA Health will report progress at agreed intervals against the key performance measures outlined in the project outline to the DoH in accordance with the terms of the Agreement.

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 and larval mosquito surveillance, which are available on the SA Health website. HPP intend to extend the range of videos to include larval 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.

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
- Healthy Environs
- 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
  - District Council of Elliston
  - Kingston District Council
  - Mid Murray Council
  - Mount Barker District 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

Table 5 Arbovirus response cross agency group

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
District Council of Loxton Waikerie	SA Health, CDCB
Environmental Protection Authority	SA Health, HPO
Mid Murray Council	SA Water
Mount Barker District Council	

Appendix 3: Northern Adelaide mosquito surveillance program trapping locations

Table 6 Northern Adelaide mosquito surveillance trap 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

Appendix 4: Health Protection Operations trapping locations

Table 7 Health Protection Operations mosquito surveillance trap locations

Trap Code	Trap Name	Location	Latitude / Longitude
CP1	Wetlands	Coober Pedy	-29.019387/ 134.752012
CP2	Wetlands	Coober Pedy	-29.018373/ 134.750529
CP3	Treatment outlet	Coober Pedy	-28.9954384/ 134.7617001
CP4	Treatment outlet	Coober Pedy	-28.996238/ 134.7617623
HW1	Hookeys waterhole	Oodnadatta	-27.59804/ 135.43549
AL1	Bridge	Algebuckina	-27.9016122/ 135.8077854
AL2	Waterhole	Algebuckina	-27.893655/ 135.826864
OO1	Riverbed	Oodnadatta	-27.55847/ 135.42561
OO2	House	Oodnadatta	-27.55511/ 135.43994
MD1	House	Mount dare	-26.1169444/ 135.4211111
DH1	Toilet female	Dalhousie Springs	-26.422714/ 135.503073
DH2	Toilet male	Dalhousie Springs	-26.423562/ 135.503299
WC1	Toilet	William creek	-28.907256/ 136.338447
WC2	Cabin	William Creek	-28.908932/ 136.337809
WC3	Septic	William Creek	-28.908464/ 136.338879

Appendix 5: South Australian River Murray councils trap locations

Table 8 River Murray councils mosquito surveillance 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
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

Council	Trap Code	Trap Name	Location	Latitude / Longitude
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
	R5	Ellen Park	Lyrup	-34.253611/ 140.64775
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

Appendix 6: South Australian non-River Murray councils trap locations

Table 9 South Australian non-River Murray councils mosquito surveillance trap locations

Council	Trap Code	Trap Name	Location	Latitude / Longitude
Mount Barker District Council	M1	Heyer Lane	Mount Barker	-35.029/ 138.908
	M2	Quarter Lane	Mount Barker	-35.09/ 138.864
	M3	Kennebec Court (Laver Rd)	Mount Barker	-35.086 /138.866
	M4	Rivergum Lane	Mount Barker	-35.079/138.864
	M5	Parkview Drive	Mount Barker	-35.071/ 138.882
	M6	Wellington Rd	Wistow	-35.119/ 138.896
	M7	Rule Court	Littlehampton	-35.041/ 138.865
	M8	Fidler Lane	Mount Barker	-35.096/ 138.87
	M9	Lavender Lane	Mount Barker	-35.092/ 138.87
	M10	Clem Lane	Littlehampton	-35.05/ 138.856
	M11	Taverner Rd	Wistow	-35.132/ 138.926
	M12	Sawyer	Mount Barker	-35.07/138.886
City of Salisbury Council	PWL001	Pledger Wetland	Mawson Lakes	-34.8118321/ 138.605969
	BWL0001	Burton Wetlands	Burton	-34.74595/ 138.590646
	EDB0001	Edinburgh	Edinburgh	-34.727424/ 138.622563
	WTS0001	Whiting Street	St Kilda	-34.734073/ 138.530451
	BWC0001	Blue Wren Circuit	Mawson Lakes	-34.813101/ 138.606591
	PSD0001	Parafield Stormwater Drain	Parafield Gardens	-34.790442/ 138.623874
	EMR001	Explosives Magazine Reserve	Dry Creek	-34.829285/ 138.581316
	SHW0001	Salisbury Highway	Salisbury	-34.812289/ 138.59624
	SBR0001	Springbank Boulevard Reserve	Burton	-34.742613/ 138.594044
	MBR0001	Myall Boulevard Reserve	Salisbury	-34.762739/ 138.626241
	DAR0001	Dutton Avenue Reserve	Mawson Lakes	-34.808952/ 138.601312
	MLD0001	Mawson Lakes Dog park	Mawson Lakes	-34.818722/ 138.616756
	PTP0001	Pooraka Triangle Park	Pooraka	-34.834893/ 138.615113
Whyalla City Council	SMT 1	Salt marsh	Whyalla	-33.04844/ 137.5679
	SMT 2	Salt marsh	Whyalla	-33.04766/ 137.5693

Appendix 7: Sentinel chicken flock locations

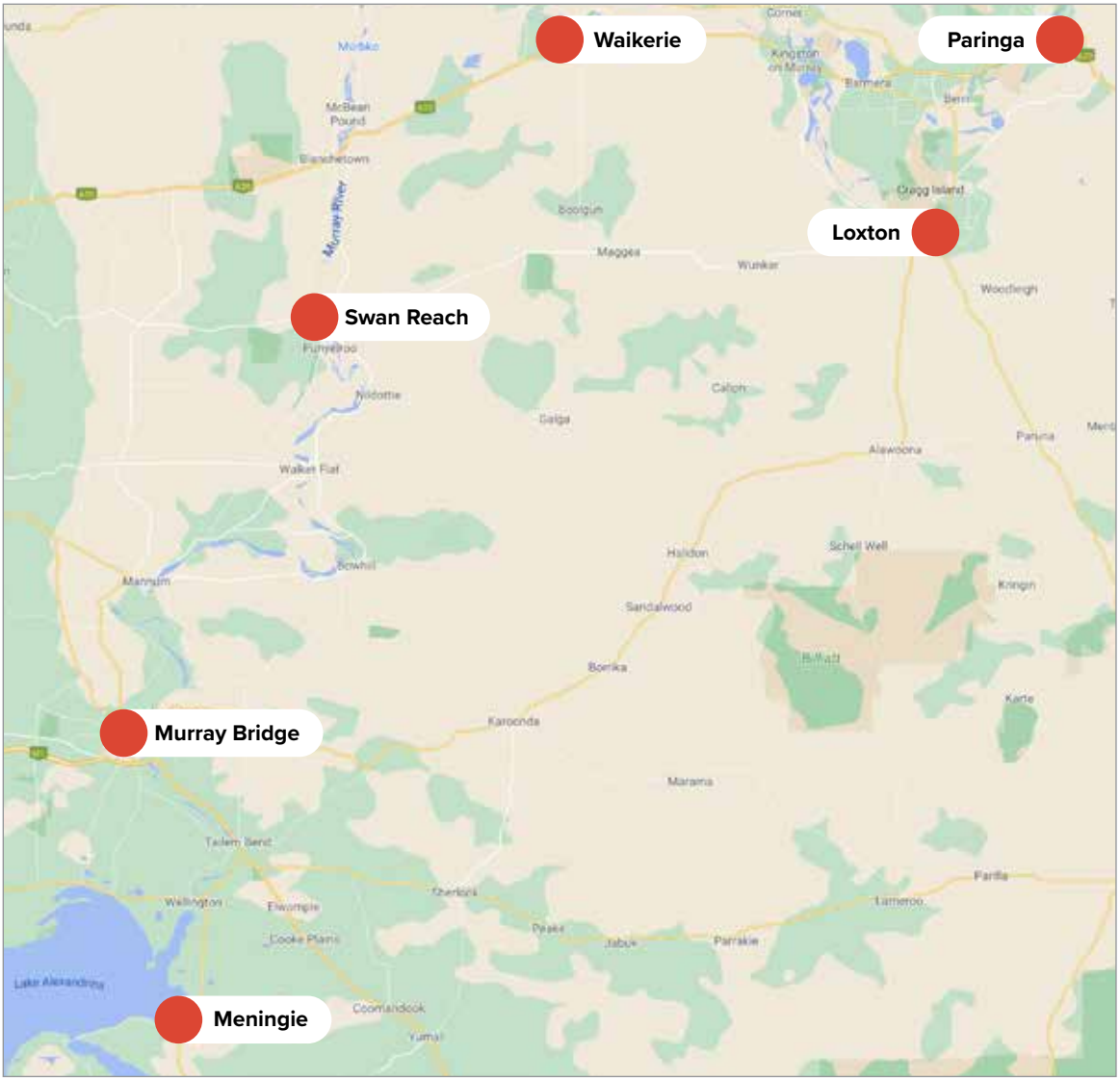


Figure 22 Sentinel chicken flock locations in South Australia

For more information

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