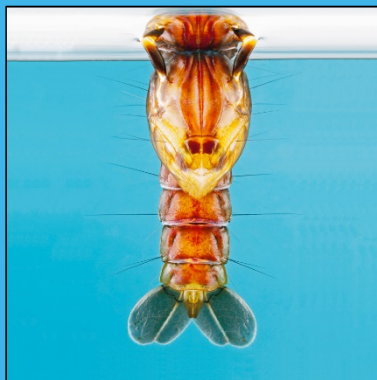


# NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2018-2019

Weekly Update: 21 December 2018



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**All reports for the season are available at:**

<https://www.health.nsw.gov.au/environment/pests/vector/Pages/nswasp-weekly-report-2018-19.aspx>

## Summary

- **Climate:** over the last week, the region of Sydney to the north coast and nearby ranges, experienced moderate levels of rainfall, while other areas had little rainfall. For November, rainfall was average for most of the state, with bands of above average precipitation across the inland. The north coast had below average rainfall. Maximum and minimum temperatures for November were slightly above average.
- **Three Month Forecast:** for January 2019 to March 2019, rainfall is predicted to be below average for NSW. Maximum and minimum temperatures are predicted to exceed the average. According to the Bureau of Meteorology (BOM) as of 18 December 2018, the El Niño Alert continues.
- **Tides:** the next series of high tides are due over 21-27 December 2018, with heights of over 2m predicted.
- **Murray Valley Encephalitis virus (MVEV) Models:** the data relevant to both the Forbes' and Nichol's hypotheses have been updated to November 2018. Neither model is suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland:** mosquito collections continue to be 'low' (<50 mosquitoes/trap) at most locations, although Griffith produced the first 'high' (100-1,000 mosquitoes/trap) collection of the season. Numbers at this site were only just 'high' and well below normal collections.
- **Mosquito Numbers Coast:** *Aedes vigilax* continue to be 'low' at all sites, with only Ballina and Kempsey yielding 'high' mosquito numbers.
- **Mosquito Numbers Sydney:** the mosquito numbers from the saline habitats (Homebush, Georges River, and Parramatta) have declined this week, but still remain 'very high' at Picnic Point (Georges River) and 'high' elsewhere. These collections were dominated by *Aedes vigilax*. The non-saline locations mostly produced 'low' numbers, although Muru Mittiger (Penrith) yielded 'high' numbers.
- **Arboviral Isolates:** there have been no arboviral isolates to date.
- **Chicken Sentinel Flocks:** all chickens were negative to MVEV and Kunjin virus (KUNV).
- **Human Notifications:** for the current fiscal year, there have been 191 Ross River virus (RRV) and 27 Barmah Forest virus (BFV) notifications, which is well below the previous four season average (315RRV and 38BFV).

**Comment:** the arbovirus season of 2018-2019 has so far, largely been unremarkable. Mosquito numbers from the inland have been well below average, there have been no isolates, nor any chicken seroconversions, and human notifications are around half the average.

The one exception is the unseasonably high numbers of saltmarsh mosquitoes from sites that encompass the saline habitats around Sydney. This week's collections were not quite as high as the last, although this is to be expected as adult numbers will decline between hatching cycles associated with high tides. However, the remaining mosquitoes will be older, which means that they have had the opportunity to feed on a viraemic vertebrate host and the virus imbibed has had the time to develop within the mosquito (known as the extrinsic

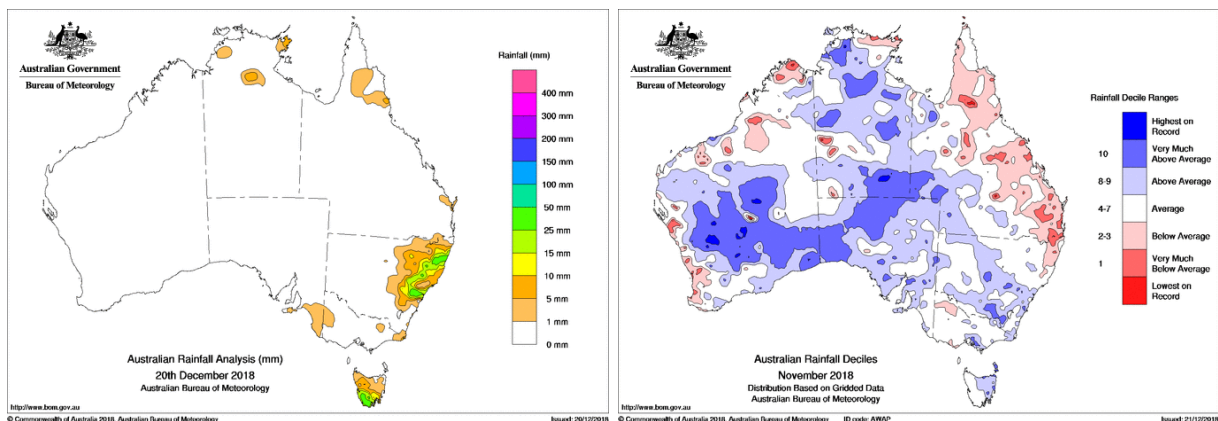
incubation period). The virus can then be transmitted during later blood meals. Thus an old mosquito is a more dangerous mosquito.

Over the next week starting today, there are a series of very high tides, plus showers are forecast for the coast for the next two days. The combination of rain and high tides is known to produce much larger *Aedes vigilax* hatches. Repeated large mosquito hatches can result in a more rapid escalation in enzootic arboviral cycles, increasing the risk of epidemics. It is therefore particularly important for communities in coastal areas to protect themselves against mosquitoes when outdoors this holiday season.

## Environmental Conditions

### Rainfall

Rainfall across Australia for the week ending 20 December 2018 is depicted on the left and monthly rainfall deciles for November 2018 are on the right. Over the last week, the region of Sydney to the north coast and nearby ranges, experienced moderate levels of rainfall, while other areas had little rainfall. For November, rainfall was average for most of the state, with bands of above average precipitation across the inland. The north coast had below average rainfall. Maximum and minimum temperatures for November were slightly above average for the state.



### Three Month Rainfall & Temperature Forecast

For January 2019 to March 2019, rainfall is predicted to be below average for NSW. Maximum and minimum temperatures are both predicted to exceed the average. The following webpages contain graphics of the seasonal outlook:

[www.bom.gov.au/climate/outlooks/#/rainfall/median](http://www.bom.gov.au/climate/outlooks/#/rainfall/median) (Rainfall outlook).

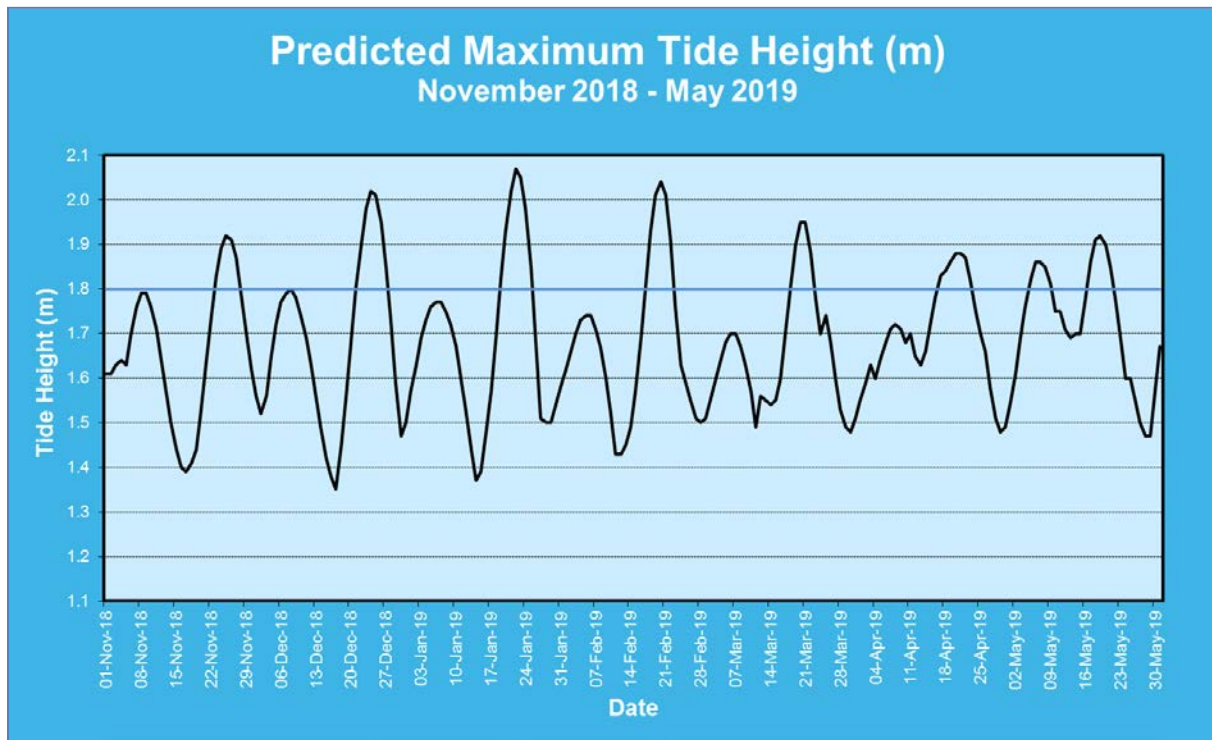
[www.bom.gov.au/climate/outlooks/#/temperature/summary](http://www.bom.gov.au/climate/outlooks/#/temperature/summary) (Max & min temperature outlook).

According to the BOM as of 18 December 2018, the El Niño Alert continues (which means that many, but not all the criteria have been met for an El Niño). A positive Indian Ocean Dipole (IOD) is now underway, however it has now weakened (positive IODs are associated with dry conditions across Australia, although has little influence on the nation's climate over December to April).

For more information: [www.bom.gov.au/climate/enso/](http://www.bom.gov.au/climate/enso/) and, [www.bom.gov.au/climate/iod/](http://www.bom.gov.au/climate/iod/)

## Tides

Tidal information is relevant for the prediction of the activity of the salt marsh mosquito, *Aedes vigilax*. Typically for NSW, tides of over 1.8m, as measured at Sydney, can induce hatching of *Aedes vigilax* larvae and the graph below of predicted tide heights can provide some indication of when this is likely to occur. Note this trigger height varies between regions, thus at Batemans Bay, a tide height over 0.8m can initiate egg hatching.



The next series of high tides are due over the next few days, 21-27 December 2018, with heights of over 2m predicted. At this stage it is not possible to determine the extent of the heights of the tides.

There are a small series of high tides that will occur over 5-8 January 2019, although the forecast heights is set to peak at 1.77m. This may not trigger any *Aedes vigilax* hatching.

Actual tide heights can vary by 0.3m (or more in unusual circumstances) due to variations in atmospheric pressure, rainfall, wind and other climatic phenomena. Sea level rise with climate change may also result increased tide heights. Thus predicted tide height should be used as a gauge only for potential *Aedes vigilax* activity. The larvae of the saltmarsh mosquito relies on an inundation/drying cycle for the mudflats in which it lives; continual wet weather prevents the drying cycles thereby reducing larval production.

## MVEV Climatic Models

Three predictive environmental based models for MVEV activity have been developed; the Forbes (which relies on rainfall in the river catchment basins of Eastern Australia), Nichols (based on the Southern Oscillation), and the Bennett theory (based on the Indian Ocean Dipole). The latter theory has low reliability and is not considered below. Note that all the predictive models have been developed on a limited data set and do not always forecast activity. There can also be unusual environmental conditions that may lead to the introduction of the virus to southeastern Australia, such as the movement of low pressure cells from the north to the south of the country during 2008 and 2011. Vertical transmission of the virus (from adult to the egg in *Aedes* species) can result in restricted activity following localised heavy precipitation (as per 2003 at Menindee).

### i. Forbes' Hypothesis

Rainfall was not above Decile 7 in all of the river catchment basins in eastern Australia for the last quarter of 2017, the first quarter of 2018, nor the last quarter of 2018 (Table 1). Thus Forbes' hypothesis for an MVEV outbreak has not been fulfilled.

**Table 1.** Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2018-2019 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2017	Jan-Mar 2018	Oct-Dec 2018*	Jan-Mar 2019
Darling River	0.93	0.52	0.84	
Lachlan/Murrumbidgee/Murray Rivers	1.15	0.70	0.77	
Northern Rivers	0.81	1.07	1.00	
North Lake Eyre system	0.75	0.69	0.73	

\*Data for October and November only

### ii. Nichol's Hypothesis

**Table 2.** The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2018-2019 season.

	Autumn 2018	Winter 2018	Spring 2018
<b>2018 Value</b>	1009.27	1011.8	1010.90
<b>Pre past MVEV seasons</b>	<1009.74	<1012.99	<1009.99

The Spring period pertaining to the Nichol's hypothesis is not in line with past MVEV active years.

## Arboviral Isolates

LOCATION – Site	Date Trapped	Mosquito Species	Virus
Nil to date			

## Exotic Detections

There were no further detections of exotic mosquitoes within New South Wales since the last report.



## Human Notifications

Weekly notifications of human mosquito-borne disease infections are available from the NSW Ministry of Health, Communicable Disease Weekly Report and summarized in the Table below\* ([www.health.nsw.gov.au/Infectious/reports/Pages/CDWR.aspx](http://www.health.nsw.gov.au/Infectious/reports/Pages/CDWR.aspx)).

**Table 4.** Notifications of mosquito-borne disease in NSW, 2018-2019\*

Week Ending	RRV	BFV	DENV <sup>†</sup>	Malaria <sup>†</sup>	CHIKV <sup>†</sup>	ZIKV <sup>†</sup>	Total
7-Jul-18	12	1	10	1	0	0	24
14-Jul-18	9	1	2	3	0	0	15
21-Jul-18	5	2	3	2	0	0	12
28-Jul-18	8	1	6	3	0	0	18
4-Aug-18	4	0	8	3	0	0	15
11-Aug-18	8	3	6	1	0	0	18
18-Aug-18	12	0	3	1	0	0	16
25-Aug-18	8	1	2	1	0	0	12
1-Sep-18	8	0	0	0	0	0	8
8-Sep-18	5	1	2	2	0	0	10
15-Sep-18	13	4	1	5	0	0	23
22-Sep-18	5	0	5	1	0	0	11
29-Sep-18	7	2	5	2	0	0	16
6-Oct-18	10	0	2	1	0	0	13
13-Oct-18	9	0	2	4	0	0	15
20-Oct-18	7	0	5	2	1	0	15
27-Oct-18	11	0	8	1	0	0	20
3-Nov-18	10	0	5	0	1	0	16
10-Nov-18	7	3	6	0	3	0	19
17-Nov-18	5	3	9	2	0	0	19
24-Nov-18	4	1	8	0	0	0	13
1-Dec-18	11	1	14	1	1	0	28
8-Dec-18	11	1	5	0	2	0	19
15-Dec-18	1	1	3	0	0	0	5
22-Dec-18							
29-Dec-18							

RRV = Ross River virus; BFV = Barmah Forest virus; DENV = Dengue virus; CHIKV = Chikungunya virus; ZIKV = Zika virus. <sup>†</sup>All of these viruses are acquired overseas, although some DENV cases may be from North Queensland. \*The data in this table is updated once available from the NSW Ministry of Health.

**Comment:** It should also be noted that notifications are for NSW residents and that the infection may have been acquired elsewhere. Winter notifications of RRV and BFV are unlikely to be recent infections or may be false positives.

**Table 4 cont.** Notifications of mosquito-borne disease in NSW, 2018-2019\*

Week Ending	RRV	BFV	DENV <sup>†</sup>	Malaria <sup>†</sup>	CHIKV <sup>†</sup>	ZIKV <sup>†</sup>	Total
5-Jan-19							
12-Jan-19							
19-Jan-19							
26-Jan-19							
2-Feb-19							
9-Feb-19							
16-Feb-19							
23-Feb-19							
2-Mar-19							
9-Mar-19							
16-Mar-19							
23-Mar-19							
30-Mar-19							
6-Apr-19							
13-Apr-19							
20-Apr-19							
27-Apr-19							
4-May-19							
11-May-19							
18-May-19							
25-May-19							
1-June-19							
8-June-19							
15-June-19							
22-June-19							
29-June-19							
<b>Total</b>	<b>190</b>	<b>26</b>	<b>120</b>	<b>36</b>	<b>8</b>	<b>0</b>	<b>380</b>

RRV = Ross River virus; BFV = Barmah Forest virus; DENV = Dengue virus; CHIKV = Chikungunya virus; ZIKV = Zika virus.

<sup>†</sup>All of these viruses are acquired overseas, although some DENV cases may be from North Queensland.

\*The data in this table is updated once available from the NSW Ministry of Health.

**Table 5.** Ross River virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2013 to Jun 2019\*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2014-2015	38	50	46	67	59	90	117	305	431	264	102	50	<b>1,619</b>
2015-2016	54	61	53	61	70	54	42	60	78	79	52	16	<b>680</b>
2016-2017	12	11	20	17	38	216	429	274	200	142	174	89	<b>1,622</b>
2017-2018	29	37	52	56	37	31	30	39	51	74	96	70	<b>602</b>
2018 - 2019	32	41	30	45	32	11							<b>191</b>
Ave <sup>†</sup>	<b>33</b>	<b>40</b>	<b>43</b>	<b>50</b>	<b>51</b>	<b>98</b>	<b>155</b>	<b>170</b>	<b>190</b>	<b>140</b>	<b>106</b>	<b>56</b>	<b>1,132</b>

\*updated 21 December 2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).

<sup>†</sup>Average for 2014-15 to 2017-18.

Table modified from: <http://www1.health.nsw.gov.au/IDD/#/ROSS>

**Table 6.** Barmah Forest virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2014 to Jun 2019\*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2014-2015	10	3	11	11	8	4	12	17	43	43	16	11	<b>189</b>
2015-2016	6	9	7	9	6	3	4	5	2	3	10	2	<b>66</b>
2016-2017	4	3	0	0	1	9	9	5	8	6	24	24	<b>93</b>
2017-2018	8	10	6	8	8	6	5	12	8	10	8	7	<b>96</b>
2018 - 2019	4	6	5	2	6	4							<b>27</b>
Ave <sup>†</sup>	<b>7</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>15</b>	<b>16</b>	<b>15</b>	<b>11</b>	<b>113</b>

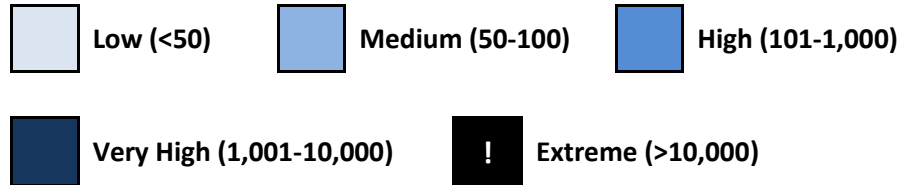
\*updated 21 December 2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).

<sup>†</sup>Average for 2014-15 to 2017-18.

Table modified from: <http://www1.health.nsw.gov.au/IDD/#/BF>

## Mosquito Results

Mosquito abundance is best described in relative terms, and in keeping with the terminology from previous NSW Arbovirus Surveillance and Mosquito Monitoring Program Annual Reports, mosquito numbers are depicted in the tables below as:



Each location represents the average for all trapping sites at that location.

## Inland

Location	Mosquito	Oct-18				Nov				Dec					Jan-19				Feb				Mar				
		7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31
Albury	<i>Cx. annul</i>																										
	Total Mosq.																										
Bourke	<i>Cx. annul</i>																										
	Total Mosq.																										
Forbes	<i>Cx. annul</i>																										
	Total Mosq.																										
Griffith	<i>Cx. annul</i>																										
	Total Mosq.																										
Leeton	<i>Cx. annul</i>																										
	Total Mosq.																										
Macquarie Marshes	<i>Cx. annul</i>																										
	Total Mosq.																										
Wagga	<i>Cx. annul</i>																										
	Total Mosq.																										

## Coastal

Location	Mosquito	Nov-18				Dec				Jan-19				Feb				Mar				Apr							
		4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28		
Ballina	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Coffs Harbour	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Gosford	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Kempsey	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Lake Macquarie	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Port Macquarie	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Tweed	<i>Ae. vigilax</i>																												
	Total Mosq.																												
Wyong	<i>Ae. vigilax</i>																												
	Total Mosq.																												

## Sydney

Location	Mosquito	Nov-18				Dec					Jan-19				Feb				Mar					Apr				
		4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28	
Banks-town	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Blacktown	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Georges River	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Hawkes-bury	<i>Cx. annul</i>																											
	Total Mosq.																											
Hills Shire	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Parramatta	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Penrith	<i>Ae. vigilax</i>																											
	Total Mosq.																											
Sydney Olympic Park	<i>Ae. vigilax</i>																											
	Total Mosq.																											

## Sentinel Chicken Flocks – MVEV and Kunjin Virus Antibody Test Results

Location	Oct	Nov				Dec					Jan-19				Feb				Mar				Apr				
	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	7	14	21	28	
Deniliquin			15N	15N	15N	15N																					
Dubbo*																											
Forbes			12N	12N	12N	14N																					
Griffith		15N	15N	15N	15N	15N																					
Hay		15N	15N	15N	15N	15N																					
Leeton	15N	15N	15N	15N	15N	15N																					
Macquarie Marshes		15N		15N	15N	15N	15N																				
Menindee		15N		15N	15N	15N																					
Moree				15N	15N	15N	15N																				

N= Negative for MVEV & Kunjin virus

\*Dubbo is commencing monitoring in January 2019.

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