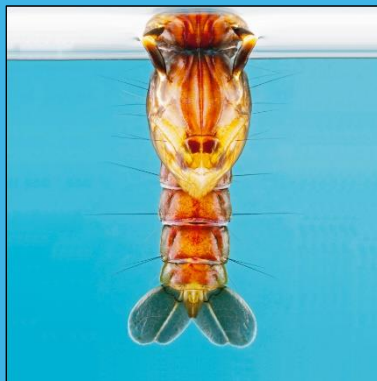


NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2018-2019

Weekly Update: Season Preamble



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Summary

- **Climate:** over the last three months, rainfall has been very much below average across the state, with central regions having record low precipitation. For September, the north coast had above average rainfall, although the remainder of the state had very dry conditions.
- **Three Month Forecast:** rainfall predictions for November 2018 to January 2019 are for below average precipitation for most of the state. Maximum and minimum temperatures are predicted to exceed the average. According to the BOM as of 9/Oct/2018, the El Niño–Southern Oscillation has been raised to an ‘El Niño Alert’, with a 70% chance of an El Niño occurring late in this year.
- **Tidal:** over 23-28/November there are a series of high tides that are forecast to reach over 1.9m and this may trigger *Aedes vigilax* hatching.
- **MVEV models:** the data relevant to both the Forbes’ and Nichols’ hypotheses have been updated to Oct 2018. Neither model is suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland:** surveillance activities are due to begin in November.
- **Mosquito Numbers Coast:** surveillance activities are due to begin in December.
- **Mosquito Numbers Sydney:** surveillance activities are due to begin in December.
- **Arboviral Isolates:** surveillance activities are due to begin in November.
- **Chicken Sentinel Flocks:** surveillance activities are due to begin in November.
- **Human Notifications:** for the current fiscal year, there have been 123 RRV and 16 BFV notifications, which is slightly below the previous four season average. However, notifications at this time of the year are either false positives or not recent infections.

Comment: this is the first report for the 2018-2019 season of the NSW Arbovirus Surveillance Program in advance of the initiation of surveillance activities. Over the last few months rainfall has been very much below average. Current indications are that conditions will stay much the same, at least until January of next year, with the possible formation of an El Niño late in the year. With the dry (and hot) conditions ahead, it is expected that mosquito numbers should not be extraordinary.

The recent rains have caused the hatch of some nuisance mosquito species such as *Aedes notoscriptus* and so remember to empty water holding containers around the house. As rainfall has been so low over the last few months, much of the recent rainfall has been rapidly absorbed into the soil meaning that pools are not forming that can provide larval habitat. Thus, these rains are not expected to result in major vector activity.

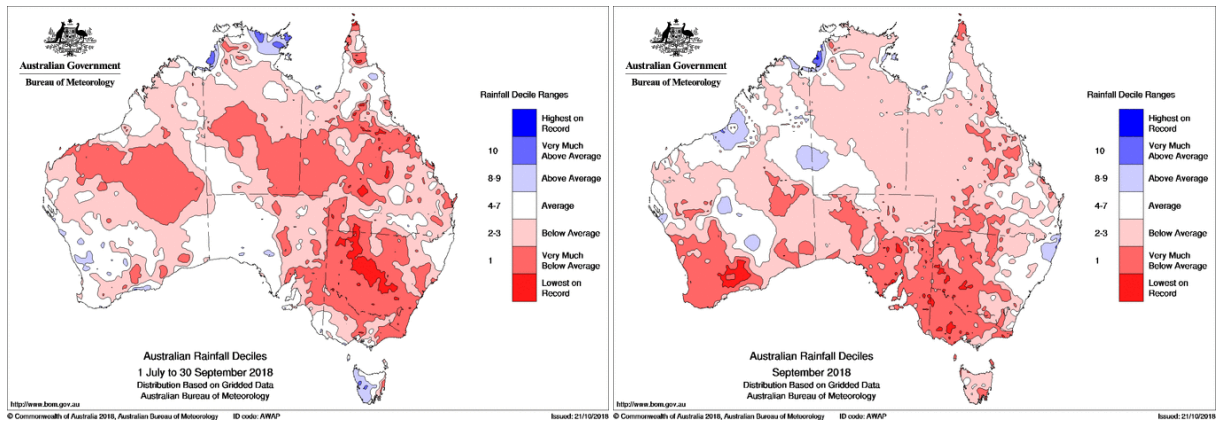
There are series of very large tides in December, January and February, with heights of over 2m predicted. These are likely to trigger *Aedes vigilax* hatching. Dry conditions tend to favour this species resulting in higher pest numbers.

The next report will be released after the completion of the first week of mosquito trapping.

Environmental Conditions

Rainfall

Rainfall deciles for Australia over July to September is depicted on the below left, while rainfall deciles for September is on the right. As can be seen, over recent months rainfall has been below to very much below average for most of the state. Maximum temperatures and minimum temperatures over these periods have been close to average.



Three Month Rainfall & Temperature Forecast

For November 2018 to January 2019, rainfall is predicted to be below average for most of NSW. Maximum and minimum temperatures are predicted to exceed the average. The following pages contain graphics of the seasonal outlook:

www.bom.gov.au/climate/outlooks/#/rainfall/median (Rainfall outlook).

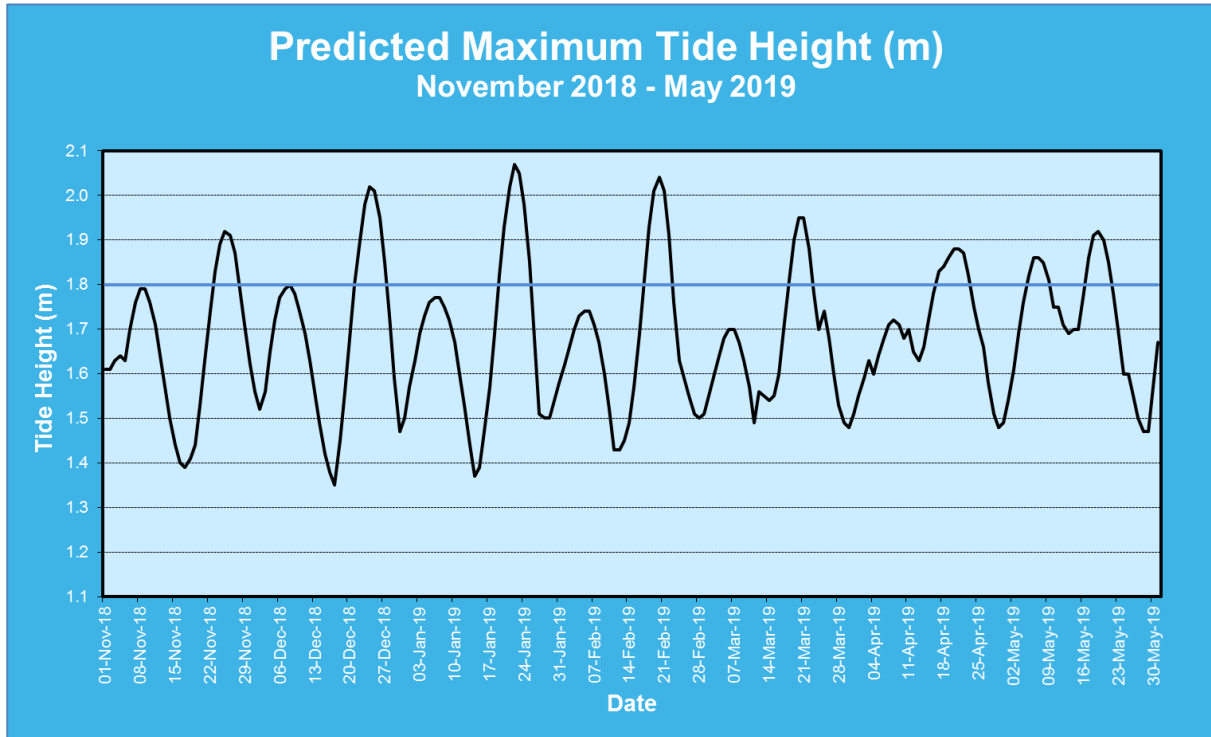
www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 9/Oct/2018, the El Niño–Southern Oscillation has been raised to an ‘El Niño Alert’, with a 70% chance of an El Niño occurring in 2018. The Indian Ocean Dipole (IOD) has been positive for the last four weeks, but a positive IOD is only declared if the value persists to November (positive IODs are associated with dry conditions across Australia). These indices suggests that rainfall patterns are likely to be below average in the upcoming months.

For more information: www.bom.gov.au/climate/enso/ and, <http://www.bom.gov.au/climate/iod/>

Tidal

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 height varies between regions, thus at Batemans Bay, a tide height over 0.8m can trigger egg hatching.



In November there is a small series of high tides over 7-10/November, although the maximum heights are predicted to be just short of 1.8m. Over 23-28/November there are a series of high tides that are forecast to reach over 1.9m and this may trigger some *Aedes vigilax* hatching.

Note that 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. Climate change will also result in much higher 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 a 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	0.85	
Lachlan/Murrumbidgee/Murray Rivers	1.15	0.70	0.44	
Northern Rivers	0.81	1.07	0.77	
North Lake Eyre system	0.75	0.69	0.52	

*Data for October 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*
2018 Value	1009.27	1011.8	1012.30
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

*Data for October only

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



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).

Table 4. Notifications of Mosquito-Borne Disease in NSW, 2018-2019*

Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	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							
27-Oct-18							
3-Nov-18							
10-Nov-18							
17-Nov-18							
24-Nov-18							
1-Dec-18							
8-Dec-18							
15-Dec-18							
22-Dec-18							
29-Dec-18							
Total	123	16	57	30	0	0	226

[†]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 infection may have been acquired elsewhere and that winter notifications of RRV are likely to be false positives.

Table 4 cont. Notifications of Mosquito-Borne Disease in NSW, 2018-2019*

Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	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							
Total	123	16	57	30	0	0	226

[†]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 May 2018*.

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	1,619
2015-2016	54	61	53	61	70	54	42	60	78	79	52	16	680
2016-2017	12	11	20	17	38	216	429	274	200	142	174	89	1,622
2017-2018	29	37	52	56	37	31	30	39	51	74	96	70	602
2018 - 2019	32	40	29	19									120
Ave [†]	33	40	43	50	51	98	155	170	190	140	106	56	1,131

*updated 22/Oct/2018 (this table is updated at different times to Table 4 above, hence there may be differences in the numbers).

[†]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 May 2018*.

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	189
2015-2016	6	9	7	9	6	3	4	5	2	3	10	2	66
2016-2017	4	3	0	0	1	9	9	5	8	6	24	24	93
2017-2018	8	10	6	8	8	6	5	12	8	10	8	7	96
2018 - 2019	4	6	5	0									15
Ave [†]	7	6	6	7	6	6	8	10	15	16	15	11	111

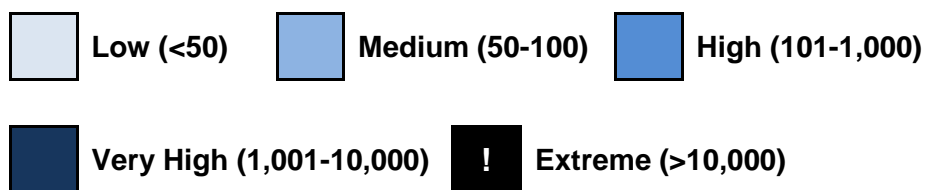
*updated 22/Oct/2018 (this table is updated at different times to Table 4 above, hence there may be differences in the numbers).

[†]Average for 2014/15 to 2017/18.

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

Mosquito Results

Mosquito abundances are best described in relative terms, and in keeping with the terminology from previous NSWASP Annual Reports, mosquito numbers are depicted on the tables below as:



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

Inland

Location	Mosquito	Oct-17				Nov				Dec					Jan-18				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.																										
Griffith	<i>Cx. annul</i>																										
	Total Mosq.																										
Leeton	<i>Cx. annul</i>																										
	Total Mosq.																										
Macquarie Marshes	<i>Cx. annul</i>																										
	Total Mosq.																										
Mathoura	<i>Cx. annul</i>																										
	Total Mosq.																										
Wagga	<i>Cx. annul</i>																										
	Total Mosq.																										

Coastal

Location	Mosquito	Oct-17				Nov					Dec				Jan-18				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
Ballina	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Coffs Harbour	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Gosford	<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.																										
Penrith	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Sydney Olympic Park	<i>Ae. vigilax</i>																										
	Total Mosq.																										

Sentinel Chicken Flocks

Location	Oct-17					Nov				Dec					Jan-18				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		
Deniliquin																												
Dubbo																												
Forbes																												
Griffith																												
Hay																												
Leeton																												
Macquarie Marshes																												
Menindee																												
Moree																												

N= Negative for MVEV & KUNV

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