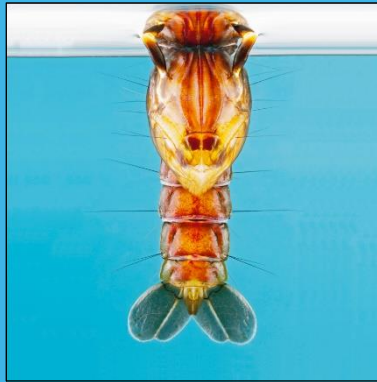


NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2017-2018

Weekly Update: 2/Feb/2018



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Summary

- **Climate:** over the last week, there was light rainfall across the entire state. For January, rainfall was below average for the north east of the state and average elsewhere.
- **Three Month Forecast:** for February to April 2018, rainfall predictions for NSW are for average precipitation for most of the state, with a slight chance of exceeding the average along the coast. Maximum and minimum temperatures are expected to be below average. According to the BOM as of 30/Jan/2018, the weak La Niña has reached its peak and due to end in autumn, hence the drier conditions of late.
- **Tidal:** there is a series of high tides currently occurring over 29/Jan to 4/Feb and these were predicted to peak at 2.04m. However, on 1/Feb, tide heights reached 2.19m.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of Dec 2017. Both models are not suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland:** cooler conditions, coupled with the recent dry weather, meant that mosquitoes numbers were lower this week..
- **Mosquito Numbers Coast:** Ballina and Tweed continue with the 'high' catches and included a diversity of mosquito species, with few *Aedes vigilax*. Other sites were mostly 'low'.
- **Mosquito Numbers Sydney:** trapping started at Georges River this week and mosquito numbers were 'high'.
- **Arboviral Isolates:** there were no further arboviral detections this week.
- **Chicken Sentinel Flocks:** there have been no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 250 RRV and 49 BFV notifications, this is well below the average compared with recent years (the averages to the end of January are 464RRV and 43BFV).

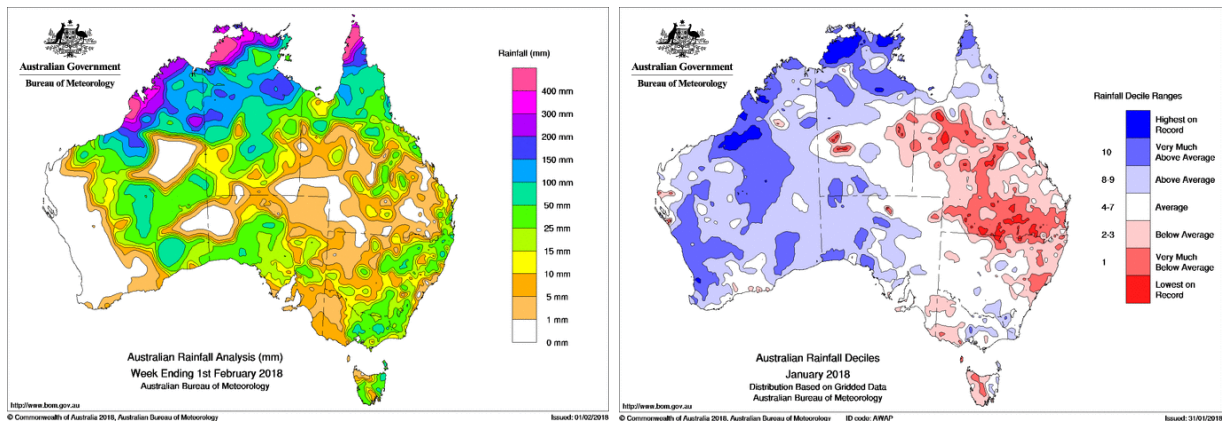
Comment: La Niña has appeared to have reached its zenith and is now on the decline. Thus we can expect rainfall patterns to be average ahead, as predicted by the three month forecast. Thus barring unusual local climatic conditions, or events associated with remanent tropical cyclones, we can probably expect unremarkable arboviral activity for the remainder of the season.

This week has been quite cool, which has clearly affected the mosquito activity, with catches generally down. Coupled with the dry conditions across the inland, collections from this region have dropped significantly. For the coast, the high spring tides may lead to increased *Aedes vigilax* hatching, but for the most part, the very high tides this year has not resulted in massive mosquito emergence along most of the coast. On the whole, a very quiet arboviral season so far and this is probably unlikely to change.

Environmental Conditions

Rainfall

Rainfall across Australia for the week ending 1/Feb/2018 is depicted on the left and monthly rainfall deciles for December 2017 are on the right. Over the last week, there was light rainfall across the entire state. For January, rainfall was below average for the north east of the state and average elsewhere. Maximum and minimum temperatures for January were well above average; up to five degrees higher than normal in the west of the state.



Three Month Rainfall & Temperature Forecast

For February to April 2018, rainfall predictions for NSW are for average precipitation for most of the state, with a slight chance of exceeding the average along the coast. Maximum and minimum temperatures are expected to be below average. The following pages contain graphics of the seasonal outlook:

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

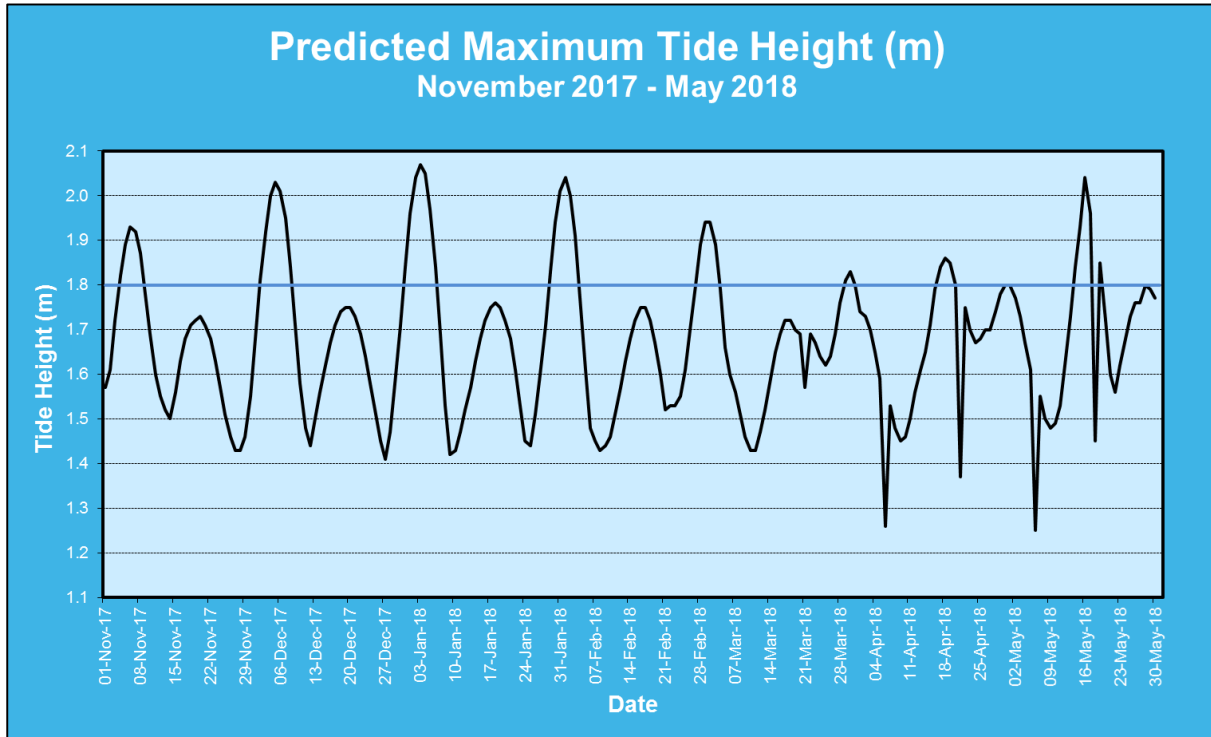
www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 30/Jan/2018, the weak La Niña is probably past its peak and should end in autumn. The Indian Ocean Dipole (IOD) remains neutral. This all suggests that rainfall patterns are likely to return to normal 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.



There is a series of high tides currently occurring over 29/Jan to 4/Feb and these were predicted to peak at 2.04m. However, on 1/Feb, tide heights reached 2.19m. There is a small series of high tides over 16-17/Feb, heights predicted to be 1.75m. The next larger series are due over 27/Feb to 4/Mar, with heights of 1.94m being predicted. In recent tides, the actual tide has surpassed that of the predicted.

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 is poorly developed (and unreliable), 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 localized 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 2016 or for the first quarter of 2017 (Table 1). For the last quarter of 2017, rainfall was above Decile 7 in only one catchment basin.

Table 1. Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2017-2018 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2016	Jan-Mar 2017	Oct-Dec 2017*	Jan-Mar 2018
Darling River	0.58	0.81	0.93	
Lachlan/Murrumbidgee/Murray Rivers	0.92	1.01	1.15	
Northern Rivers	0.98	1.03	0.81	
North Lake Eyre system	1.09	0.73	0.75	

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2017-2018 season.

	Autumn 2017	Winter 2017	Spring 2017
2017 Value	1009.60	1013.23	1009.70
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

Only the Winter 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
GRIFFITH – Lake Wyangan	3/Jan/2018	<i>Culex annulirostris</i>	Ross River

*Detection via Honey-Baited Cards, the mosquito species cannot be determined.

Human Notifications

Weekly notifications of human mosquito-borne diseases 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, 2017-2018*

Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	Total
1-Jul-17	14	6	3	2	0	0	25
8-Jul-17	6	4	0	4	1	0	15
15-Jul-17	8	0	2	1	0	0	11
22-Jul-17	10	3	7	2	0	0	22
29-Jul-17	6	0	2	2	0	0	10
5-Aug-17	8	0	4	0	0	0	12
12-Aug-17	11	1	3	2	5	0	22
19-Aug-17	5	2	1	2	2	0	12
26-Aug-17	6	3	3	2	0	1	15
2-Sep-17	6	0	1	0	1	0	8
9-Sep-17	14	0	1	2	1	0	18
16-Sep-17	9	1	5	0	0	0	15
23-Sep-17	9	1	3	1	0	0	14
30-Sep-17	7	0	1	1	1	0	10
7-Oct-17	7	0	3	2	0	0	12
14-Oct-17	10	1	2	1	0	0	14
21-Oct-17	11	2	8	2	1	0	24
28-Oct-17	16	1	6	1	1	0	25
4-Nov-17	14	3	7	3	1	0	28
11-Nov-17	5	2	7	0	0	0	14
18-Nov-17	3	2	10	0	0	0	15
25-Nov-17	9	2	6	1	1	0	19
2-Dec-17	14	1	8	0	0	0	23
9-Dec-17	9	0	3	1	0	0	13
16-Dec-17	9	4	2	1	2	0	18
23-Dec-17	7	0	6	0	0	0	13
30-Dec-17	5	0	1	0	0	0	6
Total	238	39	105	33	17	1	433

[†]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 5. Ross River virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2013 to January 2018*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2013-2014	36	23	27	36	30	30	33	35	44	72	86	57	509
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	51	55	34	30	14						250
Ave [†]	36	37	37	46	51	101	156	169	188	140	107	55	1121

*updated 2/Feb/2018 (this table is updated more regularly than Table 4 above, hence there may be differences in the numbers).

[†]Average for 2013/14 to 2016/17.

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 January 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	7	6	4						49
Ave [†]	7	5	6	7	5	5	8	9	18	17	17	12	116

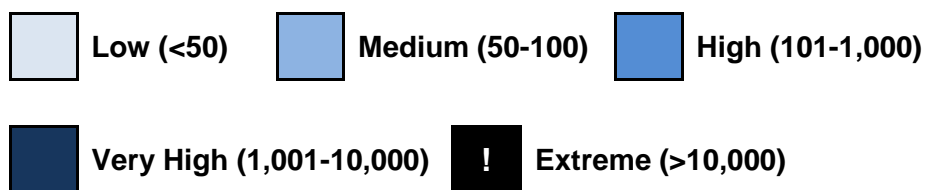
*updated 2/Feb /2018 (this table is updated more regularly than Table 4 above, hence there may be differences in the numbers).

[†]Average for 2014/15 to 2016/17.

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						
		1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25			
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	Nov				Dec					Jan-18				Feb				Mar				Apr				
		5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25	1	8	15	22	29
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				Dec					Jan-18				Feb				Mar				Apr				
		5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25	1	8	15	22	29
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>Ae. vigilax</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.																										
Ryde	<i>Ae. vigilax</i>																										
	Total Mosq.																										

Sentinel Chicken Flocks

Location	Oct-17					Nov				Dec					Jan-18				Feb				Mar			
	1	8	15	22	29	5	12	19	26	3	10	17	21	28	7	14	21	28	4	11	18	25	4	11	18	25
Bourke																										
Deniliquin						15N	14N	15N	15N	15N	15N	15N	15N	15N	15N											
Dubbo						15N	15N	15N	15N	15N	14N	14N	14N	14N	14N	14N										
Forbes						15N		15N	15N	15N	14N															
Griffith					15N	15N	15N	15N	15N	15N	15N	15N		15N	15N											
Hay					15N	15N	15N	15N	15N	15N	15N			15N	15N	15N										
Leeton						15N	15N		15N	15N	15N	15N	15N	15N	15N	14N										
Macquarie Marshes							15N	15N	15N	15N	15N		15N	15N		15N										
Menindee										15N	15N	15N	15N	15N	15N	15N										
Moama																										
Moree										15N	15N		15N	15N	15N	15N										
Wee Waa																										

N= Negative for MVEV & KUNV

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