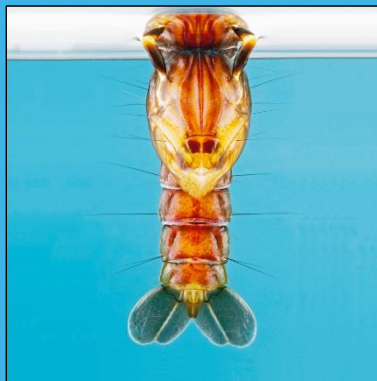


NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2017-2018

Weekly Update: 9/Mar/2018



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Contents

Summary	2
Comment.....	2
Environmental Conditions	3
Rainfall	3
Three Month Rainfall & Temperature Forecast	3
Tidal	4
MVEV Climatic Models	5
Forbes' Hypothesis.....	5
Nichol's Hypothesis	5
Arboviral Isolates	6
Exotic Detections	6
Human Notifications	7
Monthly RRV notifications	9
Monthly BFV notifications.....	9
Mosquito Results	10
Inland	11
Coastal.....	12
Sydney	13
Sentinel Chicken Flocks	14

Summary

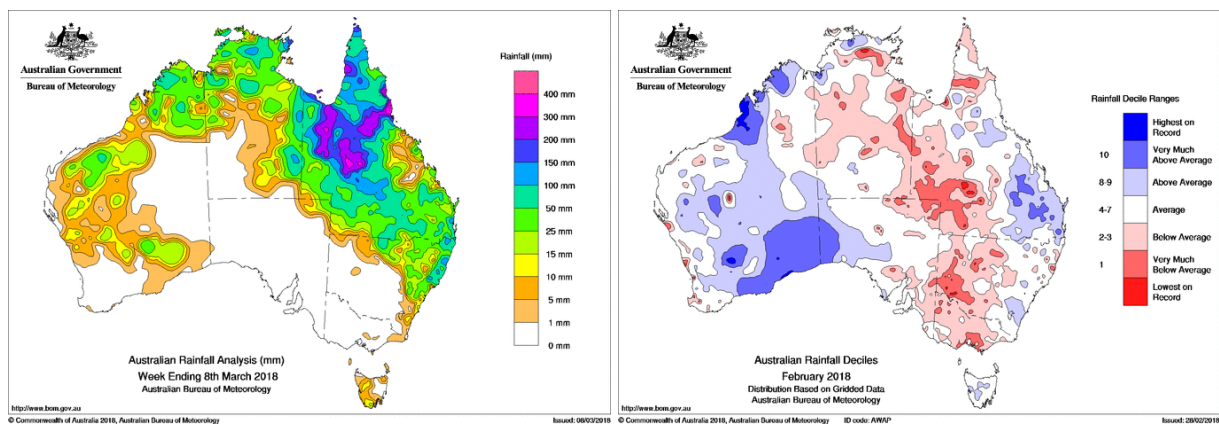
- **Climate:** over the last week, there was moderate to heavy rainfall in the north east, and tended to heavier along the north coast. For February, rainfall was below to very much below average across the inland and around average for the coast.
- **Three Month Forecast:** for March to May 2018, rainfall predictions for NSW are for average precipitation for the coast, and below average precipitation in the far west. Maximum and minimum temperatures are expected to be above average in the west of the state and around average for the coast. According to the BOM as 27/Feb/2018, the weak La Niña continues its decline and will end in early autumn.
- **Tidal:** a series of high tides that may trigger *Aedes vigilax* hatching occurred over 27/Feb to 4/Mar, with heights of 1.96m being reached.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of Feb 2018. Neither model are suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland:** all sites trapped 'low' mosquito numbers.
- **Mosquito Numbers Coast:** mosquito numbers were well up this week and 'very high' from Tweed, with a particularly large collections of *Aedes vigilax*. Ballina, Gosford, Lake Macquarie and Port Macquarie all produced a 'high' catch.
- **Mosquito Numbers Sydney:** the saltmarsh sites of Georges River and Homebush yielded 'high' collections, while everywhere else was 'low'.
- **Arboviral Isolates:** there was one detection of Barmah Forest virus from Empire Bay in the Central Coast from the collection made on 27/Feb/2018.
- **Chicken Sentinel Flocks:** there have been no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 303 RRV and 59 BFV notifications, this is well below the average compared with past years (the prior 18 season averages to the end of February are 320RRV and 192BFV).

Comment: a series of cooler nights across the inland along with the recent dry conditions meant that collections were 'low' from all trapping locations. This suggests that the inland mosquito year is virtually over for this season. In contrast, the big wet in Queensland has extended into northern NSW producing a notable increase in mosquito numbers, including the salt marsh mosquito, *Aedes vigilax*. In spite of arbovirus activity being low so far, we may yet see a late seasonal spike in activity with the higher mosquito numbers.

Environmental Conditions

Rainfall

Rainfall across Australia for the week ending 8/Mar/2018 is depicted on the left and monthly rainfall deciles for February 2018 are on the right. Over the last week, there was moderate to heavy rainfall in the north east, and tended to heavier along the north coast. For February, rainfall was below to very much below average across the inland and around average for the coast. Maximum and minimum temperatures for February were 1-2 degrees above average and higher in the west of the state.



Three Month Rainfall & Temperature Forecast

For March to May 2018, rainfall predictions for NSW are for average precipitation for the coast, and below average precipitation in the far west. Maximum and minimum temperatures are expected to be above average in the west of the state and around average for the coast. The following pages contain graphics of the seasonal outlook:

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

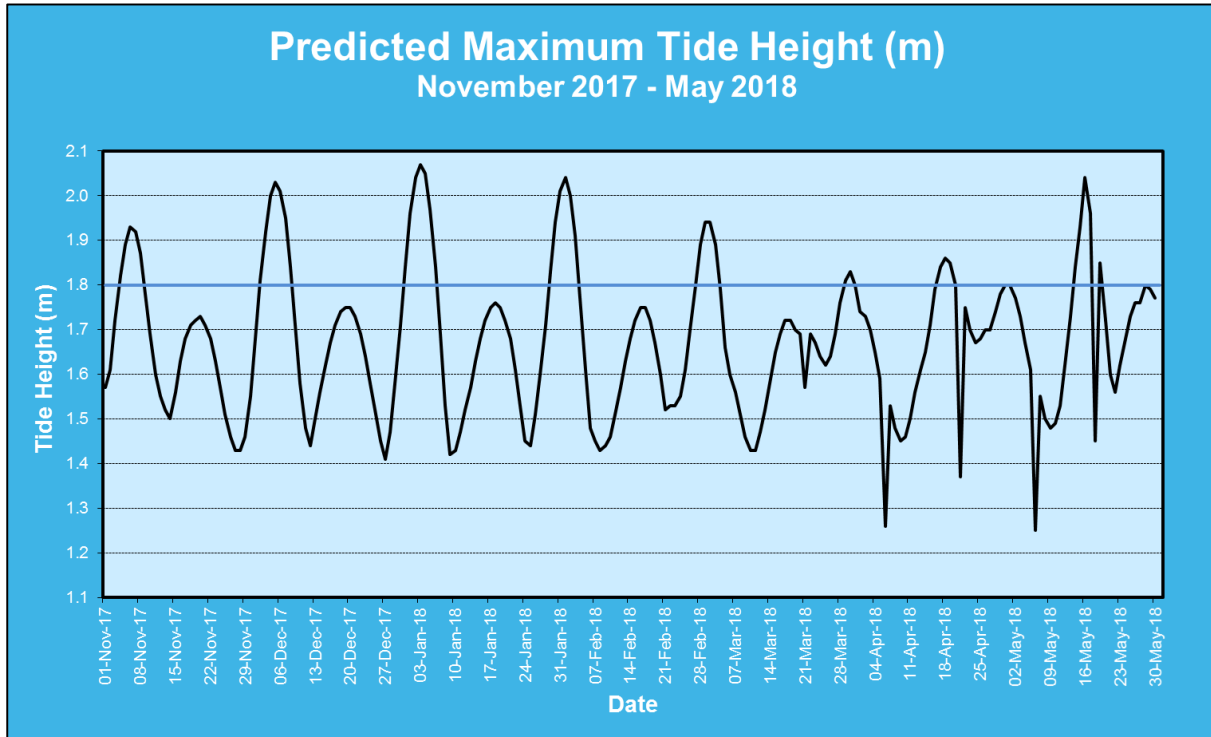
www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 27/Feb/2018, the La Niña continues its decline and will end in early 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.



A series of high tides that may trigger *Aedes vigilax* hatching occurred over 27/Feb to 4/Mar, with heights of 1.94m being predicted, with tides of 1.96m being reached, as measured at Sydney. The next series of high tides that may trigger *Aedes vigilax* hatching are predicted to occur over 28-31/Mar to 4/Mar, with heights of 1.83m being 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	0.51
Lachlan/Murrumbidgee/Murray Rivers	0.92	1.01	1.15	1.02
Northern Rivers	0.98	1.03	0.81	0.99
North Lake Eyre system	1.09	0.73	0.75	0.40

*January & February data only

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
GEORGES RIVER - Deepwater	30/Jan/2018	*	Stratford
GRIFFITH – Lake Wyangan	31/Jan/2018	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Hanwood	5/Feb/2018	<i>Culex annulirostris</i>	Ross River
GEORGES RIVER – Alford's Point	7/Feb/2018	*	Stratford
GEORGES RIVER - Deepwater	12/Feb/2018	<i>Aedes vigilax</i>	Stratford
CENTRAL COAST – Empire Bay	27/Feb/2018	*	Barmah Forest

*Detection via PCR on pooled samples; 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 4 cont. Notifications of Mosquito-Borne Disease in NSW, 2017-2018*

Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	Total
6-Jan-18	5	0	4	2	1	0	12
13-Jan-18	2	2	13	1	0	0	18
20-Jan-18	6	0	9	0	1	0	16
27-Jan-18	3	0	10	1	0	0	14
3-Feb-18	9	3	8	1	0	0	21
10-Feb-18	8	2	6	0	0	0	16
17-Feb-18	4	2	3	0	0	0	9
24-Feb-18	0	1	3	1	1	1	7
Total	275	49	161	39	19	1	518

†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 February 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	35	31	28	35	2				303
Ave [†]	27	26	25	30	35	42	65	71	86	78	68	37	589

*updated 9/Mar/2018 (this table is updated at different times to Table 4 above, hence there may be differences in the numbers).

[†]Average for 2001/02 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 February 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	4	9	0				59
Ave [†]	21	19	18	22	25	21	32	35	48	51	49	28	367

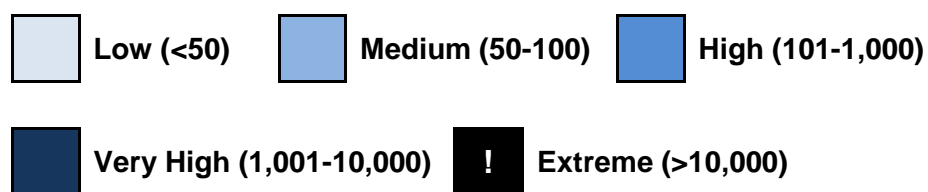
*updated 9/Mar/2018 (this table is updated at different times to Table 4 above, hence there may be differences in the numbers).

[†]Average for 2001/02 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.																										

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	14N	14N	15N	15N	15N							
Dubbo						15N	15N	15N	15N	15N	14N	14N	14N	14N	14N	14N	14N	14N	14N	14N							
Forbes						15N		15N	15N	15N	14N							15N	15N								
Griffith					15N	15N	15N	15N	15N	15N	15N	15N		15N	15N	15N	15N	15N	15N	15N							
Hay					15N	15N	15N	15N	15N	15N	15N			15N	15N	15N	15N	15N									
Leeton						15N	15N		15N	15N	15N	15N	15N	15N	15N	14N	14N	14N	14N	14N							
Macquarie Marshes							15N	15N	15N	15N	15N		15N	15N		15N	15N	15N		15N							
Menindee										15N	15N	15N	15N	15N	15N	15N	15N	15N	14N	15N							
Moama																											
Moree										15N	15N		15N	15N	15N	15N	15N	15N	15N	15N							
Wee Waa																											

N= Negative for MVEV & KUNV

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