NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2015-2016
W e e k l y U p d a t e

Date: 12/Feb/2016

SUMMARY

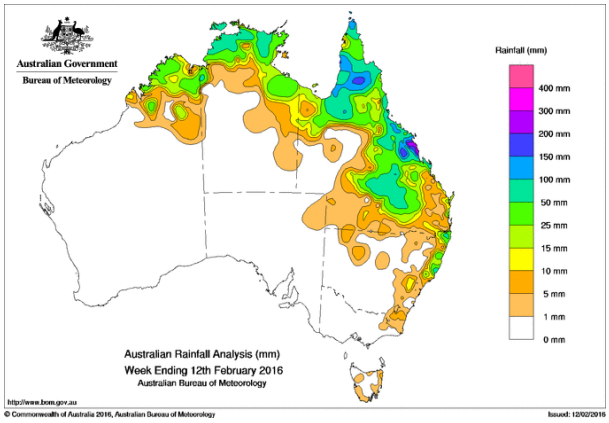
- **Climate**: over the last week, rainfall was light and was largely confined to the coast and north east. For January, rainfall was above average for most of the state and well above average for the south east. Maximum and minimum temperatures for January were mostly around average.
- **Three Month Forecast**: for February to April 2016, rainfall predictions for NSW are for slightly above average rainfall for most of state. Maximum and minimum temperatures are expected to be slightly cooler than normal. According to the BOM as of 2/Feb/16, the El Niño remains strong but continues to decline and should become neutral by the second quarter of 2016.
- **Tidal**: the current high tides have led to the inundation of the salt marshes along eastern Australia and *Aedes vigilax* numbers are expected to rise next week. The next series of high tides are due over 7-12/Mar/2016.
- **MVEV models**: the data relevant to both the Forbes' and Nichols' hypotheses have been updated to January 2016 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland**: mosquito numbers are up this week at Griffith and 'very high', although below the long term average. Elsewhere numbers remain 'low'.
- **Mosquito Numbers Coast**: the trend in mosquito numbers remain unchanged with collections being largely unremarkable and *Aedes vigilax* remaining 'low'.
- **Mosquito Numbers Sydney**: 'high' collections were made at several Sydney sites, although 'low' numbers of *Aedes vigilax* were mostly trapped.
- **Arboviral Isolates**: there was one detection of Edge Hill virus from Port Macquarie from mosquitoes collected on 8/Feb/2016.
- **Chicken Sentinel Seroconversions**: no further report has been issued.
- **Human Notifications**: for the current fiscal year, there have been 475 RRV and 49 BFV notifications. The notifications for 2016 are lower than the previous two years.

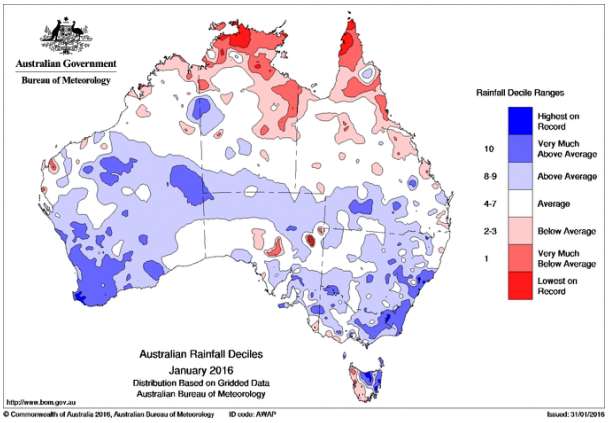
Comment: despite the first arboviral detection from mosquitoes this year, this season continues to be relatively quiet on the arboviral front. Following the high tides this week, we are expecting a rise in *Aedes vigilax* collections. There have been no further detections of *Aedes aegypti* at Sydney Airport. The NSW Ministry of Health and Medical Entomology continues to collaborate with the Department of Agriculture and Water Resources, and the Sydney Airport Corporation Limited, to identify potential risks associated with the possible introduction of exotic mosquitoes.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 11/Feb/2016 is depicted on the left and monthly rainfall deciles for January 2016 are on the right. Over the last week, rainfall was light and was largely confined to the coast and north east. For January, rainfall was above average for most of the state and well above average for the south east. Maximum and minimum temperatures for January were mostly around average.





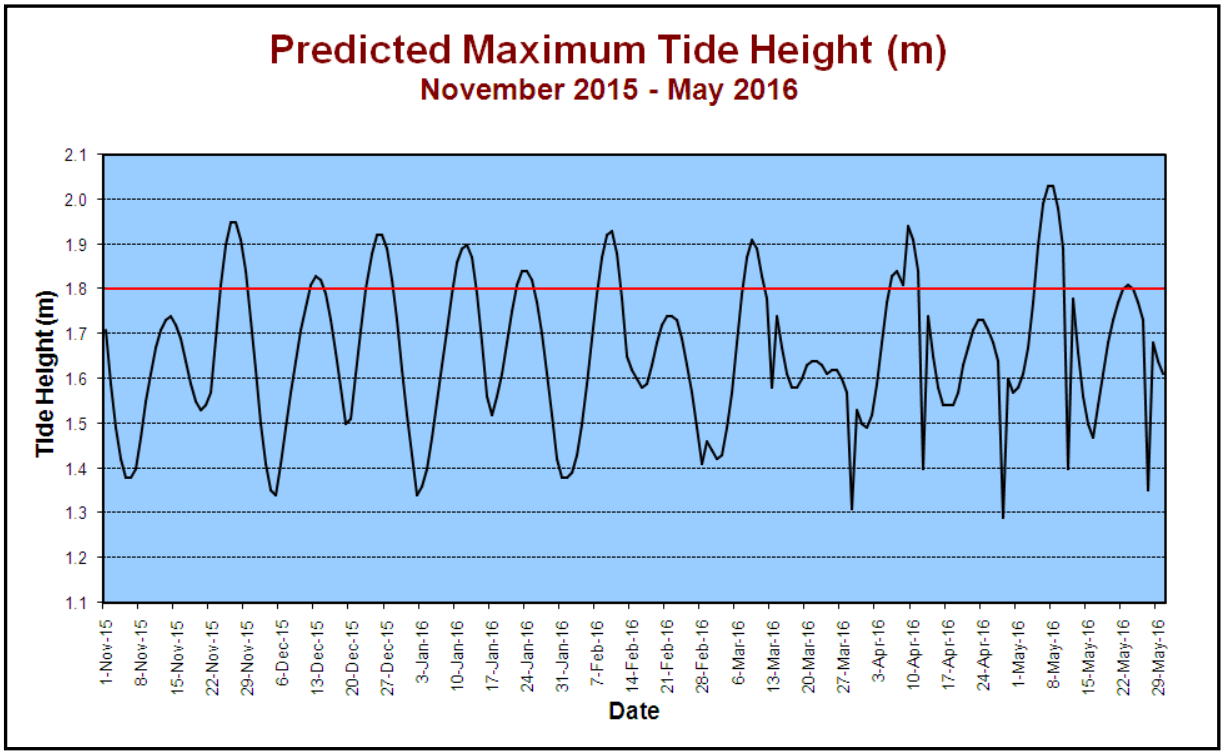
Three Month Rainfall & Temperature Forecast

For February to April 2016, rainfall predictions for NSW are for slightly above average rainfall for most of state. Maximum and minimum temperatures are expected to be slightly cooler than 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 2/Feb/16, the current El Niño is remaining strong but continues to decline and models suggest a return to neutral by the second quarter of 2016 (note: an El Niño is associated with decreased rainfall eastern Australia, whereas a La Niña is associated with increased rainfall). For more information: www.bom.gov.au/climate/enso/

On 2/Jan/16, the BOM released the Australian Annual Climate Statement for 2015 (www.bom.gov.au/climate/current/annual/aus/). The highlights include: 2015 was the fifth hottest year on record, with the last three months being especially warm; the El Niño event was one of the strongest recorded to date; and rainfall nationally was down by 5%.

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 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.

The current series of high tides has led inundation of the wetlands at Homebush Bay, with an aerial treatment ensuing (C. Webb, *pers. comm.*). In southeast Queensland, the tides were above predicted and an extensive treatment was undertaken around the Brisbane area (M. Muller, BCC, *pers. comm.*). It is probably that *Aedes vigilax* will increase substantially next week.

The next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 7-12/Mar/2016.

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. 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.

Full tidal information and the implications of the tide heights relevant to the breeding of the salt marsh mosquito, *Aedes vigilax*, can be obtained from: http://medent.usyd.edu.au/arbovirus/climate/tideheights201516.htm

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 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 2014 or most of the catchments for the first quarter of 2015 (Table 1). For the Oct-Dec 2015 period, rainfall was not above Decile 7 in all catchment basins. For Jan-Mar 2016, based on the January data alone, rainfall was not above Decile 7 in all catchment basins.

Table 1. Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2015-2016 season. Note that a value of 1 equals Deciles 7 rainfall.

Catchment Basin	Oct-Dec 2014	Jan-Mar 2015	Oct-Dec 2015	Jan-Mar 2016*
Darling River	0.80	0.65	0.72	1.23
Lachlan / Murrumbidgee / Murray Rivers	0.97	1.05	0.70	5.82
Northern Rivers	0.94	0.67	1.35	0.55
North Lake Eyre system	1.07	0.67	1.35	0.54

*Data for January 2016 only

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2015-2016 season.

	Autumn 2015	Winter 2015	Spring 2015
2015 Value	1010.83	1014.37	1014.57
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

None of seasonal periods pertaining to the Nichol's hypothesis are in line with past MVEV active years.

ARBOVIRAL ISOLATES

LOCATION - Site	Date Trapped	Mosquito Species	Virus
PORT MACQUARIE – Stevens St	8/Feb/16	*	EHV

*Detection via Honey-Baited Cards, mosquito species can not be determined.
http://medent.usyd.edu.au/arbovirus/results/virusisolates.htm

HUMAN NOTIFICATIONS

Weekly notifications of human mosquito-borne diseases infections are available from the NSW Ministry of Health, Communicable Disease Weekly Report and summarised in the Table below*:
www.health.nsw.gov.au/Infectious/reports/Pages/CDWR.aspx

Notifications of Mosquito-Borne Disease in NSW, 2015-2016*

Week Ending	RRV	BFV	DENV†	Malaria†	CHIKV†	ZIKV†	Total
5-Jul-15	14	4	5	2	0	0	25
12-Jul-15	13	3	2	0	1	0	19
19-Jul-15	7	0	4	1	0	0	12
26-Jul-15	19	0	3	0	0	0	22
2-Aug-15	21	2	4	1	0	0	28
9-Aug-15	12	3	1	0	0	0	16
16-Aug-15	16	3	4	2	1	0	26
23-Aug-15	12	1	2	2	0	0	17
30-Aug-15	27	2	5	2	0	0	36
6-Sep-15	8	3	6	1	0	0	18
13-Sep-15	12	0	3	0	1	0	16
20-Sep-15	24	5	1	0	0	0	30
27-Sep-15	11	0	1	1	0	0	13
4-Oct-15	16	2	1	0	0	0	19
11-Oct-15	11	2	4	0	0	0	17
18-Oct-15	17	1	5	0	0	0	23
25-Oct-15	19	2	4	1	0	0	26
1-Nov-15	16	2	5	1	0	0	24
8-Nov-15	17	2	6	2	0	0	27
15-Nov-15	25	2	4	1	0	0	32
22-Nov-15	19	1	4	0	0	0	24
29-Nov-15	19	3	8	4	0	0	34
6-Dec-15	13	1	5	0	0	0	19
13-Dec-15	15	0	7	1	0	0	23
20-Dec-15	17	0	8	0	0	0	25
27-Dec-15	15	0	3	1	0	0	19
Total	415	44	105	23	3	0	590

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

Week Ending	RRV	BFV	DENV†	Malaria†	CHIKV†	ZIKV†	Total
3-Jan-16	7	1	7	1	0	1	17
10-Jan-16	12	1	5	0	0	0	18
17-Jan-16	3	2	3	2	0	0	10
24-Jan-16	8	0	8	0	2	1	19
31-Jan-16	8	0	3	0	2	0	13
7-Feb-16	12	1	9	2	0	0	24
Total	475	49	129	28	7	2	701

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

Comment: For January, the number of notifications are not extraordinary and lower than the previous two years.

It should also be noted that notifications are for NSW residents and that infection may have been acquired elsewhere.

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

MOSQUITO RESULTS

All the full mosquito results can be obtained from: http://medent.usyd.edu.au/arbovirus/results/results.htm#site

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:

Low (<50) **Medium (50-100)** **High (101-1,000)**

Very High (1,001-10,000) **!** **Extreme (>10,000)**

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

Inland

Location	Mosquito	Nov-15					Dec				Jan-16					Feb				Mar				Apr			
		1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24
Albury	*Cx. annul*																										
	Total Mosq.																										
Bourke	*Cx. annul*																										
	Total Mosq.																										
Griffith	*Cx. annul*																										
	Total Mosq.																										
Leeton	*Cx. annul*																										
	Total Mosq.																										
Macquarie Marshes	*Cx. annul*																										
	Total Mosq.																										
Mathoura	*Cx. annul*																										
	Total Mosq.																										
Wagga	*Cx. annul*																										
	Total Mosq.																										

Coastal

Location	Mosquito	Nov-15				Dec					Jan-16					Feb				Mar				Apr			
		1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24
Ballina	*Ae. vigilax*																										
	Total Mosq.																										
Coffs Harbour	*Ae. vigilax*																										
	Total Mosq.																										
Gosford	*Ae. vigilax*																										
	Total Mosq.																										
Lake Macquarie	*Ae. vigilax*																										
	Total Mosq.																										
Nambucca	*Ae. vigilax*																										
	Total Mosq.																										
Port Macquarie	*Ae. vigilax*																										
	Total Mosq.																										
Shoal-haven	*Ae. vigilax*																										
	Total Mosq.																										
Tweed	*Ae. vigilax*																										
	Total Mosq.																										
Wyong	*Ae. vigilax*																										
	Total Mosq.																										

Sydney

Location	Mosquito	Nov-15					Dec				Jan-16					Feb				Mar				Apr			
		1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24
Banks-town	*Ae. vigilax*																										
	Total Mosq.																										
Blacktown	*Ae. vigilax*																										
	Total Mosq.																										
Georges River	*Ae. vigilax*																										
	Total Mosq.																										
Hawkes-bury	*Ae. vigilax*																										
	Total Mosq.																										
Penrith	*Ae. vigilax*																										
	Total Mosq.																										
Sydney Olympic Park	*Ae. vigilax*																										
	Total Mosq.																										
Ryde	*Ae. vigilax*																										
	Total Mosq.																										

Sentinel Chicken Seroconversions

http://medent.usyd.edu.au/arbovirus/results/chicken_results_all_sites.htm

	Nov-15					Dec				Jan-16					Feb				Mar				Apr			
Location	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24
Bourke																										
Deniliquin	15N	15N	15N		15N																					
Forbes			15N	15N	15N	15N																				
Griffith	15N	15N	15N	15N	15N	15N																				
Hay	15N	15N	13N	15N	15N	15N																				
Leeton	15N	15N	15N		15N	15N																				
Macquarie Marshes		15N	13N	15N	15N																					
Menindee	6N	15N	15N	15N																						
Moama	15N																									
Moree																										
Wee Waa			13N	14N	15N																					

N= Negative for MVEV & KUNV

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