

NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2015-2016

Weekly Update

Date: 21/Dec/2015

SUMMARY

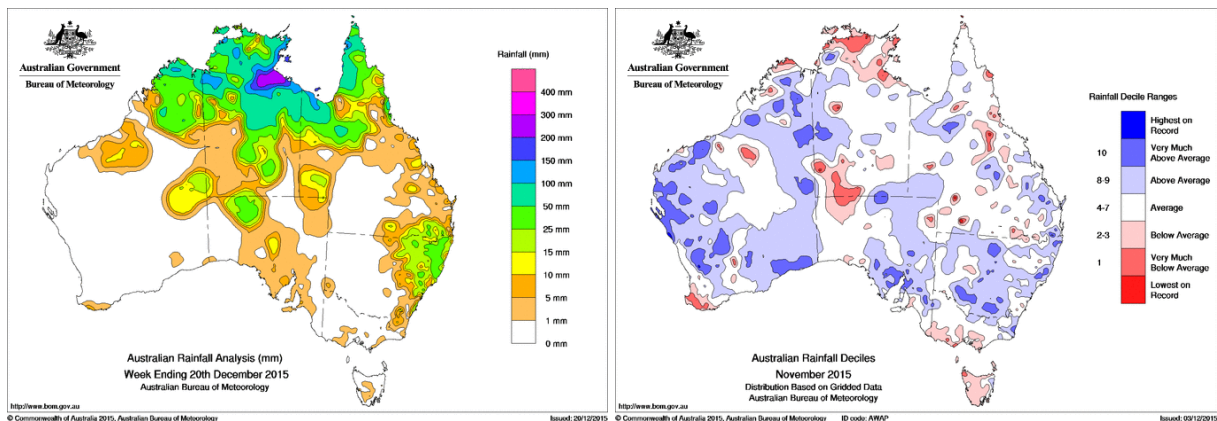
- **Climate:** over the last week, light rainfall occurred in the north east of the state. For November, rainfall was above average across most of the state. Maximum and minimum temperatures for November were 1-2 degrees above average.
- **Three Month Forecast:** for January to March 2016, rainfall predictions for NSW are for average rainfall for most of the state, with below average for the south east. According to the BOM as of 8/Dec/15, the current El Niño is near its peak and there are signs of it easing.
- **Tidal:** the next series of high tides that may result in *Aedes vigilax* hatching are due to occur over this week, 23-28/Dec/15. The high tides this week did not result in any substantial new flooding of the wetlands at Homebush Bay.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to November 2015 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** Hanwood at Griffith produced the first 'very high' collection of the season, however all other locations had 'low' to 'medium' numbers.
- **Mosquito Numbers Coast:** both Ballina and Gosford trapped 'high' mosquito numbers, however collections of *Aedes vigilax* were 'low' from all sites.
- **Mosquito Numbers Sydney:** collections from Sydney Olympic Park and at sites along the Georges River were mostly 'high', although like other coastal locations, numbers of *Aedes vigilax* were not especially abundant.
- **Arboviral Isolates:** there were no arboviral detections in the mosquitoes.
- **Chicken Sentinel Seroconversions:** there were no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 383 RRV and 44 BFV notifications.

Comment: in the lead up to Christmas, mosquito numbers have been gradually increasing, but no trapping location is producing any extraordinary collections. Overall, mosquito numbers are either around normal or slightly below average. There have been no mosquito isolates or seroconversions in the sentinel chooks.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 20/Dec/2015 is depicted on the left and monthly rainfall deciles for November 2015 are on the right. Over the last week, light rainfall occurred in the north east of the state. For November, rainfall was above average across most of the state. Maximum and minimum temperatures for November were 1-2 degrees above average.



Three Month Rainfall & Temperature Forecast

For January to March 2016, rainfall predictions for NSW are for average rainfall for most of the state, with below average for the south east. Maximum and minimum temperatures are expected to be above normal for the north east of the state and below average for the south west. The following pages contain graphics of the seasonal outlook:

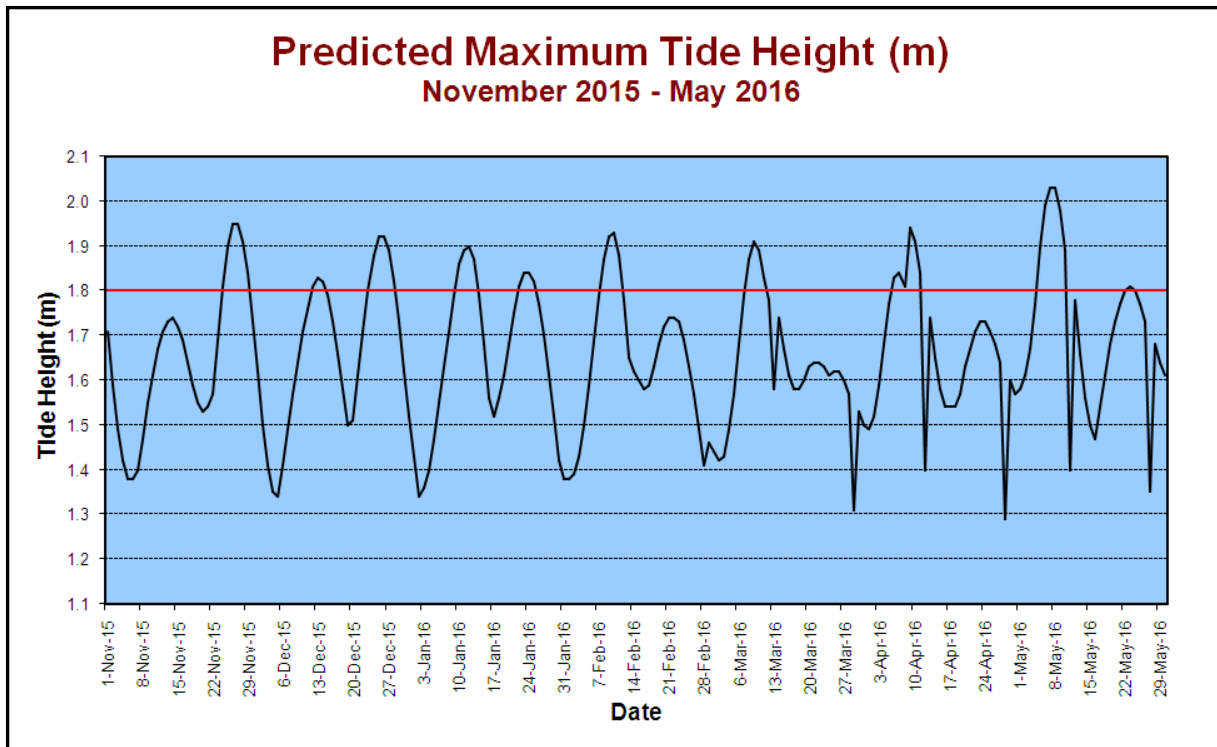
www.bom.gov.au/climate/outlooks/#/rainfall/median (Rainfall outlook).

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

According to the BOM as of 8/Dec/15, the current El Niño is near its peak and there are signs of it easing. The forecast is still that the El Niño will continue until the end of the year (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/

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.

At Homebush Bay, the recent series of high tides, while above 1.8m, did not result in any substantial new flooding of the wetlands (C. Webb, *pers. comm.*)

The next series of high tides that may result in *Aedes vigilax* hatching are due to occur 23-28/Dec/15.

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 so far, has been below 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	0.71	
Lachlan/Murrumbidgee/Murray Rivers	0.97	1.05	0.73	
Northern Rivers	0.94	0.67	0.56	
North Lake Eyre system	1.07	0.67	0.50	

*data for October & November 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

*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:

<http://www.health.nsw.gov.au/Infectious/reports/Pages/Communicable-Diseases-Weekly-Report.aspx>

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

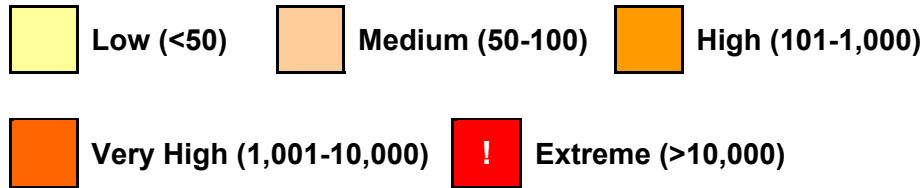
Week Ending	RRV	BFV	DENV	Malaria	CHIKV	Total
5-Jul-15	14	4	5	2	0	25
12-Jul-15	13	3	2	0	1	19
19-Jul-15	7	0	4	1	0	12
26-Jul-15	19	0	3	0	0	22
2-Aug-15	21	2	4	1	0	28
9-Aug-15	12	3	1	0	0	16
16-Aug-15	16	3	4	2	1	26
23-Aug-15	12	1	2	2	0	17
30-Aug-15	27	2	5	2	0	36
6-Sep-15	8	3	6	1	0	18
13-Sep-15	12	0	3	0	1	16
20-Sep-15	24	5	1	0	0	30
27-Sep-15	11	0	1	1	0	13
4-Oct-15	16	2	1	0	0	19
11-Oct-15	11	2	4	0	0	17
18-Oct-15	17	1	5	0	0	23
25-Oct-15	19	2	4	1	0	26
1-Nov-15	16	2	5	1	0	24
8-Nov-15	17	2	6	2	0	27
15-Nov-15	25	2	4	1	0	31
22-Nov-15	19	1	4	0	0	24
29-Nov-15	19	3	8	4	0	33
6-Dec-15	13	1	5	0	0	19
13-Dec-15	15	0	7	1	0	23
Total	383	44	94	22	3	544

Comment: last season saw the largest outbreak of RRV since notifications began to be reported on a routine basis in 1985. The high number of RRV notifications during the winter months of this year makes no epidemiological sense as vector numbers are low and the risk of acquiring the virus is small. These reports are highly unlikely to represent recent infections (recent as in the previous week) and could relate to delays in notifications, past infections as IgM can persist for long periods, or errors in the serological testing.

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:



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	<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-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	<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.																										
Nambucca	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Port Macquarie	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Shoal-haven	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Tweed	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Wyong	<i>Ae. vigilax</i>																										
	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	<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.																										
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 Seroconversions

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

Location	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	
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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