

NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2016-2017

Weekly Update

Date: 18/Nov/2016

SUMMARY

- **Climate:** over the last week there was moderate rainfall through southern NSW and light rainfall elsewhere. For October, rainfall was around average for most of the state with parts of the coast being drier than normal. Maximum and minimum temperatures for October were 2-3 degrees below average.
- **Three Month Forecast:** for November 2016 to January 2017, rainfall predictions are for average precipitation for most of the state, with November expected to be below average. Maximum and minimum temperatures are predicted to be above normal. According to the BOM as of 8/Nov/16, the current tropical Pacific Ocean El Niño-Southern Oscillation remains neutral and the negative Indian Ocean Dipole (IOD) is near its end.
- **Tidal:** the recent high tides that occurred over 13-19/Nov/2016 resulted in higher than predicted tides, which is likely to initiate large hatching of larval *Aedes vigilax*. The next series of high tides that may result in larval hatching are due to occur over 12-18/Dec/2016.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of October 2016 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** mosquito numbers were lower this week due to cooler weather patterns, however Griffith continues with the 'very high' mosquito numbers, and most other locations produced 'high' collections. *Culex annulirostris* numbers are on the increase.
- **Mosquito Numbers Coast:** surveillance activities are due to begin in December.
- **Mosquito Numbers Sydney:** surveillance activities will begin in December.
- **Arboviral Isolates:** there were seven arboviral detections this week. This includes 2RRV from Moama, 2RRV and 1BFV from Griffith, 1 BFV from Forbes, and 1RRV from Leeton.
- **Chicken Sentinel Seroconversions:** there were no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 59 RRV and 4 BFV notifications; the total represents around half the long term average.

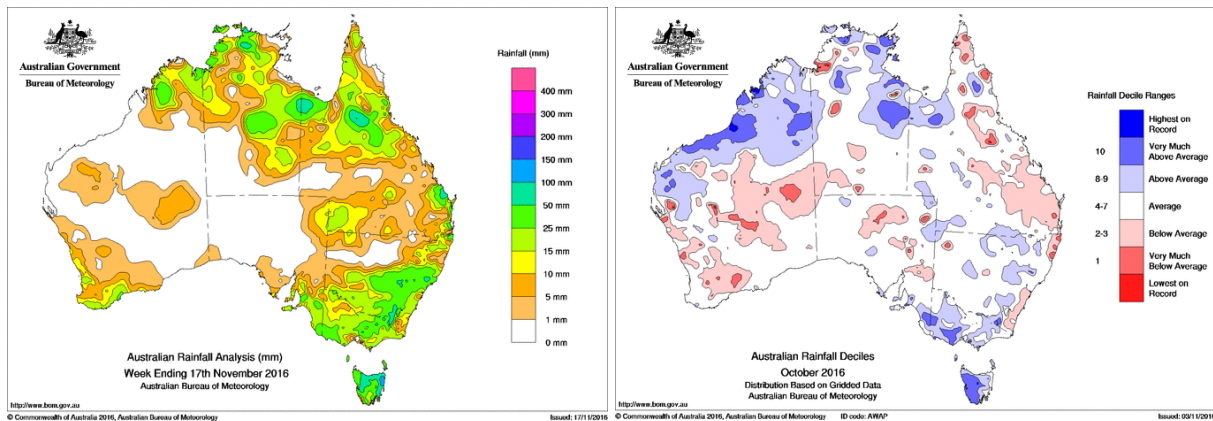
Comment: mosquito collections were lower this week with the cooler weather, however numbers continue to be well above average. There were seven arboviral detections including 5RRV and 2BFV from disparate sites across the inland. This is the first time for the history of the program that there have been this number of isolates during November. The last time there were four RRV isolates in November, which was the season of 1998-1999, there were record numbers of human notifications during November, December and January. Similarly, the last time there

was a BFV isolate from the inland during November (season of 2010-2011), BFV notifications were four times greater than normal. Thus higher case numbers are expected.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 17/Nov/2016 is depicted on the left and monthly rainfall deciles for October 2016 are on the right. Over the last week, there was moderate rainfall through southern parts of the state and light elsewhere. Rainfall during October was around average for most of the state with parts of the coast being drier than normal. Maximum and minimum temperatures for October were 2-3 degrees below average.



Three Month Rainfall & Temperature Forecast

For November 2016 to January 2017, rainfall predictions for NSW are for average precipitation for most of the state, with November expected to be below average. Maximum and minimum temperatures are expected to be above normal across the state. The following pages contain graphics of the seasonal outlook:

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

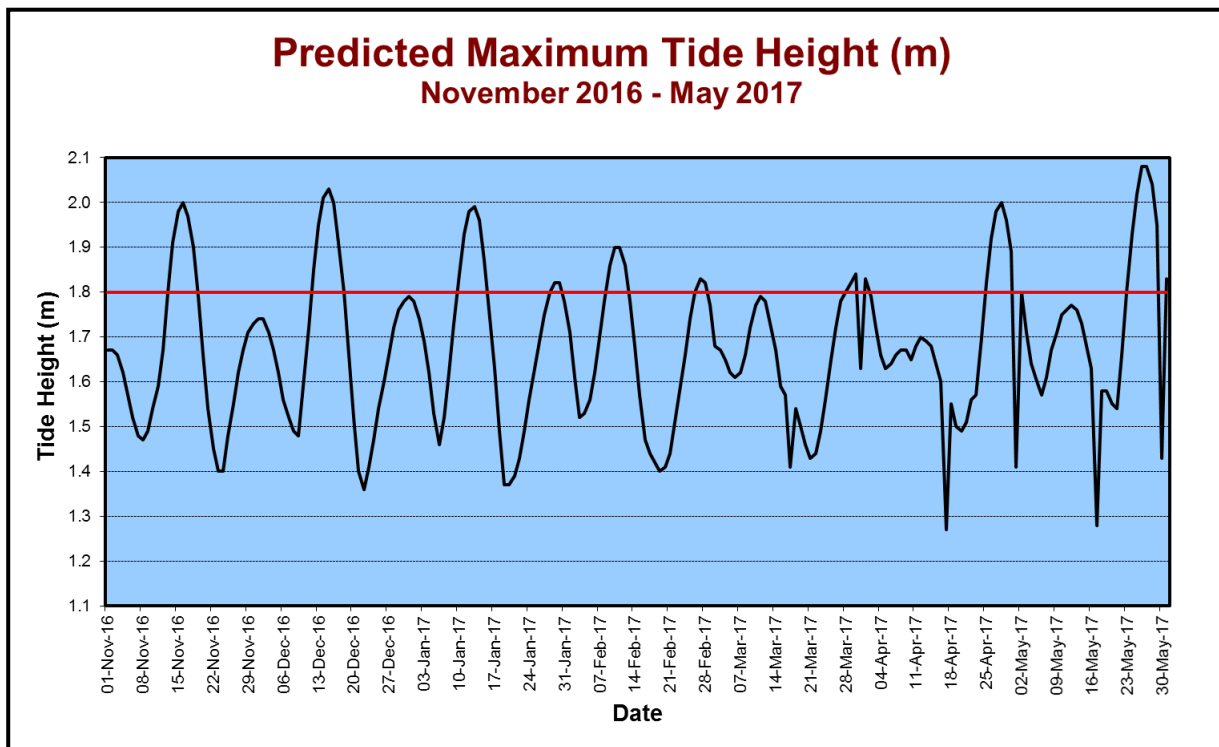
www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 8/Nov/16, the current tropical Pacific Ocean El Niño-Southern Oscillation remains neutral and the negative Indian Ocean Dipole (IOD) is near its end. Spring in eastern Australia is typically wetter than average during a negative IOD or La Niña.

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 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 recent high tides that occurred over 13-19/Nov/2016 resulted in higher than predicted tides, and high tides that extended over several days (B. Faulkner, Tweed Shire Council & C. Webb, Medical Entomology, *pers. comm.*). Extensive larval hatching is expected.

The next series of tides that may lead to *Aedes vigilax* larval hatching are due 12-18/Dec/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.

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 2015 or the majority of the catchments for the first quarter of 2016 (Table 1). For the Oct-Dec 2016 period, 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 2016-2017 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2015	Jan-Mar 2016	Oct-Dec 2016*	Jan-Mar 2017
Darling River	0.72	0.67	0.65	
Lachlan/Murrumbidgee/Murray Rivers	0.70	1.14	1.00	
Northern Rivers	1.35	0.57	0.81	
North Lake Eyre system	1.35	0.63	0.78	

*Data for Dec 2016 only

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2016-2017 season (*data for Sep & Oct/16 only).

	Autumn 2016	Winter 2016	Spring 2016*
2015 Value	1010.30	1012.57	1010.70
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

Only the Winter period pertaining to the Nichol's hypothesis is in line with past MVEV active years.

ARBOVIRAL ISOLATES

LOCATION - Site	Date Trapped	Mosquito Species	Virus
LEETON – Farm 347	16/Nov/16	*	Ross River
FORBES - STP	15/Nov/16	*	Barmah Forest
GRIFFITH – Lake Wyangan	1/Nov/16	<i>Aedes theobaldi</i>	Ross River
GRIFFITH – Lake Wyangan	1/Nov/16	<i>Anopheles annulipes</i>	Ross River
GRIFFITH – Lake Wyangan	14/Nov/16	*	Barmah Forest
MURRAY – Moama	8/Nov/16	*	Ross River
MURRAY – Moama	8/Nov/16	<i>Aedes sagax</i>	Ross River

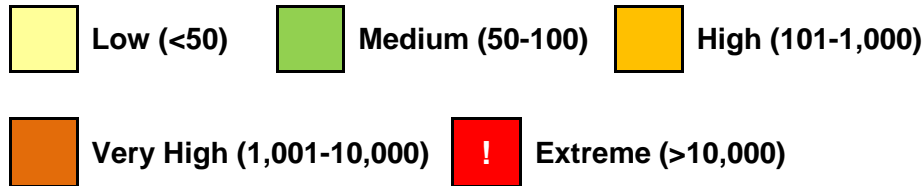
*Detection via Honey-Baited Cards, the mosquito species cannot be determined.

<http://medent.usyd.edu.au/arbovirus/results/virusisolates.htm>

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	Oct-16					Nov					Dec				Jan-17					Feb				Mar			
		2	9	16	23	30	6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	
Albury	<i>Cx. annul</i>																											
	Total Mosq.																											
Bourke	<i>Cx. annul</i>																											
	Total Mosq.																											
Forbes	<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-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
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-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
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 Seroconversions

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

Location	Oct-16					Nov				Dec				Jan-17					Feb				Mar				
	2	9	16	23	30	8	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	
Bourke																											
Deniliquin																											
Forbes				15N	15N	15N																					
Griffith			15N	15N	15N	15N																					
Hay			15N	15N	15N																						
Leeton			15N	15N	15N																						
Macquarie Marshes																											
Menindee					15N	15N																					
Moama																											
Moree																											
Wee Waa																											

N= Negative for MVEV & KUNV

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