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

Date: 6/Nov/2015

SUMMARY

- **Climate**: over the last week, the entire state experienced moderate precipitation and a minor flood warning was released for the McIntyre River.
- **Three Month Forecast**: for November 2015 to January 2016, rainfall predictions for NSW are for below average rainfall for the entire state. According to the BOM as of 27/Oct/15, the current El Niño episode is expected to persist until the end of the year.
- **Tidal**: the next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 24-29/Nov/15.
- **MVEV models**: the data relevant to both the Forbes' and Nichols' hypotheses have been updated to Oct 2015 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland**: mosquito numbers were 'low' at all sites.
- **Mosquito Numbers Coast**: surveillance activities are due to begin in December.
- **Mosquito Numbers Sydney**: surveillance activities are largely due to begin in December.
- **Arboviral Isolates**: there were no arboviral detections in the mosquitoes.
- **Chicken Sentinel Seroconversions**: no report has been issued to date.
- **Human Notifications**: for the current fiscal year, there have been 259 RRV and 33 BFV notifications.

Comment: this is the first weekly report for the 2015-2016 season of the NSW Arbovirus Surveillance Program. So what can we expect for the season ahead? (Glad you asked!).

Over recent months, the inland has been exceptionally dry and this is emphasised by the low mosquito collections for this week. Neither the Forbes nor the Nichol's hypotheses are suggestive of an MVEV epidemic, and the ongoing El Niño would imply that rainfall should remain below average. These factors would point to the probability of a relatively quiet season ahead for arbovirus activity in the inland region. However, we have seen unusual weather patterns, such as the movement of rainfall depressions from the north to the south, which has led to the introduction of MVEV into the state. Watch this space!

The coast has also been relatively dry of late. In contrast with the inland however, this can actually favour the production of *Aedes vigilax* numbers. Thus larger populations of this pestiferous mosquito may occur, which would normally increase the risk of arbovirus activity. Despite this, the large outbreak of RRV last season

would mean that herd immunity factors should keep case numbers of RRV to a minimum for this and the next couple of seasons. There have been high numbers of RRV notifications during the winter months this year, but these are unlikely to represent recent infections for a variety of reasons outlined in the report below.

As you would be aware there have been a lot of questions raised in recent years about BFV testing and the over diagnosis of this condition, which led to the commercial kit being withdrawn from the market. My feeling is that we have not experienced a lot of actual BFV activity along the coast in recent years and perhaps we are overdue for major activity. We will certainly be monitoring for this and other arboviral diseases ahead.

The Medical Entomology Department is continuing to investigate enhanced arbovirus surveillance technologies, which includes the use of Honey-Baited Cards. The next evolution in this system is the use of sugar baits that involve no mosquito trap at all. We will be trialling this system in the upcoming months at several sites, and working with other colleagues around the country to evaluate and advance this technology. Again, watch this space!

For those of you who are involved in operating sentinel chicken flocks can you please inspect your animal housing and ensure it is secure against fox attack. Often the weakest point is the door; foxes can easily dig underneath if there is only soil present. Laying a strip of cement or placing a concrete tile under the door is a very simple solution to prevent this happening.

For anyone who did not receive the annual report of last seasons activity, it and all previous reports, can be downloaded from:
http://medent.usyd.edu.au/arbovirus/information/publications.htm

Also remember that all surveillance data (as well as these weekly reports) are placed onto our arbovirus surveillance web site:
http://medent.usyd.edu.au/arbovirus/index.html

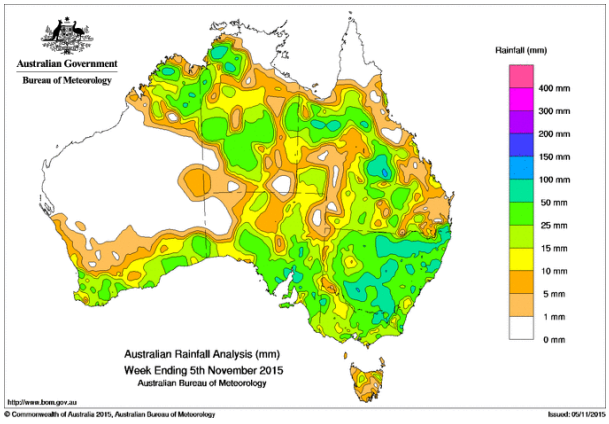
In the report this year, I have included human notifications of all mosquito-borne disease in NSW, to help keep a watching brief on these conditions. If there is something you would like to see in these reports, (and it is in my power to do so) feel free to contact me on this.

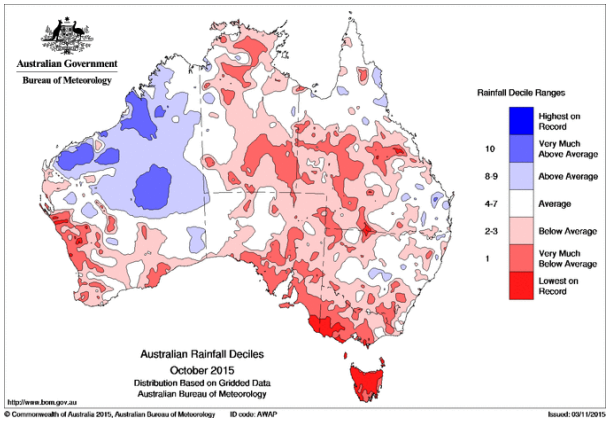
Finally, if you no longer wish to receive these reports, or would like others to be included in this circulation list, please let me know. I am relying on all of you to update me on this.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 5/Nov/2015 is depicted on the left and monthly rainfall deciles for October 2015 are on the right. Over the last week, the entire state experienced moderate precipitation and a minor flood warning has been released for the McIntyre River. For October, rainfall was above to very much above average. Maximum and minimum temperatures for April were 2-3 degrees below average.



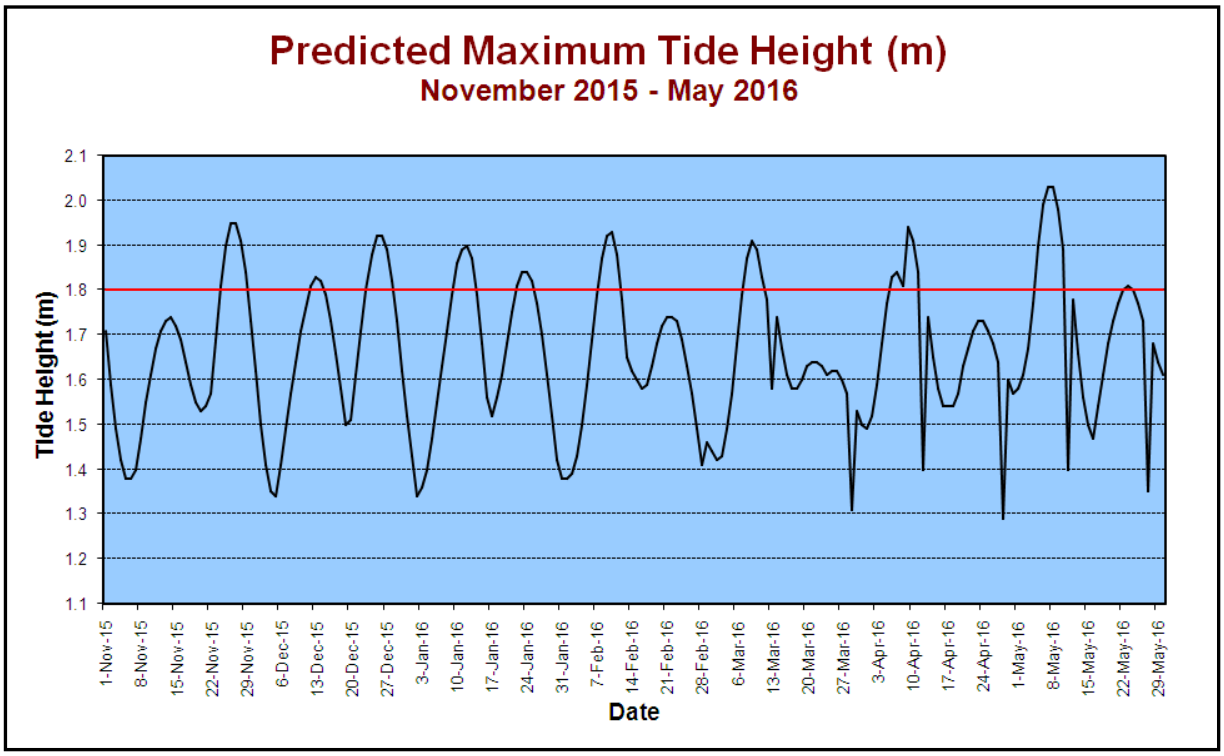


Three Month Rainfall & Temperature Forecast

For November 2015 to January 2016, rainfall predictions for NSW are for below average rainfall for the entire state. Minimum temperatures are expected to be well above normal, especially in the southeast, while maximum temperatures are also expected to be above 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 27/Oct/15, a strong El Niño in the Pacific is dominating the countries that border this ocean. The El Niño is likely to persist until the end of the year, before declining during the first 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/

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 next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 24-29/Nov/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 well 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	0.48	
Lachlan / Murrumbidgee / Murray Rivers	0.97	1.05	0.29	
Northern Rivers	0.94	0.67	0.33	
North Lake Eyre system	1.07	0.67	0.11	

*data for October 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	1013.85
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

*data for September and October only.

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	3	1	0	**25**
Total	**259**	**33**	**54**	**13**	**3**	**362**

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:

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	*Cx. annul*																										
	Total Mosq.																										
Coffs Harbour	*Cx. annul*																										
	Total Mosq.																										
Gosford	*Cx. annul*																										
	Total Mosq.																										
Lake Macquarie	*Cx. annul*																										
	Total Mosq.																										
Nambucca	*Cx. annul*																										
	Total Mosq.																										
Port Macquarie	*Cx. annul*																										
	Total Mosq.																										
Shoal-haven	*Cx. annul*																										
	Total Mosq.																										
Tweed	*Cx. annul*																										
	Total Mosq.																										
Wyong	*Cx. annul*																										
	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	*Cx. annul*																										
	Total Mosq.																										
Blacktown	*Cx. annul*																										
	Total Mosq.																										
Georges River	*Cx. annul*																										
	Total Mosq.																										
Hawkes-bury	*Cx. annul*																										
	Total Mosq.																										
Penrith	*Cx. annul*																										
	Total Mosq.																										
Sydney Olympic Park	*Cx. annul*																										
	Total Mosq.																										
Ryde	*Cx. annul*																										
	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																										
Forbes																										
Griffith																										
Hay																										
Leeton																										
Macquarie Marshes																										
Menindee																										
Moama																										
Moree																										
Wee Waa																										

N= Negative for MVEV & KUNV

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