NATIONAL ARBOVIRUS MONITORING PROGRAM
NAMP 2015–16 REPORT

OBJECTIVES OF NAMP

NAMP has three objectives:

1. **market access**—to facilitate the export of live cattle, sheep and goats, and ruminant genetic material, to countries with concerns about bluetongue, Akabane and bovine ephemeral fever (BEF) viruses

2. **bluetongue early warning**—to detect incursions of exotic strains of bluetongue virus (BTV) and vectors (*Culicoides* species biting midges) into Australia by surveillance of the northern BTV endemic area

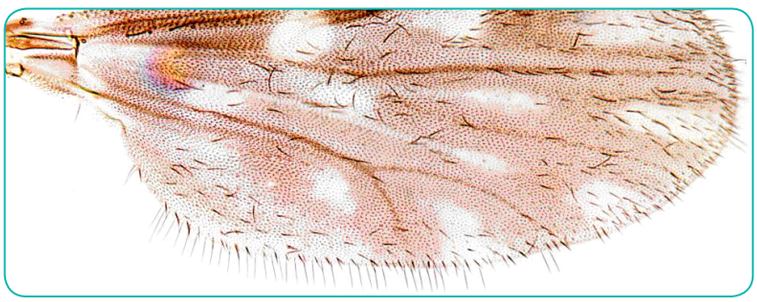
3. **risk management**—to detect changes in the seasonal distribution in Australia of endemic bluetongue, Akabane and BEF viruses and their vectors, to support livestock exporters and producers.

The NAMP partners would like to thank participating cattle producers who cooperate to establish and maintain NAMP monitoring sites. The success of NAMP is wholly dependent upon your support.

The National Arbovirus Monitoring Program (NAMP) monitors the distribution of economically important arboviruses (insect-borne viruses) of ruminant livestock and associated insect vectors in Australia. Arboviruses monitored by NAMP include bluetongue, Akabane and bovine ephemeral fever (BEF) viruses. Bluetongue virus (BTV) infection does not adversely affect production in Australian livestock, and disease has not been reported from areas of known viral transmission.

Australia's economy benefits from the export of ruminant livestock and their genetic material (semen and embryos). This trade depends on a shared confidence between Australia and its trading partners that risks to the animal health status of the importing country can be accurately assessed and properly managed. NAMP provides credible data on the nature and distribution of important specific arbovirus infections in Australia for use by the Australian Government and livestock exporters. NAMP underpins Australian Government export certification that Australian ruminants are sourced from areas that are free from transmission of these specified arboviruses. In addition, NAMP data are available for other countries when negotiating their import health conditions for Australian livestock and their genetic material.

NAMP is jointly funded by its primary beneficiaries: the cattle, sheep and goat industries; the livestock export industry; and the state, territory and Australian governments.



Microscopy image of a *Culicoides* midge wing used for species identification

OPERATION OF NAMP

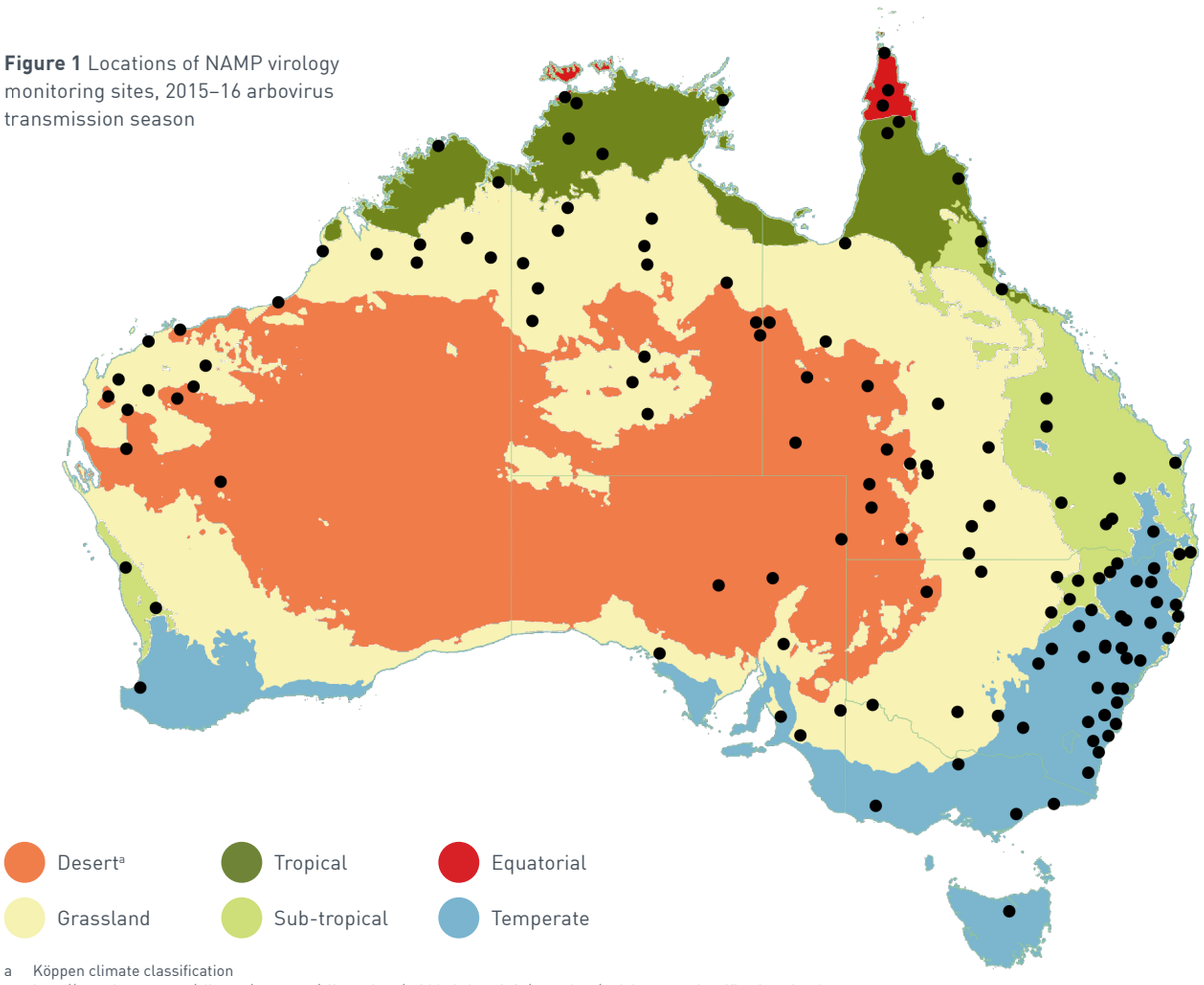
NAMP data are gathered throughout Australia by serological monitoring of cattle in sentinel herds and strategic serological surveys of other cattle herds (serosurveys) and trapping of insect vectors.

Blood samples from groups of young cattle that have not previously been exposed to arbovirus infection are tested at regular intervals for evidence of new infection with bluetongue, Akabane and BEF viruses. The frequency of blood sampling relates to the probability of arbovirus transmission—that is, the greater the likelihood of viral transmission, the more frequent the sampling. Insect traps to detect *Culicoides* species are positioned near the monitored herds during the period of testing or near herds where conditions are favourable for *Culicoides* species survival.

The number and locations of herds (Figure 1) are selected to enable the distribution of the specified arboviruses to be determined. This is why most sentinel sites are located either along the border between the zone where infection is expected and the zone where infection is not expected, or in areas where infection occurs sporadically. In addition, areas expected to be arbovirus-free are monitored to verify their freedom, and known infected areas are sampled to detect any new strains of virus and to assess the seasonal intensity of infection with each arbovirus.

Beatrice Hill in the far north of the Northern Territory is a focus for exotic BTV surveillance—virus isolation is routinely undertaken on blood samples collected at this location. Serotyping, virus isolation and molecular testing are applied strategically in other herds in New South Wales, Northern Territory, Queensland and Western Australia after seroconversions are detected. NAMP surveillance data relating to bluetongue early warning are supplemented by targeted surveillance activities conducted by the Northern Australia Quarantine Strategy of the Australian Government Department of Agriculture and Water Resources in remote coastal regions of northern Australia, including the Torres Strait Islands.

Figure 1 Locations of NAMP virology monitoring sites, 2015–16 arbovirus transmission season



a Köppen climate classification
http://www.bom.gov.au/climate/averages/climatology/gridded-data-info/metadata/md_koppen_classification.shtml

EPIDEMIOLOGY

Bluetongue, Akabane and BEF viruses are noncontagious and are biologically transmitted by their insect vectors. Climatic factors (rainfall and temperature) determine the distribution of potential vectors.

The arboviruses are transmitted only if vectors are present in sufficient density.

Many regions in Australia have never recorded the presence of competent *Culicoides* vectors and are therefore free from viral transmission of arboviruses that can only be spread by this vector species (BTV, Akabane virus). BEF, which is primarily spread by certain species of mosquito, has a more variable distribution, particularly in southern Australia. Climatic conditions have a significant effect on vector distribution and partly account for changes that occur to the boundary between areas where viral transmission occurs and areas free of transmission.

Research in Australia since the mid-1970s has provided a detailed understanding of the epidemiology of Australian BTV strains and their *Culicoides* midge vectors. The important vector species in Australia are likely to have all originally arrived on air currents from neighbouring countries.

Culicoides brevitarsis is the main vector of both BTV and Akabane virus. A close correlation exists between the southern limits of *C. brevitarsis* and the distribution of the two viruses, although the viruses are less widely distributed than their vectors. Other vectors of BTV in Australia, which are less widely distributed than *C. brevitarsis*, are *C. actoni*, *C. dumdumi*, *C. fulvus* and *C. wadai*.

The main vector of BEF virus in Australia is putatively the mosquito *Culex annulirostris*. *C. annulirostris* has different ecological thresholds from *C. brevitarsis*, particularly its tolerance to lower temperatures, which accounts for its wider distribution and its occurrence in regions not affected by BTV or Akabane virus.

MONITORING RESULTS FOR 2015–16

This section summarises and explains the results of vector and virus monitoring and describes the limits of distribution of bluetongue, Akabane and BEF viruses in the 2015–16 arbovirus transmission season (September 2015 to August 2016).

The numbers of monitoring sites for sample collection in each state and territory are shown in Table 1.

Table 1 Number of NAMP virology monitoring sites, by state and territory, 2015–16

Jurisdictions	Sentinel herds	Serosurveys	Insect traps
New South Wales	40	0	33
Northern Territory	8	10	10
Queensland	16	7	19
South Australia	4	2	3
Tasmania	1	0	1
Victoria	5	0	3
Western Australia	11	10	17
TOTAL	85	29	86

BLUETONGUE VIRUS DISTRIBUTION

The limits of BTV transmission in Australia are shown on the interactive BTV zone map[1], which defines areas in which no viral transmission[2] has been detected for the past 2 years.

BTV is endemic in northern and north-eastern Australia (New South Wales, Northern Territory, Queensland and Western Australia), and remains undetected in South Australia, Tasmania and Victoria (Figure 2).

Virology testing in the Northern Territory showed that BTV activity was widespread in the north, commencing late in the season (January to April). Serotypes BTV-1 and BTV-16 were detected at the three northernmost sentinel sites and BTV-5 and BTV-21 immediately south at Katherine. The distribution of BTV remained

1 http://namp.animalhealthaustralia.com.au

2 Viral transmission is defined as detection of evidence of viral infection based on serological monitoring of cattle

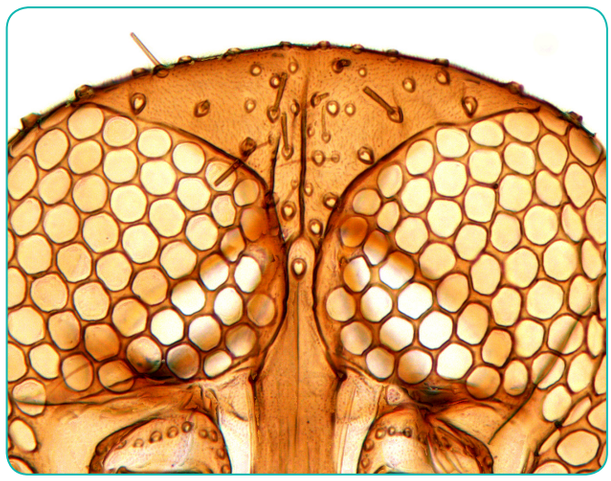
largely stable, with the exception of evidence of BTV in a serosurvey herd at Birrindudu Station (bordering the desert in central-southern Northern Territory), resulting in a small expansion of the BTV zone. This sentinel site is at the southern margins of the endemic zone and has occasionally delivered positive detections in the past.

The Northern Territory recorded below-average rainfall but above-average temperatures during each month of the arbovirus transmission season with the exception of December, which was the wettest on record for the Northern Territory. The long dry commencement to the wet season probably contributed to the late start to BTV activity in the north. With the exception of the north, where buffalo are present, cattle are the only susceptible livestock species present in any numbers in the Northern Territory.

No new serotypes were detected in Australia during 2015–16. BTV-5—detected in Australia (Beatrice Hill sentinel herd) for the first time during 2014–15—was detected in the Katherine sentinel herd. The cattle did not show clinical signs of infection.

In Western Australia, no seroconversions for BTV were detected in the southern Kimberley region, suggesting that the BTV distribution had retracted. Absence of BTV in the Pilbara region continued despite above-average rainfall and temperature (conditions favourable to vectors) in the previous season. Wet season rainfall in the Pilbara region arrived late and the Pilbara south had a cold June with frosts (conditions unfavourable to vectors). Serotypes BTV-5 and BTV-21 were detected in two northern sentinel herds, at Kalumburu and Kununurra.

In Queensland, drought was again declared across 80% of the state by the end of the arbovirus transmission season. Mean temperatures were above average during spring–autumn and rainfall was both above and below average across different areas of the state. During winter, rainfall and minimum temperatures were above average across most of the state. Following four



Microscopy image of a *Culicoides* midge head used for species identification

zone expansions in the previous season, the zone of possible BTV activity now comprises the vast majority of Queensland, with only arid south-western regions in the BTV-free zone. No changes to the zone occurred during the 2015–16 season. Only the endemic serotypes BTV-1 and BTV-21 were detected in Queensland.

In New South Wales, rainfall was average along the coastal plain and northern regions. BTV was detected along the coastal plain from the Far North Coast to the northern part of the Sydney Basin extending up into the Hunter Valley and on the Northern Tablelands of the Great Diving Range. Only a single BTV serotype (endemic BTV-1) was detected. The absence of BTV transmission in the North West Slopes and South Coast regions for the past 2 years has resulted in an expansion of the BTV-free zone in these areas. *C. brevitarsis* was mostly restricted to the coastal (as far south as Moruya) and tableland regions and the Hunter Valley, which is consistent with the distribution of BTV activity; a single specimen was detected inland near Peak Hill (south of Dubbo) in May. The vector *C. wadai* was detected at Casino in May.

No competent vector species were detected in South Australia, Tasmania or Victoria, consistent with the serological evidence of virus absence.

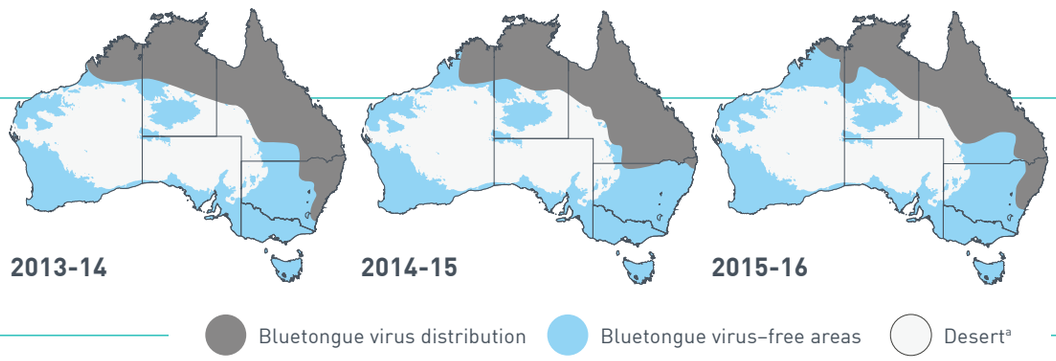


Figure 2 Distribution of bluetongue virus in Australia, 2013–14 to 2015–16

a Köppen climate classification

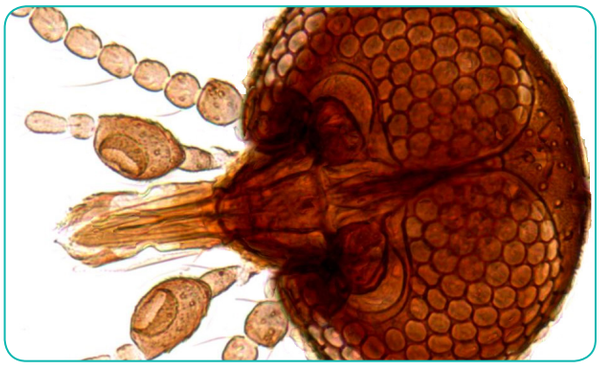
AKABANE VIRUS DISTRIBUTION

The distribution of Akabane virus (Figure 3) varies within the limits of its presumed vector, *C. brevitarsis*, occurring endemically in northern Australia (northern Queensland, Northern Territory and Western Australia) and showing a distinct seasonal spread in New South Wales and southern parts of Queensland.

In Western Australia, Akabane virus was only detected at two monitoring sites in the north Kimberley region, consistent with BTV distribution, which shares the same vector.

In the Northern Territory, limited virology detected Akabane virus in the northern and central regions, but it was not detected in the south at Alice Springs.

In Queensland, Akabane virus was detected widely across the state, extending to the far south-east and far south-west.



Microscopy image of a *Culicoides* midge mouthparts used for species identification

In New South Wales, Akabane virus detection mirrored the distribution of BTV, consistent with the season's distribution of the vector *C. brevitarsis*. The incidence of detections was low. This region is considered endemic for Akabane virus and there were no confirmed reports of Akabane-affected calves.

Akabane virus remains undetected in South Australia, Tasmania and Victoria.

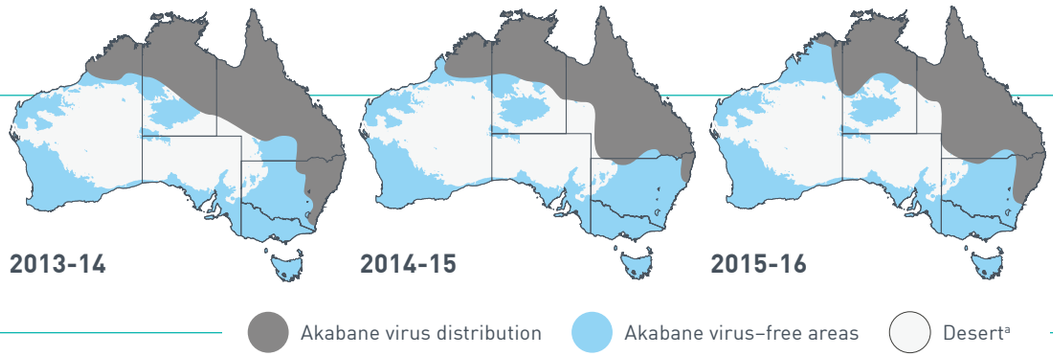


Figure 3 Distribution of Akabane virus in Australia, 2013–14 to 2015–16

a Köppen climate classification

BOVINE EPHEMERAL FEVER VIRUS DISTRIBUTION

BEF virus is endemic in northern Australia (Northern Territory, Queensland and Western Australia), where fever can occur in both the dry and wet seasons (spring, summer or autumn). In New South Wales and parts of southern Queensland, occurrence of the virus is limited by the effect of cold winters, restricting the distribution of its mosquito vector (Figure 4).

In Western Australia, BEF virus was detected by serology of sentinel herds in the Kimberley and Murchison regions. In contrast to 2014–15, BEF virus was not detected in the Pilbara and no clinical signs of BEF were reported from the other two regions this season. No serological or clinical evidence was detected in south-west Western Australia.

In the Northern Territory, BEF virus was first detected in September 2015 at Beatrice Hill in the north and widespread throughout north and central Northern Territory but was not detected at Alice Springs in the south. Numerous clinical cases were observed, including fatalities in recumbent animals.

In Queensland, BEF virus was again detected widely across the state, extending to the far south-east and far south-west.

In New South Wales, BEF virus serology was conducted on samples from sentinel herds located in inland New South Wales and south coast regions with activity only detected at Camden in May 2016. Monitoring for BEF virus occurred by investigation

of suspected clinical cases and samples sent to the Virology Laboratory, Elizabeth Macarthur Agricultural Institute. Clinical cases were confirmed along the coastal plain from the Far North Coast commencing in December 2015, extending to the Hunter Valley (January 2016) and South Coast (May 2016) regions. Single cases were confirmed inland at Dubbo and Bathurst in early to mid-autumn. To support market access to North America, BEF testing will continue in 2016–17.

BEF virus was not detected in South Australia, Tasmania or Victoria.

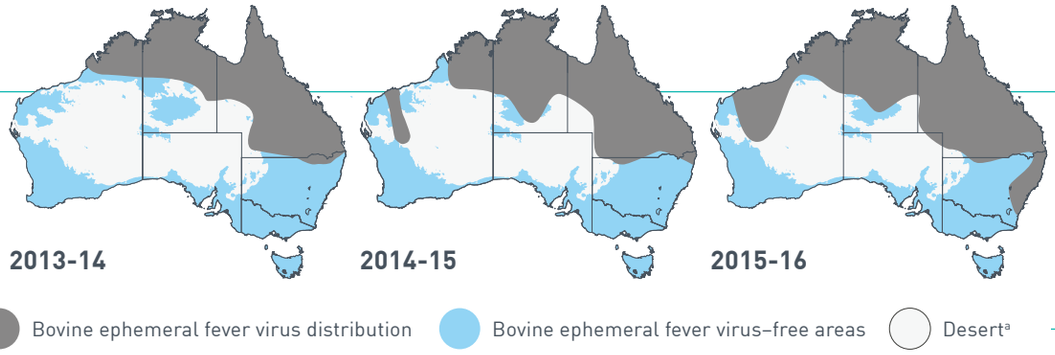


Figure 4 Distribution of bovine ephemeral fever virus in Australia, 2013–14 to 2015–16

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Previous annual reports are available from the NAMP page of the Animal Health Australia website:
www.animalhealthaustralia.com.au/programs/disease-surveillance/national-arbovirus-monitoring-program

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