

NATIONAL ARBOVIRUS MONITORING PROGRAM NAMP 2018–2019 REPORT

OBJECTIVES OF THE NATIONAL ARBOVIRUS MONITORING PROGRAM

The National Arbovirus Monitoring Program (NAMP) has three specific objectives:

1

Market access – to facilitate the export of live cattle, sheep, goats and camelids, and their

reproductive material, to countries that apply import conditions to mitigate the risk of introduction of 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) that have the potential to adversely affect Australian livestock production and trade 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 inform livestock producers and support trade.

NAMP monitors the distribution of economically important arboviruses (insect-borne viruses) of livestock (cattle, sheep, goats and camelids), and associated insect vectors in Australia.

Arboviruses monitored by NAMP include bluetongue, Akabane and BEF viruses. 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 reproductive material (semen and embryos). This trade depends on mutual confidence between Australia and its trading partners that any 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, its trading partners 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 is used during market access negotiations.

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.

Animal Health Australia and all NAMP coordinators and partners would like to warmly farewell Dr Lorna Melville AM PSM from the program this year. Dr Melville is Principal Virologist with the NT Department of Primary Industry, and has served as a NAMP Coordinator and a virology expert to the program for 27 years! We thank you for your enormous service to the program, Lorna, and wish you well in your future.

OPERATION OF NAMP

NAMP data are gathered throughout Australia by serological monitoring of cattle in sentinel herds, 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 monitoring sites (Figure 1) are selected to enable the distribution of the specified arboviruses to be determined (e.g. sites located along the border between areas where infection is expected and not expected, and sites in areas where infection occurs sporadically), and the arbovirus-free area is monitored to verify freedom.

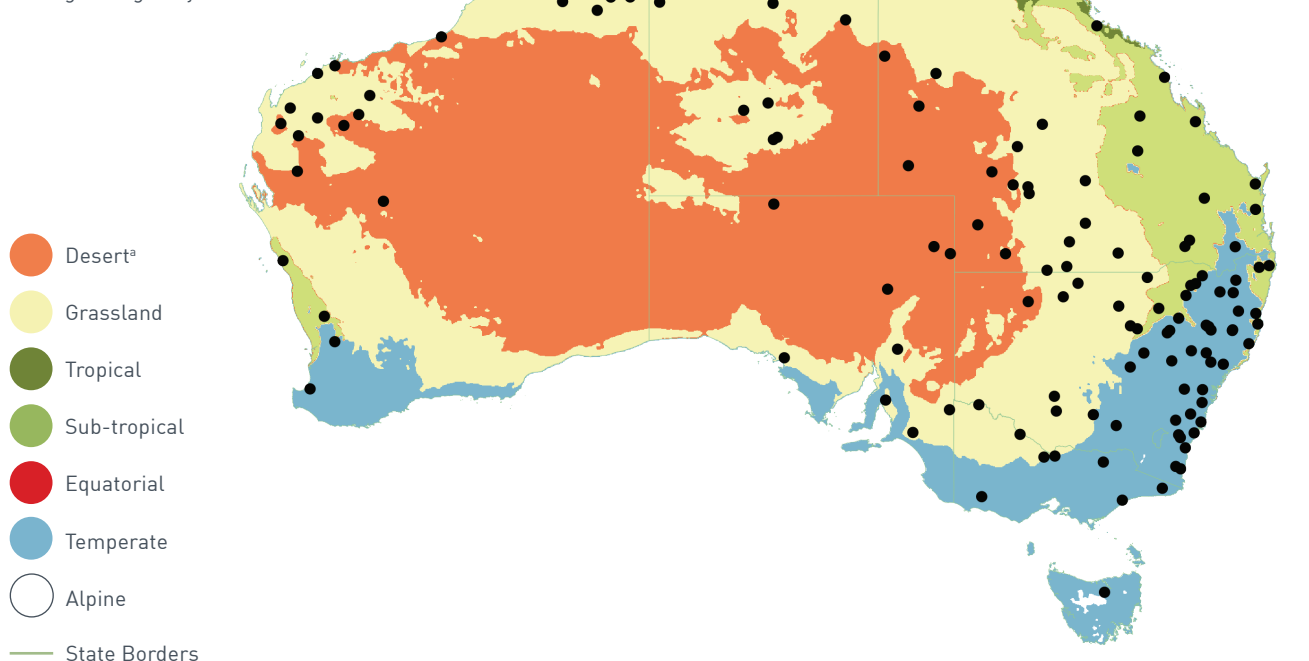
Areas that are known to be endemically infected are sampled to detect any new strains of virus and to assess the seasonal intensity of infection with each arbovirus.

Beatrice Hill, in the far north of the Northern Territory, is a focus for exotic BTV surveillance, and 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, the Northern Territory, Queensland and Western Australia after seroconversions are detected. NAMP surveillance data relating to early warning of bluetongue infection are supplemented by targeted surveillance activities conducted by the Northern Australia Quarantine Strategy of the Australian Government Department of Agriculture in remote coastal regions of northern Australia (Northern Territory, northern Queensland and Western Australia), including the Torres Strait Islands.

EPIDEMIOLOGY

Bluetongue, Akabane and BEF viruses are non-contagious and are biologically transmitted by their

Figure 1 Location of National Arbovirus Monitoring Program virology monitoring sites, 2018–2019 arbovirus transmission season (includes any replaced and new sites arising during the year)



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

insect vectors. Climatic factors (rainfall, temperature and prevailing wind speed and direction) determine the distribution of potential vectors. The arboviruses are transmitted only if vectors are present in sufficient numbers.

Culicoides brevitarsis is the main vector for both BTV and Akabane virus. There is a close correlation 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 that are less widely distributed than *C. brevitarsis* are *C. actoni*, *C. dumdumi*, *C. fulvus* and *C. wadai*.

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

Research in Australia since the mid-1970s has provided a detailed understanding of the epidemiology of Australian BTV strains and their *Culicoides* midge vectors. Vector species enter northern Australia infrequently, and entry is associated with significant weather events. This is a feature of the epidemiology of BTV in particular, and explains the infrequent detection of new serotypes in northern Australia.

Many regions in Australia have never recorded the presence of transmission-competent *Culicoides* vectors and are therefore free from viral transmission of arboviruses that can only be spread by these vector species (BTV and Akabane virus). Climatic conditions have a significant effect on vector distribution and account for variations in the boundary between areas where viral transmission occurs and areas free of transmission.

MONITORING RESULTS FOR 2018–2019

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 2018–2019 arbovirus transmission season (September 2018 to August 2019).

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, 2018–2019

Jurisdictions	Sentinel herds	Serosurveys	Insect traps
New South Wales	39	1	33
Northern Territory	9	9	11
Queensland	21	9	18
South Australia	4	2	3
Tasmania	1	0	1
Victoria	8	0	6
Western Australia	14	10	18
TOTAL	96	31	90

BLUETONGUE VIRUS DISTRIBUTION

The limits of BTV transmission in Australia are shown on the interactive Bluetongue Virus Zone Map.¹

BTV transmission is endemic in northern and northeastern Australia (New South Wales, Northern Territory, Queensland and Western Australia), and remains undetected in South Australia, Tasmania and Victoria (Figure 2). No new serotypes were detected in Australia from samples collected during 2018–2019; types detected during the period were BTV-1, BTV-7, BTV-16 and BTV-21.

In the Northern Territory, the monsoon season rainfall was well below average except in the far northeast and south. Territory-wide, rainfall total was 34% below the long-term wet season average. Daytime and night-time temperatures were the warmest on record for much of the Northern Territory from October 2018 through to April 2019.

In the Northern Territory, *C. brevitarsis* was collected at all northern sites, and *C. actoni*, *C. fulvus* and *C. wadai* at most northern sites.

BTV transmission in the Northern Territory was relatively inactive, and serotypes BTV-1, BTV-7 and BTV-16 were detected in samples collected between January 2018 and May 2019.

In northern Western Australia, rainfall was also well below average, resulting in a reduction in the number of cattle stocked. The only cyclone of the season, Cyclone Veronica, delivered rain locally

¹ namp.animalhealthaustralia.com.au

around Port Headland in March 2019. Limited rainfall and wind conditions experienced this year are not expected to increase dispersal of vectors. The southwest of Western Australia experienced good spring rains in 2018 but a warmer and dryer than average 2019 winter.

No exotic species of *Culicoides* were found at trapping sites in Western Australia. *C. brevitarsis* was detected at five sites in the Kimberley, and an individual insect was collected in July in the Pilbara. The Kalumburu site in the far north of the Kimberley collected *C. brevitarsis*, *C. actoni*, *C. wadai* and *C. fulvus* over the year.

BTV transmission was detected in the Kimberley region of Western Australia. The BTV serotypes detected this season were BTV-1, BTV-16 and BTV-21.

In Queensland, spring 2018 was the third-warmest on record (mean temperature) and summer the fourth-warmest. Rainfall was unremarkable in spring but high in summer in the northern parts of the northwest, northern interior and northeast coast, due to tropical cyclones Owen and Penny.

During autumn 2019, ex-tropical cyclone Trevor resulted in above-average rainfall in western to central Queensland and along the North Tropical Coast, Cape York Peninsula and Gulf Country. Ex-tropical cyclone Ann followed in April, resulting in rainfall in northern Cape York Peninsula and North Tropical Coast. For the State as a whole, mean minimum temperatures were the fifth-warmest recorded.

Winter rainfall was below average over southeast areas but above average in the northwest and northern tropics. Daytime temperatures were close to average across the state.

In Queensland, *Culicoides* vector species were again detected at predominantly coastal sites in the state's

north and southeast. *C. brevitarsis* was the most prevalent and abundant vector species.

C. wadai and *C. actoni* were collected at several sites, and *C. fulvus* was again detected at a single site, Cooktown. Another vector species, *C. dumdumi*, was not detected during this season.

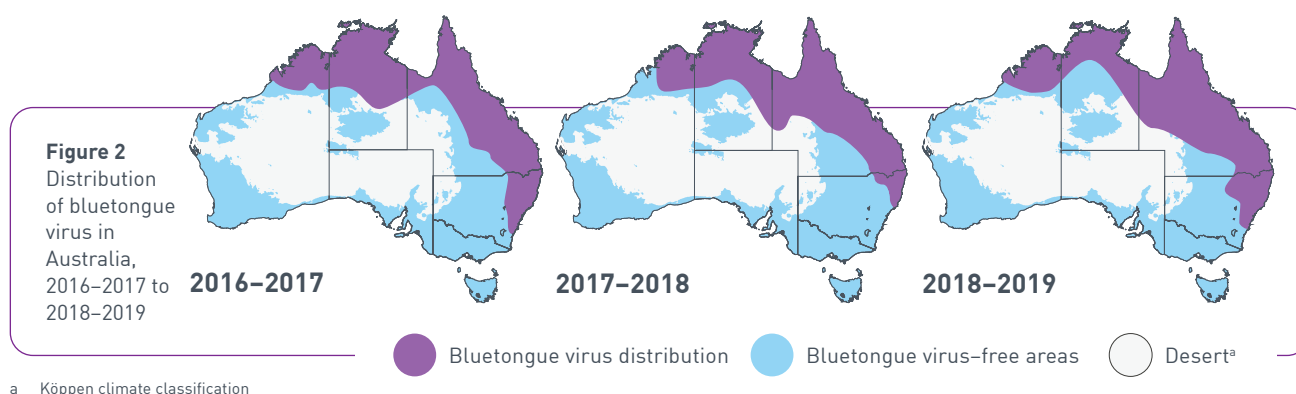
BTV transmission in Queensland occurred in all regions except the central and southwestern regions. Serotypes detected in Queensland include BTV-1, BTV-16 and BTV-21 – all previously known to occur in Queensland. BTV-2 was not detected in Queensland this season.

In New South Wales, rainfall for the season was below to well-below average, and at the end of the period almost all of the state was in drought. The most intensely affected regions are the northern tablelands and north-west slopes and plains. Maximum temperatures were highest on record for the far north coast and northern tablelands, with the remainder of the state generally very much above average for January to June 2019.

C. brevitarsis, the principal vector of BTV in New South Wales, was again detected extensively along the east coast, Hunter Valley, northern tablelands and northwest slopes. *C. wadai* was detected south to Kempsey and was for the first time detected west, on the Great Dividing Range at Wollomombi.

In New South Wales, BTV transmission was limited to the east coast as far south as Camden, to the Hunter Valley, and to the northern tablelands and northwest slopes of the Great Dividing Range as far west as Pilliga. In contrast to the 2017–2018 season (when BTV-16 was not detected) BTV-16 was the predominant serotype detected. BTV-1 was detected at only two sites and BTV-21 was not detected. BTV-16 was first detected in New South Wales in 2015–2016.

Victoria experienced its ninth-driest spring on record and below-average rainfall during summer. Summer



temperatures were warmer than average across the state, resulting in the warmest summer on record. The warm temperatures continued with both autumn and winter daytime temperatures above average for much of the state. Rainfall for both autumn and winter was again below average, continuing a run of six consecutive seasons of drier-than-average conditions.

No competent vector species were detected in South Australia, Tasmania or Victoria, consistent with the serological evidence of virus absence. Enhanced BTV surveillance and vector trapping in northern Victoria, initiated in 2017–2018, continued during the period. There was no evidence of vector-initiated viral transmission in the area.

AKABANE VIRUS DISTRIBUTION

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

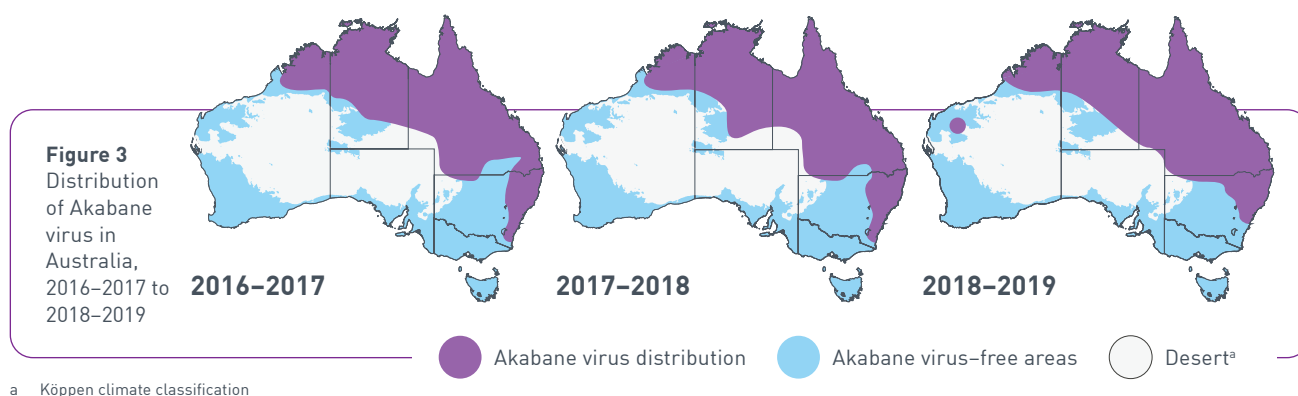
In Western Australia, Akabane virus was detected at most of the Kimberley NAMP sites – consistent with the previous season – and at one site in the Pilbara. This is the only detection in the Pilbara since 2010. In the Northern Territory, no Akabane virus testing was performed in the northern endemic herds. Activity was detected at Alice Springs, as had been the case in the previous season.

In Queensland, records of seroconversion at sentinel

sites and of seropositive animals at survey sites indicated that Akabane virus infection had been broadly distributed across all regions. Generally, only first and last samples were tested at sentinel sites. Disease due to Akabane virus infection was not reported during general surveillance disease investigations conducted by Biosecurity Queensland.

In New South Wales, Akabane virus transmission was similar to that of BTV, again being detected in the Hunter Valley, as far south as Richmond in the Sydney Basin, and on the northwest slopes (the upper Hunter Valley and northwest slopes regions are not considered endemic for this virus). Its distribution was less extensive than this season's distribution of the vector *C. brevitarsis*.

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



BOVINE EPHEMERAL FEVER VIRUS DISTRIBUTION

BEF virus is endemic in northern 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).

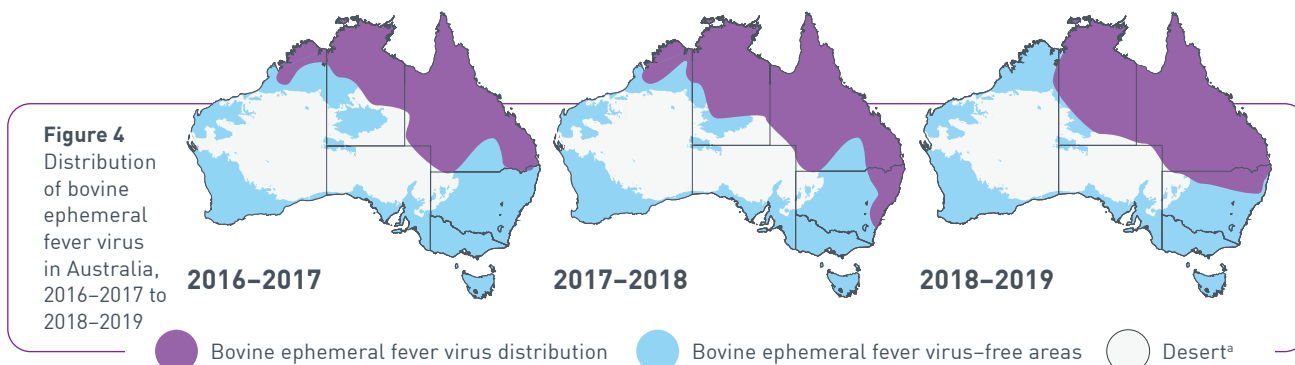
In Western Australia there was no serological or clinical evidence of BEF in this season. In the Northern Territory, BEF virus distribution was very limited, with detections only at the three most northerly NAMP sites. Sampling from NAMP sentinel and survey herds in Queensland indicated that BEF virus was widely distributed across the state, extending to the southeast and far southwest. This finding was supported by disease investigation

general surveillance data collected by Biosecurity Queensland. During the period, BEF was diagnosed on 48 occasions: 26 from shires in the southeast of the state, and 22 from remaining widely distributed shires.

In New South Wales, BEF virus activity was detected in only one NAMP herd – at Bourke in the central far north.

Clinical cases of BEF in New South Wales were detected from the far north coast to the mid north coast. Cases occurred from mid-summer to mid-autumn.

BEF virus and BEF clinical diseases were not detected in South Australia, Tasmania or Victoria.



^a Köppen climate classification

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ISSN 1836-5418

Published January 2020 © Animal Health Australia

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