

Culicoides surveillance in Australia

Glenn Bellis

Department of Agriculture, Water and the Environment
Northern Australia Quarantine Strategy

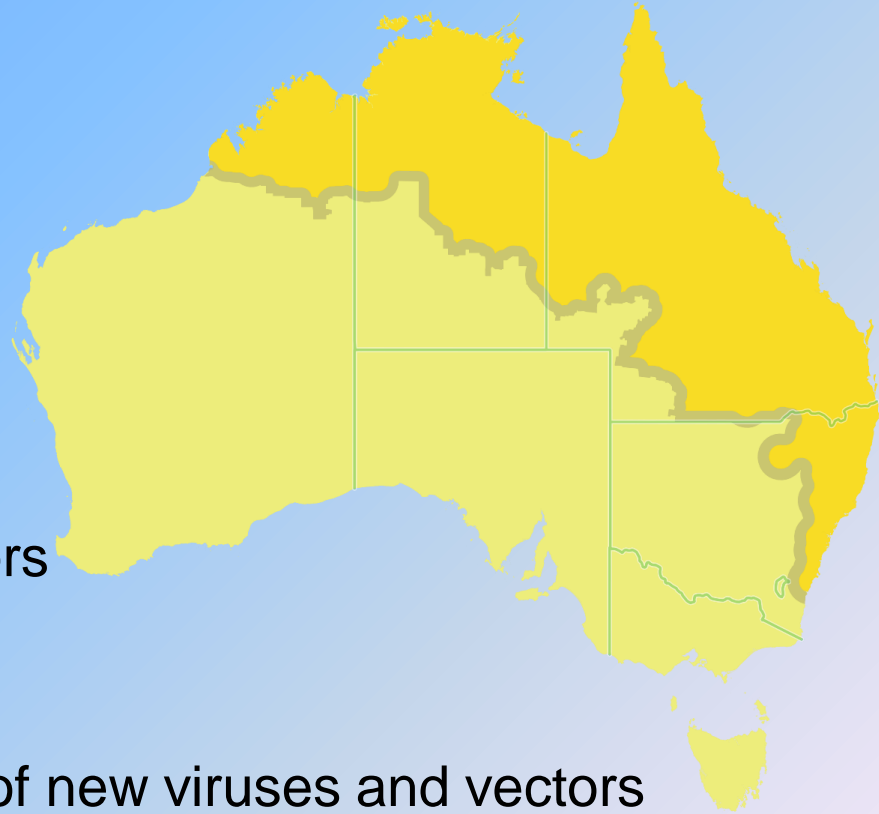
And

Lorna Melville

Northern Territory Department of Industry,
Trade and Tourism



National Arbovirus Monitoring Program



3 major objectives:

1. Determine the distribution of bluetongue virus (BTV) and its vectors in Australia to support trade in live animals
2. Provide early warning of incursions of new viruses and vectors
3. Detect seasonal changes in the distribution of arboviruses and vectors

Additionally monitors for akabane and bovine ephemeral fever viruses

Management

- Started in 1989
- Evolved from combination of independent monitoring programs by CSIRO and state Depts of Agriculture
- Coordinated by Animal Health Australia
- Funded by state and federal governments and the sheep, cattle and goat industries

Roles

Industry

Funding

Increase awareness among members

Logistical support in locating cooperators

Policy and management

State Governments

Local coordination

Technical support

Funding

Policy and management

Federal government

Market access negotiations

Policy and management

Technical support

Local coordination

Funding

What is monitored

- Diversity
- Distribution
- Prevalence/abundance
- Seasonality

of BTV serotypes and species of *Culicoides*
in Australia

How are insects monitored

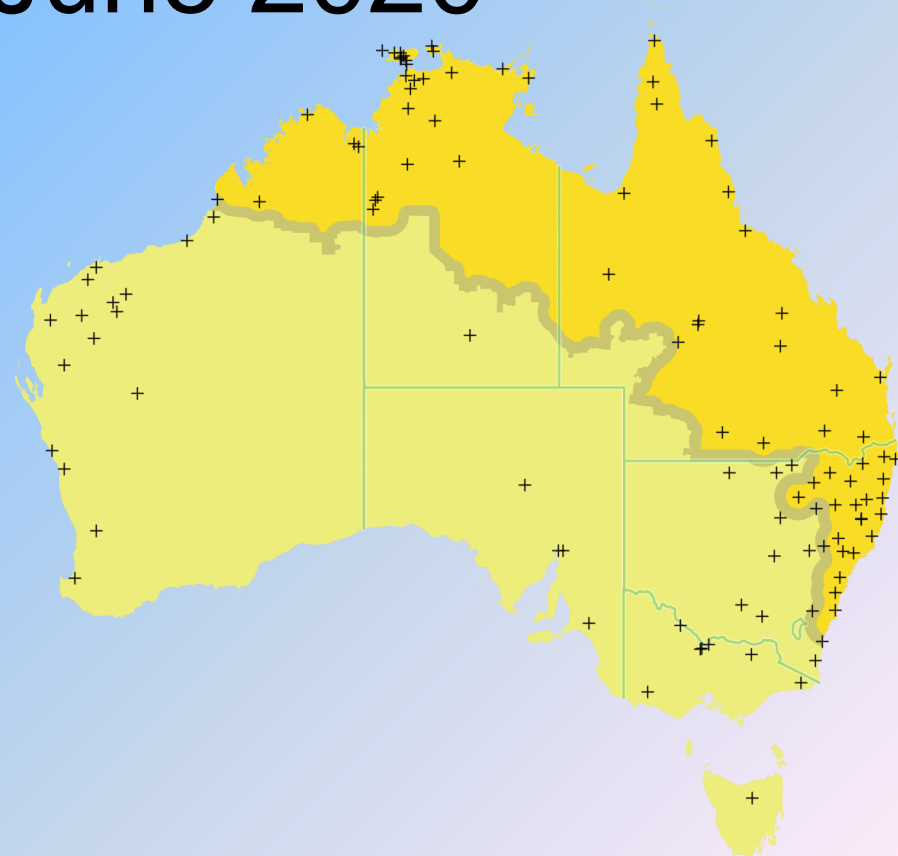
- Light trapping, usually by farmers
- 2 nights per month
- Preferably set near the sentinel cattle herd
- Specimens preserved in ethanol
- Identified to species using morphology
- Unusual findings are confirmed by DNA barcoding



Insect trapping network

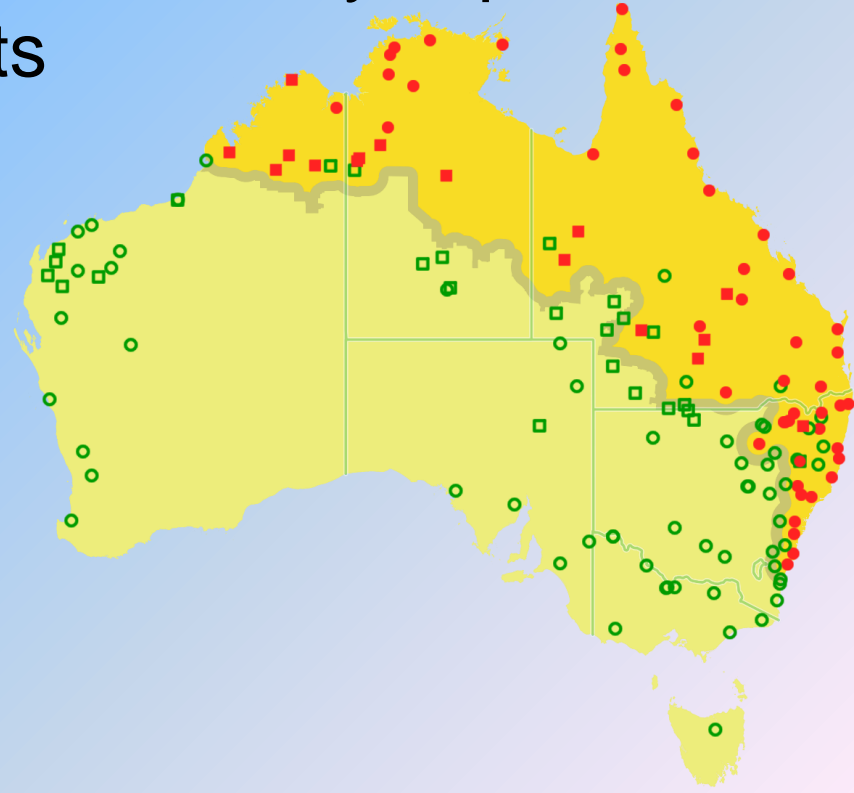
July 2019 - June 2020

- 97 trapping sites
- 946 collections
- >485 000 midges identified
- 75 species represented
- 5 entomologists



Facilitating trade

- Livestock from free areas can be safely exported to bluetongue sensitive markets
- Bluetongue map based on activity over the previous 2 years (OIE)
- Vector distribution data supports this map by illustrating vector-free areas



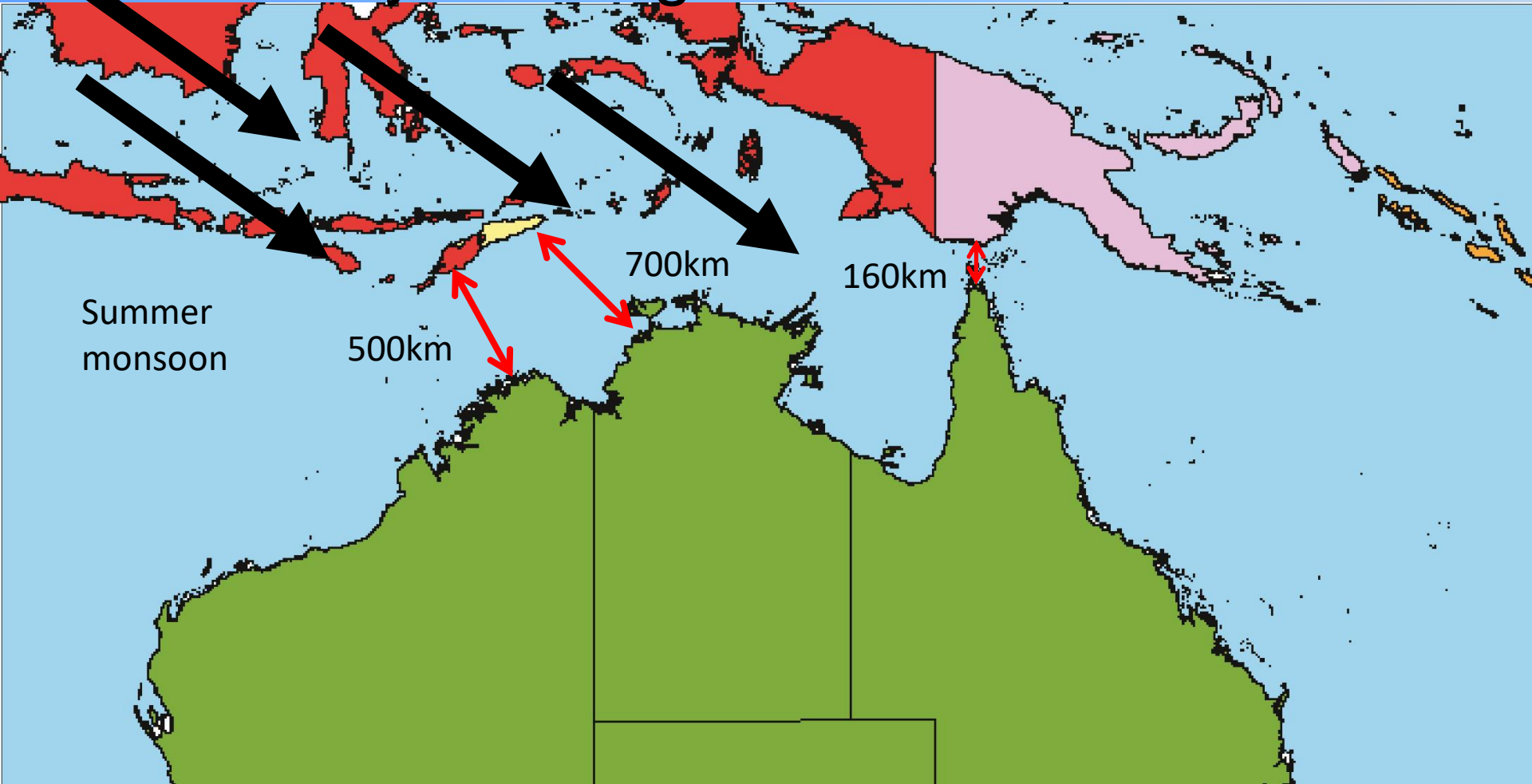
Early warning - vectors

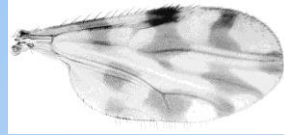
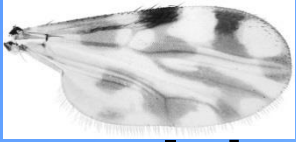
- All BTV vectors currently in Australia originate from SE Asia
- Evidence of 10 incursions of exotic species in past 11 years



Indicates an active pathway for the entry of *Culicoides* and viruses they carry, into Australia

Pathway for midges into northern Australia





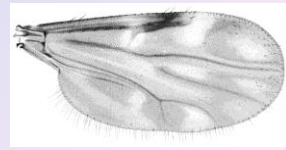
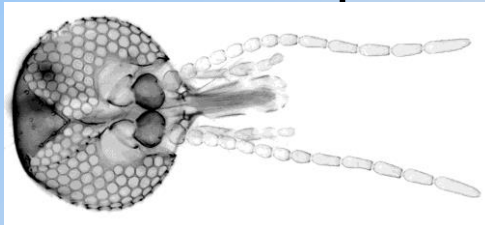
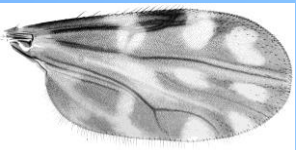
Identification of *Culcooides* species

Carried out in 4 laboratories

Reference Entomologist appointed to provide definitive diagnosis of unusual specimens

Development of morphological keys and wing picture atlases to assist with identification

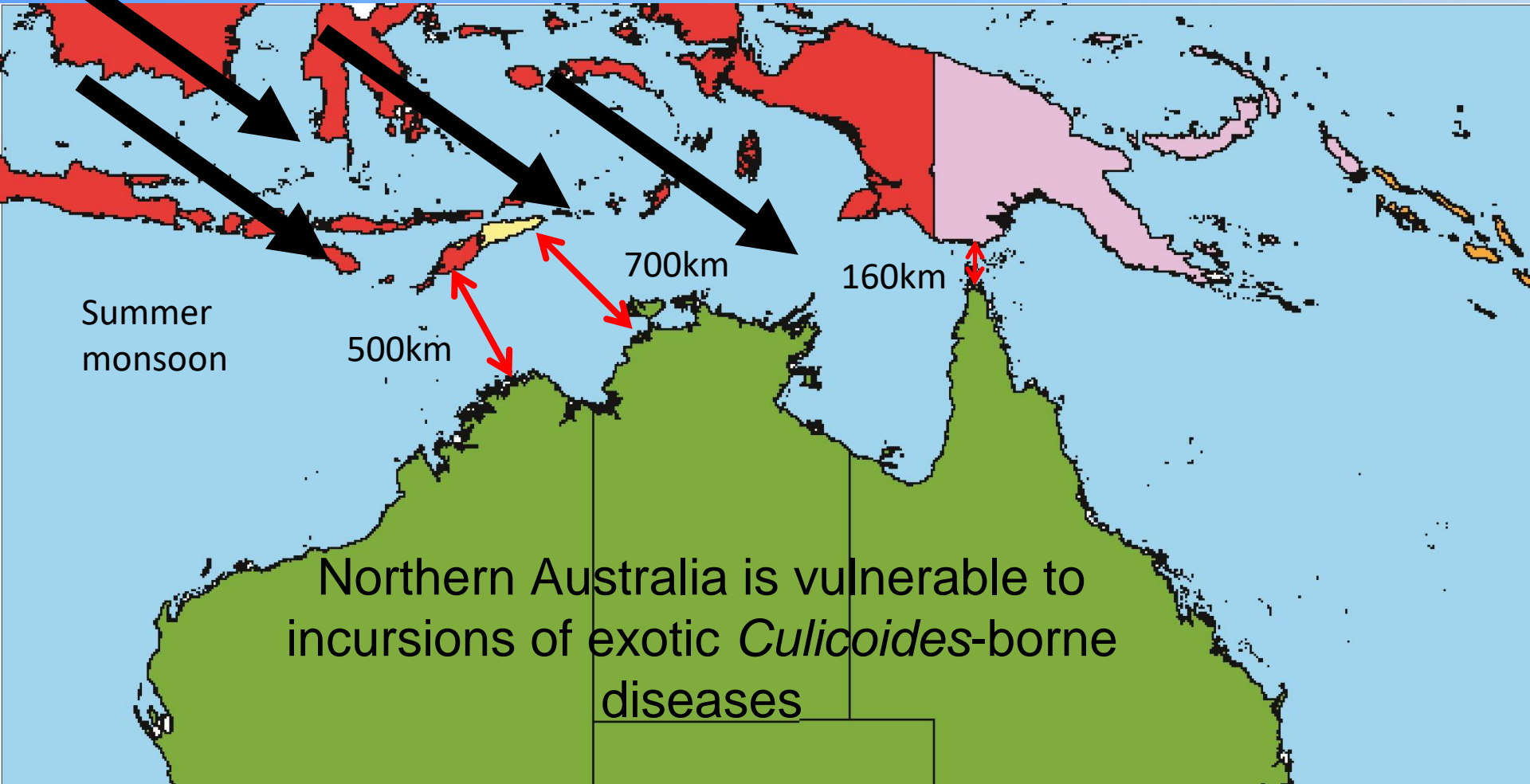
Library of COI barcodes for all species in Australia and some important exotic species



Preparation for AHS in Australia

- Extensive information on cattle-feeding species in Australia
- Relatively little is known of *Culicoides* feeding on horses
- Which species pose a threat?
- What threat do they pose?

Potential vectors of AHS in northern Australia



Research project

Determine the species of *Culicoides* that are the most likely to act as vectors of AHS in northern Australia

1. Which species are biting horses in northern Australia?
2. Which of these are the most abundant?
3. What is the distribution of these species?
4. What is the seasonality of these species?

Methods

- Direct collection from horses and nearby hosts
- Light trap collections near horses and other hosts
- Determine the source of blood meals in trapped specimens



Direct collection from horses

- Battery-powered mechanical aspirator
- Preliminary results suggest *C. actoni*, *C. brevitarsis* and *C. marksii* are the dominant horse feeding species during the dry season
- Species composition is likely to change during the wet season as other species, for example *C. oxystoma* and *C. peregrinus*, become more active
- Compare relative attractiveness of horses and cattle



Light trapping

- Existing data from NAMP provides historical and up to date information on the distribution and abundance of species
- Blood-fed specimens from light traps across northern Australia are being tested for the presence of horse blood
- Additional trapping near horses



Analysis of blood meal sources

- Real-time PCR test
- Detects horse and cattle blood in ethanol preserved midges
- Midges aspirated from animals and those collected in light traps will be tested



Acknowledgements

- NAMP cooperators
- NAMP coordinators/staff
- Pioneers of BTV work in Australia