

Responding to heat stress in flying-fox camps

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Flying-fox die-offs are an important wildlife management issue

- Extreme heat events are a major cause of death for flying-foxes (Tidemann & Nelson 2011)
- They can place enormous demands on land managers and wildlife carers
- There is an urgent need to streamline management responses!

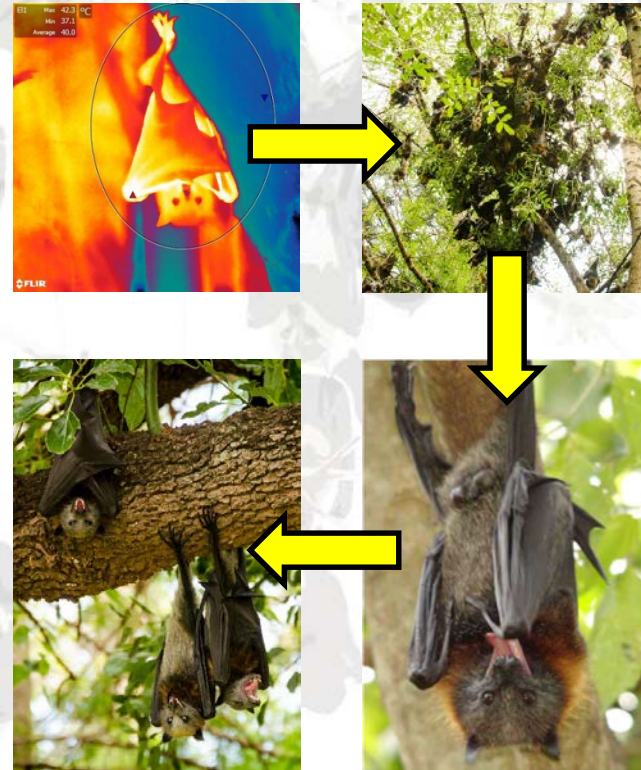


Responding to flying-fox heat stress events

Before



During



After



Responding to flying-fox heat stress events

Before



During



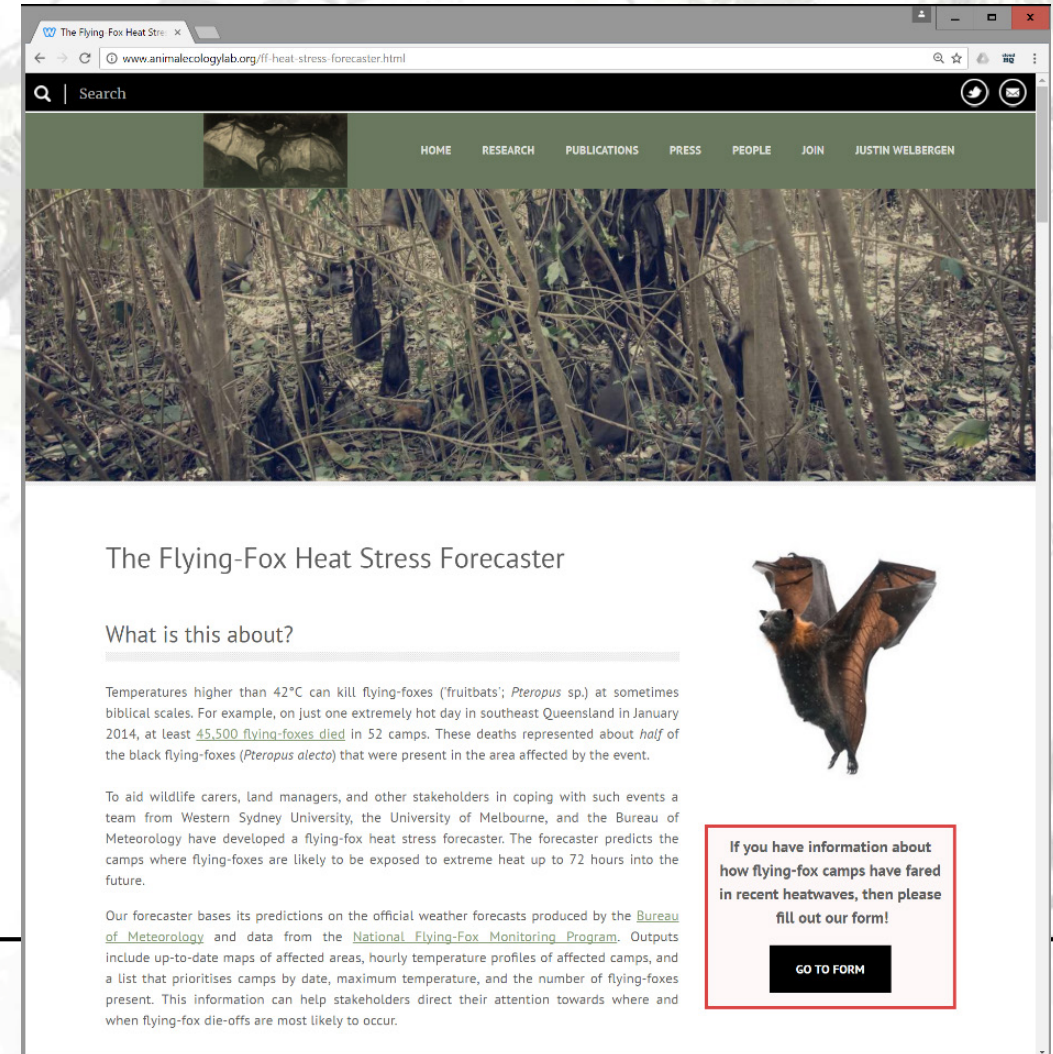
After



Before - The flying-fox heat stress forecaster

- Built in collaboration with the University of Melbourne, CSIRO, and the Australian Bureau of Meteorology
- Predicts up to 72 hours into the future where known flying-fox roosts are likely to be exposed to extreme heat ($T > 42^{\circ}\text{C}$)
- Mortality forecasts have high accuracy (24 hrs = 77%; 48 hrs = 73%, as tested against past mortality data)

www.animalecologylab.org/ff-heat-stress-forecaster



The Flying-Fox Heat Stress Forecaster

What is this about?

Temperatures higher than 42°C can kill flying-foxes ('fruitbats'; *Pteropus* sp.) at sometimes biblical scales. For example, on just one extremely hot day in southeast Queensland in January 2014, at least 45,500 flying-foxes died in 52 camps. These deaths represented about half of the black flying-foxes (*Pteropus alecto*) that were present in the area affected by the event.

To aid wildlife carers, land managers, and other stakeholders in coping with such events a team from Western Sydney University, the University of Melbourne, and the Bureau of Meteorology have developed a flying-fox heat stress forecaster. The forecaster predicts the camps where flying-foxes are likely to be exposed to extreme heat up to 72 hours into the future.

Our forecaster bases its predictions on the official weather forecasts produced by the [Bureau of Meteorology](#) and data from the [National Flying-Fox Monitoring Program](#). Outputs include up-to-date maps of affected areas, hourly temperature profiles of affected camps, and a list that prioritises camps by date, maximum temperature, and the number of flying-foxes present. This information can help stakeholders direct their attention towards where and when flying-fox die-offs are most likely to occur.

If you have information about how flying-fox camps have fared in recent heatwaves, then please fill out our form!

[GO TO FORM](#)

Before - The flying-fox heat stress forecaster

Outputs

- **Maps** of affected areas
 - **Lists** of priority colonies (ranked by date, temperature, size)
 - **Temperature profiles** of priority colonies
- Outputs help direct wildlife carers, land managers, and health officials towards where and when flying-fox die-offs are likely to occur

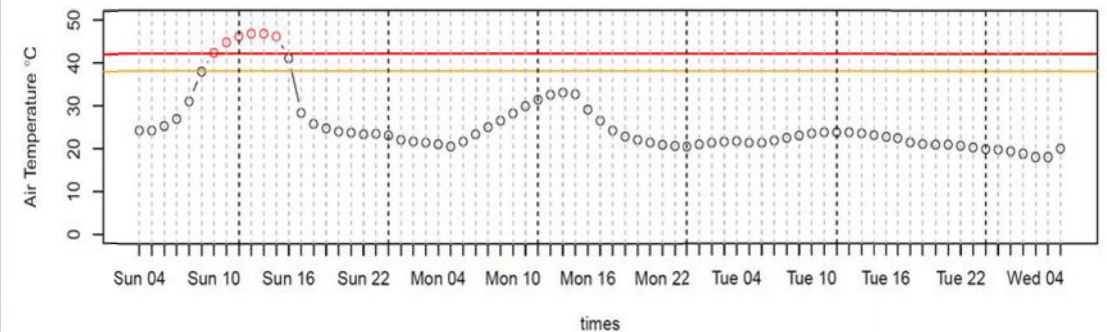
Current temperature forecasts for southeastern Australia

Heat stress alert status

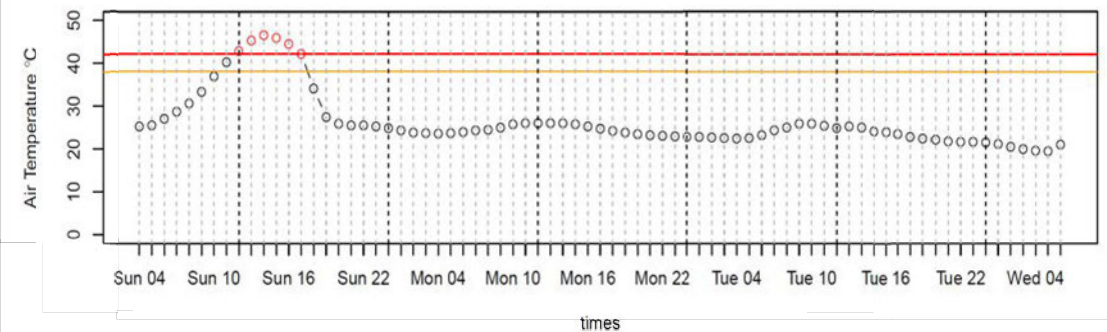
Date	Camp.Name	Camp.ID	Size.Class	Latitude	Longitude	Maximum Temperature
2017-02-12	Singleton, Burdekin Park	109	2	-32.56390	151.1759	46.70
2017-02-12	Red Hill	254	2	-31.28881	152.7707	46.39
2017-02-12	Wingham Brush	93	3	-31.86964	152.3811	46.21

HIGH

Singleton, Burdekin Park 151.176 -32.564



Red Hill 152.771 -31.289

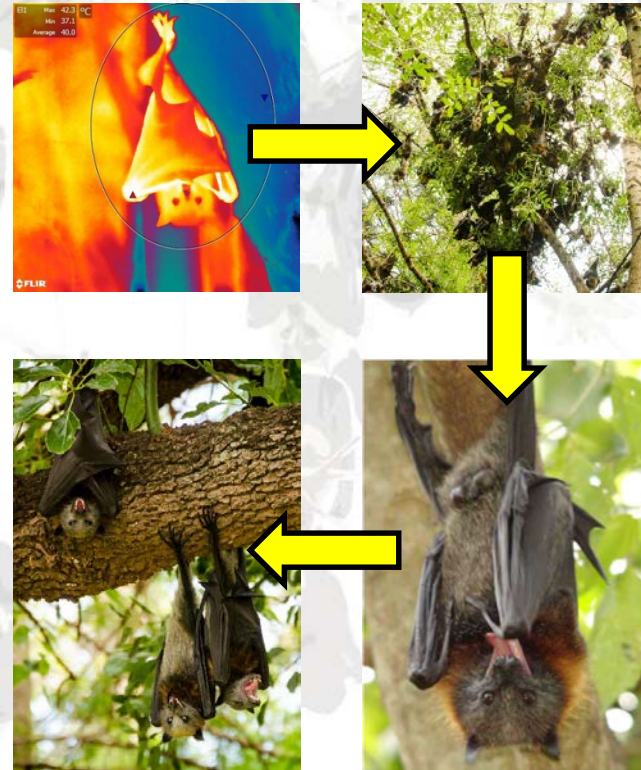


Responding to flying-fox heat stress events

Before



During



After



During - spraying

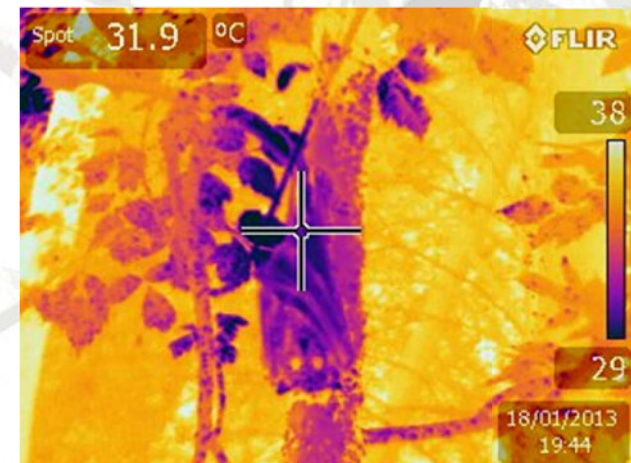
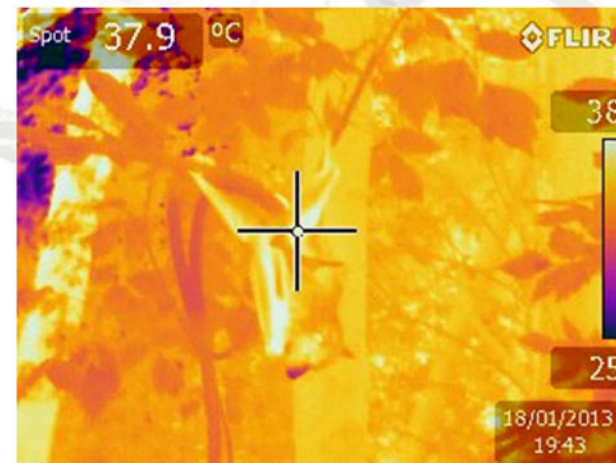
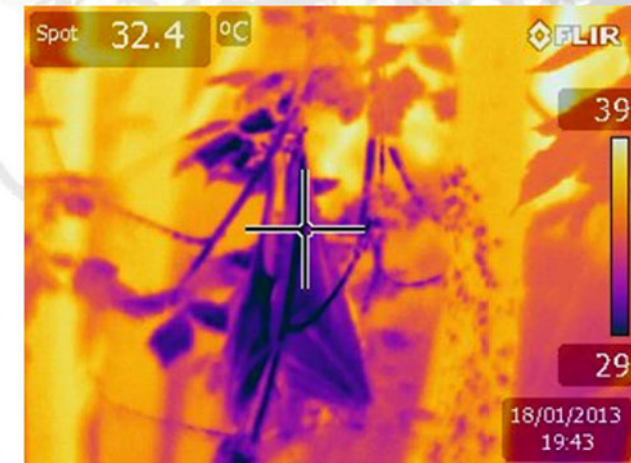
- Spraying of individuals by hand can cool highly distressed animals
- But can disturb other bats..



Before spraying



After spraying



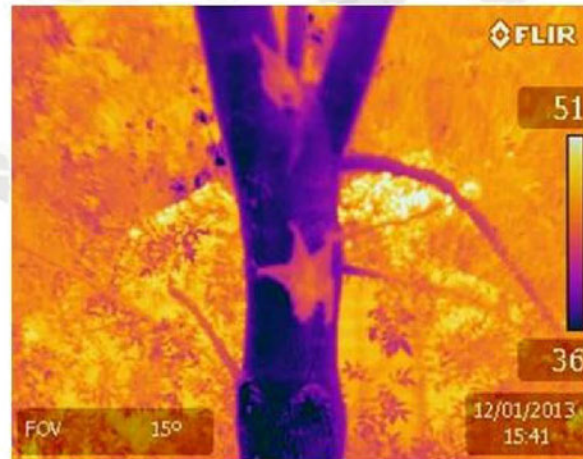
During - wholesale misting of camps

- Decreases temperature but raises humidity, which risks a *net increase* in heat stress for the bats
- Effectiveness not proven at present
- Can disturb bats!



During – disturbing heat-stressed individuals

- Entering a camp may lead to increased heat stress and mortality when animals are forced to leave their cooler microhabitats
- Disturbance is a serious issue and should not be underestimated



During - removing animals from a camp

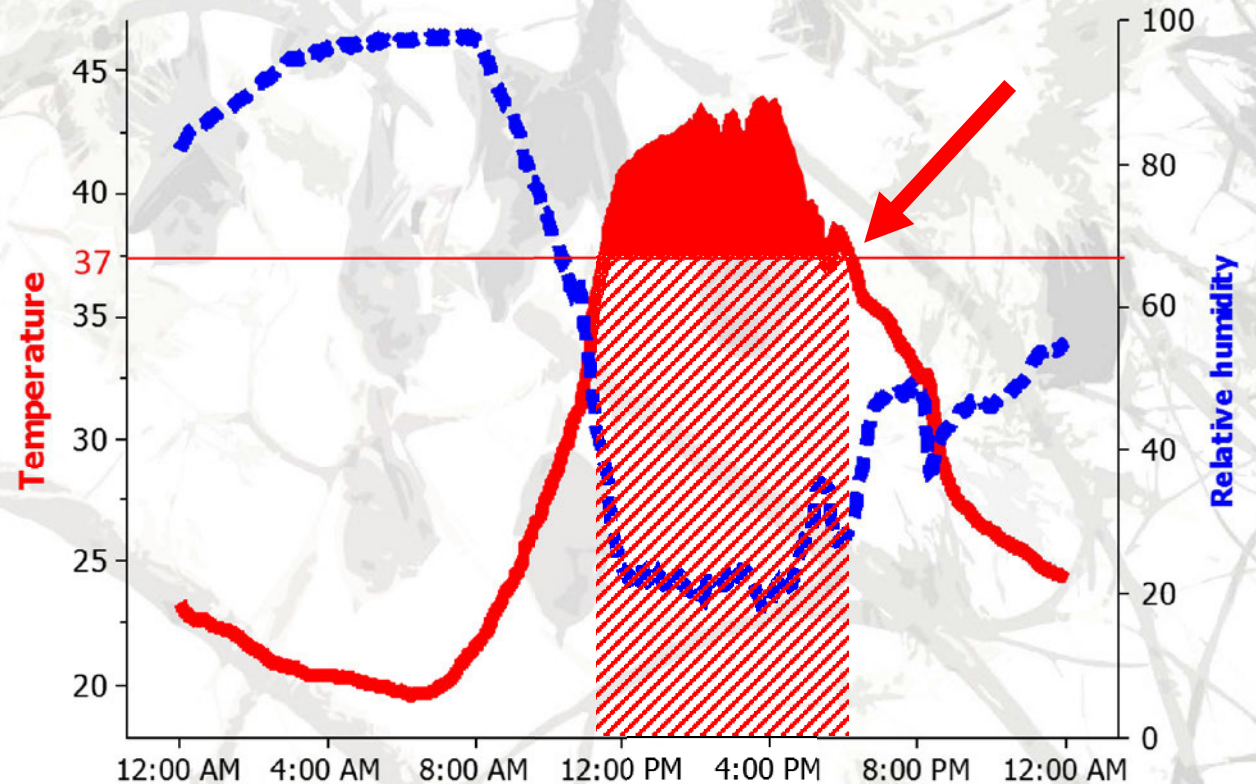
- Many animals will recover without intervention..

All heat stressed individuals in this cluster of young survived 47° C



During - removing animals from a camp

- At very high temperatures it is not clear whether the benefits of intervention to individuals outweigh the risks posed by disturbance to the colony
- Therefore, it is precautionary not to intervene, unless animals are still unresponsive after temperatures have dropped below $\sim 37^{\circ}\text{C}$



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After



After – data collection

www.animalecologylab.org/ff-heat-stress-forecaster

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GO TO FORM

Heat stress data form

Please fill out this form if you have information about how flying-fox camps have fared in recent heatwaves (this includes both affected and unaffected camps). Your input will help improve our forecaster, and create a better understanding of flying-fox heat stress events.

Date of event *

Camp name *

Did any bats die? *

If yes, approximately how many bats died?

Contact *

Roughly how many bats were in the camp? *

Species present

Of those that died, approximately what percentage was:

Of those that died, approximately what percentage was:

Were any bats taken into care?

If yes, how many (approximately)?

Any comments/observations that you would like to share?

Upload file (optional)

Submit data

Citizen Science Data:

- Contributes to more effective management
- Improves the heat stress forecaster
- Helps create a better understanding of the long-term impacts on flying-foxes

After – disposal of bodies

- Dead bodies should quickly be collected by ABLV vaccinated people and with appropriate PPE
- Carcasses can be dropped at registered landfill sites



<http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm>

<http://www.health.nsw.gov.au/infectious/factsheets/pages/rabies-australian-bat-lyssavirus-infection.aspx>

Contact: j.welbergen@westernsydney.edu.au

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