Pteropus alecto

Credit: Devin Jones

Nyctophilus gouldi

Credit: Rianne van der Aar

Coronaviruses and Australian bats:

New data and a review in the midst of a pandemic

Alison Peel

Griffith University

National Flying-fox Forum

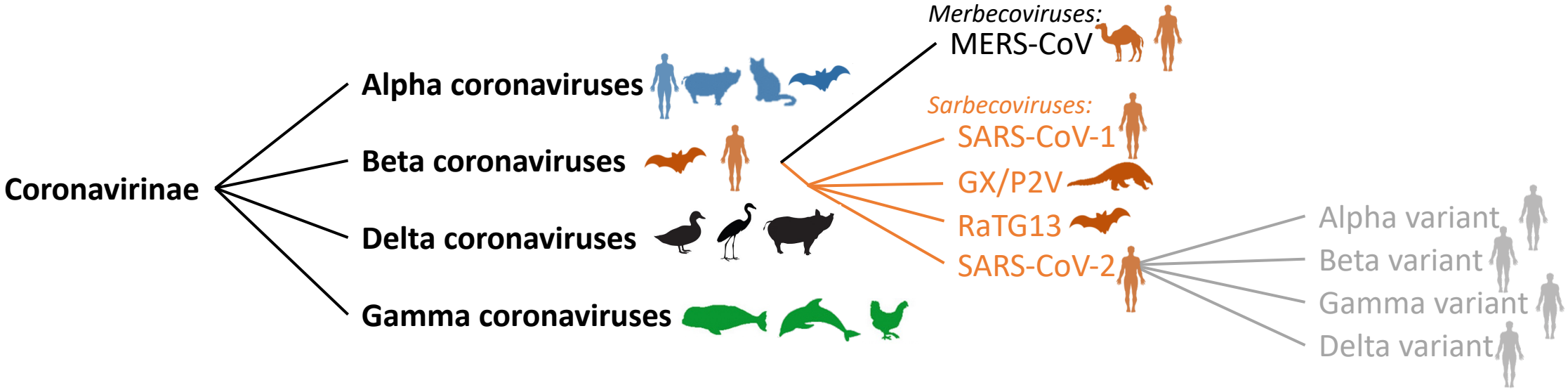
September 14, 2021

Yes, bats do host a wide diversity of coronaviruses

…but so do many other species

Intermediate horseshoe bat
(*Rhinolophus affinis*)

Bat coronavirus **RaTG13**

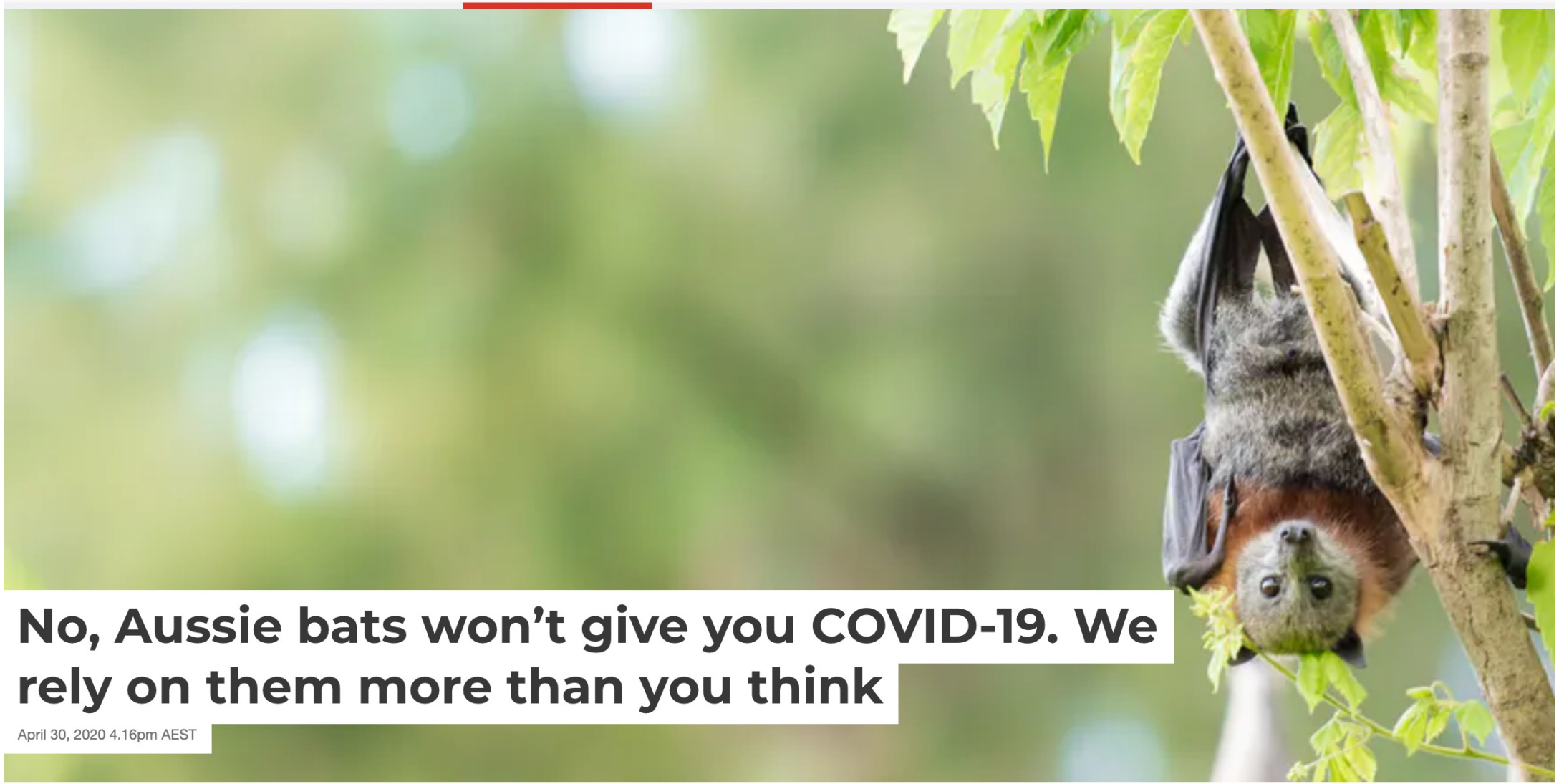


THE CONVERSATION

Academic rigour, journalistic flair

Search analysis,

Arts + Culture | Business + Economy | Education | Environment + Energy | Health + Medicine | Politics + Society | Science + Technology



No, Aussie bats won't give you COVID-19. We rely on them more than you think

April 30, 2020 4.16pm AEST

Justin Welbergen, CC BY-SA

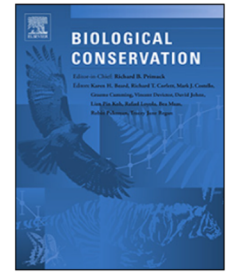
Lentini, Peel, Field, Welbergen 2020, The Conversation

Biological Conservation 248 (2020) 108650

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon



Perspective

Guidelines for communicating about bats to prevent persecution in the time of COVID-19

Douglas MacFarlane[a,b], Ricardo Rocha[c,d,*]

Animal Conservation

ZSL LET'S WORK FOR WILDLIFE

Animal Conservation. Print ISSN 1367-9430

LETTER TO THE EDITOR

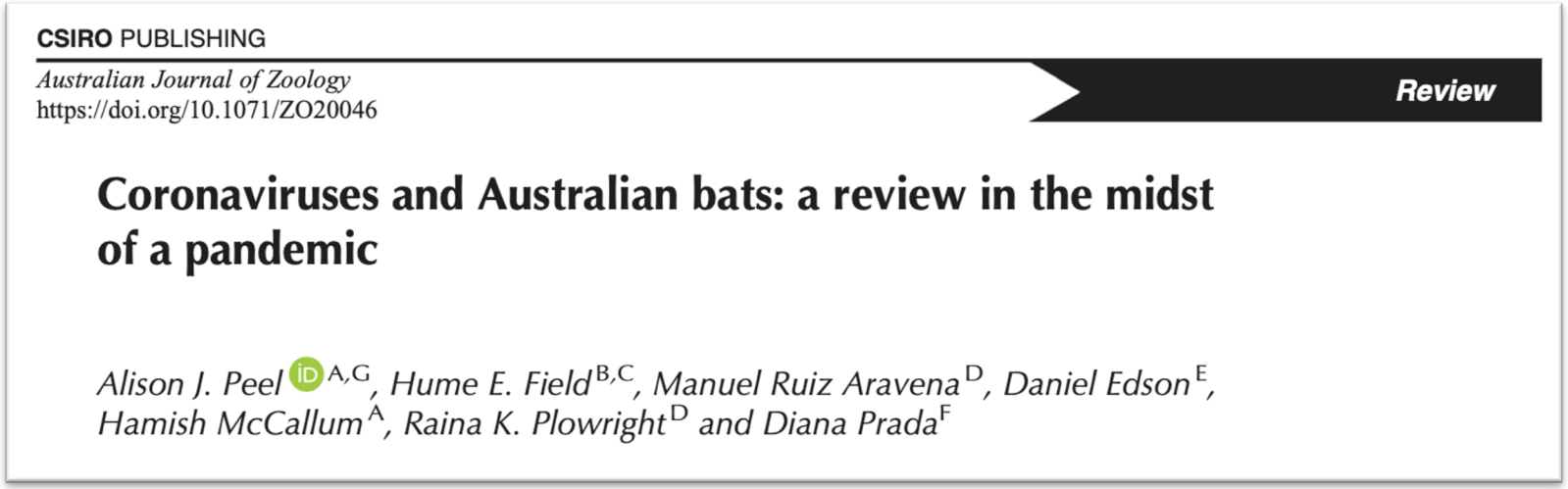
Bat conservation and zoonotic disease risk: a research agenda to prevent misguided persecution in the aftermath of COVID-19

R. Rocha[1,2], S. A. Aziz[3], C. E. Brook[4], W. D. Carvalho[5], R. Cooper-Bohannon[6,7], W. F. Frick[8,9], J. C.-C. Huang[10], T. Kingston[11], A. López-Baucells[12], B. Maas[13,14], F. Mathews[15], R. A. Medellin[16], K. J. Olival[17], A. J. Peel[18], R. K. Plowright[19], O. Razgour[20], H. Rebelo[1,2], L. Rodrigues[21], S. J. Rossiter[22], D. Russo[23], T. M. Straka[24], E. C. Teeling[25], T. Treuer[26], C. C. Voigt[27] & P. W. Webala[28]

Coronaviruses in bats in Australia?

Lentini et al, 2020, The Conversation

Aims



CSIRO PUBLISHING

Australian Journal of Zoology
https://doi.org/10.1071/ZO20046

Review

Coronaviruses and Australian bats: a review in the midst of a pandemic

Alison J. Peel[A,G], *Hume E. Field*[B,C], *Manuel Ruiz Aravena*[D], *Daniel Edson*[E], *Hamish McCallum*[A], *Raina K. Plowright*[D] and *Diana Prada*[F]

- Review the current state of knowledge of bat coronaviruses globally and within Australia
- Identify key areas in need of further research
- Canvass the potential for spillover of endemic Australian bat coronaviruses to humans
- Canvass the the potential for transmission of SARS-CoV-2 from infected humans into Australian bat populations

Peel et al, 2020 Aust J Zool

Coronaviruses in Australian bats

- Three studies:
  - **Smith, C.,** Jong, C., Meers, J., Henning, J., Wang, L., Field, H. (2016). Coronavirus Infection and Diversity in Bats in the Australasian Region EcoHealth 13(1), 72-82. https://dx.doi.org/10.1007/s10393-016-1116-x
  - **Prada, D.,** Boyd, V., Baker, M., O'Dea, M., Jackson, B. (2019). Viral Diversity of Microbats within the South West Botanical Province of Western Australia Viruses 11(12), 1157. https://dx.doi.org/10.3390/v11121157
  - **Holz, P.**, Lumsden, L., Druce, J., Legione, A., Vaz, P., Devlin, J., Hufschmid, J. (2018). Virus survey in populations of two subspecies of bent-winged bats (Miniopterus orianae bassanii and oceanensis) in south-eastern Australia reveals a high prevalence of diverse herpesviruses PLOS ONE 13(5), e0197625. https://dx.doi.org/10.1371/journal.pone.0197625
  - **Boardman WSJ**, Baker ML, Boyd V, Crameri G, Peck GR, Reardon T, Smith IG, Carague CGB, Prowse TAA (2020) Serological evidence of exposure to a coronavirus antigenically related to Severe Acute Respiratory Syndrome virus (SARS-CoV-1) in the Grey-headed flying fox (*Pteropus poliocephalus*). Transbound Emerg Dis. https://doi.org/10.1111/tbed.13908

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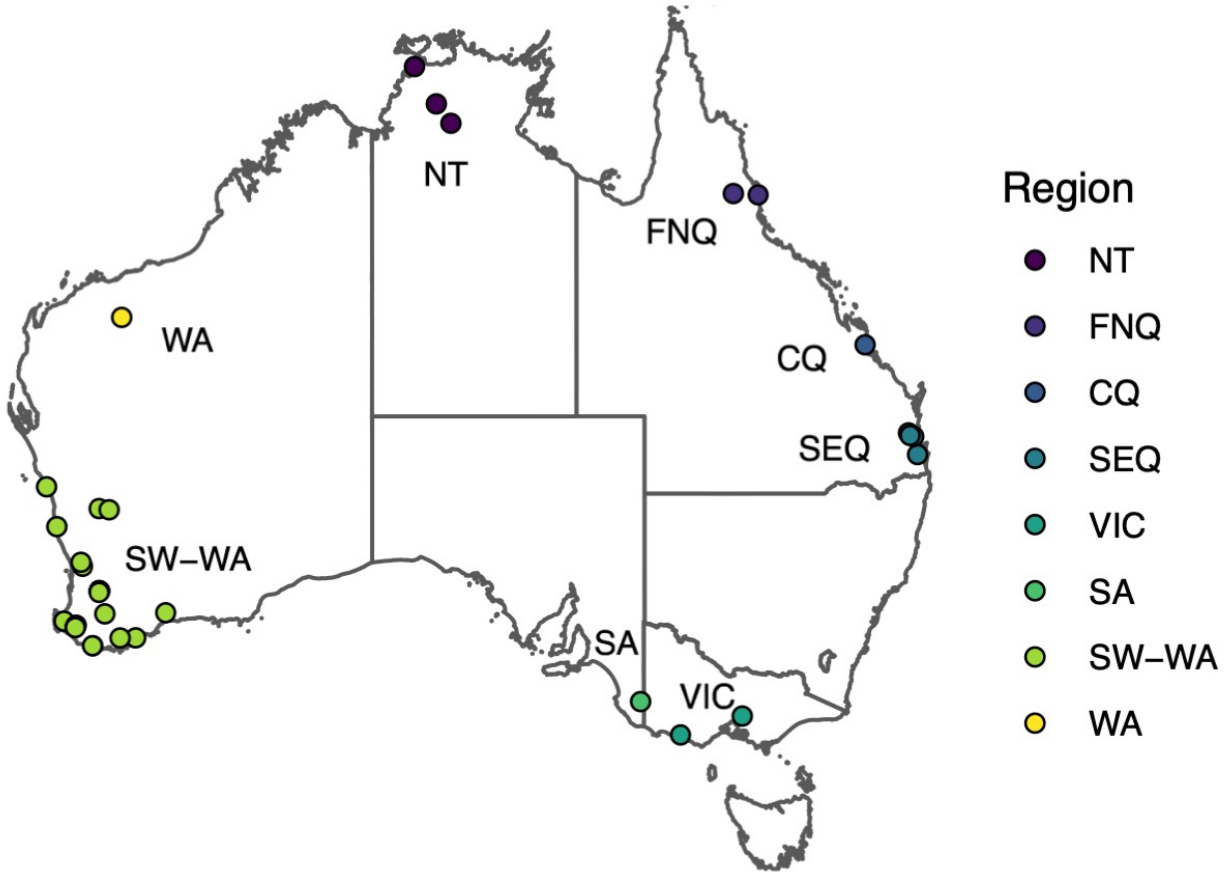
Sampling distribution



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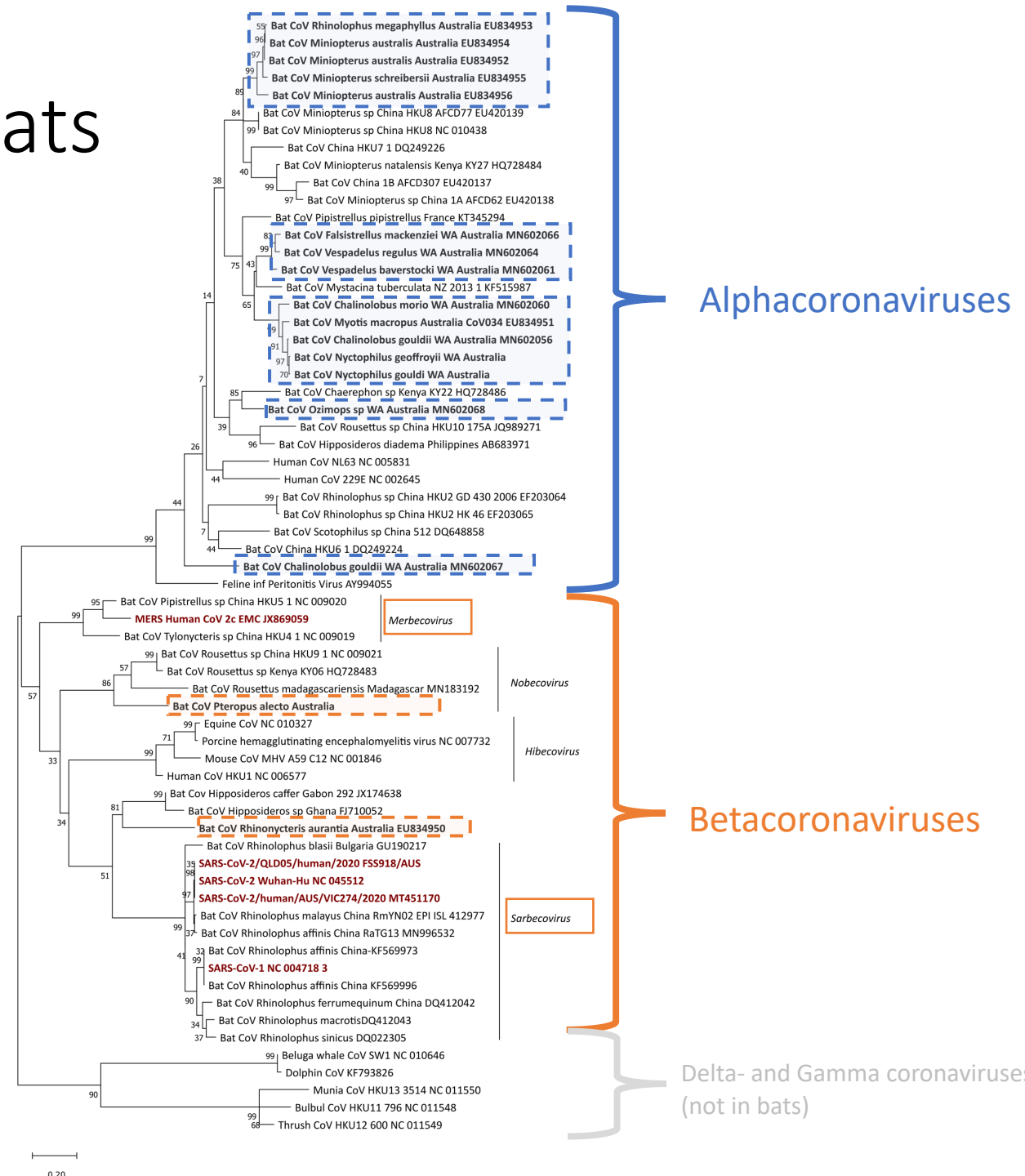
Coronaviruses in Australian bats

- 2 betacoronaviruses
- 7 alphacoronaviruses
- strong host associations
  - sequences cluster by host taxonomic affinity instead of sampling site
- no betacoronaviruses detected in Australian Rhinolophids or Hipposideros spp.



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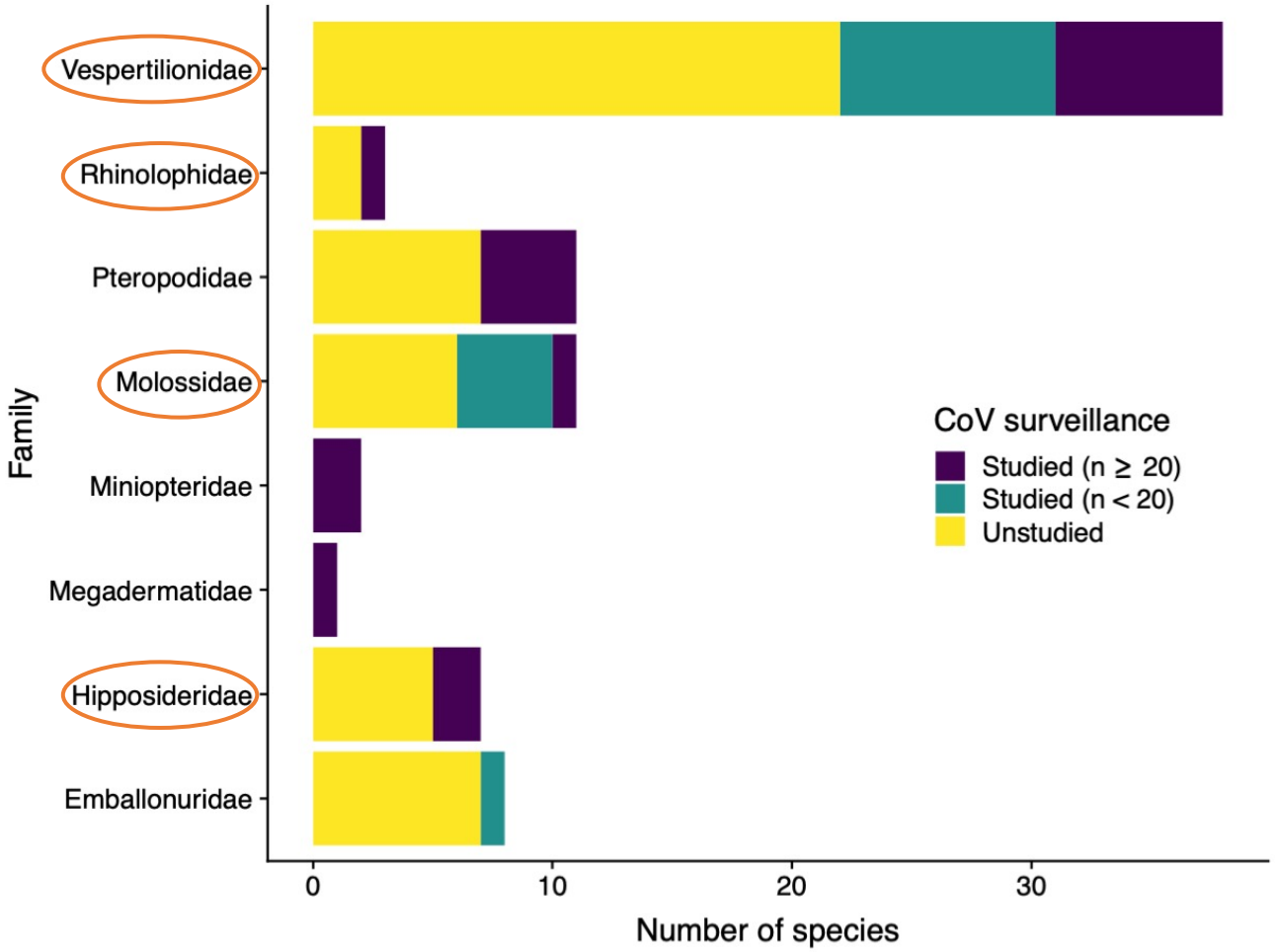
Many species remain untested



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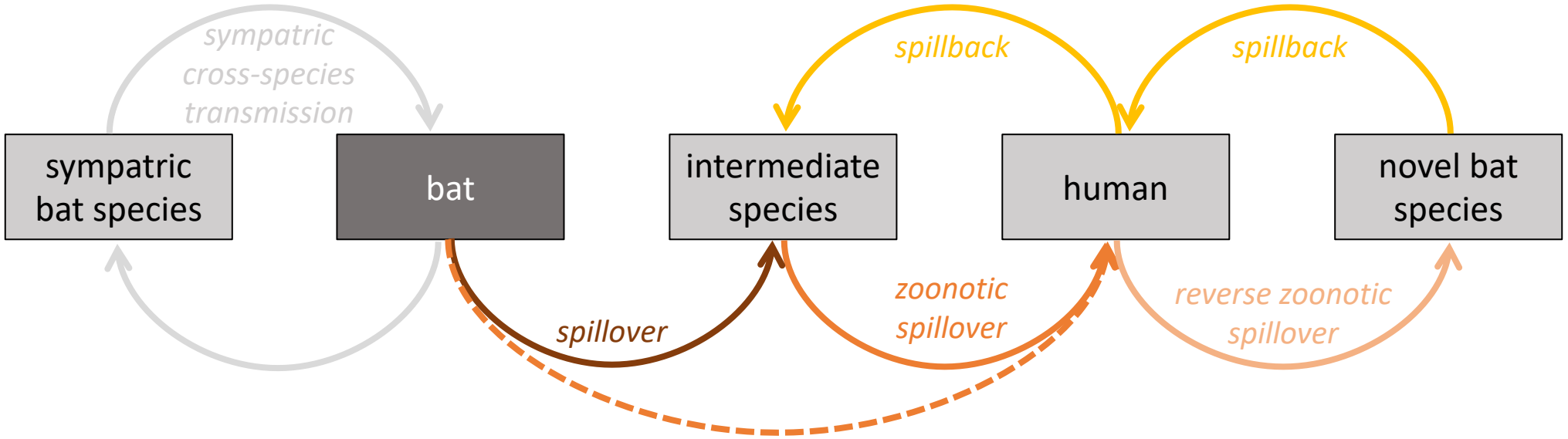
Spillover potential of Australian bat-borne coronaviruses



- Too little is known about Australian bat-borne coronaviruses to assess whether spillover does not occur, or does not cause disease, or occurs but is simply not detected.
- Spillover events are more likely to succeed where susceptible intermediate hosts are stressed and immunocompromised and where ongoing transmission is facilitated by high-density co-housing and poor on-farm biosecurity.

Peel et al, 2020 Aust J Zool

Potential establishment of novel coronaviruses in Australian bat populations following human-to-bat transmission

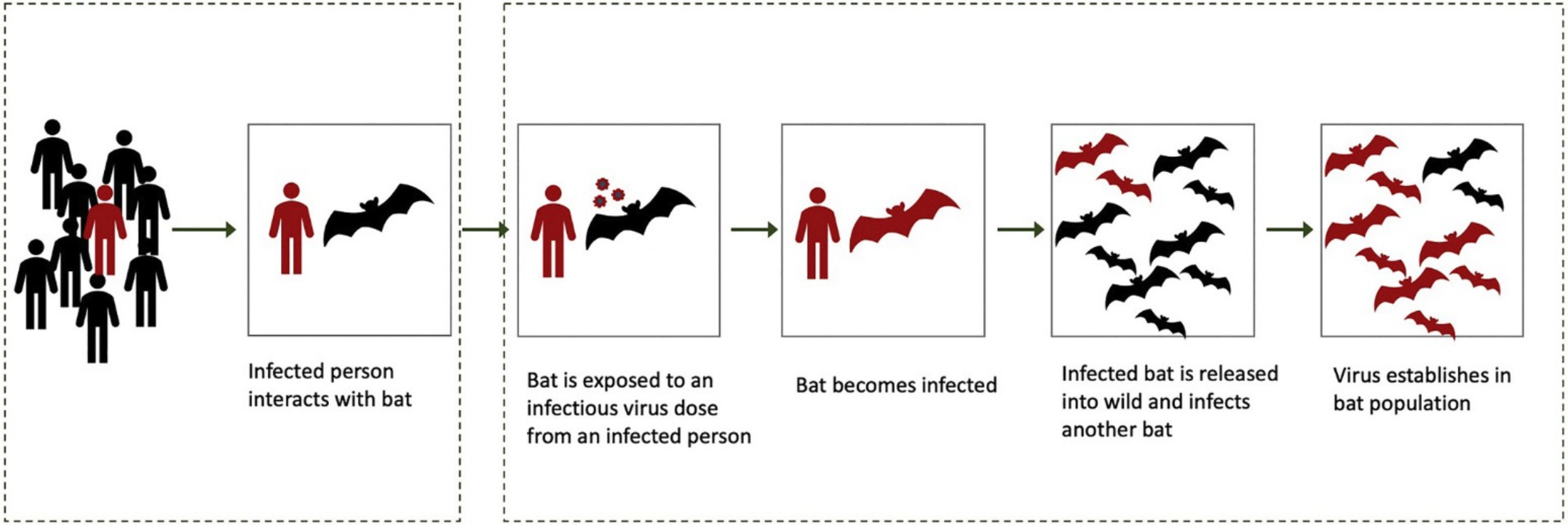
Contents lists available at ScienceDirect

One Health

journal homepage: www.elsevier.com/locate/onehlt

Risk of SARS-CoV-2 transmission from humans to bats – An Australian assessment

Keren Cox-Witton [a,*], Michelle L. Baker [b], Dan Edson [c], Alison J. Peel [d], Justin A. Welbergen [e,f], Hume Field [g,h]



LIKELIHOOD: EXTREMELY LOW* — LOW – VERY LOW

UNCERTAINTY: LOW — HIGH

Cox-Witton et al (2021). One Health

Coronavirus dynamics Australian flying foxes

BAT ONE HEALTH

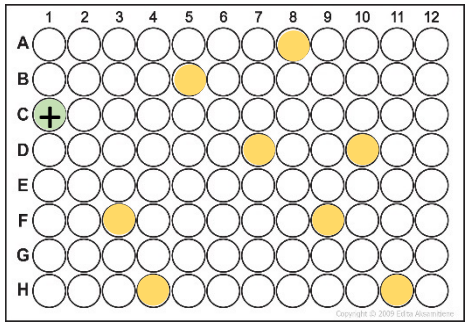
Horses as Sentinels

Pipeline to identify novel coronaviruses

Sample Collection

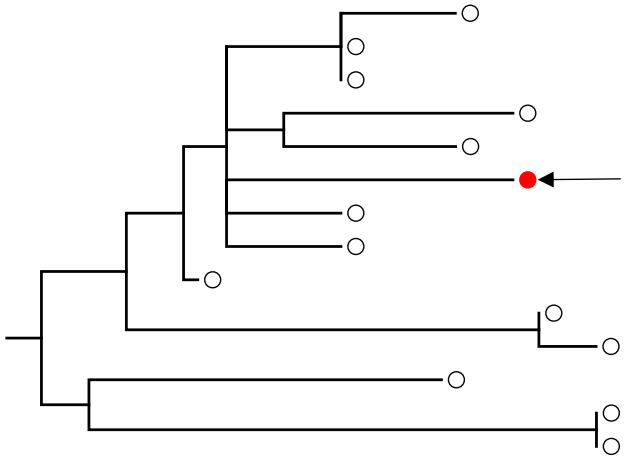
RNA Extraction
MagMAX mirVANA;
x80 samples per plate

cDNA synthesis and PCR
Primers are specific for conserved regions of coronavirus genomes



Identification of PCR Positives

Amplicon Sequencing
Illumina iSeq



Novel CoV

Sequence Analysis

Eden et al, in prep

In Summary

- No known zoonotic coronaviruses in Australian bats
- Uncertainty and gaps in our knowledge leave openings for misinformation and fear
- More viruses will be detected with increased sampling intensity, but zoonotic risk is generally expected to be very low
- Investigations of spillover potential of coronaviruses between Australian bats and humans should be framed in a broader ecological context.
- Bats are not “responsible” for the COVID-19 pandemic. Investigations of disease risk need to consider the holistic interaction of bats, their infections, and their environment.

Peel et al, 2020 Aust J Zool

Thank You

We acknowledge the Bundjalung, Butchulla, Danggan Balun, Gomeroi, Gumbainggir, Kabi Kabi, Taribelang Bunda, Turrbal, Widjabul Wia-bal, Wiradjuri, Yugambeh and Yuggera Ugarapul people, who are the Traditional Custodians of the land upon which this work was conducted.

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Raina Plowright, Vincent Munster, Kwe Claude Yinda, Tamika Lunn, Maureen Kessler, Devin Jones, Adrienne Dale, Manuel Ruiz Aravena, Andy Hoegh and others

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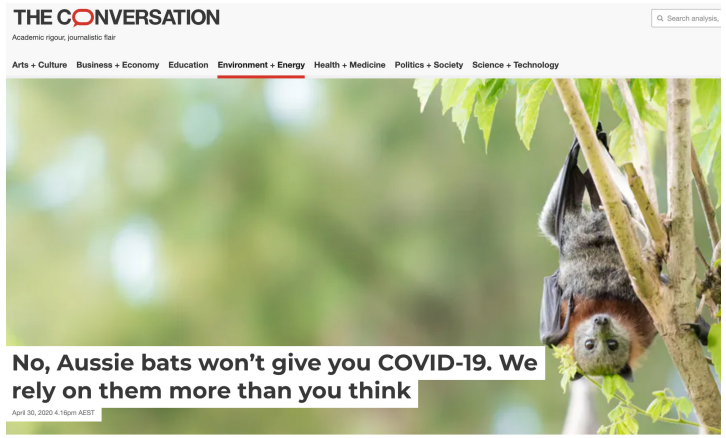

Lentini, Peel, Field, Welbergen 2020, The Conversation

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