Wildlife Health surveillance in Singapore

Dr Kelvin Lim
Director/ Biorisk & Biosurveillance, and Quarantine & Biosecurity Services
Animals & Veterinary Service/ National Parks Board

South-East Asia Wildlife Health Network Meeting

Nonthaburi, Thailand
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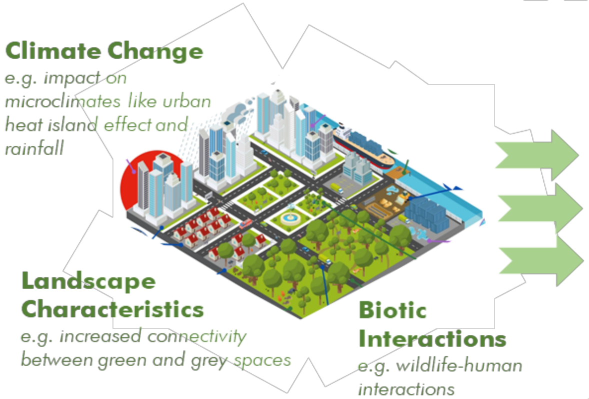
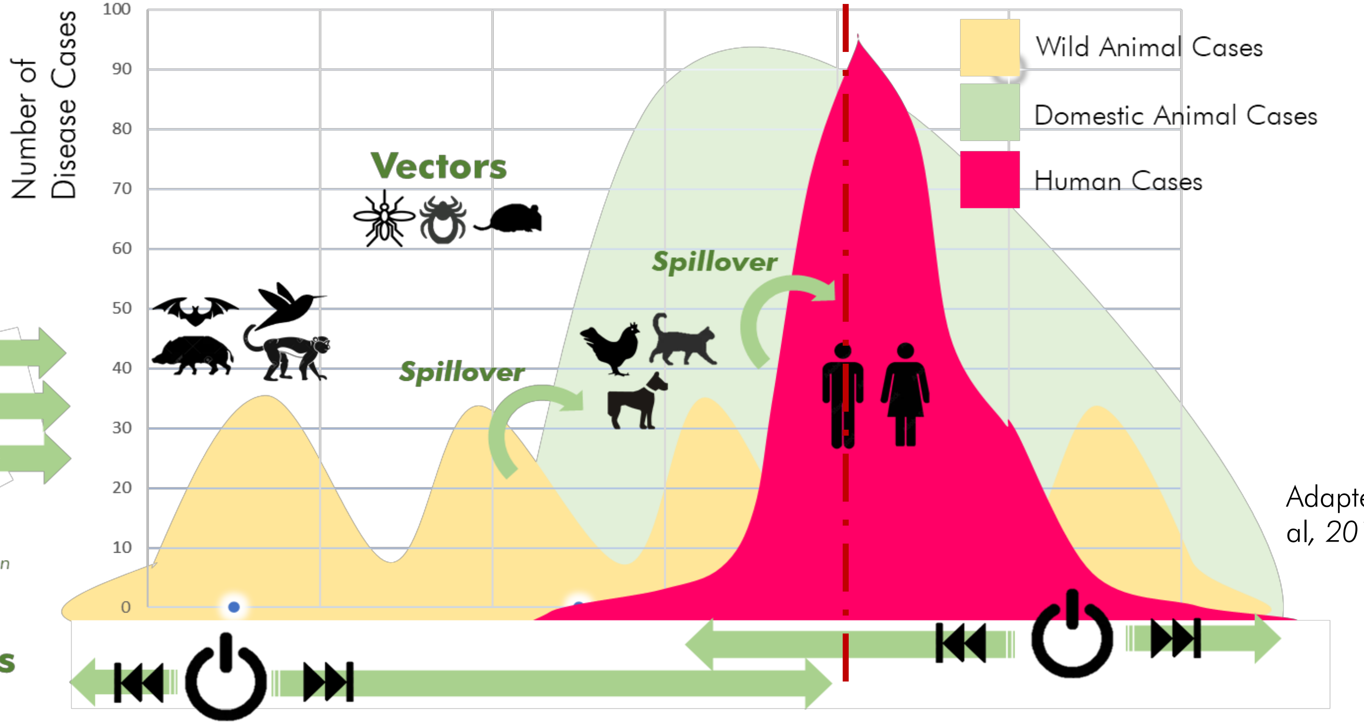
Biosurveillance

Pandemic preparedness as part of building a healthy, safe and resilient City in Nature

Biosurveillance is the systematic and continuous gathering, integration, interpretation, and communication of information on emerging diseases, animal hosts and vectors for ***early warning and detection.***

Early response policies and measures ***reduce the magnitude, and cost of emergency response measures*** *subsequently.*





Adapted from Karesh et al, 2012, *The Lancet*

Socio-ecological disease drivers within an urban system

Resulting in changes in:

1. *Host/ Vector Distribution and Abundance*
2. *Pathogen Prevalence*

Biosurveillance *to integrate disease intelligence and ecological/climate monitoring to track animal hosts, vectors and pathogens* ***before the epidemic curve***

Currently, investigation of host-vector-pathogen ecology is lacking and tends to be reactive in nature

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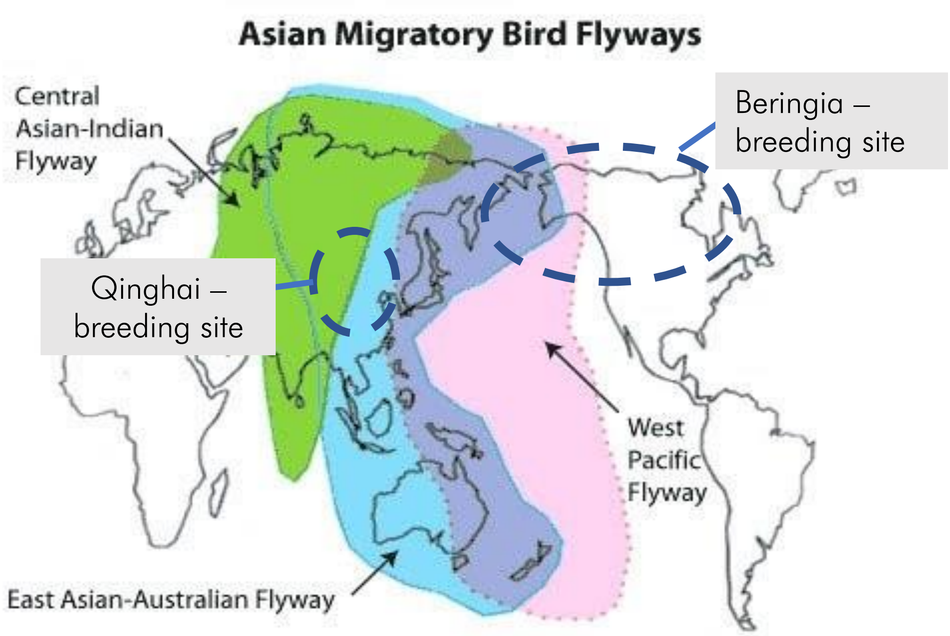
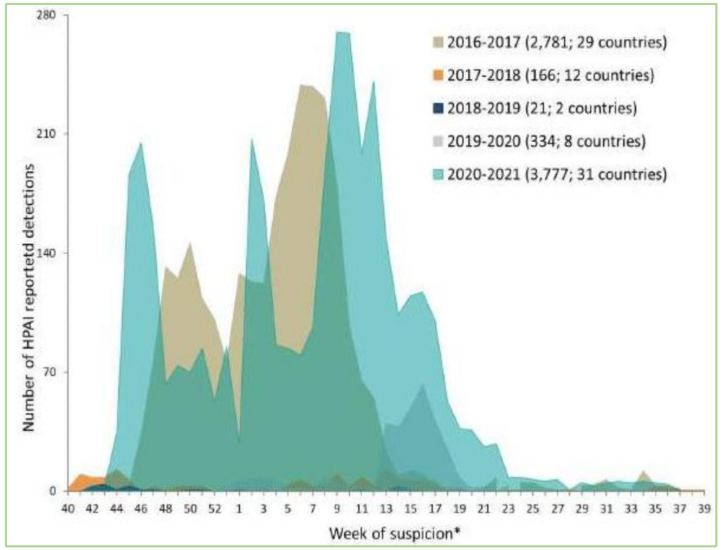
Climate Change and Disease Threats

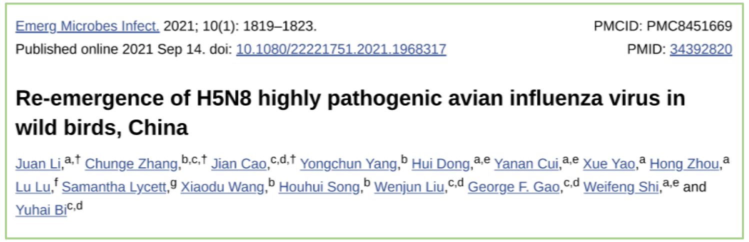
Timing and patterns of bird migrations will change with climate change
Prevalence of disease they carry may also increase



Migratory shorebirds wintering in Southeast Asia can use both the Central Asian Flyway and the East Asian-Australasian Flyway and spread disease such as avian influenza across continents



Increase in highly pathogenic avian influenza detections, especially in wild birds in Europe in recent years



Emerg Microbes Infect. 2021; 10(1): 1819–1823. PMCID: PMC8451669
Published online 2021 Sep 14. doi: 10.1080/22221751.2021.1968317 PMID: 34392820

Re-emergence of H5N8 highly pathogenic avian influenza virus in wild birds, China

Juan Li,[a,†] Chunge Zhang,[b,c,†] Jian Cao,[c,d,†] Yongchun Yang,[b] Hui Dong,[a,e] Yanan Cui,[a,e] Xue Yao,[a] Hong Zhou,[a] Lu Lu,[f] Samantha Lycett,[g] Xiaodu Wang,[b] Houhui Song,[b] Wenjun Liu,[c,d] George F. Gao,[c,d] Weifeng Shi,[a,e] and Yuhai Bi[c,d]

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Dispatch

Genetically Divergent Highly Pathogenic Avian Influenza A(H5N8) Viruses in Wild Birds, Eastern China

Guimei He, Le Ming, Xiang Li, Yuhe Song, Ling Tang, Min Ma, Jie Cui, and Tianhou Wang
Author affiliations: East China Normal University, Shanghai, China (G. He, L. Ming, L. Tang, M. Ma, T. Wang); CAS Key Laboratory of Molecular Virology & Immunology, Institut Pasteur, Center for Biosafety Mega-Science, Chinese Academy of Sciences, Shanghai (X. Li, Y. Song, J. Cui)
Cite This Article

Abstract
In late 2020, we detected 32 highly pathogenic avian influenza A(H5N8) viruses in migratory ducks in Shanghai, China. Phylogenetic analysis of 5 representative isolates identified 2 sublineages of clade 2.3.4.4b. Each sublineage formed separate clusters with isolates from East Asia and Europe.

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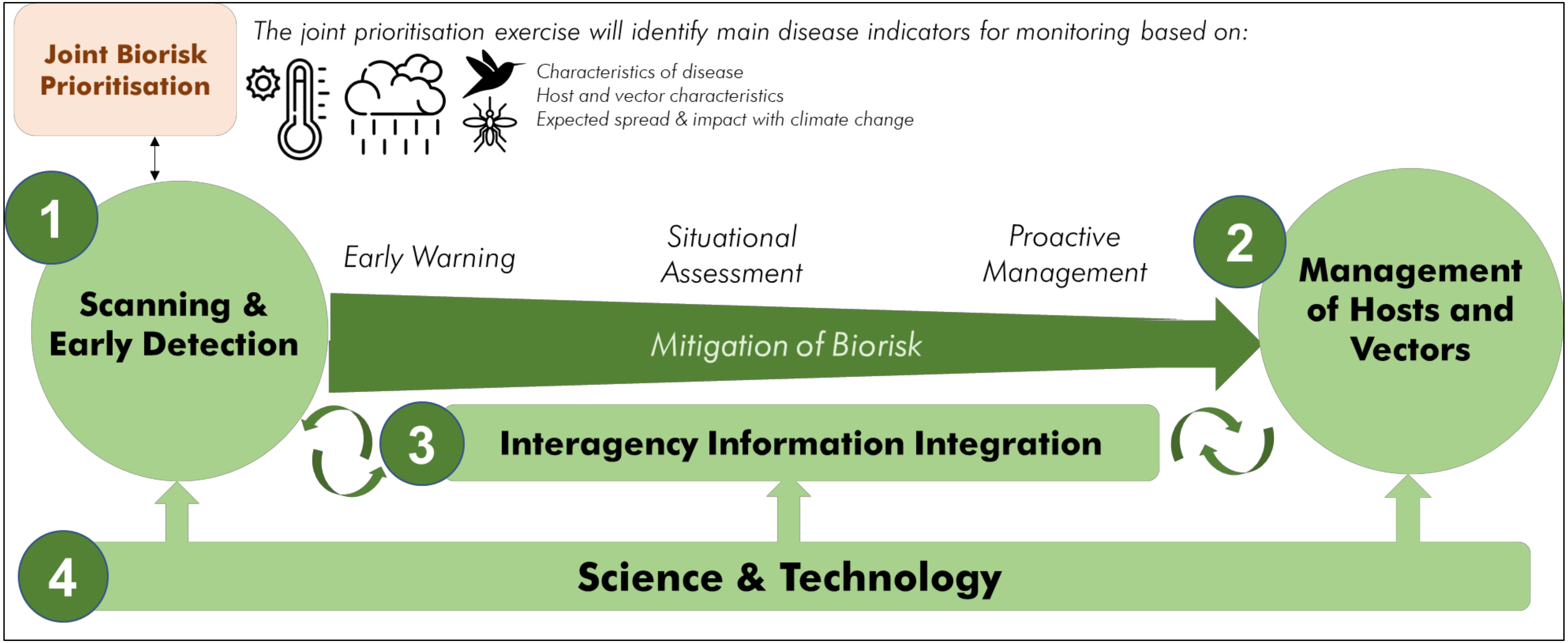
Similar viruses have also been introduced into China via wild birds in late 2020

Recent rapid and extensive geographic distribution of high pathogenicity avian influenza viruses in Europe, Asia and Middle East; bird species affected; and timing of outbreaks indicate introduction and spread through migratory wild birds

NParks Biosurveillance Framework

Four strategic thrusts are designed and planned for *adaptability* to strengthen our *resilience to public health shocks and climate change*.



Passive and Active Biosurveillance Programmes

Processes — Imports, Animal Handling, Slaughter, Pet, Leisurely Activities, Disposal

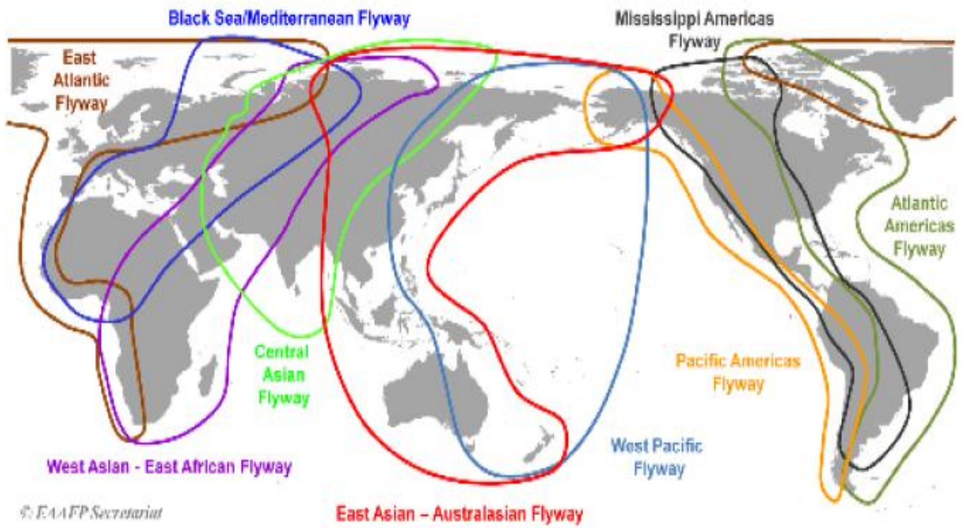
Pathogens — Emerging and Priority Animal and Zoonotic Diseases

Horizontals — Animal Population/Movement Data and Inter-Species Connections

Sample Matrices — Animal, Human, Environment, Water

Strengthen ***animal host and emerging vector monitoring for early detection***

Applied research to support biosurveillance



www.nature.com/scientificreports

Shorebirds wintering in Southeast Asia demonstrate trans-Himalayan flights

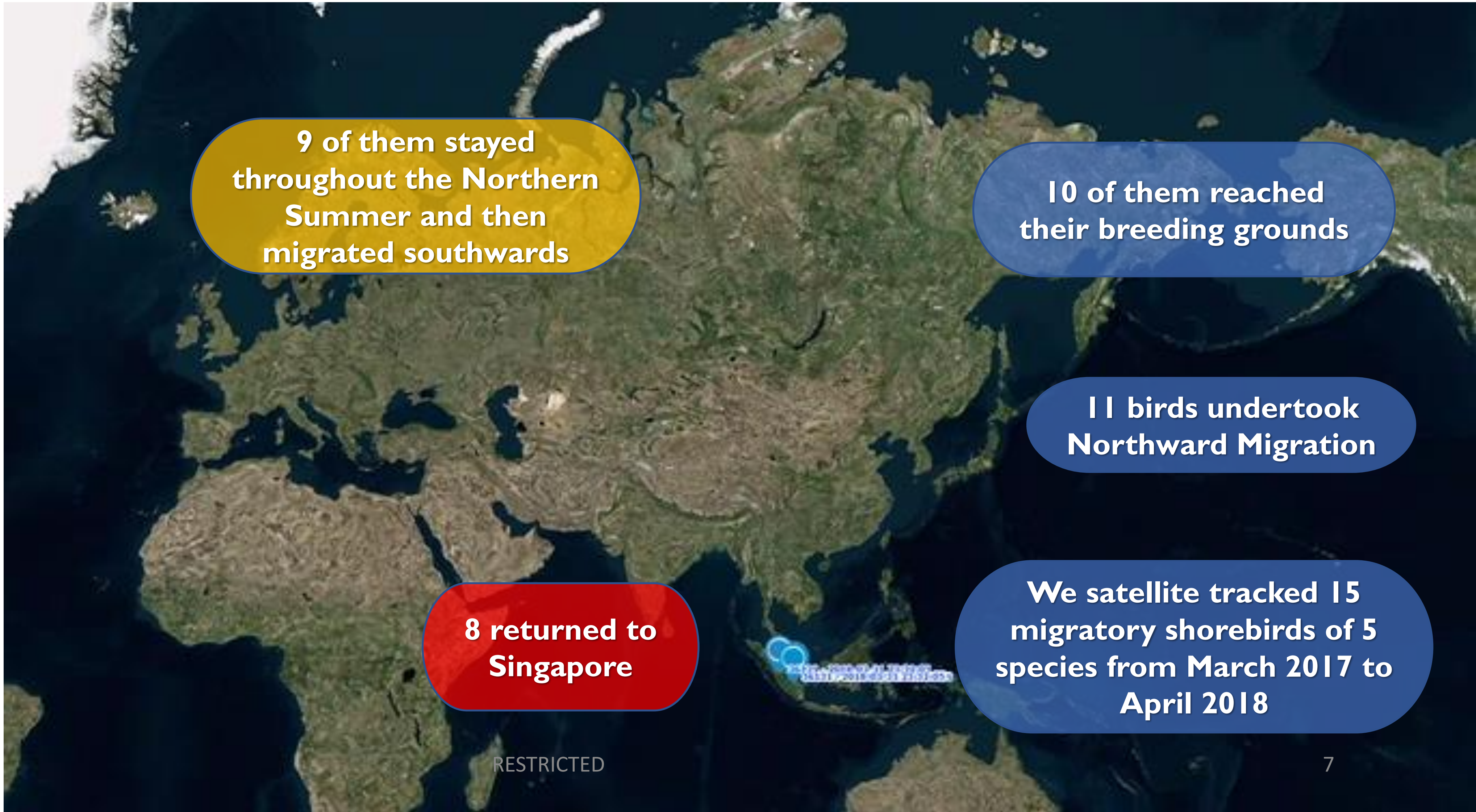
David Li[1], Geoffrey Davison[1], Simeon Lisovski[2], Phil F. Battley[3], Zhijun Ma[4], Shufen Yang[1], Choon Beng How[1], Doug Watkins[1], Philip Round[6], Alex Yee[1], Vupasana Srinivasan[1], Clarice Teo[1], Robert Teo[1], Adrian Loo[1], Chee Chiew Leong[1] & Kenneth Er[1]

- Conservation’s research improved our understanding of wild bird migratory flyways
- Inform potential risks of avian influenza
- On-going biosurveillance for early detection and expansion into environmental DNA research

Biodiversity Management

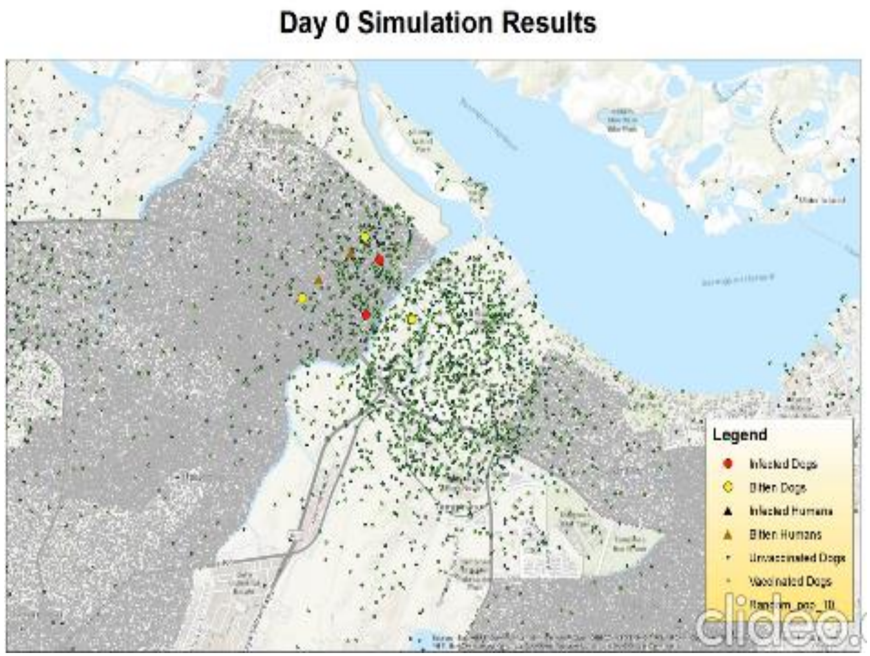
- Satellite tracking of 15 migratory shorebirds

- Common Greenshank B7
- Common Redshank WU
- Common Redshank A00
- Common Greenshank B6
- Pacific Golden Plover F3
- Common Redshank EP
- Grey Plover B3
- Whimbrel E9
- Whimbrel E6
- Whimbrel E7
- Whimbrel E8



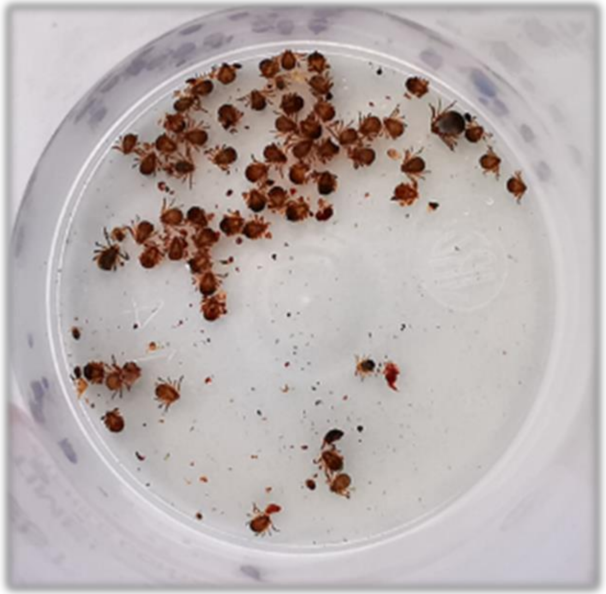
- **Develop open-source horizon scanning capabilities:** Scan and crawl more holistic sources of information on zoonotic and vector-borne diseases

- **Predictive risk-mapping and disease forecasting:** This is to determine opportunities for expanded investigation and raise operational readiness levels by enhancing the prediction of zoonotic outbreak probability



NParks is collaborating with Saw Swee Hock School of Public Health to develop disease models for zoonotic diseases. For example, pilot modelling is underway to map out spatiotemporal spread of rabies in Singapore based on data from ecological studies of stray dogs. This will help to define disease control zones and simulate control measures such as vaccination coverage.

Strengthen ***animal host and emerging vector monitoring for early detection***



Biosurveillance – emerging vectors

- Worked on enhanced vector surveillance e.g. ticks, together with wildlife and parks
- Detections of new zoonotic ticks and understanding local tick fauna
- On-going research into biting midges and sandflies (new species in Singapore)
- Developed capabilities to identify vectors and detect diseases


Contents lists available at ScienceDirect

Ticks and Tick-borne Diseases

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

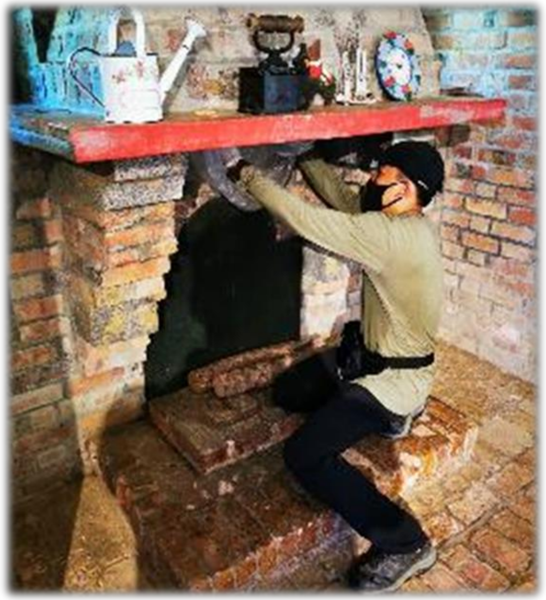
ELSEVIER

Original article

Emergence of the zoonotic tick *Dermacentor* (*Indocentor*) *auratus* Supino, 1897 (Acari: Ixodidae) in Singapore

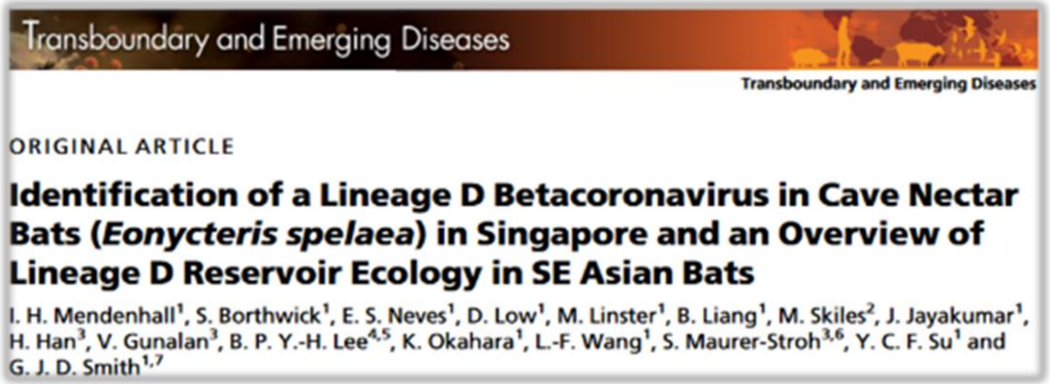
Mackenzie L. Kwak[a,*], Jean-Marc Chavatte[b], Ka Lip Chew[c], Benjamin P.Y.-H. Lee[d]

*Strengthen **animal host and emerging vector monitoring, control and disease management***



Biosurveillance – field collection

- Biosurveillance activities an extension of management and research activities
- Opening of new Centres provide us opportunities to expand syndromic surveillance and environmental sampling



Transboundary and Emerging Diseases

Transboundary and Emerging Diseases

ORIGINAL ARTICLE

Identification of a Lineage D Betacoronavirus in Cave Nectar Bats (*Eonycteris spelaea*) in Singapore and an Overview of Lineage D Reservoir Ecology in SE Asian Bats

I. H. Mendenhall[1], S. Borthwick[1], E. S. Neves[1], D. Low[1], M. Linster[1], B. Liang[1], M. Skiles[2], J. Jayakumar[1], H. Han[3], V. Gunalan[3], B. P. Y.-H. Lee[4,5], K. Okahara[1], L.-F. Wang[1], S. Maurer-Stroh[3,6], Y. C. F. Su[1] and G. J. D. Smith[1,7]

Strengthen ***animal host and emerging vector monitoring, control and disease management***

Centre for Wildlife Rehabilitation (CWR)

Animals admitted into the Centre for Wildlife Rehabilitation are examined and tested for diseases important to wildlife health and health of domestic animals and humans

- *Collection of samples from all animals for biosurveillance and research*
- *Results are analysed to guide risk assessments and management measures e.g. vaccination programmes and biosecurity practices for animals*
- *Allows us to identify potential disease threats, and to better monitor, respond and manage them accordingly*

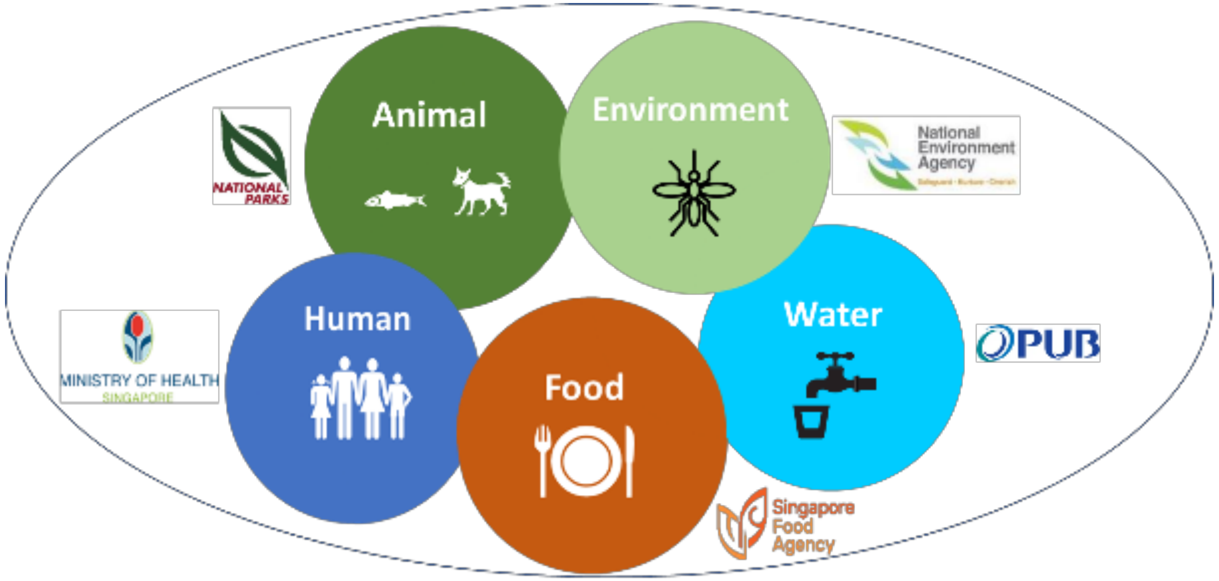
Wildlife Population Research

- Some animals are microchipped before being released
- Provides information on the movement patterns of the species and insights on the behaviour and distribution
- The Centre for Wildlife Rehabilitation works closely with academics, wildlife organisations such as ACRES and Mandai Wildlife Group, and Animal Working Groups such as the Long-tailed Macaque and Urban Wildlife Working Groups, to monitor the population of these wildlife species
- Expands opportunities with collaborations overseas and lead in the region on wildlife disease biosurveillance

*Establish an **integrated monitoring disease system** for public health threats*

One Health Cross-Sectoral Collaboration

- Interagency biosurveillance workshops in 2021 to identify and scope gaps and opportunities for early warning and detection
- Regular interagency exercises to test response plans for disease detections
- Embark on activities for joint risk assessments

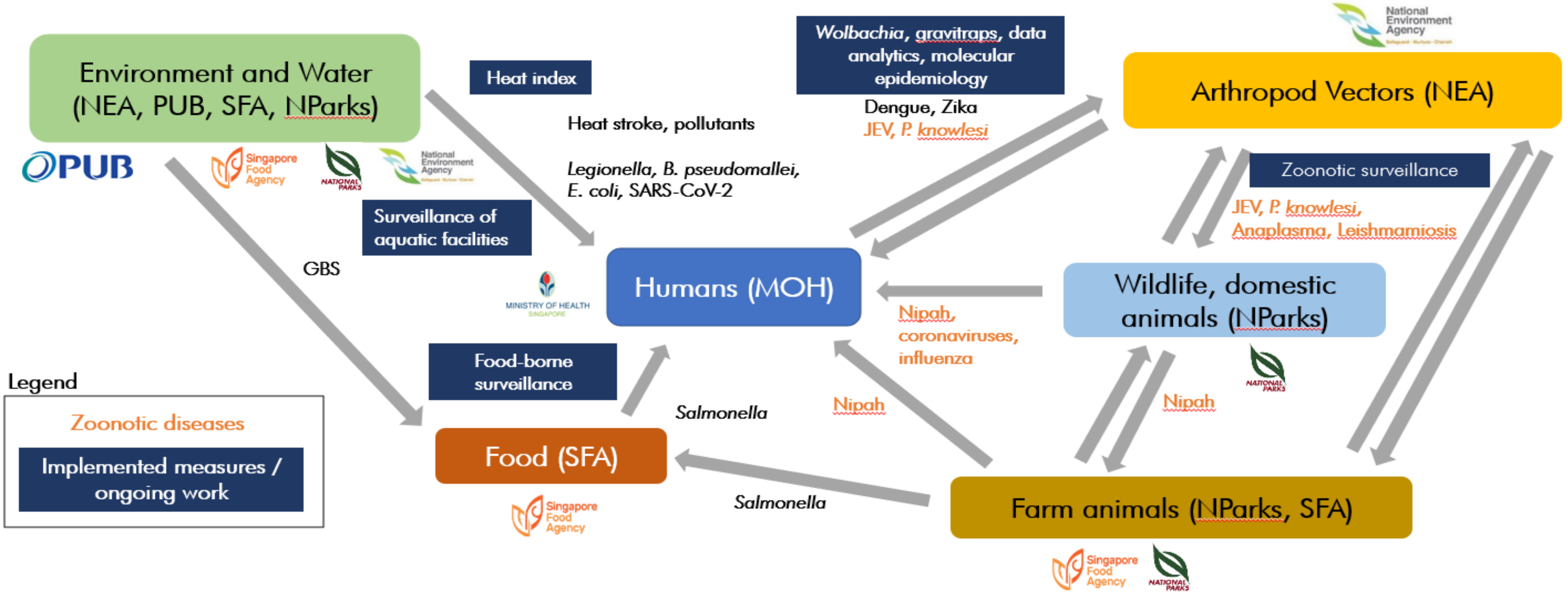


WOG Biosurveillance Scoping Workshop with One Health Partners (NEA, PUB, SFA and MOH) in Nov 2021

NParks-SFA tabletop exercise for Africa Swine Fever in 2021

WOG One Health Landscape

Ongoing biosurveillance efforts through individual agencies, One Health platform*, RWG Cluster 4*



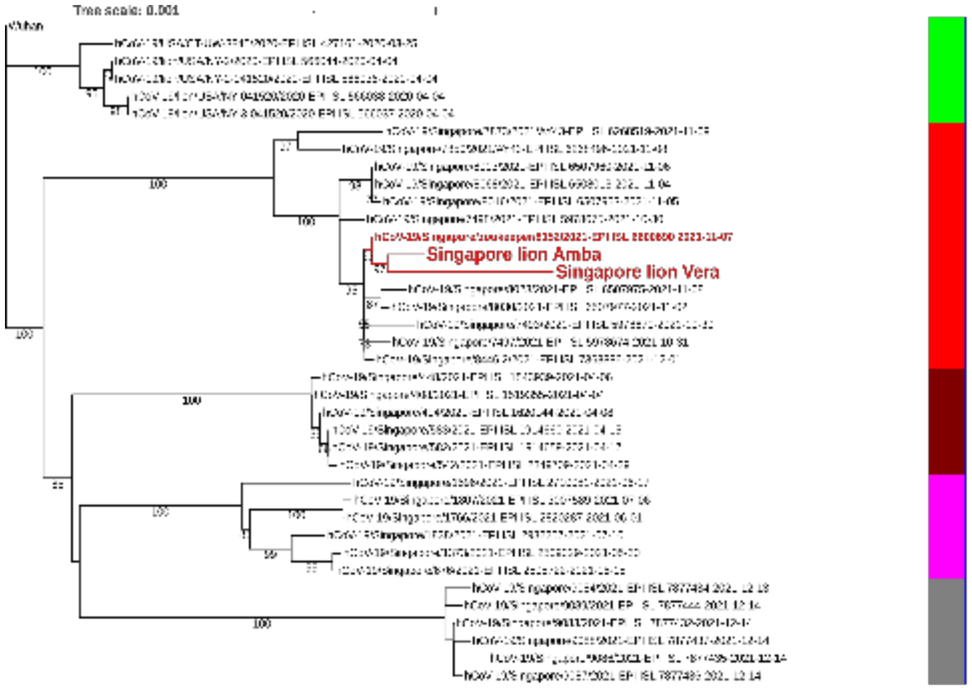
*The One Health Platform consists of the One Health Coordinating Committee and Working Group, comprising representatives from MOH, NParks, NEA, SFA and PUB. Areas of collaboration include all facets of public health e.g. biological threats, chemical threats.

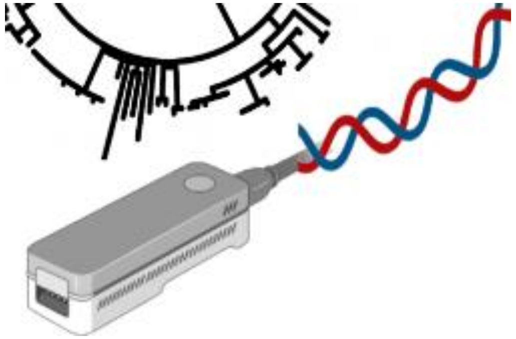
*Increase the **scale and quality of laboratory output** for disease threats*

Centre for Animal & Veterinary Sciences (CAVS)

- Enhanced eDNA and air sampler research and development
- Laboratory diagnostics to support animal disease outbreaks – SARS-CoV-2, Newcastle Disease, and Lumpy Skin Disease
    - *Use of high-throughput sequencing tools*
    - *~2 days for disease confirmation and whole genome assemblies*

- SARS-CoV-2 infection of lions, Nov 2021
    - *Whole genome assembly - Delta variant*
    - *Anthropogenic transmission*





END

- *Briefly outline surveillance of diseases (type/focus), status of surveillance.* Summary of sample collection and the lab analysis that were conducted
  - *Combination of passive and active surveillance programmes, focusing on species-pathogen combination*
  - *Embarking of environmental DNA research and surveillance*
- *What is the legal basis for wildlife surveillance – law, ministerial order, etc.*
  - Animals and Birds Act and the Wildlife Act
- *What is the source of funds for conduct of wildlife disease surveillance*
  - Government funded
- *List out agencies/stakeholders involved and briefly state their roles*
  - One Health agencies, IHLs, key wildlife establishments e.g. the zoo – they contribute expertise, field surveillance, etc.
- Which laboratories you send samples for testing?
  - Centre for Animal & Veterinary Science, and other One Health laboratories
- How do you store and analyse wildlife disease data?
  - Internal government database, which is based on a geospatial applications platform
- How were the results of data analysis applied/used ?
  - Joint risk assessment
- What the top 3 constraints/problems of implementing Wildlife disease surveillance in your country
  - Moving from animal-based to environment-based sampling; Risk Assessment and Modelling (what do we do with the results); Require regional intelligence, as opposed to local surveillance results only

- *Brief situation on submission to WAHIS and constraints*
  - *Where emerging diseases are detected, we will report to WAHIS e.g. SARS-CoV-2 in lions*
- *Briefly describe link to national or exchange of info between various data streams*, if any
  - Under development
- *List of various platforms of wildlife health/disease networks in the country and brief description*
  - Under One Health network
- *What specific trainings have your agencies conducted or attended to enhance wildlife disease surveillance*?
  - FETP and animal health training
- *Please identify top 3 priority topics for training you need in the next 12 months*
  - Linked to problem statements – wildlife disease risk assessment, looking at non-traditional models of environment monitoring and testing, modelling wildlife disease