National Environmental Research Program

Project 11.2

Improved Mosquito Disease Detection & Prevention of Spread in the Torres Strait

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Torres Strait Regional Authority

TSRA www.tsra.gov.au

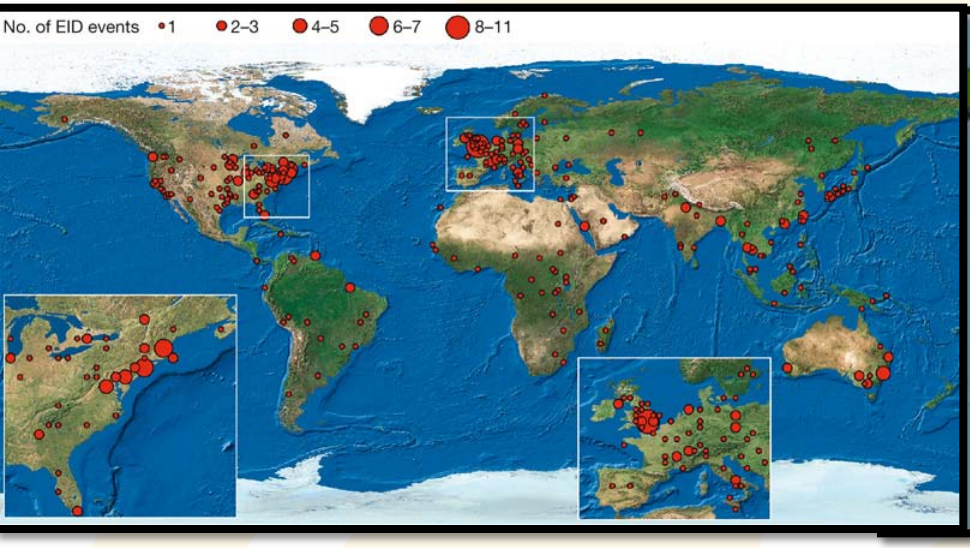
Emerging Infectious Diseases

EXISTING DISEASE TRANSMITTED TO A NEW HOST

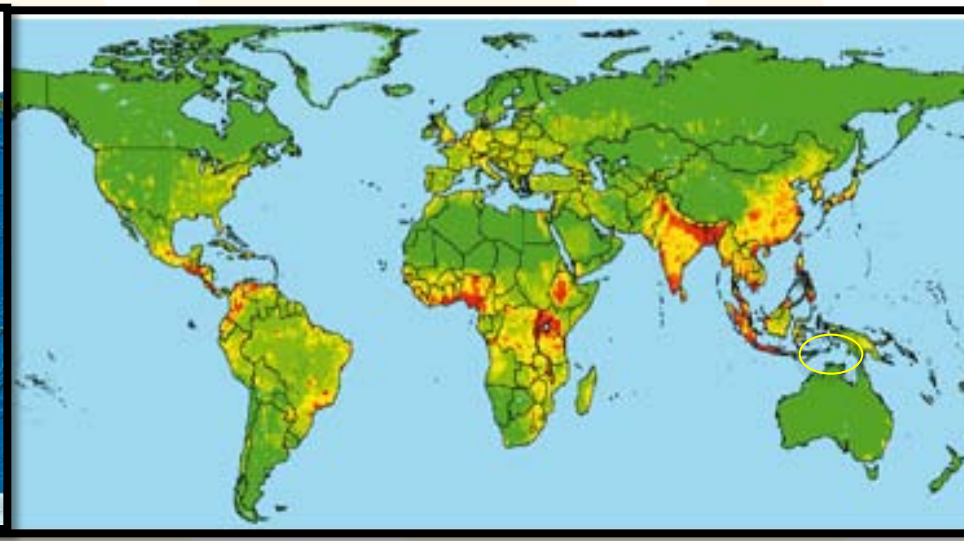
DISEASE MOVED TO A NEW AREA

Understanding Disease Risk

- Disease detection is higher in developed world
- Disease risk is higher in tropical frontier regions



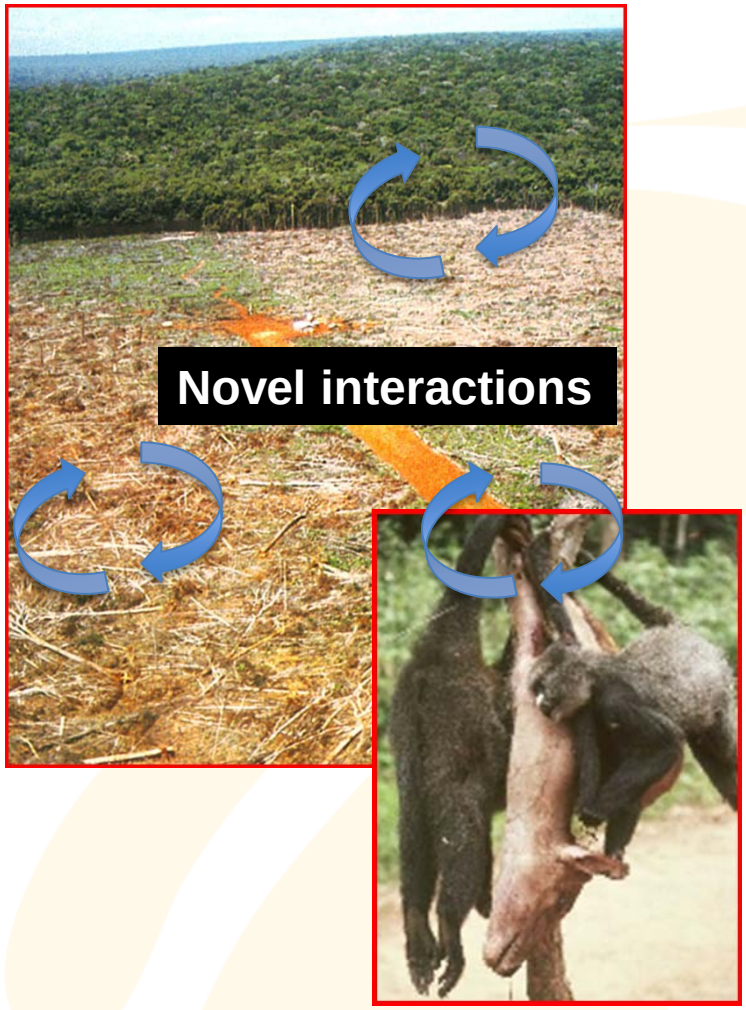
EID Detections



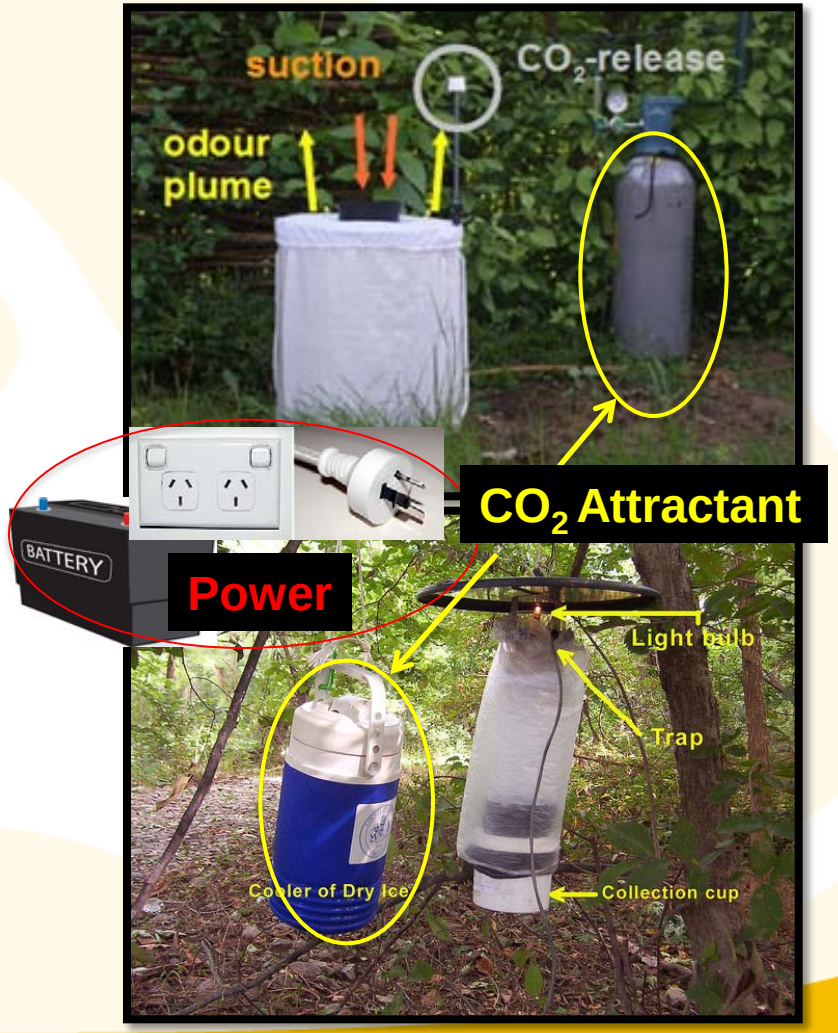
EID Risk

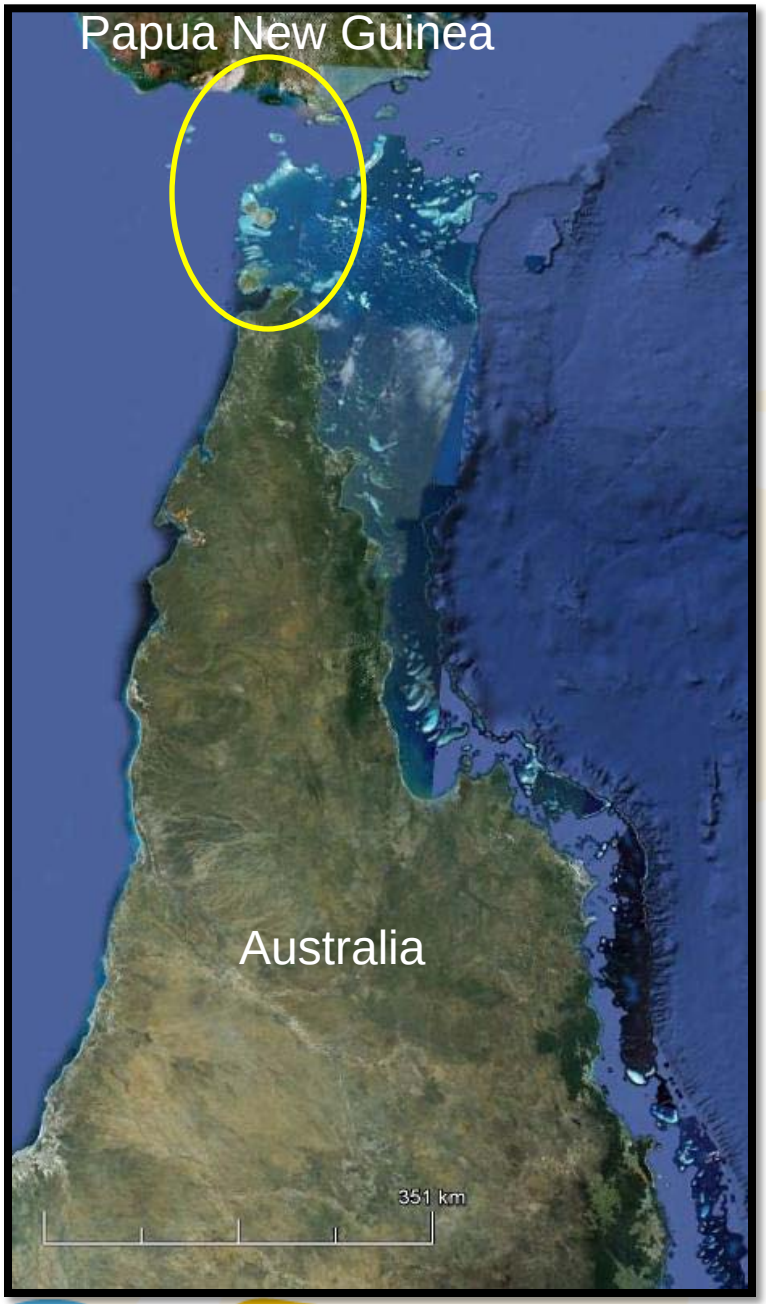
Understanding Disease Emergence

1) Human land use



2) Inadequate disease surveillance





Our research challenge was to work in the Torres Strait – a remote tropical area – and with limited funds

Step 1: Develop & trial novel mosquito sampling methods for remote regions

Standard CDC mosquito trap with battery & CO_2 from dry ice

New passive box trap (no power) with CO_2 from yeast & sugar

Field trial results

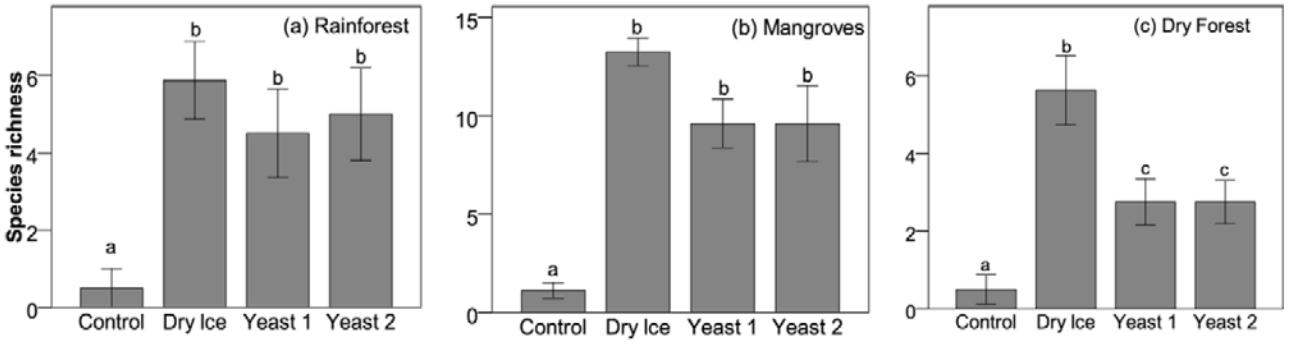


Fig. 3. Mean number of species (±1 SE) captured with control, dry ice, yeast 1, and yeast 2 treatments in (a) rainforest, (b) mangroves, and (c) dry forest—(y-axes vary). Different letters denote significant differences.

SAMPLING, DISTRIBUTION, DISPERSAL

Overcoming the Challenges of Mosquito (Diptera: Culicidae) Sampling in Remote Localities: A Comparison of CO_2 Attractants on Mosquito Communities in Three Tropical Forest Habitats

D. B. MEYER STEIGER,[1,2,3] S. A. RITCHIE,[4] AND S.G.W. LAURANCE[1,2]

J. Med. Entomol. 51(1): 39–45 (2014); DOI: http://dx.doi.org/10.1603/ME12216

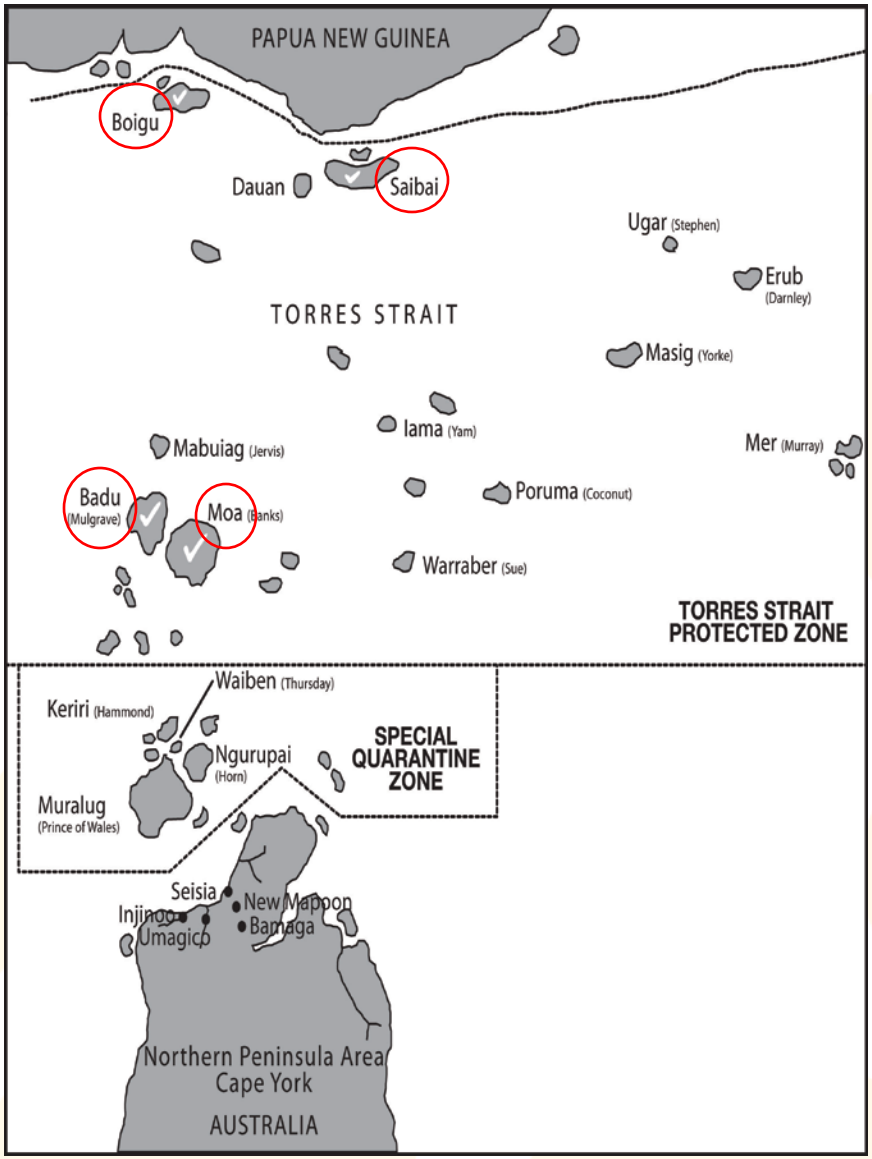
Dry ice generates more CO_2

But importantly the same species are caught with yeast attractant (where mosquitoes are abundant RF & Man).

Novel method can replace standard sampling for remote areas!

Step 2: Field Study in the Torres Strait

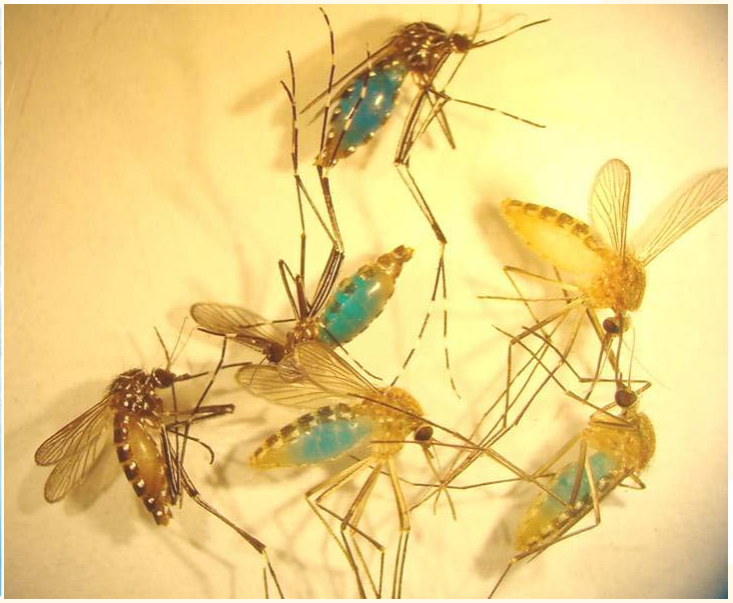
A comparison of mosquitoes in villages & native habitat on 4 islands, 2 years



Saibai, Boigu, Badu & Moa: 2013 & 2014

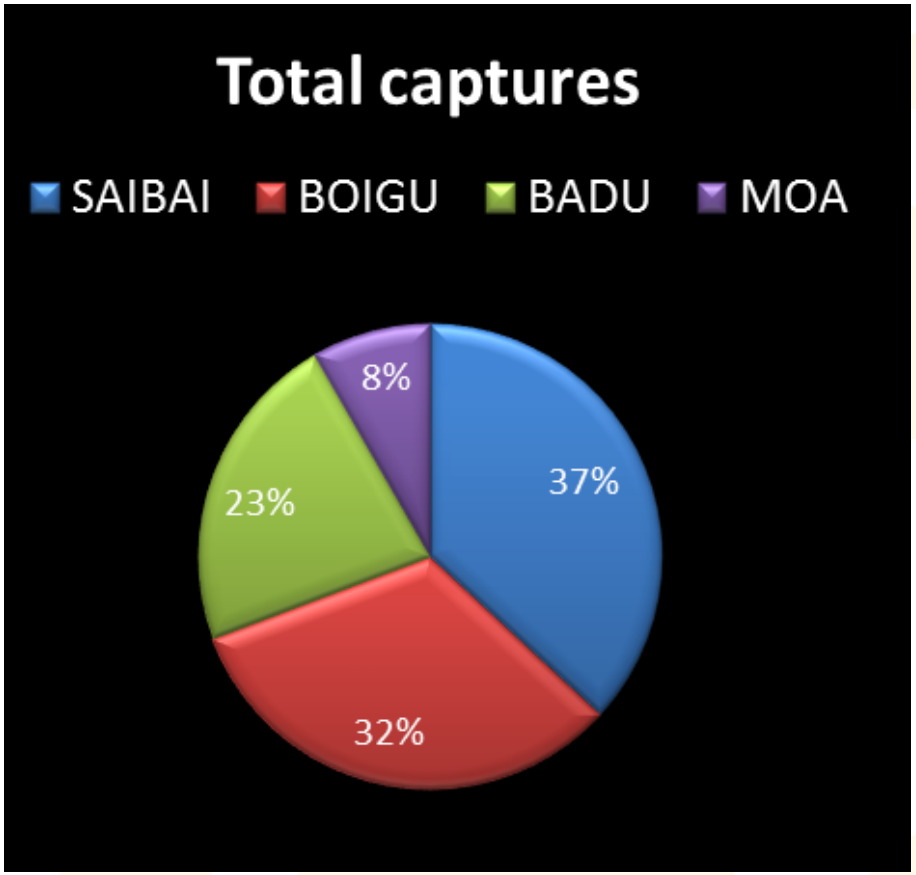
Step 3: A novel method for disease detection in mosquito vectors (& capacity building in North Qld)

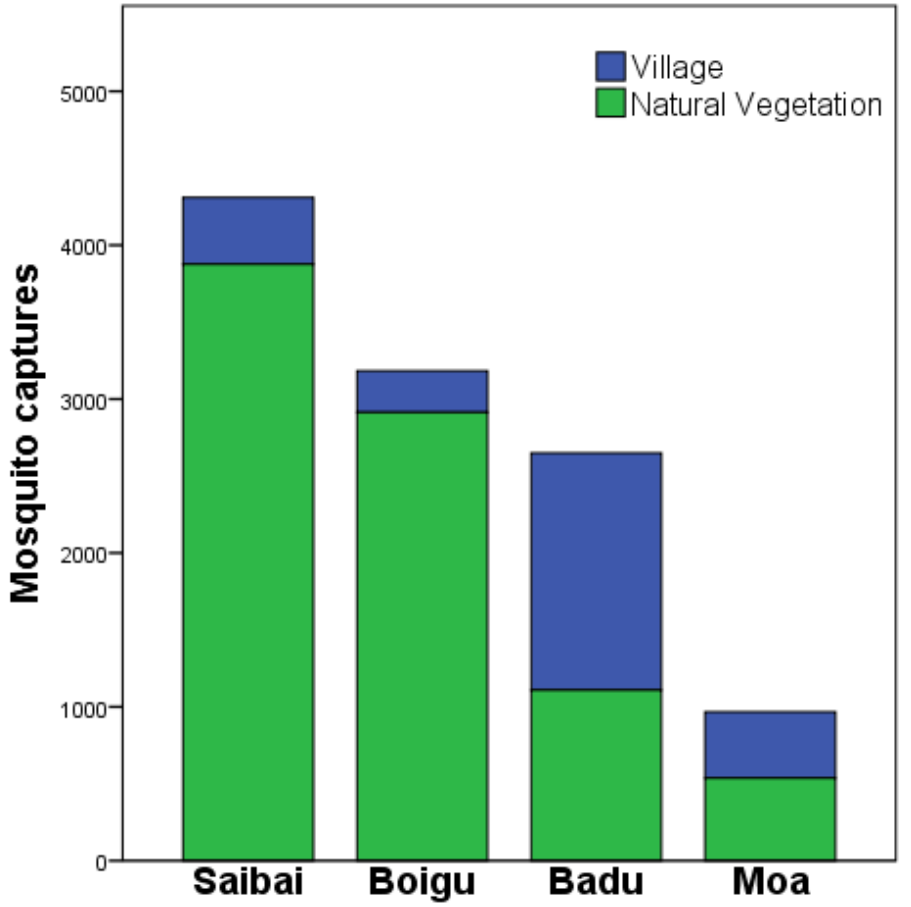
- Honey-coated FTA® (Flinders Technology Associates) cards installed in traps to collect mosquito saliva



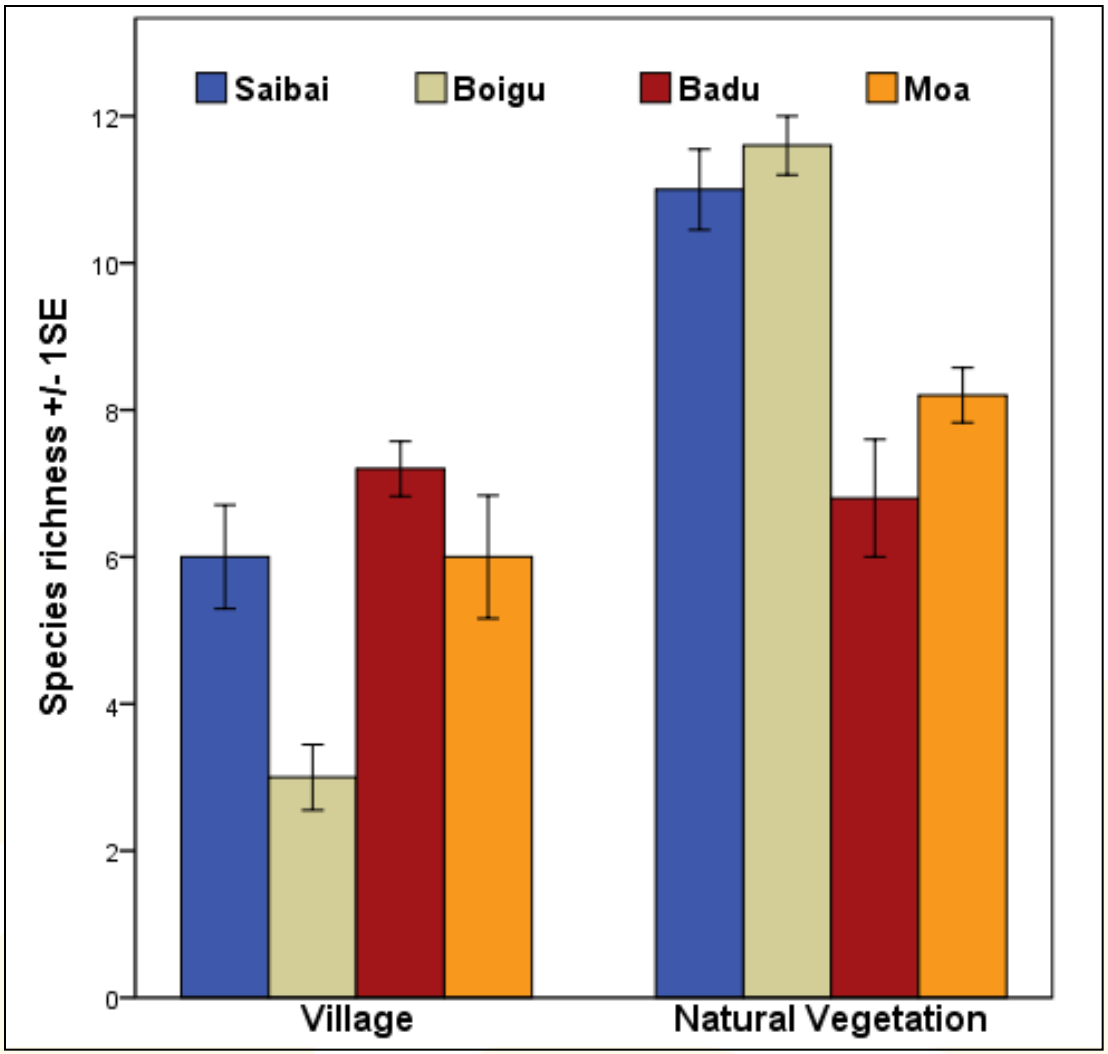
RESULTS

~ 12,000 mosquitoes captured & identified





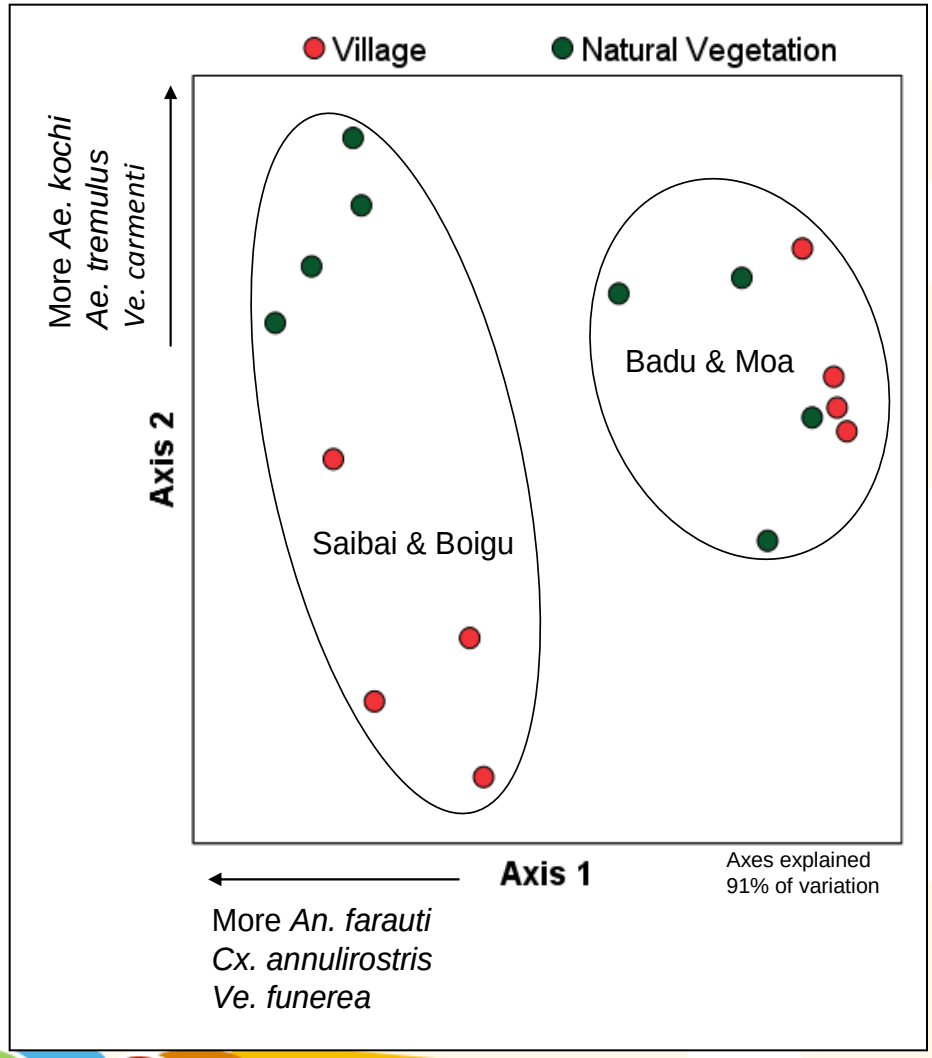
Does habitat type and island influence species richness?



34 species, 10 genera

Species Composition

Mosquito community varied strongly in response to island & habitat

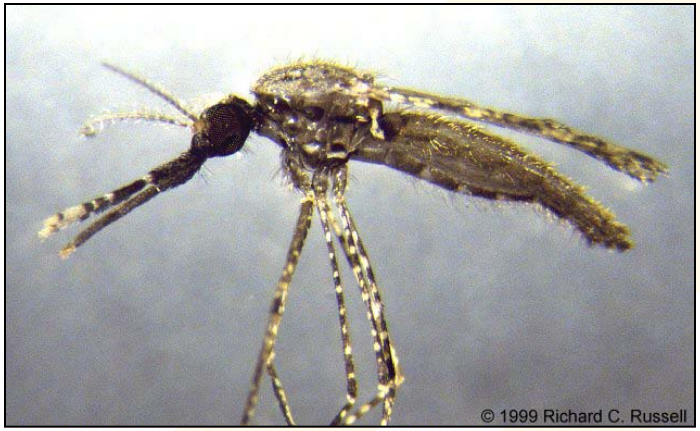


- Saibai & Boigu similar
- Badu & Moa similar
- villages & natural vegetation support different communities
- 6 species were important

Caution: no long-term study (8 weeks)

Medically important species

Culex annulirostris (Ross River, Japanese encephalitis, Murray Valley, Kunjin & many more) the most dominant species in our study.



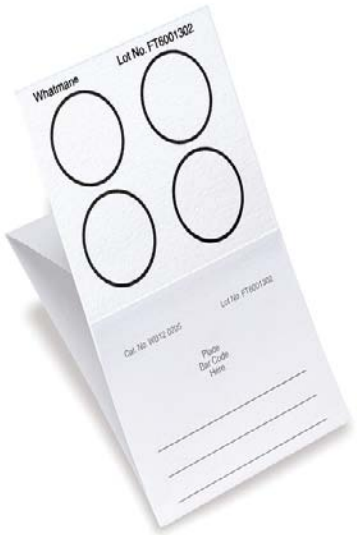
Anopheles farauti (main malaria vector in Australia): mainly captured on Boigu & Saibai

RECENT INVADER

Aedes albopictus (dengue, Chikungunya, dog heartworm): mainly captured in villages (only 1 in natural vegetation!)

Disease detection

+



➢ extracting viral RNA from honey-treated FTA® cards

➢ followed by PCR (performed in Molecular Lab at JCU Cairns)

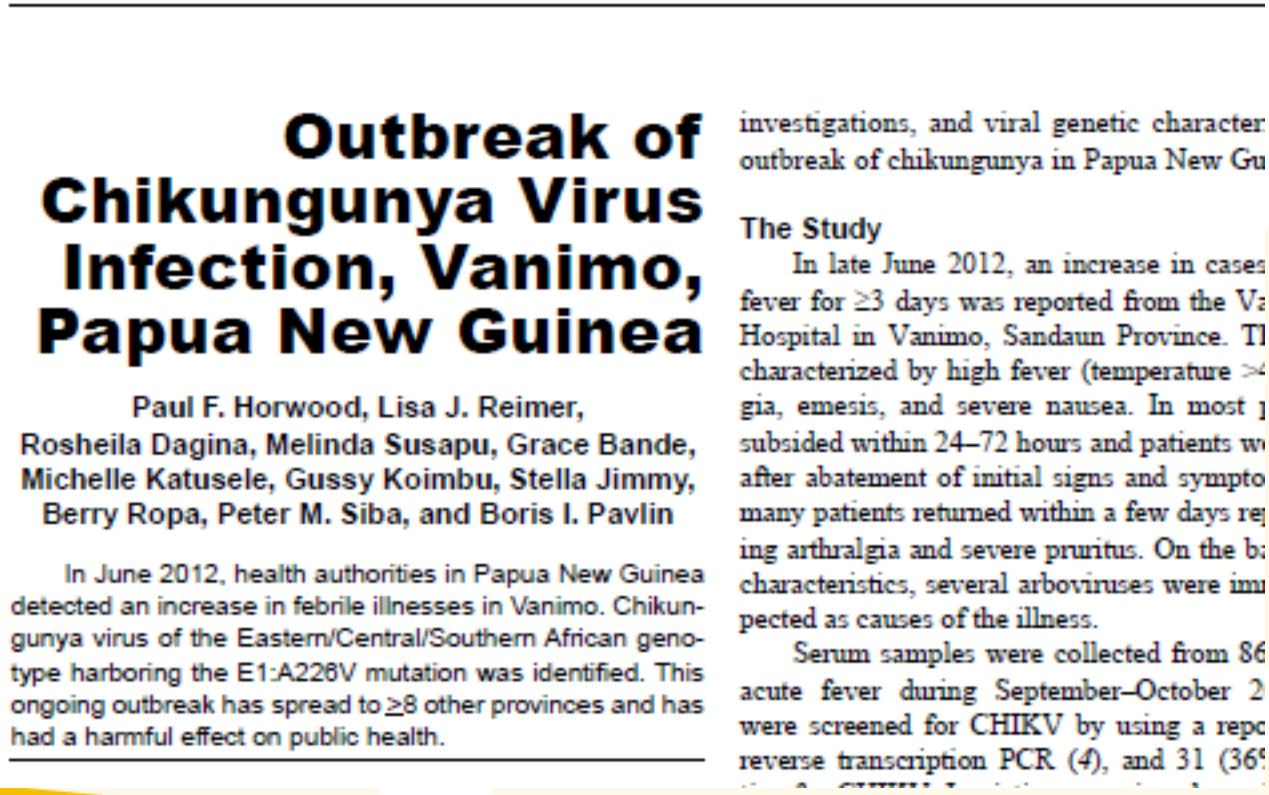
- avian & human Malaria
- Dengue
- Ross River fever
- Kunjin
- Japanese encephalitis
- Chikungunya

Step 4: Future research

- Continue to trial different yeast varieties & trap modifications

Conclusions

- Torres Strait is one of the most “at risk” communities in Australia with respect to mosquito-borne EID’s



Outbreak of Chikungunya Virus Infection, Vanimo, Papua New Guinea

Paul F. Horwood, Lisa J. Reimer, Rosheila Dagina, Melinda Susapu, Grace Bande, Michelle Katusele, Gussy Koimbu, Stella Jimmy, Berry Ropa, Peter M. Siba, and Boris I. Pavlin

In June 2012, health authorities in Papua New Guinea detected an increase in febrile illnesses in Vanimo. Chikungunya virus of the Eastern/Central/Southern African genotype harboring the E1:A226V mutation was identified. This ongoing outbreak has spread to ≥8 other provinces and has had a harmful effect on public health.

investigations, and viral genetic character
outbreak of chikungunya in Papua New Gu

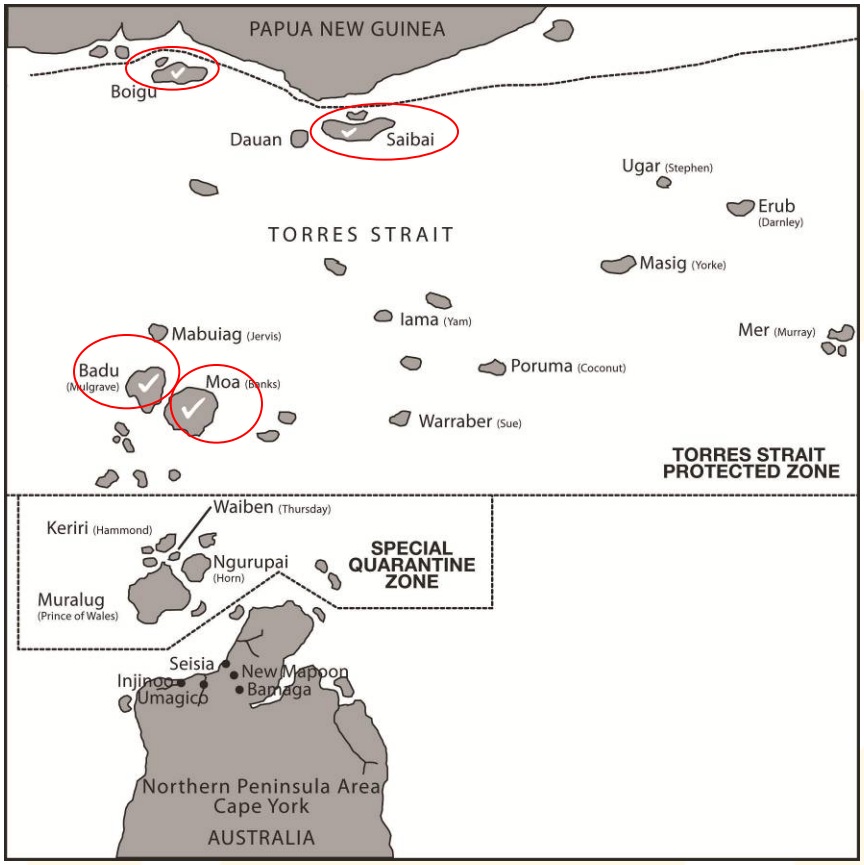
The Study

In late June 2012, an increase in cases
fever for ≥3 days was reported from the Va
Hospital in Vanimo, Sandaun Province. Tl
characterized by high fever (temperature >
gia, emesis, and severe nausea. In most
subsided within 24–72 hours and patients w
after abatement of initial signs and sympto
many patients returned within a few days re
ing arthralgia and severe pruritus. On the b
characteristics, several arboviruses were im
pected as causes of the illness.

Serum samples were collected from 86
acute fever during September–October 2
were screened for CHIKV by using a repo
reverse transcription PCR (*4*), and 31 (36

National Environmental Research Program

Collaboration with TSRA Land and Sea Management Unit Staff



- Established contact with communities of four islands: Boigu, Saibai, Badu and Moa
- Arranged permits for community visits and field work

Collaboration with TSRA Land & Sea Management Unit - Rangers

- TSRA Land & Sea Management Unit staff worked with scientists on field schedules & ranger availability
- Rangers worked closely with scientists in selecting field-sites, logistics, & field trapping of mosquitoes
- Knowledge sharing was an important result, scientists learning about the Torres Strait & TSRA rangers learning about the risk of mosquitoes & the diseases they carry to the Torres Strait communities

Acknowledgements

- RNTBC's, Elders and Island Councils, Staff of the Torres Strait Regional Authority, & the communities that welcomed us!
- Paul Zborowski, Richard Russell & John Clancy,
- Natalie Dillon, DAFF & Volunteers

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