Antimicrobial Resistance in Wildlife: A One Health Perspective for the Pacific

What We Know, What We Don't, and Why It Matters

Dr. Anthony Keyburn| 9th December 2025

I would like to begin by acknowledging the Wadawurrung People as the Traditional Owners of the lands that we're meeting on today, and pay my respect to their Elders past and present.

'Eternal Wisdom, Infinite Innovation'
artwork by Rachael Sarra, working with Gilimbaa.

Why Focus on Wildlife?

Wildlife connects ecosystems and human health.

Wildlife can act as:

Reservoirs (harbor resistant bacteria).

Sentinels (indicators of environmental AMR).

Pacific context:

High biodiversity.

Close human–wildlife interactions (tourism, aquaculture).

Fragile ecosystems.

What We Know Globally

AMR detected in wildlife worldwide:

Birds: ESBL-producing *E. coli* in gulls and migratory seabirds. (Atterby et al.,2017, Suarez-Yana et al.,2024)

Mammals: Carbapenem-resistant Enterobacterales in rodents and bats. (Ramírez-Castillo et al.,2023, Kyung & Yoo,2024)

Marine species: Resistant bacteria in seals and turtles. (Norman et al.,2021, Drane et al.,2021)

Common resistance genes reported: ESBL, carbapenemases, colistin resistance.

Drivers:

Environmental contamination (wastewater, agricultural runoff).

Proximity to humans and livestock.

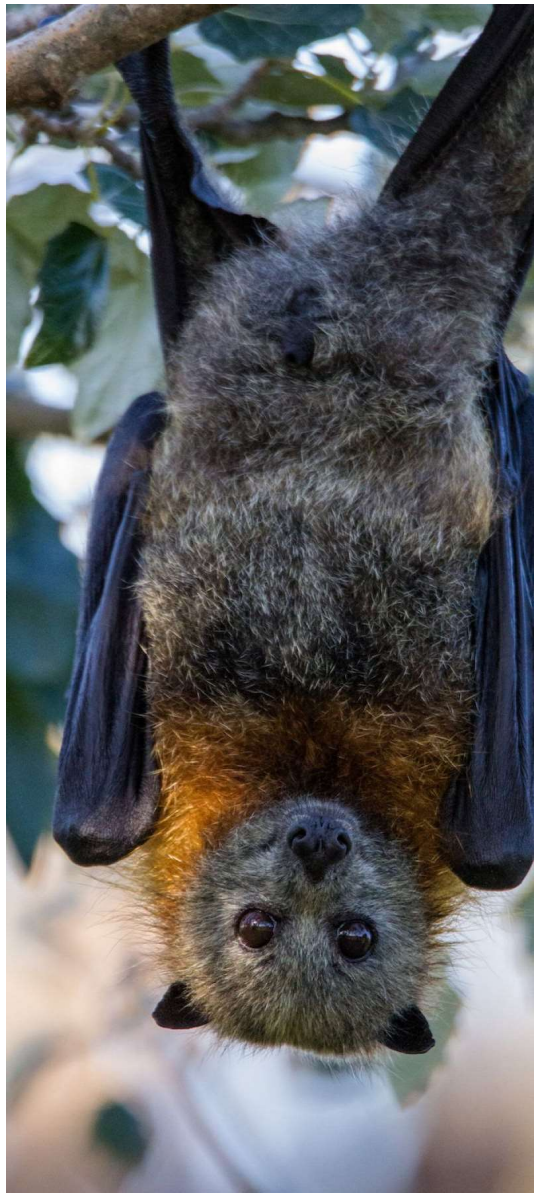
Wildlife often acts as a sink, not a primary source, but spreads AMR over large distances.

Examples of Previous Work

- Australia:
  - Resistant *E. coli* in flying foxes and seabirds. (McDougall et al.,2022, Mukerji et al.,2019)
  - AMR in reptiles linked to rehabilitation centers. (Pyne et al.,2024)

- Global:
  - Migratory birds carrying AMR genes across continents.
  - Rodents in urban areas with multidrug-resistant bacteria.

- Key insight: Wildlife AMR correlates strongly with human impact and pollution.



Pacific Region – Current Knowledge

- Very limited published data.
- Known risk factors:
  - Antibiotic use in aquaculture and livestock.
  - Wastewater discharge into marine environments.
  - Wildlife rehabilitation and release programs.

- No systematic surveillance for wildlife AMR.

Knowledge Gaps

- Extent of AMR in free-ranging wildlife in Pacific islands.
- Role of wildlife in AMR maintenance and dispersal.
- Impact on wildlife health and conservation.
- Lack of guidelines for antimicrobial use in wildlife care.
- No integration of wildlife into national AMR action plans.

Activities in the Pacific

- Capacity Building for AMR Management (COMBAT AMR)
- Watershed Interventions for Systems Health (WISH)
- Enhancing the Management of Antimicrobial Resistance (EMAR)

No direct wildlife activities embedded

Capacity Building for AMR Management (COMBAT-AMR)

Focus & Objectives:

- Strengthen AMR management in Fiji, Samoa, PNG, Solomon Islands.
- Improve antimicrobial stewardship and infection prevention in hospitals and veterinary sectors.

Key Actions:

- Developed antimicrobial treatment guidelines for animal health.
- Enhanced laboratory capacity for AMR surveillance.
- Promoted One Health collaboration between human and animal health sectors.

Wildlife Relevance:

- Reduces spillover risk to wildlife by controlling AMR in livestock and domestic animals.
- Framework adaptable for wildlife rehabilitation centers and aquaculture zones.

Watershed Interventions for Systems Health (WISH)

Focus & Objectives:

- Investigate environmental determinants of AMR in Fiji watersheds.
- Link AMR prevalence to land-use changes and ecosystem health.

Key Actions:

- Collected water, sediment, and swab samples from 29 communities in 5 watersheds.
- Used metagenomics to detect 434 antibiotic resistance genes (ARGs) across 13 antibiotic classes.
- Identified links between AMR and livestock access to waterways.

Wildlife Relevance:

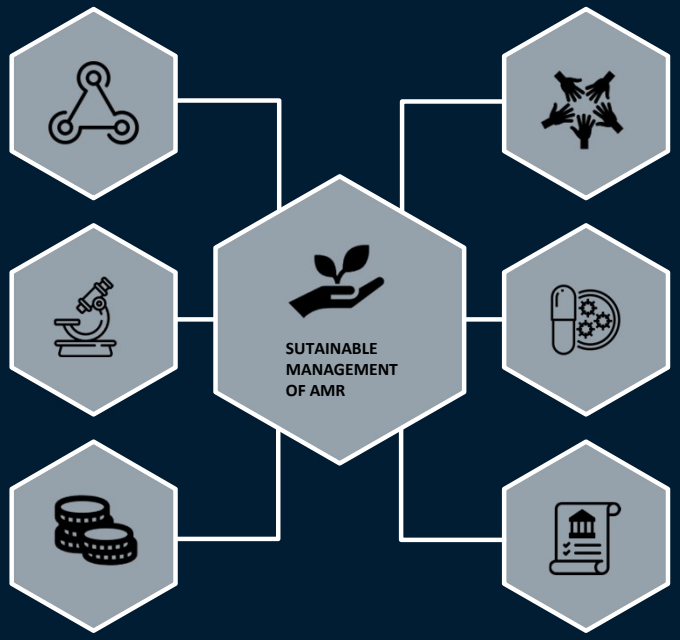
- Wildlife in these watersheds likely exposed to resistant bacteria, acting as sentinels or carriers.
- Provides a model for environmental AMR surveillance including wildlife habitats.

EMAR Focal areas

INTEGRATED AMR SURVEILLANCE
Evaluation of the occurrence of antimicrobial resistance (AMR) in humans, animals, and the environment.

LABORATORY CAPACITY BUILDING
Training of the human, animal, and the environmental laboratory staff.

ECONOMIC & RISK ANALYSIS
Evaluation of the economic impact of AMR and risk of spread in the socio-ecological system.



AMR GOVERNANCE
Promoting polycentric governance where all stakeholders are involved in managing AMR.

ANTIMICROBIAL STEWARDSHIP
Promoting antimicrobial stewardship in human and animal health.

POLICY & COMMUNITY ENGAGEMENT
Assisting in the development of evidence-based policy as well as conducting community training and public awareness on AMR.

Integrated surveillance

Human health (Fiji):

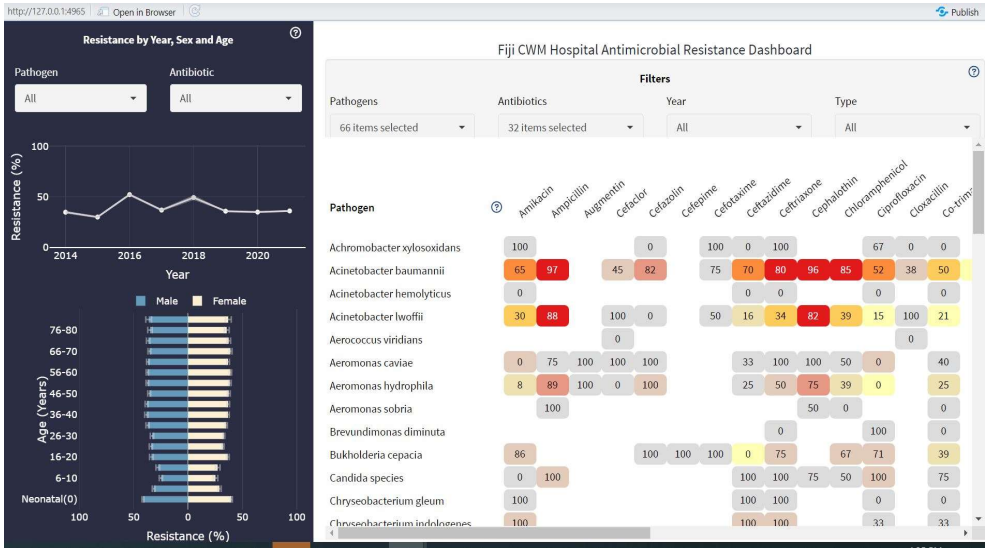
- Developed AMR dashboard to support decision making.
- Ongoing prospective study on *A. baumannii* bacteraemia at CWM hospital.
- Analysis of the KAP study is ongoing.

Animal Health (Fiji and Samoa):

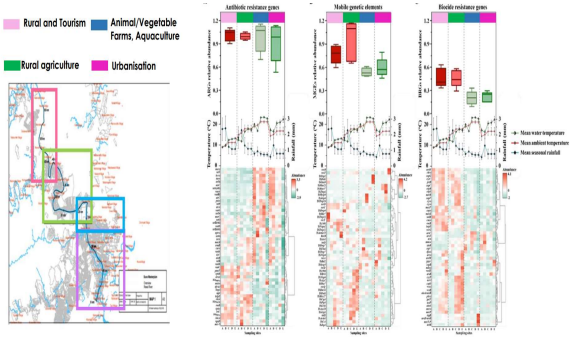
- Fiji: Analysis of samples collected from pigs, poultry, and animal manure as well as KAP studies is ongoing. We are also developing intervention strategies.
- Samoa: Sample collection from cattle and pigs is ongoing. Screening for antibacterial activity and phytogenic feed additives is ongoing.

Environment (Fiji and Samoa):

- Fiji: Analysis of samples from Rewa river, farm environment and *kai* (mollusc) is ongoing.
- Samoa: Sample collection from WWTPs is ongoing.



AMR dashboard



Rewa river transect to understand catchment effects on AMR occurrence

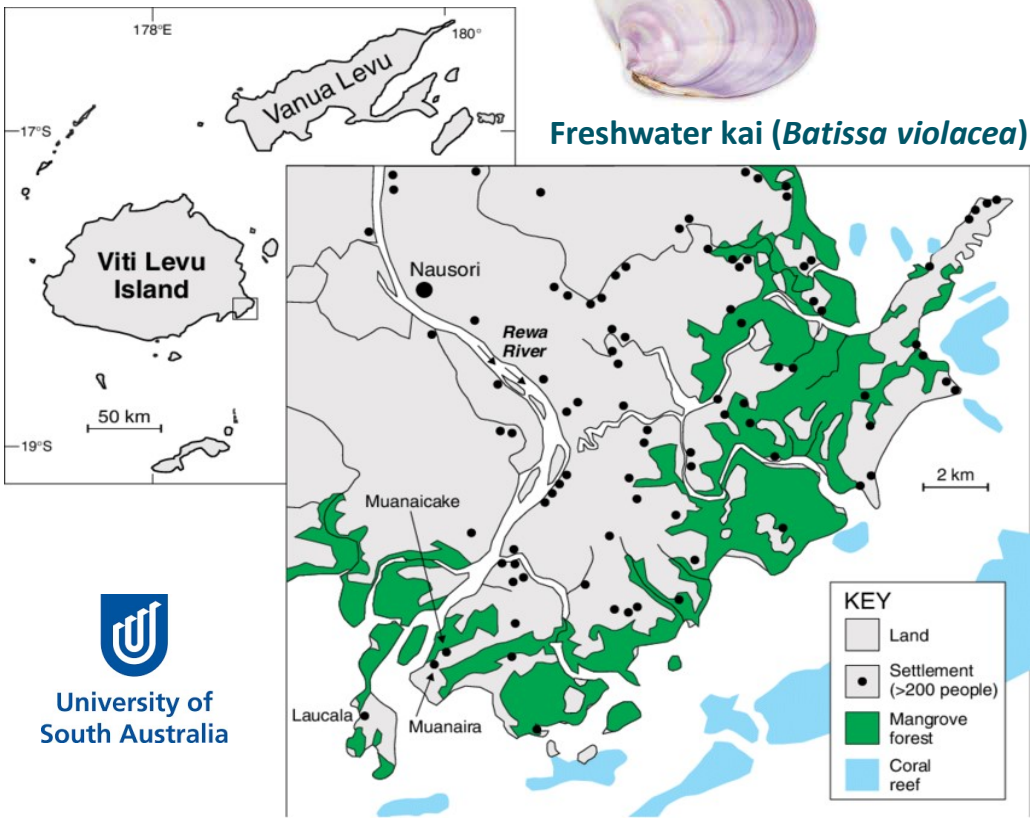
AMR sampling in pig abattoir in Fiji

Screening for antibacterial and PFA at SROS

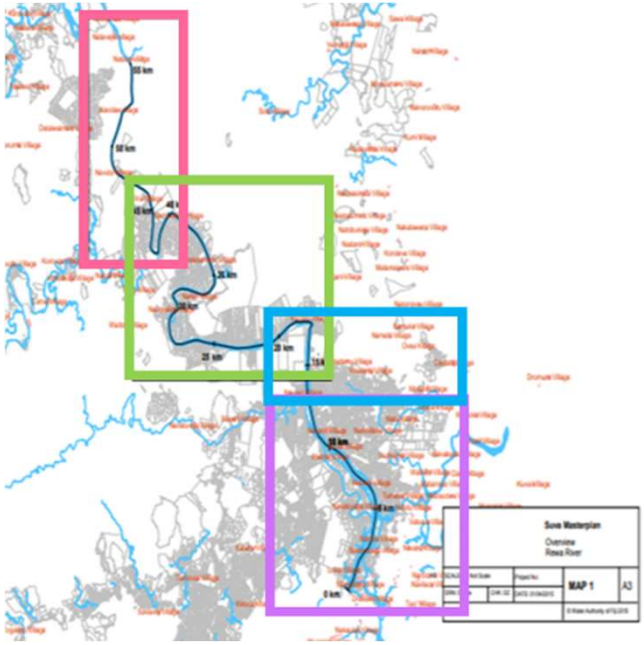
EMAR in Fiji: *Sampling Freshwater Kai*

USP Vincent Lal

Freshwater kai (*Batissa violacea*)



Freshwater kai (*Batissa violacea*) were sampled as **bioindicator** of AMR, agricultural, human and industrial pollution during the dry and wet season.



University of South Australia

UNIVERSITY OF THESSALY

Catchment effect on freshwater Kai resistome

ARGs, MGEs and Biocides

University of South Australia

Sotirios Vasileiadis

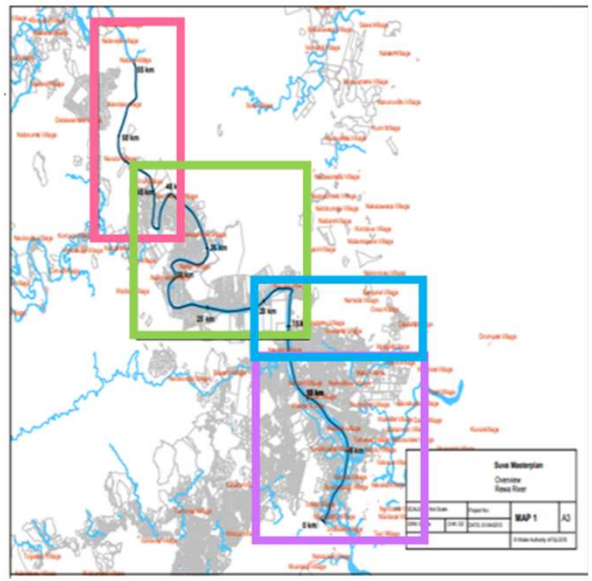
Jowenna Sim

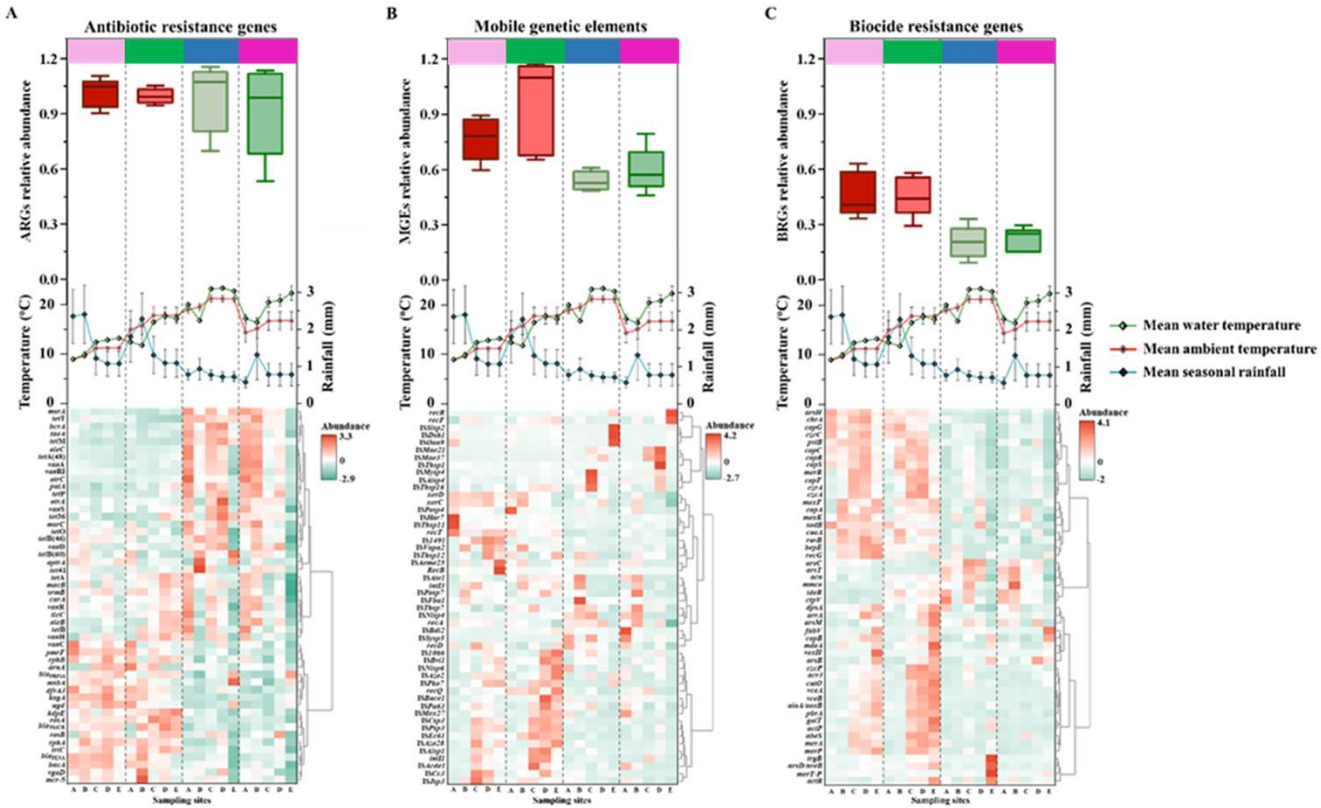
Rural and Tourism

Animal/Vegetable Farms, Aquaculture

Rural agriculture

Urbanisation





Context

Detection ≠ Clinical Risk

Finding a resistance genes in environment does not mean it will cause infections in humans or animals.

Potential misinterpretation of risk

Headlines like “Colistin resistance found in river sediment” can sound alarming.

Actual risk depends on:

- Gene mobility (plasmid vs chromosomal).
- Presence in pathogens vs environmental commensals vs intrinsic resistance.
- Pathways for transmission to humans or livestock.

Should Wildlife Be a Priority in One Health?

Arguments for inclusion:

Wildlife as early warning system for environmental AMR.

Prevent spillover to humans and livestock.

Protect biodiversity and ecosystem health.

Arguments against:

Limited evidence of wildlife driving AMR in humans.

Resource constraints in Pacific nations.

Balanced approach:

Include wildlife in surveillance at high-risk interfaces (rehab centers, migratory species, aquaculture zones).

Conclusion

AMR is a shared threat.

Wildlife may play a critical but understudied role.

One Health approach in the Pacific may require wildlife in certain circumstances.

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Thank you

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