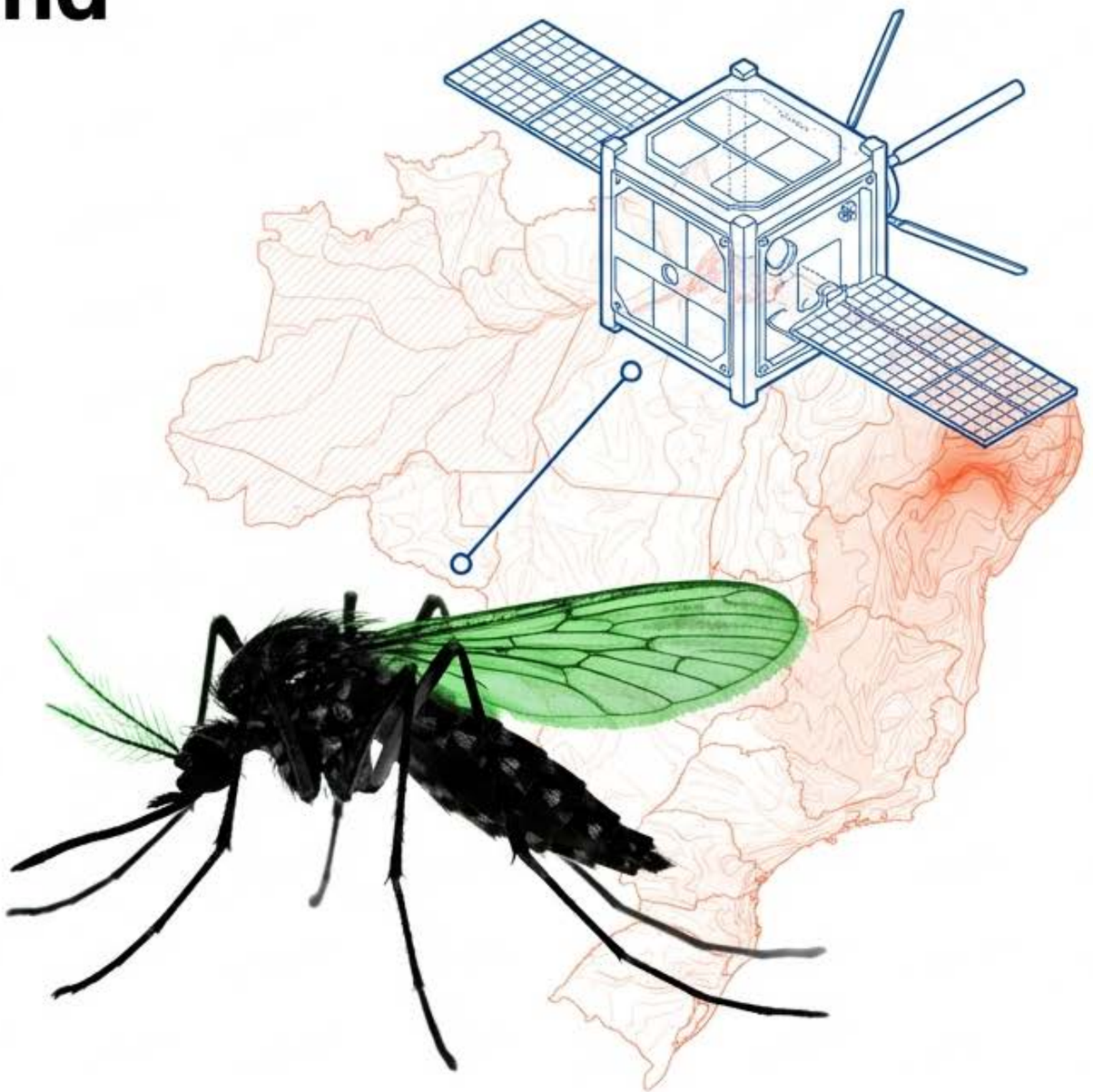
Local Climate Change and the Proliferation of Mosquitoes

An Integrated Approach Using GLOBE Observer and CubeSats



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Context: 2026 Virtual Science Symposium

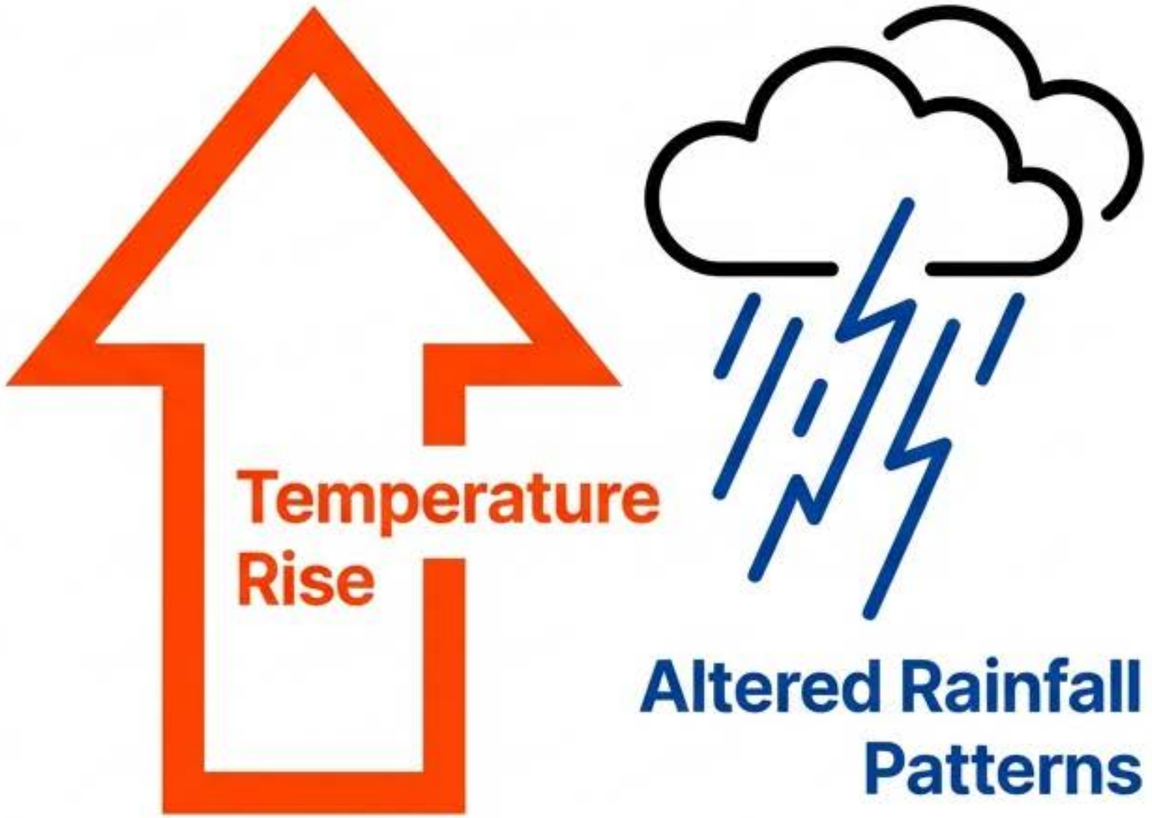
Location: School in Northeast Brazil

The Convergence of Climate Change and Urbanization

THE ENVIRONMENT

Accumulated stagnant water favors the vector life cycle (D'rembers, 2022). Urban environments amplify these risk factors (Juniel, 2015).

THE CLIMATE



Climate change expands vector geographical distribution (Zou & Cochin, 2022).

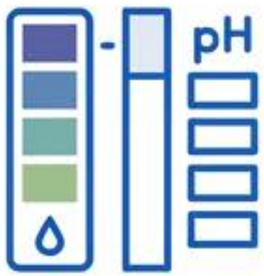
Determining the Environmental Drivers

Research Question: How do these variables influence vector proliferation?

Temperature

Precipitation

Humidity



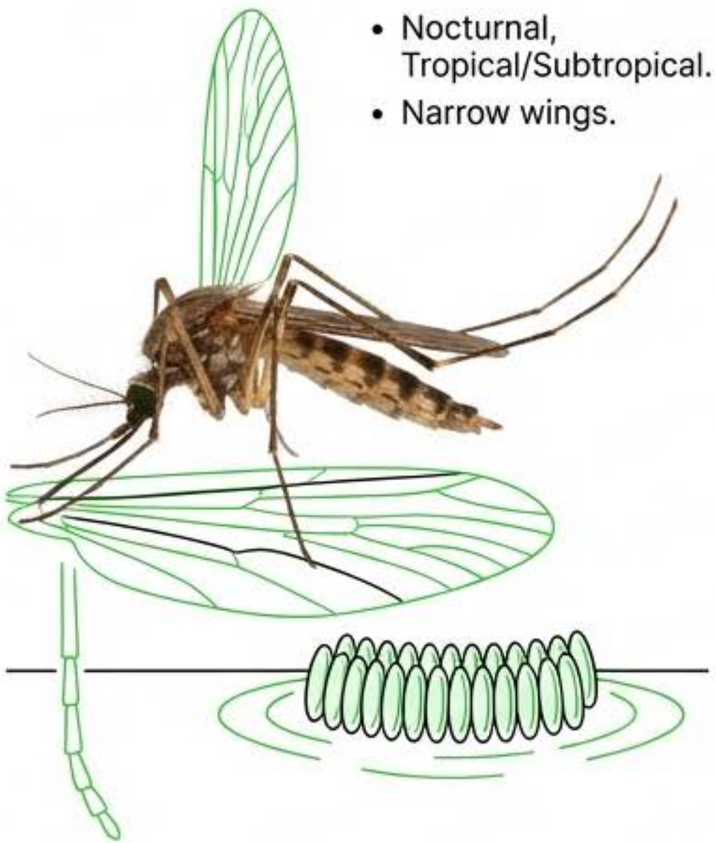
Water pH

Hypothesis:
Variations in these parameters create favorable conditions for Dengue, Zika, and Malaria vectors.

Objective: Analyze variables using Citizen Science (GLOBE Observer) and Remote Sensing (CubeSats).

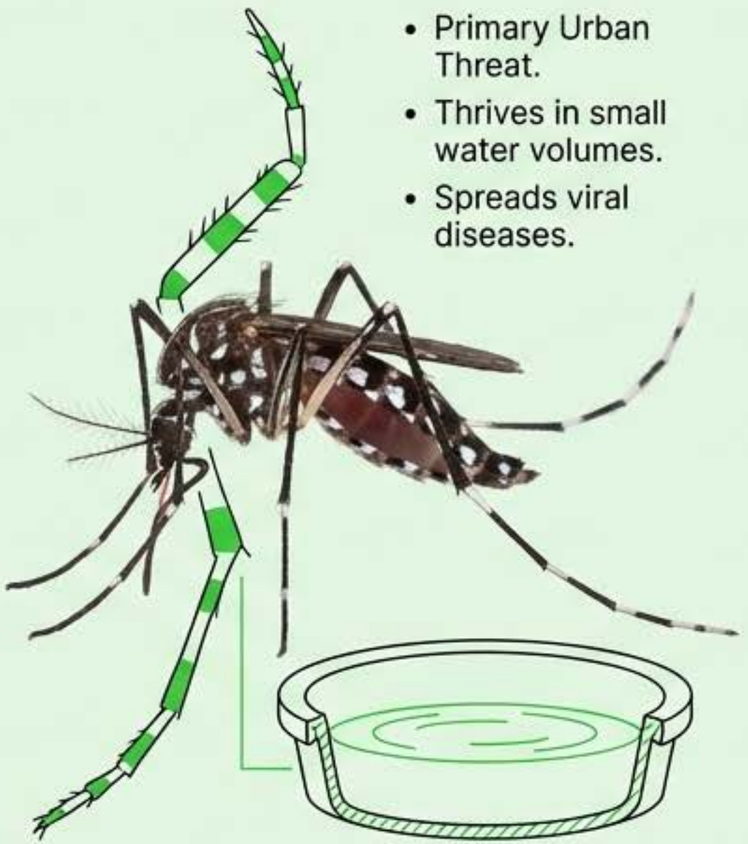
Vector Profiles and Biological Targets

Culex



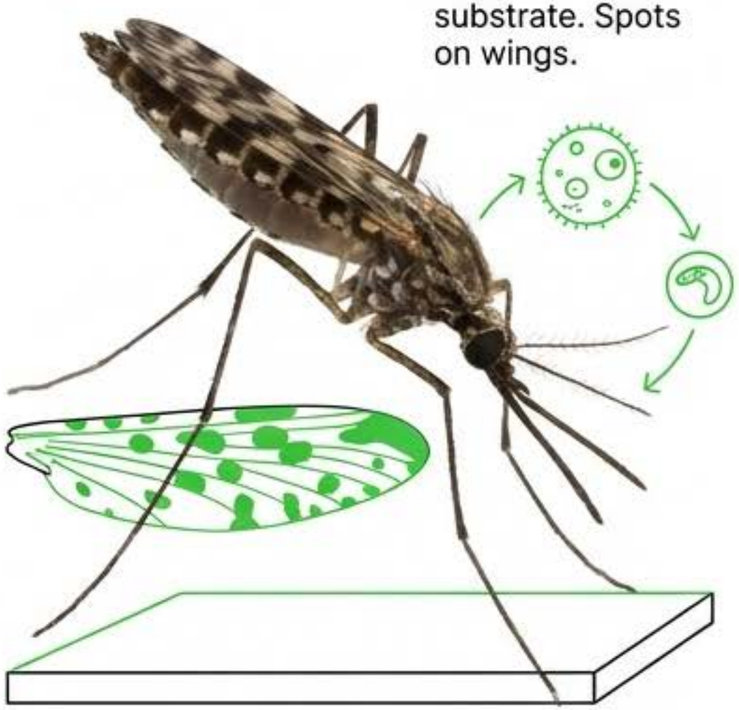
- Nocturnal, Tropical/Subtropical.
- Narrow wings.

Aedes aegypti



- Primary Urban Threat.
- Thrives in small water volumes.
- Spreads viral diseases.

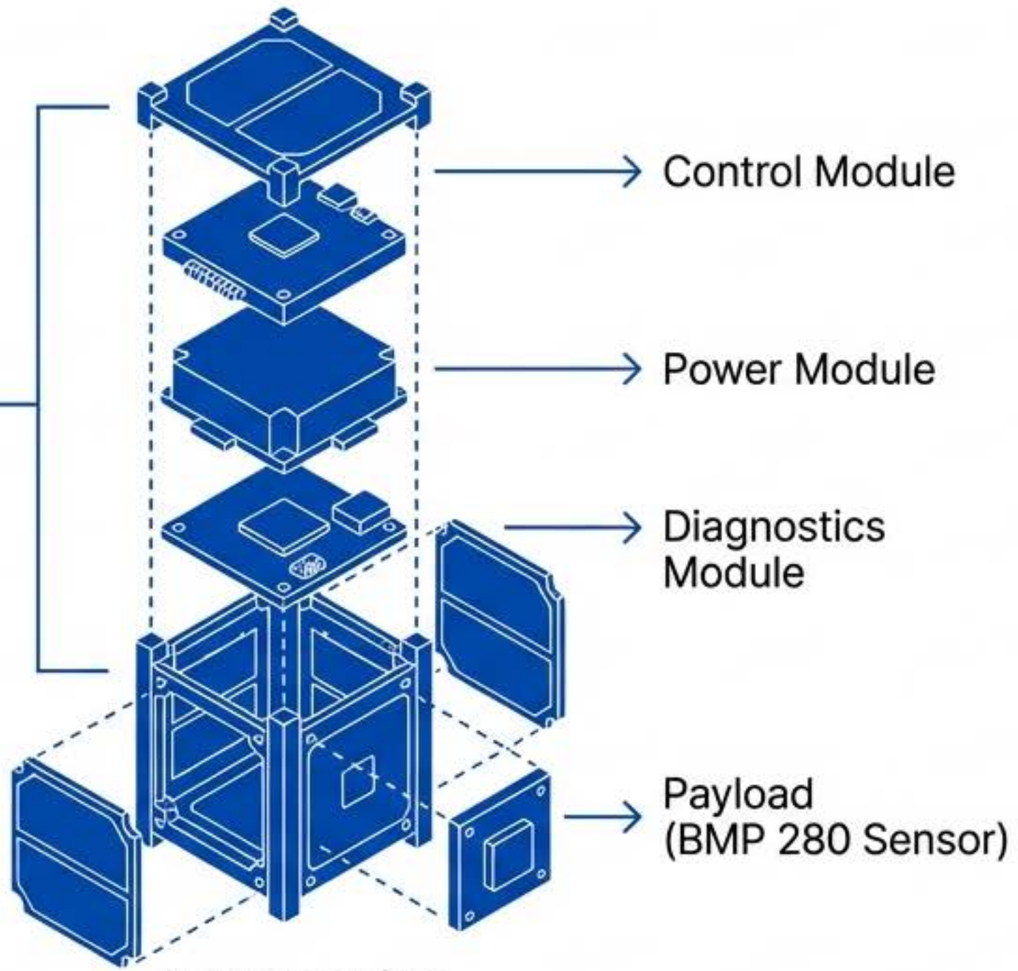
Anopheles



- Malaria vector.
- Resting position inclined relative to substrate. Spots on wings.

The Technology Arsenal

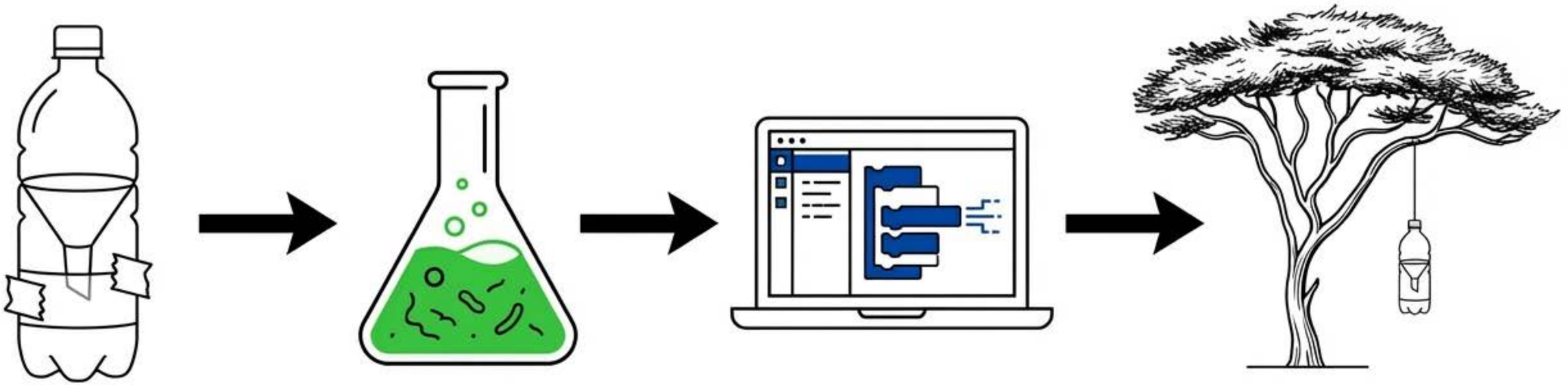
CubeSats: Low-cost nanosatellites programmed via BEEPs block-based coding (Van, 2023).



Exploded View

GLOBE Observer: NASA-backed digital platform for citizen science data collection (NASA, 2025).

Experimental Setup and Deployment



Trap Construction
(Recycled Materials)

Solution Prep
(Hay Infusion)

Sensor Programming
(BEEPS / BMP 280)

Field Deployment
(Acacia Tree)

Field Adaptations and Optimization

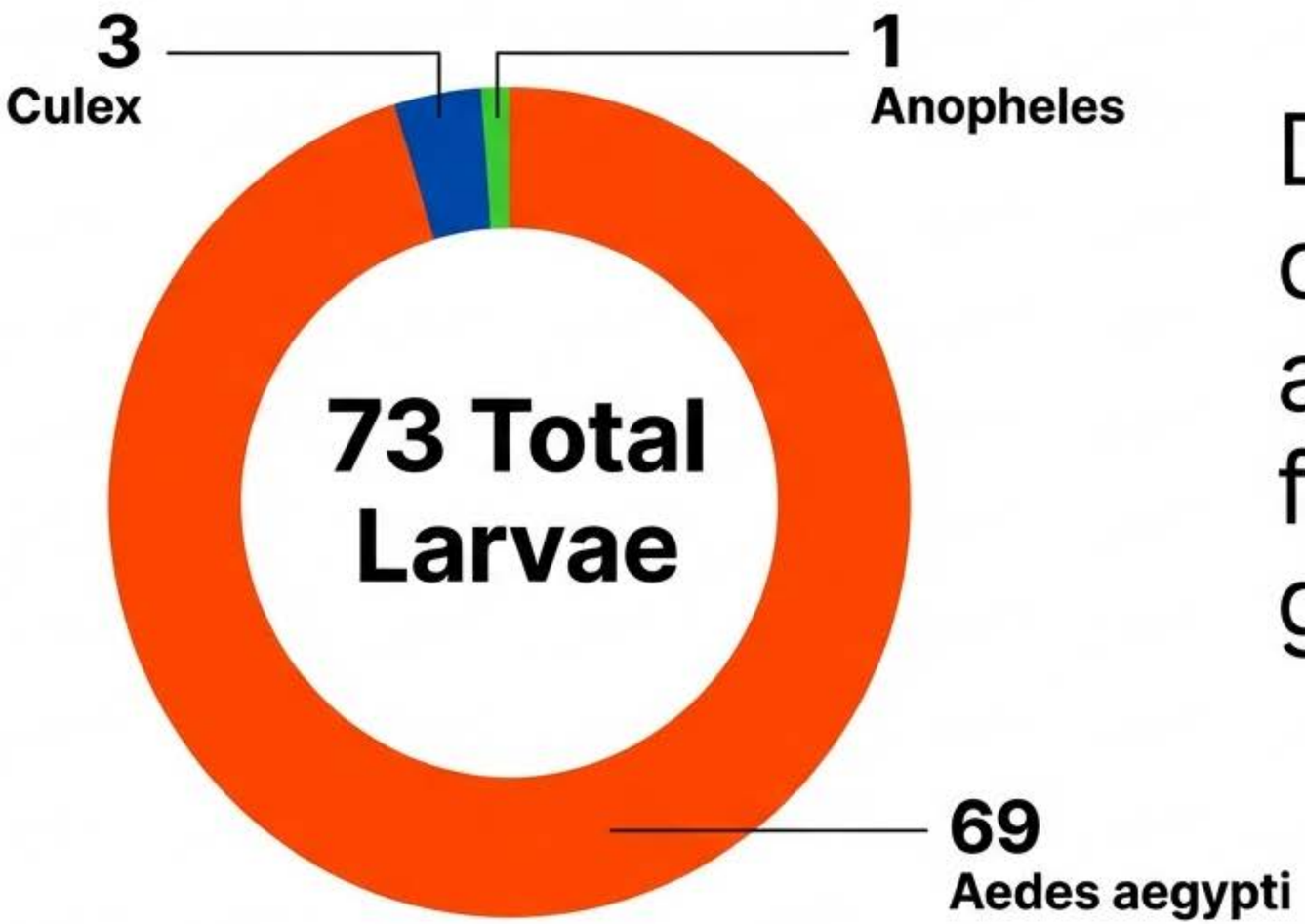
Before

Issue: Accumulation of organic residue over 2 months.

After

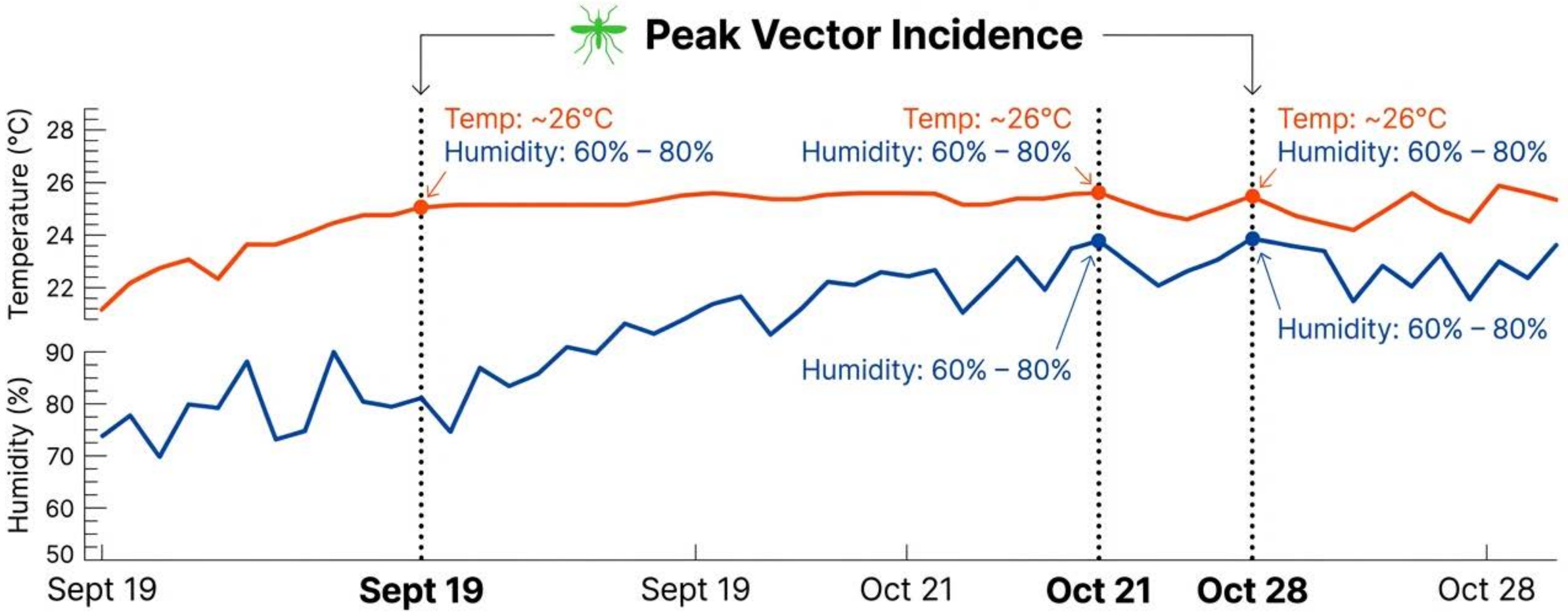
Solution: Protective Upper Cover (Fig 13). Observation continued for 4 weeks.

Biological Findings: Larvae Identification



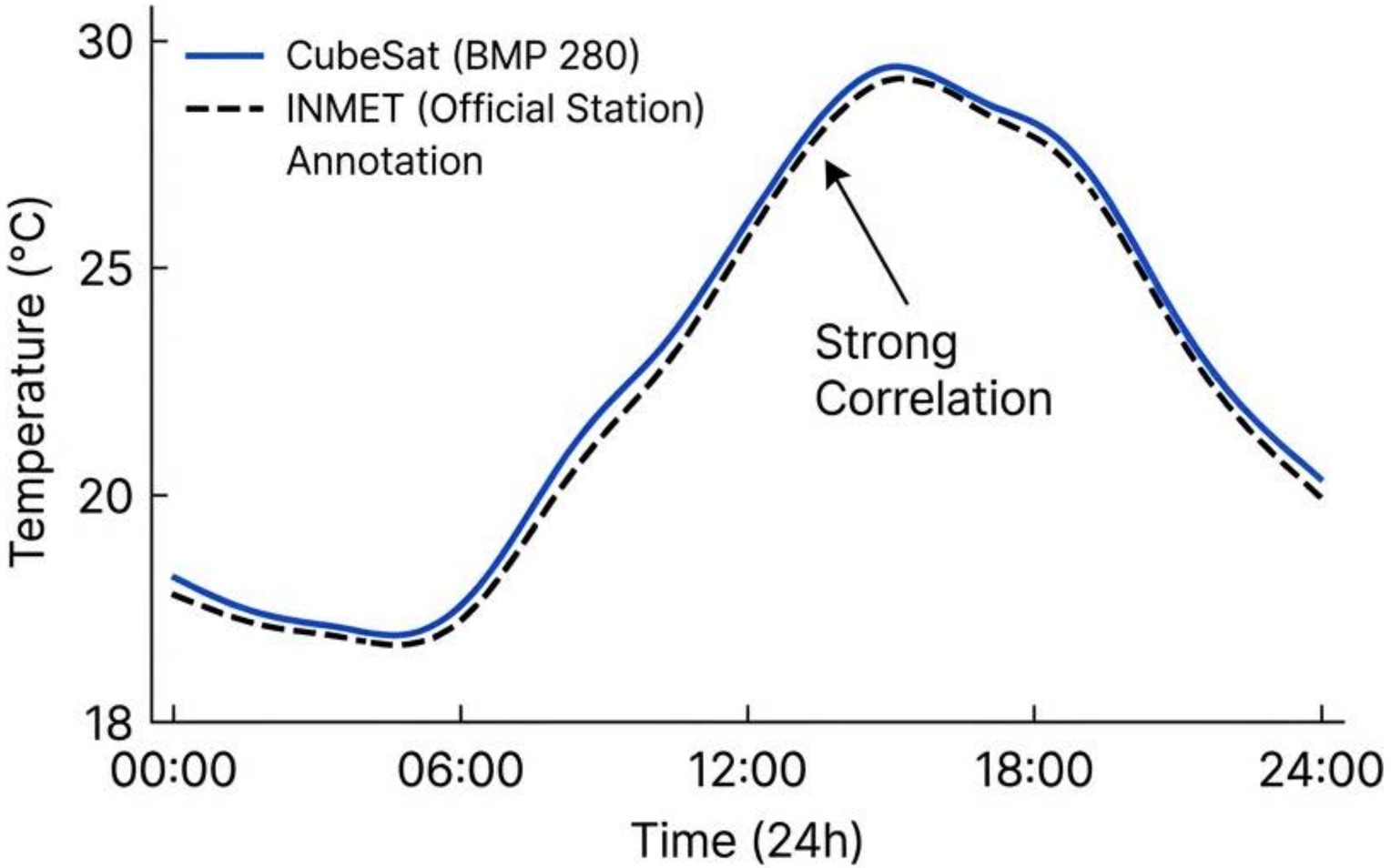
Dominance of *Aedes* confirms that slightly acidic pH is highly favorable for this genus (Media, 2020).

Atmospheric Conditions for Proliferation



Conditions align with optimal development ranges reported by Eric Kulan (2020).

Sensor Accuracy and Data Validation



CubeSat data matches official meteorological stations. Validates low-cost sensors for reliable monitoring (Hideo et al., 2016).

Impact of Seasonal Transition

Weather Dashboard

Early Oct (Rainy Season)

Rainfall:
6mm

Night Humidity:
>99%

Highly Favorable for Development

Late Oct (Transition/Dry)

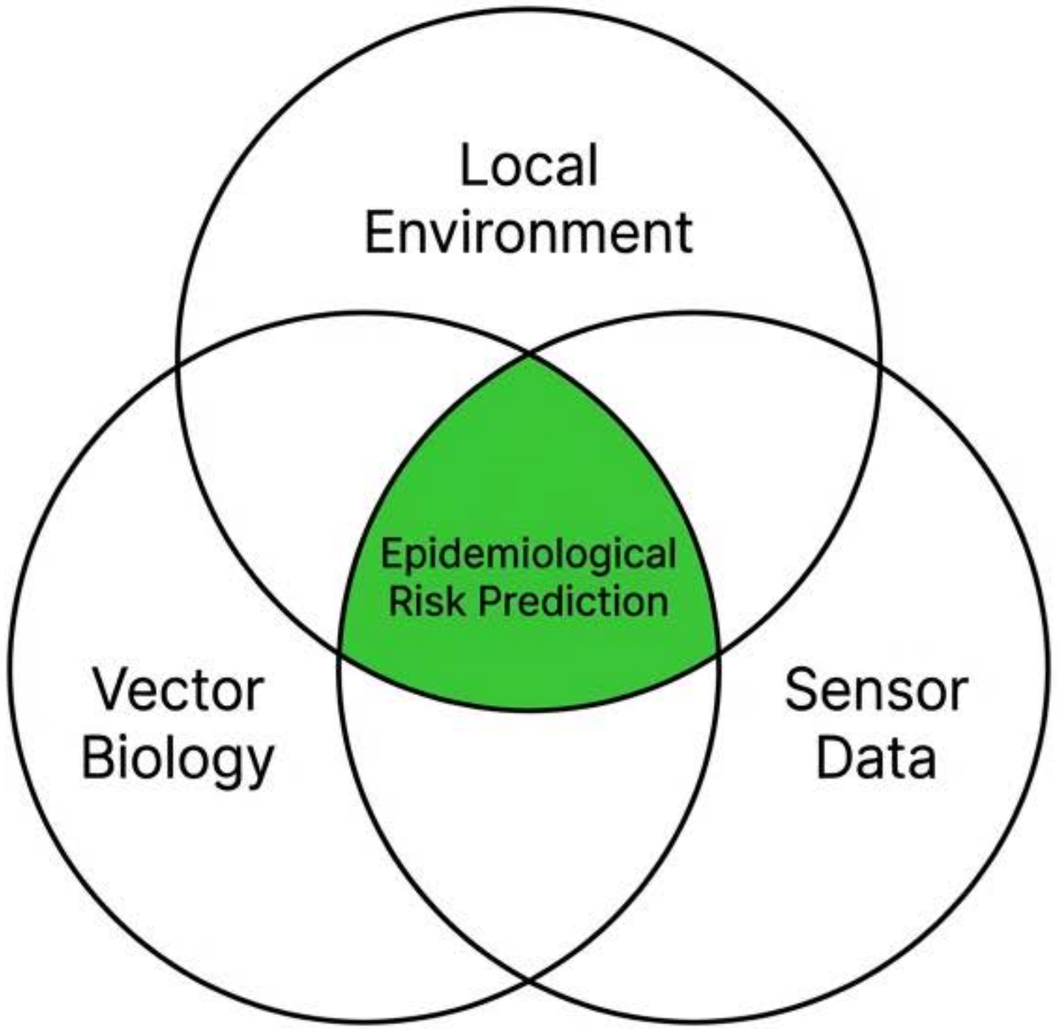
Rainfall:
2mm

Night Humidity:
~76%

Population Flux

Small climatic fluctuations directly dictate survival (Fino, 2023).

Synthesis of Findings



- Confirmed link between **local** climate and Aedes proliferation.
- Integrated accessible tech (Traps) with space tech (CubeSats).
- Effective strategy for anticipating outbreaks.

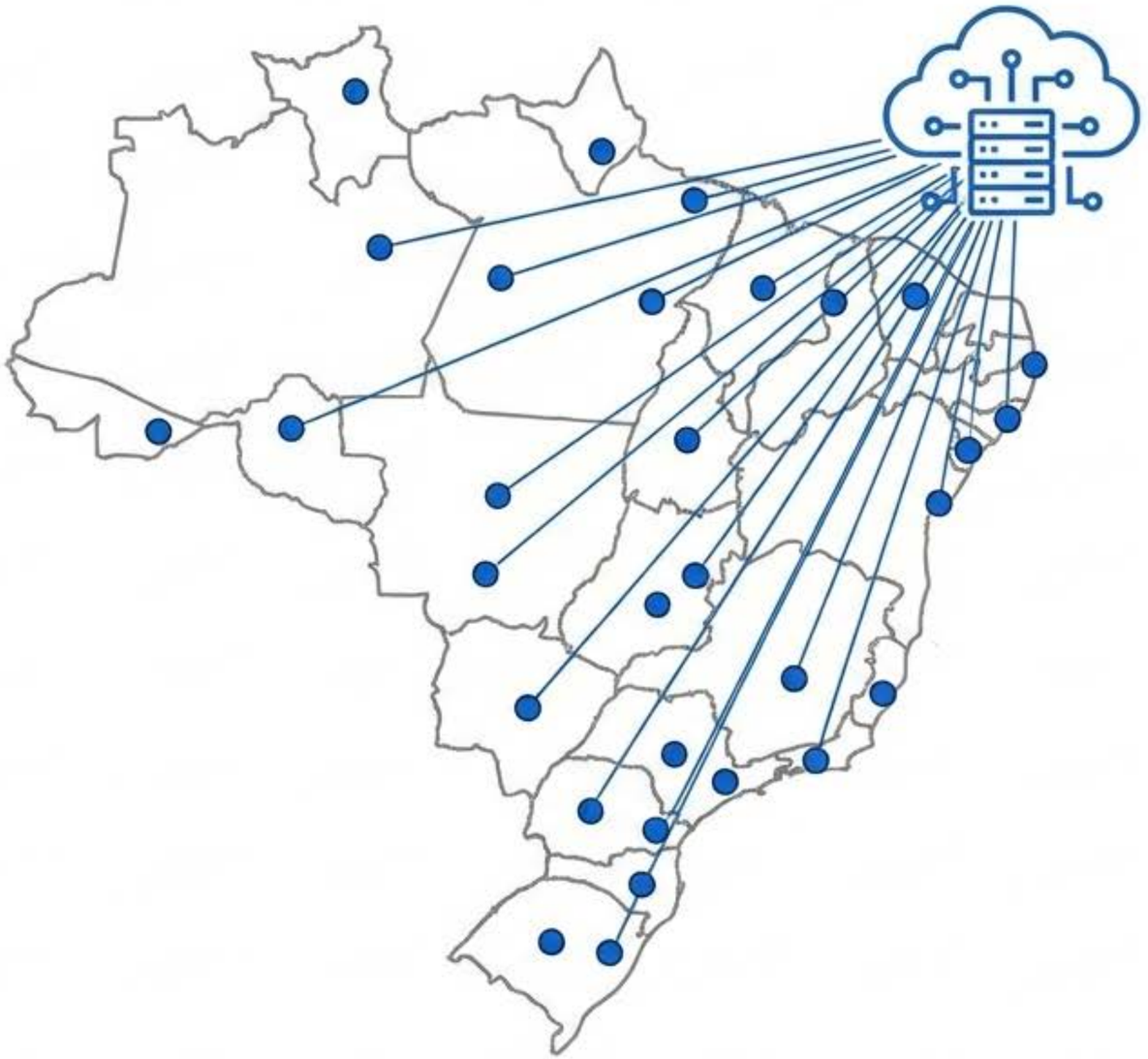
Anticipating Outbreaks Through Technology

Preventi on through Anticipation

- **Primary Conclusion:** Climate scenarios favorable to vector reproduction can be predicted using low-cost tools.
- **Dominant Threat:** *Aedes aegypti*.

Public Health Value: Critical for regions with high social vulnerability.

Scaling Citizen Science



Vision:
A scalable network of epidemiological monitoring using GLOBE Observer and low-cost sensors.

Monitoring environmental risks is a community task.

References

D’rembers (2022) - Mosquito environments

Zou & Cochin (2022) - Climate change & geography

NASA (2025) - GLOBE Observer

Van (2023) - CubeSat technology

Media (2020) - pH and Aedes

Eric Kulan (2020) - Temp/Humidity ranges

Fino (2023) - Seasonal transitions

Hideo et al. (2016) - Sensor reliability

Burke (2019) - Disease vectors

GLOBE Program