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Need for the Study

- Malaria case management is difficult, particularly in areas where there are other febrile illnesses of microbial or/and viral origin
- Arboviruses (e.g., Dengue, Chikungunya) contribute greatly to malaria misdiagnosis and overtreatment largely due to lack of appropriate diagnostic tools and skilled personnel
- Given the limited resources in SSA
 - Innovative approaches are needed for identification of malaria and arbovirus risk areas so as to facilitate effective interventions.
 - Southern-Northern partnerships are ideal in jointly identifying and deigning appropriate interventions

Aims:

- To improve capacity to predict and monitor changes in habitat for Anopheles mosquitoes relative to changes in habitat for Aedes mosquitoes

Methods

- Canadian researchers led participative workshops for doctoral and postdoctoral researchers from Tanzania aimed at providing advanced training on:
 - GIS and species distribution modelling
 - Spatial statistical methods for hotspot detection and relating the habitat maps to malaria and arbovirus prevalence
- Mosquitoes were collected using CDC light traps and then identified morphologically before processing for PCR (taqman assay).
- All households in which mosquitoes were collected were geo referenced.
- A MAXENT model was used to develop maps of suitable vector habitats in ArcGIS program, employing 22 environmental layers.
- These were then validated against independent data on vector occurrence and disease prevalence

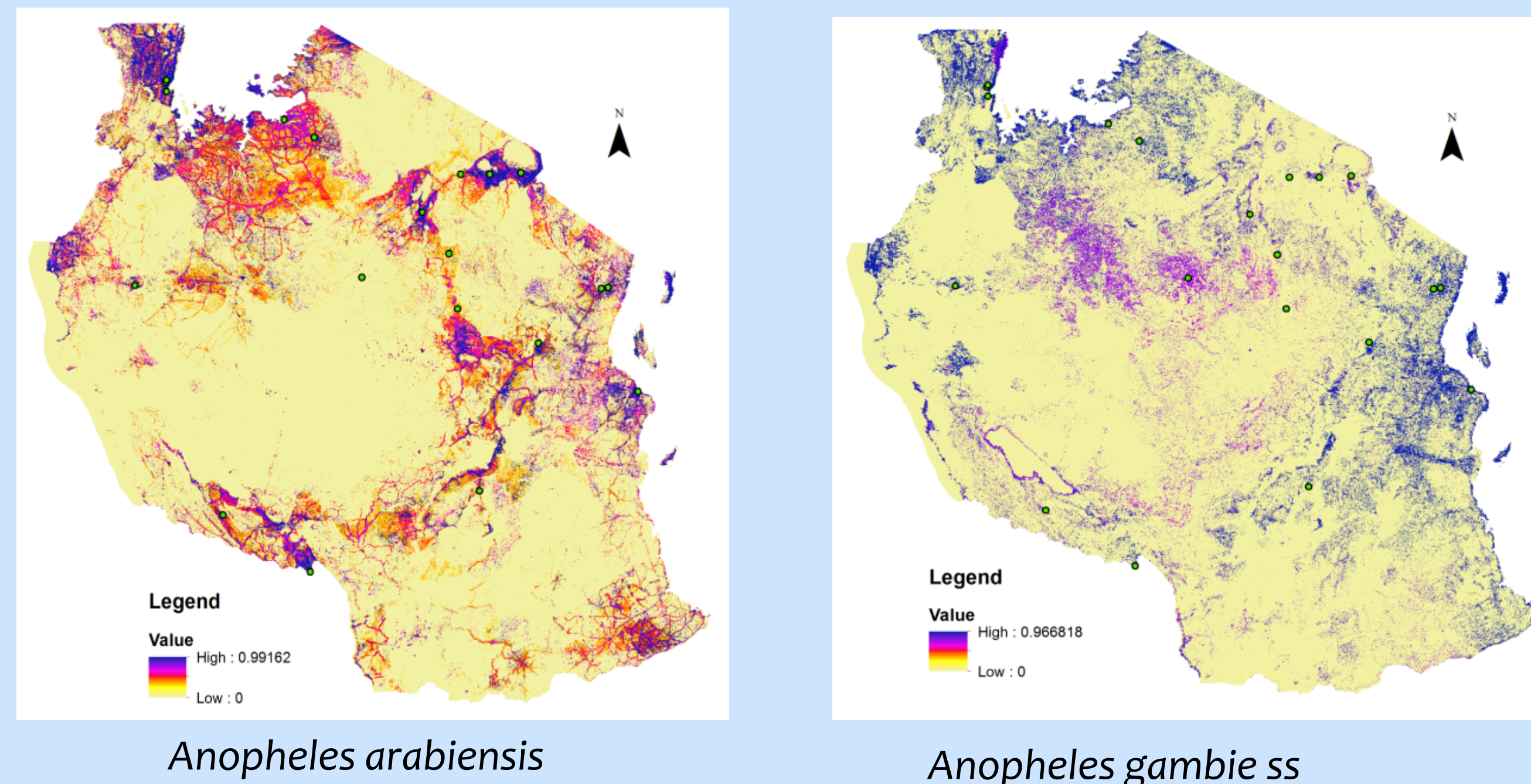
Analysis

- As a team, we developed suitable habitat maps for Tanzania as well as small-scale maps for the districts of Muleba and Muheza, two areas with significant ecological differences in disease transmission.
 - We used ArcGIS version 10.1 to format the environmental layers and conducted spatial analyses

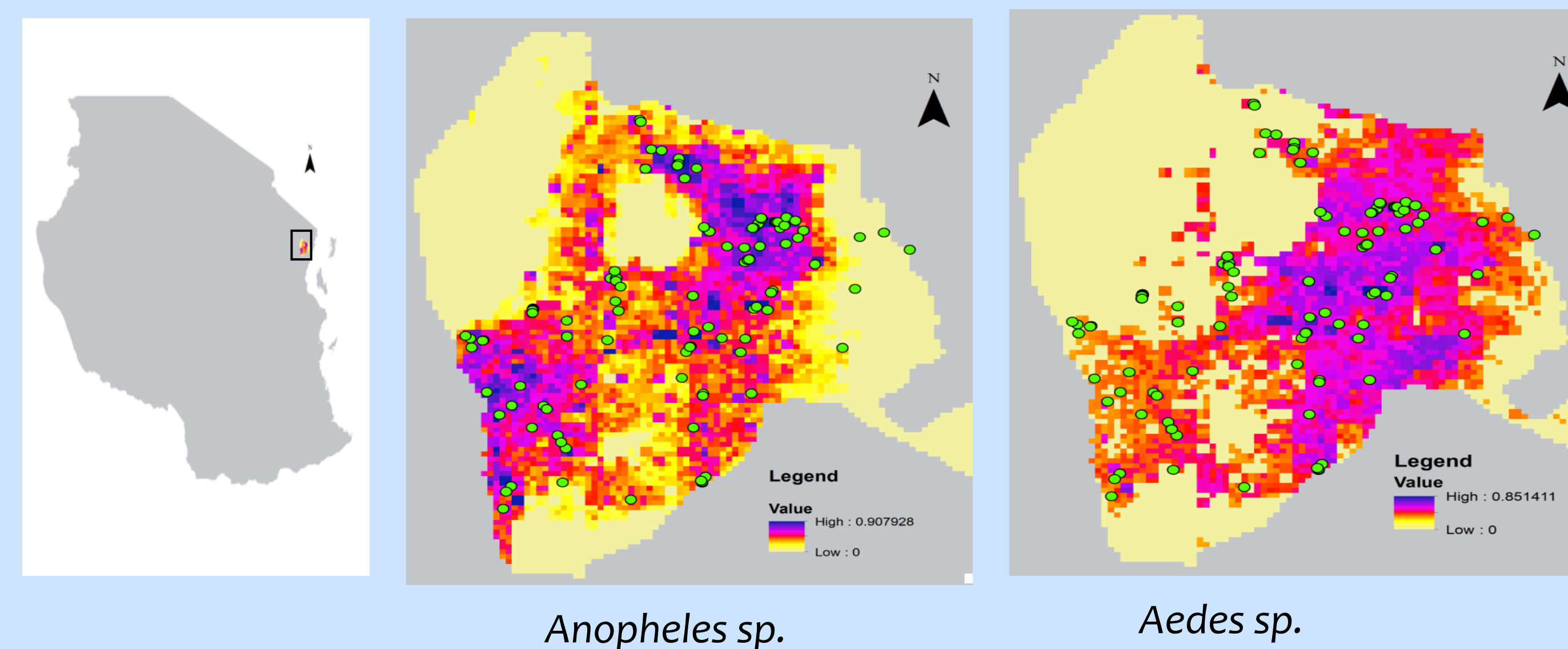
Outcome

Description	Number
People trained	4
Workshop conducted	3

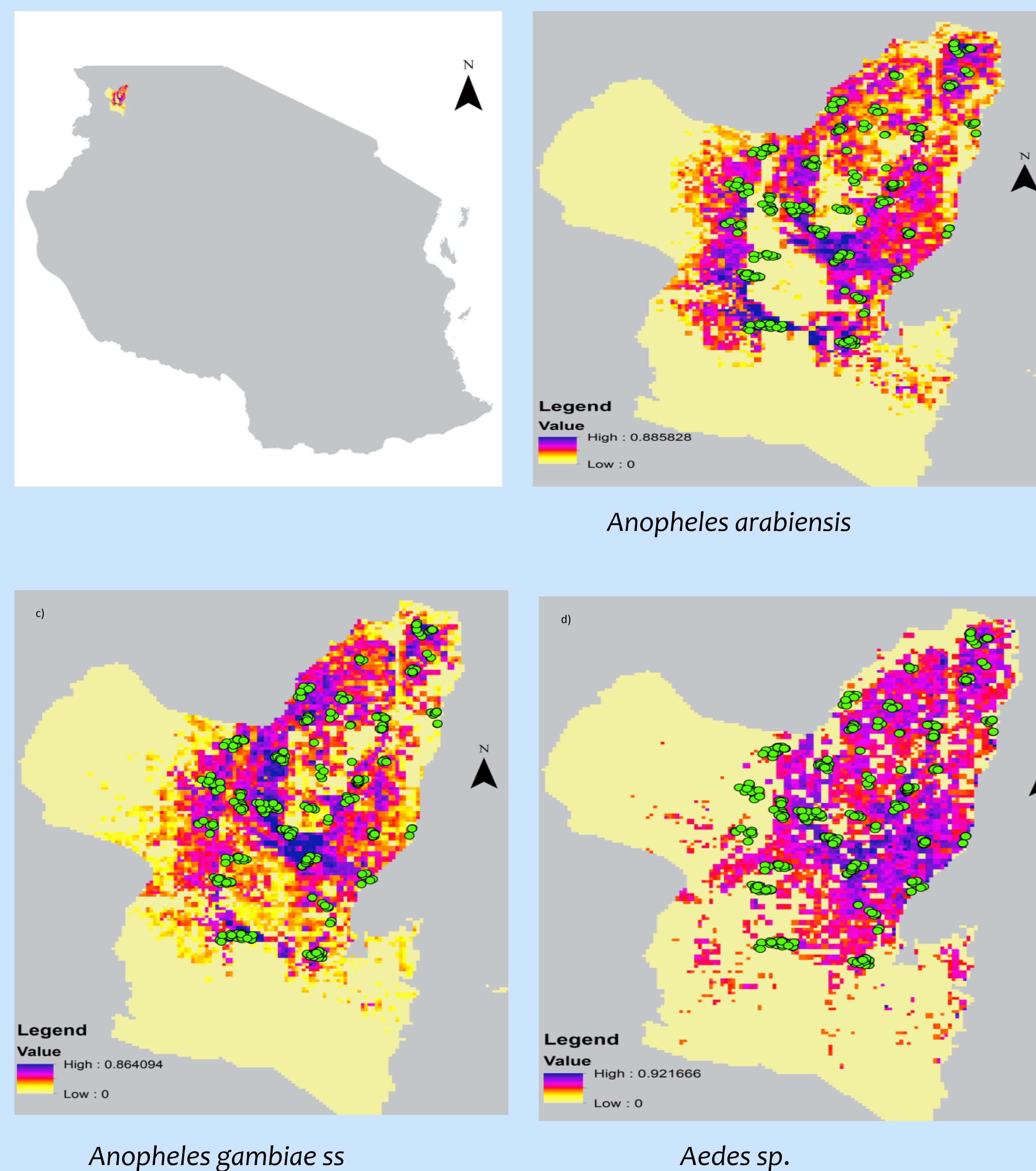
Tanzania Map



Muheza Map



Muleba Map



Results

Map	Species	Environmental Layer	Contribution to habitat suitability
Tanzania	<i>Anopheles arabiensis</i>	Human population density and land cover (Urban and build up, cropland/natural vegetation mosaic land covers)	✓✓
		Precipitation (coldest quarter of the year and in the wettest month) temperature seasonality and elevation	✓
	<i>Anopheles gambiae ss</i>	Land cover (Croplands, urban and build up, and cropland/natural vegetation mosaic land covers)	✓✓
		Temperature annual range, seasonality, and precipitation seasonality	✓
Muheza	<i>Anopheles sp</i>	Human population density, mean diurnal temperature range, elevation and precipitation in the warmest and wettest quarters	✓✓
		Land cover (Savanna and cropland/natural vegetation mosaic land covers) and maximum temperature of the warmest month	✓
	<i>Aedes sp</i>	Human population density, mean temperature of the wettest quarter and elevation	✓✓
		Precipitation in the wettest month and land cover (Savanna and cropland/natural vegetation mosaic land covers)	✓
Muleba	<i>Anopheles arabiensis</i>	Annual precipitation and precipitation in the driest quarter	✓✓
		Precipitation of wettest month and in the coldest quarter, temperature variability and elevation	✓
		Land cover (Woody savanna)	✗
	<i>Anopheles gambiae ss</i>	Annual precipitation and temperature variability, Human population density, precipitation in the driest quarter and mean diurnal temperature range	✓✓
		Land cover (specifically croplands)	✓
		Precipitation in the driest quarter and land cover (specifically woody savanna)	✗

NOTE: ✓✓=Mostly contibuted, ✓ = Also contributed, ✗ = Negatively related

Conclusion

- Ongoing dengue epidemics in Tanzania and neighboring countries highlight the need for innovative and multidisciplinary approaches to disease prevention and control
- The research partnership contributes to increased capacity of Tanzanian researchers to address this challenge.

References

- Maxent (version 3.3.3; <http://www.cs.princeton.edu/~schapire/maxent/>); Phillips et al, 2006.
- ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

Acknowledgments

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