THE UNKNOWN ECOLOGY OF AN ENVIRONMENTAL PATHOGEN: BURULI ULCER DISEASE IN WEST AFRICA

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Buruli Ulcer Disease (BU)

- **Mycobacterium ulcerans (MU)**
  - Environmental pathogen
  - Related to leprosy and tuberculosis

- **Mode of transmission and ecological niche unknown**
  - Flooding events, disturbance, land cover
  - Most studies at local scales

- **Objective**: to predict potentially suitable environments for BU across West Africa using a correlative modeling approach

Images courtesy of Lindsay Campbell and http://www.who.int/buruli/photos
Occurrence Data

- Laboratory confirmed cases
  - (1997 – 2006)

- Sampling bias
  - Random points
  - 3 data sets
  - ~275 locations
Environmental Data

1 km Monthly MODIS Aqua NDVI data (July 2002 – December 2006)
Minimum, maximum, median, range

1 km 8 Day MODIS Aqua LST Daytime data (July 2002 – December 2006)
Minimum, maximum, median, range

http://reverb.echo.nasa.gov/reverb/#utf8=%E2%9C%93&spatial_map=satellite&spatial_type=rectangle
Model: Correlative Modeling Approach

- **Maxent**
  - 3 models
  - 50% training/50% testing

- **Jackknife**
  - Removed NDVI max, NDVI min, LST min

- **Threshold**
  - $E = 10\%$

- **Validation**
  - Withheld points
  - Cumulative binomial test ($p$-value $< 0.01$)

- **MOP**
  - Model extrapolation
Projection and Results

% Suitable Area
- Sierra Leone: 81.2%
- Côte d'Ivoire: 60.4%
- Togo: 43.0%

Suitable Hectares
- Nigeria: 29,466,700 ha
- Côte d'Ivoire: 22,198,400 ha
- Cameroon: 12,789,600 ha
Conclusions and Future Directions

- Geospatial technologies are excellent tools
- Additional data
- Additional variables
- Continued interdisciplinary research

Images courtesy of http://upload.wikimedia.org/wikipedia/commons/f/fb/The_Aqua_Satellite.jpg, Lindsay Campbell, and http://www.who.int/buruli/photos
Acknowledgements

Patrick Suykerbuyk
Andrés Lira-Noriega
A. Townsend Peterson
Yoshinori Nakazawa

KU Ecological Niche Modeling Group

Research Funding and Support

Universiteit Antwerpen
C-CHANGE
KU Department of Ecology & Evolutionary Biology