To Heat or Not to Heat: A Literature Review of How Expected Climate Change in East Africa Will Impact upon Human Schistosomiasis

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Aims

- How will temperature and precipitation changes influence schistosomiasis in E. Africa?
- Are population movements likely to lead to increased schistosomiasis infection rates in E. Africa?
- How important are climate-induced agriculture changes in changes to schistosomiasis infection rates in E. Africa?

Methods

- Google Scholar and Web of Science
- Search terms were variations of "Climate Change", "Schistosomiasis", "Schistoso*", "Africa", "East Africa", "*Biomphalaria*", "*Bulinus*" and "Waterborne Disease"
- References found in sources list of other journal articles
- Only English, full text articles used
- References that did not mention African *Schistosoma spp.* were excluded

Results

Fig. 1

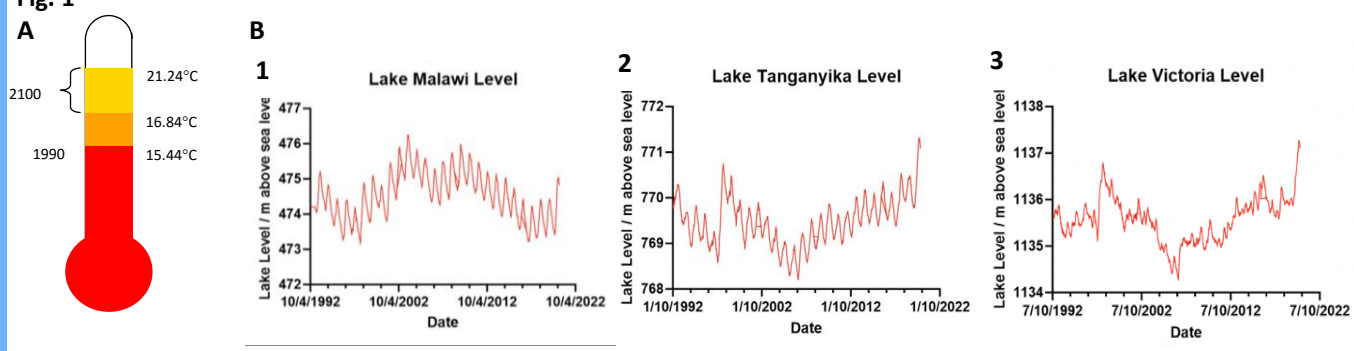

Fig.1. Image showing predicted global temperature change and water level trends of the East African Great Lakes.
Fig.1.A Image showing predicted temperature increase from 1990-2100, global average temperatures are predicted to increase by 1.4-5.8°C.
Fig.1.B Graphs showing recent levels of (1) Lake Malawi, (2) Lake Tanganyika and (3) Lake Victoria. Tanganyika and Victoria show an overall rise in depth in recent years.

Table1. Key literature summary of the findings of the study in regards to temperature, precipitation and human factors.

Temperature	Precipitation	Human Factors
Upper developmental threshold passed (Stensgaard A. S. *et al*, 2019)	↑ flow leads to forced intermediate migration (McCreesh and Booth, 2013)	Dam construction → reservoirs (Monde, Syampungani and Van den Brink, 2015)
Cercariae threshold passed first (McCreesh and Booth, 2014)	0.3 mS^{-1} flow threshold for snails may be passed (Appleton and Stiles, 1976)	↑ pressure on agriculture and fishing (Warner *et al*, 2010)
New waterbodies suitable for infection when previously unsuitable	New waterbodies created in some areas	25% ↑ yield from irrigated rice fields in E. Africa by 2070 (van Oort and Zwart, 2018)
Waterbodies at greater altitude become susceptible (John *et al*, 2008)	↑ runoff (Orindi and Murray, 2005)	Livestock movement → risk of infection and hybrids (Stothard *et al*, 2020)
↑ snail populations (McCreesh and Booth, 2014)	Depth changes effectively change temperature (McCreesh and Booth, 2013)	
Faster recovery from crashes (McCreesh and Booth, 2013)	Catastrophic short-term flooding events will likely increase, needing better hydrological management	
↑ *Helisoma duryi* competition (El-Emam and Madsen, 1982)		

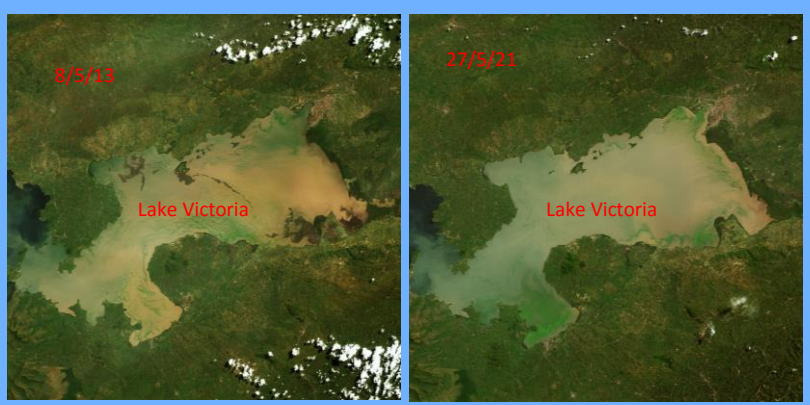

Fig. 2. Images showing different water levels of Lake Victoria in 2013 and 2021 (Earth Observatory, 2021)

Conclusions

- Changes hard to predict as a result of temperature and precipitation
- Models often based on only one or two factors
- Overall, temperature and precipitation changes will increase distribution
- Human factors will have a major impact on schistosome distribution
- Human population movement and agriculture changes key to distribution changes
- Hard to blanket-predict for larger waterbodies due to focality of disease

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