

2453-20

School on Modelling Tools and Capacity Building in Climate and Public Health

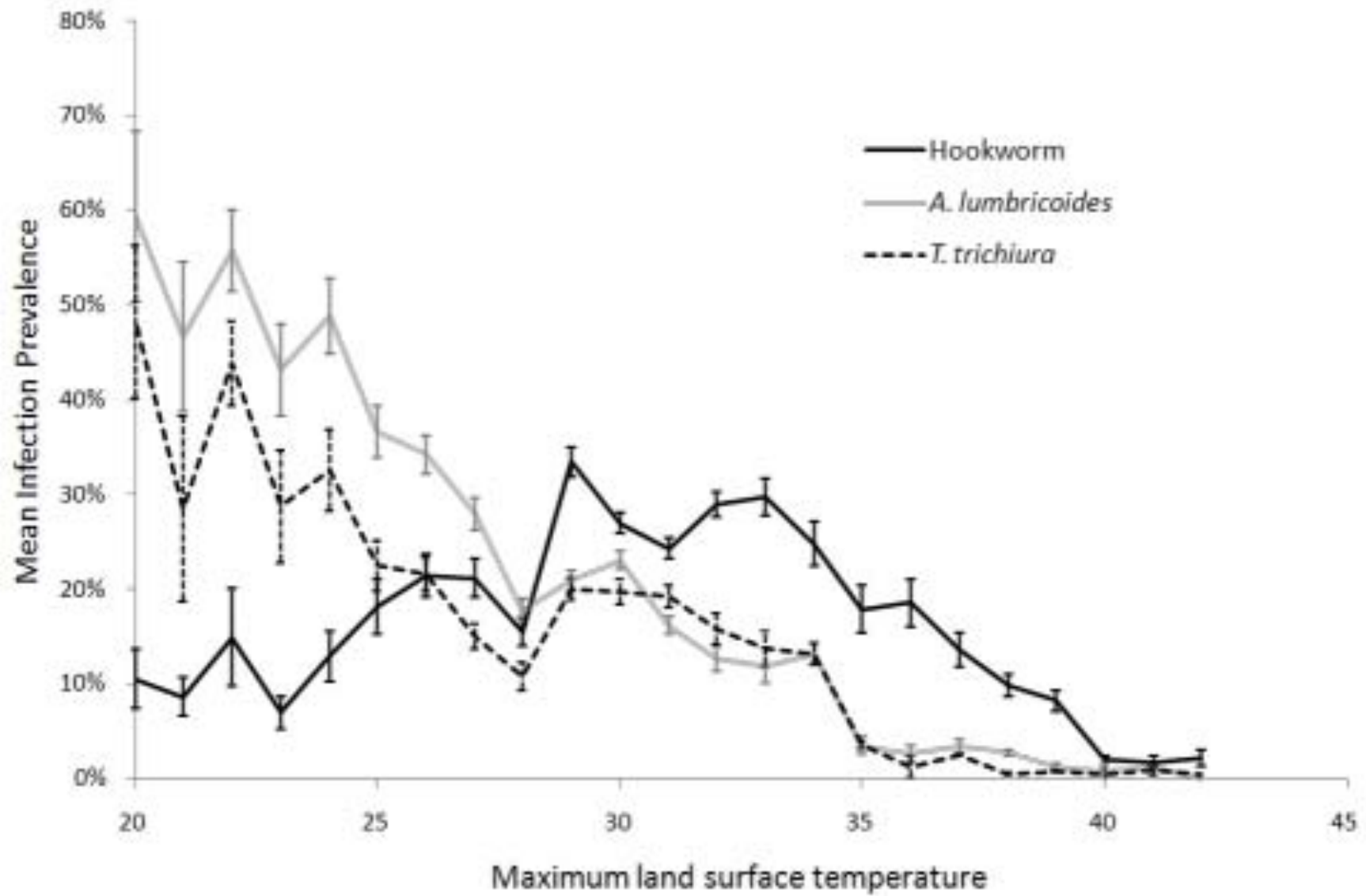
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Environmental aspects of heminth infections

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Environmental aspects of helminth infections

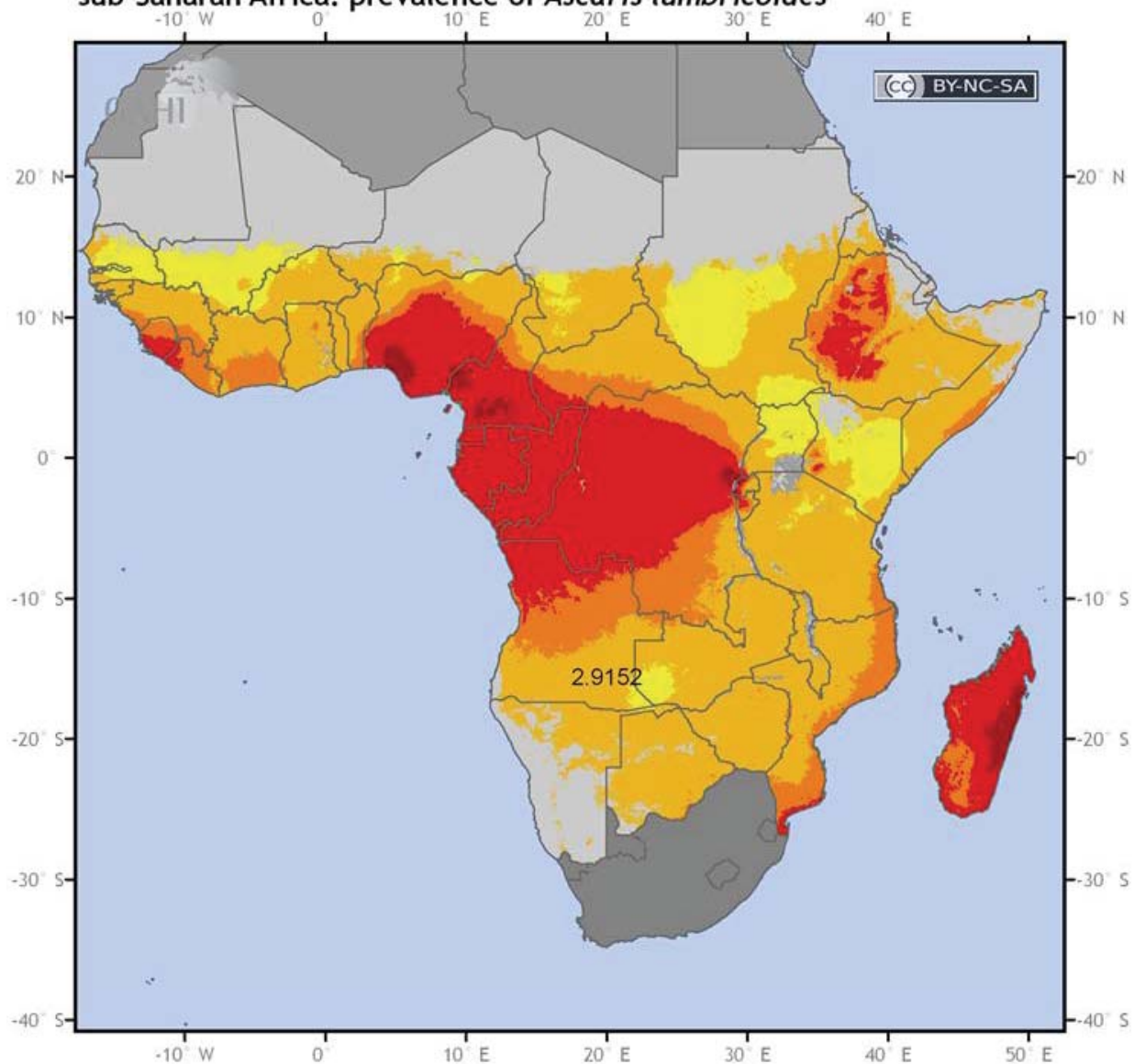


Pullan et al PLoS Negl Trop Dis. 2011 5(2): e958.

Table S1 Estimates of univariable non-spatial logistic regression models of soil-transmitted helminth infections in Kenya (1974-2009)

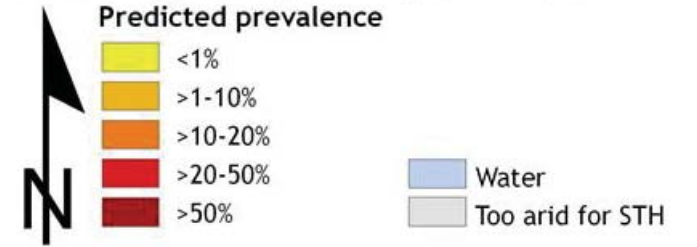
Variable	Number surveys (%)	Posterior mean (95% CI)		
		<i>A. lumbricoides</i>	Hookworm	<i>T. trichiura</i>
		OR (95% CI)	OR (95% CI)	OR (95% CI)
		P	P	P
Community based surveys (vs. school based)	27 (2.9%)	0.59 (0.32, 1.09) 0.09	0.71 (0.45, 1.12) 0.1	0.37 (0.23, 0.57) 0.09
Other diagnostic method (vs. Kato Katz)	388 (41.1%)	2.21 (1.78, 2.73) <0.001	0.38 (0.31, 0.45) <0.001	0.26 (0.21, 0.24) <0.001
max LST* (mean (range))	0 (-4.61, 3.09)	0.64 (0.58, 0.70) <0.001	1.19 (1.04, 1.28) <0.001	1.32 (1.21, 1.44) <0.001
Elevation* (mean (range))	0 (-1.75, 2.96)	1.78 (1.58, 2.01) <0.001	0.72 (0.66, 0.79) <0.001	0.59 (0.53, 0.66) <0.001
Precipitation* (mean (range))	0 (-2.94, 2.51)	1.81 (1.63, 2.01) <0.001	1.33 (1.22, 1.44) <0.001	1.22 (1.11, 1.34) <0.001
EVI (mean (range))	0.35 (0, 0.52)	2.52 (2.09, 3.05) <0.001	1.71 (1.50, 1.95) <0.001	2.22 (2.01, 18.6) <0.001
Distance to permanent water bodies (mean (range))	0.07 (0, 0.93)	6.09 (2.30, 16.15) <0.001	0.02 (0.01, 0.06) <0.001	6.42 (1.39, 29.6) <0.001

The predicted distribution of soil transmitted helminths in sub-Saharan Africa: prevalence of *Ascaris lumbricoides*



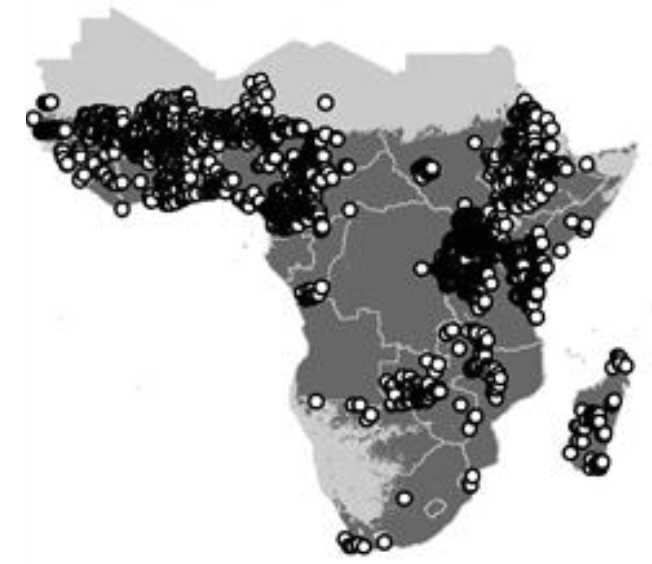
0 500 1,000 2,000 3,000 4,000 Kilometers

0 500 1,000 2,000 3,000 4,000 Kilometers



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Existing survey locations:



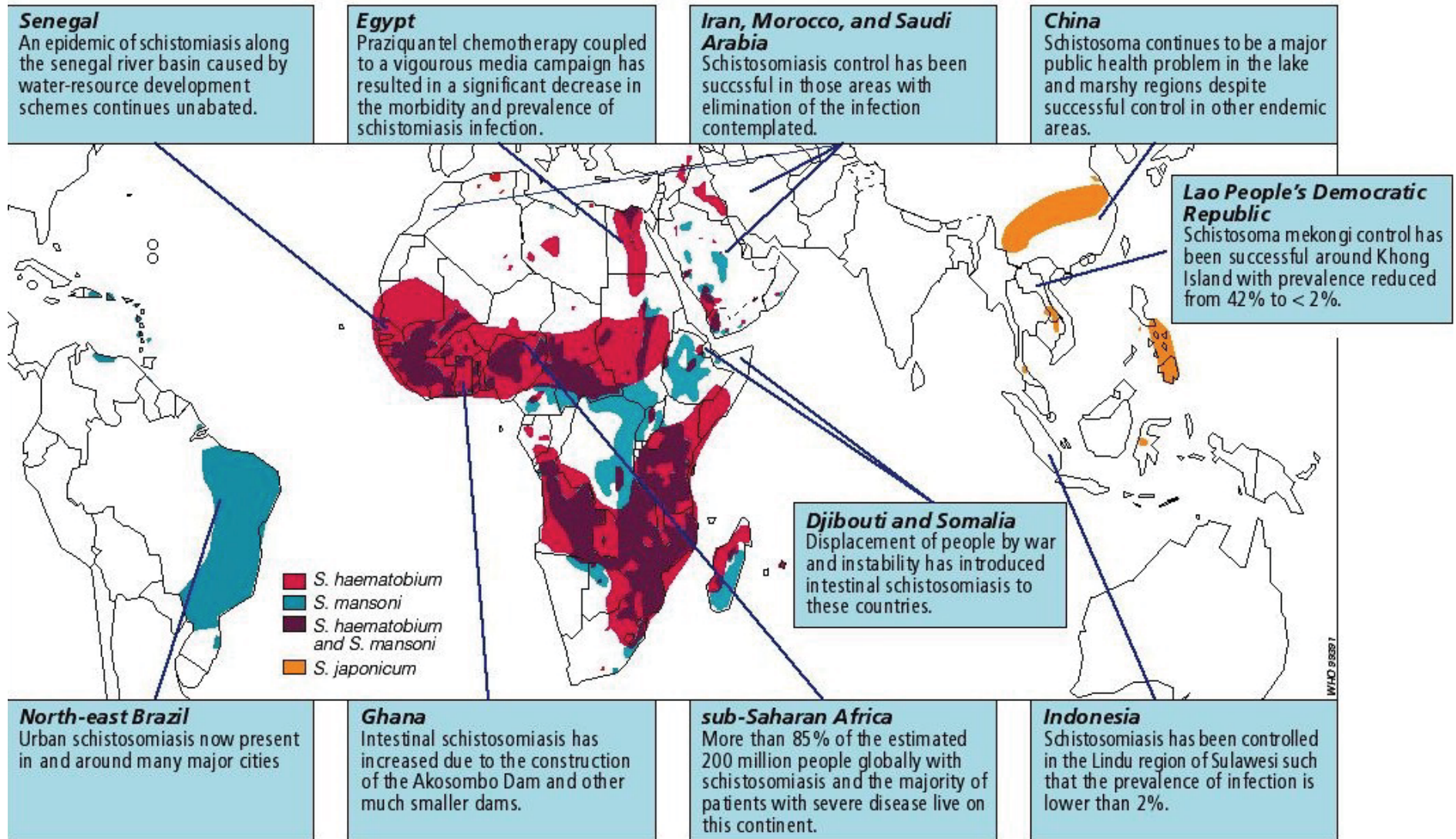
www.thiswormyworld.org

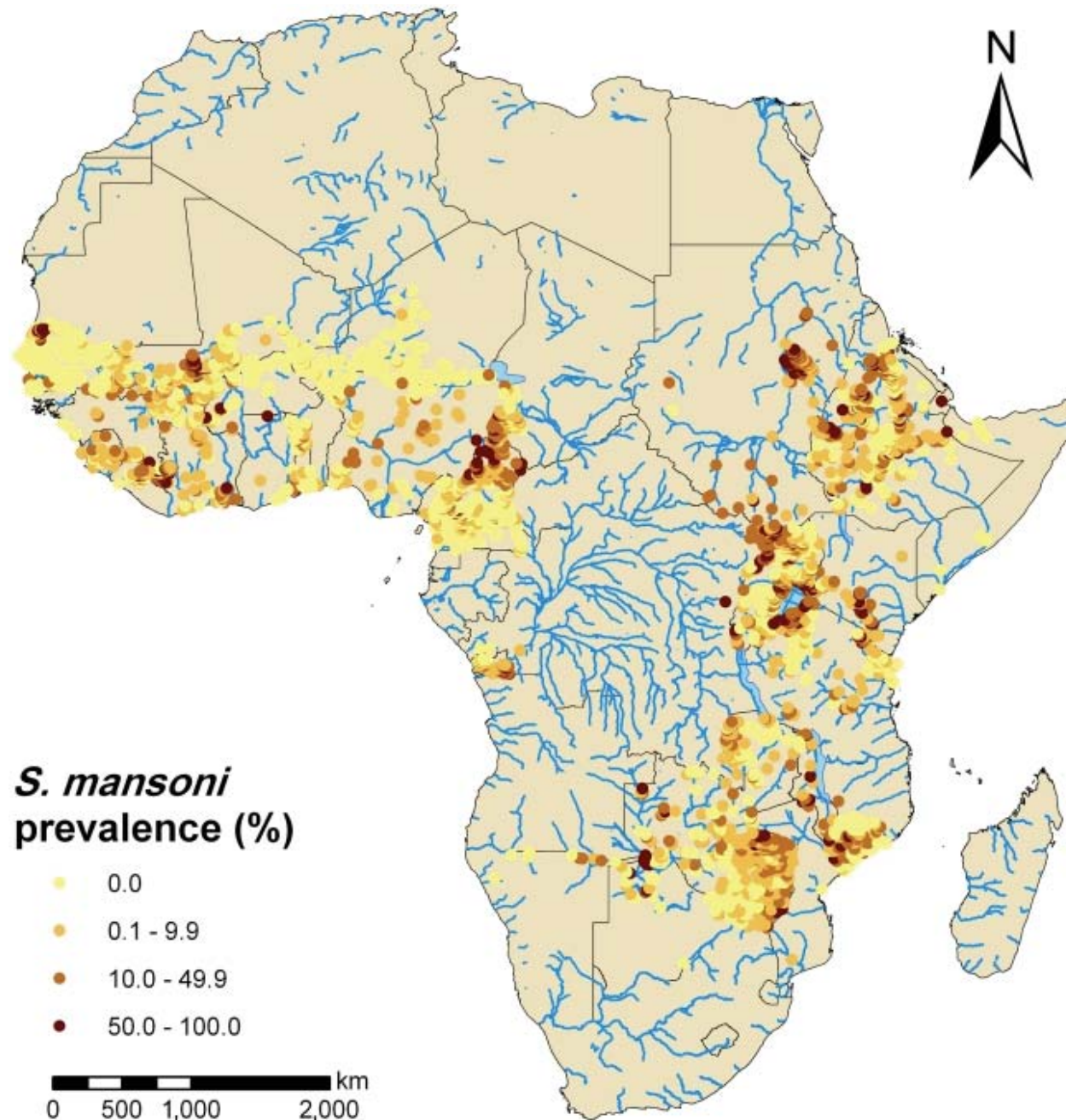
Schistosomiasis

Key features of human schistomiasis

- Geographic distribution is limited to areas near freshwater bodies supporting specific snail species
- Infections are chronic - the parasites live for 7 - 10 years
- Pathology is related to egg production rather than the worms themselves, and is immuno-modulated
- Most infected individuals have low-intensity infections (low egg counts)
- Low case:fatality ratio
- Strongly age-related infection and disease profiles

Global distribution of Schistosomiasis



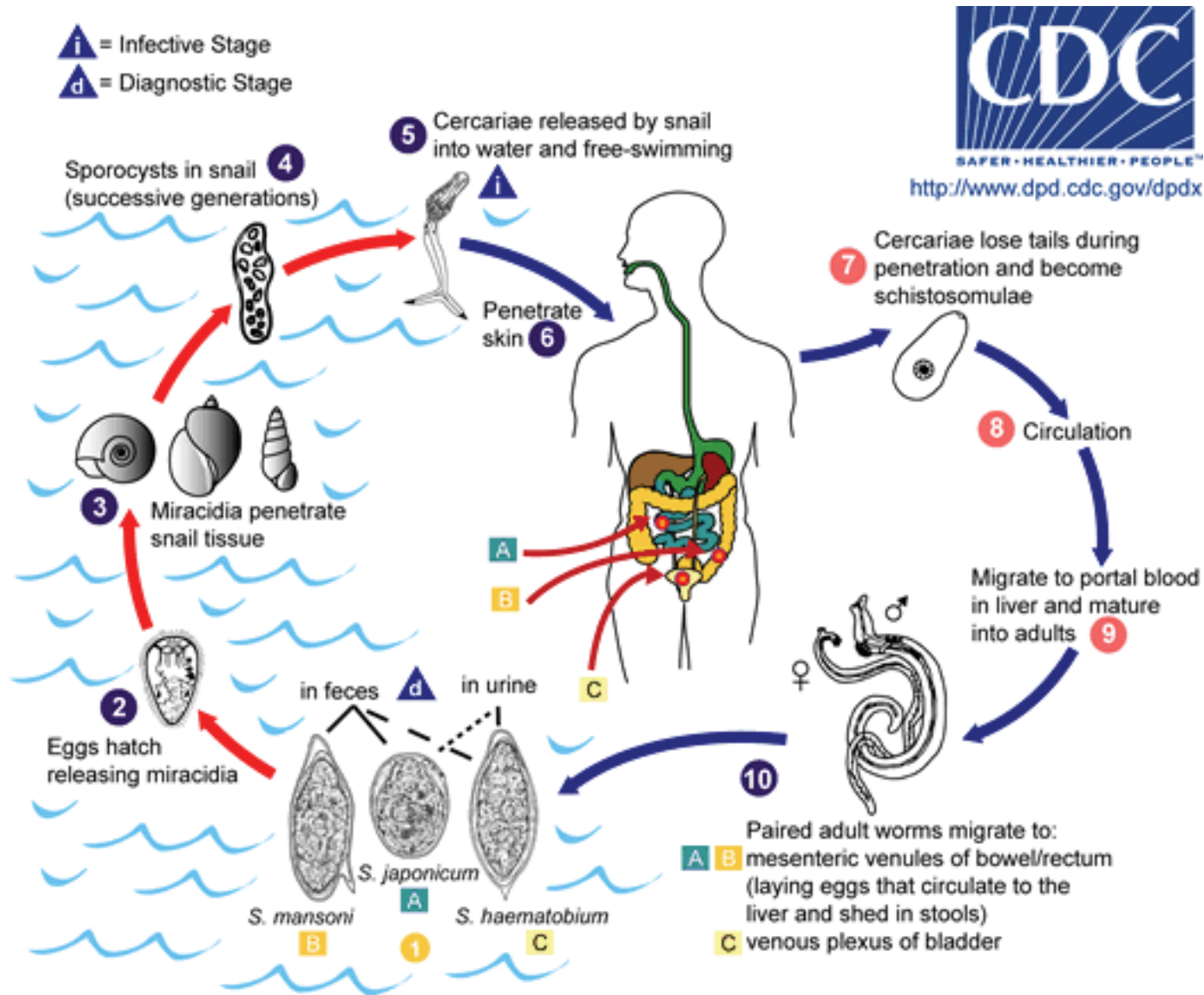


Schistosomes affecting humans

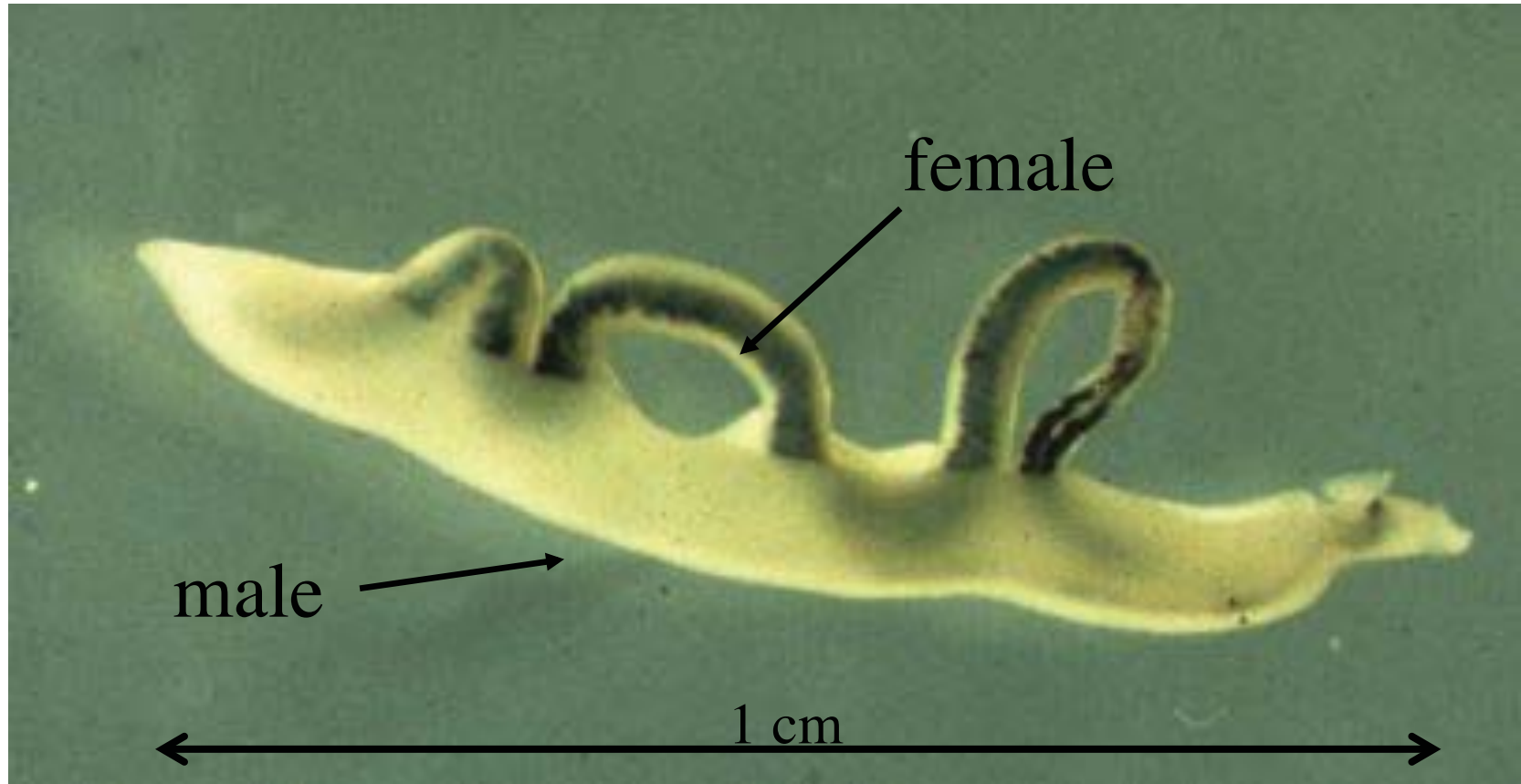
Species	Distribution	Intermediate hosts
<i>S. mansoni</i>	Sub-Saharan Africa, Nile Valley, S.W. Asia, South America	Biomphalaria spp
<i>S. haematobium</i>	Most African countries, S.W. Asia	Bulinus spp
<i>S. japonicum</i>	S.E. Asia, China	Oncomelania spp, mammals
<i>S. mekongi</i>	Kampuchea, Mekong river	Neotrichula spp
<i>S. intercalatum</i>	Central Africa	Bulinus spp

Overall - 200+ million infections in 90+ countries

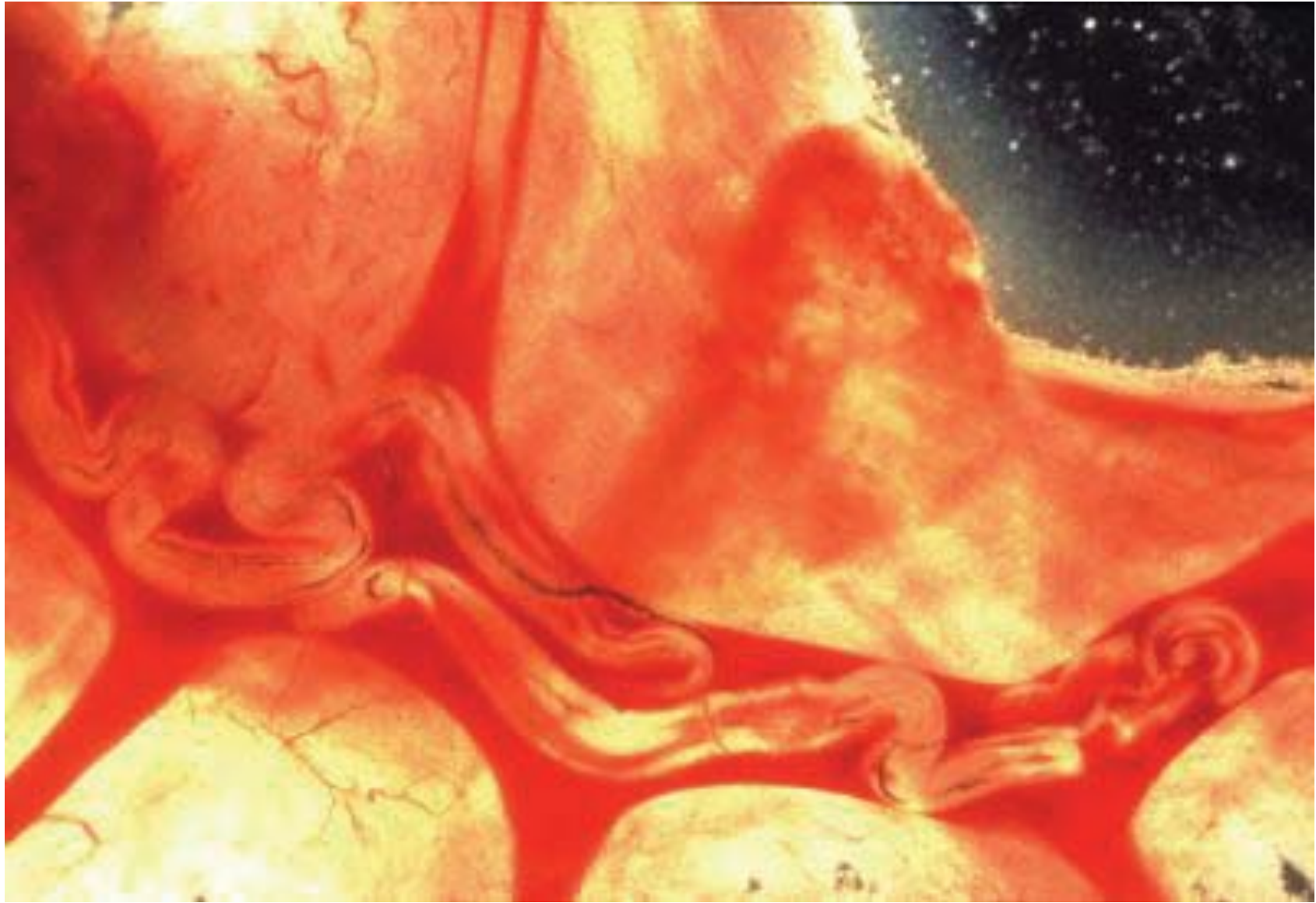
Life cycle of schistosomes



Schistosome worm (Bilharzia)



- Transmitted by SNAILS living in freshwater!
- Lives in the blood for many years
- Occasionally fatal



Signs and symptoms associated with intestinal schistosomiasis

Acute

- fever
- chills
- weakness
- headache
- nausea
- vomiting
- dry cough
- organomegaly
- eosinophilia

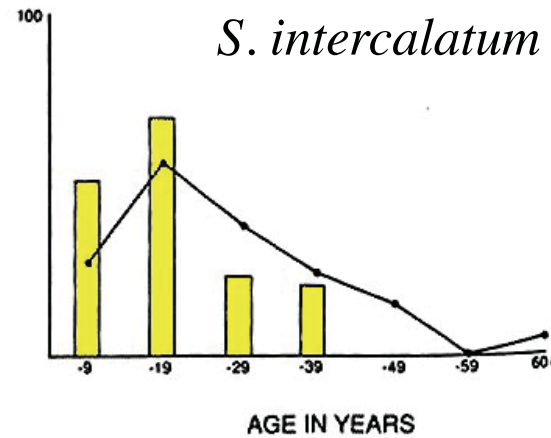
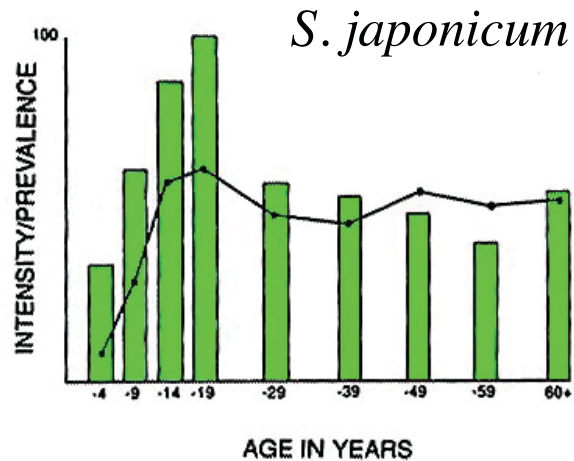
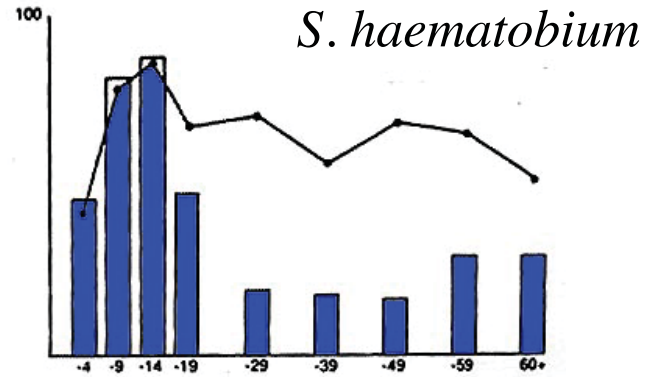
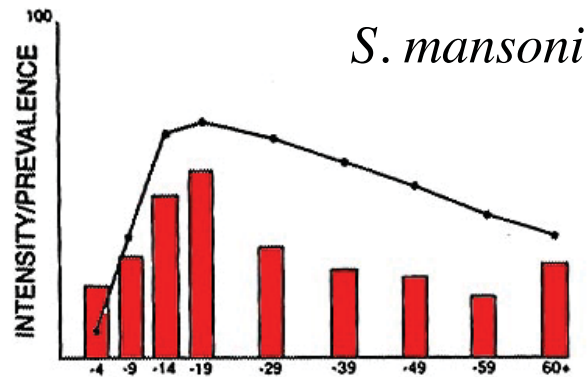
Chronic

- diarrhoea
- bloody diarrhoea
- pallor
- emaciation
- abdominal pain
- weakness
- fatigue
- hepatosplenomegaly

Late stage

- hepatic fibrosis
- portal hypertension
- ascites
- Variceal bleeding

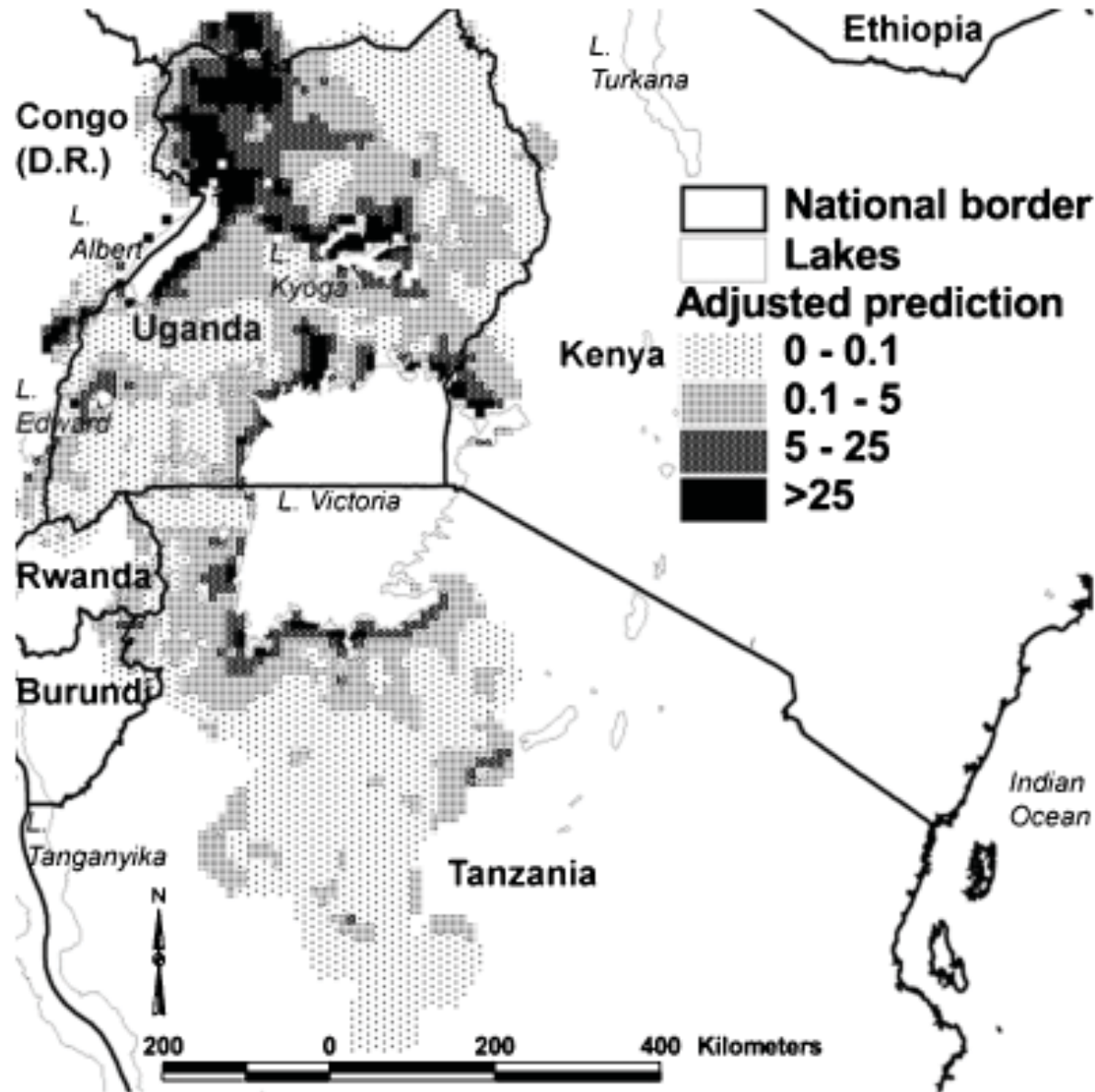
Prevalence and Infection Intensity by age



Adapted from Jordan & Webbe in 'Human Schistosomiasis' 1993, eds Jordan, Webbe, Sturrock

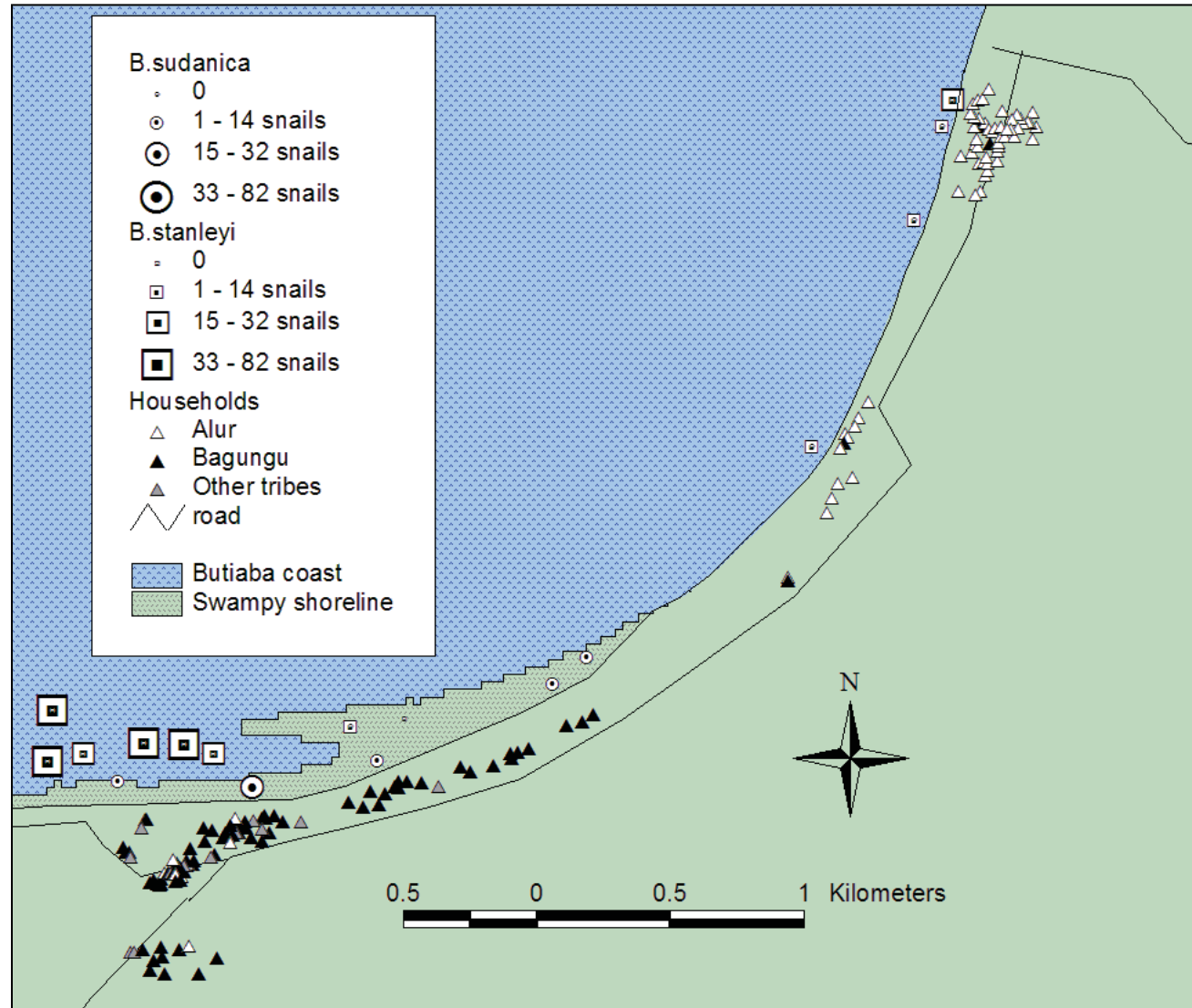
Note: similar profiles in established and recent foci (e.g. Senegal)

Predicted shistosome infection intensity in East Africa



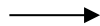
Map of Booma village

- Spatial distribution of tribes and snail species vary across Booma village





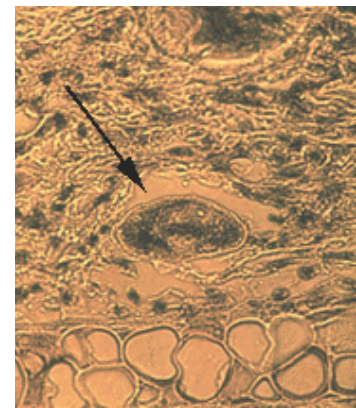
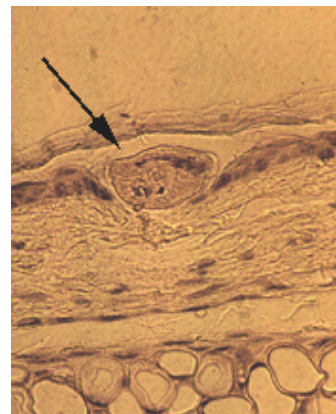
Biomphalaria spp



cercariae



skin



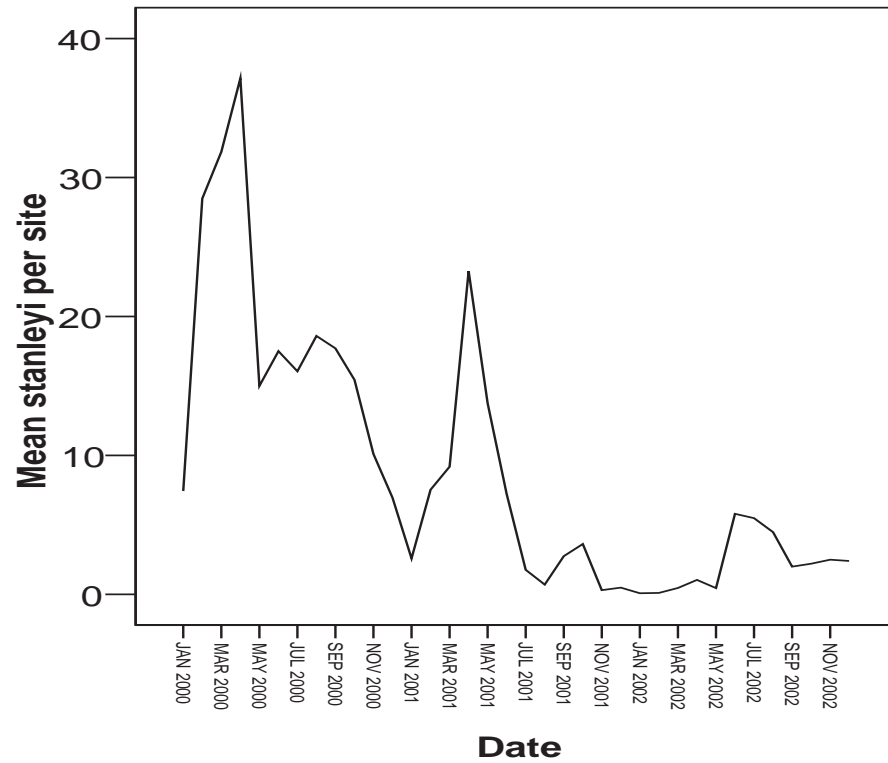
schistosomula

Booma fishermen

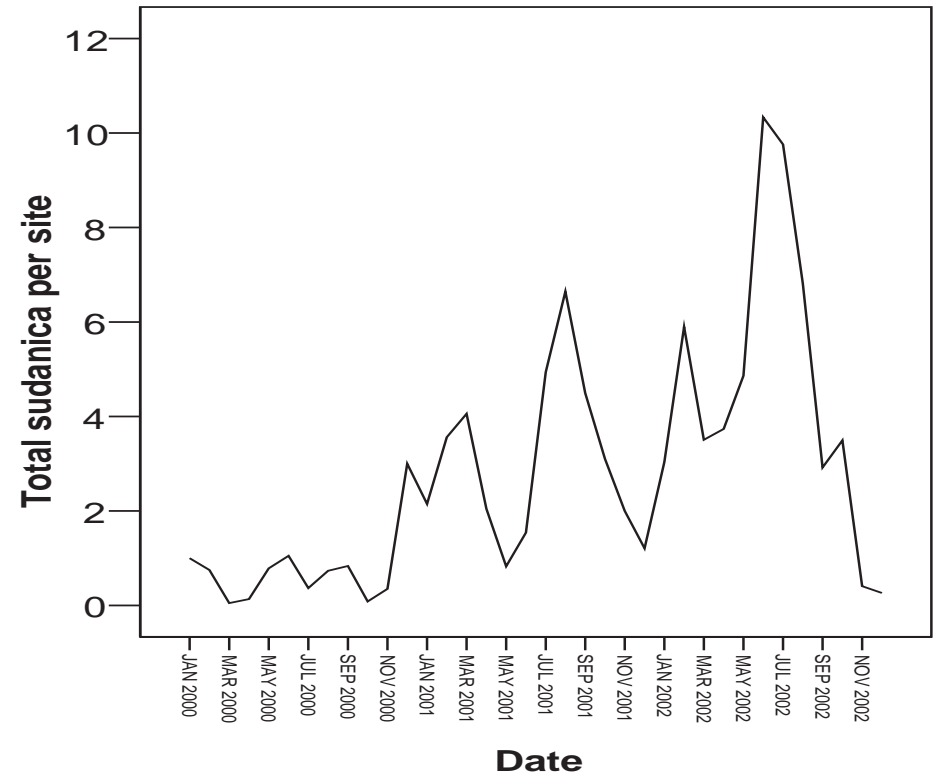


Variation in *Biomphalaria* spp abundance Jan '00 – Dec '02 in Lake Albert, Uganda

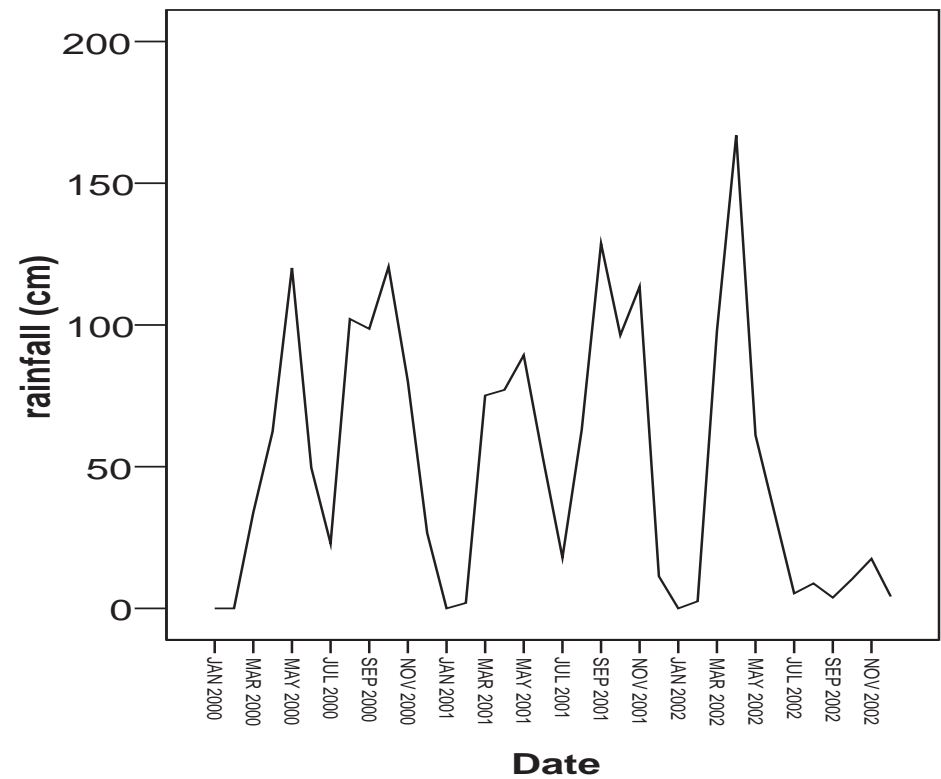
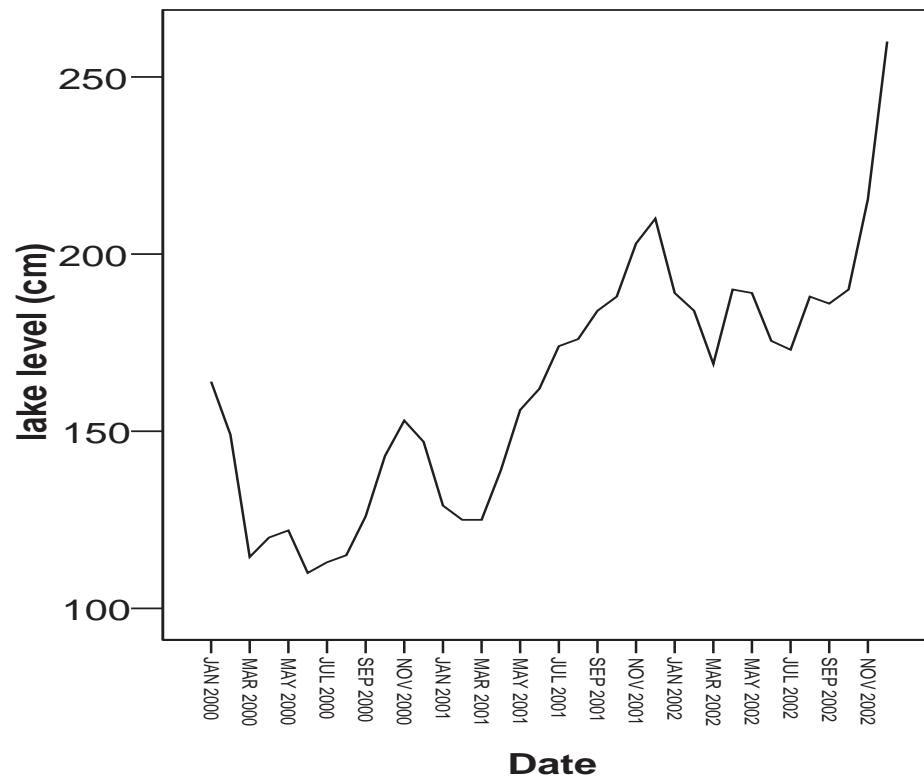
B. stanleyi



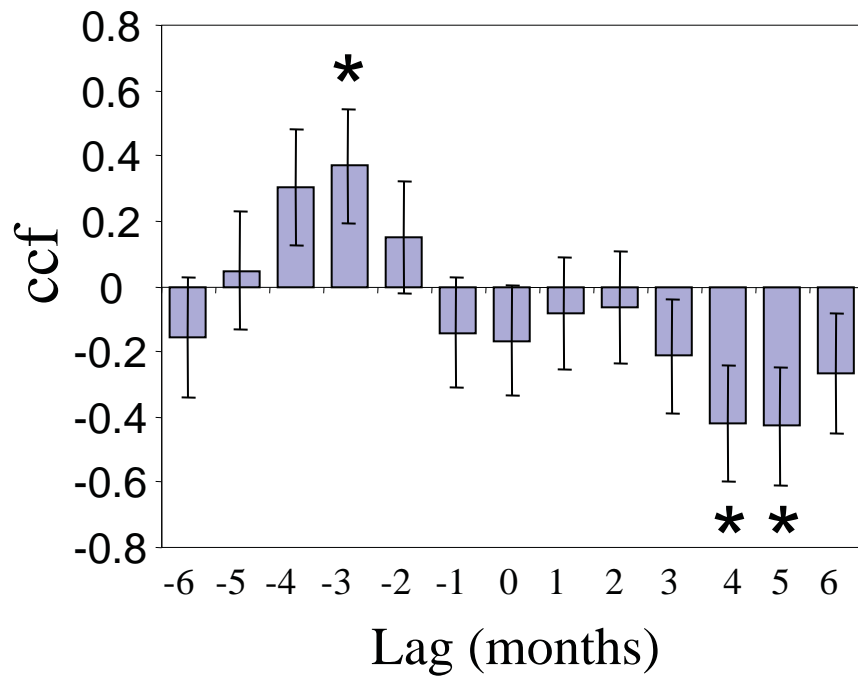
B. sudanica



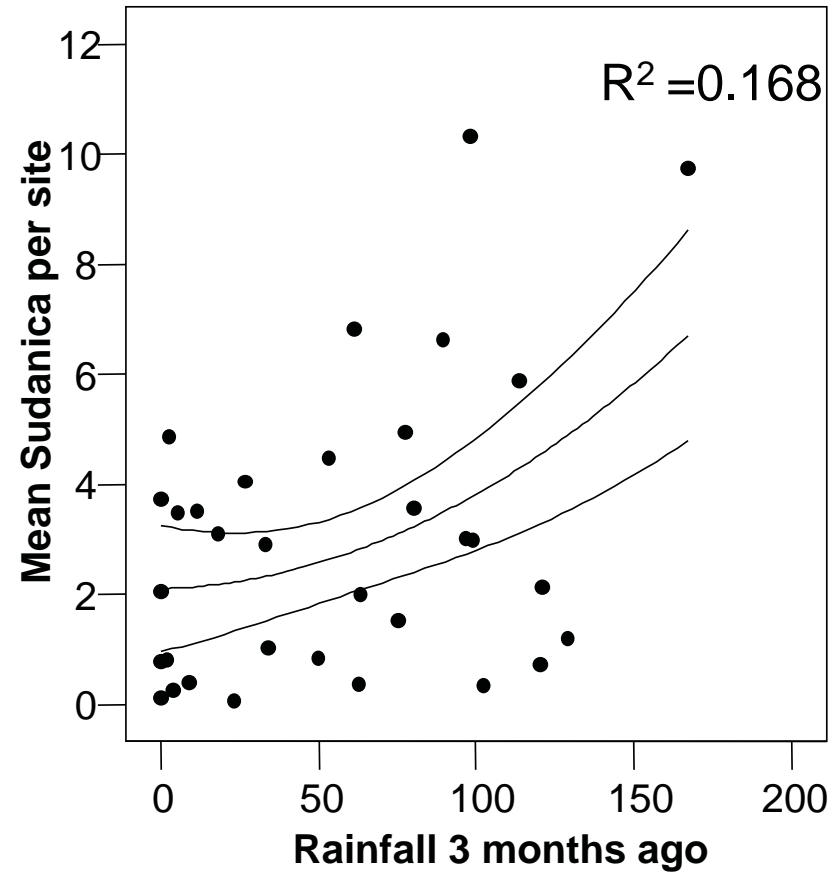
Variation in lake level and rainfall



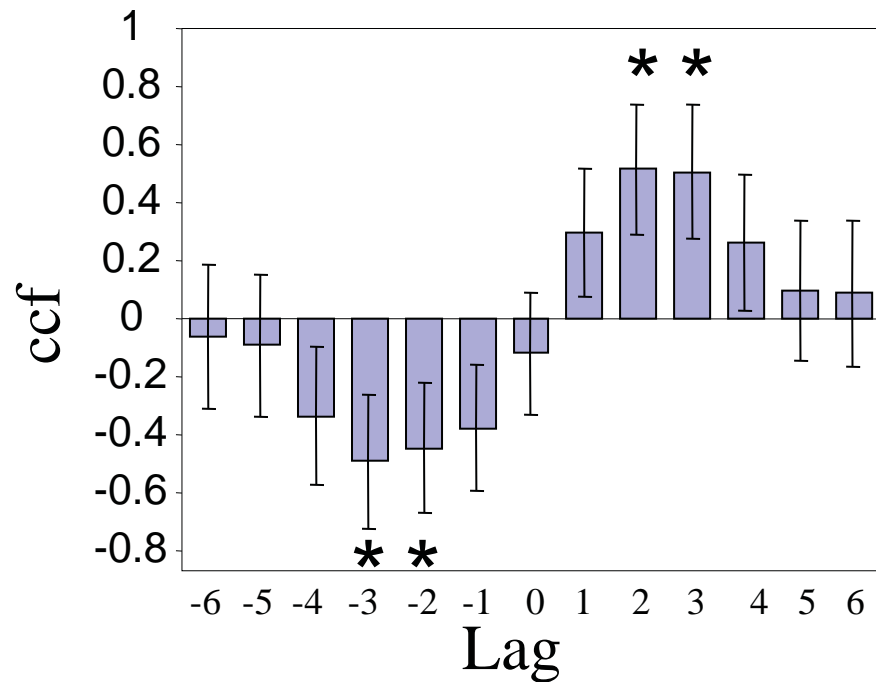
***B. sudanica* abundance and total rainfall per month**



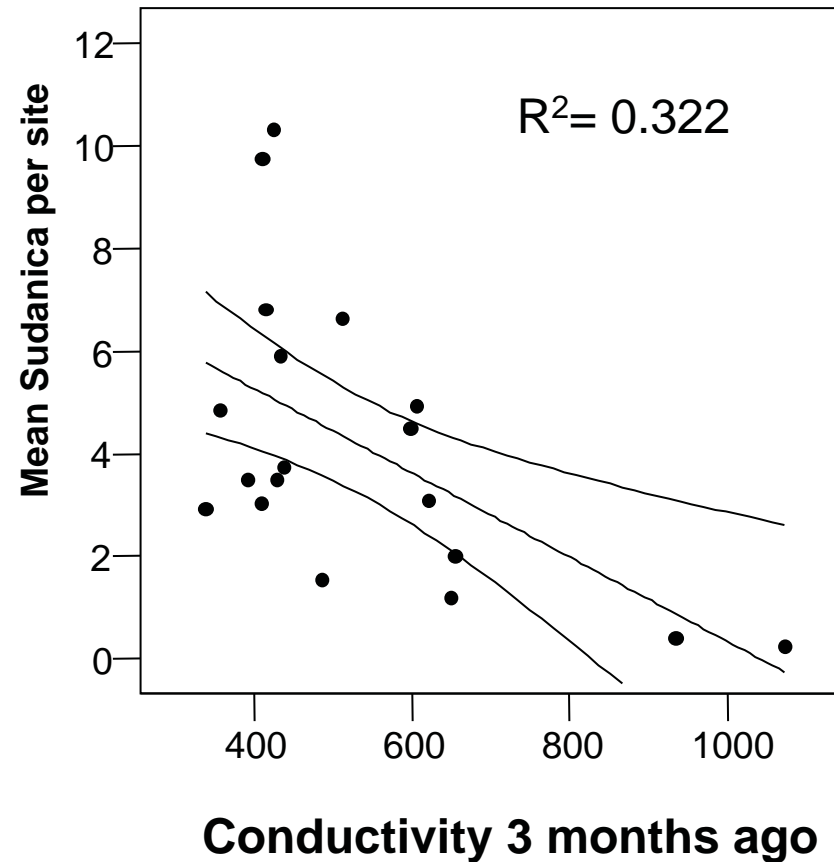
Peak correlation at -3 months



***B. Sudanica* abundance and lake water conductivity**

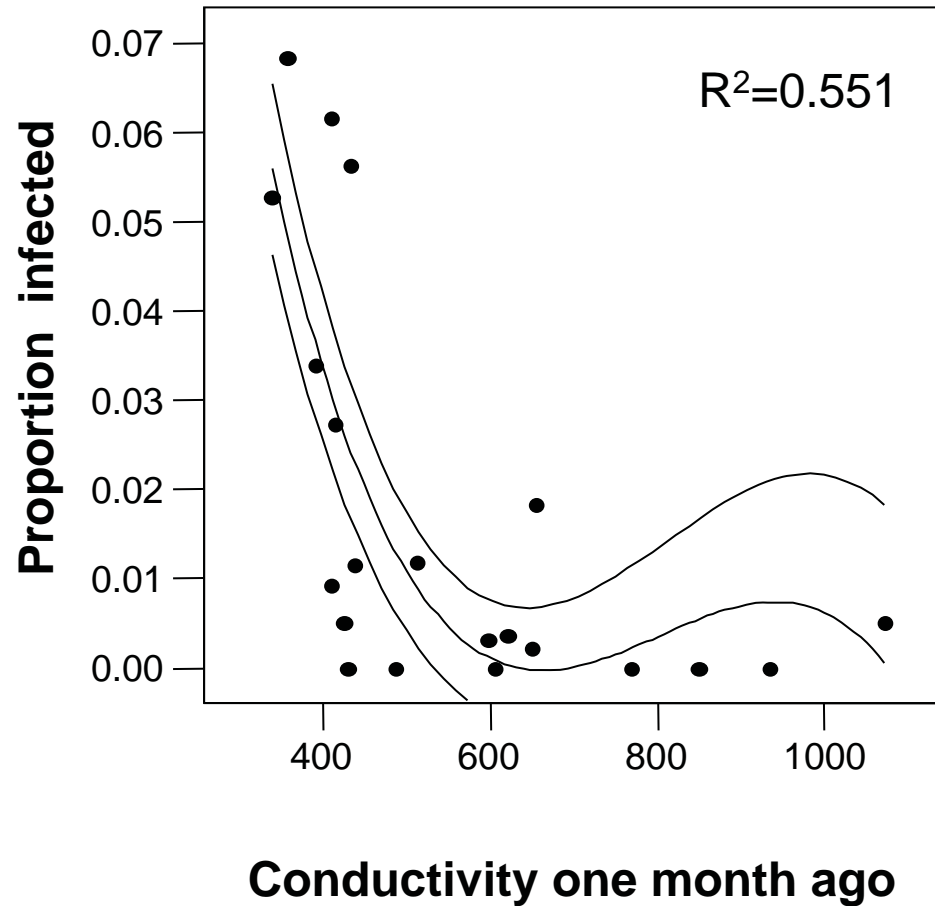


Peak correlation at -3 months

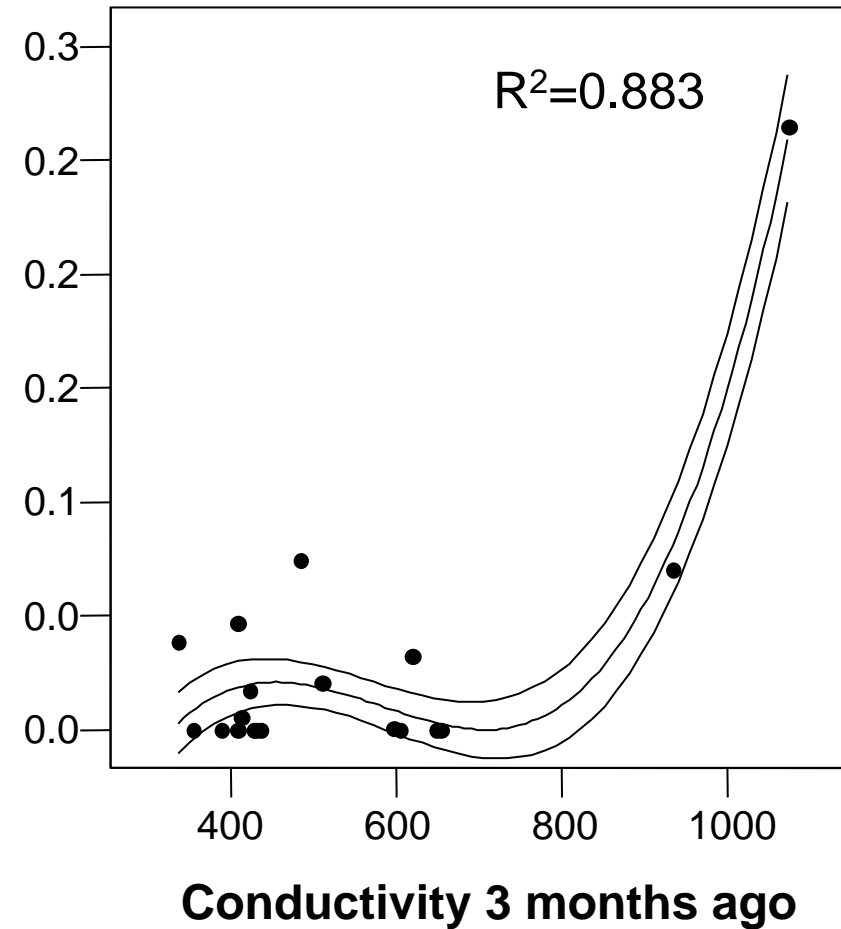


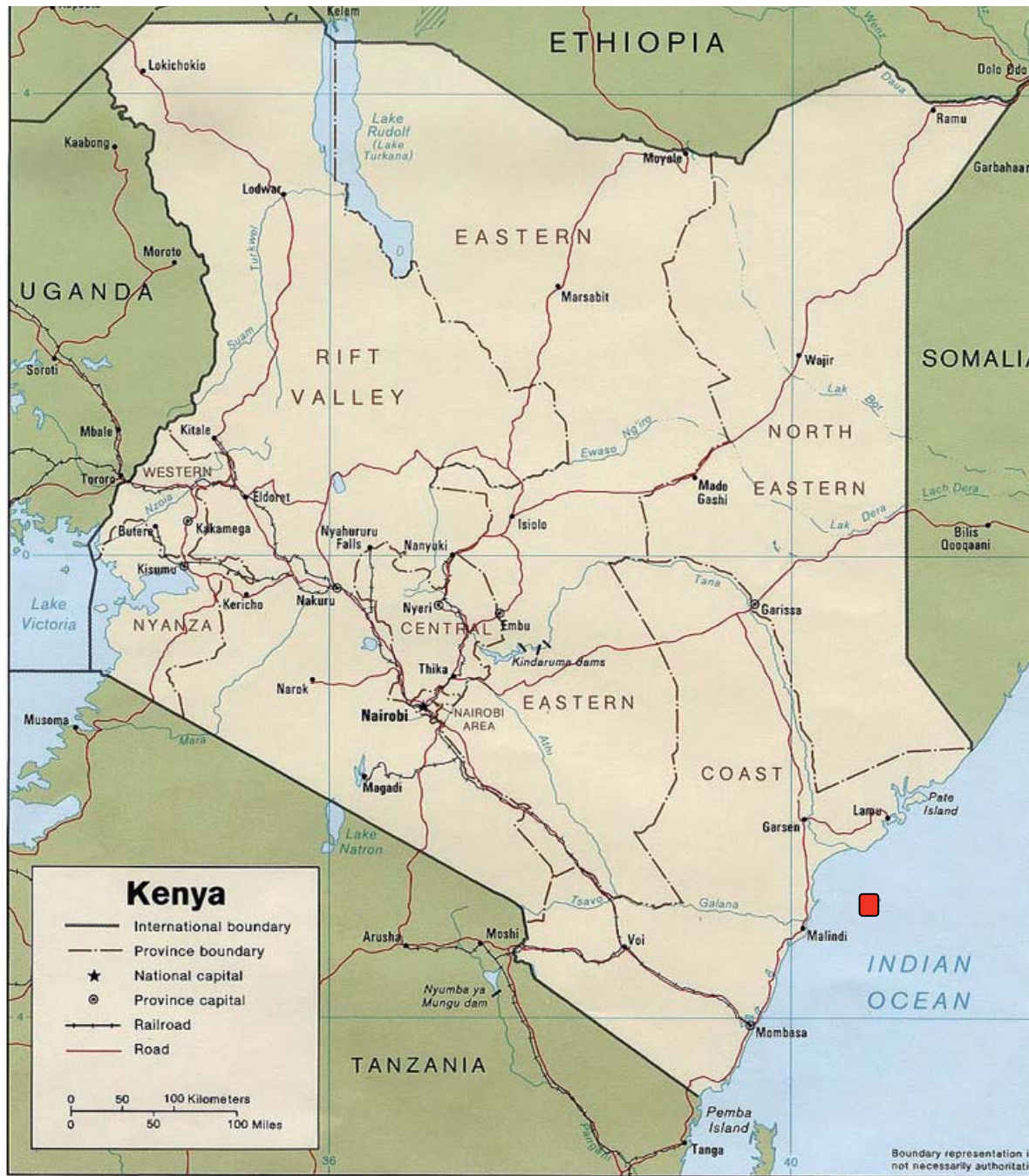
Proportion of snails infected and lake water conductivity

B. sudanica

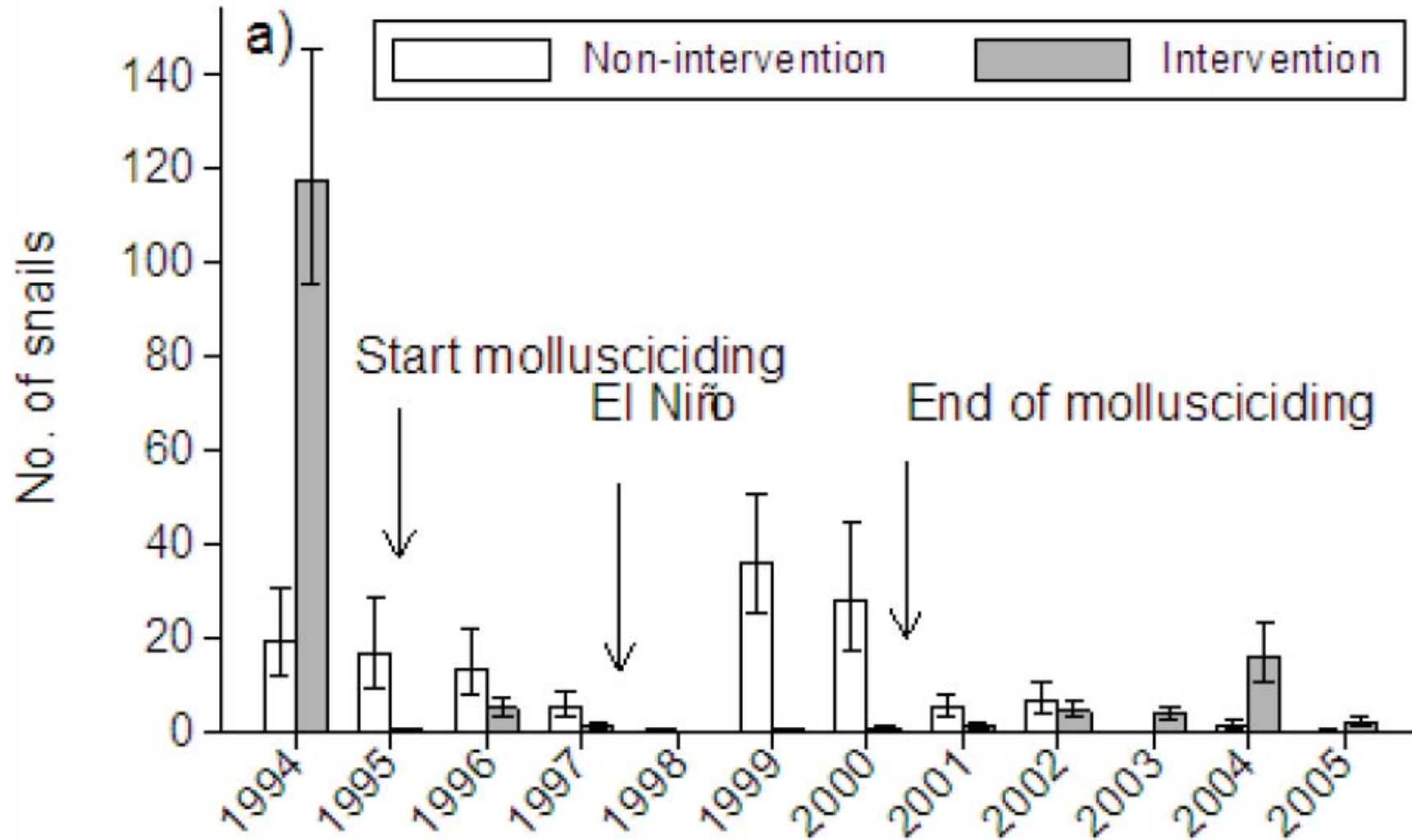


B. stanleyi





Impact of extreme weather events on snail abundance in a Kenyan stream system



Impact of extreme weather events on snail abundance in a Kenyan stream system

