2nd Session

Case of Lake Muhazi

Muhazi 1

Facilitator: Nyirishema Richard

IWRM Conference 2019

Integrated Water Resources Management

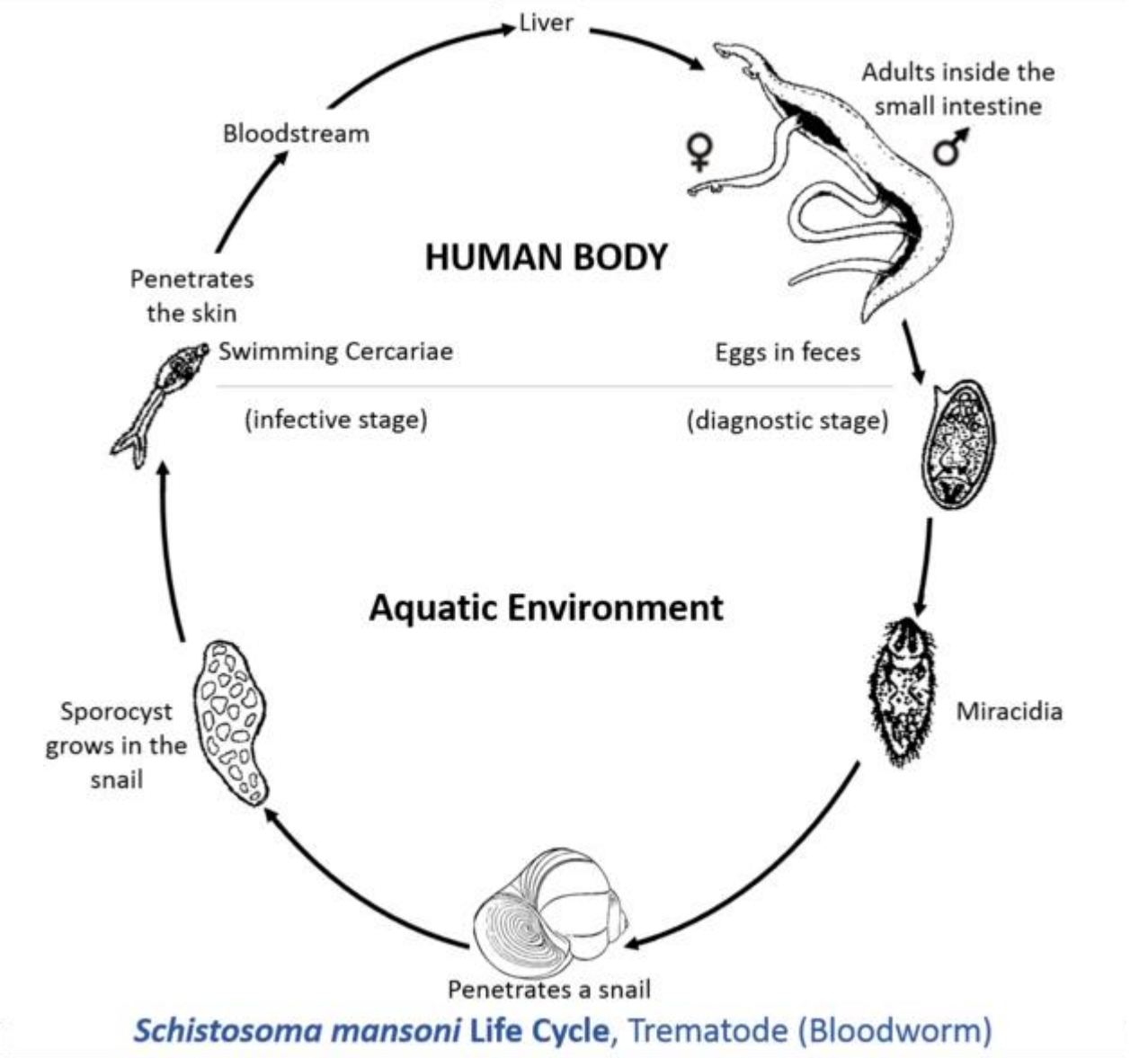
Current situation of Schistosomiasis in Lake Muhazi and the socio-ecological factors influencing its transmission

UR TEAM, 2018

Background

- Schistosomiasis (Bilharzia): parasitic disease due to *Schistosoma sp*

- *S. mansoni* and *S. haematobium* most prevalent in Africa
  - ➢ Intestinal schistosomiasis and uro-genital schistosomiasis resp.



Background

- Transmission requires the presence of ‘stagnant’ water and **snails** (intermediate hosts): different species for different *Schistosoma*

- In Rwanda, only *Schistosoma mansoni* has been documented and this is transmitted through ***Biomphalaria*** snails

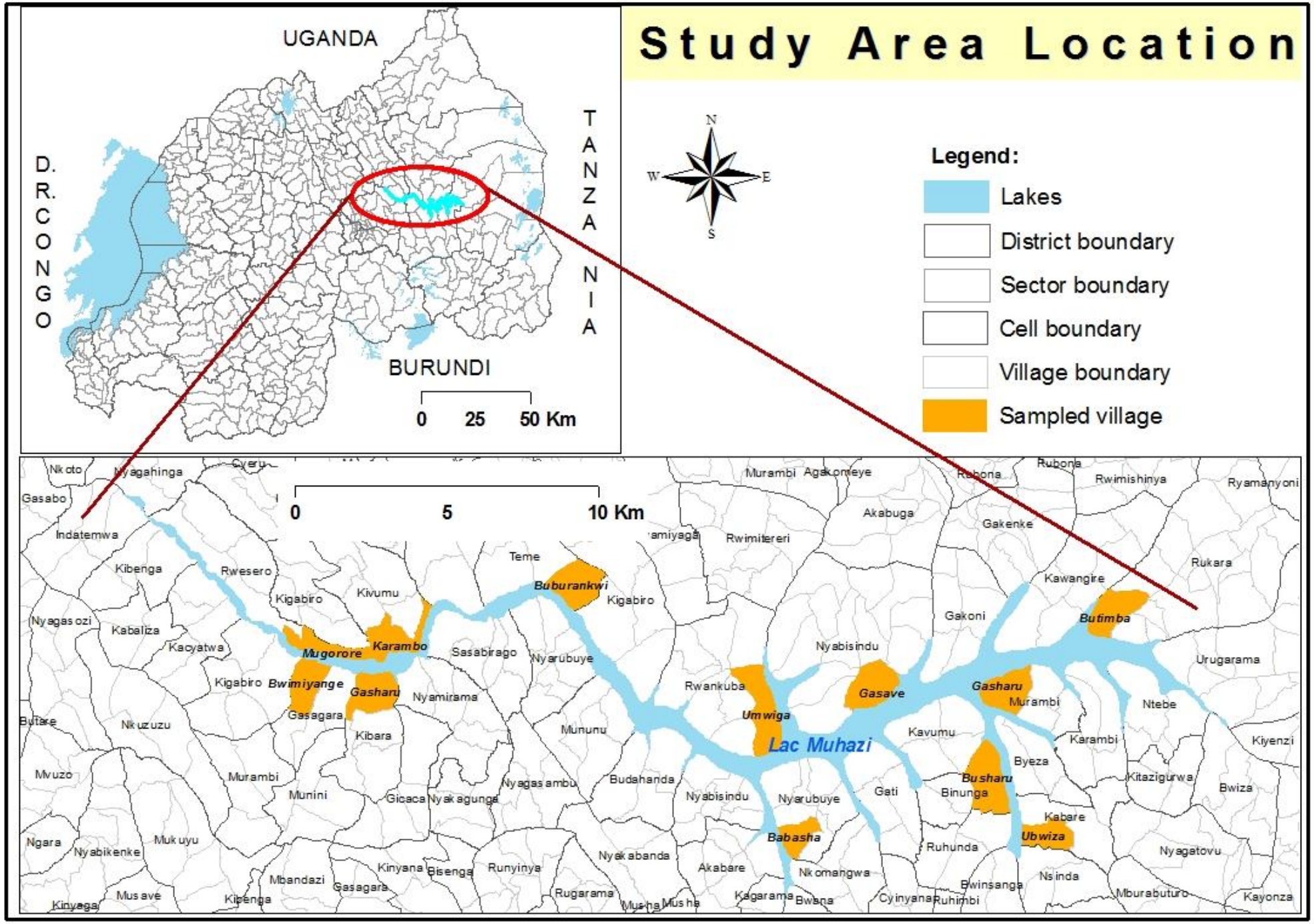
- *Schistosoma haematobium* is transmitted through ***Bulinus*** snails

Objectives

Main objective: determine the potential for Schistosomiasis transmission in Lake Muhazi and associated factors

- **Specific:**
  - Snail distribution and infectivity
  - Water physico-chemical properties
  - Land cover/land use
  - Hygiene and sanitation
  - Knowledge, attitudes and practices (KAP) of population

Methods


Study Area Location
UGANDA
D. R. CONGO
TANZANIA
BURUNDI
0 25 50 Km
N
W
E
S
Legend:
Lakes
District boundary
Sector boundary
Cell boundary
Village boundary
Sampled village
0 5 10 Km
Lac Muhazi
Buburankwi
Karambo
Mugorore
Bwimiyange
Gasharu
Umwiga
Gasave
Gasharu
Butimba
Busharu
Babasha
Ubwiza
Nkoto
Nyagahinga
Cyeru
Gasabo
Indatemwa
Kibenga
Rwesero
Kivumu
Kigabiro
Teme
Nyagasozi
Kabaliza
Kacyatwa
Sasabirago
Nyarubuye
Butare
Nkuzuzu
Gasagara
Nyamirama
Kibara
Mvuzo
Murambi
Munini
Gicaca
Nyakagunga
Nyagasambu
Mununu
Budahanda
Ngara
Nyabikenke
Mukuyu
Kinyana
Bisenga
Runyinya
Mbandazi
Gasagara
Kinyaga
Musave
Kibenga
Rugarama
Musha
Nyakabanda
Akabare
Kagarama
Bwana
Rwankuba
Nyabisindu
Rwimitereri
Amiyaga
Murambi
Agakomeye
Akabuga
Rubona
Gakenke
Rwimishinya
Ryamanyoni
Rukara
Kawangire
Gakoni
Urugarama
Ntebe
Kavumu
Karambi
Kiyenzi
Byeza
Kitazigurwa
Bwiza
Binunga
Gati
Kabare
Ruhunda
Nyagatovu
Nsinda
Bwinsanga
Mburabuturo
Kayonza
Cyinyana
Ruhimbi

Snail sampling

- Scooping methods for snail collection
- Cercariae shedding in the lab using ‘light/darkness’ exposure method
- Microscopic observation

Water and ecological factors …

❖Approach:

➢The quality of water from the snail collection sites was analyzed using portable water testing kit (Wagtec, Potalab No 2):

- ➢ Selected indicator of Organic pollution:
  - ✓ Nutrients: $NO3^-$, $NO2^-$, $NH4^{3-}$, $PO4^-$
  - ✓ Dissolved oxygen
- ➢ Faecal contamination:
  - ✓ Faecal coliforms.
- ➢ General water quality parameters:
  - ✓ Temperature,
  - ✓ turbidity,
  - ✓ pH

Sanitation, hygiene and social aspects

- Questionnaire
- Focus group discussions with farmers, fishermen and village leaders

Results

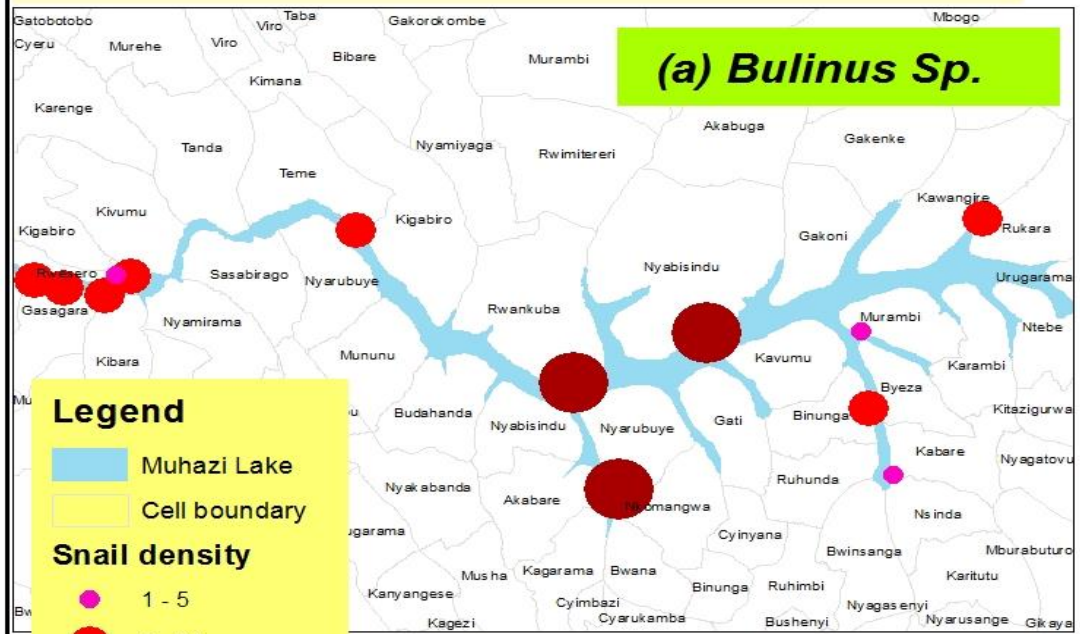
Snail distribution and infectivity

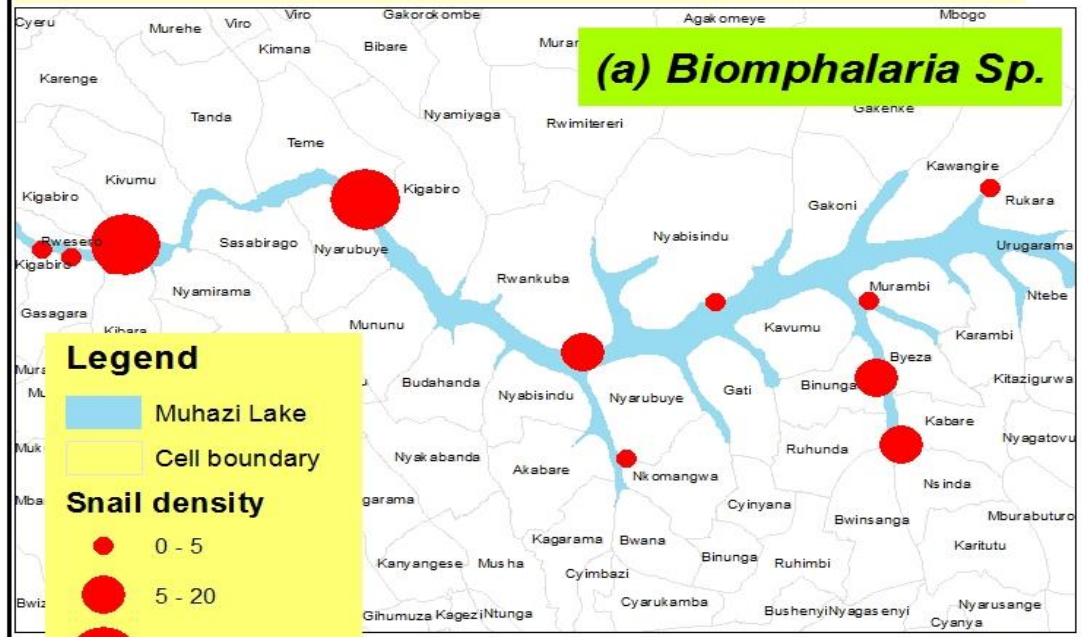
- Two species of interest: *Biomphalaria sp* and *Bulinus sp (S mansoni* and *S haematobium* respectively*)*
- Rainy season: 320 snails analyzed around Muhazi (13 sites), 129 *Biomphalaria* and 191 *Bulinus*
- Dry season: 335 snails analyzed, 133 *Biomphalaria* and 202 *Bulinus*
- Higher number of shedding cercaria in dry season, possibly due to higher temperatures

Snail infectivity levels

District	Sector	Cell	Village	Rainy season		Dry season	
				Biomph_ sp	Bulinus_ sp	Biomph_ sp	Bulinus_ sp
Gatsibo	Kiramuruzi	Nyabisindu	Gasave	60%	13.3%	-	-
Gatsibo	Gasange	Iteme	Buburankwi	65.7%	50%	52.8%	50%
Gatsibo	Murambi	Rwankuba	Umwiga	10%	50%	0%	40.6%
Kayonza	Rukara	Rukara	Butimba	66.6%	0%	52%	0%
Rwamagana	Muhazi	Kabare	Ubwiza	35.2%	0%	50%	50%
Rwamagana	Muhazi	Murambi	Gasharu	0%	50%	100%	42.9%
Rwamagana	Munyiginya	Nyarubuye	Babasha	33.3%	38.2%	0%	33.3%
Rwamagana	Gishali	Binunga	Busharu	46.6%	40%	47.6%	37.5%
Gicumbi	Bukure	Rwesero	Mugorore	24.1%	20%	0%	10.5%
Gicumbi	Bukure	Kivumu	Karambo	0%	35.3%	0%	20%
Gasabo	Gikomero	Kibara	Gasharu	100%	11.8%	0%	52.6%
Gasabo	Gikomero	Gasagara	Bwimiyange	100%	35.2%	25%	15.4%
Gasabo	Gikomero	Gasagara	Bwingeyo	40%	22.2%	0%	18.8%

Snails presence and abundance & number of Cercariae shaded

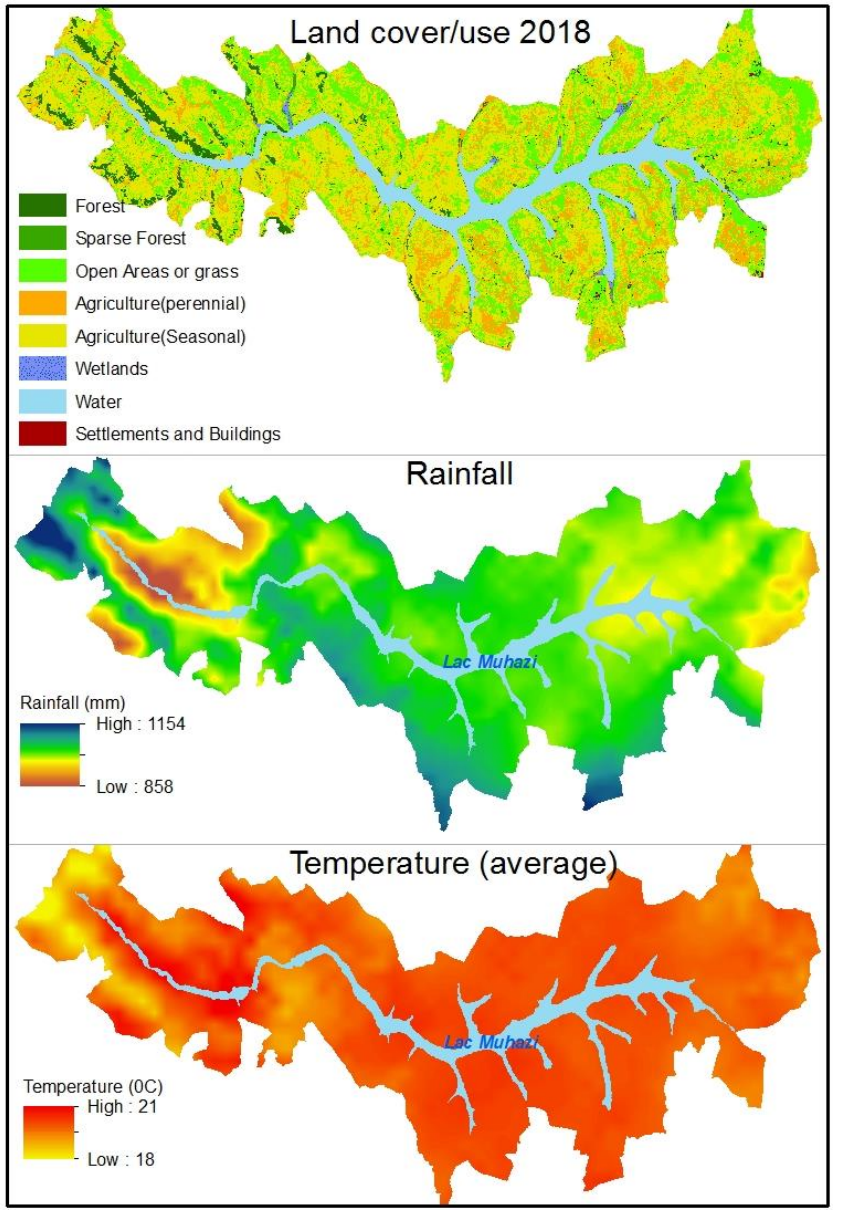




Water and ecological factors …

❖ **Lakes environment reflect surrounding areas characteristics such as:**

- ➢ Climate : warm and humid
- ➢ Land cover/use: Mixed agriculture and settlements in almost each square meter of the lake shores surrounding areas



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Land cover/use description

District	Sector	Cell	Village	Site ecology description
GATSIBO	KIRAMURUZI	NYABISINDU	GASAVE	Site with meadow vegetation, much fish with limited human activities. At this site, very few live snails were found in rainy season but were all dead in dry season
GATSIBO	GASANGE	ITEME	BUBURANKWI	The watershed was mainly occupied by Cattle farmers pasture/ranches, therefore releasing a high amount of degraded organic matter in the Lake. The biggest number of snails and cercaria was found at this site
GATSIBO	MURAMBI	RWANKUBA	UMWIGA xxx	The lake is surrounded by an improved pasture (subdivided in paddock) and with relatively low risk of erosion. No Biomphalaria snails were found but a large number of Bulinus snails were found shedding a lot of cercaria
KAYONZA	RUKARA	RUKARA	BUTIMBA	The lakeshores have a belt of natural vegetation followed by Eucalyptus tree plantations. Many Biomphalaria snails shedding cercaria were found.
RWAMAGANA	MUHAZI	KABARE	UBWIZA	Primary luxurious vegetation dominated by Cyperus papyrus (urufunzo), Phragmites sp (imiseke), Cyperus sp (ikigaga). The shore seems protected and this is another site where we found a relatively large number of snails.
RWAMAGANA	MUHAZI	MURAMBI	GASHARU	Landscape is made by a mixture of settlement and cropland with very poor land cover density. This is a site where we found a relatively small number of snails but both Biomphalaria and Bulinus snails were shedding cercaria
RWAMAGANA	MUNYIGINYA	NYARUBUYE	BABASHA xxx	Lakeshores have a small buffer of natural vegetation followed by perennial crops (banana plantation) and Pasture land. No Biomphalaria snails were found but many Bulinus were found and many cercaria were shed
RWAMAGANA	GISHALI	BINUNGA	BUSHARU	The site is characterised by intensive farming activities with seasonal crops keeping the areas poorly covered during dry season. Many snails (Biomphalaria and Bulinus) and cercaria were found
GICUMBI	BUKURE	RWESERO	MUGORORE	Mixture of settlement and cropland with a district road polluting the lake with runoff. Many Bulinus snails were found shedding cercaria
GICUMBI	BUKURE	KIVUMU	KARAMBO	Mixture of settlement banana plantation and seasonal cropland with a district road polluting the lake with runoff. No Biomphalaria found but Bulinus found and shedding cercaria
GASABO	GIKOMERO	KIBARA	GASHARU	The shores were cultivated and the vegetation was dominated by Bidenspilosa (inyabarasanya), Dracaena spp (imihati), Bothriocline ugandensis (igicumucumu), Crassocephalum ducisaprutii (isununu). In this area, though cercariae were shed, we found very few snails and only at one point and all were Bulinus sp.

Land cover/use description

District	Sector	Cell	Village	Site ecology description
GATSIBO				this site, very few live
GATSIBO				efore releasing a high ails and cercaria was
GATSIBO				with relatively low risk us snails were found
KAYONZA				ee plantations. Many
RWAMAGANA				agmites sp (imiseke), e where we found a
RWAMAGANA				and cover density. This mphalaria and Bulinus
RWAMAGANA				ennial crops (banana ulinus were found and
RWAMAGANA				ps keeping the areas d cercaria were found
GICUMBI				n runoff. Many Bulinus
GICUMBI				rict road polluting the ria
GASABO				ilosa (inyabarasanya), ephalum ducisaprutii and only at one point

1. Poor land cover and limited human activities: **fewer snails**

2. Watershed occupied by intensive farming activities, grazing land: **largest number of snails**

3. Road pollution with runoff: **No Biomphalaria but presence of Bulinus**

4. Improved pasture with low risk of erosion: **no Biomphalaria but Bulinus shedding cercaria**

Water and ecological factors …

❖ **Lake Muhazi water parameters associated with snails and cercaria:**

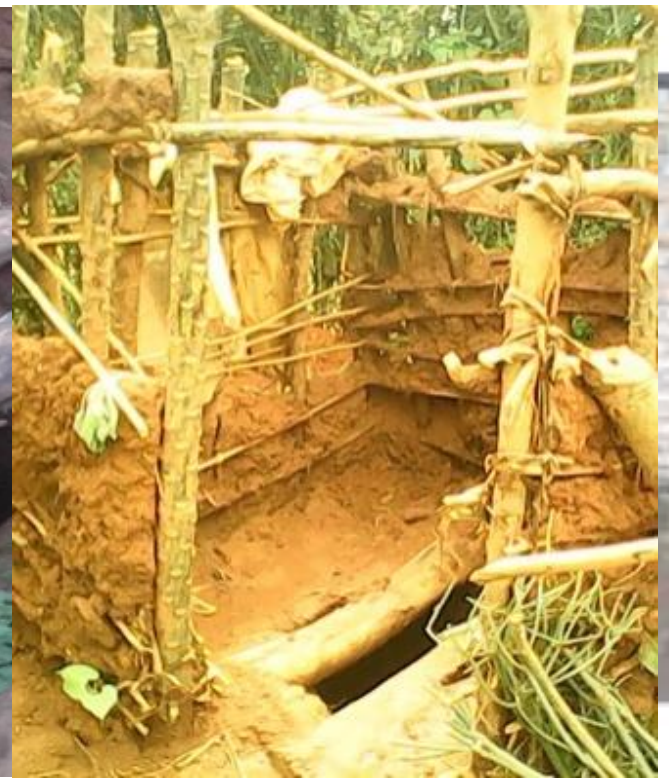
- Snail abundance associated with: Nitrogen, temperature and pH
- Cercaria shedding associated with the amount of faecal coliforms

Hygiene and sanitation, KAP

- 77.4% of interviewed people did not know the cause/transmission route for schistosomiasis
- 71.2% have regular contact with the Lake water
- Inadequate knowledge leading to seeking traditional healers or drinking alcohol in case of Schisto symptoms
- A primary school teacher in Gatsibo, on the question if he knows schistosomiasis, he replied: "*Unless it is a new epidemic disease, it does not exist here*."

Hygiene and sanitation, KAP

- 94.6% households have toilet but 44.9% are in poor conditions

Conclusions

- High number of snails (including Bulinus) shedding cercaria of Schistosoma, a causative agent for schistosomiasis (bilharzia). The presence of these cercaria is a potential for transmission of schistosomiasis around Lake Muhazi
- Increased nitrogen content and a basic pH were associated with snail abundance: snails consumers and producers of nitrogen
- Farming activities associated with snail abundance and cercaria shedding: nutrients and parasites
- Fecal coliform content and high temperatures were associated with cercaria shedding
- Poor knowledge and hygiene practices around Muhazi

Recommendations

- Water supply
- Health education for improved sanitation
- Latrines in the field for farmers and fishermen
- Promote vegetations that limit erosion, therefore water contamination from farms
- Screen for Schistosomiasis, including *S haematobium* around Lake Muhazi and strengthen control measures (treatment schedules, target groups,…)

Thank you!!