

## Introduction

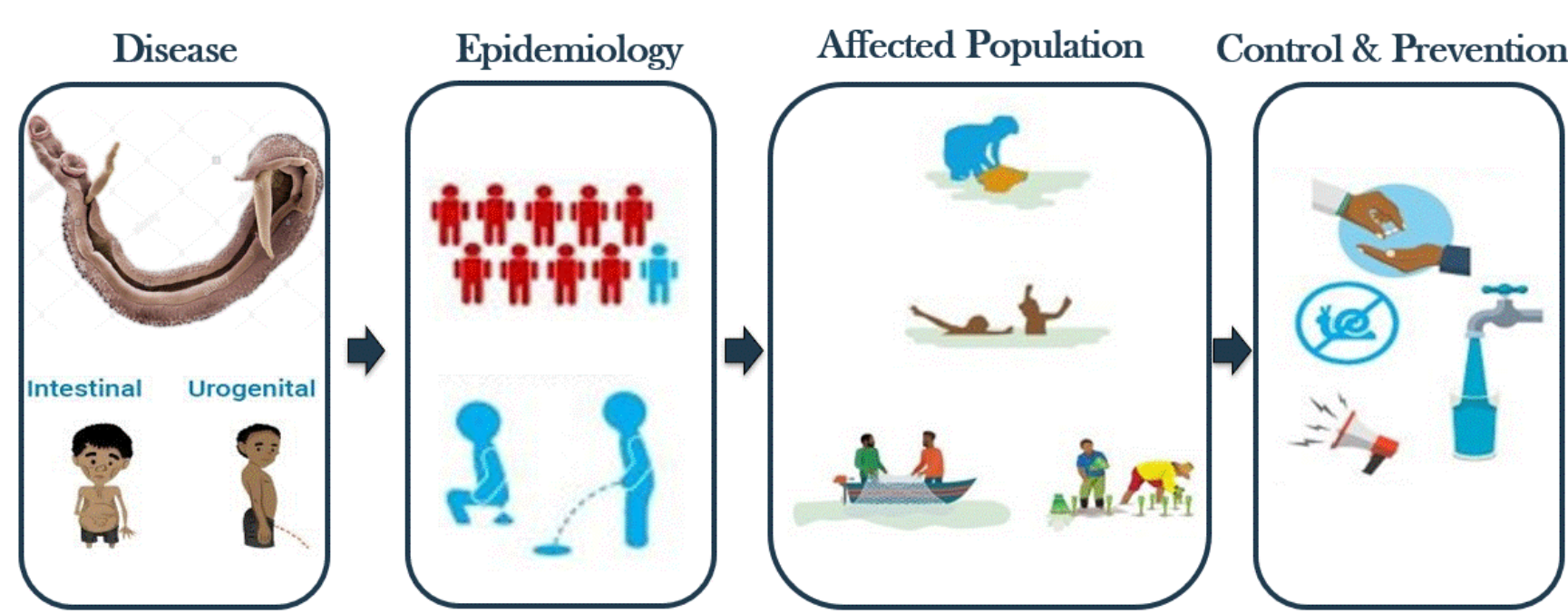
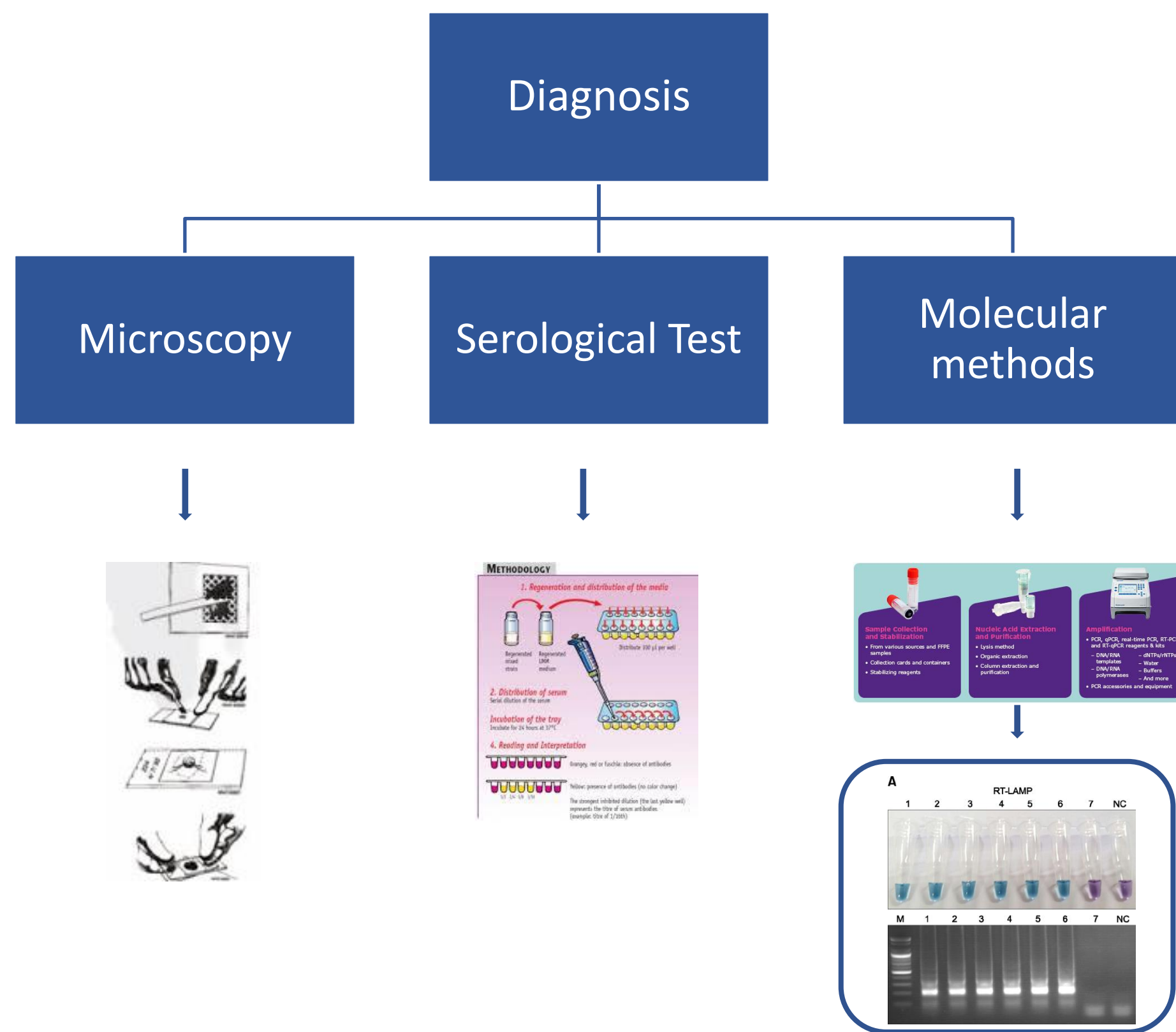


Figure 1. Chart on schistosomiasis (adopted from WHO)



## Methods and Materials

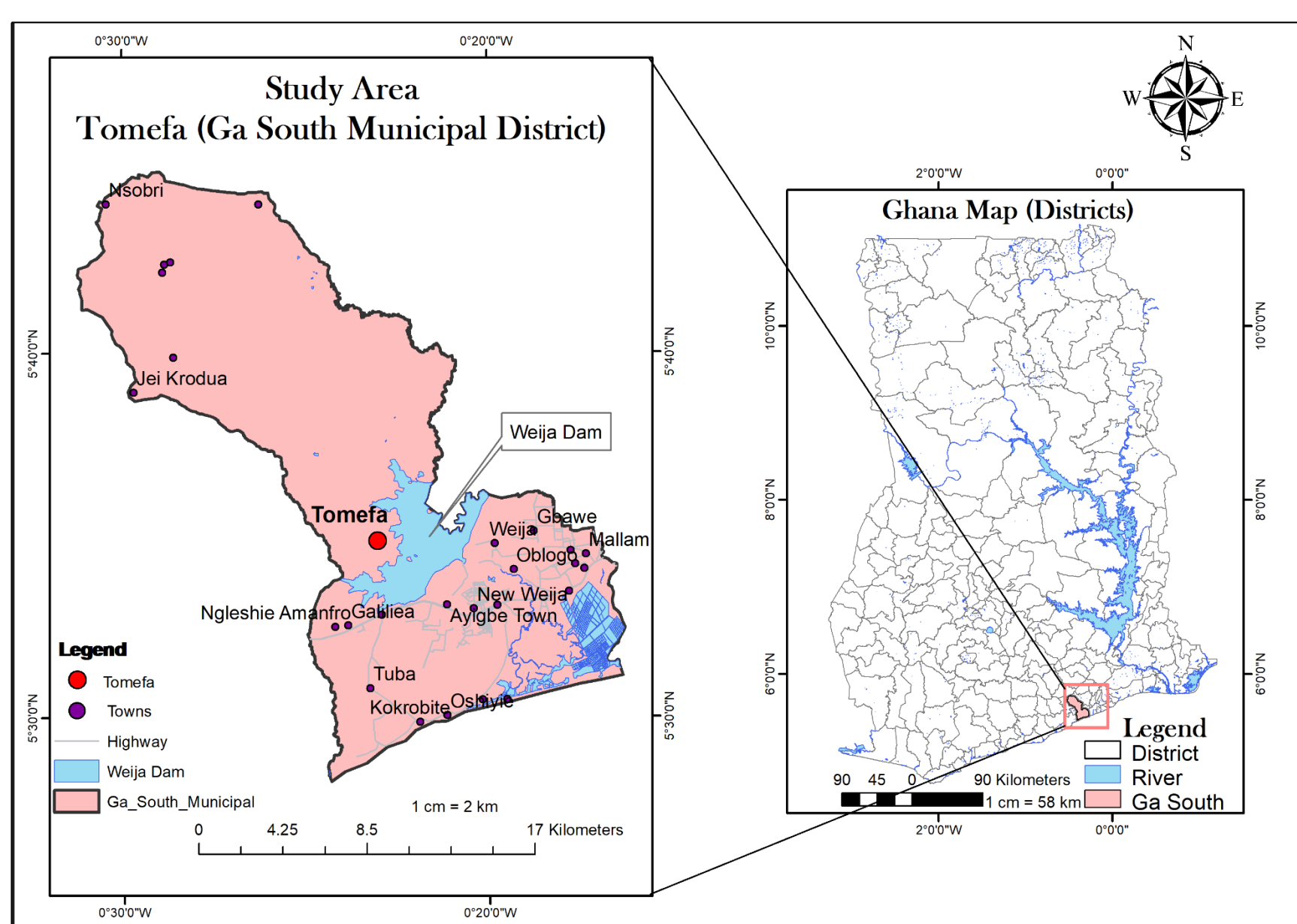


Figure 2. Tomefa in the Ga South Municipal District of Ghana

### Study design

Study used archived 150 urine and 200 stool samples from a previous study (epidemiological survey conducted in the Ga South Municipal Dist.).

Four LAMP Primers were designed from the *COX1* gene of each Schistosome species with Primer Explorer v. 5 and the loop primers were designed with OligoExplorer v 1.5.

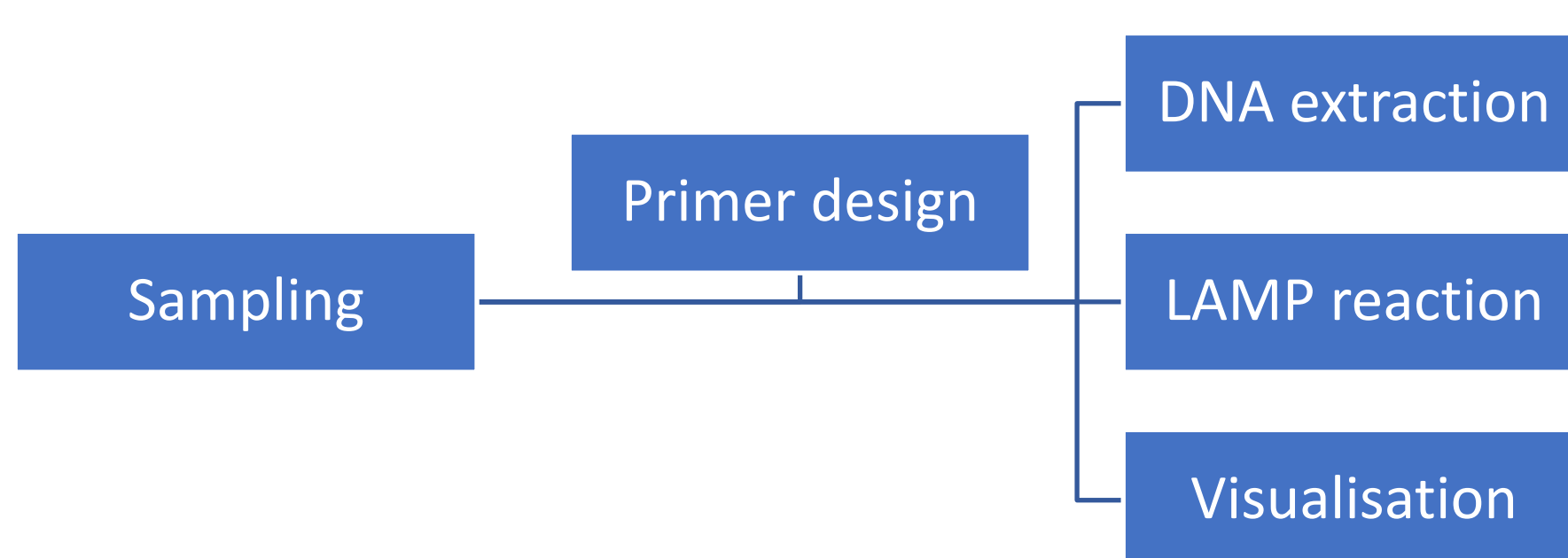


Figure 3. Flow diagram showing the workplan

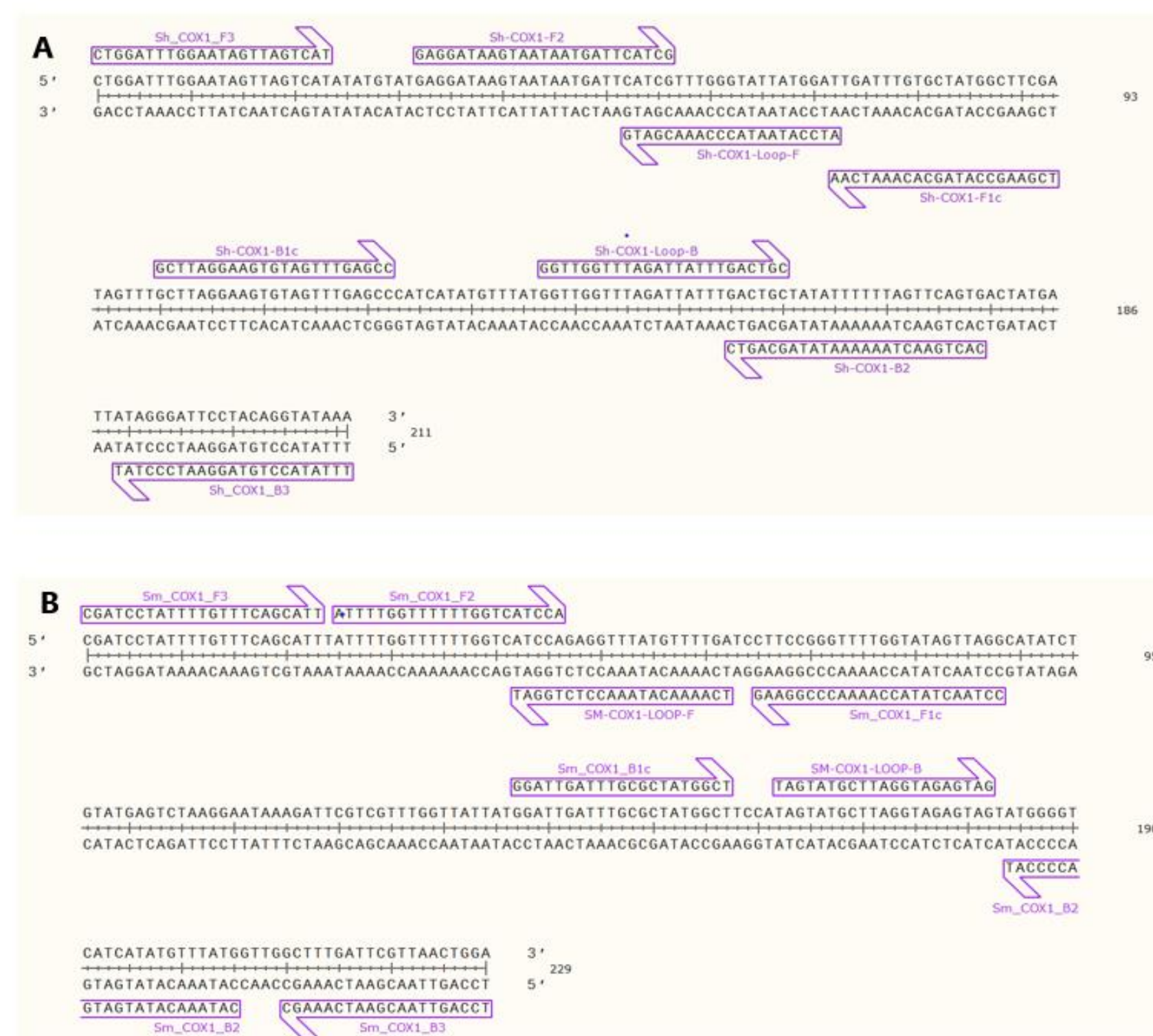


Figure 4. *S. haematobium* [A] and *S. mansoni* [B] COX1 LAMP primers

## Results

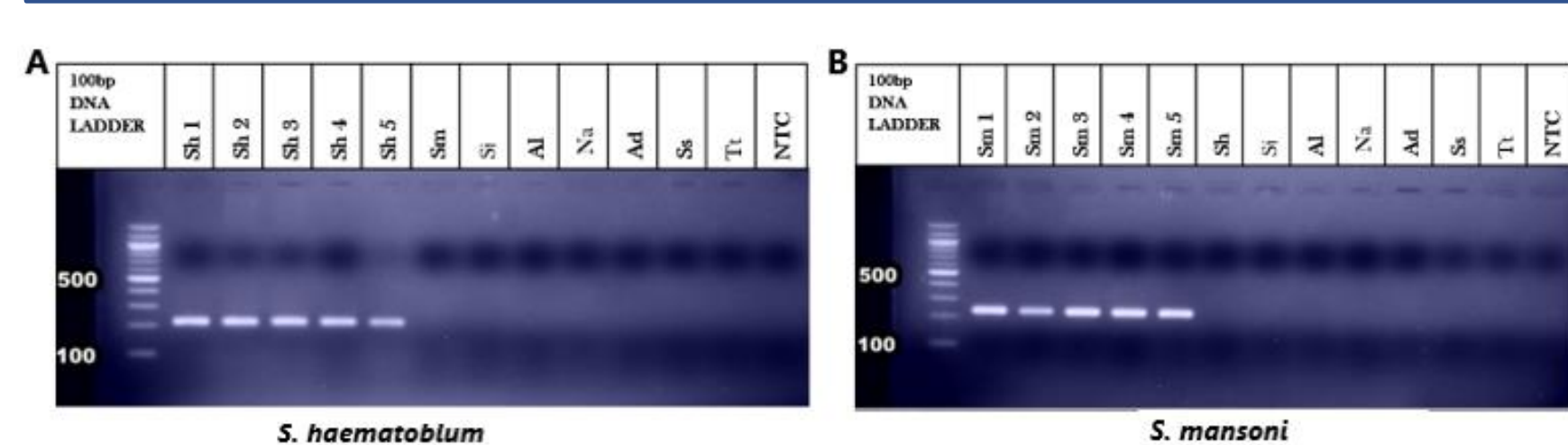


Figure 5. Primer specificity test via PCR assay with F3 and B3 outer primers. *S. haematobium* [A] and *S. mansoni* [B].

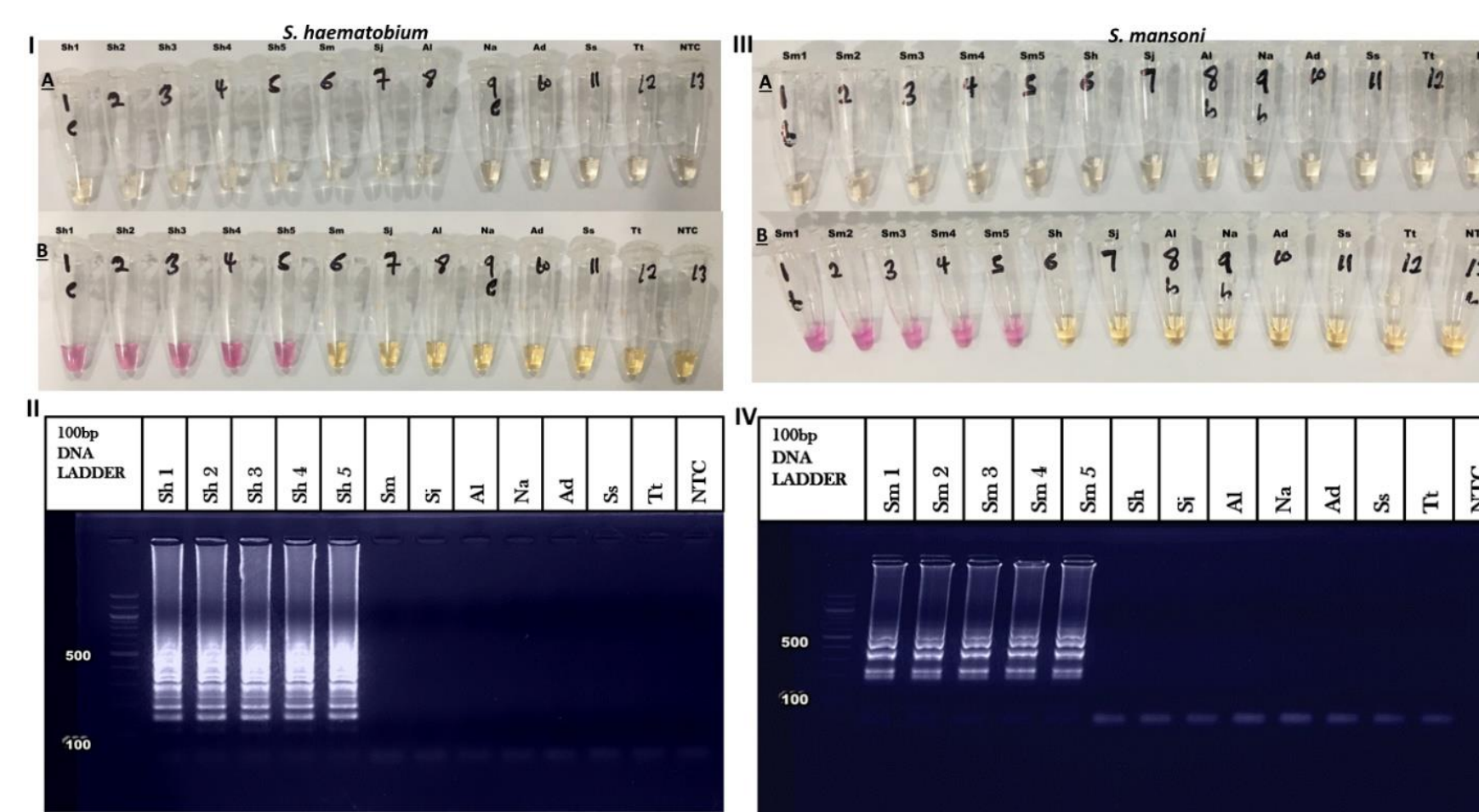


Figure 6. Primer specificity test via LAMP assay. Label [A] in I and III shows the LAMP reaction before incubation, and Label [B] shows the reaction after incubation. Labels II & IV are agarose gel confirmations of both LAMP reactions.

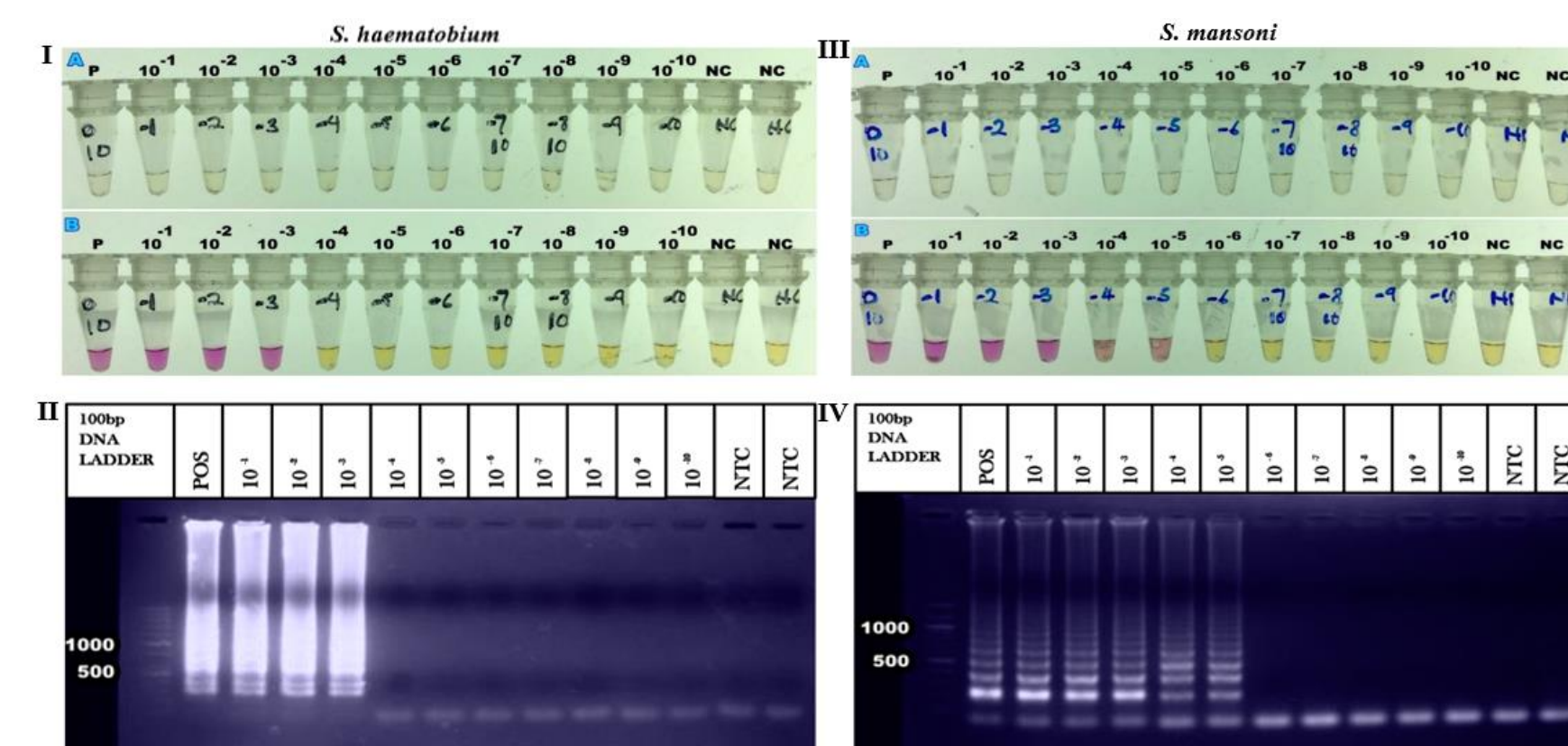


Figure 7. SCH-LAMP primer sensitivity test shows the lowest detection limit (*S. haematobium*: 0.0122ng and *S. mansoni*: 1.224pg). Label (A) in I and III shows the LAMP reaction before incubation, and Label (B) shows the reaction after incubation.

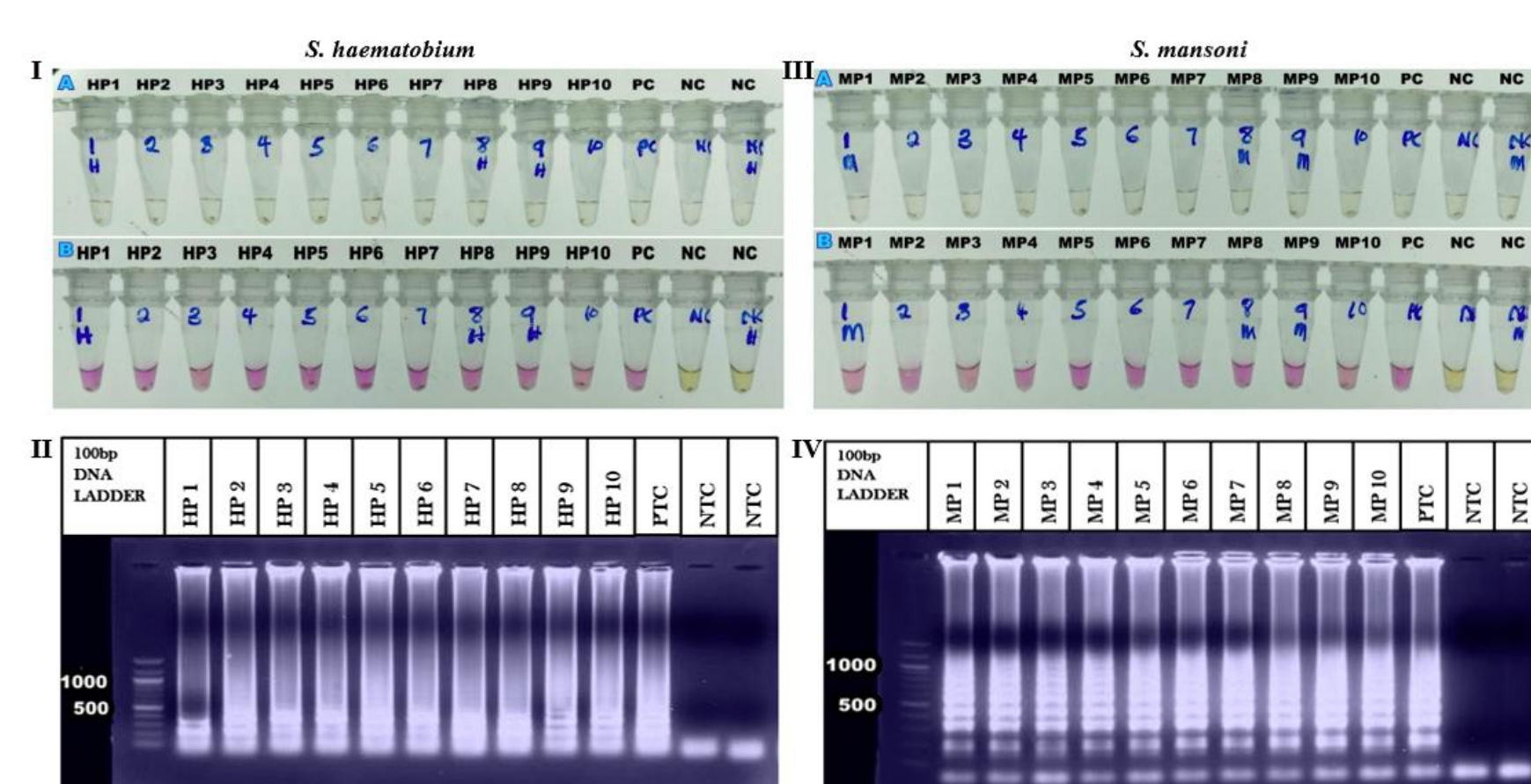


Figure 8. LAMP reaction outcome for SCH-microscopy positive samples. Label A in I & III shows the LAMP reaction before incubation, whereas label B shows the response after incubation.

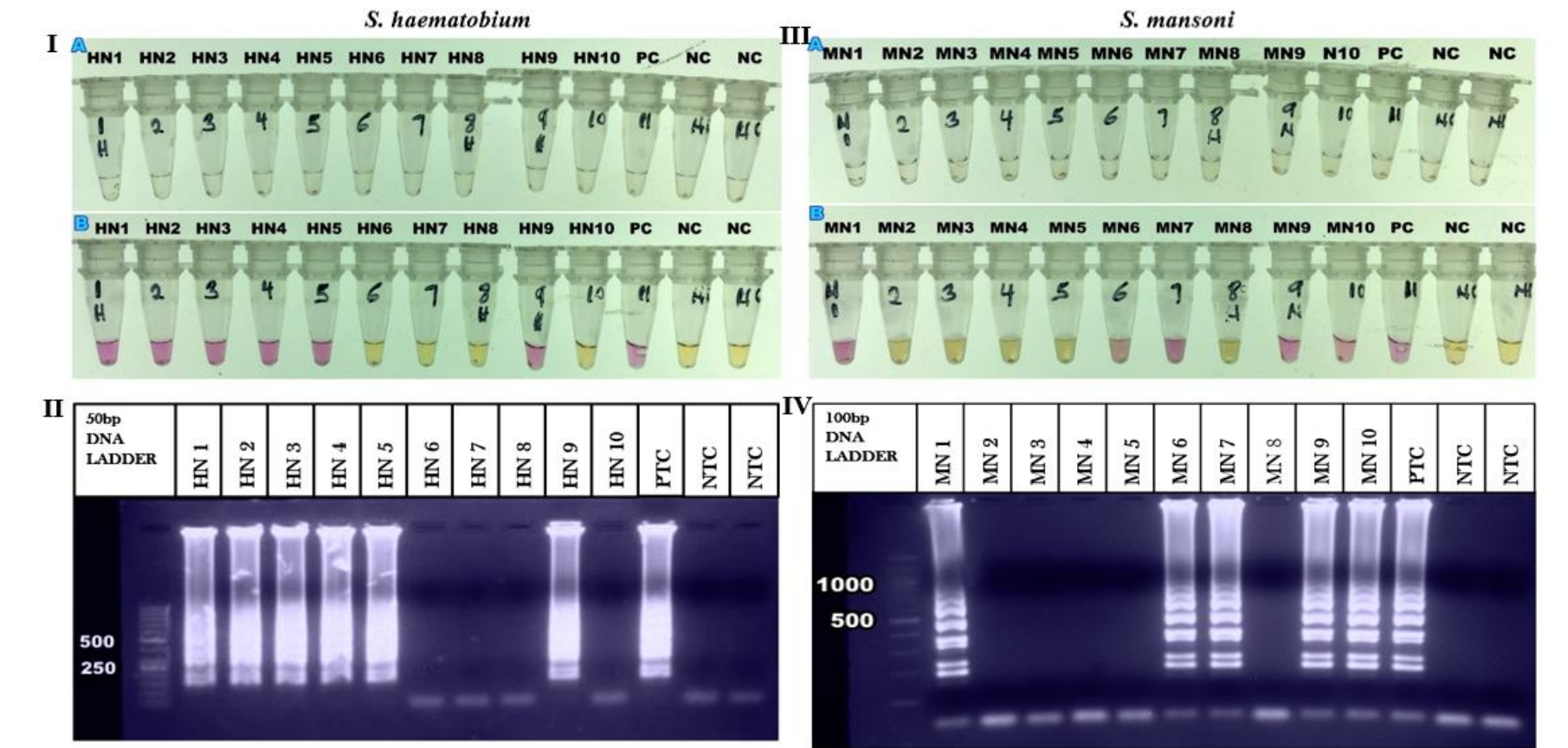


Figure 9. LAMP reaction outcome for SCH-microscopy negative samples. Label A in I & III shows the LAMP reaction before incubation, whereas label B shows the response after incubation

Table 2. Diagnostic accuracy of LAMP for Schistosomiasis.

	Microscopy (ref. method)		qPCR			
	<i>S. h.</i>	<i>S. m.</i>	<i>S. h.</i>		<i>S. m.</i>	
			+ve	-ve	+ve	-ve
Positive	73	150	65	8	150	0
Negative	77	50	13	64	44	6
Prevalence			33.8%		90.7%	
Sensitivity	-	-	93.7%		83.4%	
Specificity	-	-	89.8%		90.6%	

## Discussion

The present study was focused on developing an SCH *COX1*-based LAMP assay for the detection of schistosomiasis. In this designed assay, schistosome species-specific primers were used for the discrimination between *S. haematobium* and *S. mansoni* detection in urine and stool samples, respectively.

The application of the LAMP assay detected more *S. mansoni* (88.00%) and *S. haematobium* (16.88%) positives from the microscopy negative stool and urine samples, respectively. This outcome proved the high infection levels of intestinal schistosomiasis in the area, which requires a holistic approach such as biannual treatment, snail intermediate host control, education, provision of potable water and toilet facilities, to curb the situation. The outcome of this study was found to be similar to previous studies by Fernández-Soto *et al.* (2019) and Mwangi *et al.* (2018).

The BLCA showed a good outcome for the sensitivity and specificity for both urogenital and intestinal schistosomiasis. This is because there was minimized effect of the impact of the extra detected positives from the microscopy negative samples on the overall estimation, which was observed in the cross-tabulation method.

## Conclusions

The present study extensively evaluated the performance of LAMP for the detection of schistosomiasis by using designed primers which target the *COX1* gene of each schistosome species. The results ascertained the limitations in the microscopic detection of Schistosoma eggs as means of diagnosis.

In addition, although PCR-based assays are sensitive and specific, they are robust, and not field-friendly; hence, this colourimetric-based schistosome LAMP assay will improve diagnosis by making it cheap, quick and an easy.

## Contact

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## References

- Fernández-Soto P, Gandasegui J, Carranza Rodríguez C, Pérez-Arellano JL, Crego-Vicente B, García-Bernalt Diego J, et al. Detection of Schistosoma mansoni-derived DNA in human urine samples by loop-mediated isothermal amplification (LAMP). PLoS ONE. 2019;14:e0214125. doi:10.1371/journal.pone.0214125.
- Mwangi IN, Agola EL, Mugambi RM, Shiraha EA, Mkoji GM. Development and Evaluation of a Loop-Mediated Isothermal Amplification Assay for Diagnosis of Schistosoma mansoni Infection in Faecal Samples. J Parasitol Res. 2018;2018:1267826. doi:10.1155/2018/1267826.