

Detection and identification of *Schistosoma* sp, and other parasites of *Papio anubis* and a review of different field techniques of identification



BVA Overseas Travel Grant Report

The travel grant I was awarded by the BVA Overseas group was used to conduct a field investigation of the parasites of *Papio anubis* in Kwale District, Kenya. Myself and my colleague, Lorna Bell spent four weeks in Kenya, one week at the Institute of Primate Research and three weeks in the field, in Kwale District.

Laura Cole, Cambridge University

Introduction: Human-wildlife conflict- disease transmission

Human wildlife conflict has been in existence for as long as humans have existed and wild animals and people have shared the same landscapes and resources. Human-wildlife conflict is particularly significant in Africa where agro-pastoralists and subsistence farmers are most vulnerable. A area of this conflict that has received little attention is the disease transmission between wild and domestic species as well as between wildlife and humans. A particular concern is those diseases of non-human primates that have potential for zoonotic transfer. This became the cornerstone of my investigation. The focus of which was helminths of baboons.

Schistosomosis (“bilharzia”) is one of the most widespread parasitic infections in humans. The World Health Organization (WHO) regards it to be second only to malaria in public health and socio-economic importance. Schistosomosis is considered a neglected tropical disease, as it rarely causes mortality alone, research into the disease lags behind other parasitic diseases. Machemi (1992), Liverpool University, in association with the Institute of Primate Research implicated baboons as a maintenance host of *Schistosoma mansoni* in Kibwezi and Amboseli but no such work has been conducted in Kwale District.

Other soil transmitted helminths are a major source of outpatient morbidity in the district. Information from the Kwale District development plan shows that intestinal worms are one of the top five causes of outpatient morbidity, last surveyed over years running 2002-2004, alongside malarial diseases and diseases of the respiratory and skin and diarrhoeal diseases.

Study area- Kwale district, Coastal Province.

Kwale District, of which Kwale town is the headquarters, is one the thirteen districts in Coast Province. The district is located in the South Eastern part of Kenya covering an area of 1052.1 km², including 217.4km² of Shimba Hills Reserve. According to the 2005 constituency poverty profile, 53 percent of the population in Kwale live below absolute poverty, while 71.5 percent are food poor. The high degree of poverty is due to a plethora of reasons, but include wildlife menace, disease and insufficient health care.

Kwale was chosen as the study area, due to local contacts in the area; something that always needs to be considered when undertaking a short project such as ours. We soon found this to be of utmost importance as “first timer” researchers!

Kwale presented a good example of an area of human-wildlife interaction, particularly between humans and baboons, where baboons are often seen in area of human settlement. The Kenyan Wildlife Service (KWS) keep a database on reported physical conflicts; including raiding of crops, injuring and/or killing domestic species to injury or death of a person.

A review of their database show elephants are the most commonly reported species coming into conflict. Damage by baboons is also reported, but believed to be grossly under-reported as baboons are considered pest species but rarely kill. There are also reports of problems of schistosomosis and soil transmitted helminths. A study of soil in 2003 transmitted helminths and schistosomosis in Kwale District, showed a prevalence of 67.3% hookworm, 21.1% trichuris, 7.0% ascariasis. Muchemi (1992) demonstrated that baboons in Kibweze as a reservoir of *Schistosoma* sp. Work of this nature has not been done in Kwale, nor has a survey on the parasites of urban baboons.

Outline of work:

The itinerary of our work enabled us to experience all aspects of research in a developing country.

UK based preparation

The aim of the project was to be as self sufficient as possible, acquiring all our equipment in UK before departing and then leaving this equipment in Kenya for use by students in the future. This required a lot of forward planning! Luckily, thanks to Professor John Cooper we had already made contact with Dr Wendi Bailey, a parasitologist at the Liverpool School of Tropical Medicine. Through her much appreciated advice various literature searches we were able to determine what diagnostic test were best to identify and detect *Schistosoma* sp. Then it was time to find such equipment- “stores” at the University must be duly thanked for their enthusiasm to meet our demands. Dr Bailey, was a invaluable help, her knowledge of tropical disease and methods of diagnosing them was critical to making the project a success. A handy hint for a “first time researcher”- get in contact with someone who knows! We also compiled a risk assessment which was updated regularly whilst away documenting all potential risks (*Appendix 1*).

Our arrival in Kenya

Anthony, final year veterinary student at the University of Nairobi

On arriving we spent a day orientating ourselves in Nairobi- meeting various people at scientific establishments; Kenyan Veterinary Services, University of Nairobi Veterinary School, and The Institute of Primate Research (IPR). This provided us with insight into veterinary clinical studies in Kenya and veterinary practice of both Kenyan and non-Kenyan residents. And the importance of registration when working overseas. These meetings enabled myself and my colleague, Lorna Bell to have a support network of appropriate contacts as well as allowing us to meet our Kenya peers and make lasting friends.

Week 1: The Institute of Primate Research (IPR), Karen- Nairobi



We spent our first week at the Institute of Primate Research, a biomedical research Institute of the National Museums of Kenya (NMK) located in the natural forest area at the edge of Karen township suburb. This research centre utilizes animal models, especially non-human primates in order to research pressing issues to do with human health; such as malaria and schistosomosis. Here, with the help of the expertise of scientists in the schistosomosis laboratory and the diagnostic laboratory myself and Lorna were able to test our techniques; Faecal concentration technique and Kato-Katz method (*Appendix 2*) and refine these methods within a laboratory setting before setting out to the field.

Obviously as, a veterinary student concerned with the welfare of animals used in biomedical research, humane treatments were forefront of my mind. Everyone at IPR was very welcoming and open about the treatment of the non- human primates, readily taking myself and Lorna to see the animals' housing and allowing us to be

present during the experiments. It was a shock to see our closest relative in cages but I must commend the personnel working at the Institute for their openness to discussion about improvements in order to provide a higher standard of animal care and ethics. As part of our stay at IPR Lorna and I wrote a report on our ideas on methods to improve animal welfare (*Appendix 3*). We hope this, alongside the work of the International Review Committee will contribute to the improvement of the welfare of non-human primates.

During our stay at IPR we got to know the scientists who resided on site. Many evening were taken up by dinner invitations which were both culturally and intellectually stimulating. Forever in our memory will be Dr Junga his German wife and their adopted son, Johanas, a HIV infected orphan. Johanas is such a lovely boy, quite a character, we hope to see the family on a future visit to Kenya.



Field work: Kwale Town



After a tour of Nairobi and the cultural points of interest, by Ngudi Collins, a laboratory technician at IPR we embarked on our 9 hour (“African time!”) bus journey with one toilet stop to Mombasa. We expected to arrive to blazing sunshine. In fact, we arrived to rain. And then more rain, which “good for the locals” but not so good for us. Our base for the next three weeks field work was Curio guesthouse in

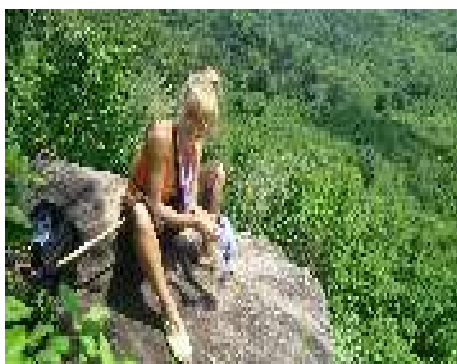
Kwale town.

The first days of our time in Kwale Town and the surrounding towns were spent introducing ourselves to residents and professionals in the area to make them aware of our project. This is an important part of research in the field; these courtesies are important and make the research more valuable and the experience all the more memorable. After various handshakes with the Head Warden of the Kenyan Wildlife Services (KWS), employees of KWS became our allies.

After all our discussion and preparation, in Nairobi, we were confident with our techniques and now were pretty good at identifying faecal parasites under a microscope. Now all we had to do was to find baboons, more importantly, their faeces. A easy task? No. And one that we could not do without the help of Soita Chimatwa and Bernard Ogowoka, researchers for KWS, and the help of the local people. Lorna and myself had done various literature searches on baboon behaviour and picked the brains of professionals at IPR about how best to find baboon faeces, but as we found out, nothing beats local knowledge..and a bit of patience!

After days of rain and not a single sighting of a baboon Bernard sat us down and made a plan of action consisting of time and places where to sight baboons from what they believed to be three baboon troops in the area. Our hopes were lifted. And yes, we saw baboons - lots of them, very close to where we were staying. We waited, we watched, and we searched and not a single faeces.

Even Bernard and Soita were surprised by this; maybe the baboons knew our plan? We continued our exploration of the sighting areas, familiarising ourselves with the areas and the behaviour of the baboon troops. On exploration of Golini, in the hills north of Kwale we then found some baboon faeces, fairly old and fairly dry but proof that baboons do in fact defecate! And gave us a few samples to test out our field equipment.



After a slow start our project began to gather momentum; more people were aware of our project, as we told them “angalais mavi ya nyani”- “We are looking for baboon faeces” in Swahili. We were getting more familiar with the habits of the baboons and

therefore allowing us to find real, fresh faeces that the dung beetles had only just got to. We were now, finally, ready to start processing samples.

Due to the unpredictable nature of baboon defecation and the shortage of time available to process we sometimes collected near 10 samples at one time and other times none. It was therefore difficult to prepare and look at a sample within half an hour collection (a necessity of the Kato-Katz method) therefore we decided that the formol ether concentration technique was most suitable technique for use in the field.

Outside our banda in our guesthouse became our “field laboratory.” Here, with help from the employees of the guesthouse, who provided us with water and candlelight when the water pump and electricity failed we processed samples. Guests and employees of the guesthouse were intrigued by our research and many people would sit and watch us process the samples. At times, even joining in- having a go at spinning the hand centrifuge! The processing part of our project went relatively smoothly, mainly due to pre-planning in the UK and our preliminary testing of the techniques at IPR. The only factor not considered in the laboratory was the evaporative ability of diethyl ether- emulsification agent of the formol ether concentration technique. This is what determined the termination of sample collection in our final week.

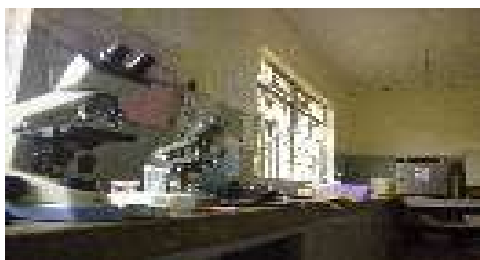


Diagnostics

After a week and a half of day long trips tracking baboons and familiarising ourselves with the routine of the baboon troops we could now think about looking at samples we had processed. We had borrowed two “antique” microscopes from the District Veterinary Officer, on the terms that we re-fitted them with bulbs kindly supplied by Reigna Stoakes, laboratory assistant at Cambridge University. On receiving these microscopes, we quickly realised they had not been in use for a while and would require some TLC before we could begin to think about using them. That was a job for the evening, microscope cleaning in our banda. We managed to start one working, but the other was too far gone. Thus, we started, very slowly, with ocular micrometer in place, reviewing microscope slides of our samples in our bedroom. With the single microscope shared between two sets of eyes and the somewhat volatile nature of the electricity supply in our banda this would take us a rather long time.

Fortunately, we had a stroke of good luck. On a visit to meet Parasitologist, Justus Macau, in Kwale hospital to discuss the burden of *Schistosoma* sp. and soil transmitted helminths of people of Kwale we were introduced to Susan, laboratory assistant in the field hospital. She, like everyone else we met, was keen to help us. She invited us to use the microscopes in the laboratory and even gave us the keys to the laboratory to allow us to gain access to it over the weekend.

Over the next week, our routine was one of early rises so as to visit “baboon hang outs” in search for faeces, breakfast at the guesthouse- chai, sausage, egg and bread, and the rest of the day in the laboratory. With various textbooks and the help of Susan we began to identify parasites.



Interestingly, we detected parasites with zoonotic potential; strongyle type eggs, ascarids and trichuris (a final review to be produced next year). We did not detect *Schistosoma* sp. on our fecal examinations, however, schistosomiasis is a known problem in the area. Discussions with local health experts such as Mr Macau informed us that *Schistosoma haematobium*, prominently a urinary pathogen, is the major *Schistosoma* sp. in the area, which is uncommonly found in faeces. Therefore, the baboons could be acting as a reservoir of infection, but due to the difficulty of retrieving urine in a non-invasive manner we were unable to investigate this further.

We did study the small river pools nearby in attempt to find snails, the important intermediate hosts, but due to unexpected rainfall, the pools were full and flowing fast making them inhospitable for snails.

Other aspects of the trip

Aside from the project itself we were exposed to various aspects of veterinary medicine. We were involved in a one day workshop of animal health and welfare, run the Professor John and his wife, Margaret Cooper in conjunction with Dr. Nderingo, the district veterinary officer. This workshop allowed us to meet animal technicians from the district and learn simple, yet effective techniques of restraint and sampling. It also gave me an insight into the resilience of the domestic species. On close examination, the short horn zebu cattle and goats we were examining were ridden with ticks and blood borne parasites, with marked lymphadenopathy and pale mucous membranes. Yet, from a distance, these animals looked in surprisingly good health. At this workshop I distributed tick removers, kindly donated by Arbury Road veterinary practice, Cambridgeshire.



At the end of our visit we took the time to visit Lamu, an island just off the north coast of Kenya where donkeys are the main mode of transportation. Here, we visited an Animal clinic dedicated to the welfare of the cats on the island and the Donkey Sanctuary, which I believe to be one of the best examples of foreign aid!



Working closely with local people I gained basic skills in Swahili and an appreciation of life and culture in Kwale, Coast Province. We weren't just “mzungus-” white people, to the local people but we became their friends. People took the time to teach us Swahilli, teach us Swahilli customs and swahilli culinary skills promoting me to buy pilau mix in a “douka,” a local convenience store, in order to re-create such a

culinary delight at home, yet an electric oven hob does not quite do it justice. One of my fondest moments is being asked to be “international judges” for a bodybuilding competition. A competition, such as this is funded by financial companies as an incentive for young men in villages to train and win competitions as a source of income for them and their family. So, myself, Lorna and a bank manager from Mombasa were trained in how to assess the muscle of each bodybuilder and then sat at our judging table to begin the judgement. Our judging efforts, even though somewhat amateur, were appreciated for their “non-biased nature”. Although, it might seem comical to consider corruption a concern, at a local body-building context, in Kenya, this remark seemed more poignant and reflective of wider political problems.



Final remarks

I have achieved a lot over the course of this trip and for this reason it has been a very valuable experience. In terms of scientific achievement my week at the Institute of Primate Research taught me a lot; becoming proficient at laboratory techniques and then adapting these so as to put them into use in the field. I hope that when the results have compiled and analysed properly that they will form part of scientific paper. In the field, the challenges faced taught me the importance of patience and persistence during fieldwork in the tropics as well as the importance of local knowledge and help.

Acknowledgements

A full list of acknowledgements can be found in *Appendix 4* I would particularly like to thank the BVA Overseas Group for their contribution towards this once in a lifetime experience and on a personal note, Professor John and Margaret Cooper who, without out them project would not have happened.