James Rennie Bequest

Work experience undertaken with the project
'Incrimination of vectors of *Trypanosoma vivax* in the new outbreak focus of Santa Cruz, Bolivia

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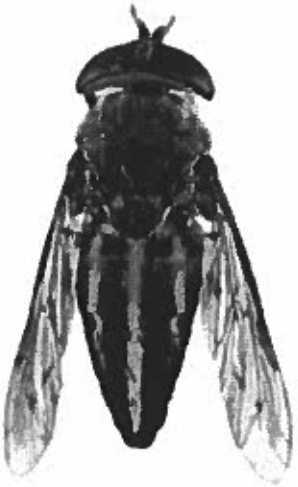


Tabanus occidentalis

Introduction

As work experience in Parasitology and Tropical Medicine, I joined a project on *Trypanosoma vivax* in Santa Cruz, Bolivia. The project was based in the city of Santa Cruz de la Sierra, but field studies occurred in different parts of the large department of Santa Cruz (370.621 Km^2).

The main members of this project are;
Dr Martin Hall, Head of Veterinary Entomology Programme, Department of Entomology, Natural History Museum London.
Ing. José Luis Aramayo, and assistant **Guido Zarate**, Department of Entomology, Museo de Historia Natural "Noel Kempf Mercado".
Dr Tudor Jones, Centre for Tropical Veterinary Medicine, University of Edinburgh;
Dr Gerardo Mendez Prado, Laboratorio de Investigacion y Diagnostico Veterinario LIDIVET, Santa Cruz.
I worked with Jose Luis Aramayo and Guido Zarate, and also with the staff in LIDIVET.

Bovine Trypanosomiasis is caused by the blood parasite *Trypanosoma (Duttonella) vivax*. The disease is accompanied by fever, parasitaemia, reduced milk production, abortion, and occasionally death. Weight loss is due to lethargy, lack of appetite and diarrhoea (Hall MJR, 1999). Cattle with other diseases, poor nutrition, and stress factors are more prone to infection (Hall MJR, 1999). In South America transmission is mechanical and involves tabanid flies. Typanosomiasis is a new problem in Bolivia, and the species of Tabanid present in Bolivia can be different and unique.

The purpose of the vector studies is to provide identification and incrimination of the vectors in Bolivia. This will enable the design of a plan for strategic application of prophylaxis, and the proposal for adaptive research on vector control.

The objective of this project is to improve the livestock of poorer people, as disease resulting in loss of a few animals has a high impact, because they also depend on the cattle for draught power and milk. Dairy herds are also at risk as they are composed of less tolerant exotic breeds and cross breeds (Hall MJR, 1999). These objectives can be achieved by designing control strategies, using knowledge gained in the project.

Work Undertaken & Methods used

Week 1

- **LIDIVET** (Thurs-Fri, 20-21st July) I was shown the thick and thin smears and the haematocrit centrifuge technique to confirm presence of Typanosomes. I also saw other parasitic, viral and bacterial infections, and helped to set up the different diagnostic techniques, e.g. for equine infectious anaemia tests, or simply identifying *Demodex canis*, which causes demodectic mange in dogs.

Week 2

- **Field Work, Chocolatal** (Mon-Fri, 24–28th July) (see map). This regularly visited farm, is positive for *T. vivax*, and provides a place of continuous vector studies in the same environment, like a test farm. The area seemed to consist mainly of subsistence farming, however Chocolatal was a very large property

owed by Alberto Rojas. He had tenants, but is main income was from Chocolate crops, as he himself only had 50 cows.

Fly traps were set up at various stations around the farm (see photos), and at the same positions as previous visits. Divided into pairs, I worked mainly with Guido Zarate, and Jose Luis Aramayo worked with another student from Santa Cruz. We collected the tabanids from the traps every day at 2.00pm, then identified and stored them. The other pair started the search for tabanid larva without success.

During the week we also collected 58 tabanids feeding on the cattle. The time of collection, name of cow and place on cow of collection was noted. The blood from the fly abdomen was removed and put on filter paper (see photos). The named and numbered samples were air dried and fixed with acetone. These samples were sent to Edinburgh for analysis. The flies were also categorised, identified, mounted and stored in a case. This procedure was repeated every day. The blood meal analysis techniques use double eluted squash preparations from the tabanids. These preparations are examined for the presence of trypanosome DNA by PCR using primer sets, in use in the CTVM.

There are two different types of trap, the Canopy trap which is optimised by use of odour bait, 1-octen-3-ol (see photos), and the Malaise trap which catches the flies by simple interception.

On the last day in Chocolatal, blood was also collected from the ears of 14 of the cattle. This was also put on filter paper, dried and then fixed with acetone. These samples are also sent Edinburgh and also London for analysis.

Week 3

- **Field Work, Pampa Grande and Mairana** (Wed-Fri, 2-4th Aug) (see map). This area was arid and dry. Two traps were set up on two different farms, however there were no tabanids present. The cattle in this area were very malnourished and underweight. The three days were spent collecting blood from the cattle on various farms in the area.

Week 4

- **Field Work, Cabezas and Abapo** (Wed-Fri, 9th-11th Aug) (see map). Again we collected blood from the cattle of various farms, and also larger ranches.

Week 5

- **Museum and LIDIVET** (Mon-Fri, 14-18th Aug)

Results

The results from the cattle tested while I was in Santa Cruz are not available yet, however I do have the general information gathered over the period of the project.

Before the project started confirming cases of Trypanosomiasis, cases were recorded spreading in direction of the main livestock trekking routes. The Red dots on the map show the general westerly spread. First in San Matias (1996), then San Vincente, to

San Ignacio de Velasco, San Javier, then eventually to Santa Cruz de Sierra (Hall MJR, 1999).

The project and LIDIVET are now working to identify and confirm areas positive for *Trymanosoma vivax*. I was informed that though LIDIVET testing, the following provinces have been confirmed as positive (Names in blue on map);-

- Prov. Guarayos,
- Prov. Nuflo de Chavez,
- Prov. J.M.de Velasco, in the area of San Ignacio de Velasco
- Prov. Chiquitos, the Laguana Concepion in which 86% of the cattle are infected, after the farmer purchased a large number of infected cattle from Brazil.
- Prov.G.Bush,

Farms in the department of Beni, have also been found to be positive. (see map).

The project itself has tested different areas in different Provinces with the following results.

Place	Province	Tests on Blood in feeding Tabanids	Tests on Blood from cattle	Results
Chocolatal	Guarayos	Yes	Yes	Positive
San Diego	Guarayos	Yes	No	Negative
Lake Dos Hermanos	Sara	Yes	Yes	Positive
El Valle	Guarayos	No	Yes	Negative
Cruz Norte	Guarayos	No	Yes	Positive
Trinidad	Dept.Beni.	No	Yes	Unknown
Pampa Grande	Florida	No	Yes	Unknown
Mairana	Florida	No	Yes	Unknown
Cabezas	Cordillera	No	Yes	Unknown
Abapo	Cordillera	No	Yes	Unknown

This shows that indeed Trypanosomiasis is spreading over the department of Santa Cruz and is now entering Beni.
The different species of Tabanid found in Chocolatal are listed below, and photos are also attached.

Tabanid species found on Cattle	Tabanid species found in Canopy traps (with 1-Octen-3-ol)	Tabanid species found in Malaise traps
Tabanus occidentalis	*Tabanus occidentalis*	*Tabanus occidentalis*
Tabanus claripennis	*Tabanus claripennis*	*Tabanus claripennis*
Tabanus ssp.	*Tabanus ssp.*	*Tabanus sorbillans*
Poecioloderas quadipunctatus	*Poecioloderas quadipunctatus*	*Diaclorus binaculatu*
	Tabanus sorbillans	
	Lepiselaga crassipes	

Conclusion

I believe that this project is essential in finding a means of controlling this unwelcome arrival into Bolivia. *Trypanosoma vivax* is a parasite, which poses a new problem to farmers who are already struggling to make a living and survive with their livestock.

This disease has only entered Bolivia in the last few years, from the Brazilian Amazonia. It is thought that the spread is due to increased cattle movement facilitated by extensive road construction. Also by the increased trading between Brazil and Bolivia in 1995, and 1996 as a result of depressed prices for Brazilian cattle (Hall MJR, 1999). There is also no control of cattle that cross the border, and no health checks during importation.

Considering that Livestock (mainly beef & milk production) represents 4% of the gross national product of Bolivia (Hall MJR, 1999), the spread of this disease qualifies as a significant problem for the country.

The main vectors of *T.vivax* have been found to belong to the family Tabanidae. The tabanid thought to be mainly responsible for the spread is *Tabanus occidentalis*.. This was the fly most frequently found on the cattle and in the traps.

It is important to study the seasonality and distribution of different species, to enable strategic timing and targeting of prophylatic treatments. Interestingly the tabanid species found on the cattle do not follow the same tend as those found in the traps. The species generally found in the Malaise and Canopy traps also differ.

However there are 32 genera, and 167 species of Tabanidae reported in Bolivia (J.E. Chainey et al., 1994) so incrimination is not that simple. Even in our short time in Chocolatal, we found a species new to the area. It will take much more work to identify which of these are capable of transmitting the disease, and which pose the most threat as a vector. Then it will be possible to design a plan for strategic application of prophylaxis, and ultimately adaptive research on vector control can be started.

References

Chainey J.E. et al. (1994) A preliminary checklist and key to the Genera and subgenera of Tabanidae (Diptera) of Bolivia with Particular reference to Santa Cruz Department. Mem Inst Oswaldo Cruz, Rio de Janeiro Vol 89(3): 321-345.

Hall, M.J.R. (1999) Research and Development Funding Application and Project Memorandum Form.

Acknowledgements

I would like to thank the Committee for awarding me for the money, which paid for my plane tickets, as without this financial help I would not have been able to have this unforgettable and invaluable summer.

I would also like to acknowledge Tudor Jones for helping me to find and obtain this work. I also want to thank the Jose Luis Aramayo and Guido Zarate for there very warm welcome and the knowledge they passed on to me. Working with them I was not only gained biological knowledge, but I also learnt much about my country and heritage for the first time. I experienced the charms and the struggles, of life in some of the most remote areas of this enormous varied country. My Spanish also improved enormously. Also I would like to acknowledge the welcome and knowledge that the LIDIVET staff passed to me. Lastly I would like to thank my parents for providing the rest of my financial support, and also their encouragement towards my plans.

Appendices

Itinerary

Week 1

- Wed, 19th July I was introduced to the staff at Museum and in LIDIVET, and shown around.
- Thurs-Fri, 20-21st July During these two days I worked in LIDIVET, from 8.00am-4.00pm. These few days were very useful, as I had not had much experience with veterinary matters in the past. I was able to learn about, and see many tropical infections, that do not exist in Britain.

- Mon-Fri, 24–28th July We travelled five hours north to Chocolatal farm, near Ascension de Guarayos (see maps). The landscape was completely wooded, with small patches of slash and burn farms. This was a new experience of a tropical environment, remote and isolated from amenities. We stayed in tents under a traditional thatched shelter, next to the river San Pablo that is the border to the department of Beni (see photos). I was also particularly taken with the diversity of plant and insect life in this area, especially the Butterflies.

Week 2

- Mon-Tues, 31-1st Aug I worked in Museum, entering data into the computers.
- Wed-Fri, 2-4th Aug I went to Pampa Grande and Mairana (see maps). Here we stayed in accommodation provided by the Priest. It was basic but we had beds, which was the main thing. We were also able to get dinner and lunch in the village. It was very clear that the livestock were suffering in this area, from the lack of pasture and water.

Week 3

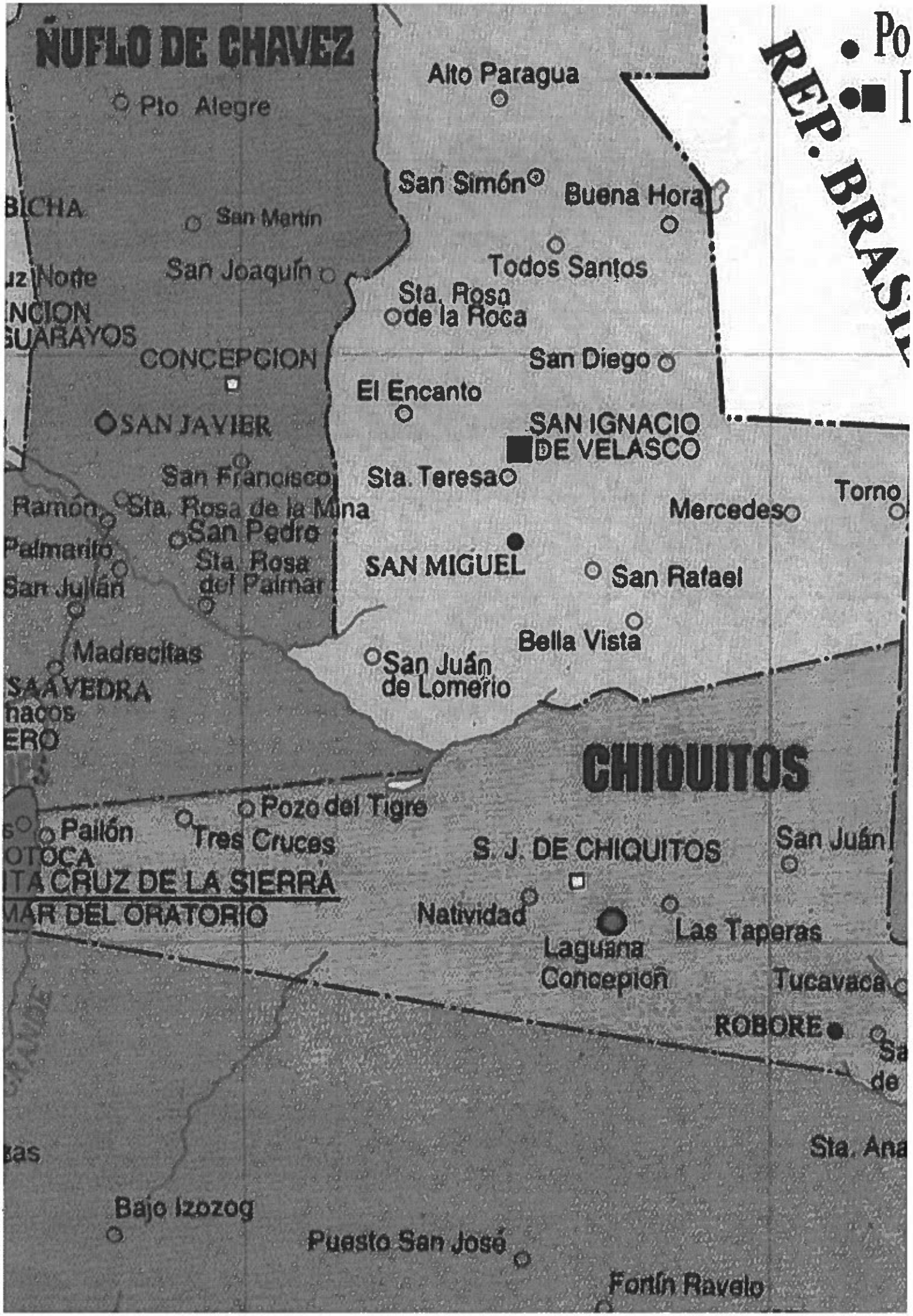
- Mon-Tues, 7-8th Aug Worked in the museum, entering data into the computer.
- Wed-Fri, 9th-11th Aug Went to the village of Cabezas, then to Abapo, which was three hours south of Santa Cruz. Here we stayed with the Veterinarian. We had beds, but even better there was a toilet, and I had my own room. The livestock there were also very malnourished and many were diseased.

Week 4

- (Mon-Fri, 14-18th Aug) My final week was spent in the Museum and LIDIVET, doing general work and also collecting information before I returned to La Paz.

Financial Support

I was Awarded £500 from the Weir Fund for Field studies and Barson Bequest, and £300 from the James Rennie Bequest. The money was spent on the plane tickets, which cost £677 for London to La Paz, then a further £132 for the flight from La Paz to Santa Cruz, a total of £809. I then needed to personally finance my accommodation, food, vaccinations, and camping and First aid equipment, this cost approximately £380 more.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