5. RESULTS

5.1 Trypanosomosis prevalence and incidence in sentinel cattle

A total of 170 blood samples from the sentinel cattle was examined in the Faro and Deo Division in March 2004. Trypanosomes were detected in 5 animals. Four infections were due to *T. congolense*, and one due to *T. brucei*. The prevalence in the plateau, buffer zone and in the valley was 1.8, 5.2 and 2.0%, respectively. During the eleven months surveillance period, a total of 60 new trypanosomal infections were detected in the sentinel cattle: 3 in the plateau, 25 in the buffer zone and 32 in the valley. In all zones *T. congolense* was the most (n=52; 86.7%) common species. *Trypanosoma vivax* was detected in 10% (n=6) of the cases and *T. brucei* in 1.7% (n=1). The remainder were mixed infections of *T. congolense* and *T. vivax* (n=1; 1.7%). The monthly incidences for each of the three zones are shown in Fig. 5.1. They ranged from 3.7 to 20.0 % and 1.8 to 13.4% in the valley and buffer zones, respectively. In the plateau, the incidence remained very low (0-2.1%).

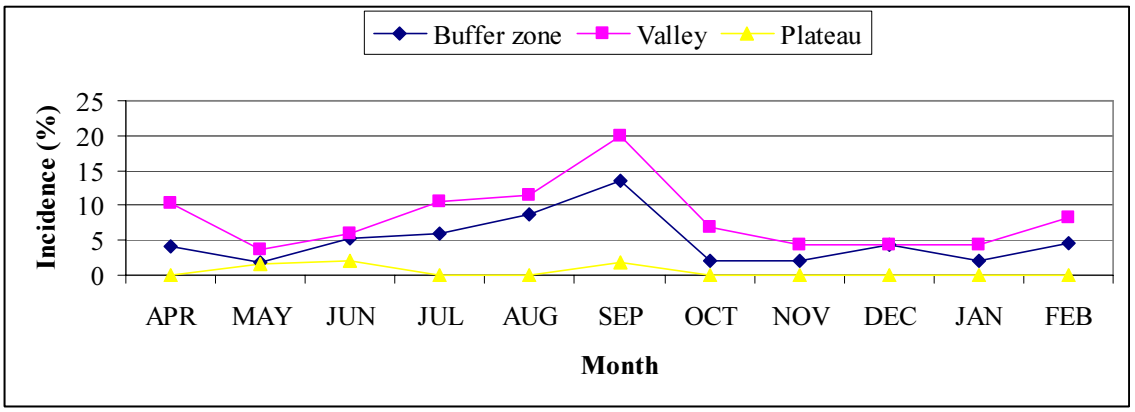

Figure 5. 1 Trends of monthly incidence of trypanosomosis in the sentinel herds in the Faro and Deo Division, Cameroon (April 2004-February 2005)

The average trypanosomosis incidence in 3 sentinel herds of the plateau during the whole study period was significantly ($p<0.001$) lower than in the valley and the buffer zone. But, the average incidence in the sentinel herds in the valley was higher ($p<0.05$) than in the buffer zone. In both zones, the maximum incidence was recorded in rainy season in September 2004. The Analysis of Variance on the PCVs among the three zones (Fig. 5.2) showed no significant ($p = 0.304$) differences. Nevertheless, the plateau had a slightly higher

mean PCV of 32%. In all three zones, there was a tendency of mean PCV increases between June and July. Afterwards the means slightly decreased and levelled out.

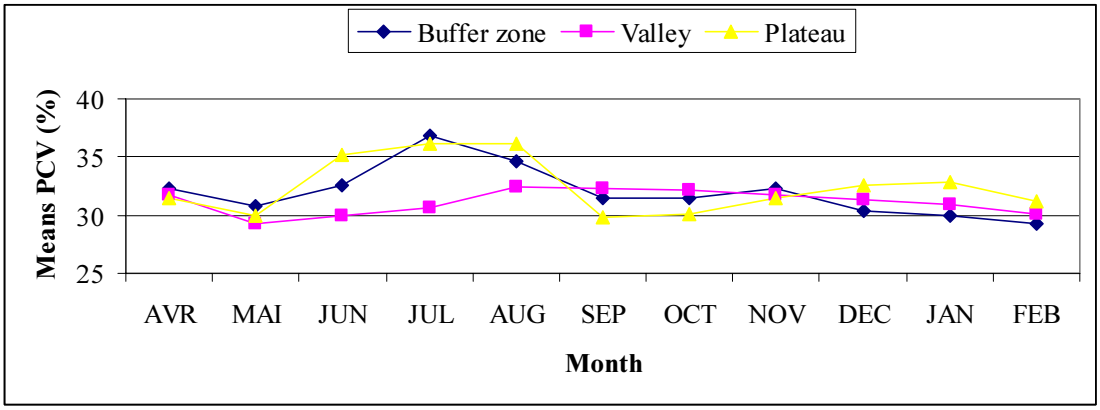

Figure 5.2 Patterns of monthly means of PCV in the sentinel herds in the 3 zones of the Faro and Deo Division, Cameroon (April 2004- February 2005)

5.2 Tsetse monitoring around sentinel herds

A total of 744 (263 females and 481 males) *G. m. submorsitans* and 5 *G. tachinoides* (2 females and 3 males) were captured in the valley between April 2004 and September 2005. In contrast, only 6 *G. morsitans submorsitans* (1 female and 5 males) were captured in the buffer zone and none on the plateau. The monthly mean indexes of abundance are shown in Fig 5.3. These showed bi-modal distribution where they peaked between May and June 2004 and May and June 2005. The lowest indexes were recorded between December 2004 and February 2005.

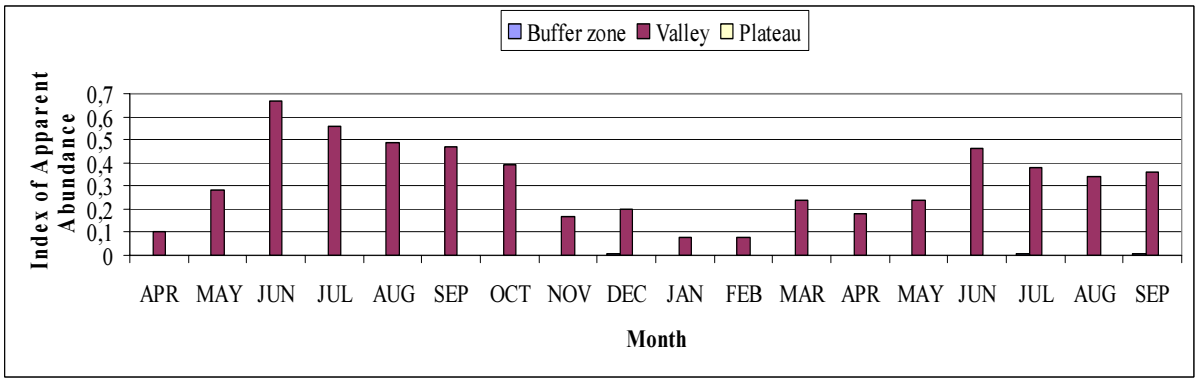

Figure 5. 3 Monthly mean Indexes of Apparent Abundance of tsetse caught per trap per day in the vicinity of the sentinel herds in the 3 zones of the Faro and Deo division, Cameroon, April 2004-September 2005

5.3 Sero-conversion during transhumance

From the 100 sero-negative calves only 78 could be sampled again upon return from transhumance. In twelve (15.4%) calves, anti-trypanosomal antibodies were detected. The proportion of animals that sero-converted varied by the herd and the area.

5.4 Apparent Abundance of tsetse along trap-transects

Throughout the study, a total of 2195 *G. m. submorsitans* and 23 *G. tachinoides* were captured using the 33 fly traps. No tsetse flies were captured in traps along the Tig wog and Lib Mbak transects. The Alme Parc transect accounted for 619 males and 328 females of *G. m. submorsitans* and 8 males and 11 females of *G. tachinoides*. A total of 65 males and 24 females of *G. m. submorsitans* were captured in the transhumance section in the Border Plateau transect. The seven traps in the game section of the Border plateau captured a total of 686 males and 473 females of *G. m. submorsitans* and 3 males and 1 female of *G. tachinoides* The seven traps deployed in the buffer zone captured a total of 2 males and 3 females of *G. m submorsitans*.

The monthly mean Index of Apparent Abundance (IAA) of tsetse varied between seasons and among sampling sites. In the valley, where cattle were kept during transhumance (transhumance section of the Border Plateau transect and Alme Parc transect), the monthly mean IAA was highest during dry season (October-February) (Fig 5. 4). Closer to the game reserve (Alme Parc and the game section of the Border Plateau transects), on the other hand, tsetse monthly mean IAA was highest during the rainy season (March-September). The

seasonal IAA was significantly (p = 0,0001) higher in the game section than in the transhumance section (4.8%) (Fig 5. 4). The monthly mean IAA of tsetse in the transhumance section of the Border Plateau transect was significantly (P = 0,000) different with the monthly mean IAA in the game section of this transect. The game section IAA values were always higher than those of transhumance section IAA values (Fig 5. 4).

All games sections from the two trap-transects had 97% females compared to transhumance area with 2.9% Females. The two proportions were significantly (p = 0,0001) different.

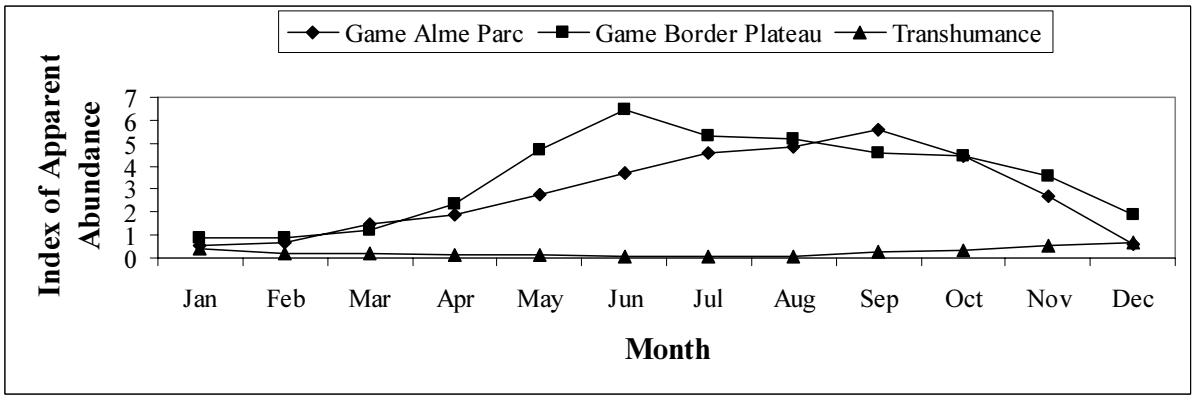

Figure 5.4 Monthly mean Indexes of Apparent Abundance of *Glossina morsitans submorsitans* in the ■ Game section of the border plateau transect ♦ Game area Alme parc ▲ Transhumance section of the border plateau transect in the two transects in the valley bordering the Adamaoua plateau (January-December 2005)

5.5 Apparent Abundance of tsetse a long fly-round-transects

A total of 1007 *G. m submorsitans* were captured during 24 fly-rounds; 794 (78.8%) were males flies. The number of tsetse captured during each fly round varied substantially between seasons and among sections. Most (86 %) of the flies were captured along the transect traversing the game area with the highest being recorded at the end of the rainy season (August-September) and lowest during the dry season (November-March) (Fig 5. 5). The monthly mean IAA of tsetse in the transhumance section increased at the end of the rainy season (September-October) and the beginning of the dry season and peaked during the dry season but was lowest during the rainy season (April-September) Fig. 5.5. There were no significant (p=0.390) differences between the sex ratios in the two areas namely, Game and Transhumance. There were also no (p= 0.302) associations between the two areas and the fly

sexes. There was a significant (p= 0.007) negative correlation (r = -0.733) between the IAA of the two areas .

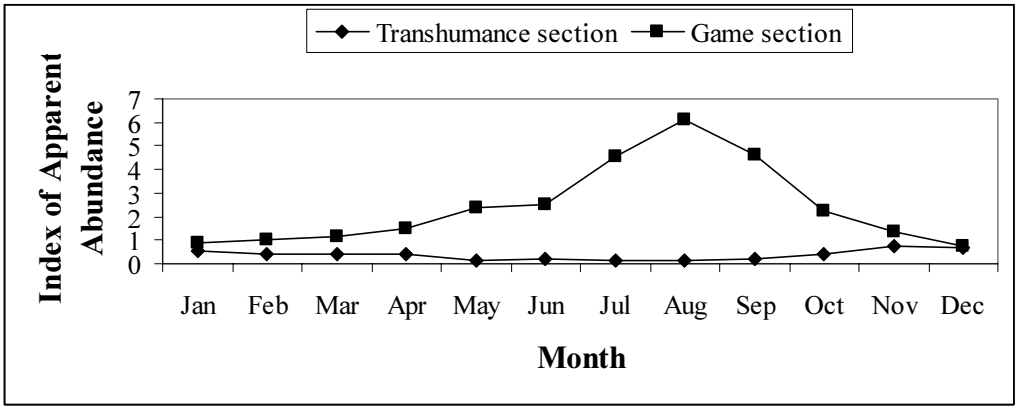

Figure 5. 5 Monthly mean Indexes of Apparent Abundance of *Glossina morsitans submorsitans* along the fly-round transects in the (♦) transhumance section, (■) in the game section of the valley bordering the Adamaoua plateau, Cameroon (January -December 2005).

5.6 Isometamidium-block treatment at Kontcha village

Cross-sectional study

The prevalence of cattle trypanosomosis in the four villages ranged from 10 (Mayo-Baleo) to 32.5% (Kontcha) (Table 5.1) with 78.6%, 15. 5% and 0.9% *T. congolense, T. brucei and T. vivax*; respectively. The remainder 4, 8% was of mixed infections of *T. congolense and T. brucei.*

Table 5.1 Prevalence of cattle trypanosomosis in four villages of Adamaoua, Cameroon, 2004

Village	Number of herds	Number of cattle sample	Number of positive animals	Prevalence (%)
Mayo-Baleo	4	119	12	10,1
Mayo-Zaoule	5	122	21	17,2
Alme	5	132	31	23,4
Kontcha	5	120	39	32,5
Total	19	493	103	20,9

Questionnaire analysis

Most 92% out of 64 cattle breeders were able to identify the clinical signs of cattle trypanosomosis and were aware that tsetse flies were the vectors of trypanosomosis. Trypanosomosis was considered the most (85%) important disease that affected cattle in the region, followed by pasteurellosis (9%) and gastro-intestinal diseases (6%). About 90% of cattle breeders treated their animals themselves while 5% asked for help from other cattle breeders and only 4,7% sought veterinary services in administering trypanocides.

Longitudinal study

After treatment at day 0 with diminazene aceturate at 7.0 mg/kg b.w., trypanosomes were detected in 13 out of 40 cattle (Table 5.2), giving an incidence of 32.5% (95% CI: 18.6-49.1%). However, in the group treated with isometamidium trypanosomes were detected in 11 out of 40 cattle (Table5.3), within a period of 8 weeks, giving an incidence of 27.5% (95% CI: 14.6-43.9%) The mean hazard ratio of new infections between the group treated with diminazene and isometamidium group was 1.38 (95% CI: 0.6-3.2%) and was marginally significant (p=0,045) from 1. There were no significant differences between the Kaplan-Meier curves relapse times of the two groups (Fig 5. 6).

Table 5.2 Summary results of parasitological diagnosis of trypanosomosis in the group treated with diminazene aceturate

Animal Number	Sex	Age in years	BCT				
			Day 0	Day 14	Day 28	Day 42	Day 56
124	F	4	1	1*	ND	-	1
126	F	2	2	-	-	-	-
127	F	2	1	-	ND	ND	ND
129	M	2	-	1*	1°	-	-
132	M	2	1	-	-	-	-
133	M	2	-	1*	1°	-	-
136	M	3	-	1*	-	1	ND
137	F	3	1	1*	-	1	-
140	M	2	-	-	-	-	1
161	M	3	-	1*	1°	-	-
163	M	3	1	-	-	-	-
164	M	2	1	-	1	-	-
165	M	3	-	-	-	2	1,2*
166	F	2	-	-	1,2	-	-
168	M	2	1	ND	-	-	-
169	F	3	1	-	-	-	-
172	F	7	-	3*	-	1	-
174	F	8	1	1*	1°	-	1
176	F	4	1	-	-	-	-
178	F	7	-	-	1	1*	-

1: *T. congolense*; 2 : *T. vivax*; 3 : *T. brucei* ; ND: not done; M: male; F: female; : BCT: *Buffy Coat* ; * suspicion of diminazene resistance; ° animals which were not cured after a second treatment with diminazene.
-= Negative

Table 5.3 Summary results of the parasitological diagnosis of trypanosomosis in the group treated with isometamidium chloride

Animal Number	Sex	Age in years	BCT				
			Day 0	Day 14	Day 28	Day 42	Day 56
101	M	4	2	-	1,2*	1**	-
104	F	4	1	-	-	-	-
105	F	6	1	-	-	1*	-
107	F	6	-	1*	-	-	-
109	M	4	1	-	-	-	-
112	M	3	-	-	1*	1**	1**
114	F	4	1	-	-	-	-
117	M	2	-	1*	-	-	-
118	F	2	1	-	-	-	-
141	M	4	1	-	1*	1**	1**
143	F	4	1	-	-	-	-
148	F	3	1	-	-	-	-
149	M	4	1	-	-	-	-
151	M	2	1	-	1*	1**	-
153	M	2	-	-	-	1*	1**
154	F	3	1	-	-	-	-
156	M	4	-	-	ND	2*	-
157	F	2	1	-	1*	-	1
159	F	3	-	1*	-	1	-

1: *T. congolense*; 2: *T. vivax*; 3: *T .brucei*; BCT: *Buffy Coat*; M: male, F: female; ND: not done; * Suspicion of resistance to isometamidium ** Suspicion of resistance to diminazene -= Negative

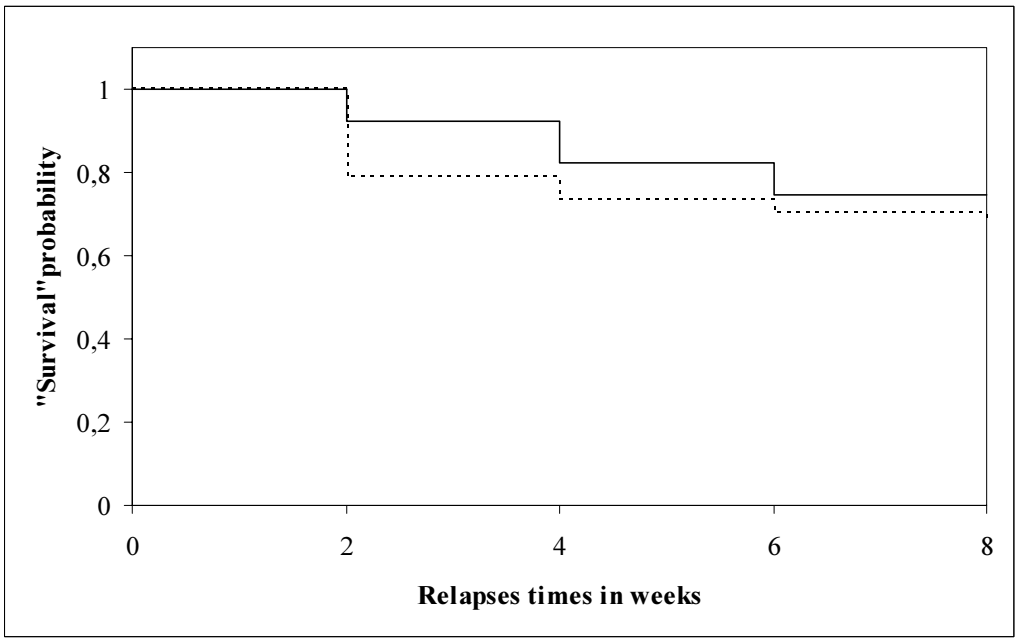

Figure 5. 6 Kaplan-Meier "survival curves" showing relapse times of trypanosomosis in weeks after cattle at Kontcha village Cameroon were treated with diminazene (-----) and isometamidium (──)

5.7 Drug-sensitivity of trypanosome isolates from Kontcha village in mice

Five or six out of 6 mice relapsed after treatment with isometamidium chloride at the doses of 1 or 10mg/kg b.w. or diminazene aceturate at doses of 20 or 40mg/kg b.w (Table 5.4)

Table 5. 4 Drug sensitivity of 6 *Trypanosoma congolense* cattle isolates from Adamaoua, Cameroon, tested in mice treated with isometamidium chloride or diminazene aceturate

Trypanosome stocks	Days of isolation after treatment	Isometamidium chloride		Diminazene aceturate	
		1mg/kg	10mg/kg	20mg/kg	40mg/kg
Kont 2/159	42 (I)	5/6*	ND	ND	ND
Kont 2/151	28 (I)	6/6	6/6	6/6	6/6
Kont 2/174	14 (D)	ND	ND	5/6	ND
Kont 1/124	14 (D)	6/6	6/6	6/6	6/6
Kont 1/129	14 (D)	6/6	6/6	6/6	6/6
Kont 2/133	14 (D)	6/6	6/6	6/6	6/6

I= Isometamidium; D= Diminazene; ND=Not done; *= relapsed/ treated

5. 8 Drug sensitivity studies in mice of trypanosome isolates collected from the valley and buffer zone

Twenty trypanosome isolates from the different villages of the infested and buffer zone of the Adamaoua plateau were tested at a single discriminatory dosage of 1mg/kg for isometamidium and 20 mg/kg, for diminazene. Trypanosomes developed successfully in at least 5 of the 6 non treated control mice for each of these isolates. Four isolates were sensitive to both isometamidium and diminazene. However, all the other isolates were resistant to either isometamidium or diminazene 13 isolates were resistant to diminazene (76.4%) and 16 were resistant to isometamidium (84.2%) (Table 5.5).

Table 5. 5 Summary results of drug sensitivity tests in mice

Number	Code	Trypanosome species	Isometamidium 1mg/kg	Diminazene 20mg/kg
1	Sarma	*T. brucei*	6/6*	6/6
2	Gadz	*T. brucei*	1/6	0/6
3	Pawti	*T. brucei*	0/6	0/6
4	Gadz2	*T. brucei*	0/6	0/6
5	Gwti	*T. brucei*	0/6	0/6
6	Galim	*T.congolense*	3/6	5/6
7	Guemf	*T.congolense*	6/6	6/6
8	Djem	*T.congolense*	6/6	6/6
9	Kont Rs	*T.congolense*	2/6	3/6
10	Alme	*T.congolense*	4/5	6/6
11	Lompt	*T.congolense*	3/6	6/6
12	Sadek	*T.congolense*	5/6	ND
13	Guasgue	*T.congolense*	6/6	6/6
14	Tigne	*T.congolense*	ND	6/6
15	Sabon	*T.congolense*	6/6	6/6
16	Wogdo	*T.congolense*	6/6	ND
17	Likok	*T.congolense*	6/6	6/6
18	Beka	*T.congolense*	6/6	6/6
19	Jabe	*T.congolense*	6/6	6/6
20	Duel	*T.congolense*	6/6	ND

ND= Not done; */ =Relapsed/Treated